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SALIDA SANITARY DISTRICT

SANITARY SEWER DESIGN

I. GENERAL

A. Description

This work shall include the furnishing of all labor, materials, tools, and equipment to construct and complete the installation of the sanitary sewer mains and laterals in accordance with the approved plans, and these Standard Details and specifications.

B. Definitions of Standard Terminology Relating to Clay Products (refer to latest revision to ASTM C896)

<u>House sewer line</u> – The line connecting a user's property to the sewage system (sewer lateral).

<u>Sewer main</u> - A pipeline that collects sewage from one (1) or more individual users and transports it to trunk sewers. (Sewer mains are 8", 10", and 12" diameter pipe).

<u>Trunk sewer</u> – A pipeline designed to transport sewage to the treatment plant (>15" diameter pipe).

<u>Sanitary Sewer system</u> – The facility designated and used for the collection, treatment, and disposal of industrial wastes and sanitary sewage.

<u>Sewer service</u> – The services and facilities for the collection, treatment, and disposal of industrial wastes, commercial wastes, and sanitary sewage.

District - The Salida Sanitary District.

<u>District Engineer</u> – The Salida Sanitary District Engineer or designated representative.

C. Submittal Map & Calculations

Sanitary sewer system design within a developing area must include provisions for size and capacity to adequately convey all domestic, commercial, and industrial waste that can be reasonably anticipated under conditions of full ultimate development. Engineering calculations to support the sewer system design shall be submitted to the District Engineer for approval.

The calculations shall include:

- 1. Map indicating service area, exiting manhole number at point of connection within the sewer system (including any future contributing development and projected use), zoning, and any physical features contributing to the sewer system design.
- 2. Sanitary sewer waste volumes, existing and proposed, within the service area of the system.
- 3. Size and slope of each pipe between appurtenant structures.
- 4. Invert/rim elevations of each pipe and appurtenant structure.

D. Service Policy

The construction, maintenance, and repair of the house sewer line (service lateral) from the property line to the sewer main shall be the property owner's responsibility. The property owner's responsibility extends into the streets, alleys, and/or easements to the sewer main. The pipe size and material shall meet District Standards when located in the public right-of-way.

E. Sewer Laterals

In all new subdivision work, the house sewer lines and risers from the sewer to the property line shall be installed at the time the sewer is constructed. Wherever a sanitary sewer is installed, which will serve existing houses or other buildings, a house sewer line shall be constructed for each existing house or building. Each house sewer line shall be referenced to the plan stationing. A separate house sewer line shall connect each individual building parcel.

Exceptions to separate sewer and water services may be granted by the District Engineer in residential or commercial centers with associations or management agencies and appropriate private easements. In all cases the public ownership will stop at the right-of-way line of the street. No dedicated public easement will be accepted.

The following are requirements for sewer laterals:

- 1. Building drains (i.e. floor drains, roof leaders, etc.) shall not be connected to the sanitary sewer system.
- 2. All wash racks and car washes must be connected through an oil/water separator before connection to the sanitary sewer system. An overhead cover shall be installed to prevent rainwater infiltration.
- 3. Sewer laterals shall be connected to the sewer main with a wye fitting in accordance with the District Standard Details.
- 4. Cleanouts shall be constructed in conformance with the District Standard Details.
- 5. Backflow prevention devices may be required as specified in the District Standard Details.

- 6. The maximum depth of a sewer service connection to the sewer main shall be 12 feet. A parallel sewer main (fly line) must be constructed for services deeper than 12 feet.
- 7. Grease traps and interceptors shall be constructed and located outside the building by the developer on private property on the sewer lateral for any facility whose operation will result in oil, grease, sand, or other solids being discharged into the District's sanitary sewer system.
- 8. The traps or interceptor shall conform to the current Uniform Plumbing Code adopted by Stanislaus County, and it shall be constructed where the District Engineer can easily inspect it for proper operation.
 - a. For additional information regarding specific requirements for grease traps, contact Stanislaus County Environmental Resources at 209.525.6700.
- 9. The service policy of the District requires that all properties served must be annexed into the District.
- 10. A property already inside the District may extend sewer mains and laterals to connect to the sanitary sewer system.
- 11. At a minimum, sewer mains shall be extended across frontage, unless otherwise approved by the District Engineer.
- 12. Sewer laterals shall not connect directly into manholes without prior approval from the District Engineer.

F. Right-of-Way Policy

Public sewers shall be located in a dedicated right-of-way, not easements for sewers and/or public use. Sewer services are not permitted in a dedicated right-of-way, outside the paved roadway, without prior written approval of the District Engineer. This approval may be given only when insufficient grade makes it impossible to serve the property directly from a sewer main in the roadway within the right-of-way.

Dedicated right-of-way, outside the roadway, for sewer mains shall meet both the following width criteria:

- 1. Minimum width of any dedication shall be 15 feet.
- 2. All dedications shall have a minimum width in feet equal to the required design trench width for the size of pipe used plus two (2) additional feet of width for every foot of depth of the pipe as measured from the bottom of the pipe to the finished grade. All sewer pipes shall be centered within the dedications.

In a residential cul-de-sac where the sewer main is extended through the cul-de-sac to another street, a dedicated right-of-way shall be constructed with a 10-foot wide drive (6" concrete) and landscaped on both sides of the drive. One (1) removable bollard shall be installed at each end of the dedicated right-of-way. Drive approaches to accommodate the access drive will not be allowed.

G. Parallel Sewer Mains (Fly Lines)

Parallel sewer mains are required to be constructed when:

- 1. The diameter of the existing main is 12" or greater, or;
- 2. When the existing main is deeper than 12 feet. The standards of construction are outlined in Standard Detail SSD10 "Sewer Parallel Connection".

II. DESIGN

A. Sewer Main Line Size and Service Policy

- 1. No public gravity sewer main conveying raw wastewater shall be less than 8" in diameter.
- 2. All intersecting sewer pipe 8" IN DIAMETER AND LARGER SHALL BE CONNECTED AT A MANHOLE.
- 3. Minimum sewer lateral size is 4", 6", or larger, and shall be installed where the intended use is industrial, commercial, or greater than single-family residential flows. Joint use of sewer laterals will not be permitted except in multi-family residential uses.
- 4. No direct connections are permitted on 12" or larger sewer mains.

B. Velocity

Sewer velocity shall be equal to or greater than two feet per second for all sewer mains when flowing half full and with a Manning's formula "n" valve of 0.013. Design velocities for sewer mains shall not exceed 10 feet per second.

The pipe diameter and slope shall be selected to obtain the greatest practiced velocities to minimize settling problems. Over-sized sewers will not be approved to justify using flatter slopes. If the proposed slope is less than the minimum slope of the smallest pipe that can accommodate the design peak hourly flows, the actual depths and velocities at minimum, average, and design maximum day and peak hourly flows for each design section of the sewer shall be calculated by the Design Engineer and be included in the plans.

