

## **DIVISION TWO - STANDARDS FOR SANITARY SEWER**

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## DIVISION TWO - STANDARDS FOR SANITARY SEWER

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### SECTION 2.1 GENERAL

#### Sec. 2.1.1 PURPOSE AND SCOPE

This division establishes the minimum acceptable standards for design, materials, and methods to be used in providing sanitary sewer systems for developments in the City of Shafter. Where the sewer system being designed is to be installed within a special district which has adopted standards for sewers, the more restrictive of that district's standards and the standards contained herein shall apply. Minor deviations from these standards may be permitted where warranted in the opinion of the City Engineer, and when applicable, with the concurrence of the Engineer for the district.

#### Sec. 2.1.2 PLAN SUBMITTAL PROCESS

- 2.1.2.1 The design data, calculations, and the construction plans for proposed sewer systems shall be submitted by the developer's engineer to the City Engineer, for review and approval prior to construction, except as provided in Section 2.1.3. This is in addition to the approval of any applicable district.
- 2.1.2.2 An Engineer's Estimate, based on "unit" prices approved by the City Engineer, shall be submitted and approved for the determination of plan check and inspection fees.
- 2.1.2.3 All plan check fees shall be paid to the Office of the City Engineer prior to the approval of any improvement plans.
- 2.1.2.4 An improvement plan checklist and two (2) sets of "blue-lines" shall be submitted for plan checking.
- 2.1.2.5 Sewer plans must be accompanied by calculations, signed by a California Registered Civil Engineer, supporting pipe sizes for any trunk sewer or sewer carrying off-site development wastewater.
- 2.1.2.6 Plans are subject to multiple checks until plans are amended to the satisfaction of the City Engineer.
- 2.1.2.7 Sewer improvement plans being submitted for "Final Signature" shall be submitted in ink on film or vellum. Once signed by the City Engineer, the developer's engineer shall be responsible for submitting three (3) sets of "blue-lines", to the Office of the City Engineer, at least 48 hours prior to the start of construction.
- 2.1.2.8 **As-Built Drawings:** Upon completion of the improvements and prior to final acceptance of the development the developer's engineer shall submit "As Built, Record Drawings" to the Office of the City Engineer, showing changes from the original drawings and the "as-built" locations of any underground facilities constructed or encountered with the sewer plans. The "as-built" plans shall be

submitted on film or mylar with either hand notations or computer generated notation. All notations shall completely illustrate the as-built condition in a neat, complete, and legible manner.

### **Sec. 2.1.3 WAIVER OF REVIEW PROCESS**

- 2.1.3.1 The requirement for review by, and approval of, the City Engineer, for sewer plans may be waived when all of the following conditions exist:
- a) Proposed improvements consisting of private facilities neither dedicated, owned, nor maintained by the City, and located within non-dedicated right-of-way.
  - b) The facilities are to be accepted and maintained by an established Public District or private company, other than the City of Shafter.
  - c) The private company or district has adopted standards which the City Engineer has found to be equivalent to, or more restrictive than, the City's adopted Development Standards.
  - d) The plans are prepared by the developer's engineer and approved by the company's or district's engineer or prepared by the company's or district's engineer.
  - e) The company's or district's engineer by certificate shall state that the plans meet or exceed the minimum City of Shafter Development Standards.
  - f) The district or company has received written approval of the City Engineer for waiver of the requirement of City review and approval of the plans.

### **Sec. 2.1.4 ALTERNATIVE DESIGN**

- 2.1.4.1 The design standards in this Division are to be deemed to be minimal. Alternate designs may be permissible, as determined by the City Engineer for designs of equal or higher quality. The City Engineer may allow such exceptions as he may find to be reasonably required by the circumstances of the case, to be in the public interest and in conformity with the general objectives of these standards.
- 2.1.4.2 The provisions of this manual are not intended to prevent the use of any material or method of construction not specifically prescribed by this manual if such alternate has been submitted to and has been approved by the City Engineer.
- 2.1.4.3 The City Engineer may approve alternate designs, if such alternate is found to be for the purpose intended and at least the equivalent of that prescribed in this manual in quality, strength, sanitation, durability, safety, and effectiveness.
- 2.1.4.4 Prior to the approval of an alternate design the City Engineer may require the developer's engineer to submit a sample of such alternate material or method, together with two copies of a technical report, including design data, report of material and chemical analysis, and details of laboratory tests which have been performed, plus copies of all tests and approvals, if any, under State Department of Health Services, or other approved testing laboratories.
- 2.1.4.5 In no event will the use of other than new and unused materials be permitted unless specifically approved by the Environmental Health Services Department and the City Engineer.

2.1.4.6 See Section 2.2.8 for clearance between water and sewer lines.

**Sec. 2.1.5 ENFORCEMENT**

2.1.5.1 Provisions of these standards for water systems shall be enforceable by the City Engineer.

**Sec. 2.1.6 DEFINITIONS, TERMS, AND ABBREVIATIONS**

Whenever any of the following words, expressions or pronouns are used in these minimum standards, they shall be understood to have the meanings given below:

APWA	American Public Works Association
ASTM	American Standards for Testing Materials.
BACKFILL	Soil materials used to fill an excavation.
BUILDING SEWER	See Sewer Lateral
CERTIFICATE OF OCCUPANCY	A document issued by the City Building Official allowing the occupancy or use of a permitted structure or site.
CITY	The City of Shafter or the City Council for the City of Shafter.
CITY ENGINEER	The City Engineer for the City of Shafter, or a duly authorized representative.
COMPACTION	The densification of materials by mechanical means.
CUL-DE-SAC	A short local street with a maximum length of four hundred feet having one end permanently terminated in and including a vehicular turning area.
CUT	See excavation.
DEDICATION	The deliberate appropriating of land by an owner(s) for any general and public uses, reserving to themselves no other rights than such as are compatible with the full exercise and enjoyment of the public uses to which the property is to be devoted. The intent to dedicate will be evidenced presentation of a deed.
DEVELOPER REIMBURSEMENT AGREEMENT	Agreement between the City and a developer, who installed public improvements. The agreement provides for reimbursement of a fair prorated share by any real estate owners who have not contributed to the original cost of such facilities, and who subsequently connect to, or use the improvement.
DEVELOPER	The applicant for a development permit, his successors, and/or assignees.

