



STEGE SANITARY DISTRICT

*STANDARD SPECIFICATIONS
AND DETAILS*

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*7500 Schmidt Lane
El Cerrito, CA 94530-0537
Phone 510/524-4667
Fax 510/524-4697*

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SECTION 1

INTRODUCTION

1-01. GENERAL INTRODUCTION

The STANDARD SPECIFICATIONS for sewerage shall govern requirements, design, and all work in connection with sewer construction within the jurisdiction of the Stege Sanitary District of Contra Costa County, California. The jurisdiction of the Sanitary District includes the entire sewerage system and its appurtenances from the point of connection with the building plumbing to the discharge terminus of the collection system. The Code and all ordinances of the District shall be considered a part of these Specifications and all plans, profiles, cut sheets, easement documents, and specifications shall conform to the standards and requirements herein established.

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

Only special provisions for particular District-designed projects, notes pertaining to sanitary sewer systems on drawings and plans approved for construction by the District, or the requirements of other jurisdictional authority when more stringent shall govern over these Specifications where apparent conflict may exist. Where any section, paragraph, subparagraph, clause, or other requirements of these Specifications is modified, deleted or additions are made thereto by the requirements and conditions shown or set forth in such aforesaid special provisions or District-approved plans, the unaltered provisions of that section, paragraph, subparagraph, clause, or drawing of these Specifications shall be considered to remain in effect.

END OF SECTION 1

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SECTION 2

DEFINITIONS AND TERMS

2-01. DEFINITIONS AND TERMS

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

ABBREVIATIONS

AAN	- American Association of Nurserymen
AASHO	- American Association of State Highway Officials
ACI	- American Concrete Institute
ANSI	- American National Standards Institute
AREA	- American Railway Engineering Association
ASCE	- American Society of Civil Engineers
ASME	- American Society of Mechanical Engineers
ASTM	- American Society of Testing and Materials
AWPA	- American Wood Preservers Association
AWS	- American Welding Society
AWWA	- American Water Works Association
OSHA	- CA Division of Occupational Safety and Health Act
Fed. Spec.	- Federal Specification
IAPMO	- International Association of Plumbing and Mechanical Officials
WPCF	- Water Pollution Control Federation

ACCEPTANCE: The formal written acceptance by the District Engineer of an entire project which has been completed in all respects in accordance with the Plans and Specifications and any modifications thereof previously approved.

ANNEXATION: The inclusion of property within District boundaries by proper legal procedures.

APPROVAL FOR CONSTRUCTION: The stamp, "Plans Approved for Construction," on the Plans signed and dated by the District Engineer, indicates that plans have been approved by the District for construction.

BACKFILL: Earth or other special material used to replace material removed from trenches during construction which is above the pipe bedding or concrete trench slab.

BEDDING: That portion of the trench backfill which encases the sewer pipe to a minimum of six (6) inches above and three (3) inches below the barrel of the pipe for the purpose of properly supporting the pipe.

BOARD OF DIRECTORS / BOARD: The governing body of the District.

BUILDING DRAIN: The building drain is that part of the lowest piping of a drainage system which receives the discharge from waste and other drainage pipes inside the walls of the building and conveys it to the building sewer (side sewer), which begins two (2) feet outside the building wall (building foundation).

CAL TRANS: State of California, Department of Transportation.

CITY: Any incorporated municipality lying partly or entirely within the District.

CODE: The Stege Sanitary District Ordinance Code, as approved and adopted by the District Board and as it may be amended from time to time.

CONTRACTOR or SIDE SEWER CONTRACTOR: Any Contractor who meets District requirements and is licensed by the state of California to enter into contracts for and to perform the work of installing sewers under District jurisdiction.

COUNTY: The county of Contra Costa, state of California.

CUT SHEETS: Cut sheets are sheets of tabulated data, indicating stationing, structures, fittings, angle points, sewer slope, staking offset, various elevations, offset cuts, and sewer depth.

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

DISTRICT: The Stege Sanitary District, Contra Costa County, California.

DISTRICT BOARD: The governing body of the District.

EASEMENTS: Easements are areas along the line of all main sewers which are outside of dedicated sewer or road easements or rights-of-way, and shall be prepared on District forms granting rights along the line of the sewer to the District.

ENGINEER: The District Engineer (District Manager), acting either directly or through authorized agents.

FIXTURE UNIT EQUIVALENTS: The unit equivalent of plumbing fixtures as tabulated in the Uniform Plumbing Code and as modified herein.

HOMEOWNER: A person(s) who owns and occupies or will occupy the residence on which sewer work will be performed.

INSPECTOR: The person for the District duly authorized by the Engineer and responsible for the particular duties delegated to him.

JOB ENGINEER: An engineer, including the District Engineer, licensed by the state of California as a civil engineer, under whose direction plans, profiles, and details for the work are prepared and submitted to the District for review and approval.

MAIN SEWER: A main sewer which has been or is being constructed to accommodate more than one (1) side sewer or another main sewer and is located within a public right-of-way.

MANUFACTURER'S NAME: Any manufacturer's name, specification, catalog number, or type used herein is specified by make in order to establish the standard requirements of the District. Other equivalent makes will be considered for approval providing they are comparable with this established standard.

OTHER SPECIFICATIONS: Wherever in these Specifications other specifications are mentioned, it shall be understood that the materials or methods mentioned therewith shall conform to all requirements of the latest revision of the Specifications so mentioned.

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

PARCEL NUMBER: Parcel number is an arbitrary number assigned to each parcel of right-of-way, including reserves, easements, and miscellaneous right-of-way.

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

PERMITS or LICENSES: Clearances to perform specific work under specific conditions at specific locations. The Job Engineer shall furnish to the District all necessary plans and documents required for the District to allow application for permits and/or licenses.

PERSON: Any person, firm, company, corporation, or association.

PIPE TYPES:

- C.I. - Cast Iron
- C.L. - Concrete Lined Steel Cylinder
- C.L. & C. - Concrete Lined and Coated Steel Cylinder
- D.I. - Ductile Iron
- H.D.P.E. - High Density Polyethylene
- R.C. - Reinforced Concrete
- V.C. - Vitrified Clay

PLANS: Construction plans, including system maps, sewer plans and profiles, cross sections, detail drawings, etc., or reproductions thereof, approved or to be approved by the District Engineer, which show the location, character, dimensions, and details for the work to be done and which constitute a supplement to these Specifications.

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

PRELIMINARY REVIEW: Plans stamped "Preliminary Review," dated and signed by the District, indicate that the Plans have been reviewed, and may now be submitted as a part of the requirements for approval for construction.

RECORD DRAWINGS: Plans signed and dated by the District representative, indicating that the Plans have been reviewed and revised, if necessary, to accurately show all the final construction details.

RIGHT-OF-WAY: All land or interest therein which by deed, conveyance, agreement, easement, dedication, usage, or process of law is reserved for or dedicated to the use of the general public, within which the District shall have the right to install and maintain sewers.

ROADBED: The upper portion of the graded roadway, usually considered to include the area between the intersections of the said upper portion and the side slopes or curb lines upon which area the base courses, pavement or surfacing, shoulders, and median are constructed.

ROADWAY: All of a right-of-way dedicated, granted, used, or to be used for vehicle movement.

SANITARY DISTRICT: The Stege Sanitary District.

SECTION: Any reference to a section which is not accompanied by further reference refers to a section or sections of these Specifications.

SEWERS:

TRUNK SEWERS: A main sewer which has been or is being constructed to accommodate one or more main sewers and is not used for side sewer connections. (Normally twelve (12) inches or greater in diameter.)

MAIN SEWER: A main sewer which has been or is being constructed to accommodate one (1) or more side sewers (normally six (6) to ten (10) inches in diameter).

SIDE SEWER or LATERAL SEWER: The privately owned and maintained sewer line which links the sanitary or waste plumbing (building drain) of a house or other building with the main sewer. The side sewer includes that portion of pipe extending from a point of connection with the building drain to and including the connection to the main sewer. The point of connection to the building drain shall be two (2) feet or less from the building foundation at the point where the plumbing first extends outside the foundation (normally four (4) or six (6) inches in diameter).

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

SEWER PROFILES: Sewer profiles (Scale: 1" = 100' Horiz. & 1" = 4' Vert.) are detail drawings which show the vertical relationship between the sewer line invert, the ground surface at time of construction and the finish surface, and other existing and/or proposed underground facilities.

SINGLE FAMILY RESIDENCE: Single living structure designed to accommodate one (1) average family unit.

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

SPECIFICATIONS: The directions, provisions, and requirements contained herein as supplemented by such special provisions as may be necessary pertaining to the method and manner of performing the work or to the quantities and qualities of materials to be furnished under the Contract. The Special Provisions are specific clauses setting forth conditions or requirements peculiar to the project under consideration and covering work or materials involved in the proposal and estimate but not satisfactorily covered by these Standard Specifications.

STANDARD DETAILS: The drawings of structures or devices commonly used on District work and referred to on the Plans and in these Specifications.

STANDARD SPECIFICATIONS: The Standard Specifications of the Stege Sanitary District as contained herein and all subsequent additions, deletions, or revisions.

STATE: The state of California.

STATE STANDARD SPECIFICATIONS: The Standard Specifications of the state of California, Business and Transportation Agency, Department of Transportation, current issue.

STREETS or ROADS: Any public highway, road, street, avenue, alley, way, easement, or right-of-way, etc. used or to be used for vehicle movement.

STRUCTURES: Those structures designated on the Standard Drawings as manholes, rodding inlets, etc. Detailed drawings of structures or devices commonly used in District work and mentioned in this guide are included in the Standard Specifications.

SUBCONTRACTOR: Any individual, partnership, firm, or corporation entering into a contract with the Contractor to perform part of the work.

SUPERINTENDENT: The executive representative of the Contractor, present on the work at all times during progress, and authorized to receive and fulfill instructions of the Engineer.

SYSTEM MAPS (by Job Engineer): System maps are 1" = 600' and 1" = 100' scale maps on the first sheet or sheets of the Plans showing the relationship and ties between the properties to be improved and the nearest intersection of existing county or city improved road on each side of the property. The system maps also show all proposed sewer improvements and all parcels to be served by the improvements.

TRAVELED WAY: The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

UNIFORM PLUMBING CODE: The Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials, current edition.

WORK: All the work to be done under District permit or inspection, in accordance with the Plans, Specifications, and/or special provisions, and/or permit conditions.

END OF SECTION 2

SECTION 3

CODE PROVISIONS AND POLICIES (GUIDE FOR ENGINEERS)

3.01. DESCRIPTION

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

3-02. GENERAL REGULATIONS

The District Code provides the authority of the Engineer and Inspectors, provides for inspection and review fees, states that only licensed contractors (and Owners in one specific case) may perform work, requires contractor bonding, and provides for establishment of uniform connection and use charges.

3-03. CONNECTION SECTIONS OF CODE

The connection sections of the Code require payment of fees for sewer use for each connection or addition to the system. The Code also provides for commercial connection fees and a yearly sewer service charge.

3-04. PAYMENT OF FEES AND CHARGES

Permit, fees, including plan review and inspection fees, if required, must be paid before any sewer work is started. The payment of all other District charges and fees must be deferred until the time of the connection of buildings to the sanitary sewer system.

3-05. (RESERVED)

3-06. ENFORCEMENT ACTIONS

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

3-07. ANNEXATION POLICY

The annexation policy of the District requires the consideration of service to any property in the ultimate service area and that all properties served must annex to the District and pay annexation charges.

Annexation charges are intended to equalize the investment in major facilities between properties which have been previously annexed to the District and those joining the District.

Annexation charges represent the unit value of the major District facilities. Properties annexed must provide their own local and private sewerage and must pay all fees prior to receipt of service.

Only complete properties of legal record can be annexed. All annexations are subject to approval of the Contra Costa County Local Agency Formation Commission (LAFCO).

3-08. RIGHT-OF-WAY POLICY

All main sewers shall be in rights-of-way or easements granted or dedicated for main sewers to the District.

In public roads, further dedication is not necessary unless specifically required. All new easements must be granted or dedicated to the District as sewer easements.

All sewers in public roads shall be within the paved portion of said road.

It is the intent of the District to minimize the use of side yard and rear yard easements. Whenever possible, the Job Engineer shall design sewer systems so that main and trunk lines will be located within paved rights of way.

Sewer easements are granted to the District for the purposes of constructing, laying, maintaining, and operating sewer pipes, appurtenances, and appliances together with the reasonable right of access to such easement for said purposes over the remaining lands of the grantor. The minimum width of easements shall be ten (10) feet for sewer lines less than twelve (12) inches in diameter, fifteen (15) feet in width for lines of twelve (12) through fifteen (15) inches in diameter, and twenty (20) feet width of lines over fifteen (15) inches in diameter. In all cases, easements shall be centered on the sewer line.

In cases where the creation of easements is justified, access to manholes shall be provided for maintenance.

3-09. CAPACITY REQUIREMENT

When the District, in its sole judgment, determines that a proposed new connection(s), including an alternative use of existing connections, will exceed the sewer capacity of existing sewer lines, it may:

- a. Require the developer(s) of such proposed new connection(s) to contract for, at their own expense, a qualified engineering firm to conduct a study of the impact of such proposed connection(s) on existing pipelines and any required sewer improvements to eliminate under capacity. Upon District approval and agreement with such study, the developer(s) shall pay the entire cost of the required improvements, the actual cost to be determined by the District.
- b. Refuse to approve such connections, if the developer(s) refuses to comply with any of the obligations imposed upon it by a., above.

3-10. LINE SIZE AND SERVICE

The line size and service policy requires that the minimum size of any new main sewer shall be six (6) inches in diameter. Side sewers shall be connected only to six (6), eight (8), or ten (10) inches in diameter main sewers or to manholes. Connection to sewers over ten (10) inches in diameter must be accomplished by extending a six (6) inch main from manhole to a point beyond the junction for side sewer service (as required by the Engineer) or by connecting directly to a manhole.

Minimum side sewer size is four (4) inches in diameter where grade requirements can be met and the use is to be only single family residential. Six (6) inches or larger in diameter side sewer shall be installed where use is to be industrial, commercial, or greater than single family residential. When the new side sewer is the same size as the existing main sewer, the connection shall be made by constructing a new manhole at the point of connection.

Joint use of side sewers will not be permitted. Side sewers connecting houses having plumbing drain outlets elevation of twelve (12) inches or less above the ground surface elevation of the next upstream sewer structure shall have a backflow prevention device installed on or near the cleanout. (See Standard Details.)

3-11. ENGINEERING POLICY

The engineering policy of the District requires strict compliance with the Civil and Professional Engineers Act of the California Business and Professions Code.

All civil engineering plans, specification, reports, or documents shall be prepared by a registered Civil Engineer, or by a subordinate employee under his direction, and shall be signed by him and stamped with his seal to indicate his responsibility for them. It shall be the Job Engineer's responsibility to review any proposed sewer system, extension, and/or existing system change with the District, prior to engineering or design work, to determine any special requirements or whether the proposal is permissible. A "Preliminary Review" and/or a "Plans Approved for Construction" stamp of the District, on the Plans, etc. for any job, does not in any way relieve the Job Engineer of his responsibility to meet all requirements of the District. The Plans, etc., for any job shall be revised or supplemented at any time it is determined that the full requirements of the District have not been met.

A report by a Geotechnical Engineer is required on projects located in hillside, creek areas, and where benching will occur.

Main sewers shall be designed, constructed, and installed in accordance with this Specification and the Plans and Specifications of the District and the orders of the Engineer.

Sewers connected to the District system shall be designed and constructed in a manner consistent with service to the ultimate service area.

3-12. BASIC SEWER SERVICE

Each property with a separate assessor's parcel number shall have a main sewer extended to it, where and when practical. Main sewers shall have proper rights-of-way established. Main

sewers are maintained by the District. Side sewers or lateral, i.e., the sewer pipeline from the building to the main sewer including the connection to the main sewer are maintained by the Owner.

3-13. PRIVATE SEWAGE DISPOSAL SYSTEM

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

3-14. PLAN REVIEW

The District's plan review process consists of three phases:

1. Tentative Maps
2. Preliminary Reviews
3. Construction Approval.

The District provides comments on designs by Job Engineers throughout the first two phases with the intent that when the Plans are ready for construction approval, all required changes have been incorporated into the design. It is the responsibility of the Job Engineer to design projects in accordance with the standards of the District. The fact that a Plan has gone through one or more Preliminary Reviews is no guarantee that the proposed design will be approved for construction. The District will continue to comment on plans until all changes required have been made and all standards have been met. The District reserves the right to require changes to the design throughout the Preliminary Review process. Job Engineers are advised that the District does not approve Plans until after the Preliminary Review process is completed.

END OF SECTION 3

SECTION 4

DESIGN STANDARDS (GUIDE FOR ENGINEERS)

4-01. DESIGN CRITERIA

A. General

The following design standards for gravity sewers within the jurisdiction of the Stege Sanitary District have been established:

1. *Population Density:* Population density shall be in accordance with the District's population density (based on county and city planning), actual count, or character of proposed development, whichever is the greatest.
2. *Average Family:* For design purposes the average family unit is considered to be 3.0 persons per residence.
3. *Design Year:* The design year for new systems and/or improvements is 2020 A.D. and the design sanitary flow shall be assumed to be one hundred (100) gallons per person per day. To this figure shall be added a flow peak allowance of fifty (50) percent to allow for non-uniform daily flow.
4. *Acreage Flow:* Unit loadings for special design guidance, subject to District review, are as follows:

Average Flow Gallons Per Acre <u>Per Day</u>	Peak Flow Gallons Per Acre <u>Per Day</u>	
Commercial Areas	1500	4500
Light Industrial Areas	2000	4000
Heavy Industrial Areas	200	400

5. *Infiltration:* Infiltration allowance shall be calculated as three thousand (3000) gallons/acre/day.

Infiltration allowances are for total entry into system of substance other than sanitary sewage. Ground water (average wet weather) allowance varies from four hundred (400) gallons to one thousand five hundred (1,500) gallons per acre per day, with surface entry, illegal connections and uses, and inundation accounting for the balance of the design allowance.

6. *Design Capacities:* Main and trunk sewers shall be designated on the following basis:
 - a. Main sewers (six (6) through ten (10) inches in diameter): Design capacities shall be based on sewers flowing full.
 - b. Trunk sewers (twelve (12) inches and larger in diameter): Design capacities shall be based on sewers flowing full, without head, using the District design chart for tributary population.
7. *Velocity:* Sewer velocity shall be equal to or greater than two (2) feet per second for all main sewers when flowing full. Where design velocities for main sewers exceed fifteen (15) feet per second, ductile iron pipe conforming to the requirements of the District Specifications shall be used.
8. *Pipe Diameter:* Diameter of gravity sewers shall be determined by Manning's pipe friction formula, using a roughness coefficient, "n," of 0.013.
9. *Pipe Cover and Clearance:* Minimum pipe covers and clearance shall be maintained in the design of sanitary sewers. If certain conditions exist which make it impractical to meet the minimum cover and clearance requirements, the conditions and locations shall be specifically noted above the sewer profile on the Plans. Each location not meeting the minimum cover and clearance requirements will require special approval for each case.

Any planned condition being specially approved with less than minimum cover will require special pipe, bedding, and/or backfill as directed by the Engineer.

10. *Unusual Design:* Special design of sewer force mains, nonresidential connections, or other unusual features or structures require individual study and approval by the District.
 - a. All sewage pump systems, including residential sewage pumps, when proposed, shall be submitted to the District for determination of circumstances necessitating such pump usage and design thereof.
 - b. The installation of a privately owned and operated sewage pumping station serving an individual building site may be considered for approval if gravity sewer service is not available.

A gravity main sewer must exist at one of the following locations before approval of a pump station will be given:

- (1) Immediately adjacent to the property within a public right-of-way.
- (2) Within ten (10) feet measured horizontally of any boundary of the property within a main sewer easement.
- (3) Physically within the property.

If none of these three conditions exist, the Owner must extend a new gravity sewer main.

- c. Use of submersible type pumps for residential sewage pumping will be considered where the installation as a whole will be made in conformance with the general requirements of COSHA and any local electrical codes that may be applicable. In general, a raw sewage sump is classified as a hazardous location which requires explosion proof equipment with a UL label and/or equivalent construction. Float control equipment must have positive level control to preclude exposing the motor if the motor is not explosion proof. Where electrical devices are immersed in the sewage, controls must be intrinsically safe with redundant controls and positive cutoff to avoid automatic total pump down that would expose motor where motor is not explosion proof. Use of submersible pumps will not be approved unless the Owner provides the Sanitary District with information that the proposed pump meets the above requirements. Where used, pump requirements insofar as solids handling capacity and pump rate head, must conform to basic standards required for standard wet pit installations. (See Standard Details.)

B. Hillside and Creek Areas

1. Soils reports will be required where:
 - a. Slopes of hills where sewers are proposed for installation exceed fifteen (15) percent.
 - b. Sewers are proposed for installation within fifty (50) feet of creek beds.
 - c. Sewers are proposed for installation within the range of influence of a possible landslide from adjacent hill.
 - d. Sewers are proposed for installation in historical slide locations.
2. A soils report prepared by a registered civil engineer practicing in Geotechnical Engineering must be submitted by the Job Engineer which covers the proposed project.
3. If the project geotechnical report provided does not cover an off-road sewer alignment, the District may require a supplementary report. This report, at a minimum, must address the following:
 - a. Supplementary geological setting, general soils and bedrock conditions along the proposed sewer alignment, and recommended set backs from slides and creeks.
 - b. Stability or instability of selected sewer alignment.
 - c. Potential ground water problems.

- d. Effect of trenching on slope stability (negative impacts on slope).
 - e. Special backfill, special trenching requirements, or special supports that may be recommended.
 - f. Erosion potential of soils around sewer near water courses.
 - g. Recommended corrections if instability exists or may develop.
4. Installation of sewers in unrepaired slide areas is to be avoided. If an acceptable gravity route is feasible around the unrepaired slide, the sewer must be installed around the slide.
 5. The Job Engineer must furnish a map which shows existing creeks or swales which may convey water in the vicinity of any proposed sewer main alignments.
 6. Sewers shall not be designed to be located in the bottom of swales or creeks.
 7. For sewers which will be parallel to swales or creeks, the sewer must be designed far enough away from the drainage way to eliminate the possibility of future eroding around the sewer. A Geotechnical Engineer shall review the proposed alignment and furnish recommendations regarding long-term erosion potentials.

If it is unfeasible to locate sewer mains on the down slope side of future homes and maintain a safe distance from drainage ways, consideration will be given to installing the sewers in street areas which may result in the installation of residential sewage pumps on individual homes.

8. For sewers which cross creeks or swales, the crossing shall be as nearly perpendicular to the drainage way as feasible.
 - a. Bank and bottom protection shall be designed per the recommendation of a Geotechnical Engineer and shall be installed in the drainage way as part of the overhead or underground crossing
 - b. The Job Engineer shall pay particular attention to designing adequate support foundations and protection for the foundation.
9. An access easement (minimum width of ten (10) feet) shall be granted by the Developer from the nearest public street to the creek crossing structure along the route of the sewer main for future maintenance.
10. The following design standards shall be used by the Job Engineer when designing sewers in hillside and/or creek areas.
 - a. Sewers to be installed across hillside slopes (generally parallel to contours) shall be ductile iron (no bedding) if the cross slope of the hill exceeds twenty five (25) percent.

- b. Sewers to be installed parallel to defined creeks shall be located no closer than twenty (20) feet from the top of the bank if the creek bank is defined; if not, no closer than thirty (30) feet from the center line of the creek.
- c. Sewers to be installed parallel to defined creeks from twenty (20) to fifty (50) feet away from the top of the bank shall be ductile iron (no bedding).
- d. Manholes to be installed on either ends of creek crossings shall be located no closer than twenty (20) feet from the top of the creek bank

4-02. MINIMUM PIPE SIZES AND STANDARDS

A. Main Sewers and Trunk Sewers

- 1. *Size:* Minimum inside diameter of main sewer pipe shall be six (6) inches.
- 2. *Selection:* Pipe cover requirements shown in the Standard Details indicate bedding conditions and minimum strength requirements for the types of pipe selected to meet the anticipated installation conditions. Guidance for selection is as follows:
 - a. Selection of pipe type, strength, and bedding requirements shall be made by the Job Engineer and shall be subject to the Engineer's approval. All selections shall be indicated on the Construction Plans. The Contractor may request a change of selection after award of a sewer contract, but the revised selection shall require revision and resubmittal of Plans and approval of the Engineer prior to construction.
 - b. All pipe and pipe joints installed between structures shall be of the same size, type, class, and manufacturer unless otherwise approved.
 - c. All pipe shall be laid to the depth, grade, and alignment as indicated on the approved Plans and cut sheets.
- 3. *Slope and Velocity:* The slope of the sewer pipe shall be such that the velocity of flow in the pipe when full shall not be less than two (2) feet per second all main sewers when flowing full. The minimum acceptable slopes for sewer pipe sizes are as follows:

MAIN SEWER

PIPE SIZE MINIMUM SLOPE RATIO
IN INCHES IN FEET PER FT.

6	0.0050
8	0.0034
10	0.0025

TRUNK SEWER

PIPE SIZE MINIMUM SLOPE RATIO
IN INCHES IN FEET PER FT.

12	0.0022
15	0.0015
18	0.0012
21	0.00095
24	0.0008
27	0.0007
30	0.0006
33	0.00055
36	0.00045

B. Side Sewers (Laterals and House Sewers)

1. *Separate Side Sewer:* Each individual building shall be connected by a separate side sewer.
2. *Plan Requirement:* Side sewers of six (6) inches or eight (8) inches diameter require two (2) prints of Site Plans for permit issuance.
3. *Size and Slope:* The inside diameter of side sewer pipe shall be four (4) inches and shall be equal to or greater than the building plumbing stub diameter. The minimum inside diameter of side sewers to serve multi-family dwellings or commercial buildings shall be six (6) inches. Fixture unit equivalents shall be used to determine the size of side sewers.
 - a. Minimum sizes and slopes for side sewer based on the fixture unit equivalents shall not be less than indicated below:

	<u>FIXTURE UNITS</u>	<u>4" PIPE</u>	<u>6" PIPE</u>	<u>8" PIPE</u>
S.F.R.	0 - 100	2.0%	N.A.	N.A.
M.F.R. or Comerc.	0 - 800	N.P.	1.1%	N.P.
M.F.R. or Comerc.	800 - 2700	N.P.	3.2%	0.77%

S.F.R. = Single Family Residential
M.F.R. = Multiple Family Residential
N.A. = Not Applicable
N.P. = Not Permitted
Comerc. = Commercial

- b. Side sewers for townhouses and similar cluster housing developments shall be installed on an even slope from the main line connection to a point two (2) feet from the end of the building cleanout conforming to the above requirements.
4. *Fixture Units:* The fixture unit equivalents for plumbing fixtures shall be based on the tables of the most current edition of the Uniform Plumbing Code.

Side sewers exceeding two hundred (200) feet in length shall include an infiltration allowance of five (5) fixture units per acre or one (1) fixture unit per forty (40) feet of sewer installed.

5. *Pipe Types:* A lateral or side sewer, being installed concurrently with a main sewer, shall be of the same type and class as the main. Any house sewer or side sewer, not being installed concurrently with the main sewer, may be any one of the types of pipe approved for side sewers.
6. *Vertical and Horizontal Deflections:* All side sewer laterals, from the building drain to the point of connection with the main line or a manhole, shall have an alignment that provides an angle of intersection between the side sewer and the downstream section of main sewer of no less than ninety (90) degrees. No lateral alignments adverse to the flow of the main will be permitted. The maximum deflection at any one point in a side sewer, not including fittings at wye connection to main sewer or at angle points having cleanouts, shall be twenty-two and one-half (22-1/2) degrees (1/16 bend) and any two (2) consecutive deflections (bends) shall not be less than two (2) feet apart.
7. *Building Drains:* The "Building Drain" shall be arranged so that the points of connection with the house sewer is on the side of the building facing the sewer main.
8. *Lateral or Side Sewer Location:* Location of lateral or side sewers in public road rights-of-way shall be in relation to the nearest corner of the property being served. Unless otherwise determined by physical controls, the lateral shall be located ten (10) feet from the lower property corner at the right-of-way line of hillside lots (3%+slope) and on the lot center line in relatively level terrain.
9. *Location Mark:* Where curbs, gutters, and/or sidewalks exist or are to be installed as a part of an improvement, the side sewer shall be permanently located by imprinting an "S" one and one half (1-1/2) inch size or by chiseling an "S" four (4) inch high in the concrete surface vertically above the side sewer pipe. The "S" shall be located in order of preference on curb, sidewalk or gutter. (See Standard Details.)

It shall be the responsibility of the Contractor installing such lateral portion of the side sewer to mark its location as specified herein.

10. *Lateral or Side Sewer Depth:* Depth of the lateral or side sewer at the building drain shall be a minimum of 18 inches.

11. *Cleanouts:* Cleanouts shall be provided in the side sewer system at the following locations:
 - a. At the point of connection to the building drain.
 - b. At any single turn greater than forty-five (45) degrees.
 - c. At intervals along the side sewer system where the cumulative total of deflections from the point of connection to the main or from another cleanout exceeds forty-five (45) degrees.
 - d. At intervals not to exceed one hundred (100) feet along the side sewer system.

Cleanout risers shall be cast iron and equal in size to the side sewer.

12. *Backflow Prevention Device:* A backflow prevention device shall be installed for all new buildings and all existing buildings having plumbing drain outlets elevation of twelve (12) inches or less above the ground surface elevation of the next upstream sewer structure.

When conditions as prescribed for a backwater overflow device installation exist, and where the sewage cannot overflow on the area surrounding such installation without damage to property, a backwater check valve and shutoff system shall be installed. (See Standard Details.)

13. *Joint Building Sewers Permitted Under Certain Conditions:* Subject to review and approval by the Engineer of each application, one residential building sewer may be joined with another to form a single sewer for the purpose of achieving convenience and economy where the buildings to be connected are on land owned by the same person.

C. **Pipe Cover and Clearance**

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

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

1. *Main and Trunk Sewers:* Main and trunk sewers shall have the following pipe covers:
 - a. The minimum pipe cover in existing roadways shall be five (5) feet. Where sewers are to be installed in existing roadways, which are not expected to receive major grade or surfacing changes, the pipe cover shall be measured from the rough subgrade to the top of pipe. No sewer work shall begin in new or existing roadways that are scheduled for major improvement, until the roadway has been completely rough-graded to within six (6) inches of design subgrade.
 - b. The minimum pipe cover in easements rights-of-way, not expected to be roadway, shall be four (4) feet. Minimum pipe cover in benched areas shall be from bench ground level to top of pipe.
2. *Side Sewers:* Side sewers shall have the following pipe cover:
 - a. That portion of a side sewer within public roadway shall have the minimum cover of four (4) feet at the property line or at a point four (4) feet outside the curb face or edge of paving, whichever is the greater distance from the roadway center line.
 - b. Minimum cover for side sewers in driveways, parking, and all other traffic areas within properties other than single family residential shall be five (5) feet. Such cover conditions shall exist from the property line to a point within eight (8) feet of the building drain connection.
 - c. The minimum cover for side sewers outside of traffic areas from the property line to a point within eight (8) feet of the building drain connection, shall be thirty (30) inches.
 - d. Minimum cover for side sewers at the point of connection to the building drain (within two (2) feet of the foundation) shall be eighteen (18) inches.
 - e. All side sewer pipelines within eight (8) feet of the building drain connection and having a minimum cover less than thirty (30) inches shall be of cast iron.
 - f. Instrument control of grades with an engineer's level will be required where side sewer installation exceeds fifty (50) feet.
 - g. Where grades are less than two (2) percent, cut sheets will be required and cuts must be staked at the site prior to trenching.
3. *Minimum and Maximum Pipe Cover:* Special approval of less than minimum pipe covers will be required. Any specially approved conditions, which will have less than minimum cover will require special pipe, bedding, and/or backfill as directed by the Engineer.

The maximum pipe covers are based on the following design assumptions.

- a. Height of backfill (cover) shall not exceed thirty (30) feet.
 - b. Backfill loading does not include live load considerations below minimum cover.
 - c. Load calculations to determine pipe classes are based on the following design parameters:
 - (1) Backfill density of one hundred twenty (120) pounds per cubic foot.
 - (2) A totally vertical trench configuration from trench bottom to finish surface or subgrade within three (3) feet of finish grade.
 - (3) A maximum allowable trench width as defined in the Standard Details.
 - (4) Any deviation from the above design assumptions or parameters by either material or method of installation, shall be noted on the Plans submitted for approval.
4. *Pipe Clearance:* Pipe clearance for main lines from other facilities shall be as follows: All sewer pipes and structures shall be designed and/or constructed to have a minimum of six (6) inches vertical and five (5) feet horizontal clearance from all other utilities and/or improvements. The District reserves the right to delay the installation of any job or portion thereof which, in the opinion of the Engineer, may be damaged by the installation of other underground facilities.

D. Sewer Connections to Existing Systems

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

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

1. New main extends forward at same horizontal alignment and vertical grade.
2. New main is the same size, pipe types, and class.

E. Sewer Alignment

Where sewer lines are to be installed within street or road rights-of-way, they shall, wherever practical, be designed and installed on the center line of the existing or future roadway. Where a sewer line cannot be designed along the center line of a roadway, it shall be located within the paved area of the street or road, with not less than one (1) foot between the outside surface of the pipe or structure and the nearest lip of the gutter or

edge of improved road shoulder. Where practical, all sewer lines within easements or reserves shall be designed and installed on the center line of the sewer easement or reserve. All sewer lines and structures shall be designed and installed well in the clear of all other improvements and utilities. In no case shall a sewer line or structure be nearer than six (6) inches vertical or five (5) feet horizontal, to any other improvement or utility, unless otherwise approved by the Engineer.

F. Sewer Pipe Stubs

Stubs shall be designed and installed in all manholes, from which future sewer line extensions are anticipated. Pipe stubs shall be minimum six (6) inches in size or as directed by the Engineer and shall be of an approved type of pipe. Stubs shall protrude one (1) foot outside of the manhole base for required pipe joints and shall be channeled within the manhole as required on a regular sewer line. The outboard end of stubs shall be a standard pipe joint end and shall be plugged with a standard watertight plug or cap, as supplied by the pipe manufacturer.

G. Sewer Line Extensions

In all new roadways, including all roads fronting or within subdivisions or other new developments where sewer lines are expected to be extended to adjacent properties, the sewer line shall be designed and installed to the end of the proposed roadway improvement prior to final paving of such roadway improvement. The sewer extension shall terminate with the proper structure or fitting, which will minimize the amount of pavement to be disturbed by future sewer extensions.

H. Sewers to Be Installed In Existing Improved Roadways

Where sewers are being designed for installation in existing improved city and/or county roadways, the Job Engineer shall submit the Plans for the proposed work to the city and/or county public works department for location and encroachment approval. The public works approval shall be obtained prior to submitting plans to the District and shall be placed on the tracing for the first sheets of the Plans and shall appear on all subsequent prints of the Plans.

I. Sewers To Be Installed In Or Across Utility Or Railroad Rights-Of-Way

Where sewers are to be constructed across or within utility or railroad rights-of-way requiring tunnels, bores, and/or special pipe, the special pipe shall extend the full length of the sewer line within the particular right-of-way and shall conform to the requirements of the permitting agency.

J. Sewers To Be Installed As Site Collector Systems

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

- a. Where fixture units exceed 1500, the District may incorporate additional requirements, including such structures as manholes and rodding inlets.
- b. Minimum pipe cover for the site collector sewer pipe shall be as specified for main sewers.
- c. Instrument control of grades will be required where side sewer installation exceeds fifty (50) feet.
- d. Where grades of side sewers are less than two (2) percent, cut sheets will be required and cuts staked at the site prior to trenching.

