

**SANITARY SEWER
STANDARD PLANS AND SPECIFICATIONS
ORDINANCE 2019-02**



CARMEL AREA WASTEWATER DISTRICT

EFFECTIVE DATE: May 24, 2019



Rachel L. Lather

Rachél L. Lather
District Engineer

ORDINANCE NO. 2019-02

AN ORDINANCE ADOPTING
NEW STANDARD PLANS AND SPECIFICATIONS

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THE BOARD OF DIRECTORS OF THE CARMEL AREA WASTEWATER DISTRICT
("CAWD") DOES ORDAIN AS FOLLOWS:

1. Adopted. The attached "SANITARY SEWER STANDARD PLANS AND SPECIFICATIONS" (Exhibit A) consisting of 147 pages, establishing new and revised standards governing sewer piping, construction design, installation and construction of sewer lines, and various other related matters, is hereby adopted by the District, to read in its entirety as set forth in Exhibit A, incorporated herein by this reference.
2. Summary of Ordinance. The Sanitary Sewer Standard Plans and Specifications shall govern sewer design and construction work by private individuals, public agencies and businesses within the District. A true and certified copy of the full text of this ordinance and the incorporated Exhibit A are on file and available for inspection at the District offices.
3. Severability. The Board declares that each section, subsection, paragraph, subparagraph, sentence, clause, phrase, and graphic of this ordinance, including incorporated Exhibit A, is severable and independent of every other section, subsection, paragraph, subparagraph, sentence, clause, phrase and graphic of this ordinance. If any section, subsection, paragraph, subparagraph, sentence, clause, phrase, or graphic of this ordinance is held invalid, the Board declares that it would have adopted the remaining

provisions of this ordinance irrespective of the portion held invalid, and further declares its express intent that the remaining portions of this ordinance should remain in effect after the invalid portion has been eliminated.

4. CEQA Exempt. This approval is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. It can be stated with certainty that adoption of the standards set out in Exhibit A is not an activity that may have a significant effect on the environment, and therefore is not subject to CEQA. (CEQA Guidelines, Section 15601(b)(3))

5. Publication. No later than 15 days following the adoption hereof, this ordinance shall be published once in a newspaper published in the District.

6. Effective Date. This ordinance shall take effect and be in force 14 days after publication per Section 5 of this ordinance.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of the Carmel Area Wastewater District duly held on April 25, 2019, by the following vote:

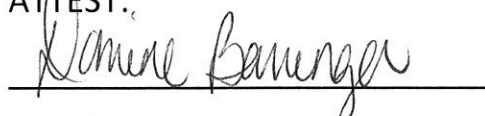
AYES: BOARD MEMBERS: D'Ambrosio, Townsend, White, Siegfried, Rachel

NOES: BOARD MEMBERS:



President of the Board

ATTEST:



Secretary of the Board

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VOLUME I - GENERAL CONDITIONS

SECTION 1 - INTRODUCTION

1.01 INTRODUCTION

The SANITARY SEWER STANDARD PLANS AND SPECIFICATIONS shall govern sewer design and construction work by private individuals, public agencies and businesses within the Carmel Area Wastewater District (CAWD) service area, including the City of Carmel-by-the-Sea and portions of Monterey County, California. Provisions of the latest version of the "Uniform Plumbing Code" (UPC), the "California Plumbing Code" and the latest version of the "Greenbook" (Standard Specifications for Public Works Construction), not in conflict with these Specifications shall be considered a part of these Specifications. All plans, profiles, cut sheets, easement documents and specifications shall conform to these Specifications.

The purpose of these STANDARD PLANS AND SPECIFICATIONS is to provide minimum standards for the design, construction, repair, and alterations of sanitary sewer systems within the Carmel Area Wastewater District. These specifications and details establish minimum acceptable design and construction criteria. More stringent requirements may be imposed by the District Engineer based on specific project conditions. Any items that are not included in these specifications and details shall be designed and constructed as required by the District Engineer.

Proposals for construction that conflict with these Specifications shall be submitted in writing with substantiating calculations and/or studies for consideration by the District Engineer.

Special Provisions, specifications addenda, and/or notes on the plans shall be provided when deemed necessary and shall be considered as part of the specifications for the work. Any addenda to these Specifications will require Board action and will be posted and made available to the Public and Contractors at the District office. Users of this text are urged to review the latest index so posted to apprise themselves of changes put into effect. Current versions of these standards and details are available online at the District's website (www.cawd.org).

In cases of conflict, only special provisions for 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 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.

1.02 AUTHORITY OF CAWD

The authority of the District is granted under the provisions of the Sanitary District Act of 1923 as entitled and as applicable by provisions of the Health and Safety Code of the State of California and regulations approved or granted by adoption of ordinance by of the Carmel Area Wastewater District Board of Directors.

1.03 LAWS TO BE OBSERVED

The Contractor shall comply with federal, state, county, district, municipal and local laws, ordinances, orders, and regulations, which in any manner affect the work and/or those engaged or employed in the work.

The Contractor shall defend, protect, indemnify, and hold CAWD, and all of CAWD's officers, directors, employees and agents free and harmless from and against claim, loss and/or liability, including attorneys' fees arising from or based on the violation of any such law, ordinance, regulation, or order, whether by the Contractor or its employees, subcontractors or agents.

If the Contractor finds any discrepancy or inconsistency between information included in the Plans, or these Specifications and any law, ordinance, regulation, or order, the Contractor shall promptly notify CAWD.

SECTION 2 - DEFINITIONS AND TERMS

2.01 DEFINITIONS AND TERMS

For the purpose of these Specifications, the following words and abbreviations shall be defined as follows:

ABANDONMENT - The permanent disconnection of main and/or laterals from service.

APPLICANT - Any person making application for a permit for a sewer or plumbing installation and shall be the owner or his authorized agent of premises to be served by the sewer for which a permit is requested.

BOARD - Board of Directors of Carmel Area Wastewater District.

BUILDING - Any structure used for human habitation, or a place of business, recreation or other purposes.

BUILDING PLUMBING (BUILDING DRAIN) - The lowest piping of a gravity drainage system which receives the discharge from waste and other sewer drainage pipes inside the building and conveys it to the private sewer.

BUILDING LATERAL - See Private Lateral.

CALTRANS - California Department of Transportation.

CITY - City -of-Carmel-by -the-Sea

CONTRACTOR – A person licensed by the State of California to perform the type of work to be done as shown on the approved Plans.

COUNTY - The County of Monterey, California.

DEFLECTION - The changing in alignment or grade by movement of a pipe. In the case of Flexible Pipe, it also means the outward movement of the sides of the pipe and the inward movement of the top and bottom of the pipe.

DEFLECTOMETER - Instrument used to determine the acceptability of deflections within Flexible Pipe. Also referred to as a mandrel.

DEVELOPER - Any person who proposes the development of property which requires construction of sanitary sewer pipelines.

DISTRICT - Carmel Area Wastewater District (CAWD).

DISTRICT ENGINEER – Principal Engineer of the Carmel Area Wastewater District or his/her authorized representative(s).

DROP MANHOLE - A manhole used when a difference in elevation between the incoming and outgoing sewer is greater than 2 feet.

EDU (Equivalent Dwelling Unit) – The combination of flow and strength of a waste stream that is equivalent to the waste discharged from a single-family home. This is often evaluated on a per day basis.

ENGINEER – District (Principal) Engineer of the Carmel Area Wastewater District or his/her authorized representative(s).

FIXTURE UNIT - The unit equivalent of plumbing fixtures as tabulated in the latest version of the Uniform Plumbing Code.

FLEXIBLE PIPE - Pipe made of Acrylonitrile-Butadiene-Styrene (ABS), Poly Vinyl Chloride (PVC), or High-Density Polyethylene (HDPE).

FOG (Fats, Oils and Grease) - Any substance, such as a vegetable or animal product, that is used in, or is a byproduct of the cooking or food preparation process, and that turns or may turn viscous or solidifies with a change in temperature or other conditions. This also includes lotions, oils and other products used in other businesses.

GARBAGE - All solid wastes from the preparation, cooking and dispensing of food, and from the handling, storage and sale of produce.

GENERAL MANAGER – General Manager of the Carmel Area Wastewater District or his/her authorized representative(s). Person or persons appointed by the Board to administer and enforce the rules and regulations of the District. The District Engineer reports directly to the General Manager.

GREASE CONTROL DEVICE- Any grease interceptor, grease trap or other mechanism, device, or process, which attaches to, or is applied to, wastewater plumbing fixtures and lines, the purpose of which is to trap, collect or treat FOG prior discharge into the sewer system. Grease Control Devices may also include other proven methods to reduce FOG, subject to the approval of the District.

GREASE INTERCEPTOR - A multi-compartment device that is constructed in different sizes and is generally required to be located according to the Uniform Plumbing Code, underground between a food establishment and the connection to the sewer system. These

devices primarily use gravity to separate FOG from the wastewater as it moves from one compartment to the next.

GREASE TRAP - A grease control device used to serve individual fixtures and is not an approved substitute for a grease interceptor.

GREENBOOK- the Standard Specifications for Public Works Construction, latest Edition (Greenbook) by Public Works Standards, Inc.

HOUSE LATERAL – See Private Lateral.

INDUSTRIAL WASTES - All wastes of producing, manufacturing and processing operations of every kind and nature. It does not include domestic sanitary sewage.

INSPECTOR - The individual official(s) authorized by the General Manger to administer and enforce the provisions of this Ordinance as adopted or amended.

LAFCO – Monterey County Local Agency Formation Commission

MANDREL – See Deflectometer.

MAIN MANHOLE - A manhole required at every horizontal or vertical change in alignment along the main sewer. (same as Trunk Manhole)

MAIN SEWER - A public sewer lying within a public road/street or District sewer easement designed to accommodate one or more sewer laterals, and for which suitable access is provided for maintenance at the sole discretion of the District. It is subject to inspection and approval by the Carmel Area Wastewater District, and, when accepted by Resolution of the Board, becomes the maintenance responsibility of the Carmel Area Wastewater District.

MULTIPLE DWELLING - A building or group of buildings on a building site which, in whole or in part, is designed for, or occupied by, members of two (2) or more living groups dwelling independently of each other in separate living quarters or units.

ON-SITE FACILITIES – Facilities under control of the Applicant, owner, or user, including but not limited to residential or commercial sewer. For sewer, the on-site facilities shall normally be those upstream of the property line or Public Utility Easement, including the sewer cleanout.

OFF-SITE FACILITIES – Facilities under control of the District, including sewer main, pumping stations, manholes, treatment facilities, and other appurtenances and property up to the point of connection with the on-site facilities.

PERSON - any human being, individual, firm, company, partnership, association, and private, public, and municipal corporations, the United States of America, the State of California, districts and all political subdivisions, governmental agencies and mandatories thereof. The masculine gender shall include the feminine, the singular shall include the plural where indicated by the context.

PIPE (SEWER) EMBEDMENT - Special material used to replace material removed from trenches during construction from the pipe subgrade to a point twelve (12) inches above the outside top of the pipe barrel.

PLANS - Drawings approved by the Engineer for construction within the Carmel Area Wastewater District.

PLUMBER - See Contractor.

PLUMBING CODE - See "Uniform Plumbing Code".

PUBLIC UTILITY EASEMENTS - Areas of a property that were defined for use by utility companies when the property was first put on a plat. They are designated for overhead electric, telephone and television lines and underground electric, water, sewer, telephone, and cable lines.

PRIVATE LATERAL – Private Lateral (Building Lateral, House Lateral) is that portion of a sewer lateral beginning 2 feet from the perimeter walls at the plumbing outlet of any building or industrial facility and running to and including the connection to the Main Sewer, or to a private sewage disposal system.

PRIVATE SEWER – A common sewer privately owned that connects one or more building sewers to the public sewer. A private sewer includes sewer main, manholes and all appurtenances which have not been accepted by Resolution of the District Board.

RECYCLED WATER – Water resulting from treatment of waste, that is suitable for direct beneficial use or for a controlled use that would not otherwise occur. Recycled water is also known as reclaimed water.

RELATIVE COMPACTION - Refers to the Compaction Test No. 216 or 231 of the State of California, Caltrans, Standard Specifications.

RIGID PIPE - Pipe made of Vitrified Clay (VCP) – extra strength, Ductile Iron (DIP), or Cast-Iron Soil Pipe.

SANITARY SEWER – Pipe that carries sewage, and into which storm, surface and ground waters are not intentionally admitted.

SEWAGE - Water-carried wastes from residences, business buildings, institutions and industrial establishments.

SEWER - A pipe or conduit for carrying sewage.

SEWER LATERAL - A sewer which connects the plumbing system of the house or building to the main sewer.

SEWER WORKS - All facilities owned or controlled by the District, for collecting, pumping, treating and disposing of sewage.

SINGLE FAMILY UNIT -A building designed for occupancy by a single-family group.

STANDARD PLANS - Detailed standard drawings of approved construction design within the Carmel Area Wastewater District.

SANITARY SEWER STANDARD PLANS AND SPECIFICATIONS - This document, as described in Volume I, Section 1.01, above, containing design and construction standards for all sewer works within the District, all as adopted by the Board and subsequent amendments. The CAWD Standard Specification, the Standard Specifications for Public Works Construction, latest Edition (Greenbook) by Public Works Standards, Inc and the Uniform Plumbing Code, latest edition.

STORM SEWER OR STORM DRAIN – A pipeline that carries storm, surface or ground waters, and drainage, but excludes sewage and polluted industrial wastes.

STORMWATER – The water running off or draining from the surface and sub-surface of an area during and after a period of rain.

SUBGRADE - Is defined as being six (6) inches below the exterior bottom of a pipe.

TRENCH BACKFILL - Earth or other special material used to replace material removed from trenches during construction.

TRUNK MANHOLE - A manhole required at every horizontal or vertical change in alignment along the main sewer. (Same as Main Manhole)

TRUNK SEWER- A main sewer to which no lateral sewers are allowed to connect. Only main sewers can connect to a trunk sewer. All connections to a trunk sewer shall be at a manhole.

UNIFORM PLUMBING ORDINANCE- A Carmel Area Wastewater District ordinance regulating the use of public and private sewers, the installation and connection of building laterals, the installation of sewer laterals and public sewer main extensions, providing permits and fees for the installation and connection of sanitary sewers, establishing charges, and providing penalties for the violation of the ordinance.

UNIFORM PLUMBING CODE – The latest edition of the International Association of Plumbing and Mechanical Officials, Uniform Plumbing Code.

UTILITY – Refers to cable TV, water, storm, fiber optics, electrical, gas, recycled water, telecommunications, nitrogen and other public or private utility lines.

2.02 ABBREVIATIONS

ANSI – American National Standards Institute

ASTM – American Society for Testing Materials

AWWA – American Water Works Association

DWG – Standard AutoCAD drawing file format

DXF – Digital Exchange Format (AutoCAD)

GIS – Geographic Information System

NAD83 – North American Datum 1983 used for horizontal ground control

NAVD88 – North American Vertical Datum 1988 used for vertical ground control

NGVD 29 – National Geodetic Vertical Datum 1929

SRV – Sewer Relief Valve

UPC – Uniform Plumbing Code

NPSHa – Net Positive Suction Head

NPSHr – Net Positive Suction Head Required

2.03 PIPE TYPES

ABS – Acrylonitrile-Butadiene-Styrene Pipe

ACP – Asbestos Cement Pipe

CIPP – Cured-In-Place Pipe

CI- Cast Iron Soil Pipe

DIP – Ductile Iron Pipe

FP – Fiberglass Pipe

FPVC – Fused PVC

PVC – Polyvinyl Chloride Pipe

VCP – Vitrified Clay Pipe

HDPE – High Density Polyethylene

SECTION 3 - SCOPE OF WORK

3.01 SCOPE

The work shall include the furnishing of all materials, labor, tools, implements and equipment necessary to construct the sewer facilities with all appurtenances, complete and ready to operate. All construction shall be done in strict accordance with the provisions of these Specifications unless otherwise authorized by the Engineer.

3.02 GUARANTEE OF WORK

All work performed, and materials used shall be guaranteed for a period of one (1) year after acceptance of the work by the District. A Surety Bond may be required to be filed with the District.

3.03 INDEMNIFICATION

Contractor shall defend, indemnify and hold harmless the District, and each of its Directors, officers, employees, agents and, if applicable, any public entities or private property owners on whose property the work is being performed from and against any and all liability, including, but not limited to, penalties, fines, costs, losses, damages, expenses, causes of action, claims or judgments, including attorney's fees and expert witness fees (collectively "Claims") resulting from:

- (a) Any alleged or actual infringement or violation of any patent or patent right arising in connection with the performance of the Work and anything done there under;
- (b) Any injury to or death sustained by any person (including Contractor's own employees) or damage to property of any kind, which injury, death or damage arises from or in any way connected with the Contractor's performance of the Work;
- (c) Any breach by Contractor of any of the obligations and covenants, and any other terms and conditions of the permit;
- (d) Any violation by Contractor or its subcontractors of one or more occupational safety and health standards, regulations, or orders, where the Contractor or its subcontractor is found to be the "Causing Employer" as defined by Title 8, CCR Section 336.10. Contractor or its subcontractor shall have the right to appeal such citations at their sole expense. The District shall provide reasonable cooperation to Contractor in its appeal of any Citations. In the event Contractor or subcontractor either fails to timely appeal the Citations and/or Citations are upheld after an appeal hearing, Contractor shall within 30 days pay the fines that were assessed against the District.

Contractor's aforesaid obligation of indemnity and defense shall not extend to that portion of the Claims that is caused by the sole negligence or willful misconduct of the District, its directors, officers, employees or agents. These obligations of defense and indemnification shall extend to Claims asserted after the completion of the Work.

The Contractor shall be solely responsible to provide uninterrupted sewer service to all properties covered by work performed per approved permits. 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 continuous service.

3.04 RESERVED

3.05 SAFETY

The Contractor shall be solely and completely responsible for conditions of the job site, including the safety of all persons (including employees) and property, during the performance of the work. This requirement shall apply continuously, and not be limited to normal working hours. Safety provisions shall conform to Cal-OSHA and all other applicable federal, state, county, and local laws, ordinances, codes, and regulations. Job site safety shall include confined space entry, traffic control, protection of public, above ground and below ground utility hazards and all incidental hazards. If any of these are in conflict, the more stringent requirement will be followed. The Contractor's failure to thoroughly familiarize himself/herself with the aforementioned safety provisions shall not relieve him/her from compliance with the obligations and penalties set forth therein.

3.06 PRESERVATION OF PROPERTY

Due care shall be exercised to avoid injury to existing sewer improvements 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 line, fences, signs, survey markers, and monuments, buildings and structures, conduits, pipeline under or above the ground, sewer and water lines, all highway facilities and any other improvements or facilities within or adjacent to the sewer work shall be protected from injury or damage and, if ordered by the Engineer, the Contractor shall provide and install suitable safeguards, approved by the District to protect such objects from injury or damage. The Contractor shall not remove trees or shrubs adjacent to the sewer trench line without authorization by the District and/or other agencies having jurisdictions. No major roots or branches crossing the trench shall be cut if, in the opinion of a qualified arborist, such cutting would seriously injure or imperil the safety of the tree or trench. All limbs, roots or branches which are cut or broken shall be trimmed and coated with the proper seal. If other objects are injured or damaged by reason of the Contractor's operation, they shall be replaced or restored, at the Contractor's expense,

to a condition as good as when the Contractor entered upon the work, or as good as required by the specifications accompanying these standards.

Roots four (4) inches or greater in diameter encountered by the Contractor in the course of excavation shall be exposed but not severed, and as a protective measure they shall be wrapped in burlap while exposed. Roots two (2) to four (4) inches in diameter that are severed in the course of excavation shall be neatly trimmed and coated with a heavy coat of an approved tree seal. Should major tree trimming be required, the District may request that the Contractor hire a qualified arborist to provide recommendations.

3.07 RIGHTS IN LAND AND IMPROVEMENTS

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

3.08 PERSONAL LIABILITY

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

3.09 SEWER SERVICE

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

3.10 TRADE NAMES AND ALTERNATIVES

Certain equipment, articles or materials may be designated under trade names or the names of manufacturers and with catalog 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 by the Engineer, and in accordance with the following requirements:

The comparative quality and suitability of alternative equipment or articles or materials shall be provided to the District Engineer by the Contractor. The Contractor shall furnish, at his own expense, all information necessary, or as required by the District to verify suitability. The District shall be the sole judge and have the final decision as to the comparative quality and suitability of the alternative equipment or articles or materials.

SECTION 4 - REQUIREMENTS PRIOR TO START OF CONSTRUCTION

4.01 PERMIT

An authorized person must have in his/her possession a valid sewer construction permit issued by the District for all construction. This includes the construction or repair of Private Laterals.

4.02 STAKING AND CUT SHEETS

A. MAIN SEWERS

A registered Civil Engineer or Land Surveyor engaged by the Developer will be responsible for setting stakes and preparing cut sheets.

B. PRIVATE LATERALS

A Registered Civil Engineer or Land Surveyor engaged by the Developer shall be responsible for setting stakes and preparing cut sheets for all "Townhouse" type projects and any other residential, commercial or industrial developments that in the opinion of the Engineer requires control of sewer grade and alignment due to slopes, other utilities, circuitous routing, and/or other site conditions.

When such staking and cut sheets are required, they will be so indicated on the Plans by the Engineer, prior to approval of Plans. Once stakes have been set, a field check must be made by the Developer's Engineer to verify the accuracy of placement of the stakes.

4.03 INSPECTION

A. DURING NORMAL DISTRICT WORKING HOURS

The District Collection Superintendent or assigned inspector must be notified at least 48 hours (two full business days) prior to the start of any sewer construction during normal District working hours, and a request must be made by contacting the Collections Superintendent or assigned inspector as indicated on the District permit. Messages or voicemails are not acceptable. This notification applies not only to starting new work, but also to restarting work which has been temporarily halted.

B. OUTSIDE OF NORMAL DISTRICT WORKING HOURS

No inspections shall be conducted outside of District working hours.

SECTION 5 - SITE PREPARATION

5.01 SITE PREPARATION

Site preparation shall consist of removing, and properly disposing of all objectionable material, such as fences, trees, brush, debris, etc., from the construction site that would interfere with the prosecution of the work.

On District contract jobs, approval must first be obtained from the Engineer to remove items that cannot practicably be replaced in kind, such as trees and limbs.

5.02 CONTAMINATED MATERIALS

In the event that soil and/or groundwater contamination is encountered, Contractor shall comply with all applicable federal, state, and local laws and regulations pertaining to the work performed during the dewatering and disposal of contaminated soil and/or groundwater. Water generated from the cleanup of spills, leaking underground storage tanks, monitoring wells or other similar sources shall not be discharged through direct or indirect connections to the sewer unless a discharge permit is issued by the District. The District may approve the discharge of such water at its discretion only when no reasonable alternative method of disposal is available. If a discharge permit is granted from the District for the discharge of such water into the sanitary sewer, the user shall pay the applicable charges and fees, and meet such other conditions as required by the District. The discharge will be Class I Industrial as defined in the Pretreatment Ordinance. The District retains the right to terminate the discharge at any time for cause.

SECTION 6- REQUIREMENTS FOR ISSUANCE OF SEWER CONSTRUCTION PERMITS

6.01 PROPERTY TO BE SERVED BY DISTRICT

All property to be served must be within the District boundary.

6.02 INSURANCE REQUIREMENTS

All main sewer and building lateral work in the District shall be performed by Contractors with current Worker's Compensation and Public Liability insurance.

Contractors shall obtain and maintain workers' compensation insurance as required by California law, and general and automobile liability insurance, no less than one million dollars (\$1,000,000). Neither this section, nor any other section of this Code, nor any predecessor section is or was intended to create or impose any responsibility upon CAWD to ensure that the Contractor obtains and maintains this insurance, such responsibility being solely that of the Contractor. CAWD may, however, investigate a Contractor's insurance coverage at any time. Failure of a Contractor to obtain and maintain required insurance may cause the denial, suspension and/or revocation of permits, at the sole discretion of CAWD.

The Contractor and subcontractors shall carry general liability and property damage insurance with limits approved by the District Counsel but in no case less than one million (\$1,000,000) dollars, naming as additional assured the Carmel Area Wastewater District, its officers, employees, and agents; and in addition, a warranty holding harmless the District, its officers, employees and agents from any liability occurring or alleged to be caused by the construction operations.

6.03 LICENSE AND PERMIT REQUIREMENTS

All main sewer construction in the District shall be performed by Contractors licensed by the State of California to perform such work except as noted in 6.04 B below. The Contractor will be required to sign necessary District forms and demonstrate they are duly insured by an active insurance policy that complies with District minimum requirements prior to being issued a sewer construction permit.

Contractors performing work requiring a permit by the District shall be licensed by the state of California and shall have a valid OSHA permit when required. Work on public property, rights of way, and easements require at a minimum a valid Class A license. Additional licensing may be required and shall be at the discretion of the District Engineer.

Contractors performing sewer work within CAWD boundaries 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.

Prior to beginning any work, the Contractor shall obtain all permits and licenses, pay all inspection charges and permit fees, and give all notices necessary for compliance with applicable federal, state, county, district, municipal and local laws, ordinances, orders and regulations.

A. LICENSE CLASSIFICATION

Work on main sewer projects and private side sewers shall be performed only by Contractors in the following classifications:

- A (General Engineering);
- C-34 (Pipeline); or
- C-42 (Sanitation Systems)

However, a Contractor properly and actively licensed in the C-36 (Plumbing) specialty may work on private side sewers, excluding installation of taps, wyes, or other work on public sewers.

B. EXCAVATION PERMIT

A Contractor with employees shall have its Cal/OSHA Excavation Permit on file with CAWD prior to performing work where the depth of excavation will be five (5) feet or greater or where soil conditions in the field may pose a hazard of cave-in for shallower excavations.

C. ENCROACHMENT PERMITS

Whenever performing sewer installations or repair work within a public street or right-of-way for private sewer work, the Contractor shall obtain an encroachment permit from the City or County and have a copy of the permit available at the jobsite for review by the Inspector at all times while performing work. All projects performed under direct supervision of the District Engineer or designee shall be exempt from obtaining an encroachment permit unless otherwise directed by the District Engineer.

6.04 BOND/DEPOSIT REQUIREMENTS

A. MAIN SEWER WORK

For construction, repairing, or altering a Main Sewer, a Bond must be obtained in a sum equal to 100% of the estimated cost of the work guaranteeing the faithful performance of the work in accordance with the ordinances and rules and regulations of the District, including making good any defects through faulty, improper or inferior workmanship or materials arising or discovered within one (1) year after the completion of said work and acceptance thereof by the District. The minimum bond amount is \$10,000.

B. PRIVATE LATERAL WORK BY CONTRACTOR OR OWNER

An individual or a Contractor shall apply for a permit for the installation or repair of a portion of a private lateral sewer which is on private property. A bond is not required for work on private property that is not being performed by or on behalf of the District.

6.05 FEES AND CHARGES

Fees will be charged per current District charges.

6.06 SUBMISSION OF DATA FOR MAIN SEWERS

A. PRELIMINARY PLANS

Two (2) sets of Preliminary Improvement Plans, Development Plans and Maps (tract map, parcel map, etc.), prepared by a Registered Civil Engineer in the State of California must be submitted to the District. Standard size sheet of 22" x 34", 24" x 36", or 30" x 42" with a scale of 1" =20', 1"=30', 1"=40' or 1"=50' and profile to 1"=4' or 1"=2' must be used unless otherwise authorized by the District Engineer. These will be reviewed by the District Engineer and one (1) corrected copy returned to the applicant as needed.

1. A digital copy of all preliminary plans shall be submitted in one (1) drawing file in accordance with Volume I, Section 6.12 of these Standard Specifications, Minimum Requirements for Digital Submittal.

B. FINAL PLANS

After corrections are made and the improvement agreement is signed by the Board or the Board's designee, the original drawing can be signed by the Engineer. After all approving Agencies have signed the Plans; two (2) sets of Final Improvement Plans must be furnished to the District. Unless otherwise authorized by the Engineer, these signed plans must be submitted to the District prior to issuance of a construction permit.

1. A digital copy of all final plans shall be submitted in one (1) drawing file in accordance with Volume I, Section 6.12 of these Standard Specifications, Minimum Requirements for Digital Submittal.
2. Approval by the Engineer of the Contractor's working drawings does not relieve the Contractor of responsibility for accuracy of dimensions and details, or for mutual agreement of dimensions and details. It is mutually agreed that the Contractor shall be responsible for agreement and conformity of his working drawings with the approved plans and specifications.

C. ENGINEER'S ESTIMATE

One (1) copy of the engineer's estimate of the quantities and unit prices of the materials for the sanitary sewer.

D. PUBLIC EASEMENT REQUIREMENTS

A main sewer authorized by the Engineer to be constructed on private property requires that an Easement be granted to the District. It must be prepared by the Grantor on Standard District Forms properly signed and notarized. A location drawing and Title Report must be submitted with the document. A digital copy of the location drawing shall be submitted in accordance with Volume I, Section 6.12 of these Standard Specifications, Minimum Requirements for Digital Submittal. After approval by the District, it shall be recorded by Grantor in favor of the District with the Monterey County Recorder. This must be accomplished prior to issuance of a construction permit by the District for the sewer main that lies within the easement.

1. Unless otherwise directed by the Engineer, a separate document will not be required for an Easement granted to the District by means of recorded maps. The easement, however, must be properly shown on a recorded final map and certificate sheet, and a copy (both hard copy and digital copy) of each furnished to the District.
2. Public Utility Easements (P.U.E.) may be used for sewer mains only when so authorized by the Engineer. If dedicated by a separate document, a copy (both hard copy and digital copy) with recording data must be furnished to the District.
3. Main sewers not located in public streets must be situated within Sanitary Sewer Easements or within Public Utility Easements. Unless otherwise approved by the Engineer, 20 feet is the minimum width of the easement.
4. Easements must be configured to encompass all publicly maintained appurtenances and will be generally centered over the facility. Separate access easements may be required depending on site conditions. When sewer mains are to be installed along a property line the easement will be wholly contained on one parcel.
5. All property restrictions placed as a result of dedication of easements will be so noted on the Subdivision Map or on the Easement Deed if the easement is not dedicated as part of a subdivision. Required notes are:
 1. No structures may encroach on, above or below the surface of the ground in any public sanitary sewer easement. This includes footing of foundations or eaves from the roof of any adjacent structure, pools, ponds, or outbuildings on slabs or foundations. Decks, sheds, or other structures that may be easily removed for maintenance of the sanitary sewer system may be allowed at the discretion of the

District and shall be removed at the Owner's expense when notified in writing by the District.

2. No trees may be planted in a public sanitary sewer easement without first obtaining approval of the District. Trees may be allowed to the extent that damage to the sanitary sewer does not occur from root intrusion and adequate access can be provided for maintenance and repair vehicles. Any repair work by the District requiring the removal of trees or other vegetation planted by the Owner or by prior property Owners shall be at the expense of the present Owner.

E. QUITCLAIM REQUIREMENTS

When a sanitary sewer easement is to be quitclaimed, a Quitclaim Deed shall be prepared and submitted to the District. After the document is reviewed by the District and accepted by the District Board of Directors, it will be recorded by the District at the Monterey County Recorder.

F. FIELD CHANGES

Two (2) sets of Plans and one (1) digital copy in accordance with Volume I, Section 6.12 of these Standard Specifications, Minimum Requirements for Digital Submittal showing field changes proposed must be submitted to the District for approval prior to the work being started.

G. RECORD DRAWINGS

One (1) set of Plans and one (1) digital copy in accordance with Volume I, Section 6.12 of these Standard Specifications, Minimum Requirements for Digital Submittal showing as-built conditions of constructed improvements must be submitted to the District after completion of the work and prior to District acceptance.

6.07 USE OF EXISTING SEWER LATERAL

The reuse of existing laterals is not allowed unless the property owner inspects and provides the District with a report of the results of the inspection of the laterals on their property prepared by a license plumber using closed circuit television (CCTV) inspection or other inspection or test method approved by the District Engineer and the lateral is found not to be defective. (see District Uniform Plumbing Ordinance, section 5). A digital copy of the lateral inspection shall be provided to the District Engineer.

A lateral shall be considered defective if it has any of the following conditions: displaced joints, root intrusion, substantial deterioration of the lines, damaged clean-out, defective clean-out, inflow, infiltration of extraneous water, or other conditions likely to substantially increase the chance for a lateral blockage, or if, within a period of one year, a lateral suffers two or more blockages resulting in overflows.

6.08 SUBMISSION OF DATA FOR PRIVATE LATERALS

Submittal requirements for District Plan Check for Private Laterals prior to approval of plans are shown in (A), (B), (C) and (D) below.

After plan check is completed by the District, one (1) set of the checked plans will be returned to the applicant for revisions and resubmittal of the required number of revised sets.

Plan submittals must have information listed below shown on original reproducible tracings to scale with prints submitted there from. Plan must be drawn to adequate scale, with north arrow, on a large enough sheet (11" x 17" min., 30" x 42" max.). The minimum scale will be 1"=50' unless otherwise authorized by the Engineer.

Name, address, telephone number and title of the company or person preparing the plan must clearly be shown on the submitted plans.

Any office or field change from final approved construction plans must be re-approved by the District and may require resubmittal of revised plans and digital files.

A. SITE PLANS

Two (2) copies of Site Plan must be submitted to the District. The Site Plan must show (unless otherwise permitted by the Engineer):

1. Elevations shown on the plans shall be converted and reported in the NAVD 88 datum. Basis of the topography data shall be provided.
2. Public street and property dimensions.
3. All existing and proposed buildings labeled with general usage and plotted accurately on site.
4. Areas to be paved and those left unpaved clearly marked.
5. Ground floor and pad elevations of all buildings.
6. Finish ground elevations at key points and curb elevations of public street.
7. Existing ground elevations where cover over proposed sewer is to be less than two (2) feet at time of construction.
8. Existing District manhole number and rim elevation of nearest upstream existing public sanitary sewer manhole in the street drawn to scale or with its distance shown to the site's nearest downstream property corner and the new sewer connection.

9. Existing and proposed utilities plotted correctly and labeled.
10. The proposed sanitary sewer size, material, minimum slope, invert elevation to nearest 0.1 foot at connection to building plumbing.
11. Structures proposed, such as cleanouts, manholes, grease interceptors, etc., labeled and shown on the plan.
12. Plumbing fixture unit count shown for each building.

B. FLOOR PLANS

Two (2) copies of Floor Plan must be submitted to the District. (Commercial and Industrial Only) Floor Plan must show area layout and proposed usage of various areas of building.

C. PLUMBING AND / OR MECHANICAL PLANS

Two (2) copies of Plumbing and/or Mechanical Plan must be submitted to the District. (Commercial and Industrial Only) Plumbing and/or Mechanical Plan must show interior plumbing (building drain) and the fixtures to be served, all properly labeled as to function. Both existing and proposed plumbing fixtures shall be shown and labeled on the plans.

D. ROOF PLAN

Two (2) copies of Roof Plan if rooftop HVAC units are proposed (commercial and industrial only). Condensate lines from HVAC, boilers, etc. are not permitted to connect to the sanitary sewer system unless such connections have been reviewed and prior approval from the Engineer is granted in writing.

6.09 PRIVATE EASEMENT REQUIREMENTS

When a private easement (across adjoining property) is required for installation of a private lateral, a copy of the recorded document must be submitted to the District prior to issuance of a construction permit.

6.10 ENCROACHMENT PERMIT

Whenever it will be necessary for workers, material, equipment or excavated trench material to be on real property not included in any deed, grant, easement or the like, an encroachment permit, license, or other permission must be obtained from the appropriate jurisdiction. This authorization must be submitted to the District prior to commencing any work in the public right of way.

6.11 MINIMUM REQUIREMENTS FOR DIGITAL SUBMITTAL

Digital files submitted shall be based on accurate coordinate geometry calculations and registered to the California State Plane Coordinate System (Zone 4) in units of feet for horizontal control, NAD83, and NAVD88 in units of feet for vertical control or other ties as authorized by the District. The digital file submitted shall be in PDF format and shall be in one (1) drawing file containing all layers, illustrating all improvements within the project area, including all existing and proposed offsite improvements, tract boundaries, street centerlines, outfall sewers, etc. Descriptive information (i.e. text) may be included in the same layer and the feature or added as a separate layer. Submitted digital files shall be in accordance with the Guidelines for Digital Submittal, or as otherwise approved by the District.

A. FILE FORMAT

All maps and associated plans, except those for private sewers, shall be submitted in digital format. Files and media submitted will not be returned. Digital submittals shall be submitted with each plan check submittal in a PDF format.

B. MEDIA

1. Flash drive (Preferred) or Compact Disk (CD)
2. FTP site

C. MISCELLANEOUS

1. All externally referenced files used shall be "bound" into the drawing file and submitted as one file. Submittal shall not contain externally referenced drawings.
2. Compressed files are acceptable only when using the Winzip utility or appropriate software to decompress the data if provided by the person or firm submitting the file.

SECTION 7- MISCELLANEOUS SEWER REQUIREMENTS

7.01 REPAIR OR RELOCATION OF EXISTING MAIN SEWER, OR APPURTENANCES

Repairs or relocations of existing main sewers, or appurtenances required by reason of damage, or conflict, may be performed by the District or by Contractors engaged by the District.

In the event any of the District's existing sewer mains, manholes or other appurtenances are damaged during construction or repair, and the District Engineer, in his/her sole discretion, determines that there is a threat to the District's system, the District may employ District Forces or other Contractors to take the necessary steps to repair such damage. In such an event, the owner of the property involved, the General Contractor and the Contractor shall jointly and severally be liable for the District's necessary repair cost. The District may withhold acceptance of construction and reporting the same to the City of Carmel-by-the-Sea and/or County of Monterey in the event of building permit issuance was required for construction until payment of the District's necessary repair costs or other financial arrangements to compensate the District are made.

In an emergency, no "Work Order" must be signed in order for the owner or any of the owner's agents or contractors to be responsible for repair costs incurred by the repairs undertaken by District. No approval and acceptance of construction will be issued by the District until the reasonable cost of repairs are paid, or arrangements acceptable to the District are made for such reimbursement.

7.02 REPAIR, RELOCATION OF, OR CONNECTION TO EXISTING PRIVATE LATERALS

Except as noted below, all repair, relocation of, or connection to existing private laterals will be done by private Contractors. Inspection fees must be paid, and a construction permit issued prior to start of work, and all work must be done per District Specifications and subject to District inspection.

In the event repair work is deemed necessary by the District in its sole discretion, to alleviate a threat to the District's sewer, emergency repairs may be undertaken by the District. No approval and/or acceptance of construction will be issued by the District until the reasonable cost of repairs are paid or arrangements appropriate to the District are made for such reimbursement.

7.03 INSPECTION OF EXISTING LATERAL UPON SALE OF PROPERTY

Property owners shall inspect, and provide to the District a report of the results of an inspection of the laterals on their property prepared by a licensed Plumber using closed circuit television (CCTV) inspection or other inspection or test method approved by the District Engineer, and if found defective, the property owner shall obtain a lateral repair

Permit and thereafter repair the lateral prior to the close of escrow when the property is transferred via sale or other transfer of ownership by deed, instrument or writing.

7.04 ABANDONMENTS

See Volume II, Section 11.10 for sewer lateral abandonment requirements.

7.05 NUMBER OF PRIVATE LATERALS REQUIRED

Every building fronting on the same street or easement requiring sewer service shall be separately and independently connected with the public sewers; provided, however that where two or more buildings are on the same parcel, belonging to one owner, and which cannot legally be subdivided, separate connections need not be made with the public sewer. No two separate owners of adjacent parcels shall be permitted to join in the use of the same sewer lateral. Single family residential units with common walls, condominiums, townhouse, stock cooperative, community apartment or other similar improvements, including commercial condominiums or similar units, which entitle owners of interests therein to occupy independent ownership interests and to make joint use of utility and other services, which may be provided by facilities owned in common, may, upon issuance of a permit authorizing such common use by the District Engineer or assignee, be permitted to maintain a common sewer lateral or sewers. Indemnification language approved by the District shall be included in the covenants, conditions and restrictions.

7.06 WORK IN PAVED AREAS

The City or County, as appropriate, will determine the requirements based on the condition of the existing street.

VOLUME II- SANITARY SEWER

SECTION 1 - SEWER PIPE LINES

1.01 SEWER CONSTRUCTION MATERIALS

All sewer construction materials proposed to be used shall be new materials approved by the Engineer prior to start of construction. Where material specification numbers are used herein, they shall refer to the latest revision thereof. For the purpose of these specifications, all pipe materials are classified as either "rigid" or "flexible."

