WATER, SEWER AND RECYCLED WATER

DESIGN & CONSTRUCTION STANDARDS

EL DORADO IRRIGATION DISTRICT
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EL DORADO IRRIGATION DISTRICT

PLACERVILLE, CALIFORNIA

DESIGN AND CONSTRUCTION STANDARDS

JULY 1999

WILLIAM T. HETLAND, GENERAL MANAGER

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ACKNOWLEDGEMENT

A special committee was created by the El Dorado Irrigation District for the sole purpose of developing these standards. Individuals having diversified training and experience in the water and wastewater industry were selected to help insure that the Standards would meet the needs of the District as a whole. Members of the committee included:

Member	Agency/Firm	Title
Steve Hutchings (Chairman)	El Dorado Irrigation District	Interim Engineering Director
RC Upham	El Dorado Irrigation District	Construction Engineer
David Powell	El Dorado Irrigation District	Senior Engineer, Wastewater Division
Bill Perley	El Dorado Irrigation District	Wastewater Superintendent
Floyd Gerig	El Dorado Irrigation District	Collection Systems Supervisor
Gary Myers	El Dorado Irrigation District	Water Superintendent
Jim Barntz	The Spink Corporation	Senior Principal
Dennis Stephani	MacKay & Somps	Senior Engineer
Larry Patterson	Patterson Development	Principal Engineer

These standards are approved by the undersigned and were adopted by the District's Board of Directors at its regular meeting on July 12, 1999.

William T. Hetland
General Manager
El Dorado Irrigation District

Steve Hutchings
Interim Engineering Director
El Dorado Irrigation District

Bill Wilkins
Operations & Maintenance Director
El Dorado Irrigation District

WATER DESIGN STANDARDS
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SECTION 1.0

INTRODUCTION AND GENERAL POLICIES

1.1 SCOPE

The planning, design and construction of water mains and other appurtenances to be owned, operated, and maintained by the El Dorado Irrigation District shall comply with these standards herein called "Water Design and Construction Standards" and the permit requirements of various governing bodies, except where specific modifications have been approved, in writing, by the Engineering Department. All submitted plans shall be signed by a registered Civil Engineer prior to submission for plan review and all work shall be in accordance with good engineering practice. This document sets forth the procedure for planning, designing and preparing plans and specifications for water systems built for the District. It also sets out minimum standards for improvements to the District's water system. Wherever there are differences between these standards and other county, state or federal regulations, the most stringent or highest requirement shall govern. The Water Design and Construction Standards are intended for pipes up to, and including, 18 inches in diameter. Larger size pipelines shall be designed and installed by the District and/or a District designated contractor or engineer.

1.2 INTERPRETATION

The Engineering Director shall decide all questions of interpretation of "good engineering practice," guided by the various standards and manuals including those published by the American Water Works Association (AWWA).

1.3 DEFINITIONS AND TERMS

Wherever in these standards or in any documents or instruments referenced by these standards, the following terms, abbreviations or definitions shall apply and the intent and meaning shall be interpreted as follows:

Abbreviations

AASHTO	-	American Association of State Highway and Transportation Officials
ACI	-	American Concrete Institute
ANSI	-	American National Standards Institute
ASCE	-	American Society of Civil Engineers

ASTM	-	American Society for Testing and Materials
AWWA	-	American Water Works Association
DOHS	-	California Department of Health Services
DOT	-	El Dorado County Department of Transportation
EID	-	El Dorado Irrigation District
EPA	-	United States Environmental Protection Agency
ISO	-	Insurance Services Office
UBC	-	Uniform Building Code
UPC	-	Uniform Plumbing Code

Pipe Types:

CCP	-	Concrete Cylinder Pipe
CIP	-	Cast Iron Pipe
MLCC	-	Cement Mortar Lined and Coated Steel Pipe
CMP	-	Corrugated Metal Pipe
DIP	-	Ductile Iron Pipe
HDPE	-	High Density Polyethylene
PCCP	-	Prestressed Concrete Cylinder Pipe
PE	-	Polyethylene
PVC	-	Polyvinyl Chloride
RCP	-	Reinforced Concrete Pipe
HDPE	-	High Density Polyethylene

Definitions

"Acceptance"	Field acceptance is when the District's inspector approves the physical installation of the water system. Final acceptance follows field acceptance, when the Project Engineer approves physical improvements and accepts ownership and O&M responsibilities and customer services approves administrative items associated with the development.
"Applicant"	A person, persons, corporation, partnership, agency or legal entity, or authorized agent of same, requesting the El Dorado Irrigation District to supply any of the following: 1) water service 2) sewer collection 3) reclaimed service, 4) other service.
"Approved"	Unless specifically otherwise indicated, this shall mean written approval by the District.
"Conduit"	A main pipeline which delivers flow to a main section of the service area.
"Collector"	A pipeline that collects sewer flow from one or more sewer services.
"Contractor"	The person, firm, partnership, corporation, or organization, either singular or plural, which is constructing any work which is authorized to be done by the approved plans and specifications.
"County"	The County of El Dorado, California
"Cross Connection"	Cross connection shall mean any unprotected connection between any part of a water system used or intended to supply water for drinking purposes and any source of system containing water or substance that is not or cannot be approved as safe, wholesome, and potable for human consumption.
"Developer"	An individual or organized group, partnership, corporation, etc., proposing to subdivide or improve land which will require service from the District's system.

"Developer's Engineer"	The engineer licensed by the State of California as a civil engineer, employed by developer, under whose direction construction plans, profiles and details for the work are prepared and submitted to the District for review and approval.
"District Regulations"	The Rules and Regulations adopted by the District pursuant to the Water Code of the State of California which govern water and sewer service provided by the El Dorado Irrigation District.
"Director"	Director shall mean the Engineering Director, or a person designated and authorized by the District to perform the duties otherwise assigned to the Director.
"District"	The El Dorado Irrigation District
"Easement"	A recorded document in which the land owner conveys to the District permanent rights to construct and maintain a water line across private or other property.
"Engineer"	A professional engineer or firm of professional civil engineers appointed by and acting for the District on District sponsored capital improvement project. In the case of a developer sponsored project, the term refers to the engineer hired by the developer and may also be referred to as "developer's engineer".
"Engineering Department"	Engineering staff as designated and authorized by the Director.
"Extension of Facilities"	Facilities to extend the District's water distribution system or sewer collection system, including, but not limited to, water lines, sewer mains, storage reservoirs, and pumping stations.
"Fire District"	The fire protection district having jurisdiction in the area of the project.
"Fire Service Line"	A water line whose sole function is to provide a particular building or property with fire protection.

"House Plumbing"	Plumbing fixtures, devices and piping within a building or structure including all pipes and appurtenances on the downstream side of the water meter.
"Inspector"	An employee or agent of the District engaged to observe and record field compliance with the plans and specifications.
"Offsite"	The water, recycled water and sewer facilities system usually consisting of pipelines 6-inches and larger which provide service up to the boundaries of the development.
"Onsite"	The system of water, sewer, and recycled water facilities constructed by a developer within the boundaries of the development.
"Onsite Recycled Water Supervisor"	Onsite recycled water supervisor shall mean a qualified person designated by a recycled water user and approved by the District. This person shall be knowledgeable in the construction and operation of onsite reclaimed water and irrigation systems and in the application of the guidelines, criteria, standards, and rules and regulations for recycled water.
"Plans"	Engineered drawings designed in accordance with District minimum design standards.
"Pressure Zone"	An area located between two elevations within the Districts system that is supplied by a reservoir(s) and/or pressure reducing station(s) having a specific maximum hydraulic grade.
"Reclamation Plant"	Reclamation plant shall mean treatment facilities that receive and treat wastewater for beneficial uses.
"Recycled Water"	Recycled Water shall mean sewage which, as a result of treatment is suitable for beneficial uses in accordance with California Administrative Regulations Title 22, Chapter 4.
"Recycled Water Purveyor"	El Dorado Irrigation District.

"Recycled Water Service"	Recycled water pipe between the onsite or offsite pipeline and meter.
"Required"	Unless specifically otherwise indicated, this shall mean a requirement of the District.
"Required Fire Flow"	A requirement established for each project as determined by the Fire District.
"Service Zone"	Areas within the District consisting of one or more pressure zones which have been established to quantify water consumption.
"Sewage"	Wastewater
"Sewer"	Wastewater gravity pipeline.
"Sewer Force Main"	Wastewater pipeline under pressure.
"Sewer Service"	The laterals from the collector sewer to the property line clean-out.
"Transmission Main"	Water pipeline generally 16-inch and greater in diameter.
"Trunk Sewer"	A pipeline that collects sewer flow from more than one collector sewer. Normally pipelines 12 inches and greater.
"User"	Any person or entity using water from District facilities.
"Water Main" or "Main Line"	The water pipeline system usually consisting of pipelines 6-inches and larger which supply water to meters, fire hydrants or fire service lines.
"Water Purveyor"	El Dorado Irrigation District
"Water Service"	The pipe between the onsite or offsite pipeline and the meter.

1.4 APPLICABLE CODES AND POLICIES

Ordinances, requirements and applicable standards of governmental agencies having jurisdiction within the District's service area shall be observed in the design and construction of water systems. Such requirements include but are not limited to current revisions of the following.

A. The Uniform Plumbing Code as amended by the County of El Dorado.

B. Municipal Code of the County of El Dorado, as applicable.

C. Road encroachment regulations of the County of El Dorado, as applicable.

D. Standard Specifications - Department of Transportation Standard specifications, current edition (CALTRANS).

E. Regulations and Policy Statements as adopted and amended by the Board of Directors of the El Dorado Irrigation District.

1.5 EL DORADO IRRIGATION DISTRICT JURISDICTION

The District is responsible for the approval of plans and inspection of all public water lines and service lines within the District's water service area. Service lines include lines from the water main to, and including, the water meter or backflow prevention device. Where repairs or replacement of a service line on the upstream side of the meter is required it shall be the responsibility of the District unless it is a system upgrade in which case the owner or customer will be billed for the work. Conversely, repairs or replacement on the customer side of the meter shall be the responsibility of the property owner.

The District delivers water to the City of Placerville for City use within City limits. Regulations, Policies, and Construction Standards for water distribution by the City shall be as established by the City of Placerville. However, distribution of water by the District directly to individual users within city limits shall be under the jurisdiction of the District.

Wells for individual users within the District's service area are not under the jurisdiction of the District.

1.6 GENERAL METER POLICY

Unless otherwise approved by the Board of Directors, metering of water, the location of meters, and the number of meters shall be governed by Policy Statement 17.

1.7 FIRE SERVICE WITHIN DISTRICT SERVICE AREA

Regulation No. 11 and Policy Statement No. 27 govern fire service within the District service area. The District will provide water for fire hydrants and other facilities used exclusively for fire fighting at such pressure, and at such rates of flow, as may be available from time to time as a result of the operation of the District's storage, transmission and distribution facilities. The El Dorado Irrigation District is the water purveyor for the District's service area.

1.8 DEVELOPER'S ENGINEER'S RESPONSIBILITY

These standards establish uniform policies and procedures for the planning, design and construction of the District's water system. They are not intended to be a substitute for engineering knowledge, judgment and experience. The contained procedures shall be reviewed by the developer's engineer and shall be applied as necessary to the project. Proposed deviations to these standards shall be submitted, in writing, in conjunction with facility plan report approvals.

All plans, specifications, reports or documents shall be prepared by a registered civil engineer, or under direction thereof, and shall be signed and stamped to indicate his/her responsibility.

A "Preliminary Review" and/or "Plans Approved for Construction" stamp or signature of the District on the plans does not in any way relieve the developer's engineer of the responsibility to meet all requirements of the District. The plans shall be revised or supplemented at any time it is determined that the District's requirements have not been met. However, generally plans that are signed as being authorized for construction will not require revisions based upon subsequent revisions to these standards unless in the District Engineering Director's opinion a change is necessary based upon a significant change in the standards or unless a developer does not proceed to construction within the time allowed in the agreement with the District.

1.9 REFERENCE SPECIFICATIONS

References to standards such as the Standard Drawings of the District, AWWA or ASTM shall refer to the latest edition or revision of such standards unless otherwise specified.

1.10 PRIVATE MAINS

The District will not allow private water mains to convey water. Private water mains are defined as pipelines between a District water main and metered points of connections intended to be privately owned and maintained.

SECTION 2.0

PRE-DESIGN SUBMITTALS

2.1 GENERAL

The District's Regulation No. 22 requires the submittal of an engineering Facility Plan Report (FPR) for the extension of District facilities for subdivisions, commercial and industrial developments, and in some cases, parcel maps. The purpose of this report is to generate an understanding between the developer and the District on what system improvements the developer must construct prior to receiving service. This will help the developer to determine the costs that will be incurred for water, wastewater and reclaimed water services. It will also help prevent misunderstandings and costly revisions from occurring when construction drawings are prepared.

The report shall conform to the criteria contained in these standards. Construction plans will not be accepted for review until the Engineering Department has approved the FPR. Refer to Section 2.3 for more information regarding the approval process.

2.2 CONTENT

The Facility Plan Report shall be a bound document organized with a table of contents and appendix. Prior to preparing the FPR, a meeting with the developer's engineer and the Engineering Department is generally required to review the project and report content. The complexity of the report will depend upon the size of the project, the number of phases, and the extent of the improvements that are required. The report shall be in the following format and include the following information as applicable:

A. Cover Page

Project Name
Owner's Name, Address, Telephone No.
Engineer's Name, Address, Telephone No.
Dates (of each submittal)
Assessor's Parcel Number(s)

B. Transmittal

The transmittal provided in the back of this section must be completed by the developer's engineer and shall accompany all Facility Plan Report submittals. The transmittal must be stamped, signed and dated by the engineer and bound into the front of the report to facilitate the approval process.

C. Section I - General

- Introduction.
- Background.
- Project Description.
- A Vicinity Map.
- Project Phasing (if applicable).
- A general project boundary map, showing adjacent developments and their existing or proposed EDUs.
- Description of adjacent developments impacting or having the potential to impact this project.
- Include typical street cross section showing all utilities and separations.

Section II - Water

- A contour map showing the location and size of all water facilities, including pressure reducing stations and pump stations (if applicable).
- Proposed source(s) of water (existing District facilities, individual wells).
- Description of water demands based upon the equivalent dwelling unit (EDU) concept and maximum demand criteria as provided in the District Standards.
- Description of any water storage requirements and proposed pressure zones.
- Description of pumping and pressure reducing facilities (if applicable).
- Include a demand table with average day, peak hour, and maximum day demands detailed by junction node.

Section III - Sewer

- Proposed sewage treatment location (El Dorado Hills WWTP, Deer Creek WWTP, Camino Heights, etc.).
- Description of average dry weather flow (ADWF) sewage generation, based upon the equivalent dwelling unit (EDU) concept; and peak wet weather flow (PWWF) sewage generation, based upon criteria as provided in the District Standards.
- A contour map showing all sewer facilities, including the size and slope of sewermains, the location of sewage lift stations, pumped lots and offsite contributions (if applicable).
- Description of sewage lift station facilities, including capacity and head, and any proposed individual house pump installations (if applicable).
- A table showing proposed sewer hydraulics such as capacities, flows, velocities, depth of flow, etc.

Section IV - Recycled Water

- A contour map showing the location and size of all reclaim water facilities, including pressure reducing stations and pump stations (if applicable).
- Proposed source(s) of water (existing District facilities, irrigation wells, etc.)
- Description of reclaim water demands based upon the equivalent dwelling unit (EDU) concept and maximum demand criteria as provided in the District Standards.
- Description of any reclaim water storage requirements and proposed pressure zones.
- Description of pumping and pressure reducing facilities (if applicable).
- Include a demand table with average day, peak hour, and maximum day demands detailed by junction node.
- Provide a preliminary irrigation plan.
- General description of system operation and monitoring to meet EID and State Department of Health Services requirements.

D. Appendix

- Copy of the Facility Improvement Letter(s) (FIL).
- Letter from the Fire Department stating required fire flow and duration.
- Copy of the tentative map (if applicable).
- Copy of pertinent calculations, and hydraulic modeling analysis.
- Water, sewer and recycled water exhibits.

2.3 APPROVAL PROCESS

Two copies of the report and a review fee shall be submitted to the District's Customer Service Department. The engineer will receive a confirmation letter indicating the report has been received. The first review will be completed within approximately four weeks. Any questions regarding the review should be directed to the Engineering Support Division.

An initial screening of the report will be performed. If the report does not meet these minimum standards, it will be returned to the engineer with comments for resubmittal. Each return by the District will consist of the report and a review letter. Any resubmittal of the report shall consist of three copies of the revised report and a copy of the review letter in the appendix. Upon approval, a signed copy of the FPR will be returned to the engineer. The FPR then becomes the basis of design.

If significant changes are made to the construction plans during review, which affect the FPR, the report shall be amended to reflect these revisions prior to approval of the plans.

2.4 EXPIRATION

The approved FPR is valid for two years from the date of approval.

