

The logo for Thermalito Water and Sewer District features a blue water droplet shape. Inside the droplet, the words "Thermalito Water and Sewer District" are written in a bold, black, sans-serif font, stacked vertically. The text is centered within the droplet.

**Thermalito  
Water and  
Sewer  
District**

**IMPROVEMENT STANDARDS  
WITH  
PLANNING & DESIGN  
FOR  
TREATED WATER & SANITARY SEWER FACILITIES**

**THERMALITO WATER AND SEWER DISTRICT**

**A Public Agency**

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**IMPROVEMENT STANDARDS**

**TREATED WATER FACILITIES – SANITARY SEWER FACILITIES - PLANNING & DESIGN  
AND CONSTRUCTION STANDARDS**

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## **IMPROVEMENT STANDARDS**

### **TREATED WATER & SANITARY SEWER FACILITIES**

#### **Preface**

The Board of Directors (the “Board”) of Thermalito Water and Sewer District (the “District”) has adopted these Improvement Standards to address general project requirements and procedures, project design and construction, plans and specifications, review and inspection procedures, and completion and acceptance of privately constructed water and sewer facilities to be dedicated to and accepted by the District.

These Standards are supplementary and subsidiary to applicable federal, state and local laws, ordinances, rules and regulations applicable to the design and construction of water and sewer facilities. In the event a federal, State of California (the “State”), County of Butte (the “County”) or, for projects located with the City of Oroville (the “City”), law, ordinance, rule or regulation conflicts with any of the Standards, it shall prevail. These Standards shall be administered in conformance with District Rules and Regulations Governing Water and Sewer Service. The information contained herein is not meant to be all inclusive of the District’s policies, procedures, or fee structures, and is subject to change without prior notice. Please be aware all District policies, procedures, and fee structures will be administered according to the District’s most current revisions.

The Board reserves the right to modify these Standards from time to time as necessary to ensure that they remain current with generally accepted construction, manufacturing, environmental and safety standards. Any such modification must be in writing and appended to the Standards in order to be effective.

It must be recognized that it is not possible to anticipate all situations that may arise or to prescribe standards applicable to every situation. Therefore, any items or situations not included in these Standards shall be resolved in accordance with the best professional engineering practices as determined by the District’s engineer.

#### **Design and Construction**

Any and all treated water and sanitary sewer facilities for a residential, commercial, or industrial project (each, a “Project”) in the District which, upon completion of the Project and acceptance by the District, are to be dedicated to the District, shall be designed and their construction overseen by a civil engineer duly licensed by the State (the “Project Engineer”).

A contractor duly licensed by the State of California with a classification suitable for the work to be performed must construct the treated water and sanitary sewer facilities called for in the approved plans and specifications.

Unless otherwise agreed in writing by the Project owner or developer (either, the “Developer”) and the District, the contractor shall act as Project Manager during construction to ensure compliance with the plans and specifications, and shall be available to provide technical assistance when required. In such capacity, he or she shall supervise daily activities and at all times shall be reasonably accessible to the District. To this end, he or she shall provide the District with a cell telephone number at which he or she can be reached. If the contractor is not to be the Project Manager, the Developer shall submit in writing the name, qualifications and experience of the person it desires to be the Project Manager for the consent of the District, which will not be unreasonably withheld.

#### **Construction Management**

The Developer must maintain control over its contractor’s activities by providing effective construction management. To help ensure proper control of the work and materials, compliance with applicable laws, and acceptable prosecution and progress, the Developer shall include in the general conditions of the construction contract, or shall otherwise provide for or ensure, that the Developer’s Project Manager will:

- Designate, in writing, its authorized field representative on a current basis. (Copies are to be sent to the District's engineer.)
- Comply with field surveys and construction staking provided by the Developer or Project Engineer.
- Cooperate with District personnel on and off the job site.
- Excepting a work necessitated by an emergency, prohibit work on any part of the water or sewer facilities before 7 a.m. and after 5 p.m. and further prohibit such work on Saturdays, Sundays and District holidays. (Note: Work performed during these prohibited times may be rejected.)
- Maintain a set of plans and specifications at the job site for use by the District's engineer and/or inspector.
- Observe all applicable laws.
- Remove promptly from the work site all work or materials having been rejected or deemed unauthorized or unsuitable by the District.
- Dismiss and remove from the job site any employee(s) of the contractor or subcontractors who, in the opinion of the District, are incompetent, intemperate, unsafe, abusive, threatening, or otherwise unsatisfactory.
- Suspend work due to unfavorable weather, unsafe act or acts, or other conditions as directed by the District.

## **SECTION 1.00 - DEFINITIONS AND TERMS**

Whenever the following terms, titles or abbreviations are used in these Standards or in any other document or instrument where this Standard governs, the intent and meaning shall be as herein defined.

**ACCEPTANCE:** The formal written acceptance by the District of a Project which has been completed in all respects in strict compliance with the plans and specifications, and any modifications thereof previously approved in writing by the District.

**AGREEMENT:** The formal written facilities and services agreement between the District and the Developer setting forth those mutual conditions, covenants and promises of the parties in connection with the design, construction, completion, acceptance, and dedication of the facilities.

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

**APPLICANT:** The Developer.

**APPURTENANCE:** Any accessory object or component connected to the water or sewer facilities.

**“AS-BUILT” PLANS:** Original plans depicting the water and/or sewer facilities as actually constructed and installed, signed and dated by the Project Engineer.

**BACKWATER VALVE:** Sewer discharge check valve, used to prevent the backup from the District collector system from entering a home. This is an appurtenance to the dwelling unit maintained by the owner.

**BUILDING:** Any structures used for human habitation, employment, place of business, recreation or any other purpose, containing sanitary facilities.

**BUILDING SEWER:** A sewer system conveying wastewater from a building or buildings on the premises having access to the facilities of the District.



**CLEAN-OUT – PROPERTY LINE:** The clean-out at the property line where the sewer service lateral meets the building sewer line. This may be a two-way clean-out to include the riser pipe, fittings, clean-out cap and Christy G-5 box with a cast iron lid.

**CLEAN-OUT – DEAD END ASSEMBLY:** This is a clean-out used to end an extension of sewer trunk line that has a length of less than 100-feet.

**CONFIDENTIALITY AGREEMENT:** A document provided by the District to the developer's consulting engineer. The engineer shall agree to the terms and conditions of not utilizing or sharing data, maps and information that is proprietary to the District with other individuals and organizations that are not affiliated to the project he is designing. Each project requires its own agreement before any information to be released. A **Grant of Authority** is a companion document required from the owner authorizing the developer's engineer to act in his name (agent).

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

**DEVELOPMENT:** Any project within the District which is required to be approved by the District before it is commenced.

**DEVELOPMENT FEE:** A "fee" as defined in California Government Code sections 66000, et seq. imposed by the District as a condition of approval of a Project.

**DISTRIBUTION LINE:** A public water supply line that has been, or is to be, constructed to distribute water to more than one service.

**DISTRICT ENGINEER:** The civil engineer licensed by the State of California employed or engaged by the District.

**DROP MANHOLE:** Drop manhole assemblies shall be provided at the junction of sanitary sewer where the difference in grade is in excess of 2-feet. Sewer lines entering a manhole less than 2-feet above the manhole invert shall not enter the manhole greater than 12-inches above the manhole invert.

**DWELLING UNIT:** A facility designed for permanent or semi-permanent occupancy and provided with minimum kitchen, sleeping and sanitary facilities. The term dwelling unit includes individual units in multiple-unit facilities, designed for permanent or semi-permanent occupancy, such as apartments and duplexes, and also includes sites for mobile homes, trailers, and similar habitations used for such occupancy.

**EASEMENTS:** Easements are areas along the line of all public utilities that are outside of dedicated public utility easements or rights-of-way and are recorded with the County Clerk Recorder and shall be prepared by the Developer subject to District approval which grant access rights along the line of the utility to the District.

**FACILITIES:** Those water and/or sewer facilities as designated in the Agreement to be designed and constructed by the Developer and accepted by and dedicated to the District. Facilities may include, but not necessarily be limited to, the following: all water and sewer systems and their appurtenant assemblies, fittings, service lines and laterals, collector trunks, transmission and distribution lines, and related works to provide domestic water and sewer collection from the District's existing system. If sewerage collection and water supply is not from the District's existing systems, the complete system shall also include sewage transmission lines and waste water treatment, water supply, treatment and storage facilities as further defined in these Standards.

**FINAL PLANS:** An original set of plans signed and dated by the District Manager and the District Engineer indicating that they have been reviewed and approved by the District and thus released for construction. The Final Plans shall include system maps, plans and profiles, cross sections, detail drawings, etc., or reproductions thereof, and shall show the location, character, dimensions and details for the work to be done and which constitute a supplement to the Standard Specifications.

**FORCE MAIN:** A sewer line that carries sewage under positive pressure.

**FUTURE USE CAPACITY:** The future capacity of District water and sewer facilities needed to accommodate anticipated future demand.

**GENERAL MANAGER:** The Manager of the District.

**GRANT OF AUTHORITY:** A written document signed and provided by the Developer granting authority to its Project Manager to interact with the District on the Developer's behalf with respect to the Project.

**GRAVITY SEWER:** A collection system where gravity is used to transport wastewater from the customer's premises to a centralized collection or pumping facility.

**GREASE TRAP:** A structure designed to facilitate the capture of grease from the effluent stream which is required at all commercial facilities, rest homes and other facilities that have cooking facilities for more than single family occupancy.

**GRINDER PUMP:** A compact lift or pump station with pump(s), storage capacity and appurtenant piping, valves and other mechanical and electrical equipment which grinds or reduces the particle size of wastewater solids to yield a sewage slurry and which conveys the waste from its source to a gravity

**INDUSTRY/INDUSTRIAL USER:** Any place of business, endeavor, arts, trade, or commerce, whether public, government, private, commercial or charitable, which uses water in a product, process, or in any manner that generates wastewater which is discharged into District's collector system.

**INFILTRATION:** Water entering the wastewater system from the ground, through such means as compromised or defective pipes, pipe joints, connections, or manhole seepage.

**INFLOW:** Water entering the wastewater system from such sources as roof leaders, cellar drains, yard drains, area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections, storm sewers and combined sewers, catch basins, storm waters, surface runoff, street wash waters, or drainage.

**INSPECTOR:** The technical personnel authorized by the District to act as its agent for the sole purpose of inspection of work covered by the Final Plans. The Inspector's authority is limited to the particular duties entrusted to him or her.

**OWNER:** Any individual, partnership, firm or corporation holding any interest in real property provided water or sewer service by the District as recorded in the official records of the Office of the Recorder of Butte County.

**PARCEL NUMBER:** Parcel number shall mean the assessor's parcel number (APN) as assigned by the Butte County Assessor.

**PROJECT:** Any work of improvement which must connect to District facilities for water or sewer service.

**PROJECT ENGINEER:** Any individual, partnership, firm or corporation duly licensed to practice civil engineering in the State of California who prepares or submits improvement plans and specifications on behalf of the Developer to the District for acceptance.

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

**SEWAGE:** A combination of the water carried wastes from residences, hotels, motels, rooming houses, business buildings, institutions and industrial establishments, together with such ground, surface, and storm waters as may be present.

**SEWER LATERAL:** The sewer line from the District's collector system to the edge of easement or property line. For single or for multiple dwelling units, the minimum lateral size will be of such diameter as the District shall require.

**SEWER MANHOLE:** A maintenance appurtenance found at District specified distances of sewer main lines. The manholes are used by District personnel for maintenance access to the system.

**SEWER MANHOLE FRAME AND COVER:** A cast iron manhole cover assembly used to seal the manhole but provide access when maintenance is required.

**SPECIAL CONDITIONS:** Special conditions are specific clauses setting forth conditions or requirements peculiar to the work and supplementary to the Specifications.

**SPECIFICATIONS:** The word "specifications" shall mean the District's Standard Specifications, Special Conditions, and all subsequent additions, deletions or revisions thereto set forth in the Agreement, together with all addenda and change orders issued with respect thereto, for the work to be done and which constitute a supplement to the plans.

**STANDARD DRAWINGS:** The plans, drawings, etc., of structures, devices or details commonly used on District work, adopted by the District, and made a part of these Standards and/or the Standard Specifications.

**STRUCTURES:** Those structures or devices designated on the standard drawings as manholes, vaults, pressure reducing stations, air relief stations, etc. Detailed drawings of structures or devices commonly used in District work and mentioned in these Standards are included in the Standard Specifications.

The term "structures" also includes those special buildings, pumping stations, treatment units, etc., as required and as shown on the drawings.

**SUBDIVISION:** That certain real property for which the Developer has entered into an Agreement with the District in connection with Facilities to be dedicated to and accepted by the District. As defined herein, subdivision shall include all such real property as described in said agreement, whether or not said real property is as defined as a subdivision in City or County's Subdivision and Land Division Regulations or the State Subdivision Map Act, as may be amended.

**TRANSMISSION LINE:** A public water supply line which has been or is to be constructed to transmit water to more than one distribution line and is normally 10-inches or greater in diameter and to which services are not normally connected.

**WATER SERVICE:** The District owned and maintained portion of the water service line that links the water plumbing of a house or building with the distribution line. This publicly owned portion of the water service line is of such diameter as the District shall require and normally extends from the distribution line to the meter box and includes the meter and customer service valve at the property line or right-of-way line.

**WILL-SERVE LETTER:** A written indication by the District that for a specified period of time, subject to the availability of water supply or sewer capacity and the developer's satisfaction of specified conditions, the District will provide water or sewer service for a project.

**WORK:** All the improvements to be done under the District's permit, or inspection, whether in or out of contract, in strict compliance with the approved plans, specifications, special provisions and/or permit conditions.

## **SECTION 2.00 - GENERAL PROJECT REQUIREMENTS AND PROCEDURES**

### **2.01 Project Costs**

For projects that alter or extend the District's system, the complete cost of the project is the responsibility of the Developer, except as specifically contained in the Service Facilities Agreement. This shall include costs directly incurred by the Developer for engineering, permitting, and construction, as well as costs incurred directly or indirectly by the District (in connection with the project) for plan checking, inspection and review, legal review and document preparation, and for District services provided by work order.

### **2.02 Agreement**

The Developer shall enter into a formal Agreement with the District, setting forth the mutual conditions, covenants and promises of the parties in connection with water and/or sewer facilities to be designed and constructed by the Developer and accepted by and dedicated to the District. The form of the Agreement shall be as provided by the District. No review of plans shall be made until such Agreement has been executed.

Unless otherwise expressly specified and except as to provisions for indemnification by the Developer, continuing operation and maintenance by the District, and the District's right to set rates and fees, the Agreement shall become null and void upon the expiration of the Tentative Map or upon the expiration of two [2] years after its execution if there is no map. The Agreement shall also become null and void upon acceptance of the Project by the District and its dedication to the District.

### **2.03 System Adequacy**

The Developer shall be responsible for construction of a complete improvement system as generally described above. A complete system, as defined, shall extend the system across the entire extent of the Developer's property. In the case of subdivisions, a complete system shall be adequate to provide service to **all** of the subdivision once that subdivision has been fully developed.

Off-site improvements may also be necessary to provide an appropriate level of service to the Project and to facilitate the safe and orderly development of the area. Where water main extensions, including off-site improvements, extend water service contiguous to other properties, the Developer may be eligible for reimbursement for the pro rata cost of facilities serving these other properties at such time as service

to these properties is requested from the District.

In special cases, the District may elect to defer construction of facilities. If deferment is allowed, the developer will be required to enter into a Future Facilities Agreement to ensure payment of the pro rata share of improvements serving the developer's property. If an easement must be secured from the developer for the anticipated future facilities construction, the developer will also be required to provide the District with an irrevocable offer of dedication for the future pipeline easement.

**2.04 Conveyance to the District**

Upon completion of the improvement system as designated in the Agreement and its approval by the District, the developer shall grant, transfer and assign to the District all of the improvement systems, including, but not limited to, all necessary easements and rights-of-way, free and clear of any encumbrances and shall warrant it to be free of all defects in materials and workmanship for a period of three years thereafter.

In consideration therefore, the District will accept such improvement systems and facilities so transferred to it, and thereafter operate and maintain such improvement systems and provide water and sewer services to the owners of real property served by the improvement systems in accordance with its then-current rate schedule and thereafter as said schedule is amended from time to time.

**2.05 Operation of Improvements**

When the subdivision has been improved as contemplated in the Agreement and the Improvement Systems are turned over to the District and accepted for operation and maintenance, the systems shall thereafter be governed in all respects as provided by the applicable laws of the State of California.

The Agreement is not intended to, nor shall it have, any effect whatsoever upon the existence, operation or affairs of the District, which at all times shall be governed and operated in accordance with the laws under which it was organized and all other laws of the State of California as they may be changed from time to time.

**SECTION 3.00 - GENERAL DISTRICT POLICIES**

**3.01 Engineering Policy**

The policy of the District requires strict compliance with the State Professional Engineers Act (California Business and Professions Code sections 6700, et seq.). All plans, calculations, specifications, cost estimates, reports or documents shall be prepared by, or under the direction of, a registered civil engineer, and shall be signed by such engineer and stamped with the engineer's seal to indicate such engineer's responsibility for them. Electrical plans, calculations, specifications, cost estimates, reports or documents shall be prepared by, or under the direction of, a registered electrical engineer and shall be signed by such engineer and also stamped with engineer's seal to indicate his, her or its responsibility for them.

It shall be the engineer's responsibility to review any proposed improvement, extension and/or existing water and sewer system changes with the District, prior to engineering or design work, to determine any special requirements or whether the proposal is permissible.

**3.02 Right-of-Way Policy**

The right-of-way policy requires that all public water and/or sewer line facilities be in express easements or right-of-ways granted or dedicated to the District or for public use.

In the case of public roads further dedication is not necessary unless specifically required. All new easements must be granted or dedicated to the District unless the District specifically approves otherwise (see Section 6.00).

Water and sewer treatment plant sites, pumping station and lift station sites, storage tank sites and sites for similar major facilities shall be granted to the District in fee title and recorded in the District's name.

The cost of creating, transferring and recording all such easements, rights-of-way, fee title sites, etc., including District engineering and legal review and approval thereof, shall be borne entirely by the developer.

### **3.03 Condemnation Policy**

When a public water and sewer line must pass through private property and a right-of-way cannot be obtained through negotiation with the property owner, the District may, under certain conditions, order condemnation of the required easement. If condemnation by the District is desired, the following will be required:

The District Manager shall submit complete construction plans, a detailed easement plan, listing of all legal owners, legal description of each parcel including total acreage and a letter to the Board explaining the situation and stating that all reasonable means to acquire the easement through normal procedures have been exhausted, that no agreement could be reached and request the Board to order condemnation.

If condemnation is ordered by the District, duplicate tracing of the easement map shall be submitted showing the entire easement, temporary working easement and affected properties and a description of easement and temporary working easement including correct and complete name and address of vested owner(s) of the property or other interests shall be furnished.

All costs of the condemnation shall be borne by the District, subject to reimbursement from any developer whose project shall be benefited from such condemnation.

