**WEST BASIN MUNICIPAL WATER DISTRICT**

# STANDARD SPECIFICATIONS AND STANDARD DRAWINGS FOR RECYCLED WATER FACILITIES

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## *INTRODUCTION*

In April 1989, the West Basin Municipal Water District (“West Basin” or “District” or “WBMWD”), in conjunction with the Metropolitan Water District of Southern California, began to study the feasibility and implementation of a recycled water system. It is the District' intent to provide recycled water service and to standardize wherever possible the design and construction of these facilities. Therefore, this manual has been prepared to formulate the general procedures and requirements to serve these purposes. These design criteria and standards are to be used in conjunction with the "Standard Specifications for Public Works Construction," (2018 edition) to identify and provide the formal guidelines and requirements for obtaining recycled water service from the District and for the design and construction of the District's recycled water facilities.

West Basin is a public agency that wholesales imported drinking water to 17 cities and nearly one million people in the coastal Los Angeles area. West Basin also owns and operates several treatment facilities and a recycled water distribution system that provides tertiary recycled water to sites for irrigation, industrial and other non-potable applications. These design criteria and standards are to be used for any new or repairs/modifications to existing recycled water distribution system, services or appurtenance construction.

West Basin distributes recycled water on a wholesale basis. The local water and recycled water purveyor is responsible for the metering and sale of the potable and recycled water to the customers. West Basin owns the recycled water piping up to the connection to the meter. The local water purveyor is responsible for the meter up to the customer side of the service. The local water purveyor also has jurisdiction over the protection of their drinking water systems by confirming the water main separation from any new recycled water main is in compliant with Title 22 Section 64572 of the California Code of Regulations.

The State Water Board Division of Drinking Water (DDW) is the primary State agency responsible for protection of public health and the regulation of drinking water. They are the primary agency for the approval of all new recycled water pipelines, services and appurtenances located within public right-of-way.

As the Recycled Water Producer and the Recycled Water Use Permit holder, West Basin is responsible for ensuring the safe use of recycled water at all Recycled Water Use Sites (“Use Sites” or “Customer Sites”) utilizing recycled water in compliance with the use permit conditions.

Los Angeles County Department of Public Health (LACDPH) is the primary local agency responsible for on-site public health issues and cross connection control. LACDPH has established guideline for pipeline construction and installation of on-site recycled water facilities. These guidelines are intended to protect public health by ensuring the safety of the local domestic potable water supplies.

All off-site recycled water systems shall be constructed in compliance with the applicable drinking water standards, specifically the water main separation requirements stated in Title 22 Section 64572 of the California Code of Regulations with the primary agency for review and approval being DDW.

All on-site recycled water systems shall be constructed in compliance with applicable potable water system construction standards as well as those specified in "THE PURPLE BOOK", California Health Laws related to recycled water, (California Health and Safety Code, Water Code, Titles 22 and 17 of the California Code of Regulations) and the Los Angeles County Code (LACC), Title 28 – Plumbing, Appendix J. The primary agency responsible for the approval of the on-site facilities is LACDPH.

The jurisdictional agency (i.e.: cities, County, Caltrans, or railroad) shall have authority over all trench backfill, pavement replacement, traffic control and street special construction limitations and requirements for all pipeline construction within their jurisdiction. West Basin has authority on the materials within the pipe zone, pipe material, pipe identification and appurtenances.

***DEFINITIONS***

Whenever the following terms, or pronouns used in their place, occur in these Design Criteria and Standards, or in any documents that these Design Criteria and Standards govern, the intent and meaning shall be interpreted as follows:

Acceptance, Final Acceptance - The formal action by the Board accepting the work as being complete.

Agency - The West Basin Municipal Water District.

Applicant - An owner, his developer, builder, engineer, or other authorized representative who applies as the owner's official agent to the District for recycled water service.

ASTM - The American Society for Testing and Materials. All references to the specifications of the ASTM are understood to refer to the current specifications as revised or amended at the date of construction.

Attorney - The District's General Counsel.

AWWA - The American Water Works Association. All references to the specifications of the AWWA are understood to refer to the current specifications as revised or amended at the date of construction.

Board - The Board of Directors of the West Basin Municipal Water District.

Calendar Day - Any day including legal holidays, Saturdays and Sundays.

Contaminated Soil - Soil which contains hazardous materials as defined in Title 22, Division 4.5 of the California Code of Regulations, or materials deemed unacceptable to use as 'clean fill' material by the California Department of Toxic Substance Control or California Regional Water Quality Control Board, Los Angeles Region.

Contractor - The person, firm, or corporation entering into contract with the owner or developer for the performance of work required under said contract and the District's ordinances, rules, regulations, and specifications.

Contract Time - Number of calendar days stated in the Contract for the completion of the Work.

Contract Completion Date - The date on which the District accepts the work as being complete.

Contract Documents - The complete contract includes all of the documents set forth herein, to wit:

Bid Documents (including Advertisement for Bid, Instructions to Bidders, Bid Form, and Bid Bond)
Contract Documents (including Agreement, Performance Bond, Payment Bond)
General and Special Provisions
Technical Specifications
Standard Drawings
Construction Drawings
Addenda Issued Prior to Bid Opening
Signed Agreement
Certificates of Insurance
Workers' Compensation Insurance
Notice of Award
Notice to Proceed
Executed Change Orders, if any

County - The County of Los Angeles, State of California.

Design Consultant - The engineer or architect designated by the Owner to have design control over the Work or a specified portion of the Work, acting either directly or through duly authorized representatives. Such representatives shall act within the scope of the particular duties delegated to them.

Direct - Action of the District by which the Contractor is ordered to perform or refrain from performing work under the Contract.

District - The West Basin Municipal Water District (“District” or “West Basin” or “WBMWD”), its authorized employees and agents.

Domestic Water (Potable Water) - That water which is pure and wholesome, does not endanger the lives or health of human beings, and conforms to the latest edition of the United States Public Health Service Drinking Water Standards, the California Safe Drinking Water Act, or other applicable standards.

Engineer - The Engineer of the West Basin Municipal Water District or their authorized agent.

Field Directive - Written documentation of the actions of the District in directing the Contractor. Also referred to as a Directive.

Field Order - A written instruction given to the Contractor authorizing work that is a change to the scope of work carried out on a time and material basis.

Float - Float or "total float" shall be defined as provided in the Associated General Contractors of America "CPM in Construction, A Manual for General Contractors".

Furnish - To deliver to the job site or other specified location any item, equipment, or material.

General Manager - An individual designated by the West Basin Municipal Water District as the chief executive officer and agent for the District.

Holidays - Legal holidays designated by the District or specifically identified in the Contract.

Inspector - A duly authorized representative of the District with the authority to require work to be accomplished in accordance with the contract plans and specifications.

Install - Placing, erecting, or constructing any item, equipment, or material.

Liquidated Damages - The amount prescribed in the Contract Documents, to be paid to the District or to be deducted from any payments due or to become due the Contractor for each day's delay in completing the whole or any specified portion of the Work beyond the time allowed in the specifications.

Los Angeles County Department of Public Health – Environmental Health Division (LACDPH) - The local primacy health agency responsible for on-site public health issues and cross connection control. Regulatory responsibility is to confirm that all on-site recycled water facilities are constructed in compliance with applicable water system standards and plumbing codes.

Off-site Facilities - Designates or relates to recycled water facilities up to and including the water meters. All off-site recycled water facilities will be owned, operated, and maintained by the District upon Acceptance by the District of the dedicated facilities.

On-site Facilities - Designates or relates to recycled water facilities downstream of the water meters. All on-site recycled water facilities will be owned, operated, and maintained by the On-Site Property Owner, unless otherwise specified.

Owner or District - The West Basin Municipal Water District. The Owner is referred to throughout the contract documents as if singular in number and masculine in gender. The term "Owner" means the Owner or his authorized representative.

Owner's Representative - The person designated in writing by the Owner to act as its agent on specified matters relating to this Contract.

Plans - The plans, working drawings, detail drawings, profiles, typical cross sections, general cross sections, and supplemental drawings or reproductions thereof, approved by the Engineer, which show locations, character, dimensions or details of the work.

Provide - Furnish and install, complete in place.

Punch List - List of incomplete items of work and of items of work which are not in conformance with the Contract.

Recycled Water - A combination of treated wastewater and intercepted surface and subsurface stream flow, supplemented by other waters, including domestic (potable) water. The pipeline distribution system is similar to domestic water construction and operation.

Record Drawings - Drawings which show the facilities including all revisions to the original plans.

Service - The furnishing of recycled water to an Owner through a metered connection to the on-site facilities.

Sewer - A pipe or conduit used to convey liquid waste.

Standard Specifications - The "Standard Specifications for Public Works Construction" (Green Book), 2018 edition, which are the District's reference specifications to be used in conjunction with these "Design Criteria and Standard Specifications and Standard Drawings."

State - The State of California.

