

# **CITY OF RIVERBANK**

## **STANDARD SPECIFICATIONS**

**DEVELOPMENT SERVICES DEPARTMENT**

**6707 Third Street**

**Riverbank, California 95367**

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**[www.riverbank.org](http://www.riverbank.org)**

**Adopted by the City Council  
January 26, 2016**

# **CITY OF RIVERBANK STANDARD SPECIFICATIONS**

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**City of Riverbank  
DESIGN SPECIFICATIONS**

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## SECTION 1 – PREFACE

### 1.101 GENERAL

The Standards of the City of Riverbank include specifications and drawings as contained herein. All work done in the public rights-of-way within the City of Riverbank shall conform to these Standards, and the Riverbank Municipal Code which includes insurance and business license requirements.

Developers are advised to have their representatives contact the engineer during design to ensure conformance with these Standards.

Work requiring plans prepared by a registered engineer such as improvements for subdivisions, parcel maps, and planned developments shall conform to these Standards, even though reference to these Standards is not made on such plans.

Work not requiring Improvement Plans prepared by a registered engineer shall conform to these Standards, and it shall be the responsibility of the developer to determine the requirements.

### 1.102 DEFINITIONS

The following shall apply to these Standards:

**CITY:** City of Riverbank.

**DEVELOPER:** Subdivider, developer, property owner, registered engineer or contractor proposing to design work or do work in the City of Riverbank public rights-of-way.

**CONSTRUCTION INSPECTOR:** Construction Inspector of the City of Riverbank.

**ENGINEER:** The Contract City Engineer of the City of Riverbank or their authorized representative.

**O.I.D:** Oakdale Irrigation District.

**M.I.D:** Modesto Irrigation District.

**PLANS:** Improvement Plans prepared by the developer or the engineer (Department of Public Works) for a specific project.

**PUBLIC WORKS**

**DEPARTMENT:** Development Services of the City of Riverbank.

**SPECIAL**

**PROVISIONS:** Specifications accompanying contract documents.

**UTILITY:**

City Sewer, City Storm Drain, City Water, Cable, Pacific Gas and Electric Company, AT&T, Railroads, Hetch Hetchy, Oakdale Irrigation District, and Modesto Irrigation District.

**1.103 PLANS**

Improvement Plans shall be prepared by the Developer and shall be submitted to the Construction Inspector and the City Engineer for approval prior to commencement of any work. The Improvement Plans shall be 24 inches by 36 inches, minimum. Submittal to the City Engineer shall allow a minimum of two weeks for review. After approval, the Developer shall provide two sets of the approved plans to the Construction Inspector and one set to the City Engineer.

The Developer shall be responsible for the design and construction of all improvements except gas lines, utility owned electric lines, telephone lines and cable television lines.

Within 2 weeks after completion of the work, and prior to final acceptance the Developer shall submit one set of plans and one digital copy(AutoCAD or PDF) marked "As Built", to the Construction Inspector. See Section 1.04, Item G.

**1.104 STANDARDS**

Subdivision improvements shall conform to the following minimum requirements and to any local standards and to any special standards as prepared or referred to by the Construction Inspector, recommended by the Planning Commission and adopted by the City Council.

- A. Subdividers shall have their contractors for subdivision improvements consult with the Director of Public Works before any construction is started, to arrive at an understanding as to the requirements and the schedule of inspections required.
- B. All required improvements shall be constructed under the inspection of and to the approval of the Department head or their authorized representative.
- C. Plans and profiles for proposed and existing improvements shall be submitted to and approved by the City Engineer prior to the commencement of construction. A plan of the entire subdivision shall be shown on the first sheet.

- D. Plans and profiles shall be on 24 inch by 36 inch paper, minimum.
- E. Cross sections or profiles beyond the boundary of the subdivision may be required to clarify drainage or road design.
- F. A plan check and inspection fee shall be charged the subdivider, equal to 3% of the Engineers's Estimate of the improvements.
- G. The subdivider shall direct his engineer to furnish the city one complete set of improvement plans in paper format and digital format (AutoCAD or PDF) after completion of improvements. These plans shall show any corrections as to location and grade of improvements, including water, sewage, and storm drains, or "No Corrections," whichever is applicable. Such plans shall be marked "As Built" and submitted to the Construction Inspector prior to acceptance of improvements by the City Council (Ord. No. 267, 7.1; Ord. No. 594, 1,).
- H. The Developer shall direct his Engineer or Land Surveyor to establish a benchmark within the boundary of the subdivision to the satisfaction of the Construction Inspector or the City Engineer.

#### **1.105 PRIORITY OF WORK**

All underground utilities shall be constructed prior to installation of curbs, gutters, sidewalks, and surfacing of streets or rights-of-way. The Developer shall be responsible for making payments as necessary with utility companies to insure that the necessary underground utilities are constructed.

#### **1.106 STAKING**

The Developer's Engineer shall provide survey stakes for work shown on plans prepared by said Engineer.

The City Engineer will stake a city funded project in a manner needed by the City Contractor and as specified by the City Engineer or the Construction Inspector. Costs of restaking may be billed to the City Contractor.

#### **1.107 INSPECTION**

The City Engineer or Construction Inspector shall perform inspection of the work to determine conformance with these Standards.

The Developer or Contractor shall request inspections 48 hours in advance to permit scheduling of inspection by the City Engineer or Construction Inspector.

The cost of inspection shall be paid by the Developer in the case of subdivisions or when so specified by agreement or by the Riverbank City Code (see Section 1.04, Item F). The cost of inspection on City contract projects will be borne by the City. Reference section 31-37 City Code.

All work rejected by the City Engineer or Construction Inspector shall be remedied, removed or replaced by the Developer or Contractor on private work or City Contractor on City contracts. Any work done beyond that shown on the plans approved by the City Engineer may be ordered at the Developer's or City Contractor's expense.

#### **1.108 CONCRETE**

Portland cement concrete, unless otherwise specified in the Special Provisions, shall be Class B as defined in the State Standards with a 28-day compressive strength of 2,500 pounds per square inch and a maximum slump of 3 inches. Concrete shall consist of Portland Cement, water, and aggregate. Portland cement shall be Type II. Aggregates shall be washed before use and be free from any foreign matter.

The aggregate shall be graded to provide a plastic, workable mixture of maximum density with a maximum size aggregate of 3/4 inches. The water shall be potable and no admixtures shall be used without approval of the City Engineer or Construction Inspector.

The cement, water and aggregates shall be combined at the batch plant and be thoroughly mixed. No water shall be added to the mixture after leaving the batch plant without approval of the City Engineer or Construction Inspector. All concrete shall be placed within 90 minutes after the introduction of water to the cement. The temperature of the concrete shall be not less than 50 degrees F. and not more than 90 degrees F.

The concrete shall be consolidated by tamping or vibrating. Concrete which has cracks, rock pockets or honey combing after curing shall be removed and replaced.

All concrete shall be cured in accordance with Section 907.01 B of the State Standards.

#### **1.109 DUST CONTROL**

Dust control shall be the responsibility of the Developer, Contractor, or City Contractor. However, the City Engineer or Construction Inspector may perform emergency dust control and the cost shall be borne by the Developer, Contractor, or City Contractor.

On existing streets the dust shall be controlled by sweeping and removal of the dirt before it leaves the site or enters the storm drain system.

In the work area, the dust may be controlled by use of water, but the storm drain system must be protected.

Water from City fire hydrants must be metered through a meter installed by the City. There is a charge for the water to the Developer. The charge rate will be set by the City of Riverbank City Council.

## 1.110 SURFACE RESTORATION

The surface of the work area shall be restored to its original condition with material as described in each trench section drawing.

Work in easement areas must be confined to the easement and the surface must be compacted, be reseeded, leveled, and all undesirable material removed.

Written agreements must be made with the property owners if work or equipment is to go outside the easement. The surface of the area outside the easement must be restored to the satisfaction of the property owner.

In the case of paved areas, excavations that leave 3 feet or less of existing surfacing shall have the remaining surfacing removed and repaved with the same material as the trench section.

Excavations in the shoulder area located with 3 feet beyond the edge of pavement shall be restored with a minimum of 8 inches of aggregate base material. The City Engineer may require a full structural section if the existing surfacing is at approximate ultimate of grade.

The Developer is responsible for obtaining from the City Engineer the resurfacing requirements for each project when the plans are drawn or an encroachment permit is obtained.

Prior to any paving, all uneven or loose edges shall be trimmed in true and even lines parallel to the center line of the work, by saw cut method. Wheel cutting is not allowed. The aggregate base shall conform to the requirements of Section 3.7 of these Standards.

A paint binder as specified in Section 3.10 of these Standards shall be applied to all existing vertical surfaces and construction joints prior to placing asphalt concrete.

The asphalt concrete shall conform to the requirements of Section 3.9 of these Standards. The asphalt concrete shall be per CALTRANS standards. 1/2 inch, or 3/4 inch-maximum, whichever is required by the City Engineer or Construction Inspector.

### **1.111 CLEANUP**

The Developer, Contractor, or City Contractor shall, at least once each week, or as requested by the City Engineer, clean up the dirt and debris in all of the adjacent streets caused by the construction. All sidewalks, curbs, and gutters, approaches, crosswalks, existing and new drain inlets, lawns, etc., shall be kept free of excess dirt and rubbish and kept in a clean and neat condition.

Before a final inspection of a project is requested, the following shall be completed:

- A. All of the right of way, adjacent property, adjacent streets and alleys and all areas used by the Developer or City Contractor in connection with this project shall be cleared of all debris and excess material, and left in a neat and presentable condition.
- B. All paved areas and gutters shall be free of dirt and dust.
- C. All concrete surfaces shall be left free of excess concrete, paving materials, liquid asphalt, dirt and dust. All expansion joints shall be trimmed flush with the concrete, all paint and reference marks will be removed.
- D. All old and new drain inlet bottoms and outlet pipes shall be left free of all dirt and debris. If water is used to clean streets, care shall be taken to keep sand and silt out of storm system. Any storm drain facilities affected by the work shall be cleaned by the Developer, Contractor, or City Contractor.
- E. All sewer and storm drain manhole bottoms shall be cleaned of all foreign matter and covers shall have all paving asphalt removed.
- F. Slurry seal all pavement prior to bond release. Restripe as required by the City Engineer or Construction Inspector.
- G. All striping shall be Thermoplastic.

The Developer, Contractor, or City Contractor shall not remove temporary warning, regulatory, and guide signs prior to formal acceptance by the City Council. Such signs shall be removed when directed by the City Engineer or Construction Inspector.

### **1.112 DEVIATIONS**

These Standards may be deviated from, if in the opinion of the City Engineer or Construction Inspector, a proposed deviation meets or exceeds the quality of these Standards, or minor deviations which meet the spirit of these Standards.

Work in developed areas may require conforming to existing work in lieu of conforming to these Standards. All such deviations shall be approved by the City Engineer or Construction Inspector.

Materials proposed for use and not specified herein shall be submitted for approval by the City Engineer prior to ordering such material.

Underground work shall not be backfilled or covered until an inspection by the City Engineer or Construction Inspector has been made and the work approved. Any work that is covered without inspection shall be uncovered at the Developer's, Contractor's, or City Contractor's expense in order for an inspection to be made. The City Engineer or Construction Inspector shall have access to the work at all times and shall be furnished every reasonable facility for ascertaining that the work done, materials used, and workmanship performed are in accordance with the requirements and intentions of these Standards. Failure of the City Engineer or Construction Inspector to note faulty material or workmanship during construction or on material submittals shall not relieve the Developer, Contractor, or City Contractor of the responsibility for correcting such deficiencies at his expense.

### **1.113 SPECIAL CONDITIONS**

Cold mix or cutback shall be required on all trenches on existing roadway if the project will not be complete within forty-eight (48) hours.

Require that a street must pass a water test to ensure that there will be no standing water in the flow line of the curb and gutter.

Lasers shall be used to set grades and install sewer and storm drain lines, unless otherwise approved by the City Engineer or Construction Inspector.

**City of Riverbank  
DESIGN SPECIFICATIONS**

**SAFETY**

## **SECTION 2- SAFETY**

### **2.100 Specifications**

- 2.101 GENERAL
- 2.102 TRAFFIC CONTROL
- 2.103 SIGNS
- 2.104 BARRICADES
- 2.105 FLASHER SUPPORTS
- 2.106 DELINEATORS
- 2.107 FLAGGER
- 2.108 WARNING LIGHTS
- 2.109 STREET CLOSURES
- 2.110 RULES AND REGULATIONS.
- 2.111 UNDERGROUND SERVICE ALERT - USA

### **2.101 GENERAL**

This Safety Section is intended to establish general principles of traffic control, worker protection and public safety measures to be taken in the performance of all work covered by these Standards.

No Specification contained herein shall be deemed to create a legal standard of conduct or duty toward the public nor shall it limit the City in the exercise of powers conferred by law in modifying these specifications under special conditions.

The requirements of the State of California, Department of Transportation, CA MUTCD, Caltrans Traffic Manual, Manual of Traffic Controls for Construction and Maintenance of Work Zones and the Uniform Sign Chart shall take precedence over the requirements of this Safety Section.

### **2.102 TRAFFIC CONTROL**

The Safe movement of traffic through construction areas depends upon communicating concise and proper information to the public by signs, barricades, delineators, flaggers and warning lights. All such devices necessary during construction shall be furnished by the Developer or City Contractor.

The size, shape, and color of such devices as shown herein shall be as required by the State of California, Department of Transportation and CA MUTCD.

All posts, signs or other obstructions must be FHWA350 tested.

A traffic control plan is required for all road or lane closures. The plan must be submitted and approved prior to construction.

### **2.103 SIGNS**

The types of signs shown are typical under normal conditions.

Warning signs used for night time conditions shall be reflectorized or illuminated. The use of orange flags in conjunction with signs is permitted if they do not at any time interfere with a clear view of the sign face.

Reflectorized signs fastened to barricades or similar supports shall have the face of the sign vertical and normal to the direction of traffic for effective visibility.

Signs are to be used only as long as necessary and then removed. During periods when the signs are temporarily unnecessary, they shall be removed or have their message covered.

### **2.104 BARRICADES**

Barricades are intended to impose an obstacle in or close off the normal flow of travel. Approved barricades are shown on Drawing Nos. 2-E and 2-F.

Barricades shall not be used unless they are needed to separate the motorist from objects of greater hazard than the barricades themselves. Barricades should never be used primarily for delineation. The use of nonstandard types of barricades, such as drums, buckets, sandbags, etc., can be hazardous and their use is prohibited.

#### **2.105 FLASHER SUPPORTS**

Portable flasher supports shall be as required by the State Department of Transportation.

#### **2.106 DELINEATORS**

The function of delineators is to channelize traffic. They shall consist of post and paddle type markers or cylindrical or cone shaped objects 18 to 48 inches in height.

Delineators should be uniformly positioned laterally and longitudinally relative to the line of traffic and they must be maintained in an erect position.

Delineators for night time use shall be reflectorized or illuminated to be visible from 500 feet under normal atmospheric conditions.

When placed in close proximity to the edge of a traffic lane, delineators should be made of a material that will withstand impact without damage to them or the striking vehicle. Consideration must also be given to the necessity for stability against knockdown from wind or from the wash of passing traffic.

#### **2.107 FLAGGER**

A flagger is one of the oldest and most basic means of controlling traffic. A flagger can observe changing conditions and transmit information to the motorist based on current conditions. The flagger can also act as a guard in advance of a work party by observing approaching traffic, and being prepared to warn the workers.

A flagger should be used only when such discretionary capability is required, and not as a substitute for other warning signs and devices.

When a flagger is necessary, the flagger must convey a message, and the message must be timely and accurate. The flagger's effectiveness and the safety of the traffic and their fellow workers depend upon the way the flagger works. Standard hand signals shall be used as shown in the State Traffic Manual and CA MUTCD.

#### **2.108 WARNING LIGHTS**

Warning lights shall be electric lanterns, electric markers or flashers provided to indicate an obstruction or restriction during periods of low visibility. Warning lights shall be placed to mark the location of obstructions. Motion may be incorporated into warning lights.

Flashing lights for delineating the path the traffic is to follow shall be uniformly spaced as approved by City Engineer or Director of Public Works.

Warning lights may be fastened to signs, barricades and portable flasher supports in a manner satisfactory to the City Engineer or Director of Public Works.

## **2.109 STREET CLOSURES**

Partial temporary street closures shall be made as per the City Engineer or the Director of Public Works. One lane for each direction of through traffic must be maintained except where flaggers are provided to control traffic, then one lane may serve both directions.

When trenching is necessary across intersecting streets, the work shall be done in such a manner to maintain two-way traffic on cross streets at all times.

Where the trench line crosses an entrance to private property, access to the property shall be maintained at all times by means of a suitable bridge, until the trench may be backfilled. Such bridges shall be properly guarded and illuminated at night. Where any crosswalk is cut by the trench, suitable bridging shall be constructed. Such bridging shall be at least 4 feet in width, shall have suitable hand railing, shall be properly guarded and illuminated at night and shall be made immediately in cases where backfill material is suitable for jetting. The City Engineer shall determine which backfill material is suitable.

The complete closure of a street is allowed only when authorized in writing by the City Engineer or Director of Public Works, as provided by the City of Riverbank Code. Such closure shall be accomplished only through the use of Type III barricades.

Permanent street closures as per City Council: Temporary closures in new developments at dead end streets and where pavement transitions match existing pavement at the edge of the development shall be constructed as per Drawing No. 205.

## **2.110 RULES AND REGULATIONS**

All work performed and all materials used by the Developer or Contractor shall comply with the following: the State Labor Code, the California Administrative Code, Construction Safety Order, Title 8, Subchapter 4, Caltrans and all other applicable Federal, State and Local Laws and regulations.

Specifically, the Developer or Contractor shall furnish, install and maintain all shoring, bracing and sheeting. Any damage resulting from a lack of adequate shoring, bracing or sheeting shall be repaired at the Developers' or Contractors' expense.

Additional requirements may be imposed by the City Engineer or Director of Public Works in the interest of public safety.

### **2.111 UNDERGROUND SERVICE ALERT - USA**

USA is a "One Call Notification Center" used for identifying any underground facilities prior to digging. The Developer or Contractor shall call USA at 800-642-2444 at least 48 hours prior to the start of any excavation, with the City Limits. All participating members not including the City of Riverbank will be informed by USA of the location, date, time and description of the proposed excavation. Any existing underground facilities will then be located and marked in the field by the appropriate USA member organization(s). Requests for field meeting shall be included in the initial call to USA. For further information, contact the City of Riverbank Public Works Department at 869-7128.

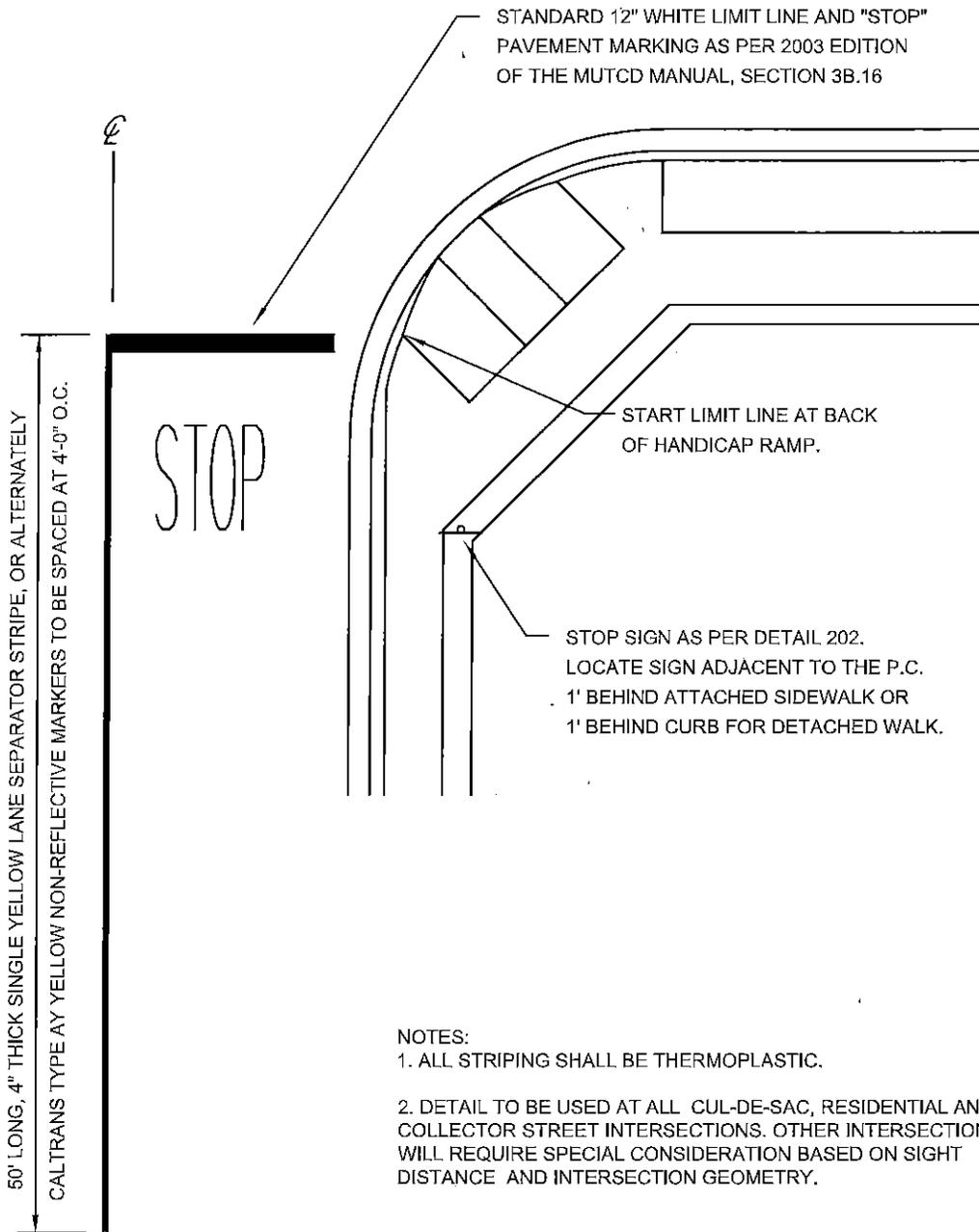
The Developer or Contractor shall be responsible for the preservation of, and any damage to, both private and public property in accordance with the current Caltrans Standards - Section 7-1.

**City of Riverbank  
STANDARD PLANS**

**SAFETY**

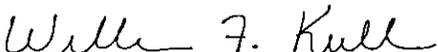
## SECTION 2- SAFETY

Drawing No	Description
201	STOP SIGN, STOP BAR, AND LANE SEPARATION LOCATIONS
202	STOP SIGN INSTALLATION
203	STREET SIGN
204	STANDARD REFLECTOR PADDLE BOARD
205	BARRICADES
206	BARRICADES- PORTABLE



NOTES:

1. ALL STRIPING SHALL BE THERMOPLASTIC.
2. DETAIL TO BE USED AT ALL CUL-DE-SAC, RESIDENTIAL AND COLLECTOR STREET INTERSECTIONS. OTHER INTERSECTIONS WILL REQUIRE SPECIAL CONSIDERATION BASED ON SIGHT DISTANCE AND INTERSECTION GEOMETRY.

CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			STOP SIGN, STOP BAR AND 56' R.O.W. - CUL-DE-SAC LOCATIONS	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 9/28/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SAFETY	DRAWING NAME: 201.DWG	1-26-16	201

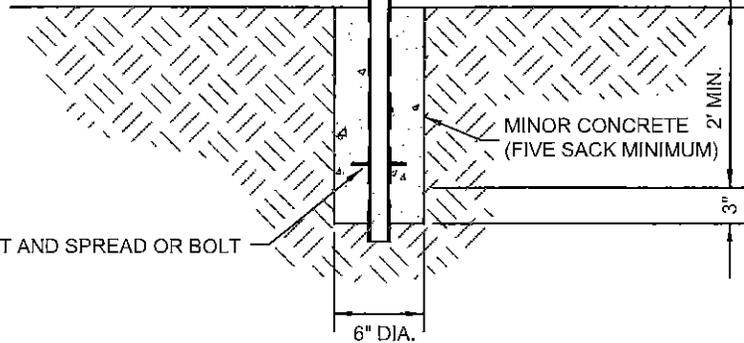
STREET SIGN TO BE PLACED ON TOP OF STOP SIGN POST IF NO LIGHT STANDARD IS AVAILABLE. SEE STD. DET. 203 FOR STREET SIGN DETAIL.



MUTCD REGULATORY SIGN R1-1 (STOP) 30" X 30"; AN R1-3 (4-WAY) OR R1-4 (ALL WAY) SIGN SHALL BE INSTALLED BELOW THE STOP SIGN, IF APPLICABLE.

2" STANDARD GALVANIZED BREAKAWAY POLE.

84"



SPLIT AND SPREAD OR BOLT

6" DIA.

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

STOP SIGN  
INSTALLATION

DRAWN BY:  
GK

DATE:  
9/28/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

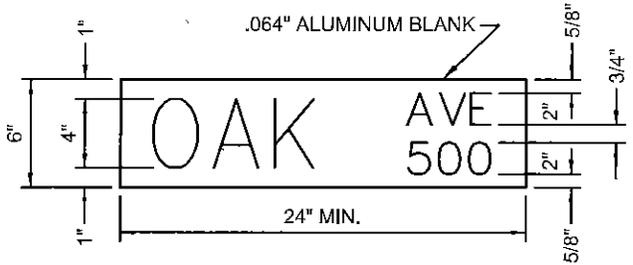
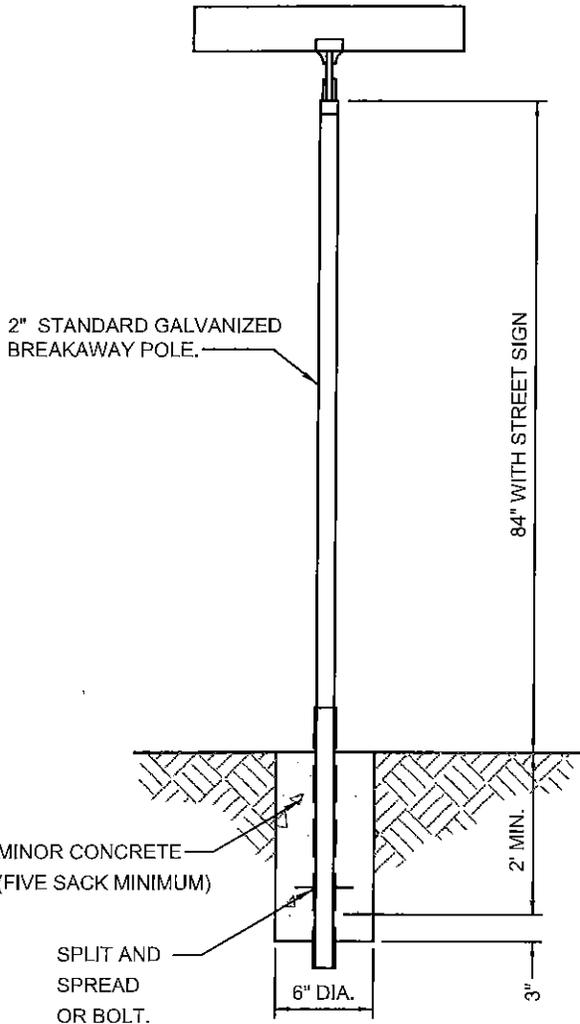
REVISIONS:  
NONE

SECTION:  
SAFETY

DRAWING NAME:  
202.DWG

1-26-16

202

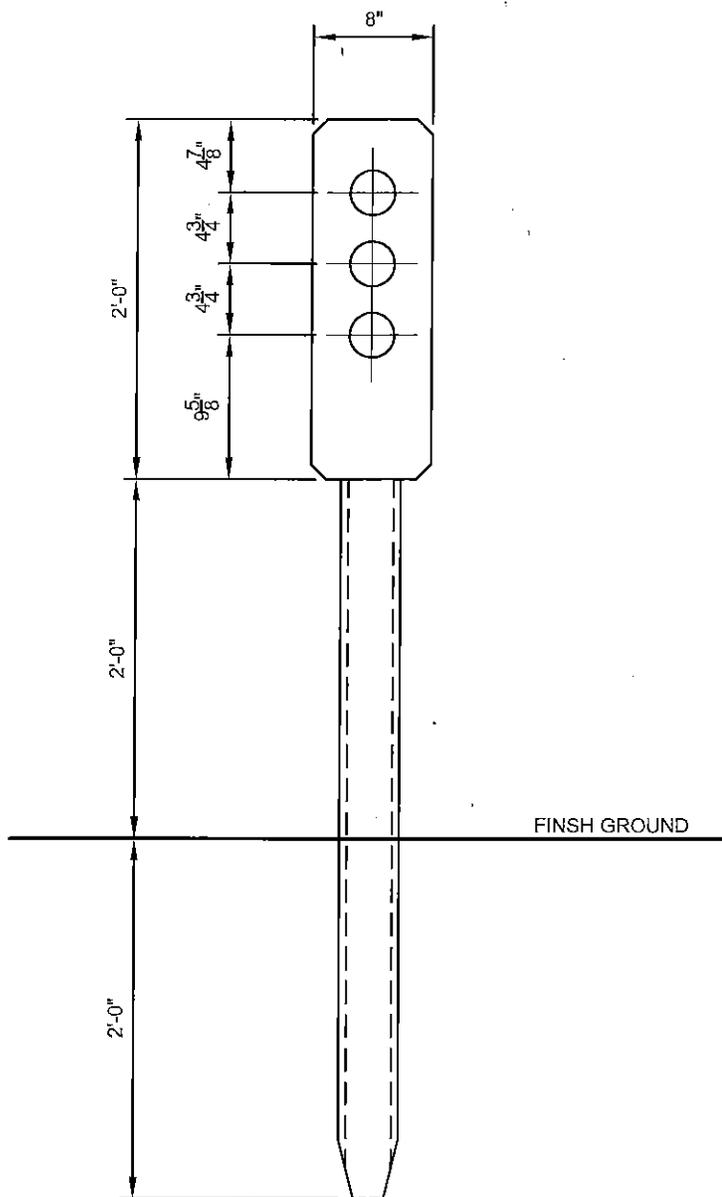


"SCOTCHLITE" (OR APPROVED EQUAL REFLECTIVE FACE).  
 GREEN REVERSED SCREENED BACKGROUND WITH SILVER COPY ON BOTH SIDES, UPPER CASE LETTERING ONLY.

NOTES:

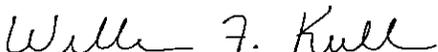
1. STREET SIGNS SHALL BE PLACED ON LIGHT STANDARD WHENEVER POSSIBLE.
2. STREET SIGN SHALL BE PLACED ON STOP SIGN TOP IF NO LIGHT STANDARD IS AVAILABLE.

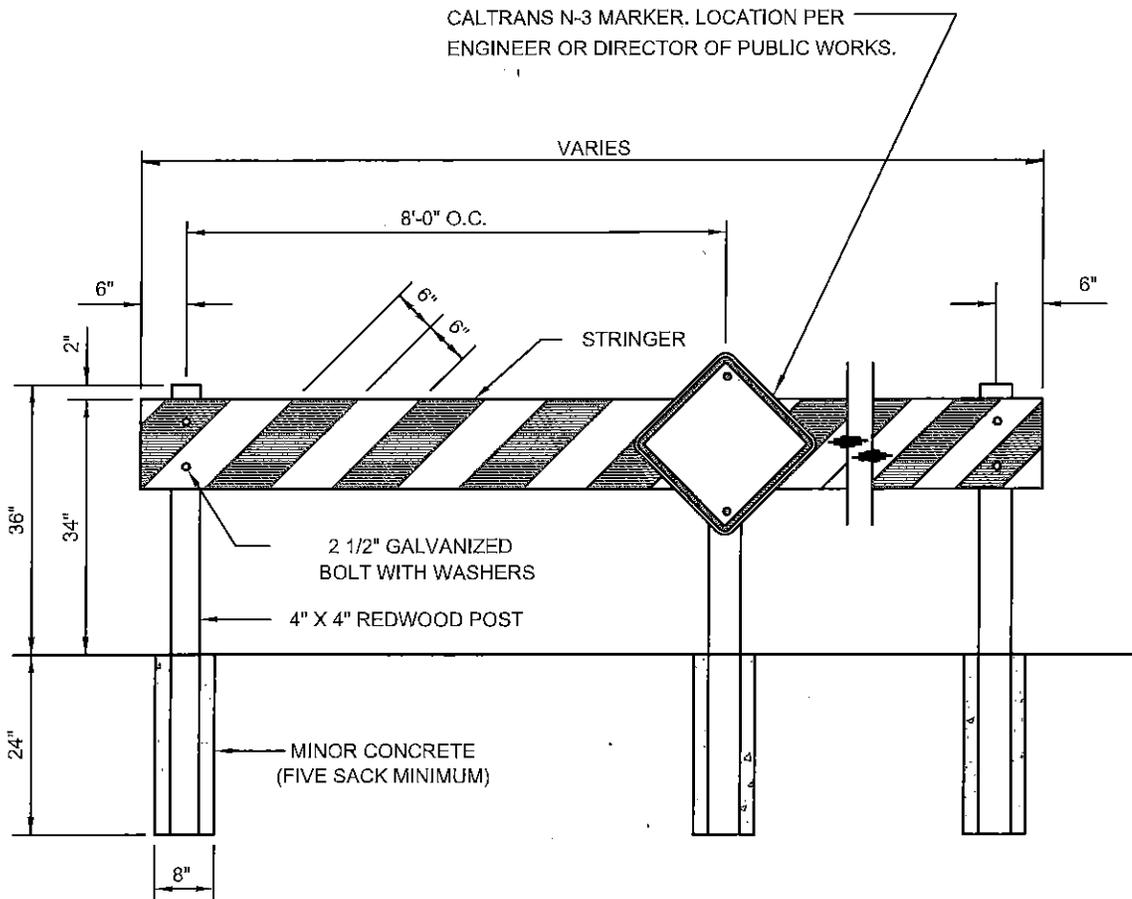
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h2 style="margin: 0;">STREET SIGN</h2>	
CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 9/28/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SAFETY	DRAWING NAME: 203.DWG	1-26-16	203



NOTES:

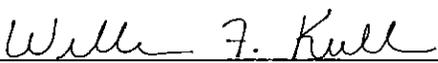
1. CONFORMS TO STATE STANDARD
2. SPACING SHALL BE AT 5' INTERVALS OR AS REQUIRED BY ENGINEER / DIRECTOR
3. STANDARD REFLECTOR SHALL BE CONSTRUCTED IF HIGH IMPACT PLASTIC.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STANDARD REFLECTOR</b>  <b>PADDLE BOARD</b>	
 CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:  <b>1-26-16</b>	
DRAWN BY: GK	DATE: 9/28/15	SCALE: NTS		
REVISIONS: NONE	SECTION: SAFETY	DRAWING NAME: 204.DWG		



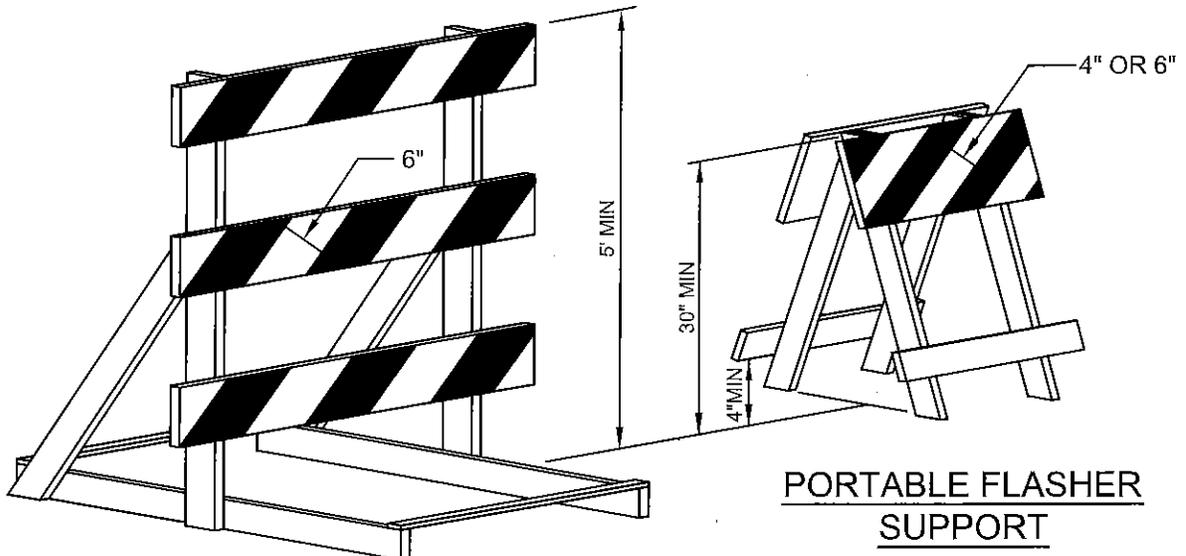
NOTES:

1. STRINGER TO BE 2" X 12" DOUGLAS FIR WITH ALTERNATING WHITE AND REFLECTIVE ORANGE TAPE (CODIT OR EQUAL), AND POST TO BE 5' X 4' REDWOOD AND PAINTED WHITE.
2. ALIGNMENT TO BE DETERMINED BY THE CITY OF RIVERBANK.
3. STRINGER TO BE KILN DRIED LUMBER REQUIRED.
4. IF STRINGER JOINTS ARE BETWEEN POSTS, THERE WILL BE 4" X 10" X 1/4" STEEL STRAP INSTALLED.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>BARRICADES</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 9/28/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:  <b>1-26-16</b>	DRAWING NO.  <b>205</b>
REVISIONS: NONE	SECTION: SAFETY	DRAWING NAME: 205.DWG		

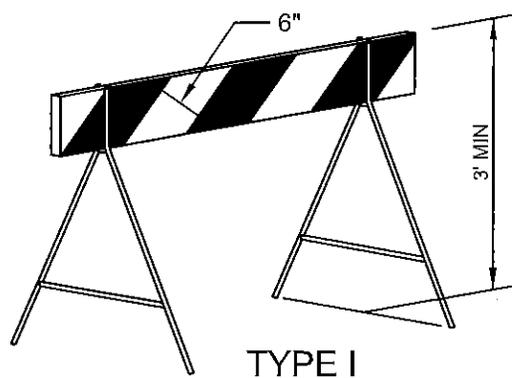
**BARRICADE AND PORTABLE FLASHER SUPPORT CHARACTERISTICS**

TYPE	I	II	III	PORTABLE FLASHER SUPPORT
LENGTH OF RAIL	2' MIN	32" - 4'	3' MIN	31" MAX
WIDTH OF STRIPE	6"	6"	6"	4" OR 6"
WIDTH OF RAIL	8" - 12"	8" - 12"	8" - 12"	TOP - 8" TO 12" BOTTOM - 4" MIN
HEIGHT	3' MIN	3' MIN	5' MIN	30" MIN
NUMBER OF RAIL FACES REFLECTORIZED	2	4	3 IF FACING TRAFFIC IN ONE DIRECTION 6 IF FACING TRAFFIC IN TWO DIRECTIONS	2 IF TOP RAIL IS 12" WIDE 4 IF TOP RAIL IS LESS THAN 12" WIDE

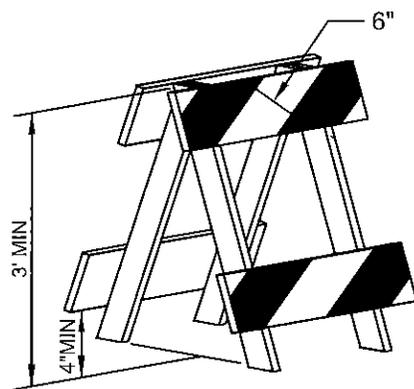


**TYPE III**

**PORTABLE FLASHER SUPPORT**



**TYPE I**



**TYPE II**

- NOTES:
1. IF THE TOP BOARD OF A PORTABLE FLASHER SUPPORT IS LESS THAN 12" WIDE, THE BOTTOM BOARD SHALL BE 8" WIDE, STRIPED, AND REFLECTORIZED.
  2. REFLECTORS AS REQUIRED BY THE CITY ENGINEER OR DIRECTOR OF PUBLIC WORKS.

**CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS**

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**BARRICADES**

DRAWN BY: GK	DATE: 9/28/15	SCALE: NTS
REVISIONS: NONE	SECTION: SAFETY	DRAWING NAME: 206.DWG

ADOPTED BY THE CITY COUNCIL: <b>1-26-16</b>	DRAWING NO. <b>206</b>
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**City of Riverbank  
DESIGN SPECIFICATIONS**

**STREETS**

## **SECTION 3 – STREETS**

### **3.100 Specifications**

- 3.101 GENERAL**
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- 3.103 STRUCTURAL DESIGN**
- 3.104 CLEARING**
- 3.105 EARTHWORK**
- 3.106 SUBGRADE**
- 3.107 AGGREGATE BASE**
- 3.108 PRIME COAT**
- 3.109 ASPHALT CONCRETE**
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- 3.111 HEADER BOARDS**
- 3.112 CURBS AND SIDEWALKS**
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- 3.123 LOT CORNER MONUMENTS**
- 3.124 CONCRETE**
- 3.125 ALL WEATHER ROADS**

### 3.101 General

Street improvements in the public right of way shall be constructed by the Developer or City Contractor to conform to these Standards.

Only a Developer or City Contractor with an appropriate license and required insurance may perform the work described herein.

The Developer shall improve all existing streets bordering on his development.

Any street improvement damaged by the Developer or City Contractor shall be repaired by the Developer or City Contractor as required by the City Engineer.

### 3.102 Geometric Design

The street widths shall conform to Drawing Nos. 3-A, 3-B, 3-C, 3-D, 3-E, and 3-F. Cul-de-sac and knuckle design shall conform to Drawing Nos. 3-G, 3-H, 3-I, and 3-J.

The gutter slope shall not be less than 0.20% without the approval of the City Engineer and the Director of Public Works.

The street cross slope grades shall be 2% on all new streets. Where matching existing pavement, cross slopes shall be 2% minimum and 4% maximum, unless approved by the City Engineer and Director of Public Works.

The streets shall be designed to collect storm water at intersections whenever possible. Horizontal curves shall conform to the following criteria:

- A. Maximum length of street without horizontal curvature shall be 500 Feet.
- B. Minimum horizontal curve radii shall be 300 feet on centerline

<u>Design Speed (mph)</u>	<u>Minimum Radius of Curve (ft)</u>
30 or less	300
40	550
50	850

- C. Street intersections shall be as near right angles as practical. In no case shall the angle of intersection be less than 70 degrees.

### 3.103 Structural Section

The R-value design method used by the California Department of Transportation shall be used as a basis to determine the structural section of the streets. Whenever the pavement calculations produce more than 8" of base rock, a safety factor may be used at the option of the City Engineer.

The Traffic Index (T.I.) shall be determined from traffic counts where they are available, or as determined by the City Engineer. A 20-year design life shall be used.

Where sufficient information is not available to determine the structural section using the above data, the following minimums may be used with the approval of the City Engineer:

Street		Aggregate Base (inches)	Asphalt Concrete (Inches)
Major	9	8	3
Collector	7	6	3
Industrial	8	6	3
Residential	6	6	2
Cul-de-sac	5	6	2

The City Engineer shall require the Developer to collect data for the R-value design method. All soil samples shall be collected in the presence of the City Inspector.

### **3.104 Clearing**

Clearing and grubbing shall be done in accordance with Sections 16-1.01, 16-1.02, and 16-1.03 of the State Standards.

### **3.105 Earthwork**

Earthwork shall be performed as set forth in Sections 19-1.01, 19-2.01, and 19-2.05 of the State Standards and the City of Riverbank Grading Ordinance, except that it shall further include the shaping of ground in the park strip and fill areas.

All embankment or fill materials shall be placed and compacted in accordance with Section 19-5.02, 19-5.03 and 19-5.04 of the State Standards, except that the City Contractor or Developer will only be required to strip the original ground of vegetation and compact the top 6 inches of original ground in place to not less than 95% relative compaction in accordance with Test Methods No. California 216 or 231-1978, a nuclear density-moisture gauge, before the fill is placed.

The Developer or City Contractor shall obtain a disposal site for all of the roadway excavation not used on the job site. The Developer or City Contractor shall obtain and file with the City a letter showing permission and conditions for use of the disposal site. The Developer or City Contractor shall control dust at the disposal site and keep any streets used free of excess material.

### **3.106 Subgrade**

All clods shall be broken and all rocks, hard ribs, and earth lumps over 2-1/2 inches in greatest dimension and other unsuitable material such as roots shall be removed from the job site. The subgrade material shall be compacted to a firm, stable condition with approved equipment until a relative compaction of not less than 95% has been obtained to a depth of 6 inches. Special provisions may require a greater depth for 95% compaction.

All street subgrades shall be tested by a geotechnical engineer at a maximum interval of 300 feet. All street testing shall be at the Developer's expense prior to final acceptance by the City (see Section 3-18).

The finished subgrade shall not vary more than 0.05 foot above or below the planned grade at any point. Care shall be taken to obtain compaction around existing manholes and water gate valves.

Relative compaction shall be tested by the City Engineer in accordance with Test Methods No. California 216 or 231-1978.

### **3.107 Aggregate Base**

The aggregate base material shall conform to the requirements of Section 26-1.01, 26-1.028, 26-1.03, 26-1.035, 26-1.04, 26-1.048, and 26-1.05 of the State Standards for 3/4 inch maximum combined grading.

An exception to Section 26-1.04 shall be that a single layer up to 0.7 foot shall be permitted.

Motor grader shall be permitted to spread and shape the aggregate base materials. The aggregate base shall be maintained in a well mixed optimum moisture condition.

All aggregate bases shall be tested by a geotechnical engineer at a maximum interval of 300 feet. All street testing shall be at the developer's expense prior to final acceptance by the City Council (see Section 3-18).

### **3.108 Prime Coat**

A liquid asphalt prime coat shall be applied in conformance with Section 39-4.02 of the State Standards. The liquid asphalt prime coat grade shall be approved by the City Engineer.

When directed by the City Engineer, a sand cover shall be spread over the prime coat at approaches and side streets in order to maintain use. Before through traffic is permitted on the prime coat, all wet spots shall be covered with sand. All loose sand shall be completely removed from the treated areas before the placing of any surfacing materials.

If, in the opinion of the City Engineer, conditions are such that this work is not feasible, the prime coat may be deleted.

### **3.109 Asphalt Concrete**

The asphalt concrete shall conform to the requirements of Sections 39-2, 39-3 and 39-6.03 of the State Standards. Asphalt concrete used in the base course shall be Type B with 3/4 inch medium grading. Asphalt concrete used in the final course shall be Type B as follows:

Major, Collector and Industrial Streets - 3/4 inch, medium grading  
Residential Streets - 1/2 inch, maximum medium grading.

Aggregate for 1 inch overlays shall as specified in the Special Provisions for each project.

The asphalt grade shall be AR 4000 as specified by the latest revision of the State Standards unless otherwise approved by the City Engineer.

- A. The base course may be placed in any reasonable number of passes and widths except that the center line of the street shall be either on the edge of the center pass or in the center of one pass. The base course may be placed with a motor grader.

The spreading of the base course shall be as required for Class 2 aggregate base in Section 26-1.04 of the State Standards.

- B. The final surface course shall be paved in the number of passes approved by the City Engineer, starting from the curb and paving toward the center line.
- C. When paving the final surfacing course, there shall be a minimum to two rakers and one screed man per paving machine.
- D. Rolling equipment shall conform to the requirements of Section 39-6.03 of the State Standards. Vibratory rollers may be approved by the City Engineer.
- E. The surface course shall be laid with a paving machine except when permitted otherwise by the City Engineer in difficult areas.
- F. Paving machines shall have automatic joint control.
- G. Extensions or wings shall not be permitted except as approved by the City Engineer.
- H. Temperature requirements shall conform to the requirements of Section 39-6.01 of the State Standards.
- I. Deep strength or full depth asphalt concrete shall conform to the Special Provisions of the particular project.

Excerpt from Caltrans Standards 39-6 - Spreading and Compacting:

General Requirements- 39-6.01: Unless lower temperatures are directed by the Engineer, all mixtures, except open graded asphalt concrete, shall be spread and the first coverage of initial or breakdown compaction shall be performed when the temperature of the mixture is not less than 250 degrees F., and all breakdown compaction shall be completed before the temperature of the mixture drops below 200 degrees F. Open graded asphalt concrete shall be

spread at a temperature of not less than 200 degrees F., and not more than 250 degrees F., measured in the hopper of the paving machine. Open graded asphalt concrete shall be compacted as soon as possible after spreading.

Type A and Type B asphalt shall be placed only when the atmospheric temperature is above 50 degrees F. Asphalt concrete base shall be placed only when the atmospheric temperature is above 40 degrees F.

Open graded asphalt concrete shall be placed only when the atmospheric temperature is above 50 degrees F., and where placement is to be on bridges or other structures, when surface temperature of such structure is above 60 degrees F.

Asphalt concrete and asphalt concrete base shall not be placed when the underlying layer or surface is frozen, or when, in the opinion of the Engineer, weather conditions will prevent the proper handling or finishing.

### **3.110 Asphalt Paint Binder**

As asphalt paint binder shall be applied in conformance with Section 39-4.02 of the State Standards to all existing vertical surfaces and construction joints prior to placing asphalt concrete.

### **3.111 Header Boards**

Header Boards shall be constructed to protect the edges of the asphalt concrete where streets are partially complete

The Boards shall be 2" X 6" dimensioned of appropriate redwood or treated Douglas fir.

### **3.112 Curbs and Sidewalks**

Curbs and sidewalks shall be constructed and repaired in accordance with the Drawings of this section and the requirements of City of Riverbank Municipal Code.

Concrete delivery tickets with weighmasters' certificates or certificates of compliance may be required by the City Engineer.

The construction shall conform to Sections 73-1.02, 73-1.03, 73-1.04, 73-1.05 and 73-1.06, of the State Standards, except for references to payments. Curbs shall be measured continuous through approaches. Approaches shall be measured to the "back of curb line", when payment is made by the square foot.

Special surface finishes or features such as exposed aggregate, color additives and redwood dividers require the written approval of the City Engineer.

Sidewalk shall have a cross slope toward the curb face of 1/4 inch per foot minimum to 1/2 inch per foot maximum.

Traffic parking and street name signs on city streets which require relocations because of the work will be relocated by the City but two working days advance notice is required. Traffic signs on state highways and stop signs on streets entering state highways must be relocated by Caltrans. Utility poles which require relocation because of the work shall be relocated by the utility company owning the poles. The Developer or City Contractor shall be responsible for coordinating this work, for protecting the work against damage, and for insuring the safety of the public.

Sidewalks which are required against the property line shall be placed 1 inch from the property line to provide space for lot corner monuments.

A gutter drainage test will be performed as per the Engineer and Director of Public Works.

### **3.113 Approaches**

Approaches shall be constructed and repaired in accordance with the Drawing Nos. 3-K, 3-L, 3-M, and 3-N, and the Riverbank Municipal Code.

The construction shall conform to Sections 73-1.02, 73-1.03, 73-1.04, 73-1.05 and 73-1.06, of the State Standards, except for references to payments. Curbs shall be measured continuous through approaches. Approaches shall be measured to the "back of the curb line" when payment is made by the square foot.

The total width of approaches serving a parcel of land shall not exceed the following limits:

- A. For frontages having a vertical curb, the limit shall be 40% of the street frontage of the property or 36 feet, whichever is greater. In the case of corner lots, the limitation shall apply to each street frontage.

The minimum distance between approaches serving the same parcel of land shall be 20 feet. The minimum distance between approaches on adjacent parcels shall be 10 feet.

Approaches shall be located so they will not interfere with intersecting sidewalks, traffic signals, light poles, fire hydrants, or other public improvements unless specific approval is given by the City Engineer and the necessary adjustments to the improvements are accomplished without cost to the City.

### **3.114 Alleys**

Alley approach driveway shall be constructed in accordance with these Standards and Drawing No. 3-K.

The concrete gutter for alley approach driveway shall be constructed as shown on Drawing No. 3-M and the concrete shall be as required in Section 1.8 of these Standards.

The subgrade shall be constructed as required in Section 3.6 of these Standards.

The aggregate base for the alley approach driveway shall be constructed as required in Section 3.7 of these Standards.

### **3.115 Valley Gutters**

Valley Gutters in street right-of-ways are not allowed in the City of Riverbank.

### **3.116 Wheelchair Ramps**

Wheelchair ramps shall be constructed at all intersections as shown on Drawing Nos. 3- AA through 3-HH.

The ramps must comply with Section 19956.5 of the State Health and Safety Code.

### **3.117 Raising Utility Boxes**

Utility boxes and manholes shall be raised by the Developer or City Contractor to conform to these Standards. Utility boxes include, but are not limited to, sewer manholes, water valves, storm drain manholes, and survey monuments.

Where existing utility boxes are in the work area, their frames and covers shall be removed before subgrade compaction is made and a cover shall be placed to prevent dirt and loose material from entering the facility.

Base and surface material shall be placed over the covers, after which the frames and covers shall be set to finish grade as shown in these Specifications.

### **3.118 Testing**

Testing of materials supplied for the work required in this section shall be performed by the City on City contract projects. On all other projects the testing of material shall be performed by the Developer and submitted to the City Engineer for approval.

Where approved by the City Engineer, certificates of compliance may be submitted in lieu of actual tests, as outlined below:

- A. 95% Compaction of subgrade at 300 foot maximum testing intervals.
- B. 95% Compaction of base at 300 foot maximum testing intervals.
- C. 90% Compaction of trenching at two feet of depth at 300 foot maximum intervals.
- D. 95% Compaction of trenching at less than two feet of depth {subgrade} at 300 foot maximum intervals.
- E. 90% Compaction on all "engineered fills" in excess of one foot of fill.

Compaction and in-place moisture may be determined by use of a nuclear density moisture gauge.

### **3.119 Inspection**

The Developer or City Contractor shall request inspections as follows: Before backfilling of any utilities lines.

- A. Completion of subgrade preparation
- B. Completion of form installation
- C. During placement of concrete
- D. During placement of aggregate base
- E. Completion of aggregate base grade
- F. During placement of asphalt concrete
- G. Completion of rock well drilling before placement of drain rock
- H. Completion of final clean up.

Other inspections to cover special items shall be requested by the Developer or City Contractor as needed.

### **3.120 Street Monuments**

Street monuments shall be placed on the centerline of each street at the following locations:

- A. Intersections
- B. Beginnings and ends of curves
- C. Changes of directions
- D. Other points deemed necessary by the City Engineer

Final Maps or recorded maps shall show where monuments are to be set. Monuments when deemed by the City Engineer will be of the Standard Well Type as shown on detail No. 3-W.

The monuments shall consist of durable new material. They shall be 1 inch O.D. x 24 inch long galvanized iron pipe or approved equal. The monument shall be tagged as required by the State of California Land Surveyor's Act.

### **3.121 Boundary Monuments**

Boundary monuments shall be placed on the exterior boundary of the subdivision at the following locations:

- A. Changes of direction
- B. Beginnings and ends of curves
- C. Other points deemed necessary by the City Engineer.

Boundary monuments shall be placed in the same manner and of the same material as street monuments except that in unpaved areas the top shall be at least 1 foot below the finished grade.

### **3.122 Block Corner Monuments**

Corner monuments shall be placed at all Block corners and alley corners.

Block corner monuments shall be placed in the same manner and of the same material as street monuments except the top shall be set at least 1 foot below the ground surface.

### **3.123 Lot Corner Monuments**

Lot corner monuments shall be placed in the same manner and of the same material as street monuments except that they may be 3/4 inch O.D. and, in unpaved areas, the top shall be at least 1 foot below the finished grade.

The basic criteria for the location shall be as follows:

- A. Lots shall have a monument at each corner except as otherwise provided by this section.
- B. Lots that are created with zero back or side yards may have lot corners under building foundations deleted except those corners that are Block or alley corners.
- C. Lots that are created as a part of townhouse or condominium development where land is to be owned in fee by the individual lot owner shall be monumented using a minimum of 4 monuments for each contiguous group of lots. Contiguous groups of lots containing 10 lots shall have additional monuments as required by the City Engineer.
- D. Condominium airspace developments where land is not to be owned in fee by the individual lot owner shall have the exterior boundary monumented as required by Section 3.21 Boundary Monuments.

### **3.124 Concrete**

Portland cement concrete, unless otherwise specified in the Special Provisions, shall be in accordance with Section 1.8 of these Specifications.

### **3.125 All Weather Roads**

Prior to issuing a building permit, the City of Riverbank Building Inspection Department shall receive written confirmation from the City Public Works Department and the Riverbank Fire Protection District that all streets within the development meet the "All Weather Road" standards.

To be considered an "All Weather Road" the following criteria shall be met:

1. All curb, gutter, and sidewalk shall be installed in accordance with project plans and specifications.
2. Fire hydrants and water systems shall be pressure tested, bacteriological tested and approved. Blank plates and jumpers shall be removed to provide an approved water supply capable of supplying the required fire flow for fire protection to all premises upon which buildings or portions of buildings are hereafter constructed, in accordance with the current "Uniform Fire Code."
3. Sewer and storm drain system shall be installed, tested, and approved.
4. All other utilities (e.g. electricity, gas, cable, television, and telephone) shall be installed within the appropriate public utilities easement adjacent to the street right-of-way.
5. The street section shall meet the following requirements.
  - A. The subgrade shall have a 95% compaction based on appropriate testing.
  - B. The AB rock grade shall have a 95% compaction based on appropriate testing.
  - C. The AC grade shall be at least 0.10 foot.
6. When utilities are placed in existing roadways, cold mix will be used to secure trenches until roadway is paved. This will be done in order to make roadways safe.

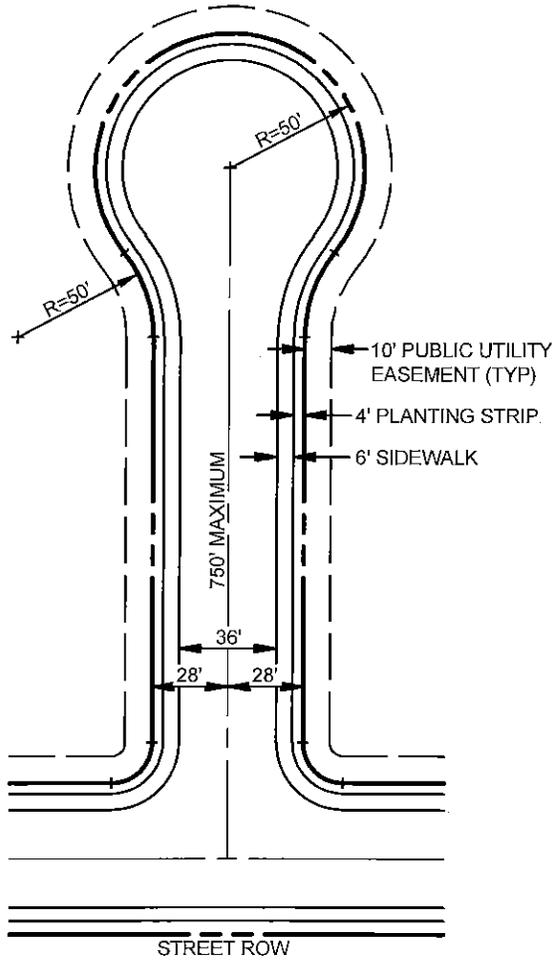
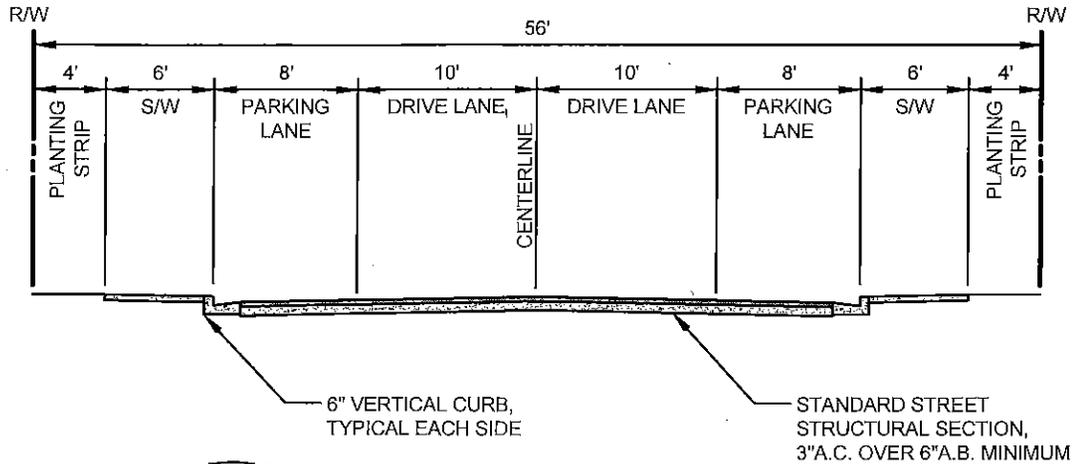
The City Engineer or Fire Chief shall have authority to terminate the construction at any time if any of the aforementioned conditions are violated.

**City of Riverbank  
STANDARD PLANS**

**STREETS**

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**LEGEND:**

P/S PARKING STRIP  
 R RADIUS  
 R/W RIGHT OF WAY  
 S/W SIDEWALK

**NOTES:**

1. FINISHED PAVING SHALL BE 3/8" HIGHER THAN LIP OF GUTTER EXCEPT WHERE PEDESTRIAN CROSSINGS ARE LOCATED, LIP WILL BE FLUSH.
2. PART WIDTH STREETS, DEAD END STREETS AND ALL PAVEMENT TRANSITIONS SHALL REQUIRE 2"x6" REDWOOD OR PRESSURE TREATED HEADERBOARD.

