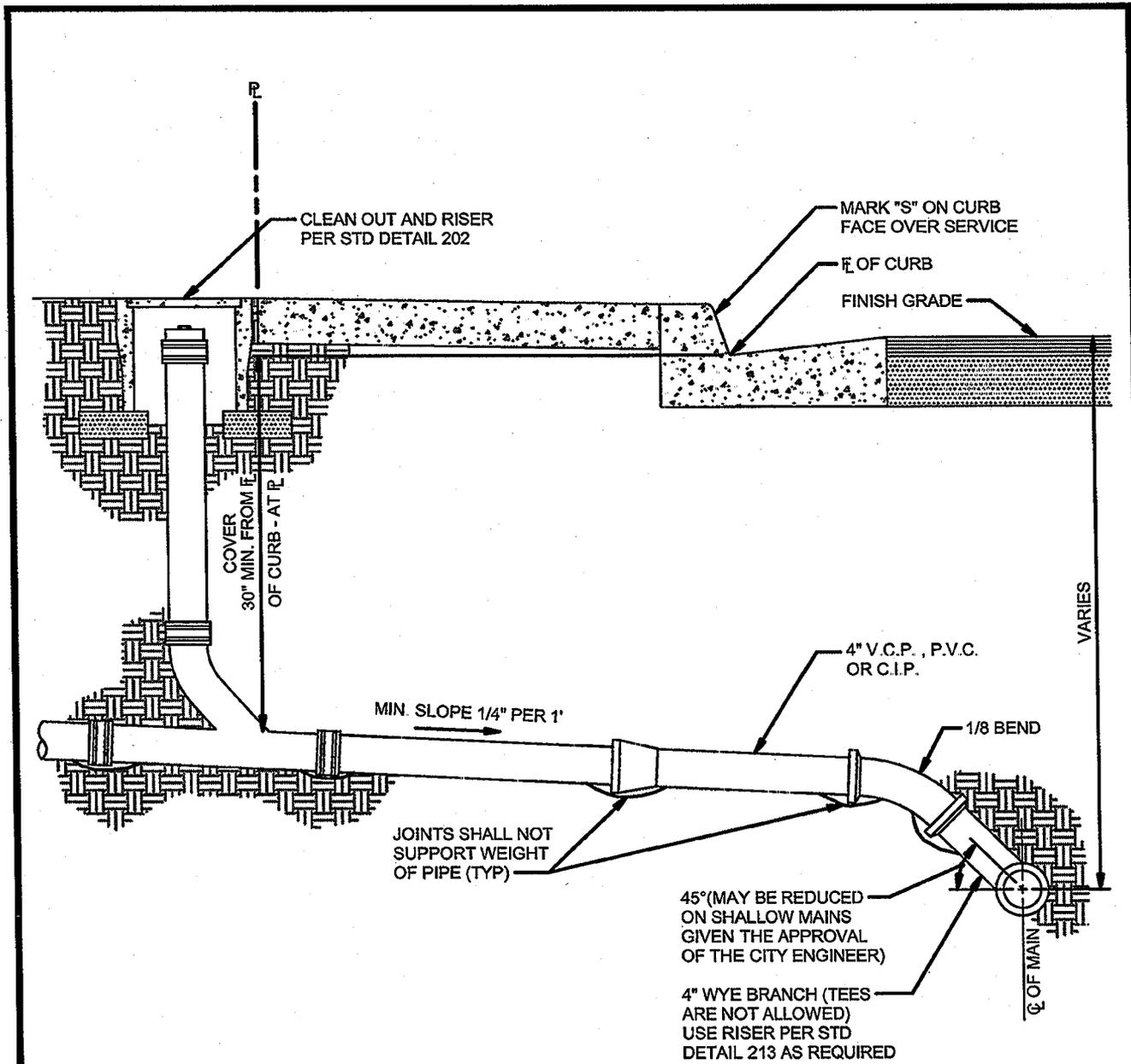


**City of Riverbank
STANDARD PLANS
WASTEWATER**

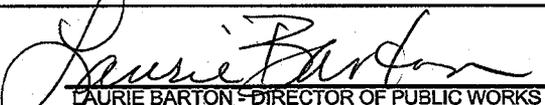
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<u>Drawing No.</u>	<u>Description</u>
601	Sewer lateral
602	Cleanout
603	Cut-In-Wye
604	Lamphole
605	Standard manhole
606	Manhole cone
607	Manhole base
608	Drop Manhole
609	Sampling Manhole
610	Terminal manhole
611	Manhole cover to new grade
612	Sewer Riser
613	Sand and grease interceptor

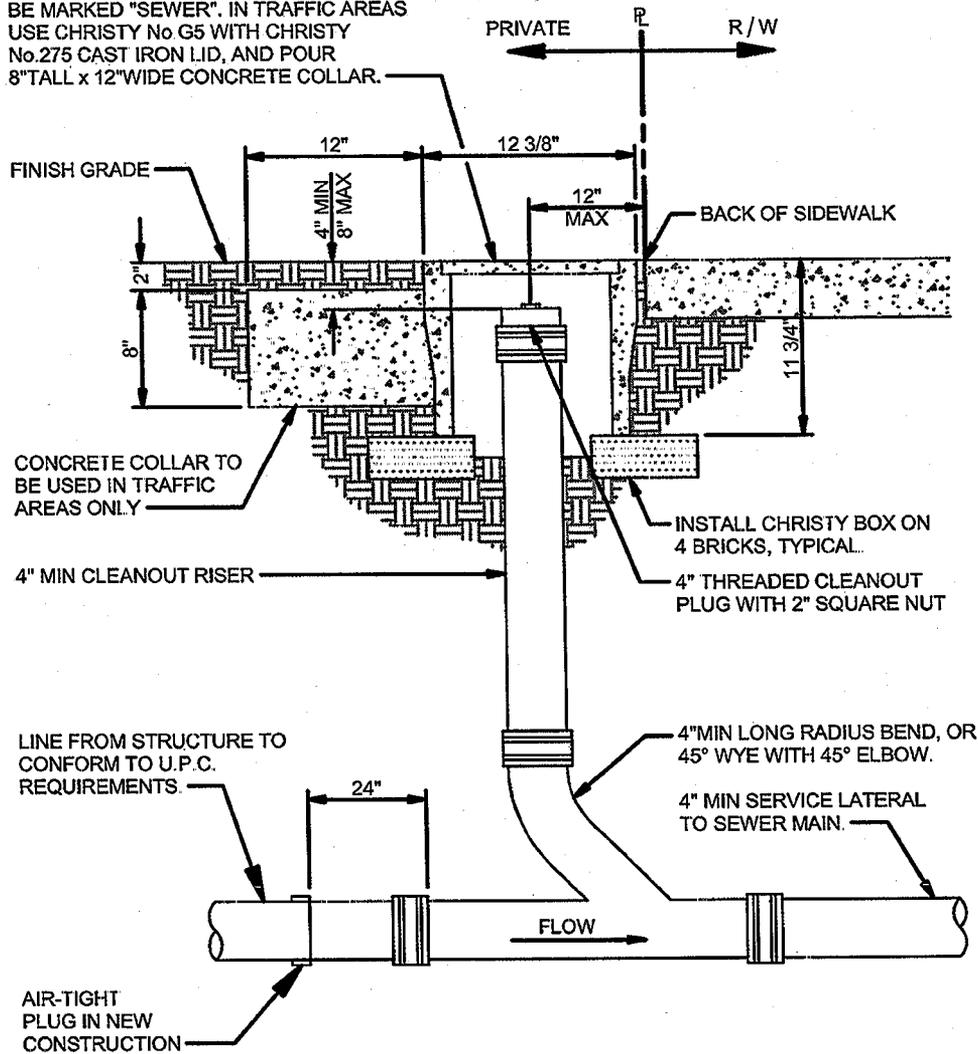


NOTES:

1. IN STREETS WHERE FLOWLINE OF MAIN SEWER IS MORE THAN 5 FEET BELOW FINISHED GRADE, A RISER WITH A 45° ELBOW MAY BE USED UP TO A POINT 5 FEET BELOW CURB GRADE, OR HOUSE CONNECTION MAY BE PLACED ON A UNIFORM SLOPE UP TO A POINT 5'-0" BELOW TOP OF CURB.
2. IF COVER IS LESS THAN 2'-6", ENCASE PIPE IN CONCRETE MINIMUM OF 4" THICK.
3. SEE SECTION 500 REGARDING BEDDING AND BACKFILL REQUIREMENTS

CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			SEWER LATERAL	
 LAURIE BARTON - DIRECTOR OF PUBLIC WORKS				
DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 201.DWG	05-29-07	601

