Appendix B to the Rules and Regulations

MINIMUM DESIGN STANDARDS
FOR WATER, WASTEWATER AND IRRIGATION SYSTEMS

RANGEVIEW METROPOLITAN DISTRICT

July 2004

Rangeview Metropolitan District

MINIMUM DESIGN STANDARDS
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SECTION 1 - GENERAL

1.1 AUTHORITY: These Minimum Design Standards are promulgated by the District's Board of Directors pursuant to the authority granted in Article 35 of Title 31, and Part 1 of Article 1, Title 32, C.R.S. The administration, interpretation and enforcement of these Minimum Design Standards is carried out by the District Manager. Any appeal and any request for variance or waiver shall be directed to the District's Board of Directors pursuant to §8.6 of the Rules and Regulations.

1.2 REVISIONS, AMENDMENTS OR ADDITIONS: These Minimum Design Standards may be revised, amended, or added to from time to time. Such revisions, amendments and additions shall be binding and of full force and effect when approved by the District's Board of Directors.

1.3 DISTRICT CONTROL: These Standards shall apply to the installation, operation, and maintenance of all potable water, irrigation water and sanitary sewer facilities under the control of the District. Such control shall be exercised in accordance with the District's Rules and Regulations.

1.4 ORGANIZATION AND INTERPRETATION OF STANDARDS:

1.4.a These Minimum Design Standards are composed of written standards, materials specifications and standard drawings.

1.4.b If there is a conflict between these Minimum Design Standards and any referenced standard, specification, or rules and regulations the most stringent requirement in the opinion of the District Manager shall apply.

1.4.c Terms used herein which are defined in the District's Rules and Regulations shall have the meanings set forth for them in the Rules and Regulations.

1.4.d Standards for materials and workmanship established by the following associations are referenced in these Minimum Design Standards, either by full name or by acronym, as set forth below. The applicable version for a specific standard shall be that one most currently adopted by the association or by the local agency having jurisdiction.

(i) AASHTO – American Association of State Highway and Transportation Officials

(ii) ANSI – American National Standards Institute

(iii) ASTM – American Society for Testing and Materials

(iv) AWWA – American Water Works Association

(v) NSF – National Sanitation Foundation

1.5 APPLICABILITY: These Minimum Design Standards, in conjunction with the Rules and Regulations, shall apply to all Main Extensions and Service Lines and to any and all other installations, repairs, replacements or other work on or connecting to any of the District's water or sewer facilities.

1.6 APPLICATION PROCEDURE: The process for design, construction and conveyance of Main Extensions shall conform generally to the following:

1.6.a The Owner schedules a pre-design meeting with the District Engineer. The District will provide information concerning the hydraulic gradeline of the District's water systems and about existing and proposed water and sewer facilities in the vicinity of the Owner's project.

1.6.b The Owner submits a feasibility study to the District Engineer for review and approval documenting that the proposed water or sewer main extensions will provide adequate and reliable municipal level services to the Owner's project and that the proposed construction is otherwise consistent with the District's water and sewer system master planning and with these Minimum Design Standards. The Owner shall pay the "System Review Fee" pursuant to §6.2 of the Rules and Regulations.

1.6.c The Owner submits two sets of construction documents, including easement conveyance instruments and other information required by §5.7 of the Rules and Regulations, for the District's review. The Owner shall pay the "Design Review Fee" pursuant to §6.4 of the Rules and Regulations.

1.6.d Within 30 days after a receipt of a complete submittal, the District will review and return one set of marked-up documents to the Owner indicating the District's approval thereof or listing any deficiencies thereon.

1.6.e As necessary, the Owner makes revisions and resubmits the documents for the District's review and approval.

1.6.f The District will indicate its approval of the construction documents by signing the approval block on the construction drawings and executing the easement conveyance documents. Prior to the District's final approval of plans for water main extensions, approval by the fire protection authority shall be obtained, as evidenced by their signing the approval block.

1.6.g The Owner shall provide the District with proof that the contractor is adequately and appropriately insured and bonded.

1.6.h Construction observation by the District is required in accordance with Section 3 below, with the Owner reimbursing the District for the actual costs incurred by the District for such observation as specified in §6.5 of the Rules and Regulations.

1.6.i Upon the Owner's request, the District inspects the substantially completed project and provides the Owner with a written list of incomplete or deficient items that are not in compliance with these Minimum Design Standards and the approved construction documents.

1.6.j The Owner prepares and submits record drawings for the District's review and approval.

1.6.k Once punch list items are completed to the satisfaction of the District, and a complete and satisfactory set of record drawings are provided to the District, the Owner may apply for "Conditional Acceptance" per §5.9 of the Rules and Regulations.

1.6.l Pursuant to §5.10 of the Rules and Regulations, the Owner shall maintain, repair, and cure any and all defects in work or materials until the District's "Final Acceptance".

1.6.m One year following "Conditional Acceptance" by the District, the Owner may apply for "Final Acceptance" per §5.11 of the Rules and Regulations.

SECTION 2 - DESIGN

2.1 ENGINEERING:

2.1.a Construction documents shall be prepared by or under the direct supervision of a Colorado-licensed professional engineer and shall bear the professional engineer's seal on the final construction set and also on the record set of drawings upon satisfactory completion of the project.

2.1.b The Owner and his contractor and professional engineer associated with said construction shall be responsible for the adequacy and satisfactory performance of the designs, materials, and all construction, inspection, and other tasks and items associated therewith.. Each shall thoroughly examine the work site to ascertain for themselves all soil, geological, groundwater, environmental and other conditions which might be encountered and affect the work being undertaken. Each shall enter into such work relying on his own investigations and information, and not on any statements or representations made by the District.

2.1.c The District does not perform engineering services for any person or entity in connection with its review of construction documents. Approval of construction documents by the District signifies only that the construction documents reasonably appear to meet the requirements of these Minimum Design Standards based upon the information provided to the District and the District makes no finding, representation, or warranty that the system and associated components will perform any certain function.

2.2 CONSTRUCTION DOCUMENTS:

2.2.a All construction documents shall be submitted to the District for review, comment, and approval.

2.2.b The design and installation of all water and sewer facilities shall support and promote the development of integrated water and sewer systems of the District.

2.2.c Submittals required for the District's review in accordance with §5.3 of the Rules and Regulations shall include two complete sets of detailed construction documents, consisting of specifications and drawings, for main extensions containing the following information:

(i) Locations and dimensions of dedicated streets, easements, and rights-of-way

(ii) Properties to be served

(iii) Existing or proposed curb and gutter

(iv) Existing or proposed utilities

(v) Existing or proposed obstructions such as vaults, catch basins, traffic islands, etc.

(vi) Proposed alignment of water and sewer mains and the location of all proposed valves, manholes, fire hydrants, fittings, etc.

(vii) Meter and water tap locations for all water service connections

(viii) Sewer service tap locations

(ix) Proposed elevation, upstream and downstream hydraulic gradient line, and pressure on pressure reducing valves

(x) Typical street cross sections showing property/easement lines, street, curb and gutter, and all existing or proposed utilities

(xi) Profile of pipelines showing street grades, existing ground line, and any proposed or existing utility crossings of the water or sewer mains. Profile drawings shall typically be provided for sanitary sewer mains and for water mains at crossings where depths of other utilities require atypical water pipeline or sewer pipeline depths.

(xii) Detail sheets showing all relevant information such as: pipe and fitting restraint, hydrant installations, manhole installations, blow-off installations, proposed crossings, etc.