1.02 PIPE MATERIALS

The following Table identifies the types of pipes which can be utilized for the sanitary sewer system, where it can be used, and design criteria associated with the pipe material.

Type of Pipe	Where Pipe May be Used	Design Criteria
Rigid Pipe and Fittings		
Vitrified Clay Pipe (VCP) – extra strength (bell and spigot only)	Main sewer, private laterals	Non-residential use, Min. Cover 3’ Engineer’s approval required for less than 3’ of cover
Flexible Pipe and Fittings		
Acrylonitrile Butadiene Styrene (ABS)	Private laterals	Residential use, Solid Wall, Min. Cover 12”
Cured in Place Pipe (CIPP)	Main sewer, Private laterals	For residential and commercial deteriorated or partially deteriorated pipe.
High Density Polyethylene (HDPE) C906 SDR21	Main sewer, private laterals	Min. Cover 3’, Butt welded per ASTM F2620.
Pipe Bursting	Main sewer, Private laterals	For residential and commercial deteriorated or partially deteriorated pipe. Must be PVC or welded HDPE, no joints allowed for replacement. (ACP shall not be burst)
Polyvinyl Chloride (PVC) (gravity) – SDR 35	Private laterals	Min. Cover 3’ 3”-4” Diameter permitted for private laterals Non-residential from building to grease interceptor
Polyvinyl Chloride (PVC) – C900/C905 or SDR 26	Main sewer, private laterals	4”-12” Diameter shall meet AWWA C900 or SDR 18

Type of Pipe	Where Pipe May be Used	Design Criteria
		14" -35" Diameter shall meet AWWA C905 or SDR 18
Polyvinyl Chloride (PVC) – Schedule 40 / Schedule 80	Private laterals (forced/pumped systems)	Min. Cover 12", glue joint only
Fused Polyvinyl Chloride (FPVC) C900/C905 or SDR 18	Main sewer	4" -12" Diameter shall meet AWWA C900 or SDR 18 14" -35" Diameter shall meet AWWA C905 or SDR 18 Butt Fused Joints

Cover requirements depend on the strength characteristics of the pipe and on soil characteristics and shall be approved by the Engineer.

A. RIGID PIPE AND FITTINGS

Rigid pipe and fittings may be used only with prior approval of the Engineer to accommodate special circumstances. Rigid pipe, fittings, and joint materials specified herein consist of Vitrified Clay Pipe (VCP) and Ductile Iron Pipe (DIP). All materials incidental to rigid pipe installations shall be supplied by the Pipe Manufacturer. All rigid pipe required in odd lengths shall be cut using a proper cutting tool and guide that insures true line cut on the plane perpendicular to the pipe axes. No bevel cuts for pipeline alignment will be permitted.

1. Vitrified Clay Pipe (VCP) and Fittings: Vitrified clay pipe and fittings shall conform to ASTM Designation C-700 extra strength, unglazed, bell and spigot. Mechanical type joints having resilient properties conforming to ASTM Designation C-425 shall be used and installed. The pipe shall be tested during manufacture in accordance with ASTM Designation C-301.
2. Ductile Iron Pipe (DIP) and Fittings: Ductile iron pipe and fittings shall conform to ANSI/AWWA C151/A21.51 minimum pressure Class 350 for pipe 12 inches and smaller in diameter and minimum pressure Class 250 for pipe greater than 12 inches in diameter.
 - a) Bell and spigot joint assemblies shall conform to the requirements of Federal Specification WW-P-421c, Section 3.1.2 as it applies to Type II, Grade B or C pipe.

- b) Standardized mechanical joint assemblies shall conform to the applicable requirements of ANSI/AWWA Standards for the pipe specified and ANSI/AWWA C111/A21.11.
- c) Any ductile iron pipe used in gravity sewer application or in pressure sewer applications where air and gasses can accumulate shall be lined. Lining shall be with high density polyethylene, ceramic epoxy or glass as specified herein.
 - i) HDPE lining shall be factory applied, certified and tested for absence of holidays and pinholes. Lining shall be minimum 40 mils thick. Lining shall be light colored for improved video inspection purposes.
 - ii) Ceramic epoxy lining shall be Protecto 401 as manufactured by Induron Coatings or equal. Ceramic epoxy shall be applied 40 mil thick.
 - iii) Glass lining shall be 2 dual layer system such as Fast Fabricators MEH-32, Vitco SG-14 or equal. Glass lining shall be a minimum 10 mils thick.
 - iv) Linings shall be applied under pipe factory supervision in accordance with liner manufacturers' published requirements. Liners shall be spark tested at voltage of 60 V per mil thickness. Pinholes and holidays will be cause for pipe rejection.
- d. DIP shall be wrapped in polyethylene encasement per manufacturer's recommendation and conforming to ANSI/AWWA C105. Encasement shall be securely taped and extended/overlapped by a minimum of 12-inches.

B. FLEXIBLE PIPE AND FITTINGS

Flexible pipe, fittings and joint materials specified herein consist of Acrylonitrile-Butadiene-Styrene (ABS), Polyvinyl Chloride (PVC), and High-Density Polyethylene (HDPE). All materials incidental to flexible pipe installations, such as gaskets, joint lubricants, cements, etc., shall be supplied by the pipe manufacturer. All flexible pipe required in odd lengths shall be cut using a proper cutting tool and guide that ensures true line cut on the plane perpendicular to the pipe axis. No bevel cuts for pipeline alignment adjustments will be permitted. All flexible pipe for new construction shall be solid wall pipe.

Sewer force mains shall be constructed to Waterworks Standards using AWWA C900 or C905 PVC or Fusion Welded HDPE.

1. ABS Solid Pipe:

ABS pipe shall only be used for private sewers. All ABS pipe and fittings shall be solid wall pipe manufactured in accordance with ASTM Designation D-2751, minimum wall thickness SDR 26, and tested in conformance with the requirements of paragraphs under Section 7 and 10 of said ASTM D-2680, for SDR 26 pipe.

Cement used for non-gasketed ABS pipe shall conform to ASTM Designation D-2295 and will be allowed for private laterals only. Jointing of wet pipe is not allowed. No primer shall be used in the pipe installation. Jointing shall be accomplished by applying a coating of cement to the inside of the socket and to the outside of the spigot end of the pipe to be joined in sufficient quantity that when the spigot is fully inserted into a socket, a bead of excess cement will form around the entire circumference of the outside juncture of said spigot and socket. Excess cement shall then be removed.

2. PVC Solid Wall Pipe:

All PVC solid wall pipe and fittings shall be in accordance with the requirements for SDR 26 sewer pipe as stated in ASTM Designation D-3034, PVC cell class 12454 ASTM D1784, minimum wall thickness of SDR 26, ASTM Designation F-789 Type PS-46. Pipe joints and fittings shall be factory assembled integral wall bell and spigot configuration compatible with the pipe. PVC solid wall pipe shall be used only for gravity sewer applications.

Gasketed PVC Pipe shall have a solid cross section rubber ring gasket. The gasket shall be securely attached to the pipe to prevent displacement of the gasket when installed in the field. All rubber ring gaskets shall be in accordance with ASTM Designation F-477. Lubricant used for field assembly of gasketed PVC Pipe shall have no detrimental effect on the gasket, joint, fitting or pipe, and shall be as recommended by the manufacturer.

Cement used for non-gasketed PVC Pipe for private laterals only shall conform to ASTM Designation D-2564. Jointing of wet pipe is not allowed. Jointing of pipe shall be accomplished by applying a coating of cement to the inside of the bell and the outside of the spigot. The cement shall be applied in sufficient quantity to produce a bead of cement around the entire circumference of the pipe joint. Excess cement shall then be removed.

3. PVC Pressure Pipe:

Where PVC pressure pipe is required, PVC pressure pipe shall conform to the requirements of AWWA C900 minimum Class 165 for Pressure Pipe manufactured in sizes from four (4) inches to twelve (12) inches in diameter and AWWA C905

Class 165 for sizes 14 inches to 24 inches in diameter. PVC pressure pipe shall be furnished in Ductile Iron Pipe equivalent outside diameters with rubber gaskets, separate couplings, or approved equal. Thrust restraint shall be provided at valves and changes of direction for pressure flow applications.

4. FPVC Pipe:

All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784. Fusible PVC pipe shall be tested at the extrusion facility for properties required to meet all applicable parameters as outlined in AWWA C900, AWWA C905 and applicable sections of ASTM D2241. Testing priority shall be in conformance with AWWA C900 and AWWA C905.

Fusible C900^R, Fusible C-905^R and FPVC. Fusible PVC shall conform to AWWA C900, ASTM 2241 or ASTM D1785 for standard dimensionality, as applicable, or AWWA C905. Fusible PVC pipe shall be extruded by plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be not bell or spigot of any kind incorporated into the pipe. The PVC pipe shall be manufactured in standard 40' lengths, and green in color for wastewater. Unless otherwise noted, fusible PVC pipe lengths shall be assembled in the field with butt-fused joints per the manufacturer's recommendations.

Unless otherwise specified, fusible PVC pipe lengths shall be assembled in the field with butt-fused joints.

5. HDPE Pipe:

All HDPE pipe shall be solid wall, butt-fused pipe conforming to AWWA C906 and ASTM D-3035 and shall meet the minimum cell classification of 345434 E for gravity sewers or 345434 C for pressure sewers as described in ASTM D3350. HDPE pipe shall meet the requirements of TYPE III, Class B, category 5 grade P34 material as described in ASTM D-1248. The pipe may contain no more than 10 percent reworked resin gathered from within the manufacturer's own plant from resin meeting these specifications. Pipe color for gravity sewer application shall be natural gray. Pipe color for pressure sewer applications may be natural gray or black. Wall thickness shall be no less than DR 21.

The pipe shall be marked at 5-foot intervals or less with a coded number that identifies the manufacturer, SDR, size, material, machine, date and shift on which the pipe was extruded.

Any pipe, which has cuts or abrasions in the pipe wall exceeding 10 percent of the wall thickness, shall be removed from the site.

The pipe shall be joined using the butt fusion method in strict accordance with the pipe manufacturer's recommendations and ASTM D2657. The fusion equipment

shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to fusion temperature, alignment, and fusion pressure. Pipes 4-inches to 12-inches in diameter shall be de-beaded. Pipes larger than 12 inches in diameter are not required to be de-beaded. De-beading method shall be pre-approved by the District.

Fittings shall conform to ASTM D-3261. Electro-fusion or butt fusion fittings may be used provided approval is granted in advance by the Engineer.

6. CIPP (Cured in Place Pipe) Lining:

The CIPP liner shall consist of thermosetting resin and an absorbent carrier tube to hold the resin. When the resin and carrier tube are combined followed by installation into the existing pipe and curing, they shall result in a finished CIPP liner that meets the requirements of ASTM F1216-03 for inversion liners, ASTM F1743 for pull-in liners and ASTM D5813 for CIPP materials. The final cured in place liner materials shall provide the mechanical and chemical resistance properties in accordance with the requirements of ASTM F1216 or F1743 and D5813. At a minimum, the cured CIPP liner shall be fully resistant, chemically and mechanically, to sewage.

CIPP liner for private laterals may be used only if approved by the District Engineer.

7. Pipe Bursting:

Bursting may be allowed for residential and commercial uses on private laterals and for District main lines. Specific material types for existing laterals may be suitable for pipe bursting, including plastic pipe, vitrified clay, cast iron, plain concrete, and reinforced concrete pipe if deteriorated and not heavily reinforced. Pipe Bursting of ACP pipe is not allowed.

- a) All existing adjacent utilities must be located prior to any pipe bursting activity. Prior to pipe bursting, plans shall be submitted to the District Engineer that include, bursting method and equipment to be used, bypass methods, plan and profile of existing sewer laterals, including location of all adjacent utilities both crossing and parallel, and limits of pipe bursting including insertion and reception pits.
- b) Replacement pipe shall be fusible PVC or welded HDPE. No joints shall be allowed for replacement pipe.

8. Storage:

- a) Pipe shall be stored, if possible, at the job site in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression, damage or deformation to bell ends of the pipe and barrel.
- b) When unit packages of flexible pipe are stacked ensure that weight or upper units do not cause deformation to pipe in lower units.
- c) Flexible pipe unit packages shall be supported by racks or dunnage to prevent damage to the bottom of the pipe during storage. Supports shall be spaced to prevent pipe bending.
- d) When long-term storage with exposure to direct sunlight is unavoidable, flexible pipe shall be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excessive heat accumulation.
- e) Flexible pipe shall not be stored close to heat sources or hot objects such as heaters, boilers, steam lines, engine exhaust, etc.
- f) Gaskets, if required, shall be protected from excessive exposure to heat.

9. Deflection:

The inside diameter of an installed section of flexible pipe shall not be allowed to deflect more than five percent (5%) of the base inside diameter (as defined in ASTM D3034) following 30 days after installation. Deflection testing conducted during daily installation and any time prior to 30 days after installation, shall be based on an allowable deflection of 3-1/3 percent of the base inside diameter. The testing mandrel sizes for PVC SDR 26 pipe are shown in the following table. For flexible pipe materials other than PVC SDR 26, the mandrel diameter shall be calculated based on the minimum inside diameter according to manufacturer's published information.

Nominal Diameter ⁽¹⁾ (inches)	Pipe Specification	Base Inside Diameter (inches)	96-2/3 Percent Mandrel Diameter ⁽²⁾ (inches)	95 Percent Mandrel Diameter ⁽³⁾ (inches)
8	PVC SDR 26	7.488	7.24	7.11
10	PVC SDR 26	9.342	9.03	8.87
12	PVC SDR 26	11.102	10.73	10.55
15	PVC SDR 26	13.575	13.12	12.90

⁽¹⁾ Larger pipe diameters shall be as determined by the Engineer.

⁽²⁾ Use for testing less than 30 days after installation.

⁽³⁾ Use for testing 30 days or more after installation.

- a) Flexible pipe deflection shall be checked by means of a 9-arm “go – no go” mandrel pipe deflection gauge. The mandrel shall have pulling rings at each end and shall be pulled by hand through the sewer without the aid of mechanical pulling devices. The pipe deflection shall be checked in the presence of the Engineer after the placement and compaction of all trench backfills, but prior to installation of aggregate base and/or asphalt concrete.
- b) The mandrel deflection gauge shall be fabricated to permit passage through installed sections of pipelines within the specified tolerances for flexible pipe. Any section or sections of flexible pipe that does not permit deflection gauge passage are unacceptable and said section or sections shall be properly repaired or replaced and rechecked as directed by the Engineer.

10. Miscellaneous Requirements:

- a) Two water stops specified by the pipe manufacturer and approved by the District shall be installed at all manhole connections. The water stops shall be placed in the manhole base and centered under the manhole wall. The water stops shall be firmly fitted around the pipe exterior. Said water stops may also consist of a manhole coupling with rubber sealing rings cast into the structure base. No rubber boot type connections are allowed. The water stops shall consist of at least two continuous circles of contact such as two O-rings or a shear band coupling with two stainless steel bands.
- b) Wyes or tees for building sewers or lateral connections shall be completed using in-line bell and spigot type fittings molded from resins specified. Exception to this is when a saddle-type fitting is authorized on the plans, or as directed by the Engineer in the field. Fittings and taps that protrude into the sewer main will not be allowed.

- c) Fittings shall be sized to receive type of pipe specified for constructing sewer lateral. Installation of fittings will be in accordance with manufacturer's recommendations.

C. OTHER PIPE

Other pipe materials may be used for sewer installation provided prior approval by the Engineer is granted. The pipe shall be joined with couplings as furnished with the pipe by the manufacturer and installed as specified by the manufacturer.

1.03 PIPE COUPLINGS

Gripper Gasket or equivalent shall be used for all connections. Other pipe couplings may be used if approved by the Engineer.

If encountered, existing Orangeburg pipe shall be removed and replaced with an approved pipe material. No connections shall be made to Orangeburg pipe.

1.04 MAIN CONNECTIONS

Where laterals are smaller than the existing sewer main, a PVC SDR 26 or C900 tee-branch saddle fitting "Inserta Tee", "Tap Tite", or equal shall be used to connect to existing main. The saddle fitting shall be fabricated of material approved by the Engineer and with a flange that will prevent the saddle from entering the main sewer beyond its inside surface. The flange shall have a curvature designed for the size main on which it is to be used. The saddle shall create an airtight connection, and at the option of the Engineer, may require air testing.

When connecting to a new main (SDR26), use a PVC SDR 26 wye or C900 wye shall be used.

When connecting to an existing main that has been rehabilitated by HDPE pipe bursting an "Inserta Tee" or equal shall be used.

Where a lateral is the same size as the main, the connection shall be made at a manhole.

When connecting to an existing trunk main (18 inches and larger), the connection shall be made at a manhole.

1.05 EMBEDMENT

All pipe shall be embedded and backfilled as specified with extra care taken in compaction of said embedment and backfills as specified in Volume II Section 5.

1.06 FITTINGS OR COUPLINGS

Gripper Gasket Max Adapter coupling, or equivalent shall be installed.

SECTION 2 - PORTLAND CEMENT CONCRETE AND MORTAR

2.01 CONCRETE

Concrete shall consist of a mixture of Type II Portland Cement, sand, fine aggregate, coarse aggregate and water. The proportions of the water, sand and aggregate shall be regulated so as to produce a plastic, workable and cohesive mixture yielding the strength indicated. Unless noted otherwise, all concrete shall be Class "A".

A. CLASS "A"

Class "A" concrete shall contain 564 pounds (6 sacks) of Portland Cement per cubic yard and shall have a minimum 28-day compressive strength of 4,000 psi in accordance with ASTM C-39.

B. CLASS "C"

1. Class "C" concrete shall contain 376 pounds (4 sacks) of Portland Cement per cubic yard and shall have a minimum 28-day compressive strength of 2,500 psi in accordance with ASTM C-39.
2. All material required, and the procedure of mixing, shall meet the requirements set forth in Section 90 of Caltrans State Standard Specifications, except that 3/4 inch maximum size aggregate shall be used and slump ranges of three (3) to four (4) inches for Class "A" concrete and four (4) to eight (8) inches for Class "C" concrete shall be maintained.
3. No admixtures will be permitted unless authorized by the Engineer.
4. Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter.
5. Mixed concrete shall be used before initial set and in no case will re-tempering with additional water be permitted.

C. CONTROLLED LOW STRENGTH MATERIAL (CLSM)

CLSM shall be flowable, hand-excavatable mixture of cement, pozzolan, coarse and fine aggregate and water which has been mixed in accordance with ASTM C 94. Cement shall be Type II in accordance with ASTM C150. Pozzolan shall be added to improve flowability and shall be Type F in accordance with the requirements of ASTM C618. Coarse aggregate shall consist of a well graded mixture of crushed rock, soil, or sand with a maximum size aggregated of 1/2 inch. 100 percent shall pass the 3/4 inch sieve. Not more than 30 percent shall be retained by the 3/8-inch sieve and not more that 12 % shall

pass the No. 200 sieve. CLSM density shall be between 120 pounds per cubic foot and 135 pounds per cubic foot. Compressive strength at 28 days for flowable CLSM shall be between 50 psi minimum and 150 psi maximum.

2.02 MORTAR AND GROUT

The dry materials used for mortar shall be thoroughly mixed with sufficient clean water to produce a uniform, plastic, workable and cohesive mixture.

Sand for mortar and grout shall be clean, dry, well-graded sand, free of organic or other deleterious matter, silt or other objectionable inorganic matter, and shall be of such size as determined by laboratory sieves, conforming to the following gradation:

Sieve Size	Percent Passing
3/8-inch sieve	100
1/4-inch sieve	95 - 100
No. 20 sieve	50 - 85
No. 100 sieve	0 - 15

Cement shall be Type II Portland Cement. An industrial grade all-purpose non-shrinking cement such as "All Crete" or "Speed Crete" may be used.

No admixtures shall be used in the mortar or the grout unless otherwise specified or approved by the Engineer.

Mortar shall be composed of cement and sand proportioned and mixed as specified herein. Type "A" mortar shall be used unless Type "B" is specified by the Engineer.

A. TYPE "A"

Type "A" shall consist of one part by volume of cement and two parts by volume of sand.

B. TYPE "B"

1. Type "B" shall be a case basis, mixed and used in accordance with manufacturer's recommendations.
2. Mixed mortar shall be used before initial set, and in no case will re-tempering with additional water be permitted.

SECTION 3 - SEWER PIPE AND STRUCTURE INSTALLATION

3.01 SEWER PIPE INSTALLATION

A. CONSTRUCTION STAKING

All main sewers and laterals shall be staked in the field in accordance with the requirements of the Carmel Area Wastewater District. The grades and alignment of the sewer staked shall be approved by the Engineer prior to start of sewer construction. (See Standard Specifications Section 4.02, Volume I and Section 1.08, Volume III for staking requirements and submission of cut sheets.)

B. ALLOWABLE DEVIATION OF ALIGNMENT AND GRADE

The horizontal deviation of the sewer from the line shown on the Plans shall be not more than three (3) inches. The sewer grade shall not deviate from the profile shown on the Plans, and the grade shall be maintained during and after backfilling operations. Sewer grades with deviations exceeding 1/2 inch shall be removed and replaced at Contractor's expense. If deviations less than 1/2 inch from the design grade occur, pipe joints may be deflected to bring the invert back to grade. Grade corrections shall be made gradually to prevent sags in the pipe invert at low spots. Pipe shall be installed to be free draining (no sags) between any two points. No reverse (adverse) grade will be allowed.

C. LASERS

When laying main sewers, unless otherwise approved by the Engineer, the Contractor shall use a commercial laser grade setting system. The following requirements and conditions must be met:

1. 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 shall adhere to the provisions of the State of California Construction Safety Orders issued by the Division of Industrial Safety. Attention is particularly directed to Section 1514, 1800 and 1801 of said orders for applicable requirements.
2. The laser shall be connected firmly to a tripod, set firmly on compacted soil. The laser height of instrument shall be taken from one (1) offset hub and checked with at least two (2) more hubs, until 2 or more hubs show consistent readings or until readings coincide. This shall be done every time the laser is set up or disturbed.
3. The laser and level instruments shall be properly calibrated within six (6) months prior to use. A laser or level instrument found to be out of calibration or without records showing it has been calibrated within the last six (6) months, shall be removed from the job site until it has been properly calibrated.

D. GRADE LINE

1. When laying pipe for laterals, in lieu of a laser grade setting system, the Contractor may use a grade line. When laying the pipe, except where vertical curves are shown on the Plans or otherwise authorized by the Engineer, the Contractor shall use a grade line with at least two (2) adjacent runs in place at all times in order to detect any variation from a straight grade.
2. The grade line must be established over the center of the trench in vertical trenches and over the center of the pipe in V-type trenches during the laying operations and grade line shall be maintained until the pipe grade is checked by the Engineer.
3. The grade line shall be accurately and securely fastened at each staked station to securely erected batter boards and be kept taut at all times.
4. The measuring pole shall be a solidly constructed straight pole with a metal foot at one end at right angles to the pole. The batter board construction, string line and measuring pole construction shall be approved by the Engineer prior to start of sewer pipe laying.
5. In caving ground and in other circumstances when the above are not practicable, and when so authorized by the Engineer, the pipe must be checked by surveying instruments under the direction of a Registered Civil Engineer or Land Surveyor who shall accept the responsibility for the pipe being installed on the proper grade.

E. SEWER PIPE PLUGS

Sewer pipe stubs, or other open ends, which are not to be connected immediately, shall be plugged or capped with standard watertight plug or cap as approved by the Engineer for use in the particular installation. The plugs or caps may only be removed when so authorized by, and in the presence of, the Engineer.

F. JOINT DEFLECTIONS AND MINIMUM RADIUS

When approved by the Engineer, curved sewers shall be in conformance with the following requirements.

1. Rigid Pipe: No deflection of rigid pipe will be allowed.
2. Flexible Pipe: Horizontal curves shall be achieved only with approval of the District Engineer and with the use of fused pipe. The minimum allowable bending radius is shown in the following table, which follows the equation $\text{Radius} = 300 \times \text{Pipe Diameter}$. Smaller radii may be approved by the Engineer.

Pipe Diameter (inches)	Minimum Radius (feet)
4	100
6	150
8	200
10	250
12	300
15	350
18	450

G. VERIFICATION OF EXISTING SEWER OR STRUCTURE

Where connection is to be made to an existing sewer or structure, said existing sewer or structure shall be uncovered and checked for location and elevation prior to submitting cut sheets. Discrepancy between the Plans and field information shall be reported immediately to the Engineer.

H. COMMENCEMENT OF NEW SEWER PIPE LINE

Unless otherwise authorized by the Engineer, the laying of the pipe in finished trenches shall be commenced at the lowest point of the project, with the spigot ends abutting and pointing in the direction of the flow. The joints shall be carefully centered so that when laid to proper grade and alignment, as designated on the Plans, they will form a sewer with a uniform invert.

I. SEWER PIPE LINE THROUGH MANHOLES

Sewers shall be laid continuously through proposed manhole locations on all straight runs and at angle points. A minimum drop of 0.1 feet is required for mains of the same size. When mains on the upstream and downstream connections to the manhole are different size pipes, the upstream and downstream pipe crowns should be at the same elevation. When excavation is made below the pipe for manhole construction, care must be taken that the pipe spanning this area is firmly supported.

J. FLEXIBLE COUPLINGS AT MANHOLES

1. For all pipes, a flexible pipe coupling, such as Gripper Gasket Max Adapter coupling, shall be installed at a point 1-3 ft. outside of the manhole base block on both upstream and downstream sides. In all cases, the flexibility of the coupling must be maintained by keeping all concrete away from the joint or coupling. A bell joint is not acceptable for this requirement.

K. PLACEMENT OF FILL/GRADING

Grading of fill in order to change the grade of a parcel shall be placed up to 3 feet above where the outside of the pipe would be and laterally to a width of the pipe outside diameter plus six (6) feet centered on where the pipe would be and compacted prior to trenching for sewer lines. The compaction requirements, as specified by the Agency governing the fill, shall be considered adequate, except that not less than 90% relative compaction per ASTM D-1557 "Modified Proctor" shall be achieved. Evidence of these results in the areas concerned shall be furnished to the District from an approved testing laboratory prior to construction of the affected sewer.

L. HANDLING OF PIPE

Pipe shall be protected during handling against impact shocks. Prior to making pipe joints, all surfaces of the portion of the pipe to be joined shall be cleaned, dried, primed or otherwise prepared as called for in these Specifications. The interior of all pipe shall be kept free from all dirt and foreign matter as the work progresses.

At the close of each day's work, and at such other times when the pipe is not being laid, the ends of all open pipes shall be closed with a water tight plug or cap. Any modification of this requirement must be approved by the Engineer.

M. FIELD CUTTING PIPE

Unless otherwise permitted by the Engineer, pipes that must be cut in the field shall be cut with mechanical cutters or as recommended by the pipe manufacturer.

3.02 SPLICE

When a pipe is to be spliced into an existing sewer, the existing sewer shall be exposed and then mechanically cut at right angles to the pipe barrel, with sufficient length removed so that a pipe section with plain ends can be joined to the cut pipe with approved couplings to form an airtight joint. All work shall be done in the presence of the Engineer. Care must be taken to fill all voids under and around the pipe splice with Type "B" to properly support the new pipe and prevent any settlement of the spliced section.

The point of connection of the new pipe to the existing sewer shall be plugged to ensure that no materials from the construction activities involved in the installation of the new sewer enters the existing system.

3.03 MANHOLE

Manholes shall be sound, watertight structures, constructed as shown on the Standard Plans, or on the Plans in the case of special structures. The type of manhole and its location is to be shown on the Plans. The manhole shall be constructed to the rim elevations shown on the Plans. The design, the specification and the name of the manufacturer shall be

submitted to the District for approval prior to the purchase of any precast manhole units. Manholes shall be constructed without steps.

Manholes shall be installed at the end of each line exceeding 150 feet; at all changes in grade, size or alignment; at all line intersections; and at distances not greater than 200 feet for curved sewers, and 400 feet for straight runs. Reverse curves between manholes are not permitted.

Types of Manholes:

1. Brick Manholes are not authorized or accepted. Brick Manholes shall be replaced or lined per current District standards when new connections are made.
2. Standard Manholes, consisting of base, riser, and top, are precast reinforced concrete manholes with concentric cones, and are forty-eight (48) inch diameter for main sewers and trunk sewers.
3. Siphon Manholes shall be reinforced, cast-in-place concrete manholes.
4. Cast-in-Place Concrete Manholes shall be forty-eight (48) inches in diameter and constructed in accordance with Section D of this Section.
5. Metering Manholes are precast forty-eight (48) inch diameter (min.) manholes.

A. MANHOLE CHANNELS

Sanitary sewer pipe shall have a joint or coupling not more than two (2) feet and not less than one (1) foot beyond the outside wall of the manhole. Where sewer lines pass through manholes, the piping shall be laid as a whole pipe, and, after the manhole floor and walls have set, the top half of the piping inside the manhole shall be cut off and the sides mortared to form a smooth channel as shown on the Standard Plans.

Channels through Siphon Manholes shall be formed or constructed to provide a channel width equal to the I.D. of the pipe from the center of the pipe to the manhole floor and shall be checked with a template.

B. MANHOLE THROAT

See standard detail for maximum depth of manhole throat.

C. MANHOLE BASE BLOCK

The base block shall be poured using Class "A" concrete and in accordance with the design shown on the Standard Plans. No precast base blocks shall be approved or accepted by the District.

1. The concrete pour shall be made only on dry, firm undisturbed ground or on "rock ballast" placed on undisturbed ground. If the pour is on filled ground, the ground shall be compacted to a 95% Relative Compaction per ASTM D-1557 "Modified Proctor." The concrete shall be placed with a continuous pour deposited in such a

manner that segregation of material does not occur. Once deposited, the concrete shall be consolidated with mechanical vibrators so as to secure a dense watertight mass.

2. An approved metal form ring shall be used so that a level keyed slot is formed in the fresh concrete to receive the pre-cast manhole shaft section.
3. For connection to an existing sewer main, the top half of the sewer pipe shall be removed to within one (1) inch longitudinally of the inside wall of the manhole and the cut finished with mortar as specified by the Engineer.
4. The width of opening at the top of base block shall be the inside diameter of the pipes in the manhole.
5. In angle point manholes and in junction manholes, the pipes shall be joined by smooth curves, warped to conform to the lower half of the pipe. In all cases, the upper portion of the manhole channel from the mid-point of the pipes in the manhole to the top of the base block shall be constructed vertically.
6. When the manhole channel is not completed in the original pour, it shall be finished smooth by use of mortar with per Volume II, Section 2.02 of these Standard Specifications. Before application of the mortar, the existing concrete surface shall be thoroughly cleaned and roughened to secure a firm bond. All channels shall be troweled smooth so that a smooth uninterrupted surface is achieved. The top of the base block shall be troweled to slope towards the channel at an approximate slope of one (1) inch in six (6) inches.

D. CAST-IN-PLACE MANHOLES

Cast-in-Place manholes shall only be used if required by the District.

E. MANHOLE SHAFT AND BASE BLOCK

The manhole shaft shall be composed of precast concrete sections.

1. Precast concrete sections shall be in accordance with the Standard Plans and shall conform to the requirements of ASTM Designation C-478 except that Type II or Type V Portland Cement shall be used. The cone section shall be concentric unless eccentric is allowed by the Engineer.
2. The taper section shall be a maximum of three (3) feet in height and taper concentrically from a forty-eight (48) inch inside diameter to a twenty-four (24) inch inside diameter.

3. Unless otherwise directed by the Engineer, manholes to be installed in all proposed City and/or County streets and paved Public Easements will be constructed with standard cone section per Standard Detail Sheets. In these cases, the grade rings and cast rings shall be installed after the street section has been completed. The 48-inch diameter rings shall be furnished in one, two, three- or four-foot sections.
4. Joints between precast sections shall have a "Ram-Nek" flexible plastic gasket installed between the tongue and groove joint to make a watertight joint. After the shaft is in place, the joint shall be trimmed smooth with a sharp tool on the inside of the manhole.
5. Manhole sections will be ordered without steps. Precast manhole base blocks are not allowed unless approved in writing by the District Engineer. When allowed by the Engineer for standard manholes, they shall have a standard pipe bell cast into the base block. Rubber boot type connections are prohibited.

F. DROP CONNECTIONS

When a drop connection is shown on the Plans, it shall be included as part of the manhole construction. The drop shall be made with approved fittings inside the manhole shaft as shown on the Standard Plans.

After the manhole shaft is in place, the upper pipe run shall be constructed through the precast wall. The hole between the pipe and the precast section shall be mortared to a watertight condition.

G. MANHOLE CASTINGS

Manhole frame and cover shall be composite frame and lids manufactured by GMI Composites, INC. as shown on the Standard Plans of these Specifications or approved equal. Cast-iron lids may only be used when directed by the District.

1. The surface to be protected shall be clean.
2. The manhole frame and cover shall be permanently set when so authorized by the Engineer.
3. The frame shall be centered on the manhole shaft and laid on mortar to final grade. The mortar shall be neatly struck.
4. The manhole cover shall bear the lettering "Sanitary Sewer".

H. MANHOLE COLLAR

Unless otherwise specified by the Engineer, a concrete collar shall be poured around the frame and shaft so as to securely anchor the frame to the shaft. (See the Standard Plans)

I. WATERPROOFING MANHOLES

See standard detail for waterproofing requirements upon completion of the manhole.

J. MANHOLE LINERS OR OTHER METHODS APPROVED BY ENGINEER

All trunk manholes and drop manholes shall be lined with 65 mil thickness PVC liner embedded into the manhole concrete at time of pour. Standard manholes shall be lined where required by the Engineer. Liner shall be T-lock as manufactured by Ameron or approved equal. Liner shall extend from the casting to the top of the bench wall shelf.

Joints in liner shall be heat welded with strips of PVC, same thickness as liner. Liner and joints shall be spark tested in the presence of the Engineer. Spark testing shall be performed at minimum 15,000 volts with a Tinker and Razor Holiday Detector or approved equal. Any holidays or pinholes shall be patched by thermal welding strips over the pinhole, and the area patched shall be retested. The manhole will not be accepted until it is holiday and pinhole free.

K. ADJUSTING OR REPAIRING MANHOLES

For repair of existing brick or cast-in-place concrete manholes, the repair or adjustment may be made utilizing pre-cast elements upon approval by the District. Existing, undamaged frames and covers may be reinstalled unless otherwise directed by the District.

Cast iron extension rings may be used for adjusting manhole covers to grade only where cast-iron manholes are existing and where the completed manhole throat will not exceed twelve (12) inches. Adjustments shall be made by removing the upper portion of the manhole down to the first barrel section or equivalent. Precast concrete barrels and cone sections shall then be utilized to reconstruct the upper portion of the manhole in accordance with the Standard Detail.

The channels in the base of the manhole shall be protected by a 48" or 60" diameter" umbrella" type shield prior to any work being done on the manhole. The" umbrella" shall be carefully removed, allowing no debris to fall or remain in the manhole when the repair has been completed.

L. CONNECTIONS TO EXISTING MANHOLES

New connections to existing manholes wherein stubs have not been provided shall be made by core drilling through the walls and base, or by another acceptable method, in the presence of and as directed by the District Engineer. Sewer pipe shall be furnished and installed in manholes at the locations and in conformance with the approved plans.

All stubs shall be plugged with stoppers at locations as shown on the plans. Where new construction starts at the stub of an existing manhole, the Contractor shall plug the opening into the manhole prior to removing the plug or stopper from the stub. Said plug shall remain in place until the District Engineer approves the removal.

3.04 CLEANOUT TO GRADE (Private Lateral Only)

A wye-branch fitting with branch the same diameter as the private sewer shall be installed vertically above the pipe barrel so that the branch opens in a direction opposite to the flow of the sewer. Necessary fittings and pipe of the same diameter as the private lateral shall be used to bring the "cleanout" vertically to ground surface, and an approved box and cover installed, all as shown on the Standard Plans.

Cleanouts shall be constructed as shown on the Standard Plans and in locations shown on approved plans. A transition coupling and cleanout shall be provided and installed at the property line.

The vertical pipe shall be plugged below subgrade of surface in improved areas, and sufficiently below the ground surface in unimproved areas, so as to be protected during final site preparation. After surface work is complete, the riser pipe will be extended to finished grade, capped with an airtight threaded body and cap plug and protected with an approved cleanout box, or shall have an approved Sewer Relief Valve (SRV) installed per the Standard Plans

3.05 TWO-WAY CLEANOUT TO GRADE (Private Lateral Only)

A two-way fitting with a riser pipe, both of the same diameter as the private lateral, shall be installed vertically above the pipe barrel. The "two-way cleanout to grade" will be brought to finished grade, capped with an airtight threaded body and cap and protected with an approved cleanout box per, or shall have an approved SRV installed per the Standard Plans.

When a plastic two-way fitting is used, a six (6) inch long plastic stub must be installed into the downstream bell of the two-way fitting to permit a proper coupling to be made with other types of material used for the private lateral.

3.06 TEST WYE (Private Lateral Only)

A wye-branch fitting with branch the same diameter as the private lateral shall be installed vertically above the pipe barrel so that it opens in a direction opposite to the flow of the sewer. The test wye shall not be removed after testing but shall be capped with an airtight threaded body and cap and left in place. Rubber caps shall not be used.

3.07 SEWER THROUGH CASING

Unless otherwise required by the Engineer, when main sewer pipe cannot be installed by open cut methods, it must be installed in a casing as shown on the Plans.

The Pipe casing size, material and thickness will be as specified on the Plans.

The casing material will be delivered to the job site with ends fabricated to a true right angle with the axis of the pipe to facilitate accuracy of jacking.

Welded Steel Pipe Casing shall conform to ASTM Designation A-53 Grade B, A-139 grade B or A-252 Grade 2.

Where approved by the Engineer, four (4) inch and six (6) inch pipes can be bored. Larger diameters require casing. The minimum inside diameter of the pipe casing shall be eight (8) inches greater than the maximum outside diameter of the sewer to be installed therein, with a minimum outside diameter of thirty (30) inches for any casing unless otherwise approved by the Engineer.

The casing sections shall be joined by a continuous watertight weld.

The jacking pits shall be excavated and backfilled in accordance with Volume II, Sections 4 and 5, respectively. A submittal for, and inspection of, the jacking pit installation shall be required prior to the start of the jacking operation.

The guide rails for the jacking machine shall be accurately set and checked by a licensed surveyor, so that the casing, while being jacked, will be guided to correct line and grade to enable the sewer pipe to be centered in the casing.

The front of the casing pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe. The auger and cutting head arrangement shall be recessed to prevent the flowing of material from the face of the casing into the casing. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered.

The Contractor shall be responsible for surface subsidence and damage or disturbance to adjacent property and facilities that may result from the Contractor's Construction method. In the event that loose material is encountered, and cave-ins occur or are anticipated, all jacking will be discontinued. Approved shoring shall be provided, and all voids filled by pressure grouting.

It is recommended that the Contractor make frequent checks on the casing grade during installation. Grade stakes indicating pipe invert elevations shall be located at both ends of proposed casing.

Voids created between the outside of the casing wall and surrounding earth shall be filled with grout or sand.

When the casing has been completed and before the sewer is installed, the casing shall be inspected and approved by the Engineer. Pipe material as shown on the Plans shall then be joined and installed on proper grade through the casing.

The sewer pipe shall be securely supported through the casing as shown on the Standard Plans. After the sewer pipe is installed, it shall be given a preliminary air test in the presence of the Engineer (see Volume II, Section 7), and internally inspected by closed circuit television (see Volume II Section 8). After the test is satisfactorily completed and the television inspection favorably reviewed, the annular space between the pipe and the casing shall be filled with dry sand mechanically blown in or filled with grout so as to completely fill all voids, after which the space between the end of the casing and the pipe shall be sealed to a watertight condition. The pipe shall be anchored and secured to prevent movement during the filling of the annular space.

3.08 PRIVATE SEWER THROUGH BORE

Unless a casing is required by the Engineer, private sewer pipe that cannot be installed by open cut methods shall be bored.

When a sewer pipe is to be installed in a bored hole, the hole shall be bored by use of a machine that 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 sewer pipe to be placed therein.

When the bore has been completed and before the sewer is installed, the bore shall be inspected and approved by the Engineer. PVC Pressure Pipe (AWWA C-900, Class 150), shall then be joined and installed through the bore.