DEVELOPER AGREEMENT	An agreement between the City and the Developer, which contains work descriptions, estimated costs, responsibilities for the work performance and an expiration date.
DEVELOPMENT	Any man-made change of improved or unimproved real estate, the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any mining, excavation, landfill, clearing, or land disturbance; or any use or extension of the use of land.
DIRECTOR	Director of the Public Works Department or designee, including the City Engineer and City inspectors.
DRIVEWAY	A private roadway providing access for vehicles to a parking space or parking lot, garage, dwelling, or other structure.
EARTH MATERIAL	Any rock and/or natural soil exclusive of any decomposable matter.
EARTHWORK	Excavation, fill and back fill, compaction, and grading.
EASEMENT	Interest in land which does not include any rights of possession. A right of one owner of land to make lawful and beneficial use of the land of another created by an express or implied agreement.
EXCAVATION	The mechanical removal of earth material.
EXISTING GRADE	The elevation in relationship to mean sea level
FINISH OR FINAL GRADE	The grade of the subject site, which conforms to the permitted plan.
GRADE	The vertical location of the ground surface to a predetermined elevation datum.
IMPROVEMENTS	Any improvement to public, real, or personal property, including but not limited to, installation of streets, roads, pedestrian/bike facilities, streetlights; landscape features; sewer and waterlines; bridge structures; storm drainage facilities; and traffic control devices.
INVERT	The lowest point in the internal cross section of a pipe or other culvert.
LOT	The smallest platted parcel of real property created by a legal subdivision.
OBSTRUCTION	Any obstacle of whatever kind or nature and shall include, but shall not be limited to, structures, power poles, telephone or telegraphic poles and appurtenances, pipe lines, conduits and canals.
OSHA	Occupational Safety and Health Administration

PERMITTEE	Any person, governmental agency, or other entity that is performing, or plans to perform, permitted work within the City.
PLANS	The plans, profiles, cross sections, elevations, details, and supplementary specifications, signed by a licensed professional engineer and approved by the Director, showing the location, character, dimensions, and details of the work to be performed.
RIGHT OF WAY	A strip of land acquired by reservation, dedication, forced dedication, prescription, or condemnation and intended to be occupied by a road, crosswalk, railroad, electric transmission lines, oil or gas pipeline, water line, sanitary sewer, storm sewer, or other similar public accesses or public uses;  Definition includes the right of one to pass over the property of another.
ROAD	Synonymous with street.
SEWER LATERAL	Portion of sewer line extending from sewer main to a building and having no other common sewers discharging into it.
SEWER TRUNK	See Sewer Main
SEWER MAIN	Sewer that received flow from one or more mains.
SITE PLAN	The graphical plan, usually in map form, prepared pursuant the construction of a development.
SITE	For purposes of this manual, a specific location on which any of the following activities are underway: excavation, cutting, or filling of earth or related earthwork.
SLOPE	An inclined ground surface the inclination of which may be expressed as the ratio of horizontal distance to vertical distance.
SOIL	Naturally occurring surface deposits overlying bedrock.
STANDARD DETAIL	Drawings approved by the City Council and adopted by said Council as part of these standards.
STREET	Includes roads and highways. The terms street, road, and highway are used interchangeably and refer to the rights of way used for vehicular traffic, whether improved or unimproved

## SECTION 2.2 DESIGN STANDARDS

### Sec. 2.2.1 SANITARY SEWER DISCHARGE

The following guidelines shall be used to compute contributing sewage:

#### 2.2.1.1 Residential Use:

- a) The average family unit shall be three and one-half (3.5) persons per single-family residential unit and three and one-half (3.5) persons per multi-family residential unit.
- b) The average daily discharge of domestic sewage shall be one hundred (100) gallons per day per person. The design peak discharge of domestic sewage shall be based upon the following formula (in the absence of any specific information to the contrary):

$$\text{DESIGN PEAK DISCHARGE} = 1.8 \times (\text{AVERAGE DAILY DISCHARGE})$$

#### 2.2.1.2 Commercial / Industrial Use:

- a) In the absence of any specific information to the contrary, the design peak discharge for commercial and industrial sewage shall be:

<u>LAND USE</u>	<u>PEAK DISCHARGE RATE<sup>††</sup></u>	<u>PEAK FACTOR</u>
Commercial	0.010 CFS/GA (6,460 GPD/GA)	1.8
Industrial	0.015 CFS/GA (9,695 GPD/GA)	2.0

GA Gross Acre

<sup>††</sup> Commercial and industrial developments shall be evaluated on a case-by-case basis by the City Engineer for the determination of peak discharge rates and pipe sizes.

- b) Provided sufficient data is available, an alternate per capita method may be used for determining commercial flows, as follows:

Compute Number of People: 5 persons per 1,000 sq. ft. NFA (Net Floor Area), where NFA = 0.85 X GFA (Gross Floor Area)

$$\text{AVG FLOW} = \text{Rate per capita for a given land use} \times \text{Number of People}$$

Flow rates may be obtained from acceptable references, historical data, or any other approved source acceptable to the City Engineer.



**Sec. 2.2.2 SANITARY SEWER MAIN DESIGN**

2.2.2.1 Depth of Flow:

- a) Trunk and main sewers may be designed to flow full.
- b) NOTE: Under no conditions is a gravity sewer ever to be designed to flow under a head.

2.2.2.2 Sewer Velocity:

- a) Minimum design velocity for any sanitary sewer shall be in excess of two (2) feet per second, for pipes flowing full or half full, or with the approval of the City Engineer, one and six-tenths (1.6) feet per second for pipes flowing full (at peak discharge). Acceptable criteria for this reduced velocity shall include calculations showing average flows causing the pipe to flow at least 40% depth.
- b) Design velocities for sanitary sewers shall be computed using Manning's formula with a constant "n" value for pipes half full or full as follows:

PVC Pipe:	n = 0.011
HDPE Pipe	n = 0.011
VCP Pipe	n = 0.015
Ductile Iron	lining dependent n = 0.013 minimum

2.2.2.3 Minimum Slope and Capacity:

- a) Minimum slopes shall conform to the following table:

PIPE SIZE	n = 0.0011		n = 0.0013	
	MINIMUM SLOPE (FT/FT)	CAPACITY (CFS)	MINIMUM SLOPE (FT/FT)	CAPACITY (CFS)
4"	.0100	-	.0100	-
6"	.0100**	0.66	.0100**	0.56
6"	.0040	0.42	.0050	0.40
8"	.0030	0.78	.0035	0.71
10"	.0020	1.16	.0025	1.10
12"	.0015	1.63	.0020	1.59
15"	.0011	2.53	.0015	2.50
18"	.0010	3.93	.0011	3.48
21"	.0009	5.62	.0009	4.75
24" & greater	.0008	7.57+	.0008	6.33+

\*\* Last 200 feet where required

2.2.2.4 Maximum Discharge and Velocity:

- a) The maximum design discharge shall not exceed the flow at critical slope and velocity. Sanitary sewers shall not be designed for flow conditions at critical slope and velocity.

**Sec. 2.2.3 SANITARY SEWER MAIN LOCATION, ALIGNMENT, COVER AND MINIMUM SIZE**

2.2.3.1 Location:

- a) Whenever possible, sewers shall be placed in the public roadway.
- b) All sanitary sewers and appurtenant structures located in streets or alleys shall be a minimum of five (5) feet from the roadway center line. In no case shall a sanitary sewer line be located closer than five (5) feet from an existing or proposed gutter lip. Sanitary sewers shall be centered on travel lanes to the greatest extent possible.
- c) Sewer lines will not be permitted in easements between the back yards or along the side yards of single or multi-family residential lots.
- d) Location of sewer lines in easements shall be subject to the approval of the City Engineer. Where sewer lines are permitted within easements, the easements shall be:
  - (1) Granted with the final map, or
  - (2) Be granted to the entity accepting and maintaining the sewers, or
  - (3) Be dedicated to and accepted by the City of Shafter.
  - (4) The minimum width of any easement for sanitary sewer purpose shall be ten (10) feet. In special cases of terrain, depth of sewer line, access, etc. the required easement width shall be increased as required and approved by the City Engineer.
  - (5) All easements shall include right of ingress and egress over adjoining property for maintenance, replacement and operation. No permanent structures shall be constructed in such easements with the exception of fencing or utilities subject to overlapping easements.
- e) The entire sanitary system shall be located as mentioned above and shall be designed to clear all other existing or proposed utilities by a minimum of twelve (12) inches and shall conform to the requirements of the affected utility. Clearances with water lines shall conform to Section 2.2.8.