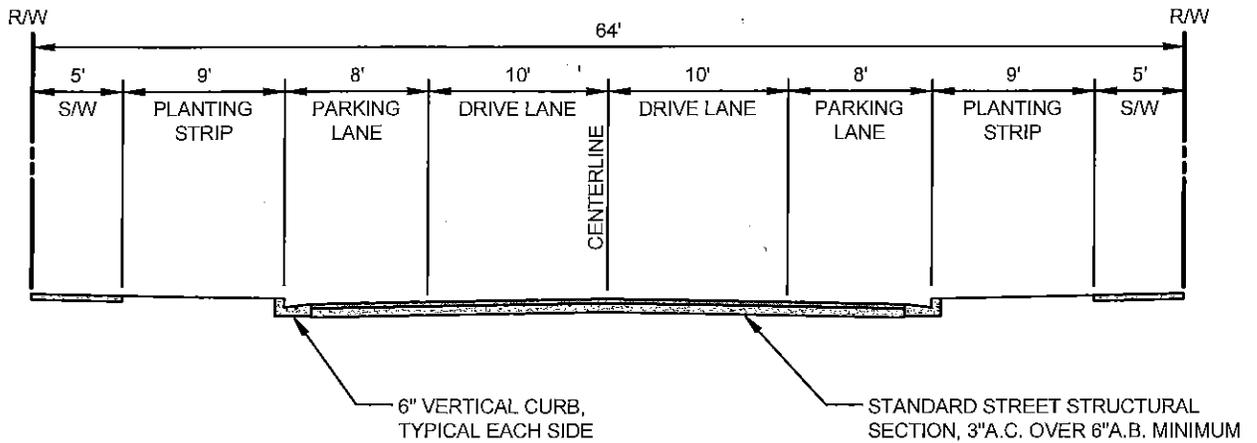
**CITY OF RIVERBANK**  
 DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
 CITY ENGINEER - WILLIAM F. KULL

**STREET SECTION**  
**56' R.O.W. - CUL-DE-SAC**  
**RESIDENTIAL**

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 301.DWG

ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
<b>3-10-15</b>	<b>301</b>



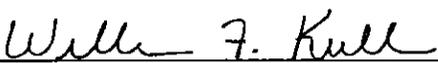
**64' R.O.W. - Residential - Typical Street**

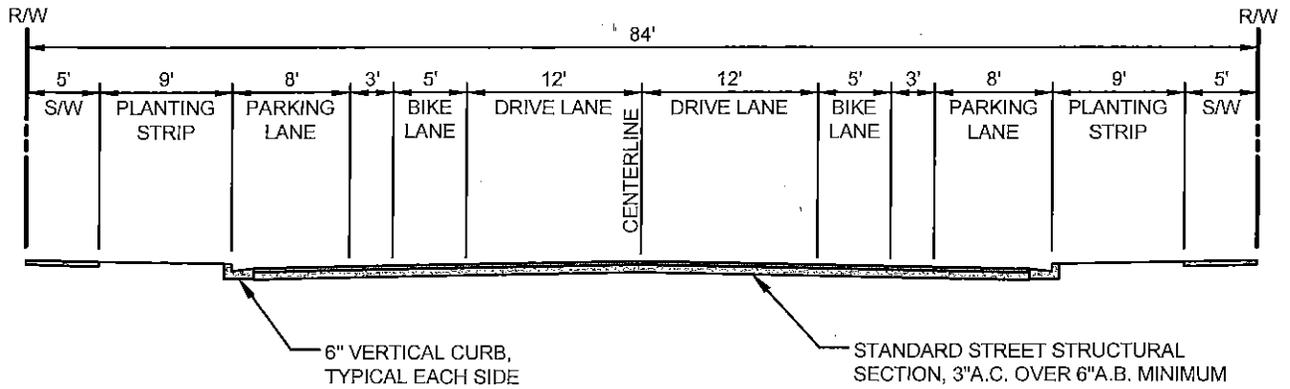
**LEGEND:**

P/S PARKING STRIP  
 R/W RIGHT OF WAY  
 S/W SIDEWALK

**NOTES:**

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<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b> <b>64' R.O.W.</b> <b>RESIDENTIAL</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 302.DWG	<b>3-10-15</b>	<b>302</b>



84' R.O.W. - Residential - Typical Minor Collector

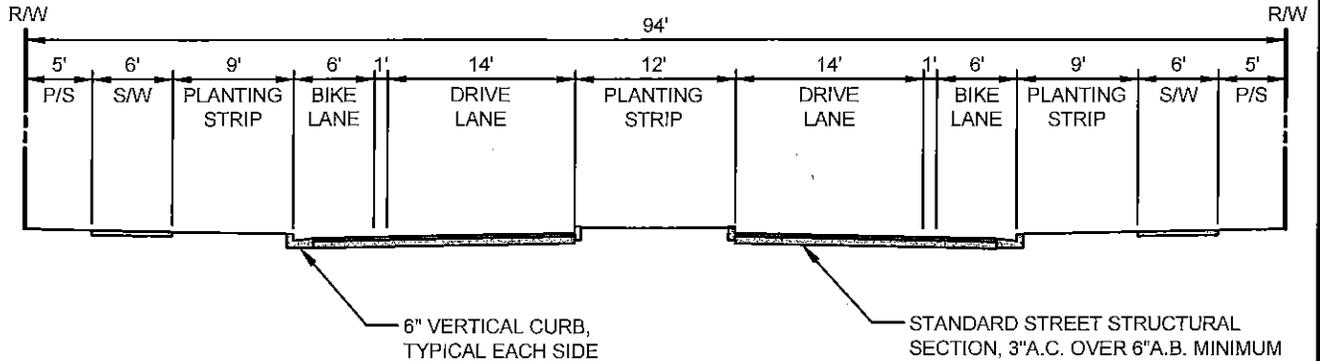
**LEGEND:**

P/S      PARKING STRIP  
R/W      RIGHT OF WAY  
S/W      SIDEWALK

**NOTES:**

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<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b>	
<i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL			<b>84' R.O.W. - RESIDENTIAL</b>	
<b>TYPICAL MINOR COLLECTOR</b>			<b>TYPICAL MINOR COLLECTOR</b>	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 303.DWG	<b>3-10-15</b>	<b>303</b>



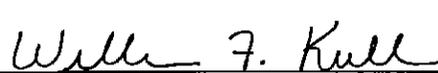
94' R.O.W. - Typical Major Collector - Residential

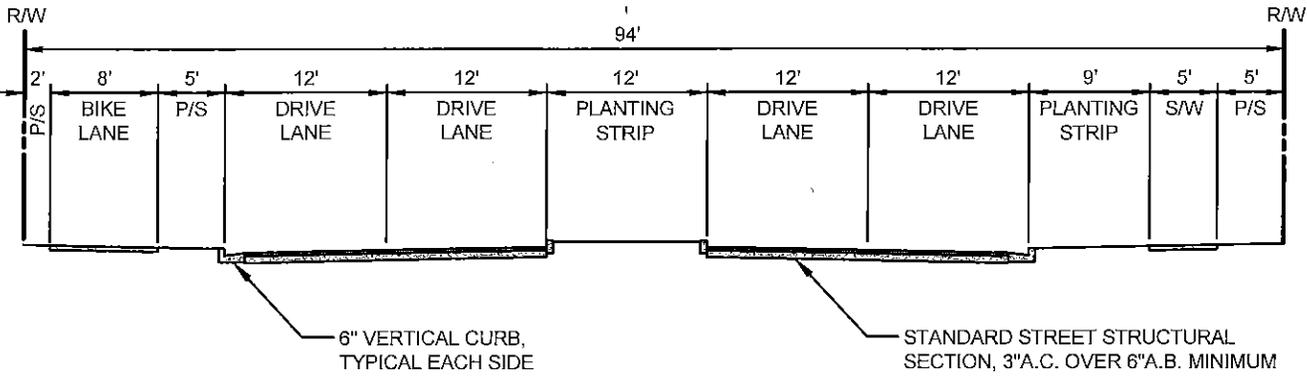
**LEGEND:**

P/S PARKING STRIP  
 R RADIUS  
 R/W RIGHT OF WAY  
 S/W SIDEWALK

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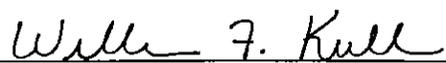
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b> <b>94' R.O.W. - RESIDENTIAL</b> <b>MAJOR COLLECTOR</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL: <b>3-10-15</b>	DRAWING NO. <b>304</b>
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 304.DWG		

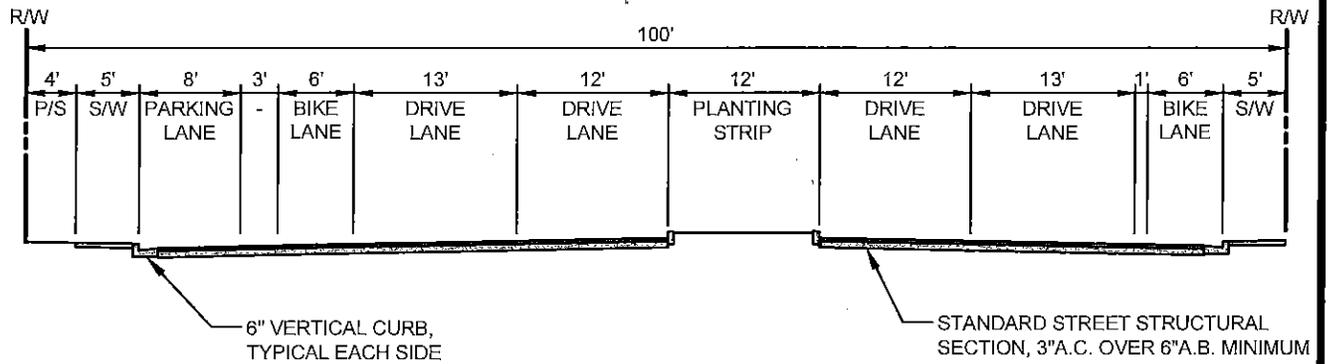


94' R.O.W. - Patterson Road East of Claus

**LEGEND:**  
 P/S      PARKING STRIP  
 R        RADIUS  
 R/W     RIGHT OF WAY  
 S/W     SIDEWALK

- NOTES:**
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<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b> <b>94' R.O.W. - PATTERSON RD</b> <b>EAST OF CLAUS</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 305.DWG	<b>3-10-15</b>	<b>305</b>



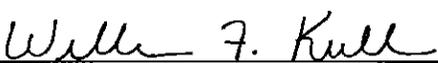
100' R.O.W. - Claus Road North of California

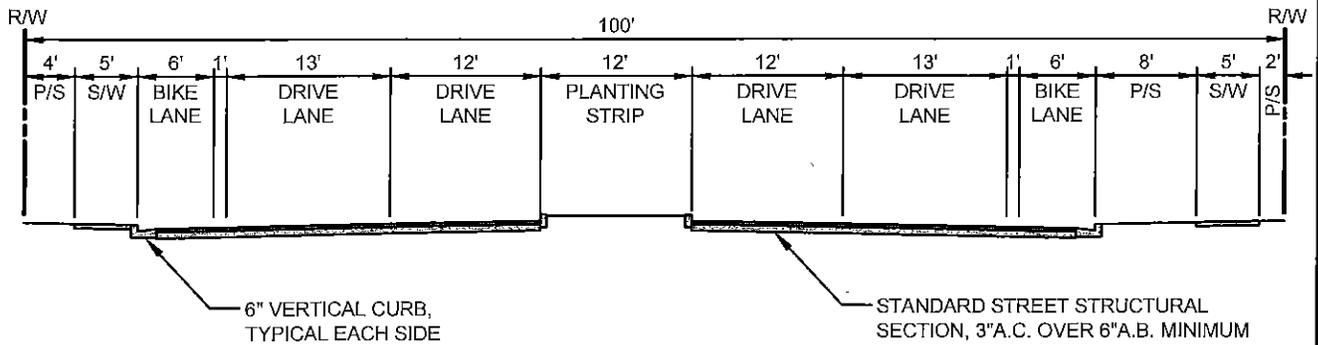
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**NOTES:**

1. FINISHED PAVING SHALL BE 3/8" HIGHER THAN LIP OF GUTTER EXCEPT WHERE PEDESTRIAN CROSSINGS ARE LOCATED, LIP WILL BE FLUSH.
2. PART WIDTH STREETS, DEAD END STREETS AND ALL PAVEMENT TRANSITIONS SHALL REQUIRE 2"x6" REDWOOD OR PRESSURE TREATED HEADERBOARD.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b> <b>100' R.O.W. - CLAUS ROAD</b> <b>NORTH OF CALIFORNIA</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL: <b>3-10-15</b>	DRAWING NO. <b>306</b>
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 306.DWG		



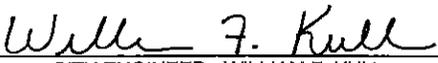
100' R.O.W. - Claus Road South of California

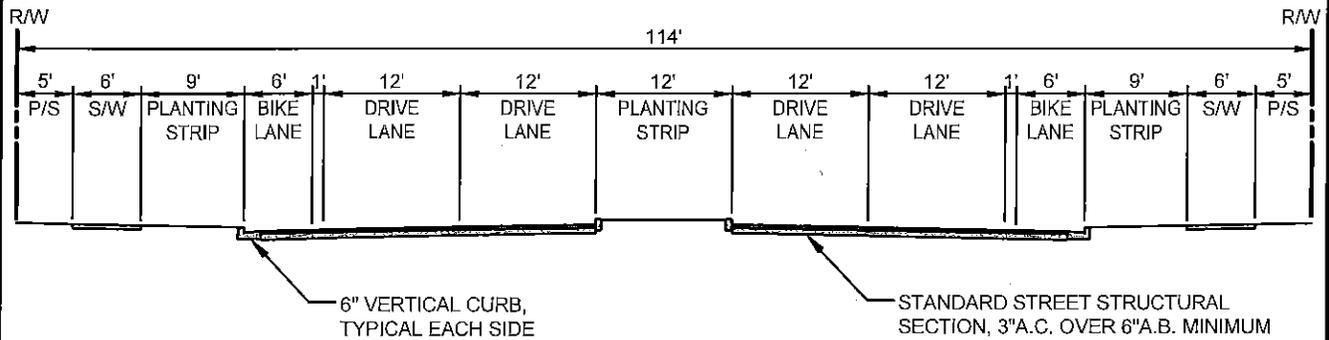
**LEGEND:**

P/S      PARKING STRIP  
R/W      RIGHT OF WAY  
S/W      SIDEWALK

**NOTES:**

1. FINISHED PAVING SHALL BE 3/8" HIGHER THAN LIP OF GUTTER EXCEPT WHERE PEDESTRIAN CROSSINGS ARE LOCATED, LIP WILL BE FLUSH.
2. PART WIDTH STREETS, DEAD END STREETS AND ALL PAVEMENT TRANSITIONS SHALL REQUIRE 2"x6" REDWOOD OR PRESSURE TREATED HEADERBOARD.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b> <b>100' R.O.W. - CLAUS ROAD</b> <b>SOUTH OF CALIFORNIA</b>	
 CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	<b>3-10-15</b>	DRAWING NO.  <b>307</b>
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 307.DWG		



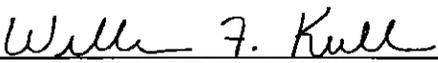
114' R.O.W. - Typical Major Collector

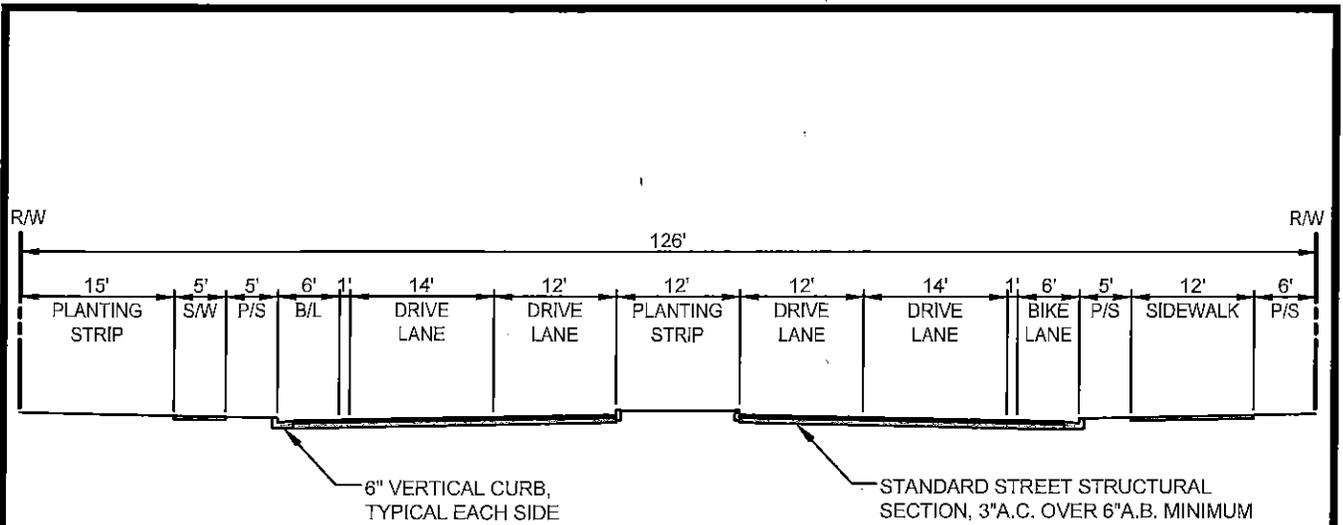
**LEGEND:**

P/S PARKING STRIP  
 R/W RIGHT OF WAY  
 S/W SIDEWALK

**NOTES:**

1. FINISHED PAVING SHALL BE 3/8" HIGHER THAN LIP OF GUTTER EXCEPT WHERE PEDESTRIAN CROSSINGS ARE LOCATED, LIP WILL BE FLUSH.
2. PART WIDTH STREETS, DEAD END STREETS AND ALL PAVEMENT TRANSITIONS SHALL REQUIRE 2"x6" REDWOOD OR PRESSURE TREATED HEADERBOARD.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b> <b>114' R.O.W. - TYPICAL</b> <b>MAJOR COLLECTOR</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 308.DWG	<b>3-10-15</b>	
			DRAWING NO. <b>308</b>	



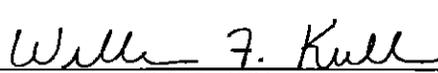
126' R.O.W. - Oakdale Rd South of Crawford Rd

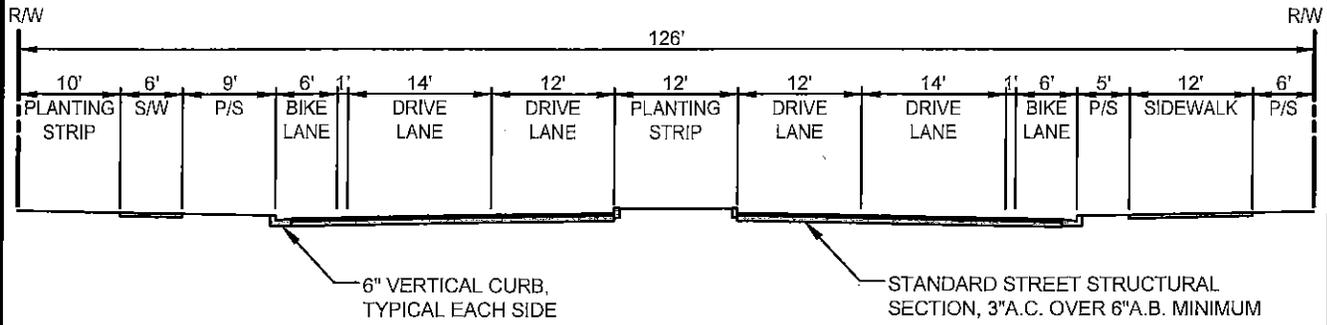
**LEGEND:**

P/S      PARKING STRIP  
R/W      RIGHT OF WAY  
S/W      SIDEWALK

**NOTES:**

1. FINISHED PAVING SHALL BE 3/8" HIGHER THAN LIP OF GUTTER EXCEPT WHERE PEDESTRIAN CROSSINGS ARE LOCATED, LIP WILL BE FLUSH.
2. PART WIDTH STREETS, DEAD END STREETS AND ALL PAVEMENT TRANSITIONS SHALL REQUIRE 2"x6" REDWOOD OR PRESSURE TREATED HEADERBOARD.

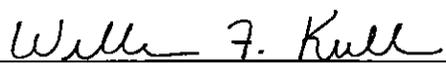
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b> 126' R.O.W. - OAKDALE ROAD SOUTH OF CRAWFORD ROAD	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 309.DWG	3-10-15	309

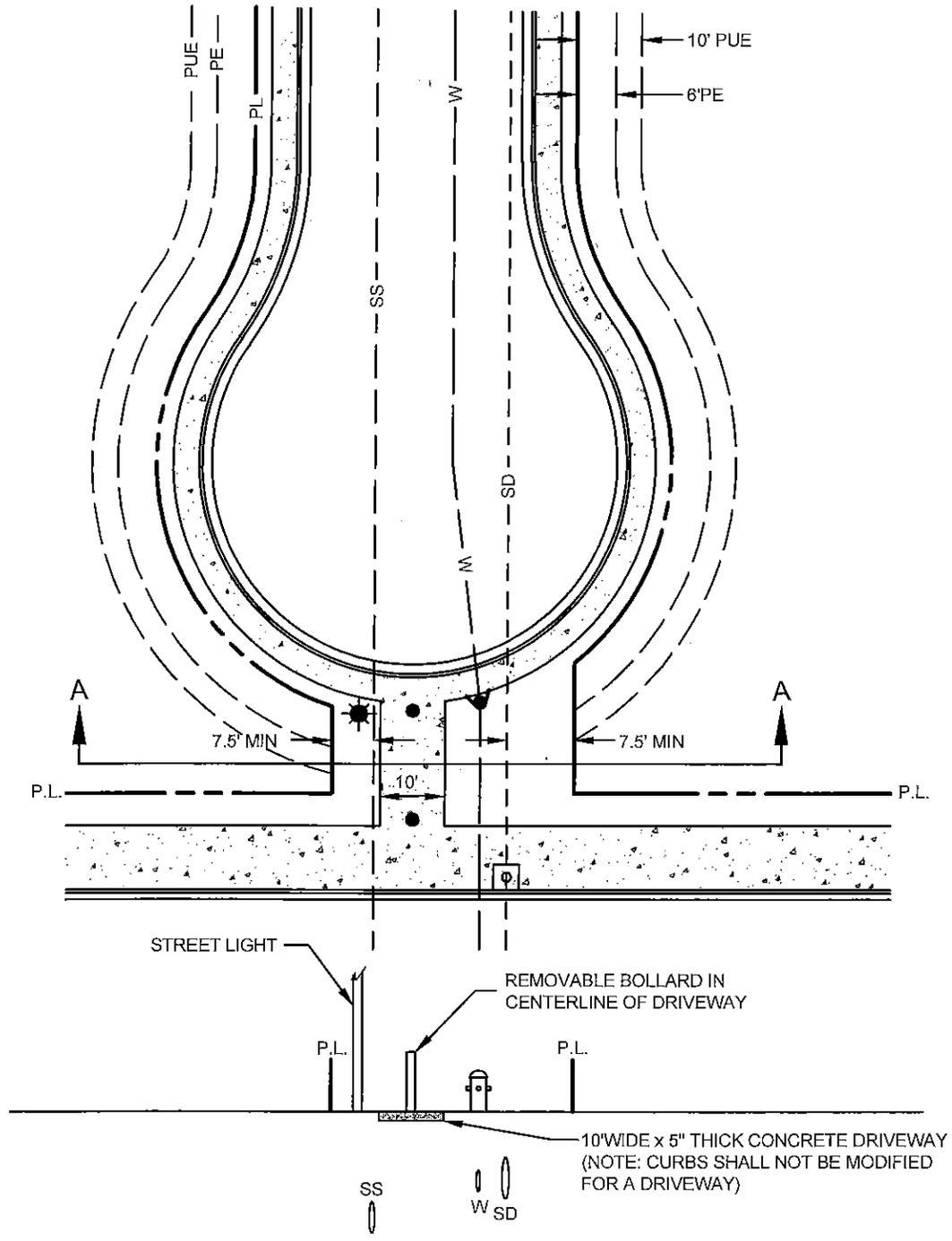


126' R.O.W. - Oakdale Rd South of Morrill Rd

**LEGEND:**  
 P/S PARKING STRIP  
 R/W RIGHT OF WAY  
 S/W SIDEWALK

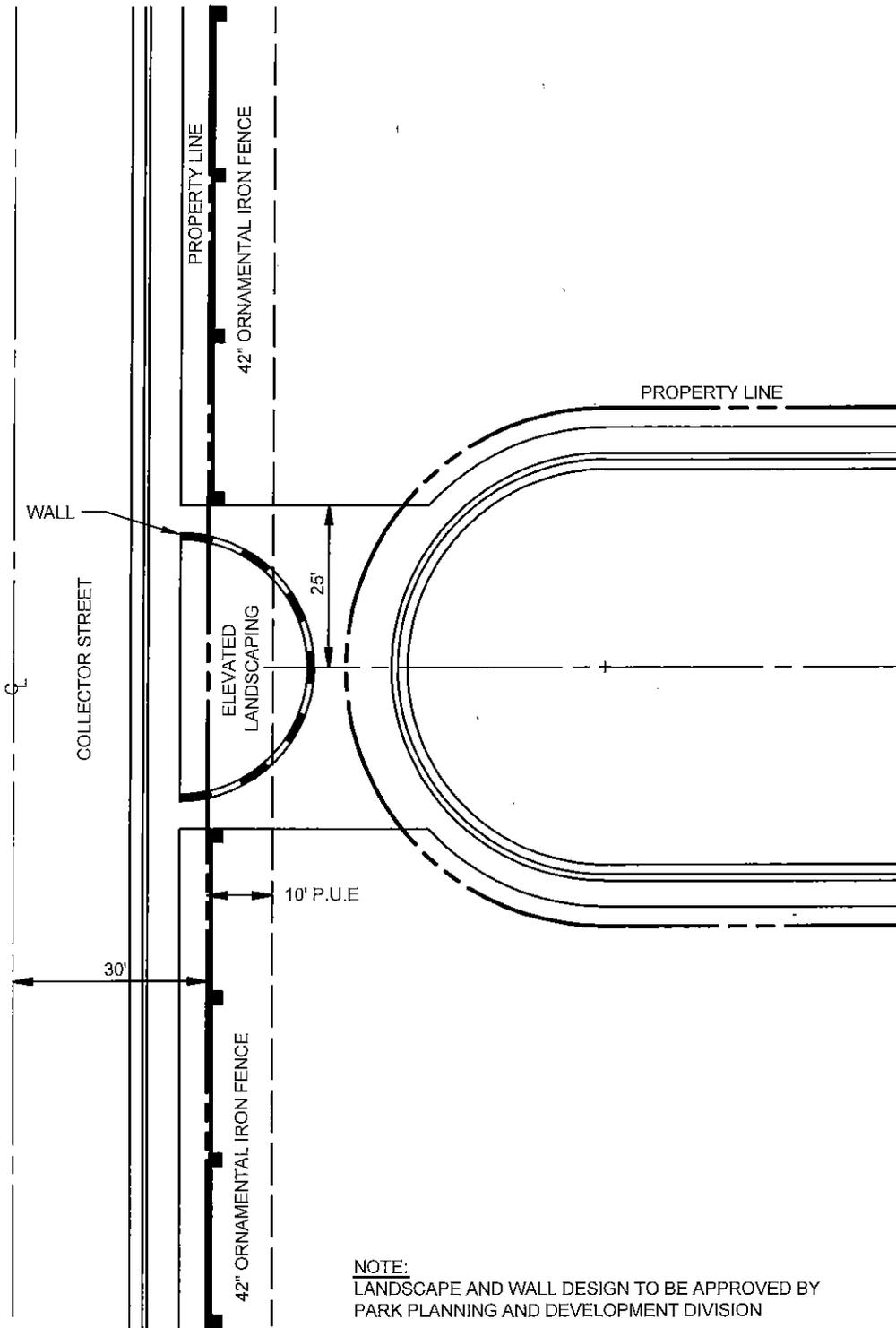
- NOTES:**
1. FINISHED PAVING SHALL BE 3/8" HIGHER THAN LIP OF GUTTER EXCEPT WHERE PEDESTRIAN CROSSINGS ARE LOCATED, LIP WILL BE FLUSH.
  2. PART WIDTH STREETS, DEAD END STREETS AND ALL PAVEMENT TRANSITIONS SHALL REQUIRE 2"x6" REDWOOD OR PRESSURE TREATED HEADERBOARD.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>STREET SECTION</b> <b>126' R.O.W. - OAKDALE ROAD</b> <b>SOUTH OF MORRILL ROAD</b>	
 CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	<b>3-10-15</b>	DRAWING NO. <b>310</b>
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 310.DWG		



SECTION A-A  
TYPICAL UTILITY SECTION

<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>WALK THRU CUL-DE-SAC SECTION</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>				
<p>DRAWN BY: GK</p>	<p>DATE: 7/21/15</p>	<p>SCALE: NTS</p>	<p>ADOPTED BY THE CITY COUNCIL:</p>	<p>DRAWING NO.</p>
<p>REVISIONS: NONE</p>	<p>SECTION: STREETS</p>	<p>DRAWING NAME: 311.DWG</p>	<p><b>3-10-15</b></p>	<p><b>311</b></p>



NOTE:  
 LANDSCAPE AND WALL DESIGN TO BE APPROVED BY  
 PARK PLANNING AND DEVELOPMENT DIVISION

**CITY OF RIVERBANK**  
 DEPARTMENT OF PUBLIC WORKS

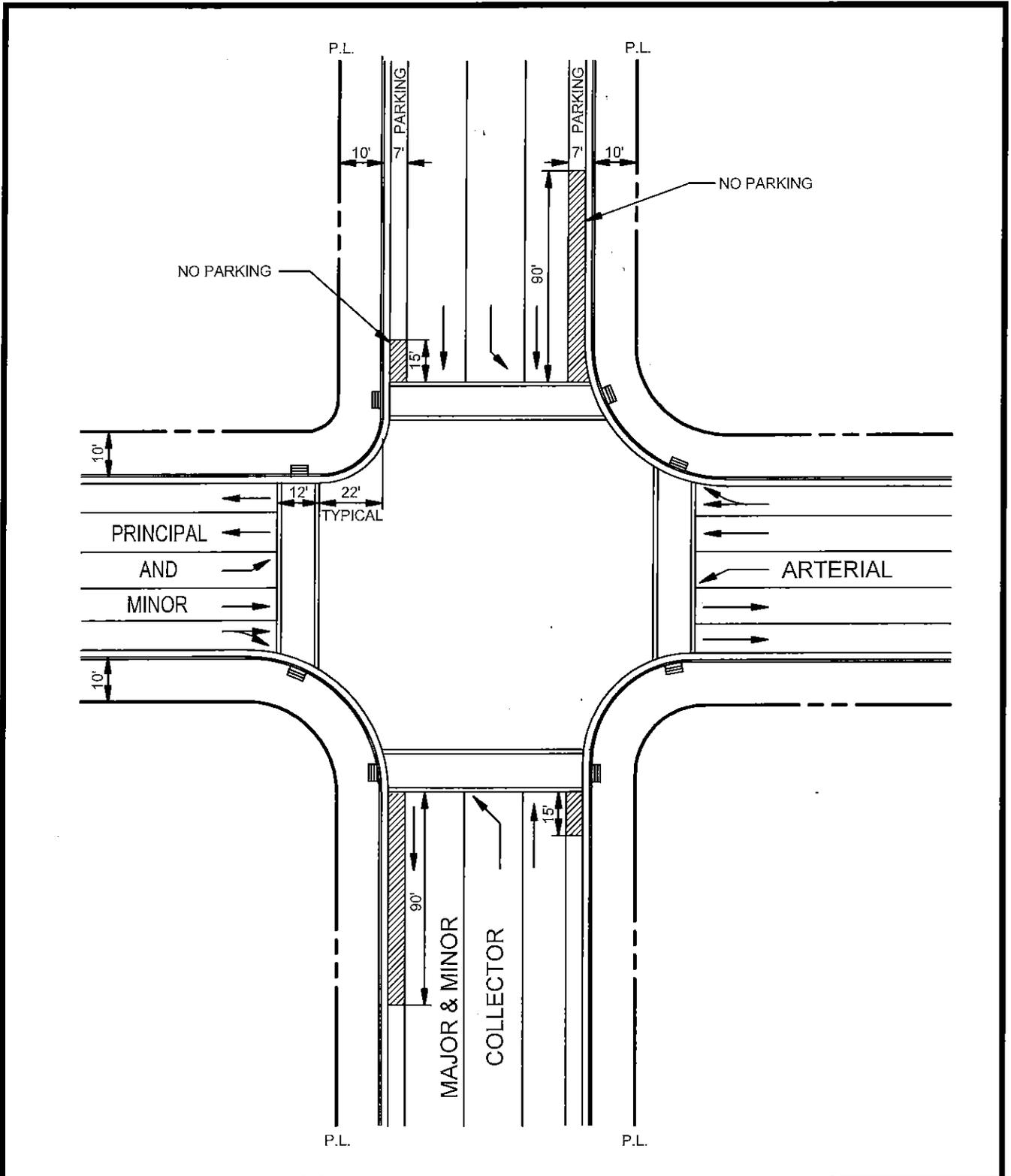
**OPEN-ENDED CUL-DE-SAC**

*William F. Kull*  
 CITY ENGINEER - WILLIAM F. KULL

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 312.DWG

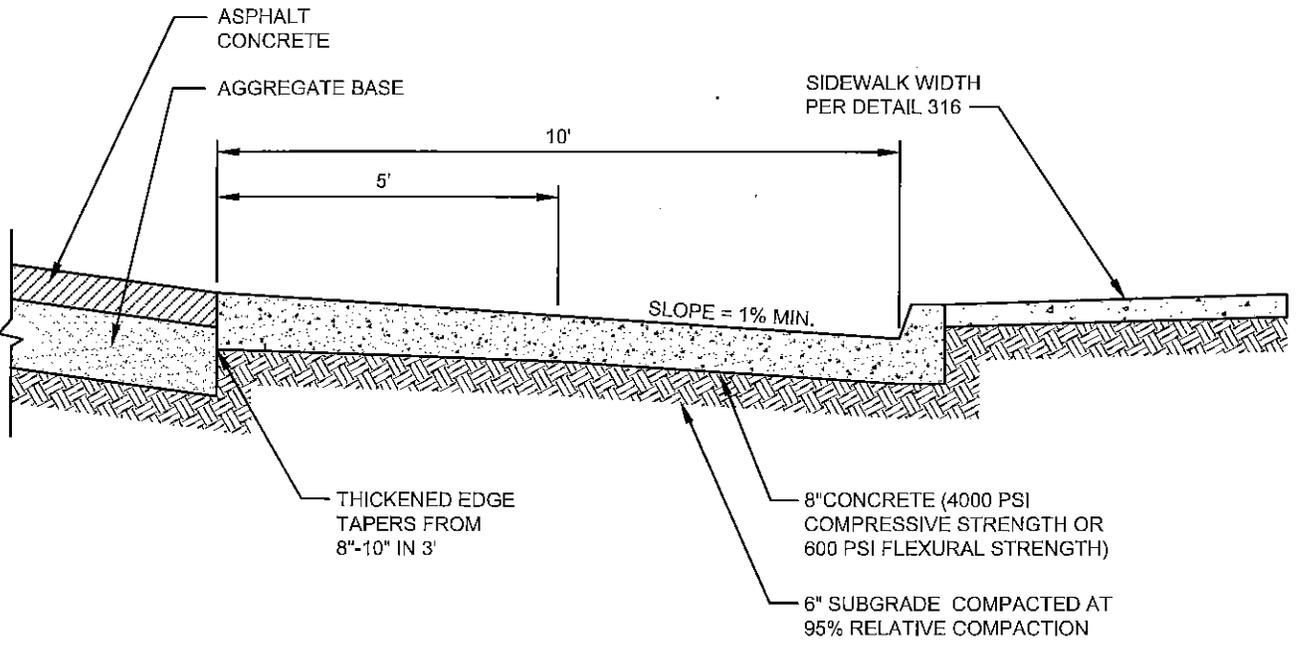
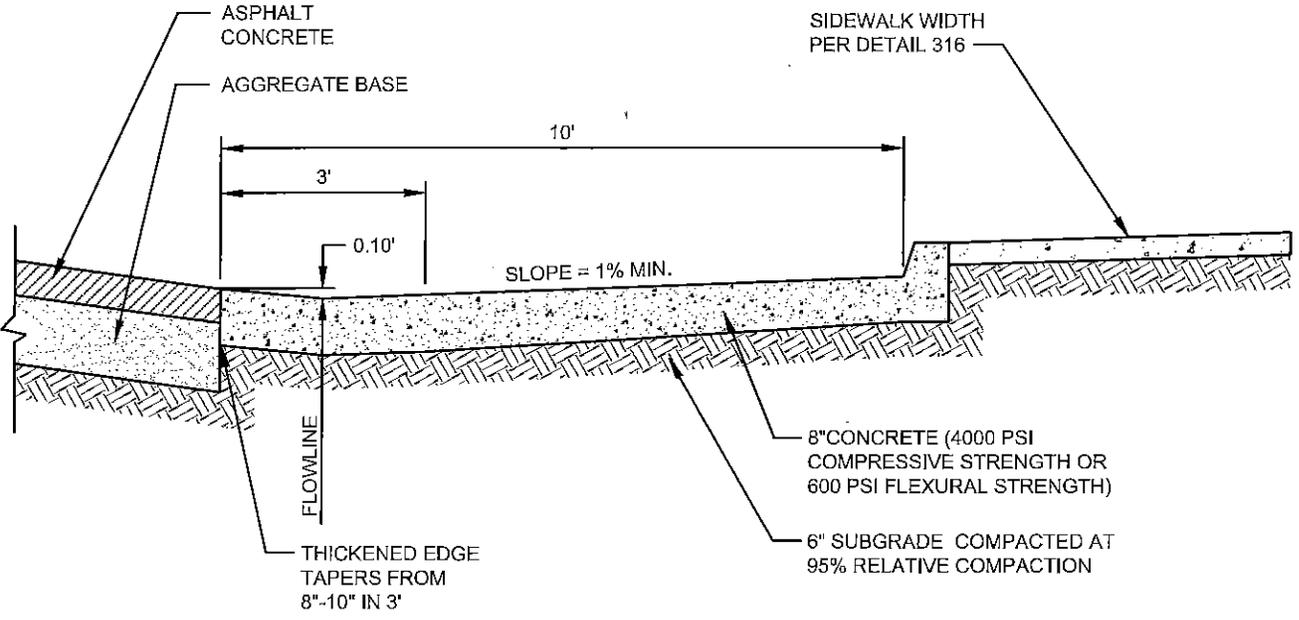
ADOPTED BY THE CITY COUNCIL:  
**3-10-15**

DRAWING NO.  
**312**



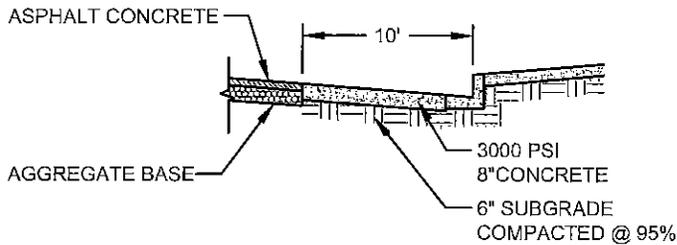
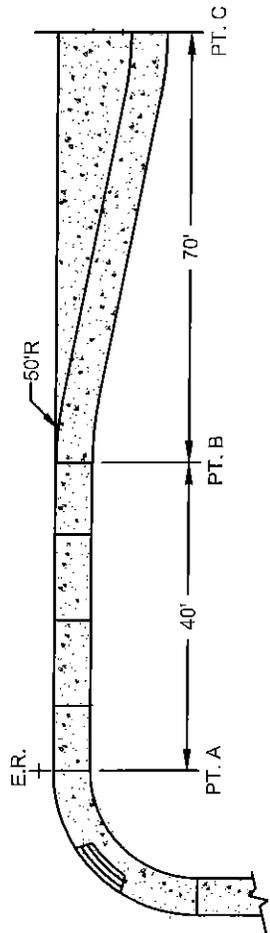
<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>NO-PARKING AREA</b> <b>COLLECTOR / ARTERIAL</b> <b>INTERSECTION</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>				
<p>DRAWN BY: GK</p>	<p>DATE: 7/21/15</p>	<p>SCALE: NTS</p>	<p>ADOPTED BY THE CITY COUNCIL:</p>	<p>DRAWING NO.</p>
<p>REVISIONS: NONE</p>	<p>SECTION: STREETS</p>	<p>DRAWING NAME: 313.DWG</p>	<p><b>3-10-15</b></p>	<p><b>313</b></p>





**SECTION A-A**  
**TYPICAL BUS TURNOUTS**  
 NOT TO SCALE

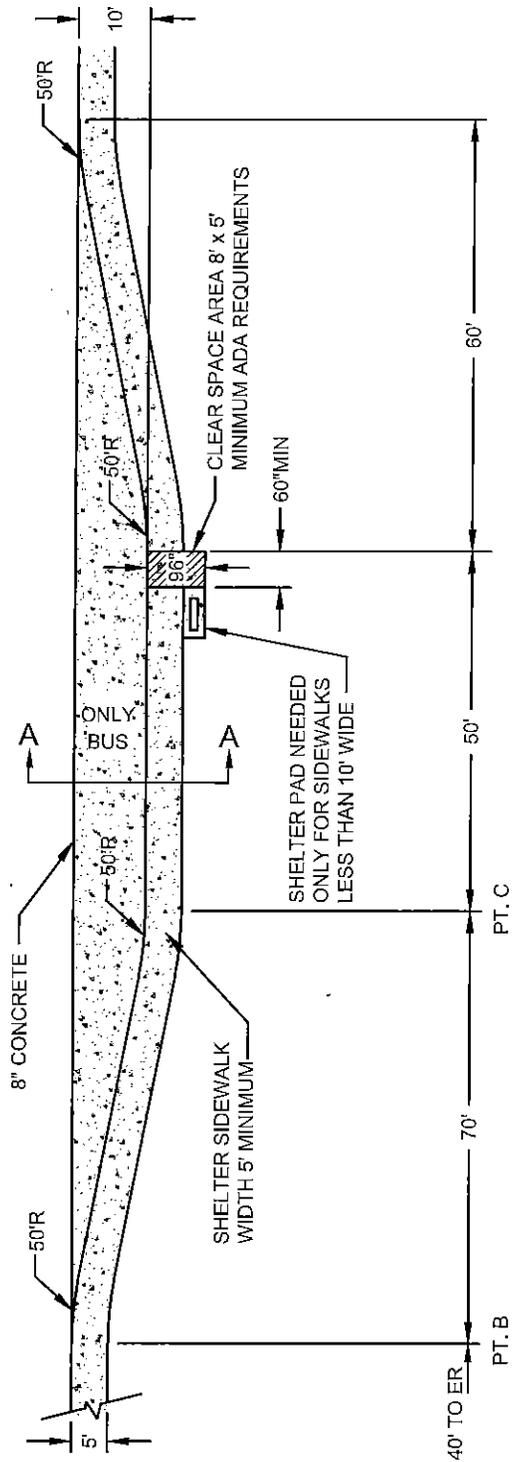
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>BUS TURNOUT</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 315.DWG	<b>3-10-15</b>	<b>315</b>



**SECTION A-A**

**NOTES:**

1. NO ADDITIONAL SHELTER PAD NEEDED FOR SIDEWALKS WIDER THAN 10'
2. SHELTER PAD AND SHELTERS MUST BE WIDE ENOUGH TO MEET ADA REQUIREMENTS, 48"x30" CLEAR FLOOR AREA WITHIN SHELTER PERIMETER.



**CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS**

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**FAR SIDE BUS TURNOUT**

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

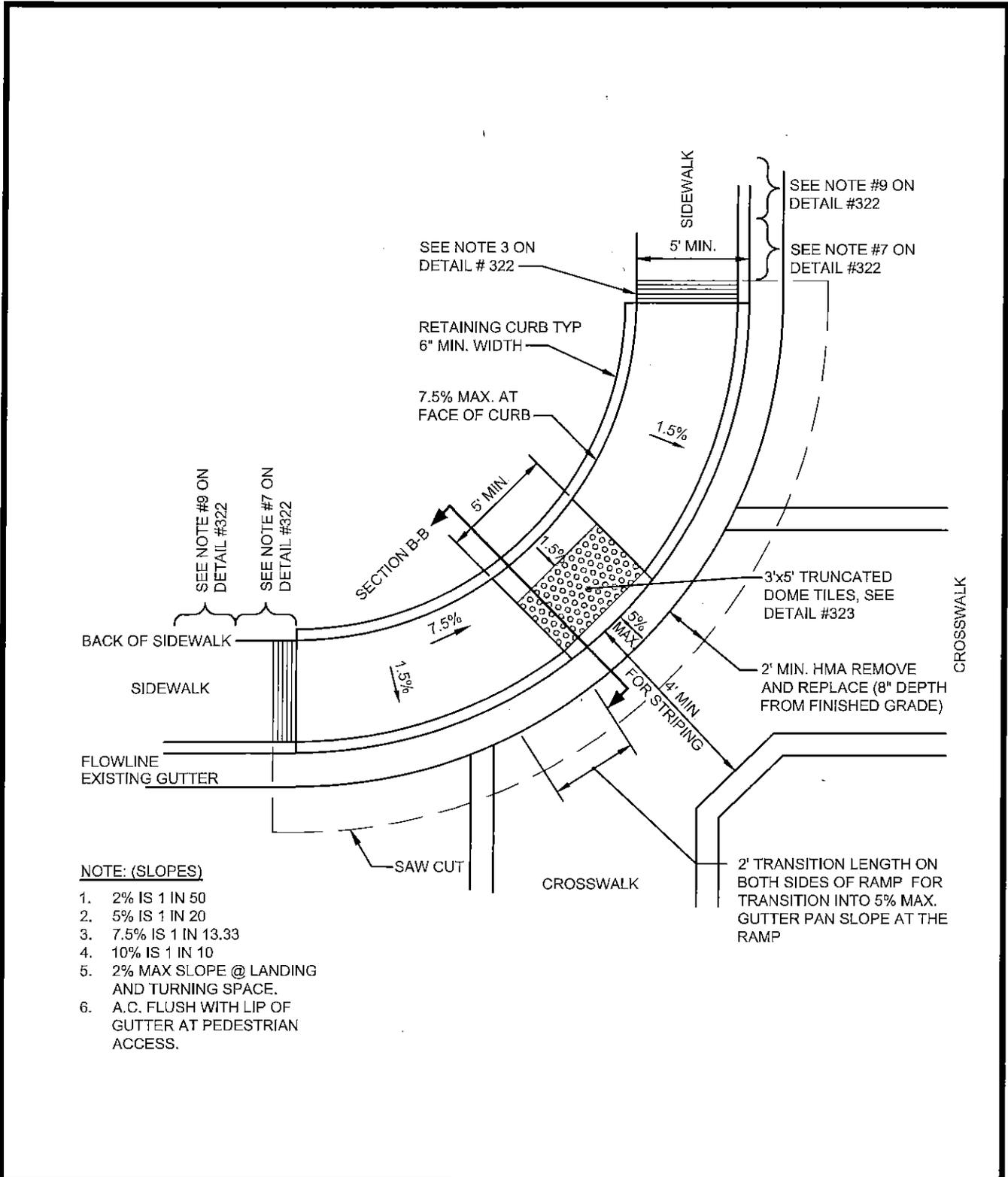
REVISIONS:  
NONE

SECTION:  
STREETS

DRAWING NAME:  
316.DWG

**3-10-15**

**316**



**NOTE: (SLOPES)**

1. 2% IS 1 IN 50
2. 5% IS 1 IN 20
3. 7.5% IS 1 IN 13.33
4. 10% IS 1 IN 10
5. 2% MAX SLOPE @ LANDING AND TURNING SPACE.
6. A.C. FLUSH WITH LIP OF GUTTER AT PEDESTRIAN ACCESS.

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**CURB RAMP**  
**CASE A**

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

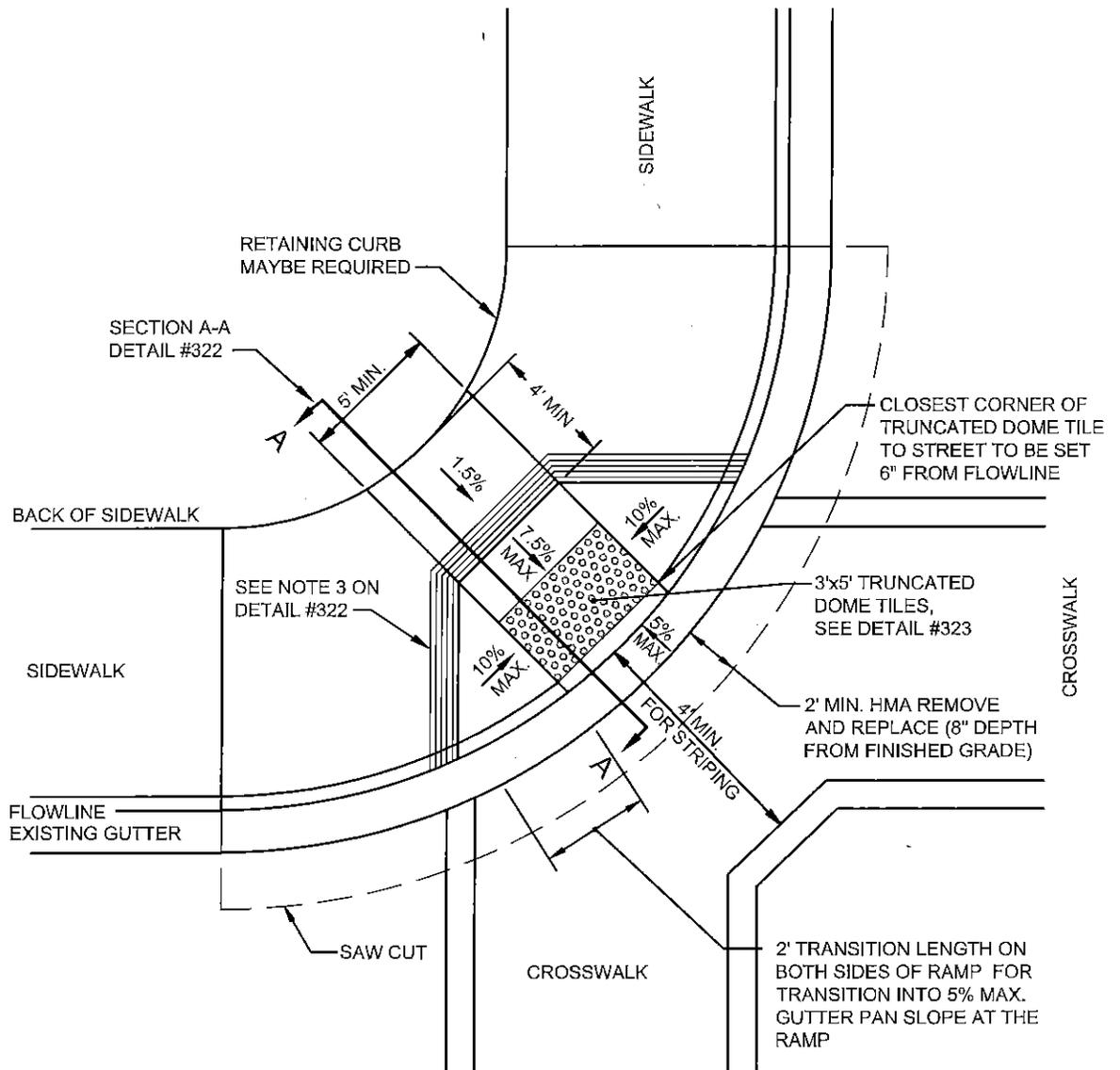
REVISIONS:  
NONE

SECTION:  
STREETS

DRAWING NAME:  
317.DWG

**3-10-15**

**317**



**NOTE: (SLOPES)**

1. 2% IS 1 IN 50
2. 5% IS 1 IN 20
3. 7.5% IS 1 IN 13.33
4. 10% IS 1 IN 10
5. A.C. FLUSH WITH LIP OF GUTTER AT PEDESTRIAN ACCESS

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**CURB RAMP**  
**CASE B**

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

REVISIONS:  
NONE

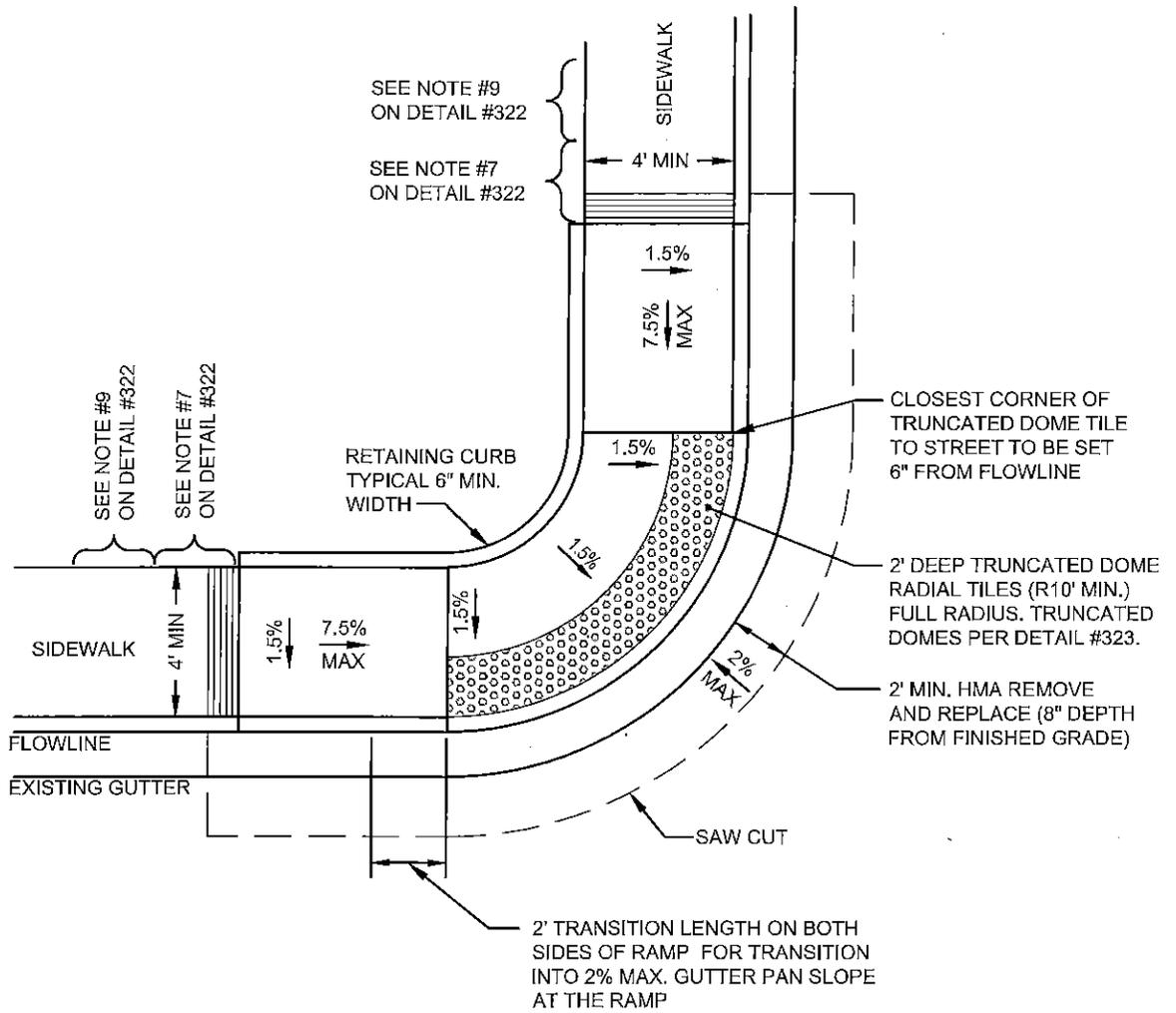
SECTION:  
STREETS

DRAWING NAME:  
318.DWG

**3-10-15**

**318**



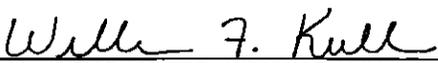


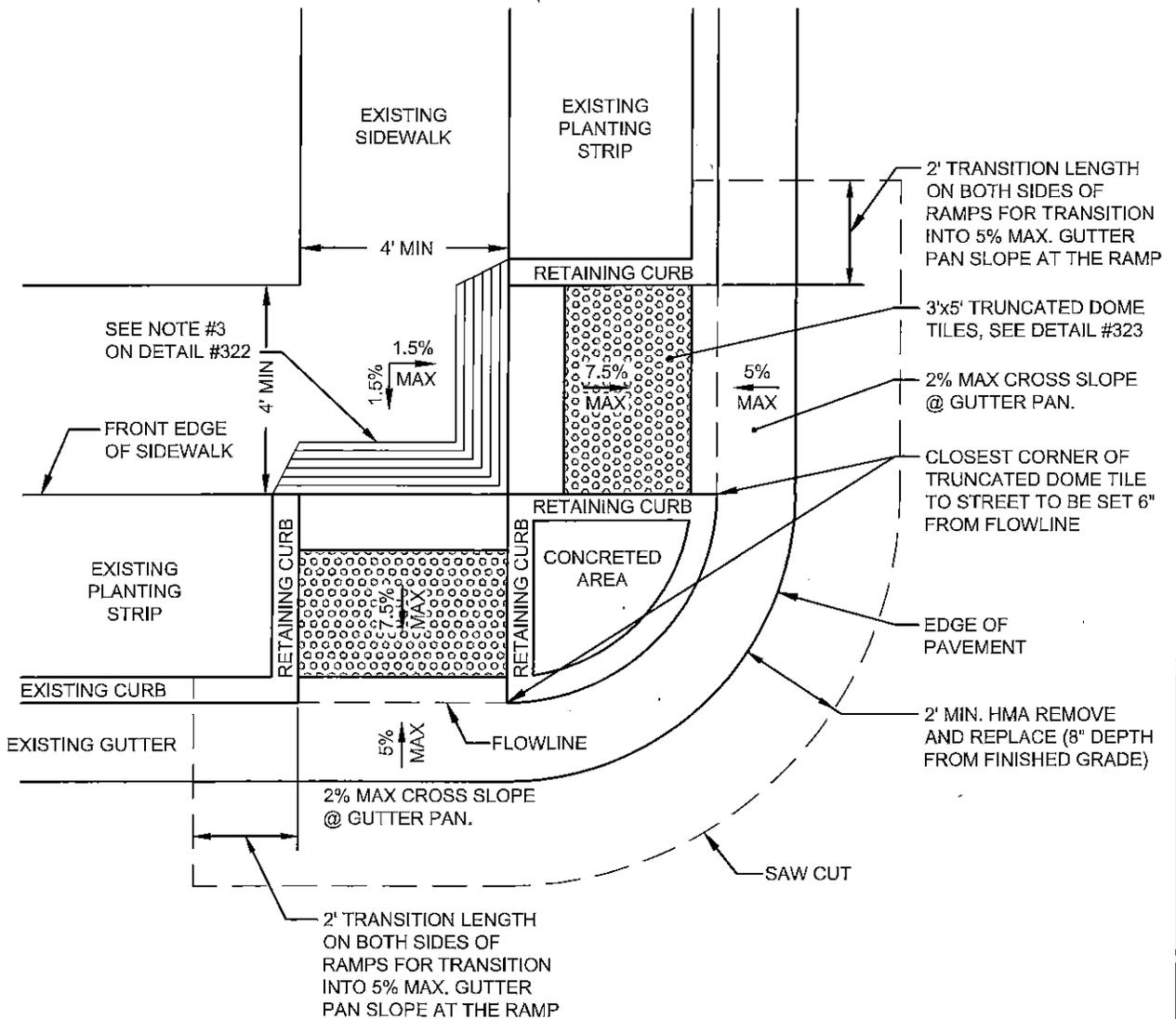
**NOTE: (SLOPES)**

1. 2% IS 1 IN 50
2. 5% IS 1 IN 20
3. 7.5% IS 1 IN 13.33
4. 10% IS 1 IN 10
5. 2% MAX CROSS SLOPE @ GUTTER PAN.
6. A.C. FLUSH WITH LIP OF GUTTER AT PEDESTRIAN ACCESS

**NOTE:**

THIS RAMP IS FOR LOCATIONS WITH RIGHT-OF-WAY ISSUES AND RADIUS LARGER THAN 10'.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>CURB RAMP</b> <b>CASE D</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 320.DWG	<b>3-10-15</b>	<b>320</b>



**NOTE: (SLOPES)**

1. 2% IS 1 IN 50
2. 5% IS 1 IN 20
3. 7.5% IS 1 IN 13.33
4. 10% IS 1 IN 10
5. A.C. FLUSH WITH LIP OF GUTTER AT PEDESTRIAN ACCESS.

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**CURB RAMP**  
**CASE E**

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

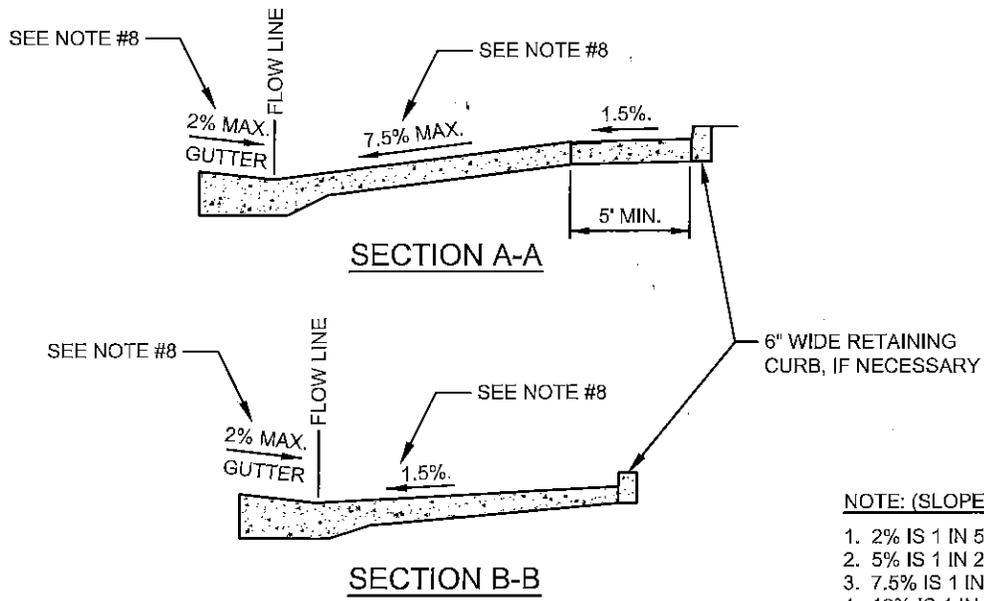
REVISIONS:  
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SECTION:  
STREETS

DRAWING NAME:  
321.DWG

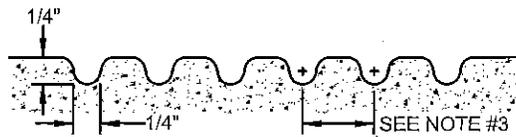
3-10-15

321



**NOTE: (SLOPES)**

1. 2% IS 1 IN 50
2. 5% IS 1 IN 20
3. 7.5% IS 1 IN 13.33
4. 10% IS 1 IN 10



**GROOVING DETAIL**

**NOTES:**

1. THE LOWER END OF EACH RAMP SHALL BE FLUSH WITH GUTTER.
2. WHEN THE RAMP IS LOCATED IN THE CENTER OF THE CURB RETURN, CROSS WALK CONFIGURATION MUST BE SIMILAR TO THAT SHOWN ON THE PLAN TO ACCOMMODATE WHEELCHAIRS.
3. THE RAMP SHALL HAVE A 12" WIDE BORDER WITH 1/4" GROOVES APPROXIMATELY 3/4" O.C. (SEE GROOVING DETAIL) AT LOCATIONS INDICATED ON THE PLANS. THE SURFACE OF THE RAMP SHALL HAVE A TRANSVERSE BROOMED SURFACE TEXTURE ROUGHER THAN THE SURROUNDING SIDEWALK EXCEPT WHEN LOCATED IN THE CENTER OF CURB RETURN.
4. THE RAMPS SHALL HAVE TRUNCATED DOME TILES AS DETECTABLE WARNINGS AT THE END OF THE RUNNING SLOPE OF THE RAMP, AS INDICATED IN THE PLANS AND SPECIFICATIONS.
5. ALL CURB RAMPS SHALL BE 4" THICK CONCRETE.
6. 5% MAX. GUTTER PAN SLOPE, 2% MIN.
7. CONTRACTOR TO PROVIDE A LEVEL LANDING (4' LONG MIN. BY WIDTH OF SIDEWALK AT THE TOP OF THE RAMP WHICH SHALL BE AS WIDE AS THE RAMP WITH SLOPES AT 2% MAXIMUM, BOTH DIRECTIONS IF SIDEWALK CROSS SLOPE IS MORE THAN 2%
8. THE GRADE BREAK BETWEEN THE COUNTER SLOPES OF GUTTER AND/OR ROAD SURFACES WITHIN 24 INCHES OF THE CURB RAMP AND THE RUNNING GRADE OF THE CURB RAMP SHALL NOT EXCEED THE ALGEBRAIC DIFFERENCE OF 11 PERCENT. IF TWO OR MORE PLANE CHANGES ARE PRESENT, THEY SHALL BE SEPARATED BY 24 INCHES (2% MAX)
9. 4' LONG TRANSITION BY WIDTH OF SIDEWALK IS REQUIRED IF EXISTING SIDEWALK CROSS SLOPE IS MORE THAN 2%.
10. TRAFFIC SIGNAL PEDESTRIAN PUSH BUTTONS SHALL BE 40" MAX. VERTICAL FROM CLEAR 2% MAX. LANDING AREA, 6" MAX. HORIZONTAL FROM FRONT OF CURB ADJACENT TO LANDING AND 32" MIN. AWAY FROM EDGE OF CURB RETURN.

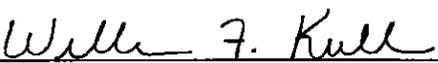
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>CURB RAMP</b> <b>NOTES &amp; DETAILS</b>	
<i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 322.DWG	<b>3-10-15</b>	<b>322</b>

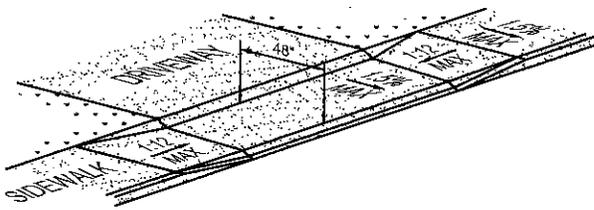
# CALIFORNIA DEPARTMENT OF TRANSPORTATION DETECTABLE WARNING SURFACE AUTHORIZED MATERIAL LIST

THE FOLLOWING PRODUCTS HAVE BEEN FOUND ACCEPTABLE FOR USE ON STATE HIGHWAY CONTRACTS:

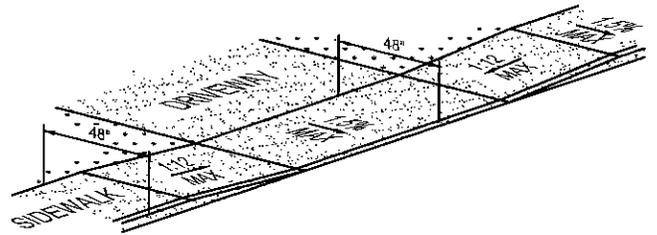
<p>THREE D TRAFFIC WORKS 430 N. VARNEY STREET BURBANK, CA 91502 MR. SCOTT BEHM (877) 843-9757 www.trafficworks.com</p>	<p>DWT TOUGH-EZ TILE (PRESSURE SENSITIVE ADHESIVE)</p>
<p>ACCESS PRODUCTS, INC. 241 MAIN STREET, SUITE 100 BUFFALO, NY 14203 MS SHERRY MORRISON (630) 881-9320 www.accessstile.com</p>	<p>1. ACCESS TILE-CAST IN PLACE REPLACEABLE 2. ACCESS TILE-SURFACE APPLIED</p>
<p>CAPE FEAR SYSTEMS, III LLC. 215 SOUTH WATER STREET, SUITE 103 WILMINGTON, NC 2840 MR. ALEX MUNROE (877) 232-6287 www.AlertTile.com</p>	<p>ALERTCAST</p>
<p>ARMORCAST PRODUCTS COMPANY 13230 SATICOY STREET NORTH HOLLYWOOD, CA 91605 MR. ARI S. ALEONG (818) 982-3600 www.armorcastprod.com</p>	<p>1. ARMORCAST CAST-IN-PLACE DETECTABLE WARNING PANELS (WETSET) 2. ARMORCAST SURFACE APPLIED DETECTABLE WARNING TILE (RETROFIT)</p>
<p>STRONGGO INDUSTRIES, LLC. 3296 E. HEMISPHERE LOOP TUCSON, AZ 95706 MR. NIRANJAN VESCIO (520) 547-3510 www.stronggo.com</p>	<p>TEKWAY DOME-TILES</p>
<p>ADA SOLUTIONS, INC. 10 ELIZABETH DRIVE, UNIT #5 CHELMSFORD, MA 01824 MR. JOSEPH R. DUNNIGAN (800) 372-0519 www.adatile.com</p>	<p>CAST-IN-PLACE-WET-SET-TACTILE</p>
<p>ENGINEERED PLASTICS INC. 1104 CORPORATE WAY SACRAMENTO, CA 95831 MR. GERARD ANGELES (916) 844-4132 www.armor-tile.com</p>	<p>ARMOR-TILE CAST-IN -PLACE DETECTABLE WARNING TILE</p>

FOR ADDITIONAL INFORMATION, PLEASE SEND E-MAIL TO [David.Cordova@dot.ca.gov](mailto:David.Cordova@dot.ca.gov)

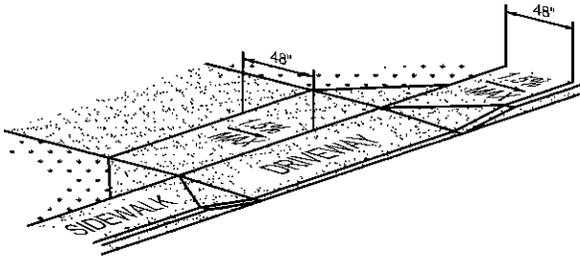
<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>CALIFORNIA D.O.T.</b> <b>DETECTABLE WARNING SURFACE</b> <b>AUTHORIZED MATERIAL LIST</b></p>	
<p> CITY ENGINEER - WILLIAM F. KULL</p>			<p>ADOPTED BY THE CITY COUNCIL:</p> <p style="font-size: 1.5em;"><b>3-10-15</b></p>	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	<p>DRAWING NO.</p> <p style="font-size: 1.5em;"><b>323</b></p>	
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 323.DWG		



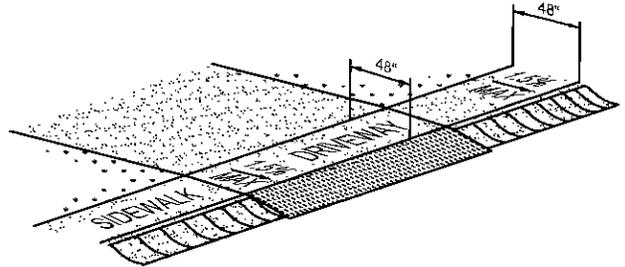
COMBINATION SIDEWALK



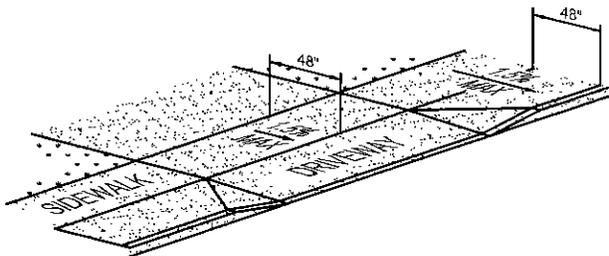
RAMP SIDEWALK



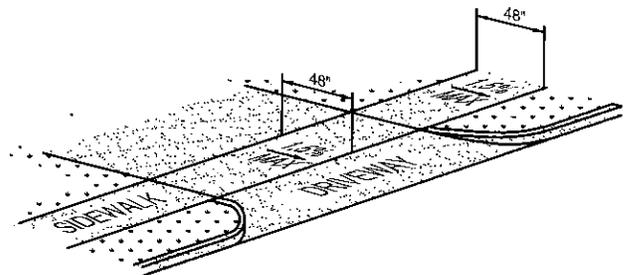
APRON OFFSET SIDEWALK



GUTTER BRIDGE PLATE

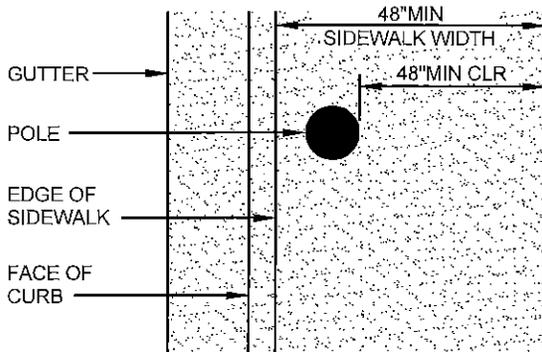


WIDE SIDEWALK



SETBACK SIDEWALK

SIDEWALK DRIVEWAY CONNECTIONS



SIDEWALK WIDTH

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

DRIVEWAY APPROACH

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: STREETS	DRAWING NAME: 324.DWG

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

3-10-15

324

**City of Riverbank  
DESIGN STANDARDS**

**LIGHTING**

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### **4.100 General**

**4.101 Scope**

**4.102 Design**

**4.103 Foundations**

**4.104 As-built Plans**

## **SECTION 4: LIGHTING**

### **4.100 General**

#### **4.101 Scope**

Street lighting shall be installed to conform to these Standards by the Developer or City Contractor holding an appropriate license for such work under the provisions of the State of California Business and Professions Code. In the development of the plans, the City Engineer shall be consulted. The Developer is responsible for coordination with the electrical distribution system as proposed by Pacific Gas & Electric (PG & E).