After the sewer pipe is installed, it shall be given a preliminary air test in the presence of the Engineer (see Volume II, Section 7 of these Specifications), and internally inspected by closed circuit television (see Volume II, Section 8 of these Specifications).

3.09 REHABILITATION OF PRIVATE SEWERS USING PIPE-BURSTING

A. GENERAL

Private sewers in poor condition due to cracked pipe or joints, leaking joints (infiltration), or root intrusion may be rehabilitated using the pipe-bursting method, if approved in advance by the District. Certain conditions, such as private sewers with insufficient grade, sags, or in close proximity to other utilities, may not be suitable for

rehabilitation using the pipe-bursting method. This specification is intended for rehabilitation of 4-inch or 6-inch diameter private sewers only.

1. Approval of the pipe-bursting method by the District can only be made after reviewing the pre-rehabilitation television inspection tape, which is a required submittal item. Approval of the submittal by the District does not imply that the proposed pipe-bursting installation is appropriate for the specific location being proposed for installation. The Contractor is completely responsible for all elements of the pipe-bursting installation, including safety of installation, conflicts or damage to utilities, property improvements, sidewalks, driveways, curbs, gutters, pavement, and equipment, or installation problems caused by existing private sewer pipe materials, subsurface conditions, or access restrictions.

B. DESCRIPTION

Pipe-bursting rehabilitation consists of splitting and expanding the existing pipe and simultaneously pulling, or pushing, a new high-density polyethylene (HDPE) pipe into the resulting void. The method requires the excavation of two pits. The insertion pit shall be used to insert the pipe splitting device followed by the new pipe. The exit pit shall be used to receive the splitting device and new pipe through the existing private sewer. After insertion, a cleanout to grade shall be installed at the property line, and the new pipe shall be connected to the existing pipe.

C. SUBMITTALS

Minimum pipe-bursting experience requirements:

1. The Contractor shall have completed a minimum of two pipe-bursting projects within the last two years. Submit short project descriptions and references (name and phone numbers of property owners or construction inspectors) for two projects.
2. A letter signed by the property owner authorizing the installation of the private sewer using the pipe-bursting method. The letter must also acknowledge that the pipe-bursting procedure and limitations have been explained to the property owner by the Contractor.
3. Pre-rehabilitation television inspection: The Contractor shall inspect the private sewer using a CCTV camera and provide a DVD-format video and inspection report for each private sewer. The video shall show the footage of the camera and shall include the complete length of the private sewer to be replaced. Prior to television inspection, the existing pipe must be clean of all debris, and must be wet so that sags can be easily detected. The television inspection shall be completed in the presence of the District representative. If approved by the Engineer, the television inspection

may be completed without a District representative if the inspection video adequately documents the location of the work.

- D. Post-rehabilitation television inspection. The television inspection shall be completed in the presence of the District representative. If approved by Engineer, the television inspection may be completed without a District representative if the inspection video adequately documents the location of the work.

3.10 EQUIPMENT

The pipe-bursting equipment may be either hydraulic, pneumatic, or the cone cracking type. The bursting head shall be designed to force its way through the existing pipe materials by fragmenting the pipe and compressing the old pipe section into the surrounding soil as it progresses. The head shall be designed to produce a maximum opening dimension of 1 inch (diameter) larger than the outside diameter of the new HDPE pipe. The pipe-bursting system shall be used to replace the existing private sewer with the same nominal size pipe. The system shall not be used to increase the size of the private sewer.

A. PIPE

The HDPE pipe shall be as specified in Volume II, Section 1.02 of these Standard Specifications.

B. UTILITIES

At least 48 hours prior to excavation, the Contractor shall call Underground Services Alert (USA) at 811. The Contractor shall request utility markings for the entire reach of the proposed pipe burst. The Contractor shall pothole all utilities crossing the proposed pipe burst to determine the clear distance between each utility and the existing private sewer. Utilities with less than 12 inches of clearance or water mains and services with less than 24 inches of clearance shall be left exposed during the pipe-bursting installation.

C. INSTALLATION

After coordinating with the property owner and residents, the Contractor shall plug the existing private sewer or provide by-pass pumping system to prevent sewage spills. Dumping or free flow of sewage within the excavation or on public or private property, gutters, streets, and storm drain facilities is prohibited.

1. The insertion pit shall be large enough so that HDPE pipe can be installed without exceeding the minimum bending radius. The minimum bending radius shall be 20 times the outside diameter of the pipe or as recommended by the pipe manufacturer, whichever value is larger.

2. After installation, the Contractor shall allow a minimum of four (4) hours for relaxation due to tensile stressing and to allow the pipe to thermally acclimate with the soil prior to installing final connections to main sewer or private sewer. Temporary connections can be installed sooner to reinstate sewage flows.
3. Any installed pipe which has cuts or abrasions in the pipe wall exceeding 10 percent of the wall thickness shall be cut out and removed from the site.
4. After final cleaning of the private sewer, water shall be introduced into the new pipe section and the post-rehabilitation television inspection shall be completed. The video shall be submitted to the District for approval.

D. CONNECTIONS

A cleanout to grade, including box and cover, shall be installed at or near the property line as shown on the Standard Plans. Connections shall be completed using Gripper Gasket Max Adapter coupling.

3.11 REHABILITATION OF PRIVATE SEWERS USING CURED IN PLACE PIPE (CIPP)
LINING

A. GENERAL

The CIPP process will renovate an existing pipeline from the inside by the installation of an interior pipe that fits tightly to the inside of the existing pipe. The process will be accomplished through the use of existing access, such as maintenance holes or other existing openings, and is to be done with minimal excavation. The new interior pipe, called a CIPP liner, is provided in sufficient thickness to address the deterioration situation of the existing pipeline. Typical thickness ranges from 4.5mm to 50mm depending on the size, condition and depth of the existing pipe. Liner thickness shall be submitted to the Engineer for review and approval based on the project-specific situation.

Restoration of existing sanitary sewers by installation of a resin impregnated flexible felt tube into the existing sewer line utilizing a vertical inversion standpipe and hydrostatic head and curing by circulating hot water or steam/air mixture to produce a hard, impermeable pipe during the cure process.

The finished pipe liner in place shall be fabricated from materials which, when complete, are chemically resistant to, and will withstand internal exposure to, domestic sewage having a pH range of 6 to 9 and temperatures up to 150°F.

B. DESCRIPTION

CIPP rehabilitation consists of inserting CIPP liner into the existing pipe in a soft, flexible and expandable configuration containing thermosetting resin in a viscous liquid

state. A resin absorbent carrier tube called a felt bag will be used to carry, properly position and uniformly distribute the liquid resin within the existing pipe. Upon final positioning and expanding of the carrier tube against the inside surface of the existing pipe, the resin will be transformed to a solid state by a thermosetting process. The thermoset process will be initiated by applying heat to the resin that was previously catalyzed before its absorption into the carrier tube. The methods used to introduce the required heat will be by internally circulating heated water or by a flow through of steam/air mixture.

1. The process of absorbing the catalyzed resin into the carrier tube is called resin impregnation or wet-out of the carrier tube. The process of installing the resin impregnated liner tube into the existing pipe is called inversion or pull-in, depending on the specific insertion method used and type of carrier tube. The process to make the liquid resin in the carrier tube transform to a solid by the thermostatic reaction is called curing.
2. Following the cure of the CIPP liner, the closed ends of the liner at manholes or other accesses will be removed and the pipeline made available for flow. Incoming connections, such as service laterals, will be reinstated into the pipeline by cutting corresponding openings in the cured CIPP liner. For non-man entry sized pipeline, CCTV monitored robot cutters will be used. For all other pipe, reinstatement may be done by man entry.
3. The CIPP lining installation process will include the cleaning and preparation of the existing pipeline to a suitable state, and the provision of flow bypass when necessary. The CIPP rehabilitation is completed with CCTV inspection of the finished liner.

C. SUBMITTALS

The following shall be submitted by the Contractor to the District:

1. The Contractor shall have completed a minimum of 50,000 feet in wastewater collection systems construction within five years of the project bid. Contractor shall submit short project descriptions and references (name and phone numbers of property owners or construction inspectors) for five projects.
2. Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new liner.
3. Pre-installation television inspection reports and video.

4. Detailed Project Plan including drawings and written descriptions of the entire construction procedure to fabricate, wet-out, stage, install liner, bypass pumping configuration, details and equipment, inversion locations, and location of all special connections.
5. Television inspection reports, video, and test results made after new liner is installed.
6. Testing reports and results from final installation.
7. CIPP liner installation and sequencing plan for the entire project, to the District and Owner for review and approval. Plan shall show location of all insertion points, water draw locations, and staging areas.
8. Emergency Response Plan.
9. Project Schedule.
10. Resin manufacturer's heating and curing requirements.
11. Final design calculations, liner thickness, and resin design for all lined segments.
12. Resin and tube installation test results of field installations for system proposed.

D. MATERIALS

The materials for CIPP shall be as specified in Volume II, Section 1.02 of these Standard Specifications.

E. INSTALLATION

It shall be the responsibility of the Contractor to coordinate with the District to locate and designate all manhole access points open and accessible for the work and provide rights-of-access to these locations. If a street must be closed to traffic because of the orientation of the sewer, the Contractor shall take all actions necessary to provide access for the mutually agreed time period. The Contractor must coordinate with the District for access to water hydrants for cleaning, installation and other process related work items requiring water.

1. Cleaning of Sewer Lines - The Contractor, when required, shall remove all internal debris out of the sewer line that will interfere with the installation of CIPP. The Contractor shall dispose of all debris removed from the sewers during the cleaning operation at an acceptable facility.

2. Bypassing Sewage - The Contractor, when required, shall provide for the flow of sewage around the section or sections of pipe designated for repair. Plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system shall make the bypass. The pump(s) and bypass line(s) shall be of adequate capacity to accommodate the sewage flow. The District may require details of the bypass plan to be submitted that include, at a minimum, 24-hour backup pumping equipment/generator, emergency contact numbers, qualified personnel to provide continuous supervision of bypass pumping system, traffic control, surface pipe restrictions, etc., adequate to accomplish the bypass pumping operation.
3. Inspection of Pipelines - Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections using close circuit television (CCTV) inspection techniques. The pipeline interior shall be carefully inspected to determine the location of conditions that may prevent proper installation of CIPP. These shall be noted and corrected. A video and suitable written log for each line section shall be produced for later reference by the District.
4. Line Obstructions - It shall be the responsibility of the Contractor to clear the line of obstructions, such as solids and roots, that will prevent the insertion of CIPP.
5. Public Notification - The Contractor shall make every effort to maintain sewer service usage throughout the duration of the project. In the event that a connection will be out of service, the longest period of no service shall be 8 hours. A public notification program shall be implemented, and shall, as a minimum, require the Contractor to contact each home or business connected to the sanitary sewer, inform them of the work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:
 - a. Written notice delivered to each home or business the day prior to the beginning of work on the section and a local telephone number of the Contractor to discuss the project or any potential problems.
 - b. Personal contact with any home or business that cannot be reconnected within the time stated in the written notice.
6. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing the CIPP.

SECTION 4 - EXCAVATION

4.01 DEFINITION

Excavation shall mean all of the below ground-surface work (including cutting of pavement; control of groundwater, storm water and extraneous water; removal, handling, stockpiling and/or proper disposal of removed material and water) necessary to prepare a firm, dry bed for the sewer line and structures.

The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the Work. This requirement shall apply continuously, and not be limited to normal working hours. Safety provisions shall conform to U.S. Department of Labor (OSHA), the California Occupational Safety and Health Act (CalOSHA), and all other applicable Federal, State, County, and local laws, ordinances, codes, including but not limited to the requirements set forth below, and any regulations that may be detailed in other parts of these Standard Specifications. In the event of conflicting requirements, the most stringent requirement pertinent to the Contractor's safety responsibility shall be followed by the Contractor.

The excavation shall be made to enable the sewer to be laid to the grade and alignment designed on the Plans.

4.02 OPEN TRENCHING

The excavation for sewers shall be made by open trenching, except where tunneling is necessary. Existing pavement shall be saw cut and replaced in accordance with Volume II, Section 6. The walls of the sewer trench shall be vertical in the region between the bottom of the trench and the top of the sewer pipe. In this region:

1. At least 6 inches clearance on each side shall be maintained for sewers 8 inches and smaller;
2. 9 inches clearance on each side shall be maintained for sewers less than 18 inches; or
3. As approved by the Engineer for sewers 18 inches and larger.

A minimum of 6-inches and not more than 12-inches clearance shall be maintained between the outer wall of the pipe barrel and the embankment or shoring, unless otherwise approved by the Engineer.

The trench shall be excavated to a level section and to such elevation as will give a uniform bearing and true flow line elevation when the sewer pipe is laid. All loose dirt in the bottom of the trench must be removed.

A. MUD OR OTHER SOFT OR SPONGY MATERIAL

Where mud or other soft or spongy material incapable of proper pipe support is encountered, it shall be excavated to a minimum depth of twelve (12) inches below sewer subgrade. Limits of the material to be removed shall be designated by the Engineer in the field. However, this does not relieve the Contractor of the requirements of these Specifications, including, but not limited to, allowable deviation of alignment and grade.

When so directed by the Engineer, the trench shall be extended below the pipeline grades to permit the placement of ballast for the pipe foundation. All areas of over excavation, to remove unsuitable material or for any other reason, shall be brought to grade with approved ballast material and compacted.

B. ROCK

Where rock is encountered, the trench shall be excavated to a minimum depth of three (3) inches below the sewer subgrade and backfilled to sewer subgrade with approved import material, thoroughly compacted to grade before the sewer pipe is laid.

C. OVER-EXCAVATED AREAS

Over-excavated areas in the trench bottom where approved trench foundation material will be placed shall be restored to sewer subgrade with imported backfill materials, thoroughly compacted before the sewer pipe is laid.

D. COMPACTION

In all the above situations, compaction shall be achieved by mechanical means. Water settling, flooding, jetting, and other water consolidation methods are expressly prohibited.

E. BRACING AND SHORING

The Contractor shall at all times furnish, install, and maintain sufficient bracing and shoring in trenches to insure safety of the workmen and to protect and facilitate the work. When practical, all such bracing and shoring shall be removed from the trench as the backfilling proceeds. Whenever an onsite Designee of the District warrants sufficient cause to suspect that an unsafe condition exists or that existing shoring is inadequate, the District reserves the right to direct all workers involved to terminate work until the condition is remedied. Any Direction given to a Contractor or the employees of such for unsafe conditions shall be at the sole expense of the Contractor. The District will not reimburse expenses incurred if a District employee issues a stop work command for unsafe conditions.

F. BLASTING

In the event that blasting is necessary in excavation, special permission, in writing, must be obtained from the Agency having jurisdiction over the issuance of blasting permits before any blasting will be permitted. Such permission shall in no way relieve the Contractor of the responsibility for obtaining any permits or licenses required by State Law or Local Ordinance.

G. SEWER SUBGRADE

The sewer subgrade shall be kept dry at all times and precautions shall be taken that no storm water is allowed to enter the excavation prior to backfilling. The Contractor shall, at all times, have on the job, sufficient pumping machinery for immediate use. Water shall be disposed of in accordance with the requirements of the agency having local jurisdiction, and in such a manner as to cause no damage to public health or safety, or to public or private property. The Contractor shall control surface runoff to prevent entry or collection of water in excavations.

H. EXCAVATION MATERIAL

Material excavated within streets and roadways may only be reused per approval of the City or County. Any such material shall be laid alongside the trench and kept trimmed up to minimize inconvenience to public travel.

1. Free access must be provided to all fire hydrants, water gates, meters and private drives, and means shall be provided so that water can flow in the gutters uninterruptedly.
2. All materials excavated in streets and roadways not permitted for backfill, shall be immediately removed and properly disposed of at an approved facility by the Contractor. No surplus material shall be dumped on private property.

I. OPEN TRENCH PERMITTED

The Engineer will specify the amount of open trench permitted at any one time. In general, the length of trench open at any time shall be limited to 100 feet in business area; 250 feet or one block (whichever is less) in residential area; and 1,000 feet in undeveloped areas.

1. No trench shall be allowed to remain open outside of work hours and/or outside of immediate work area. At the end of a work day the trench shall be backfilled or secured with steel plates.

J. CONTRACTOR'S RESPONSIBILITY

It shall be the responsibility of the Contractor to conform to all the requirements of all permits obtained from all Agencies, and to make the construction site safe against injury

to people and/or livestock by erection of adequate posted barricades and/or temporary fences.

K. GROUNDWATER

The Contractor shall keep excavations free from water during construction. Groundwater shall be controlled to prevent sloughing or erosion of trench walls, softening of the bottom of excavations, or formation of "quick" conditions where effective stress is reduced due to upward movement of flow of water. The static water level shall be drawn down to a sufficient depth below the bottom of excavations to maintain the undisturbed state of natural soils and allow the placement of any fill to the specified density. Dewatering systems shall not remove natural soils.

1. Dewatering and shoring plans should be approved by a licensed geotechnical engineer as necessary, to verify subsurface soil and groundwater conditions and adequate handling of field conditions to facilitate construction.
2. The Contractor shall obtain any and all permits required in conjunction with the installation and removal of the dewatering system and shall meet all permit requirements.
3. The Contractor shall contact the local drainage authority for discharge requirements.
4. The Contractor shall dispose of water from dewatering operations so as not to cause injury or damage to adjacent property and shall at all times remain in compliance with the requirements of the local drainage authority.

SECTION 5 - TRENCH BACKFILLING

5.01 TRENCH BACKFILLING

Trench backfilling shall consist of all materials placed in an excavation in the process of constructing a sewer line and/or appurtenance. No backfill shall be deposited over a sewer line and/or appurtenance until pipe laid has been inspected and approved by the District for backfilling operations.

5.02 PIPE FOUNDATION - (If Required by Engineer)

Pipe foundation shall be that portion of the trench which is twelve (12) inches below the sewer subgrade. This portion of the trench shall be backfilled with "Trench Foundation" thoroughly compacted to achieve a firm, dry bed for the sewer pipe or structure. Locations of the "Trench Foundation" will be designated by the Engineer in the field. However, this does not relieve the Contractor of the requirements of these Specifications, including, but not limited to, allowable deviation of alignment and grade. Trench Foundation shall be wrapped in non-woven geotextile fabric composed of polypropylene. The fabric shall be consistent with the physical characteristics of Mirafi 140N non-woven geotextile or approved equal.

A. TRENCH FOUNDATION:

Trench Foundation shall be $\frac{3}{4}$ inch by $\frac{1}{2}$ inch clean crushed, angular rock or Class II Aggregate Base. The material shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the following grading:

Sieve Size	Percent Passing (by weight)
1-inch sieve	100
$\frac{3}{4}$ -inch sieve	90 - 100
No. 4 sieve	35 - 60
No. 30 sieve	10 - 30
No. 200 sieve	2 - 9

5.03 GEOTEXTILE FILTER FABRIC

If required by the Engineer, geotextile filter fabric shall be used to wrap pipe foundation and pipe embedment as specified herein and as indicated on the Standard Plans. The requirement for geotextile filter fabric may vary depending on groundwater and soil conditions.

Geotextile filter fabric shall be a non-woven material consisting of polyester, nylon, and/or polypropylene filaments formed into a stable network. The fabric shall be permeable, not

act as a wicking agent, be inert to commonly encountered chemicals, be rot-proof, and resistant to ultraviolet light.

The geotextile fabric shall also conform to the following physical properties:

Property	Test value	Test method
Weight	5.4 oz/yd ² (min.)	ASTM D3776/D5261
Grab tensile strength	150 lb (min.)	ASTM D4632
Elongation at break	50% (max.)	ASTM D4632
Puncture strength	80 lb (min.)	ASTM D4833
Burst strength	300 psi (min.)	ASTM D3786
Apparent opening size	#70 (max.)	ASTM D4751
Permittivity	1.0 sec ⁻¹ (min.)	ASTM D4491
UV resistance	70% (min.)	ASTM D4355

The geotextile fabric shall be Mirafi 160N or approved equal.

Wrap foundation material with geotextile fabric in a “burrito wrap” and overlap geotextile minimum twelve (12) inches. Secure edges of geotextile to prevent unraveling.

5.04 PIPE EMBEDMENT

Pipe embedment shall mean that portion of the material placed within the trench from the sewer subgrade to a point at least six (6) inches, but no more than twelve (12) inches, above the outside top of the pipe. "Sewer Subgrade" is defined in Section 5.02.

A. PIPE EMBEDMENT MATERIAL

1. Import:

Shall be 3/4-inch x1/2-inch clean, crushed rock. Alternate backfill bedding material may be used only if prior written approval is granted by the District Engineer. This approval is on a case-by-case basis.

Pipe bedding material shall be compacted by and tamping to a minimum ninety (90%) relative compaction from six inches (6”) below the bottom of pipe to a point twelve inches (12”) above top of pipe.

B. BACKFILL

1. Import Backfill Materials is an approved combination of gravel, sand, or rock material, free from deleterious substances, graded so that it will compact readily to a stable base with the following minimum requirements meeting the Caltrans Class 2

Aggregate Base standard for 3/4-inch maximum grading. The material shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the following grading:

Sieve Size	Percent Passing (by weight)
1-inch sieve	100
3/4-inch sieve	90 - 100
No. 4 sieve	35 - 60
No. 30 sieve	10 - 30
No. 200 sieve	2 - 9

The material shall also have a minimum sand equivalent (Test Method of Northern California 217) of 25, a minimum resistance (R) value (Test Method of Northern California 301) of 78, and a minimum durability index (Test Method of Northern California 229) of 35.

2. **Approved Native Backfill Material:**

Native backfill may be used for sewer lines located in areas outside of paved roads. Material free from vegetal matter, refuse, stones or clods larger than four (4) inches in diameter and containing sufficient fines so that all voids will be filled when compacted, and so constituted that compaction requirements can be met.

C. **TRENCH EXCAVATION MATERIAL**

Acceptable trench excavation material shall be that material which is free from vegetal matter and refuse, shall contain no concrete, stones or clods larger than 3/4-inch in diameter, and shall contain sufficient fines so that all voids will be filled when compacted.

D. **PIPE EMBEDMENT INSTALLATION**

1. Main and laterals in public utility and District easements, public rights-of-way and paved private property shall use or embed pipes with Import Backfill Material.
2. Trenches for private laterals (building sewers) in unpaved private property from property line to building shall be backfilled with approved Import Backfill Material to twelve inches above the top of pipe and the balance with Import Backfill or Approved Native Backfill Material.

5.05 TRENCH BACKFILL MATERIAL

Trench backfill material is considered to be all material placed in the trench between the pipe embedment and the road bed or ground surface.

A. BACKFILL IN PUBLIC RIGHTS-OF-WAY, DISTRICT EASEMENTS, PUBLIC UTILITY EASEMENTS, OR IN EXISTING OR FUTURE PAVED AREAS

The material, placement and compaction shall be done in accordance with the requirements and inspection of the District, City or County as applicable.

B. BACKFILL IN EXISTING AND FUTURE UNPAVED PRIVATE PROPERTY AREAS

The material placed must meet the following requirements:

1. Native Backfill:

Backfill shall be "Approved Native Backfill Material" compacted to the same degree of compaction as the adjacent ground or a minimum of 90% Relative Compaction per ASTM D-1557, whichever is greater.

2. Imported Backfill:

In areas where the excavated material does not meet the requirements for "Approved Native Backfill Material", material meeting the requirements for "Import Backfill Material", or "Trench Excavated Material" under Section 5.04 may be used. It shall be compacted to the same degree of compaction as the adjacent ground or a minimum of 95% Relative Compaction, whichever is greater.

C. COMPACTION

The method the Contractor uses to meet compaction requirements is not specified except for the following limitations.

1. Compaction shall be achieved by mechanical means. Water settling, jetting, ponding, and other water compaction methods are prohibited. Compaction testing shall be done in accordance with the requirements of the City or agency having jurisdiction.
2. For sloped trenches or when heavy-impact compaction equipment is used, such as sheep-foot wheels and self-propelled compactors, the Contractor shall protect the pipe from being damaged during mechanical compaction. The remainder of the backfill shall be in accordance with the requirements of the City or County.

SECTION 6 - PAVEMENT REPLACEMENT

6.01 DEFINITION

As used in this Section 6, pavement shall mean that portion of the material in the trench from the top of the backfill to the surface of the ground. It includes all lime or cement treated base material, rock, aggregate base, and surface pavement material.

6.02 PAVING IN PUBLIC RIGHTS-OF-WAY OR PUBLIC UTILITY EASEMENT

Paving in these areas shall be done in accordance with the requirements of the City, County or other Agency having jurisdiction thereover.

6.03 PAVING IN CAWD EASEMENTS AND IN PRIVATE PROPERTY

Pavement shall be replaced in kind unless otherwise shown on Plans or required by the Engineer.

All existing pavement at trench edges shall be saw cut to sound pavement and the exposed surfaces coated with tack coat, applied in accordance with Greenbook Section 301-Roadway Surfacing, just prior to paving.

The pavement shall in all cases be removed to a minimum of six (6) inches outside of the excavation to permit proper keying of the restored pavement.

6.04 ALL-WEATHER ACCESS

Clear access must be provided and maintained to all structures on the sewer system.

1. All weather vehicle access roads are required to every structure on the sewer system. Access roads must be a minimum of 12 feet wide and must be provided with a turnaround when back-up distance for any maintenance vehicle exceeds 100 feet.
2. The design of access roads must be included with the sewer system design plans. Include adequate drainage measures in the design to prevent damage to the access roads from storm water.
3. Gates must be provided for access through any fence that crosses a public sewer easement. Where vehicular access is required for maintenance, minimum 14-foot-wide gates must be provided.
4. The maximum grade allowed at any point on an access road is 15%. The maximum cross-slope for any access road is 5%. The Engineer may make exceptions to access road slope and cross-slope only if the Contractor provides an equivalent and equal method of complying with the intent of these standards. Equivalency shall be at the sole discretion of the Engineer.

SECTION 7 – TESTING

7.01 TESTING MAIN SEWERS

The Contractor shall, in the presence and under the direction of the Engineer, test the air tightness of all main sewer lines. The test will be made between each adjacent structure and between the most upstream structure and dead end. The air test will be made only after all other utilities and the curb and gutter have been installed and before any street base rock has been oiled. The Engineer shall be present during installation of plugs prior to air testing.

A. WHEN TESTED

1. In areas to be left unpaved, the air test shall be made after the backfill is satisfactorily compacted.
2. In areas to be paved, per Improvement Plans, when the outside top of the sewer is less than three (3) feet below the top of backfill, the air test shall be made after the "base rock" portion of the paving is satisfactorily compacted and before any street base rock has been oiled.
3. In areas to be paved, per Improvement Plans, when the outside top of the sewer main is three (3) feet or more below top of backfill, the air test shall be made after all other utilities and the curb and gutter have been installed and the "sub-base" material portion of the paving is satisfactorily compacted.

The air test as noted in 1, 2 or 3 above is considered the "official test". However, preliminary air testing is strongly recommended and may be conducted by the Contractor at any time prior to the "official test".

4. As directed by the Engineer, the Contractor shall conduct a preliminary air test if the Engineer has reason to believe that the Contractor's means and methods have impacted the condition of the system. The preliminary test will not be considered the "official test".

B. EQUIPMENT

The Contractor shall furnish all necessary equipment for conducting the test, including but not limited to an air compressor, air hoses, blank plug, liquid-filled test gauge, test plug, stopwatch, and personnel.

C. AIR TEST PROCEDURE

Air testing sewer mains, particularly larger diameter mains, can be very dangerous due to the very large forces developed. The Contractor shall be fully responsible and take all precautions necessary to ensure the safety of their workers. All plugs shall be adequately braced and restrained to support the full load developed. No workers shall

be allowed in the excavation or manhole while the line is under pressure. The Contractor shall make provisions for reading the pressure at the ground surface, and for safely releasing the air pressure without entering the manhole or excavation.

The following procedure shall be used for air testing:

1. Prior to testing, clean pipe to be tested by propelling a snug fitting inflated rubber ball through the pipe with water and remove any debris.
2. Plug all pipe outlets with suitable test plugs. Brace each plug securely.
3. If the pipe to be tested is submerged in groundwater, insert a pipe probe by boring or jetting into the backfill material adjacent to the center of the pipe, and determine the pressure in the probe when air passes slowly through it. This is the backpressure due to groundwater submergence over the end of the probe. All gauge pressures in the test shall be increased by this amount.
4. Add air slowly to the portion of the pipe being tested until the internal pressure is raised to 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe.
5. Check exposed pipe and plugs for abnormal leakage by coating with a soap solution. If any leakage is observed, bleed off air and make necessary repairs.
6. After an internal pressure of 4.0 psig is obtained, allow at least two (2) minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
7. After the two (2) minute period, disconnect the air supply. When pressure decreases to 3.5 psig, start stopwatch. Determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. The minimum allowable time in seconds shall be based on the diameters and lengths of pipe under test.
8. The pipeline shall be considered acceptable when the total time interval for the pressure drop from 3.5 to 2.5 pounds per square inch meets or exceeds the calculated test time based on the following table. This table is based on a rate of 0.0015 cubic feet per minute per square foot of internal pipe surface when tested per ASTM F-1417. At the Inspector's option, the test may be conducted for a pressure drop of 3.5 to 3.0 pounds per square inch and ½ of the time shown.
9. If the pipe installation fails to meet these air test requirements, the Contractor shall determine the source or sources of leakage, and he shall repair or replace all

defective materials or workmanship in accordance with these Specifications and in the presence of the Engineer. The completed pipe installation shall meet the requirements of this test.

Pipe Diameter, Inches	Test Time, seconds/ft x feet	Minimum Test Time, minutes: seconds
4	0.38	3:46
6	0.85	5:40
8	1.52	7:34
10	2.37	9:26
12	3.42	11:20
15	5.34	14:10
18	7.69	17:00
21	10.47	19:50
24	13.67	22:40
27	17.31	25:30
30	21.37	28:20
33	25.85	31:10
36	30.77	34:00

D. MANDREL OR DEFLECTOMETER TEST

Mandrel test for flexible pipes shall also meet the requirements specified in Volume II, Section 1.02(B).8.

1. Flexible Pipe Less than 18" In Diameter:

Upon completion of the air test, the Contractor shall pull a mandrel or deflector, approved by the Engineer, through the installed flexible pipe. This test shall be performed without mechanical pulling devices. Mandrel shall not be tampered with.

2. Flexible Pipe 18" or Greater in Diameter:

At the end of each working day, or as directed by the Engineer, the Contractor shall pull an approved Mandrel or deflector through the portion of the pipe specified by the Engineer. This section of pipe will have pipe embedment fully in place and compacted per these specifications plus at least four feet of backfill in place with a minimum of 85% relative compaction per ASTM D-1557. This shall be a preliminary test only to insure the integrity of the pipe at the time of installation. The Mandrel test for acceptance shall be performed after the air test as described in Section 7.01 (C), but before final paving is installed.

7.02 TESTING PRIVATE SEWER LATERALS

The Contractor shall, in the presence and under the direction of the Engineer, test the air-tightness of all private sewer laterals. The test will be made between the cleanout to grade at the property line, "test-wye" or manhole and the most upstream dead-end at a point not more than two (2) feet outside the building line (see A-2 below for exception). Note that actual connection of the private sewer to the building plumbing will not be permitted until the main sewer to which it connects has been accepted for use by the District and the herein described testing has been satisfactorily completed. Entry into "live" District manholes requires District approval.

A. WHEN TESTED

1. In all areas, the official air test shall be made after the backfill is satisfactorily compacted, base rock installed and all other underground utilities installed.
2. Preliminary air testing is strongly recommended and may be conducted by the Contractor at any time prior to the "official test".
3. Exception to 1 above is for residential private laterals when a water test is authorized by indication on the Plans or as directed by the Engineer in the field. In these cases, the following procedure will be used: After the private sewer has been laid and the pipe bedding has been installed to the satisfaction of the Engineer, the sewer shall be filled with water in the presence of the Engineer. Any and all leaks shall be found and repaired by the Contractor in accordance with these Specifications, after which the sewer trench shall be immediately backfilled.

B. EQUIPMENT

Same as for main sewers.

C. PROCEDURE

Same as for main sewers.

D. REQUIREMENTS

Same as for main sewers.

E. MANDREL OR DEFLECTOMETER

Upon completion of the air test, the Contractor shall pull a mandrel or deflectometer approved by the Engineer between manholes on sewer lines six (6) inches in diameter and larger. This test shall be performed without mechanical pulling devices. Pull tag lines shall be attached to both sides of mandrel.

7.03 TESTING PRIVATE PRESSURE SEWERS

This section regulates the testing of private pressure sewers four (4) inches in diameter or less with normal operating pressures of 10 psi or less. The procedure described in "Testing Main Sewers" shall be used, except that no air loss will be permitted in the time period computed for a gravity sewer of same size and length.

The pressure used will be determined by the Engineer and will be equal to 1-1/2 times the maximum pressure the sewer will be expected to withstand in actual use.

7.04 MANHOLE VACUUM TESTING

All manholes shall be vacuum tested. Manholes that fail the test shall be corrected as required and retested. Vacuum test procedures and requirements shall be as follows:

1. After completion of the manhole barrels but prior to backfilling, sealing of PVC liner seams and installing grade rings, all openings in the manholes shall be sealed with plugs and a rubber ring "donut" type plug inserted inside the opening of the cone.
2. A small vacuum pump shall be attached to a hose connected to the plug, and 4 psi (8 in. Hg) of vacuum applied.
3. The vacuum shall be permitted to stabilize at 3.5 psi (7 in. Hg) for 1 minute; before the test begins.
4. The manhole must maintain vacuum such that no greater than 0.5 psi (1 in. Hg) of vacuum is lost during the specified test period. The specified test period is as follows:

Manhole depth (feet)	Test period (minutes)
0 - 5	4.5
5 -10	5.5
10 - 15	6.0
Greater than 15	6.5

5. A vacuum regulator shall be provided on the vacuum pump such that no greater than 10 psi (20 in. Hg) can be applied to the manhole during the test.
6. All manholes that do not meet the leakage test, or are unsatisfactory from visual inspection, shall be repaired to the satisfaction of the Engineer.

7.05 ORDER OF WORK

A. The following order of work shall be performed by the Contractor following construction of the sewer mains and laterals, manholes, and sewer system appurtenances after placement and compaction of road base:

1. Preliminary Punch list
2. Preliminary Air Test
3. Mandrel Test
4. Installation of curb, gutter, sidewalk, and other surface features
5. Official Air Test
6. Clean Entire Sewer System
7. CCTV Inspection
8. Paving. Coordinate with District Engineer on timing for final pavement lift.
9. Final Punch list

SECTION 8 - TELEVISION INSPECTION

8.01 TELEVISION INSPECTION

Prior to acceptance of any sanitary sewer line by the District, said line shall be inspected internally by the Contractor by television as outlined below.

Defects such as high and low spots, joint separations, offset joints, chipped ends, cracked or damaged pipe, infiltration points and debris in lines shall be corrected by the Contractor. The camera equipment shall include a gauge that is visible on the video to accurately determine the depth of any standing water. For joint separations, low spots and chipped ends, the following maximum acceptable limits shall apply:

4" Private Lateral: No standing water, indentation or chipped ends will be permitted.

6"-10" Pipe: Joint separations - 1/2 inch
Low spots - 1-inch maximum depth
Chipped ends - 1/4 inch

10" or Greater: Specific maximum limits set by District and incorporate into contract for each project.

1. The complete job is ready for television inspection when the following work has been completed.
 - a) All sewer pipelines are installed and backfilled.
 - 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.
 - e) Pipelines to be inspected have been preliminarily balled, flushed and the vertical deflection test completed for flexible sewer lines.
 - f) Final air test has been completed.
2. When the above work is complete, the Contractor shall arrange for the television inspection.

3. The Contractor of the project shall notify the District in writing of the scheduled date of the television inspection.
4. After conditions outlined above are met, the entire job will be initially televised.
 - a) A video will be made and defects requiring correction will be noted.
 - b) If no deficiencies are observed, the work will be considered satisfactory.
5. The Contractor will be notified in writing of any deficiencies revealed by the television inspection that will require repair. If corrective work is indicated and the Contractor wishes to view the video, he shall contact the District to set a time for the viewing with the Engineer.
6. Corrective work shall be done.
7. Those portions of the pipeline system that have been corrected must be re-televised.
8. The procedure outlined above will be repeated until all deficiencies observed by television inspection have been corrected to the satisfaction of the District.

SECTION 9 - CLEANING

9.01 CLEANING

After the sewers have satisfactorily passed the tests required in Volume II, Section 9, and structures, backfilling and final paving are complete, the Contractor, in the presence of the Engineer, shall clean each section of the sewer in the following manner:

A. SEWERS EIGHT (8) INCHES THROUGH TWELVE (12) INCHES IN DIAMETER

1. High pressure hydraulic cleaning or jetting shall be used to remove dirt, grease, rocks, sand and other materials or obstructions from the sewer line and manholes.
2. Sludge, dirt, sand, rocks, grease, and other solid or semi-solid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing materials to downstream sewer reaches is not permitted.

B. SEWERS FIFTEEN (15) INCHES IN DIAMETER AND LARGER

The Engineer shall visually inspect the sewer and if in his/her opinion cleaning is necessary, the Contractor shall clean the sewer to the satisfaction of the Engineer. District may clean the sewer in these sizes at Contractor's request and at his/her expense. The sewer shall be cleaned as described in Paragraph A, above.

C. FOUR (4) INCH AND SIX (6) INCH PRIVATE SEWER LATERALS

When, in the opinion of the Engineer, the sewer is not clean, it shall be flushed or otherwise cleaned so as to properly serve its intended function. Clean private sewer lateral as described in Paragraph A, above.

9.02 DISCHARGE OF CLEANING WATER

Water used for cleaning the lines shall be screened to remove sediments prior to being discharged into the existing sewer system.

SECTION 10 - SITE CLEANUP

10.01 SITE CLEANUP

Surplus pipeline material, tools, remaining material from site preparation, etc., shall be removed by the Contractor, and all dirt, broken pavement, rubbish and excess earth from excavation shall be hauled to an approved disposal site provided by the Contractor, and the construction site left clean, to the satisfaction of the Engineer.

Replaceable items, such as fences, signs, landscaping, etc., requiring removal during construction operations must be replaced in kind by the Contractor at his/her expense or disposed of as noted on the approved Plans. Driveway areas or other improvements requiring removal and/or excavation will be restored in accordance with the requirements of the agency having local jurisdiction to a condition equivalent to their original condition, and to the satisfaction of the Engineer.

SECTION 11 - MISCELLANEOUS REQUIREMENTS

11.01 INSPECTION

A. CONFORMANCE TO THESE SPECIFICATIONS

All work done under these Specifications shall be subject to rigid inspection and shall be performed to the satisfaction of the Engineer.

B. DOCUMENTS OF MATERIALS AND PERFORMANCE TESTS

The Contractor shall, at any time when requested by the Engineer, submit at his/her expense properly authenticated documents of materials and performance tests as proof to the District of compliance with these Specifications.

C. ACCESS TO JOB SITE

The Engineer shall, at all times, have access to the work during construction, and the Contractor shall provide proper and safe facilities for such access and inspection.

11.02 ALTERATIONS

The Engineer reserves the right to make such alterations, deviations, additions or omissions from the approved plans as may be determined during the progress of the work to be necessary and advisable for the proper completion thereof.

11.03 DEFECTIVE WORK AND/OR MATERIALS

All work that has been rejected shall be remedied or removed and replaced by the Contractor in a manner acceptable to the Engineer.

All materials not conforming to these Specifications shall be considered as defective, and all such materials, whether in place or not, will be rejected. They shall be removed immediately from the site of the work.

11.04 MANHOLE PROTECTION

Particular care must be taken to protect new and existing manholes from damage and to keep rock, dirt or debris from getting into the sewer. The Contractor will be responsible to see that the manholes are kept clean and free from debris. Submit protection plan to District Engineer for review. Plan shall include protection materials, methods and devices.

On new manholes or manholes that have had frame and cover removed, a steel cover of adequate strength, close fitted and well secured, shall be installed over the manhole opening until the frame and cover are permanently installed.

Ground or surface water must be kept out of existing sewers. Temporary plugs may be required by the Engineer to affect this protection.

