

# STANDARD PLANS



COUNTY OF ORANGE

ORANGE COUNTY  
PUBLIC WORKS DEPARTMENT

SEPTEMBER 2018 EDITION

KHALID BAZMI, COUNTY ENGINEER



# **STANDARD PLANS**

**RESOLUTION NO. 18-097**

## **STANDARD PLANS 112 THROUGH 633**

### **STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION (2012 EDITION)**

**PUBLIC WORKS STANDARDS, INC.**

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## **STANDARD PLANS 1100 THROUGH 1810**

### **STANDARD PLANS FOR COUNTY OF ORANGE ORANGE COUNTY PUBLIC WORKS DEPARTMENT**

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## **PREFACE**

The Standard Plans for Public Works Construction of the Public Works Standards, Inc. are hereinafter called SPPWC.

It is County of Orange, OC Public Works Department (OCPW)'s intent to adopt the latest edition of the SPPWC Standard Plans and Standard Specifications for Public Works Construction (Greenbook) as published by BNI Building News (except for Sections 209, 214, 307 and 312) except where current OCPW Standard Plans, or portions thereof, should be retained on the basis of cost or safety or where portions of OCPW Standard Plans can be used with SPPWC Standard Plans in a way that meets special OCPW needs and does not adversely affect the benefits of standardization.

There are three categories of Standard Plans:

- 1) OCPW has adopted SPPWC Standard Plans with or without conditions.
- 2) OCPW has a Standard Plan which addresses a subject but SPPWC does not.
- 3) SPPWC has a Standard Plan which addresses a subject but OCPW does not.

This edition of the OCPW Standard Plans includes the first two categories. The third category has not yet been adopted by OCPW. SPPWC has a number of Standard Plans that have no equivalent OCPW Standard Plans. Although it is intended to consider such Standard Plans for adoption by OCPW, time has precluded a review of such SPPWC Standard Plans and, therefore, such SPPWC Standard Plans shall not be used for OCPW projects at this time.

The adopted SPPWC Standard Plans (with and without conditions) are now included in this edition of OCPW Standard Plans. The SPPWC Standard Plans are copyrighted and published by BNI Books, Division of Building News, Inc., (990 Park Center Drive, Suite E, Vista, CA 92081, (760) 734-1113). Therefore, OCPW has included the adopted SPPWC Standard Plans in their entirety without making revisions directly on the SPPWC Standard Plans. OCPW conditions, if any, are located immediately following the SPPWC Standard Plans.

Construction plan call-outs should include the appropriate letter prefix: such as "Construct per SPPWC 312-1" or "Construct per OCPW 1101". Where the call-out omits the letter prefix, the OCPW Standard Plan shall apply unless otherwise directed by the Engineer (see definition below). Where an SPPWC Standard Plan is called out which has been approved by OCPW with conditions, the plan call-out as an example would be identified as "OCPW 100-0-OC". In this case, the SPPWC Standard Plan is given the suffix OC. However, a plan call-out for an SPPWC Standard Plan shall automatically include the OCPW conditions, if any.

OCPW and SPPWC Standard Plans may be used by reference, for example, "Construct per OCPW 100-0-OC" or the standard plans may be reproduced on project drawings submitted for OCPW approval. However, where standard plans are reproduced in the drawings, the entire standard plan shall be reproduced. The SPPWC Standard Plans are copyrighted and may not be reproduced except for use on OCPW plans as noted above.

The users of these Standard Plans should also be aware that the SPPWC Standard Plans are unsigned. Where Standard Plans (either OCPW or SPPWC) have been approved by OCPW, OCPW's approval is an approval that the adopted Standard Plan is suitable for general OCPW use. The project proponent, by including the Standard Plans (by reference or reproduction) in project plans, assumes a professional engineer's responsibility for their use.

In addition to the adoption of a portion of SPPWC Standard Plans, OCPW has also adopted a portion of the Department of Transportation, State of California Standard Plans and Specifications latest Edition. Due to their availability, those Standard Plans are not included in this booklet. The following are the portion of Standard Plans, Department of Transportation, State of California, OCPW has adopted:

1. The portion covering "Signals, Lighting and Electrical Systems."
2. The portion covering "Bridges".
3. Standard Plans A77A1 through A77K2 covering "Metal Beam Guard Railing".

The term "ENGINEER" as it appears in this document is defined as: The County Engineer, OC Public Works Department, acting either directly or through authorized agents (such as Resident Engineer or Resident Inspector), such agent acting within the scope of the particular duties delegated to them.

The term "GEOTECHNICAL ENGINEER" as it appears in this document is defined as: The Professional Engineer and Manager in responsible charge for the operation and performance of the OC Public Works, Materials Laboratory and all reports and tests performed therein or on his behalf, or his duly assigned designee.

<b><u>Acronym or Abbreviation</u></b>	<b><u>Word or Words</u></b>
AASHTO	American Association of State Highway and Transportation Officials
AB	Aggregate Base
ABS	Acrylonitrile Butadiene Styrene
AC	Asphalt Concrete
ACP	Asbestos-Cement Pipe
ADA	Americans with Disabilities Act
ADAAG	Americans with Disability Act Accessibility Guidelines
ADT	Average Daily Traffic
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
Approx.	Approximate
ARHM	Asphalt Rubber Hot Mix
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
BC	Beginning of Curve
BCR	Beginning of Curb Return
Bldg.	Building

BMP	Best Management Practice
CAB	Crushed Aggregate Base
CAPA	Corrugated Aluminum Pipe Arch
CAP	Corrugated Aluminum Pipe
CASQA	California Stormwater Quality Association
CCTV	Closed Circuit TV
CF	Cubic Feet
CHDPE	Corrugated High Density Polyethylene
CI	Cast Iron
CIP	Cast-In-Place or Cast Iron Pipe
CIPCP	Cast-In-Place Concrete Pipe
CIPP	Cured-In-Place Pipe
CL	Centerline
Clr.	Clearance
CMB	Crushed Miscellaneous Base
CMP	Corrugated Metal Pipe
CMU	Concrete Masonry Unit
Conc.	Concrete
Const.	Construction
CSP	Corrugated Steel Pipe
CSPA	Corrugated Steel Pipe Arch
Ctr.	Center
CY	Cubic Yard
Det.	Detail
Dia.	Diameter
DIP	Ductile Iron Pipe
Dwy.	Driveway
EC	End of Curve
ECR	End of Curb Return
EG	Edge of Gutter
Elev.	Elevation
EM	Engineer Manual
EP	Edge of Pavement
EPA	Environmental Protection Agency
Exist.	Existing
Exp. Jt.	Expansion Joint
FG	Finished Grade
FL	Flow Line
fps	Feet per Second
FS	Finished Surface
FT	Foot (Feet)
Gal	Gallon
Galv.	Galvanized
HC	House Connection
HCSP	High Carbon Steel Pipe
HD	Hole Diameter
HDPE	High Density Polyethylene
Hex.	Hexagon
HPSV	High Pressure Sodium Vapour

ID	Inside Diameter
in	Inch
Inv.	Invert
ITE	Institute of Transportation Engineers
JS	Junction Structure
LS	Lump Sum
Max.	Maximum
Min.	Minimum
MUTCD	Manual on Uniform Traffic Control Devices
N/A	Not Applicable
NC	National Coarse
NEC	National Electrical Code
Non-Reinf.	Non-Reinforced
NS	Native Soil
oc	On-Center
OCVCD	Orange County Vector Control District
OD	Outside Diameter
PC	Portland Cement
PCC	Portland Cement Concrete
PE	Polyethylene
PI	Point of Intersection
PL	Property Line
PLI	Pounds per Linear Inch
psf	Pounds per Square Foot
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
R	Radius or Resistance Value
RC	Reverse Curve
RC	Relative Compaction
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe
RCV	Remote Control Valve
RPM	Raised Pavement Marker
RW	Reclaimed Water
R/W or ROW	Right-of-Way
SDR	Standard thermoplastic pipe dimension ratio (ratio of pipe OD to minimum wall thickness)
sf	Square Foot (Feet)
Sq. Ft.	Square Foot (Feet)
SI	International System of Units (Metric)
SPPWC	Standard Plans for Public Works Construction
Std.	Standard
SWPPP	Storm Water Pollution Prevention Plan
TC	Top of Curb
TCP	Traffic Control Plan
Typ.	Typical
UL	Underwriters' Laboratories Inc.
Var.	Varies
VCP	Vitrified Clay Pipe

Vert.	Vertical
WATCH	Work Area Traffic Control Handbook
WPJ	Weakened Plane Joint
WWM	Welded Wire Mesh
UF	Underground Feeder
Ult.	Ultimate
USACE	United States Army Corps of Engineers



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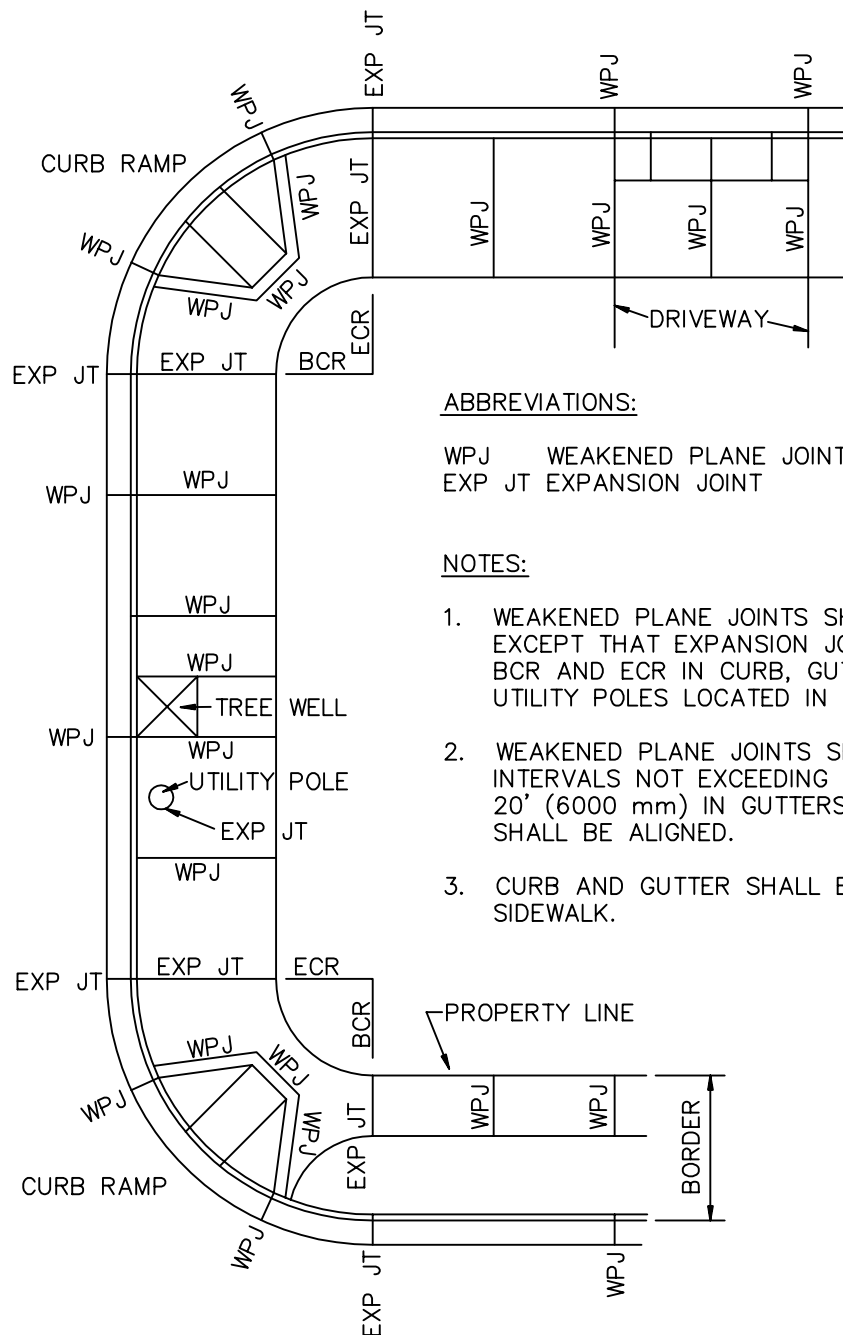
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ABBREVIATIONS:

WPJ WEAKENED PLANE JOINT      BCR BEGINNING OF CURB RETURN  
EXP JT EXPANSION JOINT      ECR END OF CURB RETURN

NOTES:

1. WEAKENED PLANE JOINTS SHALL BE USED FOR ALL JOINTS, EXCEPT THAT EXPANSION JOINTS SHALL BE PLACED AT THE BCR AND ECR IN CURB, GUTTER AND SIDEWALK, AND AROUND UTILITY POLES LOCATED IN SIDEWALK AREAS.
2. WEAKENED PLANE JOINTS SHALL BE CONSTRUCTED AT REGULAR INTERVALS NOT EXCEEDING 10' (3000 mm) IN WALKS AND 20' (6000 mm) IN GUTTERS. JOINTS IN CURB AND WALK SHALL BE ALIGNED.
3. CURB AND GUTTER SHALL BE CONSTRUCTED SEPARATELY FROM SIDEWALK.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2009

**CURB AND SIDEWALK JOINTS**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**112-2**

SHEET 1 OF 1

**SEE OCPW STANDARD PLAN 112-2-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

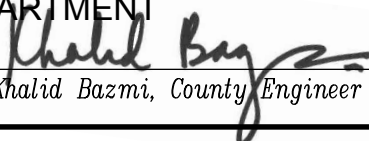
<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
112-2	112-2-OC	<u>CURB AND SIDEWALK JOINTS</u>

1. WEAKENED PLANE JOINTS (WPJ) SHALL BE CONSTRUCTED IN CURB AND AND GUTTER NOT EXCEED 10 FEET.
2. WPJ SHALL BE A DEPTH OF  $\frac{1}{4}$  TO  $\frac{1}{3}$  OF THE CONCRETE THICKNESS.
3. EXPANSION JOINT (EXP JT) SHALL BE FULL DEPTH.
4. SIDEWALK:
  - WPJ SHALL BE QUICKJOINTS AND FINISHED WITH A BUTTERFLY TOOL ( $R=\frac{1}{8}$  inch).
  - a. FORMED CURB AND GUTTER:
    - EXP JT SHALL BE  $\frac{1}{4}$  INCH THICK PREMOLDED FILLER (ASPHALT SATURATED FIBER) IN THE TOP OF CURB, FACE OF CURB AND ACROSS THE GUTTER, AS REQUIRED BY THE ENGINEER.
  - b. EXTRUDED CURB AND GUTTER:
    - EXP JT SHALL BE CUT (HAND TOOLED) IN THE TOP OF CURB, FACE OF CURB, AND ACROSS THE GUTTER OR SAWCUT (WITHIN 24 HOURS).
  - c. GUTTER TRANSITION:
    - EXP JT SHALL BE  $\frac{1}{4}$  INCH THICK PREMOLDED FILLER, AS REQUIRED BY THE ENGINEER.
5. METER BOXES AND VAULTS SHALL HAVE WPJ SIMILAR TO TREE WELL DETAIL.
6. PREMOLDED FILLER ( $\frac{1}{4}$  INCH THICK ASPHALT SATURATED FIBER) SHALL BE PLACED BETWEEN SIDEWALK RETURN AND CURB.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

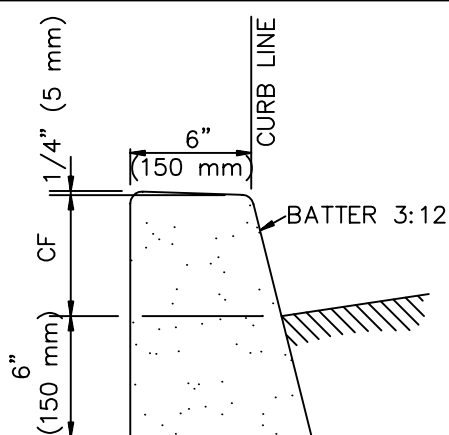
  
Khalid Bazmi, County Engineer

STD. PLAN

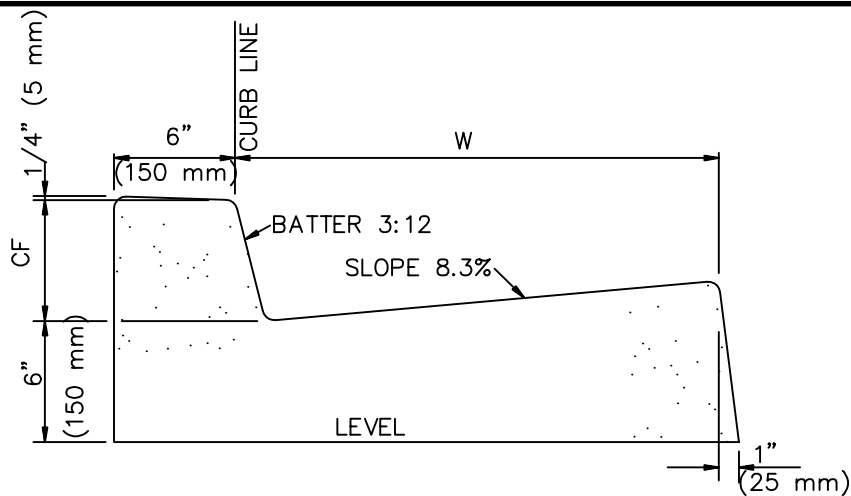
112-2-OC

SPPWC STANDARD PLANS - CURB & SIDEWALK JOINTS

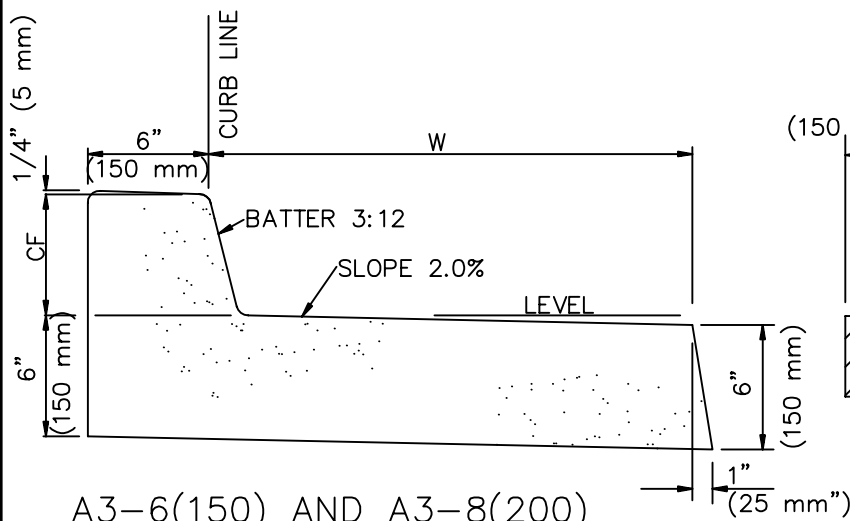
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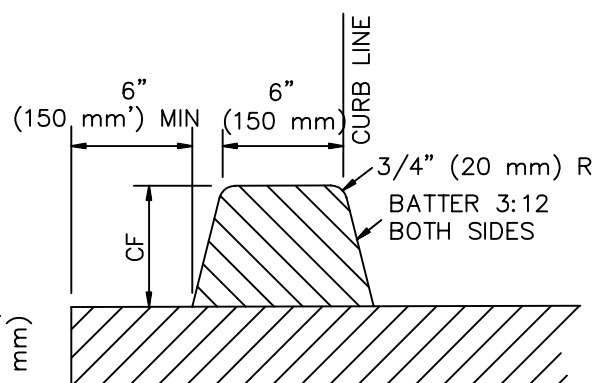
A1-6(150) AND  
A1-8(200)



A2-6(150) AND A2-8(200)



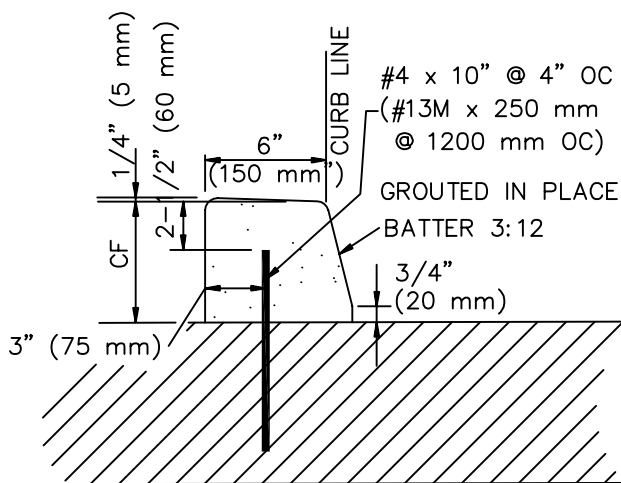
A3-6(150) AND A3-8(200)



D1-6(150) AND  
D1-8(200)

NOTES:

1. THE LAST NUMBER IN THE DESIGNATION IS THE CURB FACE (CF) HEIGHT, INCHES (mm).
2. GUTTER WIDTH, W, IS 24" (600 mm) UNLESS OTHERWISE SPECIFIED.
3. TYPES A1, A2, A3 AND C1 SHALL BE CONSTRUCTED FROM PCC.
4. TYPE D1 CURB SHALL BE CONSTRUCTED FROM ASPHALT CONCRETE.
5. TYPE C1 CURB SHALL BE ANCHORED WITH STEEL DOWELS AS SHOWN OR WITH AN EPOXY APPROVED BY THE ENGINEER.
6. ALL EXPOSED CORNERS ON PCC CURBS AND GUTTERS SHALL BE ROUNDED WITH A 1/2" (15 mm) RADIUS.



C1-6(150) AND C1-8(200)

STANDARD PLAN FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2009

**CURB AND GUTTER – BARRIER**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**120-2**

SHEET 1 OF 1

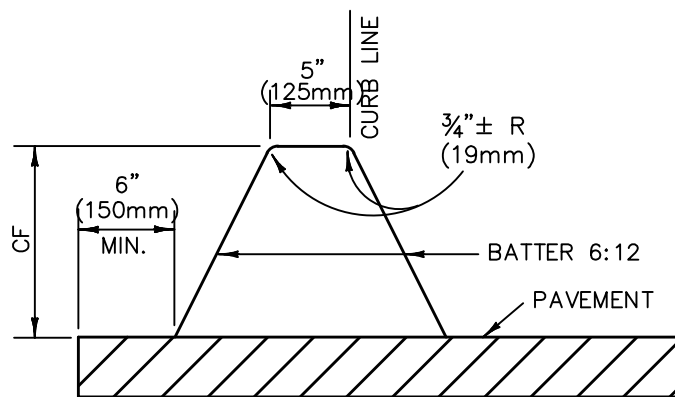
**SEE OCPW STANDARD PLAN 120-2-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

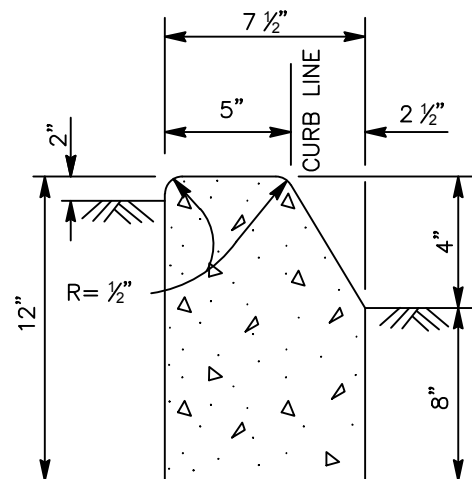
SPPWC #	OCPW #	NAME AND CONDITIONS
120-2	120-2-OC	CURB AND GUTTER-BARRIER

1. TYPE A-2. PLACE ASPHALT CONCRETE SURFACING  $\frac{3}{8}$  INCH ABOVE EDGE OF PCC GUTTER, EXCEPT IN THE CASE OF CURB RAMPS WHERE THE ASPHALT CONCRETE SURFACING SHALL BE FLUSH WITH THE PCC GUTTER.
2. TYPE D-1. TACK AC PAVEMENT WITH EMULSIFIED ASPHALT AT RATE OF 0.05 GALLONS PER SQUARE YARD PRIOR TO PLACING AC CURB. ALTERNATE D1 CURB MAY BE CONSTRUCTED USING A BATTER OF 6:12 AND 5 INCHES TOP WIDTH AS SHOWN PER DETAIL "A" BELOW.
3. FOR THE TYPE A2-6(150) CURB, THE "W" DIMENSION SHALL BE 1 FOOT-6 INCHES, UNLESS OTHERWISE INDICATED ON THE PLANS.
4. CURB TYPE SHALL BE SELECTED ACCORDING TO THE FOLLOWING TABLE:

	< 45 mph	$\geq 45$ mph
MEDIAN	A1-6(150)	SEE DETAIL "B" BELOW
ADJACENT TO SIDEWALK	A2-6(150)	A2-6(150)



ALTERNATE D1-6(150)  
DETAIL "A"



DETAIL "B"

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

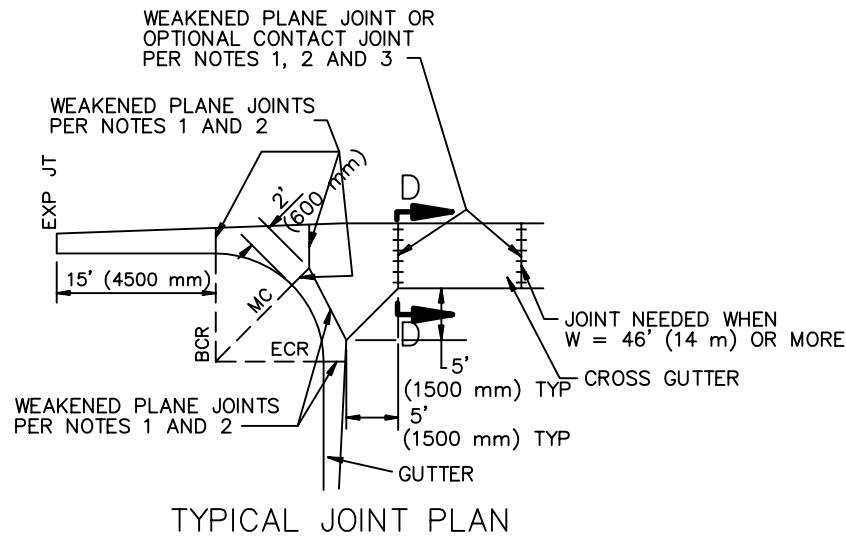
STD. PLAN

120-2-OC

SPPWC STANDARD PLAN - CURB AND GUTTER-BARRIER

SHT. 1 OF 1





NOTES:

1. WEAKENED PLANE AND/OR CONTACT JOINTS SHALL BE PLACED IN CURB AND GUTTER AT LOCATIONS SHOWN ON THE TYPICAL JOINT PLAN HEREON.
2. WEAKENED PLANE JOINTS SHALL BE PLASTIC CONTROL JOINTS OR 1-1/2" (40 mm) DEEP SAW CUTS. CONCRETE SAWING SHALL TAKE PLACE WITHIN 24 HOURS AFTER CONCRETE IS PLACED.
3. DOWELS FOR CONTACT JOINTS SHALL BE #4 BARS 18" LONG (#13M BARS 450 mm LONG).
4. PLACE A WEAKENED PLANE OR CONTACT JOINT WHERE LONGITUDINAL ALLEY GUTTER JOINS CONCRETE ALLEY INTERSECTION.
5. ALL EXPOSED CORNERS ON PCC GUTTERS SHALL BE ROUNDED WITH 1/2" (15 mm) RADIUS.
6. CONCRETE SHALL BE INTEGRAL WITH CURB UNLESS OTHERWISE SPECIFIED.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**CROSS AND LONGITUDINAL GUTTERS**

STANDARD PLAN

**122-2**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 122-2-OC FOR CONDITIONS**

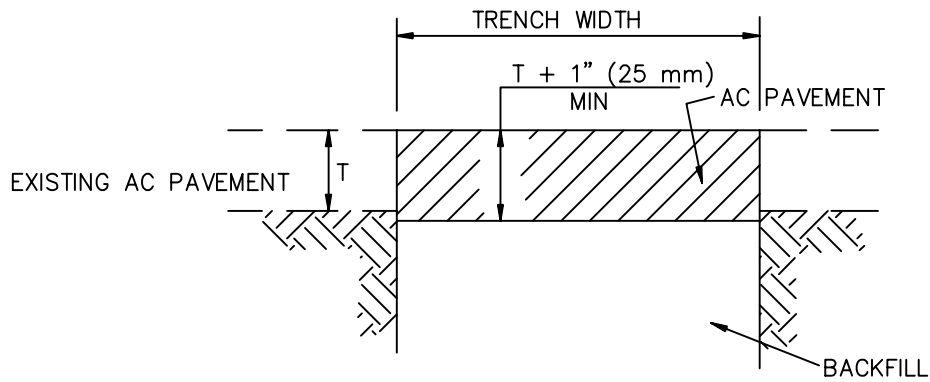
<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
122-2	122-2-OC	CROSS AND LONGITUDINAL GUTTERS

- 
- Diagram illustrating the cross-section of a bridge deck, showing the gutter and spandrel details. The diagram includes the following dimensions and labels:
- Overall width: 15' (left) and 15' (right) from the centerline.
  - Gutter width: 4' (left) and 4' (right) from the centerline.
  - Gutter depth: 1" (left) and 1" (right) from the centerline.
  - Spandrel width: 8" (left) and 8" (right) from the centerline.
  - Cross gutter/spandrel: 6" (SEE NOTE 4).
  - Labels: "LEVEL LINE", "PAVEMENT LIP", "NORMAL STRUCTURAL SECTION", "CROSS GUTTER/SPANDREL".

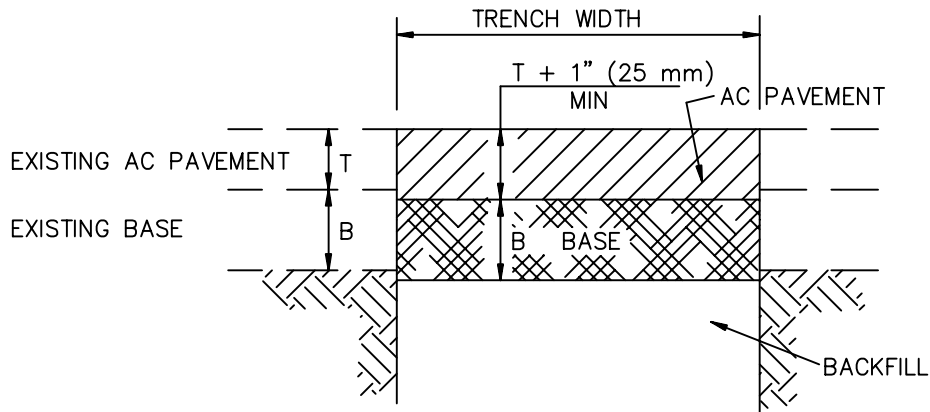
\* SUBGRADE TRANSITION

SHT. 1 OF 1

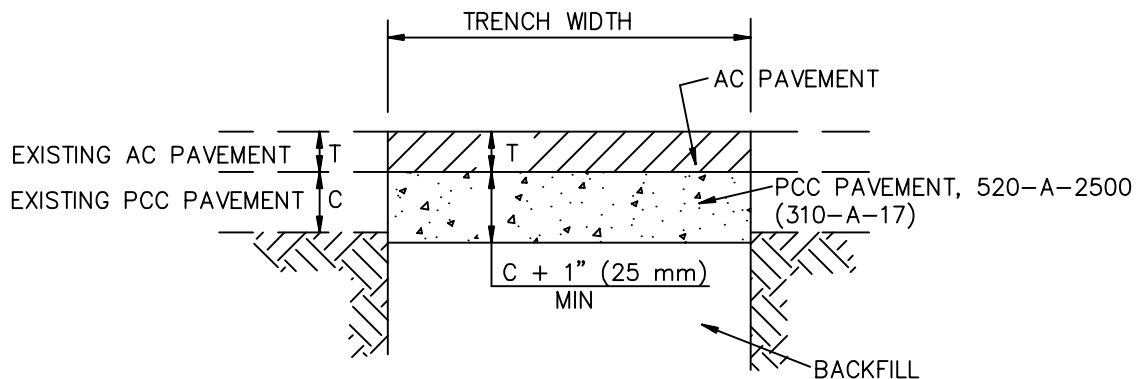




CASE I – WITHOUT BASE



CASE II – WITH BASE



CASE III – AC PVMT ON PCC PVMT

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1993  
REV. 2005, 2009

## ASPHALT CONCRETE PAVEMENT REPLACEMENT

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**133-3**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 133-3-OC FOR CONDITIONS**

NOTES:

1. BACKFILL AND DENSIFICATION SHALL CONFORM TO SSPWC 306-1.3.
3. TEMPORARY RESURFACING SHALL BE PLACED PER SSPWC 306-1.5.1.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**ASPHALT CONCRETE PAVEMENT  
REPLACEMENT**

STANDARD PLAN

**133-3**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 133-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #   OCPW #   NAME AND CONDITIONS

133-3      133-3-OC      ASPHALT CONCRETE PAVEMENT REPLACEMENT

1. DELETE NOTES 1 AND 3 OF SPPWC STANDARD PLAN 133-3.
2. PAVEMENT REPLACEMENT SHALL BE "T-CUT" TO EXTEND 12 INCHES BEYOND EACH SIDE OF TRENCH WIDTH. PAVEMENT REMOVAL IN THE AREA OF ADDITIONAL WIDTH SHALL BE BY COLD PLANE OR OTHER METHOD APPROVED BY THE ENGINEER. DEPTH OF REMOVAL SHALL BE AT LEAST 0.15 FEET ON ARTERIAL HIGHWAYS AND AT LEAST 0.12 FEET ELSEWHERE.
3. FULL TRAVEL LANE REPLACEMENT OR GRINDING WITH AT LEAST 0.15 FEET CAP IS REQUIRED ON ALL ARTERIAL HIGHWAYS IN ACCORDANCE WITH SECTION 6-3-60 (D) OF THE ORANGE COUNTY CODIFIED ORDINANCE.
4. FULL TRAVEL LANE REPLACEMENT OR GRINDING WITH AT LEAST 0.12 FEET CAP IS REQUIRED ON ANY STREET IF THE EXISTING SURFACE COURSE HAS BEEN IN PLACE FOR LESS THAN 2 YEARS.
5. SURFACE COURSE AND BASE COURSE ASPHALT CONCRETE PAVEMENT SHALL BE OF THE SAME MIX AS THE EXISTING ASPHALT CONCRETE PAVEMENT(S) UNLESS OTHERWISE APPROVED BY THE ENGINEER.
6. ALL PAVEMENT REMOVALS SHALL BE MADE ON STRAIGHT LINE SAW CUTS A MINIMUM OF 1½ INCHES DEEP. IF CUT LINE IS LESS THAN 36 INCHES FROM A CUT LINE, EXPANSION JOINT OR EDGE, THE EXISTING PAVEMENT SHALL BE REMOVED TO CUT LINES, EXPANSION JOINT OR EDGE OR AS DIRECTED BY THE ENGINEER.
7. DURING EXCAVATION AND SUBGRADE PREPARATION, THE CONTRACTOR SHALL TAKE ALL NECESSARY STEPS TO ENSURE THE PROTECTION OF ALL IMPROVEMENTS, WHETHER PUBLIC OR PRIVATE, INCLUDING UTILITIES AND THEIR SERVICES, FROM ANY DAMAGE THAT COULD OCCUR DUE TO CONTRACTOR'S OPERATION.
8. BACKFILL AND DENSIFICATION SHALL BE DONE IN CONFORMANCE WITH SECTION 306-1.3, "BACKFILL AND DENSIFICATION," OF THE GREENBOOK, EXCEPT AS FOLLOWS:

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

STD. PLAN

133-3-OC

SPPWC STANDARD PLAN - ASPHALT CONCRETE PAVEMENT REPLACEMENT

SHT. 1 OF 2

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
133-3	133-3-OC	<u>ASPHALT CONCRETE PAVEMENT REPLACEMENT</u>

- a. TRENCH BACKFILL SHALL BE DENSIFIED TO A MINIMUM OF 90 PERCENT RELATIVE COMPACTION.
- b. WHEN PAVEMENT IS TO BE PLACED DIRECTLY ON SUBGRADE MATERIAL, THE TOP 6 INCHES OF SUBGRADE MATERIAL SHALL BE COMPACTED TO A RELATIVE COMPACTION OF 95 PERCENT.
- 9. TEMPORARY PAVEMENT REPLACEMENT SHALL BE PLACED AT THE CONTRACTOR'S EXPENSE, UNLESS OTHERWISE SPECIFIED BY THE ENGINEER. IT SHALL BE PLACED LEVEL WITH THE EXISTING PAVEMENT ON COMPACTED TRENCH BACKFILL AND SHALL BE A MINIMUM OF 2 INCHES THICK.
- 10. PERMANENT PAVEMENT RESURFACING SHALL BE DONE WITHIN TWO (2) WEEKS AFTER BACKFILLING OF TRENCHES HAS BEEN COMPLETED, AND ONLY AFTER SETTLEMENT HAS TAKEN PLACE AND THE FILL SURFACE HAS SUFFICIENTLY DRIED. ALL CUTS SHALL BE CLEAN AND STRAIGHT.
- 11. CONTACT SURFACES OF EXISTING PAVEMENT, MANHOLE FRAMES AND SHAFTS AND CONCRETE SURFACES SHALL BE GIVEN A TACK COAT BEFORE PERMANENT ASPHALT TRENCH RESURFACING IS PLACED.
- 12. UNLESS PERMANENT PAVEMENT IS PLACED IMMEDIATELY, TEMPORARY BITUMINOUS RESURFACING 2 INCHES THICK SHALL BE PLACED AND MAINTAINED AT LOCATIONS DETERMINED BY THE ENGINEER WHEREVER EXCAVATION IS MADE THROUGH PAVEMENT, SIDEWALK OR DRIVEWAYS. IN SIDEWALK AREAS, THE TEMPORARY BITUMINOUS RESURFACING SHALL BE AT LEAST 1 INCH THICK; IN ALL OTHER AREAS IT SHALL BE AT LEAST 2 INCHES THICK. AT MAJOR INTERSECTIONS AND OTHER CRITICAL LOCATIONS, A GREATER THICKNESS MAY BE ORDERED. TEMPORARY RESURFACING SHALL BE PLACED AS SOON AS THE CONDITION OF THE BACKFILL IS SUITABLE TO RECEIVE IT AND SHALL REMAIN IN PLACE UNTIL THE CONDITION OF THE BACKFILL IS SUITABLE FOR PERMANENT RESURFACING.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

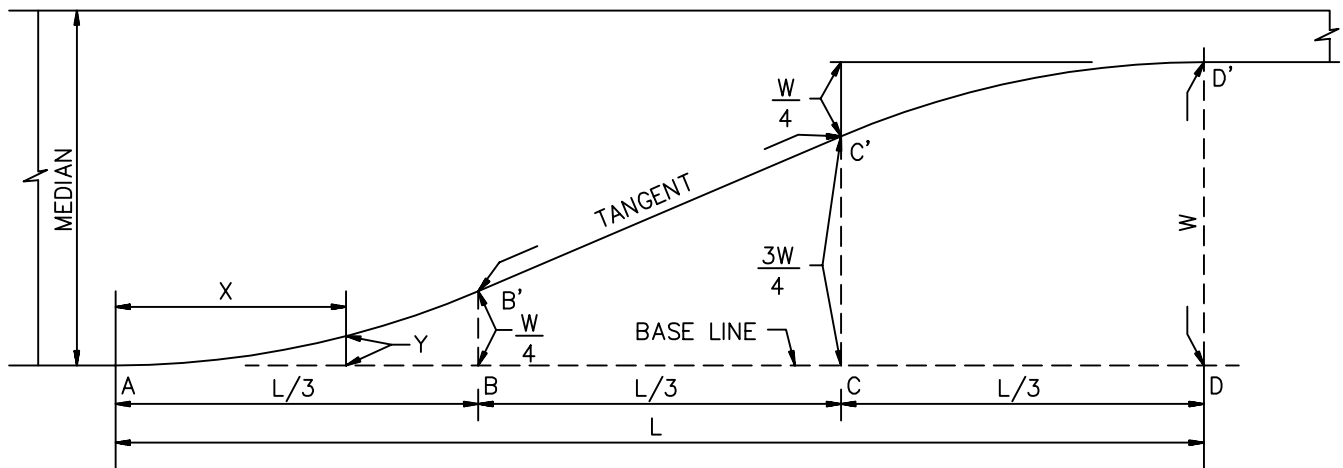
  
Khalid Bazmi, County Engineer

STD. PLAN

133-3-OC

SPPWC STANDARD PLAN - ASPHALT CONCRETE PAVEMENT REPLACEMENT

SHT. 2 OF 2



$$Y = 2.25W \left( \frac{X}{L} \right)^2$$

L=LENGTH OF TAPER  
W=MAXIMUM OFFSET DISTANCE  
X=DISTANCE ALONG BASE LINE  
Y=OFFSET FROM BASE LINE

L, ft (m)	DISTANCE X, L/12 INCREMENTS, ft (m)											
60' (18.00)	5' (1.50)	10' (3.00)	15' (4.50)	20' (6.00)	25' (7.50)	30' (9.00)	35' (10.50)	40' (12.00)	45' (13.50)	50' (15.00)	55' (16.50)	60' (18.00)
72' (21.60)	6' (1.80)	12' (3.60)	18' (5.40)	24' (7.20)	30' (9.00)	36' (10.80)	42' (12.60)	48' (14.40)	54' (16.20)	60' (18.00)	66' (19.80)	72' (21.60)
90' (27.00)	7.5' (2.25)	15' (4.50)	22.5' (6.75)	30' (9.00)	37.5' (11.25)	45' (13.50)	52.5' (15.75)	60' (18.00)	67.5' (20.25)	75' (22.50)	82.5' (24.75)	90' (27.00)
120' (36.00)	10' (3.00)	20' (6.00)	30' (9.00)	40' (12.00)	50' (15.00)	60' (18.00)	70' (21.00)	80' (24.00)	90' (27.00)	100' (30.00)	110' (33.00)	120' (36.00)
150' (45.00)	12.5' (3.75)	25' (7.50)	37.5' (11.25)	50' (15.00)	62.5' (18.75)	75' (22.50)	87.5' (26.25)	100' (30.00)	112.5' (33.75)	125' (37.50)	137.5' (41.25)	150' (45.00)
W, ft(mm)	OFFSET Y, ft (mm)											
10' (3000)	0.16' (47)	0.62' (188)	1.41' (422)	2.50' (750)	3.75' (1125)	5.00' (1500)	6.25' (1875)	7.50' (2250)	8.59' (2578)	9.38' (2812)	9.84' (2953)	10.00' (3000)
11' (3300)	0.17' (51)	0.69' (206)	1.55' (464)	2.75' (825)	4.13' (1238)	5.50' (1650)	6.88' (2063)	8.25' (2475)	9.45' (2836)	10.31' (3094)	10.83' (3249)	11.00' (3300)
12' (3600)	0.19' (56)	0.75' (225)	1.69' (506)	3.00' (900)	4.50' (1350)	6.00' (1800)	7.50' (2250)	9.00' (2700)	10.31' (3094)	11.25' (3375)	11.81' (3544)	12.00' (3600)
19' (5700)	0.30' (89)	1.19' (356)	2.67' (802)	4.75' (1425)	7.13' (2138)	9.50' (2850)	11.88' (3562)	14.25' (4275)	16.33' (4898)	17.81' (5344)	18.70' (5611)	19.00' (5700)
20' (6000)	0.31' (94)	1.25' (375)	2.81' (844)	5.00' (1500)	7.50' (2250)	10.00' (3000)	12.50' (3750)	15.00' (4500)	17.19' (5156)	18.75' (5625)	19.69' (5906)	20.00' (6000)
21' (6300)	0.33' (98)	1.31' (394)	2.95' (886)	5.25' (1575)	7.88' (2363)	10.50' (3150)	13.13' (3937)	15.75' (4725)	18.05' (5414)	19.69' (5906)	20.67' (6202)	21.00' (6300)
22' (6600)	0.34' (103)	1.38' (412)	3.09' (928)	5.50' (1650)	8.25' (2475)	11.00' (3300)	13.75' (4125)	16.50' (4950)	18.91' (5672)	20.62' (6188)	21.66' (6497)	22.00' (6600)

# NOTE:

TO DETERMINE OFFSET DISTANCE FOR ANY LENGTH OF TAPER USE THE FORMULA  $Y = 2.25W \left( \frac{X}{L} \right)^2$  FOR THE PORTIONS AB' AND C'D' WHICH ARE PARABOLIC CURVES. THE PORTION B'C' IS A TANGENT. WHEN THE BASE LINE IS CURVED, THE OFFSETS ARE APPLIED TO THE CURVED BASE LINE, AND B'C' IS NO LONGER A TANGENT.

## STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1992, 1996, 2009

## MEDIAN TAPER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

140-3

SHEET 1 OF 1

SEE OCPW STANDARD PLAN 140-3-OC FOR CONDITIONS

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #    OCPW #    NAME AND CONDITIONS

140-3    140-3-OC    MEDIAN TAPER

1. 90 FEET (27.00M) FOR SINGLE LEFT TURN POCKET AND 150 FEET (45.00M) FOR A DUAL LEFT TURN POCKET. FOR L=150 FEET, W=20 FEET

DISTANCE X (m)	10' (3.00)	20' (6.00)	30' (9.00)	40' (12.00)	50' (15.00)	60' (18.00)	70' (21.00)	80' (24.00)	90' (27.00)	100' (30.00)	110' (33.00)	120' (36.00)	130' (39.00)	140' (42.00)	150' (45.00)
OFFSET Y (mm)	0.20' (60)	0.80' (240)	1.80' (540)	3.20' (960)	5.00' (1500)	7.00' (2100)	9.00' (2700)	11.00' (3300)	13.00' (3900)	15.00' (4500)	16.80' (5040)	18.20' (5460)	19.20' (5760)	19.80' (5940)	20.00' (6000)

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

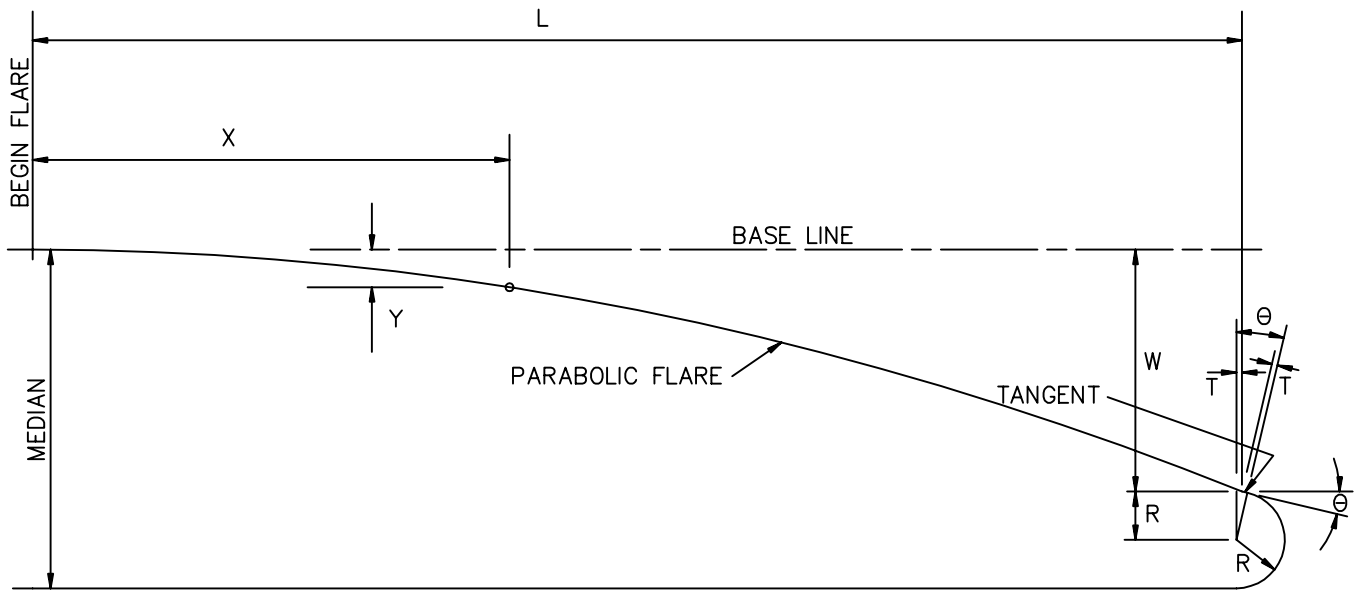
Revision: August 2018

STD. PLAN

140-3-OC

SPPWC STANDARD PLAN - MEDIAN TAPER

SHT. 1 OF 1



L = LENGTH OF FLARE  
 W = MAXIMUM OFFSET DISTANCE  
 X = DISTANCE ALONG BASE LINE  
 Y = OFFSET FROM BASE LINE  
 T = TANGENT LENGTH  
 R = RADIUS OF NOSE  
 Θ = MAXIMUM FLARE DEFLECTION ANGLE

$$Y = W \left( \frac{X}{L} \right)^2$$

$$\tan \theta = \frac{2W}{L}$$

$$T = R \tan \frac{\theta}{2}$$

IF STATION OF RADIUS POINT IS NOT  
 GIVEN ON PLAN, TANGENT DISTANCE  
 T MAY BE IGNORED

OFFSET Y, ft (mm)

L, ft (m)	W, ft (mm)	X, ft (m)													
		10' (3.0)	15' (4.5)	20' (6.0')	25' (7.5)	30' (9.0')	40' (12.0)	45' (13.5')	50' (15.0)	60' (18.0')	70' (21.0)	75' (22.5')	80' (24.0)	90' (27.0)	100' (30.0)
W/L = 1:5															
25' (7.5)	5' (1500)	0.80' (240)	1.80' (540)	3.20' (960)	5.00' (1500)										
50' (15.0)	10' (3000)	0.40' (120)	0.90' (270)	1.60' (480)	2.50' (750)	3.60' (1080)	6.40' (1920)	8.10' (2430)	10.00' (3000)						
W/L = 1:10															
50' (15.0)	5' (1500)	0.20' (60)	0.45' (135)	0.80' (240)	1.25' (375)	1.80' (540)	3.20' (960)	4.05' (1215)	5.00' (1500)						
100' (30.0)	10' (3000)	0.10' (30)	0.23' (68)	0.40' (120)	0.63' (188)	0.90' (270)	1.60' (480)	2.03' (608)	2.50' (750)	3.60' (1080)	4.90' (1470)	5.63' (1688)	6.40' (1920)	8.10' (2430)	10.00' (3000)
W/L = 1:15															
45' (13.5)	3' (900)	0.15' (44)	0.33' (100)	0.59' (178)	0.93' (278)	1.33' (400)	2.37' (711)	3.00' (900)							
75' (22.5)	5' (1500)	0.09' (27)	0.20' (60)	0.36' (107)	0.56' (167)	0.80' (240)	1.42' (427)	1.80' (540)	2.22' (667)	3.20' (960)	4.36' (1307)	5.00' (1500)			
90' (27.0)	6' (1800)	0.07' (22)	0.17' (50)	0.30' (89)	0.46' (139)	0.67' (200)	1.19' (356)	1.50' (450)	1.85' (555)	2.67' (800)	3.63' (1089)	4.17' (1250)	4.74' (1422)	6.00' (1800)	

## STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
 PUBLIC WORKS STANDARDS INC.  
 GREENBOOK COMMITTEE  
 1984  
 REV. 1996, 2009

# MEDIAN FLARE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

# 141-2

SHEET 1 OF 1

**SEE OCPW STANDARD PLAN 141-2-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #    OCPW #    NAME AND CONDITIONS

141-2    141-2-OC    MEDIAN FLARE

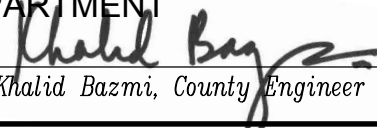
1. 60 FEET (18.00M) FLARE FOR A 14 FEET (4.20M) MEDIAN WIDTH, USE R=4 FEET (1.20M) 100 FEET (30.00M) FLARE FOR A 24 FEET (7.20M) MEDIAN WIDTH, USE R=7 FEET (2.10M) FOR W/L = 1:10

DISTANCE X (m)	10' (3.00)	15' (4.50)	20' (6.00)	25' (7.50)	30' (9.00)	40' (12.00)	45' (13.50)	50' (15.00)	60' (18.00)
OFFSET Y (mm)	0.17' (50)	0.38' (112)	0.67' (200)	1.04' (312)	1.50' (450)	2.67' (800)	3.38' (1012)	4.17' (1250)	6.00' (1800)

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

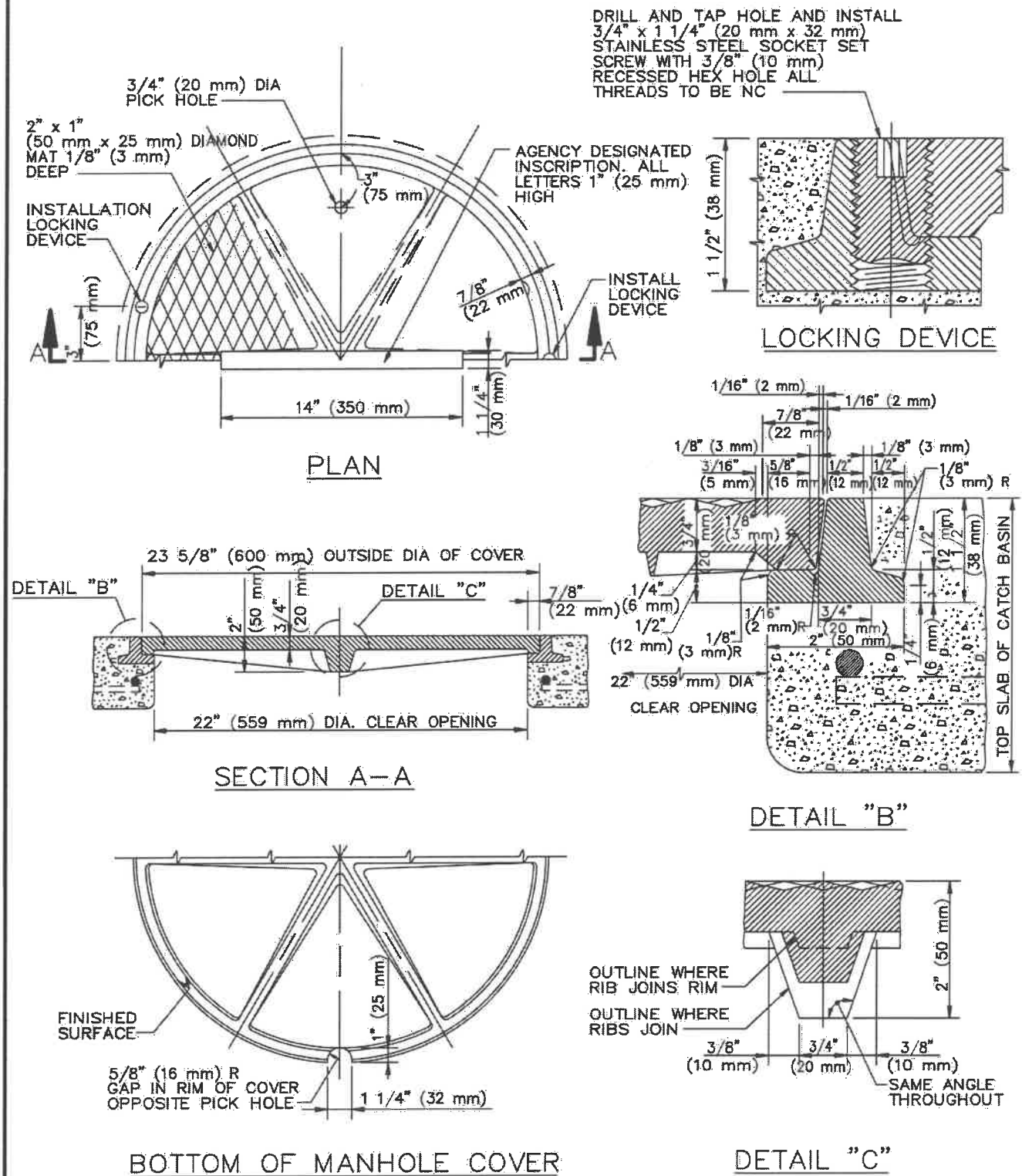
  
Khalid Bazmi, County Engineer

STD. PLAN

141-2-OC

SPPWC STANDARD PLAN - MEDIAN FLARE

SHT. 1 OF 1



# STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
 PUBLIC WORKS STANDARDS INC.  
 GREENBOOK COMMITTEE  
 1984  
 REV. 1993, 1996, 2009, 2011

## CATCH BASIN MANHOLE FRAME AND COVER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

312-4

SHEET 1 OF 2

SEE OCPW STANDARD PLAN 312-4-OC FOR CONDITIONS

#### NOTES

1. THE CAST IRON USED SHALL CONFORM TO ASTM A48M CLASS 35B.
2. THE FRAME AND COVER SHALL BE COATED WITH ASPHALTUM OR BITUMINOUS PAINT AFTER TESTING AND INSPECTION.
3. FOUNDRY IDENTIFYING MARK, HEAT AND DATE SHALL BE CAST ON THE BOTTOM OF THE COVER AND ON THE INSIDE OF THE FRAME.
4. IMPORTED COVERS AND FRAMES SHALL HAVE THE COUNTRY OF ORIGIN MARKING IN COMPLIANCE WITH FEDERAL REGULATIONS.
5. WEIGHT OF FRAME SHALL BE 30 POUNDS (15 kg). WEIGHT OF COVER SHALL BE 85 POUNDS (40 kg). ACTUAL WEIGHTS SHALL BE WITHIN A RANGE OF 95% TO 110%.
6. THE MANHOLE FRAME AND COVER SHALL BE INSPECTED BY THE ENGINEER PRIOR TO SHIPMENT TO THE WORK SITE. ACCEPTANCE WILL BE INDICATED BY THE AGENCY'S MARK.
7. AGENCY INSCRIPTION SHALL BE AS SPECIFIED ON THE PLANS OR SPECIAL PROVISIONS.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**CATCH BASIN MANHOLE FRAME AND COVER**

STANDARD PLAN

**312-4**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 312-4-OC FOR CONDITIONS**

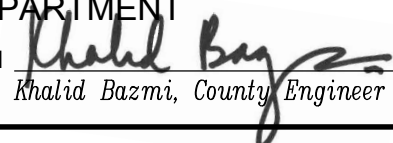
THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2012 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
312-4	312-4-OC	<u>CATCH BASIN MANHOLE FRAME AND COVER</u>  1. DELETE NOTE 2. 2. FRAME AND COVER SHALL BE GALVANIZED.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

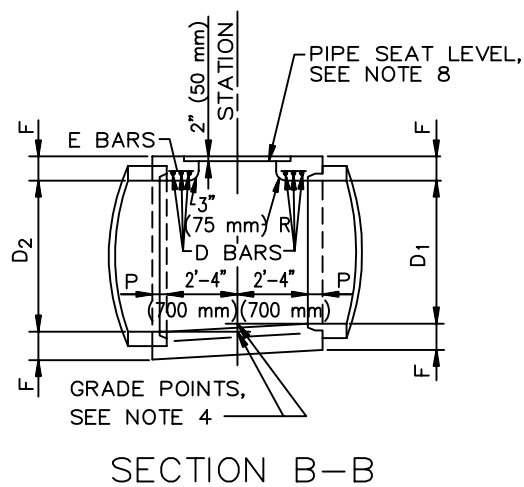
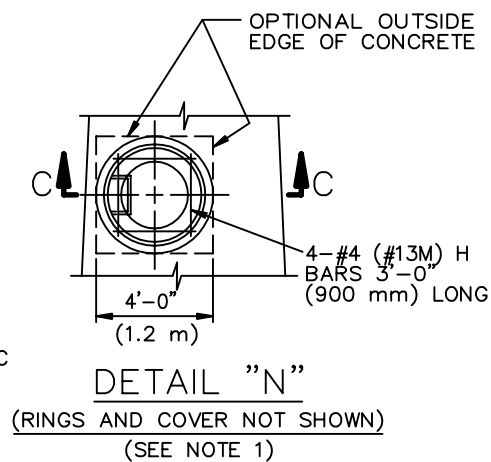
STD. PLAN

312-4-OC

SPPWC STANDARD PLAN - CATCH BASIN MANHOLE FRAME AND COVER

SHT. 1 OF 1





SHEET 1 OF 4

**SEE OCPW STANDARD PLAN 320-2-OC FOR CONDITIONS**

TABLE OF VALUES FOR F	
D <sub>2</sub>	F
36" (900 mm)	6 1/2" (165 mm)
39" (975 mm)	7" (180 mm)
42" (1050 mm)	7 1/2" (190 mm)
45" (1125 mm)	7 3/4" (195 mm)
48" (1200 mm)	8" (205 mm)
51" (1275 mm)	8 1/2" (215 mm)
54" (1350 mm)	9" (230 mm)
57" (1425 mm)	9 1/4" (235 mm)
60" (1500 mm)	9 1/2" (240 mm)
63" (1575 mm)	10" (255 mm)
66" (1650 mm)	10 1/4" (260 mm)
69" (1725 mm)	10 3/4" (275 mm)
72" (1800 mm)	11" (280 mm)
78" (1950 mm)	11 3/4" (300 mm)
84" (2100 mm)	12 1/2" (320 mm)
90" (2250 mm)	13 1/4" (335 mm)
96" (2400 mm)	14" (355 mm)
102" (2550 mm)	15 1/2" (395 mm)
108" (2700 mm)	16" (405 mm)
114" (2850 mm)	16 1/2" (420 mm)
120" (3000 mm)	17" (430 mm)
126" (3150 mm)	17" (430 mm)
132" (3300 mm)	17 1/2" (445 mm)
138" (3450 mm)	17 1/2" (445 mm)
144" (3600 mm)	18" (455 mm)

TABLE OF VALUES FOR M (SEE NOTE 1)				
SECTION	PAVED STREET		UNPAVED STREET	
	MAX	MIN	MAX	MIN
A-A		2'-10 1/2" (867 mm)		3'-6" (1060 mm)
C-C	11" (282 mm)	8 1/2" (217 mm)	16" (410 mm)	15" (380 mm)

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
<b>MANHOLE PIPE-TO-PIPE</b>	<b>320-2</b>
<b>MAIN LINE ID = 36" (900 mm) OR LARGER</b>	SHEET 2 OF 4

**SEE OCPW STANDARD PLAN 320-2-OC FOR CONDITIONS**

## NOTES

1. WHEN DEPTH M FROM STREET GRADE TO THE TOP OF THE BOX IS LESS THAN 2'-10 1/2" (867 mm) FOR PAVED STREETS OR 3'-6" (1060 mm) FOR UNPAVED STREETS, CONSTRUCT MONOLITHIC SHAFT PER SECTION C-C AND DETAIL "N". SHAFT FOR ANY DEPTH OF MANHOLE MAY BE CONSTRUCTED PER SECTION C-C. WHEN DIAMETER D<sub>1</sub> IS 48" (1200 mm) OR LESS, CENTER OF SHAFT MAY BE LOCATED PER NOTE 2.
2. CENTER OF MANHOLE SHAFT SHALL BE LOCATED OVER CENTER LINE OF STORM DRAIN WHEN DIAMETER D<sub>1</sub> IS 48" (1200 mm) OR LESS, IN WHICH CASE PLACE E BARS SYMMETRICALLY AROUND SHAFT AT 45° WITH CENTERLINE AND OMIT J BARS.
3. L AND P SHALL HAVE THE FOLLOWING VALUES UNLESS OTHERWISE SHOWN ON THE PROJECT DRAWINGS:
  - A. D<sub>2</sub>=96" (2400 mm) OR LESS, L=5'-6" (1.7 m), P=5" (130 mm)
  - B. D<sub>2</sub> OVER 96" (2400 mm), L=6'-0" (1.8 m), P=8" (210 mm)L MAY BE INCREASED OR LOCATION OF MANHOLE SHIFTED TO MEET PIPE ENDS. WHEN L GREATER THAN THAT SHOWN ABOVE IS SPECIFIED, D BARS SHALL BE CONTINUED 6" (150 mm) OC.
4. STATIONS OF MANHOLES SHOWN ON PLANS APPLY AT CENTERLINE OF SHAFT. ELEVATIONS ARE SHOWN AT CENTERLINE OF SHAFT AND REFER TO THE PROLONGED INVERT GRADE LINES.
5. REINFORCEMENT SHALL CONFORM TO ASTM A 615M, GRADE 300 (ASTM A 615, GRADE 40), AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACES UNLESS OTHERWISE SHOWN.
6. FLOOR OF MANHOLE SHALL BE STEEL TROWELED TO SPRING LINE.
7. BODY OF MANHOLE SHALL BE POURED IN ONE CONTINUOUS OPERATION EXCEPT THAT A CONSTRUCTION JOINT WITH A LONGITUDINAL KEYWAY MAY BE PLACED AT SPRING LINE.
8. THICKNESS OF THE DECK SHALL VARY WHEN NECESSARY TO PROVIDE A LEVEL SEAT BUT SHALL NOT BE LESS THAN THE TABULAR VALUES FOR F SHOWN ON SHEET 2.
9. D BARS SHALL BE #4 (#13M) FOR D<sub>2</sub>≤39" (975 mm) OR LESS, #5 (#16M) FOR D<sub>2</sub> = 42" (1050 mm) TO 84" (2100 mm) INCLUSIVE AND #6 (#19M) FOR D<sub>2</sub> = 90" (2250 mm) OR OVER.
10. CENTERLINE OF INLET PIPE SHALL INTERSECT INSIDE FACE OF CONE AT SPRING LINE UNLESS OTHERWISE SHOWN.
11. STEPS SHALL CONFORM TO SPPWC 635 OR 636. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14" (350 mm) TO 15" (375 mm) OC. THE LOWEST STEP SHALL NOT BE MORE THAN 24" (600 mm) ABOVE THE INVERT.
12. THE FOLLOWING CRITERIA SHALL BE USED FOR THIS MANHOLE:
  - A. MAIN LINE = 36" (900 mm) INSIDE DIAMETER OR LARGER. EXCEPT IF THE MAIN LINE RCP DOWNSTREAM OF MANHOLE IS 36" (900 mm) TO 42" (1050 mm) INSIDE DIAMETER AND THE MAIN LINE RCP UPSTREAM IS 33" (825 mm) OR LESS SPPWC 321 SHALL BE USED.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**MANHOLE PIPE-TO-PIPE**  
**MAIN LINE ID = 36" (900 mm) OR LARGER**

STANDARD PLAN

**320-2**

SHEET 3 OF 4

**SEE OCPW STANDARD PLAN 320-2-OC FOR CONDITIONS**

- B. THE OUTSIDE DIAMETER OF THE LATERAL MUST BE LESS THAN OR EQUAL TO 1/2 THE INSIDE DIAMETER OF THE MAIN LINE. IF THE UPSTREAM AND DOWNSTREAM DIAMETERS OF THE MANHOLE ARE NOT THE SAME, THE GOVERNING INSIDE DIAMETER OF THE MAIN LINE SHALL BE CONSIDERED TO BE THAT WHERE THE EXTENDED CENTERLINE OF THE LATERAL ENTERS THE MANHOLE.
- C. IN NO INSTANCE SHALL THE INSIDE DIAMETER OF THE LATERAL TO THE MANHOLE BE GREATER THAN 30" (750 mm).
13. MANHOLE FRAME AND COVER SHALL CONFORM TO SPPWC 630 UNLESS OTHERWISE SHOWN.
14. MANHOLE SHAFT SHALL CONFORM TO SPPWC 324 UNLESS OTHERWISE SHOWN.
15. WHERE A MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER IS SPECIFIED REFER TO SPPWC 326.
16. WHERE A PRESSURE MANHOLE SHAFT – WITH ECCENTRIC REDUCER IS SPECIFIED REFER TO SPPWC 328.
17. WHERE A PRESSURE MANHOLE SHAFT – 914 mm (36") WITHOUT REDUCER IS SPECIFIED REFER TO SPPWC 329.
18. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:
- 324 MANHOLE SHAFT – WITH ECCENTRIC REDUCER
  - 326 MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
  - 328 PRESSURE MANHOLE SHAFT – WITH ECCENTRIC
  - 329 PRESSURE MANHOLE SHAFT 36" (914 mm) WITHOUT REDUCER
  - 630 24" (610 mm) MANHOLE FRAME AND COVER
  - 633 36" (914 mm) MANHOLE FRAME AND COVER
  - 635 STEEL STEP
  - 636 POLYPROPYLENE PLASTIC STEP

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
320-2	320-2-OC	MANHOLE PIPE-TO-PIPE MAIN LINE ID=36" (900MM) OR LARGER

1. REVISE THE NAME OF SPPWC STD. PLAN 320-2 TO "JUNCTION STRUCTURE - TYPE II".
2. REVISE NOTES AS FOLLOWS:
  - 3B. D<sub>2</sub> OVER 96 INCHES (2400 mm), L=6 FEET (1.8 m), P=8 INCHES 2 (210 mm), L MAY BE INCREASED A MAXIMUM OF 1 FOOT AT EACH END TO MEET PIPE ENDS; CONTINUE D BARS AT 3 INCHES ON-CENTER. WHEN L IS GREATER THAN THAT SHOWN ABOVE IS SPECIFIED, D BARS SHALL BE CONTINUED 6 INCHES (150 mm) ON-CENTER.
  - II. STEPS SHALL CONFORM TO STD. PLAN 1507 OR SPPWC STD. PLAN 635. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14 INCHES (350 mm) TO 15 INCHES (375 mm) ON-CENTER. THE LOWEST STEP SHALL NOT BE MORE THAN 24 INCHES (600 mm) ABOVE THE INVERT.
14. MANHOLE SHAFT SHALL CONFORM TO STD. PLAN 1503 UNLESS OTHERWISE SHOWN.
3. DELETE NOTES 16, 17 & 18.
4. ADD NOTES:
  19. RINGS, REDUCER AND PIPE FOR ACCESS SHAFT SHALL BE SEATED IN 1:2 MORTAR AND NEATLY POINTED OR WIPED INSIDE THE SHAFT. GROUT BETWEEN THE SHAFT AND THE PIPE OR RING SEAT.
  20. THE ANGLE BETWEEN THE LATERAL AND THE MAIN LINE SHALL NOT BE GREATER THAN 45 DEGREES WHEN THE FLOW IN THE LATERAL EXCEEDS 10 PERCENT OF THE FLOW IN THE MAIN LINE.
  21. CONSTRUCT DEEP MANHOLE LANDING(S) PER STD. PLAN 1508 AND INCREASE JUNCTION STRUCTURE BOTTOM WIDTH TO 4 FEET MINIMUM WHEN THE COMBINED DEPTH OF THE PIPE DIAMETER AND MANHOLE SHAFT (M) IS 20 FEET OR GREATER AND THE MANHOLE SHAFT IS GREATER THAN 12 FEET OR, AS DIRECTED BY THE ENGINEER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

STD. PLAN

320-2-OC

SPPWC STANDARD PLAN - MANHOLE PIPE-TO-PIPE  
MAIN LINE ID = 36" (900 mm) OR LARGER  
(JUNCTION STRUCTURE - TYPE II)

SHT. 1 OF 2

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #    OCPW #    NAME AND CONDITIONS

320-2

320-2-OC

MANHOLE PIPE-TO-PIPE  
MAIN LINE ID=36" (900mm) OR LARGER

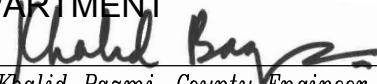
5. INCREASE DIMENSION "F" AT EDGES TO A MINIMUM OF 6 INCHES+(PIPE WALL THICKNESS) FOR EMBEDMENT DIMENSION "P"+6 INCHES.
6. REVISE A PORTION OF "TABLE OF VALUES FOR F" AS SHOWN:

TABLE OF VALUES FOR F	
D <sub>2</sub>	F
36" (900 mm)	8" (205 mm)
39" (975 mm)	8" (205 mm)
42" (1050 mm)	8" (205 mm)
45" (1125 mm)	8" (205 mm)

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

STD. PLAN

320-2-OC

SPPWC STANDARD PLAN - MANHOLE PIPE-TO-PIPE  
MAIN LINE ID = 36" (900 mm) OR LARGER  
(JUNCTION STRUCTURE - TYPE II)

SHT. 2 OF 2



## NOTES

1. WHEN DEPTH M FROM STREET GRADE TO THE TOP OF THE BOX IS LESS THAN 2'-10 1/2" (867 mm) FOR PAVED STREETS OR 3'-6" (1060 mm) FOR UNPAVED STREETS, CONSTRUCT SHAFT PER SECTION C-C AND DETAIL "N". DEPTH M MAY BE REDUCED TO AN ABSOLUTE LIMIT OF 6" (150 mm) WHEN LARGER VALUES OF M WOULD REDUCE H IN SECTION C-C TO 3'-6" (1060 mm) OR LESS.
2. H (IN SECTION A-A AND B-B) SHALL NOT BE LESS THAN 4'-0" (1.2 m), BUT MAY BE INCREASED PROVIDED THAT THE VALUE OF M SHALL NOT BE LESS THAN THE MINIMUM SPECIFIED AND THAT THE REDUCER SHALL BE USED. FOR H (IN SECTION C-C) SEE NOTE 1.
3. L SHALL BE 4'-0" (1.2 m) UNLESS OTHERWISE SHOWN. L MAY BE INCREASED OR LOCATION OF MANHOLE SHIFTED TO MEET PIPE ENDS, BUT ANY CHANGE IN LOCATION OF THE SPUR MUST BE APPROVED BY THE ENGINEER.
4. T SHALL BE 8" (200 mm) FOR VALUES OF H UP TO AND INCLUDING 8'-0" (2.4 m) AND 10" (250 mm) FOR VALUES OF H OVER 8'-0" (2.4 m).
5. STATIONS OF MANHOLES SHOWN ON PLANS APPLY AT CENTERLINE OF SHAFT. ELEVATIONS ARE SHOWN AT CENTERLINE OF SHAFT AND REFER TO THE PROLONGED INVERT GRADE LINES. SEE NOTE 3.
6. REINFORCEMENT SHALL CONFORM TO ASTM A 615, GRADE 40 (ASTM A 615M, GRADE 300), AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACES UNLESS OTHERWISE SHOWN.
7. FLOOR OF MANHOLE SHALL BE STEEL TROWELED TO SPRING LINE.
8. BODY OF MANHOLE SHALL BE POURED IN ONE CONTINUOUS OPERATION EXCEPT THAT A CONSTRUCTION JOINT WITH A LONGITUDINAL KEYWAY MAY BE PLACED AT SPRING LINE.
9. THICKNESS OF THE DECK SHALL VARY WHEN NECESSARY TO PROVIDE A LEVEL SEAT BUT SHALL NOT BE LESS THAN 8" (200 mm).
10. STEPS SHALL CONFORM TO SPPWC 635 OR 636. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14" (350 mm) TO 15" (375 mm) OC. THE LOWEST STEP SHALL NOT BE MORE THAN 24" (600 mm) ABOVE THE LEDGE AT THE SIDE OF THE MANHOLE.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**MANHOLE PIPE-TO-PIPE (ONE OR BOTH  
MAIN LINE IDS 33" (825 mm) OR SMALLER)**

**321-2**

SHEET 2 OF 3

SEE OCPW STANDARD PLAN 321-2-OC FOR CONDITIONS

11. THE FOLLOWING CRITERIA SHALL BE USED FOR THIS MANHOLE:

- A. MAIN LINE = 33" (825 mm) INSIDE DIAMETER OR LESS. (EXCEPTION – IF THE MAIN LINE RCP DOWNSTREAM OF THE MANHOLE IS 36" (900 mm) TO 42" (1050 mm) INSIDE DIAMETER AND THE MAIN LINE RCP UPSTREAM IS 33" (825 mm) OR LESS.) SPPWC 320 OR 322 IS NOT APPLICABLE WHERE THE MAIN LINE CONDUIT IS LESS THAN 36" (900 mm) IN DIAMETER.
- B. SEE SECTION A – A. THE MAXIMUM SIZE LATERAL THAT MAY BE CONNECTED TO THIS MANHOLE IS SUCH THAT THE DISTANCE FROM THE OUTSIDE (TOP) OF THE LATERAL TO THE BOTTOM OF THE 8" (200 mm) THICK TOP OF THE MANHOLE CHAMBER, MEASURED VERTICALLY FROM THE END OF THE RCP, SHALL BE A MINIMUM OF 6" (150 mm).
- C. IF THE SIZE OF THE LATERAL IS SUCH THAT THE ABOVE–SPECIFIED MINIMUM DISTANCES CANNOT BE MAINTAINED, THEN ONE OF THE FOLLOWING ALTERNATE SOLUTIONS MUST BE USED.
  - 1. PROVIDE A SPECIAL STRUCTURE.
  - 2. PROVIDE TWO STANDARD STRUCTURES, CONSISTING OF THIS MANHOLE PLACED UPSTREAM OR DOWNSTREAM FROM THE APPLICABLE JUNCTION STRUCTURE OR TRANSITION STRUCTURE.

12. MANHOLE FRAME AND COVER SHALL CONFORM TO SPPWC 630 UNLESS OTHERWISE SHOWN.

13. MANHOLE SHAFT SHALL CONFORM TO SPPWC 324 UNLESS OTHERWISE SHOWN.

14. WHERE A MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER IS SPECIFIED REFER TO SPPWC 336.

15. WHERE A PRESSURE MANHOLE SHAFT – WITH ECCENTRIC REDUCER IS SPECIFIED REFER TO SPPWC 328.

16. WHERE A PRESSURE MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER IS SPECIFIED REFER TO SPPWC 329.

17. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

- 324 MANHOLE SHAFT – WITH ECCENTRIC REDUCER
- 326 MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
- 328 PRESSURE MANHOLE SHAFT – WITH ECCENTRIC
- 329 PRESSURE MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
- 630 24" (610 mm) MANHOLE FRAME AND COVER
- 633 36" (900 mm) MANHOLE FRAME AND COVER
- 635 STEEL STEP
- 636 POLYPROPYLENE PLASTIC STEP

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**MANHOLE PIPE-TO-PIPE (ONE OR BOTH  
MAIN LINE IDS 33" (825 mm) OR SMALLER)**

STANDARD PLAN

**321-2**

SHEET 3 OF 3

SEE OCPW STANDARD PLAN 321-2-OC FOR CONDITIONS

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #    OCPW #    NAME AND CONDITIONS

321-2                      321-2-OC                      MANHOLE PIPE-TO-PIPE  
(ONE OR BOTH MAIN LINE IDS 33" (825 mm) OR LARGER)

1. REVISE THE NAME OF SPPWC STD. PLAN 321-2 TO 1.  
"JUNCTION STRUCTURE-TYPE I".
2. SECTION A-A, B-B, & C-C:
  - REVISE THE TOP THICKNESS OF THE BASE FROM 8 INCHES TO 10 INCHES.
  - REVISE THE PIPE EMBEDMENT INTO THE BASE FROM 4 INCHES TO 5 INCHES.
  - A 4 INCHES X 4 INCHES MORTAR FILLET SHALL BE PLACED BETWEEN THE BASE AND THE RINGS IF THE STRUCTURE IS NOT LOCATED IN A PAVED STREET. (SECTION C-C)
3. MANHOLE SHAFT SHALL CONFORM TO STD. PLAN 1503.
4. CONCRETE RINGS SHALL CONFORM TO STD. PLAN 1502.
5. REPLACE NOTE 3 WITH THE FOLLOWING:  
"LENGTH L SHALL BE 4 FEET FOR LATERALS OF 20 INCHES OR LESS AND 5 FEET FOR LATERALS GREATER THAN 20 INCHES, UNLESS OTHERWISE SHOWN ON THE IMPROVEMENT PLAN. LENGTH L MAY BE INCREASED A MAXIMUM OF ONE FOOT AT EACH END TO MEET PIPE ENDS. CONTINUE #4 REBARS AT 4 INCHES ON-CENTER."
6. REPLACE NOTE 10 WITH THE FOLLOWING:  
"STEPS SHALL CONFORM TO SPPWC STD. PLAN 635 OR STD. PLAN 1507. UNLESS OTHERWISE, SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14 INCHES (350 MM) TO 15 INCHES (375 MM) ON-CENTER. THE LOWEST STEP SHALL NOT BE MORE THAN 24 INCHES (600 MM) ABOVE THE LEDGE AT THE SIDE OF THE MANHOLE."
7. DELETE NOTES 10 AND 13-17.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Adopted:  
Revision: August 2018

Approved   
Khalid Bazmi, County Engineer

STD. PLAN

321-2-OC

SPPWC STANDARD PLAN - MANHOLE PIPE-TO-PIPE (ONE OR BOTH  
MAIN LINE IDS 33" (825 mm) OR SMALLER)  
(JUNCTION STRUCTURE - TYPE I)

SHT. 1 OF 2

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
321-2	321-2-OC	MANHOLE PIPE-TO-PIPE (ONE OR BOTH MAIN LINE IDS 33" (825 MM) OR LARGER)

8. ADD NOTES:

18. RINGS, REDUCER AND PIPE FOR ACCESS SHAFT SHALL BE SEATED IN 1:2 MORTAR AND NEATLY POINTED OR WIPED INSIDE THE SHAFT. GROUT BETWEEN THE SHAFT AND THE PIPE OR RING SEAT.
19. LEDGE SHALL BE SLOPED AT 2 INCHES PER FOOT.
20. THE ANGLE BETWEEN THE LATERAL AND THE MAIN LINE SHALL NOT BE GREATER THAN 45 PERCENT WHEN THE FLOW IN THE LATERAL EXCEEDS 10 PERCENT OF THE FLOW IN THE MAIN LINE.
21. CONSTRUCT DEEP MANHOLE LANDING(S) PER STD. PLAN 1508 AND INCREASE JUNCTION STRUCTURE BOTTOM WIDTH TO 4 FEET MINIMUM WHEN THE COMBINED DEPTH OF THE PIPE DIAMETER AND MANHOLE SHAFT (M) IS 20 FEET OR GREATER AND THE MANHOLE SHAFT IS GREATER THAN 12 FEET OR, AS DIRECTED BY THE ENGINEER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

321-2-OC

SPPWC STANDARD PLAN - MANHOLE PIPE-TO-PIPE (ONE OR BOTH  
MAIN LINE IDS 33" (825 mm) OR SMALLER)  
(JUNCTION STRUCTURE - TYPE I)

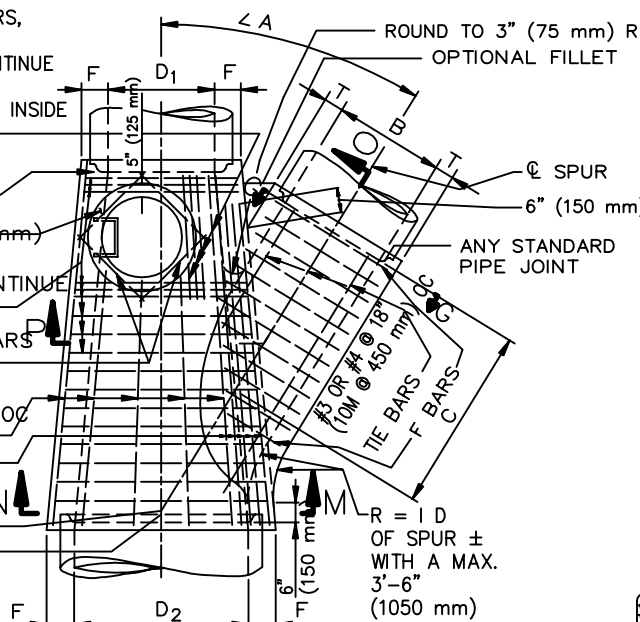
SHT. 2 OF 2



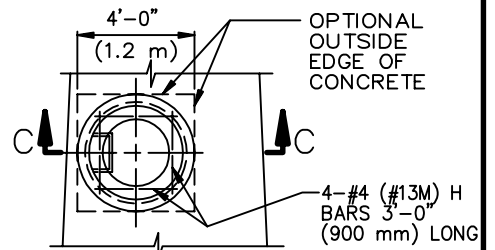
3-#4 (#13M) J BARS,  
4'-8" (1.4 m) LONG,  
3" (75 mm) OC CONTINUE  
ADDITIONAL BARS  
6" (150 mm) OC TO INSIDE  
EDGE OF MANHOLE

STATION  
5"x2" PIPE SEAT  
(125 mm x 50 mm)  
3-D BARS, 3"  
(75 mm) OC CONTINUE  
6" (150 mm) OC  
4-#6 (#19M) E BARS  
SEE NOTE 3  
#3 OR #4 @ 18"  
(10M @ 450 mm) OC  
TIE BARS  
A & B BARS

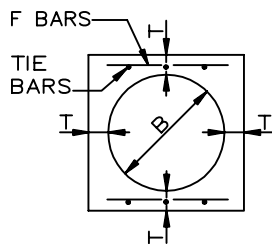
STATION POINT  
STATION



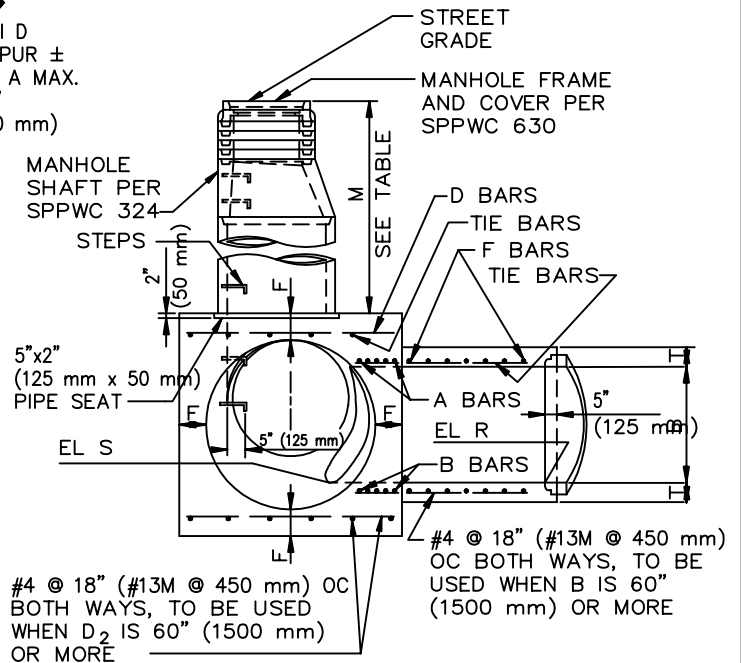
PLAN  
(SHAFT NOT SHOWN)



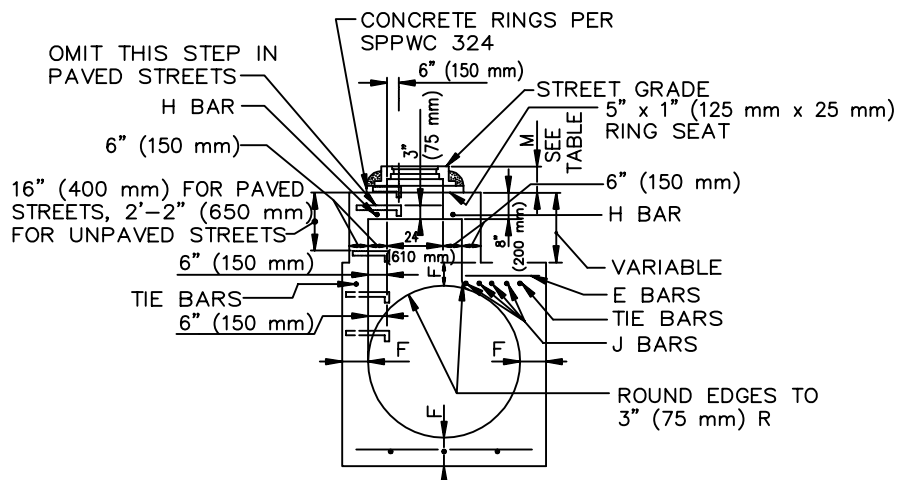
DETAIL "N"  
(RINGS AND COVER NOT SHOWN)  
SEE NOTE 2



SECTION G-G



SECTION N-M-P-O



SECTION C-C

# STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1992  
REV. 1996, 2009

## MANHOLE PIPE-TO-PIPE (LARGE SIDE INLET)

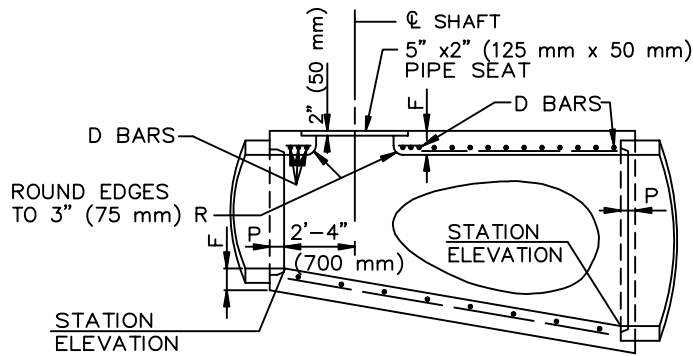
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

322-2

SHEET 1 OF 4

SEE OCPW STANDARD PLAN 322-2-OC FOR CONDITIONS



LONGITUDINAL SECTION

TABLE OF BARS SIZES		
D <sub>2</sub> OR B	A & B	D OR F
12\" (300 mm)–39\" (975 mm)	#5 @ 3\" (#16M @ 75 mm)	#4 @ 6\" (#13M @ 150 mm)
42\" (1050 mm)–84\" (2100 mm)	#6 @ 3\" (#19M @ 75 mm)	#5 @ 6\" (#16M @ 150 mm)
90\" (2250 mm)–144\" (3600 mm)	#7 @ 3\" (#22M @ 75 mm)	#6 @ 6\" (#19M @ 150 mm)

TABLE OF VALUES FOR M (SEE NOTE 2)				
SECTION	PAVED STREET		UNPAVED STREET	
	MAX	MIN	MAX	MIN
N-M-P-O		2'-10 1/2" (867 mm)		3'-6" (1060 mm)
C-C	11" (282 mm)	8 1/2" (217 mm)	16" (410 mm)	15" (380 mm)

TABLE OF VALUES FOR F	
D <sub>2</sub>	F
36\" (900 mm)	6 1/2\" (165 mm)
39\" (975 mm)	7\" (180 mm)
42\" (1050 mm)	7 1/2\" (190 mm)
45\" (1125 mm)	7 3/4\" (195 mm)
48\" (1200 mm)	8\" (205 mm)
51\" (1275 mm)	8 1/2\" (215 mm)
54\" (1350 mm)	9\" (230 mm)
57\" (1425 mm)	9 1/4\" (235 mm)
60\" (1500 mm)	9 1/2\" (240 mm)
63\" (1575 mm)	10\" (255 mm)
66\" (1650 mm)	10 1/4\" (260 mm)
69\" (1725 mm)	10 3/4\" (275 mm)
72\" (1800 mm)	11\" (280 mm)
78\" (1950 mm)	11 3/4\" (300 mm)
84\" (2100 mm)	12 1/2\" (320 mm)
90\" (2250 mm)	13 1/4\" (335 mm)
96\" (2400 mm)	14\" (355 mm)
102\" (2550 mm)	15 1/2\" (395 mm)
108\" (2700 mm)	16\" (405 mm)
114\" (2850 mm)	16 1/2\" (420 mm)
120\" (3000 mm)	17\" (430 mm)
126\" (3150 mm)	17\" (430 mm)
132\" (3300 mm)	17 1/2\" (445 mm)
138\" (3450 mm)	17 1/2\" (445 mm)
144\" (3600 mm)	18\" (455 mm)

TABLE OF VALUES FOR T	
B	T
12\" (300 mm)	4\" (100 mm)
15\" (375 mm)	4 1/4\" (110 mm)
18\" (450 mm)	4 1/2\" (115 mm)
21\" (525 mm)	5\" (125 mm)
24\" (600 mm)	5 1/4\" (135 mm)
27\" (675 mm)	5 1/2\" (140 mm)
30\" (750 mm)	6\" (150 mm)
33\" (825 mm)	6 1/4\" (160 mm)
36\" (900 mm)	6 1/2\" (165 mm)
39\" (975 mm)	7\" (180 mm)
42\" (1050 mm)	7 1/2\" (190 mm)
45\" (1125 mm)	7 3/4\" (195 mm)
48\" (1200 mm)	8\" (205 mm)
51\" (1275 mm)	8 1/2\" (215 mm)
54\" (1350 mm)	9\" (230 mm)
57\" (1425 mm)	9 1/4\" (235 mm)
60\" (1500 mm)	9 1/2\" (240 mm)
63\" (1575 mm)	10\" (255 mm)
66\" (1650 mm)	10 1/4\" (260 mm)
69\" (1725 mm)	10 3/4\" (275 mm)
72\" (1800 mm)	11\" (280 mm)
78\" (1950 mm)	11 3/4\" (300 mm)
84\" (2100 mm)	12 1/2\" (320 mm)
90\" (2250 mm)	13 1/4\" (335 mm)
96\" (2400 mm)	14\" (355 mm)
102\" (2550 mm)	15 1/2\" (395 mm)
108\" (2700 mm)	16\" (405 mm)
114\" (2850 mm)	16 1/2\" (420 mm)
120\" (3000 mm)	17\" (430 mm)
126\" (3150 mm)	17\" (430 mm)
132\" (3300 mm)	17 1/2\" (445 mm)
138\" (3450 mm)	17 1/2\" (445 mm)
144\" (3600 mm)	18\" (455 mm)

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**MANHOLE PIPE–TO–PIPE  
(LARGE SIDE INLET)**

STANDARD PLAN

**322–2**

SHEET 2 OF 4

**SEE OCPW STANDARD PLAN 322-2-OC FOR CONDITIONS**

## NOTES

1. VALUES FOR A, B, C,  $D_1$ ,  $D_2$ , ELEVATION R AND ELEVATION S ARE SHOWN ON THE PLANS. ELEVATION S APPLIES AT INSIDE WALL OF STRUCTURE.
2. WHEN DEPTH M FROM STREET GRADE TO THE TOP OF THE BOX IS LESS THAN 2'-10 1/2" (867 mm) FOR PAVED STREETS OR 3'-6" (1060 mm) FOR UNPAVED STREETS, CONSTRUCT MONOLITHIC SHAFT PER SECTION C-C AND DETAIL "N". SHAFT FOR ANY DEPTH OF MANHOLE MAY BE CONSTRUCTED PER SECTION C-C. WHEN DIAMETER  $D_1$  IS 48" (1200 mm) OR LESS, CENTER OF SHAFT MAY BE LOCATED PER NOTE 3.
3. CENTER OF MANHOLE SHAFT SHALL BE LOCATED OVER CENTERLINE OF STORM DRAIN WHEN DIAMETER  $D_1$  IS 48" (1200 mm) OR LESS, IN WHICH CASE PLACE E BARS SYMMETRICALLY AROUND SHAFT AT 45° WITH CENTERLINE.
4. LENGTH OF MANHOLE MAY BE INCREASED AT OPTION TO MEET PIPE ENDS, BUT ANY CHANGE IN LOCATION OF SPUR MUST BE APPROVED BY THE ENGINEER.
5. P SHALL BE 5" (125 mm) FOR  $D_2=96"$  (2400 mm) OR LESS AND 8" (200 mm) FOR  $D_2$  OVER 96" (2400 mm).
6. REINFORCEMENT SHALL CONFORM TO ASTM A 615, GRADE 40 (ASTM A 615M, GRADE 300), AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACES UNLESS OTHERWISE SHOWN.
7. FLOOR OF MANHOLE SHALL BE STEEL TROWELED TO SPRING LINE.
8. BODY OF MANHOLE SHALL BE POURED IN ONE CONTINUOUS OPERATION EXCEPT THAT A CONSTRUCTION JOINT WITH A LONGITUDINAL KEYWAY MAY BE PLACED AT SPRING LINE.
9. THICKNESS OF THE DECK SHALL VARY WHEN NECESSARY TO PROVIDE A LEVEL SEAT BUT SHALL NOT BE LESS THAN THE TABULAR VALUES OF F SHOWN ON TABLE, SHEET 1.
10. IF LATERALS ENTER ON BOTH SIDES OF MANHOLE, SHAFT SHALL BE LOCATED ON SIDE RECEIVING THE SMALLER LATERAL.
11. STEPS SHALL CONFORM TO SPPWC 635 OR 636. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14" (350 mm) TO 15" (375 mm) OC. THE LOWEST STEP SHALL NOT BE MORE THAN 24" (600 mm) ABOVE THE INVERT.
12. THE FOLLOWING CRITERIA SHALL BE USED FOR THIS MANHOLE:
  - A. THIS STANDARD PLAN IS USED WHEN SPPWC 320 IS INADEQUATE.  
MAIN LINE = 36" (900 mm) INSIDE DIAMETER OR LARGER.
  - B. LATERAL = 12" (300 mm) TO 144" (3600 mm) INSIDE DIAMETER; HOWEVER, THE INSIDE DIAMETER SHALL NOT EXCEED THE INSIDE DIAMETER OF THE MAIN LINE.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

# MANHOLE PIPE-TO-PIPE (LARGE SIDE INLET)

STANDARD PLAN

**322-2**

SHEET 3 OF 4

**SEE OCPW STANDARD PLAN 322-2-OC FOR CONDITIONS**

13. MANHOLE FRAME AND COVER SHALL CONFORM TO SPPWC 630 UNLESS OTHERWISE SHOWN.
14. MANHOLE SHAFT SHALL CONFORM TO SPPWC 324 UNLESS OTHERWISE SHOWN.
15. WHERE A MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER IS SPECIFIED REFER TO SPPWC 326.
16. WHERE A PRESSURE MANHOLE SHAFT – WITH ECCENTRIC REDUCER IS SPECIFIED REFER TO SPPWC 328.
17. WHERE A PRESSURE MANHOLE SHAFT – 36" (914 mm) WITHOUT REDUCER IS SPECIFIED REFER TO SPPWC 329.
18. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:
  - 324 MANHOLE SHAFT – WITH ECCENTRIC REDUCER
  - 326 MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
  - 328 PRESSURE MANHOLE SHAFT – WITH ECCENTRIC REDUCER
  - 329 PRESSURE MANHOLE SHAFT – 36" (914 mm) WITHOUT REDUCER
  - 630 24" (610 mm) MANHOLE FRAME AND COVER
  - 633 36" (914 mm) MANHOLE FRAME AND COVER
  - 635 STEEL STEP
  - 636 POLYPROPYLENE PLASTIC STEP

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**MANHOLE PIPE-TO-PIPE  
(LARGE SIDE INLET)**

STANDARD PLAN

**322-2**

SHEET 4 OF 4

**SEE OCPW STANDARD PLAN 322-2-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
322-2	322-2-OC	<u>MANHOLE PIPE-TO-PIPE (LARGER SIDE INLET)</u>

1. REVISE THE NAME OF STANDARD PLAN 320-2 TO  
"JUNCTION STRUCTURE - TYPE III".
2. REVISE NOTES AS FOLLOWS:
  - 3B. D<sub>2</sub> OVER 96 INCHES (2400 mm), L=6 FEET-0 INCH (1.8 m), P=8 INCHES (210 mm), L MAY BE INCREASED A MAXIMUM OF 1 FOOT AT EACH END TO MEET PIPE ENDS; CONTINUE D BARS AT 3 INCHES ON-CENTER. WHEN L GREATER IS THAN THAT SHOWN ABOVE IS SPECIFIED, D BARS SHALL BE CONTINUED 6 INCHES (150 mm) ON-CENTER.
  11. STEPS SHALL CONFORM TO STD. PLAN 1507 OR SPPWC STD. PLAN 635. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14 INCHES (350 mm) TO 15 INCHES (375 mm) ON-CENTER. THE LOWEST STEP SHALL NOT BE MORE THAN 24 INCHES (600 mm) ABOVE THE INVERT.
  14. MANHOLE SHAFT SHALL CONFORM TO STD. PLAN 1503 UNLESS OTHERWISE SHOWN.
3. DELETE NOTES 16, 17 & 18.
4. ADD NOTES:
  19. RINGS, REDUCER AND PIPE FOR ACCESS SHAFT SHALL BE SEATED IN 1:2 MORTAR AND NEATLY POINTED OR WIPED INSIDE THE SHAFT. GROUT BETWEEN THE SHAFT AND THE PIPE OR RING SEAT.
  20. THE ANGLE BETWEEN THE LATERAL AND THE MAIN LINE SHALL NOT BE GREATER THAN 45 DEGREE WHEN THE FLOW IN THE LATERAL EXCEEDS 10 PERCENT OF THE FLOW IN THE MAIN LINE.
  21. CONSTRUCT DEEP MANHOLE LANDING(S) PER STD. PLAN 1508 AND INCREASE JUNCTION STRUCTURE BOTTOM WIDTH TO 4 FEET MINIMUM WHEN THE COMBINED DEPTH OF THE PIPE DIAMETER AND MANHOLE SHAFT (M) IS 20 FEET OR GREATER AND THE MANHOLE SHAFT IS GREATER THAN 12 FEET OR AS DIRECTED BY THE ENGINEER.
5. INCREASE DIMENSION "T" AT EDGES TO A MINIMUM OF 6 INCHES+(PIPE WALL THICKNESS) FOR EMBEDMENT DIMENSION "P"+6 INCHES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

STD. PLAN

322-2-OC

SPPWC STANDARD PLAN - MANHOLE PIPE-TO-PIPE (LARGE SIDE INLET)  
(JUNCTION STRUCTURE - TYPE III)

SHT. 1 OF 2

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION,  
OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH  
CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #   OCPW #   NAME AND CONDITIONS  
322-2      322-2-OC      MANHOLE PIPE-TO-PIPE (LARGER SIDE INLET)

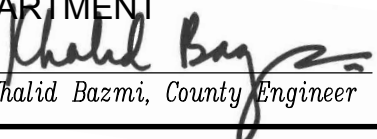
6. REVISE A PORTION OF "TABLE OF VALUES FOR F" AS SHOWN:

TABLE OF VALUES FOR F	
D <sub>2</sub>	F
36" (900 mm)	8" (205 mm)
39" (975 mm)	8" (205 mm)
42" (1050 mm)	8" (205 mm)
45" (1125 mm)	8" (205 mm)

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

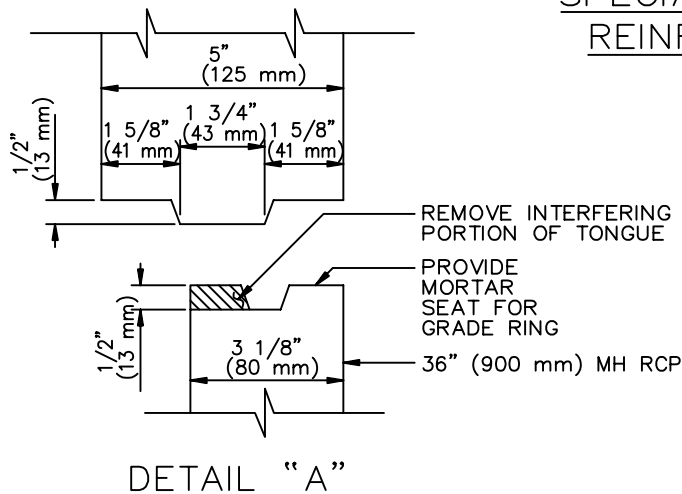
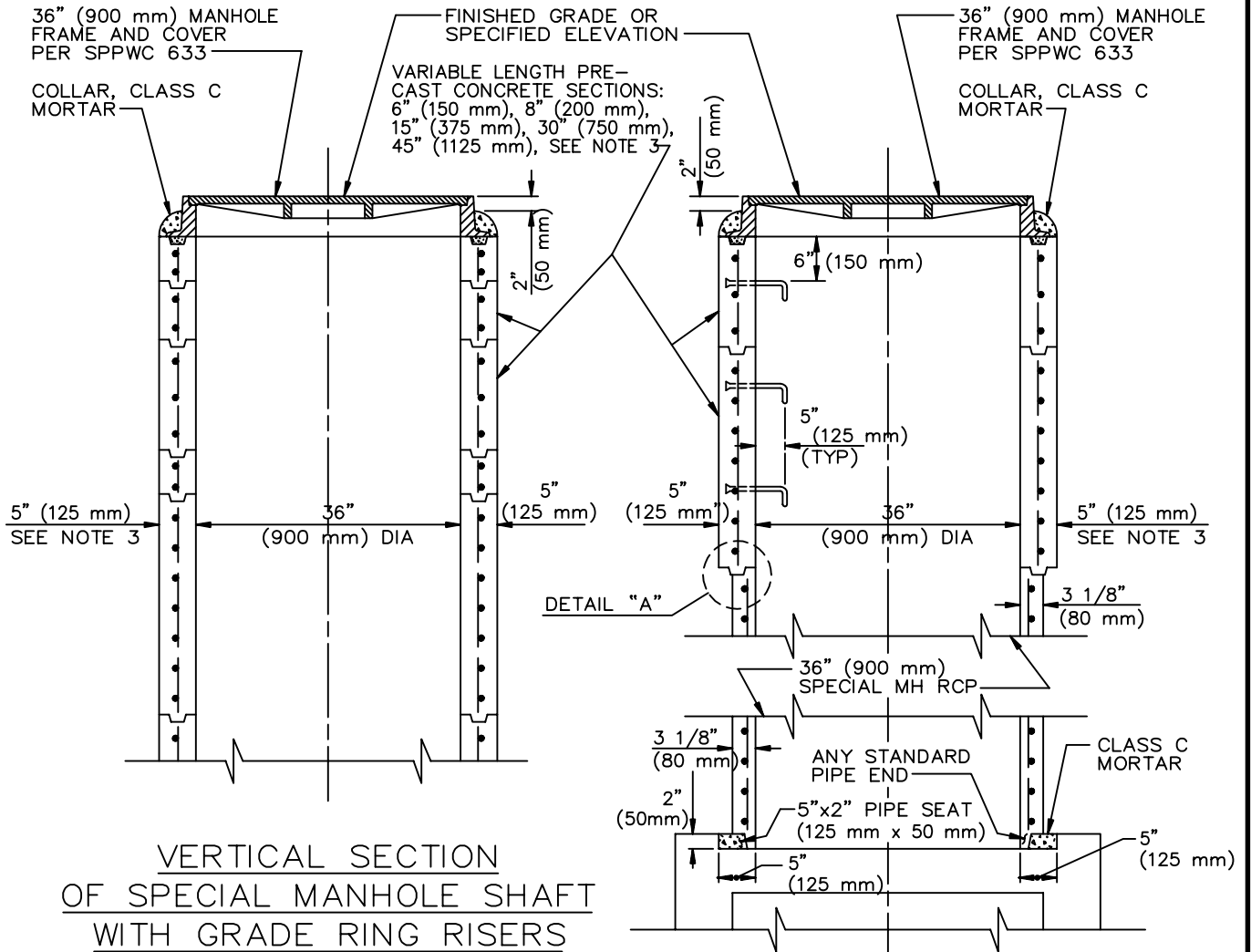
  
Khalid Bazmi, County Engineer

STD. PLAN

322-2-OC

SPPWC STANDARD PLAN - MANHOLE PIPE-TO-PIPE (LARGE SIDE INLET)  
(JUNCTION STRUCTURE - TYPE III)

SHT. 2 OF 2



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1992  
REV. 1996, 2009

**MANHOLE SHAFT  
36"(900 mm) WITHOUT REDUCER**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**326-2**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 326-2-OC FOR CONDITIONS**

## NOTES

1. UNLESS OTHERWISE INDICATED THIS STRUCTURE SHALL CONFORM TO ASTM C 478 (ASTM C 478M). ALL STEEL SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACES AND ALL CONCRETE SHALL BE PER SSPWC.
2. WHERE A 36" (900 mm) MANHOLE IS CONSTRUCTED WITH 36" (900 mm) MANHOLE RCP, THE RCP SECTION SHALL CONTAIN A CIRCULAR CAGE AND HAVE A LOAD CARRYING CAPACITY OF AT LEAST 1000D (50D). SPECIAL MANHOLE SHAFT SHALL BE PER THIS STANDARD AND 36" (900 mm) MANHOLE FRAME AND COVER SHALL BE PER SPPWC 633.
3. THE MANHOLE SHAFT AND RINGS MAY BE PLAIN CONCRETE. FOR PLAIN CONCRETE SECTIONS THE MINIMUM THICKNESS SHALL BE 6" (150 mm).
4. ALL JOINTS SHALL BE SEALED BY FILLING THE ANNULAR SPACES WITH CLASS C MORTAR. THE INSIDE OF THE SHAFT AT EACH JOINT SHALL BE WIPED CLEAN OF EXCESS MORTAR.
5. PROTECTIVE PLASTIC LINER (T LOCK) OR ENGINEER-APPROVED COATINGS WHERE REQUIRED BY THE PLANS SHALL BE IN ACCORDANCE WITH SSPWC AND THE MANUFACTURER'S DIRECTIONS.
6. STEPS SHALL CONFORM TO SPPWC 635 OR 636. THE TOP STEP SHALL BE PLACED 6" (150 mm) BENEATH THE MANHOLE COVER FRAME. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14" (350 mm) TO 15" (375 mm) OC.
7. THE PRECAST CONCRETE MANHOLE STRUCTURES WILL BE INSPECTED BY THE ENGINEER WHO WILL INDICATE ACCEPTANCE FOR SHIPMENT TO THE JOB BY MARKING THE STRUCTURES WITH THE AGENCY'S STAMP.
8. THE VERTICAL SIDES OF THE MANHOLE SHAFT SHALL BE LOCATED ABOVE AND IN LINE WITH THE SIDE OF THE STORM DRAIN CONDUIT.
9. CONSTRUCT MANHOLE SAFETY LEDGE PER SPPWC 330 IF DEPTH OF MANHOLE TO INVERT IS GREATER THAN 20' (6 m) AND MANHOLE SHAFT IS GREATER THAN 10' (3 m).
10. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:
  - 633 36" (900 mm) MANHOLE FRAME AND COVER
  - 635 STEEL STEP
  - 636 POLYPROPYLENE PLASTIC STEP