4-03. SEWER STRUCTURES

A. Manholes

1. *Locations:* Manholes shall be placed at all intersections of sewer lines other than side sewer connections, at all vertical or horizontal angle points, at all points of trunk, and main sewer pipeline size changes and at intervals not greater than four hundred (400) feet in paved areas and two hundred fifty (250) feet in unpaved areas. Where practical, manholes shall be located at the center of street or road intersections. All manholes, from which future sewer line extensions are anticipated, shall have a pipe stub planned and installed at the grade and the direction of the anticipated sewer extension. Pipe stub size, slope, length, and pipe type shall be shown on the Plans.
When a sewer line terminates in an easement with a manhole, said manhole shall be located a minimum of five (5) feet within the last property served.
2. *Drop Across Structure:* Where there is to be more than thirty (30) degrees of horizontal deflection angle between any inlet line and the outlet line of a structure, the vertical drop across the structure from said inlet to outlet shall be twenty-five hundredths (0.25) of a foot.

Drop manholes will not be permitted unless with a special approval of the Engineer. The maximum shelf height above crown of outlet pipe shall be one (1) foot. The invert of any inlet pipe shall not be higher than the top of the shelf and these controls can only be used with prior approval (See Standard Details.)
3. *Line Deflection in Structure:* The angle of deflection between incoming and outgoing lines in a manhole shall not be greater than ninety (90) degrees.
4. *Connections to Existing Structures:* See Standard Details.
5. *Cul-de-sac Requirement:* A standard manhole shall be located at the end of any main line terminating within a cul-de-sac, which has three (3) or more lots or parcels of land fronting on the cul-de-sac. No more than five (5) side sewers shall be connected directly into such a manhole.

B. Use of Rodding Inlets

Used only with special approval of the Engineer.

C. Test Fittings

All test fittings, unless otherwise approved, shall be wye or tee branches of the same size, type, and quality as that of the line in which they are being installed.

Test fittings for air testing shall be installed in all new side sewers. Main and trunk sewer installations to be air tested will not require test fittings except where the main or trunk sewers are to be extensions of an existing sewer without a structure at the junction between the existing and the new sewer.

D. Plugs For Future Extensions

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

E. Pressure Frame and Covers

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

F. Grease and Sand Traps, Grease Interceptors

All building connections through which liquid wastes containing grease, oil, and/or sand may be introduced into District sewer system, shall have a grease and sand trap or grease interceptor installed as specified herein.

1. *Food Handling Facilities:* All food handling facilities are required to obtain a Food Handling Facilities Permit from East Bay Municipal Utility District and shall comply with all the terms and conditions specified within.
2. *Other Commercial Business:* All other commercial business, including service stations, car washes, and similar establishments as determined by the District as categorically inclusive, shall have a grease and sand trap. The restroom of such establishments shall be plumbed separately and connected to the building sewer downstream of the trap.

G. Remodeling Structures

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

H. **Trench Dams**

Trench dams shall be installed in all sewer trenches through areas where the slope of natural or fill ground surfaces which are neither paved or intended to be paved equals or exceeds a horizontal to vertical ratio of one to one (1:1).

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

I. **Special Structures**

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

4-04. **SWIMMING POOLS**

No person may discharge the contents of a swimming pool into a sewer without a permit from the District. The Engineer shall fix the terms and conditions of the permit. A swimming pool discharging into a District sewer shall be equipped with a two (2) inch maximum diameter discharge pipe and an approved air gap separation to prevent the entry of sewage into the swimming pool or piping system. Discharge of water or waste from swimming pools to the sewer shall only be through pumping systems regulated to avoid surcharge at any portion of the sewer system.

END OF SECTION 4

SECTION 5

PLAN PREPARATION (GUIDE FOR ENGINEERING)

5-01. SIZES OF REQUIRED MAPS, PLANS, ETC.

- A. **System Maps** - Sheet size, 22" x 34".
- B. **Sewer Plan and Profile** - Sheet size, 22" x 34".
- C. **Right-of-Way Map for Sewer** - Sheet size, 8-1/2" x 11".
- D. **Permit or License Map** - Sheet size, 8-1/2" x 14".
- E. **Grant of Easement (description)** - Sheet size, 8-1/2" x 11", form furnished by District.
- F. **Cut Sheet** - Sheet size, 8-1/2" x 11".

5-02. LETTERING

All printing and/or lettering shall be of one-eighth (1/8) inch minimum height and of such shape and line weight as to be readily legible on prints, sepias, microfilm prints, and other reproduction made from the original drawings.

5-03. TYPE OF PRINTS AND DUPLICATE TRACINGS

- A. *Review Drawings:* All prints of drawings, including plans, profiles, details, maps, cut sheets, etc., submitted for review, shall be of high definition line work and lettering produced on a white vellum or high contrast background paper. All required tracings shall be high quality originals capable of reproducing prints of equal or better quality than those submitted for review.
- B. *Original Drawings:* High quality drafting vellum for original drawings shall be Mylar, or approved equal and shall be 22" x 34" in size with black printed or ink drawn borders and title boxes in one or more of three following styles:
 - 1. Half Plan, Half Profile
 - 2. Full Plan
 - 3. Full Profile

Sepia originals or "cut-ins" will not be accepted.

5-04. COMPLETE SETS

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

5-05. DATA REQUIRED ON PLANS

A. Reference Numbers

The Sanitary District job number, District Base Map number, California Coordinate number, and sheet reference numbers shall appear in the lower right hand corner of all plan sheets in minimum three-eighths (3/8) inch high figures.

Example: **SSD 9115 - 19 - 1479B520 1 of 2**

1. *SSD Job Number:* A Sanitary District job number (Example: **SSD 9115**) will be assigned by the District when the sewer plan is received for preliminary review. When submitting the sewer plan for final approval, the job number shall appear on all sheets. The job number shall also appear on all communications, easements, plats, cut sheets, etc., that are connected with the job.
2. *Base Map Sheet Reference Number:* The Base Map Sheet Reference (Example: **19**) refers to the District's two hundred (200) foot scale Base Map.
3. *California Coordinate System Reference:* The California Coordinate System, Zone III Sheet Reference (Example: **1479B520**) shall be indicated on all sewer plans when submitted for preliminary review.

B. System Maps

There shall be two system maps, one being 1" = 600' scale and the other 1" = 100' scale. The 600' scale system map shall cover sufficient area to show existing and proposed sewers, all properties to be served, and distance ties to existing improved public road intersections in two directions from the proposed improvement.

The 100' scale system map shall be a composition, where possible, showing all complete properties to be served by the sewer improvement, existing and proposed sewers, line sizes and designations, structures and their numbers, laterals and ties to nearest property corner, all rights-of-way with their widths and respective numbers, tract names or numbers, lot numbers or Owners last name, street names and total acreage including roads (show under 100' scale map title) of area directly served by the improvements. The 100' scale system map may also, when practical, serve as the sewer plan by adding all required stationing and horizontal curve data.

C. North Arrow, Scale

Each individual map and/or plan sheet shall have North arrow and appropriate scale indicated at the top, or near the upper portion, thereof. All maps and/or sewer plan sheet and right-of-way maps shall be prepared as specified herein and arranged such that the directions of North always points toward the top or the left edge of the sheet.

D. Sewer Plans

The sewer plans (1" = 100') shall show the true horizontal relationship between the proposed sewer improvements and the existing and/or proposed field conditions, including existing or proposed utilities and other facilities in accordance with available information. Sewer plans shall also include total acreage of improvement or development, sewer line size and designations, all structures and their respective numbers, all property lines and corners adjacent to the sewer alignment, laterals and ties to property corners, all necessary and required lateral and structure stationing, horizontal curve data, and street names. The 100' scale system map may serve as the sewer plan if all required data is shown on the map.

E. Sewer Profiles

The sewer profiles (1" = 50' horizontal and 1" = 5' vertical (using 10 x 10 grid) reading from 0 + 00 left to right) shall show the vertical relationship between sewer line invert and the ground surface at the time of sewer construction and the finish ground and/or paving surface. The sewer line size, pipe type, and pipe class shall be shown between each pair of consecutive structures on the sewer profiles. Pipe types and Class may be designated by abbreviations. Sewer profiles shall also show all existing and/or proposed utilities and/or other facilities, which cross the alignment of the sewer and shall accurately indicate clearance when less than twelve (12) inches. All sections of sewer line necessarily designed with less than the required minimum cover shall be noted above the profile with the length of the section indicated and shall require special approval in each case. When the pipeline is to be constructed from a subgrade, bench, or subtrench more than three (3) feet below finish grade over the pipeline, such subgrade, bench, or subtrench profile shall be shown and identified on the sewer profile. All design rim and invert elevations for each manhole, including existing manholes, shall be shown on the sewer profile.

F. Elevation Datum

The bench mark location shall be shown on the Plans and shall be identified thereon with the following information:

1. Agency which established bench mark.
2. Bench mark elevation.
3. Brief description of bench mark and its location with respect to the work.

G. Line Stationing

Each line with a separate designation shall be stationed continuously upgrade from 0 + 00 at its point of connection to another line.

H. Ties to Existing System

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

I. Structure Numbers

Manholes, trunk manholes, rodding inlets, and all other sewer structures shall be numbered consecutively upgrade by type of structure. The structure number shall appear on the Plans or profiles wherever the structure is shown or referred to. Numbers shall begin with one (1).

J. Side Sewer Locations

The junction of side sewers with the main line shall be shown and stationed on the Plans and cut sheets. Lateral sewers within public road rights-of-way shall be in relation to the nearest corner of the property being served. Unless otherwise determined by physical controls, the lateral shall be located ten (10) feet from the lower property corner at the right-of-way line of hillside lots (3%+slope) and on the lot center line in relatively level terrain. The length of all side sewers shall be shown on the Plans either by note or by individual distance. Where properties are fronting on a cul-de-sac and the main sewer terminates with a manhole, all laterals from these properties shall be connected into the manhole. The Job Engineer may locate side sewers to fit buildings, but the Plans must show proper ties, and the completed side sewer must be permanently marked and accurately located. Minimum spacing for sewer main connections shall be five (5) feet.

K. Right-of-Way Log

The Right-of-Way Log shall appear on the first sheet of the Plans.

L. Owner's and Job Engineer's Names

The Owner's name and Job Engineer's name, their addresses, zip codes, and phone numbers shall appear on the front sheet near the title block.

M. Compaction Note

Add note on Plans where appropriate:

"All work on Sanitary Sewers shall conform to the requirements of the Stege Sanitary District."

5-06. CUT SHEETS

A. General

Cut sheets shall be prepared on the District furnished form for all sewers specified herein and submitted prior to construction.

1. All trunk, main, and site collector sewer.
2. All side sewers six (6) inches or greater in size and where such installations exceed fifty (50) feet (available in the field prior to trenching).
3. All side sewers for townhouses, condominiums, and similar cluster housing developments.

B. Submittals

Complete cut sheets as required herein shall be submitted and be a requirement prior to the start of construction.

5-07. RIGHTS-OF-WAY

Rights-of-Way define and establish the rights for the District to construct, lay, and maintain a sewer facility in the location designated by the Job Engineer. A "Right-of-Way Map for Sewer" for all sewer installations in private property with metes and bounds description on each affected parcel of land shall be provided by the Job Engineer.

All sewer work shall conform to the District Ordinance No. 1793-0602 which establishes policies, standards and requirements for District easements and regulates easement encroachments. No sewer work will be accepted by the District until the District receives and approves all grants of sewer easements. The Job Engineer shall provide the District with signed and notarized grants of easements covering the sewer systems prior to acceptance of the sewers.

A. Right-of-Way Log

The Right-of-Way Log shall appear on the first sheet of the Plans. The log shall contain parcel numbers, last name of grantor, the type of rights, and the recording data of such rights, if available, for each parcel (except those within dedicated city or county streets and roads).

B. Parcel Numbers

A parcel number shall be assigned to each portion of a right-of-way, dedicated easements or reserves. Parcel numbers shall also be assigned to crossings of county roads, state highways, railroads, flood control easements, East Bay Municipal Utility District properties, public utility rights-of-way, etc., which require permits or licenses. The parcel numbers shall appear on the grant easement form and on the plan sheet adjacent to the sewer line.

C. Descriptions

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

D. Right-of-Way Map for Sewer

The right-of-way map for sewer shall be prepared on the tracing paper form as furnished by the District and shall show the entire area to be covered by the easement, permit, or license. The right-of-way map shall be drawn so that the North arrow points toward the top or to the left edge of the sheet. For clarity, a separate plat shall be prepared for each parcel and shall show all necessary survey ties, courses, and distances along the right-of-way. Whenever possible, adjacent roads shall be shown to facilitate locating the subject easement area. The job number, parcel number, and the last name of the grantor shall also appear on each right-of-way plat. One copy of the respective right-of-way map for sewer shall accompany each description of an easement, permit, or license and the original tracing shall be submitted to the District prior to acceptance.

E. Reserves and Easements for Sewers

Reserves and/or easements for sewers shall be set aside on new subdivision or parcel maps and shall be dedicated as exclusive subsurface rights and appropriate surface rights for the purposes of constructing, laying, maintaining, and operating sewer pipes and appurtenances, with the exception that other utilities and/or facilities, including storm drainage, may cross the exclusive subsurface area of the reserve of easement at right angles or at angles not greater than forty-five (45) degrees from right angle and at elevations which will not now or in the future conflict with any sanitary sewer installation. Reserves and/or easements for main sewers less than twelve (12) inches in diameter shall have minimum width of ten (10) feet and reserves and/or easements for trunk sewers twelve (12) to fifteen (15) inches in diameter shall have a minimum width of fifteen (15) feet, for trunk sewers greater than fifteen (15) inches in diameter, a

minimum of twenty (20) feet. All reserves and/or easements shall be shown and assigned parcel numbers on the 50 scale system map and sewer plans. Copies of filed subdivisions maps, grants of easements or other evidence substantiating existence of reserve and/or easement rights for proposed sewer installations shall be submitted prior to approval of construction.

The following are acceptable right-of-way for main sewers:

1. *For Subdivisions:* On filed subdivisions and parcel maps, easements shall be shown and dedicated to the District for sanitary sewer purposes and shall be noted as followed:

GRANT DEED OF EASEMENT
TO STEGE SANITARY DISTRICT

For valuable consideration, receipt of which is acknowledged, [Grantor] grants to Stege Sanitary District, a public agency of the State of California located in Contra Costa County, California, the real property described as follows:

A(n) [exclusive/non-exclusive] Easement for the purposes stated below located at [general description of location] and more particularly described in Exhibit "A" attached to this Grant Deed, which is incorporated by reference.

The purposes of the Easement are for construction, installation, use, operation, maintenance, repair, relocation, alteration, replacement and/or reconstruction of equipment and facilities, including their appurtenances and accessories, for the collection, transmission, treatment and disposition of wastewater together with rights of ingress, egress and access in, on, above, under and to the Easement territory and equipment and facilities, appurtenances and accessories located there. The rights and obligations of the Stege Sanitary District and of the owners and/or occupants of the servient tenement with respect to those parties' respective occupations and uses of the Easement territory shall conform to and be consistent with all rules and regulations of the Stege Sanitary District which had been promulgated and were in effect at this time the Easement was granted and, to the full extent permitted by law, as such rules and regulations may subsequently be supplemented, modified and/or otherwise amended. The owners and/or occupants of the servient tenement shall not cause or permit any use to be made of the territory of the Easement that will interfere in any significant way with the Easement rights granted to the Stege Sanitary District under this Grant Deed.

The Exhibit "A" attachment should provide a metes and bounds or other reasonably precise legal description of the Easement territory.

In addition, for each parcel containing sewer easements on the subdivision map, a separate grant of easement shall be prepared and recorded on the District form, except for those parcels and/or areas dedicated as city or county street and roads.

2. *For Parcels:* A grant of easement to the District describing the easement for sewer purposes and shown on an accompanying right-of-way map for sewers.
3. *For "Flag Lots":* Private access and utility type easements which specifically mention sewer pipes (where the sewer installation will not serve over two residential units and cannot be extended).

The following are not acceptable rights of way for main sewers:

1. Non-exclusive easements for all utilities, "P.U.E."
2. Private roadways or other private easements designated for sewer pipes (where the sewer installation may be extended to serve more than two residential units or properties not having rights over the private easement).

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

F. Permits and Licenses

Parcels requiring permits and licenses shall be shown and assigned parcel numbers on the 50' scale system map and sewer plans.

G. Easements for Future Extensions

Easements shall be dedicated for sewers or granted to the District in all cases where future extensions of sewer lines will be required on the property being sewered. Such easements will be included on the construction plans where there is any doubt as to the ability to properly serve the ultimate service area.

H. Use of Sewer Easements Exclusive or Non-Exclusive

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

The use of Sanitary sewer easement surfaces shall conform to Ordinance No. 1793-0602 which regulates easement encroachments.

Surface structures (manholes, rodding inlets, etc.) within easements shall not be covered by earth or other material and shall remain in an exposed and accessible condition at all times.

END OF SECTION 5

SECTION 6

PLAN APPROVAL (GUIDE FOR ENGINEERING)

6-01. APPROVAL PROCEDURE

The following procedure shall be followed when submitting Plans to the District for reviewing and approval:

A. **Plan Review Fee**

The Plan review fee shall be paid to the District prior to the review of plans, as part of the permit fee and application process.

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

B. **Minimum Standards**

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

C. **Preliminary Review Submittals**

Submittals for preliminary plan review shall include: two (2) complete sets of prints of the development plans, including a plan and profile sheet showing 100' and 600' scale sewer system maps; one (1) duplicate tracing of the sheet showing said 100' and 600' scale sewer system maps; two (2) sets of prints of the plat and description for each easement and/or other rights-of-way required; two (2) copies of all necessary permits and/or license requirements in conformance with and one (1) print of preliminary subdivision or parcel map, including title or certificate sheet.

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

D. Easements

Grants of easements to the District and their respective right-of-way maps shall be prepared, obtained, and submitted to the District for approval by the Job Engineer for all sewer installations on private property prior to acceptance of main sewers by the District.

E. Permits and Licenses

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

1. Encroachment permit applications for all work within state highways, railroad rights-of-way, and utility rights-of-way shall be prepared by the Job Engineer and submitted to the District for acquisition.
2. Permits to do work in county roads or city streets shall be obtained by the Contractor or Job Engineer, and copies submitted to the District before work starts.
3. After all required and/or recommended revisions have been made, a detailed profile with horizontal and vertical scales of ten (10) feet to the inch for each sewer line crossing of a storm water channel, conduit, or drainage course shall be incorporated in the Plans and submitted to the Contra Costa Flood Control and Water Conservation District for approval. One (1) copy of each crossing profile, bearing Flood Control approval, shall accompany Plans submitted to the District for approval for construction.

F. Geotechnical Review

The geotechnical review shall include, but not be limited to, slope stability, placement of spoils, control of excavated material, permanent versus temporary benches, affect of benching on existing trees and vegetation and erosion control. The report shall be submitted during the preliminary review process.

6-02 PLAN REVISIONS

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

6-03. FINAL REVIEW - APPROVAL FOR CONSTRUCTION

All plans submitted for final review for approval for construction shall comply with the requirements of these Specifications. When submitting plans for approval for construction the following are required:

1. Four (4) complete sets of prints, cut sheets and one (1) complete set of high quality mylar duplicate tracings of the construction Plans, including the 100' and 600' system maps are required;
2. Three (3) prints of the sewer plan (100' scale) and system map (600' scale) sheet one (1) set of prints of the recorded parcel or subdivision map shall be presented.
3. A sewer construction cost estimate.

The Job Engineer shall allow a minimum of one (1) week for this final review by the District. "Plans Approved for Construction", implies that the District has reviewed the Plans, cut sheets, and the field area in which the work is proposed and the Plans, cut sheets, and field conditions seem to meet the requirements of the District. Construction may begin only after Approval for Construction. Any office or field change from "Plans Approved for Construction", including changes of pipe type, class, grade, cover, quantities or any other details which will affect the sanitary sewer installation, nullifies any prior approval of the Plans and will require that new plans be submitted and approved prior to construction.

If during construction the Contractor encounters field conditions which dictate that one or more of the changes mentioned above must be made in the "Plans Approved for Construction", construction shall be halted until plans are revised by the Job Engineer, resubmitted to the District and again approved for construction. Approval for construction may be withdrawn at any time it is determined that any portion of the Plans, cut sheets, and/or construction work fails to meet all District requirements.

Approval for construction shall become void three (3) months from date of approval, unless the sanitary sewer work, as detailed on the Plans, has begun.

Whenever sewer plans and cut sheets are submitted for approval for construction in sections or phases of the total development submitted in the preliminary review, an additional review fee, as established by the District, will be charged for each sectional review thereof.

If after the initial full set of plans has been submitted and approved and no further changes have been made, subsequent submittals of plans in phases shall consist of four (4) prints of the 1" = 100' sewer plan, four (4) prints of cut sheets and the review fee.

6-04. COMMENCEMENT OF WORK

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

6-05. ITEMS TO BE CONSIDERED BEFORE SUBMITTING PLANS

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

1. Have arrangements been made for the payment of the fee for the review of plans?
2. Are there any special details needed, such as special drawings, notes, and/or specifications to supplement the Standard Specifications?
3. Is the property within the District sphere of influence?
4. Is the property to be sewerred within the District boundaries?
5. Annexation petitions for property outside the boundary of the District must be signed, received and reviewed by the Board of Directors before Plans will be accepted for preliminary review.
6. Can the proposed sewerage system provide service to properties other than those arranging for the installation? If so, have full provisions been made for the additional service or future extension?
7. Has Flood Control approval been secured for all sewer line crossings of storm water channels or conduits?
8. Are all the necessary easements prepared?
9. Are there any permits and/or licenses required ?
10. Have bonds and agreements executed by Owner/Developer been submitted?
11. Are any special approval forms required and have they been completed?

END OF SECTION 6

SECTION 7

CONSTRUCTION ENGINEERING (GUIDE FOR ENGINEERING)

7.01. REFERENCE

Refer to Sections 10-17, 13-03 and 13-07 of these Specifications.

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

7-02. FIELD SURVEYS

A. Cut Stakes

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

1. If any building drains for townhouses and similar cluster housing developments have not been installed and marked, their ends shall be staked noting the appropriate building identification number to be served and cut to flow line on said stake. It is the responsibility of the Job Engineer to ensure that the ends of all such unit side sewers, which shall also be staked as required herein, will meet the proposed building drains.
2. In areas where benching is required for installation of the sewer, benches shall be cut prior to staking. The final cut sheets shall reflect center line cover from the top of the bench.

B. Side Sewer Location

Prior to installation of lateral sewers in subdivisions, the lot corner nearest the side sewer, and the side sewer location at property line, shall be located, staked, and flagged in the field.

C. Survey Authorization and Responsibility

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

D. Restaking

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

7-03. COVER REQUIREMENTS AND MATERIALS

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

END OF SECTION 7

SECTION 8
EASEMENT MAP AND DESCRIPTION

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SECTION 9
SYMBOLS, SEWER PLANS AND CUT SHEETS

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SECTION 10

LEGAL RELATIONS AND RESPONSIBILITY

10-01. LAWS TO BE OBSERVED

The Contractor shall keep himself fully informed of and comply with all existing and future State and National laws and county, district and municipal ordinances and regulations which in any manner affects those engaged or employed in the work, or the materials used in the work, or which in any way affect the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. He shall protect and indemnify the District, the District Engineer, and all of its and his officers and agents and servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or his employees. If any discrepancy or inconsistency is discovered on the Plans, Drawings, Specifications, or Contract for the work in relation to any such law, ordinance, regulation, order or decree, the Contractor shall forthwith report the same to the Engineer in writing.

A. Registration of Contractors

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

10-02. INSURANCE

A. Coverage

The Contractor shall maintain in full force and effect, at his own cost and expense, a comprehensive general insurance policy, or policies in form and substance typical of insurance coverage of contractors in Contra Costa County, insuring against claims arising out of all work and operations of the Contractor, whether conducted by the Contractor, a Subcontractor, or others consisting of:

1. Completed operations coverage (products).
2. General liability coverage, including coverage for injury or death sustained by any person and for property damage, and not excluding damage to property caused by explosion or resulting from collapse of buildings or structures or damage to property underground (commonly referred to as the "XCU" hazards).
3. Contractual liability coverage for the liability assumed by the Contractor under Section 10-10. hereof.
4. Automobile liability coverage.
5. Worker's Compensation coverage.

Should the Contractor fail to maintain such insurance, all work shall cease until such time as insurance is reinstated. Insurance coverage shall not be limited in amount except in accordance with District Ordinance, permit or license, or any Special Provisions applicable thereto.

B. Amounts of Insurance

Minimum amounts shall be as specified by the District at time of plan approval.

C. Certificates and Endorsements

Prior to commencing work, the Contractor shall furnish to the District satisfactory certificates indicating the contents and carriers of its insurance, and evidencing the following endorsements:

1. "This insurance reflects insurance coverage of the Contractor hereon named as required by the Specifications of the Stege Sanitary District."
2. "It is understood and agreed that the policy will not be canceled and the coverage provided therein will not be reduced or permitted to expire until thirty (30) days after receipt, by the District Board of Directors of the Stege Sanitary District, of a written notice by registered mail of such cancellation or reduction in coverage or expiration."
3. "Such insurance does not include provisions for automatic termination or reduction in coverage in the event the District makes use or takes possession of any completed or partly completed portion of the work under contract prior to the entire work's acceptance."
4. "Such insurance does not contain any exclusion regarding loss or damage to property caused by explosion or resulting from collapse of buildings or structures or damage to property underground."
5. "Such insurance is primary insurance and no insurance of the Stege Sanitary District will be called on to contribute for any loss or damage under this coverage that may be attributable to the Contractor or forces under his control whether occurring in or arising from the execution of the work under contract hereon named."
6. "The Stege Sanitary District, its directors, officers, representatives, agents and employees are included as additional insureds under this coverage with respect to all work and operations for the duration of the hereon named contract."

10-03. PERMITS AND LICENSES

The Contractor shall (prior to beginning any work) procure all permits and licenses, pay all inspection charges and permit fees, give all notices necessary and incident to the due and lawful prosecution of the work and shall furnish to the District written proof of compliance with this Section.

10-04. (RESERVED)

10-05. SANITARY PROVISIONS

The Contractor shall conform to the rules and regulations pertaining to sanitary provisions as established by the District, the County Health Department and the State of California, as may be applicable.

10-06. PUBLIC CONVENIENCE

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

The Contractor shall so conduct his operations as to offer the least possible obstruction and inconvenience to public traffic, and he shall have under construction no greater length or amount of work than he can prosecute properly with due regard to the rights of the public. Where existing roads are not available for use as detours, unless otherwise provided in the Special Provisions, all traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. Spillage resulting from hauling operations along or across the traveled way shall be removed immediately at the Contractor's expense.

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

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

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

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

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

Bridges of approved construction shall be installed and maintained across the trench at all crosswalks, intersections and at such other points where, in the opinion of the Engineer, traffic conditions make it advisable.

In order to expedite the passage of public traffic through or around the work and where ordered by the Engineer, the Contractor shall install signs, lights, flares, barricades, and when requested by the Engineer, shall furnish a pilot car and driver and other facilities for the sole convenience and direction of public traffic . Also where directed by the Engineer, the Contractor shall provide and station competent flaggers whose sole duties shall consist of directing the movement of public traffic through or around the work. See Section 10-07 for flagger'

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

10-07. SAFETY

This Section defines the Contractor's responsibility with regard to providing for safety during construction. The Contractor alone shall be responsible for the safety of his plant, equipment and methods.

All roads must be kept open for public travel at all times unless specific written permission to close or restrict the use of a particular roadway is given by the agency having jurisdiction.

It shall be the Contractor's responsibility to notify all affected public bodies such as fire districts, school districts, etc., as to construction schedules and he shall keep a current list or diagram of limited access areas.

Whenever the Contractor's operations create a hazardous condition, he shall furnish at his own expense and without cost to the District, such flaggers and guards as are necessary to give adequate warning of the protection from, any dangerous conditions to be encountered and he shall furnish, erect, and maintain such fences, barricades, lights, signs and other devices as are necessary to prevent accidents and avoid damage or injury. Flaggers and guards while on duty shall be equipped with orange wearing apparel and an orange flag or paddle type signal which shall be kept clean and in good repair.

Attention is also directed to Section 24400 of the Health and Safety Code of the State of California and it is the intent of the District that this Section shall apply to the Contractor throughout the work and to the Owner upon completion of the work. All septic tanks taken out of service by connection to District sewers shall become the responsibility of the Owner and should be filled in accordance with the above mentioned Section 24400.

Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures, the Engineer may direct attention to the existence of a hazard, and may order the Contractor to improve his facilities or methods. The Contractor shall promptly comply with such orders, and the necessary warning and protective measures shall be furnished and installed by the Contractor at his own expense without cost to the District. The Contractor shall not be relieved

from responsibility for securing the necessary degree of safety, nor his obligation to furnish and pay for appropriate plant, equipment and methods abrogated.

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

No material or other obstruction shall be placed within fifteen (15) feet of fire hydrants, which shall be at all times readily accessible to the Fire Department, nor within five (5) feet of United States Postal Service boxes. No material or equipment shall be parked or placed within a road right-of-way in a manner which will impair the vision of roadway traffic or otherwise create a dangerous obstacle to traffic.

10-08. USE OF EXPLOSIVES

When the use of explosives is necessary for the prosecution of the sewer work, all necessary explosive work shall only be accomplished by a Contractor having the proper COSHA License to handle and use explosives. Utmost care shall be taken to avoid danger or damage to life and property. The Contractor shall furnish the District a copy of the license. The Contractor shall be responsible for obtaining all necessary permits and for compliance with regulatory agency blasting requirements.

10-09. PRESERVATION OF PROPERTY

Attention is directed to Section 17 of these Specifications. Due care shall be exercised to avoid injury to existing sewer improvement or facilities, streets, highways, pavements, utility facilities, adjacent property, and roadside trees and shrubbery that are not to be removed.

Trees and shrubbery adjacent to the sewer trench, pole lines, fences, signs, survey markers and monuments, buildings and structures, conduits, pipe line under or above ground, sewer and water lines, all highway facilities and any other improvements or facilities within or adjacent to the sewer work shall be protected from injury or damage.

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

The Contractor shall examine all roadbeds, bridges, culverts and other structures on or near the work, over which he will move his materials and equipment, and before using them, he shall properly strengthen such roads and structures, where necessary. The Contractor will be held

responsible for any and all injury or damage to such roads and structures caused by reason of his operations.

10-10. RESPONSIBILITY FOR DAMAGE

The District, or any of its officers, or employees, or the Engineer shall not be answerable or accountable in any manner, for any loss or damage that may happen to the work or any part thereof; or for any of the materials or other things used or employed in performing the work; or for injury to any person or persons, either worker or the public; or for damage to property from any cause which might have been prevented by the Contractor, or his worker, or anyone employed by him; against all of which injuries or damages to persons and property the Contractor having control over such work must properly guard.

The Contractor shall be responsible for any liability imposed by law upon the District, its officers, employees, or the Engineer for any damage to any person or property occurring or arising in the execution of a contract, agreement or permit or performance of the work, or occurring or arising out of the improper execution of a contract, agreement or permit or performance of the work, including such resulting from failure to abide by all applicable laws and regulations, or resulting from work or materials which are defective, unsatisfactory, or imperfect.

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

10-11. DISPOSAL OF MATERIAL OUTSIDE THE RIGHT-OF-WAY

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

When the material, including excess or unsuitable excavated earth or other sewer materials are to be disposed of outside the right-of-way, the Contractor shall first obtain a written permit from the Owner on whose property the disposal is to be made, and shall file a copy of the permit with the District.

When material is disposed of as above provided and the disposal area location is visible from a highway, the Contractor shall dispose of the material in a neat and uniform manner to the satisfaction of the Engineer. Disposal of septic tank pumping into the sewerage system of the District will only be permitted at certain locations and with the specific written permission of the District.

10-12. ACCEPTANCE AND GUARANTEE OF WORK

Acceptance of the work will be made in writing by the Engineer only after the following requirements have been met: The final inspection has been made in accordance with Section 13-12 of these Specifications and, in the opinion of the Engineer, the work is complete and has

received a favorable final inspection. The Job Engineer, if connected with the work, has been notified in writing by the Contractor that the work has been completed.

Immediately upon and after acceptance of the work by the District, the one (1) year guarantee period on all work shall be in effect. During the one (1) year guarantee period, the District may perform an internal closed circuit television inspection, pull a mandrel, or other such device to determine condition of the total line footage of the main and/or trunk sewers installed under the particular job.

Any faulty workmanship and/or defective materials which are discovered within one (1) year after acceptance of the work by the District, shall be corrected and/or replaced by the Contractor at no expense to the District. Such guarantee period may be extended upon disclosure of a defect until one (1) year after correction of the defect.

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

10-13. RIGHTS IN LAND AND IMPROVEMENTS

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

10-14. PERSONAL LIABILITY

Neither the District Board, the Engineer, nor any other officer or authorized employees of the District shall be personally responsible for any liability arising under or by virtue of the contract.

10-15. SURVEY MONUMENTS

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

10-16. SEWER SERVICE

The Contractor shall be held solely responsible to provide uninterrupted sewer service to all services affected by his work. The Contractor shall protect and indemnify the District, the District Board, the Engineer, the Inspector and all their officers, agents and employees against any claim or liability arising from or based on failure to provide such continuous service.

10-17. ABANDONED EXCAVATIONS

Every person owning land in fee simple or in possession thereof under lease or contract of sale who knowingly permits the existence on the premises of any abandoned mining shaft, pit, well, septic tank, cesspool or other abandoned excavation dangerous to persons legally on the premises, or to minors under the age of twelve (12) years, who fails to cover or fence securely any such dangerous abandoned excavation and keep it so protected, is guilty of a misdemeanor as provided under Section 24400, Chapter 4, Division 20 of the Health Safety Code of the State of California.

END OF SECTION 10

SECTION 11

DISTRICT PERMITS, LICENSES, AND BONDS

11-01. PERMITS

All work under the jurisdiction of the Stege Sanitary District requires a specific permit in accordance with said District Code and regulations. No permit in relation to or for connection to the District sewer system shall be issued for any work until the Homeowner or Prime Sewer Contractor presents a COSHA permit conforming to the requirements of Section 20-02.C of these Specifications. Homeowners exclusively performing all of the work on their side sewer without employees or any other person or persons are exempt from securing a COSHA permit, workers' compensation insurance, and liability insurance. The Sewer Contractor must maintain proper liability insurance and workers compensation coverage in accordance with Section 10-02 of these Specifications. Any permit for new construction or repair of sanitary sewers issued by the District shall be kept on hand at the jobsite and made readily available for review during prosecution of the work.

A. Main Sewer, Trunk Sewer, Structure, and Manhole Installation Permits

Engineering plans are required.

B. Side Sewer - Lateral Permit

Location plans are required on all subdivisions and when a six (6) inch or larger side sewer is to be installed.

C. Side Sewer - House Sewer Permit

A house sewer permit will not be issued until the main sewer is completed and accepted by the District and until the house plumbing system is complete including the installation of permanent vents through the roof. Appropriate connection fees and charges must be paid and will be accepted at the time a house sewer permit is issued.

11-02. LICENSE

Contractors performing work requiring permit by the District shall be licensed by the state of California (Division 3, Chapter 9, Business and Professions Code). Work on public property, roads, streets, and other rights-of-way shall be performed only by duly licensed Contractors.