The following are the minimum slopes required for sewer lines:

PIPE SIZE	MINIMUM SLOPE
8"	0.35%
10"	0.25%
12"	0.20%

C. Flow

The design sanitary sewer flow shall be computed using the following formula:

$$\mathbf{Q}_{\mathrm{D}} = \mathbf{Q}_{\mathrm{P}} + \mathbf{I}$$

Where Q_D = Design Flow (gal per day)

 Q_P = Peak Flow

I = Infiltration*

The peak flow ($\mathbf{Q}_{\mathbf{P}}$) for residential service areas is defined as 3.0 times the average flow. The average flow for the residential service area shall be computed from two (2) basic assumptions:

- 1. 2.90 persons per single-family dwelling.
- 2. 100 gallons per person per day.

*Infiltration (I) to be determined by analysis also. See ASTM 1091 for Allowable Infiltration Test Rate gallons/100 feet of line per hour.

Acreage flow estimates for master planning and sizing sewer mains when the exact numbers of residential services are NOT specified are as follows:

TABLE II-1 ACREAGE FLOWS ESTIMATES

Land Use	Density Units/Acre	Persons Dwelling/Unit	Average Flow (Gal/AC)/Day	Peak Flow (Gal/AC)/Day
Very low Density	2	2.90	580	1740
Residential				
Low Density Residential	5	2.90	1450	4350
Medium Density	8	2.90	2320	6960
High Density Residential	10	2.90	2900	8700
Multi-Family	22	1.90	4180	12540
Commercial			1000	3000
Office			1000	3000
Light Industrial			1000	3000
Heavy Industrial				*Note
Schools			20 GPCD	Calculate

*Note: Sewage flow rate shall be considered on a case-by-case basis and may require special design.

Population, thousands

- 1. Manning's Formula, Q = A (1.49/n) $R^{2/3}S^{1/2}$, shall be used to determine pipe capacity. The "n" value shall be 0.013.
- 2. All sewer mains shall be sized to carry the design flows at 50% of pipe capacity.
- 3. Design capacities for trunk sewers shall require approval by the District Engineer.

D. Vertical Alignment

 Minimum pipe cover and clearance shall be maintained in the design of the sanitary sewer system. If certain conditions exist, which make it impractical to meet the minimum cover and clearance requirements, the conditions and locations shall be specifically noted above the sewer profile on the plans. Each location not meeting the minimum cover and clearance requirements will require special pipe, bedding, and/or backfill and must be approved by the District Engineer.

Under no conditions or circumstances shall other utilities be installed **directly** over and/or parallel to any sanitary sewer system installation.

- 2. Sewer Main and trunk sewers shall have a minimum depth of 42" from the top of the pipe to the finished grade, and a minimum depth of two (2) feet to the bottom of street sub-grade. Sewer mains installed with 36" of cover shall use ductile iron pipe. Sewer mains and sewer trunks shall not be allowed with less than 36" cover from the top of pipe to finished grade.
- 3. Sewer laterals shall have a minimum depth of three (3) feet from the top of the pipe to the finished grade at the right-of-way and a maximum depth of five (5) feet at the right-of-way for residential subdivisions. Commercial, industrial, and multi-family shall have a minimum depth of five (5) feet to the finish grade at right-of-way and shall be increased by one (1) foot for every 250 feet of lot depth.
- 4. Sewer pipe shall be laid with a minimum of 12" vertical clearance from all improvements and utilities, unless otherwise approved by the District Engineer.
- 5. At points of convergence of pipes of various sizes, the crowns of the pipes shall match.
- 6. Sewer mains shall be installed on a straight grade between manholes. Siphons are not permitted in sanitary sewer systems.
- 7. Whenever a change in the size of pipe or an angle of 20⁰ or more in alignment occurs at manholes, the flow line of the incoming pipe shall be a minimum of 0.10 foot above the flow line of the outgoing pipe, or an amount necessary to match pipe crowns, whichever is greater. The Improvement Plans will show invert in and invert out of the manhole.

E. Horizontal Alignment

- 1. Alignment shall be at the street centerline wherever possible. See Standard Detail SSD1 "Sewer Pipe Location in Public Rights-of-Way".
- 2. Sewer mains shall be on a straight line between manholes. Whenever it is essential that a curved alignment be used, a minimum radius of 200 feet shall be required, but shall be greater whenever possible. The radius and delta of

all curves shall be indicated on the plans adjacent to the curve. If the sewer line parallels the road centerline then only the street centerline data on radius and delta needs to be indicated on the plans.

- 3. The deflection of the joint between any two successive pipe sections shall not exceed 80% of the maximum deflection as recommended in writing by the pipe manufacturer. Minimum two (2) feet pipe lengths may be used to install short radius curves providing the requirements specified herein are met.
- 4. Sewer mains and sewer laterals that are stubbed for future development must be stubbed the greater distance of five (5) feet or two (2) feet for every one (1) foot of depth below finished grade beyond the termination of developed landscaping or pavement (if right-of-way is available).

III. MATERIALS

A. General

The District Engineer shall approve the source and supply of all materials.

B. Gravity Sewer Pipe

- 1. Verified Clay Pipe (VCP) shall be extra strength, bell and spigot end compression joint pipe, conforming to ASTM C700 as it applies to unglazed vitrified clay pipe.
- 2. Ductile Iron Pipe (DIP) shall be Pressure Class 30 and shall conform to ANSI/AWWA C151. All DIP shall be protected by a polyethylene encasement meeting the requirements of the ANSI/AWWA C151. Fittings shall conform to ANSI/AWWA C151.

DIP for use in gravity sewer systems shall be lined with Protecto 401 Ceramic Epoxy Liner or equal.

 PVC-Lined Reinforced Concrete Pipe (RCP) for trunk sewers larger than 36" shall conform to ASTM C76 and ASTM 655. Pipe shall be provided with 350° internal PVC sheet liner, T-Lock, or approved equal. RCP shall be Class III, Wall B, minimum or stronger to suit design conditions. Joint assembly shall be reinforced concrete bell and spigot-type, incorporating a full-retained single or double gasket in accordance with ASTM 361. <u>Steel joints will not be</u> <u>allowed.</u>

C. Sanitary Sewer Force Mains

 Ductile Iron Pipe (DIP) shall be Pressure Class 350 and shall conform to ANSI/AWWA C151 and C150. All DIP shall be protected by a polyethylene encasement, meeting the requirements of ANSI/AWWA C105. Flanged-end pipe shall be Class 53, minimum. Fittings shall conform to ANSI/AWWA C110 and C111. Interior and exterior coatings shall conform to AWWA C210.

- 2. Systems valves shall be located and designed to facilitate the isolation of each section of pipeline as required.
- Underground pressure piping systems shall be securely anchored by acceptable means at all tees, plugs, caps, bends, and valves, and at all other locations where unbalanced forces exist, or as directed by the District Engineer. Restrained joints shall be used in accordance with manufacturer's recommendations.