## **SECTION 4.00 - FEES AND BONDS**

### **4.01 Review and Inspection Fees**

The Developer will pay all direct and indirect costs incidental to review by the District or by its consultants or agents or project calculations, plans, specifications, cost estimates, property descriptions, right-of-ways, and easement verification, permits and for the complete improvement of water and sewer systems and will pay all direct and indirect costs incidental to the construction inspection, permits, licenses, bonds, easement verification expenses, administration and the preparation of "As-Built" drawings. All fee deposit calculations shall be rounded to the nearest whole dollar amount. Without limiting the foregoing, the District engages an engineer to review all plans, specifications and legal descriptions, and to inspect and accept works of improvement, the fees and costs of which shall be paid by the Developer.

**A. Planning Review Fees** Concurrently, with the submittal of calculations, plans, specifications, cost estimates, legal property descriptions and legal utility easements to the District for conceptual review, the Developer will deposit as an advance for Plan Review and Plan Checking such amount or amounts as the District may require:

**Planning Review - Concept Acceptance** (non-refundable)

1. Parcel Maps (District Engineer will determine and assess fee by time and labor for each review.)
2. Subdivision (District Engineer will determine and assess fee by time and labor for each review.)
3. Utility Easement verifications for water or sewer (District Engineer will determine and assess fee by time and labor for each review.)

**Plan Checking Fee Advance**

**Preliminary Construction Estimate\* Plan Checking Fee Advance Amount**

\$0.00 to \$100,000.00	-	10% of estimate (\$1,000.00 minimum)
\$100,001.00 to \$1,000,000.00	-	7.5% of estimate (\$7,500.00 minimum)
Greater than \$1,000,001.00	-	5% of estimate (\$50,000.00 minimum)

\*“Construction Estimate” or “estimate” refers to the construction cost estimate prepared by the Developer and approved by the District Engineer.

The project will not be submitted to the District Engineer for review until the Plan Review Fee and Plan Checking Fee Advance have been paid.

In the event that actual plan checking costs exceed the deposit amount during project review, an additional deposit may be required to cover the additional costs. If the Developer is not current with District invoicing, the District may discontinue all review services to the Developer. Any excess amounts shall be credited to the Developer’s inspection fee account at the time of billing.

**B. Inspection Fee** Concurrently with the submittal of the bonds or letters of credit required to guarantee completion and payment of the complete improvement system, the Developer will advance in cash or check an Inspection Fee Deposit calculated in accordance with the following schedule. The District must receive the Inspection Fee deposit and completed Water, Sewer and/or Service Facilities Agreement before the plans will be “Released for Construction.”

<b><u>Final Construction Estimate</u></b>		<b><u>Inspection Fee Deposit</u></b>
\$0.00 to \$100,000.00	-	10% of estimate (\$1,000.00 minimum)
\$100,001.00 to \$1,000,000.00	-	7.5% of estimate (\$7,500.00 minimum)
Greater than \$1,000,001.00	-	5% of estimate (\$50,000.00 minimum)

In the event that actual inspection costs exceed the deposit amount, an additional deposit may be required to cover the additional costs. If the Developer is not current with invoicing, the District may discontinue all inspection services to the Developer. All construction activity shall cease until the Developer is current with invoicing.

The District shall hold any advance or deposit until satisfactory final inspection and acceptance of the Facilities and will refund any balance thereof 45 days thereafter.

District Planning Review, Plan Check, and Inspection fees may be charged from time to time by the District as necessary in light of the costs of performing such services.

**4.02 Performance and Payment Bonds**

As a condition of letters to the State Department of Real Estate or to the County or City or its commitment to provide service and to ensure completion of and payment for the Facilities in accordance with the Final Plans, the Developer will provide and deliver to the District prior to the plans being “Released for Construction,” a Performance Bond and a Payment Bond, each issued by a surety company authorized to do business in the State of California and acceptable to the District. Each bond shall be in the amount of 110% of the **final estimate** of the construction costs for the Facilities as approved by the District Engineer. The bonds will guarantee completion of and payment for the Improvement System contemplated in the Agreement in accordance with the approved plans and specifications. The bonds will remain in full force and effect until such time as the District accepts the Improvement System. The District will permit the conversion of a Performance Bond to a Maintenance Bond.

**4.03 Maintenance Bond**

As a condition precedent to the acceptance of the Facilities, the Developer shall furnish the corporate surety maintenance bond or bonds of an acceptable surety company, authorized to do business in the State of California. Alternative methods of bonding may be utilized upon the approval of the District. The bonds shall protect the District against the results of faulty materials, poor workmanship, or defective equipment. The bonds shall be for a period of **three (3) years** after acceptance of the project. A separate bond will be provided for each water facilities and sewer facilities shall be in a sum as shown in the table below:

<u>Project Construction Costs</u>	<u>Percentage</u>
Up to \$100,000	40
\$100,000 to \$1,000,000	30
Greater than \$1,000,000	20

**SECTION 5.00 - PROJECT REVIEW AND ACCEPTANCE**

**5.01 General**

The Developer will submit to the District all engineering calculations, plans, specifications, cost estimates and property descriptions designed to provide a complete Improvement System in accordance with these Improvement Standards, and Standard Specifications of the District, the executed Agreement, and any other appropriate and necessary governmental authorities.

See Section 10.00 and 11.00, Design Criteria for Water and Sewer Systems, for specific requirements.

**5.02 Planning Review - Concept Review Fee**

The Planning Review Fee shall be paid to the District prior to any project review.

**5.03 Concept Review**

The purpose of the Concept Review is to evaluate overall Project general concepts, to determine approximate location and sizing of major system components, the effect of the Project on adjacent improvements and areas, to estimate preliminary Project costs and to establish general Project feasibility. When submitting plans for Planning Review, three (3) complete sets of plans, engineering calculations (including projected water and sewer demands for domestic water and sewer collection uses), etc., shall be submitted with sufficient detail to determine general sizing and arrangement of major components and



the general organization and design of the Project as a whole. When the Project includes installation or upgrade of fire hydrants, a plan set bearing City or County approval of hydrant locations and required fire flow must also be submitted. Generally, plans submitted will be based on the "system maps" and will become part of the Final Plans.

A print of the approved tentative subdivision or parcel map and a copy of City or County conditions shall be included with each set of improvement plans submitted.

The submitted plans will be reviewed by the District staff and, if there are no required and/or recommended revisions, the plans will be granted "**Conceptual Approval**" (this is not approval for construction). However, if there are required and/or recommended revisions, they will be noted on the plans, etc., and one (1) set will be returned to the Project Engineer for necessary revisions and re-submittal. Conceptual Approval shall become void six (6) months from the date of approval unless plans have been submitted for Plan Checking and the Agreement has been executed.

For projects of limited scope, the District staff may designate the project as a "Special Project." Special Projects are handled at the staff level only. See Section 5.11 for details on Special Projects.

#### 5.04 **Agreement**

The Developer will enter into an Agreement with the District on all property where service is being requested. The Agreement shall state and provide for design, engineering and installation of complete water and/or sewer systems at the expense of the Developer; and thereafter, upon its acceptance by the District, the system with requisite easements will be conveyed to and owned, operated, maintained and served by the District.

The Agreement will provide for, but not be limited to, provisions for the Developer to prepare and submit to the District for review all engineering calculations, plans, specifications, cost estimates, property descriptions, pay all fees, deliver all bonds, construct and pay for all facilities, and do all other work as required to provide a Complete Improvement System within the development. The Complete Improvement System is to be constructed in compliance with these Improvement Standards, and the Standard Specifications, together with any and all amendments thereto, and all other requirements of each and every governmental authority having jurisdiction over the development.

The Agreement shall provide that at the time of completion, the Facilities shall be granted, in their entirety, free and clear of any and all encumbrances, to the District. Upon acceptance of the system, the District will charge monthly fees to the users and impose or raise fees in order to operate and maintain the systems.

The Agreement will be drafted by District staff and placed on the agenda for review and approval by the District Board of Directors. Within the Agreement the District may impose special conditions for the conservation of water due to finite water supplies, provisions for cost sharing and reimbursement, etc.

#### 5.05 **Easements**

Grants of Easements to the District for all installations on off-site private property shall be in form acceptable to the District. The Grant of Easement, properly signed and notarized, and the original right-of-way description, shall be submitted to the District for acceptance and recording prior to acceptance of the Facilities. The Developer shall be solely responsible for all fees and costs associated with such, including those of District legal review.

**5.06 Geological Investigation**

The District reserves the right to require at the Developer's sole cost and expense a geological investigation and report when the soil formations appear to be a hazard for excavation, trenching, and pipe laying, prior to Release for Construction being approved. In general, locations on steep side hills, locations in areas of established instability, locations in known fault or slip zones, spring or seepage areas or areas where concentrated or unusual development exists or is planned, shall be investigated and construction controlled by the recommendations contained in the geological report.

**5.07 Final Review - Release for Construction**

When submitting plans for review for construction, three (3) complete sets of prints shall be presented. All easement descriptions and right-of-way documents, fully executed and ready for recording, complete specifications, cost estimates, etc., shall also be furnished to the District prior to review for construction. The Developer shall sign and date the plan Title Sheet. Where the Developer cannot file the final map prior to construction, the District will sign the Release for Construction plans when the County or City has informed the District that all the plan requirements have been met and the County or City is prepared to sign and release the plans. Be advised that the City or County will require that District improvements be included with your submittal package.

The Project Engineer shall allow a minimum of three (3) weeks for this final review by the District. Once signed and dated by the District Manager and District Engineer, the plans shall be deemed approved and final and may be used for construction. Any office or field change in the Final Plans which will affect the Project nullifies any prior approval of the Final Plans and will require that the change, revisions and/or new plans be submitted and reviewed and approved by the District in writing prior to use in construction. If any field conditions are encountered during construction that necessitate significant deviation from the Final Plans, construction shall be halted until the plans are revised by the Project Engineer, re-submitted to and approved by the District. Approval of any portion of the work may be withdrawn at any time it is determined that any portion of the plans, calculations, etc., and/or construction work fails to meet District requirements. **Approval shall become void six (6) months from date of release from the County or City, unless construction of the Project, as detailed on the plans, has begun.**

**5.08 Plan Revisions**

All revisions recommended or required by the District will be noted in a written plan check evaluation from the District Engineer. No plans will be returned. The plan check evaluation will note the name of the Project, date of review, and will contain a page by page listing of revisions. Any revisions noted shall be made. The plans, cuts sheets, etc., shall be resubmitted for review.

**5.09 Plan Resubmittal Procedure**

To request approval of revised plans for the Project, the following will be needed:

**A.** The above noted plan revision comments shall be addressed in writing, in the order presented, and by such plan revisions as necessary to reflect compliance. Mark the plan sheet location of any corrections on the correction list.

**B.** Please read each item carefully and comply with the requirement. If a change to the drawings is necessary to reflect the correction, a note will not be sufficient.

**C.** Place the corrections in appropriate locations on the drawings. If the corrections cannot be found or the drawings have not been changed as required, the drawings and the corrections may be returned without completing the review.

**D.** The California Business & Professions Code requires that plans, reports and calculations prepared by a California licensed civil engineer, bear the stamp and wet signature of the responsible engineer.

**E.** ADDITIONAL FEES MAY BE ASSESSED FOR REPEATED PLAN REVIEWS.

**F.** Re-submit three complete plan sets (all sheets) and all documents as applicable.

**5.10 Commencement of Work**

No work will be permitted to proceed until all the District's requirements have been met, including payment of all fees, acquisition of all off-site easements, permits, licenses and Final Plans approved, and all required bonds posted.

**5.11 Special Projects**

Special Projects are those which are due to the size, complexity or minimal cost thereof, do not require compliance with all of these Standards. Approval and administration thereof shall be handled completely at the District's staff level. In general, Special Project status shall be reserved for water and sewer system improvements costing less than such amount as may be determined by the District from time to time and do not result in the conveyance of facilities to the District. Appeals regarding Special Project status may be directed to the Board. Special Project conditions shall be stipulated in a letter agreement, countersigned by the Developer. The District Improvement Standards and Pipeline Installation Procedures and Specifications shall apply to Special Projects except as specifically provided for by the letter agreement.

**SECTION 6.00 - EASEMENTS, RIGHTS-OF-WAY AND PERMITS**

**6.01 Easements and Rights-of-Way.**

Rights-of-way define and establish the rights of the District to construct, reconstruct and maintain facilities in the location designated by the design engineer. The Developer shall secure Grants of Easement to the District and provide a right-of-way map for all installations in off-site private property. No construction work will be permitted to proceed until the District receives and accepts all off-site right-of-way easements.

**A. Right-of-Way Width:** The minimum width of easements shall be 20-feet, and shall be centered on the pipeline whenever possible. When water and sewer lines share the same right-of-way, the minimum width thereof will be extended to at least 25-feet for added maintenance needs. Easement requirements will consider various factors, including, but not limited to, pipe depth, number of pipes, topography, and location of adjacent buildings and structures. The District may approve easement widths of less than 20-feet in special situations. No building or permanent structure shall be constructed within these easements. No trees, shrubs, structures, fences or obstacles shall be placed within an easement, which would render the easement inaccessible, by equipment. Temporary construction easements, of varying widths, shall be acquired when necessary to facilitate domestic water and wastewater system construction. Permanent, all weather access shall be provided to all maintenance appurtenances.

**B. Descriptions and Exhibits:** Descriptions or exhibits for easements to be acquired shall be prepared by the Project Engineer granting rights along the alignment of the improvements. The parcel number shall appear on the description or exhibit. The correct name of the grantor (individual(s), partnership or corporation) shall appear on the description or exhibit. Two (2) copies of each description or exhibit with its respective right-of-way map shall be submitted with plans prior to being "Released for Construction."

**C. Grant of Easement:** After the Project Engineer has submitted the descriptions or exhibits and right-of-way map for checking, the Developer will prepare and execute a Grant of Easement for the respective right-of-way in form acceptable to the District. The properly executed Grant of Easement shall be submitted to the District for acceptance by the Board and recording.

**D. Right-of-Way Plat** The right-of-way plat shall be prepared by the Developer and shall show the entire area to be covered by the easement, permit or license. A separate plat shall be prepared for each parcel and shall show all necessary survey ties, courses and distances. The right-of-way plat shall accompany each description of an easement, permit or license, and the original drawing shall be submitted to the District.

**E. Easements and/or Reserves:** Easements and/or reserves shall be shown on the Final Map and shall be dedicated for the purposes of constructing, reconstruction, laying and maintaining and operating the improvements and appurtenances.

**F. Easements for Future Extensions:** Easements shall be dedicated or granted to the District in all cases where future extensions of lines will be required on property being served. Such easements will be included on the parcel or subdivision map and shown on the Final Plans.

## 6.02 **Permits and Licenses**

Where permits and/or licenses other than those issued by the District are required, the Project Engineer shall prepare and provide to the District all necessary permit or license requirements prior to the plans being "Released for Construction."

**Cal-Trans, Railroad and Utility Encroachment Permit** The Project Engineer shall obtain all permits for all work within state highways, railroad rights-of-way and utility rights-of-way and submit copies to the District with the final review plans.

**County or City Encroachment Permits** The Project Engineer shall obtain all permits for all work within county roads or city streets and submit copies to the District with the final review plans.

## 6.03 **Fee Title**

Fee title to water and sewer appurtenances, treatment plant sites, pumping and lift station sites, storage tank sites and sites for similar major facilities, free and clear of all liens and encumbrances, shall be granted to the District and recorded in the District's name. The District shall accept all sites and descriptions prior to the plans being "Released for Construction" and recording must be completed prior to the District acceptance of the improvements.

## SECTION 7.00 - PREPARATION OF PLANS

### 7.01 **Sizes of Required Maps, Plans, etc.**

District standards are as outlined below:

- System Maps - sheet size, 24" x 36"
- Improvement Plans - sheet size, 22" x 34"
- Right-of-Way Maps - sheet size, 18" x 26" or 22" x 34"
- Description or Exhibit - sheet size, 8½" X 11"
- DWG or DXF Extension/AutoCAD, Windows compatible
- CDs; DWG or DXF Extension/AutoCAD, Windows compatible

**7.02 Original Drawings**

All original drawings prepared by the Project Engineer shall be on Mylar film in ink.

**7.03 Prints**

All prints of plans shall be high quality blue or black ink on white background.

**7.04 Plan Sets**

The following details are to be shown on plans submitted for District review. This does not in any way exempt the Project Engineer who is preparing plans from the responsibility of preparing neat, accurate and comprehensive plans in keeping with the standards of the profession. If the plans submitted are not prepared in accordance with these Standards, the Standard Specifications, the Agreement, etc., or are not in keeping with the highest standards of the engineering profession, the District Engineer may return such plans unmarked and unproved.

**A. General:** All sheets of each set of plans shall be in order and stapled together as a complete set which shall generally consist of a Title Sheet, System Map(s), Plan and Profile Sheet(s), Detail Sheets, etc. Each revision and its date shall be indicated on the pertinent sheet. The Project name shall appear on **each** sheet of the plans.

1. **Legible Original Drawings.** To produce legible original drawings, half-size reproducible copies and prints, all line work must be clear, sharp and heavy. Letters and numerals must be 1/4-inch minimum height (font size 18). Station grid lines shall not bisect numerals showing profile elevations.
  2. **Standard Symbols and Legend.** Standard symbols and legend shall be incorporated into all plans as shown on the District's Standard Details.
  3. **Signature and Stamp.** The signature and stamp of the design engineer(s) (responsible registered engineer, registration number and date of expiration) shall appear on each sheet of the plans.
  4. **Title Blocks.** Each sheet within the set of drawings shall have a title block showing the sheet title, number, date, scale and the Project Engineer's name and registration number, and the name of the subdivision, or Project.
  5. **Stationing and Orientation.** The stationing on plan and profile sheets shall normally read from left to right. Plans shall be so arranged that the North arrow points towards the top or upper 180°, insofar as practical.
  6. **Benchmarks.** The benchmarks and datum shall be clearly pointed out on the plans both as to location, description and elevations. The datum shall be U.S.G.S. or U.S.C.&G.S. The Project shall contact the County for location and elevation of the nearest official benchmark.
- The District Engineer may require that the proposed improvements be tied into the California Coordinate System if monument coordinate points are available within a reasonable distance of said improvements as determined by the District Engineer.
7. **Typical Sections.** A typical section for each type of street within the improvement setting out the structural features shall be a part of the plans.
  8. **Cross Sections.** Cross sections shall be included in the plans where determined necessary by the District Engineer. When, in limited areas, unusual topographic features or special conditions occur that would affect the work, individual cross sections may be shown on the pertinent plan

sheet.

**9. Special Notes.** Special notes shall be clearly indicated. When the District has agreed to cooperate in any portion of work shown on Project Engineer's plans, these plans shall be clearly noted: "Contractor shall submit a proposal to and obtain a work order from the District prior to construction." The District will not pay for any work done without said work order.

**a. Include the following:** "District approval of plans does not relieve the Developer from his/her responsibility to correct errors and omissions discovered during construction. Any required plan revisions shall be promptly submitted to the District for approval."

**b. Include the following:** "District will final inspect all sewer facilities with a camera truck. The Developer shall not asphalt roads before this inspection is complete."

**10. Design Criteria.** The design criteria used shall be shown on the plans. It can be summarized in table form.

**B. Title Sheet:** On improvement plans exceeding three (3) sheets in one set, a title sheet shall be prepared showing Project title, the Developer, the Project Engineer, general notes, sheet index, location map, etc.