11.05 RESERVED

11.06 PRIVATE (STREET) LATERAL MARKING

Each private lateral shall be marked at the location where it passes under the property curb in the following manner:

A. NEW CURB

Where new curbs are constructed, a three (3) inch high letter "S" shall be impressed with an approved stamp into the fresh concrete on the curb to be clearly visible.

B. EXISTING CURBS

Where curbs already exist, a three (3) inch high letter "S" shall be neatly chiseled on the curb to be clearly visible.

11.07 TRACER WIRE AND MARKER TAPE

All sewer mains and sewer laterals shall have green marker tape installed within the trench per Standard Plans. Curved sections of sewer mains and laterals shall have tracer wire installed within the trench per the Standard Plans.

Tracer wire shall be Trace-Safe® water blocking tracer wire and shall be a minimum of 19 gage. Tracer wire shall be continuous from manhole to manhole and shall only be installed as specified by the manufacture with approved connectors if needed.

Marker tape shall be 5 mil., 3-inch wide green marking tape. Tape shall read "Caution Buried Sewer Line Below".

11.08 MANHOLE MARKING

If deemed necessary by the Engineer, manholes located in easements will be marked with a District Marker. Marker will be supplied and installed by the District (at others expense.)

11.09 REPAIR OF DAMAGED SEWERS AND OTHER UTILITIES

A. NEW MAIN

Mains not yet accepted by the District that are damaged during construction will be repaired by the Contractor in accordance with these Standard Plans and Specifications. The work shall be done in the presence of and to the satisfaction of the Engineer. The portion of the pipe bedding from sewer subgrade to outside bottom of sewer pipe shall be satisfactorily installed before the pipe is laid.

B. EXISTING MAIN SEWER OR APPURTENANCES

Repairs or relocations of existing main sewers or appurtenances required by reason of damage or conflict will be performed by the District or by Contractors engaged with the

District through a Contract or Permit. Upon completion of the work, the District will bill the party responsible for payment thereof.

C. EXISTING PRIVATE LATERALS

Except as noted below or otherwise agreed to by the District, all work involving repair or relocation of existing private laterals shall be done by private Contractors. Minimum inspection fees must be paid, and a sewer construction permit issued prior to start of work. All work must be done per District Specifications and subject to District Inspection.

D. REPAIR OF OTHER AGENCY FACILITIES

Repair of other Agency utilities damaged during construction shall be made in accordance with the requirements of the Agency concerned.

11.10 ABANDONMENTS

Abandonment of existing District facilities shall be performed by Contractors engaged with the District through a Contract or Permit.

A. MAIN SEWERS

Main sewer pipe that is required to be abandoned shall be abandoned by one of the following methods:

1. Filling with slurry. Slurry shall be a flowable mix containing a minimum of 2 sack cement per cubic yard.
2. Removing the existing pipe.

B. PRIVATE LATERALS

Contractor, at its own expense, shall cap the lateral at the sewer main, and remove the wye for any private lateral serving a building that is to be moved or demolished.

1. If it is noted on the improvement plans that the lateral is to be abandoned, the lateral shall be filled with slurry (as directed by the Engineer) and capped by the Contractor. The sewer shall be capped with an approved coupling and a watertight cap at the main and property line (right of way). The wye shall be removed. This work shall be done in the presence of, and to the satisfaction of, the Engineer. Alternatively, the lateral and wye connection may be removed.
2. If it is not noted on the improvement plans, the Contractor shall contact the District for abandonment requirements.

C. MANHOLE

Castings and manhole body shall be removed to a minimum of three (3) feet below final street grade or existing ground elevation, whichever is lower. The castings shall be delivered to Carmel Area Wastewater District, as directed.

Drainage holes shall be made at the bottom of the manhole, and the channel shall be sealed to a watertight condition with concrete. The manhole shall then be filled and compacted with self-compacting material such as slurry or as approved by the Engineer and City jurisdiction. Entry into "live" District manholes is prohibited but may be allowed if the Contractor secures an Encroachment Agreement from the District.

D. SEPTIC TANK

Every cesspool, septic tank, and seepage pit that has been abandoned or otherwise has been discontinued from further use shall be abandoned as required by County and/or the City.

E. COMMERCIAL GREASE INTERCEPTORS

Immediately prior to abandonment, grease interceptors shall be pumped and cleaned of debris, shall have 3-inch diameter holes drilled every 12-inches through the bottom of the structure to provide drainage of groundwater, and shall be filled and compacted with cement slurry, or as approved by the Engineer.

All existing sewer laterals shall be disconnected from grease interceptors to be abandoned. Reconnect laterals with approved couplings and pipe materials.

11.11 COMMERCIAL GREASE AND OIL COLLECTION SYSTEMS

A. GENERAL

For the purposes of this specification section, a restaurant is any facility that prepares or serves food to non-family members. Without limitation, this includes full-service restaurants, fast food restaurants, take-out restaurants, recreation facilities, cafeterias for employees, church kitchens, school cafeterias and grocery store take-out facilities.

1. All restaurants shall be equipped with grease interceptors and/or grease traps designed to limit the discharge of grease and oil to the District's sewer system. The size and type of restaurant shall dictate the size of the grease trap or grease interceptor required. The minimum sizes specified are subject to review by the Engineer and sized and installed according to criteria in the current UPC.
2. A plumbing permit shall be obtained from the District prior to the installation of a grease trap or grease interceptor.

3. A detailed Pretreatment Ordinance adopted by resolution of the Board of Directors shall supersede this section.

B. GREASE INTERCEPTORS

All restaurants or food service facilities shall have an outside grease interceptor located on private property only and be installed per the requirements of the current edition of the UPC and the District's Pretreatment Ordinance.

1. Designation as a grease intensive restaurant shall be as determined by the District Engineer. Grease interceptors shall be two-compartment interceptors with sampling box as shown in the Standard Plans and shall be manufactured by Jensen Precast, or approved equal.
2. All new construction for restaurants shall have grease interceptors. Grease interceptors are not allowed within the public right-of-way. If this is found to be unworkable, the owner must apply from the City of Carmel-by-the-Sea, or, if outside the City limits, the County of Monterey Planning Department for an encroachment within the public right-of-way.
3. Grease Interceptors shall be located outside buildings unless a finding is made by the District Engineer or authorized representative that the location of the building on the site or some other aspect of the use prevents an outside location and that placement within a building is not hazardous to public health and safety.

C. GREASE TRAPS

The District may also allow the use of a grease trap in lieu of a grease interceptor in tenant improvement projects where it is not feasible to install a grease interceptor or food service facilities with limited cooking that do not contain deep fryers, grills or other cooking equipment. The District Engineer shall determine if a grease trap shall be allowed. Grease traps shall be sized and installed per the current edition of the UPC.

Grease Traps shall have two compartments with an acid resistant coated interior and an exterior fabricated steel device as shown in the Standard Plans. Other mechanical grease traps may be approved by the District Engineer.

D. CONNECTIONS

1. All kitchen area pot sinks, prep sinks (not vegetable prep sinks), and three-compartment sinks shall be connected to the grease trap or interceptor. All Kitchen mop sinks, floor drains and dishwashers shall be connected to the interceptor.

2. Toilets, lavatories, and other sanitary fixtures shall not be connected to any grease trap, grease interceptor or comparable device.
3. All discharging fixtures shall be individually trapped and vented in accordance with the CAWD Plumbing Code.

E. DISHWASHERS

Dishwashers shall not be connected to any grease trap but shall be connected to a grease interceptor which has been sized appropriately for the service volume.

F. GARBAGE DISPOSALS

The installation and use of garbage grinders (food waste disposals) in commercial food establishments is prohibited, except where a grease interceptor is in use.

G. OTHER REQUIREMENTS

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

11.12 OUTDOOR SINK REQUIREMENTS

A. OUTDOOR SINKS ON RESIDENTIAL PARCELS

1. Option 1: Cover outdoor sink (when not in use) with a device that will not allow rain water to enter into the sewer system. The cover shall be permanently attached to the sink or counter top (This method also reduces the likelihood of rodents entering the sewer lateral).

Note: Outdoor floor drains will not be allowed to connect to sanitary sewer for this option.

2. Option 2:
 - a) Install a permanent roof structure over the sink (kitchen) area. The roof shall be solid and extend past any open sides a distance equal to 1/2 the height of the opening (i.e. if the distance from the countertop with sink to the roof is 4 feet the overhang is required to extend 2 feet past the wall).
 - b) For floor drains, on the open side, a grade break line shall be constructed at the inside edge of the wall with the slab sloping to prevent rainwater from entering the drain.

- c) For floor drains, the ground shall be sloped away from the structure on all other sides.

B. OUTDOOR SINKS ON COMMERCIAL PARCELS

1. Install a permanent roof structure over the sink (kitchen) area. The roof shall be solid and extend past any open sides a distance equal to 1/2 the height of the opening (i.e. if the distance from the countertop with sink to the roof is 4 feet the overhang is required to extend 2 feet past the wall).
2. For floor drains, on the open side, a grade break line shall be constructed at the inside edge of the wall with the slab sloping inwards on the inside of the structure and away from the structure on the outside in order to prevent precipitation from entering the floor drains.
3. For floor drains, the ground shall be sloped away from the structure on all other sides.

11.13 TRASH ENCLOSURE DRAIN REQUIREMENTS

1. The District only allows wastewater drains in trash enclosure areas that are servicing restaurants or other types of food service facilities (i.e. grocery stores).
2. The drain is required to be connected to the facility's grease interceptor.
3. A roof shall be placed on the trash enclosure to prevent rainwater from entering the sanitary sewer system. The roof shall extend past open sides without a gate by a distance equal to 1/2 the height of the opening (i.e. if the bottom of the roof is 2 feet above the top of the structure wall it is required to extend 1 foot past the outside edge of the wall). To allow garbage trucks to access the bins, the roof shall extend 6 inches past the outside edge of the gate (on the gate side of the structure only).
4. On the open side, a grade break line shall be constructed at the inside edge of the wall with the slab sloping inwards on the inside of the structure and away from the structure on the outside in order to prevent precipitation from entering the floor drains.
5. The ground shall be sloped away from the structure on all other sides.

11.14 CAR WASH AND VEHICLE SERVICE FACILITIES

1. Car wash facilities shall include a sand and oil separator and a metered water source (separate meter from the remainder of the site).

2. Car wash facilities shall be permanently covered, and the area around the building shall be graded away from the car wash slab.
3. Permanent awnings shall be placed over the open sides of the car wash and shall extend a distance equal to 1/2 the height of the opening.
4. A plan meeting the above requirements and showing how the car wash will be connected to the sanitary sewer system shall be submitted to the District for approval.
5. Vehicle Service Stations, Garages, Public Works Yards and School Transportation Yards shall be required to install a gravity separating device designed to prevent the discharge of sand, silt, oil and grease to the District's sewage system.

All new and existing laundries and dry cleaners, or similar establishments, shall install a gravity separating device of a size and design approved by the District Engineer. They shall also install any other pretreatment facility required by the District Engineer to ensure their compliance with all requirements and specifications of this Ordinance. Establishments in existence prior to this date shall install an appropriate pretreatment system, if in the opinion of the District Engineer, the system is warranted.

11.15 OUTDOOR POOL AND SPA REQUIREMENTS

1. No plumbing from outdoor pool/spa areas or water features shall be connected directly to the sanitary sewer system.
2. A permit is required for the discharge of pool/spa water to the sanitary sewer system.

11.16 WINTERIZING SANITARY SEWER SYSTEM DURING CONSTRUCTION

If the sanitary sewer system is connected to the District's existing sanitary sewer system but construction of the site improvements is not complete, the Contractor shall install measures to block storm water from entering the sewer system. If winterizing is required by the District Engineer, the Contractor shall coordinate with the District about specific requirements.

11.17 STORM DRAINAGE

No stormwater, rain water or drainage systems shall be connected to the sewer system, including private laterals.

SECTION 12 - APPROVAL AND ACCEPTANCE OF CONSTRUCTION

12.01 MAIN SEWERS

After all construction of the main sewer has been completed to the satisfaction of the Engineer, all fees and charges paid, all easements, annexations, and maps have been recorded and copies have been given to the District, and all other requirements have been met, the main sewer can be accepted as a public utility by the District.

12.02 CONSTRUCTION AND REHABILITATION/REPLACEMENT OF PRIVATE LATERALS

After all construction of the private lateral has been completed to the satisfaction of the Engineer, all fees and charges paid, and all other requirements met, the utilities can be approved by the District. This approval of construction will be indicated by the notification of the City or County in which the work occurred as required.

12.03 PRIVATE SEWER LATERAL (See Volume I, Section 6.07 of these specification)

12.04 PAYMENT

In no event will a private lateral or main sewer be accepted, and so reported to the City and/or County, until all fees and charges are paid, including charges for work performed by the District and repairs undertaken by the District as provided in Volume I, Section 7.

VOLUME III- DESIGN POLICY AND STANDARDS

SECTION 1 - DESIGN AND POLICY STANDARDS FOR MAIN SEWERS

1.01 PIPE MATERIALS

Limited to Vitrified Clay Pipe (VCP) extra strength, Poly Vinyl Chloride Pipe (PVC, SDR 26, C900 CL 165), High density Polyethylene pipe (HDPE, DR 21 or less) and all as listed in the Standard Specifications. Additional pipe materials may be used upon approval by the Engineer.

1.02 PIPE MATERIAL CHANGES

Size or pipe material changes and vertical deflections are not allowed between any two manholes.

1.03 SIZE AND SLOPE

Minimum pipe size is six (8) inches in diameter. A minimum pipe size of 4-inch with a minimum slope of 2% will be allowed for laterals only. Unless otherwise permitted by the Engineer, the slopes shown in the following table will be the minimum for sewer sizes shown:

Pipe Diameter	Minimum Slope (feet per foot)	Desirable Slope (feet per foot)
8"	0.0034	0.005
10"	0.0025	0.004
12"	0.0020	0.0032
15"	0.0016	0.0024

(Larger sewer sizes shall have a minimum slope as specified by the Engineer).

Sewer design will be based on District Capacity Model as to ultimate total volume of flow expected from the tributary area. All sewers shall be designed and constructed to give mean velocities, when flowing half full, of not less than 2.0 feet per second based on Manning's formula using an "n" value of 0.013.

1.04 MAIN SIZING CRITERIA

Public mains will be sized to serve the entire tributary area at build-out densities conforming to the District's Collection System Capacity Model. Engineers for large developments may be required to provide trunk or collection system calculations or have a wastewater model run performed.

Design flows will be based on the following criteria:

1. Population density for a single-family home shall be 210 gpd/ EDU;
2. Peaking Factor: A minimum peaking factor of 2.5 shall be utilized. For flows less than 0.45 mgd refer to chart in Figure 10-1 at the end of this section.
3. I/I = 500 gpd/acre

Design all gravity sewers to achieve a minimum velocity of 2 fps at average dry weather flow (ADWF) and a maximum velocity of 10 fps using design flows. Velocities less than 2 fps require approval of the District. When analyzing the existing or proposed sewer systems, use Manning's Formula to determine the design flow and velocity. Use a Manning's "n-value" of $n=0.013$.

1.05 ALIGNMENT

Sewer shall be laid in a straight alignment except that horizontally curved sewers may be used for flexible pipe only when located within a defined street area and concentric with center of street, unless otherwise approved. Minimum curve radius shall be in accordance with Volume II, Section 3.01.F.

1.06 CROSS CONNECTION

Sewers will be required to be designed with cross-connections to existing sewer except in dead end streets or as required.

1.07 GRADE

Sewer shall be laid on a straight grade.

1.08 GRADE STAKES

Unless otherwise required by the Engineer, sewer construction stakes will be located at 50 feet maximum intervals, except that on horizontal curves and on sewers with a slope flatter than 0.0034 feet per foot the maximum spacing will be 25 feet.

The stakes shall be offset from the center line of the sewer at a safe distance from the edge of the trench, but in no case greater than 10 feet unless authorized by the Engineer. The stakes will be marked with offset distance and station only.

1.09 DESIGN DEPTH

To avoid interference between sewer laterals and other utilities, the sanitary sewer main shall be designed, when possible, with no less than three (3) feet and no greater than eleven (11) feet of cover below finished grade.

1.10 MINIMUM PIPE COVER

Minimum permitted cover in inches over outside top of pipe bell to top of "backfill" or to existing ground at time of sewer installation, whichever is lower, shall be no less than three (3) feet. Cover requirements for other pipe materials and sizes will be based on their strength characteristics as approved by the Engineer.

Special Pipe Cover – Main and Trunk Sewers – Special pipe cover shall be used when total cover over main or trunk sewers is less than three (3) feet and may be required when total cover will not be placed immediately after pipe installations, or when other special conditions exist.

1. Two (2) to three (3) feet of cover shall require the use of C-900 or shall require concrete encasement of pipes of material other than C-900.
2. Less than two (2) feet of cover requires special design subject of the approval of the Engineer.
3. Special pipe cover requirements through cultivated or landscaped areas, shall be modified by replacing the upper six (6) inches of excavation material with topsoil.

1.11 TRENCH INTERSECTIONS

Non-perpendicular crossings/intersections between the sanitary sewer and other underground utilities require approval of Engineer.

1.12 HORIZONTAL AND VERTICAL CLEARANCE REQUIREMENTS

A minimum outside-to-outside horizontal clearance of five (5) feet shall be maintained between the sewer mains and structures and adjacent non-potable water and stormwater underground utility mains and structures. Provide eight (8) feet outside-to-outside separation from planter strips and six (6) feet separation from continuous sidewalk and concrete curbs, unless approved by the engineer.

A minimum horizontal clearance of ten (10) feet shall be maintained between the sewer main and parallel water mains, unless approved in advance by the Engineer.

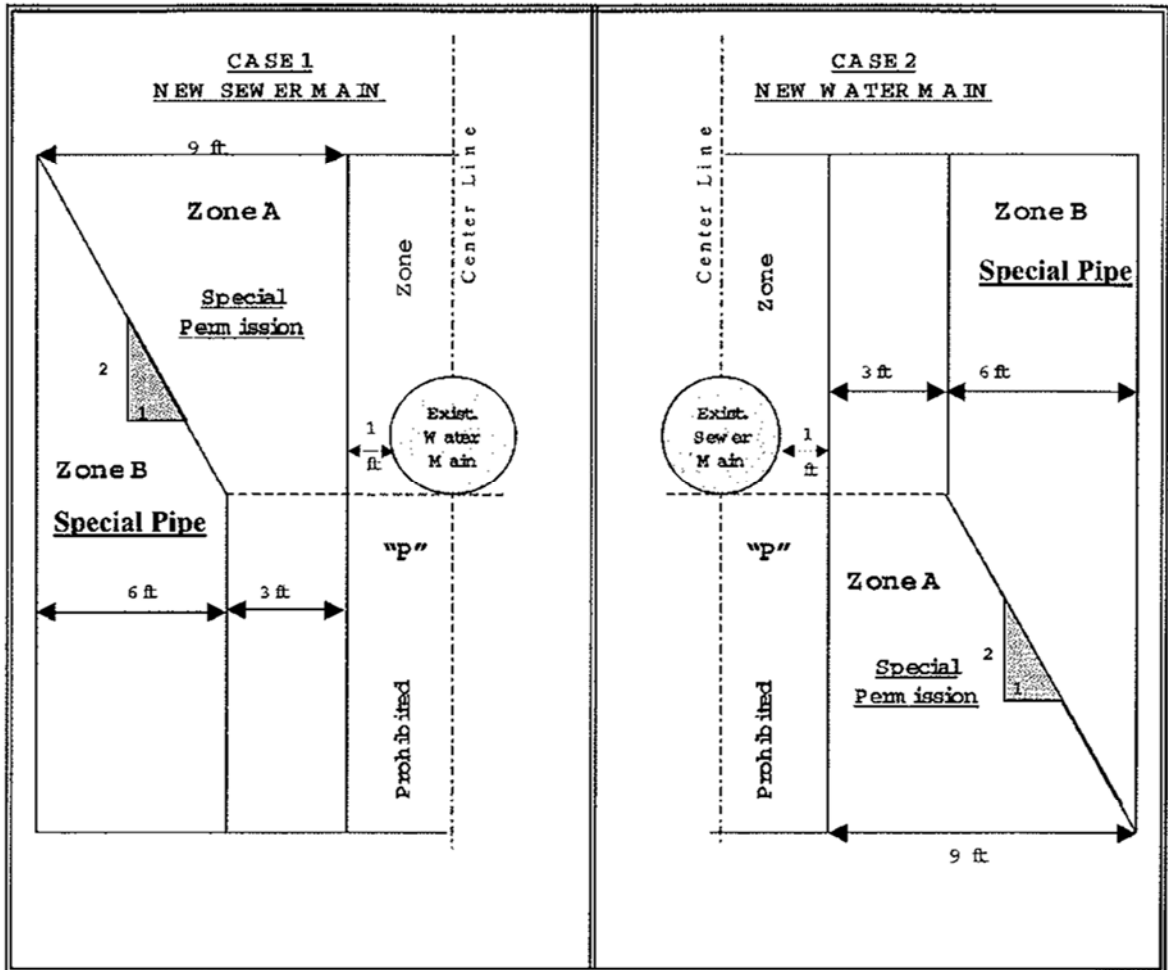
A minimum vertical clearance between the sewer main and adjacent, non-potable water underground utility mains shall be six (6) inches. Pipe couplings are not allowed within the trench. Greater clearance may be required by the District.

1.13 WATER MAIN SEPARATION

- A. New water mains and new lateral lines shall not be installed in the same trench as and shall be at least ten (10) feet horizontally from and one foot vertically above, any parallel pipeline conveying untreated sewage.

- B. If crossing a pipeline conveying a fluid listed in subsection (A), a new water main shall be constructed no less than 45-degrees to and at least one foot above that pipeline. No connection joints shall be made in the water main within eight horizontal feet of the fluid pipeline.
- C. The vertical separation specified in subsection (A) is required only when the horizontal distance between a water main and pipeline is less than ten (10) feet.
- D. The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.

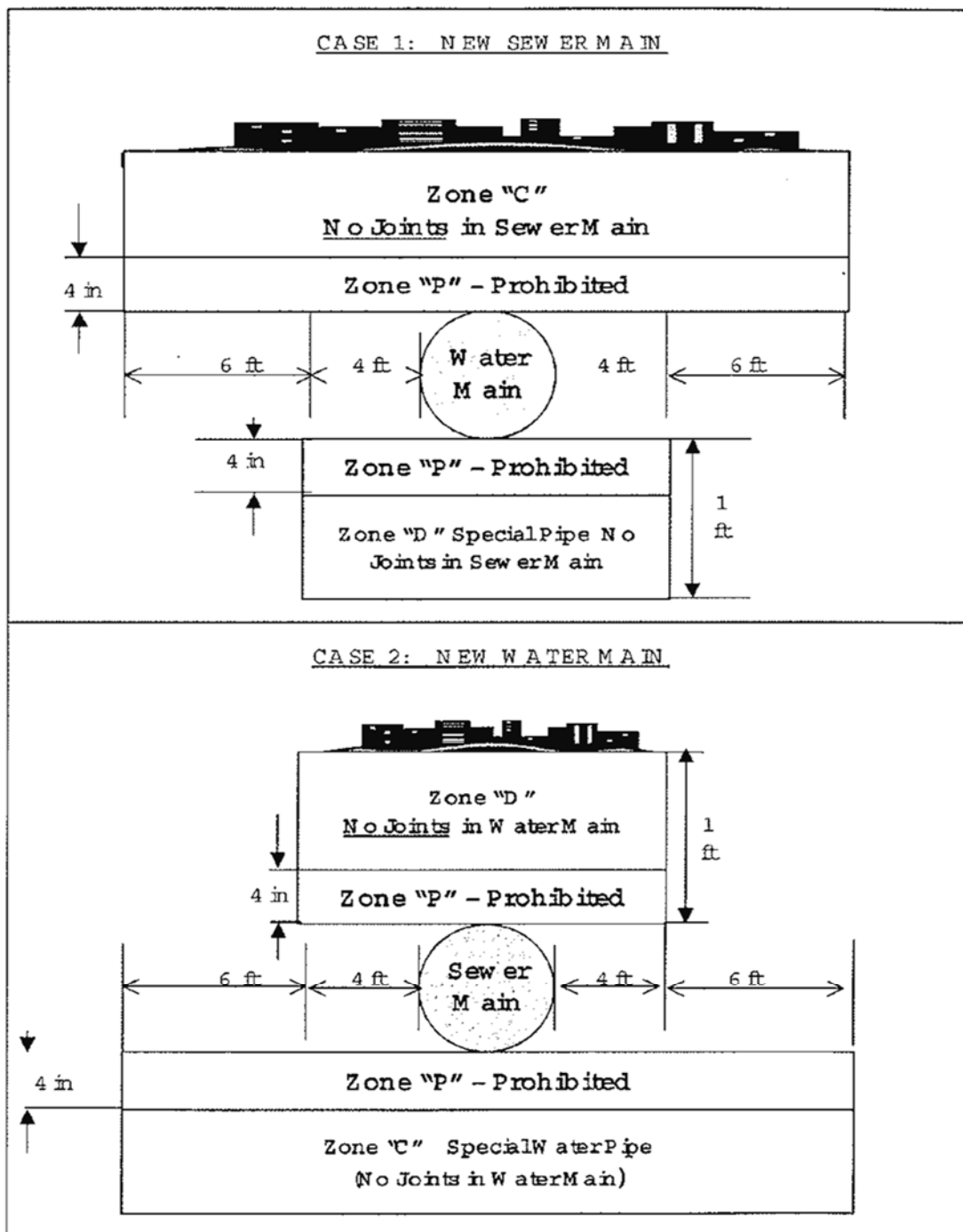
FIGURE 1 PARALLEL CONSTRUCTION



Note: Zones identical on either side of center lines

Zones "P" is a prohibited zone, Section 64630 (e) (2) California Administrative Code, Title 22

FIGURE 2 CROSSINGS



1.14 CROSSING STORM DRAINS

Generally, provide a minimum of six (6) inches of vertical separation between storm drains and the sewer below the storm drain. Joints shall be located outside the storm drain trench. When the minimum cannot be maintained, plans will indicate installation of felt expansion material or equivalent between facilities. To protect the sewer main from distorting under extreme loads, other measures, such as concrete encasement may be submitted for approval.

1.15 STRUCTURE LOCATIONS

Except as noted below; manholes are required at all angle points, changes in grade and permanent dead ends. Maximum structure spacing is 400 feet unless otherwise permitted by the Engineer. A flush hole inlet riser may be used in lieu of a manhole on dead end runs only in cul-de-sacs that are less than 150 feet in length. Manholes shall be provided at locations where pipe slope changes, pipe material changes, and where a new lateral connects to an existing or new main that is greater than 15 inches in diameter.

1.16 MAIN LOCATIONS

To accommodate traffic control and access, mains should be located in the center of traffic lanes when possible. For two-lane streets without medians, the mains should typically be located approximately five (5) feet on either side of the street centerline.

1.17 INVERT ELEVATIONS AT MANHOLES

The In-and-Out elevations of the incoming and outgoing sewers shall be shown on the plans, and, unless authorized by the Engineer, the following shall apply:

A. SEWERS OF SAME DIAMETER

Where two or more main sewers of the same diameter intersect, the difference in invert elevations of the incoming and outgoing sewers shall be a minimum of 0.10 feet. For flow through manholes, maintain grade.

B. SEWERS OF DIFFERENT DIAMETERS

Where two or more main sewers of different diameters intersect, the incoming and outgoing sewers shall be so related that the inside tops (crown) of the sewers are at the same elevation.

1.18 MAXIMUM DEFLECTION AT MANHOLES

At manholes, the upstream deflection angle at the intersection of two main sewers must not be greater than 90 degrees.

1.19 MANHOLE RIM ELEVATION

Manhole rim elevation shall be shown on Plans to nearest 0.1 foot. Unless otherwise indicated on the Plans, it shall be assumed to be flush with the adjacent ground surface. In

areas where streets will be constructed later, rim elevation shall also be shown for future finished grade.

1.20 CONNECTION TO EXISTING MANHOLE

In existing manholes where no stub exists, Contractor shall provide a channel in the portion of the base block located inside the manhole two inches larger than the outside diameter of the proposed stub. It shall be the responsibility of the Contractor to perform all the necessary work on the exterior of the manhole in preparation for the installation of the new stub. The Contractor shall be responsible for the alignment and grade of the new stub. The Contractor shall make a water-tight seal of the new stub from the outside of the manhole. All work by the Contractor shall be performed in a manner that will maintain the integrity of the existing manhole. The Contractor shall provide 48 hours' notice to the District prior to the start of any work.

1.21 CONNECTIONS BETWEEN MAIN SEWERS

Connections of new main sewers into existing main sewers must be made by means of a new manhole installed by the Contractor. (See Volume II, Sections 3.09 and 12.03 of these Standard Specifications for connection of private sewer into existing main sewer).

1.22 DROP MANHOLES

Normally, outside drop manholes are not permitted. Use of outside drop manholes will be at the discretion of the District Engineer.

1.23 BOLT-DOWN MANHOLE COVERS

Standard District bolt-down manhole frame and cover without vent holes shall be required when manhole is located on a lot where there will be a residence.

1.24 EASEMENT ALL-WEATHER ACCESS REQUIREMENTS

All manhole structures appurtenant to sanitary main sewers must be accessible to District maintenance vehicles.

Paved access roads shall be constructed to all manholes to permit maintenance by the District.

1.25 EASEMENT ACCESS REQUIREMENTS

Sanitary sewer shall be installed in Sanitary Sewer Easements having a minimum width of twenty (20) feet. The easement shall be located on one lot and in no case will the District accept an easement split between two lots. Easement descriptions and accompanying maps shall be prepared by the applicant's engineer. Easements shall be in a form acceptable to the District and will be checked by the District Engineer. Easements shall also be shown on the construction plans. The District will not accept the sewer until all required easements have been deeded to the District together with any necessary partial conveyances or

subordination agreements. Access to and along the easement, including all manholes, shall be feasible and safely achievable by District maintenance vehicles.

1.26 EXTENT OF SEWER MAIN IMPROVEMENTS

When the sewer main will serve properties beyond the project limits, the sewer main must be designed and installed to cross the full frontage.

1.27 CONNECTIONS TO EXISTING MAIN OR NEW MAIN

A. CONNECTION OF MAINS OF THE SAME DIAMETER

When the diameters are of the same size a new manhole shall be installed and the inverts shall be offset as described in Volume III, Section 1.17 (A) of these Standard Specifications.

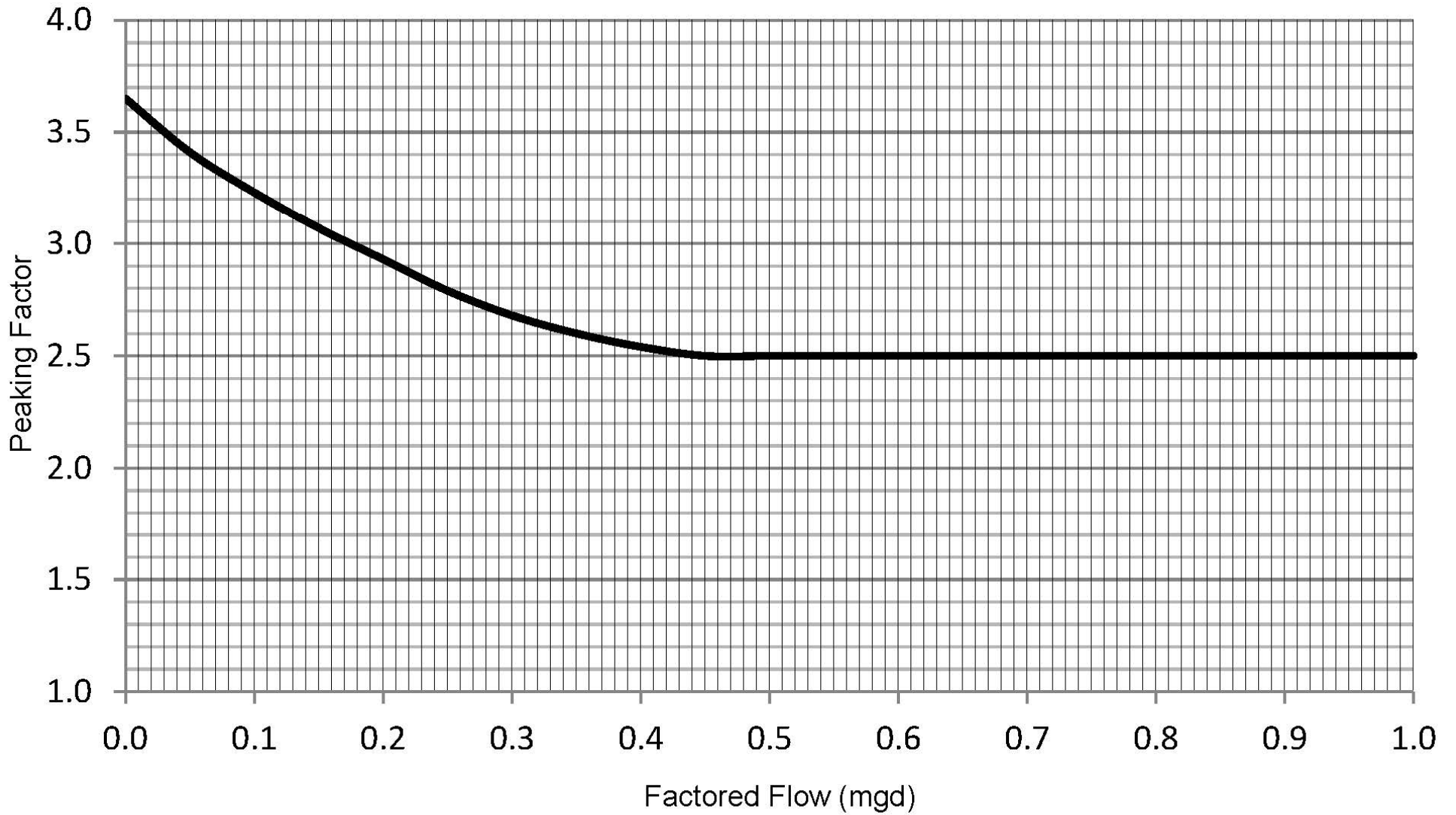
B. CONNECTION OF LATERAL TO EXISTING MAIN WITH DIAMETER GREATER THAN 15 INCHES

When connecting a new main or lateral to an existing or new main greater than 15 inches in diameter, a new manhole shall be installed and the incoming and outgoing sewers shall be offset as described in Volume III, Section 1.17 (B) of these Standard Specifications.

C. CONNECTION OF LATERAL WITH DIAMETER LESS THAN THE SIZE OF THE EXISTING/NEW MAIN

When the diameter of the connecting lateral is less than the diameter of the existing or new main, the Contractor shall match the crowns at the connection.

Figure 10-1
Peaking Factor Curve



SECTION 2 - DESIGN AND POLICY STANDARDS FOR PRIVATE LATERALS

2.01 SIZE AND SLOPE

Minimum size of private sewer shall be four (4) inches in diameter, but in no case smaller than the building drain (building plumbing) stub diameter. Plumbing fixture unit values, as established by the latest edition of the UPC, shall be used in designing the private sewer.

4-inch diameter sewers shall have a minimum slope of 2%, and 6-inch diameter sewers shall have a minimum slope of 1%. Larger pipes and flatter slopes may be accepted. However, they will require review and approval by the Engineer.

2.02 PIPE MATERIALS

Pipe materials shall be limited to Vitrified Clay Pipe (VCP), Poly Vinyl Chloride Pipe (PVC, SDR 26, C900 CL 150), ABS, High density Polyethylene pipe (HDPE, DR 21 or less) and all as listed in the Standard Specifications. Additional pipe materials may be used upon approval by the Engineer.

2.03 ALIGNMENT

Sewer alignment shall be as straight as possible. When angle points are approved, only one vertical 45-degree (maximum) change of direction is permissible without a cleanout. Any additional vertical changes of direction, in excess of 22-1/2 degrees shall be served by a cleanout or manhole. A cleanout shall also be placed at all blind bends or other locations along the alignment where access is limited. Ninety-degree bends or tees and horizontal changes of direction are not permitted.

2.04 GRADE

Unless otherwise authorized by the Engineer, the sewer shall be laid on a straight grade between the main sewer and the property line and between the property line and the building drain (building plumbing). Changes in grade shall be served by a cleanout or manhole.

2.05 GRADE STAKES

When cut sheets are required by the Engineer, sewer construction stakes shall be located at angle points, grade breaks, cleanouts, wyes, structures and at a 50-foot maximum spacing. An additional stake will also be required at property line and at connection point with building plumbing (building drain).

The stakes shall be offset from the center line of the sewer at a safe distance from the edge of the trench but in no case greater than ten (10) feet unless authorized by the Engineer. The stakes will be marked with off-set and station only.

When the sewer is to be constructed to property line only, the Engineer may require a stake to be set at the point prior to construction.

2.06 CURB MARKING

When applicable and at the time the curb stakes are set (prior to construction of curb and gutter), an additional stake must be set on the curb stake line opposite the point at which the private sewer crosses the property line. This will insure that the "S" can be stamped in the fresh concrete in the proper location as required under Volume II, Section 11.06 of these Standard Specifications.

2.07 CONNECTION TO EXISTING PRIVATE SEWER

All laterals, shall have installed:

1. An approved backwater overflow device
2. An approved backwater check valve

These backwater prevention devices shall be installed on the side sewers outside of and adjacent to the structure being protected. In the event any question exists whether such device is required, the final decision shall be made by the District Engineer.

The connection may be made by means of a private manhole, or by a wye spliced into the existing private sewer or stub installed by means of a tap made by "Tap Tite" or approved equal, as shown on the District Standard Plans.

Actual connection of a new private sewer to an existing private sewer will not be permitted until the new sewer has been satisfactorily tested. If authorized by the Engineer, a test wye may be used with a plug in lieu of leaving a temporary gap in the sewer.

2.08 CONNECTION TO BUILDING DRAIN (PLUMBING KICK-OUT)

After a permit authorizing said construction has been issued, private sewers may be constructed up to a point five (2) feet from the building wall. Actual connection of the private sewer to the building drain (building plumbing) will not be permitted until the main sewer or private sewer to which it connects has been accepted by the District and the subject private sewer has been satisfactorily tested in accordance with Volume II, Section 7.

Actual connection must be done by a sewer contractor with a valid sewer construction permit issued by the District. Work must be done in the presence of and to the satisfaction of the Engineer.

2.09 CLEARANCES

1. When a building sewer crosses another utility, a vertical clearance of at least six (6) inches shall be maintained, unless otherwise permitted by the Engineer.
2. Unless otherwise permitted in the UPC, building sewers and other utilities shall be kept sufficiently separated to be laid in separate trenches.

2.10 SEWER UNDER OR NEAR STRUCTURES

1. Any sewer deeper than the footing of any building or structure and paralleling the same must be designed to be of sufficient distance from the footing so that no part of the trench will fall within a 45-degree line drawn downward from the bottom of the footing.
2. Any sewer than crosses under a structure or retaining wall shall be installed in a casing.

2.11 MINIMUM PIPE COVER

Minimum cover for private lateral sewers shall be:

1. Not less than three (3) feet of cover at property line without the Engineer's approval.
2. Not more than five (5) feet cover at the property line.
3. Not less than (12) inches of cover at the building plumbing connection.

Cover requirements for other pipe materials and sizes will be based on their strength characteristics as approved by the Engineer.

2.12 TRENCH INTERSECTIONS

Avoid non-perpendicular crossings/intersections between the sanitary sewer and other underground utilities.

2.13 HORIZONTAL UTILITY CLEARANCE

A minimum horizontal clearance of five (5) feet should be maintained between the private sewer and adjacent underground utility lines and concrete curbs. A minimum horizontal clearance of ten (10) feet should be maintained between the private sewer and parallel water mains or services.

2.14 STRUCTURE TYPE AND LOCATION

A. PRIVATE MANHOLE

For private sewers eight (8) inches in diameter and larger, private manholes must be constructed with a maximum spacing of 300 feet, at changes in horizontal or vertical direction and at other locations required by the Engineer. They may be used on smaller private sewers in lieu of cleanouts.

A control manhole is required on the private sewer serving each user in an industrial building, as required by the Engineer in accordance with District Ordinances.

B. CLEANOUT TO GRADE "C.O.T.G."

A cleanout shall be constructed on four (4) inch and six (6) inch sewer laterals at intervals not to exceed 100 feet, as well as at blind bends greater than 45-degrees. See Section "C" below for requirements at connection to building plumbing. Also see "A" above for use of manholes in lieu of cleanout to grade for private sewers. No cleanout is required on runs less than 10 feet in length (See Volume II, Section 3.04 of these Standard Specifications).

