

CHAPTER 1 - GENERAL

1.0 PURPOSE

These specifications set forth District regulations, engineering, design, and materials specifications and construction procedures for all water facilities intended to become a part of the District System, and for privately owned water facilities connected thereto, to the extent regulated hereby. These Specifications supplement the Denver Water Department's Engineering Standards and the District's Rules and Regulations. The Denver Water Department Engineering Standards may be purchased at the Denver Water Department, located at 1600 W. 12th Avenue, Denver, CO 80254. The District's Specifications and the Rules and Regulations may be purchased at the Southgate Water District, located at 3722 E. Orchard Road, Littleton, CO 80121.

1.0A DISTRICT SERVICE AREA

The Southgate Water District Service Area consists of approximately 9,100 acres located in both Douglas and Arapahoe Counties, Colorado. Generally, the District is located South of E. Quincy Avenue and west of Interstate Highway I-25. The District's Service Area is more particularly shown on the District Service Area Map found on the following page.

1.01 AUTHORITY

These Specifications shall be administered by the District, and all matters involving the interpretation and enforcement hereof shall be finally determined by the District.

1.03 REVISIONS

These Specifications are effective as of June 13, 1995. Revisions to these specifications may be made from time to time by the District. Any revisions shall be in effect at the date of issuance by the District. Any person using these specifications should contact the District for information relative to revisions.

1.06 DEFINITION OF TERMS

As used in these Specifications and the District Rules and Regulations, unless the context clearly indicates otherwise, the words defined below shall have the respective meanings set forth for them:

A. Actual Costs

All direct and indirect costs attributable to any project or undertaking. Actual costs to the District shall include its engineering, legal, labor, material, equipment, administrative, and overhead expenses, calculated in accordance with the rates set forth in Appendix 1 to Article 7 of the Rules and Regulations, and all direct payments to third parties, at cost.

B. Board or Board of Directors

The duly constituted Board of Directors of the District.

C. Contractor

Any person who performs any work, either for himself or another, on any water facilities, public or private, within the District, including all subcontractors, agents, employees, officers and other representatives of such person.

D. Construction Plans

Plans and Specifications for the construction of a specific Developer/Owner water system project which have been reviewed and signed by the District and the District's Consulting Engineer.

E. Denver; Denver Water Department

The City and County of Denver, acting by and through its Board of Water Commissioners, its officers, agents, employees, consultants and representatives.

F. District

Southgate Water District, Arapahoe and Douglas Counties, Colorado, its employees, agents, officers, directors, insurers, and professional consultants.

G. District Engineer

The District's Staff Engineer.

H. District Manager

The Manager of the District appointed by the Board of Directors, or any other person duly authorized to perform the duties of District Manager.

I. District System

The Plant, facilities, systems, assets, and appurtenant property rights owned or directly controlled by the District, but excluding all privately owned water facilities.

J. Foreign Material

Any objects or substances other than treated potable water.

K. License

The written authority to receive water at specified premises for specified purposes.

L. Licensed Premises

The land area and improvements thereto to which water service is limited under any particular License.

M. Main or Water Main

Those pipes and appurtenant facilities used for distributing water, along public streets or appropriate rights of way deeded or licensed to the District, directly to various Licensed Premises.

N. Main Extension

The construction of any facilities, or the facilities themselves, which are intended to become a part of the District System upon acceptance by the District in accordance with Article 6 of the Rules and Regulations.

O. Person

Associations, corporations, firms, partnerships and bodies politic and corporate, as well as individuals.

P. Property Owner/Owner/Developer

All of these terms shall be synonymous with each other and shall mean any person who, whether solely or with others, owns real property within the District. When property is owned by more than one person, the term includes all owners thereof. As used in these Specifications, the term shall apply to such person only in connection with his ownership of any specific parcel of real property involved in any specific matter governed by these Specifications or the Rules and Regulations. For purposes of clarity, the

masculine singular pronoun is used in these Specifications to refer to Property Owner.

Q. Record or As-built Drawings

A separate set of full-scale construction plans marked to indicate completely and accurately the field-installed condition of facility construction in progress, as required by Section 8.9.0 of these Specifications.

R. Rules and Regulations

The comprehensive set of operating rules and requirements, as now or hereafter constituted, adopted by the Board of Directors for the purpose of regulating the design, construction, operation, maintenance, use, repair and replacement of the District System.

S. Service Lines

All pipe, fittings, and appurtenances, owned by Property Owner, which convey water from the District System to the plumbing of the Licensed Premises. The dividing point between the District System and privately-owned service lines is the plug on the corporation stop tapped into the Main or, where applicable, the discharge side of the M.J. or tapping valve closest to the Main.

T. Stub-In

A tap made for the propose of installing service lines prior to the paving of streets. Such connection shall include fittings necessary to extend the service line to the valve at the property line.

U. Tap or Service Connection

The physical connection to a District Main which, together with the Tap license for same, effects water service to any Licensed Premises.