Acceptable state Contractors' licenses are:

1. A General Engineering Contractor
2. B Building Contractor
3. C-34 Pipeline
4. C-36 Plumbing
5. C-42 Sanitation System

11-03. BOND AND AGREEMENTS

A. Contractor's Bonds

Contractors performing work requiring permit by the District will be required to post a refundable cash bond or cashiers check of five hundred (500) dollars to guarantee workmanship and materials.

For contracts in excess of ten thousand dollars (\$10,000) construction value a separate 100% performance material and labor bond will be required.

B. Owner's House Sewer Bond (NOT REQUIRED)

11-04. VIOLATIONS -PENALTIES

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

- A. Forfeiture of the cash bond in part or in total.
- B. The District may perform the work or have it performed by others at the Contractor's or Owner's expense.
- C. The District may refuse to accept the work and disconnect the work from the District system at the Contractor's or Owner's expense.
- D. The District may revoke or suspend the Contractor's District bond.

END OF SECTION 11

SECTION 12

SCOPE OF WORK

12-01. WORK TO BE DONE

The work to be done consists of furnishing all labor, methods or process, implements, tools, machinery and materials, except as otherwise specified, which are required to construct and put the portion of sewerage system designated in the contract, permit or by other agreement in complete order ready for use.

All work shall be done in an orderly and workmanlike manner to the satisfaction of the Engineer.

12-02. FINAL CLEANING UP

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

12-03. ALTERATIONS

The District reserves the right to increase or decrease the quantity of any items or portion of the work or to omit portions of the work as may be deemed necessary or advisable by the Engineer; also to make such alterations or deviations, additions to or omissions from the Plans and Specifications, as may be determined during the progress of the work to be necessary and advisable for the proper completion thereof.

12-04. MAINTENANCE OF DETOURS

The Contractor shall construct, maintain and remove detours and detour bridges for the use of traffic as provided in the special provisions, or as shown on the Plans or as directed by the Engineer.

The failure or refusal of the Contractor to construct and maintain detours at the proper time shall be sufficient cause for closing down the work until such detours are in satisfactory condition for the use of public traffic.

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

END OF SECTION 12

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SECTION 13

CONTROL OF THE WORK

13-01 AUTHORITY OF ENGINEER

The Engineer shall decide all questions which may arise as to the quality or acceptability of materials furnished and work performed. His decision shall be final and he shall have authority to enforce and make effective such decisions and orders which the Contractor fails to carry out promptly.

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

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

The authority of the District is granted under the provisions of Division 6, Part 1, of the Health and Safety Code of the State of California, and regulations of the Stege Sanitary District.

13-02. PLANS

The approved plans shall be supplemented by such working drawings as are necessary to control the work adequately. All authorized alterations affecting the requirements and information given on the approved plans shall be in writing. No changes shall be made in any plan or drawing after it has been approved by the Engineer, except by his direction.

The Contractor shall ensure that a copy of all submittals stamped "PLANS APPROVED FOR CONSTRUCTION" and signed by the District Engineer, as well as a copy of these Standard Specifications and all other governing agency specifications incident to the work shall be kept on the jobsite during prosecution of the work and made accessible to the Engineer at all times. The Plans, Specifications, Standard Drawings, Special Provisions, and all supplementary documents are to be considered the requirements of the work, and it shall be the responsibility of the Contractor to familiarize himself fully with the requirements of these and the various governing authorities having jurisdiction over the work.

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

It is expressly understood that approval by the Engineer of the Contractor's working drawings does not relieve the Contractor of any responsibility for accuracy of dimensions and details, or for mutual agreement of dimensions and details.

13-03. CONFORMITY WITH PLANS AND ALLOWABLE DEVIATIONS

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

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

13-04. COORDINATION OF PLANS, SPECIFICATIONS, AND SPECIAL PROVISIONS

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

Special Conditions shall take precedence over all documents; Specifications shall govern over plans, unless deviation from the Specifications is specifically approved by the Engineer in writing. Any job shall be installed in accordance with the Standard Specifications and addenda, in effect at the time the plans were approved. "Plans Approved for Construction" become void three (3) months from the date of approval, unless work has begun within that period.

13-05. INTERPRETATION OF PLANS AND SPECIFICATIONS

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

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

13-06. SUPERINTENDENCE

The Contractor or his representative, authorized to make field decisions for the Contractor, shall be present at the site of the work at all times while work is actually in progress.

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

13-07. LINES AND GRADES

The Contractor shall have all the utilities located and marked prior to staking.

Stakes and marks set by the Job Engineer shall be carefully preserved by the Contractor. If any such stakes and marks, necessary to complete construction, are destroyed or damaged by reason of the Contractor's operations, all cost incurred by the Job Engineer in replacing or restoring such stakes and marks, may be deducted from any moneys due or to become due the Contractor.

Elevations shown on the Plans shall refer to the Official Base heretofore adopted by the District Board which is United States Coast and Geodetic Survey sea level datum 1929. Acceptable elevation bench marks shall be permanently marked points of vertical control established by a public agency. Such control bench marks shall be of record on file with the agency, and information as required by Section 5-05.F of these Specifications shall be available to the public. All vertical control for the design and construction of sewer pipelines and appurtenant structures shall be based on an acceptable elevation bench marks.

13-08. INSPECTION

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

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

The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill his contract as prescribed, and defective work shall be made good and unsuitable materials may be rejected, notwithstanding that such defective work and materials have been previously overlooked and accepted by the Engineer. (See Section 14-12.)

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

After completion of final air testing in conformance with Section 22-04.B and completion of preliminary cleaning in conformance with Section 22-04.C but prior to any placing of pavement structural sections for streets, roads or highways and prior to final inspection in accordance with Section 13-12, the District will cause to have performed an internal closed circuit television inspection on all new main and trunk sewer pipeline installations. (See Section 22-04.D.) During inclement weather, the inspection will be made after air testing, cleaning and placement of aggregate base but prior to application of road oil and/or asphalt concrete. Sewer pipelines without structures on the upstream ends, i.e., stubs, will be inspected by television. Stubs over fifty (50) feet in length shall have a temporary access structure provided by the Contractor on the upstream end.

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

The Contractor shall make applications for District inspections required by these Specifications at least forty-eight (48) hours in advance of the times such inspections are required for the work. Any changes in the Contractor's work schedule affecting scheduled inspections shall be phoned to the District in care of the District's Permit Department as soon as possible to allow for rescheduling.

13-09. REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

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

13-10. EQUIPMENT AND PLANT

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

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

Permission to use alternative equipment in place of equipment specified will only be granted where such equipment is new or improved and its use is deemed by the Engineer to be in furtherance of the project and is found to be in compliance with the requirements of COSHA.

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

13-11. CHARACTER OF WORKERS

None but competent foremen and workers, including Subcontractors, shall be employed on work requiring special qualifications and, when required by the Engineer, the Contractor shall discharge any person who commits trespass or is, *in the opinion of the Engineer, disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable*, and such person shall not again be employed on the work. Such discharge shall not be the basis of any claim for compensation or damages against the District or any of its officers or representatives.

13-12. FINAL INSPECTION

When the work contemplated by the contract, permit or agreement has been completed, the Engineer will, upon request by the Contractor, make the final inspection of the work site together with an authorized representative or representatives of the Owner of the development or property served by the new sewer installations and any and all other agencies having an interest in the work.

END OF SECTION 13

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SECTION 14

CONTROL OF MATERIAL

14-01. CONTRACTOR FURNISHED MATERIALS

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

14-02. SOURCE OF SUPPLY AND QUALITY OF MATERIALS

Only new materials conforming to the requirements of these Specifications and approval by the Engineer shall be used in the work. All materials proposed for use may be inspected or tested at any time during their preparation and use. After trial, if it is found that sources of supply which have been approved do not furnish uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish approved material from other approved sources. No material which, after approval, has in any way become unfit for use shall be used in the work. Manufacturers' guarantees, instructions and parts lists, where appropriate, shall be delivered to the Engineer before acceptance of the work.

14-03. LOCAL MATERIALS

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

When tests of materials from sources in the vicinity of the work have been made by the District, the results of such tests will be available to the Contractor or to prospective bidders on inquiry at the office of the District. This information is furnished for the Contractor's or the bidder's convenience only and the District does not guarantee such tests and assumes no responsibility whatever as to the accuracy thereof or the interpretation thereof stated in the test records.

14-04. USE OF MATERIALS FOUND ON THE WORK

The Contractor, with the approval of the Engineer, may use in the proposed construction such stone, gravel, sand or other material suitable in the opinion of the Engineer as may be found in the excavation. No charge for materials so used will be made against the Contractor. The Contractor shall not excavate or remove any material which is not within the excavation as indicated by the slope and grade lines, without written authorization from the Engineer.

14-05. ACQUISITION OF MATERIALS

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

14-06. STORAGE OF MATERIALS

Materials shall be so stored as to insure the preservation of their quality and fitness for the work. When considered necessary by the Engineer, they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground. They shall be placed under cover when so directed. Stored materials shall be so located as to facilitate prompt inspection.

All surplus piping materials shall be removed from the site of the work within five (5) days after the completion of the pipe laying.

14-07. DEFECTIVE MATERIALS

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

14-08. TRADE NAMES AND ALTERNATIVES

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

The burden of proof as to the comparative quality and suitability of alternate equipment, articles and/or materials shall be upon the Job Engineer (excluding the District Engineer) or Prime Contractor performing the work, and all information necessary or related thereto as required by the District Engineer shall be furnished at no expense to the District. This information shall include: the method and materials of fabrication, the test procedures used for product uniformity, manufacturer's name, trade name or item identification, manufacturer's recommended application or installation procedures and any guarantees, warranties or effective use life of the proposed alternate. The final decision as to the acceptability of any alternate equipment, article and/or materials shall be vested with the District Engineer and his decision shall be final. For all work with the District, thirty-five (35) days shall be allowed after award of the contract for submission of all data substantiating requests for substitution of alternate items. Failure to submit requests for alternate equipment, article and/or materials will be considered as evidence that the work anticipated shall utilize only those items of equipment, articles and/or materials that are included in the Specifications and Plans.

All alternate selections of construction materials and/or methods by the Contractor to be used where such alternate is allowed or permitted, explicit or not, either in the District's Standard Specifications or in the Special Provisions, shall be approved by the Engineer prior to their application.

14-09. TESTING MATERIALS

Whenever reference is made in these Specifications to a test designation of the American Society for Testing and Materials, or any other recognized national organization, it is to be understood that the test method in use on the date plans are approved for construction shall prevail for that project.

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

When requested by the Engineer, the Contractor shall furnish without charge, samples of all materials entering into the work, and no material shall be used prior to approval by the Engineer.

Before the start of work, the Contractor shall notify the Engineer of the proposed sources of supply of all materials to be furnished by him.

Materials may be tested at any time during the progress of the work, and defective materials will be rejected.

14-10. PLANT INSPECTION

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

14-11. CERTIFICATES OF COMPLIANCE

The Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance stating that the materials involved comply in all respects with the requirements of the Specifications. The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials. A Certificate of Compliance must be furnished with each lot of material delivered to the work and the lot so certified must be clearly identified in the certificate.

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

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

14-12. SPECIAL TEST METHODS

Except as otherwise provided under Section 14-09 and in the Special Provisions, special tests and test methods shall be in conformance with those specified in the State Standard Specifications.

END OF SECTION 14

SECTION 15

PROSECUTION AND PROGRESS

15-01. COMMENCEMENT OF WORK AND DELAYS

Before initial work is begun, the Contractor and his foremen shall file with the District addresses and telephone numbers where they can be reached during hours when the work is not in progress. Prior to any excavation work, the Contractor shall contact the following agencies and utilities (see Section 17-02.), unless it can be determined that the particular agency or utility has no jurisdiction or facilities within the work area:

Contra Costa County Public Works Department	(925) 313-2000
City of El Cerrito Public Works Department	(510) 215-4382
City of Richmond Engineering Department	(510) 307-8091
U.S.A.	(800) 642-2444
P.G. and E	(800) 743-5000
E.B.M.U.D.	(510) 835-3000
SBC (Pacific Bell)	(925) 823-6527
Comcast Cable	(925) 229-8516
Stege Sanitary District	(510) 524-4668

The Contractor shall also give the Engineer notice of the time when he will start work or resume said work when suspended. Notice shall be given at least forty-eight (48) hours in advance of the starting or resumption time, exclusive of Saturdays, Sundays or holidays, for the purpose of permitting the Engineer to make the necessary assignment of his representative or inspector on the work. After the Contractor once begins the work, the work shall be prosecuted diligently and continuously each day until completed. Work may be suspended only during emergencies or inclement weather or where required by these Specifications.

15-02. PROGRESS OF THE WORK

The Contractor shall, on commencing operations, take all precautions required for public safety and shall observe all provisions of the Standard Specifications and Special Provisions relating thereto.

Once work is started on any one section of sewer line, the work on that section shall be prosecuted with diligence, satisfactory to the District, until the section is complete, including testing, compaction, paving (if required) and clean-up.

15-03. METHODS AND APPLIANCES

The methods and appliances adopted by the Contractor shall be such as will, in the opinion of the Engineer, secure a satisfactory quality of work and at a satisfactory rate of progress. If, at any time, the methods and appliances appear inadequate, the Engineer may order the Contractor to improve their character or efficiency and the Contractor shall conform to such order. Failure of

the Engineer to order such improvement methods or efficiency will not relieve the Contractor from his obligation to perform satisfactory work at a satisfactory rate of progress.

15-04. TEMPORARY SUSPENSION OF WORK

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

In the event that a suspension of work is ordered as provided above, the Contractor, at his own expense, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic, during the period of such suspension. In the event that the Contractor fails to perform the work above as specified, the District will perform such work and the cost thereof will be charged to the Contractor or Owner.

END OF SECTION 15

SECTION 16
(RESERVED)

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SECTION 17

UTILITIES, EXISTING FACILITIES, AND CONCRETE REMOVAL

17-01. PRESERVATION OF PROPERTY

Attention is directed to Section 10-09. and 10-10., "Preservation of Property", and "Responsibility for Damage", of these Specifications. Due care shall be exercised to avoid damage to existing improvements, utility facilities, and adjacent property. When any railroad, street, highway, private or public utility is crossed, all precautionary construction measures required by the Owner of said structure shall be followed by the Contractor.

17-02. UTILITY FACILITIES

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

The Contractor shall, before proceeding with the work, confer with all agencies and utilities which have or may have aboveground and/or underground facilities in the vicinity of the work. (See Section 15-01.). The purpose of the Conference shall be to notify said agencies and utilities of the proposed construction schedule and to locate and/or verify the locations of all facilities, including house connections, in the area of the work. The Contractor shall also arrange for all necessary suspension of service and make arrangements to physically locate and avoid interference with all existing facilities. The Contractor may make arrangements for alterations for his sole convenience (not actually required to complete the sewer installation); such alterations shall be completely at the expense of the Contractor.

Where existing utilities and/or other facilities, aboveground and/or underground, are encountered during construction, they shall not be displaced or molested unless necessary. If it is necessary to relocate a facility, or if a facility is disturbed or accidentally damaged in the prosecution of the work, the Contractor shall notify the District and the Owner or proper authority and shall abide with the requirements of and cooperate with such Owner or authority (who may enter upon the work at any time) while protecting, repairing, replacing or relocating such facilities. All abandoned pipe lines that are severed during the work, shall be immediately plugged by the Contractor, with approved material (See Section 27-01.), unless otherwise approved by the Engineer.

All utility and other facility arrangements, agreements, fees, locating, protection, repair, replacement, suspension of service, temporary relocations and all other work in connection with utilities and other facilities, shall be the sole responsibility of and at the expense of the Contractor. Necessary permanent relocation of utilities and other facilities to accommodate the sewer construction, shall be the Owner's responsibility.

17-03. PRESERVING, REMOVING AND SALVAGING SEWERS AND OTHER IMPROVEMENTS

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

When an existing sewer line is cracked, broken, displaced or more than three (3) feet of the pipe is exposed, the District shall be immediately notified and the sewer line shall not be covered prior to District inspection and approval.

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

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

17-04. REMOVAL OF CONCRETE, MASONRY OR MORTARED CONSTRUCTION

At locations shown on the Plans or where directed by the Engineer, portions of existing portland cement, concrete pavement, curbs, gutters, sidewalks, foundations, and other concrete or mortared structures shall be removed to the lines and elevations specified or shown on the Plans or ordered by the Engineer. Concrete structures or objects not shown or noted on the Plans but encountered during construction, and requiring one-half (1/2) cubic yard or less of removal per encounter, shall be removed where necessary and disposed of by the Contractor.

Concrete removal operations in connection with the reconstruction of existing structures, (Section 25-20.), shall be performed without damage to any portion of the structure that is to remain in place. If damage occurs, the Contractor shall repair any such damage at his own expense, to the satisfaction of the Engineer. Where existing reinforcement is to be incorporated in new work, such reinforcement shall be protected from damage and shall be thoroughly cleaned of all adhering material before being embedded in new concrete.

Unless otherwise provided, material removed as above specified shall be broken into pieces not larger than two (2) feet in greatest dimension and disposed of in a manner acceptable to the Engineer.

17-05. CROSSING UNDER RAILROAD, HIGHWAY OR UTILITIES

Where any railroad, highway, private or public utility is crossed, all precautionary construction measures required by the owner of the railroad, highway or utility shall be followed by the Contractor. The Contractor shall obtain and pay for all necessary permits, licenses, bonds, and fees required for the crossing and give all notices necessary and incident to the work.

END OF SECTION 17

SECTION 18

CLEARING AND GRUBBING

18-01. DESCRIPTION

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

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

Within sewer easements or rights-of-way, trees, shrubs, fences, and all other improvements that have to be removed to permit construction, shall be replaced in kind and size or with approved substitutes by the Contractor. However, trees shall not be replaced. The removal of any trees, shrubs, fences or other improvements outside of sewer easements or rights-of-way as deemed necessary by the Contractor, shall be arranged with the Owner, removed and replaced, if required, by the Contractor at his expense.

18-02. REMOVAL AND DISPOSAL OF MATERIAL

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

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

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

18-03. PRESERVATION OF PROPERTY

Attention is directed to Section 10-09. and 10-10., "Preservation of Property", and "Responsibility for Damage", of these Specifications. Existing sewerage improvements or facilities, and adjacent property, that are not to be removed, shall be protected from injury or damage resulting from the Contractor's operations. Only trees and shrubbery that are specifically designated or marked for removal by the Engineer shall be removed.

When a sewer pipe or appurtenance is to be constructed on property over which the District has a right-of-way or an easement, the Contractor's operations shall be governed by the terms of the easement and any supplemental agreement on file at the District office. Such property shall be restored to a condition equal in all respects to that prior to entry. Special attention shall be

directed to the restoration of vegetation, top soil, landscaping improvements, subsurface pipes and drains and buildings.

END OF SECTION 18

SECTION 19

WATERING AND JETTING

19-01. DESCRIPTION

Water for compacting backfill material, subgrades and water required for laying dust caused by grading operations and the passage of traffic through the work shall be applied as follows or as directed by the Engineer.

19-02. REQUIREMENTS

Water for compacting subgrades and for laying dust caused by grading operations and the passage of traffic through the work shall be applied by means of distributors equipped with a spray system that will insure a uniform application of water. Dust resulting from the Contractor's operations shall be controlled to a minimum.

19-03. JETTING

Jetting of trench backfill will be permitted only when, in the written opinion of the Owner's Geotechnical Engineer, such backfill and surrounding ground are of such character that they will not soften or be otherwise damaged by applied waters. Prior to commencing jetting, the Geotechnical Engineer's report will be delivered to the Engineer via the Construction Inspector. Jetting shall be supplemented by the use of mechanical compaction equipment to obtain the relative compaction requirements of these Specifications.

Jetting shall be accomplished by introducing water into the backfill by means of a jet pipe. The jet pipe shall be not less than one (1) inch in diameter and shall extend to within fifteen (15) inches of the top of the sewer pipe during jetting. The source of water for jetting shall be a pressure hydrant or a water tank with a minimum pressure of sixty (60) pounds per square inch. All "bridges" in backfill shall be completely broken down during the jetting process without flooding. Proceeding upgrade, jet points along the line of the ditch shall be staggered from side to side at intervals not to exceed six (6) feet center to center or as necessary to insure that the backfill takes full possible subsidence while water is being introduced into it through the jet pipe. When this method of consolidation is permitted either by the District or other agency having governing controls on such method, the backfill shall be placed in lifts or steps complying to the specific requirements of such agency having jurisdiction. Under no conditions shall successive lifts or steps of backfill placements to be jetted exceed six (6) feet in height.

END OF SECTION 19

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SECTION 20

EXCAVATION AND BACKFILL

20-01. DESCRIPTION

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

Whenever a relative compaction requirement or sand equivalent value is specified under this Section, or in the Special Provisions in connection with earthwork, the tests shall be made in accordance with the CALTRANS test methods.

20-02. TRENCH EXCAVATION

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

A. Excavation

Prior to any excavation and backfill work, the Contractor shall obtain and provide the Engineer with copies or other evidence of acquisition thereof, all required permits for the work including: permits to do work in County roads and /or City streets, any bonds which may be required by encroachment permits for the work, District work permit, COSHA permit.

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

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

Where trenching occurs in paved areas, the pavement shall be blade cut or scored and broken ahead of the trenching operations, and shall be cut or trimmed to a neat edge after backfilling and prior to paving. The proper tools and equipment shall be used in marking

and breaking so that the pavement will be cut accurately and on neat lines parallel to the trench. Any pavement damaged outside these lines shall be re-cut and restored prior to final paving. Trenching for all pipes, unless otherwise specified, shall be open cut to the lines and grades shown on the plans.

When trenching occurs in natural or filled ground which is neither paved nor intended to be paved and the slope of such surface equals or exceeds a horizontal to vertical ratio of one and a half to one (1.5:1), check dams shall be installed in conformance with Section 4-03.H.

The Contractor shall remove all water which may accumulate in the excavation during progress of the work so that all work can be done in a dry trench. Trenches or other excavations shall be kept free from water while the pipe or structures are being installed, while concrete is setting, and until backfill has progressed to a sufficient height to anchor the work against possible flotation or leakage. Water shall be disposed of in such a manner as to cause no injury to public or private property or be a menace to the public health.

All loose material shall be removed from the bottom of the trench prior to placement of any bedding material.

B. Trench Width

Unshored trenches shall be sixteen (16) inches wider than the external diameter of the barrel of the pipe to be used in the trench. Where shoring is required, (see Sect. 20-02.C) the width of the trench shall be increased only by the thickness of the sheathing. Trenches shall be excavated with full depth vertical sides where possible. Minimum vertical trench shall be from pipe flowline to a point two (2) feet above top of pipe. Any over width trench, whether by over excavation, cave-in or by ground movement, may require special pipe and/or special backfill, as directed by the Engineer.

C. Shoring

All shoring for open excavations shall conform to the requirements herein and to the requirements of the State of California, Department of Industrial Relations, Division of Occupational Safety 'Construction Safety Orders' (latest edition thereof), which are hereby adopted by reference as part of these Specifications.

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

No shoring, once installed, shall be removed until backfill operations on such shored portion of the work has been approved by the Engineer. Removal of shoring shall only be accomplished during backfill operations and in such a manner as to prevent any movement of the ground or damage to the piping or other structures.

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

It shall be the Contractor's responsibility to obtain, at his own expense, all permits for any excavations over five (5) feet in depth into which a person is required to descend or any excavation less than five (5) feet in depth in soils where hazardous ground movement may be expected and into which a person is required to descend. Permits for such excavations shall be obtained from COSHA, a copy of which shall be filed with the District's Permit Department prior to any work permit issuance in conformance with Section 11-01.

D. Signing

Whenever a Contractor is working in an existing street, motorists must be given proper advance warning of the operation. Contractors shall place warning signs a distance of two hundred-fifty (250) to five hundred (500) feet on either side of their work area. Placement of signs and barricades shall be in accordance with the requirements of the agency having roadway jurisdiction. Signs shall be metal and a minimum of thirty (30) inches by thirty (30) inches in dimensions. The legend on the sign shall be appropriate for the type of work. Legends available include "MEN WORKING", "ROAD WORK AHEAD", "SINGLE LANE AHEAD". If the width of the pavement and/or driveable shoulder is less than twenty (20) feet or if two lanes of traffic cannot safely pass the area of work, flaggers must be used to control the flow of traffic.

E. Disposal of Excavated Material

Excavated material to be used for backfill shall be laid alongside of the trench and kept trimmed up so as to cause as little inconvenience as possible to public travel and the normal use of adjacent properties. Free access must be provided to all fire hydrants, water gates, meters, and private drives. Gutters or other drainage ways shall be kept clear unless other provisions are made for handling drainage.

All material excavated in streets, roadways, and rights-of-way, which is determined unsuitable for use as backfill or in excess of the amount required for backfilling, shall be removed immediately and disposed of as described in Section 10-11. of these Specifications.

F. Unsuitable Material

In advance of placing sewer pipe, existing material within the area where such pipe is to be placed, which in the opinion of the Engineer is unsuitable as a foundation for the pipe, including but not limited to vegetable matter, garbage, and junk piles, either on the surface or buried, shall be removed in its entirety and disposed of in accordance with the provisions in Section 20-02.E of these Specifications.

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

shall be removed and disposed of in accordance with the provisions of these Specification.

Where sewer lines cross areas which are unsuitable due to excessive water, enough material shall be removed so that underdrains can be installed in accordance with Section 20-03.A.1.

20-03. TRENCH BACKFILLING

Trench backfill shall consist of all materials placed in an excavation in the process of constructing a sewer line and/or appurtenances. No backfill shall be deposited over a sewer line and/or appurtenances until pipe laid has been inspected and approved for backfilling operations. Backfill operations shall closely follow pipe laying and the Contractor shall ensure no trench shall remain overnight without backfill and adequate protection as specified in Section 10-07. of these Specifications.

A. Replacement of Unsuitable Material

Materials excavated as being unstable or otherwise unsatisfactory in the vicinity of the sewer construction, shall be replaced as follows:

1. Material removed as unsuitable foundation for sewer construction, shall be replaced with Coarse Bedding material (see Section 20-03.C.2.b) and compacted to ninety (90) percent relative compaction.

Under drains shall be installed as shown on the Plans or as directed by the Engineer.

2. Over-excavation below the construction grades of the sewer work shall be restored by placing and compacting standard bedding material to the proper grade prior to any sewer construction.
3. All unsuitable material (including slide, cave-in, etc.) which enters the excavation after pipe or other sewer construction materials have been placed in the excavation, shall be removed from the excavation prior to any backfilling with the specified bedding and/or backfill material. See Section 20-02.B for excessive trench width construction requirements.

B. Bedding Details

Attention is directed to Standard Drawing Sections 32-27, 32-28 and 32-29 for applicable pipe bedding details. Unless otherwise specified or approved for use by the Engineer, Bedding Detail A of Section 32-27 shall be used in the design and construction of all sewer system pipelines in compliance with the minimum and maximum cover limitations tabulated for the various pipe sizes, types and strength classes. Use of Bedding Detail B shall be restricted to cast iron type pipe installations.

Bedding Details and cover limitations of Sections 32-28 and 32-29 require special approval of the District Engineer.

C. Bedding Material

1. Standard Bedding Material shall be free from vegetable matter and other deleterious substances and shall form a firm, stable base when compacted. The percentage composition by weight shall conform to the following grading:

SIEVE SIZES	PERCENTAGE PASSING
3/4"	100
No. 4	35-55
No. 200	2-9

The material shall also conform to the following quality requirements:

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

(Standard Bedding Material shall be equivalent to Aggregate Base. See Section 29.)

2. The use of special pipe bedding will be specified in the Special Provisions or determined by the Engineer.
 - a. *Fine bedding material* shall be clean mineral aggregate free from deleterious substances, having a minimum sand equivalent of seventy-five (75) and conforming to the following grading requirements:

SIEVE SIZES	PERCENTAGE PASSING
3/4"	100
1/2"	90-100
3/8"	40-100
No. 4	0-60
No. 8	0-45
No. 200	0-3

- b. *Coarse bedding material* shall be used under fine bedding material or TYPE 1 Backfill Material when conditions warrant or when ordered by the Engineer. Coarse bedding material shall be clean rock conforming to the following requirements:

GRADING LIMITS (CA TEST 202)	PERCENTAGE PASSING
SIEVE SIZES	PASSING
2"	100
1-1/2"	90-100
3/4"	5-30
3/8"	0-5
No. 200	0-2

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

3. Bedding around the pipe in restricted areas (tunnels, bores, casings, etc.) shall be placed by blowing sand in around the pipe or by the use of other suitable methods or materials approved by the Engineer.
4. Bedding in trenches shall be placed uniformly on each side of the pipe to prevent displacement. Bedding shall be graded by hand to provide a uniform surface on which the sewer pipe is to be laid.
5. Bedding materials shall be compacted to a minimum of ninety (90) percent relative compaction and all bedding material shall be carefully handled to prevent intrusion of foreign materials. Compaction tests may be required on a job by job basis. The Engineer may indicate the required tests on the Plans for the project or require that tests be taken during the construction of the project.

D. Backfill

Backfill is considered to be all material placed in the trench between the pipe bedding and the roadbed or ground surface. All backfill material shall be placed and consolidated in such a manner as to permanently prevent damage to the sewer, roadbed, road surfacing, and private property, or inconvenience to the public.

1. *Backfill Materials* shall be referred to by the following types:
 - a. *TYPE I* - TYPE I Backfill Material (Standard Bedding Material) (3/4 Minus Aggregate Base) shall be free from vegetable matter and other deleterious substances and shall form a firm, stable base when compacted. The percentage composition by weight shall conform to the following grading:

SIEVE SIZES	PERCENTAGE PASSING
3/4"	100
No. 4	35-55
No. 200	2-9

The material shall also conform to the following quality requirement:

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

(Type 1 Backfill shall be equivalent to Aggregate Base, See Section 29.)

- b. *TYPE II* - TYPE II Backfill Material (Aggregate Subbase) shall be free from vegetable matter and other deleterious substances and shall conform to the following grading requirements.

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

The material shall also conform to the following quality requirements:

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

- c. *TYPE III* - TYPE III Backfill Material (Trench Material) shall be free from vegetable matter and refuse and shall contain no concrete, stones or clods larger than four (4) inches in diameter and shall contain sufficient fines so that all voids will be filled when compacted, and shall be so constituted that compaction requirements can be met.
 - d. *SELECT TYPE III:* SELECT TYPE III Backfill Material (Trench Material) shall meet all requirements of the above described TYPE III Material except that the maximum particle size shall be three-quarters (3/4) inch in diameter.
2. *Procedures and Required Materials* for backfilling the various depths and types of trenches are covered in the following classes of backfill work:
- a. *All trenches in roadways and paved areas* and any excavations for repairs shall be backfilled with approved TYPE I Backfill Material.
 - b. *All trenches located in off-site public roads* shall be backfilled with TYPE I backfill material.
 - c. *Trenches in landscaped or cultivated areas* shall have the top twelve (12) inches backfilled with topsoil.
 - d. *Other Trenches* - All trenches other than those in existing paved areas may be backfilled from the top of the pipe bedding to the finish grade with TYPE III Backfill unless otherwise specified.
 - e. *Trench Maintenance* - All backfilled trenches within roadways shall be maintained in a smooth safe passable manner at all times until final compaction and paving are completed.
3. *Earth Trench Dams* (Sec. 32-33) shall be constructed over side sewers at property line or at the easement line, at locations indicated on the Plans and at locations designated by the Engineer. Trench dams will not be required in sections where underdrains are installed.

E. Compaction of Backfill

1. Compaction of backfill material may be accomplished by mechanical tamper, by vibrating, by jetting or by a combination of these methods. Jetting of any trench backfill within the upper three feet of trenches located in all existing streets will not be permitted and will be permitted in other areas only after the written recommendation of a Geotechnical Engineer is delivered to the Construction inspector.
2. For trenches in County roads, the relative compaction of trench backfill from the pipe bedding up to the subgrade or base of surfacing replacement shall be not less than ninety (90) percent.
3. Aggregate subbase or aggregate base shall be compacted to a minimum of ninety-five (95) percent relative compaction.
4. Standards designated above for County roads will be used in cities unless modified in writing by the city public works authority.
5. Trench work within State Highway rights-of-way requires a specific permit to be obtained through this District. Unless otherwise noted on the permit, all backfill will be compacted as specified above for County roads.
6. Trench backfill in private roadways and/or in other paved areas shall be placed and compacted in accordance with the requirements for County roads, as hereinabove described.
7. TYPE III Backfill Material not under pavement shall be compacted to a minimum of eighty (80) percent relative compaction.

F. Temporary Paving

The same day the trench is backfilled, it will be graded to conform to the existing surface and temporary pavement consisting of a minimum of two (2) inches of premixed asphaltic paving material will be placed over the trench. Temporary pavement shall be maintained in a safe and driveable condition until permanent pavement is placed.

G. Permanent Surfacing Replacement

During sealing or paving operations, all structure surface castings shall be protected from being covered. No adhesive materials that would affix to the top of said castings or otherwise fill frame and cover joints will be permitted.

Temporary pavement shall be removed and permanent pavement shall be installed within three (3) weeks after backfilling and compacting unless otherwise specified by the City or County. The permanent pavement shall be maintained to the satisfaction of the Engineer for the full guarantee period or until relief from maintenance is obtained in writing from the Owner or Agency maintaining the paved area.

1. *Public Streets:* Surfacing replacement in public streets and highways shall conform to the requirements of the Agency maintaining such streets and highways, but in no case will consist of less than the following:
 - a. Asphaltic pavement shall be replaced with an equal thickness of Asphalt Concrete, but not less than two (2) inches.
 - b. Portland Cement Concrete pavement shall be replaced with an equal thickness of concrete, but not less than nine (9) inches, with the top of the replacement level with the top of existing concrete pavement. Paving materials above the concrete pavement shall be replaced with Asphalt Concrete.
 - c. Excavations backfilled with TYPE II (or better) backfill shall be restored with twelve (12) inches of Aggregate Base under paving.
 - d. Unpaved public streets or public street areas outside of the traveled way, but used by traffic shall be surfaced with a minimum of six (6) inches of Aggregate Base.
2. *Areas Other Than Public Streets:* Paved or surfaced areas other than public streets (such as private driveways) shall be restored by replacement of identical pavement and base when practical. Portland Cement Concrete pavement shall be replaced in kind, and color shall be matched. Asphaltic pavements shall be replaced with an equal or greater thickness of Asphalt Concrete, but in no case will less than two (2) inches be applied over trench area. Base material will be replaced with a minimum of six (6) inches of Aggregate Base.

20-04. CASING, BORES, AND TUNNELS

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

A. Bores

Where a casing or sewer pipe is installed in a bored hole, whether wet or dry, the hole shall be bored by use of a machine which will cut a true circular bore to the required line and grade. Bored tunnels shall be no more than two (2) inches larger in diameter than the maximum outside diameter of the casing of sewer pipe to be placed therein.

When designated on the plans, permit, or by the Engineer in writing, approved metal casing shall be placed in a bored hole under the area to be crossed. Metal casings, when required, shall have a minimum wall thickness approved by the Engineer and have an inside diameter not less than eight (8) inches greater than the largest outside diameter dimension of the sewer pipe to be installed therein. All metal casing used for any particular bore shall be the same throughout the limit of such bore. All bore and/or jacking pit shoring shall comply with Section 20-02.C of these Specifications.

After the casing has been installed, redwood planks with guide strips nailed thereon shall be inserted and blocked or wedged securely to grade. The previously jointed sewer pipe shall be placed thereon and slid along the guide planks into the casing. An approved jointing material shall be used on all sewer pipe placed in casings. If other than Ductile Iron pipe is used, a double joint immediately outside the casing is required to provide flexibility. (See Section 32-41 for joint requirement.)