C. TWO-WAY CLEANOUT TO GRADE

Two-way cleanouts shall be constructed on all four (4) inch sewers at the connection of the private sewer with the plumbing drain. This cleanout shall be located no further than two (2) feet from the building wall and protected with an approved box. (See Volume II, Section 3.05 of these Standard Specifications). Each building lateral shall have a vent, trap and cleanout. The vent riser shall be extended a minimum of four (4) inches above finished grade, but not higher than the elevation of the lowest plumbing fixture attached to the building drains. Building lateral cleanouts shall be installed at intervals not to exceed 100 feet of straight runs and at all changes in alignment exceeding 22-1/2 degrees. They shall be extended to finished grade, and be placed in a concrete, or other approved yard box with removable lid. The entire assembly shall have adequate strength to resist applied loads.

D. OTHER STRUCTURES

Other required structures will be located as shown on approved Plans and be constructed in accordance with District requirements.

2.15 OVERFLOW DEVICES

Overflow protection devices shall be installed on all private sewers. The particular device to be used and its installation must be approved by the Engineer. This device will be required on all residential and commercial buildings.

2.16 NUMBER OF PRIVATE SEWERS REQUIRED

See Volume I, Section 7.05 of these Standard Specifications.

2.17 PRIVATE PUMPING STATIONS

Private pumping stations should be avoided if possible. Private pumping stations must be approved by the Engineer. The pumping stations should be designed and stamped by a California registered civil engineer. Submittals, including design calculations, flows, pump information, etc., shall be made to the Engineer. Minimum requirements for private pumping stations are provided in Volume III, Section 4 of these Standard Specifications.

2.18 NEW UTILITIES CROSSING EXISTING SEWER MAINS AND PRIVATE LATERALS

A. New utilities shall be installed with a minimum of 12-inches of clearance when crossing an existing sewer main or private lateral.

B. If requested by the District, existing sewer main or private lateral shall be CCTV inspected prior to and after installation of new utility.

C. If requested by the District, submit work plan and provide final clearance measurement of crossing utility.

SECTION 3 - DESIGN AND POLICY STANDARDS FOR PRIVATE MAINS

3.01 GENERAL

Private mains shall be designed and constructed per the requirements in Volume II, Section 3. However, the minimum slope of a 4-inch private main shall be 2%, and the minimum slope of a 6-inch (or larger) private main shall be 1%.

The owner/developer shall enter into a Private Main Agreement with the District.

SECTION 4 – PUMP STATIONS

4.01 PUMP STATIONS

A. GENERAL

1. Public pumping stations serving more than one parcel are not normally allowed. They may be considered under extraordinary circumstances, but only by specific approval by the District Engineer during the preliminary design stages. If a public pump station is allowed, the planning and design must consider at a minimum, but not limited to, the following:
 - a. SCADA
 - b. Remote Monitoring with redundant alarm notification
 - c. Noise
 - d. Backup Power
 - e. Corrosion
 - f. Odor
 - g. Pumping Equipment
 - h. Electrical Equipment
 - i. Telemetry
2. Further conditions are provided in this section. They should be considered minimum conditions for use in the basis of design.
3. Plans and specifications for all lift stations are to be prepared by a Registered Professional Engineer and submitted to the District for review and approval.

B. HYDRAULICS

1. Design Conditions:
 - a. Minimum force main velocity: 2 fps
 - b. Maximum force main velocity: 8 fps
 - c. Minimum inlet pipe slope: 2%

2. Firm-capacity for the lift station is defined as the pumping capacity for the facility with the largest pump out of service.
3. The preferred operating region (POR) for a given pump is between 70% and 120% of the flow at the best-efficiency-point (BEP). Use the pump speed affinity relationships to estimate the BEP at reduced speeds.
4. Design the lift station to serve the entire tributary area using build-out densities that conform to the District's most recent capacity study based on the City's or County's latest General Plan.
5. The lift station must be capable of operating within the POR at all flows between the firm-capacity and one quarter of the firm-capacity.
6. The ratio of minimum net positive suction head available (NPSHa) to net positive suction head required at BEP (NPSHr) must be 2.0 or greater.
7. Pump station design calculations shall address surge and "water hammer," and, if required, surge control shall be provided.
8. Unless waived by the District Engineer, a hydrogen sulfide study will be required. Corrosion control and odor control may be required based on the results of the hydrogen sulfide study.

C. PUMPS AND MOTORS

1. All pumps shall be designed to handle solids and must be capable of passing a minimum 3-inch diameter sphere.
2. All pumps shall be identical.
3. All pumps shall be fitted with 240/480 VAC, 3-phase, premium-efficiency, inverter-duty motors except as approved by the District Engineer.
4. Brake horsepower shall not exceed the nominal rating of the motor between shutoff and the maximum flow shown on the manufacturers' published performance curves.
5. The service factor for all motors shall be 1.15.
6. Provide thermal and seal minder overload protection for all pump motors.

7. Provide a spare mechanical seal and other spare parts as recommended by the pump manufacturer.

D. WET WELL

1. Working capacity of the wet well is defined as the volume between the maximum and minimum normal operating levels.
2. Wet well shall have enough working capacity to prevent any pump from starting more than four times per hour.
3. Wet wells shall be designed in accordance with Hydraulic Institute Standard No. 9.8 (Pump Intake Design), except as noted otherwise in this standard.
4. Set the high-level alarm at the invert elevation of the nearest upstream manhole. Provide a minimum clearance of six (6) inches between the maximum normal operating level and the high-level alarm.
5. Set the low-level alarm at least one foot above the motor (for submersible pumps), and at least three feet above the suction bell. Provide a minimum clearance of six (6) inches between the minimum normal operating level and the low-level alarm.
6. Design the wet well to counteract the effects of buoyancy due to high groundwater conditions. The groundwater elevation used for design shall be determined by a licensed geotechnical engineer. Ground surface may be used as groundwater level in lieu of a Geotechnical Report.
7. Wet well shall be constructed using reinforced concrete. Concrete mix design shall be suitable to resist damage from sulfides.
8. Wet wells shall be lined with GSE 5 mm HDPE Studliner in accordance with manufacturer's recommendations.
9. Penetrations into the wet well shall resist infiltration and exfiltration.

E. PIPING AND VALVES

1. Provide a control gate or plug valve on the wet well inlet to permit isolation of the wet well.
2. Provide a plug valve and rubber flapper style check valve on the discharge of each pump. Plug valves shall be non-lubricated neoprene faced eccentric. Check valves shall be installed in the horizontal plane.

3. Buried pressure piping shall be AWWA C151 ductile iron or C900/C905 PVC with AWWA C110 and/or HDPE with mechanical joint fittings.
4. Provide mechanical joint restraint at all fittings and pipe joints. Thrust blocks are permitted only if mechanical joint restraint is not feasible.
5. Design pressure piping to maintain velocities between 2 ft/s and 8 ft/s.
6. Design gravity piping in accordance with the District's standard for sewer construction.
7. Provide a connection to the force main to permit bypass pumping. Coordinate sizing and connection details with District staff.
8. Provide restrained flanged coupling adapters to permit removal of all valves, meters, and other mechanical equipment connected to the piping.
9. District Engineer will determine if swabbing or pigging facilities are required at the lift station. If so, all downstream piping and related equipment shall be designed to accommodate this appurtenance. Launching facility will be detailed on lift station plans and must accommodate using lift station pumps for propulsion. Provide all necessary valving. Contact the District for suggested design requirements.

F. ELECTRICAL EQUIPMENT

1. Install all major electrical equipment, including utility meter and main circuit breaker enclosures, panel boards, control panels, and motor control centers outside of hazardous areas, as defined in the National Electric Code, Article 500.
2. Provide utility meter and main circuit breaker in an overall 316 stainless steel enclosure rated NEMA 4X with a viewing window centered on the utility meter.
3. Provide NEMA 4X, 316 stainless steel enclosures for electrical equipment and control devices where ventilation or air conditioning of the devices is required. Provide NEMA 4X, 316 stainless steel enclosures for all other equipment and devices.
4. Provide OSHA approved rubber mat in front of all indoor control panels.
5. Provide industrial LED strip fixtures in the building interior.

6. Provide an exterior light in accordance with STD #601. Provide 12-inch diameter pole-mounted LED luminaires at 120V.
7. Provide a NEMA combination motor starter. Manufacturer: Allen Bradley, CUTLER-HAMMER, or equal.

G. INSTRUMENTATION AND CONTROLS

1. No flow tube or flow meter required, unless stated by the District Engineer.
2. Provide Siemens Hydromanager for continuous level monitoring in the wet well.
3. Provide discrete level float switches for high-high level and low-low wet well level alarms.
4. Provide a programmable logic controller (PLC) and human-machine interface (HMI) for monitoring all instrumentation signals, alarm conditions, and pump control. Provide a minimum of 20% spare I/O capacity. Manufacturer and model shall be approved by the District Engineer.
5. Develop Local Operator Interface (LOI) for the District's SCADA system. Coordinate screen development with District Engineer.
6. Provide facility for pump testing.

H. TELEMETRY

1. Control Panels. All control panels will have the following general features.
 - a. Panel design will incorporate the following features:
 - 1) LED lamp with switch.
 - 2) 120 VAC duplex convenience outlet.
 - 3) Provide 120 VAC uninterruptible power supply (UPS) APC SC620 or an equivalent DC voltage subsystem sized for 150% of peak load for all internal panel components for a minimum of 30 minutes run time.
 - 4) Provide documentation that adequate interface with the District's SCADA system is achievable to the satisfaction of the District Engineer.

STANDBY GENERATOR

1. A standby generator is required for all new pump stations. The following minimum requirements for the standby generator are as provided herein.
2. Provide permanently installed, natural gas generator with an automatic transfer switch. The generator's engine must meet the Monterey Bay Air Resources District (MBARD) emission standards.
3. Generator sizing calculations will assume loading based on lead pump running, lag pump starting, and full operation of all electrical equipment at the site.
4. Provide instrumentation:
 - a. Generator voltage, frequency, and amp meters.
 - b. Oil pressure gauge.
 - c. Battery volt meter.
 - d. Water temperature gauge.
 - e. Hour meter.
 - f. External battery with trickle charge.
 - g. Dry contacts for telemetry - showing generator running and generator failure.
5. Provide automatic shut-off and alarms:
 - a. Low engine oil pressure.
 - b. High engine temperature.
 - c. Over speed.
 - d. Over crank.
6. Provide sound attenuation as necessary to meet or exceed applicable noise standards for location. Attenuation may include silencers and/or insulation.

I. DETAILS REQUIRED ON IMPROVEMENT PLANS

1. Site Plan: Locations of power pole, transfer switch, emergency generator, grounding electrode, control panel, wet well, driveway, fencing, water service, emergency suction/discharge boxes. Provide site grading and drainage details.
2. Wet well: Influent piping (standard inside drop manhole); suction piping (min. 6 inches off bottom of manhole); emergency suction line; water/alarm levels (pump on, pump off, low level, high level), redundant high-water float switch.
3. Force main discharge details.

J. RECORD DRAWINGS AND MANUALS

1. Provide three (3) copies of approved record drawings and an electronic scan of the drawings in *.TIF or *.PDF format with a minimum 200 dpi resolution, and an electronic copy in AutoCAD latest version.
2. Provide three (3) copies of O&M Manuals plus an electronic copy when available.

K. BUILDING STRUCTURE

Pump station buildings shall be constructed of split-face concrete masonry unit (CMU) with standing-seam metal roofing unless otherwise approved by the District Engineer.

4.02 PACKAGED PUMP STATIONS

A. SYSTEM DESCRIPTION

Provide packaged sewer lift station system, shop assembled with basin, submersible, non-clog grinder pumps and single automatic control for in ground installation. Provide duplex system (one operating pump and one installed spare pump).

B. GENERAL REQUIREMENTS

1. Plans and specifications for lift stations shall be prepared by a California registered professional engineer and submitted to the District for review and approval.
2. Materials shall be corrosion resistant and rated for sewage service. Metal exposed to sewage environment must be stainless steel.
3. Manufacturer: Company specializing in manufacturing of packaged lift stations with minimum three years of experience.

4. Environmental: Comply with State of California, Department of Public Health Water Main Separation Criteria (Title 22).
5. Provide and install an approved reduced pressure (RP) backflow assembly for potable water service line to lot.

C. HYDRAULICS

1. As required for Pump Station per Section 4.01 (B)

D. PRODUCT REQUIREMENTS

1. General

- a. Station must have a cartridge type, easily removable core assembly containing: pump, motor, grinder, motor controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. Provide lifting hooks, mechanical and electrical disconnects with easy disconnect accessibility.
- b. Station must be maintainable without entry. Entry is not permitted without appropriate OSHA confined space permits.
- c. Station shall be free from electrical and fire hazards.
- d. Station shall be free from noise, odor or health hazards and shall have been tested by an independent laboratory to certify its capability to perform in sewer system applications.
- e. Provide NSF International seal on product as evidence of compliance.

2. Pump

- a. Provide identical, submersible, non-clog grinder pumps with stainless steel impellers, shredding rings, cutters, shafts and hardware.
- b. Pump capable of delivering negative total dynamic head without overloading the motor. Use of in-line piping or valves to create false apparent head is not permitted.

3. Motor

- a. 120/240V, 60Hz, single phase, 1800rpm max, non-overloading.
- b. Service factor: 1.15

- c. Provide thermal overload protection.
4. Basin
- a. Working capacity of the basin is defined as the volume between the maximum and minimum normal operating levels.
 - b. Basin shall have enough working capacity to prevent pumps from starting more than four times per hour.
 - c. Basin shall have capacity for emergency storage to accommodate a 1-day (24-hour) lift station outage during maximum day demand.
 - d. Design basin to counteract the effects of buoyancy due to high groundwater conditions. The groundwater elevation used for design shall be determined by a licensed geotechnical engineer. Ground Surface may be used as groundwater level in lieu of a Geotechnical Report.
 - e. Basin shall be suitable to prevent damage from sulfides, and use custom molded HDPE or fiberglass reinforced polyester resin.
 - f. Penetrations into the basin shall resist infiltration and exfiltration.
 - g. Basin shall be dual contained with a smooth internal wall to promote scouring.
 - h. Basin seams shall be thermally welded, factory tested and leak-proof.
 - i. Basin shall withstand saturated soil loads at maximum burial depth.
 - j. Basin Cover must be lockable and sufficient to withstand live load of 150 psf minimum. If basin cover is potentially accessible to vehicular traffic, provide HS20 rated cover.
 - k. Basin shall have integral bug-free vent, an inlet piping connection and a discharge piping connection
5. Packaged Lift Station Piping and Valves
- a. Provide stainless steel discharge piping and hardware.
 - b. Provide non-clog check valve.
 - c. Provide anti-siphon valve.

- d. Provide full port, stainless steel isolation valve.
6. Site Piping and Valves
- a. Force main piping: HDPE (SDR 11) or PVC (Schedule 80) with a minimum depth of cover of 3 feet.
 - b. Provide plug-style isolation valves for buried service with corrosion resistant valve stem extension, riser and cover plate labeled SEWER for basin inlet and force main to permit isolation of the basin.
 - c. Provide non-clog check valve immediately upstream of force main plug valve.
 - d. Connect inlet and force main piping to basin with flexible connector.
 - e. Valves and appurtenances shall use either of the following bolts and nuts:
 - 1) Fluoropolymer coated carbon steel: bolts (ASTM A307, Gr. B) and nuts (ASTM A563, Gr. A)
 - 2) 304 stainless steel: bolts (ASTM A193 Gr. B8M) and nuts (ASTM A194 Gr. 8).
 - f. Refer to Standard Plans for force main discharge.
7. Operations
- a. Level control: non-fouling level detection with no moving parts in direct contact with wastewater.
 - b. Level control points: "pump on," "pump off," and "high level" in basin. Start pump automatically when "pump on" set-point is activated. Stop pump automatically when "pump off" set-point is activated. Signal alarm condition automatically when "high level" set-point is activated.
 - c. Provide alarm dry contacts for "high level", "low level" and "power failure".
 - d. Sound, Vibration, and Thermal Control: Dampen or suppress noise, absorb vibration, accommodate thermal expansion and stresses, and adjust or correct for misalignment in piping systems.
8. Electrical
- a. Power/Alarm cable:
 - 1) Provide NEMA 6P MELTRIC brand quick disconnect.

- 2) Provide cable shroud and strain relief cord connector.
- 3) Provide cable for direct burial use.
- b. Back-up power: As an alternate to providing emergency storage within the basin, provide back-up power source to ensure continuous operations in the event of a power outage.
- c. Alarm/Disconnect Panel
 - 1) Corrosion resistant NEMA 4X rating
 - 2) UL listed.
- d. Wiring: in accordance with requirements of National Electrical Code.
- e. Provide Local Operator Interface (LOI) for the District's SCADA system. Coordinate screen development with District Engineer.

E. INSTALLATION REQUIREMENTS

- 1. Install per manufacturer's standard printed instructions if acceptable to the District Engineer.
- 2. Seal cover penetrations with manufacturer's recommended sealant.
- 3. Set cover frames and covers level to correct elevations without tipping.
- 4. Provide Basin anchorage.

F. STARTUP, INITIAL TESTING AND OPERATIONS

- 1. Notify the District three days prior to testing. Coordinate and operate pumps in conjunction with District.
- 2. Provide startup and initial testing of system. District must be present to observe testing (including retests).
- 3. Hydraulically test station to performance requirements by receiving, pumping and discharging 500 gallons of water to/from basin.
- 4. Correct failures during test by repairing or replacing malfunctioning parts or equipment or faulty workmanship.

5. After correcting failures, re-test. Repeat until failures are eliminated.
6. Confirm that general sequencing of pump and level control operations at basin and control panel are in accordance with performance requirements.
7. Document and certify lift station system startup and initial testing results in startup report. Submit startup report to the District for review and permitting approval. Do not operate lift station without a District-approved permit.

G. PROTECTION OF FINISHED WORK

1. Do not allow access to general public. Provide secure, lockable access.

H. DETAILS REQUIRED ON IMPROVEMENT PLANS

1. Site plan: Location of packaged sewer lift station, driveway, fencing, water services within 120 ft. Please see Monterey County Health Department Specifications for additional details required on improvement plans. Provide site grading and drainage.
2. Basin inlet piping and force main discharge details.

I. RECORD DRAWINGS

1. Provide three (3) copies of approved record drawings and electronic scan of the drawings in *.TIF or *.PDF format with a minimum 200 dpi resolution and an electronic copy in AutoCAD latest version.

4.03 PRIVATE PUMP STATIONS

A. GENERAL

1. Private individual pump stations shall not be allowed where an alternative gravity option exists.

B. GENERAL REQUIREMENTS

1. Tank size for a residence (additional fixtures shall be evaluated on a case-by-case basis) shall have a minimum capacity of 100 gallons for a duplex system, a minimum 100 gallons for a simplex system serving a washing machine or a single bathroom, and a minimum of 600-gallon capacity for a simplex system.
2. The tank design shall consider buoyancy and corrosion.

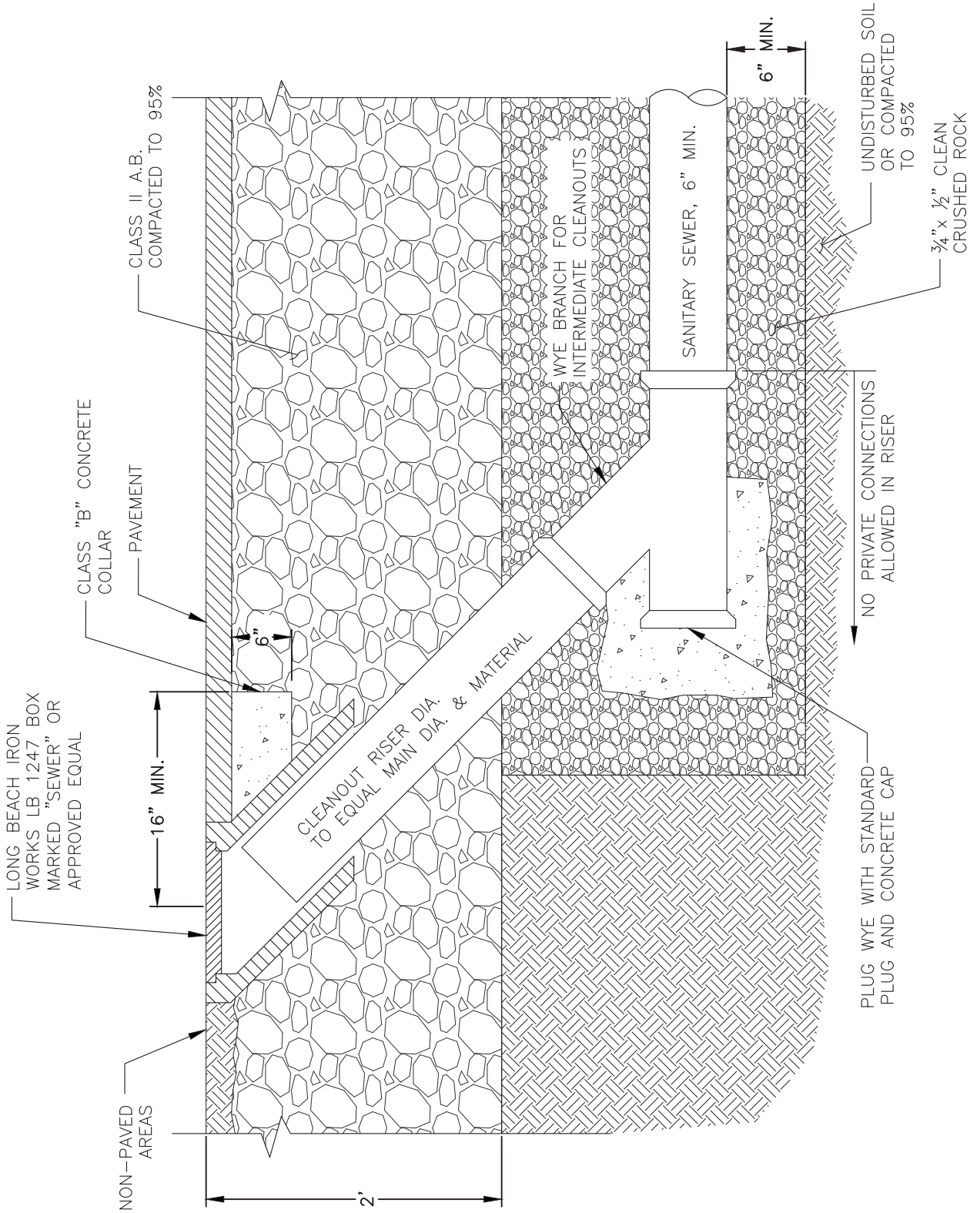
3. The outlet pipe material shall be a minimum of Schedule 40 PVC glue joint pipe. The outlet pipe shall be designed based on the pump size.
4. An audible and visible high-water alarm is required. The audible alarm shall be able to be heard throughout the house.
5. A check valve and gate valve are required downstream of each pump.
6. The pressure line from the pump system shall break to gravity flow prior to connecting to the sewer main.
7. If the pressure line is connected to a gravity private lateral, a District-approved overflow device shall be installed outside next to the foundation upstream of the connection point.
8. Private individual pump stations are not allowed within street right-of-way.
9. All work shall conform to the latest Uniform Plumbing, Electrical, and Building Codes. City or County building permit are required unless otherwise directed by the District Engineer.
10. Designs shall be submitted to the District for review and approval.

STANDARD PLANS

STANDARD PLANS

- SS-1 – Sanitary Sewer Flushing Cleanout
- SS-2 – Standard Residential Private Lateral up to 4' Deep
- SS-3 – Standard Residential Private Lateral Deeper than 4'
- SS-4 – Sewer Lateral Crossing Utility, No Conflict in Grade
- SS-5 – Simple Sewer Lateral Break with Conflict in Grade
- SS-6 – Sewer Lateral Layout 1
- SS-7 – Sewer Lateral Layout 2
- SS-8 – Drop Type Manhole
- SS-9 – Standard Pre-Fab Manhole 21" Diam. Or Less
- SS-10 – Standard Pre-Fab Manhole 24" and 27" Diam. Pipe
- SS-11 – Standard Manhole Notes
- SS-12 – Barrel Section Joints for Standard Pre-Fab Manhole
- SS-13 – Typical Manhole Using Impression Ring
- SS-14 – Pre-Cast Concrete 48"x24" Reducer Slab for Manholes
- SS-15 – Typical Method for Setting Appurtenances
- SS-16 – Standard 24" Manhole Frame and Cover
- SS-17 – Bolt-Down 24" Manhole Frame and Cover
- SS-18 – 36" Diameter Manhole Frame and Cover
- SS-19 – Standard Casing Installation
- SS-20 – Redwood Check Dam
- SS-21 – Trench Dams
- SS-22 – Earth Trench Dam
- SS-23 – Two Stage Sand and Grease Interceptor
- SS-24 – Standard Trench Section
- SS-25 – Standard Tracer Wire Installation Detail
- SS-26 – Abandoned Pipe Plug
- SS-27 – Abandoned Manhole
- SS-28 – Abandoned Sewer Lateral
- SS-29 – Sewer Saddle Connection Detail

NOTE: CLEANOUT SHALL MATCH EXISTING A.C. PAVEMENT ELEVATION AND WILL NOT BE PERMITTED BELOW GRADE.



CARMEL AREA WASTEWATER DISTRICT



TITLE

**SANITARY SEWER
FLUSHING CLEANOUT**

DATE: JAN 2019

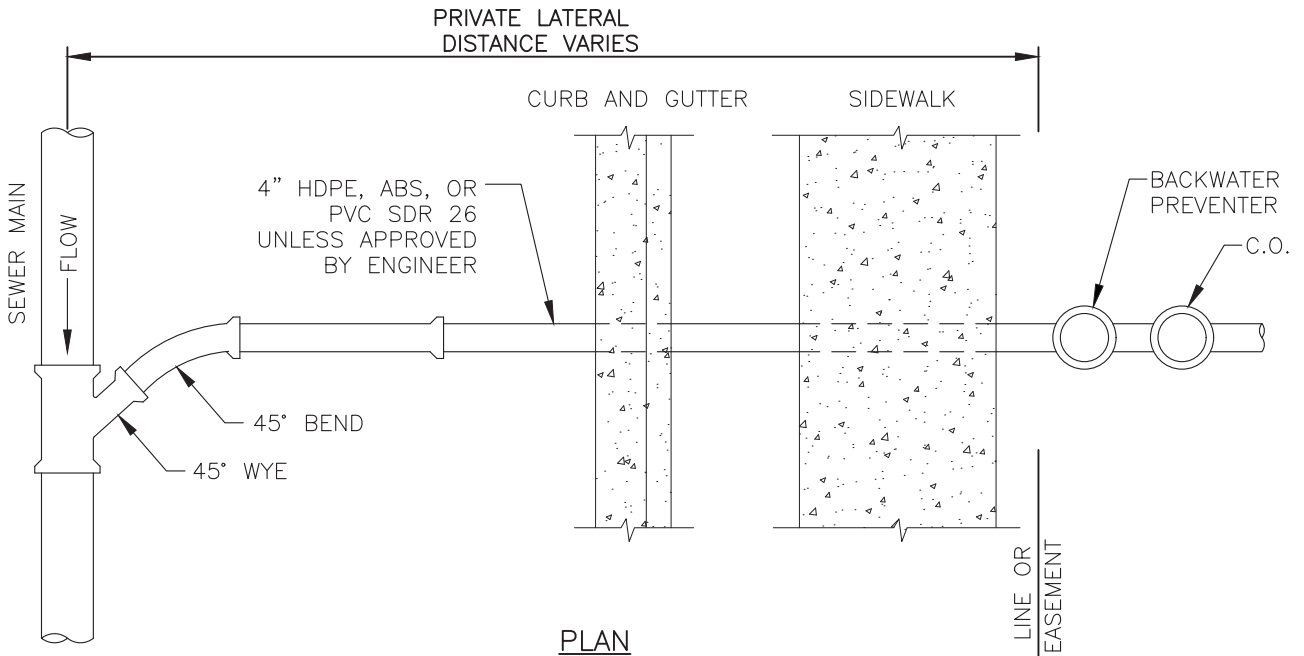
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APPROVED BY: *CP. Yather*

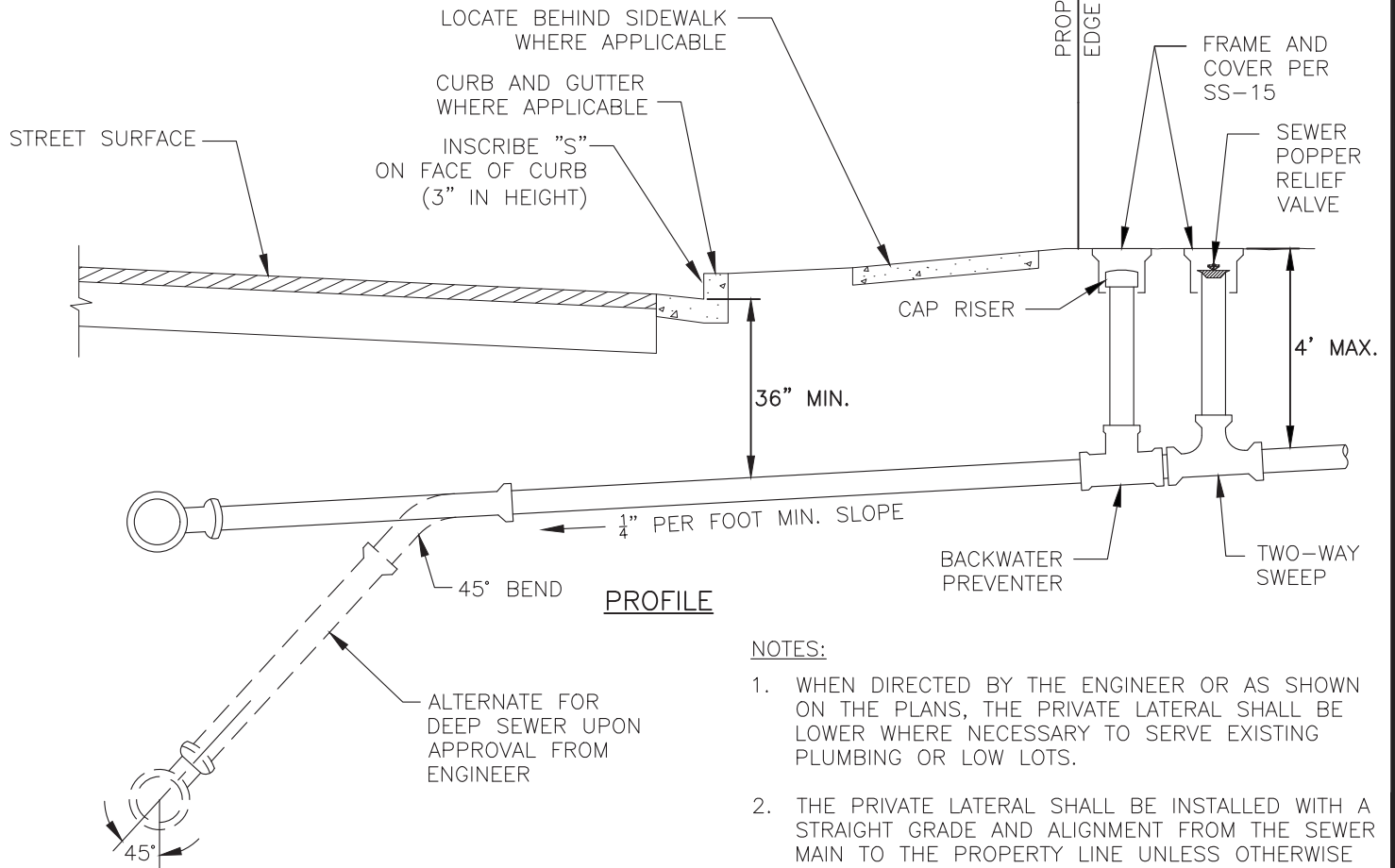
SCALE: NONE

DRAWING NO.

SS-1



PLAN



PROFILE

NOTES:

1. WHEN DIRECTED BY THE ENGINEER OR AS SHOWN ON THE PLANS, THE PRIVATE LATERAL SHALL BE LOWER WHERE NECESSARY TO SERVE EXISTING PLUMBING OR LOW LOTS.
2. THE PRIVATE LATERAL SHALL BE INSTALLED WITH A STRAIGHT GRADE AND ALIGNMENT FROM THE SEWER MAIN TO THE PROPERTY LINE UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

CARMEL AREA WASTEWATER DISTRICT



TITLE
**STANDARD RESIDENTIAL
 PRIVATE LATERAL
 UP TO 4' DEEP**

DATE: **JAN 2019**

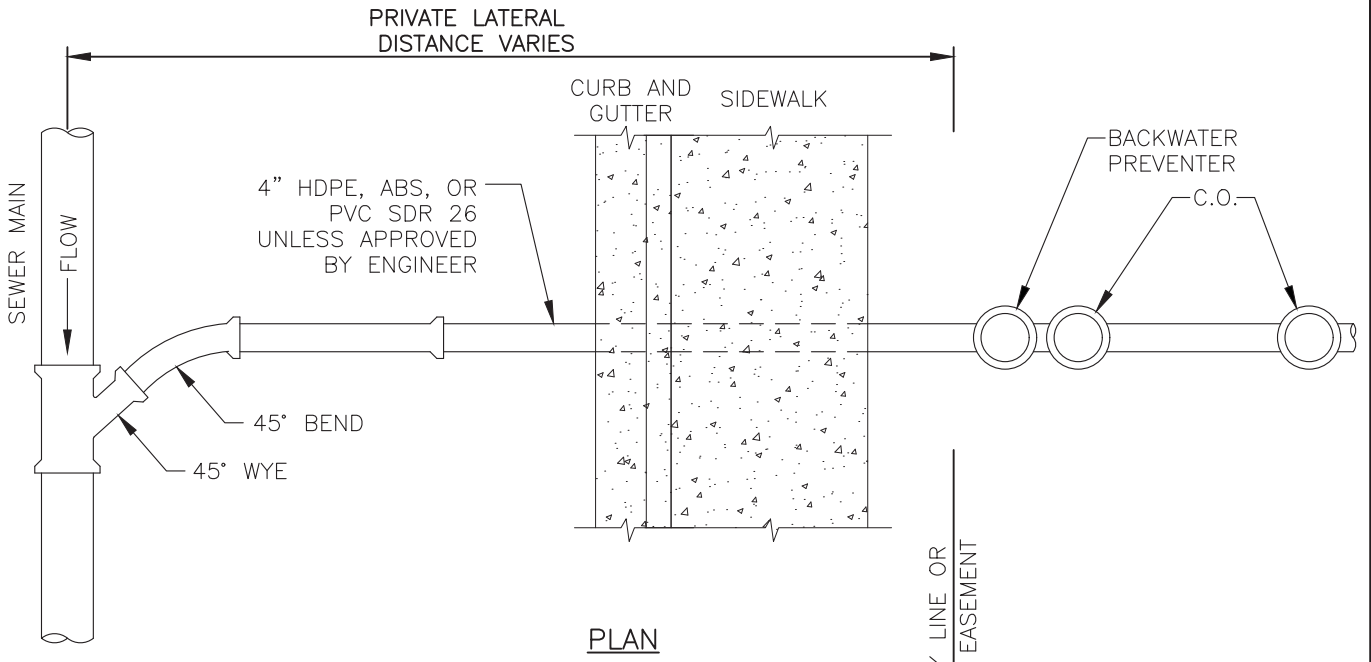
CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

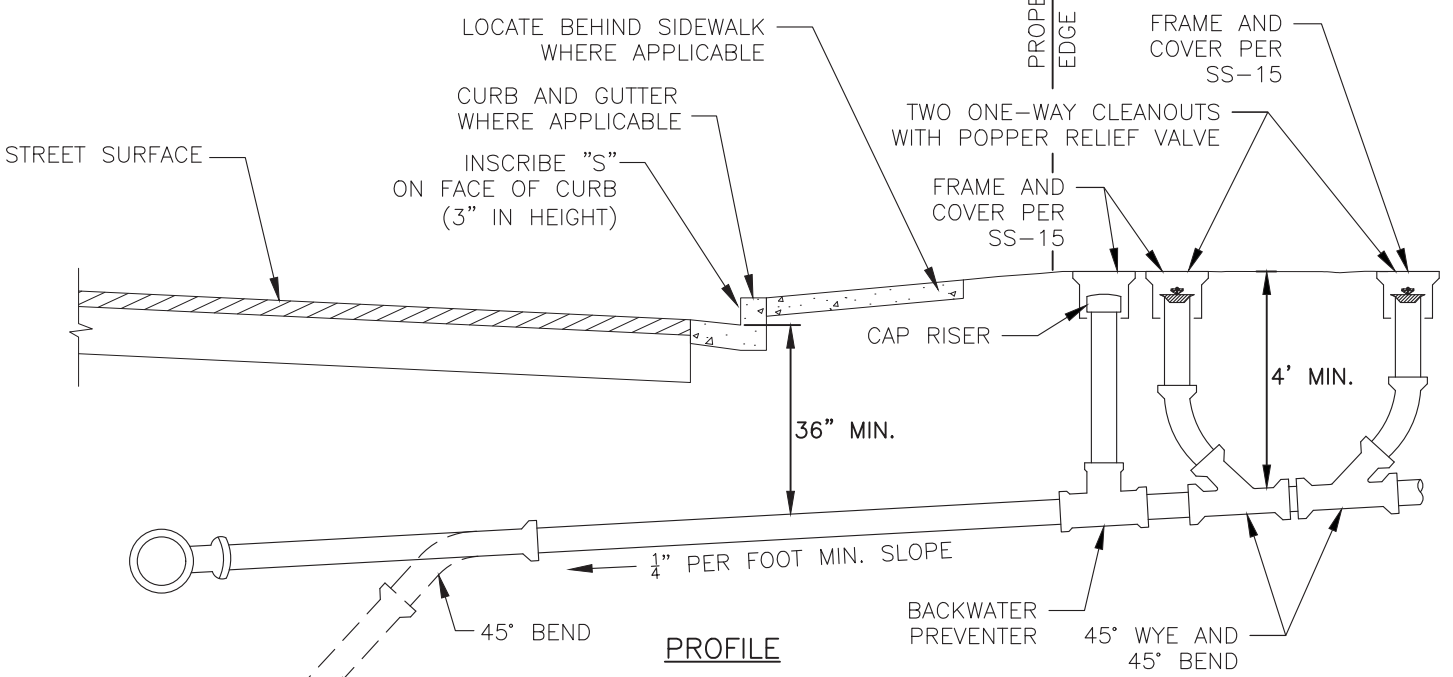
SCALE: **NONE**

DRAWING NO.

