

**SUPERSTITION MOUNTAINS
COMMUNITY FACILITIES DISTRICT NO. 1**



**Standard Specifications
of Design and Construction**

**Dated
November 1, 2021**

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1.0 Introduction

1.1 General Information

Superstition Mountains Community Facilities District No. 1 (“the District”) was created by the City of Apache Junction to operate, and maintain, a regional system for the collection, transport, and treatment of sewage from the properties existing within its boundaries. The sanitary sewer system that the District oversees is a master planned system that includes hundreds of miles of gravity collection main, force mains, lift stations and a water reclamation facility.

Within this document are the design guidelines and construction criteria for wastewater collection system improvements within the District’s service area. This document is to be used in the planning, design, and construction phases of any sewer related improvement projects.

1.2 Abbreviations

AAC	Arizona Administrative Code
AASHTO	American Association of State Highway and Transportation Officials
ADEQ	Arizona Department of Environmental Quality
fps	feet per second
ft.	feet
GPM	gallons per minute
HDPE	High Density Polyethylene
ID	inner diameter
in	inch
lb	pound
MAG	Maricopa Association of Governments
OD	outer diameter
PDF	portable document format
PUE	Public Utility Easement
PVC	Polyvinyl Chloride
SDR	Standard Dimension Ratio

1.3 Basic Requirements

The construction or adjustment of sewer mains, service lines, lift stations, force mains and manholes shall conform to the Superstition Mountains Community Facilities District No. 1 Standard Specifications of Design and Construction, except as otherwise approved by the District Authorized Representative. Materials shall conform to the District’s applicable materials specifications. In specific circumstances where this specification does not provide for the construction, A.A.C. R18-9-E301, 4.01 General Permit: Sewage Collection Systems shall be used. Other references include Maricopa Association of Governments Standard Specifications for Public Works Construction.

All work is to be completed in a safe, professional manner and in accordance with these Specifications; any deviation therefrom must be approved by the District's Authorized Representative. Work cannot begin until permits or other authorized permission has been received from the District, the City of Apache Junction, and/or Pinal County and/or the Arizona Department of Environmental Quality ("ADEQ").

Permitting with the District begins at mygovernmentonline.org where an account can be created, and an application submitted. Please provide an applicable phone number and email and as much information as possible. Plan submittals can be added with the application for review.

All installations must conform with the requirements of all governmental regulating agencies and the cost of conforming to such regulations will be borne by the Contractor.

The Contractor shall provide all shoring, safety devices and protective equipment and take any other needed actions, on their own responsibility, as reasonably necessary to protect the life and the health of employees on the job, and the safety of the public. The Contractor shall comply with the provisions of all applicable laws including all Federal and State occupational safety and health acts. The Contractor shall provide a competent person capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals, warning signs and other traffic control devices, and shall take all necessary precautions for the protection of the work and safety of the public in accordance with the requirements of the City of Apache Junction.

Sewer Availability is subject to approval by a District Authorized Representative. They can be contacted at engineering@smcfd.org.

2.0 Design Guidelines

2.1 Flow Criteria

Flows in all gravity sewer lines must maintain velocities between 2.25 feet per second (2.25 fps) and 10 feet per second (10 fps) with the pipe flowing full. This ensures that there is no buildup of solids, but that turbulence is minimized within the system.

Designs shall be dedicated to minimizing odor potential by mitigating the production of hydrogen sulfide. Special consideration should be given to drop manholes, larger pipe diameters and changes in slope, changes in direction and changes in pipe diameters.

Per the District's Master plan, the average use is 80 gallons per capita per day, and persons per dwelling unit is 2.5 persons. Any peaking factors shall be referenced from ADEQ Table 1, R18-9-E301D. Wet weather peaking factor is Dry Weather Peak Flow multiplied by 1.1.

2.2 Sewer Mains

2.2.1 General

Sewer mains and service lines shall be constructed of SDR-35 PVC pipe. Sewer mains shall be at least six-inches (6") in diameter or larger.

All sewers shall be designed to give mean velocities when flowing full of not less than 2.25 feet per second, based upon Manning's formula using an "n" value of 0.013. Maximum design velocity in sewers shall be limited to 10 feet per second for pipes flowing full. See Table 1 below.

TABLE 1	
Size of Pipe (I.D.)	Min. Pipeline Slope (%)
4-inch	1.00%
6-inch	0.64 %
8-inch	0.42 %
10-inch	0.31 %
12-inch	0.24 %
15-inch	0.18 %
18-inch	0.14 %
≥ 21-inch	0.10%

Bedding, haunching and backfill to 12 inches over the top of pipe shall be **screened 3/8" fractured rock chips** (MAG Section 716, Table 716-1 Low Volume Traffic). Please see section 4.5 for backfill details.