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**MANHOLE SHAFT  
36"(900 mm) WITHOUT REDUCER**

STANDARD PLAN

**326-2**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 326-2-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
326-2	326-2-OC	<u>MANHOLE SHAFT</u> <u>36" (900 mm) WITHOUT REDUCER</u>

1. REVISE THE NAME OF STANDARD PLAN 326-2 TO 1.  
"MANHOLE SHAFT 36" (900 mm) WITHOUT REDUCER."
2. REVISE NOTES AS FOLLOWS: STEPS SHALL CONFORM TO STD. PLAN 1507 OR SPPWC STD. PLAN 635. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14 INCHES (350 mm) TO 15 INCHES (375 mm) ON-CENTER. THE LOWEST STEP SHALL NOT BE MORE THAN 24 INCHES (600 mm) ABOVE THE INVERT.
3. DELETE NOTE 10.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi, County Engineer*

STD. PLAN

326-2-OC

SPPWC STANDARD PLAN -

MANHOLE SHAFT  
36" (900 mm) WITHOUT REDUCER  
(MANHOLE SHAFT 36" WITHOUT REDUCER)

SHT. 1 OF 1



CL MAIN LINE RCP OR  
REINFORCED MONOLITHIC  
ARCH, SEE NOTE 2

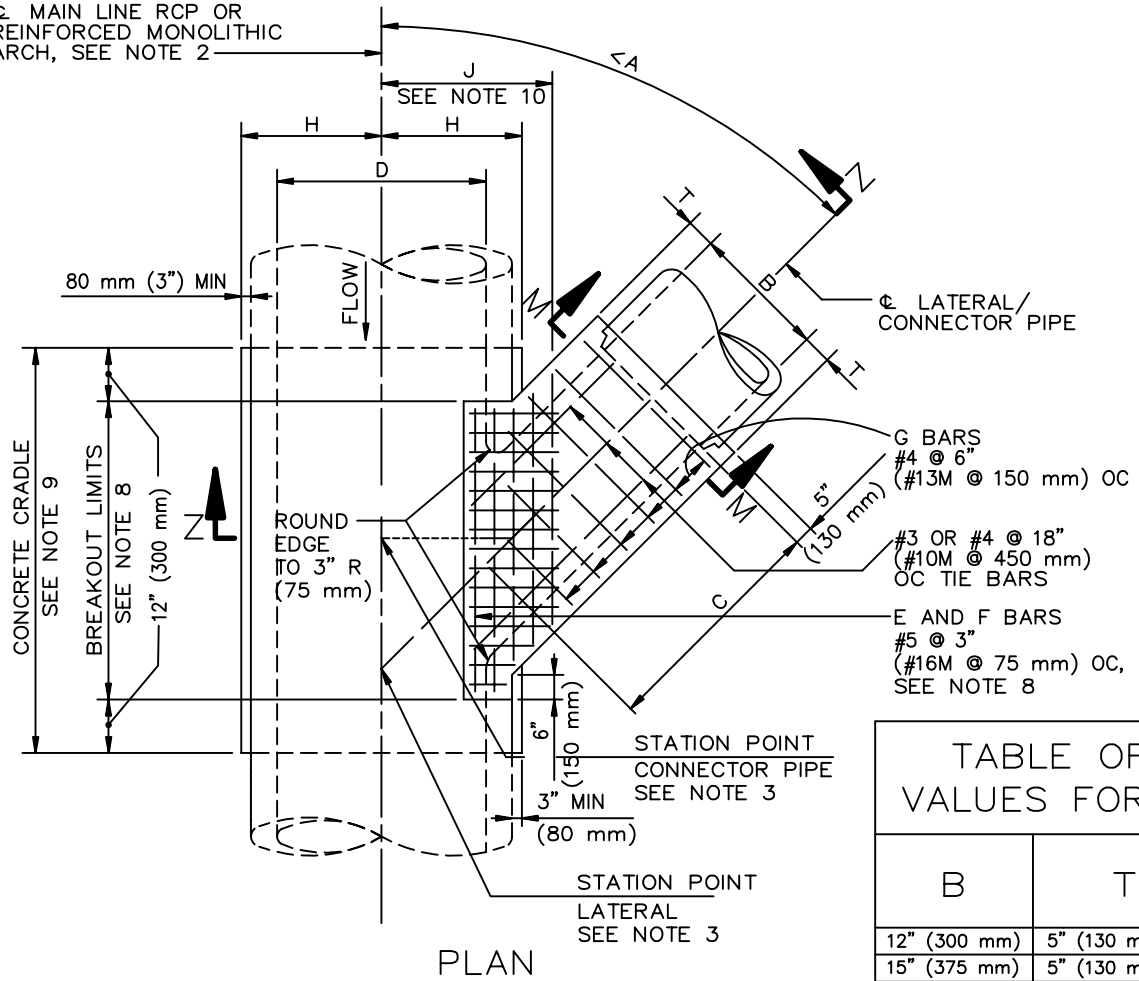
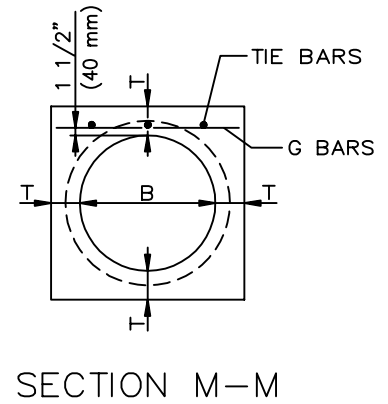
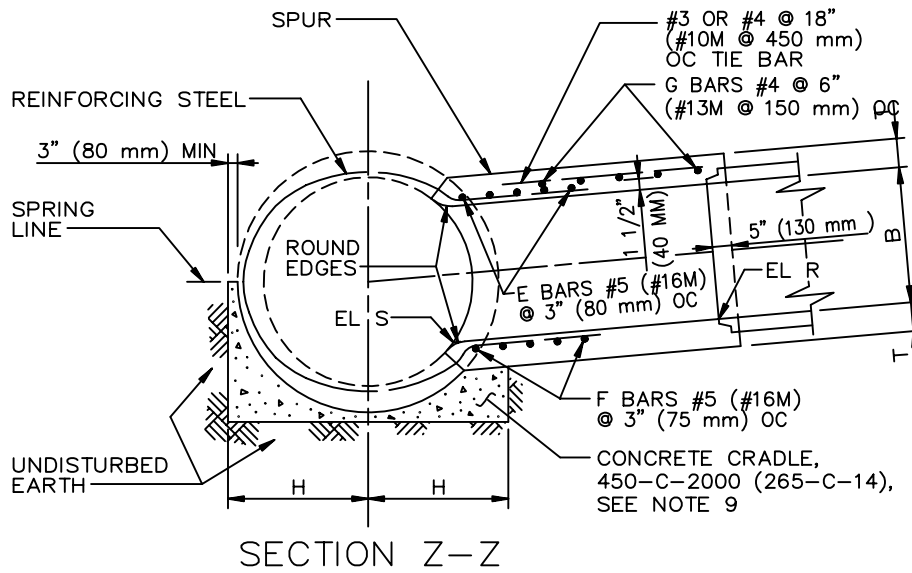


TABLE OF  
VALUES FOR T

B	T
12" (300 mm)	5" (130 mm)
15" (375 mm)	5" (130 mm)
18" (450 mm)	5" (130 mm)
21" (525 mm)	5" (130 mm)
24" (600 mm)	5 1/2" (140 mm)
27" (675 mm)	5 1/2" (140 mm)
30" (750 mm)	6" (150 mm)
33" (825 mm)	6 1/2" (170 mm)
36" (900 mm)	6 1/2" (170 mm)
39" (975 mm)	7" (180 mm)



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 1999, 2009

**JUNCTION STRUCTURE—PIPE TO PIPE**  
**INLET ID ≥ 24" (600 mm) OR OD > 1/2 MAIN LINE ID**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**331-3**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 331-3-OC FOR CONDITIONS**

## NOTES

1. THIS JUNCTION STRUCTURE SHALL BE USED WHEN THE OUTSIDE DIAMETER OF THE LATERAL IS GREATER THAN  $1/2$  THE INSIDE DIAMETER D OF THE MAIN LINE; OR WHEN THE INSIDE DIAMETER B OF THE LATERAL IS GREATER THAN 24" (600 mm). B SHALL NOT EXCEED  $0.75 D$  OR 39" (975 mm).
2. IF THE MAIN LINE IS A REINFORCED MONOLITHIC ARCH STORM DRAIN, D SHALL REFER TO THE CLEAR SPAN OF THE ARCH. REINFORCING STEEL SHALL BE CUT AND BENT INTO THE JUNCTION STRUCTURE IN THE SAME MANNER AS FOR A PIPE. A CONCRETE CRADLE IS NOT REQUIRED FOR A REINFORCED MONOLITHIC ARCH.
3. STATIONS SHOWN ON THE PLANS FOR LATERALS APPLY AT THE INTERSECTION OF CENTERLINES OF MAIN LINE AND LATERAL. STATIONS SHOWN ON THE PLANS FOR CATCH BASIN CONNECTOR PIPES APPLY AT THE INTERSECTION OF THE INSIDE WALL OF THE MAIN LINE WITH THE CONNECTOR PIPE CENTERLINE.
4. VALUES FOR A, B, C AND D SHALL BE SHOWN ON THE PLANS. ELEVATION R AND ELEVATION S SHALL BE SHOWN ONLY WHEN REQUIRED PER NOTE 5.
5.
  - a. ELEVATIONS R AND S NEED NOT BE SHOWN ON THE PLANS IF THE INLET PIPE IS TO ENTER THE MAIN LINE RADially.
  - b. ELEVATION R SHALL BE SHOWN ON THE PLANS ONLY IF A STUB IS TO BE PROVIDED IN THE MAIN LINE FOR FUTURE CONNECTION OF AN INLET PIPE.
  - c. ELEVATION S SHALL BE SHOWN ON THE PLANS IF AN INLET PIPE IS TO ENTER THE MAIN LINE OTHER THAN RADially. INLET PIPE SHALL BE LAID ON A STRAIGHT GRADE FROM ELEVATION S TO THE CATCH BASIN OR GRADE BREAK IN LINE.
6. THE INLET PIPE SHALL ENTER THE MAIN LINE RADially UNLESS OTHERWISE INDICATED. THE INLET PIPE MAY ENTER THE MAIN LINE OTHER THAN RADially IF ANGLE A IS GREATER THAN  $45^\circ$ ; B IS LESS THAN OR EQUAL TO 24" (600 mm) AND THE OUTSIDE DIAMETER OF THE INLET PIPE IS LESS THAN  $0.5 D$ ; OTHERWISE, SPPWC 340 SHALL BE USED.
7. NO MORE THAN ONE OPENING SHALL BE MADE IN ANY ONE SECTION OF PIPE.
8. THE OPENING FOR THE BREAKOUT SHALL BE RECTANGULAR AND CUT NORMAL TO THE PIPE SURFACE WITHOUT DAMAGING THE REINFORCING STEEL. THE TRANSVERSE REINFORCEMENT OF THE MAIN LINE SHALL BE CUT AT THE CENTER OF THE OPENING AND BENT INTO THE TOP AND BOTTOM SLABS OF THE SPUR.
9. THE MAIN LINE SHALL BE REINFORCED WITH A CONCRETE CRADLE AND ENCASEMENT (AS APPLICABLE). A CONCRETE ENCASEMENT IS REQUIRED IF A JOINT IN THE MAIN LINE FALLS WITHIN THE LIMITS OF THE CRADLE. THE CONCRETE ENCASEMENT SHALL EXTEND 12" (300 mm) ABOVE THE TOP OF THE MAIN LINE AND TO THE LIMITS OF THE CRADLE. IF CONNECTING TO AN EXISTING STORM DRAIN, PORTION OF CRADLE OPPOSITE INLET MAY BE OMITTED.
10. REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 40, (ASTM A 615M, GRADE 300), AND BE PLACED  $1\frac{1}{2}$ " (40 mm) CLEAR FROM CONCRETE SURFACES, UNLESS OTHERWISE SHOWN F BARS SHALL BE CARRIED TO A POINT NOT LESS THAN J DISTANCE FROM CENTER LINE WITH  $J=7D/12 + 6"$  (150 mm).
11. FLOOR OF THE SPUR SHALL BE STEEL-TROWELED TO THE SPRING LINE OF THE SPUR.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**JUNCTION STRUCTURE—PIPE TO PIPE**  
**INLET ID  $\geq 24"$  (600 mm) OR OD  $> 1/2$  MAIN LINE ID**

STANDARD PLAN

**331-3**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 331-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
331-3	331-3-OC	<u>JUNCTION STRUCTURE PIPE-TO-PIPE</u> <u>INLET ID &gt; 24" (600 MM) OR OD &gt; MAIN LINE</u>

1. REVISE THE NAME OF STANDARD PLAN 331-3 TO "JUNCTION STRUCTURE-TYPE IV".
2. ADD NOTE:  
12. JUNCTION STRUCTURE-TYPE IV SHALL BE USED ONLY WHEN SUFFICIENT MEANS OF ACCESS IS AVAILABLE FOR STORM DRAIN MAINTENANCE.
3. REPLACE "TABLE OF VALUES FOR T" WITH:

TABLE OF VALUES FOR T	
B	T
12"	6"
15"	6"
18"	6"
21"	6"
24"	7"
27"	7"
30"	7"
33"	8"
36"	8"
39"	8"

4. INCREASE DIMENSION "T" AT EDGES TO A MINIMUM OF 6 INCHES+(PIPE WALL THICKNESS).

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

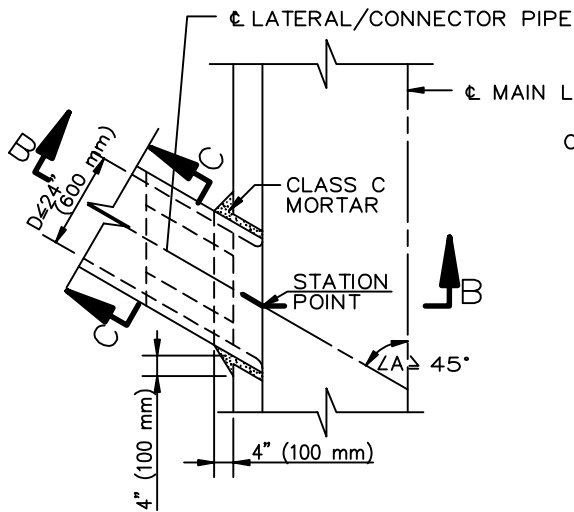
STD. PLAN

331-3-OC

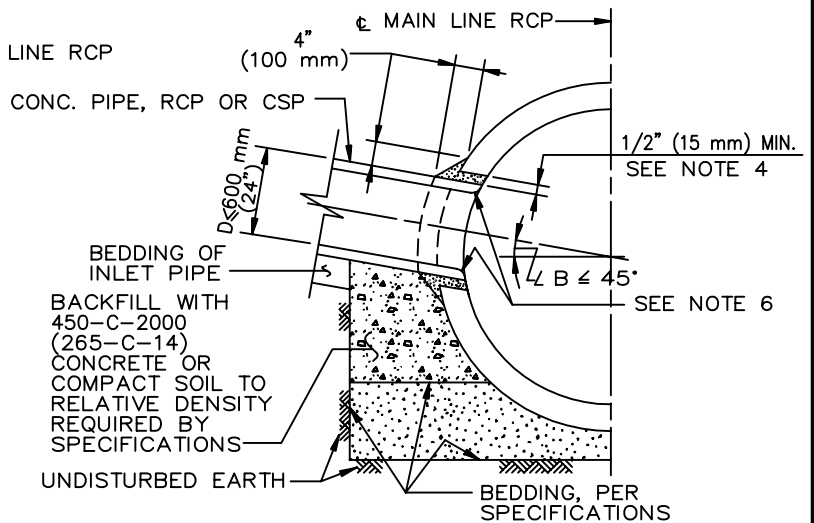
SPPWC STANDARD PLAN - JUNCTION STRUCTURE-PIPE TO PIPE  
INLET ID > 24" (600 mm) OR OD > 1/2 MAIN LINE ID  
(JUNCTION STRUCTURE-TYPE IV)

SHT. 1 OF 1

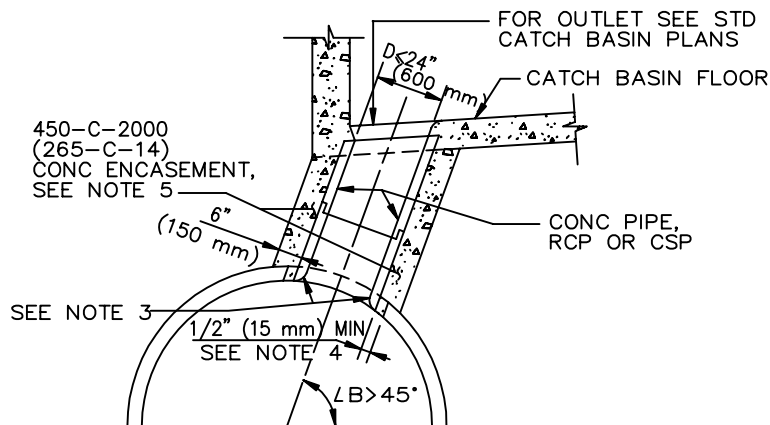




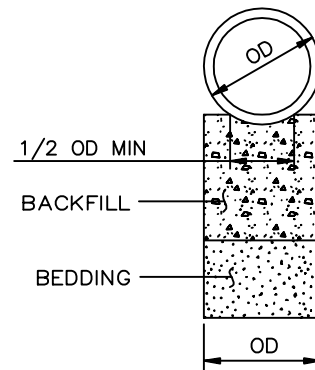
CASE 1  
PLAN



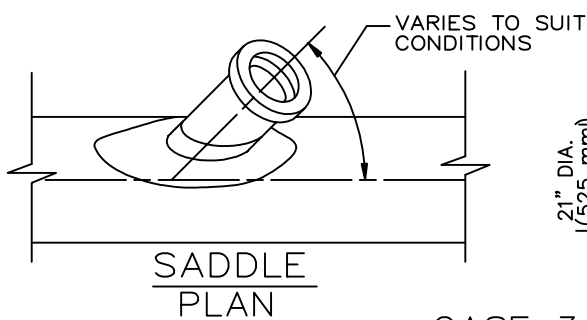
CASE 1  
SECTION B-B



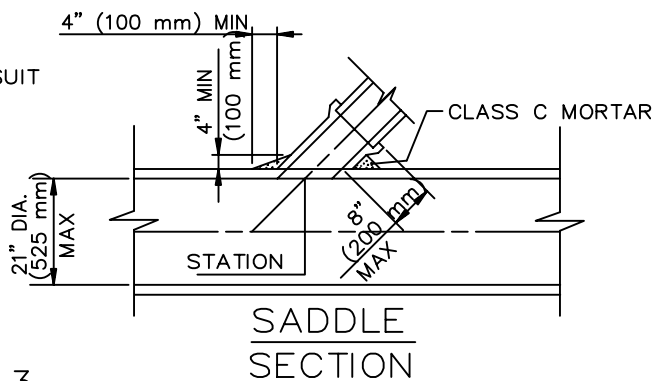
CASE 2  
(SEE NOTES 9 & 10)



CASE 1  
SECTION C-C



CASE 3  
SADDLE CONNECTION



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2009

**JUNCTION STRUCTURE – PIPE TO PIPE**  
**(ID ≤ 24" (600 mm))**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**332-2**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 332-2-OC FOR CONDITIONS**

## NOTES

### CASE 1 AND CASE 2

1. IF ANGLE A IS LESS THAN 45° OR IF D IS LARGER THAN 24" (600 mm), THEN ANOTHER STANDARD STRUCTURE SHALL BE SPECIFIED.
2. THE OUTSIDE DIAMETER OF THE INLET PIPE SHALL NOT EXCEED 1/2 THE INSIDE DIAMETER OF THE MAIN LINE.
3. THE INLET PIPE SHALL ENTER THE MAIN LINE RADially. IF THE INLET PIPE CANNOT ENTER RADially, THEN ANOTHER STANDARD STRUCTURE SHALL BE SPECIFIED.
4. THE SIZE OF THE OPENING INTO THE MAIN LINE SHALL BE THE OUTSIDE DIAMETER OF THE INLET PIPE PLUS 1" (30 mm) MINIMUM TO 3" (75 mm) MAXIMUM.
5. ALL CONNECTOR PIPES FOR CASE 2 SHALL BE ENCASED IN CONCRETE IF LAID WITHIN THE MAIN LINE EXCAVATED TRENCH OR IF LAID ON FILL WHICH HAS NOT BEEN DENSIFIED.
6. BURN OR CHIP END OF CONNECTOR PIPE FLUSH WITH INNER SURFACE OF MAIN LINE. ROUND EDGE OF CONCRETE PIPE OR RCP.
7. ALL CSP AND FITTINGS SHALL BE GALVANIZED.
8. STATION SPECIFIED ON THE PLANS APPLIES AT THE INTERSECTION OF THE INSIDE WALL OF MAIN LINE AND THE CENTERLINE OF INLET PIPE.
9. CASE 2 SHALL NOT BE USED TO CONNECT TO THE FLOOR OF A GRATING CATCH BASIN WHERE THE GRATE WILL BE SUBJECT TO VEHICLE TRAFFIC.
10. FOR CASE 2, NOT MORE THAN 12' (3.5 m) OF INLET PIPE SHALL BE LOCATED WITHIN THE MAIN LINE EXCAVATED TRENCH.

### CASE 3

11. CONNECTIONS TO PIPES 21" (525 mm) OR LESS IN DIAMETER WITHOUT JUNCTION STRUCTURES OR PRECAST Y BRANCHES SHALL BE MADE WITH SADDLES.
12. THE OUTSIDE DIAMETER OF THE INLET PIPE SHALL NOT EXCEED ONE-HALF THE INSIDE DIAMETER OF THE MAIN LINE.
13. TRIM OR CUT SADDLE TO FIT SNUGLY OVER THE OUTSIDE OF THE MAIN LINE SO ITS AXIS WILL BE ON THE LINE AND GRADE OF THE CONNECTOR PIPE.
14. THE OPENING INTO THE PIPE SHALL BE CUT AND TRIMMED TO FIT THE SADDLE SO THAT NO PART WILL PROJECT WITHIN THE BORE OF THE SADDLE PIPE.
15. THE CONNECTOR PIPE SHALL BE SUPPORTED AS SHOWN IN CASES 1 AND 2.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**JUNCTION STRUCTURE – PIPE TO PIPE**  
**(ID ≤ 24" (600 mm))**

STANDARD PLAN

**332-2**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 332-2-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
332-2	332-2-OC	<u>JUNCTION STRUCTURE – PIPE TO PIPE</u> <u>(ID ≤ 24" (600 MM))</u>

1. REVISE THE NAME OF STANDARD PLAN 331-3 TO "JUNCTION STRUCTURE-TYPE VI".

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

STD. PLAN

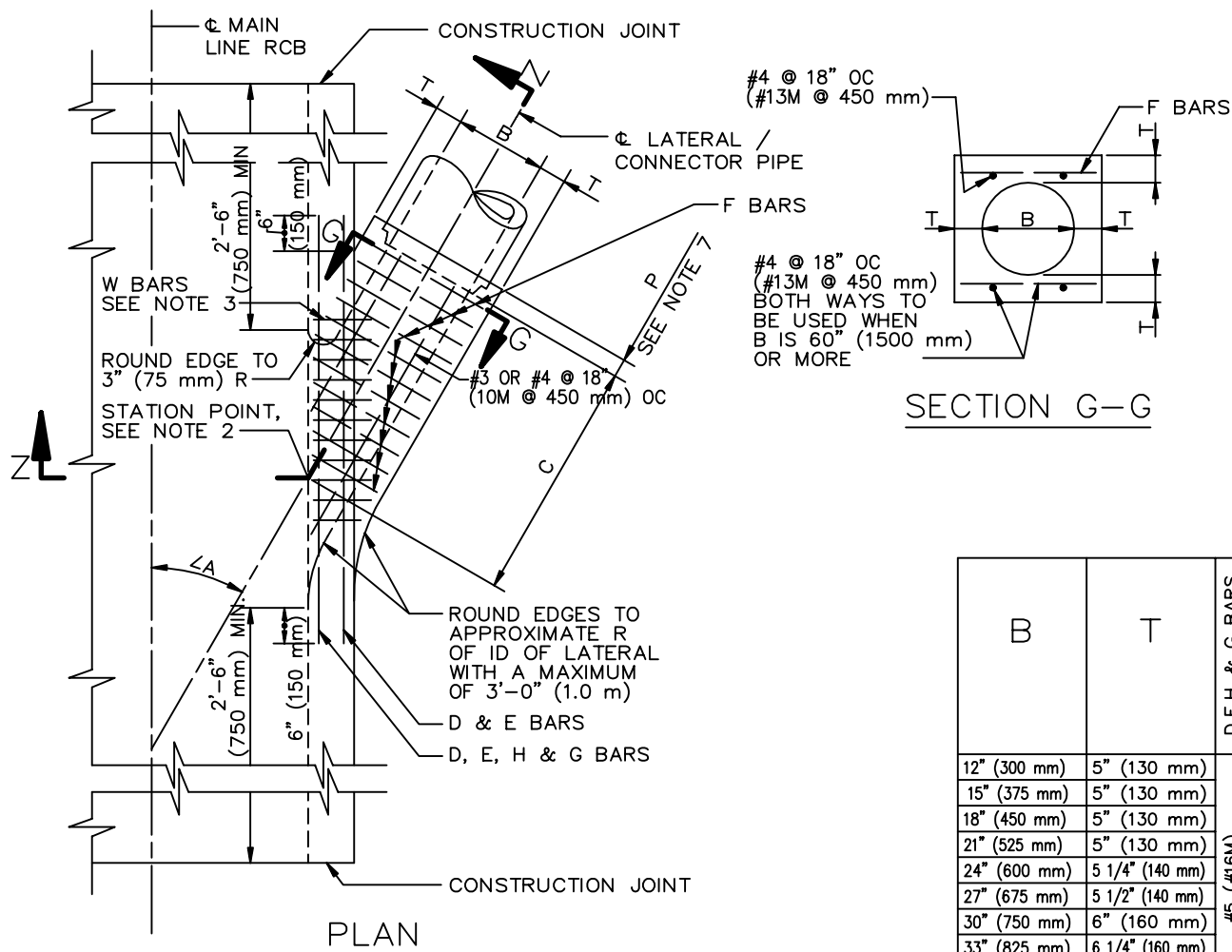
332-2-OC

SPPWC STANDARD PLAN -

JUNCTION STRUCTURE - PIPE TO PIPE  
(ID ≤ 24" (600 mm))  
(JUNCTION STRUCTURE - TYPE VI)

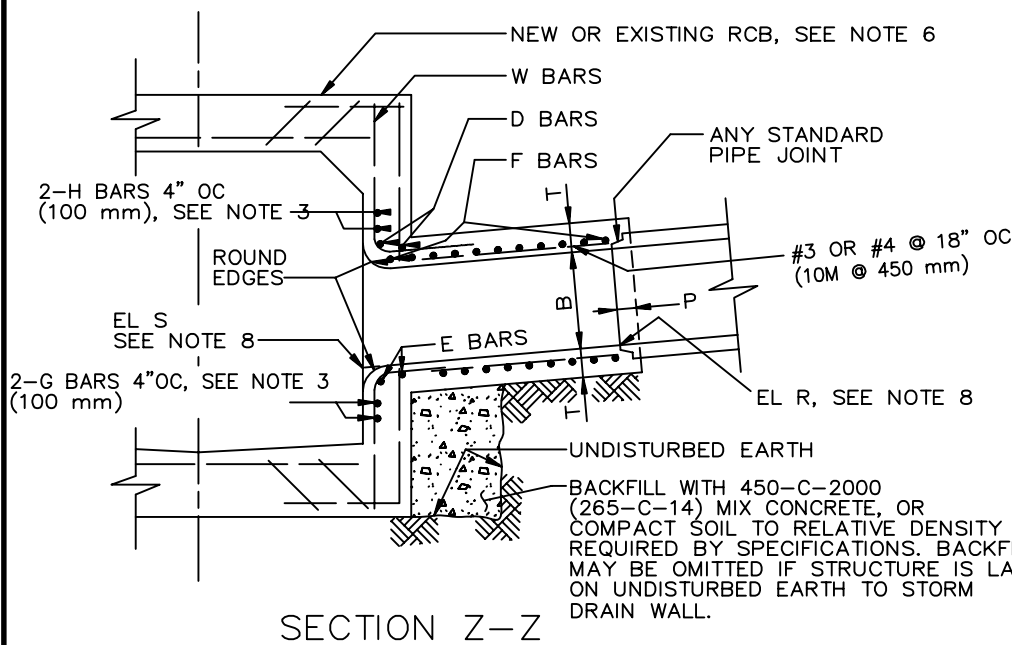
SHT. 1 OF 1





SECTION G-G

B	T	D, E, H & G BARS	F BARS
12" (300 mm)	5" (130 mm)	#5 (#16M)	#4 @ 6" (#13M @ 150 mm) OC
15" (375 mm)	5" (130 mm)		
18" (450 mm)	5" (130 mm)		
21" (525 mm)	5" (130 mm)		
24" (600 mm)	5 1/4" (140 mm)		
27" (675 mm)	5 1/2" (140 mm)		
30" (750 mm)	6" (160 mm)	#5 (#16M)	#4 @ 6" (#13M @ 150 mm) OC
33" (825 mm)	6 1/4" (160 mm)		
36" (975 mm)	6 1/2" (170 mm)		
39" (990 mm)	7" (180 mm)		
42" (1050 mm)	7 1/2" (190 mm)		
45" (1125 mm)	7 3/4" (200 mm)		
48" (1220 mm)	8" (210 mm)	#6 (#19M)	#5 @ 6" (#16M @ 150 mm) OC
51" (1275 mm)	8 1/2" (220 mm)		
54" (1350 mm)	9" (230 mm)		
57" (1500 mm)	9 1/4" (240 mm)		
60" (1500 mm)	9 1/2" (240 mm)		
63" (1650 mm)	10" (260 mm)		
66" (1680 mm)	10 1/4" (260 mm)	#7 (#22M)	#5 @ 6" (#16M @ 150 mm) OC
69" (1800 mm)	10 3/4" (280 mm)		
72" (1850 mm)	11" (280 mm)		
78" (1950 mm)	11 3/4" (300 mm)		
84" (2100 mm)	12 1/2" (320 mm)		
90" (2400 mm)	13 1/4" (340 mm)		
96" (2440 mm)	14" (360 mm)	#7 (#22M)	#5 @ 6" (#16M @ 150 mm) OC
102" (2550 mm)	15 1/2" (400 mm)		
108" (2700 mm)	16" (410 mm)		
114" (3000 mm)	16 1/2" (420 mm)		
120" (3050 mm)	17" (430 mm)		
126" (3150 mm)	17" (430 mm)		
132" (3300 mm)	17 1/2" (450 mm)	#7 (#22M)	#5 @ 6" (#16M @ 150 mm) OC
138" (3450 mm)	17 1/2" (450 mm)		
144" (3600 mm)	18" (460 mm)	#7 (#22M)	#5 @ 6" (#16M @ 150 mm) OC



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2009

JUNCTION STRUCTURE – PIPE TO RCB

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

333-2

SHEET 1 OF 2

SEE OCPW STANDARD PLAN 333-2-OC FOR CONDITIONS

## NOTES

1. VALUES FOR A, B AND C SHALL BE SHOWN ON THE PLANS. ELEVATION R AND ELEVATION S SHALL BE SHOWN WHEN REQUIRED PER NOTE 8.
2. STATIONS SPECIFIED ON THE PLANS APPLY AT THE INTERSECTION OF CENTERLINES OF MAIN LINE AND LATERALS, EXCEPT THAT STATIONS FOR CATCH BASIN CONNECTOR PIPES APPLY AT INSIDE WALL OF STRUCTURE.
3. REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 40, (ASTM A 615M, GRADE 300), AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACE UNLESS OTHERWISE SHOWN.
  - a. W BARS ARE OF SIZE AND SPACING SPECIFIED FOR WALL STEEL ON PLANS, AND SHALL BE CUT IN CENTER OF OPENING AND BENT INTO TOP AND BOTTOM OF JUNCTION STRUCTURE.
  - b. OMIT H BARS WHEN SOFFIT OF SPUR IS 12" (300 mm) OR LESS BELOW SOFFIT OF MAIN LINE, AND OMIT G BARS WHEN INVERT OF SPUR IS 12" (300 mm) OR LESS ABOVE FLOOR OF MAIN LINE.
4. JUNCTION STRUCTURE SHALL BE POURED MONOLITHICALLY WITH MAIN LINE, MANHOLE OR TRANSITION STRUCTURE.
5. FLOOR OF STRUCTURE SHALL BE STEEL-TROWELED TO THE SPRING LINE.
6. WHEN CONNECTING TO EXISTING RCB, BREAKOUT LIMITS AND DETAILS SHALL BE SHOWN ON THE PLANS.
7. EMBEDMENT, P, SHALL BE 5" (130 mm) FOR B = 96" (2400 mm) OR LESS 8" (200 mm) FOR B OVER 96" (2400 mm).
8. IF ELEVATION R AND ELEVATION S ARE NOT SHOWN ON THE PLANS THEN THE INLET OPENING SHALL FALL 6" (150 mm) BELOW THE SOFFIT OF THE MAIN LINE WITH THE INLET PIPE LAID ON A STRAIGHT GRADE FROM MAIN LINE TO CATCH BASIN OR TO GRADE BREAK IN INLET LINE. ELEVATION S SHALL BE SHOWN ON THE PLANS IF THE INLET OPENING FALLS MORE THAN 6" (150 mm) BELOW THE SOFFIT OF THE MAIN LINE WITH THE INLET PIPE LAID ON A STRAIGHT GRADE AS STATED ABOVE.  
ELEVATION R SHALL BE SHOWN ON THE PLANS ONLY WHEN A STUB IS TO BE PROVIDED FOR A FUTURE CONNECTION.
9. LATERALS OR CONNECTOR PIPES 24" (600 mm) OR LESS IN DIAMETER SHALL BE NO MORE THAN 5' (1.5 m) ABOVE THE INVERT. LATERALS OR CONNECTOR PIPES 27" (675 mm) OR LARGER IN DIAMETER SHALL BE NO MORE THAN 18" (450 mm) ABOVE THE INVERT, WITH THE EXCEPTION THAT CATCH BASIN CONNECTOR PIPES LESS THAN 50' (15 m) IN LENGTH SHALL NOT BE MORE THAN 5' (1.5 m) ABOVE THE INVERT.
10. THE NEED FOR AN EDGE BEAM AND/OR ADDITIONAL REINFORCEMENT SHALL BE INVESTIGATED BY THE ENGINEER FOR ANY ONE OF THE FOLLOWING CONDITIONS:
  - a. ANGLE A IS LESS THAN 30°
  - b. TOP OF INLET PIPE IS LESS THAN 6" (150 mm) BELOW THE SOFFIT
  - c. FLOW LINE OF INLET PIPE IS LESS THAN 7" (180 mm) ABOVE THE FLOOR OF THE RCB AT THE INSIDE FACE

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

## JUNCTION STRUCTURE – PIPE TO RCB

STANDARD PLAN

**333-2**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 333-2-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
333-2	333-2-OC	<u>JUNCTION STRUCTURE – PIPE TO RCB</u>

1. REVISE THE NAME OF STANDARD PLAN 333-2 TO "JUNCTION STRUCTURE – TYPE V".
2. REVISE NOTES:
  2. STATIONS SPECIFIED ON THE PLANS APPLY AT THE INTERSECTION OF CENTERLINES OF THE LATERALS AND THE INSIDE WALL OF STRUCTURE.
  - 3B. OMIT H BARS WHEN SOFFIT OF LATERAL IS 12 INCHES (300 MM) OR LESS BELOW SOFFIT OF MAIN LINE, AND OMIT G BARS WHEN INVERT OF LATERAL IS 12 INCHES (300 MM) OR LESS ABOVE FLOOR OF MAIN LINE.
  8. IF ELEVATION R AND ELEVATION S ARE NOT SHOWN ON THE PLANS THEN THE INLET OPENING SHALL FALL 6 INCHES (150 MM) BELOW THE SOFFIT OF THE MAIN LINE WITH THE INLET PIPE LAID ON A STRAIGHT GRADE FROM MAIN LINE TO CATCH BASIN OR TO GRADE BREAK IN INLET LINE. ELEVATION R SHALL BE SHOWN ON THE PLANS ONLY WHEN A STUB IS TO BE PROVIDED FOR A FUTURE CONNECTION. LATERALS OR CONNECTOR PIPES 24 INCHES OR LESS IN DIAMETER.
  9. SHALL BE IN THE LOWER 3 OF THE STRUCTURE. LATERALS OR CONNECTOR PIPES 27 INCHES OR LARGER IN DIAMETER SHALL BE NO MORE THAN 18 INCHES ABOVE THE INVERT, WITH THE EXCEPTION THAT CATCH BASIN CONNECTOR PIPES LESS THAN 50 FEET IN LENGTH SHALL NOT BE MORE THAN 5 FEET ABOVE THE INVERT. MINIMUM DIAMETER OF LATERAL OR CONNECTOR PIPES SHALL BE 18 INCHES.
4. ADD NOTE:
  - II. THIS JUNCTION STRUCTURE MAY BE USED WHEN ANGLE A 30 DEGREE, BARREL WIDTH OF THE RCB IS 20 FEET OR LESS, AND COVER OVER RCB IS 10 FEET OR LESS.
5. INCREASE DIMENSION "T" AT EDGES TO A MINIMUM OF 6 INCHES+(PIPE WALL THICKNESS) FOR EMBEDMENT DIMENSION "P"+6 INCHES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

333-2-OC

SPPWC STANDARD PLAN -

JUNCTION STRUCTURE - PIPE TO RCB  
(JUNCTION STRUCTURE - TYPE V)

SHT. 1 OF 2

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #      OCPW #      NAME AND CONDITIONS  
 333-2      333-2-OC      JUNCTION STRUCTURE – PIPE TO RCB

6. THIS JUNCTION STRUCTURE MAY BE USED FOR PIPE INLETS TO VERTICAL WALL CONCRETE CHANNELS.
7. REVISE A PORTION OF THE TABLE AS SHOWN.

B	T	BARS	
		D, E, H & G	F
12" (300 mm)	6"	#5	#4 @ 6" OC
15" (375 mm)	6"		
18" (450 mm)	6"		
21" (525 mm)	6"		
24" (600 mm)	7"		
27" (675 mm)	7"		
30" (750 mm)	7"		
33" (825 mm)	8"		
36" (975 mm)	8"		
39" (990 mm)	8"		
42" (1050 mm)	8"		
45" (1125 mm)	8"		

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
 Khalid Bazmi, County Engineer

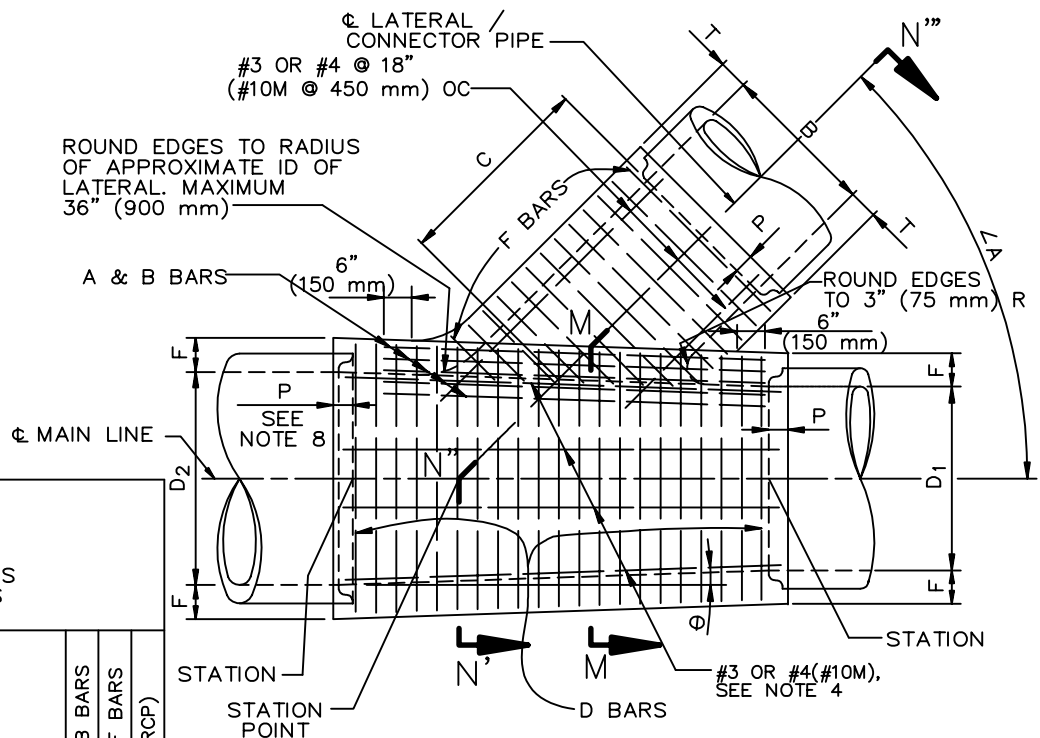
STD. PLAN

333-2-OC

SPPWC STANDARD PLAN -

JUNCTION STRUCTURE - PIPE TO RCB (JUNCTION  
 STRUCTURE - TYPE V)

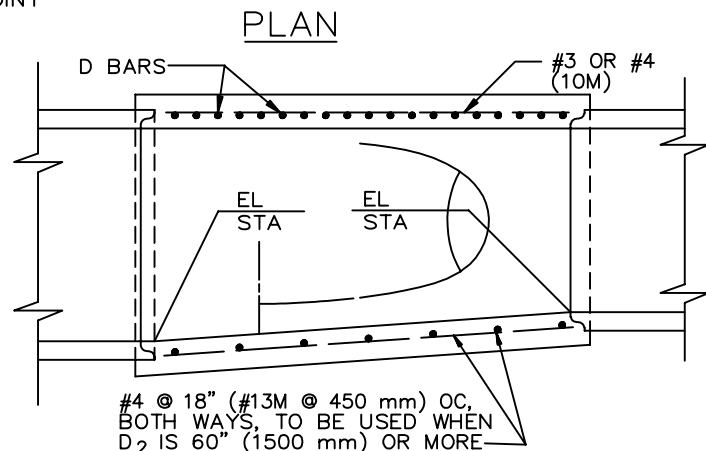
SHT. 2 OF 2



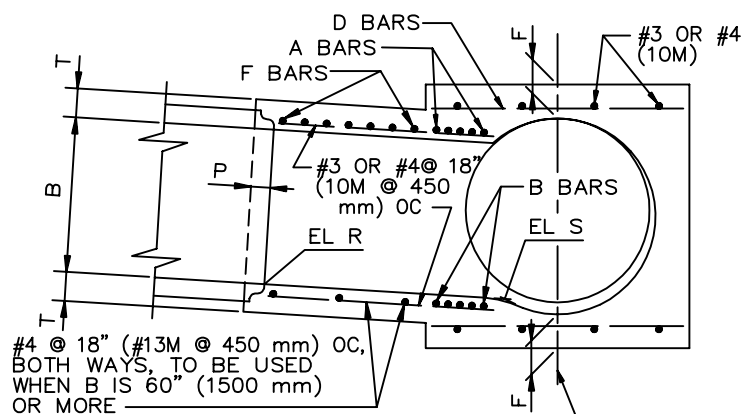
**TABLE**

FOR DIMENSIONS  
AND BAR SIZES

D <sub>2</sub> OR B		F OR T		A OR B BARS	D OR F BARS	P (RCP)
(INCHES)	(mm)	(INCHES)	(mm)			
12	300	4	110	OC	OC	5" (125 mm)
15	375	4 1/4	110			
18	450	4 1/2	120			
21	525	5	130			
24	600	5 1/4	140			
27	675	5 1/2	140			
30	750	6	160			
33	825	6 1/4	160			
36	900	6 1/2	170			
39	975	7	180			
42	1050	7 1/2	190			5" (125 mm)
45	1125	7 3/4	200			
48	1200	8	210			
51	1275	8 1/2	220			
54	1350	9	230			
57	1425	9 1/4	240			
60	1500	9 1/2	250			
63	1575	10	260			
66	1650	10 1/4	260			
69	1725	10 3/4	280			
72	1800	11	280			8" (200 mm)
78	1950	11 3/4	300			
84	2100	12 1/2	320			
90	2250	13 1/4	340			
96	2400	14	360			
102	2550	15 1/2	400			
108	2700	16	410			
114	2850	16 1/2	420			
120	3000	17	440			
126	3150	17	440			
132	3300	17 1/2	450			8" (200 mm)
138	3450	17 1/2	450			
144	3600	18	460			



**LONGITUDINAL SECTION**



**SECTION N'-N'-N'  
PROJECTED ON M-M-N'**

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1992  
REV. 1995, 2009

**TRANSITION STRUCTURE  
PIPE TO PIPE**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**340-2**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 340-2-OC FOR CONDITIONS**

## NOTES

1. THE HORIZONTAL ANGLE OF CONVERGENCE OR DIVERGENCE,  $\theta$ , SHALL NOT EXCEED  $5^{\circ} 45'$ .
2. VALUES FOR A, B, C, D<sub>1</sub> AND D<sub>2</sub> ARE SHOWN ON THE PLANS. ELEVATION R AND ELEVATION S ARE SHOWN WHEN REQUIRED BY NOTE 10.
3. FLOOR OF STRUCTURE SHALL BE STEEL TROWELED TO SPRING LINE.
4. REINFORCEMENT STEEL SHALL CONFORM TO ASTM A 615 (A 615 M), GRADE 300 (40), AND SHALL TERMINATE  $1\frac{1}{2}"$  (40 mm) CLEAR OF CONCRETE SURFACES UNLESS OTHERWISE SHOWN. LONGITUDINAL BARS SHALL BE #3 OR #4 @ 18" (#10M @ 450 mm) OC OR LESS.
5. ELEVATION S APPLIES AT INSIDE WALL OF STRUCTURE.
6. TRANSITION STRUCTURE SHALL BE POURED IN ONE CONTINUOUS OPERATION, EXCEPT THAT THE CONTRACTOR SHALL HAVE THE OPTION OF PLACING AT THE SPRING LINE A CONSTRUCTION JOINT LONGITUDINAL KEYWAY.
7. THE LENGTH OF THE STRUCTURE MAY BE INCREASED AT THE OPTION OF THE CONTRACTOR TO MEET RCP ENDS, USING D BARS, LONGITUDINAL AND BOTTOM REINFORCEMENT IN EXTENDED PORTION OF SAME DIAMETER AND SPACING AS SPECIFIED IN THE TABLE, BUT ANY CHANGE IN THE LOCATION OF SPUR MUST BE APPROVED BY THE ENGINEER.
8. EMBEDMENT P SHALL BE AS SPECIFIED IN THE TABLE, UNLESS OTHERWISE SHOWN ON THE PLANS.
9. WHEN THERE IS NO SPUR REQUIRED, A & B BARS SHALL BE OMITTED.
10. WHEN ELEVATION R AND ELEVATION S ARE NOT SHOWN ON PLANS, INLET PIPE SHALL ENTER MAIN LINE RADially. WHEN INLET PIPE ENTERS MAIN LINE OTHER THAN RADially, ELEVATION S SHALL BE SHOWN ON PLANS, AND INLET PIPE SHALL BE LAID ON A STRAIGHT GRADE FROM ELEVATION S TO CATCH BASIN OR GRADE BREAK IN INLET LINE. ELEVATION R SHALL BE SHOWN ON THE PLANS ONLY WHEN STUB IS TO BE PROVIDED IN MAIN LINE FOR FUTURE CONSTRUCTION OF INLET PIPE.
11. THE MAXIMUM COVER ABOVE THIS STRUCTURE SHALL BE 25' (7.5 m). IF THE COVER EXCEEDS 25' (7.5 m') A SPECIAL STRUCTURE SHALL BE DESIGNED FOR THE COVER AND DETAILED ON THE PLANS.

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #    OCPW #    NAME AND CONDITIONS  
 340-2    340-2-OC    TRANSITION STRUCTURE – PIPE TO PIPE

1. SPPWC STANDARD PLAN 340-2 MAY ONLY BE USED WHEN THE ENGINEER DETERMINES SUFFICIENT MEANS OF ACCESS IS AVAILABLE FOR STORM DRAIN MAINTENANCE.
2. ADD NOTES: 12. THE ANGLE BETWEEN THE LATERAL AND THE MAIN LINE SHALL NOT BE GREATER THAN 45 DEGREES WHEN THE FLOW IN THE LATERAL EXCEEDS 10 PERCENT OF THE FLOW IN THE MAIN LINE.
3. INCREASE DIMENSIONS "T"&"F" AT EDGES TO A MINIMUM OF 6 INCHES + (PIPE WALL THICKNESS) FOR EMBEDMENT DIMENSION "P" + 6 INCHES.
4. REVISE A PORTION OF "TABLE FOR DIMENSIONS AND BAR SIZES" AS SHOWN:

TABLE FOR DIMENSIONS AND BAR SIZES					
D <sub>2</sub> OR B		F OR T		A OR B BARS	D OR F BARS
(INCHES)	(mm)	(INCHES)	(mm)		
18	450	6	120	#5 @ 3" OC	#4 @ 6" OC
21	525	6	130		
24	600	6	140		
27	675	6	140		
30	750	6	160		
33	825	7	160		
36	900	7	170		
39	975	7	180	#6 @ 3" OC	#5 @ 6" OC
42	1050	8	190		
45	1125	8	200		
48	1200	8	210		

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
 Khalid Bazmi, County Engineer

Revision: August 2018

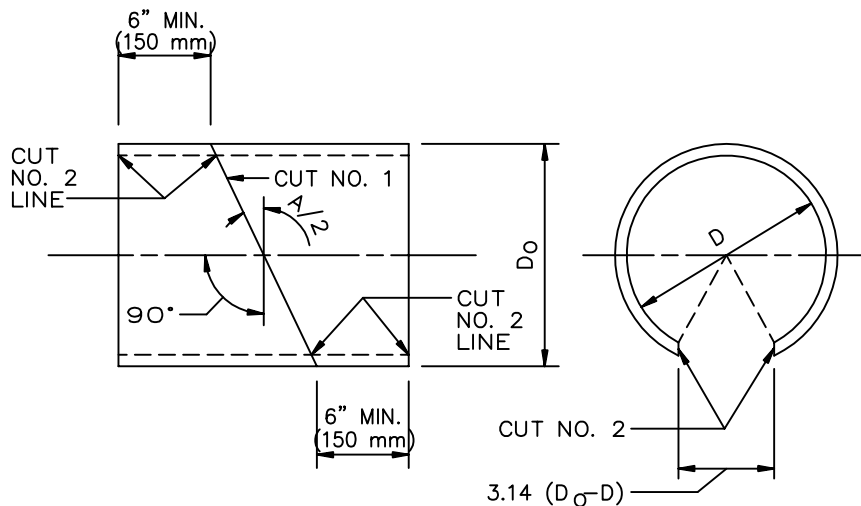
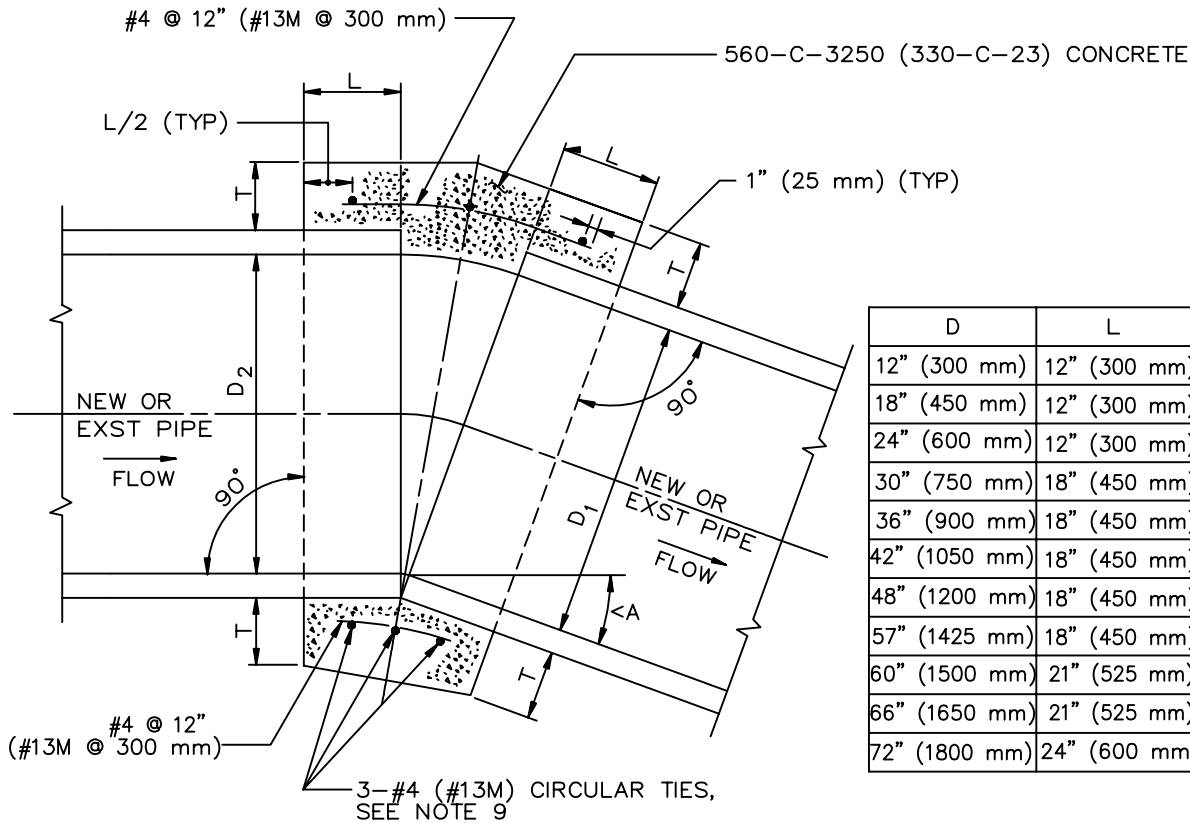
STD. PLAN

340-2-OC

SPPWC STANDARD PLAN - TRANSITION STRUCTURE - PIPE TO PIPE

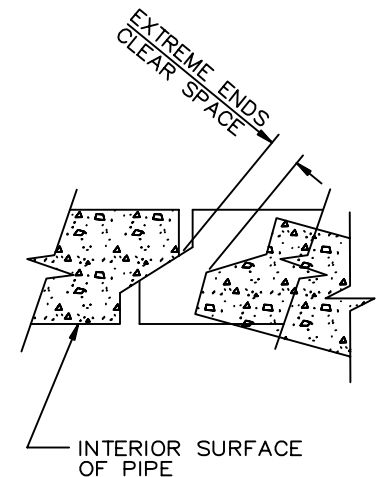
SHT. 1 OF 1





DETAIL "A" (SEE NOTE 10)  
SONO-TUBE, OR EQUAL, INTERIOR FORM

CUT NO. 1: SAW THE TUBE AT AN ANGLE OF A/2 WITH THE TRANSVERSE PLANE. REVERSE ONE SECTION AND TAPE BOTH SECTIONS TOGETHER FORMING THE DEFLECTION ANGLE A.  
CUT NO. 2: SAW THE TUBE LONGITUDINALLY REMOVING A STRIP 3.14 (D<sub>o</sub> - D) WIDE ON THE SIDE OPPOSITE THE OPEN JOINT. BEND THE ENDS OF THE CUT TOGETHER AND INSERT THE TUBE IN THE PIPE.



DETAIL "B"  
TYPICAL JOINT FOR  
REINFORCED CONCRETE PIPE

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1992  
REV. 1996, 1997, 1999, 2009

**CONCRETE COLLAR FOR RCP**  
**12" (300 mm) THROUGH 72" (1800 mm)**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**380-4**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 380-4-OC FOR CONDITIONS**

## NOTES

1. A CONCRETE COLLAR IS REQUIRED WHERE THE CHANGE IN GRADE EXCEEDS 10%.
2. FOR CURVE JOINTS (SEE DETAIL B, SHEET 1)  
IF THE EXTREME ENDS OF THE PIPE LEAVE A CLEAR SPACE THAT IS GREATER THAN 1" (25 mm), BUT IS LESS THAN 3" (75 mm) A CONCRETE COVER IS REQUIRED IN ACCORDANCE WITH SSPWC 306-1.2.4.  
IF THE EXTREME ENDS OF THE PIPE LEAVE A CLEAR SPACE THAT IS EQUAL TO OR GREATER THAN 3" (75 mm), BUT LESS THAN 6" (150 mm), A CONCRETE COLLAR IS REQUIRED. IF THE CLEAR SPACE IS 6" (150 mm) OR GREATER, A TRANSITION STRUCTURE IS REQUIRED.
3. CONCRETE COLLAR SHALL NOT BE USED FOR A SIZE CHANGE ON THE MAIN LINE.
4. CONNECTOR PIPES
  - A. WHERE PIPES OF DIFFERENT DIAMETERS ARE JOINED WITH A CONCRETE COLLAR, L AND T SHALL BE THOSE OF THE LARGER PIPE.  $D = D_1$  OR  $D_2$ , WHICHEVER IS GREATER.
  - B. WHEN  $D_1$  IS EQUAL TO OR LESS THAN  $D_2$ , JOIN INVERTS AND WHEN  $D_1$  IS GREATER THAN  $D_2$ , JOIN SOFFITS.
5. FOR PIPE LARGER THAN 72" (1800 mm) SPECIAL COLLAR DETAILS ARE REQUIRED.
6. FOR PIPE SIZE NOT LISTED USE NEXT SIZE LARGER.
7. REINFORCEMENT SHALL CONFORM TO ASTM A 615 (A 615 M) GRADE 40 (300).
8. WHERE REINFORCING IS REQUIRED THE DIAMETER OF THE CIRCULAR TIES SHALL BE  $D + (2 \times \text{WALL THICKNESS}) + T$ .
9. REINFORCING SHALL BE USED WHERE THE PIPE DIAMETER IS GREATER THAN 21" (525 mm) AND ON ALL PIPES WHERE THE SPACES BETWEEN THE EXTREME OUTER ENDS IS 3" (75 mm) OR LARGER.

CIRCULAR TIES:

PIPE DIAMETER	NO. OF CIRCULAR TIES
21" (525 mm) OR LESS	3
24" (600 mm) TO 30" (750 mm)	3
33" (825 mm) TO 57" (1425 mm)	4
60" (1500 mm) TO 72" (1800 mm)	5

WHERE THE SPACE BETWEEN PIPE ENDS EXCEEDS 3" (75 mm), THE NUMBER OF CIRCULAR TIES SHALL BE INCREASED TO MAINTAIN AN APPROXIMATE SPACING OF 6" (150 mm) O.C.

10. WHERE THE PIPE IS 21" (525 mm) OR LESS IN DIAMETER AN INTERIOR FORM OF UNSEALED SONO-TUBE OR EQUAL SHALL BE USED TO PROVIDE A SMOOTH INTERIOR JOINT. THE PAPER FORM MAY BE LEFT IN PLACE (SEE DETAIL A). WHEN THE PIPE IS 24" (600 mm) OR LARGER A REMOVABLE INTERIOR FORM SHALL BE USED OR THE INTERIOR JOINT SHALL BE COMPLETELY FILLED WITH MORTAR AND NEATLY POINTED.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**CONCRETE COLLAR FOR RCP**  
**12" (300 mm) THROUGH 72" (1800 mm)**

STANDARD PLAN

**380-4**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 380-4-OC FOR CONDITIONS**

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
380-4	380-4-OC	<u>CONCRETE COLLAR FOR RCP</u> 12" THROUGH 72"

- | D             | L            | T            | $\angle A$ |
|---------------|--------------|--------------|------------|
| 12" (300 mm)  | 12" (300 mm) | 4" (100 mm)  | 01°49'35"  |
| 18" (450 mm)  | 12" (300 mm) | 5" (125 mm)  | 01°16'14"  |
| 24" (600 mm)  | 12" (300 mm) | 6" (150 mm)  | 00°58'27"  |
| 30" (750 mm)  | 18" (450 mm) | 7" (175 mm)  | 00°47'23"  |
| 36" (900 mm)  | 18" (450 mm) | 9" (225 mm)  | 00°39'51"  |
| 42" (1050 mm) | 18" (450 mm) | 9" (225 mm)  | 00°34'23"  |
| 48" (1200 mm) | 18" (450 mm) | 10" (250 mm) | 00°30'14"  |
| 54" (1372 mm) | 18" (450 mm) | 10" (250 mm) | 00°26'58"  |
| 60" (1500 mm) | 21" (525 mm) | 11" (275 mm) | 00°24'21"  |
| 66" (1650 mm) | 21" (525 mm) | 11" (275 mm) | 00°22'12"  |
| 72" (1800 mm) | 24" (600 mm) | 12" (300 mm) | 00°20'23"  |

SHT. 1 OF 1



POINT OF CONNECTION

POC

WATER METER



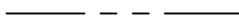
PIPE – LATERAL LINE



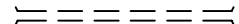
PIPE – PRESSURE WATER MAIN



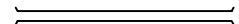
PIPE – POTABLE WATER



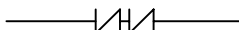
SLEEVE – EXISTING



SLEEVE – NEW



BACKFLOW PREVENTION ASSEMBLY –  
DOUBLE CHECK TYPE



BACKFLOW PREVENTION ASSEMBLY –  
REDUCED PRESSURE



VACUUM BREAKER ASSEMBLY –  
ATMOSPHERIC TYPE



VACUUM BREAKER ASSEMBLY –  
PRESSURE TYPE



PRESSURE REGULATOR



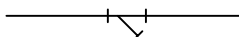
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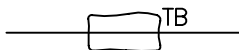
PUMP



Y-STRAINER



THRUST BLOCK



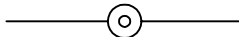
ANGLE VALVE



GATE VALVE



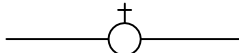
QUICK COUPLER VALVE –  
ABOVE GRADE



QUICK COUPLER VALVE –  
BELOW GRADE



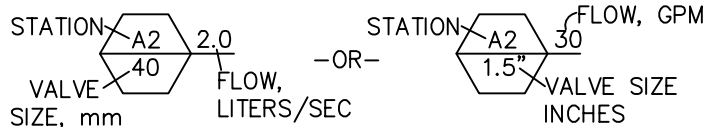
HOSE BIBB



REMOTE CONTROL VALVE



RCV STATION INFORMATION



## STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1993  
REV. 2005, 2009

# LANDSCAPE IRRIGATION SYMBOLS

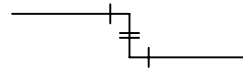
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

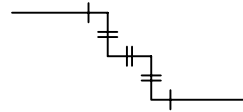
## 500-2

SHEET 1 OF 2

SWING JOINT ASSEMBLY –  
SINGLE

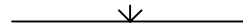


SWING JOINT ASSEMBLY –  
DOUBLE

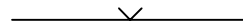


SHRUB HEAD\*

1/4 CIRCLE

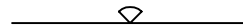


1/2 CIRCLE



LAWN HEAD\*

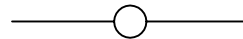
1/4 CIRCLE



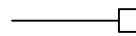
1/2 CIRCLE



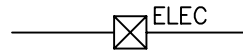
FULL



BUBBLER HEAD



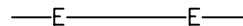
ELECTRICAL METER CABINET



AUTOMATIC CONTROLLER & CABINET



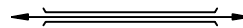
ELECTRICAL CONDUIT



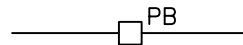
CONTROL WIRES – DIRECT BURIAL



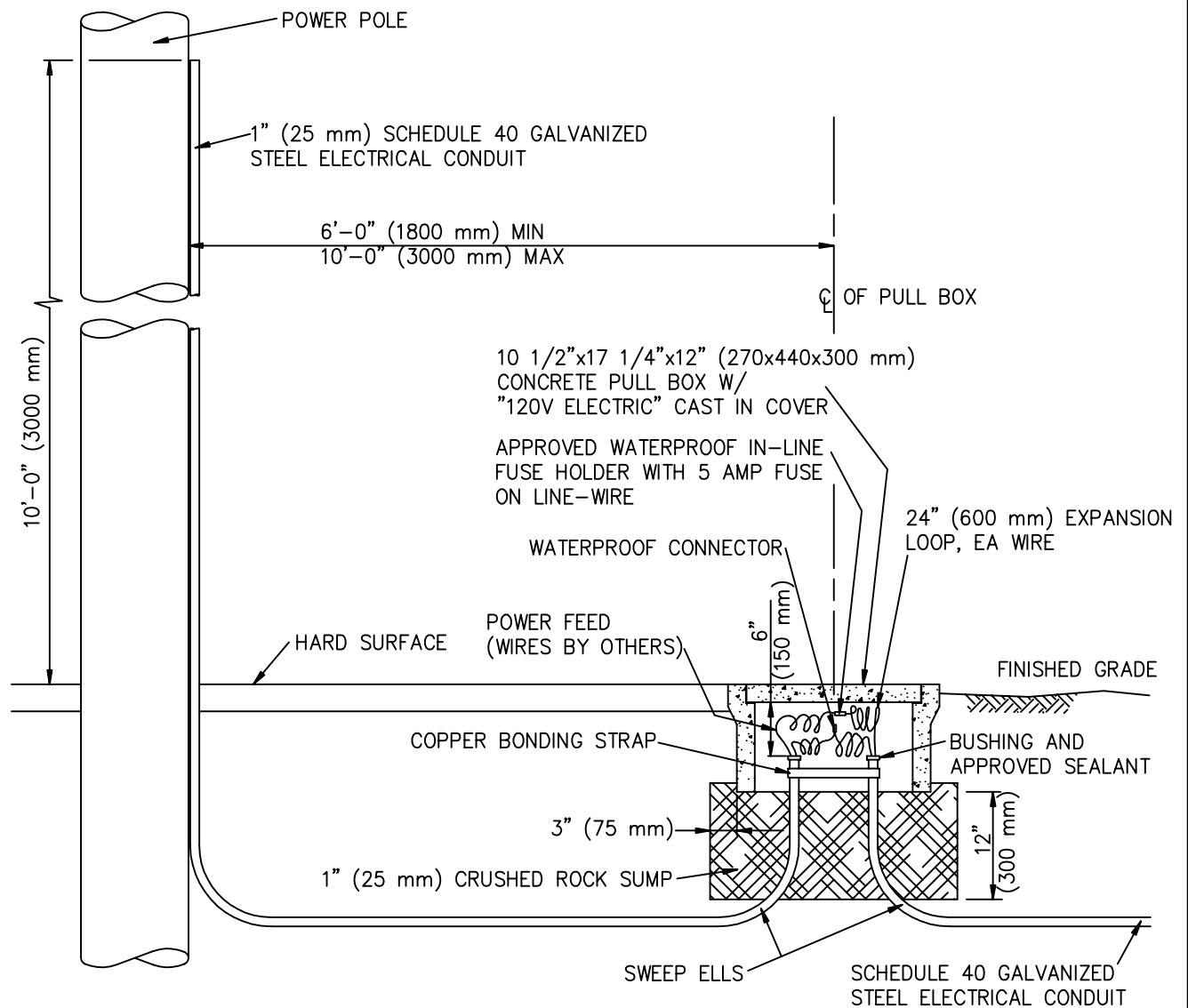
CONTROL WIRES – IN CONDUIT



PULL BOX



\*SEE PLANS FOR SYMBOLS USED FOR MULTIPLE TYPES AND SIZES



**NOTES:**

1. AREA AROUND BOX MAY BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.
2. TOP OF BOX:  
AT GRADE FOR HARD SURFACE  
1/2" (12 mm) ABOVE GRADE FOR LAWN  
1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS
3. CRUSHED ROCK SHALL COVER ELECTRICAL BOX SIDE OPENINGS TO PREVENT SOIL ENTRY.
4. WATERPROOF CONNECTORS SHALL BE SUBJECT TO ENGINEER'S APPROVAL.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

**ELECTRICAL SERVICE**

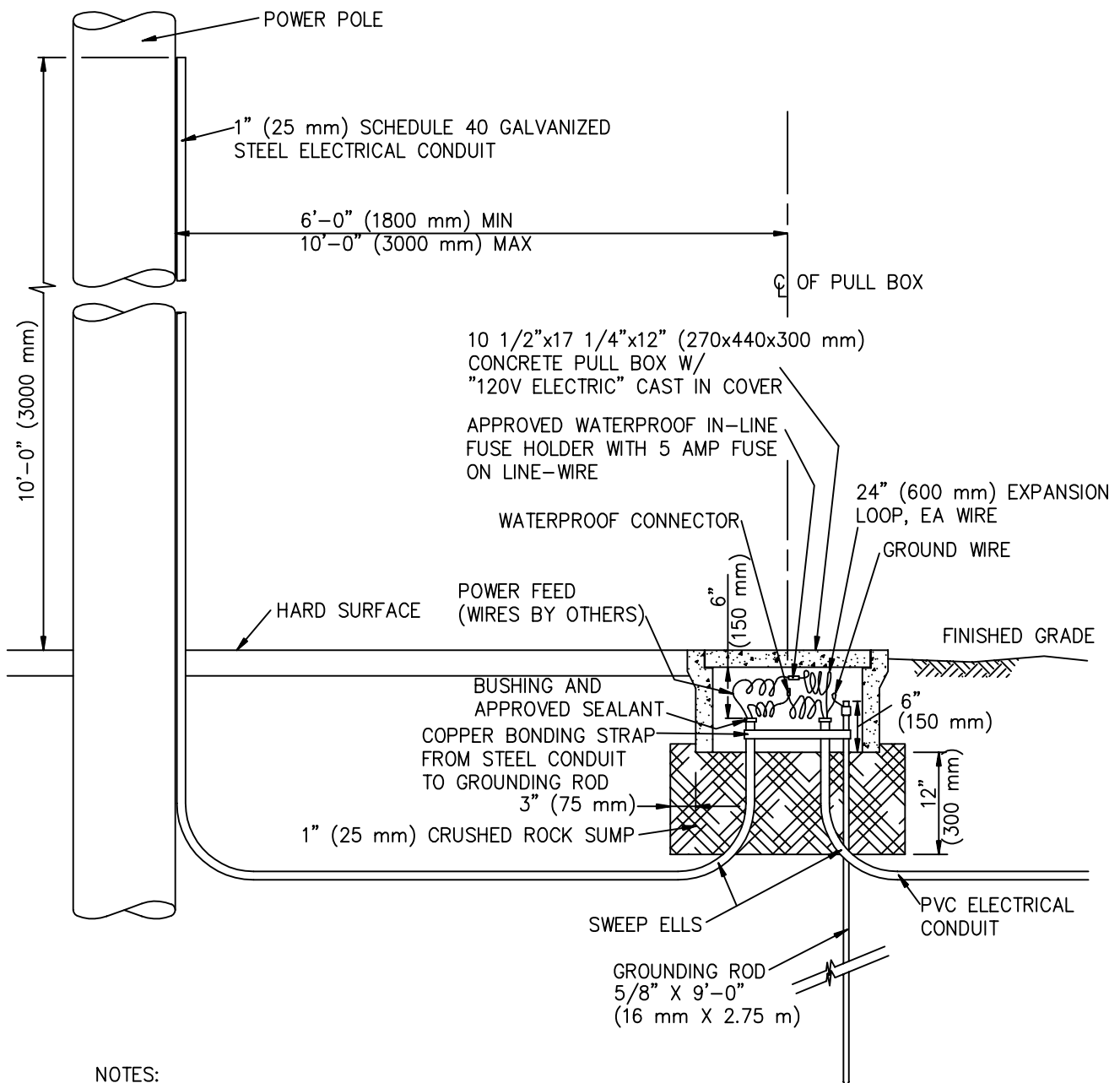
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**501-3**

SHEET 1 OF 3

**SEE OCPW STANDARD PLAN 501-3-OC FOR CONDITIONS**



**NOTES:**

1. AREA AROUND BOX MAY BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.
2. TOP OF BOX:  
AT GRADE FOR HARD SURFACE  
1/2" (12 mm) ABOVE GRADE FOR LAWN  
1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS
3. CRUSHED ROCK SHALL COVER ELECTRICAL BOX SIDE OPENINGS TO PREVENT SOIL ENTRY.
4. WATERPROOF CONNECTORS SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.
5. GROUND WIRE SHALL BE CONTINUOUS No. 10 COPPER, WRAPPED AROUND AND BONDED TO GROUNDING ROD WITH AN APPROVED CLAMP.
6. GROUNDING ROD SHALL BE COPPER-CLAD STEEL.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

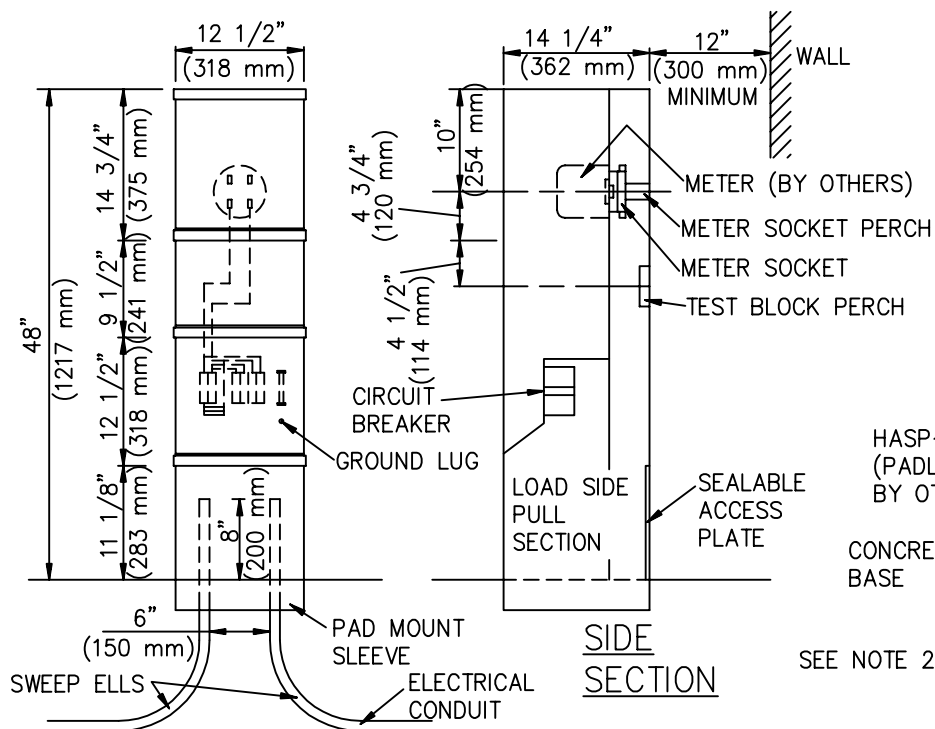
**ELECTRICAL SERVICE**

STANDARD PLAN

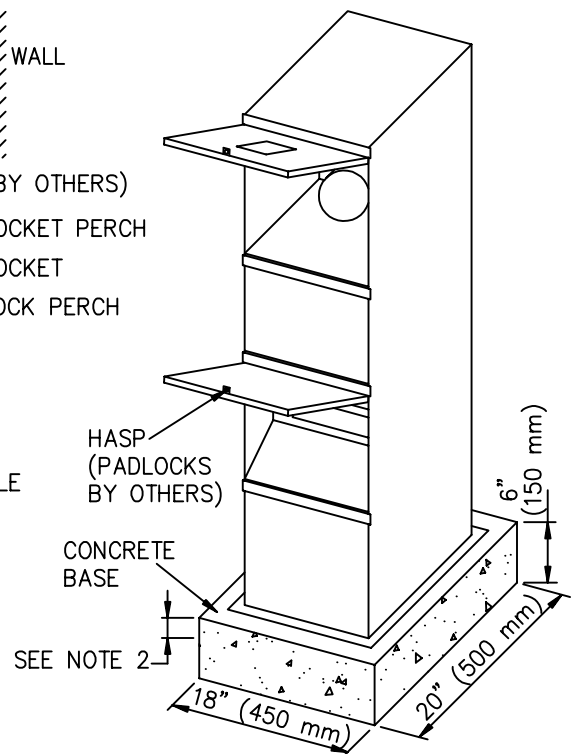
**501-3**

SHEET 2 OF 3

**SEE OCPW STANDARD PLAN 501-3-OC FOR CONDITIONS**



FRONT ELEVATION



OBLIQUE VIEW

NOTES:

1. AREA AROUND BOX MAY BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.
2. TOP OF CONCRETE BASE:  
AT GRADE FOR HARD SURFACE  
1/2" (12 mm) ABOVE GRADE FOR LAWN  
1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS
3. CONCRETE BASE SHALL BE CLASS 450-C-2000 (265-C-14)
4. CONTRACTOR SHALL FILL PAD MOUNT WITH 1" (25 mm) CRUSHED ROCK 12" (300 mm) DEEP.
5. MATERIAL (UNLESS OTHERWISE NOTED):  
BODY - 12 GAGE (2.75 mm) GALVANIZED STEEL. DEAD FRONT AND COVERS -  
16 GAGE (1.61 mm) GALVANIZED STEEL. FINISH - IRON PHOSPHATE DIP,  
ZINC CHROMATE PRIME, GREEN BAKED ENAMEL SURFACE.
6. CABINET SHALL INCLUDE 2 POLE MAIN CIRCUIT BREAKER, 100 A.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**ELECTRICAL SERVICE**

STANDARD PLAN

**501-3**

SHEET 3 OF 3

**SEE OCPW STANDARD PLAN 501-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITONS</u>
501-3	501-3-OC	<u>ELECTRICAL SERVICE</u>

SHEET 1

1. DELETE SCHEDULE 40 GALVANIZED STEEL AT POWER POLE. ADD SCHEDULE 80 PVC.
2. ADD APPROVED TO WATERPROOF CONNECTION.
3. DELETE SCHEDULE 40 GALVANIZED STEEL AT SWEEP ELL. ADD SCHEDULE 40 PVC.
4. DELETE COPPER BONDING STRAP.
5. PLASTIC BOX MAY BE SUBSTITUTED IN PLANTING AREAS NOT IMMEDIATELY ADJACENT TO OR IN CONCRETE.

SHEET 2

NOT APPROVED

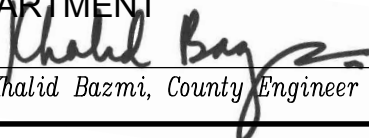
SHEET 3

1. ADD NOTE 7. EQUIPMENT SHALL BE UL LISTED.
2. ADD NOTE 8. SLOPE CONCRETE AWAY FROM BASE AT 1 PERCENT MIN.
3. ADD NOTE 9. INSTALL GROUND ROD  $\frac{5}{8}$  INCH BY 9 FOOT COPPER CLAD STEEL IN METER CABINET.
4. ADD NOTE 10. INSTALL PER NEC REQUIREMENTS.
5. ADD CONTINUOUS NO. 10 COPPER GROUND WIRE WRAPPED AROUND AND BONDED WITH AN APPROVED GROUND CLAMP TO GROUNDING ROD.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

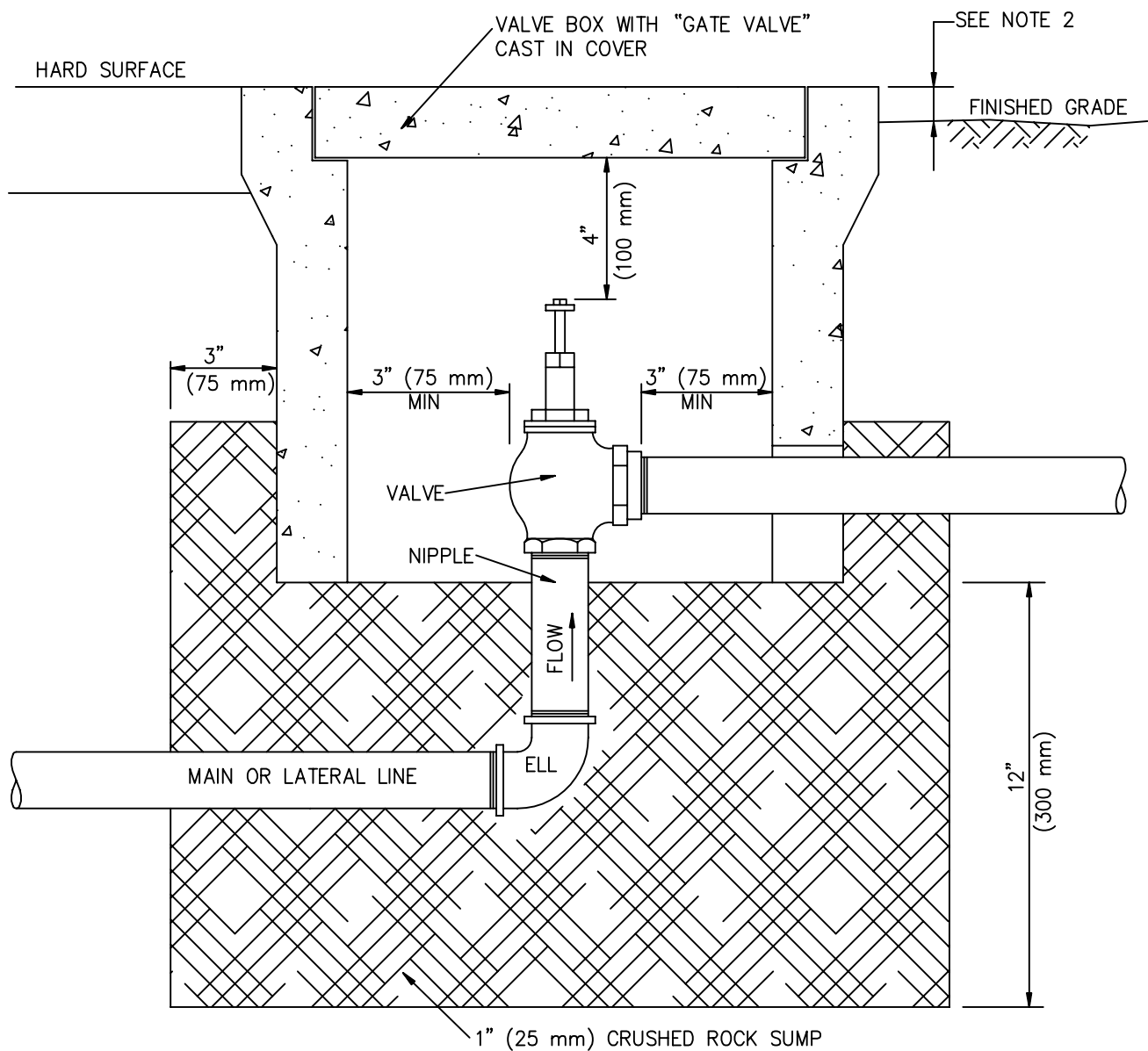
  
Khalid Bazmi, County Engineer

STD. PLAN

501-3-OC

SPPWC STANDARD PLAN - ELECTRICAL SERVICE

SHT. 1 OF 1



**NOTES:**

1. AREA AROUND BOX MAY BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.
2. TOP OF BOX:  
 AT GRADE FOR HARD SURFACE  
 1/2" (12 mm) ABOVE GRADE FOR LAWN  
 1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS
3. CLOSE NIPPLES SHALL NOT BE USED.
4. CRUSHED ROCK SHALL COVER VALVE BOX PIPE OPENINGS TO PREVENT SOIL ENTRY.

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

**ANGLE VALVE**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**502-3**

SHEET 1 OF 1

**SEE OCPW STANDARD PLAN 502-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

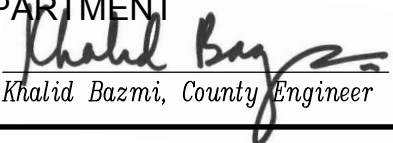
SPPWC #   OCPW #   NAME AND CONDITIONS  
502-3      502-3-OC      ANGLE VALVE

1. USE CLASS 315 PVC PIPE AND SCHEDULE 40 PVC FITTINGS FOR 2 INCHES OR GREATER. USE SCHEDULE 40 PVC PIPE AND FITTINGS FOR SIZES 1½ INCHES OR LESS.
2. PROVIDE TWO OPERATING KEYS FOR VALVES.
3. FOR TURF AREAS – ALL ANGLE VALVES SHALL BE LOCATED OUTSIDE THE DESIGNATED PLAYING FIELD (I.E., BALL DIAMOND, SOCCER, ETC.).
4. VALVES UP TO 2 INCHES IN DIAMETER SHALL HAVE MALLEABLE IRON "TEE" HANDLES. VALVES LARGER THAN 2 INCHES IN DIAMETER SHALL HAVE SQUARE OPERATING NUTS.
5. VALVE BOX SHALL BE ONE OF THE FOLLOWING CASES AS SPECIFIED ON THE PLANS:  
  
CASE 1. CONCRETE BOX W/CONCRETE COVER  
  
CASE 2. CONCRETE BOX W/LOCKING CAST IRON COVER  
  
CASE 3. PLASTIC BOX W/LOCKING PLASTIC COVER
6. WRAP LANDSCAPE FABRIC AROUND SIDES AND BOTTOM OF BOX TO COVER ALL OPENINGS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

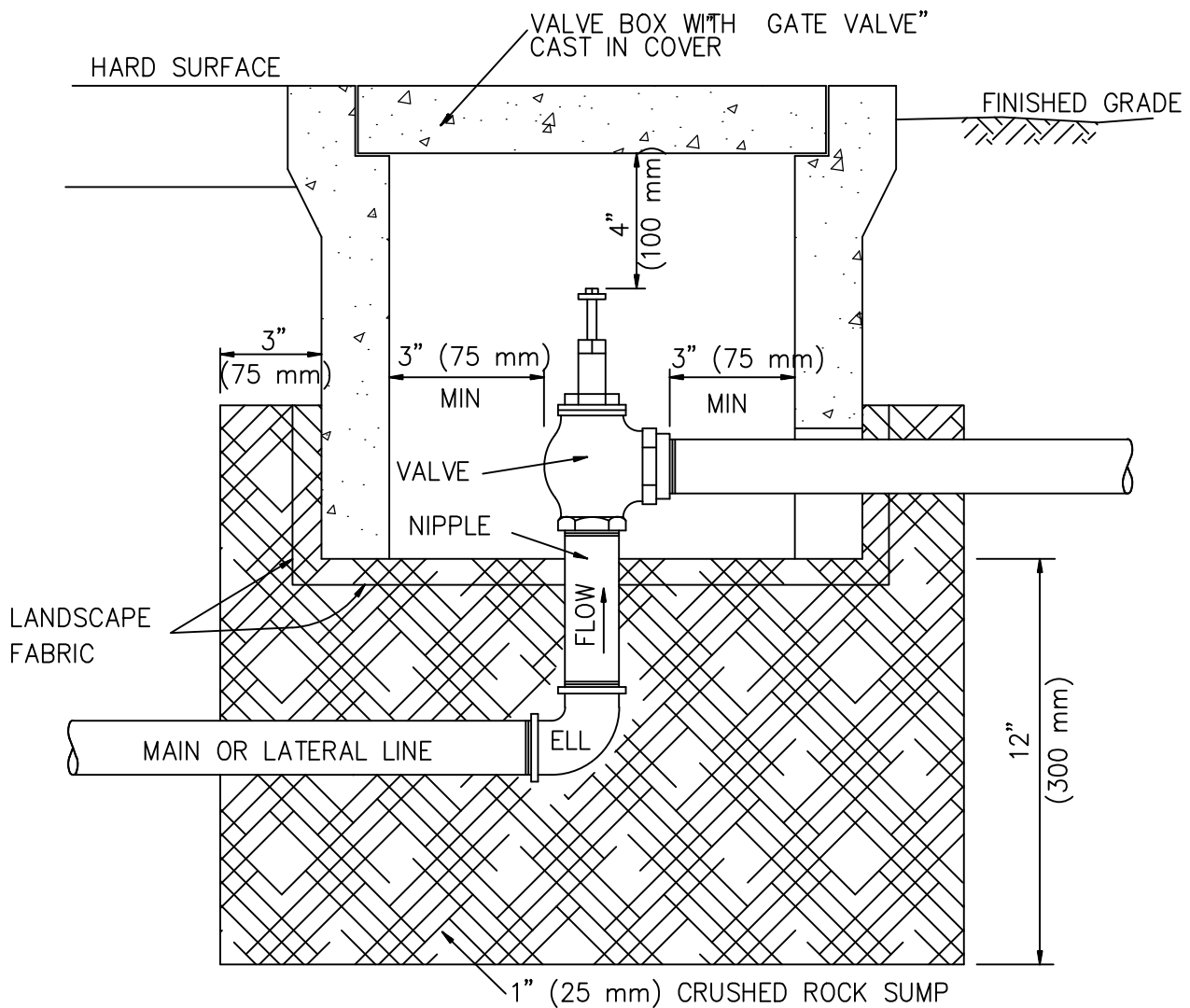
  
Khalid Bazmi, County Engineer

STD. PLAN

502-3-OC

SPPWC STANDARD PLAN - ANGLE VALVE

SHT. 1 OF 2



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

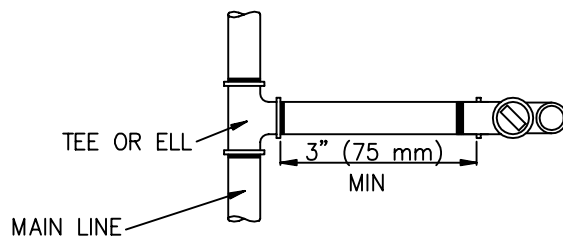
STD. PLAN

502-3-OC

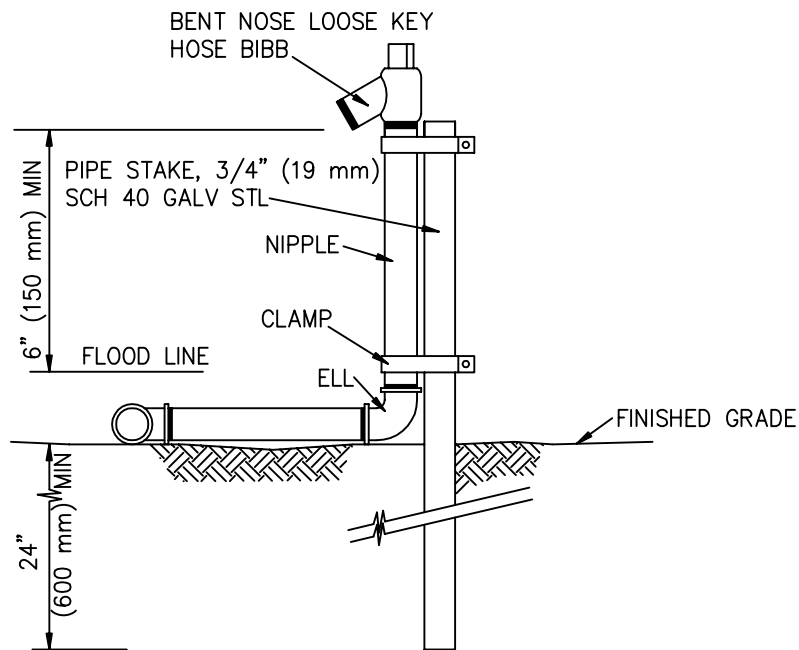
SPPWC STANDARD PLAN - ANGLE VALVE

SHT. 2 OF 2





PLAN



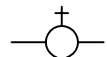
ELEVATION

NOTES:

1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 GALVANIZED STEEL.
2. PIPE SIZE FROM MAIN LINE SHALL MATCH QUICK COUPLER INLET DIAMETER.
3. DISSIMILAR METALS SHALL BE SEPARATED BY AN APPROVED DIELECTRIC COUPLING.
4. CLAMPS SHALL BE STEEL (COMMERCIAL QUALITY, GALVANIZED OR CADMIUM PLATED) OR STAINLESS STEEL.
5. PLASTIC PIPE SHALL NOT BE USED ABOVE FINISHED GRADE.

ABOVE-GRADE PIPING INSTALLATION

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

**HOSE BIBB VALVE**

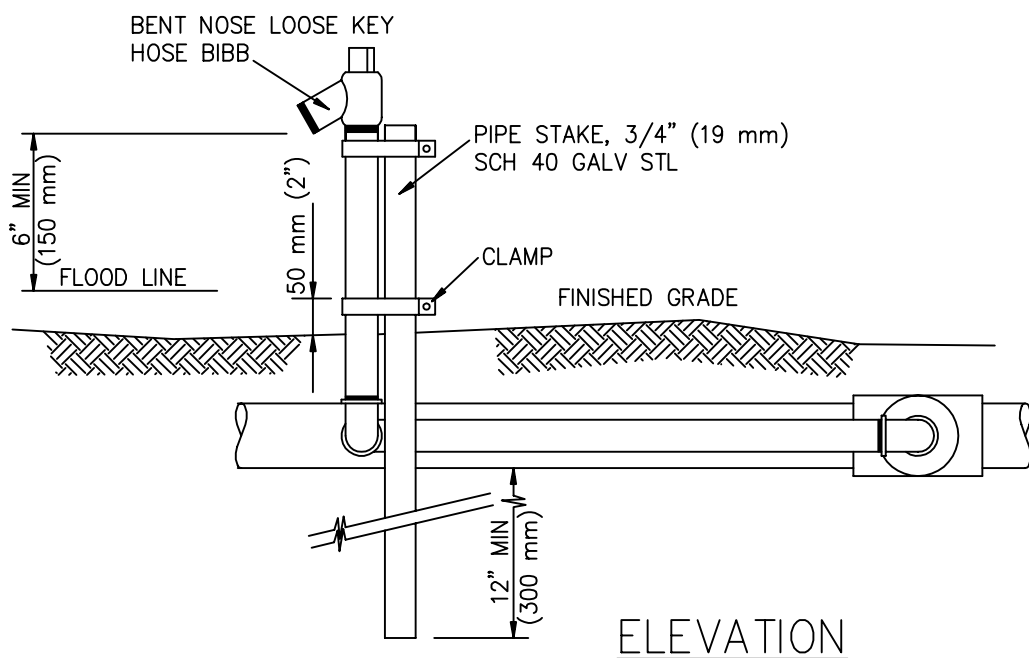
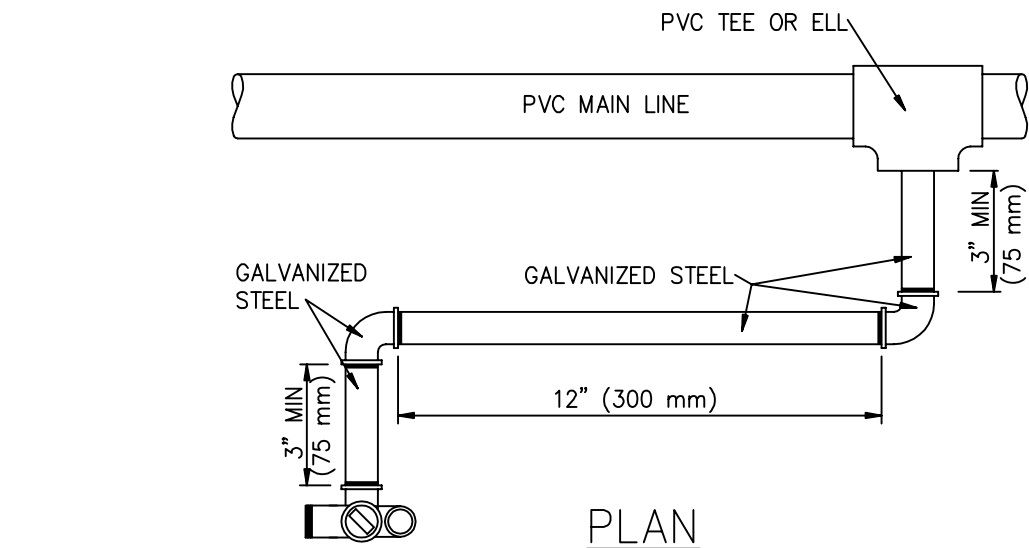
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**505-3**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 505-3-OC FOR CONDITIONS**



NOTES:

1. GALVANIZED STEEL PIPE AND FITTINGS SHALL BE SCHEDULE 40. PVC PIPE AND FITTINGS SHALL BE SCHEDULE 80.
2. VALVE IN LAWN AREAS SHALL BE SET AT GRADE. IN SHRUB AREAS, VALVE SHALL BE SET 4" (100 mm) ABOVE FINISHED GRADE.
2. PIPE SIZE FROM MAIN LINE SHALL MATCH QUICK COUPLER INLET DIAMETER.
3. DISSIMILAR METALS SHALL BE SEPARATED BY AN APPROVED DIELECTRIC COUPLING.
4. CLAMPS SHALL BE STEEL (COMMERCIAL QUALITY, GALVANIZED OR CADMIUM PLATED) OR STAINLESS STEEL.
5. PLASTIC PIPE SHALL NOT BE USED ABOVE FINISHED GRADE.

BELOW-GRADE PIPING INSTALLATION

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**HOSE BIBB VALVE**

STANDARD PLAN

**505-3**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 505-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
505-3	505-3-OC	<u>HOSE BIBB VALVE</u>

SHEET 1

1. HOSE BIBB VALVE SHALL BE BRASS.
2. FOR TURF AREAS - ALL HOSE BIBB VALVES SHALL BE LOCATED OUTSIDE THE DESIGNATED PLAYING AREA (I.E., BALL DIAMOND, SOCCER FIELD, ETC.).
3. REVISE NOTE 5 TO READ: SCHEDULE 80 PVC RISERS, FITTINGS AND SCHEDULE 40 ULTRAVIOLET RESISTANT PVC PIPE ARE APPROVED FOR ABOVE GROUND INSTALLATION.

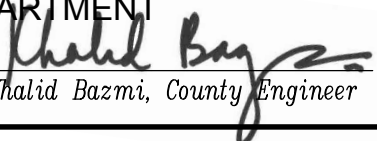
SHEET 2

1. HOSE BIBB VALVE SHALL BE BRASS.
2. FOR TURF AREAS - ALL HOSE BIBB VALVES SHALL BE LOCATED OUTSIDE THE DESIGNATED PLAYING AREA (I.E., BALL DIAMOND, SOCCER FIELD, ETC.).
3. REVISE NOTE 5 TO READ: SCHEDULE 80 PVC RISERS, FITTINGS AND SCHEDULE 40 ULTRAVIOLET RESISTANT PVC PIPE ARE APPROVED FOR ABOVE GROUND INSTALLATION.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

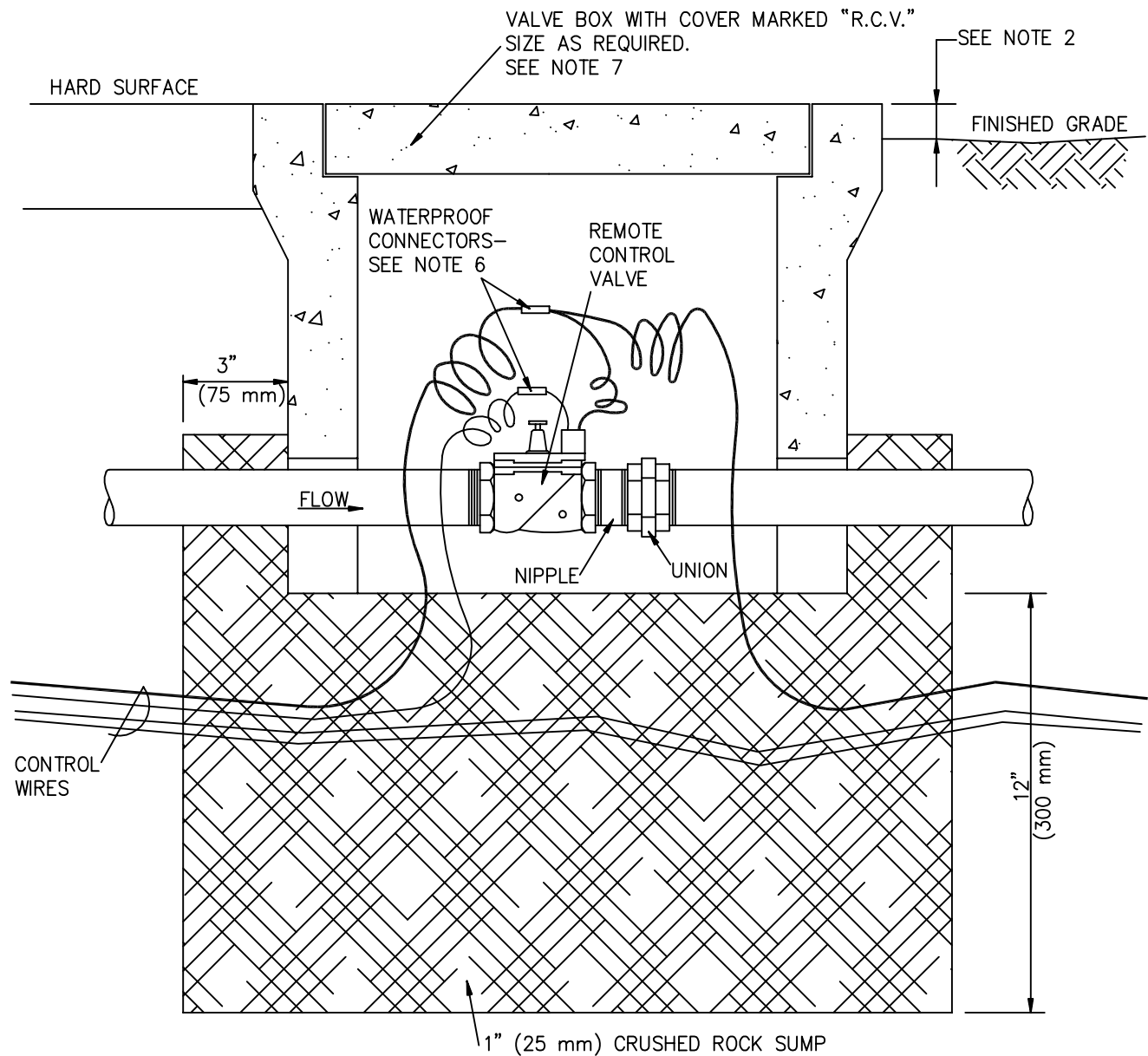
STD. PLAN

505-3-OC

SPPWC STANDARD PLAN - HOSE BIBB VALVE

SHT. 1 OF 1





**NOTES:**

1. AREA AROUND BOX MAY EITHER BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.
2. TOP OF BOX:  
 AT GRADE FOR HARD SURFACE  
 1/2" (12 mm) ABOVE GRADE FOR LAWN  
 1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS
3. CLOSE NIPPLES SHALL NOT BE USED.
4. CRUSHED ROCK SHALL COVER VALVE BOX PIPE OPENINGS TO PREVENT SOIL ENTRY.
5. PIPE AND FITTINGS SHALL BE SCHEDULE 80 PVC.
6. WATERPROOF CONNECTORS SHALL BE SUBJECT TO ENGINEER'S APPROVAL.
7. VALVE BOX SHALL BE AS SPECIFIED, EITHER:  
 CASE 1—CONCRETE BOX w/ CONCRETE COVER  
 CASE 2—CONCRETE BOX w/ LOCKING CAST IRON COVER  
 CASE 3—PLASTIC BOX w/ LOCKING PLASTIC COVER
8. PROVIDE 24" (600 mm) EXPANSION LOOP FOR EACH CONTROL WIRE IN BOX.

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

**REMOTE CONTROL VALVE**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**506-3**

SHEET 1 OF 1

**SEE OCPW STANDARD PLAN 506-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.


SPPWC #    OCPW #    NAME AND CONDITIONS  
506-3        506-3-OC        REMOVE CONTROL VALVE

1. USE CLASS 315 PVC PIPE AND SCHEDULE 40 PVC FITTINGS FOR SIZES 2 INCHES OR GREATER. USE SCHEDULE 40 PVC PIPE AND FITTINGS FOR SIZES 1 INCHES OR LESS.
2. PROVIDE ONE CONTROLLER VALVE ID TAGS PER VALVE. ID TAGS SHALL BE POLYURETHANE 2 $\frac{1}{4}$  INCHES X 2 $\frac{3}{4}$  INCHES MINIMUM WITH 1 $\frac{1}{8}$  INCHES BLOCK LETTERS ON A CONTRASTING BACKGROUND.
3. ALL REMOVE CONTROL VALVES AND ENCLOSURES SHALL BE LOCATED OUTSIDE OF DESIGNATED PLAYING FIELD (I.E., BASEBALL, SOCCER, ETC.).
4. DISTANCE BETWEEN BOTTOM OF VALVE BOX COVER AND TOP OF VALVE SHALL BE 4 INCHES.
5. WRAP LANDSCAPE FABRIC AROUND SIDES AND BOTTOM OF BOX TO COVER ALL OPENINGS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

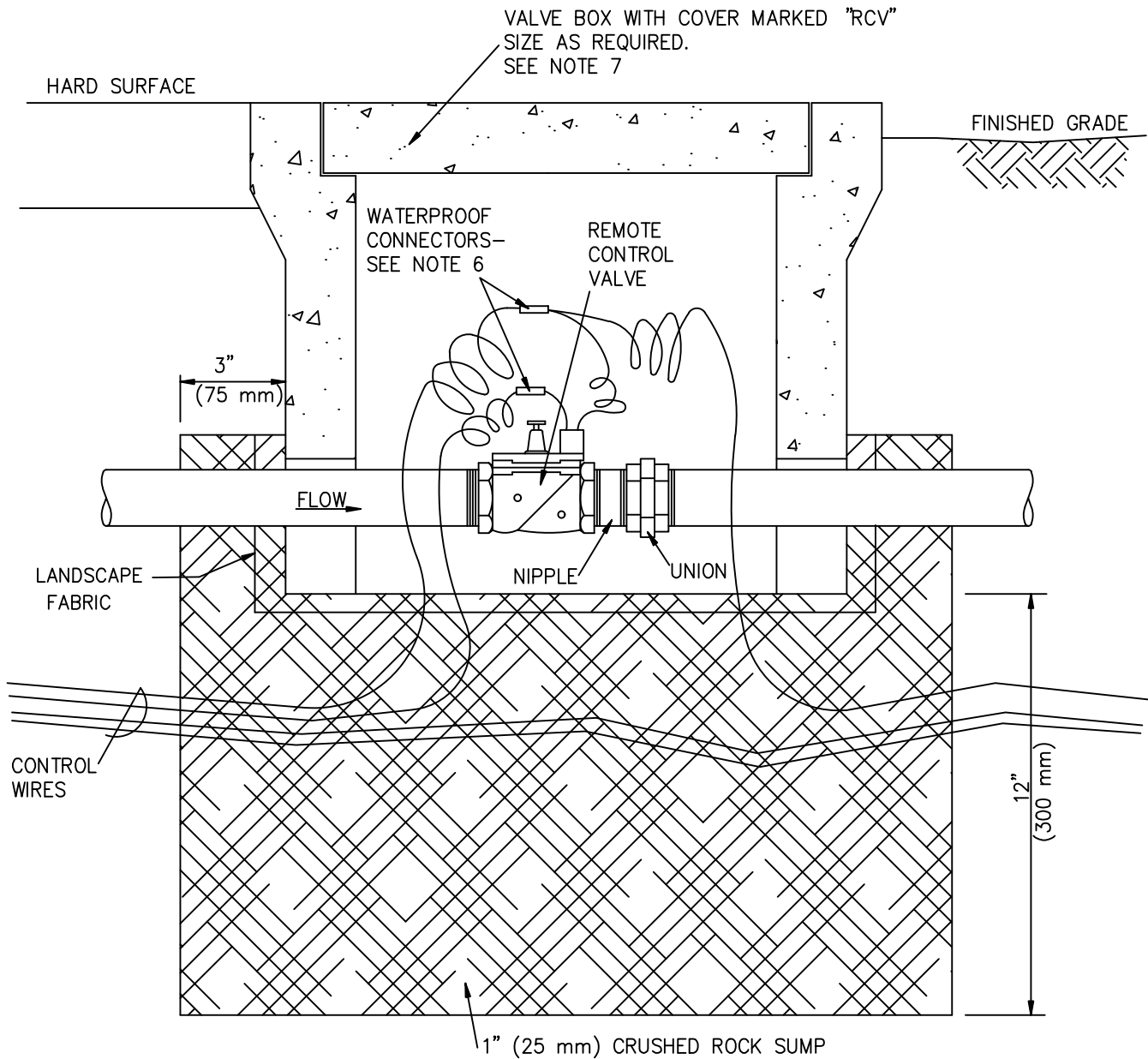
  
Khalid Bazmi, County Engineer

STD. PLAN

506-3-OC

SPPWC STANDARD PLAN - REMOTE CONTROL VALVE

SHT. 1 OF 2



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

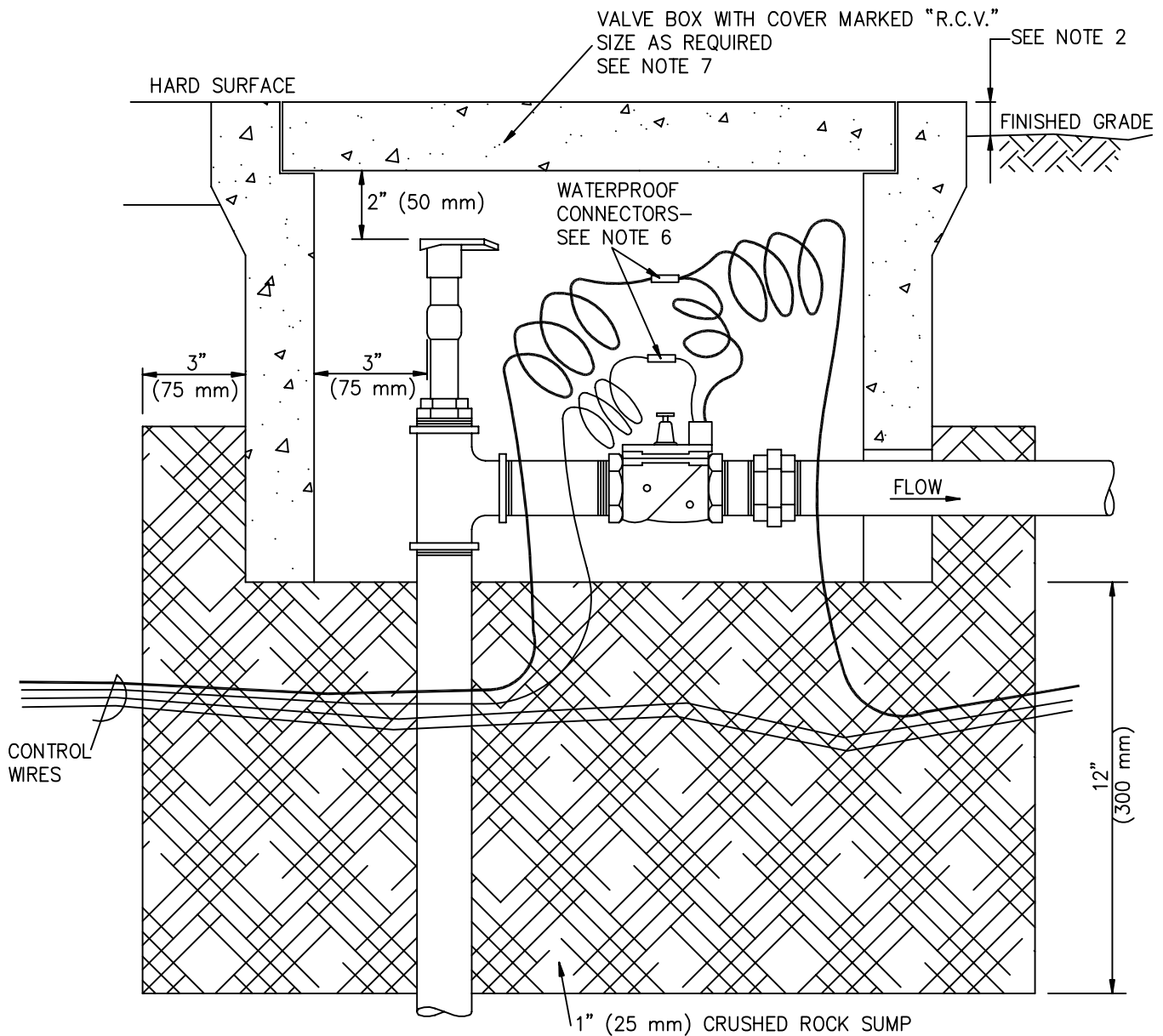
STD. PLAN

506-3-OC

SPPWC STANDARD PLAN - REMOTE CONTROL VALVE

SHT. 2 OF 2





**NOTES:**

1. AREA AROUND BOX MAY EITHER BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.
2. TOP OF BOX:  
 AT GRADE FOR HARD SURFACE  
 1/2" (12 mm) ABOVE GRADE FOR LAWN  
 1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS
3. CLOSE NIPPLES SHALL NOT BE USED.
4. CRUSHED ROCK SHALL COVER VALVE BOX PIPE OPENINGS TO PREVENT SOIL ENTRY.
5. PIPE AND FITTINGS SHALL BE SCHEDULE 80 PVC.
6. WATERPROOF CONNECTORS SHALL BE SUBJECT TO ENGINEER'S APPROVAL.
7. VALVE BOX SHALL BE AS SPECIFIED, EITHER:  
 CASE 1-CONCRETE BOX w/ CONCRETE COVER  
 CASE 2-CONCRETE BOX w/ LOCKING CAST IRON COVER  
 CASE 3-PLASTIC BOX w/ LOCKING PLASTIC COVER
8. PROVIDE 24" (600 mm) EXPANSION LOOP FOR EACH CONTROL WIRE IN BOX.