2.2.3.2 Alignment:

Whenever possible, sewer lines shall be laid out in a straight line between structures. Curved sewer lines will be allowed under the following conditions:

- a) All curve data shall be shown on the plans.
- b) Minimum radius of curvature and joint deflections shall be as recommended by the pipe manufacturer and approved by the City Engineer. Alignment shall be concentric to street or easement centerline, unless approved by the City Engineer.

- c) In the event non-concentric pipe alignments are used, any non-metallic sewer line shall have a No. 10 bare soft copper detector wire placed over the pipe line prior to backfilling. The detector wire shall be brought up to the manhole frames at each end of the pipeline. Detector wire shall be secured to manhole walls in a manner acceptable to the City Engineer
- d) All deflections shall be at the pipe joints or by specially mitered pipe sections. Actual bending of the pipe itself will not be allowed.
- e) Manholes shall be constructed at the beginning and ending of all curved sections.
- f) Identification tape, designed for use on sewers, shall be buried 18 to 24 inches above sewer main along its entire length. Identification tape shall also be buried 18 to 24 inches above sewer laterals from the sewer main to the right of way or property line.

2.2.3.3 Cover:

- a) Minimum cover for any sewer main shall be four (4) feet within the public right-of-way, and three (3) feet in sewer easements. Any deviation from this cover shall require special design and approval by the City Engineer.
- b) Minimum cover for a building sewer shall be per Section 2.2.6.

2.2.3.4 Minimum Size:

- a) Minimum line size for any sewer main shall be eight (8) inches inside diameter for local streets, and twelve (12) inches for major collectors, minor collectors, and arterials.
- b) For sewer mains which cannot be extended, or for cul-de-sacs, which are no more than 300 feet in length, sewer lines shall not be less than six (6) inches in diameter.

**Sec. 2.2.4 MANHOLES**

- 2.2.4.1 Manholes shall be placed at the intersections of all main sewer lines. A main sewer line shall be defined as any sewer, other than a building lateral, serving one or more building laterals or other sewer mains.
- 2.2.4.2 Manholes shall be placed at all changes of alignment, either vertical or horizontal.
- 2.2.4.3 The maximum distance between manholes shall be four hundred (400) feet for sewer mains 12 inches in diameter or smaller. For larger mains the maximum manhole spacing shall be six hundred (600) feet.
- 2.2.4.4 A one tenth (0.1) foot energy drop shall be allowed for flow through manholes with a deflection of 45° or more.
- 2.2.4.5 Invert elevations of varying size pipes leading into and out of manholes shall be set by matching elevations of the eight-tenths (0.80) depth. Invert elevations of equal size pipes leading into an out of manholes shall be the same or shall conform to Sections 2.2.4.4 or 2.2.4.9.

- 2.2.4.6 Inverts of building drains or house laterals which terminate in a manhole shall be elevated a minimum of six (6) inches and a maximum of 12 inches above the flowline of the manhole.
- 2.2.4.7 A maximum of six (6) building drains or house laterals shall terminate in a manhole. Holes cored into manhole shall be spaced at minimum 24" horizontally around the circumference and staggered vertically.
- 2.2.4.8 Manholes shall be placed only in locations that provide ready access to the sewer for maintenance and emergency service.
- 2.2.4.9 **Drop Manholes:** Whenever the vertical distance between the inverts of sewer line connections of a manhole exceed thirty (30) inches, a standard Drop Manhole shall be constructed per City standard detail SW-5. Vertical distances less than 30 inches between inverts will not be allowed, other than as specified in Section 2.2.4.

#### **Sec. 2.2.5 RODDING AND FLUSHING CLEANOUT**

- 2.2.5.1 Standard rodding and flushing cleanouts shall be allowed at the end of cul-de-sacs and at the terminal end of sewer segments constructed for later extension, such as at the edge of a subdivision, provided the sewer segment does not exceed 200 feet in length. If the segment exceeds 200 feet, a standard manhole shall be constructed in lieu of a rodding & flushing cleanout.

#### **Sec. 2.2.6 BUILDING SEWERS (LATERALS)**

- 2.2.6.1 Minimum size of any sanitary building sewer within City right of way to serve individual residences, commercial structures, etc. shall be four (4) inches. Actual size of building sewers larger than four (4) inches shall be determined by fixture unit requirements as per the current edition of the California Plumbing Code.
- 2.2.6.2 A separate building sewer shall be provided to each lot, parcel or building. Subdivision of land into large parcels subject to potential future re-subdivision or multiple building sites may require additional laterals or increased lateral size, as directed by the City Engineer.
- 2.2.6.3 The depth of building sewers shall provide a minimum of two and one-half (2½) feet of cover at the gutter flowline. Where circumstances require cover of less than two and one-half (2½) feet, special design and approval by the City Engineer is required. Any lateral with less than 2½ feet of cover shall be noted on the plans.
- 2.2.6.4 For residential, building sewer shall be placed at the center of each lot or parcel. The terminus of the building sewer shall not be under any proposed or existing driveway.
- 2.2.6.5 For commercial or industrial lots, building sewers shall be placed at a location approved by the City Engineer.

#### **Sec. 2.2.7 SPECIAL EQUIPMENT AND STRUCTURES**

- 2.2.7.1 All special equipment such as package lift stations, their appurtenances, and their effluent disposal methods shall be designed, located, and constructed so as to preclude contamination, pollution, nuisance, and structural and mechanical instability. Special structures, such as pump stations, pressure lines, sags, etc. shall

be subject to the approval of the City Engineer and when applicable the maintaining district.

2.2.7.2 See Section 2.7 for Lift Station Requirements.

## **Sec. 2.2.8 REQUIREMENTS FOR SEPARATION OF SEWER & WATER LINES**

Separation of water & sewer mains shall be in compliance with the "California Waterworks Standards" discussed in Title 22, Chapter 16, Article 5 of the California Code of Regulations.

Every effort will be made to adhere to these standards. Any deviation from these standards will require special design & approval of the City Engineer.

### **2.2.8.1 Gravity Sewer Lines:**

- a) Gravity sewer lines shall be laid in separate trenches a minimum horizontal clear distance of ten (10) feet away from water lines.
- b) Sewer lines shall be laid at a lower elevation than nearby water lines.
- c) When pipelines must cross, the bottom of the water line shall be at least twelve (12) inches above the top of the sewer pipe.
- d) If minimum separation can not be attained as outlined in this section, pipelines shall be constructed as directed by the City Engineer.
- e) Where steel casings or tunnels are used for the passage of water and sewer lines under railroad tracks, highways or other structures, the same shall be specially designed to eliminate any hazard of contamination to the water system.