#### **4.102 Design**

The lighting system shall be designed to best serve the area and to minimize the length of service runs from the points of connection to the street lights, as approved by the City Engineer. The lighting system will be designed with traffic and pedestrian safety as the foremost objective, with consideration given to connectivity to parks, trails, bike paths, mail receptacles, and local commercial projects.

The Consulting Engineer shall show the proposed street lighting system or park trail lighting system on the project Improvement Plans. The plans shall include the following items:

1. Location of electroliers
2. Intensity of luminaries
3. Location of service points (As-Built)
4. Location of pull boxes (As-Built)
5. Location of conduit runs (As-Built)

The Consulting Engineer shall submit three (3) copies of the street light plans to the City of Riverbank for preliminary review in the initial submittal.

Guidelines for street light spacing and location are as follows:

1. Street lights shall be placed at street intersections and curves.
2. Pole height and arm length shall be as shown in the Standard Details.
3. If possible, street lights shall be located within 3' of a property line.
4. On streets with separated sidewalks, street lights shall be centered 18 inches behind the curb.
5. On streets with monolithic curb, gutter and sidewalk, street lights shall be centered 18 inches behind the walk
6. T intersections - a street light shall be located on the through street within 20' of the projected centerline of the intersection street (placed on the crosswalk side).

7. Cul-de-sac – a street light shall be located at the end of the bulb if longer than 150 feet (from centerline of intersecting street to center of bulb).
8. Four-way intersection of major streets – a street light shall be located on each corner (4 total) per Standard Detail 407.
9. Four-way intersection of major and minor streets – a street light shall be located at the far right curb returns of the major street in the direction of travel (2 total) per Standard Detail 407.
10. Four-way intersection of minor streets – a street light shall be located at the far right curb return of the through street in the direction of travel (1 total) per Standard Detail 407.
11. Electroliers will normally be staggered on opposite sides of the street, however preference shall be given to the side of the street with fronting lots.
12. Electroliers are required at each knuckle. The electrolier shall be located on the property line that is closest to the midpoint of the outside of the knuckle.
13. Electroliers at roundabouts shall follow the same guidelines as 4-way intersections, based on street classifications, with emphasis on placement near crosswalks.

#### **4.103 Foundations**

Foundations for poles shall be constructed of Type II Portland cement concrete per State Specifications and located as shown on Standard Detail 402.

Foundations shall be placed monolithically to within 4 inches of sidewalk grade. After pole is installed, a 36 inch square cap shall be placed to bring the foundation to sidewalk grade.

#### **4.104 As-Built Plans**

The Developer or Contractor shall supply the City of Riverbank with sepia mylars of the as-built plans of the City maintained conduits and conductors from their points of service to the electroliers prior to requesting final acceptance by the City Engineer.

**City of Riverbank**  
**CONSTRUCTION SPECIFICATIONS**  
**LIGHTING**

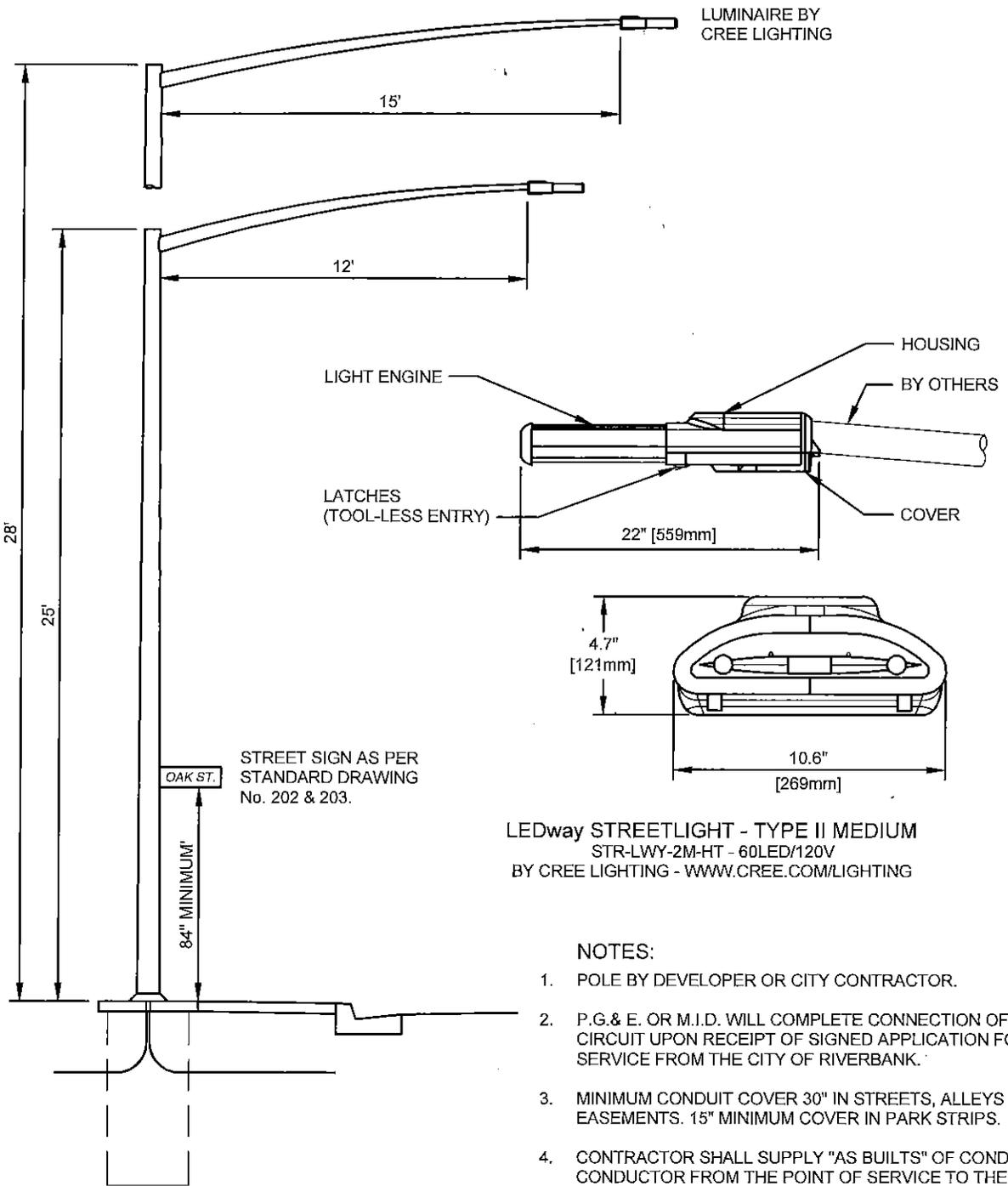
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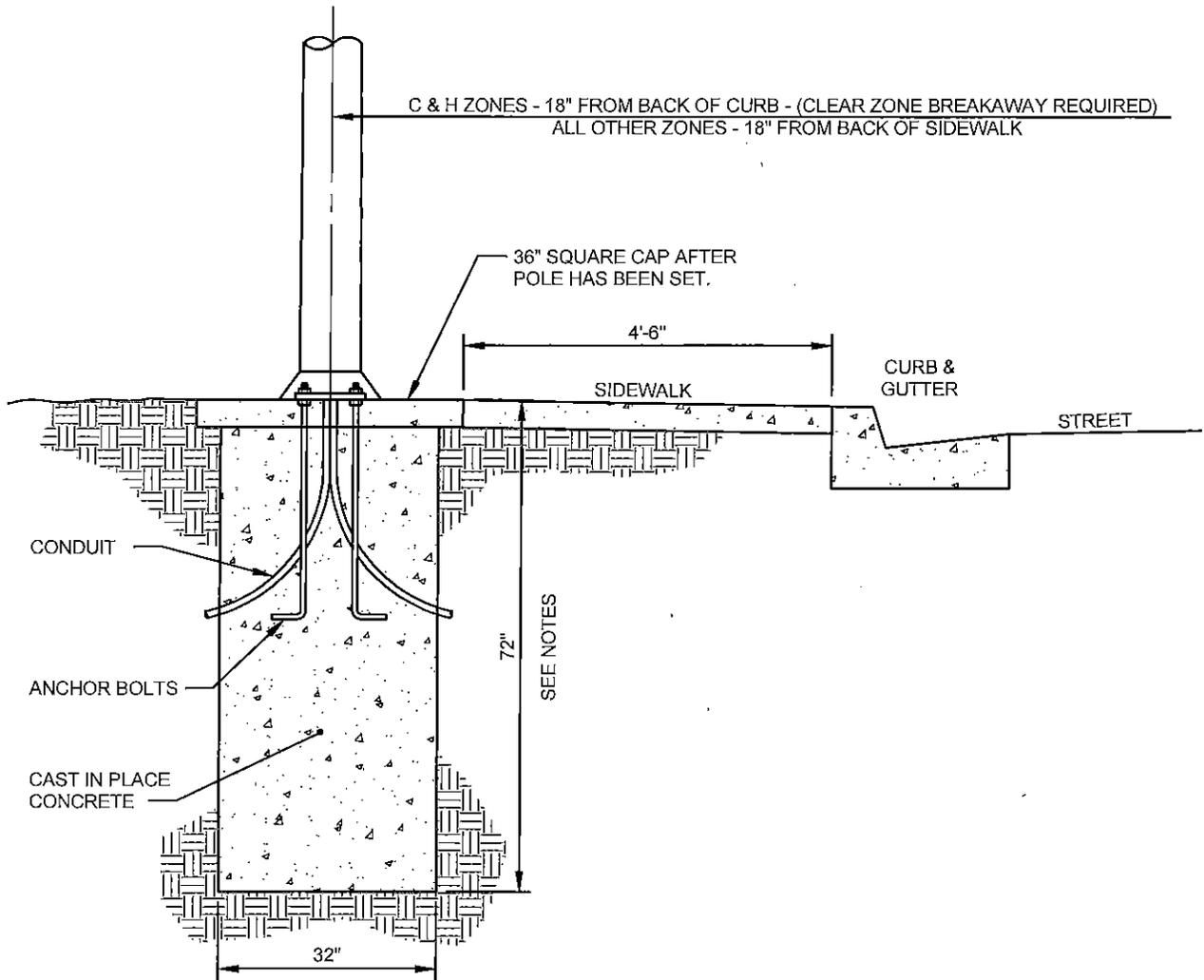
LEDway STREETLIGHT - TYPE II MEDIUM  
 STR-LWY-2M-HT - 60LED/120V  
 BY CREE LIGHTING - WWW.CREE.COM/LIGHTING

NOTES:

1. POLE BY DEVELOPER OR CITY CONTRACTOR.
2. P.G. & E. OR M.I.D. WILL COMPLETE CONNECTION OF 120V CIRCUIT UPON RECEIPT OF SIGNED APPLICATION FOR SERVICE FROM THE CITY OF RIVERBANK.
3. MINIMUM CONDUIT COVER 30" IN STREETS, ALLEYS AND EASEMENTS. 15" MINIMUM COVER IN PARK STRIPS.
4. CONTRACTOR SHALL SUPPLY "AS BUILTS" OF CONDUIT/ CONDUCTOR FROM THE POINT OF SERVICE TO THE ELECTROLIER.

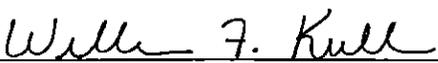
FOR POLE FOUNDATION REFERENCE  
 SEE STANDARD DRAWING No. 402.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h2 style="margin: 0;">LIGHTING STANDARD</h2>	
CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 6/09/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: LIGHTING	DRAWING NAME: 401.DWG	1-26-16	401



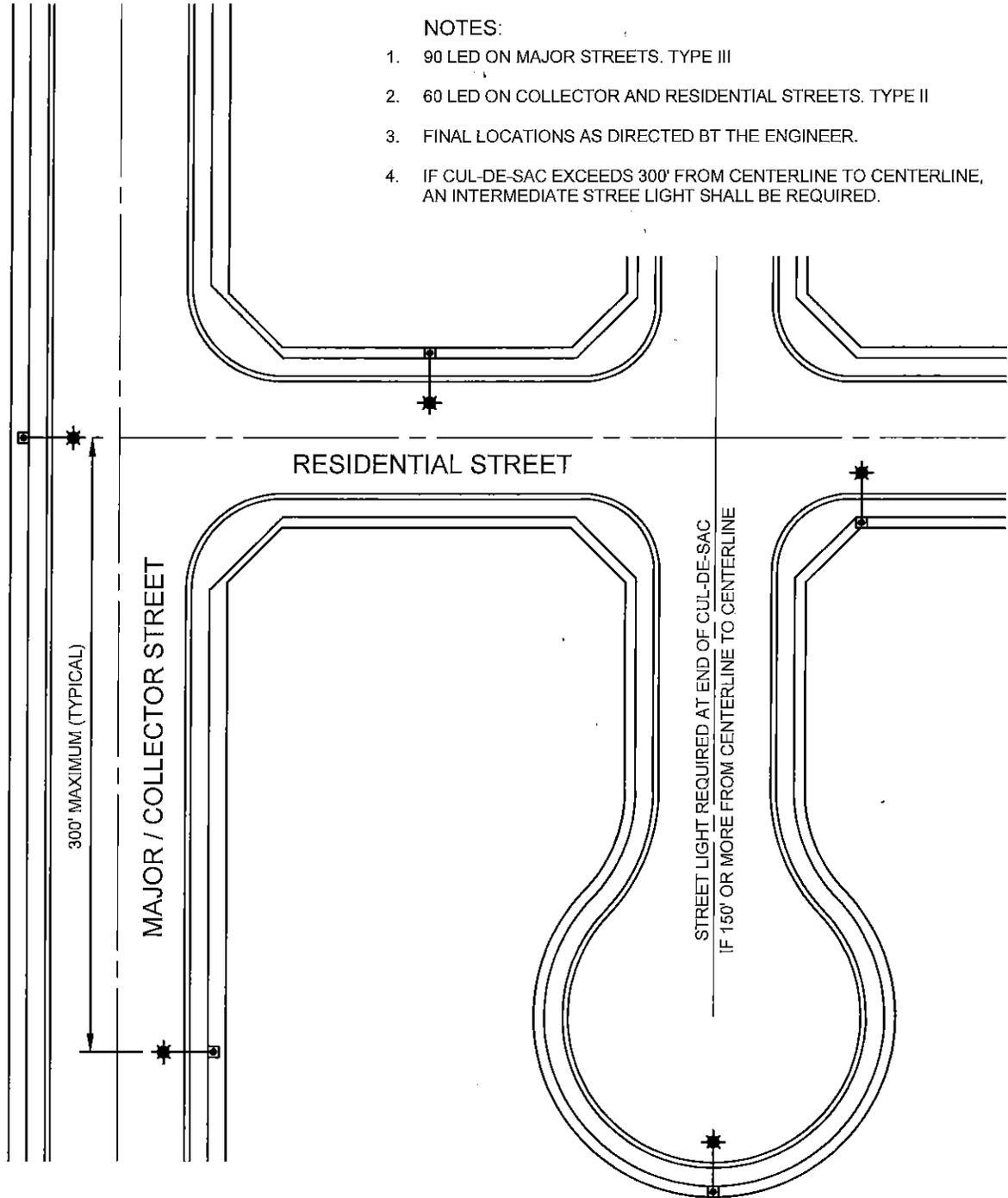
NOTES:

1. TYPICAL FOR 25' AND 28' POLES.
2. FOUNDATIONS MAY BE 36" SQUARE AND 60" DEEP.
3. CONCRETE TO BE PLACED AGAINST UNDISTURBED EARTH.
4. GROUND WIRE SHALL BE USED.

CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			LIGHTING POLE FOUNDATION	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 6/09/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: LIGHTING	DRAWING NAME: 402.DWG	1-26-16	402

NOTES:

1. 90 LED ON MAJOR STREETS. TYPE III
2. 60 LED ON COLLECTOR AND RESIDENTIAL STREETS. TYPE II
3. FINAL LOCATIONS AS DIRECTED BY THE ENGINEER.
4. IF CUL-DE-SAC EXCEEDS 300' FROM CENTERLINE TO CENTERLINE, AN INTERMEDIATE STREET LIGHT SHALL BE REQUIRED.



CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

STREET LIGHT  
LOCATIONS

DRAWN BY: GK	DATE: 6/09/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: LIGHTING	DRAWING NAME: 403.DWG	1-26-16	403

**City of Riverbank  
DESIGN STANDARDS**

**WATER**

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## SECTION 5: WATER

### 5.100 General

#### 5.101 Scope

These standards apply to all public water facilities designed for installation within a public right-of-way or PUE in the City, and are limited to mains and services 12" or less in diameter. Standards and requirements for larger sizes will be determined by the City Engineer on a case-by-case basis. In residential developments, on-site mains and hydrants for fire protection shall be public. Other on-site facilities, unless specifically noted in these Standards or as required as part of project approval, shall be private and shall be designed and constructed in accordance with the provisions of these Standards and the Uniform Plumbing Code, as adopted by the City.

### 5.200 Design Flow

#### 5.201 Flow Demand

Unless actual field measurements or metering data are available, the following water demands shall be used:

<u>Land Use</u>	<u>Unit Demand</u>	<u>Peaking Factors</u>	
		<u>Peak Day</u>	<u>Peak Hour</u>
Residential	285 gpcd	2.24	3.28
Commercial/Office	2,750 gpad (floor area)	2.24	3.28
Parking Lots	200 gpad	2.24	3.28
Industrial	(detailed information regarding industrial water demand to be submitted) (gpcd = gallons per capita per day ; gpad = gallons per acre per day)		

Per capita and density figures per Section 5.201 shall be used unless specific project information is available.

Fire flow for specific projects shall be based on the Insurance Services Organization (ISO) Guidelines for a Class I City, or as otherwise approved by the Stanislaus Consolidated Fire District. In lieu of the ISO guidelines, the following conservative minimum criteria may be used:

<u>Land Use</u>	<u>Fire Flow</u>
Low-Density Residential	1,000 gpm from each of 2 adjacent hydrants flowing simultaneously, or 2,000 gpm available
Multi-Family	1,500 gpm from each of 2 adjacent hydrants flowing simultaneously, or 3,000 gpm available at building service point (not simultaneously with hydrant flow).

Commercial	1,500 gpm from each of 2 adjacent hydrants flowing simultaneously, or 4,000 gpm available at building service point (not simultaneously with hydrant flow).
Industrial	Fire flow for industrial projects shall be based on a site-specific investigation using ISO guidelines. 4,000 gpm may be used for preliminary studies.

Fire flow for low-density residential areas can generally be obtained using the following guidelines for water main sizing:

- a) 12" mains –1/2 mile looped grid
- b) 8" mains –1/4 mile looped grid
- c) 8" looped distribution system (internal to ½ mi and ¼ mi grids mentioned above)

### **5.202 Design Pressure**

The system shall be designed to maintain a minimum residual pressure of 20 psi at the service point or fire hydrant under the worst case of either:

- Peak Day flow plus fire flow, or:
- Peak Hour flow

Calculations shall be based on actual flow tests performed by the Stanislaus Consolidated Fire District, or as otherwise approved by the City Engineer.

The Hazen-Williams formula should be used to calculate design flow, pressure loss, velocity and pipe diameter relationships. The coefficient of friction, "C", shall be 100 for pipes 6" and smaller, 120 for 8" and 10", and 130 for 12" and larger pipes. If losses due to fittings are calculated separately using equivalent length or other approved methods, a "C" of 130 may be used.

## **5.300 Pipe Design**

### **5.301 Minimum Size**

Minimum pipe sizing for public water mains shall be based on an approved Water Master Plan, regional modeling analysis, or similar document. Typically, these documents are prepared either at the Specific Plan or Tentative Mapping phases of a project, and are intended to provide sizing information for a relatively large region.

For new public water mains in areas that are not already covered by a regional water study or analysis (i.e. smaller "infill" projects), minimum sizing for public water mains shall be based on requirements as described in Section 5.200, or as otherwise directed by the City Engineer.

New onsite private water main sizing shall be based on the required fire flow and pressure, as described in section 5.200.

In addition to the above requirements, minimum pipe sizes for new water mains shall be as per the following table:

<u>Location/Use</u>	<u>Min. Size</u>
Fire hydrant laterals, max. length =100'	6"
Public water mains –1/2 mi. looped grid	12"
All other public water mains	8"
Residential dead end with fire hydrant*	8"
Residential dead end with no fire hydrant*	6"

\* Looping of water mains is typically required on all projects, unless specifically approved otherwise by the City Engineer.

### **5.302 Vertical Alignment**

There are no slope requirements for water mains. However, inverts of new public water mains shall be shown on the drawings. Combination air & vacuum release valves shall be placed at all substantial high points in newly constructed water mains.

Minimum cover on water mains shall be 36". In special circumstances, minimum cover may be reduced below 36" using special backfill and/or special pipe materials. The requirements for reduced cover below 36" shall be considered on a case-by-case basis, and approved by the City Engineer.

When practical, new water mains shall be installed above wastewater or storm drain pipes with a minimum vertical clearance of 1' at crossing locations. However, if this is not a practical option, water main crossings shall be constructed using special construction in accordance with DHS Guidelines. Refer to Section 5.306 for vertical separation requirements for new public water mains.

### **5.303 Horizontal Alignment**

Public water mains shall be installed within street rights of way unless an easement installation is specifically approved by the City Engineer. Alignment shall be parallel to the street centerline wherever possible.

Curved water mains may be constructed provided that joint deflections or pipe curvature does not exceed the pipe manufacturer's recommendations.

See Section 5.306 regarding horizontal separation requirements from other utilities.

### **5.304 Pipe Materials**

The following pipe materials shall be used for water main construction, and shall conform to the appropriate American Water Works Association (AWWA) standards (latest revision):

Pipe Material:

1. Polyvinyl Chloride (PVC) as per AWWA C900, Class 150 minimum.
2. Ductile Iron Pipe (DIP) as per AWWA C151, Class 50, with cement mortar lining in accordance with AWWA C104 and polyethylene encasement in conformance with AWWA C105.

These approved pipe materials apply to water mains up to 12" in diameter. Service materials shall be polyethylene tubing CTS or copper. The material for new water mains greater than 12" shall be determined on a case-by-case basis as approved by the City Engineer.

### **5.305 Fittings and Thrust Blocking**

Pipe fittings shall conform to AWWA C110 for flange fittings and AWWA C111 for mechanical joint fittings, and shall be cast iron or ductile iron, class 150. Joints in fittings and adapters shall be of the type with a seal ring groove for positively holding the rubber gaskets in place against the water pressure, and shall be similar to the specified joint for the pipe used.

Thrust blocking shall be installed at all bends, tees, dead ends, and changes in pipe diameter, and installed per City Standard Details. Thrust blocking shall be placed so that the joints of the pipe and fittings will be accessible for repair.

### **5.306 Separation Requirements**

Public water mains shall have the required separation, both horizontal and vertical, from other utilities as per the current California Department of Health Services (DHS) Guidelines, as adopted by the City of Riverbank. The following are excerpts from the DHS Guidelines for separation requirements of public water mains from other utilities:

- 10' horizontal separation, and 1' vertically above parallel sanitary sewer lines, or pipelines carry other hazardous fluids (fuel, industrial wastes, etc.)
- 4' horizontal separation, and 1' vertically above parallel storm drain lines or disinfected tertiary recycled water.
- 4' horizontal separation, and 1' vertically above parallel new supply lines conveying raw water to be treated for drinking purposes.
- The vertical separation mentioned above for parallel pipelines does not apply if an 11' horizontal separation is maintained.
- Water mains crossing other utilities shall be 1' vertically above the other utility. If this is not attainable, then special construction shall be required in accordance with the April 14, 2003 guidance memorandum from DHS contained in the Appendix of these Standards.

The aforementioned requirements are excerpts from the DHS Guidelines, and are listed only as a convenience for common situations in water main layout and design. Refer to the Appendix for the April 14, 2003 memorandum from DHS for additional separation requirements for water mains and non-potable pipelines.

All separation requirements indicated above and in the April 14, 2003 DHS memorandum are to the outside edges of the pipe. If these separation requirements are not attainable, special construction shall be required in accordance with DHS guidelines, and as approved by the City Engineer.

## **5.400 Services**

### **5.401 General**

Each individual lot or parcel shall have a separate water service complete from the water main to the property. Larger parcels with multiple buildings may require additional services, as approved by the City Engineer. All water services from the public water main shall be metered in accordance with the standards contained herein, with the exception of dedicated fire service lines.

### **5.402 Domestic Services**

The minimum size service is 1 inch polypropylene, and is to be installed in accordance with City Standard Details. Larger diameter services shall be per Standard Plan 406 (1 ½" & 2") and Standard Plan 407 (4" & larger). The size of service is to be determined by the design engineer for the parcel/land use being served, subject to requirements contained in these Design Standards.

Backflow prevention devices shall be provided as specified in these Standards, and as per the appropriate Standard Detail. Refer to Section 5.404 for additional information regarding backflow prevention.

All domestic service meter boxes shall be placed outside of driveways. Exceptions to this rule will be granted only when it is not feasible or practical to place service meter boxes outside driveways. Such exceptions will require specific approval by the City Engineer.

The preferred horizontal separation of water services and sewer laterals is 10'. However, sewer laterals and water services may have a minimum of 5' separation given prior approval by the City Engineer.

### **5.403 Fire Services**

Private on-site fire protection systems include hydrants and building sprinkler systems, and shall be installed per the requirements of the City Building Code, these Standard Specifications, and the requirements of the Stanislaus Consolidated Fire District. Fire and domestic systems shall be kept separate on-site, and shall be valved such that either system can be shut-down without affecting the other. These Standards cover requirements imposed by the Public Works Department in its role as a water utility, mainly as they apply to maintenance and backflow prevention required by State Law. In addition, the Stanislaus Consolidated Fire District may have other design requirements pertaining to fire protection.

1. **General:** All on-site improvements shall conform to City Standards for public water mains, unless additional design or construction requirements are stipulated by the Stanislaus Consolidated Fire District. In addition, automatic sprinkler systems shall be installed in accordance with NFPA #13, or as required by the Stanislaus Consolidated Fire District.
2. **Backflow Prevention:** All private fire systems shall have backflow prevention as described in section 5.404.
3. **Fire Hydrants:** refer to Section 5.502 of these Standards
4. **Domestic Services:** It is preferable to keep domestic services separate from fire systems. However, given the approval of the City Engineer, domestic services may be taken from the fire service lateral provided that an additional backflow prevention device is installed and sufficient valving is in place to isolate the two systems.
5. **Fire District Approval:** The location and layout of all fire protection system components including, but not limited to: piping, fire department connections, indicator valves, detector check valves, booster pumps, fire hydrants and service risers shall be approved by the Stanislaus Consolidated Fire District.
6. **Fire Department Connections (FDC) and Post-Indicator Valves (PIV):** FDC's and PIV's shall be installed as per City Standard Details, in locations approved by the Stanislaus Consolidated Fire District.
7. **Inspection:** All private fire systems shall be inspected by the Fire District prior to backfill of trench. Testing shall also be performed in accordance with current NFPA standards, and as required by the Fire District, prior to acceptance.

#### **5.404 Backflow Prevention**

**General:** Backflow prevention devices shall be installed at new connections to the public water main as specified in these Standards. All backflow prevention assemblies shall be approved by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC Foundation), and installed according to the manufacturer's specifications.

**Domestic Services:** New water services for potable uses, as well as landscape irrigation uses, shall require installation of a Reduced Pressure Principle Backflow Prevention Assembly (RPBP) as stated herein. Requirements for fire service lines are listed in a separate topic within this section.

**Residential Uses:** An RPBP, installed in accordance with City Standards, shall be required for water services that serve residential uses in each of the following cases:

- All services for multi-family dwellings of 2 units or more
- Services for single family dwellings of 3 stories or more.
- Separate water services used specifically for landscape irrigation in new residential developments.
- At service connections to the public main for private water systems serving 2 or more residential units.
- Water services for residential lots that use water from sources other than the City of Riverbank system, including reclaimed water, irrigation water (O.I.D., M.I.D.), or private on-site wells that have not been abandoned.
- Residential uses not specified above where a high hazard for contamination of the public water main is present, as deemed necessary by the City Public Works Department.

1" water services for standard single-family dwellings in the City will typically not require installation of a separate backflow prevention device, unless one of the aforementioned conditions is met.

**Non-Residential Uses:** All domestic and landscape water services for new commercial, industrial, public, institutional, or other non-residential uses shall require installation of an RPBP in accordance with City Standards.

**Fire Services:** Dedicated fire service lines 2" and under, including those serving single-family residences, shall require installation of an RPBP in accordance with City Standard Details.

Dedicated fire service lines 3" and above shall require installation of a Double Detector Check Assembly (DCDA) with Outside Stem and Yoke (OS&Y) valves in accordance with City Standard Details. This requirement includes private on-site water systems serving only fire hydrants.

RPBP's with detectors shall be required for fire service lines in the following instances:

- a) Systems in which chemical additives may be used such as antifreeze or fire suppressants
- b) Any building where a high hazard exists, as required by the City Engineer.

## **5.500 Valves, Fire Hydrants, and Other Appurtenances**

### **5.501 Valves**

Valves on mains shall be spaced and located in conformance with the following criteria:

- Valves shall have a minimum spacing of 500 ft.
- Valves shall be placed on each side of a water main crossing a separate right-of-way. Examples would include, but not be limited to: Canal crossings, aqueduct crossings, Caltrans highway crossings, and railroad crossings.
- At tees and crosses in public mains, valves shall be required at all legs. If there are minimal connections in between valves, valves may be eliminated at certain legs given the approval of the City Engineer.
- Private services extending from a tee in a public main shall require a valve on the service leg of the tee, and do not require valves on public main legs of the tee.
- At ends of mains or on stubs such that future extensions will not interrupt service.
- At fire hydrant laterals

### **5.502 Fire Hydrants**

Fire hydrants shall be installed per City Standard Details. Where the main is located within 15 ft. of the hydrant location, the valve on the hydrant lateral shall be located at least 10 feet offset from the hydrant station and the lateral installed with 90 deg. elbows.

Fire hydrants shall be supplied from the largest available main, and shall be fed from 2 directions unless specifically approved otherwise by the City Engineer and the Stanislaus Consolidated Fire District. The exception to this would be hydrants placed at the end of cul-de-sacs.

Public fire hydrant spacing and distribution shall be as follows:

- 300 feet maximum spacing in high density, commercial, or industrial zoning.
- 500 feet maximum spacing in low density residential areas
- A fire hydrant shall be located within the bulb of all cul-de-sacs
- Hydrants shall be spaced as described above on both sides of an arterial street. On streets that are separated from buildings by a 6' restrictive wall, hydrants shall be placed at all street intersections with a maximum spacing of 1000' on both sides of the street.

Hydrant locations on all new projects, both public and private, shall be approved by the Stanislaus County Consolidated Fire District.

### **5.503 Blow-offs and Temporary Connections**

Blow-offs per Standard Plan 511 shall be located at the ends of all dead-end mains, or as otherwise required by the City Engineer.

The location and type of temporary connections to the public main shall be approved by the City Engineer, and be installed as per the appropriate Standard Detail. The meter/backflow assembly shall be located to provide optimal flow for main flushing and to minimize disruption of public traffic upon device removal. The meter/backflow assembly is not required on new systems with less than 150 feet of 6" or smaller pipe.

### **5.504 Water Sampling Stations**

Sampling stations shall be installed in new developments at the discretion of the City Engineer, and shall be constructed as per Standard Detail 512.

### **5.505 Tracer Wire**

All non-conductive water mains shall be installed with tracer wire in accordance with the Standard Details. The locating wire is to be laid at the top of the pipe, and bare wire shall not touch valves or fittings.

**City of Riverbank  
CONSTRUCTION STANDARDS**

**WATER**

## **SECTION 5: DOMESTIC WATER FACILITIES**

**General:** Domestic water facilities shall be furnished and installed in accordance with these Construction Specifications and as shown on the plans.

**Payment:** Full compensation for furnishing all labor, materials, tools, equipment, excavating, backfilling, testing, disinfecting and flushing and for doing all work involved in installing the water system shown on the plans and as specified in these Construction Specifications shall be included in the appropriate contract item and no additional compensation will be allowed therefore.

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## **5.100 Materials**

### **5.101 Water Main Pipe**

Water main pipe 4" through 12" shall be either ductile iron pipe (DIP) conforming to the requirements of AWWA Standard C-151, Class 51 (4") or Class 50 (6" thru 12") with cement-mortar lining or polyvinyl chloride (PVC) pipe conforming to the requirements of AWWA Standard C-900, Cast Iron (CI) O.D. Class 150 (DR18) with elastomeric gasket (solvent weld is unacceptable). DIP shall have "Tyton" joints, "Tyseal" joints, or approved equal.

In addition to the above, the following requirements apply to all pipe joints:

- Solvent welded PVC is not allowed
- Mechanical joints are only allowed at fittings
- Cast-iron repair/adaptor couplings may be used where approved by the City Engineer
- Water service lines shall be per Section D of these specifications

### **5.102 Miscellaneous Fittings**

Pipe fittings shall conform to AWWA Standard C110, latest revision, and shall be of cast iron, match the make of pipe used, and be as specified by the manufacturer for use with the pipe specified. Joints in fittings and adapters shall be of the type with a seal ring groove for positively holding the rubber gaskets in place against the water pressure and shall be similar to the specified joint for the pipe used.

All cast iron fittings shall be coated outside and inside with a bituminous coating as per Section 10-3 of AWWA Standard C110, latest revision.

Flanged fittings are allowed, and shall be used where shown on the plans. Mechanical joint fittings are allowed provided the Contractor follows proper assembly procedures.

Not all pipe fittings required to do the work are shown on the plans. The Contractor shall furnish and install all fittings as necessary to accomplish grade and adjustment changes in conformance with the pipe manufacturer's recommendations and as approved by the Engineer.

### **5.103 Valves**

Valves 2" through 12" valves shall be resilient seated gate valves or butterfly valves. Resilient seated gate valves shall be Mueller RS, American Darling CRS-80, Clow RS or approved equal and shall conform to the requirements of AWWA Standard C509, latest revision.

Butterfly valves shall be MH 450, Mueller Linesal III, Clow 450 or approved equal and shall conform to the requirements of AWWA Standard C504, latest revision.

All valves shall open left (clockwise to close) and be equipped with a 2-inch AWWA operating nut. All valves shall be coated for buried service per AWWA Standards. All valves shall be Class 150 minimum.

Valves requiring operating wrenches exceeding 2 feet in length shall have extensions and guides as provided by the valve manufacturer installed in the valve riser.

The valve boxes shall be Christy G5 with cast iron cover and extensions and shall conform to City of Riverbank Standard Details. Cover shall have a free fit in the box. All valve boxes shall be adjusted to grade by the paving contractor as per the appropriate Standard Plan.

#### **5.103 Service Lines and Fittings**

Service lines and fittings shall be polyethylene CTS or copper for services 3 inches and smaller and ductile iron or polyethylene for services 4 inches and larger. All water services shall conform to the requirements shown on the appropriate Standard Details.

#### **5.104 Fire Hydrants**

Fire hydrants shall be furnished and installed in accordance with the Standard Details.

#### **5.105 Backflow Prevention Devices**

Backflow prevention devices including double detector checks and reduced pressure principle devices, shall be of a type approved by University of Southern California Foundation for Cross-Connection Control and Hydraulic Research Foundation (USC Foundation), and installed according to the manufacturer's specifications.

### **5.200 Installation**

Water main pipe shall be installed in accordance with the manufacturer's recommendations, City Standard Plans, these Special Provisions and the improvement plans.

#### **5.201 General Requirements:**

Water mains shall be installed with due regard for protection from sanitary hazards, including current spacing and crossing requirements of the California Administrative Code, Title 22. Minimum pipe cover shall be 3 feet.

Thrust blocking shall be installed per City Standard Details at all bends, tees, dead ends, and changes in pipe diameter. Thrust blocking shall be placed so that the joints of the pipe and fittings will be accessible for repair.

The Contractor shall also take the necessary precautions to protect workers from asbestos fiber hazards. Reference is made to AWWA Manual M-16, "Work Practices for Asbestos-Cement Pipe." Use of any "non-recommended work practices" such as cutting any AC pipe with abrasive disc-dry tools is strictly forbidden.

Reference is made to AWWA Manual M23 "PVC Pipe - Design and Installation" and AWWA Standards C603 "Installation of Asbestos Cement Water Pipe", C600 "Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances", and C601 "Disinfecting Water Mains", and applicable California Department of Health Waterworks Standards.

The pipe must be kept exceptionally clean during installation since the use of calcium hypochlorite tablets prevents flushing before disinfection.

The City takes no responsibility for water quality downstream of temporary connections to the water system.

Hydrants installed but not in service shall be wrapped with burlap and wired and remain so until such time as the hydrants are in service. Holes may be cut in the burlap in order that the hydrant may be used for construction water.

#### **5.202 Inspection**

All water lines shall be inspected for proper installation by the City Engineer, prior to backfilling of trenches. If work is to be completed after normal business hours, Contractor shall call 869-3671 to arrange for an inspection to be made after normal business hours.

#### **5.203 Disinfection**

The preferred method of disinfection is continuous feed injection with a 24 hour contact time. The continuous feed method may be delayed until completion of the pressure test. The continuous feed method shall provide a dose of 100 parts per million.

If calcium hypochlorite tablets are used, the number shall be in accordance with the following table and disinfection shall be prior to pipe flushing, and after pressure testing.

Length of Section (ft)	Diameter of Pipe (in.)			
	6	8	10	12
13 or less	4	6	8	12
18 or 20	4	8	12	16

The table is based on 5 gram tablets per ounce (3.25 grams available chlorine per tablet), which is equal to 100 parts per million.

Residual chlorine ppm will be verified prior to flushing the line, at the direction of the City Engineer.

#### **5.204 Connections to Existing Water Mains**

Under no circumstances shall anyone other than a representative of the City of Riverbank Public Works Department open or close any valve in the existing City water system. Requests for valve operation shall be made to the Engineer at least 48 hours in advance. In cases where customer service will be interrupted, the request shall be made at least 48 hours in advance and the Contractor shall make satisfactory preparation for the planned work to minimize the interruption. The procedure shall be reviewed and approved by the City prior to the start of construction.

#### **5.205 Connection Details**

Shall be made per the appropriate Standard Detail(s). The number and location of temporary connections with meter assembly shall be approved by the City Engineer.

Upon request, the City will open its valve to the new pipe after the mains and services have been installed and backfilled and thrust blocks have cured for 48 hours.

#### **5.206 PVC Pipe**

Shall not be bent more than as recommended by the manufacturer. Joint deflections are not allowed. The Contractor shall take extra precautions to follow the pipe manufacturer's recommendations regarding rubber rings, fittings, tapping and installation practices.

#### **5.300 Testing:**

Official test for acceptance shall normally be conducted after compaction has been completed.

#### **5.301 Pressure Test**

All piping shall be tested to a pressure of 150 pounds per square inch (psi). All material, equipment and labor for testing shall be approved by the City prior to testing and shall be furnished without cost to the City of Riverbank. The system will be tested as directed by the Engineer as a unit or in sections not to exceed 1,000 lineal feet. Each unit tested shall successfully meet the requirements herein specified. The water services shall be considered as part of the main for test purposed and no allowance for additional leakage shall be made.

Unless otherwise directed by the Engineer, testing shall be accomplished by opening hydrants and service line cocks at the high points of the system and blowoffs at all dead ends. The valve controlling the admission of water into the section of pipe to be tested should be opened slowly and fully before closing the hydrants or blowoffs. After the system has been filled with water and all air expelled, all the valves controlling the section to be tested shall be closed, and the line remain in this condition for a period of not less than 24 hours.

The pipe shall then be refilled, if necessary, and subjected to a maintained pressure of not less than 150 pounds per square inch (psi) for a period of one hour.

Allowable leakage shall not exceed a rate in gallons per hour per 1000' lineal feet of pipeline of 0.25 multiplied by the pipe diameter in inches.  
(gph per 1000' < 0.25 \* pipe dia).

All leaks that are found shall be immediately corrected and the system again subjected to the same test.

All repairs of any damage to the pipes and their appurtenances, or to any other structures, resulting from or caused by these tests, shall be performed by the Contractor as the Engineer may direct, all without cost to the City of Riverbank.

### **5.302 Bacteriological Test**

After the successful completion of the pressure tests, bacteriologic samples shall then be taken at locations and times specified by the City Engineer. Bacteriologic testing shall be performed at the expense of the contractor and will comply with the current AWWA standards. See AWWA website for current standards and requirements.

### **5.303 Final Connections to Existing Mains**

After notification of passing bacteriological tests, the connections to the existing mains shall be completed by the Contractor per Standard Plan 507-B. Requests for City valve operation shall be made per these specifications.

Removal of the meter assembly and replacement with the flanged spool shall be accomplished in a sanitary manner. The nearest valves on the newly installed main shall be closed to minimize the amount of water that will enter the excavation. No water shall be allowed to reenter the main.

As each connection is made, the main shall be flushed such that the flow is away from the existing water system. Each connection shall be flushed in this manner until the entire new water system is flushed, all under the direction of the Engineer. Burlap wrapping shall be removed from all hydrants. At this point, the City will take over operation of the water system. The contractor will be responsible for the cost of repairing any damage to the system until acceptance by the City Council.

#### **5.304 Backflow Certification**

All backflow prevention devices installed shall be certified and tested in accordance with current regulations of the California-Nevada Section of the American Water Works Association (AWWA). Certification shall be provided to the City Public Works Department prior to acceptance of new backflow prevention devices.

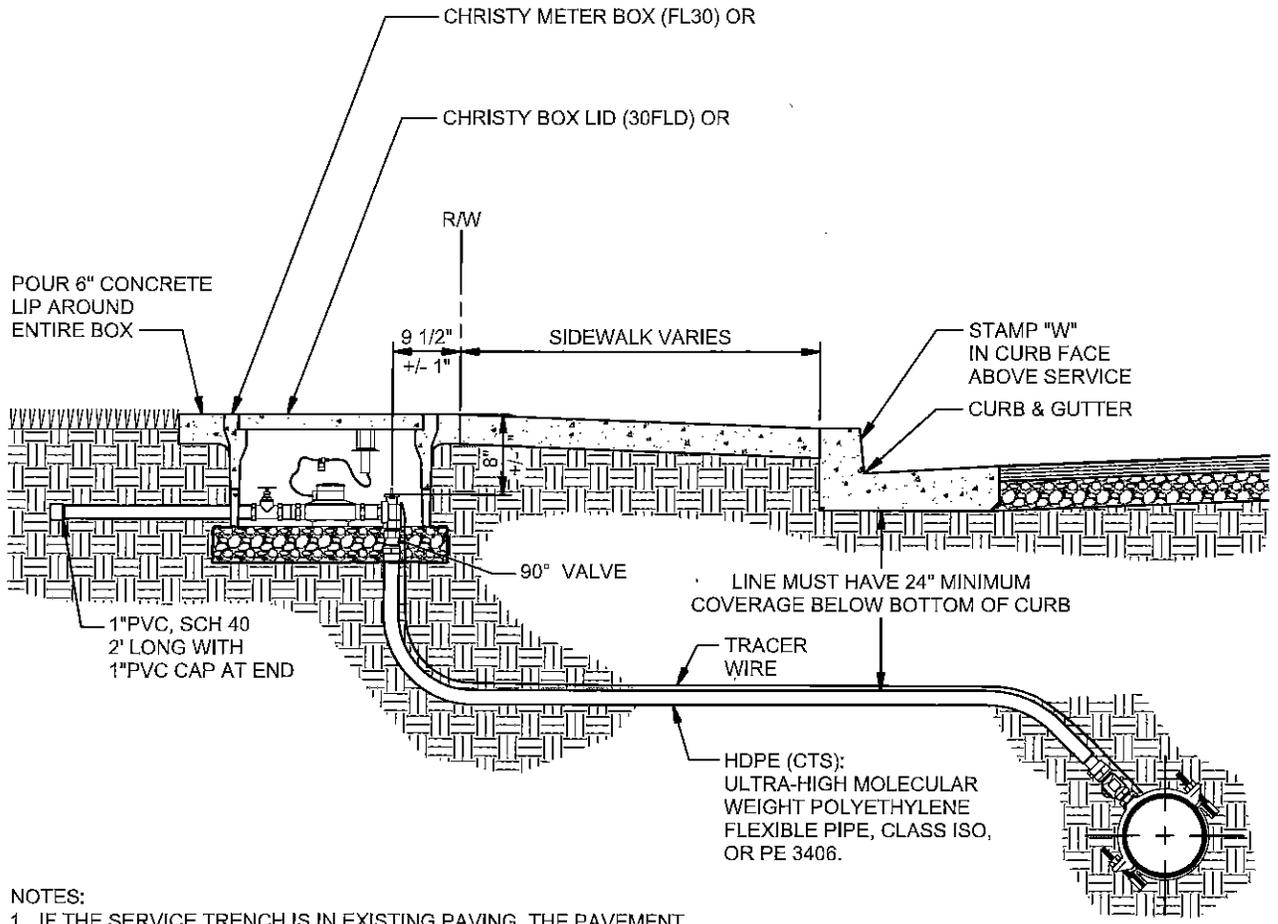
In addition, the location of any backflow prevention device shall be field verified with the City Public Works Department, or their appointed representative, prior to installation.

**City of Riverbank  
STANDARD PLANS**

**WATER**

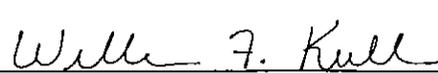
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503	1" Water Service Meter Box Location
504	1" Water and Fire Service Residential
505	2" Water Service
506	Water Service 4" and Larger
507	Fire Service Double Detector Check Valve
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- NOTES:
1. IF THE SERVICE TRENCH IS IN EXISTING PAVING, THE PAVEMENT SHALL BE REPLACED AS PER SPECIFICATIONS FOR MAIN LINE TRENCH.
  2. CONTRACTOR/OWNER SHALL BE RESPONSIBLE FOR DAMAGE TO THE CURB, GUTTER AND SIDEWALK, INCLUDING DRAINAGE FROM SETTING THE TRENCH, IF THEY ARE INSTALLED PRIOR TO TRENCHING.
  3. CURB, GUTTER AND SIDEWALK TO BE INSTALLED AFTER WATER SERVICE INSTALLATION, UNLESS OTHERWISE NOTED.
  4. SERVICE LINE SHALL BE A MINIMUM OF 24" BELOW BOTTOM OF CURB.
  5. ALL FITTINGS TO BE BRASS.

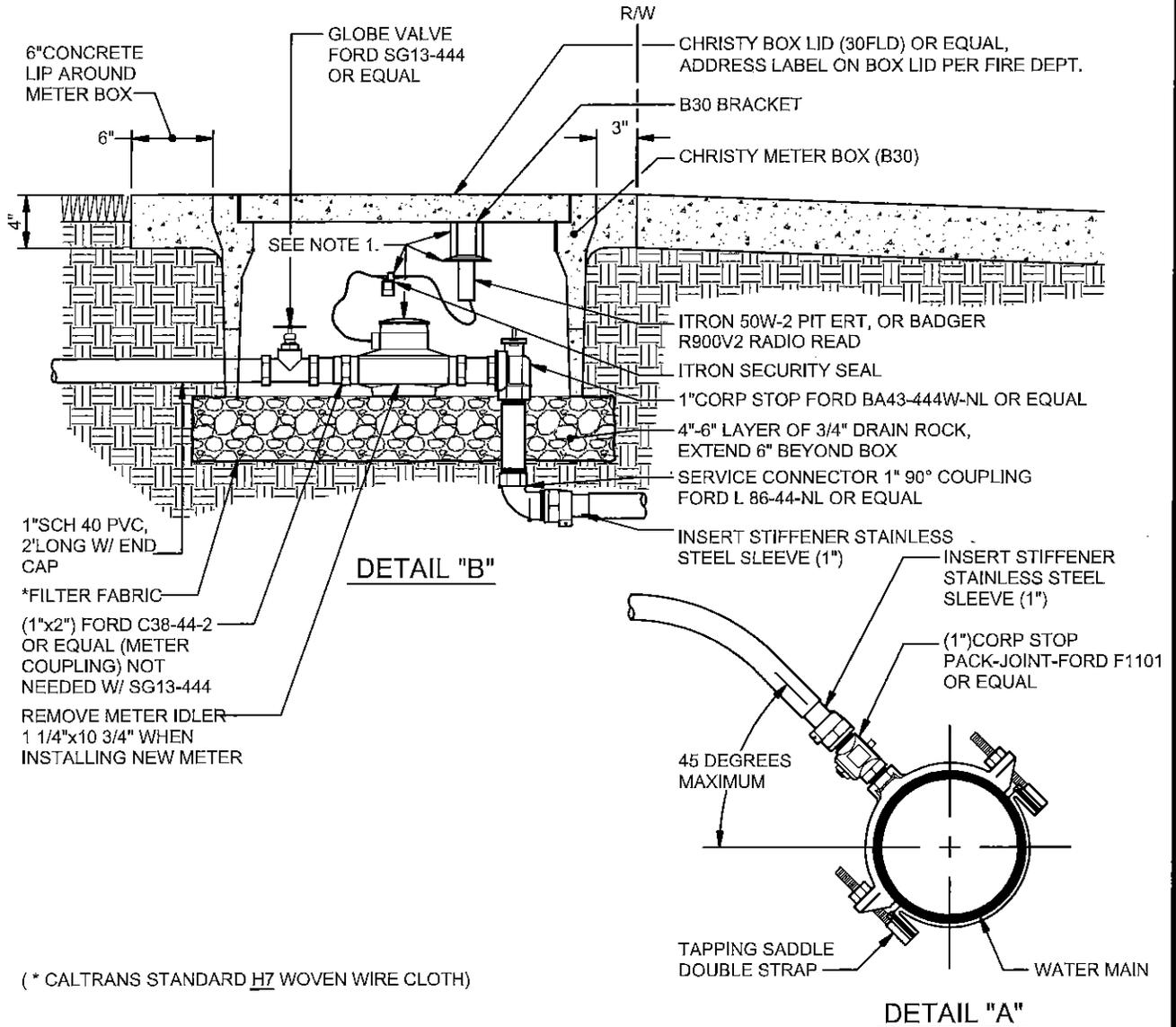
REFER TO (STD 502)

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>NEW 1" WATER SERVICE</b>  <b>RESIDENTIAL</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 501.DWG	9-23-14	501

VENDOR:  
 CONTACT THE WATER SUPERVISOR  
 FOR VENDOR INFORMATION:  
 CITY OF RIVERBANK  
 6707 THIRD ST (MAILING)  
 2901 HIGH ST  
 RIVERBANK, CA 95367  
 PHONE (209)869-7128

METER INFORMATION:  
 1"BADGER METER MODEL 55  
 ADE 67 DIAL CUBIC FEET

- NOTES:
1. CONTRACTOR/OWNER TO FURNISH AND INSTALL NEW 1" WATER METER, SENDING UNIT, BRACKET AND SECURITY SEAL PER METER INSTALLATION MANUALS. REFER TO ATTACHED DETAILS.
  2. CITY TO INSPECT INSTALLATION OF METER AND SENDING UNIT, VERIFY METER NUMBER TO HOUSE ADDRESS PRIOR TO HOUSE OCCUPANCY.
  3. CONTRACTOR TO TAKE SPECIAL CARE AS NOT TO CROSS THREAD BRASS FITTINGS ONTO PLASTIC METER. THIS WILL DAMAGE THE METER. PLEASE CONTACT THE PUBLIC WORKS DEPARTMENT AT (209)869-7128, IF YOU HAVE ANY INSTALLATION QUESTIONS.



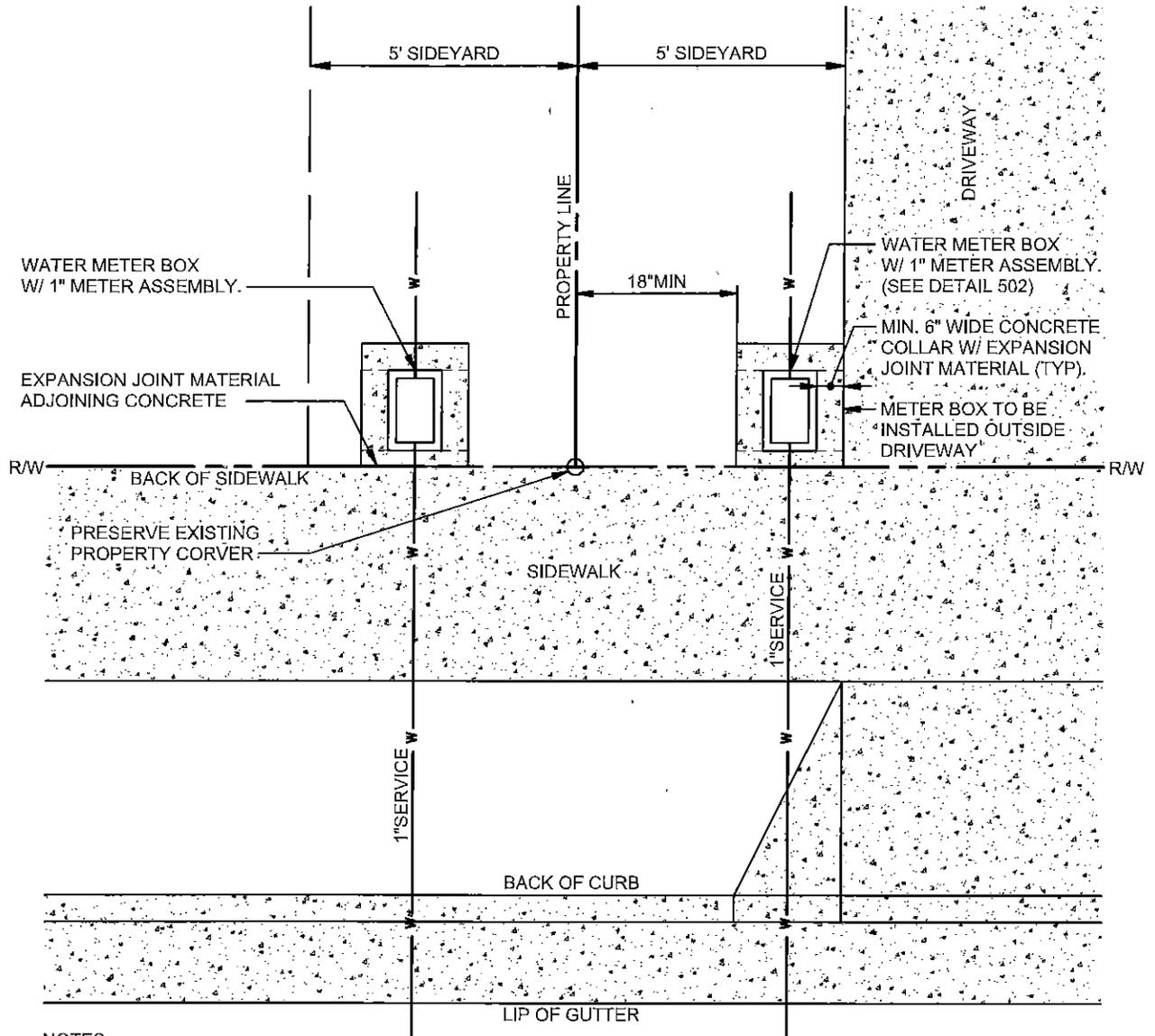
CITY OF RIVERBANK  
 DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
 CITY ENGINEER - WILLIAM F. KULL

NEW 1" WATER SERVICE  
 RESIDENTIAL

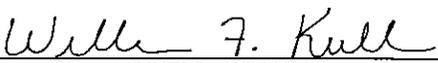
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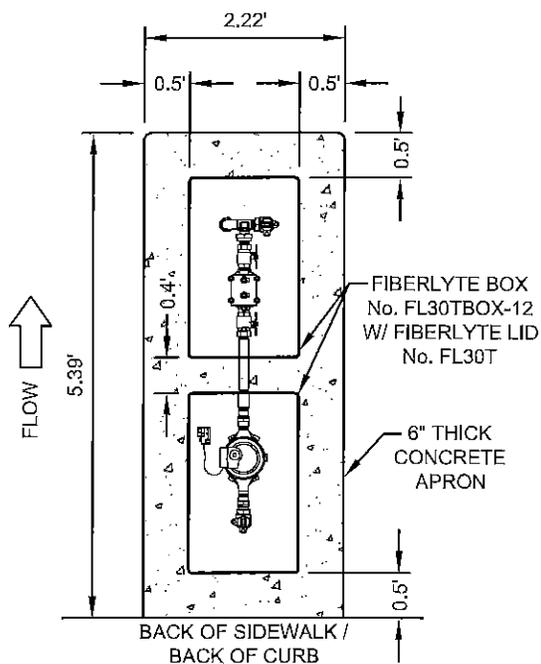
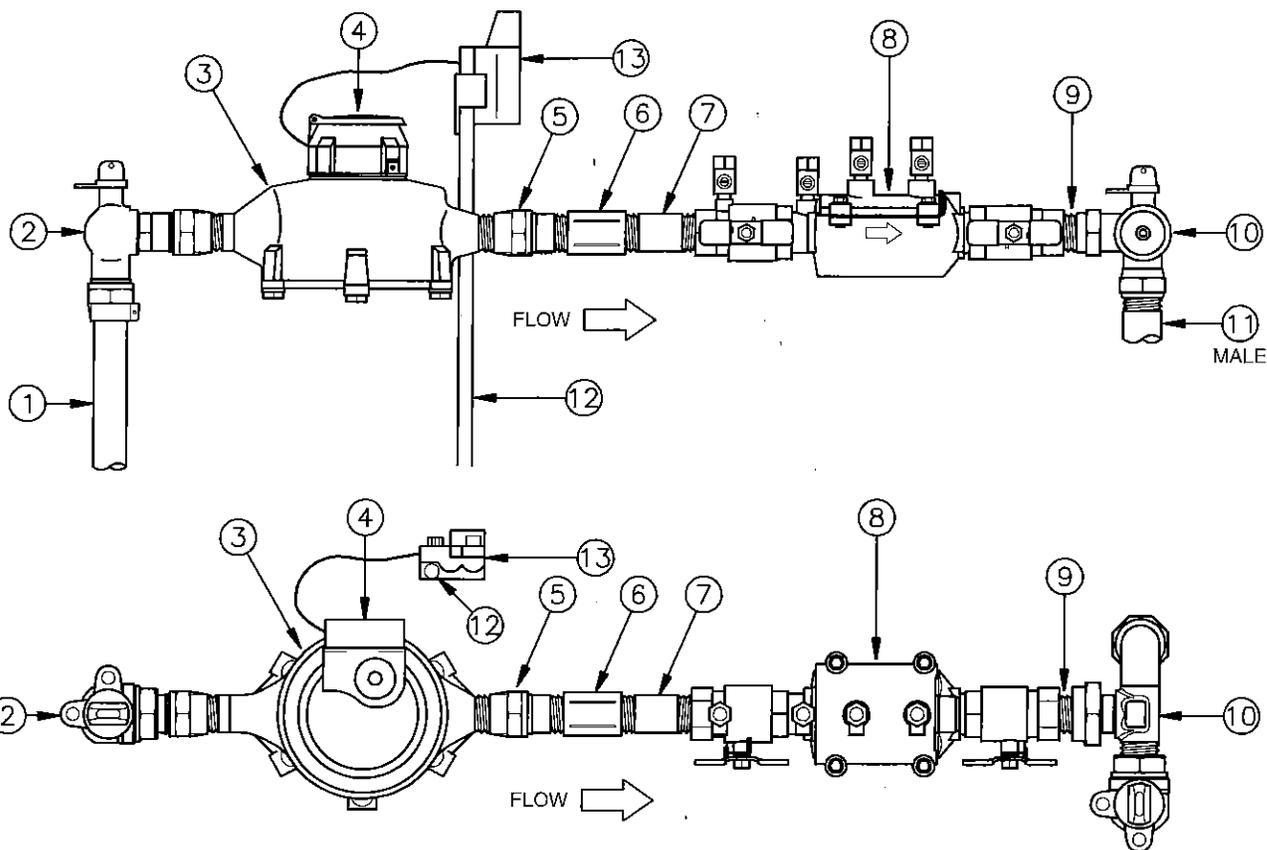
ADOPTED BY THE CITY COUNCIL: 9-23-14	DRAWING NO. 502
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**NOTES:**

1. THE PREFERRED LOCATION FOR THE NEW RESIDENTIAL WATER SERVICE IS 18" TO 5 FEET OFF THE PROPERTY CORNER AND ON THE OPPOSITE SIDE OF THE LOT FROM JOINT TRENCH SERVICES (CABLE, GAS, ELECTRIC PHONE, AND SEWER). HOWEVER, THIS STANDARD LOCATION MAY BE SHIFTED FURTHER FROM THE PROPERTY LINE AS NECESSARY TO AVOID CONFLICTS WITH OTHER UTILITIES.
2. IN NO CASE SHALL A WATER SERVICE BOX BE LOCATED WITHIN DRIVEWAY, OR WITHIN OTHER AREAS OF ONSITE CONCRETE (i.e. SLABS, SIDEWALKS, DECORATIVE). EXCEPTIONS TO THIS RULE WILL BE GRANTED ONLY WHEN IT IS NOT PRACTICAL OR FEASIBLE TO KEEP THE SERVICE BOX OUT OF THE DRIVEWAY, AND SHALL REQUIRE SPECIFIC APPROVAL BY THE CITY ENGINEER. SERVICES WITHIN DRIVEWAYS, IF ALLOWED, WILL REQUIRE A TRAFFIC RATED BOX AND CAST IRON LID.
3. THE CONTRACTOR IS TO PRESERVE ALL PROPERTY CORNERS. DAMAGED OR REMOVED CORNERS WILL REQUIRE REPLACEMENT BY A LICENSED LAND SURVEYOR, AT THE CONTRACTOR'S EXPENSE.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>1" WATER SERVICE</b>  <b>METER BOX LOCATION</b>	
 CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY:	DATE:	SCALE:	<b>9-23-14</b>	
GK	7/21/15	NTS	<b>DRAWING NO.</b>  <b>503</b>	
REVISIONS:	SECTION:	DRAWING NAME:		
NONE	WATER	503.DWG		



**LEGEND**

1. 1" CTS (POLY PIPE) SUPPLY LINE FROM WATER MAIN.
2. FORD 1" ANGLE BALL VALVE - MODEL BA43-444W-NL.
3. BADGER METER - MODEL 55, 1" RECORDALL COLD WATER BRONZE DISC METER WITH BRASS BOTTOM.
4. BADGER METER - ADE 6-DAIL ENCODER REGISTER WITH ITRON IN-LINE CONNECTOR, CU FT.
5. FORD METER COUPLING - MODEL C38-44-2-NL.
6. 1" BRASS COUPLING
7. 1" SCH-80 PVC NIPPLE (ADJUST LENGTH TO SPAN SERVICE BETWEEN TWO FIBERLYTE BOXES)
8. WILKINS - DOUBLE CHECK VALVE ASSEMBLY - MODEL 950XLT2 OR 350XLT2.
9. 1" THREADED BRASS NIPPLE.
10. FORD ELL TEE FOR FIRESETTER, 1" IN X 1" OUTLETS - MODEL LTBA 113-444W-AWT-NL, OR EQUIVALENT.
11. (2) 1" SCH-40 SUPPLY LINES TO RESIDENCE - WATER SERVICE AND FIRE SERVICE, OR EQUIVALENT.
12. 18" FIBERGLASS MOUNTING ROD.
13. 100W ERT® COMMUNICATION MODULE, SHOULD BE MOUNTED ABOUT 2" BELOW FIBERLYTE, COMPOSITE OR PLASTIC (RADIO FRIENDLY) LID.