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

**REMOTE CONTROL VALVE  
WITH QUICK COUPLER**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**507-3**

SHEET 1 OF 1

**SEE OCPW STANDARD PLAN 507-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

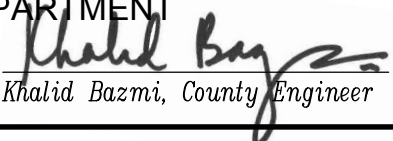
<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
507-3	507-3-OC	<u>REMOTE CONTROL VALVE WITH QUICK COUPLER</u>

1. USE CLASS 315 PVC PIPE AND SCHEDULE 40 PVC FITTINGS FOR SIZE 2 INCHES OR GREATER. USE SCHEDULE 40 PVC PIPE AND FITTINGS FOR SIZES 1 INCHES OR LESS.
2. PROVIDE ONE CONTROLLER VALVE IDENTIFICATION TAG PER VALVE. ID TAGS SHALL BE POLYURETHANE 2 INCHES X 2 INCHES WITH 4 8 INCHES BLACK LETTERS ON A CONTRASTING BACKGROUND.
3. ALL REMOTE CONTROL VALVES WITH QUICK COUPLER AND ENCLOSURES SHALL BE LOCATED OUTSIDE OF DESIGNATED PLAYING FIELD (I.E., BASEBALL DIAMOND, SOCCER FIELD, ETC.).
4. DISTANCE BETWEEN BOTTOM OF VALVE BOX COVER AND TOP OF VALVE SHALL BE 4 INCHES.
5. QUICK COUPLER SHALL HAVE LOCKING.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

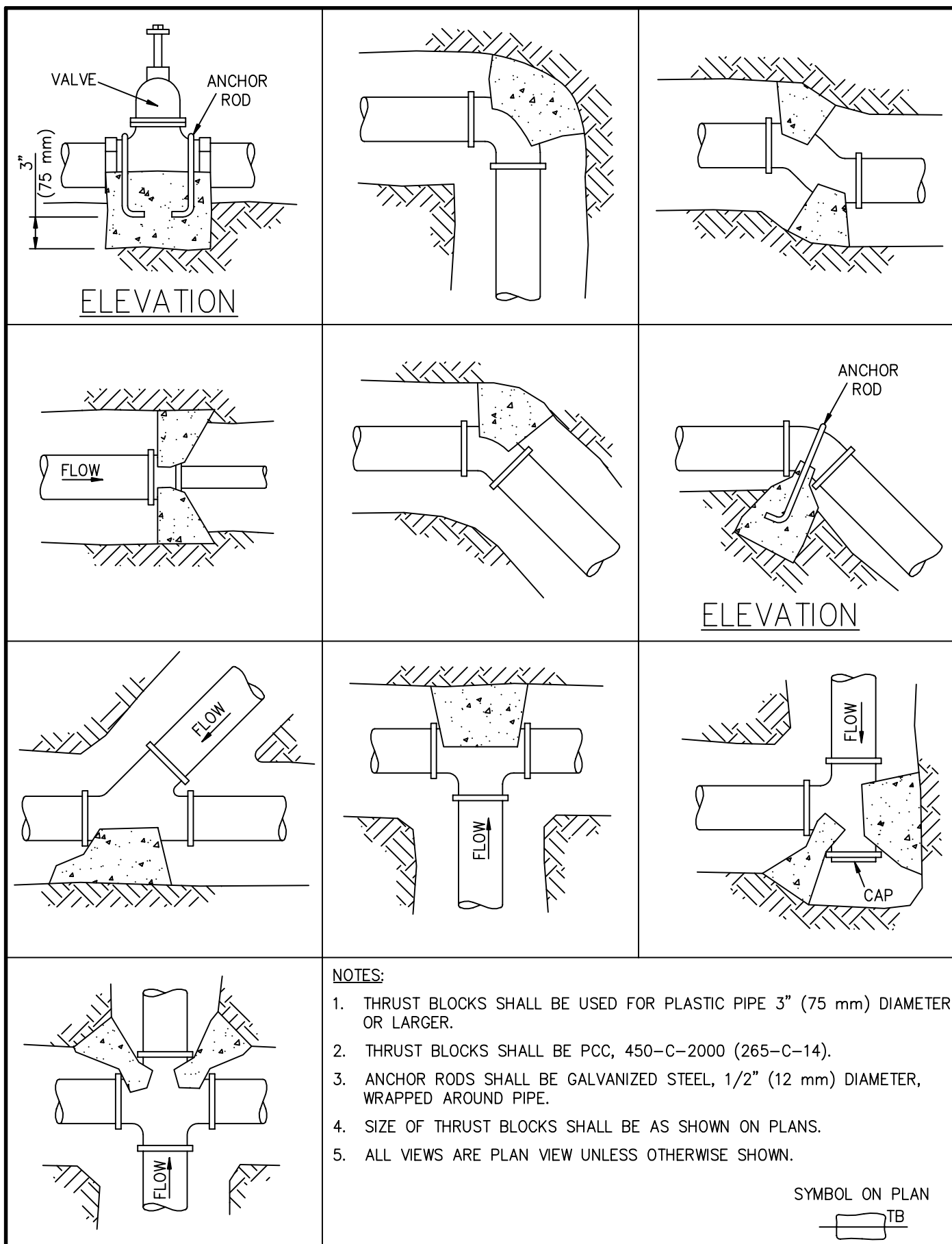
  
Khalid Bazmi, County Engineer

STD. PLAN

507-3-OC

SPPWC STANDARD PLAN-REMOTE CONTROL VALVE W/QUICK COUPLER

SHT. 1 OF 1



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

## THRUST BLOCKS FOR PLASTIC PIPE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

### 508-3

SHEET 1 OF 1

**SEE OCPW STANDARD PLAN 508-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC#      OCPW #      NAME AND CONDITIONS  
 508-3      508-3-OC      THRUST BLOCKS FOR PLASTIC PIPE

1. FOR DESIGN LINE PRESSURES OTHER THAN 100 PSI, THE REVISED BEARING AREA SHALL EQUAL THE ACTUAL LINE PRESSURE, AS DETERMINED BY ENGINEER, TIMES THE TABULATED AREA DIVIDED BY 100 PSI.
2. FOR ANGLES NOT TABULATED, USE THE NEXT LARGER TABULATED AREA (SEE BELOW).
3. REVISE NOTE 3 TO READ: THE REQUIRED BEARING AREAS MAY BE DECREASED WHEN THE ALLOWABLE SOIL BEARING CAPACITY HAS BEEN VERIFIED (SOIL REPORT) GREATER THAN 1,000 PSF.
4. ADD TO NOTE 2, UNLESS OTHERWISE NOTED.

DESIGN LINE PRESSURE = 100 psi (690 kPa)				
PIPE SIZE(mm)	REQUIRED BEARING AREA, SQ. FT. (m <sup>2</sup> )			
	TEE	90° ELL	45° ELL	22 <sup>1</sup> / <sub>2</sub> ° ELL
3" (70)	1.0 (0.09)	1.4 (0.13)	1.0 (0.09)	1.0 (0.09)
4" (100)	1.6 (0.15)	2.3 (0.21)	1.2 (0.11)	1.0 (0.09)
6" (150)	3.6 (0.33)	5.0 (0.46)	2.7 (0.25)	1.4 (0.13)
8" (200)	5.9 (0.55)	8.3 (0.77)	4.5 (0.42)	2.3 (0.21)
10" (250)	9.1 (0.85)	12.8 (1.19)	6.9 (0.64)	3.5 (0.33)
12" (300)	12.8 (1.19)	18.1 (1.68)	9.8 (0.91)	5.0 (0.46)

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi, County Engineer*

STD. PLAN

508-3-OC

SPPWC STANDARD PLAN - THRUST BLOCKS FOR PLASTIC PIPE

SHT. 1 OF 2

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
508-3	508-3-OC	<u>THRUST BLOCKS FOR PLASTIC PIPE</u>

5. THE FOLLOWING ARE GENERAL DESIGN CRITERIA:

a) ALL CONCRETE USED IN THRUST BLOCK SHALL ATTAIN 2,000 PSI AT 28 DAYS.

b) MIN. THICKNESS (IN) = MIN. BEARING AREA (SF) X

$$\begin{aligned} & 1,000 \text{ psf} / (0.85 \times \sqrt{2,000 \text{ psi} \times \text{bp (IN)}}) \\ & = 26.3 \times \text{MIN. BEARING AREA (SF)} / \text{bp (IN)} \end{aligned}$$

WHERE:

BP = CONCRETE CONTACT ALONG PIPE (IN)


ASSUMPTIONS:

- BASED ON 100 PSI WATER PRESSURE
- BEARING PRESSURE OF 1,000 PSF
- CONCRETE STRENGTH OF 2,000 PSI

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

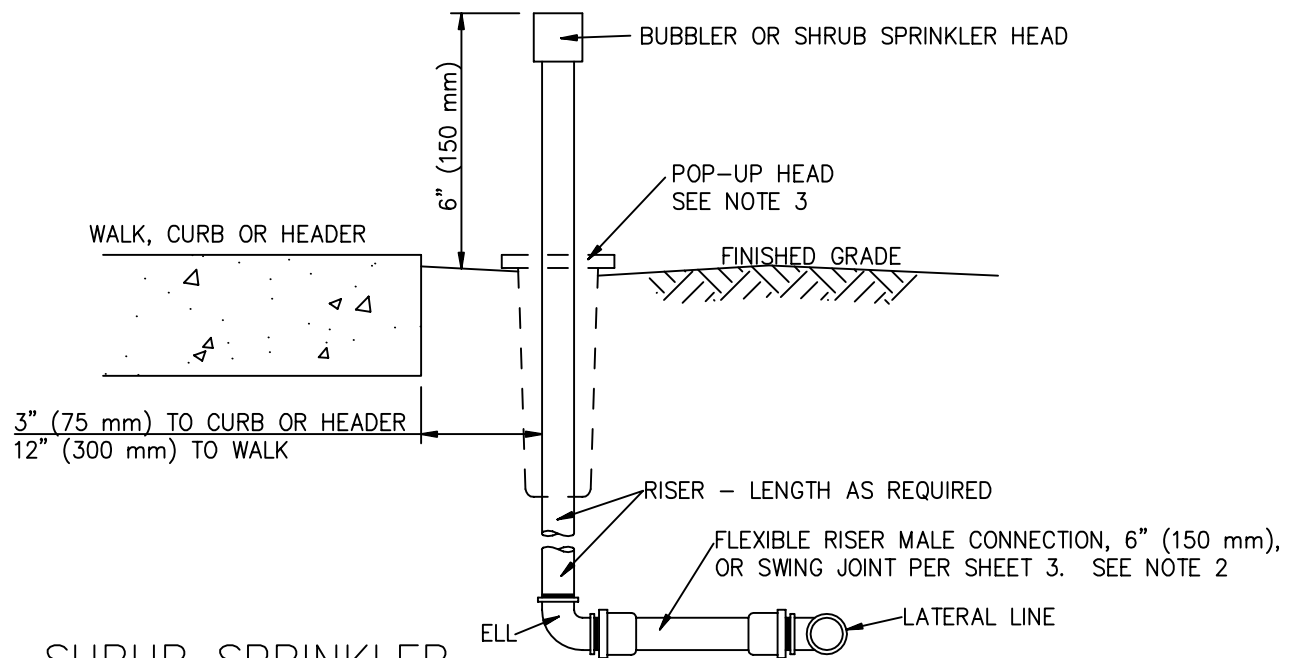
STD. PLAN

508-3-OC

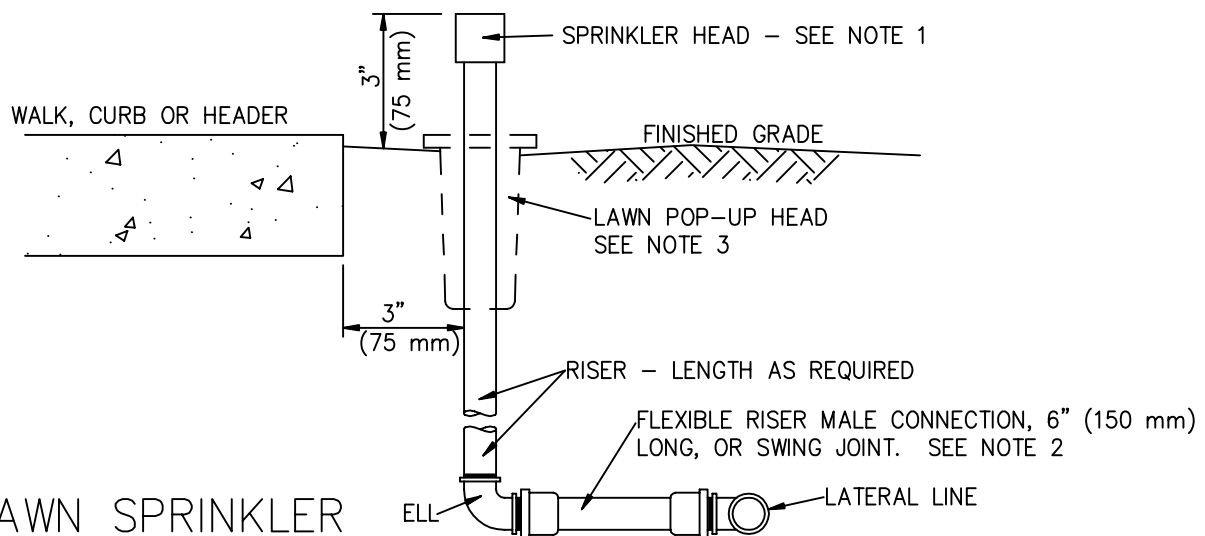
SPPWC STANDARD PLAN - THRUST BLOCKS FOR PLASTIC PIPE

SHT. 2 OF 2





## SHRUB SPRINKLER



## LAWN SPRINKLER

### NOTES:

1. PIPE AND FITTINGS SHALL BE SCHEDULE 80 PVC.
2. FLEXIBLE RISERS SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER. CONTRACTOR MAY USE SWING JOINTS PER DETAIL, SHEET 3, INSTEAD OF FLEXIBLE RISERS.
3. INSTALL LAWN HEADS 3" (75 mm) ABOVE GRADE. BEFORE FIRST MOWING, ADJUST NON-POP-UP LAWN HEADS TO FINISHED GRADE.
4. INSTALL POP-UP BODIES 1/4" (10 mm) ABOVE FINISHED GRADE.
5. ELLS AND RISERS SHALL BE MADE OF THE SAME MATERIAL.

### STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

## IRRIGATION SPRINKLER HEAD

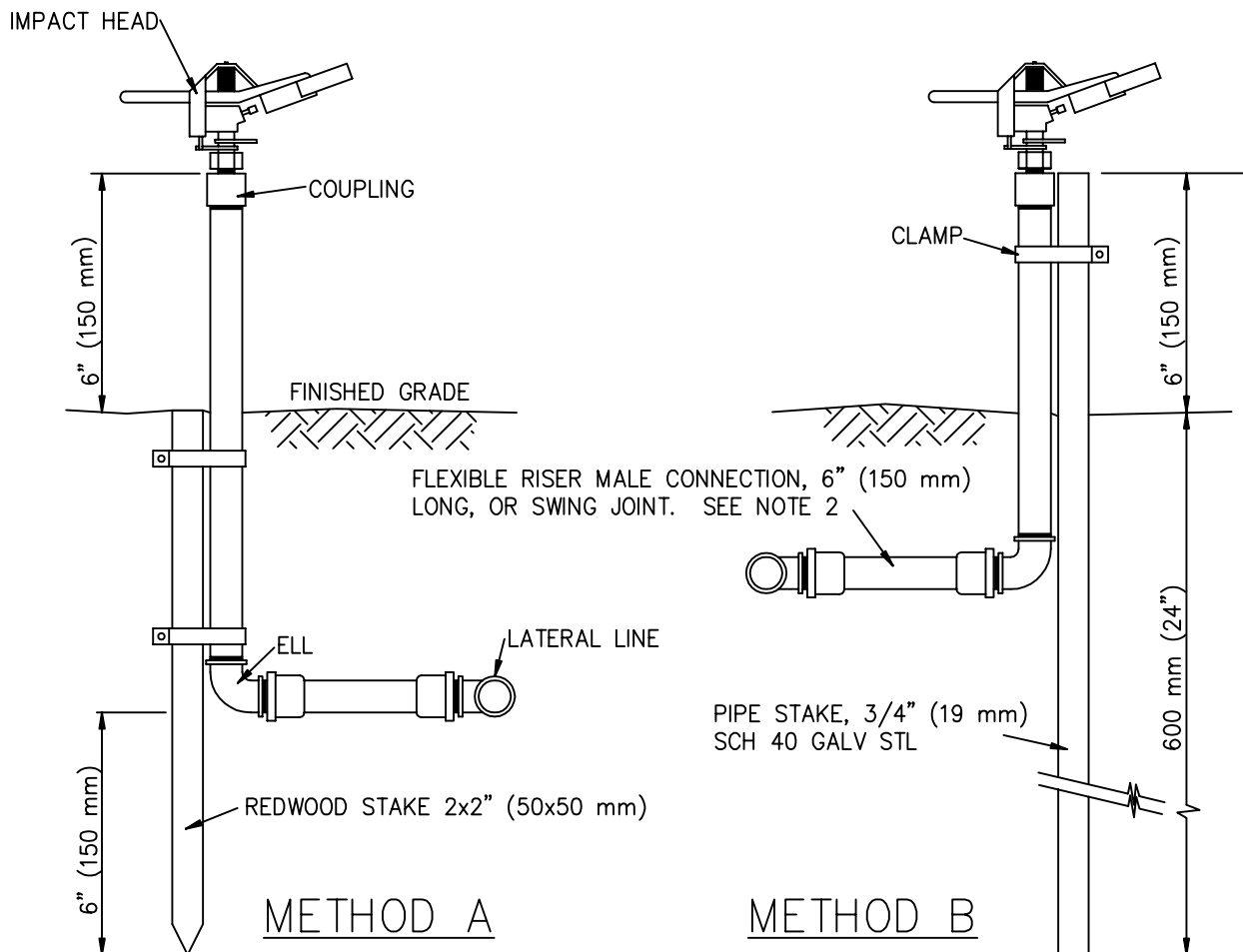
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**509-3**

SHEET 1 OF 3

**SEE OCPW STANDARD PLAN 509-3-OC FOR CONDITIONS**



**NOTES:**

1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 GALVANIZED STEEL.
2. FLEXIBLE RISERS SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER. CONTRACTOR MAY USE SWING JOINTS PER DETAIL, SHEET 3, INSTEAD OF FLEXIBLE RISERS.
3. DISSIMILAR METALS SHALL BE SEPARATED BY AN APPROVED DIELECTRIC COUPLING.
4. CLAMPS SHALL BE STEEL (COMMERCIAL QUALITY, GALVANIZED OR CADMIUM PLATED) OR STAINLESS STEEL.
5. PLASTIC PIPE SHALL NOT BE USED ABOVE FINISHED GRADE.

IMPACT SPRINKLER

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

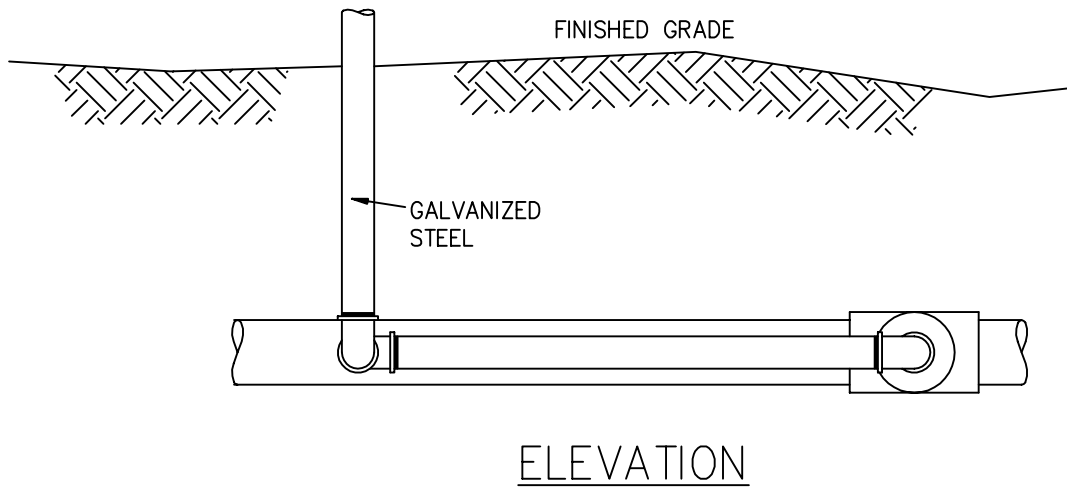
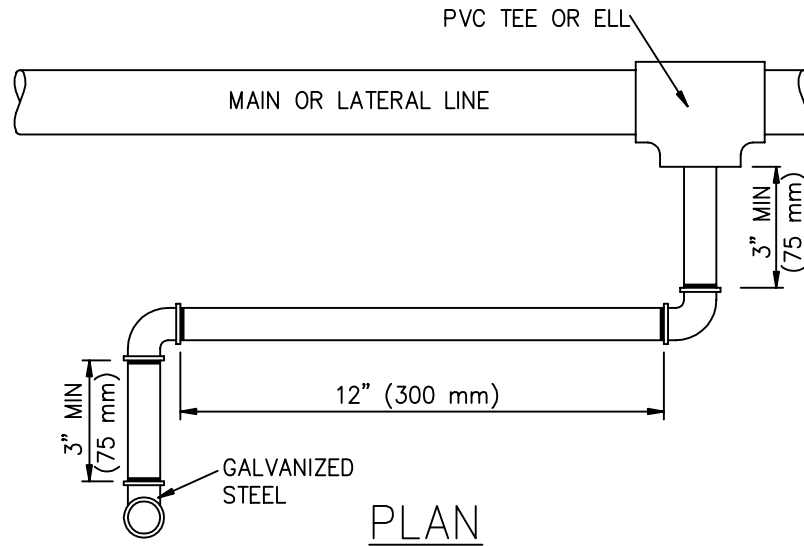
**IRRIGATION SPRINKLER HEAD**

STANDARD PLAN

**509-3**

SHEET 2 OF 3

**SEE OCPW STANDARD PLAN 509-3-OC FOR CONDITIONS**



NOTES:

PIPE AND FITTINGS SHALL BE SCHEDULE 80 PVC UNLESS SHOWN OTHERWISE. GALVANIZED STEEL PIPE AND FITTINGS SHALL BE SCHEDULE 40.

SWING JOINT DETAIL

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**IRRIGATION SPRINKLER HEAD**

STANDARD PLAN

**509-3**

SHEET 3 OF 3

**SEE OCPW STANDARD PLAN 509-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
509-3	509-3-OC	<u>IRRIGATION SPRINKLER HEAD</u>

LAWN SPRINKLER – SHEET 1

1. THE INSTALLATION OF 90 PERCENT RISER FROM LATERAL LINE IS PROHIBITED. LAWN AND SHRUB SPRINKLER ASSEMBLY SHALL USE SWING JOINT ASSEMBLY.
2. SPRING-LOADED CHECK VALVES SHALL BE PROVIDED ON ALL HEADS NECESSARY TO PREVENT LINE BLEEDING.

IMPACT SPRINKLER – SHEET 2

1. SCHEDULE 80 PVC RISER, FITTINGS AND SCHEDULE 40 FITTINGS AND SCHEDULE 40 ULTRAVIOLET RESISTANT PVC PIPE MAY BE USED FOR ABOVE GROUND INSTALLATION.

SWING JOINT DETAIL – SHEET 3

1. SCHEDULE 80 PVC RISER, FITTINGS AND SCHEDULE 40 FITTINGS AND SCHEDULE 40 ULTRAVIOLET RESISTANT PVC PIPE MAY BE USED FOR ABOVE GROUND INSTALLATION.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

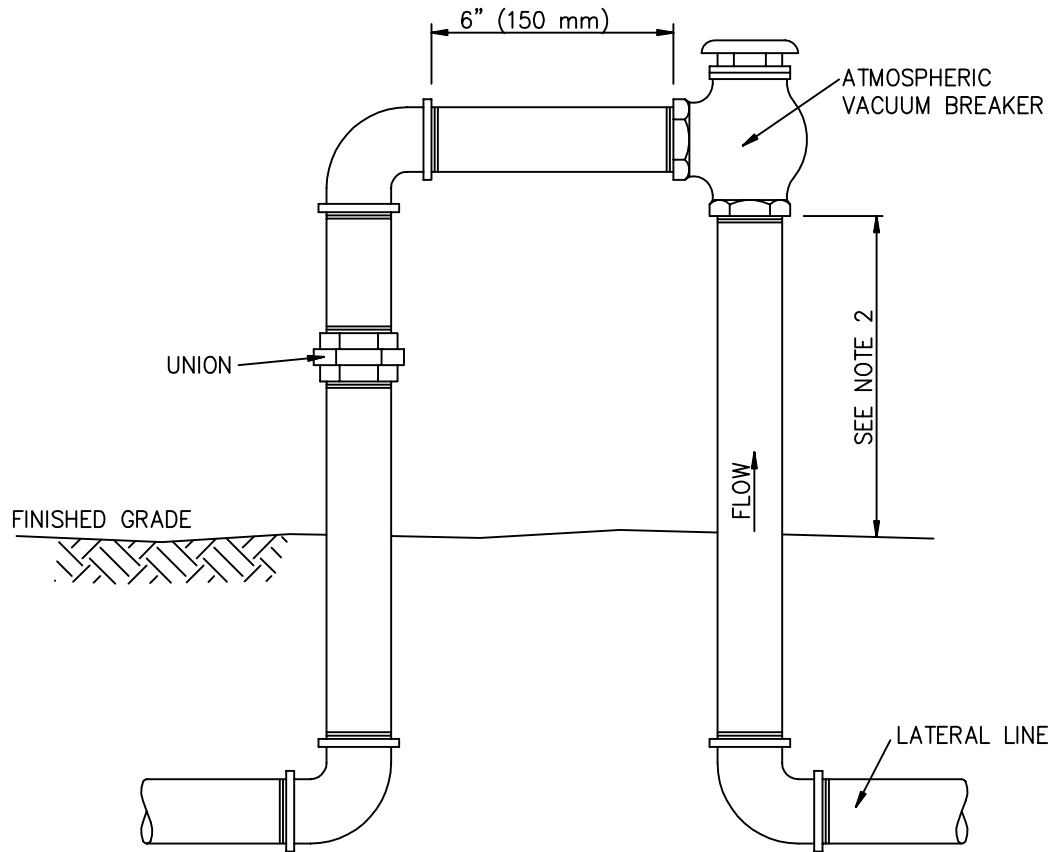
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

509-3-OC

SPPWC STANDARD PLAN - IRRIGATION SPRINKLER HEAD

SHT. 1 OF 1

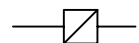


## ATMOSPHERIC TYPE, 2" (50 mm) AND SMALLER

### NOTES:

1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 GALVANIZED STEEL UNLESS OTHERWISE NOTED.
2. ATMOSPHERIC TYPE VACUUM BREAKER SHALL BE INSTALLED DOWNSTREAM OF CONTROL VALVE AND AT LEAST 6" (150 mm) ABOVE THE HIGHEST OUTLET OR THE FLOOD LINE, WHICHEVER IS HIGHER.
3. DEVICES AND INSTALLATIONS SHALL COMPLY WITH LOCAL HEALTH AND WATER AGENCY REQUIREMENTS.
4. CLOSE NIPPLES SHALL NOT BE USED.
5. USE APPROVED PLASTIC TAPE 1/2" (12 mm) WIDE AT ALL THREADED CONNECTIONS. COAT EXPOSED THREADS WITH APPROVED RUST-INHIBITING SEALANT.

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

## VACUUM BREAKER ASSEMBLY

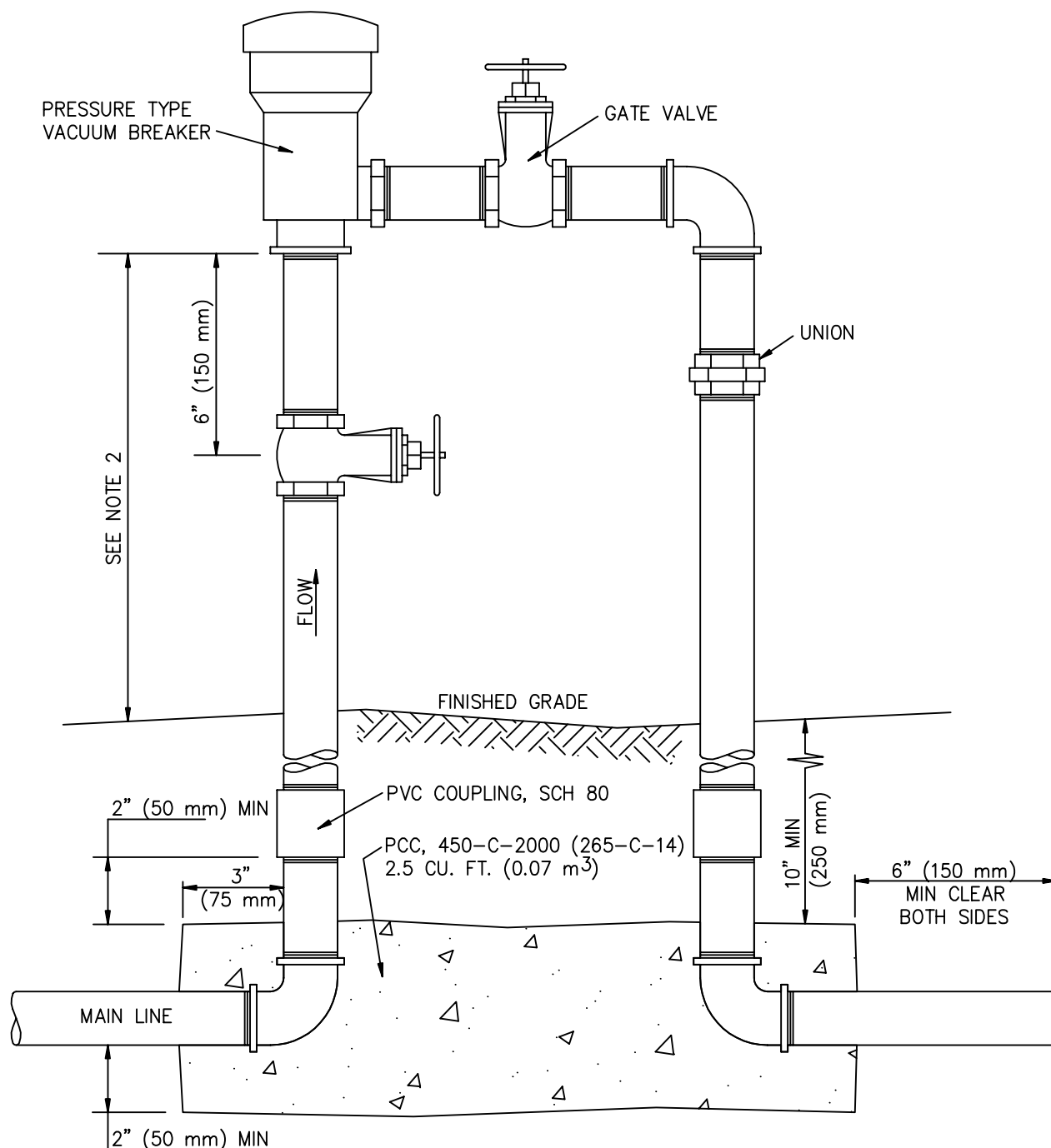
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**510-3**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 510-3-OC FOR CONDITIONS**



## PRESSURE TYPE, 2" (50 mm) AND SMALLER

### NOTES:

1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 GALVANIZED STEEL UNLESS OTHERWISE NOTED.
2. PRESSURE TYPE VACUUM BREAKER SHALL BE INSTALLED AT LEAST 12" (300 mm) ABOVE THE HIGHEST OUTLET OR THE FLOOD LINE, WHICHEVER IS HIGHER. PRESSURE TYPE VACUUM BREAKERS SHALL NOT BE SUBJECTED TO BACK PRESSURE OR DRAINAGE.
3. DEVICES AND INSTALLATIONS SHALL COMPLY WITH LOCAL HEALTH AND WATER AGENCY REQUIREMENTS.
4. CLOSE NIPPLES SHALL NOT BE USED.
5. USE APPROVED PLASTIC TAPE 1/2" (12 mm) WIDE AT ALL THREADED CONNECTIONS. COAT EXPOSED THREADS WITH APPROVED RUST-INHIBITING SEALANT.
6. DISSIMILAR METALS SHALL BE SEPARATED BY AN APPROVED DIELECTRIC COUPLING.
7. PLASTIC PIPE SHALL NOT BE USED ABOVE FINISHED GRADE.

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**VACUUM BREAKER ASSEMBLY**

STANDARD PLAN

**510-3**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 510-3-OC FOR CONDITIONS**

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<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
510-3	510-3-OC	<u>VACUUM BREAKER ASSEMBLY</u>

SHEET 1

1. REVISE NOTE 1 TO READ: RISER PIPES AND FITTINGS SHALL BE BRASS.


SHEET 2

1. REVISE NOTE 1 TO READ: RISER PIPES AND FITTINGS SHALL BE BRASS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

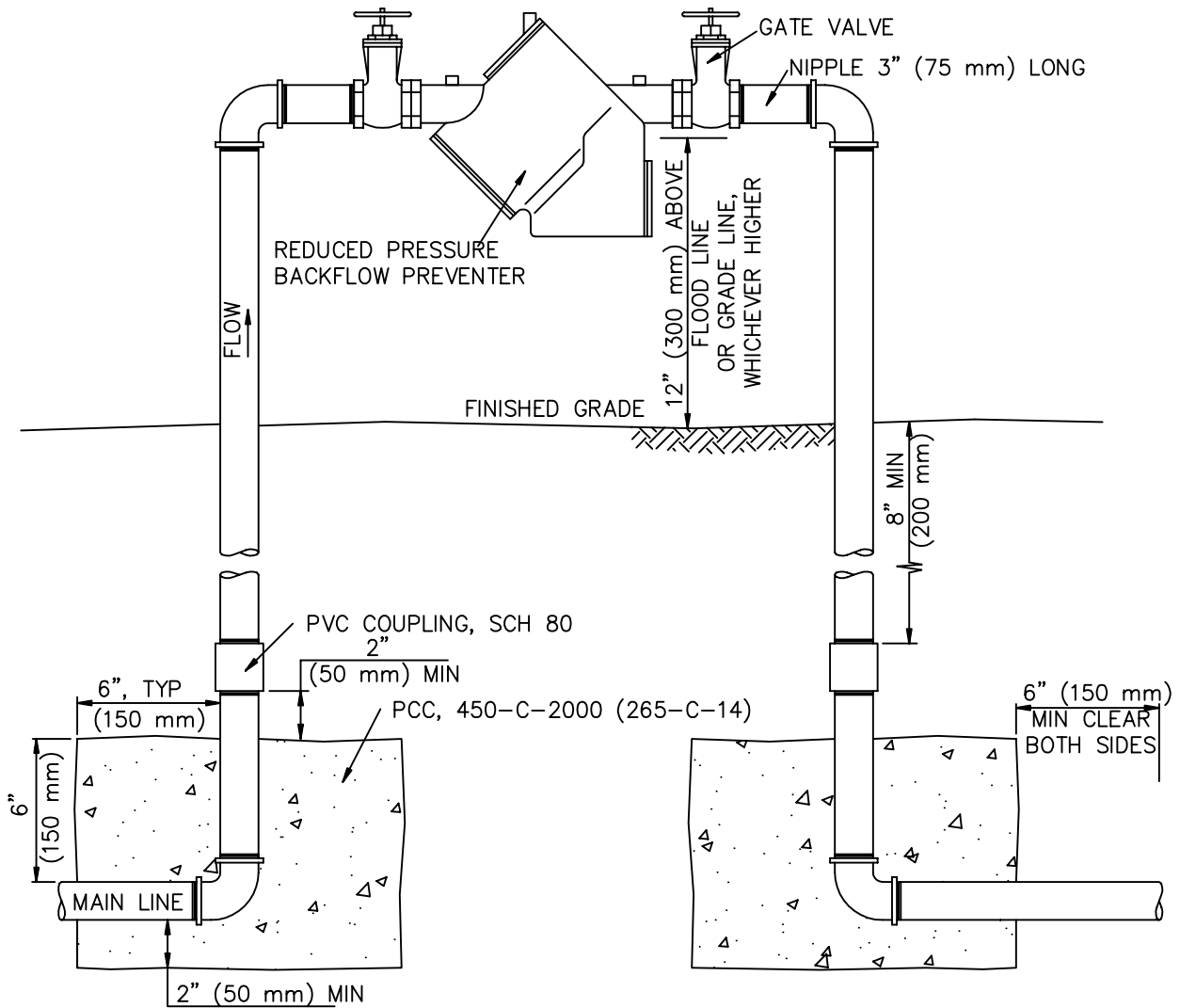
STD. PLAN

510-3-OC

SPPWC STANDARD PLAN - VACUUM BREAKER ASSEMBLY

SHT. 1 OF 1





**NOTES:**

1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 GALVANIZED STEEL UNLESS OTHERWISE NOTED.
2. DEVICES AND INSTALLATIONS SHALL COMPLY WITH LOCAL HEALTH AND WATER AGENCY REQUIREMENTS.
3. VALVE ASSEMBLIES MAY HAVE SCREWED OR FLANGED FITTINGS.
4. USE APPROVED PLASTIC TAPE 1/2" (12 mm) WIDE AT ALL THREADED CONNECTIONS. COAT EXPOSED THREADS WITH APPROVED RUST-INHIBITING SEALANT.
5. DISSIMILAR METALS SHALL BE SEPARATED BY AN APPROVED DIELECTRIC COUPLING.
6. PLASTIC PIPE SHALL NOT BE USED ABOVE FINISHED GRADE.

SYMBOL ON PLAN

—BPA—

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
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**BACKFLOW PREVENTER ASSEMBLY  
REDUCED PRESSURE TYPE**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**512-3**

SHEET 1 OF 1

**SEE OCPW STANDARD PLAN 512-3-OC FOR CONDITIONS**

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<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
512-3	512-3-OC	<u>BACKFLOW PREVENTER ASSEMBLY</u> <u>REDUCED PRESSURE TYPE</u>

1. REVISE NOTE 1 TO READ: RISER, PIPES AND FITTINGS SHALL BE BRASS.
2. ADD TO NOTE 2: UNLESS OTHERWISE NOTED.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

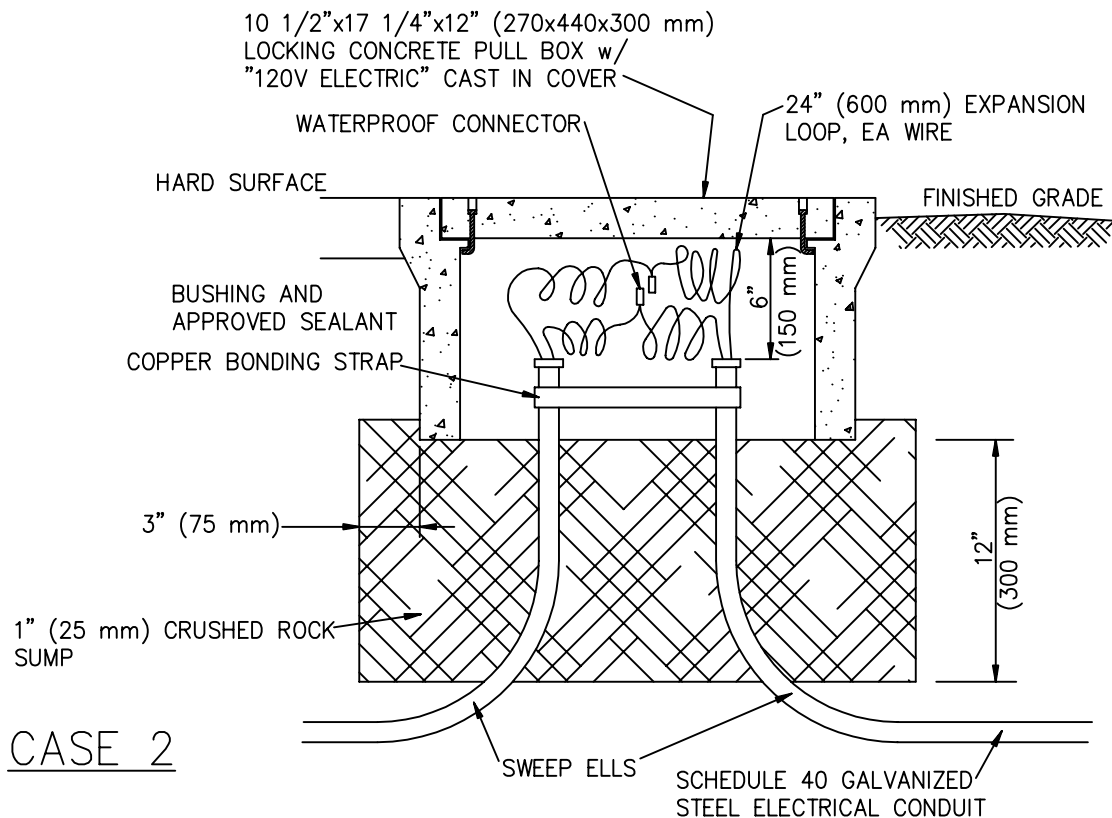
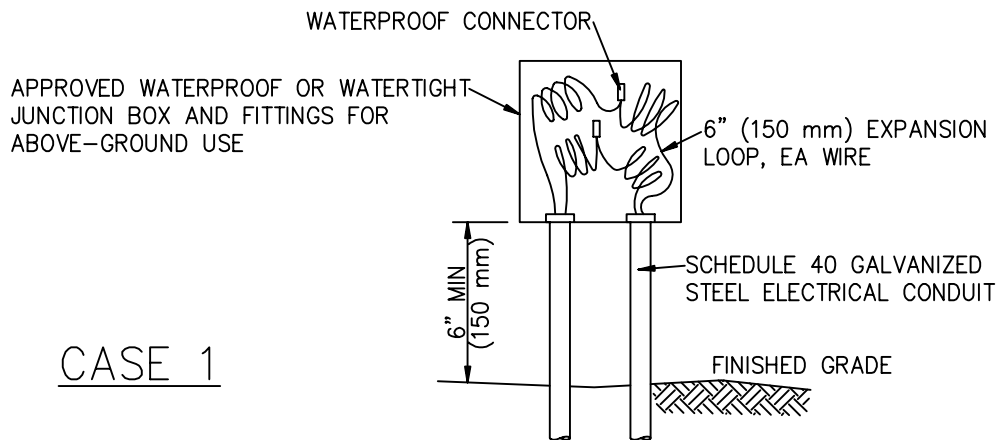
  
Khalid Bazmi, County Engineer

STD. PLAN

512-3-OC

SPPWC STANDARD PLAN - BACKFLOW PREVENTER ASSEMBLY  
REDUCED PRESSURE TYPE

SHT. 1 OF 1

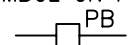


NOTES:

1. AREA AROUND BOX MAY BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.
2. TOP OF BOX:  
AT GRADE FOR HARD SURFACE  
1/2" (12 mm) ABOVE GRADE FOR LAWN  
1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS
3. CRUSHED ROCK SHALL COVER ELECTRICAL BOX SIDE OPENINGS TO PREVENT SOIL ENTRY.
4. WATERPROOF CONNECTORS SHALL BE SUBJECT TO ENGINEER'S APPROVAL.
5. PVC CONDUIT MAY BE USED FOR CASE 2 IF APPROPRIATE GROUND WIRES ARE INSTALLED.

HIGH VOLTAGE INSTALLATION

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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**ELECTRICAL PULL BOX**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**513-3**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 513-3-OC FOR CONDITIONS**

**SEE OCPW STANDARD PLAN 513-3-OC FOR CONDITIONS**

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<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
513-3	513-3-OC	<u>ELECTRICAL PULL BOX</u>

SHEET 1, CASE 1

1. DELETE SCHEDULE 40 GALVANIZED STEEL AND REPLACE WITH SCHEDULE 80 PVC.

SHEET 1, CASE 2

1. DELETE COPPER BONDING STRAP.
2. DELETE SCHEDULE 40 GALVANIZED STEEL AND REPLACE WITH SCHEDULE 40 PVC.
3. ADD APPROVED TO WATERPROOF CONNECTOR.
4. ADD 120 VOLTS TO HIGH VOLTAGE INSTALLATION TITLE.

SHEET 2, LOW VOLTAGE INSTALLATION

1. USE TRAFFIC WEIGHT FIBERGLASS PULL BOX WITH HINGE, VANDAL-PROOF LOCKING COVER MARKED "IRRIGATION-LOW VOLTAGE".
2. ADD 24 VOLTS TO LOW VOLTAGE INSTALLATION TITLE.

SHEETS 1 & 2

CASE 1: CONCRETE BOX W/CONCRETE COVER.

CASE 2: CONCRETE BOX W/LOCKING CAST IRON COVER.

LOW VOLTAGE INSTALLATION: PLASTIC BOX W/LOCKING PLASTIC COVER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

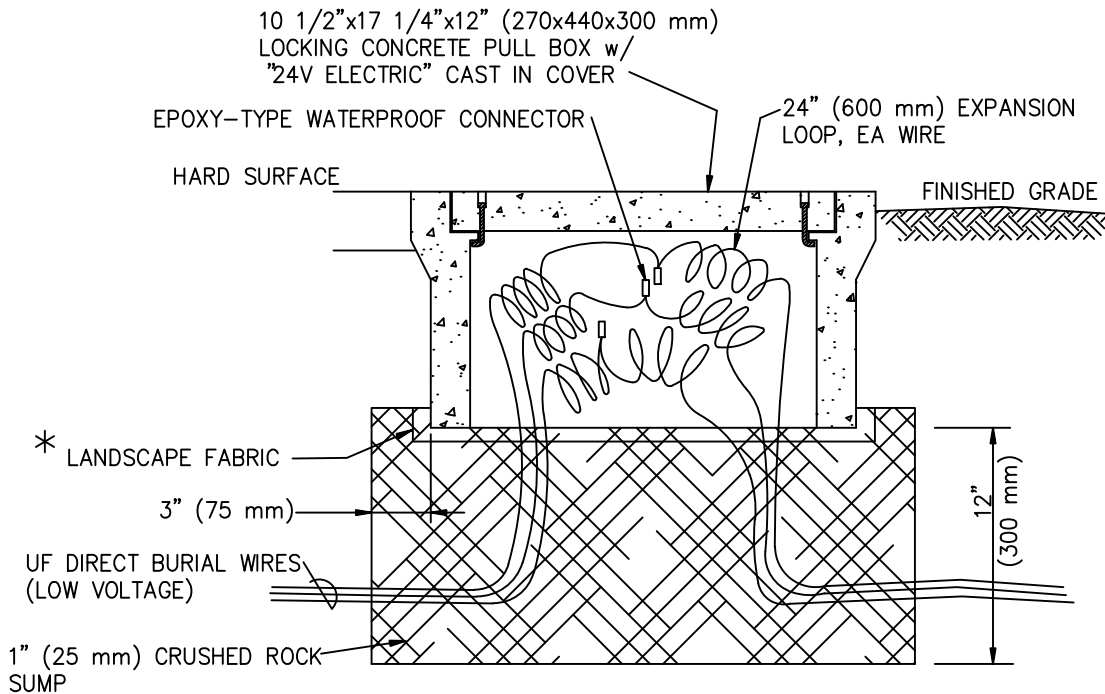
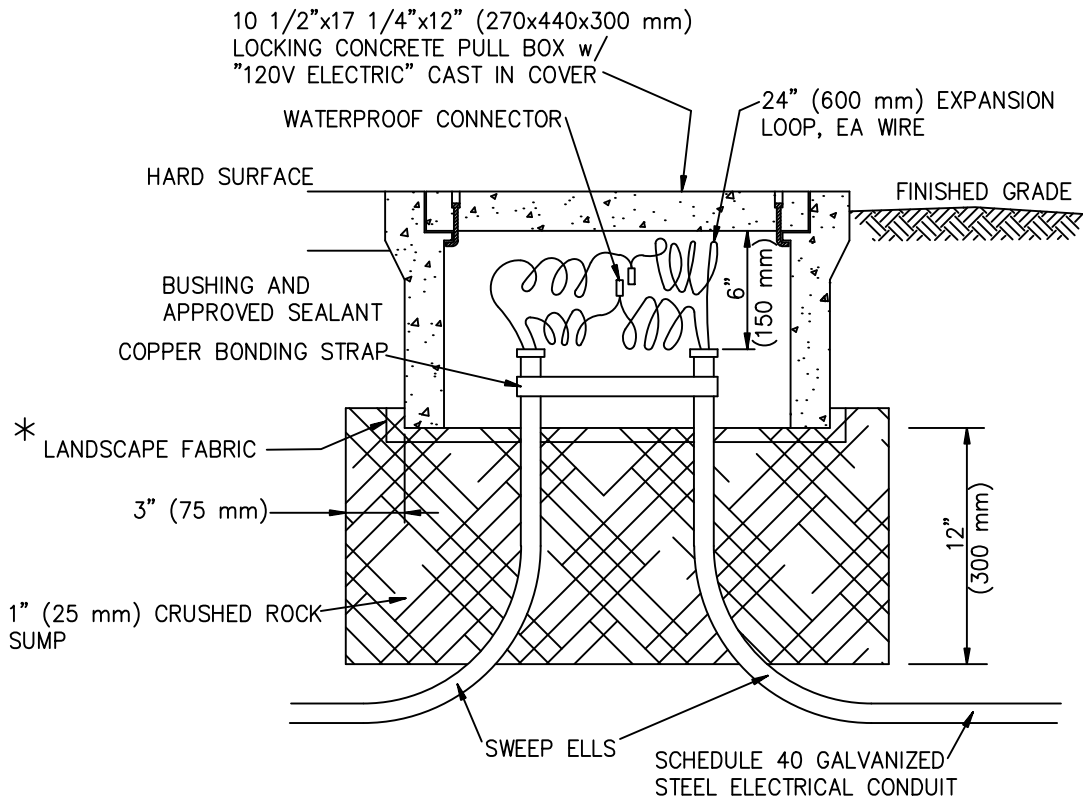
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

513-3-OC

SPPWC STANDARD PLAN - ELECTRICAL PULL BOX

SHT. 1 OF 2



\* WRAP LANDSCAPE FABRIC AROUND SIDES AND BOTTOM OF  
BOX TO COVER ALL OPENINGS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

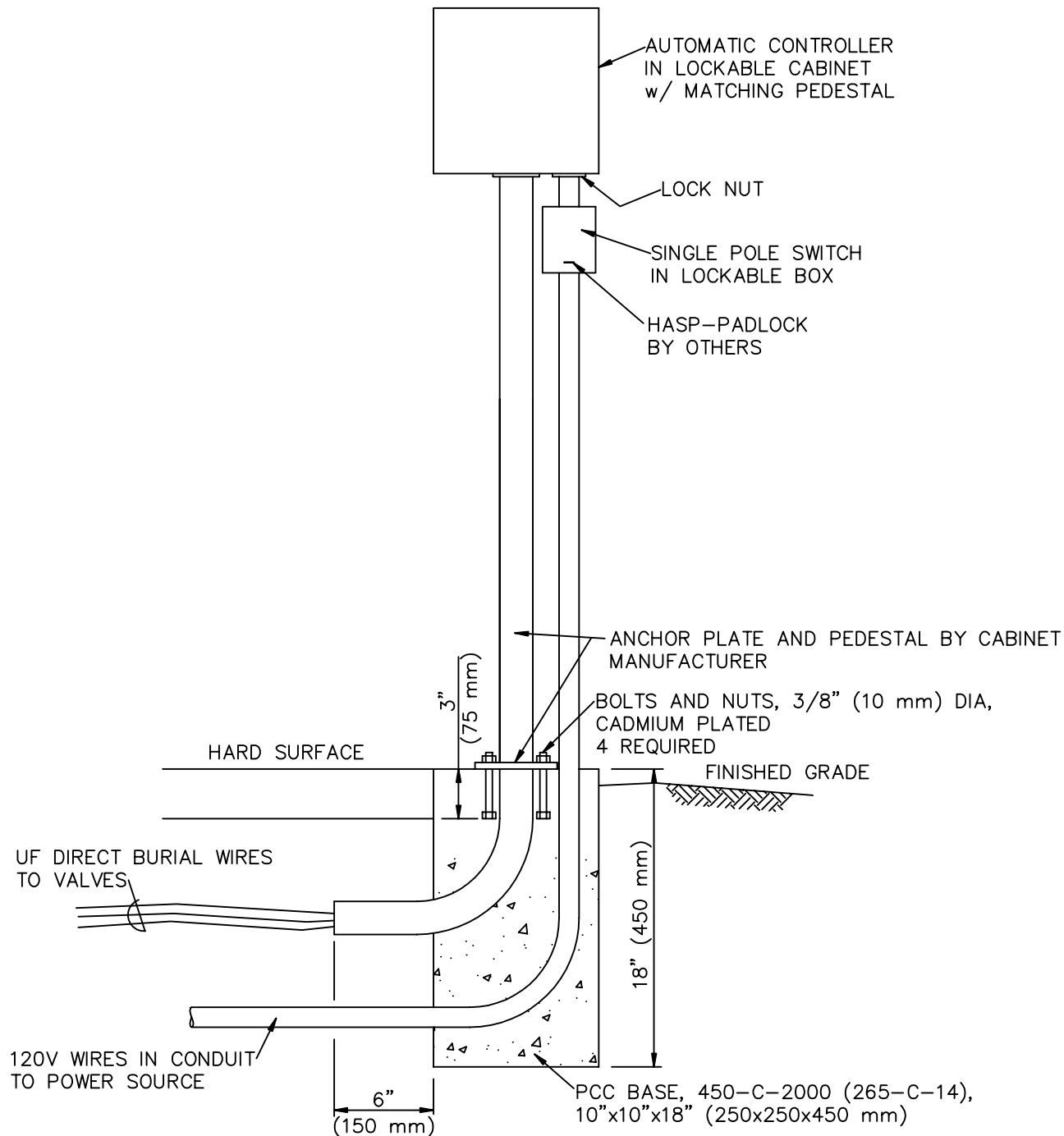
Approved *Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

513-3-OC

SPPWC STANDARD PLAN - ELECTRICAL PULL BOX

SHT. 2 OF 2



## PEDESTAL MOUNT – TYPE A

### NOTES:

1. AREA AROUND BOX MAY BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.
2. TOP OF BASE:  
 AT GRADE FOR HARD SURFACE  
 1/2" (15 mm) ABOVE GRADE FOR LAWN  
 1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS

SYMBOL ON PLAN



### STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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GREENBOOK COMMITTEE  
1984  
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## IRRIGATION CONTROLLER ENCLOSURE

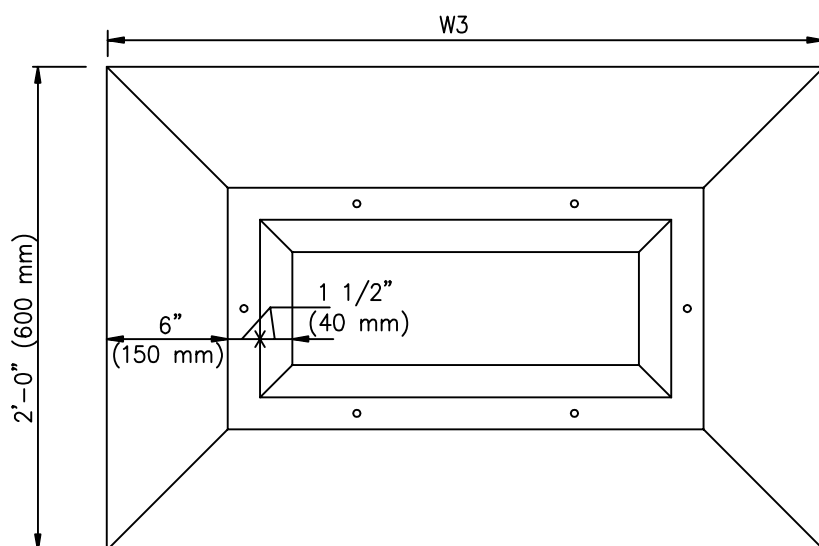
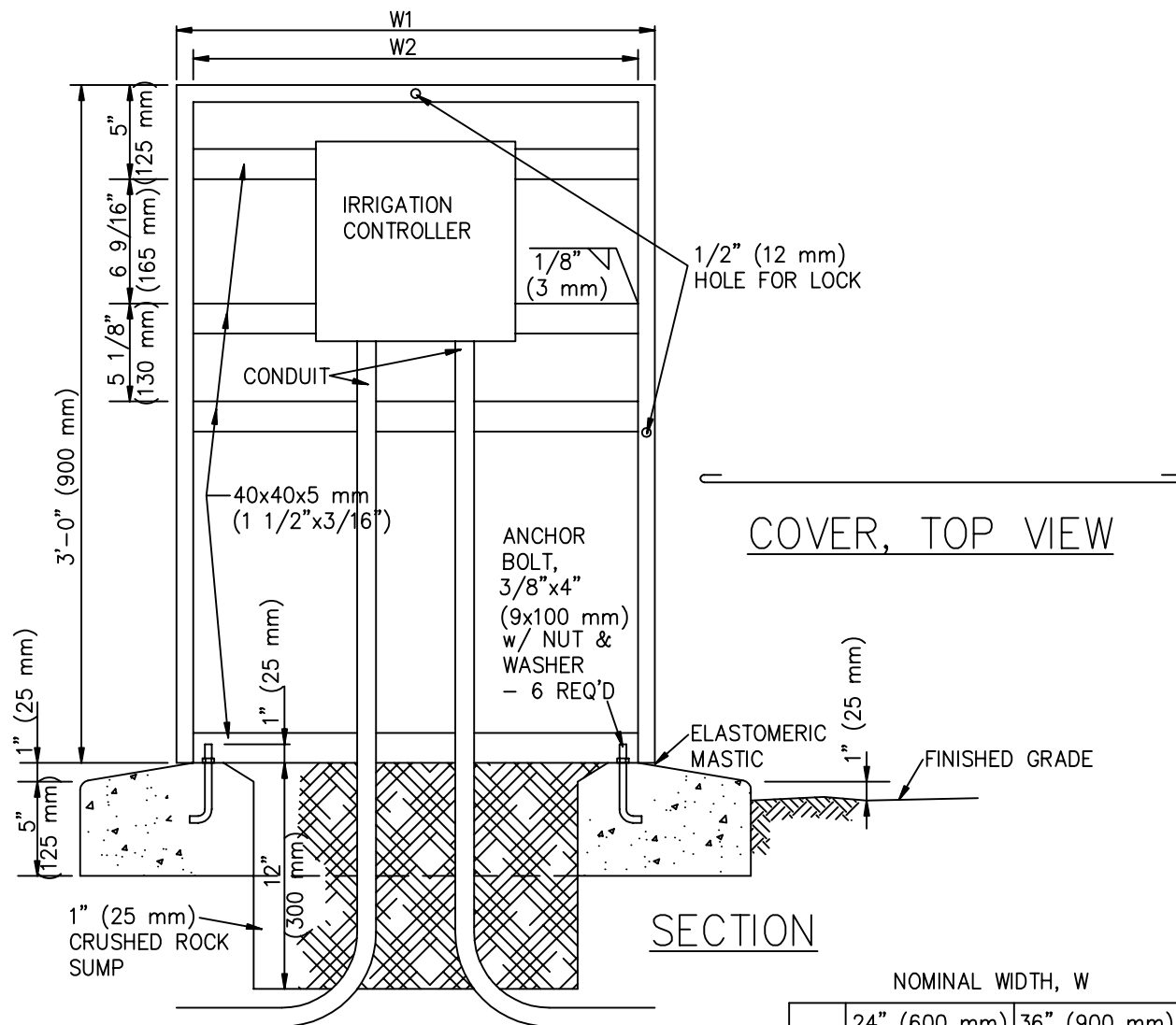
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

514-3

SHEET 1 OF 4

SEE OCPW STANDARD PLAN 514-3-OC FOR CONDITIONS



PLAN OF CONCRETE BASE

PEDESTAL MOUNT - TYPE B

NOMINAL WIDTH, W

	24" (600 mm)	36" (900 mm)
W1	2'-7/8" (630 mm)	3'-7/8" (935 mm)
W2	1'-11" (585 mm)	2'-11" (890 mm)
W3	2'-11" (890 mm)	3'-11" (1190 mm)

NOTES:

1. CONCRETE SHALL BE CLASS 450-C-2000 (265-C-14).
2. UNLESS OTHERWISE NOTED, ENCLOSURE SHALL BE 3/16" (5 mm) PLATE STEEL. PAINT ENCLOSURE WITH TWO COATS OF RUST INHIBITING PAINT (COLOR WILL BE SELECTED BY ENGINEER).

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

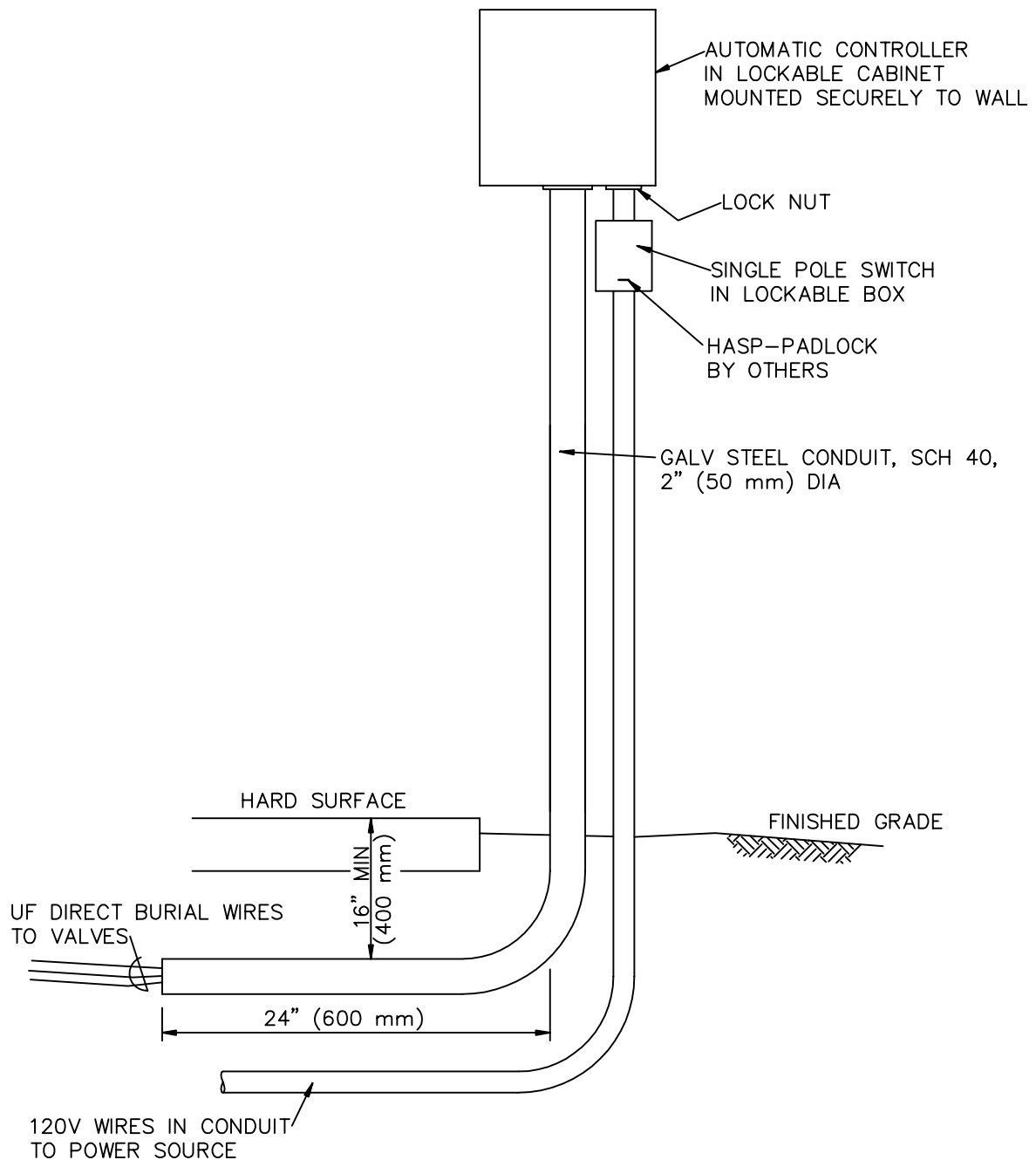
IRRIGATION CONTROLLER ENCLOSURE

STANDARD PLAN

514-3

SHEET 2 OF 4

SEE OCPW STANDARD PLAN 514-3-OC FOR CONDITIONS



WALL MOUNT - TYPE C

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

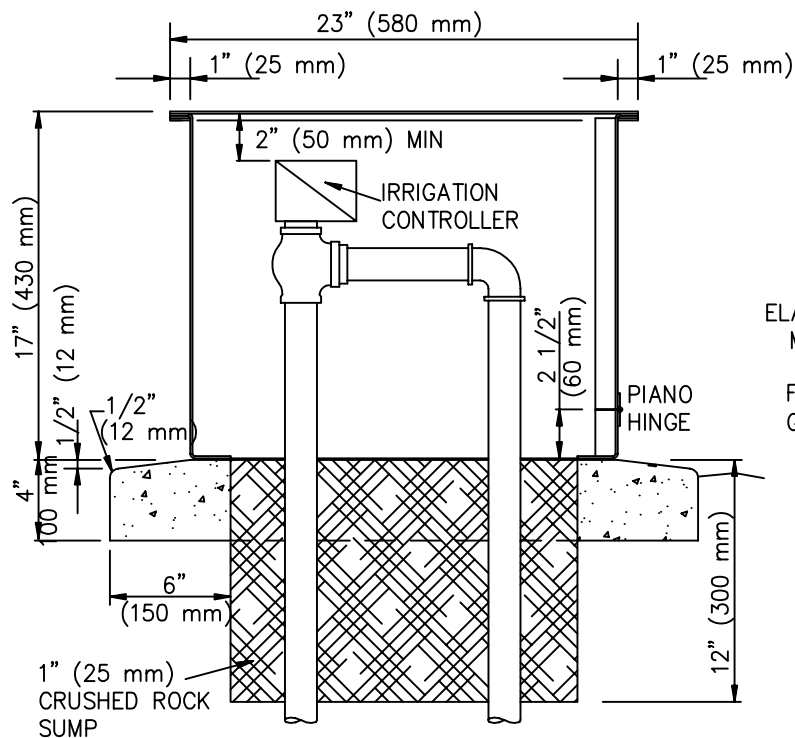
STANDARD PLAN

**IRRIGATION CONTROLLER ENCLOSURE**

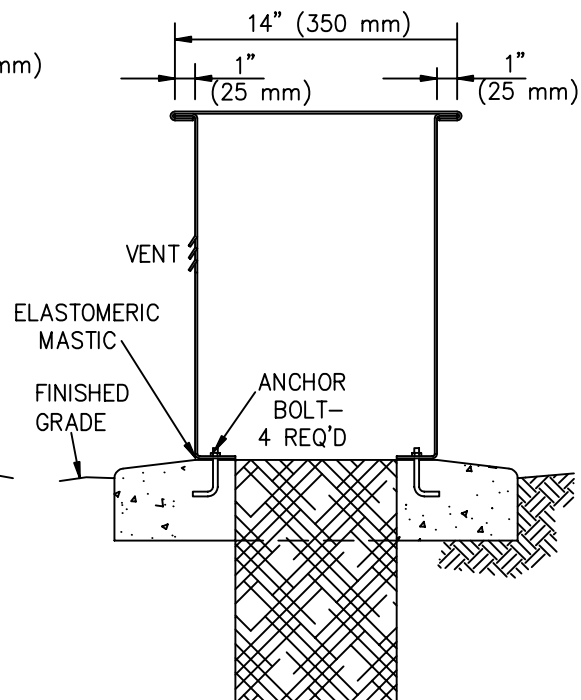
**514-3**

SHEET 3 OF 4

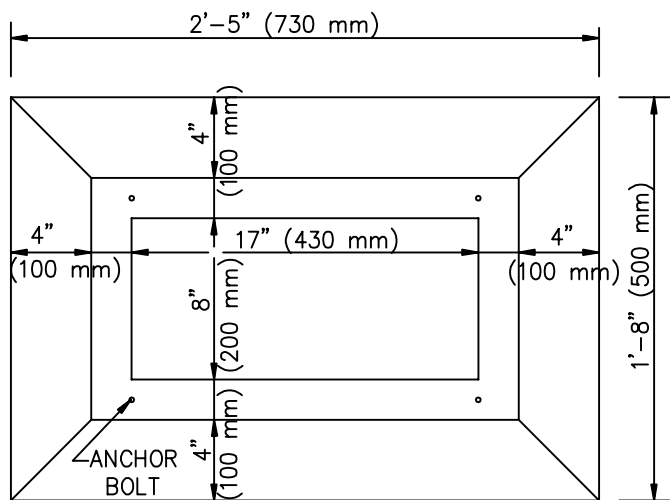
**SEE OCPW STANDARD PLAN 514-3-OC FOR CONDITIONS**



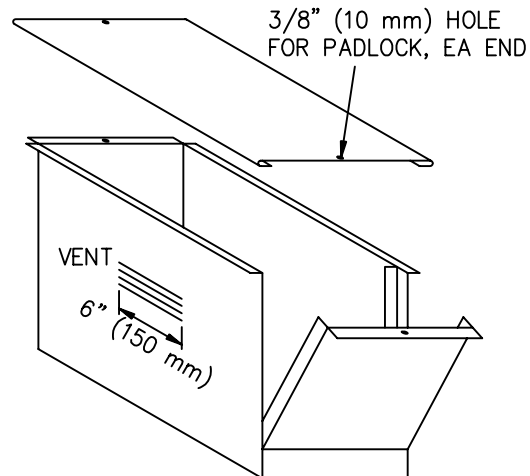
SECTION



END VIEW



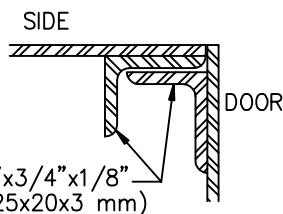
PLAN OF CONCRETE BASE



OBLIQUE VIEW

NOTES:

1. CONCRETE SHALL BE CLASS 450-C-2000 (265-C-14).
2. UNLESS OTHERWISE NOTED, ENCLOSURE SHALL BE 12 GAGE (2.75 mm) STEEL. PAINT ENCLOSURE WITH TWO COATS OF RUST INHIBITING PAINT (COLOR WILL BE SELECTED BY ENGINEER).



CORNER DETAIL

TYPE D

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**IRRIGATION CONTROLLER ENCLOSURE**

**514-3**

SHEET 4 OF 4

**SEE OCPW STANDARD PLAN 514-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #   OCPW #   NAME AND CONDITIONS

514-3      514-3-OC      IRRIGATION CONTROLLER ENCLOSURE

GENERAL NOTES

1. PEDESTAL MOUNT – TYPE A IS NOT ALLOWED.
2. PULLBOX FOR DIRECT BURIAL WIRES SHALL BE INSTALLED A MAXIMUM OF 2 FEET FROM FACE OF CONTROLLER.
3. PULLBOX SHALL BE TRAFFIC WEIGHT FIBERGLASS WITH HINGED, VANDAL-PROOF, LOCKING COVER MARKED "IRRIGATION-LOW VOLTAGE".

PEDESTAL MOUNT – TYPE B – SHEET 2

1. UF DIRECT BURIAL WIRES TO VALVES SHALL BE BURIED A MINIMUM OF 12 INCHES.
2. 120 VOLT WIRES IN ELECTRICAL CONDUIT TO POWER SOURCE SHALL BE BURIED 18 INCHES.
3. ADD TO NOTE 1: UNLESS OTHERWISE NOTED.

WALL MOUNT – TYPE C – SHEET 3

1. 2 INCH SCHEDULE 40 GALVANIZED STEEL PIPE SHALL READ: 3 INCH GALVANIZED CONDUIT.

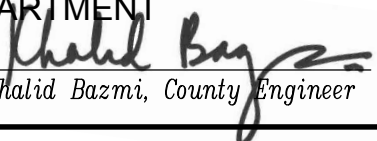
ALL SHEETS

1. STAINLESS STEEL MAY BE SUBSTITUTED FOR GALVANIZED STEEL.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

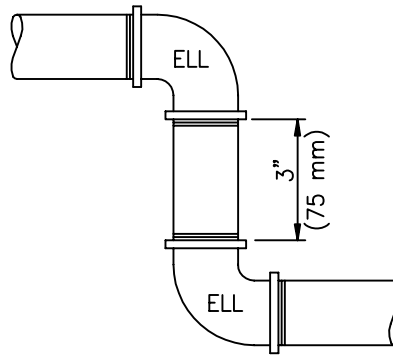
STD. PLAN

514-3-OC

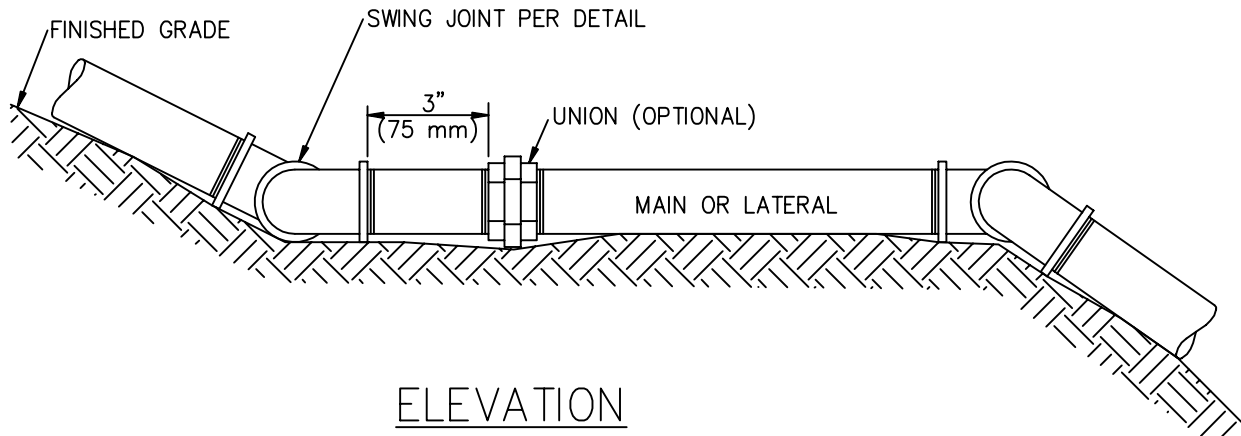
SPPWC STANDARD PLAN - IRRIGATION CONTROLLER ENCLOSURE

SHT. 1 OF 1





SWING JOINT PLAN DETAIL

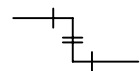


NOTES:

1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 GALVANIZED STEEL UNLESS OTHERWISE NOTED.
2. SWING JOINTS SHALL BE INSTALLED AT EACH CHANGE OF GRADE.
3. PIPE SHALL BE PINNED PER STANDARD PLAN 515.

SINGLE SWING JOINT ASSEMBLY

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

**SWING JOINT ASSEMBLY**

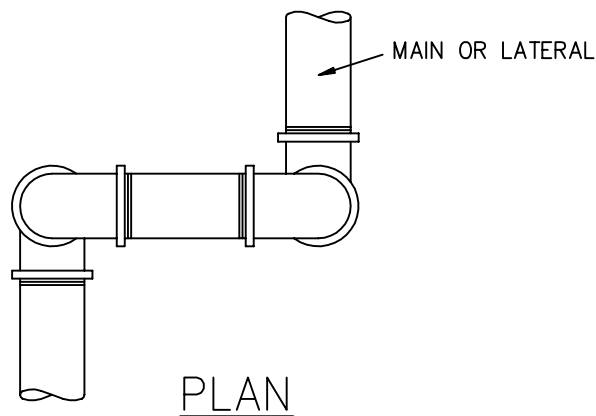
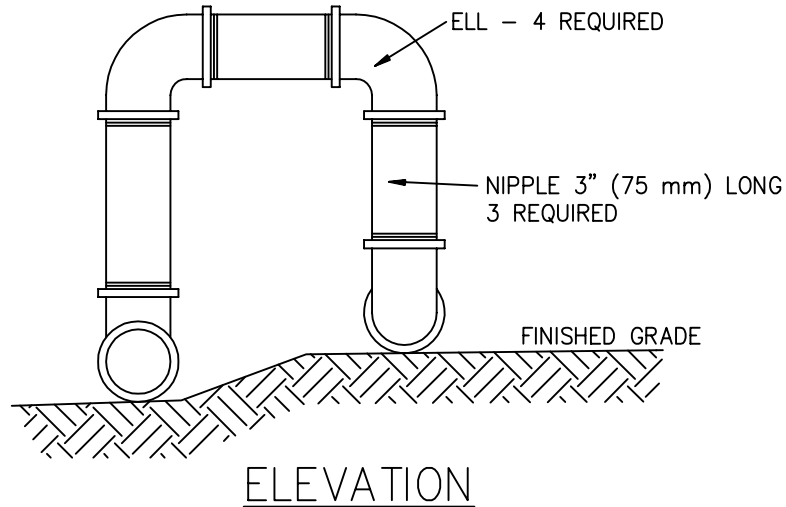
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**517-3**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 517-3-OC FOR CONDITIONS**

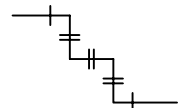


NOTES:

1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 GALVANIZED STEEL UNLESS OTHERWISE NOTED.
2. DOUBLE SWING JOINTS SHALL BE INSTALLED WHERE CHANGES OF GRADE AND ALIGNMENT OCCUR SIMULTANEOUSLY.
2. DOUBLE SWING JOINTS SHALL ALSO BE INSTALLED AS EXPANSION JOINTS ON LONG RUNS OF GALVANIZED PIPE, EACH 300' (90 m) MAXIMUM.
3. PIPE SHALL BE PINNED PER STANDARD PLAN 515.

DOUBLE SWING JOINT

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**SWING JOINT ASSEMBLY**

STANDARD PLAN

**517-3**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 517-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
517-3	517-3-OC	<u>SWING JOINT ASSEMBLY</u>

SHEET 1

1. ADD TO NOTE 1: SCHEDULE 80 PVC RISERS, FITTINGS AND SCHEDULE 40 ULTRAVIOLET RESISTANT PVC PIPE ARE APPROVED FOR ABOVE GROUND INSTALLATION.


SHEET 2

1. ADD TO NOTE 1: SCHEDULE 80 PVC RISERS, FITTINGS AND SCHEDULE 40 ULTRAVIOLET RESISTANT PVC PIPE ARE APPROVED FOR ABOVE GROUND INSTALLATION.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Adopted: Res. 06-010  
Revised: Res. YY-XXX

Approved

  
Khalid Bazmi, County Engineer

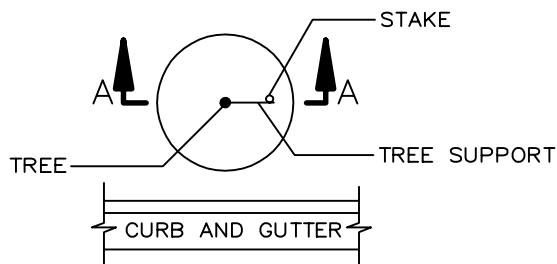
STD. PLAN

517-3-OC

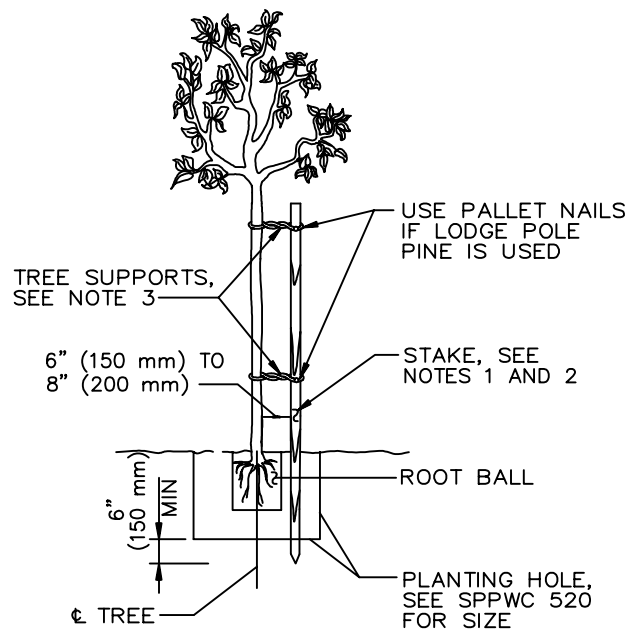
SPPWC STANDARD PLAN - SWING JOINT ASSEMBLY

SHT. 1 OF 1





PLAN



SECTION A-A

## SINGLE STAKING

### NOTES:

1. STAKE SHALL BE EITHER 2" (50 mm) DIAMETER LODGE POLE PINE, TREATED WITH COPPER NAPHTHANATE OR PRESSURE TREATED WITH CHROMATED COPPER ARSENATE, OR GALVANIZED STEEL PIPE, PER SSPWC 308-4.6.1 (METHOD A).
2. HEIGHT OF STAKE SHALL BE 10' (3 m); HOWEVER, IT SHALL NOT BE HIGHER THAN THE TOP OF THE TREE.
3. TREE SUPPORTS SHALL BE PER SSPWC 308-4.6.1.

## STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARD, INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

## TREE STAKING

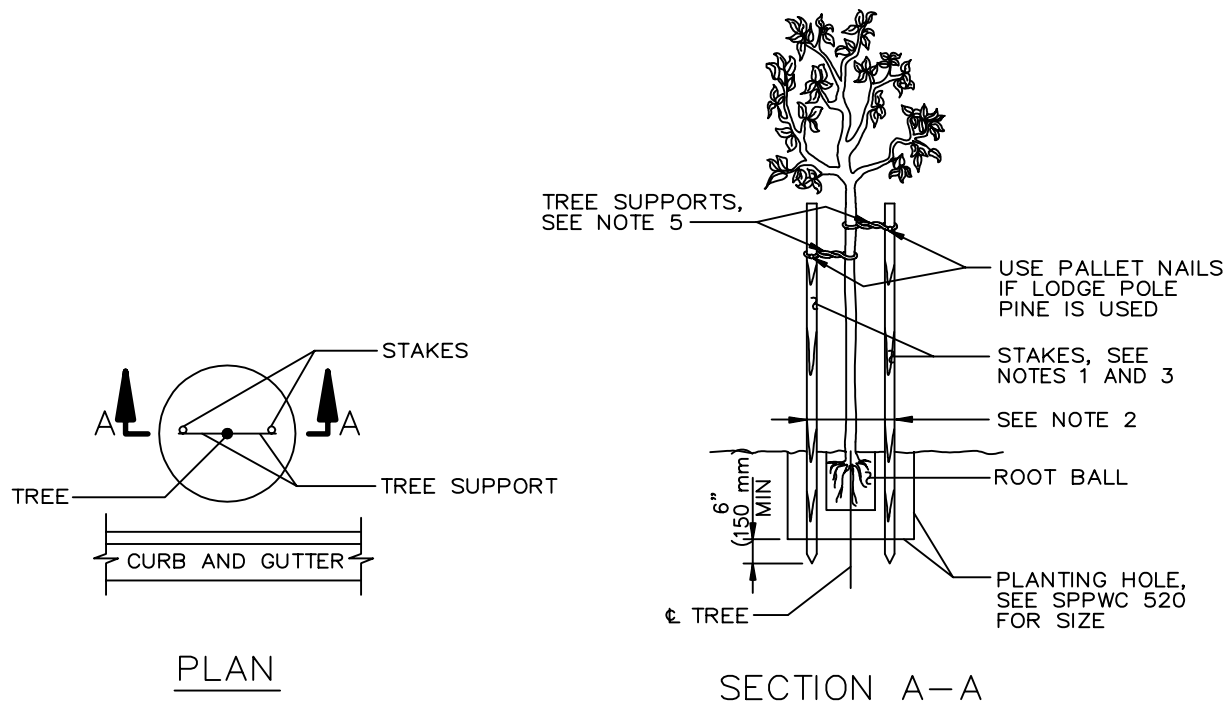
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**518-3**

SHEET 1 OF 3

**SEE OCPW STANDARD PLAN 518-3-OC FOR CONDITIONS**



LENGTH OF STAKES	
TREE SIZE	LENGTH
15 GAL (55 L)	10' (3 m)*
24" (600 mm) BOX	12' (3.6 m)
30" (750 mm) BOX	12' (3.6 m)
36" (900 mm) - 48" (1200 mm) BOX	SEE NOTE 4

\*USE 12' (3.6 m) WITH CASE 2. SEE SPPWC 520.

## DOUBLE STAKING

### NOTES:

1. STAKE SHALL BE EITHER 2" (50 mm) DIAMETER LODGE POLE PINE, TREATED WITH COPPER NAPHTHANATE OR PRESSURE TREATED WITH CHROMATED COPPER ARSENATE, OR GALVANIZED STEEL PIPE, PER SSPWC 308-4.6.1 (METHOD A).
2. PLACE STAKES 18" (450 mm) APART FOR 15GAL (55 L) TREE. PLACE STAKES AT OUTER EDGE OF ROOT BALL FOR LARGER SIZE (BOX) TREES.
3. HEIGHT OF STAKES SHALL NOT BE HIGHER THAN THE TOP OF THE TREE.
4. FOR 36" (900 mm) OR LARGER BOX TREES-STAKE OR GUY AT THE DIRECTION OF THE ENGINEER.
5. TREE SUPPORTS SHALL BE PER SSPWC 308-4.6.1.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

## TREE STAKING

STANDARD PLAN

**518-3**

SHEET 2 OF 3

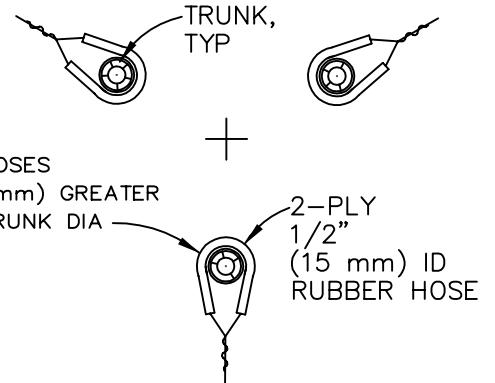
**SEE OCPW STANDARD PLAN 518-3-OC FOR CONDITIONS**

### GUY WIRE SIZES

24"–48" BOX (600–1200 mm) 2 STRAND #12 BWG (2.7 mm) ZINC COATED

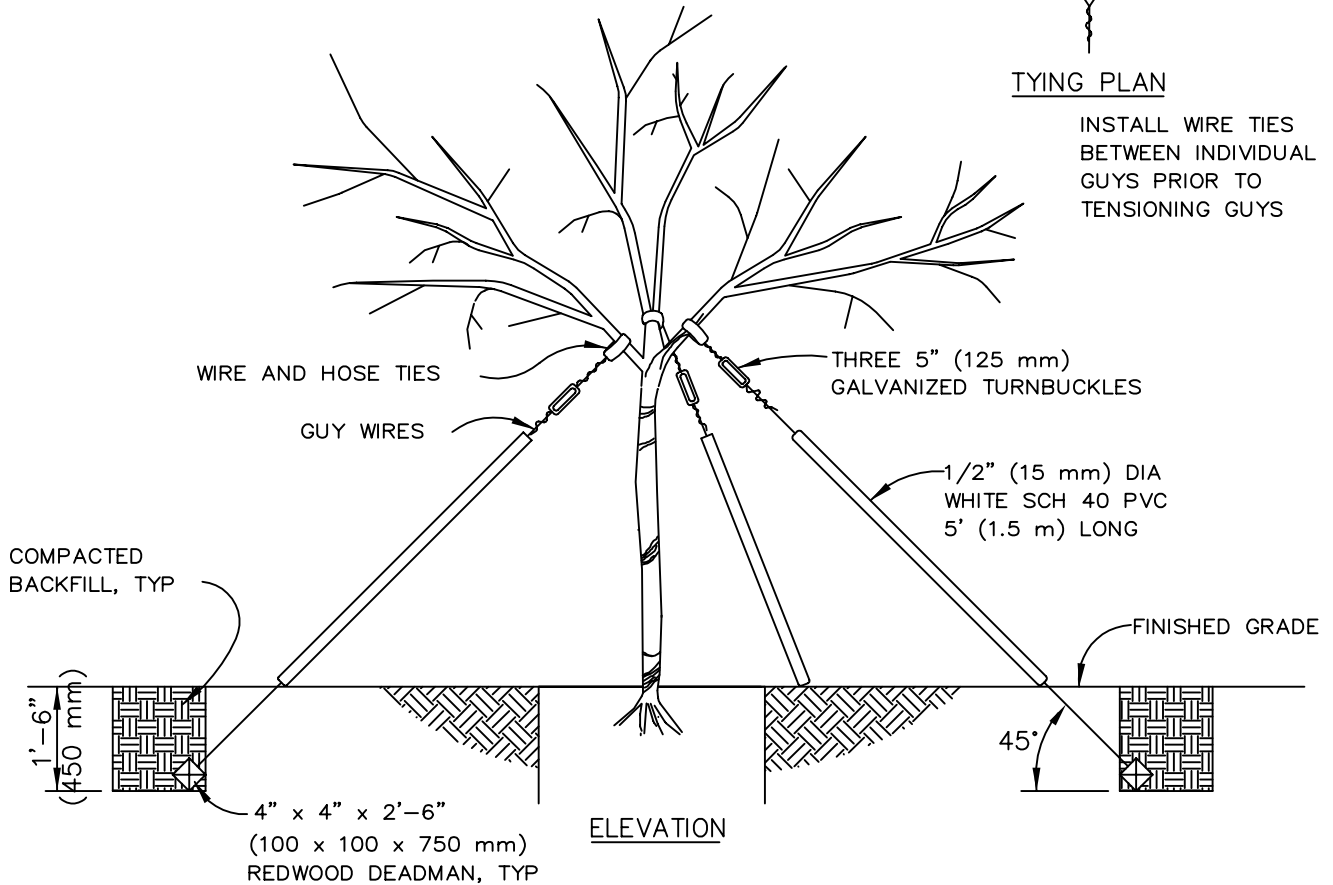
OVER 48" (1200 mm) BOX 3 STRAND #12 BWG (2.7 mm) ZINC COATED

MULTIPLE STRANDS SHALL BE TWISTED TOGETHER

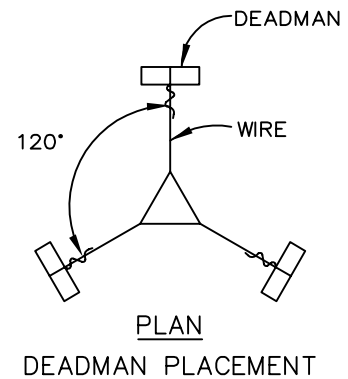
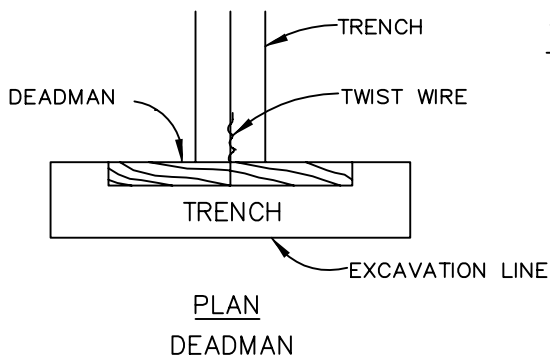


### TYING PLAN

INSTALL WIRE TIES BETWEEN INDIVIDUAL GUYS PRIOR TO TENSIONING GUYS



### TREE GUYING



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

## TREE STAKING

STANDARD PLAN

**518-3**

SHEET 3 OF 3

**SEE OCPW STANDARD PLAN 518-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
518-3	518-3-OC	<u>TREE STAKING</u>

ALL SHEETS

1. TREE SUPPORTS SHALL BE 1 INCH WIDE RUBBER OR PLASTIC STRAP, NO WIRE.
2. TREE SHALL BE TIED LOOSE TO ALLOW FOR MOVEMENT.

SHEETS 1 & 2

1. REVISE NOTE 1 TO READ: STAKE SHALL BE EITHER 2 INCH DIAMETER LODGE POLE PINE, TREATED WITH ALKALINE COPPER QUATERNARY, OR GALVANIZED STEEL PIPE, PER SECTION 308-4.6.1, "METHOD "A" TREE STAKING", OF THE GREENBOOK.
2. DELETE NOTE 2 SHEET 1 AND NOTE 3 SHEET 2 AND REPLACE WITH: STAKE SHALL BE HIGH ENOUGH TO KEEP TREE FROM FALLING OVER, HOWEVER IT SHALL NOT BE HIGHER THAN THE TOP OF THE TREE, NOR RUB AGAINST ANY PART OF THE TREE. STAKE SHALL BE INSTALLED OUTSIDE ROOT BALL.
3. DELETE "LENGTH OF STAKES" CHART ON SHEET 2. SEE NOTE 2 ABOVE.

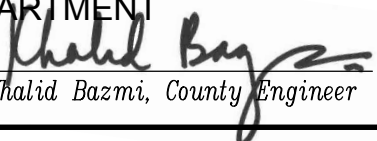
SHEET 3

1. ADD NEW TREE GUYING NOTE: TREE SUPPORTS PER SECTION 308-4.6.3, "GUYING", OF THE GREENBOOK.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

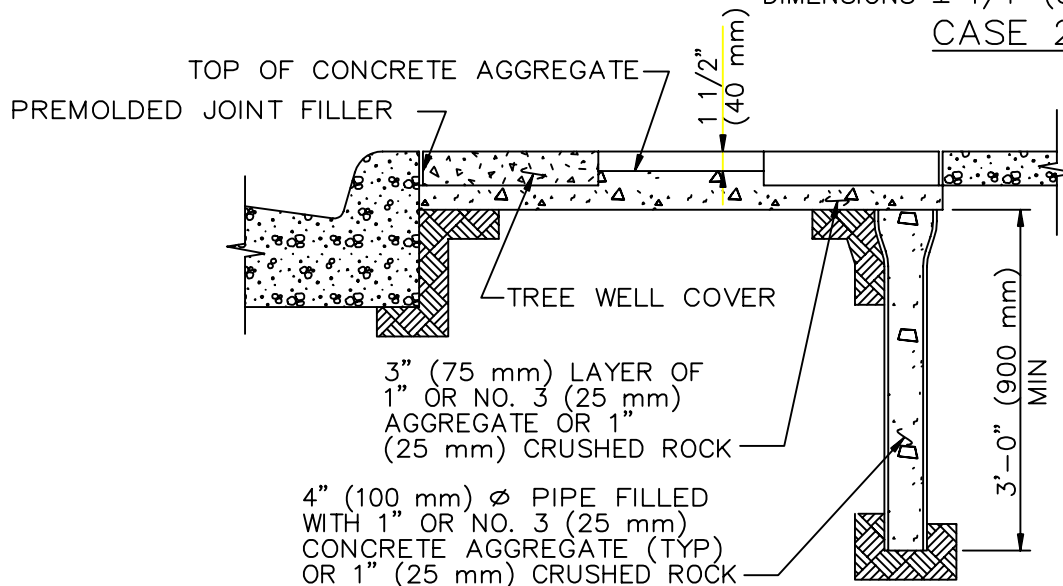
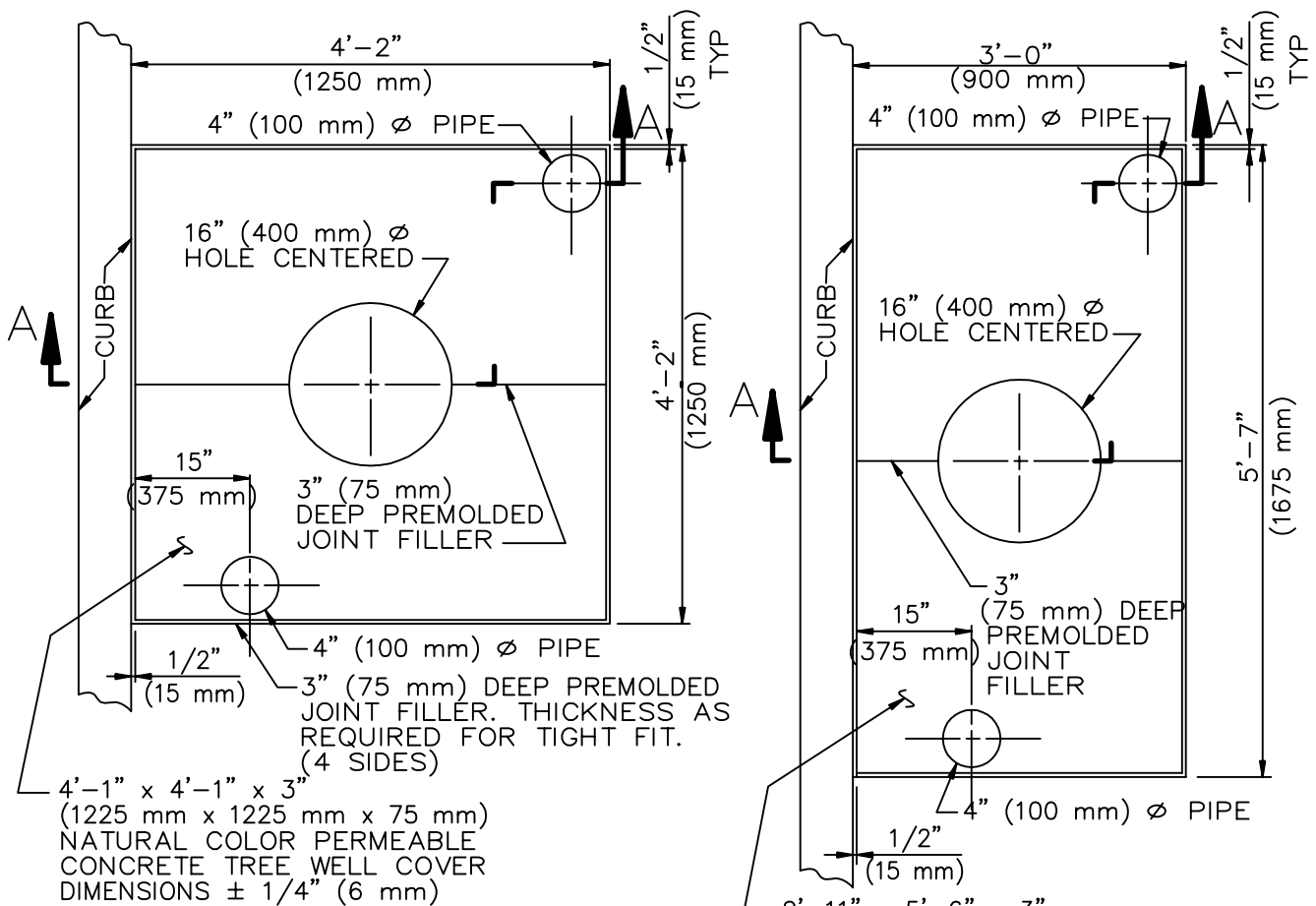
  
Khalid Bazmi, County Engineer

STD. PLAN

518-3-OC

SPPWC STANDARD PLAN - TREE STAKING

SHT. 1 OF 1



### SECTION A-A

#### NOTE:

SEE SHEETS 3 AND 7 FOR NOTES PERTAINING TO THIS SHEET.

### TYPE 1

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

## TREE WELL

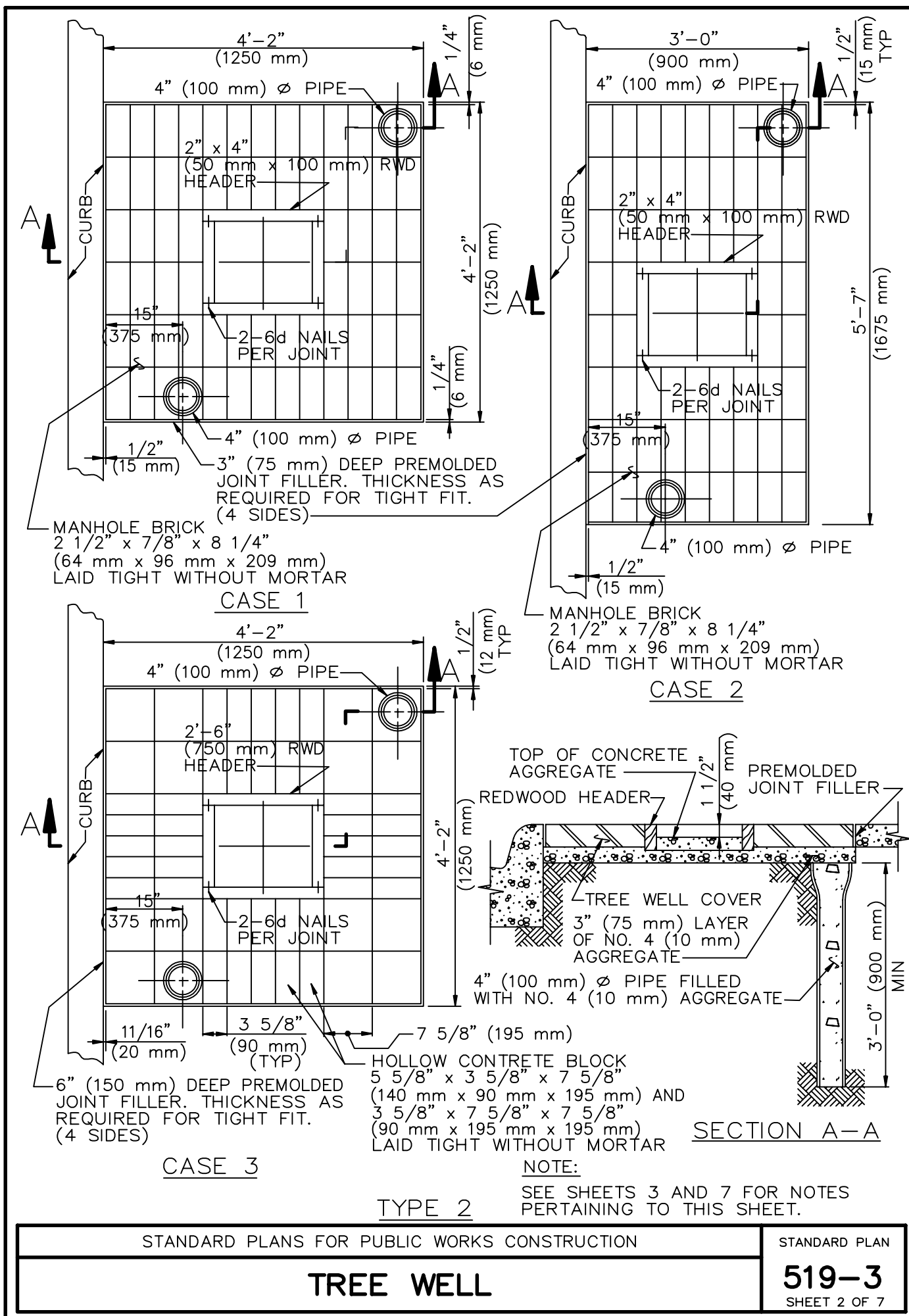
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

519-3

SHEET 1 OF 7

SEE OCPW STANDARD PLAN 519-3-OC FOR CONDITIONS



#### NOTES FOR TYPE 1 TREE WELL

1. THE COVER SHALL BE MADE OF PERMEABLE CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 1200 PSI (8.5 MPa) AND SHALL BE CAST-IN PLACE OR PRECAST "AGRIPERM" OR EQUIVALENT. CAST-IN-PLACE CONCRETE SHALL CONSIST OF ONE PART CEMENT TO FOUR PARTS 3/8" (10 mm) GRAVEL AND APPROXIMATE 4 GALLONS (15 LITERS) OF WATER PER 94 LB (42.5 kg) OF CEMENT. THE GRAVEL SHALL BE CLEAN WITH FINES REMOVED. THE CONCRETE MIXTURE SHALL BE DEPOSITED AS NEAR AS POSSIBLE TO ITS FINAL LOCATION. THE EXCESS CONCRETE SHALL BE RODDED OFF IN A SAWING MOTION. A SURPLUS OF CONCRETE SHOULD BE MAINTAINED AGAINST THE FRONT SURFACE OF THE SCREED IN ORDER THAT LOW AREAS WILL BE FILLED AS THE SCREED PASSES OVER. RODDING SHALL BE HELD TO A MINIMUM. AFTER THE SURFACE IS FLAT NO OTHER FINISHING WILL BE REQUIRED. CURING COMPOUND TO WHICH WATERPROOFING MATERIALS HAVE BEEN ADDED WILL NOT BE PERMITTED.
2. EXISTING SIDEWALKS SHALL BE CAREFULLY SAWCUT PREPARATORY TO INSTALLATION OF TREE WELL COVERS. SAWCUT OVER-RUNS SHALL BE CLEANED AND FILLED WITH EPOXY APPROVED BY THE ENGINEER AND FINISHED TO SIDEWALK GRADE.
3. THE PIPE MAY BE CIP, ACP, VCP, ABS, PVC, GALV STL OR ASPHALT IMPREGNATED FIBER DUCT AND IT MAY BE BELL OR PLAIN END.
4. AFTER ALL OTHER WORK PERTINENT TO PLANTING HAS BEEN COMPLETED, EACH TREE SHALL BE WATERED IMMEDIATELY WITH A MINIMUM OF 20 GALLONS (75 LITERS) OF WATER, AND REPEATED 2 TIMES IN THE NEXT 3 DAYS, AFTER THE TREE HAS BEEN WATERED AND THE SOIL IS SUFFICIENTLY DRY, THE SOIL SHALL BE GRADED AND TAMPED. THE 3" (75 mm) LAYER OF AGGREGATE SHALL BE PLACED AND GRADED TO ACCEPT THE TREE WELL COVER FIRMLY, WITHOUT ROCKING, AND FLUSH WITH THE TOP SURFACE OF THE SIDEWALK. THE PREMOLDED JOINT FILLER SHALL BE CAREFULLY PLACED TO INSURE A TIGHT FIT WITH THE TOP OF THE JOINT FILLER FLUSH WITH THE ADJACENT SIDEWALK.
5. IF CAST-IN-PLACE, THERE SHALL BE A 3 MIL (0.075 mm) PLASTIC LINER BETWEEN WALK AND AGGREGATE

#### NOTES FOR TYPE 2 TREE WELL

1. EXISTING SIDEWALK SHALL BE CAREFULLY SAWCUT PREPARATORY TO LAYING OF CONCRETE BLOCKS OR BRICK. SAWCUT OVER-RUNS SHALL BE CLEANED AND FILLED WITH EPOXY APPROVED BY THE ENGINEER AND FINISHED TO SIDEWALK GRADE.
2. THE PIPE MAY BE CIP, ACP, VCP, ABS, PVC, GALV STL OR ASPHALT IMPREGNATED FIBER DUCT, AND IT MAY BE BELL OR PLAIN END.
3. NAILS SHALL BE GALVANIZED STEEL BOX.
4. AFTER ALL OTHER WORK PERTINENT TO PLANTING HAS BEEN COMPLETED, EACH TREE SHALL BE WATERED IMMEDIATELY WITH A MINIMUM OF 20 GALLONS (75 LITERS ) OF WATER AND REPEATED 2 TIMES IN THE NEXT 3 DAYS. AFTER THE WATER HAS SETTLED AND THE SOIL IS SUFFICIENTLY DRY, THE SOIL SHALL BE GRADED AND TAMPED. A 3" (75 mm) LAYER OF AGGREGATE SHALL BE PLACED AND GRADED TO ACCEPT BRICKS FLUSH WITH THE TOP SURFACE OF THE SIDEWALK. THE PREMOLDED JOINT FILLER AND HEADERS SHALL BE CAREFULLY PLACED TO INSURE A TIGHT FIT WITH THE TOP OF THE JOINT FILLER FLUSH WITH THE ADJACENT SIDEWALK.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

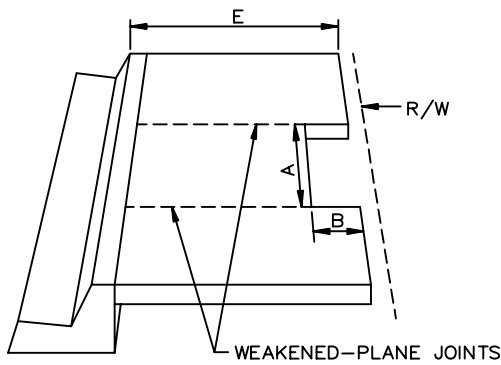
**TREE WELL**

STANDARD PLAN

**519-3**

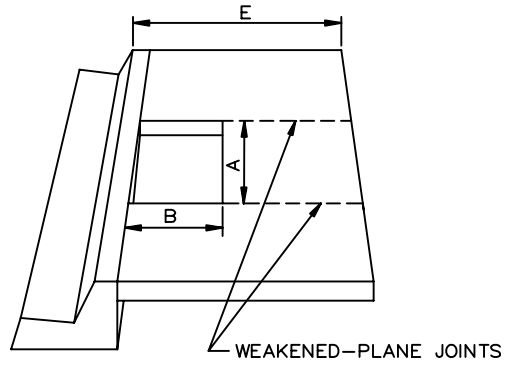
SHEET 3 OF 7

**SEE OCPW STANDARD PLAN 519-3-OC FOR CONDITIONS**



1 COVER REQUIRED

CASE 1: 3' x 18" (900 mm x 450 mm) TREE WELL  
CASE 2: 4' x 24" (1200 mm x 600 mm) TREE WELL

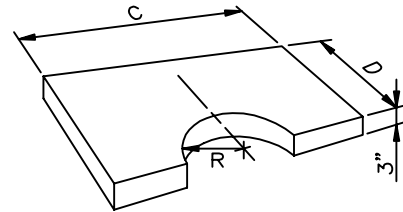


2 COVERS REQUIRED

CASE 3: 3' x 3' (900 mm x 900 mm) TREE WELL  
CASE 4: 4' x 4' (1200 mm x 1200 mm) TREE WELL

## TREE WELLS

CASE	A	B	C	D	E	R
1	3'-0" (900 mm)	18" (450 mm)	2'-11" (975 mm)	17 1/2" (450 mm)	5'-0" (1500 mm) MIN	9" (225 mm)
2	4'-0" (1200 mm)	24" (600 mm)	3'-11" (1175 mm)	23 1/2" (600 mm)	5'-6" (1650 mm) MIN	15" (375 mm)
3	3'-0" (900 mm)	3'-0" (900 mm)	2'-11" (975 mm)	17 1/2" (450 mm)	6'-6" (1950 mm) MIN	9" (225 mm)
4	4'-0" (1200 mm)	4'-0" (1200 mm)	3'-11" (1175 mm)	23 1/2" (600 mm)	7'-6" (2250 mm) MIN	15" (375 mm)



## POROUS TREE WELL COVER (SEE NOTE 2)

### NOTES FOR TYPE 3 TREE WELL

- SEE SHEET 7 FOR NOTES PERTAINING TO THE SHEET.
- PERMEABLE (POROUS) CONCRETE TREE WELL COVER:  
THE COVER SHALL BE MADE OF PERMEABLE CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 1200 PSI (8.5 MPa) AND SHALL BE PRECAST & REINFORCED WITH 2 1/4" x 2 1/4" (60 mm x 60 mm) 16 GAUGE WIRE MESH. CONCRETE SHALL CONSIST OF ONE PART CEMENT TO FOUR PARTS 3/8" (10 mm) GRAVEL AND APPROXIMATELY FOUR GALLONS (15 LITERS) OF WATER PER SACK OF CEMENT. THE GRAVEL SHALL BE CLEAN WITH FINES REMOVED. CURING COMPOUND TO WHICH WATER-PROOFING MATERIALS HAVE BEEN ADDED WILL NOT BE PERMITTED.