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

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

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

B. Backfill

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

20-05. STRUCTURE EXCAVATION AND BACKFILL

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

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

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

A. Excavation

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

If the Contractor over excavates or disturbs the foundation surfaces shown on the plans or specified herein without written authorization of the Engineer, he shall replace such foundations with compacted, standard bedding material (See Section 20-03.C) or other material approved by the Engineer in a manner which will show by test an equal bearing quality with the undisturbed foundation material. If the Contractor encounters ground water and/or unsuitable foundation material, he shall increase the depth of excavation to a minimum of nine (9) inches below the required concrete base of the structure and shall backfill with Coarse Bedding Material (See Section 20-03.C) or other material approved by the Engineer and compact it to a relative compaction of ninety (90) percent.

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

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

B. Cofferdams

Cofferdams for foundation construction shall be carried well below the bottom of the footings and shall be well braced and as watertight as practical. The interior dimensions of cofferdams shall be such as to provide sufficient clearance for construction forms and, when no seal is placed, to permit pumping outside the forms.

In the judgment of the Contractor, if the clearance provided on the Plans between the outside line of the footing and any pile or interior wall or surface is not sufficient to permit the expeditious driving of piles or building of forms, he may provide such necessary clearances by constructing the cofferdam sufficiently large to provide such clearance as he may deem necessary.

Cofferdams which are tilted or moved out of position by any cause whatsoever during the process of sinking, shall be righted or enlarged so as to provide the necessary clearance and proper location.

In tidal waters or in streams at a time of probable flood, cofferdam walls shall be vented at low water elevation to insure full hydrostatic head both inside and outside of the cofferdam during the period of pouring and setting of seals.

No shoring will be permitted in cofferdams which will induce stress, shock, or vibration in the permanent structure.

When permitted by the Engineer, cross struts or bracing may extend through foundation concrete. Such struts or bracing below low water will be permitted to remain in place. Struts or bracing above low water shall be removed and the volume displaced filled with concrete of the same mix as that specified for the surrounding concrete.

For structure work, the Job Engineer shall submit drawings showing the proposed method of cofferdam construction and other details. The type and clearance of cofferdams, insofar as such details affect the character of the finished work, will be subject to the approval of the Engineer, but the other details of design will be left to the Job Engineer, who will be responsible for the design of the work.

After the completion of the substructure, the cofferdams with all sheeting and bracing shall be removed to the level of the streambed, or ground water table, by the Contractor, at his own expense, and such removal shall be performed in such a manner as not to disturb or mar the finished concrete or masonry.

C. Foundation Treatment

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

When piles are to be used, the Contractor will be permitted to excavate a sufficient distance below the bottom of the footing as shown on the plans to take care of swell due to driving piles. After the piles are driven, if it is found that the ground has risen above plan grade, the Contractor shall remove such surplus material. After the piles are driven, if it is found that the surface of the ground is below plan grade, the Contractor shall backfill to the plan grade with material approved by the Engineer.

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

D. Inspection

Whenever any structure excavation is completed to the grade of the bottom of the footing shown on the plans, or set forth in the special provisions, or ordered by the Engineer, the Contractor shall notify the engineer, who will make an inspection of the elevation and character of the foundation. No footing concrete or masonry shall be placed in a footing until the Engineer has inspected and approved the elevation and character of the foundation for the footing.

E. Backfill

Structure backfill operations shall conform to the requirements of this section and/or the governing requirements of any project special provisions which are considered greater than specified herein.

Backfill material for all structures which are to be installed in existing streets shall be TYPE II Backfill Material as specified in Section 20-03.D.1.b of these Specifications. Structure backfill in areas other than streets may be native material free from stones and lumps four (4) inches and larger, vegetable and other deleterious matter resulting from structure excavation when permitted by the Engineer or not otherwise specified in special provisions for construction of the structure.

Material resulting from structure excavation and not used as structure backfill shall be disposed of as specified in Section 10-11.

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

All structure backfill material shall be placed in horizontal layers not exceeding eight (8) inches in loose thickness and brought up uniformly on all sides of the structure to avoid bending or distortional stresses. Each layer of backfill shall be moistened as required and thoroughly tamped, rolled or otherwise compacted until a relative compaction of not less than ninety (90) percent is achieved. Compaction by jetting or pounding may be approved by the Engineer for import granular backfill materials and backfills placed outside of existing streets under the provisions and requirements of Section 19-03 and/or Section 25-16.D of these Specifications.

END OF SECTION 20

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SECTION 21
(RESERVED)

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SECTION 22

SEWER PIPE LINES

22-01. DESCRIPTION

Sewer pipe lines shall be installed as shown on the Plans and in accordance with the following provisions, the Special Provisions, or as directed by the Engineer.

22-02. MATERIALS

A. General

All pipe, pipeline installations and requirements incident to appurtenant structure or joint connections shall be as specified herein. All pipe installation procedures and materials shall be in accordance with the pipe manufacturer's recommendations where not modified under the various types of pipeline materials specified herein. A current list, hereinafter referred to as "APPROVED MATERIAL LIST", of all pipe, fitting and joint materials specifically approved by the Engineer as conforming to these Specifications and for use in sewer pipeline installations under the jurisdiction of the District is on file and available at said District offices. Pipe, pipe products and/or pipe specifications not appearing on said Approved Material List or not specified herein shall not be used within the District without approval of and written authorization from the District Engineer. All pipe sizes refer to the nominal inside diameter of pipe (including any pipe linings) and no pipe, except where specified herein, shall be more than one-quarter (1/4) inch smaller than the nominal size designated. All pipe, pipe joints incorporated into the pipe, and manufactured fittings connecting pipe between structures shall be of one and only one manufacturer's brand and of the same type, quality, class and size unless otherwise specified or detailed on the Drawings. All field cut pipe shall be accomplished with equipment recommended by the pipe manufacturer. No hammer and chisel cuts will be permitted. The Contractor shall submit at his own expense shop and material details of all special pipe for approval before the pipe shall be manufactured or used on the work. All pipe and fittings delivered to the job site shall be marked by the manufacturer with such inventory and identification (Brand Name, Pipe Type, Strength Class, Batch Lot, Lengths, etc.) as to be properly identified in the field as meeting the requirements herein and for the work.

B. Banded Rubber Couplings

Banded rubber couplings, where specified, shown on the Standard Drawings of Section 32 or otherwise approved by the Engineer for use in the joining of the new pipe or repair of existing pipelines shall be compression type; "Band-Seal"^R couplings with external adjustable stainless steel shear rings, "Mission Clay Products Corp.", or "Ceramicweld couplings, Joints, Inc.", or approved equal. Use of couplings without external shear support, or couplings with shear rings in direct contact with the pipe at joints, (internal of the rubber collar), will not be permitted except when joining dissimilar pipe (e.g. clay to cast iron).

C. Rigid Pipe

Rigid pipe, fittings and joint materials specified herein consists of Vitrified Clay, hereinafter referred to as V.C., Cast Iron, hereinafter referred to as C.I., Ductile Iron herein referred to as D.I. and Reinforced Concrete, hereinafter referred to as R.C.

1. *V.C. Pipe:* All V.C. Pipe and fittings shall conform to the requirements of ASTM Designation C-700 as it applies to extra strength, unglazed vitrified clay pipe.
 - a. Resilient material conforming to the requirements of ASTM Designation C-425 shall be used for V.C. Jointing.
 - b. Rubber couplings used to join plain end V.C. pipe shall conform to the material and performance requirements of ASTM Designation C-594.
2. *C.I. Pipe:* All C.I. Soil Pipe, for use in side sewer installations only, shall conform to the requirements of ASTM Designation A-74 as it applies to Single Hub, extra heavy and service weight pipe. Service weight, Class SV, pipe shall be the normal requirement of C.I. Soil Pipe installations; however, the Engineer may require use of extra heavy, Class XH, pipe under special conditions. C.I. Soil Pipe may be installed without the use of foundation bedding material where such trench bottom provides solid bearing for the full length of the pipe.

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

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

3. *D.I. Pipe:* All D.I. pipe and fittings for main and trunk sewers shall conform to the requirements of ANSI Standards A21.50 and/or A21.51 as they apply to Ductile Iron Pipe. All main and trunk sewer D.I. pipe and fittings shall be of sufficient thickness to withstand the designed working pressure, and depth of cover under the laying conditions and provisions of Sections 32-27 and 32-28 of these Specifications. There are no special lining or coating requirements; however, bituminous coated material or concrete coated and/or lined pipe conforming to the requirements of ANSI Standard A21.4 may be used.

All D.I. pipe shall be shown on construction drawings by type and thickness class designations herein and as provided in Sections 32-27 and 32-28 of these Specifications.

- a. Bell and spigot joint assemblies shall conform to the requirements of Federal Specifications WW-P-421c, Section 3.1.2 as it applies to Type II, Grades B or C pipe.
 - b. Standardized mechanical joint assemblies shall conform to the applicable requirements of ANSI Standards for the pipe specified and ANSI Standard A21.11.
 - c. D.I. pipe may be installed without use of foundation bedding material where trench bottom provides solid bearing for the full length of pipe between bell holes, and where such installation otherwise meets the requirements of these Specifications. (See Bedding Detail "B" of Section 32-27.)
4. *R.C. Pipe:* All R.C. pipe and fittings shall conform to the requirements of either ASTM Designation C-76 or C-361, as modified hereunder:
- a. Where not otherwise modified by these Specifications, all provisions of the above-mentioned ASTM Designations shall govern.
 - b. The basis of acceptance of R.C. pipe manufactured in compliance with these specifications shall be in accordance with Sec. 4.1.1 of ASTM designation C-76 and as follows:
 - (1) Engineer approval of submittals required under sections 22-02.C.4.b.3, 22-02.C.4.d.4 and 22-02.C.4.f.7.
 - (2) Three-edge bearing test loads shall be applied to the extent that no greater than a 0.01-inch crack is produced in tested pipe sections. Applied test loading may be terminated without producing a 0.01-inch maximum crack if or when such loading has reached one hundred twenty-five (125) percent of that required for and relative to the specified D-load for the subject pipe.
 - (3) Test results shall be submitted to the District prior to shipment to the project jobsite. Results shall indicate the District-assigned project number, agency and operator performing the test, test date, pipe size and specified D-load and ultimate test load applied.
 - c. Materials shall comply with Section 5 of the appropriate ASTM Designation under which the subject pipe is to be manufactured, modified as specified hereunder:
 - (1) Cement used in the manufacture of R.C. pipe shall be TYPE II in conformance with ASTM Designation C-150.
 - (2) Aggregates used shall consist of granitic, calcareous or combinations thereof such that the concrete material samples for testing alkalinity in conformance with Section 22-02.C.4.f.7 of

- these Specifications shall exhibit a total Carbonate equivalence of not less than fifty (50) percent.
- (3) No admixtures shall be introduced to concrete mixes without specific District approval. Approval for admixture or blend usage for pipe for a given project shall not be considered a general use approval for subsequent projects unless so stated.
 - (4) Rubber for gaskets shall comply with the requirements of Sec. 2.11 of AWWA Standard C-302.
- d. Design shall comply with Sections 6 and 7 of appropriate ASTM Designation under which the subject pipe is to be manufactured and/or modified as specified hereunder:
- (1) All R.C. pipe shall be designed for anticipated trench loads calculated in conformance with Section 22-02.C.4.g of these Specifications, combined with a minimum head of at least twenty-five (25) feet. However, in no case shall pipe design under ASTM C-76 provisions be less than that specified therein for CLASS III, nor shall pipe design under ASTM C-361 provisions be less than that specified therein for Class B.
 - (2) Total concrete cover of reinforcement at the inner wall (clearance of steel surface to inner wall surface) shall not be less than one (1) inch, regardless of pipe diameter size or type and placement configuration of reinforcement.
 - (3) Joint assembly design shall be reinforced concrete bell and spigot type incorporating a fully-retained, single rubber gasket in accordance with Sec. 3.3 of AWWA Standard C-302.
 - (4) Manufacturer's design drawings for each project shall be submitted to the Engineer for approval prior to fabrication. Drawings shall indicate, at relative scale, concrete covers, reinforcement placements and joint assembly design. Submittals shall also include the design pipe size, D-load, cement type, concrete strength and areas, types and placements of reinforcement.
- e. Pipe manufactured under these Specifications shall be fabricated by the "centrifugal spun" process in accordance with AWWA Standard C-302 and as modified hereunder.
- (1) Sec. 3.6.9 - Form oils or release agents shall not contain any material or substance as would penetrate or otherwise retard concrete set at the formed surface.
 - (2) Sec. 3.6.10 - The steel forms shall be placed horizontally in a machine capable of spinning the forms at speeds that will produce concrete meeting or exceeding the concrete strengths required

under the appropriate ASTM Standard for the subject pipe specified.

f. The method and procedure for determining the alkalinity content for the inner wall of RCP shall be as follows:

- (1) A minimum of two (2) carbonate equivalence tests shall be run on sample pipe manufactured from concrete ingredients batched each week of manufacture for each pipe size manufactured there from. Additional testing on different pipe sections shall be required if the carbonate equivalence results of individual tests per pipe sample vary by more than ten (10) percent.
- (2) Test samples of concrete shall be obtained from random selected pipe sections by drilling, using carbide concrete bits as will procure at least five (5) grams of material per drilling. Sample material shall be taken at two (2) locations at least twelve (12) inches apart longitudinally and to the depth of the steel reinforcement surface. (For elliptically-placed reinforcements, sample material shall be taken at the minor axis as marked on the pipe.)
- (3) All drilled holes shall be repaired with cement and fine aggregate as specified and used in the manufacture of the subject pipe.
- (4) Each material sample shall be tested separately as obtained from the subject pipe. Test material shall be ground or pulverized sample material, oven dried for at last four (4) hours at a temperature of $100^{\circ}\text{C} \pm 5^{\circ}\text{C}$ just prior to testing.
- (5) Testing shall involve the following equipment and procedures:
 - i. *Equipment:* Sample weighing shall be performed with a precision balance readable to at least the nearest ten (10) milligrams. Liquid measures shall be performed with precision burets readable to at least two-tenths (0.2) of a milliliter. Ph meters shall read to at least the nearest tenth (0.1) of a unit. Weighing and pH meter equipment shall have been calibrated for correctness within six (6) months of the test.
 - ii. *Test Procedure:* Weight at least one (1) gram of the test material of each sample into an appropriately-sized Erlenmeyer flask and add about one hundred (100) ml of distilled water. (Place glass funnel in neck of flask to minimize spray losses). Slowly add fifty (50) ml of Standardized 1-Normal Hydrochloric Acid per gram of test material. When effervescence has subsided, heat to boiling and boil about one half (1/2) minute period. Cool and add

fifty to one hundred (50-100) ml distilled water. Titrate with Standardized, Carbonate-free, 1-Normal Sodium Hydroxide solution to an end point of pH metering reading of six and eight-tenth (6.8) minimum to seven and eight-tenth (7.8) maximum. End point reading must be stabilized for not less than two (2) minutes.

- (6) *Calculation of Carbonate Equivalence:* Calculations shall be based upon the chemical reaction of equivalent weights of Calcium Carbonate, CaCO_3 , and the liquid measures of specifically standardized acid and base titrating solutions, to the nearest tenth of one (0.1) gram at the stabilized end point. The equivalence of the tested sample shall be expressed in a percentage as CaCO_3 to the nearest tenth of one (0.1) percent.
- (7) *Quality Control Records:* The Contractor shall, prior to pipe installation, furnish the Engineer with two (2) copy sets of the manufacturer's quality control records for pipe manufactured in accordance with this section. Records shall indicate thereon:
- i. The agency and technician performing the test
 - ii. The test date
 - iii. The District's Job Number assigned to the project
 - iv. The pipe size and date manufactured
 - v. The weight of the test material
 - vi. The actual standardized normality of the acid and titrate solutions and the test amounts used
 - vii. The individual sample and pipe section average equivalent CaCO_3 percentage.

Each test record sheet shall be endorsed by the manufacturer (and the agency performing the test if other than the manufacturer), as certifying compliance with this Section.

- g. Trench load calculations and design shall reflect the following minimum criteria:
- (1) Maximum trench width of twenty-four (24) inches greater than the outside diametric dimension (O.D.) of the pipe and a backfill density relative to that anticipated, but in all cases not less than one hundred twenty (120) pounds per cubic foot.

- (2) A dead load factor not greater than one and nine-tenths (1.9) for beddings shown and specified under Sections 32-27 and 32-29 of these Specifications.
 - (3) Live load and impact factors relative to that anticipated but in all cases not less than that produced by using AASHO H-20 load criteria and a one and one-half (1.5) impact factor.
 - (4) A safety factor of not less than one and one half (1.5).
5. *C.L. and C.L. & C. Pipe:* C.L. and C.L. and C. pipe shall conform to the requirements of FEDERAL SPECIFICATIONS SS-P-381a of December 14, 1967 and latest amendments thereto and/or SS-P-385a of January 31, 1964 and latest amendments thereto except as modified herein. The total area of steel used for design purposes shall be the cross-sectional area of steel in the wall of the pipe cylinder only.

Rod-wrapping, cross-sectional area shall not be considered for design purposes. Reinforcing steel used for rod-wrapping for all C.L. & C. pipe shall have a minimum diameter of seven thirty-seconds (7/32) inch. Concrete linings and coatings shall be manufactured with TYPE II Portland cement conforming to the requirements of ASTM Designation.

C 150: Concrete linings shall extend to the ends of each pipe length. The Concrete coating shall be held back three (3) inches from each end of each pipe, except where otherwise specified for abutting pipe or structure connections. An approved corrosion protective coating shall be shop applied to all exposed metal portions of pipe before shipment. Minor shop coating damage shall be repaired in the field with material consistent with that used by the pipe manufacturer as directed by and to the satisfaction of the Engineer. Except where shorter lengths are required to meet special conditions, with due allowance for jointing, C. L. and C. L. & C. pipe shall be fabricated in individual lengths not exceeding forty (40) feet. All pipe shall be clearly marked with date of manufacture, type of concrete lining and/or coating and name or trademark of the manufacturer as identification on each individual length unless otherwise specified or shown on the Drawings. Fabrication of C. L. & C. pipe for above ground crossings, siphon installations or other underground installations specified shall be in accordance with the minimum basic requirements of the following table: (Based on a maximum span of thirty (30) feet).

Lined inside diameter of pipe (In.)	6	8	10	12	14
Steel Cylinder Gauge (U.S. Standard)	10	10	7	7	7
Uniform Minimum Lining Thickness	1/2	1/2	1/2	3/4	3/4
Uniform Minimum Coating Thickness	1	1	1	1	1
Rod-wrapping or wire reinforcement inches maximum clear by-4-inch No. 13	7/32 inch diameter or greater at 1.75 spacing. Self-furring welded fabric of 2- gauge steel wire				

Steel cylinders in the above table shall be such that the lined pipe shall have the nominal pipe size within the one-quarter(1/4) inch tolerance set by these

Specifications. Fittings for C.L. & C. pipe shall conform to the requirements of AWWA Standard C 208. Special fittings shall be shop fabricated as detailed on drawings approved by the Engineer for construction.

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

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

- a. C. L. and/or C. L. & C. joining by butt welding shall be performed on all plain end pipe. Field welds will be permitted at support points only as designated on drawings approved for construction and provided that the ends of such pipe are clean of all concrete, grease, scale and dirt. All welding shall be accomplished as specified in accordance with the latest AWS standards. After field welding is complete and approved by the Engineer, all exposed portions of the cylinder and joint shall be wrapped with eighteen (18) gage stucco wire and then cement grout band coated with CLASS I grout specified in Section 23 of these Specifications. The grout band, once finished, shall immediately be coated with an approved membrane type, fast curing material which will seal the band surface completely.
- b. Appropriately sized joint rings for joining C. L. and/or C. L. & C. pipe shall be welded to the cylinder to form a self-centering bell and spigot type joint sealed by a compressed rubber gasket conforming to the requirements of said FEDERAL SPECIFICATION SS-P-381a. When such method of jointing is used, CLASS I mortar, as specified in said Section 23, shall be used to point the joint on the inside and CLASS I grout, conforming to said Section 23, shall be used to completely fill the annular space between abutting pipe sections on the outside.
- c. Flexible steel couplings for joining C. L. and/or C. L. & C. pipe shall consist of approved beveled or flared sleeves, pressed or rolled steel flanges, rubber or neoprene gaskets and steel bolts with hexagon nuts.

D. Flexible Pipe

Flexible pipe, fittings and joint materials, for use in pipe bursting and/or sliplining sewer installations only, specified herein consists of High Density Polyethylene, hereinafter referred to as H.D.P.E.

H.D.P.E. pipe and fittings shall be Plexco EHMW PE 3408 SDR 17, 21, 26 or approved equal, consisting of virgin high molecular weight polyethylene, specified under ASTM D3350 as having a cell classification of PE345434C. Manhole adapter rings shall conform to recommendations of manufacturer of H.D.P.E. pipe supplied.

H.D.P.E. pipe shall be butt welded in accordance with ASTM D2657-67. The joints shall be leak proof, thermal, butt joints. All fusing shall be done using tools recommended by the pipe supplier and approved by the District. Operators shall be certified by the pipe manufacturer. The fusing machine shall have hydraulic pressure control for fusing two pipe ends together. The ends of pipe shall be trimmed to form perpendicular faces prior to fusing. The heating plate on the fusing machine shall be electrically heated and thermostatically controlled and shall contain a temperature gauge for monitoring temperature. The heating plate shall be subject to periodic inspection, using a temperature stick, to assure even heating.

The tensile strength of yield of the butt fusion joints shall not be less than that of the pipe. A specimen of pipe cut across the butt fusion joints shall be tested in accordance with ASTM C638.

Any material may be rejected for failure to meet any of the requirements of this specification. The acceptance of any deviation from these specifications shall be subject to the approval of the District.

The internal bead shall be controlled to protrude no greater than 1/8 inch circumferentially on the inside wall of the pipe barrel.

22-03. INSTALLATION

A. Main or Trunk Sewer Installations

All main and trunk sewer pipe installations shall be accomplished as specified herein except where modified by the requirements peculiar to the various types of pipeline materials specified under Sections 22-02.C and D.

1. All sewer pipe shall be laid with a minimum six (6) inches vertical clearance from all other improvements and utilities, unless otherwise approved by the Engineer. Refer to the Pipe Cover Requirements at Sections 32-27 and 32-28 of these specifications for minimum cover requirements. All pipe shall be laid to conform to the prescribed line and grade as shown on the plans and each pipe length checked to the grade line which the Contractor establishes from the grade stakes.

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

- a. A grade line shall be established in the bottom of the trench such that the top of each bell will touch the line when the pipe has been properly positioned or,

- b. A grade line shall be established above the trench on firmly secured batter boards from which the grade of each pipe can be checked by using a grade pole.

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

- a. The Contractor shall have the responsibility of providing an instrument operator who is qualified and trained in the operation of the LASER and said operator must adhere to the provisions of the state of California Construction Safety Orders issued by the Division of Industrial Safety. Attention is particularly directed to Sections 1516, and 1800 through 1801, of said Orders for applicable requirements.
 - b. All LASER control points shall be established bench marks or construction off-set stakes identified on cut sheets and set in the field for the work. LASER set up points shall be on these control points or on point set directly from them by instrument.
2. Each length of pipe shall be laid on compacted, approved bedding material as specified and shall have full bearing for its entire length between bell holes excavated in said bedding material to allow for unobstructed assembly of all bell and spigot joints. "Stabbing", "Swinging In", or "Popping On" spigot ends of pipe into bell ends will not be permitted. After jointing is accomplished, all annular spaces between pipe and bell holes shall be packed with bedding material, taking care not to damage, move, or lift the pipe from its bedding support.

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

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

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

Rigid pipe entering and leaving manholes or other structures shall have joints as follows: Pipe six (6), eight (8), and ten (10) inches in diameter shall have two (2) approved joints within three (3) feet, three (3) inches of the manhole base. One

(1) joint shall be incorporated in the manhole base or installed immediately adjacent to the manhole base and there shall not be less than twelve (12) inches between the two (2) joints. (See Section 32-41 for details.)

All rigid pipe entering and leaving manholes or other structures twelve (12) through eighteen (18) inches in diameter shall have a joint within twenty-four (24) inches of the manhole base. (See Section 32-02.)

All rigid pipe larger than eighteen (18) inches in diameter shall be installed with an approved flexible joint within twenty-four (24) inches of the manhole or structure base.

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

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

The Engineer may, at his discretion, require special pipe to be laid in areas that are potentially unstable or subject to settlement.

If the sewer is to be laid in an area that is to be filled, and the cover prior to filling is less than five (5) feet, the pipe shall not be laid until the area has been filled to a level five (5) feet above the proposed pipe and compacted to ninety (90) percent relative compaction, unless otherwise authorized by the Engineer.

When a new main or trunk sewer is extended from other than an existing manhole and the first new manhole upstream of the connection establishes conditions prescribed under Section 4-02.B.12, the Contractor installing such new facilities shall also be responsible for installing backflow prevention devices in conformance with said Section 4-02.B.12 on existing side sewers so affected.

B. Side Sewer Installations

Attention is directed to Sections 4-01., 4-02.B and 32-43 through 32-48 of these Specifications for additional details and requirements pertinent to side sewer installations. When a backflow prevention device is required as specified under Section 4-02.B.12, such installation shall be made at the time of connection and at a location where sewage can overflow without serious property damage on adjacent areas.

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

1. Whenever the grade of any sewer pipeline has been approved by the Engineer to be installed on less than the minimum slope ratios specified under Section 4-02.B.3 of these Specifications, such pipeline installations shall be done under instrument control of grades.

2. The maximum slope of any portion of a side sewer shall not be greater than one hundred fifty (150) percent, (1-1/2 vertical to 1 horizontal ratio). If a building is located immediately adjacent to a sewer main, the point of connection to the main shall be sufficiently downstream of the building sewer outlet so that the above maximum slope is not exceeded.
3. When a lateral sewer is not installed and tested in conjunction with a main line installation, it shall be installed as follows to provide for air testing: Place a test plug, with adequate length of one-quarter (1/4) inch minimum diameter air hose attached, in the downstream end of the first length of pipe upstream of the wye branch connection. Thread the air hose through each successive length of pipe as it is laid to the property line, then lace a test fitting at the upstream end of the lateral and plug the straight through end of the fitting.
4. If a complete side sewer (lateral and house sewers combined) is to be installed and tested as one section of sewer, a test fitting or test plug (as shown in Section 32-46) shall be installed immediately upstream of the connection to the main sewer.

Complete installation of the side sewer from the test fitting or test plug to a point near the building plumbing outlet, but do not connect until testing is complete and approved. Side sewers shall not be connected directly into twelve (12) inch or larger sewers without written special approval, but may be connected at manholes on the line. The final air test for townhouses and similar housing developments shall be performed as specified herein for complete side sewers after all other utilities for such units have been installed.

5. A house sewer shall be installed by first placing a test fitting on the upstream end of the lateral sewer, unless this fitting has been previously installed. Then proceed with the installation of the house sewer to a point near the building plumbing outlet, but do not connect until all testing is completed and approved.
6. All upstream ends of side sewer installations for townhouses and similar cluster housing developments shall be plugged with a standard watertight plug or cap, as supplied by the pipe manufacturer, immediately after such installation and shall remain plugged until the time of building drain connection. All side sewers in this category may not be used until the job has been completed and accepted by the District.
7. Test fittings (See Section 32-46) shall be wye or tee branches of the same type, size and quality as that to the side sewer pipe, unless otherwise approved, and shall be installed where required. The branch of each test fitting shall be laid in an upright position.
8. If the vertical location of adjacent utilities is such that it is necessary to install side sewers over the utilities, the side sewers shall be installed after these utilities have been properly installed and backfilled.

9. With the approval of the Engineer, contractors may tap and install four (4) inch diameter laterals on new D.I. sewer main pipelines under the following conditions:
 - a. All taps and materials used are to be installed in strict compliance with the pipe manufacturer's recommendations.
 - b. The location of each tap is to be verified by the inspector prior to the drilling of each tap. Taps shall be spaced a minimum of two (2) feet for D.I. pipe.
 - c. All taps to be made by contractors on New Projects shall be noted on the Plans prior to Approval for Construction by the District.
10. To mark the location of laterals, a three (3) inches wide strip of green plastic marking tape shall be installed horizontally one foot below subgrade from the main line end of each sewer lateral. Plastic shall be labeled "Buried Sewer Line Below."

C. Connections to Existing Sewerage Systems

The existing sewers are shown on the plans at the location where the new sewers are to be connected. It is the responsibility of the Contractor to determine the exact location and depth of the existing sewers prior to the installation of any sewer pipe.

1. Connection of new main and/or trunk sewers to existing lines up to and including forty-eight (48) inch in diameter, shall be made at existing manholes or by constructing a new manhole over the point of connection or by removing an existing rodding inlet or plug. Where the connection is to be made into an existing manhole, the Contractor shall make the connection by breaking through the manhole base, cutting a rough channel through the manhole shelf to the existing channel, installing the new pipe (see Section 32-01 and 32-02 for required joints), finishing a new channel within the manhole and repairing any damage to the structure. Where the connection is to be made by constructing a new manhole on an existing sewer, the manhole and new connection shall conform to details as shown in Section 32-01 and 32-02. The existing sewer shall not be broken until immediately before the cleaning and flushing operation commences. Where the connection is to be made at a removed rodding inlet or plug, an air test fitting shall be installed at the connection of new and existing pipelines installed in preparation for said test as directed by the Engineer. In each of the applicable cases mentioned above, temporary plugs shall be installed as specified in Section 25-19 of these Specifications.
2. Where wye and/or laterals were previously installed on the main sewer, the side sewer or house sewer shall be connected to the wye or lateral as provided for the particular connections. Side sewer or lateral connections to new or existing manholes shall be as detailed on the drawing for Standard Manholes (see Section 32-01 and 32-02), unless otherwise shown on the plans or directed by the Engineer.

All side sewer connections shall be made with approved fittings or adapters. Side sewer connections to main sewers ten (10) inches or smaller where wyes or laterals were not installed, or where tees were installed, shall be made by installing a new standard wye branch, of the same size and type of material as the main line, into the main line at the point of connection or by connecting to an existing manhole.

The excavation shall provide a minimum clearance of three (3) inches under and six (6) inches on each side of the main sewer for a distance of twelve (12) inches each way along the main sewer from the point of connection. The outer surface of the main in this exposed area shall be thoroughly cleaned. The excavation above the main, for the working area, shall be a minimum of two (2) feet in width without under-cut sides and shall be properly shored. Before the connection is made, the Contractor shall have sufficient standard bedding material at the site of the work to adequately backfill under the wye branch to support it. If the Contractor breaks or otherwise damages the main while excavating for the connection, he shall notify the District and shall make repairs as directed by the Engineer, at the expense of the Contractor. Otherwise, the District will make the repairs as necessary at the expense of the Contractor.

D. Repairs to Existing Side Sewers and Mains

Repairs to main sewers shall be made using Class 52 D.I. pipe, V.C. pipe (service weight soil pipe) with special approval of the Engineer, or approved equal. Repairs to side sewers shall be made using V.C. pipe (service weight soil pipe) or C.I. pipe of quality stipulated by the Engineer and shall conform to the general requirements of Section 32-48. All repair couplings shall have shear bands and be approved by the Engineer prior to use.

If an existing side sewer is being repaired or altered and the conditions prescribed in Section 4-02.B.12 are found to exist, a backflow prevention device shall be installed on such side sewer system as part of the work.

E. Side Sewer Connections Requiring a Residential Sewage Pump

All information applicable to Section 32-50 shall be submitted and approved in accordance with Sections 32-49 and 4-01.A.10.b before a permit is issued or any work can begin on the side sewer or pumping system.

F. Flexible Pipe Installation

H.D.P.E. pipe shall be used for pulled sections only. All installations of H.D.P.E. pipe, where applicable, shall be in conformance with the above requirements for main, trunk and side sewers and to the following requirements:

PIPE JOINT: Pipe shall be butt welded in accordance with ASTM D2657-67. The joints shall be leak proof, thermal, butt joints. All fusing shall be done using tools recommended by the pipe supplier and approved by the District. Operators shall be certified by the pipe manufacturer. The fusing machine shall have hydraulic pressure

control for fusing two pipe ends together. The ends of pipe shall be trimmed to form perpendicular faces prior to fusing. The heating plate on the fusing machine shall be electrically heated and thermostatically controlled and shall contain a temperature gauge for monitoring temperature. The heating plate shall be subject to periodic inspection, using a temperature stick, to assure even heating.

The tensile strength of yield of the butt fusion joints shall not be less than the pipe. A specimen of pipe cut across the butt fusion joints shall be tested in accordance with ASTM C638.

Any material may be rejected for failure to meet any of the requirements of this specification. The acceptance of any deviation from these specifications shall be subject to the approval of the District.

The internal bead shall be controlled to protrude no greater than 1/8 inch circumferentially on the inside wall of the pipe barrel.

All other pipe not butt welded to the pulled section, shall be in conformance with the above requirements for rigid pipe.

METHOD: The method of pipe sliplining or pipe bursting shall be limited to mechanically pulling a device or tool, commonly known as a "mole," through the existing sewer pipes that are proposed for replacement. The mole is to be inserted in the sewer section to be replaced, and shall be pulled by a pulling machine, or a pulling winch located in a pulling pit, located at a certain distance along the alignment of the sewer section under consideration, away from the mole insertion location. The mole shall pull behind it the new H.D.P.E. pipe to be placed along the same horizontal and vertical alignments of the existing sewer. Where applicable, existing manhole walls and channels shall be chipped out as needed to allow the mole to be pulled through manholes.

Special approval from the District must be obtained prior to any work or practice involving H.D.P.E. pipe not specifically covered by the above requirements for pipe installation.

22-04. CLEANING AND TESTING

A. Description

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

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

B. Testing

The Contractor shall perform low air pressure tests on the total footage of all new sewer pipeline installations after such pipelines have been properly installed, including necessary test fittings, backfilling, and, in the case of all main and trunk sewer pipeline installations, before all required District television inspections specified under Section 13-08 of these Specifications. Sections not to be air tested, if any, shall be designated by the Engineer.

In new tract or subdivision developments, air testing shall be performed only after the installation of all proposed lateral sewers to the main sewer system has been completed. Attention is directed to Section 22-03.B of these Specifications for other side sewer system installations to be air tested.

1. Low pressure air tests shall be conducted in accordance with the following Test Procedure and the details shown on Section 32-46 and 32-47 of these Specifications. All necessary test equipment shall conform to the requirements of said Section 32-46 and be in proper working order. Tests shall be made in the presence of the Contractor and a District representative. Test plugs shall be carefully placed at each end of the sections of line to be tested. When all necessary test equipment (see Section 32-46) is in place, a compressed air supply shall be attached to the air fitting on the test equipment and the air pressure within the line increased to four (4) pounds per square inch. After the air supply is securely turned off or disconnected, there shall be a two (2) minute waiting period to allow stabilization of air within the sewer line before the actual test period begins. In no case shall the air pressure, within the line, be less than three and five tenths (3.5) pounds per square inch at the beginning of the test period. The allowable air pressure loss shall not exceed one (1) pound per square inch. When testing main or trunk sewers up to and including eighteen (18) inches in diameter, refer to the chart at Section 32-47 of these Specifications for the length of the test period (minimum two (2) minutes). When testing side sewers, or portions thereof, the test period shall be two (2) minutes and the allowable loss shall not exceed one (1) pound per square inch. After completion of a test, the air pressure shall be released slowly through the valve, which is incorporated in the test equipment. Air test plugs shall not be removed until the air pressure is no longer measurable.
2. An infiltration allowance of fifteen (15) gallons per day/inch diameter/1000 linear feet shall be used in lieu of low pressure air test when the diameter of the pipe is over twenty-one (21) inches.