2.2.d The construction documents shall meet the following requirements:

(i) Designs shall be based on field surveys prepared by a Colorado-licensed land surveyor or professional engineer, referenced to land corners or other official survey control points and be of sufficient accuracy so that the facilities can be accurately staked for installation and can be readily located after installation for maintenance, tapping, and control.

(ii) Construction drawings shall show sufficient adjacent area to give the relation of new facilities to existing facilities.

(iii) Plan drawings shall have a scale of 1" = 50' unless otherwise approved.

(iv) The cover sheet shall have an approval block as shown in Standard Drawing C.1. Approval by the appropriate fire protection authority is required for water main extensions.

(v) A title block containing pertinent information including project name, design engineer, and dates shall be located on each drawing.

(vi) The construction documents shall require that the contractor and all materials and work comply with the District's Rules and Regulations and Minimum Design Standards.

2.2.e Two copies of the construction documents shall be delivered to the District after the District's acceptance of them for construction. After construction is substantially completed, the Owner shall provide a complete set of record drawings, stamped by a Colorado-licensed professional engineer, showing dimensioned ties to surface features for all buried facilities. The record drawings shall include mylar transparencies suitable for reproductions and one complete paper copy. Information to be shown on these drawings shall generally conform to the Standard Drawing "Typical Record Drawing Information", Drawing C.2.

2.3 <u>EASEMENTS</u>: Where deeded easements are required to cover main extensions not located in public rights-of-way, the Owner shall, in addition to meeting the requirements of §5.7 of the Rules and Regulations, comply with the following:

2.3.a The legal description for the easements shall be prepared by and bear the stamp and signature of a Colorado-licensed land surveyor, and shall be in a form acceptable to the District.

2.3.b Legal descriptions and drawings shall be prepared on legal sized paper, and shall be referenced to the nearest section corner. The legal description shall be a metes and bounds description accurately describing to a hundredth of a foot the point of beginning, each easement line bearing and distance, and the total area contained in acres. Easement traverse shall close within one-ten thousandth.

2.3.c Easement drawings shall be presented at a scale sufficient to clearly show all easement boundaries. The drawing shall show the north arrow, referenced section corner, all bearings and distances, total acres, adjacent property identification, street names, and date of preparation.

2.3.d Easement agreements will be prepared by the District on the District's standard easement agreement form. The District reserves the right to modify the easement agreement form.

2.3.e Minimum width of easements for pipelines shall be 24 feet. Temporary construction easements shall have a minimum width of 30 feet. Wider easements may be required for deep sections of pipeline, multiple pipelines, storm sewers and overflow swales, or where otherwise required by the District. Easements shall be shown on the construction drawings. The District will not approve construction documents until all required easements have been conveyed to the District and duly recorded in the real property records.

2.4 WATER DISTRIBUTION SYSTEM:

2.4.a Design/Sizing.

(i) General. Water mains shall be designed to meet the most stringent of the following two conditions: (i) maximum hourly demand with pressures not less than 40 psig at any point of the distribution system, or (ii) maximum daily demand rate plus needed fire flow (as determined by ISO guidelines and other criteria approved by the fire protection authority and the District) with delivery pressures of not less than 20 psig at the hydrant. The maximum static pressure at any point of the distribution system shall be 110 psig.

(ii) Sizing. Water main sizing and connections shall be reviewed with the District Engineer prior to final design and drafting. The systems shall be designed to maximize interconnections and looping, to minimize dead ends, and to otherwise strengthen the District's water system. Where in the opinion of the District any main extension facility may have a wholesale facility function, the District may direct that such facility be oversized, and the Owner shall so design and build the same. In this case the District may pay the oversize costs or alternately allow the Owner an opportunity for reimbursement pursuant to §5.13 of the Rules and Regulations. The normal minimum water distribution main diameter shall be as follows:

(a) For pipelines providing for fire protection: 8 inches, although 6-inch pipe may be used for short looped pipelines in single family residential areas.

(b) For pipelines not providing fire protection and for dead-end mains without fire hydrants or fire services or the possibility of future tie-ins with other mains: 2 inches.

(iii) Demands. The Owner's Engineer shall be responsible for determining the demands placed by customers on the District Water Facilities and shall use the best planning information available. Recommended minimum water system demands, not including

fire protection flows, are listed following (gpd = gallons per day, SFFA = Square Foot Floor Area):

Customer	Average Day Water Demand	Max. Day / Avg. Day	Peak Hour / Max. Day
Single family residential – inhouse	300 gpd per unit	1.5	2
Multi-family residential and mobile homes – inhouse	220 gpd per unit	1.5	2
Neighborhood commercial and retail - excluding irrigation	0.1 gpd per SFFA	1.5	3
Industrial – excluding irrigation	0.15 gpd per SFFA	2	2
Irrigated lawns, parks, open space, medians, etc.	3,000 gpd per irrigated acre	3.25	2

Demands from high-demand customers (e.g., car washes, restaurants) shall also be considered. The Owner's Engineer shall determine the needed fire flow for each area so as to comply with requirements of the fire protection authority. A minimum needed fire flow of 1,000 gpm shall be used for residential areas.

(iv) Minimum Cover. Water pipelines shall have a minimum cover of four and one-half feet (4'-6"). Pipelines shall not be placed deeper than 10 feet without prior District approval.

(v) Sanitary Separation. A 10-foot minimum horizontal separation between water, sewer and irrigation water mains is required. When pipelines are located under roadways, the potable water pipelines shall normally be located about 11 feet north or east of the roadway centerline, and the irrigation pipelines shall normally be located about 11 feet south or west of the roadway/easement centerlines. Whenever a crossing must occur where an irrigation water or sewer main passes within 10 feet horizontally of potable water main, and where the potable water main is not at least 18 inches vertically clear above the irrigation water or sewer main, special construction will be required in accordance with Drawing C.3, "Sewer Crossing Water Pipeline Detail". Crossings shall be at approximately 90-degree angles.

(vi) Fire Hydrants. Fire hydrants shall be installed in accordance with Drawing C.4, "Standard Fire Hydrant Detail". The Owner shall obtain the approval from the fire protection authority and the District for fire hydrant locations and orientation of hose connections. Subject to the fire protection authority's approval for each water main extension, the following criteria are provided as general guidance for locating fire hydrants:

(a) In residential areas, fire hydrants will be spaced at a maximum distance, as measured along the street curb, of five hundred feet (500').

(b) Whenever practical, fire hydrants shall be located at the northeast corner of intersections.

(c) Where blocks in residential areas exceed eight hundred feet in length, intermediate hydrants will be placed near the center of the block.

(d) A fire hydrant will be placed at the end of each cul-de-sac longer than three hundred feet (300').

(e) In retail, commercial, and industrial areas, fire hydrants shall be spaced at a maximum distance of three hundred feet (300').

(f) Additional fire hydrants may be required in areas having large needed fire flows.

(vii) Pipeline Installation. Water pipelines shall be installed in a thorough and workmanlike manner in accordance with the District-approved construction documents and the Rules and Regulations. The minimum bedding and backfill requirements for pipelines and appurtenances shall be as shown on Drawing C.5, "Main and Service - Bedding and Backfill Detail".

(viii) Valves. Mainline valves on distribution mains shall be placed at a maximum spacing of six hundred feet (600'). At intersections, valves shall typically be placed in alignment with each extended property line. A valve shall be provided at each fire hydrant as shown on Drawing C.4. Valves shall also be placed at each side of creek or channel crossings.