TRANSMITTAL

FACILITY PLAN REPORT

Project Name _____
Contact Person _____
Address _____
TelephoneNumber _____ FAX Number _____
Assessor's Parcel No(s)_____
Location_____

1) This development will be constructed in _____ phases.
2) Annexation to EID required? _____Yes _____ No.
3) The total acreage of the development is _____ acres.
4) The number of parcels proposed is _____.
5) The number of EDUs requested is _____.
6) The estimated maximum day water demand is _____ gpm and a peak hour demand of ____ gpm for the project.
7) The fire flow requirement is _____ gpm for _____ hours duration.
8) Pressure reducing stations are required? _____Yes _____No.
9) The estimated average dry weather sewer flow is _____ gpm.
10) The estimated peak wet weather sewer flow is _____ gpm.
11) Recycled water proposed for irrigation? _____ Yes _____ No.
12) The number of recycled water EDUs requested is _____.
13) The estimated maximum day recycled water demand is _____ gpm with a peak hour of _____ gpm for the total project.

Exceptions: _____

FPR Submitted by:

_____
Signature of Developer's Engineer
PE# _____
Date _____

FPR Approved by:

_____
EID Engineer
PE #_____

SECTION 3.0

DESIGN CRITERIA

3.1 WATER MAIN PRESSURES, CAPACITIES AND SIZES

A. Quantity of Flow: The system shall be sized for either the peak hour demand or the maximum day demand plus fire flow, whichever is greater. Flow rates shall be determined according to land use of the area to be served and the location of the development within the District's service area.

The District's service area is subdivided into three regions and two satellite systems. Standard Drawing No. 1 shows the location of the regions, service zones and the satellite systems. Table 3-1 shows the mean annual water demands for each region. Demands for the satellite systems shall be determined by the District on a case by case basis.

Projected demands for residential development projects shall be determined using the unit values in Table 3-1 and the known number of units or an estimated number of units based on the particular land use designation for the area.

Projects including commercial, and/or industrial development, shall include a determination of estimated demand based on the type and size of the actual business and/or buildings using methods similar to those contained in AWWA Manual No. M22 and the Uniform Plumbing Code. In the absence of such information on future use, the values shown in Table 3-1 for commercial and industrial may be used.

Once the mean annual demands have been determined, the demands shall be multiplied by the peaking factors shown in Table 3-2. To this value an allowance of 10% of the mean annual demand shall be added for unaccountable water to obtain design flows.

TABLE 3-1

MEAN ANNUAL WATER DEMANDS

Land Use Category	Density (dwelling units/acre)	Unit Consumption (acre feet/dwelling unit)	Average Day (gpm/dwelling unit)
WESTERN REGION			
Low Density Residential	0.1 to 0.2	1.03	0.64
Medium Density Residential	0.2 to 1.0	0.79	0.49
High Density Residential	1.0 to 7.0	0.58	0.36
Multiple Family	7.0 to 24	0.30	0.18
Mobile Homes	7.0 to 24	0.38	0.23
Schools	—	1.5 Acre Feet/Acre	—
CENTRAL REGION			
Low Density Residential	0.1 to 0.2	0.99	0.61
Medium Density Residential	0.2 to 1.0	0.62	0.38
High Density Residential	1.0 to 7.0	0.43	0.26
Multiple Family	7.0 to 24	0.29	0.18
Mobile Homes	7.0 to 24	0.35	0.21
Schools	—	1.4 Acre Feet/Acre	—
EASTERN REGION			
Low Density Residential	0.1 to 0.2	0.33	0.20
Medium Density Residential	0.2 to 1.0	0.28	0.17
High Density Residential	1.0 to 7.0	0.24	0.15
Multiple Family	7.0 to 24	0.18	0.11
Mobile Homes	7.0 to 24	0.17	0.11
Schools	—	0.9 Acre Feet/Acre	—
DISTRICT WIDE (ALL REGIONS)			
Commercial/Industrial	—	2.4 Acre Feet/Acre	—
Golf Courses	—	3.0 Acre Feet/Acre	—
Parks	—	2.5 Acre Feet/Acre	—

DISTRICT SERVICE ZONES (Zone No.)

Western Region	Central Region	Eastern Region	Satellite Systems
El Dorado Hills (2)	Lotus/Coloma (3)	Sly Park (12)	Outingdale (14)
Cameron Park (4)	Logtown (6)	Pollock Pines (13)	Strawberry(15)
Shingle Springs (5)	Diamond Spgs/El Dorado (7)	Swansboro (9)	
	Camino/Fruitridge (10)		
	Pleasant Valley (11)		
	Placerville-North (18)		
	Placerville-South (28)		

TABLE 3-2

ESTIMATED PEAKING FACTORS

Category/Location	Maximum Day	Peak Hour
Low Density Residential	2.5	5.0
Medium/High Density Residential		
Western Region	2.0	4.5
Central Region	2.0	4.5
Eastern Region	2.0	3.5
Multiple Family Mobile Home	1.5	2.5
Commercial/Industrial	2.0	2.5
Parks/Golf Courses/Schools	4.5	4.5

If and when special studies of a particular area are conducted which demonstrate that different water use or peaking factors are appropriate, then those values may be used if approved by the Engineering Department.

B. Fire Flow Requirements: The local Fire District governs fire flow requirements. It is the developer's responsibility to demonstrate through fire flow tests and calculations that the required fire flow can be met while the District's water system is under a maximum day demand condition for the specified duration. The calculations shall assume that the fire flow is obtained from storage or through pressure reducing stations and that pumping stations provided for fire suppression are operating. The storage facilities providing fire flows shall be assumed to be half full. Under fire flow conditions including the maximum daily requirement, the residual pressure throughout the system shall not be less than 20 psi. In making the calculation, District mains must be considered with respect to their headloss.

C. Pressure: Water mains shall be sized and designed taking into consideration both static and dynamic conditions. The criteria that shall be followed is outlined in Table 3-3.

TABLE 3-3

WATER SYSTEM DESIGN PRESSURE

Condition	Design Criteria
Static Pressure	Maximum without District approval based on full reservoir or maximum PRV setting in pressure zone = 150 psi.
	Desired Maximum based on full reservoir or maximum PRV setting in pressure zone = 90 psi.
	Minimum based on empty reservoir or minimum PRV setting in pressure zone = 40 psi.
Dynamic Operating Pressure	Minimum under normal operation based on half full reservoir or lowest PRV setting in pressure zone = 40 psi.
	Minimum under emergency conditions based on empty reservoir or lowest PRV setting in pressure zone = 20 psi. Residual during fire flow based on half full reservoir or lowest PRV setting in pressure zone = 20 psi.

Note: For pressure zones supplied by hydro-pneumatic systems, minimum and maximum pressures shall be related to minimum and maximum pressure switch set points of the pump controls.

D. Velocity: Water mains shall be designed so that the maximum velocity does not exceed 10 feet per second without approval of the District. As flows approach 10 feet per second, special consideration should be given to the design and operation of control valves and pumps.

E. Hydraulics: Water system analysis shall be performed taking into consideration both existing and future development. Hydraulic calculations shall be conducted using the average Hazen-Williams coefficients shown in Table 3-4. The coefficients have been adjusted to include minor pipeline losses.

TABLE 3-4

HAZEN-WILLIAMS COEFFICIENTS

Size Diameter (Inches)	Existing Mains "C" Value	Proposed Mains "C" Values
4 and 6	100	110
8 and 10	110	120
12 - 18	115	130

F. Minimum Water Main Size: Pipelines shall be sized to deliver the required flows at minimum pressures specified herein. No water main, however, shall be less than 6 inches in diameter, except as outlined below:

Four-inch diameter pipe may be installed in cul-de-sacs where no fire hydrants will be connected, the length of pipe is less than 500 feet, no more than eight ¾-inch services or equivalent will be installed, and no future extensions will be constructed.

3.2 SELECTION OF PIPE TYPES AND CLASS

A. General: These standards cover main lines up to and including 18 inches in diameter. See Section 3.1 for proper sizing of mains.

B. Main Pipelines: In general, main lines 12 inches and smaller in diameter shall be either polyvinyl chloride (PVC, AWWA C900), or ductile iron pipe. Pipelines in diameter greater than 12 inches shall be ductile iron.

Upon approval of the District, alternative pipe materials may be used for special conditions. Where different classes of pipe are required for the same system, the separation shall be at a valve.

C. Internal Pressure: Static pressure shall not exceed the pressure class of the pipe. The pressure classes of Table 3-5 shall be used.

TABLE 3-5

PRESSURE CLASSES

PVC CLASS	D.I.P. CLASS
150	250
200	300
	350

D. External Loads: External loads are defined as earth loads and live loads. Common design practice shall determine the class of pipe required to resist the deflection caused by external loads.

E. Service Lines: Service lines 1 inch through 2 inches shall be polyethylene tubing CTS, AWWA C901. Service lines greater than 2 inches shall be polyvinyl chloride plastic pipe, Schedule 40 ASTM D1785. Service lines shall be rated equal to the pressure of the main line.

3.3 LAYOUT OF WATER MAINS

A. General - Water mains should be laid out only in segmented grids and loops and should be located within streets. Dead-end water mains shall be installed only if:

1. Looping or gridding is impractical due to topography, geology, pressure zone boundaries, unavailability of easements or locations of users; or

2. The main is to be extended in the near future and the planned extension will eliminate the dead-end conditions.

B. Water Mains in Streets: The pipeline centerline, wherever possible, shall be located in public streets parallel to and offset 5 feet from the edge of pavement or 3 feet from lip of gutter. See Section 3.5 for separation requirements between wastewater and water lines. Water mains located in streets shall generally follow the street alignment and remain on the same side of the street. Meandering alignments of waterlines shall be avoided. The five-foot offset should be maintained as close as practical utilizing fittings if the minimum pipe radius cannot be achieved (see Section 3.10).

When storm drains or other facilities are located in the street, the water mains shall be located with the minimum clearance shown in the Standard Drawings.

Water mains, wherever possible, shall cross over nonpressure pipelines and wastewater force mains. Water mains crossing under storm drains or other gravity flow pipes shall have prior approval by the Engineering Department.

When an area outside the tract or development project area can be logically served by extension of the water main in future streets or easements, the pipeline shall extend to the tract/project boundary or to the end of a paved street in a manner facilitating future extensions.

C. Water Mains in Easements: Unless there are either physical limitations or extreme economic penalties, water pipelines shall be installed within public right-of-way. When easements are required, there shall be careful consideration of how the pipeline is to be maintained and/or replaced. Where there are side slopes (perpendicular to the pipe), the plans shall clearly indicate graded access within the easement.

In general, the pipeline within an easement shall be accessible by conventional maintenance vehicles traveling over all weather relatively level surfaces or driveways unless otherwise approved.

Service lines shall not be connected to a main line within an easement unless specifically approved. Easements and water main installations shall comply with the following requirements:

1. Width: Water easements for pipes up to 18 inches in diameter shall be a minimum of 20-feet wide. Additional easement width will be required where the depths of pipe are excessive or where deemed necessary by the District. Parallel block walls, structures, foundations, new trees or other similar obstructions within an easement are prohibited.

   Where the easement is contiguous to a public right of way or a public utility easement the width of the new easement may be decreased upon review and approval by the Engineering Department.

2. Pipeline Locations: Pipelines shall generally be placed 5 feet off easement centerline. Offsets greater than 5 feet shall have prior approval.

3. Easement Location: The full easement width shall be on one lot or property in such manner that access to the pipeline will not be obstructed by walls, trees or permanent improvements. Where this requirement cannot be met without interfering with existing buildings, easements may straddle lot lines providing special approval is received by Engineering Department and the water pipeline is not located on the lot lines.

4. Easement Provisions: Easements for proposed or existing facilities shall be recorded using the standard easement forms provided by the District's Right-of-Way Division. Easements shall be recorded by the following documents as conditions dictate:

   a. Exclusive Easements - Where the water main is the sole utility, an exclusive easement shall be dedicated to EID.

   b. Non-Exclusive - Where other parallel utilities are to be installed within an EID easement, a non-exclusive easement shall be dedicated to EID. A 5-foot envelope on each side of the water main shall be exclusively reserved for the water main.

   c. Irrevocable Offer of Easement Dedication - This can be used on existing water/sewer/ditch systems where an easement does not exist and a metes and bounds description is not available or practical to obtain. This form is recommended to be used on all parcel maps 4-½ acres and larger. Should the existing facility need to be located, the District will be responsible to field locate such facility.

5. Crossings - Utilities or other improvements may cross easements upon a review by the Engineering Department. Generally, crossings are to be perpendicular. Surface improvement crossings shall have provisions for accessibility.

6. Easement Identification - Marker posts per the Standard Drawing shall be used to identify easement boundaries. Locations of posts shall be determined by the Engineering Department.

3.4 DEPTH OF WATER MAINS

The minimum depth of cover to the top of the pipe from finished grade shall be 36 inches in unpaved areas and 30 inches from subgrade to top of pipe in paved areas. Water mains installed at elevations of 5,000 feet or greater shall have a minimum cover of 36 inches or be below frost depth, whichever is greater.

In achieving the above depths it must be recognized that numerous grade changes to achieve the minimum depths of cover are not desirable. The pipeline shall be designed with constant grades rather than designed to a uniform depth.

Increases in depth may be required where future road improvements could potentially remove some of the existing cover or where there are other conflicting utilities.

3.5 SEPARATION REQUIREMENTS

A. General: Proper separation of wastewater and water systems is necessary to reduce the potential for an outbreak of waterborne diseases. Sanitary sewers have the potential to leak and saturate the surrounding soil with sewage. This is caused primarily by structural failure of the sewer line, improperly constructed joints, and subsidence or upheaval of the soil encasing the conduit. A serious public health hazard exists when the water mains are depressurized and no pressure or negative pressures occur. The hazard is further compounded when, in the course of installing or repairing a water main, existing sewer lines are broken. Sewage spills into the excavation has potential to enter into the water main. Additionally, if a water main fails in close proximity to a sewer line, the resultant failure may disturb the bedding of the sewer line and cause it to fail. In the event of an earthquake or man-made disaster, simultaneous failure of both conduits often occurs. The following criteria, a summary of Title 22 paragraph 64630 of the California Code of Regulations, shall be used for determining clearance between water and waste facilities.

B. Basic Separation Standards

1. Parallel Construction: Water mains shall be laid at least 10 feet horizontally from any sanitary wastewater, storm sewer, or sewer manhole, whenever possible. The distance shall be measured edge to edge.

2. Perpendicular Construction (Crossing): Pressure water mains shall be at least one foot above sanitary sewer lines where these lines must cross.

3. Common Trench: Water mains and wastewater lines and other utilities shall not be installed in the same trench.

4. Leach Fields: Edge of water main easements shall be at least twenty-five feet horizontally from cesspools, septic tanks, sewage leach fields, and seepage pits.

C. Exceptions to Basic Separation Standards: Local conditions such as available space, limited slope, existing structures, etc., may create a situation where there is no alternative but to install water mains or sewer lines at a distance less than that required by the Basic Separation Standards. In such cases, alternative construction criteria as specified in the Standard Drawings shall be followed, subject to the special provisions outlined below and prior approval from the Engineering Department. The Standard Drawings contain thorough discussions of various cases where less than 10-feet separation would be allowed.

D. Special Provisions

1. The Basic Separation Standards are applicable under normal conditions for wastewater (sewage) collection lines and water distribution mains. More stringent requirements may be necessary if conditions such as high groundwater exist as determined by the Engineering Department.

2. Wastewater lines shall not be installed within 25 feet horizontally of a low head (5 psi or less pressure) water main.

3. In the installation of water mains or sewer lines, measures should be taken to prevent or minimize disturbances of the existing trench section of the line. Disturbance of the supporting base of this section could eventually result in failure of this existing pipeline.

4. Wastewater Force Mains.

   a. Wastewater force mains shall not be installed within ten feet (horizontally) of a water main.

   b. When a wastewater force main must cross a water line, the crossing shall be as close as practical to the perpendicular. The wastewater force main shall be at least one foot below the water pipeline.

   c. When a new wastewater force main must cross under an existing water main, all portions of the wastewater force main within ten feet (horizontally) of the water main shall be installed in a steel casing having welded joints.

   d. When a new water main crosses over an existing wastewater force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi or equivalent pressure rating.

3.6 TYPE, LOCATION AND SIZE OF VALVES

Valves twelve inches and smaller shall be resilient seated gate valves and valves larger than twelve inches shall be butterfly valves. When static water pressures exceed 250 psi, valve selection will be determined by the Engineering Department.

Valves shall be placed at locations allowing for the isolation of particular pipe segments in the event repairs or replacement are needed. In general, all but one branch at intersections shall be valved unless otherwise approved.

Longer reaches of pipelines shall require an in-line valve at intervals of no more than 1,000 feet except for lines 10 inches or larger, where valves shall be at intervals of 100 ft. per inch of pipeline diameter.

All pipeline valves shall be the same nominal size as the pipeline, unless previously approved by the Engineering Department.

A. High Pressure Valves: Static pressures exceeding 200 psi (150 psi for mains over 12 inches in diameter) will require high pressure main line valves. Valves shall be high pressure butterfly valves rated equally or greater than the static pressure. Depending on size and application, valves may require a by-pass. Manufacturers data for high pressure valves shall be submitted to the Engineering Department for review and approval with the first submittal.