State Water Board's Division of Drinking Water (DDW) - The primary State agency responsible for protection of public health and the regulation of drinking water. One of its specific regulatory responsibilities is to confirm that the separation of potable water, recycled water and sanitary sewers are constructed in compliance with Title 22, Section 64572 of the California Code of Regulations.

Sub-subcontractor - A sub-subcontractor is a person or entity who has a direct or indirect contract with a subcontractor to perform any of the Work at the Site. The term sub-subcontractor means a sub-subcontractor or an authorized representative thereof.

Substantial Completion - Substantial Completion is the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

Supplemental Standard Specifications - Includes modifications to Standard Specifications.

Supplier - Any person, firm, corporation, or organization who supplies materials or equipment for the Work, including that fabricated to a special design, and may also be a Subcontractor or a Sub-subcontractor.

Terms - The terms "acceptable," "accepted," "adequate," "approved," "directed," "necessary," "or equal," "proper," "required" and "specified" mean acceptable, accepted, adequate, approved, directed, necessary, or equal, proper, required or specified by or in the opinion of the District.

Time of Completion - Time allowed for completion of contract computed in calendar days.

Will - Actions entered into by the Contractor or the District as a covenant with the other party to do or to perform the action.

Work - The improvements proposed to be constructed or done pursuant to a legal agreement and consistent with these Design Criteria and Standards, including the furnishing of all labor and materials.

Working Day - Any day, other than a holiday, Saturday or Sunday, on which the Contractor may proceed with regular work on the current controlling operation as determined by the District toward the completion of the Contract. A working day is equivalent to 1.45 calendar days.

# ABBREVIATIONS

List of General Abbreviations

| | |
|---|---|
| A | Area |
| AASHTO | American Association of State Highway and Transportation Officials |
| AB | Anchor Bolt/Aggregate Base |
| ABAN | Abandoned |
| ABC | Asphalt Base Course |
| ABT | About |
| AC | Acre/Asphaltic Concrete |
| ACI | American Concrete Institute |
| ACP | Asbestos-Cement Pipe |
| ADDL | Additional |
| AHD | Ahead |
| AI | The Asphalt Institute |
| AISC | American Institute of Steel Construction |
| AISI | American Iron and Steel Institute |
| AL | Aluminum |
| ALIGN | Alignment |
| ALTN | Alternate |
| ANCH | Anchor |
| ANG | Angle |
| ANSI | American National Standards Institute |
| APPROX | Approximate |
| APWA | American Public Works Association |
| ARCH | Architecture/Architectural |
| AREA | American Railway Engineering Association |
| ARV | Air-Release Valve |
| ARVV | Air-Release/Vacuum Valve Abbreviation Term |
| ASCE | American Society of Civil Engineers |
| ASME | American Society of Mechanical Engineers |
| ASPH | Asphalt |
| ASSY | Assembly |
| ASTM | American Society of Testing and Materials |
| AVE | Avenue |
| AVG | Average |
| AWG | American Wire Gauge |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| | |
| BC | Beginning of Curve |
| BCR | Begin Curb Return |
| BEG | Begin |
| BETW | Between |

| | |
|---|---|
| BF | Blind Flange |
| BK | Back |
| BL | Base Line |
| BLDG | Building |
| BLK | Block |
| BM | Bench Mark/Beam |
| BO | Blowoff |
| BOCA | Building Officials Code Administration International, Inc. |
| BOT | Bottom |
| BRG | Bearing |
| BUR CBL | Buried Cable |
| BV | Butterfly Valve |
| BVC | Begin Vertical Curve |
| BW | Block Wall |
| | |
| C | Conduit |
| CAB | Crushed Aggregate Base |
| CALTRANS | California Department of Transportation |
| CAP | Capacity |
| CATV | Cable Television |
| CB | Catch Basin |
| C-C | Center-to-Center |
| CCB | Concrete Block |
| CCP | Concrete Cylinder Pipe |
| CD | Cross Drain |
| CEM | Cement |
| CF | Cubic Feet/Curb Face |
| CFH | Cubic Feet Per Hour Abbreviation Term |
| CFM | Cubic Feet Per Minute |
| CFS | Cubic Feet Per Second |
| C & G | Curb and Gutter |
| CHG | Change |
| CHKD PL | Checkered Plate |
| CI | Cast Iron |
| CIP | Cast in Place/Cast-Iron Pipe |
| CISP | Cast Iron Soil Pipe |
| CISPI | Cast-Iron Soil Pipe Institute |
| CJ | Construction Joint |
| CL | Centerline/Class/Clearance |
| CLR | Clear |
| CMC | Cement-Mortar Coated or Coating |
| CML | Cement-Mortar Lined or Lining |
| CMLCSP | Cement-Mortar Lined and Coated Steel Pipe |
| CMP | Corrugated Metal Pipe |
| CMPA | Corrugated Metal Pipe Arch |
| CMU | Concrete Masonry Unit |

| | |
|---|---|
| CO | Cleanout/Conduit Only |
| COL | Column |
| COMPL | Complete |
| CONC | Concrete |
| CONN | Connection |
| CONST | Construct or Construction |
| CONT | Continuous |
| CONTR | Contractor |
| COORD | Coordinate/Coordinated |
| COP | Copper |
| COR | Corner |
| CPLG | Coupling |
| CRES | Corrosion Resistant Steel |
| CRSI | Concrete Reinforcing Steel Institute |
| CS | Carbon Steel/Commercial Standard |
| CSP | Corrugated Steel Pipe |
| CT | Center Top |
| CTG | Coating |
| CTR | Center |
| CTV | Cable Television |
| CULV | Culvert |
| CU YD, | CY Cubic Yard |
| CYL | Cylinder |
| | |
| D | Degree of Curvature |
| DB | Direct Buried |
| DBL | Double |
| DDW | State Water Board’s Division of Drinking Water |
| DEPT | Department |
| DET | Detail/Detour |
| DI | Drop Inlet/Ductile Iron Abbreviation Term |
| DIA | Diameter |
| DIM | Dimension |
| DIMJ | Ductile-Iron Mechanical Joint |
| DIP | Ductile-Iron Pipe |
| DIPRA | Ductile-Iron Pipe Research Association |
| DISCH | Discharge |
| DIST | Distance |
| DMH | Drop Manhole |
| DN | Down |
| DR | Drain/Door |
| DWG | Drawing |
| DWY | Driveway |
| | |
| E | East |
| EA | Each |

| | |
|---|---|
| EC | End of Curve |
| ECC | Eccentric |
| ECR | End of Curb Return |
| ED | External Distance |
| EE | Each End |
| EF | Each Face |
| EFF | Efficiency |
| EFL | Effluent |
| EGL | Energy Grade Line |
| EL | Elevation |
| E/L | Easement Line |
| ELEC | Electric |
| ELEV | Elevation |
| ELP | Elliptical |
| ENC | Encasement |
| ENCL | Enclosure |
| EOP | Edge of Pavement |
| EOS | Equivalent Opening Size |
| EP | Edge of Pavement |
| EPA | Environmental Protection Agency (Federal) |
| EQ | Equation |
| EQL | Equal |
| ESMT | Easement |
| EST | Estimate or Estimated |
| ETC | And so Forth |
| EVC | End Vertical Curve |
| EW | Each Way |
| EXC | Excavate or Excavation |
| EXP | Expansion |
| EXST | Existing |
| EXT | Exterior/Extension Abbreviation Term |
| | |
| F | Fahrenheit/Floor |
| FAB | Fabricate |
| FCO | Floor Cleanout |
| FCV | Flow Control Valve |
| FD | Floor Drain |
| FE | Flanged End |
| FF | Finished Floor/Flat Face |
| FG | Finished Grade |
| FHY | Fire Hydrant |
| F&I | Furnish and Install |
| FIG | Figure |
| FIN | Final |
| FIT | Fitting |
| FL | Floor/Flow Line |

| | |
|---|---|
| FLG | Flange |
| FM | Force Main/Factory Mutual |
| FNSH | Finish |
| FPC | Flexible Pipe Coupling |
| FPM | Feet Per Minute |
| FPS | Feet Per Second |
| FPT | Female Pipe Thread |
| FS | Finished Surface/Federal Specifications |
| FT | Feet or Foot |
| FTG | Footing |
| FUT | Future |
| FWY | Freeway |
| | |
| G | Gas |
| GA | Gauge |
| GAL | Gallon |
| GALV | Galvanized |
| GB | Grade Break |
| GDR | Guard Rail |
| GE | Grooved End |
| GENL | General |
| GM | Gas Main |
| GND | Ground |
| GPD | Gallons Per Day |
| GPM | Gallons Per Minute |
| GR | Grade |
| GRTG | Grating |
| GSKT | Gasket |
| GUT | Gutter |
| GV | Gate Valve Abbreviation Term |
| | |
| HARN | Harness |
| HB | Hose Bibb |
| HD | Heavy Duty |
| HDPE | High Density Polyethylene |
| HGL | Hydraulic Grade Line |
| HGT | Height |
| HORIZ | Horizontal |
| HP | High Pressure |
| HPT | High Point |
| HR | Hour/Handrail |
| HS | High Strength |
| HV | Hose Valve |
| HVY | Heavy |
| HW | Headwall |
| HWL | High Water Level |