### **2.2.8.2 Sewer Force Mains:**

- a) Sewer force mains shall be laid in separate trenches a minimum horizontal clear distance of ten (10) feet away from water lines.
- b) When a sewer force main must cross a water line, the crossing should be as close as practical to the perpendicular. The sewer force main should be at least one foot below the water line.
- c) When a new sewer force main crosses under an existing water main, all portions of the sewer force main within ten feet (horizontally) of the water main shall be enclosed in a continuous sleeve.
- d) When a new water main crosses over an existing sewer force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 PSI or equivalent pressure rating.

## **SECTION 2.3 MATERIAL STANDARDS**

### **Sec. 2.3.1 GENERAL**

- 2.3.1.1 All material that is to become a permanent part of any sanitary sewer or appurtenant structure, shall conform to the requirements for the particular materials set forth in these specifications.
- 2.3.1.2 The contractor shall supply any and all certificates of compliance, certified test results or shall perform tests as required to assure the City Engineer that the material being incorporated into the work has met the requirements as specified.
- 2.3.1.3 Requests to use materials not listed in these standards shall require special consideration and approval of the City Engineer.
- 2.3.1.4 Material Tests
- a) All tests to determine compliance with any of these specifications shall be made within the Continental United States.
  - b) If requested by the Engineer, the test results shall be certified by an established reputable materials testing firm and a copy forwarded to the Engineer.
  - c) Any materials delivered to the job site and suspected of damage due to shipping or handling, if requested by the Engineer, shall be tested again and the test results certified by an approved materials testing firm.

### **Sec. 2.3.2 PIPE AND CONDUITS**

- 2.3.2.1 All pipe or conduits shall be of the size, material and strength as shown on the plans.
- 2.3.2.2 All pipe and fittings shall be marked or stamped with the trade brand name of the manufacturer, applicable ASTM standards, diameter, material, and strength or class of pipe.
- 2.3.2.3 All pipe shall be designed to withstand all internal or external loads applied.
- 2.3.2.4 A certificate of compliance from the pipe manufacturer shall be provided for each type of material used.
- 2.3.2.5 Supporting strength of conduits as installed to safely carry imposed gravity loads and superimposed loads (including a suitable factor of safety) shall be determined by use of Marston formula as per Chapter IX (Structural Requirements) ASCE Manual of Engineering Practices No. 37.
- 2.3.2.6 All pipe or conduits shall be of the same material between structures.

### **Sec. 2.3.3 POLY VINYL CHLORIDE PIPE (PVC)**

PVC is the preferred material of choice for gravity sewers.

#### **2.3.3.1 Materials:**

- a) Pipe and fittings shall conform to ASTM specification D-3034 for SDR-35 requirements. Pipe and fittings shall be made from PVC having a minimum cell classification of 12454-B, 12454-C or 13364-B, as defined by ASTM-D-1784, and shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other injurious defects. Fittings shall be injection molded and shall be installed in line on new pipelines; cut-in fittings are not permitted. Pipe stiffness shall be 46 PSI minimum when measured in accordance with ASTM-D-2412.
- b) PVC pipe shall not deviate from straight by more than 1/16th inch per foot (camber) when the maximum offset is measured from the concave side of the pipe. The pipe shall be of the bell and spigot type. Bells shall be factory attached to the pipe.
- c) Each length of pipe shall be marked with the applicable ASTM, SDR (if applicable), cell classification, nominal pipe size and manufacturers name or trademark.

#### **2.3.3.2 Joints:**

- a) Use only elastomeric gasket joints. Field solvent welded joints shall not be allowed. The assembly of joints shall be in accordance with the manufacturer's recommendation and ASTM-D-3212.
- b) Where PVC pipe connects to VCP or other sewer pipe material, use couplings approved by the City Engineer.
- c) Wyes or tees for house service connections shall be complete fittings. Saddle type fittings shall not be allowed.

### **Sec. 2.3.4 HIGH DENSITY POLYETHYLENE (HDPE)**

#### **2.3.4.1 Materials:**

- a) The pipe and fittings shall be made of High Density, Extra High Molecular Weight (EHMW) polyethylene with a standard thermoplastic material designation code of PE3408. Pipe material shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other injurious defects
- b) The pipe shall be manufactured in accordance with ASTM F714 and/or ASTM D3035.
- c) Manufacturer's name, date of manufacture, diameter, DR rating, and the ASTM standard shall also appear as ASTM F714 with the material designation as PE3408.
- d) U.V. stabilizer per manufacturer's recommendation shall be sufficient to provide for two years storage life.

2.3.4.2 Joints:

- a) Pipe and fittings shall be joined by one of the following types of thermal fusion per the manufacturer's recommended procedures: butt fusion, saddle fusion or socket fusion.

**Sec. 2.3.5 DUCTILE IRON (DI)**

Ductile iron shall be allowable for gravity sewer only where PVC or HDPE sewer pipe will not work or when depth of the sewer cannot meet these standards. Ductile Iron pipe for gravity sewer will meet the following:

2.3.5.1 Materials:

- a) Ductile iron pipe and fittings shall be as specified in ASTM A746 for thickness Class 52. Extra thickness shall be provided where required by deep cover in accordance with ASTM A746, Table 12, for Type 2 laying condition.
- b) Cutting of ductile iron pipe shall be by saw, cutter, abrasive wheel or other approved means. In no case shall ductile iron pipe be cut by burning.
- c) Marking of ductile iron pipe shall include the pressure rating, metal thickness, net weight of pipe without lining, length of pipe, name of manufacturer and letters "DI" which shall be clearly marked on each length of pipe.

2.3.5.2 Joints:

- a) Ductile iron pipe for gravity sewers shall be mechanical joint or push-on joint, unless specified otherwise, conforming to ASTM A746.

2.3.5.3 Lining:

- a) Ductile iron pipe and fittings shall be lined and coated with ceramic epoxy lining, fusion-bonded epoxy lining, fusion-bonded polyethylene lining, or polyurethane lining specifically designed to withstand the corrosive environment typical in septic sewage systems.
- b) Lining shall withstand exposure to hydrogen sulfide (H<sub>2</sub>S). Supplier shall provide certifications to the City Engineer that the sewer pipe has been lined and coated in accordance with manufacturers recommendations and shall specify the thickness of the coating.
- c) Extra lining material shall be available at the construction site to repair or patch coating as required for acceptance.
- d) Ductile iron pipe, if not coated, shall be polyethylene encased per ANSI/AWWA C105/A21.5.
- e) Cement-mortar linings, asphaltic linings, or other linings typically used for domestic water pipe are not acceptable for sewer service.



**Sec. 2.3.6 VITRIFIED CLAY PIPE (VCP)**

2.3.6.1 Vitrified Clay Pipe (VCP) shall only be used at the consent of the City Engineer and only in connection with existing VCP sewer pipe belonging to the City.

2.3.6.2 Materials:

- a) The pipe and fittings shall be new, first quality pipe and shall comply with the specifications for Extra Strength Unglazed Clay Pipe ASTM Designation: C-700, and shall be installed in conformance with the provisions of Sections 71 of the Standard Specifications of the State of California, Department of Transportation, current edition and the current ASTM designation C-12.