3.7 FIRE HYDRANTS

Fire hydrants shall be of the dry barrel type and have a 4-1/2 inch connection and 2 - 2-1/2 inch hose nozzles. Fire hydrants shall be generally located as directed by the local Fire District having jurisdiction. Hydrant locations should be adjusted where possible to that of required blow-offs so that a single assembly can be utilized. A fire hydrant provides greater capacity for draining and flushing pipelines and can be used in lieu of a blow-off.

The location of fire hydrants with respect to the traveled roadway shall be in accordance with the Standard Drawings and/or El Dorado County Department of Transportation details.

3.8 AIR AND VACUUM ASSEMBLIES

A. Types of Valves:

1. Small-orifice air release valves allow the discharge of air from the pipe while the pipe is in operation. Air entrained in flowing water tends to form bubbles at or near the summit in a pipeline. If not removed, such bubbles become serious obstacles to flow and creates a throttling effect as would a partially closed valve.

2. Large-orifice air and vacuum valves allow large quantities of air to be expelled during line filling and allow air to re-enter the pipeline during draining of the pipeline whether planned or due to a rupture. These valves are located at high points along the line.

3. Combination air valves combine both the features of the air release and air and vacuum valves described above. These valves are generally specified for the District's system.

B. Location: Combination air valves shall be located at all significant high points along the pipeline and as required by the Engineering Department. Air valves above ground are to be located near side lot property lines rather than in the middle of the front yard.

Air and vacuum valves shall be installed on the downhill side of isolation valves on transmission mains to admit air into the pipe to prevent a vacuum during draining of the pipeline and to vent air during filling.

C. Sizing: In order to simplify the selection of the combination air release valves, the following is provided as guidelines for determining the size:

1. Determine the rate of flow equal to the filling rate of the pipeline. When the pipeline is being filled by a pump, convert the gpm of the pump to cubic feet per second (cfs),

cfs = (GPM of pump)/449

or when the pipeline is being filled or drained by gravity use the following conversion,

$$cfs = 0.087\sqrt{SD^5}$$

S = Most severe slope or gradient (ft. per foot)
D = Diameter of pipe in inches

2. When the pipeline is being filled, the air pressure across the valve is not to exceed 2 psi. When the line is to be drained the pressure across the valve is not to exceed 5 psi.

3. Using the calculated flows and pressure limits, the appropriate combination air valve from manufacture's literature can be selected. For most installations involving 6 to 8-inch pipelines, the valve will be 1-inch size. The Standard Drawings specify the typical installation.

3.9 BLOWOFF ASSEMBLIES

A. General: Blowoff assemblies are placed at low spots in the line to facilitate line draining and to allow the removal of sediments, which accumulate in low areas of the pipeline. The Standard Drawings show 2-inch and 4-inch assemblies, respectively. Also, fire hydrants can perform the same functions as a blowoff and therefore can be substituted for them.

A blowoff assembly shall be installed at the end of a dead-end line (i.e. future extensions, cul-de-sacs) in order to drain and flush the line.

B. Sizing: Blowoffs shall be sized to satisfy the following conditions:

1. In general, a particular section of pipeline should be capable of being drained within 2 to 4 hours; and

2. The blowoff shall be capable of creating a velocity of not less than 2.5 fps in the pipeline for the removal of sediments. For typical pressures between 40 and 150 psi, this velocity can be created by the following:

TABLE 3-6

Pipe Size	Blowoff Size
6"	2"
8"	2"
10"	4"
12"	4"
Above 12"	By special design

3.10 HORIZONTAL AND VERTICAL CURVES

A. General: Where curves are less than the minimum radius or allowable deflections, fittings will be required. In curved streets, the waterline shall generally follow the street curvature and not cross the street centerline. Vertical curves and peaks shall be minimized to avoid air valve and blow-offs installations. A deeper waterline shall be installed, when practical, to eliminate peaks.

B. PVC (AWWA C 900) Pipe: The standard laying length for a joint of PVC pipe is 20 feet. The pipe shall not be bent to a lesser (tighter) radius than the minimum shown below. Deflection at the joints is not permissible.

TABLE 3-7

Normal Pipe Size (inches)	Minimum Radius of Curvature (feet)
4	190
6	200
8	250
10	Fittings required
12	Fittings required

Ten and twelve inch PVC can be joined with "HD" (High Deflection) couplings. Table 3-7A shows minimum radius for various lengths of pipe segments based on a 5° total deflection per coupling.

TABLE 3-7A

Pipe Length (Ft.)	Min. radius @ 5° deflection without bending pipe (Ft.)
20	229
10	115
6-8	76
5	57

C. Ductile Iron Pipe: The maximum allowable deflection shall be as follows for mechanical and push-on joint pipe:

Pipe Size	Allowable Joint Deflection	Curvature, 18-Foot Lengths
6" - 12"	4 degrees	260 feet
14" - 18"	3 degrees	345 feet

3.11 STRUCTURAL REQUIREMENTS

A. Under Roads: All structures and pipe placed under public roads shall be of sufficient strength to support with an adequate factor of safety the backfill, road surfacing and H-20 loading per AASHTO Standard Specifications (truck loading with impact). Higher loading may be specified by the Engineering Department or as required by good design.

B. Other Pipes and Structures: Water lines designed to cross under or over other pipes or structures shall be protected from damage and shall be constructed to prevent endangering the other pipe or structure. In this regard, particular attention should be given to the possibility and prevention of settlement-caused damage. Also, where future replacement of any line may be extremely difficult due to the pipe or structure, special design consideration may be required. Any of the Standard details which detail various encasements or other protection may be required in such instances.

C. Flexible Joints: Flexible joints which will allow for differential settlements or other movement of pipelines or structures, shall be provided where water lines enter encasements or other rigid structures. Flexible joints shall be within a minimum of 24 inches of such structure unless otherwise approved.

D. Thrust Restraint: Restraint shall be provided to prevent movement of pipe and appurtenances in response to unbalanced thrust forces. Restraint is required wherever the pipeline:

- Changes direction
- Changes size
- Stops at dead ends
- Includes valves and hydrants where thrust develops when closed

Acceptable thrust restraint systems are thrust blocks or a restraining joint incorporated with the pipe. The Standard Drawings show dimensions and details for thrust blocks.

E. Steep Grades: Water lines laid on grades steeper than 10 percent which are not under nor intended to be under pavement shall be examined for possible erosion protection. Where the slope exceeds 35 percent a check dam shall be installed across the top of the trench at 20 feet intervals to reduce erosion.

Slopes above 35 percent shall have sand/cement bags placed along the trench section at the intervals specified in the Standard Drawings to reduce the migration of bedding material within the pipe trench.
Where steep grades are present, restrained joint pipe may be preferable because of thrust considerations. Pipe without restrained joints will require substantial anchorage to prevent separation. Use of restrained joint pipe shall have prior approval from the Engineering Department.

F. Creek Crossing: Depths and protection of pipelines crossing below the flow line of creeks or channels are dependent on site improvements and geotechnical considerations. Generally pipelines are to conform to the Standard Drawings.

Other criteria to consider at creek crossings are:

- Pipelines are to cross upstream of hydraulic structures (i.e. bridges, culverts, etc.)
- Crossings are to be perpendicular to flow line of creek.
- The protection of the pipeline is to extend 10 feet beyond the top of defined banks.
- The type and length of pipeline protection will be dependent on creek conditions.

Pipelines may be suspended from road bridges with prior approval from the Engineering Department and agency of having jurisdiction. Special design criteria will be provided by the District for this type of crossing.

3.12 MARKER POSTS

In easements or where required on the plans, marker or guard posts shall be installed to identify the facilities. Posts shall conform to the Standard Drawing.

3.13 VAULTS

Vaults may be precast or poured-in-place. Precast vaults shall be so designed that all joints and corners are waterproof. The roof and walls of precast and poured-in-place vaults shall be made waterproof after construction by use of sealants, epoxies or other approved methods.

If the vault is not to be in a street, the roof shall be designed to support the overhead earth fill and any other reasonable loading that may occur. If the vault is to be built in a street, the roof shall be accordance with AASHTO Specifications. However, if there is any doubt, the vault shall be designed for traffic loading.

3.14 SERVICE CONNECTIONS AND METERS

A. General:

1. Domestic Connections: Each new single family dwelling unit shall have an individual metered service connection. Multi-family dwelling units are encouraged to have separate meters for each unit to facilitate water conservation. Each service shall be shown on the plans. Service lines shall be installed perpendicular to the main except for taps on the end of mains in cul-de-sacs.

   Service lines shall be sized in accordance with applicable codes, except that no service line shall be less than 1 inch in diameter and no meter shall be smaller than a ¾-inch meter.

   The minimum pressure class for polyethylene service tubing shall be 160 psi. The sum of the system working pressure and surge pressure shall not exceed 1.25 times the pressure class of the tubing.

   Approved pressure reducing valves and strainers shall be installed downstream of all meters. The valve and strainer shall be owned and maintained by the customer and shall not be the responsibility of the District. District approved reduced pressure backflow prevention assemblies shall be installed on each service connection to all new multiple unit, commercial, and industrial accounts and where otherwise may be required by District Regulation 10, "Prevention of Contamination by Backflow and Cross Connection."

2. Agricultural Connection: All agricultural service connections shall be metered. The meter and service line shall be sized taking into consideration the design of the irrigation system, so that the maximum continuous flow rate of the meter as specified by AWWA is not exceeded. All agricultural connections shall be equipped with a District approved reduced pressure backflow prevention assembly.

B. Meter Types: The positive-displacement-piston or disc-type meter is the most widely used meter because it is adaptable to residential and other customers who experience long periods when no water is used. Current and propeller meters are suitable only when the water usage is without low flow periods in which the flow will not register; as such, they require special approval. Compound meters are a combination of the positive-displacement and the current type meters and have lower head losses than the displacement equipment. These have a high wear and maintenance requirement and must be carefully selected to provide economical service. Table 3-8 summarizes the type of meters.

TABLE 3-8
SUGGESTED USES FOR EACH TYPE OF METER CLASSIFICATION

Meter Type	Suggested Use
Positive-displacement meters ¾ inch - 2 inches	Customer with normal demands Residential, small to medium apts. Small businesses (barber shops, etc.) Filling stations Restaurants
Current-meters (strainer required) (usually Turbine) 1- ½ inches - 12 inches	Customers requiring high demands, or continuous flows Some manufacturing, refineries, petro-chemical Public irrigation (no leakage) Pump discharge Large government installations Agricultural installations
Compound meters 2 inches - 10 inches (Strainer required)	Most commercial and industrial Hotels and motels Special customers having high and low demands Schools Public buildings Laundries Large apartments

C. Meter Sizing: Water meters are designed to deliver a maximum flow for short periods of time with a lower flow capacity for sustained usage without damage or above-normal wear occurring to the meter. The selection of the type and size of the meter shall be based solely on the flow requirement and the type of use - not on the pressure loss through the meter.

If there is a known expansion program or increased meter usage can be anticipated in the future, then provision should be made for larger facilities in the future. When this occurs, the meter should be installed for the needs at the time but also with a meter box and connections that are adequate for future requirements.

The District selects and installs meters. As a guide in determining the meter size, Table 3-9 can be used. Pressure losses through the meters may be illustrated as follows:

TAB
METER TYPE AND SIZE

Application	Meter Size	Meter Description	Low Flow GPM*	Maximum Continuous GPM*	Maximum Intermittent Capacity GPM*	Normal Operating Flow Range Continuous GPM*
Residential, Domestic Irrigation, And Commercial	:"	Positive Displacement	0.50	15	30	2-15
	1"	Positive Displacement	0.75	25	50	3-25
	12"	Positive Displacement	1.50	50	100	5-50
	2"	Positive Displacement	2.00	80	160	8-80
Commercial Irrigation And Wholesale	12"	Positive Displacement	1.50	50	100	5-50
	2"	Positive Displacement	2.00	80	160	8-80
	12"	Turbo	3.00	120	160	4-120
	2"	Turbo (or current)	3.00	160	200	4-160
	3"	Turbo (or current)	4.00	350	450	5-350
	4"	Turbo (or current)	10.00	1,000	1,250	15-1000
	6"	Turbo (or current)	20.00	2,000	2,500	30-2000
	8"	Turbo (or current)	30.00	3,500	4,500	35-3500
	10"	Turbo (or current)	35.00	5,500	7,000	55-5500
Commercial and Industrial	2"	Compound	0.25	80	160	2-80
	3"	Compound	0.50	160	320	4-160
	4"	Compound	0.75	250	500	6-250
	6"	Compound	1.50	500	1,000	10-500

* At 95% Accuracy

TABLE 3-10

Meter Type	Pressure Loss (psi) at designated flow @ 30% of Max. Capacity	@ 80% of Max. Capacity
Displacement	0.5 - 1.1	6.1 - 8.6
Compound	2.5 - 4.2	5.8 - 8.9
Current (Turbine)	0.7 - 1.2	2.0 - 3.0

The sizing of the meter is dependent upon the correct establishment of a maximum flowrate. In this regard, Chapter 4 of AWWA Manual No. M22 can be consulted. In general, the meter shall not be oversized and for all but residential or small commercial structures, the developer's engineer shall check such items as fixture units and landscape irrigation in arriving at the proper meter size.

D. Service Line Sizing: Proper service line sizing is a function of the maximum anticipated flow rates and the allowable pressure loss for adequate pressure. If pressure to the structure is questionable or if flows are anticipated to increase in the future, it is better to oversize the service line than to oversize the meter. The following service lines should be used with the respective meters as a guideline for the smaller installations:

TABLE 3-11

SERVICE LINE SIZE

Meter Size (inches)	Service Line Size (inches*)
$^5/_8$ x $^3/_4$	1
1	1
1½	2
2	2

* Larger sizes than those shown can be used if justified hydraulically.

In order to judge the pressure loss through the service line, the following Table can be used:

Table 3-12
PRESSURE LOSS IN PSI PER 100 FT. OF PE TUBING FOR INDICATED FLOW

	Flow Rate (GPM)			
Service Line Size	5	10	20	50
1 inch	2.09	7.52	27.13	----
2 inches	----	0.34	1.23	6.69

In using the above table, the losses are for 100 feet of tubing and that most service lines will be shorter.

E. Meter Location:

1. Residential. Meters shall be located as shown on the Standard Drawings. A primary consideration is to keep the meters out of driveways.

2. Landscape Irrigation Meters. Where the parkways or side landscaping strips along streets are to be irrigated, a separate meter must be installed on each side of the street. In such cases, running an irrigation line from the meter to the other side of the street is not allowed.

Where a median strip must be irrigated, the meter may either be in the side parkway or in the median strip, providing that at either location the meter is easily accessible and protected from being covered by landscape materials or other obstructions. The District reserves the right to select all meter locations.

3.15 FIRE SERVICE LINES

Fire service connections are used to supply private fire protection systems, consisting of privately owned fire hydrants, sprinkler systems, and similar outlets used exclusively for fire fighting. The size of a required fire service connection shall be provided by the developer. Each fire service line shall include a District approved backflow prevention assembly. The District has jurisdiction for the design and inspection up to and including the backflow prevention assembly.

3.16 WATER QUALITY SAMPLING STATIONS

Water quality sampling stations shall be installed when required at locations designated by the Environmental Compliance and Water Policy Department. Generally, a set of three sampling stations will be required for every 1,000 services. The sampling stations shall be as shown on the Standard Drawings. The requirement for sampling stations will be determined during the FPR review and shown on the approved plans.

SECTION 4.0

PLAN PREPARATION

4.1 GENERAL

The Engineering Department has established procedures, which shall be followed in the preparation of plans. Deviations from these requirements, unless specifically authorized will be cause for rejection by the Engineering Department. All engineers preparing plans should have in their possession a complete set of these Standards.

The engineer has a distinct responsibility to follow the progress of the project and to submit change orders or to incorporate "as-built" information on the drawings.

It should be understood that the responsibility for accuracy and completeness of the drawings rests with the developer's engineer. By signing the drawings, the Engineering Department attests to the fact that they have been reviewed and that the Board has authorized construction.

The District requires the preparation of separate drawings for the construction of water system improvements as discussed herein. The District may, however, allow proposed water system improvements to be shown on street improvement drawings for certain developments where no other underground facilities are proposed and combining the road construction information will not detract from the clarity of the water system design. The developer's engineer must obtain prior written approval from the District if he proposes to show water system construction requirements on the street improvement drawings. A topographic map and typical street sections for the development must be submitted with the request.

NOTE: The preparation of separate drawings for water and sewer system improvements <u>is optional</u> at this time. The requirement will be given further consideration in the future.

4.2 SHEET SIZE AND MARGINS

Drawings shall have overall dimensions of 24" x 36". Margins shall be sufficient to allow proper binding.

4.3 COVER SHEET

The cover sheet shall be the first sheet in the set of plans and shall contain:

A. An <u>index map</u> or a separate utility sheet with an overall plan at an appropriate scale showing general layout of waterlines, sizes, valve and fire hydrant locations, named streets, tract boundaries, lot boundaries, section lines and corners, township and range, a sheet index, scale, title and other pertinent information. The cover sheet

shall include a note as to the pressure zone by number and elevation. Care must be exercised to make sure scale and orientation are correct since these index maps are used to produce water system maps. Incorrectly drawn maps will be returned.