3. For side sewer installations, a water test may be substituted instead of an air test. The water test shall be applied to the side sewer system either in its entirety or in sections. All openings in the piping shall be tightly plugged, except the highest opening, and the system shall be filled with water to point of overflow. All sections shall not be tested with less than a five (5) foot head of water. The water shall be kept in the system or in the portion being tested for at least 15 minutes before inspection starts; and inspection or testing of the system shall confirm that the system is tight at all points.

C. Cleaning

All new main and trunk sewer installations, and such site collector and side sewer system installations deemed necessary by the Engineer, shall be cleaned as required herein with an approved cleaning ball or device in accordance with such device manufacturer's instructions or recommendations and/or flushed prior to sanitary waste use. If high pressure water cleaning, such as hydro-flush, is utilized, the pressure must be maintained below two thousand (2,000) pounds per square inch. Sand traps with screens shall be used in trapping debris, shall be in accordance with Section 32-61 and shall be secured to the manhole with an approved nylon rope. All cleaning, including screen installations and removal, shall be accomplished by the Contractor in the presence of the Engineer.

1. After all work on the pipeline installation has been completed to the satisfaction of the Engineer, including all manhole channeling and final air testing, but prior to any final pavement placements and television inspection, the Contractor shall perform a preliminary cleaning in conformance with this Section 22-04.C to prepare installations for television inspections in accordance with Section 13-08 of these Specifications.
2. Prior to acceptance, and after all other required inspections, the Contractor may be required to clean the pipeline a final time in conformance with this Section 22-04.C unless debris covers are installed in the manholes after T.V. inspection.

D. Television Inspection of New Work

The Contractor shall arrange for television inspection in accordance with the following procedures:

1. The complete job is ready for television inspection when the following work has been completed:
 - a. All sewer pipelines are installed, backfilled, and compacted.
 - b. All structures are in place, all channeling is complete and pipelines are accessible from structures.
 - c. All other underground facilities, utility piping and conduits are installed.
 - d. Final street subgrading is complete. For wet weather periods, placement of aggregate base has been completed.

- e. Pipelines to be inspected have been preliminarily cleaned and flushed.
 - f. Final air test has been completed.
2. After the above work is complete, the Contractor shall request the District's Inspector to establish a date for television inspection.
 3. The Contractor for the project will be notified by phone as to the scheduled date of the television inspection.
 4. If the jobsite will not be ready or accessible for the television inspection on the scheduled date, the Contractor shall notify the District of the necessary cancellation at least twenty four (24) hours in advance of the scheduled inspection to avoid being charged a cancellation fee.
 - a. If the District's television crew arrives at the jobsite and the work is not ready or accessible, the Contractor will be billed the cancellation fee payable to the District prior to the date of rescheduled television inspection.
 - b. The Contractor shall reschedule inspection as outlined above.
 5. If a portion of an entire job is to be television inspected, a separate fee will be due as established by the District. Fees are payable prior to the date of the partial television inspection.
 6. The entire job will be initially televised by the District.
 - a. If no deficiencies are observed, the work will be considered satisfactory.
 - b. If deficiencies are observed, a videotape will be made and defects serious enough to require correction will be determined by the District.
 7. Notification will be made in writing of any deficiencies revealed by the television inspection that will require repair. If corrective work is indicated and viewing of the videotapes is desired, the District shall be contacted to set a time for the viewing with the Engineer.
 8. Corrective work shall be done. The District reserves the right to require another re-air test of any repair.
 9. Those portions of the pipeline system that have been corrected must be re-televised. Payment of re-television inspection fees must be received by the District's Permit Division prior to the scheduled date of the television re-inspection.
 10. The procedure outlined in conditions 1 through 9 above will be repeated until all deficiencies observed by television inspection have been corrected to the complete satisfaction of the District.

11. All sewer main stubs will be televised.
12. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to paving:
 - a. Low spot (one (1) inch or greater - mainlines only)
 - b. Joint separations (three quarters (3/4) inch or greater opening between pipe sections)
 - c. Cocked joints present in straight runs
 - d. Chips in pipe ends
 - e. Cracked or damaged pipe
 - f. Dropped joints (offsets)
 - g. Infiltration
 - h. Debris or other foreign objects
 - i. Other obvious deficiencies
 - j. Irregular condition without logical explanation
Television inspection of new work and the correction of observed defects will not relieve the Contractor of his responsibility for the one-year guarantee period. The District may inspect and/or televise portions of any projects during said guarantee period.

END OF SECTION 22

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SECTION 23

PORTLAND CEMENT CONCRETE AND MORTAR

23-01. DESCRIPTION

A. Concrete

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

1. *CLASS A:* CLASS A concrete shall contain five hundred sixty-four (564) pounds (six (6) sacks) of portland cement per cubic yard.
2. *CLASS B:* CLASS B concrete shall contain four hundred seventy (470) pounds (five (5) sacks) of portland cement per cubic yard.
3. *CLASS C:* CLASS C concrete shall contain three hundred seventy-six (376) pounds (four (4) sacks) of portland cement per cubic yard.
4. *CLASS D:* CLASS D concrete shall contain six hundred fifty-eight (658) pounds (seven (7) sacks) of portland cement per cubic yard.

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

B. Mortar

Mortar shall be composed of TYPE II portland cement and sand conforming to the requirements set forth for fine aggregate, proportioned and mixed as specified herein.

1. *CLASS I:* CLASS I mortar shall consist of one part by volume of cement to one part of sand.
2. *CLASS II:* CLASS II mortar shall consist of one part by volume of cement to two parts of sand.
3. *CLASS III:* CLASS III mortar shall be CLASS I mortar containing fifteen (15) percent Pozzolan of the calcimined reactive siliceous type as a replacement.
4. *CLASS IV:* CLASS IV mortar shall be CLASS I mortar containing twenty-five (25) percent Embecco as a sand replacement.

5. *CLASS V:* CLASS V mortar shall be CLASS II mortar to which may be added hydrated lime to the extent of eight (8) percent of the volume of cement for masonry bedding and ten (10) percent for masonry pointing. Hydrated lime shall be added to the mixture and not substituted for cement.

Grout shall be composed of mortar diluted with water to flow readily. No mortar or grout shall be used later than thirty (30) minutes after the water has been introduced in the mix.

Unless otherwise permitted by the Engineer, mortar shall be mixed in an approved type of mixing machine in accordance with the applicable requirements of these Specifications. Should hand mixing of the mortar be permitted by the Engineer, the sand, cement and lime shall be mixed dry in a tight box until the mixture assumes a uniform color, after which water shall be added as the mixing continues. Mortar shall be of such consistency that it can be easily handled and spread with a trowel.

23-02. MATERIALS, ETC.

Materials, equipment and plant, storage of aggregates, proportioning, machine mixing, hand mixing, admixtures, amount of water and slump test, and cold weather work shall conform to the requirements of Portland Cement Concrete, of the State Standard Specifications.

Unless otherwise specified, Class A concrete shall have:

1. A minimum compressive strength of three thousand (3,000) pounds per square inch at twenty-eight (28) days.
2. A one (1) inch maximum combined aggregate grading.
3. No admixtures incorporated.
4. A slump of from three (3) to six (6) inches.

END OF SECTION 23

SECTION 24

REINFORCEMENT

24-01. DESCRIPTION

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

24-02. MATERIALS

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

A. Bar Reinforcement

Bar reinforcement shall be deformed bars conforming to ASTM A-615, Grade 40 or Grade 60.

In testing bar reinforcement, only the theoretical cross-sectional area shall be used in all computations.

B. Mesh Reinforcement

Mesh or welded steel wire fabric reinforcement shall conform to the requirements of the ASTM A-185. The gauge of the wire and the dimensions of the mesh will be shown on the Plans.

C. Black Annealed Wire

All wire used as reinforcing steel, but not including tie wire, in structures and concrete piles as shown on the Plans, shall be black annealed wire of the gauge designated, the gauge to be American Steel and Wire Gauge.

24-03. CLEANING

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

24-04. BENDING

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

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

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

24-05. PLACING

Reinforcing bars shall be placed as shown on the Plans and shall be firmly and securely held in position by wiring at intersections with No. 14 or No. 16 wire and by using concrete or metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under full load. Metal supports which extend to the surface of the concrete, except where shown on the Plans, and wooden supports shall not be used. Placing bars on layers of fresh concrete as the work progresses and adjusting bars during the placing of concrete will not be permitted.

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

Unless otherwise specified, all reinforcement, other than stirrups or spacers, shall have a clear coverage of two (2) inches, measured from the surface of the concrete to the outside of the bar. Additional coverage shall be provided for reinforcement in the bottoms of footings or where exposed to salt water or unusual corrosive or abrasive conditions, as shown on the Plans.

24-06. SPLICING

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

24-07. SAFETY

A. Guarding

No employee shall be permitted to work above vertically protruding reinforcing steel until it has been so protected that the employee cannot fall or be impaled on it. This may be accomplished by bending the steel over or covering with suitable timber or other material, or by other suitable method.

B. Installing

Employee working more than six (6) feet above any adjacent working surface placing and tying reinforcing steel in walls, piers, columns, etc., shall be provided with and required to use a safety belt or other device affording equivalent protection for the hazard of falls from elevated surfaces.

C. Guying

Reinforcing steel for walls, piers, columns, and similar vertical structures shall be guyed and supported to prevent collapse.

D. Wire Mesh Rolls

Wire mesh rolls shall be secured at each end to prevent dangerous recoiling action.

24-08. INSPECTION

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

END OF SECTION 24

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SECTION 25

CONCRETE STRUCTURES

25-01. DESCRIPTION

Concrete manholes, manhole bases, expansion blocks, pedestal supports, walls and all other types of concrete structures shall be constructed to the dimensions, lines and grades given by the Engineer and in accordance with the designs shown on the Standard Drawing or Plans; using there for the classes of concrete designated on the Plans or in Section 23 of these Specifications. Unless otherwise indicated on the Plans, Class A concrete shall be used, and the aggregate shall conform to the combined aggregate size designated as one (1) inch maximum.

25-02. DEPTH OF FOOTING

The elevations of the bottoms of footings, as shown on the Plans, shall be considered as approximate only and the Engineer may order in writing such changes in dimensions or elevations of footings as may be necessary to secure a satisfactory foundation (see Section 20-05.A).

25-03. PUMPING

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

25-04. FORMS

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

Falsework and forms supporting concrete beams, ribs, slabs, or other members subject to direct bending stress and forms on the inside of structures shall not be removed or released in less than twenty-one (21) days after the concrete has been placed, unless concrete test cylinders show a strength of not less than three thousand (3,000) pounds per square inch in compression when cured under conditions similar to those affecting the structure. At times of low temperatures or other adverse conditions, the Engineer may increase the setting time to twenty-eight (28) days.

Forms for all surfaces, which will not be completely enclosed or hidden below the permanent surface of the ground, or where plywood forms are not specified, shall be made of surfaced

lumber or material which will provide a surface equally satisfactory. Any lumber or material which becomes badly warped or checked prior to placing of the concrete may be rejected.

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

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

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

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

25-05. FALSEWORK AND CENTERING

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

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

Falsework or centering shall be founded upon a solid footing safe against undermining and protected from softening.

25-06. REINFORCEMENT

Reinforcement shall be furnished and placed as shown on the Plans, and in accordance with the applicable provisions of these Specifications. All reinforcing shall be kept a minimum of two (2) inches clear of any exposed surface and a minimum of one (1) inch clear of all pipes or other objects piercing the structure.

25-07. MIXING CONCRETE

All concrete shall be mixed as specified in Section 23 of these Specifications, and the proportions of aggregate, cement and water shall be as defined by the Engineer, who shall have authority to vary proportions as necessary during the pour.

25-08. PLACING CONCRETE

All concrete or mortar shall be used while fresh and before it has taken an initial set. Retempering any partially hardened concrete with additional water will not be permitted.

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

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

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

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

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

25-09. CONCRETE DEPOSITED UNDER WATER

On excavating for the footings of proposed structures, if conditions render it impossible or inadvisable in the opinion of the Engineer to dewater the excavation before placing concrete, the Contractor shall deposit under water, by means of a tremie or bottom dump bucket, a layer of concrete of sufficient thickness to thoroughly seal the cofferdam. Concrete deposited in water shall be Class A with ten (10) percent extra cement added. The exact thickness will depend upon the hydrostatic head, but in no case shall the seal be less than eighteen (18) inches in thickness. This seal shall, in general, be allowed to remain in place for not less than five (5) days and preferably ten (10) days before dewatering so as to set sufficiently to withstand the hydrostatic pressure.

All portions of the structure for which concrete must be deposited under water shall be poured continuously until completed. When such portions are completed, all scum, laitance, and sediment shall be removed before fresh concrete is deposited. Concrete shall not be placed in running water.

25-10. CONSTRUCTION METHODS

The concrete in each integral part of the structure shall be placed continuously, and the Contractor will not be allowed to commence work on any such part unless his inspected and

approved material is on hand, and his forces are sufficient to complete the part without interruption in the placing of the concrete.

Joints in the concrete due to stopping work are to be avoided as far as possible, except where indicated on the plans.

25-11. JOINTS

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

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

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

25-12. WATERSTOPS

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

25-13. BONDING

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

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

Immediately before making a new concrete pour, the entire contact surface of the construction joint of the existing concrete structure shall be cleaned by methods specified in 25-11. Joints.

25-14. CURING

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

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

25-15. MANHOLE BASES

Cast in place manhole bases are intended to be poured against native, undisturbed material, which has been excavated to the dimensions shown on the plans (see Sections 32-01 and 32-02). If the Contractor over-excavates beyond the horizontal dimensions shown on the standard drawings, he shall construct forms and pour the base to the specified dimensions.

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

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

Precast manhole bases are acceptable provided they are individually designated on the plans and approved by the Engineer.

25-16. MANHOLES

All manhole precast sections shall conform to ASTM C-478 where not otherwise modified in the Standard Drawings of Section 32. Manholes shall be water-tight structures and shall have metallic steps from top to bottom (see Section 26-06). The Design, the Specifications and the name of the manufacturer shall be submitted to the Engineer for approval prior to the purchase of any precast manhole units. Refer to Section 32 for details. Structures constructed with precast sections shall be so constructed using single manufacturer's products and/or with such compatible products as may be recommended by the precast section manufacturer.

A. Standard Manholes

Standard Manholes are precast reinforced concrete section manholes conforming to the applicable requirements of these Specifications (see Section 32-01 or 32-02).

B. Manhole Channels

Where sewer lines pass through manholes, construction shall conform to the applicable Standard Detail. Pipe shall be used as a form for the channel. After the manhole base concrete has taken a set, the channel shall be carefully shaped and mortared to obtain a smooth channel. All channels shall be checked with the proper template.

C. Manhole Throat

The maximum depth of the manhole throat shall be eighteen (18) inches, measured from the top of the manhole cover to the lower extremity of the throat at the top of the cone section.

D. **Manhole Construction**

All manholes shall be excavated and backfilled in conformance with the requirements of Section 20-05.E of these Specifications and installed as specified herein. All embedment materials under, around, and at least three (3) inches over all pipelines located within five (5) feet of structure bases shall be compacted without jetting prior to barrel section placements. All manholes shall be constructed to subgrade prior to jetting adjoining sewer pipeline trench and/or structure backfill where such method of compaction is permitted and used.

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

1. *Installations of gaskets:*

- a. Apply one coat of primer to clean, dry joint surface (both tongue and groove) and *allow to dry*. Remove the paper wrapper from one side only of the two-piece wrapper on the gasket. The outside paper will protect the gasket and assure against stretching. Before setting the manhole section in the trench, attach the plastic gasket strips end-to-end to the tongue or groove of each joint, forming a continuous gasket around the entire circumference of the manhole joint.
- b. Handling of barrel sections after the plastic gasket has been affixed shall be carefully controlled to avoid bumping the gasket and thus displacing it or covering it with dirt or other foreign material. Any gaskets so disturbed shall be removed and replaced if damaged and repositioned if displaced.
- c. Care shall be taken to properly align the manhole section with the previously set section before it is lowered into position.
- d. During cold or wet weather, pass direct heat lightly over the concrete joint surface until ice, frost, and moisture are removed and surface to be primed is dry and warm immediately before application of primer. Direct heat shall also be passed over plastic gasket strips immediately prior to attaching them to joint surfaces and immediately prior to insertion of tongue into groove.

E. **Manhole Surface Collar**

Manhole collars for precast manholes are intended to be poured against native, undisturbed earth or compacted structure backfill material (see Section 20-05.E) which has been excavated to the dimensions shown on the drawings (see Sections 32-01 and 32-02). If the Contractor over-excavates beyond or otherwise cannot maintain the horizontal or vertical dimensions shown on the Standard Drawings, he shall construct forms to the specified dimensions prior to placement of concrete for the surface collar.

F. Manholes on Steep Slopes

All manholes to be located on slopes steeper than forty-five (45) degrees in easement areas shall be constructed without top collars with the rim elevation set approximately twelve (12) inches above the adjacent upslope ground surface. The method proposed to attach the frame assembly to the cone shall be shown in a detail on the Plans.

25-17. RODDING INLETS (Special Approval Required)

Rodding inlets shall conform to Section 32-10. The frame and cover shall not be installed at the same time that the top collar is poured. A recess shall be formed to receive the frame and cover. The Contractor may use repair couplings to extend the pipe portion of the rodding inlet structure on new installations when raising the inlet to its final elevation.

25-18. OTHER STANDARD STRUCTURES

All other standard structures to be made of concrete shall be constructed in accordance with this section and as detailed in Section 32.

25-19. TEMPORARY COVERS AND PLUGS FOR STRUCTURES

A. Temporary Covers

A temporary debris cover, as described in Section 25-20.B.1, shall be placed over the base of any existing manhole prior to beginning any adjustment or repair work.

B. Temporary Plugs

Temporary plugs shall be approved mechanical expanding types. These plugs shall be installed and removed in the presence of an Inspector and shall be secured to the steps of manholes using an approved nylon rope. Temporary plugs shall be installed on all projects as noted below and remain there intact, until immediately prior to the beginning of the cleaning and flushing operation. Temporary plugs shall be identified as specified below.

1. If there is an existing manhole at the beginning of a new system, a plug shall be installed in the new pipe at the existing manhole and another plug installed on the downstream side of the first upstream manhole of the new system pipeline.
2. If the Contractor constructs a new manhole at the beginning of a new system, the existing pipe in that manhole shall not be broken until immediately prior to the commencing of the balling and flushing operation and a plug shall be installed on the downstream side of the first upstream manhole of the new system pipeline.
3. If the new system begins at an existing rodding inlet or stub, a plug shall be installed on the downstream sides of the first two manholes upstream from the beginning of the new system.

4. Temporary plugs shall be installed in the open ends of sewer lines while adjusting, repairing, or pouring the top collars on rodding inlets or similar structures.
5. All temporary mechanical plugs and air inflatable plugs shall be marked with the company identification or initials. The marking must be done in an acceptable manner such as welding the identification onto the metal portion of the plug. Fastening tags or nameplates, onto the plug with wire, clips, screws, etc., is unacceptable.

25-20. RECONSTRUCTION OF EXISTING STRUCTURES

A. General

Before beginning any structure reconstruction work, the Contractor shall submit to the District in writing, a summary of the procedures he proposes to use, which shall conform to the criteria listed below. Approval by the District of this work summarization, shall be authorization for the Contractor to proceed.

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

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

B. Structure Adjustment and Repairs

All workmanship and materials for structure adjustments shall conform to the requirements of these Specifications and the provisions herein. In the case of existing brick or cast-in-place concrete structures, repair or adjustments shall be accomplished with materials in kind or with precast elements as detailed on the drawings and/or approved by the Engineer.

1. Before any work is started on adjusting or repairing a manhole, the channels in the base shall be covered with plywood or a similar material and then the entire base covered with a heavy piece of canvas as a temporary debris cover. This temporary debris cover shall be kept in place during all work, and upon completion, picked up containing all debris. The canvas and the plywood shall be carefully removed from the manhole allowing no debris to fall or to remain in the manhole.
2. Precast elements, adjustment rings, frames, and covers removed from an existing structure during adjustments and/or repairs may be reinstalled only when such undamaged items are approved by the Engineer for reuse.

3. Manhole adjustments shall be accomplished by one of the methods specified herein or as detailed on the Drawings.
 - a. Upward adjustments of standard manholes to finish grade surface may be accomplished with reinforced concrete grade rings or formed concrete and/or a cast iron extension ring when the completed manhole throat does not exceed a total of eighteen (18) inches; single concrete grade rings may be used for such adjustments not exceeding four (4) inches. In no case shall multiple cast iron extension rings be used in adjustments. When adjustments are made that position the bottom of the cast iron manhole frame above the existing concrete collar, said collar shall be extended to meet the requirements of Section 32-01 or 32-02 of the Specifications and as directed by the Engineer.
 - b. Precast reinforced concrete grade rings and/or cast iron extension rings shall not be used in upward adjustments of standard manholes which would create a completed manhole throat section exceeding eighteen (18) inches. In all such cases, the upper manhole section, including reinforced concrete block and cone section, shall be removed and the adjustment shall be accomplished by use of additional manhole barrel sections, cone, grade rings, etc., and such manhole reconstruction's shall comply with the requirements of Section 32-01 or 32-02 and applicable provisions thereto of these Specifications.
 - c. Downward adjustments of standard manholes may be accomplished by removal of existing grade or extension rings. When such removals will not accomplish the necessary adjustment, the upper manhole section, including barrel sections as required, shall be removed and the manhole reconstructed as specified in Section 25-20.B.3.b above. In all downward adjustments the dimensional requirements of the reinforced concrete collar in the upper section of the manhole as detailed in said Section 32-01 or 32-02 shall be maintained or restored.
 - d. Unless otherwise designated by the Engineer, when adjustment of an existing standard main or trunk manhole in a street or other traveled way is required and no manhole surface collar exists, the Contractor performing the adjustment shall provide and install a manhole surface collar in conformance with the applicable Section 32-01 or 32-02 as part of the work.
 - e. Adjustment of existing brick manholes require special approval of the Engineer.
4. Rodding inlet adjustments shall be accomplished by one of the methods specified herein or as detailed on the Drawing.
 - a. Upward adjustments of rodding inlets to finish grade surface may be accomplished with a formed concrete or a cast iron extension ring where such does not already exist and where such extension does not exceed

eight (8) inches. The existing reinforced concrete collar shall be extended whenever the bottom of the cast iron frame is to be positioned above the top of said existing collar.

- b. Upward adjustments of rodding inlets exceeding eight (8) inches shall be accomplished by removing the structure's frame, cover, and concrete collar and reconstructing said structure as detailed in Section 32-10 of these Specifications. Pipe used for such adjustments shall be consistent in material, line and grade with that already in place and be appropriately jointed where required.
- c. Downward adjustments of rodding inlets shall be accomplished by removal and reconstruction of the entire upper section, including the collar.

25-21. SURFACE FINISHES

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

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

Forms on all vertical faces which do not act as supporting members shall be removed as soon as practicable, but not sooner than forty-eight (48) hours after the concrete is poured. The Engineer shall be the sole judge as to which parts of the forms are supporting members.

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

END OF SECTION 25

SECTION 26

CASTINGS AND METAL FABRICATIONS

26-01. DESCRIPTION

Castings and metal fabrications shall be constructed in accordance with the details shown on the Plans, Standard Details and as hereinafter specified. The Contractor shall install or erect the metal work, remove the temporary construction, including the removal of the old structure or structures if specified, in accordance with the Plans and these Specifications.

26-02. MATERIALS

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

<u>MATERIAL</u>	<u>ASTM DESIGNATION</u>
Structural steel	A-36
Structural nickel steel	A-8
High-strength low-alloy structural steel for welding	A-242
High-strength structural steel	A-440-75
Bolts and nuts	A-307
Black steel pipe (std. wt. seamless)	A-120
Carbon steel for forgings	A-235, Class C1
Alloy steel for forgings	A-237, Class A
Steel castings	A-27, Grade 65-35
Gray iron castings	A-48, Class 30
Malleable iron castings	A-47, Grade No. 32510
Wrought iron bars	A-207
Wrought iron plate	A-42
Bronze castings	B-22, Class C
Aluminum Alloy GS11A-T6	B-178
Stainless steel forgings	A-473
Ductile iron castings	A-536, Grade 65-45-12

Structural steel manufactured by the acid-Bessemer process shall not be used.

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

Where the Contractor has been granted permission to substitute rolled stock for forgings, the rolled stock shall meet the physical and chemical requirements for forged steel.

26-03. CASTINGS

To insure good annealing and machining properties in steel castings, the steel used shall contain not less than 0.60 percent of manganese and not less than 0.20 percent of silicon.

All castings shall be sound and free from shrinkage cracks, blow holes, and other defects. All fins and burnt sand must be removed. Excessive porosity and spongy surfaces will constitute causes for rejection. The Engineer shall be the final judge as to whether the defects present are sufficient to cause rejection.

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

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

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

26-04. CAST IRON FRAME AND COVERS

Castings shall conform to the shape and dimensions shown on the Standard Drawings (See Section 32).

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

Cast iron frames and covers shall be dipped or painted with asphalt which will form a tough, tenacious, non-scalding coating which does not have a tendency to become brittle when cold or sticky when hot.

26-05. FILLETS

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

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

26-06. MANHOLE STEPS

Manhole steps shall be composed of a one-half (1/2) inch minimum diameter steel rod covered by chemical resistant plastic. See Section 32 for step dimensions and locations.

26-07. STRAIGHTENING MATERIAL

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

If straightening is necessary in the field, only methods approved by the Engineer shall be used.

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

26-08. MATCH MARKING AND FINISH

Connecting parts assembled in the shop for the purpose of reaming holes in field connections shall be match marked, and a diagram showing such marks shall be furnished to the Engineer. Portions of the work exposed to view shall be finished neatly. Shearing and chipping shall be done carefully and accurately.

26-09. BOLTS

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

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

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

26-10. FINISHED MEMBERS

Finished members shall be true to line and free from twists, ends, and open joints.

26-11. WEB PLATES

In girders having no cover plates and not to be encased in concrete, the top edge of the web plate shall not extend above the backs of the flange angles and shall not be more than one-eighth ($1/8$) inch below at any point.

26-12. EYE BARS

Eye bars shall be straight, true to size, and free from twists, folds in the neck and head, and other defects. The heads shall be made by upsetting and rolling or forging, and not by welding. The form of the heads will be determined by the dies in use at the work where the eye bars are made,

if they are satisfactory to the Engineer. The thickness of the head and neck shall not overrun more than one-sixteenth (1/16) inch.

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

26-13. SCREW THREADS

Screw threads shall be made to have a close fit in the nuts and shall be American National Form.

26-14. BEARINGS AND ANCHORAGE

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

26-15. CUTTING WITH TORCH

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

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

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

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

26-16. WELDING

All welding shall be done by qualified welders in accordance with the requirements of the American Welding Society. Proposed operators may be examined at the site of the work and upon satisfactory completion of test welds, designated by the Engineer, may be permitted to perform welding operations on the project. All welding operators shall be subject to examination for requalification, at any time during the progress of the work.

Welding electrodes shall comply with the requirements of the ASTM Designation: A-233, except they shall be uniformly and heavily coated (not washed) and shall be of such nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

In welding metal which is to be galvanized, bare electrodes shall be used unless otherwise specified.

26-17. GALVANIZING

When galvanizing is specified for structural steel shapes, manhole steps, plates and bars and their products, it shall be performed by the hot dip process after fabrication into the largest practical sections. The galvanizing shall conform to the requirements of the ASTM Designation: A-123. Fabrication shall include all operations such as shearing, punching, forming, bending, welding, riveting, etc. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the spelter coating.

Small structural steel or cast steel articles, such as bolts, nuts, washers, and similar articles that are to be galvanized, shall be galvanized after fabrication in accordance with the requirements of the ASTM Designation: A-153.

26-18. PAINTING

All iron and steel surfaces shall be cleaned and painted in accordance with the requirements of Section 28 of these Specifications.

26-19. REMOVAL OF OLD FABRICATIONS AND FALSEWORK

The Contractor shall dismantle old structures which, unless otherwise provided on the Plans, shall be the property of the District and the Contractor shall deliver the materials to the District. If a structure is to be re-erected, it shall be dismantled without unnecessary damage and the parts match marked and carefully piled.

The Contractor shall dismantle the falsework, and remove all debris and refuse resulting from his work leaving the premises in good condition.

26-20. PLANT

The Contractor shall provide the falsework and all tools, machinery, and appliances necessary for the expeditious handling of the work.

All falsework shall be designed and constructed to support the loads which will be applied. Workmanship and finish shall be equal to the best general practice in modern shops.

26-21. METHODS AND EQUIPMENT

Before starting work, the Contractor shall inform the Engineer fully as to the method of erection or installation he proposes to follow, and the amount and character of equipment he proposes to use, which shall be subject to the approval of the Engineer. The approval of the Engineer shall not be considered as relieving the Contractor of the responsibility for the safety of his method or equipment or from carrying out the work in full accordance with the Plans and Specifications.

26-22. INSPECTION

All castings and fabrications shall be inspected and approved prior to installation. The acceptance of any material or finished members by the Inspector shall not be a bar to their

subsequent rejection, if found defective. Rejected material shall be replaced promptly or made good by the Contractor.

END OF SECTION 26

SECTION 27

ABANDONMENT OF LINES AND STRUCTURES

27-01. ABANDONMENT OF SEWER LINES

Sewer lines to be abandoned shall be securely closed at all pipe ends by a watertight plug of concrete or concrete grout not less than two (2) feet thick.

Before a building connected to the District system is removed or modified in a manner which requires a physical disconnection of the building from the sewer, the owner of the building shall obtain an abandonment permit from the District. The physical disconnection shall be witnessed by District personnel. The owner shall disconnect and plug the side sewer with a watertight plug of concrete or an approved fitting at the main sewer prior to demolition work.

27-02. STRUCTURES TO BE ABANDONED

Structures to be abandoned shall have all openings, inlets and outlets sealed off as set forth for sewer lines and the structure shall be removed to a point three (3) feet below the proposed street grade or ground surface.

If the structure is in State, County, or City roadway right-of-way, it must be filled with TYPE I backfill. If the structure is outside of the State, County or City roadway right-of-way it shall be filled with earth and compacted.

27-03. SALVAGED MATERIALS

Salvaged metal castings such as frames and covers and other metal appurtenances, unless otherwise specified, shall be delivered to the District Yard, 7500 Schmidt Lane, El Cerrito.

END OF SECTION 27

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SECTION 28

PAINING

28-01. PAINTING

Where not otherwise specified, all exposed metal fabrications and construction work not shop painted or corrosion protected by galvanizing specified in Section 26-17 of these Specifications shall be thoroughly cleaned and/or sandblasted to the degree of surface preparation recommended by the paint manufacturer for application of the protective coating. All primers and finish coatings must be approved by the Engineer prior to application.

END OF SECTION 28

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SECTION 29

AGGREGATE BASE

29-01. AGGREGATE BASE

Aggregate base shall consist of mineral aggregate, furnished and placed on prepared subgrade, subbase or as backfill in conformity with the lines, grades and dimensions shown on the Plans, Standard Drawings, or Special Provisions, or as directed by the Engineer. Material, subgrade preparation, adding water, spreading and compacting shall conform to the requirements for "AGGREGATE BASE" under Section 26 of the State Standard Specifications.

END OF SECTION 29

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SECTION 30

BITUMINOUS SEALS

30-01. SEAL COATS

Seal coats shall consist of an application or applications of bituminous binder and a cover of screenings applied to pavement, prepared base or surfacing in conformance with the requirement excluding measurement and pavement for a BITUMINOUS SEALS under Section 37 subsection "37-1 SEAL COATS" and the requirements, excluding measurement, for "ASPHALTIC EMULSIONS" under Section 94 of the State Standard Specifications.

Unless otherwise specified or directed by the Engineer, Seal Coats specified herein shall meet the requirements for "Fine" Seal Coat Type and the bituminous binder shall be penetration type asphaltic emulsion Grade MS2 specified in said State Standard Specifications.

END OF SECTION 30

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SECTION 31

ASPHALT CONCRETE

31-01. ASPHALT CONCRETE

Asphalt Concrete shall consist of a mixture of mineral aggregate and bituminous binder, the materials of which, proportioning, mixing, spreading and compaction thereof shall conform to the requirements, excluding measurement and pavement, for "ASPHALT CONCRETE" under Section 39, and for "ASPHALTIC EMULSIONS" under Section 94 of the State Standard Specifications. Unless otherwise specified or directed by the Engineer, Asphalt Concrete shall be Type B with aggregate conforming to the grading requirements specified for the one-half (1/2) inch maximum medium grading. Asphalt binder for permanent paving shall consist of paving asphalt, Grade designation AR-4000. Asphalt binder for temporary paving shall consist of liquid asphalt Grade MC-800. Liquid asphalt for use as a Prime Coat shall be Grade SC-70, spread at the approximate total rate of one-quarter (1/4) gallon per square yard of surface covered. Asphaltic emulsion for use as a Paint Binder shall be Grade SS-1, applied in one application at a rate of from two-hundredths (0.02) to one-tenth (0.10) gallon per square yard of surface covered.

END OF SECTION 31

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SECTION 32
STANDARD DETAILS

CLASS A CONCRETE BLOCK 4'-6" Ø OR 4'-6" SQUARE, SQUARE SIDES PARALLEL TO OR AT RIGHT ANGLES TO EDGE OF PAVEMENT. FORM 3" VERTICAL EDGES AROUND TOP OF BLOCK.

ROUND BLOCK SQUARE BLOCK

SQUARE BLOCKS SHALL BE USED IN EASEMENTS

#4 CONTINUOUS E.F.
FORM INSIDE OF BLOCK TO RECEIVE FRAME AND COVER WITH 1/4" CLEARANCE

#4 @ 2'-0"

PLACE REINFORCING BARS AS SHOWN

CAST IRON FRAME & COVER TOP ELEVATION AS SHOWN ON PLANS

ROAD SURFACE - A.C. SURFACING.

POUR CONCRETE TO WITHIN 2" OF TOP OF COVER CASTING.

#4 HOOPS

#4 @ 18"

24" THROAT

TOP OF BLOCK, TYPICAL

EASEMENT GROUND SURFACE

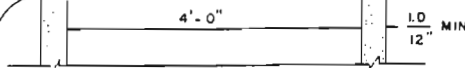
9 1/2"

10" MAX.

3'-0"

ECCENTRIC CONE

CLEAN JOINT AND INSTALL PREFORMED PLASTIC SEALING GASKET PRIOR TO SETTING NEXT BARREL OR CONE SECTION



UPPER SECTION
(ROTATED 45°)

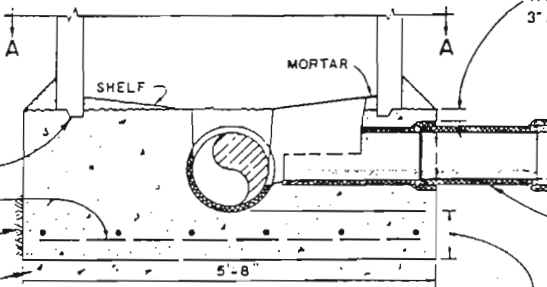
NOTE:
ALL STEEL TO BE 3" CLEAR

FORM RECESS IN BASE WITH APPROVED METAL FORMING RING TO RECEIVE PRECAST MANHOLE JOINT. INSTALL PREFORMED PLASTIC SEALING GASKET BEFORE PLACING FIRST BARREL OR CONE SECTION.