**1. Names and Signatures.** The printed name, signature and date of the following, when applicable to the improvement project, shall appear on the title sheet:

- a) Project Engineer
- b) Developer
- c) District Engineer
- d) District Manager

**2. General Notes.** The following information is to be included in the general notes:

- a) Datum information
- b) Depth of underground utilities, if known
- c) Contractor responsible for notifying USA
- d) Stationing along street centerline, unless otherwise noted
- e) Time of completion
- f) Special sequence of construction
- g) Reference to District Standard Specifications
- h) Reference to District Standard Details
- i) Drafting symbol legend
- j) Clearances shown are from construction centerline to the nearest surface of object noted

**C. System Map:** The system map scale shall normally be 1-inch = 200-feet. The system map shall cover sufficient area to show adjacent, existing and proposed improvements, all properties to be served, contours with intervals not less than 20-feet, line sizing, sewer trunks, manholes, pressure zones for water systems, water tanks with base elevation and tank height, pumping stations, treatment plants, street names, subdivision names and/or numbers, project boundaries, key layout of plan and profile sheets, permanent benchmarks, etc. Areas not served within the Project boundaries and which cannot be served at a future date by simple extension of the Project's system (without pumping) shall be indicated.

Preliminary system maps are to be submitted as part of the Planning Review phase and must be sufficient in detail to determine general concepts, system adequacy and potential service to adjacent properties. See Sections 10.00 and 11.00 for specific requirements for water and sewer.

Final system maps are to be submitted with the Final Review Plans and shall show all sewer lines, laterals, manholes, valve, ARV, PRS, HPRS fire hydrants and etc. locations.

**D. Plan and Profile Sheets:** When the project is in unimproved land, plans should be drawn from topo base maps. When the project is an improved land, plans should be drawn from aerial photos. In both cases, the topo or aerial photo is to be placed on the back of the Mylar film. Appropriate water and sewer facilities may be combined on the same original base sheets.

**1. Plan.** The scale normally shall be 1-inch = 40-feet or 1-inch = 50-feet horizontal (1-inch = 40-feet required when proposed facilities are to be constructed in existing improved or built-up areas) and shall show the true horizontal relationship between the proposed improvements and the existing and/or proposed field conditions, including existing or proposed utilities and other facilities in accordance with available information. Plans also shall include topographic contours, line size, pipe type, pipe class and designation, all manholes and laterals, all valves, fittings and appurtenances for water and sewer, all structures and their respective numbers, lot numbers, all property lines and corners adjacent to the alignment, all necessary and required stationing, location dimensions, horizontal curve data and street names.

- a. **Services for Water and Sewer:** The location of each water service and sewer lateral proposed to be constructed shall be indicated on the plans by stationing or by reference to a permanent, well-defined structure. Improvements or lots shown on a plan sheet but served by a line shown on another plan sheet shall have the service shown by a small triangle and the letter "W" (water service) and "S" (sewer lateral).
- b. **Permanent and Working Easements:** Permanent and working easements shall be shown to scale on the plans. Easement dimensions shall be shown. Each easement shall be tied to both the property line and the improvement line.
- c. **Improvement Line:** The proposed improvement line shall be shown on each plan sheet as a solid line. Sufficient dimensions from right-of-way centerline shall be given. If the line is to be located in an easement, sufficient dimensions to locate the line in the field shall be shown on the plans.
- d. **Utilities:** Existing and proposed gas, water, sewer, power, telephone and all other utility lines above or below the ground shall be determined and shown upon the plans with accuracy as great as practicable. The location of any utility line that is within 5-feet of the improvement line shall be shown to an accuracy of  $1.0 \pm$  foot and the clearance shown upon the plans. Service lines shall be shown. Water service and sewer laterals lines will be shown.
- e. **Obstructions:** Trees and other objects within the working easement shall have their correct location shown on the plans, the clearance from construction centerline shown, and the diameter of tree trunks and interfering heavy tree branches noted. Removal of a tree or object or other special handling shall be noted on the plans. The Project Engineer shall assume full responsibility for such notes because it is assumed that the Project Engineer has made all necessary arrangements with the owner of the object to be handled. Tree removal within public right-of-way must be approved by the appropriate public agency.
- f. **Culverts:** Culverts shall be shown on both plan and profile sheets when crossed by the construction and shall be shown when parallel and within 20-feet of the construction line or may affect location or depth of services and laterals to individual lots. The size and type of all such culverts shall be indicated. When the culvert crosses or is perpendicular or nearly so to the construction line, the invert(s) of the culvert affecting the work shall be shown.
- g. **Pavement Designation:** The existing pavement type and condition shall be indicated on each sheet. Pavement replacement type and location also shall be indicated.

- h. **Miscellaneous Structures:** Driveways, curbs, sidewalks, pavement edges, buildings and all other items that could influence the work shall be shown. Only the front line and indication on the side lines of buildings need be shown.

**2. Profile.** The profile shall show the approximate vertical relationship between underground improvement lines and the ground surface at the time of construction and the finish ground and/or paving surface. Size and location of structures shall be repeated in profile. Designate all clearances when less than 12-inches. All sections of line necessarily designed with less than the required minimum cover shall be noted with the length of the section indicated and shall require special approval in each case.

The length, size, type and strength designation shall be shown in the profile view between well-defined points.

Indicate the pipe material and class. Imported sand bedding and initial backfill is required on all non-metallic pipe. If more than one combination of pipe class, maximum limiting trench width, or bedding type is available, a practical range of such combinations shall be shown on the plans.

**E. Detail Sheets:** Items of special nature such as creek crossings, shallow manholes, etc., shall be shown in large scale upon a separate sheet of plans labeled "Detail Sheet." This "Detail Sheet" shall be bound immediately after the plan and profile sheets.

**F. Pumping Station, Lift Station and Treatment Plant:** Pumping station, sewer lift station and treatment plant shall include site plans, erosion control plans, drainage plans, grading plans, pump curves, detail plans, sections, electrical details, miscellaneous details, process flow sheets (treatment plants), etc., sufficient to describe, layout and construct the proposed facilities. Preparation of such plans shall be closely coordinated with the District Engineer.

## SECTION 8.00 - CONSTRUCTION OF FACILITIES

### 8.01 Construction of Facilities

The Developer shall promptly, continuously and diligently cause the improvements as described in the Agreement to be constructed and installed to serve all of the parcels or services of the development in strict compliance with the accepted plans, specifications, real property descriptions, etc.

The Developer may construct and install portions of the improvements from time to time contemporaneously with other development improvements as they are installed in the development from time to time. The improvements shall be installed and in operating condition and offered to the District within two (2) years after the District has accepted the plans, specifications, legal property descriptions, etc., unless an extension of time has been authorized by the District.

If the Developer fails to complete or get an extension, the District may terminate the service agreement, call on bonds to complete works, or other action as the District may determine.

All construction shall be in accordance with District Standard Specifications, using new materials and performed by an appropriately licensed contractor for the work being performed.

### 8.02 Construction Inspection

Any improvement or private works will be constructed to District requirements. Where it is intended that



such improvements or private works be dedicated to and accepted by the District for operation and maintenance, the District must inspect those improvements during construction. Each phase of construction must be inspected and accepted prior to proceeding to subsequent phases.

Any improvements or private works constructed without inspection as provided above or constructed contrary to the orders or instructions of the District Engineer will be deemed as not complying with these requirements and will not be accepted by the District.

The owner will pay all costs incidental to the construction inspection of the system as outlined in Section 4.00.

### **8.03 Final Inspection**

Upon completion of any improvements that are constructed under and in conformance with these Standards, and prior to requesting a final inspection, the area shall be thoroughly cleaned of all rubbish, excess material and equipment, and all portions of the work shall be left in a neat and orderly condition satisfactory to the District Engineer.

Within fourteen (14) days after receiving the request for final inspection, the District Manager, or delegated personnel, shall inspect the work. The Contractor, Project Engineer and the Developer will be notified in writing as to any particular defects or deficiencies to be remedied. The Contractor shall proceed to correct any such deficiencies within thirty (30) days. At such time as the work has been completed, a second inspection shall be made by the District Manager, or delegated personnel, to determine if the previously mentioned defects have been repaired, altered and completed.

At such time as the District accepts the work and the Board accepts the improvements, the Developer will be notified, in writing, as to the date of final approval, acceptance and recording.

For projects where the District participates in the costs thereof, quantities will be measured in the presence of the District Manager or Engineer, Project Engineer and Contractor.

## **SECTION 9.00 - PREPARATION OF AS-BUILT PLANS**

### **9.01 General**

Upon completion of the work, subsequent to the final inspection but prior to the Board's acceptance of the improvements, the Project Engineer shall submit accurate project "As-Built" plans to the District. To the extent feasible, the District will cooperate in compiling necessary field data to aid in the preparation of "As-Built" plans.

The Developer will pay all costs incidental to the preparation of the "System Maps" plans by the District.

### **9.02 As-Built Plans**

"As-Built" plans shall include all details shown on the original plans "Released for Construction," corrected and/or expanded to reflect all design or construction changes. The original drawings as corrected for As-Built, noted and signed by the Project Engineer as "As-Built" plans, shall be submitted to the District for acceptance. "As-Built" plans will be reviewed and signed, if acceptable, by the District Manager or Engineer.

Hard copy "As-Built" plans shall be submitted on "D" size reproducible media, as described in Section 7.00. When plan sets are prepared using Computer Assisted Drafting and Design (CAD) software, a

digital media copy of the “As-Built” plans shall also be submitted. CAD submittals shall contain “paper space” layouts for each hard copy plan sheet. The Project Engineer shall also submit all files containing special fonts, symbols, pen assignments, etc. necessary to open the file and plot the plan sheets. The Project Engineer shall contact the District for current information regarding appropriate software release, etc.

### **9.03 Items to Consider**

Items to be considered in the preparation of "As-Built" plans include, but are not necessarily limited to:

- a. Line, valve and hydrant horizontal locations
- b. Mechanical and electrical details. Wire and Terminal Strip Identifications
- c. Ground and road surfaces and water line vertical locations (where different from "standard")
- d. Size and type of pipe used
- e. Service locations and depth
- f. Mechanical modifications (treatment plant, pumping stations, etc.)
- g. Backflow devices
- h. Pressure reducing, high pressure relief, and air relief valves
- i. When sewer is to be conveyed to the District, all applicable appurtenances are to be included: lines, laterals, manholes, lift stations, etc
- j. Survey datum

## **SECTION 10.00 - DESIGN CRITERIA - WATER SYSTEMS**

### **10.01 Introduction**

These design criteria shall govern the engineering design of water systems that will be dedicated to and accepted by the District for maintenance and operation and those systems designed for the District by its consultants.

It is the intent of these criteria to provide a water system that will dependably and safely convey the required amount of high quality water at adequate pressures and with minimum maintenance and operational costs.

The Developer shall furnish, without cost to the District, all intrinsic and auxiliary components for maintenance and operation as necessary to provide a complete water system.

### **10.02 Regulatory Standards**

Pertinent requirements of the following agency standards, including all changes thereto, shall be considered and complied with, except that in the event of conflict, the stricter design criteria shall prevail.

- a. United States Public Health Service (USPHS) Drinking Water Standards and the Environmental Public Agency (EPA) Standards
- b. Laws and Standards of the State of California, Department of Health Services, Public Water Supply Branch
- c. The Porter-Cologne Water Quality Control Act and the California Regional Water Quality Control Board, Central Valley Region
- d. Ordinances of the County
- e. Rules, regulations, and ordinances of the City
- f. Uniform fire code and local fire ordinances
- g. Rules, regulations, and ordinances of the District
- h. Others as appropriate

### 10.03 **Design Procedures**

A design for each project proposed to be constructed under District Agreement or by its consultants shall be submitted to, and accepted by, the District Engineer in accordance with Section 5.00, Project Review and Acceptance, of these standards.

**A. Preliminary Design:** The preliminary design shall be submitted in the form of a map (and associated calculations) to include the following:

1. Location of Project
2. Tributary areas outside Project
3. Adjacent
4. Contours over complete map
5. Major line layout and preliminary pipe size
6. Residual pressures with design flows at major junctions and critical points; pressure zones. Maximum velocity 11-feet per second
7. Predicted design flows (peak and/or average as appropriate) at major junctions, including flows into and out of the project area
8. Direction of flow under design conditions
9. Zoning used to predict flows
10. Special areas such as hospitals, schools, large office buildings, industrial, commercial areas, etc.
11. Boundaries of areas within the project that are tributary points of major flow
12. Location and sizing of major system components, including water treatment plant and storage facilities, if included in the Project
13. Electrical and telemetry details at final design

### 10.04 **Hydraulic Analysis**

The hydraulic analysis for the pipeline network serving the proposed development shall use an industry standard method of analysis and shall be submitted to the District for review and approval by the District Engineer.

The design flow of the pipelines shall be determined by use of the Hazen-Williams formula, using a roughness coefficient of 140 or the value recommended by the pipe manufacturer with concurrence of the District. Pipe with a coefficient less than 140 shall not be used. When analyzing existing transmission or distribution system the coefficient values should be selected in consultation with District. The hydraulic analysis shall include considerations of all flow and demand conditions, which will produce the most critical pressure or velocity within the system. The Project Engineer shall submit a thoroughly documented hydraulic analysis of any proposed distribution system improvements to District.

### 10.05 **District Flow Requirements**

**A. Zoning:** Flow determination shall be based upon the current or proposed zoning. The minimum population density in areas of potential development shall be equivalent to that of single-family zoning. The area shall be examined for trends toward population concentration and, if found, an estimate should be made of the probable extent of such concentration. This estimate shall be used as the basis for determining flow. All calculations shall assume full development, except where a stage concept has been specifically approved by the District.

#### **B. Residential Living Units:**

1. Design population per living unit. Developments of 100 living units and less - 3.5  
Developments of greater than 100 living units - 3.0

2. Average per capita daily flow requirement. 250 gallons per person per day.

**C. Commercial, Industrial Development:** Every attempt should be made to base flow requirements on specific development plans. Consult the District.

**D. Schools:** The larger flow, as determined from one of the two following methods, shall be used:

1. The entire school area shall be assumed a single family zoning, with minimum sized lots assumed.
2. Flow shall be based on ultimate design student population plus administration, teaching and operating personnel.

**E. Average Daily Flow (ADF):** ADF shall be determined for tributary service area(s) by multiplying the sum of the area(s) design population by the average per capita daily flow requirement as designated above, plus any commercial, industrial, school, etc., contribution(s).

**F. Maximum Daily Flow (MDF):** MDF shall be determined by multiplying the ADF by a factor of two (2).

**G. Maximum Hourly Flow (MHF):** MHF shall be determined by multiplying the ADF by a factor of three (3).

**H. Non-Residential Areas:** Non-residential areas of the system, including parks, landscaped common areas, large lot landscaping, etc, shall have design flows approved by the District Manager and/or Engineer.

#### **10.06 Fire Flow (FF)**

City or County fire departments will set the fire flow requirements and approve hydrant locations for their respective responsibility.

#### **10.07 Source**

This section is applicable where it is necessary to develop a new source of water for the proposed development, i.e., where existing District facilities are either inadequate or unavailable to the development, or where a District approved firm supply contract cannot be obtained through another water supply agency.

**A. Quality:** Quality of the water shall conform to current EPA Drinking Water Standards and **all** of the current requirements of the State and County Health Departments. A pollution survey of existing and potential sources of contamination shall be prepared and forwarded for review with other data submitted for planning review. Refer to and utilize the watershed surveys prepared for the Department of Health Services.

**B. Testing:** The Developer shall provide sufficient tests during significant times of the year to determine the quality of water and to determine the design parameters for required treatment processes. Such tests shall include, but not necessarily be limited to, complete Public Health Service chemical tests (including heavy metals), dissolved oxygen, turbidity, temperature, bacteriological (including fecal coliform), pH, organics, radioactivity, pesticides, herbicides, etc.

**C. Reliability:** Sufficient geological, hydrological and meteorological studies will be required to prove that the design flows can be maintained through the driest years of record.

## 10.08 Treatment Plant and Pumping Station Design

All phases of treatment plant and pumping station design shall be closely coordinated with the District. In general, such facilities shall include all necessary components and amenities as required by the District to ensure a complete, automated, operating facility that will lend itself to minimum maintenance and operational costs. All electrical and telemetry equipment must be designed to be compatible with existing equipment. Treatment plants need to be designed in accordance with the California Surface Water Treatment Rule requirements.

**A. Pumping Units:** Pumping units shall approximately pace the expected flow pattern and shall be capable of providing the maximum design flow with the largest pumping unit out of service.

**B. Access:** All-weather, asphalt access shall be provided to all major functional units.

**C. Structures:** Structures shall provide protection against weather and vandalism, shall be designed to blend architecturally with the character of the development, and shall afford minimum District maintenance. Access to lower or upper structure levels shall be by inside stairways. Structures shall be multipurpose whenever practical and must provide toilet and sink facilities.

Laboratory, storage and/or warehouse facilities may be required where the new development cannot practically utilize existing District facilities. An "in-lieu" fee will be required where it is practical to expand existing District facilities to accommodate the new development.

**D. Treatment Process:** Treatment process will, in general, consist of preliminary screening equipment, an automatic multi-cell Microfiltration system installation and any other process equipment required to adequately treat the raw water from the approved source to meet Surface Water Treatment Rules guidelines for water treatment plant design to meet State and Federal Standards.

**E. Chlorination Facilities:** Chlorination facilities will consist of liquid metering pumps that are designed to handle liquid bleach (Sodium Hypochlorite). These metering pumps shall be capable of pacing water demand either by a flow governed by a residual analyzer or a series of individual meter pumps activated from the pump control panel, as approved by the District.

Chlorine contact facilities shall be designed to provide not less than thirty (30) minutes contact time at peak discharge rate.

**F. Chlorine Analyzer:** A chlorine analyzer with circular recorder will be installed at all treatment plants. The analyzer will be SCADA compliant and plug into the existing monitoring computer.

**G. Clear Well Facilities:** Clear well facilities should be sized in conjunction with distribution system storage to relieve the filters from having to meet all fluctuations in water use or to meet peak demands, including use for backwashing filters and loss of capacity due to filter outages. Additionally, clear wells will provide for the minimum contact time (CT) for disinfection at peak demands.

**H. Backwash Water Recovery Facilities:** Backwash water recovery facilities will be included with all new or modified treatment plants.

**I. pH:** pH adjustment may be required.

**J. Turbidity:** Turbidity monitors with recorder(s) will be installed at all treatment plants. It will be SCADA compliant and its output will be monitored by the existing computer system.

**K. Corrosion Control:** Chemical feeders, as a result of corrosive water, may be required at the completion of the water treatment process, prior to entering the distribution system.

**L. Metering, Recording and Monitoring Equipment:** Metering, recording and monitoring shall be provided at all treatment plants and at major pumping stations as determined by the District. All such equipment shall be compatible with existing District equipment. Radio monitoring and alarm equipment shall be purchased from and installed by District's vendor. Generally requirements are as follows:

**1. Treatment Plants:**

- Flow meter and recorder (seven [7] day programmable circular chart)
- Recording, continuous reading turbidimeter, both raw and finished for each filter, equipped with low and high alarm contacts
- Recording, continuous reading chlorine analyzer to detect chlorine residual, and equipped with adjustable low and high alarm contacts to actuate the alarm and stop water production on indication of excessive or low chlorine residual
- Radio monitoring and alarm equipment shall be compatible and interface with existing District equipment

**2. Pumping Stations:**

- Flow meter and recorder (seven [7] day programmable circular chart)
- Radio monitoring and alarm equipment

**M. Design Flow:** Pumping stations and treatment plants are normally designed to treat and/or pump the Maximum Daily Flow (MDF), maximum hourly, emergency and fire demands are normally supplied from storage without pumping. Where storage facilities are not available, such facilities shall be designed for the Maximum Hourly Flow (MHF), including fire demands and stand-by power, or pumping equipment will be required.