There shall be a minimum cover of three feet of backfill over all sewer lines. Reference **SM200** for bedding detail. This must be included in improvement plans.

2.2.2 Required Separation

To provide sufficient separation, the installation of the sewer mains must conform to A.A.C. R18-5-502 and the following requirements:

A. Horizontal Distance

The horizontal distance between any underground utility shall not be less than **6 feet**. Each line shall be laid on undisturbed or bedded material in a separate trench.

Where conditions prevent the minimum horizontal separation set forth above, extra protection will be required. Extra protection for water mains shall consist of encasing both the water and sewer main in at least 6 inches of concrete for 10 feet beyond the area covered in this subsection. In some circumstances constructing the sewer main with mechanical joint ductile iron pipe or with slip-joint ductile iron pipe will be permitted but must be authorized by District Authorized Representative.

Under no circumstances will the horizontal separation between sewer mains and water mains be less than **2 feet**. All distances are to be measured from the outside of the sewer main to the outside of the water main.

The minimum horizontal separation between water mains and manholes shall be **6 feet**, measured from the center of the manhole.

B. Vertical Distance

When a water main is parallel to or crosses a sewer main within **2 feet** above the sewer or greater than **2 feet** below the sewer, extra protection will be required in the form of encasing both the water and sewer main in class 'C' concrete according to MAG Section 725 and MAG Standard Detail 404.

Under no circumstances will the vertical separation of a sewer main installed above a water main be less than **2 feet**. All distances are to be measured from the outside of the sewer main to the outside of the water main.

The minimum separation between force mains or pressure sewers and water mains shall be **6 feet** vertically and **6 feet** horizontally under all conditions. Where a sewer force main crosses above a water line, the sewer main shall be encased in at least **6 inches** of concrete for **10 feet** on either side of the water main.

2.3 Service Lines

All service lines shall be connected shall be installed per **SM440 Sewer Building Connection**. Lines shall be connected to disconnect cleanout and follow all notes given on the detail.

2.4 Manholes

Five-foot (60-inch) diameter manholes are standard. Manhole covers are thirty inches standard. Provide watertight manhole covers for areas subject to flooding or in low lying areas. All manhole construction and materials are to adhere to MAG Specification Section 625.

Manholes shall be installed at the end of each line except as noted above, at all sewer pipe intersections, at all changes in grade, pipe size, or alignment, and at distances not exceeding those shown below in Table 2:

Size of Pipe (I.D.)	Max. Manhole Spacing (feet)
6-inch	400 feet
8-inch – 18-inch	500 feet
>18-inch – 30-inch	600 feet

Manhole covers are not to be designed to be in any sidewalks, driveways, curbs, gutters, trails, washes or retention basins.

2.5 Cleanouts

A main line cleanout is acceptable at the end of sewer mains where the pipeline segment is two hundred feet (200') or less in the length and the pipeline diameter is eight inches (8") or less. Disconnect cleanouts are required for all service line connections per MAG Section 441.

2.6 Lift Stations

Lift stations shall have engineering justification and will be subject to review on a case-by-case basis by the District. They shall adhere to AAC Title 18, Chapter 9.

2.7 Force Mains

Force Mains are subject to review on a case-by-case basis. Materials used should have engineering justification and must adhere to testing standards from the AAC or MAG. SMCDFD prefers the use of HDPE. See below section 4.8 for testing requirements.

2.8 Private Sewer Systems

Private sewer systems that connect to the District's collection system are subject to approval by the District Authorized Representative. All materials, construction and testing of a private system within the District's jurisdiction must adhere to these Specifications.

2.9 Grease, Sand and Oil Interceptors

Any commercial facilities such as, but not limited to, restaurants, car washes, laundry facilities and automobile facilities must install a pre-treatment device to minimize unauthorized materials that can enter the collection system. Designs shall account for appropriate tank size that will accommodate all necessary plumbing fixtures. Calculations shall be presented on improvement plans and are subject to review of the District Authorized representative.

3.0 System Materials

3.1 PVC Sewer Pipe and Fittings

3.1.1 General

Unless otherwise noted on the plans or in the special provisions, gravity sanitary sewer mains and service lines shall be constructed using PVC pipe for diameters not exceeding **15 inches**. For pipes exceeding 15 inches, please contact a District Authorized Representative for guidance. Pipe, fittings, couplings, and joints shall be in conformance with the requirements of **ASTM D-3034, SDR-35**.