(ix) Thrust Restraint. All water pipeline fittings (i.e. bends, tees, plugs, and caps) shall be installed with concrete thrust blocks adequately designed for the specific application. Thrust blocks shall be cast-in-place from concrete having a minimum compressive strength of 3,000 psi. Alternate means of thrust restraint may be considered and approved for use where proven to provide similar restraint. Supplemental restraint may also be used where the Owner's Engineer of record believes the soil bearing pressures to be inadequate, or is otherwise concerned about subsequent movement.

2.4.b Materials.

(i) Pipe. Water distribution mains 4-inch through 12-inch in diameter shall be polyvinyl chloride (PVC) conforming to AWWA C900 having a minimum pressure rating of 150 and a minimum wall thickness of DR18. Water pipelines larger than 12-inch diameter shall be PVC conforming to AWWA C905 having a minimum pressure rating of 165 and a minimum wall thickness of DR25. Pipe joints shall be gasketed push-on type. Potable water mains shall be blue or white. Irrigation water mains shall be purple and shall have the words "Reclaimed Water – Do Not Drink" imprinted thereon at regular intervals along each length of pipe.

Potable water distribution mains smaller than 4-inch shall be PVC conforming to ASTM D2241 having a minimum pressure rating of 200 psi., SDR21.

(ii) Fittings. Fittings shall be ductile-iron or cast-iron, 250 psi minimum working pressure, conforming to AWWA C153 or C110 with mechanical joint connections. Fittings shall have a cement mortar lining and bituminous exterior coating.

(iii) Buried Valves. Valves 12" and smaller shall be non-rising stem, resilient wedge gate valves with mechanical joint ends conforming with AWWA C509. Valves larger than 12 inches shall be butterfly valves with mechanical joint ends complying with AWWA C504. Valves shall have 2 inches square operating nuts and open left (counterclockwise rotation). Valves shall be Mueller, Clow, Waterous, or approved equal.

(iv) Sheathing. All ductile-iron or cast-iron valves, and fittings shall be polyethylene sheathed in accordance with AWWA C105. Sheathing shall have an 8 mil minimum thickness.

(v) Valve Boxes. Each buried valve shall be provided with a cast iron valve box and cover. The box shall have a minimum inside diameter of 5-1/4", be of the screw type for adjusting length. For potable water valves, the covers shall be round and shall have the word "WATER" cast thereon. For irrigation water valves, the covers shall be triangular and shall have the word "REUSE" cast thereon. Valve boxes shall be Tyler, Clow, or approved equal. Valve boxes shall allow for at least 3 inches additional extension above the level required for final grade at the time of initial installation.

(vi) Fire Hydrants. Fire hydrants shall be of the dry barrel type and conform with AWWA C502. Hydrants shall have a 5-1/4 inch main valve, two 2-1/2 inch hose connections and one 4-1/2 inch pumper connections. Hydrants shall have 6-inch mechanical joint connections, bronze seat ring, and safety traffic flange. Fire hydrants shall be Mueller Super Centurion 250 A-423, Waterous Pacer WB-67-250 or approved equal. Fire Hydrants shall be red except that the top cover casting and all outlet caps shall be purple when the hydrant is located on the irrigation system.

(vii) Tracer Wire. A tracer wire shall be installed with all water pipelines and shall consist of a 12 AWG type UF insulated solid copper conductor and surface access points. The wire shall be located near the bottom of the pipe. All splices shall be made using water tight connectors suitable for direct bury. Tracer wires shall be brought to surface access points at a maximum distance of every 500 feet. When Service Lines are installed with the water mains, convenient water meter pits may be used for access points and shall be so indicated on the record drawings. When Service Lines are not installed with the water mains or are otherwise unavailable, access points shall be located preferably near fire hydrants, alternately near valve boxes, and shall consist of a ABS plastic body with cast-iron collar and pentagonal nut locking cover with terminals; Valvco, Inc. Mini-Test Station or approved equal.

(viii) Buried Pipe Warning Tape. All water pipelines shall be installed with warning tape. Warning tape shall be 3 inches wide, 5 mils thick, with ½ mil aluminum center core. Warning tape shall be installed centered over the pipelines and between six and eighteen inches below bottom of road base or finished grade, as applicable. The warning tape for potable water pipelines shall be blue in color and imprinted with "Caution Buried Water Line Below". The warning tape for irrigation pipelines shall be purple in color and imprinted with "Caution Buried Rec. Water Line Below".

(ix) Flushing Hydrants. Flushing hydrants shall be installed on the potable water mains when fire hydrants are located on the Irrigation System. Flushing Hydrants shall be located to allow for pipeline flushing by sections not exceeding 1,200-foot in length. The flushing hydrants shall be of cast iron with brass working parts, padlockable valve actuator cover, traffic breakaway flange, 2" FIP inlet, and 2½" NST outlet with cover.

Flushing hydrants shall be of the full draining style for a 4'-6" cover depth. Provide "MainGuard" from Kupferle Foundary Company or approved equal. Flushing hydrants on the potable water system shall be painted red while those on the irrigation system shall be purple.

2.5 SANITARY SEWER COLLECTION SYSTEM

2.5.a Design/Sizing.

(i) General. Collection sewer system design is intended to provide gravity service to essentially all properties in the District. Sewage flows shall be directed to the trunk sewer having designed capacity as indicated by the District's Master Plan. Sewage lift stations will not be permitted unless specifically authorized by the Board.

(ii) Design Capacity. Collection sewers shall be designed to carry not less than the projected peak flow rates flowing half full, unless otherwise approved by the District Engineer. Sewers shall be so designed and constructed to give mean velocities, when flowing full, of not less than 2 feet per second.

(iii) Loadings. The Owner's Engineer shall be responsible for determining sewage loadings from customers of the District Wastewater Facilities and shall use the best planning information available. Recommended minimum wastewater loadings for some common users are listed following (gpd = gallons per day, SFFA = Square Foot Floor Area):

Customer	Average Day Wastewater Loading
Single family residential	260 gpd per unit
Multi-family residential and mobile homes	150 gpd per unit
Neighborhood retail and commercial, medical offices	0.3 gpd per SFFA
Office buildings, warehouses	0.1 gpd per SFFA
Restaurants	1 gpd per SFFA

The minimum acceptable peaking factor, defined as the ratio of the peak flow divided by the average day wastewater loading in million gallons per day (MGD), shall be as determined by the following equation, except that a maximum peaking factor of 5.0 is acceptable:

$$\text{Minimum Peaking Factor} = 3.6 / (\text{Average Day Flow in MGD})^{0.167}$$

Peak flow contributions from sewage lift stations and from customers that generate large amounts of wastewater (e.g., car washes) shall also be considered.

(iv) Minimum Size. The minimum diameter of collection sewers shall be 8 inches.

(v) Location. Unless otherwise approved by the District Engineer, sewer pipelines shall be located at the center of the street with potable water pipelines being located to the north or east and irrigation water pipelines and storm sewers being located to the south or west.

(vi) Depth. Sewers shall generally be designed with sufficient depth to serve basements by gravity. The minimum cover shall be 6 feet from top of sewer to finished grade.

(vii) Manhole Spacing. Manholes shall be located at a maximum spacing of 400 feet, at changes in sewer pipeline alignment and/or grade, and at the end of each sewer. Sewers shall be laid with uniform slope and straight alignment between manholes.

2.5.b Sewer Pipeline Materials.