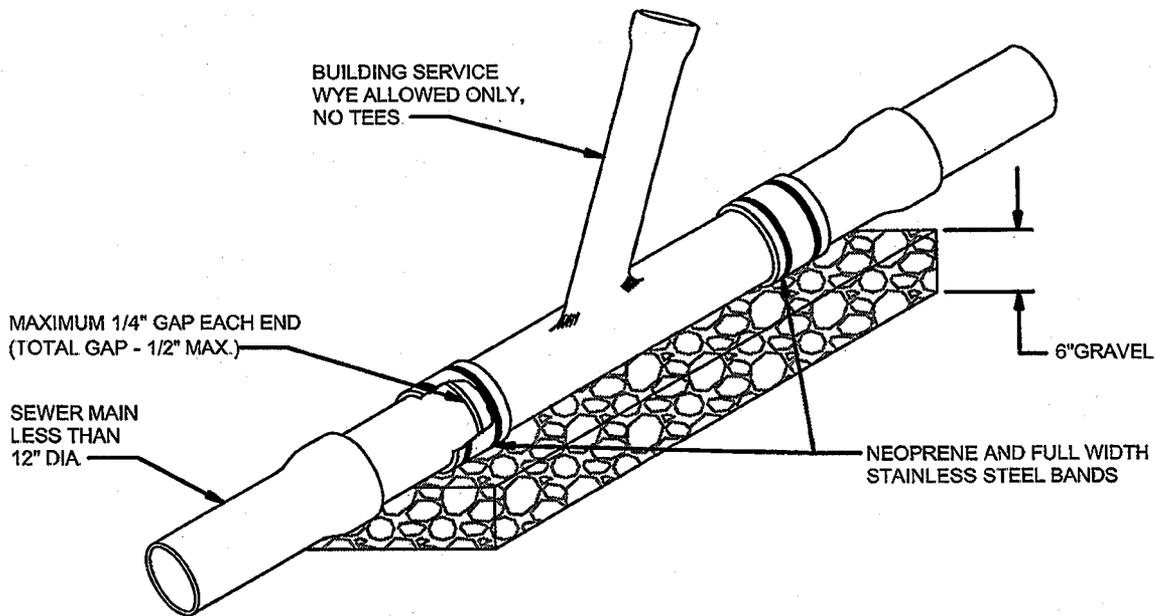
CHRISTY F8 PROTECTION BOX WITH CHRISTY F8D CONCRETE LID. ALL LIDS TO BE MARKED "SEWER". IN TRAFFIC AREAS USE CHRISTY No G5 WITH CHRISTY No.275 CAST IRON LID, AND POUR 8" TALL x 12" WIDE CONCRETE COLLAR.



NOTES:

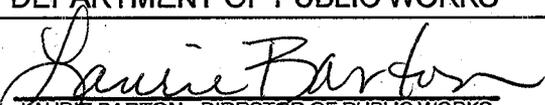
1. CLEANOUT RISER SHALL BE THE SAME SIZE AS THE SEWER LATERAL
2. CLEANOUT SHALL BE LOCATED JUST BEHIND THE R/W LINE OUTSIDE THE R/W
3. WYE AND CLEANOUT RISER COMBINATION MAY BE CAST IRON, PVC OR VITRIFIED CLAY PIPE
4. ALL COUPLINGS SHALL HAVE STAINLESS STEEL BANDS

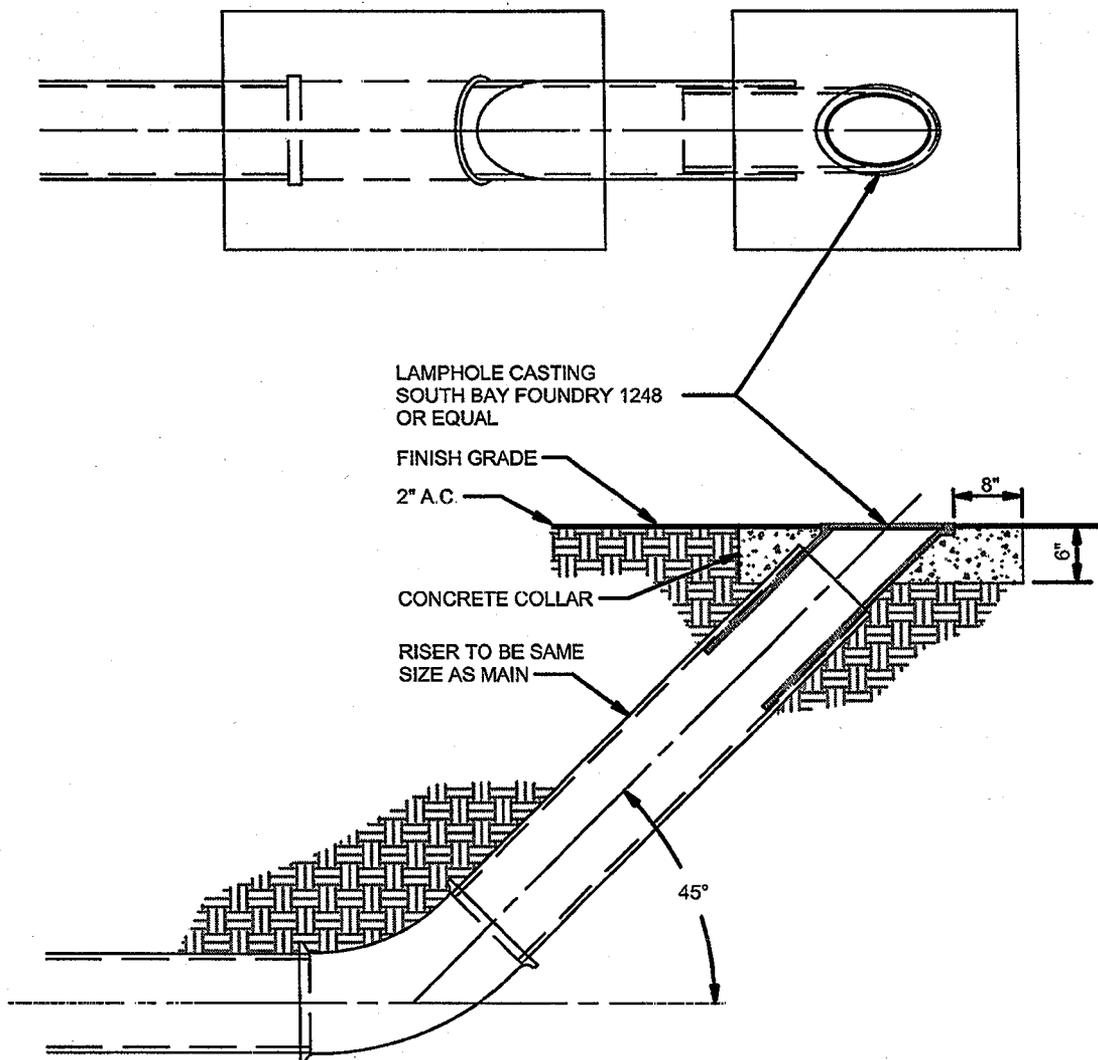
CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			CLEANOUT	
<i>Laurie Barton</i> LAURIE BARTON - DIRECTOR OF PUBLIC WORKS				
DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 202.DWG	05-29-07	602



NOTES:

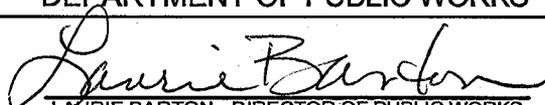
1. CUTS ARE TO BE MADE WITH A PIPE CUTTING TOOL.
2. SHEAR RINGS OF A TYPE APPROVED BY THE CITY ENGINEER SHALL BE INSTALLED ON ALL JOINTS.
3. TO BE USED ON EXISTING MAINS ONLY.