A. Pipe and Fittings

Per **MAG Section 745** Pipe and Fittings including those required for stubs shall have a pipe stiffness (**PS**) of **46 psi** at **5%** deflection of the initial inside pipe diameter. Sizes less than or equal to **24 inches** shall conform to **ASTM D-3034, Type PSM, SDR 35 or SDR-26 if at depths below eighteen feet (18')**. Sizes **24 inches** and larger shall conform to ASTM F679 or be Sanitite HP Pipe. Force Main shall be HDPE or HDPP.

Identification marks shall be clearly and permanently marked at not greater than 5-foot intervals with pipe diameter, PVC cell classification, manufacturer, plant, ASTM, SDR, date designations and service designation.

B. Caps and Plugs

Caps and plugs for building connections may be molded or fabricated from rubber, polyurethane, PVC, or other suitable compound.

C. Gaskets

Rubber gaskets shall be manufactured from a synthetic elastomer and shall comply in all respects with the physical requirements specified in **ASTM F-477**.

D. Lubricant

The lubricant used for assembly shall have no detrimental effect on the gasket or on the pipe.

E. Fittings

Fittings for PVC pipe may include elbows, wyes, tee wyes, double bell couplings, manhole couplings, manhole adapter rings, plugs, caps, adapters, and increasers. New building service lines tying into existing sewer mains must use an integral wye fitting. Saddle type fittings are not allowed. All metal products used are to be made of stainless steel.

3.1.2 Joining Systems

Joints for the piping system and fittings shall be push on, conforming to **ASTM D-3212** and **F-477**, and consisting of an internally cast bell with one sealing ring, designed to hold the pipe in alignment, provide flexibility, separate the ends of the pipe lengths, resist applied earth pressures, and provide fluid tightness. When assembled, the elastomeric gasket conforming to ASTM D-3212 and F-477, located within the bell is compressed radially on the pipe or fitting spigot to form a positive seal (push-on bell and spigot). All pipe shall have a home mark on the spigot end to indicate proper penetration when the joint is made. The bell and spigot configurations for the fittings shall be compatible to those used for the pipe.

3.2 HDPE and Other

The use of HDPE or other pipe material shall be approved by the District Authorized Representative. Any submittal requiring the use of this pipe shall have engineering justification and will be subject to a case-by-case review by the District. Any design containing HDPE pipe shall reference **MAG Section 738** and shall adhere to testing which is detailed below.

3.3 Manholes

All manhole construction and materials are to adhere to **MAG Section 625**.

A. Mortar

Mortar for bonding grade rings, setting frames and plugging lift holes. Use rapid-set patching material or equivalent.

B. Concrete Mix

Cast in place, see **MAG Specification Section 725, Class A**.

C. Base

Pre-cast or Cast-in-Place concrete bases are acceptable. Tops accurately shaped by ring forms to suit riser sections. Cast and build into bases during manufacture to include resilient connectors for pipe connections and holes for future pipe connections

D. Walls (Risers and Cones)

Pre-cast concrete per MAG Specification Section 742. Cement ASTM C-150, Type II (See MAG Specification, Section 725). Cast or drill only 2 lift holes in each section. Eccentric cones and conical transitions similar in design and construction to riser sections. Reinforced concrete grade adjusting rings.

E. Top of Cone

Reinforced concrete grading rings, minimum 4-inch depth, for adjusting frame to match finished surface (not to exceed 18 inches per MAG Specification Section 420-1) or integrally cast in place concrete grade ring. Use metal shims and mortar to adjust frames less than 4 inches in depth. Provide plaster coat 1/4" – 3/8" thick over inside of grading rings using rapid set patching material or equivalent.

F. Polymer Manholes or Epoxy Coatings

For trunk or interceptor manholes over 12-inches (12"), use an epoxy liner spray or troweled on to a minimum thickness of 1/8" to protect against concrete deterioration from sulfuric acid. Polymer manholes to MAG Specification Section 744 are also acceptable.

G. Inverts

Form invert channels of concrete or PVC half pipe. Conform to adjoining pipes size. Curve side inverts and lay out main inverts (where direction changes) in smooth curves of longest possible radius tangent to adjoining pipelines centerline.

H. Frames and Covers

Cast Iron minimum Class 25 conforming to ASTM A-48. Cover castings are to be free from scale, lumps, blisters, and sand holes. Frames and Covers are to have machined contact surfaces to prevent rocking and should be capable of withstanding AASHTO H-20 loading unless otherwise indicated or specified. All manhole covers are to include the District Logo on top.

I. Manhole Collars

Manholes to have a circular concrete collar (MAG Specification 422, Class AA) sloped to finish grade for unpaved areas or set per specification of City of Apache Junction Engineering Department in paved areas.

J. Joints

Joints between pre-cast sections: 2" rope type butyl rubber-based sealants per Type B, AASHTO M-198, but no bitumen content.