SS-2



PLAN



PROFILE

NOTES:

1. WHEN DIRECTED BY THE ENGINEER OR AS SHOWN ON THE PLANS, THE PRIVATE LATERAL SHALL BE LOWER WHERE NECESSARY TO SERVE EXISTING PLUMBING OR LOW LOTS.
2. THE PRIVATE LATERAL SHALL BE INSTALLED WITH A STRAIGHT GRADE AND ALIGNMENT FROM THE SEWER MAIN TO THE PROPERTY LINE UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

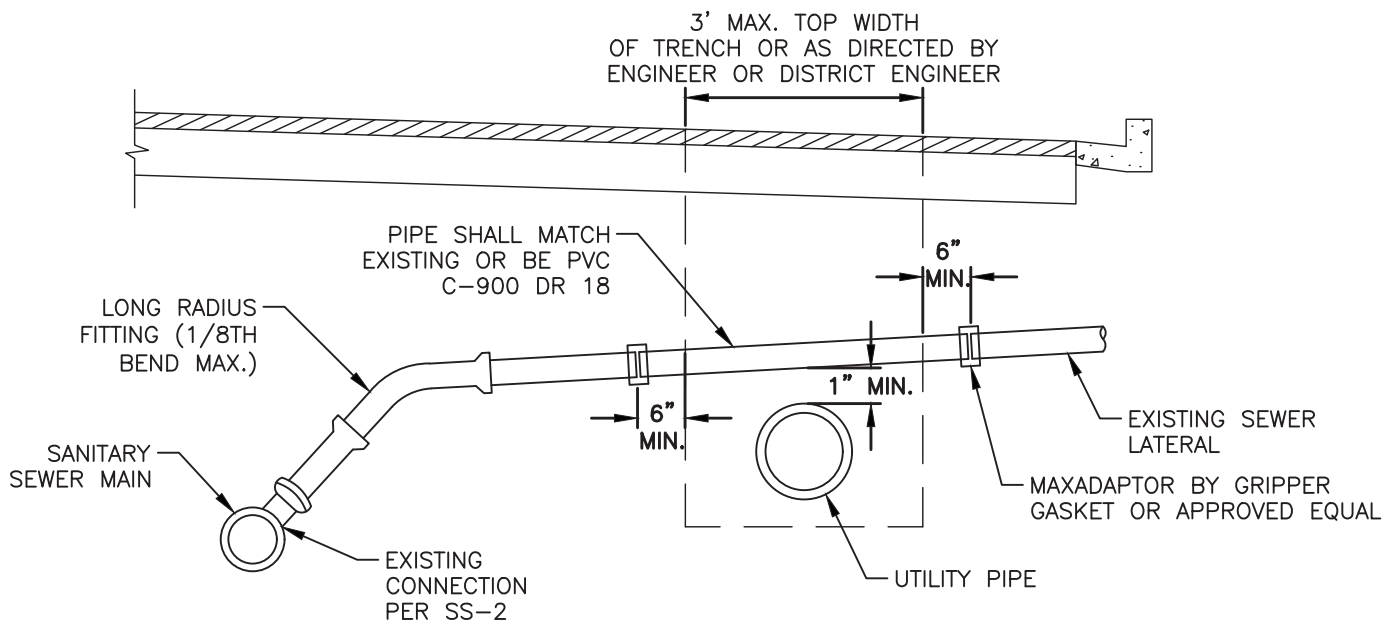
CARMEL AREA WASTEWATER DISTRICT



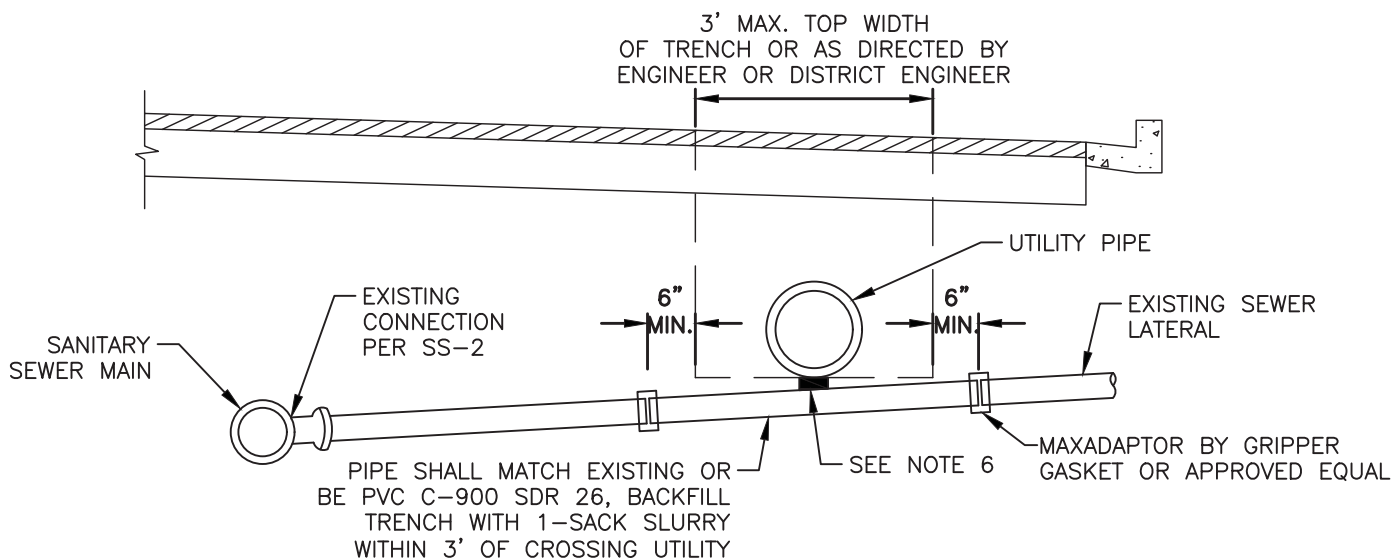
TITLE
**STANDARD RESIDENTIAL
 PRIVATE LATERAL
 DEEPER THAN 4'**

DATE: **JAN 2019**
 CHECKED BY: *John Pappas*
 APPROVED BY: *CP. Hatcher*
 SCALE: **NONE**

DRAWING NO.
SS-3



TYPICAL LATERAL CROSSING OVER UTILITY (EXCLUDING WATER)



TYPICAL LATERAL CROSSING UNDER UTILITY (EXCLUDING WATER)

PROCEDURE:

1. TRIM LATERAL SEWER PIPE BACK TO A CLEAN CUT UNDAMAGED END, A MINIMUM OF 6" INTO TRENCH WALL.
2. CUT PIECE OF NEW PIPE OF EQUAL DIAMETER TO FIT SPACE BETWEEN TRIMMED ENDS WITH A MAXIMUM CLEARANCE OF 1/4 INCH AT EACH END.
3. REMOVE PIPE STOP RING FROM ONE COUPLING AND INSTALL THE COUPLING ON THE UPSTREAM END OF THE LATERAL SEWER, THEN PLACE ANOTHER COUPLING ON THE DOWNSTREAM END.
4. PLACE AN ADAPTOR RING OF THE PROPER SIZE ON EACH END OF THE PIPE REPLACEMENT SECTION, THEN INSERT ONE END IN THE COUPLING DOWNSTREAM CENTERING IT OVER THE JOINT, TIGHTEN COUPLING BANDS.
5. A SMALL AMOUNT OF LIGHT OIL WILL AID IN SLIDING UPSTREAM COUPLING.
6. WHEN O.D. OF PIPES ARE WITHIN 1 INCH OF EACH OTHER, PLACE A 4"x4" PAD OF 35-45 DUROMETER RUBBER SNUGLY BETWEEN THE PIPES.

NOTE: ALTERATIONS OF SEWER GRADES WILL BE PERMITTED ONLY AFTER WRITTEN PERMISSION HAS BEEN RECEIVED FROM THE DISTRICT ENGINEER.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**SEWER LATERAL
CROSSING ABOVE UTILITY
NO CONFLICT IN GRADE**

DATE:

JAN 2019

DRAWING NO.

CHECKED BY:

John P. Pappas

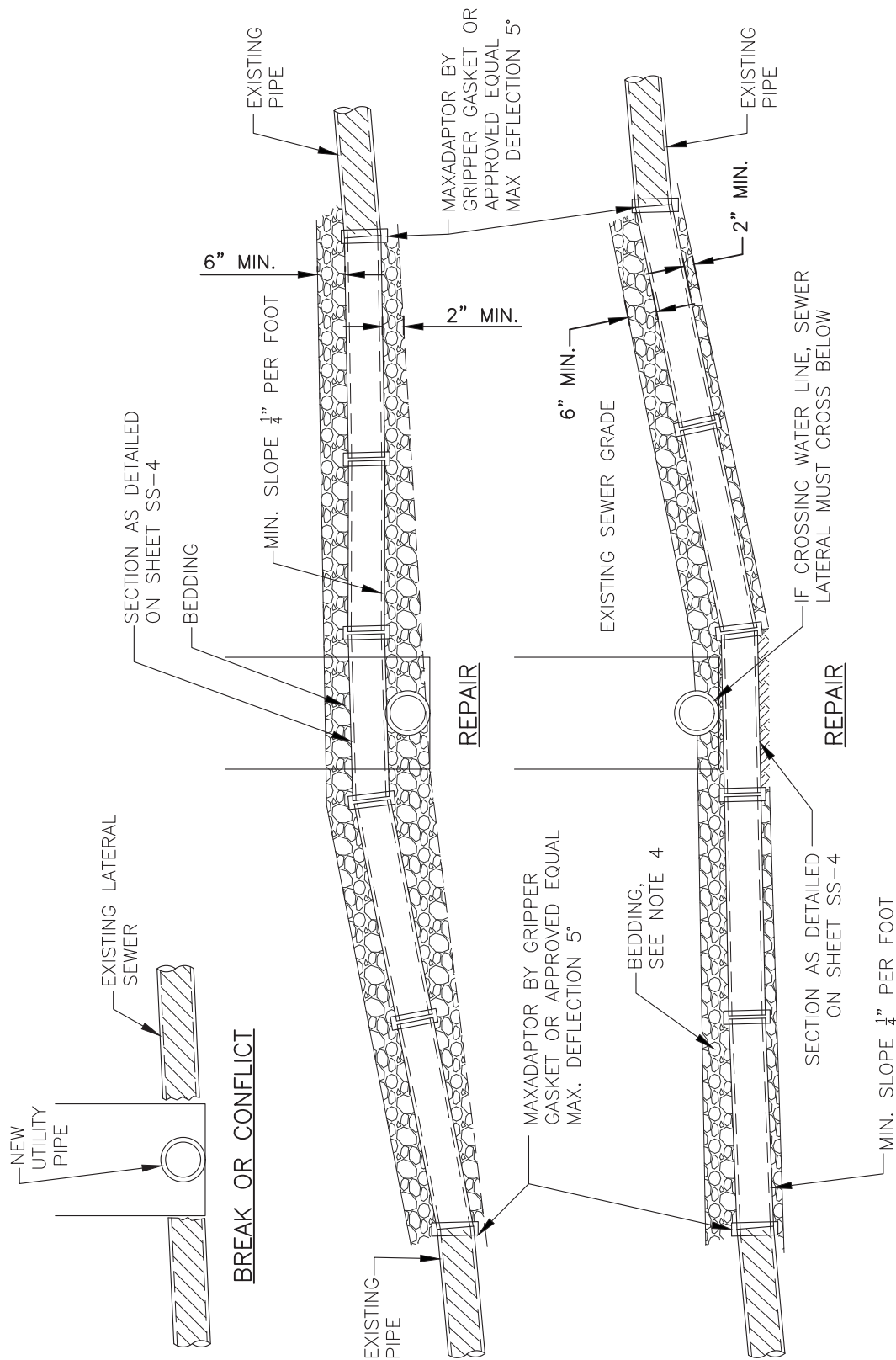
APPROVED BY:

W.P. Hatcher

SS-4

SCALE:

NONE



PROCEDURE:

1. 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.
2. IF IT IS NOT POSSIBLE TO MOVE THE UTILITY LINE, WRITTEN PERMISSION SHALL BE ACQUIRED FROM THE DISTRICT ENGINEER TO RELOCATE THE SEWER LINE.
3. THE SEWER LINE SHALL BE RELOCATED IN ACCORDANCE WITH ONE OF THE DETAILS ABOVE AND THE STANDARD SPECIFICATIONS OF THE DISTRICT.
4. BEDDING SHALL BE CRUSHED ROCK OR CLASS II A.B. COMPACTED TO MIN. 90% MAXIMUM DENSITY.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**SIMPLE SEWER
LATERAL BREAK
WITH CONFLICT IN GRADE**

DATE: **JAN 2019**

CHECKED BY: *John Pappas*

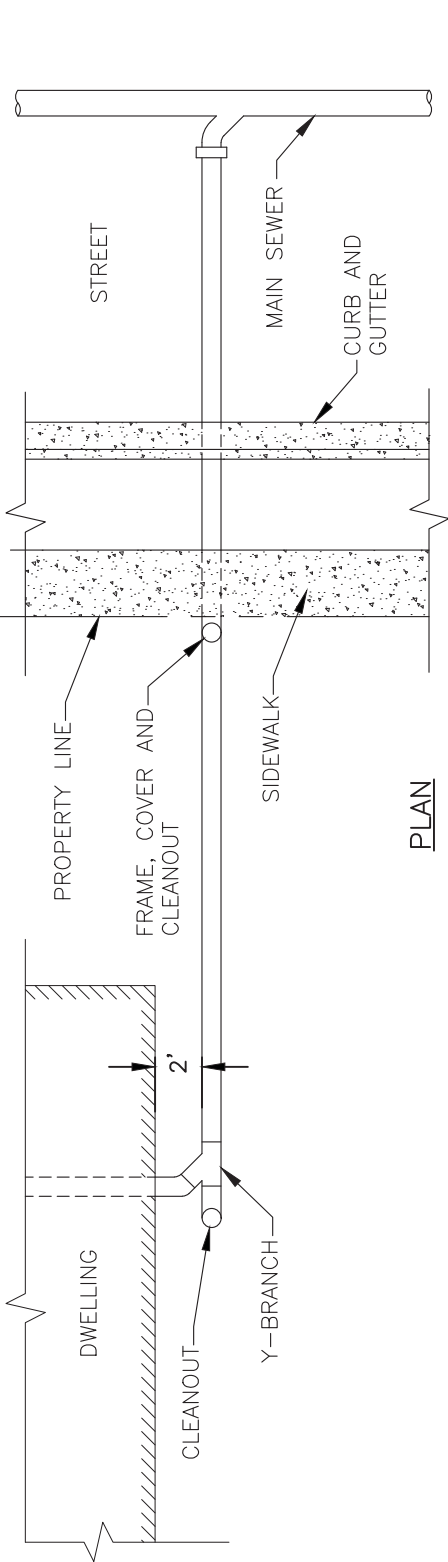
APPROVED BY: *CP. Hatcher*

SCALE: **NONE**

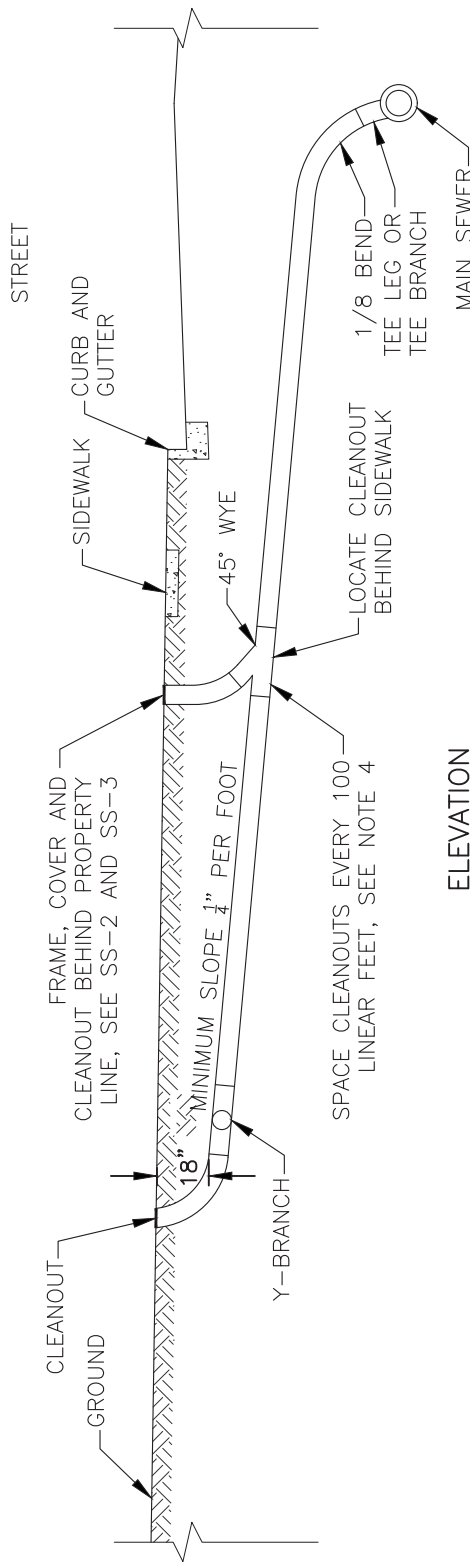
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SS-5

PRIVATE LATERAL ENDS AT SEWER TRUNK LINE CONNECTION
TRUNK LINE CONNECTION IS THE RESPONSIBILITY OF PRIVATE ENTITY



PLAN



ELEVATION

NOTES:

1. CLEANOUT AT JUNCTION OF LINE ENTERING DWELLINGS CONSISTS OF WYE-BRANCH, NIPPLE, 45° BEND, SUFFICIENT PIPE TO BRING CLEANOUT TO SURFACE OF GROUND, AND A WATER PROOF CAP.
2. ALL SEWER LATERALS SHALL BE AT RIGHT ANGLES TO MAIN SEWER UNLESS OTHERWISE APPROVED BY THE DISTRICT ENGINEER.
3. USE 4" PVC PIPE FROM MAIN SEWER TO AND INCLUDING CLEANOUT.
4. THE LAST CLEANOUT BEFORE THE PROPERTY LINE MUST BE A TWO-WAY CLEANOUT AND BACKWATER PREVENTER PER SS-2 IF 4' DEEP OR LESS AND PER SS-3 IF DEEPER THAN 4'.

CARMEL AREA WASTEWATER DISTRICT



TITLE

SEWER LATERAL LAYOUT 1

DATE: JAN 2019

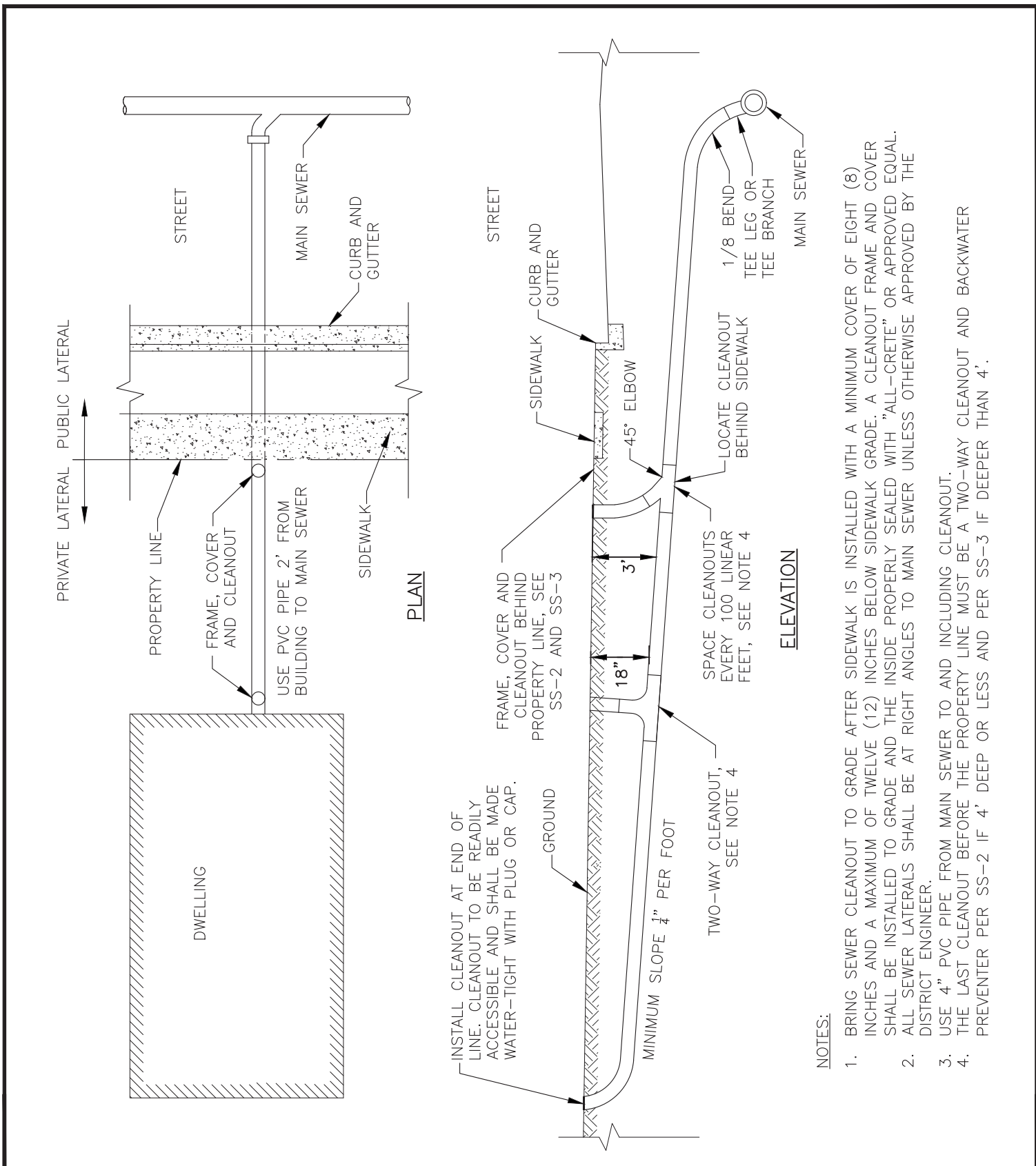
CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

SCALE: NONE

DRAWING NO.

SS-6



- NOTES:**
- BRING SEWER CLEANOUT TO GRADE AFTER SIDEWALK IS INSTALLED WITH A MINIMUM COVER OF EIGHT (8) INCHES AND A MAXIMUM OF TWELVE (12) INCHES BELOW SIDEWALK GRADE. A CLEANOUT FRAME AND COVER SHALL BE INSTALLED TO GRADE AND THE INSIDE PROPERLY SEALED WITH "ALL-CRETE" OR APPROVED EQUAL.
 - ALL SEWER LATERALS SHALL BE AT RIGHT ANGLES TO MAIN SEWER UNLESS OTHERWISE APPROVED BY THE DISTRICT ENGINEER.
 - USE 4" PVC PIPE FROM MAIN SEWER TO AND INCLUDING CLEANOUT.
 - THE LAST CLEANOUT BEFORE THE PROPERTY LINE MUST BE A TWO-WAY CLEANOUT AND BACKWATER PREVENTER PER SS-2 IF 4' DEEP OR LESS AND PER SS-3 IF DEEPER THAN 4'.

CARMEL AREA WASTEWATER DISTRICT



TITLE

SEWER LATERAL LAYOUT 2

DATE: **JAN 2019**

CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

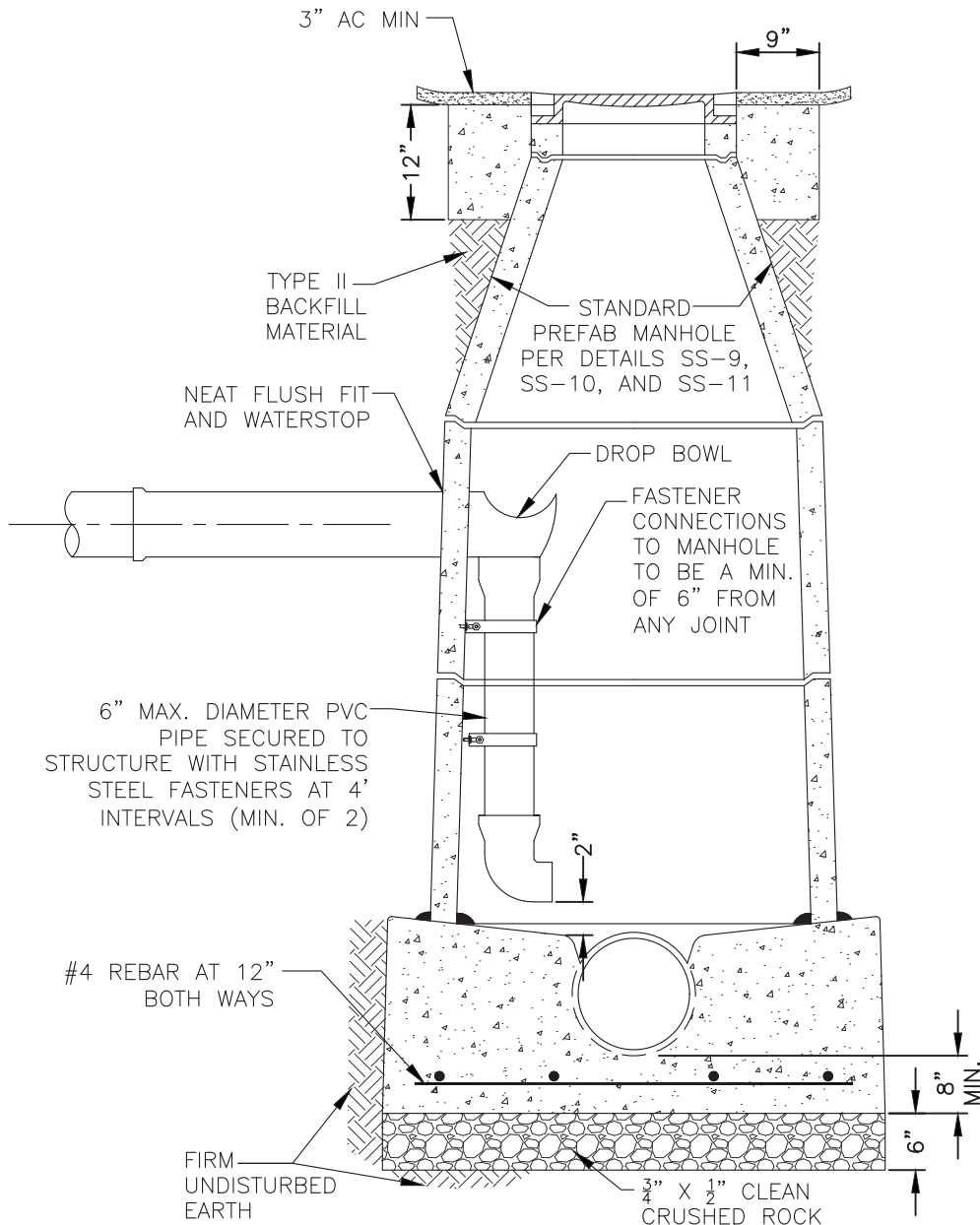
SCALE: **NONE**

DRAWING NO.

SS-7

GENERAL NOTES:

1. STOP ALL PIPE AT INSIDE WALL. FORM ALL CHANNELS THROUGH MANHOLES.
2. ALL CONCRETE SHALL BE CLASS "A".
3. DROP TYPE CONNECTION SHALL BE USED IF THE DIFFERENCE IN INVERT ELEVATION BETWEEN THE MAIN AND INTERSECTING PIPES IS GREATER THAN 2 FEET.
4. THE DROP TYPE MANHOLE IS SAME AS THE STANDARD MANHOLE EXCEPT FOR DROP TYPE CONNECTION.
5. DROP TYPE MANHOLE TO ONLY BE USED WITH APPROVAL OF DISTRICT ENGINEER.
6. DROP TYPE MANHOLE SHALL BE PVC LINED OR EQUAL AS APPROVED BY DISTRICT ENGINEER.
7. SEE DETAILS SS-9, SS-10, AND SS-11 FOR ADDITIONAL MANHOLE REQUIREMENTS.



CARMEL AREA WASTEWATER DISTRICT



TITLE

**DROP TYPE
MANHOLE**

DATE: **JAN 2019**

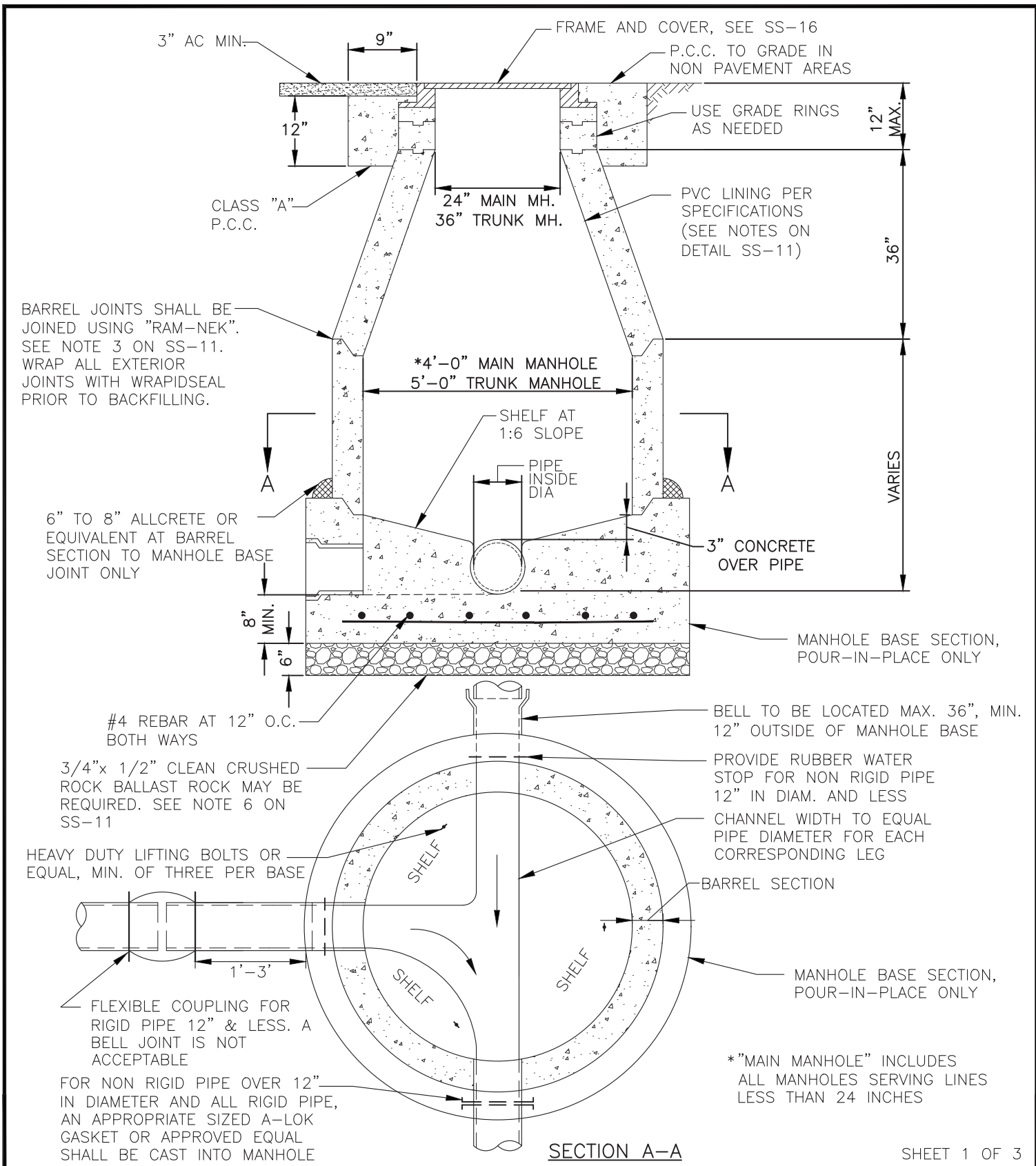
CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*


SCALE: **NONE**

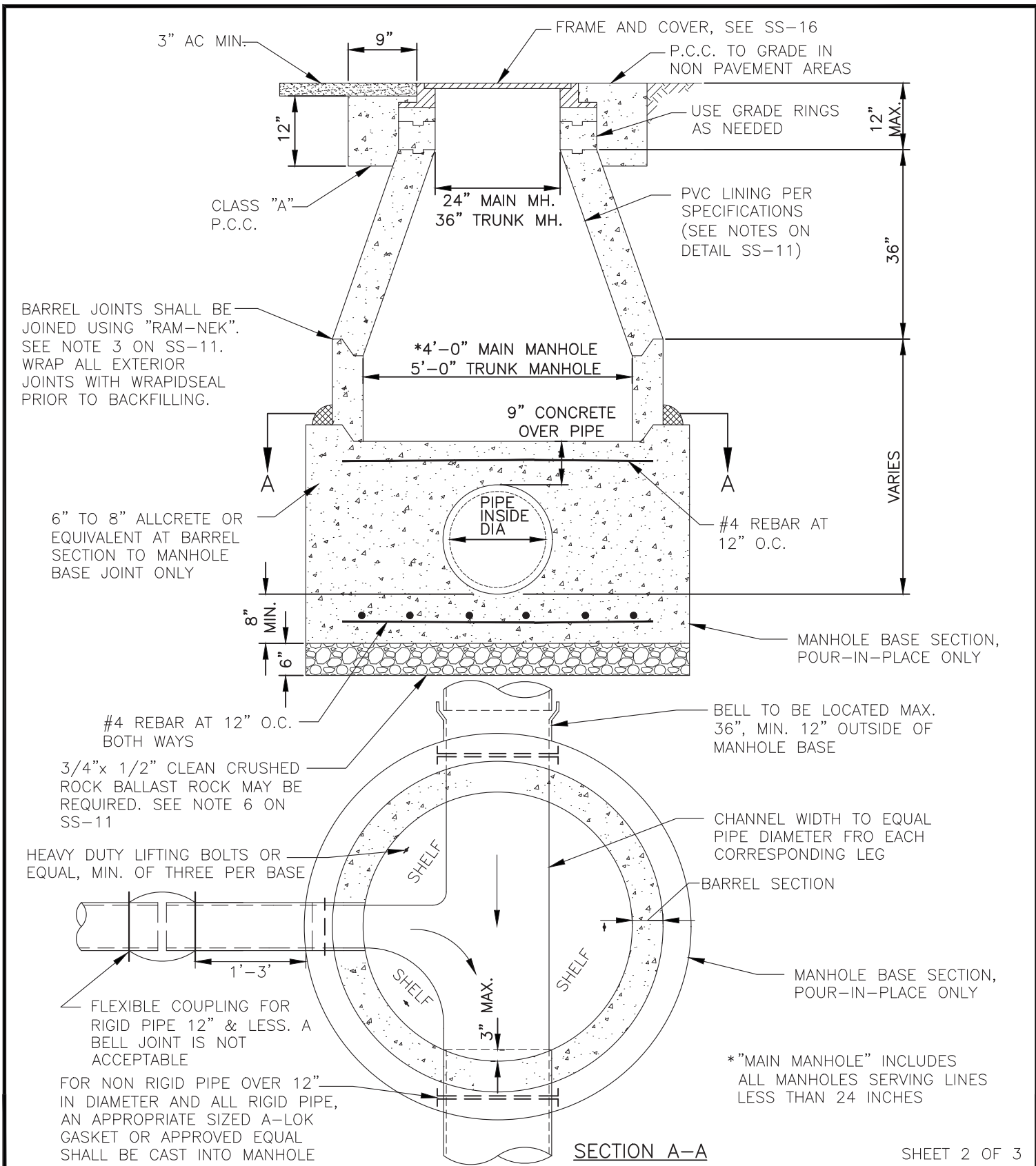
DRAWING NO.

SS-8



CARMEL AREA WASTEWATER DISTRICT

	TITLE	DATE:	JAN 2019	DRAWING NO.
	STANDARD PREFAB MANHOLE 21" DIAM. OR LESS	CHECKED BY:	<i>John Pappas</i>	SS-9
		APPROVED BY:	<i>CP. Hatcher</i>	
		SCALE:	NONE	



CARMEL AREA WASTEWATER DISTRICT



TITLE
**STANDARD
 PREFAB MANHOLE
 24" AND 27" DIAM. PIPE**

DATE: **JAN 2019**
 CHECKED BY: *John Pappas*
 APPROVED BY: *CP. Hatcher*
 SCALE: **NONE**

DRAWING NO.
SS-10

GENERAL NOTES

1. MANHOLE BASE SHALL BE CAST MONOLITHIC USING CLASS "A" PORTLAND CEMENT CONCRETE.
2. THE CENTER LINE OF THE MANHOLE FRAME SHALL COINCIDE WITH THE CENTER LINE OF THE SEWER MAIN.
3. ALL CONCRETE JOINTS SHALL BE CLEANED, AND THEN JOINED TOGETHER USING "RAM-NEK" AND "RAM-NEK" PRIMER, OR APPROVED EQUAL. INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS. AFTER JOINT IS MADE, TRIM JOINT SMOOTH ON INSIDE OF MANHOLE.
4. ALL PRECAST REINFORCED CONCRETE MANHOLE RISERS AND CONES SHALL CONFORM TO ASTM C478 OR APPROVED EQUAL.
5. IF POOR OR UNSTABLE SUBGRADE IS ENCOUNTERED AFTER EXCAVATING FOR THE MANHOLE, A LAYER OF BALLAST ROCK MAY BE REQUIRED. THICKNESS SHALL BE DETERMINED BY THE ENGINEER.
6. MANHOLE ACCESS, SECTION JOINTS, AND PICK HOLES SHALL BE SEALED WITH "WRAPIDSEAL" SHEET ROLL ENCAPSULATION.
7. STANDARD MANHOLE BARREL SECTIONS PER ASTM C478 15.1 (1).
8. ALL NEW MANHOLES SHALL BE EVALUATED FOR POTENTIAL ELEVATED H₂S CORROSION PRIOR TO INSTALLATION. WHEN DIRECTED BY THE ENGINEER, A LINING WILL BE REQUIRED.

SHEET 3 OF 3

CARMEL AREA WASTEWATER DISTRICT



TITLE

**STANDARD
MANHOLD
NOTES**

DATE: JAN 2019

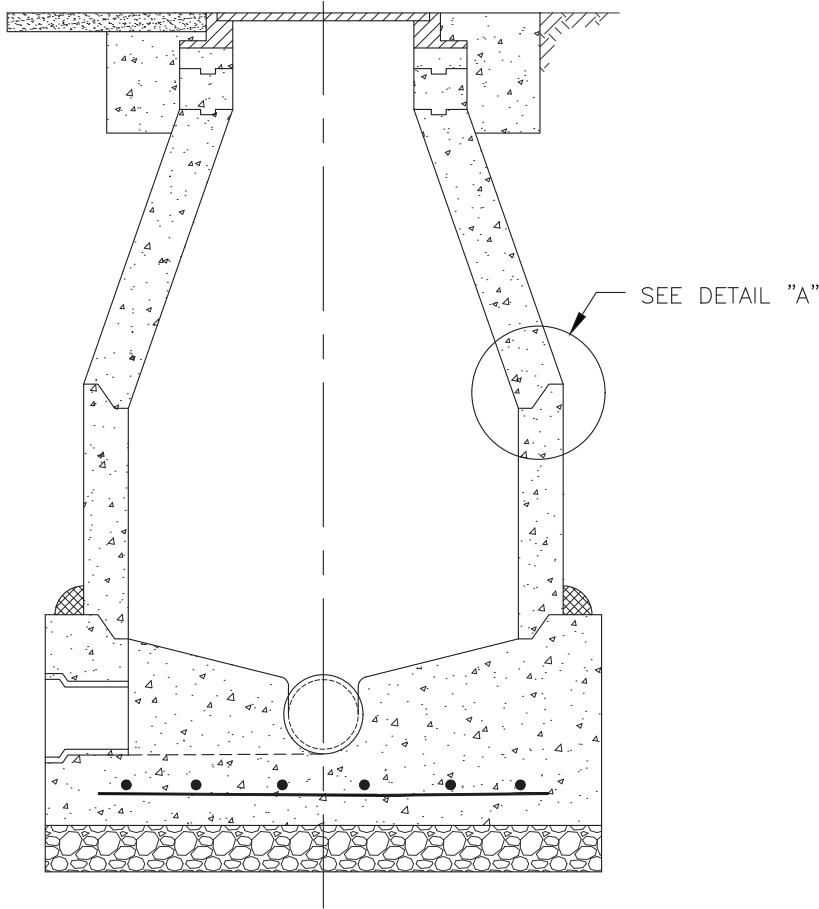
CHECKED BY: *John P. [Signature]*

APPROVED BY: *CP. [Signature]*

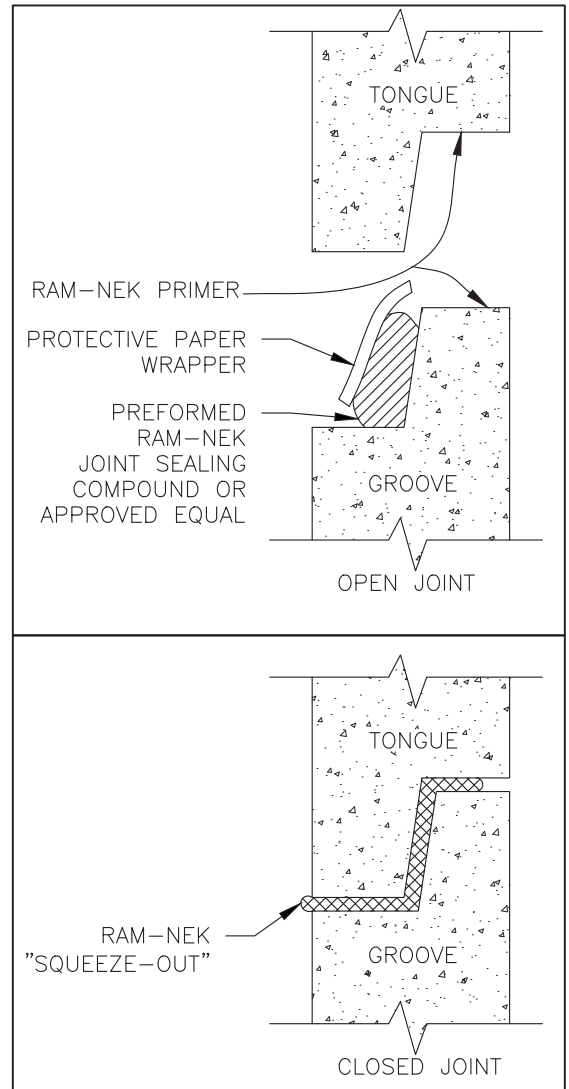
SCALE: NONE

DRAWING NO.