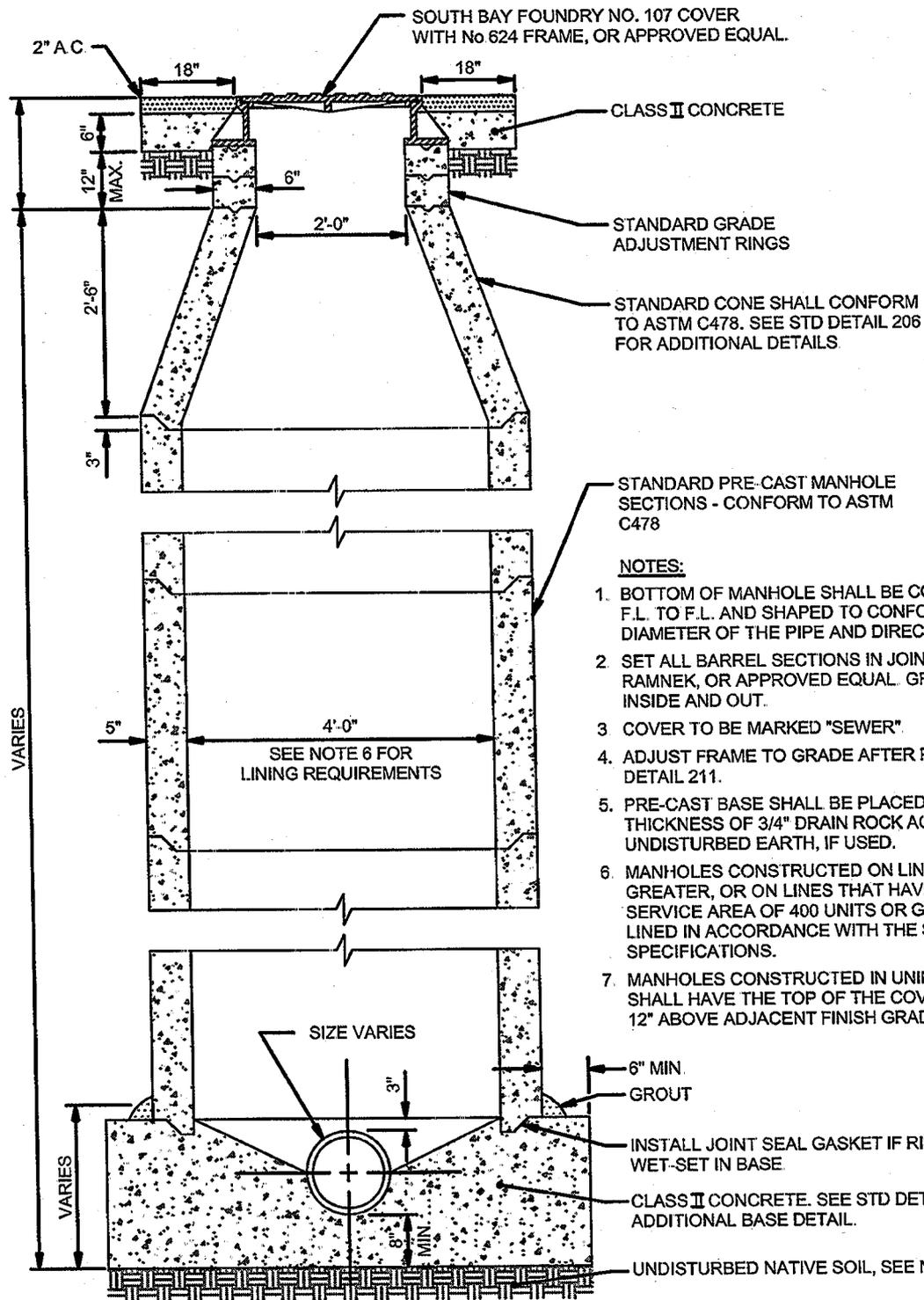
CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			CUT - IN - WYE	
 LAURIE BARTON - DIRECTOR OF PUBLIC WORKS				
DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 203.DWG	05-29-07	603



NOTE:

1. LAMPHOLE TO BE USED AT DISCRETION OF CITY ENGINEER AT THE ENDS OF SHORT MAINS OR WHEN A SMALL NUMBER OF SERVICES ARE CONNECTED TO MAIN.
2. LAMPHOLES MAY BE INSTALLED AT SEWER LINES STUBBED FOR FUTURE EXTENSION.

CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			LAMPHOLE	
 LAURIE BARTON - DIRECTOR OF PUBLIC WORKS				
DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 204.DWG	05-29-07	604

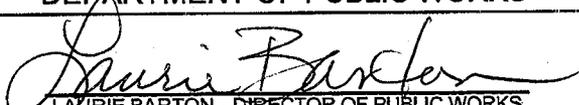


STANDARD PRE-CAST MANHOLE SECTIONS - CONFORM TO ASTM C478

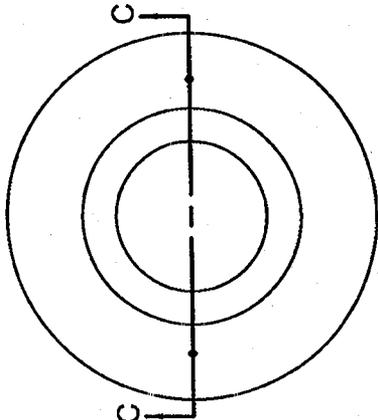
NOTES:

1. BOTTOM OF MANHOLE SHALL BE CONSTRUCTED FROM F.L. TO F.L. AND SHAPED TO CONFORM WITH THE DIAMETER OF THE PIPE AND DIRECTION OF FLOW
2. SET ALL BARREL SECTIONS IN JOINT GASKETS, RAMNEK, OR APPROVED EQUAL. GROUT ALL JOINTS INSIDE AND OUT.
3. COVER TO BE MARKED "SEWER"
4. ADJUST FRAME TO GRADE AFTER PAVING, PER STD DETAIL 211.
5. PRE-CAST BASE SHALL BE PLACED ON 6" MINIMUM THICKNESS OF 3/4" DRAIN ROCK AGAINST UNDISTURBED EARTH, IF USED.
6. MANHOLES CONSTRUCTED ON LINES OF 12" DIA OR GREATER, OR ON LINES THAT HAVE AN UPSTREAM SERVICE AREA OF 400 UNITS OR GREATER, SHALL BE LINED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.
7. MANHOLES CONSTRUCTED IN UNIMPROVED AREAS SHALL HAVE THE TOP OF THE COVER APPROXIMATELY 12" ABOVE ADJACENT FINISH GRADE.

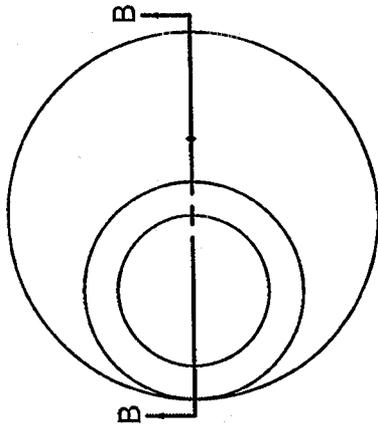
- 6" MIN. GROUT
- INSTALL JOINT SEAL GASKET IF RISER IS NOT WET-SET IN BASE.
- CLASS II CONCRETE. SEE STD DETAIL 207 FOR ADDITIONAL BASE DETAIL.
- UNDISTURBED NATIVE SOIL, SEE NOTES.

CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS		STANDARD MANHOLE	
 LAURIE BARTON - DIRECTOR OF PUBLIC WORKS			
DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS	ADOPTED BY THE CITY COUNCIL: 05-29-07
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 205.DWG	DRAWING NO. 605

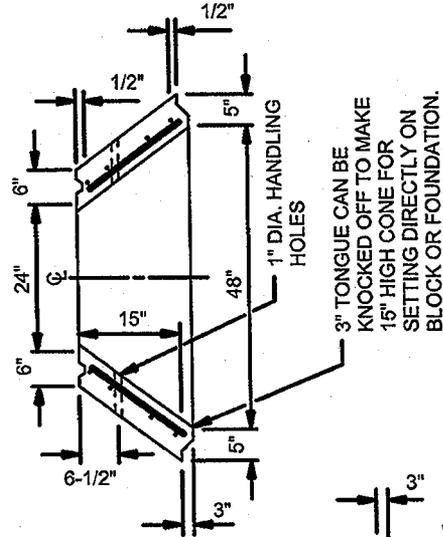
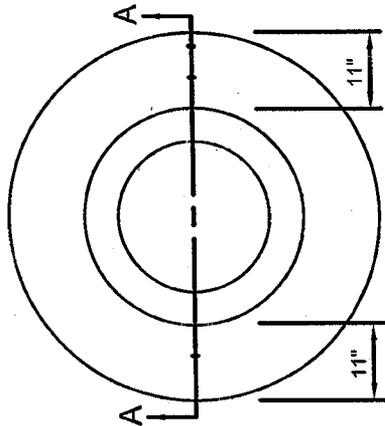
CONCENTRIC SHORT CONE