Interlocking neoprene rubber link-type seal sleeves or neoprene rubber boot water stops to be used for pipe connections to manholes: resilient material that will fit snugly over pipes, held firmly against pipe surface by friction or means of adjustable stainless steel pipe clamps. Water stop designed and installed so that leakage between pipe and manhole is minimized. Materials and manufacture of water stops to adhere to ASTM C-923. Non-shrink mortar grout for pipe connections to existing manholes.

K. Steps

The use of steps in manholes is not permitted.

L. Insect Coating

The use of Insecta spray or equivalent is required in manholes.

3.4 Tracer Wire and Marker Tape

The use of tracer wire or marking tape is required. Tracer wire is to be taped to the top of the pipe every 8 to 10 feet to ensure it will not be moved during burying and terminated or grounded at each end to ensure ability to locate.

Sewer warning tape shall be installed and of the type specifically manufactured for marking and locating underground utilities. The tape shall be installed directly above sewer mains and service pipes, at a depth of **12 inches** below finished grade unless otherwise shown. The tape shall be acid and alkali-resistant polyethylene film, **6 inches** wide with minimum thickness of **0.004 inch**.

4.0 System Construction

4.1 Site Preparation

Unless otherwise provided by the District, it is the responsibility of the Contractor to provide all surveying and alignment staking.

The Contractor shall notify all known utilities in the area of the work performed under the contract and shall make arrangements to have their facilities marked in accordance with **Arizona Revised Statutes Section 40-360.22**. The Contractor shall be responsible for locating and preserving all marked facilities. Any damages to these marked facilities shall be repaired at the expense of the Contractor.

All work being performed shall exist within the authorized area. Any clearing, grubbing, and stripping of existing vegetation shall be promptly disposed of and shall not be reused or stockpiled. In doing so, observe all applicable laws, ordinances, rules, and regulations. Do not consider the work is completed until final cleaning, unless otherwise directed the District. The Contractor shall accept responsibility for damages outside these lines.

4.2 Trenching

A. Description

Excavation for pipelines and appurtenance structures, such as manholes, inlets, transition structures, junction structures, vaults, valve boxes, catch basins, etc. shall be deemed to be in the category of trench excavation.

The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the plans, and including excavation ordered by the District Authorized Representative of compacted backfill for the purpose of making tests on any portion of the backfill. All excavation shall be open cut unless otherwise shown on the plans or approved by the District's Authorized Representative.

B. Trench Widths

Per **MAG Specification, Section 601** trenches shall conform to the dimensions in Table 3 (values from **MAG Table 601-1**), unless otherwise specified in the special provisions, indicated on the plans, and/or approved by the District Authorized Representative. The width of the trench shall not be greater than the maximum indicated at and below the level of the top of the pipe. The width of the trench above that level may be made as wide as necessary for sheeting and bracing, and for proper installation of the work.

If the maximum trench width as specified is exceeded at the top of the pipe, the Contractor shall provide, at no additional cost to the District, the necessary additional load bearing capacity by means of bedding, or a higher strength pipe, or a concrete cradle, cap or encasement, or by other means approved in writing by the District Authorized Representative.

TABLE 3 (values from MAG Table 601-1)		
Size of Pipe (Nom. Dia.)	Maximum Width at Top of Pipe Greater than O.D. of Bell	Minimum Width at Springline Each Side of Pipe
Less than 18"	16 inches	6 inches
18" to 24" inclusive	19 inches	7.5 inches

For larger value nominal diameter pipes, please refer to **MAG Table 601-1**.

C. Trench Grade

Alignment and elevation stakes shall be furnished by the Contractor at set intervals and agreed upon offsets.

For all pipe from 4 inches in diameter on up, the Contractor shall over excavate a minimum of 4" below the design grade line and a maximum of 6" below the design grade line.

Remove or pulverize rocks, soil clumps and other debris greater than 2" diameter and then rake or otherwise smooth out the bottom of the trench.

D. Applying Bedding to the Grade Line

Place an initial bedding of 3/8" screened, fractured stone chips (M.A.G. Section 716 – Low Volume type) to bring trench bottom surface to the grade line. The bedding material shall be placed at a uniform density and raked to provide a firm trench surface.

Dig bell and joint holes after the trench bottom has been graded and the pipe section is about to be installed. Holes shall be excavated only as necessary to permit accurate work in the making of the joints and to **ensure that the pipe will rest upon the prepared bottom of the trench, and not be supported by any portion of the joint.**

See SM200 for bedding detail

E. Over-excavation

Per **MAG 601.2.5**, excavation more than 6" below the specified grade line shall be refilled at the Contractor's expense with ABC material compacted to a uniform density of not less than **95%** of the maximum density as determined by **AASHTO T-99** and **T-191** or **ASTM D-2922** and **D-3017**. When **AASHTO T-99**, method **A** or **B**, and **T-191** are used for density determination, **ARIZ 227c** will be used for rock correction.