| | |
|---|---|
| HWY | Highway |
| HYDR | Hydraulic |
| I | Intersection Angle Officials |
| ID | Inside Diameter |
| IE | Invert Elevation |
| IN | Inches |
| INCL | Include |
| INL | Inlet |
| INS | Insulating |
| INSTL | Install or Installation |
| INTR | Interior/Intersection |
| INV | Invert |
| IP | Iron Pipe |
| IPS | Iron Pipe Size |
| IPT | Iron Pipe Thread |
| IRR | Irrigation |
| JCT | Junction |
| IN | Join |
| JT | Joint |
| KIPS | Thousands of Pounds Abbreviation Term |
| L | Length of Curve/Long/Left |
| LACDPH | Los Angeles County Department of Public Health |
| LATL | Lateral |
| LB | Pound |
| LF | Linear Foot |
| LG | Long |
| LOC | Location/Locate |
| LP | Light Pole |
| LPT | Low Point |
| LR | Long Radius |
| LS | Lift Station |
| LT | Left/Light |
| LWL | Low Water Level |
| MATL | Material |
| MAX | Maximum |
| MB | Machine Bolt |
| MECH | Mechanical |
| MFR | Manufacturer |
| MG | Million Gallons/Milligram |
| MGD | Million Gallons Per Day |
| MH | Manhole |

| | |
|---|---|
| MI | Malleable Iron/Mile |
| MIL | Military Specifications |
| MIN | Minimum |
| MISC | Miscellaneous |
| MJ | Mechanical Joint |
| MOD | Modification |
| MON | Monument |
| MPT | Male Pipe Thread |
| MSL | Mean Sea Level |
| MSS | Manufacturer's Standardization Society |
| | |
| N | North |
| NA | Not Applicable |
| NBFU | National Board of Fire Underwriters |
| N & C | Nail and Cap |
| NC | Normally Closed |
| NE | Northeast |
| NIC | Not in Contract |
| NIP | Nipple |
| NO | Number/Normally Open |
| NOM | Nominal Abbreviation Term |
| NPT | National Pipe Taper |
| NRS | Nonrising Stern |
| NTS | Not to Scale |
| NW | Northwest |
| NWL | Normal Water Level |
| | |
| OA | Overall |
| OC | On Center |
| OD | Outside Diameter |
| OE | Or Equal |
| OF | Outside Face |
| OPNG | Opening |
| OPP | Opposite |
| ORIG | Original |
| OSHA | Occupational Safety and Health Administration |
| OVFL | Overflow |
| | |
| P | Pole |
| PC | Point of Curvature |
| PCA | Portland Cement Association |
| PCC | Point of Compound Curvature/Portland Cement Concrete |
| PE | Plain End/Polyethylene/Professional Engineer |
| PI | Point of Intersection |
| PKWY | Parkway |
| PL | Plate/Property Line |

| | |
|---|---|
| PLF | Pounds Per Lineal Foot |
| POB | Point of Beginning |
| POC | Point of Connection |
| POJ | Push-On Joint |
| PP | Power Pole/Polypropylene |
| PRC | Point of Reverse Curve |
| PRESS | Pressure |
| PRL | Parallel |
| PROV | Provisions |
| PRPSD | Proposed |
| PRVC | Point of Reverse Vertical Curve |
| PSI | Pounds Per Square Inch |
| PSIG | Pounds Per Square Inch Gauge |
| PSF | Pounds Per Square Foot |
| PT | Point of Tangency |
| PVC | Polyvinyl Chloride Abbreviation Term |
| PVMT | Pavement |
| | |
| Q | Flow Rate |
| QTY | Quantity |
| | |
| R | Right/Radius |
| RC | Reinforced Concrete |
| RCP | Reinforced Concrete Pipe |
| RCPA | Reinforced Concrete Pipe Arch |
| RD | Road |
| ROC | Reduce |
| RDCR | Reducer |
| REF | Reference |
| REINF | Reinforce or Reinforced |
| RELOC | Relocated |
| REQ | Required/Requirement |
| REQD | Required |
| RF | Raised Face |
| RND | Round |
| RJ | Restrained Joint |
| RPM | Revolutions Per Minute |
| RR | Railroad |
| RST | Reinforcing Steel |
| RT | Right |
| RW | Recycled Water |
| R/W | Right-of-Way |
| | |
| S | South/Slope in Feet Per Foot/Sewer |
| SAN | Sanitary |
| SCHED | Schedule |

| | |
|---|---|
| SO | Storm Drain |
| SDG | Siding |
| SDWK | Sidewalk |
| SE | Southeast |
| SECT | Section |
| SF | Square Feet |
| SGL | Single |
| SH | Sheet/Sheeting |
| SIM | Similar |
| SLP | Slope |
| SLV | Sleeve |
| SOL | Solenoid |
| SOV | Solenoid-Operated Valve Abbreviation Term |
| SP | Steel Pipe |
| SPCG | Spacing |
| SPEC | Specification |
| SPLC | Splice |
| SPRT | Support |
| SQ | Square |
| SQ FT | Square Feet |
| SR | Short Radius |
| SS | Sanitary Sewer |
| SSPC | Steel Structures Painting Council |
| SST | Stainless Steel |
| ST | Street |
| STA | Station |
| STD | Standard |
| STK | Stake |
| STL | Steel |
| STR | Straight |
| STRL | Structural |
| STRUCT | Structure |
| SURF | Surface |
| SW | Southwest |
| SYMM | Symmetrical |
| SYS | System |
| | |
| T | Tangent Length of Curve/Telephone |
| TAN | Tangent |
| TB | Top of Bank |
| T & B | Top and Bottom |
| TBG | Tubing |
| TBM | Temporary Bench Mark |
| TC | Top of Curb |
| TDH | Total Dynamic Head |
| TEL | Telephone |

| | |
|---|---|
| TEMP | Temperature/Temporary |
| THB | Thrust Block |
| THD | Thread or Threaded |
| THH | Thrust Harness |
| THK | Thick |
| T/O | Top of |
| TOC | Top of Concrete |
| TOS | Top of Slab |
| TOT | Total |
| TP | Telephone Pole |
| TV | Television |
| TYP | Typical Abbreviation Term |
| | |
| UBC | Uniform Building Code |
| UD | Underdrain |
| UG | Underground |
| UL | Underwriters' Laboratories, Inc. |
| UNO | Unless Noted Otherwise |
| UTC | Underground Telephone Cable |
| | |
| V | Vent/Valve/Volt |
| VC | Vertical Curve |
| VCP | Vitrified Clay Pipe |
| VEL | Velocity |
| VERT | Vertical |
| VOL | Volume |
| VPC | Vertical Point of Curve |
| VPI | Vertical Point of Intersection |
| VPT | Vertical Point of Tangency |
| | |
| W | West/Wide/Water |
| W/ | With |
| WL | Waterline |
| WLD | Welded |
| WM | Water Meter |
| W/O | Without |
| WSE | Water Surface Elevation |
| WT | Weight |
| WTR | Water |
| WWF | Welded Wire Fabric |
| WWM | Woven Wire Mesh |
| | |
| YD | Yard |
| YR | Year |
| YS | Yield Strength |

# PART I

# DESIGN CRITERIA
# FOR
# RECYCLED WATER FACILITIES

## ***SECTION A*** *GENERAL DESIGN CRITERIA*

### A-1 IMPROVEMENT PLANS

Improvement plans shall be prepared and submitted to the Engineer for approval and signature for all recycled water facilities to be constructed by the District or by the Applicant and dedicated to the District for operation and maintenance. All improvements shall be designed and constructed in accordance with these Design Criteria and Standards. For tract developments, the off-site recycled water facilities may be shown on the improvement plans, which are to be approved by the City or County. However, all of the below requirements shall also be included on the improvement plans for the tract development including the District's Standard Recycled Water System Notes.

The general requirements for the preparation of the improvement plans are outlined below.