(i) Pipe: Sewer pipe and fittings shall be polyvinyl chloride (PVC), SDR 35 minimum thickness conforming to ASTM D3034. Joints shall be of the "slip on" type with integrally cast bell having an elastomeric gasket. When subdrains are to be constructed in the same trench, sanitary sewer pipe shall be green in color (or other approved color) and the subdrain shall be white or black.

(ii) Manholes: Manholes shall be precast concrete units conforming with ASTM C-478. Manholes shall have a minimum inside diameter of 4 feet. Manholes shall be constructed and installed in accordance with the appended drawings: Drawing C.6, "Standard Precast Concrete Manhole"; Drawing C.7, "Shallow Precast Concrete Manhole"; and Drawing C.8, "Drop Detail for Manhole". An approved fall protection device shall be provided at each manholes over sixteen feet deep. An intermediate landing platform shall be provided for each manhole over thirty feet deep.

(iii) Manhole Covers: Manhole frames and covers shall be cast iron with the word "SEWER" cast thereon. The frame shall provide a minimum clear opening of 22 inches.

2.5.c Installation.

(i) The sewer system shall be installed in a thorough, workmanlike manner in accordance with the design documents that have been approved by the District. The minimum bedding and backfill requirements shall be as shown on Drawing C.5, "Main and Service - Bedding and Backfill Detail".

(ii) Where sewers are within 10 feet of water pipelines, sanitary separation of the water pipelines shall be provided in conformance with Drawing C.3. Where concrete encasement is used, it shall be in conformance with Drawing C.10, "Pipe Encasement Detail".

(iii) Care shall be taken to insure that no earth, sand, rocks or other foreign material enter the sewers or manholes during construction.

2.5.d Subdrains. The District may permit subdrains to be installed with the sanitary sewers in certain circumstances subject to all of the following conditions:

(i) Subdrain piping is watertight and leak free where installed in the sanitary sewer trenches.

(ii) The subdrains do not connect to the sanitary sewer manholes or to any sanitary sewers.

(iii) The subdrain pipe material and installation procedures are approved by the District.

(iv) Subdrain flow is diverted from the sewer trench as frequently as practicable based on grade and availability of storm sewers or drainageways.

(v) The Owner of the subdrains will at all times indemnify and hold the District harmless from any and all liability, expenses, claims or damages, including reasonable costs of defense, based upon, arising out of or alleged to be due to contamination of stormwater by leakage from the adjacent sanitary sewers or due to leakage from or other failure of the subdrains, or which in any other way arise from the subdrain being located with the sanitary sewers. The Owner of the subdrains shall be responsible for the Actual Cost of repairing any District Facilities damaged as a result of the failure of the subdrain or otherwise caused by the subdrain being installed in the sanitary sewer trenches. {Subsection modified by Resolution 2004-10.}

SECTION 3 - CONSTRUCTION

3.1 PRELIMINARY MATTERS

3.1.a Commencement: No work shall commence on any Main Extension until the construction documents have been approved in writing by the District, all necessary easements have been recorded, the preconstruction meeting required herein has been held, and the District has given its approval for construction to begin. If construction has not commenced within one year after the District's approval, or if construction is halted for more than one year, the construction documents shall be resubmitted for review and approval.

3.1.b Preconstruction Meeting: The Owner shall schedule a preconstruction meeting to include at least the Owner's contractor, the Owner's professional engineer, and representatives from the District and Owner. The purpose of the meeting shall be to discuss the construction project, scheduling, and to define responsibilities for the personnel involved in the project. The Owner shall give at least 48 hours notice to the District prior to the preconstruction meeting.

3.1.c Laws and Permits: The Owner shall comply with all applicable local, county, State and Federal rules, regulations, ordinances, standards and specifications. The Owner shall be solely responsible for identifying and obtaining any and all permits required for the work from other governmental entities or agencies having jurisdiction and shall perform all work in accordance therewith.

3.1.d Available Capacity: Water mains shall not be installed unless they can be extended from an approved permanent water source which can supply sufficient water to meet anticipated demands and to provide water for chlorinating, flushing, and hydrostatic testing. Sewer main extensions shall not be installed unless they can be connected to an approved trunk sewer that has available capacity and that the wastewater treatment facility has adequate capacity to handle the additional loading.

3.1.e Warranty: The Owner is responsible for a one year warranty providing for maintenance and repair pursuant to §5.10 of the Rules and Regulations. All materials and workmanship furnished by the Owner shall conform to these Minimum Design Standards and to the construction documents approved by the District, and shall be free from all defects.

3.1.f Utilities, Structures And Property

(i) Although the District will make available to the Owner, upon the Owner's request, information that the District possesses concerning the location of its underground facilities in the vicinity of the work, the Owner shall be finally and solely responsible for notifying all owners or operators of underground and aboveground utilities and structures of his intent to work in the area and for determining the existence and location of all structures and subsurface utilities in the vicinity of the work.

(ii) If any utility, structure or other property is damaged by the Owner during the work, the Owner shall immediately notify the District and, if different, the owner of the utility, structure or property. The Owner shall immediately take such measures as may be reasonably necessary or appropriate to protect public health and safety, to minimize further damage to the structures, facilities or property and, when applicable, to prevent the escape of water from or the entry of water or debris into the District's system and to prevent and mitigate damage due to water or sewage escaping from the District's

system. Unless otherwise authorized by the District, the District shall repair damaged District facilities and will assess the costs thereof to the Owner, as provided for in §8.5.b of the Rules and Regulations.

(iii) An Owner who damages any utility, structure or property shall indemnify and hold the District harmless against any and all claims for damages resulting either directly or indirectly there from.

3.1.g Indemnification: By undertaking any work subject to these Minimum Design Standards, the Owner agrees to indemnify and hold harmless the District from any and all liability, claims, and demands, on account of any injury, loss, or damage, including without limitation claims arising from bodily injury, personal injury, sickness, disease, death, property loss or damage, or any other loss of any kind whatsoever, which arise out of or are in any manner connected with the work provided that such injury, loss, or damage is caused in whole or in part by, or is claimed to be caused in whole or in part by, the act, omission, error, professional error, mistake, negligence, or other fault of Owner, or which arise out of any Workmen's Compensation claim by any employee, contractor, subcontractor or agent of the Owner. The Owner agrees to investigate, handle, respond to, and to provide defense for and defend against such liability, claims or demands at the Owner's sole expense. Nothing in this section shall be deemed to impose any obligation upon the Owner to defend or hold the District harmless against claims for damages legally caused by any unlawful act or omission of the District.

3.1.h Contractor: Contractors performing any work for Main Extensions or Service Lines shall be competent firms with adequate experience, manpower and equipment to accomplish the work in accordance with these Minimum Design Standards and the approved construction documents. A responsible representative of the Contractor shall be present at the jobsite whenever work is being conducted by the Contractor or his subcontractors.

3.1.i Working Hours. Unless otherwise limited or approved by the District, and other local jurisdictions as applicable, work on water and sewer utilities shall occur during standard working hours of 7 a.m. to 7 p.m. Monday through Friday, excluding standard holidays.

3.1.j Documents Onsite: A signed copy of the approved construction documents and all appropriate permits shall be kept on the project site by the Owner at all times and be made available to District personnel upon their request.

3.1.k Surveying. Line and grade for water or sewer main extensions shall be established by or under the direct supervision of a Colorado-licensed professional engineer or land surveyor. All work shall be done in a workmanlike manner. Correct alignment and elevation of water and sewer mains as shown on the approved construction drawings is the responsibility of the Owner. Approval of the staked alignment and elevations by the District does not relieve the Owner in any manner from the responsibility for field errors.