D. Sewer Laterals

- 1. Pipe material shall be the same type and class as that used for the sewer main unless approved by the District Engineer.
- Joints and couplings for sewer laterals shall be the same type and specifications as those used for the sewer main unless otherwise specified in Section III. Materials B – Gravity Sewer Pipe.
- Existing service laterals may be replaced using any approved material in Section III. Materials B – Gravity Sewer Pipe, except where depth from the top of the pipe to the finished grade at the right-of-way is less than three (3) feet. Ductile iron must be used when replacing service laterals with less than three (3) feet depth and must be approved by the District Engineer.

E. Manhole Pipe Connections

- 1. Sewer Main, Sub-trunk, and Trunk transitions in pipe diameter, pipe material, and horizontal alignment shall occur at manholes.
- 2. Sewer Laterals Connections to Manholes (see Standard Detail SSD4a "Sewer Lateral Connections to Manholes")

Extreme caution should be exercised in the placement of manholes to assure an unyielding foundation. Settlement of the manhole may cause damage to the adjacent pipe. Short Lengths (24" maximum) with flexible compression joints and/or flexible manhole connections should be used at the manhole walls to accommodate minor differential movement. A bell and spigot joint with a factory-applied gasket or plain-end pipe joined with rubber compression couplings will provide the needed flexibility and water tightness. Two points of flexibility should be used within 36" of each manhole connection. This can be accomplished by:

- a. Using two short lengths (stubs of 24" or less) or;
- b. One short length and one flexible manhole connector.

If a manhole connection is utilized, it is important that the pipe is centered in the connector and the tightening clamp torqued per the manufacturer's instructions in order to remain a flexible and watertight connector. It is equally important that no mortar be placed between the pipe and the wall of the concrete structure. Both the use of mortar in this area and not centering the pipe would decrease the effectiveness of the connector to compensate for shear caused by settlement or ground movement.

The need for proper haunch support at and around manhole connections is just as important as it is for the entire pipeline.

F. Manholes

1. General

Pipes between 6" and 24" in diameter, refer to Standard Detail SSD4 "Lateral and Subtrunk Manholes" and SSD4 "Sewer Lateral Connections to Manholes". Pipes between 30" and 60" in diameter, refer to Standard Detail SSD5 "Trunk Manhole".

Pipes larger than 72" shall have manholes constructed of custom boxes with 48" diameter sections with a cone and grade rings extending to the surface.

Manhole spacing along the alignment shall not exceed 500 feet.

2. Standard Precast

Sanitary sewer section manholes shall be precast reinforced concrete conforming to ASTM C478, except that the Portland cement shall be Type II modified cement. The manhole base, riser, and cone shall have a minimum compressive strength of 4,000 psi at 28 days. Manholes shall be constructed in accordance with the Standard Details. Manhole bases shall be pour-in-place concrete. Contractor shall provide a submittal of the proposed lining system for the District Engineer's approval.

3. Lined Manholes

Manholes on trunk sewer lines shall be PVC-lined (T-Lock), Calcium Aluminate (SewperCoat), or Polyurethane-lined. The scope of the lining shall include, unless otherwise shown on the plans, all unlined interior concrete surfaces of the manhole.

<u>PVC Liner (T-Lock)</u>: The material used in the liner, welding strips, and other accessory items shall be a combination of poly-vinyl chloride resin, pigments, and plasticizers specially compounded to remain flexible. Poly-vinyl chloride resin shall constitute not less than 99 percent (99%) by weight of the resin used in the formulation. <u>Copolymer resins will not be permitted.</u>

<u>Polyurethane Lining</u>: The lining material shall be an epoxy base coat under a polyurethane finish coat. The material shall be Sancon 100 or equal. The epoxy base coating shall be applied in a thickness of five (5) mils. The polyurethane shall be applied to a thickness of 125 mils (1/8") in one (1) continuous coat, without seams, free from any holes or defects.

<u>Lining System Warranty</u>: Lining System shall be warranted for five (5) years against any type of failure. The Contractor shall remove and replace all failures at its expense.

4. Frames and Covers

Sewer manhole frames and covers shall be PAMREX (reference number CDPA6OEHSEW) or equal, or PAMTIGHT (reference number CDPE&OAF) or equal or Cast Iron Lid 24 as shown in Standard Detail SSD9 (PAMREX), SSD9a (Cast Iron), and SSD9b (PAMTIGHT).

In areas requiring lockable lids, as required by the District Engineer, PAMREX shall be installed. In areas within the flood way, flood plain, or in areas where water intrusion is a factor, PAMTIGHT lids shall be installed.

Castings:

Iron castings for manhole covers and frames shall conform to ASTM A 48, Class 25 and be of the dimension shown on the Standard Details.

All castings shall be sound and free from shrinkage cracks, blowholes, and other defects. All fins and burnt sand must be removed. Excessive porosity and spongy surfaces will constitute causes for rejection.

The manhole cover shall seat evenly and firmly in the frame. Cast iron frames and covers shall be dipped or painted with asphalt that will form a tough, tenacious, non-scaling coating, and does not have a tendency to become brittle when cold or sticky when hot.

5. Drop Manholes

Drop manholes shall be used where the difference in elevation between the top of the outlet pipe and the invert of the inlet pipe exceeds 24". Pipes for the drop inlet shall be the same material as the sewer unless approved adapters are used. If two or more drop inlets are required in a single manhole, each shall be constructed separately. Refer to Standard Detail SSD6 and SSD 7 for Drop Manholes.

G. Cleanouts

Cleanout frames and covers shall be manufactured, tested, and otherwise furnished in accordance with the Standard Specification of Fray Iron Castings ASTM A 48, Class 30 when installed within the public right-of-way. See Standard Detail SSD 12 Sewer Service. The contact surfaces of frames and cover shall be machine surfaced to eliminate rattling and other movement under traffic. Castings shall be equal in materials and construction to Christy F8, or equal. Concrete shall be Grade B conforming to Section 3.05 and have a 28-day compressive strength of 2,500 psi. Cleanouts shall not be used on sewer mains, only terminal manholes will be permitted.

H. Carrier or Casing Pipe

Pipe used as a conductor pipe under a highway or railroad shall be welded steel pipe and shall comply with that utilities' permit requirements. The Pipe shall conform to the Standard Specifications for Public Works Construction SSPWC (Greenbook) Section 207-10, "Steel Pipe". The protective lining and coating, if any, shall conform to requirements of the utilities permit requirements.

IV. INSTALLATION

A. Sanitary Sewer Installation

All sanitary sewer pipe installation of vitrified clay pipe shall be in accordance with the latest version of ASTM C12, or reinforced concrete pipe shall be in accordance with the latest version of ASTM C76, and of ductile iron pipe in accordance with the latest version of ASNI/AWWA C600. The pipe installation shall be accomplished as specified herein except where modified by the requirements specific to the various types of pipeline materials specified under III. Materials, B Gravity Sewer Pipe.