## TYPE 3

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**TREE WELL**

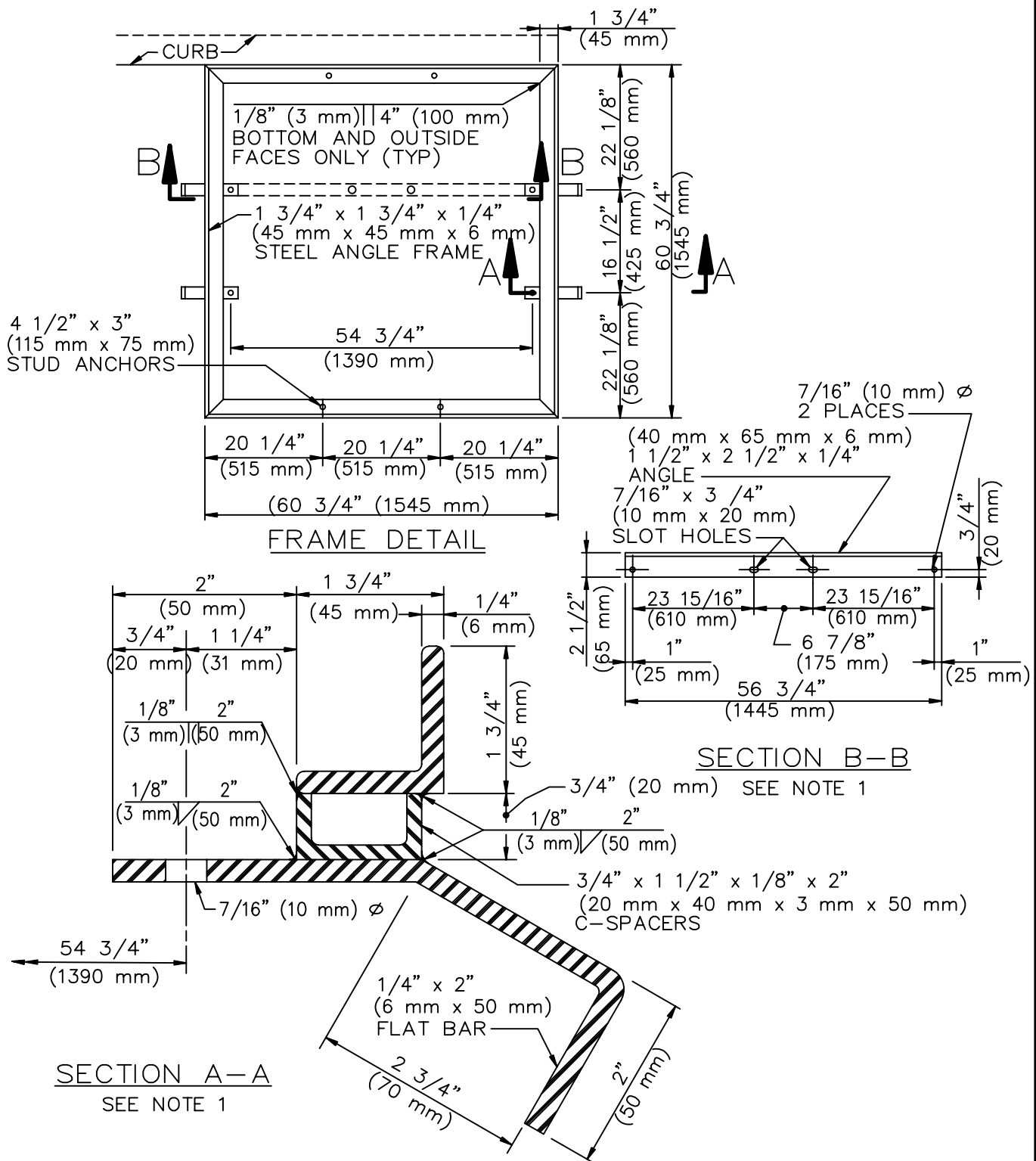
STANDARD PLAN

**519-3**

SHEET 4 OF 7

**SEE OCPW STANDARD PLAN 519-3-OC FOR CONDITIONS**





#### NOTES FOR TYPE 4 TREE WELL

1. SECTION A AND B REQUIRED ONLY WHEN TREE GUARD IS REQUIRED.
2. ALL METAL PARTS AND FRAME SHALL CONFORM TO THE SSPWC AND SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
3. SEE SHEET 7 FOR NOTES PERTAINING TO THIS SHEET.

#### TYPE 4

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**TREE WELL**

STANDARD PLAN

**519-3**

SHEET 6 OF 7

**SEE OCPW STANDARD PLAN 519-3-OC FOR CONDITIONS**

GENERAL NOTES FOR ALL FOUR TYPES OF TREE WELL

1. TREE WELLS SHOULD BE SPACED APPROXIMATELY 50' (15 m) APART, BUT NOT LESS THAN ONE PER RESIDENTIAL LOT.
2. LOCATION OF TREE WELLS SUBJECT TO THE FOLLOWING MINIMUM CLEARANCES:
  - A. 50' (15 m) FROM BCR ON THE APPROACH TO AN INTERSECTION AND 15' (4.5 m) FROM THE ECR ON THE EXIT SIDE.
  - B. 20' (6 m) FROM LIGHT STANDARDS.
  - C. 10' (3 m) FROM FIRE HYDRANTS AND DRIVEWAYS.
  - D. 5' (1.5 m) FROM HOUSE WALKS AND UTILITY METERS.
3. COVERS SHALL BE COLORED BUFF USING AN ACCEPTABLE COLORING AGENT.
4. TREE WELL SHALL BE BACKFILLED WITH CLEAN DIRT FLUSH WITH ADJACENT WALK UNTIL TREE IS PLANTED.
5. DO NOT USE CASE 1 OR CASE 2 TREE WELL WHERE THERE IS AN EXISTING FENCE OR WALL AT THE R/W LINE.
6. TOP OF TREE WELL COVER SHALL BE FLUSH WITH ADJACENT SIDEWALK.
7. LOCATION OF TREE SUBJECT TO CHANGE AT THE DIRECTION OF THE ENGINEER.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**TREE WELL**

STANDARD PLAN

**519-3**

SHEET 7 OF 7

**SEE OCPW STANDARD PLAN 519-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC#</u>	<u>OCPW#</u>	<u>NAME AND CONDITIONS</u>
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519-3	519-3-OC	<u>TREE WELL</u>
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SHEET 1, SECTION A-A

1. REVISE CALLOUT OF 4 INCH DIAMETER PIPE TO READ: 4 INCH DIAMETER PIPE FILLED WITH 1 INCH OR NO. 3 AGGREGATE (TYP), OR 1 INCH CRUSHED ROCK.

SHEET 2, CASE 1 & 2

1. MANHOLE BRICK SHOULD READ:  
2½ INCH X 3⅞ INCH X 8¼ INCH

SHEET 4, NOTE 2

1. REVISE CONCRETE MINIMUM COMPRESSIVE STRENGTH OF 1,200 PSI TO 2,000 PSI.

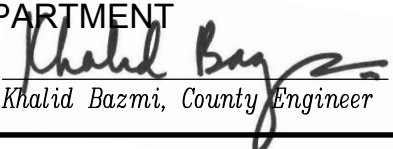
SHEET 7

1. TREE WELLS MUST CONFORM TO NOTES 1 AND 2 OF SPPWC STANDARD PLAN 519-3, AND OCPW STANDARD PLAN 1700.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

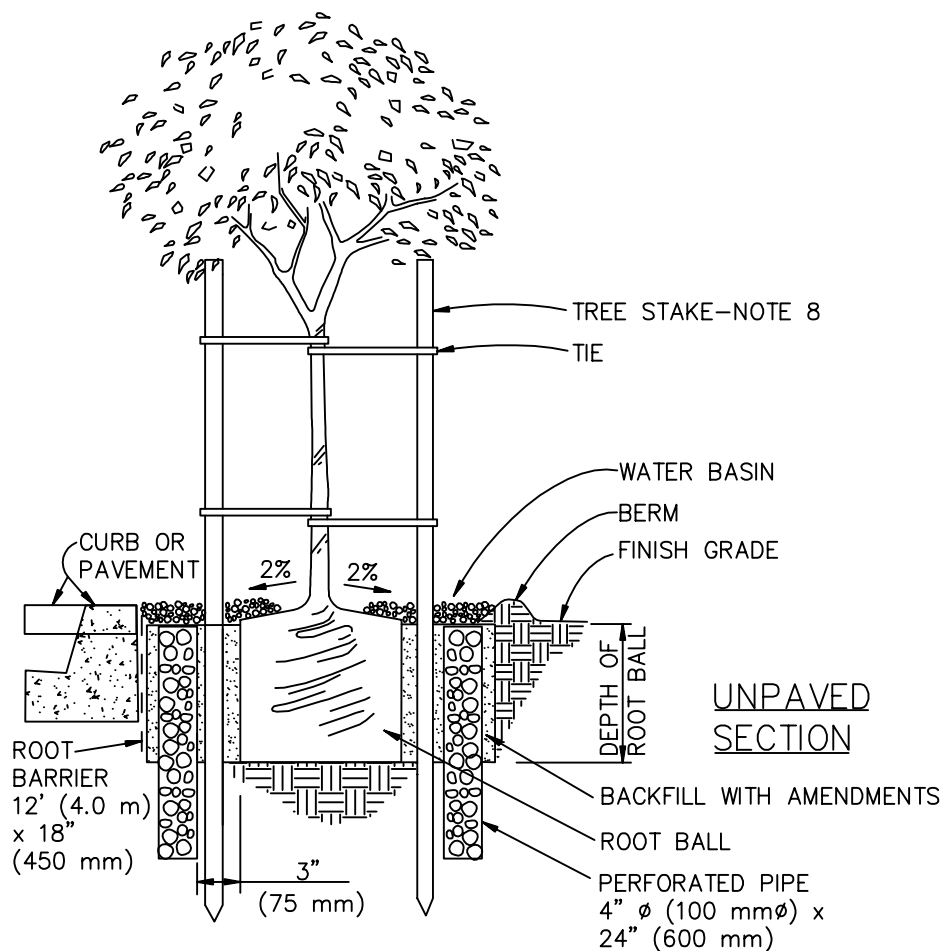
STD. PLAN

519-3-OC

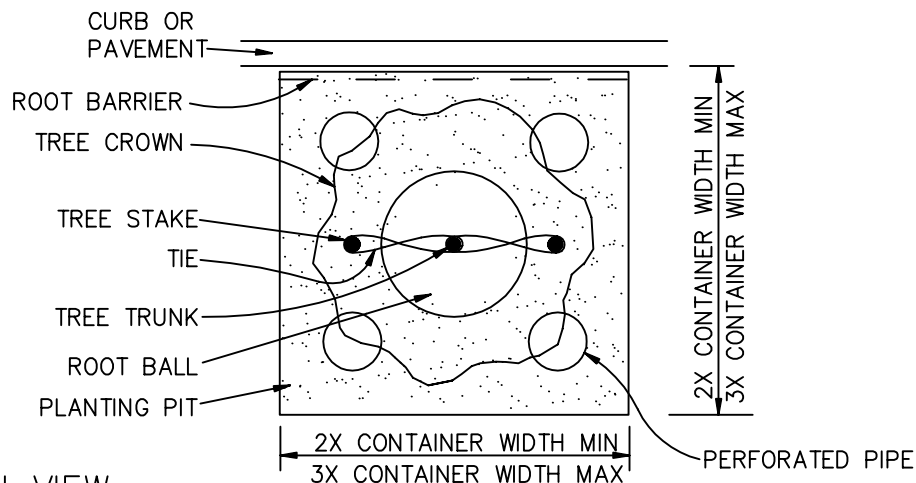
SPPWC STANDARD PLAN - TREE WELL

SHT. 1 OF 1

PAVED  
SECTION



PLAN VIEW



UNPAVED PARKWAY  
15 GAL (60 LITER) OR 24" (600 mm) BOX

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1985  
REV. 1993, 1996, 2005, 2009

**TREE PLANTING**

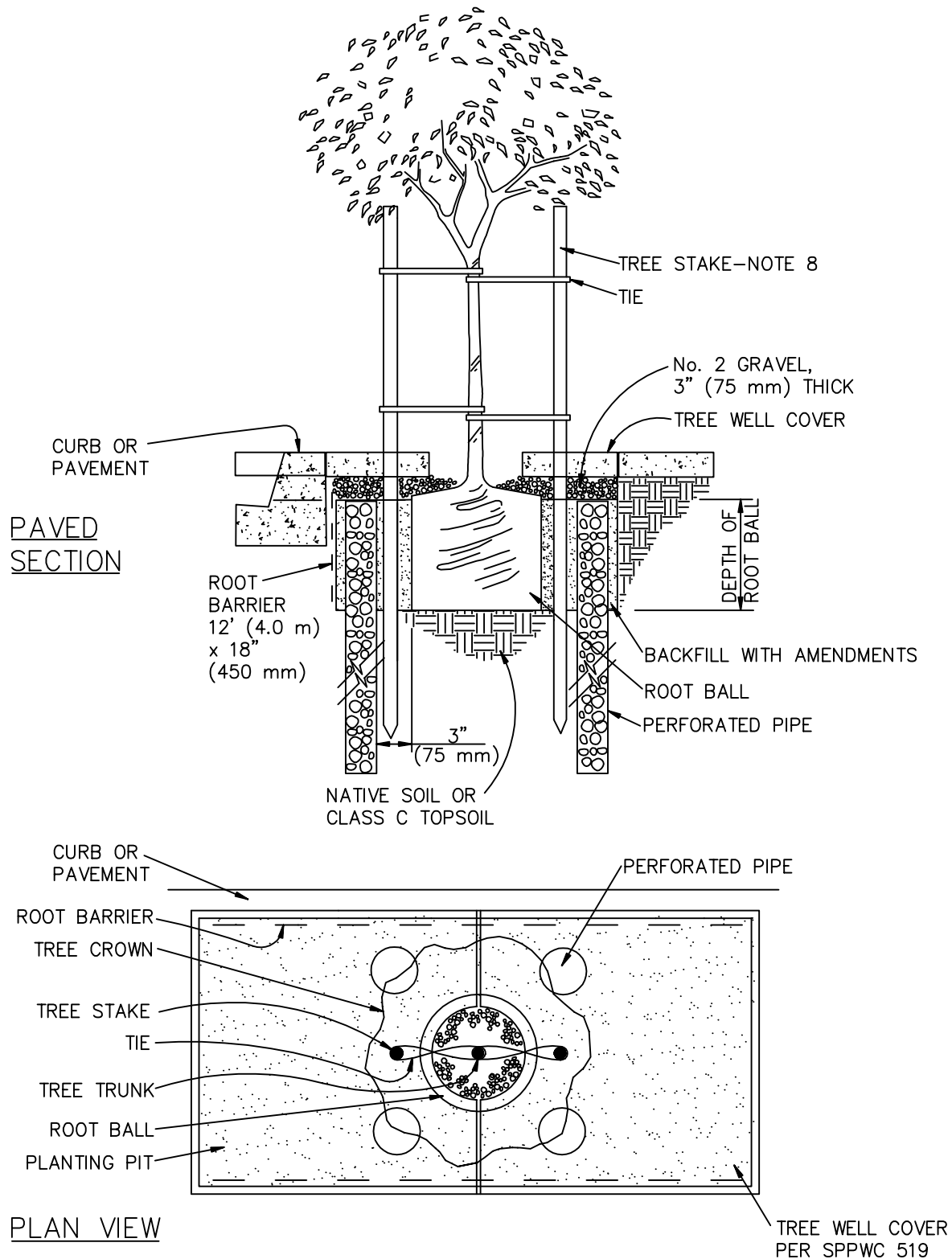
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**520-4**

SHEET 1 OF 4

**SEE OCPW STANDARD PLAN 520-4-OC FOR CONDITIONS**



SIDEWALK TREE WELL  
15 GAL (60 LITER) OR 24" (600 mm) BOX

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

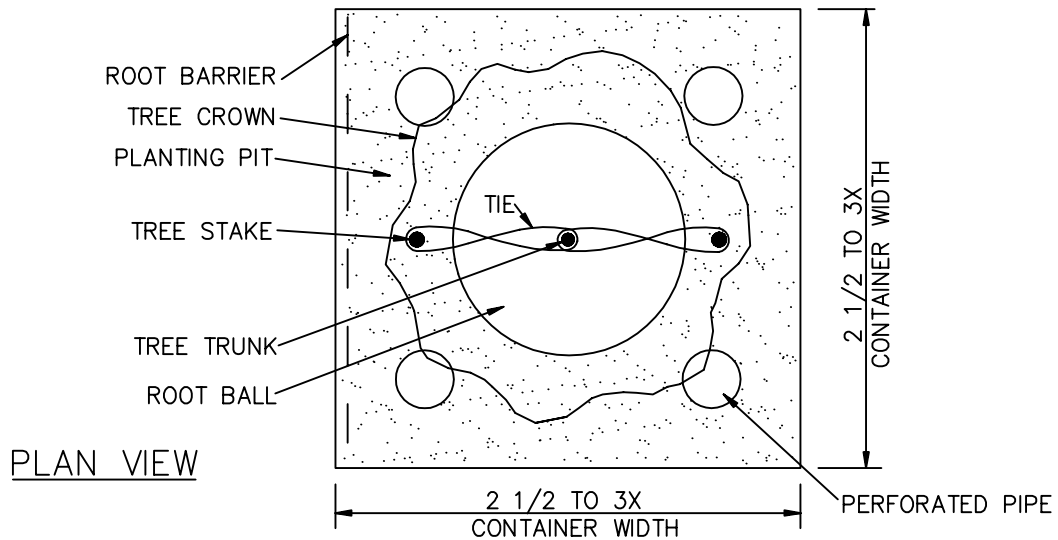
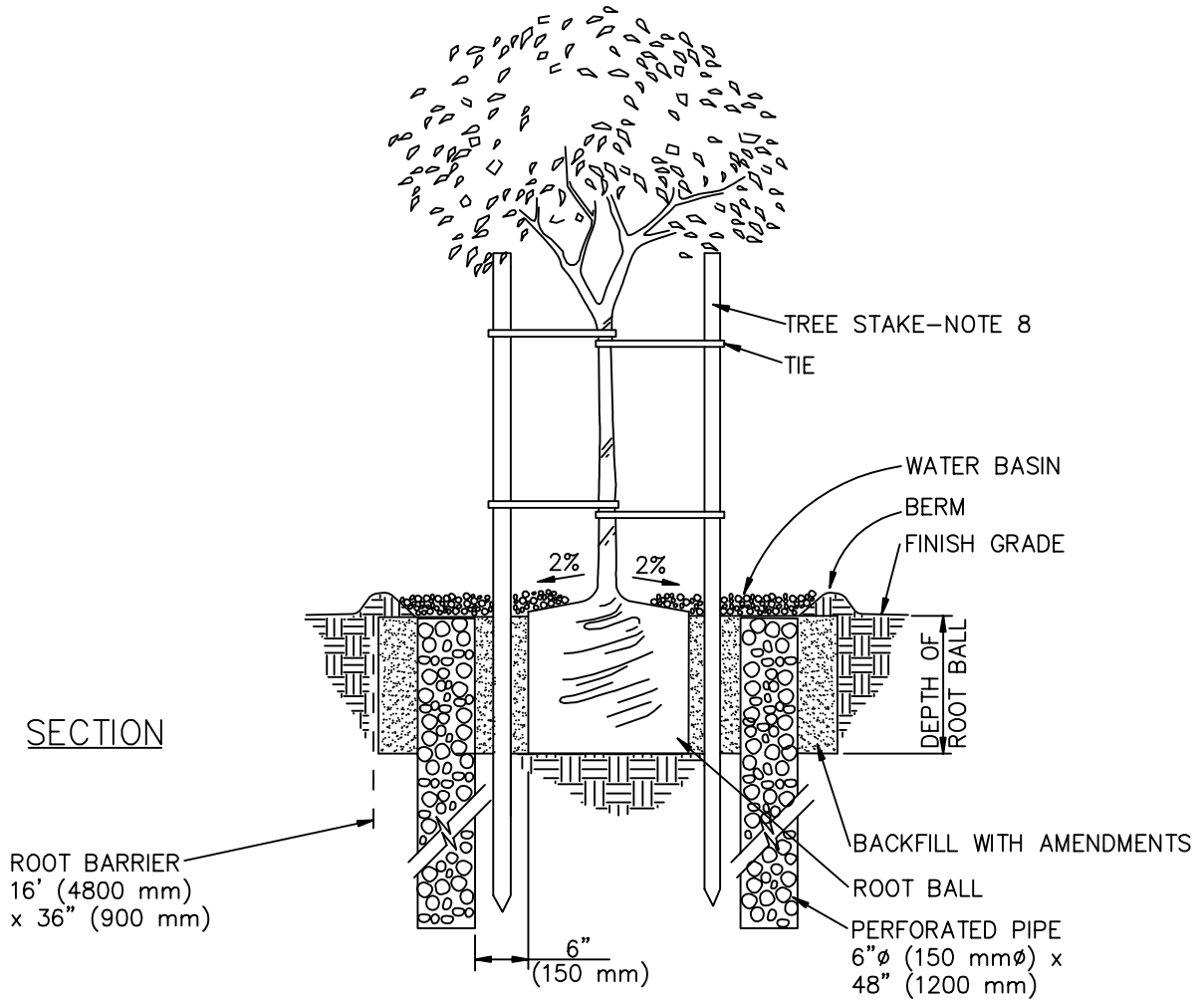
# **TREE PLANTING**

STANDARD PLAN

**520-4**

SHEET 2 OF 4

**SEE OCPW STANDARD PLAN 520-4-OC FOR CONDITIONS**



30" (750 mm) TO 48" (1200 mm) BOX

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

## TREE PLANTING

STANDARD PLAN

**520-4**

SHEET 3 OF 4

**SEE OCPW STANDARD PLAN 520-4-OC FOR CONDITIONS**

NOTES:

1. SET TOP OF ROOT BALL 1" (25 mm) ABOVE FINISH GRADE.
2. FOR 24" (600 mm) BOX TREES OR SMALLER, INSTALL ROOT BARRIERS IF TRUNK IS WITHIN 5' (1.5 m) OF CURB OR WALK.  
FOR 30" TO 48" (750 mm TO 1200 mm) BOX TREES, INSTALL ROOT BARRIERS IF TRUNK IS WITHIN 10' (3.0 m) OF CURB OR WALK.
3. AMEND BACKFILL MIX PER SPECIFICATIONS. LEAVE TRUNK AND ROOT FLARE VISIBLE.
4. SET PERFORATED PIPE FLUSH WITH TOP OF BACKFILL. FILL PIPE WITH No. 2 GRAVEL PER SSPWC TABLE 200-1.4.(B) AND COVER WITH FILTER FABRIC. WRAP FABRIC 6" (150 mm) DOWN SIDES OF PIPE.
5. FORM 3 1/2" (90 mm) HIGH BERM AROUND BACKFILL AS A WATER BASIN.
6. TOP WATER BASIN WITH 3 1/2" (90 mm) OF No. 2 GRAVEL OR TYPE 1 MULCH PER THE SPECIAL PROVISIONS. KEEP GRAVEL OR MULCH 3 1/2"(90 mm) CLEAR OF TRUNK. LEAVE TRUNK AND ROOT FLARE VISIBLE.
7. REMOVE ALL NURSERY STAKES.
8. INSTALL NEW TREE STAKES PER SPPWC 518.
9. FASTEN TREE TO STAKES PER 308-4.6, TWO TIES PER STAKE.
10. AFTER PLANTING, PRUNE THE TREE AS APPROVED BY THE ENGINEER.
11. ROOT BARRIER, WHERE SHOWN, SHALL BE 80 MIL (2.0 mm) THICK.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**TREE PLANTING**

STANDARD PLAN

**520-4**

SHEET 4 OF 4

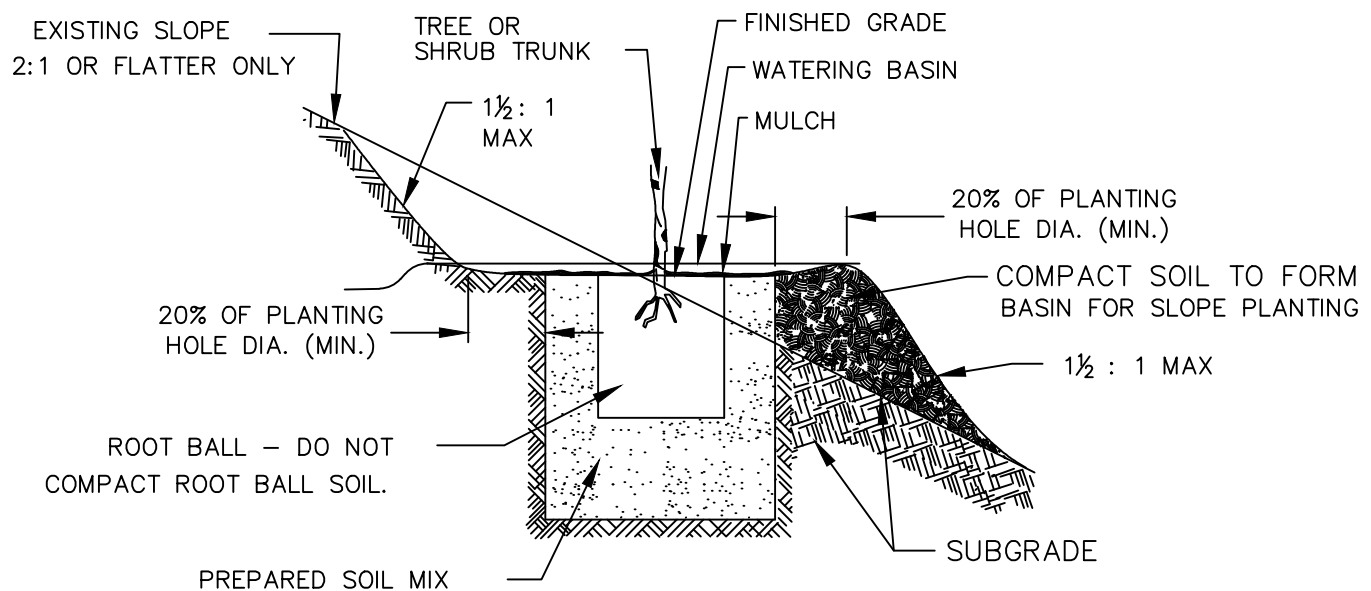
**SEE OCPW STANDARD PLAN 520-4-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC#	OCPW#	NAME AND CONDITIONS
520-4	520-4-OC	TREE PLANTING

SHEET 4

1. ADD TO NOTE 1: PREPARED SOIL-MIX HOLE SHALL BE TWICE THE ROOT-BALL DEPTH AND TWICE THE ROOT-BALL DIAMETER.
2. REVISE NOTE 3 TO READ: PREPARED SOIL MIX PER SPECIFICATIONS OR APPROVAL.
3. REVISE NOTE 2 TO READ: MINIMUM PLANTING CLEARANCES OF TREES SHALL CONFORM TO OCPW STANDARD PLAN 1700.
4. ADD TO NOTE 6: FILL UP PLANT HOLE WITH WATER AND ALLOW TO DRAIN PRIOR TO PLANTING.
5. ADD THE TREE AND SHRUB PLANTING DETAIL AS SHOWN BELOW:



TREE & SHRUB PLANTING DETAIL

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

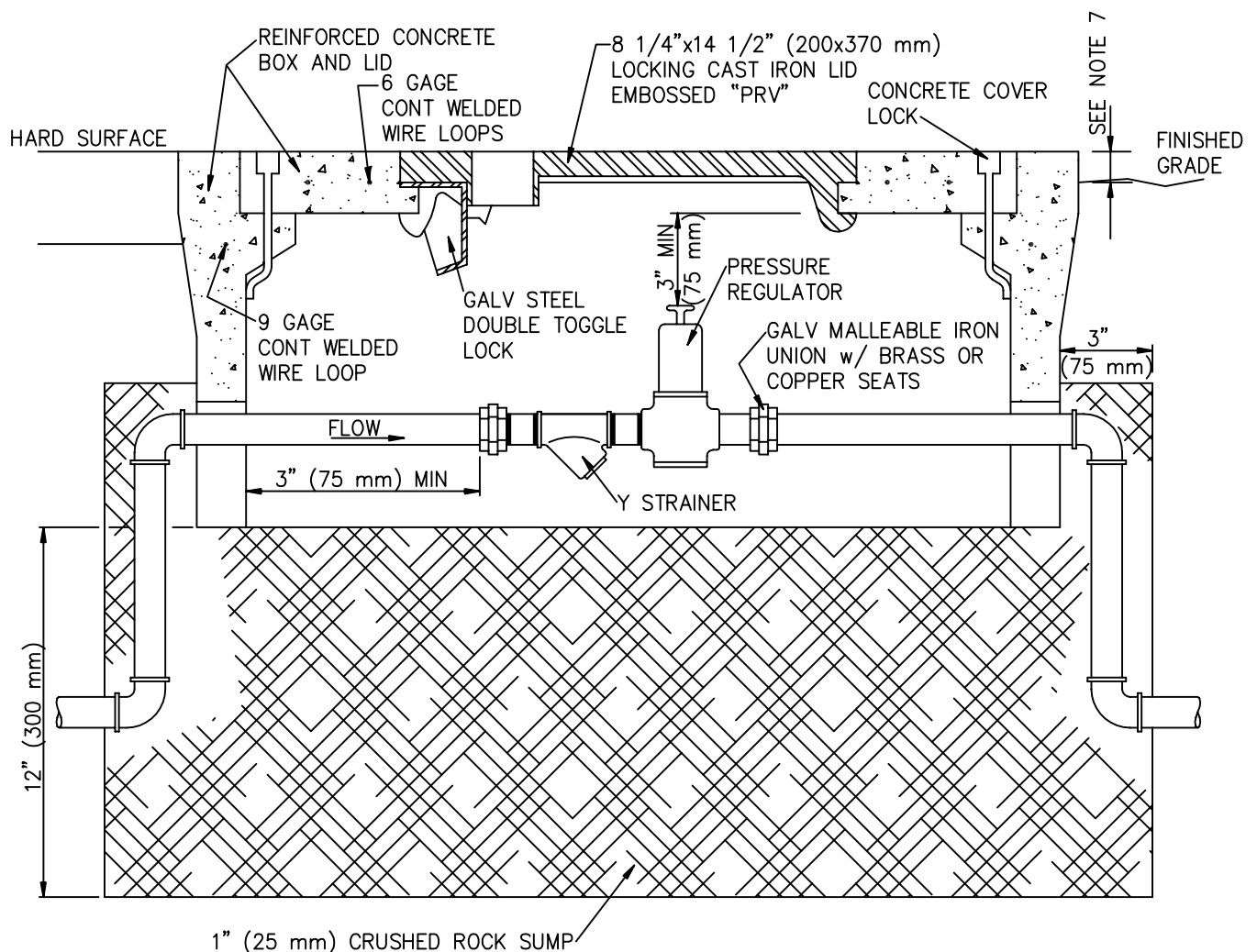
STD. PLAN

520-4-OC

SPPWC STANDARD PLAN - TREE PLANTING

SHT. 1 OF 1

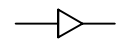




**NOTES:**

1. PRESSURE REGULATOR AND Y STRAINER SHALL BE BRASS OR BRONZE.
2. PRESSURE RATING SHALL BE AS SPECIFIED.
3. Y STRAINER SHALL BE FITTED WITH A 30 MESH SCREEN OF STAINLESS STEEL OR MONEL AND A BLOW-OFF COCK.
4. VALVE BOX SHALL BE SIZED TO CONTAIN ENTIRE Y STRAINER AND PRESSURE REGULATOR ASSEMBLY.
5. ASSEMBLY SHALL BE INSTALLED HORIZONTAL. BLOW-OFF COCK, ADJUSTMENT NUT, AND MAIN CAP ON REGULATOR SHALL BE ACCESSIBLE.
6. UNLESS OTHERWISE NOTED, FITTINGS SHALL BE THREADED SCHEDULE 80 PVC.
7. AREA AROUND VALVE BOX MAY BE PLANTED OR HARD SURFACE OR A COMBINATION OF BOTH.  
TOP OF VALVE BOX:  
AT GRADE FOR HARD SURFACE  
1/2" (12 mm) ABOVE GRADE FOR LAWN  
1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS
8. CRUSHED ROCK SHALL COVER BOX SIDE OPENINGS TO PREVENT SOIL ENTRY.
9. CLOSE NIPPLES ARE PROHIBITED.

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005, 2009

**PRESSURE REGULATOR INSTALLATION**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**521-3**

SHEET 1 OF 1

**SEE OCPW STANDARD PLAN 521-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.


<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
521-3	521-3-OC	<u>PRESSURE REGULATOR INSTALLATION</u>

1. DELETE NOTE 6.
2. USE CLASS 315 PVC PIPE AND SCHEDULE 80 PVC FITTINGS FOR SIZE 2 INCHES OR GREATER. USE SCHEDULE 40 PVC PIPE AND FITTINGS FOR SIZES 1 1/2 INCHES OR LESS.
3. FOR INSTALLATION IN TURF AREAS, ALL PRESSURE REGULATOR SYSTEMS SHALL BE LOCATED OUTSIDE OF DESIGNATED PLAYING FIELDS (I.E., BASEBALL DIAMOND, SOCCER FIELD, ETC).
4. LOCKING CAST IRON LID SHALL BE 8 INCH X 14 INCH.
5. WRAP FILTER FABRIC AROUND SIDES AND BOTTOM OF BOX TO COVER ALL OPENINGS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

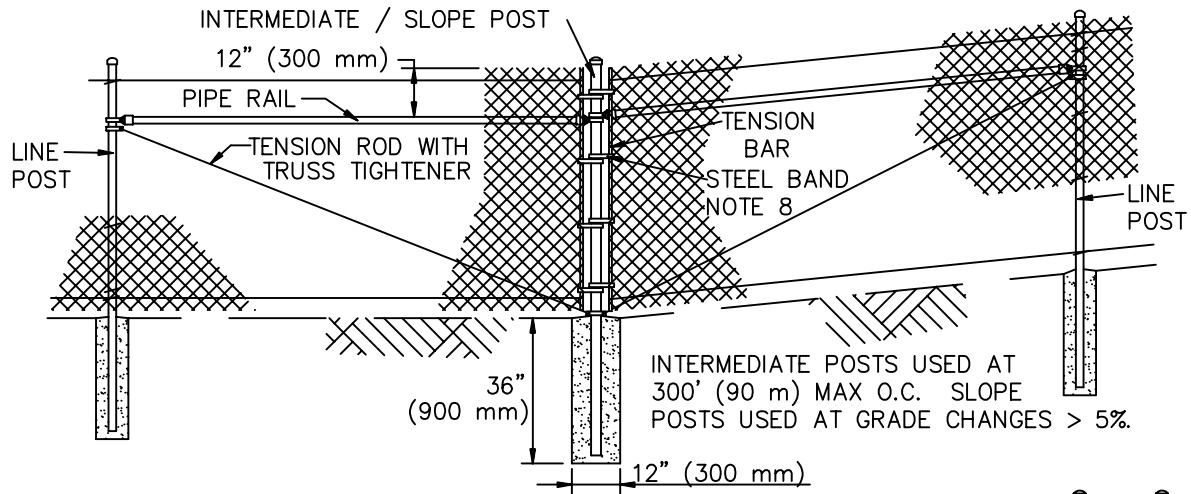
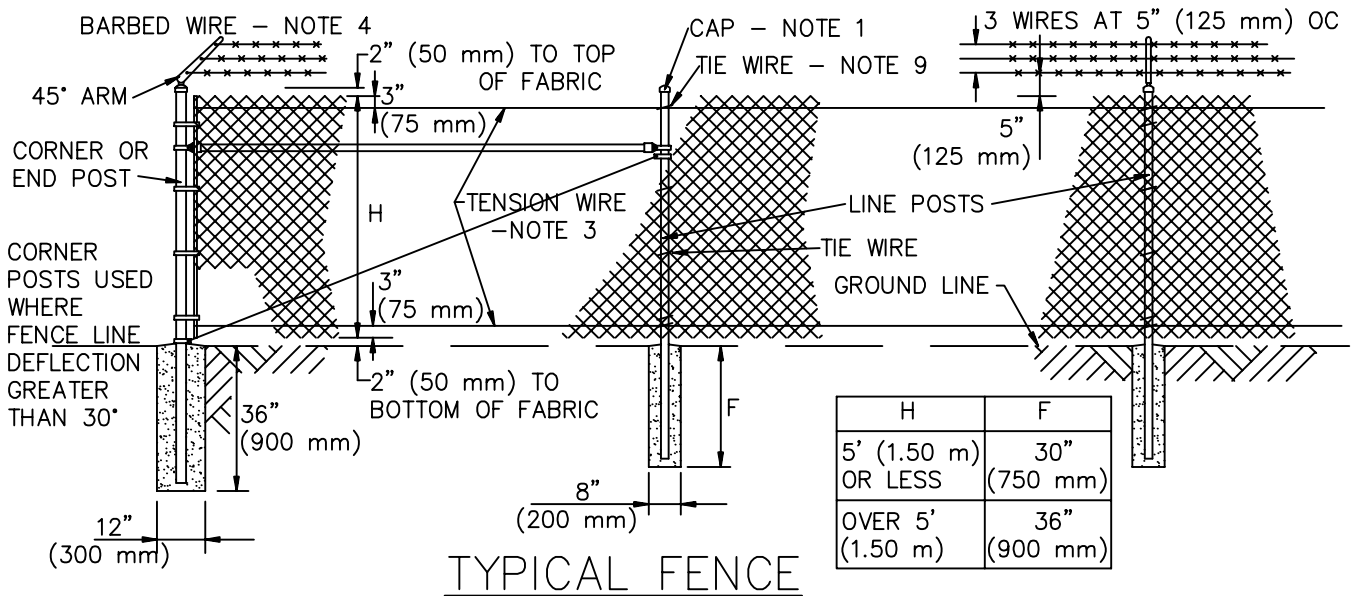
  
Khalid Bazmi, County Engineer

STD. PLAN

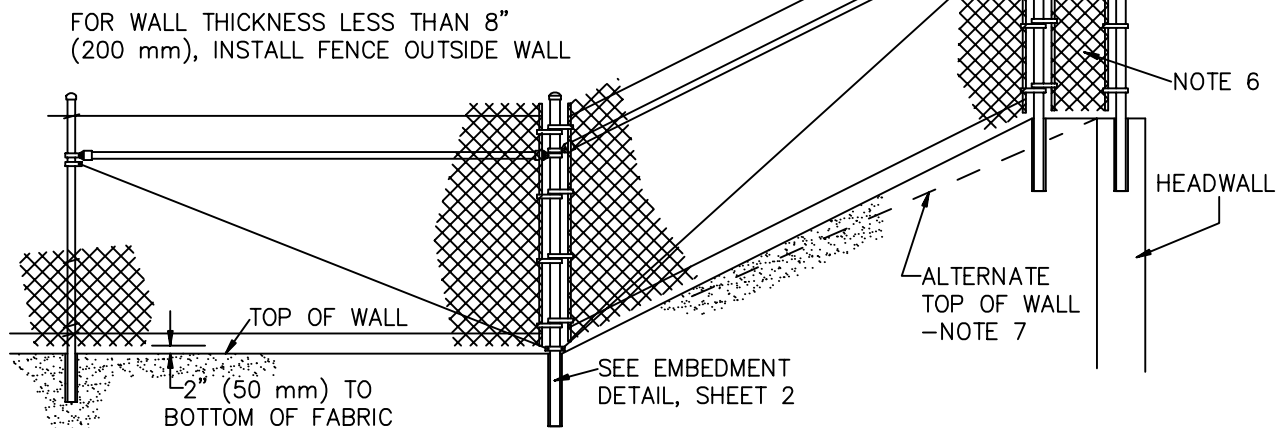
521-3-OC

SPPWC STANDARD PLAN-PRESSURE REGULATOR INSTALLATION

SHT. 1 OF 1



## INTERMEDIATE / SLOPE POST



## CHANNEL WALL AND WINGWALL AT HEADWALL

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2005

# CHAIN LINK FENCE AND GATES

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

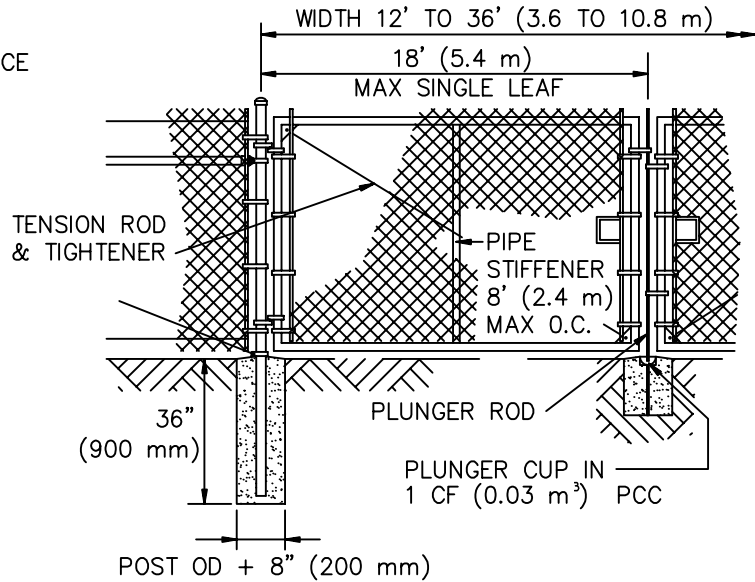
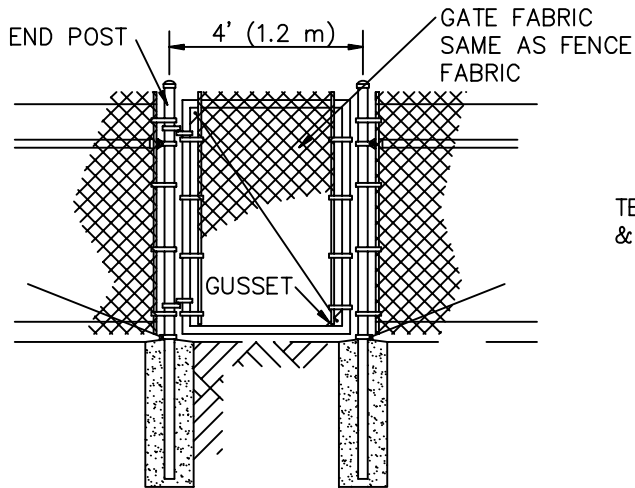
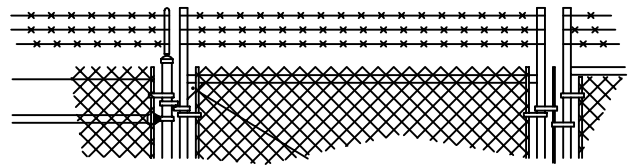
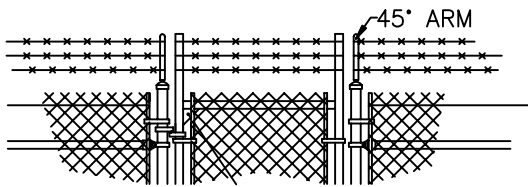
STANDARD PLAN

**600-3**

SHEET 1 OF 3

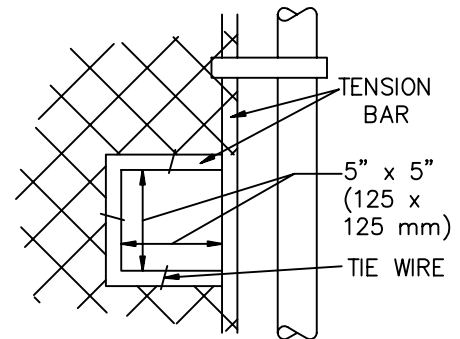
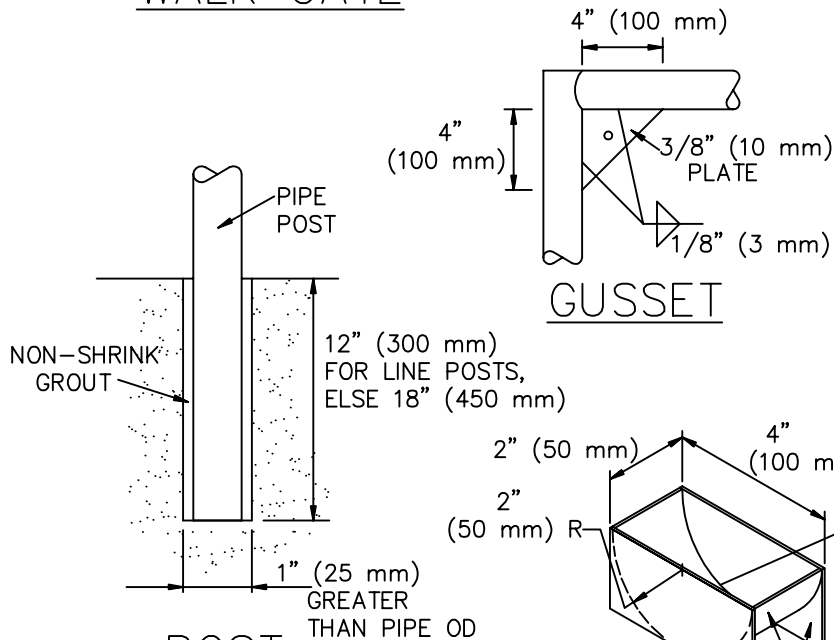
**SEE OCPW STANDARD PLAN 600-3-OC FOR CONDITIONS**

BARBED WIRE — NOTE 4



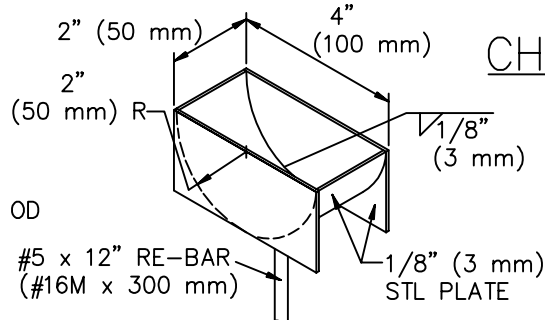
WALK GATE

DRIVE GATE



CHAIN AND LOCK  
CUT-OUT

POST  
EMBEDMENT



PLUNGER CUP  
ISOMETRIC

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**CHAIN LINK FENCE AND GATES**

STANDARD PLAN

**600-3**

SHEET 2 OF 3

**SEE OCPW STANDARD PLAN 600-3-OC FOR CONDITIONS**

NOTES:

1. SECURE DRIVE-FIT GALVANIZED CAP TO POST WITH 1/4" (6 mm) ROUND-HEAD RIVET.
2. H DENOTES FABRIC WIDTH AND NOMINAL FENCE HEIGHT. H = 5' (1.5 m) UNLESS OTHERWISE NOTED.
3. IF FENCE WITH TOP RAIL IS SPECIFIED, DELETE STEEL TENSION WIRE AT TOP, AND PIPE RAILS AT INTERMEDIATE, SLOPE, END AND CORNER POSTS. EXTEND TENSION ROD TO TOP RAIL.
4. BARBED WIRE SHALL BE USED ONLY WHEN SPECIFIED.
5. POST SPACING IS MAXIMUM 10' (3.0 m).
6. FILL CLEAR OPENINGS GREATER THAN 3" (75 mm) WITH FABRIC. FOR OPENINGS LESS THAN 18" (450 mm), TIE FABRIC TO POSTS.
7. USE ONE POST FOR COMBINED SLOPE AND CORNER POST IF TOP OF CHANNEL WALL IS CONSTRUCTED AS SHOWN FOR "ALTERNATE".
8. STEEL BANDS AT TENSION BARS SHALL BE 1/8" x 1" (3 x 25 mm), MINIMUM, SPACED AT MAXIMUM 16" (400 mm).
9. SECURE TENSION WIRES TO EACH LINE POST WITH TIE WIRES.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**CHAIN LINK FENCE AND GATES**

STANDARD PLAN

**600-3**

SHEET 3 OF 3

**SEE OCPW STANDARD PLAN 600-3-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
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600-3

600-3-OC

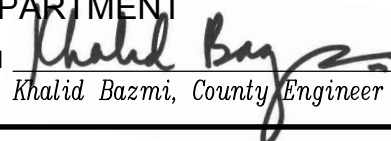
CHAIN LINK FENCE AND GATES

1. THE CHAIN LINK FENCE FABRIC SHALL BE 9-GAGE FOR ALL FENCES, REGARDLESS OF HEIGHT, UNLESS OTHERWISE SPECIFIED. FABRIC SHALL HAVE "KNUCKLES" (NOT TWISTS) AT THE TOP AND BOTTOM.
2. CONSTRUCT FENCE WITH FABRIC SIDE (OUTWARD SIDE) 0.2 FEET (60 mm) 2. INSIDE R/W (RIGHT-OF-WAY) LINE. PLACE POSTS AT LEAST 2.5 FEET (750 mm) FROM ANY R/W MONUMENT. R/W SHALL BE IDENTIFIED AND/OR STAKED TO THE SATISFACTION OF THE ENGINEER PRIOR TO PLACING FENCE POSTS.
3. CHAIN LINK FENCE FABRIC SHALL BE ATTACHED TO THE TOP AND BOTTOM TENSION WIRES AT 18 INCHES (450 mm) ON-CENTER WITH 12-GAGE HOG RINGS. FABRIC SHALL BE ATTACHED TO POSTS AND BRACES AT 16 INCHES (400 mm) ON-CENTER WITH 9-GAGE ALUMINUM WIRE.
4. ENTRY GATES ON FLOOD CONTROL FACILITIES SHALL BE THE MAXIMUM WIDTH POSSIBLE (NOT TO EXCEED 20 FEET (600 mm)) WITHIN THE R/W. ALL GATES OVER 12 FEET IN WIDTH (3600 mm) SHALL BE DOUBLE LEAF GATES.
5. GATES SHALL BE HUNG BY TWO HINGES FOR GATES 10 FEET-0 INCH (3000 mm) OR LESS AND BY THREE HINGES FOR GATES OVER 10 FEET-0 INCH (3000 mm). GATE HINGES SHALL BE AN INDUSTRIAL HANGER TYPE HINGE.
6. ALL GATE FRAMES ARE TO BE CONSTRUCTED OF 1½ INCHES (35 mm) MINIMUM, GALVANIZED PIPE.
7. DOUBLE LEAF GATES ARE TO INCLUDE TWO 5/16 INCH X 18 INCHES (8 mm X 450 mm) GALVANIZED CHAINS, FILLET WELDED TO CENTER OF GATE FRAME AND CUTOUT, CONFORMING TO DETAIL A ON SHEET 2 OF 3. NOTE: ALL FILLET WELDS ARE TO BE COATED WITH COLD GALVANIZING COMPOUND (95 PERCENT METALLIC ZINC BY WEIGHT IN DRY FILM).
8. SINGLE LEAF GATES ARE TO INCLUDE TWO 5/16 INCH X 18 INCHES (8 mm X 450 mm) GALVANIZED CHAINS, FILLET WELDED TO CENTER OF LATCH POST AND CUTOUT, CONFORMING TO DETAIL B ON SHEET 3 OF 3.  
  
NOTE: ALL FILLET WELDS ARE TO BE COATED WITH COLD GALVANIZING COMPOUND (95 PERCENT METALLIC ZINC BY WEIGHT IN DRY FILM).
9. MATERIALS FOR POSTS, RAILS, AND BRACES SHALL CONFORM TO TABLE 206-6.2 (A) OF THE CURRENT ISSUE OF THE GREENBOOK.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

STD. PLAN

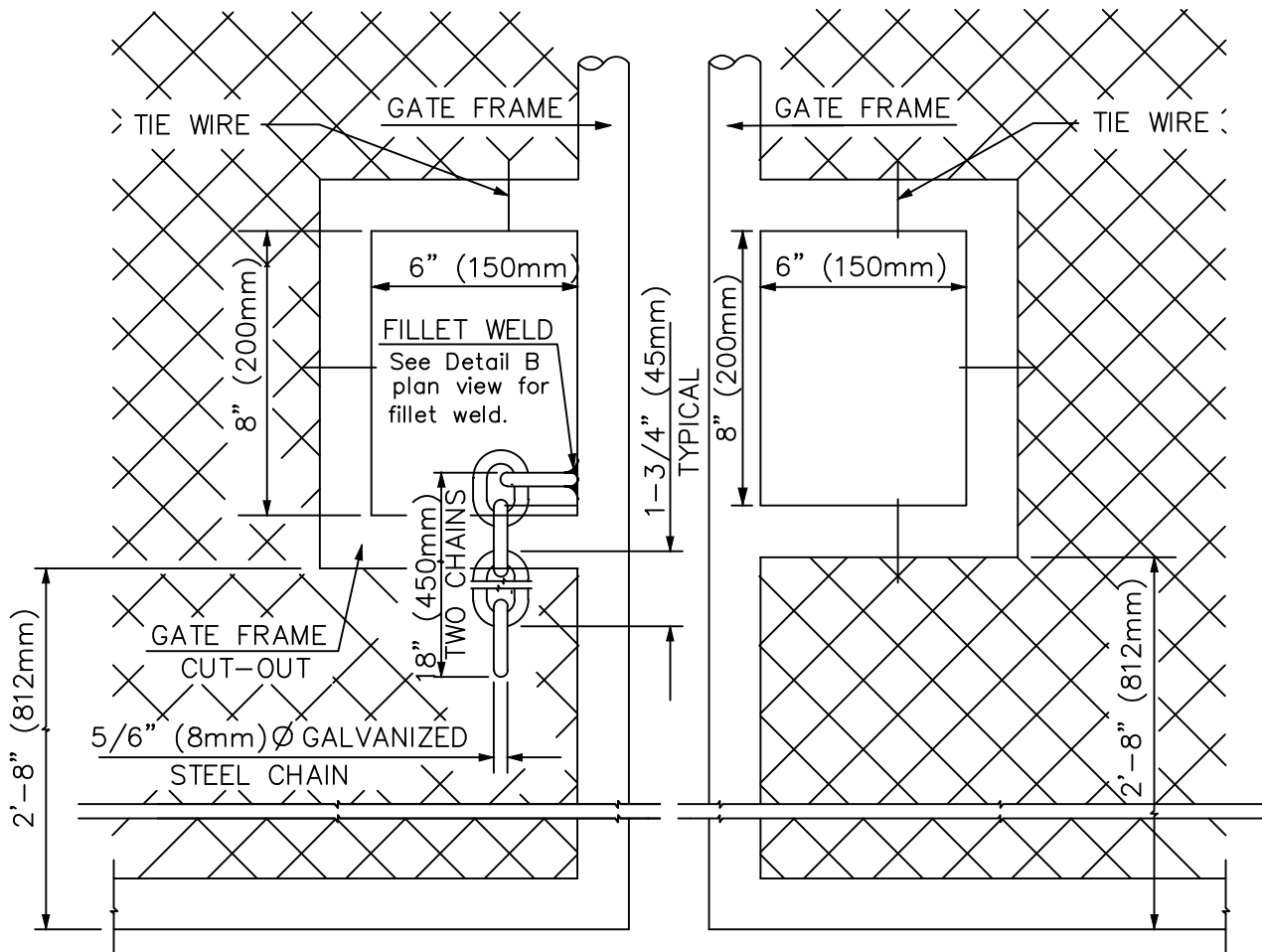
600-3-OC

SPPWC STANDARD PLAN - CHAIN LINK FENCE AND GATES

SHT. 1 OF 3

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #	OCPW #	NAME AND CONDITIONS
600-3	600-3-OC	CHAIN LINK FENCE AND GATES



TYPICAL DOUBLE LEAF  
GATE FRAME, CHAIN AND LOCK CUT-OUT

NOTE:

ALL GATE FRAMES AND CUT-OUTS  
SHALL BE 1½" (38 mm) MIN. STANDARD GALV. PIPE

DETAIL A

NTS

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

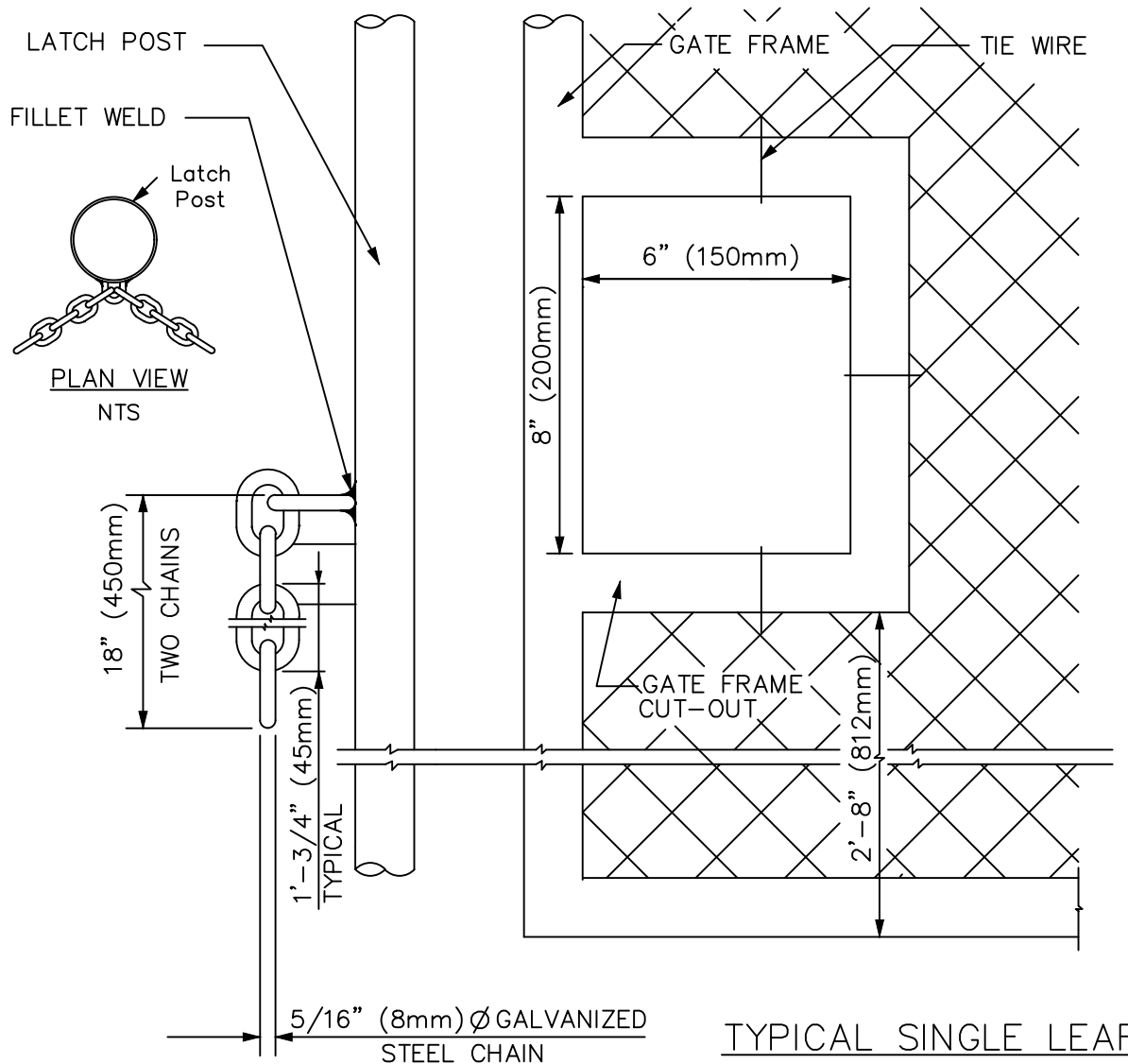
600-3-OC

SPPWC STANDARD PLAN - CHAIN LINK FENCE AND GATES

SHT. 2 OF 3

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

SPPWC #	OCPW #	NAME AND CONDITIONS
600-3	600-3-OC	CHAIN LINK FENCE AND GATES



**NOTE:**

ALL GATE FRAMES AND CUT-OUTS  
SHALL BE 1/2" (38 MM) MIN. STANDARD GALV. PIPE

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

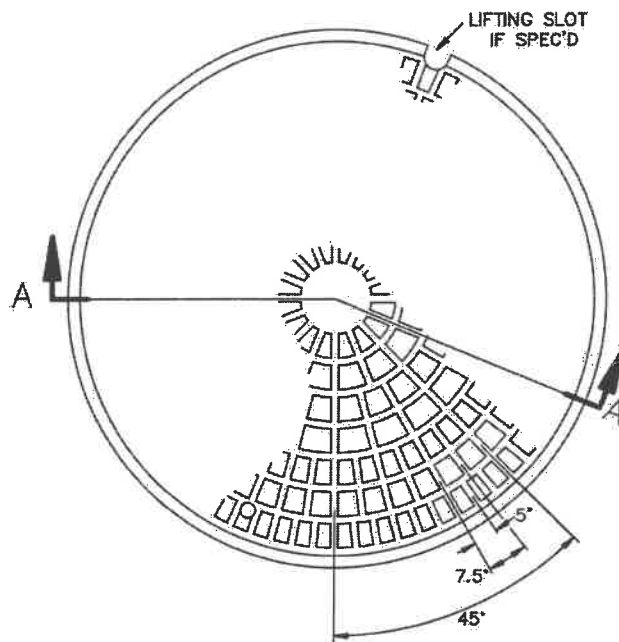
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

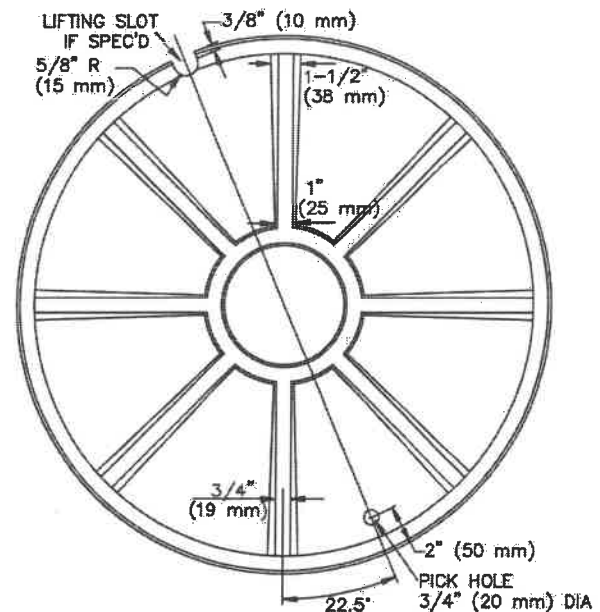
600-3-OC

SPPWC STANDARD PLAN - CHAIN LINK FENCE AND GATES

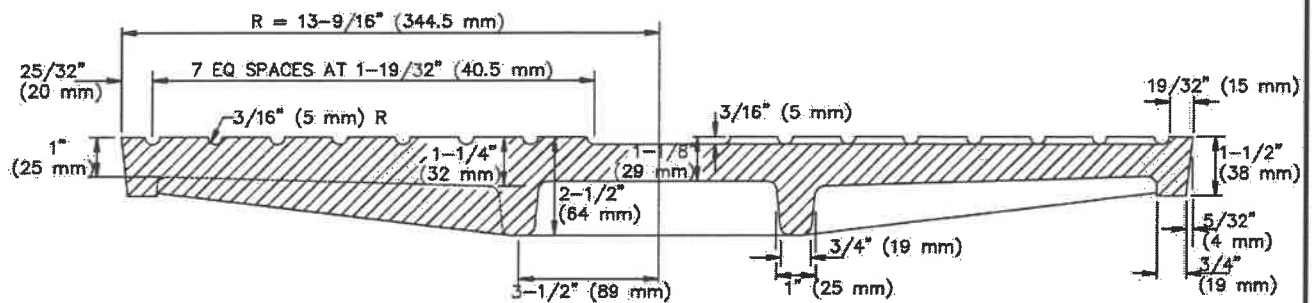
SHT. 3 OF 3



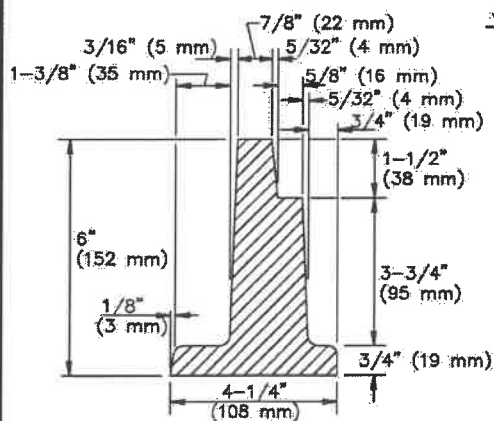
TOP OF COVER



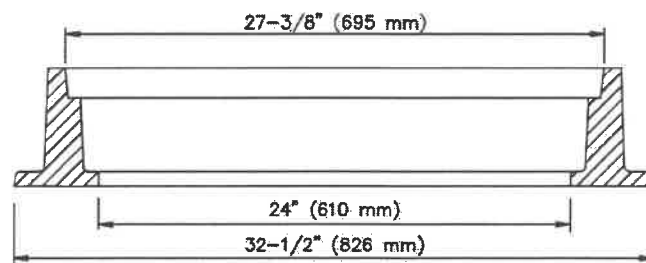
BOTTOM OF COVER



SECTION A-A



FRAME DETAIL



SECTION THRU FRAME

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE  
PUBLIC WORKS STANDARDS INC.  
GREENBOOK COMMITTEE  
1984  
REV. 1996, 2009, 2011

**24" (610 mm) MANHOLE FRAME  
AND COVER**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN

**630-4**

SHEET 1 OF 2

**SEE OCPW STANDARD PLAN 630-4-OC FOR CONDITIONS**

NOTES:

1. THE CAST IRON USED SHALL CONFORM TO ASTM A-48 CLASS 35B.
2. COVERS SHALL BE CAST WITH THE LETTER "D" FOR STORM DRAINS AND "S" FOR SEWERS, AND THE AGENCY'S IDENTIFICATION IN ACCORDANCE WITH INSTRUCTIONS FURNISHED BY THE AGENCY. THE LETTER "D" OR "S" SHALL BE APPROXIMATELY 2-1/2" (65 mm) HIGH WITH 1/2" (15 mm) LINE WIDTH, AND PLACED IN THE CENTER OF THE COVER. ALL LETTERS SHALL BE FLUSH WITH THE FINISHED SURFACE OF THE COVER.
3. FOUNDRY IDENTIFYING MARK, HEAT AND DATE SHALL BE CAST ON THE BOTTOM OF THE COVER AND ON THE INSIDE OF THE FRAME.
4. IMPORTED COVERS AND FRAMES SHALL HAVE THE COUNTRY OF ORIGIN MARKING IN COMPLIANCE WITH FEDERAL REGULATIONS.
5. WEIGHT OF FRAME SHALL BE 260 LBS (118 kg). WEIGHT OF COVER SHALL BE 175 LBS (79 kg). ACTUAL WEIGHTS SHALL BE WITHIN A RANGE OF 95% TO 110%.
6. THE MANHOLE FRAME AND COVER SHALL BE INSPECTED BY THE ENGINEER PRIOR TO SHIPMENT TO THE JOB SITE. ACCEPTANCE WILL BE INDICATED BY THE AGENCY'S MARK.
7. COVERS FOR MANHOLES LOCATED IN EASEMENTS, ALLEYS, PARKWAYS AND ALL PLACES OTHER THAN PAVED STREETS SHALL BE PROVIDED WITH SOCKET-SET SCREW LOCKING DEVICES. DRILL AND TAP TWO HOLES TO A DEPTH OF 1" (25 mm) AT 90 DEGREES TO PICK HOLE AND INSTALL 3/4" x 3/4" (20 x 20 mm) STAINLESS STEEL SOCKET-SET SCREWS WITH 3/8" (10 mm) RECESSED HEX HEAD. ALL THREADS SHALL BE N.C.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

**24" (610 mm) MANHOLE FRAME & COVER**

STANDARD PLAN

**630-4**

SHEET 2 OF 2

**SEE OCPW STANDARD PLAN 630-4-OC FOR CONDITIONS**

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2012 EDITION, OF THE PUBLIC WORKS STANDARDS, INC. HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
630-4	630-4-OC	<u>24" (610 MM) MANHOLE FRAME AND COVER</u>

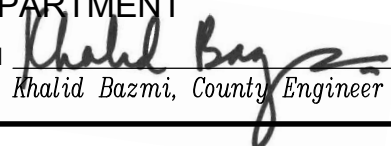
1. A CERTIFICATE OF COMPLIANCE STATING THAT THE MANHOLE FRAME(S) AND COVER(S) FURNISHED COMPLY IN ALL RESPECTS WITH THE REQUIREMENTS OF THE SPECIFICATIONS. SUCH CERTIFICATES SHALL BE SIGNED BY THE MANUFACTURER, SHALL CLEARLY IDENTIFY THE LOT ON THE CERTIFICATE AND SHALL BE FURNISHED WITH EACH LOT.

MANHOLE FRAME(S) AND COVER(S) PRODUCED OUTSIDE THE UNITED STATES SHALL BE FURNISHED WITH A CERTIFICATE OF COMPLIANCE ALONG WITH COMPLETE COPIES OF ALL TESTS AND TEST RESULTS FROM A PRIVATE TESTING FIRM LOCATED WITHIN CALIFORNIA AT NO ADDITIONAL EXPENSE TO THE AGENCY. THE TESTING FIRM SHALL BE EXPERIENCED IN AND KNOWLEDGEABLE OF THE TESTING OF MANHOLE FRAMES AND COVERS AND SHALL PROVIDE PROOF OF LIABILITY INSURANCE FOR AN AMOUNT NOT LESS THAN \$500,000 IN A FORM ACCEPTABLE TO COUNTY'S RISK MANAGEMENT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

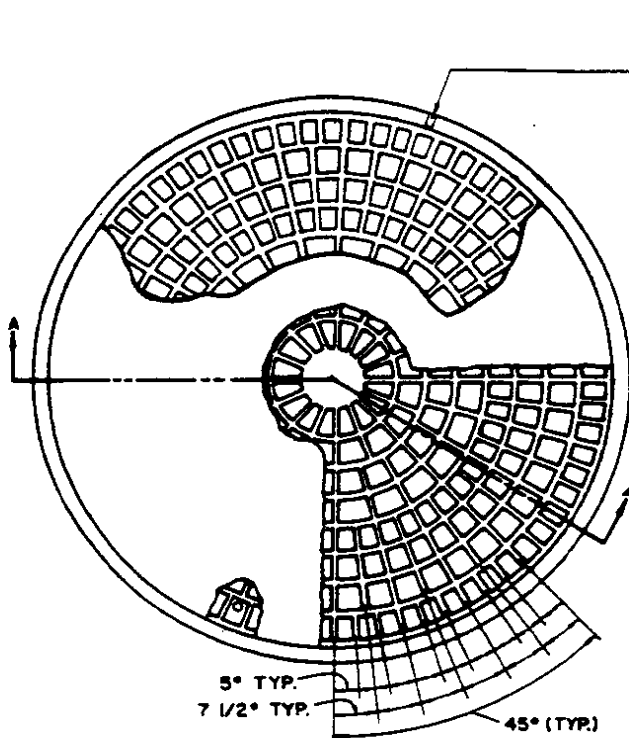
STD. PLAN

630-4-OC

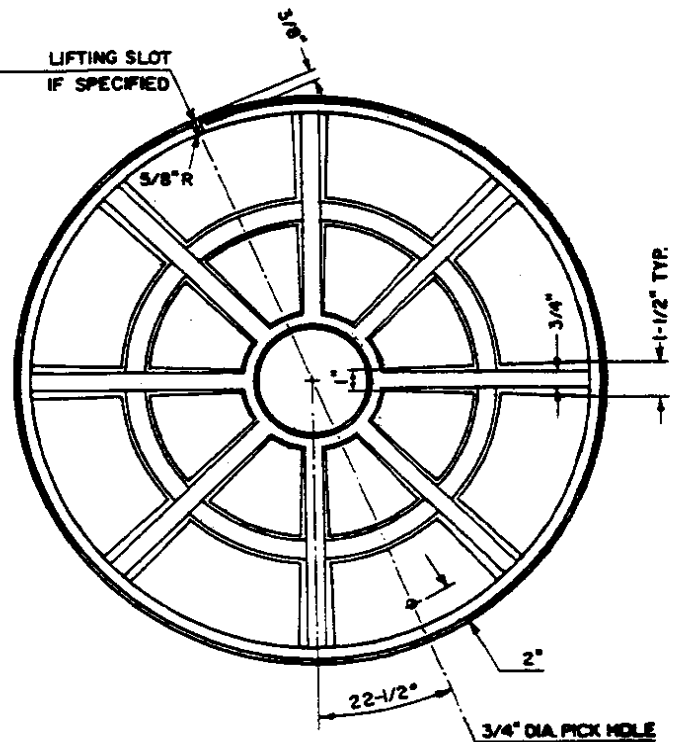
SPPWC STANDARD PLAN - 24" MANHOLE FRAME AND COVER

SHT. 1 OF 1

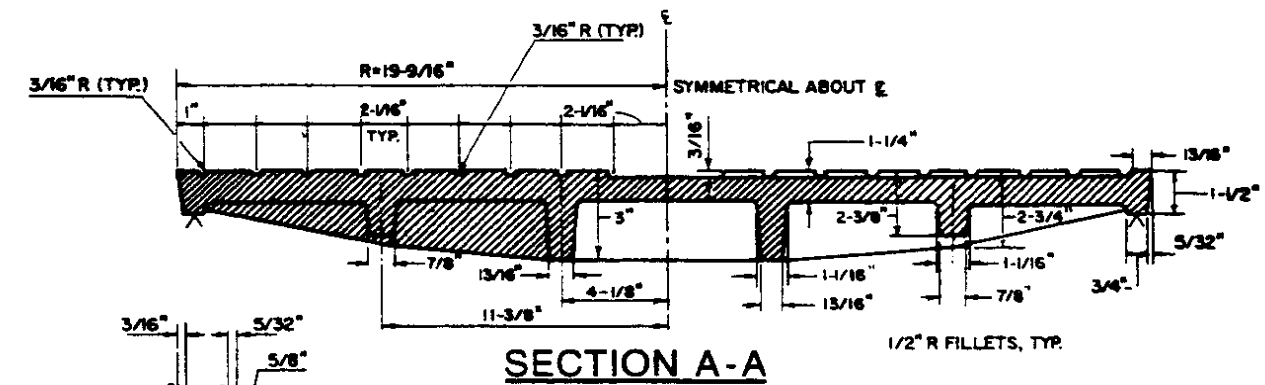




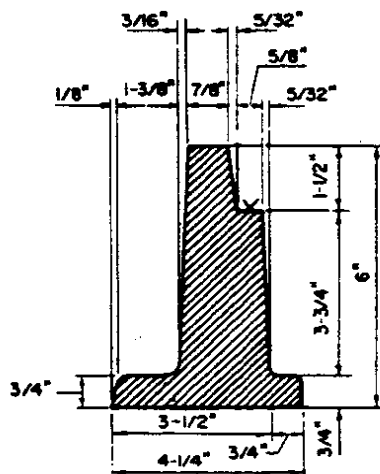
**COVER FOR 36" CLEAR OPENING FRAME**



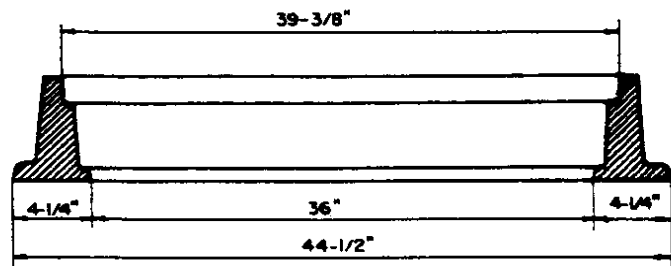
**BOTTOM PLAN OF COVER**



**SECTION A-A**



**DETAIL OF FRAME**



**SECTION THRU FRAME**

AMERICAN PUBLIC WORKS ASSOCIATION - SOUTHERN CALIFORNIA CHAPTER		
PROMULGATED BY THE APWA-AGC JOINT COOPERATIVE COMMITTEE 1984	<b>36-INCH MANHOLE FRAME AND COVER</b>	STANDARD PLAN <b>633-1</b>
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION		SHEET 1 OF 2

SEE OCPW STANDARD PLAN 633-1-OC FOR CONDITIONS

**NOTES:**

1. THE CAST IRON USED SHALL CONFORM WITH ASTM A-48 CLASS 35B.
2. THE FRAME AND COVER SHALL BE COATED WITH ASPHALTUM OR BITUMINOUS PAINT AFTER TESTING AND INSPECTION.
3. COVERS SHALL BE CAST WITH THE LETTER "D" FOR STORM DRAINS AND "S" FOR SEWERS AND THE AGENCY'S IDENTIFICATION IN ACCORDANCE WITH INSTRUCTIONS FURNISHED BY THE AGENCY. THE LETTER "D" OR "S" SHALL BE APPROXIMATELY 2½ INCHES HIGH WITH ½-INCH LINE WIDTH AND PLACED IN THE CENTER OF THE COVER. ALL LETTERS SHALL BE FLUSH WITH THE FINISHED SURFACE OF THE COVER.
4. FOUNDRY IDENTIFYING MARK, HEAT AND DATE SHALL BE CAST ON THE BOTTOM OF THE COVER AND ON THE INSIDE OF THE FRAME.
5. IMPORTED COVERS AND FRAMES SHALL HAVE THE COUNTRY OF ORIGIN MARKING IN COMPLIANCE WITH FEDERAL REGULATIONS.
6. WEIGHT OF FRAME SHALL BE 425 POUNDS. WEIGHT OF COVER SHALL BE 480 POUNDS. ACTUAL WEIGHTS SHALL BE WITHIN A RANGE OF 95% TO 110%.
7. THE MANHOLE FRAME AND COVER SHALL BE INSPECTED BY THE ENGINEER PRIOR TO SHIPMENT TO THE JOB SITE. ACCEPTANCE WILL BE INDICATED BY THE AGENCY'S MARK.
8. THE PROOF-LOAD FOR TEST METHOD B OF THE STANDARD SPECIFICATIONS IS 49,700 POUNDS.
9. COVERS FOR MANHOLES LOCATED IN EASEMENTS, ALLEYS, PARKWAYS AND ALL OTHER PLACES EXCEPT PAVED STREETS SHALL BE PROVIDED WITH SOCKET SET SCREW LOCKING DEVICES. DRILL AND TAP TWO HOLES TO A DEPTH OF ONE INCH AT 90 DEGREES TO PICK HOLE AND INSTALL ¾-INCH X ¾-INCH STAINLESS STEEL SOCKET SET SCREWS WITH ¾-INCH RECESSED HEX HEAD. ALL THREADS SHALL BE N.C.

**AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER****36-INCH MANHOLE FRAME AND COVER**

STANDARD PLAN

**633-1**

SHEET 2 OF 2

SEE OCPW STANDARD PLAN 633-1-OC FOR CONDITIONS

THE FOLLOWING STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 1985 EDITION, OF THE AMERICAN PUBLIC WORKS ASSOCIATION (SOUTHERN CALIFORNIA CHAPTER) AND ASSOCIATED GENERAL CONTRACTORS OF CALIFORNIA (SOUTHERN CALIFORNIA DISTRICTS) HAVE BEEN ADOPTED BY OCPW WITH CONDITIONS WHICH SHALL APPLY TO OCPW USE. THE CONDITIONS ARE LISTED BELOW.

<u>SPPWC #</u>	<u>OCPW #</u>	<u>NAME AND CONDITIONS</u>
633-1	633-1-OC	36" MANHOLE FRAME AND COVER

1. A CERTIFICATE OF COMPLIANCE STATING THAT THE MANHOLE FRAME(S) AND COVER(S) FURNISHED COMPLY IN ALL RESPECTS WITH THE REQUIREMENTS OF THE SPECIFICATIONS. SUCH CERTIFICATES SHALL BE SIGNED BY THE MANUFACTURER, SHALL CLEARLY IDENTIFY THE LOT ON THE CERTIFICATE AND SHALL BE FURNISHED WITH EACH LOT.

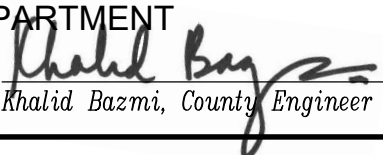
MANHOLE FRAME(S) AND COVER(S) PRODUCED OUTSIDE THE UNITED STATES SHALL BE FURNISHED WITH A CERTIFICATE OF COMPLIANCE ALONG WITH COMPLETE COPIES OF ALL TESTS AND TEST RESULTS FROM A PRIVATE TESTING FIRM LOCATED WITHIN CALIF. AT NO ADDITIONAL EXPENSE TO THE AGENCY. THE TESTING FIRM SHALL BE EXPERIENCED IN AND KNOWLEDGEABLE OF THE TESTING OF MANHOLE FRAMES AND COVERS AND SHALL PROVIDE PROOF OF LIABILITY INSURANCE FOR AN AMOUNT NOT LESS THAN \$500,000 IN A FORM ACCEPTABLE TO COUNTY'S RISK MANAGEMENT.

2. SPPWC STD. PLAN 633-2, 633-3, AND 633-4 HAVE NOT BEEN APPROVED FOR USE IN ORANGE COUNTY.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

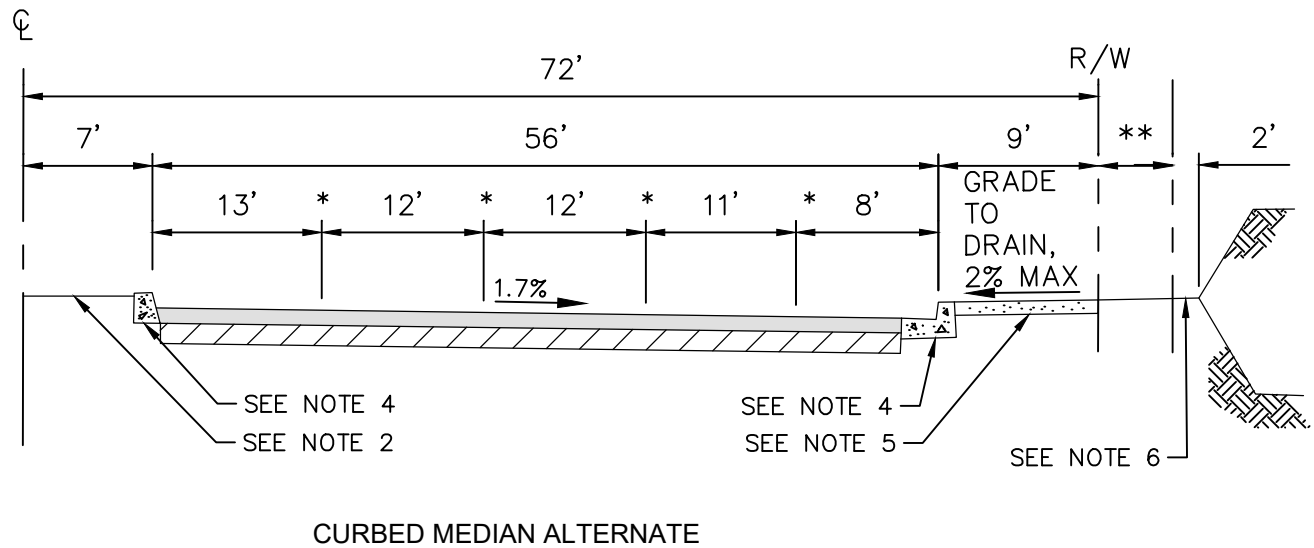
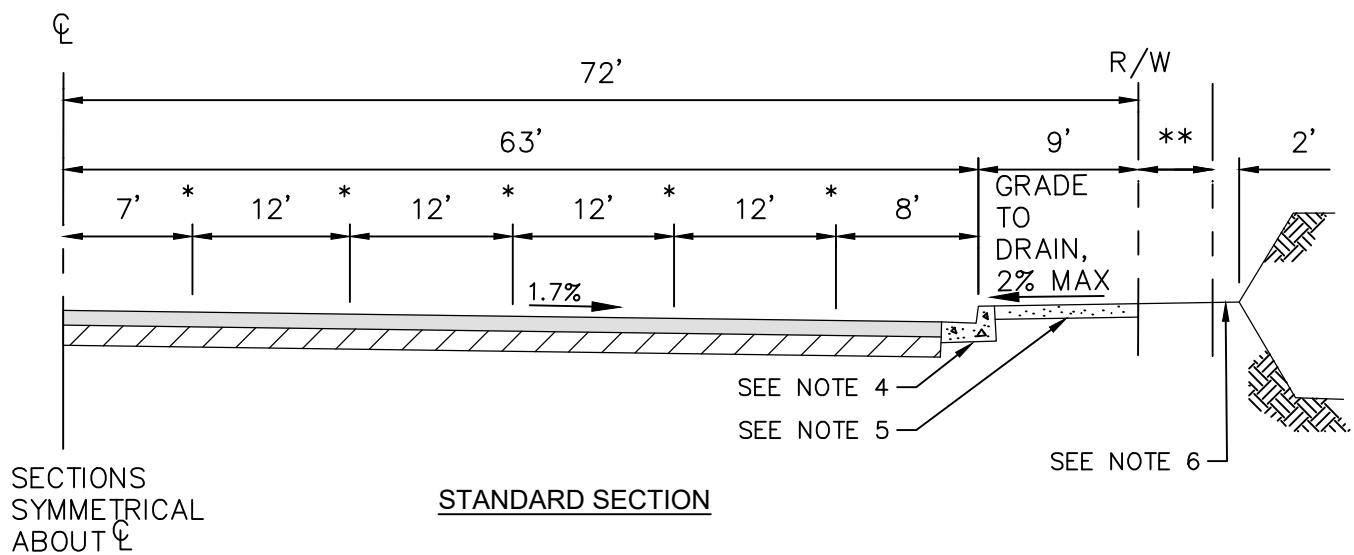
STD. PLAN

633-1-OC

SPPWC STANDARD PLAN - 36" MANHOLE FRAME AND COVER

SHT. 1 OF 1





- \* LONGITUDINAL JOINT FOR FINISH COURSE AC.
- \*\* ADDITIONAL RIGHT OF WAY MAY BE REQUIRED WHEN A PRINCIPAL HIGHWAY COINCIDES WITH AN ADOPTED ROUTE FOR AN ADDITIONAL PUBLIC FACILITY (I.E., PEDESTRIAN, BICYCLE, OR EQUESTRIAN TRAIL), OR FOR A SCENIC HIGHWAY.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1100

PRINCIPAL HIGHWAY TYPICAL SECTIONS

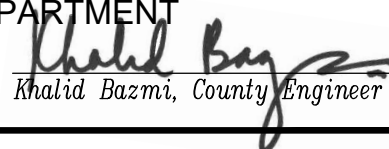
SHT. 1 OF 4

## TYPICAL ROADWAY SECTION NOTES:

1. THE STANDARD SECTION SHALL BE USED EXCEPT AS NOTED BELOW. THE CURBED MEDIAN ALTERNATE MAY BE ACCEPTABLE UNDER ANY OF THE FOLLOWING CONDITIONS AND SUBJECT TO APPROVAL OF THE ENGINEER:
  - A. WHEN IT FILLS A GAP ON A STRETCH OF ROADWAY ALREADY BUILT IN ADJACENT AREAS WITH CURBED MEDIAN.
  - B. WHEN IT IS A SHORT SECTION NEAR INTERSECTION FOR DELINEATION AND/OR PLACING TRAFFIC CONTROL DEVICES.
  - C. WHEN NECESSARY TO CONTROL TURN MOVEMENTS AND ACCESS ON HEAVILY TRAVELED ARTERIALS WITH COMMERCIAL FRONTAGE AND MULTIPLE DRIVEWAYS.
  - D. WHEN IT IS TO BE LANDSCAPED.
2. IF THE CURBED MEDIAN ALTERNATE IS USED, THE FOLLOWING SHALL APPLY:
  - A. SEE STANDARD PLAN 1114 FOR LANDSCAPED MEDIAN DETAIL.
  - B. SEE STANDARD PLAN 120-2-OC FOR CURB TYPE.
  - C. TO BE PAVED WITH 2 INCH AC/APPROVED SOIL STERILANT, UNLESS LANDSCAPING OR OTHER PAVING IS APPROVED BY THE ENGINEER.
  - D. LANDSCAPED MEDIANS SHALL NOT BE MAINTAINED WITH ROAD FUNDS; A METHOD OF FUNDING MAINTENANCE SHALL BE ESTABLISHED PRIOR TO APPROVAL OF STREET IMPROVEMENT PLANS.
3. THICKNESS OF PAVEMENT AND BASE TO BE DETERMINED BY THE ENGINEER.
4. SEE STANDARD PLAN 120-2-OC FOR CURB TYPE.
5. SEE STANDARD PLAN 1205 FOR SIDEWALK DETAILS.
6. DISTANCE SHOWN IS MINIMUM FROM RIGHT OF WAY TO HINGE POINT.
7. MINIMUM STREET FLOW LINE GRADE SHALL BE ONE PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

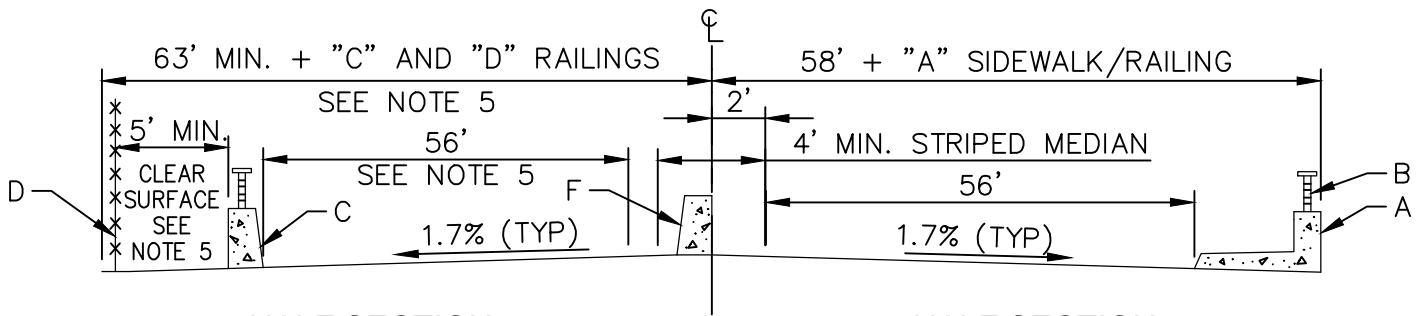
PRINCIPAL HIGHWAY TYPICAL SECTIONS

STD. PLAN

1100

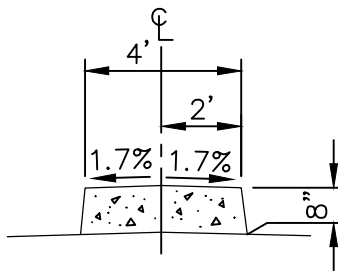
SHT. 2 OF 4

## TYPICAL BRIDGE SECTIONS

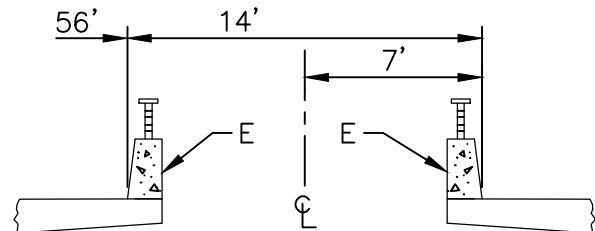


**HALF SECTION**  
**POSTED SPEED > 45 MPH**

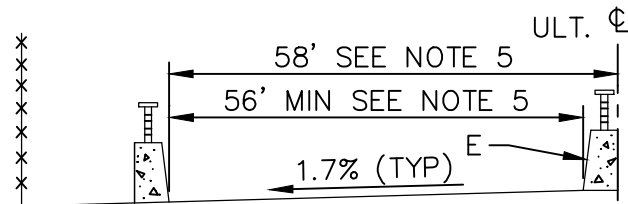
**HALF SECTION**  
**POSTED SPEED ≤ 45 MPH**  
FOR POSTED SPEEDS > 40 MPH  
CONSULT THE ENGINEER



**CURBED MEDIAN ALTERNATE**  
**POSTED SPEED ≤ 45 MPH**

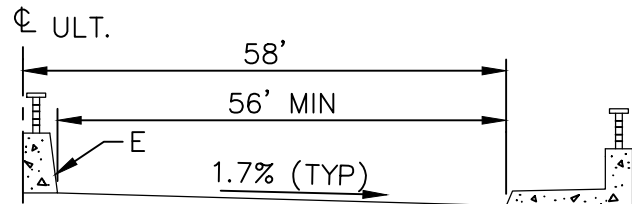


**OPEN MEDIAN ALTERNATE**



**INITIAL PHASE HALF SECTION**  
**POSTED SPEED > 45 MPH**

SAME AS STANDARD SECTION  
ON SHT. 1 EXCEPT AS NOTED



**INITIAL PHASE HALF SECTION**  
**POSTED SPEED ≤ 45 MPH**

SAME AS STANDARD SECTION  
ON SHT. 1 EXCEPT AS NOTED

SEE SHT. 4 FOR LETTERS A, B, C, D, E, & F.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1100

PRINCIPAL HIGHWAY TYPICAL SECTIONS

SHT. 3 OF 4

### TYPICAL BRIDGE SECTION NOTES:

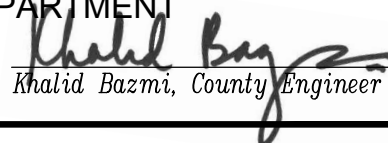
1. ULTIMATE BRIDGE TYPICAL SECTIONS TO BE APPROVED BY THE ENGINEER.
2. BRIDGE TYPE TO BE APPROVED BY THE ENGINEER.
3. MEDIAN WIDTH SUBJECT TO VARIATION DEPENDING ON INTERSECTION PROXIMITY.
4. CURBED MEDIAN OR OPEN MEDIAN ALTERNATE TO BE USED ONLY WHEN APPROACHING HIGHWAY ALSO HAS A RAISED MEDIAN.
5. FOR EQUESTRIAN TRAILS, SEE CALIFORNIA START PARKS ACCESSIBILITY GUIDELINES.
6. WEATHERING STEEL MAY BE USED FOR ANY RAILING WITH APPROVAL OF THE ENGINEER.
7. THICKNESS OF PAVEMENT AND BASE TO BE DETERMINED BY THE ENGINEER.

### BRIDGE RAILING TYPES:

- "A" ANY TRAFFIC/PEDESTRIAN COMBINATION RAILING & RAISED SIDEWALK FROM CALTRANS STD. PLANS OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE.
- "B" CALTRANS STANDARD TYPE 7 CHAIN LINK RAILING REQUIRED IN LIEU OF TUBULAR HAND RAILING WHEN STRUCTURE SPANS OVER A PUBLIC ROADWAY OR OTHER TRANSIT WAY.
- "C" ANY TRAFFIC/PEDESTRIAN COMBINATION RAILING FROM CALTRANS STD. PLANS OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE. SEE NOTE 5.
- "D" ANY CALTRANS PEDESTRIAN OR BICYCLE RAILING OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE. SEE NOTE 5.
- "E" ANY TRAFFIC/BICYCLE COMBINATION RAILING FROM CALTRANS STD. PLANS OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE.
- "F" TYPE 60 BARRIER, HALF-SECTION SHOWN

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

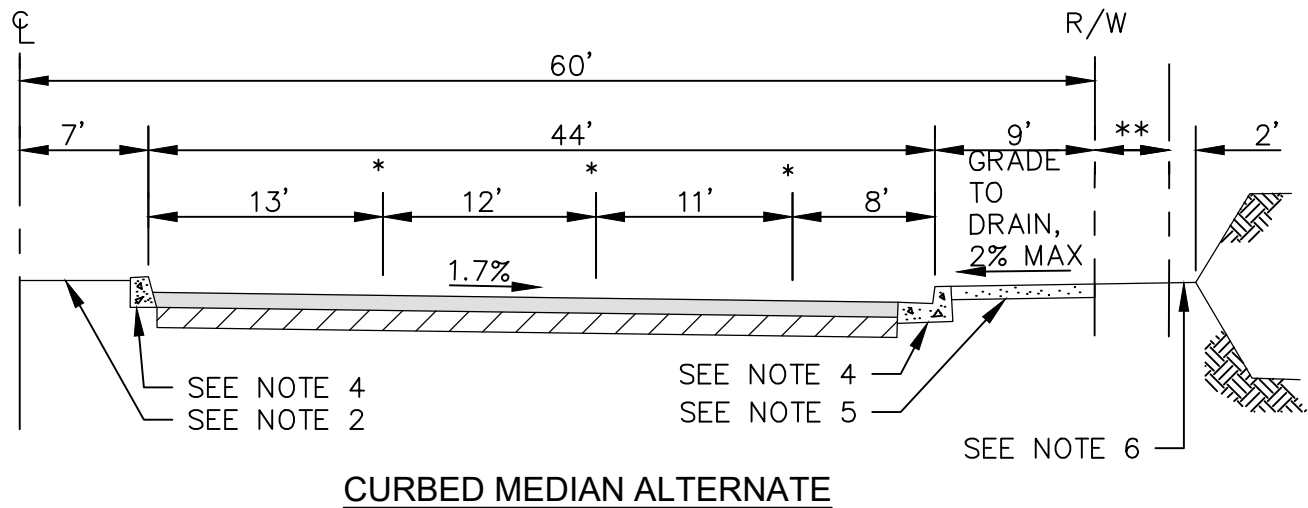
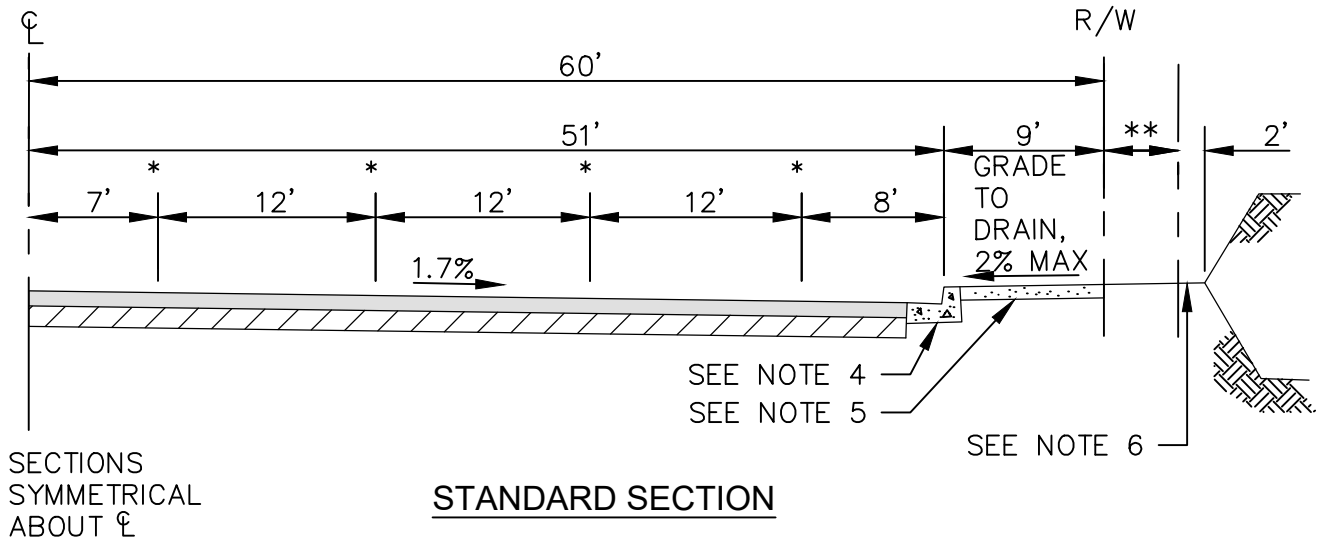
Revision: August 2018

STD. PLAN

1100

PRINCIPAL HIGHWAY TYPICAL SECTIONS

SHT. 4 OF 4



- \* LONGITUDINAL JOINT FOR FINISH COURSE AC.
- \*\* ADDITIONAL RIGHT OF WAY MAY BE REQUIRED WHEN A PRINCIPAL HIGHWAY COINCIDES WITH AN ADOPTED ROUTE FOR AN ADDITIONAL PUBLIC FACILITY (I.E., PEDESTRIAN, BICYCLE, OR EQUESTRIAN TRAIL), OR FOR A SCENIC HIGHWAY.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1101

MAJOR HIGHWAY TYPICAL SECTIONS

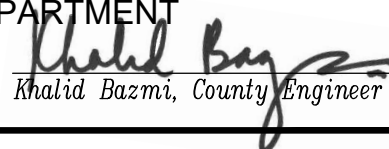
SHT. 1 OF 2

## GENERAL NOTES:

1. THE STANDARD SECTION SHALL BE USED EXCEPT AS NOTED BELOW. THE CURBED MEDIAN ALTERNATE MAY BE ACCEPTABLE UNDER ANY OF THE FOLLOWING CONDITIONS AND SUBJECT TO APPROVAL OF THE ENGINEER:
  - A. WHEN IT FILLS A GAP ON A STRETCH OF ROADWAY ALREADY BUILT IN ADJACENT AREAS WITH CURBED MEDIAN.
  - B. WHEN IT IS A SHORT SECTION NEAR INTERSECTION FOR DELINEATION AND/OR PLACING TRAFFIC CONTROL DEVICES.
  - C. WHEN NECESSARY TO CONTROL TURN MOVEMENTS AND ACCESS ON HEAVILY TRAVELED ARTERIALS WITH COMMERCIAL FRONTAGE AND MULTIPLE DRIVEWAYS.
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2. IF THE CURBED MEDIAN ALTERNATE IS USED, THE FOLLOWING SHALL APPLY:
  - A. SEE STANDARD PLAN 1114 FOR LANDSCAPED MEDIAN DETAIL.
  - B. SEE STANDARD PLAN 120-2-OC FOR CURB TYPE.
  - C. TO BE PAVED WITH 2 INCH AC/APPROVED SOIL STERILANT, UNLESS LANDSCAPING OR OTHER PAVING IS APPROVED BY THE ENGINEER.
  - D. LANDSCAPED MEDIANS SHALL NOT BE MAINTAINED WITH ROAD FUNDS; A METHOD OF FUNDING MAINTENANCE SHALL BE ESTABLISHED PRIOR TO APPROVAL OF STREET IMPROVEMENT PLANS.
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5. SEE STANDARD PLAN 1205 FOR SIDEWALK DETAILS.
6. DISTANCE SHOWN IS MINIMUM FROM RIGHT OF WAY TO HINGE POINT.
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COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

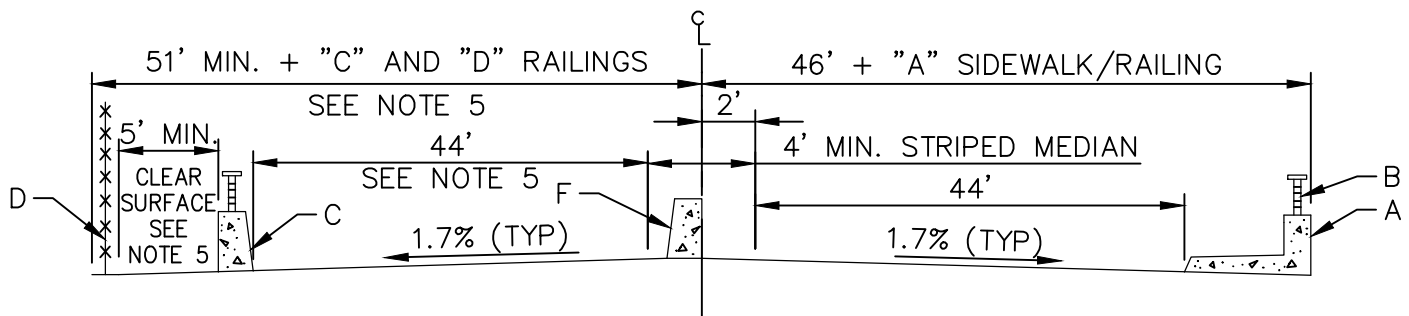
STD. PLAN

1101

SHT. 2 OF 2

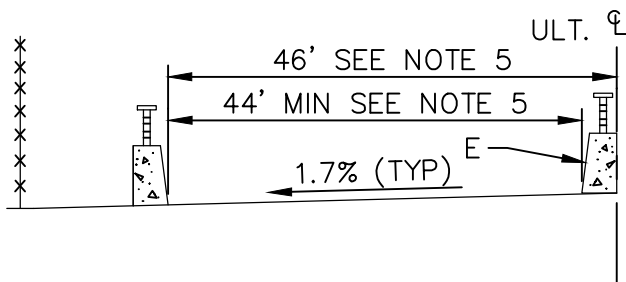
MAJOR HIGHWAY TYPICAL SECTIONS

# TYPICAL BRIDGE SECTIONS



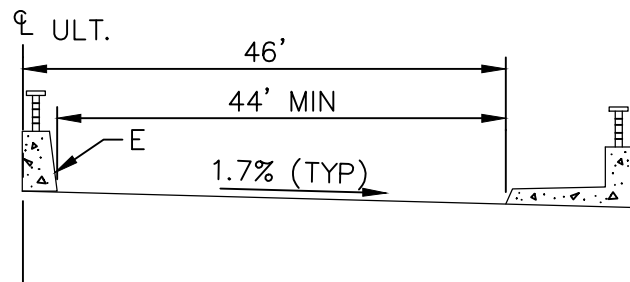
**HALF SECTION**  
**POSTED SPEED > 45 MPH**

**HALF SECTION**  
**POSTED SPEED ≤ 45 MPH**  
FOR POSTED SPEEDS > 40 MPH  
CONSULT THE ENGINEER



**INITIAL PHASE HALF SECTION**  
**POSTED SPEED > 45 MPH**

SAME AS STANDARD SECTION  
SHOWN ON STANDARD PLAN  
1101 EXCEPT AS NOTED



**INITIAL PHASE HALF SECTION**  
**POSTED SPEED ≤ 45 MPH**

SAME AS STANDARD SECTION  
SHOWN ON STANDARD PLAN  
1101 EXCEPT AS NOTED

SEE SHT. 2 FOR LETTERS A, B, C, D, E, & F.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

**1102**

**MAJOR HIGHWAY BRIDGE SECTIONS**

SHT. 1 OF 2

### TYPICAL BRIDGE SECTION NOTES:

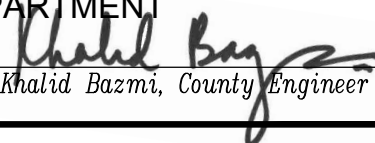
1. ULTIMATE BRIDGE TYPICAL SECTIONS TO BE APPROVED BY THE ENGINEER.
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5. FOR EQUESTRIAN TRAILS, SEE CALIFORNIA START PARKS ACCESSIBILITY GUIDELINES.
6. WEATHERING STEEL MAY BE USED FOR ANY RAILING WITH APPROVAL OF THE ENGINEER.
7. THICKNESS OF PAVEMENT AND BASE TO BE DETERMINED BY THE ENGINEER.
8. FOR CURBED MEDIAN ALTERNATIVE DETAILS, SEE STANDARD PLAN 1100.