B. A vicinity map showing project area, streets, local communities, major streets and north arrow.

C. All bench marks used in the project shall be graphically shown on either map and the elevation, a descriptions, the location, etc., as indicated shown below:

B.M. No. _____ Elev. _____

Type of Marker _____

Location _____

_____

When possible, the project shall include the establishment of at least one bench mark in conjunction with facility improvements to allow for the propagation of U.S.G.S. elevations to future line extensions.

Said bench mark shall be established utilizing accepted standard of surveying procedure and accuracy, and shall be permanently affixed to a substantial facility such as a manhole casting, concrete vault corner, or other permanent facility. The record drawings for the project shall clearly describe and identify the location and elevation of the bench mark.

D. An approval signature block, as shown on Standard Drawing. The approval blocks shall be signed before any construction occurs. Any changes to the plans after initial approval shall be shown as revisions and shall be approved by the Engineering Department.

4.4 SECOND SHEET

The following information can be shown on the cover sheet. Should space be limited on the cover sheet, the second sheet in the set of plans shall include the following:

A. The general notes shall be shown in a conspicuous location. The general notes shall include a note requiring compliance with these standards as shown on the Standard Drawings.

B. Water service certification is required and shall be worded as follows and shown on the cover sheet:

WATER SERVICE CERTIFICATION

I hereby certify that the water system as shown on Drawing number _____, sheets _____ through _____ has been designed to provide each lot (or facility) of this tract (project) with adequate water pressure and fire flow as of the date shown, based on criteria supplied by the El Dorado Irrigation District.

_____	_____	_____
Registered Civil Engineer	RCE No.	Date

If the project does not involve specific lots, then the Engineer shall substitute the words "....designed to adequately provide service for the development said system is intended to serve."

Further, the engineer's California registration stamp including license expiration date shall be placed on the cover sheet. The design engineer shall be fully responsible for the adequacy and satisfactory performance of the water system design.

C. A block, as shown below, shall be completed with estimated quantities at time of submittal for final approval then adjusted for the record drawing.

Material List

Item	Supplier and/or Manufacturer	Model/ Type/Size	Quantity
Pipe	_____	_____	_____
	_____	_____	_____
Services	_____	_____	_____
	_____	_____	_____
Fire Hydrants	_____	_____	_____
	_____	_____	_____
Valves (by type)	_____	_____	_____

The material list shall be completed by the developer's engineer upon submittal of the record drawings. Multiple items may need to be shown to reflect the various types and sizes of items, i.e. gate valves, air release valves, butterfly valves.

D. The following Record Drawing Statement shall be placed:

RECORD DRAWING CERTIFICATE

This set of Plans, having been reviewed by me, reflect all approved revisions to the project known to me, and all field deviations to the planned improvements by the construction contractor, as reported to me as of _____(Date)_____. It does not represent field verification of planned improvements by me.

Registered Civil Engineer	RCE No.	Date

4.5 PLAN OF WATER SYSTEM

The water system plan view shall show the construction requirements for the installation of water mains, service lines, and water system appurtenances. The location of all water system improvements including bends, blow-offs, air valve assemblies, fire hydrants, and line valves are to be "called out" and stationed. Data for horizontal control of water lines including deflections, curves, offsets, and limits of all easements shall be shown.

Existing, proposed and future street improvements including street centerlines, property lines, easements, pavement, curbs, gutters, sidewalks, driveways, storm drains, catch basins, manholes, sewer mains, sewer laterals, vaults, fences, walls, barricades, trees and utilities are to be shown. Sufficient detail shall be given to accurately locate and identify these facilities. Data for the construction of the facilities, however, shall not be shown.

Those projects that lie within 1,000 feet horizontally of monuments or improvements that are known to be based upon the California coordinate system shall also be based upon that system. Bench marks set in conjunction with a project shall clearly have their horizontal control coordinates indicated on the plans.

4.6 PROFILE OF WATER SYSTEM

Proposed water system improvements shall be shown in profile on the same sheet as the plan view. Pipeline profile information shall include pipeline stationing, invert elevations to 0.01 of a foot at grade changes, and any curve data. Profiles shall show type, size and pressure class of pipe, blow-offs, air valves, line valves, fire hydrants, limits of restrained joints, concrete encasement, and steel casing. The cross section of existing and proposed utilities two inches and larger in diameter shall be shown where the lines cross proposed water system improvements. The grade of major parallel lines within 5 feet of the water main shall be shown as dashed. Stationing along the profile shall generally increase from left to right.

Existing grade and top of proposed and future pavement or grade shall be shown together with any other information needed to provide clarity for the design.

The District is not responsible for the accuracy of the location of underground lines, and approval of the plans by the District does not constitute a representation as to the accuracy of the location of, or the existence or non-existence of any underground utility, pipe, or structure within the limits of the project. The District will, however, "pothole" to expose the location of water and sewer mains at a reasonable number of locations as determined by the District. It will be the Engineer's responsibility to make necessary measurements and show the lines correctly on the drawings.

4.7 GRAPHIC SCALES AND NORTH ARROW

All plan and profile sheets shall contain:

A. A graphic scale, horizontal as well as vertical, illustrated such that a true representation is produced when the plans are reduced in size. Scale shall be as shown below, unless otherwise pre-approved.

Horizontal	1" =	40 feet
Vertical	1" =	4 feet

*Double scale drawings (i.e., 1" = 8 feet) may only be submitted where the predominant slope of the existing ground surface on any one sheet exceeds 7 percent. In such cases, the words "Double Scale" shall be boldly shown.

B. Generally, north should be oriented towards the top or right hand side of the sheet.

4.8 DETAIL SHEET

The District's Standard Drawings are referred to in the general notes and need not be reproduced. Only special details or modification to the District's Standard Drawings shall be included on a detail sheet with a set of plans.

4.9 PROCEDURE FOR APPROVAL

Approval of improvement plans consists of two phases. Each phase consists of a series of requirements, which must be met before final acceptance.

A. Requirements for plan approval (see Section 5 of these Standards).

B. Requirements for final acceptance (see Section 6 of these Standards).

4.10 PLAN CHECKING LIST

The following list is intended as a guideline to assist the preparer; it is not represented to be a complete list of requirements. However, the Standard Drawings, check list shall be submitted with the plans appropriately checked off by the Developer's engineer.

Check List
Plan Checking and Project Requirements
Water

Cover Sheet/Second Sheet.

Standard size, title block, signature block.
Revision and engineer's block.
Key and vicinity map.
Include lot numbers and lot lines.
Sheet index.
Pressure zone and elevation.
Adjacent tracts and street layout.
Bench mark.
Design and as-built certificates.
Pressure in project and fire flow requirement.
General notes.
Underground service alert note.
Engineer's stamp and expiration date.
Fire Department signature.

General Design

Conform to master plans.
Check for oversizing requirements.
Check for pressure and fire flow.
Selection of pipe type(s).
For any tie-ins to the District's existing system, provide instructions relative to sequencing, timing and thrust blocks.

Plan & Profile Sheets

Graphic scales.
North arrows.
Water line stationing left to right
Invert elevations.
Proper cover with uniform pipeline grade.
Curve data if there are curves.
Pipe sizes and type(s).
Street, curb dimensions, street names.
Lot boundaries.
Easements including line bearing.
Location of valves, fittings, fire hydrants, air and blowoff valves.
Lot numbers.
Separation between any parallel pipes (normally 4 feet O.D. to O.D. (minimum).
Fitting to fitting lengths or pipe centerline stationing.
Existing utilities.
Size and location of service and irrigation lines.

Administrative Before Construction of Improvements

Agreement executed by Board of Directors.
Cost estimate.
Inspection and plan check fee.
Bonds.
Environmental Documentation.
Easements signed and Notarized.

Administrative During or After Construction of Improvements

Fee's paid.
Record drawing certification
1 year surety
Project cost documentation
Change Order approvals
Shop Drawing Submittal

4.11 GENERAL NOTES

The "General Notes" on the District's Standard Drawings, shall be reproduced on the cover or following sheet of the plans. The Notes on the Standard Drawing are subject to change to suit the needs of the District.

SECTION 5.0

REQUIREMENTS FOR PLAN APPROVAL

5.1 GENERAL

Fees and requirements for plan approval are subject to procedures as outlined in the District's Policy Statements and Regulations. Plans will not be accepted for review unless the submittal includes the documentation as described in Policy Statement 22. The Developer's Engineer is encouraged to contact Customer Service prior to plan submittal to ensure that the plans will be accepted for review.

5.2 PLAN REVIEW SUBMITTALS

All of following items shall be submitted for review as a complete package if any of the items are missing.

A. Three sets of blueline prints of the proposed water system improvements.

B. One copy of the Facility Improvement Letter and approved Facility Plan Report.

C. Two copies of the Environmental document(s), except as specified in Section 5.3.

D. One complete set of other than water improvement plans, i.e. sewer, storm drains, road as described in Section 4.0.

E. One copy of proposed easements, not executed.

Plans indicating incomplete design and drafting detail that do not meet minimum District Standards will be rejected prior to the first plan review. The developer and the developer's engineer should be aware that most projects involve several plan review and resubmittals before final approval is obtained.

5.3 ENVIRONMENTAL DOCUMENTS

Environmental documents include Environmental Impact Reports (EIR), negative declarations, and exemptions. When the environmental document has been prepared by another agency, a copy of the document must accompany the first submittal. If the document is a negative declaration, then the initial study must also be submitted.

The Engineering Department will determine the appropriate type of environmental document where the District is the lead agency for a project. The developer will be provided with a cost estimate and schedule for preparing the document. A public

comment period and/or Board approval may be required depending on the type of environmental document required.

The construction plans will not receive final approval until after appropriate reviews of the Document and payment of District costs associated with environmental work has been made.

5.4 EASEMENTS

All EID easements must have deeds submitted for checking and must be shown on the final tract map before recordation. Easements shall only be accepted on the standard document form provided by District Right-of-Way staff. Also, see Section 3.3 of these Standards for easement requirements.

5.5 AGREEMENTS AND BONDS

Staff will provide the developer with the proper forms and developer shall submit the following:

A. Agreement for Extension of Facilities.

B. A faithful performance bond equivalent to 100 percent of the estimated cost of construction, including contingencies. Certificates of Deposit, cash, and letters of credit may be substituted. Performance bonds will not be required if water and sewer facilities are included with the County required bond for subdivisions.

5.6 METER AWARD LETTER

Prior to or concurrent with any Board approval, the District shall issue a meter award letter indicating that the District will provide water service subject to certain terms, conditions and limitations as outlined in Policy Statement No. 22 or as required by these Standards.

5.7 APPROVAL FOR CONSTRUCTION

Upon receipt of all documents, bonds, fees and checking for all documents, bonds and fees, the staff shall prepare an agreement for Board action, which is accompanied by or refers to the following material:

- Original water plans.
- Agreement for construction of water facilities.

- Easement deeds.
- Faithful performance bond.

The Engineering Department will sign the original plans only after all revisions have been made. Customer Service will notify the developer's engineer that the plans are signed and available. The developer's engineer will then provide the Engineering Department with two sets of blueline prints.

No construction shall occur before the plans are signed and before the proper notifications have been given. These notifications will allow time for a preconstruction meeting of all interested parties.

5.8 SPECIAL CHARGES

If there are items requiring special approval, the Engineering Department may require deposit of funds or agreements for funds in the future to provide for operation and maintenance of the substandard facilities.

5.9 MAIN LINE EXTENSION AND REIMBURSEMENT AGREEMENTS

District Regulation No. 8 discusses this subject. In general, if any developer desires to enter into a reimbursement agreement with the District, such arrangements shall be made prior to the time of plan approval.

SECTION 6.0

REQUIREMENTS FOR FINAL ACCEPTANCE

6.1 GENERAL

Upon completion of construction, final inspection by the District Engineering Department, submission of record drawings and project costs, and payment of any outstanding monies, the project shall be accepted by the District Engineering Department. The facilities shall be owned, operated and maintained by the District.

6.2 RECORD DRAWINGS

Record drawing submissions consisting of non-digital (hand) drawings shall be photo-mylars only. Record drawing submissions consisting of digital (computer) drawings shall have signature pages photo-mylars and subsequent pages plotted in ink on mylar. Sepia mylars of any kind or xerox mylars will not be accepted. Record drawings shall reflect the actual improvementss made and shall give the accurate location of all new/or relocated facilities. The drawings will be subject to District approval. The following certificate shall be signed and shall appear on the appropriate sheet of the plans:

Record Drawing Certificate

This set of Plans, having been reviewed by me, reflect all approved revisions to the project known to me, and all field deviations to the planned improvements by the construction contractor, as reported to me as of _____(Date)_____. It does not represent field verification of planned improvements by me.

_____	_____	_____
Registered Engineer	RCE No.	Date

It should be emphasized that the responsibility for accurate record drawings must involve active participation by the developer's engineer during the project. All changes, whether done through formal change order or revision process or whether done as a field adjustment, should be reflected on the record drawings.

6.3 PROJECT COSTS

The developer or his engineer shall submit an itemized list of costs that were incurred to have the water system facilities constructed for the project. The costs shall include a prorated share of engineering, administration, and legal cost that can be attributed to the water system and the total construction cost for the water system including all change orders. The information will be used by the District to determine total "plant value" for

maintaining a replacement reserve fund for system depreciation and for use in preparing any reimbursement agreements.

6.4 OTHER ADMINISTRATIVE ITEMS/INCLUDING EASEMENTS

Depending upon the project, there can be other administrative items required before final acceptance. Examples are outstanding monies, contractual requirements, notification of completion to DOT and warranties.

6.5 FIRST YEAR WARRANTY RESPONSIBILITIES (Reg. No. 8-L)

The property owner shall warrant, for one year, repair of the installed facilities. Regulation No. 8-K contains additional information for the one year warranty. The date for the one year warranty shall begin as of the field acceptance date established by the Inspector.

When the facilities serve a subdivision, the applicant, or the applicant's contractor, shall, submit a one year repair surety; a bond (in form acceptable to the District), certificate of deposit, or irrevocable letter of credit, in an amount not less than ten percent (10%) of the construction costs of the facilities.

A bond, certificate of deposit, or letter of credit, will not be required to be deposited with the District to the extent the applicant or applicant's contractor guarantees repair of the project by providing such surety to the City or County having jurisdiction for the project which satisfies the provisions of this section regarding amount, time and scope."

SECTION 7.0

CROSS CONNECTION AND BACKFLOW PREVENTION

7.1 GENERAL

The District's Board Policy 5020 sets forth policy, authority, and requirements for the prevention of contamination by backflow and cross connections.

The type of backflow prevention assembly shall be determined by the District Cross-Connection Control Specialist after the use of the service can be determined. Should the developer wish to install a prevention assembly concurrently with the water system improvements without knowing the service use, a reduced pressure principle assembly shall be installed as shown on the Standard Drawing.

7.2 TYPES OF BACKFLOW PREVENTION

Where actual or potential cross connections exist, backflow prevention shall be provided. Only the following type of backflow prevention assemblies are approved for use within the District.

- Double Check Valve Assembly (DC): The double check valve assembly is composed of two single, independently acting check valves. The unit also has two tightly closing shutoff valves located at each end of the device and four test cocks for the testing of the check valves. This assembly shall only be used to protect against a non-health hazard (i.e., pollutant).

- Double Check-Detector Backflow Prevention Assembly (DCDA): The double check- detector backflow prevention assembly is a specially designed assembly composed of a line-size approved double check valve assembly with a bypass containing a specific water meter and an approved double check valve assembly. This assembly shall only be used to protect against a non-health hazard (i.e., pollutant). The DCDA is primarily used on fire sprinkler systems.

- Reduced Pressure Principle Assembly (RP): The reduced pressure principle assembly consists of two independently acting check valves, together with an automatically operating pressure differential relief valve located between the two check valves. The first check valve reduces the supply pressure at a predetermined amount so that during normal flow, and at cessation of normal flow, the pressure between the two check valves shall be lower than the supply pressure. If either check valve leaks, the relief valve will discharge to atmosphere. This will maintain the pressure in the zone between the two check valves lower than the supply pressure. The unit also has two shutoff valves (one upstream and one downstream of the checks) and properly located test cocks for field testing. This assembly is designed to protect against a non-health (i.e. pollutant) or a health

hazard (i.e., contaminant).

- Reduced Pressure Principle Detector Assembly (RPDA): The reduced pressure principle-detector backflow assembly is a specially designed assembly composed of a line-size approved reduced pressure principle backflow prevention assembly with a bypass containing a specific water meter and an approved reduced pressure principle assembly. This assembly shall be used to protect against a non-health hazard (i.e., pollutant) or a health hazard (i.e., contaminant). The RPDA is primarily used on fire sprinkler systems.

- Air Gap (AG): An air gap is a physical separation between the free flowing discharge end of a potable pipeline and an open or non-pressure receiving vessel. To have an acceptable air gap, the end of the discharge pipe has to be at least twice the diameter of the pipe above the topmost rim of the receiving vessel, but in no case can this distance be less than one inch.