2.3.6.3 Joints:

- a) The pipe and fittings shall have a socket end and a spigot end with compression joints conforming with the current ASTM C-425.
- b) The pipe and fittings for 6", 8", 10", and 12" sanitary sewer mains may be plain-end with compression couplings conforming with the current ASTM designation C-425, excepting that a stainless steel shear ring as manufactured by Mission Clay Products Corporation for their "Mainline" bandseal compression coupling, or approved equal, shall be required.
- c) The pipe and fittings for private sanitary house sewer or building laterals may be plain-end with compression coupling conforming with the current ASTM designation C-425, (stainless steel shear rings are not required).

**Sec. 2.3.7 ACRYLONITRILE-BUTADIENE-STYRENE PIPE (ABS)**

ABS pipe shall not be used for sewer mains in the City of Shafter.

**Sec. 2.3.8 MANHOLES**

2.3.8.1 All manholes shall be as shown in the City standard drawing SW-4. Drop Manholes shall be per City standard detail SW-5

2.3.8.2 Manholes shall be constructed to grade, and in accordance with Section 70-1.02H and 71-1.07 of the Standard Specifications of the State of California, Department of Transportation, current edition.

2.3.8.3 Precast reinforced concrete manhole risers and tops shall conform to ASTM Designations: C-478. Precast tops shall be eccentric cone type, with the opening over the outgoing sewer. All concrete used in the construction of manholes shall be Class B and conform to ASTM Designation: C-150.

2.3.8.4 Manholes outside of paved areas shall be constructed to prevent drainage water from entering manhole. Approved water stops are required for all PVC sewer lines entering any manholes.

2.3.8.5 Manholes serving as outlets for a sewer force main shall have their interior surfaces lined or otherwise protected from erosion of the concrete structure in a manner acceptable to the City.

- 2.3.8.6 Frame and cover shall be as shown in the City standard drawings SW-6 and shall conform to ASTM A 48-83 Class 35B gray cast iron with minimum strength 35,000 PSI for H20-44 highway loading.

**Sec. 2.3.9 RODDING & FLUSHING CLEANOUT**

- 2.3.9.1 All rodding & flushing cleanouts including frame & cover shall be constructed in accordance with the City's standard drawings.

**Sec. 2.3.10 BUILDING SEWERS (LATERALS)**

- 2.3.10.1 All building sewers shall be as shown on the City's standard drawings. The lateral and marker shall extend to a minimum of four feet beyond the property line.
- 2.3.10.2 Building sewer material shall be the same as the mainline it is connected to unless otherwise allowed by the City Engineer.
- 2.3.10.3 Wye fittings shall be in-line type and shall be used for all lateral connections and shall be rotated a minimum of 23° degrees above the horizontal plane running through the centerline of the main.
- 2.3.10.4 All sewer stubs shall be 4" in diameter except as noted on plans and closed with a standard plastic plug, solvent welded.
- 2.3.10.5 Top of curb over building sewer shall be stamped with an "S".

## SECTION 2.4 CONSTRUCTION STANDARDS

### Sec. 2.4.1 CONNECTION TO EXISTING SEWER SYSTEM

- 2.4.1.1 Where new building sewers laterals are to be connected to the City's existing sewer system, the tie-in location & hardware must be as approved by the City Engineer.
- 2.4.1.2 Where new sewer mains are to be connected to the City's existing sewer system, the tie-in location & details must be shown on the plans & approved by the City Engineer. Main sewers must be connected to other main sewers or outfall sewers with a manhole.

### Sec. 2.4.2 MATERIAL HANDLING

- 2.4.2.1 All pipe material shall be handled, laid, blocked and joined in accordance with the manufacturer's recommendations.
- 2.4.2.2 All open ends of all water mains being installed shall be properly covered at the end of each day's work to prevent entry of foreign matter, animals, debris, or children.
- 2.4.2.3 **Storage and Handling of PVC Pipe:** PVC pipe shall be stored on a smooth bed. The pipe shall not be dropped or dragged. Stored pipe shall be covered to protect it from ultraviolet light (sun's rays). PVC pipe with noticeable color changes resulting from exposure to ultraviolet light shall be rejected by the City.

### Sec. 2.4.3 EXCAVATION AND TRENCHING FOR SEWER LINES

- 2.4.3.1 All excavations, trenching, and shoring shall be performed in a manner to provide the highest possible worker safety and protection of property and in conformance with all rules, orders and regulations of all local, state, and federal agencies having jurisdiction over such matters.
- 2.4.3.2 The width of trench for all pipe shall provide a minimum clear distance between the outer surface of the pipe and the side of the excavation in conformance with City standard details.
- 2.4.3.3 The trench shall be excavated to a flat bottom, cut true and even to the indicated grade. Where rock or other hard substances are present on the trench bottom they shall be removed to a depth of 6 inches deeper than the indicated trench bottom and refilled with well tamped granular earth, fine gravel or coarse sand. Any uneven areas in the trench bottom shall be shaved off or filled in with well tamped material as specified.
- 2.4.3.4 Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe, as determined by the City is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with suitable material as specified.
- 2.4.3.5 The trench and other excavation shall be kept entirely free of water while pipe is being placed and until the joints have been made and approved.

**Sec. 2.4.4 TRENCH BEDDING**

2.4.4.1 Only Class IA, IB, II, and III embedment materials will be considered suitable. Embedment materials (Class IA, IB, II, and III) shall conform to Table 1 of ASTM D-2321, a portion of which has been recreated as follows:

CLASS	TYPE	SOIL GROUP SYMBOL D-2487	DESCRIPTION	PERCENTAGE PASSING SIEVE SIZES		
				1½ inch	No. 4	No. 200
1A	Manufactured Aggregates: open-graded, clean	None	Angular, crushed stone or rock, crushed gravel, broken coral, crushed slag, cinders or shells; large void content, contain little or no fines	100%	≤10%	< 5%
1B	Manufactured, Processed Aggregates: dense-graded, clean	None	Angular, crushed stone (or other Class 1A materials) and stone/sand mixtures with gradations selected to minimize migration of adjacent soils; contain little or no fines	100%	≤50%	< 5%
II	Coarse-Grained Soils, clean	GW	Well-graded gravels and gravel-sand mixtures; little or no fines	100%	< 50% of "Coarse Fraction"	<5%
		GP	Poorly graded gravels and gravel-sand mixtures; little or no fines			
		SW	Well graded sands and gravelly sands; little or no fines		> 50% of "Coarse Fraction"	
		SP	Poorly graded sands and gravelly sands, little or no fines			
	Coarse-Grained Soils, borderline clean to w/fines	e.g. GW-GC, SP-SM	Sands and gravels which are borderline between clean and with fines	100%	Varies	5% to 12%
III	Coarse-grained soils with fines	GM	Silty gravels, gravel-sand-silt mixtures	100%	< 50% of "Coarse Fraction"	12% to 50%
		GC	Clayey gravels, gravel-sand-clay mixtures			
		SM	Silty sands, sand-silt mixtures		> 50% of "Coarse Fraction"	
		SC	Clayey sands, sand-clay mixtures			

- 2.4.4.2 Soil classification is in conformance with Unified Soil Classification System ASTM Designation D-2487 and D-2488. Native soils meeting the requirements for Class II and Class III materials may be accepted by the City.
- 2.4.4.3 Bedding procedure shall conform to Table 2 of ASTM-D-2321 and the following:
- a) Bedding shall be placed and compacted for all main lines as shown on the City's standard drawings.
  - b) After placement and compaction of bedding and prior to installation of water main and laterals, the City shall inspect the bedding placement and compaction.