### BRIDGE RAILING TYPES:

- "A" ANY TRAFFIC/PEDESTRIAN COMBINATION RAILING & RAISED SIDEWALK FROM CALTRANS STD. PLANS OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE.
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- "F" TYPE 60 BARRIER, HALF-SECTION SHOWN

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

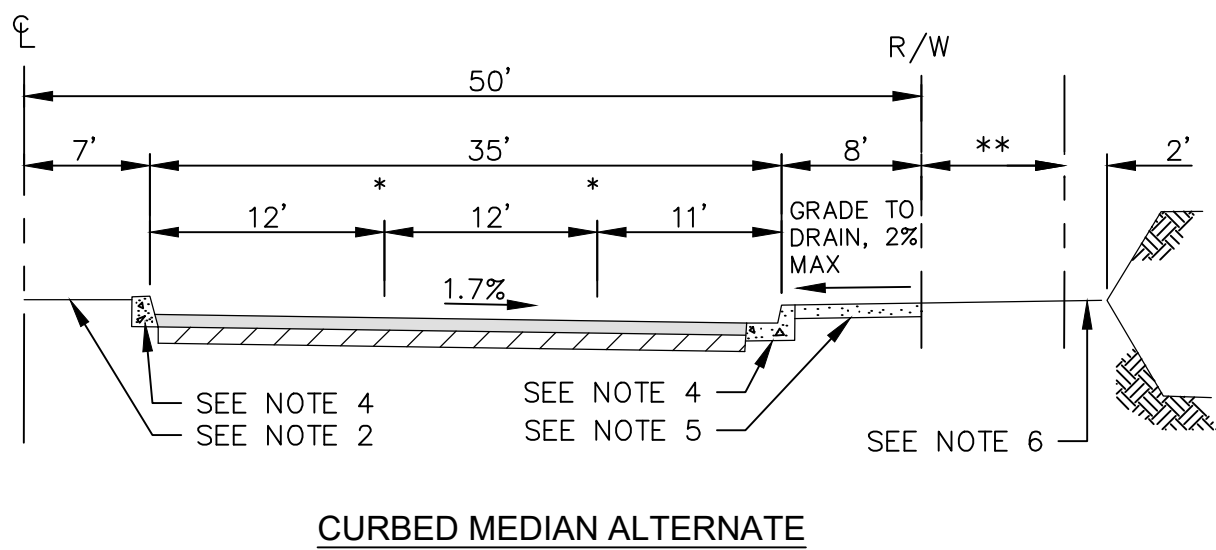
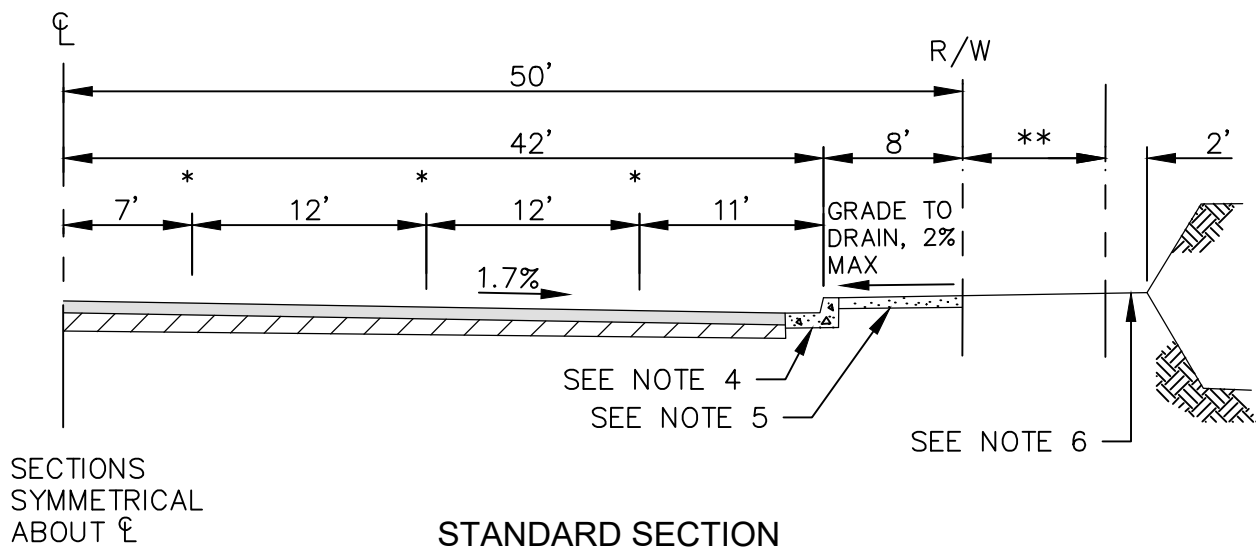
Revision: August 2018

STD. PLAN

1102

MAJOR HIGHWAY BRIDGE SECTIONS

SHT. 2 OF 2



- \* LONGITUDINAL JOINT FOR FINISH COURSE AC.
- \*\* ADDITIONAL RIGHT OF WAY MAY BE REQUIRED WHEN A PRINCIPAL HIGHWAY COINCIDES WITH AN ADOPTED ROUTE FOR AN ADDITIONAL PUBLIC FACILITY (I.E., PEDESTRIAN, BICYCLE, OR EQUESTRIAN TRAIL), OR FOR A SCENIC HIGHWAY.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved *Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1103

PRIMARY HIGHWAY TYPICAL SECTIONS

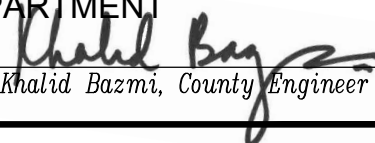
SHT. 1 OF 2

## GENERAL NOTES:

1. THE STANDARD SECTION SHALL BE USED EXCEPT AS NOTED BELOW. THE CURBED MEDIAN ALTERNATE MAY BE ACCEPTABLE UNDER ANY OF THE FOLLOWING CONDITIONS AND SUBJECT TO APPROVAL OF THE ENGINEER:
  - A. WHEN IT FILLS A GAP ON A STRETCH OF ROADWAY ALREADY BUILT IN ADJACENT AREAS WITH CURBED MEDIAN.
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6. DISTANCE SHOWN IS MINIMUM FROM RIGHT OF WAY TO HINGE POINT.
7. MINIMUM STREET FLOW LINE GRADE SHALL BE ONE PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

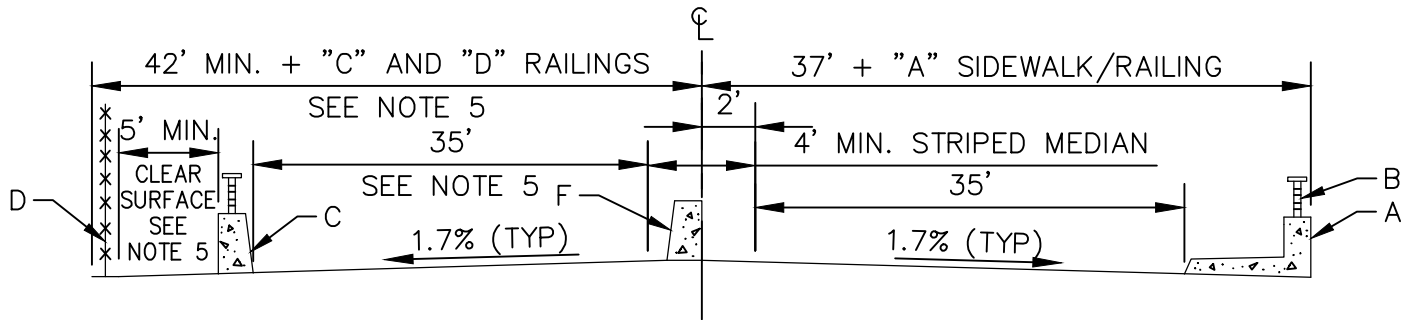
STD. PLAN

1103

SHT. 2 OF 2

PRIMARY HIGHWAY TYPICAL SECTIONS

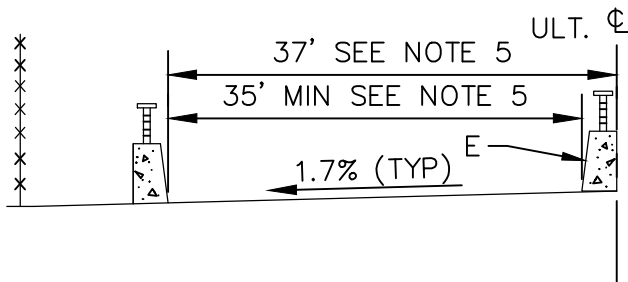
## TYPICAL BRIDGE SECTIONS



**HALF SECTION**  
**POSTED SPEED > 45 MPH**

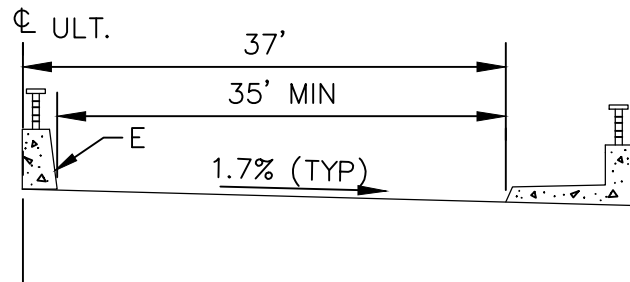
**HALF SECTION**  
**POSTED SPEED ≤ 45 MPH**

FOR POSTED SPEEDS > 40 MPH  
CONSULT THE ENGINEER



**INITIAL PHASE HALF SECTION**  
**POSTED SPEED > 45 MPH**

SAME AS STANDARD SECTION  
SHOWN ON STANDARD PLAN  
1103 EXCEPT AS NOTED



**INITIAL PHASE HALF SECTION**  
**POSTED SPEED ≤ 45 MPH**

SAME AS STANDARD SECTION  
SHOWN ON STANDARD PLAN  
1103 EXCEPT AS NOTED

SEE SHT. 2 FOR LETTERS A, B, C, D, E, & F.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1104

SHT. 1 OF 2

**PRIMARY HIGHWAY BRIDGE SECTIONS**

### TYPICAL BRIDGE SECTION NOTES:

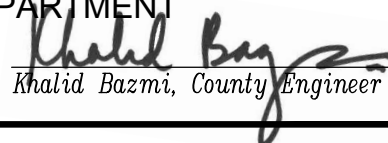
1. ULTIMATE BRIDGE TYPICAL SECTIONS TO BE APPROVED BY THE ENGINEER.
2. BRIDGE TYPE TO BE APPROVED BY THE ENGINEER.
3. MEDIAN WIDTH SUBJECT TO VARIATION DEPENDING ON INTERSECTION PROXIMITY.
4. CURBED MEDIAN OR OPEN MEDIAN ALTERNATE TO BE USED ONLY WHEN APPROACHING HIGHWAY ALSO HAS A RAISED MEDIAN.
5. FOR EQUESTRIAN TRAILS, SEE CALIFORNIA START PARKS ACCESSIBILITY GUIDELINES.
6. WEATHERING STEEL MAY BE USED FOR ANY RAILING WITH APPROVAL OF THE ENGINEER.
7. THICKNESS OF PAVEMENT AND BASE TO BE DETERMINED BY THE ENGINEER.
8. FOR CURBED MEDIAN ALTERNATIVE DETAILS, SEE STANDARD PLAN 1100.

### BRIDGE RAILING TYPES:

- "A" ANY TRAFFIC/PEDESTRIAN COMBINATION RAILING & RAISED SIDEWALK FROM CALTRANS STD. PLANS OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE.
- "B" CALTRANS STANDARD TYPE 7 CHAIN LINK RAILING REQUIRED IN LIEU OF TUBULAR HAND RAILING WHEN STRUCTURE SPANS OVER A PUBLIC ROADWAY OR OTHER TRANSIT WAY.
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- "F" TYPE 60 BARRIER, HALF-SECTION SHOWN

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

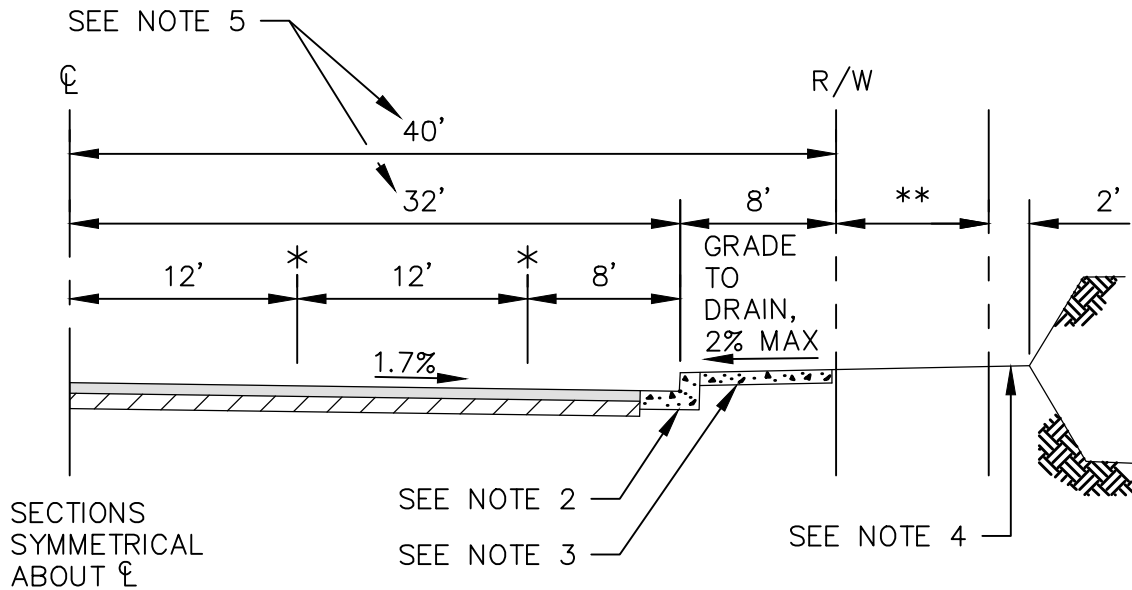
Revision: August 2018

STD. PLAN

1104

PRIMARY HIGHWAY BRIDGE SECTIONS

SHT. 2 OF 2



#### GENERAL NOTES:

1. THICKNESS OF PAVEMENT AND BASE TO BE DETERMINED BY THE ENGINEER.
2. SEE STD. PLAN 120-2-OC FOR CURB TYPE.
3. SEE STD. PLAN 1205 FOR SIDEWALK DETAILS.
4. DISTANCE SHOWN IS MINIMUM FROM R/W TO HINGE POINT.
5. ADD FIVE (5) FEET TO EACH SIDE OF CENTERLINE TO PROVIDE FOR A TEN (10) FOOT LEFT TURN POCKET WITHIN 400 FEET OF ANY INTERSECTION WITH AN ARTERIAL HIGHWAY OR HIGH-VOLUME (GREATER THAN 4,000 ADT) COLLECTOR, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
6. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.

\* LONGITUDINAL JOINT FOR FINISH COURSE AC.

\*\* ADDITIONAL RIGHT OF WAY MAY BE REQUIRED WHEN A PRINCIPAL HIGHWAY COINCIDES WITH AN ADOPTED ROUTE FOR AN ADDITIONAL PUBLIC FACILITY (I.E., PEDESTRIAN, BICYCLE, OR EQUESTRIAN TRAIL), OR FOR A SCENIC HIGHWAY.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

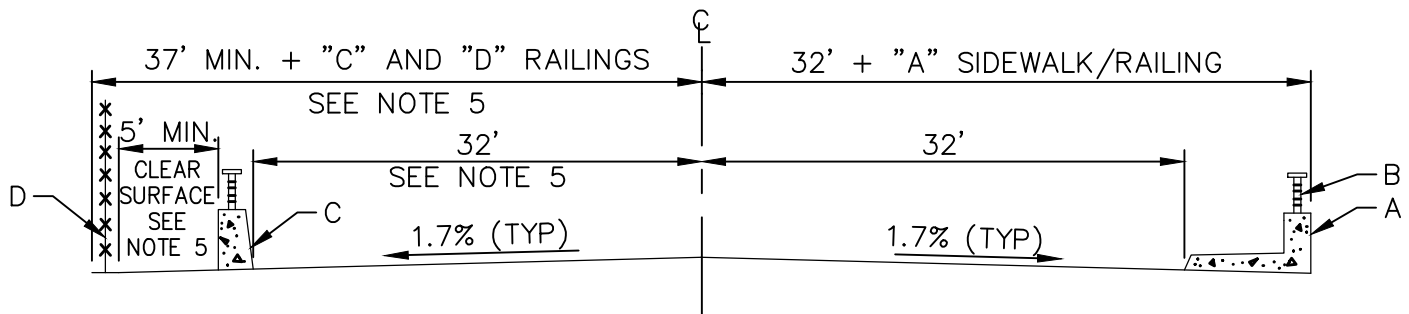
1105

SHT. 1 OF 1

SECONDARY HIGHWAY TYPICAL SECTIONS



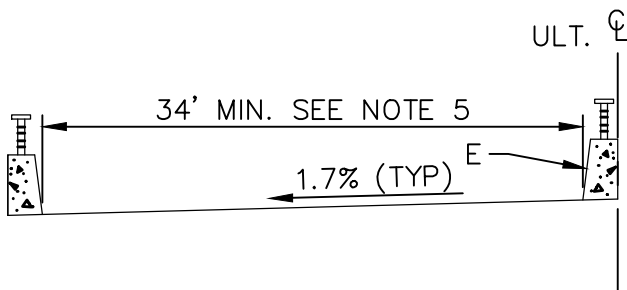
## TYPICAL BRIDGE SECTIONS



**HALF SECTION**  
**POSTED SPEED > 45 MPH**

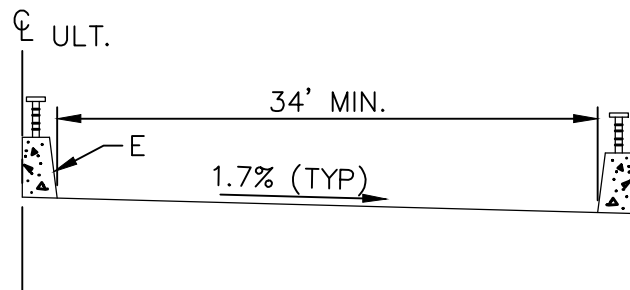
**HALF SECTION**  
**POSTED SPEED ≤ 45 MPH**

FOR POSTED SPEEDS > 40 MPH  
CONSULT THE ENGINEER



**INITIAL PHASE HALF SECTION**  
**POSTED SPEED > 45 MPH**

SAME AS STANDARD SECTION  
SHOWN ON STANDARD PLAN  
1105 EXCEPT AS NOTED



**INITIAL PHASE HALF SECTION**  
**POSTED SPEED ≤ 45 MPH**

SAME AS STANDARD SECTION  
SHOWN ON STANDARD PLAN  
1105 EXCEPT AS NOTED

SEE SHT. 2 FOR LETTERS A, B, C, D, & E.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

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Khalid Bazmi, County Engineer

Revision: August 2018

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1106

**SECONDARY HIGHWAY BRIDGE SECTIONS**

SHT. 1 OF 2

### TYPICAL BRIDGE SECTION NOTES:

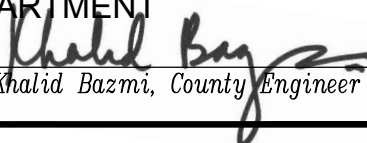
1. ULTIMATE BRIDGE TYPICAL SECTIONS TO BE APPROVED BY THE ENGINEER.
2. BRIDGE TYPE TO BE APPROVED BY THE ENGINEER.
3. FOR EQUESTRIAN TRAILS, SEE CALIFORNIA STATE PARKS ACCESSIBILITY GUIDELINES.
4. WEATHERING STEEL MAY BE USED FOR ANY RAILING WITH APPROVAL OF THE ENGINEER.
5. THICKNESS OF PAVEMENT AND BASE TO BE DETERMINED BY THE ENGINEER.

### BRIDGE RAILING TYPES:

- "A" ANY TRAFFIC/PEDESTRIAN COMBINATION RAILING & RAISED SIDEWALK FROM CALTRANS STD. PLANS OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE.
- "B" CALTRANS STANDARD TYPE 7 CHAIN LINK RAILING REQUIRED IN LIEU OF TUBULAR HAND RAILING WHEN STRUCTURE SPANS OVER A PUBLIC ROADWAY OR OTHER TRANSIT WAY.
- "C" ANY TRAFFIC/PEDESTRIAN COMBINATION RAILING FROM CALTRANS STD. PLANS OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE. SEE NOTE 3.
- "D" ANY CALTRANS PEDESTRIAN OR BICYCLE RAILING OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE. SEE NOTE 3.
- "E" ANY TRAFFIC/BICYCLE COMBINATION RAILING FROM CALTRANS STD. PLANS OR ALTERNATE TYPE APPROVED BY THE ENGINEER. RAILING HEIGHT SHALL EXTEND 3 FEET-6 INCHES (3'-6") MIN. ABOVE ADJACENT SURFACE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

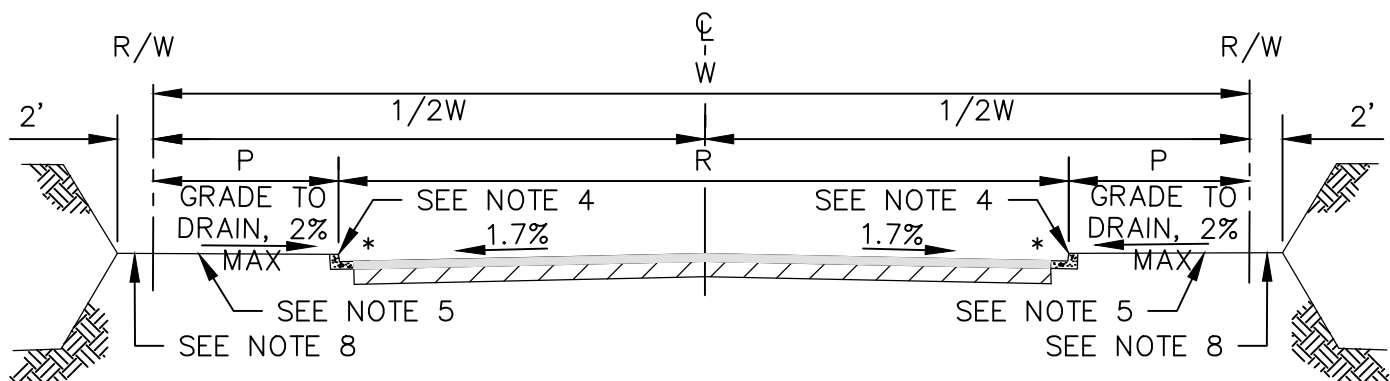
Revision: August 2018

STD. PLAN

1106

SECONDARY HIGHWAY BRIDGE SECTIONS

SHT. 2 OF 2



### TYPICAL SECTION

\*CURBS SHALL BE TYPE A2-150(6). SPECIAL CONDITIONS MAY REQUIRE OTHER TYPES.

#### LEGEND

W = WIDTH OF RIGHT OF WAY IN FEET  
R = WIDTH OF ROADWAY IN FEET  
P = WIDTH OF PARKWAY IN FEET (INCL. SIDEWALK)

AVERAGE DAILY TRAFFIC	CLASSIFICATION	TYPICAL ACCESS BY:	RESIDENTIAL FRONTAGE ALLOWED	MINIMUM DESIGN SPEED (MPH)	W	R	SIDEWALK
4,000-10,000	INDUSTRIAL COLLECTOR	INDUST. LOCAL STREET DRIVEWAY BOTH SIDES	N/A	35	80	64	BOTH SIDES
<4,000	INDUSTRIAL LOCAL-A	INDUST. LOCAL STREET DRIVEWAY BOTH SIDES	N/A	25	60	44	BOTH SIDES
4,000-10,000	COMMUTER	LOCAL STREETS	NONE	35-45	56	40	BOTH SIDES
1,200-6,000	COLLECTOR	LOCAL STREETS	NONE	35	56	40	BOTH SIDES
500-1,200	LOCAL-B	LOCAL STREETS DRIVEWAY BOTH SIDES	ONE SIDE	25	48	34	ONE SIDE
500-1,200	LOCAL	LOCAL STREETS DRIVEWAY BOTH SIDES	BOTH SIDES	25	56	40	BOTH SIDES
<500	LOCAL	DRIVEWAY BOTH SIDES	BOTH SIDES	25	52	36	BOTH SIDES
200-500	LOCAL-B	DRIVEWAY ONE SIDE	ONE SIDE	25	44	30	ONE SIDE
<200	LOCAL-C	DRIVEWAY ONE SIDE	ONE SIDE	25	40	28	ONE SIDE

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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STD. PLAN

1107

OTHER STREET IMPROVEMENTS

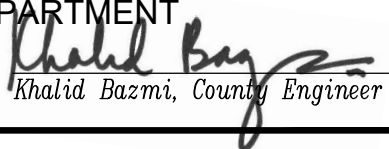
SHT. 1 OF 5

## TYPICAL ROADWAY SECTION NOTES:

1. SIDEWALKS, IN ADDITION TO THOSE INDICATED ABOVE, MAY BE REQUIRED TO PROVIDE CONTINUOUS PEDESTRIAN ROUTES.
2. REQUIRED PAVEMENT STRUCTURAL SECTION TO BE DETERMINED BY THE ENGINEER.
3. CURB SHALL BE TYPE A2-150(6) EXCEPT FOR INDUSTRIAL COLLECTOR STREETS.
4. SEE STD. PLAN 120-2-OC FOR CURB TYPE.
5. SEE STD. PLAN 1205 FOR SIDEWALK DETAILS.
6. BASIC CRITERIA: 12 FEET TRAVEL LANES FOR VOLUMES GREATER THAN 500 ADT AND 11 FEET TRAVEL LANES FOR VOLUMES LESS THAN 500 ADT.
  - A. ROADWAY, R, SHALL BE 50 FEET AND PARKWAY, P, MAY BE REDUCED TO 5 FEET WITHIN 100 FEET OF CURB RETURN OF AN INTERSECTION WITH A HIGHER CLASSIFICATION HIGHWAY. CURB & GUTTER TRANSITION SHALL BE CONSTRUCTED BETWEEN 100 FEET & 140 FEET FROM CURB RETURN.
  - B. 8 FEET PARKWAY ON DRIVEWAY SIDE. 6 FEET PARKWAY WITHOUT ACCESS. PAVEMENT CROWNLIN E SHALL BE CENTERED BETWEEN CURBS.
  - C. 8 FEET PARKWAY ON DRIVEWAY SIDE. 5 FEET PARKWAY WITHOUT ACCESS. PAVEMENT CROWNLIN E SHALL BE CENTERED BETWEEN CURBS.
7. MIN. STREET FLOW LINE GRADE SHALL BE 1 PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.
8. DISTANCE SHOWN IS MIN. FROM R/W TO HINGE POINT, WHEN SIDEWALK IS ADJACENT TO R/W AND/OR HINGE POINT IS FOR A DOWN SLOPE. WHEN HINGE POINT IS FOR AN UP SLOPE AND WHEN SIDEWALK IS ADJACENT TO CURB, HINGE POINT SHALL BE LOCATED AT R/W OR A MIN. OF 2 FEET BEHIND SIDEWALK, WHICHEVER IS THE GREATER DISTANCE FROM CURB FACE.
9. FOR RAILING DETAILS AT BRIDGES, SEE STANDARD PLAN 1100, 1102, 1104, AND 1106.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

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STD. PLAN

1107

SHT. 2 OF 5

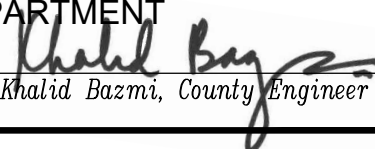
OTHER STREET IMPROVEMENTS

## GENERAL NOTES:

1. ALL LOCAL STREETS, PRIVATE AND PUBLIC, SHALL BE DESIGNED AND CONSTRUCTED IN COMPLIANCE WITH THE REQUIREMENTS OF THIS AND ALL OTHER APPLICABLE OCPW STANDARD PLANS, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. DESIGN SPEED FOR LOCAL STREETS WITH RESIDENTIAL FRONTAGE SHALL BE 25 MILES PER HOUR, AND MAXIMUM GRADE SHALL BE 10 PERCENT. DESIGN SPEED FOR STREETS WITHOUT RESIDENTIAL FRONTAGE SHALL BE 35 MILES PER HOUR. STREET ALIGNMENT AND PROFILE SHALL COMPLY WITH THE CRITERIA FOR SAFE STOPPING SIGHT DISTANCE IN CONFORMANCE WITH THE LATEST EDITION OF CALTRANS HIGHWAY DESIGN MANUAL FOR THESE DESIGN SPEEDS.
3. STREET SYSTEMS SHOULD BE LAID OUT TO DISCOURAGE TRAVEL AT HIGHER THAN DESIGN SPEEDS BY INCORPORATING CURVES, KNUCKLES AND "T" INTERSECTIONS AT NO MORE THAN 1,000 FOOT INTERVALS, DEPENDING ON TERRAIN. CONTINUOUS STRAIGHT STREETS CONNECTING TWO ARTERIAL HIGHWAYS, WHICH WOULD ACT AS A "SHORTCUT" THROUGH A RESIDENTIAL AREA, SHALL BE AVOIDED.
4. STREETS SHALL INTERSECT AT RIGHT ANGLES WHEREVER POSSIBLE. STREETS SHALL NOT INTERSECT AT GREATER THAN 15 DEGREES SKEW TO RIGHT ANGLE. FOUR-LEGGED INTERSECTIONS SHALL BE AVOIDED EXCEPT AT SIGNALIZED LOCATIONS. INTERSECTIONS SHALL HAVE ADEQUATE SIGHT DISTANCE IN CONFORMANCE WITH STD. PLAN 1117. INTERSECTIONS ON CREST VERTICAL CURVES OR ON THE INSIDE OF HORIZONTAL CURVES SHALL BE AVOIDED. THE MINIMUM DISTANCE BETWEEN INTERSECTIONS SHALL BE 150 FEET MEASURED FROM THEIR CENTERLINES.
5. THE LOCATION OF ANY INTERSECTION OF A LOCAL STREET AND AN ARTERIAL HIGHWAY SHALL BE REVIEWED BY THE ENGINEER TO DETERMINE SAFETY AND COMPATIBILITY FOR SIGNAL PROGRESSION. TRAFFIC AT ANY INTERSECTION MAY BE ULTIMATELY RESTRICTED TO RIGHT TURN IN AND OUT ONLY.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

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STD. PLAN

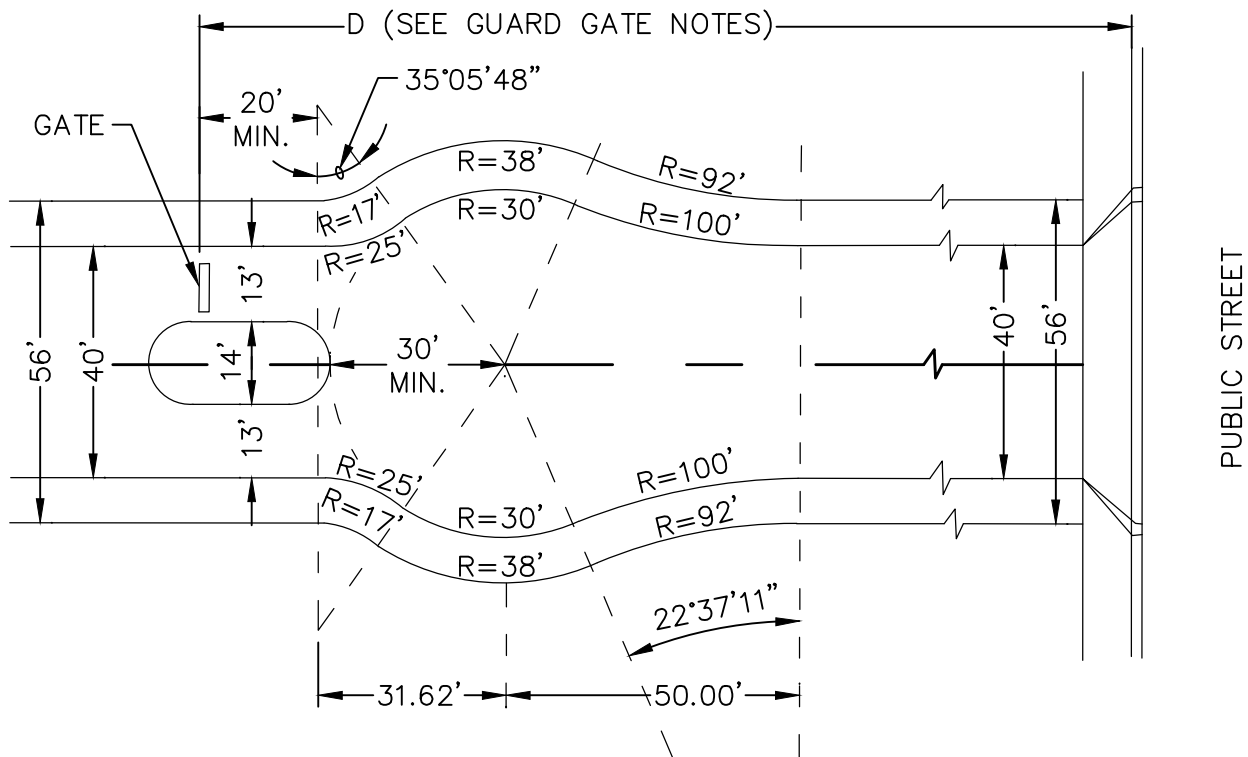
1107

OTHER STREET IMPROVEMENTS

SHT. 3 OF 5

## PRIVATE STREET STANDARDS NOTES:

1. PRIVATE STREETS SHALL BE PERMITTED ONLY AS DESCRIBED IN THE ORANGE COUNTY SUBDIVISION CODE, SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER, AND THE SPECIAL PROJECTS DIVISION.
2. PRIVATE STREETS SHALL PROVIDE A PAVED TRAVEL WAY IN CONFORMANCE WITH STD. PLAN 1107. WALKWAYS SHALL BE PROVIDED ON ALL PRIVATE STREETS IN CONFORMANCE WITH STD. PLANS 1107 AND 1205 UNLESS AN ALTERNATE PEDESTRIAN CIRCULATION SYSTEM IS PROVIDED MEETING THE APPROVAL OF THE ENGINEER.
3. REQUIRED PAVEMENT STRUCTURAL SECTION SHALL BE DETERMINED BY THE ENGINEER.
4. ENTRYWAYS TO PRIVATE TRACTS SHALL BE DESIGNED TO EMPHASIZE THEIR PRIVATE STATUS. TEXTURED CONCRETE OR WIDE FLARE DRIVEWAYS, GUARD GATES OR OTHER ACCESS CONTROLS SHALL BE REQUIRED FOR PRIVATE TRACTS. ENTRY GATES SHALL BE SET BACK FROM THE NEAR CURB LINE OF ANY PUBLIC STREET TO PROVIDE A MINIMUM 100 FEET OF STORAGE FOR ENTERING VEHICLES TO STACK WITHOUT INTERFERING WITH THROUGH TRAFFIC. MINIMUM DESIGN CRITERIA AND REQUIRED FEATURES FOR GUARD GATES ARE SHOWN BELOW:



## GUARD GATE NOTES:

1.  $D = 1$  FOOT PER DWELLING UNIT SERVED, 100 FEET MINIMUM  
(MULTIPLE LANES MAY BE USED TO SATISFY STORAGE DISTANCE REQUIREMENT).

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

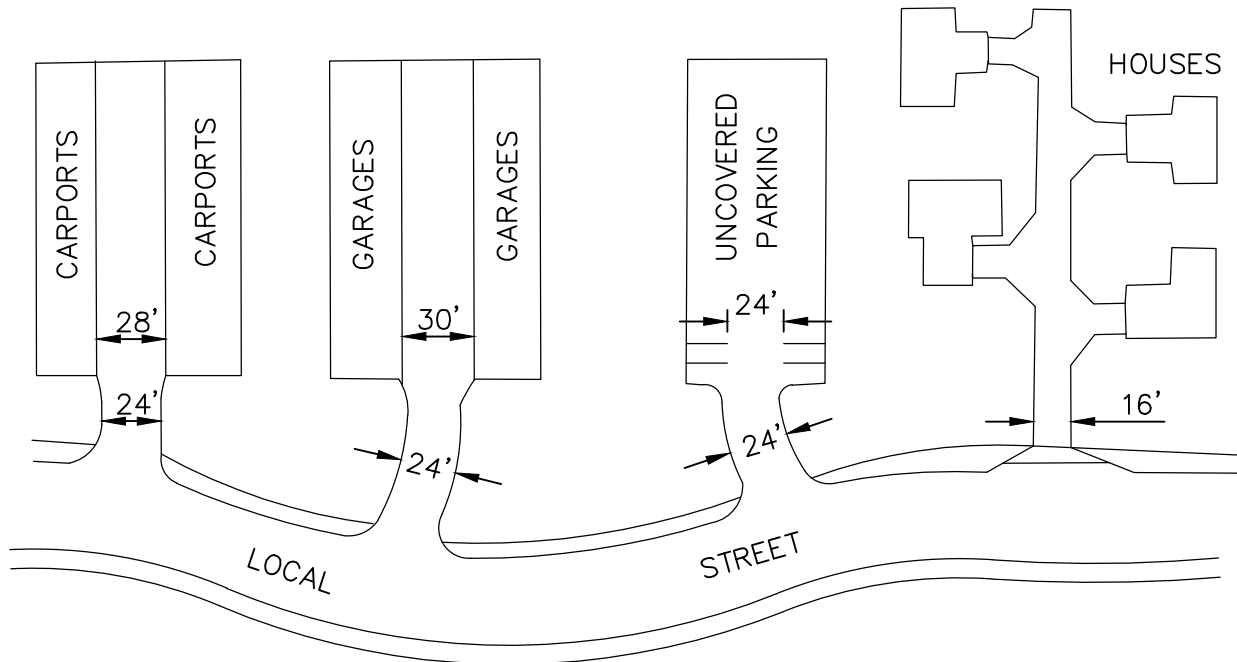
Revision: August 2018

STD. PLAN

1107

SHT. 4 OF 5

OTHER STREET IMPROVEMENTS



### PARKING AISLES AND DRIVEWAYS NOTES:

1. THE NUMBER AND SIZE OF PARKING SPACES PROVIDED FOR ANY DEVELOPMENT SHALL CONFORM WITH THE REQUIREMENTS OF THE ORANGE COUNTY ZONING CODE, SECTIONS 7-9-145.3-5.
2. PARKING, OTHER THAN PARALLEL ON-STREET, SHALL BE PROVIDED WITHIN PARKING LOTS AND PARKING BAYS. DIAGONAL AND PERPENDICULAR PARKING AREAS CANNOT FACE STREETS DIRECTLY, EXCEPT WITH THE APPROVAL OF THE ENGINEER.
3. ACCESS DRIVES AND DRIVEWAYS SERVING PARKING LOTS SHALL PROVIDE A MINIMUM 24 FOOT TRAVEL WAY. MORE WIDTH WILL BE REQUIRED IF PARALLEL PARKING IS PROPOSED ON THE DRIVEWAY.
4. AISLES BETWEEN ROWS OF BACK-OUT PERPENDICULAR PARKING SHALL PROVIDE A MINIMUM 24 FOOT-WIDE TRAVEL WAY. AISLES BETWEEN ROWS OF COVERED BACK-OUT PARKING SHALL PROVIDE A MINIMUM 28 FOOT-WIDE TRAVEL WAY. AISLES BETWEEN ROWS OF GARAGES SHALL PROVIDE A MINIMUM 30 FEET BETWEEN FACING GARAGES.
5. JOINTLY-USED PRIVATE DRIVEWAYS SERVING FOUR (4) OR LESS RESIDENTIAL DWELLING UNITS SHALL BE PAVED TO A MINIMUM WIDTH OF 16 FEET. IF MORE THAN FOUR (4) RESIDENTIAL DWELLING UNITS ARE ULTIMATELY SERVED BY A PRIVATE DRIVEWAY AND NO OTHER ACCESS IS PROVIDED, THE DRIVEWAY SHALL BE PAVED TO A MINIMUM WIDTH OF 24 FEET.
6. MINIMUM PRIVATE DRIVEWAY GRADES SHALL BE 0.5 PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

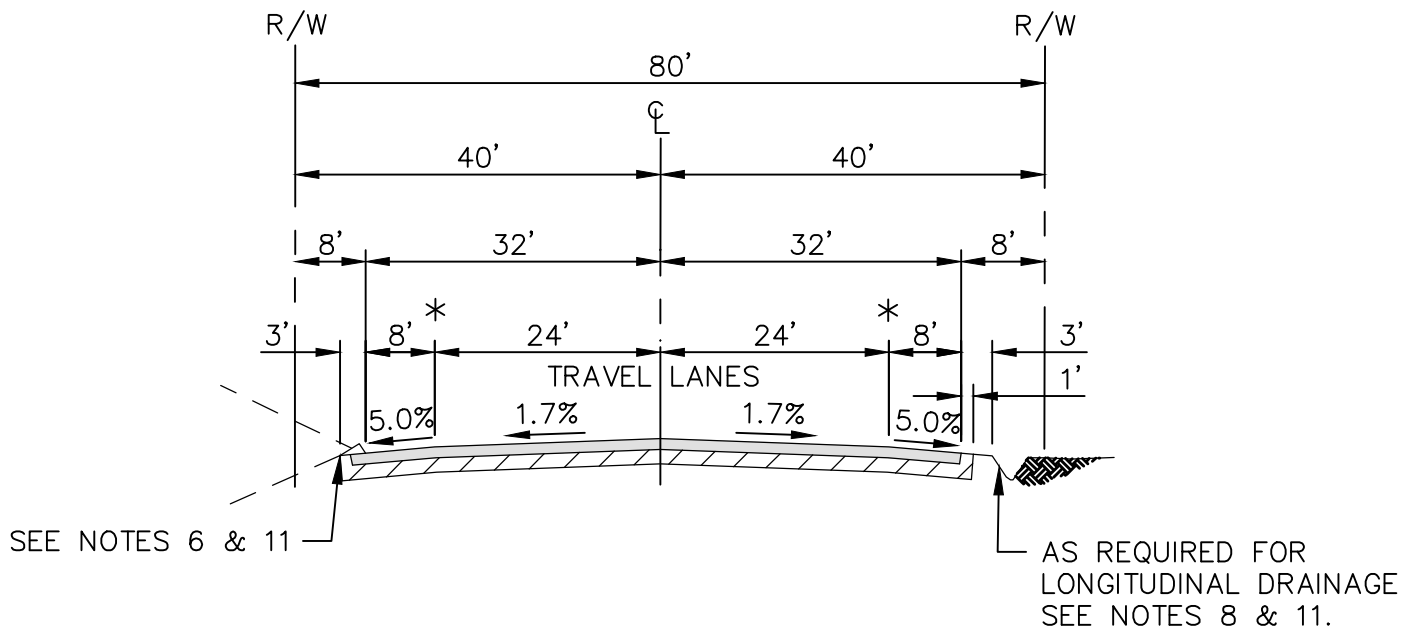
STD. PLAN

1107

SHT. 5 OF 5

OTHER STREET IMPROVEMENTS





### TYPICAL SECTION

\* LONGITUDINAL JOINT FOR FINISH COURSE AC

### TYPICAL ROADWAY SECTION NOTES:

1. STD. PLAN 1108 SHALL ONLY APPLY TO AREAS APPROVED BY THE ENGINEER.
2. LOCATION OF IMPROVEMENTS WITHIN THE R/W MAY VARY DUE TO PHYSICAL CONSTRAINTS (TREES, DRAINAGE), TO PROVIDE TRAILS, ETC.
3. ADDITIONAL R/W MAY BE REQUIRED WHERE TRAIL IS ADOPTED OR ESTABLISHED.
4. PAVED SHOULDERS TO BE USED FOR EMERGENCY PARKING, PEDESTRIANS & BICYCLES.
5. LEFT TURN POCKETS WILL BE PROVIDED WHEN REQUIRED.
6. WHERE ROADSIDE CONDITIONS DICTATE, AC DIKES PER STANDARD PLAN 120-2-OC MAY BE REQUIRED TO CONTROL DRAINAGE.
7. REQUIRED PAVEMENT STRUCTURAL SECTION TO BE DETERMINED BY THE ENGINEER.
8. A STORM DRAIN SHALL BE CONSTRUCTED WHEN LONGITUDINAL FLOW EXCEEDS CAPACITY OF THE MAXIMUM SIZE DITCH WHICH CAN BE CONSTRUCTED WHOLLY WITHIN THE STREET RIGHT-OF-WAY.
9. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.
10. FOR RAILING DETAILS AT BRIDGES, SEE STANDARD PLAN 1100, 1102, 1104, AND 1106.
11. WHERE ROADSIDE CONDITIONS DICTATE, ROADSIDE BARRIERS MAY BE REQUIRED. REFER TO LATEST EDITION OF CALTRANS HIGHWAY DESIGN MANUAL AND AASHTO ROADSIDE DESIGN GUIDE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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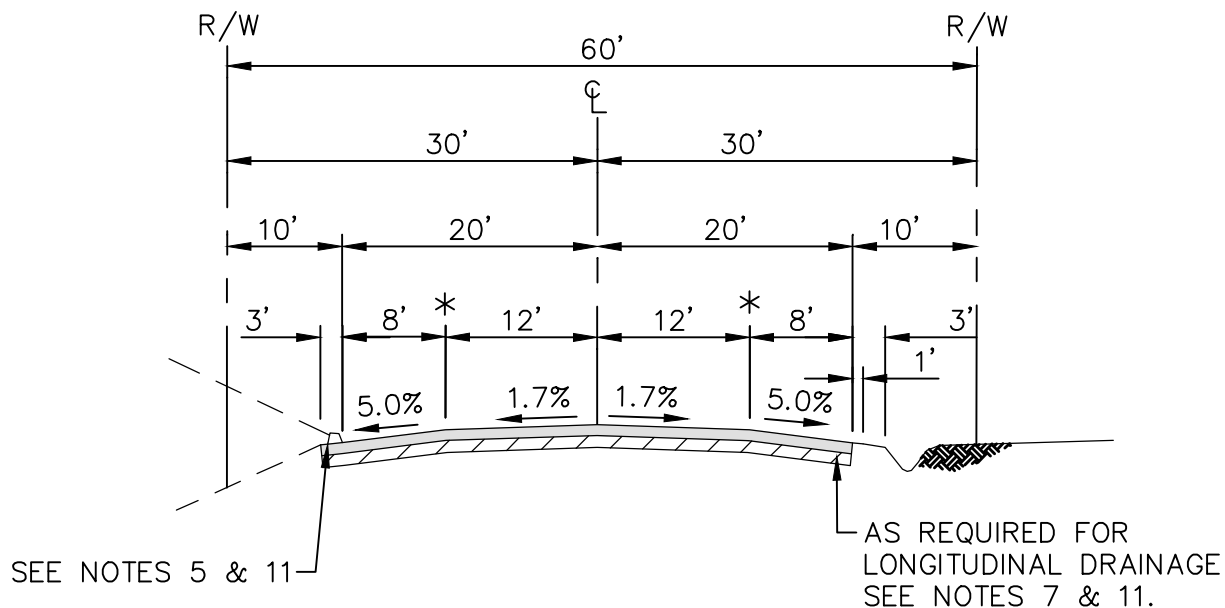
STD. PLAN

1108

RURAL SECONDARY HIGHWAY TYPICAL SECTION

SHT. 1 OF 1





\* LONGITUDINAL JOINT FOR FINISH COURSE AC

### TYPICAL SECTION

#### TYPICAL ROADWAY SECTION NOTES:

1. STD. PLAN 1109 SHALL ONLY APPLY TO AREAS APPROVED BY THE ENGINEER.
2. LOCATION OF IMPROVEMENTS WITHIN THE R/W MAY VARY DUE TO PHYSICAL CONSTRAINTS (TREES, DRAINAGE), TO PROVIDE TRAILS, ETC.
3. ADDITIONAL R/W MAY BE REQUIRED WHERE TRAIL IS ADOPTED OR ESTABLISHED.
4. PAVED SHOULDERS TO BE USED FOR EMERGENCY PARKING, PEDESTRIANS & BICYCLES.
5. LEFT TURN POCKETS WILL BE PROVIDED WHEN REQUIRED.
6. WHERE ROADSIDE CONDITIONS DICTATE, AC DIKES PER STANDARD PLAN 120-2-OC MAY BE REQUIRED TO CONTROL DRAINAGE.
7. REQUIRED PAVEMENT STRUCTURAL SECTION TO BE DETERMINED BY THE ENGINEER.
8. A STORM DRAIN SHALL BE CONSTRUCTED WHEN LONGITUDINAL FLOW EXCEEDS CAPACITY OF THE MAXIMUM SIZE DITCH WHICH CAN BE CONSTRUCTED WHOLLY WITHIN THE STREET RIGHT-OF-WAY.
9. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.
10. FOR RAILING DETAILS AT BRIDGES, SEE STANDARD PLAN 1100, 1102, 1104, AND 1106.
11. WHERE ROADSIDE CONDITIONS DICTATE, ROADSIDE BARRIERS MAY BE REQUIRED. REFER TO LATEST EDITION OF CALTRANS HIGHWAY DESIGN MANUAL AND AASHTO ROADSIDE DESIGN GUIDE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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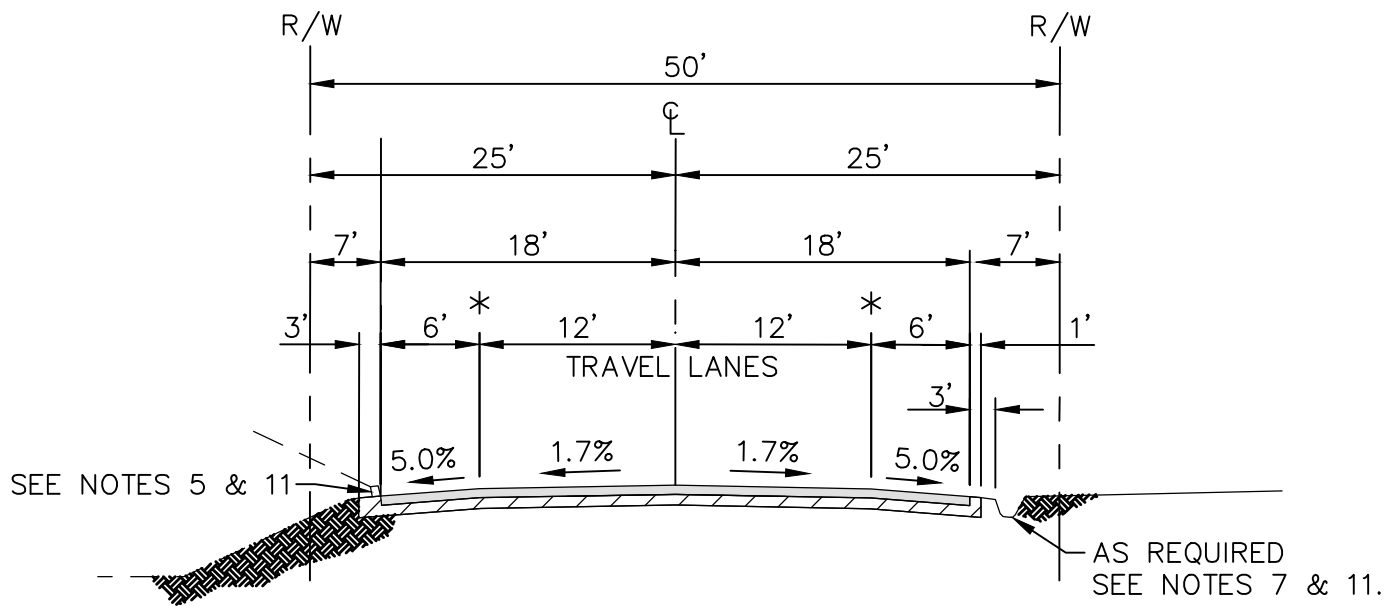
STD. PLAN

1109

RURAL LOCAL STREET TYPICAL SECTION

SHT. 1 OF 1





\* LONGITUDINAL JOINT FOR FINISH COURSE AC

### TYPICAL SECTION

#### TYPICAL ROADWAY SECTION NOTES:

1. STD. PLAN 1110 SHALL ONLY APPLY TO AREAS APPROVED BY THE ENGINEER.
2. LOCATION OF IMPROVEMENTS WITHIN THE R/W MAY VARY DUE TO PHYSICAL CONSTRAINTS (TREES, DRAINAGE), TO PROVIDE TRAILS, ETC.
3. ADDITIONAL R/W MAY BE REQUIRED WHERE TRAIL IS ADOPTED OR ESTABLISHED.
4. PAVED SHOULDERS TO BE USED FOR EMERGENCY PARKING, PEDESTRIANS & BICYCLES.
5. LEFT TURN POCKETS WILL BE PROVIDED WHEN REQUIRED.
6. WHERE ROADSIDE CONDITIONS DICTATE, AC DIKES PER STANDARD PLAN 120-2-OC MAY BE REQUIRED TO CONTROL DRAINAGE.
7. REQUIRED PAVEMENT STRUCTURAL SECTION TO BE DETERMINED BY THE ENGINEER.
8. A STORM DRAIN SHALL BE CONSTRUCTED WHEN LONGITUDINAL FLOW EXCEEDS CAPACITY OF THE MAXIMUM SIZE DITCH WHICH CAN BE CONSTRUCTED WHOLLY WITHIN THE STREET RIGHT-OF-WAY.
9. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.
10. FOR RAILING DETAILS AT BRIDGES, SEE STANDARD PLAN 1100, 1102, 1104, AND 1106.
11. WHERE ROADSIDE CONDITIONS, DICTATE ROADSIDE BARRIERS MAY BE REQUIRED. REFER TO LATEST EDITION OF CALTRANS HIGHWAY DESIGN MANUAL AND AASHTO ROADSIDE DESIGN GUIDE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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STD. PLAN

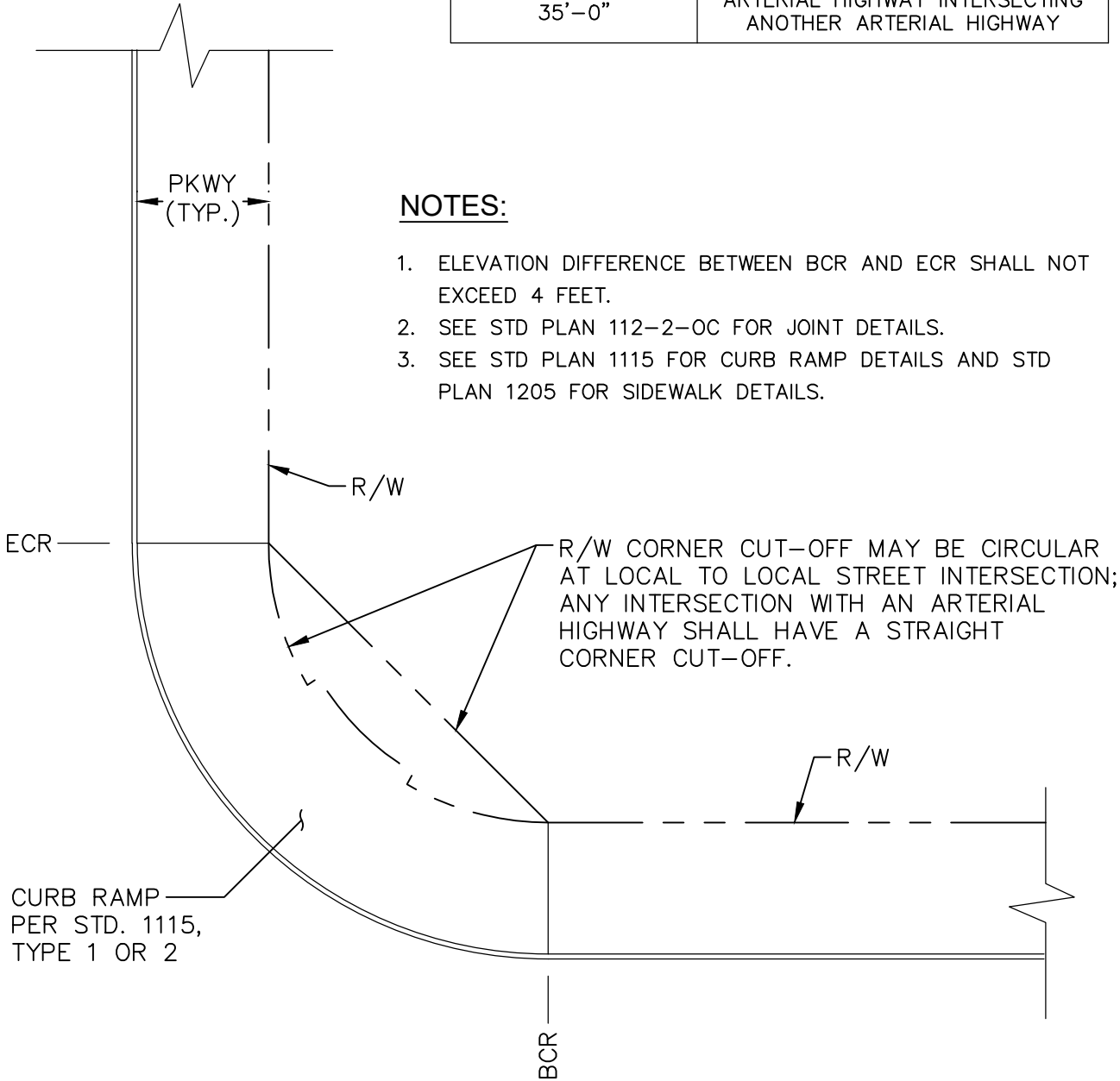
1110

SHT. 1 OF 1

RURAL LOCAL STREET TYPICAL SECTION



CURB RETURN RADIUS	APPLICATION
25'-0"	RESIDENTIAL STREET INTERSECTING ANOTHER RESIDENTIAL STREET OR ARTERIAL HIGHWAY INTERSECTING A RESIDENTIAL STREET
35'-0"	ARTERIAL HIGHWAY INTERSECTING ANOTHER ARTERIAL HIGHWAY



**NOTES:**

1. ELEVATION DIFFERENCE BETWEEN BCR AND ECR SHALL NOT EXCEED 4 FEET.
2. SEE STD PLAN 112-2-OC FOR JOINT DETAILS.
3. SEE STD PLAN 1115 FOR CURB RAMP DETAILS AND STD PLAN 1205 FOR SIDEWALK DETAILS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved *Khalid Bazmi*  
Khalid Bazmi, County Engineer

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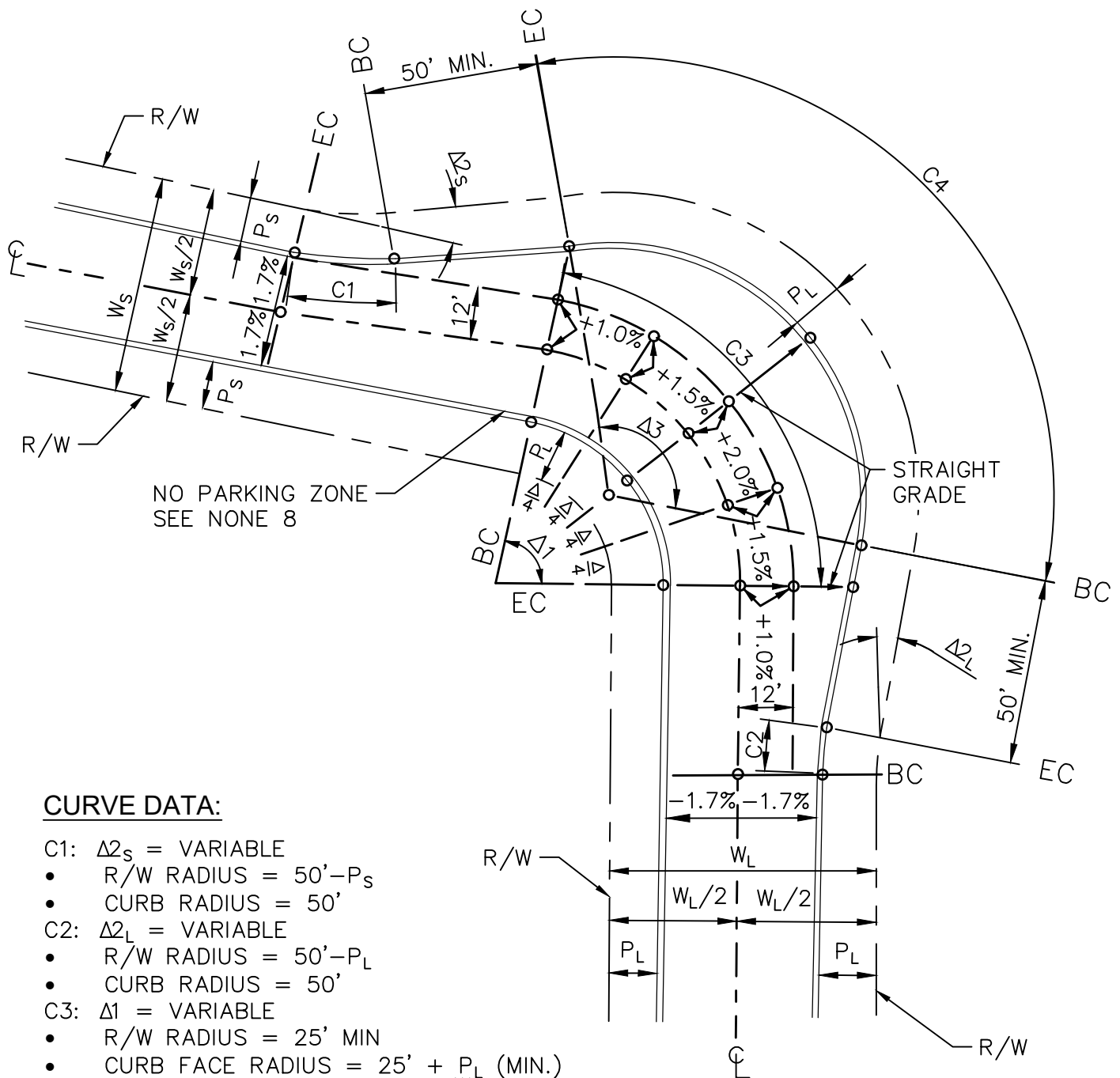
STD. PLAN

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SHT. 1 OF 1

**CURB RETURN RADIUS AND CORNER CUT-OFF**





### CURVE DATA:

- C1:  $\Delta 2_S$  = VARIABLE
- R/W RADIUS =  $50' - P_S$
  - CURB RADIUS =  $50'$
- C2:  $\Delta 2_L$  = VARIABLE
- R/W RADIUS =  $50' - P_L$
  - CURB RADIUS =  $50'$
- C3:  $\Delta 1$  = VARIABLE
- R/W RADIUS =  $25'$  MIN
  - CURB FACE RADIUS =  $25' + P_L$  (MIN.)
  - CENTERLINE RADIUS =  $25' + \frac{W_L}{2}$
- C4:  $\Delta 3 = \Delta 1 + \Delta 2_S + \Delta 2_L$
- R/W RADIUS =  $W_L + 10'$
  - CURB FACE RADIUS =  $W_L + 10' - P_L$

$W_{(L \text{ OR } S)}$  = ROAD WIDTH (R/W TO R/W)

$P_{(L \text{ OR } S)}$  = PARKWAY WIDTH (R/W TO R/W)

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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STD. PLAN

1112

SHT. 1 OF 2

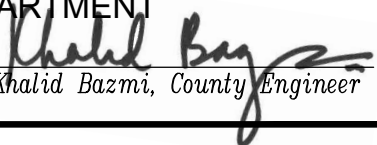
STANDARD KNUCKLE

### GENERAL NOTES:

1. USE NORMAL SECTION FROM INNER CURB TO CENTERLINE.
2. FROM CROWN LINE TO OUTER CURB, THE MAXIMUM SLOPE IS 1 INCH PER FOOT.
3. SUBSCRIPTS "S" AND "L" DENOTE SMALLER AND LARGER STREETS RESPECTIVELY.
4. SUPERELEVATIONS PERCENTAGES SHOWN ARE A STRAIGHT GRADE FROM CENTER LINE TO CROWN LINE.
5. ELEVATIONS ARE REQUIRED WHERE CIRCLED °.
6. WHEN STREETS HAVE TILT-TYPE SECTION, THE CROWN LINE WILL NOT NECESSARILY TERMINATE ON CENTER LINE AT ANGLE POINT OF CURB.
7. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT, REVERSE GRADE VERTICAL CURVES EXCEPTED.
8. WHEN  $\Delta I$  IS  $\leq 120$  DEGREES, PARKING SHALL BE RESTRICTED 25 FEET PRIOR TO BC AND 25 FEET PAST EC.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

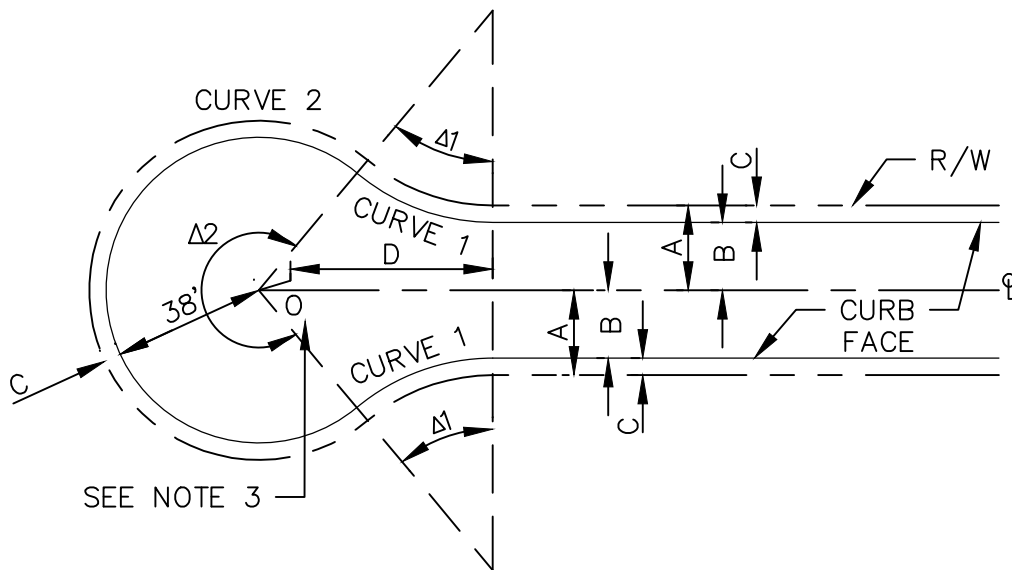
Revision: August 2018

STANDARD KNUCKLE

STD. PLAN

1112

SHT. 2 OF 2



### SYMMETRICAL CUL-DE-SAC

CURVE 1											
R/W	A	B	C	D	$\Delta 1$	CURB			RIGHT-OF-WAY		
						R	R	T	R	L	T
80'	40'	32'	8'	40.25'	16°57'27"	100'	29.60'	14.91'	92'	27.23'	13.71'
60'	30'	22'	8'	64.50'	27°51'51"	100'	48.63'	24.81'	92'	44.74'	22.82'
56'	28'	20'	8'	68.15'	29°35'31"	100'	51.65'	26.41'	92'	47.54'	24.30'
52'	26'	18'	8'	71.55'	31°13'56"	100'	54.51'	27.95'	92'	50.15'	25.71'

CURVE 2									
R/W	A	B	C	D	$\Delta$ 2	CURB		RIGHT-OF-WAY	
						R	L	R	L
80'	40'	32'	8'	40.25'	213°54'53"	38'	141.87'	46'	171.74'
60'	30'	22'	8'	64.50'	235°43'42"	38'	156.34'	46'	189.25'
56'	28'	20'	8'	68.15'	239°11'01"	38'	158.63'	46'	192.11'
52'	26'	18'	8'	71.55'	242°27'52"	38'	160.81'	46'	194.66'

### SYMMETRICAL CUL-DE-SAC NOTES:

1. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT
2. REVERSE GRADE VERTICAL CURVES EXCEPTED.
3. POINT "O" SHALL BE 0.30 FOOT MIN. ABOVE THE HIGHEST TOP OF CURVE ELEVATION WITHIN CUL-DE-SAC.
4. SEE SHEET 2 FOR ASYMMETRICAL CUL DE SAC DETAILS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

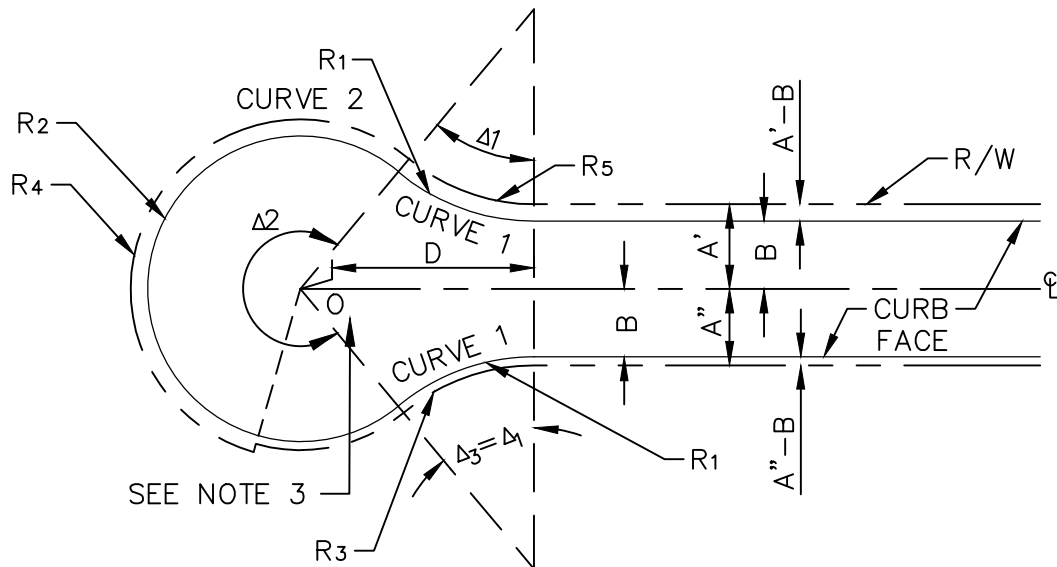
Revision: August 2018

STD. PLAN

1113

STANDARD CUL-DE-SAC

SHT. 1 OF 4



### ASYMMETRICAL CUL-DE-SAC

CURB FACE CURVE DATA											
R/W	A'	A''	B	D	$\Delta_1$	R <sub>1</sub>	L <sub>1</sub>	T <sub>1</sub>	$\Delta_2$	R <sub>2</sub>	L <sub>2</sub>
48'	25'	23'	17'	73.18'	32°01'26"	100'	55.89'	28.70'	244°02'53"	38'	161.86'
44'	23'	21'	15'	76.28'	33°33'26"	100'	58.57'	30.15'	247°06'53"	38'	163.89'
40'	22'	18'	14'	77.77'	34°18'04"	100'	59.87'	30.86'	248°36'08"	38'	164.88'

RIGHT-OF-WAY CURVE DATA												
R/W	A'	A''	B	D	$\Delta_1$	R <sub>5</sub>	L <sub>5</sub>	T <sub>5</sub>	R <sub>3</sub>	L <sub>3</sub>	T <sub>3</sub>	R <sub>4</sub>
48'	25'	23'	17'	73.18'	32°01'26"	92'	51.42'	26.40'	94'	52.54'	27.55'	46'
44'	23'	21'	15'	76.28'	33°33'26"	92'	53.88'	27.74'	94'	52.54'	27.55'	46'
40'	22'	18'	14'	77.77'	34°18'04"	92'	55.08'	28.39'	94'	53.66'	29.63'	46'

#### ASYMMETRICAL CUL-DE-SAC NOTES:

1. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT
2. REVERSE GRADE VERTICAL CURVES EXCEPTED.
3. POINT "O" SHALL BE 0.30 FOOT MIN. ABOVE THE HIGHEST TOP OF CURVE ELEVATION WITHIN CUL-DE-SAC.
4. REDUCTION IN PARKWAY WIDTH SHALL OCCUR AT THE PROPERTY LINE OF THE LAST LOT TAKING ACCESS FROM THE CUL-DE-SAC.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

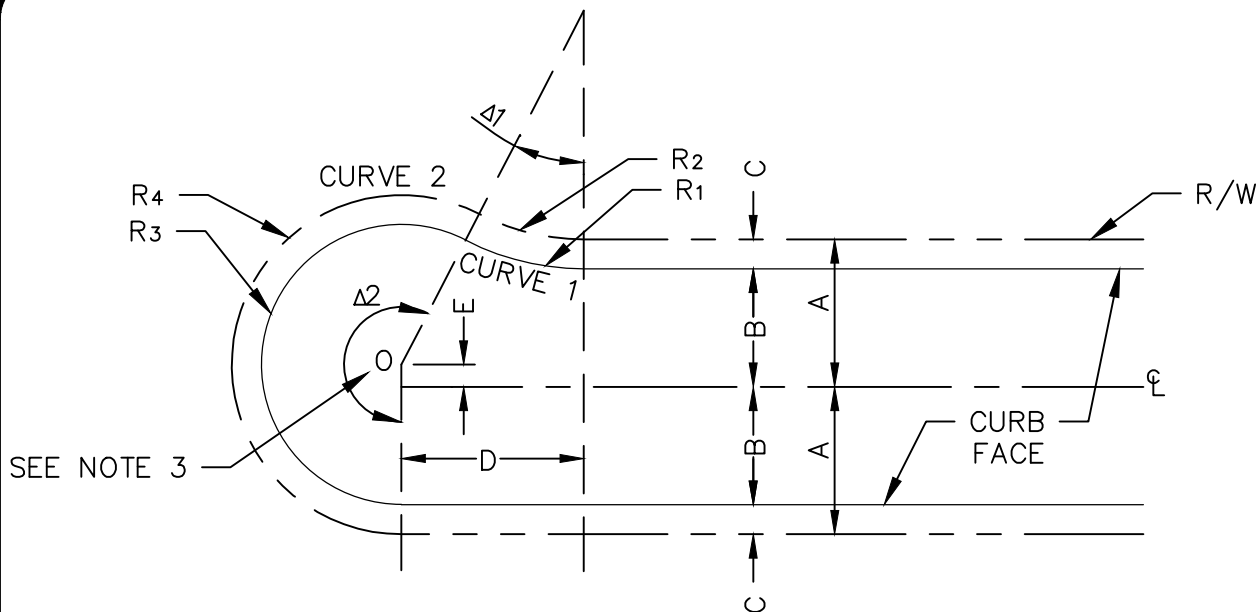
Revision: August 2018

STD. PLAN

**1113**

**STANDARD CUL-DE-SAC**

SHT. 2 OF 4



### OFFSET CUL-DE-SAC

CURVE 1												
R/W	A	B	C	D	E	$\Delta_1$	CURB			RIGHT-OF-WAY		
							R1	L1	T1	R2	L2	T2
80'	40'	32'	8'	49.42'	6'	27°15'58"	70'	33.31'	16.98'	62'	29.50'	15.04'
60'	30'	22'	8'	76.73'	16'	45°16'31"	70'	55.31'	29.19'	62'	48.99'	25.86'
56'	30'	20'	8'	80.50'	18'	48°11'23"	70'	58.87'	31.30'	62'	52.15'	27.73'
52'	26'	18'	8'	83.90'	20'	50°58'38"	70'	62.28'	33.37'	62'	55.16'	29.56'

CURVE 2										
R/W	A	B	C	D	E	$\Delta_2$	CURB		RIGHT-OF-WAY	
							R3	L	R4	L
80'	40'	32'	8'	49.42'	6'	207°15'58"	38'	137.46'	46'	166.40'
60'	30'	22'	8'	76.73'	16'	225°16'31"	38'	149.41'	46'	180.86'
56'	30'	20'	8'	80.50'	18'	228°11'23"	38'	151.34'	46'	183.20
52'	26'	18'	8'	83.90'	20'	228°11'23"	38'	153.19'	46'	185.44'

### OFFSET CUL-DE-SAC NOTES:

1. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT
2. REVERSE GRADE VERTICAL CURVES EXCEPTED.
3. POINT "O" SHALL BE 0.30 FOOT MIN. ABOVE THE HIGHEST TOP OF CURVE ELEVATION WITHIN CUL-DE-SAC.
4. RADIAL POINT MAY BE OFFSET EITHER RIGHT OR LEFT OF CENTERLINE.
5. SEE SHEET 4 FOR ASYMMETRICAL CUL DE SAC DETAILS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

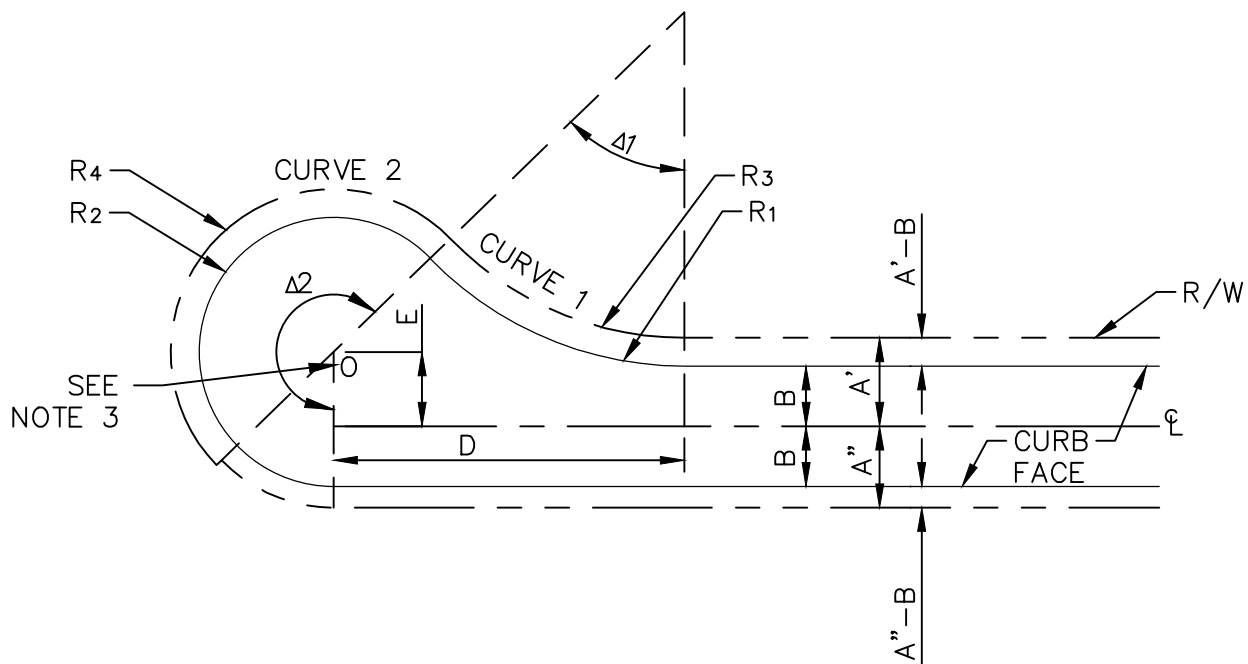
Revision: August 2018

STD. PLAN

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STANDARD CUL-DE-SAC

SHT. 3 OF 4



### OFFSET ASYMMETRICAL CUL-DE-SAC

CURB FACE CURVE DATA												
R/W	A'	A''	B	D	E	$\Delta_1$	$R_1$	$L_1$	$T_1$	$\Delta_2$	$R_2$	$L_2$
48'	25'	23'	17'	99.14'	21'	45°55'15"	100'	80.15'	42.37'	225°55'15"	38'	149.84'
44'	23'	21'	15'	102.86'	23'	48°11'23"	100'	84.11'	44.72'	228°11'23"	38'	151.34'
40'	22'	18'	14'	104.61'	24'	49°17'39"	100'	86.03'	45.88'	229°17'39"	38'	152.07'

RIGHT-OF-WAY CURVE DATA										
R/W	A'	A''	B	D	E	$\Delta_1$	$R_3$	$L_1$	$T_1$	$R_4$
48'	25'	23'	17'	99.14'	21'	45°55'15"	92'	73.74'	38.98'	46'
44'	23'	21'	15'	102.86'	23'	48°11'23"	92'	77.38'	41.14'	46'
40'	22'	18'	14'	104.61'	24'	49°17'39"	92'	79.15'	42.21'	46'

### OFFSET ASYMMETRICAL CUL-DE-SAC NOTES:

1. MINIMUM STREET FLOW LINE GRADE SHALL BE 1 PERCENT
2. REVERSE GRADE VERTICAL CURVES EXCEPTED.
3. POINT "O" SHALL BE 0.30 FOOT MIN. ABOVE THE HIGHEST TOP OF CURVE ELEVATION WITHIN CUL-DE-SAC.
4. REDUCTION IN PARKWAY WIDTH SHALL OCCUR AT THE PROPERTY LINE OF THE LAST LOT TAKING ACCESS FROM THE CUL-DE-SAC.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

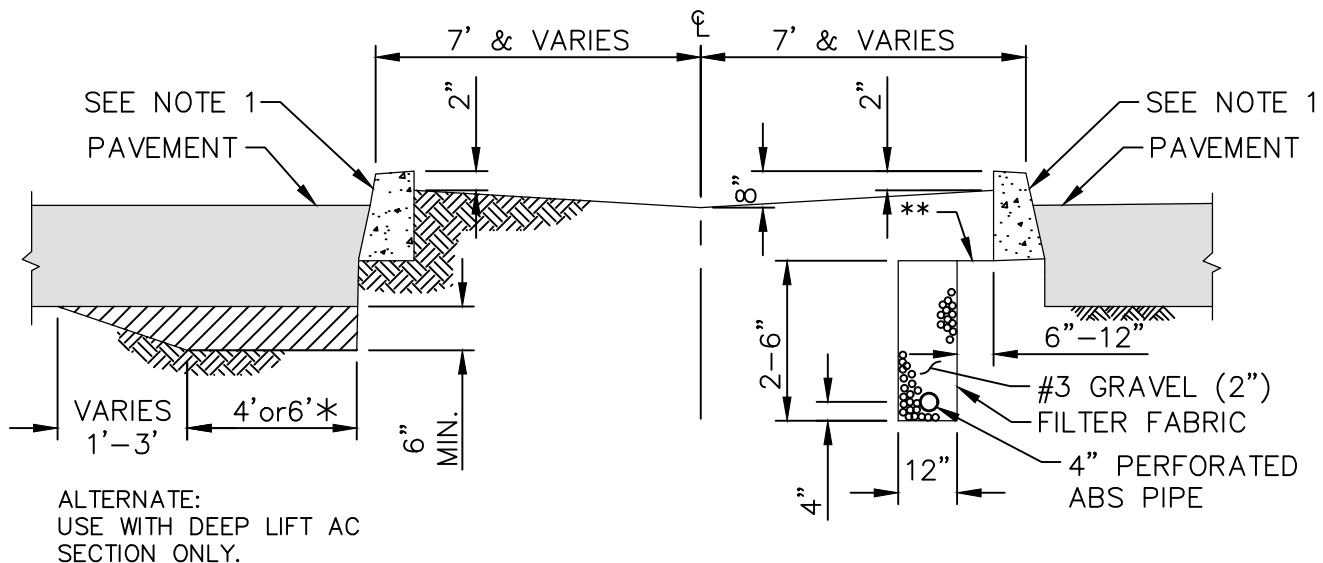
Revision: August 2018

STD. PLAN

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STANDARD CUL-DE-SAC

SHT. 4 OF 4



### ALTERNATE I

TYPICAL BOTH SIDES OF  $\mathcal{C}$

- \* 6 FEET: 9 INCHES AC OR LESS  
IN THICKNESS  
4 FEET: OVER 9 INCHES OF AC  
THICKNESS

### ALTERNATE II

TYPICAL BOTH SIDES OF  $\mathcal{C}$

- \*\* INTERMEDIATE LINE TO SHOW  
LEVEL BETWEEN BOTTOM OF CURB  
AND TOP OF DRAIN

### GENERAL NOTES:

1. SEE STD. PLAN 120-2-OC FOR CURB TYPE.
2. DRAINAGE RUNOFF SHALL FLOW LONGITUDINALLY.
3. MEDIAN DRAINAGE STRUCTURES SHALL BE PROVIDED TO PREVENT ANY WATER FROM OVERFLOWING CURBS.
4. MEDIAN DRAINAGE STRUCTURES AND UNDERDRAINS SHALL DRAIN TO A POINT OF DISPOSAL, AS APPROVED BY THE ENGINEER.
5. PLACEMENT OF PLANTS SHALL NOT OBSTRUCT THE FLOW OF WATER TO THE EXTENT THAT IT WILL OVERFLOW CURBS.
6. MEDIAN AREAS LESS THAN 6 FEET IN WIDTH SHALL BE PAVED PER STD. PLAN 1807, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
7. ALL LANDSCAPING, IRRIGATING AND DRAINAGE DEVICES SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
8. UNDERDRAIN SHALL BE INSTALLED 200 FEET EACH WAY FROM PROFILE SUMP LOCATIONS AND 50 FEET UP GRADE FROM STREET INLET STRUCTURE LOCATIONS.
9. NON-WOVEN FILTER FABRIC SHALL COMPLY WITH STD. PLAN 1808.
10. LANDSCAPE PLANS SHALL BE PREPARED, STAMPED, AND SIGNED BY A LICENSED LANDSCAPE ARCHITECT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

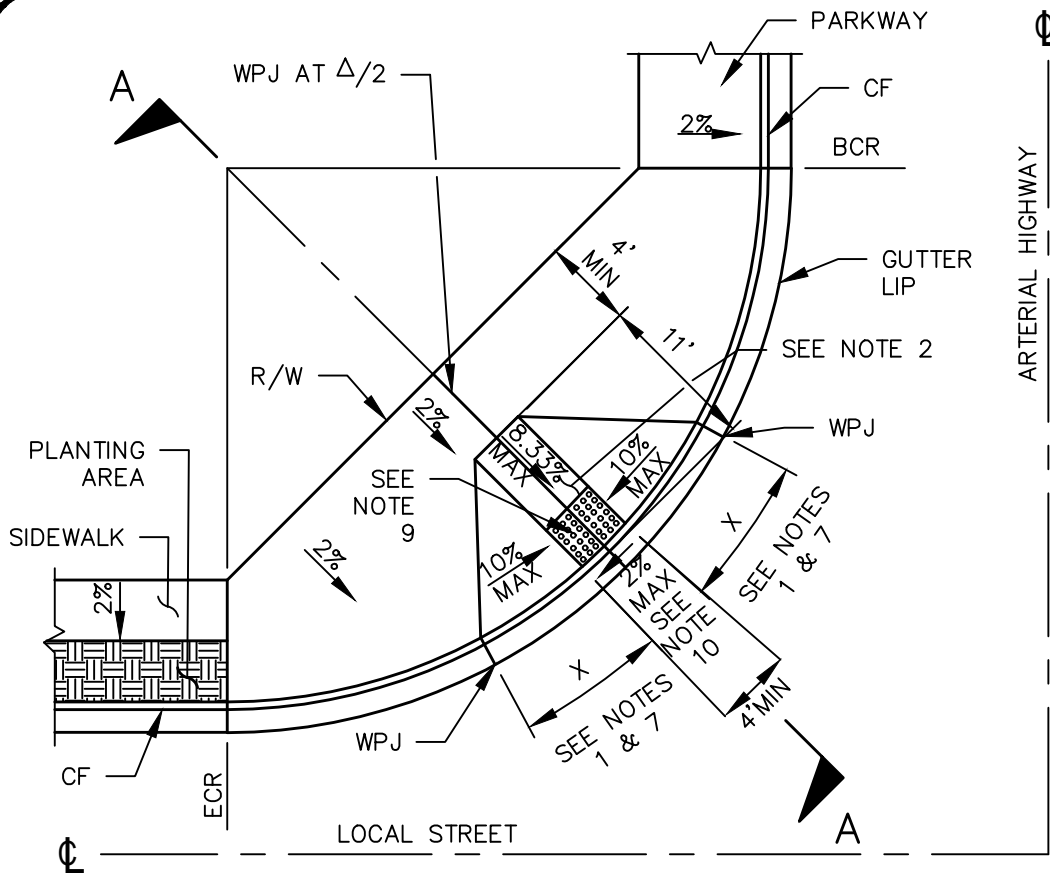
STD. PLAN

1114

SHT. 1 OF 1

LANDSCAPED MEDIAN TYPICAL SECTION



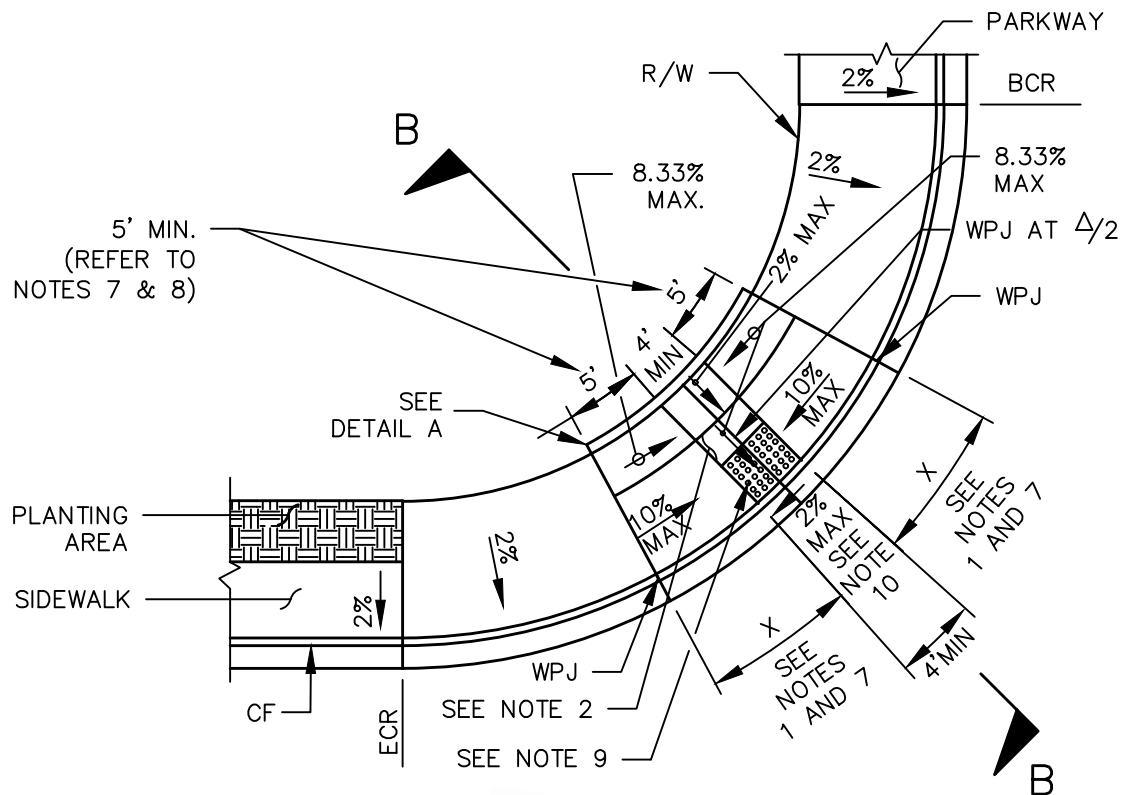


## TYPE 1

### NOTE:

ALL SIDEWALK CROSS-SLOPES SHALL BE 2% MAX, 1% MIN.

## TYPE 2



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

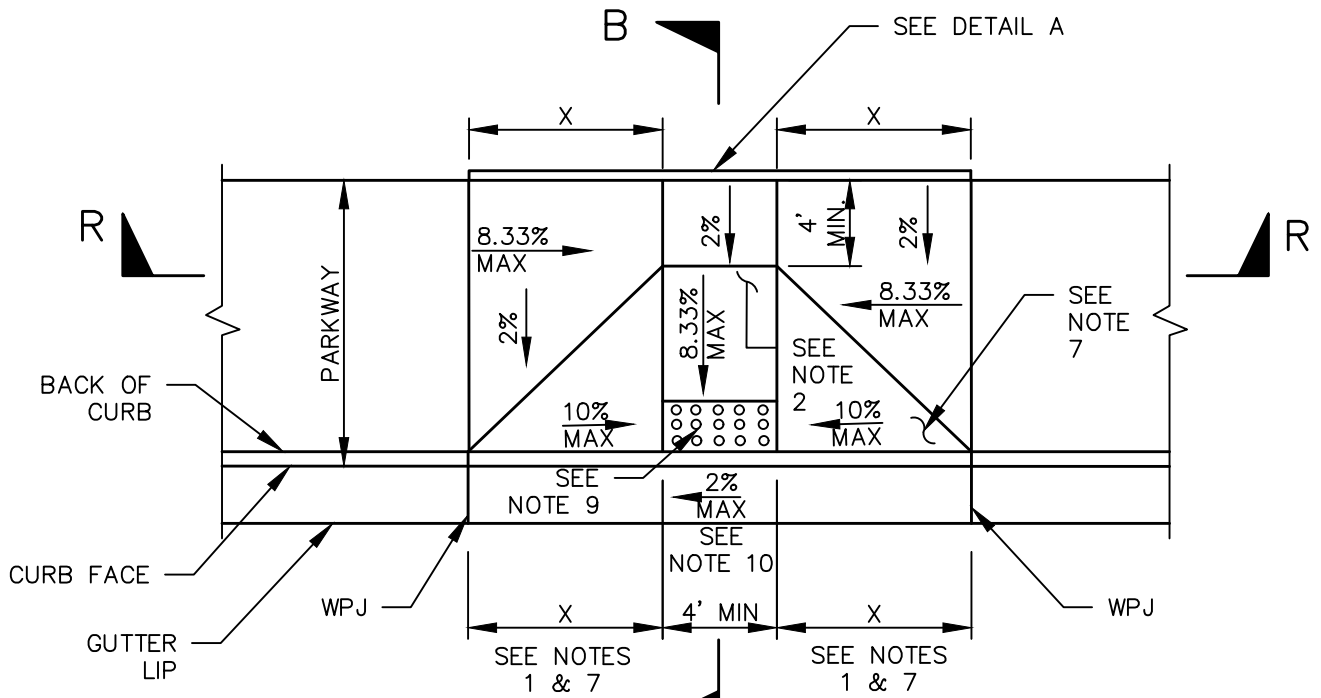
Revision: August 2018

STD. PLAN

1115

CURB RAMP

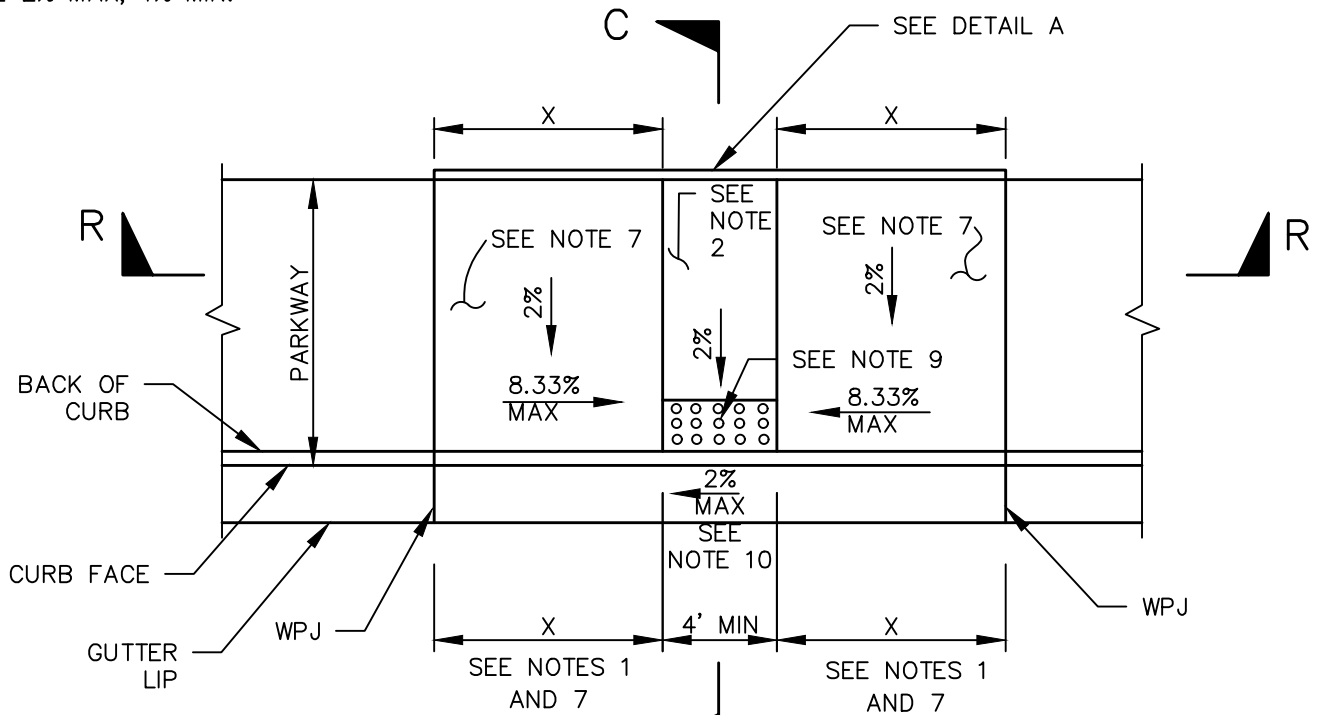
SHT. 1 OF 10



**NOTE:**

ALL SIDEWALK  
CROSS-SLOPES SHALL  
BE 2% MAX, 1% MIN.

**B**  
**TYPE 3**



**C**  
**TYPE 4**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

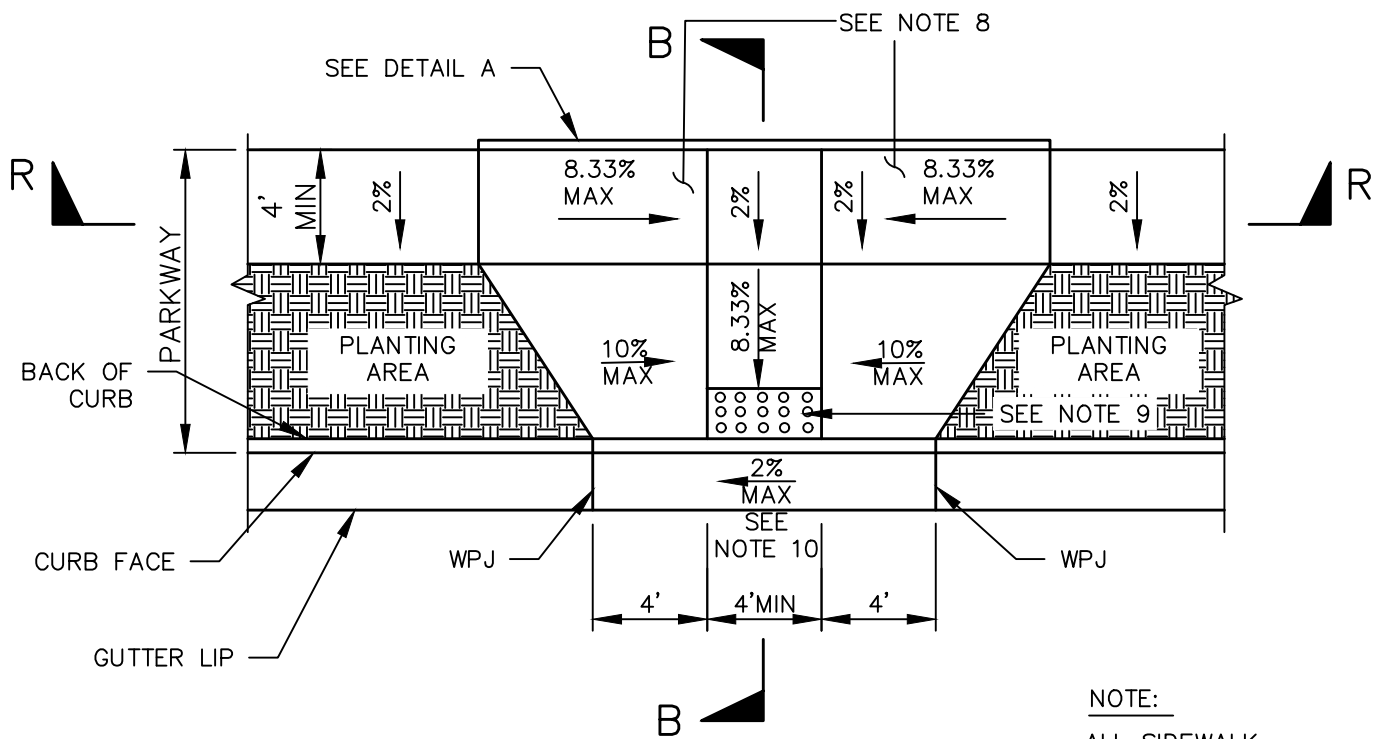
Revision: August 2018

STD. PLAN

1115

SHT. 2 OF 10

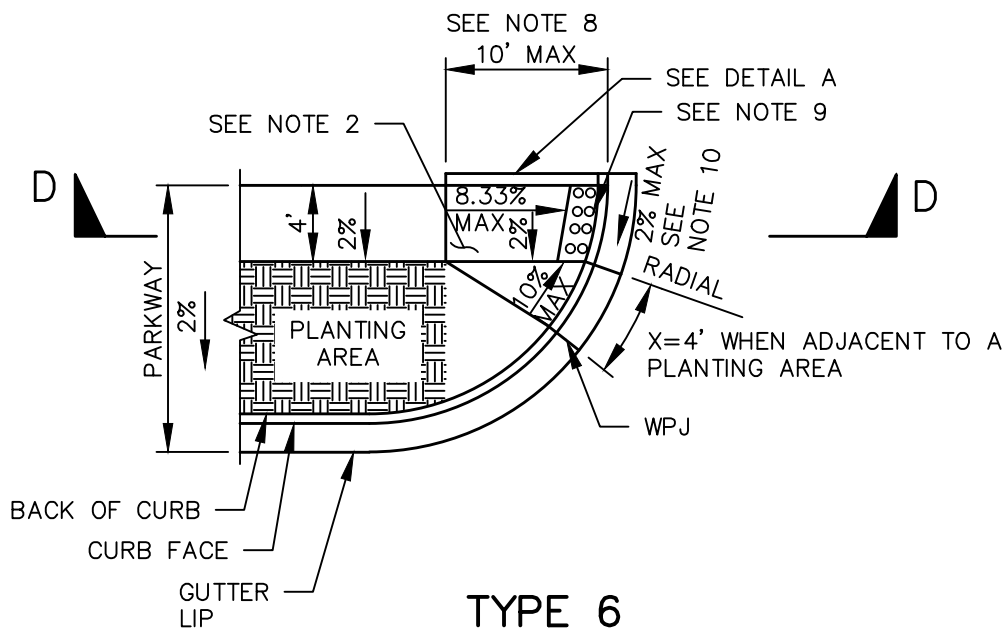
**CURB RAMP**



**TYPE 5**

**NOTE:**

ALL SIDEWALK  
CROSS-SLOPES SHALL  
BE 2% MAX, 1% MIN.



**TYPE 6**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

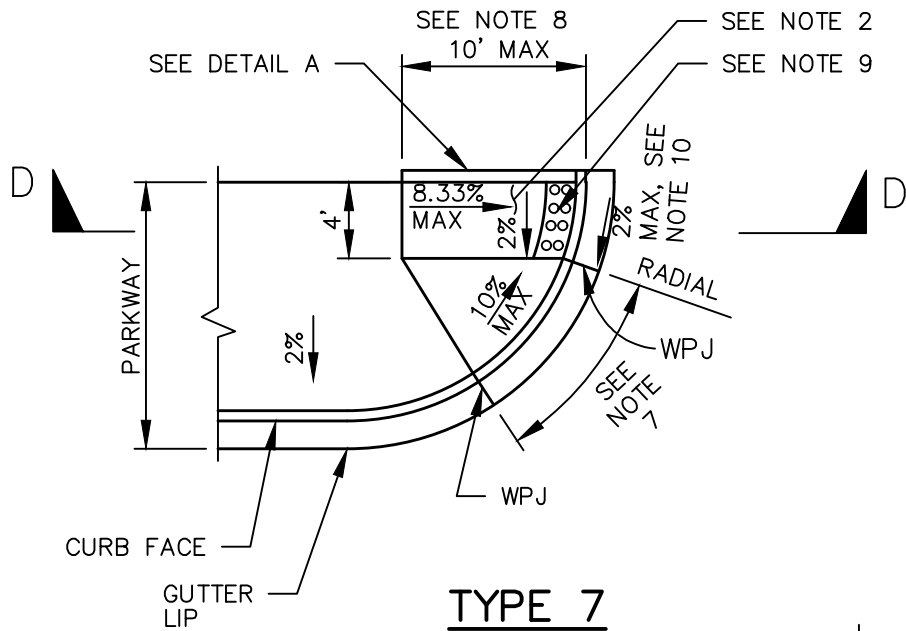
Revision: August 2018

**CURB RAMP**

STD. PLAN

**1115**

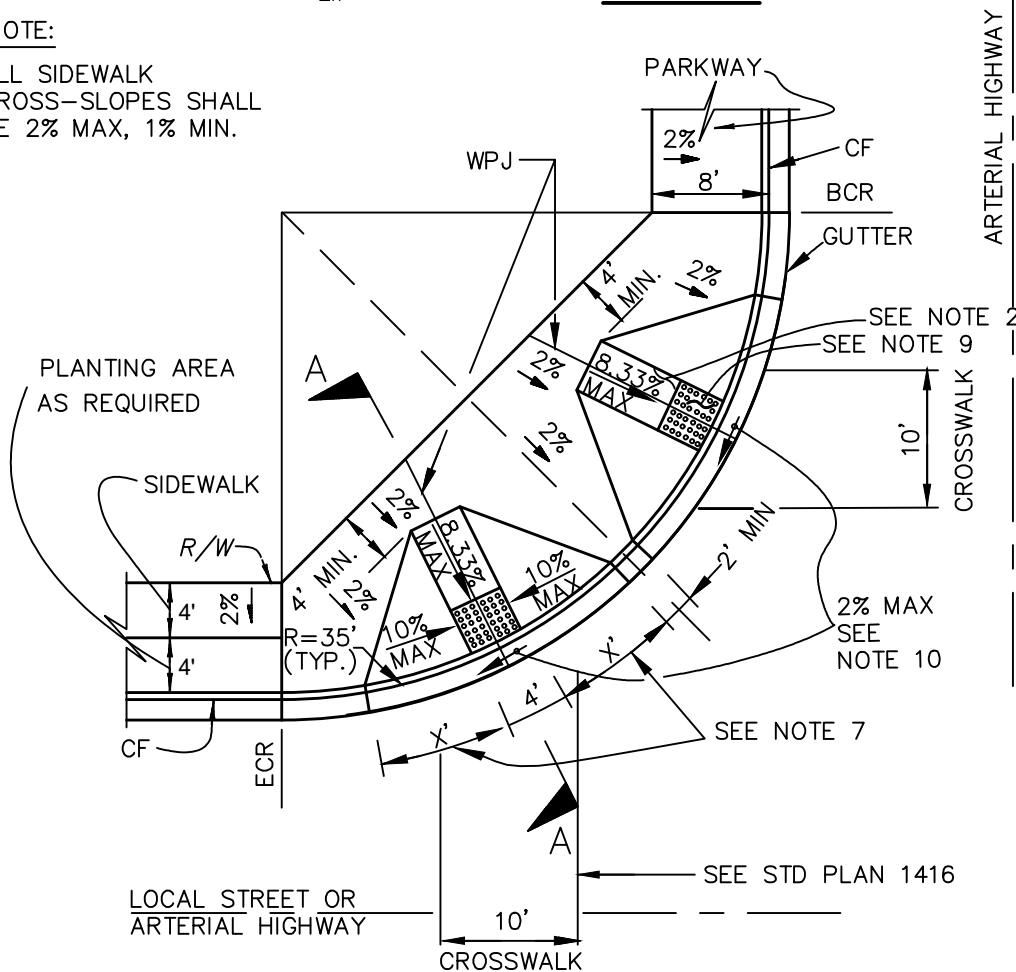
SHT. 3 OF 10



**TYPE 7**

**NOTE:**

ALL SIDEWALK CROSS-SLOPES SHALL BE 2% MAX, 1% MIN.