For circumstances of encountering rock or unsuitable soil, please reach out to a District Authorized Representative.

F. Excavation for Manholes and Other Accessories

Per **MAG 601.2.6** The Contractor may excavate to place the concrete structure directly against the excavated surface, provided that the faces of the excavation are firm and unyielding and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing or if pre-cast structures are used, the Contractor shall over-excavate to place the structure and this Over Excavation shall be backfilled with the same material required for the adjoining pipe.

Any excavation below the elevation indicated for the foundation of any structure shall be filled with ABC and compacted to at least **95%** at the expense of the Contractor.

Excavation for manholes or similar structures shall be sufficient to leave at least **12 inches** clear between the outer structure surfaces and the face of the excavation or support members. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

G. Pavement and Concrete Cutting and Removal

Where trenches lie within paved or concrete sections of streets, alleys, driveways, or sidewalks, etc., such pavement or concrete shall be saw cut to neat, vertical, true lines in such a manner that the adjoining surface will not be damaged per the City of Apache Junction Specification.

H. Trench Shoring

The Contractor shall do such trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to governing federal and state OSHA regulations. The bracing, sheathing, or shoring shall not be removed in one operation but shall be done in successive stages to prevent overloading of the pipe during back-filling operations. The cost of the bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per foot for the pipe.

I. Open Trench

Work within existing City roadways and public utility easements where the construction is in any stage of completion (excavation, pipe laying, or back-filling), shall not exceed **400 feet** in the aggregate at any one location. Similar work within new subdivisions where the public roadways have not been constructed, shall not exceed **1,000 feet**.

Any excavated area shall be considered open trench until all slurry and/or base course to the pavement surface has been placed and compacted. With the approval of the District's Authorized Representative, pipe laying may be carried on at more than one separate location: the restrictions on open trench applying to each location.

Trenches shall be completely back-filled as soon as possible after pipe laying.

Per **MAG 601.2.10**: Substantial steel plates with adequate trench bracing shall be used to bridge across trenches at street crossings where trench backfill and temporary patches have not been completed during regular work hours. Safe and convenient passage for pedestrians shall be provided. The District's Authorized Representative may designate a passage to be provided at any point they deem necessary. Access to hospitals, fire stations, and fire hydrants must be maintained at all times.

4.3 Sewer Installation

A. Excavation Inspection

Examine the excavation before pipe placement to ensure excavation is complete to elevations and slopes indicated, that no obstruction exists to interfere with installation and that the bottom of the trench is firm and dry. Inspect and ensure that appropriate shoring, shielding or sidewall stepping has been completed, and appropriate means of entry and exit are in place so that work can proceed in a safe fashion.

Inspect each pipe and fitting before installation. Non-straight pipe sections shall not be installed. Remove defective pipe and replace with sound pipe.

B. Handling

Store until installation, acceptable to the District's Authorized Representative and keep pipe at ambient outdoor temperature. Provide temporary shading and do not use covering causing temperature build-up. Handle into position to avoid damage. No damaged or defective pipe shall be installed in the work.

C. Type of Pipe

Pipe shall be of the type, class, and size called for on the plans. **Only PVC, or in special cases, lined ductile iron, are allowed for sewer mains. For sections exceeding 15" in diameter, HDPE or FRP materials may be proposed, but must be approved by the District Authorized Representative. Asbestos-concrete, vitrified clay, polyethylene plastic or ABS plastic are not allowed for sewer mains. Only 4" diameter and 6" diameter PVC is allowable for sewer laterals. ABS is not allowed for sewer use in the right of way.**

D. Laying Pipe

The laying of the pipe shall be in finished trenches free from water or debris and shall be commenced at the lowest point with the spigot (plain) ends pointing (downhill) in the direction of the flow and the bell end.

Each pipe shall be laid firmly and true to line and grade, in such manner as to form a close concentric joint with the adjoining pipe, and to prevent sudden offsets of the flow line. Since PVC pipe sections have a slight bend to them, **the pipe shall be laid flat in the trench so that the curve of the pipe section is to the right or left of the center line of the trench, and not up or down from the grade line.** Any adjustment to line and grade shall be made by scraping away or filling in chips under the body of the pipe, never by wedging or blocking under the pipe ends. Pipe shall be kept clean at all times, and as the work progresses; the interior of the pipe shall be cleared of all dirt and superfluous materials of every description.