The District's cross-connection control specialist may choose a higher level of protection than described above, depending on project specifics.

7.3 WHERE PROTECTION IS REQUIRED

The type of protection that will be provided to prevent backflow into the District's water system shall be commensurate with the degree of hazard that exists on the customer's premises. The customer may choose a higher level of protection than required by this policy. Typical examples of services that will require protection are:

A. Agricultural, Commercial or Industrial Services: All new service connections to Agricultural, Commercial and Industrial accounts will require at a minimum a Reduce Pressure Principle Assembly. A request for a lesser degree of protection may be granted by the Cross Connection Administrator or a designated cross connection specialist on a case by case basis. The installation of a lesser degree of protection may result in more frequent testing and/or on-site surveys.

B. Multiple Story Units: Service connections to all new multiple unit accounts will be evaluated by the District on a case-by case basis to determine whether protection is required, and if so, by what method.

C. Fire Protection Services:

1. Low Hazard Fire Protection Systems (Residential, Commercial and Industrial) requiring Double Check Detector Assembly:

a) Premises where the fire system is directly supplied from the District's water system and there are no pumps, tanks, or

reservoirs; no physical connections from other water supplies; no antifreeze or additives of any kind; and all sprinkler drains discharge to the atmosphere. –

b) Premises where the fire system is directly supplied from the District's water system and a booster pump is installed, no tanks or reservoirs, no physical connections from other water supplies, no antifreeze or additives of any kind, and all sprinkler drains discharge to the atmosphere.

2. High Hazard Fire Protection Systems (Residential, Commercial and Industrial) requiring Reduced Pressure Detector Assembly:

a) Fire protection system is supplied from the District's water system and interconnected with an unapproved auxiliary water supply.

b) Fire protection system is supplied from the public water system and contains any hazardous substance.

c) Where the degree of hazard is not known at the time of construction.

7.4 FREEZE PROTECTION

Above-ground installation shall be protected from freezing with insulation and/or an enclosure. Proposals for freeze protection utilizing below grade installations shall be approved on a case by case basis by the Cross-Connection Specialist. Access to assemblies and the test cocks shall be made available to the District upon request.

SECTION 8.0

WELLS

8.1 GENERAL

The District's requirements for groundwater wells are found in Policy 16. Policy No. 16 states "Because of the unreliable nature of underground water sources in most of El Dorado County, such water will not be relied upon as a sole source of water for domestic, irrigation or fire fighting purposes.

Any request to the Board to consider groundwater augmentation of the existing system must be evaluated on the basis of short-term and long-term reliability, quality and economics. More than one professional, expert opinion regarding the adequacy of the supply will be required. The costs of the necessary tests, expert opinion(s), and District Staff time will be borne by the applicant."

The Engineering Department shall also establish the required conditions and procedures for evaluation of the ground water augmentation proposal by the applicant. All studies shall address the requirements of the County Department of Environmental Health, the California Department of Health Services, and the California State Department of Water Resources. The applicant shall meet with the Engineering Department to review the conditions and procedures prior to any submittals or studies.

SECTION 9.0

PRESSURE REDUCING STATIONS

9.1 GENERAL

Pressure reducing stations will be required to reduce system pressures to the limits required for downstream pressure zones. The stations shall be readily accessible by maintenance vehicles during all weathering conditions. Normally, the facility should be located outside the traffic way of streets or roadways.

9.2 DESIGN CRITERIA

A. Valve Sizes - The District shall determine valve sizes. Pressure reducing valves shall be sized for low and peak flow. Existing and ultimate demands shall be considered when sizing valves. Multiple valves in parallel are normally required to handle a wide range of flow rates.

A pressure relief valve shall be incorporated into the design of a pressure reducing station to prevent water system damage in the event of a failure of the pressure reducing valves.

B. Pressure - The District shall determine the need, location, and settings for the station. Pressure drops across valves exceeding 70% of the inlet pressure shall be reviewed for cavitation.

C. Station Layout - Each station shall generally conform, as a minimum, to the Standard Drawings. Original drawings are to be obtained from the Engineering Department and shall be completed and included with the submittal. Drawings other than the originals will not be accepted.

Site grading shall be shown on the plans designed such that surface drainage is away from the station. Drainage from the vault and relief flow shall be discharged at a location to permit gravity flow to a drainage course.

D. Equipment - Capacities, ranges, and settings of control valves, as established by the District, and design criteria shall be shown on the station details. Equipment shall be supplied by those on the District's approved manufacturer's list.

SEWER DESIGN STANDARDS
TABLE OF CONTENTS

SECTION 1.0

INTRODUCTION AND GENERAL POLICIES

1.1 SCOPE

The planning, design and construction of sewer mains and other appurtenances to be owned, operated, and maintained by the El Dorado Irrigation District shall comply with these standards herein called "Sewer Design and Construction Standards" and the permit requirements of various governing bodies, except where specific modifications have been approved, in writing, by the Engineering Department. All submitted plans shall be signed by a registered Civil Engineer prior to submission for plan review and all work shall be in accordance with good engineering practice. This document sets forth the procedure for planning, designing and preparing plans and specifications for sewer systems built for the District. It also sets out minimum standards for improvements to the District's sewer collection system. Wherever there are differences between these standards and county, state or federal regulations, the most stringent or highest requirement shall govern. The Sewer Design and Construction Standards are intended for collector sewer systems. Trunk sewer lines shall be designed and installed by the District and/or a District designated engineer or contractor.

1.2 INTERPRETATION

The Engineering Director shall decide all questions of interpretation of "good engineering practice," guided by the various standards and manuals.

1.3 DEFINITIONS AND TERMS

Refer to Section 1.3 of the Water Design Standards for Definitions and Terms.

1.4 APPLICABLE CODES AND POLICIES

Ordinances, requirements and applicable standards of governmental agencies having jurisdiction within the District's service area shall be observed in the design and construction of sewer systems. Such requirements include but are not limited to current revisions of the following.

A. The Uniform Plumbing Code as amended by the County of El Dorado.

B. Municipal Code of the County of El Dorado, as applicable.

C. Road encroachment regulations of the County of El Dorado, as applicable.

D. Standard Specifications - Department of Transportation Standard specifications, current edition (CALTRANS).

E. Regulations and Policy Statements as adopted and amended by the Board of Directors of the El Dorado Irrigation District.

1.5 EL DORADO IRRIGATION DISTRICT JURISDICTION

The District is responsible for the approval of plans and inspection of all public sewer lines to, and including, the property line cleanout. Where repairs or repland service lines within the District's service area. Service lines include lines from the placement of a service line on the downstream side of the cleanout is required it shall be the responsibility of the District unless it is a system upgrade in which case the owner or customer will be billed for the work. Conversely, repairs or replacement on the customer side of the cleanout shall be the responsibility of the property owner.

1.6 DEVELOPER'S ENGINEER'S RESPONSIBILITY

These standards establish uniform policies and procedures for the planning, design and construction of the District's sewer system. They are not intended to be a substitute for engineering knowledge, judgment and experience. The contained procedures shall be reviewed by the developer's engineer and shall be applied as necessary to the project. Proposed deviations to these standards shall be submitted, in writing, in conjunction with facility plan report approvals.

All plans, specifications, reports or documents shall be prepared by a registered civil engineer, or under direction thereof, and shall be signed and stamped to indicate his/her responsibility.

A "Preliminary Review" and/or "Plans Approved for Construction" stamp or signature of the District on the plans does not in any way relieve the developer's engineer of the responsibility to meet all requirements of the District. The plans shall be revised or supplemented at any time it is determined that the District's requirements have not been met. However, generally plans that are signed as being authorized for construction will not require revisions based upon subsequent revisions to these standards unless in the District Engineering Director's opinion a change is necessary based upon a significant change in the standards or unless a developer does not proceed to construction within the time allowed in the agreement with the District.

1.7 REFERENCE SPECIFICATIONS

References to standards such as the Standard Drawings of the District or ASTM shall refer to the latest edition or revision of such standards unless otherwise specified.

1.8 FACILITY PLAN REPORT

All sewer collection systems shall be included with the Facility Plan Report as described in Section 2.0 of the Sewer Design and Construction Standards. A separate Facility Plan Report is <u>not</u> required for sewer when both water and sewer facilities are proposed for a project.

SECTION 2.0

PRE DESIGN SUBMITTALS

2.1 GENERAL

Refer to Section 2.0 of the Water Standards for submittals.

SECTION 3.0

DESIGN CRITERIA

3.1 GENERAL

All gravity sewers, force mains, and lift stations shall be of adequate size to serve the development in question together with existing and any future development that may occur. Sewage flows shall be determined for the tributary area based on land uses designated in the El Dorado County General Plan in effect at the time of application.

Sewage flows for 33 EDU's and less shall be serviced by 6-inch sewers at a minimum slope of 0.015 ft/ft. Sewage flows and pipe sizes for 34 EDU's and more shall be determined by the methods outlined in Section 3.2.

3.2 DESIGN FLOWS, HYDRAULICS AND SIZES

A. Design Flows: All facilities shall be sized for peak wet weather flow as defined herein. Peak wet weather flow is the average dry weather flow multiplied by a peaking factor which includes an allowance for inflow/infiltration.

1. Average Dry Weather Flow

Residential: An average dry weather flow of 240 gallons per day shall be used for a single family dwelling which represents an equivalent dwelling unit (EDU). Sewage flows for multi-family residential developments shall be based on 180 gallons per day for each unit when establishing the total anticipated average dry weather flow.

Commercial: Table 3-1 shall be used to determine EDU's for commercial, industrial and institutional developments when water meter sizes have been determined and on which facility capacity charges (FCC's) will be based. Table 3-2 shall be used if water meter size is not known.

TABLE 3-1

EQUIVALENT DWELLING UNITS

DOMESTIC WATER METER SIZE (IN)	WATER METER TYPE	EDU's
¾"	Positive Displacement	1
1"	Positive Displacement	2
1½"	Positive Displacement	3
2"	Positive Displacement	5
3"	Compound	11
3"	Turbine	23
4"	Compound	17
4"	Turbine	67
6"	Compound	33
6"	Turbine	133
8"	Turbine	233
10"	Turbine	367

TABLE 3-2

AVERAGE DRY WEATHER FLOW RATES
BY LAND USE

Commercial/Industrial	Gal/Day
Motel (per person)	50
Bar (per seat)	15
Restaurant (per seat)	30
Laundry (per machine)	500
Small Business (per 1000 SF)	25
Offices (per 1000 SF)	40
Automobile Service Station (per employee)	15
Institutional	
Hospital (per bed)	200
Elementary School (per student)	4
Intermediate/High School (per student)	5

Undeveloped Areas: It is recognized, however, that in many cases the engineer will not know building occupancies nor specific future residential development when water and sewer mains are designed. When this occurs, use Table 3-3 for the unit average dry weather flows.

TABLE 3-3
UNDEVELOPED AREAS

Land Use	Density (Dwelling Units/Acre)	Average Dry Weather Flow (Gal/Day/Acre)
Low density single family	0.1 to 0.2	34
Medium density single family	0.21 to 1.0	120
High density single family	1.1 to 7.0	600
Multi-family	7.1 to 24	2,200
Commercial	------	500
Industrial	------	500

2. Peak Wet Weather Flow: The average dry weather flow shall be multiplied by a flow factor of 4 to obtain the peak wet weather flow. The flow factor accounts for peak flows and provides an allowance for inflow/infiltration.

B. Hydraulics: Pipeline capacities shall be based on peak flows. The design flow rate to be used for a pipeline reach shall be the flow rate entering the upstream manhole. Sewers shall be designed to flow no more than 50% full for 6-inch pipe and 67% full for all other pipe. The minimum design velocity shall be 2.0 feet per second and the maximum shall be 10 feet per second. The slope of the pipeline shall not exceed 19%.

Manning's "n" shall be 0.013 for all calculations.

When the above minimum criteria can not be achieved, the developer's engineer may request using criteria less than the minimums. The engineer must submit along with this request backup data and reasons why the minimum cannot be attained. The request will by reviewed by the District and the decision will be conveyed to the applicant.

C. Pipe Sizes: The District will not accept sewer mains smaller than 6-inches in diameter for operation and maintenance. Generally, collector lines are sewers 10-inches in diameter and smaller. Trunk lines are sewers 12-inches in diameter and larger and will be designed and constructed under the direction of the District.

3.3 SEWER PIPE MATERIALS

All gravity sewers shall be SDR-35 PVC as a minimum as specified in the Standard Specifications. An increase in pipe stiffness may be required depending on soil/loading conditions.

All sewer force mains shall be constructed with minimum Class 150 PVC pipe manufactured in accordance with AWWA C-900.

All sewer service laterals shall be SDR-35 PVC pipe.

Where ductile iron pipe is specified for sewer, the pipe is to be lined with a District approved material.

3.4 PIPE DESIGN

Unless otherwise approved by the District, PVC pipe shall be installed. Pipe design procedures shall follow the flexible pipe design criteria. A rigorous analysis will generally not be required for collector lines (lines less than 12 inches in diameter). However, soil and loading conditions will dictate if an analysis of any pipe size is necessary.

Should an analysis of the pipe be necessary, applicable criteria shown in Table 3-4 shall be incorporated into the design. PVC pipe design shall be based on long-term structural strength. Material characteristics shown in Table 3-4 are based on long-term values as determined by Section 18 of AASHTO's Standard Specifications for Highway Bridges. Pipe design considerations should include vertical deflection, buckling, wall and hoop strain. Methods to determine these values can be found in design manuals, pipe manufacturers' publications, ASCE Manual of Practice #37, and AASHTO Section 18.

TABLE 3-4

DESIGN CRITERIA

Criteria	Allowable
Design Life	50 Years
Earth Load	Prism Load
Live Load	H20
Vertical Deflection	3%
Tensile Strength	2600 psi (PVC)
Mod. of Elast. (E)	158,400 psi (PVC)
Strains	3.5% (PVC)
Soil Modules (E)	700 psi
Safety of Factor	2.0

3.5 DEPTH OF LINES

Depth of cover is measured as the distance to the top of pipe from the finished surface over the sewer centerline for unimproved areas. In streets, cover shall be measured from the top of pipe to subgrade.

Mains and laterals shall be installed at a depth which shall provide suitable service to the properties connected and will allow subsequent installation of waterlines and other utilities in accordance with the Separation Standards shown in the Standard Drawings.

Minimum cover is 3 feet. Where this cover cannot be maintained, other details may be required, such as higher strength pipe, pipe encasements, special backfill, or concrete trench slabs. Depths of cover less than 3 feet require special approval by the District.

3.6 SEPARATION REQUIREMENTS

A. General: Proper separation of wastewater, recycled, and water systems is necessary to reduce the potential for an outbreak of waterborne diseases. Sanitary sewers may leak and saturate the surrounding soil with sewage. This is caused primarily by structural failure of the sewer line, improperly constructed joints, and subsidence or upheaval of the soil encasing the conduit. A serious public health hazard exists when the water mains are depressurized and no pressure or negative pressures occur. The hazard is further compounded when, in the course of installing or repairing a water main, existing sewer lines are broken. Sewage spills into the excavation and hence enters into the water main. Additionally, if a water main fails in close proximity to a sewer line, the resultant failure may disturb the bedding of the sewer line and cause it to fail. In the event of an earthquake or man-made disaster, simultaneous failure of both conduits often occurs. The following criteria, a summary of Title 22 paragraph 64630 of the California Code of Regulations, shall be used for determining clearance between water and waste facilities.

B. Basic Separation Standards

1. Parallel Construction: Water mains shall be laid at least 10 feet horizontally from any sanitary wastewater, storm sewer, or sewer manhole, whenever possible. The distance shall be measured edge to edge.

2. Perpendicular Construction (Crossing): Pressure water mains shall be at least one foot above sanitary sewer lines where these lines must cross.

3. Common Trench: Water mains and wastewater lines and other utilities shall not be installed in the same trench.

4. Leach Fields: Edge of water main easements shall be at least twenty-five feet horizontally from cesspools, septic tanks, sewage leach fields, and seepage pits.

C. Exceptions to Basic Separation Standards: Local conditions such as available space, limited slope, existing structures, etc., may create a situation where there is no alternative but to install water mains or sewer lines at a distance less than that required by the Basic Separation Standards. In such cases, alternative construction criteria as specified in the Standard Drawings shall be followed, subject to the special provisions outlined below and prior approval from the Engineering Department. The Standard Drawings contain thorough discussions of various cases where less than ten-feet separation would be allowed.

D. Special Provisions

1. The Basic Separation Standards are applicable under normal conditions for wastewater (sewage) collection lines and water distribution mains. More stringent requirements may be necessary if conditions such as high groundwater exist as determined by the Engineering Department.

2. Wastewater lines shall not be installed within twenty-five feet horizontally of a low head (5 psi or less pressure) water main.

3. In the installation of water mains or sewer lines, measures should be taken to prevent or minimize disturbances of the existing trench section of the line. Disturbance of the supporting base of this section could eventually result in failure of this existing pipeline.