3.1.l Coordination With Street Grading. Prior to the installation of water or sewer mains in streets, grading in the vicinity must have progressed to at least the subgrade stage unless otherwise approved by the District. Subgrade is defined as an elevation of no more than 1 foot below the final grade proposed for the street.

3.1.m Notification. The Owner shall give at least 48 hours notice to the District before the start of construction. Construction shall not proceed until all construction documents have been approved by the District and a preconstruction meeting has been held with the District.

3.1.n Customer Notification. Adequate provisions for notification of customers who may suffer outages shall be developed and used by the Owner and shall be coordinated with the District. Outages shall be kept to a minimum.

3.1.o Operation Of Valves. The District shall be notified whenever it becomes necessary to open or close a valve on the District's water systems. Except in the event of an emergency, only District personnel are authorized to operate these valves. The District shall be promptly notified of any valve operation by non-District personnel.

3.1.p Adjusting Manholes, Valves And Hydrants: All valve boxes, manholes and fire hydrants shall be adjusted to the final finished grade by the Owner.

3.2 CONSTRUCTION OBSERVATION/TESTING

3.2.a Purpose Of District Observation: Construction observation by the District is for the purpose of determining with reasonable certainty that all work is completed in accordance with these Minimum Design Standards and the approved construction documents. The extent of the District's construction observation shall be discussed at the preconstruction meeting and will take into account the construction inspection services to be performed by the Owner's engineer. The District's observation shall not be construed as a guarantee by the District of the Owner's contractor's performance. The District is not responsible for safety in, on, or about the construction site, nor for compliance of any regulations relating thereto. The District exercises no control over the safety or adequacy of any equipment, materials, or work methods used, or in superintending of the same.

3.2.b Testing: The Owner shall be solely responsible for the cost of all testing required to verify that the work performed complies with these Minimum Design Standards and the approved construction documents. At a minimum, tests shall be conducted for those items described following. The District may require additional testing if deemed necessary by the District to establish compliance with the minimum requirements. All tests shall be observed by the District unless otherwise approved by the District and except for compaction testing. The Owner shall notify the District not less than 48 hours prior to the anticipated test times and shall be responsible for all instruments and materials required for testing. The Owner shall remedy any defects identified by the District until compliance with the standards and documents is achieved. Inspection and testing will be repeated following completion of remedial work.

3.2.c Compaction Testing And Geotechnical Observation: Geotechnical observation and compaction tests will be performed by the Owner's soils engineer to establish bedding and backfill compaction, foundation suitability, and trench stability. Compaction testing shall occur at a minimum every 200 feet along the length of the trench. Half of the tests shall occur midway between the pipe and top of the trench, after that depth has been fully compacted. The other half of the tests shall occur at the top of the subgrade (or top of trench if not in the roadway). Additional compaction testing shall be required near any valves, services, manholes, vaults or other appurtenances. If initial compaction tests do not establish compliance with the Minimum Design Standards and construction documents, the substandard areas shall be reworked and additional compaction tests performed until compliance is demonstrated. Copies of all compaction tests shall be provided to the District on the working day following the test.

3.3 WATER SYSTEM TESTING & DISINFECTION:

3.3.a Leakage Testing. All water pipelines, after all components restraining pipe movement are in place, shall be pressure and leakage tested at not less than 150 psig. Testing shall be in conformance with AWWA C600. No pipeline installation will be acceptable until the leakage is less than the amount computed by the following formula:

$$L = \frac{SD(P)^{0.5}}{133{,}200}$$

L = Allowable leakage in gallons per hour
S = Tested length of pipe, feet
D = Nominal diameter of pipe, inches
P = Average test pressure during the test, psig

3.3.b Disinfection and Bacteriologic Testing. All potable water piping shall be disinfected in accordance with AWWA C601. Chlorine shall be added to the water used to fill the pipeline or chlorine tablets shall be placed along the length of the pipeline in an amount and manner to form a minimum 50 ppm free chlorine residual at all locations inside the pipeline. The chlorine solution shall be left in the pipelines for not less than 24 hours, during which time all valves and fire hydrants shall be operated in order to disinfect the appurtenances. After that length of time, the chlorine residual of the solution, at any place in the system, shall not be less than 10 ppm. All chlorination work must be done under the observation of the District. At the end of at least 24 hours, but in no event longer than 72 hours, bacteriological testing is to be performed to insure adequate disinfection to the satisfaction of the local health authority and the District.

3.3.c Flushing. After satisfactory leakage testing of the water pipelines, and after satisfactory disinfection and bacteriologic test results have been obtained for potable water pipelines, the pipelines shall be flushed. The Owner shall be responsible for the safe disposal of the highly chlorinated water in accordance with all applicable laws and regulations.

3.4 SEWER SYSTEM TESTING

3.4.a Sewer Pipeline Testing: The testing procedures set forth below are intended to determine if the sanitary sewers meets the District's minimum standards. Alternative procedures meeting or exceeding the intent of these procedures and accepted by the District may be used. Regardless, testing procedures shall be included in the construction documents.

(i) Pipeline Flushing. The Owner shall flush the pipelines, as the work progresses by means that are in accordance with good practice, to insure that earth, sand, rocks or other foreign materials are removed from the interior of the pipeline.

(ii) Alignment and Grade. Sewer pipelines will be checked by the District to determine whether any displacement of the pipe has occurred after the trench has been bedded. Light will be flashed between manholes, or if the manholes have not yet been constructed, between the locations of the manholes. If the illuminated interior of the pipelines shows poor alignment, displaced pipe, debris, or other defect, the defect shall be remedied by the Owner to the District's satisfaction.

(iii) Leakage. Tests for water tightness shall be made by the Owner in the presence of the District and be documented by the Owner to insure that all sewers are satisfactorily tested. The sewer and connections shall not leak in excess of the following rate for a 24-hour test period:

Table 1 - MAXIMUM ALLOWABLE SEWER LEAKAGE

Pipe Size Inches	Maximum Leakage Gal/Foot/24 Hours
8	0.30
10	0.38
12	0.45
15	0.57
18	0.68

Each reach of pipeline between manholes shall be tested individually. Any individual reach that leaks in excess of the amount allowed in the previous paragraph shall be considered as failing, and shall be repaired and retested. At the discretion of the District, the time for leakage rate test may be shortened to four (4) hours. The tests and measurement of infiltration or exfiltration shall be conducted in a manner approved by the District. Infiltration tests shall be used if the groundwater table is one foot or more above the finished sewer. Otherwise, exfiltration tests will be used. The minimum head for the exfiltration tests shall be two feet above the top of the pipe at its highest point in the test section. Sections shall be bulk-headed so that during any test the head on the sewer at its lowest elevation will not be more than ten feet.

(iv) Low-Pressure Air Test. At the option of the Owner, low pressure air testing of the installed sewer pipe may be used instead of exfiltration test for leakage. The construction documents shall specify the testing procedure including safety precautions. If the time shown in Table 2 for the designated pipe size and length, elapses before the air pressure drops 1.0 psig (from 3.5 to 2.5 psig after stabilization), the section undergoing testing shall be considered to have passed. At no time during testing shall the air pressure be allowed to exceed 5 psig.