**N. Taste and Odor:** Activated carbon feed system for taste and odor may be required.

**10.09 Storage Facilities**

Storage capacity shall be equal to the sum of the fire storage reservation, plus the allowance for system peaking, plus an allowance for emergency reserve. The minimum storage tank size shall be 250,000 gallons.

**A. Fire Storage Reservation (FSR):** FSR shall be the product of the appropriate fire flow and the design fire duration. The minimum design fire duration shall be four (4) hours but may be increased upwards by the appropriate fire protection agency, where a higher figure is deemed appropriate.

**B. System Peaking Storage (SPS):** SPS is a function of the system design and generally is approximately twenty (20) percent of the total maximum daily flows, assuming a 24 hour pumping rate.

**C. Emergency Storage (ES):** ES shall provide sufficient capacity, without encroaching into the fire storage reservation or the system peaking storage, to carry the system through reasonable periods of system failure. An emergency storage increment of four (4) hour duration, based on the Maximum Daily Flow (MDF) is normally considered adequate. Isolated developments may require a larger increment and must be discussed individually with the District.

**D. Overflow Pipes:** Overflow pipes must be sized to pass the maximum incoming flow rate with a design head of 4-inches; head loss calculators must include both entrance and friction losses. Overflow

must be directed to a natural watercourse in a manner that prevents scouring.

**E. In-Lieu Fee:** Where it is impractical to construct required facilities at the required elevations, or where, in the opinion of the District, it is more practical to expand existing District facilities, the owner shall pay an "in-lieu" fee based on required storage volume and current construction cost.

#### 10.10 Transmission Lines

The following requirements are applicable from a source to a storage facility and where there are no services off the transmission line. Beyond the point of storage, or if storage is not available, or where services are taken off, the requirements of distribution lines normally apply

**A. Design Flow Rate:** Size line to pass the Maximum Daily Flow (MDF).

**B. Design Pressure:** Design pressure shall be such that the Design Flow Rate can be maintained to supply water from the source to the storage facility.

**C. Main Line, Valves, Blow-off Assemblies and Air Release Valves:** Main line valves shall be provided at least every 1,000-lineal-feet in residential areas and 500-feet in commercial, industrial or institutional areas. The District must approve any exceptions. Air release valves shall be installed at all major summits and every 1,500- to 3,000-feet, and at both ends of long horizontal runs of pipe. Blow-offs shall be installed at all major low points. Whenever practical, a fire hydrant shall be substituted for blow-off valves. Whenever possible, valves shall be shown as required in Section 10.11. All valve risers shall be 8-inches minimum diameter.

#### 10.11 Distribution Lines

The following requirements are applicable on all water lines not classified as transmission lines.

**A. Design Flow Rate:** Size lines for the higher of the following two conditions at the Design Pressures:

1. Municipal Service-Maximum Hourly Flow (MHF).
2. Fire Flow Demand Rate plus Maximum Daily Flow (MDF).

**B. Design Pressure:** Shall be such that the Design Flow Rate can be maintained as follows:

- Maximum Day flow - 40-psi
- Peak Demand Flow - 30-psi
- Fire Demand plus Maximum Hourly Flow (MHF) 20-psi

**C. Minimum Size Lines:** In general, the minimum pipe size shall not be less than 8-inches inside diameter. The installation of smaller mains shall be limited to cul-de-sacs or courts where the length of the pipeline is 300-feet or less, and will be approved by the District Manager and/or Engineer.

1. Commercial: 8-inch
2. Transmission and major distribution lines shall not be less in diameter than the lines that they serve.

#### **D. Service Connections**

1. **Backflow Assembly:** Reverse Pressure Principle (RPP) Backflow Devices (BFD) will be required for all connections where there is potential contamination to the water system. The following Reverse Pressure Principle (RPP) assemblies are approved: Wilkins 975XL, WATTS 800MY and FEBCO 765-766 or District approved equal. The following PVB's are approved: FEBCO 765-766, WATTS 800 MY and the Watts 800 QT.
2. **Water Meters:** At least one meter shall be established for each separately deeded parcel identified by a county Assessor's Parcel Number (APN). All meter connections issued shall require an APN. An exception to this policy may be granted by the District Manager for

landscape irrigation deeded to the City and service to street medians or parkways which are contained within a public street right-of-way and are not defined as a separate deeded parcel. Model homes may be allowed water and sewer service by the District Manager on a case-by-case application, when a written request by the Developer is submitted.

When master metering is not utilized, water meters are required for each residence, dwelling, commercial and industrial unit. The Project Engineer shall size each meter service according to the District's metering Policy 7120. All meter sizing shall be subject to District review.

**E. Valves, Air Release Valves, Pressure Reducing Stations, High Pressure Relief Stations and Blow-off Assemblies:** The distribution system shall be designed with a sufficient number of valves so that no single shut down will result in shutting down a distribution line or necessitate the removal from service, of a length of pipe greater than 500-feet in school, commercial, industrial, or multiple family dwelling areas, or greater than 900-feet in other locations. In no case shall more than two (2) fire hydrants be removed from service. The valves shall be so located that any section of the main can be shut down without going to more than two locations to close valves. There shall be three control valves at a tee or wye intersection(s) and four (4) valves at a cross intersection. Valves shall, preferably, be located at street intersections. If it is necessary to install valves between street intersections, they shall be located on the prolongation of property lines between lots.

Pressure Reducing Stations (PRS) will be installed when appropriate and shall automatically reduce a higher inlet pressure to a steady lower downstream pressure. High Pressure Relief Stations (HPRS) shall be installed to relieve excessive downstream pressure in the case of failure of the PRS. HPRS will be placed downstream of PRS and set at 25-psi above static pressure at that point.

All stations shall be located outside of the traveled way and protected from traffic.

In general, fire hydrants shall be used for blow-off assemblies. A blow-off assembly shall be installed on all permanent dead-end runs and at all major low points in the system. Special attention shall be given to those of a temporary nature, taking into consideration the length of the dead-end run, the number of services on the line and the estimated time before extension. Wherever possible, the blow-off shall be installed in the street right-of-way. In no case shall the location be such that there is a possibility of back-siphonage into the distribution system.

Air release assemblies shall be provided at all major high points in the system and protected from traffic.

**F. Line Location:** All water and sewer mains shall be designed to be within the paved portion of the roadway. Normally water is 6-feet from the right-of-way centerline, and parallel with the centerline, or in a public easement. All locations within existing road rights-of-way shall be approved by the City or County. If it is necessary to install water or a sewer main within a private road, the easement shall be the width of the road easement, or 20-feet, whichever is larger.

**G. Sample Sites:** When a project has fifteen (15) or more parcels, a sample station is required. Include a copy of the District drawing W-15 in the plan details.

**H. Regulations Relating to Sanitary Hazards:** All construction shall conform to applicable regulations relative to safeguarding the public health, particularly the regulations relating to cross-connections as established by the California Administrative Code, Title 22 and Title 17 for dual plumbed re-cycle water.

In designing the distribution system, it is intended that 10-feet be the minimum horizontal distance between parallel water and sanitary sewer lines and that the water main be at least 12-inches higher.



Where water and sewer pipelines must cross, the water pipeline shall be constructed above the sewer, with at least 12-inches vertical separation. All joints in the water pipeline shall be located at least 9-feet from the point of intersection, and at least 9-feet from the nearest joint in the sewer pipeline. To accomplish this requirement, it may be necessary to enclose either the water line or sewer line in a conductor pipe, or utilize materials and joint lengths other than those specified for the balance of the pipeline.

All other State Health Department Standards will be applicable when interfacing with sewer and non-potable water issues and how they are dealt with.

**I. Main Layout:** Whenever possible, the distribution system shall be in a grid form so that pressures throughout the pressure zone(s) tend to become equalized under varying rates and locations of maximum demand. Further attention will be given to avoid all "dead-ends" within the system whenever possible. The minimum pressures and flows, as specified above, shall govern design of the system.

#### 10.12 **Fire Protection**

**A. Type of Fire Hydrants:** Specific hydrant locations and make and model shall be approved by the fire department having jurisdiction. Fire hydrants shall be served by a minimum of 6-inch diameter pipe, not exceeding 40-feet in length. Each hydrant will have its own control valve teed from the District's main.

#### **B. Spacing of Fire Hydrants**

1. Single family and duplex residential developments, not to exceed 400-feet.
2. Townhouse, multiple-residential and similar density, as per the standards of the applicable Fire Department.
3. Hydrants serving commercial or industrial will have a spacing not to exceed 300-feet.

**C. Guard Valves** Guard valves are required for all fire hydrants; risers shall be 8-inch minimum.

#### 10.13 **Tying Into Existing Lines**

Tying into an existing Asbestos Cement pipe line will require the removal of a full length of existing pipe and replacing with a tee and valve assembly of three (3) valves. When tapping into existing PVC pipe a length of pipe equal to the valve assembly length maybe cut out for the installation.

#### 10.14 **Connection to Transmission Lines**

Services shall **not** connect to transmission lines without the written approval of the District Engineer.

#### 10.15 **Creek Crossings**

Crossing details of pipe, pier, anchorage, transition couplings, etc., shall be shown upon a detail sheet of the plans in large scale.

Ductile iron pipe shall be used under the full creek width, plus 10-feet on each side. All soft or organic material shall be replaced with select imported backfill. Special care shall be used to provide a firm base for the pipe bedding. Full concrete encasement is required.

If the pipe must cross above the creek bed, ductile iron pipe shall be used. Reinforced concrete cylindrical piers of adequate depth shall be used. The pipe shall be held by galvanized steel straps, with galvanized anchor bolts of adequate size, in cylindrical cradles formed in the pier tops. Cushion material shall be placed between the pipe, clamps and support.

Calculations shall be submitted which clearly indicate the design of the pipe and supports regarding impact, horizontal and vertical forces, overturning, pier and anchorage reactions, etc.

**10.16 Locator Wire**

All runs of non-metallic and ductile iron pipe shall have a No. 10WG solid, soft drawn copper wire with Type TW insulation, blue in color for water and green in color for sewer. The locator shall be installed on top and over the centerline of the pipe with tape (refer to DWG W-3). The wire shall be looped up inside valve boxes, pump stations and PRV vaults for water, and inside property line cleanouts for sewer, etc. Splices in the locator wire will be with under ground direct bury waterproof connectors (Dryconn #10666) and will be taped with electrical tape, to be approved by the District.

**SECTION 11.00 - DESIGN CRITERIA – SEWER SYSTEMS**

**11.01 Design Flow**

Sewer size shall be designed on the basis of a design average flow of not less than 100-gallons per capita per day, or 250-gallons per dwelling unit, and provide a minimum of 2.0-feet per second velocity when flowing full. In no case shall a public sewer be sized less than 8-inches in diameter.

Non-residential structures shall have wastewater design flow rates approved by the District Manager and/or Engineer.

Infiltration/inflow of groundwater or other leakage into the sewer (including manholes) shall not exceed 50-gallons per mile of sewer per inch of inside diameter of the sewer per 24-hours in any section of the completed work, and in no case shall it exceed 3,000-gallons per mile per 24-hours. The infiltration rate into each section of the sewer shall be measured by the temporary installation of suitable recordable flow meters as authorized by the District. These flow meters shall be furnished, installed, and removed by the Contractor. If leakage is excessive, leaks into the sewer shall be located, repaired and corrected.

All sewers shall be designed to pass the design flow with a free water surface.

The estimated population used for design, including population equivalents for commercial, industrial and institutional uses, shall be indicated on the construction plans submitted for approval.

Sewer mains subject to extension in the future shall be sized to serve the entire area tributary to the proposed development. The project engineer shall submit a study substantiating the proposed size of sewer in such cases. Discussion of parameters with the District Manager and/or Engineer is advised prior to the study.

**11.02 Gradient**

All gravity sewers to be installed in the District shall be designed to give mean velocities, when flowing full, of at least 2.0-feet per second.

Gravity sewers shall be laid with uniform slope between manholes. The minimum slope of gravity main line sewer shall be as listed in the table below or as otherwise approved by the District Manager and/or Engineer.

**Minimum Sewer Gradients**

<u>Diameter</u>	<u>Slope</u>
Service line	0.0200 (1/4" per foot)
6"	0.0050

8"	0.0035
10"	0.0025
12"	0.0020
15"	0.0015
18"	0.0012

At changes in pipe size, the invert of the pipe flowing from the manhole shall be sufficiently lower than the incoming pipe invert to match the inside crown elevation of the pipes.

At manholes where sewer diameters change, the flow energy gradient shall be continuous. An approximate method for securing these results is to match the 0.8-depth point of both sewers.

Average flow velocities greater than 10-feet per second shall not be permitted. Drop manholes shall be provided where required to eliminate steep slopes and to reduce high velocities to a limit of 8-feet per second or less.

Head loss in manholes and all changes of direction, size or shape of sewers shall be made by gradual transitions so as to minimize head loss in manholes. The Project Engineer shall take into consideration the head losses occurring at all manhole inlets and outlets. Manholes should be designed with a minimum 0.1-foot drop in elevation from the inverts of the inlets to the invert of the outlet (for straight through). For all other horizontal alignment deflections of greater than 40° but less than or equal to 90° shall include a 0.2-foot drop between inlet and outlet. The elevation of the inverts of all inlets and the outlet shall be shown on the plans along with the elevation of the top of the manhole.

Manholes with a depth greater than 12-feet shall have a minimum of 60-inch inside diameter barrels for the entire depth. Manholes shall be designed by a professional engineer when depths exceed 25-feet.

A drop manhole shall be constructed at any location where there is drop in the sewer invert of more than 2.0-feet. Outside drop manhole structures shall be used on all 48-inch barreled manholes in accordance with the Standard Details (refer to S-4). Interior drop manholes shall have a minimum interior diameter of 60-inches. Generally, only one interior drop is permitted per manhole, multiple interior drops must be approved on a case-by-case situation and will need District Manager or Engineer approval.

**11.03 Sewer Connections**

Sewer connections of lateral, 6-inches in diameter or larger, shall be made at manholes.

**11.04 Pipe Size**

Sewer pipe sizes shall be adequate to carry peak design flows at the design gradient, with a minimum size of 8-inch diameter, except for service lines. Service lines shall be 4-inch diameter, except where the design flow requires a larger size. A 6-inch diameter pipe may be used in the last run in residential areas on cul-de-sacs, and in locations where no future extensions of the main are intended.

**11.05 Location and Alignment**

Sanitary sewers shall be installed within right-of-way dedicated for public street or roads where practical. If not located in street or road right-of-way, sewers shall be installed within the center of a 20-foot wide permanent easement deeded to and accepted by the District or to the City or the County as a public utilities easement. Section 6.00, (Easements, Rights-of-Way and Permits), will provide greater detail.

Gravity sewers shall be laid with straight alignment between manholes.

Where a curved alignment is necessary, the minimum radius of curvature shall be 400-feet. No sanitary sewer, including service lines, shall be located within 50-feet of a water well.

The permissible location and installation requirements for any sanitary sewer to be installed in existing streets or roads shall be obtained from the appropriate agency prior to submission of plans.

**11.06 Manhole Locations**

Manholes shall be constructed at all pipeline intersections (except service lines), at angle points, at changes of pipe size or gradient, at the terminus of lines, and at maximum intervals of 400-feet on sewers up to 18-inches in diameter, and at intervals of 500-feet on sewers 18-inches in diameter or larger.

Where manhole locations are fixed by intersections, the spacing of intervening manholes shall be approximately equal.

**11.07 Manholes and Appurtenances**

All manholes may have pre-cast or poured-in-place bases with reinforced concrete pipe sections 4-feet inside diameter on all pipe 18-inches and less. 5-foot inside diameter will be required for pipe sizes greater than 18-inches and all inside drop manholes. Poured-in-place bases will be approved by the District Manager and/or Engineer on a case-by-case basis. The height adjustment rings and taper sections will be manufactured in conformance with ASTM Designation C-76. Manhole covers and cover frames shall be cast iron, and shall be of a type as manufactured by D&L Supply A-1024 Water Tight, South Bay Foundry SBF 1900 OS, Phoenix Iron Works P-1090 R/G, or equal. Manhole covers shall be clearly marked "S.S." in raised letters to denote sanitary sewer.

Manhole frames and covers shall be set at elevations to exclude surface water. Concrete adjustment rings maybe used to adjust manhole rim elevations up to 12-inches. A 1-foot barrel riser section must be used in adjustments greater than 12-inches. In undeveloped areas, the rim elevation shall be set 18-inches above the existing ground elevation. In areas subject to flooding, watertight manhole covers are required to be used. Where a series of watertight manhole covers are used on a main line sewer for a distance of 1,000-feet or more, vent pipes are required.

Manholes receiving force main discharge shall have the interior (excluding individual residential grinder pump force main) coated with an approved coating material. The interior of downstream manholes for a distance of 1,000-linear-feet must also be coated with the acid resistant material.

A maximum of three (3) service connections may be installed into one manhole. When the service connection is to be installed into an existing manhole, a boot connector must be used. Corings for boot connectors shall not be within 6-inches of a manhole barrel section joint.

**11.08 Clean-outs**

A clean-out may be used in lieu of a manhole at the terminus of any sewer where the distance from the terminus to the next manhole does not exceed 100-feet. Exceptions may be permitted by approval of the District Manager and/or Engineer.

**11.09 Stubs for Extensions**

When required by the District, stub pipes shall be installed in manholes, with plugged end, for anticipated future extensions. The location and size of stubs is subject to approval by the District Manager and/or Engineer.

**11.10 Service Line Design**

Each residence or structure will have its own independent sewer lateral. The clean-out with plug will require a concrete sewer box equal to Christy No. G-5 concrete box, a cast iron traffic lid installed for each service lateral and it shall be brought to grade at the property line.

Minimum Depth: All service lines shall be maintained at 36-inches to 60-inches of cover at the property line wherever practicable. Minimum cover on service lines shall be 3-feet throughout the length of the line within the public right-of-way. Any exception from this rule must have prior approval by the District Manager and/or Engineer.

Connection of the service laterals to the collection sewer shall be by means of a sanitary sewer pipe wye. The service lateral shall be constructed to a point 1-foot behind the sidewalk.

For existing mains where single dwellings are tapped, the saddle and service tap will be provided by District personnel.

All sanitary sewer clean-outs serving 4-inch lateral shall conform to the Uniform Plumbing Code with clean-outs at no more than 100-foot spacing and no more than two bends in excess of 45° without a clean-out.

All clean-outs shall have a box equivalent to a Christy G-5 box with a cast iron lid over it and shall not be placed any lower than 10-inches below grade.

Prior to the installation of a sewer lateral into a commercial, industrial, or municipal building, the Developer is required to submit plans for review to the District. The plans will be reviewed to determine the necessity for the installation of a grease interceptor, sand trap, or sewer monitoring manhole. The District will not serve the development with water and sewer until there is compliance with this requirement.

The minimum lateral size shall be 4-inch SDR-35 or 26 from the house to the street.

A 6-inch or larger lateral serving three (3) or more dwelling units will end at the District main in a manhole.