- 1. General Notes
 - a. All pipes shall be laid to conform to the prescribed line and grade as shown on the plans and each pipe length checked to the grade line that the Contractor establishes from the grade stakes.
 - b. Alternate use of commercial LASER grade setting systems in lieu of string lines specified herein are acceptable when the following requirements and conditions are met:
 - The Contractor shall have the responsibility of providing an instrument operator who is qualified and trained in the operation of the LASER, and said operator must adhere to the provisions of the State of California Construction Safety Orders issues by the Division of Industrial Safety. Attention is particularly directed to ANS Z136.1 Laser Safety Standards, Warning Signs, Labeling, and Posting of Signs.
 - All LASER control points shall be established benchmarks or construction offset stakes identified on cut sheets and set in the field for the work.
 LASER set up points shall be these control points or points set directly from them by instrument.
 - c. Foundation Preparation Trench load design for all pipe is based upon a firm and unyielding foundation. It is essential that the trench bottom remain stable during backfilling, compaction, and under all subsequent trench operations.

The foundation is critical to the performance of the entire pipe installation. The foundation must be firm and unyielding as it needs to support the bedding, pipe, and backfill.

In cases where the trench bottom is soft and unsuitable to support the pipe, bedding, and backfill; removal of material is necessary. Replacement can be accomplished with crushed rock and/or a woven geotextile fabric to stabilize the foundation. Consult a Geotechnical engineer for other design methods to ensure the foundation can support the load.

When unstable or rocky trench bottoms are encountered, it will be necessary to over excavate and restore the trench bottom to a firm and unyielding foundation with selected materials capable of properly supporting the pipe. Select native materials, crushed stone, gravel, slag, coral, or other granular materials are commonly used for this purpose. The amount of granular material necessary to stabilize the trench bottom will vary according to the field conditions encountered.

d. Pipe Installation – Care shall be taken in storage, handling, and installation to avoid damage to the pipe and joint surface.

A visual inspection of the pipe just prior to installation shall be performed by the installer.

Pipe shall be installed with the bells pointing upgrade. The pipe barrel shall rest firmly and evenly on the trench bottom or bedding material to support the trench load. Bell or coupling holes shall be dug to ensure the pipe barrel, not the bells or couplings, supports the trench load. If a trench box is used and within the limits of the pipe zone, re-excavation of the bell hole may be necessary on the last pipe laid if filled with bedding material during box advancement. The pipe shall be installed to the design line and grade.

e. Pipe Joining – Compression joints should be assembled in strict accordance with the manufacturer's recommendations.

Particular care should be taken to keep foreign materials from interfering with proper joint assembly. The mating surfaces of the joint should be wiped clean and lubricated prior to assembly following the manufacturer's recommendation.

All compression joints are manufactured in accordance with ASTM C425 Compression Joints for Vitrified Clay Pipe and Fittings.

- f. Pipe Bedding The bedding or backfill materials shall be sliced into the haunch areas of the pipe with a shovel or other hand tool to fill the voids in this area. See Standard Detail SSD2 "Pipe Installation".
- g. Initial Backfill Initial backfilling takes place after the pipe has been installed. The initial backfill extends from top of the bedding material, up the sides of the pipe, to a level 12" over the top of the pipe. The initial backfill should be carefully placed as soon as possible to protect the sewer line.
- h. Final Backfill The final backfill extends from the initial backfill to the top of the trench. Final backfill shall be placed in lifts or stages not to exceed 10 feet when using water consolidation or as required by designated methods of mechanical compaction. Final backfill shall have no rocks or stones having a dimension larger than 6" within two (2) feet of the top of the initial backfill. Selected backfill material may be required for the top foot or more as specified by the District Engineer.
- i. Compaction Refer to Public Works, Stanislaus County, Standards and Specifications (latest revision) 3.30 Trenching and Backfill.

- j. All sewer line connections to manholes, trunk sewers, sewer main, or sewer laterals shall be left uncovered until after the inspection has been completed. After approval of the connection, the trench shall be backfilled as specified.
- k. If the sewer is to be laid in an area that is to be filled, and the cover prior to filling is less than five (5) feet, the pipe shall not be laid until the area has been filled to a level five (5) feet above the proposed pipe and compacted to 90% relative compaction, unless otherwise authorized by the District Engineer.

B. Sewer Laterals

Attention is directed to the Standard Details for additional requirements pertinent to sewer lateral installations.

- 1. Install wye per Standard Detail SSD12 "Sewer Service". Tees shall not be used.
- 2. That portion of any lateral line to be placed under an existing curb and gutter and/or sidewalk shall be done by boring or cutting and replacing the existing curb and gutter and/or sidewalk.
- 3. The lateral line shall have a clean-out at the back edge of the sidewalk as shown on the Standard Details. A box shall be installed as noted on the detail. Said cleanout shall consist of a combination wye and eighth bend. Laterals and cleanouts shall not be located in the driveway.
- 4. Where required, an approved backwater valve shall be installed ahead of the cleanout and behind the sidewalk. An appropriately-sized valve box shall be installed with adequate clearance to access and maintain the said device along with the correct number of grade rings, (to bring the lid to finish grade).
- 5. The wye branches, unless otherwise specified, shall be inclined at any angle not greater than 45^o from the horizontal.
- 6. The end of the lateral service shall extend a maximum of 48" and a minimum of 24" beyond the rear edge of the sidewalk in streets having sidewalks adjacent to the curb and shall extend a maximum of 12" and a minimum of 6" beyond the back edge of the curb for sidewalks that are separated from the curb by a planter strip and in commercial sidewalks.
- 7. The location of every sewer lateral shall be marked with an "S" directly above the sewer service on the face of the curb; the "S" shall be 2" in height and ¼ " in depth.
- 8. Residential sewer laterals shall not be connected directly to manholes, unless approved by the District Engineer.
- 9. Services for VCP: Services shall be new factory manufactured vitrified clay pipe wye and bend for each service connection on vitrified clay pipe sewer mains. The

sewer couplings to connect the bend to the sewer lateral shall be a band sealtype with outside stainless steel sheer ring as supplied by Gladding, McBean and Company, or equal. <u>Calder couplings will not be allowed.</u>

- a. For 6" VCP mains, a cut-in-clay wye or tee shall be used with plain ends along the "run" of the pipe, and a bell branch end may be used.
- b. Cut-in wye connections are only allowed in mains less than 12".
- c. When cutting in a wye or tee, well graded, crushed stone or crushed gravel shall be placed under the sewer main and the sewer lateral within the right-of-way line. The crushed stone or crushed gravel used must meet the requirements of ASTM C33, Graduation 67 (3/4 to No. 4).
- d. When joining the cut ends of the existing sewer main to the wye or tee, a "BAND SEAL" with stainless steel shear-type sewer repair couplings or plastic couplings will not be permitted on the "run" of the pipe.