**TYPE 8**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

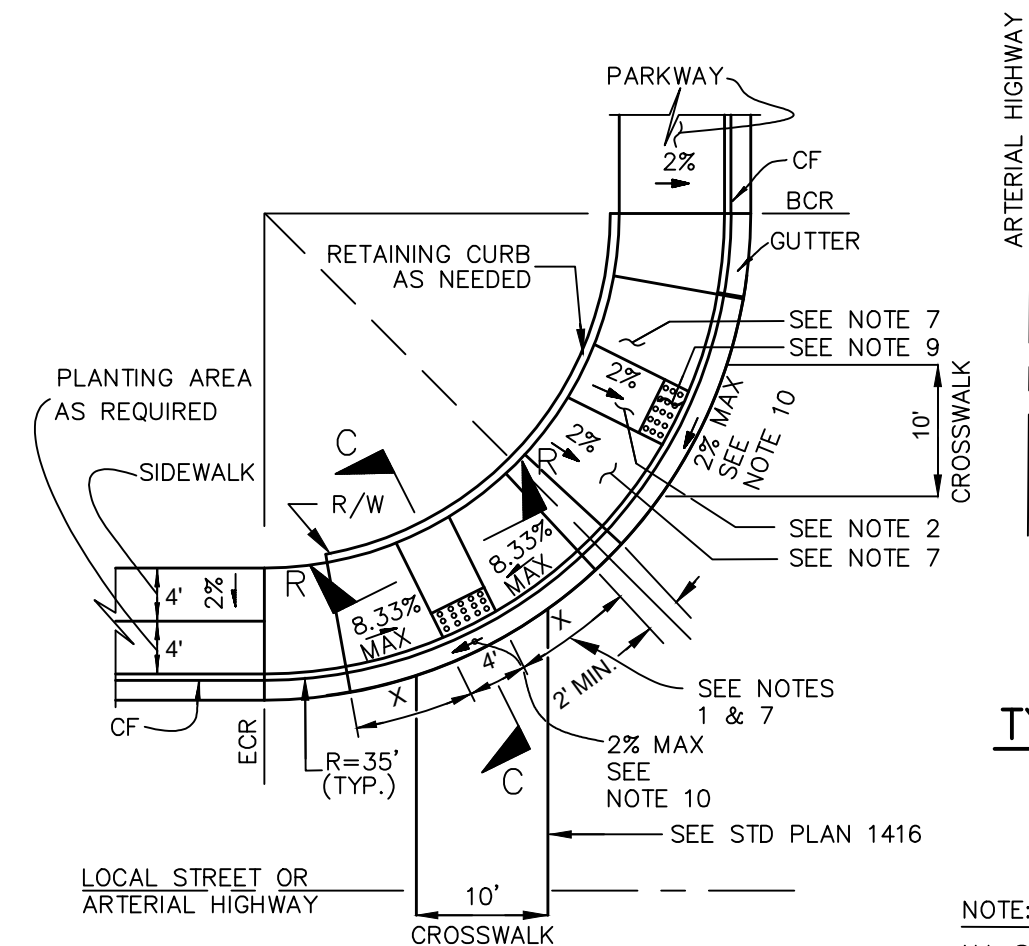
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1115

SHT. 4 OF 10

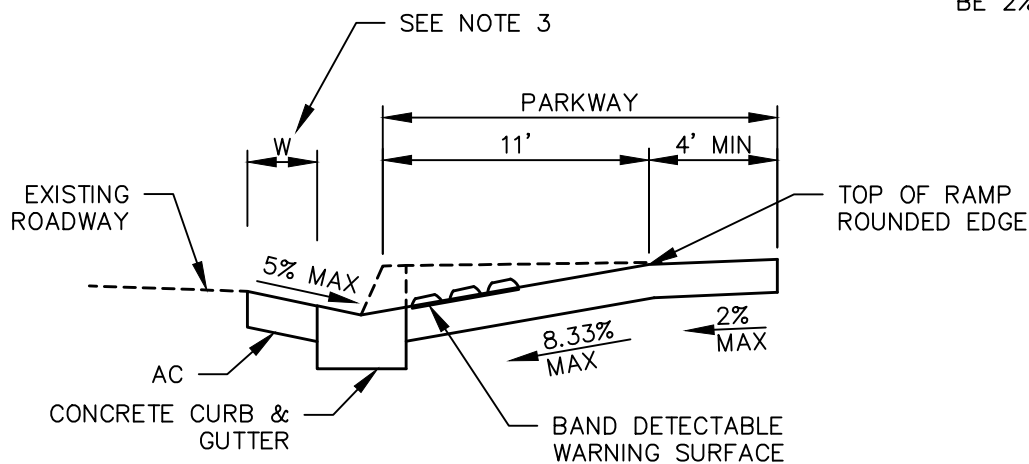
**CURB RAMP**



# **TYPE 9**

## **NOTE:**

ALL SIDEWALK  
CROSS-SLOPES SHALL  
BE 2% MAX, 1% MIN.



## **SECTION A-A**

SEE CURB RAMP TYPE 1 ON SHEET 1,  
AND TYPE 8 ON SHEET 4

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

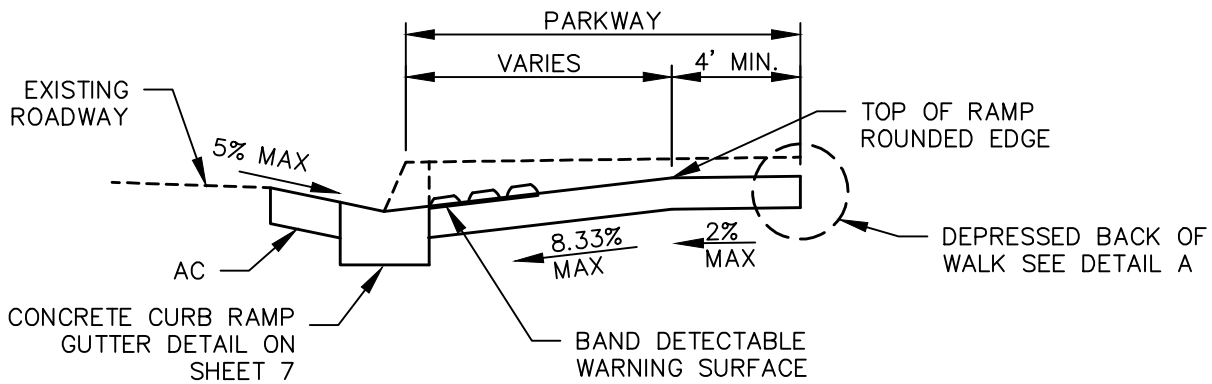
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1115

SHT. 5 OF 10

**CURB RAMP**

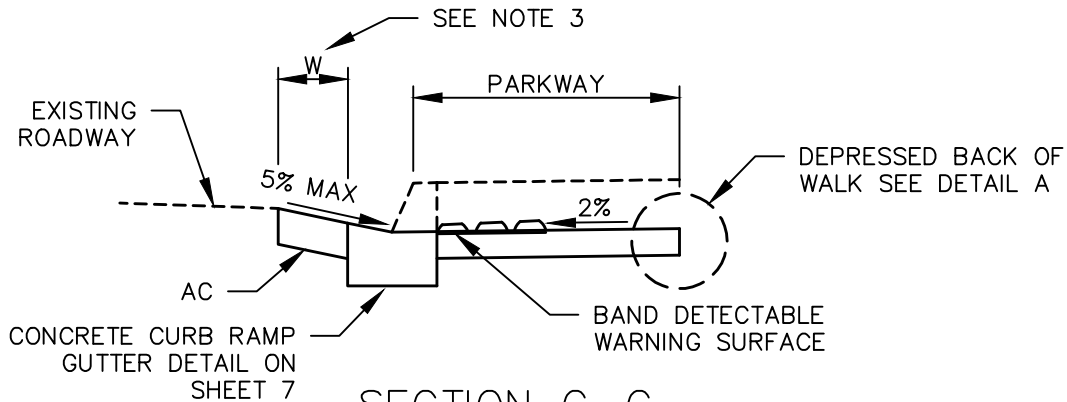


### SECTION B-B

SEE CURB RAMP TYPE 2 ON SHEET 1,  
TYPE 3 ON SHEET 2, AND TYPE 5 ON  
SHEET 3

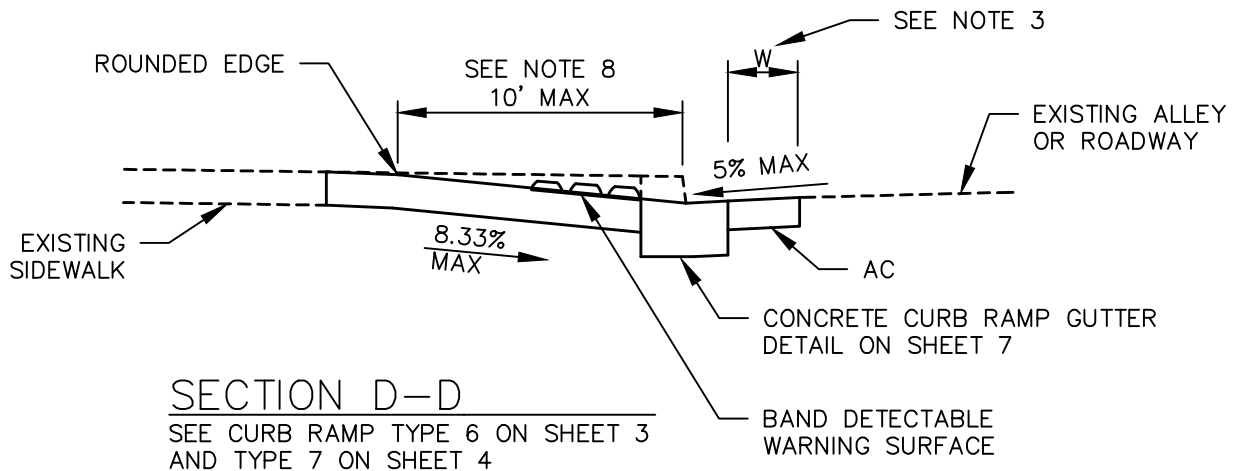
#### NOTE:

ALL SIDEWALK  
CROSS-SLOPES SHALL  
BE 2% MAX, 1% MIN.



### SECTION C-C

SEE CURB RAMP TYPE 4 ON SHEET 2,  
AND TYPE 9 ON SHEET 5



### SECTION D-D

SEE CURB RAMP TYPE 6 ON SHEET 3  
AND TYPE 7 ON SHEET 4

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

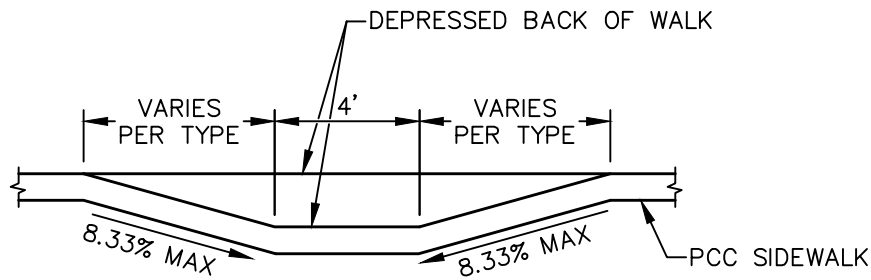
Revision: August 2018

STD. PLAN

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SHT. 6 OF 10

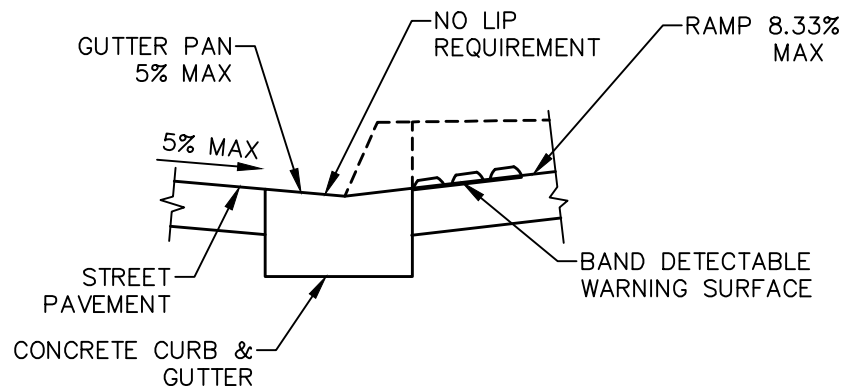
CURB RAMP



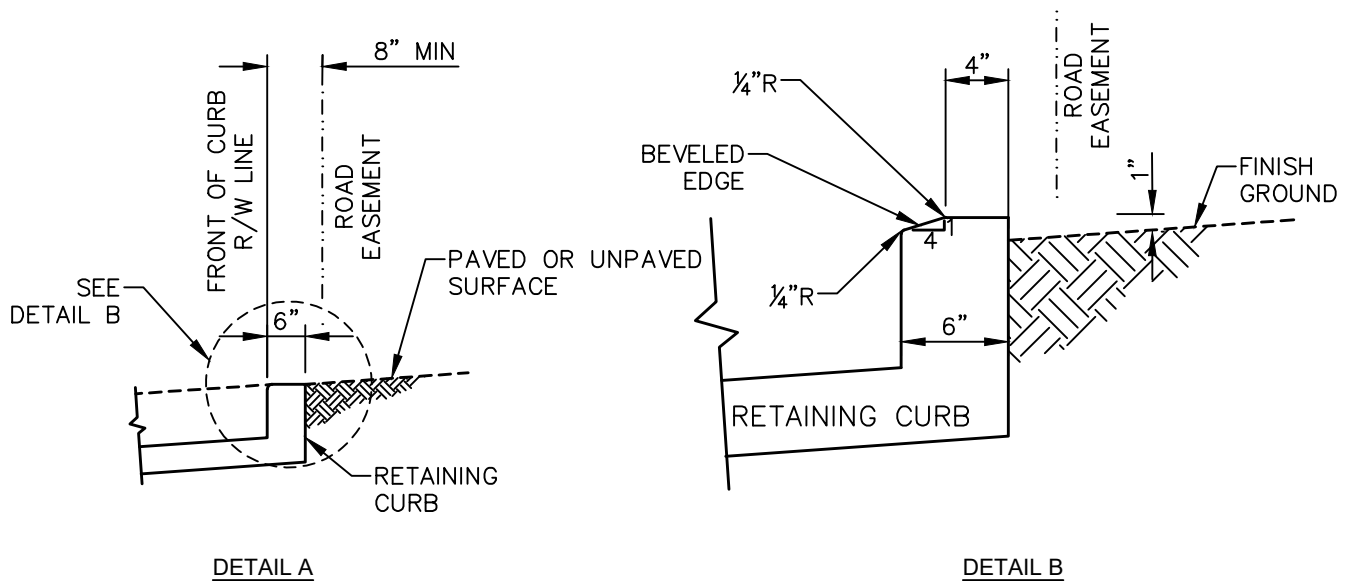
### SECTION R-R

#### NOTE:

ALL SIDEWALK  
CROSS-SLOPES SHALL  
BE 2% MAX, 1% MIN.



### CURB RAMP GUTTER DETAIL



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

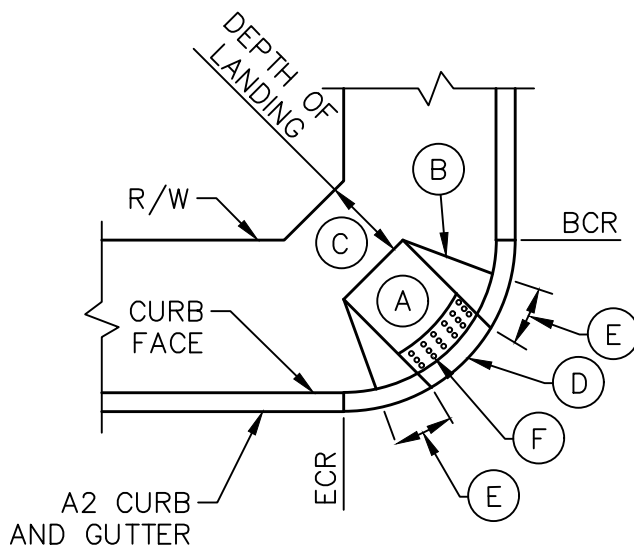
1115

SHT. 7 OF 10

CURB RAMP

## GENERAL NOTES :

1.  $X=8'$  MINIMUM ON CURB WITH 8 INCH CURB FACE HEIGHT.  
 $X=6'$  MINIMUM ON CURB WITH 6 INCH CURB FACE HEIGHT.
2. THE RAMP SURFACE SHALL HAVE A TRANSVERSE BROOMED SURFACE TEXTURE.
3.  $W=3.5$  FEET TO RETROFIT EXISTING STREET PAVEMENT. NEW CONSTRUCTION SHALL MAINTAIN THE STANDARD STREET CROSSFALL.
4. A 10-FOOT MAXIMUM GUTTER PAN TRANSITION IS REQUIRED BETWEEN THE A2 GUTTER PER STD PLAN 120-2-OC (8.33% MAX) AND THE CURB RAMP GUTTER (5% MAX), AS SHOWN ON PAGE 7, CURB RAMP GUTTER DETAIL). LENGTH OF GUTTER PAN TRANSITION SHALL EQUAL DIMENSION 'X'.



- (A) CURB RAMP
- (B) FLARED SIDE SLOPES
- (C) LANDING AREA
- (D) CURB RAMP GUTTER LIP
- (E) GUTTER PAN TRANSITION
- (F) DETECTABLE WARNING SURFACE

5. FOR CONSTRUCTION OF CURB RAMP ON AN EXISTING WALKWAY AREA WHERE SPACE LIMITATION PROHIBITS THE USE OF 8.33% SLOPE, A STEEPER SLOPE MAY BE ALLOWED PENDING REQUIREMENTS OUTLINED IN GENERAL NOTE #10 OF THIS STANDARD PLAN.
6. CURB RAMP TYPES 3, 4, 5, 6, AND 7 SHALL NOT BE USED AT LOCATIONS WHERE MARKED CROSSWALK EXISTS IN BOTH DIRECTIONS.
7. FOR EXISTING WALKWAYS, IF DEPTH OF LANDING IS LESS THAN 4 FEET, THE FLARED SIDE SLOPES SHALL NOT EXCEED 8.33%.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

**CURB RAMP**

STD. PLAN

**1115**

SHT. 8 OF 10

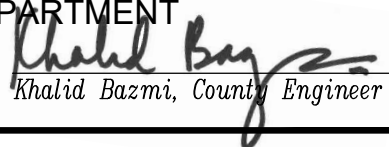
8. AT HILLSIDE DEVELOPMENTS, STREET GRADES CAN EXCEED THE STANDARD 6% FOR ARTERIAL HIGHWAYS AND 10% FOR LOCAL AND COLLECTOR STREETS. WHERE SITE CONDITIONS MAKE IT TECHNICALLY INFEASIBLE OR STRUCTURALLY IMPRACTICABLE TO FULLY COMPLY WITH ADA STANDARDS, ACCESSIBILITY SHALL BE PROVIDED TO THE MAXIMUM EXTENT FEASIBLE OR TO THE EXTENT THAT IS NOT STRUCTURALLY IMPRACTICABLE. [ADAAG 4.1.6(1)(J) & 4.1.1(5)(a)]  
DEVIATIONS MAY BE CONSIDERED PENDING REQUIREMENTS OUTLINED IN GENERAL NOTE #10 OF THIS STANDARD PLAN.
9. CURB RAMPS SHALL HAVE A DETECTABLE WARNING SURFACE THAT EXTENDS THE FULL WIDTH AND 3 FEET DEPTH OF THE CURB RAMP. THE DETECTABLE WARNING SURFACE SHALL BE LOCATED SO THAT THE EDGE NEAREST THE STREET SHALL BE BETWEEN 6 INCHES AND 8 INCHES FROM THE GUTTER FLOW LINE. CURB RAMP DETECTABLE WARNING SURFACE SHALL CONSIST OF A PREFABRICATED SURFACE APPLIED TACTILE MAT INCORPORATING TRUNCATED DOMES. THE TACTILE MAT SHALL MEET THE FOLLOWING STANDARDS:

PROPERTY	ASTM TEST METHOD	NOMINAL VALUE
SALT SPRAY (200 HOURS)	B117	NO CHANGE
SLIP RESISTANCE	C1028	COEFFICIENT OF FRICTION: 0.80 (WET OR DRY)
WEAR RESISTANCE	C501	500 MIN.
WATER ABSORPTION	D570	0.35% MAX.
TENSILE STRENGTH	D638	10,000 PSI MIN.
COMPRESSIVE STRENGTH	D695	20,000 PSI MIN.
FLEXURAL STRENGTH	D790	25,000 PSI MIN.
FLAME SPREAD	E84	FSI: 25 MAX.
ACCELERATED WEATHERING (2,000 HOURS)	G155	DELTA E: 5.0 MAX.
CHEMICAL RESISTANCE	D543 OR D1308	NO-REACTION OR NO-STAIN DETERIORATION

PREFABRICATED WARNING SURFACES SHALL BE IN CONFORMANCE WITH THE REQUIREMENTS ESTABLISHED BY THE DEPARTMENT OF GENERAL SERVICES, DIVISION OF STATE ARCHITECTURE AND BE ATTACHED IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS, BUT IN NO CASE SHALL THE CONCRETE CURE PERIOD FOR RAMPS BE LESS THAN FOURTEEN (14) DAYS. INSTALLATION SHALL BE ACCOMPANIED WITH A WRITTEN 5-YEAR WARRANTY FROM THE MANUFACTURER, GUARANTEEING REPLACEMENT WHEN THERE IS DEFECT IN THE DOME SHAPE, COLOR FASTNESS, SOUND-ON-CANE ACOUSTIC QUALITY, RESILIENCE OR ATTACHMENT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

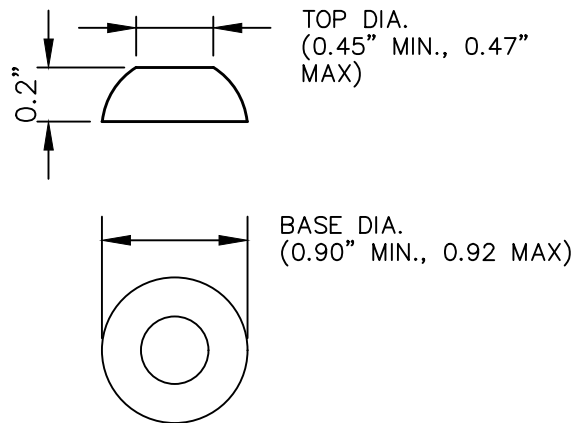
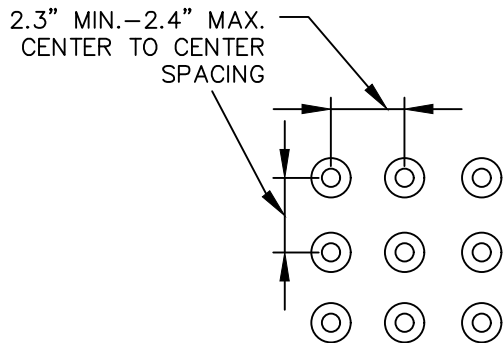
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**CURB RAMP**

STD. PLAN

**1115**

SHT. 9 OF 10



### RAISED TRUNCATED DOME IN PATTERN (IN-LINE)

### RAISED TRUNCATED DOME

#### NOTE:

THE COLOR OF THE DETECTABLE WARNING SURFACE SHALL BE YELLOW CONFORMING TO FEDERAL STANDARD 595 B, COLOR NO. 33538, OR AS APPROVED BY COUNTY, IN COMPLIANCE WITH THE 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN.

10. ANY DEVIATIONS FROM THE 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN MUST COMPLY WITH THE THE FOLLOWING REQUIREMENTS:
- (A) THE CURB RAMP DESIGN HAS BEEN PREPARED BY A CIVIL ENGINEER LICENSED IN THE STATE OF CALIFORNIA.
  - (B) THE CURB RAMP DESIGN HAS BEEN REVIEWED BY A CERTIFIED ACCESS SPECIALIST (CASP) AND DETERMINED THAT THE PROPOSED MODIFICATIONS MEET THE INTENT OF THE ACCESSIBILITY STANDARDS.
  - (C) THE ENGINEER OF RECORD COMPLETES AND SUBMITS A "DESIGN MEMORANDUM" TO THE COUNTY.
  - (D) THE DESIGN HAS BEEN APPROVED BY THE COUNTY BUILDING OFFICIAL FOR IMPROVEMENTS ON PRIVATE RIGHT-OF-WAY, OR THE COUNTY ENGINEER (OR DESIGNEE) WITHIN PUBLIC RIGHT-OF-WAY.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

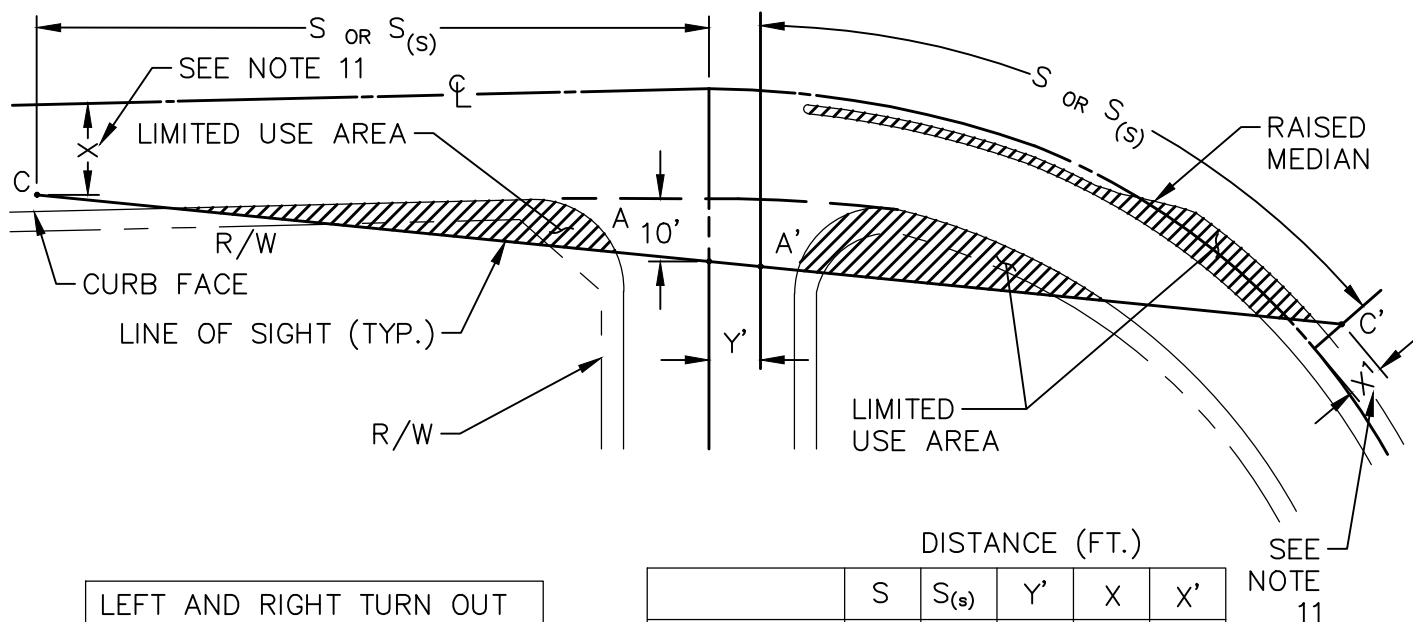
Revision: August 2018

**CURB RAMP**

STD. PLAN

**1115**

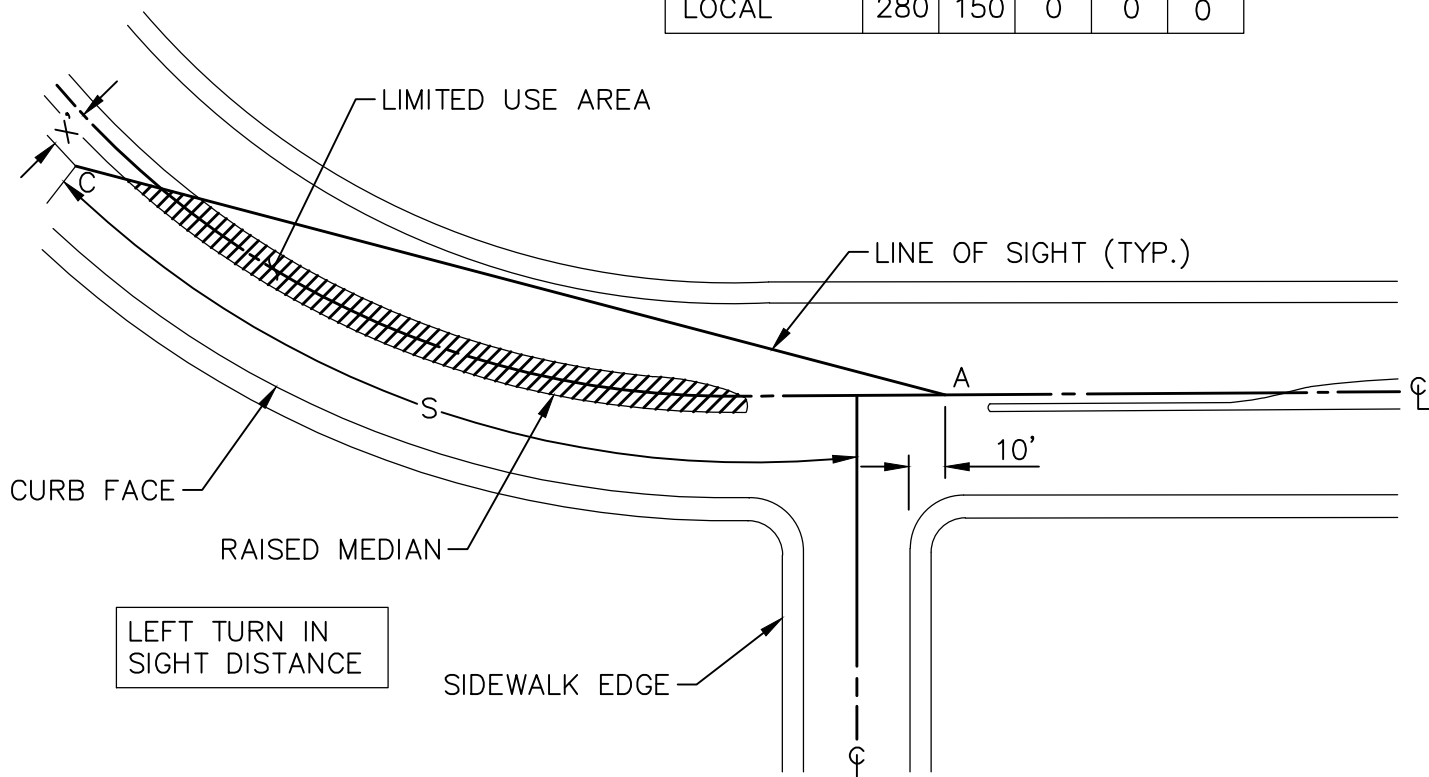
SHT. 10 OF 10



LEFT AND RIGHT TURN OUT  
AND CROSS TRAFFIC  
SIGHT DISTANCE

	DISTANCE (FT.)				
	S	$S_{(s)}$	Y'	X	X'
MAJOR	660	580	37	37	13
PRIMARY	610	500	25	25	13
SECONDARY	550	430	18	18	6
COMMUTER	500	360	0	0	0
COLLECTOR	390	250	0	0	0
LOCAL	280	150	0	0	0

SEE  
NOTE  
11



LEFT TURN IN  
SIGHT DISTANCE

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1117

SHT. 1 OF 3

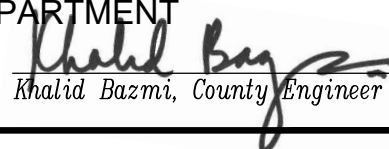
INTERSECTION SIGHT DISTANCE

## NOTES:

1. THE DISTANCE S REPRESENTS THE INTERSECTION SIGHT DISTANCE MEASURED ALONG THE CENTERLINE OF THE ROAD. THE INTERSECTION SIGHT DISTANCE IS THE DISTANCE REQUIRED TO ALLOW  $7\frac{1}{2}$  SECONDS FOR THE DRIVER ON THE CROSS ROAD (OR LEFT TURN POCKET) TO SAFELY CROSS THE MAIN ROADWAY OR TURN LEFT WHILE THE APPROACH VEHICLE TRAVELS AT THE ASSUMED DESIGN SPEED OF THE MAIN ROADWAY.
2. THE DISTANCE S SHOULD BE INCREASED BY 20 PERCENT FROM THE AMOUNT SHOWN ON THE TABLE ON SUSTAINED DOWNGRADES STEEPER THAN 3 PERCENT AND LONGER THAN ONE MILE.
3. POINTS A AND A' ARE THE LOCATIONS OF A DRIVER'S LINE OF SIGHT (3.5 FOOT EYE HEIGHT) TO ONCOMING VEHICLES (4.25 FOOT OBJECT HEIGHT) LOCATED AT POINTS C AND C' WHILE IN A VEHICLE AT AN INTERSECTION 10 FEET BACK FROM THE PROJECTION OF THE CURB LINE. IN NO CASE SHALL POINTS A OR A' BE LESS THAN FIFTEEN (15) FEET FROM THE EDGE OF THE TRAVELED WAY.
4. THE DISTANCE Y' IS THE DISTANCE MEASURED FROM THE CENTERLINE OF THE MAIN ROAD TO THE FAR RIGHT THROUGH TRAVEL LANE. THE DISTANCE Y' IS EQUAL TO ZERO FOR T-INTERSECTIONS. THE DISTANCE X IS THE DISTANCE MEASURED FROM THE CENTERLINE OF THE MAIN ROAD TO THE CENTER OF THE FAR RIGHT THROUGH TRAVEL LANE. THE DISTANCE X' IS THE DISTANCE MEASURED FROM THE CENTERLINE OF THE MAIN ROAD TO THE CENTER OF THE TRAVEL LANE NEAREST THE CENTERLINE OF THE ROAD.
5. THE LIMITED USE AREA IS DETERMINED BY THE GRAPHICAL METHOD USING THE APPROPRIATE DISTANCES GIVEN IN THE ABOVE TABLE. IT SHALL BE USED FOR THE PURPOSE OF PROHIBITING OR CLEARING OBSTRUCTIONS IN ORDER TO MAINTAIN ADEQUATE SIGHT DISTANCE AT INTERSECTIONS.
6. THE LINE OF SIGHT LINE SHALL BE SHOWN AT INTERSECTIONS ON ALL LANDSCAPING PLANS, GRADING PLANS AND TENTATIVE TRACT PLANS WHERE SAFE SIGHT DISTANCE IS QUESTIONABLE. IN CASES WHERE AN INTERSECTION IS LOCATED ON A VERTICAL CURVE, A PROFILE AT THE LINE OF SIGHT MAY BE REQUIRED.
7. OBSTRUCTIONS SUCH AS BUS SHELTERS, WALLS OR LANDSCAPING WITHIN THE LIMITED USE AREA WHICH COULD RESTRICT THE LINE OF SIGHT SHALL NOT BE PERMITTED.
  - A. PLANTS AND SHRUBS WITHIN THE LIMITED USE AREA SHALL BE OF THE TYPE THAT WILL GROW NO HIGHER THAN 12 INCHES ABOVE THE GROUND AND SHALL BE MAINTAINED AT A MAXIMUM HEIGHT OF 12 INCHES ABOVE THE GROUND. MAINTENANCE AT A LOWER HEIGHT MAY BE REQUIRED ON CREST VERTICAL CURVES PER NOTE 6 ABOVE.
  - B. A PROFILE OF THE LINE OF SIGHT MAY BE REQUIRED TO VERIFY 12 INCHES MINIMUM VERTICAL CLEARANCE ABOVE VARIABLE HEIGHT OBSTRUCTIONS SUCH AS SLOPE LANDSCAPING, PLANTS AND SHRUBS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1117

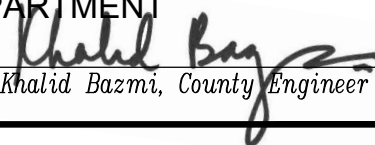
SHT. 2 OF 3

INTERSECTION SIGHT DISTANCE

- C. THE TOE OF SLOPE MAY ENCROACH INTO THE LIMITED USE AREA PROVIDED THAT THE REQUIREMENTS OF (B) ABOVE ARE SATISFIED.
- D. IN LIEU OF PROVIDING A PROFILE OF THE LINE OF SIGHT, THE TOE OF SLOPE SHALL NOT ENCROACH INTO THE LIMITED USE AREA, AND THE LIMITED USE AREA SHALL SLOPE AT 2 PERCENT MAXIMUM TO THE ROADWAY.
- 8. TREES SHALL NOT BE PERMITTED WITHIN ANY PORTION OF THE LIMITED USE AREA.
- 9. MEDIAN AREAS LESS THAN SIX (6) FEET IN WIDTH SHALL BE PAVED WITH CONCRETE PER STANDARD PLAN 1807, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
- 10. RESIDENTIAL DRIVEWAYS SERVING FOUR OR MORE UNITS AND COMMERCIAL DRIVEWAYS SHALL BE TREATED AS A LOCAL STREET INTERSECTION.
- 11. X AND X<sup>1</sup> ARE BASED UPON A STANDARD 14' MEDIAN FOR MAJOR AND PRIMARY HIGHWAYS USE S VALUES FOR UNSIGNALIZED INTERSECTIONS AND S<sub>(s)</sub> VALUES FOR SIGNALIZED INTERSECTIONS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

INTERSECTION SIGHT DISTANCE

STD. PLAN

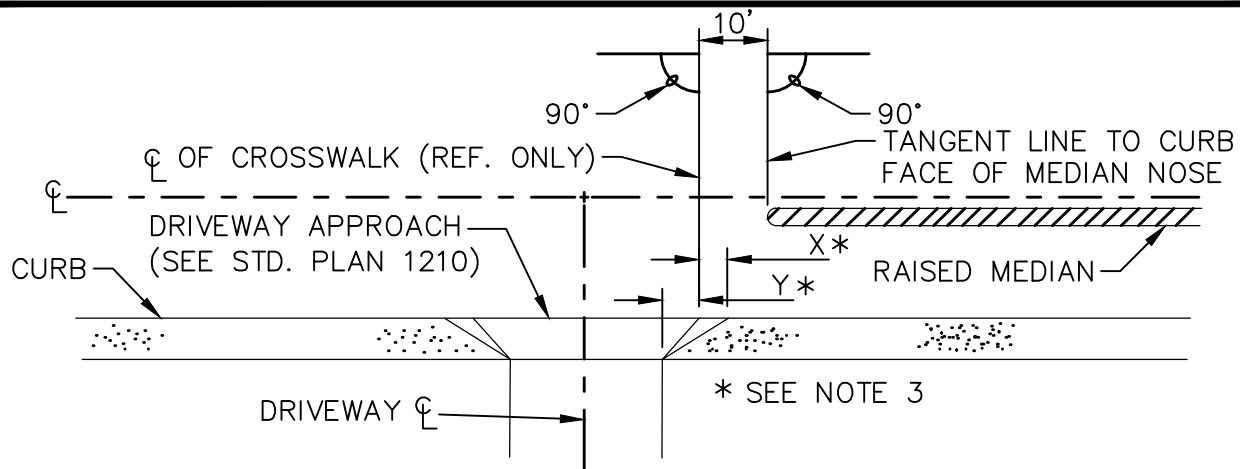
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SHT. 3 OF 3

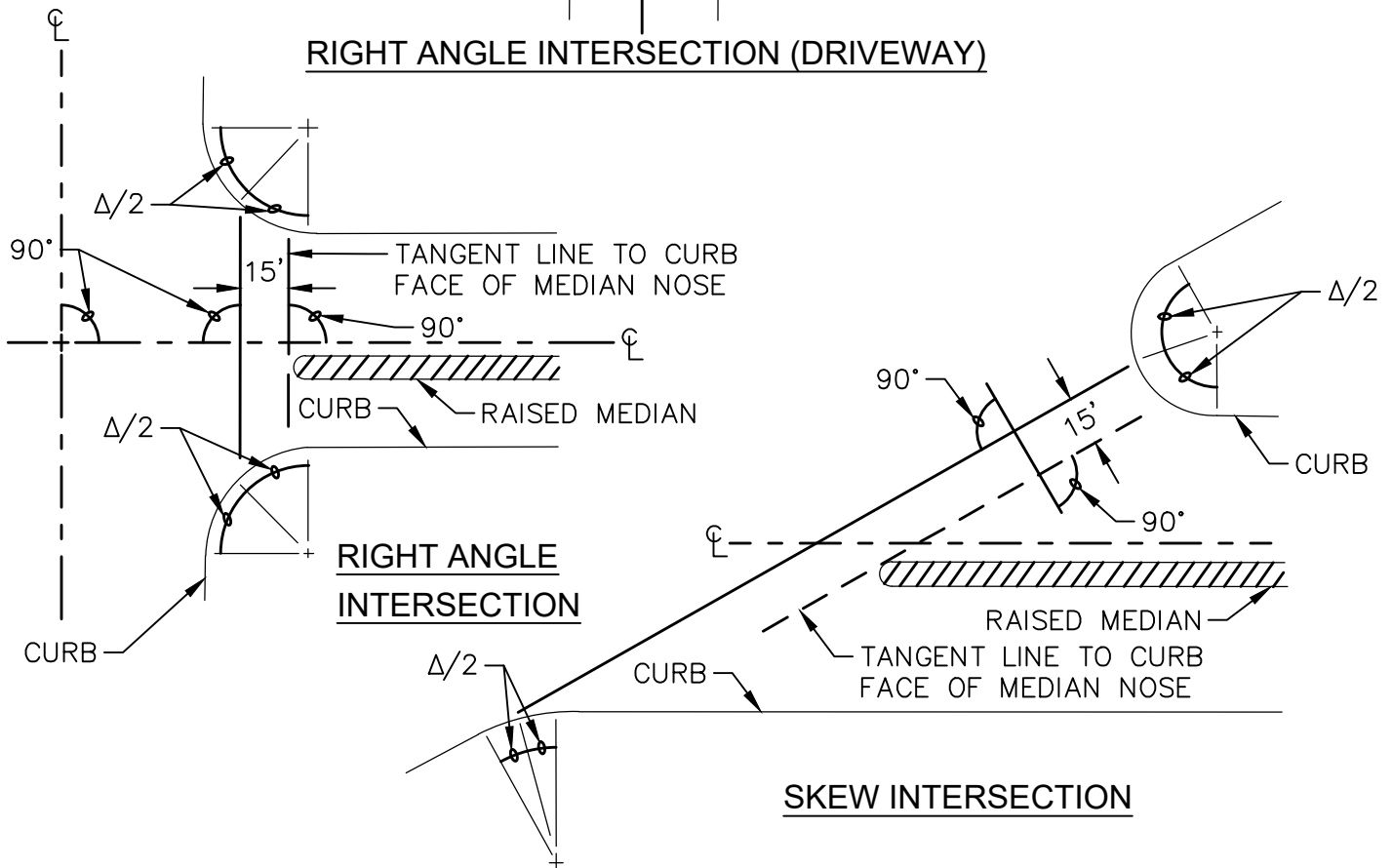








**RIGHT ANGLE INTERSECTION (DRIVEWAY)**



**RIGHT ANGLE INTERSECTION**

**SKEW INTERSECTION**

**NOTES:**

1. EXTEND DOUBLE YELLOW STRIPING FROM MEDIAN NOSE TO CROSSWALK OR TO  $\Delta/2$  IF THERE IS NO CROSSWALK.
2. SEE STANDARD PLAN 1416 FOR CROSSWALK DETAIL.
3. SEE STANDARD PLAN 1210 FOR DRIVEWAY FLARE DIMENSIONS 'X' AND 'Y'.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

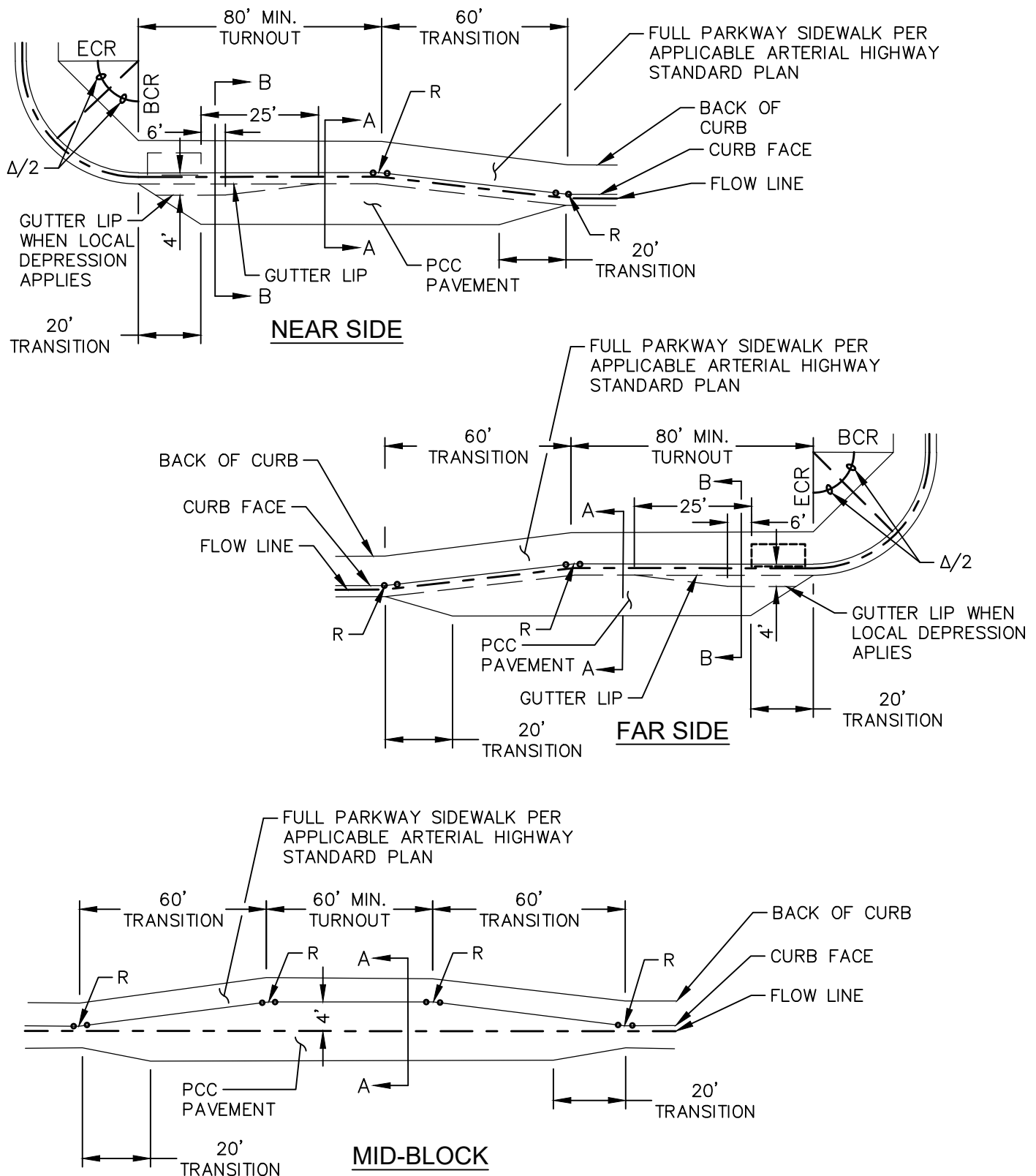
STD. PLAN

**1119**

**RAISED MEDIAN NOSE LOCATION**

SHT. 1 OF 1





COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

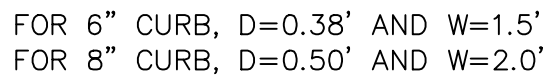
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1120

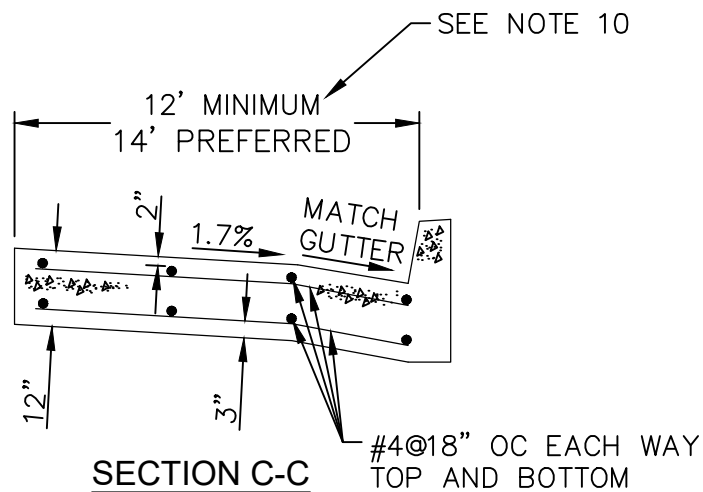
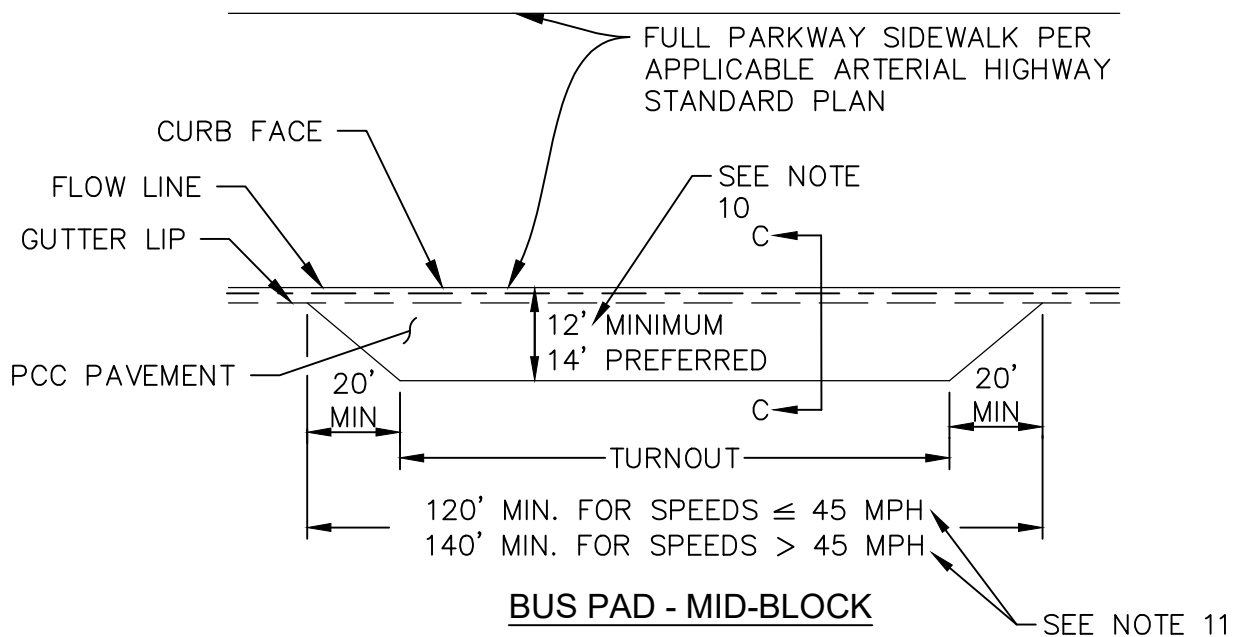
SHT. 1 OF 4

BUS TURNOUTS AND PADS



## SECTION A-A

## BUS TURNOUTS AND PADS



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1120

SHT. 3 OF 4

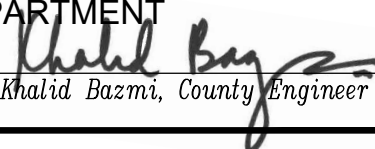
BUS TURNOUTS AND PADS

## NOTES:

1. R=50 FEET.
2. PCC PAVEMENT THICKNESS SHALL BE 12 INCHES.
3. BUS SHELTERS SHALL BE SET BACK FROM THE FACE OF THE CURB A MINIMUM CLEAR DISTANCE OF FOUR (4) FEET FOR PEDESTRIAN TRAVELWAY.
4. CURB AND GUTTER SHALL BE POURED MONOLITHIC WITH PCC PAVEMENT.
5. MODIFICATIONS OF THIS STANDARD SHALL BE REVIEWED FOR ACCEPTABILITY BY OCPW TRAFFIC ENGINEERING DIVISION.
6. CONSTRUCT CONTROL JOINTS AT 10-FOOT INTERVALS.
7. INLETS SHOULD NOT BE LOCATED IN BUS TURNOUTS.
8. DRIVEWAYS SHOULD NOT BE LOCATED IN BUS TURNOUTS.
9. 4' WHEN LOCAL DEPRESSION FOR INLET APPLIES. SEE LOCAL DEPRESSION PER STD. PLAN 1308, INCLUDING D DIMENSION.
10. WITH INTENT TO MATCH LANE LINE.
11. CONSULT WITH OCTA FOR REQUIRED TURNOUT LENGTH.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

**BUS TURNOUTS AND PADS**

STD. PLAN

**1120**

SHT. 4 OF 4

TABLE 1

# TAPER LENGTH CRITERIA AND CHANNELIZING DEVICE SPACING

SPEED (S)	MINIMUM TAPER LENGTH * FOR WIDTH OF OFFSET 12 FEET (W)				MAXIMUM CHANNELIZING DEVICE SPACING		
					X	Y	Z **
	TANGENT 2L	MERGING L	SHIFTING L/2	SHOULDER L/3	TAPER	TANGENT	CONFLICT
mph	ft	ft	ft	ft	ft	ft	ft
20	160	80	40	27	20	40	10
25	250	125	63	42	25	50	12
30	360	180	90	60	30	60	15
35	490	245	123	82	35	70	17
40	640	320	160	107	40	80	20
45	1080	540	270	180	45	90	22
50	1200	600	300	200	50	100	25
55	1320	660	330	220	55	110	27
60	1440	720	360	240	60	120	30
65	1560	780	390	260	65	130	32
70	1680	840	420	280	70	140	35

\* – FOR OTHER OFFSETS, USE THE FOLLOWING MERGING TAPER LENGTH FORMULA FOR L:  
 FOR SPEED OF 40 MPH OR LESS,  $L = WS^2/60$   
 FOR SPEED OF 45 MPH OR MORE,  $L = WS$

WHERE: L = TAPER LENGTH IN FEET  
 W = WIDTH OF OFFSET IN FEET  
 S = POSTED SPEED LIMIT, OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR  
 THE ANTICIPATED OPERATING SPEED IN MPH.

\*\* – USE FOR TAPER AND TANGENT SECTIONS WHERE THERE ARE NO PAVEMENT MARKINGS OR WHERE  
 THERE IS A CONFLICT BETWEEN EXISTING PAVEMENT MARKINGS AND CHANNELIZERS.

## NOTE:

TABLES ARE TO BE USED WITH STD. PLANS 1151–1159.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
 Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1150

SHT. 1 OF 3

TRAFFIC CONTROL: SPACING FOR LANE AND SHOULDER CLOSURES

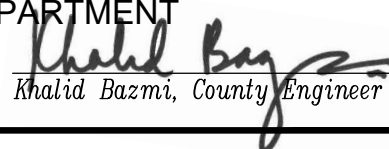
TABLE 2

LONGITUDINAL BUFFER SPACE AND FLAGGER STATION SPACING				
SPEED *	Min D **	DOWNGRADE Min D ***		
		-3%	-6%	-9%
mph	ft	ft	ft	ft
20	115	116	120	126
25	155	158	165	173
30	200	205	215	227
35	250	257	271	287
40	305	315	333	354
45	360	378	400	427
50	425	446	474	507
55	495	520	553	593
60	570	598	638	686
65	645	682	728	785
70	730	771	825	891

- \* — SPEED IS POSTED SPEED LIMIT, OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH
- \*\* — LONGITUDINAL BUFFER SPACE OR FLAGGER STATION SPACING
- \*\*\* — USE ON SUSTAINED DOWNGRADE STEEPER THAN -3 PERCENT AND LONGER THAN 1 MILE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
 Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1150

TRAFFIC CONTROL: SPACING FOR LANE AND SHOULDER CLOSURES

SHT. 2 OF 3

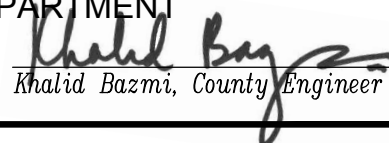
TABLE 3

ADVANCE WARNING SIGN SPACING			
ROAD TYPE	DISTANCE BETWEEN SIGNS *		
	A	B	C
	ft	ft	ft
URBAN – 25 mph OR LESS	100	100	100
URBAN – MORE THAN 25 mph TO 40 mph	250	250	250
URBAN – MORE THAN 40 mph	350	350	350
RURAL	500	500	500
EXPRESSWAY	1000	1500	2640

\* – THE DISTANCES ARE APPROXIMATE, ARE INTENDED FOR GUIDANCE PURPOSES ONLY, AND SHOULD BE APPLIED WITH ENGINEERING JUDGMENT. THESE DISTANCES SHOULD BE ADJUSTED BY THE ENGINEER FOR FIELD CONDITIONS, IF NECESSARY, BY INCREASING OR DECREASING THE RECOMMENDED DISTANCES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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Khalid Bazmi, County Engineer

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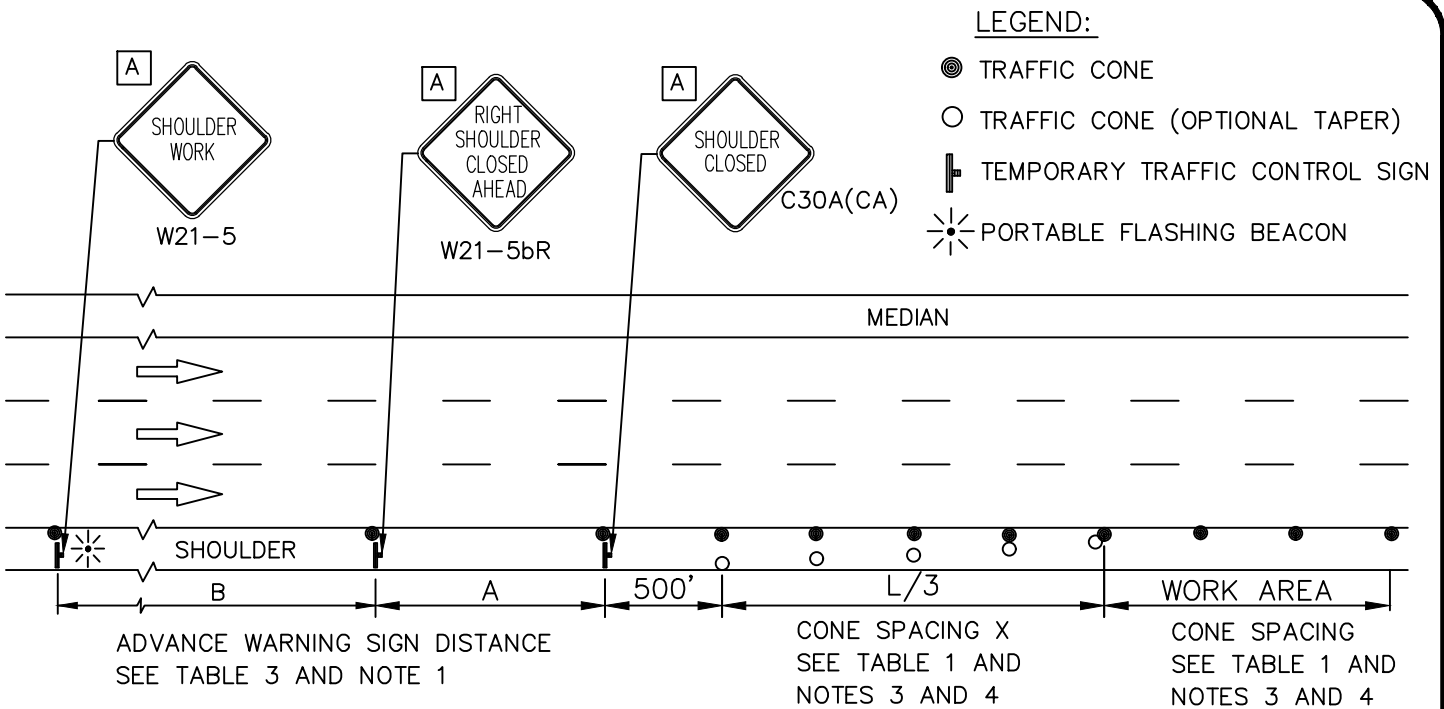
STD. PLAN

1150

TRAFFIC CONTROL: SPACING FOR LANE AND SHOULDER CLOSURES

SHT. 3 OF 3





SIGN PANEL SIZE (MIN)

A 36" x 36"

**NOTES:**

1. EACH ADVANCE WARNING SIGN SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AT LEAST 16" X 16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. FLASHING BEACONS SHALL BE PLACED AT THE LOCATIONS INDICATED FOR LANE CLOSURE DURING HOURS OF DARKNESS.
2. LANE CLOSURES SHALL NOT BEGIN AT TOP OF CREST VERTICAL CURVE OR ON A HORIZONTAL CURVE.
3. ALL CONES USED FOR LANE CLOSURES DURING THE HOURS OF DARKNESS SHALL BE FITTED WITH RETRO-REFLECTIVE BANDS (OR SLEEVES).
4. PORTABLE DELINEATORS, PLACED AT ONE-HALF THE SPACING INDICATED FOR TRAFFIC CONES MAY BE USED INSTEAD OF CONES FOR DAYTIME CLOSURES ONLY.
5. SEE STANDARD PLAN 1150 FOR TABLES.
6. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICT SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
7. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
8. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

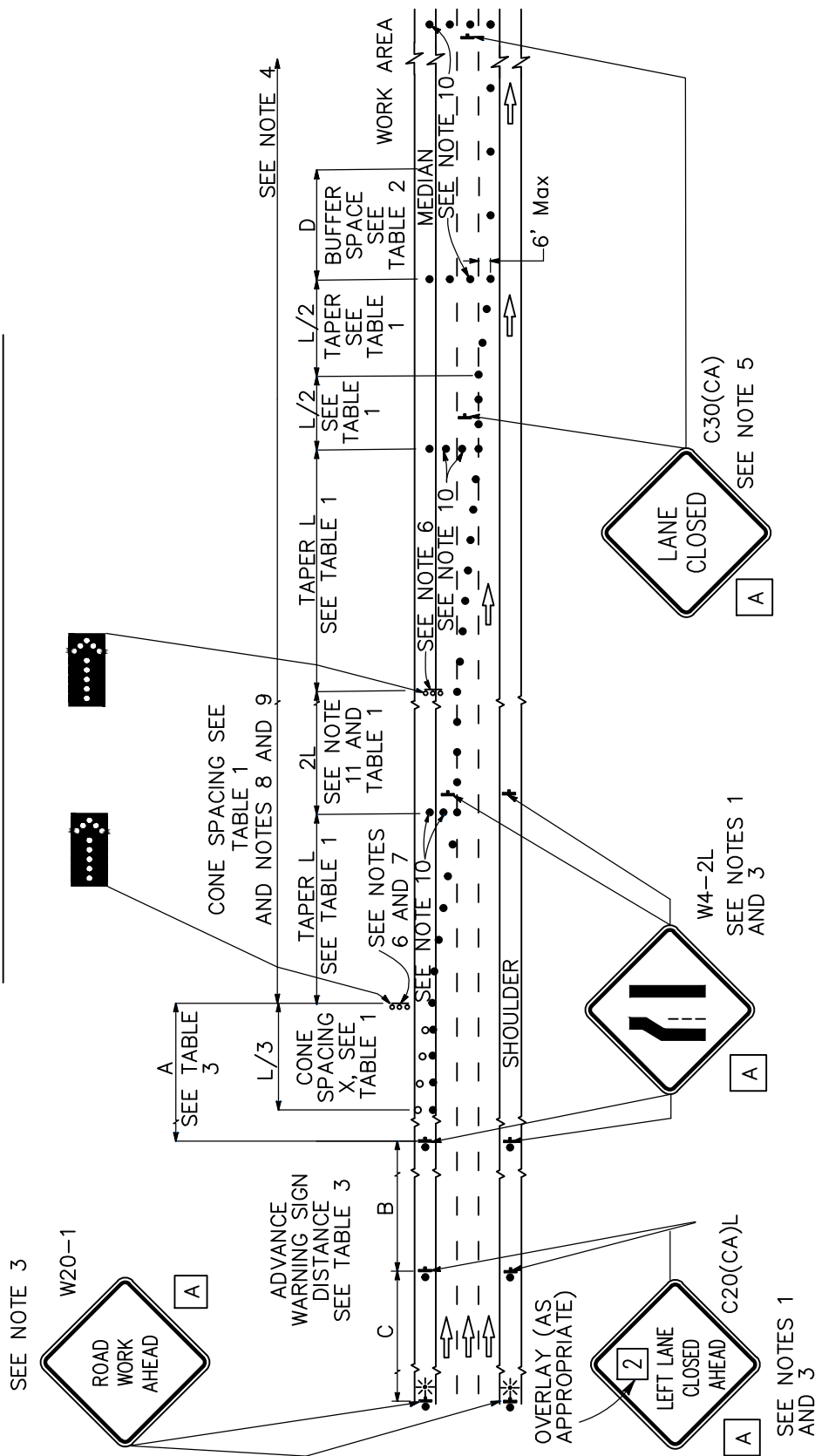
1151

SHT. 1 OF 1

TRAFFIC CONTROL: SHOULDER CLOSURE ON ARTERIAL HIGHWAYS






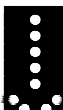


## COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT



SIGN PANEL SIZE (MIN)

A 48" x 48"

LEGEND:

- |                                                                                       |                                |
|---------------------------------------------------------------------------------------|--------------------------------|
|  | TRAFFIC CONE                   |
|  | TRAFFIC CONE (OPTIONAL TAPER)  |
|  | TEMPORARY TRAFFIC CONTROL SIGN |
|  | FLASHING ARROW SIGN (FAS)      |
|  | FAS SUPPORT OR TRAILER         |
|  | PORTABLE FLASHING BEACON       |

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Approved

DEPARTMENT  
*Khalid Bazmi*  
*Khalid Bazmi, County Engineer*

## STD. PLAN

1152

SHT. 1 OF 2

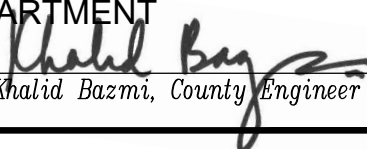
## TRAFFIC CONTROL: LANE CLOSURE WITH PARTIAL SHOULDER USE

NOTES:

1. LANE CLOSURES ON THE RIGHT SIDE USING PARTIAL MEDIAN SHOULDER AS A TRAFFIC LANE SHALL CONFORM TO THE DETAILS SHOWN EXCEPT THAT C20(CA)R AND W4-2R SIGNS SHALL BE USED.
2. AT LEAST ONE PERSON SHALL BE ASSIGNED TO PROVIDE FULL TIME MAINTENANCE OF TRAFFIC CONTROL DEVICES FOR LANE CLOSURES.
3. EACH ADVANCE WARNING SIGN ON EACH SIDE OF THE ROADWAY SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AT LEAST 16" X 16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. FLASHING BEACONS SHALL BE PLACED AT THE LOCATIONS INDICATED FOR LANE CLOSURE DURING HOURS OF DARKNESS.
4. A G20-2 "END ROAD WORK" SIGN, WITH MINIMUM SIZE OF 48" X 24" AS APPROPRIATE, SHALL BE PLACED AT THE END OF THE LANE CLOSURE UNLESS THE END OF WORK AREA IS OBVIOUS OR ENDS WITHIN A LARGER PROJECT'S LIMITS.
5. PLACE A C30(CA) SIGN EVERY 2000' THROUGHOUT LENGTH OF LANE CLOSURE.
6. USE ONE FLASHING ARROW SIGN FOR EACH LANE CLOSED. THE FLASHING ARROW SIGNS SHALL BE TYPE I.
7. FOR EXPRESSWAYS, A MINIMUM 1500' OF SIGHT DISTANCE SHALL BE PROVIDED WHERE POSSIBLE FOR VEHICLES APPROACHING THE FIRST FLASHING ARROW SIGN. LANE CLOSURES SHALL NOT BEGIN AT THE TOP OF CREST VERTICAL CURVE OR ON A HORIZONTAL CURVE.
8. ALL CONES USED FOR LANE CLOSURES DURING THE HOURS OF DARKNESS SHALL BE FITTED WITH RETROREFLECTIVE BANDS (OR SLEEVES).
9. PORTABLE DELINEATORS, PLACED AT ONE-HALF THE SPACING INDICATED FOR TRAFFIC CONES, MAY BE USED INSTEAD OF CONES FOR DAYTIME CLOSURES ONLY.
10. A MINIMUM OF 3 CONES SHALL BE PLACED TRANSVERSELY ACROSS EACH CLOSED LANE AND SHOULDER AT EACH LOCATION WHERE A TAPER ACROSS A TRAFFIC LANE ENDS AND EVERY 2000' AS SHOWN ON THE "LANE CLOSURE WITH PARTIAL SHOULDER USE" DETAIL. TWO TYPE II BARRICADES MAY BE USED INSTEAD OF THE 3 CONES. THE TRANSVERSE ALIGNMENT OF THE CONES OR BARRICADES ON THE CLOSED SHOULDER MAY BE SHIFTED FROM THE TRANSVERSE ALIGNMENT TO PROVIDE ACCESS TO THE WORK.
11. THE 2L TANGENT SHOWN ALONG LANE LINES SHALL BE USED BETWEEN THE L TAPERS REQUIRED FOR EACH CLOSED TRAFFIC LANE.
12. A MINIMUM OF TWO TYPE 2 OR TYPE 3 BARRICADES SHALL BE PLACED ACROSS EACH CLOSED LANE AND SHOULDER AT THE LOCATION SHOWN AND EVERY 2000' WITHIN THE COMPLETE CLOSURE AREA, THE TRANSVERSE ALIGNMENT OF THE BARRICADES ON THE CLOSED SHOULDER MAY BE SHIFTED FROM THE TRANSVERSE ALIGNMENT TO PROVIDE ACCESS TO THE WORK.
13. SEE STANDARD PLAN 1150 FOR TABLES.
14. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICT SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
15. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
16. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1152

SHT. 2 OF 2

TRAFFIC CONTROL: LANE CLOSURE WITH PARTIAL SHOULDER USE

## COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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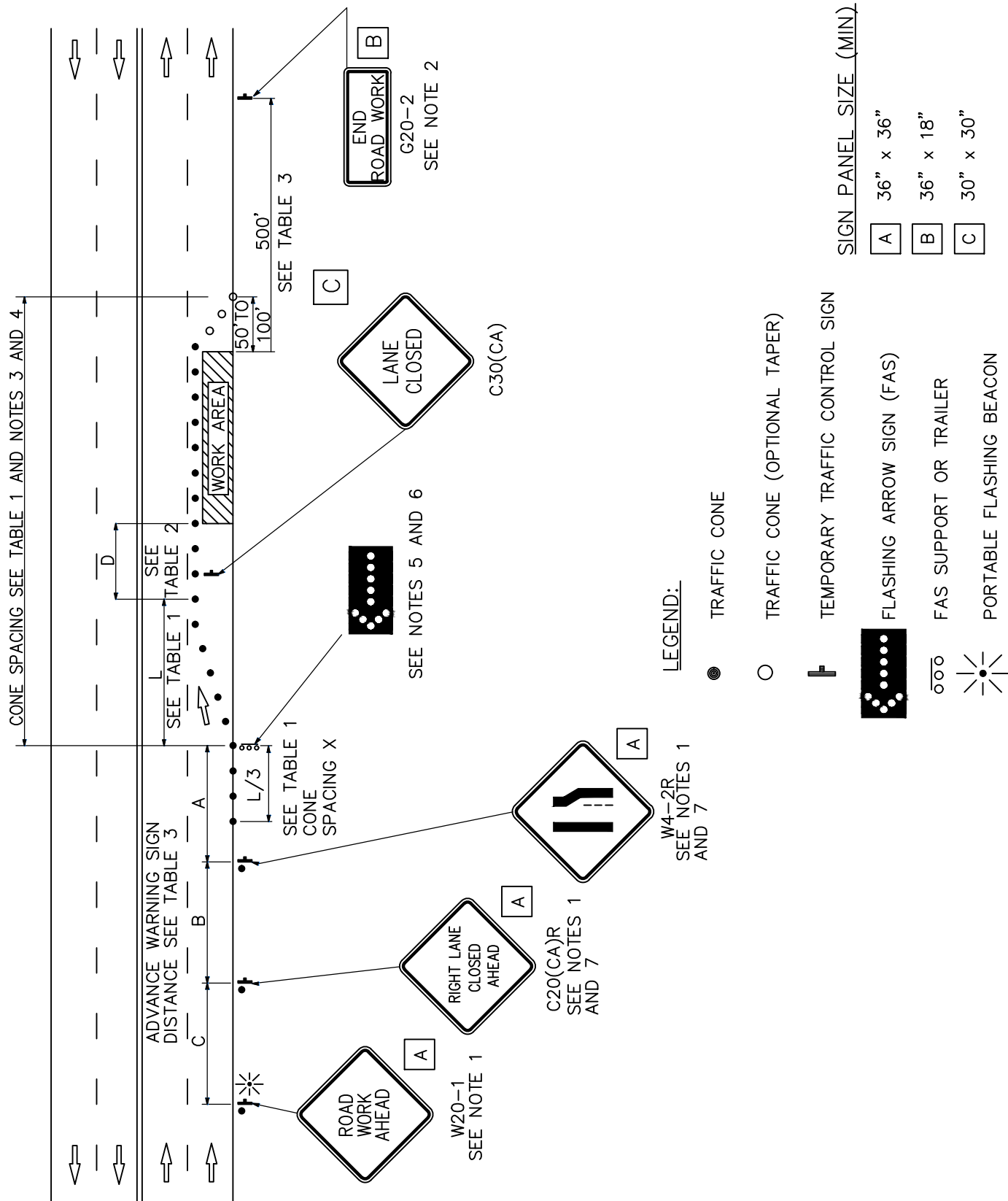
Approved

**DEPARTMENT OF**  
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

## STD. PLAN

1153

SHT. 1 OF 2

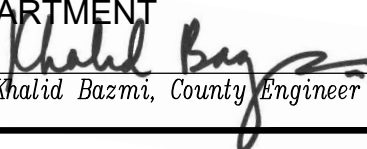


NOTES:

1. EACH ADVANCE WARNING SIGN SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AT LEAST 16" X 16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. FLASHING BEACONS SHALL BE PLACED AT THE LOCATIONS INDICATED FOR LANE CLOSURE DURING HOURS OF DARKNESS.
2. A G20-2 "END ROAD WORK" SIGN, AS APPROPRIATE, SHALL BE PLACED AT THE END OF THE LANE CLOSURE UNLESS THE END OF WORK AREA IS OBVIOUS, OR ENDS WITHIN A LARGER PROJECT'S LIMITS.
3. ALL CONES USED FOR LANE CLOSURES DURING THE HOURS OF DARKNESS SHALL BE FITTED WITH RETROREFLECTIVE BANDS (OR SLEEVES).
4. PORTABLE DELINEATORS, PLACED AT ONE-HALF THE SPACING INDICATED FOR TRAFFIC CONES, MAY BE USED INSTEAD OF CONES FOR DAYTIME CLOSURES ONLY.
5. FLASHING ARROW SIGN SHALL BE EITHER TYPE I OR TYPE II.
6. LANE CLOSURES SHALL NOT BEGIN AT THE TOP OF CREST VERTICAL CURVE OR ON A HORIZONTAL CURVE.
7. MEDIAN LANE CLOSURES SHALL CONFORM TO THE DETAILS SHOWN EXCEPT THAT C20(CA)L AND W4-2L SIGNS SHALL BE USED.
8. AT LEAST ONE PERSON SHALL BE ASSIGNED TO PROVIDE FULL TIME MAINTENANCE OF TRAFFIC CONTROL DEVICES FOR LANE CLOSURE UNLESS, OTHERWISE DIRECTED BY THE ENGINEER.
9. SEE STANDARD PLAN 1150 FOR TABLES.
10. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICT SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
11. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
12. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1153

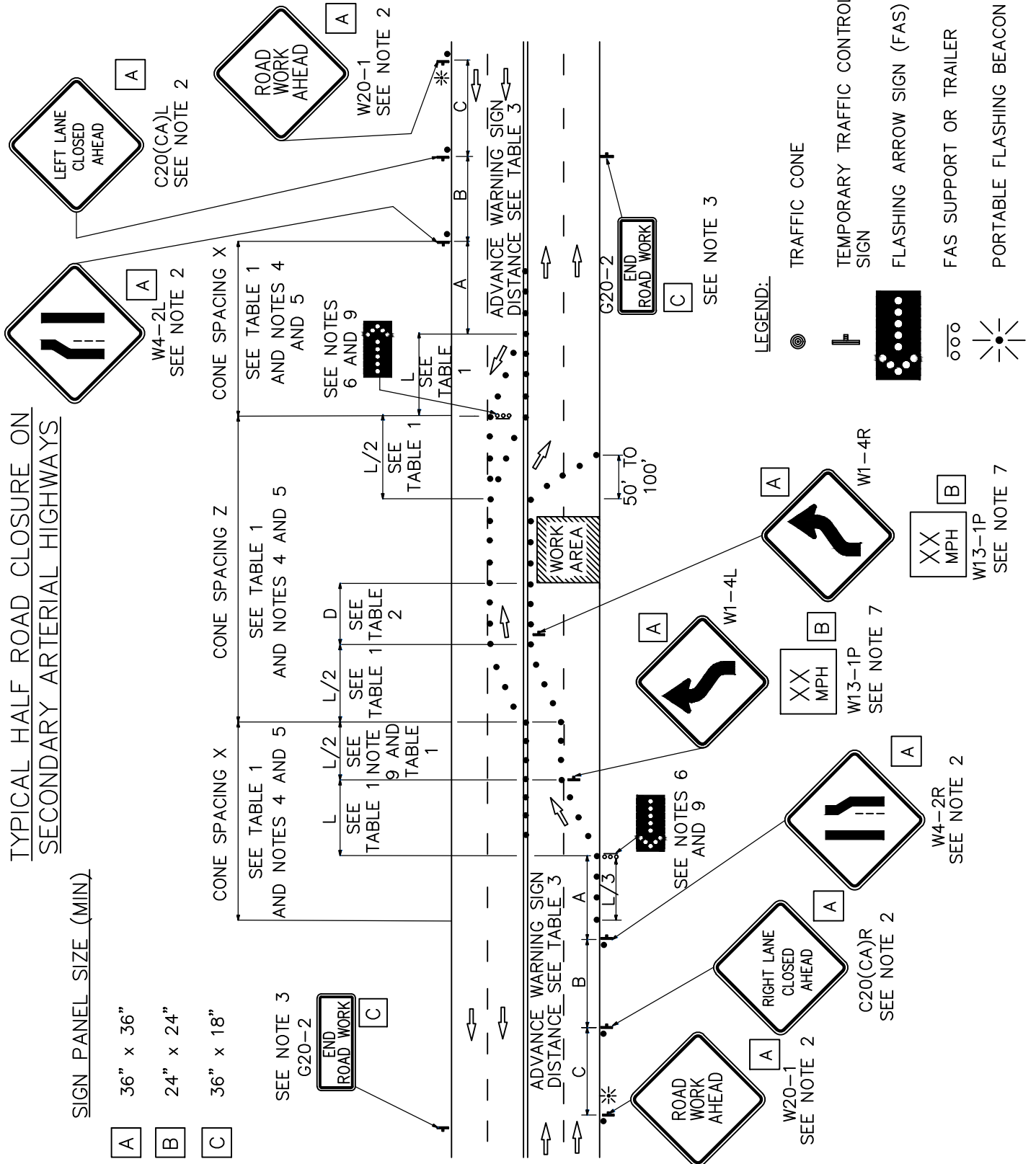
SHT. 2 OF 2

TRAFFIC CONTROL: TYPICAL LANE CLOSURE

# TYPICAL HALF ROAD CLOSURE ON SECONDARY ARTERIAL HIGHWAYS

SIGN PANEL SIZE (MIN.)

- A 36" x 36"
- B 24" x 24"
- C 36" x 18"



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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STD. PLAN

1154

SHT. 1 OF 2

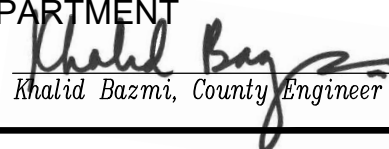
TRAFFIC CONTROL: TYPICAL HALF ROAD CLOSURE

NOTES:

1. AT LEAST ONE PERSON SHALL BE ASSIGNED TO PROVIDE FULL TIME MAINTENANCE OF TRAFFIC CONTROL DEVICES FOR LANE CLOSURE UNLESS, OTHERWISE DIRECTED BY THE ENGINEER.
2. EACH ADVANCE WARNING SIGN IN EACH DIRECTION OF TRAVEL SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AT LEAST 16" X 16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. FLASHING BEACONS SHALL BE PLACED AT THE LOCATIONS INDICATED FOR LANE CLOSURE DURING HOURS OF DARKNESS.
3. A G20-2 "END ROAD WORK" SIGN, AS APPROPRIATE, SHALL BE PLACED AT THE END OF THE LANE CLOSURE UNLESS THE END OF WORK AREA IS OBVIOUS, OR ENDS WITHIN A LARGER PROJECT'S LIMITS.
4. ALL CONES USED FOR LANE CLOSURES DURING THE HOURS OF DARKNESS SHALL BE FITTED WITH RETROREFLECTIVE BANDS (OR SLEEVES).
5. PORTABLE DELINEATORS, PLACED AT ONE-HALF THE SPACING INDICATED FOR TRAFFIC CONES, MAY BE USED INSTEAD OF CONES FOR DAYTIME CLOSURES ONLY.
6. FLASHING ARROW SIGNS SHALL BE EITHER TYPE I OR TYPE II.
7. ADVISORY SPEED WILL BE DETERMINED BY THE ENGINEER. THE W13-1P PLAQUE WILL NOT BE REQUIRED WHEN ADVISORY SPEED IS MORE THAN THE POSTED OR MAXIMUM SPEED LIMIT.
8. THE TANGENT (L/2) SHALL BE USED.
9. LANE CLOSURES SHALL NOT BEGIN AT THE TOP OF CREST VERTICAL CURVE OR ON A HORIZONTAL CURVE.
10. SEE STANDARD PLAN 1150 FOR TABLES.
11. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICT SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
12. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
13. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

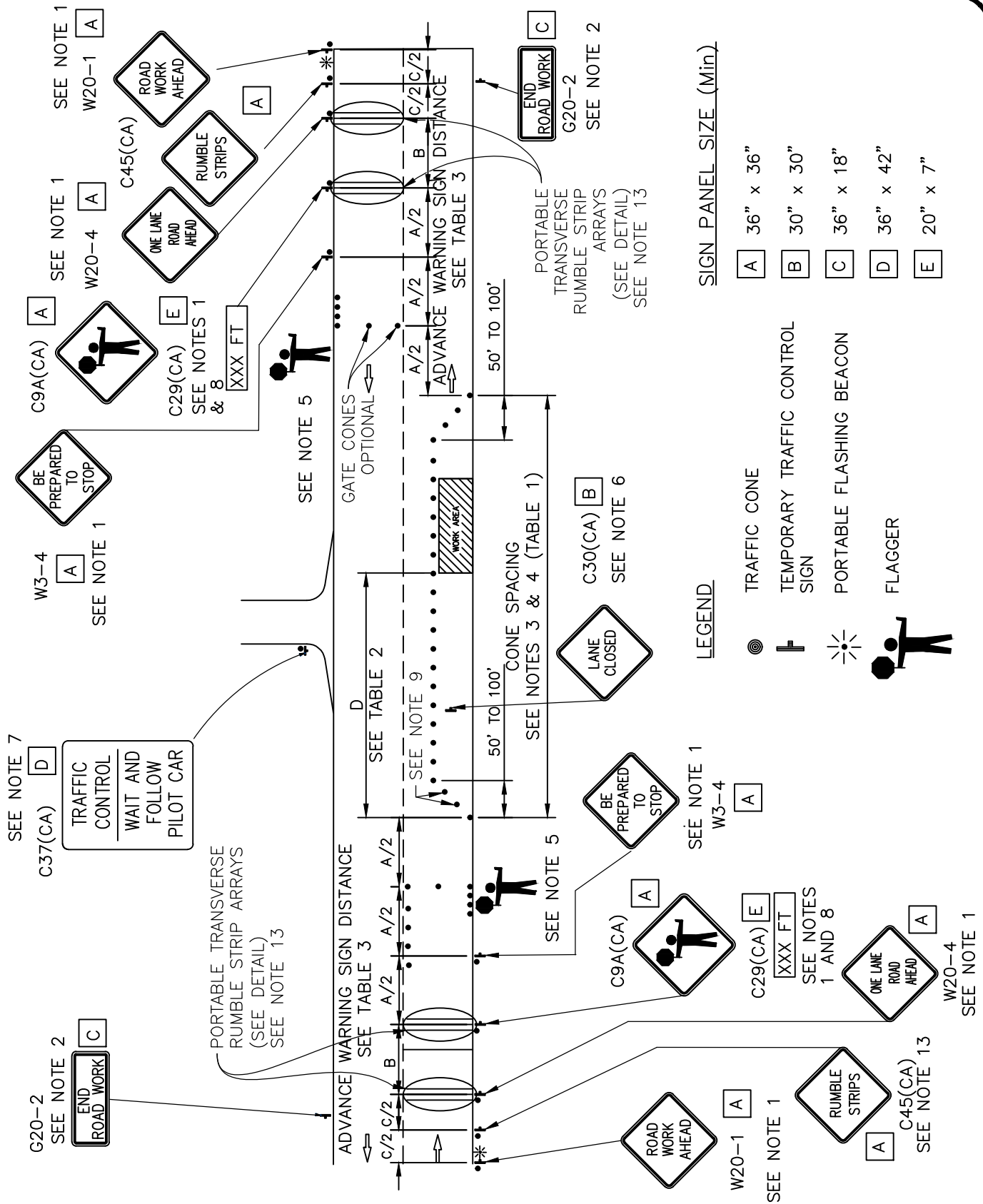
Revision: August 2018

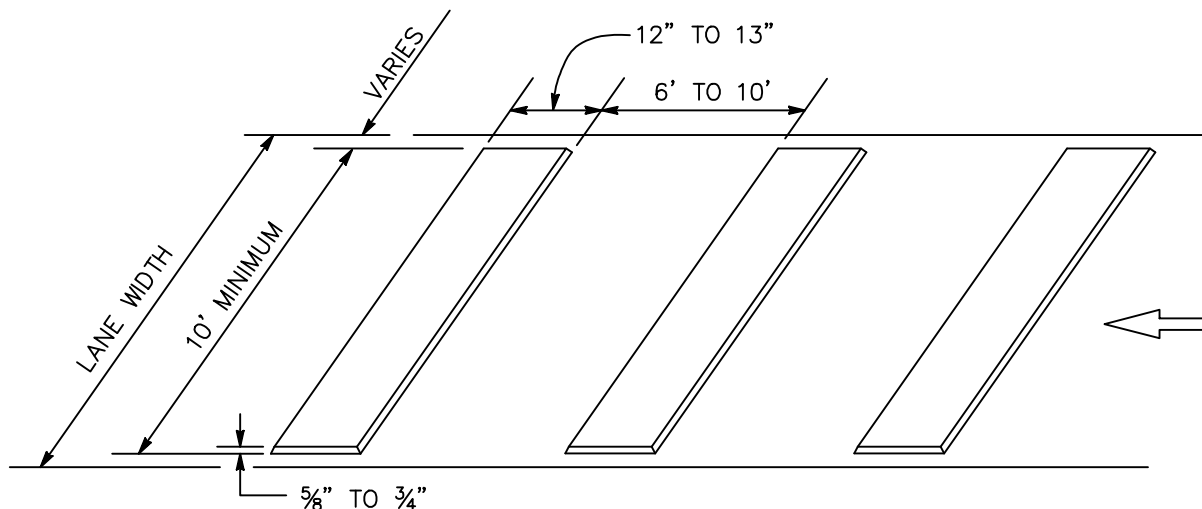
TRAFFIC CONTROL: TYPICAL HALF ROAD CLOSURE

STD. PLAN

1154

SHT. 2 OF 2





### PORTABLE TRANSVERSE RUMBLE STRIP ARRAY DETAIL

#### GENERAL NOTES:

1. EACH ADVANCE WARNING SIGN IN EACH DIRECTION OF TRAVEL SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AT LEAST 16" X 16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. FLASHING BEACONS SHALL BE PLACED AT THE LOCATIONS INDICATED FOR LANE CLOSURE DURING HOURS OF DARKNESS.
2. A G20-2 "END ROAD WORK" SIGN, AS APPROPRIATE, SHALL BE PLACED AT THE END OF THE LANE CONTROL UNLESS THE END OF WORK AREA IS OBVIOUS, OR ENDS WITHIN A LARGER PROJECT'S LIMITS.
3. ALL CONES USED FOR LANE CLOSURES DURING THE HOURS OF DARKNESS SHALL BE FITTED WITH RETROREFLECTIVE BANDS (OR SLEEVES).
4. PORTABLE DELINEATORS, PLACED AT ONE-HALF THE SPACING INDICATED FOR TRAFFIC CONES, MAY BE USED INSTEAD OF CONES FOR DAYTIME CLOSURES ONLY.
5. ADDITIONAL ADVANCE FLAGGERS MAY BE REQUIRED. FLAGGER SHOULD STAND IN A CONSPICUOUS PLACE, BE VISIBLE TO APPROACHING TRAFFIC AS WELL AS APPROACHING VEHICLES AFTER THE FIRST VEHICLE HAS STOPPED. DURING THE HOURS OF DARKNESS, THE FLAGGING-STATION AND FLAGGER SHALL BE ILLUMINATED AND CLEARLY VISIBLE TO APPROACHING TRAFFIC. THE ILLUMINATION FOOTPRINT OF THE LIGHTING ON THE GROUND SHALL BE AT LEAST 20' IN DIAMETER. PLACE A MINIMUM OF FOUR CONES AT 50' INTERVALS IN ADVANCE OF FLAGGER STATION AS SHOWN.
6. PLACE C30(CA) "LANE CLOSED" SIGN AT 500' TO 1000' INTERVALS THROUGHOUT EXTENDED WORK AREAS. THEY ARE OPTIONAL IF THE WORK AREA IS VISIBLE FROM THE FLAGGER STATION.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1155

TRAFFIC CONTROL: LANE CLOSURE WITH REVERSIBLE CONTROL

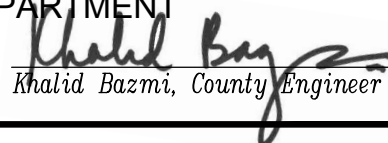
SHT. 2 OF 3

GENERAL NOTES: (CONTINUED)

7. WHEN A PILOT CAR IS USED, PLACE A C37(CA) "TRAFFIC CONTROL-WAIT AND FOLLOW PILOT CAR" SIGN WITH BLACK LEGEND ON WHITE BACKGROUND AT ALL INTERSECTIONS, DRIVEWAYS AND ALLEYS WITHOUT A FLAGGER WITHIN TRAFFIC CONTROL AREA. SIGNS SHALL BE CLEAN AND VISIBLE AT ALL TIMES. WHERE TRAFFIC CAN NOT BE EFFECTIVELY SELF-REGULATED, AT LEAST ONE FLAGGER SHALL BE USED AT EACH INTERSECTION WITHIN TRAFFIC CONTROL AREA.
8. AN OPTIONAL C29(CA) SIGN MAY BE PLACED BELOW THE C9A(CA) SIGN.
9. EITHER TRAFFIC CONES OR BARRICADES SHALL BE PLACED ON THE TAPER. BARRICADES SHALL BE TYPE I, II, OR III.
10. THE COLOR OF THE PORTABLE TRANSVERSE RUMBLE STRIPS SHALL BE BLACK OR ORANGE. USE 2 ARRAYS, EACH ARRAY SHALL CONSIST OF 3 RUMBLE STRIPS.
11. PORTABLE TRANSVERSE RUMBLE STRIPS SHALL NOT BE PLACED ON SHARP HORIZONTAL OR VERTICAL CURVES NOR SHALL THEY BE PLACED THROUGH PEDESTRIAN CROSSINGS.
12. IF THE PORTABLE TRANSVERSE RUMBLE STRIPS BECOME OUT OF ALIGNMENT (SKEWED) BY MORE THAN 6 INCHES, MEASURED FROM ONE END TO THE OTHER, THEY SHALL BE READJUSTED TO BRING THE PLACEMENT BACK TO THE ORIGINAL LOCATION.
13. PORTABLE TRANSVERSE RUMBLE STRIPS ARE NOT REQUIRED IF ANY ONE OF THE FOLLOWING CONDITIONS IS SATISFIED:
  - A. WORK DURATION OCCUPIES A LOCATION FOR FOUR HOURS OR LESS
  - B. POSTED SPEED LIMIT IS BELOW 45 MPH
  - C. WORK IS OF EMERGENCY NATURE
  - D. WORK ZONE IS IN SNOW OR ICY WEATHER CONDITIONS
14. SEE STANDARD PLAN 1150 FOR TABLES.
15. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICT SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
16. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
17. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

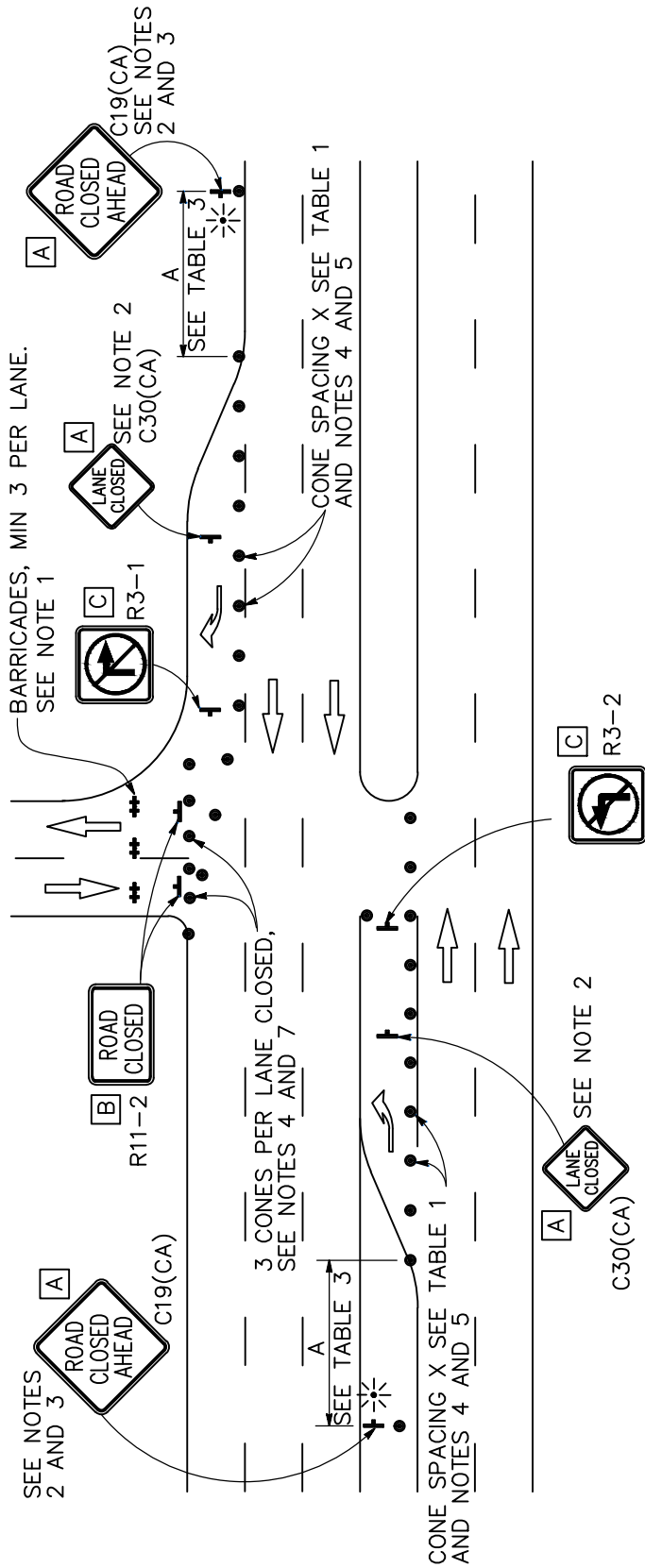
1155

SHT. 3 OF 3

TRAFFIC CONTROL: LANE CLOSURE WITH REVERSIBLE CONTROL



# FOR SECONDARY ARTERIAL T-INTERSECTIONS WITHOUT TURNING POCKETS



SIGN PANEL SIZE (Min)

A 36" x 36"

B 48" x 30"

B 36" x 36"

TRAFFIC CONE

# TEMPORARY TRAFFIC CONTROL SIGN

# PORTABLE FLASHING BEACON

## BARRICADES

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi, County Engineer*

Revision: August 2018

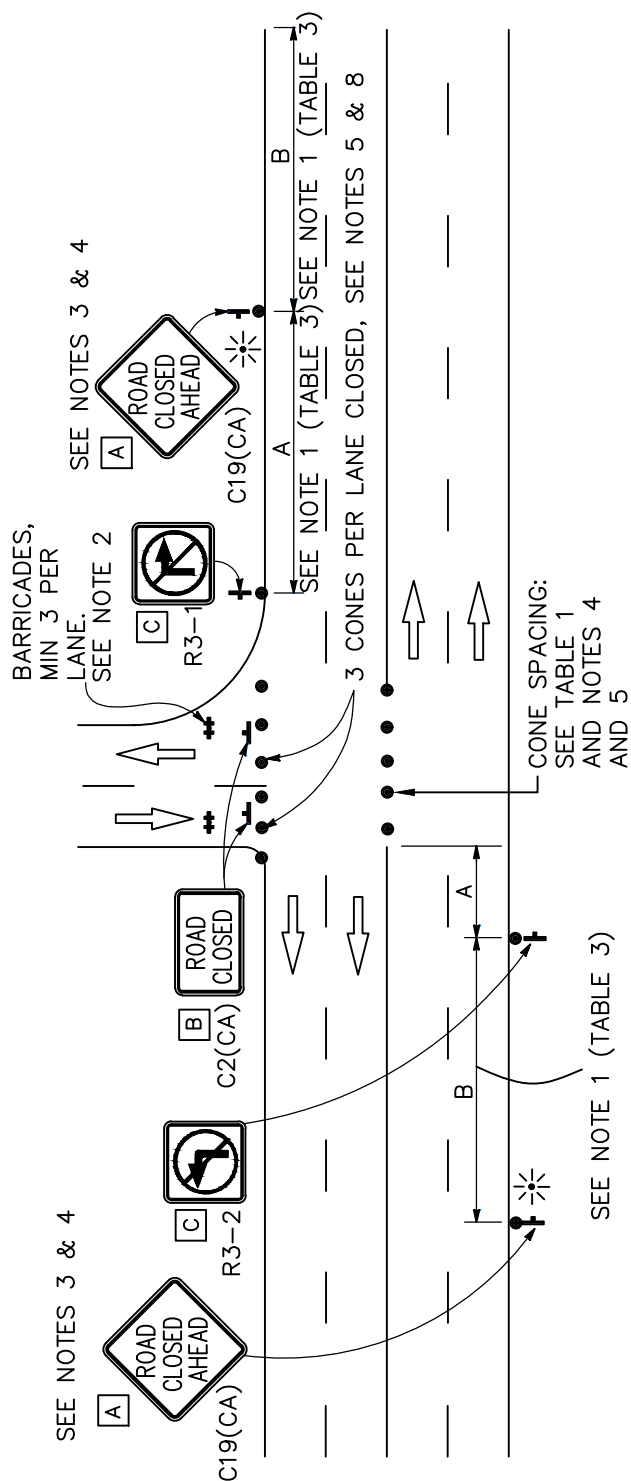
## TRAFFIC CONTROL: T-INTERSECTION

STD. PLAN

1156

SHT. 1 OF 3

# FOR SECONDARY ARTERIAL T-INTERSECTIONS WITHOUT TURNING POCKETS



### LEGEND

SIGN PANEL SIZE (Min)

A 36" x 36"

B 48" x 30"

C 36" x 36"

TRAFFIC CONE

# TEMPORARY TRAFFIC CONTROL SIGN

## PORTABLE FLASHING BEACON

## BARRICADE

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

DEPARTMENT  
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

## STD. PLAN

1156

SHT. 2 OF 3

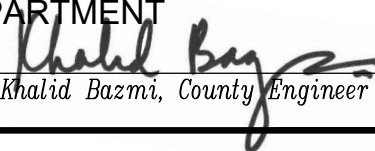
## TRAFFIC CONTROL: T-INTERSECTION

GENERAL NOTES:

1. SEE STANDARD PLAN 1150 FOR TABLES.
2. BARRICADES SHALL BE TYPE I, II, OR III FOR CLOSURES LASTING ONE WEEK OR LESS AND TYPE III FOR CLOSURES LASTING LONGER THAN ONE WEEK.
3. IN ADDITION TO PLACING THE C19(CA) "ROAD CLOSED AHEAD" AND C30(CA) "LANE CLOSED" SIGNS, BLACK ON ORANGE OVERLAY PLATES WITH THE WORD "CLOSED" MAY BE MOUNTED, AS DIRECTED BY THE ENGINEER, ON ALL GUIDE SIGNS THAT REFER TO THE CLOSED ROAD. THE LETTER SIZE ON THE OVERLAY SHALL BE THE SAME AS THE GUIDE SIGN.
4. EACH ADVANCE C19(CA) "ROAD CLOSED AHEAD" SIGN SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AT LEAST 16" X 16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. A FLASHING BEACON SHALL BE PLACED ON TOP OF THE FIRST C19(CA) SIGN DURING HOURS OF DARKNESS.
5. ALL CONES USED FOR ROAD CLOSURES DURING THE HOURS OF DARKNESS SHALL BE FITTED WITH RETROREFLECTIVE BANDS (OR SLEEVES) AS SPECIFIED IN THE SPECIFICATIONS.
6. PORTABLE DELINEATORS, PLACED AT ONE-HALF THE SPACING INDICATED FOR TRAFFIC CONES, MAY BE USED INSTEAD OF CONES FOR DAYTIME RAMP CLOSURES ONLY.
7. AT LEAST ONE PERSON SHALL BE ASSIGNED TO PROVIDE FULL TIME MAINTENANCE OF TRAFFIC CONTROL DEVICES, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
8. A MINIMUM OF 3 CONES SHALL BE PLACED TRANSVERSELY ACROSS EACH CLOSED LANE AND SHOULDER.
9. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICT SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
10. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
11. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

TRAFFIC CONTROL: T-INTERSECTION

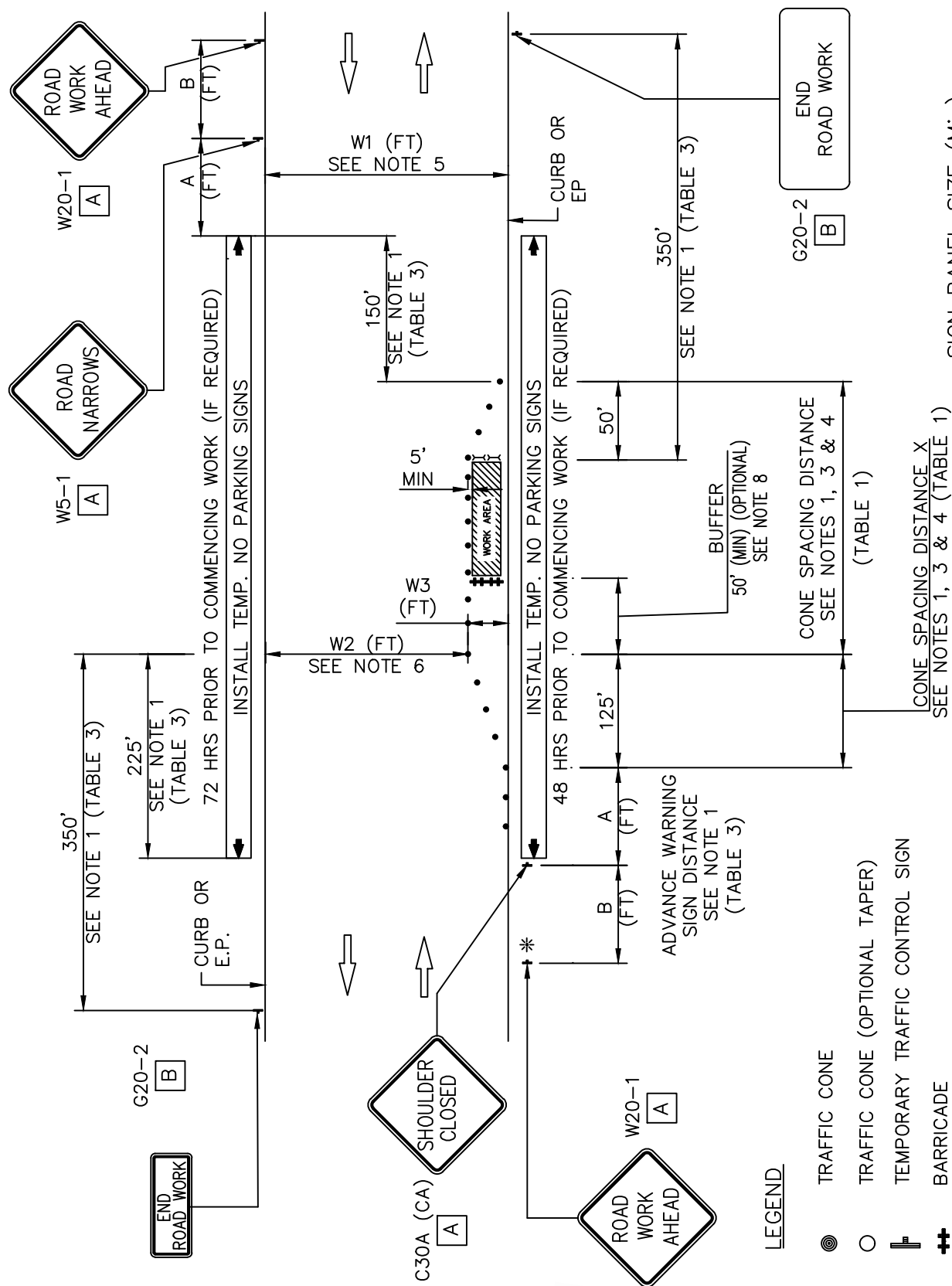
STD. PLAN

1156

SHT. 3 OF 3



FOR MINOR STREET WORK ON (25 MPH) RESIDENTIAL STREETS WITH NO CENTERLINE









SIGN PANEL SIZE (Min)

A 36" x 36"

**B** 36" x 18"

CONCRETE SPACING DISTANCE X  
SEE NOTES 1, 3 & 4 (TABLE 1)

	TRAFFIC CONE
	TRAFFIC CONE (OPTIONAL TAPER)
	TEMPORARY TRAFFIC CONTROL SIGN
	BARRICADE
	FAS SUPPORT OR TRAILER
	PORTABLE FLASHING BEACON

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

DEPARTMENT  
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

## STD. PLAN

1157

SHT. 1 OF 2

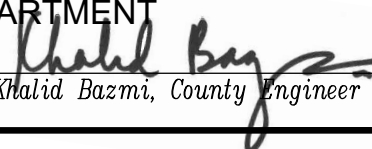
## TRAFFIC CONTROL: MINOR RESIDENTIAL STREET WORK

GENERAL NOTES:

1. SEE STANDARD PLAN 1150 FOR TABLES.
2. LANE CLOSURES ON THE RIGHT SIDE USING PARTIAL MEDIAN SHOULDER AS A TRAFFIC LANE SHALL CONFORM TO THE DETAILS SHOWN EXCEPT THAT C20(CA)R AND W4-2R SIGNS SHALL BE USED.
3. EACH ADVANCE WARNING SIGN ON EACH SIDE OF THE ROADWAY SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AT LEAST 16" X 16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. FLASHING BEACONS SHALL BE PLACED AT THE LOCATIONS INDICATED FOR LANE CLOSURE DURING HOURS OF DARKNESS.
4. A G20-2 "END ROAD WORK" SIGN, WITH MINIMUM SIZE OF 48" X 24" AS APPROPRIATE, SHALL BE PLACED AT THE END OF THE LANE CLOSURE UNLESS THE END OF WORK AREA IS OBVIOUS OR ENDS WITHIN A LARGER PROJECT'S LIMITS.
5. FOR W1 DIMENSION OF 28' (MIN) TO 44' (MAX).
6. W2 SHALL NOT BE LESS THAN 20'.
7. FLAGGERS SHALL BE USED FOR W2 LESS THAN 20'. (SEE FIG. 6H-10 OF 2014 CA MUTCD)
8. BUFFER NOT OPTIONAL FOR EXCAVATION WORK.
9. IDENTIFY ALL DRIVEWAYS AND EXISTING ROADSIDE SIGNS WITHIN TRAFFIC CONTROL ZONE IF PRESENT AND USE CONE SPACING Z, TABLE 1.
10. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICT SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
11. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
12. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1157

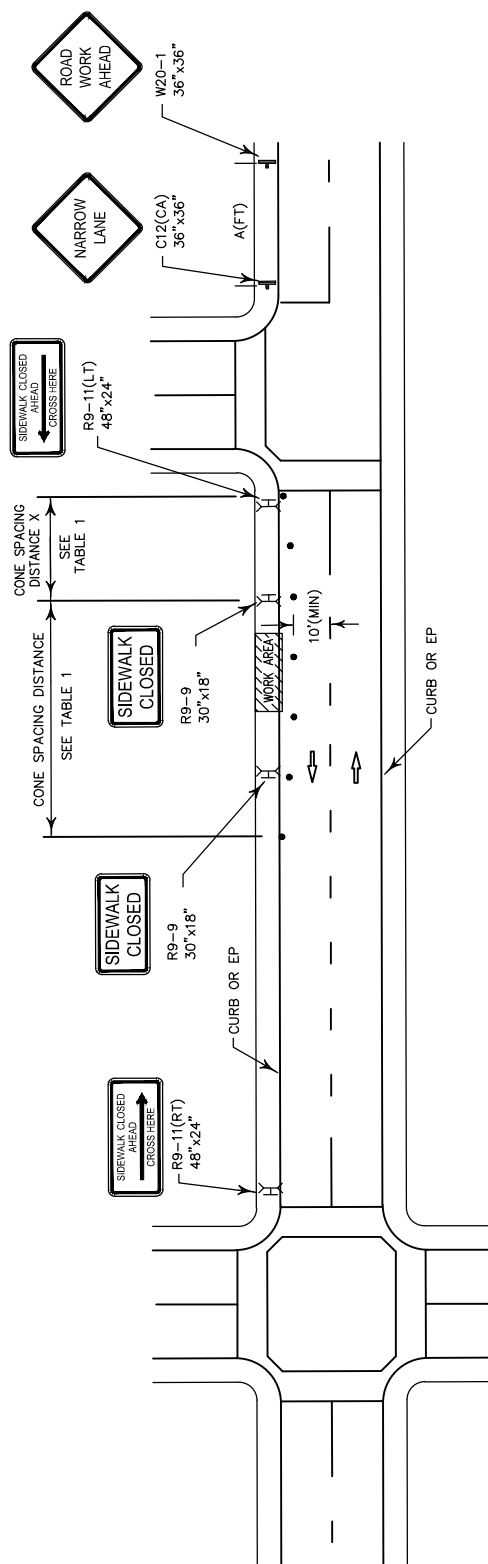
TRAFFIC CONTROL: MINOR RESIDENTIAL STREET WORK

SHT. 2 OF 2

1. EACH ADVANCE WARNING SIGN ON EACH SIDE OF THE ROADWAY SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AS LEAST 16"x16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. FLASHING BEACONS SHALL BE PLACED AT THE LOCATIONS INDICATED FOR LANE CLOSURE DURING HOURS OF DARKNESS.
2. BUFFER NOT OPTIONAL FOR EXCAVATION WORK.
3. IDENTIFY ALL DRIVEWAYS AND EXISTING ROADSIDE SIGNS WITHIN TRAFFIC CONTROL ZONE IF PRESENT AND USE CONE SPACING Z, TABLE 1.
4. ALL SIGNS SHALL BE REFLECTORIZED AND OF STANDARD SIZE.
5. TYPE I AND II BARRICADES MAY BE USED, IN LIEU OF OR IN ADDITION TO THE RUBBER GUIDE POSTS, AT THE DISCRETION OF THE CONTRACTOR, WHEN THEY ARE INTENDED TO PROVIDE ADDITIONAL EMPHASIS IN AREAS WHERE WORKERS ARE PRESENT.
6. CONSTRUCTION OPERATIONS SHALL BE CONDUCTED IN SUCH A MANNER AS TO CAUSE AS LITTLE INCONVENIENCE AS POSSIBLE TO ABUTTING PROPERTY OWNERS.
7. THE CONTRACTOR SHALL MAINTAIN, ON A 24-HOUR BASIS, ALL SIGNS, DELINEATORS, BARRICADES, ETC. TO INSURE PROPER FLOW AND SAFETY OF TRAFFIC.
8. THESE PLANS INDICATE VEHICULAR TRAFFIC CONTROL IN THE WORK AREA DURING CONSTRUCTION ACTIVITY. ADDITIONAL TRAFFIC CONTROLS, TRAFFIC SIGNS, OR BARRICADES MAY BE REQUIRED IN THE FIELD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLACEMENT OF ANY ADDITIONAL DEVICES NECESSARY TO ASSURE SAFETY TO THE PUBLIC AT ALL TIMES DURING CONSTRUCTION.