1.07 ABBREVIATIONS

These Specifications utilize and otherwise make reference to other Standards and Specifications. Where these references are made, they shall refer to the latest edition or revision thereof.

ACI	American Concrete Institute
AISC	American Institute of Steel Construction, Inc
DWD	Denver Water Department
UL	Underwriter's Laboratories
UNI	Uni-Bell Association
UPC	Uniform Plumbing Code

SUPPLEMENT TO DWD CHAPTER 2 - MAIN EXTENSIONS

2.0 GENERAL

All water lines, appurtenances, and related public water system within the Southgate Water District shall be designed in accordance with these Specifications and the Engineering Standards of the Denver Water Department. Any deviation from these Specifications shall require the written approval of the District prior to design or construction. Design of all water system construction plans shall be performed under the direct supervision of a Professional Engineer, registered in the State of Colorado. The intent is to provide a consistently designed, long-term, reliable system which can be easily located and maintained by the District.

2.07 WATER SYSTEM PLAN REQUIREMENTS

Construction plans for water systems shall meet the guidelines set forth in the Denver Water Department Engineering Standards, the Water System Plan Requirements check list, and General Notes found in the Appendix. The Check List and General Notes are guidelines and as such, some items may not be applicable to all projects as determined by the District.

Construction plans will be reviewed by the Southgate Water District and the Denver Water Department for conformance with these specifications, the Denver Water Department Engineering Standards, and the Southgate Water District's Rules and Regulations.

SUPPLEMENT TO DWD CHAPTER 5 - SYSTEM DESIGN AND LAYOUT

5.03 SIZING OF DISTRIBUTION MAINS - Water Demands and Fire Flow Criteria

Water lines shall be designed to transport average annual, peak day, peak hour and fire flow demands in accordance with these Specifications. The criteria presented in following Table 5.1 are minimum criteria, and the District reserves the right to modify the criteria, at any time, for the design of specific projects. Water demand criteria for proposed uses not shown in Table 5.1 (i.e. car wash, laundries, auto service stations, supermarkets, places of assembly, hospitals, etc.) shall be determined by the District during system design, on a case by case basis using generally accepted planning criteria.

An allowance for irrigation is included in the residential criteria, however, irrigation is not included in the non-residential criteria (i.e. commercial, office, restaurant, etc.) and shall be added per Table 5.1. Irrigation should be designed to take place during off peak demand periods (i.e. 10:00 p.m. to 5:00 a.m.).

The Southgate Water District is overlain by two (2) Fire Protection jurisdictions being: the South Metro Fire Rescue District; and the City of Littleton Fire District. It is the owner's responsibility to contact the appropriate Fire Protection Agency and establish the required fire flow and hydrant locations for each specific project.

TABLE 5.1 - WATER DEMAND CRITERIA

USE	OCCUPANCY	AVERAGE DAY DEMAND	PEAK DAY DEMAND	PEAK HOUR DEMAND
Single-Family	3.5 Persons	150 GPCD	600 GPCD	1028 GPCD
Townhome	2.5 Persons	150 GPCD	600 GPCD	1028 GPCD
Multi-Family	2.1 Persons	150 GPCD	600 GPCD	1028 GPCD
Commercial	N/A	0.50 GPD/SF	1.06 GPD/SF	2.14 GPD/SF
Office	N/A	0.15 GPD/SF	0.35 GPD/SF	0.71 GPD/SF
Elementary School	700 Stu./Staff	40 GPCD	80 GPCD	200 GPCD
Middle School	1070 Stu./Staff	40 GPCD	80 GPCD	200 GPCD
High School	2470 Stu./Staff	40 GPCD	80 GPCD	200 GPCD
Irrigation	N/A	2000 GPD/AC	8000 GPD/AC	14000 GPD/AC

ABBREVIATIONS

GPCD	Gallons Per Capita Per Day
GPD/SF	Gallons Per Day Per Square Feet Developed Floor Area
GPD/AC	Gallons Per Day Per Acre
Multi-Family	Attached Single-Family Residential Dwelling (Rented)
N/A	Not Applicable
SF	Square Feet Developed Floor Area
Single-Family	Detached Single-Family Residential Dwelling (Owned)
Stu.	Students
Townhome	Attached Single-Family Residential Dwelling (Owned)

5.03A Water System Hydraulic Design Criteria

5.03A.1 General

All water lines shall be designed to transport water during average and peak demand conditions in accordance with these Specifications, and the District's Water Master Plan, using a pipe network reviewed by the District. No public water line shall be less than six inches (6") in diameter. Water systems shall be looped systems and shall provide a level of service consistent with the Southgate Water District, Denver Water Department, and appropriate Fire Protection District Standards.