C. Manholes

 Precast Manhole Construction: Excavation and backfill for all precast manholes shall be in conformance with the requirements of ASTM C478 and ASTM 497. All embedment materials under, around, and at least 3" over all pipelines located within five (5) feet of structure bases shall be compacted without jetting prior to section placements. All precast manholes shall be constructed to subgrade prior to adjoining sewer pipeline trench and/or structure backfill where such method of compaction is permitted and used. At no time shall precast manhole bases be utilized.

Manholes installed in unimproved areas or areas outside of the street, shall have bolted manhole covers. Rim elevations shall be a minimum of 1" above ground. The exposed manhole above existing ground shall be constructed entirely of grade rings and noted on the plan sheets. If the manhole is outside an existing street, but in a future street area, then grade rings shall extend below ground at least 18". Four (4) bollards shall be installed around the manholes to protect it from farm machinery and other vehicles.

All joint surfaces of precast sections and face of manhole base shall be thoroughly cleaned prior to setting precast sections. These various sections shall be set in preformed plastic sealing gaskets of material.

- a. Installation of gaskets Apply one (1) coat of primer to clean, dry joint surface (both tongue and groove) and of the two-piece wrapper on the gasket. The outside paper will protect the gasket and assure against stretching. Before setting the manhole section in the trench, attach the plastic gasket strips end-to-end to the tongue or groove of each joint, forming a continuous gasket around the entire circumference of the manhole joint.
- b. Handling of barrel sections after the plastic gasket has been affixed shall be carefully controlled to avoid bumping the gasket and thus displacing it or contaminating it with dirt or other foreign material. Any gaskets so disturbed

shall be removed and replaced if damaged and repositioned if displaced.

- c. Care shall be taken to properly align the manhole section with the previously set section before it is lowered into position.
- d. During cold or wet weather, pass direct heat over the concrete joint surface lightly until ice, frost, and moisture are removed and the surface to be primed is dry and warm immediately before application of primer. Direct heat shall also be passed over plastic gasket strips immediately prior to attaching them to joint surfaces and immediately prior to insertion of tongue and groove.

The cast-in-place base shall be 4,000 psi, 28-day concrete with 1 ½" maximum size aggregate. It shall rest on firm, undisturbed soil, and shall be the dimensions shown on the Standard Details. Where sewer lines pass through manholes, the pipe shall be laid continuously as a whole pipe. After the manhole's base and precast sections have been placed and sufficient time has elapsed to allow all concrete and grout to set, the top half of the pipe within the manhole shall be carefully cut off and the sides mortared. All channels so formed shall be checked with a template and shall form a smooth flowing channel at all flow depths.

Temporary 3/8" steel plate covers of sufficient size to adequately cover the opening shall be placed on the cone until the base is complete and the manhole casting shall then be installed. Suitably located ribs shall be welded to the underside of the cover to hold it in place during any grading operations.

The throat of the manhole shall be made of precast concrete rings of the proper inside diameter. The minimum depth of throat permitted shall be one "3" ring between the cone and the frame. The maximum depth permitted shall be 12" of rings between the cone and frame.

When adjusting the manhole frame and cover to grade, the frame shall be wired to a 2" x 4" of sufficient length to span the excavation and the throat completed to the right level. Whenever the space between the bottom of the frame and the top of a ring is less than 3", the void may be filled with concrete, poured against a suitable form on the inside of the structure.

When adjusting an existing manhole to grade and the total depth of the throat from the top of the frame to the bottom of the throat exceeds 18", the upper portion of the manhole shall be removed to the first full-size manhole section. The upper portion shall then be reconstructed as outlined above.

Penetrations for connections to existing manholes shall be core drilled by the Contractor. Single cores shall be cored between $\frac{1}{2}$ " to $\frac{3}{4}$ " larger than the pipe's outside diameter and not to exceed 20" in diameter. Cores larger than 20" in diameter shall be performed by the Contractor drilling multiple small diameter cores no larger than 1" diameter, spaced no greater than $\frac{3}{4}$ " between outside diameters of cores, through the concrete manhole wall, in a symmetrical pattern not to exceed $\frac{3}{4}$ " of the diameter of the newly installed pipe. The core area to be removed

shall not be removed by the use of impact hammers including, but not limited to, sledge hammers or jack hammers. Use of a pneumatically-powered chipping hammer for use in the removal of pre-drilled cores shall be used on a case-by-case basis and only with the prior approval of the on-site inspector. The surface edge of the cored opening shall be ground or milled to the limits specified with all reinforcing wire ground to the level of the surrounding concrete wall of the core opening. Reinforcing wire shall be removed and not permitted to remain in the core cut. Bent wire left in core cut shall not be permitted.

Short lengths (24" maximum) with flexible compression joints and/or flexible manhole connections should be used at the manhole walls to accommodate minor differential movement. See Standard Detail SSD4a "Sewer Lateral Connections to Manholes".

The newly installed pipe shall be inserted into the cored opening 4" inches beyond the inside wall of the manhole, measured at the springline axis of the pipe. The Contractor must contour the inserted end of the pipe, by grinding or other acceptable means of conforming to the contour of the manhole, to provide access to the interior of the manhole as required. If fittings are planned for the inserted end of the pipe, contouring may not be required. Finished ends of pipe shall be determined as shown on the plans or as determined in the field by the District Engineer.

Sealing the pipe shall be performed by the Contractor, inserting the pipe through the cored hole in the manhole wall to the penetrations depth required, contouring the end of the pipe (if required), and packing the annular space between the pipe and the edge of the cored opening (inside and outside of the manhole wall) with a stiff mix of concrete mortar thoroughly compacted or preferably premixed high strength non-shrink concrete grout. The mortar shall be composed of one (1) part of type 2 Portland cement and three (3) parts of clean sand. Brick, stone, or other material shall not be used as filler or blocking. The interior mortared area shall have a smooth finish similar to the adjacent barrel section of the manhole wall that follows the contour of that interior wall. The exterior mortared area should <u>fully</u> cover the entire cut area and shall conform to approximately the same contour as the exterior wall of the manhole barrel. This exterior mortared area shall exceed the dimensions of the cored area. The exterior grout seal SHALL NOT BE aggregate-based concrete. Connections shall be watertight.

Before any work is started on adjusting or repairing a manhole, the channels in the base shall be covered with strips of wood, and the entire base covered with a heavy piece of canvas. This cover shall be kept in place during all work. Upon completion of the work, the wood strips and the canvas shall be removed from the manhole, allowing no debris to fall or remain in the manhole.

2. Lined Manholes

Installation of the PVC Liner (T-Lock), HDP Embedment Liner, Calcium Aluminates Mortar Liner (SewperCoat), or Polyurethane lining shall conform to the requirements as specified by the manufacturer.