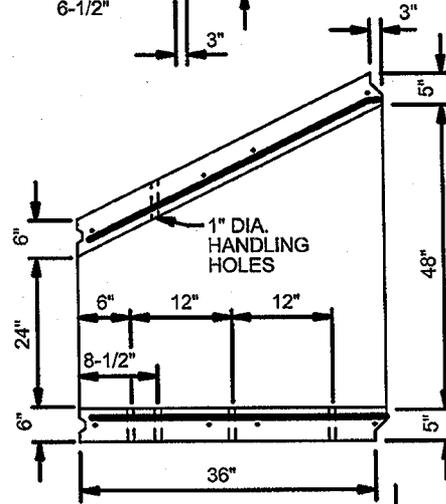
ECCENTRIC CONE



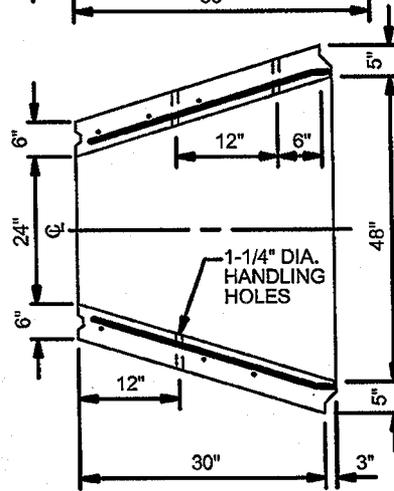
CONCENTRIC CONE



SECTION C-C



SECTION B-B



SECTION A-A

CITY OF RIVERBANK
DEPARTMENT OF PUBLIC WORKS

Laurie Barton
LAURIE BARTON - DIRECTOR OF PUBLIC WORKS

DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 206.DWG

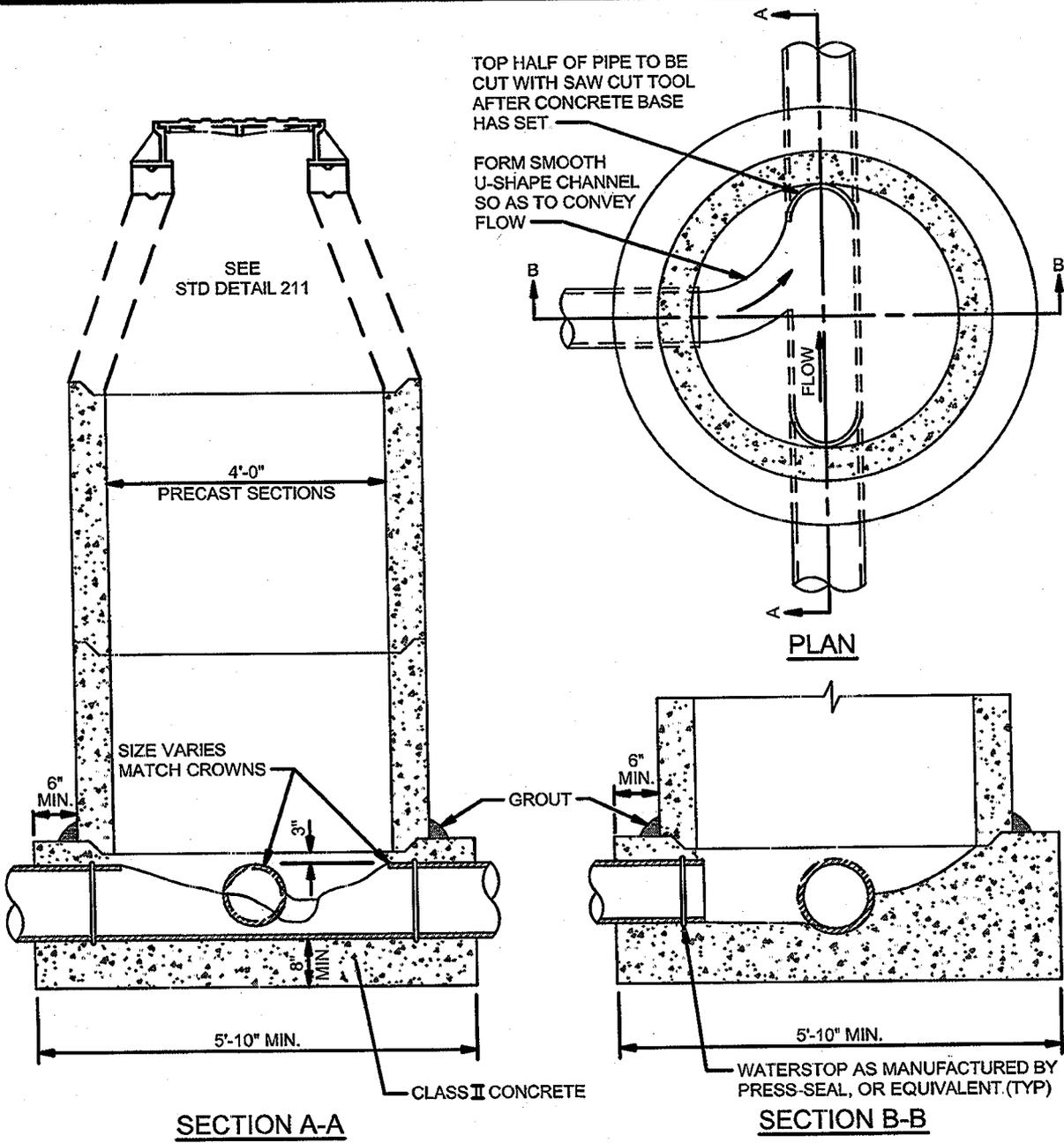
MANHOLE CONE

ADOPTED BY THE CITY COUNCIL:

05-29-07

DRAWING NO.

606

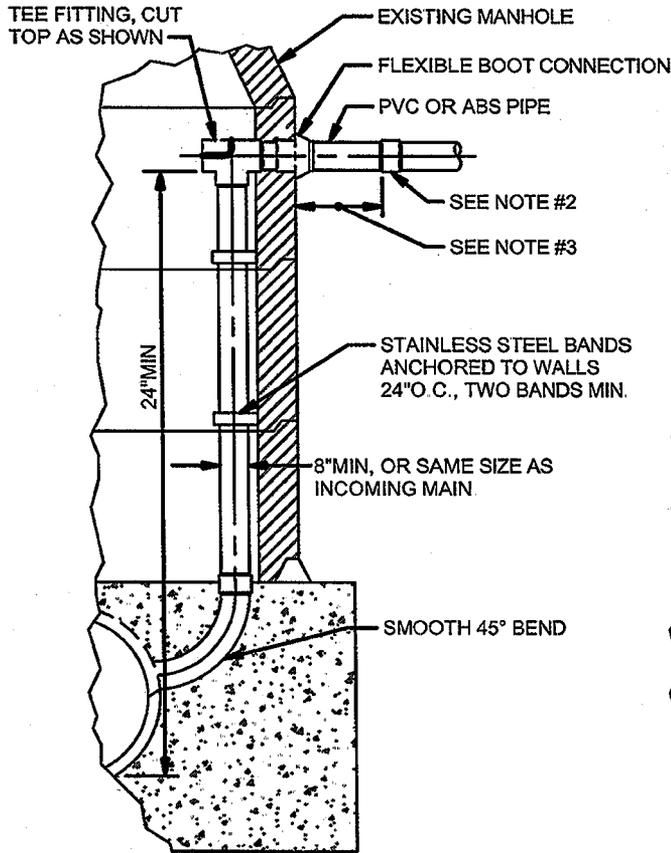


NOTES:

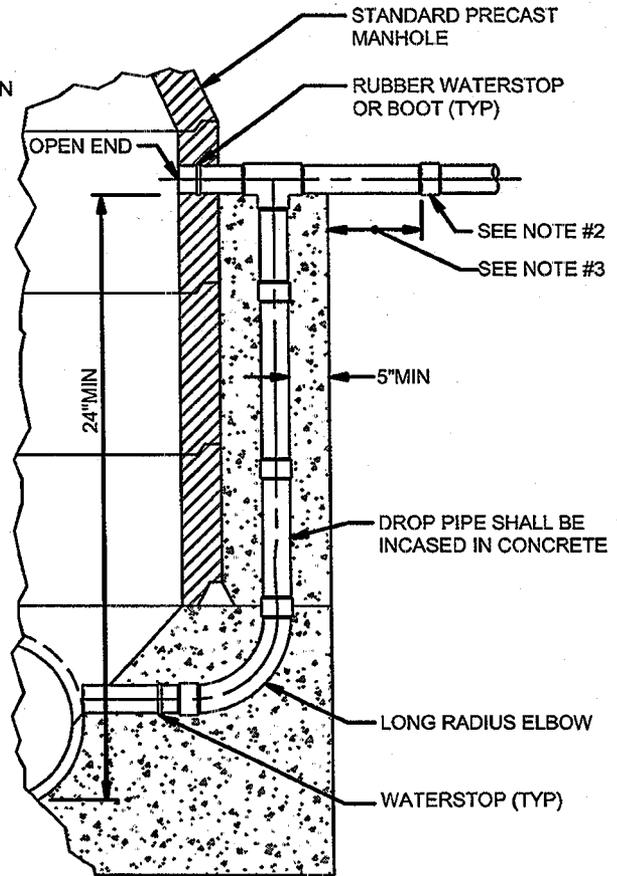
1. PIPE TO BE LAID THROUGH MANHOLE AND TOP HALF REMOVED AFTER CONCRETE HAS SET.
2. POUR IN PLACE BASES TO BE POURED AGAINST UNDISTURBED NATIVE SOIL. PRE CAST BASES SHALL BE SET ON A 6" MIN LAYER OF 3/4" DRAIN ROCK ON UNDISTURBED NATIVE SOIL.
3. FLEXIBLE RUBBER MANHOLE GASKETS SHALL BE INSTALLED AT ALL PIPE PENETRATIONS INTO THE BASE. USE PRESS-SEAL WATERSTOPS, OR SIMILAR.

CITY OF RIVERBANK		MANHOLE BASE	
DEPARTMENT OF PUBLIC WORKS			
 LAURIE BARTON - DIRECTOR OF PUBLIC WORKS		ADOPTED BY THE CITY COUNCIL:	
DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS	05-29-07
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 207.DWG	607

**SANITARY SEWER DROP
IN EXISTING MANHOLE**



**SANITARY SEWER
DROP MANHOLE**



THIS TYPE OF DROP CONNECTION SHOULD BE USED ONLY ON EXISTING MANHOLES, AS APPROVED BY THE CITY ENGINEER.

THIS TYPE MANHOLE SHALL BE USED WHERE THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE OUTLET PIPE AND THE INVERT OF THE FEEDER OR COLLECTOR SEWER EXCEEDS 24"

NOTES:

1. MORE THAN A 2' DROP FOR AN INCOMING PIPE SHALL REQUIRE A DROP CONNECTION.
2. FLEXIBLE JOINT-BELL & SPIGOT OR ADJUSTABLE REPAIR COUPLING (ARC). SOLVENT WELDED NOT PERMITTED.
3. 12" MAX. FOR 8" OR LARGER PIPE. 24" MAX. FOR PIPES LESS THAN 8".
4. INSIDE DROP CONNECTIONS NOT PERMITTED ON NEW MANHOLES.