5.03A.2 Maximum Head loss Criteria

The maximum allowable Head loss in peak hour conditions for water lines six inches (6"), eight inches (8"), and twelve inches (12") in diameter, shall be two feet (2') of water per thousand feet of pipe. Maximum allowable Head loss in peak hour conditions for water lines sixteen inches (16") and twenty inches (20") in diameter shall be one and one-half feet (1.5') of water per thousand feet of pipe. A Hazen-Williams "C" factor of 130 shall be used for all new Ductile Iron Pipe (DIP) and Polyvinyl Chloride Pipe (PVC).

5.03A.3 Peak Demand Conditions

A variety of peak demand or critical demand conditions exist for different types of developments. Peak conditions shall be reviewed by the designing Engineer with the highest demand condition being used to size water lines. Some typical peak demand conditions include: peak hour demand, and peak day demand plus fire flow with one feed closed.

5.03A.4 System Pressure Requirements

Static pressures within the water system shall range from a minimum of 50 psi to a maximum of 110 psi. During the peak hour demand, pressures shall be a minimum of 40 psi.

During peak hour plus fire flow demand conditions, the residual pressure at any fire hydrant shall be 20 psi, minimum. The maximum allowable pressure fluctuation between average demand conditions and peak hour demand conditions shall be 30 psi. The maximum line velocity shall be 10 feet per second in fire flow conditions.

Where static water pressures exceed 80 psi, individual pressure reducing valves shall be installed on water services.

5.09 LAYOUT OF THE DISTRIBUTION SYSTEM

5.09A General Location

Where water lines are located in street right-of-way, they shall be designed to the following guidelines.

In streets running generally north and south, the water line shall be located ten feet (10') east of the street centerline.

In streets running generally east and west, the water line shall be located ten feet (10') north of the street centerline.

Water lines may be designed on curvilinear streets parallel to street centerline using deflected pipe joints. Joint deflections shall be within the manufacturer's maximum recommended deflection per joint. Bending of PVC water lines to achieve a change in alignment is not permitted.

In streets shaped as a "U" or on streets having unusually sharp turns, the water line will conform to the above Specifications as near as is practical, but the final location shall be determined by the District. Where water lines are proposed to cross the street centerline, they shall be designed to cross the street using 45 degree horizontal bends.

In cul-de-sacs, water lines shall be located in conformance with the "Water Distribution System Typical Plan for Cul-de-sacs" detail, found in the Standard Drawings of the DWD Engineering Standards. Where stub outs are to be provided for service to future areas, they shall be located in conformance with the "Stubout Configurations" detail, found in the Standard Drawings of the DWD Engineering Standards.

In no case shall the water line be designed closer than five (5) feet to the lip of a crossspan, or gutter, or ten (10) feet to any right-of-way line or easement boundary.

5.09A.1 Relation to other Utilities

Water lines in streets shall be designed to provide a minimum separation of ten (10) horizontal feet measured between the centerline of any sanitary sewer line and any water line or appurtenance. Horizontal separation with utilities other than sanitary sewer lines shall be five (5) horizontal feet minimum, but shall in all cases allow for future excavation of the water line without causing damage to the adjacent utility.

Where water lines are proposed to cross sanitary sewer lines or other utility lines, they shall be designed to cross at an angle close to ninety degrees (90°). Minimum vertical clearance between the edge of any water line and edge of any other water line or utility, shall be eighteen inches (18"), minimum.

5.09B Water System Layout at Creek Crossings

Where water lines are proposed to cross creeks or drainage ways, they shall be designed to cross perpendicular to the creek or drainage way centerline. Valves shall be provided on each side of the crossing to isolate the crossing in the event of a line break. A specific geotechnical investigation shall be performed by the owner for each proposed crossing to evaluate potential 100 year flood scour depths of the creek or drainage way at ultimate development of the drainage basin.

After the investigation has been reviewed by the District, a minimum water line depth will be established, as well as encasement and/or erosion protection requirements. Review by the County or Urban Drainage and Flood Control District may be required.

5.09C Encasements, Casings and Insulation

Concrete Encasements

Concrete encasements shall be required by the District under the following conditions:

Where water lines are at a depth too shallow to sustain traffic load or any other load to which they are subjected.

At any other location designated by the District.

Concrete encasements shall provide concrete and reinforcement in accordance with the "Concrete Encasement" detail, found in the Standard Construction Drawings of these Specifications, and shall be of a length to completely span the condition encountered. The concrete encasement detail is generally acceptable for most conditions; however, the District may require a special, site specific concrete encasement detail on a case by case basis.

Pipe Casings

Pipe casing shall be used where bores or protective installations are required by the District. All pipe casings shall be constructed to conform with the "Pipe Casing and Sled" detail, found in the Standard Construction Drawings of these Specifications.

Water Line Insulation

The District may require that water lines be insulated from freezing where cover considerations, bridge crossings, or other special freezing related considerations warrant. The limits of the insulation shall be determined by the District. Impermeable Cellular Glass Insulation shall be "Foamglass" manufactured by Pittsburgh Corning, or equal.