TABLE 2
MINIMUM TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP
FOR SIZE AND LENGTH OF PIPE INDICATED

Pipe Diameter (in.)	Minimum Time (min:sec)	Length for Minimum Time (ft.)	Time for Longer Length (sec)
8	7:34	298	1.520 L
10	9:26	239	2.374 L
12	11:20	199	3.419 L
15	14:10	159	5.342 L
18	17:00	133	7.692 L

(v) Deflection. All PVC sewer pipelines shall be tested for vertical deflection after placement and compaction of backfill unless testing is specifically excepted by the District. Method of testing shall be by deflectometer of the rigid Go/No-Go type unless an alternative methods is approved by the District. Maximum allowable deflection shall be five- percent of the pipe diameter. Any pipe with deflection greater than the allowable shall be replaced and retested.

3.4.b Manhole Testing:

(i) Visual Examination. The District shall visually check each manhole, both exterior and interior, for flaws, cracks, holes, or other inadequacies which might affect the operation or watertight integrity of the manhole. Should any defects be found, the Owner shall make any repairs to the District's satisfaction.

(ii) Leakage Test. All manholes shall be tested for leakage and all tests shall be witnessed by the District. The leakage test shall he conducted prior to backfilling around the manhole and shall be carried out using one of the following described procedures:

(iii) Water Test of Manholes

(a) All sewers leading into or out of the manhole shall be tightly plugged.

(b) The manhole shall be filled with water to a level at least 2 inches above the uppermost step. The water shall be allowed to stand for two hours to allow for normal water absorption into the manhole material. At the end of the two-hour stabilization period, if the water level in the manhole has dropped below the top step, additional water will be added to bring the level above the step as before. Any visible external leakage or drop in water level noted within the one-hour test period shall constitute failure and the Owner shall repair or replace the defective work and retest.

(iv) Vacuum Test of Manholes. The vacuum testing procedure shall be generally be performed in the following described manner. The construction documents shall provide a detailed description of the testing procedures including safety precautions.

(a) All sewers leading into or out of the manhole shall be tightly plugged.

(b) The vacuum test head shall be placed and secured on the top manhole cone or cover section.

(c) A vacuum of 10" mercury (Hg) shall be drawn and the vacuum pump shall be turned off.

(d) The time for the vacuum to drop to 9" Hg shall be noted and recorded.

(e) For a successful test, the minimum time in seconds that must pass for the vacuum to drop from 10" Hg to 9" Hg shall be as follows: 60 seconds for 4-foot manholes, 75 seconds for 5-foot manholes, and 90 seconds for 6-foot manholes.

3.5 DESIGN REVISIONS DURING CONSTRUCTION: In the event that field conditions are encountered which prohibit construction from occurring in substantive conformance with the approved construction documents, a meeting shall be scheduled by the Owner with the Owner's engineer and District to discuss necessary design changes. Construction shall not deviate from the approved construction documents without the prior review and approval by both the Owner's engineer and the District.

3.6 DEFECTIVE MATERIALS: All materials used shall conform with these Minimum Design Standards and the construction documents and shall be subject to the inspection by the Owner's

engineer and District at all times. Any nonconforming or defective materials, whether installed or not, shall be promptly removed from the construction site upon the direction of the District or the Owner's engineer and shall not be returned to the construction site or otherwise used in the work unless the defects are cured to the satisfaction of the District and the Owner's engineer.

3.7 STOP WORK ORDERS: The District may revoke any approval for construction work and issue a Stop Work Order upon a determination that the Owner has violated or is about to violate any provision of these Minimum Design Standards, the District's Rules and Regulations, or the approved construction documents. The Stop Work Order shall take effect immediately upon issuance by the District and notice to the Owner, and shall remain in full force and effect until rescinded in writing by the District. No person shall undertake any work in violation of the terms of the Stop Work Order except as may be permitted by the District or otherwise required in order to render the construction site safe and secure.

3.8 CURE OF DEFECTS: If the District determines that any part of the work was not performed in conformity with the District's Rules and Regulations and the approved construction documents, or that said work is defective, of poor or un-workmanlike quality, or not in conformity with any applicable warranty, it may give written notice to the Owner describing the defective work and directing the Owner to proceed with remedial work in accordance with the provisions of §8.5 of the Rules and Regulations, which provisions shall apply to and govern the rights and obligations of the parties with respect to the cure of the noticed matters.

3.9 FINAL PUNCH LIST: Upon substantial completion of the project, the District will provide the Owner a punch list of items that do not comply with the Minimum Design Standards or approved construction documents. The Owner shall repair, replace or complete all items on the punch list to the satisfaction of the District within 30 days. The Owner may then apply for conditional acceptance in accordance with §5.9 of the Rules and Regulations.

3.10 CONVEYANCE AND ACCEPTANCE: Conditional and final acceptance by the District of facilities intended to be owned and operated by the District shall be accomplished as provided in §5.9 and §5.11 of the Rules and Regulations.

SECTION 4 - SERVICE LINES

4.1 GENERAL PROVISIONS

4.1.a Scope; Applicability: The provisions of this Section 4.1 shall apply generally to potable water, irrigation water, and sewer Service Lines and appurtenances. The provisions of Sections 4.2, 4.3, and 4.4 below shall apply specifically to the potable water, sewer and irrigation water Service Lines, respectively.

4.1.b Procedure For Obtaining Water And Sewer Service: The Owner shall comply with and be governed by the provisions of Article 4 of the Rules and Regulations in connection with obtaining water and sewer service.

Upon the District's acceptance and approval of the completed License Application, and after obtaining any approvals required by the local building authority, the Owner may proceed to construct its Service Lines except that the water meters shall not be installed and the tap to the District's systems, or the final connection to stub outs from the District's systems when said stub outs are available, shall not be made prior to the District's inspection and approval of the Service Lines.

When the Owner is ready to tap or otherwise connect to the District's facilities, the Owner shall contact the District for an open trench inspection at least two business days before the tap/connection is to be made. Excavations for Service Lines shall remain open until the District's inspection and approval of the Service Lines. The Owner will be solely responsible for re-exposing any part of the Service Lines which have been backfilled without the District's inspection and approval in the event that the Owner fails to notify the District in accordance herewith. The Owner may connect to the District's system and install the water meter following the District's inspection and approval of the Service Line. The District will turn on the potable or irrigation water and record initial meter information following the Owner's completion of their Service Lines.

4.1.c Licensed Plumber Required; Compliance With Laws: Construction of all Service Lines and Taps shall be done only by a licensed plumber under the District's observation. All Contractors, licensed plumbers, and other persons doing work on any mains, Service Lines, or other water and sewer facilities in the District shall comply with Federal, state, county, and municipal regulations. All permits, fees, and Licenses shall be paid for prior to the start of construction on any Service Lines or Main Extensions.

4.1.d Design/Construction Requirements:

(i) Potable water, irrigation water, and sewer Service Lines shall have ten feet minimum of horizontal separation. Where this separation is impractical the District may permit other arrangements, in accordance with the Colorado Department of Public Health and Environment standards.

(ii) Potable water and sewer Service Lines shall enter a structure approximately perpendicularly and shall provide flexibility such that the service will not be damaged by settlement of the structures. Where routed parallel to a structure's wall, Service Lines shall be at least five feet from the wall.

(iii) Excavations required for the installation of Service Lines shall be open trench unless otherwise approved by the District.

(iv) Service Lines shall be constructed in accordance with applicable codes, generally accepted good construction practices, and these Minimum Design Standards. These Minimum Design Standards are provided for standardization purposes only, and represent minimum design standards which may require upgrading for specific applications. Materials not specifically referenced in these Service Line Standards, but required to complete the Service Line installations, shall be of a type, style and manufacture approved by the District.