Field Welding and Testing – Field welding and testing of the lining of the structures and between pipe and structures shall be made in strict conformance with lining manufacturer's instructions and recommendations (excluding Calcium Aluminates Mortar Liner). The surface of the liner shall be cleaned to permit visual inspection and spark testing using a 20,000 volt Tinker and Rasor Spark Tester, Model No. AP-W with power pack, or equal. All tests shall be performed by the Contractor in the presence of the District Engineer. The District inspector shall be notified at least 24 hours in advance of a scheduled test.

a. PVC Liner (T-Lock) shall be used for new manholes.

Field Joints – All joints between lined pipe and lined structures shall be either Type C-1 or Type C-2 as defined in Section 311-1 of the Standard Specifications for Public Works Construction SSPWC (Greenbook).

When transitioning between lined and unlined pipe, a factory "turn back" shall be used or a Type 316 stainless steel band and neoprene gasket/termination secured with Type 316 stainless wedge anchors provided at the transition for the full pipe circumference. Contractor shall provide transition details to the District Engineer for review prior to installation. Unless shown otherwise, field joints in lined structures shall be one (1) of the following types defined in the SSPWC: Type C-1, Type C-2 or Type C-3.

b. HDPE Embedment Liner shall be used for existing and new manholes.

Installation of the lining and the welding of all joints shall be done in strict accordance with the manufacturer's instructions and recommendations and the details and methods indicated on reviewed shop drawings by an experienced and qualified installer acceptable to the manufacturer and the District Engineer. HDPE lining welders shall be trained and certified by the lining manufacturer prior to the start of welding. All joints and other lined areas where welding is performed shall be numbered and initialed by the welder. The Contractor or precast manufacturer shall record on a daily basis, at the end of each working day, the identification of the joint areas and the welder who performed the work. This information must be submitted to the District Engineer in a timely manner.

Coverage of the lining shall not be less than the minimum specified or as shown on the Plans.

When needed, the lining shall be held snugly in place against inner forms by means of steel banding straps or other means recommended by the manufacturer. Banding straps must be located in the interstitial space between studs to prevent crushing or tilting of the embedment studs. A minimal amount of banding straps to perform requirements shall be used and shall not interfere with concrete consolidation.

Where liner is extended for the purpose of joint overlap, embedment studs shall terminate not more than $\frac{1}{2}$ " from the end of the inside surface of the pipe section. Joint flaps shall extend approximately 4" beyond the end of the inside surface.

Concrete poured against lining shall be vibrated in a careful manner so as to protect the lining and produce a dense, homogenous concrete securely anchoring the locking studs into the concrete.

Forms shall be properly cleaned and prepared to remove any abrasive areas that may damage the liner. In removing forms, care should be taken to protect the lining from damage. Sharp instruments shall not be used to pry forms from lined surfaces. When forms are removed, any nails that remain in the lining shall be pulled without tearing the lining and resulting holes clearly marked. Form tie holes shall be marked before ties are broken off and all areas of abrasion or damage shall be marked. Form ties and nails are not allowed except where specifically shown on the Plans.

Hot joint compounds, such as coal tar, shall not be poured or applied to the lining. Solvents or adhesives shall not be used in fusion of material in any manner.

The Contractor shall take all necessary measures to prevent damage to the installed lining from equipment and materials used in or taken through the work area, and shall immediately repair any damage per the manufacturer's recommendations.

c. Calcium Aluminate (SewperCoat) Liner shall be used for existing manholes.

Preparation of the surface to be coated should be performed in accordance with applicable industry standards and specific project specification requirements. Sandblasting and/or hydro-demolition with high-pressure water may be used to remove existing deterioration and debris. The immediate bonding surface should be rough, damp, and free of any existing coatings, sewer residue, and running water. The structure itself should be fully saturated prior to a lining installation. Refer to manufacturer's specification language for detailed surface preparation recommendations.

Clean potable water should be used for mixing per manufacturer's recommended specifications for mixing water. Lining shall be designed to be applied with dry gunite equipment.

Lining shall not be used as a "build-out" mix or underlayment for any other product. Lining shall not be used in conjunction with or adjacent to any inert or organic coatings including, but not limited to, epoxy, polyurethane, and fiberglass. Curing should be implemented as soon as the surface begins to harden and dry (as early as one hour after application). Several layers of ASTM C309 liquid membrane curing compound or a 100% humid moisture can be used. Equipment used must always be clean and free of Portland cement buildup to avoid accelerated set.

Generally accepted concreting practices (water ratio per bag, compaction, curing, etc.) should be employed to obtain the best quality installation with respect to mechanical strength and corrosion resistance.

d. Polyurethane Lining shall be used for wet pit manholes.

Surface Preparation: The Contactor shall furnish all labor, materials, and equipment necessary for the preparation of surfaces, application of lining, safety procedures, and protection of existing surfaces, equipment, and cleanup.

All new concrete surfaces shall be grit-blasted to provide proper adhesion of coating system.

All debris produced from the blasting operation shall be removed from the structure prior to coating. No debris shall be allowed to enter the sanitary sewer system. The concrete surfaces shall be air dried prior to installation of the liner.

All unnecessary holes in the structure shall be sealed prior to lining with acid resistant sealant recommended for surfaces being sealed.

Lining Installation: The lining application shall be performed only by workers trained and experienced with the specified material. The lining shall be applied by high-pressure airless equipment approved by the lining manufacturer. The equipment shall be in good working order to insure correct proportioning and mixing of the components.

The polyurethane shall be applied to a thickness of 125 mils (1/8") in one (1) continuous coat, without seams, and free from any holes or defects. The lining shall be installed over dry concrete below the water level by using appropriate bypass equipment.

During the lining application, the Contractor shall take wet gauge thickness readings as required to insure correct lining thickness.

The finished coating shall be free from bubbles or pinholes and uniform in color. All areas in question shall be removed and reworked to the satisfaction of the District Engineer.

Application of the lining shall not take place when exposed to rain, fog, or high winds. It is the Contractor's responsibility to insure protection of the work from the above-mentioned conditions.

Lining System Warranty: Lining System shall be warranted for five (5) years against any type of failure. Contractor shall remove and replace all failures at its expense.

D. Acceptance Testing of Sewer Lines

All leakage tests shall be completed and approved after backfilling and prior to placement of permanent resurfacing.

1. Cleaning and Flushing

Prior to performing a leakage test, the pipe installation shall be thoroughly cleaned. Cleaning shall be performed by the Contractor by means of an inflatable rubber ball. The ball shall be a size that will fit snugly into the pipe to be flushed. The ball shall be placed in the last cleanout or manhole on the pipe to be cleaned and water introduced behind it. The ball shall pass through the pipe with only pressure of the water impelling it. All debris flushed out ahead of the ball shall be removed at the first manhole where its presence is noted. If any wedged debris or damaged pipe stops the ball, the Contractor shall remove the obstruction. When a new sewer main and/or sewer lateral is connected to an existing line, cleaning and flushing shall be carried out to the first existing manhole downstream from the point of connection.