The District does not assume responsibility for sewer laterals. It is the responsibility of the home or business owner to construct, maintain, and operate any and all sewer lateral service connections from the waste disposal system on such premises to the District's sewer main adjacent to the lot or parcel. All expenses and costs of this matter will be the sole responsibility of the property owner.

The exact location of sewer laterals passing under curb and gutter and sidewalks shall be indicated with the letter "S" cast in the curb directly above the underground service lateral. The exact location of the end of service lines stubbed for future residences of structures shall be marked by a steel "T" type fence post placed vertically in the ground at the end of the stub and extending a minimum of 12-inches above the ground surface, with the exposed portion painted white.

#### **11.11 Private Sewer Line Requirements**

All private sewer system construction shall be required to meet these standards and/or be subject to review by the District.

Wastewater grinder pumping stations, where they cannot be avoided, may be permitted within a private sewer system and shall not be located within a public sewer system.

#### **11.12 Sewer Service Line Backflow Prevention Check Valve**

A one-way sewer check valve shall be installed before the first cleanout in the service line at a location approved by the District inspector, from the service line exit of the parent structure. A box will be installed over this assembly to allow for two-hand service and maintenance (minimum of Christy B-16). The Adapt-A-Valve combination extendable backwater valve and testing system (made by Mainline) with a Christy G-5 box and cast iron lid may be substituted at the property line. These valves, along with all clean-outs in the service lines, will be the customer's service and maintenance responsibility. Suppliers know them as "backwater valves."

#### **11.13 Grease Traps and Grease Interceptors**

When, in the judgment of the District, waste pretreatment is required, a grease interceptor shall be installed (refer to TWSD grease interceptor detail) in the waste line leading from sinks, drains, and other fixtures or equipment in establishments such as restaurants, cafes, lunch counters, cafeterias, bars, clubs, hotels, hospital, sanitarium, factory, school kitchens or other establishments where grease (plant or animal) may be introduced into the sewage system in quantities that can effect line stoppage.

No grease trap shall be installed which has an approved rate of flow of more than 55-gallons per minute, nor less than 20-gallons per minute, except when specially approved by the District.

Not more than four (4) separate fixtures shall be connected to or discharged into any one grease trap.

Calculations shall be submitted to the District to verify that the volume of the tank has been determined under the provisions of the most recent edition of the Uniform Plumbing Code.

No food waste disposal unit shall be connected to or discharged into any grease interceptor or grease trap.

Refer to the grease interceptor detail. The submittal of an alternate design for manufactured tanks must be submitted to the District for approval.

Structural Requirements:

- A. Reinforcing steel, deformed bar ASTM A61, Grade 40, tensile strength, 40,000 psi.
- B. Concrete shall be 2500 psi compressive strength or greater at 28 days, and shall not contain aggregate larger than 3/4" in size.
- C. Maximum top slab loading shall not exceed: 100 psf light wheel load, 300 psf soil load, 1200 psf soil bearing load and 45 psf lateral load.

A grease trap is not required for individual dwelling units or for any private living quarters.

#### **11.14 Locator Conductors**

A continuous detectable metallic warning identification tape shall be installed within 18-inches of the ground surface. In addition, all sewer lines shall have a plastic coated 10-gauge single strand copper tracer wire running the entire length of the pipe. The tracer wire shall be attached with plastic strapping or duct tape to the line at a maximum of 10-foot intervals. The tracer wire shall terminate inside the clean-out boxes

Private grinder pump stations shall have the continuous detectable metallic warning identifications tape installed within 18-inches of the ground surface only.

### **SECTION 12.00 - BUILDING SEWER (LOW PRESSURE SYSTEMS) STANDARDS**

**ADOPTION DATE: July 7, 1990**

**Amended February 2008**

#### **12.01 General**

Building sewers shall be installed in accordance with Chapter 7, Sanitary Drainage of the Uniform Plumbing Code, 2003 Edition, unless specified otherwise below.

It is the responsibility of the Developer to obtain all approvals required from other public agencies for the proposed installation.

These standards apply to sewer services that will remain owned by the Developer, and for which the District will have no responsibility for operation and/or maintenance.

#### **12.02 General Description**

The manufacturer shall furnish complete factory-built and tested Grinder Pump Station(s), each consisting of grinder pump(s) suitably mounted in a basin constructed of high density polyethylene (HDPE) for simplex stations and fiberglass reinforced polyester resin for duplex stations, NEMA 6P electrical quick disconnect (EQD) pump removal system, shut-off valve, anti-siphon valve, check valve, each assembled in the basin, electrical alarm panel, and all necessary internal wiring and controls. Component type grinder pump systems that require field assembly will not be acceptable, due to the

potential problems that can occur during field assembly. All components and materials shall be in accordance with DWG S-10 and S-11\_of these standards.

**A. Manufacturer:** The manufacturer of the grinder pump station shall be Environment One Corporation (or proposed alternate)

**B. Alternate Equipment:** In the event that the contractor or another supplier proposes an alternate to the specified manufacture, the District recognizes that it will be difficult to conform to certain details of this specification due to different manufacturing techniques or grinder pump station designs. If proposing an alternate, the Contractor (supplier) must submit, and allow 15 business days for the District to review, a complete description of any changes that will be necessary to the system design, a complete submittal package, a system hydraulic analysis (including pipe sizes, flows, velocities, retention times and number and location of recommended valves and cleanouts, if any) based on the proposed pump. This information must be submitted to the District for pre-approval of the alternate equipment being proposed and determination of compliance with these standards. If the equipment differs materially, or differs from the dimensions given on the drawings, the Contractor (supplier) shall submit complete drawings showing elevations, dimensions, or any necessary changes to the standards for the proposed equipment and its installation. Pre-approval, if granted, will be provided in writing by the District to the Contractor (supplier). If the District approval is obtained for alternate equipment, the contractor (supplier) must make any needed changes in the structures, system design, and piping or electrical systems necessary to accommodate the proposed equipment at the expense of the contractor (supplier).

**12.03 Product Specification For Alternate Building Sewer (pressure):** Project dependent, requires District Engineer and Manager approval.

**12.04 Pump**

The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. Plating on the rotor will not be acceptable due to its tendency to delaminate. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service.

**12.05 Grinder**

The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder will be of the rotating type with a stationary hardened and ground stainless steel shredding ring spaced in close annular alignment with the driven impeller assembly, which shall carry two (2) hardened type 400 series stainless steel cutter bars.

1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
2. The maximum flow rate through the cutting mechanism must not exceed 4-feet per second. This is critical design element to prevent jamming and, as such, must be adhered to.
3. The inlet shroud shall have a diameter of no less than 5-inches. Inlet shrouds that are less than 5- inches in diameter will not be accepted due to their inability to maintain the specified 4-feet per second maximum inlet velocity which, by design, prevents unnecessary jamming of the cutter mechanism and eliminates binding of the pump by large objects blocking the inlet shroud.
4. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, rubber and the like, to finely-

divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

**12.06 Electric Motor**

As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. To reduce the potential of environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oil-filled motors will not be accepted.

**12.07 Mechanical Seal**

The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

**12.08 Tank and Integral Access-way  
(Models 2012 & 2014) High Density Polyethylene Construction.**

The tank shall be made of rotationally molded high density polyethylene, with a melt index of 2.0 grams/10 minutes or lower to assure high environmental stress cracking resistance. The tank shall have a nominal thickness of 1/2". All seams created during tank construction are to be thermally welded and factory tested for leak tightness. Tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. Tank capacities shall be as shown on the contract drawings.

The access-way shall be an integral extension of the wet well assembly and include a lockable cover assembly providing low profile mounting and watertight capability. Access-way design and construction shall facilitate field adjustment of station height in increments of 3-inches without the use of any adhesives or sealants requiring cure time before installation can be completed.

The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak-free installation, no field penetrations shall be acceptable.

All discharge piping shall be constructed of 304 Series Stainless Steel and terminate outside the access-way bulkhead with a stainless steel, 1-1/4 inch female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 200 psi WOG; PVC ball valve will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

The access-way shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with access-way penetrations warranted by the manufacturer to be watertight. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. The access-way shall also include a 2-inch PVC vent to prevent sewage gases from accumulating in the tank.

**12.09 Check Valve**

The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6-inches of water at maximum



rated flow. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection-molded part made of glass filled PVC. Ball type check valves are unacceptable due to their limited sealing capacity in slurry applications.

Each grinder pump installation shall also include one separate check valve of the type detailed in S-10 or S-11 for installation in the 1-1/4-inch service lateral between the grinder pump station and the sewer main, preferably next to the curb stop. The separate check valve shall be provided as a separate line item in the bid schedule.

**12.10 Anti-Siphon Valve**

The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from a glass-filled thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices, due to their tendency to clog from the solids in the slurry being pumped.

**12.11 Core Unit**

The grinder pump station shall have cartridge type, easily removable core assembly consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level control, electrical quick disconnect and wiring. The watertight integrity of each core unit shall be established by 100-percent factory test at a minimum of 5 psig.

**12.12 Controls**

All necessary controls, including motor and level controls, shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners.

Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a separate air-bell sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices.

**12.13 Alarm Panel**

Each grinder pump station shall include a NEMA 4X, UL listed alarm panel suitable for wall mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic to assure corrosion resistance. The enclosure shall include a hinged, lockable cover, padlock, and secured dead front. The enclosure shall not exceed 11.38"W x13.5"H x 5.63"D.

For each core, the panel shall contain one (1) 15 amp, double pole circuit breaker for the power circuit and one (1) 15 amp single pole circuit breaker for the alarm circuit. The panel shall contain terminal blocks, integral power bus, push to run feature and a complete alarm circuit.

**A. The Alarm Panel** shall include the following features: audio & visual alarm, push-to-run switch, and high level (redundant) pump starting control. The alarm sequence is to be as follows:

1. When liquid level in the sewage wet-well rises above the alarm level, visual and audio alarms will be activated. The contacts on the alarm pressure switch will close. The redundant pump starting system will be energized.
2. The audio alarm may be silenced by means of the externally mounted, push-to-silence button.
3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.

**B. Detectable Metallic Underground Tape:** The pressurized pipe for all installations will have the Metallic Underground tape installed within 18-inches of ground level. The tape will terminate in the cleanout box at property line and will be exposed at the ball valve assemblies on the effluent side of the tank. In addition, all pressurized underground sewer shall have a plastic coated ten gauge solid copper tracer wire running the entire length of the pipe as the Metallic Tape (refer to Section 10.16 - Locator Wire)

**C. Clean-outs:** Shall be provided for pressure drainage systems in like manner as gravity systems. Clean-outs will be installed at intervals not to exceed 100-feet in straight runs and for each aggregate horizontal change in direction exceeding 45°.

**D. Property Line Clean-out:** If the gravity drainage line to which such discharge line connects is horizontal, the method of connection shall be from the top through a wye branch fitting.

**E. District sewer may be considered as not being available** when the District's sewer main or any building or any exterior drainage facility connected thereto is located more than 200-feet from any proposed building or exterior drainage facility on any lot or premises which abuts and is served by the District.

**F. Low Pressure Sewer Lines:** Low pressure sewer lines shall be installed with a minimum depth of 24-inches. All material and work shall be in accordance with manufacturer's instructions and recommendations.

Each pipe section and fitting must be positively identifiable as to type and specification. Only the types of pipe listed below are acceptable.

- **Polyvinyl Chloride Pipe (PVC)** material for pipe and fittings shall conform to ASTM D1784r, Class 1254-B. Pipe and fittings shall either be in accordance with ASTM D1785r, Schedule 40, or shall conform to ASTM D2241 for standard dimension ratios: 200 psi—SDR 21. Neoprene gaskets with push-on joints shall conform to ASTM F477. Schedule 40 PVC fittings shall conform to ASTM D2466. PVC solvent weld cement for socket connections shall meet the requirements of ASTM D2564

**G. Valve Boxes:** Valve boxes may be used and shall be high density, reinforced concrete boxes with non-settling shoulders. Valve boxes shall be 10-3/8-inch diameter (nominal) with traffic rated cast-iron grade lid and cover. All lids shall be marked "SEWER." Valve boxes shall be as manufactured by Christy G-5, or equivalent.

## **SECTION 13.00 – DESIGN CRITERIA - LIFT STATIONS AND FORCE MAIN**

Sewage lift stations are neither desirable nor recommended and shall be resorted to only after all other means have been exhausted in engineering analysis.

### **13.01 General**

It is the policy of the District that lift stations be installed only at locations that facilitate providing sewer service on a regional basis, to all parcels within natural water shed areas. Project proposals that include a

site-specific lift station that would preclude sewerage of other properties within the project site's natural drainage area will not be approved.

Lift station and force main designs, along with supporting data and calculations shall be submitted by the Project Engineer. Discussion of parameters with the District Manager and/or Engineer prior to design is advised.

If Project Engineer specifies a factory built and tested "package" unit, detailed calculations, shop and construction drawings and complete specifications for materials must be submitted prior to project approval.

A detailed layout showing each lift station site shall be provided the District for review and approval by the District Engineer prior to project approval by the Board of Directors. The layout shall detail, as a minimum, the following items:

- a. Site location, wet well and valve vault layout, emergency generator location, electrical power conduits and routing, transformer location, roadway access and driveway location. Dimensions shall be provided for all items and separations;
- b. A grading plan with elevation grades shall be provided for the wet well, valve vault, all concrete pads and the asphalt pavement (for storm water drainage);
- c. The entire lift station site and driveway (12-foot wide minimum) shall be asphalt, 2-inch minimum each surface course and base course, with 8-inch minimum base course;
- d. Landscaping item for site screening;
- e. Location and sizes of on-site conduits required for the lift station electric supply and controls, etc.;
- f. Location of existing and proposed utilities, gas and electric services along with accompanying easements;
- g. The lift station site shall be enclosed with a 6-foot high "green vinyl" galvanized chain-link security fence. A 12-foot wide double gate shall be provided for vehicle access. A gate shall be provided within one of the double gates for personal access. Both gates shall be provided with padlock hasps. A shop drawing of the proposed fences shall be provided for review and approval;
- h. The site shall be provided with a potable water supply that is properly protected with an RPP backflow assembly. An on-site fire hydrant installation is required;
- i. Calculations used for determining station design flow;
- j. Pump design criteria including pump performance curves;
- k. Load calculations for station and valve box lid and cover;
- l. Specifications for concrete;
- m. Specifications for protective epoxy linings to prolong the life of the concrete;
- n. Method of sealing concrete rings;
- o. Mechanical drawings showing exact locations of pumps, disconnects, pipes, valves, etc. (all components shall be dimensioned adequately for proper assembly);
- p. Detailed drawings and specifications of all hardware and components used in the wet well and valve box;
- q. Method used for anchoring components to concrete slab and/or walls;
- r. Buoyancy calculations for underground facilities.

### **13.02 Design Considerations for Lift Station**

Shop drawing of the lift station installation and electrical schematics shall be provided for review and approval. These drawings shall detail the wet well and valve vault piping, the control panel schematic and cinder block building to contain back-up generator, control panel and emergency storage equipment.

Single pit type stations with two (2) submersible pumps shall be used except under special conditions. Check valves and isolation valves shall be located in separate vault. A magnetic flow meter shall be installed in the valve vault.

### 13.03 Wet Wells

#### A. Sizing

The usable wet well volume (dead-band volume) shall be calculated using the following formula:

$$V = \frac{TQ}{4}$$

Where: V = dead-band volume, gallons

T = cycle time (time between starts), minutes

Q = design pump flow rate, gpm

The minimum value of T shall be 10-minutes based on a maximum of 6 starts per hour. The value of T may be increased according to pump manufacture's recommendations.

- B. The wet well shall be constructed of high quality concrete cylinder pipe. The interior will be coated with an epoxy lining to prolong the life of the concrete.
- C. Items installed in the wet well shall utilize 316 stainless steel construction. This shall include the pump guide bars, intermediate support brackets, upper guide bar bracket, and all miscellaneous bolts and other hardware.
- D. M-A industrial plastic coated steps, located 16-inches on center, shall be provided in the wet well.
- E. Wet well shall be sized in accordance with acceptable engineering standards for detention times.
- F. Bottom of the lift station shall be constructed in accordance with the pump manufacture's recommendations.
- G. All electrical conduits from the wet well shall be sealed to prevent gases forming in the well from entering the junction box and control panel.

### 13.04 Hatchway

Bilco Company hatchways (or approved equal) shall be utilized for the wet well and valve vault. Both hatchways shall be provided with a recessed hasp covered by a hinged lid, which is flush with the surface. The hatches shall be sized in accordance with the pump manufacturer's recommendation. Each hatch shall be made entirely of structural aluminum with stainless steel hardware to provide a highly corrosion resistant unit.

The hatch covers shall be designed for 300-pounds per square foot loading. In areas subject to possible heavier loading, covers capable of H-20 loadings shall be used.

A Bilco Ladder-Up (or approved equal) shall be included on the valve vault steps for access into and out of the vault.

### 13.05 Capacity

The design pump capacity for sewer lift stations shall be based on peak wet weather flow for the area being served. An average flow of 100-gallons per person per day, or 350-gallons per dwelling unit, shall be used for design of sewers with peak flows. All sewers shall be designed to carry peak flow without surging the manholes.

The estimated population use for design including population equivalents for commercial, industrial and institutional uses shall be submitted prior to commencement of design of improvements. Historic flows may be considered in determining design flow where adequate information is available.

**13.06 Pump Configuration**

Pump configuration shall be submersible grinder type and manufactured by Flygt, with Submeg units. The pump model selected shall be suitable for both high and low flow conditions. The impeller shall be sized to pass a minimum 3-inch size sphere. Consideration shall be given to the new and old force main friction coefficient valves. A minimum of two (2) pumps (duplex) shall be required where each pump is capable of pumping the design flow, with the second pump action as a back up. Operation of pumps shall automatically alternate to maintain even wear. The District may require a three (3) pump (triplex) system based on conditions of operation or where a higher level of reliability is required.

**13.07 Emergency**

The amount of storage will be based on design flows, environmental sensitivity, and estimated time for District personnel to respond to the emergency and reestablish station operation.

**13.08 Stand-by Power**

On-site stand-by power shall be required for all lift stations. Stand-by generators shall be sized to accommodate pumping the maximum design flow.

The automatic transfer switch shall be provided with a manual override and automatic exercise features. The manual override switch will include a receptacle to accommodate the District's portable generator. A shop drawing must be provided for review.

The engine shall be fueled by natural gas. A detail of the natural gas service line shall be included.

**13.09 Bypass Pipe**

All stations shall be equipped with a bypass pipeline to allow pumping from the wet well to the force main through a portable pump. Suction and discharge bypass pipes shall be 6-inches in diameter with cam-lock quick disconnect and cap for connection to pump hoses. Suction pipe shall include a drop pipe installed in the wet well to within 6-inches of the invert. The discharge pipe shall be installed in the force main downstream from the pump check valves and shall include an isolation valve between the force main and disconnect.

**13.10 Telemetry and/or SCADA Communications**

Telemetry and/or SCADA Communications systems that utilizes radio communication shall be provided to protect the lift station from unauthorized access, vandalism, theft, sabotage, terrorism, etc. Security measures for the lift station shall include 24-hour remote monitoring including unauthorized entry and operation trouble alarms. Developers shall be responsible for all costs of installing and activation of security monitoring. Developers shall be responsible for monitoring and power cost until the District formally accepts the improvement.