NOTE: WATER & FIRE SERVICE ASSEMBLY TO BE SET WITHIN TWO FIBERLYTE BOXES - No. FL30TBOX-12, WITH FIBERLYTE LIDS No. FL30T. BOXES TO BE INSTALLED IN LINE AND ALLOW ACCESS TO ALL VALVES. BLOCK BELOW BOX CUTOUTS WITH PRESSURE TREATED 2X'S.

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**NEW 1" WATER & FIRE  
SERVICE - RESIDENTIAL**

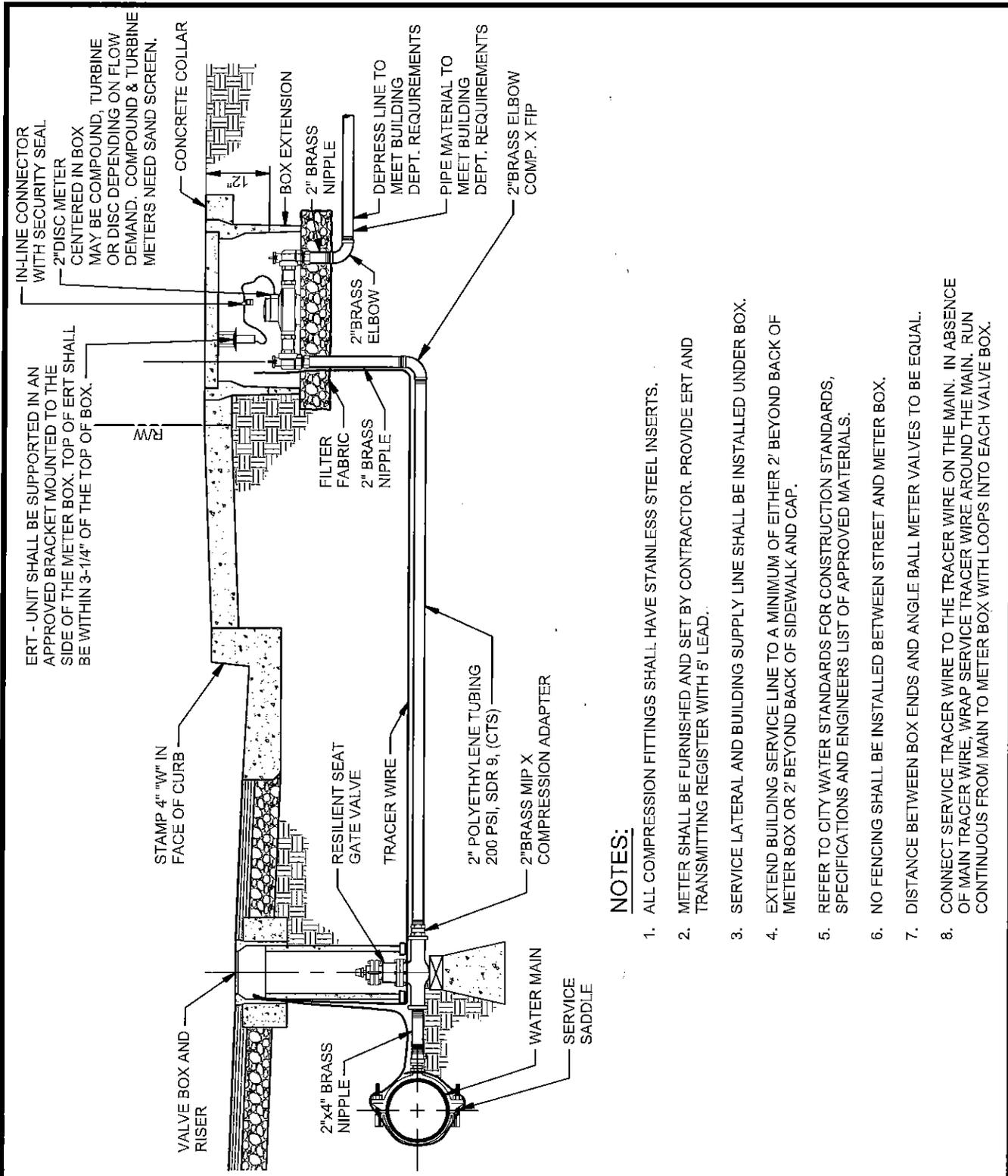
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 504.DWG

ADOPTED BY CITY COUNCIL

DRAWING NO.

**9-23-14**

**504**



ERT - UNIT SHALL BE SUPPORTED IN AN APPROVED BRACKET MOUNTED TO THE SIDE OF THE METER BOX. TOP OF ERT SHALL BE WITHIN 3-1/4" OF THE TOP OF BOX.

IN-LINE CONNECTOR WITH SECURITY SEAL

2" DISC METER CENTERED IN BOX MAY BE COMPOUND, TURBINE OR DISC DEPENDING ON FLOW DEMAND. COMPOUND & TURBINE METERS NEED SAND SCREEN.

CONCRETE COLLAR

BOX EXTENSION

2" BRASS NIPPLE

DEPRESS LINE TO MEET BUILDING DEPT. REQUIREMENTS

PIPE MATERIAL TO MEET BUILDING DEPT. REQUIREMENTS

2" BRASS ELBOW COMP. X FIP

ERT - UNIT SHALL BE SUPPORTED IN AN APPROVED BRACKET MOUNTED TO THE SIDE OF THE METER BOX. TOP OF ERT SHALL BE WITHIN 3-1/4" OF THE TOP OF BOX.

STAMP 4" "W" IN FACE OF CURB

FILTER FABRIC

2" BRASS NIPPLE

2" BRASS ELBOW

2" POLYETHYLENE TUBING 200 PSI, SDR 9, (CTS)

2" BRASS MIP X COMPRESSION ADAPTER

VALVE BOX AND RISER

RESILIENT SEAT GATE VALVE

TRACER WIRE

2" x 4" BRASS NIPPLE

WATER MAIN

SERVICE SADDLE

**NOTES:**

1. ALL COMPRESSION FITTINGS SHALL HAVE STAINLESS STEEL INSERTS.
2. METER SHALL BE FURNISHED AND SET BY CONTRACTOR. PROVIDE ERT AND TRANSMITTING REGISTER WITH 5' LEAD.
3. SERVICE LATERAL AND BUILDING SUPPLY LINE SHALL BE INSTALLED UNDER BOX.
4. EXTEND BUILDING SERVICE LINE TO A MINIMUM OF EITHER 2' BEYOND BACK OF METER BOX OR 2' BEYOND BACK OF SIDEWALK AND CAP.
5. REFER TO CITY WATER STANDARDS FOR CONSTRUCTION STANDARDS, SPECIFICATIONS AND ENGINEERS LIST OF APPROVED MATERIALS.
6. NO FENCING SHALL BE INSTALLED BETWEEN STREET AND METER BOX.
7. DISTANCE BETWEEN BOX ENDS AND ANGLE BALL METER VALVES TO BE EQUAL.
8. CONNECT SERVICE TRACER WIRE TO THE TRACER WIRE ON THE MAIN. IN ABSENCE OF MAIN TRACER WIRE, WRAP SERVICE TRACER WIRE AROUND THE MAIN. RUN CONTINUOUS FROM MAIN TO METER BOX WITH LOOPS INTO EACH VALVE BOX.

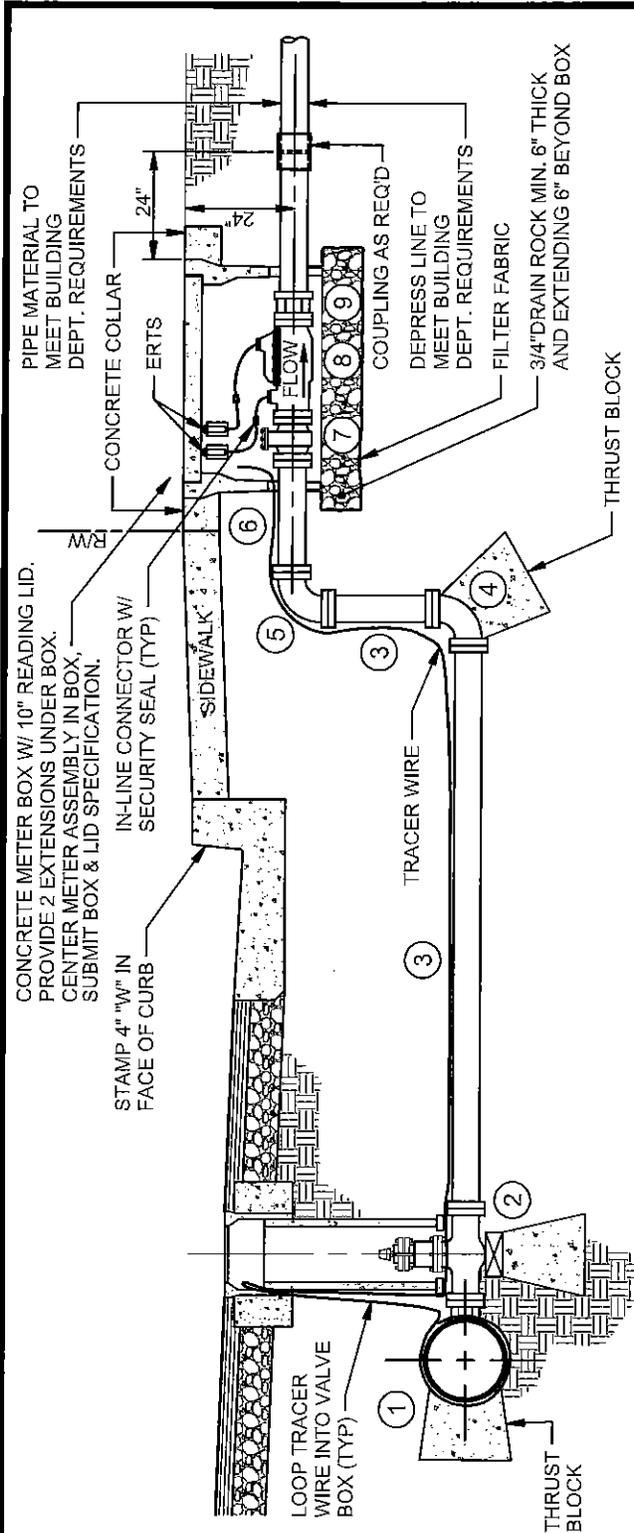
**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**2" WATER SERVICE**

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 505.DWG

ADOPTED BY THE CITY COUNCIL: <b>9-23-14</b>	DRAWING NO. <b>505</b>
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**NOTES:**

1. SET METER BOX FLUSH WITH FINISHED SURFACE.
2. METER ASSEMBLY SHALL BE FURNISHED AND INSTALLED BY CONTRACTOR. PROVIDE ERTS AND TRANSMITTING REGISTERS WITH 5 FT. LEADS.
3. REFER TO CITY STANDARD 515 FOR GATE VALVE INSTALLATION DETAILS. VALVES MAY BE INSTALLED IN SIDEWALK WHERE SPACE LIMITATIONS EXIST.
4. REFER TO CITY WATER STANDARDS FOR CONSTRUCTION STANDARDS, SPECIFICATIONS AND ENGINEER'S LIST OF APPROVED MATERIALS.
5. PIPE OPENINGS IN METER BOX SHALL BE CUT - DO NOT USE HAMMER. PRIOR TO BACKFILLING, PIPE OPENINGS AND BOX JOINTS SHALL BE GROUTED.
6. CONNECT SERVICE TRACER WIRE TO THE TRACER WIRE ON THE MAIN. IN ABSENCE OF MAIN TRACER WIRE, WRAP SERVICE TRACER WIRE AROUND THE MAIN. RUN CONTINUOUS FROM MAIN TO METER BOX WITH LOOPS INTO EACH VALVE BOX.
7. ERTS TO BE MOUNTED IN APPROVED BRACKET ATTACHED TO BOX WITH STAINLESS STEEL ANCHORS. THE TOP OF ERTS SHALL BE NO MORE THAN 3-1/4" BELOW TOP OF BOX.
8. NO FENCING SHALL BE INSTALLED BETWEEN STREET AND METER BOX.
9. ALL METER ASSEMBLIES SHALL BE BADGER MODEL F5AA-01.

NO	ITEM DESCRIPTION
①	TEE OR TAPPING TEE WITH FLANGED OUTLET
②	GATE VALVE, FLG X MJ
③	DIP, PVC (LENGTH AS REQUIRED, INTERMEDIATE JOINTS RESTRAINED)
④	90° ELL, MJ W/ MEGA-LUG RETAINER GLANDS
⑤	90° ELL, MJ W/ MEGA-LUG RETAINER GLAND X FLG
⑥	DIP SPOOL, FLG (24" MIN. LENGTH)
⑦	PLATE STRAINER
⑧	COMPOUND METER W/ 2 TRANSMITTING REGISTERS AND 2 ERTS
⑨	FLANGED COUPLER ADAPTER

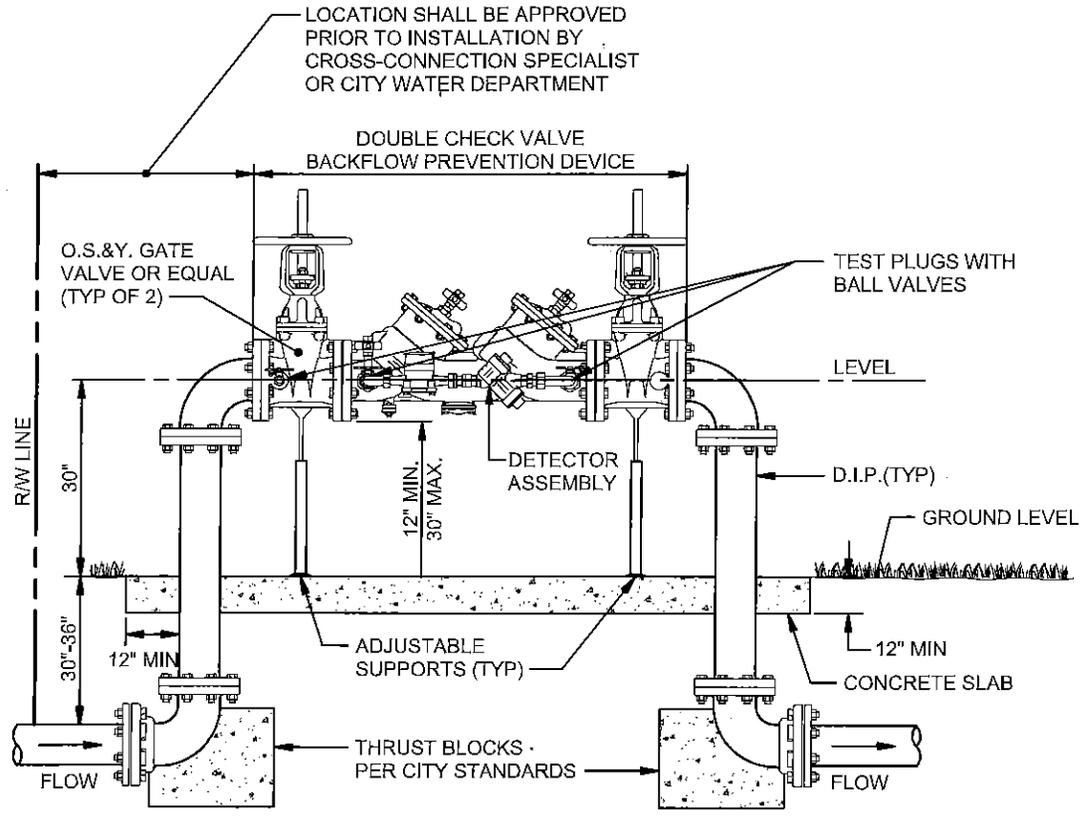
**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 506.DWG

**WATER SERVICE**  
**4" AND LARGER**

ADOPTED BY THE CITY COUNCIL: <b>9-23-14</b>	DRAWING NO. <b>506</b>
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**FIRE SERVICE-DOUBLE CHECK DETECTOR ASSEMBLY**

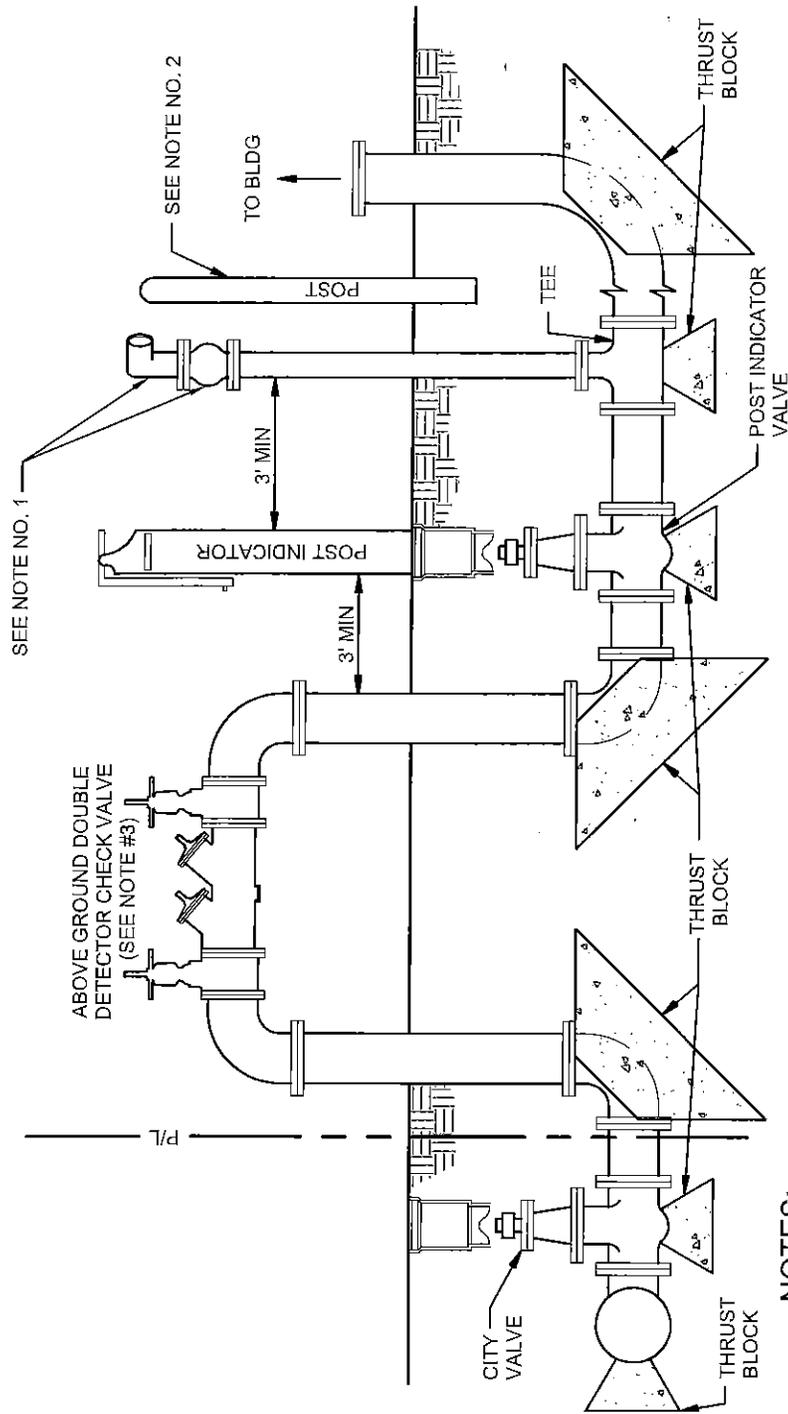
**NOTES:**

1. REQUIRED BY TITLE 17 OF THE CALIF. DEPT OF HEALTH SERVICES, MODEL OF BACKFLOW DEVICE TO BE DETERMINED FOR EACH INSTALLATION DEPENDING ON THE TYPE OF HAZARD AND UPON ALLOWABLE HEAD LOSS.
2. BARRIER POST SHALL BE LOCATED TO PROTECT PIPING AND VALVES. CURB AND PARKING BARRIERS CAN BE CONSIDERED PROTECTION IF EFFECTIVELY LOCATED.
3. DEVICE SHALL BE ACCESSIBLE FOR TESTING AND MAINTENANCE.
4. CERTIFICATION REQUIRED PRIOR TO ACCEPTANCE.
5. ALL DESIGN PLANS ARE TO BE SUBMITTED TO THE CROSS-CONNECTION SPECIALIST FOR APPROVAL AND A CROSS CONNECTION SURVEY IS TO COMPLETED TO EVALUATE HAZARDS THAT POSSIBLY EXIST.
6. ELECTRONICALLY MONITORED TAMPER SWITCHES ARE BE REQUIRED IN ACCORDANCE WITH NFPA72.

**MATERIALS:**

1. ALL STEEL PIPE SHALL BE AS PER AWWA C-200 WITH 1/4" WALL COATED AND LINED BY FUSION BONDED EPOXY AS PER AWWA C-213, 20 MILS MINIMUM
2. ALL STEEL FLANGES SHALL BE CLASS D AS PER AWWA C-207
3. ALL DUCTILE IRON FITTINGS SHALL MEET AWWA C-153 CLASS 150. THE INTERIOR SHALL BE MORTAR LINED AS PER AWWA C-104 AND BELOW GROUND EXTERIOR SHALL HAVE A COAL TAR COATING AS PER AWWA C-203.
4. ALL NUTS AND BOLTS BELOW GROUND SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 AT TAPE WRAPPED AS PER AWWA C-209. 20 MILS MINIMUM IN BOTH CASES.
5. STEEL CAGE & BLANKET REQUIRED.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>FIRE SERVICE DOUBLE          DETECTOR CHECK VALVE</b>	
 CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY:	DATE:	SCALE:	<b>9-23-14</b>	
GK	7/21/15	NTS	<b>DRAWING NO.</b> <b>507</b>	
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 507.DWG		



**NOTES:**

1. LISTED AND APPROVED FIRE DEPT. CONNECTION WITH CHECK VALVE PER CITY OF MODESTO FIRE DEPT. REQUIREMENTS.
2. GUARD POSTS AS REQUIRED.
3. DOUBLE CHECK VALVE WITH VALVES DETERMINED BY FIRE SPRINKLER DESIGNER WITH APPROVAL BY THE CITY CROSS CONNECTION SPECIALIST. ALSO REQUIRED FOR FIRE HYDRANTS ON PRIVATE PROPERTY.
4. CLASS 3-6 FIRE SPRINKLER SYSTEMS SHALL REQUIRE A REDUCED PRESSURE DEVICE. PLANS SHALL BE APPROVED BY THE CROSS CONNECTION SPECIALIST.
5. CLASS 200, C-900 PIPE.

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**FIRE SERVICE DOUBLE  
DETECTOR CHECK VALVE  
WITH P.I.V. AND F.D.C.**

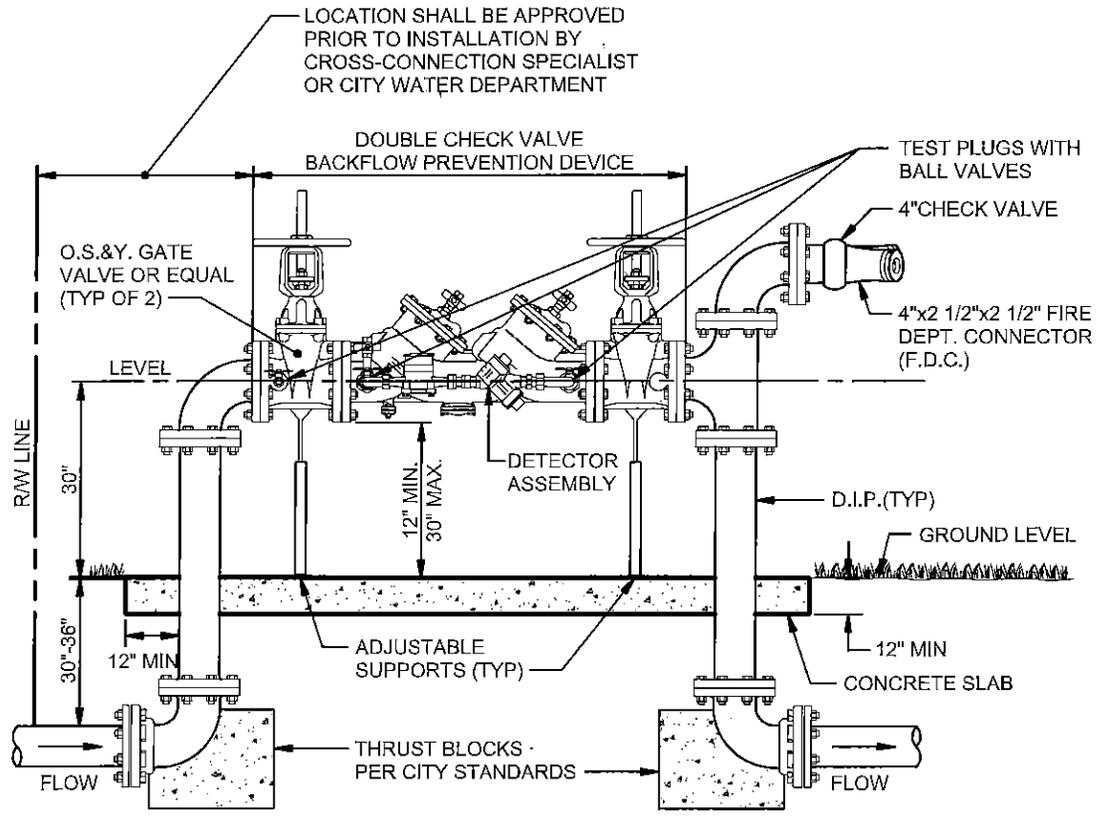
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REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 508.DWG

ADOPTED BY THE CITY COUNCIL:

**9-23-14**

DRAWING NO.

**508**



**FIRE SERVICE-DOUBLE DETECTOR CHECK VALVE  
WITH FIRE DEPARTMENT CONNECTION**

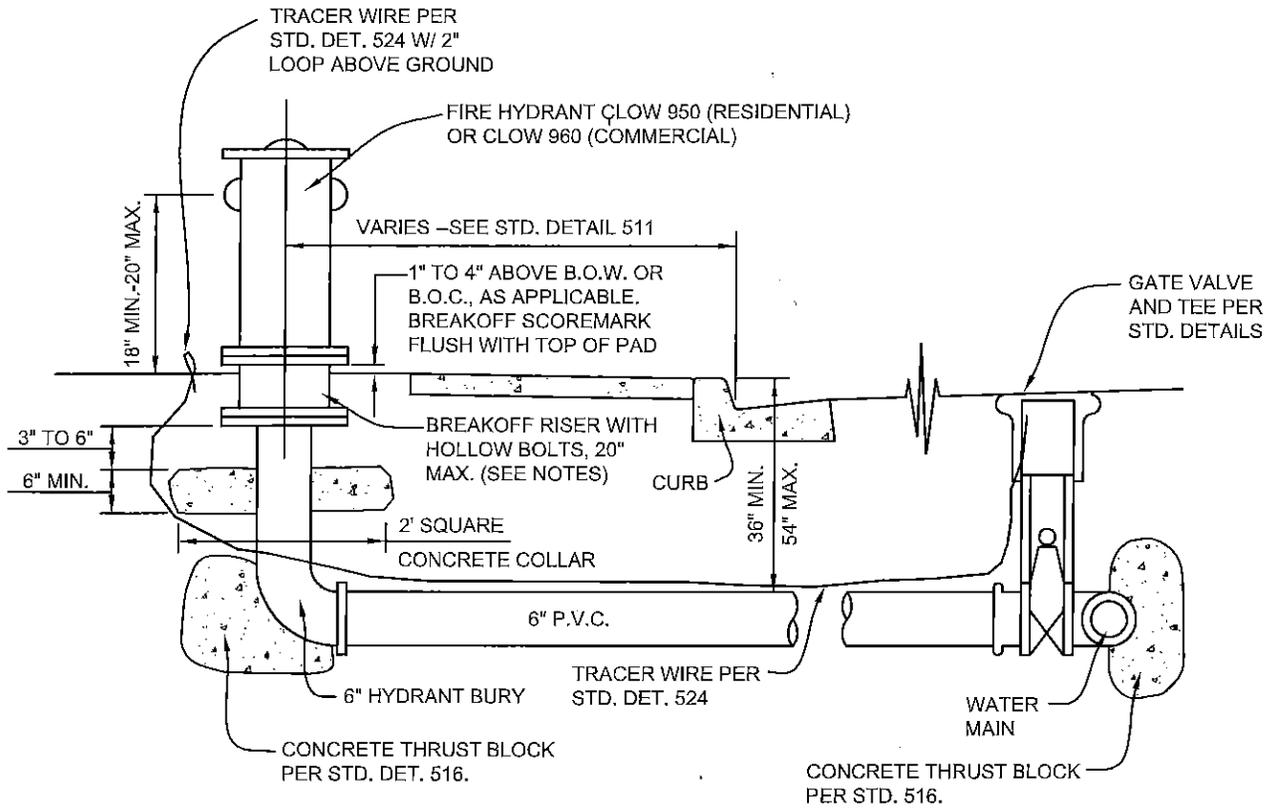
**NOTES:**

1. REQUIRED BY TITLE 17 OF THE CALIF. DEPT OF HEALTH SERVICES, MODEL OF BACKFLOW DEVICE TO BE DETERMINED FOR EACH INSTALLATION DEPENDING ON THE TYPE OF HAZARD AND UPON ALLOWABLE HEAD LOSS.
2. BARRIER POST SHALL BE LOCATED TO PROTECT PIPING AND VALVES. CURB AND PARKING BARRIERS CAN BE CONSIDERED PROTECTION IF EFFECTIVELY LOCATED.
3. DEVICE SHALL BE ACCESSIBLE FOR TESTING AND MAINTENANCE.
4. CERTIFICATION REQUIRED PRIOR TO ACCEPTANCE.
5. ALL DESIGN PLANS ARE TO BE SUBMITTED TO THE CROSS-CONNECTION SPECIALIST FOR APPROVAL AND A CROSS CONNECTION SURVEY IS TO COMPLETED TO EVALUATE HAZARDS THAT POSSIBLY EXIST.
6. ELECTRONICALLY MONITORED TAMPER SWITCHES ARE REQUIRED IN ACCORDANCE WITH NFPA72.

**MATERIALS:**

1. ALL STEEL PIPE SHALL BE AS PER AWWA C-200 WITH 1/4" WALL COATED AND LINED BY FUSION BONDED EPOXY AS PER AWWA C-213, 20 MILS MINIMUM
2. ALL STEEL FLANGES SHALL BE CLASS D AS PER AWWA C-207
3. ALL DUCTILE IRON FITTINGS SHALL MEET AWWA C-153 CLASS 200. THE INTERIOR SHALL BE MORTAR LINED AS PER AWWA C-104 AND BELOW GROUND EXTERIOR SHALL HAVE A COAL TAR COATING AS PER AWWA C-203.
4. ALL NUTS AND BOLTS BELOW GROUND SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 AT TAPE WRAPPED AS PER AWWA C-209. 20 MILS MINIMUM IN BOTH CASES.
5. STEEL CAGE AND BLANKET REQUIRED.

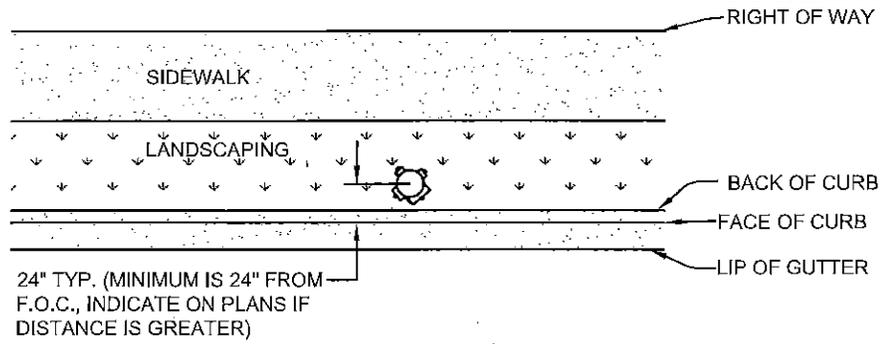
<b>CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS</b>			<b>FIRE SERVICE DOUBLE DETECTOR CHECK VALVE WITH F.D.C.</b>	
CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	<b>9-23-14</b>	
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 509.DWG	<b>DRAWING NO. 509</b>	



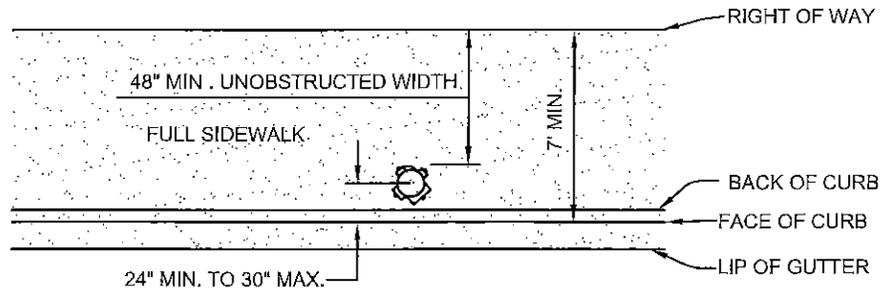
**NOTES:**

1. ALL FIRE HYDRANTS ARE TO HAVE HOLLOW BOLTS LOCATED THROUGH THE FIRE HYDRANT FLANGE WITH THEM POINTING DOWN.
2. ALL FIRE HYDRANTS WILL BE INSTALLED SO THAT THE DISTANCE BETWEEN THE CENTER OF THE 4 1/2" OUTLET AND THE TOP OF SIDEWALK OR CURB IN ALL ZONES WILL BE NO LESS THAN 18" AND NO GREATER THAN 20".
3. ALL HYDRANTS SHALL BE PAINTED SAFETY YELLOW AT THE FACTORY AND FURNISHED WITH NATIONAL STANDARD HOSE THREAD OUTLETS AND CAST IRON CAPS.
4. INSTALL GUARD POSTS WHERE HYDRANTS ARE INSTALLED IN PAVED AREAS ACCESSIBLE TO TRAFFIC, OR AS OTHERWISE DIRECTED BY THE CITY ENGINEER.
5. ALL FIRE HYDRANTS WHEN INSTALLED, POSITIONED OR REPOSITIONED SUCH THAT THE 4 1/2" DISCHARGE IS 45 DEGREES FROM THE RUN OF THE STREET. IF LOCATED ON A CORNER, 4 1/2" DISCHARGE SHALL BE 45 DEGREES FROM RUN OF NEAREST STREET.
6. HYDRANTS SHALL HAVE ONE 4-1/2" OUTLET, AND TWO 2-1/2" OUTLETS MINIMUM, AND SHALL BE OF A TYPE APPROVED BY THE STANISLAUS CONSOLIDATED FIRE DISTRICT.
7. EACH HYDRANT SHALL BE INSTALLED WITH A BLUE RETROREFLECTIVE PAVEMENT MARKER, INSTALLED 6" FROM THE ADJACENT CENTERLINE OF THE ROADWAY. IF ON A CORNER, MARKERS WILL BE PLACED ON BOTH ADJACENT STREETS.

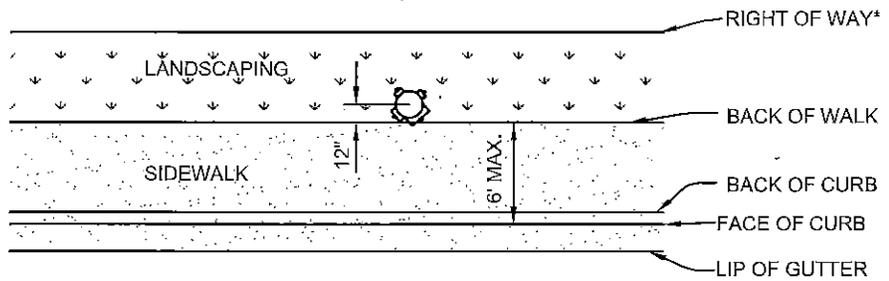
<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>FIRE HYDRANT INSTALLATION</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 510.DWG	<b>9-23-14</b>	<b>510</b>



**SPLIT LANDSCAPE / SIDEWALK**



**FULL SIDEWALK**

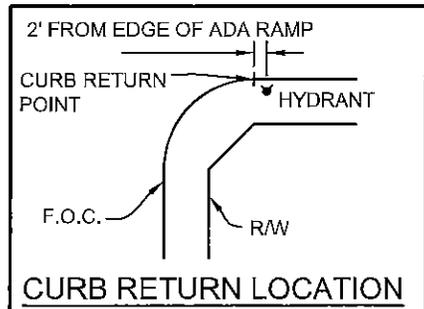


**SIDEWALK ADJACENT TO CURB**

\* NOTE: EASEMENT OR ADDITIONAL R/W DEDICATION WILL BE REQUIRED IF SUFFICIENT LANDSCAPE AREA IS NOT AVAILABE WITHIN R/W FOR INSTALLATION OF HYDRANT.

**NOTES:**

1. MAINTAIN 48" MIN. CLEAR UNOBSTRUCTED TRAVEL WAY ON SIDEWALKS AND 24" MIN. CLEARANCE FROM F.O.C. IN LOCATIONS WITH DIFFERENT WIDTHS THAN SHOWN ABOVE.
2. HYDRANTS SHALL BE INSTALLED A MIN. OF 5' FROM THE EDGE OF RESIDENTIAL DRIVEWAYS, AND 10' FROM COMMERCIAL DRIVEWAYS. (DISTANCE TAKEN FROM DRIVEWAY THROAT)
3. THE PREFERRED LOCATION FOR HYDRANTS ARE ON CURB RETURNS. HYDRANTS ON STRAIGHT RUNS SHALL BE LOCATED ON PROPERTY LINES WHENEVER POSSIBLE.



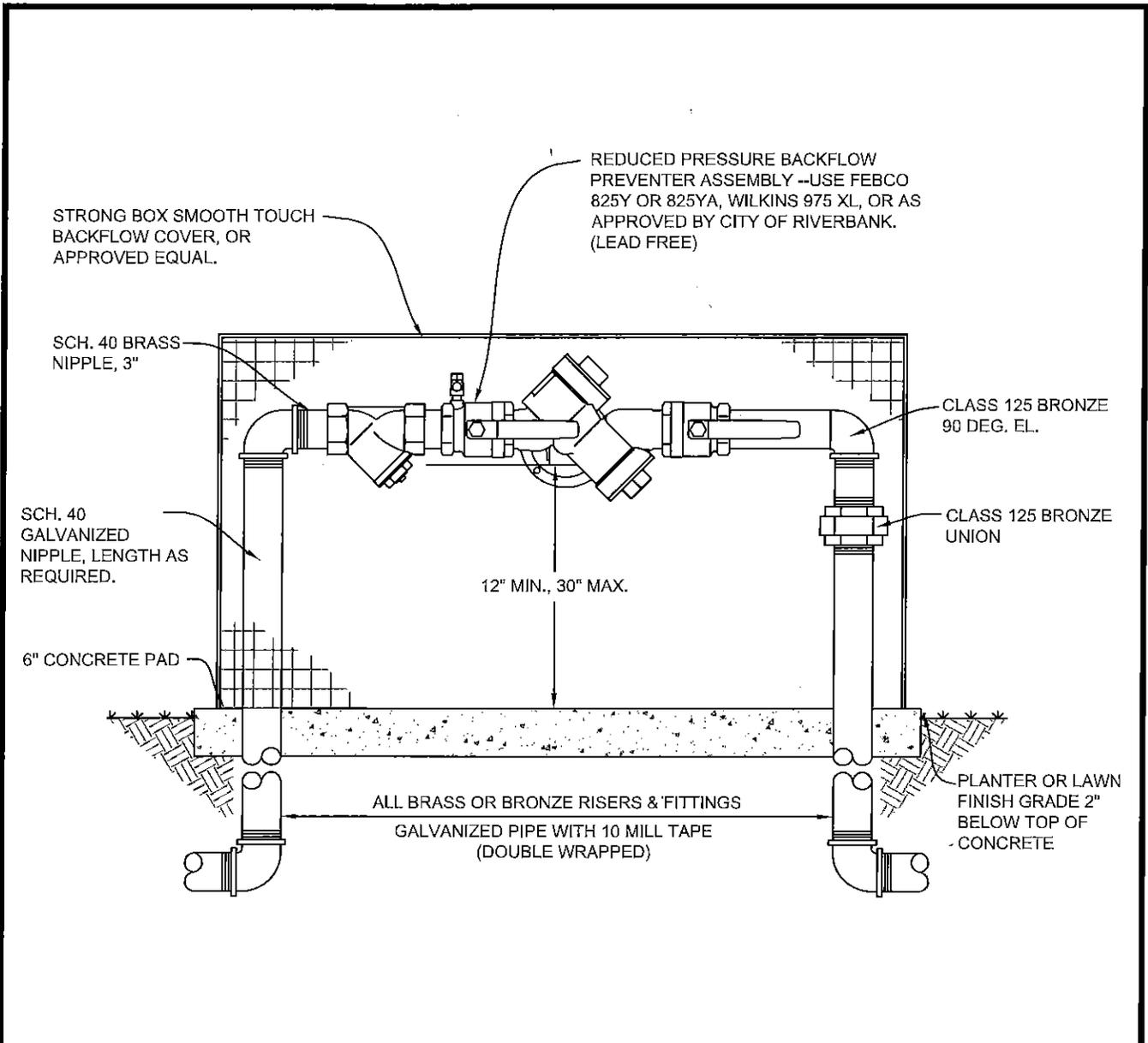
**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

**FIRE HYDRANT**  
**LOCATION**

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

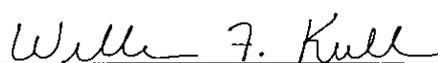
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 511.DWG

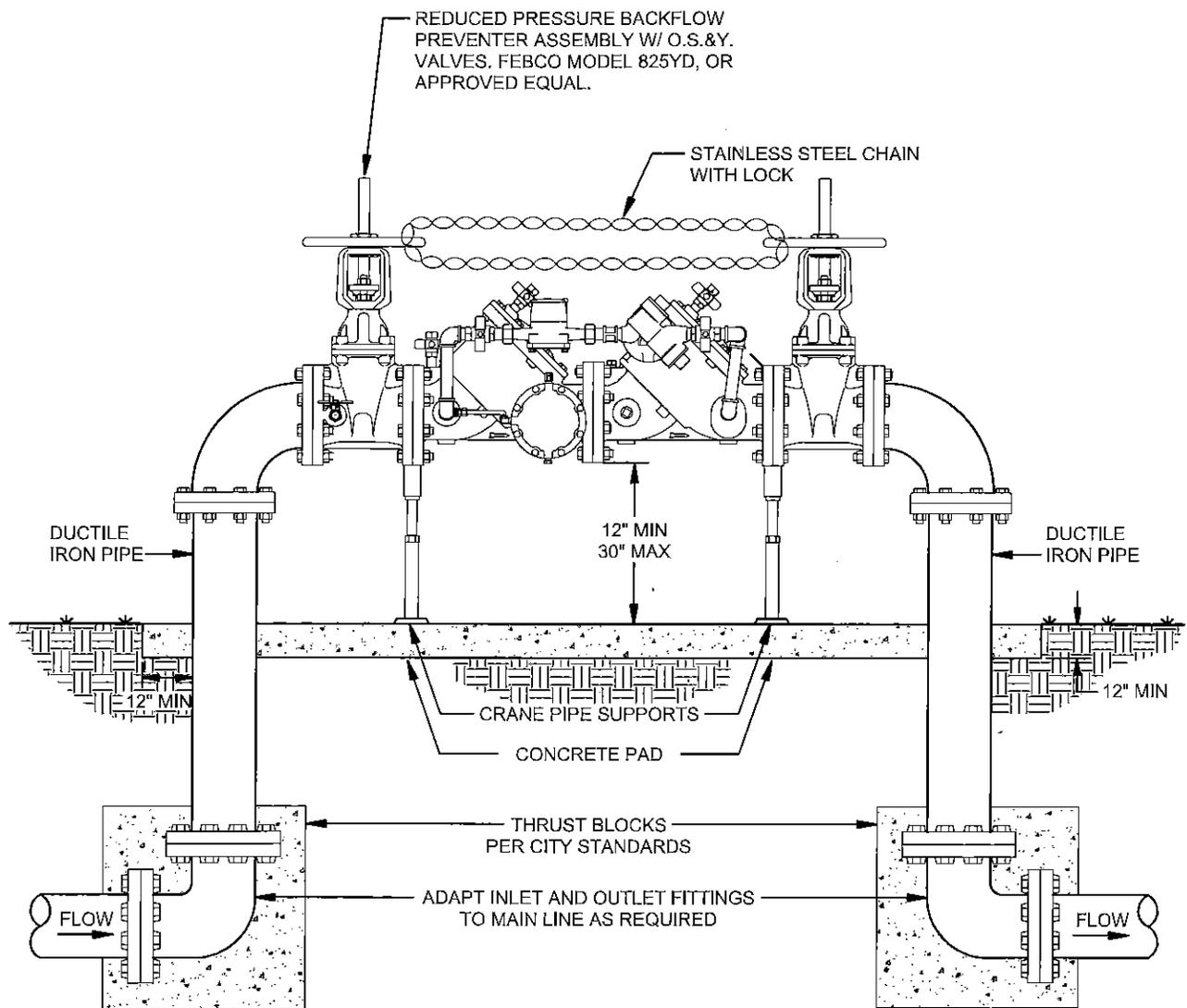
ADOPTED BY THE CITY COUNCIL: <b>9-23-14</b>	DRAWING NO. <b>511</b>
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**NOTES:**

1. INSTALL APPROPRIATELY SIZED WEATHER BLANKET AND CAGE TO ALL BACKFLOW PREVENTION DEVICES.
2. BACKFLOW PREVENTERS SHALL BE PLACED IN LANDSCAPE AREAS, A MIN. OF 24" CLEAR FROM ADJACENT CURBS. BACKFLOW PREVENTERS NOT PLACED IN CURBS SHALL REQUIRE GUARD POSTS TO THE SATISFACTION OF THE CITY ENGINEER.

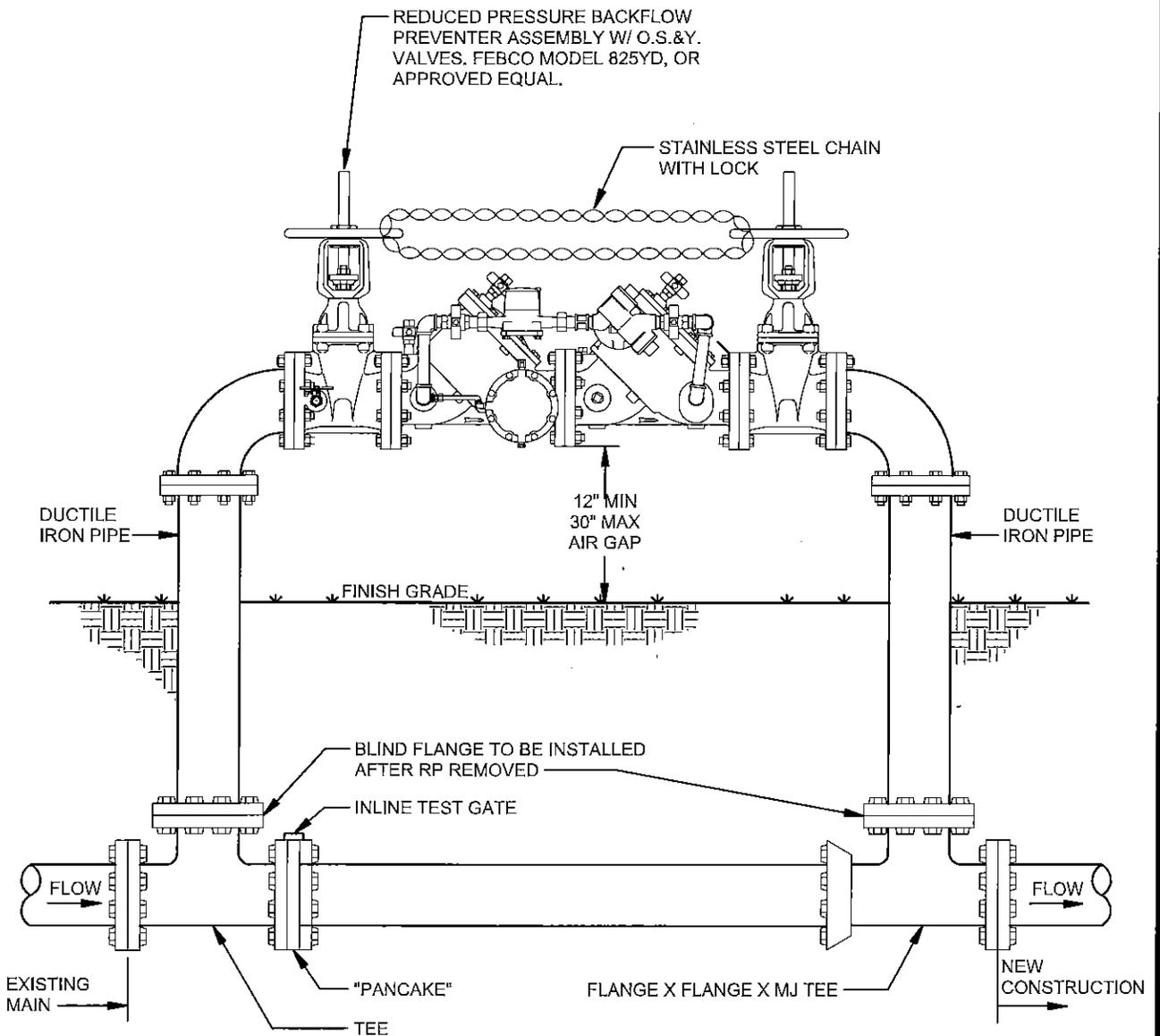
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>REDUCED PRESSURE PRINCIPLE</b> <b>BACKFLOW PREVENTION ASSEMBLY</b> <b>1" TO 2 1/2" SIZE</b>	
 CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	<b>9-23-14</b>	
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 512.DWG	<b>512</b>	



**NOTES:**

1. INSTALL 12" AIR GAP MINIMUM (CONSULT LOCAL CODE)
2. ALL CONNECTIONS ON ASSEMBLY TO BE FLANGED.
3. BACKFLOW ASSEMBLY SHOULD BE PLACED IN A PLANTER SO THAT PLANT MATERIAL WILL SCREEN VIEW OF THE ASSEMBLY FROM THE STREET.
4. INSTALL APPROPRIATELY SIZED WEATHER BLANKET AND CAGE.

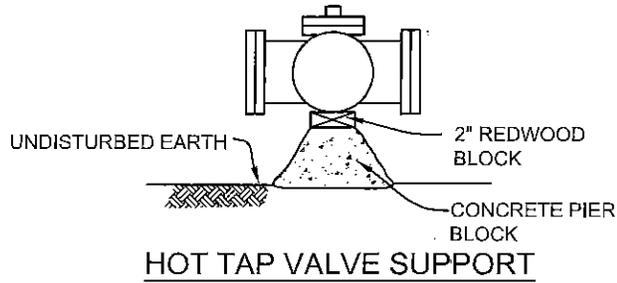
<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY FOR 3" &amp; LARGER</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>			<p>ADOPTED BY THE CITY COUNCIL: <b>9-23-14</b></p>	
<p>DRAWN BY: GK</p>	<p>DATE: 7/21/15</p>	<p>SCALE: NTS</p>	<p>DRAWING NO. <b>513</b></p>	
<p>REVISIONS: NONE</p>	<p>SECTION: WATER</p>	<p>DRAWING NAME: 513.DWG</p>		



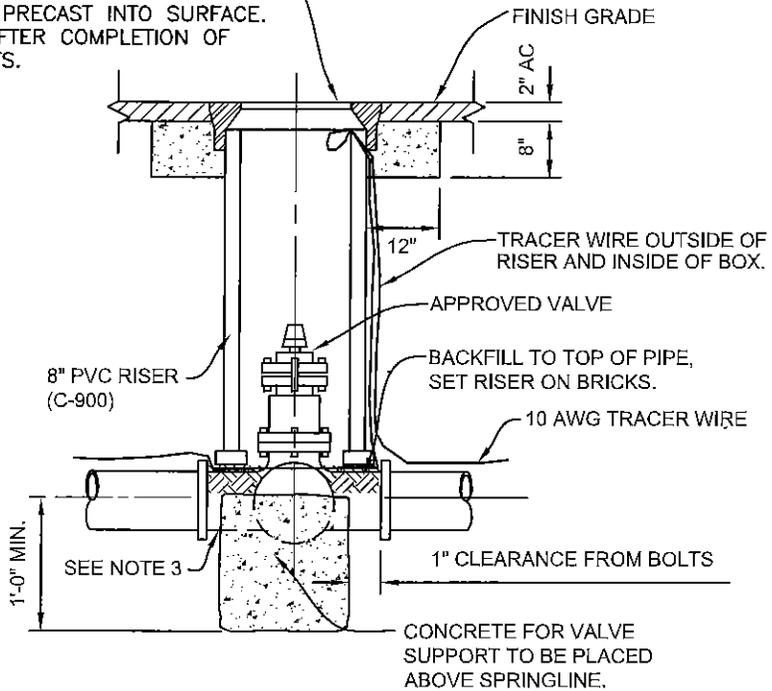
**NOTES:**

1. BACKFLOW DEVICE TO BE SAME SIZE AS EXISTING MAIN.
2. CONTRACTOR TO PROVIDE INLINE METER IF REQUIRED BY CITY.

<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>TEMPORARY BACKFLOW PREVENTION ASSEMBLY FOR 3" &amp; LARGER</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>			<p>ADOPTED BY THE CITY COUNCIL:</p>	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	<p><b>9-23-14</b></p>	
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 514.DWG	<p><b>514</b></p>	



CHRISTY G5 RECEPTACLE WITH C275 CAST IRON LID, OR APPROVED EQUAL. LID TO HAVE "WATER" CAST PRECAST INTO SURFACE. ADJUST TO GRADE AFTER COMPLETION OF PAVING IMPROVEMENTS.

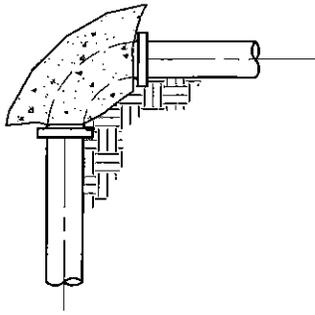


**NOTES:**

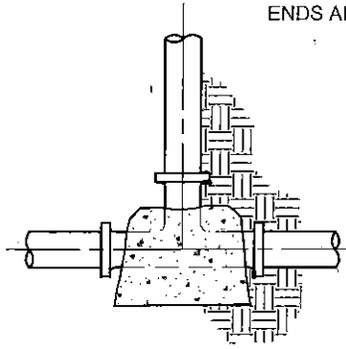
1. INSTALL EXTENSION STEM WHEN DISTANCE FROM VALVE COVER TO OPERATING NUT IS GREATER THAN 48"
2. VALVES SHALL HAVE FLANGED FITTINGS AT ALL TEES AND CROSSES UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
3. PLACE VISQUEEN AROUND VALVES BEFORE PLACEMENT OF CONCRETE SUPPORTS.
4. VALVES SHALL BE RESILIENT SEAT GATE FOR LINES 12" OR LESS, AND BUTTERFLY VALVES FOR LINES GREATER THAN 12".

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>WATER VALVE</b>  <b>INSTALLATION</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 515.DWG	<b>9-23-14</b>	<b>515</b>

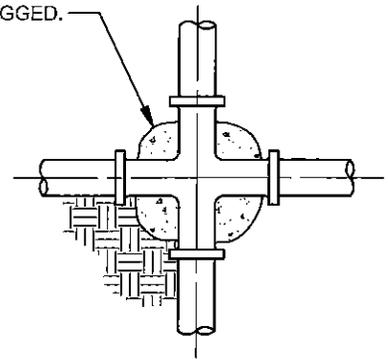
NO THRUSTING ON  
CROSS EXCEPT WHERE  
ENDS ARE PLUGGED.



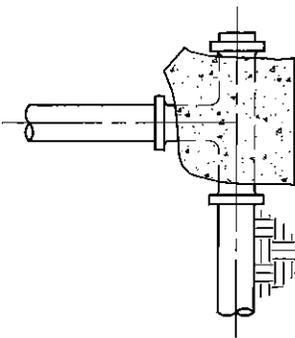
90° BEND



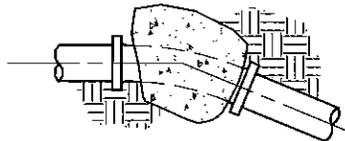
TEE



CROSS

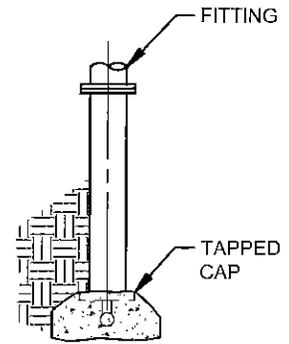


PLUGGED TEE



45° OR 22 1/2°

HORIZONTAL BEND

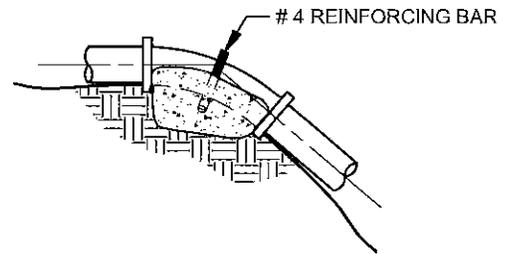


BLOW OFF

MINIMUM THRUST BLOCK BEARING AREAS IN SQUARE FEET				
PIPE SIZES	90°	45°	22 1/2°	TEES & BLOWOFF
6"	3	2	2	2
8"	4	3	2	3
10"	6	4	3	4
12"	8	5	3	6
14"	12	7	4	8

NOTES:

1. CONCRETE SHALL BE 2000 PSI MINIMUM AT 28 DAYS.
2. THRUST BLOCKS SHALL BE PLACED AGAINST UNDISTURBED EARTH.
3. ALL FITTINGS SHALL BE SUPPORTED IN CONCRETE.
4. FOR FIRE HYDRANT THRUSTING SEE 90° BEND.
5. DON'T COVER FLANGE BOLTS WITH CONCRETE.
6. WRAP ALL FITTINGS AND FLANGES WITH VISQUEEN.
7. USE RESTRAINT LENGTH CALCULATOR FOR ADDITIONAL JOINTS.



VERTICAL BEND

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**THRUST BLOCK  
REQUIREMENTS**

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

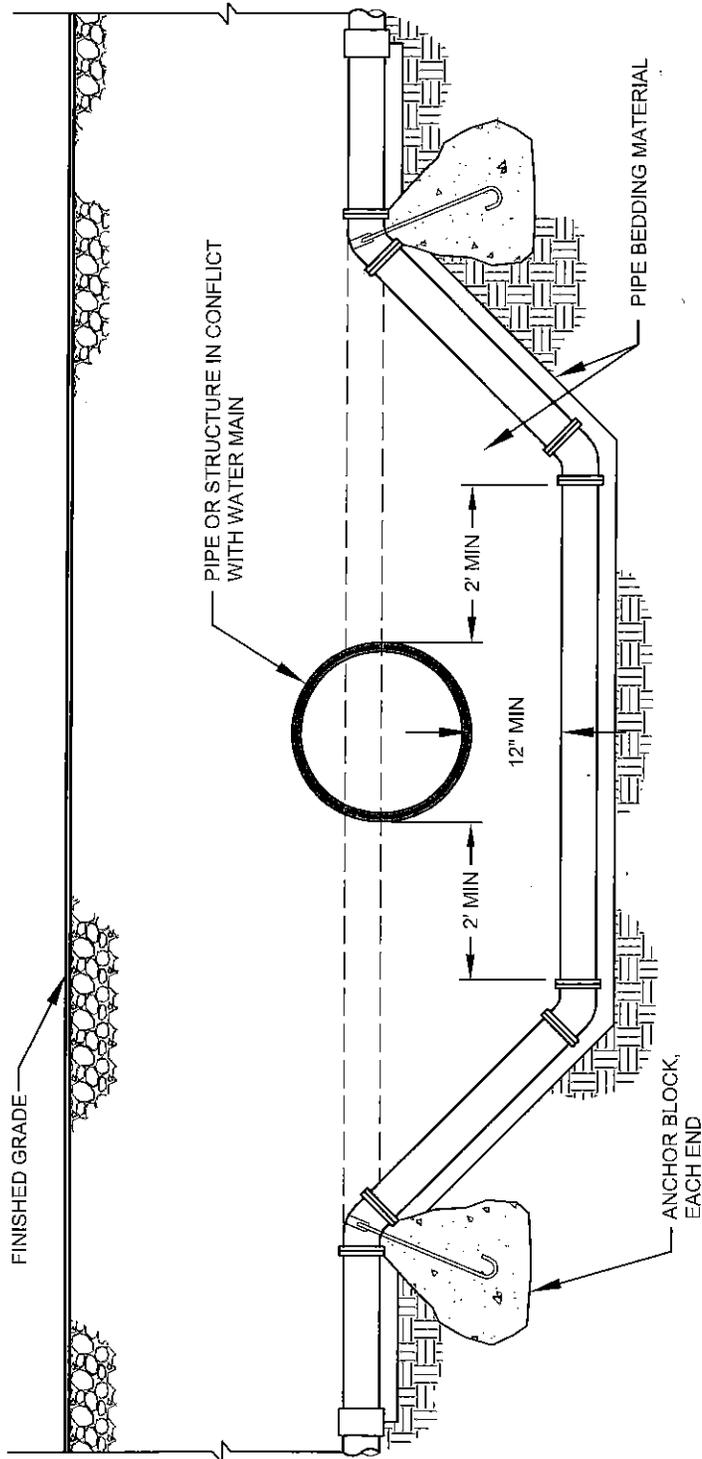
REVISIONS:  
NONE

SECTION:  
WATER

DRAWING NAME:  
516.DWG

9-23-14

516



NOTES:

1. ALL PIPE AND FITTINGS SHALL BE DUCTILE IRON & SHALL BE WRAPPED IN POLYETHYLENE - PER CITY OF RIVERBANK STD CONSTRUCTION SPECIFICATIONS.
2. ONLY MECHANICAL JOINT FITTINGS WITH RESTRAINED JOINTS MAY BE USED.
3. ALL BENDS SHALL BE 45° OR 22-1/2° FITTINGS.
4. USE RESTRAINT LENGTH CALCULATOR FOR ADDITIONAL JOINTS.

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

WATER MAIN  
LOWERING

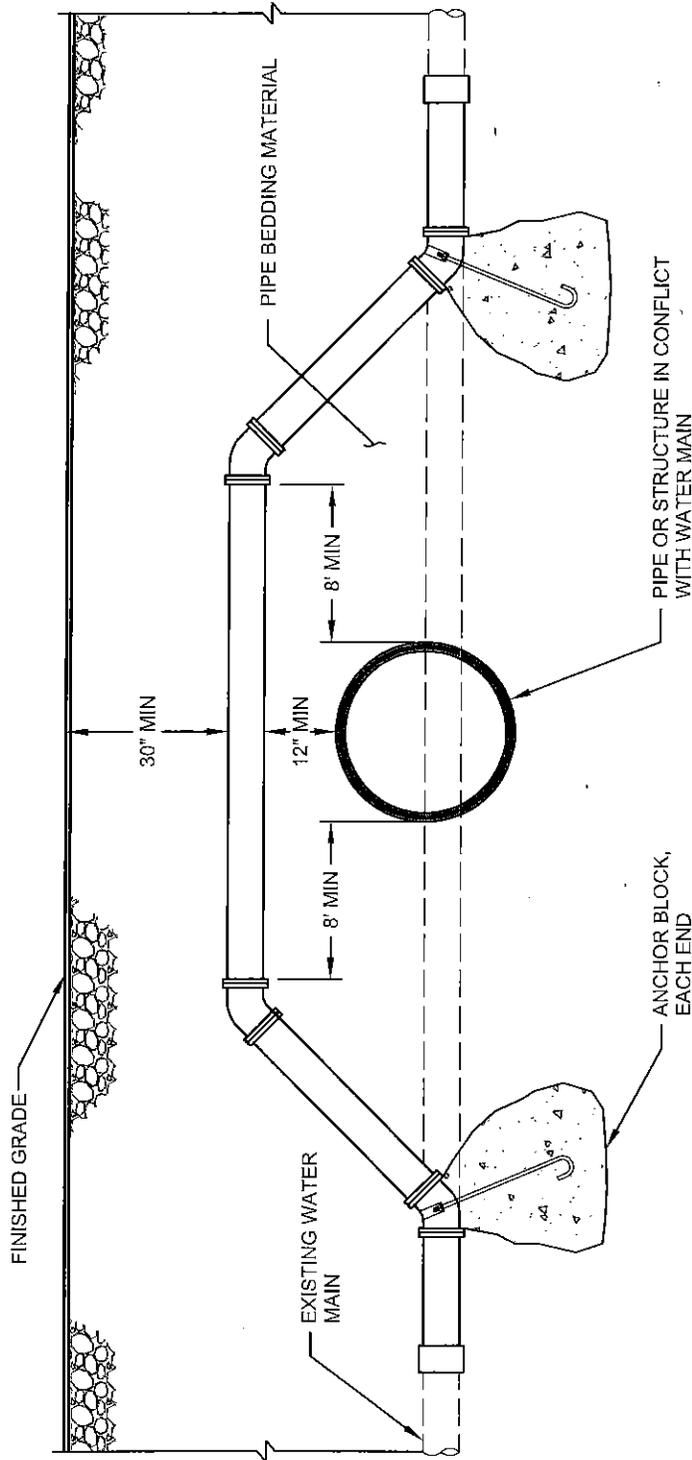
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 517.DWG

ADOPTED BY THE CITY COUNCIL:

9-23-14

DRAWING NO.