#### A-1.1 Drawings

a. Drawings shall be on standard (22" x 34") or maximum size of 24" x 36" sheets with sheet number, title, revisions, and signature blocks and shall be per the District's latest CAD standards.

b. Improvement plans shall conform to the Standard Procedure for Processing Maps and Improvement Plans of the city or county having jurisdiction using the latest version of Auto CAD required by the jurisdictional agency.

c. Title sheets shall have an index or key map clearly indicating the sheet numbers issued.

d. The following shall be clearly shown on the drawings, preferably on the Title Sheet:

   (1) Project bench mark(s) and basis of bearings; and

   (2) Detailed quantity estimates and standard notes, categorized by domestic water, sewer and recycled water facilities.

e. The District's Standard Recycled Water General Notes shall be included (Standard Drawing RW39).

f. Improvement plans for tracts or other developments shall have a separate small scale map showing the overall layout of recycled water facilities if improvement plans contain three or more separate sheets of drawings.

g. The following scales shall be used on all drawings, unless otherwise approved or specified by the Engineer:

(1) Plan and Profile sheets:
Horizontal: 1" = 40 feet
Vertical: 1" = 4 feet (1" = 8 feet or as appropriate for steep grades)

(2) Details: As appropriate to clearly indicate the required details (minimum: trench/pavement replacement, appurtenance, services, and RW pipe identification)

h. Profiles shall be shown on the top of the sheets.

i. All facilities to be operated and maintained by the District shall be located within public rights-of-way or recorded easements, which shall be clearly shown on the improvement plans.

j. The drawings shall show on plan and profile the position of all other known or proposed underground facilities.

k. Record drawings shall be prepared upon completing the construction of the improvements. The record drawings shall be submitted to the District within 30 days of completion of construction of recycled water facilities.

l. Professional Land Surveyor, hired by the improvement plans design engineer or the Applicant, shall verify in writing that the recycled water facilities were constructed within the easements as listed in the easement documents and shown on the improvement plans.

A-1.2 Signatures

a. Unless otherwise specified or approved by the Engineer, each sheet of plans submitted for the Engineer's approval shall be signed by the civil engineer responsible for that design, except that a sheet of complex grading, structural, mechanical, or electrical plans shall be signed by the professional engineer responsible for that design. All electronic submittals shall include the official signature and signed seal of the design engineer.

b. Civil and other professional engineers signing plans to be submitted for the Engineer's approval shall be registered with the State of California. The Engineers signing the plans shall also affix their seal to the drawings near their signature.

c. Plan revisions subsequent to the Engineer's approval shall be legibly identified and resigned per the requirements of Subsection A-1.2 "a" and "b" above, prior to resubmittal for the Engineer's approval.

A-1.3 Submittals

a. Recycled water calculations complete in accordance with the requirements of Section B, shall accompany plans submitted for checking, unless this requirement is specifically waived by the Engineer.

b. Plans submitted for approval shall be accompanied by a letter of transmittal addressed to the Engineer. All submittals shall include one (1) set, at a minimum, of improvement plans (bond paper) plus one (1) set of the plans in electronic (PDF file) format on CD, flash drive or other acceptable media. Plans not approved shall have a watermark or stamp stating “NOT FOR CONSTRUCTION” or “DRAFT” to make it clear that there are not an approved set. Prior to submittal, confirm with the Engineer the number of hard copies required for each submittal.

c. Plans shall be checked for consistency, accuracy, drafting, and conformance with the District's Standards and these Design Criteria prior to submission for the Engineer's approval. If plans have obviously not been checked by the submitting design engineer, they will be returned unapproved by the Engineer.

d. Check prints shall accompany revised plans, which are resubmitted for approval. Resubmitted plans shall be accompanied by a letter of transmittal addressed to the Engineer and shall be resigned prior to resubmittal to the District.

e. Geotechnical and corrosion investigation reports, unless specifically waived by the Engineer. Reports shall be signed and stamped.

f. Any and all proposed off-site recycled water facilities must be reviewed and approved by the District through the District’s plan approval process before the facilities will be allowed to be constructed. Approval by the Engineer does not neglect the professional design engineer liability for the design. In addition, the plans will need to be approved by the jurisdictional and regulatory agency that the work is being performed within.

g. Once the plans have been approved by the District, the approved plans shall be submitted to the District. The submittal shall include one (1) set, at a minimum, of improvement plans (bond paper) plus one (1) set of the plans in electronic (PDF file) format on CD, flash drive or other acceptable media. The PDF file will be of a quality of high resolution. Prior to submittal, confirm with the Engineer the number of hard copies required of the approved plans.

h. All recycled water facilities shall be guaranteed against defects in workmanship (improper contractor's installation) and material defects for a period of one (1) year after the date of acceptance of the facilities by the District.

It is further agreed that the facilities shall be restored to full compliance with the requirements of the District and these Design Criteria and Standards if during said one (1) year period the facilities or any portion thereof are found not to be in conformance with any provisions of the Improvement Plans or these Design Criteria and Standards. This guarantee is in addition to any and all other warranties or guarantees, express or implied within the Project Specifications or Plans prepared for these recycled water facilities.

## A-2 SEPARATION BETWEEN WATERLINES AND SEWER LINES

### A-2.1 Horizontal Separation

Per Title 22 Section 64572 of the California Code of Regulations, Division of Drinking Water (DDW) require that all new recycled water mains and services (conveying Title 22 recycled water) be installed at least four (4) feet horizontally from and one (1) foot vertically below any parallel pipeline conveying potable water. The vertical separation noted above is required only when the horizontal distance between the potable water main and the recycled water main or service is less than ten (10) feet. The minimum separation distances noted above shall be measured from the nearest outside edge of each pipe barrel.

If crossing a pipeline containing potable water, the new recycled water main or service shall be constructed no less than 45-degrees to and at least one (1) foot vertically below that pipeline. No connection joints shall be made in the recycled water main within eight (8) horizontal feet of the other crossing pipeline.

The DDW separation requirements are shown on the District's Standard Drawing No. RW18.

The above separation requirements shall be met, whenever feasible for all new construction. If the District agrees that it is not feasible to meet these requirements, the District will be required to propose an alternative to these requirements to the water purveyor as well as to DDW.

The waiver and alternative proposed shall: demonstrate to the State Board that the proposed alternative would provide at least the same level of protection to public health; and obtain written approval from DDW prior to implementation of the alternative. The Design Engineer shall be responsible to provide a draft of the waiver request. DDW has prepared an application checklist that may be used in proposing an alternative to the Waterworks Standards. This checklist is available from the District, the water purveyor and DDW. The District will review, revise, and finally submit the waiver request to the water purveyor for forwarding to DDW.

In addition, the District requires the following additional horizontal separation requirements from untreated sewage, primary or secondary treated sewage, disinfected secondary recycled water, and hazardous fluids (such as fuels, industrial wastes and wastewater sludge):

- New recycled water mains shall be installed at least four (4) feet horizontally from, and one (1) foot vertically above, any parallel pipeline conveying the above sewage or fluids.
- If crossing a pipeline containing the above sewage or fluids, a new recycled water main shall be constructed no less than 45-degrees to and at least one (1) foot above that pipeline. No connection joints shall be made in the recycled water main within eight (8) feet of the other crossing pipeline.

A-2.2 Vertical Separation

Normally, domestic water, recycled water, and sewer mains shall be located vertically from the street surface in order of the higher quality, i.e., domestic water shall be above recycled water/storm drains and recycled water/storm drains shall be above sewer.

Whenever a crossing must occur where the new recycled water main or service passes within one (1) foot vertically of a domestic water main or a sewer main, special construction will be required. Encasement may be required if the vertical separation requirements cannot be met. One of the following types of encasement may be required: reinforced concrete encasement, a minimum thickness of six (6) inches; or piping within a continuous welded steel casing which shall have a thickness of not less than 1/4-inch.

If the recycled water main is above a water main, the special construction shall extend a minimum of eight (8) feet of horizontal clearance on both sides, or if not feasible, center the piece of new recycled water pipe over the crossing to maximize this horizontal clearance.

If the sewer is located above the recycled water main or within a vertical distance of one (1) foot clearance distance, the special construction shall extend a minimum of four (4) feet of horizontal clearance on both sides of the crossing. These construction requirements shall not apply to house laterals that cross perpendicular less than one (1) foot below the recycled water main.

A-2.3 Separation from New and Existing Utilities

Construction of new recycled water mains or new utilities or structures shall maintain a minimum of five (5) foot parallel separation and a minimum of one (1) foot vertical separation from all District recycled water mains unless written authorization is obtained from the District. Construction of all new recycled water mains and services shall maintain a minimum of five (5) foot parallel separation and one (1) foot minimum vertical separation from all existing utilities and structures unless written authorization is obtained from the District.

## ***SECTION B*** ***DESIGN CRITERIA FOR RECYCLED WATER FACILITIES***

### B-1 GENERAL RECYCLED WATER SYSTEM CRITERIA

#### B-1.1 Standard Requirements

The design and construction of all off-site recycled water system facilities to be operated and maintained by the District shall be in accordance with these Design Criteria and Standards, the District's "Regulations for Recycled Water Facilities," and the applicable potable water system construction standards related to recycled water, California Code of Regulations Title 17 and Title 22, and the requirements of the State Water Quality Control Board.

No fire hydrants or service connections other than recycled water services shall be connected to the recycled water system without prior District written approval.

#### B-1.2 Calculations Required

Substantiating engineering calculations for demands, pressures, and structural designs shall accompany plan submittals to the Engineer.