4. Wastewater Force Mains

   a. Wastewater force mains shall not be installed within ten feet (horizontally) of a water main.

   b. When a wastewater force main must cross a water line, the crossing shall be as close as practical to the perpendicular. The wastewater force main shall be at least one foot below the water pipeline.

   c. When a new wastewater force main must cross under an existing water main, all portions of the wastewater force main within ten feet (horizontally) of the water main shall be installed in a steel casing having welded joints.

   d. When a new water main crosses over an existing wastewater force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi or equivalent pressure rating.

3.7 LOCATION AND ALIGNMENT

A. Sewers in Streets: In local residential and industrial streets, sewers are to be located in the center of the driving lane. In multiple lane roads, the sewer mains will be located in the center of the driving lane nearest to the center of the street, but will not be located in the median strip.

On curved streets, sewer mains shall be parallel with the centerline of the street by use of horizontal curves for the alignment.

A maximum horizontal separation between sewer and domestic water mains shall be achieved by aligning the sewer on the opposite side of the centerline from the domestic water main.

Storm drains and other underground facilities shall be located to provide a minimum of five feet clearance between outside edges.

Sewerlines, wherever possible, shall cross under water pipelines.

When an area outside the tract or development project area can be logically served by extension of the sewerline in future streets or easements, the pipeline shall extend to the tract/project boundary or to the end of a paved street in a manner facilitating future extensions.

B. Sewerlines in Easements: Unless there are either physical limitations or extreme economic penalties, sewerlines shall be installed within public right-of-way. When easements are required, there shall be careful consideration of how the pipeline is to be maintained and/or replaced. The installation of sewers within easements along back lot lines will only be permitted under unusual circumstances because of the difficulty and high cost of maintaining and replacing these sewers. A preferred alternative involves constructing a sewer lateral along the side lot line for collecting wastewater from no more than two homes. Where there are side slopes (perpendicular to the pipe), the plans shall clearly indicate graded access within the easement.

In general, the sewerline within an easement shall be accessible by conventional maintenance vehicles traveling over all weather, relatively level surfaces, or driveways unless otherwise approved.

Easements and sewer installations shall comply with the following requirements:

1. Width: Sewer easements shall be a minimum of 20-feet wide. Additional easement width will be required where the depths of pipe are excessive or where deemed necessary by the District. Parallel block walls, structures, foundations, new trees or other similar obstructions within an easement are prohibited.

Where the easement is contiguous to a public right-of-way or a public utility easement, the width of the new easement may be decreased upon review and approval by the Engineering Department.

2. Pipeline Locations: Pipelines shall generally be placed 5 feet off easement centerline. Offsets greater than 5 feet shall have prior approval.

3. Easement Location: The full easement width shall be on one lot or property in such manner that access to the pipeline will not be obstructed by walls, trees or permanent improvements. Where this requirement cannot be met without interfering with existing buildings, easements may straddle lot lines providing special approval is received by Engineering Department and the sewer is not located on the lot lines.

4. Easement Provisions: Easements for proposed or existing facilities shall be recorded using the standard easement forms provided by the District's Right-of-Way Division. Easements shall be recorded by the following documents as conditions dictate:

   a. Exclusive Easements - Where the sewer is the sole utility, an exclusive easement shall be dedicated to EID.

   b. Non-Exclusive - Where other parallel utilities are to be installed within an EID easement, a non-exclusive easement shall be dedicated to EID. A 5-foot envelope on each side of the sewer shall be exclusively reserved for the sewer.

   c. Irrevocable Offer of Easement Dedication - This can be used on existing water/sewer/ditch systems where an easement does not exist and a metes and bounds description is not available or practical to obtain. This form is recommended to be used on all parcel maps 4½ acres and larger. Should the existing facility need to be located, the District will be responsible to field locate such facility.

5. Crossings - Utilities or other improvements may cross easements upon a review by the Engineering Department. Generally, crossings are to be perpendicular. Surface improvement crossings shall have provisions for accessibility.

6. Easement Identification - Marker posts per the Standard Drawing shall be used to identify easement boundaries. Locations of posts shall be determined by the Engineering Department.

3.8 HORIZONTAL AND VERTICAL CURVES

In curved streets, the sewer shall follow the street curvature, but not crossing the centerline. Vertical plus horizontal curves will not be allowed between manholes unless it is demonstrated that another solution is not reasonably feasible. Vertical curves shall not be used unless excessive extra depth of excavation would be otherwise incurred.

The pipe shall not be curved to a lesser (tighter) radius than shown below. Deflection at the joints is not permissible.

TABLE 3-5

MINIMUM RADIUS

NOMINAL PIPE SIZE (IN.)	MINIMUM RADIUS (FT.)
6"	200
8"	250
10"	310
12"	375

3.9 STRUCTURAL REQUIREMENTS

A. Under Roads: All structures and pipe placed under public roads shall be of sufficient strength to support with an adequate factor of safety the backfill, road surfacing and H-20 loading per AASHTO Standard Specifications (truck loading with impact). Higher loading may be specified by the Engineering Department or as required by good design.

B. Other Pipes and Structures: Sewer lines designed to cross under or over other pipes or structures shall be protected from damage and shall be constructed to prevent endangering the other pipe or structure. In this regard, particular attention should be given to the possibility and prevention of settlement-caused damage. Also, where future replacement of any line may be extremely difficult due to the pipe or structure, special design consideration may be required. Any of the Standard details which detail various encasements or other protection may be required in such instances.

C. Steep Grades: Sewer lines laid on grades steeper than 10 percent which are not under nor intended to be under pavement shall be examined for possible erosion protection. Where the surface slope exceeds 35 percent a check dam shall be installed across the top of the trench at 20 feet intervals to reduce erosion.

D. Creek Crossing: Depths and protection of sewers crossing below the flow line of creeks or channels are dependent on site improvements and geotechnical considerations. Generally pipelines are to conform to the Standard Drawings.

Other criteria to consider at creek crossings are:

- Sewers are to cross upstream of hydraulic structures (i.e. bridges, culverts, etc.)
- Crossings are to be perpendicular to flow line of creek.
- The protection of the sewer is to extend 10 feet beyond the top of defined banks.
- The type and length of sewer protection will be dependent on creek conditions.

Special design criteria will be provided by the District for sewers attached to bridges.

E. High Water Table: A structural stability analysis of the pipe shall be provided where the water table is, or anticipated to be, above the flow line of the sewer.

3.10 MANHOLES

A. General: The maximum distance between manholes shall be 400 feet from centerline to centerline. Brick and mortar knockouts for future extensions shall be installed on stub and capped pipes.

Unless otherwise approved, all manholes should be accessible to standard maintenance vehicles. Therefore, manholes placed in back or side yards will not normally be approved. Every reasonable effort shall be made to provide a stable, all weather graded roadway to manholes in open space areas.

B. Location: Manholes shall be located at the following:

1. At all grade changes
2. At all changes in horizontal alignment (except on curves)
3. At all changes in pipe sizes
4. At the terminal end of all lines exceeding 120 feet in length. Manholes will be required in cul-de-sacs.
5. At all junctions of main sewers.

6. At the point of tangency of each reverse curve. No reverse curves will be allowed between manholes.

Manholes shall generally be located no less than 10 feet from the curb line when within a cul-de-sac. Also, manholes shall not be located within the street such that rainfall runoff is directed to the manhole.

Manholes (and cleanouts) shall generally be located at least 10 feet past the downstream property line of the last property served.

C. Manhole Sizes: Standard manholes and shallow manholes shall be in accordance with the Standard Drawings. Normally, manholes will be 4' diameter; 5' diameter manholes are required for lines 18" and larger or where the depth to pipe invert exceeds 15 feet.

D. Slope of Manhole Channels: Channel slopes for 6" and 8" inlet sewers are to have a minimum drop of 0.1 foot. Special channel slope construction is required for sewers 10" and larger in accordance with drawing S09A. The maximum drop through the channel shall be 2 feet. When the channel drop is greater than 2 feet, then a drop manhole is to be installed.

E. Drop Manholes: Drop manholes may be required because of some physical constraint; they should not be used unless unusual circumstances exist. Where approved, the drop shall be constructed in accordance with the Standard Drawing.

F. Rim Elevations of Manholes: Rim elevations for all manholes shall be shown on the profile. In paved areas, the manhole rim elevation shall match the finished grade. In other than paved areas or traveled way, the height of the manhole rim will normally be 6 inches above the finished grade, high water mark, or above the top of the future fill areas. The elevations shown for the tops of manholes on the design plans shall not relieve the contractor from making final adjustments to match street surfaces.

G. High Water Table/Undeveloped Areas: When manholes are constructed in natural or man-made drainage courses or flood channels, the manhole covers and rim shall be watertight and shall be fitted with a grooved gasket and bolted down with stainless steel cap screws. The exterior of manholes shall be waterproofed in accordance to the Standard Drawing. In other undeveloped areas above the high-water level, bolt-down vandal-proof manhole covers shall be used. Manhole markers shall be installed for easy identification per the Standard Drawing.

H. Marker Posts: In easements or where required on the plans, marker or guard posts shall be installed to identify manholes. Posts shall conform to the Standard Drawing.

I. Structural Requirements: All manholes shall be designed for the appropriate dead, live, and impact loads.

J. Lining: Manholes that have turbulent flows require lining. Manholes requiring lining include:

1) at force main termination and up to 3 downstream manholes,
2) drop manholes, and
3) multiple and 90° angle inlets.

Manholes requiring lining shall be designated on the plans.

3.11 CLEANOUTS

Dead end lines under 120 feet long may terminate in a cleanout or flushing branch unless a manhole is required. Cleanouts shall be constructed in accordance with the Standard Drawings.

3.12 SERVICE LATERALS

A. General: The District will inspect the construction of service laterals from the main sewer line to the property line. The local building authority inspects the lateral from the property line to the building or house.

Where it is known or can be reasonably assumed that a building sewer connection is required, a service lateral shall be shown on the plans and installed to the property line as a part of the sewer construction prior to paving. A service lateral shall be provided for each lot. Service laterals shall be installed in general conformity with the Standard Drawings.

B. Size: Service laterals for single family dwellings shall normally be 4-inch minimum diameter unless otherwise required by the Uniform Plumbing Code. Townhouses shall be required to have separate 4 inch minimum diameter laterals. All other laterals for commercial or industrial uses shall be no less than 6 inches minimum diameter.

The maximum size for a lateral connection by wye or tee fitting to a larger diameter sewer shall be six (6) inches. A manhole shall be installed when an eight (8) inch or larger sewer is connected to an equal or larger diameter sewer.

C. Depth: Service laterals from the main sewer to the property line shall be constructed at a minimum 2.0 percent grade unless otherwise approved. In addition, the depth at the curb or property line shall normally be 3 feet minimum and a maximum of 6 feet from top of the pipe to ground surface.

The grade and location of laterals within the property are under the jurisdiction of the County Building Department. As a guide, the laterals shall be at a minimum 2.0 percent grade from the property line to the point of connection at the house with a minimum clearance of 1 foot under the building foundation.

D. Future Connection: Unused openings shall be tightly sealed and supported in a manner to facilitate their future location and use. Developer's engineer shall select appropriate service lateral locations and shall instruct Contractor to locate lateral according to the design elevations and locations. A steel "T-Post" painted green shall be installed at the end of the lateral.

E. Laterals in Cul-de-sac Streets: Where numerous laterals connect to the end of a sewer, they shall be brought into a standard manhole. Three such laterals may enter the inlet channel in preference to installing numerous wye branches in series immediately downstream from the terminal manhole.

F. Backflow Prevention: It is the designer's responsibility to recognize the possibility of reverse flow in service laterals serving lots or buildings with plumbing fixtures below the nearest upstream sewer manhole rim where the pad elevation is below upstream manhole rim. In such instances, a suitable backwater valve or overflow device shall be provided at the property line clean-out as shown on the Standard Drawings. The lots where backflow prevention is required, shall be indicated on the plans.

G. Spacing: Minimum spacing between manufactured wyes or taps shall be 2 feet. Wyes and taps shall be staggered left and right. No double wyes will be allowed.

3.13 METERING VAULT

A sewage metering vault shall be installed at locations designated by the Engineering Department. Generally, a metering vault will be required at connections to a main collector line. The requirement for metering vaults will be determined during the FPR review.

3.14 GREASE, SAND AND OIL TRAPS

A. General - All building connections through which sewage containing grease, oil, and/or sand may be introduced into District sewer system, shall have an oil and sand trap or grease trap installed.

B. Restaurants - All restaurants and other establishments with common food preparation facilities shall have a grease trap. Standards for grease traps for restaurants are as follows:

1. The grease interceptor shall be located outside the building so that it is readily and easily accessible for cleaning and inspection.

2. The grease interceptor shall be sized pursuant to the Uniform Plumbing Code.

3. All floor drains from the kitchen area shall be plumbed separately and connected to the building's sewer downstream of the grease interceptor.

4. All restroom facilities shall be plumbed separately and connected to the building's sewer downstream of the grease interceptor.

5. The discharger shall adequately maintain the grease interceptor so that it is in proper working order at all times.

C. Other Commercial Business - All other commercial businesses, including service stations, car washes, and similar establishments as determined by the District as categorically inclusive, shall have a grease and sand trap as specified in these Standards. The restrooms of such establishments shall be plumbed separately and connected to the building sewer downstream of the trap.

SECTION 4.0

PLAN PREPARATION

4.1 GENERAL

The Engineering Department has established procedures, which shall be followed in the preparation of plans. Deviations from these requirements, unless specifically authorized will be cause for rejection by the Engineering Department. All engineers preparing plans should have a complete set of these Standards in their possession.

The engineer is responsible for following the progress of the project and submitting change orders and "as-built" drawings.

It should be understood that the responsibility for accuracy and completeness of the drawings rests with the developer's engineer. By signing the drawings, the Engineering Department attests to the fact that they have been reviewed and that the Board has authorized construction.

The District requires the preparation of separate drawings for the construction of sewer system improvements as discussed herein. The District may, however, allow proposed sewer system improvements to be shown on street improvement drawings for certain developments where no other underground facilities are proposed and combining the road construction information will not detract from the clarity of the sewer system design. The developer's engineer must obtain prior written approval from the District if he proposes to show sewer system construction requirements on the street improvement drawings. A topographic map and typical street sections for the development must be submitted with the request.

NOTE: The preparation of separate drawings for water and sewer system improvements is optional at this time. The requirement will be given further consideration in the future.

4.2 SHEET SIZE AND MARGINS

Drawings shall have overall dimensions of 24" x 36". Margins shall be sufficient to allow proper binding.

4.3 COVER SHEET

The cover sheet shall be the first sheet in the set of plans and shall contain:

A. An index map or a separate utility sheet with an overall plan at an appropriate scale showing general layout of sewers, sizes, manholes, street names, tract boundaries, lot boundaries, section lines and corners, township and range, a sheet index, scale,

title and other pertinent information shall be included. Care must be exercised to make sure scale and orientation are correct since these index maps are used to produce system maps. Incorrectly drawn maps will be returned.

B. A vicinity map showing project area, streets, local communities, major streets and north arrow.

C. All benchmarks used in the project shall be graphically shown on either map and the elevation, a descriptions, the location, etc., as indicated shown below:

B.M. No. _____ Elev. _____

Type of Marker _____

Location _____

_____

When possible, the project shall include the establishment of at least one bench mark in conjunction with facility improvements to allow for the propagation of U.S.G.S. elevations to future line extensions.

Said bench mark shall be established utilizing accepted standard of surveying procedure and accuracy, and shall be permanently affixed to a substantial facility such as a manhole casting, concrete vault corner, or other permanent facility. The record drawings for the project shall clearly describe and identify the location and elevation of the benchmark.

D. An approval signature block, as shown on Standard Drawing. The approval blocks shall be signed before any construction occurs. Any changes to the plans after initial approval shall be shown as revisions and shall be approved by the Engineering Department.

4.4 SECOND SHEET

The following information can be shown on the cover sheet. Should space be limited on the cover sheet, the second sheet in the set of plans shall include the following:

A. General notes shall be included and shown in a conspicuous location. The general notes shall include a note requiring compliance with these standards as shown on the Standard Drawings.

B. Sewer service certification is required and shall be worded as follows and shown on the cover sheet:

SEWER SERVICE CERTIFICATION

I hereby certify that the sewer system as shown on Drawing number _____, sheets _____ through _____ has been designed to provide each lot (or facility) of this tract (project) with sewer service as of the date shown, based on criteria supplied by the El Dorado Irrigation District.

_____ _____ _____

Registered Civil Engineer RCE No. Date

If the project does not involve specific lots, then the Engineer shall substitute the words "....designed to adequately provide service for the development said system is intended to serve."

Further, the engineer's California registration stamp including license expiration date shall be placed on the cover sheet. The design engineer shall be fully responsible for the adequacy and satisfactory performance of the sewer collection design.

C. A block, as shown below, shall be used for record drawing information.

Material List

Item	Supplier and/or Manufacturer	Model/ Type/Size	Quantity
Pipe	_____	_____	_____
	_____	_____	_____
Manholes	_____	_____	_____
	_____	_____	_____
Services	_____	_____	_____

The material list shall be completed by the developer's engineer upon submittal of the record drawings. Multiple items may need to be shown to reflect the various types and sizes of items.