#### **Sec. 2.4.5 INSTALLATION OF SEWER PIPE AND FITTINGS**

- 2.4.5.1 PVC pipe exposed to the sun during summer months shall be allowed to cool prior to placement of haunching. Allowance shall be made for the movement of pipe along the main line and at the laterals. Fittings shall be sized to receive type of pipe used.
- 2.4.5.2 Pipe shall be laid up-grade with the bell ends of the pipe up-grade unless otherwise authorized by the city.
- 2.4.5.3 Pipe shall be laid to plan line and grade, with uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the socket or bell, which shall not bear upon the subgrade or bedding
- 2.4.5.4 Installation of fittings shall be in accordance with manufacturer's recommendations.

#### **Sec. 2.4.6 TRENCH BACKFILL AND COMPACTION**

- 2.4.6.1 Backfilling of pipe trenches shall commence immediately after the pipe joints have been approved to preclude damage to the installed pipe.
- 2.4.6.2 Backfill shall be in conformance with City standard detail SW-1.
- 2.4.6.3 Water jetting and flooding shall not be used for backfill compaction for any underground pipe.
- 2.4.6.4 **Haunching** shall conform to Table 2 of ASTM-D-2321, and the following:
- a) After cooling of the PVC pipe, haunching shall be placed and compacted for all main lines as shown on the City's standard drawings.
  - b) Materials used for haunching shall be the same class as that used for bedding.
  - c) Care shall be exercised in placing haunching material to prevent damage to or displacement of, the sewer pipe.
- 2.4.6.5 **Initial Backfill** shall conform to Table 2 of ASTM-D-2321 and the following:
- a) After placement and inspection of haunching, initial backfill placement shall be completed and compacted for all main lines as shown on the City's standard drawings.

- b) Materials used for initial backfill shall be the same class as that used for haunching.
- c) Prior to placement and compaction of initial backfill, the city shall inspect the placement of the sewer main and laterals, haunching and compaction.
- d) Care shall be exercised in placing initial backfill material to prevent damage to or displacement of, the sewer pipe.
- e) Initial backfill shall be installed to a minimum of 12 inches above the pipe crown.

2.4.6.6

**Final Backfill (within dedicated City street right-of-ways or easements):** The remainder of the trench backfill shall conform with Section 19-3 of the Standard Specifications and as follows:

- a) Section 19-3.062, "Slurry Cement Backfill", of the Standard Specifications is deleted.
- b) Prior to placement and compaction of final backfill, the city shall inspect the initial backfill and compaction.
- c) Backfill material shall be free of all rock or lumps, exceeding six (6) inches maximum dimension.
- d) Backfill over joints or fittings shall not exceed the initial backfill until they have been inspected, tested, and approved by the City.
- e) Compacting of final backfill material shall be required for all main lines and service connections as shown on the City's standard drawings.

2.4.6.7

**Final Backfill (outside dedicated City street right-of-ways or easements):**

- a) Subject to the approval of the City Engineer, the engineer in charge of the design and construction of the sewer system shall specify compaction requirements for the backfill of all sewerline trenches not located in streets dedicated or offered for dedication.
- b) Prior to acceptance of the sewer system the developer's engineer shall certify by letter that all trenches have been backfilled in accordance with the specifications. Compaction tests from an accredited soil testing lab shall accompany the certificate.

## **SECTION 2.5 FINAL ACCEPTANCE**

### **Sec. 2.5.1 GENERAL**

- 2.5.1.1 Prior to the acceptance of any sewer line by the City, the contractor, at his own expense, shall clean and test all lines in the presence of City inspectors, as outlined below.
- 2.5.1.2 All cleaning and testing of sewer lines shall take place after all construction work is completed up to, but not including, final paving.
- 2.5.1.3 The system will be inspected after final paving is completed and any damage to the system during final paving and cleanup will be corrected before final approval.

### **Sec. 2.5.2 CLEANING**

- 2.5.2.1 Cleaning shall be performed with a Wayne-type sewer cleaning ball under hydrostatic pressure. Any stoppage, dirt or foreign matter shall be removed from the lines.

### **Sec. 2.5.3 TESTING**

- 2.5.3.1 All installed sewer pipe shall be tested in accordance with the following standards, the recommendations of the manufacturer, and as acceptable to the City Engineer.
- 2.5.3.2 The Office of the City Engineer shall be given at least a 24 hour notice prior to testing and inspection.
- 2.5.3.3 Mandrel Test of PVC Pipe:
  - a) After cleaning, the sewer lines shall be mandreled to measure for obstructions (excessive deflections, joint offsets and lateral pipe intrusions). The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. The mandrel shall have an odd number of ribs, numbering no less than nine (9), spaced evenly around the mandrel. Before use, the mandrel shall be passed through a go/nogo ring provided by the Contractor and approved for use by the City.
  - b) Deflections in the installed sewer pipe shall not reduce the base inside diameter, as listed by the manufacturer, by more than 5% thirty (30) days after backfill and compaction. A rigid mandrel, with a circular cross section certified as having a diameter conforming to the table below, shall be pulled through the pipe by hand.

MANDREL TABLE  
(FOR PVC SDR-35 PIPE ONLY)

<u>NOMINAL DIAMETER</u>	<u>BASE DIAMETER (ID)</u>	<u>MANDREL DIAMETER</u>
6"	5.74"	5.45"
8"	7.67"	7.28"
10"	9.56"	9.08"
12"	11.36"	10.79"
15"	13.90"	13.20"

- c) If the pipe does not pass the mandrel test, vibratory means of correcting is allowed provided the pipe has not been crushed and vibratory methods will not disrupt adjacent property. Otherwise, contractor shall uncover the pipe and replace any damages lengths. Contractor shall backfill the pipe again in accordance with City standards. Pipe shall then be tested again for conformance to City standards.

2.5.3.4 Pressure Test (PVC Pipe):

- a) Prior to final approval, all sewer lines shall be tested for leakage by low pressure air test. Air test shall be performed in accordance with the procedures outlined in Uni-Bell PVC Pipe Association's publication entitled "UNI-B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe".
- b) The air test shall consist of pumping air into the sewer main to a static pressure of 5.0 PSIG. Once the air pressure has been stabilized, the air source shall be shut off or disconnected from the test section.
- c) The pressure gauge shall be observed to determine the length of time it takes for the internal pressure within the test section to drop 0.5 PSIG. If the time shown in the following table elapses prior to the 0.5 PSIG pressure drop, the test section shall have passed the air test and shall be determined to be free from defect.

ALLOWABLE TIME FOR 0.5 PSI DROP (MIN:SEC)						
PIPE DIA. (INCH)	LENGTH OF PIPE (FEET)					
	00 ft	200 ft	300 ft	400 ft	500 ft	600 ft
6"	2:50	2:50	2:50	2:50	3:34	4:16
8"	3:46	3:46	3:46	5:04	6:20	7:36
10"	4:43	4:43	5:56	7:55	9:54	11:52
12"	5:40	5:41	8:33	11:24	14:15	17:05
>12"	per City Engineer					

- d) Should any test on any section of pipe line disclose an air loss rate greater than permitted, the contractor shall, at his own expense, locate and repair the defective joints or pipe sections. After the repairs are completed, the line shall be retested until the air loss rate is within the specified allowance as outlined above.