#### B-1.3 Design System Demands

In general, the design of the recycled water system facilities shall be based on the recycled water demands, pressures, and system elements as outlined in these Design Criteria and Standards. The off-site recycled water system facilities shall be designed to deliver peak flows to the new recycled water customer to be irrigated by the on-site recycled irrigation systems, which they will supply. All demand estimations shall be submitted to the Engineer for approval.

Unless otherwise approved by the Engineer, the recycled water demand shall be estimated by using 3.0 acre-feet per year per acre for turf irrigation and 1.0 acre-feet per year per acre landscape irrigation with a peak hour demand factor of 7 due to restricted hours of irrigation with recycled water and seasonal peaking.

#### B-1.4 Design Off-site and On-Site System Pressures

The off-site recycled water system facilities shall be designed to operate at a maximum working pressure of 200 psi, unless otherwise specified by the District. The on-site irrigation system shall be designed assuming a minimum supply pressure of 55 psi at the meter.

#### B-1.5 Improvement Plans

Improvement plans for off-site recycled water system facilities shall be prepared in accordance with the requirements of Subsection A-1 and shall include the following:

a. Profiles of recycled water mains 4 inches in diameter and larger. Profile of recycled water service laterals may be required by the District when the service crosses multiple existing utilities. A clear description of the pipeline material shall be provided on the profile portion of the drawings.

b. Detailed quantity estimates indicating linear footage of pipe by size, class, and type; number of valves by size, class, and type; number of recycled water services by size; number of blow-offs and combination air valve assemblies; linear footage of concrete encasements (if applicable); and any other appurtenances that should be identified for quantity purposes.

c. For the project bench marks and basis of bearings: the horizontal datum shall be NAD 1983, State Plane California V FIPS (Zone 5), and the vertical datum shall be NAVD 1988. The following horizontal control information shall be provided for each project: horizontal control coordinates reference points, dedicated recycled water pipeline calculated coordinates, and the description of the project vertical bench mark. For all projects at District facilities, the plans shall reference the horizontal and vertical bench mark points installed within the District's facilities. District will provide the survey report for vertical and horizontal monument network within their facilities.

d. Improvement plans shall conform to the Standard Procedure for Processing Maps and Improvement Plans of the city or county having jurisdiction using the latest version of Auto CAD required by the jurisdictional agency.

e. For mechanical piping within buildings and at treatment plants, the plans shall be created using REVIT or equivalent 3D software approved by the District.

f. Standard Recycled Water System Notes to be included, but not limited to, on all Improvement Plans or recycled water construction plans:

    (1) The recycled water system, as shown on these plans, shall be constructed by the Owner/Developer/Applicant in accordance with the latest West Basin Municipal Water District Standards for recycled water construction. The Owner's/Developer's/Applicant's contractor shall have a copy of these standards, as well as a copy of the project plans and specifications, on the job at all times.

    (2) The Owner/Developer/Applicant shall furnish the District with recorded easements for all portions of the recycled water system outside the public right-of-way. In addition, post construction, the Owner/Developer/Applicant shall have a Professional Land Surveyor verify in writing that the facilities to be accepted by the District were constructed within the easements as listed in the recorded easements.

    (3) The District shall be furnished with four hard copies (full size) of the approved construction plans prior to the start of construction.

    (4) The District Inspector shall be notified at least 3 working days prior to the start of construction and any subsequent required inspection.

(5) A preconstruction conference with representatives from all affected agencies and the Contractor shall be held on the job-site at least 48 hours prior to the start of construction.

(6) The Contractor shall obtain all necessary jurisdictional agency's permits (i.e.: City, County, Caltrans or Railroad/Metro) prior to the start of construction.

(7) Construction of recycled water mains and appurtenances shall only be performed by qualified contractors with a valid California Contractor "A" or "C34" license.

(8) Recycled water mains shall be staked for line and grade or shall be installed subsequent to the installation of the curbs but prior to paving of the streets.

(9) The minimum cover over recycled water mains shall be 42 inches below pavement finished grade or at no time shall there be less than 36 inches of cover from the top of pipe to subgrade or street undercut (existing ground during construction) unless approved in advance by the District. For circumstances where the District has approved in advance a cover less than 42-inches, the recycled water main shall be concrete encased if the cover is less than 36-inches.

(10) Contractor to verify depth and location of all utilities prior to trenching as required in the District's Design Criteria, Part 1, Section B-17.

(11) Maximum deflection of pipe joints allowable on curved alignments shall be in accordance with the pipe manufacturer's recommendations. The Design Engineer may specify even stricter requirements. PVC pipe sections shall not be bent to achieve a curve. Pipe deflections for short radius curves and angle points shall be accomplished by means of standard fittings. The location of all fittings shall be detailed on the plans.

(12) No valve shall be located within a gutter or other concrete drainage device.

(13) No recycled water service or meter shall be located within a driveway. All recycled water services shall be installed per the District's Standard Drawings. Curbs shall be inscribed with a 2-inch high "RW" indicating locations of all recycled water services.

(14) All flanged connections shall be coated with three coats of eight mils each of low VOC epoxy coating after installation, including nuts, bolts, and flanges and then shall be wrapped with 10-mil polyethylene sheet.

(15) No facility is to be backfilled until inspected by the District and, if necessary, by the jurisdictional agency.

(16) Thrust blocks shall be installed in accordance with the District Standard Drawing RW19 at all pipe deflections (greater than 5 degrees), all angle points (both horizontal and vertical), and at all fittings. Valve anchor blocks shall be installed at all valves.

(17) Shut down of existing recycled waterlines to facilitate connection to existing facilities shall be coordinated with the District Inspector. The District cannot guarantee a complete shutdown of existing mains and the contractor shall be responsible for any required dewatering of the excavation.

No connections shall be made to the District's existing recycled water system until the new facilities have been successfully pressure tested. All connections to the District's recycled water system shall be made in the presence of the District Inspector.

(18) The recycled water system shall be pressure tested in accordance with the District's Standards. Recycled water mains are not required to pass disinfection or bacteriological tests unless required by the District.

(19) All recycled water piping, including service lines, attached appurtenances, and connections shall be installed with recycled water identification tape and/or tags in accordance with the District's "Design Criteria, Standard Specifications, and Standard Drawings" and in accordance with LACDPH Guidelines.

(20) All valve boxes or manhole frame and covers shall be adjusted to finished pavement grade by the contractor. This is to be done prior to placing seal coat paved roadway.

(21) Final acceptance of the construction will not occur until original record drawings and digital file of the record drawings are delivered to and accepted by the District's Inspector. All field changes shall be showed on the record drawings.

(22) All recycled water facilities included in this work shall be installed in accordance with the District's "Regulations for Recycled Water Facilities."

## B-2 RECYCLED WATER MAINS

### B-2.1 Sizes of Mains

The normal minimum size transmission main shall be 8 inches in diameter. The normal minimum size distribution main shall be 6 inches in diameter.

The maximum allowable design velocity shall be 7 feet per second.

All water mains 4 inches in diameter and larger shall have a profile shown on the improvement plans.

B-2.2 Types and Class of Pipe

All recycled water mains, 12-inches in diameter and smaller, shall be AWWA C-900 PVC pipe, DR-14 or AWWA C-151 Ductile Iron Pipe, Class 350. All other pipe materials require special review and approval by the Engineer.

Ductile iron pipe and fittings shall be encased in a loose polyethylene encasement in accordance with AWWA C105 standard. All PVC pipe shall be installed with tracer wire and detectable warning tape in accordance with these Design Criteria and Standards.

For pipe sizes 14-inches in diameter and larger, the pipe material will need special review and approval by the Engineer and may be AWWA C-900 PVC, ductile iron pipe or cement mortar lined and coated steel pipe.

Cathodic protection and/or test stations shall be provided on ductile iron and steel pipe, 14-inches in diameter and larger.

B-2.3 Minimum Depth to Top of Recycled Water Main

The top of recycled water mains shall be a minimum of 42 inches below street pavement or finished grade, or at no time shall there be less than 36 inches of cover from the top of pipe to subgrade or street undercut (existing ground during construction) unless approved in advance by the District. For circumstances where the District has approved in advance a cover less than 42-inches, the recycled water main shall be concrete encased if the cover is less than 36-inches.

B-2.4 Standard Location

Recycled water mains shall normally be located on the opposite side of the street from the potable water mains and shall conform to the separation requirements of Subsection A-2.

B-3 VALVES

B-3.1 Type of Valves

Resilient wedge gate valves shall be used on all recycled water mains 12-inches in diameter and smaller. Butterfly valves shall be used on all recycled water mains greater than 12-inches in diameter. All other valves require special review and approval by the Engineer. All butterfly valves shall be bi-directionally tested with the operator installed in accordance with these Design Criteria and Standards.