D. The following Record Drawing Statement shall be placed on the cover sheet:

RECORD DRAWING CERTIFICATE

This set of Plans, having been reviewed by me, reflect all approved revisions to the project known to me, and all field deviations to the planned improvements by the construction contractor, as reported to me as of ____(Date)____. It does not represent field verification of planned improvements by me.

_____ _____ _____

Registered Civil Engineer RCE No. Date

4.5 PLAN OF SEWER SYSTEM

The sewer system plan view shall show the construction requirements for the installation of sewer, laterals/sewer services, and appurtenances. The location of all sewer system improvements including manholes are to be "called out" and stationed. Data for horizontal control of sewer lines including curves, offsets, and limits of all easements shall be shown.

Existing, proposed and future street improvements including street centerlines, property lines, easements, pavement, curbs, gutters, sidewalks, driveways, storm drains, catch basins, manholes, water mains, water services, vaults, fences, walls, barricades, trees and utilities are to be shown. Sufficient detail shall be given to accurately locate and identify these facilities. Data for the construction of the facilities, however, shall not be shown. See Standard Drawing for example.

Those projects that lie within 1,000 feet horizontally of monuments or improvements that are known to be based upon the California coordinate system shall also be based upon that system. Benchmarks set in conjunction with a project shall clearly have their horizontal control coordinates indicated on the plans.

4.6 PROFILE OF SEWER SYSTEM

Proposed sewer improvements shall be shown in profile on the same sheet as the plan view. Pipeline profile information shall include pipeline stationing, invert elevations to 0.01 of a foot at grade changes, and any curve data. Profiles shall show type, size and class of pipe, manholes, vertical curves, concrete encasement, and steel casing. Hydraulic data (design Q, velocity, d/D) shall be shown upstream of selected manholes where directed by District. The cross section of existing and proposed utilities two inches and larger in diameter shall be shown where the lines cross proposed sewer system improvements. The grade of major parallel lines within 5 feet of the sewer line shall be shown as dashed. Stationing along the profile shall generally increase from left to right. See Standard Drawing for example.

The District is not responsible for the accuracy of the location of underground lines, and approval of the plans by the District does not constitute a representation as to the accuracy of the location of, or the existence or non-existence of any underground utility, pipe or structure within the limits of the project. The District will, however, "pothole" to expose the location of water and sewer mains at a reasonable number of locations as determined by the District. It will be the engineer's responsibility to make necessary measurements and show the lines correctly on the drawings.

4.7 GRAPHIC SCALES AND NORTH ARROW

All plan and profile sheets shall contain:

A. A graphic scale, horizontal as well as vertical, illustrated such that a true representation is produced when the plans are reduced in size. Scale shall be as shown below, unless otherwise pre-approved.

Horizontal	1" =	40 feet
Vertical	1" =	4 feet

*Double scale drawings (i.e., 1" = 8 feet) may only be submitted where the predominant slope of the existing ground surface on any one sheet exceeds 7 percent. In such cases, the words "Double Scale" shall be boldly shown.

B. Generally, north should be oriented towards the top or right hand side of the sheet.

4.8 DETAIL SHEET

The District's Standard Drawings are referred to in the general notes and need not be reproduced. Only special details or modification to the District's Standard Drawings shall be included on a detail sheet with a set of plans.

4.9 PROCEDURE FOR APPROVAL

Approval of improvement plans consists of two phases. Each phase consists of a series of requirements, which must be met before final acceptance.

A. Requirements for plan approval (see Section 5 of these Standards).

B. Requirements for final acceptance (see Section 6 of these Standards).

4.10 PLAN CHECKING LIST

The following list is intended as a guideline to assist the preparer; it is not represented to be a complete list of requirements. However, the Standard Drawing's Sewerline Plan Check List (S04) shall be submitted with the plans appropriately checked off by the Developer's engineer.

Check List
Plan Checking and Project Requirements
Sewer

Cover Sheet/Second Sheet

Standard size, title block, signature block
Revision and engineer's block
Key and vicinity map
Lot numbers and lot lines
Sheet index
Adjacent tracts and street layout
Bench mark

Design and as-built certificates
General notes
Underground service alert note
Engineer's stamp and expiration date

General Design

Conformance with master plans
Oversizing requirements where required
Selection of pipe type(s)
Sequencing instructions for any tie-ins to the District's existing system

Plan and Profile Sheets

Graphic scales
North arrows
Stationing left to right
Invert elevations
Curve data if there are curves
Pipe sizes and type(s)
Street, curb dimensions, street names
Lot boundaries
Easements including lengths and bearings
Manhole locations
Lot numbers
Separation between any parallel pipes (normally a minimum of 4 feet O.D. to O.D.)
Existing utilities
Size and location of service lines

Administrative Submittals Required Before Construction of Improvements

Executed Agreement
Cost estimate
Inspection and plan check fee
Bonds
Environmental Documentation
Easements signed and Notarized

Administrative Submittals Required During or After Construction of Improvements

Fees
Record drawing certification
One year surety
Project cost documentation
Change Orders
Shop Drawings

4.11 GENERAL NOTES

The "General Notes" on the District's Standard Drawings, shall be reproduced on the cover or the following sheet of the plans. The Notes on the Standard Drawing are subject to change to suit the needs of the project and District.

SECTION 5.0

REQUIREMENTS FOR PLAN APPROVAL

5.1 GENERAL

Fees and requirements for plan approval are subject to procedures as outlined in the District's Policy Statements and Regulations. Plans will not be accepted for review unless the submittal includes the documentation as described in Policy Statement 22. The Developer's Engineer is encouraged to contact Customer Service prior to plan submittal to ensure that the plans will be accepted for review.

The plan approval requirements for water and sewer are identical. Water and sewer plans are to be submitted as one package if the project has both utilities.

5.2 PLAN REVIEW SUBMITTALS

All of the following items shall be submitted for review:

1. Two sets of blueline prints of the proposed sewer system improvements.

2. One copy of the Facility Improvement Letter and approved Facility Plan Report.

3. Two copies of the Environmental document(s), except as specified in Section 5.3.

4. One complete set of other than sewer improvement plans, i.e. water, storm drains, road as described in Section 4.0.

5. One copy of proposed easements, not executed.

Plans indicating incomplete design and drafting detail that do not meet minimum District Standards will be rejected prior to the first plan review. The developer and the developer's engineer should be aware that most projects involve several plan reviews and resubmittals before final approval is obtained.

5.3 ENVIRONMENTAL DOCUMENTS

Environmental documents include Environmental Impact Reports (EIR), negative declarations, and exemptions. When the environmental document has been prepared by another agency, a copy of the document must accompany the first submittal. If the document is a negative declaration, then the initial study must also be submitted.

The Engineering Department will determine the appropriate type of environmental document when the District is the lead agency for a project. The developer will be provided with a cost estimate and schedule for preparing the document. A public comment

period and/or Board approval may be required depending on the type of environmental document required.

The construction plans will not receive final approval until after appropriate reviews of the document and payment of District costs associated with environmental work has been made.

5.4 EASEMENTS

All EID easements must have deeds submitted for checking and must be shown on the final tract map before recordation. Easements shall only be accepted on the standard document form provided by District Right-of-Way staff. Also, see Section 3.7B of these Standards for easement requirements.

5.5 AGREEMENTS AND BONDS

Staff will provide the developer with the proper forms and the developer shall submit the following:

A. Agreement for Extension of Facilities.

B. A faithful performance bond equivalent to 100 percent of the estimated cost of construction, including contingencies for subdivisions. Certificates of deposit, cash, and letters of credit may be substituted for performance bonds. A surety will not be required if water and sewer facilities are included with the County required bond for subdivisions.

5.6 APPROVAL FOR CONSTRUCTION

Construction shall not proceed until plans have been signed by the District. Plans will be signed once the following material has been submitted in acceptable form.

- Original sewer plans
- Agreement for construction of sewer facilities
- Environmental documents
- Easement deeds
- Faithful performance bond

The Engineering Department will sign the original plans only after all revisions have been made. Customer Service will notify the developer's engineer that the plans are signed and available. The developer's engineer will then provide the Engineering Department with two sets of blueline prints.

No construction shall occur before the plans are signed and before the proper notifications have been given. These notifications will allow time for a preconstruction meeting of all interested parties.

5.7 SPECIAL CHARGES

If there are items requiring special approval, the Engineering Department may require a deposit of funds or agreements for funds in the future to provide for operation and maintenance of substandard facilities.

5.8 MAIN LINE EXTENSION AND REIMBURSEMENT AGREEMENTS

District Regulation No. 8 discusses this subject. In general, if any developer desires to enter into a reimbursement agreement with the District, such arrangements shall be made prior to the time of plan approval.

SECTION 6.0

REQUIREMENTS FOR FINAL ACCEPTANCE

6.1 GENERAL

Upon completion of construction, final inspection by the District Engineering Department, submission of record drawings and project costs, and payment of any outstanding monies, the project will be accepted by the District Engineering Department. The facilities will be owned, operated and maintained by the District.

6.2 RECORD DRAWINGS

Record drawing submissions consisting of non-digital (hand) drawings shall be photo-mylars only. Record drawing submissions consisting of digital (computer) drawings shall have signature pages photo-mylars and subsequent pages plotted in ink on mylar. Sepia mylars of any kind or xerox mylars will not be accepted. Record drawings shall reflect the actual improvementss made and shall give the accurate location of all new/or relocated facilities. The drawings will be subject to District approval. The following certificate shall be signed and shall appear on the appropriate sheet of the plans:

Record Drawing Certificate

This set of Plans, having been reviewed by me, reflect all approved revisions to the project known to me, and all field deviations to the planned improvements by the construction contractor, as reported to me as of ___(Date)____. It does not represent field verification of planned improvements by me.

_____	_____	_____
Registered Engineer	RCE No.	Date

It should be emphasized that the responsibility for accurate record drawings must involve active participation by the developer's engineer during the project. All changes, whether done through formal change order or revision process or whether done as a field adjustment, should be reflected on the record drawings.

6.3 PROJECT COSTS

The developer or his engineer shall submit an itemized list of costs that were incurred to have the sewer system facilities constructed for the project. The costs shall include a prorated share of engineering, administration, and legal cost that can be attributed to the sewer system and the total construction cost for the sewer system including all change orders. The information will be used by the District to determine total "plant value" for maintaining a replacement reserve fund for system depreciation and for use in preparing any reimbursement agreements.

6.4 OTHER ADMINISTRATIVE ITEMS/INCLUDING EASEMENTS

Depending upon the project, there can be other administrative items required before final acceptance. Examples are outstanding monies, contractual requirements, notification of completion to DOT and warranties.

6.5 FIRST YEAR WARRANTY RESPONSIBILITIES (Reg. No. 8-L)

The property owner shall warrant, for one year, repair of the installed facilities. Regulation No. 8-L contains additional information for the one-year warranty. The date for the one-year warranty shall begin as of the field acceptance date established by the District Inspector.

When the facilities serve a subdivision, the applicant, or the applicant's contractor, shall submit a one year repair surety; a bond (in form acceptable to the District), certificate of deposit, or irrevocable letter of credit, in an amount not less than ten percent (10%) of the construction costs of the facilities.

A bond, certificate of deposit, or letter of credit, will not be required to be deposited with the District to the extent the applicant or applicant's contractor guarantees repair of the project by providing such surety to the City or County having jurisdiction for the project which satisfies the provisions of this section regarding amount, time and scope.

SECTION 7.0

WASTEWATER PRESSURE SYSTEMS

7.1 GENERAL

Wastewater pressure systems consisting of pump stations and force mains will only be allowed in special cases when gravity service is not practicable. A description of all proposed wastewater pressure systems shall be submitted to the District for approval in the Facility Plan Report.

A. Restrictions: Wastewater pressure systems will only be allowed in special circumstances when the use of gravity sewers is physically impossible or economically impractical. Justification for the use of a pump station and force main, in lieu of a gravity sewer, must be submitted and take into consideration the perpetual operation and maintenance cost associated with the lift station.

1. The use of private residential pumps within subdivisions shall be limited to isolated cases where gravity flow from houses can only be achieved by constructing sewers deeper than 20 feet within the street or when only a force main is available for service.

2. Low pressure wastewater systems consisting of small diameter force mains pressurized by private household pumps within subdivisions, will not be permitted except when written approval has been obtained from the District Engineer.

3. Where multiple projects or multiple phases of a project will connect to a pump station over a period of time, wet well, pumping, and storage or emergency generator capacity may be reasonably staged. The staged installations shall meet all standard design criteria for pump stations and provisions shall be made for expansion to ultimate capacity. Parallel force mains may be required to meet minimum velocity requirements at lower pumping rates.

4. Temporary pump stations, those stations to be replaced by a future facility, shall be considered permanent and designed as such. All future phases and improvements shall meet the design standards in effect at the time the phased improvements are made.

5. Individual private pumping stations of 3 EDUs or less that are proposed to connect to a District force main are generally discouraged. The applicant must investigate the feasibility of a septic system prior to the District considering such a service. For District force mains operating at over 80 psi, connection by a private party is prohibited. Effluent only pumping stations

shall not be allowed. A packet of information about private pumping stations is available from the Customer Service Department.

7.2 PUMP STATIONS

A. Capacity: The station design capacity shall be based on peak wet weather flow as determined in accordance with Section 3.0 Design Criteria. Where multiple projects or multiple phases of a project will connect to the pump station, over a period of time, components of the ultimate station may be reasonably staged. The staged installations shall meet all standard design criteria for pump stations and provisions shall be made for expansion to ultimate capacity. The staged capacities are to be clearly identified on the plans.

B. Station Configuration: Pump stations shall be of the duplex wet well submersible type with equipment and instrumentation as specified by the District. Drawings and Technical specifications are to be provided by the District. In addition, the following criteria is to be considered:

1. Site Selection: Site selection shall be reviewed with the District and include consideration for zoning and proximity to homes and businesses. Land shall be dedicated to the District in fee.

2. Aesthetics: Wastewater pump stations shall include features to make the station aesthetically acceptable in the location planned. If the station is in a neighborhood with lot sizes less than one acre, then all equipment shall be housed in a masonry structure using exterior brick, flutted block, split face block or similar features compatible with the proposed subdivision. The site shall include asphalt concrete paving, security fence and landscaping.

   If the station is in a rural area with at least 200 feet to any neighboring property, then the generator and control panel, at the discretion of the District, may be housed in individual self-contained units meeting all requirements.

3. Grading: Grading of the site shall provide drainage away from the proposed structures. The pump station structures and electrical and mechanical equipment shall be protected from physical damage by a 100-year flood event. Wastewater pumping stations shall remain fully operational and accessible during a 25-year flood. Regulations of state and federal agencies regarding flood plain obstructions shall be met.

4. Accessibility and Security: The pumping station shall be readily accessible by maintenance vehicles during all weather conditions. Depending on the location of the station a paved access and site may be required. If the pumping station is not located near paved roads, a separate paved access drive

is to be provided. The facility shall be located off the traffic way of the streets and alleys. Security fencing, buildings, and access hatches will be provided with hasps. Parking for at least two pickup trucks shall be provided. Adequate working area within the site for large equipment vehicles is to be provided.

Property boundary shall be enclosed with plastic slated chain link fencing. Generally, all area within the fence station is to be paved. Manual flood lights shall be installed for yard lighting.

5. Safety: Adequate provisions shall be made to effectively protect maintenance personnel from hazards. Equipment for confined space entry in accordance with OSHA and regulatory agency requirements shall be provided for wastewater pumping stations. Where outdoor control panel cabinets are allowed, cabinets shall be NEMA 3R or 4 design and have a shed roof cover.

6. Construction Materials: Materials shall be selected that are appropriate under conditions of exposure to hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in wastewater. This is particularly important in the selection of metals and paints. Contact between dissimilar metals shall be avoided or other provisions made to minimize galvanic action.

7. Operation and Maintenance Manual: Wastewater pumping stations and portable equipment shall be supplied with a complete set of operational instructions, including emergency procedures, maintenance schedules, tools and such spare parts as may be necessary.

C. Operation: The station shall be of the duplex type (2 pumps) and have duplex controls which will automatically alternate the pumps and can energize both pumps on an alarm for high water level. The number of on/off cycles per pump should not exceed 5 per hour.

The system shall operate in accordance with the following wet well level indicators:

LEVEL	INDICATOR
1	Redundant off and low level alarm
2	Lead off
3	Lag off
4	Lead pump on

5	Lag pump on
6	Generator on (if required)
7	High level alarm

D. Pumping Systems

1. Type of Pumps: Pumps are to be submersible-type. Each pump is to be rated equally to allow alternating operation. Each pump shall have the capacity such that, with one pump out of service, the remaining pump will have capacity to handle the design peak wet weathers flow. Pumps shall be heavy-duty non-clog submersible impeller type capable of passing 3-inch solids. Additional pumps may be required at the discretion of the District.

2. Pump Selection: Pumps and motors shall be selected by considering initial, interim, and ultimate conditions. Insofar as is practicable, stations shall be designed to deliver as uniform a flow as practicable in order to minimize hydraulic surges and to maintain a minimum velocity of 2 feet per second in the force main. Pumps shall be selected such that design flows are within an operating range of 60% to 120% of the flow at the best efficiency point (BEP). The pump shall be so placed that under normal operating conditions it will operate under a positive suction head.