**CITY OF RIVERBANK
DEPARTMENT OF PUBLIC WORKS**

Laurie Barton
LAURIE BARTON - DIRECTOR OF PUBLIC WORKS

**SANITARY SEWER DROP
IN EXISTING MANHOLE
& DROP MANHOLE**

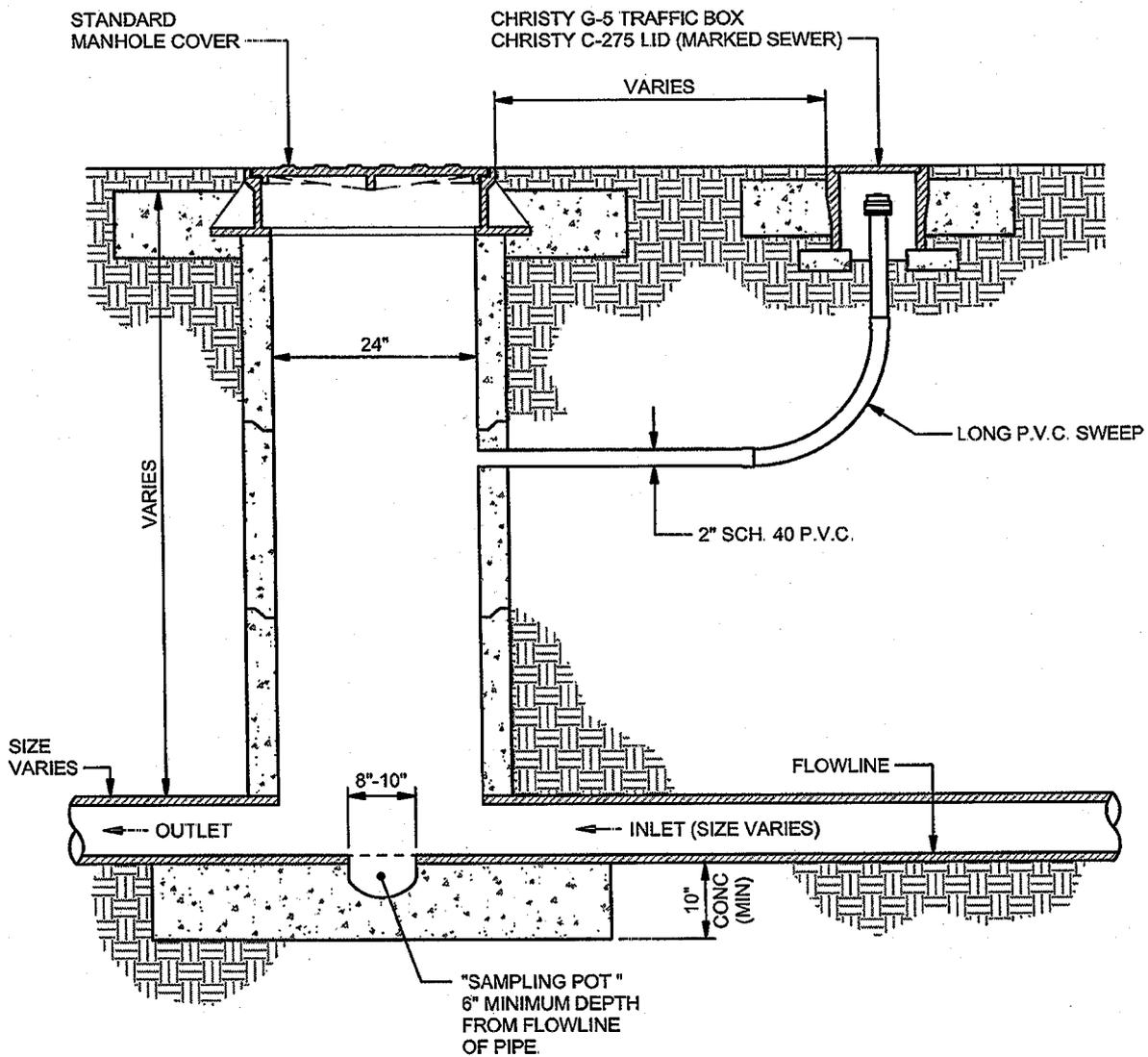
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REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 208.DWG

ADOPTED BY THE CITY COUNCIL:

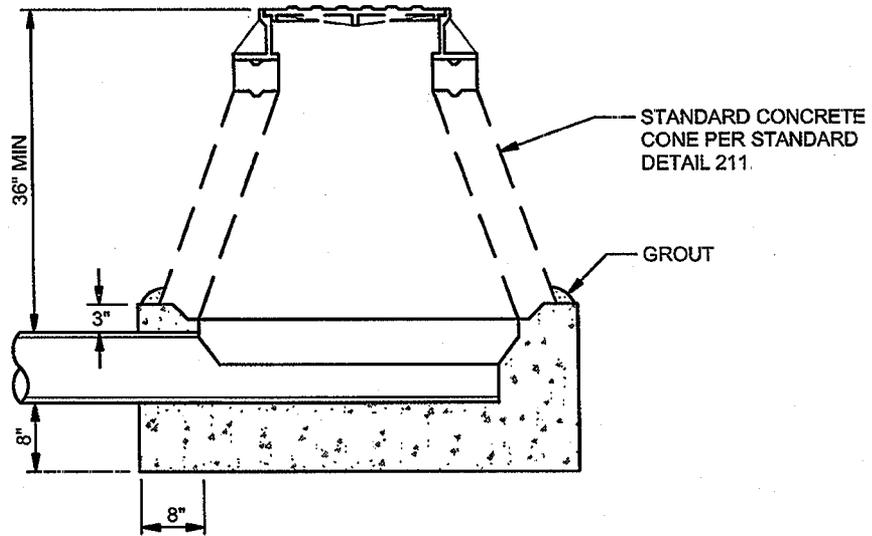
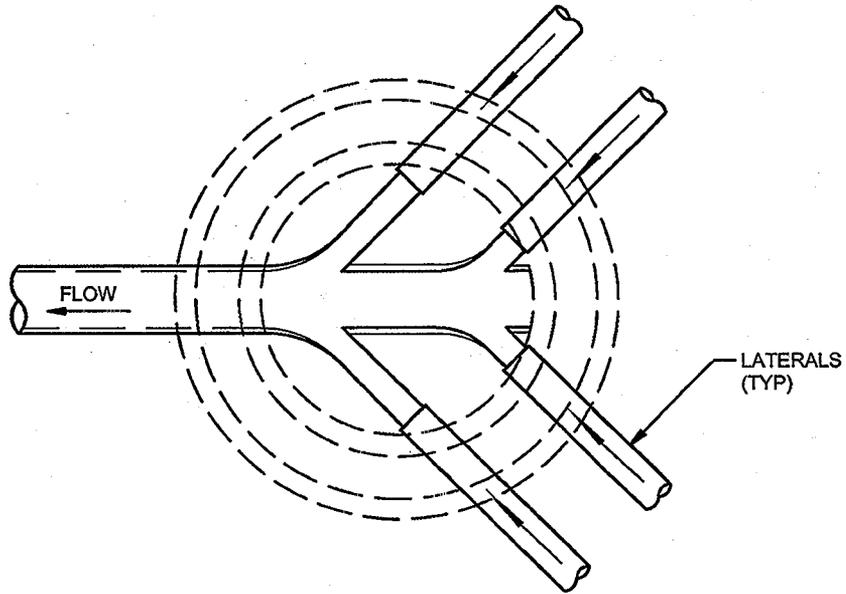
05-29-07

DRAWING NO.

608



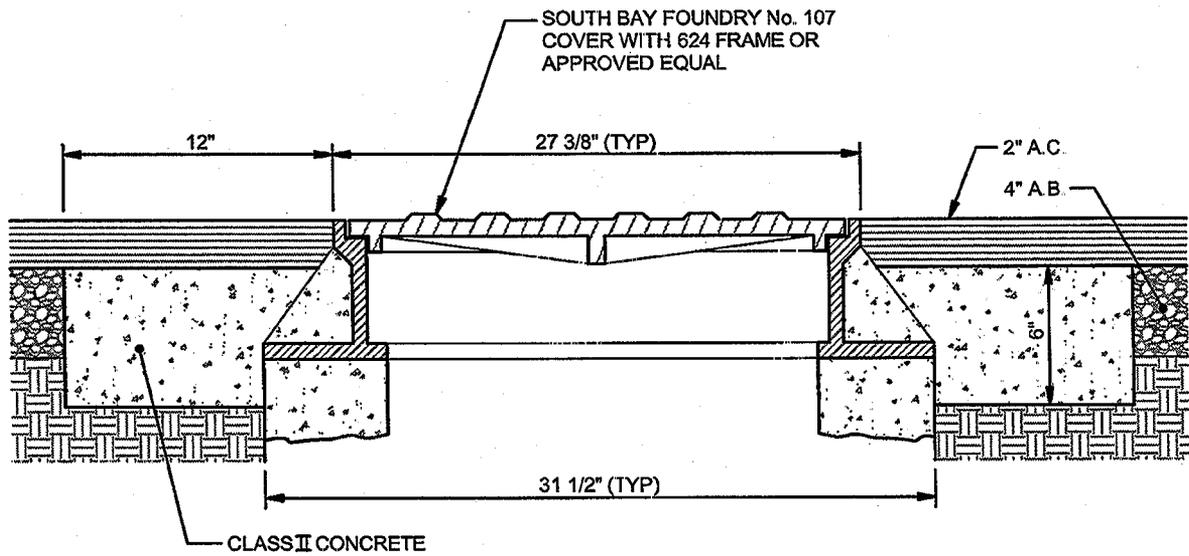
<p align="center">CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS</p>			<p align="center">SAMPLING MANHOLE</p>	
<p align="center"><i>Laurie Barton</i> LAURIE BARTON - DIRECTOR OF PUBLIC WORKS</p>				
<p>DRAWN BY: GK</p>	<p>DATE: 4/04/07</p>	<p>SCALE: NTS</p>	<p>ADOPTED BY THE CITY COUNCIL:</p>	<p>DRAWING NO.</p>
<p>REVISIONS: NONE</p>	<p>SECTION: SEWER</p>	<p>DRAWING NAME: 209.DWG</p>	<p align="center">05-29-07</p>	<p align="center">609</p>