B-3.2 Location of Valves

There shall be at least two control valves at the three-way intersection of any recycled water mains; at least three control valves at the four-way intersection of any recycled water mains; and four control valves at any four-way intersection of major distribution mains.

The control valves at all intersections, as described herein, shall be flanged to the main line tee or cross, unless otherwise approved by the Engineer. Unless specifically approved by the Engineer, the maximum allowable spacing for intermediate valves on transmission mains is 2,000 feet. All intermediate main line valves should be located on the prolongation of a property line wherever possible.

Where recycled water mains are located within an easement outside of paved streets, a valve shall be located at each end of the easement within the street section.

In no event shall any valve be installed within a gutter or other concrete drainage device.

Valve stem operating nuts having over 48 inches of cover shall be provided with an approved extension.

The final determination of the locations of all valves shall be subject to the approval of the Engineer.

### B-3.3 Blow-offs and Combination Air Valves

Blow-offs shall be installed at the end of all mains where either the flow velocity or the slope of the main could cause sediment to settle at the end of the main. A blow off valve shall be installed as near a catch basin as possible to flush the line. Blow-offs shall normally be installed at all low points in recycled water transmission mains and at any other location specified by the Engineer to assure the capability of complete flushing of a main.

Combination Air Valves shall be installed at all high points in mains larger than 6 inches in diameter.

## B-4 SERVICES

Recycled water services shall be installed in accordance with the District's Standard Specifications and Standard Drawings, and the following requirements:

a. All service lines (2 inches and less) shall be copper, unless otherwise approved by the Engineer. District does not recommend 1-1/2 inch services. Services shall be 1-inch or 2-inch.

b. The minimum service line size to the meter shall be 1 inch in diameter.

c. Profile of recycled water service laterals may be required by the District when the service crosses multiple existing utilities.

d. Special designs are required to be submitted for approval of the Engineer for services to which the District's Standards are not applicable.

e. No water services shall be located within a driveway area or at any other location which is not easily accessible to the District at all times.

Typically, the meter box, meter, valves, fittings and meter piping will be furnished and installed by the water purveyor or the water purveyor's contractor unless otherwise specified. The location of the services will be recommended by the design engineer but the final location will be determined, specified and approved by the water purveyor.

Typically, meters, meter boxes, valves and piping for one-, one-and-one half, and two-inch recycled water services shall be provided and installed by the water purveyor or the water purveyor's contractor. Recycled water meters for three/four-inch and larger recycled water services shall be provided by the water purveyor. The meter vault, valves, fittings and piping will be provided and installed by the District's Contractor, if directed, or by the water purveyor's contractor as agreed upon on a case by case basis with the District and the water purveyor.

West Basin owns the recycled service piping up to the connection to the meter. The local water purveyor is responsible for the meter up to the customer side of the service.

## B-5 PUMP STATIONS AND PRESSURE REDUCING STATIONS

All pump stations and pressure reducing stations shall be special designs, subject to the approval of the Engineer.

Requirements for on-site pressure reducing valves downstream of the meter and on-site irrigation pumps (if required to meet customer's irrigation pressure requirements) can be found in Part 4 - Design Criteria for On-Site Recycled Water Facilities of these Design Criteria and Standards.

## B-6 RECYCLED WATER IDENTIFICATION

All piping in the recycled water system, including service lines, attached appurtenances, and connections shall either be colored purple, Pantone 512, and embossed or be integrally stamped/marked "CAUTION: RECYCLED WATER, DO NOT DRINK" or be installed with a purple identification tape, or a purple polyethylene vinyl wrap, color to be Pantone 512 as indicated in the District's Standard Drawings, specified within these Standard Specifications and as required per LACDPH "Guidelines for Pipeline Construction and Installation".

The District also requires warning tags to be installed on all appurtenances within vaults, including air valves, blowoffs, and meters, and any above ground appurtenances.

## B-7 DUCTILE IRON PIPE

All ductile iron pipe shall be per Standard Specification Section 209-1. Ductile iron pipe shall be manufactured in accordance with AWWA C151. The minimum wall thickness shall be as specified in AWWA C150 for the design pressure class, and thickness Class 53 for flanged spools. For ductile iron pipe sizes 3-inches to 12-inches in diameter, the minimum wall thickness shall be Pressure Class 350.

Unless otherwise called out on the plans and approved by the Engineer, push-on type joints shall be used. The joint dimension and gasket shall be as specified in AWWA C111. For pipe sizes, 14-inches in diameter and larger, all pipe joints shall be bonded to provide electrical continuity for corrosion monitoring and future cathodic protection.

All flanges shall be ductile iron and shall be “screwed-on” type in accordance with AWWA C115 and shall be minimum of Class 150 flanges.

Where called for on the plans, ductile iron pipe and fittings can be restrained. Acceptable restrained joints are specified within Standard Specification Section 209-1.

Ductile-iron fittings shall be manufactured in accordance with AWWA C110 or AWWA C153. All pipe fittings shall be made with push-on joints unless restrained joints are called for on the plans. Where restrained joints are called on the plans, acceptable restrained fittings are specified within Standard Specification Section 209-1.

Gaskets for flanged joints shall be 1/8-inch thick and made of EPDM, or synthetic fiber. The gaskets shall be compatible with recycled water that may have a high chlorine residual. Full face type gaskets with pre-punched holes shall be used where both flanges are flat face. Gaskets for push-on, mechanical and restrained joints shall be synthetic or natural rubber in accordance with AWWA C111.

The interior of all pipe and fittings shall be lined with cement-mortar per AWWA C104. Lining shall be the double thickness listed in AWWA C104. Lining materials shall conform to ASTM C150, Type II.

Exterior surfaces of buried pipe and fittings shall be coated with an asphaltic material in conformance with AWWA C110 and AWWA C151.

All ductile iron pipe and fittings shall be polyethylene encased in accordance with AWWA C105 and Standard Specification Section 212-12.

Ductile iron pipe and fittings shall be installed in accordance with the applicable sections of AWWA C600 and as specified within Standard Specification Section 306-8.2.

Deflection of gasketed joints, including restrained joints, shall not exceed 75 percent of the manufacturer’s recommendations. The Design Engineer may specify even stricter requirements.

## B-8 POLYVINYL CHLORIDE PRESSURE PIPE (AWWA C900)

All polyvinyl chloride (PVC) pressure pipe shall be per Standard Specification Section 209-4. PVC pipe shall be manufactured in accordance with AWWA C900. The dimension ratio (DR) for C900 PVC pressure pipe shall be DR-14 (305 psi pressure rating), as a minimum. The pipe shall have gasketed bell end or plain end with elastomeric gasketed coupling.

Fittings shall be ductile iron in accordance with Standard Specification Section 209-1. Rubber rings for use in couplings and fittings shall conform to requirements of ASTM F477.

Services saddles for 1-inch and 2-inch diameter outlets shall be designed for use on C900 PVC pipe and shall conform to the requirements of Standard Specification Section 212-10. For outlets of larger than 2-inch diameter and for all outlets on PVC pipe larger than 12-inches in diameter, ductile iron tees with flanged outlets shall be used.

The maximum deflection of PVC pipe joints allowable on curved alignments shall be in accordance with the pipe manufacturer's recommendations. The Design Engineer may specify even stricter requirements. PVC pipe sections shall not be bent to achieve a curve. Pipe deflections for short radius curves and angle points shall be accomplished by means of standard fittings.

All PVC pipe shall be installed with tracer wire and detectable warning tape in accordance with these Design Criteria and Standards.

## B-9 STEEL PIPE

Cement mortar lined and coated steel pipe may be considered as an acceptable pipe material for pipe sizes 14-inches in diameter and larger. However, the steel pipe will require special design to take into account the specific site conditions and is not covered by these Design Criteria and Standards. The steel pipe design will be performed on a case by case basis and will need special review and approval by the Engineer.

## B-10 TRENCH EXCAVATION AND BACKFILL

### B-10.1 Pipe Bedding Zone Material

West Basin has authority on the materials within the pipe bedding zone. The pipe bedding zone requirements are shown on the District's Standard Drawing RW17.

The pipe zone shall include the full width of trench from the bottom of the pipe to a horizontal level 12 inches above the top of the pipe. This zone is also part of the "pipe bedding zone" and as such it shall be filled with bedding material identical to that which is placed in the pipe base. The pipe base shall be defined as a layer of material immediately below the pipe zone and extending over the full trench width. This is also part of the "pipe bedding zone". The pipe bedding zone shall include the pipe base and the pipe zone. It shall include the full width of the trench from the bottom of the trench to a point 12-inches above the top of the pipe.

The pipe base and pipe zone ("pipe bedding zone") backfill material for PVC Pipe, ductile iron pipe and copper services shall be imported sand with a minimum SE of 30.

The thickness of the pipe base shall be a minimum of 4-inches for copper pipe and a minimum of 6-inches for PVC and ductile iron pipe.