(v) Excavations for Service Line installations shall be adequately guarded with barricades and lights so as to protect the public safety. Street, sidewalks, parkways, and other public or private property disturbed in the course of work shall be restored to their original condition in a manner satisfactory to the owner or other authorities responsible for maintenance of the disturbed property.

(vi) All Service Line connections to the District's water and sewer systems shall be made at locations acceptable to the District and be in a public street or in a similar place to which the District has as free a right of access as it would have in a public street and which is otherwise suitable for the installation of buried piping.

4.1.e Maintenance: The Owner shall maintain all Service Lines and appurtenances, which includes the Service Line piping and all fittings, valves, meter pits, and all other fixtures and appurtenances except the water meters. The curb stop and/or meter pit on water Service Lines and clean outs on sewer services shall be kept conveniently accessible from the street or other approved public right-of-way and shall be clear of trees and shrubs for a minimum of two feet around the meter pit, in good working order, and properly capped and clean of debris. Any box or pit not conforming to these Standards shall be cleaned, repaired or relocated by the Owner of the premises within a reasonable time after notification by the District. The District is not responsible for the thawing of frozen Service Lines, for the repair of damaged Service Lines, or for any other repair or maintenance of the Service Lines except for the water meters.

4.1.f Cross-Connections Prohibited: In order to prevent the possibility of contamination or pollution due to backflow or back siphonage, no cross-connection shall be allowed between the District's potable water or irrigation systems and any potential source of contamination or pollution. No interconnection between the District's potable water and irrigation systems shall be allowed. Definitions, specifications, standards, policies and regulations established in the "Colorado Cross-Connection Control Manual," published by the Colorado Department of Public Health and Environment, shall be observed and complied with.

4.2 POTABLE WATER SERVICE LINES

4.2.a Design/Construction Requirements:

(i) Sizing. Sizing of the Service Line shall be the responsibility of the Owner and shall be made in general conformance with AWWA Manual M11, "Sizing Water Service Lines and Meters", and be subject to the District's approval. The Owner shall at his expense furnish calculations and other information as required for the District's evaluation of the service size.

(ii) Location. The water service shall be laid at uniform grade and in straight alignment so as to have a minimum cover of 4½ feet from final finish grade. A reference mark shall be placed on the curb above the Service Line. No Service Line shall be more than one hundred feet in length from the property line to the point of connection to the structure unless specifically approved by the District.

(iii) Water Meter Location. The water meter shall be placed in a pit located near the property line. When that location is not reasonably available, the District Manager may permit an inside meter installation provided that the meter and the meter's remote reading device will be located at readily accessible locations, that there will be no reasonable possibility for the meter to be bypassed or water to be taken upstream of the meter, that the District has perpetual access to the meter for inspections and maintenance, and that no additional liability or obligations are assumed by or imposed upon the as a result of the meter being located inside. Curb stops shall be installed near the property line for each service having an inside meter installation. Where a potable water meter is located inside for a premises also having an irrigation service, the remote read conductors shall be extended from the potable meter to the TouchRead pit-lid meter register for the irrigation meter for that premise.

(iv) Service Line Installation. Service pipelines shall be bedded and backfilled in accordance with Drawing C.5, "Main and Service - Bedding and Backfill Detail".

(v) Cross Connections. Cross connections of any type that permit or could permit a backflow condition from any source other than the District's potable water mains are strictly prohibited. The District will not provide water service to any Owner unless the potable water supply is protected from potential or actual cross connections as required by State and District regulations.

(vi) Pressure Regulation. All services shall be equipped with a pressure reducing valve (PRV), except where specifically exempted by the District. The PRV shall be downstream of the meter and upstream of all uses. Installation of the PRV in the meter pit may be acceptable to the District if the pit and piping are designed such as not to interfere with the District's access to the meter for service and inspection. The PRV shall be set for a downstream pressure not exceeding 80 psig.

(vii) Thermal Expansion. Due to the provision of a backflow preventer on the potable water service line, each Owner shall install and maintain an expansion tank on the potable water service downstream of the meter. Each Owner shall be solely responsible for the proper sizing, selection, installation, operation and maintenance of their expansion tank.

4.2.b Potable Water Service Materials: All materials used for potable water service shall be NSF 61 certified.

(i) Water Service Pipeline. Potable water service pipeline 2" and smaller shall be Type K, soft copper conforming to ASTM B88. Fittings shall be brass or copper alloy. Connections shall be by flared joints with no soldered joints permitted for buried piping. Service Lines larger than 2" shall be approved by the District.

(ii) Corporation Stops. Bronze-bodied corporation stops shall be used for the connection of services 2-inch and smaller to the water main. Corporation stops shall be of the ball-

type and conform with AWWA C800. The inlet shall be standard AWWA taper inlet thread and the outlet shall be for flared copper service pipe. Corporation stops shall be Mueller B-25000, Ford FB-600, or approved equal.

(iii) Curb Stops. Bronze-bodied curb stops with cast-iron curb boxes shall be used for all services 2-inch and smaller having inside meter installations. Curb stops shall be of the ball-type and conform with AWWA C800. Connections shall be for flared copper service pipe. Curb stops shall be Mueller B25204, Ford B-22, or approved equal. Curb boxes shall be Mueller H-10334, Ford EA-2 or approved equal, with arch pattern base, brass pentagon plug, stationary rod, and round cover with the word "WATER" cast thereon.

(iv) Service Saddles. Bronze-bodied service saddles approved for use on AWWA C900 PVC pipe shall be used for all water taps and shall have positive stops to prevent over tightening. Provide Mueller H-13000 series, Ford Style S70, or approved equal.

4.2.c Meters And Appurtenances:

(i) Potable water meters 2-inch and smaller shall be bronze-cased, sealed register, positive displacement, magnetic drive meters. Meters shall be Sensus SRII for 5/8" through 1" and Sensus SR for 1 1/2" and 2" sizes. All meters shall be provided with a TouchRead register with PitLid-type for meters installed in pits and ECR-type for inside meter installations.

(ii) Meter Pits for meters 1-inch and smaller shall be precast concrete with 20-inch inside diameter and a wall thickness of not less than 2 inches. The minimum strength of the concrete shall be 5,000 psi. Setting shall consist of a lower section with bottom notches for entrance and exit of the service pipe. Meter pits for 1½ -inch and 2-inch meters shall consist of 4-foot or larger precast concrete manhole sections (conforming to ASTM C478) and generally conform to Drawing B.3. Barrel sections shall fit together allowing no visible gaps and the top section shall be shaped for placement of the meter box cover. Adjustable grade rings shall be of reinforced concrete or cast iron.

(iii) Meter Pit Covers for 1-inch and smaller meters shall have a cast iron frame and cover with rubber or plastic inner frost lid. Installed depth shall be about 10 inches. The top cover shall have a worm type lock with standard waterworks pentagonal head. The lid and cover shall be Ford Wabash No. W3-D-T or approved equal with hole for installing a TouchRead pit lid meter register. Covers for larger than 1-inch meters shall be cast iron, provide a minimum 22" clear opening, be of suitable strength for the intended location, and be approved by the District on a case-by-case basis. All meter pit covers shall have the word "WATER" cast thereon.

(iv) Meter Setters shall be used for all 2-inch and smaller meters and shall consist of a copper meter yoke with inlet angle ball valve. The meter setters shall be designed and installed such that the centerline of the meter is located between 14 and 18 inches from the top of the meter pit cover and so as not to interfere with the frost lid or meter register. Meter setters shall be manufactured by Ford, Mueller or approved equal. Also, refer to §4.2.c(vii) for backflow preventer requirements.