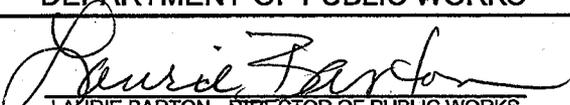


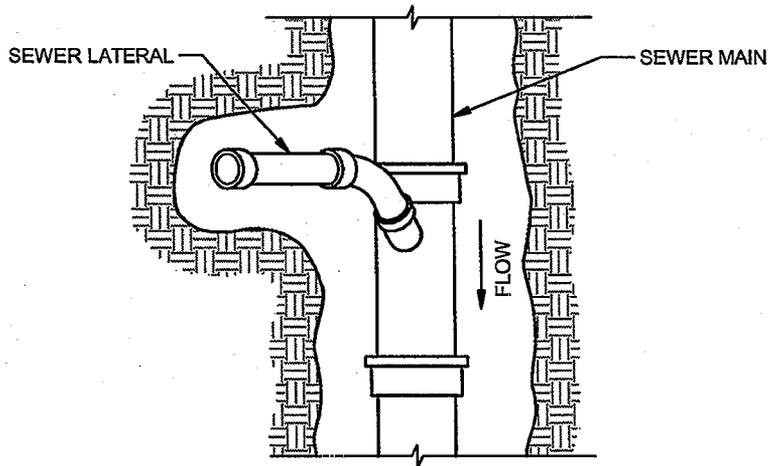
NOTES:

1. ALL SEWER LATERALS SHALL BE CONNECTED TO THE MAIN.
2. A MAXIMUM OF 4 LATERALS SHALL CONNECT INTO A TERMINAL MANHOLE.

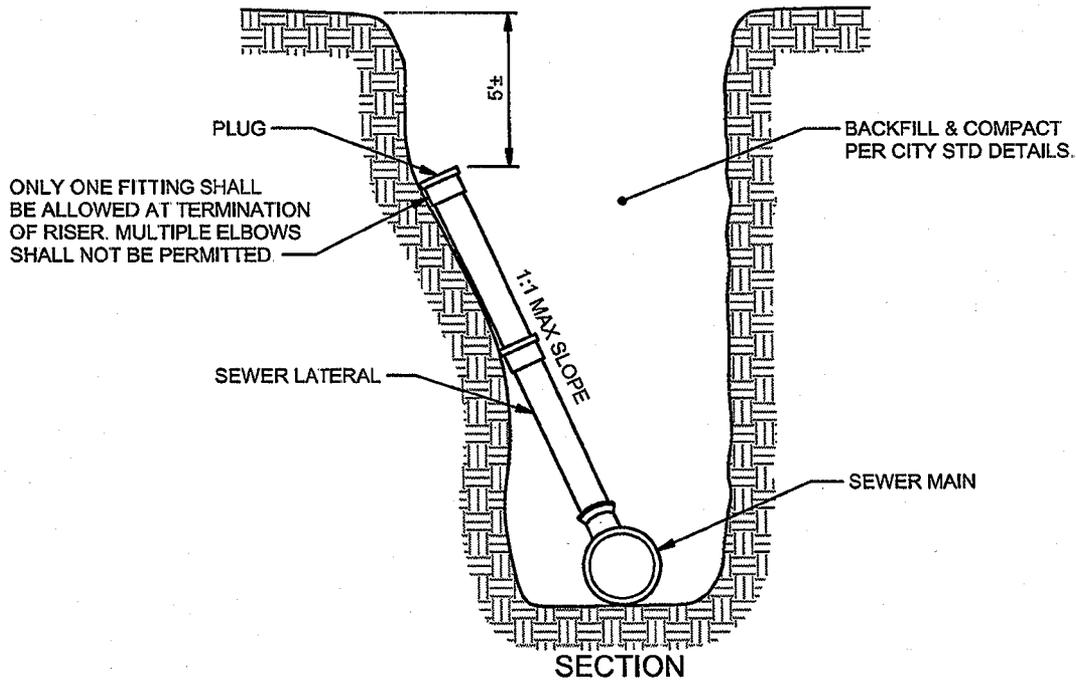
CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			TERMINAL MANHOLE	
<i>Laurie Barton</i> LAURIE BARTON - DIRECTOR OF PUBLIC WORKS				
DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 210.DWG	05-29-07	610



CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			MANHOLE COVER TO NEW GRADE	
 LAURIE BARTON - DIRECTOR OF PUBLIC WORKS				
DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS	ADOPTED BY THE CITY COUNCIL: 05-29-07	DRAWING NO. 611
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 211.DWG		



PLAN



SECTION

NOTE:

SEWER RISER TO BE USED IN CONJUNCTION WITH SEWER LATERAL PER STD DETAIL 201 AS NECESSARY. MAINS EXCEEDING 12' OF COVER SHALL REQUIRE A FLYLINE FOR LATERALS.

**CITY OF RIVERBANK
DEPARTMENT OF PUBLIC WORKS**

Laurie Barton
LAURIE BARTON - DIRECTOR OF PUBLIC WORKS

SEWER RISER

DRAWN BY:
GK

DATE:
4/04/07

SCALE:
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

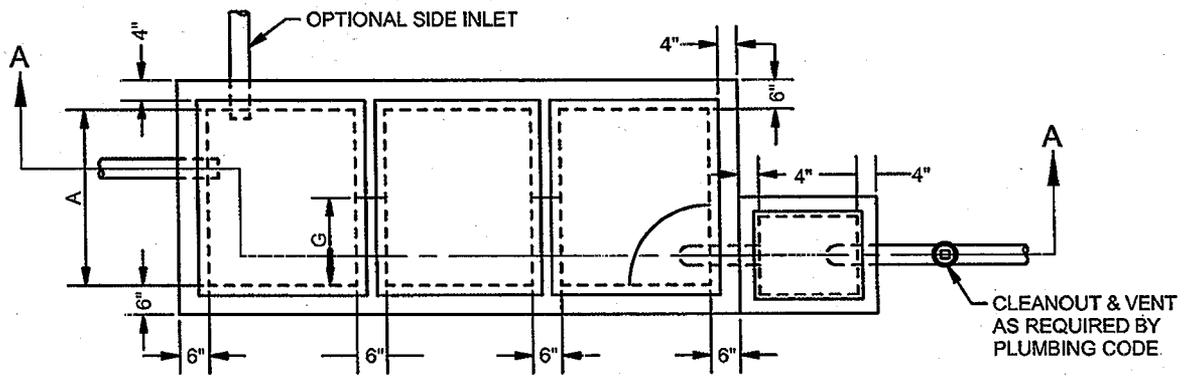
REVISIONS:
NONE

SECTION:
SEWER

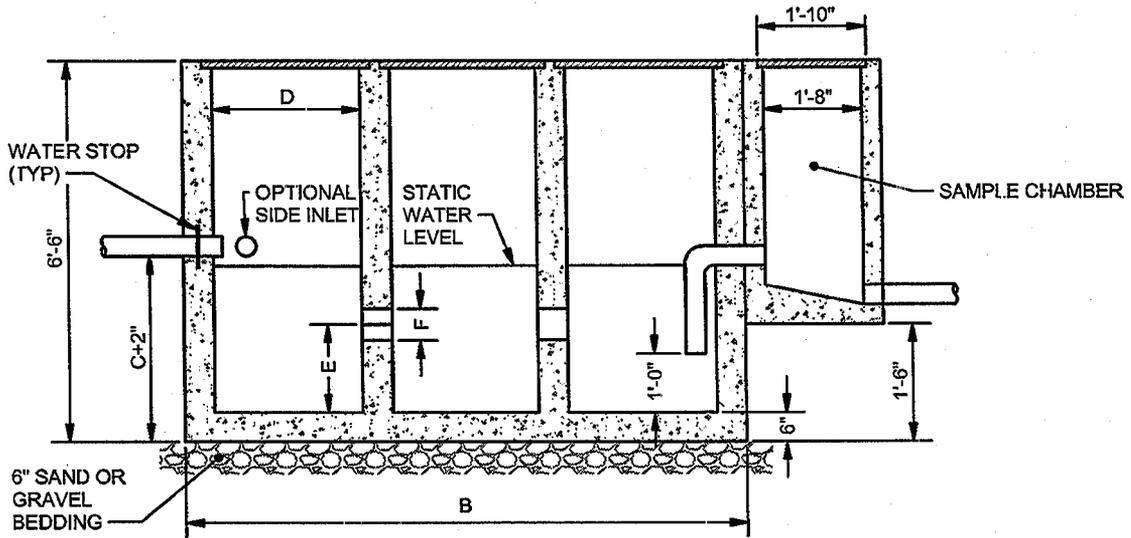
DRAWING NAME:
212.DWG

05-29-07

612



PLAN VIEW



SECTION A-A

NOTES:

1. AN ACCEPTED ALTERNATE IS P&L CONCRETE PRODUCTS PRECAST GREASE TRAP WITH ADDED SAMPLE CHAMBER ON OUTLET AS SHOWN ON THIS DRAWING.
2. ALL LIDS TO WITHSTAND H-20 LOADING. STANDARD MANHOLE FRAMES, COVERS AND GRADE RINGS ARE ACCEPTABLE FOR ACCESS. ACCESS TO BE PROVIDED TO EACH CHAMBER.
3. INTERCEPTORS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH SECTIONS 1009 THROUGH 1017 AND APPENDIX H OF THE UNIFORM PLUMBING CODE, AS APPLICABLE.
4. INTERCEPTORS SHALL BE OF THE THREE-STAGE TYPE WITH A SAMPLING CHAMBER, AS SHOWN IN THIS DRAWING
5. CONTRACTOR IS TO PROVIDE SUBMITTAL DATA TO CITY PUBLIC WORKS DEPARTMENT OF PRE MANUFACTURED UNITS FOR REVIEW PRIOR TO CONSTRUCTION

CAPACITY GALLONS	DIMENSIONS							COVER SIZE	METAL COVERS	PIPE SIZE
	A	B	C	D	E	F	G			
510	3'-0"	9'-6"	3'-0"	2'-6"	1'-6"	4 1/2"	1'-6"	2'-10"x3'-4"	1/4" STEEL PLATE	4"
866	3'-5"	10'-3"	4'-0"	2'-5"	2'-0"	0'-6"	1'-9"	3'-10"x3'-10"	3/8" ALUMINUM PLATE	4"
1260	4'-0"	12'-6"	4'-0"	3'-6"	2'-0"	0'-6"	2'-0"	3'-10"x4'-4"	3/8" ALUMINUM PLATE	4"

CITY OF RIVERBANK
DEPARTMENT OF PUBLIC WORKS

Laurie Barton
LAURIE BARTON - DIRECTOR OF PUBLIC WORKS

**SAND AND GREASE
INTERCEPTOR**

DRAWN BY: GK	DATE: 4/04/07	SCALE: NTS
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 213.DWG

ADOPTED BY THE CITY COUNCIL:
05-29-07

DRAWING NO.
613

City of Riverbank
CONSTRUCTION STANDARDS
WASTEWATER

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- A. General
- B. Gravity Sewer Pipe
- C. Service Laterals
- D. Manholes
- E. Castings
- F. Cleanouts
- G. Carrier or Casing Pipe
- H. Pipe to Manhole Connections

6.200 Installation

- A. Sanitary Sewer Installation
- B. Service Connections
- C. Manholes

6.300 Testing

- A. Cleaning and Flushing
- B. Low Pressure Air Test
- C. Televised Inspection
- D. Deflection Testing

6.400 Measurement & Payment

- A. Pipe
- B. Structures & Manholes

SECTION 6: SANITARY SEWER

6.100 MATERIALS

A. General

The City Engineer shall approve the source and supply of materials.

B. Gravity Sewer Pipe

1. Vitrified Clay Pipe 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 shall be Pressure Class 350 and shall conform to ANSI/AWWA C151. All DIP shall be protected by a polyethylene encasement meeting the requirements of ANSI/AWWA C105. Fittings shall conform to ANSI/AWWA C110.

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

3. Polyvinylchloride Pipe (PVC) shall be SDR 26, conforming to the requirements of ASTM D3034. Joints shall be gasketed, bell-and-spigot, push-on type with elastomeric seals conforming to ASTM D3212. Gaskets may be factory installed or field installed, as recommended by pipe manufacturer.

C. Service Laterals

Pipe shall be the same type and class as that used for the main.

Joints and Couplings for laterals shall be the same type and specifications as those used for the main.

D. Manholes

1. Standard Precast :

Sanitary sewer section manholes shall be precast reinforced concrete conforming to ASTM C 478. The manhole base, risers and cone shall have a minimum compressive strength of 3,000 psi at 28 days. Manholes shall be constructed in accordance with the Standard Details.

2. Lined Manholes:

When required by City Standards or indicated on the plans, manholes shall be SuperCoat or Polyurethane lined. The scope of the lining shall include, unless otherwise shown on the plans, all unlined interior concrete surfaces of the manhole. The Contractor shall provide submittal data for review and approval by the Public Works Department prior to application.

Polyurethane Lining: The lining material shall be an epoxy base coat under a polyurethane finish coat. The material shall be Sancon 100, or equivalent. The epoxy base coating shall be applied to a minimum thickness of 3 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.

SuperCoat Lining:

SuperCoat lining by Lafarge aluminates. The lining shall be applied by a licensed SuperCoat applicator and in accordance to the product recommendations. The depth of the application shall be $\frac{3}{4}$ " to 1" minimum.

Lining System Warranty:

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

I. Castings

Iron castings for manhole covers and frames shall conform to ASTM A 48, Class 25 and be of the dimensions and makes/models 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, which will form a tough, tenacious, non-scaling coating which does not have a tendency to become brittle when cold or sticky when hot.

F. 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. 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 F14, or equal. Concrete shall be Class II and have a 28-day compressive strength of 3,000 psi.

G. Carrier or Casing Pipe

Pipe used as a conductor pipe under a highway or railroad shall be welded steel pipe. The Pipe shall conform to the Standard Specifications for Public Works Construction (Greenbook) Section 207-10, "Steel Pipe". The protective lining and coating, if any, shall be as shown on the plans or specified in the Special Provisions.

When the conductor pipe is to be installed by boring and jacking, the wall thickness shall be $\frac{1}{4}$ " for sizes up to and including 24" in diameter, and $\frac{5}{16}$ " for sizes 27" to 36" in diameter, unless otherwise specified.

H. Pipe to Manhole Connections:

A Waterstop grouting ring or seal shall be used for pipe penetrations into cast-in-place manhole bases. Flexible rubber boot connections with stainless steel components shall be used for pipe penetrations into the walls of the manhole, or into pre-cast bases. Connections shall be installed as per the manufacturer's recommendations, and shall meet the requirements of ASTM C 923.

6.200: INSTALLATION

A. Sanitary Sewer Installation

1. All sanitary sewer pipe installations shall be accomplished as specified herein except where modified by the requirements specific to the various types of pipeline materials specified under Section 5.03.
2. 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, which the Contractor establishes from the grade stakes.
3. Each length of pipe shall be laid on compacted, approved bedding material as specified and shall have full bearing for its entire length between bell holes excavated in said bedding material to allow for unobstructed assembly of all bell and spigot joints. "Stabbing", "Swinging In", or "Popping On" spigot ends of pipe into bell ends will not be permitted. After jointing is accomplished, all spaces between pipe and bell holes shall be packed with bedding material, taking care not to damage, move or lift the pipe from its bedding support.
4. Adjustments of pipe to line and grade shall be made by scraping away or filling in and tamping approved material under the body of the pipe. No wedging or blocking to support the pipe will be permitted.
5. A sewer line, unless otherwise approved by the Inspector, shall be laid, without break, upgrade from point of connection to existing sewer and with the bell end forward or upgrade. Pipe shall not be laid when the Inspector determines that the condition of the trench or the weather is unsuitable. When pipe laying is not in progress, the forward end of the pipe shall be kept effectively closed with an approved temporary plug or cap.
6. Sewer pipes, branches, stubs, or other open ends which are not to be immediately connected, shall be plugged or capped with a standard watertight plug or cap, as approved by the Inspector for use in the particular installation. The plug or cap shall be placed on a standard end.
7. Pipe entering or leaving manholes or other structures shall have joints within 2½' of the manhole base.
8. In all cases, flexibility of joints at the manhole base shall be preserved to prevent damage to the pipe by differential settlement.
9. All sewer line connections to manholes, trunk sewers, main sewers, or side sewers shall be left uncovered until after the inspection has been made. After approval of the connection, the trench shall be backfilled as specified.

10. If the sewer is to be laid in an area that is to be filled, and the cover prior to filling is less than 5', the pipe shall not be laid until the area has been filled to a level 5' above the proposed pipe and compacted to 90% relative compaction, unless otherwise authorized by the City Engineer.