## B-10.2 Trench Widths

The trench should be as wide as necessary for proper installation and compaction of backfill and pipe bedding zone material and provide adequate room to meet safety requirements for workers. The minimum and maximum clearance between the pipe wall and trench wall varies depending on the size of the pipe and is defined on the Standard Details. Note that the trench width could be reduced horizontally if a slurry material such as controlled low strength material (CLSM) is used in lieu of the pipe zone material but this is only acceptable if approved in writing by the Engineer prior to installation.

## B-10.3 Shoring/Sloping of Trench

The Contractor is responsible for sloping or shoring the trench in accordance with all CAL/OSHA, Federal, State, and local requirements. Lateral pressures for design of trench sheeting, shoring and bracing shall be based on the type of soil exposed in the trench, groundwater conditions, surcharge loads adjacent to the trench and the type of shoring that will be used in the trench.

## B-10.4 Backfill and Surface Restoration

All trench backfill and surface restoration shall be in accordance with these Standard Specifications and Standard Plans, and the specific requirements of the jurisdictional permitting agencies. The jurisdictional agency responsible for the public right-of-way that the recycled water main is to be constructed within shall have authority over all trench backfill and pavement (surface) restoration. The typical trench and paving restoration are shown on the District's Standard Drawing RW18.

The minimum material for trench backfill shall be import sand with SE of 30 or higher or Class II base (90% compaction) for all pipes within paved roadways or parking areas that will have traffic over it. For trenches traversing a major street at 90 degrees and/or in intersections of major streets, the minimum trench backfill material from the top of pipe zone to the street subbase shall be one sack sand slurry. If the jurisdictional agency's permit or standards are more stringent or if the jurisdictional agency demands that the backfill and surface restoration meet their requirements, then the jurisdictional agency's permit or standards shall govern.

## B-10.5 Special Conditions

The Design Engineer shall be responsible to review all jurisdictional agency permit requirements and summarize these requirements on the plans and/or specifications and any special conditions required by the permitting agencies. The Contractor shall review the final jurisdictional agency permit requirements and notify the District of any permit requirements that were not identified by the Design Engineer on the plans or specifications prior to starting any construction activities.

## B-10.6 Groundwater and Surface Water Control

Methods to control groundwater and surface water shall be the responsibility of the Contractor. Control methods must meet the requirements of the permitting agencies and must be installed and operated such that no damage is done to adjacent buildings, parallel utilities and other surrounding facilities.

Suitable means and devices shall be provided and maintained to continuously remove and dispose of all water entering the trench excavation during the time the trench is being prepared for the pipe laying, during the laying of the pipe, and until the backfill within the pipe zone has been completed. These provisions shall apply during the noon hour as well as overnight when construction activities are not being performed. Trench water shall not be drained through the pipeline under construction. Groundwater shall not be allowed to rise around the pipe until jointing compound has firmly set and the pipe zone has been backfilled. Dewatering shall commence when groundwater is first encountered and shall be continuous until such times as water can be allowed to rise. No concrete shall be poured in water, nor water be allowed to rise around the concrete or mortar until it has set at least eight (8) hours.

The California Regional Water Quality Control Board governs the discharge of any groundwater or inflow of surface water to a storm drain system. The Contractor will not be authorized to discharge groundwater, pipeline dewatering, or water for pressure testing or flushing to the storm drain without obtaining a NPDES permit. The Contractor will be required to obtain and pay for any NPDES permit required for the temporary dewatering and surface drainage control discharges to a storm drain facility.

Unless the Contractor has obtained a NPDES permit, all dewatering of groundwater shall be discharged to the nearest sewer facility with adequate capacity. Prior to using an existing sewer system for disposal, the Contractor shall obtain written permission of the owner of the sewer facility. The Contractor will need to coordinate this disposal with the sewer agency in order to schedule the disposal as well as confirm that the sewer system has adequate capacity to handle the dewatering rate. Contractor shall obtain a permit to discharge to the sewer, if required by the sewer agency, and meet all permit requirements.

As an alternative, the Contractor could collect, truck and deliver the groundwater dewatering to one of West Basin's closest treatment plants. The Contractor should contact the District and confirm this is a viable option based on the quantity and quality of the groundwater dewatering. The Contractor will be required to test the water quality and provide treatment as requested by the District in order for this to be a viable option.

## B-11 THRUST BLOCKS AND THRUST RESTRAINT

Thrust blocks and anchor blocks can be used for 12-inch-diameter and smaller pipe where the thrust blocks or anchor blocks will not interfere with existing or future utilities. Thrust blocks shall be installed in accordance with the District Standard Drawing RW19 at all pipe deflections (greater than 5 degrees), at all angle points (both horizontal and vertical), and at all fittings. Valve anchor blocks shall be installed at all valves.

Carrying the thrust through the pipe joints (restrained joints) shall be used in all streets for all pipes larger than 12 inches in diameter. Restrained joints may also be required when parallel pipes are being constructed in the same or adjacent trenches or there is insufficient available space within the road to construct the required thrust blocks.

The length of pipe to be restrained shall be determined by the Design Engineer considering the soil types, pipe zone backfill, groundwater conditions, type of pipe coatings, and other issues. The designer shall obtain the appropriate soil and groundwater conditions from the geotechnical report or supplemented by additional geotechnical investigations as necessary on a case by case basis for each project.

## B-12 EASEMENTS AND RIGHTS-OF-WAY

Permanent easements for the pipeline should be a minimum of 20 feet wide. Construction easements should be a minimum of 50 feet wide, where feasible. Acquisition of temporary and permanent easements will be the responsibility of the District based on the specific easement requirements for each project. Construction lay-down or staging areas will be the responsibility of the Contractor.

## B-13 CORROSION PROTECTION

The level of corrosion protection required will be directed by the District on a project-by project basis.

## B-14 GEOTECHNICAL INVESTIGATIONS

When required to perform geotechnical work for the project, the Design Engineer or Contractor shall submit to the District a final signed geotechnical investigation report conducted by an engineer suitably licensed to practice geotechnical engineering. The report shall provide recommendations for the satisfactory design, construction, and performance of the project.

### B-14.1 Field Investigation

The Design Engineer or Contractor shall perform sufficient subsurface exploration to supplement the existing information. The Contractor shall use any or all of the information provided in the bid package, at its own risk. The spacing of exploration shall be based on the review of existing information to provide adequate coverage to facilitate the design and construction. A minimum of one boring shall be performed at either end of all proposed bore-and-jack or microtunneling locations. The depth of these explorations shall be at the discretion of the geotechnical engineer; however, shall be of sufficient depth to provide information necessary for design and construction. Soil samples shall be collected at frequent intervals to facilitate adequate laboratory testing. All explorations shall be logged by a geotechnical engineer or under the direct supervision of the geotechnical engineer. All explorations, sampling, and logging of explorations shall be in accordance with applicable ASTM standards.

The Contractor shall perform additional investigation to determine the extent of areas of known contaminants (that were identified in the bid package) that may impact the project. The Contractor shall prepare a health and safety plan for all work done for this purpose. Adequate soil and groundwater samples shall be collected and tested to identify the type and amount of contaminants in this area. All soil cuttings from these areas shall be collected in drums and disposed of accordingly. All activities within the potentially contaminated areas shall be performed in accordance with applicable local, state, and federal standards and the requirements of the health and safety plan. If the Contractor encounters contaminants outside of the zones identified in the bid package, the Contractor shall stop work and contact the District immediately for further instructions.

The Contractor is responsible for obtaining all necessary permits for field investigation. Where deemed necessary by the permitting agencies, the Contractor shall employ appropriate traffic control measures.

Backfilling of all explorations shall be in accordance with the provisions of applicable local, state, or federal laws and the jurisdictional agency requirements. As a minimum, exploratory holes that extend below the groundwater table and within potentially contaminated zones, shall be backfilled with bentonite grout to the entire depth. All exploratory holes that do not penetrate to the groundwater table and outside the potentially contaminated zones shall be backfilled, as a minimum, with soil cuttings. The upper five feet of these holes shall be backfilled, as a minimum, with bentonite grout.

B-14.2 Laboratory Testing

The Design Engineer or Contractor is responsible for performing the necessary tests to determine design soil parameters. The test shall be performed to supplement the existing information provided in the bid package. The tests performed shall include, but are not limited to, the determination of the following properties:

Moisture Content
Dry Density
Cohesion
Angle of Internal Friction Grain Size Distribution Atterberg Limits
Corrosivity
Expansion Potential Consolidation Characteristics

All tests shall be performed in accordance with applicable ASTM and/or Caltrans Test Methods. Soil and groundwater samples shall be tested to identify the type and amount of contaminants present in the subsurface.

B-14.3 Engineering Analyses

Based on the current and previous investigation, the Design Engineer or Contractor shall provide the following:

*Site Condition*

Evaluate the subsurface soil conditions, determine the soil parameters required for design, and determine collapse and expansion potential of soils.