**13.11 Alarms**

Lift station equipment shall include alarms for the following conditions: low water level, high water level, pump failure, generator failure, station power failure, fire, security and low fuel on generator. If the pumps have diagnostics, which will shut them down in case of failure, these are to be alarmed also.

**13.12 Force Main Design and Testing**

Plan Submittal – The force main shall be shown in profile. The force main shall be installed at uniform grades (0.10% min. slope). Force mains shall be designed to reduce energy costs and prevent settling of solids in the line. A minimum velocity of 3.0-ft/s shall be provided. A roughness coefficient of C=120 shall be used for the force main calculations. Force mains shall be designed using restrained joints or concrete thrust blocks to prevent movement of pipeline and fittings under pressure.

The minimum size of force mains shall be 4-inches.

A minimum depth of 5-foot, 6-inches shall be maintained for the force main. This depth shall be from

proposed final grade elevation to the crown of the force main.

The pipe used will be class 52 ductile iron per AWWA standard C-151 grade pressure pipe for water. All fittings will be pressure fittings for water. All pipe and fittings will have a minimum pressure rating of 150-psi. After District review and approval, HDPE pipe maybe used when directional boring. 10-gauge tracer wire will be placed over pipe.

Pressure-rated clean-outs (flushing stations) shall be provided at 1,000-foot intervals. A cleaning pig device launching port shall be provided. This launching port may serve as a by-pass port.

Installation of sewage air release and sewage combination air release and air vacuum valves(A.R.I. D-020 Stainless steel) shall be detailed on the approved drawings. These valves shall be installed at high points on the force main installation and at intervals of 2,000-feet on long horizontal runs that lack clearly defined high points.

Force main construction pipe shall be encased in polyethylene in accordance with AWWA C-105.

A minimum depth of 5-foot, 6-inches shall be maintained for the force main. This depth shall be from proposed final grade elevation to the crown of the force main.

**Force Main Water Pressure Test**—Test shall be made in conformance with the applicable provisions of **AWWA standard C-600**. The test pressure shall be at 100-psi. If no pressure drop occurs within a two (2) hour test time, the pipe shall pass the test. Any pressure lost is a failure. The alternate test procedure will be in strict according to **C-600** for pressure testing and allowance for acceptable water lose utilizing proper measurement of added water and an acceptable formula for water loss.

### **13.13 Pigging Port**

All lift stations shall include a pigging port to allow insertion of a pipe cleaning pig into the force main. Pigging port shall be installed downstream of the pump check valves.

### **13.14 Odor Control**

Depending on the local conditions and proximity to potentially sensitive receptors, odor control may be required at sewer lift stations. A 6-inch air vent in the form of an inverted “J” shall be installed on the vault well to vent gases. This vent shall be made of ductile iron. The end shall have provisions to attach a charcoal filter for lift stations where odors are a problem. Where a charcoal filter is not required, a stainless steel mesh insect screen shall be installed. Odor control might also include chemical treatment or forced air ventilation through the charcoal filter media. Any one or all of the above applications are at the discretion of the District.

### **13.15 Noise Control**

Depending on the local conditions and proximity to potentially sensitive receptors, noise control may be required at sewer lift stations. Noise control may include sound deadening insulation in buildings and/or mechanical sound attenuation for equipment such as stand-by generators at the discretion of the District.

### **13.16 Location and Access Site**

Lift station site shall be located such that heavy equipment can reach sit without trespassing on other properties. Site shall be at least 50-feet by 50-feet to minimize potential adverse environmental impacts in the event of an overflow or spill. Where lift stations must be placed near open watercourses, they must include adequate protection such as emergency storage and grading and drainage modifications to prevent discharge into surface waters.

District is to have ownership in fee simple, or provided with an exclusive easement dedicated to the District. Lift station sites shall include adequate driveways, parking, and turnaround space to allow District service vehicles access to wet well and valve vault hatches and building doorways.

Ingress and egress are to be provided by direct connection to public roadway or by easement dedicated to the District. The site shall be accessible through a paved asphalt or concrete driveway.

**13.17 Pump/Motor Handling Equipment**

Where lift stations include pumps, motors, or other equipment which cannot be accessed or lifted with the District's standard service equipment, pump/motor handling equipment may be required. Pump/motor handling equipment may include cranes, trolleys, hoists, or other equipment determined necessary by the District.

**13.18 Comminution (Sewer Grinder)**

Depending on the nature of the customers being served and the level of reliability required, comminution may be required. The District, on a case-by-case basis, will determine the need for comminution.

**13.19 Buildings**

Buildings shall be required for all sewer lift stations and will be of the cinder block design. Buildings shall include at least one standard entry door and one minimum 8-foot wide roll-up door.

**13.20 Outside Security Lighting**

All sewer lift stations shall be equipped with outdoor security lighting. Security lighting shall operate on an automatic photo/motion sensor, with a manual override.

**13.21 Vibration**

Regardless of the type of unit constructed, maximum vibration measured around the upper circumference of the motor of the completed and functioning sewer lift stations shall be less than 1-mil peak measured around the upper circumference of the motor. Vibration will be measured before the District Board accepts the station. Corrections for excess vibration shall be the responsibility of the contractor.

**SECTION 14.00 –INSTALLATION PROCEDURES & SPECIFICATIONS –  
WATER & SEWER SYSTEM**

**14.01 Control of Materials**

The Developer shall furnish samples of materials as deemed necessary by the District for testing to verify conformance with project specifications and District Standards. Samples shall be furnished at no cost to the District.

All tests of materials will be made in accordance with recognized standards of national organizations. The project sponsor shall pay the cost of testing for materials, which conform or do not conform, to such specifications and standards

At the discretion of the District, materials may be approved for use when accompanied by a Certificate of Compliance, stating that the material complies with all requirements of the specifications and District Standards. The certificate shall be signed by the manufacturer of the material. A Certificate of Compliance shall be furnished with each lot of material delivered to the work, and the lot so certified shall be clearly identified in the certificate

All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The Certificate of Compliance shall not relieve the project sponsor of responsibility for furnishing material which conforms to the requirements of the specifications and District Standards. Any material not conforming to such requirements will be subject to rejection, regardless of its stage of installation.

**14.02 Rights-of-Way**

All facilities to be operated or maintained by the District shall be located in public street rights-of-way wherever possible. When facilities cannot be located in streets, they shall be located in public utility

easements dedicated to the District. The location and width of easements shall be in accordance with Section 6.00 and is subject to District approval.

**14.03 Control of Work**

A minimum of not less than two (2) full business days' notice shall be given to the District prior to commencement of any work. A minimum of not less than two (2) full business days' notice shall be given to the District prior to any phase of the work requiring disruption of existing water and/or sewer service. Connection to existing District facilities or conflicts with other utilities, shall be discussed well in advance of the commencement of that phase of the work.

It shall be the contractor's responsibility to ascertain possible conflicts with underground utilities, locate said utilities in advance of the work, and notify all applicable agencies and acquire any and all required permission and/or permits.

**14.04 Conveyance of Facilities**

Conveyance of facilities will be required before the District accepts the facilities. The completion of construction of the Project's water and/or sewer improvements must be in accordance with the approved plans and these standards. The Developer shall convey title of the completed works to the District without cost, and free and clear of all liens and encumbrances, by appropriate conveying documents. Start all conveyance proceedings with the District's front office.

**14.05 Policy 7160**

Policy 7160 specifies that owners of lands desiring annexation to the District for domestic water service, and sub-divisions currently within District boundaries desiring domestic water service, agree to deed exclusive underground water rights to the District. The owners of said lands will execute a Quitclaim Deed and Authorization for Underground Water Rights" (Policy 7160) at the time the District agrees to the annexation or facilities acceptance.

**14.06 Connections to Facilities**

No connections will be permitted to any portion of the Project's water and/or sewer improvements which are not completed in accordance with these standards and accepted by the District.

**14.07 Work Within County, Cal-Trans or City Rights-of-Ways**

All contractors performing work in connection with District's facilities within County, Cal-Trans or City rights-of-way, for which application for an encroachment permit by the District is required by the above agencies, shall be covered by a bond for maintenance of the work for three (3) years following the completion thereof. Said bond to be on file with the County and/or City and the District, and to be in the amount of not less than \$3,000.00.

**SECTION 15.00 - GENERAL CONSTRUCTION REQUIREMENTS**

**15.01 Conformance with Approvals**

All construction work shall be performed in strict conformance with the approved plans and specifications, permits issued by other agencies, all applicable State and local laws, and these Standards.

**15.02 Water Pollution**

Water pollution is regulated by the State Resources Control Board in the Oroville area and all projects will be required to have the proper **NPDES** permits in possession before any construction begins. For further information, contact the State Resources Control Board at 1-916-341-5537 or <http://www.waterboards.ca.gov/stormwtr/index.html>.

The Developer shall be completely responsible for compliance with all State, and federal **NPDES** regulations pertaining to water pollution and soil erosion, including the payment of any fines or penalties imposed by said agencies as a result of work performed by or for the Developer.



Nothing in these Standards shall relieve the Developer of the responsibility for compliance with Sections 5650 and 12015, California Fish and Game Code, or other applicable statutes relating to prevention or abatement of water pollution.

### **15.03 Installation of Casing, Boring and Jacking**

At locations shown or specified in the contract, conductor pipe and associated carrier pipe (water and sewer) shall be jacked into place between the limits shown or specified, in accordance with Section 65-1.05 - "Jacking Pipe," of the State Specifications, and these Specifications. Refer to **AWWA C-600**. All boring and jacking operations shall comply with Cal OSHA Tunnel Safety Orders.

The contractor shall provide a boring and jacking plan to the District prior to beginning the boring and jacking operations. The boring and jacking plan shall describe the equipment, method, and construction sequence for boring and jacking. The plan shall identify the location of all potential conflicting public and private utilities and address any conflicts with their root systems. Work associated with boring and jacking shall not begin until the District has reviewed the contractor's boring and jacking plan.

Excavation of boring and receiving pits shall be the minimum size necessary to complete the work. Shoring and bracing for the boring and receiving pits shall conform to the requirements. Shoring and bracing for the boring and receiving pits shall conform to the requirements in Section 15.07 (Excavation) of these Specifications.

**Installation of Conductor Pipe:** The diameter of the bored hole shall not be more than one-tenth foot (0.1') greater than the outside diameter of the conductor pipe. Guide rails shall be accurately set to line and grade to ensure installation of the conductor pipe within permitted tolerances. The conductor pipe diameter shall be sufficient to allow adjustment of line and grade of the carrier pipe to meet allowable tolerances and to allow sand to be placed between the conductor pipe and the carrier pipe. Conductor pipe sizes shall be as shown or specified in the approved plans, but in no case shall the inside diameter of the conductor pipe be less than six-inches greater than the outside diameter of the carrier pipe.

**Installing Carrier Pipe Inside Conductor Pipe:** Each joint of carrier pipe for water shall be strapped according to the manufacturer's recommendations with casing insulators. The insulators should be close enough to prevent contact of the pipe with the casing between insulators. At least one complete insulator should be installed within six inches of each end of the Conductor pipe.

The calculated weight load on each runner on the insulator, based on the weight of the pipe and its contents, should not exceed 200 to 250 psi.

Casing insulators that allow at least one inch clearance between the inside diameter of the conductor and the top runner should be used, especially in large diameter pipes. Greater clearance is recommended when possible to allow for misaligned casings, out of round conductor pipe, etc.

Carrier pipe sections shall be joined outside the conductor pipe and then slid into place. The space between the carrier pipe and the conductor pipe shall be completely filled with clean, dry sand. The method of placing sand shall be as approved by the District. Adjustment in grades for water pipe shall be as shown or specified in the contract, or directed by the District.

Whenever conductor pipes are installed, each end shall be sealed to prevent the entry of water, dirt and other debris between the conductor and carrier pipe. This can be accomplished by the use of any of several models of casing End Seals offered by the manufacturer. The End Seal used will be approved by the District Engineer during the planning stage.

**Tolerances:** The maximum deviation of conductor pipe from the line and grade shown in the plans shall be such that line and grade of the carrier pipe can be adjusted within the conductor pipe and maintain the line and grade along its full length.

#### 15.04 **Trench Excavation and Backfill**

#### 15.05 **Applicability**

These standards regarding trench excavation and backfill shall apply to construction in private roads and in easements, and shall supplement conditions of an encroachment permit for construction within public streets and roads. In case of a conflict between the terms of these standards and an encroachment permit, the terms of the encroachment permit shall prevail.

#### 15.06 **Materials**

Native backfill shall be the material excavated from the trench. The native material used for backfill shall be free of roots and debris, lumps, frozen materials, and rocks larger than 4-inches in greatest dimensions. Wherever rock is used in the trench, sufficient fine material shall be placed with the rock to prevent any voids in the backfill.

The requirements for native soil used as back fill within a roadway prism, or future road easements, will be regulated by the applicable agency.

Imported bedding material to be applied around the pipe shall be a grade of sand known as PG&E sand (washed sand and screened to ¼” or smaller).

#### 15.07 **Excavation**

**General:** When the District is required to maintain an encroachment permit with the City, County or Cal-Trans, the following requirements apply:

- No more than 300-feet of open trench shall be excavated on advance of pipe installation.
- Not more than 50-feet of trench excavation shall remain unbackfilled at the end of each day’s work.
- The remainder of the trench shall be backfilled, compacted, and opened to traffic.
- When the District is not required to maintain encroachment permit, the above is not applicable.

**Width of Trench:** Except where otherwise specifically permitted, banks of trenches shall be vertical, and shall be of uniform width from top to bottom. Trenches shall be a minimum of 6-inches wider than the widest external diameter (to include bells and couplers) of the pipe. The maximum width of trench, measured at the top of the pipe, shall not exceed the width allowed for various strengths of pipe as may be specified elsewhere in the applicable sections of these Standard Specifications.

If no maximum width is elsewhere specified, the width measured at the top of the pipe shall not exceed the external diameter of the pipe, exclusive of bells and collars, plus 24-inches.

**Stripping of Topsoil:** Where the trench crosses cultivated or residential land not in a roadway, the top 12-inches of soil shall be stripped and stockpiled separately from the balance of the excavated material so that it may be later placed in the top of the trench.

**Bracing of Trenches:** Where required to prevent caving of the trench, the contractor shall furnish and install shoring, bracing and sheeting as necessary to protect the excavation and to meet safety regulations. If required by the District, the contractor shall install sheeting and bracing as required to permit the inspector safe access to the trench for inspection of the work. However, this requirement does not relieve the contractor of the responsibility for maintaining the trench to meet safety regulations.

**Depth of Trench:** The bottom of the trench shall be carried to the lines and grades shown on the plans with proper allowance for thickness of pipe and for the type of bedding specified. In all instances, the minimum coverage over the top of any or all pipe will be 36-inches. Any part of the trench excavated below the proper grade shall be corrected with approved bedding material compacted to 95-percent relative compaction, at the contractor’s expense.

**Appurtenances:** Excavations for valve vaults and other similar structures shall be large enough to provide proper working room. Any over-depth in excavation shall be corrected with concrete or other approved material.

**Removal of Water:** The contractor shall remove and dispose of all water entering the excavation. Disposal of water shall be done in a manner to prevent damage or nuisance to adjacent properties. Sufficient pumping equipment shall be provided to maintain the trench in a dry condition during the bedding and initial backfilling of the pipe. (This may require a permit from the State Water Quality Control Board.)

#### 15.08 **Types of Bedding**

The trench shall be excavated below the grade required by the standard pipe bedding, showing the typical trench sections. Selected backfill material shall then be installed and tamped in a layer the full width of the trench to form the base for the pipe bedding.

**Imported Bedding:** Imported bedding material shall be installed in a layer the full width of the trench, and of proper thickness to form the bed for the pipe. After the imported bedding has been placed and spread, it shall be compacted to proper grade and to not less than 95-percent relative compaction.

**Cement Slurry Encasement:** Cement slurry encasement shall be installed at the locations and in the manner shown on the plans. The pipe shall be temporarily supported on masonry blocks. Supports shall be set accurately to grade with a minimum of two supports per joint of pipe. After the pipe has been laid and approved for covering, the pipe shall be bedded and encased in cement slurry as detailed on the plans. Care shall be taken not to float or shift the pipe when placing the cement slurry.

#### 15.09 **Backfilling**

**General:** No backfilling shall be done until the installation to be covered has been inspected and approved for covering. Backfilling shall be carried out in an orderly fashion and, in general, shall be done as soon as approval has been given to cover the pipe. Compaction of backfill shall proceed simultaneously with backfilling operations. All compaction testing requirements will be enforced by the applicable road agency.

Where trenches cross roads, backfilling shall be completed immediately following excavation. No trenches across roads shall remain open overnight. All crossings shall be backfilled, compacted, and open to traffic at the end of each day's work. Major road crossings shall be excavated and backfilled to allow controlled traffic at all times during the work.

**Bedding and Covering Pipe:** The bed for the pipe shall be final-graded by hand to the line and grade to which the pipe is to be laid, making proper allowance for the thickness of the pipe. The bed shall be hand-raked ahead of the pipe laying operation to remove any stones or lumps that will interfere with smooth and proper bedding. Bell holes shall be hand-dug at the location of the joints and shall be of sufficient size to allow proper making of the joint and to prevent the collar or bell of the pipe from bearing on the bottom of the trench. After the pipe has been laid and approved for covering, imported bedding material shall be placed evenly on both sides of the pipe and the full width of the trench. This material shall be placed by hand in layers, and each layer shall be compacted by use of approved tampers. For pipe 10-inches in nominal diameter or less, the first layer shall be half the outside diameter in thickness, and shall be tamped by hand. The thickness of the next layer shall be half the diameter of the pipe, plus 8- to 12-inches. For pipe 12-inches and larger in nominal diameter, the imported bedding material shall be placed in layers not more than 8-inches thick. Regardless of the size of pipe being installed, at least 12-inches of imported bedding materials shall be placed over the pipe. Particular care shall be taken to attain the required compaction in the material supporting the underside of the pipe. Compaction of bedding and material around the pipe, and up to 12-inches above the pipe, by jetting or ponding shall not be permitted.

#### 15.10 **Trench Backfill Above the Pipe Cover**

**Backfill Within Easements:** Where the trench is not in public road right-of-way, native backfill may be placed by machine in 1-foot lifts. Sufficient compaction effort will be used to consolidate the trench section so as to avoid future settlement of the backfill. Where the trench is in cultivated land, the topsoil shall be replaced and the trench finished uniformly with the surrounding ground. Elsewhere, the trench will be finished by mounding the excess material over the trench within the limits indicated on the plans. Upon completion of backfilling, the work area will be smoothed and restored similar to adjacent, undisturbed land, and excess material shall be removed from the work site.

**Backfill Within Private Driveways and Roads, and Within Public Roads:** In public roads, backfill and compaction shall be done in accordance with the terms of the excavation permit. The following requirements are the minimum and do not relieve the contractor of the responsibility of complying with any more stringent requirements of the permit:

- The trench shall be backfilled in layers with suitable native material, which may be placed by machine. Material shall be placed in 8- to 12-inch thick layers.
- Prior to commencing the backfilling operations, the contractor shall notify the District of the method of compaction that he intends to use. No method will be approved until the contractor has demonstrated, under actual field conditions, that such method will produce the degree of compaction required.
- The trench backfill shall be compacted to a relative compaction of not less than 95-percent.
- Immediately after backfilling, any excess material shall be removed and disposed of in an approved disposal area, or as directed by the District.
- The minimum cover over any or all pipe shall not be less than 36-inches to the original ground grade line.