#4 @ 12" GRID

REINFORCED CLASS A CONCRETE BASE

9" COARSE BEDDING MATERIAL IF WATER IS PRESENT



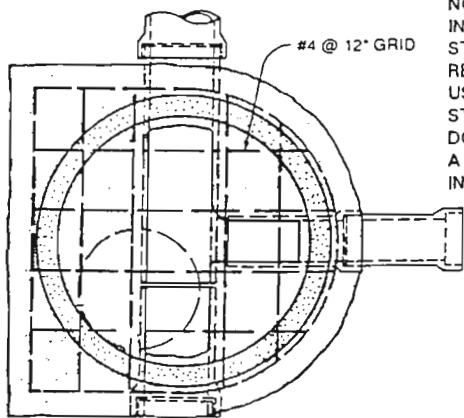
BASE SECTION

8" - M.H. DEPTH 0'-15'
10" - M.H. DEPTH 15'-25'

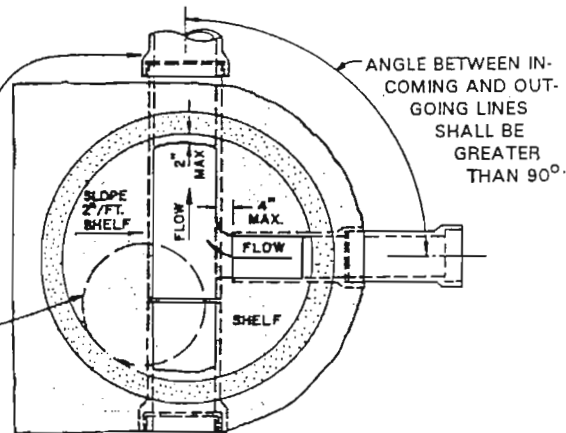
TYPICAL BELOW SHELF CONNECTION TO MANHOLE (SIDE SEWER OR MAIN) CROWN TO CROWN

NOTE:
LAY PIPE THRU M.H. WHEN POSSIBLE.

NO WYE FITTING SHALL BE INSTALLED WITHIN 12" OF STRUCTURE. AN APPROVED REPAIR COUPLING MAY BE USED BETWEEN THE STRUCTURE AND THE NEXT DOWNSTREAM PIPE WHEN A WYE FITTING IS BEING INSTALLED.



BASE SECTION A-A
REINFORCING DETAIL



BASE SECTION A-A



STEGE SANITARY DISTRICT

APPROVED

LC Ruggard, P.E., District Manager/Engineer

REV / DATE:

STANDARD MAIN MANHOLE
FOR 15" OR SMALLER LINES

DWG. NO.

SEC.
32-01

GENERAL NOTES:

- LAY PIPE THRU MH WHEN POSSIBLE OR FORM CHANNEL TO MAINTAIN PIPE SECTION. TRUNK SEWER PIPES ENTERING OR LEAVING THE MH BASE SHALL HAVE A STANDARD JOINT LOCATED WITHIN 24" OF THE BASE.
- ALL STEEL TO BE 3" CLEAR.
- SQUARE BLOCK TO BE USED FOR STREETS OR EASEMENTS.
- ROUND BLOCK MAY BE USED IN STREETS.

CONCRETE BLOCK 4'-6" DIAMETER OR 4'-6" SQUARE, SQUARE SIDES PARALLEL TO OR AT RIGHT ANGLES TO EDGE OF PAVEMENT. FORM 3" VERTICAL EDGES AROUND TOP OF BLOCK.

ROUND BLOCK (STREETS, 4'-6" DIAMETER)

SQUARE BLOCK (STREETS OR EASEMENTS, 4'-6" SQUARE)

CAST IRON FRAME & COVER TOP ELEVATION TO BE DETERMINED IN FIELD

FORM INSIDE OF BLOCK TO RECEIVE FRAME AND COVER WITH 1/4" CLEARANCE

#4 CONTINUOUS E.F.

#4 @ 2'-0"

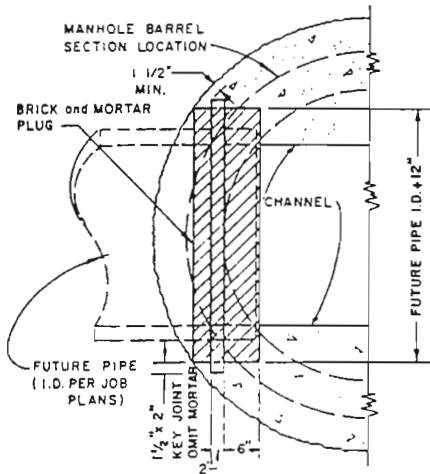
#4 HOOP E.F.
#4 @ 18"

ROAD SURFACE

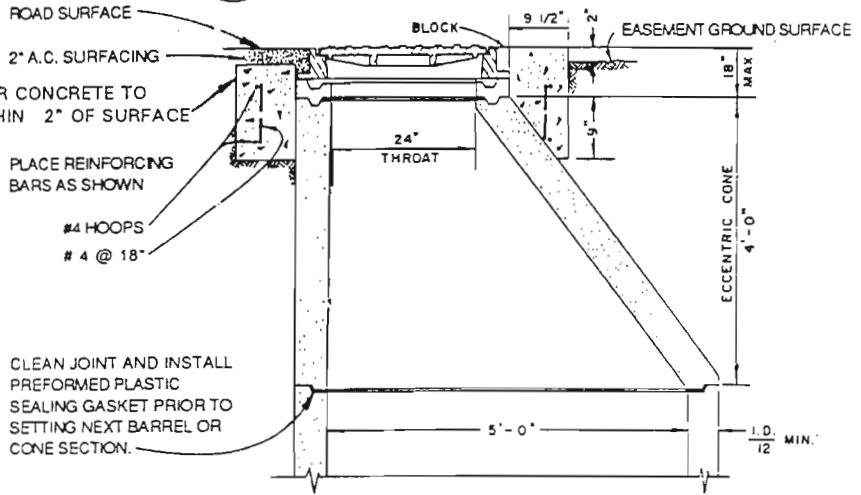
2" A.C. SURFACING
POUR CONCRETE TO WITHIN 2" OF SURFACE

PLACE REINFORCING BARS AS SHOWN
#4 HOOPS
#4 @ 18"

CLEAN JOINT AND INSTALL PREFORMED PLASTIC SEALING GASKET PRIOR TO SETTING NEXT BARREL OR CONE SECTION.



BLOCK-OUT FOR FUTURE PIPE



UPPER SECTION (ROTATED 90°)

JOINT REQUIRED IF BELL END OF PIPE INCORPORATED IN BASE UPSTREAM, DOWNSTREAM OR BOTH.

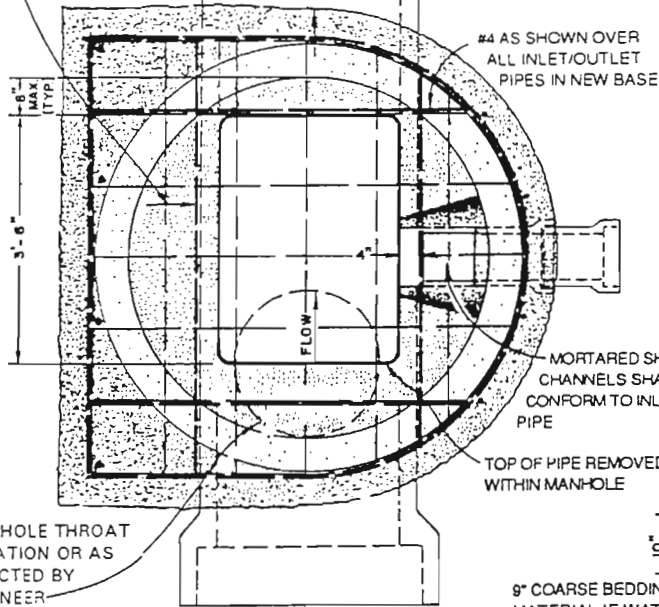
SLOPE SHELF TO CHANNEL 2"/FT.
OPTIONAL SQUARE BASE

OPTIONAL ROUND BASE

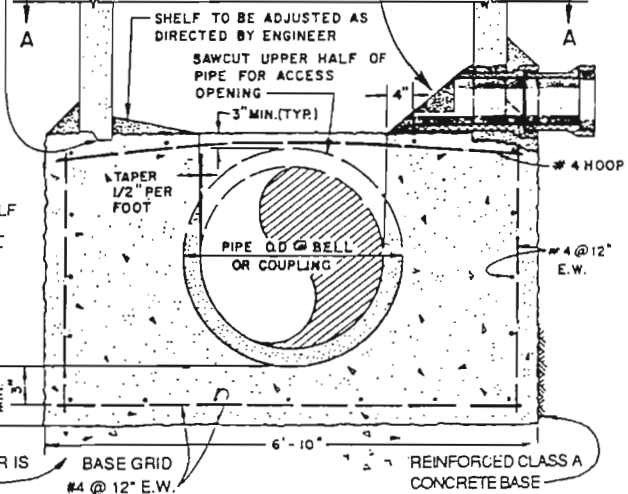
#4 AS SHOWN OVER ALL INLET/OUTLET PIPES IN NEW BASE

FORM RECESS WITH APPROVED METAL FORMING RING TO RECEIVE PRECAST MANHOLE JOINT. INSTALL PREFORMED PLASTIC SEALING GASKET BEFORE PLACING FIRST BARREL SECTION.

TYPICAL ABOVE SHELF CONNECTION TO MANHOLES (SIDE SEWER OR MAIN)



BASE SECTION A-A



BASE SECTION

MANHOLE THROAT LOCATION OR AS DIRECTED BY ENGINEER

9° COARSE BEDDING MATERIAL IF WATER IS PRESENT

BASE GRID #4 @ 12" E.W.

REINFORCED CLASS A CONCRETE BASE



STEGE SANITARY DISTRICT

APPROVED

LC Ruggard, P.E., District Manager/Engineer

REV./DATE:

STANDARD TRUNK MANHOLE
FOR 18" TO 45" LINES

DWG NO.:

SEC. 32-02

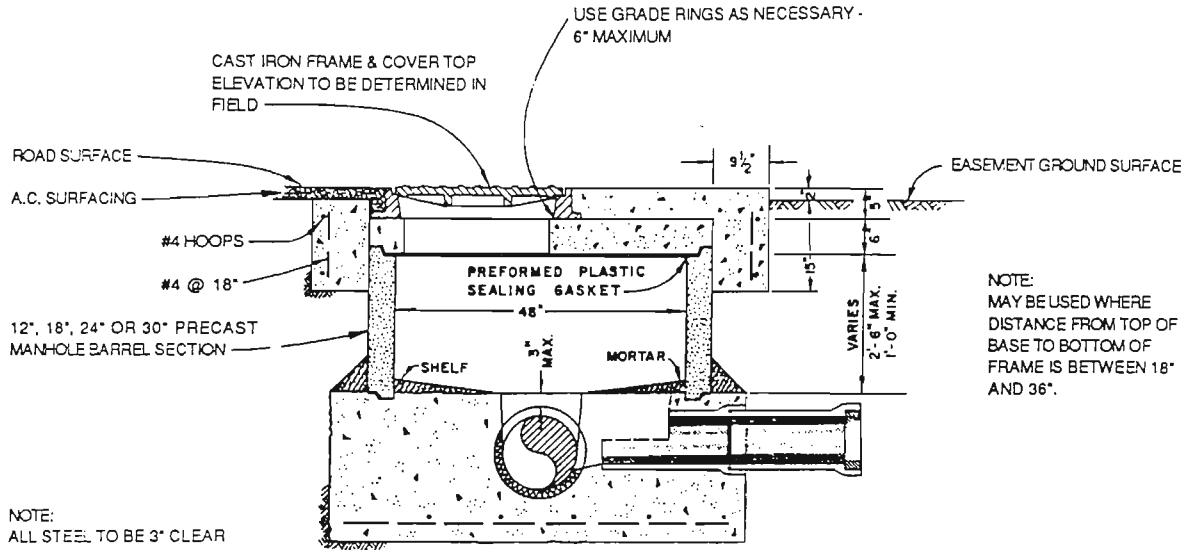
SECTION 32-03

SECTION 32-04

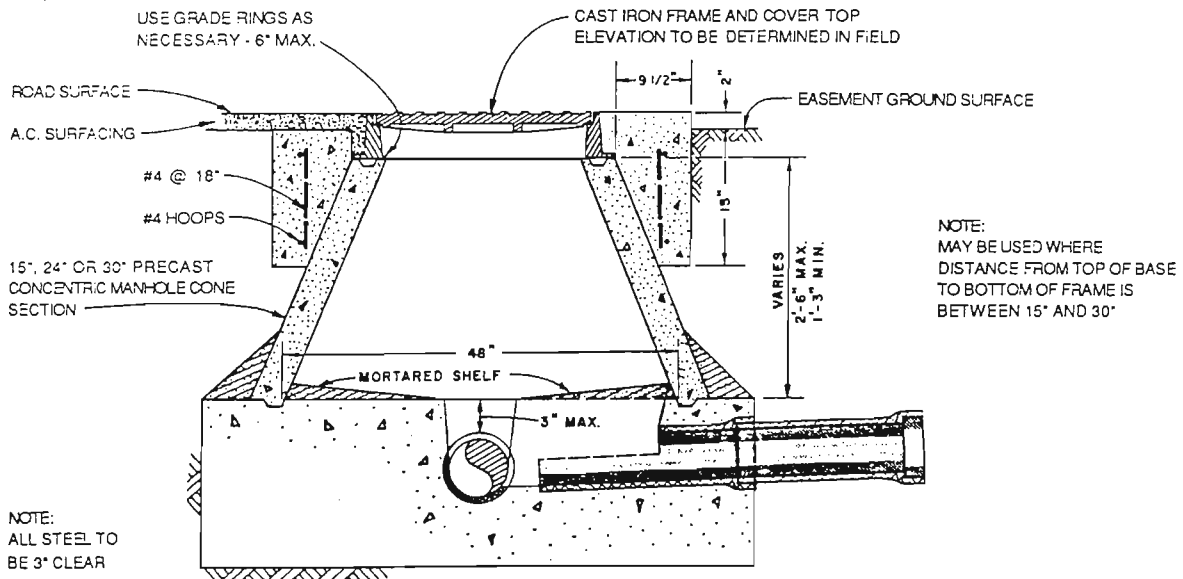
SECTION 32-05

SECTION 32-06

(RESERVED)



ELEVATION
BETWEEN 18" & 36"



ELEVATION
BETWEEN 15" & 30"

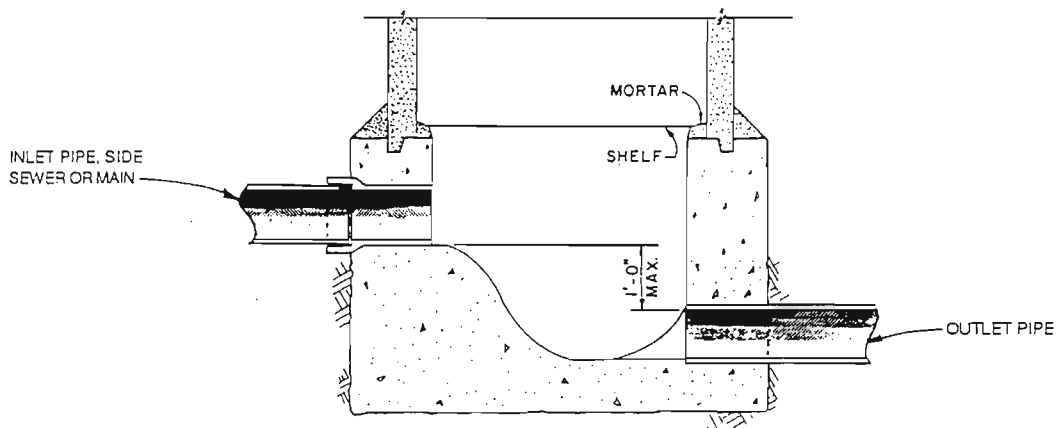


STEGE SANITARY DISTRICT
APPROVED *Richard P.E.*
L.C. Rugard, P.E., District Manager/Engineer

REV./DATE:

STANDARD SHALLOW
MANHOLE

DWG. NO.:
SEC.
32-07



ELEVATION



STEGE SANITARY DISTRICT
 APPROVED: *L. C. Rugaard*
 L. C. Rugaard, P.E., District Manager/Engineer

REV./DATE:

**ALLOWABLE DROP IN
 MANHOLE**
 (SPECIAL APPROVAL REQUIRED)

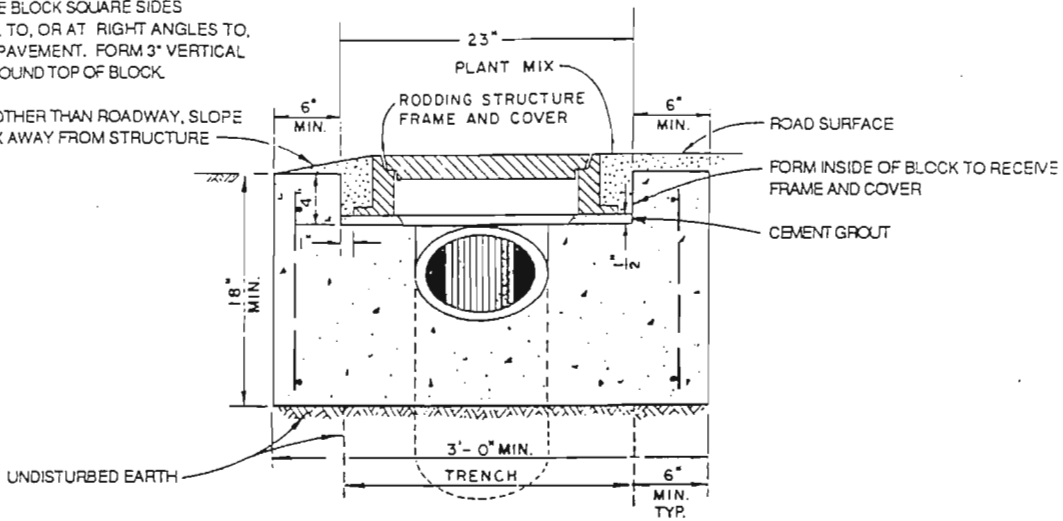
DWG. NO.:
**SEC.
 32-08**

SECTION 32-09

(RESERVED)

CONCRETE BLOCK SQUARE SIDES PARALLEL TO, OR AT RIGHT ANGLES TO, EDGE OF PAVEMENT. FORM 3" VERTICAL EDGES AROUND TOP OF BLOCK.

WHEN IN OTHER THAN ROADWAY, SLOPE PLANT MIX AWAY FROM STRUCTURE



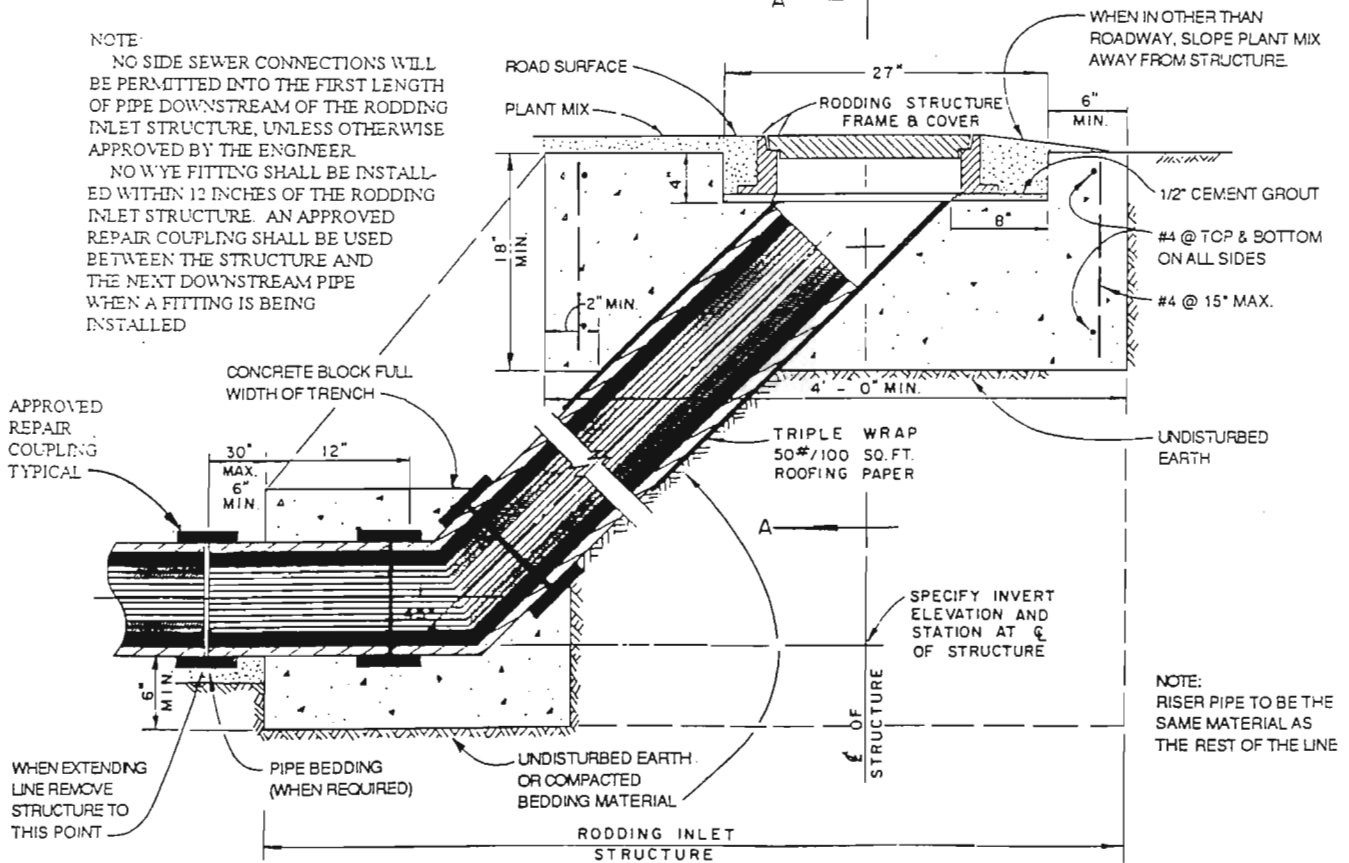
SECTION A-A

ℓ TO ℓ DISTANCE BETWEEN STRUCTURES STATION OF RODDING INLET

NOTE:

NO SIDE SEWER CONNECTIONS WILL BE PERMITTED INTO THE FIRST LENGTH OF PIPE DOWNSTREAM OF THE RODDING INLET STRUCTURE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

NO WYE FITTING SHALL BE INSTALLED WITHIN 12 INCHES OF THE RODDING INLET STRUCTURE. AN APPROVED REPAIR COUPLING SHALL BE USED BETWEEN THE STRUCTURE AND THE NEXT DOWNSTREAM PIPE WHEN A FITTING IS BEING INSTALLED.



VERTICAL SECTION

SSD STEGE SANITARY DISTRICT
 APPROVED: *Rugard*
 L.C. Rugard, P.E., District Manager/Engineer

REV./DATE:

RODDING INLET
 (SPECIAL USE APPROVAL REQUIRED)

DWG. NO.:
SEC. 32-10

SECTION 32-11

SECTION 32-12

SECTION 32-13

SECTION 32-14

SECTION 32-15

SECTION 32-16

SECTION 32-17

SECTION 32-18

SECTION 32-19

SECTION 32-20

SECTION 32-21

SECTION 32-22

SECTION 32-23

SECTION 32-24

SECTION 32-25

SECTION 32-26

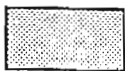
(RESERVED)

PIPE COVER LIMITATION TABLE

PIPE SPECIFICATION			MIN. - MAX. COVER IN FEET	
SIZE	MATERIAL	TYPE AND MINIMUM CLASS	DETAIL A	DETAIL B
SIDE SEWERS (TRAFFIC AREAS)				
4-6"	VC	--	4-30	
4-6"	CI	Soil Pipe	--	4-30
4-6"	DI	(Ductile) 52	--	4-30
MAIN SEWERS (TRAFFIC AREAS)				
6-8"	VC	--	5-30	
10"	VC	--	5-15	
6-10"	DI	(Ductile) 52	--	5-30
MAIN SEWERS (NON-TRAFFIC AREAS)				
6-8"	VC	--	4-30	
10"	VC	--	4-15	
6-10"	DI	(Ductile) 52	--	4-30

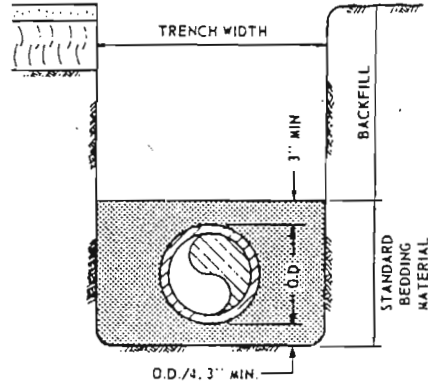
TABLE NOTES:

1. THE MINIMUM COVER FOR SIDE SEWERS MAY BE REDUCED TO 2.5 FEET WHERE THE PIPE LINE INSTALLATION IS IN A NON-TRAFFIC AREA.
2. THE MAXIMUM COVERS SHOWN ARE BASED ON NORMAL TRENCH INSTALLATION CONDITIONS IN SOILS OF ASSUMED AVERAGE CHARACTERISTICS. IF VARIATIONS FROM NORMAL CONDITIONS OR AVERAGE SOIL CHARACTERISTICS OCCUR, SPECIAL DESIGNS MUST BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
3. COVER LIMITATIONS FOR ALL 12 INCH AND LARGER DIAMETER SIZE PIPE MUST BE CALCULATED AND SUBMITTED TO THE ENGINEER FOR APPROVAL.

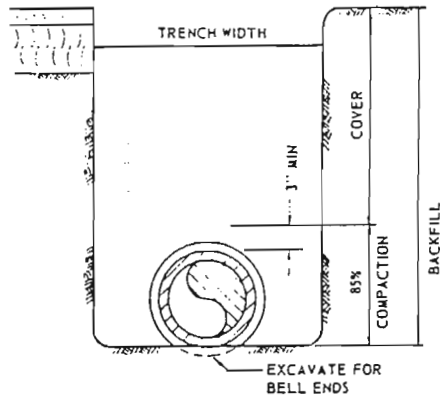


NOT PERMITTED

PIPE BEDDING DETAILS

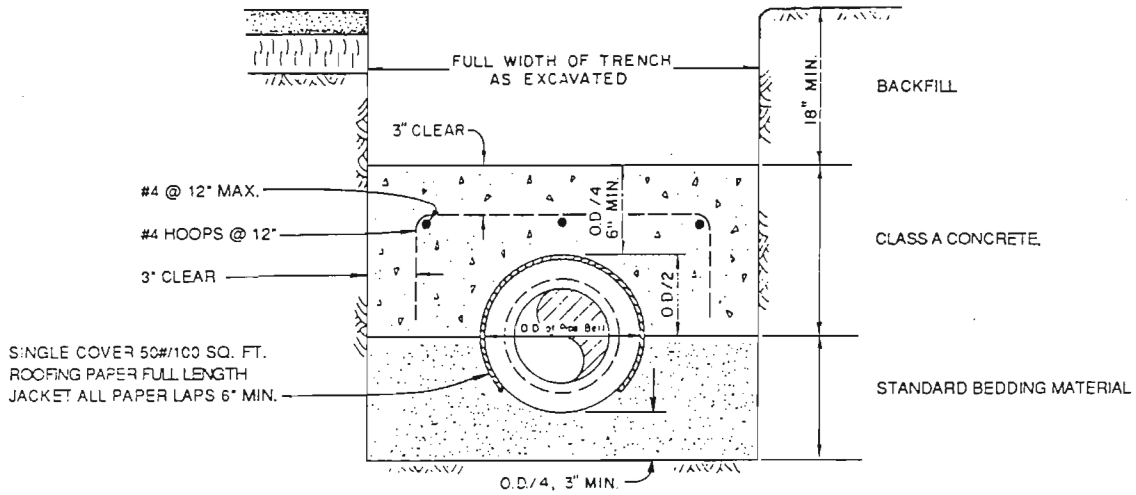


DETAIL A



DETAIL B

IN SPECIAL CASES WHERE LESS THAN MINIMUM COVER CAN BE ATTAINED, THE ENGINEER MAY DIRECT THE USE OF DETAIL C



DETAIL C

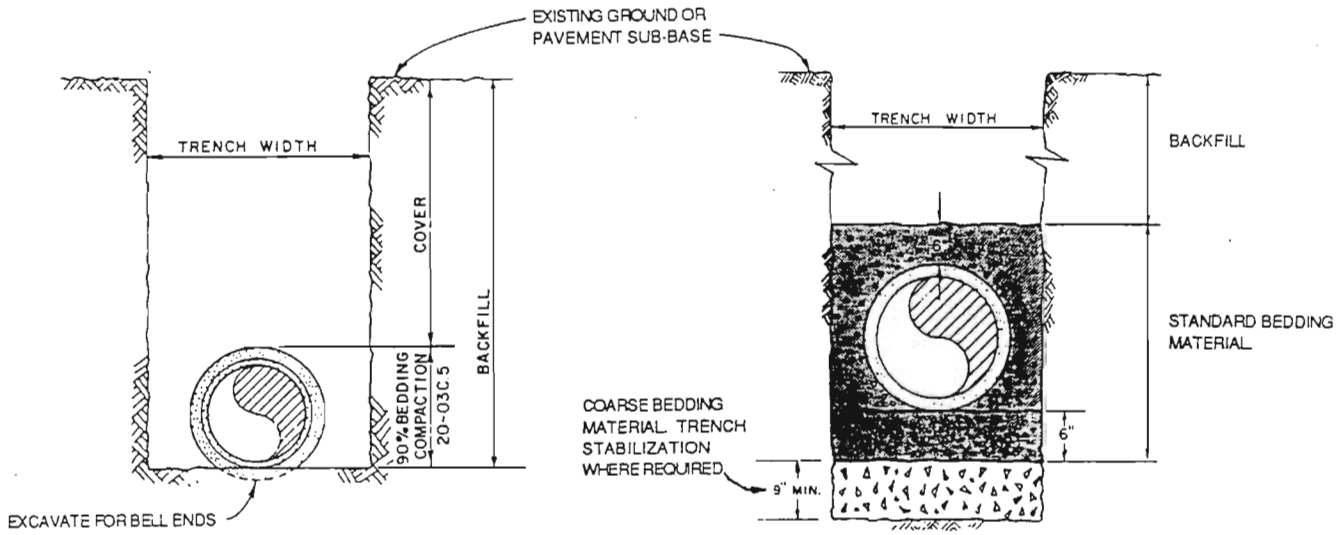


STEGE SANITARY DISTRICT
 APPROVED: *L.C. Rugaard, P.E.*
 L.C. Rugaard, P.E. District Manager/Engineer

REV./DATE:

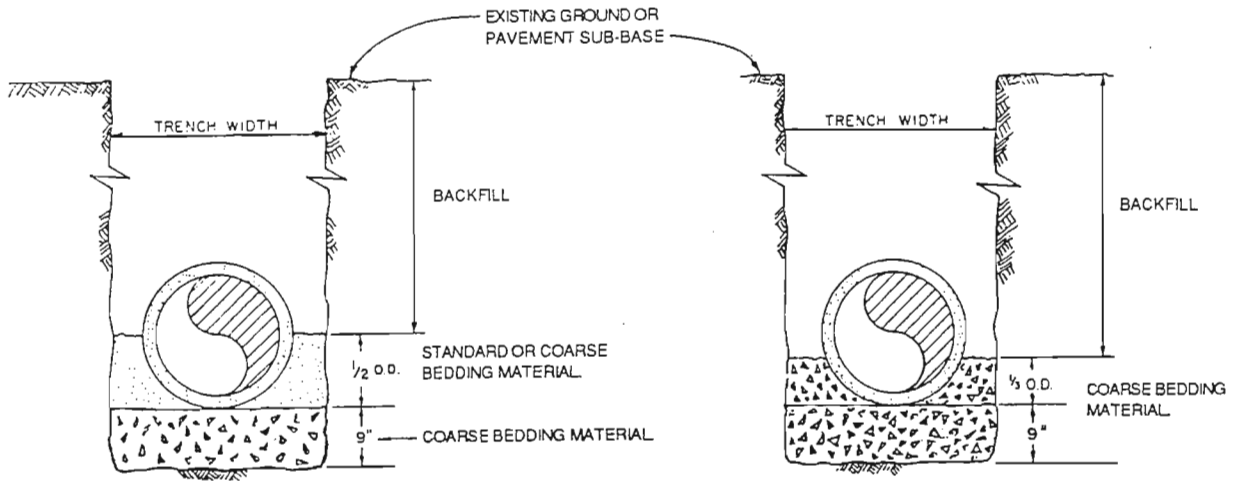
SPECIAL TRENCH DETAILS
 (SPECIAL USE APPROVAL REQUIRED)

DWG. NO.:
SEC.
32-28



DETAIL D
FOR D.I. TYPE PIPE
INSTALLATIONS ONLY

DETAIL E
FOR ALL V.C. TYPE AND FORCE
MAIN PIPE INSTALLATIONS



DETAIL F
FOR R.C. AND C.L. & C. TYPE PIPE
INSTALLATIONS UP TO 42" ONLY

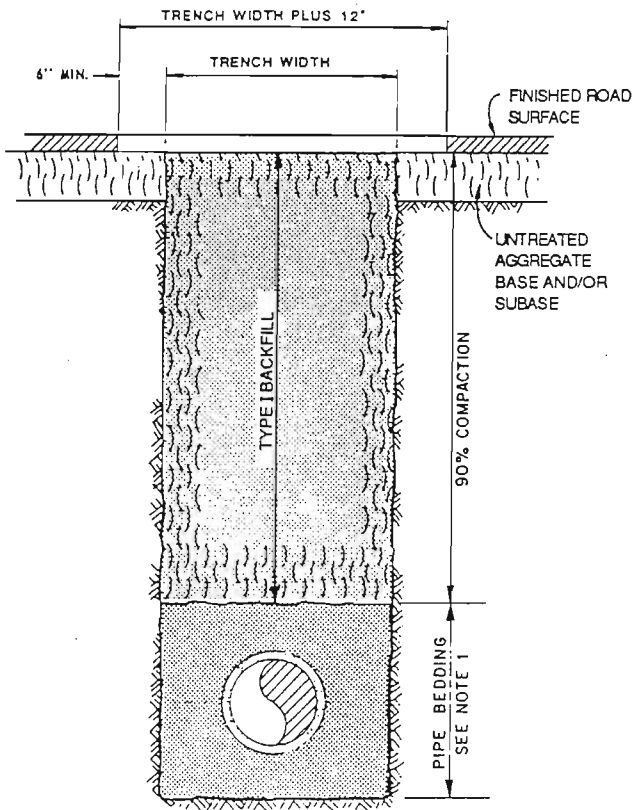
DETAIL G
FOR R.C. TYPE PIPE INSTALLATIONS
48" AND LARGER ONLY

SSD STEGE SANITARY DISTRICT
APPROVED: *L.C. Rugaard, R.E.*
L.C. Rugaard, R.E. District Manager/Engineer

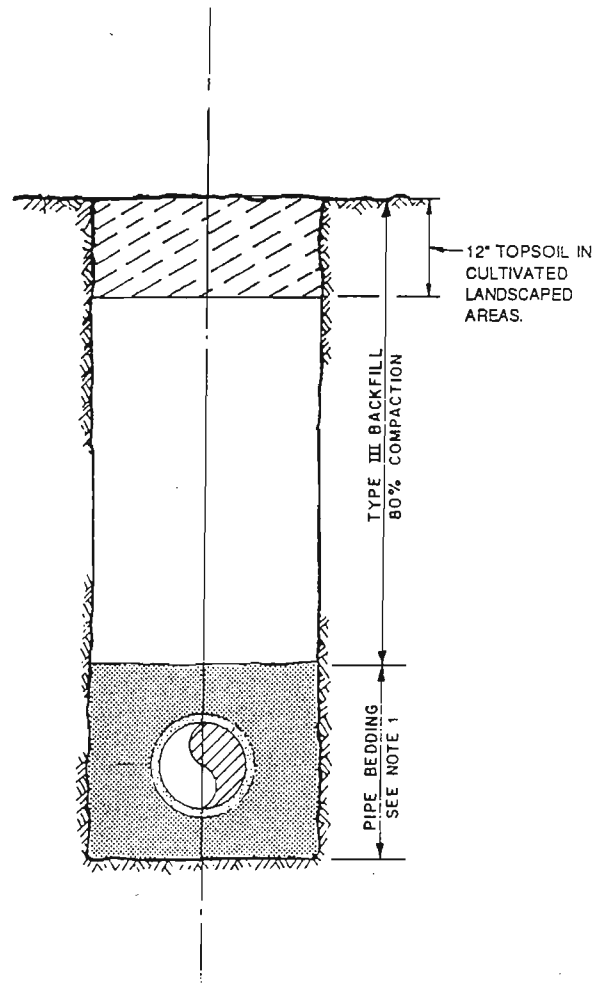
REV./DATE:

**STANDARD TRUNK SEWER
TRENCH DETAILS**
FOR 18" AND LARGER PIPE
(SPECIAL USE APPROVAL REQUIRED)

DWG. NO.:
**SEC.
32-29**



DETAIL A
TRENCH SECTION IN
TRAFFIC AREAS *



DETAIL B
TRENCH SECTION IN
NON-TRAFFIC AREAS

NOTES:

1. ALL PIPE BEDDING SHALL CONFORM TO THE APPLICABLE REQUIREMENTS AND PROVISIONS OF THESE SPECIFICATIONS.
2. MAINS AND SIDE SEWERS TO BE INSTALLED AFTER ROAD BASE HAS BEEN LAID AND COMPACTED.
- WHERE NOT OTHERWISE GOVERNED BY OTHER JURISDICTIONAL AGENCY REQUIREMENTS EXCEEDING THOSE SHOWN.