Evaluate suitability of the subsurface soil for support of structure foundation and pipelines. Provide recommendations for over-excavation of unsuitable materials, and replacement with suitable soils.

Evaluate the impacts of groundwater conditions on design and construction.

Evaluate the stability of proposed excavations (both temporary and permanent) and provide recommendations for the design of shoring (braced or un-braced).

Identify nearby existing structures and utilities that will be impacted by the construction. Provide recommendations for protection of these structures and utilities.

Provide recommendations for preparation for subgrade for structures.

*Structures*

Provide recommendations for foundation design. These should include foundation type, allowable bearing capacity, and settlement of foundations.

Specify structure backfill requirement around structure foundations and behind retaining structures.

Provide lateral earth pressure recommendations for retaining structures.

*Pipeline and Appurtenant Structure*

Provide backfill requirements around pipelines.

Provide recommendations of constrained soil modulus for native and backfill material at the appropriate overburden pressure.

Provide allowable friction resistance and/or net passive resistance for anchor and thrust blocks.

Check suitability of excavated material for bedding and backfill of trenches.

*Corrosion*

Provide sulfate concentrations in soil and recommendations for type of cement. Evaluate the corrosivity of metals in contact with the soils based on the results of pH, resistivity, and chlorides. Provide recommendations for appropriate gauge thickness and/or coating for metals to account for the estimated corrosion potential.

*Seismic*

Evaluate the regional geology and engineering seismology.

Discuss the impacts of known active and potentially active faults on the project site. Provide recommendations for design seismic acceleration. Discuss potential for liquefaction, seismically-induced settlement, and the impact to the proposed, development. Provide necessary mitigative measures.

*Contaminated Soils*

Report the observed extent, type, and amounts of contaminated soils and groundwater within the proposed alignment.

### B-14.4 Geotechnical Report

The Design Engineer or Contractor shall document findings and recommendations in an adequately illustrated report and submit to the District for review and acceptance.

## B-15 CONTAMINATED SOILS SURVEYS

A Phase I Site Assessment will be provided by the District or the Design Engineer that will include a search of available records and contact with appropriate agencies.

## B-16 ROADWAY AND MAJOR UTILITY UNDERCROSSINGS

### B-16.1 Type of Crossing

For the purpose of this section, bore and jack is a trenchless method of pipeline construction which consists of construction of jacking and receiving pits, hydraulically pushing a steel casing through existing ground or a pilot tunnel, constructing a pipeline within the steel casing, and filling the annular space. Standard Specification Section 307 covers this trenchless method of pipeline construction.

Microtunneling is an unmanned entry method that uses a remotely operated microtunnel boring machine (MTBM) to install pipes underground with minimal surface disruption. Microtunneling continuously installs pipe behind a remotely controlled, steerable, laser-guided, full-face controlled, articulated MTBM. The pipe to be installed is connected to and follows the MTBM. Standard Specification Section 308 covers this trenchless method of pipeline construction.

### B-16.2 Size of Casing

The minimum size of casing shall be adequate to permit insertion of the carrier pipe (with restrained joints) and grouting the annular space between the casing and the carrier pipe for the full length of the tunneled crossing, but not less than the diameter shown on Standard Drawing RW20.

A Division of Industrial Safety classification is required for each bore exceeding 30-inches in diameter. It shall be the Contractor’s responsibility to call the required safety meeting with representatives from the State Division of Industrial Safety prior to beginning the construction of each bore.

B-16.3 Support of Pipe Within Casing

Insulator with skids to support the carrier pipe shall be as shown on Standard Drawing RW20. A minimum of three skids shall be provided for each length of pipe, one 12-inches from each joint and one centered. Additionally, one skid shall be installed 12-inches from each end of the casing. See Standard Specification Section 307 for specific requirements.

The height of the supports and runners combined shall be sufficient to keep the carrier pipe bell at least 2 inches from the casing pipe wall at all times.

B-16.4 Length and Wall Thickness of Casing

The minimum length of a cased crossing shall meet the requirements of the permitting agency but shall not be less than the length of the crossing plus 10 feet on each side. The length of the crossing shall be the distance between projected fill lines at the top of the pipe or the distance between the outside edges of a pipe or structure or group of pipes or structures or the railroad/freeway right-of-way to be crossed by trenchless construction methods.

The minimum wall thickness and size of casing shall be as required by the permitting agency, but shall not be less than shown on Standard Drawing RW20. Greater casing thickness and diameter may be used as convenient for the method of work and loadings as involved, as suitable for the site and limited by possible interferences. The Contractor may choose a size of casing at or above the minimum specified, in order that the jacking may be done with sufficient degree of accuracy to permit installation of the carrier pipe to the grades shown on the plans and to properly accommodate the largest dimension of the carrier pipe and the method to restrain the carrier pipe.

B-16.5 Cathodic Protection

The level of cathodic protection required for the casing installation will be directed by the District on a project-by-project basis. The minimum requirements are shown on the Standard Drawing RW20.

B-17 POTHOLING EXISTING UTILITIES

The location of existing utilities shall be shown on the construction drawings based on search of available records. The construction drawings shall identify any existing utilities that were potholed during design and the District should be provided with the potholing report summarizing this work.

All existing utilities shall be protected in place, unless otherwise noted on the construction drawings. The Contractor shall be responsible for any damage to existing utilities as a result of his operations.

It shall be the Contractor’s responsibility to notify the respective utility owners and Underground Service Alert (811) to determine the exact field location of all utilities

shown or not shown on the plans, which may conflict with the Contractor's construction activities. Potholing of existing crossing utilities, parallel utilities within ten feet of the proposed alignment, existing services and points of connection to determine exact depth, conduit/pipe material and field locations shall be the responsibility of the Contractor.

The Contractor shall complete the above potholing a minimum of three (3) weeks in advance (or longer depending on the availability of obtaining fittings to revise the horizontal or vertical alignment without impacting the pipeline scheduled construction) or at least 1,500 feet ahead of pipe trench heading to provide sufficient lead-time to resolve utility conflicts. In the event of any conflicts, the Engineer shall be immediately notified.

Coordinate all potholing activities with Underground Service Alert and the owner of the facility prior to digging near their structures. Schedule soft-dig techniques for the potholing, however, "hand excavation" may be prudent for specific utilities or may be required by the utility agency. Some utility owners require that their own staff or contractor perform potholing on their facilities. Provide survey information for x,y coordinate and depth from top of ground to top of pipe for each pothole location. Verify material and diameter of pipe being potholed. Obtain all state, county, and local permits for potholing activities prior to performing the work.

## B-18 HYDRAULIC ANALYSIS

All hydraulic analysis will be performed by the District. District will provide pipe sizes, pipe flows, and operating pressures to Design Engineer and the Contractor unless otherwise directed by the District.

## B-19 PERMITTING

### B-19.1 District-Obtained Approvals

The District or the Design Engineer will obtain design approvals/permits, as needed for each project, from environmental agencies, Caltrans, cities, County Flood Control District, Southern California Edison, Los Angeles Department of Water and Power, Metropolitan Water District of Southern California, railroads, County Sanitation District of Los Angeles County, State of California OSHA Mining and Tunneling Division, and any other regulatory permit required by the project. Whenever possible, a copy of the standard permit requirements for these agencies will be provided when the actual permit is not available to include in the Bid Package.

The Contractor will be responsible to obtain the actual construction permits as required from all of the above jurisdictional agencies.

### B-19.2 Contractor Obtained Permits

The Contractor will be responsible for all jurisdictional agency (i.e.: local county or city) construction encroachment permits, State Water Resources Control Board, General

Construction Activity Storm Water Permit, all double encroachment permits with Caltrans, Flood Control, railroads, and an excavation permit from the State of California Division of Occupational Safety and Health.

## B-20 ORDER OF PRECEDENCE

In the case of conflict between specific project construction plans and specifications, Design Criteria and Standards, and permit requirements, with regard to construction of facilities, the following order of precedence will apply:

1. Permit requirements, as approved by the agency having jurisdiction.
2. Specific details prepared as part of the specific project construction plans and specifications.
3. Improvement Plans and Specifications as approved by the District (should not be less stringent than the District's Design Criteria and Standards).
4. Special Conditions for the specific project and incorporated into the project contract documents as approved by the District.
5. District's Standard Drawings.
6. District's Design Criteria and Standard Specifications.
7. Standard Specifications for Public Works Construction, 2018 Edition.

Figured dimensions on the drawings shall govern, but work not dimensioned shall be as directed. Work not particularly shown or specified shall be the same as similar parts that are shown or specified or ad directed. Full-size details shall take precedence over scale drawings as to shape and details of construction. Scale drawings, full-size details, and specifications are intended to be fully cooperative and to agree; but should any discrepancy or apparent difference occur between the plans and specifications, or should errors occur in projects being constructed by others affecting the work, and the contractor proceeds with the work affected without instruction from the District, the contractor shall be fully responsible for any resultant damage or defect.