Carefully clean the gasket area. Make sure the gasket is seated uniformly in the groove of the bell end by running your finger around the inner edge of the gasket. Do not remove the gasket from the bell.

Pipe joint lubricant should be applied to the bevel of the spigot (plain) end and approximately mid-way back to the insertion line, to the gasket surface which makes contact with the spigot end. Only lubricants supplied or recommended by the manufacturer should be used. Push the lubricated end past the gasket into the bell until the insertion line on the spigot is even with the edge of the bell. Do not over-insert the pipe into the bell end. If there is trouble assembling the joint, disassemble and examine the gasket. Replace if damaged. Be sure the gasket is properly seated and both lengths are lined up

Place haunching of **screened 3/8" fractured stone chips (M.A.G. Section 716 – Low Volume type) to the spring line of the pipe.**

Placement of haunching material is an important factor affecting pipe performance and deflection. Proper placement of the fractured stone chips reduces voids and increases pipe support. After placement of the chips to the spring line it is necessary to have a workman walk down the length of the pipe and, using a shovel, make slicing strokes into the chips on both sides of the pipe to ensure there no voids are left in the material.

A District Inspection is required after haunching has been placed, and at least three pipe sections are completed, or a sewer service installation. The alignment and grade of each length of pipe shall be checked after setting by measurement from the string line, laser beam target or other approved means. A uniform slope of the pipe will be maintained toward the point of disposal.

Before the District accepts the construction, it will water flush the lines and video inspect the entirety of the system using National Association of Sewer Service Companies (“NASSCO”) certified inspectors. Observation of any of the following will be cause for requiring excavation and relaying of the pipe section at Contractor expense:

- any standing water in a pipe section greater than $\frac{1}{4}$ ”; or,
- any cracked, dimpled or other obvious pipe defect; or,
- any pipe joint that has more than $\frac{1}{2}$ ” opening from the spigot end to the proper stop point in the bell end of the pipe; or,
- any evidence of damage to or misplacement of the bell end rubber gasket.

At all times when work is not in progress, open ends of the pipe and fittings shall be securely closed with temporary plugs to the satisfaction of the District’s Authorized Representative, so that no water, earth, or other substance will enter the pipe or fittings. If water is in trench, do not remove plug until provisions are made to prevent water, earth, or other substances from entering the pipe; then resume work. The pipeline shall not be used for trench drainage during its construction.

E. Fittings and Jointing

All fittings shall conform to the requirements of the pipe specifications and shall be located as shown on the plans, or as directed by the District’s Authorized Representative, in accordance with the standards details.

Prior to making pipe joints, all surfaces of the portions of the pipes to be joined shall be cleaned and dried. If short sections of pipe are needed, or the pipe must be cut to install fittings such as wyes, the cut must deviate no more than $\frac{1}{2}$ ” from square to the perpendicular of the pipe section. Deburr the inside edge of the pipe section and bevel the outside edge using a file, rasp, or commercial pipe bevel tool built for the purpose.

Before the District accepts the construction, it reserves the right to video inspect the entirety of the system. Observation of any of the following will be cause for requiring excavation and relaying of the pipe fitting or section at Contractor expense:

- any cut pipe end that is not within $\frac{1}{2}$ ” of square;
- any pipe joint that has more than $\frac{1}{2}$ ” opening from the spigot end to the proper stop point in the bell end;
- any burrs on the inside edge of a cut pipe that can catch debris so as to impede hydraulic flow within the pipe;
- any burrs or trapped debris between the spigot outside edge and the receiving (bell) inside surface that could have damaged or compromised the sealing gasket;
- any raggedly cut holes in the pipe, such as for a sewer service wye saddle;
- any dip or flat section in the pipeline where there is standing water greater than $\frac{1}{4}$ ” deep.

F. Service Lines

Service lines shall enter the sewer via integral tee-wye fittings in the sewer mains. Sewer service saddle type fittings are not acceptable for service lines entering existing sewer mains. **Service lines and building laterals shall be constructed of PVC SDR-35 pipe not less than 4" in diameter. ABS plastic lines and fittings are not allowed.**

The location of the service line for each property shall be as shown on the approved plans, or in the downstream **1/3** of the lot, or as requested by the property owner. Sewer service lines and laterals shall not be covered until they have been inspected and approved by the District's Authorized Representative.

When any damage occurs to the pipe ribs or walls outside of the tap area, the Contractor shall perform repairs, as recommended by the manufacturer at no cost to the District. Damage to the pipe will include, but not be limited to, gouging, marring, and scratching forming a clear depression in the pipe.