B. Service Connections

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

1. Where indicated on the plans, a cut-in wye shall be used with plain ends along the "run" of the pipe. Tees shall not be used. Cut-in wyes shall be allowed on existing mains, only. For new mains under construction, the wyes shall be connected to the main using standard bell-and-spigot joints. The first pipe segment downstream from the wye shall then be cut (beveled) to the required length so as to fit into the bell of the next downstream pipe end.
2. Cut-in wye connections are only allowed in mains less than 12", otherwise a manhole in accordance with the Standard Details is required.
3. When cutting in a wye, make three (3) initial cuts in the main, 2" to 6" inches apart, and remove the rings. Cut the main to the required length to insert wye.
4. Use well graded, crushed stone or crushed gravel, meeting the requirements of ASTM C 33, Gradation 67 (3/4 to No. 4) shall be placed under the main line and the sewer service lateral within the right-of-way.
5. When joining the cut ends of the existing main to the wye, a "BAND SEAL" with stainless steel shear type sewer repair couplings, or equal; shall be used. Calder couplings, No-Hub couplings or plastic will not be permitted on the "run" of the pipe.
6. Whenever possible, all connections at new and existing manholes shall be made with matching crowns.
7. 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.
8. The lateral line shall have a clean-out at back edge of sidewalk as shown on the Standard Details. A box shall be installed as noted on detail. Said cleanout shall consist of a combination wye and eighth bend. Laterals and cleanouts shall not be located in the driveway, unless specifically approved by the City Engineer.
9. The wye branches, unless otherwise specified, shall be inclined at an angle of 45 degrees from the horizontal. In no case shall the springline of the lateral be lower than the springline of the main line.
10. The end of the lateral service shall extend a minimum of 24" beyond cleanout wye/riser combination.

11. The location of every sewer service shall be marked with an "S" directly above the service on the face of the curb; the "S" shall be 2" in height and ¼" in depth.

C. Manholes

1. Precast Manhole Construction -Excavation and backfill for all precast manholes shall be in conformance with the requirements of Section 19-3 of the State Specifications and installed as specified herein. All embedment materials under, around and at least 3" over all pipelines located within five 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.
2. Manholes installed in areas outside of developed areas 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 outside an existing street is in a future street area, then grade rings shall extend below ground at least 18".
3. All joint surfaces of precast sections and face of manhole base shall be thoroughly clean prior to setting precast sections. These various sections shall be set in preformed plastic sealing gaskets of material conforming to the requirements of FEDERAL SPECIFICATION SS-S-00210.
 - 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 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 into groove.

- e. After manhole section has been set, the excess joint gasket shall be neatly trimmed away, and each joint shall be neatly grouted along the manhole wall, inside and out.
4. The cast-in-place base shall be Class II, 3,000 psi, 28-day concrete with 1½" 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. Waterstop gaskets, or equivalent, flexible rubber gaskets shall be installed at each pipe penetration into the manhole base. After the manhole base and precast sections have been placed and sufficient time has elapsed to allow all concrete and grout to set, the top half of pipe within the manhole shall be carefully cut off and the sides mortared. All channels so formed form a smooth flowing channel at all flow depths.
5. Temporary covers of 3/8" steel plate 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.
6. 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.
7. 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" inches, the void may be filled with concrete, poured against a suitable form on the inside of the structure.
8. 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.
9. Penetrations for connections to existing manholes shall be core drilled or neatly sawcut by the contractor. Use of a pneumatically powered chipping hammer for use in the removal of the sections of the manhole wall or base shall be on a case-by-case basis and only with the prior approval of the on site inspector. The surface edge of the opening shall be ground or milled as necessary, with all reinforcing wire ground to the level of the surrounding concrete wall of the opening. Reinforcing wire shall be removed and not be permitted to remain in the cut. Bent wire left in cut shall not be permitted.
10. Sealing the pipe shall be accomplished through the use of either a mechanically installed, flexible watertight boot connection, a cast-in-place watertight flexible boot connection, or a similar flexible sealing gasket. Boot connections shall use stainless steel bands and components, and shall conform to the requirements of

ASTM C923. Contractor shall provide submittal data prior to construction for review and approval by the onsite inspector. All sealing gaskets and/or boot connections shall be installed in accordance with the manufacturer's recommendations.

11. 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.

12. Lined Manholes

Installation of the SuperCoat, or Polyurethane lining shall conform to the requirements as specified by manufacturer.

- a. **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 Standards Specifications for Public Works Construction (SSPWC). Field joints between sections of lined pipe shall be Type P-1 as defined in Section 311-1 of the SSPWC specifications. 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 steel wedge anchors provided at the transition for the full pipe circumference. Contractor shall provide transition details to the 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. **Field Welding and Testing:**
Field welding and testing of the lining of structures and between pipe and structures shall be made in strict conformance with lining manufacturer's instructions and recommendations. All tests shall be performed by the contractor in the presence of the City inspector. The inspector shall be notified at least 24 hours in advance of a scheduled test.
- c. **Polyurethane Lining Surface Preparation:**
The Contractor shall furnish all labor, material and equipment necessary for the preparation of surfaces, application of lining, safety procedures, 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 sewer system. The concrete surfaces shall be air dried prior to installation of the liner.

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

d. Lining Installation:

The lining application shall be performed only by workmen 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, 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 gage thickness readings as required to insure correct lining thickness.

The finished coating shall be free from porosity, without bubbles or pinholes and uniform in color. All areas in question shall be removed and reworked to the satisfaction of the 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.

e. 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 his expense.

6.300: Inspection and Testing of Sewer Lines

All testing indicated herein shall be performed after backfill and compaction of the trench, grading and compaction of subgrade, after installation of curb and gutter, and prior to placement of aggregate base and AC paving. Compacted subgrade shall have passed the applicable compaction tests required by these Construction Specifications prior to sewer line testing. All tests shall be performed under the supervision of the City Public Works Department, or their appointed representative. Testing, and any required re-testing, shall be at the expense of the Contractor.

A. 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 of 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 the 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 shall stop the ball, the Contractor shall remove the obstruction. When a new sewer is connected to an existing line, cleaning and flushing shall be carried out to the first existing manhole downstream from the point of connection.

B. Low-Pressure Air Test:

After completing backfill of a section of sewer line, the Contractor shall at his/her expense, conduct a Line Acceptance Test using low-pressure air. The test shall be performed using the equipment listed below, according to stated procedures and under the supervision of the City Engineer.

PROCEDURE: The section of pipe to be tested shall be isolated by completely blocking all outlets in the section under 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 slowly 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 (2) 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 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:

SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED

Pipe Dia. (in)	Min. Time (min:sec)	Length for Min. time (ft)	Time for Longer Length(ft)	Specification Time for Length Shown						
				Length (ft), Time (min:sec)						
4	3:46	597	.360L	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	396	.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42
8	7:34	296	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:50
12	11:20	199	3.418L	11:20	11:20	11:23	14:14	17:05	19:56	22:47
15	14:10	159	5.342L	14:10	14:10	17:49	22:16	26:43	31:10	35:37
18	17:00	133	7.692L	17:00	19:14	25:38	32:03	38:28	44:52	51:17

The air test shall be performed after the completion of backfill and compaction and prior to final paving and pouring of the curbs, gutters and sidewalks.

The Contractor shall furnish all equipment needed to complete this test.

If the installation fails to meet this requirement, the Contractor shall, at his/her own expense, determine the source of leakage. He/she shall then repair or replace all

defective materials and/or workmanship and perform the air test as many times as necessary to achieve an acceptable test.

C. Televised Inspection:

The Contractor shall inspect all new pipelines with closed circuit television and furnish a CD/DVD of the inspection, along with a hard copy report to the City. The Contractor shall give the City Engineer at least two (2) working days notice prior to performing the TV work so a city representative can verify the work.

The Contractor shall clean all lines of dirt and other debris, clean manholes, remove broken pipe, compact trench, raise manhole rims to grade, and pass the air test prior to television inspection. Areas adjacent to manholes shall be leveled and made accessible to the television trailer.

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 their expense. For joint separations, low spots and chipped ends, the following maximum acceptable limits will apply for new sanitary sewer lines:

Joint separations -1/2"

Low spots:

Pipe size	Depth tolerance of trapped water
6"	0.93 in.
8"	1.25 in.
10"	1.50 in.
12"	1.87 in.
15"	2.25 in.
18"	2.75 in.

Chipped ends – 1/4" (VCP, only)

Prior to the end of the one-year warranty period, the City may require televised inspection of the new sanitary sewer laterals for the project at the Contractor's expense.

D. Deflection Testing:

A deflection test on all new gravity sewer mains 6" and larger shall be performed using a pre-sized, rigid mandrel device approved by the City Engineer. The mandrel shall be clearly labeled and sized so as to provide a diameter of at least 95% of the Base Internal Diameter as defined in ASTM D-3034 for PVC SDR 26 gravity sewer pipe.

The mandrel shall be drawn through the pipe using only the force that can be exerted by one man on the end of a rope, using no mechanical advantage. Under no circumstances shall the mandrel device be attached to the cleaning ball.

Pipe exceeding 5% deflection shall be repaired or replaced, and shall be remandrelled in the presence of the City Engineer (or appointed representative). Mechanical re-rounding will not be acceptable.

6.400 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 & 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.