(v) Dual Potable Meter Pits. When a meter pit for residential potable services is located on a property line common to two adjacent properties, the use of a single, larger diameter meter pit for two ⅝" x ¾" potable meters with a single 1" corporation stop and service line from the water main to the meter pit may be permitted when the meter pit cover is provided with double holes for the TouchRead modules and where an appropriate meter setter that accommodates access and service of the meters and the dual check valves is used.

(vi) Larger Than 2-inch. Meters and installation details for potable water services larger than 2-inch shall be reviewed and approved by the District on a case-by-case basis. Meters larger than 2-inch shall normally be Sensus compound type.

(vii) Backflow Preventers shall be provided at each potable water service installation. For meters 1" and smaller, an ASSE approved top entry, vertical, cartridge-type, dual-check valve with test cocks shall be provided at the outlet side of the meter setter. For larger meters, an ASSE approved dual-check valve with test cocks shall be provided immediately downstream of the water meter.

4.3 SEWER SERVICE LINES

4.3.a General Design: The size and slope of the service sewer shall be subject to the approval of the District, but in no event shall the diameter be less than 4". Minimum grade and slopes shall be as follows:

4" ...2.0% Normal; 1.0% Absolute Minimum
6" ...1.0%
8" ...0.6%

4.3.b Service Connection: When practicable, pre-installed wye fittings shall be used for service connections; otherwise the connection of the sewer Service Line to the District's sewer main shall be made as follows: If the sewer main is 12 inches or smaller, the Owner shall, at his expense, install a saddle on up to 8-inch branches in the public sewer. Where the public sewer is greater than 12 inches, a neat hole may be cut into the public sewer, with entry in the downstream direction at an angle of 45 degrees. The use of saddles is mandatory. Service connections shall conform to Drawing B.6, "Sewer Service Connection Detail".

4.3.c Sewer Service Materials: Sanitary sewer service pipe shall be PVC conforming with ASTM D3034, with a minimum wall thickness to provide a standard dimension ratio (SDR) of 35 or less. Pipe shall be green or other similar acceptable color.

4.3.d Design/Construction Requirements:

(i) The sewer Service Line shall be water tight and installed at a constant grade, in a straight line, and not closer than 5 feet from any bearing wall.

(ii) Service Line cleanouts shall conform to Drawing B.7 "Service Line Cleanout Detail". Cleanouts are required for any significant change in Service Line direction and at intervals no greater than 100 feet or as otherwise required by the local building authority.

(iii) Sewer Service Line excavation bedding and backfill shall be in accordance with Drawing C.5, "Main & Service - Bedding and Backfill Detail".

4.4 IRRIGATION SERVICE LINES

4.4.a Irrigation System Standards and Use Guidelines. The Owner of every premises obtaining service from the District Irrigation System shall be subject to and abide by the requirements contained in the District's "Irrigation System Standards and Use Guidelines", Appendix C hereto.

4.4.b Installation Requirements: Criteria established for potable water Service Lines in Section 4.2 above shall apply for the irrigation water Service Lines with exceptions as set forth below:

(i) Irrigation Service Lines that are continuously pressurized shall not be installed closer than 10 feet horizontally to the potable water or sewer Service Lines. Where a crossing of a potable water main or Service Line is required, the crossing shall be near perpendicular and the Irrigation Service Line shall cross at least 18 inches below the potable water line.

(ii) No irrigation Service Line shall be extended to inside a building or to within five feet of a building's foundation.

(iii) Each irrigation meter pit shall be installed on at least ½ cubic yard of washed gravel to allow for draining of water from the piping downstream from the meter.

4.4.c Irrigation Service Materials: All materials used for irrigation Service Lines will be easily and readily distinguishable from materials use for potable water Service Lines. Materials shall be as specified in Section 4.2 above for potable water Service Lines, with exceptions as set forth below.

(i) Pipe shall be plastic and shall conform with the following requirements:

(a) 1/2-inch thru 3-inch pipe shall be polyethylene tubing conforming to AWWA C901, SDR9, 200 psi working pressure rating, with copper-pipe sized outside diameter. Pipe shall be extended from the corporation stop to the meter setter with an un-splice length.

(b) Pipe larger than 3 inches shall be polyethylene conforming with AWWA C906, SDR9, 200 psi WPR.

(c) Pipe shall be purple in color and imprinted with the legend "Reclaimed Water" at intervals not exceeding two feet.

(ii) Fittings and Connections. Corporation stops, curb stops, and other fittings for 2-inch and smaller irrigation services shall be bronze-bodied as specified for potable service except that connections shall be of the compression style; Ford, Mueller or approved equal. Stainless steel insert stiffeners shall be used at each compression connection. Fittings for 3-inch and larger Service Lines shall be of the butt fusion type complying with ASTM D3261 or the electrofusion style conforming to ASTM F1055. All fittings and connections shall accommodate and/or restrain the thermal expansion/contraction of the PE pipe and be approved by the pipe manufacturer, with written notice indicating

said approval being included with the record set of the construction documents. Curb box covers shall be triangular or be circular with triangle cast thereon and shall have "IRRIG" cast thereon.

(iii) Buried Pipe Warning Tape. The warning tape shall be purple in color and imprinted with "Caution Buried Rec. Water Line Below".

(iv) Tracer Wire. A tracer wire shall be installed with the irrigation service line and shall consist of an un-spliced length of 12 AWG type UF insulated solid copper conductor. The wire shall be located near the bottom of the pipe and shall extend from the meter pit to the service connection to the irrigation main.

(v) Irrigation Meters. 1-inch and smaller meters shall be of the bronze body, multi-jet type with plastic register bonnet complying with AWWA C708; Invensys model PMM. Meters 1½-inch through 2" shall be either the multi-jet type specified above or be of the bronze-bodied, single-jet type conforming to the functional requirements of AWWA C712; Metron-Farnier Spectrum Series. Meters larger than 2" shall be of the single-jet type specified above. Each meter shall be fitted with a remote read register compatible with the Invensys EER for TouchRead automated meter reading and be provided with a pit lid adaptor.

(vi) Meter Setters shall have compression style connections and be identified with purple electrical tape neatly and securely applied for at least 2 inches at both the inlet and outlet tubing. Although no backflow preventer is required, a drain/test valve shall be located near the outlet connection.

(vii) Meter Pits for 1-inch and smaller meters shall be plastic with notches for service line entrance/exit and having a 20 to 21-inch inside diameter. Provide Ford "Plastic Pit Setter", Mueller "Thermal Shell", Mid-States Plastics "B" series, or approved equal. Meter pits and installation details for irrigation services larger than 1-inch shall be reviewed and approved by the District on a case-by-case basis.

(viii) Meter Pit Covers shall have a large embossed triangle and the words "NONPOTABLE - DO NOT DRINK" cast integrally thereon.

(ix) Dual Irrigation Meter Pits. When a meter pit for residential irrigation services is located on a property line common to two adjacent properties, the use of a single, larger diameter meter pit for two ⅝" x ¾" irrigation meters with a single 1" corporation stop and service line from the water main to the meter pit may be permitted when the meter pit cover is provided with double holes for the TouchRead modules and where an appropriate meter setter that accommodates access and service of the meters is used.

APPENDIX MDS-A

STANDARD DRAWINGS

APPENDIX MDS-B

FORMS AND APPLICATIONS