The depth of the service line at the property line shall be not less than **3.75 feet or more than 5 feet per SM440**, as measured from the top of the pipe to the surrounding grade, unless the minimum required slope of the service pipeline from the sewer main to the property line forces the end of the line to be less.

G. Means of Disconnection Required at Property Line

For all residential construction the service line and disconnect cleanout shall be of 4" diameter PVC SDR-35 or Schedule 40 pipe. The riser pipe shall be of 4" PVC SDR-35 pipe. The top of the riser pipe shall be cleanly cut at 90 degrees perpendicular to the line of the pipe and completed with a PVC threaded female fitting. The cleanout cap shall be enclosed and protected within a ductile iron monument at the finished surface grade. The District supplies both the disconnect valve and the monument as part of the connection permit process.

H. Collection Main Cleanouts

Collection main line cleanouts shall be constructed at locations shown in the plans, in accordance with the standard details for cleanouts.

I. Cleaning

Prevent earth, water, and other material from entering the pipeline. Clean and flush pipeline and manholes of dirt, rock, debris, and obstructions upon completion. Any material that has accumulated into the pipeline should not be washed into the system.

4.4 Manhole Installation

A. Setting Pre-cast Sections

When excavation is made below the pipe for manhole construction, the sewer shall be laid continuously through manholes on all straight runs and at angle points when so authorized by the approved plans.

Set verticals with sections in alignment. Set bases true to line and elevation. Install Butyl rubber-based sealant in joints between sections. Plug holes for handling with mortar. Hammer mortar into hole until dense and excess of paste appears, then smooth flush with adjoining surface.

B. Laying Grade Rings

If grade rings are used, lay grade rings in full bed and joint of mortar without subsequent grouting, flushing, or filling, bond thoroughly.

C. Jointing and Connections

Hold rubber ring water stops for pipe-to-manhole firmly against pipe surface by mechanical take-up device to compress resilient material when tightened. Install to minimize leakage. Apply non-shrink mortar according to manufacturer's instruction.

D. Setting Frames and Covers

Set frames with top conforming to finished ground or pavement surface as indicated. Set circular frames concentric with top of masonry. Set frames in full bed of mortar to fill and make watertight the space between top of cone or grade ring, and bottom flange of frame.

If manhole is in an unpaved area, they shall be, at minimum, 6 inches above finished grade.

Place a thick ring of mortar extending to the outer edge of cone or grade ring around bottom flange. Finish mortar smoothly and give a slight slope to shed water away from frame.

Place circular concrete collar around frame when placing in permanent pavement per MAG specifications. Place concrete collar around frame and slope to existing grade when placing in unpaved areas. Remove all fallen debris from inside of manhole on base and invert after placement of frame is completed. Place covers on frames after completion of work.

E. Leakage Tests

Vacuum testing is required on all manholes installed. Inspect for visible leakage after backfilling with ground water at normal level. Locate visible leakage inside manhole and repair leaks.

F. Connection to Existing System

Unless approved by the District's Authorized Representative, no tie-in on the existing system shall be made unless the District's inspector is present.

4.5 Backfill Requirements

A. Initial Backfill

Backfill from the spring line of the pipe to 12" over the top of the pipe shall be fractured stone chips (M.A.G. Section 716 – Low Volume type). Backfill around utilities that are exposed during trench excavation shall be fractured stone chips from 4" below the utility line to 12" over the utility line.

B. Final Backfill and Compaction

Native material used for backfill shall be screened 3" minus earthen material free from broken concrete, pavement, wood, vegetation or other scrap. An acceptable method of compacting the native material is by using a compaction wheel on a backhoe or excavator, or by using a self-propelled drum vibration compactor. The native material must be processed to achieve optimum moisture before placement into the trench and the maximum lift is restricted to 36 inches.

C. Final Surface

Final surface material should match the existing condition surrounding it. The City of Apache Junction requires a T-top finish for the surface A.C. pavement, 12 inches on each side of the trench. The A.C. pavement must be applied to a saw-cut straight edge of unbroken existing pavement. Please refer to City of Apache Junction Specification for clear instructions.

4.6 Quality Assurance

Contractor is to provide labor necessary to assist the District Authorized Representative in inspecting pipe and all other materials upon delivery. Mark and remove rejected pipe and other materials immediately. Any imperfections which in the opinion of the District Authorized Representative may adversely affect the performance of the pipe, joints, manholes or other material shall be cause for rejection. Upon request of the District Authorized Representative, provide certification that pipe, manholes and fittings comply to the specification.