SS-11



TYPICAL MANHOLE SECTION PER SS-9



DETAIL "A"

OPERATIONS TO BE PERFORMED IN THE FIELD:

1. ON THE BANK: APPLY ONE BRUSH COAT RAM-NEK PRIMER TO CONCRETE SURFACES TO BE SEALED. REMOVE PAPER WRAPPER ON THE SIDE ONLY OF PREFORMED RAM-NEK STRIP AND PRESS FIRM TO THE DRY CLEAN PRIMED SURFACE.
2. IN THE DITCH - OPEN JOINT: REMOVE PAPER WRAPPER FROM RAM-NEK ON GROOVE, LOWER PIPE IN THE SECTION PREVIOUSLY INSTALLED. EACH PRECAST MANHOLE UNIT IS FORCED "HOME" BY ITS OWN WEIGHT FORCING RAM-NEK TO SQUEEZE-OUT FOR VISUAL INSPECTION OF FLEXIBLE WATER-TIGHT JOINT.
3. IN THE DITCH - CLOSED JOINT: AFTER JOINT IS LOWERED "HOME" RAM-NEK APPLICATION IS COMPLETE. BACKFILLING AND COMPACTION OPERATION CAN START IMMEDIATELY. TRIM JOINT SMOOTH WITH SHARP TOOL OR FLATTEN SMOOTH WITH ROLLER.
4. THE JOINT BETWEEN THE BARREL SECTION AND MANHOLE BASE SHALL HAVE 6" TO 8" ALLCRETE OR EQUAL OUTSIDE THE JOINT PRIOR TO BACKFILL.
5. WRAP ALL EXTERIOR JOINTS WITH "WRAPIDSEAL" PRIOR TO BACKFILLING.

CARMEL AREA WASTEWATER DISTRICT



TITLE
**BARREL SECTION JOINTS
 FOR STANDARD
 PREFAB MANHOLE**

DATE: **JAN 2019**

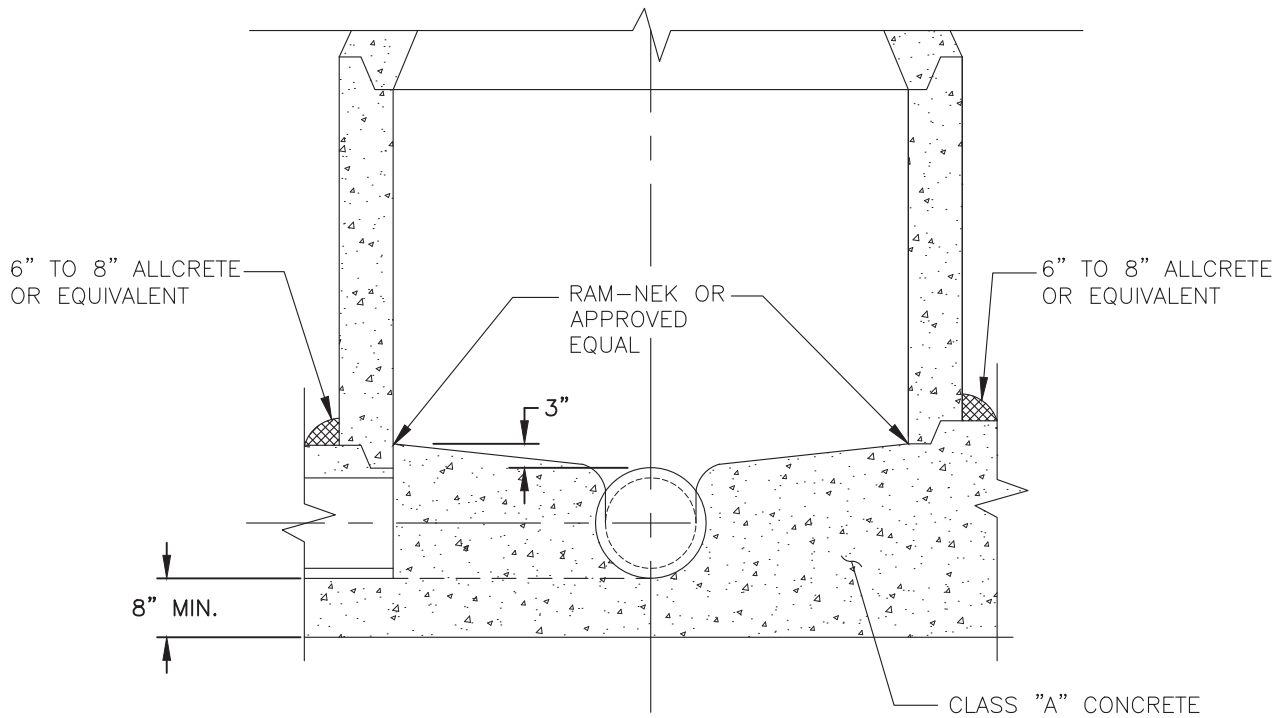
CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

SCALE: **NONE**

DRAWING NO.

SS-12



OPERATIONS TO BE PERFORMED IN THE FIELD:

1. AFTER BASE HAS CURED ENOUGH TO SUPPORT THE WEIGHT OF THE MANHOLE SECTIONS, RAM-NEK WILL BE PLACED IN GROOVE IN BASE AND A BARREL SECTION PLACED IN PLACE.
2. 6" TO 8" OF ALLCRETE OR EQUIVALENT WILL BE PLACED AROUND THE BASE OUTSIDE OF THE BARREL SECTION.
3. THE REST OF THE MANHOLE WILL BE STACKED IN ACCORDANCE WITH SS-9 AND SS-10.
4. ALLCRETE OR EQUIVALENT SHALL BE USED ON THE OUTSIDE OF ALL JOINTS.
5. SEE ALSO GENERAL NOTES ON SS-11.

NOTE: STRETCHING OF RAM-NEK IS PROHIBITED.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**TYPICAL MANHOLE
USING
IMPRESSION RING**

DATE: **JAN 2019**

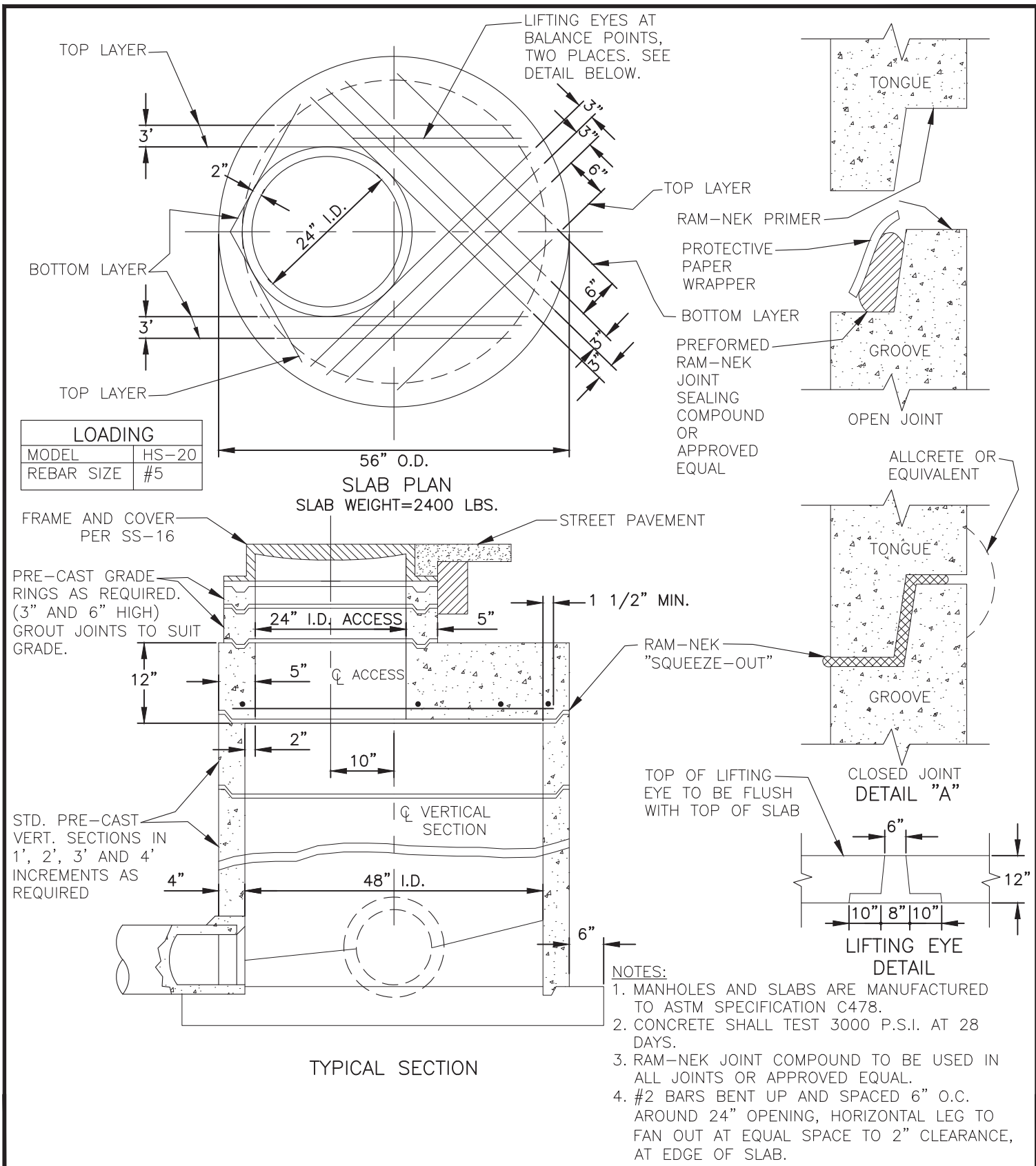
CHECKED BY: *John P. Pappas*

APPROVED BY: *W.P. Hatcher*

SCALE: **NONE**

DRAWING NO.

SS-13



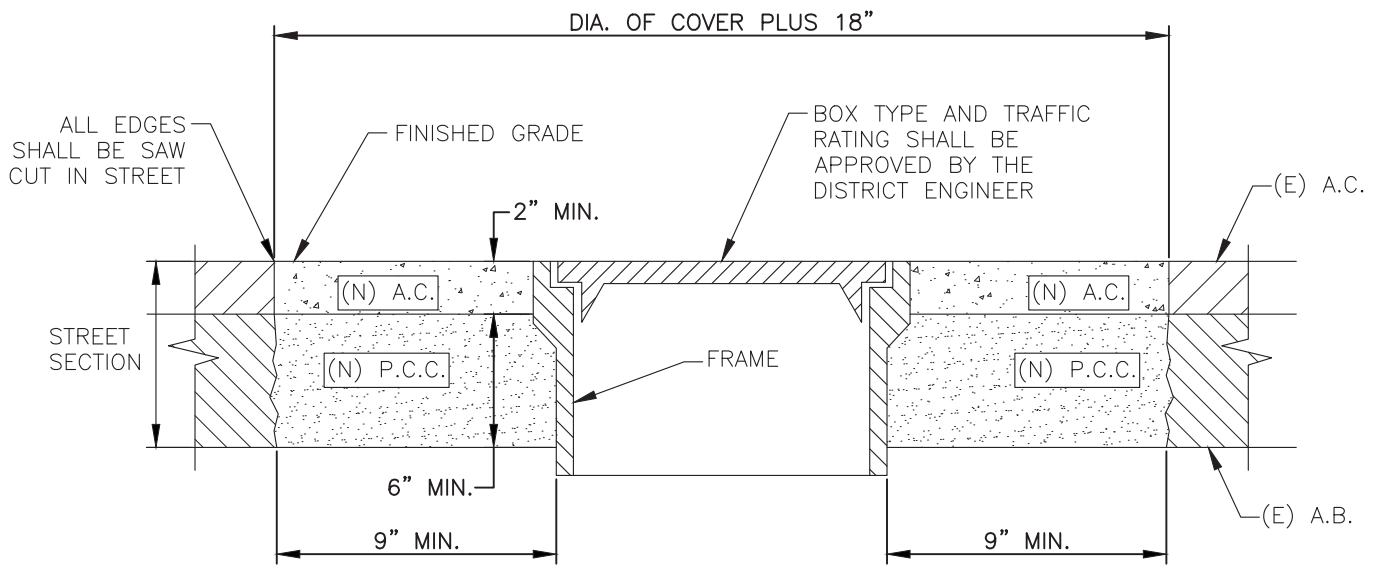
CARMEL AREA WASTEWATER DISTRICT



TITLE
**PRE-CAST CONCRETE
48"x24" REDUCER SLAB
FOR MANHOLES**

DATE: **JAN 2019**
 CHECKED BY: *John Pappas*
 APPROVED BY: *CP. Hatcher*
 SCALE: **NONE**

DRAWING NO.
SS-14



NOTES:

1. THE FINISH GRADE OF THE COVERS SHALL BE FLUSH WITH THE ADJACENT SURFACE.
2. PORTLAND CEMENT CONCRETE (P.C.C.) SHALL BE CLASS A (6 SACKS PER CUBIC YARD AND 3/4" AGGREGATE) WITH 2 LBS. OF LAMPBLACK PER CUBIC YARD OF P.C.C. LAMPBLACK NOT REQUIRED WHERE A.C. COVERS P.C.C.
3. THE COVER SHALL BE MARKED WITH "SANITARY SEWER".
4. ALL STRUCTURES SHALL BE SET TO GRADE AFTER PAVING.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**TYPICAL METHOD
FOR SETTING
APPURTENANCES**

DATE: **JAN 2019**

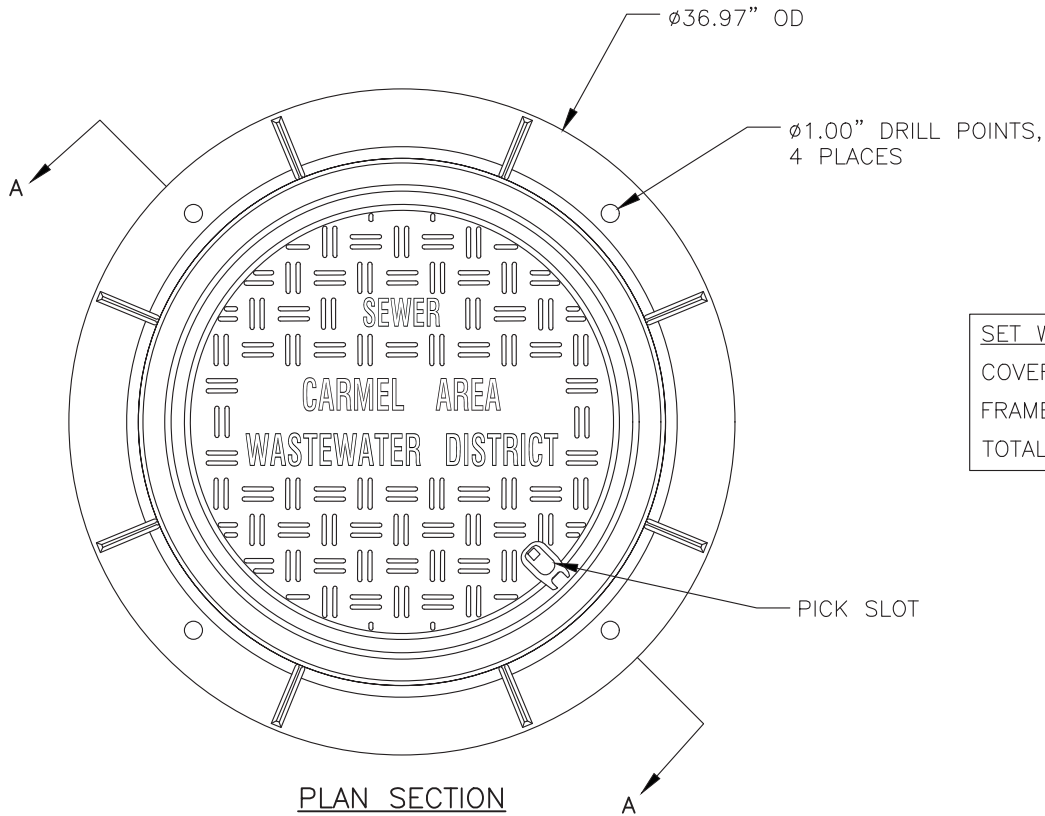
CHECKED BY: *John Pappas*

APPROVED BY: *W.P. Hatcher*

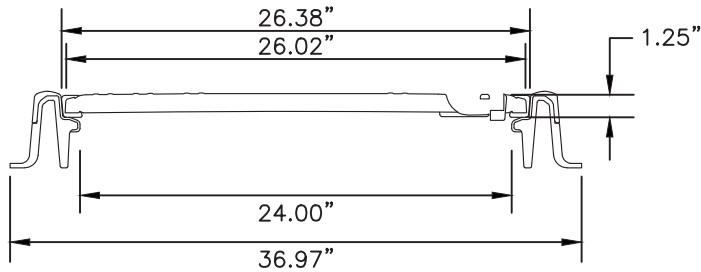
SCALE: **NONE**

DRAWING NO.

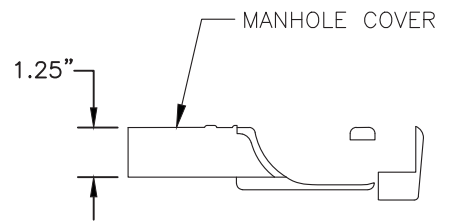
SS-15



SET WEIGHT	
COVER	32
FRAME	28
TOTAL	60 LBS.



SECTION A-A



PICK SLOT DETAIL

NOTES:

- COVER SHALL HAVE SKID SLIP GREATER THAN 0.6 PER ASTM C-1028.
- FRAME & COVER BEARING SURFACES MACHINED TO ASSURE CLOSE, QUIET FIT.
- STANDARD COVER MARKINGS AVAILABLE: "SANITARY SEWER", OR AS PER REQUIRED LETTER DESIGNATION.
- REFER TO: GMI COMPOSITES, INC. SERIES 2600 WITH PICK BAR.
- FRAME AND COVER SHALL HAVE LOAD CARRYING CAPACITY CONFORMING TO AASHTO M306-05 H-20 AND H-25.

CARMEL AREA WASTEWATER DISTRICT



TITLE

STANDARD 24" MANHOLE
FRAME AND COVER

DATE: JAN 2019

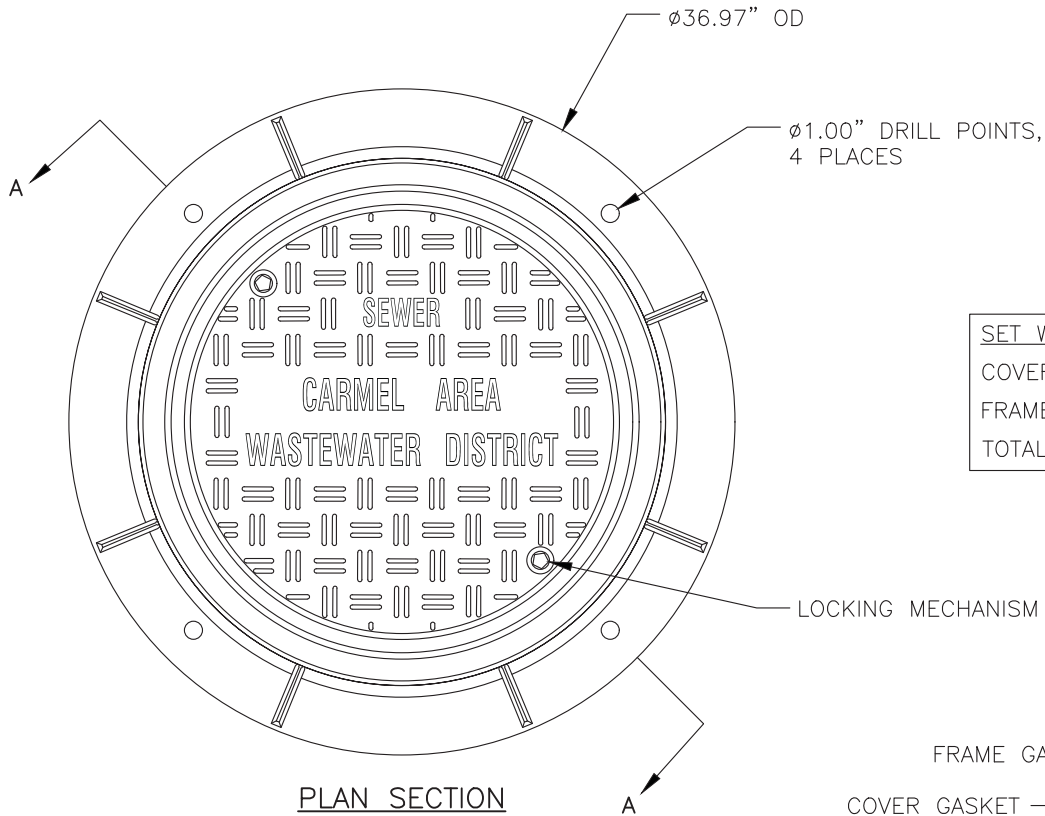
CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

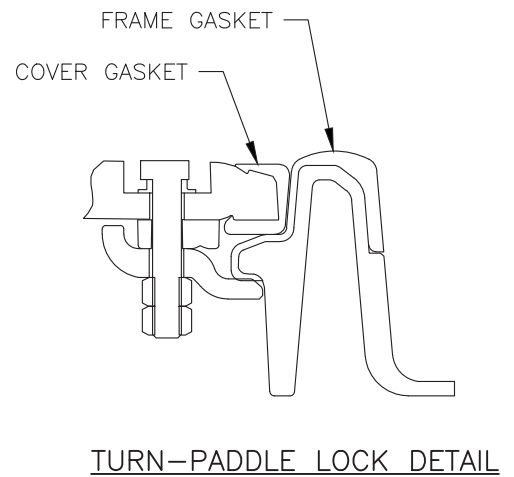
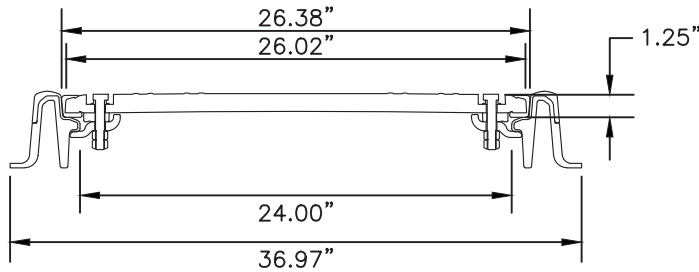
SCALE: NONE

DRAWING NO.

SS-16



SET WEIGHT	
COVER	32
FRAME	28
TOTAL	60 LBS.



NOTES:

- COVER SHALL HAVE SKID SLIP GREATER THAN 0.6 PER ASTM C-1028.
- FRAME & COVER BEARING SURFACES MACHINED TO ASSURE CLOSE, QUIET FIT.
- STANDARD COVER MARKINGS AVAILABLE: "SANITARY SEWER", OR AS PER REQUIRED LETTER DESIGNATION.
- REFER TO: GMI COMPOSITES, INC. SERIES 2600 WITH QUARTER TURN-PADDLE LOCKING MECHANISM.
- FRAME AND COVER SHALL HAVE LOAD CARRYING CAPACITY CONFORMING TO AASHTO M306-05 H-20 AND H-25.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**BOLT-DOWN
 STANDARD 24" MANHOLE
 FRAME AND COVER**

DATE: JAN 2019

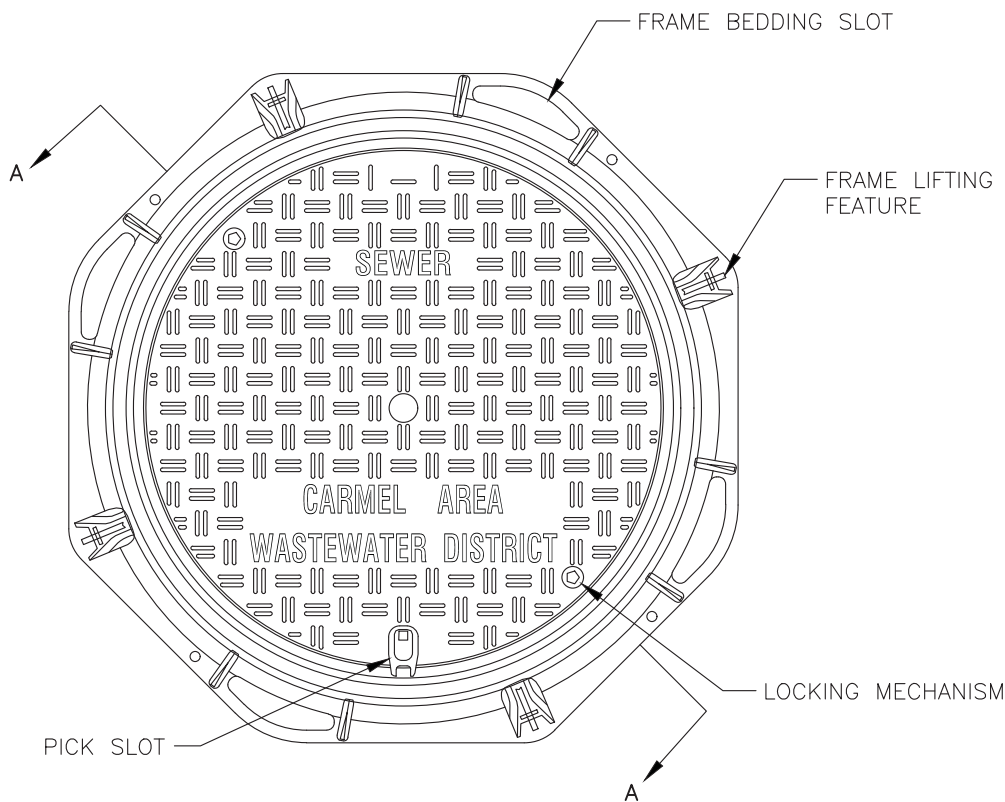
CHECKED BY: *John P. Pappas*

APPROVED BY: *W.P. Hatcher*

SCALE: NONE

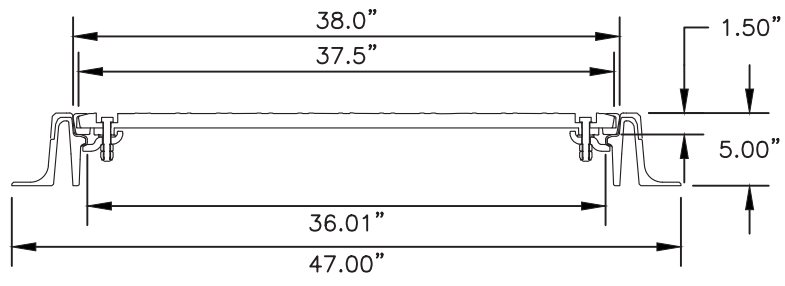
DRAWING NO.

SS-17

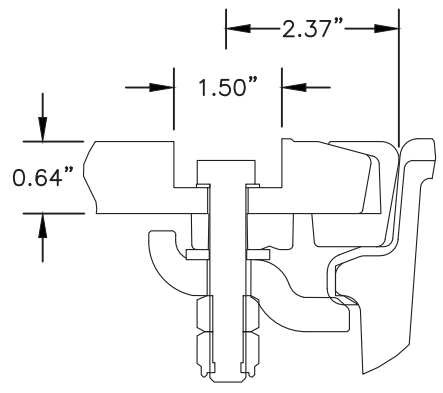


SET WEIGHT	
COVER	75
FRAME	45
TOTAL	120 LBS.

PLAN SECTION



SECTION A-A



TURN-PADDLE LOCK DETAIL

NOTES:

- COVER SHALL HAVE SKID SLIP GREATER THAN 0.6 PER ASTM C-1028.
- FRAME & COVER BEARING SURFACES MACHINED TO ASSURE CLOSE, QUIET FIT.
- STANDARD COVER MARKINGS AVAILABLE: "SEWER", OR AS PER REQUIRED LETTER DESIGNATION.
- REFER TO: GMI COMPOSITES, INC. SERIES 3800.
- FRAME AND COVER SHALL HAVE LOAD CARRYING CAPACITY CONFORMING TO AASHTO M306-05 H-20 AND H-25.

CARMEL AREA WASTEWATER DISTRICT



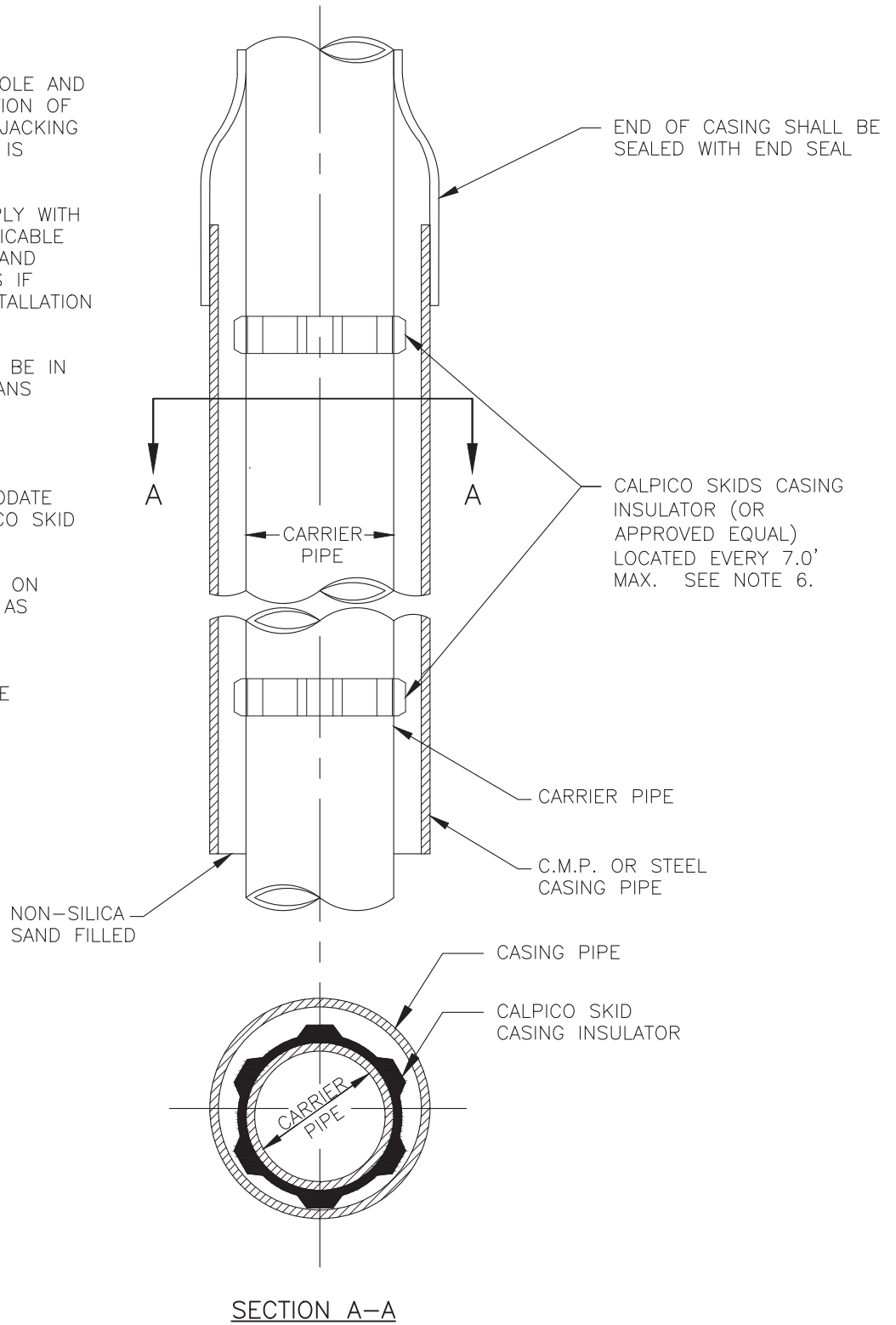
TITLE
**36" DIAMETER
 MANHOLE FRAME
 AND COVER**

DATE: **JAN 2019**
 CHECKED BY: *John Pappas*
 APPROVED BY: *CP. Hatcher*
 SCALE: **NONE**

DRAWING NO.
SS-18

NOTES:

1. CONTRACTOR SHALL POTHOLE AND VERIFY DEPTH AND LOCATION OF UTILITIES IF BORING AND JACKING METHOD OF INSTALLATION IS USED.
2. CONTRACTOR SHALL COMPLY WITH ALL PROVISIONS OR APPLICABLE ENCROACHMENT PERMITS AND TUNNELING REQUIREMENTS IF BORING AND JACKING INSTALLATION OR CASING USED.
3. CASING THICKNESS SHALL BE IN ACCORDANCE WITH CALTRANS REQUIREMENTS OR OTHER GOVERNING JURISDICTION, WHICHEVER IS GREATER.
4. SIZE CASING TO ACCOMMODATE CARRIER PIPE AND CALPICO SKID INSULATOR.
5. PROVIDE ANTI-FLOATATION ON CALPICO SKID INSULATOR AS NEEDED.
6. FOR VITRIFIED CLAY PIPE, REDWOOD SKIDS SHALL BE UTILIZED.



CARMEL AREA WASTEWATER DISTRICT



TITLE

**STANDARD
CASING
DETAIL**

DATE: **JAN 2019**

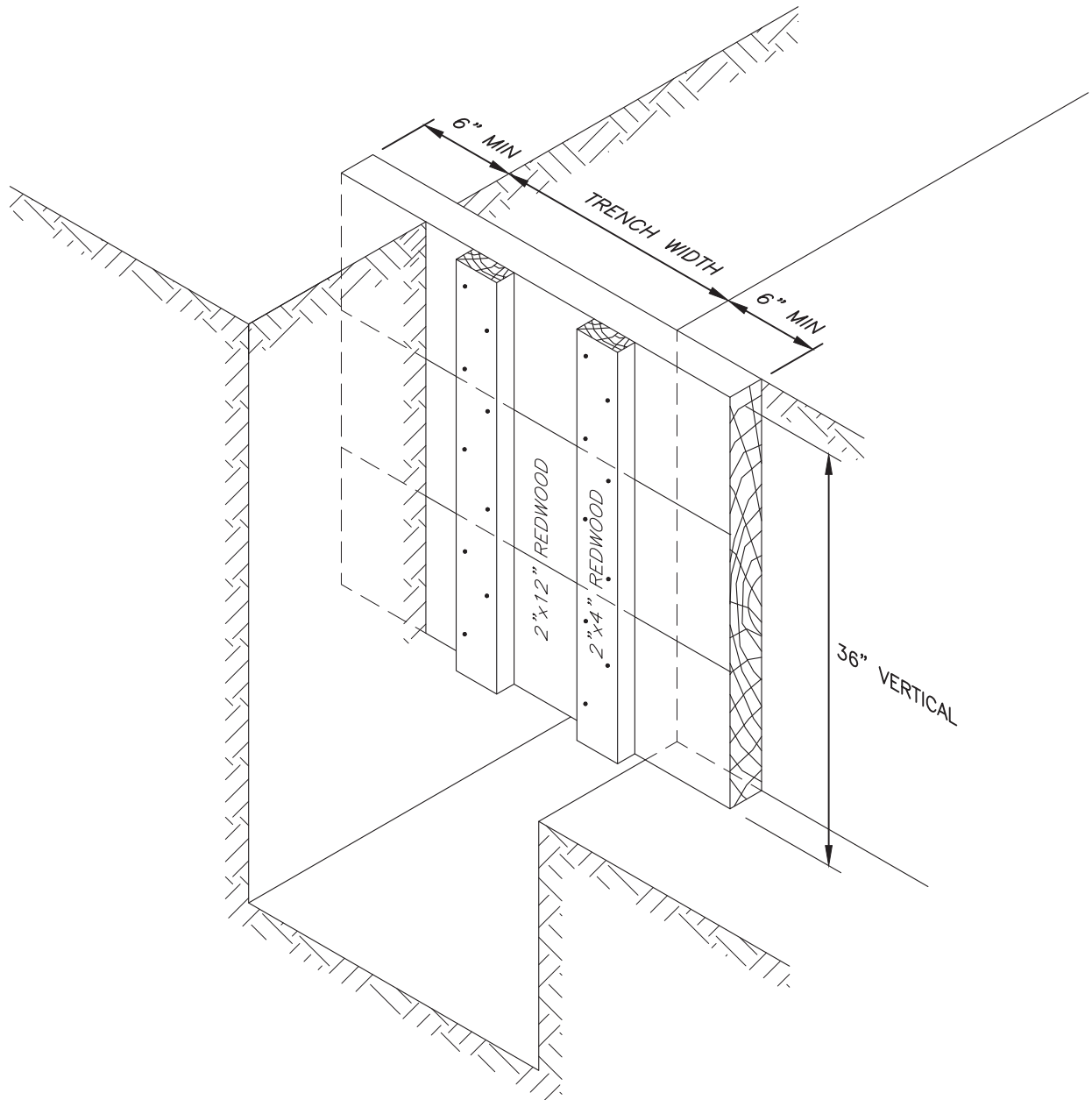
DRAWING NO.

CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

SS-19

SCALE: **NONE**



NOTES:

1. TO BE PLACED AT 20 FOOT INTERVALS WHERE GROUND SLOPE IS 1 TO 1 OR GREATER OR AS REQUIRED BY DISTRICT ENGINEER.
2. USE NO. 16 X 3" LONG 316 SST SCREWS (24 EA) IN ASSEMBLY.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**REDWOOD
CHECK DAM**

DATE: **JAN 2019**

DRAWING NO.