2.5.3.5 Pressure Test (Other Pipe):

- a) Pressure testing for sewer materials other than PVC pipeline shall be performed in accordance with Section 2.5.3.4 or per manufacturer's recommendations as approved by the City.

2.5.3.6 Video Test

- a) Currently the City of Shafter does not require video of sewer lines for pipes with nominal diameters of 12 inches or less. However, if during the course of construction personnel were negligent in the handling or installation of sewer materials, the City, at its own discretion, may require video testing of the sewer to verify compliance with these standards.
- b) Video Testing for pipelines greater than 12 inches or for any sewer required to be tested in accordance with this section shall be done in accordance with the following:
  - (1) Thirty days after the completion of laying pipe Contractor shall conduct a closed circuit television inspection of said pipe in the presence of the engineer. During the inspection, Contractor shall keep a log suitable for future reference which documents the condition of the interior of the pipe. Both the original log and the original video tape shall become the property of the City of Shafter. If the Contractor wants to have a copy of the video tape, Contractor shall record two tapes simultaneously.
  - (2) Video quality shall conform to Section 500-1.1.5. "Television Inspection", of the "Greenbook Standard Specifications for Public Works Construction" and these special provisions. Contractor shall use color VHS equipment and a pan & tilt or rotating lens camera
  - (3) Contractor to also ensure sufficient lighting. The video tape shall indicate the date, time, and running total of pipeline footage. Tapes of low quality due to poor lighting or other technical irregularities shall be summarily rejected. Video inspection of the pipe will re-performed at Contractor's expense.

## SECTION 2.6 SEWER CONSTRUCTION PLANS

Sewer construction plans shall contain all notes, details and specifications necessary to complete the proposed work. For sake of simplicity, Sewer Plans can be combined with Water Plans whenever applicable. Maximum sheet size shall be 24" x 36". Project information shall include, but not be limited to the following checklist:

### Sec. 2.6.1 COVER SHEET

- Project Title
- Vicinity Map
- Key Map drawn to a scale of 1" = 200'
- Engineer's Certificate with seal and license expiration date.
- General Notes - see Section 2.6.4
- Special Notes - notes particular to the project
- Material Specifications
- Legend
- Bench Mark
- Sheet Index
- Total number of sheets
- Materials List - show Engineer's Estimate of Quantities
- City Engineer's Approval/Signature Block
- Developer's name and address/Engineer's address and contact person/Legal Description

**Engineer's Certificate:**

I hereby certify that these plans and specifications comply with City of Shafter ordinances, standards, and design criteria, and that they include all improvement requirements of the Advisory Agency or other review board.

I am responsible for all calculations and drawings on these plans and any errors, omissions, or violations of those ordinances, standards, and design criteria shall be corrected during construction.

### Sec. 2.6.2 PLAN & PROFILE SHEETS

- Horizontal & vertical scales on each sheet (1" = 50' and 1" = 10' max). Same scale to be used on all sheets.
- North arrow
- Sewer line location relative to centerline or property line
- Pipe size, length, and slope
- Relation to existing and/or proposed pipes, utilities, etc. - show by cross sections with verified depths
- Required sewer and water line separations, utility separations
- Lateral size - Show Depth of Cover (min. & max.) for each street
- Lateral location
- Lateral Stationing
- Finish Grade Profile with top of manhole elevations
- Stationing (centerline) - from south to north and west to east; coincident with street stationing; show 100 foot interval ticks on street centerline
- Manhole/Cleanout locations
- Conforms to master sewer plan (if applicable)
- Connection to existing sewer lines or structures
- Construction phasing limits shown

### Sec. 2.6.3      **DETAIL SHEETS**

Provide Details as Applicable

- SW-1 Pipe Backfill and Compaction
- SW-2 Pipe in Casing
- SW-4 Precast Concrete Manhole
- SW-5 External Drop Manhole
- SW-6 Manhole Frame & Cover
- SW-7 Rodding & Flushing Cleanout
- SW-8 Rodding & Flushing Cleanout Cover
- SW-9 Building Service Sewer Lateral
- SW-10 Dry Sewer House Connection
- SW-11 Lift Station Wetwell
- SW-12 Lift Station Valve Box
- SW-13 Sewer Line Repair
  
- Tie-in Details - as approved by City Engineer
- Other Details as required by City Engineer

### Sec. 2.6.4      **SAMPLE GENERAL NOTES**

General notes shall include all necessary notes to convey the intent of the City of Shafter Sewer Design Standards, the project at hand, and as directed by the City Engineer. They shall include, but not be limited to the following.

- 2.6.4.1 24 hour inspection notice - Prior to the start of any phase of construction, the Office of the City Engineer shall be given at least 24 hours notice. Phone: (661) 746-2065.
- 2.6.4.2 Compaction test note - Compaction testing shall be the responsibility of the developer/subdivider/contractor. The number and location of required test shall be determined by the City Engineer.
- 2.6.4.3 For the location of existing underground utility lines the Contractor shall notify both the City of Shafter Department of Public Works, and Underground Service Alert (USA) at least two (2) working days prior to the start of construction.  
USA Phone:           (800) 642-2444  
City of Shafter:       (661) 746-2065
- 2.6.4.4 Contractor shall obtain all necessary permits before start of construction. A permit shall be obtained from the Office of the City Engineer for all work to be performed in city right-of-way.
- 2.6.4.5 The locations of existing utilities and underground pipelines shown on these plans are approximate only. The contractor shall determine the exact location of all existing utilities and underground pipelines before commencing work. Contractor assumes all liability for any and all damages to existing utilities occasioned by his failure to exactly locate, preserve, and protect any and all underground utilities and pipelines.
- 2.6.4.6 Any trenching conducted within this project shall be backfilled and compacted in accordance with the City Standards.
- 2.6.4.7 The contractor shall remove and/or relocate all obstructions within the street right-of-way as directed by the City Engineer.
- 2.6.4.8 Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including the safety of all

persons and property; that this requirement shall apply continuously and not be limited to normal working hours; that the contractor shall defend, indemnify, and hold the owner, engineer, and the City of Shafter harmless from any and all liability, real or alleged, in connection with the performance of work on this project, excepting the liability arising from the sole negligence of the owner/engineer/City of Shafter.

- 2.6.4.9 All construction work shall be performed in accordance with City of Shafter Standards, the State of California, Department of Transportation Standard Specifications, and as directed by the City Engineer.

#### **Sec. 2.6.5 SAMPLE STANDARD SEWER NOTES (FOR PVC SEWER)**

Sewer notes shall provided detailed information regarding project material, construction, and testing requirements, applicable ASTM specifications, and references to City Standards. Below is a set of notes typically seen on sewer pipeline projects using PVC SDR-35 sewer pipe.