SUPPLEMENT TO DWD CHAPTER 6 - MATERIALS

6.01 GENERAL

All water system materials, construction and testing shall be in accordance with these Specifications and the most current Denver Water Department Engineering Standards. Any material proposed as "an equal" must be reviewed and found acceptable by the District, prior to design or construction. Any occurrence of the Denver Water Department in their Engineering Standards shall also include the District.

6.04 SELECTION OF PIPE

Ductile Iron Pipe

Ductile Iron Pipe (DIP) is the pipeline material preferred for use for all sizes of lines in water systems within the Southgate Water District. Ductile Iron Pipe shall be designed in accordance with ANSI/AWWA C150/A21.50 Specifications, latest revision. Minimum design working pressure shall be 150 psi. Minimum design transient or water hammer pressure shall be: 120 psi for 6- and 8-inch lines, 110 psi for 12-inch diameter lines, and 80 psi for 16- and 20-inch diameter lines. Pipe design calculations shall be submitted to the District, upon request.

6.06 GATE VALVES

Valves on 6, 8, and 12-inch diameter lines shall be direct bury gate valves.

Direct bury gate valves shall be double-disc. Valves shall have 2 inch (2") square operating nuts and shall open by turning the nut clockwise (right). Nuts shall be painted red.

Valves on 16- and 20-inch water lines shall be direct bury butterfly valves, and shall be designed and manufactured in strict compliance with AWWA C504, except as modified herein. Valves shall have 2-inch (2") square operating nuts and shall open by turning the nut clockwise (right). Nuts shall be painted red.

6.07 PRESSURE REDUCING VALVE AND VAULT INSTALLATION

Pressure reducing valves shall be Ross Model 40WR or Clay Model 90-01 for Standard One-Way Flow, or Ross Model 50WR for Two-Way Flow where specified, or equal.

6.29 CONCRETE STRUCTURES - (ENCASEMENTS)

6.29.1 General

Reinforced concrete encasements shall be constructed to the limits shown on the construction drawings. However, should field conditions differ from the reviewed and signed plans (e.g. ground elevations, creek locations), the encasement limits shall be reviewed in the field by the District, prior to any encasement construction.

6.29.2 Materials

Encasements shall be constructed using a Type II cement concrete having a minimum twenty-eight (28) day design strength of 3000 psi, slump of 2" to 4", and air entrainment of 3 to 5 percent.

Reinforcement steel used in encasements shall be ASTM A-36 steel.

6.29.3 Installation

Reinforced concrete encasements shall be installed in accordance with the "Concrete Encasement" detail found in the Standard Construction Drawings of these Specifications. Minimum clear distance between steel reinforcement and the edge of the concrete encasement pour shall be three inches (3"). The encasement shall be formed using undisturbed soils or concrete formwork.

Concrete shall be vibrated around steel reinforcement using vibration equipment or manual poling. Concrete shall not be placed on frozen or unstable foundation. Suitable concrete protection shall be provided when temperatures may drop to freezing or lower.

6.29.4 Testing

Forty-eight (48) hours prior to encasement construction, the Contractor shall submit the concrete mix design to the District for review. The District may require that concrete cylinders be poured on-site and tested at twenty-eight (28) days to show conformance with required twenty-eight (28) day compressive strength of 3000 psi, slump and air entrainment may also be tested at the time of the concrete pour, at the District's discretion.

6.38 SERVICE LINES - (SERVICE CONNECTIONS)

The Denver Water Department shall install all taps for services 2 inches in diameter or smaller. Service connections larger than 2 inches may be installed by the Owner's Contractor in accordance with the Denver Water Department Standards.

SUPPLEMENT TO DWD CHAPTER 7 - EARTHWORK

7.04 TRENCHING OPERATIONS - (LIMITS OF EXCAVATION)

Length - Except by expressed written permission of the District the maximum length of open trench shall be 600 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is smaller. The distance is the collective length at any location, including open excavation, pipe laying, appurtenance, construction, and backfill. The trench shall not be left open when the Contractor has left the project site and is not engaged in construction operations. Traffic Barriers shall be placed as required by the representative County, or as stipulated by local conditions, to ensure construction safety at all times.

7.04C Foundations and Subgrade

General

All vault foundations and pipe subgrade installation shall be in a stable condition. Any and all questions relative to foundation and subgrade stability shall be coordinated through District and the Developer's Geotechnical Engineer. The Geotechnical Engineer will be responsible for determining if the foundation and/or subgrade is stable prior to the utility installation.

Stable Foundations and Subgrade

The trench bottom shall be excavated six inches (6") below the invert of the pipe unless otherwise designated on the plans. Before the pipe is laid, the foundation shall be prepared by backfilling with bedding material conforming to these specifications. The bedding shall be thoroughly tamped to achieve a relative density of 70% as determined by ASTM D-2049.