CHECKED BY: *John P. Pappas*

APPROVED BY: *W.P. Hatcher*

SS-20

SCALE: **NONE**

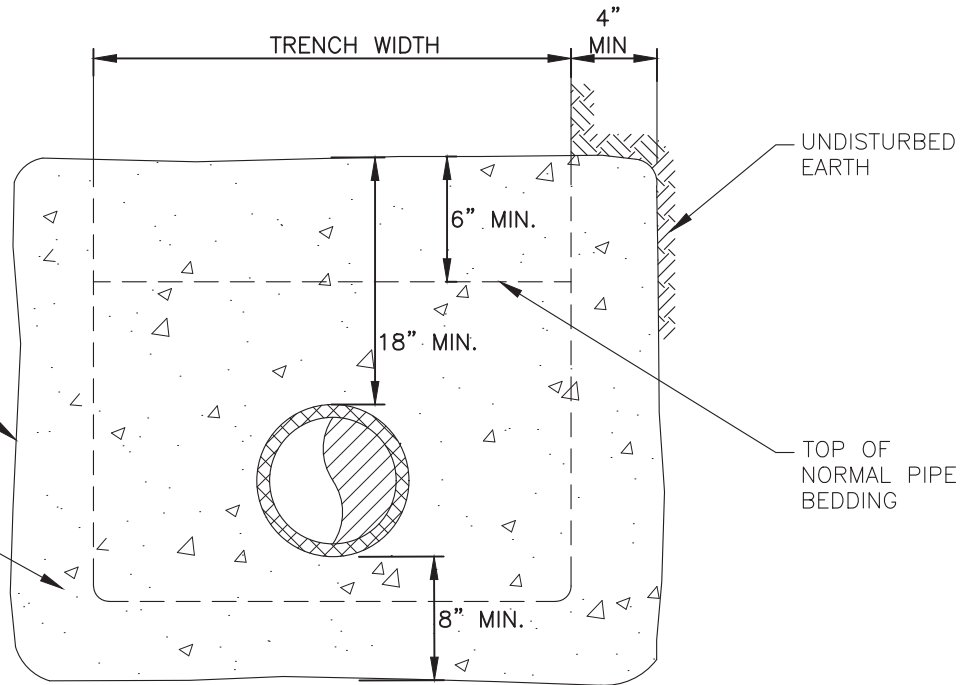
TRENCH DAMS

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

NOTE:
CONCRETE TRENCH DAM TO
HAVE 8" MINIMUM THICKNESS
(ALONG TRENCH)

TYPICAL KEY
SIDES AND
BOTTOM

CLASS A OR
B CONCRETE



CONCRETE TRENCH DAM SECTION

TOP OF
TRENCH

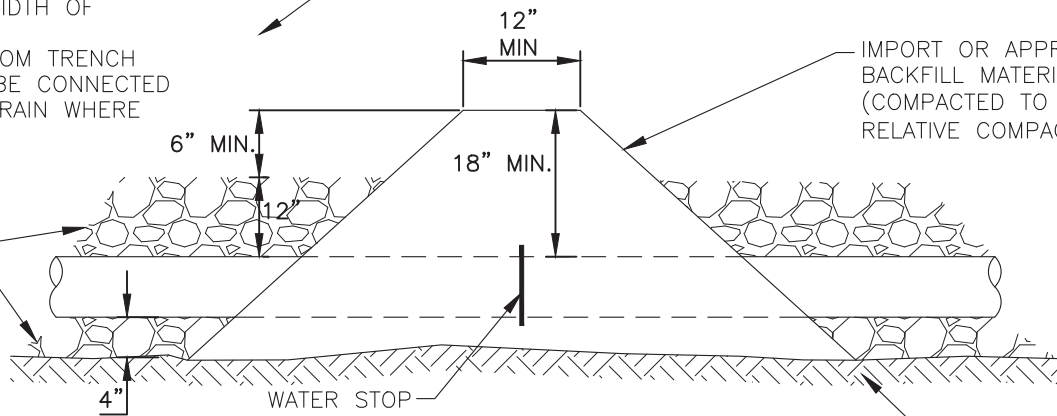
NOTES:

1. EARTH TRENCH DAM SHALL BE ENTIRE WIDTH OF TRENCH
2. DRAINAGE FROM TRENCH DAM SHALL BE CONNECTED TO STORM DRAIN WHERE FEASIBLE

BACKFILL AS REQUIRED

IMPORT OR APPROVED NATIVE
BACKFILL MATERIAL
(COMPACTED TO 95%
RELATIVE COMPACTION)

PIPE BEDDING



EARTH TRENCH DAM ELEVATION

UNDISTURBED
EARTH

CARMEL AREA WASTEWATER DISTRICT



TITLE

TRENCH DAMS

DATE: **JAN 2019**

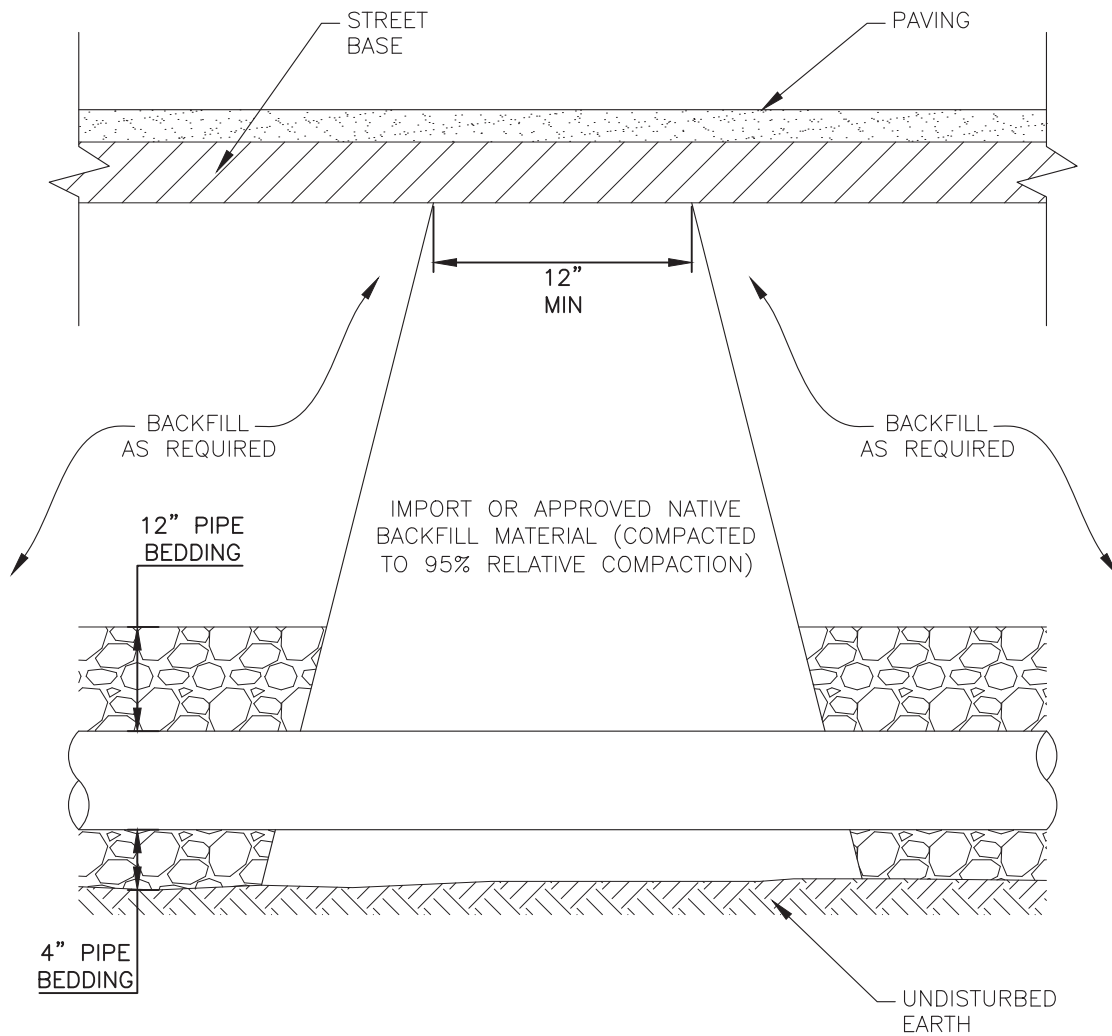
CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

SCALE: **NONE**

DRAWING NO.

SS-21



NOTES:

1. EARTH TRENCH DAM SHALL BE ENTIRE WIDTH OF TRENCH.
2. DRAINAGE FROM TRENCH DAM SHALL BE CONNECTED TO STORM DRAIN.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**EARTH
TRENCH DAM**

DATE: **JAN 2019**

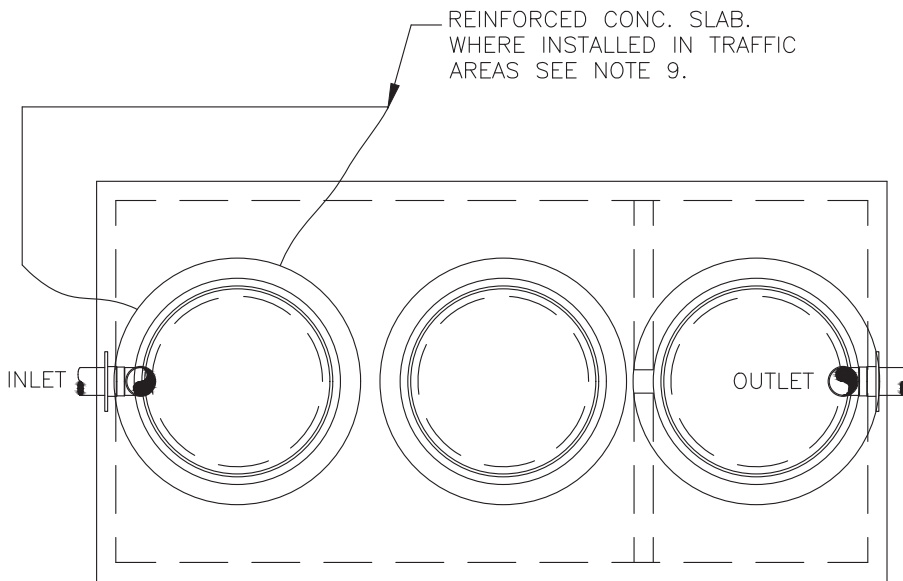
CHECKED BY: *John Pappas*

APPROVED BY: *W.P. Hatcher*

SCALE: **NONE**

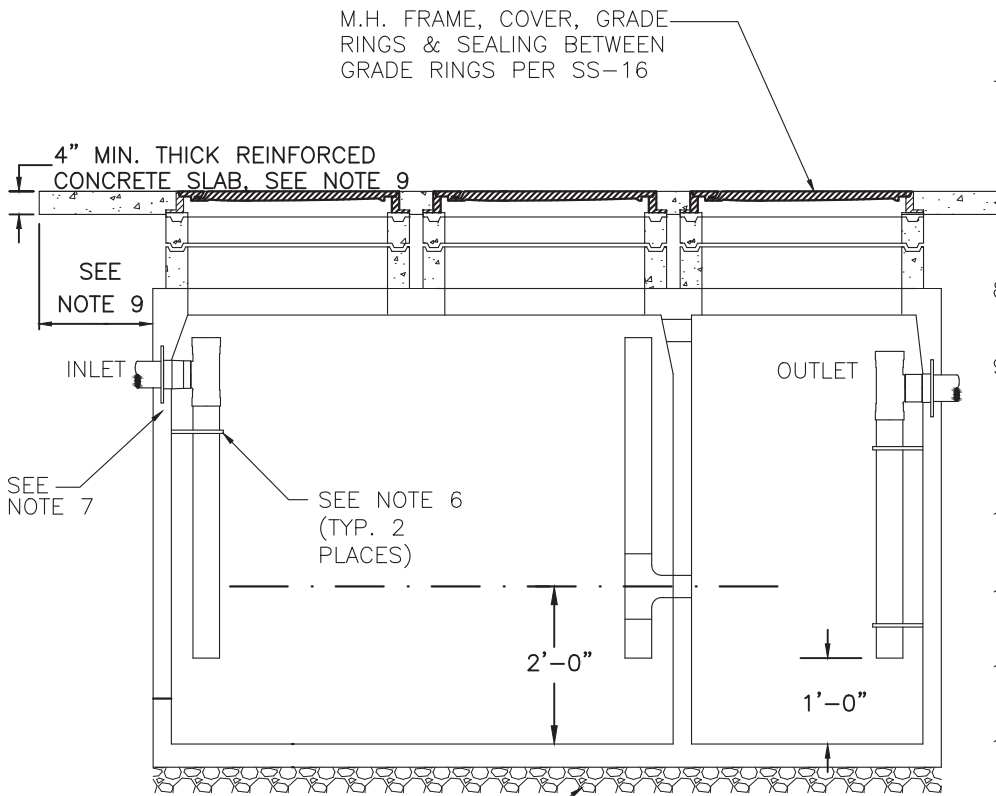
DRAWING NO.

SS-22



NOTE:
ALL WASTE MUST ENTER
THROUGH INLET FITTING ONLY.

PLAN



SEE NOTE 8

SECTION

NOTES:

1. PRE MANUFACTURED TANK SHALL BE SIZED PER DISTRICT PRETREATMENT ORDINANCE.
2. ALL GREASE INTERCEPTORS SHALL BE LOCATED OUTSIDE PUBLIC RIGHT-OF-WAY EXCEPT WITH WRITTEN APPROVAL OF THE DISTRICT ENGINEER.
3. GREASE INTERCEPTORS SHALL BE LOCATED OUTSIDE OF BUILDINGS IN A LOCATION ACCESSIBLE TO WASTE HAULER PUMPER. LOCATION SUBJECT TO THE APPROVAL OF DISTRICT ENGINEER.
4. TANK CAPACITY TO BE DETERMINED AT THE TIME OF PERMIT APPLICATION.
5. ALTERNATE DESIGN BY A REGISTERED ENGINEER MAY BE SUBSTITUTED FOR REVIEW BY THE DISTRICT.
6. STAINLESS STEEL CLAMP AND BOLTS 3'-0" O.C. MAX. (TYP.) MIN. 2 REQUIRED.
7. A WATERSTOP CONSISTING OF A STANDARD MANHOLE ADAPTER GASKET AS SUPPLIED BY THE PIPE MANUFACTURER SHALL BE GROUTED INTO THE INTERCEPTOR WALL NEAR THE CENTER OF THE INLET AND OUTLET WALLS.
8. PLACE 6" MIN. 3/4" X 1/2" CLEAN CRUSHED ROCK.
9. CONCRETE SLAB TO EXTEND MIN. 24" BEYOND ALL SIDES OF TANK IN TRAFFIC AREAS. SLAB SHALL BE DESIGNED AND APPROVED FOR HS20 RATING FOR TRAFFIC AREAS.
10. INSTALL INTERCEPTOR PER MANUFACTURER'S SPECIFICATIONS.
11. PIPE AND FITTINGS TO BE SCHEDULE 40 PVC AND MATCH LATERAL SIZE.
12. ALL SURFACE WATER MUST DRAIN AWAY FROM MANHOLES.
13. ALL WASTE MUST ENTER THROUGH INLET FITTINGS ONLY.
14. PROTECTIVE COATING SHALL COVER ALL INTERNAL SURFACES AND MEET THE CRITERIA OF ASTM-C1315.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**TWO STAGE
SAND AND GREASE
INTERCEPTOR**

DATE: **JAN 2019**

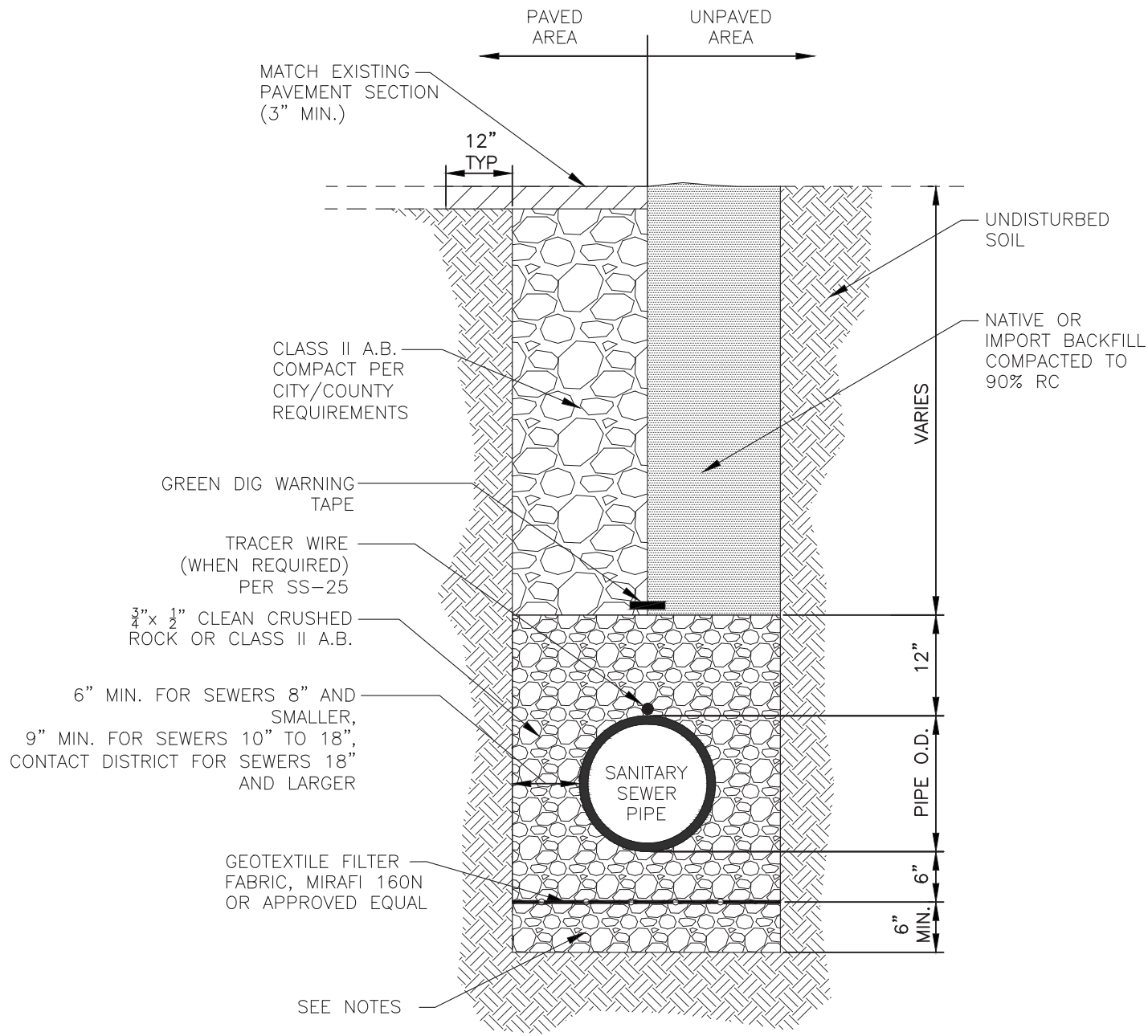
CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

SCALE: **NONE**

DRAWING NO.

SS-23



NOTES:

1. FOR STABLE TRENCH SECTION SHALL BE UNDISTURBED SOIL OR COMPACTED TO 95% RC.
2. FOR UNSTABLE TRENCH SECTION SHALL CONSIST OF ROCK BALLAST AND GEOTEXTILE FILTER FABRIC AS SHOWN.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**STANDARD
TRENCH
SECTION**

DATE: **JAN 2019**

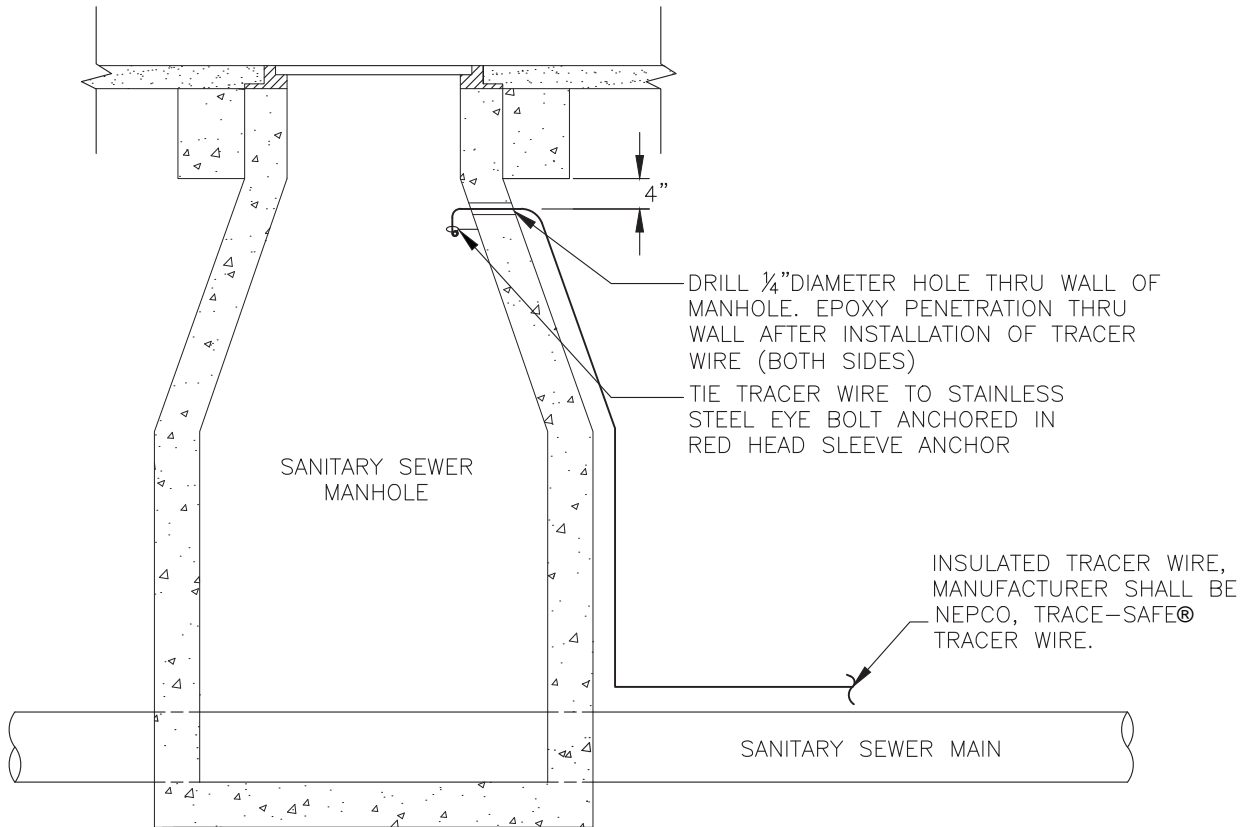
CHECKED BY: *John P. Pappas*

APPROVED BY: *W.P. Hatcher*

SCALE: **NONE**

DRAWING NO.

SS-24



NOTES:

1. TRACER WIRE TO BE INSTALLED WHEN DIRECTED BY DISTRICT ENGINEER.
2. TRACER WIRE TO BE INSTALLED CONTINUOUS FROM MANHOLE TO MANHOLE, NO SPLICING WILL BE ALLOWED.
3. CONNECTIONS TO TRUNKLINE TRACER FEED SHALL BE ALLOWED PER SPECIFICATIONS OF TRACE-SAFE WATER PROOF WIRE CONNECTOR SYSTEM.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**STANDARD
TRACER WIRE
INSTALLATION DETAIL**

DATE: **JAN 2019**

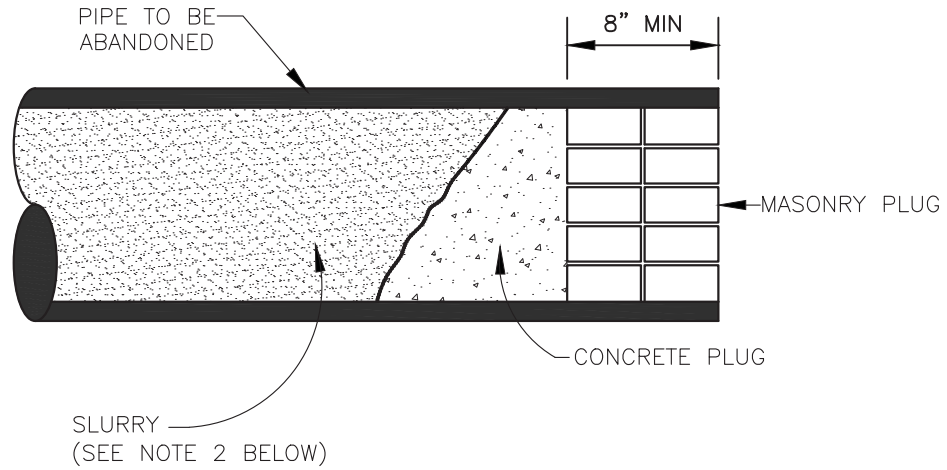
CHECKED BY: *John P. Pappas*

APPROVED BY: *W.P. Hatcher*

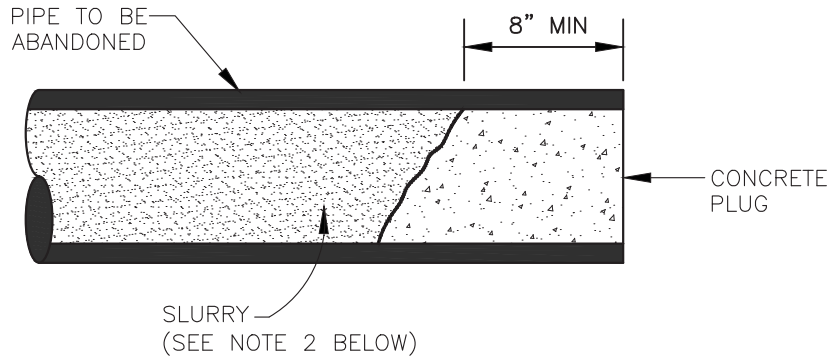
SCALE: **NONE**

DRAWING NO.

SS-25



12" DIAMETER PIPE AND LARGER



PIPES LESS THAN 12" DIAMETER

NOTES:

1. PIPE PLUGS SHALL BE INSTALLED TO THE SATISFACTION OF THE DISTRICT ENGINEER.
2. ABANDONED MAINS SHALL BE FILLED COMPLETELY WITH SLURRY.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**ABANDONED
PIPE PLUG**

DATE: **JAN 2019**

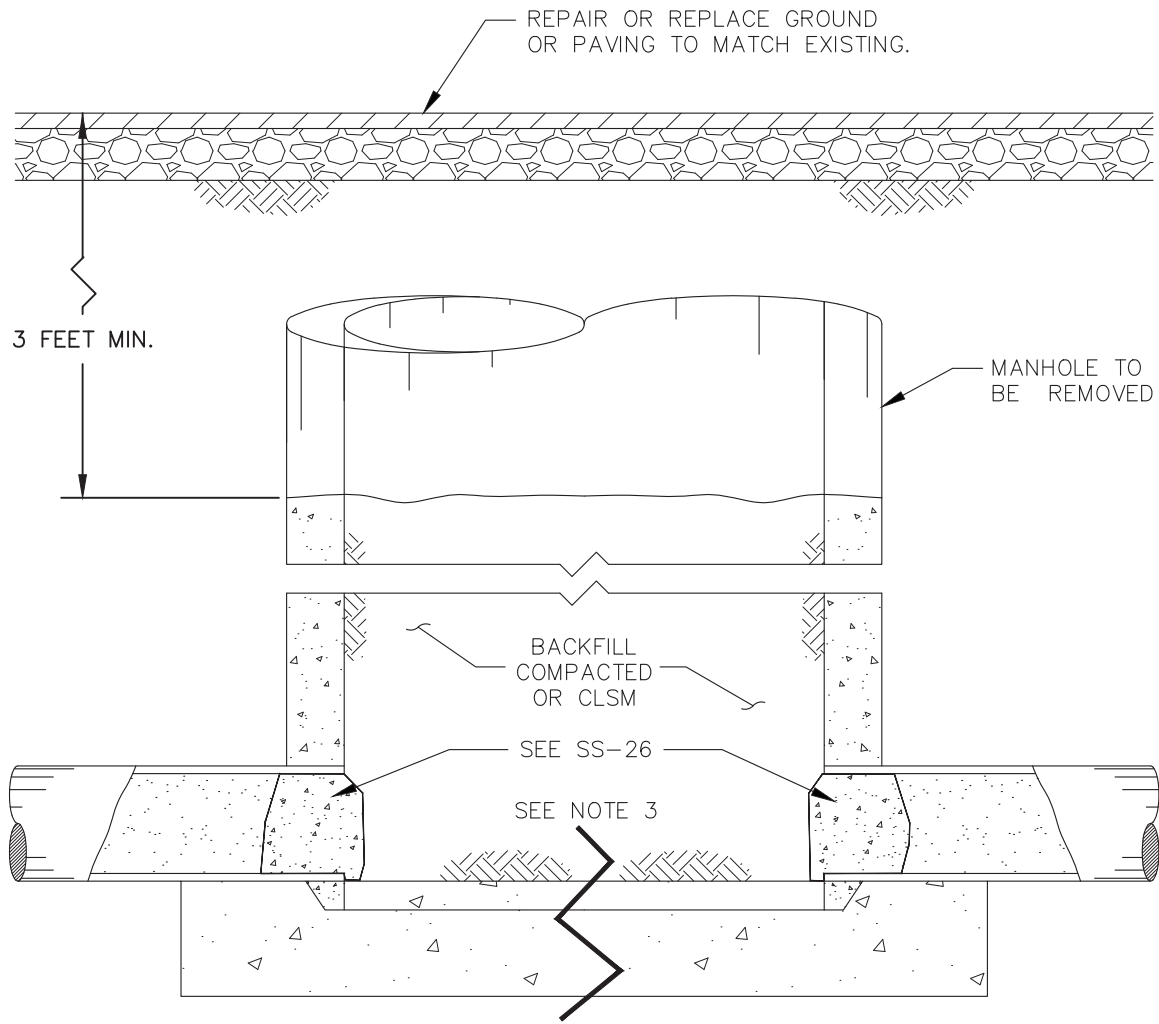
DRAWING NO.

CHECKED BY: *John P. [Signature]*

APPROVED BY: *W.P. [Signature]*

SS-26

SCALE: **NONE**



ONLY ALLOWED WITH SPECIFIC APPROVAL BY THE DISTRICT ENGINEER

NOTES:

1. REMOVE FRAME, COVER, TAPER AND BARREL SECTIONS AS REQUIRED TO A MINIMUM OF 3' BELOW FINISHED GRADE.
2. AFTER PLUGGING ALL PIPES IN MANHOLE, THE REMAINING PORTION OF THE BARREL SECTION AND ALL VOIDS CREATED BY THE REMOVAL OF THE UPPER PORTIONS OF THE MANHOLE, SHALL BE BACKFILLED AND COMPACTED TO 90% RELATIVE DENSITY WITH SELF-COMPACTING MATERIAL.
3. BOTTOM OF MANHOLE SHALL BE BROKEN/HOLES CREATED FOR DRAINAGE.
4. CASTINGS SHALL BE DELIVERED TO CARMEL AREA WASTEWATER DISTRICT OR AS DIRECTED BY THE ENGINEER.

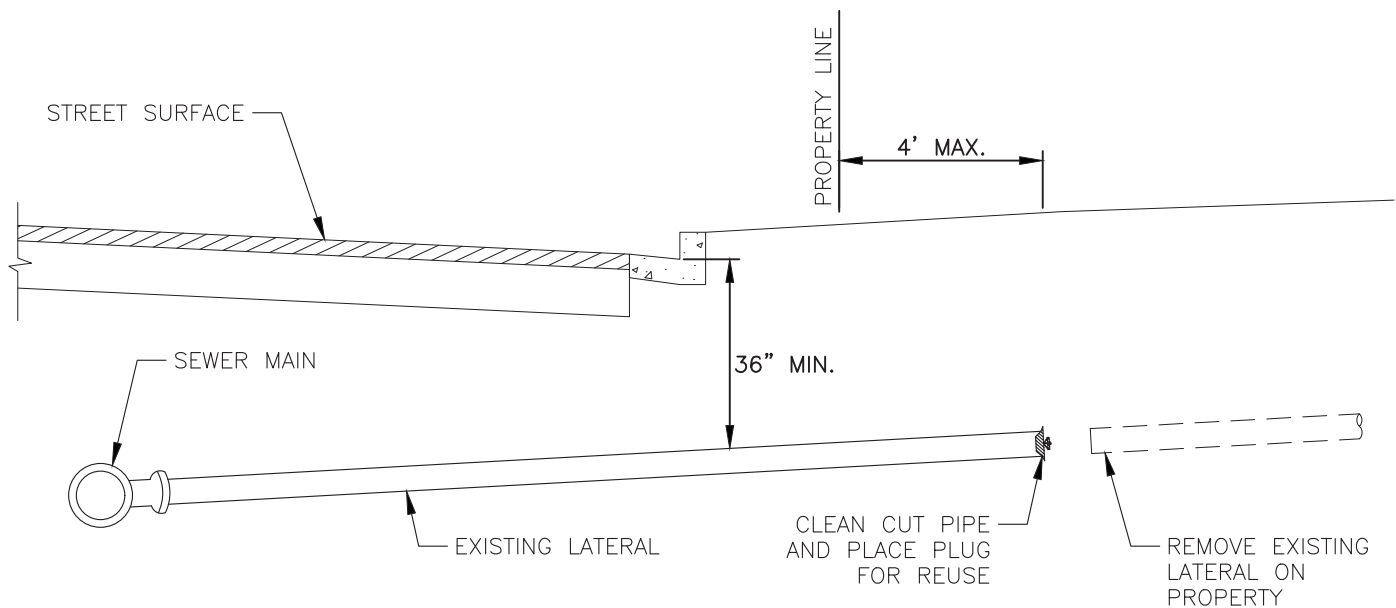
CARMEL AREA WASTEWATER DISTRICT



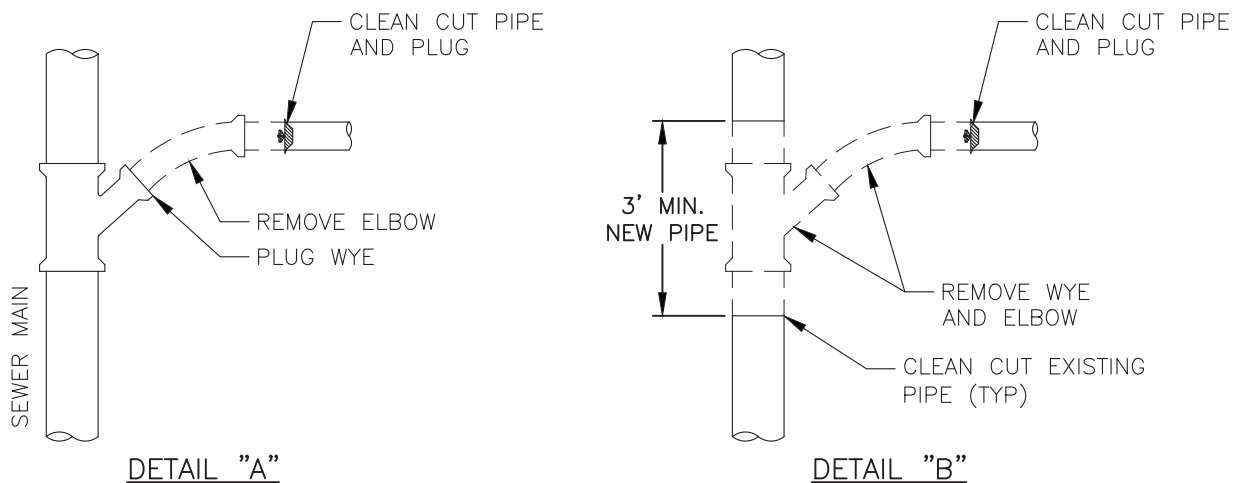
TITLE
**ABANDONED
MANHOLE**

DATE: **JAN 2019**
 CHECKED BY: *John P. [Signature]*
 APPROVED BY: *CP. [Signature]*
 SCALE: **NONE**

DRAWING NO.
SS-27



LATERAL DISCONNECTION AT PROPERTY LINE FOR REUSE



LATERAL DISCONNECTION AT MAIN SEWER

NOTES:

1. THE CONTRACTOR SHALL EXCAVATE BY HAND EXPOSING THE WYE AT THE MAIN SEWER LINE FOR INSPECTION BY A DISTRICT REPRESENTATIVE. IF THE MAIN AND WYE ARE DEEMED IN GOOD CONDITION, PLUG WYE AS SHOWN IN DETAIL "A". IF THE MAIN IS IN GOOD CONDITION AND THE WYE IS IN POOR CONDITION, REMOVE TEE AND SECTION OF PIPE AS SHOWN IN DETAIL "B". IF BOTH ARE IN POOR CONDITION, NOTIFY THE DISTRICT.
2. REPLACEMENT PIPE SHALL MATCH EXISTING SEWER MAIN PIPE. COUPLING SHALL BE FERNCO STAINLESS STEEL SHIELDED BANDS OR EQUAL FOR ALL DIAMETERS.
3. IF SEWER MAIN IS CONCRETE ENCASED OR CRADLED, ANY PORTION REMOVED BY CONTRACTOR SHALL BE REPLACED ENTIRELY TO THE SATISFACTION OF THE DISTRICT'S REPRESENTATIVE.
4. CONTRACTOR SHALL SUPPLY ADDRESS OF ABANDONED LATERAL AND DISTANCE AS MEASURED FROM THE DOWNSTREAM MANHOLE.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONFIRM THAT NO OTHER PROPERTIES ARE CONNECTED TO THE LATERAL PRIOR TO DISCONNECTION.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**ABANDONED
SEWER LATERAL**

DATE: **JAN 2019**

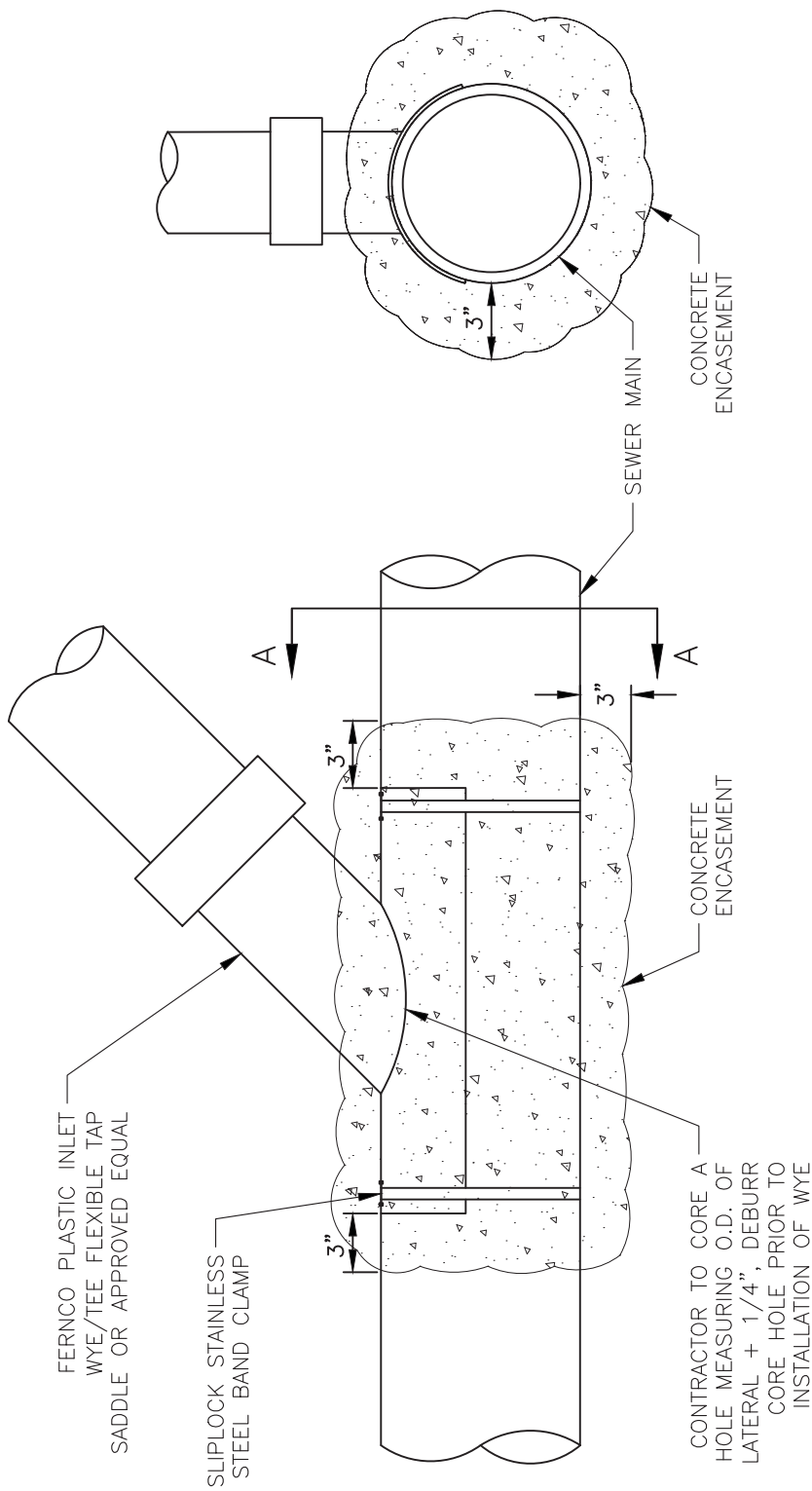
CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

SCALE: **NONE**

DRAWING NO.

SS-28



END VIEW A-A

SECTIONAL VIEW

NOTES:

1. WYE SIZE SHALL FIT SEWER MAIN AND LATERAL SIZES.
2. ENCASE PIPE IN CONCRETE AROUND WYE AFTER INSTALLATION AS SHOWN.
3. 4"-6" PVC INLET WYE/TEE SADDLE MANUFACTURED BY FERNCO, INC., MODEL # TSW-R, TSW-6, OR APPROVED EQUAL.

CARMEL AREA WASTEWATER DISTRICT



TITLE

**SEWER SADDLE
CONNECTION
DETAIL**

DATE: JAN 2019

CHECKED BY: *John Pappas*

APPROVED BY: *CP. Hatcher*

SCALE: NONE

DRAWING NO.

SS-29