SSD STEGE SANITARY DISTRICT
 APPROVED: *L.C. Ruggaard*
 L.C. Ruggaard, P.E., District Manager/Engineer

REV./DATE:

TRENCH STRUCTURAL DETAILS
 (MINIMUM REQUIREMENTS)

DWG. NO.:
SEC.
32-30

SECTION 32-31

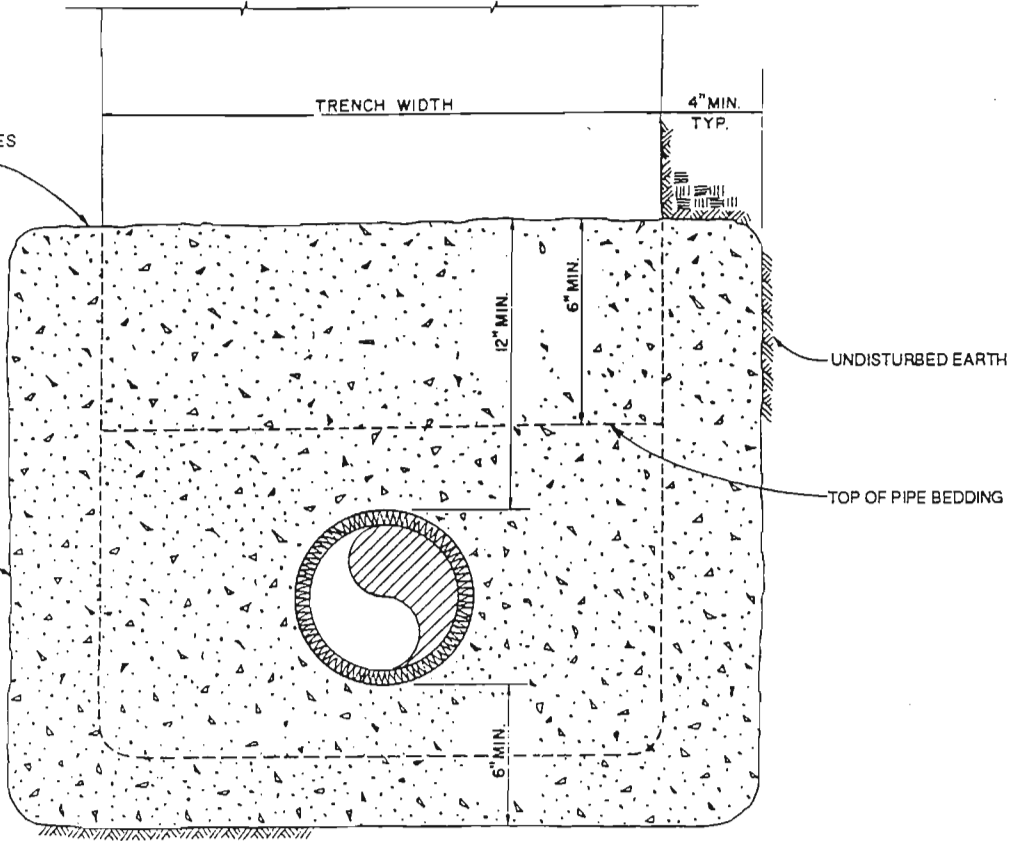
SECTION 32-32

(RESERVED)

TYPICAL KEY SIDES AND BOTTOM

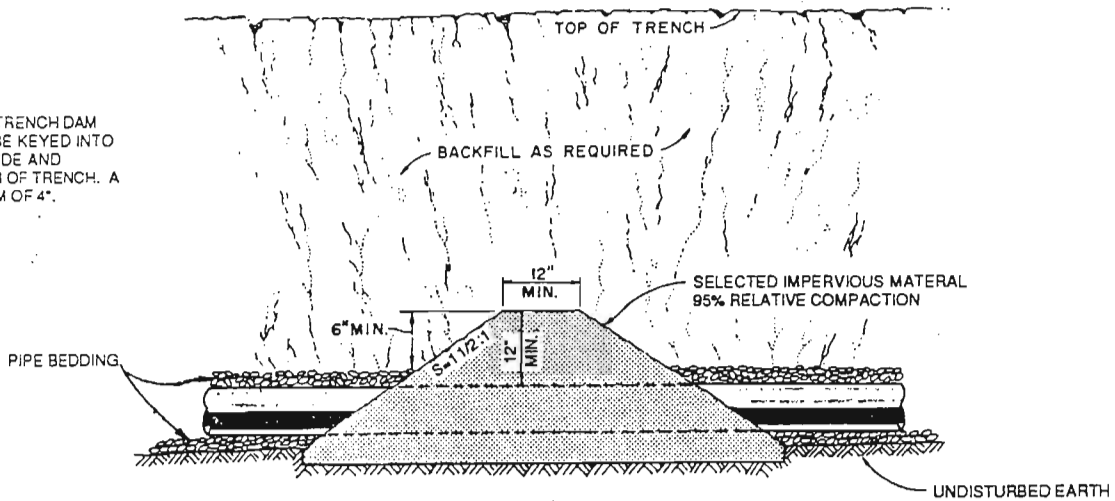
NOTE:
CONCRETE TRENCH DAM TO HAVE 12" MAX. THICKNESS (ALONG TRENCH).

CLASS A OR B CONCRETE



SECTION
CONCRETE TRENCH DAM

NOTE.
EARTH TRENCH DAM SHALL BE KEYED INTO EACH SIDE AND BOTTOM OF TRENCH. A MINIMUM OF 4".



ELEVATION
EARTH TRENCH DAM

SSD STEGE SANITARY DISTRICT
APPROVED: *L.C. Rugaard*
L.C. Rugaard, P.E., District Manager/Engineer

REV./DATE:

TRENCH DAMS
LOCATED AS SHOWN ON THE PLANS
OR AS DIRECTED BY THE ENGINEER

DWG. NO.:

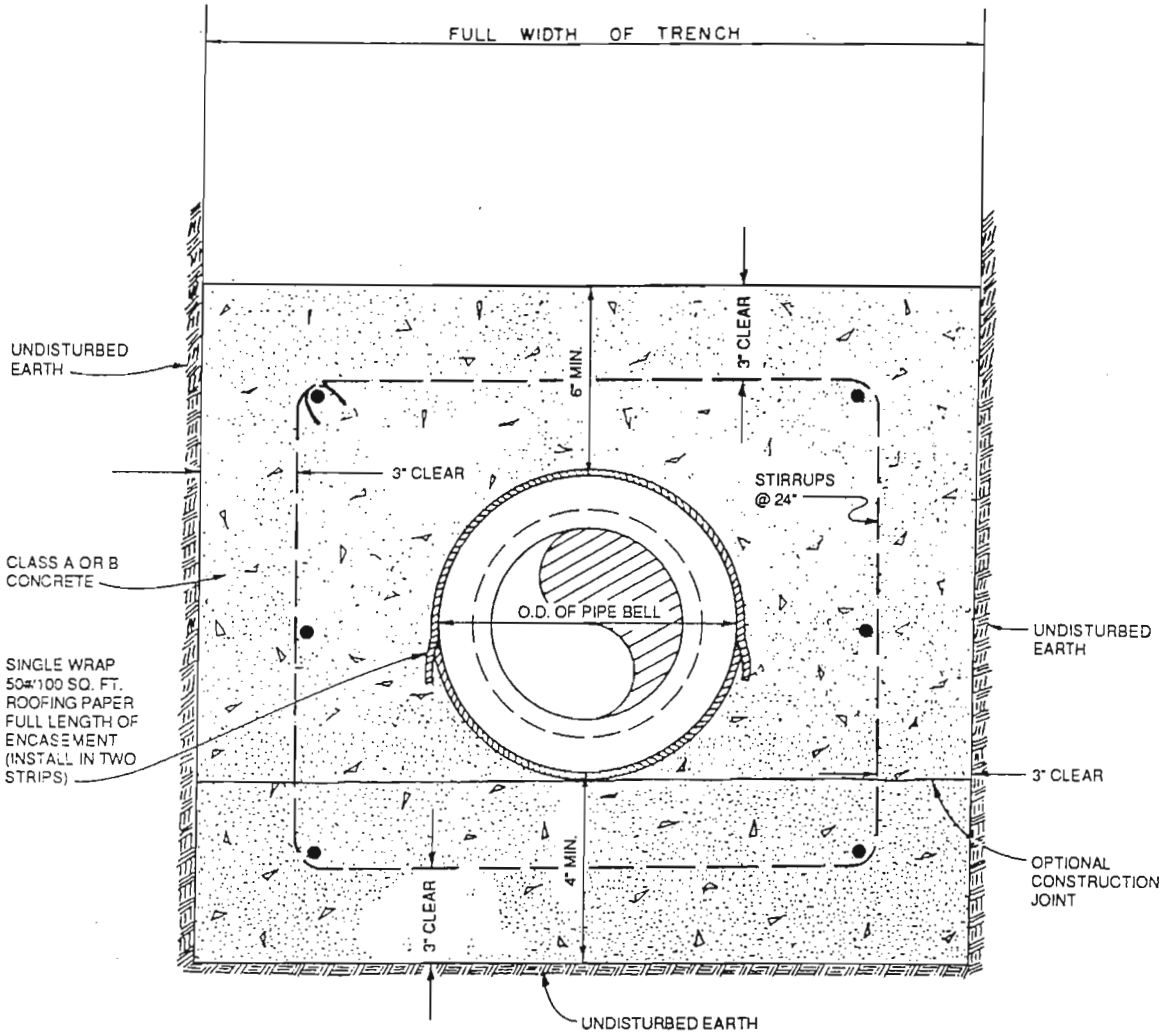
SEC.
32-33

SECTION 32-34

SECTION 32-35

SECTION 32-36

(RESERVED)



SECTION

NOTES:

1. ALL REINFORCING, #4 BARS AS SHOWN.
2. EACH JOINT SHALL BE TIED DOWN TO PREVENT FLOATING USING A METHOD APPROVED BY THE ENGINEER.



STEGE SANITARY DISTRICT
 APPROVED: *LC Rugaard*
 L.C. Rugaard, P.E., District Manager/Engineer

REV./DATE:

CONCRETE ENCASEMENT
 (SPECIAL USE APPROVAL REQUIRED)

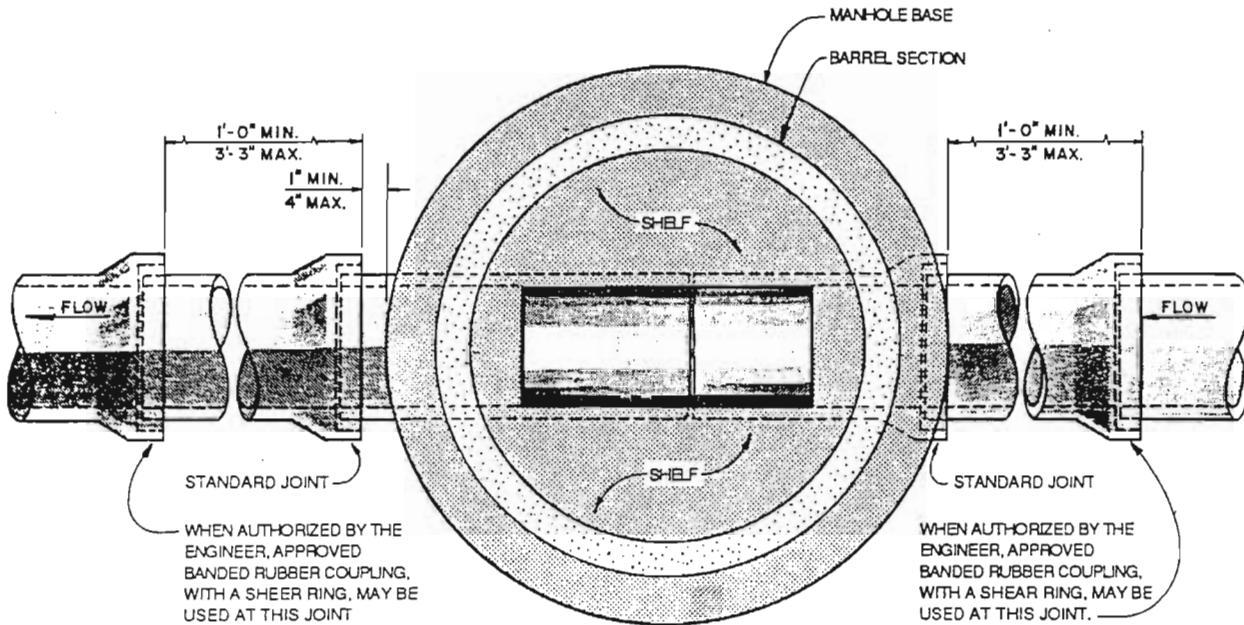
DWG. NO.:
SEC. 32-37

SECTION 32-38

SECTION 32-39

SECTION 32-40

(RESERVED)



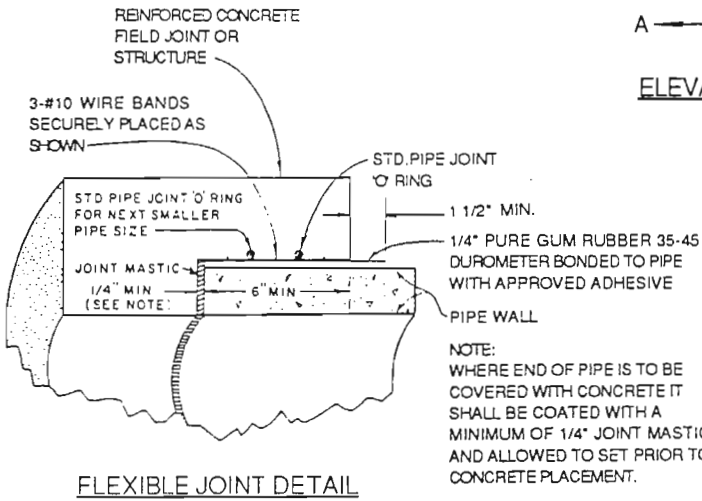
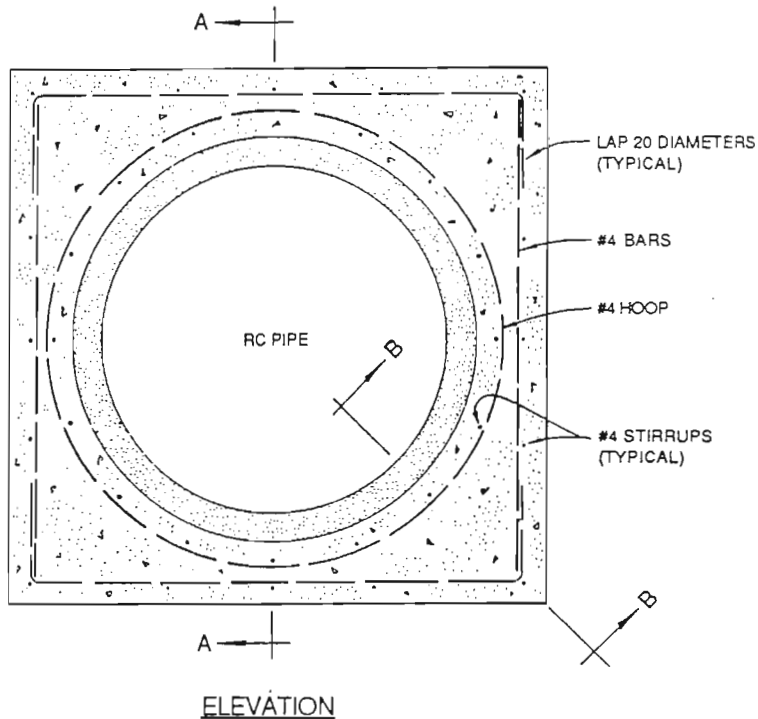
RIGID PIPE
 JOINT LOCATIONS APPLICABLE TO ALL
 INCOMING AND OUTGOING PIPELINES
 EXCEPTION: D.I.

SSD STEGE SANITARY DISTRICT
 APPROVED: *L. C. Rugaard*
 L.C. Rugaard, P.E., District Manager/Engineer

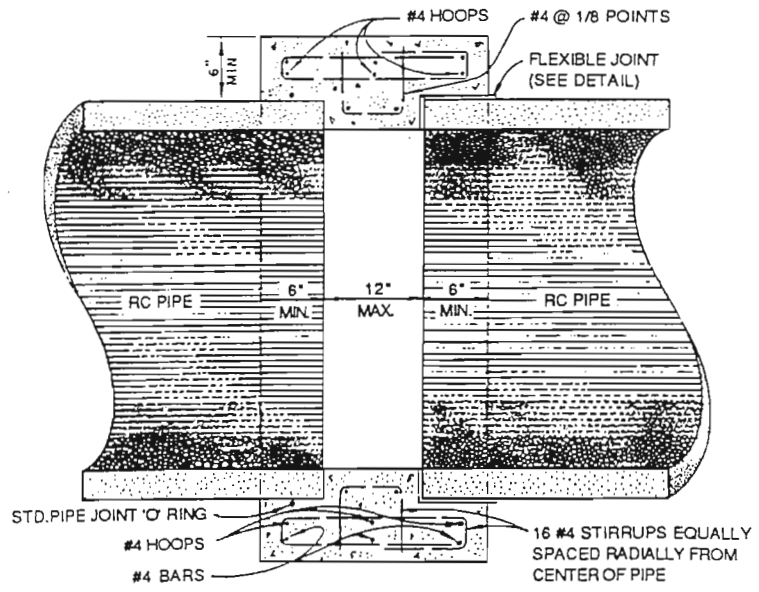
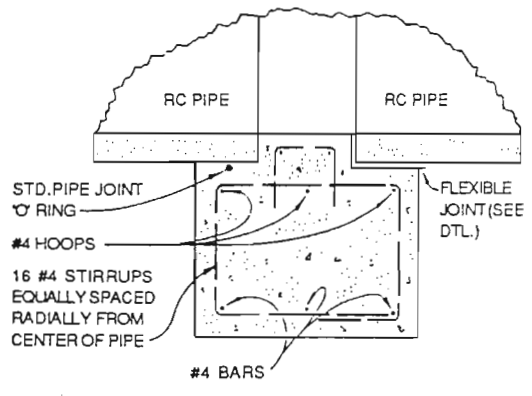
REV./DATE:

JOINT REQUIREMENTS
 IN 10" OR SMALLER LINES
 AT MANHOLE BASES

DWG. NO.:
SEC.
32-41



NOTE:
WHERE END OF PIPE IS TO BE COVERED WITH CONCRETE IT SHALL BE COATED WITH A MINIMUM OF 1/4" JOINT MASTIC AND ALLOWED TO SET PRIOR TO CONCRETE PLACEMENT.

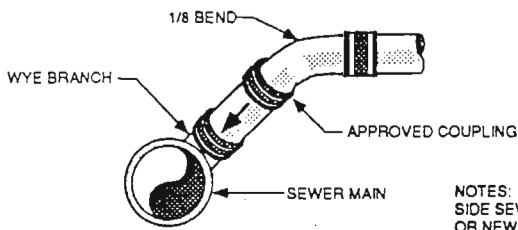


SSD STEGE SANITARY DISTRICT
 APPROVED: *LC Rugaard*
 LC Rugaard, P.E. District Manager/Engineer

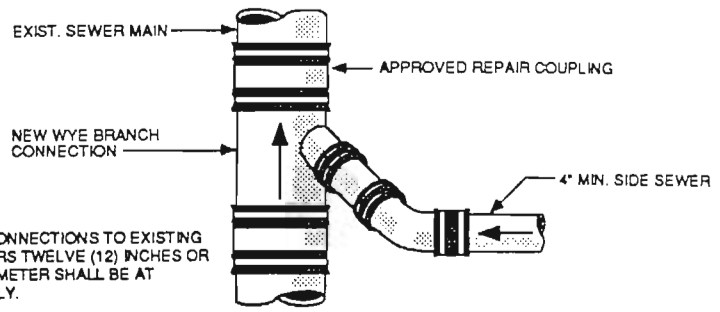
REV / DATE:

R.C. PIPE
FIELD JOINT DETAIL
 (SPECIAL USE APPROVAL REQUIRED)

DWG. NO.:
SEC. 32-42



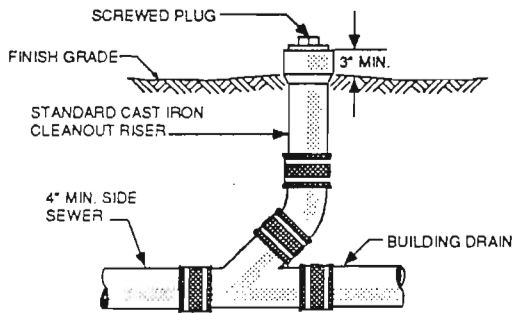
PROFILE VIEW



PLAN VIEW

NOTES:
SIDE SEWER CONNECTIONS TO EXISTING OR NEW SEWERS TWELVE (12) INCHES OR LARGER IN DIAMETER SHALL BE AT MANHOLES ONLY.

MAIN LINE CONNECTION

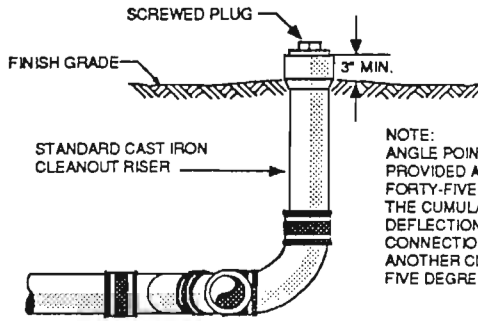


PROFILE VIEW

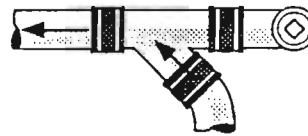


PLAN VIEW

IN - LINE CLEANOUT



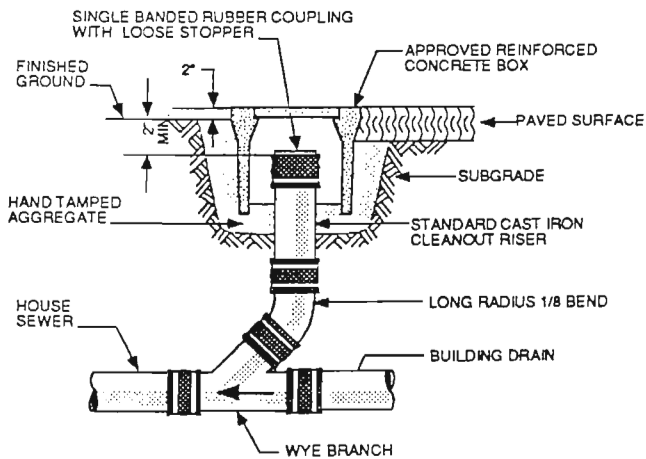
PROFILE VIEW



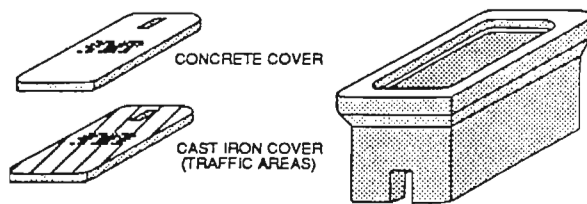
PLAN VIEW

ANGLE POINT CLEANOUT

NOTE:
ANGLE POINT CLEANOUTS SHALL BE PROVIDED AT ANY BEND GREATER THAN FORTY-FIVE DEGREES (45°) OR WHERE THE CUMULATIVE TOTAL OF DEFLECTIONS FROM THE POINT OF CONNECTION TO THE MAIN, OR FROM ANOTHER CLEANOUT, EXCEEDS FORTY-FIVE DEGREES (45°).

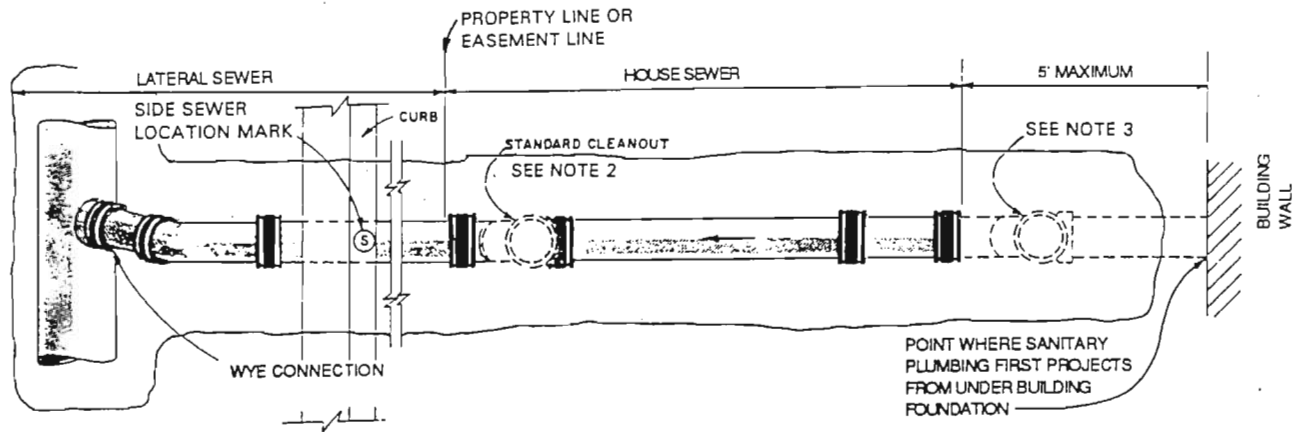


CLEANOUT TO GRADE

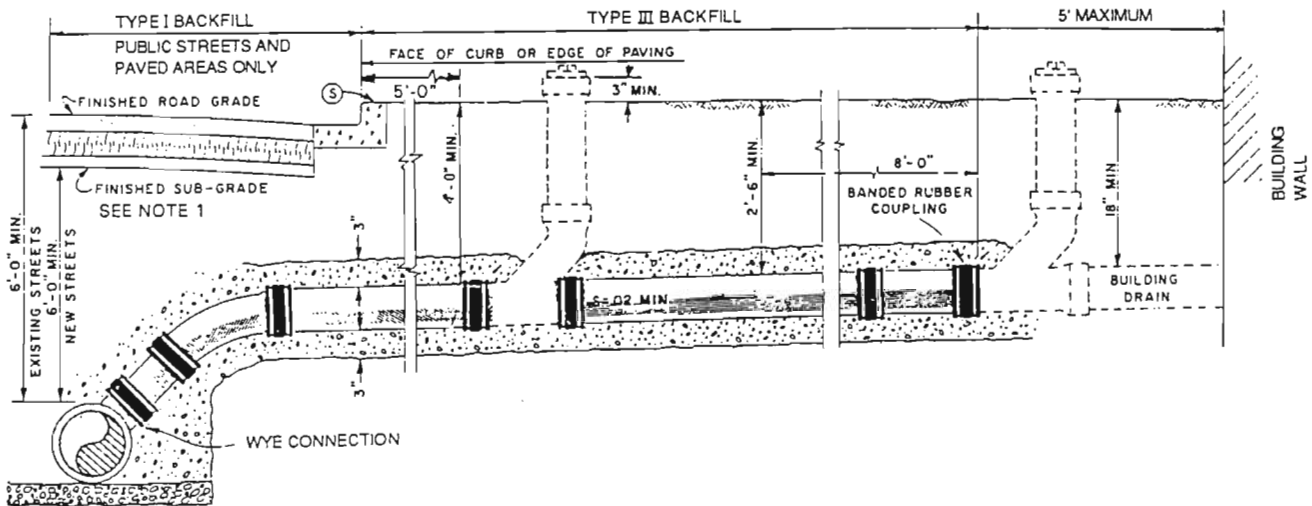


NOTES:
RECTANGULAR BOX (10-1/4" x 17-1/4"), CHRISTY - MODEL B9 OR EQUAL, SHALL BE USED FOR CLEANOUTS WHEN TERMINATED BELOW GRADE.
CAST IRON LIDS SHALL BE USED IN ALL TRAFFIC AREAS. ALL LIDS SHALL BE MARKED WITH AN "S" OR "SEWER".

CONCRETE BOX



SIDE SEWER PLAN



SIDE SEWER PROFILE

NOTES:

1. IN NEW STREETS OR ROADS, NO SEWER WORK SHALL BEGIN UNTIL THE ROAD BASE HAS BEEN LAID AND COMPACTED. ALL MAIN SEWERS SHALL BE LOCATED AS NEAR AS PRACTICAL TO THE CENTER LINE OF THE TRAVELED WAY.
2. WHEN A SEWER LATERAL IS INSTALLED IN ADVANCE OF THE HOUSE SEWER, IT SHALL BE TERMINATED AT OR NEAR THE PROPERTY LINE WITH A CLEANOUT RISER.
3. REFER TO STANDARD DETAILS FOR SPECIAL SIDE SEWER FITTINGS AND PROTECTIVE DEVICES FOR PREVENTION OF PROPERTY DAMAGE

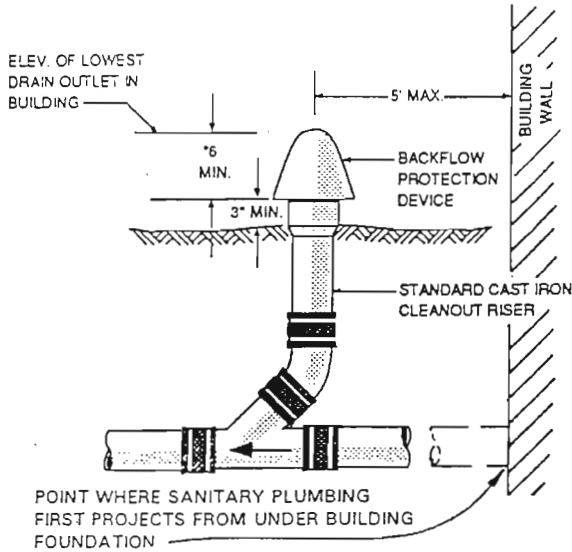


STEGE SANITARY DISTRICT
L. C. Rugaard, P.E.
 APPROVED: L. C. Rugaard, P.E., District Manager/Engineer

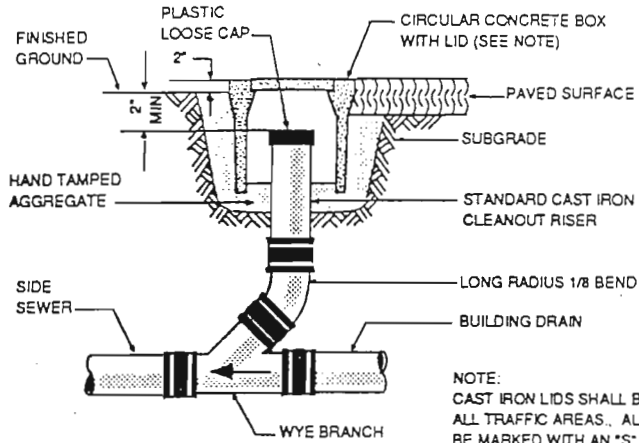
REV./DATE:

**TYPICAL SIDE SEWER
 DETAILS**

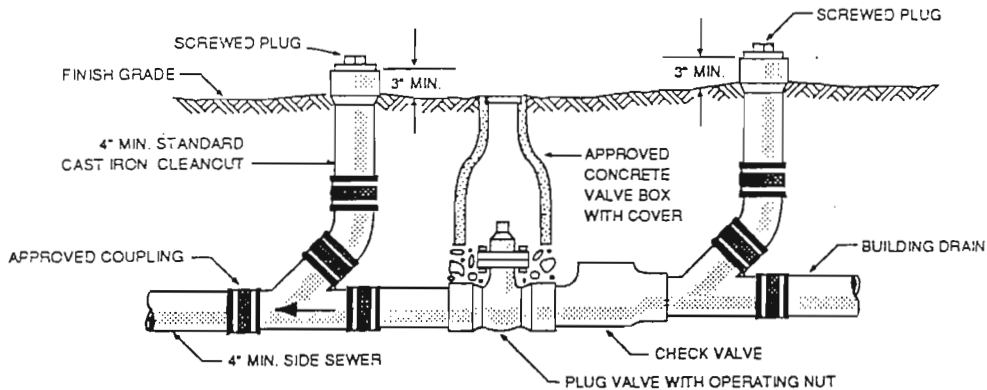
DWG. NO.:
**SEC.
 32-44**



**BACKFLOW PROTECTION/
OVERFLOW SYSTEM
TYPE 1**



**BACKFLOW PROTECTION/
OVERFLOW SYSTEM
TYPE 2**



**BACKWATER CHECK VALVE & SHUTOFF SYSTEM
TYPE 3**

NOTES:

BACKFLOW PROTECTION/OVERFLOW SYSTEM - TYPE 1 OR 2 SHALL BE INSTALLED IN SEWERS WHERE THE LOWEST DRAIN OUTLET TO BE CONNECTED TO THE MAIN SEWER IS BELOW A POINT 12-INCHES ABOVE THE SURFACE OF THE NEAREST UPSTREAM SEWER STRUCTURE AND IN ALL NEW BUILDINGS.