- 2.6.5.1 Contractor will furnish all materials, tools, labor, equipment and supervision necessary to complete installation and testing of sewer improvements as shown on the approved plans and specified in the bidding documents.
- 2.6.5.2 Poly Vinyl Chloride Pipe (PVC)
- a) Materials: Pipe and fittings shall meet the requirements of ASTM Specification D-3034 SDR-35. Pipe fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other injurious defects. Fittings shall be injection molded and shall be installed in line on new pipelines; cut-in fittings are not permitted.
  - b) Joints: Use only elastomeric gasket joints. The assembly of joints shall be in accordance with the manufacturer's recommendation and applicable ASTM specifications. Where PVC pipe connects to VCP, DI, or other existing sewer line materials, use couplings approved by the City of Shafter.
  - c) Installation: Pipe and fittings should be installed in accordance with ASTM D 2321. Only class I, II, and III embedment materials will be considered suitable.
- 2.6.5.3 Excavation shall be supported in conformance with the rules, orders and regulations of the industrial accident commission and the public utilities commission of the State of California. Sheet piling and other timbers shall be drawn in a manner that will prevent caving of the walls of the excavation or other load on the pipe or conduit.
- 2.6.5.4 Wye fittings shall be in-line type and shall be used for all lateral connections and shall be rotated a minimum of 23° above the horizontal plane running through the centerline of the main.
- 2.6.5.5 All manholes shall be constructed in accordance with the City of Shafter Standard Details and Section 70-1.02h and 71-1.07 of the Standard Specifications of the State of California, Department of Transportation, latest edition.
- 2.6.5.6 All rodding & flushing cleanouts shall be constructed in accordance with City of Shafter standard drawing.
- 2.6.5.7 All sewer stubs shall be closed with a standard plastic plug, solvent weld.

2.6.5.8 The system will be inspected after final paving is completed and any damage to the system during final paving and cleanup will be corrected before approval, at the full expense of the contractor.

2.6.5.9 Cleaning:

- a) Prior to the acceptance of any sewer line by the city of shafter, contractor shall clean all lines with a wayne-type sewer cleaning ball under hydrostatic pressure.
- b) Any stoppage, dirt, or foreign matter shall be removed from the lines.
- c) All cleaning and testing of sewer lines shall take place after all construction work is completed, up to but not including the final paving.

2.6.5.10 Testing - Mandrel Test of PVC Pipe:

- a) Following the placement and densification of backfill and prior to the placing of permanent pavement, all main line pipe shall be cleaned and then mandrelled to measure for obstructions (deflections, joint offsets, and lateral pipe intrusions).
- b) A rigid mandrel, with a circular cross section, certified as having a diameter conforming to City specifications, shall be pulled through the pipe by hand. The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. The mandrel shall have odd number of ribs, numbering no less than 9, spaced evenly around the mandrel.
- c) If pipe does not meet mandrel test, vibratory means of correcting is allowed provided pipe has not been crushed and vibratory methods will not disrupt adjacent property.

2.6.5.11 Testing - Pressure Test:

- a) Prior to final approval all gravity sewer lines shall be tested for leakage by standard hydrostatic or low pressure air test.
- b) Testing of the sewer line shall be conducted from manhole to manhole in accordance with the procedures outlined in Uni-Bell PVC Pipe Association's publication entitled "UNI-B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe" and the City standards.
- c) If pipe does not meet pressure test, pipe shall be uncovered and the defective joint or pipe replaced. Section of pipe shall be re-tested until pressure test is passed.

## **SECTION 2.7 REQUIREMENTS FOR DESIGN & CONSTRUCTION OF SANITARY SEWER LIFT STATIONS**

### **Sec. 2.7.1 DESIGN FLOW**

- 2.7.1.1 Sewer lift stations shall be designed to lift the design peak flow as determined by using the criteria in Section 2.2.1 of this manual.

### **Sec. 2.7.2 DUEL PUMP VS. MULTI-PUMP SYSTEMS**

- 2.7.2.1 The lift station shall be equipped with two pumps, each with the ability to discharge the peak flow.
- 2.7.2.2 Multiple pump stations equipped with three or more pumps may be considered where dual pump stations are infeasible, subject to the approval of City Engineer. Such facilities shall be capable of passing the peak flow with any one pump out of service.

### **Sec. 2.7.3 MIN & MAX DETENTION**

- 2.7.3.1 The wet well capacity shall not exceed 10 minute detention of average flow, and shall not be less than 3 minute detention at peak flow.

### **Sec. 2.7.4 REQUIRED HARDWARE**

- 2.7.4.1 Sewer lift stations shall conform to plans and specifications as approved by the City Engineer, and shall have, as a minimum, the following features:
- a) Pumps shall be installed in a single wet well and shall be the submersible type from an approved manufacturer.
  - b) Pumps shall be removable from their operating position through use of guide rails and a cable lifting system permanently attached to the wet well.
  - c) Sewer lift stations shall be located outside street right of way on property deeded to the City of Shafter.
  - d) The site shall be enclosed within a 72 inch high masonry block wall or approved equal, and the interior shall be surfaced with 0.30' of 3/4" gravel. Color and style of wall and materials shall be approved by the City. Site shall have approved access equipped with gates.
  - e) Wet well shall be equipped with an aluminum access frame and cover which will allow the complete installation and removal of the pump and motor assembly. Access cover to be able to withstand H2O loading, but not be traffic rated.
  - f) At the request of the City Engineer, wet well shall be mechanically vented to prevent odors from reaching adjacent properties.
  - g) Minimum pump horsepower shall be 5 HP.
  - h) Interior wetwell & valve box surfaces shall be treated as approved by the City Engineer.

- i) A fresh water supply shall be provided for wash down. Fresh water supply shall be equipped with an appropriately sized reverse-pressure-principal backflow preventer installed shortly after the meter location and within the lift station perimeter wall. Backflow preventer to be installed and tested prior to lift station acceptance.
- j) Bottom of wet well shall be sloped to direct sludge toward pumps. Pumps shall be supported on smooth and level bottom area.
- k) All pipes entering & exiting the wetwell and valve box shall be equipped with water stops.
- l) A wash down assembly to facilitate break-up of scum layer shall be connected to each discharge as near the top as possible. It shall consist of a 1" NPT Bronze strap service saddle with stainless steel nuts and bolts, a 1" NPT cast iron threaded nipple 8" long, and a 1" cast iron threaded 90° elbow
- m) Discharge shall feed into a valve box equipped with check valves, tees with blind flange and 2 inch gate valve on vertical outlet, and gate valves for each discharge line. The box shall have a 0.5 feet of ¾ inch gravel bedding and a 4-inch PVC valve box drain line flowing back to the wet well.
- n) The pump number shall be painted in a contrasting color on each discharge pipe in a manner clearly visible from above.
- o) The motor control center shall be pedestal mounted on a concrete base in a weatherproof, rainproof and lockable enclosure. In addition, the motor control center shall have the following features:
  - (1) Liquid level controller, pneumatic, compressor driven (with backup compressor), purge and clear feature. It shall have level sensors for (1) on lead and highwater elevation (Minimum of 0.5' below lowest inlet invert), (2) on lead, (3) off lead or off lead and lag.
  - (2) Automatic alternator to cycle lead and lag pumps
  - (3) Run time meter for each pump
  - (4) Hand - Off - Auto switch for each pump
  - (5) Run lights; green for each pump
  - (6) General Warning Beacon, red, set to turn on indicating a high water alarm condition
  - (7) Alarm silence and reset switches
  - (8) Phone Dialer with automatic alarm call-out
- p) Sewer lift station shall have adequate lighting to allow for night emergency work.