517



**NOTES:**

1. ALL PIPE AND FITTINGS SHALL BE CLASS-200 C-900 OR EQUIVALENT PER AWWA STANDARDS
2. ONLY MECHANICAL JOINT FITTINGS WITH RESTRAINED JOINTS MAY BE USED.
3. ALL BENDS SHALL BE 45° OR 22-1/2° FITTINGS. - NO 90° BENDS ALLOWED.
4. IF A MINIMUM COVER OF 30" CAN NOT BE ACHIEVED, THE NEW WATER LINE SHALL BE INCASED WITH CONCRETE (SEE STD. DWG. NO. W-10) 2 FEET PAST BOTH EXISTING UTILITY PIPE EDGE.

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**WATER MAIN CROSSING  
OVER EXISTING UTILITY**

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

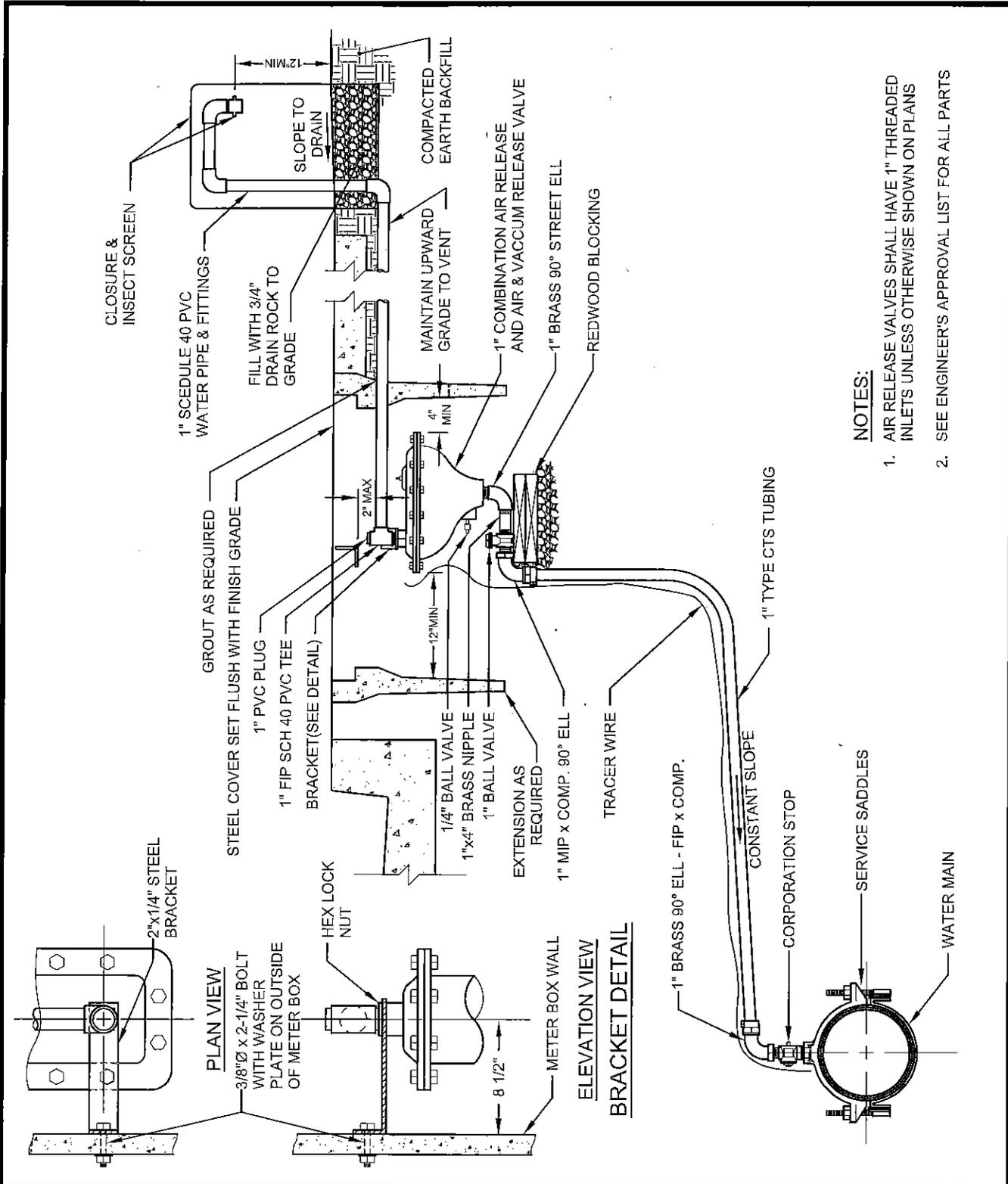
REVISIONS:  
NONE

SECTION:  
WATER

DRAWING NAME:  
518.DWG

**9-23-14**

**518**



**NOTES:**

1. AIR RELEASE VALVES SHALL HAVE 1" THREADED INLETS UNLESS OTHERWISE SHOWN ON PLANS
2. SEE ENGINEER'S APPROVAL LIST FOR ALL PARTS

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**AIR AND VACCUM / AIR  
RELEASE VALVE**

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

REVISIONS:  
NONE

SECTION:  
WATER

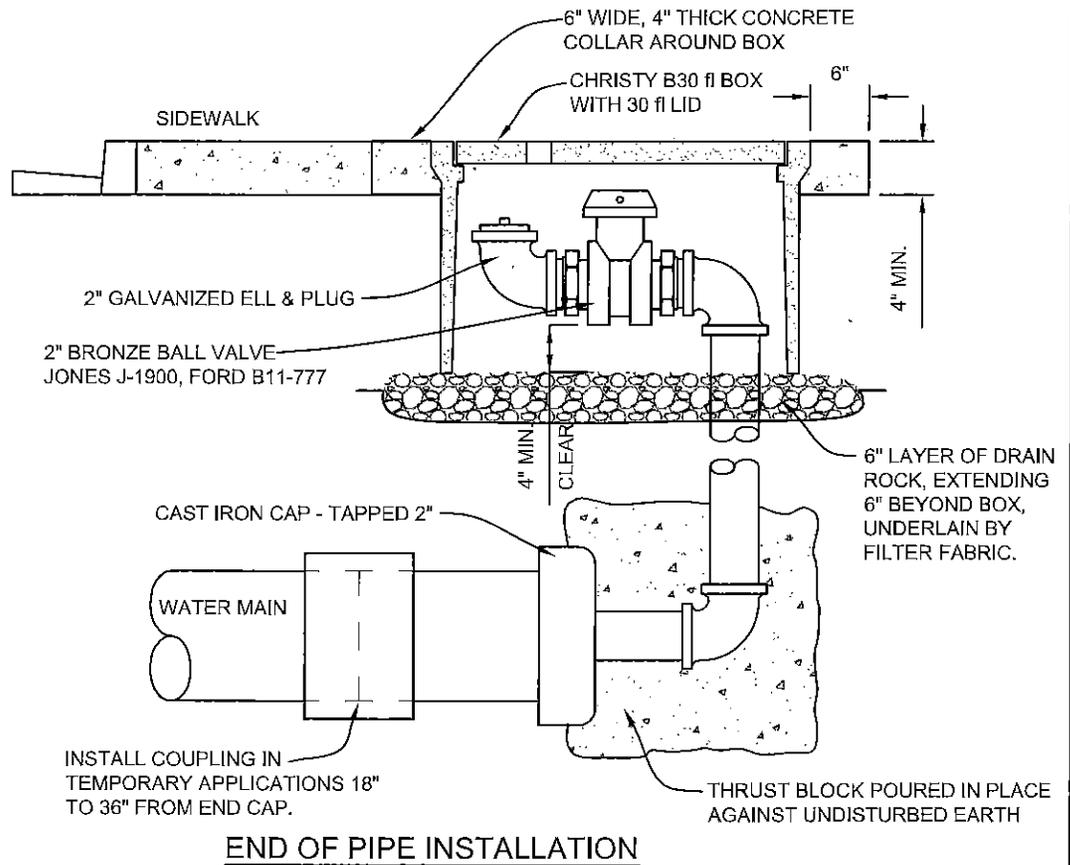
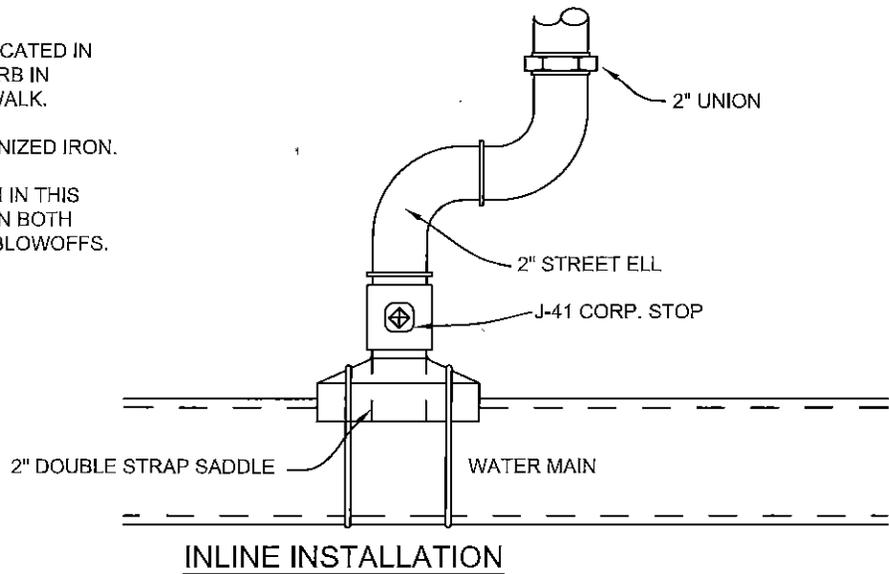
DRAWING NAME:  
519.DWG

**9-23-14**

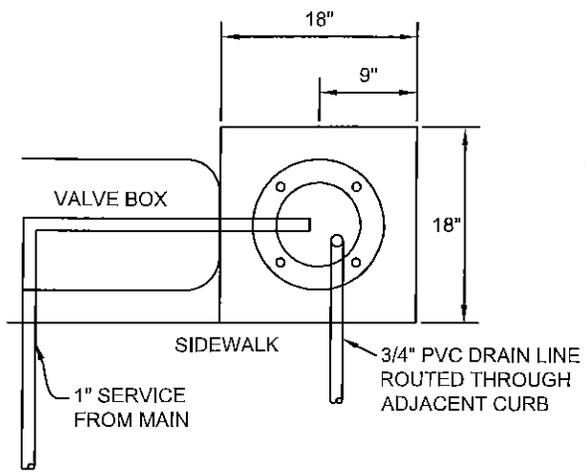
**519**

NOTES:

1. BLOW-OFF SHALL NOT BE LOCATED IN SIDEWALK. LOCATE BEHIND CURB IN LANDSCAPING IF IN SPLIT SIDEWALK.
2. ALL FITTINGS TO BE 2" GALVANIZED IRON.
3. ALL APPURTENANCES SHOWN IN THIS DETAIL ARE TO BE INSTALLED ON BOTH TEMPORARY AND PERMANENT BLOWOFFS.
4. TRACER WIRE REQUIRED.



<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>WATER BLOWOFF</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>				
<p>DRAWN BY: GK</p>	<p>DATE: 7/21/15</p>	<p>SCALE: NTS</p>	<p>ADOPTED BY THE CITY COUNCIL:</p>	<p>DRAWING NO.</p>
<p>REVISIONS: NONE</p>	<p>SECTION: WATER</p>	<p>DRAWING NAME: 520.DWG</p>	<p><b>9-23-14</b></p>	<p><b>520</b></p>



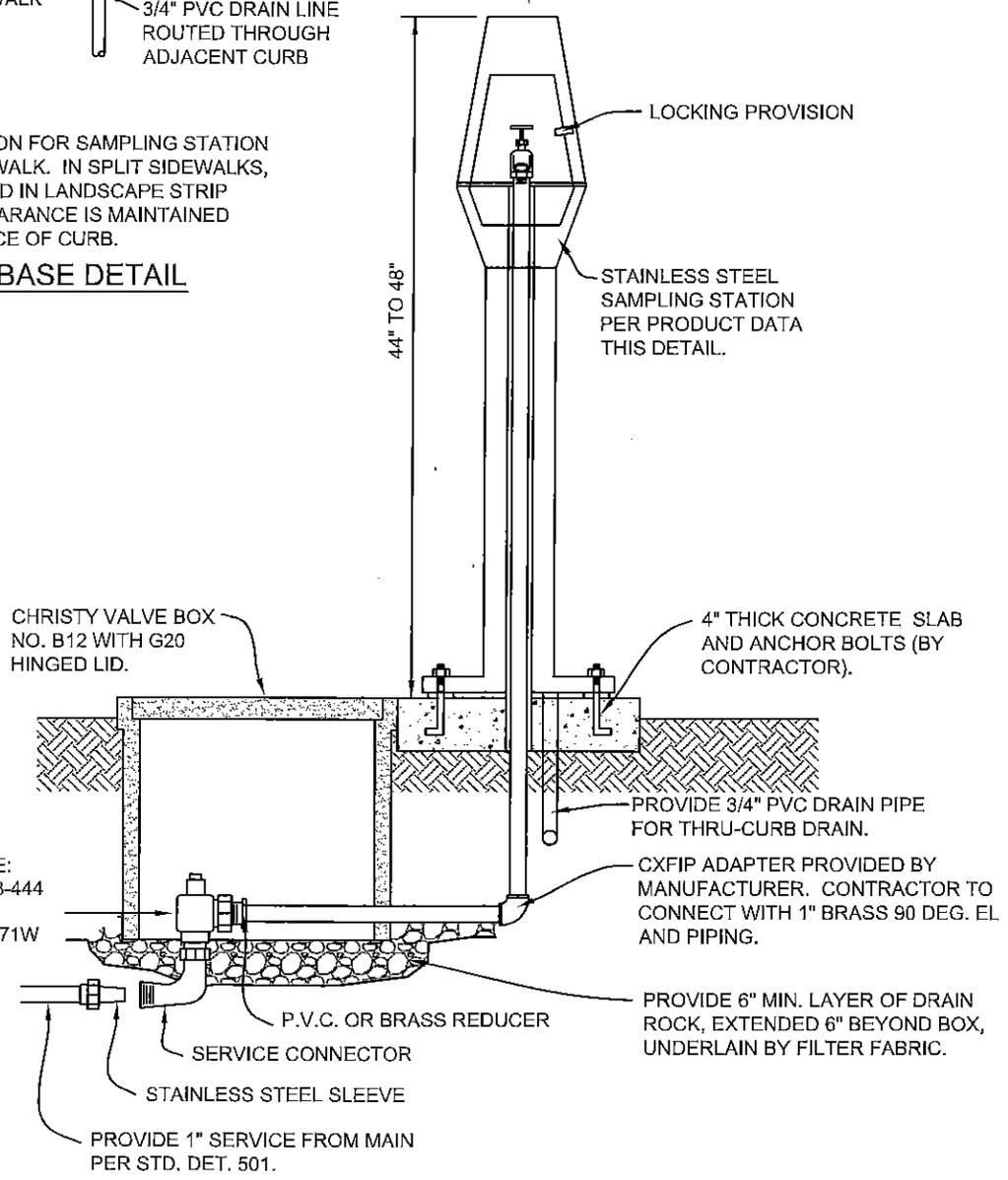
THE PREFERRED LOCATION FOR SAMPLING STATION IS BEHIND THE BACK OF WALK. IN SPLIT SIDEWALKS, STATION MAY BE LOCATED IN LANDSCAPE STRIP PROVIDED A 24" MIN. CLEARANCE IS MAINTAINED FROM THE ADJACENT FACE OF CURB.

**CONCRETE BASE DETAIL**

**PRODUCT DATA**

MODEL: MX 3000 SAMPLING STATION  
 VENDOR: STEEL SOURCE CONSTRUCTION  
 ADDRESS: 20885 REDWOOD RD.  
 CASTRO VALLEY, CA 94546  
 PHONE: 510-582-2700  
 FAX: 510-582-2750  
 www.steelsourceco.com

NOTE: ALTERNATE MANUFACTURERS AND MODELS MAY BE SUBSTITUTED GIVEN THE APPROVAL OF THE CITY PUBLIC WORKS DEPT.

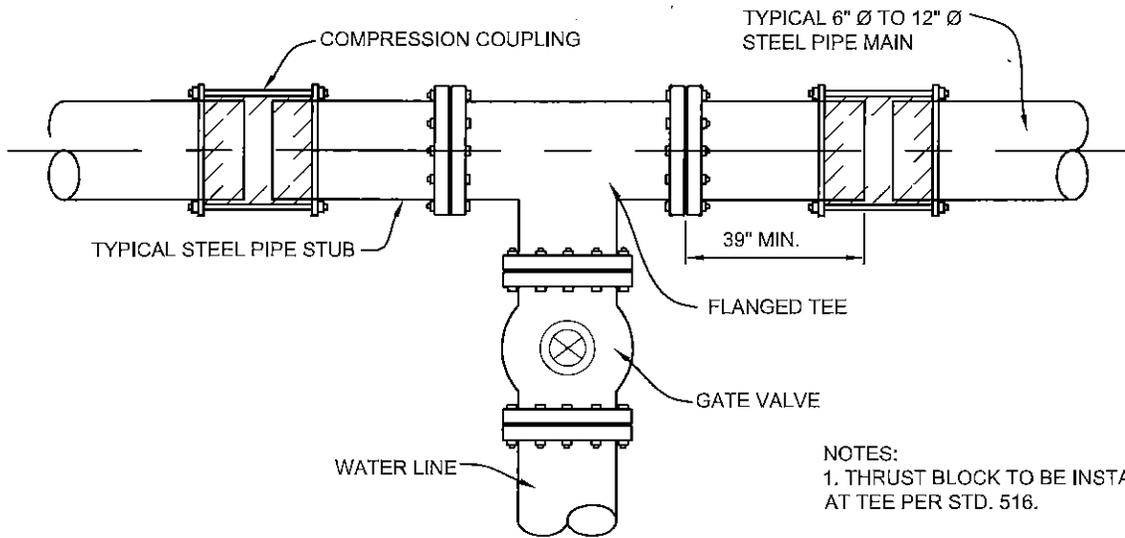
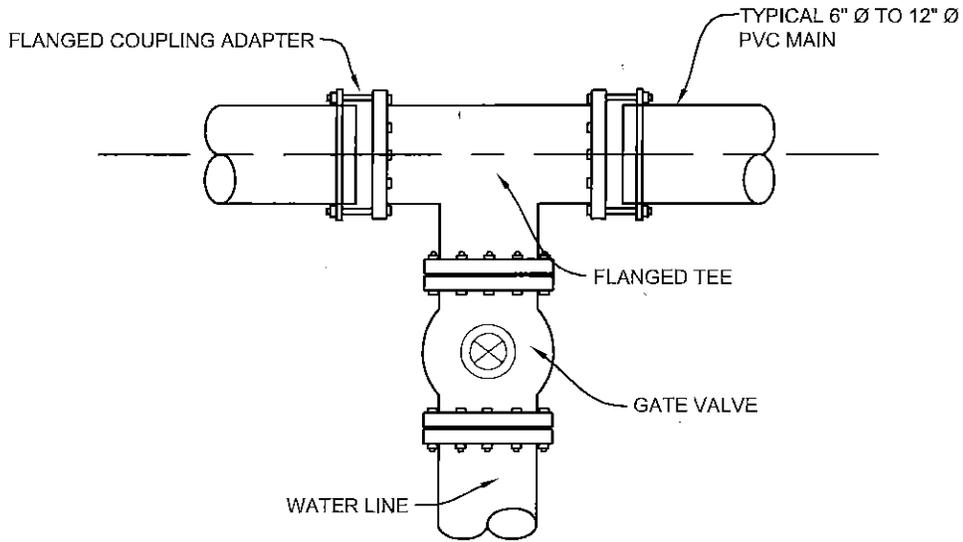


**CITY OF RIVERBANK**  
 DEPARTMENT OF PUBLIC WORKS

**WATER SAMPLING STATION**

*William F. Kull*  
 CITY ENGINEER - WILLIAM F. KULL

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 521.DWG	<b>9-23-14</b>	<b>521</b>



- NOTES:
1. THRUST BLOCK TO BE INSTALLED AT TEE PER STD. 516.
  2. GATE VALVE TO BE SUPPORTED ON CONCRETE PIER BLOCK PER STD.515.

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

TEE & GATE VALVE  
INSTALLATION ON EX. MAIN

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

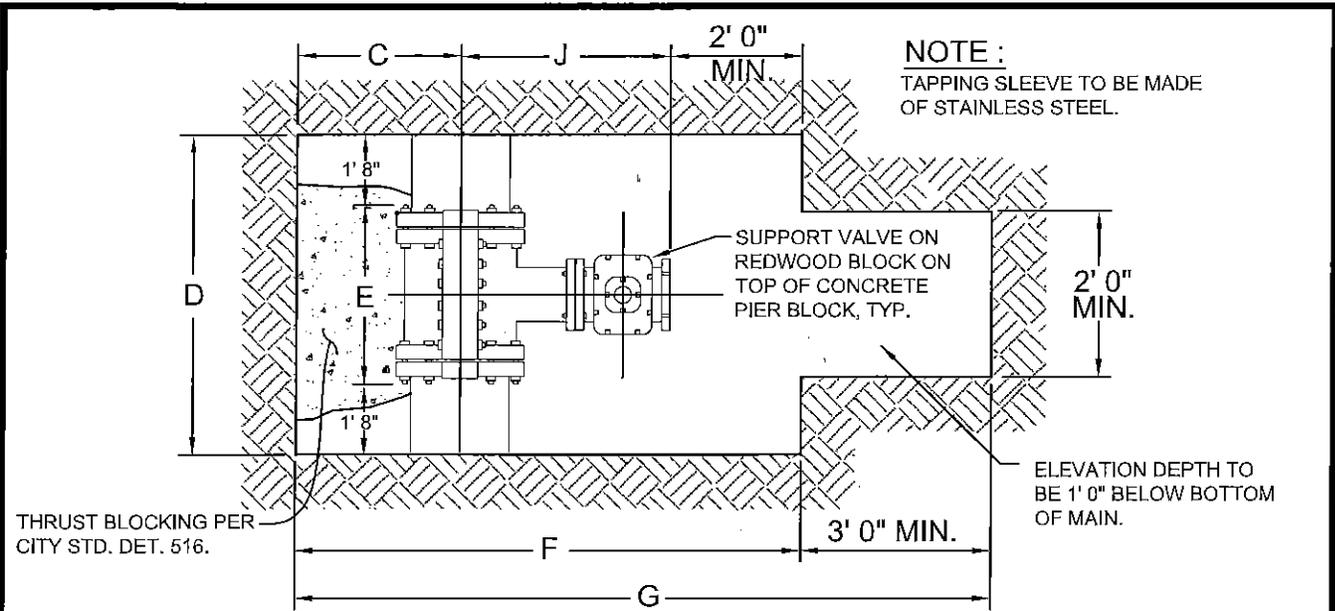
REVISIONS:  
NONE

SECTION:  
WATER

DRAWING NAME:  
522.DWG

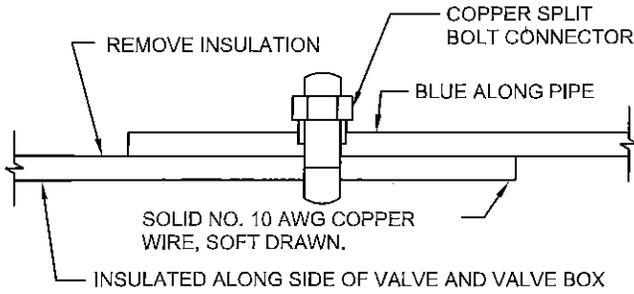
9-23-14

522



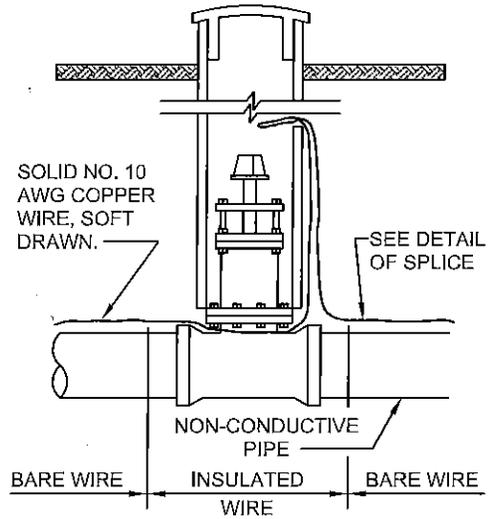
TAPPING SLEEVE SIZE	C	D	E	F	G	J
4 X 2"	1' 3"	4' 9"	16 1/2"	4' 5"	7' 5"	14 1/32"
4 X 3"	1' 3"	4' 9"	16 1/2"	4' 6"	7' 6"	14 3/4"
4 X 4"	1' 3"	4' 9"	16 1/2"	4' 10"	7' 10"	18 9/16"
6 X 2"	1' 4"	4' 10"	18 3/8"	4' 7"	7' 7"	15 5/32"
6 X 3"	1' 4"	4' 10"	18 3/8"	4' 8"	7' 8"	15 7/8"
6 X 4"	1' 4"	4' 10"	18 3/8"	5' 0"	8' 0"	20 3/8"
6 X 6"	1' 4"	4' 10"	18 3/8"	5' 1"	8' 1"	21 7/16"
8 X 2"	1' 5"	4' 11"	19 1/4"	4' 10"	7' 10"	16 7/32"
8 X 3"	1' 5"	4' 11"	19 1/4"	4' 10"	7' 10"	17 1/4"
8 X 4"	1' 5"	4' 11"	19 1/4"	5' 2"	8' 2"	21 1/16"
8 X 6"	1' 5"	4' 11"	19 1/4"	5' 4"	8' 4"	22 13/16"
8 X 8"	1' 5"	5' 1"	21 1/4"	5' 6"	8' 6"	24 5/8"
10 X 2"	1' 6"	4' 11"	19"	5' 0"	8' 0"	17 25/32"
10 X 3"	1' 6"	4' 11"	19"	5' 1"	8' 1"	18 1/2"
10 X 4"	1' 6"	4' 11"	19"	5' 5"	8' 5"	22 9/16"
10 X 6"	1' 6"	5' 11"	19"	5' 6"	8' 6"	23 13/16"
10 X 8"	1' 6"	5' 3"	23"	5' 7"	8' 7"	25 5/16"
10 X 10"	1' 6"	5' 3"	23"	5' 9"	8' 9"	26 3/8"
12 X 2"	1' 7"	4' 11"	19"	5' 2"	8' 2"	18 29/32"
12 X 3"	1' 7"	4' 11"	19"	5' 3"	8' 3"	19 5/8"
12 X 4"	1' 7"	4' 11"	19"	5' 7"	8' 7"	23 9/16"
12 X 6"	1' 7"	4' 11"	19"	5' 8"	8' 8"	24 13/16"
12 X 8"	1' 7"	5' 1"	21"	5' 9"	8' 9"	25 5/16"
12 X 10"	1' 7"	5' 5"	25"	5' 10"	8' 10"	27 3/8"
12 X 12"	1' 7"	5' 5"	25"	5' 11"	8' 11"	27 1/2"
14 X 4"	1' 8"	5' 8"	27 3/4"	5' 9"	8' 9"	24 5/8"
14 X 6"	1' 8"	5' 8"	27 3/4"	5' 10"	8' 10"	25 7/16"
14 X 8"	1' 8"	5' 8"	27 3/4"	6' 0"	9' 0"	27 15/16"
14 X 10"	1' 8"	5' 8"	27 3/4"	6' 1"	9' 1"	29"
14 X 12"	1' 8"	5' 8"	27 3/4"	6' 1"	9' 1"	29 1/8"
14 X 14"	1' 8"	6' 2"	33 1/2"	6' 2"	9' 2"	30 1/4"

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>TAPPING SLEEVE</b> <b>INSTALLATION</b>	
<i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL: <b>9-23-14</b>	DRAWING NO. <b>523</b>
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 523.DWG		

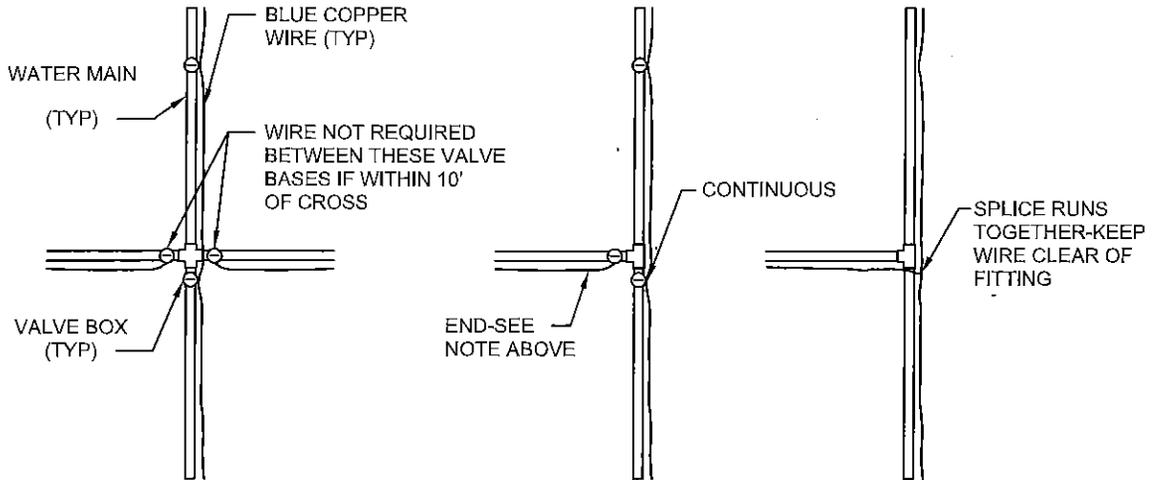


NOTE: IF WIRE ENDS AT VALVE BOX, RUN SINGLE INSULATED LEAD UP TO 10' BELOW GROUND.

DETAIL OF CONNECTION



INSTALLATION AT VALVE BOX



TYPICAL PLACING AT MAIN INTERSECTIONS

NOTES:

1. WIRE TO BE CONTINUOUS BETWEEN VALVE BOXES, EXCEPT WHERE BOXES ARE WITHIN TEN (10') FEET OF PIPE INTERSECTION.
2. BLUE WIRE NOT TO TOUCH VALVE OR FITTINGS. (COATED WIRE ONLY)
3. LOCATING WIRE TO BE LAID AT TOP OF PIPE.

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

TRACER WIRE  
INSTALLATION

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 524.DWG

ADOPTED BY THE CITY COUNCIL:

9-23-14

DRAWING NO.

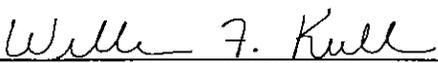
524

# ALLOWABLE GALLONS LOST IN ONE HOUR AT 150 PSI

PIPE LENGTH (FT)	PIPE DIAMETER.					
	4"	6"	8"	10"	12"	15"
25	0.03	0.04	0.05	0.06	0.08	0.09
50	0.05	0.08	0.10	0.13	0.15	0.19
75	0.08	0.11	0.15	0.19	0.23	0.28
100	0.10	0.15	0.20	0.25	0.30	0.38
125	0.13	0.19	0.25	0.31	0.38	0.47
150	0.15	0.23	0.30	0.38	0.45	0.56
175	0.18	0.26	0.35	0.44	0.53	0.66
200	0.20	0.30	0.40	0.50	0.60	0.75
225	0.23	0.34	0.45	0.56	0.68	0.84
250	0.25	0.38	0.50	0.63	0.75	0.94
275	0.28	0.41	0.55	0.69	0.83	1.03
300	0.30	0.45	0.60	0.75	0.90	1.13
325	0.33	0.49	0.65	0.81	0.98	1.22
350	0.35	0.53	0.70	0.88	1.05	1.31
375	0.38	0.56	0.75	0.94	1.13	1.41
400	0.40	0.60	0.80	1.00	1.20	1.50
425	0.43	0.64	0.85	1.06	1.28	1.59
450	0.45	0.68	0.90	1.13	1.35	1.69
475	0.48	0.71	0.95	1.19	1.43	1.78
500	0.50	0.75	1.00	1.25	1.50	1.88
525	0.53	0.79	1.05	1.31	1.58	1.97
550	0.55	0.83	1.10	1.38	1.65	2.06
575	0.58	0.86	1.15	1.44	1.73	2.16
600	0.60	0.90	1.20	1.50	1.80	2.25
625	0.63	0.94	1.25	1.56	1.88	2.34
650	0.65	0.98	1.30	1.63	1.95	2.44
675	0.68	1.01	1.35	1.69	2.03	2.53
700	0.70	1.05	1.40	1.75	2.10	2.63
725	0.73	1.09	1.45	1.81	2.18	2.72
750	0.75	1.13	1.50	1.88	2.25	2.81
775	0.78	1.16	1.55	1.94	2.33	2.91
800	0.80	1.20	1.60	2.00	2.40	3.00

**NOTE:**

IN ACCORDANCE WITH CITY CONSTRUCTION STANDARDS, NEW WATERLINES SHALL BE HYDROSTATICALLY TESTED TO A MINIMUM OF 150 PSI, FOR A PERIOD OF NOT LESS THAN 2 HOURS. NO PIPE INSTALLATION SHALL BE ACCEPTED IF LEAKAGE FOR THE SECTION EXCEEDS A RATE IN GALLONS PER HOUR PER ONE THOUSAND FEET (GPH/1000') OF 0.25 MULTIPLIED BY THE PIPE DIAMETER IN INCHES. (GPH/1000' < 0.25xPIPE DIA.) THIS CHART COMPUTES MAXIMUM ALLOWABLE LEAKAGE RATES FOR VARIOUS LENGTHS OF PIPE BASED ON THIS STANDARD, AND IS INTENDED AS A CONVENIENCE, ONLY.

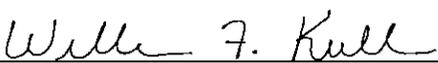
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>WATER HYDROSTATIC</b>  <b>PRESSURE / LOSS</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 525.DWG	<b>9-23-14</b>	<b>525</b>

# ALLOWABLE GALLONS LOST IN ONE HOUR AT 150 PSI

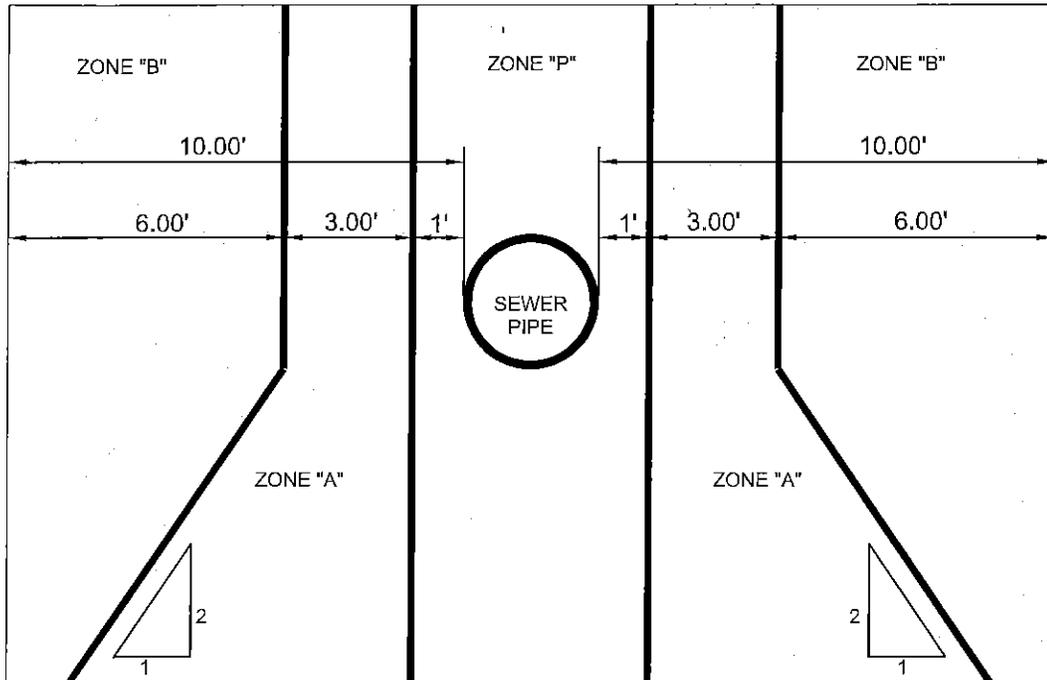
PIPE LENGTH (FT)	PIPE DIAMETER					
	4"	6"	8"	10"	12"	15"
825	0.83	1.24	1.65	2.06	2.48	3.09
850	0.85	1.28	1.70	2.13	2.55	3.19
875	0.88	1.31	1.75	2.19	2.63	3.28
900	0.90	1.35	1.80	2.25	2.70	3.38
925	0.93	1.39	1.85	2.31	2.78	3.47
950	0.95	1.43	1.90	2.38	2.85	3.56
975	0.98	1.46	1.95	2.44	2.93	3.66
1000	1.00	1.50	2.00	2.50	3.00	3.75
1025	1.03	1.54	2.05	2.56	3.08	3.84
1050	1.05	1.58	2.10	2.63	3.15	3.94
1075	1.08	1.61	2.15	2.69	3.23	4.03
1100	1.10	1.65	2.20	2.75	3.30	4.13
1125	1.13	1.69	2.25	2.81	3.38	4.22
1150	1.15	1.73	2.30	2.88	3.45	4.31
1175	1.18	1.76	2.35	2.94	3.53	4.41
1200	1.20	1.80	2.40	3.00	3.60	4.50
1225	1.23	1.84	2.45	3.06	3.68	4.59
1250	1.25	1.88	2.50	3.13	3.75	4.69
1275	1.28	1.91	2.55	3.19	3.83	4.78
1300	1.30	1.95	2.60	3.25	3.90	4.88
1325	1.33	1.99	2.65	3.31	3.98	4.97
1350	1.35	2.03	2.70	3.38	4.05	5.06
1375	1.38	2.06	2.75	3.44	4.13	5.16
1400	1.40	2.10	2.80	3.50	4.20	5.25

**NOTE:**

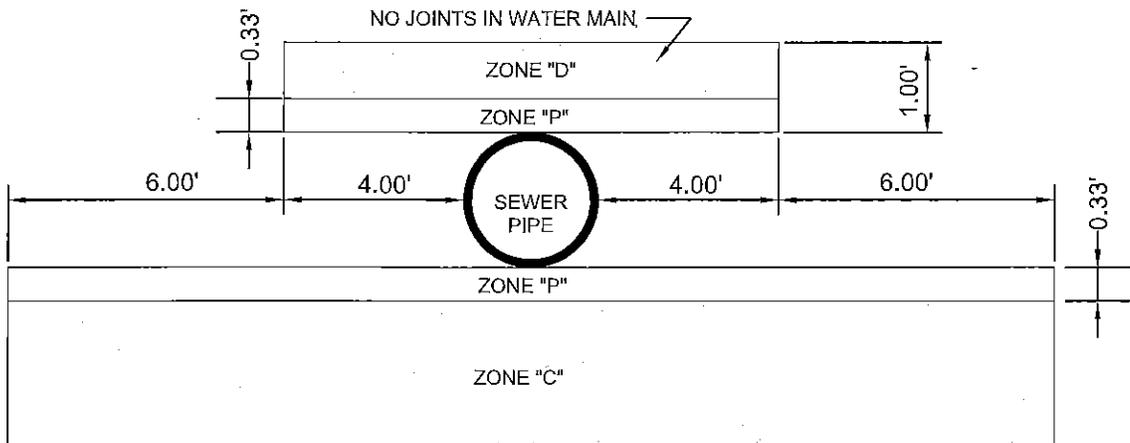
IN ACCORDANCE WITH CITY CONSTRUCTION STANDARDS, NEW WATERLINES SHALL BE HYDROSTATICALLY TESTED TO A MINIMUM OF 150 PSI, FOR A PERIOD OF NOT LESS THAN 2 HOURS. NO PIPE INSTALLATION SHALL BE ACCEPTED IF LEAKAGE FOR THE SECTION EXCEEDS A RATE IN GALLONS PER HOUR PER ONE THOUSAND FEET (GPH/1000') OF 0.25 MULTIPLIED BY THE PIPE DIAMETER IN INCHES. (GPH/1000' < 0.25xPIPE DIA.) THIS CHART COMPUTES MAXIMUM ALLOWABLE LEAKAGE RATES FOR VARIOUS LENGTHS OF PIPE BASED ON THIS STANDARD, AND IS INTENDED AS A CONVENIENCE, ONLY.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>WATER HYDROSTATIC PRESSURE / LOSS</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 526.DWG	<b>9-23-14</b>	<b>526</b>

**ALTERNATE DESIGN FOR REDUCED SEPERATION**  
 (TO BE USED ONLY WHERE REQUIRED 10 FT. SEPARATION CANNOT BE OBTAINED)  
**NEW WATER LINE BEING INSTALLED**



PARALLEL CONSTRUCTION



PERPENDICULAR CONSTRUCTION

**NOTES:**

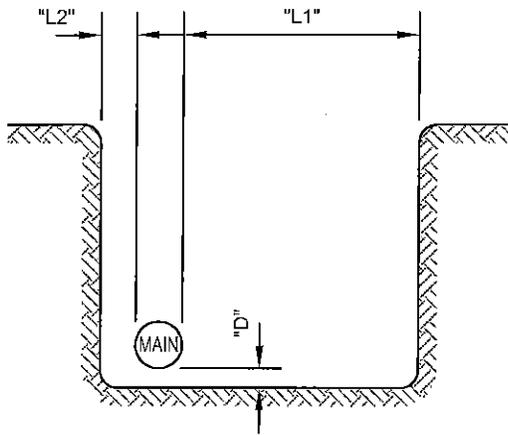
1. ZONE "A" REQUIRES SPECIAL PIPE AND SPECIAL PERMISSION FROM THE PUBLIC HEALTH AGENCY
2. ZONE "B" REQUIRES SPECIAL PIPE
3. ZONE "C" REQUIRES SPECIAL PIPE AND PIPE JOINTS ARE NOT ALLOWED
4. ZONE "D" REQUIRES STANDARD PIPE AND PIPE JOINTS ARE NOT ALLOWED
5. ZONE "P" IS A PROHIBITED ZONE.

**CITY OF RIVERBANK**  
 DEPARTMENT OF PUBLIC WORKS

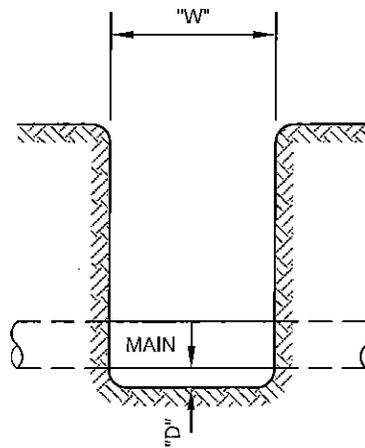
**WATER MAIN SEPARATION  
 REGULATIONS**

*William F. Kull*  
 CITY ENGINEER - WILLIAM F. KULL

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 527.DWG	<b>9-23-14</b>	<b>527</b>



PERPENDICULAR TO EXISTING MAIN



PARALLEL TO EXISTING MAIN

EXCAVATION REQUIREMENTS FOR CONNECTIONS TO EXISTING WATER MAINS				
EXISTING PIPE SIZE	W	D	L1	L2
4"	3'-0"	0'-6"	7'-0"	1'-0"
6"	4'-0"	1'-0"	7'-0"	1'-0"
8"	5'-0"	1'-6"	7'-0"	1'-0"
10"	6'-0"	2'-0"	7'-0"	1'-6"
12" OR LARGER	6'-0"	2'-0"	7'-0"	1'-6"

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

EXCAVATION REQUIREMENTS  
FOR CONSTRUCTION

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

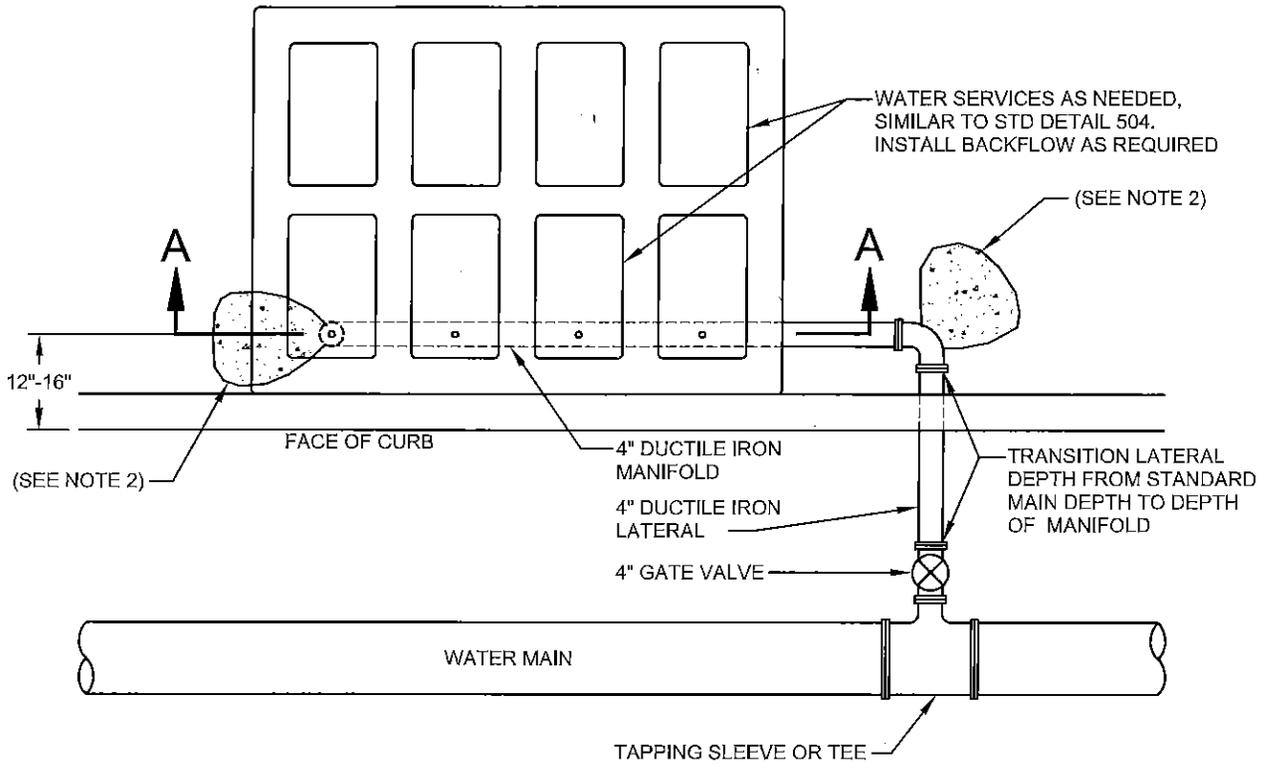
REVISIONS:  
NONE

SECTION:  
WATER

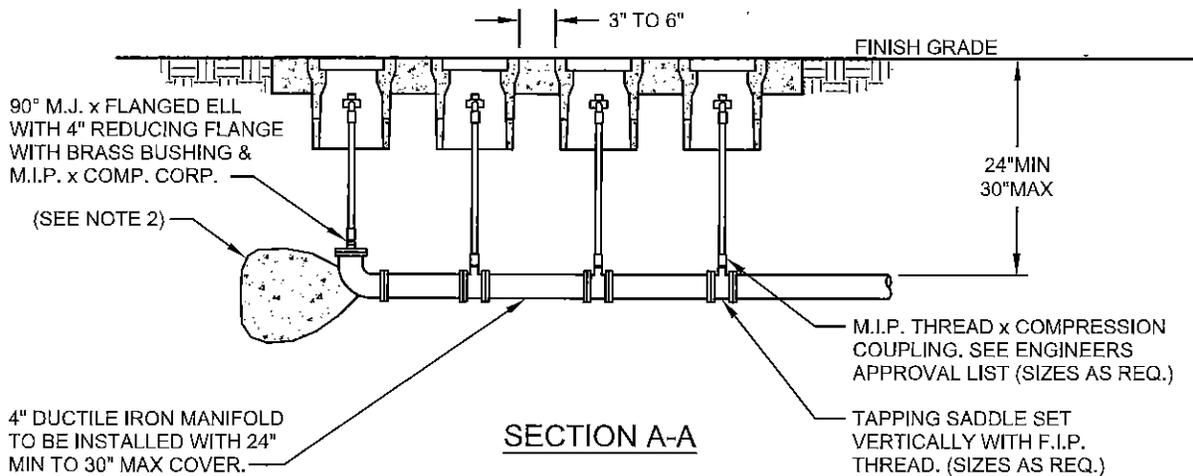
DRAWING NAME:  
528.DWG

9-23-14

528



**PLAN VIEW**



**SECTION A-A**

**NOTES:**

1. THIS STANDARD MAY BE ADAPTED FOR CONNECTION TO A COMBINATION WATER SERVICE PER STD DETAIL 504.
2. RESTRAINED JOINTS ARE REQUIRED FOR ALL NEW CONSTRUCTION FROM GATE VALVE TO END OF 4" MANIFOLD. THRUST BLOCKS ARE ONLY REQUIRED WHERE EXISTING SERVICES ARE BEING MODIFIED AND RESTRAINED JOINTS ARE NOT USED.

**CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS**

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**4" DUCTILE IRON  
MULTI-SERVICE MANIFOLD**

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: WATER	DRAWING NAME: 529.DWG

ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
<b>9-23-14</b>	<b>529</b>

**City of Riverbank  
DESIGN STANDARDS**

**WASTEWATER**

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## SECTION 6: WASTEWATER

### 6.100 General

#### 6.101 Scope

These standards apply to all public wastewater facilities designed for installation within a public right-of-way or PUE in the City and are limited to sewer mains and laterals 18 inches or less in diameter. Standards and requirements for larger sizes will be determined by the City Engineer on a case-by-case basis. Except where specifically noted in these Standards, or as required as part of project approval, all wastewater facilities installed on private property for private use and ownership shall be designed and constructed in accordance with the provisions of the Uniform Plumbing Code, as adopted by the City.

Wastewater lines shall be designed in accordance with acceptable engineering principles, California OSHA Standards (legal min.), and State of California Title 22 requirements (legal min.), and shall conform to City Standards. Storm water collection facilities shall not be connected to a wastewater line. Industrial waste sources may be connected or discharged into a wastewater line with approval of the City Engineer.

These Standards do **not** cover all the applicable City, State and Federal requirements for wastewater quality and monitoring.

### 6.200 Design Flow

Wastewater facilities shall be designed on a peak flow basis in accordance with the following formula:

$$Q_D = (P_F * Q_A) + I$$

Where:

$Q_D$	=	Design Wastewater Flowrate
$Q_A$	=	Average Wastewater Flowrate - See section 2.201
$P_F$	=	Peaking Factor - See section 2.202
$I$	=	Infiltration - See section 2.203

#### 6.201 Average Wastewater Flowrate

Average wastewater flows for residential areas shall be based on 100 gallons per capita per day (gpcpd), with an assumed population of 3.0 capita per single family dwelling unit, and 2.0 capita per multifamily dwelling unit. (Note: duplexes, "patio" homes, condominiums and townhomes shall be considered multifamily dwellings when determining wastewater flowrates).

For studies in which the exact unit count has not yet been determined, the average wastewater flowrate shall be determined based on gross area, as summarized in the following table:

Zoning	Land Use	Units/Acre	Avg. Flow (gal./acre/day)
R1	Single Family Residential	5	1500
R2	Duplex Residential	12.5	2500
R3	High Density Residential	20	4000
C1 and C2	Commercial	-	1760
CM, M1, M2	Industrial (See Note 1)	-	1500

Notes:

1. The average flows listed for industrial areas shall be used in preliminary studies, only. Additional data on anticipated wastewater flows for industrial projects shall be provided and considered on a case-by-case basis prior to the final design/improvement plan phase of the project.
2. Wastewater flows for areas of Planned Development (PD) zoning shall be based on the underlying zoning and land uses as indicated in the project's Master Plan, if exact unit counts are not yet known.
3. Average wastewater flows from schools shall be based on 20 gallons per attendant per day.

### 6.202 Peaking Factor

Peak flow shall be based on land use, and obtained by multiplying the average flow by the following peak factors:

- Commercial: 3.0
- Industrial: 2.0
- Residential: 3.0, for upstream service populations up to 10,000 persons. For populations greater than 10,000, the following formula may be used to determine the peaking factor:

$$P_F = (18 + x^{1/2}) / (4 + x^{1/2})$$

Where "x" = population in thousands

### 6.203 Infiltration and Inflow

Infiltration and inflow shall be determined on a gross acreage basis, at a rate of 1000 gallons per acre per day.

## 6.300 Pipe Design

### 6.301 Minimum Size

New gravity wastewater lines shall be 8 inches or greater in nominal diameter. Terminal runs that have no potential for further extension, such as in cul-de-sacs, may be 6" in diameter.

### 6.302 Design Depth of Flow

All gravity wastewater lines shall be designed to flow at a maximum of 70% full under the design flow conditions.

### 6.303 Slope

All sewers shall be designed to provide a minimum velocity of 2.0 feet per second at the flowing full condition, using Manning's equation with an "n" of 0.013. Summarized below are minimum slopes, design capacities and flowing full capacities for different pipe sizes:

Size	Minimum Slope (ft/ft)	Design Cap. (gpm)	Full Cap. (gpm)
6	0.0050	149	178
8	0.0035	269	320
10	0.0025	412	492
12	0.0020	599	715
15	0.0015	940	1123

Designs in which downstream mains do not meet these velocity standards shall be specifically approved by the City Engineer.

Maximum velocity shall not exceed 10 feet per second at the design flowrate. Sewers shall be designed with uniform slope between manholes.

### 6.304 Vertical Alignment

The minimum cover for wastewater lines shall be 3 feet from the existing or planned final grade, whichever is lower, to the top of the sewer pipe. Laterals shall have a nominal cover of 30 inches at the property line or at a point 5 feet outside the curb face or edge of paving, whichever is the greater distance from the roadway centerline. Minimum cover requirements may be reduced if special backfill and/or special piping are used. See §2.401 for additional information regarding service lateral cover and §5.701 for structural considerations.

When crossing a water main, the wastewater line shall be installed below the water main with a clearance of at least 12 inches where this separation cannot be maintained, the City Engineer may approve reduced clearances based on the California Dept. of Health Services Guidelines. A minimum vertical clearance of at least 3 inches shall be maintained between a wastewater line and a storm drain. Separation distances shall be measured from the nearest edges of the facilities.

At points of convergence of pipes of various sizes, the pipe crown of the inflowing pipe(s) shall be no lower in elevation than the crown of the outflowing pipe. Exceptions to this may be granted at the discretion of the City Engineer if this is not practical (cover requirements, clearance issues, etc...) See §2.502 regarding drop manholes for additional information.

### 6.305 Horizontal Alignment

Wastewater Lines shall be placed within street rights-of-way unless placement in an easement is specifically approved by the City Engineer. Alignment shall be parallel to the street centerline whenever possible.

The horizontal alignment of wastewater lines in new streets, easements and private streets shall be as shown on the appropriate City of Riverbank Standard Plan. In existing streets and other special cases (such as looped streets in which the utilities may be located concentrically to avoid crossings), the alignment may vary from the Standard Plans, but in no case shall there be less than 10 feet horizontal clearance to a water main, except as specifically approved by the City Engineer in accordance with State Department of Health Services policies.

Curved sewers are allowed. However, joint deflections or pipe curvature shall not exceed the pipe manufacturer's recommendations. The following table may be used as a conservative guide. If a shorter radius is desired, the appropriate design information (i.e. short pipe lengths, radius fittings, etc) shall be shown on the plans.

Minimum Radius of Bending Circle (ft.)

Pipe Size	Ductile Iron	PVC	VCP
4	190	160	200
6	190	160	200
8	190	210	200
10	190	270	200
12	190	320	200
15	n/a	390	260

Wastewater lines, including laterals, or other sanitary hazards shall not be constructed adjacent to any existing or proposed well site. California State Department of Health Services requirements shall be the minimum required separation, however these may be increased where the well location is not fixed or redrilling is planned.

### 6.306 Pipe Materials

The following standard pipe materials shall be used for gravity flow wastewater line construction and shall conform to the appropriate American Society of Testing and Materials (ASTM) and American Water Works Association (AWWA) specifications (latest revision):

<u>Pipe Material</u>	<u>Specification</u>
Ductile iron pipe	ASTM A746
w/polyethylene lining & polyethylene encasement*	ASTM D1248, Class C, 30 mil thickness AWWA C105
PVC sewer pipe and fittings	ASTM D3034 SDR 26
Vitrified clay pipe	ASTM C700 (extra strength)
laterals only:	
Cast iron soil pipe (4" & 6")	ASTM A74, service weight

\* polyethylene encasement may be omitted if a corrosivity soils report provided per Appendix A of AWWA C105 indicates encasement is not needed. Alternate linings may be approved on a case-by-case basis,

New main sewers and/or laterals servicing exclusively industrial and commercial development may be limited to vitrified clay pipe depending on the proposed use.

Trench and pipe strength design shall be shown on the improvement plans per §5.700.,

### 6.307 Joints and Fittings

Joints and fittings shall be selected and installed to minimize infiltration and to prevent the entrance of roots throughout the life of the system. Ductile iron pipe joints and fittings shall conform to AWWA C110 or other approved joint for wastewater applications. Joints for PVC pipe shall be flexible elastomeric type conforming to ASTM D3212, Solvent welded joints for PVC pipe are not permitted. Joints for vitrified clay pipe shall conform to ASTM C425.

Joining of pipe sections of unlike materials shall be accomplished using approved flexible band seals. Other joining methods shall not be used unless approved by the City Engineer.

## **6.400 Services**

### **6.401 General**

One service is typically allowed per parcel being served. Additional services may be specifically approved by the City Engineer in order to eliminate the need for on-site pumps, excessive trenching, or in other circumstances.

The minimum diameter for services (lateral sewers) shall be 4 inches.

A lateral sewer installed concurrently with a main sewer shall be of the same type and class of pipe material as the sewer main except where land use, cover or water main separation requirements indicate otherwise. For new services on existing mains, the lateral sewer may be of any approved pipe material as specified in §2,306,,

Size and depth of services is to be determined by the design engineer for the parcel being served subject to minimums contained in City Standards. Particular attention should be given to large, deep parcels.

Storm drainage shall not be permitted to discharge into the sanitary sewer system.

### **6.402 Monitoring Structures**

Sanitary sewer monitoring structures and/or sampling manholes shall be installed on new development projects if so directed by the City Engineer. Typically, monitoring structures will not be required on residential developments, but may be necessary on industrial and commercial projects. Monitoring structures shall be in a location that is accessible to City personnel at all times, and may be considered a cleanout in lieu of a separate required cleanout.

### **6.403 Traps and Waste Interceptors**

Appropriate traps and waste interceptors shall be installed on services on-site as required by the City Engineer in conformance with the Uniform Plumbing Code, as adopted by the Riverbank Municipal Code, and the Standard Plans. Grease traps and/or sand/oil interceptors shall be installed on sewer services for any facility whose operation will result in oil, grease, sand or other solids being discharged into the City's sanitary sewer system.

## **6.500 Manholes and Miscellaneous Structures**

### **6.501 Manholes**

Manholes shall be located in areas accessible to cleaning equipment and at:

- ◆ the end of each line
- ◆ all changes in pipe grade, size, or alignment
- ◆ all junctions of sewer mains and/or laterals 6 inches or greater in diameter
- ◆ distances not greater than 400 feet

24" diameter risers may be used in lieu of standard 48" manholes where the depth to the invert is less than 42 inches.

Manholes/risers may be required for inspection purposes at the end of stubs exceeding 25 feet in length

### **6.502 Drop Manholes**

Drop manholes per City Standard Details shall be provided where the inflowing pipe crown elevation is more than 2 feet above the crown elevation of the outflowing pipe.

## **6.600 Lift Stations**

### **6.601 General**

All lift stations shall be specifically approved by the City Engineer after consideration of all reasonable gravity flow alternatives, and shall be designed in accordance with the standards contained herein.

Lift station structures, electrical, and mechanical equipment shall be located and designed such that they are protected from physical damage by the 100-year flood and will remain fully operational and accessible during the design storm.

The lift station shall be located off the traveled way of streets and alleys, and shall be provided with paved vehicular access and appropriate security as required by the City Engineer.

### **6.602 Design**

Lift stations shall be designed to be compatible with current City equipment, systems, and operational/maintenance practices. As each lift station will be a unique design, developers and design engineers are highly recommended to consult with the City Engineer prior to final design of the new lift station

In areas of corrosive soils, impressed current cathodic protection is required and shall be designed by a qualified corrosion control engineer.

California OSHA standards shall be observed in the design of all pumping station access structures

#### **Pumps:**

Pumps in all new lift stations shall be of a manufacturer and model approved by the City Engineer.

At least two pumps shall be provided for each pumping station. If only two units are provided (duplex), they shall have the same capacity, and each be capable of handling the design flow. Where three or more units are provided, they shall be of such capacity that with any one unit out of service, the remaining units will have capacity to handle maximum design flows.

Design pumping rate shall be the design wastewater flowrate (see section 2.200) for the ultimate tributary area. For lift stations that are intended to serve a relatively large, phased tributary area, initial lower flow rates shall be considered in the design. It may be necessary to provide an interim design with fewer or smaller capacity pumps. In these instances, the plans shall indicate what the ultimate pumps shall be, as well as the ultimate design

discharge flowrate and total dynamic head. The station and site should be designed for ultimate conditions, and for maximum ease of transition from interim to ultimate design.

**Wetwells:**

The wetwell size and control setting shall be appropriate to avoid heat buildup in the pump motors due to frequent starting, and to avoid septic conditions due to excessive detention time. Wetwells and controls shall be such that sewage detention time is limited to 2 hours. Detention time in excess of 2 hours shall require provisions for odor control. Total pump starts shall be limited to no more than 10 per hour. Volume available in upstream sewer mains may not be considered to be part of the available wet well storage volume.

Wetwells shall be reinforced concrete and lined in accordance with the Construction Specifications. The type of lining shall be indicated on the plans.

The wetwell floor shall have a minimum slope of 1 to 1 to a hopper bottom. The horizontal area of the hopper bottom shall not be greater than necessary for proper installation and function of the pump inlet.

Wetwell covers and access hatches shall be H-20 traffic rated.

**Valving:**

Each pump discharge shall be equipped with the following valves:

**Gate Valves:** Gate valves shall be resilient wedge, flanged joints. All resilient wedge gate valves shall conform to the applicable requirements of ANSI/AWWA C509, and shall be handled and installed in accordance with the recommendations set forth in the appendix to ANSI/AWWA C509, and the recommendations of the manufacturer. All interior and exterior ferrous metal surfaces of valves and accessories shall be shop coated for corrosion protection. Approved manufacturers: Clow F-6100, Mueller A-2370, Kennedy 4561/4701, and American Flow Control –Series 2500

**Check Valves:** Check valves shall be installed immediately downstream of the gate valves, and shall be swing type with an external lever and minimum pressure rating of 250 psi. Approved manufacturers: Clow F5345, Mueller #2600-6-01, Kennedy IBBM Swing Check Valve, American "50" Line with Weight and Lever

Valves shall be contained underground in a separate precast concrete box, with a traffic rated lid.

**Electrical Equipment:**

All wetwell electrical equipment shall be explosion proof and meet National Electrical Code Class 1, Division 2, Group D requirements. All drywell electrical equipment shall be NEMA 4.

Telemetry and level sensing equipment compatible with the City's latest SCADA equipment shall be provided. Alarms shall be activated in cases of high water, power failure, pump failure, use of the lag pump, unauthorized entry, or any cause of pump station malfunction.

**Standby Power:**

Pump stations of greater than 1.0 mgd peak flow capacity shall include permanent installation of an emergency standby power generator with an automatic transfer switch. Engines shall be provided with silencing equipment appropriate for the adjacent land use per zoning and General Plan requirement. The location and tank design of the generator fuel tank shall be reviewed and approved by the fire department.

Smaller capacity stations, where approved, shall provide dual, manually switchable electrical feeds from a separate transformer.

**Potable Water Service:**

A potable water service with a reduced pressure backflow prevention device (Febco Model 825) is required for all pump stations.

**Site / Location:**

Lift stations shall not be located within the traveled way of streets, and shall be easily accessible for maintenance personnel. All lift stations shall be fenced, and lift station items within the fenced area shall be set back per the appropriate code, or as required for site access.

Lift station sites shall be paved with a durable surface as required for access by maintenance vehicles, as approved by the City Engineer. Storm drainage shall be provided for the lift station site, as required.

**Instructions and Equipment:**

Three complete sets of operational instructions (including emergency procedures and maintenance schedules), special tools, and such spare parts (i.e., mechanical seals, wear rings, filters, etc.) as may be necessary shall be provided for all pump station equipment.

**6.603 Force Mains**

At average pump flow, a velocity of at least 2 feet per second shall be maintained. Maximum velocity shall be limited to 8 feet per second.

To maximize pump efficiency, it is preferable to provide a force main design that gradually slopes upward from the pump station discharge, to the point of downstream connection. Low points or sumps in the force main are not allowed. High points in the force main shall be avoided. An automatic air relief valve shall be placed at high points in the force main to prevent air locking.

Force mains shall enter the gravity sewer system at a point not more than 1 foot above the flow line of the receiving manhole.

The force main and fittings, including thrust blocking, shall be designed to withstand normal pressure and pressure surges (water hammer). The following standard pipe materials shall be used for force-main construction and shall conform to the applicable ASTM or AWWA specification (latest revision)

<u>Pipe Material</u>	<u>Specification</u>
Ductile iron pipe	AWWA C151
w/ polyethylene lining & Polyethylene encasement*	ASTM D1248, Class C, 30 mil thickness
PVC Plastic Pipe	AWWA C105
	AWWA C900

\* polyethylene encasement may be omitted if a corrosivity soils report provided per Appendix A of AWWA C105 indicates encasement is not needed. Alternate linings may be approved on a case-by-case basis.

Pipe strength (Class) shall be determined by accepted engineering principles and the pipe specification based on the design pressure.

Friction losses through force mains shall be based on the Hazen-Williams' formula with a value for "C" equal to 120.

#### **Separation from Water Mains**

Force main separation from water mains shall conform to applicable State Dept. of Health Services regulations (legal min), and City Standards. The appropriate construction details shall be shown on the plans.

**City of Riverbank  
CONSTRUCTION STANDARDS  
WASTEWATER**

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## SECTION 6: SANITARY SEWER

### **6.100 Materials**

#### **6.101**

#### **General**

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

#### **6.102 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.

#### **6.103 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.

#### **6.104 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 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.