4.7 Inspection

A. Construction Inspection

The construction of sewer mains shall be inspected by the District representative as follows:

- After the sewer pipe has been laid to grade and 3/8" screened rock chip haunching has been applied to the spring line of the pipe
- After 3/8" screened rock chips have been placed 12" over the top of the pipe
- After placement of manhole bases
- After manholes have been stacked
- After any sand, lint or grease interceptor or other pre-treatment device has been set in place
- During all acceptance testing of the sewer system
- After construction of the sewer system and final grading/surfacing of the lot.

The District Inspector will conduct a final inspection of every service line after all final surfacing or grading has been completed. During this inspection, the District Inspector will check that building and disconnect cleanouts have been properly installed and capped, and that the monument has been properly installed to finished surface grade over the end of the disconnect cleanout riser pipe. The District Inspector will not sign off on any building connection permit until the disconnect cleanout riser and monument have been properly installed.

B. Closed Circuit TV Inspection

Before the District accepts the construction, it will water flush the lines and video inspect the entirety of the system using NASSCO certified inspectors. Observation of any of the following will be cause for requiring excavation, repair or re-laying of the pipe section at Contractor expense:

- Any standing water in a pipe section greater than $\frac{1}{4}$ "; or,
- Any cracked, dimpled or other obvious pipe defect; or,
- Any pipe joint that has more than $\frac{1}{2}$ " opening from the spigot end to the proper stop point in the bell end of the pipe; or,
- Any evidence of damage to or misplacement of the bell end rubber gasket; or,
- Any cut pipe end that is not within $\frac{1}{2}$ " of square; or,
- Any burrs on the inside edge of a cut pipe that can catch debris so as to impede hydraulic flow within the pipe; or,
- Any burrs or trapped debris between the spigot outside edge and the receiving (bell) inside surface that could have damaged or compromised the sealing gasket.

4.8 Testing

A. Acceptance Testing

Sewer main pipelines and manholes shall be subject to acceptance testing before the District will accept the construction. This acceptance testing is in addition to the TV video inspection in B. above.

100% of the sewer pipelines shall be both low-pressure air tested and 5% deflection (mandrel) tested. All manholes shall be vacuum tested from the top of the cone down.

Pipeline segments that have been installed (as verified per the Design Engineer's stamped "as-built" drawings) at or less than a slope that would give a mean velocity when flowing half-full at 2.0 feet per second, or less based upon Manning's formula using an "n" value of 0.013, shall be **flow tested**.

B. Low-pressure Air Test

Testing will be accomplished by the means of **low-pressure air testing per "Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air" published by the American Society for Testing and Materials, ASTM Designation F1417.**

C. Vacuum Test for Manholes

The air vacuum test for acceptance of manholes shall be per the "Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test" published by the American Society for Testing and Materials, **ASTM C1244.**

All lift holes and any pipes entering the manhole are to be plugged. The test head is fitted and a vacuum of 10 inches of mercury is drawn, and the vacuum line closed. The time required for the vacuum to drop to 9 inches of mercury must meet or exceed that shown in Table 4 below.

Table 4	
Manhole Depth	60" MH, sec
8 ft. or less	26
10 ft.	33
12 ft.	39
14 ft.	46
16 ft.	52
18 ft.	59
20 ft.	65

D. Deflection Test for HDPE and PVC Pipe

In addition to the tests prescribed above, the Contractor shall perform a deflection test on the system as directed by the District's Authorized Representative. Any part of the installation which shows deflection in excess of **5%** of the base inside diameter as per **ASTM D-3034, ASTM F-679, ASTM F-794, and ASTM F-789** shall be corrected.

E. Testing of Force Main

The testing of Force Mains shall adhere to **MAG Section 611.2.2(A)**. This requires that a force main be subjected to air pressures between 200-205 psi for two hours. In the event this exceeds the design pressures by a significant amount, according to AAC R18-9-E01.D.4f, the force main pipe must be tested 50 psi above the design pressure. Either testing method must be approved by the District Authorized Representative.

4.9 Final Acceptance

Commencement of flow into the sewer system is not allowed until the District has given written notice of acceptance and unconditional responsibility for operation and maintenance of the system. For private sewer systems, some steps below will be required but the District will not own or maintain the system.

Ownership of systems constructed under a Collection Main Extension Agreement are transferred to the District when five (5) conditions are met:

1. the sewer installation has received a final inspection after final cleaning and all acceptance testing and right-of-way improvements have been completed, including the final paving of roads;
2. the District has received a signed and stamped copy in .pdf format of the as-built plans
3. the District has received State Plane coordinates for each manhole on the plans
4. the District has given written notice of acceptance and unconditional responsibility for operation and maintenance of the public portion of the system; and,
5. a written authorization for operation has been received by the District from the Arizona Department of Environmental Quality. Obtaining authorization from ADEQ will require submittals from the Design Engineer to ADEQ.