2. Closed Circuit Television Inspection

The Contractor shall inspect all new lines and manholes with Closed Circuit Television (CCTV) and furnish a written or printed PACP (NASSCO) report and CD/DVD copy of the PACP-coded inspection along with a hard copy report to the District Engineer at time of inspection. All inspections shall be recorded in an unprotected (.mpg) digital format. The Contractor shall give the District Engineer at least two (2) working days' notice prior to televising the line(s), so that a District representative can verify the work.

The Contractor must provide a 1-1/2" camera target to judge the depth of the trapped water.

The Contractor shall clean all lines and manholes of dirt and other debris, remove pipe crowns, compact trenches, raise manhole rims to grade, and correct all visible infiltration, leaks, and deficiencies PRIOR to inspection. Areas adjacent to manholes shall be leveled and made accessible to the television equipment. All inspection, equipment time, and costs for the inspection shall be the responsibility of the Contractor.

CCTV inspection shall use adequate lighting.

Defects such as high and low spots, joint separations, offset joints, chipped ends, cracked or damaged pipe, infiltration points, and debris in lines shall be corrected by the Contractor at its expense. Low spot defects to be measured with appropriate-sized target viewed clearly by CCTV camera.

For joint separations, chipped ends, and low spots, the following maximum acceptable limits will apply for 6", 8", and 10" pipes:

Joint separations $-\frac{1}{2}$ "	
Chipped ends $-\frac{1}{4}$ "	
Low Spots –	
Pipe Size	Depth tolerance of trapped water
6"	½" (.04 feet)
8"	³ ⁄4" (.06 feet)
10"	1" (.08 feet)
12" & larger	10% of pipe Diameter (in feet)

All defects and deficiencies discovered during this inspection shall be corrected by the Contractor to the satisfaction of the District Engineer at the Contractor's expense. Low spot defects are to be measured with appropriate-sized target viewed clearly by CCTV camera.

3. Low-Pressure Air Test for Gravity Sewer

After completing backfill of a section of sewer line the Contractor shall, at its expense, conduct a Line Acceptance Test using low-pressure air in accordance with ASTM 828, Standard Test Method for Low-Pressure Air Test for Vitrified Clay Pipe Line. The test shall be performed using the equipment listed below, according to stated procedures, and under the supervision of the District Engineer.

PROCEDURE

The section of pipe to be tested shall be isolated by completely blocking all outlets in the section under the test. Careful attention must be given to the bracing of all plugs, as the line will be under pressure. One (1) of the plugs used at the manhole must be equipped for an air inlet to fill the line from the air compressor. The air compressor which feeds air into the pipe section must be equipped to control the air entry rate and to prevent the pressure from exceeding 5.0 psig. The air compressor shall be fitted with a blow-off valve to operate at 5.0 psig to prevent an increase in pressure, which could be hazardous to the pipeline.

After the pipe has been wetted, the air shall be allowed to slowing fill the pipeline until a constant pressure of 4.0 psig is maintained. At this point, the air compressor shall be controlled so that the internal pressure in the line is

maintained between 4.0 and 3.5 psig for at least two (2) minutes to permit the temperature of the entering air to equalize with the temperature of the pipe wall. If it is necessary to bleed off the air to repair a faulty plug, a new two-minute interval must be allowed when the line has been refilled.

When the temperature of the air has reached equilibrium with that of the pipe wall, the air source shall be disconnected. Before disconnecting the air supply, the pressure shall be at 4.0 psig. The gauge is then watched until the air pressure reaches 3.5 psig. When the pressure has reached 3.5 psig, a stopwatch will be started and stopped when the pressure has reached 2.5 psig. The time required as shown on the watch, for the loss of 1.0 psig drop shall be in accordance with ASTM C 828 or NCPI Low Pressure Air Tables for Sanitary Sewer. The portion of line being tested shall be considered "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig is not less than the time shown for the given diameters in the following table:

TABLE IV-1 AIR PRESSURE TEST

Main Line

4" House Connection

	House Connection Length								
Diameter (Inches)	Length (Feet) 0 ft. 100 ft 200 ft 300 ft 400ft								
	0	0	20	40	50	70			
	50	40	50	70	90	80			
	100	70	90	100	100	90			
8	150	110	120	110	100	100			
	200	140	120	110	110	100			
	300	140	130	120	110	110			
	400	140	130	120	120	110			

4. Low-Pressure Air Testing

When the measured water table is five (5) feet or less above the pipe barrel at the midpoint of the test section, a low-pressure air test is an accurate method of testing a sewer line for acceptance (for five (5) feet or greater, see "Hydrostatic Infiltration Testing" in No. 5 below).

Acceptance or failure of a line is determined by a specific drop in air pressure over a specified length of time. (See "Low-Pressure Air Test for Sanitary Sewers" booklet.)

TEST PROCEDURE

Clean the sewer line by flushing before testing to wet the pipe surface and clean out any debris. Plug all pipe outlets to establish the required test pressure. All stoppers in laterals should be braced.

ASTM C828 Standard Test Method for Low-Pressure Air Test of Vitrified Clay *Pipe Lines* describes the procedure for air testing sewer lines. Air test tables found in the NCPI Low-Pressure Air Test for Sanitary Sewers are derived from ASTM C828.

The pressure-holding time is based on an average holding pressure of 3 psig or a drop from 3.5 psi to 2.5 psi.

Add air until the internal air pressure of the sewer line is approximately 4.0 psig. After an internal pressure of approximately 4.0 psi is obtained, allow time for the air pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.

When the pressure has stabilized above the 3.5 psig reading, reduce the pressure to 3.5 psi to start the test. Record the drop in pressure for the test time. If the pressure does not drop more than 1.0 psi during the test time, the line is presumed to have passed. It is not necessary to continue the test for the total time when it is clearly evident that the rate of air loss is less than the allowable.

This procedure can be used as a presumptive test, which enables the installer to determine the acceptability of the line before backfill and subsequent construction activities.

SAFETY DURING TESTING

The air test can be dangerous if a line is improperly prepared due to improper training, a lack of understanding, or carelessness.

Calculate the amount of back pressure the plug must withstand and be certain the plug being used is designed to withstand this pressure. Always use a pressure gauge and regulator when inflating a sewer plug. Underinflated plugs will not be able to withstand the required back pressure. Overinflated plugs can rupture causing possible damage and injury.

It is extremely important to install and brace the various plugs to prevent blowouts. A force of 250 Lbf is exerted on an 8" plug by an internal pipe pressure of 5 psi. The sudden expulsion of a poorly installed plug, or a plug that is partially deflated before the pipe pressure is released, can be dangerous. As a safety precaution, pressurizing equipment should include a regulator relief valve set a 10 psi to avoid over pressurizing and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

5. Hydrostatic Infiltration Testing

When the measured water table is five (5) feet or greater above the pipe barrel at the midpoint of the test section, infiltration testing is the preferred and least expensive method of acceptance testing. The infiltration test measures the ground water entering the pipeline. Manholes should be tested independent of the sewer line.