#### 15.11 **Tests**

Where a degree of relative compaction is specified, compaction test will be made in accordance with the Standard ASTM D1557.

#### 15.12 **Protection of Paving**

During the entire construction period, the contractor shall protect existing pavement. Track laying equipment shall be equipped with pavement pads when used on pavement. Any pavement damaged, cracked or broken, by the contractor's operation shall be removed and replaced to at least the original condition. Damaged pavement shall be restored to the satisfaction of the District and/or applicable agency.

#### 15.13 **Removal and Replacement of Paving and Base**

**General:** All paving work will be done according to the applicable agency: refer to the encroachment easement issued for the project.

**Replacement of Paving:** Paving shall be replaced in accordance with the specifications, the applicable excavation permit, and the details shown on the plans. Pavement shall be replaced in all streets and highways as soon as possible after completion of backfilling. In no case shall any section of trench in public roads remain unpaved more than one week from the date that the excavation was made. Where trenches cross roadways, pavement shall be replaced the same day the excavation was made.

**Temporary Pavement:** Where weather conditions or time preclude placing permanent pavement, temporary pavement will be installed. Temporary paving will consist of a one-inch thick layer of premixed asphalt surfacing material, and shall be installed flush with the existing surface. Temporary pavement shall be maintained to provide a smooth, uniform surface, and shall be removed prior to placing permanent pavement.

**Placing Aggregate Base:** Where base material is required, aggregate base shall be placed and compacted in one even layer to the depth shown on the plans, and extending the full width of the trench.

Segregation shall be avoided and extra care shall be taken in compacting the base near the sides of the trench. Relative compaction shall be not less than 95-percent.

**Preparation for Asphalt Concrete Paving:** Edges of existing paving shall be neatly cut and shall be vertical. All loose pieces or cracked sections of existing paving shall be removed.

**Prime Coat:** For asphalt concrete paving, a prime coat of liquid asphalt shall be applied to the prepared base at a rate of 0.25-gallons to 0.33-gallons per square yard of surface.

**Installing Asphalt Concrete:** Rolling equipment shall consist of power rollers equivalent to tandem rollers weighing not less than eight tons.

After the prime coat has penetrated, the asphalt concrete shall be spread at a temperature suitable for workability, and to a depth that will compact to the required thickness as shown on the plans. No material shall be spread when the outside temperature is less than 40° F. After spreading, the material shall be thoroughly compacted, smooth, and free of irregularities.

**Clean Up:** During the progress of the work, the contractor shall maintain the entire job site in a clean and orderly condition as required by all agencies having jurisdiction. The contractor shall promptly attend to the concerns of any persons having contact with the work and shall repair or replace any damage caused by his/her operation as directed by the District Manager and/or Engineer. The contractor shall clean up and dispose of all trash, debris, and excess materials, and shall remove his equipment from the site of the work as completed.

#### **15.14 Trench Plating**

When the District is required to maintain an encroachment permit with the contractor, the following applies: Steel plate bridging, if used, shall be steel plate designed to Cal-Trans Standard Specification TR-0157. The permittee shall maintain on the steel plate a non-skid surface having a minimum coefficient of friction equivalent to 0.35, as determined by California test method 342.

Approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of 2 dowels pre-drilled into the corners of the plate and drilled 2-inches into the pavement. Subsequent plates are butted to each other. Fine graded asphalt concrete shall be compacted to form ramps: maximum slope will be 8.5% with a minimum 12-inch taper to cover all edges of the steel backfilled with either graded fines of asphalt concrete mix, concrete slurry, or an equivalent slurry satisfactory to the District Engineer.

The contractor shall be responsible for maintenance of the steel plates. Shoring and asphalt concrete ramps.

Unless specifically noted in the provisions of the County, City or Cal-Trans encroachment permit, steel plate bridging should not exceed four (4) consecutive working days in any given week. Backfilling of excavations shall be performed in accordance with the provisions of the agency issuing the encroachment permit.

The required minimal thickness of steel plate bridging required for trench widths from 1-foot to 3-foot wide, will be 1-inch. For trenches of 4-foot widths a plate thickness of 1-1/4-inches is required. Note: For spans greater than 4-feet, a structural design shall be prepared by a registered civil engineer and approved by the District Manager and/or Engineer.

## **SECTION 16.00 - MATERIALS AND WORKMANSHIP – WATER SYSTEM**

**16.01 Water Pipe and Fittings** All Ductile iron pipe and fittings, cast iron fittings and all other Ferrous metal fittings will be wrapped with Plastic Poly 8 mill wrapping for corrosion control. Use duct tape to seal the wrapping to pipe and fittings.

**16.02 Polyvinyl Chloride (PVC)**  
PVC pipe 3-inches and smaller in diameter shall be Schedule Rated (SR) in accordance with ASTM D-1785 for Schedule 40 and Schedule 80 pipe, shall have a maximum DR of 18 for “Class150” applications, a maximum DR of 14 for “Class 200” applications, shall have solvent welded joints, and shall be hydrostatically tested to four-times the rated operating pressure.

Pipe 4-inches and larger in diameter shall be of cast-iron-pipe-equivalent diameters, conform to **AWWA Standard C900**, and will have solid cross-section flexible elastomeric joints in accordance with ASTM D-3139.

Fittings shall be PVC with the same pressure rating and hydrostatic test pressure as the pipe, or ductile iron fittings with gaskets sized for PVC pipe.

**16.03 Locator Conductor**  
Locator conductor for all pipes shall be No. 10 solid copper wire with TW insulation, blue in color. The locator shall be installed on top and over the centerline of the pipe with tape. The tracer will be brought to within 6-inches of the top of all valve boxes. Splices in the locator wire will be with under ground burial wire lug connectors.

**16.04 Ductile Iron Pipe**  
Pipe shall be Class 200, and shall conform to **AWWA Standard C-151**. Pipe shall be cement-mortar-lined and sealed with an approved bituminous seal coat in accordance with **AWWA C-104**.

Pipe-to-pipe joints shall be push-on types that employ a single rubber gasket to effect the seal in accordance with **AWWA C-111**.

Fittings shall be ductile iron conforming to **AWWA C-110**. Fittings shall be cement-mortar-lined and sealed with an approved bituminous seal coat in accordance with **AWWA C-104**.

Joints for fittings shall be mechanical or push-on type with a rubber gasket, conforming to **AWWA C-111**.

**16.05 Mechanical Couplings**  
Mechanical couplings, including flexible couplings and flanged coupling adapters, shall be manufactured by Smith-Blair, or approved equal. All mechanical couplings shall have the longest standard sleeve length.

**16.06 Concrete**  
Concrete for thrust blocks shall be Class B concrete, and shall conform to the applicable sections of Sections 51 and 90 of the State Standard Specifications.

**16.07 Polyethylene Pressure Pipe**  
Polyethylene pressure pipe will be used according to the pressure zone of installation. For 4-inch and larger pipe, the following classes are acceptable: PE2406, PE3406 and 3408. All installations will be according to **AWWA C906**. 2-inch and under pipe installations will be PE 3408, according to **AWWA C901**. All pipe installations 4-inch and larger will be approved, before installation, by the District Manager and/or Engineer. (Not approved by Board)

**16.08 Valves, Hydrants and Appurtenances**

Valves, Hydrants and Appurtenances shall be at the Discretion of the District Engineer and applicable Fire Protection Agency.

**16.09 Gate Valves, 3-inches and Larger**

Valves shall be Resilient Seated Gate Valves, conforming to **AWWA C-509**. Valves shall be rated for a minimum working pressure of 150-psi, and shall have end fittings to conform to the pipe or fittings being connected. Valves shall be similar and equal to Mueller "Resilient Seat," Watrous "Series 500," Clow "Resilient Wedge," or approved equal. Valves shall be provided with 2-inch square operating nuts when installed underground.

**16.10 Gate Valves Under 3-Inches in Size**

These valves shall be full bore wedge disc, non-rising stem, screwed, all bronze, similar and equal to Red & White 206, Nibco T-113, Crane No. 438 or an approved equal. All the gate valves under 3-inches will be on the customer side of meter.

**16.11 Check Valves**

Check valves shall be slanting disc type similar and equal to APCO Series 800, or an approved equal.

**16.12 Hose Bibs**

Hose bibs shall be similar and equal to Crane No. 117 with threaded male outlet for standard garden hose.

**16.13 Air Release Valves**

Air release valves shall be similar and equal to Crispin Universal Air Release Valves, APCO Series 140 Combination Air Valves, or an approved equal.

**16.14 Valve Boxes for Air Relief Assembly**

Valve boxes shall consist of a concrete enclosure and cast iron cover similar and equal to Ford C-32 H; cover to be marked "WATER."

**16.15 Valve Boxes**

Valve boxes shall be provided for all gate valves placed underground, and shall be similar and equal to Christy G-5, or Brooks Products, Inc., No. 3-RT with 8-inch concrete pipe extension sleeve. Cover to be marked "water."

**16.16 Fire Hydrants**

Fire hydrants shall be Clow-Rich Model #855 epoxy lined with one (1) 2-1/2-inch and one (1) 4-1/2-inch outlet. All outlets shall have outlet caps. Hydrant outlet threads shall be national standard. Hydrants will be painted with high visibility yellow paint. Gate valve shall be a 6-inch Clow resilient wedge Series 2830 or equal, one end flanged. Valve shall open counter clockwise. Gate valve shall comply with the performance and test requirements part of **AWWA C-509**. Each hydrant shall be fitted with a 6-inch inlet bury, with 6-inch ductile iron or 6-inch PVC Class 150 pipe for connection between bury and ringtite end of gate valve flanged on to main line tee.

**16.17 Blow-off Assembly**

Blow-off assembly shall be installed at all low points in the water system, and at all dead ends. A fire hydrant may be utilized as a blow-off when properly located. All blow-off's under 4-inches will be plumbed from main to assembly and assembly will be brass.

## **SECTION 17.00 - CONNECTIONS AND APPURTENANCES – WATER SERVICE**

### **17.01 Definition of Services**

The standardized water services established by the District are as follows:

Standard Service or Standard ¾-inch Service consists of 1-inch pipe. (Suitable for 30 gpm.)

1-inch Service consists of 1-inch pipe. (Suitable for 50 gpm.)

1 ½-inch Service consists of a 2-inch service pipe. (Suitable for 70 gpm.)

2-inch Service consists of a 2-inch service pipe. (Suitable for 140 gpm.)

3-inch Service consists of a 4-inch service pipe. (Suitable for 225 gpm.)

4-inch Service consists of a 4-inch pipe. (Suitable for 350 gpm.)

6-inch Service consists of a 6-inch pipe.

The capacity listed above with each service is the safe maximum operating capacity. The District reserves the right to change the size of service should the expected capacity of the service be incorrect after six months operation. Additional service information is shown on the attached District Water System Details. All pipe used shall be National Sanitation Foundation approved.

### **17.02 Materials**

A 2-inch service pipe that will supply a single 1.5-inch or 2-inch meter, or a manifold for two to four ¾-inch to 1-inch meters, shall be Polyvinyl Chloride (PVC). For a single ¾-inch or 1-inch meter, a 1-inch service line of Polyethylene (PE) pipe shall be used.

PVC pipe shall be a minimum of Schedule 40, conforming to ASTM D-1785 for Standard Dimension Ratios, and extruded from clean, virgin, approved Class 12454-A PVC Compound conforming to ASTM resin Specification D-1784. Joints shall be solvent welded.

Fittings for PVC pipe shall be Schedule 80 PVC, and shall have a pressure rating equal to, or greater than, the pipe.

PE pipe shall be iron pipe size (IPS), a minimum of 200-psi rated, conforming to **AWWA C-901**. It shall meet the requirements of Type III Class C Category SIDR-7 polyethylene as defined by ASTM D 2239 and be equal to the ultra-high molecular weight PE-3408 manufactured by Westflex Gold Label.

Connections at fittings may be the conventional flare, butt compression type with stainless steel inserts, or of the “stab” type made especially for PE pipe (referred to as cold flaring) with iron pipe size fittings.

Service pipe larger than 2-inch shall be PVC, or ductile iron, as specified in these Standard Specifications. All 2-inch and smaller services shall have corporation stops.

Gate valves for services shall be as specified under Section 5.21 or 5.22 of these Standard Specifications.

Ductile iron tees for 4-inch through 6-inch services shall be as specified under these Standard Specifications.

Service Saddles for 2-inch and smaller service connections shall be as recommended for the type of pipe being saddled. For ductile iron, steel and PVC pipe the saddles shall be all bronze with 2-bolt straps on each side similar and equal to JONES J995 or J996 or an approved equal.

### **17.03 Workmanship**

All work shall be undertaken, continuously and diligently pursued, and completed in a good and workmanlike manner in strict compliance with the plans and specifications therefor approved by the District.



**17.04 General**

All materials shall be handled in a manner that will not damage the material or its coating. Before installation, each article shall be inspected and any damaged material shall be discarded. Any damaged coating shall be repaired. The interior and ends of the pipe and appurtenances shall be clean. When it is necessary to cut pipe, such cuts shall be neatly made.

**17.05 Laying Pipe**

All pipe shall be laid on a smooth bed, prepared in accordance with the provisions specified in Section 15.04 (Trench, Excavation and Backfill) of these Standards.

As soon as possible after the installation of the pipe, sufficient backfill material shall be placed over pipe.

**17.06 Joints**

Bell and spigot joints shall be made up in accordance with the instructions of the manufacturer. Adjoining pipe sections shall be level, and both bell and spigot shall be clean. The bell shall be lubricated and the rubber gasket properly installed. The spigot shall then be inserted and seated in correct position by use of a joint puller or other approved method. After seating, each joint shall be checked with a feeler gauge to ensure that the gasket is not twisted, and that the spigot is seated to the proper depth. Any improper joints shall be taken apart and correctly made. The maximum installed deflection at joints shall not exceed that recommended by the manufacturer.

**17.07 Rubber Ring Joints for PVC C-900 and Ductile Iron Pipe**

Push-on type rubber ring joints with rubber rings for integral bell ends shall be joined as follows: The ring groove, bell socket and plain end should be wiped clean. Insert the gasket making sure that it faces the proper direction and that it is correctly seated. The plain end shall be beveled and free of any sharp or ragged edges which may damage or dislodge the gasket. Lubricate the entire outside end of the pipe including the pipe bevel; also lubricate the exposed portion of the rubber ring gasket in the bell (See "pipe joint lubricant" below). Push the plain end into the bell by hand or with the use of a bar and block until it is completely seated, keeping the joint straight while pushing. Construction machinery shall not be used to push the pipe into a pipe bell end or a fitting bell end. After assembly, the resulting position of the rubber ring shall be checked with a feeler gauge.

If "Field Lok" gaskets are specified on the plans, the gasket shall be installed in accordance with the manufacturer's recommendations.

If "TR FLEX" restrained joint system is specified on the plans, the joint assembly shall be installed in accordance with the manufacture's recommendations.

**17.08 Fittings**

Joints of bell and spigot fittings shall be made up and sealed as specified for pipe joints. Joints of flanged fittings shall be made up true and square so that there is no strain on the pipe or fitting. Bolts shall be tightened uniformly around the joint.

**17.09 Anchorage**

Concrete thrust blocks shall be provided in accordance with the Standard details.

**17.10 Flexible Couplings**

Flexible couplings shall be installed in accordance with the recommendations of the manufacturer. The finished joint shall be watertight under the test pressure of the pipeline. After completion of the connection, the entire coupling and any exposed steel shall be wrapped with Polyethylene sheeting, and all seams, folds and contact points will be sealed with Duct Tape. As an alternative, the coupling and all exposed metal can be painted with two coats of coal tar epoxy.

**17.11 Hydrostatic Tests**

Hydrostatic tests shall be made in conformance with the applicable provisions of **AWWA C-600** for Ductile Iron or **C-605** for Polyvinyl Chloride Pipe. Hydrostatic pressure testing will be maintained for two hours at 150% of working pressure at point of test, but not less than 125% of normal working pressure at highest elevation. The leakage test is done at the same time of the pressure test. Tests shall be made in the presence of the District Manager or his representative.

Before the test, the pipeline shall be sufficiently anchored to withstand the test pressure. During the filling of the line with water, precautions shall be taken to prevent air pockets at high points. Water may be allowed to stand in the line for several hours prior to the test. The leakage shall not exceed the limits of the following Table.

**Nominal Pipe Diameter in inches**

<b>Aver. Test Pressure</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>
175	0.72-gal.	0.89-gal.	1.07-gal.	1.25-gal.	1.43-gal.
150	0.66-gal.	0.83-gal.	0.99-gal.	1.16-gal.	1.32-gal.

For further details on additional pipe sizes refer to **AWWA C605**.

The contractor shall provide all labor, tools, and equipment required to perform the hydrostatic tests.

**17.12 Disinfection and Flushing of Completed Mains**

**General**

In general, the methods outlined in **AWWA C-651** entitled, "Disinfecting Water Mains," should be used as a guide in performing this operation where applicable.

1. Precautions shall be taken to prevent soiling of pipe, fittings and other materials. Pipe and fittings shall be stored so as not to accumulate mud or water, and other material shall be stored in a clean, dry location. Particular care shall be taken to keep rubber gaskets and pipe ends clean.
2. All pipe shall be clean before lowering the pipe into the trench.
3. When the main is left unattended, even for a short time, the ends shall be plugged to prevent the entrance of foreign material or small animals.
4. Loading of new mains: A ball check valve is required on all new main installations to prevent any chlorine used for disinfection to enter into domestic water supply. Before the ball check can be installed to load the main, install the ball check in a backwards flow position to ensure it is working properly with no leaks. This test will be verified by the District inspector. The ball check can be placed on a blow-off or fire hydrant. Ball check valves will be supplied by the installing contractor.
5. Apply the chlorine using one of the methods described under section **17.14**. A District inspector is to measure the chlorine concentration to insure that a 50 ppm concentration has been applied ( not to exceed 200 ppm). Samples with a high chlorine concentration (>3.5 ppm) must be diluted with deionized or distilled water prior to analysis. This ensures that the test sample is within the operating range of the chlorine test kit.
6. Allow heavily chlorinated water to stand therein for a contact period of at least 24 hours. A District inspector is to measure the chlorine after this contact period. If the concentration has dropped to less than 1 ppm, then chlorination and the 24-hour contact period shall be repeated due to the high chlorine demand.

7. At the end of the contact period, flush the main thoroughly (see Specifications for Dechlorination of Flushed Water). The District inspector is to test for chlorine to demonstrate that the water leaving the main has no more chlorine than in the water entering the main.
8. The District's representative will collect a sample and work with the Water Treatment Department in having it analyzed for coliforms and general microbiological quality. The sample should be taken from a sample station illustrated in drawing W-15 or a service located near the end of the chlorinated section.
9. A Treatment Plant staff member will review the bacteriological results and determine if the main can be put into service. Further flushing and analytical work will be necessary if the bacteriological tests are positive. The main will only be put into service with negative bacteriological results and a free chlorine residual between 0.3 ppm and 1.0 ppm.