#### **6.105 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.

#### **6.106 Cleanouts**

Cleanout frames and covers shall be manufactured, tested and otherwise furnished in accordance with the Standard Specification of Gray 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.

#### **6.107 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 1/4" for sizes up to and including 24" in diameter, and 5/16" for sizes 27" to 36" in diameter, unless otherwise specified.

#### **6.108 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**

### **6.201 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.

## 6.202 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.

### **6.203 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 onsite 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.

#### **6.301 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.

### **6.302 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)						
				100	150	200	250	300	350	400
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.

**6.303 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 – ¼" (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.

#### **6.304 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**

#### **6.401 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.

#### **6.402 Structures & Manholes**

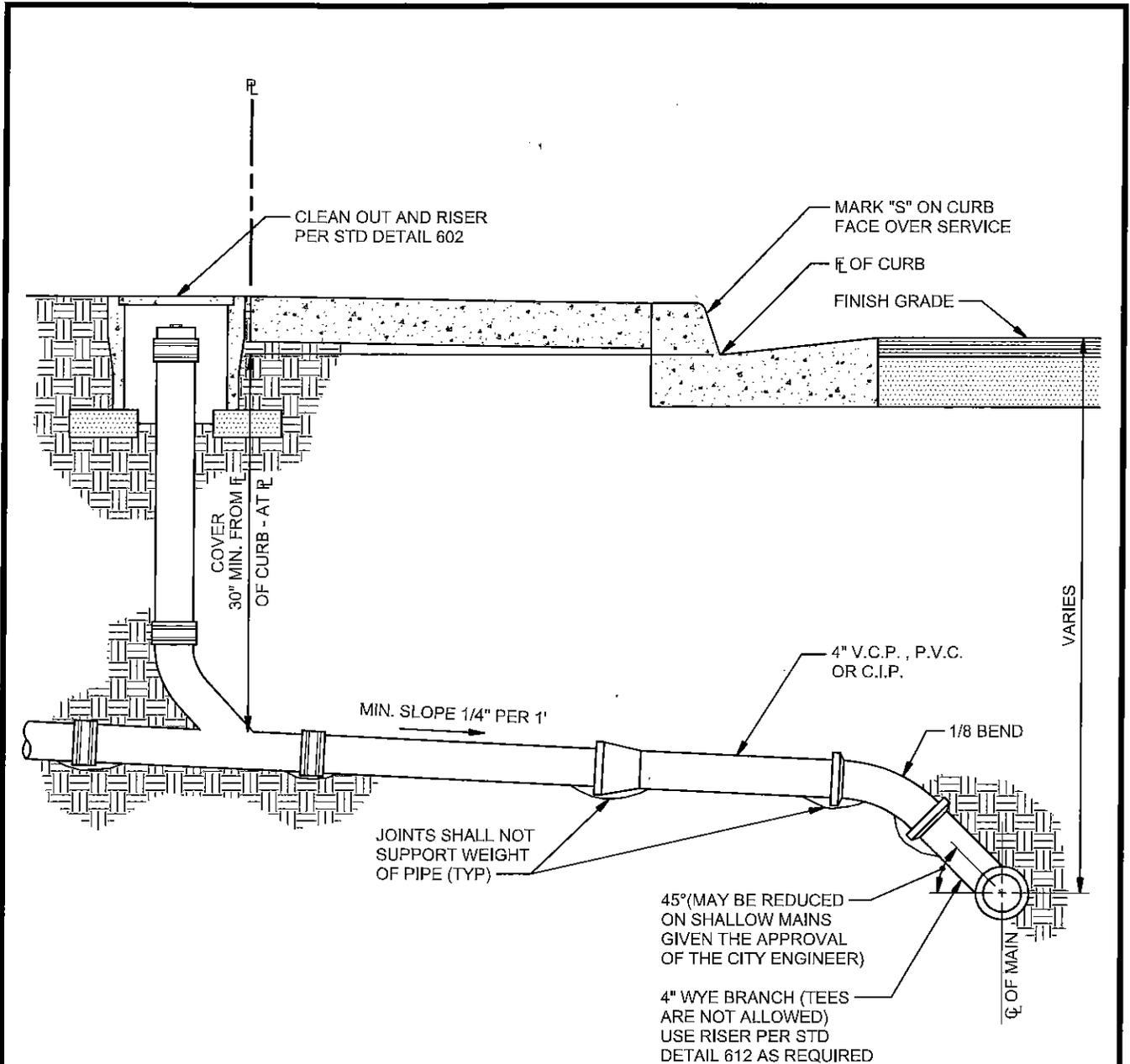
The unit of measure for payment shall be per each unit. Payment shall be made at the bid price per item for each structure complete in place and shall include the cost of excavation, backfill, frames, covers, plates, or reinforcing steel where required.

**City of Riverbank  
STANDARD PLANS**

**WASTEWATER**

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606	Manhole Cone
607	Manhole Base
608	Sanitary Sewer Drop In Existing Manhole & Drop Manhole
609	Sampling Manhole
610	Terminal Manhole
611	Manhole Cover to New Grade
612	Sewer Riser
613	320-5000 Gallon Grease Interceptor
614	Sample Box with Pipe Connectors

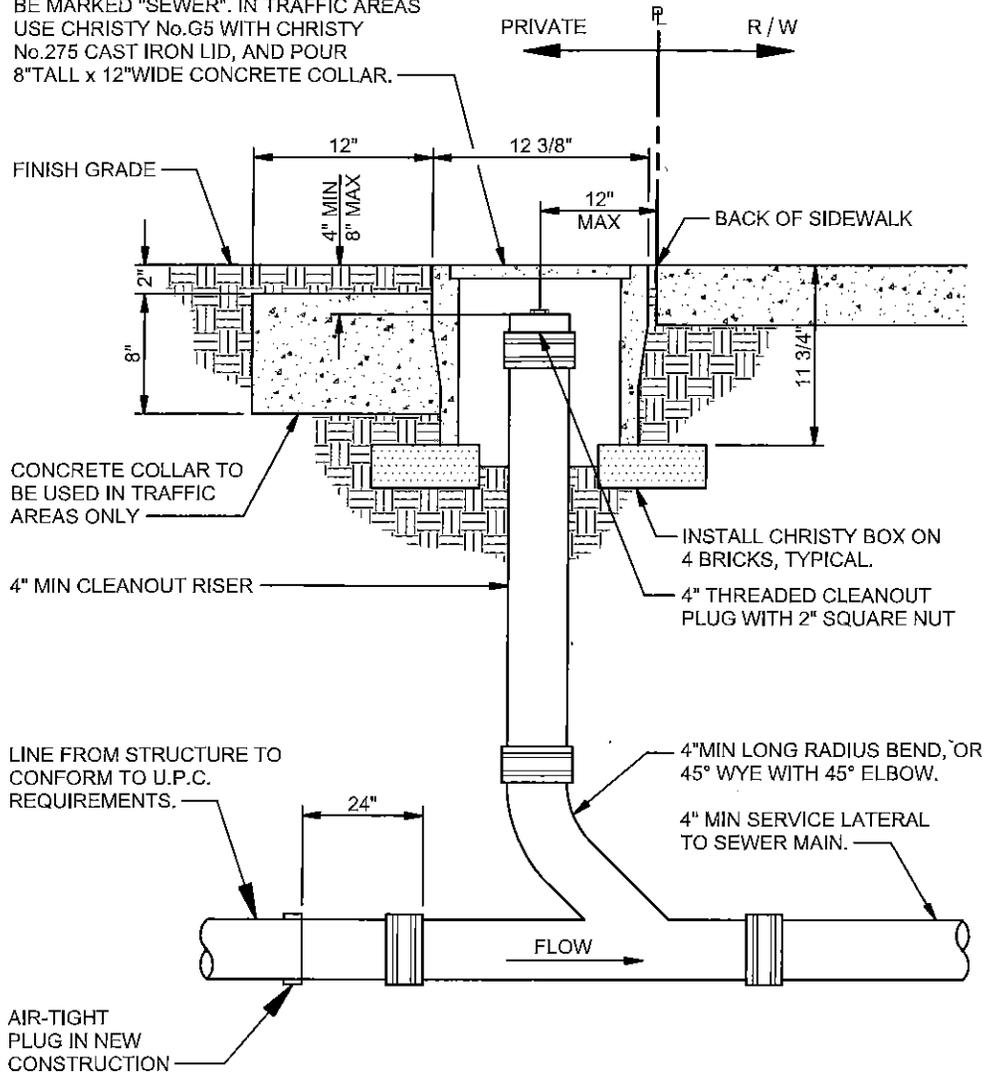


**NOTES:**

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 1000 REGARDING BEDDING AND BACKFILL REQUIREMENTS.

<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>SEWER LATERAL</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 601.DWG	<p><b>9-23-14</b></p>	<p><b>601</b></p>

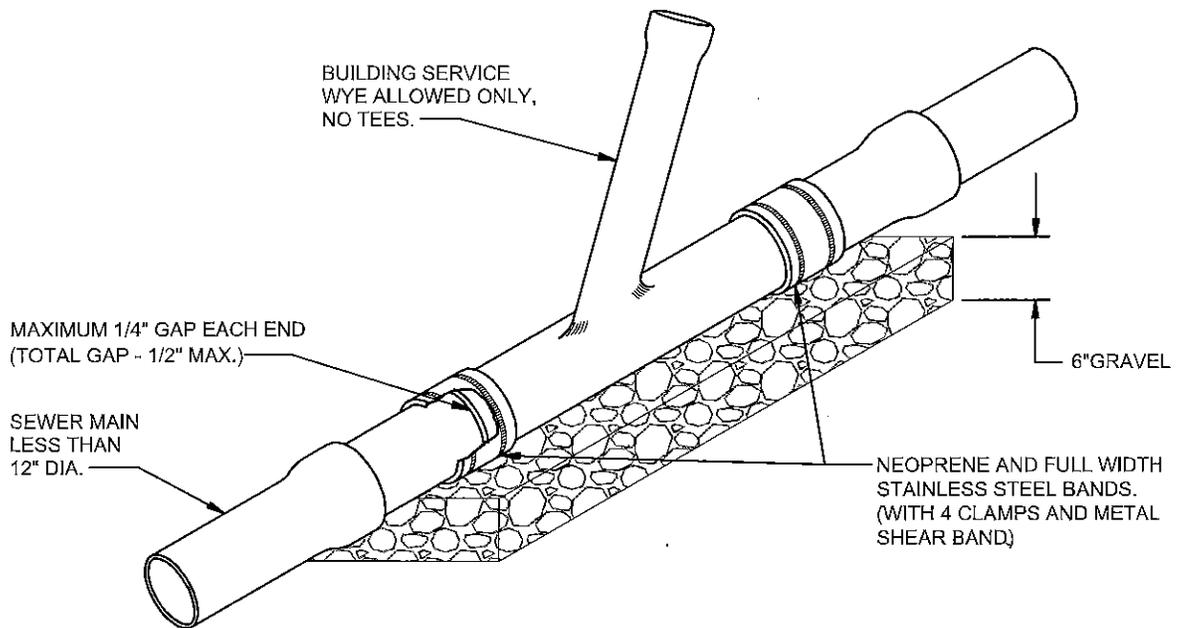
CHRISTY F8 PROTECTION BOX WITH  
CHRISTY F8D CONCRETE LID. ALL LIDS TO  
BE MARKED "SEWER". IN TRAFFIC AREAS  
USE CHRISTY No.G5 WITH CHRISTY  
No.275 CAST IRON LID, AND POUR  
8" TALL x 12" WIDE CONCRETE COLLAR.



**NOTES:**

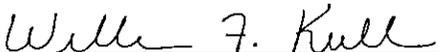
1. CLEANOUT RISER SHALL BE THE SAME SIZE AS THE SEWER LATERAL.
2. CLEANOUT SHALL BE LOCATED JUST BEHIND THE R/W LINE OUTSIDE THE R/W.
3. WYE AND CLEANOUT RISER COMBINATION MAY BE CAST IRON, PVC(SDR 26) OR VITRIFIED CLAY PIPE.
4. ALL COUPLINGS SHALL HAVE STAINLESS STEEL BANDS. (WITH 4 CLAMPS AND METAL SHEAR BAND)

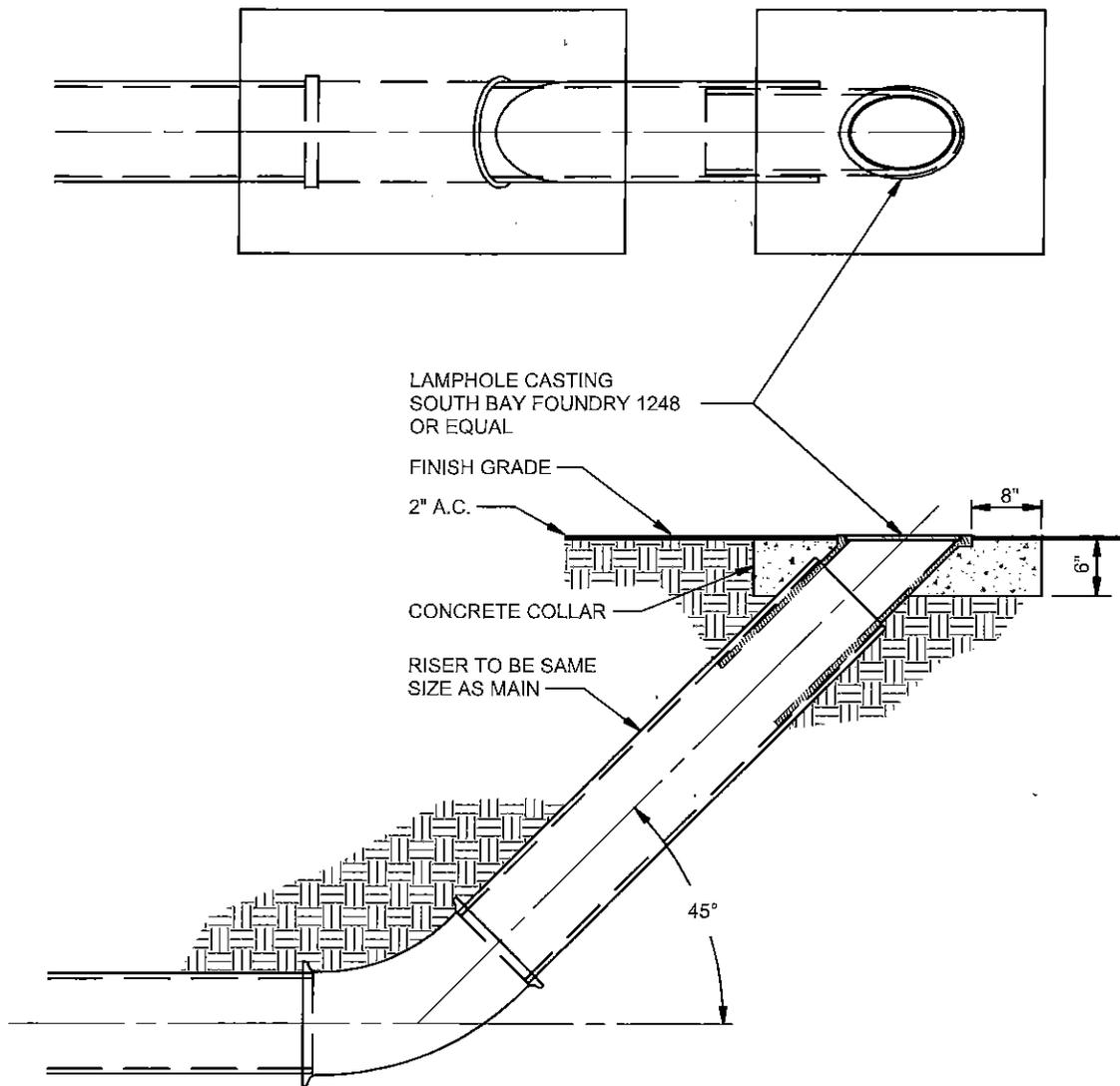
<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>CLEANOUT</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 602.DWG	9-23-14	602



**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.

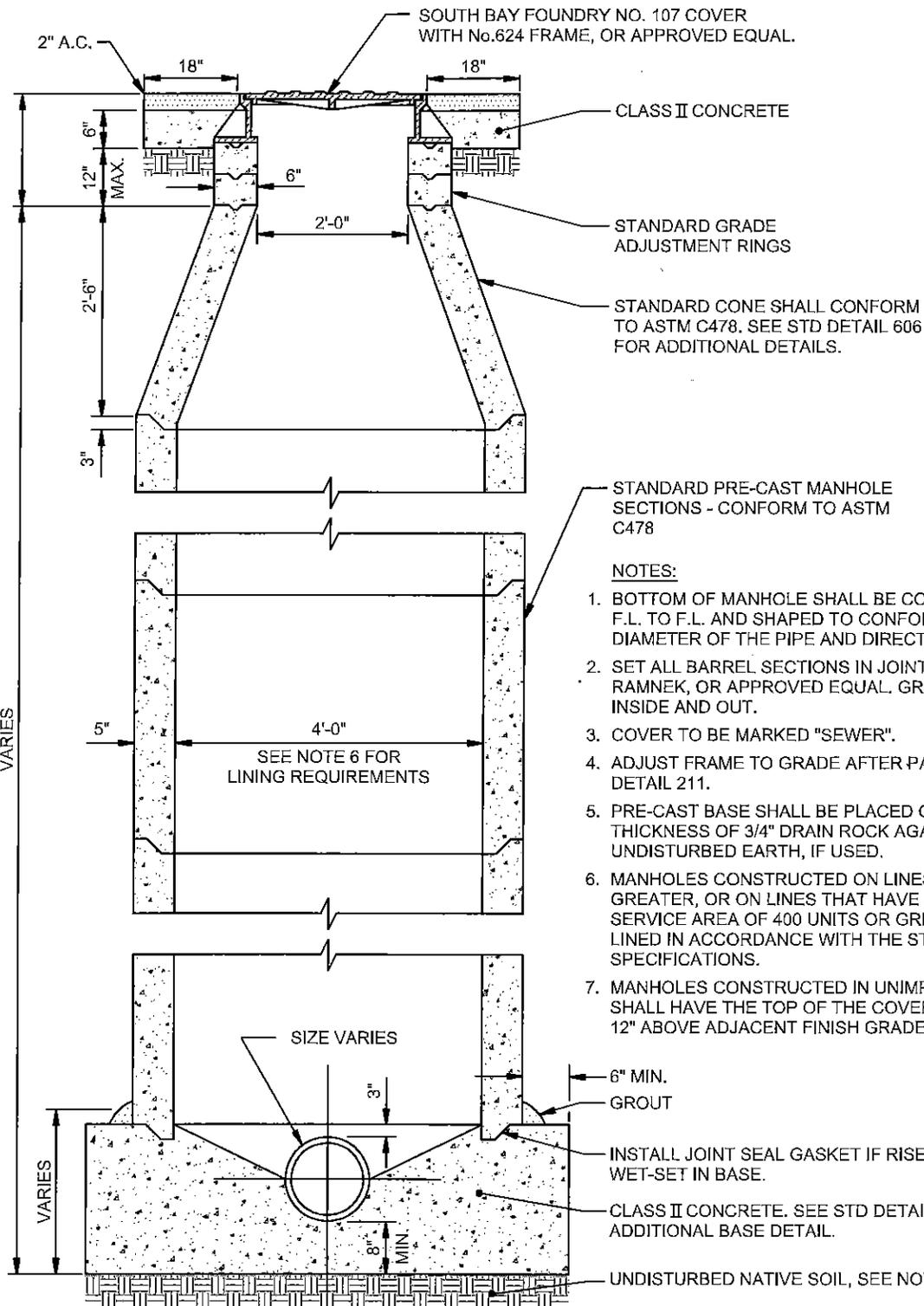
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h2 style="margin: 0;">CUT - IN - WYE</h2>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 603.DWG	9-23-14	603



**NOTE:**

1. LAMP HOLE 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. LAMP HOLES MAY BE INSTALLED AT SEWER LINES STUBBED FOR FUTURE EXTENSION.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h1 style="margin: 0;">LAMP HOLE</h1>	
CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 604.DWG	<b>9-23-14</b>	<b>604</b>



CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

STANDARD MANHOLE

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 605.DWG

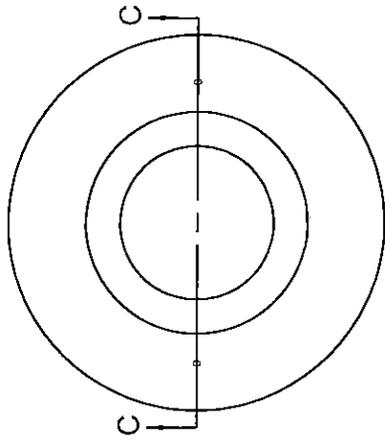
ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

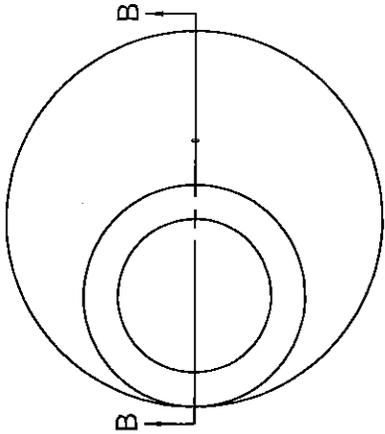
9-23-14

605

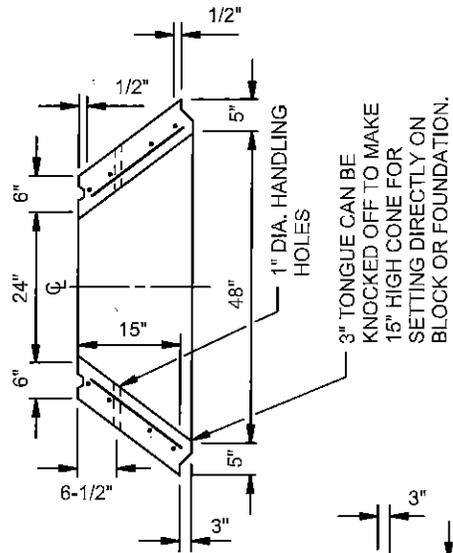
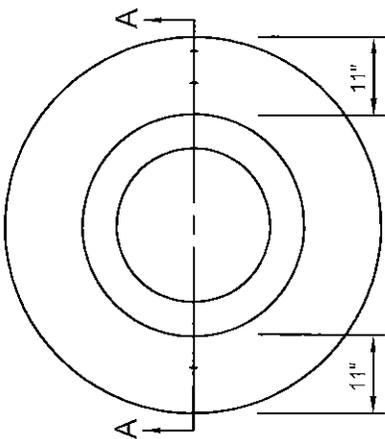
CONCENTRIC SHORT CONE



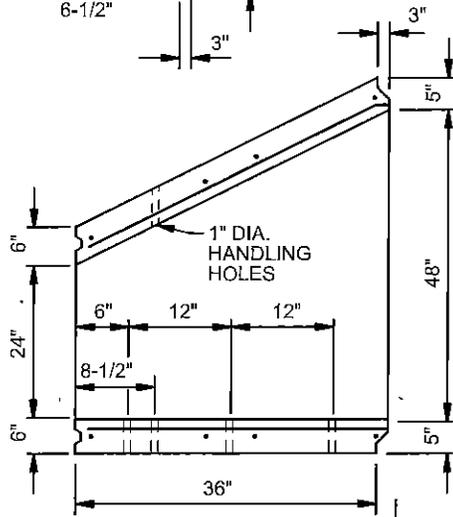
ECCENTRIC CONE



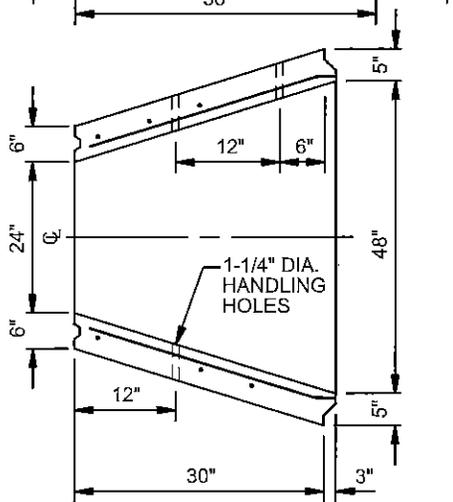
CONCENTRIC CONE



SECTION C-C



SECTION B-B



SECTION A-A

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

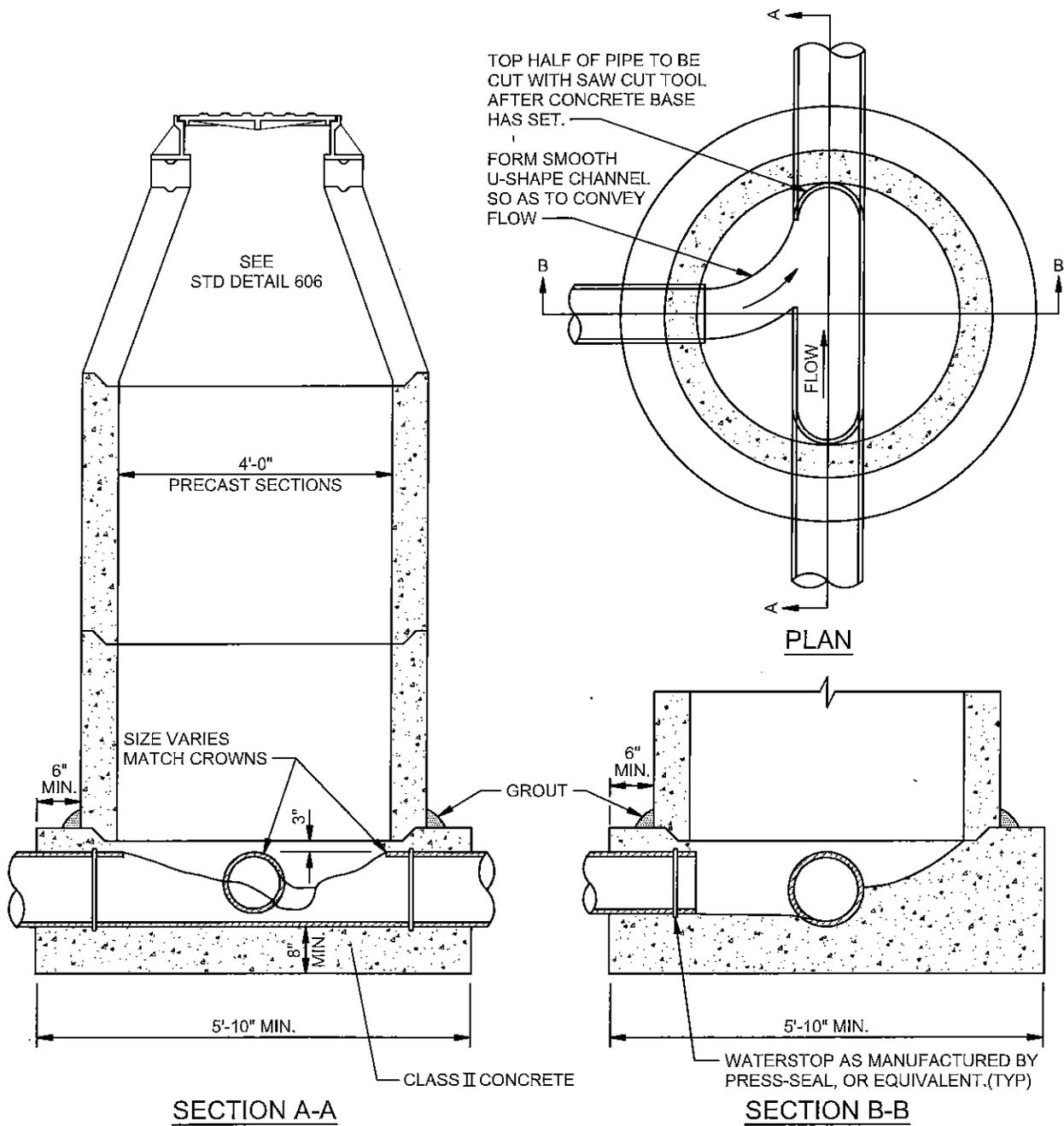
*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

MANHOLE CONE

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 606.DWG

ADOPTED BY THE CITY COUNCIL: <b>9-23-14</b>
--

DRAWING NO. <b>606</b>
---------------------------

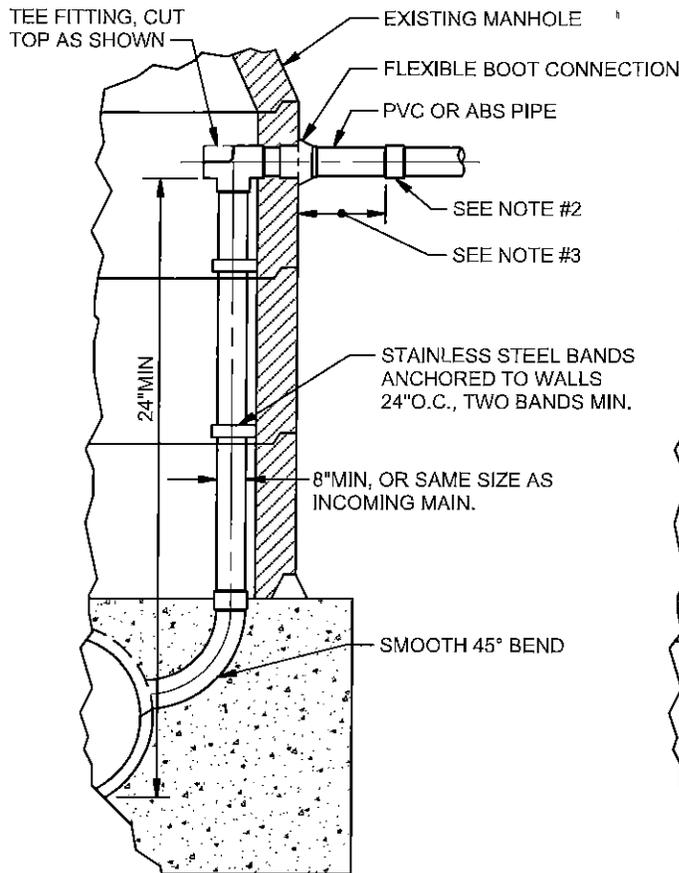


**NOTES:**

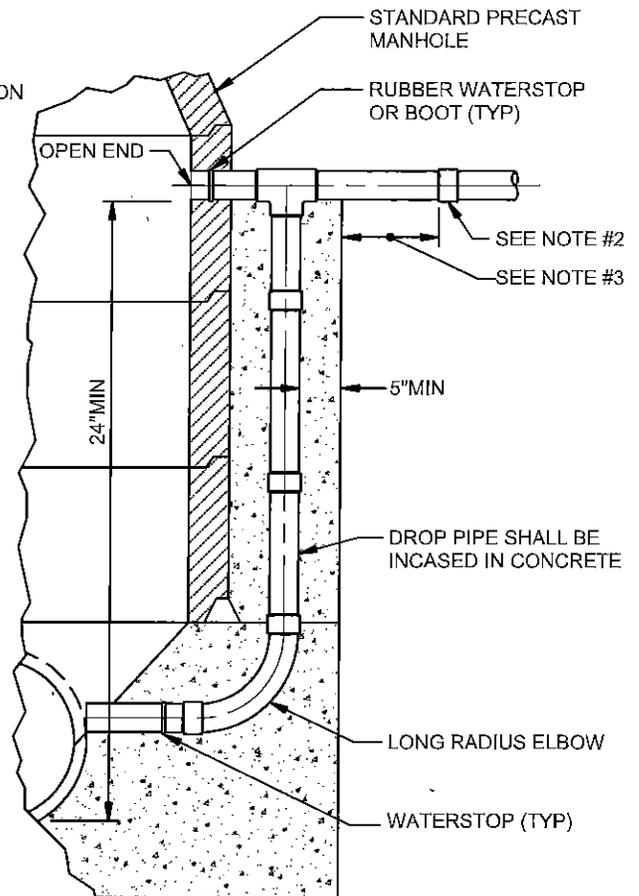
1. PIPE TO BE LAID THROUGH MANHOLE AND TOP HALF REMOVED AFTER CONCRETE HAS SET.
2. POUR IN PLACE BASES TO BE POURED AGAINST UNDISTURBED NATIVE SOIL. PRE CAST BASES SHALL BE SET ON A 6" MIN LAYER OF 3/4" DRAIN ROCK ON UNDISTURBED NATIVE SOIL.
3. FLEXIBLE RUBBER MANHOLE GASKETS SHALL BE INSTALLED AT ALL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

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h2 style="margin: 0;">MANHOLE BASE</h2>	
CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 607.DWG	9-23-14	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.

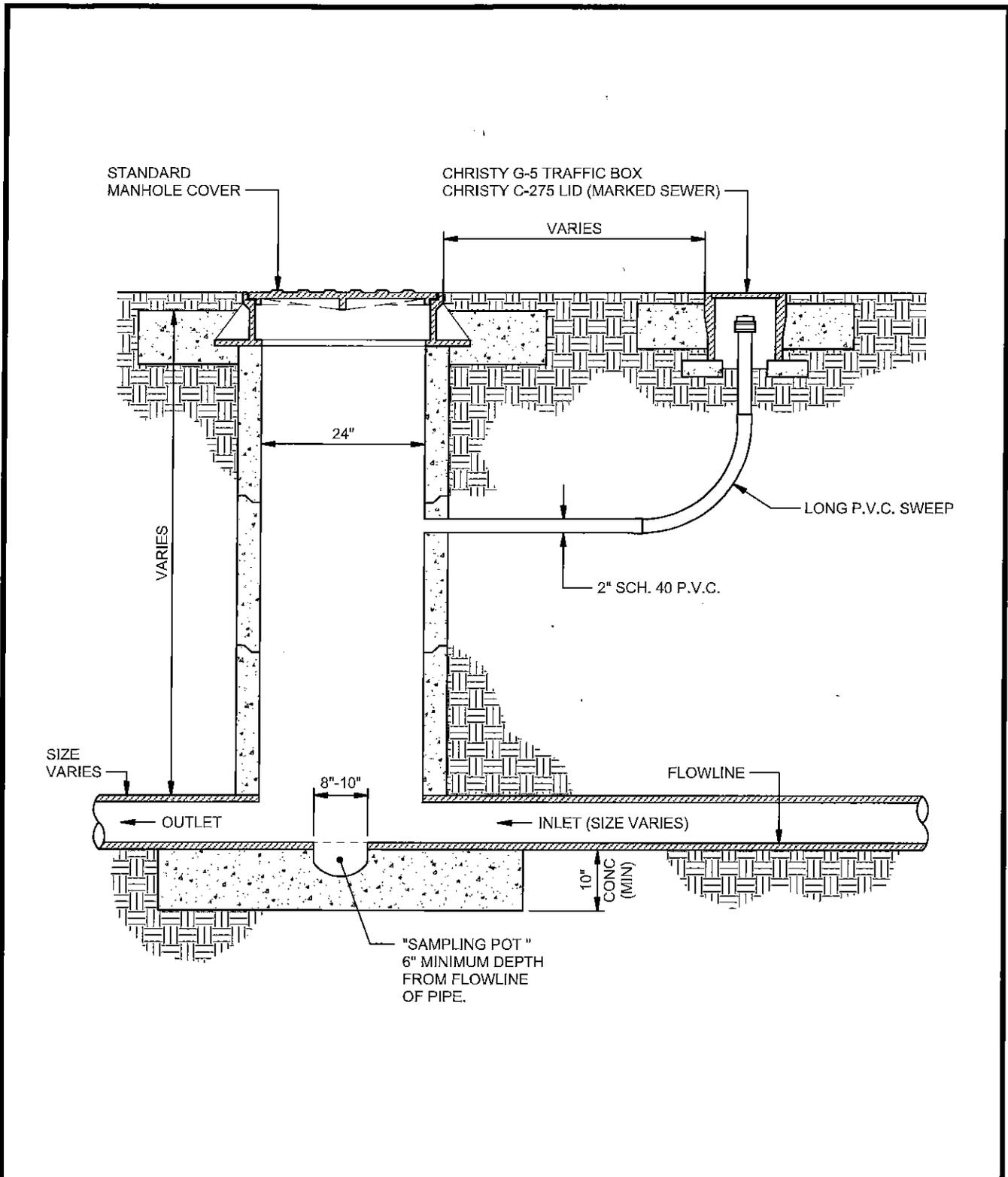
**CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS**

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

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

DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 608.DWG

ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
<b>9-23-14</b>	<b>608</b>



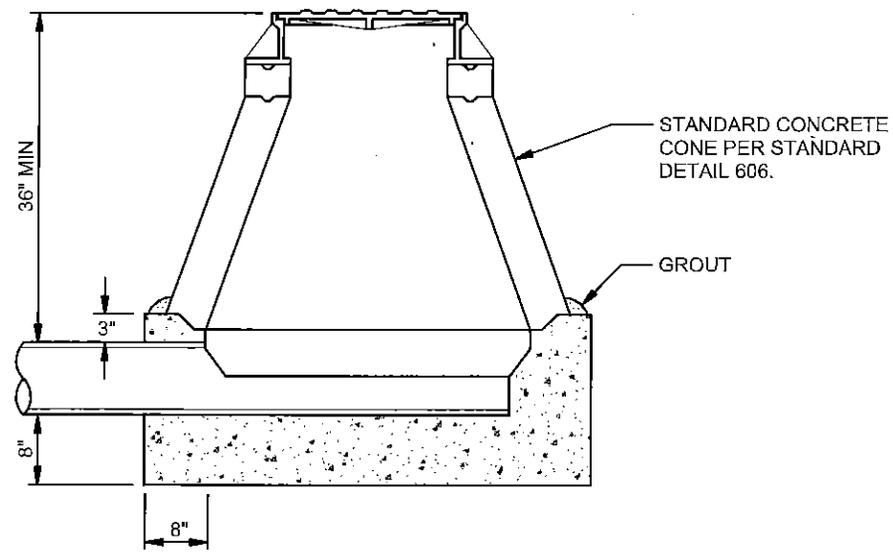
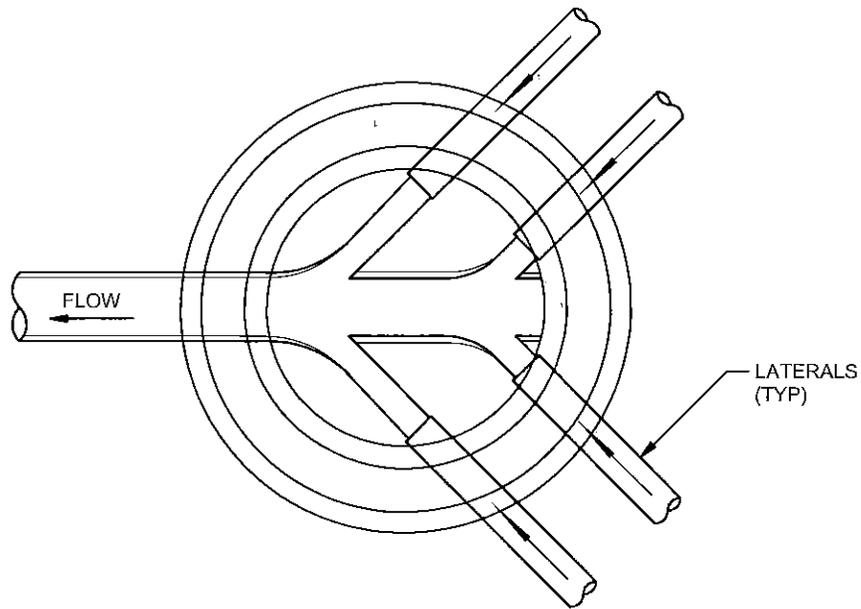
CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

SAMPLING MANHOLE

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

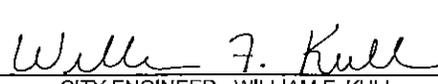
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REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 609.DWG

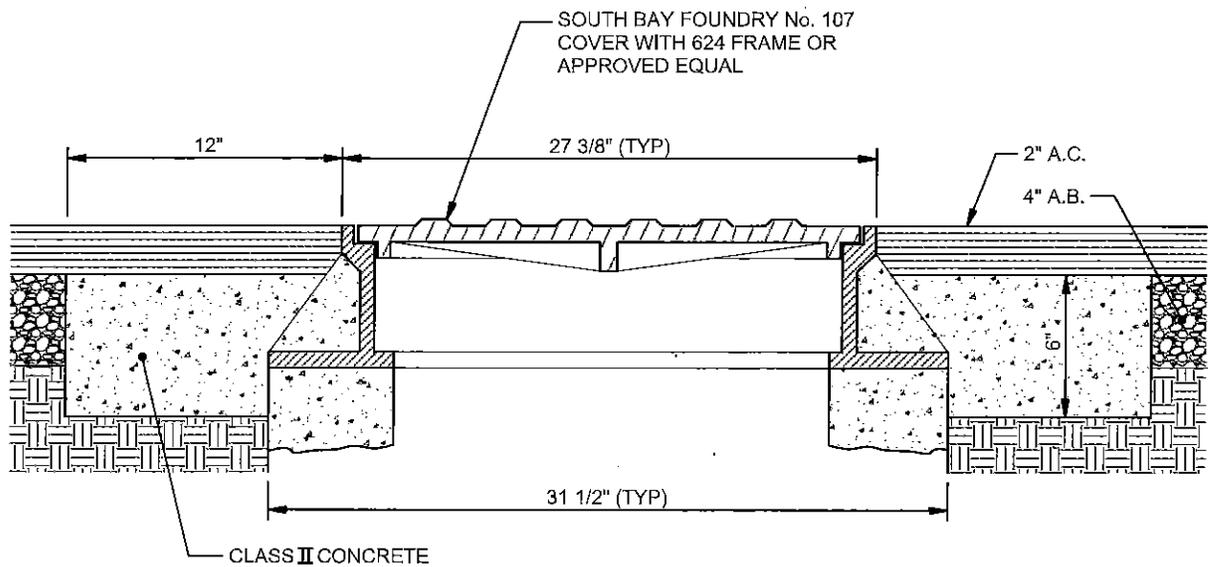
ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
9-23-14	609



**NOTES:**

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

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h2 style="margin: 0;">TERMINAL MANHOLE</h2>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 610.DWG	9-23-14	610



CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

MANHOLE COVER  
TO NEW GRADE

DRAWN BY:  
GK

DATE:  
7/21/15

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

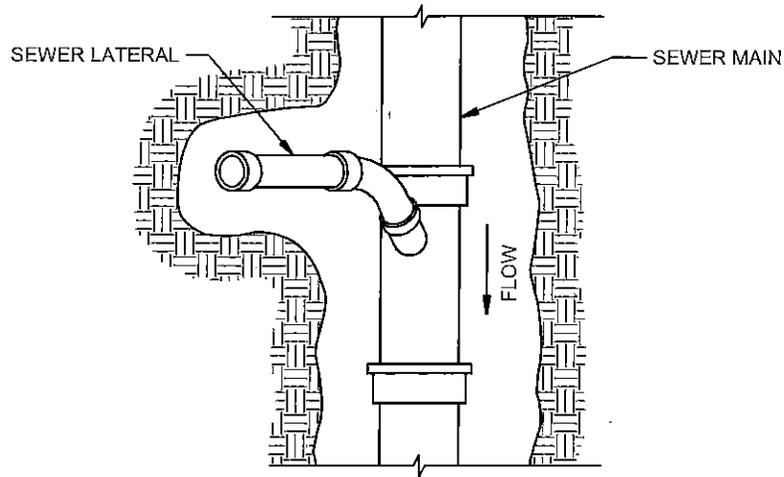
REVISIONS:  
NONE

SECTION:  
SEWER

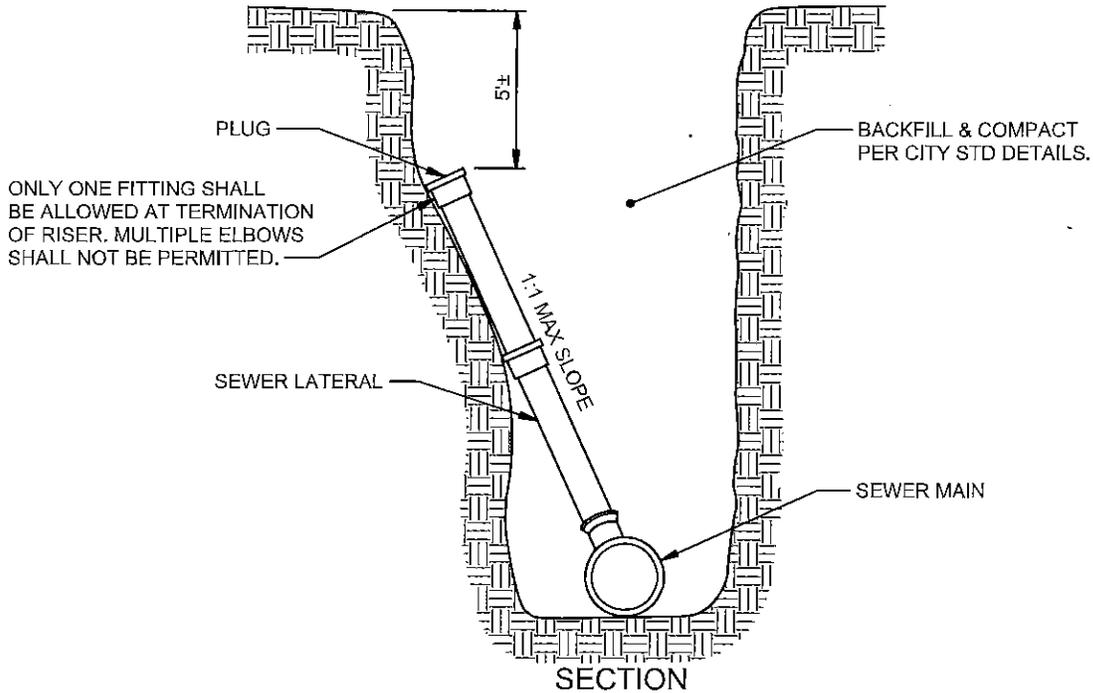
DRAWING NAME:  
611.DWG

9-23-14

611



PLAN

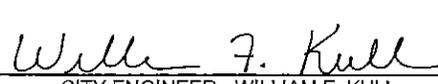


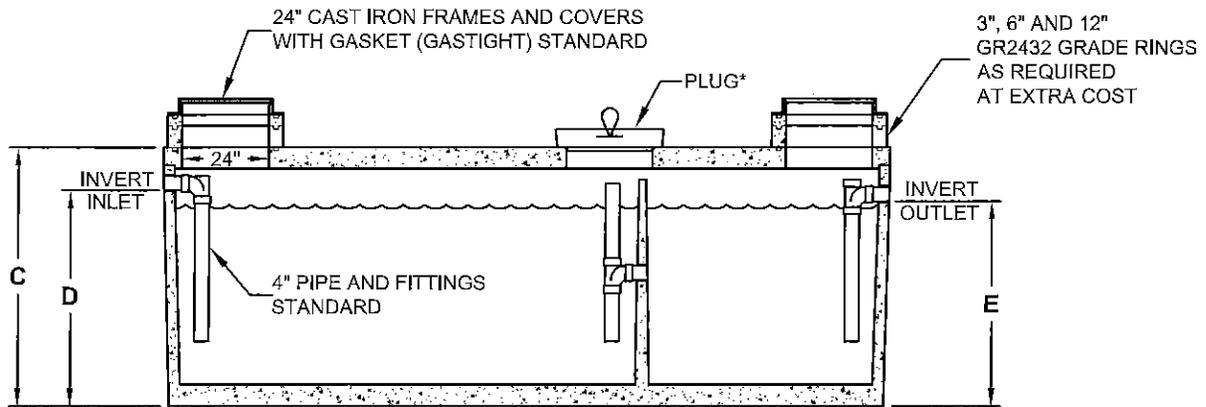
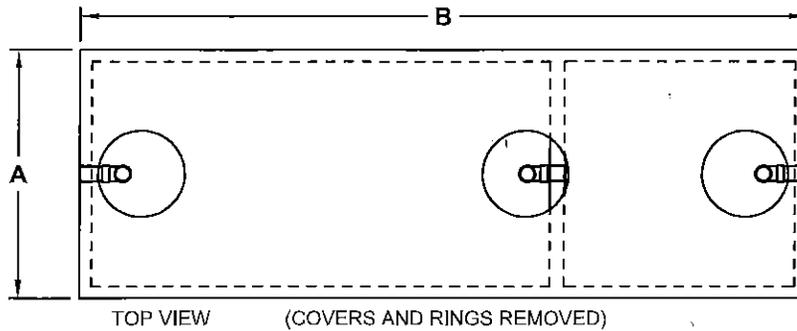
SECTION

ONLY ONE FITTING SHALL BE ALLOWED AT TERMINATION OF RISER. MULTIPLE ELBOWS SHALL NOT BE PERMITTED.

**NOTE:**

SEWER RISER TO BE USED IN CONJUNCTION WITH SEWER LATERAL PER STD DETAIL 601 AS NECESSARY. MAINS EXCEEDING 12' OF COVER SHALL REQUIRE A FLYLINE FOR LATERALS.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h1>SEWER RISER</h1>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 612.DWG	9-23-14	612



SIDE SECTION VIEW

\*EXCEPT MODELS 320 & 500

MODEL NUMBER	LIQUID CAPACITY (GALLONS)	DIM A	DIM B	DIM C	DIM D	DIM E	MINIMUM EXCAVATION WIDTH	MINIMUM EXCAVATION LENGTH	DEPTH OF BURY
JP320EE-G	320	3'-0"	7'-0"	4'-6"	3'-7"	3'-4"	4'-0"	8'-0"	1' TO 8'
JP500EE-G	500	4'-0"	6'-0"	5'-10"	4'-10"	4'-7"	5'-0"	7'-0"	1' TO 6'
JP750EPE-G	750	4'-0"	8'-1"	6'-3"	5'-0"	4'-9"	5'-3"	9'-1"	1' TO 6'
JP1000EPE-G	1000	5'-1"	8'-2"	6'-3"	5'-0"	4'-9"	6'-4"	9'-2"	1' TO 6'
JP1200EPE-G	1200	5'-9"	8'-6"	6'-6"	5'-0"	4'-9"	7'-0"	9'-6"	1' TO 6'
JP1500EPE-G	1500	5'-7"	10'-8"	6'-3"	5'-0"	4'-9"	6'-10"	11'-8"	1' TO 6'
JP2000EPE-G	2000	4'-11"	15'-11"	6'-0"	5'-0"	4'-9"	5'-11"	16'-11"	1' TO 6'
JZ2500EPE-G	2500	5'-9"	16'-10"	6'-0"	5'-0"	4'-9"	6'-9"	17'-10"	1' TO 5'
JZ3000EPE-G	3000	5'-9"	16'-10"	6'-9"	5'-9"	5'-6"	6'-9"	17'-10"	1' TO 5'
JZ4000EPE-G	4000	7'-8"	16'-7"	6'-9"	5'-6"	5'-3"	8'-8"	17'-7"	1' TO 5'
JZ5000EPE-G	5000	7'-8"	16'-7"	7'-11"	6'-9"	6'-6"	8'-8"	17'-7"	1' TO 4'

DESIGN LOAD: H-20 TRAFFIC WITH DRY SOIL CONDITIONS (WATER LEVEL BELOW TANK.)

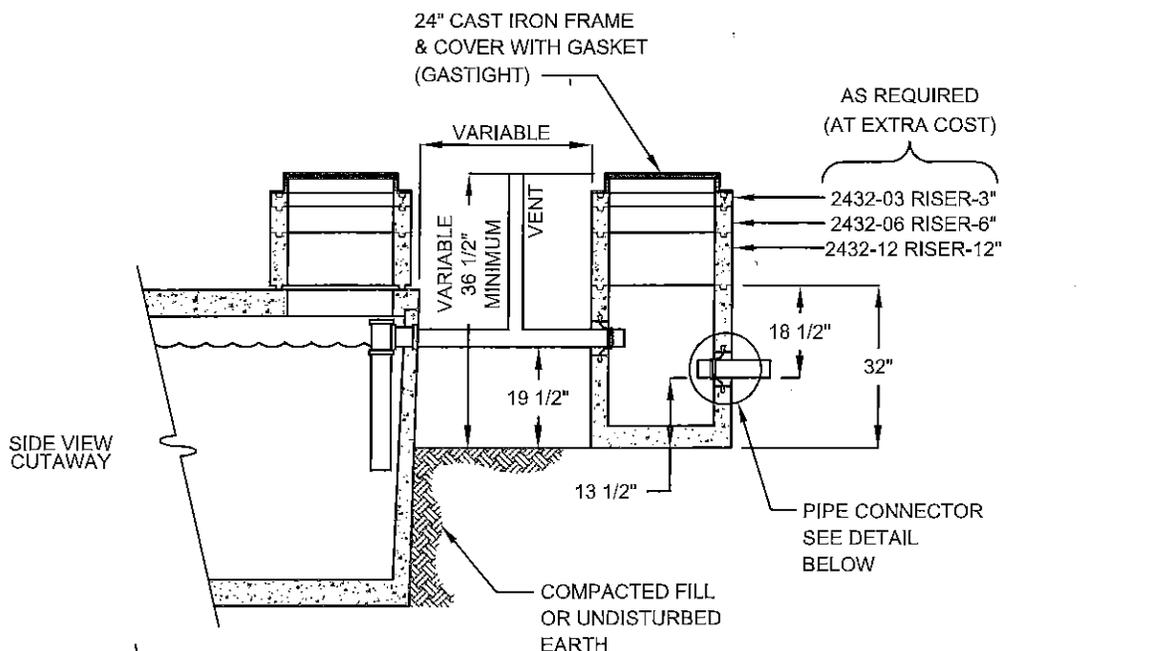
BEDDING NOTE: SUITABLE SUB-BASE BEDDED WITH GRANULAR MATERIAL SHALL BE PREPARED TO HANDLE ANTICIPATED LOADS.

FOR COMPLETE DESIGN AND PRODUCT INFORMATION CONTACT JENSEN PRECAST.

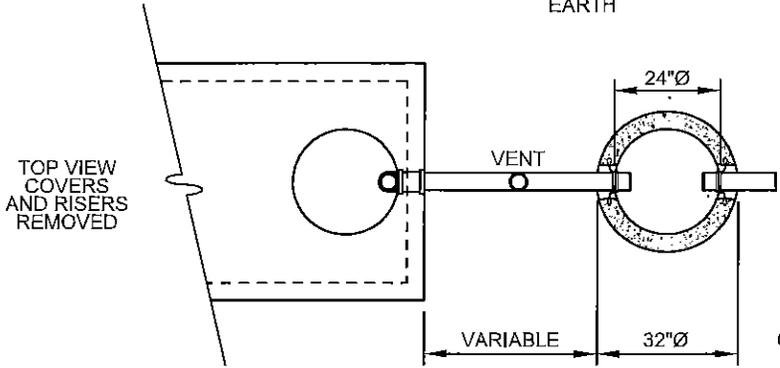
Jensen Precast reserves the right to make changes to product design and/or dimensions without notice. Please contact Jensen Precast whenever necessary for confirmation or advice on product design.



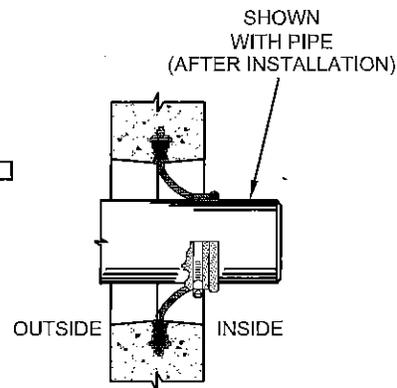
CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			320-5000 GALLON GREASE INTERCEPTOR NORTHERN CALIFORNIA	
 CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	9-23-14	
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 613.DWG	DRAWING NO. 613	



SIDE VIEW CUTAWAY



TOP VIEW COVERS AND RISERS REMOVED



DETAIL PIPE CONNECTOR (Z-LOK)

PIPE CONNECTOR CAST INTEGRALLY IN WALL. WILL ACCEPT PIPE O.D. (INCHES)

MIN.	MAX.
4.25	6.25

SEE Z-LOK PIPE CONNECTOR PAGE FOR ADDITIONAL INFORMATION

BOX WEIGHT: 1250 LBS.  
BOX DESIGN LOAD: H-20 TRAFFIC

SAMPLE BOX MUST BE PLACED ON SUITABLE BASE OF COMPACTED SOIL OR UNDISTURBED EARTH IN TRAFFIC CONDITION. FOR COMPLETE DESIGN AND PRODUCT INFORMATION, CONTACT JENSEN PRECAST.



CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			SAMPLE BOX	
 CITY ENGINEER - WILLIAM F. KULL			WITH PIPE CONNECTORS	
			MODEL 2432 NLV	
DRAWN BY: GK	DATE: 7/21/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: SEWER	DRAWING NAME: 614.DWG	9-23-14	614

**City of Riverbank  
DESIGN STANDARDS**

**STORM DRAIN**

## **SECTION 7: STORM DRAIN DESIGN STANDARDS TABLE OF CONTENTS**

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- 7.202 Rational Method –Peak Flow Determination
- 7.203 Rational Method –Runoff Volume Determination

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- 7.302 Minimum Size
- 7.303 Horizontal Alignment
- 7.304 Vertical Alignment
- 7.305 Hydraulic Design

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### **7.500 Manholes**

### **7.600 Percolation Facilities**

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- 7.602 Horizontal Drains
- 7.603 Additional Considerations And Restrictions For Percolation Facilities

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### **7.800 Additional Design Considerations**

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- 7.803 Maintenance Agreements

## **7.100 General**

These standards apply to all public storm water facilities designed for installation within a public right-of-way or PUE within the City. Except where specifically noted in these standards, or as required as part of project approval, all storm drainage facilities installed on private property for private use and ownership shall be designed and constructed in accordance with these standards, as well as the provisions of the Uniform Plumbing Code, as adopted by the City.

Storm drainage lines shall be designed in accordance with acceptable engineering principles and California OSHA Standards (legal min.), and shall conform to City Standards. Storm water collection facilities shall not be connected to a wastewater line except where specifically required by the City Engineer. Industrial waste sources shall not be connected or discharged into a storm water line without a specific discharge permit.

These standards are not intended to cover applicable storm water discharge requirements of any agencies of the State or Federal Government, such as U.S. Dept. of Fish and Wildlife, F.E.M.A., Army Corps of Engineers, or State Dept. of Fish and Game.

All storm water management must conform to the City of Riverbank's Low Impact Development requirements, the City's MS4 Permit requirements including the Post Construction Standards Plan and CASQA's Stormwater Best Management Practice Handbook for New Development and Redevelopment.

## **7.200 Hydrologic Design Criteria**

The criteria presented in this section shall be used for design of all new storm drainage facilities, both public and private, within the City of Riverbank.

### **7.201 Method**

When designing storm drainage facilities, the runoff determination method will be based on the upstream tributary area served by that facility.

For tributary areas of two hundred (200) acres or less, design runoff peak flow shall be determined using the Rational Method ( $Q = CIA$ ) as further described in this chapter. Storm water runoff volume shall be determined using a similar methodology ( $V = CAR / 12$ ).

### **7.202 Rational Method – Peak Flow Determination**

The Rational Method shall be used to determine peak flow for storm drainage facilities using the formula  $Q = CIA$ , where:

- Q = Peak Flow (cfs)
- C = Runoff Coefficient
- I = Rainfall Intensity (in/hr)
- A = Tributary Area (acres)

Runoff Coefficient (C):

Summarized below are design runoff coefficients based on land use of the tributary area:

Standard Composite Runoff Coefficients

<u>Land Use</u>	<u>Runoff Coefficient</u>
Parks	0.20
Very Low Density Residential (½ acre lots or larger)	0.40
Low-Density Residential (density greater than 4.0 units per acre and less than 6.0 units per acre)	0.55
Medium Density Residential ("cluster" housing, condominiums, townhomes)	0.70
High Density Residential (apartments)	0.85
Commercial	0.90
Industrial	0.90

For tributary areas with land uses that do not meet the descriptions given in the above table, weighted runoff coefficients may be proposed using the Basic Runoff Coefficients indicated below:

Basic Runoff Coefficients

<u>Surface</u>	<u>Runoff Coefficient ©</u>
Pavement and roofs	0.95
Compacted earth w/o pavement	0.70
Lawns, pasture, crops, open space	0.20

Rainfall Intensity (I):

The rainfall intensity for a given design storm event shall be determined using the IDF curve on Standard Detail 701, and based on the computed time of concentration (Tc) for the watershed. Tc shall be determined using the following parameters and assumptions:

- 20 minute initial Tc (overland flow time from lot to street) for Low Density Residential watersheds.
- 10 minute initial Tc for Commercial, Industrial, Medium and High Density Residential Projects.

- 2.0 foot per second gutter flow time from high point to drainage inlet. (This is a conservative estimate for streets with less than 1% average longitudinal slopes. Lower values may be proposed if sufficient calculations are provided.)
- Pipe travel time shall be based on actual flow.
- Initial Tc's for relatively large or undeveloped watersheds shall be considered on a case-by-case basis using formulas or methods approved by the City Engineer.

### **7.203 Rational Method –Runoff Volume Determination**

The design volume shall be computed using the formula:  $V = CAR / 12$ , where:

V = Design Volume (acre-feet)

C = Runoff Coefficient (see section 7.201)

A = Tributary Area (acres)

R = Total Runoff for the Design Storm (in)

100-yr, 24 hour:  $R_{100} = 3.1$  in.

50-yr, 24 hour:  $R_{50} = 2.8$  in.

10-yr, 24 hour:  $R_{10} = 2.24$  in.

(Runoff depths were computed using methods presented in the 2007 edition of the Stanislaus County Standards & Specifications)

## **7.300 Pipe Design**

### **7.301 Materials**

The following standard pipe materials are acceptable for storm drainage facilities within the City of Riverbank:

Reinforced Concrete Pipe (RCP):

RCP shall conform to the standards of ASTM C76, and shall use rubber gasket joints in accordance with ASTM C443. Class III RCP shall normally be used for pipes with burial depths between 3 ft. and 14 ft., unless special conditions exist which require a different pipe class. Class V RCP shall be used when pipes with burial depths in excess of 14 ft, or when pipes lie partially within the road base material. The classification of pipe shall be indicated on the improvement plans.

Polyvinyl chloride (PVC) Pipe:

PVC pipe used for gravity storm drainage shall be the same materials as required for PVC gravity sewer pipe as further described in Chapter 200 of these Standards. (SDR 26, ASTM D3034, with elastomeric gasket joints conforming ASTM D3212.)

Force mains shall be the same materials, installation methods, and testing as required for sewer force mains. (AWWA C900 or C905)

Asbestos Cement Pipe, High Density Polyethylene (HDPE), and Cast-in-Place Concrete Pipe are not allowed within the City of Riverbank for conveyance systems. HDPE is allowed for horizontal drains only.

### 7.302 Minimum Size

The minimum size for publicly maintained storm drainage pipes in the City of Riverbank shall be 18". Short catch basin lateral connections may be 12", with prior approval by the City Engineer. Privately maintained on-site piping (landscape drainage, roof leaders) may be smaller than 12", at the discretion and judgment of the City Engineer, and as allowed by the Uniform Plumbing Code.

### 7.303 Horizontal Alignment

Whenever practical, storm drain piping shall run parallel with the street centerline in new developments, and not underneath curb, gutter, or sidewalk.

Curved alignments are allowed. However, pipe joints shall not exceed 80% of the manufacturer's recommended deflection. The City Engineer at his discretion may request tabulations, drawings, or other evidence from the Design Engineer to demonstrate acceptable joint deflection on curved alignments.

In new residential developments, it is recommended that the storm drainage pipe be placed on the opposite side of the street of the water line. When this is not practical, the storm drainage and water line horizontal alignment shall conform to the separation guidelines contained in the State D.H.S. Memorandum, located in the Water Design Standards. This will require a minimum 4' horizontal and 1' vertical separation between storm drainage and water pipe lines.

### 7.304 Vertical Alignment

The minimum cover for storm drainage piping shall be 3.0 feet from the existing or planned final grade to the outside top of the pipe. Minimum cover requirements may be reduced if special backfill and/or special piping are used, as approved by the City Engineer.

Storm drainage piping shall be installed below waterlines with a minimum clearance of 12 inches. If this is not practical, then special construction is required in accordance with the State DHS Guidelines for separation of water mains. (See Appendix for guidelines).

Minimum slopes shall be as required for conveyance of the design flow, as further described in this chapter. However, minimum slopes shall not be less than as shown in the following table:

Minimum Pipe Slopes	
Pipe Diameter (in.)	Min. Slope (ft/ft)
12"	0.0020
18"	0.0013
24" and above	0.0010

Pipes shall be designed with a uniform slope between structures with no vertical curves. Siphons or sumps are not permitted in storm drainage piping in new development projects.

### **7.305 Hydraulic Design**

Hydraulic calculations shall use the Manning's formula, with an "n" value equal to 0.013 for all storm drainage piping.

#### **Pipe Capacity:**

Pipes shall be designed such that the flowing full capacity based on Manning's equation is greater than the peak flow for the 10-year design storm. It is important to note that this computation is not intended to replace a hydraulic grade line (HGL) analysis for the pipe network.

New storm drainage networks will need to meet the pipe capacity criteria described above, as well as the HGL requirements described later in this section.

#### **Velocities:**

Pipes shall be designed to achieve a velocity not less than 2.0 fps when flowing full, unless otherwise approved by the City Engineer. Additional slope requirements are noted in the Vertical Alignment section. It is recognized that actual flows might not produce velocities of 2.0 fps or greater in all instances. In these instances, the Design Engineer is encouraged to maximize the available slope to increase velocities.

Pipelines with actual velocities of 10 fps or greater shall require detailed analysis to evaluate and mitigate the effects of erosion and energy dissipation.

#### **Hydraulic Grade Line (HGL):**

Storm drainage piping shall be designed such that the hydraulic grade line (HGL) from the 10-year storm event is at least 1.0 ft. below the adjacent gutter or rim elevation.

For drainage piping connecting into a basin in a new development, the starting downstream HGL shall be the high-water elevation for the 10-year storm volume, or the crown of the outlet pipe –whichever is greater. It is recognized that new systems will sometimes connect into existing drainage systems which may not have an HGL determined by a previous study. In these instances the starting HGL shall be determined by the Design Engineer using reasonable methods and assumptions, as approved by the City Engineer.