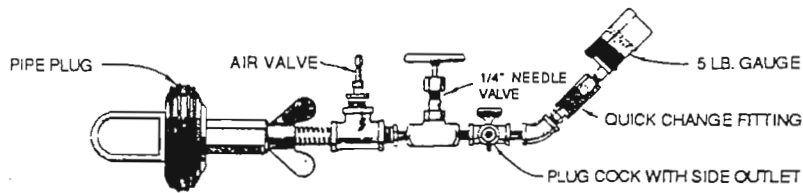
BACKWATER CHECK VALVE AND SHUTOFF SYSTEM - TYPE 3 SHALL BE INSTALLED IN SEWERS SERVING BUILDINGS WHERE A BACKFLOW PROTECTION/OVERFLOW SYSTEM IS REQUIRED AND WHERE SEWAGE CANNOT OVERFLOW TO AN ADJACENT AREA WITHOUT SERIOUS DAMAGE.

SSD STEGE SANITARY DISTRICT
APPROVED: *LC Rugaard*
LC Rugaard, P.E. District Manager/Engineer

REV / DATE:

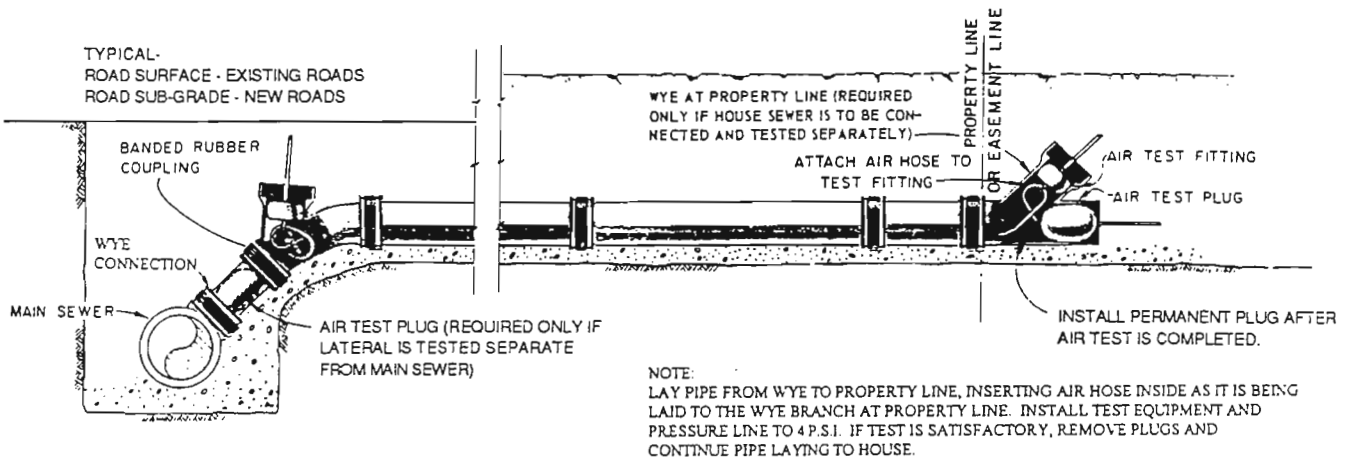
BACKFLOW RELIEF DEVICES

DWG. NO.:
SEC. 32-45

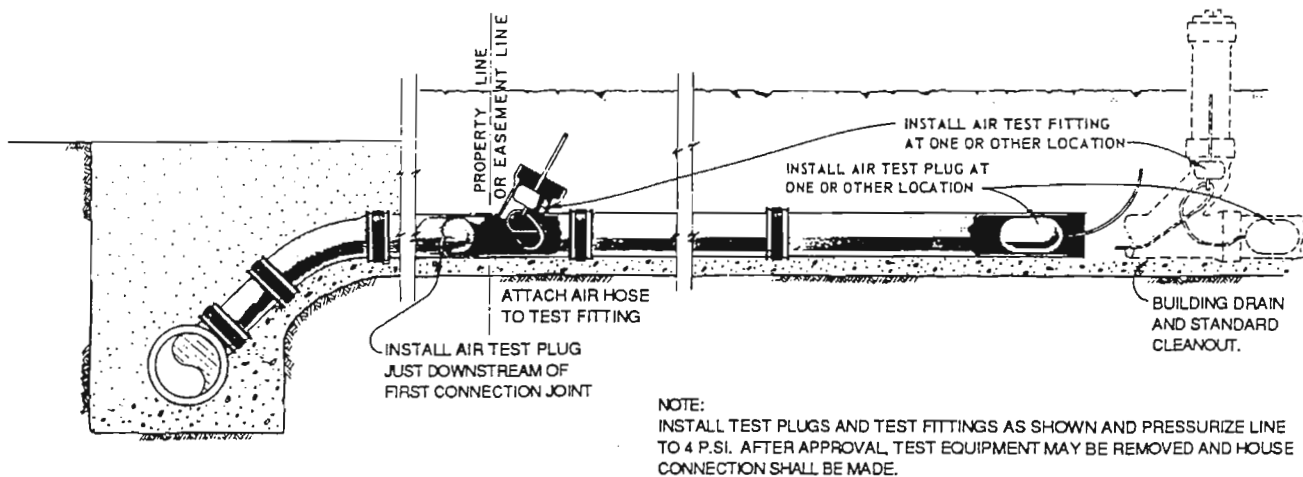


AIR TEST FITTING

FITTING SHOWN ABOVE CONSISTS OF THE MINIMUM HARDWARE REQUIRED AND SUGGESTS A RECOMMENDED CONFIGURATION ONLY



LATERAL SEWER TEST



HOUSE SEWER TEST

SSD STEGE SANITARY DISTRICT
 APPROVED: *L.C. Rugaard*
 L.C. Rugaard, P.E., District Manager/Engineer

REV / DATE:

**SIDE SEWER
 AIR TEST DETAILS**

DWG. NO.:
**SEC.
 32-46**

AIR TEST CHART
CONDENSED

DIAMETER OF PIPE (INCHES)	LENGTH OF LINE (FEET)	LENGTH OF TEST (MINUTES)
4	ALL	2
6	0 TO 300	2
6	300 TO 370	2 1/2
6	370 AND GREATER	3
8	0 TO 170	2
8	170 TO 210	2 1/2
8	210 TO 250	3
8	250 TO 290	3 1/2
8	290 AND GREATER	3 3/4
10	0 TO 110	2
10	110 TO 165	3
10	165 TO 215	4
10	215 AND GREATER	4 3/4
12	0 TO 115	3
12	115 TO 155	4
12	155 TO 190	5
12	190 AND GREATER	6
15	0 TO 120	5
15	120 TO 165	7
15	165 AND GREATER	8
18	ALL	8 1/2
21	ALL	10
24	ALL	11 1/2

NOTE:
IF THE SECTION OF SEWER TO BE TESTED IS COMPOSED OF BOTH A MAIN LINE AND SIDE SEWER, ADD 4 SECONDS TO THE LENGTH OF TEST REQUIRED FOR THE MAIN PER EVERY 10 FEET OF SIDE SEWER CONJOINTLY TESTED.



STEGER SANITARY DISTRICT

APPROVED:

L. C. Rugaard
L. C. Rugaard, P. E., District Manager/Engineer

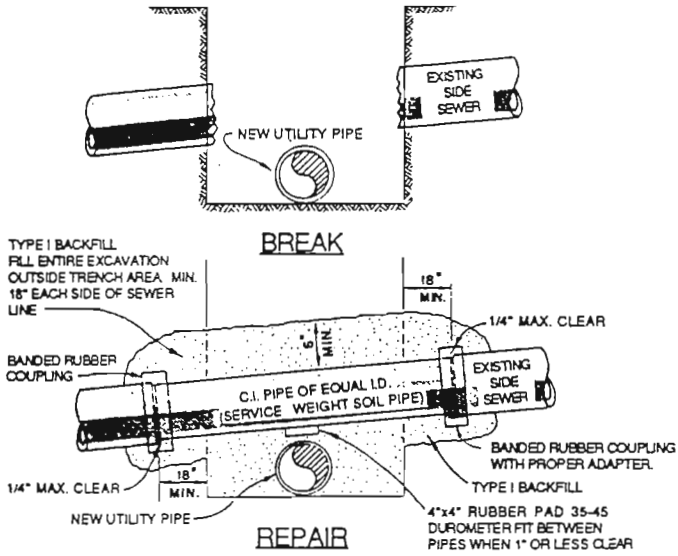
REV./DATE:

AIR TEST CHART
CONDENSED

DWG. NO.:

SEC.
32-47

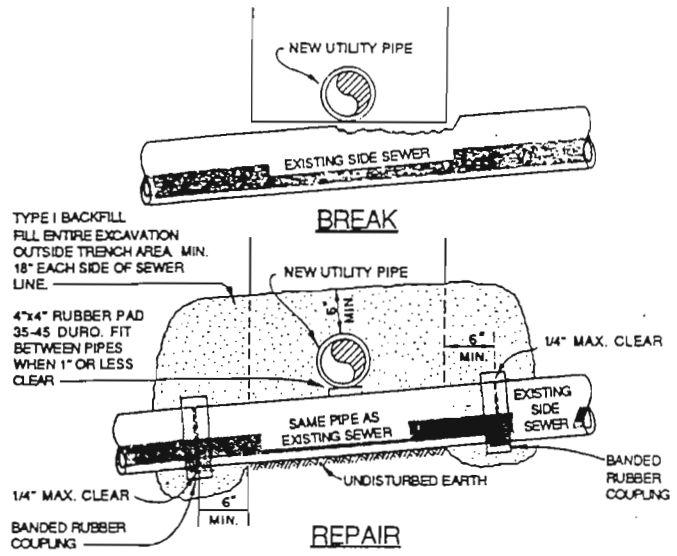
**SIMPLE SIDE SEWER BREAK
NO CONFLICT IN GRADE**



PROCEDURE

1. NOTIFY STEGE SANITARY DISTRICT. (524-4667)
2. TRIM SIDE SEWER PIPE TO A CLEAN CUT UNDAMAGED END. A MINIMUM OF 18" INTO TRENCH WALL. CUT PIECE OF NEW CAST IRON PIPE OF EQUAL DIAMETER TO FIT SPACE BETWEEN TRIMMED ENDS WITH A MAXIMUM CLEARANCE OF 1/4" AT EACH END. REMOVE PIPE STOP RING FROM ONE BANDIED RUBBER COUPLING AND INSTALL THE COUPLING ON THE UPSTREAM END OF THE SIDE SEWER, THEN PLACE ANOTHER BANDIED RUBBER COUPLING ON THE DOWNSTREAM PIPE REPLACEMENT SECTION, THEN INSERT ONE END IN THE COUPLING ON THE DOWNSTREAM END. ALIGN PIPES AT UPSTREAM END AND SLIDE COUPLING DOWNSTREAM, CENTERING IT OVER THE JOINT, TIGHTEN COUPLING BANDS. A SMALL AMOUNT OF LIGHT OIL WILL AID IN SLIDING UPSTREAM COUPLING. WHEN O.D. OF PIPES ARE WITHIN 1" OF EACH OTHER, THERE SHALL BE A 4"x4" PAD OF 35-45 DUROMETER RUBBER PLACED BETWEEN THE PIPES.

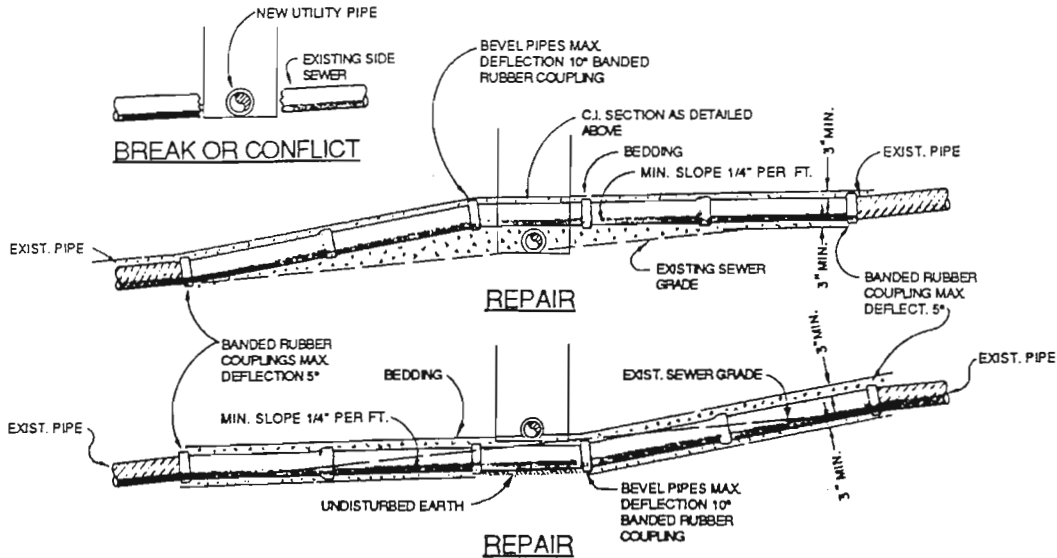
**SIMPLE SIDE SEWER BREAK
NO CONFLICT IN GRADE**



PROCEDURE

1. NOTIFY STEGE SANITARY DISTRICT. (524-4667)
2. REPAIR SHALL BE MADE AS SHOW ABOVE. WHEN CLEARANCE BETWEEN SEWER PIPE AND UTILITY PIPE IS 6" OR MORE, REPAIR MAY BE MADE WITH THE SAME TYPE OF PIPE AS THE EXISTING SEWER. WHEN O.D. OF PIPES ARE WITHIN 1" OF EACH OTHER, THERE SHALL BE A 4"x4" PAD OF 35-45 DUROMETER RUBBER PLACED BETWEEN THE PIPES.

SIMPLE SIDE SEWER BREAK - WITH CONFLICT IN GRADE



PROCEDURE

1. NOTIFY STEGE SANITARY DISTRICT. (524-4667)
2. WHEN NEW UTILITY PIPE OR CONDUIT CONFLICTS WITH SEWER LINE GRADE, THE UTILITY PIPE OR CONDUIT SHALL BE RAISED OR LOWERED, IF POSSIBLE, TO MISS THE SEWER LINE. IF NOT POSSIBLE TO MOVE THE UTILITY LINE, WRITTEN PERMISSION SHALL BE ACQUIRED FROM THE SANITARY DISTRICT AND THE SEWER LINE RELOCATED IN ACCORDANCE WITH ONE OF THE DETAILS ABOVE AND STANDARD SPECIFICATIONS OF THE DISTRICT. WHEN O.D. OF PIPES ARE WITHIN 1" OF EACH OTHER, THERE SHALL BE A 4"x4" PAD OF 35-45 DUROMETER RUBBER PLACED BETWEEN THE PIPES

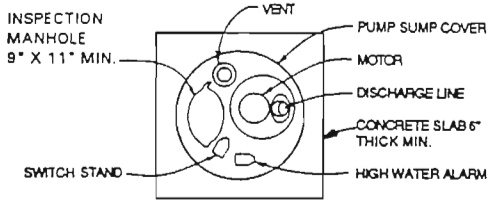


STEGE SANITARY DISTRICT
APPROVED: *L.C. Rugaard PE*
L.C. Rugaard, P.E., District Manager/Engineer

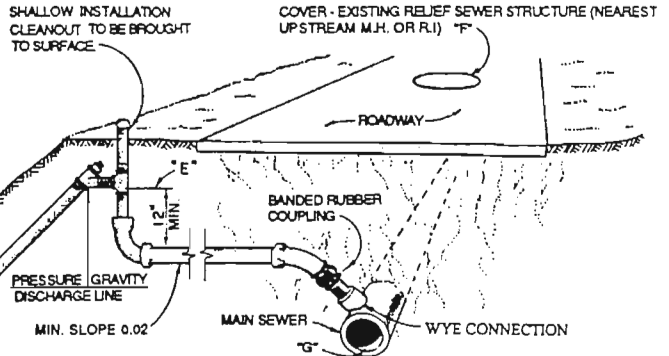
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SIDE SEWER REPAIRS

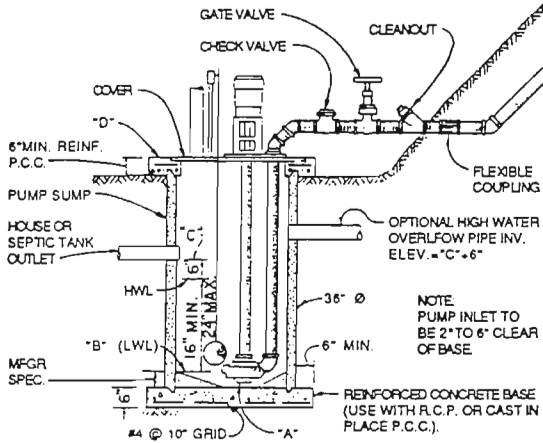
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SEC. 32-48



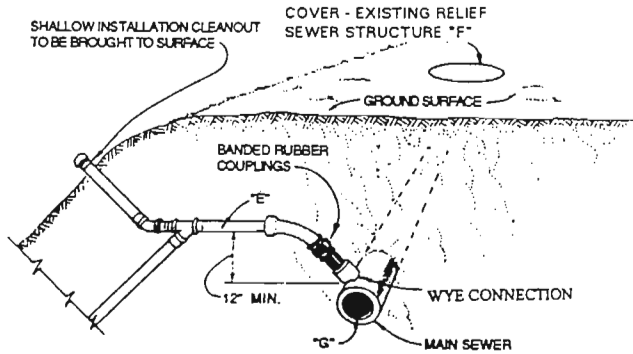
PLAN



**TYPICAL CONNECTION TO MAIN SEWER
IN PUBLIC ROADWAY**



**ELEVATION
TYPICAL INSTALLATION**



**TYPICAL CONNECTION TO MAIN SEWER
IN EASEMENT OR TO SIDE SEWER**



STEGE SANITARY DISTRICT
 APPROVED: *L. C. Rugaard*
 L. C. Rugaard, P.E., District Manager/Engineer

REV./DATE:

**RESIDENTIAL PUMPING SYSTEM
 (SPECIAL USE APPROVAL REQUIRED)**

DWG. NO.:
**SEC.
 32-49/A**

GENERAL:

THE MINIMUM REQUIREMENTS FOR A RESIDENTIAL SEWAGE PUMPING SYSTEM CONNECTING A SINGLE RESIDENCE (OR EQUIVALENT) TO THE DISTRICT'S SYSTEM ARE SPECIFIED IN THE FOLLOWING PARAGRAPHS. THE DISTRICT ACCEPTS NO RESPONSIBILITY FOR THE DESIGN, OPERATION, OR MAINTENANCE OF SUCH PRIVATELY OWNED AND OPERATED SYSTEMS. ALL EQUIPMENT AND ACCESSORIES SHALL BE STANDARD MANUFACTURED ITEMS AND THOSE COMING IN DIRECT CONTACT WITH SEWAGE SHALL BE SPECIFICALLY MANUFACTURED FOR SEWAGE USE. WHEN INSTALLED OUTSIDE OF A BUILDING, THE MOTOR AND CONTROLS SHALL BE PROTECTED AND SHELTERED BY A WEATHER-PROOF, WELL-VENTILATED ENCLOSURE. WHEN SURCHARGE HEAD IS EXCESSIVE, A PRESSURE RELIEF STRUCTURE WILL BE REQUIRED.

PUMPS:

RAW SEWAGE PUMP: RAW SEWAGE PUMP SHALL BE USED ON ALL NEW CONSTRUCTION AND MAY BE USED ON EXISTING FACILITIES. THE PUMP SHALL BE A CENTRIFUGAL, NON-CLOG TYPE, HAVING A VERTICAL ENCLOSED SHAFT OF PROPER LENGTH TO FIT THE PUMP SUMP AND SHALL HAVE A MINIMUM CAPACITY OF FORTY-FIVE (45) GPM WHEN PUMPING AGAINST THE REQUIRED HEAD. THE IMPELLER SHALL BE CAPABLE OF PASSING A TWO (2) INCH SPHERE. THE MINIMUM PUMP DISCHARGE SHALL BE THREE (3) INCHES IN DIAMETER. IF A GARBAGE DISPOSAL UNIT IS TO BE CONNECTED, THE PUMP CAPACITY SHALL BE INCREASED TO A MINIMUM OF SEVENTY-FIVE (75) GPM WHEN PUMPING AGAINST REQUIRED HEAD AND THE MINIMUM PUMP DISCHARGE SHALL BE FOUR (4) INCHES IN DIAMETER. IF GRINDER PUMPS ARE USED, THE MINIMUM PUMP DISCHARGE SHALL BE TWO (2) INCHES IN DIAMETER. PUMP CAPACITY SHALL BE AS REQUIRED ABOVE.

COMMERCIAL INSTALLATIONS: COMMERCIAL INSTALLATIONS SHALL CONSIST OF FOUR (4) INCHES DUPLEX PUMPS EACH RATED FOR TOTAL LOADING.

EFFLUENT SEWAGE PUMP: EFFLUENT SEWAGE PUMP MAY BE USED WITH EXISTING SEPTIC TANK INSTALLATIONS ONLY. THE PUMP SHALL BE A SUMP OR BILGE TYPE, WITH A VERTICAL ENCLOSED SHAFT, HAVING A MINIMUM CAPACITY OF TWENTY (20) GPM WHEN PUMPING AGAINST THE REQUIRED HEAD. THE MINIMUM PUMP DISCHARGE SHALL BE TWO (2) INCHES IN DIAMETER.

SUBMERSIBLE PUMPS: SUBMERSIBLE PUMPS MUST BE U.L. RATED AS EXPLOSION PROOF. IF THE PUMP IS NOT EXPLOSION PROOF, CONTROLS MUST BE INTRINSICALLY SAFE WITH REDUNDANT CONTROLS AND POSITIVE CUT-OFF TO AVOID PUMP DOWN THAT WILL EXPOSE MOTOR. PUMP REQUIREMENTS INSOFAR AS SOLIDS HANDLING CAPACITY AND PUMP RATE AND HEAD, MUST CONFORM TO BASIC STANDARDS REQUIRED FOR STANDARD WET PIT INSTALLATIONS.

PUMP SUMP: THE PUMP SUMP SHALL BE THIRTY-SIX (36) INCHES IN DIAMETER AND THE DEPTH SHALL BE AS REQUIRED TO EXTEND SIX (6) INCHES ABOVE GROUND AND THREE (3) FEET BELOW THE INLET PIPE. THE PUMP SUMP MAY BE MADE OF THE FOLLOWING MATERIALS:
1. REINFORCED CONCRETE (CAST IN PLACE OR CONCRETE PIPE).
2. ASPHALT COATED STEEL (PREFABRICATED 3/16 INCH STEEL PLATE OR 12 GAUGE CORRUGATED METAL PIPE). STEEL SUMPS SHALL BE ENCASED WITH A MINIMUM OF THREE (3) INCHES OF CONCRETE.
3. MOLDED FIBERGLASS REINFORCED POLYESTER RESIN, INTERIOR GEL-COATED FROM 10 TO 20 MIL THICK. WALL THICKNESS TO WITHSTAND A LOAD OF 120 POUNDS PER CUBIC FOOT. THE PUMP SUMP SHALL BE PROVIDED WITH A FOUR (4) INCH MINIMUM INLET AND IN ANY CASE THE INLET ID. SHALL BE EQUAL TO OR GREATER THAN THE BUILDING PLUMBING STUB.

PUMP SUMP COVER: THE PUMP SUMP COVER SHALL BE NOT LESS THE 1/2 INCH STEEL PLATE OR HEAVY CAST IRON COVER MADE TO ACCOMMODATE THE PUMP, AUTOMATIC APPARATUS, VENT, WITH AN INSPECTION MANHOLE (MINIMUM OF NINE (9) BY ELEVEN (11) INCHES). THE PUMP SUMP COVER SHALL BE SECURELY ANCHORED TO THE PUMP SUMP BY BOLTS AND ALL JOINTS BETWEEN THE COMPONENT PARTS SHALL BE SEALED WITH A WATERPROOF MASTIC.

VENT FOR PUMP SUMP: WHERE THE SYSTEM IS LOCATED WITHIN THE DWELLING, A VENT TWO (2) INCHES OR LARGER SHALL BE PROVIDED AS REQUIRED BY THE BUILDING INSPECTOR. WHERE THE SYSTEM IS LOCATED OUTSIDE THE DWELLING, A TWO (2) INCH OR LARGER VENT SHALL BE EXTENDED TO A POINT TEN (10) FEET ABOVE THE PUMP SUMP COVER.

MOTOR: THE ELECTRIC MOTOR SHALL BE A DRIP-PROOF VERTICAL TYPE CONFORMING TO THE STANDARDS OF NEMA.

ELECTRICAL POWER SERVICE: THE POWER REQUIREMENTS SHALL BE AS RECOMMENDED BY THE PACIFIC GAS AND ELECTRIC COMPANY. THE NAME PLATE HORSEPOWER SHALL BE GREATER THAN THE BRAKE HORSEPOWER NECESSARY TO OPERATE THE PUMP AT THE TOTAL REQUIRED HEAD AND SHALL NOT OVERLOAD. IF OPERATING HEAD SHOULD DROP 30%, THE MOTOR SHALL BE GUARANTEED TO OPERATE WITH A TEMPERATURE RISE OF FORTY (40) DEGREES CENTIGRADE ABOVE AMBIENT.

ELECTRICAL WORK AND CONTROLS: ALL ELECTRICAL WORK AND CONTROLS SHALL CONFORM TO THE REQUIREMENTS OF THE CITY, COUNTY, AND/OR THE SANITARY DISTRICT, WHICHEVER IN THE OPINION OF THE DISTRICT ENGINEER IS THE GREATER. THE ELECTRICAL CONTROLS SHALL PROVIDE ADEQUATE PROTECTION FOR MOTOR AND EQUIPMENT.

FLOAT SWITCH ASSEMBLY AND HIGH WATER ALARM: THE LEVEL CONTROL SWITCH AND THE HIGH WATER ALARM SHALL BE GAS TIGHT MOUNTINGS WITH A NEMA 1 SWITCH ENCLOSURE.

HIGH WATER OVERFLOW PIPE: THE OVERFLOW PIPE SHALL BE A MINIMUM OF FOUR (4) INCHES IN DIAMETER AND SHALL EXTEND FROM THE PUMP SUMP TO A LOW DRAINAGE WAY. A CHECK VALVE OR OVERFLOW DEVICE SHALL BE INSTALLED IN THE LINE. THE OVERFLOW SHALL SUIT FIELD CONDITIONS AND MEET ALL DISTRICT REQUIREMENTS.

DISCHARGE LINE: THE PRESSURE PORTION OF THE DISCHARGE LINE, INCLUDING THE CHECK VALVE, GATE VALVE, AND FLEXIBLE COUPLINGS, SHALL BE EQUAL IN SIZE TO THE PUMP DISCHARGE. THE PIPE SHALL BE CAST IRON CONFORMING TO REQUIREMENTS OF THESE SPECIFICATIONS FOR MAIN SEWERS. PIPE SHALL HAVE A WORKING PRESSURE RATING NOT LESS THAN 150 P.S.I. CLASS DESIGNATION OF PIPE SHALL BE NOTED ON THE DRAWINGS. ALL VALVES AND COUPLINGS SHALL BE TYPES WHICH APPEAR ON THE APPROVED MATERIAL LIST OR APPROVED EQUAL. THE GRAVITY PORTION OF THE DISCHARGE LINE SHALL BE FOUR (4) INCH MINIMUM DIAMETER PIPE AND SHALL MEET THE DISTRICT REQUIREMENT FOR SIDE SEWERS, AND SHALL PROVIDE A MINIMUM TWELVE (12) INCH VERTICAL DROP AT THE JUNCTION WITH THE PRESSURE LINE.

DATA REQUIRED FOR DISTRICT APPROVAL: THE OWNER OR CONTRACTOR SHALL SUBMIT TO THE DISTRICT FOR APPROVAL A PLOT PLAN AND A COMPLETE LIST OF EQUIPMENT AND ACCESSORIES TO BE INSTALLED, INCLUDING PUMP CURVES. THE ENGINEERING DATA REQUIRED SHALL BE FURNISHED ON SPECIAL DISTRICT FORM FOR RESIDENTIAL SEWERAGE PUMPING SYSTEM PRIOR TO ISSUANCE OF SIDE SEWER PERMIT



STEGE SANITARY DISTRICT

APPROVED:

Rugaard PE
L.C. Rugaard, P.E., District Manager/Engineer

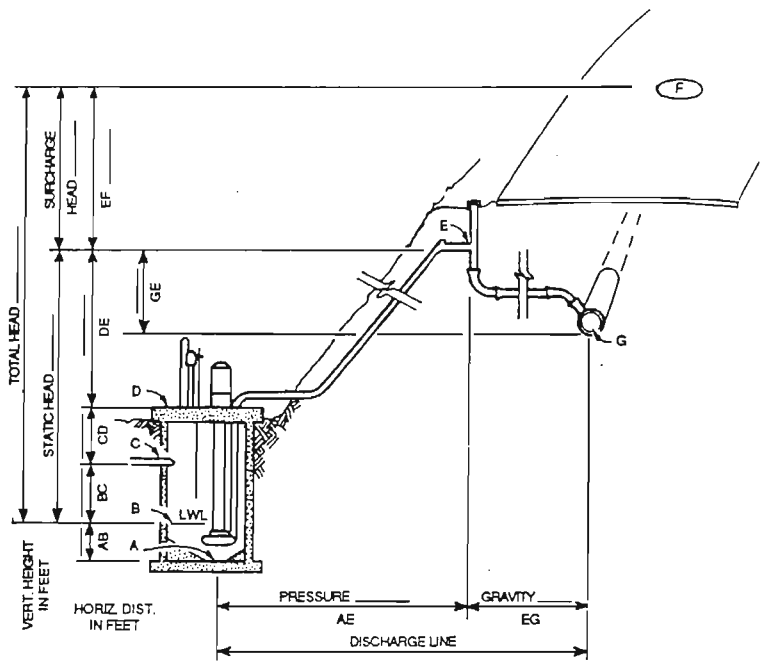
REV./DATE:

**RESIDENTIAL PUMPING SYSTEM
NOTES**

DWG. NO.:

**SEC.
32-49/B**

GENERAL DATA



Owner _____

Address _____

Location _____

Sewer Contractor _____

Garbage Disposal Yes [] No []
 Septic Tank: Yes [] No []
 Pump Head Requirements
 Static Head _____ Ft.
 Surcharge Head _____ Ft.
 Friction Head _____ Ft.
 Total Dynamic Head _____ Ft.

HYDRAULIC PROFILE

(See Standard Drawing for detail layout)

EQUIPMENT DATA

1. Pump Manufacturer _____ Model _____
 2. Pump Capacity _____ gpm @ _____ TDH
 3. Pump Size _____, Type _____, Built For _____ Deep Sump
 4. Pump Discharge Size _____ Inches and Will Pass a _____ Inch Sphere
 5. Pump Brake Horsepower _____
 6. Motor HP _____, speed _____ RPM
 7. Pump Sump Construction _____
- By _____ Date _____
 Pump Distributor

DISTRICT USE ONLY (DO NOT WRITE BELOW THIS LINE)

	Date	By
1. Plot Plan Submitted	_____	_____
2. Elevation and Distances Checked	_____	_____
3. Equipment Data Submitted	_____	_____
4. Reviewed By: Field Engineer	_____	_____
Office Engineer	_____	_____
Inspection Dept.	_____	_____
5. Approved By	_____	_____
6. Completed - Final Inspection	_____	_____

SSD STEGE SANITARY DISTRICT
 APPROVED: *L.C. Rugaard*
 L.C. Rugaard, P.E., District Manager/Engineer

REV / DATE:

RESIDENTIAL SEWERAGE PUMPING SYSTEM

DWG. NO.:
SEC. 32-50

SECTION 32-51

SECTION 32-52

SECTION 32-53

SECTION 32-54

SECTION 32-55

SECTION 32-56

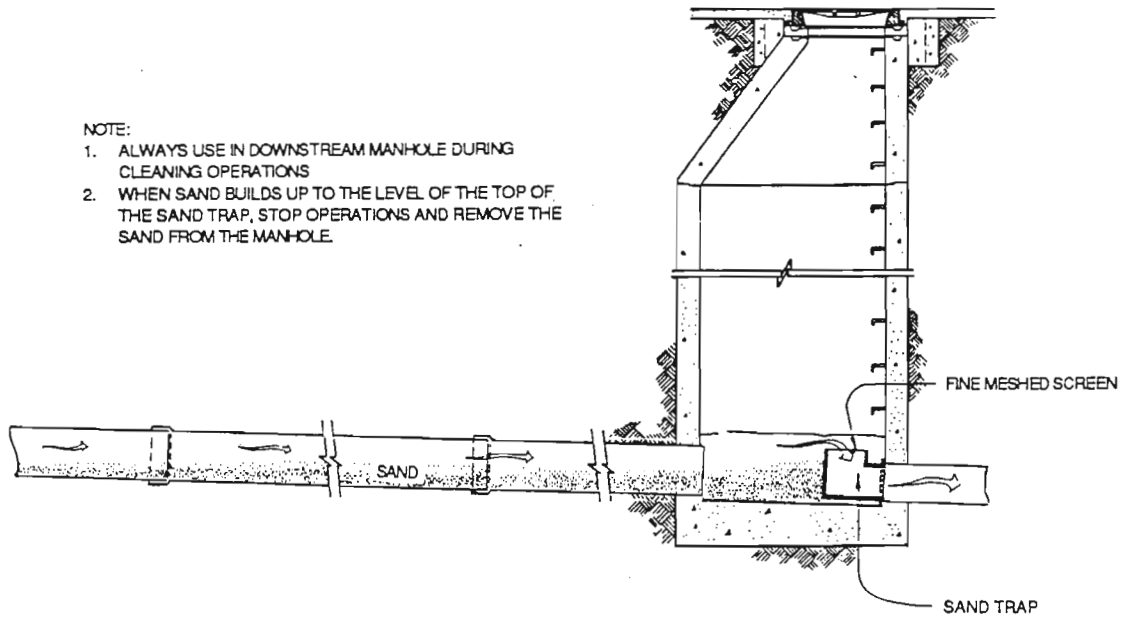
SECTION 32-57

SECTION 32-58

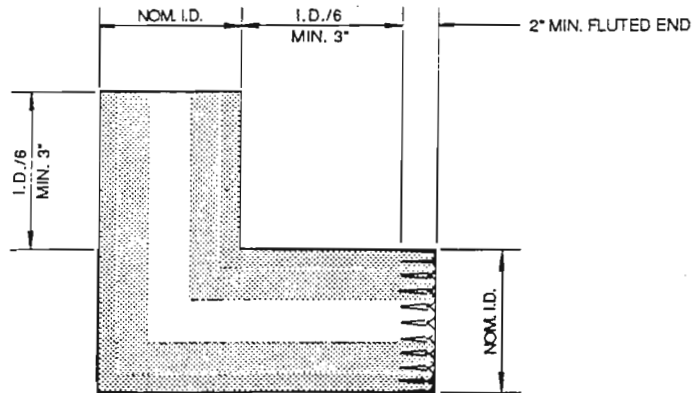
SECTION 32-59

SECTION 32-60

- NOTE:
1. ALWAYS USE IN DOWNSTREAM MANHOLE DURING CLEANING OPERATIONS
 2. WHEN SAND BUILDS UP TO THE LEVEL OF THE TOP OF THE SAND TRAP, STOP OPERATIONS AND REMOVE THE SAND FROM THE MANHOLE.



TYPICAL INSTALLATION



SAND TRAP DETAIL

SSD STEGE SANITARY DISTRICT
 APPROVED: *L. C. Rugaard P.E.*
 L. C. Rugaard, P.E., District Manager/Engineer

REV / DATE:

SAND TRAP
 FOR CLEANING PURPOSES

DWG. NO.:
SEC.
32-61

SECTION 33
PROJECT DRAWINGS