9. THE COUNTY ENGINEER RESERVES THE RIGHT TO MAKE ANY CHANGES NECESSARY AS FIELD CONDITIONS WARRANT. ANY CHANGES SHALL SUPERSEDE THESE PLANS AND BE DONE SOLELY AT THE CONTRACTOR'S EXPENSE.
10. THE CONTRACTOR SHALL POST TEMPORARY NO PARKING SIGNING 48 HOURS PRIOR TO COMMENCING WORK.
11. SEE STANDARD PLAN 1150 FOR TABLES.
12. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICTING SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
13. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
14. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.

	BARRICADE
	BARRICADE WITH SIGN
	TRAFFIC CONE
	TEMPORARY TRAFFIC CONTROL SIGN
	WORK AREA



DEPARTMENT  
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

## TRAFFIC CONTROL: SIDEWALK CLOSURES

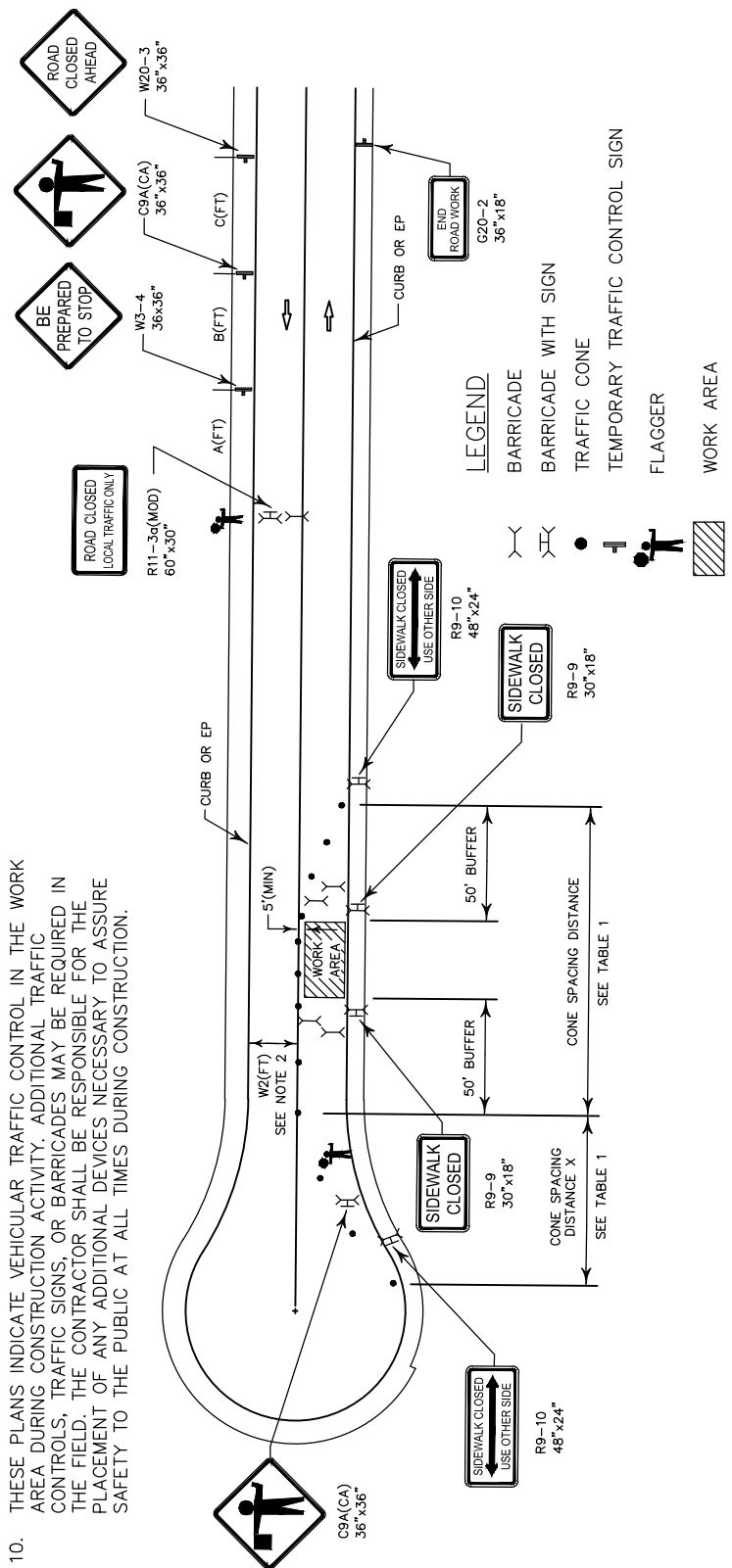
1158

SHT. 1 OF 1



## COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

1. EACH ADVANCE WARNING SIGN ON EACH SIDE OF THE ROADWAY SHALL BE EQUIPPED WITH AT LEAST TWO FLAGS FOR DAYTIME CLOSURE. EACH FLAG SHALL BE AT LEAST 16"x16" IN SIZE AND SHALL BE ORANGE OR FLUORESCENT RED-ORANGE IN COLOR. FLASHING BEACONS SHALL BE PLACED AT THE LOCATIONS INDICATED FOR LANE CLOSURE DURING HOURS OF DARKNESS.
2. W2 SHALL NOT BE LESS THAN 20'.
3. FLAGGERS SHALL BE USED FOR W2 LESS THAN 20' (SEE FIG. 6H-10 OF 2014 CA MUTCD.)
4. BUFFER NOT OPTIONAL FOR EXCAVATION WORK.
5. IDENTIFY ALL DRIVEWAYS AND EXISTING ROADSIDE SIGNS WITHIN TRAFFIC CONTROL ZONE IF PRESENT AND USE CONE SPACING Z, TABLE 1.
6. ALL SIGNS SHALL BE REFLECTORIZED AND OF STANDARD SIZE.
7. TYPE I AND II BARRICADES MAY BE USED, IN LIEU OF OR IN ADDITION TO THE RUBBER GUIDE POSTS, AT THE DISCRETION OF THE CONTRACTOR, WHEN THEY ARE INTENDED TO PROVIDE ADDITIONAL EMPHASIS IN AREAS WHERE WORKERS ARE PRESENT.
8. CONSTRUCTION OPERATIONS SHALL BE CONDUCTED IN SUCH A MANNER AS TO CAUSE AS LITTLE INCONVENIENCE AS POSSIBLE TO ABUTTING
11. THE COUNTY ENGINEER RESERVES THE RIGHT TO MAKE ANY CHANGES NECESSARY AS FIELD CONDITIONS WARRANT. ANY CHANGES SHALL SUPERSEDE THESE PLANS AND BE DONE SOLELY AT THE CONTRACTOR'S EXPENSE.
12. THE CONTRACTOR SHALL POST TEMPORARY NO PARKING SIGNING 48 HOURS PRIOR TO COMMENCING WORK.
13. FULL CLOSURES ONLY WHEN TOTAL NUMBER OF HOMES IS LESS THAN OR EQUAL TO SIX.
14. INCLUDE FULL-TIME FLAGGER TO SAFELY ASSIST RESIDENTS ACCESS OR EXIT PASSED THE STREET CLOSURE AND TO ENSURE PASSAGE OF EMERGENCY VEHICLES.
15. SEE STANDARD PLAN 1150 FOR TABLES.
16. USE CONE SPACING X FOR TAPER SEGMENT, Y FOR TANGENT SEGMENT OR Z FOR CONFLICTING SITUATIONS, AS APPROPRIATE, PER TABLE 1, UNLESS X, Y, OR Z CONE SPACING IS SHOWN ON THIS SHEET.
17. ALL TEMPORARY WARNING SIGNS SHALL HAVE BLACK LEGEND ON FLUORESCENT ORANGE BACKGROUND.
18. CALIFORNIA CODES ARE DESIGNATED BY (CA). OTHERWISE, FEDERAL (MUTCD) CODES ARE SHOWN.



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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Approved

DEPARTMENT  
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1159

SHT. 1 OF 1

# TRAFFIC CONTROL: CUL-DE-SAC

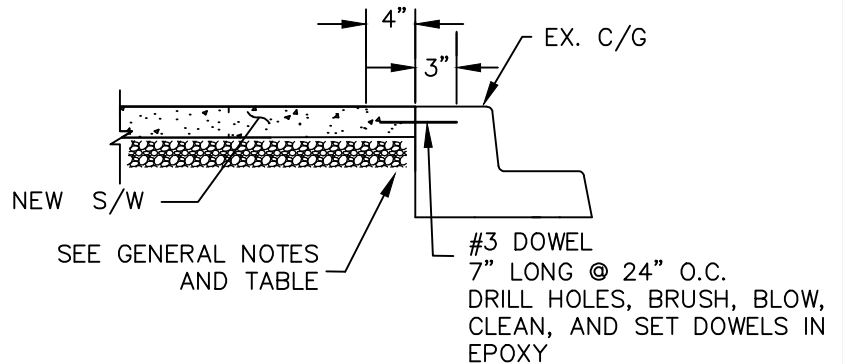
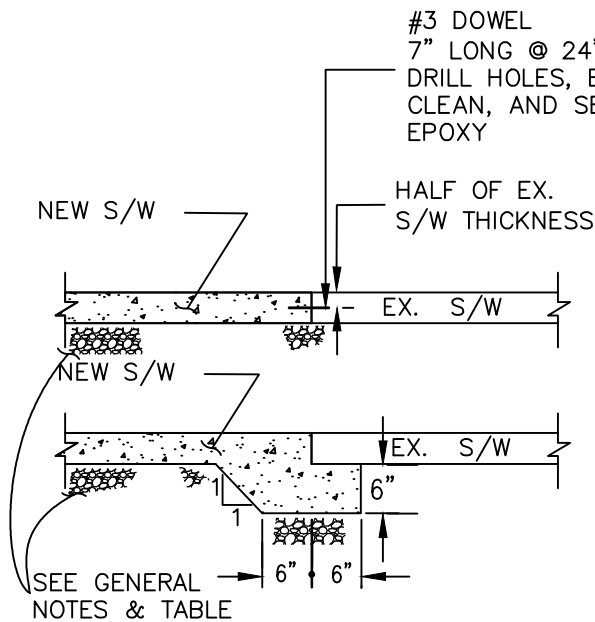






## GENERAL NOTES

1. SP1204 SHALL BE USED FOR COUNTY PROJECTS, WHEN REQUIRED BY THE ENGINEER OR GEOTECHNICAL ENGINEER OR IN ABSENCE OF PROJECT-SPECIFIC GEOTECHNICAL RECOMMENDATIONS.
2. THE EXPANSION INDEX TEST FOR SUBGRADE SOILS SHALL BE DETERMINED BY ASTM D4829 TEST METHOD.
3. SEE TABLE 1204-1 ON SHEET 3 FOR SUBGRADE PREPARATION, AGGREGATE BASE, PCC SIDEWALK THICKNESS, REINFORCEMENT, THICKENED EDGE, DOWELS, AND WEAKENED PLANE JOINT SPACING.
4. STEEL REINFORCEMENT SHALL BE #3 BARS GRADE 40.
5. DOWELS SHALL BE 7" LONG #3 BARS GRADE 40.
6. PROVIDE THE DOWEL JOINT AT THE EXPANSION JOINT FOR NEW SIDEWALK AND CURB & GUTTER.
7. THE FOLLOWING STANDARDS SHALL BE USED WHERE EXPANSION INDEX > 20, UNLESS SUPERSEDED BY THE GEOTECHNICAL ENGINEER'S RECOMMENDATION.



### NEW SIDEWALK TO EXISTING SIDEWALK

1. IF EXISTING SIDEWALK IS LESS THAN 4" THICK, USE 6" DEEP X 12" WIDE PCC KEY WITHOUT DOWEL CONNECTION.
2. IF THE EXISTING SIDEWALK IS 4" THICK OR GREATER, USE #3 DOWEL CONNECTION.

### NEW SIDEWALK TO EXISTING CURB

1. WHERE NEW DRIVEWAY DEPRESSION IS ADDED, REPLACE EX. CURB & GUTTER BETWEEN THE NEAREST JOINTS & POUR CURB & GUTTER MONOLITHICALLY.
2. DAMAGED CURB & GUTTER REPLACEMENT SHALL BE MONOLITHIC.

#### ABBREVIATIONS:

EX. — EXISTING  
 S/W — SIDEWALK  
 F/C — FACE OF CURB  
 L/G — LIP OF GUTTER  
 C/G — CURB & GUTTER  
 CMB — CRUSHED MISCELLANEOUS BASE  
 CAB — CRUSHED AGGREGATE BASE

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
 Khalid Bazmi, County Engineer

Revision: August 2018

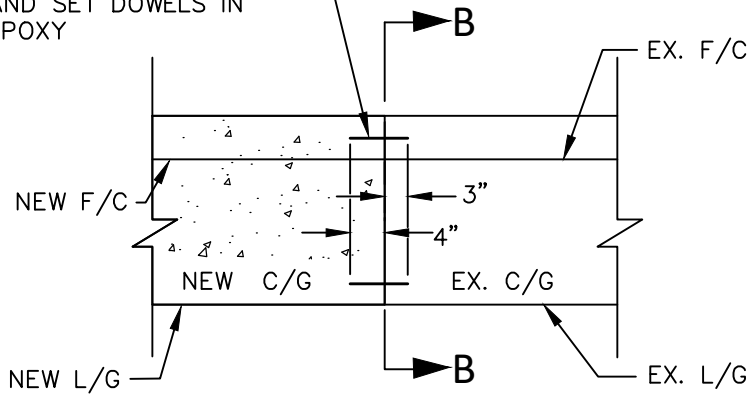
STD. PLAN

1204

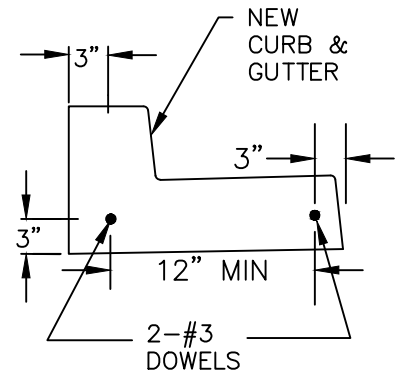
SHT. 1 OF 3

SIDEWALK ON EXPANSIVE SOILS

USE 2-7" LONG, #3  
DOWEL DRILL HOLES,  
BRUSH, BLOW, CLEAN,  
AND SET DOWELS IN  
EPOXY

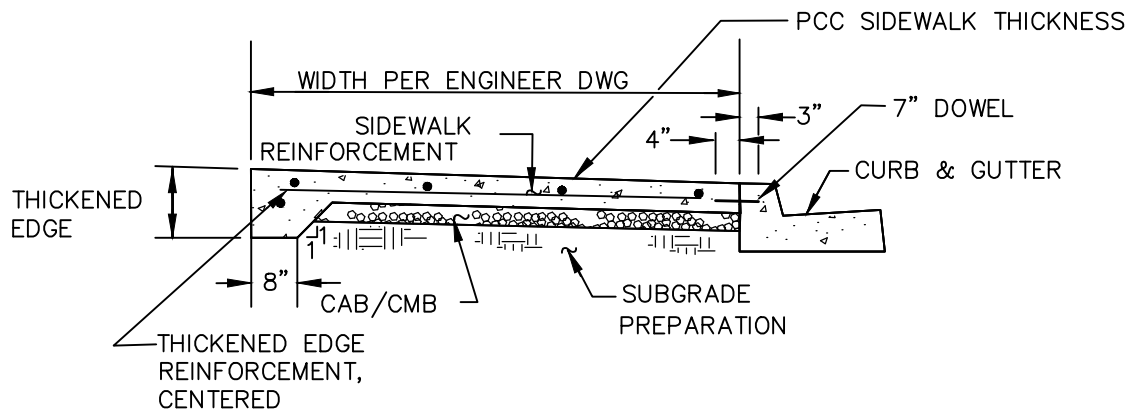


PLAN VIEW



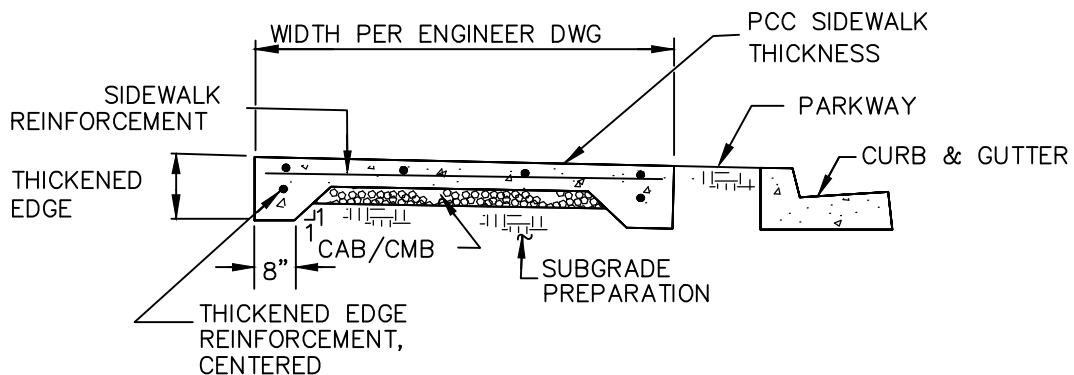
SECTION B-B

### NEW CURB & GUTTER TO EXISTING CURB & GUTTER



### NEW CURB-ADJACENT SIDEWALK AT NEW OR EXISTING CURB

SEE TABLE 1204-1 ON SHEET 3



### NEW NON-CURB-ADJACENT SIDEWALK AT NEW OR EXISTING CURB

SEE TABLE 1204-1 ON SHEET 3

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved *Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

SIDEWALK ON EXPANSIVE SOILS

STD. PLAN

1204

SHT. 2 OF 3

**TABLE 1204-1 Sidewalks on Expansive Soils**

**Subgrade Preparation, Aggregate Base, Sidewalk Thickness, Reinforcement, Thickened Edges, Dowels and Weakened Plane Joint Spacing**

**Non-Vehicular PCC Sidewalks, Width 6 Feet or Less**

E.I. per ASTM D4829	Expansion Potential	Subgrade Prep, Min % over Optimum Moisture	Min Depth of Subgrade Prep, Inches	Min Depth of CAB or CMB under PCC, Inches	Minimum Sidewalk Thickness, Inches	Sidewalk Reinforcement, both directions	Thickened Edge	Thickened Edge Reinforcement	Doweling Into Adjacent Curbs & Flatwork	Weakened Plane Joint Spacing, feet
0 - 20	Very Low	N/A	N/A	None	4"	None	None	N/A	None	6'
21 - 50	Low	2%	12"	None	4"	None	None	N/A	7" long #3 Bar @ 24"	6'
51 - 90	Medium	3%	12"	2"	4"	None	None	N/A	7" long #3 Bar @ 24"	6'
91 - 130	High	5%	18"	2"	4"	None	None	N/A	7" long #3 Bar @ 24"	5'
>130	Very High	5%	18"	2"	4"	None	None	N/A	7" long #3 Bar @ 24"	5'

**Non-Vehicular PCC Sidewalks, Width Greater than 6 Feet**

E.I. per ASTM D4829	Expansion Potential	Subgrade Prep, Min % over Optimum Moisture	Min Depth of Subgrade Prep, Inches	Min Depth of CAB or CMB under PCC, Inches	Minimum Sidewalk Thickness, Inches	Sidewalk Reinforcement	Thickened Edge, Inches	Thickened Edge Reinforcement	Doweling Into Adjacent Curbs & Flatwork	Weakened Plane Joint Spacing, feet
0 - 20	Very Low	N/A	N/A	None	4"	None	N/A	N/A	None	8'
21 - 50	Low	2%	12"	None	4"	#3 Bars @ 24" both ways	10"	1- #3 Bar Longitudinal	7" long #3 Bar @ 24"	8'
51 - 90	Medium	3%	12"	2"	5"	#3 Bars @ 24" both ways	10"	1- #3 Bar Longitudinal	7" long #3 Bar @ 24"	8'
91 - 130	High	5%	18"	2"	5"	#3 Bars @ 24" both ways	12"	1- #3 Bar Longitudinal	7" long #3 Bar @ 24"	5'
>130	Very High	5%	18"	2"	5"	#3 Bars @ 24" both ways	12"	1- #3 Bar Longitudinal	7" long #3 Bar @ 24"	5'

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

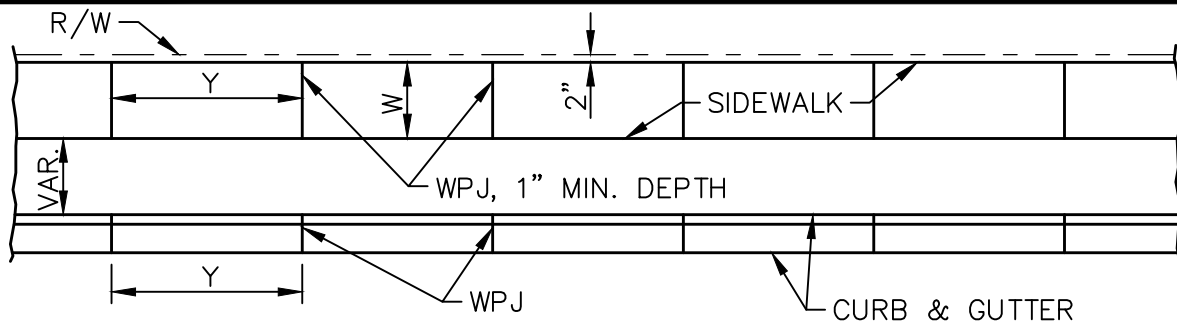
**SIDEWALK ON EXPANSIVE SOILS**

STD. PLAN

**1204**

SHT. 3 OF 3





APPLICATION	W	Y
ARTERIAL ROADS*	FULL PKWY.	10'
RESIDENTIAL SIDEWALK ADJACENT TO R/W **	4'	10'
RESIDENTIAL SIDEWALK ADJACENT TO CURB***	5'	10'
COMMERCIAL, INDUSTRIAL, AND SCHOOL ZONES	FULL PKWY.	10'

#### NOTES:

THICKNESS=4 INCHES PCC STANDARD; 6 INCHES WITHIN DRIVEWAY AREA.

#### CURB & GUTTER:

WPJ SHALL BE PLACED AT EACH SIDE OF DRIVEWAYS, AT THE ENDS OF ALL CURB RETURNS, AND AT 10 FOOT INTERVALS (EXCEPT WITHIN CURB RETURNS), TO A DEPTH OF 1 ½ INCHES WITH EDGER FINISH.

#### SIDEWALK:

WPJ SHALL BE CONSTRUCTED IN SIDEWALKS, 1 INCH MINIMUM DEPTH, AT 10 FOOT INTERVALS AND AT ENDS OF DRIVE APPROACHES, CURB RETURNS AND TREE WELLS. JOINTS SHALL BE EDGER FINISHED (R= ⅛ INCH).

COLOR ADDITIVES OR PATTERN STAMPED CONCRETE SHALL NOT BE USED.

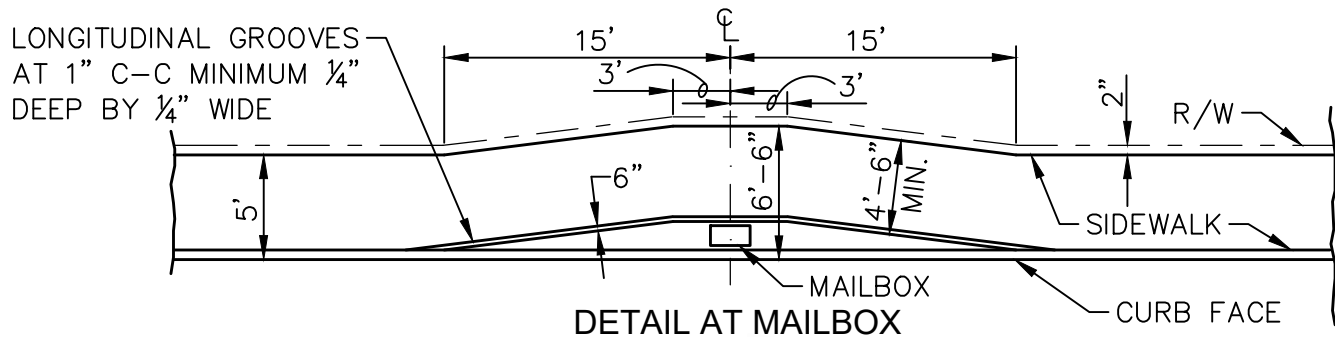
\* WPJ MAY BE REDUCED TO 5 FEET WITH ADEQUATE PROVISION FOR MAINTENANCE OF REMAINING PARKWAY.

\*\* RECOMMENDED WHERE GRADE IS LESS THAN 5 PERCENT AND DESIGN IS CONSISTENT WITH ADJACENT RESIDENTIAL DEVELOPMENT. PURSUANT TO ADA REQUIREMENTS, A SIDEWALK WITH A CLEAR WIDTH LESS THAN 5 FEET SHALL PROVIDE PASSING SPACES AT INTERVALS OF 200 FEET MAXIMUM. PASSING SPACE SHALL BE A MINIMUM SPACE OF 5 FEET BY 5 FEET.

\*\*\* RECOMMENDED WHEN GRADE IS GREATER THAN 5 PERCENT. UTILITY VAULTS, HYDRANTS, MAILBOXES AND OTHER OBSTRUCTIONS MUST BE PLACED BACK OF SIDEWALK.

SEE STD. PLAN 1410 FOR VERTICAL OBSTRUCTION LOCATION.

SEE STD. PLAN 112-2-OC FOR JOINT DETAILS.



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1205

SHT. 1 OF 1

SIDEWALK DETAILS

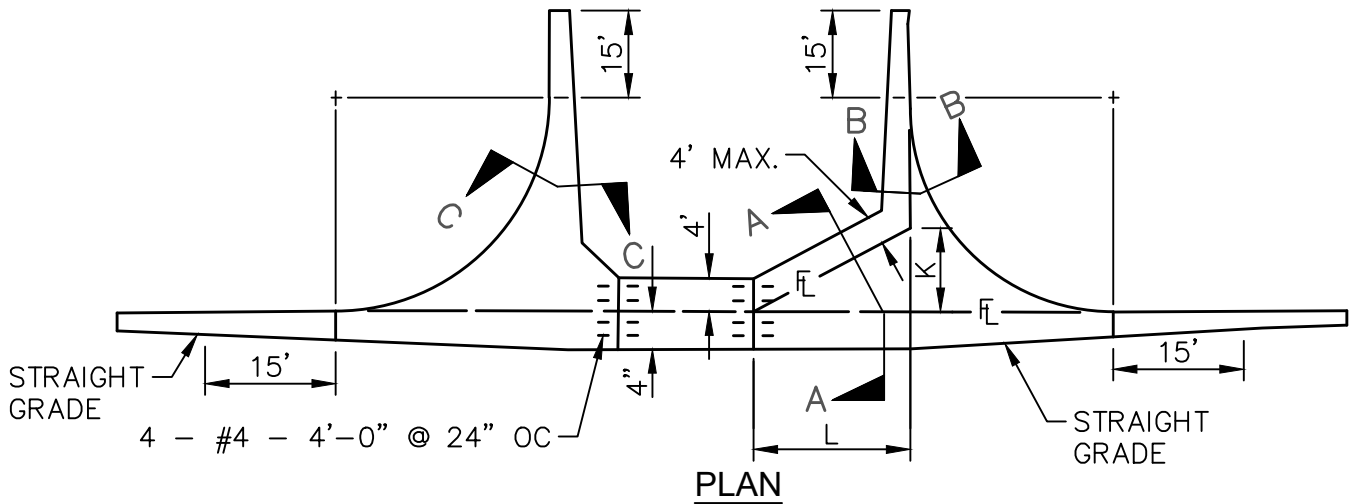




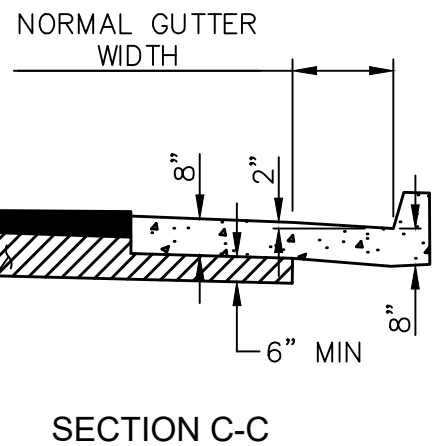
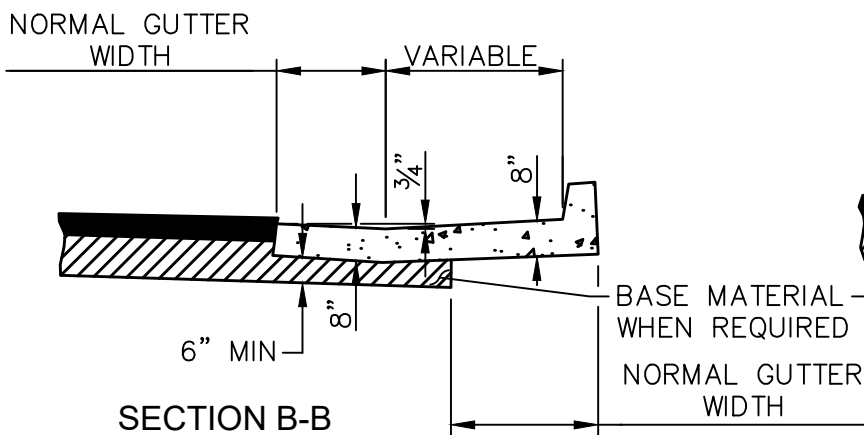
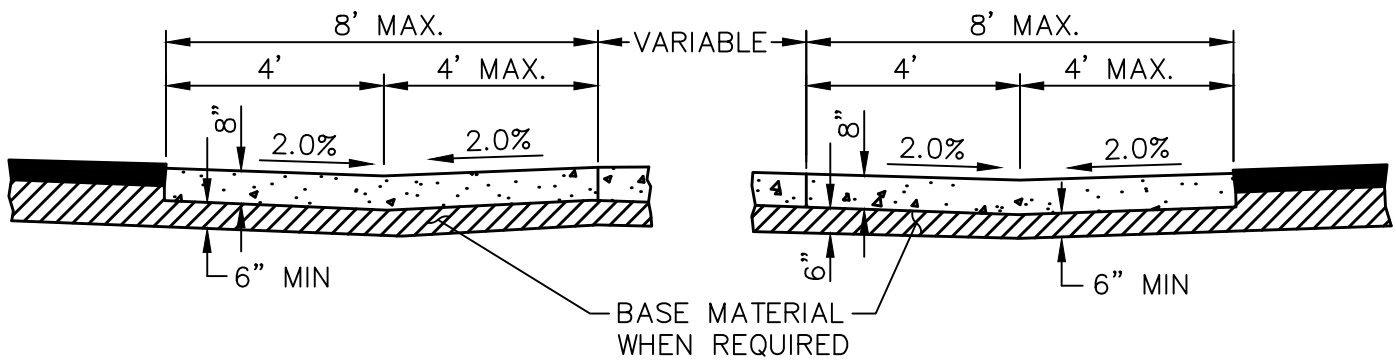
## ALLEY INTERSECTION



SEE SHEET 2 FOR APPLICATION.



NOTE: SEE STD. PLAN 112-2-OC & 122-2-OC FOR JOINT DETAILS



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

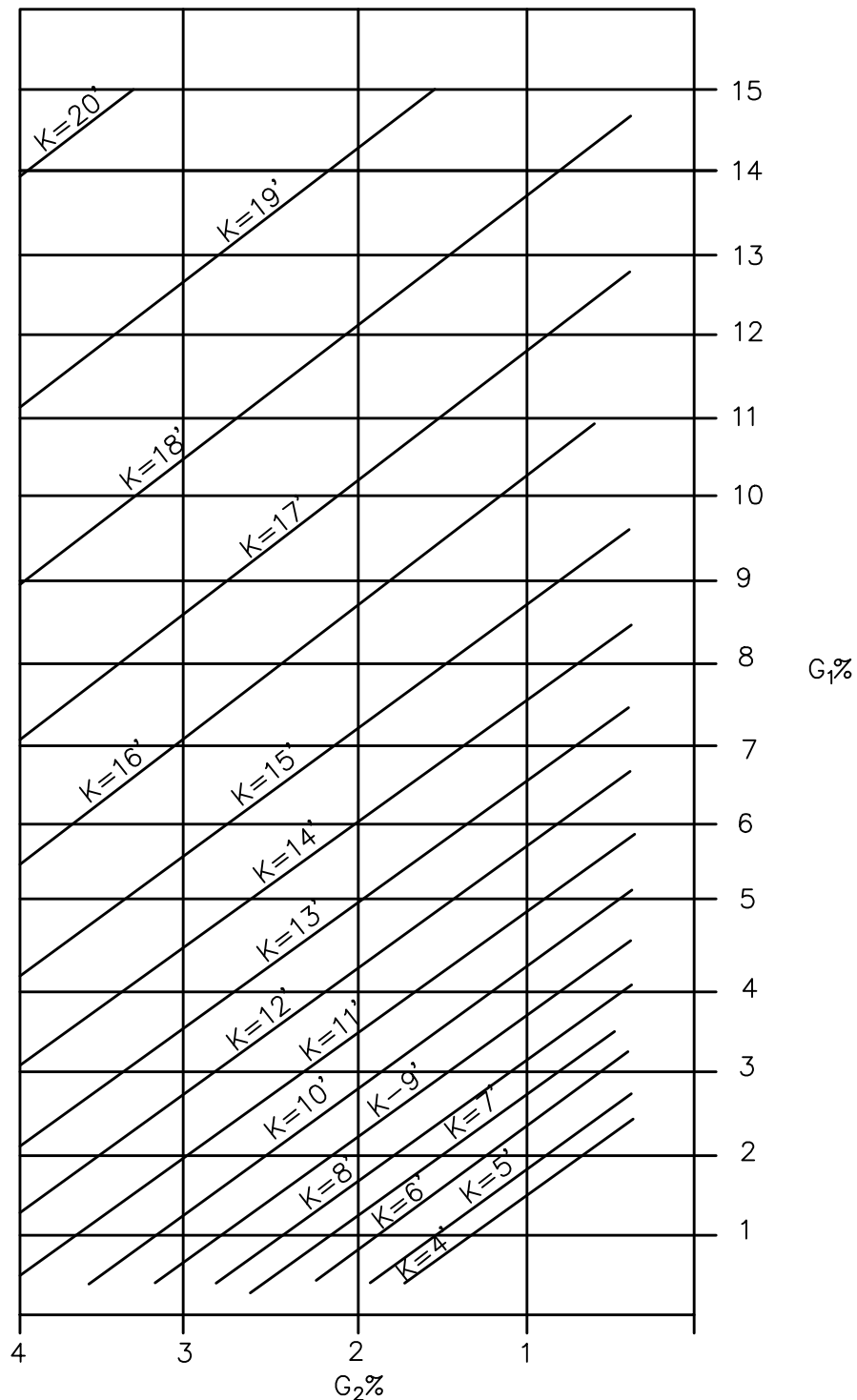
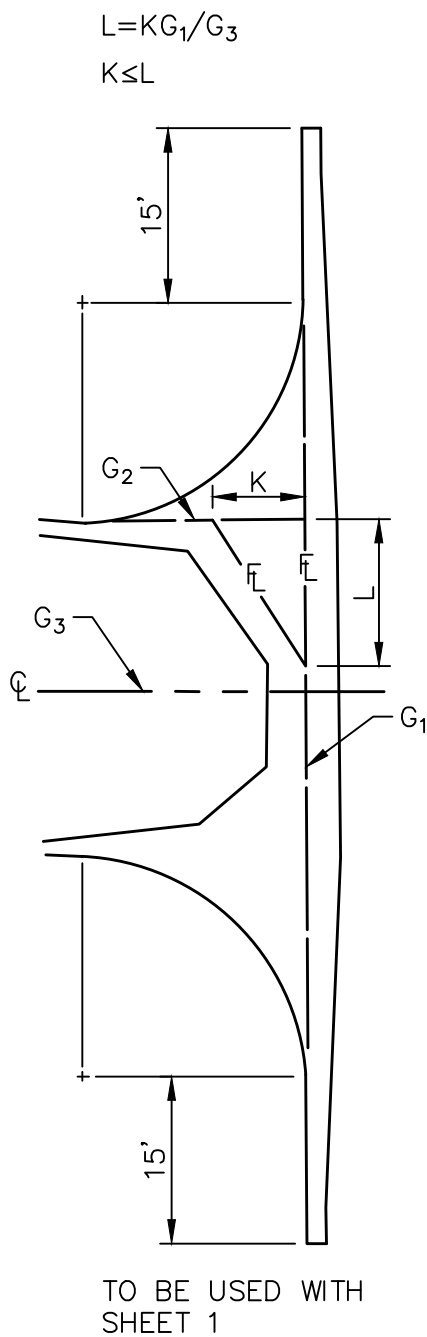
Revision: August 2018

STD. PLAN

1208

SHT. 1 OF 2

SPECIAL CROSS GUTTER (STEEP GRADE)



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
 Khalid Bazmi, County Engineer

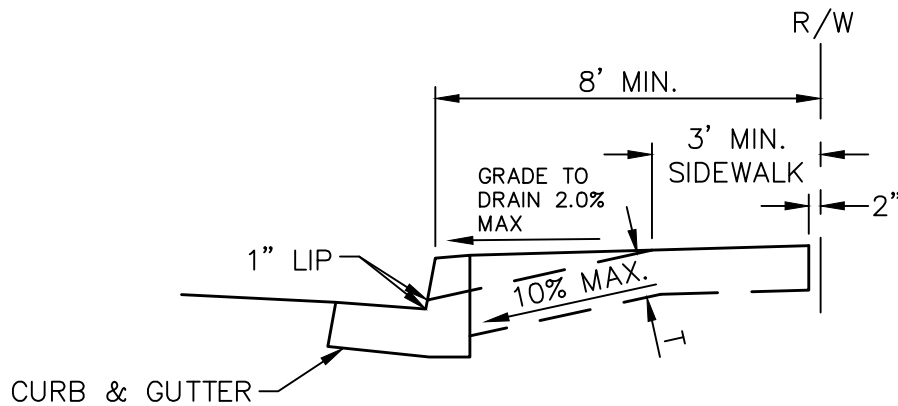
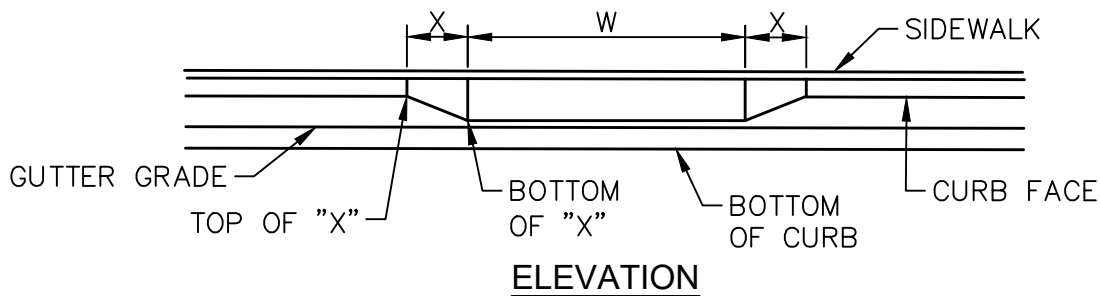
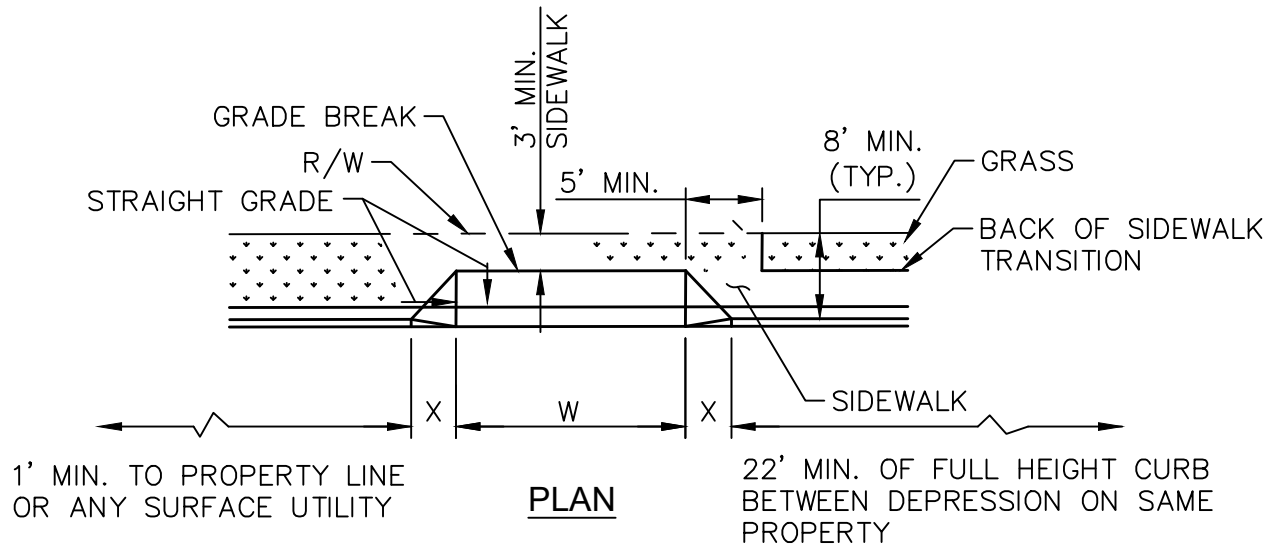
Revision: August 2018

STD. PLAN

1208

SHT. 2 OF 2

SPECIAL CROSS GUTTER (STEEP GRADE)



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

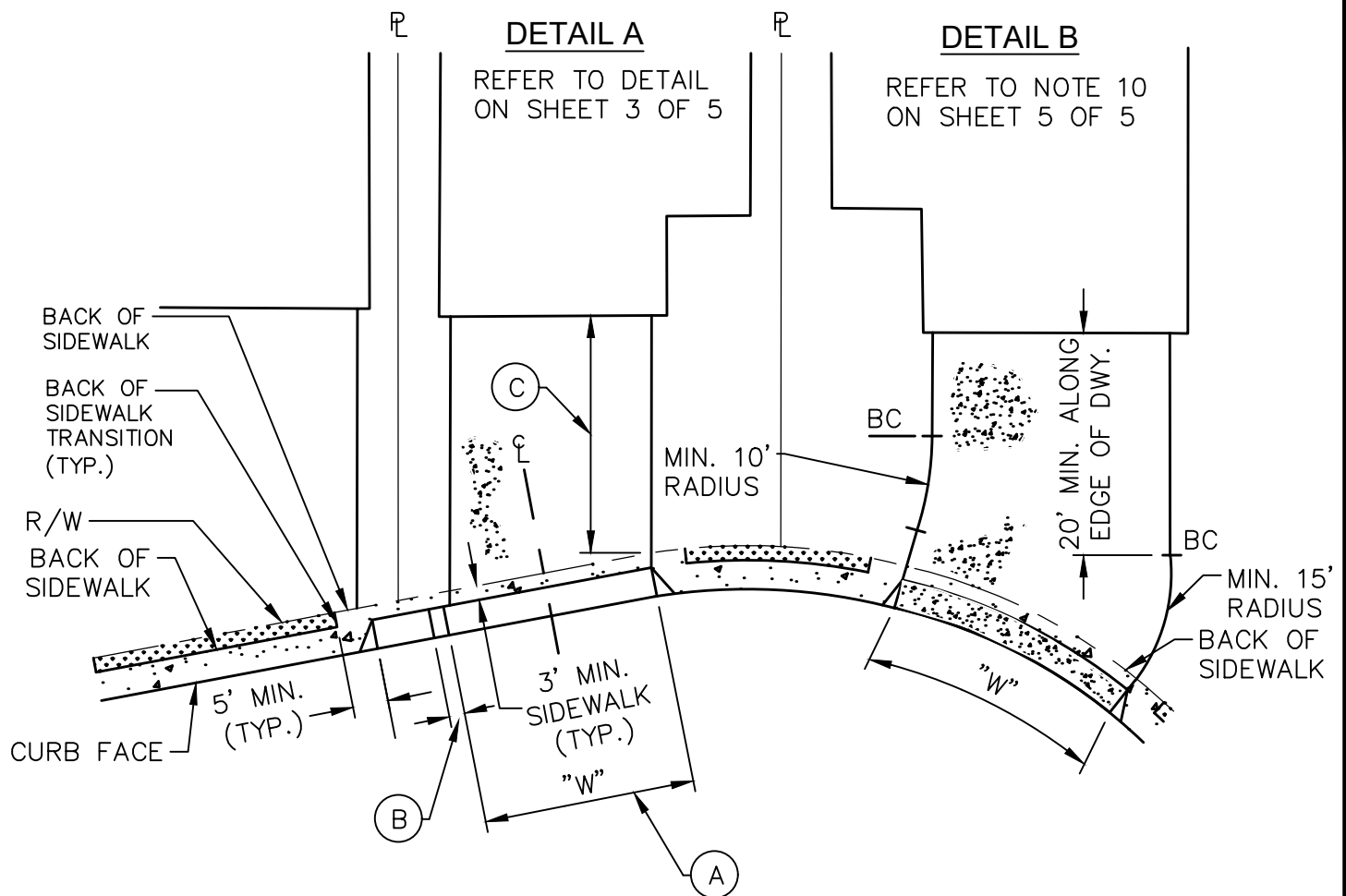
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1209

SHT. 1 OF 5

DEPRESSED CURB DRIVEWAY APPROACH



**NOTES:**

- (A) WIDTH OF DEPRESSION (W) SHALL BE DESIGNED USING PROJECTED DWY. LINES WHERE THEY INTERSECT BACK OF SIDEWALK AND/OR CURB FACE. THE MINIMUM DIMENSION FOR W SHALL BE THE GREATEST OBTAINABLE LENGTH BETWEEN THE PROJECTION INTERSECTIONS, MEASURED PARALLEL TO THE CURB FACE.
- (B) 2 FEET MIN. BETWEEN TOP OF "X". IF 2 FEET CANNOT BE MAINTAINED USING THE CRITERIA SHOWN ABOVE, A CONTINUOUS DEPRESSION SHALL BE USED PER NOTE 11 ON SHEET 5 OF 5.
- (C) DIMENSION SHALL BE A MINIMUM OF 20 FEET UNLESS OTHERWISE PROVIDED BY ZONING.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

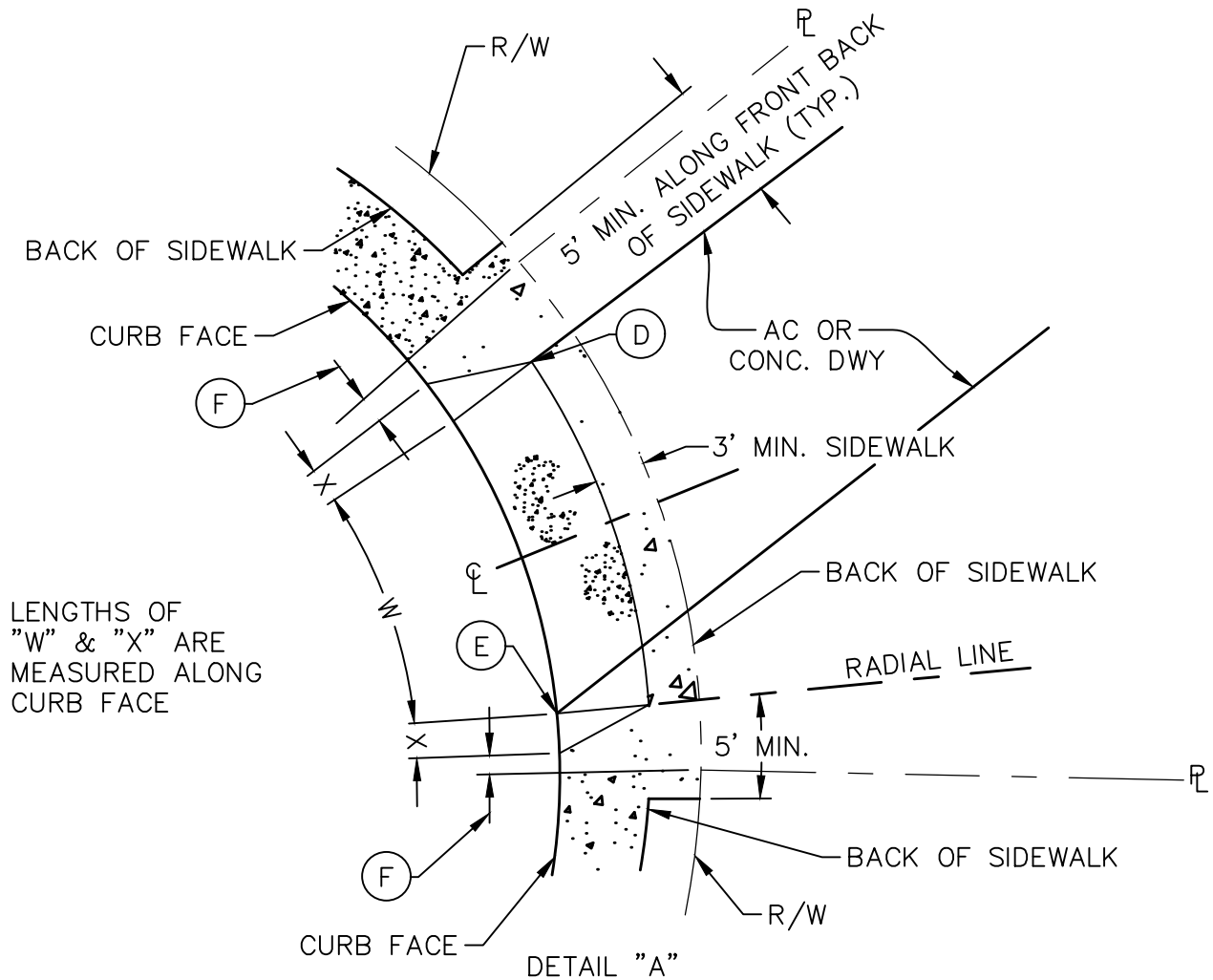
Revision: August 2018

STD. PLAN

1209

SHT. 2 OF 5

DEPRESSED CURB DRIVEWAY APPROACH



**NOTES:**

\* REFER TO NOTE 9 ON SHEET 5 OF 5

- (D) BOTTOM OF "X" IS RADIAL TO INTERSECTION OF DWY. AND BACK OF SIDEWALK. IF NO SIDEWALK, INTERSECTION TO OCCUR AT R/W.
- (E) BOTTOM OF "X" AT INTERSECTION OF DWY. PROJECTION AND CURB FACE.
- (F) 1 FOOT MINIMUM AT CURB FACE FROM TOP OF "X" TO RADIAL PROJECTION OF PROPERTY LINE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

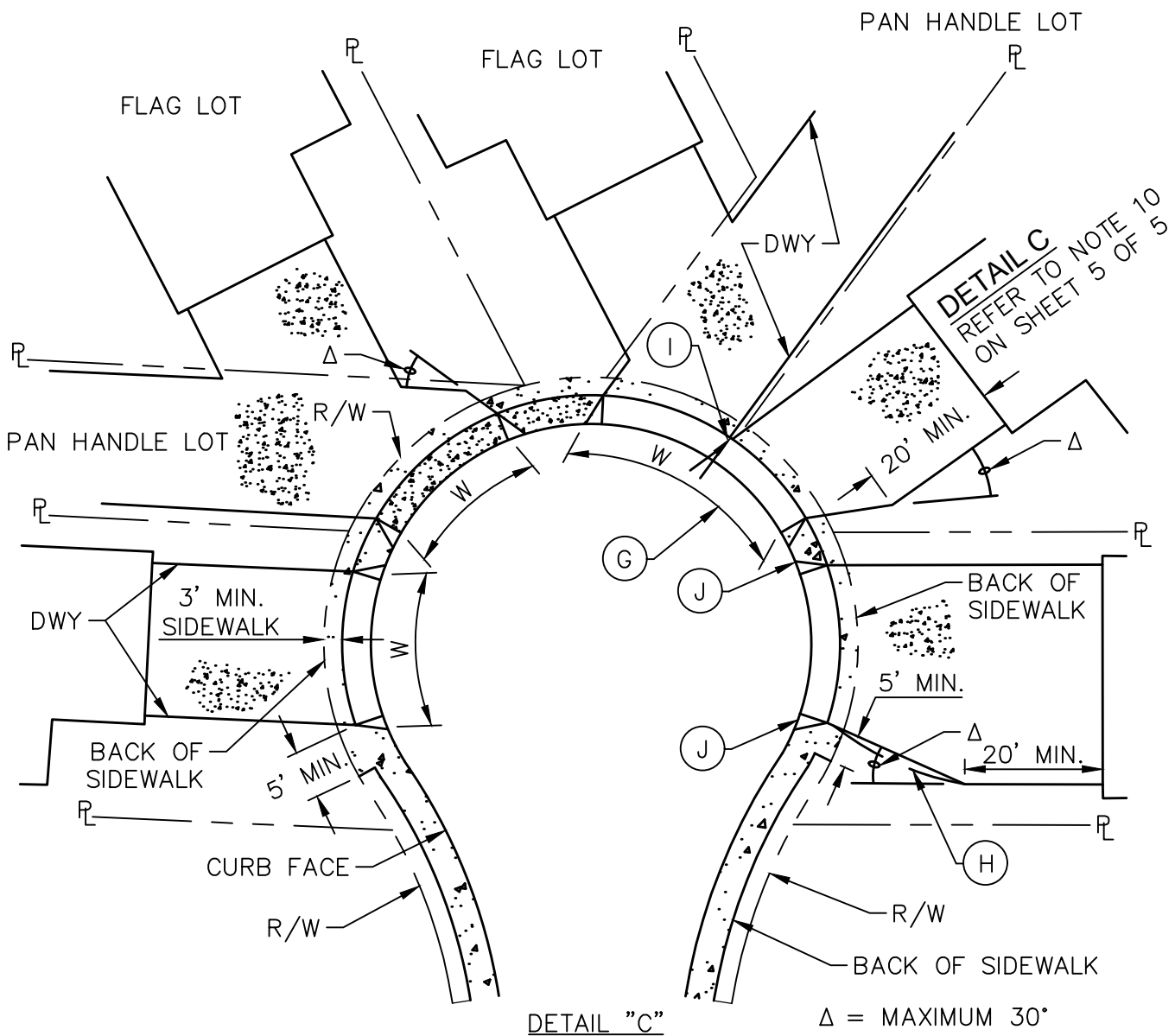
Revision: August 2018

STD. PLAN

1209

SHT. 3 OF 5

DEPRESSED CURB DRIVEWAY APPROACH



**NOTES:**

- (G) COMMON DRIVEWAY, REFER TO NOTE 11 ON SHEET 5 OF 5.
- (H) OPTIONAL CURVED EDGE OF DWY. SEE DETAIL "B" ON SHEET 2 OF 5.
- (I) IT IS PERMISSIBLE TO CROSS DWY. PROJECTIONS AS LONG AS POINT OF INTERSECTION IS WITHIN ROAD R/W.
- (J) PLACEMENT OF "X" PER CRITERIA ON SHEET 3 OF 5.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1209

SHT. 4 OF 5

DEPRESSED CURB DRIVEWAY APPROACH

SIDEWALK	VALUES OF "X"
ADJACENT TO R/W	2'
ADJACENT TO CURB	3'
FULL PARKWAY	3'

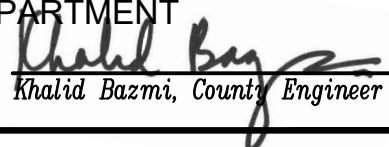
MINIMUM "W"	MIN.
RESIDENTIAL	12'
COMMERCIAL & INDUSTRIAL ONE WAY TWO WAY	14' 28'

### GENERAL NOTES:

1. IN CERTAIN SITUATIONS IF ALL OF THE FOLLOWING MINIMUMS ARE PROVIDED, THE RESULT MAY NOT BE WORKABLE. NOTWITHSTANDING THE MINIMUMS, THE INTENT IS TO PRODUCE A DRIVEWAY THAT PROVIDES REASONABLE ACCESS TO THE GARAGE.
2. PCC SIDEWALK AND RAMP THICKNESS "T" SHALL BE 6 INCHES.
3. AC SECTION MAY BE CONSTRUCTED BETWEEN BACK OF SIDEWALK AND RIGHT-OF-WAY FOR RESIDENTIAL DRIVEWAYS IF THE ONSITE DRIVEWAY IS AC.
4. ONE (1) FOOT MINIMUM OF FULL HEIGHT CURB SHALL BE MAINTAINED BETWEEN PROPERTY LINE AND TOP OF "X" UNLESS A COMMON DRIVEWAY IS WARRANTED PER NOTE 11.
5. NO LESS THAN 22 FEET OF FULL HEIGHT CURB SHALL BE MAINTAINED BETWEEN TWO DRIVEWAYS ON THE SAME PROPERTY.
6. COMMERCIAL, INDUSTRIAL AND RESIDENTIAL DRIVEWAYS HAVING AN ANTICIPATED ADT GREATER THAN 100 VEHICLES SHALL BE DESIGNED AS FLARED DEPRESSED CURB DRIVEWAY APPROACHES PER STD. PLAN 1210. RESIDENTIAL DRIVEWAYS SERVING MORE THAN 25 UNITS AND COMMERCIAL AND INDUSTRIAL DRIVEWAYS HAVING ANTICIPATED ADT IN EXCESS OF 1000 VEHICLES WILL BE DESIGNED AS LOCAL STREETS WITH CURB, SPANDREL AND CROSS GUTTER, SUBJECT TO APPROVAL OF THE ENGINEER.
7. COLOR ADDITIVES OR PATTERN STAMPED CONCRETE SHALL NOT BE USED.
8. WHEN GARAGE DOOR OPENING AND RIGHT-OF-WAY LINE ARE PARALLEL AND DISTANCE BETWEEN GARAGE DOOR OPENING AND RIGHT-OF-WAY IS 20 FEET OR LESS, "W" SHALL BE A MINIMUM WIDTH EQUAL TO THE GARAGE DOOR OPENING AND SHALL BE CENTERED ON THE TOTAL GARAGE DOOR OPENING.
9. WHEN GARAGE DOOR OPENING AND RIGHT-OF-WAY LINE ARE NOT PARALLEL, "W" SHALL BE DETERMINED IN ACCORDANCE WITH DETAIL ON SHEET 3 OF 5.
10. WHEN THE CLOSEST SETBACK DISTANCE BETWEEN THE GARAGE DOOR OPENING AND RIGHT-OF-WAY IS GREATER THAN 20 FEET, "W" MAY BE REDUCED AND THE DRIVEWAY ON SITE MAY BE CURVED OR ANGLED AS NECESSARY PROVIDING A MINIMUM DISTANCE OF 20 FEET IS MAINTAINED ADJACENT AND PERPENDICULAR TO THE GARAGE DOOR IN ORDER TO PROVIDE ROOM FOR A CAR TO BACK OUT OF THE GARAGE AND MANEUVER. REFER TO DETAIL "B" ON SHEET 2 OF 5, AND DETAIL "C" ON SHEET 4 OF 5.
11. WHEN THE "X" OF ONE DRIVEWAY CONFLICTS WITH THE "X" OF AN ADJACENT DRIVEWAY IN A KNUCKLE OR CUL-DE-SAC, A COMMON DRIVEWAY SHALL BE USED.
12. IT IS PERMISSIBLE FOR THE PROJECTION OF THE EDGES OF TWO ADJACENT ONSITE DRIVEWAYS TO CROSS PROVIDING THEY DO SO WITHIN THE RIGHT-OF-WAY AS SHOWN ON SHEET 4 OF 5.
13. DRIVEWAYS FOR PANHANDLE AND FLAG LOTS MUST MEET APPLICABLE MINIMUM WIDTH REQUIREMENTS AS WELL AS ALLOW FOR MANEUVERING ROOM AS CALLED FOR BY NOTE 10.
14. SEE STD. PLAN 1107 FOR PARKWAY NOTES AND STD. PLAN 1205 FOR ADDITIONAL SIDEWALK DETAILS AND NOTES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

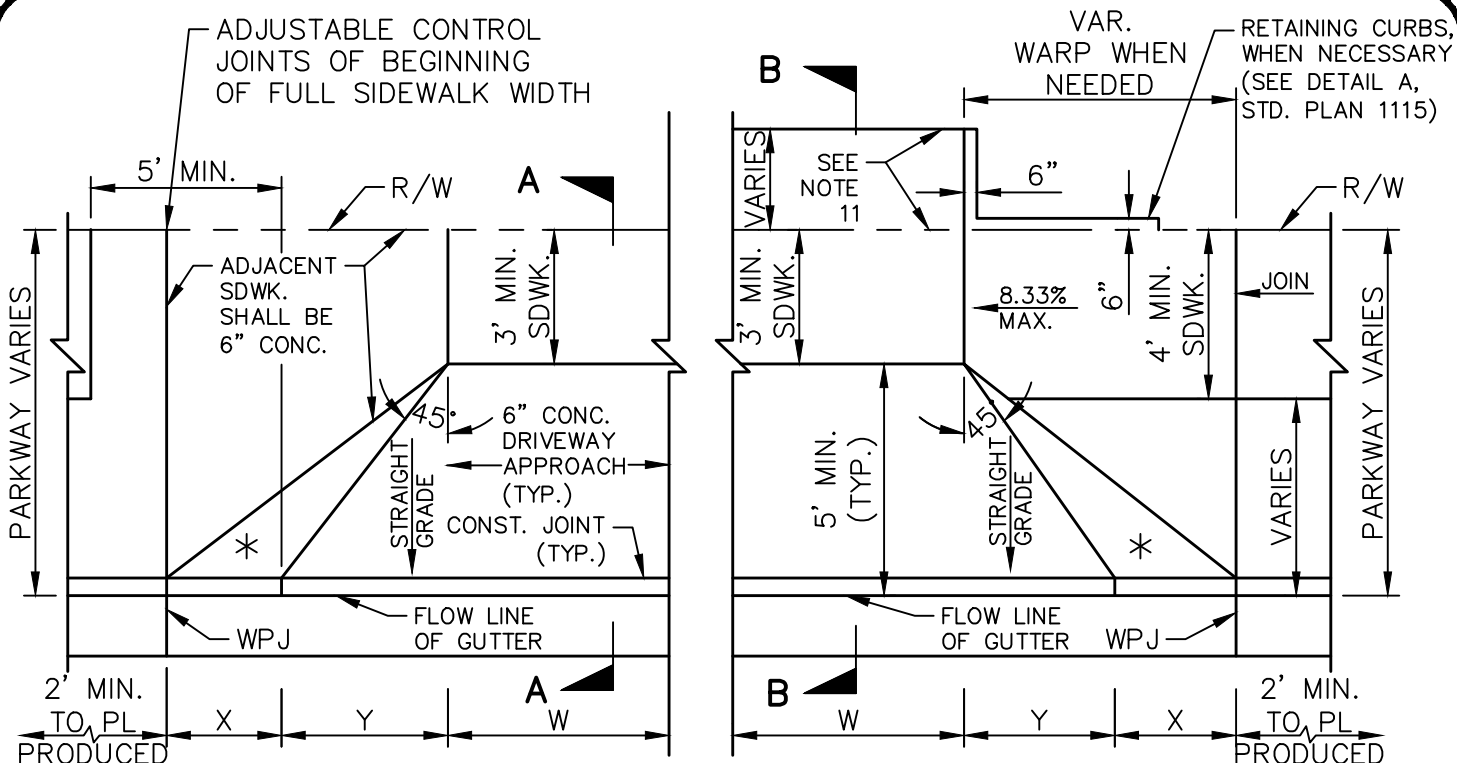
STD. PLAN

1209

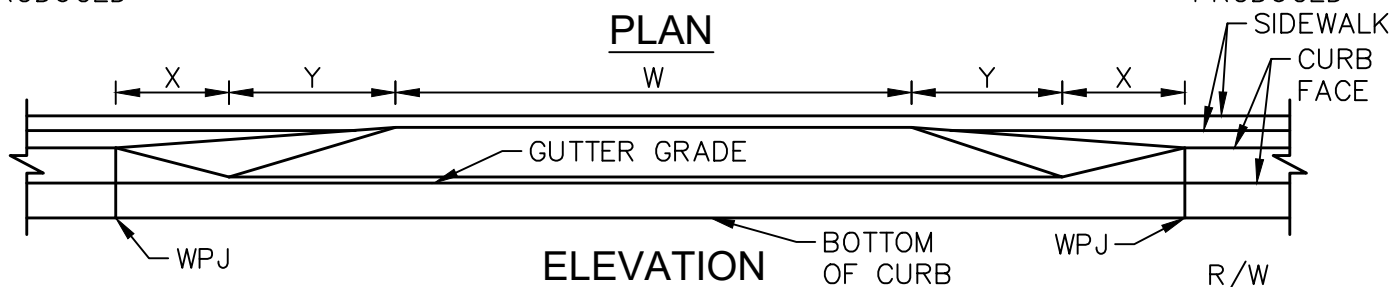
SHT. 5 OF 5

DEPRESSED CURB DRIVEWAY APPROACH

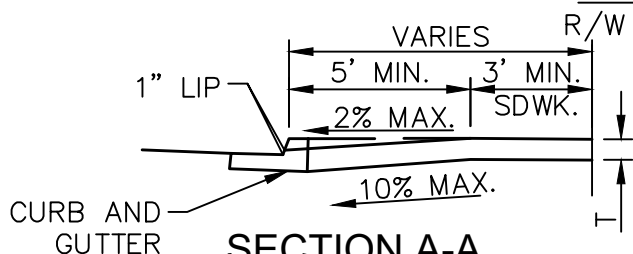




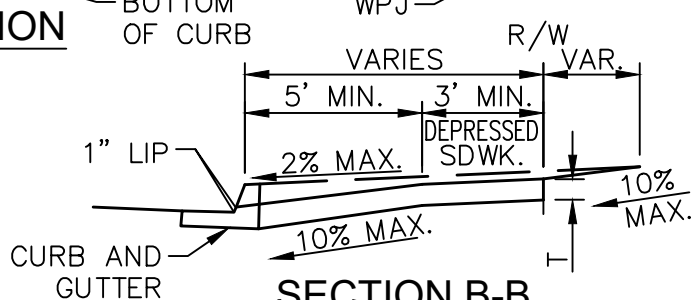
PLAN



ELEVATION



SECTION A-A



SECTION B-B

SIDEWALK	VALUES OF "X"	VALUES OF "W"		
Adjacent to R/W	2'	Residential **	Min.	Max.
Adjacent to curb	3'		18'	28'
Full Parkway	3'	Commercial & Industrial		
			One-way	Two-way
			12'	14'
			24'	30'

\* "X" IS A VARIABLE WHEN SIDEWALK IS LOCATED WHERE WHEELCHAIRS MAY TRAVERSE THE SURFACE. SLOPES SHALL NOT EXCEED 8.33 PERCENT.

\*\* COMMON DRIVEWAYS SERVING 5 OR MORE DWELLING UNITS: "W" SHALL BE 28 FEET

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1210

SHT. 1 OF 2

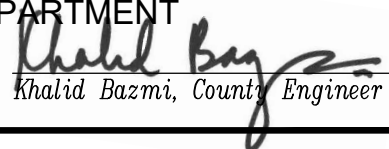
FLARED DEPRESSED CURB DRIVEWAY APPROACH

NOTES:

1. PCC SIDEWALK AND RAMP THICKNESS "T" SHALL BE 6 INCHES.
2. AC SECTION MAY BE CONSTRUCTED BETWEEN BACK OF SIDEWALK AND R/W FOR RESIDENTIAL DRIVEWAYS.
3. TWO (2) FEET OF FULL HEIGHT CURB SHALL BE MAINTAINED BETWEEN PL AND EDGE OF DRIVEWAY.
4. NO LESS THAN 22 FEET OF FULL HEIGHT CURB SHALL BE MAINTAINED BETWEEN DRIVEWAYS ON SAME PROPERTY.
5. THE TOTAL WIDTH OF DEPRESSION ("W" + 2"Y"), IN CASE OF MULTIPLE DRIVEWAYS ON A SINGLE OWNERSHIP PARCEL FRONTAGE, SHALL NOT EXCEED 70 PERCENT OF THE FRONTAGE WHERE FRONTAGE IS 100 FEET OR LESS, OR 60 PERCENT WHERE FRONTAGE IS GREATER THAN 100 FEET.
6. DESIGN SHALL BE IN ACCORDANCE WITH STD. PLAN 1206 WHERE ON-SITE DRAINAGE GUTTER ABUTS DRIVEWAY.
7. FRONTAGE LENGTH MINUS DEPRESSION WIDTH ("W" + 2"Y") SHALL NOT BE LESS THAN 20 FEET.
8. COMMERCIAL, INDUSTRIAL AND RESIDENTIAL DRIVEWAYS HAVING AN ANTICIPATED ADT GREATER THAN 100 VEHICLES WILL BE DESIGNED AS FLARED DEPRESSED CURB DRIVEWAY APPROACHES PER STD. PLAN 1210. RESIDENTIAL DRIVEWAYS SERVING MORE THAN 25 UNITS AND COMMERCIAL AND INDUSTRIAL DRIVEWAYS HAVING ANTICIPATED ADT VOLUME IN EXCESS OF 1,000 VEHICLES WILL BE DESIGNED AS LOCAL STREETS WITH CURB, SPANDREL, AND CROSS GUTTER PER STD. PLAN 122-2-OC SUBJECT TO APPROVAL OF THE ENGINEER.
9. COLOR ADDITIVES OR PATTERN STAMPED CONCRETE SHALL NOT BE USED.
10. SEE STD. PLAN 112-2-OC FOR JOINT DETAILS.
11. RETAINING CURBS AND ACQUISITION OF CONSTRUCTION EASEMENT MAY BE NECESSARY FOR NARROW SIDEWALKS OR CURB HEIGHTS IN EXCESS OF 6 INCHES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

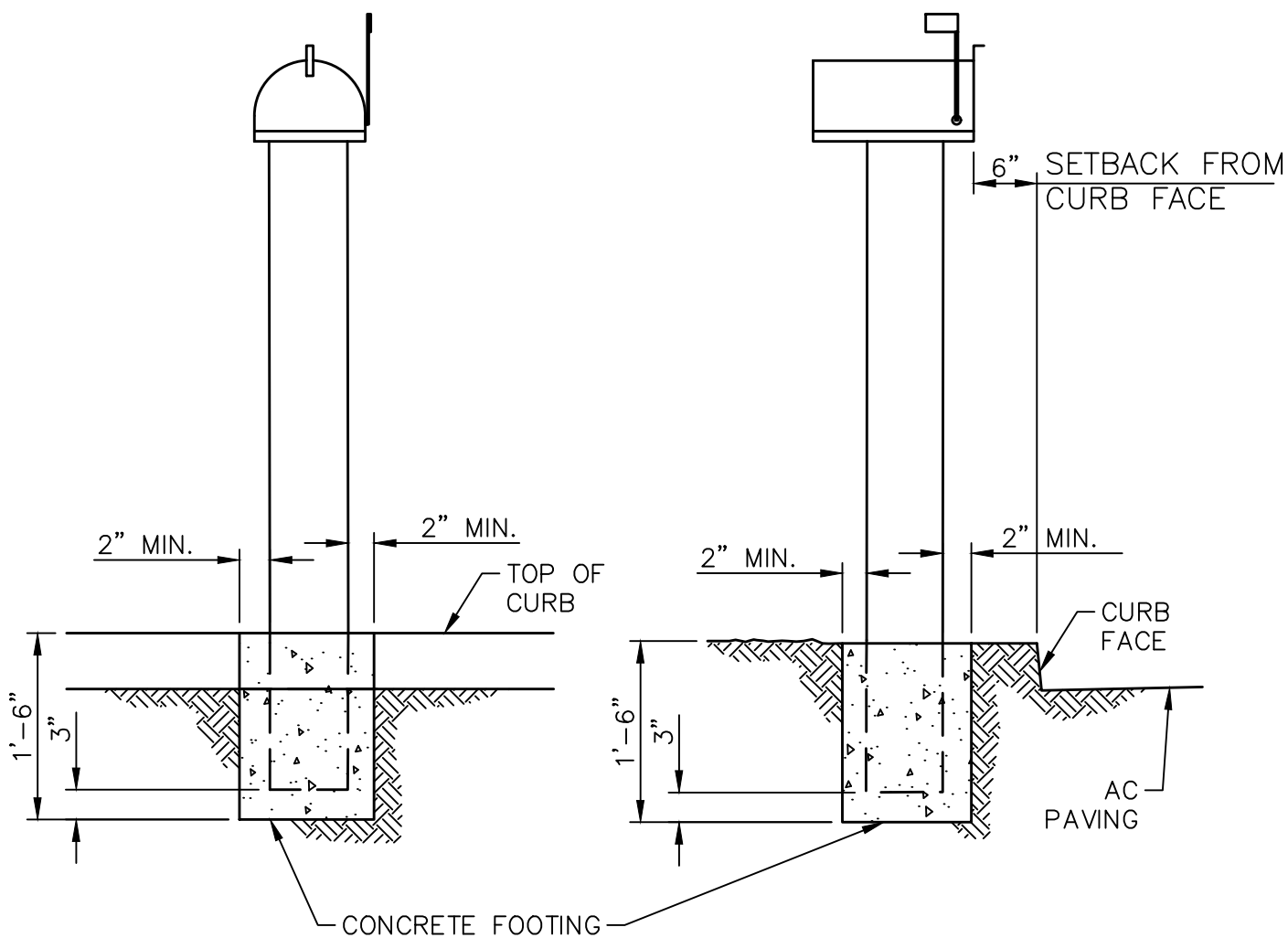
Revision: August 2018

STD. PLAN

1210

FLARED DEPRESSED CURB DRIVEWAY APPROACH

SHT. 2 OF 2



NOTES:

1. MAILBOX LOCATION, HEIGHT, AND MATERIAL TO BE APPROVED BY THE LOCAL POSTMASTER.
2. SINGLE UNIT MAILBOX TO BE USED IF PARKWAY IS BETWEEN CURB AND SIDEWALK.
3. MAILBOX POST SHALL BE OF TREATED REDWOOD OR METAL.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

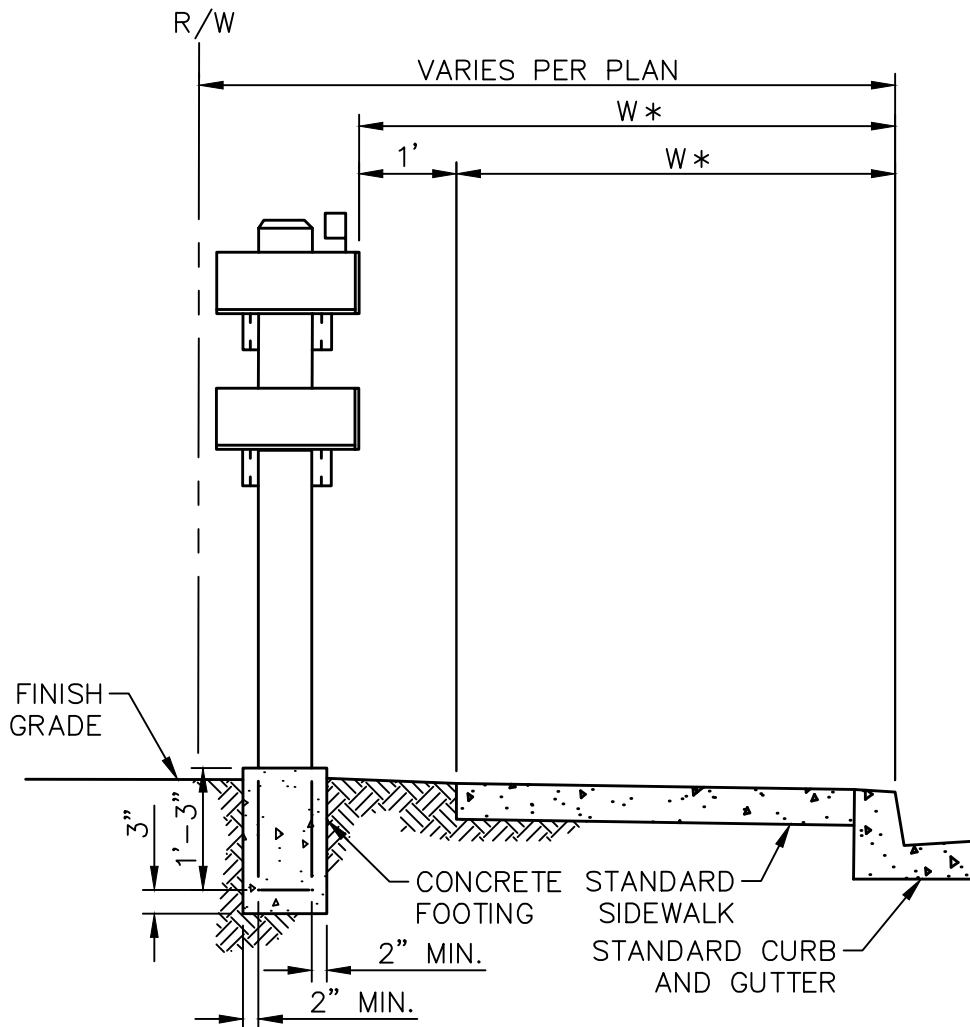
STD. PLAN

1211

SHT. 1 OF 1

SINGLE UNIT MAILBOX DETAIL

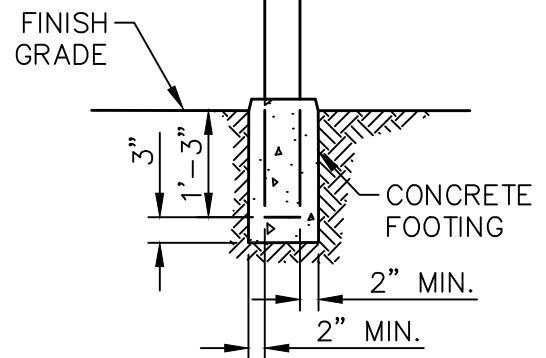




\* PLEASE REFER TO STD. PLAN 1205.

#### NOTES:

1. MAIL BOX CLUSTERS LOCATION, HEIGHT, AND MATERIAL TO BE APPROVED BY THE LOCAL POSTMASTER.
2. MAILBOX CLUSTERS TO BE USED IF SIDEWALK IS ADJACENT TO CURB.
3. MAILBOX POST SHALL BE OF TREATED REDWOOD OR METAL.



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

MULTI UNIT MAILBOX DETAIL

STD. PLAN

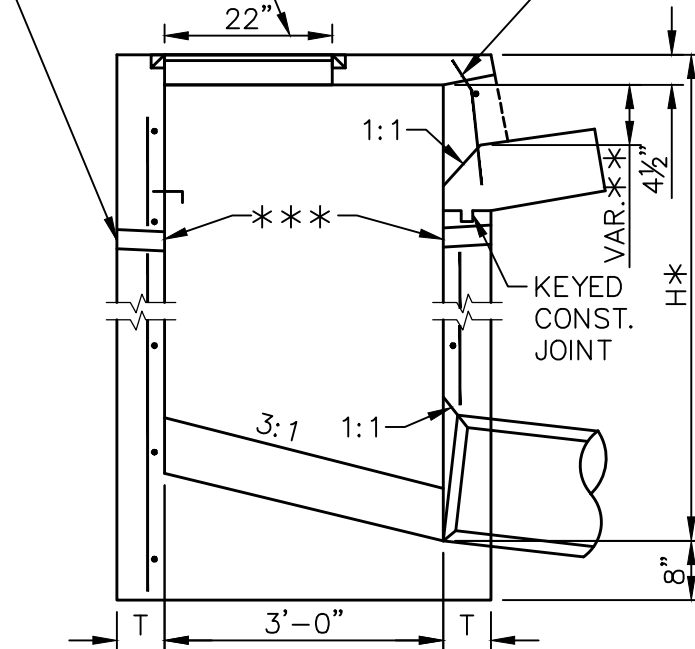
1212

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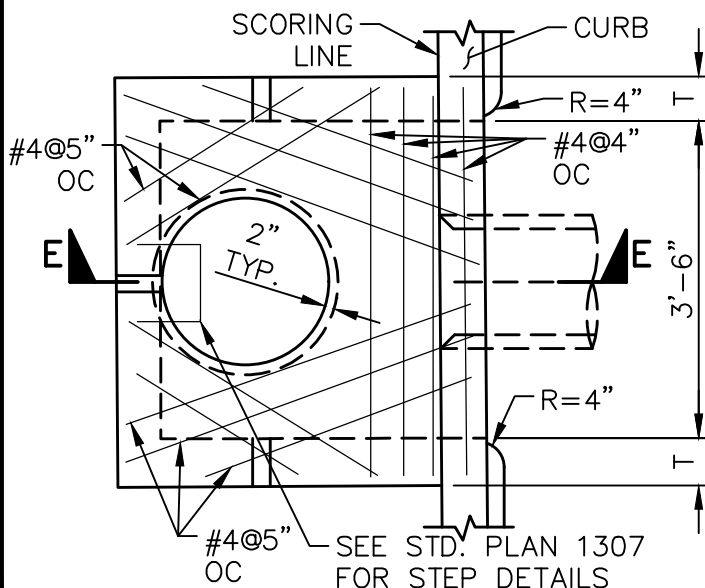


H	T	H	T
8'-0" or less	6"	8'-1" TO 20'-0"	8"

SEE STD. PLAN  
1306 FOR CURB  
SUPPORT DETAILS.



SECTION E-E



## PLAN

- \* WHEN OUTLET PIPE IS CONSTRUCTED WITHIN ROADWAY A MINIMUM OF 30 INCHES (CO. ORD. NO. 6-3-69) OR THE ROADWAY STRUCTURAL SECTION THICKNESS PLUS 6 INCHES, WHICHEVER IS GREATER, SHALL BE MAINTAINED BETWEEN THE TOP OF PIPE AND THE ROADWAY SURFACE.
- \*\* TO BE DETERMINED BY THE ENGINEER AND AS INDICATED ON PLANS.
- \*\* 2" DIA. WEEPHOLES AT SIDES & BACKWALL AT 24" OC; 2 WEEPHOLES MIN. PER WALL; MIN. 6" BELOW KEY

1. CURB OPENING SHALL CONFORM TO CURB ALIGNMENT.
2. SEE STD. PLANS 1306 AND 1307 FOR DETAILS AND NOTES.
3. SEE STD. PLAN 1308 FOR LOCAL DEPRESSION DETAILS.
4. DECK INCLUDING STEEL REINFORCEMENT SHALL BE CONSTRUCTED THE SAME WIDTH AS SIDEWALK (UP TO 6 INCHES WIDE).
5. A STAINLESS STEEL MARKER PER THE SPECIAL PROVISIONS WITH THE WORDS **"NO DUMPING DRAINS TO OCEAN"** SHALL BE MOUNTED ON THE TOP OF THE INLET WITH SILKABOND ADHESIVE OR EQUAL.
6. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.
7. BASIN FLOOR SHALL BE GIVEN A STEEL TROWEL FINISH. SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.
8. CONCRETE STRENGTH AND TYPE SHALL BE PER STD. PLAN 1803.

Approved

DEPARTMENT  
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

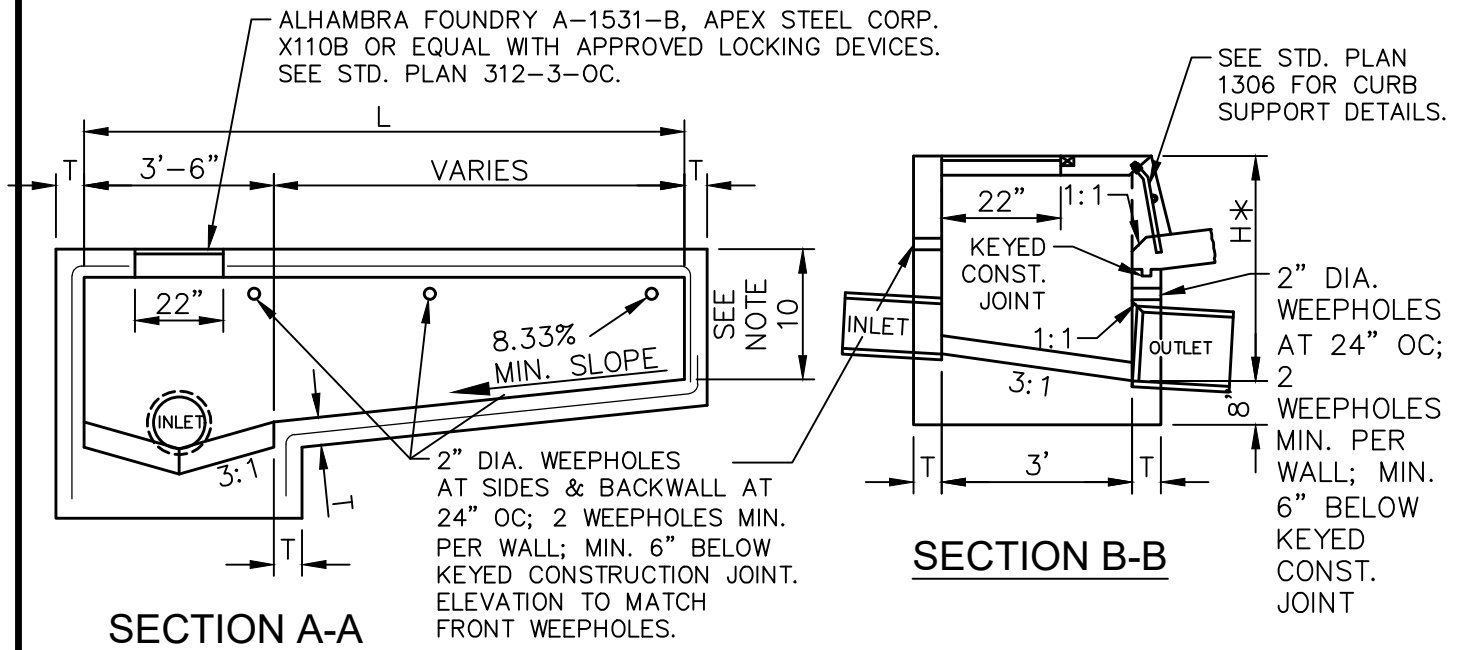
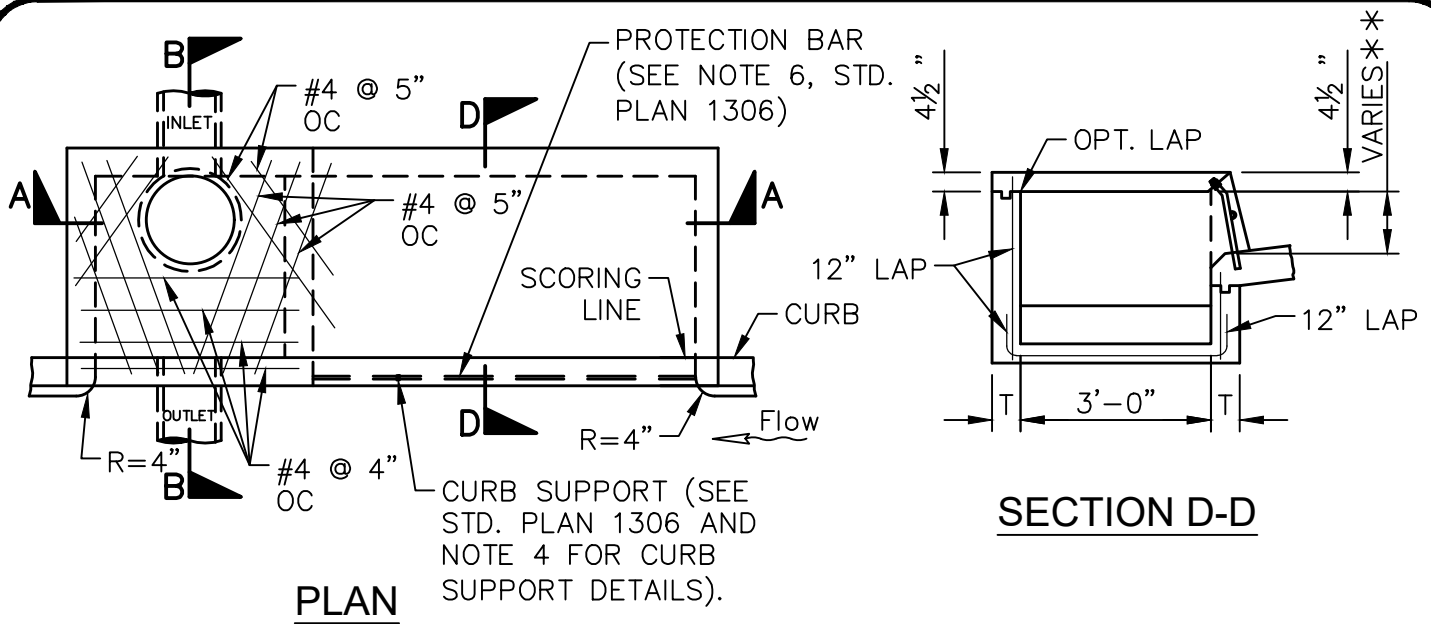
## STD. PLAN

1301

SHT. 1 OF 1

## INLET TYPE I





\* WHEN OUTLET PIPE IS CONSTRUCTED WITHIN ROADWAY, A MINIMUM OF 30 INCHES (COUNTY ORD. NO. 6-3-69) OR THE ROADWAY STRUCTURAL SECTION THICKNESS PLUS 6 INCHES, WHICHEVER IS GREATER, SHALL BE MAINTAINED BETWEEN THE TOP OF PIPE AND THE ROADWAY SURFACE.

\*\* TO BE DETERMINED BY THE ENGINEER AND AS INDICATED ON PLANS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

INLET TYPE II

STD. PLAN

1302

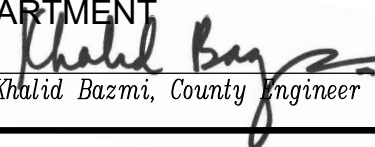
SHT. 1 OF 2

NOTES:

1. STANDARD OPENING LENGTHS, "L" ARE 7 FEET, 10 FEET, 14 FEET AND 21 FEET. OTHER LENGTHS MAY BE USED, BUT SHALL NOT EXCEED 21 FEET, UNLESS OTHERWISE SPECIFIED AND APPROVED BY THE ENGINEER.
2. ALL REINFORCING IS #4 AT 12 INCHES ON-CENTER FOR  $H < 8$  FEET AND #5 AT 12 INCHES ON-CENTER FOR  $H \geq 8$  FEET, UNLESS OTHERWISE SPECIFIED AND APPROVED BY THE ENGINEER.
3. CURB OPENING SHALL CONFORM TO CURB ALIGNMENT.
4. SEE STD. PLANS 1306 AND 1307 FOR DETAILS AND NOTES.
5. SEE STD. PLAN 1308 FOR LOCAL DEPRESSION DETAILS.
6. ALL STEEL SHALL BE 2 INCHES CLEAR FROM INTERIOR CONCRETE SURFACES.
7.  $T=6$  INCHES FOR  $H=5$  FEET TO  $< 8$  FEET.  $T=8$  INCHES FOR  $H=8$  FEET TO 20 FEET.
8. A STAINLESS STEEL MARKER PER THE SPECIAL PROVISIONS WITH THE WORDS "NO DUMPING DRAINS TO OCEAN" SHALL BE MOUNTED ON THE TOP OF THE INLET WITH SILKABOND ADHESIVE OR EQUAL.
9. DECK, INCLUDING STEEL REINFORCEMENT, SHALL BE CONSTRUCTED THE SAME WIDTH AS SIDEWALK (UP TO 6 FEET WIDE).
10.  $D=3$  FEET FOR L LESS THAN OR EQUAL TO 10 FEET.  $D=4$  FEET FOR L GREATER THAN 10 FEET.
11. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.
12. BASIN FLOOR SHALL BE GIVEN A STEEL TROWEL FINISH. SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.
13. CONCRETE STRENGTH AND TYPE SHALL BE PER STD. PLAN 1803.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

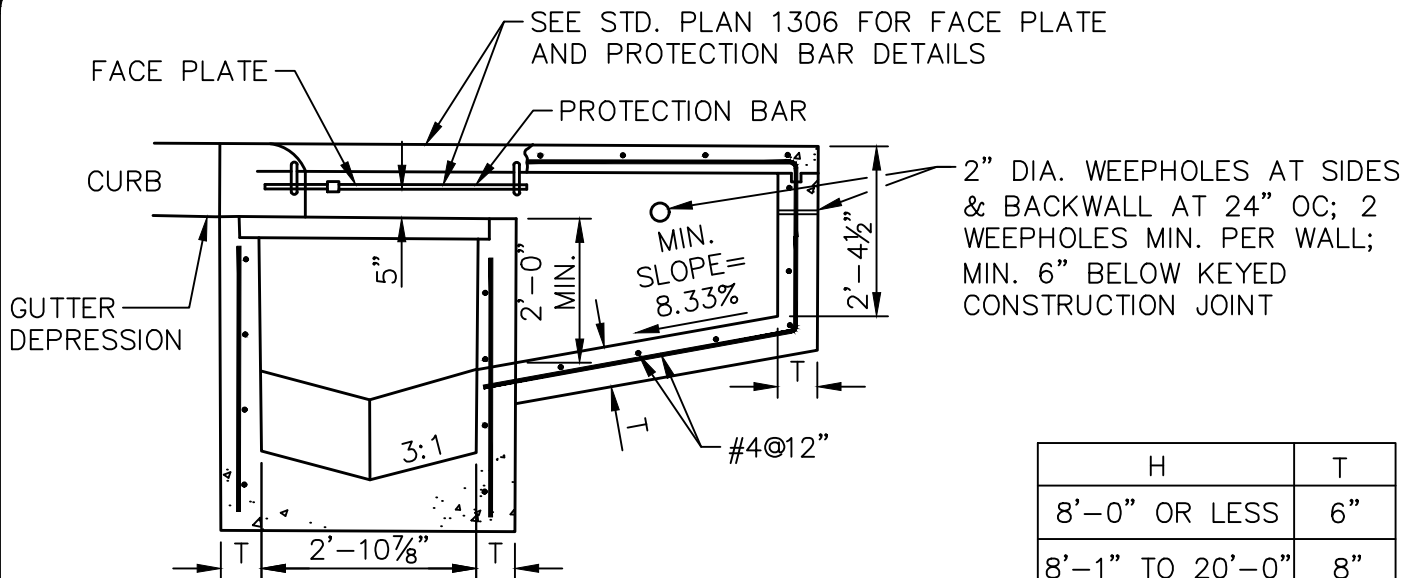
Revision: August 2018

INLET TYPE II

STD. PLAN

1302

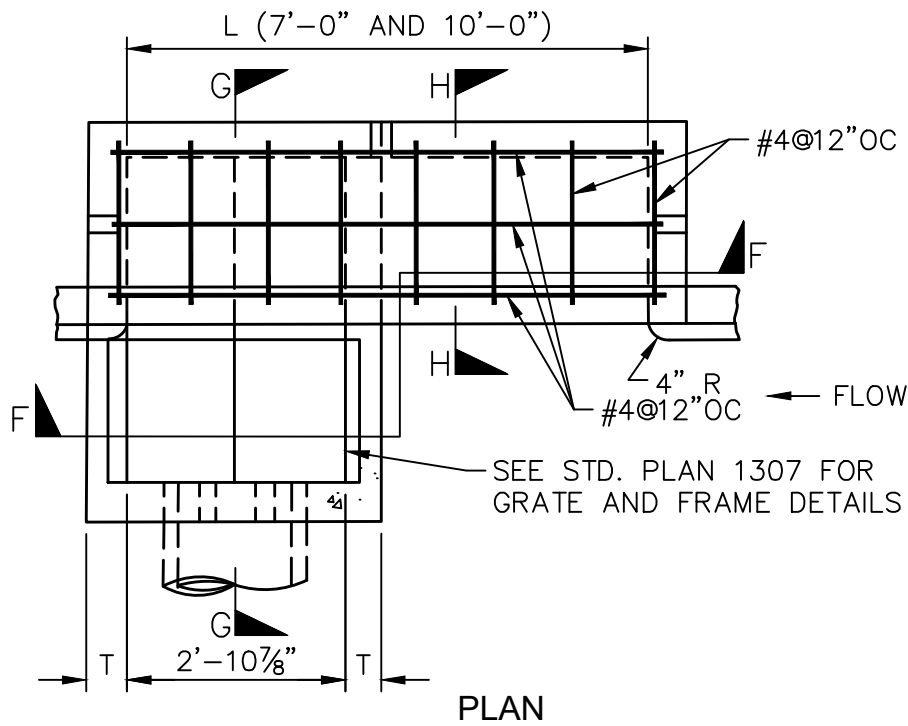
SHT. 2 OF 2



H	T
8'-0" OR LESS	6"
8'-1" TO 20'-0"	8"

**SECTION F-F**

CURB TYPE	CURB FACE HEIGHT	X	W
A2-8(200)	12"	2'-4"	1'-10"
A3-8(200) OR A2-6(150)	10"	2'-4 1/2"	1'-10 1/2"



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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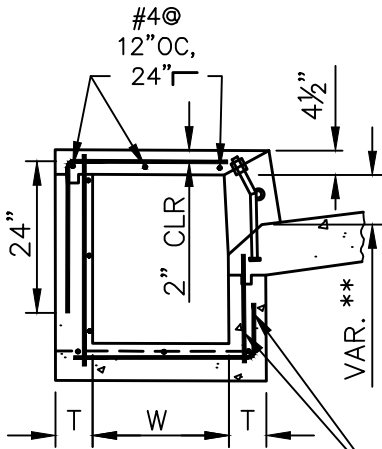
**1303**

SHT. 1 OF 2

**INLET TYPE III**

2" DIA. WEEPHOLES AT 24" OC; 2 WEEPHOLES MIN. PER WALL; MIN. 6" BELOW KEYED CONSTRUCTION JOINT.

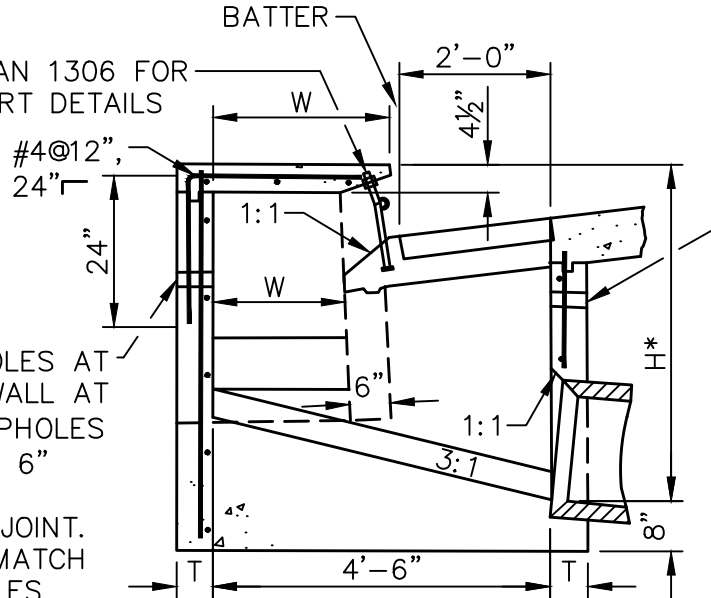
SEE STD. PLAN 1306 FOR CURB SUPPORT DETAILS



**SECTION H-H**

2" DIA. WEEPHOLES AT SIDES & BACKWALL AT 24" OC; 2 WEEPHOLES PER WALL; MIN. 6" BELOW KEYED CONSTRUCTION JOINT. ELEVATION TO MATCH FRONT WEEPHOLES

#4@12" OC



**SECTION G-G**

\* WHEN OUTLET PIPE IS CONSTRUCTED WITHIN ROADWAY A MINIMUM OF 30 INCHES (COUNTY ORD. NO. 6-3-69) OR THE ROADWAY STRUCTURAL SECTION THICKNESS PLUS 6 INCHES, WHICHEVER IS GREATER, SHALL BE MAINTAINED BETWEEN THE TOP OF PIPE AND THE ROADWAY SURFACE.

\*\* AS INDICATED ON PLANS, AND AS APPROVED BY THE ENGINEER.

**NOTES:**

1. CURB OPENING SHALL CONFORM TO CURB ALIGNMENT.
2. SEE STD. PLANS 1306 AND 1307 FOR DETAILS AND NOTES.
3. SEE STD. PLAN 1308 FOR LOCAL DEPRESSION DETAILS.
4. DECK INCLUDING STEEL REINFORCEMENT SHALL BE CONSTRUCTED THE SAME WIDTH AS SIDEWALK (UP TO 6 FEET WIDE).
5. A STAINLESS STEEL MARKER PER THE SPECIAL PROVISIONS WITH THE WORDS "NO DUMPING DRAINS TO OCEAN" SHALL BE MOUNTED ON THE TOP OF THE INLET WITH SILKABOND ADHESIVE OR EQUAL.
6. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.
7. BASIN FLOOR SHALL BE GIVEN A STEEL TROWEL FINISH. SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.
8. CONCRETE STRENGTH AND TYPE SHALL BE PER STD. PLAN 1803.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

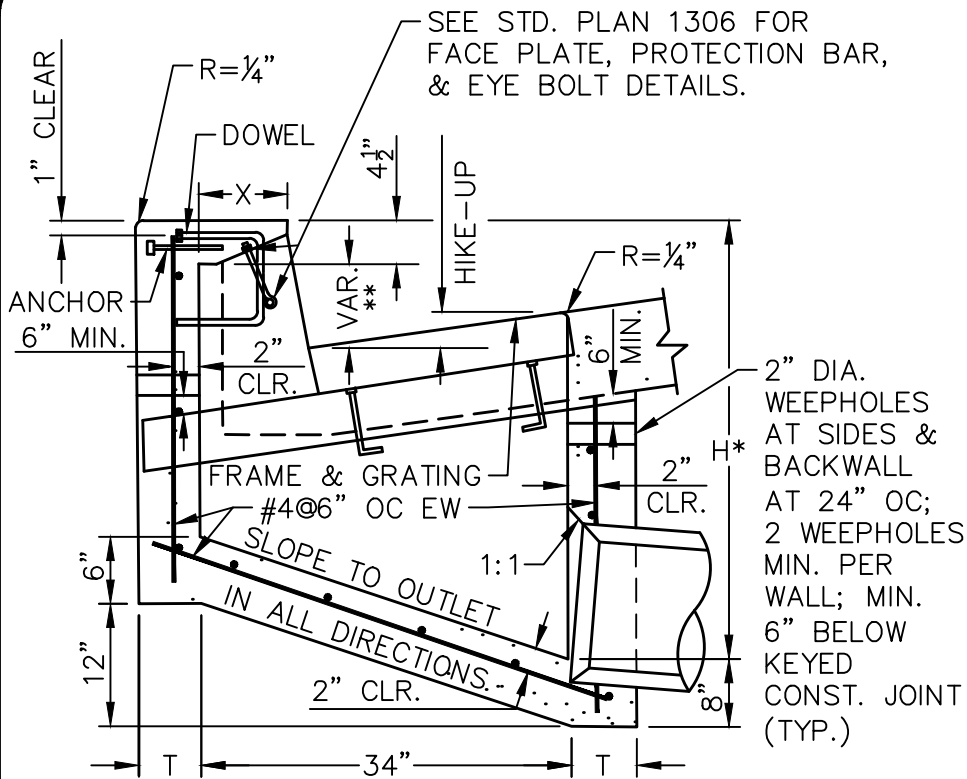
Revision: August 2018

STD. PLAN

**1303**

SHT. 2 OF 2

**INLET TYPE III**



**SECTION A-A**

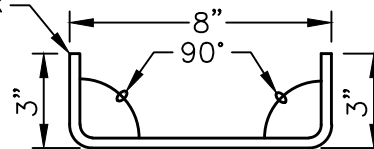
\* SEE NOTE 9 ON SHEET 2

\*\* TO BE DETERMINED BY THE ENGINEER AND AS INDICATED ON PLANS.