HGL calculations shall include the effects of minor losses at junctions. In general, minor losses shall be computed using the following formula:

$$H_m = K (V^2 / 2g)$$

Where:

$H_m$  = minor loss (ft)  
K = loss coefficient  
V = Actual velocity (fps)  
G = gravitational constant, 32.2ft/sec<sup>2</sup>

Summarized below are estimates of the loss coefficient "K" for various situations:

Typical Loss Coefficients, "K"

K Value	Description
0.15	Manhole or structure, straight run
1.10	45 degree bend at structure
1.50	90 degree bend at structure
1.00	Outlet at basin w/trash rack

Full discussion and values of coefficients are given in several different civil engineering references. Other values and methods used for determining minor losses in storm drainage piping shall be accepted, as approved by the City Engineer.

#### **7.400 Catch Basins**

Catch basins shall be spaced along a street alignment so as to prevent the gutter flow from encroaching into the traveled way of the adjacent street. In addition, a maximum of 500 lineal feet of gutter flow shall be permitted to drain to a single catch basin. Catch basins shall be constructed as per City Standard Details. However, certain situations may require construction of a non-standard catch basin, such as a "double" catch basin. In these situations, the Design Engineer shall provide the appropriate engineering details and capacity calculations to the satisfaction of the City Engineer.

Catch basin laterals shall drain to a manhole. However, short lateral runs (<100') may be permitted to drain catch basin to catch basin, given the approval of the City Engineer. A typical example of where this is acceptable would be at an intersection with two or more catch basins in close proximity.

#### **7.500 Manholes**

Storm drain manholes shall be required at all pipe intersections, changes in horizontal and vertical alignment, and at all changes in pipe size. Manholes shall have a maximum spacing of 450 feet, and shall be constructed at ends of all pipes.

Manholes shall be constructed in accordance with City Standard Details, based on the size of the pipes entering and exiting the structure. The type of manhole shall be noted on the plans. It is important to note that manholes with relatively large diameter (>72 in. dia.) pipes, with multiple large penetrations, or in other circumstances may require special design. In these situations, the Design

Engineer shall provide the engineering details on the improvement plans, to the satisfaction of the City Engineer.

## **7.600 Percolation Facilities**

It is preferable to provide on-site storage for storm drainage in new developments, as opposed to positive discharge. Percolation rates and storm drainage calculations supporting the design is required. A plan for ultimate positive discharge shall be incorporated into all designs, if practicable.

### **7.601 Percolation Testing**

Percolation facilities shall be based on percolation test results performed by a licensed Geotechnical Engineer. Test locations and corresponding design percolation rates shall be in the same location, both horizontally and vertically, as the location of the proposed percolation facility.

The recommendations for the design percolation rate shall include a Factor of Safety of two (2), or as recommended by the Geotechnical Engineer. After application of the required Factor of Safety, the maximum allowable percolation rate to be used in design and calculations is 50.0 gallons per sq. ft. per day (gpsfd). This maximum value shall be held even if much higher values are encountered during testing.

If soil conditions that are encountered during construction are significantly different from those explained in the Geotechnical Report, the City may request additional percolation testing, or analysis of the design percolation rate.

### **7.602 Horizontal Drains (French Drains)**

Horizontal drains shall be constructed in accordance with City Standard Details and these Design Standards. Refer to the Construction Specifications for additional requirements for testing and inspection.

Materials:

Allowable Pipe materials are as follows:

- Perforated or slotted PVC
  - Perforated or slotted CMP
  - Perforated or slotted HDPE in non-traffic areas only
- Additional materials will be considered by the City Engineer for approval on a case-by-case basis.

Filter Fabric:

Horizontal drains shall be wrapped in a layer of engineered filter fabric, or as directed by the geotechnical engineer.

Drain Rock:

3/4 in. to 2 1/2 in. clean, crushed drain rock shall be used in the horizontal drain trenches.

#### Layout:

The following basic layout and construction criteria apply to all horizontal drains (French drains) installed within the City of Riverbank.

- Horizontal drains shall have a minimum pipe size of 18 in.
- The bottom of the drain rock trench shall be no less than five (5) feet above the ground water table.
- For horizontal drains installed in basin bottoms, it is preferable to provide a single continuous line of trench, as opposed to a gridded layout. This prevents reduction of percolation capacity due to over-saturation of the adjacent soil. However, if it is necessary to have a gridded layout, then the trenches shall be designed to maximize horizontal separation.
- With respect to the above, horizontal drains shall have a minimum separation as recommended by the Geotechnical Engineer, but not less than twice the trench depth (bottom of rock trench to finish grade), or less than 20 ft – whichever is greater. Separation measurements are to the nearest edges of the trench walls.
- Horizontal drains within basin bottoms shall be constructed clear of basin side slopes.
- All inlets to proposed horizontal drains shall utilize an “inverted siphon” to a manhole as shown in the Standard Details.
- Adequate separation per the sewer and water design standards shall be maintained from horizontal drains. Water lines shall be a minimum of 4 ft. from the outside edge of the rock trench when parallel. Water lines crossing a horizontal drain shall do so at right angles, and no joints shall be permitted within 4 ft. of the rock trench.

#### Percolation Criteria:

Horizontal drains shall be capable of emptying the volume of the 10-year 24-hour storm within a 48 hour period. For basin applications, runoff volume from the 10-year storm may remain in the underground system for an additional 24 hours, provided that the basin itself is empty within the 48 hour period.

#### **7.603 Additional Considerations and Restrictions for Percolation Facilities**

- The following items are additional design parameters, restrictions and items to be incorporated into the design of all new percolation facilities in the City of Riverbank:
- The following design parameters shall be adhered to for horizontal drain calculations:
- Only the sides of the trench may be considered for allowable percolation area. Bottoms of trenches shall not be included in the calculations.
- A design void ratio of 25% is allowed in the rock trench when determining available storage volume.
- Bottoms and side slopes of basins shall not be considered for allowable percolation area in percolation calculations.
- New vertical drains (drywells or rockwells) are not permitted for use within the City of Riverbank.

- All hydraulic grade line and volume storage design criteria that are presented in other sections of this standard shall apply when percolation facilities are the primary means of storm drainage for new developments.

## **7.700 Basin Design**

### **7.701 General**

This section contains design requirements for both Dual-Use, and Non-dual use storm drainage basins in the City of Riverbank. Storm drainage basins shall typically be planned for on a regional basis, meaning fewer basins to serve larger areas. The type of basin (dual-use or non-dual use) should be determined during the early planning stages of new developments, and shall be subject to the approval of Public Works Department, and the Community Development Department. Dual-use basins, meaning to be used for park or open spaces purposes where park land dedication credit is expected, shall be designed with a park or open space purpose as the primary design parameter. Meaning the storm drainage consideration shall be secondary to the systems design. The recreational value of the Dual-use basin shall be determined by the parks and Recreation Director in his/her sole discretion.

Each basin design shall be considered unique, with the layout and design evaluated on a case-by-case basis --subject to the minimum requirements contained herein. For this reason, the designer is encouraged to consult with the City Engineer during all phases of planning and design of new basins in the City of Riverbank.

New basins that use percolation facilities shall be designed to include provisions for a future connection to a positive discharge system, to the maximum extent practicable.

### **7.702 Design Volume**

All new storm drainage basins within the City of Riverbank shall be designed to contain the runoff from the 50-year, 24-hour storm event. The design High Water Level (HWL) from this event shall be no less than 6 in. below the lowest tributary inlet rim elevation. Volume requirements shall be met assuming no outlet, percolation, or other available disposal of runoff. Storage volume contained in underground piping and horizontal drain systems may be considered in the available storage volume calculation.

### **7.703 Dry-Weather Runoff (Nuisance Water)**

All basins shall be designed and constructed with infrastructure for disposal of dry-weather runoff, such as nuisance waters associated with runoff from landscape irrigation. The basin surface shall be inundated only during storm events. Percolation facilities (i.e. Horizontal drains) are recommended for this purpose. However, pump discharge may be utilized given the approval of the City Public Works Department, as well as any other agencies involved with receiving waters.

The design of the nuisance water system shall be based on an estimate of the amount of dry-weather flows from the tributary area, and shall include a Factor of Safety of two (2).

#### **7.704 Storm Water Treatment Control Devices**

All new basins shall be designed and constructed with infrastructure for the removal of pollutants from runoff entering the basin. In addition, certain treatment control devices may be required by outside agencies with jurisdiction over receiving waters. All treatment devices and methods shall be considered on a case-by-case basis for approval by the City of Riverbank, and any other applicable outside agencies.

All devices are to be designed for functionality and ease of maintenance, and shall meet with the approval of the City Public Works Department. At a minimum, devices shall be in place to prevent sediment, debris, and trash from entering the basin and percolation system or pump discharge, to the maximum extent practicable. A variety of methods and devices are available for this purpose including, but not limited to:

- Pre-manufactured devices, such as CDS units or Contech StormVaults
- Specially fabricated trash racks
- Grass-lined or vegetated swales

The City encourages the use of innovative and unique design solutions for storm water treatment. Accordingly, the list of devices above is not intended to be prohibitive of other methods or devices of storm water treatment. The designer should utilize CASQA's Stormwater Best Management Practice Handbook for New Development and Redevelopment.

#### **7.705 Inlet/Outlet Structures**

Basin inlet and outlet structures shall be constructed so as to provide ease of accessibility for maintenance purposes. At the same time, inlet/outlet structures shall be designed to be secure and prohibit access by small children and the general public. The ultimate design of these structures shall be approved by the City Engineer in cooperation with the Parks and Recreation Director.

If below grade, or "bubble-up", basin inlet structures are used, precautions shall be made to prevent uplifting of the grates and/or rims due to high inlet flows and velocities. Supporting calculations may be necessary for these instances, at the discretion of the City Engineer.

Metal components of inlet/outlet structures shall be of a corrosion resistant material, such as galvanized steel, stainless steel, or powder-coated steel. Powder coated steel is recommended for dual-use basins due to its more pleasing aesthetic appearance.

Basin inlets shall be designed to include energy dissipation elements such as concrete baffles or rip-rap so as to prevent scouring near the inlet.

### **7.706 Non-Dual Use Basins**

Non-dual use basins, when allowed, shall be subject to the minimum layout and design criteria contained herein:

**Side Slopes:** Side slopes shall be no steeper than 3h:1v. Side slopes in excess of 5h:1v shall be lined with gunite or shotcrete, and reinforced with welded wire fabric or other suitable slope protection approved by the City Engineer.

**Maximum Depth:** Basins shall have a maximum depth of 10 ft., from bottom of slope to top of slope.

**Bottom Slopes:** Basin bottoms shall have a minimum of 1% slope to an inlet leading to an underground pipe system for nuisance water and/or discharge.

**Access:** A 12 ft. wide minimum access ramp shall be constructed from the top of the basin to the bottom, with a maximum slope of 10%. The access ramp shall consist of a 10 ft. wide concrete section with 12 in. compacted shoulders on either side. Concrete shall be a 5-sack mix, 8" minimum thickness, reinforced with welded wire fabric, on native soils compacted to 90% relative dry density.

Basins shall have a 15 ft. minimum flat area between the top of the basin slope and the adjacent fence or wall. A minimum 45' inside turning radius shall be provided around the top of the basin.

Paved access shall be provided to and around basin infrastructure such as pump stations and electrical equipment, to the satisfaction of the City Public Works Department.

**Fencing:** Non-dual use basins shall be surrounded by a masonry wall constructed with landscape screening from public viewing and access to the satisfaction of the City Public Works and Community Development Departments.

### **7.707 Dual-Use Basins**

Dual-Use Basins are intended to provide flood control storage during storm events, while providing space for recreational or visual amenities during dry periods. Dual-use basins shall be subject to the minimum layout and design criteria contained herein:

**Landscaping:** All dual-use basins shall be landscaped to the satisfaction of the Parks and Recreation, Public Works and Community Development Departments. Landscaping Improvement Plans shall be prepared by a licensed Landscape Architect and approved by the Parks and Recreation, Public Works and Community Development Departments.

**Amenities:** Dual-use basins shall include visual and recreational amenities, to the satisfaction of the Community Development Department and the Parks & Recreation Department. The type of amenities should typically be determined during the master-plan level of new developments. Play structures, restrooms, parking, drinking fountains, lighted areas, art work, signage and other "active"

recreational amenities, if provided, shall be located above the 100-yr, 24-hour flood elevation.

Side slopes: Dual use basin side slopes shall be no steeper than 6h:1v.

Maximum depth: Dual use basins shall have a maximum depth of 6', as measured from the lowest adjacent curb elevation to the toe of slope.

Bottom Slopes: Landscaped areas of dual-use basin bottoms shall have minimum slopes of 2.0% to an inlet which leads to an underground conveyance or percolation system.

Fencing: Fencing around the dual-use basin perimeter shall typically not be allowed. However, fencing around certain basin infrastructure, such as pump stations or electrical equipment, may be necessary. In these instances, fencing shall be of a type to maximize aesthetic appeal, while maintaining security of basin infrastructure. All fencing and/or walls shall be approved by the Parks and Recreation, Public Works and Community Development Departments.

Access: Ideally, dual-use basins should be constructed with street frontages on all sides, without fencing, to maximize viewing from the street and adjacent properties. This will not only increase public safety, but will allow access for maintenance personnel. In these situations, and where parking is available on the adjacent streets, a 20ft. minimum flat area between the top of slope and the adjacent face of curb or edge of pavement is required. Sidewalk and/or street landscaping may be included in this distance.

Driveways from the adjacent streets to the dual-use basin shall be provided at the discretion of the Public Works Department. Driveways to the basin shall be constructed with removable bollards or locked gates to prevent unauthorized vehicular access.

In situations where a basin is directly adjacent to a wall or fence, a 15 ft. minimum flat area shall be provided between the wall or fence, and the top of the basin slope.

A.D.A. access shall be required for all "upland" recreational amenities. The need for A.D.A. access for bottom portions of dual-use basins shall be evaluated on a case-by-case basis, at the discretion of the City Engineer and the Community Development Department.

#### **7.708 Lift Stations**

Storm drainage lift stations shall generally conform to the same design requirements indicated in the Sanitary Sewer Design Standards, Section 2.600. In addition, the following are requirements specifically for storm drainage lift stations:

- Storm drainage lift station wet wells will typically not need to be lined with polyurethane as per the Sanitary Sewer Design Standards.

- Storm drainage lift stations shall contain a trash rack or similar mechanism to prevent debris from entering the pump chamber.

## **7.800 Additional Design Considerations**

### **7.801 National Pollution Discharge Elimination System (NPDES) Requirements**

In order to comply with the City's general storm water permit, as well as state and federal NPDES requirements, all construction projects of one (1) acre or more shall be required to prepare, implement, and maintain a Storm Water Pollution Prevention Plan (SWPPP). In addition, improvement plans shall include an Erosion and Sedimentation Control Plan (ESCP) for construction activities.

Notice of Intent (NOI): Prior to improvement plan approval, the Developer shall prepare and submit an NOI, and the appropriate fee, to the State Water Resources Control Board. The date of the submitted NOI and the Water Department Identification (WDID) Number shall be noted on the plans. To obtain a copy of this form, and for information on required attachments and fees, the State Water Resources Control Board may be contacted at:

State Water Resources Control Board  
Division of Water Quality  
Attn: Storm Water  
1001 I Street  
Sacramento, CA 95814  
Ph: 916-341-5537  
Fax: 916-341-5543  
Web: [www.swrcb.ca.gov/stormwtr/construction.html](http://www.swrcb.ca.gov/stormwtr/construction.html)

Storm Water Pollution Prevention Plan (SWPPP): A SWPPP shall be prepared, implemented and maintained for all construction projects of one (1) acre or more. The SWPPP shall indicate the appropriate Best Management Practices (BMP's) for the project, as well as post-construction measures for the prevention of storm water pollution. A copy of the SWPPP shall be maintained on-site at all times.

SWPPP's shall be prepared and implemented in accordance with the guidelines contained in the California Best Management Practices Handbook, as published by the California Storm Water Quality Association (CASQA). For further information, contact CASQA at:

California Storm Water Quality Association  
PO Box 2105  
Menlo Park, CA 94026  
Ph: 650-366-1042  
Fax: 650-365-8678  
Web: [www.casqa.com](http://www.casqa.com)  
Or visit [www.cabmphandbooks.com](http://www.cabmphandbooks.com) for SWPPP preparation guidelines.

Erosion and Sedimentation Control Plan (ESCP): An ESCP shall be prepared and included in the improvement plans which identify the types and locations of

BMP have to be used during construction. This ESCP shall reference the approved WDID number issued by the State Water Resources Control Board, as well as the SWPPP prepared for the project.

Notice of Termination (NOT): Upon completion of construction, the Developer shall be required to prepare and submit an NOT to the State Water Resources Control Board. Contact the State Water Resources Control Board for further information.

#### 7.802 Private On-site Drainage Systems

The following requirements apply to privately owned and maintained storm drainage systems constructed with on-site developments:

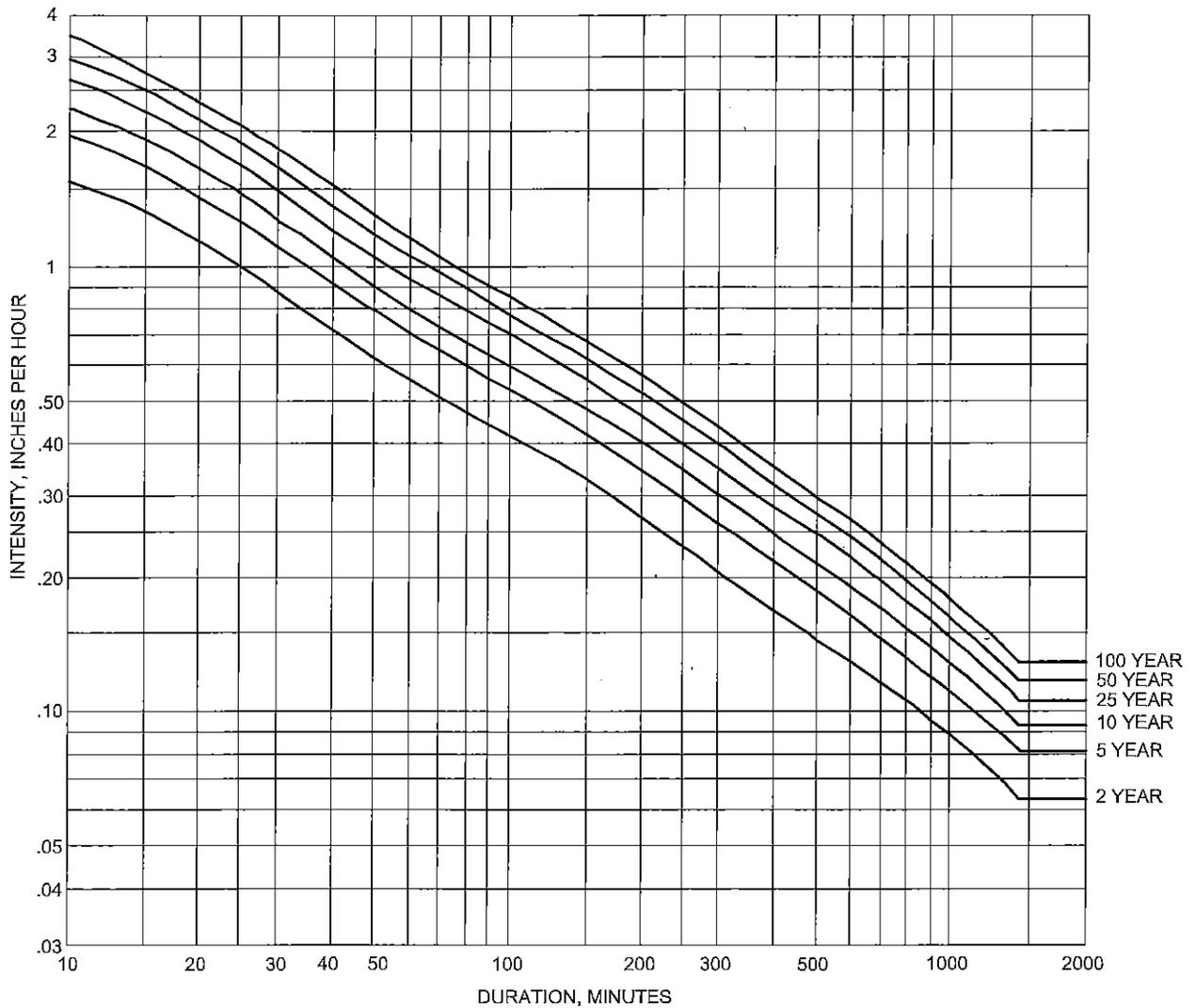
- Ideally, on-site developments that connect into the City drainage system should be considered on a regional basis, as part of a storm drainage master plan or study. However, often times this is not the case –especially with infill development. In these instances, the design engineer shall evaluate the downstream system and proposed development to the satisfaction of the City Engineer.
- Private on-site storm drainage systems shall connect into the City underground system at a manhole. If it is not practical to connect into the City underground system, then the development shall include a percolation system designed in accordance with the Design Standards contained herein.
- If volume storage for the development was not previously included in a storm drain master plan for a larger plan area, then sufficient volume storage shall be provided on-site to reduce peak discharge to pre-development levels.
- Storm Water Treatment Control Devices shall be required for all new developments, if they are not already included as part of a regional, master-planned storm drainage system. Treatment Control Devices shall be designed to reduce runoff pollutants to the Maximum Extent Practicable (MEP), to the satisfaction of the City Engineer.

#### 7.803 Maintenance Agreements

All projects shall have a sign a Filter Maintenance Agreement and or a Basin Maintenance Agreement. These agreements are between the property owner and the City of Riverbank and ensure that the filtration systems remain in place and are regularly maintained. The agreement documents are available from the City of Riverbank and are required prior to final acceptance or final approval.

## SECTION 7 - STORM

<b>Drawing No</b>	<b>Description</b>
701	RAINFALL INTENSITY CURVE
702	CATCH BASIN
703	HOOD DETAIL
704	FRAME & GRATE DETAIL
705	CURB THROUGH DRAIN
706	OPEN AREA DRAIN
707	CONCENTRIC MANHOLE
708	TRUNK MANHOLE
709	GUTTER CAPACITY
710	TYPICAL HORIZONTAL DRAIN LAYOUT
711	SAMPLE DRAINAGE MAP
712	SAMPLE DRAINAGE CALCULATION WORKSHEET
713	SAMPLE DRAINAGE CALCULATION WORKSHEET COLUMN DESCRIPTIONS
714	REMOVED
715	REMOVED
716	LATERAL MANHOLE
717	POURED-IN-PLACE TRUNK MANHOLE
718	CAST-IN-PLACE TRUNK MANHOLE
719	REMOVED
720	MANHOLE FRAME AND COVER FOR FEDERAL PROJECTS
721	HORIZONTAL DRAIN
722	HORIZONTAL DRAIN PIPE



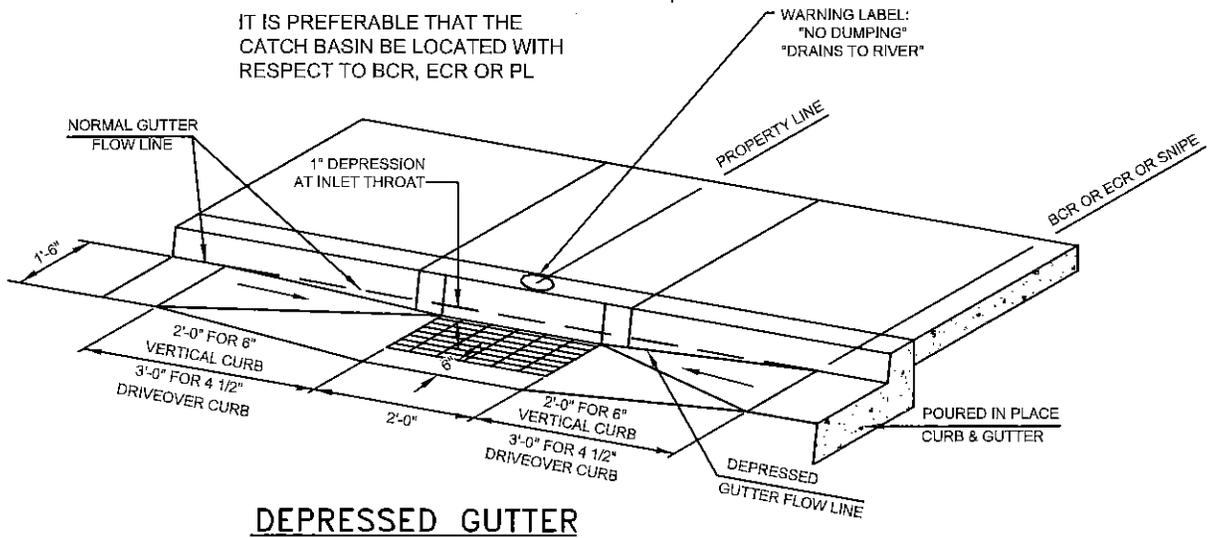
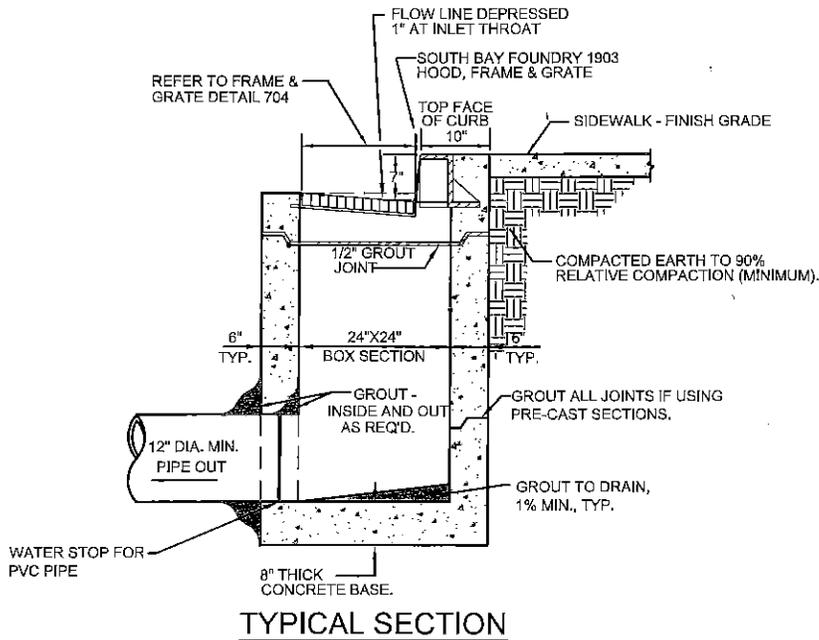
THESE CURVES ARE BASED ON CALIFORNIA  
 DEPARTMENT OF WATER RESOURCES DATA  
 FOR THE RIVERBANK RAINFALL GAUGING STATION  
 WITH ADJUSTMENTS FOR M.A.P.

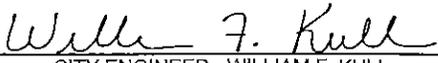
**CITY OF RIVERBANK**  
 DEPARTMENT OF PUBLIC WORKS

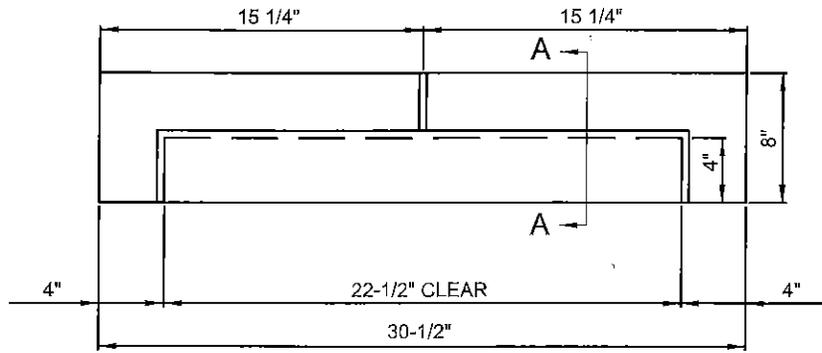
**RAINFALL INTENSITY CURVE**

*William F. Kull*  
 CITY ENGINEER - WILLIAM F. KULL

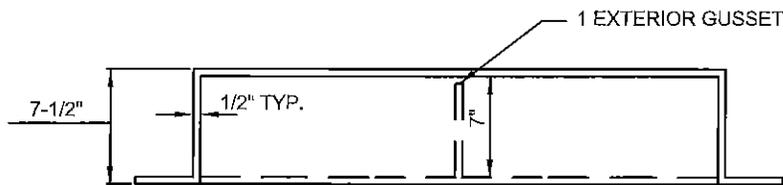
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REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 701.DWG	<b>1-26-16</b>	<b>701</b>



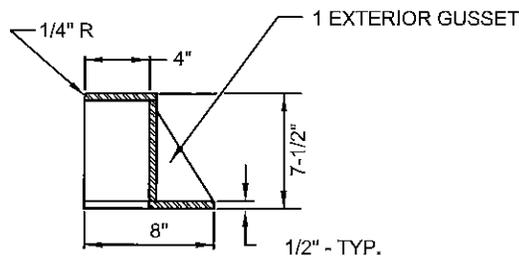
CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			CATCH BASIN	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 702.DWG	1-26-16	702



PLAN VIEW



FRONT VIEW



SECTION A-A

NOTES:

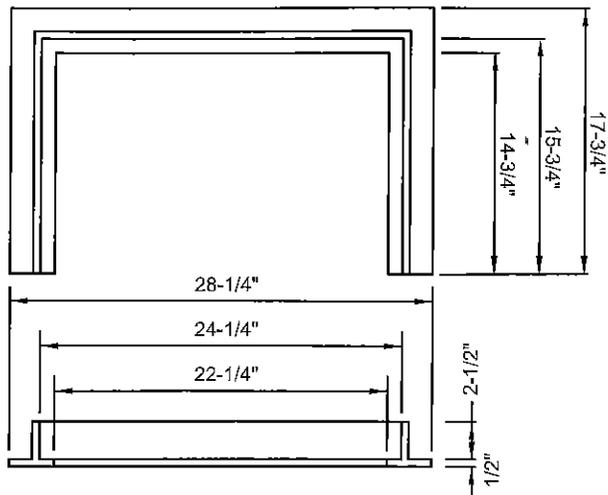
1. HOOD, FRAME & GRATE SHALL BE SOUTH BAY FOUNDRY 1903 OR EQUAL.
2. MATERIAL SHALL CONFORM TO ASTM 48, CLASS 35B.
3. FRAME & COVER SHALL BE RATED FOR H-20 LOADING.
4. CASTINGS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

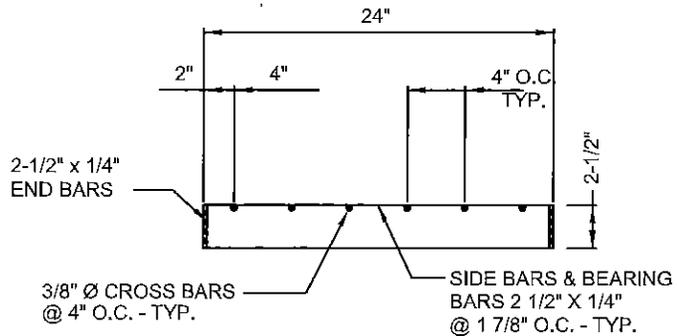
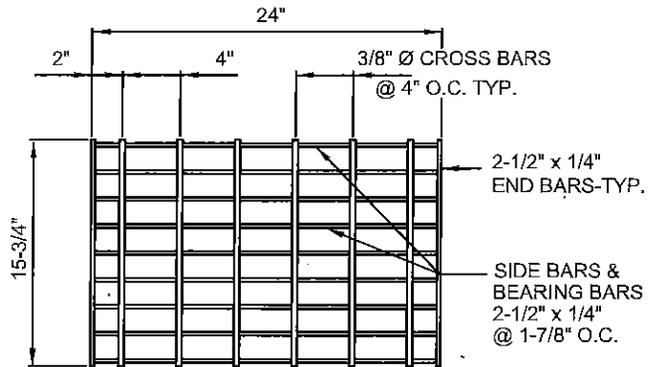
*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**HOOD DETAIL**

DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 703.DWG	<b>1-26-16</b>	<b>703</b>



FRAME PLAN VIEW  
AND FRONT ELEVATION



GRATE PLAN VIEW AND FRONT ELEVATION

NOTES:

1. FRAME/GRATE SHALL BE SOUTH BAY FOUNDRY 1903 OR EQUAL.
2. MATERIAL SHALL CONFORM TO ASTM 48, CLASS 35B.
3. FRAME & COVER SHALL BE RATED FOR H-20 LOADING.
4. CASTINGS SHALL BE HOT-DIP GALVANIZED, AFTER FABRICATION.
5. 12" LENGTHS OF 1/4" GALVANIZED CHAIN CONNECTING GRATE TO FRAME AT CORNER.

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

FRAME & GRATE DETAIL

DRAWN BY:  
GK

DATE:  
1/05/16

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

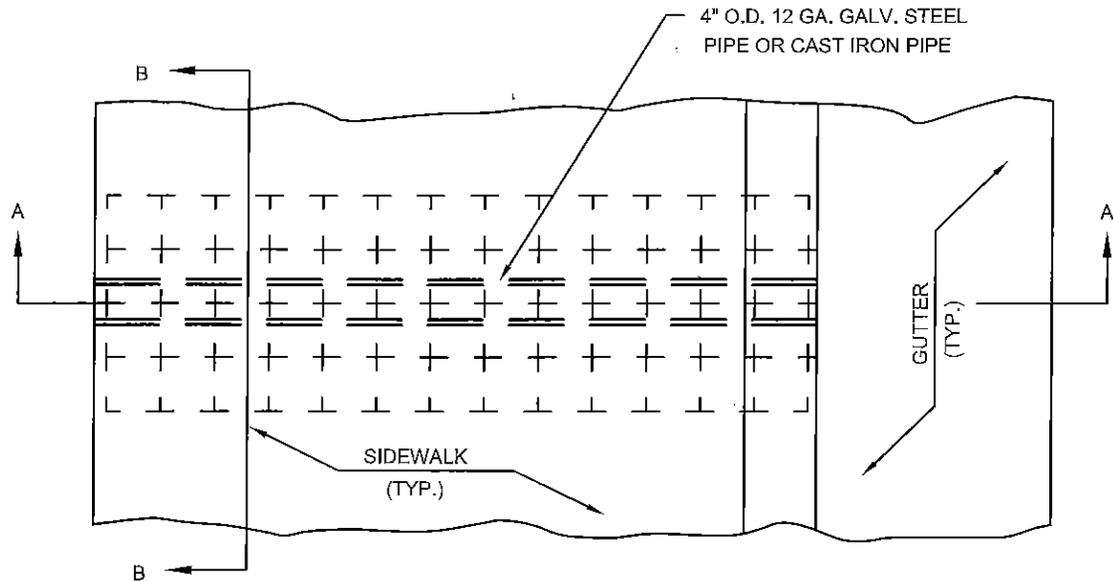
REVISIONS:  
NONE

SECTION:  
STORM

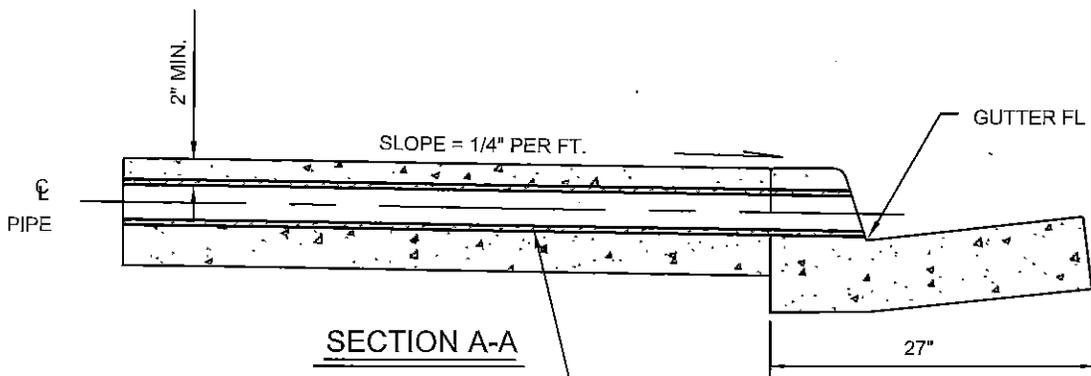
DRAWING NAME:  
704.DWG

1-26-16

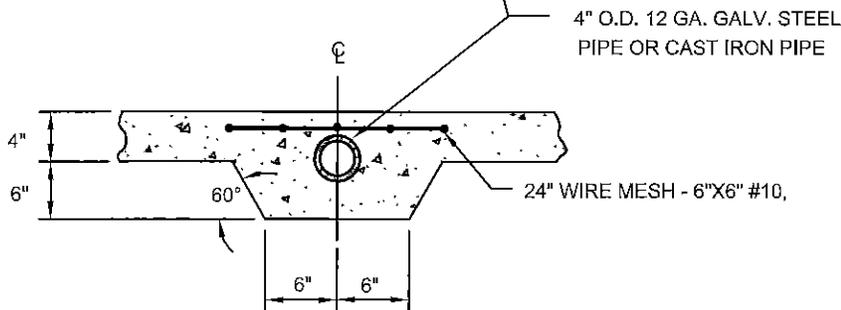
704



PLAN



SECTION A-A



SECTION B-B

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

CURB THROUGH DRAIN

DRAWN BY:  
GK

DATE:  
1/05/16

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

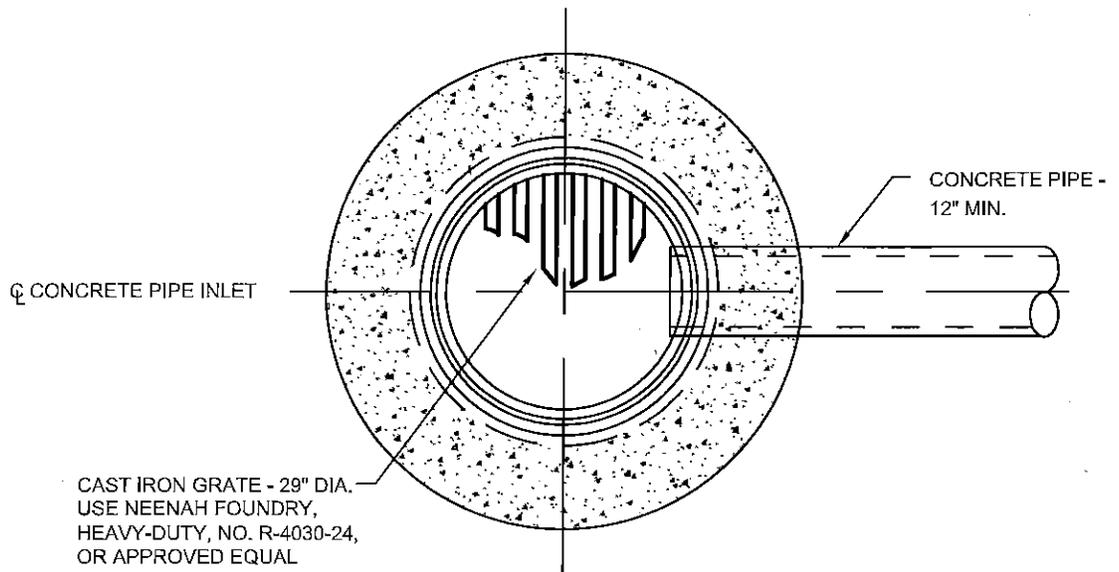
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SECTION:  
STORM

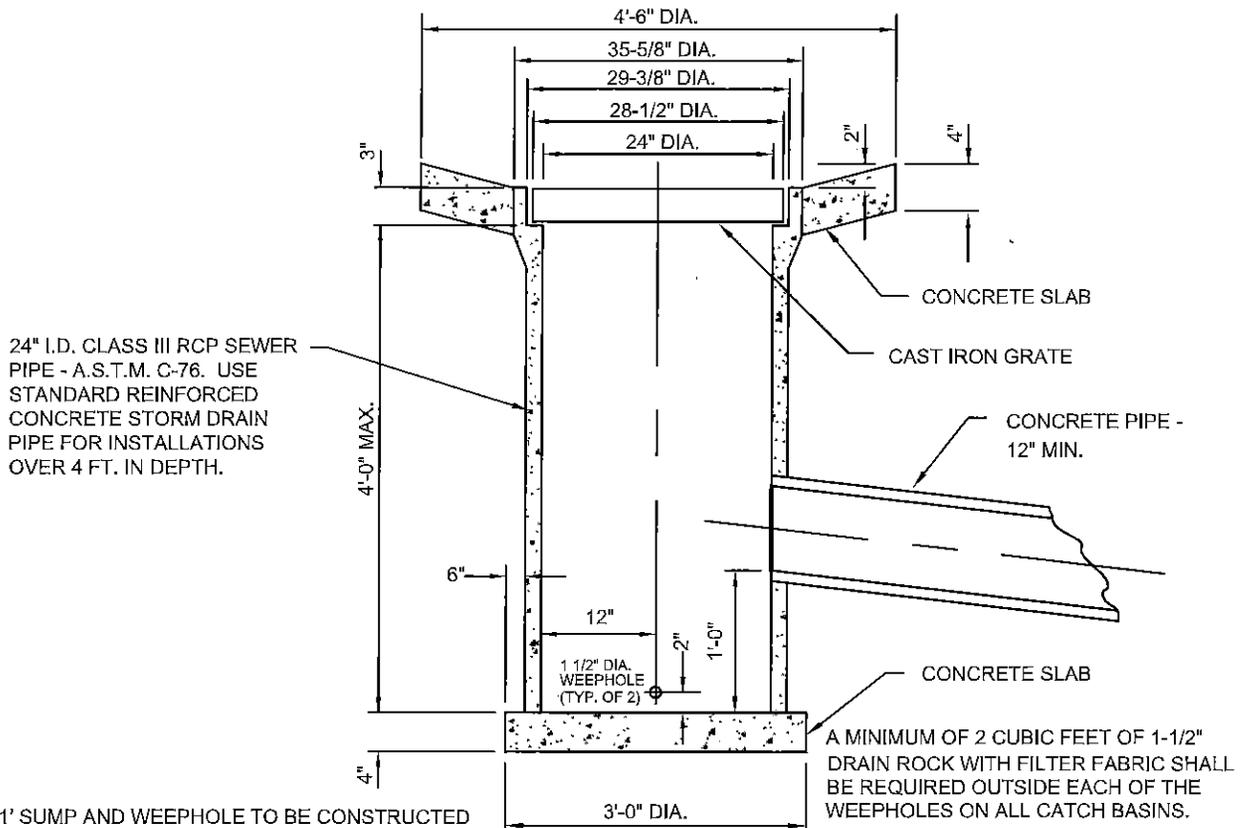
DRAWING NAME:  
705.DWG

1-26-16

705



PLAN



SECTION

NOTE: 1' SUMP AND WEEPHOLE TO BE CONSTRUCTED  
WHEN CONNECTING TO PERCOLATION FACILITIES, ONLY.  
FOR POSITIVE DRAIN APPLICATIONS, GROUT INLET  
FLOOR TO DRAIN TO OUTGOING PIPE INVERT.

CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

OPEN AREA DRAIN

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

DRAWN BY:  
GK

DATE:  
1/05/16

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

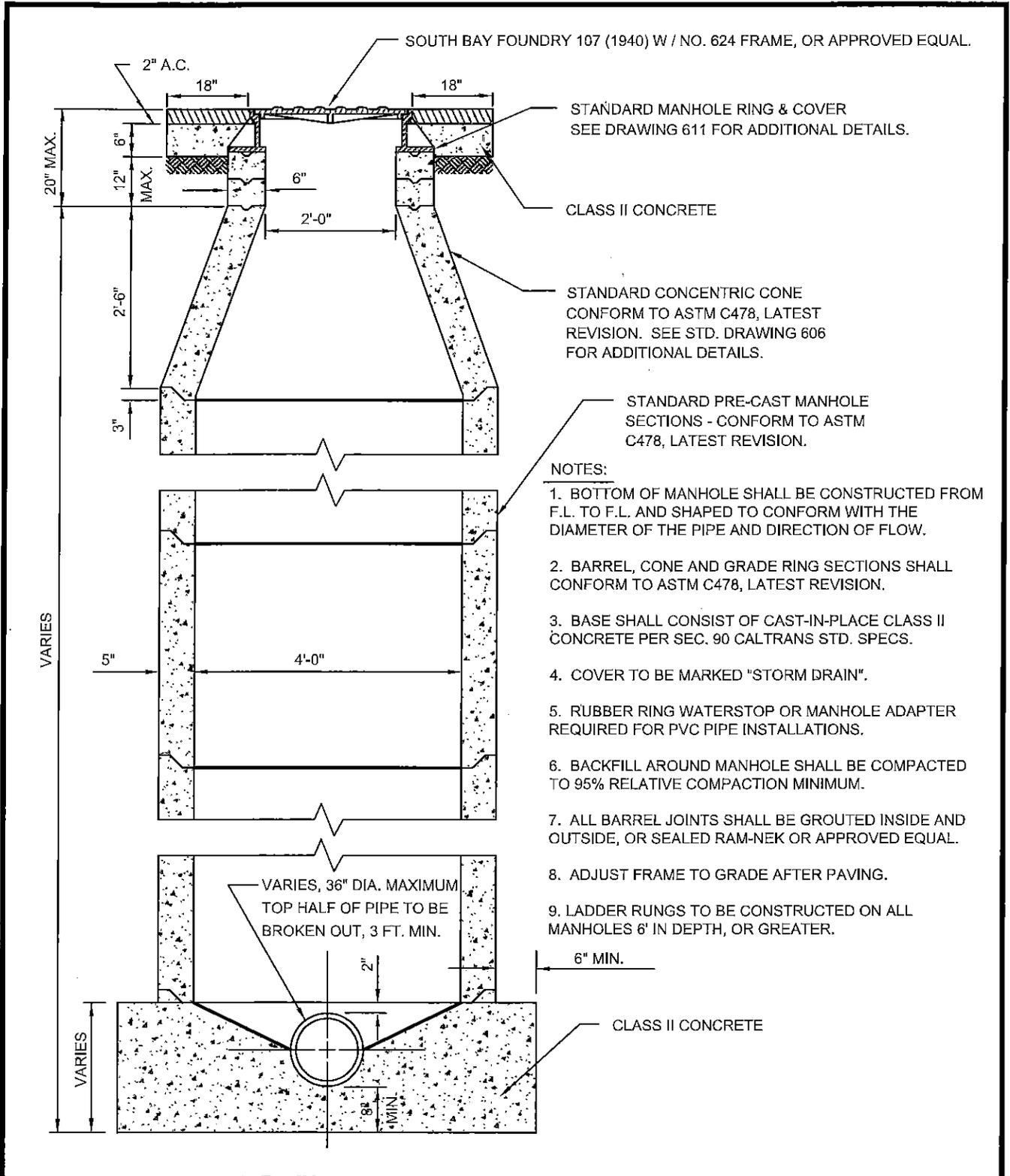
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SECTION:  
STORM

DRAWING NAME:  
706.DWG

1-26-16

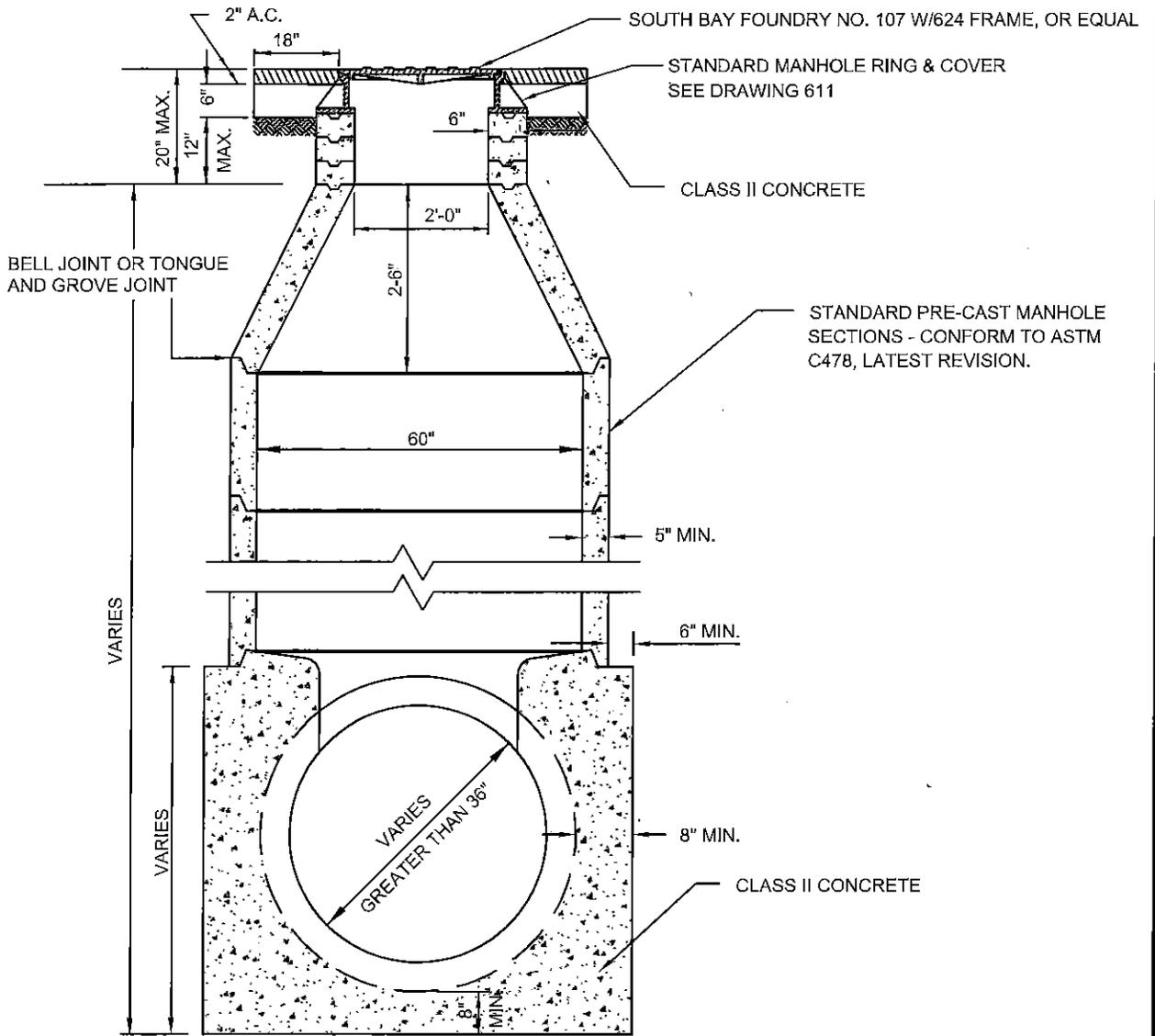
706



**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. BARREL, CONE AND GRADE RING SECTIONS SHALL CONFORM TO ASTM C478, LATEST REVISION.
3. BASE SHALL CONSIST OF CAST-IN-PLACE CLASS II CONCRETE PER SEC. 90 CALTRANS STD. SPECS.
4. COVER TO BE MARKED "STORM DRAIN".
5. RUBBER RING WATERSTOP OR MANHOLE ADAPTER REQUIRED FOR PVC PIPE INSTALLATIONS.
6. BACKFILL AROUND MANHOLE SHALL BE COMPACTED TO 95% RELATIVE COMPACTION MINIMUM.
7. ALL BARREL JOINTS SHALL BE GROUTED INSIDE AND OUTSIDE, OR SEALED RAM-NEK OR APPROVED EQUAL.
8. ADJUST FRAME TO GRADE AFTER PAVING.
9. LADDER RUNGS TO BE CONSTRUCTED ON ALL MANHOLES 6' IN DEPTH, OR GREATER.

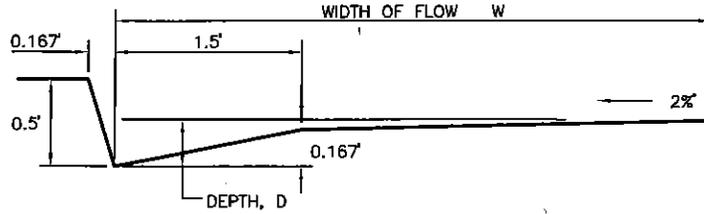
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h2 style="margin: 0;">CONCENTRIC MANHOLE</h2>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 707.DWG	1-26-16	707



**NOTE:**

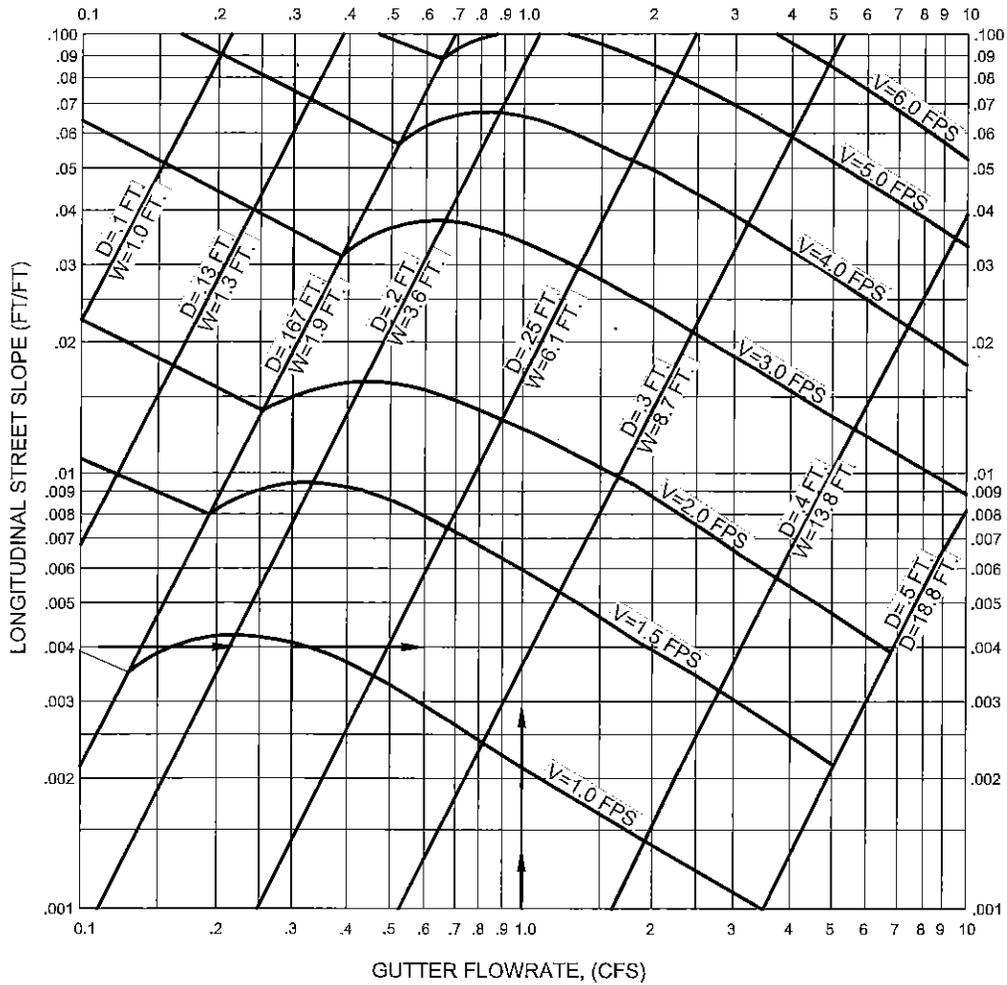
1. BOTTOM OF MANHOLE SHALL BE CONSTRUCTED FROM F.L. TO F.L. AND SHAPED TO CONFORM WITH THE DIAMETER OF THE PIPE AND DIRECTION OF FLOW.
2. BARREL, CONE AND GRADE RING SECTIONS SHALL CONFORM TO ASTM C478, LATEST REVISION.
3. BASE SHALL CONSIST OF CAST-IN-PLACE CLASS II CONCRETE PER SEC. 90 CALTRANS STANDARD SPECIFICATIONS.
4. COVER TO BE MARKED "STORM DRAIN".
5. PIPE TO BE LAID THROUGH MANHOLE AND TOP PORTION REMOVED AFTER CONCRETE HAS SET.
6. BACKFILL AROUND MANHOLE SHALL BE COMPACTED TO 95% RELATIVE COMPACTION MIN.
7. ALL BARREL JOINTS SHALL BE GROUTED INSIDE AND OUTSIDE, OR SEALED RAM-NEK OR APPROVED EQUIVALENT.
8. ADJUST FRAME TO GRADE AFTER PAVING.
8. LADDER RUNGS TO BE CONSTRUCTED ON ALL TRUNK MANHOLES.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h2 style="margin: 0;">TRUNK MANHOLE</h2>	
 CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	<h1 style="margin: 0;">1-26-16</h1>	
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 708.DWG	<h1 style="margin: 0;">708</h1>	



GIVEN:  $Q = 1.0$  CFS,  $S = 0.004$

RESULTS: DEPTH = 0.3 FT., WIDTH = 8.7 FT., VELOCITY = 1.3 FPS



CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

## GUTTER CAPACITY

DRAWN BY:  
GK

DATE:  
1/05/16

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

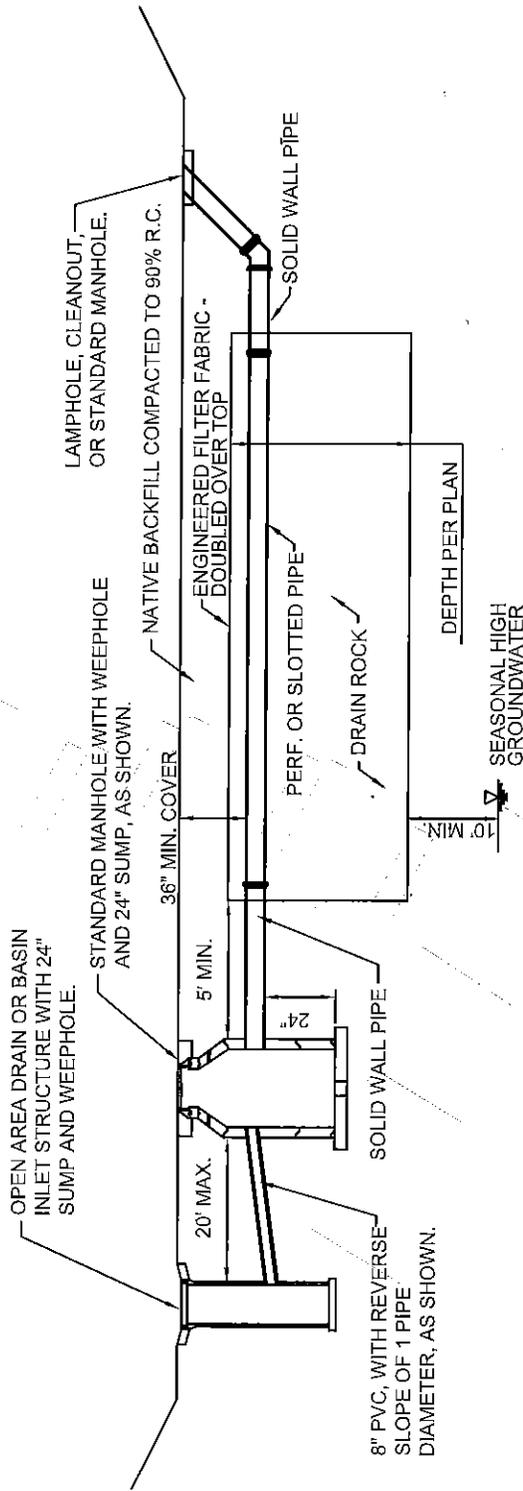
REVISIONS:  
NONE

SECTION:  
STORM

DRAWING NAME:  
709.DWG

1-26-16

709



NOTE: IT IS THE INTENT THAT A FILTRATION SYSTEM, OR SIMILAR DEVICE, BE USED UPSTREAM OF THIS SYSTEM IN ORDER TO CAPTURE SEDIMENT AND DEBRIS PRIOR TO ENTERING FRENCH DRAINS.