7.09 FOUNDATIONS ON UNSTABLE SOIL

When excessively wet, soft, spongy, or similarly unsuitable materials is encountered at the surface upon which the bedding material is to be placed, dewatering shall be performed and unsuitable materials shall be removed to a depth as determined in the field by the Owner's Geotechnical Engineer and the District.

The degree of soil instability will determine the limits of over excavation. In general, over excavation will be required, and stabilization rock shall be installed as indicated on the "Special Bedding" detail until the foundation and/or subgrade is stable as determined by the Owner's Geotechnical Engineer and the District.

7.09.A Foundations in Rock

Where rock is encountered, it shall be removed below grade. The trench shall be backfilled with clean imported bedding material to provide a compacted foundation cushion. The minimum clearance between rock and the pipe shall be nine inches (9").

7.10 PIPE BEDDING

General

All pipe bedding materials for stable and unstable installation conditions shall be reviewed by the Owner's Geotechnical Engineer and the District prior to delivery of bedding to the construction site. The area indicated in the bedding details from the trench bottom to twelve inches (12") above the pipe shall be referred to as the "pipe zone". Bedding materials and installation shall meet or exceed the requirements of this section.

Bedding Material

The pipe bedding, using either clean imported sand, squeegee or 3/4-inch gravel conforming to these specifications shall be placed in the pipe zone and compacted to the requirements set forth in this section. The following classes of bedding are permitted:

Class A Bedding

Class A bedding shall be used for the bedding of ductile iron and PVC water main at normal depths of cover (i.e. 4.5 feet to 10 feet of cover). Class A bedding shall consist of placing select bedding material (known as "squeegee") as defined below, from the pipe foundation to a point twelve inches (12") above top of pipe.

Class A bedding material shall conform to the following limits:

<u>Sieve Size</u>	<u>Total Percent Passing by Weight</u>
3/8"	100%
No. 8	65% - 100%
No. 50	10% - 30%
No. 100	0% - 10%
No. 200	0% - 5%

Class B Bedding

Class B bedding shall be reviewed for use by the District for bedding of PVC or ductile iron water lines when depths of cover exceed ten feet. Class B bedding shall consist of placing crushed aggregate, as defined below, from the pipe foundation to a point twelve inches (12") above the top of the pipe in accordance with the provisions of this section. Class B bedding shall be clean crushed aggregate conforming to ASTM D 448, as follows:

<u>Sieve Size</u>	<u>Total Percent Passing by Weight</u>
1"	100%
3/4"	90% - 100%
3/8"	20% - 55%
No. 4	0% - 10%
No. 8	0% - 5%

Bedding Installation

The pipe shall be bedded as indicated on the "Standard Bedding" and "Special Bedding" details, found in the Standard Construction Drawings. The Contractor shall accurately shape the pipe subgrade to fit the bottom of the pipe. The intent is to relieve the bell of the pipe of all loading and provide continuous bearing of the pipe barrel on the bedding. Use of a drag template shaped to conform to the outer surface of the pipe will be required if other methods do not give satisfactory results.

The pipe shall be centered in the trench, adjusted to line and grade and bedding shall be simultaneously placed on both sides of the pipe so as not to disturb alignment and grade. The bedding material shall be sliced under the haunches of the pipe to fill all voids. The slicing shall be performed when the bedding material covers approximately one-third (1/3) of the pipe's diameter.

Bedding Compaction

All bedding material shall be compacted to a minimum Relative Density of 70 percent, as determined by ASTM D2049. Each lift shall be solidly tamped with the proper tools so as not to injure, damage, or disturb the pipe. Backfilling shall proceed simultaneously on each side of the pipe. Water settling for compaction is generally not permitted and must be reviewed by the District prior to its use.

Bedding Testing Requirements

Bedding material shall be tested by the Owner's Geotechnical Engineer for gradation requirements set forth herein, and test reports shall be submitted to the District prior to delivery of any bedding material to the project site.

Bedding compaction shall be tested using the "Sand Cone Method" in conformance with ASTM D1556 or other methods reviewed by the District. Compaction test results shall be submitted to the District on the working day following the test. If test results do not meet these specifications, the area shall be reworked and retested until these specifications are met. The location and frequency of bedding

compaction testing will be determined by the District on a case-by-case basis.

7.11 BACKFILL AND COMPACTION

General

All trenches shall be backfilled after pipe, fittings and appurtenances have been installed and reviewed.

When a compaction requirement is specified herein, the optimum moisture content and density shall be determined in accordance with the appropriate ASTM specification.

Backfill Material

Backfilling shall be done with on-site material, sand or gravel. No oil cake, bituminous pavement, concrete, rock or other lumpy material shall be used in the backfill unless these materials are scattered and do not exceed 3" in any dimension. Material or perishable, organic, spongy, frozen debris, or otherwise unacceptable nature shall not be used in backfilling. No material greater than 3" in any dimension shall be placed within 1 foot of any pipe, manhole or structure. Backfill material shall be subject to the review of the District.

Within the street right-of-way, the road subgrade and final grade, including base course and asphalt placement, shall be replaced in strict accordance with Arapahoe or Douglas County Department of Highway.