ASTM C1091 Standard Test Method for Hydrostatic Infiltration Testing of Vitrified Clay Pipe Lines describes the procedure for Infiltration Testing and allowable rate of infiltration.

If water is present in the line, isolate the section of pipeline being tested from the upstream side. Discontinue pumping of ground water for a minimum of 24 hours prior to testing. Determine the infiltration flow rate in the sewer line at the furthest downstream point of the section being tested.

It is necessary to collect and measure the infiltration over a period of time. A convenient collection time is one (1) hour. This measurement can be converted to gallons per hour and to gallons per inch diameter per mile, per day and compared to the specified standard.

Water infiltration may be collected by using a dam at the invert of the pipe, using a flow-through plug or other convenient method.

After the infiltration for the pipe is determined, the lower plug in the upstream manhole can be removed and the combined infiltration from the pipeline and the manhole can be measured. The manhole infiltration is calculated by simply subtracting the pipeline infiltration from the combined pipeline and manhole infiltration. Other procedures for infiltration testing may be equally satisfactory.

V. MEASUREMENT AND PAYMENT

A. Pipe

Payment for sanitary sewer pipe complete in place shall be per linear foot measured from center of manhole to center of manhole following a line parallel to the grade of the sewer. Payment shall include the furnishing of all labor, materials, water, tools, and equipment required to construct and complete the installation of the sewer pipe in accordance with the plans and these specifications.

B. Structures and Manholes

The unit of measure for payment shall be per each unit. Payment shall be made at the bid price per item for each structure complete in place and shall include the cost of excavation, backfill, frames, covers, plates, or reinforcing steel where required.

STANDARD DETAILS INDEX

SSD1	Sewer Pipe Location in Public Rights of Way
SSD2	Pipe Installation
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SSD4a	Sewer Lateral Connections to Manholes
SSD5	Trunk Manhole
SSD6	External Drop Manhole
SSD7	Internal Drop Manhole
SSD8	Terminal Manhole
SSD9	PAMREX 24" Manhole Frame and Cover
SSD9a	Cast Iron Manhole Frame and Cover
SSD9b	PAMTIGHT 24" Manhole Frame and Cover
SSD10	Sewer Parallel ("Fly-Line") Connection
SSD11	Lateral and Subtrunk Manhole
SSD 12	Sewer Service
SSD13	Service Riser
SSD14	Cut-in Service
SSD15	Existing House Lateral Relocation
SSD16	Grease and Oil Interceptor

PROPERTY LINE	SANITARY LATERAL (TYP.)					
SANITARY SEW						
WATER MAIN	10' MIN.					
SANITARY LAT	ERAL (TYP.)					
<u>PLAN VIEW</u>						
<u>NOTE:</u> 1. SEMER LINES SHALL BE LOCAT	TED IN THE CENTER OF RIGHTS OF WAY.					
APPROVED BY:	SANITARY SEWER SALIDA SANITARY					
REVISED: DATE: REVISED: DATE:	SEWER PIPE LOCATION IN PUBLIC					
REVISED: DATE:	RIGHTS OF WAY DETAIL NO. SSD1					







THE ARE THE AR						
. <u>NOTES:</u> 1. EXTREME CAUTION SHOULD BE EXERCISED IN THE PLACEMENT OF MANHOLES TO ASSURE AN						
UNYIELDING FOUNDATION. 2 SETTIEMENT OF THE MANHOLE MAY CAUSE DAMAGE TO THE AD LACENT PIPE						
 SEPTEMENT OF THE HARROLE HAR GROUP DATIAL TO THE ROCHOLERT FITE. SHORT LENGTHS (24" MAX.) WITH FLEXIBLE COMPRESSION JOINTS AND/OR FLEXIBLE MANHOLE CONNECTIONS SHOULD BE USED AT THE MANHOLE WALLS TO ACCOMMODATE MINOR DIFFERENTIAL MOVEMENT. A BELL AND SPIGOT JOINT WITH A FACTORY APPLIED GASKET OR PLAIN-ENDED PIPE JOINED WITH RUBBER COMPRESSION COUPLINGS WILL PROVIDE THE NEEDED FLEXIBILITY AND WATER-TIGHTNESS. TWO POINTS OF FLEXIBILITY SHOULD BE USED WITHIN 36" OF EACH MANHOLE CONNECTION. THIS CAN BE ACCOMPLISHED BY: A. USING TWO SHORT LENGTHS (STUB OF 24" OR LESS) OR B. ONE SHORT LENGTH AND ONE FLEXIBLE MANHOLE CONNECTOR. 						
4. IF THE MANHOLE CONNECTOR IS UTILIZED, IT IS IMPORTANT THAT THE PIPE IS CENTERED IN THE CONNECTOR AND THE TIGHTENING CLAMP TORQUED PER MANUFACTURERS INSTRUCTIONS IN ORDER TO REMAIN A FLEXIBLE AND WATER-TIGHT CONNECTION.						
* THE USE OF MORTAR IN THE PIPE/MANHOLE CONNECTION AND NOT CENTERING THE PIPE WOULD DECREASE THE EFFECTIVENESS OF THE CONNECTORS TO COMPENSATE FOR SHEAR CAUSED BY SETTLEMENT OR GROUND MOVEMENT.						
APPROVED BY: GANITARY SEWER						
AIKE GILTON, DISTRICT ENGINEER SEWER LATERAL						
REVISED: DATE: CONNECTIONS TO DISTRICT MANHOLES DATE: DATE: CONNECTIONS TO DISTRICT						













MODEL	A INCHES	0 INCHES	H INCHES	C INCHES	E INCHES	F INCHES	REFERENCE	WEIGHT LBS	COVER WEIGHT LBS
NON VENTILATED	33 1/2	24	4	26 7/9	3 5/7	2	CDPA60EH5EN	225	116
<u>NOTE:</u> THIS MANHOLE FRAME & COVER SHALL BE USED IN AREAS WHERE INSTALLATION IS IN THE FLOOD WAY OR FLOOD PLAIN OR WHERE WATER INTRUSION IS A FACTOR.									
APPROVED BY: MIKE GILTON, DISTRICT ENGINEER SANITARY SEVER									
REVISED:	DATE		- ,	PAMTIGHT 24 INCH			S WWW		
REVISED: DATE: MANHOLE FRAME DISTRICT REVISED: DATE: AND COVER DETAIL NO. SSD9b									













REVISED:	DATE:			
	2	EXISTI	ING	HOUSE
REVISED:	DATE:	LATERAL	REL	OCATION

DATE:

REVISED:

DISTRICT DETAIL NO. SSD15