**17.14 Chlorination of Completed Lines H.T.H. Tablet (65% free) Method 1**

The tablet method consists of placing calcium hypochlorite tablets (5g each) in the water main as it is being installed, and then filling the main with potable water when installation is completed. During construction, 5g calcium hypochlorite tablets shall be placed in each section of pipe and also one such tablet shall be placed in each hydrant, hydrant branch, and other appurtenance. The number of 5g tablets required for each pipe section shall be based on the following formula:

$0.0012d^2L$  rounded to the next higher integer,

where **d** is the inside pipe diameter in inches and **L** is the length of the pipe section in feet (Refer to **Table 2 in AWWA C-651**).

When using formula or **AWWA C-651** review with District inspector.

The tablets shall be attached by an adhesive such as Permatex No. 1 Catalog No. 80001. There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. Attach all the tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

H.T.H. tablets should be removed at the end of the day, when pipe is not installed in the ground. Reuse those tablets in the following days if still intact. This is to prevent moisture from reducing the amount of chlorine available for disinfection.

In addition to the tablets, place 10 ounces of H.T.H. granules at the upstream end of the first length of pipe into which water will flow. This will ensure that heavily chlorinated water flows into crevasse caused by couplings and valves. For long runs, this should be repeated about 500 feet.

When using flexible couplings, apply NSF grade sodium hypochlorite with a spray bottle method, or place additional H.T.H. granules in the annular space between the coupling and the pipe.

**A. Method No. 2-12.5% Liquid Chlorine (Sodium Hypochlorite)**

This method is general in scope and must be used when it is necessary to re-chlorinate on existing main. It may also be used on new mains, in which case place 10 ounces of H.T.H. granules at the upstream end of the first length of pipe into which water will flow, and every 500 feet thereafter.

**Procedures**

1. Calculate the total volume (ounces or gallons) of 12.5% Hypochlorite solution needed, based on the pipe diameter and section length (See table 1)
2. Choose a suitable filling rate and determine the time required to fill the water main from Table 2.

3. Calculate the 12.5% hypochlorite dose rate using the results form 1 and 2 above.
4. It is recommended to use a metering pump, a controlled vacuum device, or an equivalent device to introduce the 12.5% hypochlorite solution into the main at a constant rate. The feed device and method must be approved by the District prior to loading the main. Adjust the feed device to the dose rate. Introduce the solution through a corporation cock, blowoff, or service connection at or ahead of the inlet end of the water main to be disinfected.
5. After flushing the main thoroughly, adjust the filling rate by measuring the time required to fill a five-gallon or other suitable container.
6. Begin introducing the 12.5% hypochlorite solution into the main, and continue until a chlorine residual test on a sample taken from the discharge end of the main shows at least 50 ppm chlorine.
7. Close the filling valve or blowoff, and stop introducing hypochlorite solution. Disconnect and flush the feed device and equipment thoroughly with fresh water.
8. Proceed as outlined under the "General Instructions."

**Table 1**

Length of Section	DIAMETERS											
	8"		10"		12"		14"		16"		18"	
	Amount In oz	ppm	Amount In oz	ppm	Amount In oz	ppm	Amount In oz	ppm	Amount In oz	ppm	Amount In oz	ppm
18'	3	60	4	55	6	55	8	55	10	50	13	55
20'	3	55	5	60	6	50	9	55	11	50	14	50
30'	4	50	7	55	9	50	13	55	16	50	21	50
40'	6	55	9	55	12	50	17	50	22	50	27	50

Table 1 is used to calculate the total ounces of 12.5% hypochlorite required to produce water with a free chlorine concentration of at least 50 ppm in the main.  
 For example: A 20 ft. section of 8 inch pipe needs 3 ounces so for 1000 ft (50-20' sections)  $50 \times 2 = 150 / 128$  ounces/gal = 1.2 gal.

**Table 2**

	DIAMETER OF PIPE BEING DISINFECTED (INCHES)						
	8"	10"	12"	14"	16"	18"	20"
<b>(GPM)</b>	<b>TIME REQUIRED TO FILL 100 FEET OF PIPE MINUTES</b>						
10	26.1	40.8	58.8	---	---	---	---
20	13.0	20.4	29.4	---	---	---	---
35	7.5	11.7	16.8	---	---	---	---
50	5.2	8.2	11.8	15.0	20.9	---	---
75	3.5	5.5	7.9	10.7	14.0	---	---
100	2.6	4.1	5.9	8.0	10.4	13.2	16.3

Table 2 is used to estimate the time required to fill the pipe with chlorinated water. For example: a flow rater of 50 gpm will fill 1000 feet of 8" pipe in  $10 \times 5.2$  min = 52.0 min.

**17.15 Filling and Contact Time**

When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 fps. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24-hours. If the water temperature is less than 5° C (41° F), the water shall remain in the pipe for at least 48-hours. Valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service.

**17.16 Final Flushing**

Following chlorination, all treated water shall be thoroughly flushed at a minimum velocity of 2.5-feet per second from the newly laid pipe line at its extremities until the replacement water throughout its entire length shall, upon test, be proved comparable in quality to the water served the public from the existing water supply system in accordance with State of California Department of Health Services requirements. Should the initial Bac-T test fail to result in the condition specified above, the original chlorination procedure shall be repeated. If satisfactory results are not obtained after two tests, the District reserves the right to re-chlorinate the new system and perform the above procedures until the Bac-T passes. All expenses accrued and man-hours will be charged to the contractor for District involvement.

**17.17 Specifications for De-chlorination of Flushed Water**

- A. The Discharge/disposal of all chlorinated water generated from the procedures in the “SPECIFICATIONS FOR DISINFECTION OF NEW MAINS” shall be the Contractor’s responsibility. The contractor shall comply with all federal, State, and local discharge/disposal requirements for chlorinated water.
- B. If de-chlorination of the water is required, then the chlorinated water that is discharged to an open stream or storm drain shall be de-chlorinated by water industry accepted methods. The de-chlorinated water will be tested for chlorine residual to verify that no detectable amount of free chlorine is present. This testing will take place from the onset of discharging the water and at frequent intervals throughout the dewatering of the pipe.
- C. Determine the chlorine concentration of the water to be flushed. If the water to be flushed contains a detectable level of chlorine (typically greater than 0.1 mg/L), then that water must be de-chlorinated. (Refer to **AWWA C651-05**)

**SECTION 18.00 - MATERIALS AND WORKMANSHIP – SEWER SYSTEM**

**18.01 Concrete**

Concrete shall conform to the State Standard Specifications. Concrete shall be Class “A” unless otherwise shown on the plans or specified on these Standards.

**18.02 Pipe Joints and Fittings**

All pipe shall be PVC or Ductile Iron Pipe as described below. Only one type of pipe shall be used in any given project unless otherwise approved by the District Manager and/or Engineer.

**18.03 Polyvinyl Chloride (PVC) Gravity Sewer Pipe**

PVC gravity sewer pipe shall be integral bell and spigot pipe conforming to ASTM Specification D-3034. Pipe and fittings shall meet the extra strength minimum of SDR-35. All fittings such as wyes, tees, bends, reducers and connections shall be of the same material and manufacturer as the pipe. Rubber rings shall conform to ASTM D-1869 and /or ASTM D-3212. No solvent cement joints shall be used.

All residential laterals shall be a minimum 4-inch diameter. All laterals shall be furnished with end plugs, which shall be adequately installed and/or braced to resist blowout or leakage during the water tightness tests.

Minimum “pipe stiffness” at 5% deflection shall be 46-psi for all sizes when tested in accordance with ASTM Test Method D-2412.

Maximum pipe deflection shall not exceed 5% of the nominal manufacturer’s average inside pipe diameter, and shall be determined as specified in Section 18.16c (Pipe Deflection Testing) of this Specification.

**18.04 Ductile Cast Iron Sewer Pipe**

Ductile cast iron sewer pipe shall be bell and spigot “push-on” rubber gasket joint pipe with cement mortar lining and tar coating conforming to **AWWA C-151**, and **AWWA C-104** with Class 50 minimum wall thickness.

Fittings and accessories shall be as manufactured and furnished by the pipe supplier, or approved equal, and have bell and/or spigot configurations compatible with that of the pipe.

**18.05 Manholes and Appurtenances**

All manholes may have pre-cast or poured-in-place bases with reinforced concrete pipe sections 4-feet inside diameter. Poured-in-place bases will be approved by the District Manager and/or Engineer on a case-by-case basis. The height adjustment rings and taper sections will be manufactured in conformance with ASTM Designation C-76. Manhole covers and cover frames shall be cast iron, and shall be of a type as manufactured by D&L Supply A-1024 Water Tight, South Bay Foundry SBF 1900 OS, Phoenix Iron Works P-1090 R/G, or equal. Manhole covers shall be clearly marked S.S. in raised letters to denote sanitary sewer.

Clean-outs shall be cast iron, and shall be of a type as manufactured by Phoenix Iron Works P-7103, South Bay Foundry S-1254, or equal.

**18.06 Slurry Cement**

Slurry cement for encasing sewer pipe shall be a fluid, workable mixture of concrete sand, cement and water which is thoroughly mixed in a rotary drum mixer. When used to encase sewer pipe, the slurry shall contain 90 pounds of cement per cubic yard (one sack/cubic yard), unless otherwise directed by the District. Cement shall be Portland cement, conforming to the provisions of Section 90-2.01 of the State Standard Specifications. The water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of the aggregate during placement.

**18.07 Force Main Pipe**

The pipe used will be class 52 ductile iron per AWWA standard C-151 grade pressure pipe for water. All fittings will be pressure fittings for water. All pipe and fittings will have a minimum pressure rating of 150-psi. After District review and approval, HDPE pipe may be used when directional boring. 10-gauge tracer wire will be placed over all force main pipe.

**18.08 Grease Traps**

The cement vault type will be installed at all commercial and institutional kitchens facilities. Refer to Section 11.13 (Grease Trap and Grease Interceptor).

**18.09 Concrete and Patching Mortars**

Concrete shall conform to the State of California Standard Specifications in the latest edition and shall be Class A unless otherwise shown on the approved plans or specified herein.

Patching and sealing mortar shall be **Rapid Set Cement All**, manufactured by Cement Manufacturing Corp. The product conforms to ASTM C-928, ASTM C-1107 and by the Army Corp of Engineers CRD C-621.

**18.10 Workmanship**

All work shall be undertaken, continuously and diligently pursued, and completed in a good and workmanlike manner in strict compliance with the plans and specifications therefor approved by the District.

**18.11 Placement and Jointing**

Under ordinary laying conditions, work shall proceed uphill, with the bell end of the pipe facing in the direction of laying. Pipe shall be lowered into trenches in accordance with manufacturer’s recommendations. All pipe shall be fitted together and matched while being laid so that, when joined, the

invert forms a true straight grade line. All necessary precautions shall be taken to prevent dirt and foreign materials from entering pipe bells prior to completion of the jointing operation. Plugs shall be placed in the open end of pipe during all waiting periods in the construction process. Prior to joining adjacent pipes, the spigot groove, inside bell surface, and rubber gaskets inside bell surfaces, or other surfaces as recommended by the manufacturers, will be liberally lubricated with a soft vegetable soap compound, or lubricants as supplied or recommended by the pipe manufacturer. The placement of the rubber gasket, joint pulling, and checking of the rubber gasket position after joining shall be one in accordance with the pipe manufacturer's recommendations.

**18.12 Angular Deflections**

Standard straight sewer pipe may be laid on curves of long radii provided the interior joint spaces are not pulled beyond the limits recommended by the manufacturer. A general rule of 3° to 5° maximum deflection is allowed.

**18.13 Alignment and Grade Control**

Unless otherwise approved by the District, line and grade shall be staked by a registered civil engineer or licensed land surveyor. Staking shall be on 50-foot intervals, minimum, for straight lines, and 25-foot intervals for horizontal and vertical curves.

The District may, at any time, check the alignment and grade from staking. The contractor shall take appropriate means to preserve, as is practicable, all stakes, benchmarks and controls used in the setting of alignment and grade. Where, in the judgment of the District, the loss of stakes and/or other reference points from what ever cause, requires re-staking, such re-staking shall be preformed when and as directed by the District and shall be done at the cost of the Developer

**18.14 Construction of Appurtenances**

Appurtenances shall include manholes, clean-outs, grease traps and miscellaneous pipeline structures. All concrete used in structures shall be Class A, and shall conform to all applicable portions of Section 90 of the State of California, Department of Transportation (Cal-Trans) Standard Specifications. The District shall specify mortar used in structures. Manholes shall be installed complete in place with all metal appurtenances and drop structures or pipe as necessary, and shall be of the diameter indicated in these standards. All joints shall be mortared with **Rapid Set Cement All**. All pipe drops entering a manhole shall be embedded in concrete no less than 12-inches from the outer diameter of the above mentioned items in all directions (360°).

When pre-cast, sewer manhole bases are used they shall be placed on a minimum of 4-inches of ¾-inch maximum size crushed rock. Stubs or couplings provided in pre-cast bases shall be of the same material as the pipe to which they connect, unless otherwise approved by the District.

All manhole barrel joints and grade rings shall be sealed with **Ramsneck** or **Kentseal** in the middle groove of the female portion of the barrel section. Internally and externally the joints of the barrel section joints shall be mortared with **Rapid Set Cement All**.

All manhole grade rings and manhole frame joints shall be sealed with **Ramsneck** or **Kentseal** and mortared with **Rapid Set Cement All**, internally and externally. A concrete barrier shall be cast on the external circumference of the grade rings and manhole frame no less than 24-inches in width, and extending from 12-inches below the top of cone to include manhole frame.

All manhole lids shall have no penetrations or openings in their exposed area to allow surface water to enter

All manholes shall be tested as per District specification and warranted against internal or external leakage for a period of 3-years or 36-months.

Care shall be taken in setting of barrels, tapered sections and risers to achieve good elevation control so that no more that 12-vertical-inches of grade rings are necessary to adjust the level of the manhole castings.

**18.15 Acceptance Tests**

As each length of sewer pipe between manholes is backfilled to a depth where additional backfilling will not disturb the pipe, it shall be tested under the direction of the District Engineer as outlined below. Individual joints or structures that exhibit visible seepage or leakage, even though the maximum allowable leakage rate per section is not surpassed, shall be repaired by the contractor at the direction of the District representative.

All necessary tools, materials and appurtenances to conduct the tests shall be provided by the contractor, and he shall dispose of all wastes, including water, at his own expense.

**(a) Test for Obstructions:** All pipelines shall be tested for obstructions and cleaned by hydro jet washing.

**(b) Air Test:** The **Uni-O-Bell Standard UNI –B-6-98** for low Pressure air testing is to be referenced at all phases of the testing procedure for safety issues and pipe concerns. Length of line tested at one time shall be limited to the length between adjacent manholes. Contractor shall take all necessary precautions to prevent any joints from drawing while the pipelines or their appurtenances are being tested. He shall, at his own expense, correct any excess leakage and repair any damage to the pipe and its appurtenances, or to any structures indicated or resulting from these tests.

Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0-psi greater than the average back-pressure of any groundwater that may submerge the pipe. The total pressure during the test should not exceed 9.0-psi. At least five-minutes shall be allowed for temperature stabilization. The pressure at the beginning of the test shall not be less than 3.5-psi (greater than the average groundwater back pressure). The allowable time for the pressure to drop a maximum of 0.5-psi is shown below, per size of pipe.

Pipe Size	Allowable Time for 0.5 psi Drop.
4"	113 seconds
6"	170 seconds
8"	227 seconds
10"	283 seconds
12"	340 seconds
15"	425 seconds
18"	510 seconds
24"	680 seconds

Refer to Table II in UNI-B-6-98

If the pressure drop exceeds 0.5-psi over the time allowed, that section of pipe shall have failed the test and the contractor shall locate and repair the faulty portion or portions and successfully retest.

Prior to air testing, the contractor shall satisfy the District Manager and/or Engineer that the thus far completed lines are free of obstructions to the point that the air test is deemed valid by the District Manager and/or Engineer. Jet-washing may be done at this time, however, jet-washing is required after completion of all surface work and final paving, if any, and installation of a manhole castings, final



leveling thereof and any and all remaining manhole work. Where service lines extend through or into easements, final air test shall be performed after the completion of all work in the easements.

The contractor shall supply the compressor, plugs, necessary piping and pressure gauge used. The pressure gauge shall have a minimum division of 0.10-psi, and shall have an accuracy of 0.04-psi. Accuracy and calibration shall be certified by a reliable testing firm at six month intervals, or when requested by the District.

Before the sewer lines are accepted, they shall be cleaned and/or flushed, and all foreign matter shall be removed to the satisfaction of the District inspector. Suitable traps shall be placed in the manholes during cleaning to intercept large material. Such material shall be removed from the lines.

After pressure testing has been completed, all gravity sewer mains shall be cleaned by the contractor and televised, by the District, before permanent paving is applied. The televising of facilities will be a part of construction inspection by the District. Televising of the sewer mains shall be done in conformance with the standard of the industry. Any deficiencies in the construction shall be corrected and the line shall be televised again.

**(c) Pipe Deflection Testing:** The pipe installation shall be tested for excessive deflections after all backfill and resurfacing materials have been placed and the line has been cleaned.

A mandrel having an outside diameter of 95% of the average manufactured internal diameter shall be pulled through the pipeline. If the mandrel does not pass freely through the pipe, the pipe shall be re-excavated, bedded and backfilled to adequately support the pipe and reduce the pipe deflection to 5% or less. The pipeline shall then be re-tested for both deflection and water tightness.

**(d) Manhole, Separators, Grease Traps and/or Private Lift Stations Shall Be Leak Tested by the Contractor:** All mentioned appurtenances shall be tested by the vacuum method. The hydrostatic method, when approved by the District, may be substituted. Sewer manholes shall be tested prior to backfill. If the manhole fails the test, the manhole shall be repaired by the contractor and retested. All lift holes shall be plugged. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

**The test procedures shall be as follows:** The test head shall be placed at the top of the manhole in accordance with the manufacture's recommendations.

A vacuum of 10-inches of mercury shall be drawn on the sewer manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9-inches of mercury.

The manhole will pass the test if the time for the vacuum to drop from 10-inches to 9-inches of mercury meets or exceeds the values indicated in the following table, with the following constraint: a minimum of 9-inches of mercury shall be held for a minimum of one minute.

### MINIMUM VACUUM PASS TIMES

Manhole Size (inches)	Minimum time to drop To 9" Hg (seconds)
48	60
54	67
60	75
72	90
84	105
96	120

The vacuum gauge used for this test shall be supplied by the contractor and have maximum scale divisions of 0.1-psi, and an accuracy of 0.04-psi. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six month intervals, or when requested by the District.

**Hydrostatic test:** This test will have the inlet and outlet lines plugged and the manhole filled with water to the top of the casting. A one-hour maximum absorption may be required, followed by the District observance of the testing. Maximum allowable leakage in gallons per minute (gpm) shall be determined by the following formula:

$$(0.001)(M.H. \text{ depth})(\text{Head above invert or prevailing ground water}^*)(0.5)$$

\*whichever is least

Example: For a 6-foot deep manhole with dry conditions.

Leakage  $(0.001) (6) [(6)0.5] = 0.018$  gpm

Using 7.48-gallons per cubic foot, and 1728 cubic inches per cubic foot, the drop in inches can easily be calculated and measured from the casting rim.

If the manhole leakage exceeds the allowable amount, the manhole shall have failed the test and the contractor shall repair and retest the manhole to the District's satisfaction.