Backfill Installation

In street rights-of-way, the portion of the trench above the "pipe zone" to the finished roadway surface shall be backfilled, compacted, and/or consolidated by methods reviewed by the District to obtain a Standard Proctor Density of 95% (ninety-five percent) or equivalent relative density. In easements and other areas outside street rights-of-ways, the portion of the trench above the "pipe zone" shall be backfilled, compacted and/or consolidated by methods reviewed by the District's geotechnical consultant to obtain a Standard Proctor Density of 90% (ninety percent) or equivalent relative density.

Backfill to be compacted by heavy compaction equipment shall be placed in uniform horizontal lifts not exceeding 12" or as specified by the District.

Heavy compaction equipment shall not be used closer than three feet to walls at the top of any structure nor closer than three feet to the top of the pipe. Before each lift is compacted, the material therein shall be brought within 1% above or 3% below the optimum moisture content for the specified compaction.

Flooding, pooling, or jetting shall not be allowed for consolidation of backfill.

Any damage to the pipe as a result of the Contractor's backfill and compaction operation shall be repaired and/or replaced by the Contractor.

Backfill Compaction Tests

Compaction tests shall be performed by a qualified testing laboratory at locations designated by the District. All expenses involved in these tests shall be borne by the Contractor or Developer.

Copies of test results shall be provided to the District. In all cases where the tests indicate sub standard compaction, additional compactive effort and tests will be required until these specifications are met. Final acceptance of the lines by the District will be contingent upon satisfactory compaction results. Testing of water lines, as outlined in Chapter 8 of the DWD Engineering Standards, shall not be allowed until backfill compaction meets the standards set forth within these specifications.

The location and frequency of compaction testing shall be per the City, County, or District Specifications, whichever is more stringent. The minimum testing interval is as follows:

	<u>Horizontal Interval</u>	<u>Vertical Interval</u>
Water Line Trench	250'	every 1'
Water Line Structure	every structure	every 1'
Service Line	random representation	every 1'

7.12 CLEAN UP

Prior to probationary acceptance, the contractor shall clean street right-of-ways and easements of all rubbish, excess materials, temporary structures and equipment and shall leave the same areas to plus or minus 1/10 of a foot from the elevations that existed prior to construction or the final grades as shown on the reviewed and signed construction plans.

SUPPLEMENT TO DWD CHAPTER 8 - PIPE INSTALLATION

8.0 GENERAL CONSTRUCTION STANDARDS

The following is in addition to DWD Chapter 8 - Pipe Installation.

All excavations affecting or involving any part of the District System, and all work on Main Extensions, Taps, or other District facilities shall be performed in conformity with and are subject to the requirements and conditions set forth herein. Whenever any provision of these Specifications or the Rules and Regulations imposes a duty addressed in this Section upon a Contractor, the term "Contractor" in such context shall be deemed to apply also to the Property Owner.

8.0.1 Compliance

Contractor shall comply with all District, Denver Water Department, State and Federal Rules, Regulations, Standards and Specifications.

8.0.2 Permits

The Contractor shall be solely responsible for determining and obtaining any and all permits required for the work from other governmental entities or agencies having jurisdiction, and shall perform the work in accordance with any and all applicable ordinances, regulations, laws and orders of, or permits issued by such entities or agencies.

8.0.3 Subsurface Structures

The District will make available to the Contractor record drawings showing the location of its facilities and such information as it has about other subsurface structures in the vicinity of the work, but the Contractor shall be finally and solely responsible for notifying all owners or operators thereof of his intent to excavate in the area, and determining the existence and location of all subsurface structures in such area.

If a Contractor damages any District facilities during construction, he shall immediately notify the District and take such measures as may be reasonably necessary or appropriate to minimize damage to the District System, prevent the escape of water from the District System, and prevent and mitigate damage from fugitive water. The District shall perform all repairs of District facilities and may assess the costs thereof to Contractor, as provided in Sections 9-5 and 9-8 of the Rules and Regulations.

Any Contractor who damages District facilities shall indemnify and hold the District harmless against any and all claims for damage resulting therefrom, and shall indemnify and hold the District harmless against any and all claims for damage to any such structures.

8.0.4 Warranty

All materials and workmanship furnished by the Contractor shall conform to the Denver Water Department standards, these specifications and to all plans and design approved by the District, and shall be free from all defects due to faulty or non-conforming materials or workmanship.

8.0.5 Independent Investigation

Contractor shall thoroughly examine the work site to ascertain for himself all soil, geological, groundwater and other conditions to be encountered which might affect the work being undertaken. The Contractor shall enter into such work relying on his own investigation and information, and not on any statements or representations, if any, that have been made by the District.