3. Pump Construction: Submersible pumps and motors shall be designed specifically for raw wastewater use, including totally submerged operation during a portion of each pumping cycle and shall meet the requirements of the National Electrical Code for such units.

4. Selected Alarm Conditions: Linebreaker phase monitors and instrumentation is to detect failures in a pump seal are to be provided.

5. Motor Starters: Soft starters may be required for pump motors larger than 40 hp.

E. Valves and Piping: The discharge for each pump shall be the same size as the pump outlet and be a minimum of 4-inches. The discharge piping shall terminate in a common valve vault adjacent to the wet well. Gate valves with hand wheels and swing check valves shall be placed on each discharge line in the valve vault. The check valve shall be located between the gate valve and the pump. Check valves shall be suitable for the material being handled and shall be placed on the horizontal position. Valves shall be capable of withstanding normal operating pressure plus water hammer.

Swing check valves shall be accessible from the top. Outside levers are required on swing check valves.

The valve vault is to have provisions to remove or drain accumulated water. The vault may be dewatered to the wet well through a drain line with a gas and watertight valve. Check valves that are integral to the pump are not allowed.

F. Wet Wells

1. Size: Design calculations are to be submitted for the wet well. The design fill time and minimum pump cycle time shall be considered in sizing the wet well. The operational volume of the wet well shall be based on design average dry weather flow and a filling time not to exceed 30 minutes. When the anticipated initial flow tributary to the pumping station is less than the design average dry weather flow, provisions should be made so that the fill time indicated is not exceeded.

2. Material: The wet well shall be constructed of reinforced concrete for H-20 highway loading. Wet wells shall be lined in accordance to District Standards.

3. Floor Slope: The wet well floor shall be configured to prevent accumulation of soils. The wall-to-floor corners shall be sloped with a 1 ft. to 1 ft. fillet. The pump intake area is to be configured per the manufacturers recommendations to prevent vortex formation.

4. Air Displacement: Covered wet wells shall have provisions for air displacement to the atmosphere, such as an inverted "j" tube or other means.

5. Access Doors: Aluminum plate double lead door designed for H-20 highway loading shall be provided for the wet well and valve vault.

6. Buoyancy: Buoyancy of the wastewater pumping station structures shall be considered and adequate provisions shall be made for protection. Buoyancy calculations shall provide for groundwater at grade and a minimum 1.5 factor of safety.

7. Inlet: Inlet design shall be such as to minimize turbulence in the wet well.

G. Electrical Equipment: Electrical systems and components (e.g., motors, lights, cables, conduits, switch boxes, control circuits, etc.) in raw wastewater wet wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class I Group D, Division 1 locations. In addition, equipment located in the wet well shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with a watertight seal and separate strain relief. A

circuit breaker located above ground shall be provided for the main power feed for all pumping stations. When such equipment is exposed to weather, it shall meet the requirements of weatherproof equipment NEMA 3R or 4. Lightning and surge protection systems shall be included. A 110 volt power receptacle to facilitate maintenance shall be provided inside the control panel for lift stations that have control panels outdoors. Ground fault interruption protection shall be provided for all outdoor outlets.

1. Power Supply and Control Circuitry – Electrical supply, control, and alarm circuits shall be designed to provide strain relief and to allow disconnection from outside the wet well. Terminals and connectors shall be protected from corrosion by location outside the wet well or through use of watertight seals. All installations shall be protected from the rain with an appropriate shed roof cover or building.

2. Motor Control Center – The motor control center shall be housed above ground, be readily accessible, and be protected by a conduit seal or other appropriate measures meeting the requirements of the National Electrical Code, to prevent the atmosphere of the wet well from gaining access to the control center. The seal shall be so located that the motor may be removed and electrically disconnected without disturbing the seal.

3. Power Cord – Pump motor power cords shall be designed for flexibility and serviceability under conditions of extreme usage and shall meet the requirements of the National Electrical Code standards for flexible cords in wastewater pump stations. Ground fault interruption protection shall be used to de-energize the circuit in the event of any failure in the electrical integrity of the cable. Power cord terminal fittings shall be corrosion-resistant and constructed in a manner to prevent the entry of moisture into the cable, shall be provided with strain relief appurtenances, and shall be designed to facilitate field connecting.

4. Level Measurement – Level measurement for controls and alarms shall be either a submersible transducer for use in a wastewater environment or an ultrasonic device. Measurement devices should be so located in the wet well as not to be damaged by routine maintenance activities. Above ground boxes are to be provided to allow removal of the devices. In addition, two floats are to be installed for redundant high and low level alarms.

5. Equipment Removal: Provision shall be made to facilitate removing pumps, motors, and other mechanical and electrical equipment. Submersible pumps shall be readily removable and replaceable on guide rails without dewatering the wet well or disconnecting any piping in the wet well.

H. Flow Measurement: Either a magmeter or ultrasonic meter for measuring wastewater flow shall be provided at all pumping stations in a separate metering vault. Indicating, totalizing, and recording shall be features provided with the flow meter at pumping stations with a 750 gpm or greater peak wet weather flow. Elapsed time meters used in conjunction with annual pumping rate tests are acceptable for pump stations with a peak wet weather flow of less than 750 gpm provided sufficient metering is configured to measure the duration of individual and simultaneous pump operation.

I. Water Supply: A suitable water supply shall be provided at all installations. A supply line to the wet well with an automatic valve shall be provided. There shall be no physical connection between any potable water supply and a wastewater pumping station which under any conditions might cause contamination of the potable water supply. The potable water supply shall comply with El Dorado Irrigation District Standards for backflow prevention with an insulated cover.

J. Alarm Systems: Alarm systems shall be provided for pumping stations. The alarm shall be activated in cases of power failure, pump failure, unauthorized entry, communication failure, high and low wet well water level or any other cause of pump station malfunction. Pumping station alarms shall be telemetered to EID SCADA Central. Audio and visual alarm systems shall be included at the lift station site as a redundant alarm. Signage with site name and an emergency phone number shall be provided.

K. Standby Systems: Standby systems are to be provided to prevent the discharge of raw or partially treated wastewater to any waters and to protect public health by preventing back-up of wastewater and subsequent discharge to homes, streets, and other public and private property. Standby systems can be provided by either storage or standby power. A combination of storage and standby power may be required if the lift station is in the vicinity of a sensitive environment. For stations without backup power, a manual transfer switch with a District approved transfer switch is to be installed for hook up to a portable generator.

1. Storage: Emergency storage may be utilized provided the average dry weather design flow to the station does not exceed 20,000 gallons per day. Such storage will provide a minimum of 6 hours of peak wet weather flow. Emergency storage **does not** include upstream manholes, pipelines or wet well operating storage volume. The storage shall have a common inlet/outlet pipe to the wet well with the invert set at the high water level of the wet well.

2. Standby Power: Standby power is to be provided when the average dry weather flow exceeds 20,000 gpd. Standby power shall generally consist of one engine drive electric generator, fuel storage, and enclosure. Generating unit size shall provide power for sequential pump motor starting current and for lighting, ventilation, and other auxiliary equipment necessary for safety and proper operation of the lift station. Details of these components shall be in

accordance with the District Technical Specifications and Drawings, and as described below.

a. Capacity – The generator shall be rated to start-up and maintain the total running electrical load of the station under normal working operations.
b. Fuel Type – Diesel fuel shall be used to drive generators.
c. Fuel Storage – Fuel storage and piping facilities shall be constructed in accordance with applicable state, local, and federal regulations. Underground storage will not be allowed. Fuel tanks are to be approved by the local Fire District.
d. Engine Ventilation – The engine shall be located above grade with ventilation of fuel vapors, exhaust gases, and heat.
e. Routine Startup – All emergency equipment shall be provided with instructions indicating the need for and frequency of regular starting and running of such units at full loads.
f. Protection of Equipment – Emergency equipment shall be protected from damage at the restoration of regular electrical power.
g. Operation – Provisions shall be made for automatic and manual startup and load transfer. The generator must be protected from operating conditions that would result in damage to equipment. Provisions should be considered to allow the engine to start and stabilize at operating speed before assuming the load.

L. HVAC: Heating, ventilating, and cooling of the motor control and generator building is required. Design of the system is to be in accordance with the applicable State and local codes. Mechanical ventilation must be provided if routine maintenance will require personnel to enter the station. Thirty air changes per hour are required for intermittent operation.

M. Noise Control: Noise from the generator building shall not exceed 55 decibels at 50 feet from the building perimeter.

7.3 FORCE MAINS

A. General: Design of force mains shall consider operating and maintenance costs, surges, velocity, and friction losses. These conditions also influence the lift station design. Sewage force mains can generate gases during periods of non-flow resulting in odors and corrosion. This condition can be minimized by good design practice.

B. Velocity and Diameter: At design pumping rates, a cleansing velocity of at least 2 feet per second shall be maintained. The maximum pipe velocity shall not exceed 8 feet per second. The minimum force main diameter for raw wastewater shall not be less than 4 inches.

C. Air and Vacuum Relief Valve: Air relief valves shall be placed at high points and at locations along long runs in the force main to prevent air locking. Vacuum relief valves may be necessary to relieve negative pressures on force mains. The force main configuration and head conditions should be evaluated as to the need for and placement of air and vacuum relief valves. Valve size shall be calculated in accordance with Section 3.8 of the Water Design Standards. Where air and vacuum valves are required, combination valves shall be used. Automatic valves are to be provided with back flushing provisions.

D. Termination: Force mains should enter the gravity sewer system at a point not more than 2 feet above the flow line of the receiving manhole. The manholes shall be lined.

E. Design Pressure: The force main shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater lift stations. Surge protection chambers should be evaluated. Surges generally do not require analysis if the TDH (Total Dynamic Head) is less than 40 feet. For TDH greater than 40 feet, the surge potential shall be evaluated and submitted to the District for review.

F. Special Constructions: Force main construction near streams or water works structures and at water main crossings shall meet applicable provisions of the District Standards. A cleaning entry port shall be installed at all lift stations. Intermediate cleaning entry ports are to be installed in long line runs.

G. Design Friction Losses: Friction losses through force mains shall be based on the Hazen and Williams formula with a "C" value of 145 for new force mains and 120 for existing mains in calculating pump and power requirements.

H. Pipe Type: Pipe shall be either pressure rated polyvinyl chloride (PVC AWWA C900) or ductile iron pipe (AWWA C151). The minimum pressure rating shall be 150 psi.

I. Layout: Force mains are to have the required horizontal separation and be at least one foot below potable water mains for both horizontal and crossings. Force mains are not permitted to cross over a potable water line. Numerous grade changes are to be avoided.

RECYCLED WATER STANDARDS

TABLE OF CONTENTS

SECTION 1.0

INTRODUCTION AND GENERAL POLICIES

1.1 SCOPE

The planning, design and construction recycled water mains and other appurtenances to be owned, operated, and maintained by the El Dorado Irrigation District shall comply with these standards herein called "Recycled Water Design and Construction Standards" and the permit requirements of various governing bodies, except where specific modifications have been approved, in writing, by the Engineering Department. All submitted plans shall be signed by a registered Civil Engineer prior to submission for plan review and all work shall be in accordance with good engineering practice. This document sets forth the procedure for planning, designing and preparing plans and specifications for water systems built for the District. It also sets out minimum standards for improvements to the District's recycled water system. Wherever there are differences between these standards and other county, state or federal regulations, the most stringent or highest requirement shall govern. The Recycled Water Design and Construction Standards are intended for pipes up to, and including, 8 inches in diameter. Larger size pipelines shall be designed and installed by the District and/or a District designated contractor or engineer.

1.2 INTERPRETATION

The Engineering Director shall decide all questions of interpretation of "good engineering practice," guided by the various standards and manuals including those published by the American Water Works Association (AWWA).

1.3 DEFINTIONS AND TERMS

Definitions and terms are listed in Section 1.3 of the Water Section of these standards.

1.4 APPLICABLE CODES AND POLICIES

Ordinances, requirements and applicable standards of governmental agencies having jurisdiction within the District's service area shall be observed in the design and construction of recycled water systems. Such requirements include but are not limited to current revisions of the following.

A. The Uniform Plumbing Code as amended by the County of El Dorado.

B. Municipal Code of the County of El Dorado, as applicable.

C. Road encroachment regulations of the County of El Dorado, as applicable.

D. Standard Specifications - Department of Transportation Standard specifications, current edition (CALTRANS).

E. California State Department of Health Services (DHS).

F. American Water Works Association (AWWA).

G. Regulations and Policy Statements as adopted and amended by the Board of Directors of the El Dorado Irrigation District.

1.5 EL DORADO IRRIGATION DISTRICT JURISDICTION

The District is responsible for the approval of plans and inspection of all public recycled water lines and service lines within the District's recycled water service area. Where repairs or replacement of a service on the upstream side of the meter is required it shall be the responsibility of the District unless it is a system upgrade in which case the owner or customer will be billed for the work. Conversely, repairs or replacement on the customer side of the meter shall be the responsibility of the property owner.

1.6 GENERAL METER POLICY

Unless otherwise approved by the Board of Directors, metering of recycled water, the location of meters, and the number of meters shall be governed by Policy Statement 20.

1.7 DEVELOPER'S ENGINEER'S RESPONSLBILITY

These standards establish uniform policies and procedures for the planning, design and construction of the District's recycled water system. They are not intended to be a substitute for engineering knowledge, judgment and experience. The contained procedures shall be reviewed by the developer's engineer and shall be applied as necessary to the project. Proposed deviations to these standards shall be submitted, in writing, in conjunction with facility plan report approvals.

All plans, specifications, reports or documents shall be prepared by a registered civil engineer, or under direction thereof, and shall be signed and stamped to indicate his/her responsibility.

A "Preliminary Review" and/or "Plans Approved for Construction" stamp or signature of the District on the plans does not in any way relieve the developer's engineer of the responsibility to meet all requirements of the District. The plans shall be revised or supplemented at any time it is determined that the District's requirements have not been met. Generally, plans that are signed as being authorized for construction will not require revisions unless, in the District Engineering Director's opinion, a change is necessary based upon a revision to the standards.

1.8 REFERENCE SPECIFICATIONS

References to standards such as the Standard Drawings of the District, AWWA or ASTM shall refer to the latest edition or revision of such standards unless otherwise specified.

1.9 PRIVATE MAINS

The District will not allow private recycled water mains to convey recycled water. Private recycled water mains are defined as pipelines between a District recycled water main and metered points of connections intended to be privately owned and maintained.

1.10 PRE-DESIGN SUBMITTALS

Refer to Section 2.0 of Water Standards for required submittals.

SECTION 2.0

DESIGN CRITERIA

2.1 GENERAL:

Design of recycled water systems is to be in accordance with the potable water design criteria as modified by this section.

2.2 DEMANDS, PRESSURES, AND MINIMUM SIZES

A. Demands: Facilities shall be sized for either the peak month peak day demand. Flow rates shall be determined according to land use of the area to be served and the location of the development within the District's service area.

Projected demands for residential development projects shall be determined using the unit values in Table 2-1 and the known number of units or an estimated number of units based on the particular land use designation for the area.

Projects including commercial, and/or industrial development, shall include a determination of estimated demand based on estimated acreage for irrigation, and process needs for other pre-approved uses only.

Once the average demands have been determined, the demands shall be multiplied by the peaking factors shown in Table 2-2.

TABLE 2-1

MEAN ANNUAL WATER DEMANDS

Land Use Category	Density (dwellings/acre)	Unit Consumption (acre-feet/DU)	Average Flow Rate (gallons/minute)
WESTERN REGION			
High/Medium Density Residential	1.0 to 7.0	.041	0.26
Turf Irrigation		3.0 af/Acre	1.9 gpm/acre

TABLE 2-2

ESTIMATED PEAKING FACTORS

Category/Location	Peak Month Average Day	Peak Month Peak Day
High/Medium Density Residential	2.2	7.0
Turf Irrigation		
Parks and Landscaping	2.6	2.6
Schools	2.6	5.3

If and when special studies of a particular area are conducted which demonstrate that different water use or peaking factors are appropriate, then those values may be used if approved by the Engineering Department.

B. Pressure: Distribution systems are to be designed for a pressure range of 40 psi to 90 psi.

C. Minimum Water Main Size: Pipelines shall be sized to deliver the required flows at minimum pressures specified herein. No recycled water main, however, shall be less than 4 inches in diameter, except as outlined below:

Smaller diameter mains may be individually approved by the District Engineer on cul-de-sacs and dead end mains or the possibility of future tie-ins with other mains. These mains shall be sized so that sufficient water is regularly drawn to prevent stagnation.

2.3 MINIMUM COVER REQUIREMENTS

The top of distribution mains, 8-inch and smaller, shall be a minimum of 48 inches below subgrade unless indicated otherwise on job plans or directed otherwise by the District Inspector because of unusual field conditions.

The top of transmission mains, 10-inch and larger, shall be a minimum of 60 inches below subgrade unless indicated otherwise on job plans or directed otherwise by the District Inspector because of unusual field conditions.

2.4 SEPARATION REQUIREMENTS

With regards to layout and separation, recycled water lines shall meet the same requirements as wastewater lines.