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**TYPICAL HORIZONTAL  
DRAIN LAYOUT**

DRAWN BY:  
GK

DATE:  
1/05/16

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

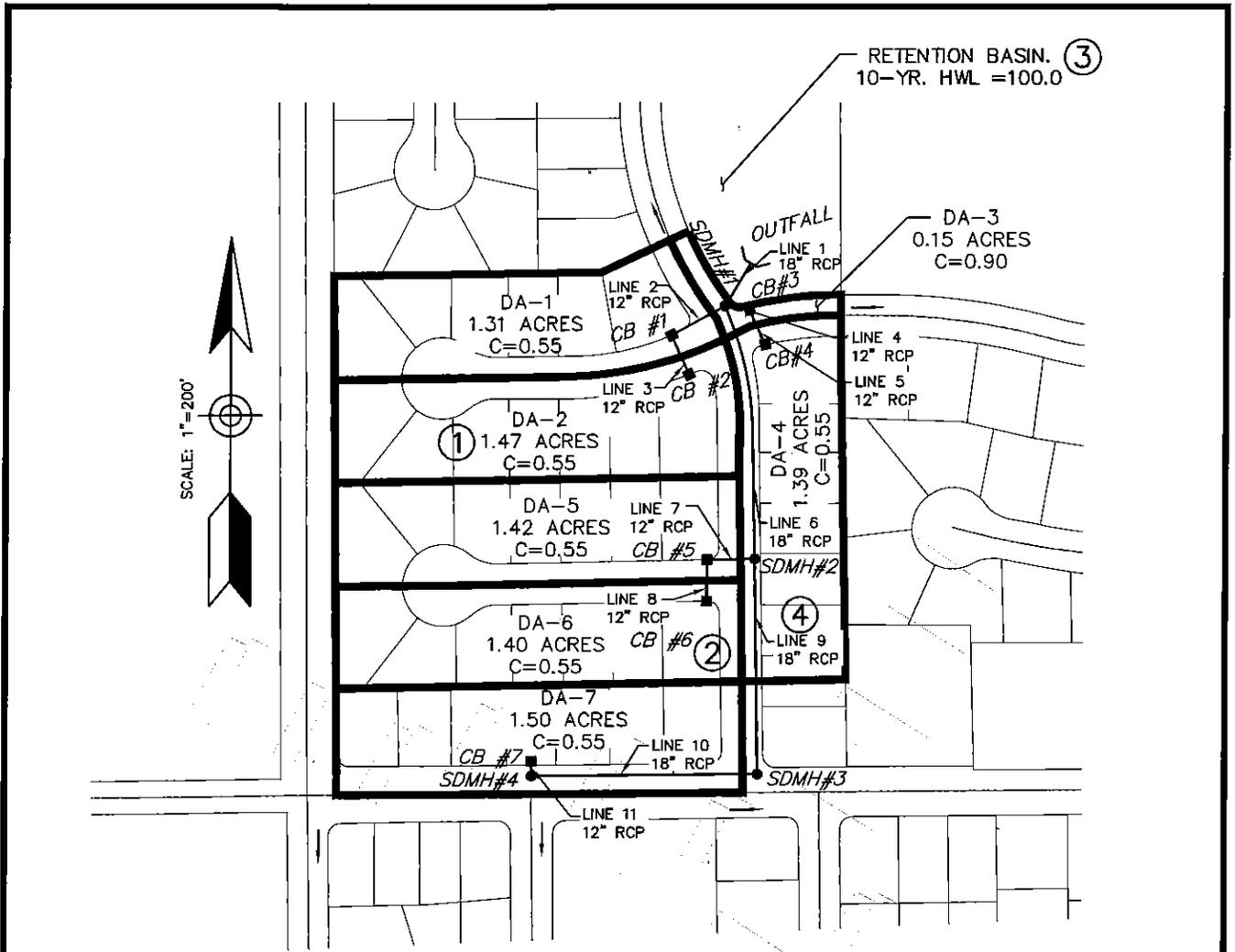
REVISIONS:  
NONE

SECTION:  
STORM

DRAWING NAME:  
710.DWG

**1-26-16**

**710**



**NOTES:**

- ① LABEL EACH DRAINAGE AREA NUMBER, SIZE, AND RUNOFF COEFFICIENT.
- ② LABEL EACH STRUCTURE NUMBER. NUMBERS SHALL MATCH IMPROVEMENT PLANS.
- ③ LABEL DRAINAGE BASIN H.W.L., IF APPLICABLE.
- ④ LABEL LINE NUMBER REFERENCED IN CALCULATIONS AND PIPE DIAMETER.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<h2 style="margin: 0;">SAMPLE DRAINAGE MAP</h2>	
CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 711.DWG	1-26-16	711

CITY OF RIVERBANK STORM DRAINAGE CALCULATION WORKSHEET

City of Riverbank  
Department of Public Works

Design Engineer Stamp and Signature

NOTES:  
 1 Starting HGL based on basin H.W.L. = 100.0 per previous calculations  
 2 Manning n = 0.013  
 Rainfall intensities based on 10-year recurrence interval  
 From the City of Riverbank Standard Detail 701

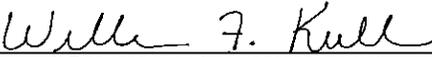
(A) LINE No.	(B) UP STRM STRUCTURE	(C) DRAINAGE AREA I.D.	HYDROLOGY										CAPACITY						LOSSES						HYDRAULIC GRADE LINE															
			(D) Acres	(E) Runoff Coef	(F) C/A	(G) Sum Acres	(H) Sum C/A	(I) Tc (min)	(J) Tc (hr)	(K) Qc (cfs)	(L) Qc (gpm)	(M) pipe dia. (inches)	(N) pipe area (sq ft)	(O) pipe slope (ft/ft)	(P) pipe cap. (cfs)	(Q) pipe slope (ft/ft)	(R) pipe length (feet)	(S) route time (min)	(T) friction loss (feet)	(U) 'k'	(V) Minor Loss (ft)	(W) HGL elev UP	(X) HGL elev DN	(Y) HGL elev UP	(Z) HGL elev DN	(AA) HGL elev UP	(AB) HGL elev DN	(AC) HGL elev UP	(AD) HGL elev DN	(AE) HGL elev UP	(AF) HGL elev DN									
1	SDNR #1	DA-1	1.31	0.55	0.72	2.78	1.53	21	1.52	1.17	2.48	12	0.79	0.005	2.52	3.15	74	0.38	0.005	0.38	1.50	0.23	100.92	100.92	102.50	102.50	102.50	102.50	1.48	1.48	100.92	100.92	102.50	102.50	1.48	1.48	100.92	100.92	102.50	102.50
2	CR #1	DA-2	1.47	0.55	0.61	1.47	0.61	20	1.52	1.33	1.33	12	0.79	0.010	3.56	1.70	52	0.51	0.001	0.07	1.50	0.07	100.95	101.02	102.50	102.50	102.50	102.50	1.48	1.48	100.95	100.97	102.50	102.50	1.48	1.48	100.95	100.97	102.50	102.50
3	CR #2	DA-3	1.54	0.55	0.61	1.54	0.61	20	1.52	1.26	1.26	12	0.79	0.010	3.56	1.66	30	0.27	0.002	0.05	1.50	0.03	100.97	100.97	102.50	102.50	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50
4	CR #3	DA-4	1.38	0.55	0.76	1.38	0.76	20	1.52	1.26	1.26	12	0.79	0.010	3.56	1.66	30	0.27	0.002	0.05	1.50	0.03	100.97	100.97	102.50	102.50	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50
5	CR #4	DA-4	1.38	0.55	0.76	1.38	0.76	20	1.52	1.26	1.26	12	0.79	0.010	3.56	1.66	30	0.27	0.002	0.05	1.50	0.03	100.97	100.97	102.50	102.50	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50
6	SDNR #2	DA-5	1.43	0.55	0.78	1.43	0.78	21	1.52	1.12	1.12	12	0.79	0.010	3.56	1.61	46	0.48	0.001	0.05	1.50	0.06	100.97	100.97	102.50	102.50	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50
7	CR #5	DA-5	1.43	0.55	0.78	1.43	0.78	21	1.52	1.12	1.12	12	0.79	0.010	3.56	1.61	46	0.48	0.001	0.05	1.50	0.06	100.97	100.97	102.50	102.50	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50	1.48	1.48	100.97	100.97	102.50	102.50
8	CR #6	DA-6	1.40	0.55	0.77	1.40	0.77	20	1.52	1.27	1.27	12	0.79	0.010	3.56	1.82	50	0.52	0.001	0.06	1.50	0.08	101.12	101.18	102.50	102.50	102.50	102.50	1.48	1.48	101.12	101.18	102.50	102.50	1.48	1.48	101.12	101.18	102.50	102.50
9	SDNR #3	DA-6	1.50	0.55	0.77	1.50	0.77	20	1.52	1.36	1.36	12	0.79	0.003	5.75	0.77	262	5.67	0.000	0.04	1.50	0.00	100.53	100.56	102.50	102.50	102.50	102.50	1.48	1.48	100.53	100.56	102.50	102.50	1.48	1.48	100.53	100.56	102.50	102.50
10	SDNR #4	DA-7	1.50	0.55	0.83	1.50	0.83	20	1.52	1.36	1.36	12	0.79	0.010	3.56	1.73	12	0.12	0.001	0.02	1.50	0.07	100.70	100.72	102.50	102.50	102.50	102.50	1.48	1.48	100.70	100.72	102.50	102.50	1.48	1.48	100.70	100.72	102.50	102.50
11	CR #7	DA-7	1.50	0.55	0.83	1.50	0.83	20	1.52	1.36	1.36	12	0.79	0.010	3.56	1.73	12	0.12	0.001	0.02	1.50	0.07	100.70	100.72	102.50	102.50	102.50	102.50	1.48	1.48	100.70	100.72	102.50	102.50	1.48	1.48	100.70	100.72	102.50	102.50

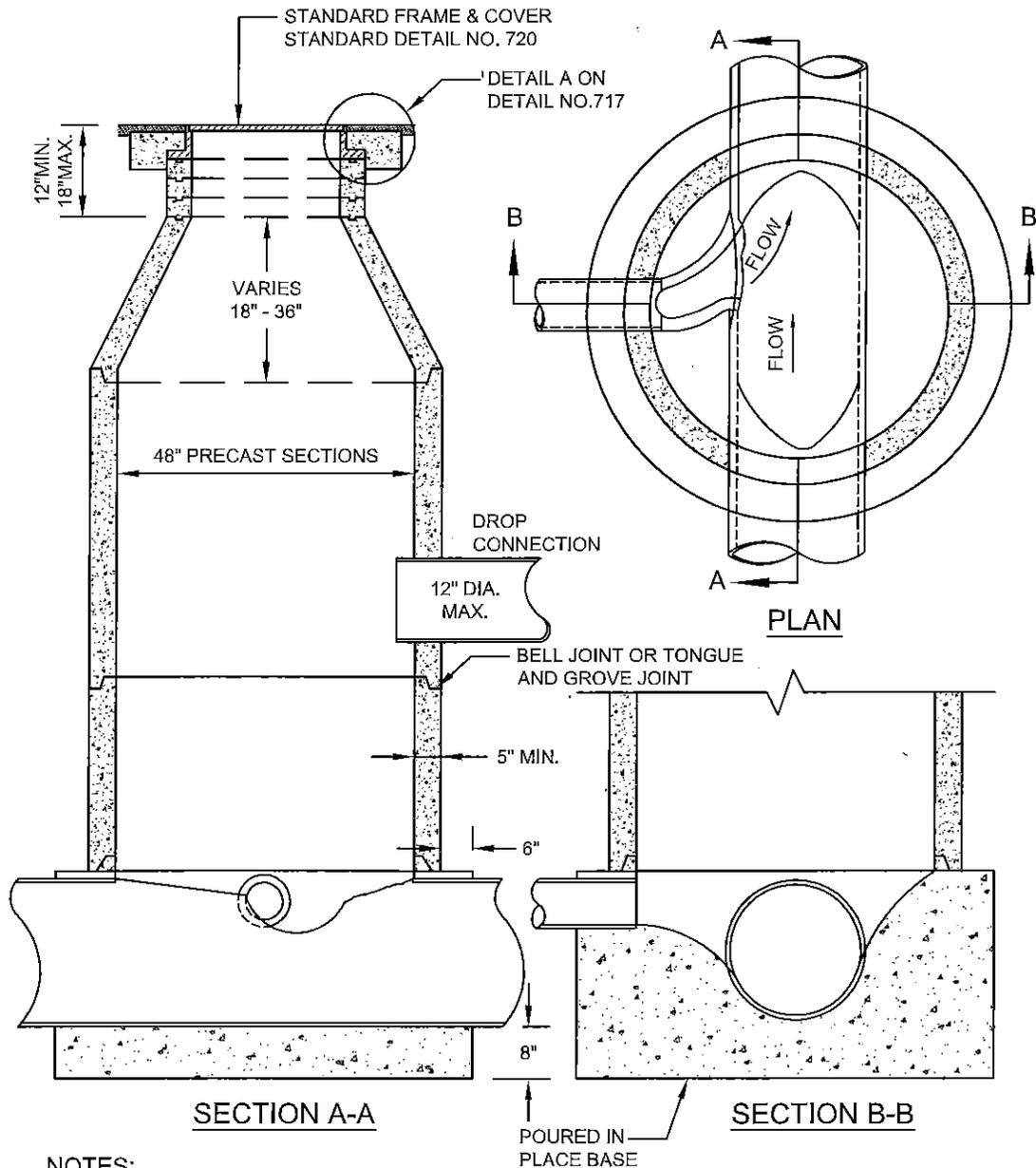
NOTES:

- 1 INDICATE SOURCE OF STARTING H.G.L.
  - 2 SEE STD. DETAIL 713 FOR EXPLANATION OF COLUMN HEADINGS.
- SAMPLE SHOWN IS INTENDED AS A GUIDELINE. ONLY, AND MAY NEED TO BE AMENDED TO MEET CERTAIN PROJECT CONDITIONS.
- SAMPLE IS REDUCED TO 8.5"x11" SIZE FOR CONVENIENCE ONLY. ACTUAL CALCULATION SUBMITTALS SHOULD BE ON 11"x17" PAPER

<p>CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS</p> <p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>			<p>SAMPLE DRAINAGE CALCULATION WORKSHEET</p>		
<p>DRAWN BY: GK</p>	<p>DATE: 1/05/16</p>	<p>SCALE: NTS</p>	<p>ADOPTED BY THE CITY COUNCIL:</p>	<p>DRAWING NO.</p>	
<p>REVISIONS: NONE</p>	<p>SECTION: STORM</p>	<p>DRAWING NAME: 712.DWG</p>	<p>1-26-16</p>	<p>712</p>	

COLUMN HEADING	DESCRIPTION
A.	LINE # AS SHOWN ON DRAINAGE MAP. (DOES NOT NEED TO BE IN PLANS)
B.	UPSTREAM STRUCTURE OF LINE NUMBER
C.	DRAINAGE AREA NUMBER SHOWN ON DRAINAGE MAP
D.	ACREAGE OF INDIVIDUAL DRAINAGE AREA AT INLET
E.	RUNOFF COEFFICIENT PER CITY STDS. OF INDIVIDUAL DRAINAGE AREA
F.	E*D
G.	TOTAL UPSTREAM TRIBUTARY AREA
H.	G*E
I.	TIME OF CONCENTRATION; INCLUDES TRAVEL TIME FOR UPSTREAM PIPE RUNS, IF APPLICABLE
J.	BASED ON CITY STD. IDF CURVE FOR OBTAINED TC
K.	RUNOFF CALCULATION FOR INDIVIDUAL DRAINAGE AREAS, ONLY. (F * J)
L.	TOTAL PEAK FLOW AT NODE. (J * H)
M.	PIPE DIAMETER
N.	PIPE X-SECTIONAL AREA
O.	PIPE INVERT SLOPE PER PLAN
P.	MANNING'S CAPACITY BASED ON FULL FLOW AT GIVEN SLOPE, DIAMETER AND "N". $Q = A * 1.486 * N * R^{(2/3)} * S^{.5}$
Q.	SINCE THIS EXAMPLE SHOWS A SUBMERGED CONDITION, THE PIPE VELOCITY IS THE TOTAL FLOW DIVIDED BY THE AREA (L / N). IN AN UNSUBMERGED CONDITION, THE ACTUAL PIPE VELOCITY WILL NEED TO BE OBTAINED USING MANNING'S FORMULA.
R.	PIPE LENGTH PER PLAN
S.	INDIVIDUAL PIPE TRAVEL TIME (Q / R)
T.	SLOPE OF THE HYDRAULIC GRADE LINE BASED ON TOTAL FLOW, PIPE DIA., AND MANNING'S N. ASSUMES SUBMERGED CONDITION FOR THIS EXAMPLE. $S = (Q * N / [A * 1.486 * R^{(2/3)}])^2$
U.	FRICTION SLOPE * PIPE LENGTH (T * R)
V.	MINOR LOSS COEFFICIENT OF DOWNSTREAM CONDITION (90DEG ANGLE, STRAIGHT RUN, ETC...)
W.	MINOR LOSS = $K * (V^2 / 2G)$ USE (=V * (Q^2 / 64.4))
	NOTE THAT OTHER METHODS OF COMPUTING MINOR LOSSES, SUCH AS THOSE USED BY VARIOUS SOFTWARE PROGRAMS, WILL BE CONSIDERED FOR APPROVAL BY THE CITY ENGINEER.
X.	HYDRAULIC GRADE LINE ELEVATION OF DOWNSTREAM END. ADD MINOR LOSS (COL. W) TO UPSTREAM HGL OF THE NEXT DOWNSTREAM PIPE.
Y.	HGL OF UPSTREAM END OF PIPE -ADD FRICTION LOSS TO DOWNSTREAM HGL. (Y + X)
Z. AND AA.	(DOWNSTREAM AND UPSTREAM RIM ELEVATIONS OF STRUCTURES, PER PLAN)
BB.	FREEBOARD AT UPSTREAM END OF PIPE. USE HIGHEST HGL AT STRUCTURE -WILL NEED TO HGL ANALYZE DOWNSTREAM END OF NEXT UPSTREAM PIPE, AS APPLICABLE.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>SAMPLE DRAINAGE CALCULATION WORKSHEET COLUMN DESCRIPTIONS</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 713.DWG	<b>1-26-16</b>	<b>713</b>



**NOTES:**

1. PIPE TO BE LAID THROUGH MANHOLE AND TOP PORTION REMOVED AFTER CONCRETE HAS SET.
2. MORTAR ALL JOINTS INSIDE AND OUT.
3. INCOMING SMALLER PIPES SHALL MATCH CROWNS OF THE LARGER PIPE.
4. ADJUST FRAME TO GRADE AFTER PAVING.
5. ALL PRECAST CONCRETE SHALL BE DESIGNED TO WITHSTAND H2O LOADING.
6. IN TRAFFIC AREAS CONCRETE COLLAR SHALL BE MADE WITH 3000 PSI PCC, HIGH-EARLY STRENGTH BARRICADES TO BE REMOVED IN 24 HOURS.
7. PRECAST BASES ARE NOT PERMITTED.

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**LATERAL  
MANHOLE**

DRAWN BY:  
GK

DATE:  
1/05/16

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

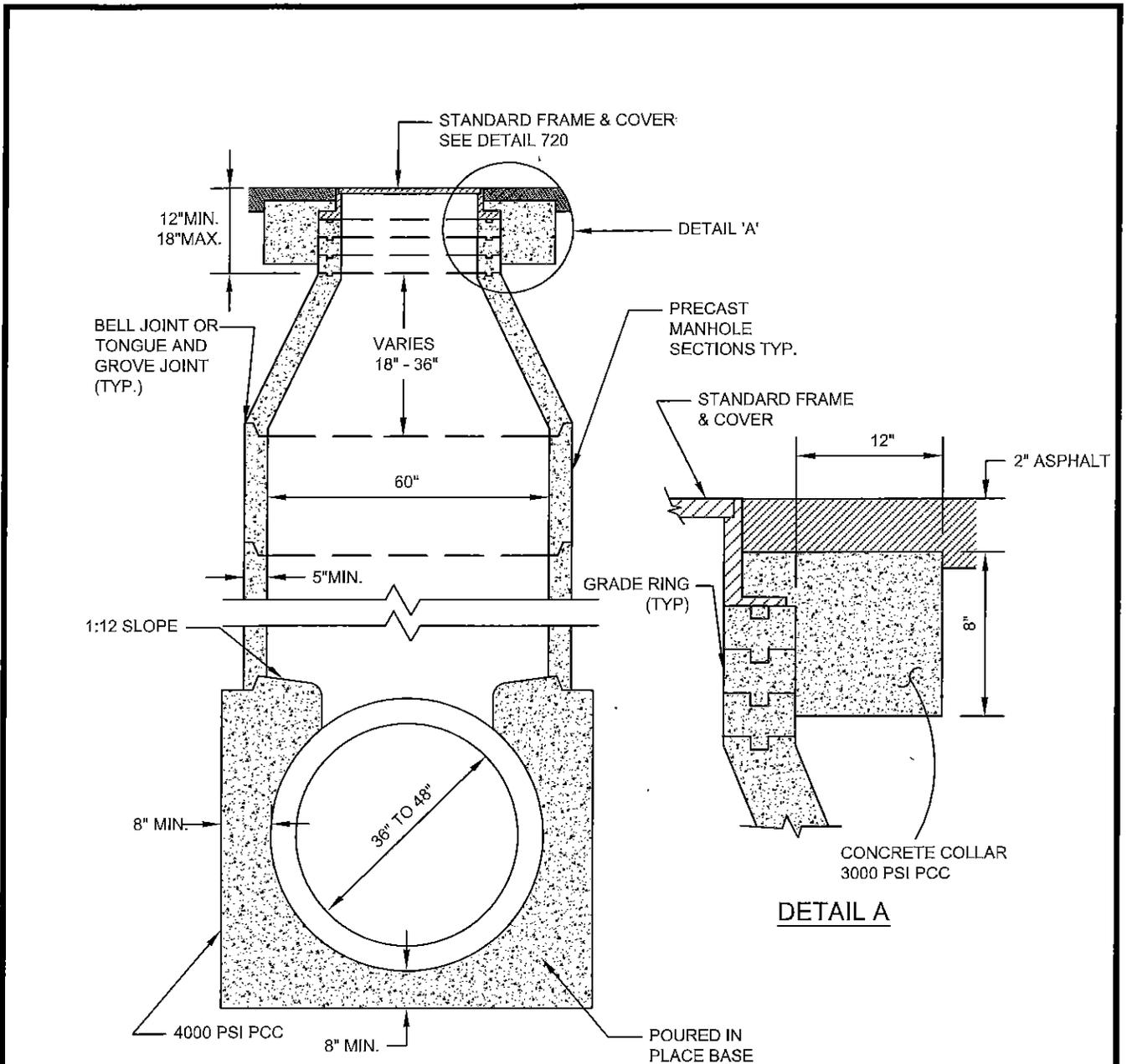
REVISIONS:  
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SECTION:  
STORM

DRAWING NAME:  
716.DWG

**1-26-16**

**716**



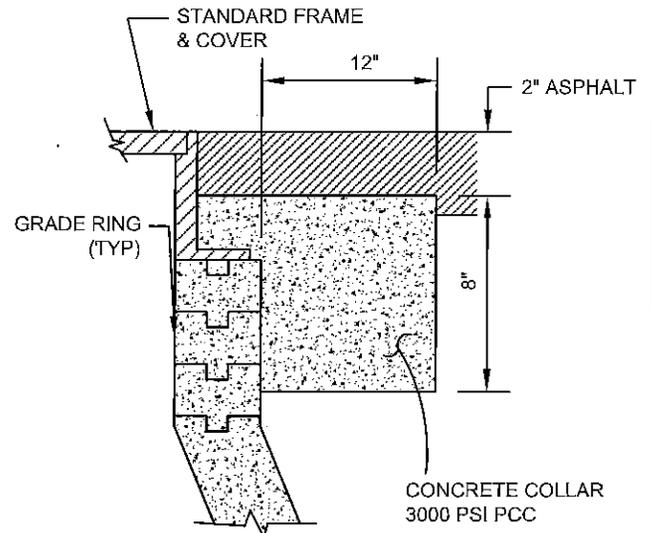
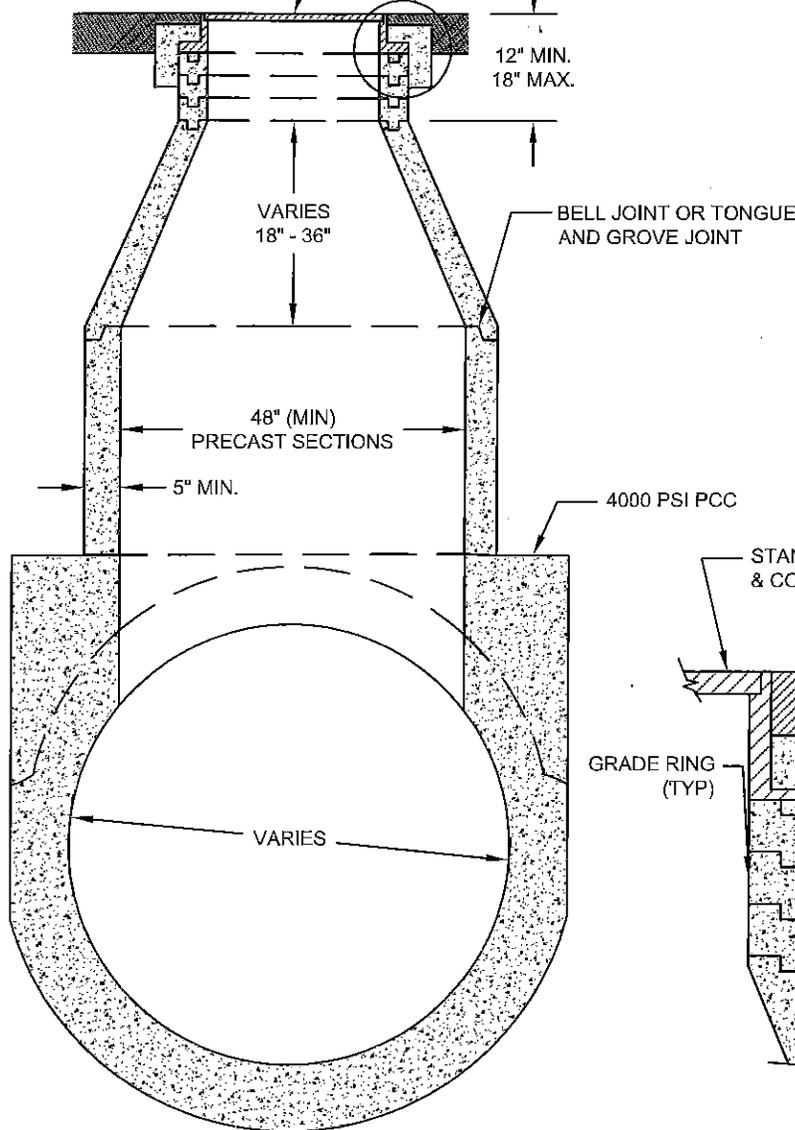
**NOTES:**

1. PIPE TO BE LAID THROUGH MANHOLE AND TOP PORTION REMOVED AFTER CONCRETE HAS SET.
2. MORTAR ALL JOINTS.
3. INCOMING SMALLER PIPES SHALL MATCH CROWNS OF THE LARGER PIPE.
4. ADJUST FRAME TO GRADE AFTER PAVING.
5. ALL PRECAST CONCRETE SHALL BE DESIGNED TO WITHSTAND H2O LOADING.
6. IN TRAFFIC AREAS, CONCRETE COLLAR SHALL BE MADE WITH 3000 P.S.I. PCC, HIGH-EARLY STRENGTH. BARRICADES SHALL BE REMOVED IN 24 HOURS.
7. PRECAST BASES ARE NOT PERMITTED.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>POURED-IN PLACE TRUNK MANHOLE</b>	
CITY ENGINEER - WILLIAM F. KULL			ADOPTED BY THE CITY COUNCIL:	
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	<b>1-26-16</b>	
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 717.DWG	<b>717</b>	

STANDARD FRAME & COVER  
SEE DETAIL 720

DETAIL 'A'



**DETAIL A**

**NOTES:**

1. MAKE MANHOLE OPENING IN TOP OF PIPE BEFORE CONCRETE SETS AND PLACE BARREL WITHIN 7 DAYS.
2. MORTAR ALL JOINTS.
3. ADJUST FRAME TO GRADE AFTER PAVING.
4. ALL PRECAST CONCRETE SHALL BE DESIGNED TO WITHSTAND H<sub>2</sub>O LOADING.
5. IN TRAFFIC AREAS, CONCRETE COLLAR SHALL BE MADE WITH 3000 P.S.I. PCC, WITH HIGH-EARLY STRENGTH CEMENT. BARRICADES TO BE REMOVED IN 24 HOURS.
6. PRECAST BASES ARE NOT PERMITTED.

**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

**CAST-IN-PLACE  
TRUNK MANHOLE**

DRAWN BY:  
GK

DATE:  
1/05/16

SCALE:  
NTS

ADOPTED BY THE CITY COUNCIL:

DRAWING NO.

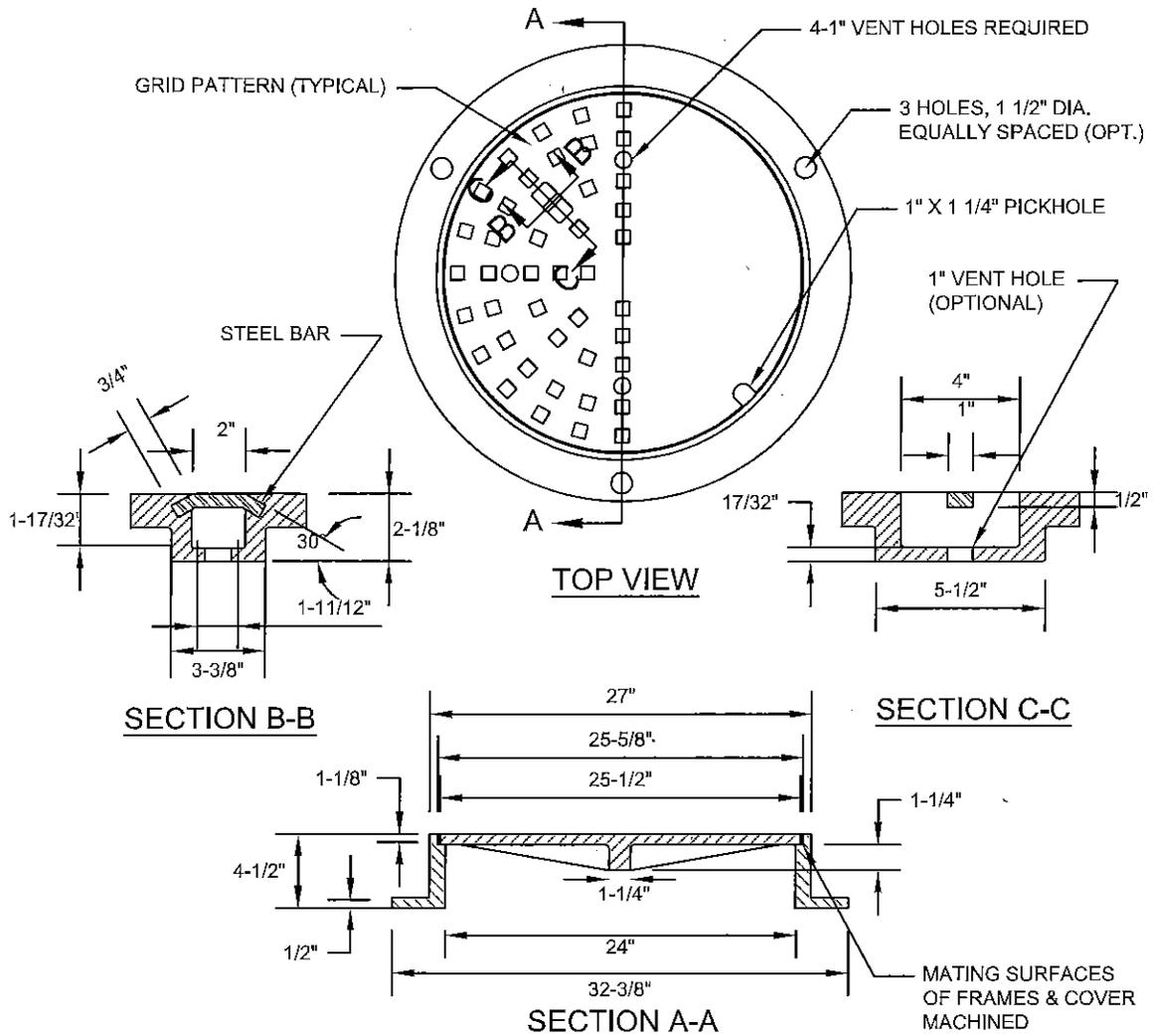
REVISIONS:  
NONE

SECTION:  
STORM

DRAWING NAME:  
718.DWG

**1-26-16**

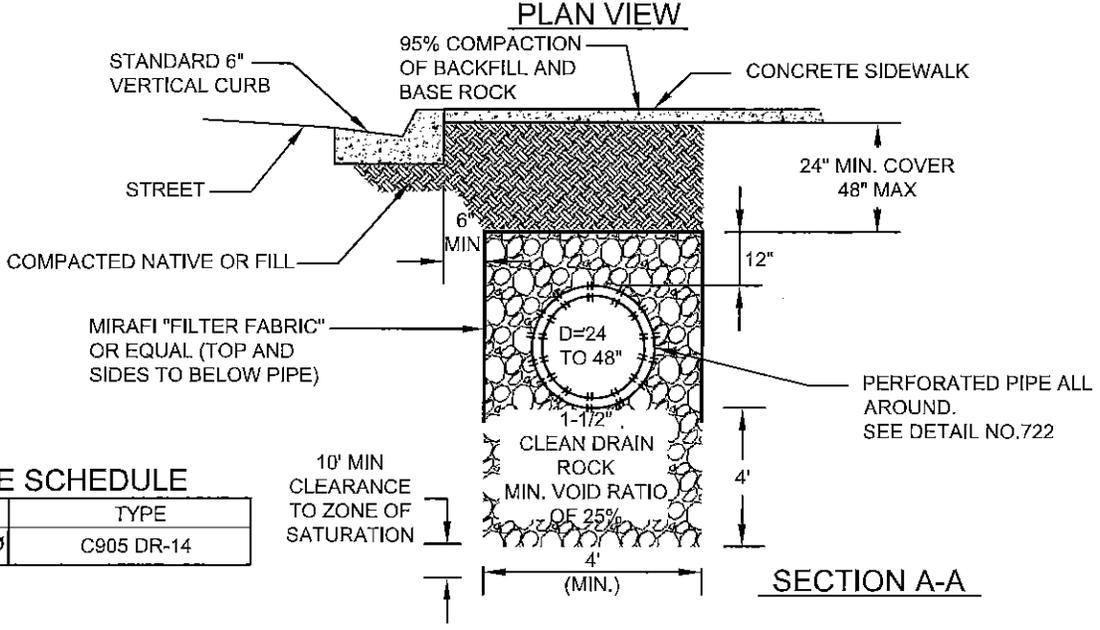
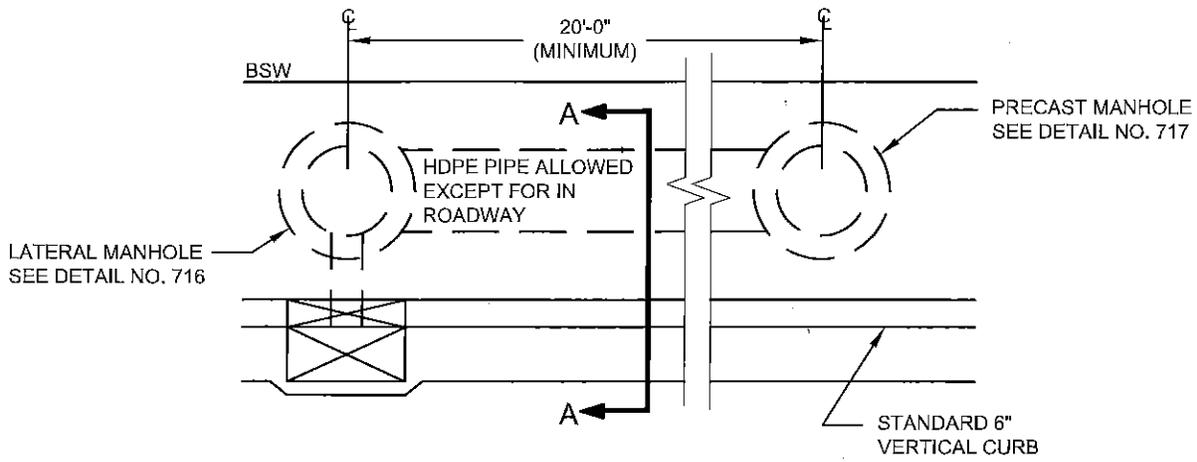
**718**



**NOTES:**

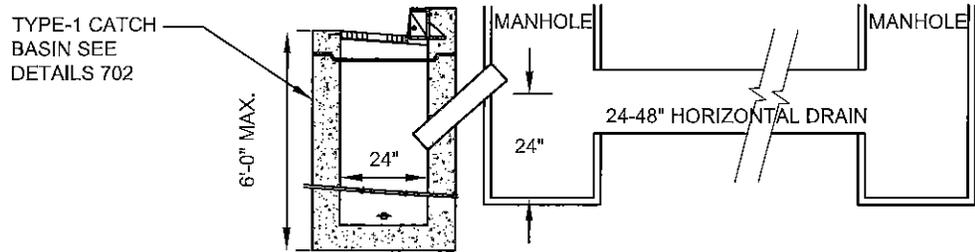
1. DIMENSIONS FOR FRAME AND COVER SHALL MATCH. MATING SURFACES OF FRAME AND COVER SHALL BE MACHINED TO INSURE NO-ROCK FIT.
2. COVER SHALL HAVE VERTICAL SIDES. NO TAPERED COVERS SHALL BE INSTALLED.
3. WEIGHT OF COVER SHALL BE NO LESS THAN 130 POUNDS. WEIGHT OF FRAME SHALL BE NO LESS THAN 140 POUNDS.
4. SOUTH BAY FOUNDRY SBF 624 FRAME AND COVER OR APPROVED EQUAL.
5. EACH MANHOLE COVER SHALL BE STAMPED "STORM DRAIN" WITH 1" TO 2" LETTERING.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>MANHOLE FRAME AND COVER FOR FEDERAL PROJECTS</b>	
 CITY ENGINEER - WILLIAM F. KULL			<b>1-26-16</b>	
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 720.DWG		<b>720</b>

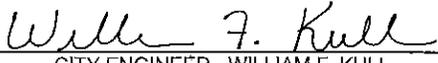


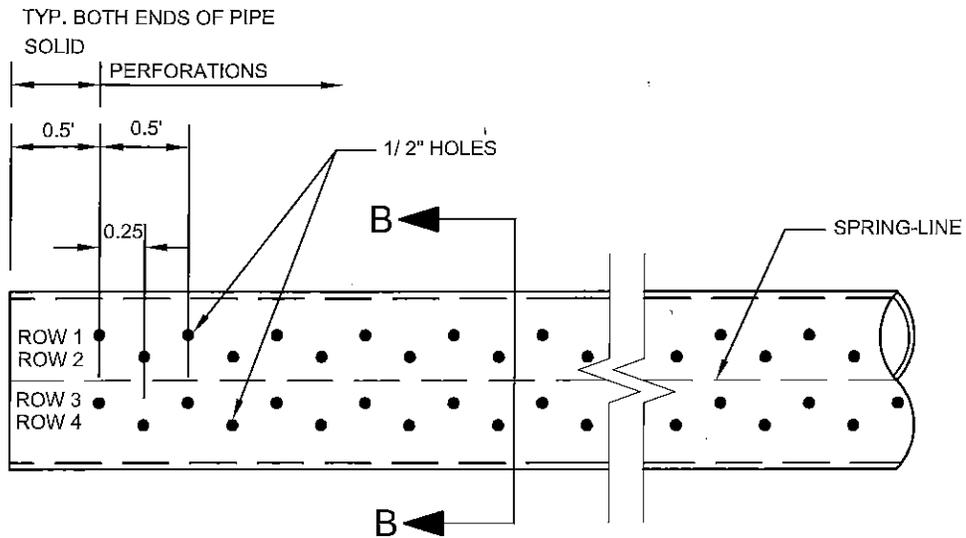
**PIPE SCHEDULE**

SIZE	TYPE
24"-48"Ø	C905 DR-14

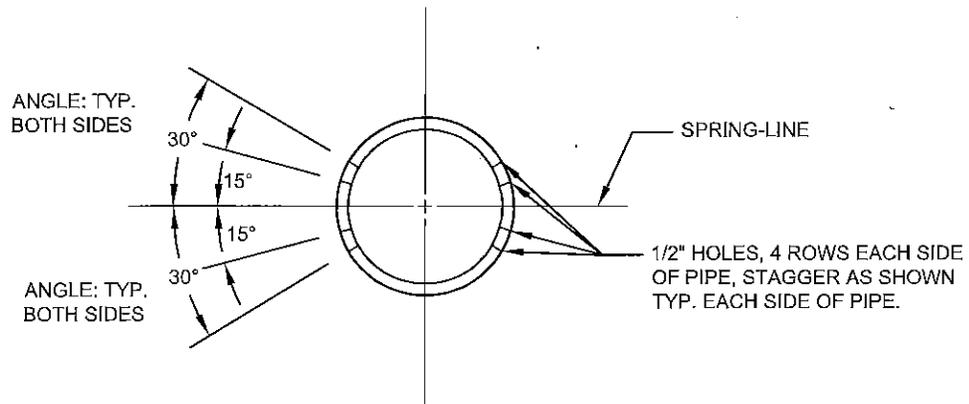


**NOTE:**  
 THIS HORIZONTAL DRAIN SYSTEM HAS BEEN DESIGNED FOR DEVELOPMENT AND INFILL AREAS WHICH HAVE NO ROOM FOR ON-SITE BASINS. ENGINEERING AND CALCULATIONS ARE REQUIRED AND SHALL MEET THE DESIGN STANDARD VOLUME REQUIREMENTS. CITY SHALL APPROVE ALL SUBMITTALS PRIOR TO CONSTRUCTION.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>HORIZONTAL DRAIN</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 721.DWG	<b>1-26-16</b>	<b>721</b>

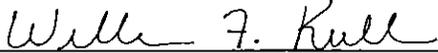


PERFORATED HORIZONTAL PIPE



**NOTES:**  
 PRE-FABRICATED PERFORATED PIPE WILL BE ALLOWED WITH CITY ENGINEER APPROVAL.

PIPE SECTION B-B

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>HORIZONTAL DRAIN PIPE</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 1/05/16	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: STORM	DRAWING NAME: 722.DWG	<b>1-26-16</b>	<b>722</b>

**City of Riverbank  
DESIGN SPECIFICATIONS**

**PARKING  
OFF-STREET**

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**8.100 Parking Design Guide**

**8.200 Disabled Parking Requirements**

## SECTION 6: PARKING, OFF-STREET

### 8.100 Parking Design Guide

To aid in the design of parking layouts, the following information is offered as a guide to meet the minimum requirements for off-street parking in the layout design of driver- parking lots under normal use conditions.

The following factors should be considered:

1. **Sizes and Access:** Each standard size off-street parking space shall have dimensions of not less than nine feet (9') width and nineteen feet (19') depth exclusive of access drives or aisles, and shall be of usable shape, location, and condition. Compact spaces having dimensions not less than seven and one-half feet (7-1/2') width and fifteen feet (15') depth, exclusive of access drives and aisles, shall be permitted, not to exceed thirty percent (30%) of the total required parking stalls. Small car spaces shall have "compact" or "small car" painted on the pavement at the entrance of each stall.
2. **Entrances and exits** - also location of nearest intersection, in each direction.
3. The width of the parking area normally determines the parking angle to be used.
4. Right angle (90 degree) parking is usually more efficient and provides for two-way movement in the aisles and shorter cruise distance. However, it generally requires more effort in such spaces.
5. Angle parking (other than 90 degrees) affords greater ease in parking and allows for narrower aisles but it requires one-way circulation.
6. **Parking Space:** An accessible and usable space on a building site of at least nine feet by nineteen feet (9' x 19') with access for the parking of automobiles. The length of the space may be reduced by two feet (2') if landscaped planters of sufficient width are used as curb stops.
7. With these factors in mind, an accurate drawing of the proposed parking area should be prepared showing such details as sidewalks, curb cuts for driveways, use of abutting properties, immovable obstacles, flow of on-street traffic in the area, and other pertinent information. This drawing can then be used to aid in the determination of a layout pattern based on selection of the best of all possible parking arrangements. The best arrangement should provide the maximum number of parking spaces with aisles and stalls designed for one-turn driver-parking.

## **8.200 Disabled Parking Requirements**

1. Each parking area associated with any type of land use listed in the Riverbank Zoning Code, except for single-family and two-family residential dwellings, shall include a number of parking spaces specifically reserved for vehicles licensed or authorized by the State of California for use by physically challenged/disabled drivers in accordance with the following:

<u>Total Spaces in Parking Area</u>		<u>Minimum Number of Spaces Required for Physically Challenged/Disabled Drivers</u>
1	40	1
41	80	2
81	120	3
121	160	4
161	300	5
301	450	6
451	600	7

One (1) space for each 200 spaces thereafter.

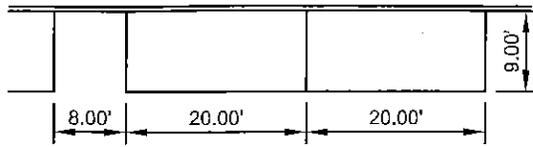
2. Such parking spaces shall be located within a reasonable proximity of any conveniently accessible entrance to the building served by the parking area.
3. Where single spaces are provided, they shall be fourteen feet (14') wide and outlined to provide a nine foot (9') parking area and a five foot (5') loading/unloading area. When more than one (1) space is provided, in lieu of providing a fourteen foot (14') wide space for each parking space, two (2) spaces can be provided within a twenty-three foot (23') wide area lined to provide a nine foot (9') wide parking area on each side of a five foot (5') wide loading I unloading area in the center. The minimum length of each parking space shall be nineteen feet (19'). Parking spaces required by this section shall be identified per State Law requirements.

**City of Riverbank  
STANDARD PLANS**

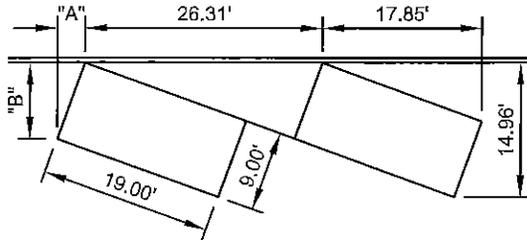
**PARKING**

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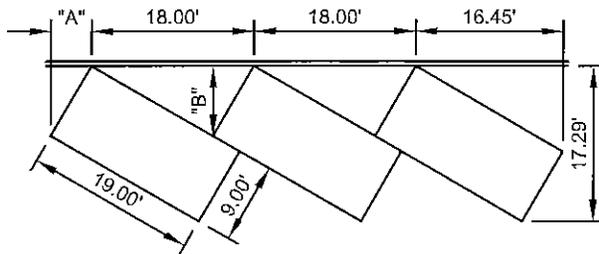
<b>Drawing No.</b>	<b>Description</b>
801	Parking Design
802	Parking Design
803	Parking Design
804	Typical Striping
805	Handicap Striping
806	International Symbol
807	Typical Handicap Parking Lot & Stall Signage



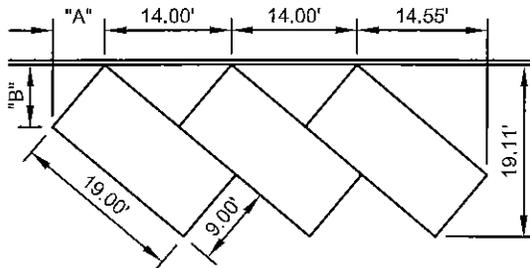
PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH
0°	7.5'	20.00'	7.5'	12.0'
	8.0'	20.00'	8.0'	12.0'
	9.0'	20.00'	9.0'	12.0'



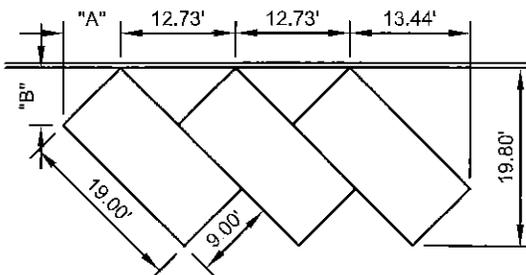
PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH	"A"	"B"
20°	7.5'	21.93'	13.55'	11.0'	2.57'	7.05'
	8.0'	23.39'	14.02'	11.0'	2.74'	7.52'
	9.0'	26.31'	14.96'	11.0'	3.08'	8.46'



PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH	"A"	"B"
30°	7.5'	15.00'	16.00'	11.0'	3.75'	6.50'
	8.0'	16.00'	16.43'	11.0'	4.00'	6.93'
	9.0'	18.00'	17.29'	11.0'	4.50'	7.79'



PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH	"A"	"B"
40°	7.5'	11.67'	17.96'	12.0'	4.82'	5.75'
	8.0'	12.45'	18.34'	12.0'	5.14'	6.13'
	9.0'	14.00'	19.11'	12.0'	5.79'	6.89'



PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH	"A"	"B"
45°	7.5'	10.61'	18.74'	13.5'	5.30'	5.30'
	8.0'	11.31'	19.09'	13.5'	5.66'	5.66'
	9.0'	12.73'	19.80'	13.5'	6.36'	6.36'

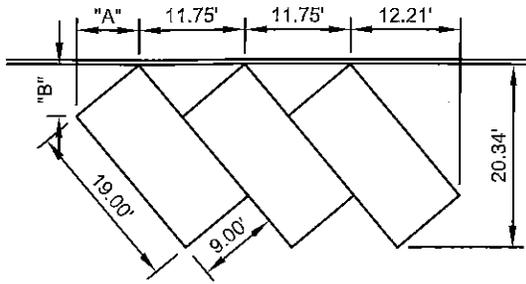
CITY OF RIVERBANK  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

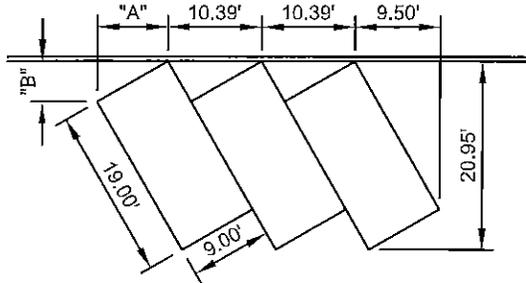
PARKING  
DESIGN

DRAWN BY: GK	DATE: 6/09/15	SCALE: NTS
REVISIONS: NONE	SECTION: PARKING	DRAWING NAME: 801.DWG

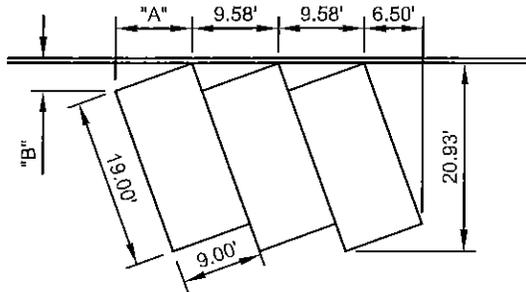
ADOPTED BY THE CITY COUNCIL: <b>1-26-16</b>	DRAWING NO. <b>801</b>
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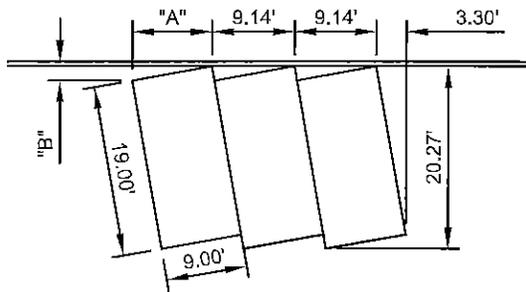
PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH	"A"	"B"
50°	7.5'	9.79'	19.38'	12.5'	5.75'	4.82'
	8.0'	10.44'	19.70'	12.5'	6.13'	5.14'
	9.0'	11.75'	20.34'	12.5'	6.89'	5.79'



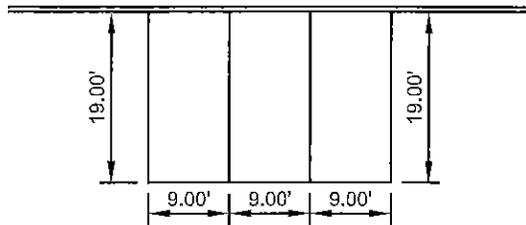
PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH	"A"	"B"
60°	7.5'	8.66'	20.20'	18.5'	6.50'	3.75'
	8.0'	9.24'	20.45'	18.5'	6.93'	4.00'
	9.0'	10.39'	20.95'	18.5'	7.79'	4.50'



PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH	"A"	"B"
70°	7.5'	7.98'	20.42'	19.5'	7.05'	2.57'
	8.0'	8.51'	20.59'	19.5'	7.52'	2.74'
	9.0'	9.58'	20.93'	19.5'	8.46'	3.08'



PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH	"A"	"B"
80°	7.5'	7.62'	20.01'	24.0'	7.39'	1.30'
	8.0'	8.12'	20.10'	24.0'	7.88'	1.39'
	9.0'	9.14'	20.27'	24.0'	8.86'	1.56'



PARK ANGLE	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	MIN AISLE WIDTH
90°	7.5'	7.5'	19.0'	25.0'
	8.0'	8.0'	19.0'	25.0'
	9.0'	9.0'	19.0'	25.0'

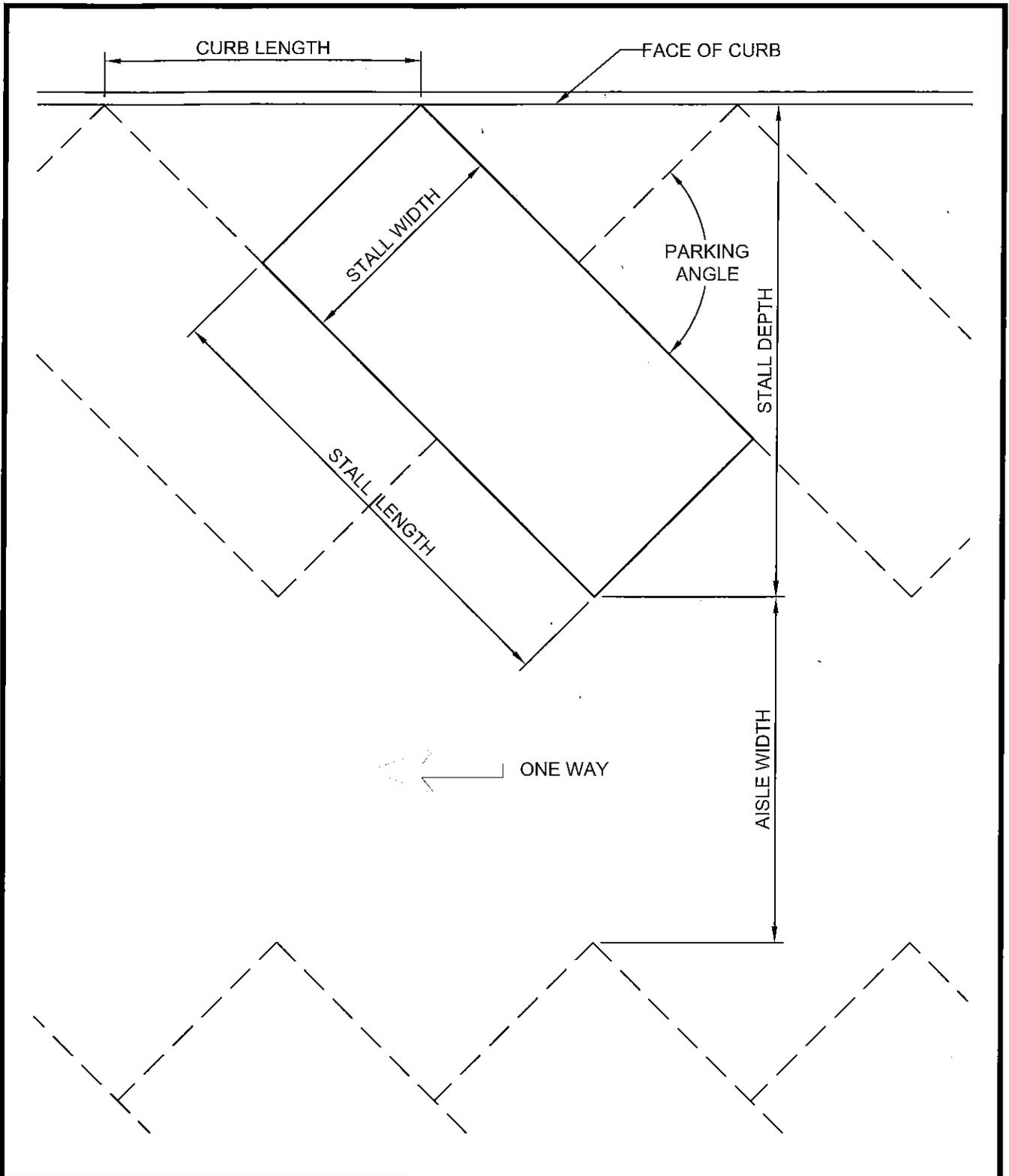
**CITY OF RIVERBANK**  
DEPARTMENT OF PUBLIC WORKS

*William F. Kull*  
CITY ENGINEER - WILLIAM F. KULL

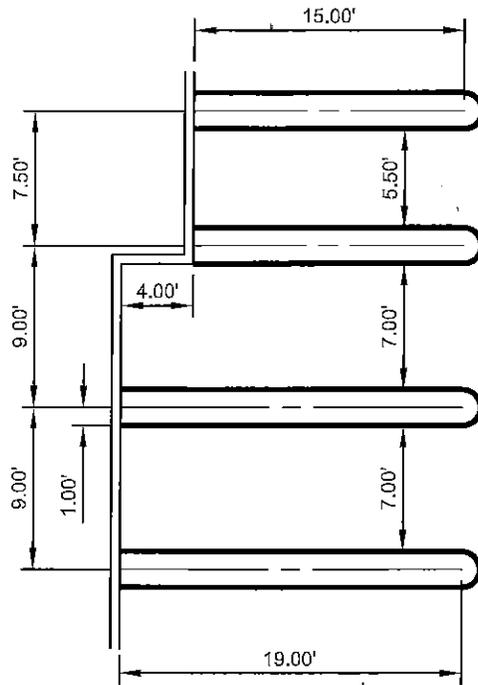
DRAWN BY: GK	DATE: 6/09/15	SCALE: NTS
REVISIONS: NONE	SECTION: PARKING	DRAWING NAME: 802.DWG

**PARKING  
DESIGN**

ADOPTED BY THE CITY COUNCIL: <b>1-26-16</b>	DRAWING NO. <b>802</b>
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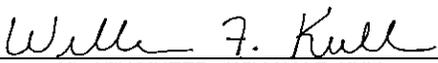


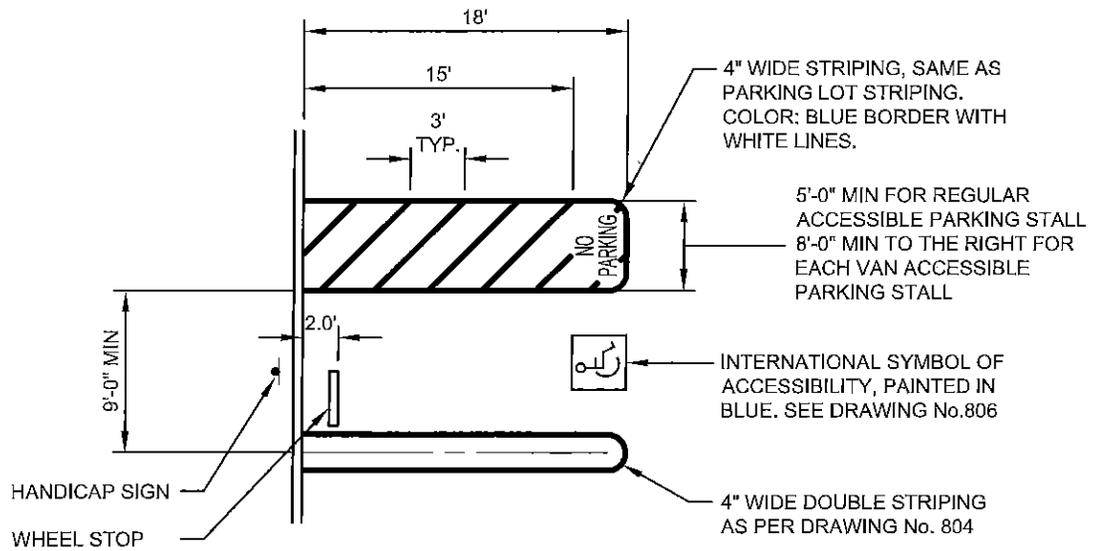
<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>PARKING DESIGN</b>	
<i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 6/09/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL: <b>1-26-16</b>	DRAWING NO. <b>803</b>
REVISIONS: NONE	SECTION: PARKING	DRAWING NAME: 803.DWG		



STRIPING: ALL PARKING SPACES SHALL BE MARKED BY EITHER STRIPING BUTTONS OR SIMILAR DEVICE TO DELINEATE SPACES. SPACES SHALL BE PAINTED WITH A LINE WIDTH OF FOUR INCHES (4"). BUTTONS SHALL BE A MINIMUM OF THREE AND ONE-HALF INCHES (3 1/2") IN DIAMETER, SPACED NO MORE THAN THREE FEET (3') ON CENTER. SPACES SHALL BE DOUBLE STRIPED WITH ONE FOOT (1') OF STRIPING LINE WITHIN EACH STALL, NINETEEN FEET (19') FOR EACH FULL SIZED SPACE AND FIFTEEN FEET (15') FOR SMALL CAR SPACE, NOT EXCLUDING THE SEMI-CIRCLE CAP.

PAINT: ALL PAINT SHALL BE WHITE LATEX BASE CONFORMING TO FEDERAL SPECIFICATION TT-P-1952.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>TYPICAL STRIPING</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 6/09/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:  <b>1-26-16</b>	DRAWING NO.  <b>804</b>
REVISIONS: NONE	SECTION: PARKING	DRAWING NAME: 804.DWG		

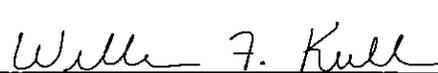


**OFF -STREET PARKING**

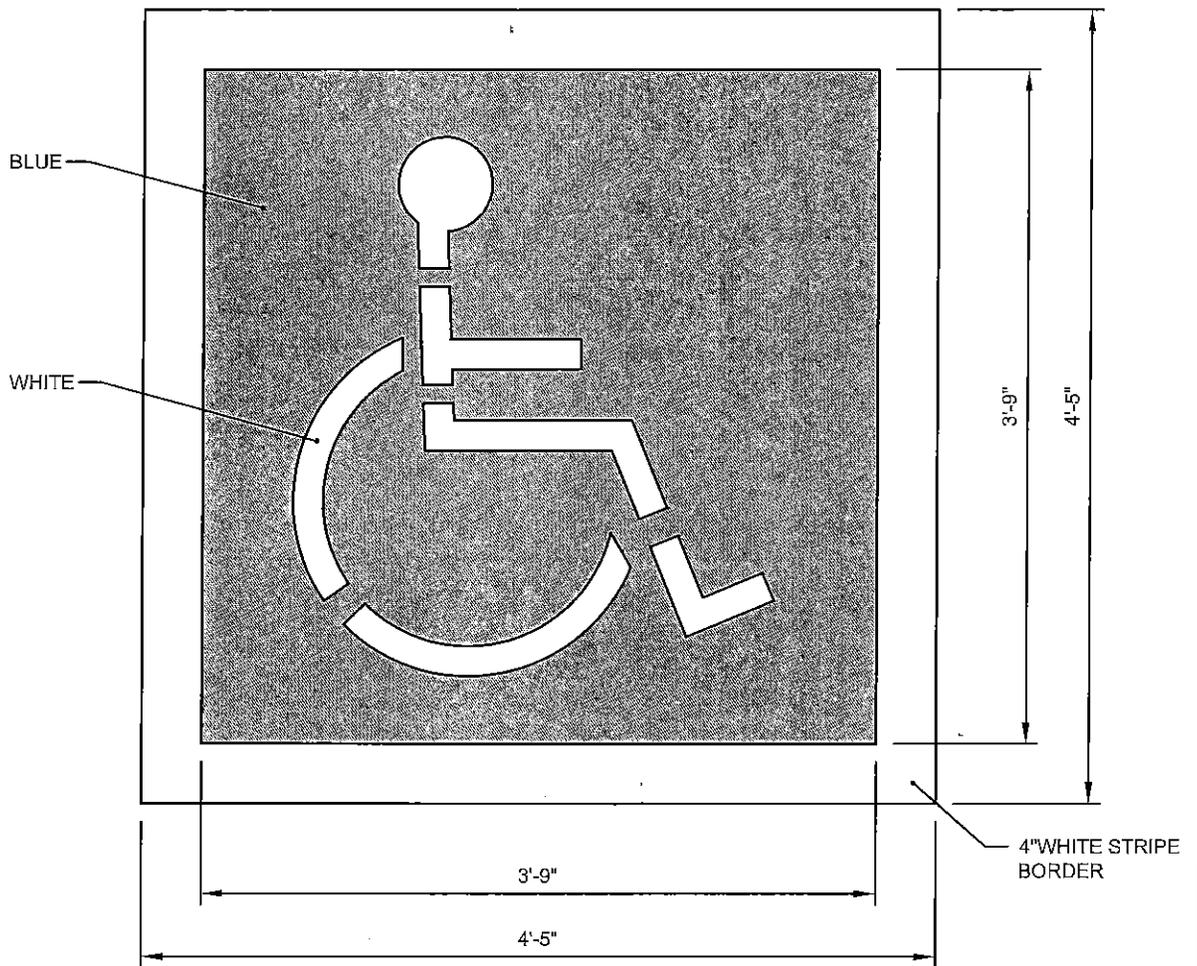
TOTAL NUMBER OF PARKING SPACES PROVIDED IN PARKING FACILITY	MINIMUM NUMBER OF REQUIRED ACCESSIBLE PARKING SPACES
1 - 25	1
26 - 50	2
51 - 75	3
76 - 100	4
101 - 150	5
151 - 200	6
201 - 300	7
301 - 400	8
401 - 500	9
501 - 1000	2 PERCENT OF TOTAL
1001 AND OVER	20 PLUS 1 FOR EACH 100 OR FRACTION THEREOF OVER 1000

1 IN EVERY 6 ACCESSIBLE SPACES SHALL BE VAN ACCESSIBLE.

NOTE:  
 EACH PARKING AREA ASSOCIATED WITH ANY TYPE OF LAND USE LISTED IN THE RIVERBANK ZONING CODE SHALL INCLUDE A NUMBER OF PARKING SPACES SPECIFICALLY RESERVED FOR VEHICLES LICENSED OR AUTHORIZED BY THE STATE OF CALIFORNIA FOR USE BY PHYSICALLY CHALLENGED/DISABLED DRIVERS. SEE SECTION 8.200 FOR DISABLED PARKING REQUIREMENTS.

<b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS			<b>DISABLED STRIPING</b>	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 9/25/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: PARKING	DRAWING NAME: 805.DWG	1-26-16	805

TYPICAL DISABLED STALL



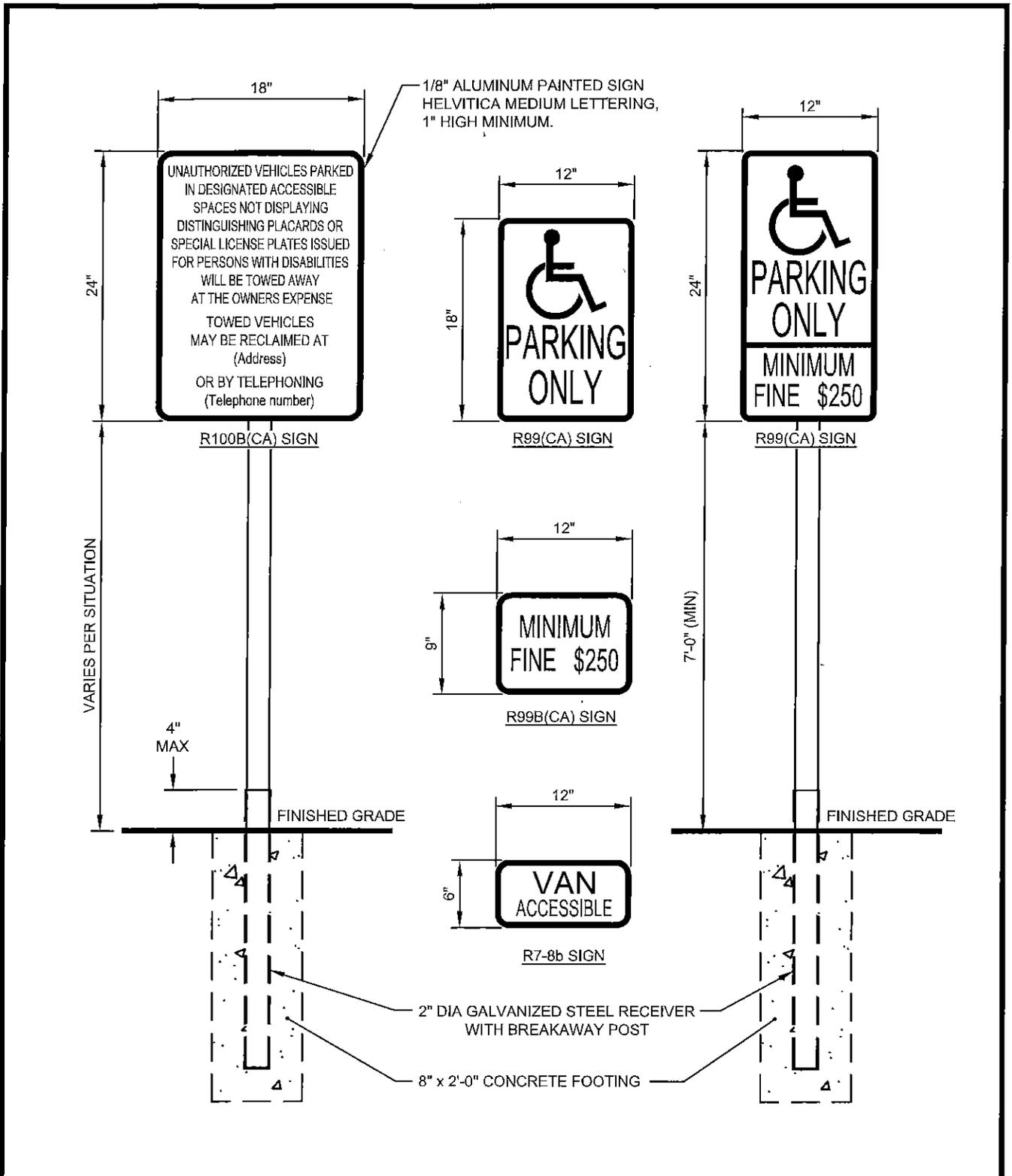
DISABLED PARKING STALL SYMBOL:

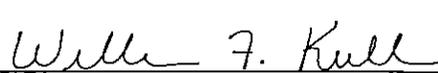
SYMBOL PAINTED HIGHWAY WHITE WITH 2" STRIPES.

BACKGROUND PAINTED BLUE, EQUAL TO COLOR No. 15090 IN FEDERAL STANDARDS 595A.

BACKGROUND MEASURES 3'-9" SQUARE.

<p><b>CITY OF RIVERBANK</b> DEPARTMENT OF PUBLIC WORKS</p>			<p><b>INTERNATIONAL</b></p>	
<p><i>William F. Kull</i> CITY ENGINEER - WILLIAM F. KULL</p>			<p><b>SYMBOL</b></p>	
<p>DRAWN BY: GK</p>	<p>DATE: 9/25/15</p>	<p>SCALE: NTS</p>	<p>ADOPTED BY THE CITY COUNCIL:</p>	<p>DRAWING NO.</p>
<p>REVISIONS: NONE</p>	<p>SECTION: PARKING</p>	<p>DRAWING NAME: 806.DWG</p>	<p><b>1-26-16</b></p>	<p><b>806</b></p>



CITY OF RIVERBANK DEPARTMENT OF PUBLIC WORKS			TYPICAL DISABLED PARKING LOT & STALL SIGNAGE	
 CITY ENGINEER - WILLIAM F. KULL				
DRAWN BY: GK	DATE: 9/25/15	SCALE: NTS	ADOPTED BY THE CITY COUNCIL:	DRAWING NO.
REVISIONS: NONE	SECTION: PARKING	DRAWING NAME: 807.DWG	1-26-16	807