8.0.6 Indemnification

By undertaking any work subject to this section, Contractor agrees to indemnify and hold harmless the District from any and all liability, claims, and demands, on account of 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 any work subject to this section if 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 Contractor, or which arise out of any Workmen's Compensation claim of any employee of the Contractor. Contractor agrees to investigate, handle, respond to, and to provide defense for and defend against such liability, claims or demands at the sole expense of Contractor. The Contractor also agrees to bear all other costs and expenses related thereto, including court costs and attorney fees, whether or not any such liability, claims, or demands alleged are groundless, false, or fraudulent. Nothing in this subsection shall be deemed to impose upon Contractor any obligation to defend or hold the District harmless against claims for damages legally caused by any unlawful act or omission of the District.

8.1.0 REQUIRED SUBMITTALS

No Contractor shall begin work on any Main Extension, Tap, or other District facilities until he has obtained the prior approval of the District therefor, and has submitted, in addition to any other materials required elsewhere herein, the following, approved as to form by the District.

8.1.1 WRITTEN AGREEMENT

If required by the District, a writing duly signed by Contractor (1) acknowledging his consent to be bound by the provisions of Section 8.0; (2) warranting that the work will conform to such provisions and will be free from defects due to faulty or non-conforming materials and workmanship; (3) agreeing to indemnify the District as provided in 8.0.6, and (4) agreeing to pay any and all applicable fees and charges provided by these Specifications and the Rules and Regulations in connection with the work.

8.1.2 Fees

The full amount of all fees payable in advance, or any required costs deposits, or both.

8.2.0 STOP WORK ORDERS

8.2.1 Order

The District may revoke any approval for work and issue a Stop Work Order upon a determination that the Contractor has violated or is about to violate any condition of any plan approval, any provision of these Specifications or Rules and Regulations, or any other standard, specification, or rule imposed by the District. A Stop Work Order shall take effect immediately upon the entry thereof by the District and notice to the Contractor, and shall remain in full force and effect until rescinded in writing by the District.

8.2.2 Effect

It is unlawful for any person to do any work in violation of the terms of any Stop Work Order issued pursuant to this section except such as may be permitted by the District in order to render the construction site safe and secure.

8.3.0 CURE OF DEFECTS

8.3.1 Order to Cure

If the District determines that any part of the work was not performed in conformity with these Specifications, Rules or Regulations or approved plans, or is defective, of poor or unworkmanlike quality, or is otherwise not in conformity, with any applicable warranty, it may give written notice thereof to the Contractor. Such notice shall specify the nonconformity, direct the Contractor at his cost to perform specified remedial work, and specify the period of time determined by the District reasonably necessary for completion of the remedial work.

8.3.2 District Cure

If the Contractor fails within the time stated following such notice to cure the nonconformity specified therein, the District, in addition to and without waiving any of its other remedies, may perform the work and charge the Contractor for its actual costs incurred in connection therewith, calculated in accordance with the rates set forth in Appendix 1 to Article 7 of the Rules and Regulations. The provisions of Article 7 of the Rules and Regulations applicable to invoicing and collection of fees and charges shall apply to any charge assessed to Contractor under this section.

8.4.0 PRE-CONSTRUCTION

A Pre-construction Meeting shall be arranged by the District and held prior to the start of any work. The District Engineer, Denver Water Department, Contractor, Soils Engineer, Surveyor, and Developer, or Developer's Engineer, must be represented at this meeting, which shall generally be held at the District Office. After the Pre-construction meeting is held, the Contractor shall, at least 48 hours prior to the start of construction, notify the District of its construction schedule and start date.

8.5.0 CONSTRUCTION PLANS

Construction plans shall be reviewed and signed by the District. The signed plans and a copy of these Specifications shall be kept on the project site by the Contractor at all times.

8.6.0 DEFECTIVE MATERIALS

All materials not conforming to the requirements of the Denver Water Department or Southgate Water District shall be considered defective. Whether in place or not, such material shall be removed immediately from the site of the work, unless otherwise permitted by the District. Rejected material, the defects of which have been subsequently corrected, shall not be used until the District has reviewed them and found them acceptable. The District will not consider conveyance and acceptance of a project if the contractor fails to comply promptly with any order of the District made under the provisions of this section.

8.7.0 DESIGN REVISIONS DURING CONSTRUCTION

Should the Contractor encounter field conditions that prevent construction to occur in conformance with the reviewed and signed plans, a meeting shall be scheduled by the Contractor with the Owner's Engineer and District to discuss an alternative design. The Contractor's construction shall not deviate from the signed plans without the prior review and approval of the District, and the Owner's Engineer.

8.8.0 CONSTRUCTION WATER

The Contractor shall be responsible for obtaining any water required for various phases of construction. Arrangement and coordination of permits shall be made through the appropriate agency.

8.9.0 RECORD DRAWINGS

The Contractor shall maintain on the job site, a separate set of full-scale Construction Plans marked up to fully indicate field installed conditions. These drawings shall be maintained in a current condition at all times until completion of the work and shall be available for review by the District at all times. All reviewed variations from the signed Construction Plans, for whatever reason, including those occasioned by optional materials, and those required by coordination between trades, shall be indicated. These variations shall be shown in the same general detail utilized in the original design. Upon completion of the work, the marked up set of drawings shall be furnished to the District for review. After the District has reviewed the marked up drawings, the drawings shall be returned to the Owner's Engineer. The Owner's Engineer shall use the marked up plans to prepare half-sized (12" x 18") mylars. The mylar shall be a reverse read, wash-off (moist erasable) photographic 4 mil mylar reproduction. A half-sized (12" x 18") CADD plot on mylar is acceptable.

The following construction information shall be added to the mylars at a letter and pen size that will be legible after reduction is completed.

Date Installed:
Contractor:
Field Engineer:
Soils Engineer:
Surveyor:

All service lines must be shown on the plans.

These finalized half-size drawings and a computer disk containing the drawings in the latest version of AutoCAD must be presented to the District prior to probationary acceptance of the project.

8.10.0 REPLACEMENT OF EXISTING STREET IMPROVEMENTS

In areas where existing pavement, concrete improvements, storm or drainage improvements are removed during construction, they shall be replaced in kind to the limits disturbed by water line construction. All replacement shall be in accordance with the appropriate City, County, or State Highway Department.

8.11.0 SAFETY; TRAFFIC CONTROL

The Contractor shall determine, initiate, maintain and supervise all measures necessary to protect the public during construction.

Traffic shall be controlled at those locations throughout the project area in order to maintain an efficient and orderly vehicular and pedestrian traffic flow. All traffic control, construction signing, vehicular traffic and residential access, etc., shall be handled in conformance with the Uniform Traffic Control Manual and the appropriate City, County, or State Highway Department Standards.

The Contractor shall furnish, construct, maintain, and finally remove detours, road closures, lights signs, fences, barricades, flares, miscellaneous traffic devices, flagmen, drainage facilities, reconstruct paving and such other items and services as are necessary to adequately safeguard the public, both traveling and otherwise, from hazard and inconvenience. He shall erect and maintain such warnings and directional signs as may be requested by the City, County, or State Highway Department.

Should the progress of construction require closure of residential access, the Contractor shall notify the residents which may be affected at least 24 hours in advance and provide temporary access. Prior to the start of construction, the Contractor shall notify affected residents as well as the appropriate police and fire departments, giving the approximate starting date expected, completion date, and the name and telephone number of a responsible person representing the contractor who may be contacted at any hour.

8.12.0 CONSTRUCTION OBSERVATION

The District shall decide any and all questions that may arise during construction as to the quality and acceptability of the materials furnished, the work performed, or the manner of performance of the work.

No observation or testing will be performed by the District on weekends or holidays without the express agreement of the District secured in advance. Whenever any observation or testing is required by any specific provision of these Specifications or the Rules and Regulations, or by the terms of any permit or plan approval, the Contractor shall give the District such notice as is required and shall not cover or otherwise obscure the work until the observation or testing has been made. The Contractor shall at his cost uncover or otherwise make such work accessible for observation or testing when ordered to do so by the District if he violates this requirement.

The observations, testing and reviews performed by the District are for the sole and exclusive benefit of the District. No liability shall attach to the District by reason of any observations, testing, or reviews required or authorized by these Specifications or the Rules and Regulations, or by reason of the issuance of any approval or permit for any work subject to this section.

The District is not a guarantor of the construction Contractors' obligations and performance of contract.

Observations of work in progress and on-site visits are not to be construed as a guarantee by the District of the Contractors' performance.

The District is not responsible for safety in, on, or about the Project site, nor for compliance by the appropriate party of any regulations relating thereto.

The District exercises no control of the safety or adequacy of any equipment, building components, scaffolding, forms, or any other work aids used in or about the project, or in the superintending of the same.

8.13.0 GEOTECHNICAL OBSERVATION

Geotechnical observation and backfill density tests will be performed by the Owner's Soils Engineer to provide acceptable fill control, bedding compaction, and foundation suitability. All supervision necessary to control fill and compaction tests will be at the expense of the Owner.

If the first compaction test does not meet with the Specifications, the sub-standard areas shall be reworked and additional compaction tests will be performed until the Specification is met. Any deviation from the plans, Specifications, or soils report, must be corrected by the Contractor to the satisfaction of the District. Copies of all compaction tests shall be provided to the District on the working day following the test. The location and frequency of compaction testing shall be per Chapter 7.11.

8.14.0 FEES

Contractor will pay the District all fees imposed and assessed by the District for reviews, observation, tests, approvals, and any other undertakings performed by the District or its professional consultants in connection with the administration and enforcement of these Specifications and the Rules and Regulations, as provided by Article 7 of the Rules and Regulations.

8.15.0 IMPROVEMENTS AGREEMENT

Conveyance and acceptance by the District of facilities intended to be owned and operated by the District shall be accomplished as provided in Article 6 of the Rules and Regulations.