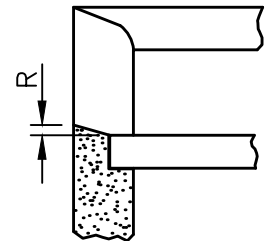
STEEL LIST						
NUMBER OF GRATINGS		#4 BARS 11" LONG		FACE PLATE (SEE STD. PLAN 1306)		
1	5	3'-10 <sup>7</sup> / <sub>8</sub> "	2	2	SEE NOTES	3 <sup>3</sup> / <sub>4</sub> " GALV. STEEL STEPS
2	12	7'-3 <sup>3</sup> / <sub>4</sub> "	2	3		
3	19	10'-8 <sup>7</sup> / <sub>8</sub> "	2	4		
				DOWELS		
				ANCHORS		
				REINFORCING STEEL		
				PROTECTION BAR (SEE STD. PLAN 1306)		

2" DIA. WEEPHOLES AT SIDES & BACKWALL AT 24" OC; 2 WEEPHOLES MIN. PER WALL; MIN. 6" BELOW KEYED CONST. JOINT (TYP.)

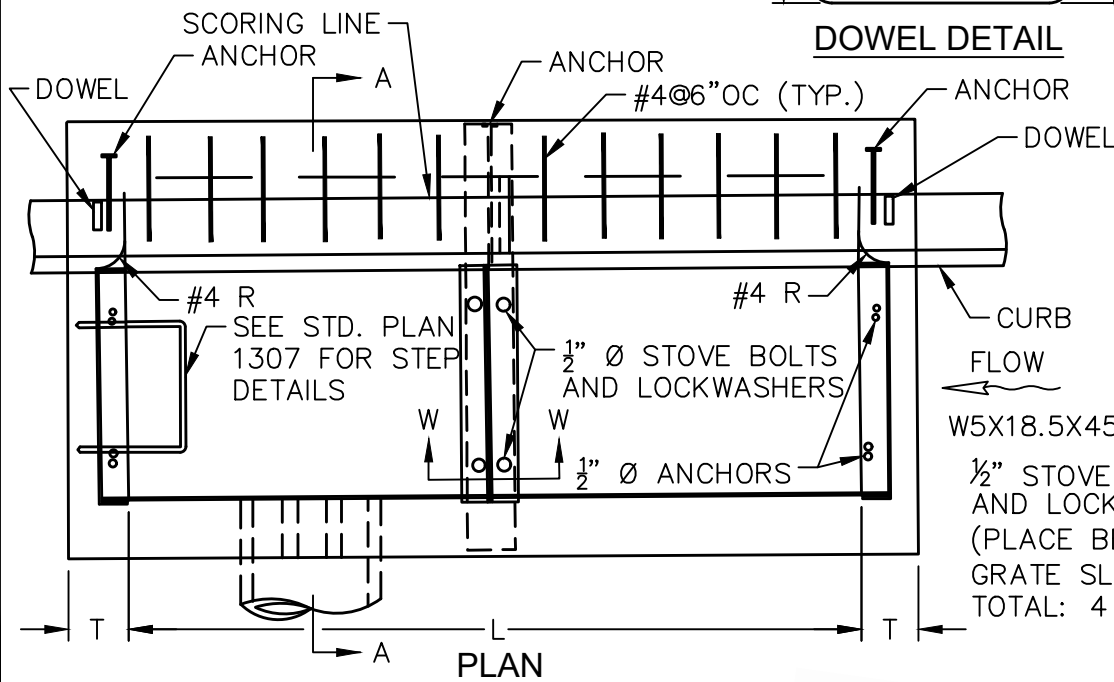
#4 DEF. BAR



**DOWEL DETAIL**

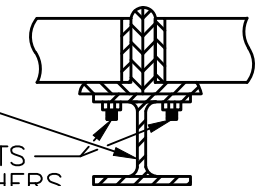


**END WALL DETAIL**



**PLAN**

W5X18.5X45"  
1/2" STOVE BOLTS AND LOCKWASHERS. (PLACE BETWEEN GRATE SLATS). TOTAL: 4



**SECTION W-W**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

**1304**

SHT. 1 OF 2

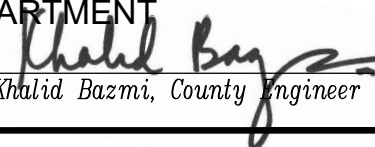
**INLET TYPE IV**

#### NOTES:

1. BASIN SHALL HAVE ONE GRATING UNLESS OTHERWISE SPECIFIED.
2. CURB OPENING SHALL CONFORM TO CURB ALIGNMENT.
3. CURVATURE OF THE END WALLS AT THE CURB OPENING SHALL BE FORMED BY CURVED FORMS AND SHALL NOT BE MADE BY PLASTERING.
4. DIMENSIONS:
  - HIKE-UP SHALL BE IN SAME PLANE AS LOCAL DEPRESSION.
  - $R = \frac{1}{2}$  INCH FOR LOWER END WALL OF A SINGLE BASIN, OR THE LOWEST BASIN OF A SERIES OF SPREAD BASINS.
  - $R = 0$  FOR ALL OTHER END WALLS.
  - $X = 8\frac{1}{2}$  INCHES FOR TYPE "A2-6" CURB.
  - $X = 8"$  FOR TYPE "A2-8" CURB.
  - $T = 6$  INCHES FOR  $H = 8$  FEET OR LESS.
  - $T = 8$  INCHES FOR  $H = 8$  FEET-1 INCH TO 20 FEET.
  - $H = 3$  FEET-6 INCHES UNLESS OTHERWISE SPECIFIED.
  - $L = 2$  FEET- $10\frac{7}{8}$  INCHES FOR ONE GRATING. ADD 3 FEET- $4\frac{7}{8}$  INCHES FOR EACH ADDITIONAL GRATING.
  - (SEE NOTE 4, STD. PLAN 1306 WHEN  $L = 7$  FEET).
5. EXPOSED SURFACES OF THE CATCH BASIN SHALL CONFORM IN SLOPE, GRADE, COLOR, FINISH AND SCORING TO EXISTING IMPROVEMENTS ADJACENT TO THE BASIN. THE TOP SHALL BE FINISHED TO CONFORM TO STANDARD SIDEWALK SLOPE AND FINISH WHERE NO SIDEWALK EXISTS.
6. OUTLET PIPE SHALL BE TRIMMED TO THE FINAL SHAPE AND LENGTH BEFORE CONCRETE IS PLACED.
7. BASIN FLOOR SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 12:1 (H:V) MINIMUM AND 3:1 (H:V) MAXIMUM RESPECTIVELY, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8 PERCENT IN WHICH CASE THE LONGITUDINAL SLOPE OF THE FLOOR SHALL BE THE SAME AS THE GUTTER GRADE. SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.
8. MISCELLANEOUS: SEE IMPROVEMENT PLANS FOR LENGTHS. SEE STD. PLANS 1306, 1307 AND 1308 FOR FACE PLATE, FACE PLATE ANCHORAGE, MISC. INLET DETAILS, ADDITIONAL NOTES, GRATE AND FRAME DETAILS, STEP DETAILS AND LOCAL DEPRESSION DETAILS.
9. WHEN THE OUTLET PIPE IS CONSTRUCTED WITHIN THE ROADWAY A MIN. OF 30 INCHES (CO. ORD. NO. 6-3-69) OR THE ROADWAY STRUCTURAL SECTION THICKNESS PLUS 6 INCHES, WHICHEVER IS GREATER, SHALL BE MAINTAINED BETWEEN THE TOP OF PIPE AND THE ROADWAY SURFACE.
10. A STAINLESS STEEL MARKER PER THE SPECIAL PROVISIONS WITH THE WORDS "NO DUMPING DRAINS TO OCEAN" SHALL BE MOUNTED ON THE TOP OF THE INLET WITH SILKABOND ADHESIVE OR EQUAL.
11. CONCRETE STRENGTH AND TYPE SHALL BE PER STD. PLAN 1803.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

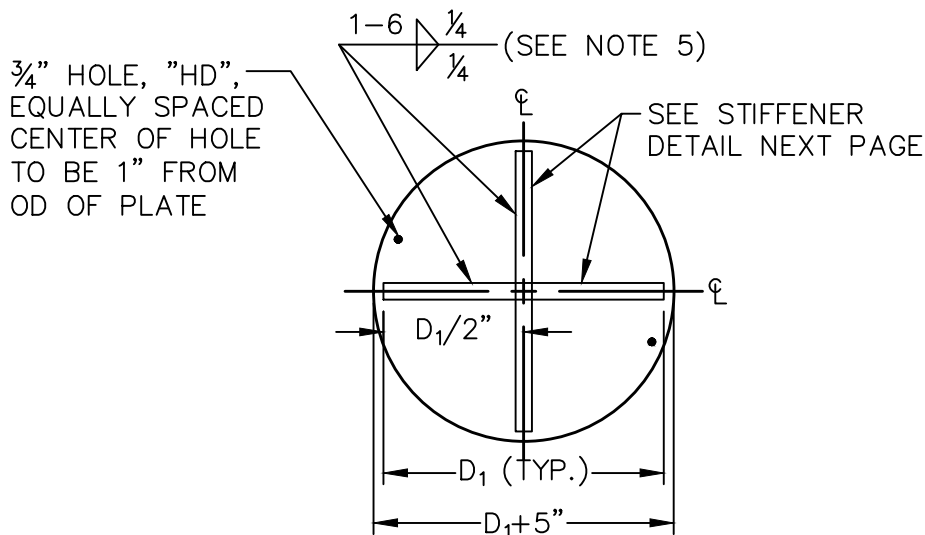
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INLET TYPE IV

STD. PLAN

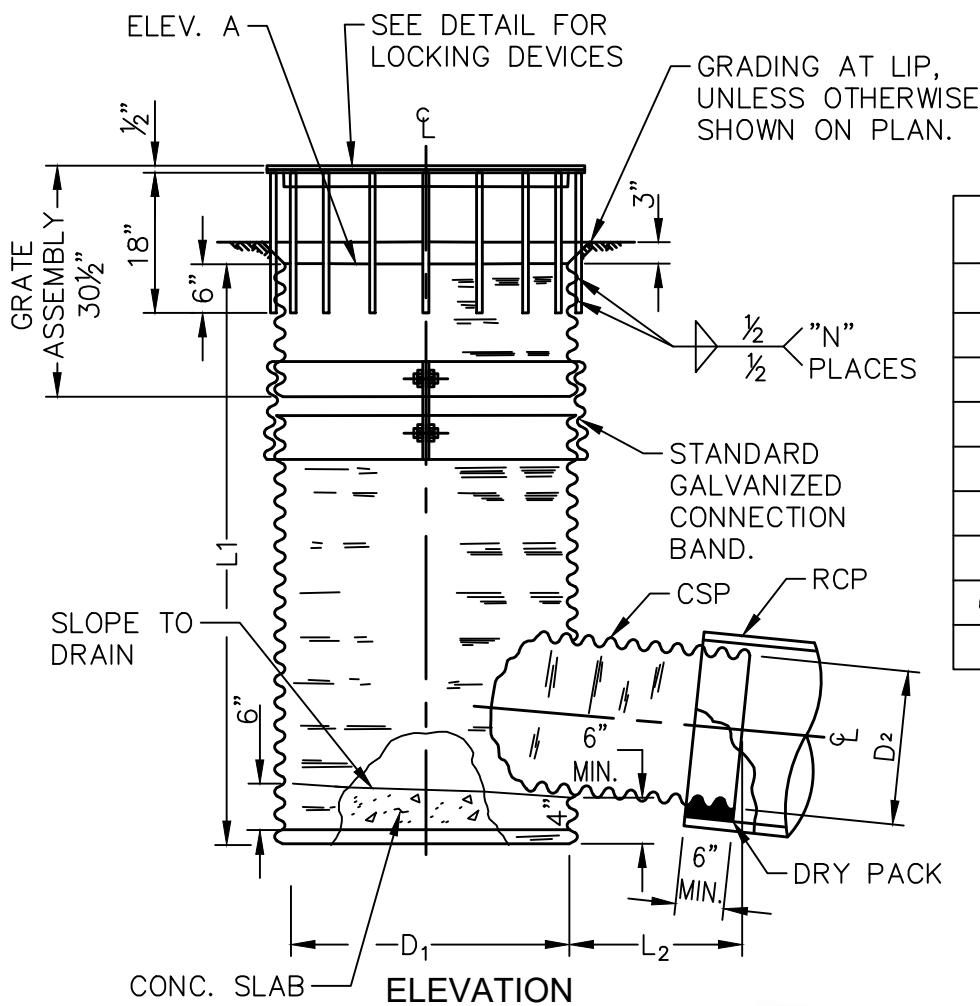
1304

SHT. 2 OF 2



**BOTTOM VIEW  
TOP PLATE**

$D_1$ RISER DIAMETER	CSP GAUGE
18"–27"	16
30"–39"	14
42"–48"	12
51"–66"	10



$D_1$	$\Delta$	n	HD
18"	40°	9	2
24"–27"	30°	12	
30"–33"	24°	15	3
36"–39"	20°	18	
42"–45"	16.5°	22	4
48"–51"	14.5°	25	
54"–57"	13°	28	
60"–63"	11.5°	31	
66"	10.5°	34	

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

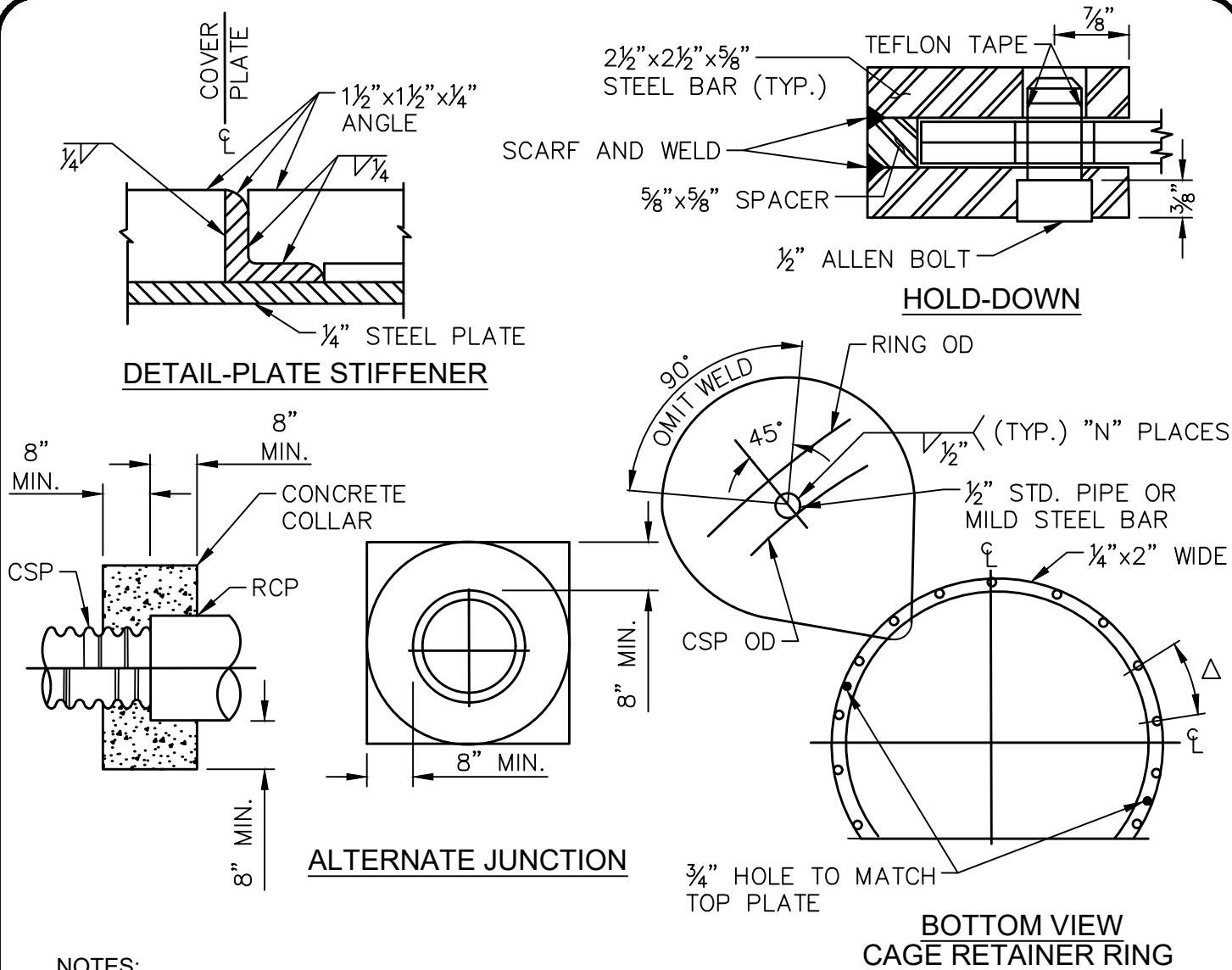
Revision: August 2018

STD. PLAN

**1305**

SHT. 1 OF 2

**INLET TYPE V**



**NOTES:**

1. RISER PIPE SHALL EXTEND TO "ELEV. A".
2. ELEVATIONS A, D<sub>1</sub>, D<sub>2</sub>, L<sub>1</sub>, L<sub>2</sub> SHALL BE DETERMINED BY ENGINEER AND BE SHOWN ON PLANS.
3. CORRUGATED STEEL PIPE SHALL CONFORM TO AASHTO M-36.
4. GRATE ASSEMBLY SHALL BE GALVANIZED AFTER FABRICATION.
5. FOR D<sub>1</sub> = 54 INCHES AND LARGER, WELD  $1\frac{1}{2}$  INCH X  $1\frac{1}{2}$  INCH X  $\frac{1}{4}$  INCH TO PLATE WITH 1 INCH WELDS AT 6 INCHES ON-CENTER.
6. N=NUMBER OF BARS ON GRATE ASSEMBLY.
7. GAUGE OF PIPE FOR DIAMETER D<sub>2</sub> SHALL BE SAME AS FOR RISER.
8. RISER AND STUB SHALL BE SHOP FABRICATED AND GALVANIZED AFTER WELDING.
9. A STAINLESS STEEL MARKER PER THE SPECIAL PROVISIONS WITH THE WORDS "NO DUMPING DRAINS TO OCEAN" SHALL BE BOLTED ON TO GRATE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
 Khalid Bazmi, County Engineer

Revision: August 2018

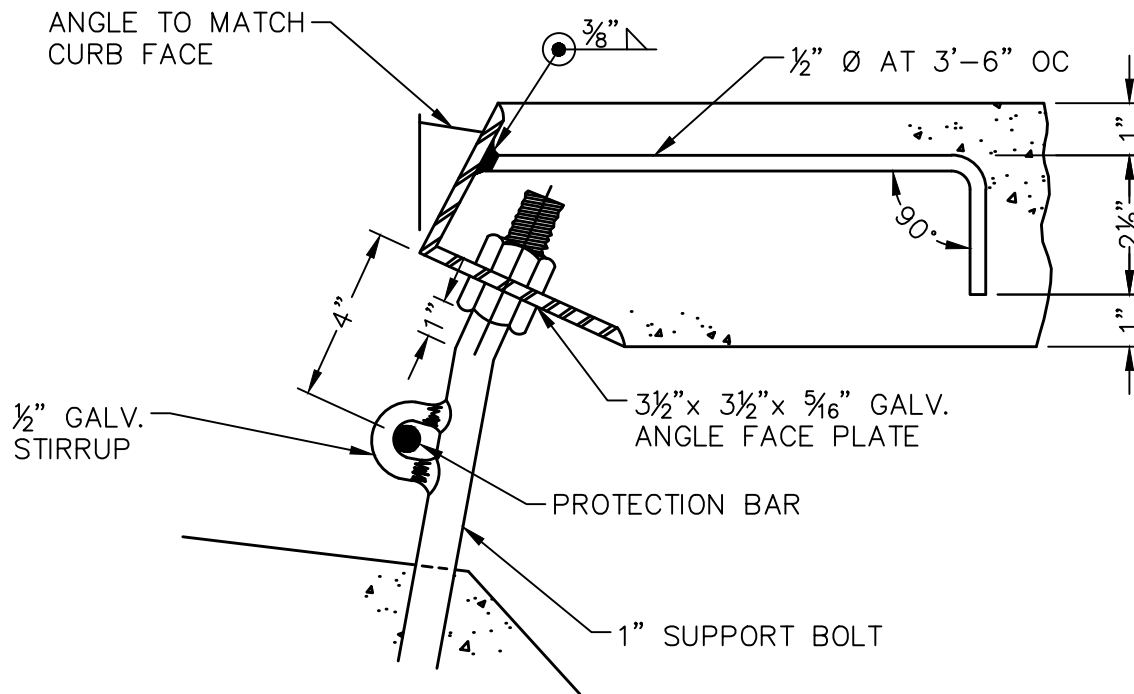
STD. PLAN

1305

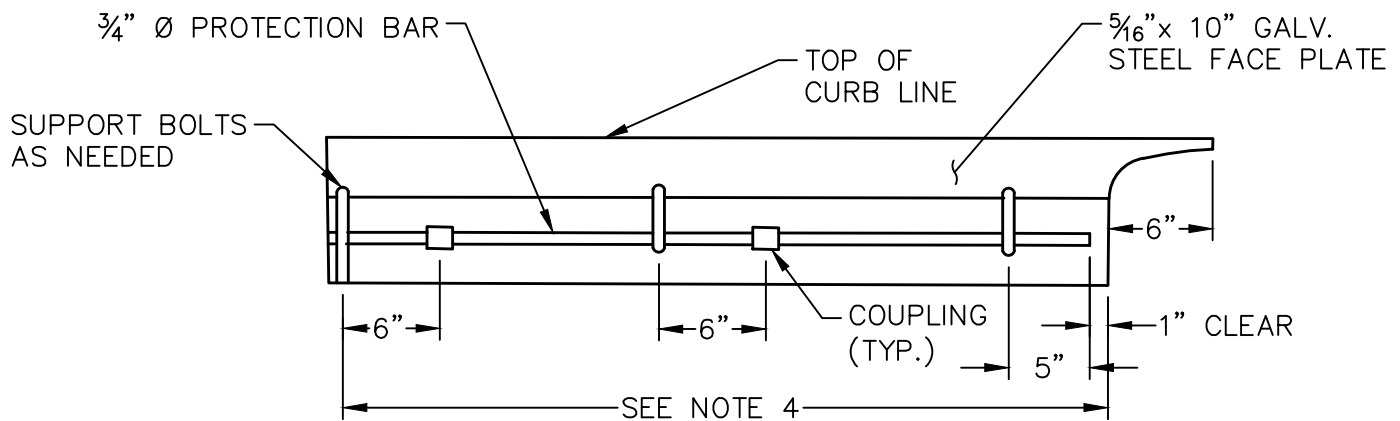
SHT. 2 OF 2

INLET TYPE V





DETAIL A



PROTECTION BAR DETAIL

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1306

SHT. 2 OF 3

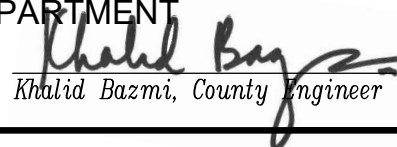
MISCELLANEOUS CURB INLET DETAILS AND NOTES

NOTES:

1. ONE EYEBOLT SHALL BE PLACED 12 INCHES FROM EACH END OF FACE PLATE.
2. EYEBOLTS SHALL BE SYMMETRICALLY SPACED IN THE CURB OPENING SO THAT THE UNSUPPORTED SPAN IS NOT MORE THAN 4 FEET; SUPPORT BOLTS, WHEN USED, SHOULD BE CONSIDERED AS EYEBOLTS IN THE SPACING.
3. ONE COUPLING SHALL BE PLACED 6 INCHES TO THE RIGHT OR LEFT OF EACH EYEBOLT WITH THE EXCEPTION OF THE LAST EYEBOLT. COUPLINGS SHALL BE THREADED TO FACILITATE REMOVAL OF PROTECTION BAR.
4. GALVANIZED STEEL SUPPORT BOLTS SHALL BE INSTALLED WHEN LENGTH OF CURB OPENING EXCEEDS 7- FEET AND SHALL BE SPACED AT NOT MORE THAN 7 FEET ON-CENTER AND NOT LESS THAN 5 FEET ON-CENTER.
5. FACE PLATE ANCHORS SHALL BE UNIFORMLY SPACED NOT TO EXCEED 4 FEET BETWEEN CENTERS AND SHALL BE PLACED 4½ INCHES FROM EACH END OF THE FACE PLATE. AN ANCHOR SHALL BE PLACED OVER EACH W-BEAM IN A GRATING INLET.
6. A COUPLING MAY BE OMITTED PROVIDED THE PROTECTION BAR IS REMOVABLE AFTER INSTALLATION.
7. ALL METAL SHALL BE GALVANIZED AFTER FABRICATION.
8. SUPPORT BOLTS, EYEBOLTS, AND ANCHORS MAY BE ATTACHED BY A FULL PENETRATION BUTT WELD AS AN ALTERNATE.
9. PLACE A ¾-INCH DIA. PROTECTION BAR HORIZONTALLY ACROSS THE ENTIRE LENGTH OF THE CURB OPENING.
10. SEE STD. PLAN 1307 FOR ADDITIONAL MISCELLANEOUS INLET DETAILS AND NOTES.
11. CURB SECTION SHALL MATCH ADJACENT CURB TYPE.
12. CURB OPENING SHALL CONFORM TO CURB ALIGNMENT.
13. HEIGHT OF CURB OPENING WILL VARY WITH THE TYPE OF CURB AND THE DEPTH OF THE LOCAL DEPRESSION (STD. PLAN 1308).
14. THE ANGLE AS SHOWN ON DETAIL A SHALL BE ALLOWED ONLY WHEN ON APPROVED PLANS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

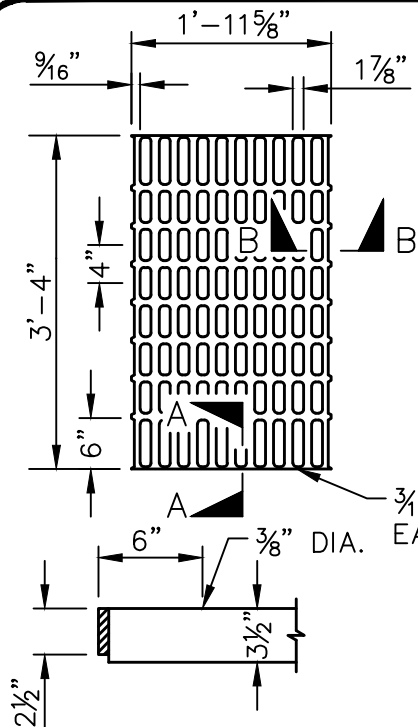
STD. PLAN

1306

MISCELLANEOUS CURB INLET DETAILS AND NOTES

SHT. 3 OF 3





SECTION A-A

WELDED STEEL GRATE

NOTES:

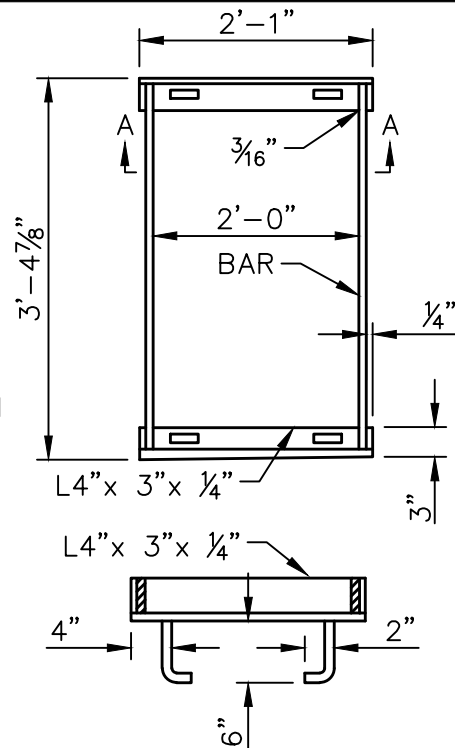
BEARING BARS TO BE  
3 1/2" x 1/4" BARS  
ON 1 7/8" CENTERS.

3/8" DIA. CROSS BARS  
RESISTANCE WELDED OR  
ELECTROFORGED TO  
BEARING BARS.

WEIGHT OF GRATE = 141 LBS  
USE TYPICAL FRAME AS SHOWN

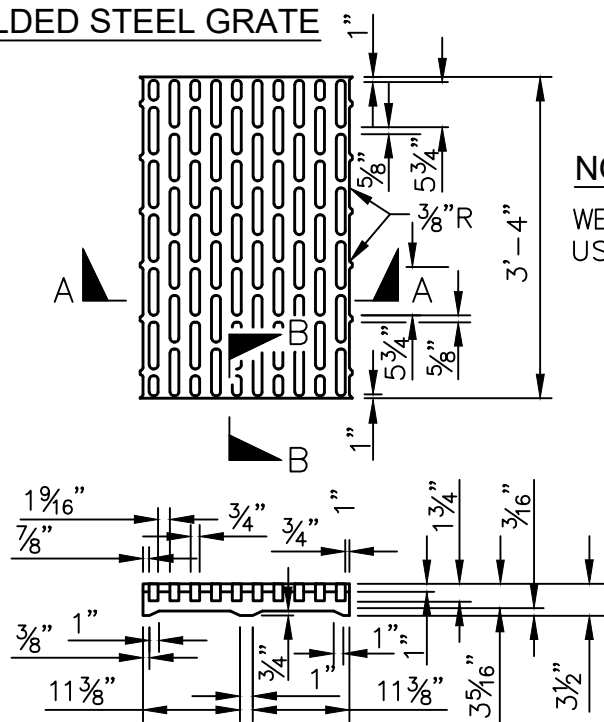
3/16" FILLET WELD FULL DEPTH  
EACH SIDE ALL BARS

SECTION B-B



SECTION A-A

TYPICAL FRAME

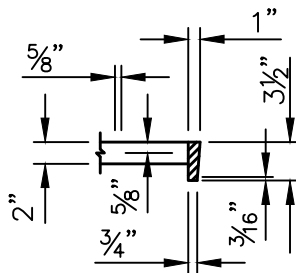


SECTION A-A

CAST MODULAR IRON GRATE

NOTE:

WEIGHT OF GRATE = 155 LBS  
USE TYPICAL FRAME AS SHOWN



SECTION B-B

GRATE & FRAME DETAILS  
(SEE SHEET 3 FOR LOCKING DEVICE)

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

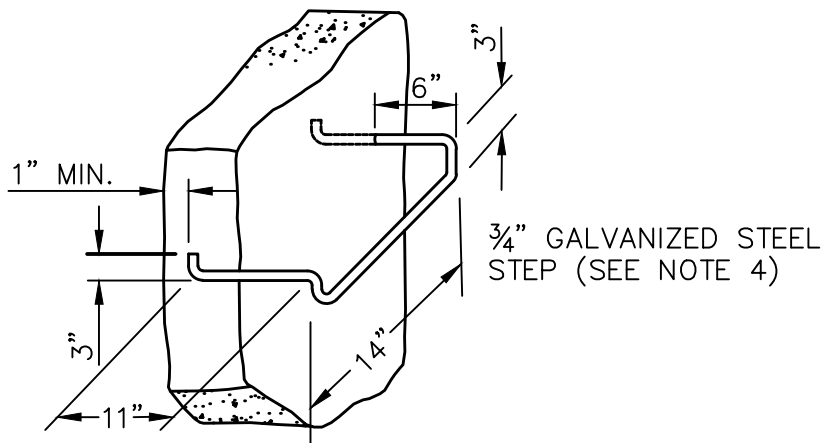
Revision: August 2018

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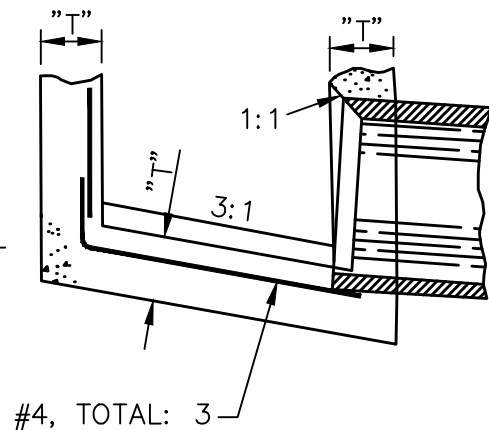
1307

SHT. 1 OF 3

MISCELLANEOUS CURB INLET DETAILS AND NOTES



STEP DETAIL



ALTERNATE  
REINFORCED FLOOR

(SEE NOTE 7)

NOTES:

1. GRATE AND FRAME SHALL BE GALVANIZED. SEE GREENBOOK OR SPECIAL PROVISIONS.
2. FOR "T" WALL THICKNESS SEE TABLE ON INLET PLAN.
3. REINFORCING STEEL SHALL BE #4 BARS AT 18 INCHES ON CENTER PLACED 1½ INCHES CLEAR TO INSIDE OF BOX, UNLESS OTHERWISE SHOWN.
4. STEPS – NONE REQUIRED WHERE "H" IS 3 FEET–6 INCHES OR LESS. INSTALL ONE STEP 16 INCHES ABOVE FLOOR WHEN "H" IS MORE THAN 3 FEET–6 INCHES AND LESS THAN 5 FEET–0 INCHES. WHERE "H" IS MORE THAN 5 FEET–0 INCHES, STEPS SHALL BE EVENLY SPACED AT 16 INCHES INTERVALS FROM 16 INCHES ABOVE FLOOR TO WITHIN 12 INCHES OF THE TOP OF THE BOX. PLACE STEPS IN WALL WITHOUT PIPE OPENINGS.
5. PIPE(S) CAN BE PLACED IN ANY WALL.
6. EXCEPT FOR INLETS USED AS JUNCTION BOXES AND AS NOTED ON PLANS, BASIN FLOORS SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 12:1 (H:V) MINIMUM AND 3:1 (H:V) MAXIMUM RESPECTIVELY, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8 PERCENT IN WHICH CASE THE LONGITUDINAL SLOPE OF THE FLOOR SHALL BE THE SAME AS THE GUTTER GRADE. SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.
7. ALTERNATE REINFORCED FLOOR AT THE OPTION OF THE CONTRACTOR.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1307

SHT. 2 OF 3

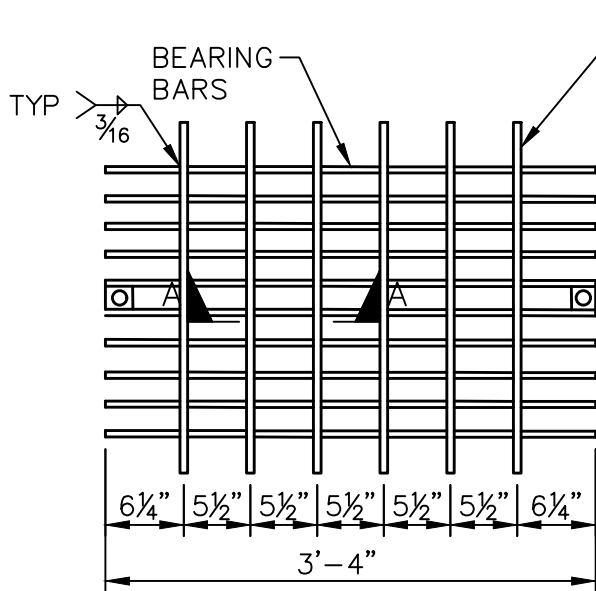
MISCELLANEOUS CURB INLET DETAILS AND NOTES

## CONSTRUCTION NOTES:

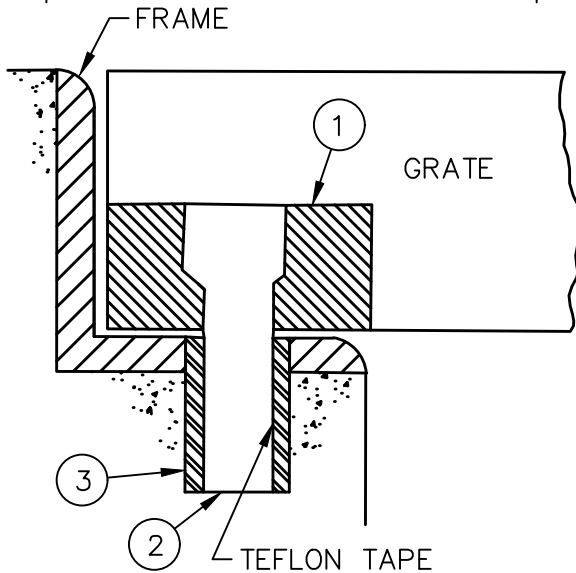
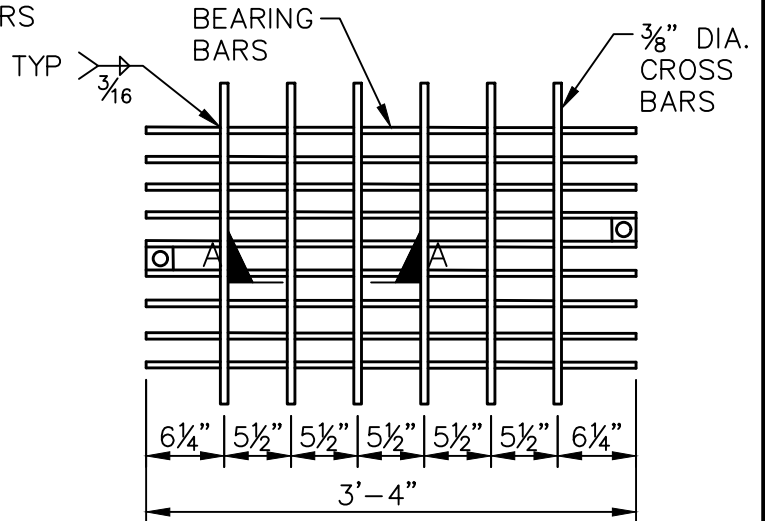
- ① USE  $\frac{3}{4}$  INCH THICK STEEL BAR. DRILL  $\frac{1}{2}$  INCH HOLE & COUNTERSINK WITH  $\frac{3}{4}$  INCH DRILL  $\frac{3}{8}$  INCH DEEP. WELD TO GRATE. PAINT TO PREVENT RUST.
- ②  $\frac{1}{2}$  INCH DIA. ALLEN BOLT.
- ③ USE  $\frac{1}{2}$  INCH CONCRETE ANCHOR OR OR  $\frac{1}{2}$  INCH THREADED RECEIVER WELDED TO FRAME

IF THERE ARE AN EVEN NUMBER OF BARS IN THE GRATE, INSTALL THE HOLD-DOWNS IN THE CENTER SPACE

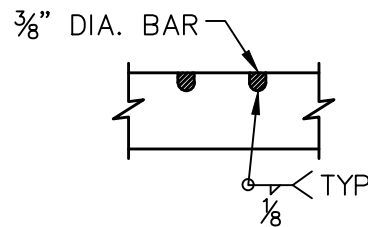
IF THERE ARE AN ODD NUMBER OF BARS IN THE GRATE, INSTALL THE HOLD-DOWNS ON OPPOSITE SIDES OF THE CENTER BAR.



$\frac{3}{8}$ " DIA. CROSS BARS



GRATE HOLD-DOWN



SECTION A-A

## NOTES:

BEARING BARS TO BE  $3\frac{1}{2}$ " X  $\frac{3}{8}$ "  
BARS ON  $1\frac{7}{8}$ " CENTERS.

$\frac{3}{8}$ " DIA. CROSS BARS RESISTANCE WELDED  
OR ELECTROFORGED TO BEARING BARS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

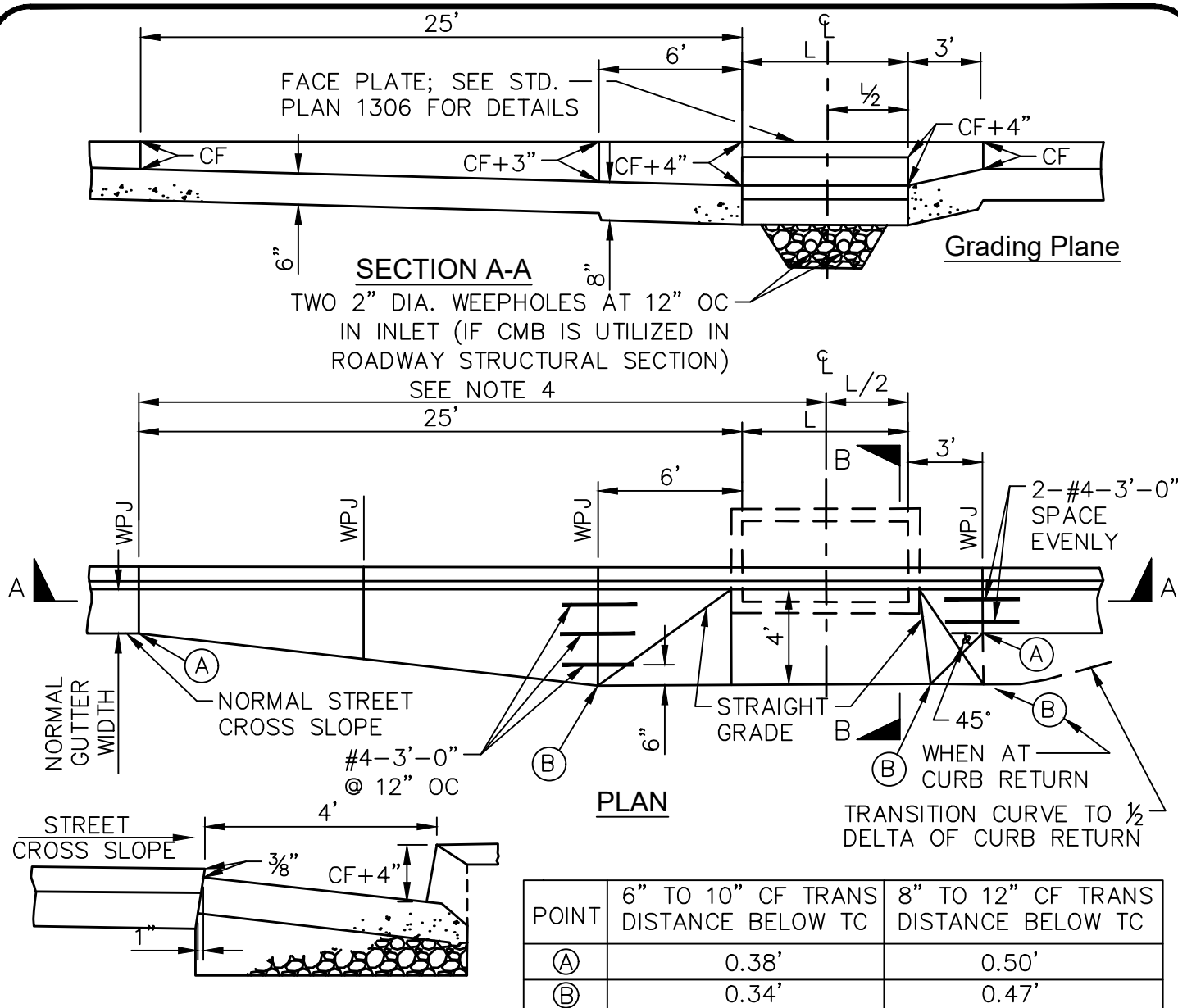
STD. PLAN

1307

SHT. 3 OF 3

MISCELLANEOUS CURB INLET DETAILS AND NOTES





COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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*Khalid Bazmi*  
 Khalid Bazmi, County Engineer

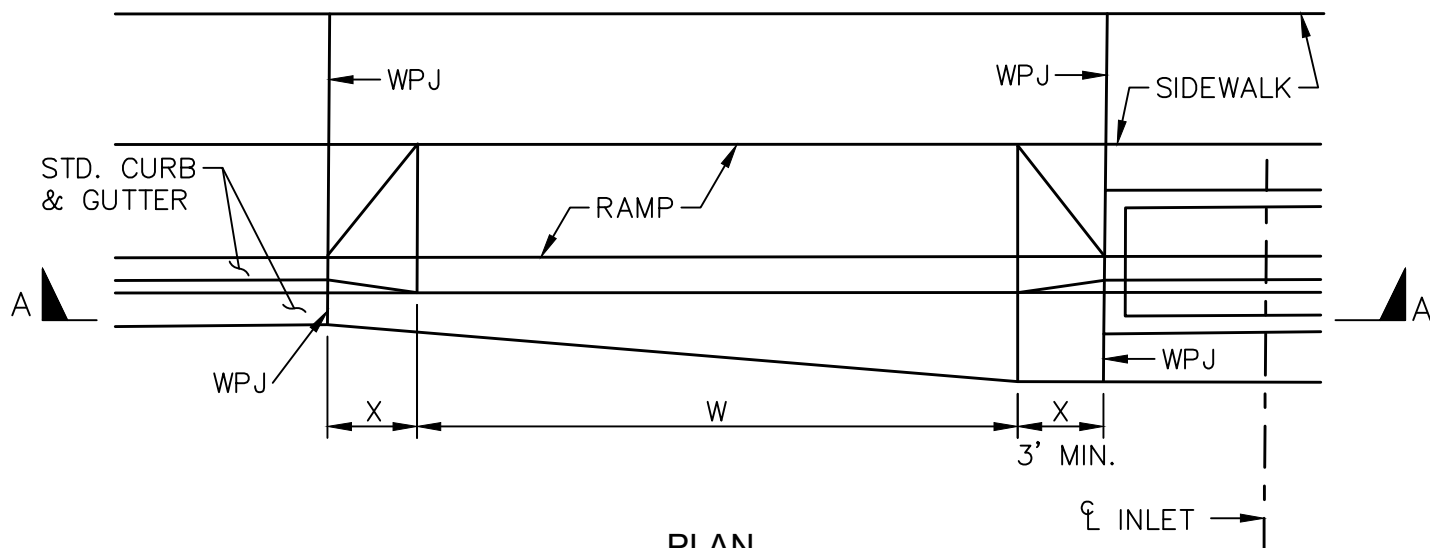
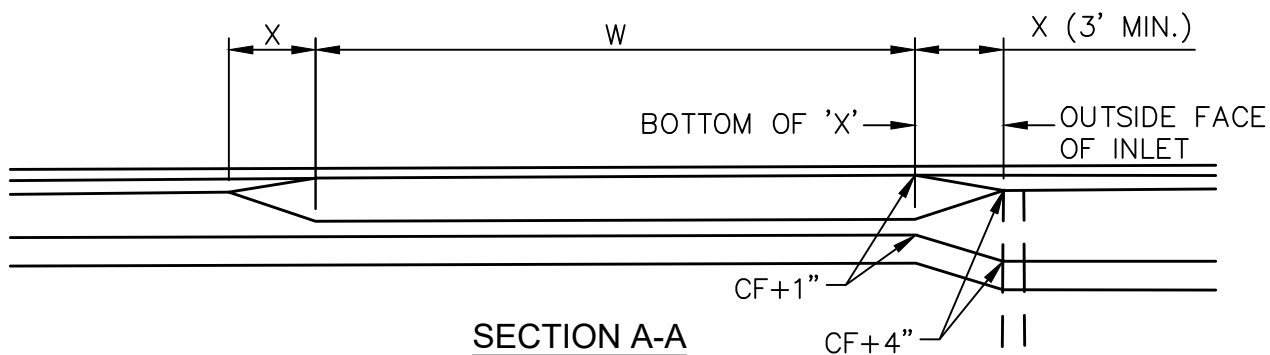
Revision: August 2018

STD. PLAN

1308

LOCAL DEPRESSION

SHT. 1 OF 2



### TYPE "A"

#### NOTES:

1. TYPE A LOCAL DEPRESSION SHALL BE USED ADJACENT TO DRIVEWAY DEPRESSIONS ONLY.
2. USE OF TYPE A LOCAL DEPRESSION MAY REQUIRE LENGTHENING OF INLET TO PROVIDE ADEQUATE HYDRAULIC CAPACITY.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

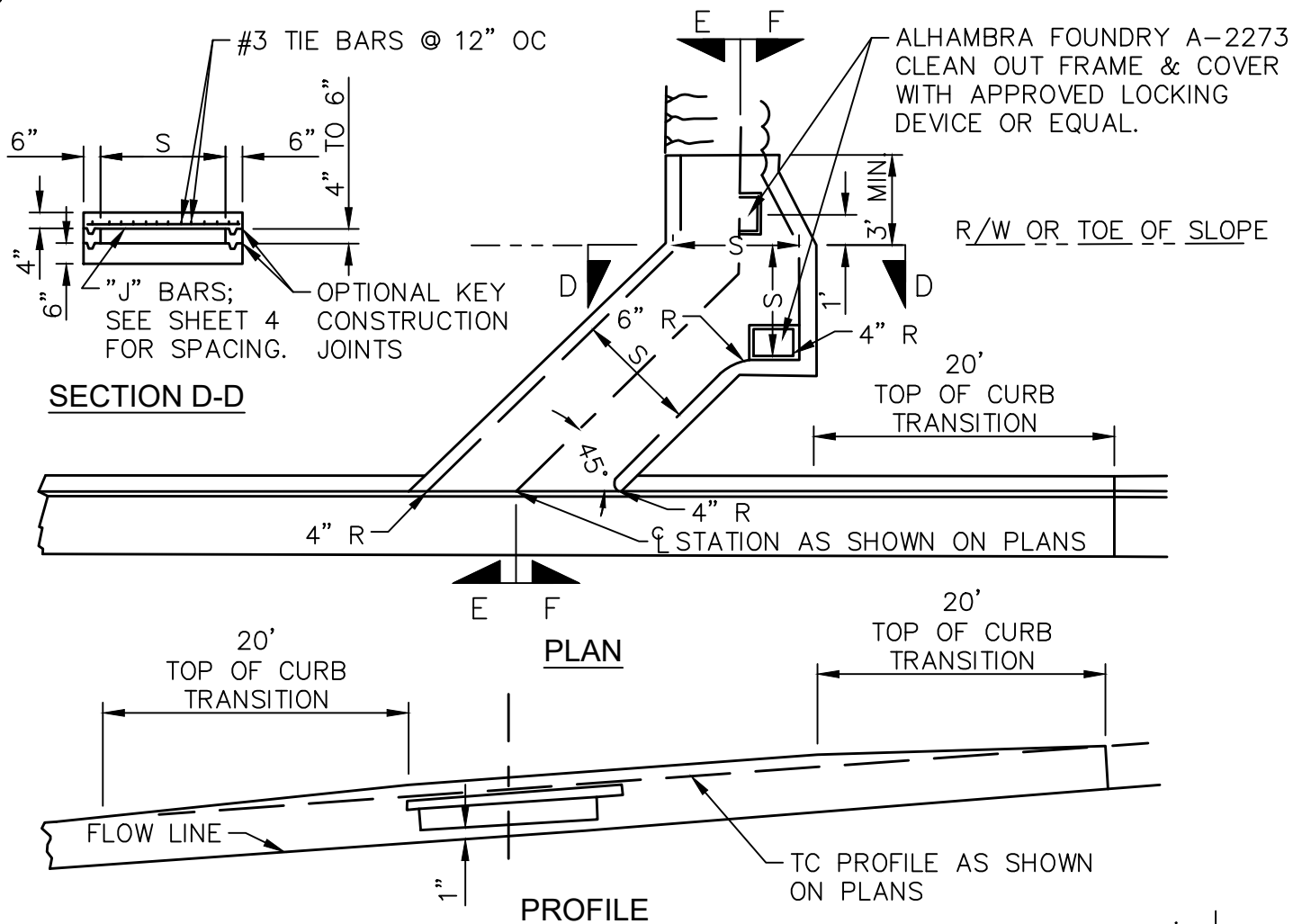
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1308

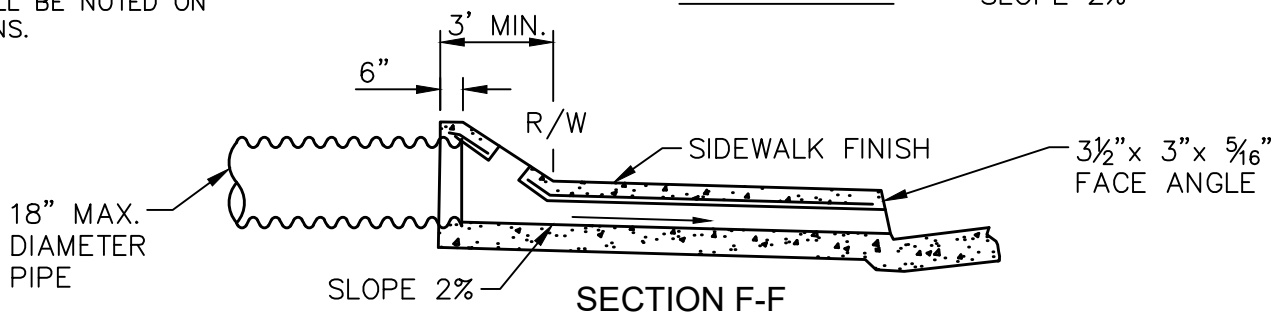
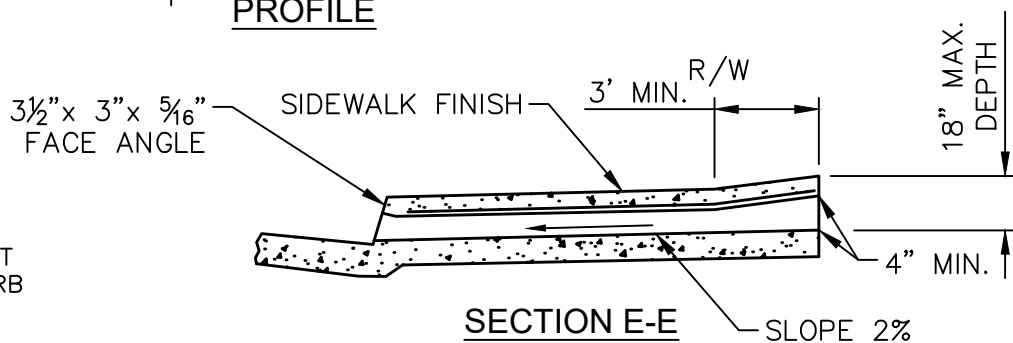
SHT. 2 OF 2

LOCAL DEPRESSION



**NOTES:**

1. SEE SHEET 4 FOR DETAILS AND NOTES.
2. SPAN "S" AND HEIGHT OF OPENING AND CURB FACE AT CULVERT SHALL BE NOTED ON PLANS.



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

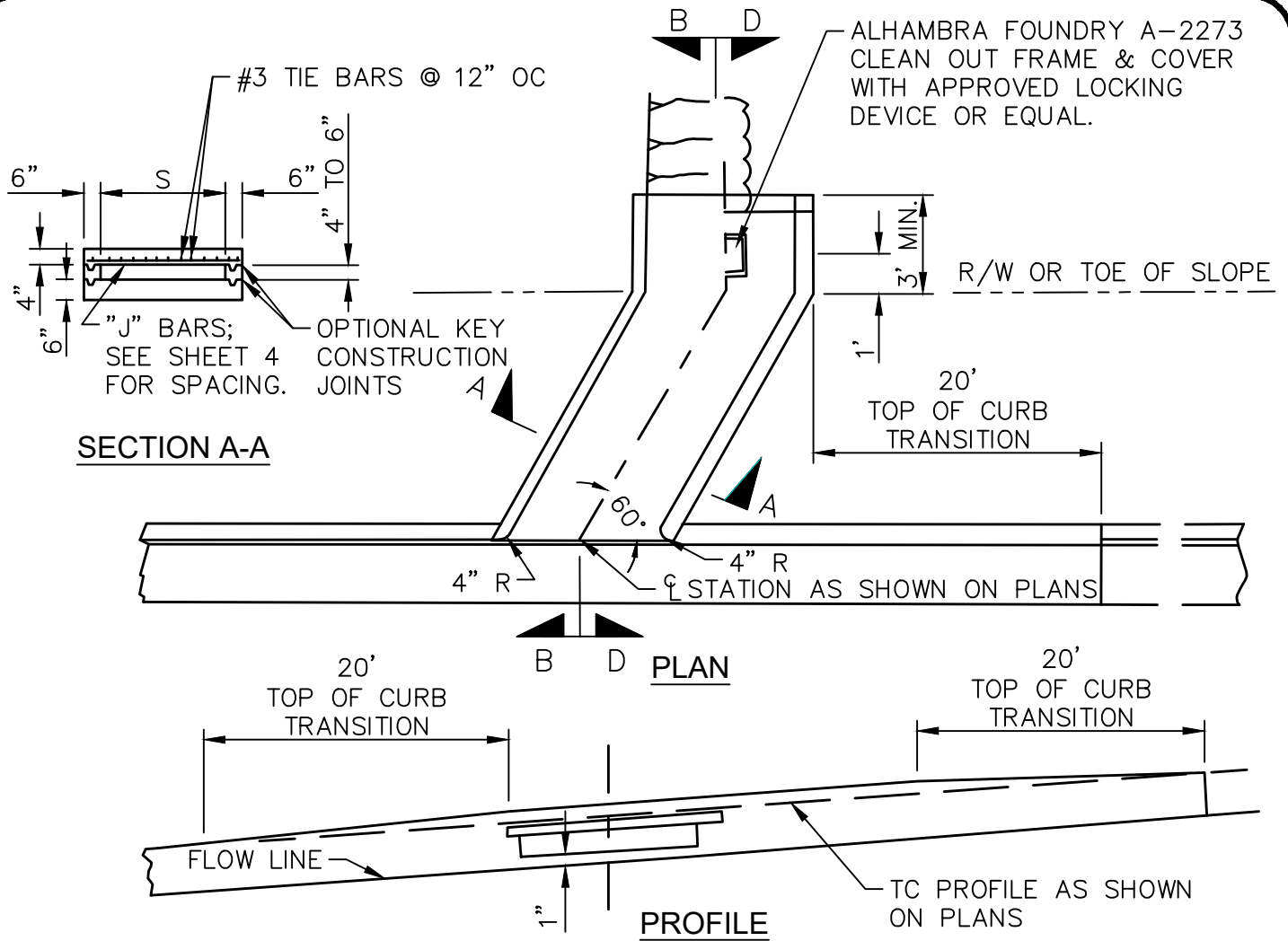
Revision: August 2018

STD. PLAN

1309

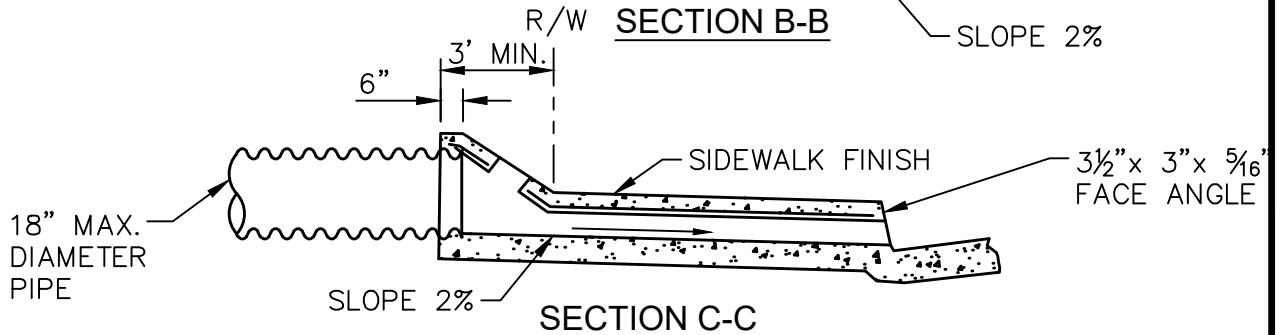
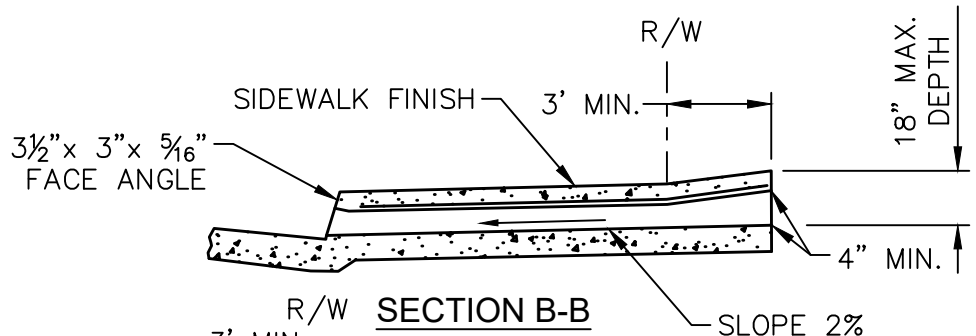
SHT. 1 OF 4

PARKWAY CULVERT TYPE - "A"



**NOTES:**

1. SEE SHEET 4 FOR DETAILS AND NOTES.
2. SPAN "S" AND HEIGHT OF OPENING AND CURB FACE AT CULVERT SHALL BE NOTED ON PLANS.



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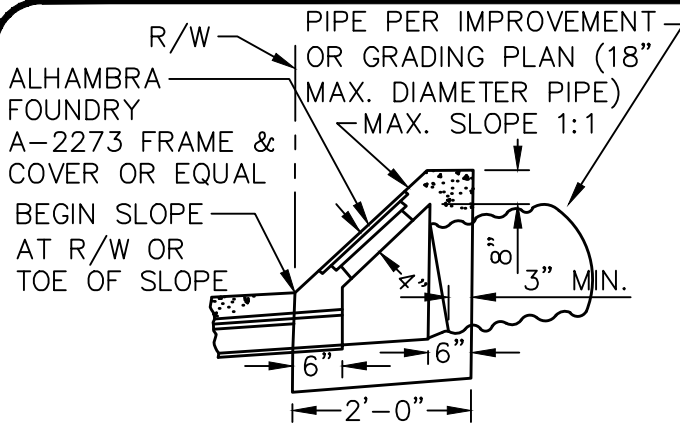
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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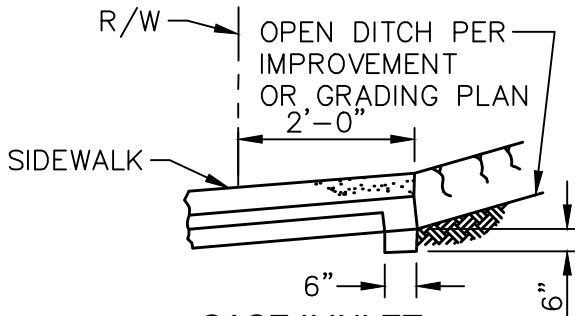
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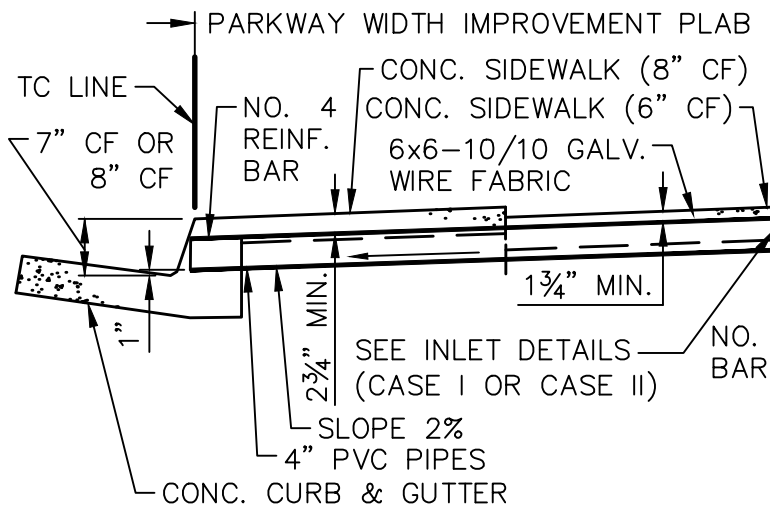
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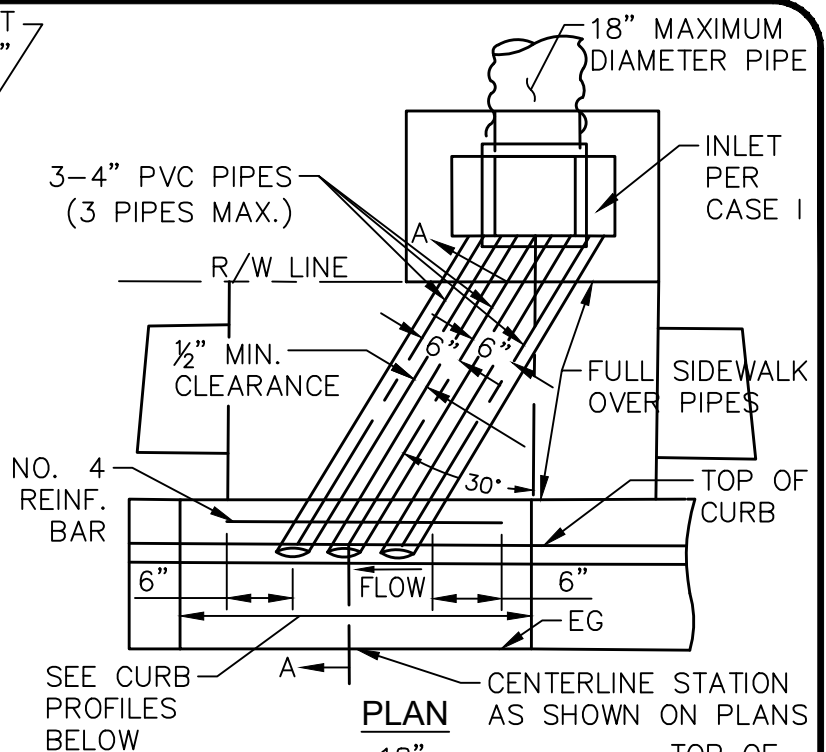
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TRANSITION STRUCTURE SECTION



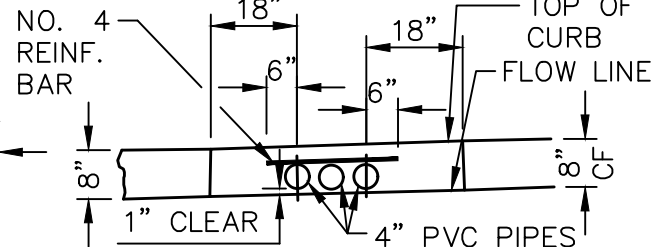
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**SECTION A-A**

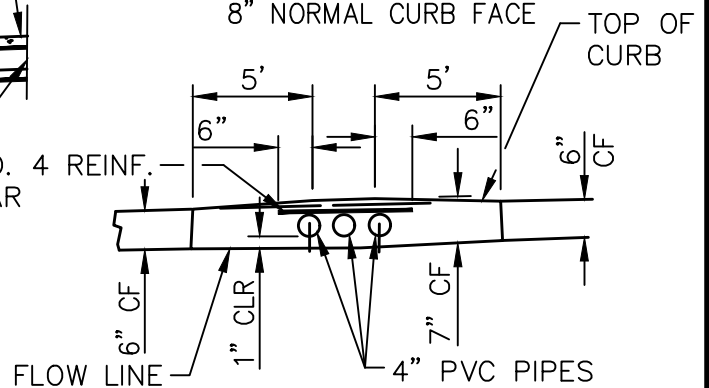


**PLAN**



**CURB PROFILE**

8" NORMAL CURB FACE



**CURB PROFILE**

6" NORMAL CURB FACE

\* NORMAL TO GRADE LINE AS SHOWN ON PROFILE

**NOTES:**

1. SEE SHEET 4 FOR DETAILS AND NOTES.
2. ALHAMBRA FOUNDRY A-470 RECTANGULAR CAST IRON CONDUIT MAY BE SUBSTITUTED AT THE CONTRACTOR'S OPTION OR AS SPECIFIED ON THE PLANS.
3. PVC PIPES SHALL BE SCHEDULE 80.

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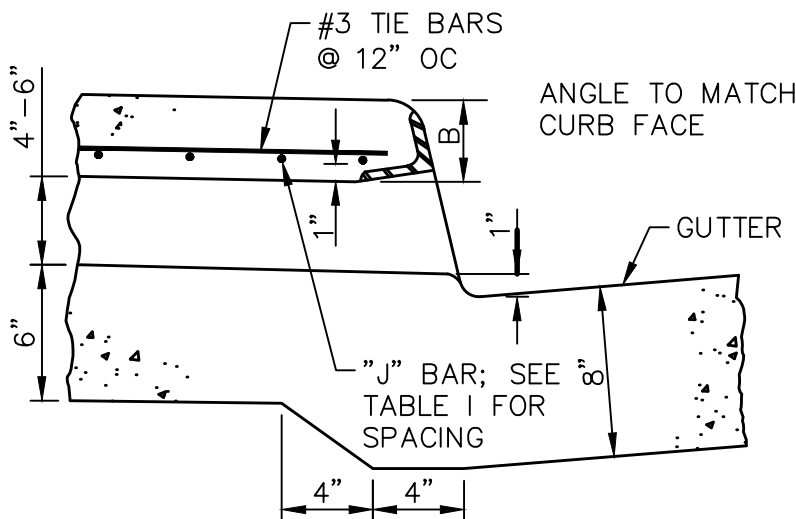
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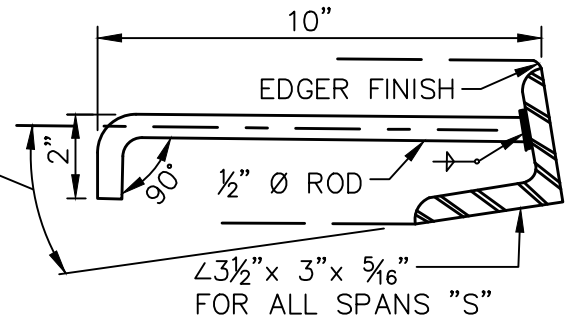
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SHT. 3 OF 4

**PARKWAY CULVERT - TYPE "C"**



**OUTLET DETAIL**



LENGTH OF CURB OPENING	NO. OF ANCHORS
3' OR LESS	2
3'-6" TO 6'-0"	3

**FACE ANGLE ANCHOR  
DETAIL**

Span S	B	STEEL	SCHEDULE	J-BARS
		SIZE	SPACING C-C	LENGTH
2'-0"	3"	#3	7"	2'-9"
2'-6"	"	"	"	3'-3"
3'-0"	"	"	"	3'-9"
3'-6"	"	"	6"	4'-3"
4'-0"	"	"	5"	4'-9"
4'-6"	4"	"	6½"	5'-3"
5'-0"	"	"	5"	5'-9"
5'-6"	"	"	4"	6'-3"
6'-0"	"	"	3½"	6'-9"

**TABLE 1**

**GENERAL NOTES:**

1. USE PARKWAY CULVERT – TYPE "A" WHEN INLET VELOCITIES ARE 10 FEET PER SECOND OR GREATER.
2. USE PARKWAY CULVERT – TYPE "B" WHEN INLET VELOCITIES ARE LESS THAN 10 FEET PER SECOND.
3. USE PARKWAY CULVERT – TYPE "C" WHEN INLET VELOCITIES ARE LESS THAN 5 FEET PER SECOND.
4. FLOOR OF PARKWAY CULVERT SHALL HAVE A STEEL TROWEL FINISH.
5. ALL EXPOSED METAL SHALL BE GALVANIZED AFTER FABRICATION.
6. HEIGHT OF CURB OPENING FOR TYPES "A" & "B" PARKWAY CULVERTS WILL VARY WITH TYPE OF CURB.
7. SPAN "S" AND HEIGHT OF CURB OPENING WILL BE DETERMINED FROM THE REQUIRED HYDRAULIC CAPACITY AND LIMITED TO THE DIMENSION IN TABLE 1.
8. REINFORCING STEEL SHALL BE 1 INCH CLEAR TO INSIDE OF CULVERT, UNLESS OTHERWISE SHOWN.

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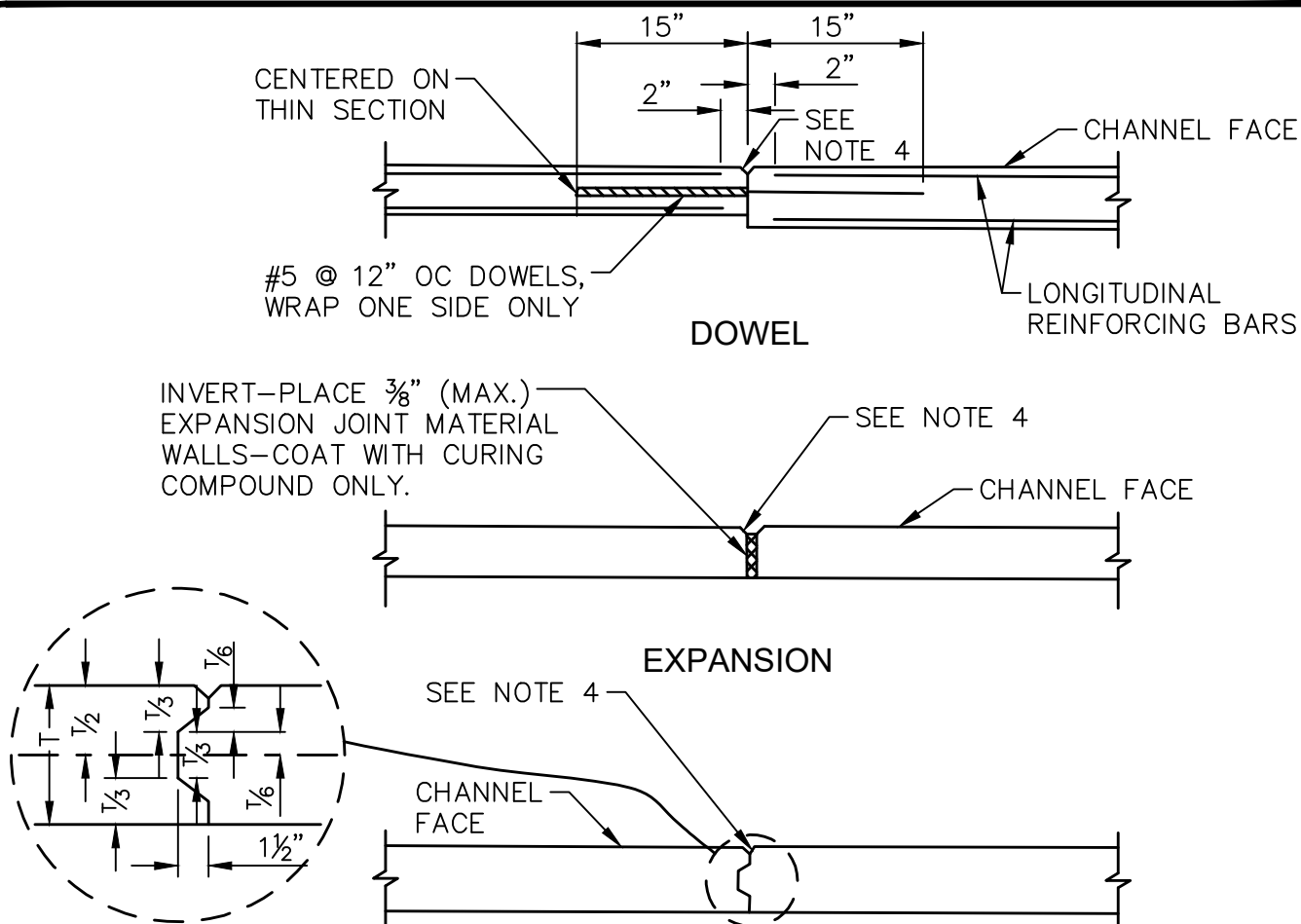
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SHT. 4 OF 4

**PARKWAY CULVERT - DETAILS AND NOTES**



#### NOTES:

1. EXPANSION JOINTS SHALL BE USED FOR RC CHANNEL AT INTERVALS NOT LESS THAN 10 FEET OR MORE THAN 50 FEET, UNLESS OTHERWISE NOTED.
2. ALL JOINTS SHALL BE IN THE SAME PLANE FOR THE ENTIRE STRUCTURE AND ON THE RADIAL FOR CURVED SECTIONS. NO STAGGERING OF JOINTS WILL BE PERMITTED.
3. CONSTRUCTION JOINTS SHALL BE USED FOR RCB CULVERTS AT INTERVALS NOT LESS THAN 10 FEET OR MORE THAN 50 FEET, UNLESS OTHERWISE NOTED.
4. JOINT FINISH FOR CHANNEL FACE SHALL BE CHAMFERED 1/2 INCH ON WALLS AND DECKS AND ROUNDED WITH EDGER TOOL ON INVERT.
5. LOCATION OF DOWEL JOINTS SHALL BE SHOWN ON PLANS.
6. EXPANSION JOINT MATERIAL SHALL MEET THE REQUIREMENT OF SECTION 201-3.2, "PREMOLDED JOINT FILLER", OF THE GREENBOOK AND SHALL BE APPROVED BY THE ENGINEER.
7. ALL JOINT TYPES SHALL BE SPECIFIED BY THE ENGINEER ON THE PLANS.
8. LONGITUDINAL REINFORCING BARS SHALL BE CONTINUOUS IN INVERTS AND NON-CONTINUOUS IN WALLS FOR ALL TRANSVERSE JOINTS.

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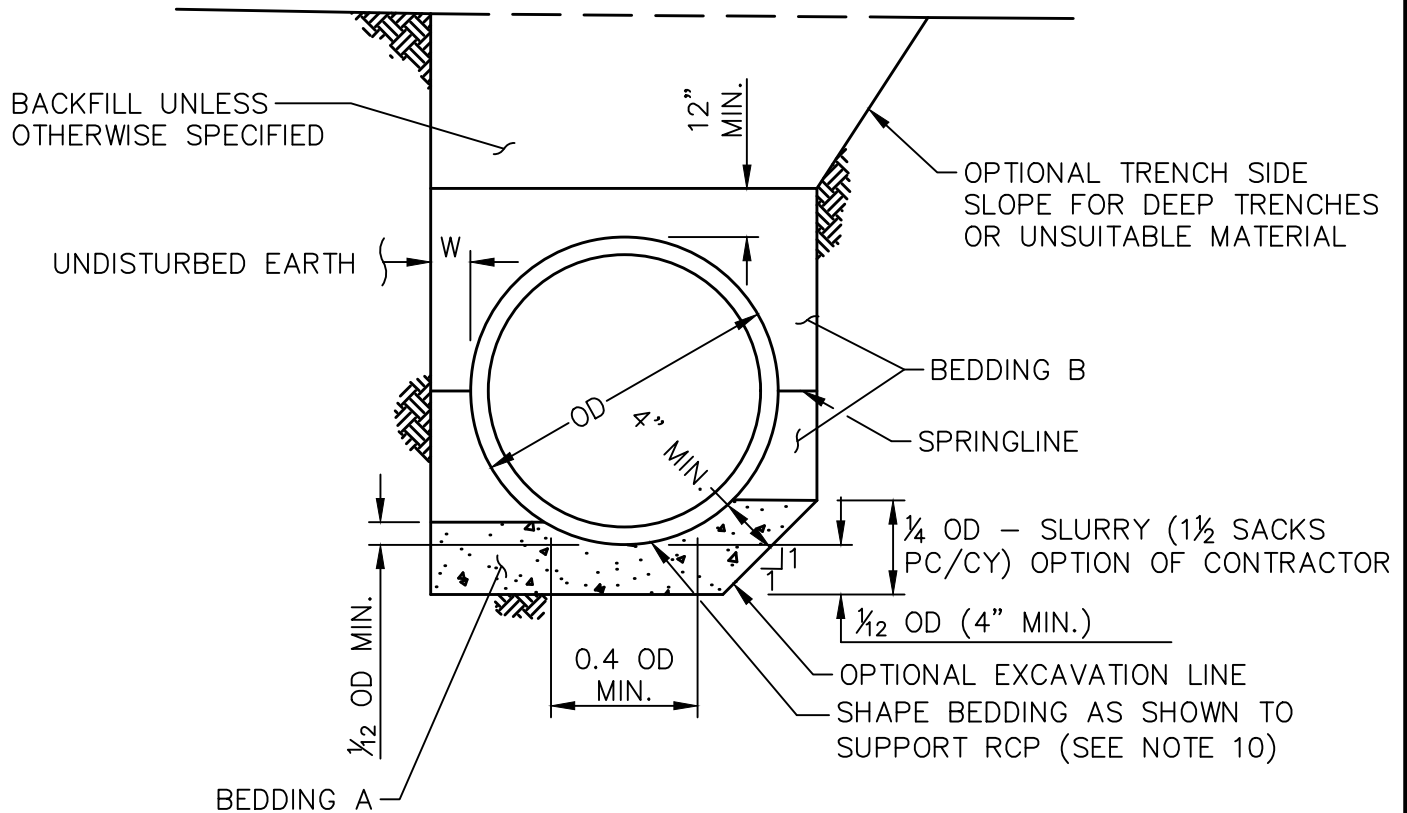
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SHT. 1 OF 1

TRAVERSE JOINT DETAILS





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REINFORCED CONCRETE PIPE - BEDDING DETAIL

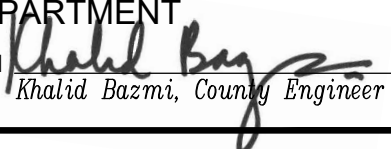
SHT. 1 OF 2

NOTES:

1. BEDDING A SHALL BE COMPOSED OF SAND, NO. 3 OR NO. 4 CRUSHED ROCK OR GRAVEL PER THE GREENBOOK OR OTHER GRANULAR MATERIAL AS MAY BE SPECIFIED OR APPROVED BY THE ENGINEER.
2. BEDDING B SHALL BE COMPOSED OF SAND OR OTHER GRANULAR MATERIAL AS MAY BE SPECIFIED OR APPROVED BY THE ENGINEER AND SHALL CONFORM TO SECTION 217-1.1 OF THE GREENBOOK & STD PLAN 1803.
3. BEDDING B SHALL BE COMPACTED TO A RELATIVE COMPACTION OF NOT LESS THAN 90 PERCENT UNLESS OTHERWISE SPECIFIED.
4. BEDDING B SHALL BE PLACED IN TWO OR MORE LIFTS FOR OD GREATER THAN 60 INCHES.
5. BACKFILL SHALL BE PER SECTION 217-2 & 306-12 OF THE GREENBOOK, AND STD PLAN 1803.
6. WHERE THE COVER IS 8 FEET OR LESS, "W" MUST BE GREATER THAN OR EQUAL TO 6 INCHES. WHERE THE COVER IS GREATER THAN 8 FEET, "W" MUST BE BETWEEN 6 AND 10 INCHES INCLUSIVE FOR PIPES UP TO AND INCLUDING 96 INCHES IN DIAMETER. FOR PIPES OVER 96 INCHES IN DIAMETER, "W" MUST BE BETWEEN 6 AND 12 INCHES INCLUSIVE.
7. "W" SHALL INCLUDE THE THICKNESS OF ANY SHORING.
8. SHORING SHALL BE A MINIMUM OF 6 INCHES FROM THE PIPE AT SPRINGLINE.
9. AN IMPROVED BEDDING METHOD SHALL BE SUBMITTED TO THE ENGINEER FOR ANY "W" OTHER THAN THAT PERMITTED IN NOTE 6.  
  
THE TRENCH BOTTOM SHALL BE SHAPED AS SHOWN, OR THE CONTRACTOR, AT HIS OPTION MAY CHOOSE NOT TO SCREED BEDDING "A" IN WHICH CASE, THE PIPE SHALL BE BACKFILLED TO A DEPTH OF  $\frac{1}{4}$ " OD WITH TRENCH BACKFILL SLURRY AT NO ADDITIONAL COST TO THE COUNTY.
10. THIS BEDDING DETAIL SHALL ONLY BE USED FOR RCP OR AS APPROVED BY THE ENGINEER.
11. BEDDING DETAIL FOR PLASTIC PIPE SHALL BE SHOWN ON THE PLANS.

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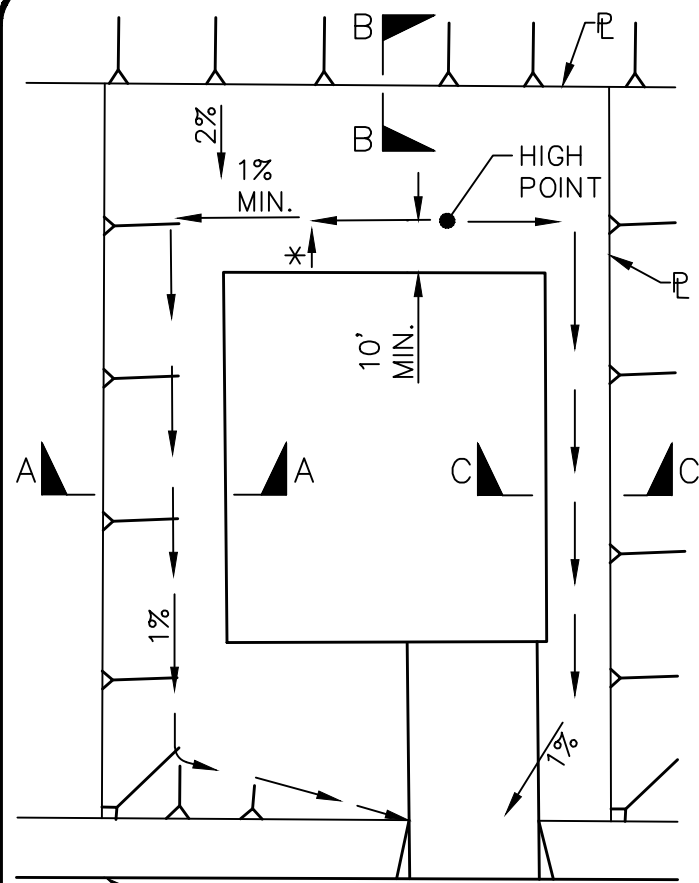
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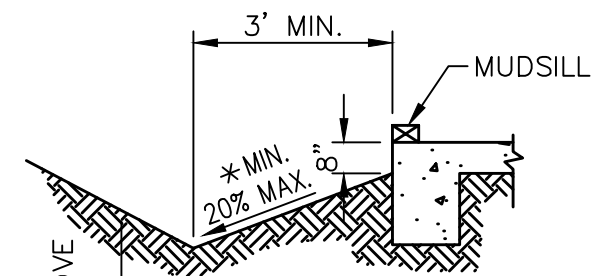
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REINFORCED CONCRETE PIPE - BEDDING DETAIL

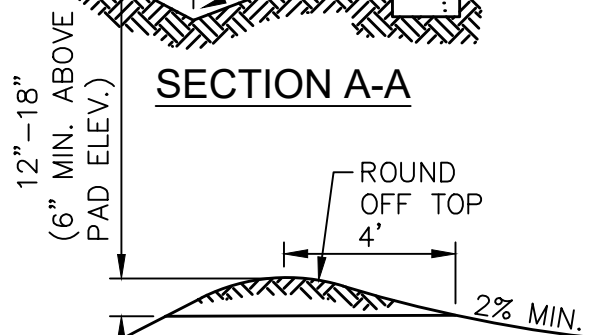
SHT. 2 OF 2



**PLAN**

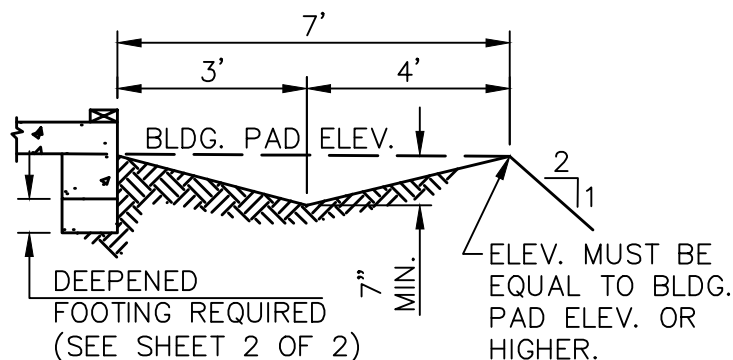


**SECTION A-A**



**SECTION B-B**

TYPICAL BERM DETAIL



**SECTION C-C**

ALTERNATE

\* 2 PERCENT MIN. FOR NON-EXPANSIVE SOILS AND 5 PERCENT MINIMUM FOR EXPANSIVE SOILS OR PER CURRENTLY ADOPTED COUNTY BUILDING REGULATIONS.

**NOTES:**

1. SWALES TO BE CUT IN AT 1 PERCENT AT ROUGH GRADING AND PRIOR TO BUILDING CONSTRUCTION.
2. A PAVED DRAINAGE SWALE, A CATCH BASIN AND PIPE, OR OTHER SIMILAR DRAINAGE DEVICE IS REQUIRED WHEN A STOOP, FIREPLACE, OR PORTION OF THE BUILDING EXTENDS WITHIN THE MINIMUM ESTABLISHED DRAINAGE SETBACKS.
3. A COMMON DRAINAGE SWALE MAY BE USED ALONG SIDEYARD PROPERTY LINES AS SHOWN ON SHEET 2 OF 2.
4. THIS DIMENSION MAY BE REDUCED TO THE REQUIRED MINIMUM SETBACK IN THE GRADING & EXCAVATION CODE IF AN IMPROVED (I.E., CONCRETE) DRAINAGE DEVICE IS USED.
5. ALL BUILDING SETBACKS FROM SLOPES SHALL BE IN ACCORDANCE WITH THE GRADING & EXCAVATION CODE.

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Khalid Bazmi, County Engineer

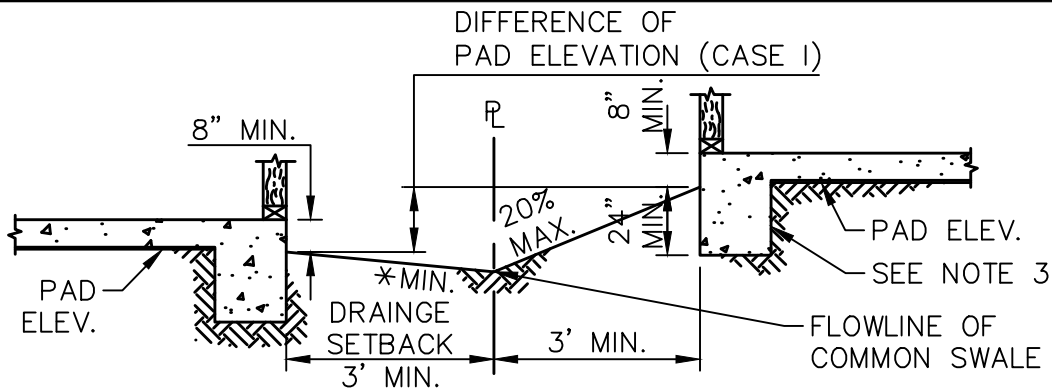
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SHT. 1 OF 2

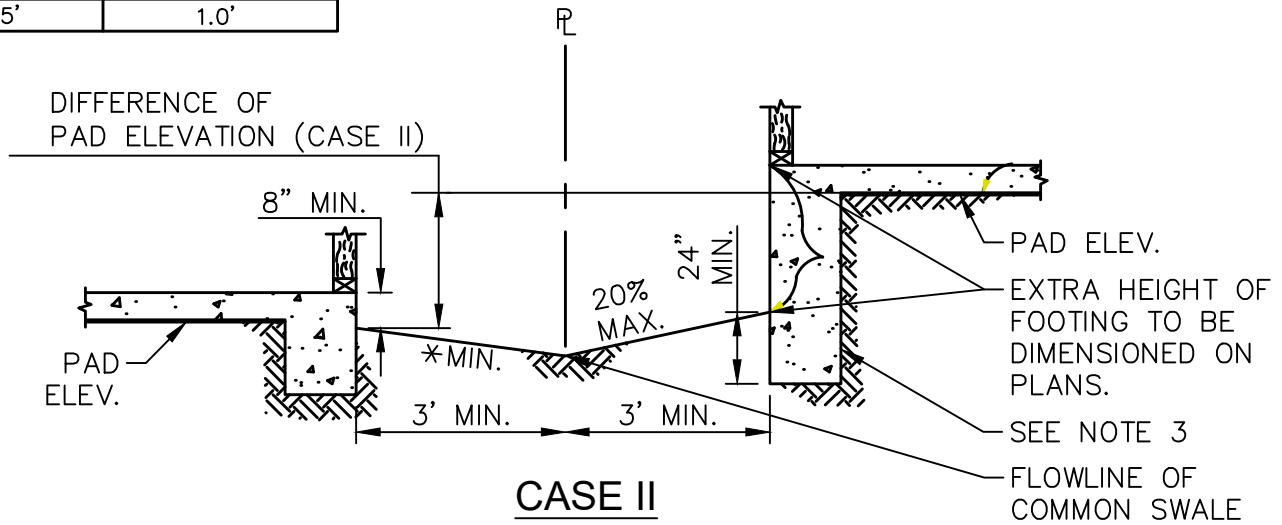
HILLSIDE LOT DRAINAGE



### CASE I

\* 2 PERCENT MIN. FOR NON-EXPANSIVE SOILS AND 5 PERCENT MINIMUM FOR EXPANSIVE SOILS OR PER CURRENTLY ADOPTED COUNTY BUILDING REGULATIONS.

TABLE A	
LIMITING CASE 1 CONDITIONS	
DRAINAGE SETBACK	MAXIMUM DIFFERENCE OF PAD ELEVATIONS
3'	0.6'
4'	0.8'
5'	1.0'



### CASE II

### NOTES:

1. CASE I APPLIES WHEN THE DIFFERENCE IN PAD ELEVATIONS AND DRAINAGE SETBACK ALLOWS A COMMON DRAINAGE SWALE TO BE CONSTRUCTED IN ACCORDANCE WITH TABLE A.
2. CASE II MAY BE USED WITH A COMMON DRAINAGE SWALE WHEN THE DIFFERENCE OF PAD ELEVATIONS EXCEEDS THE LIMITING CONDITIONS OF TABLE A AND THE EXTRA HEIGHT FOOTING IS SHOWN ON THE GRADING AND STRUCTURAL PLANS.
3. IN NO CASE SHALL THE SWALE FLOW LINE BE LOWER THAN THE BOTTOM OF THE FOOTING WITHIN 5 FEET OF THE FOOTING.
4. A COMMON SIDEYARD DRAINAGE SWALE SHALL NOT BE USED WHEN THE DIFFERENCE BETWEEN THE PAD ELEVATIONS EXCEEDS ONE FOOT.
5. MINIMUM GRADIENTS TO COMPLY WITH THE CURRENT ADOPTED COUNTY BUILDING REGULATIONS.

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Khalid Bazmi, County Engineer

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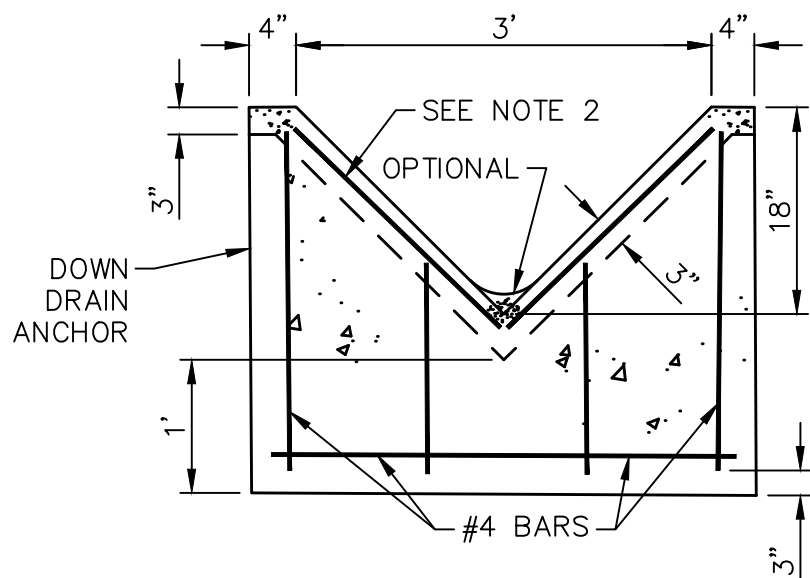
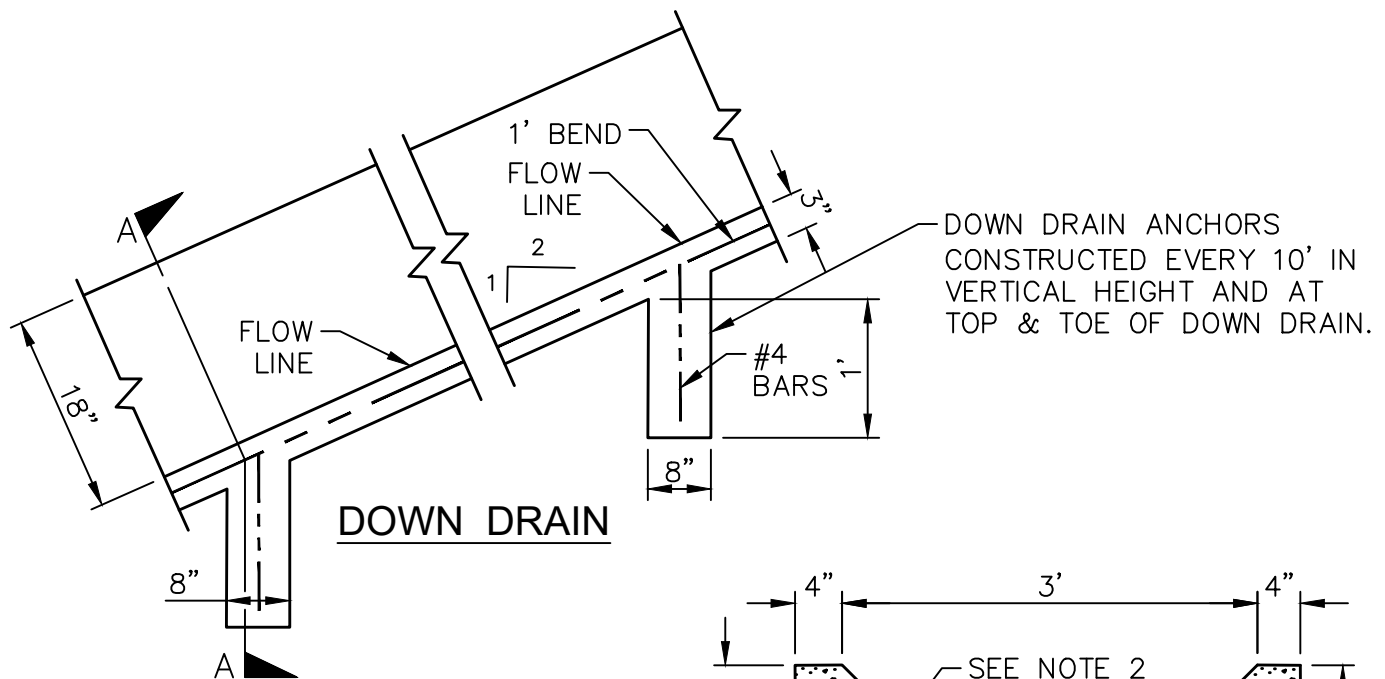
SHT. 2 OF 2

COMMON SIDEYARD DRAINAGE



1. CONCRETE SHALL BE TYPE II OR V, CLASS 520-C-2500 OR 520-C-2500P (IF PUMPED) CONFORMING TO THE REQUIREMENTS OF OCPW STANDARD PLAN 1803. AIR-PLACED CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF SECTION 303-2, "AIR-PLACED CONCRETE," AND METHOD OF PLACEMENT SHALL CONFORM TO SECTION 303-2.1.3, "METHOD B (SHOTCRETE)" OF THE GREENBOOK, UNLESS OTHERWISE ALLOWED FOR BY THE ENGINEER.
2. REINFORCING SHALL BE 6-INCH X 6-INCH - W 1.4 X W 1.4 WWM OR ENGINEER APPROVED EQUAL. REINFORCEMENT SHALL HAVE A MINIMUM OF 1-INCH CLEAR COVER AND SHALL BE PROPERLY FIXED AND SUPPORTED DURING PLACEMENT OF CONCRETE.
3. GROUND SHALL BE PRE-WETTED TO THE SATISFACTION OF THE ENGINEER PRIOR TO PLACEMENT OF CONCRETE.
4. CONCRETE OR CONCRETE BLOCK DIVERTER (SPLASH) WALL SHALL BE CONSTRUCTED WHEN DOWN DRAIN TERMINATES AT TERRACE DRAIN. SEE PLAN FOR LOCATION AND DETAILS.

## TERRACE AND DOWN DRAIN



**SECTION A-A**

**NOTES:**

1. CONCRETE SHALL BE TYPE II OR V, CLASS 520-C-2500 OR 520-C-2500P (IF PUMPED) CONFORMING TO THE REQUIREMENTS OF OCPW STANDARD PLAN 1803. AIR-PLACED CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF SECTION 303-2, "AIR-PLACED CONCRETE," AND METHOD OF PLACEMENT SHALL CONFORM TO SECTION 303-2.1.3, "METHOD B (SHOTCRETE)" OF THE GREENBOOK UNLESS OTHERWISE ALLOWED FOR BY THE ENGINEER.
2. REINFORCING SHALL BE 6-INCH X 6-INCH - W 1.4 X W 1.4 WWM OR ENGINEER APPROVED EQUAL. REINFORCEMENT SHALL HAVE A MINIMUM OF 1-INCH CLEAR COVER AND SHALL BE PROPERLY FIXED AND SUPPORTED DURING PLACEMENT OF CONCRETE.
3. GROUND SHALL BE PRE-WETTED TO THE SATISFACTION OF THE ENGINEER PRIOR TO PLACEMENT OF CONCRETE.

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Khalid Bazmi, County Engineer

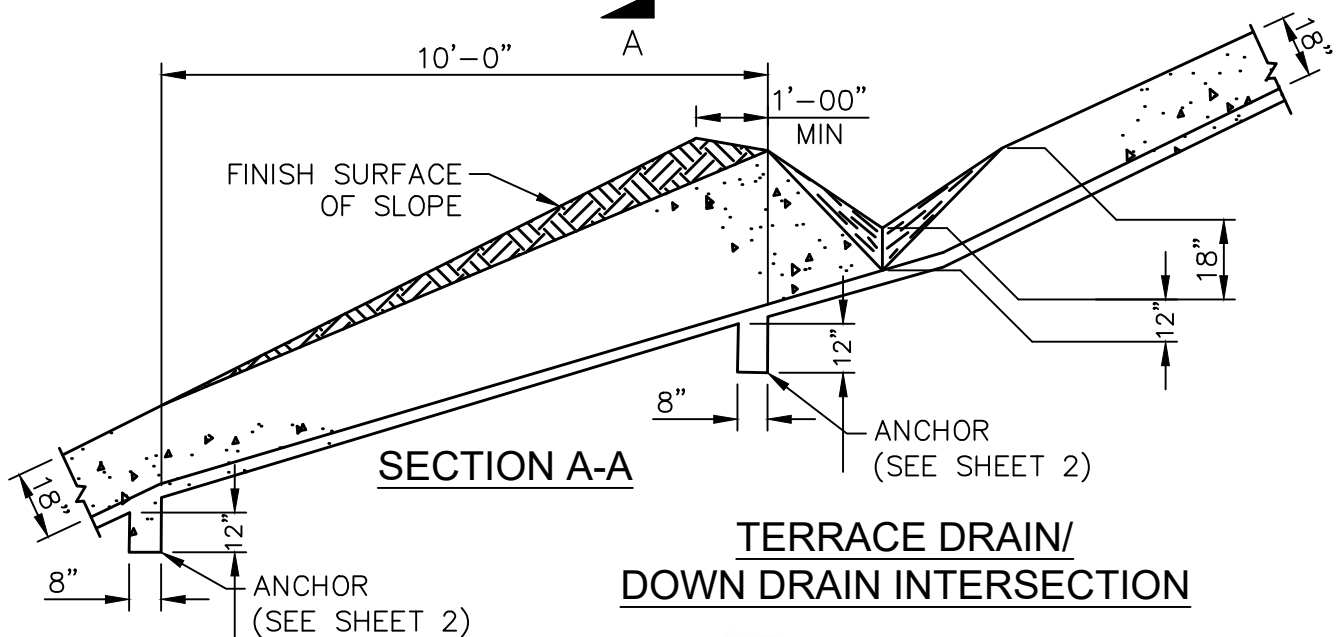
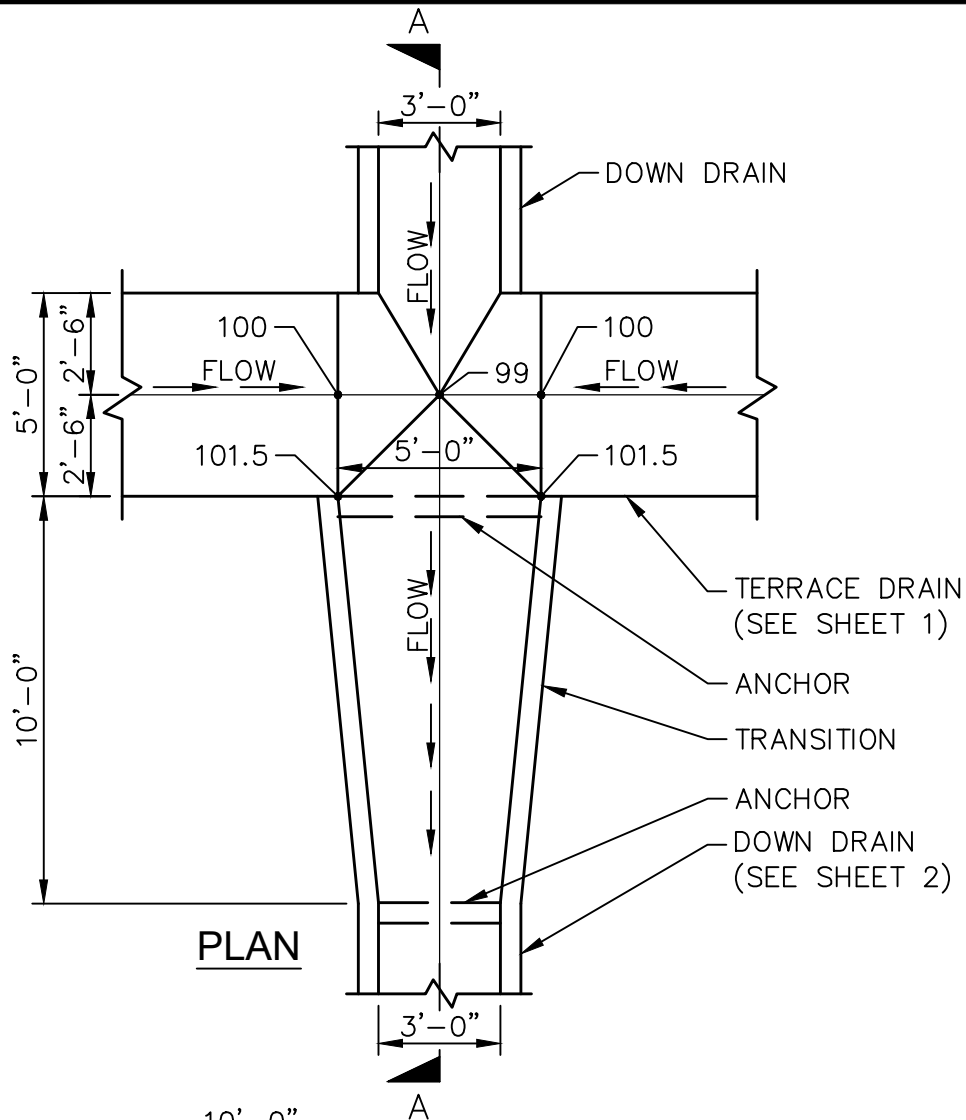
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**1321**

SHT. 2 OF 3

**TERRACE AND DOWN DRAIN**



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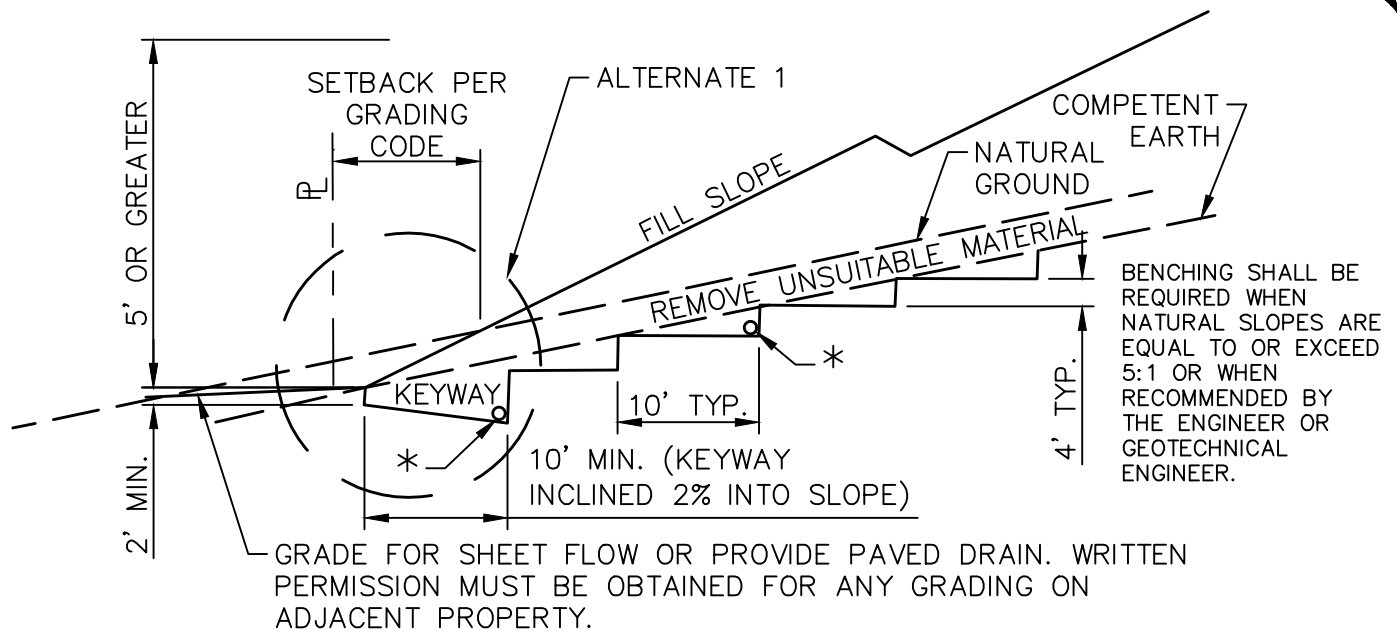
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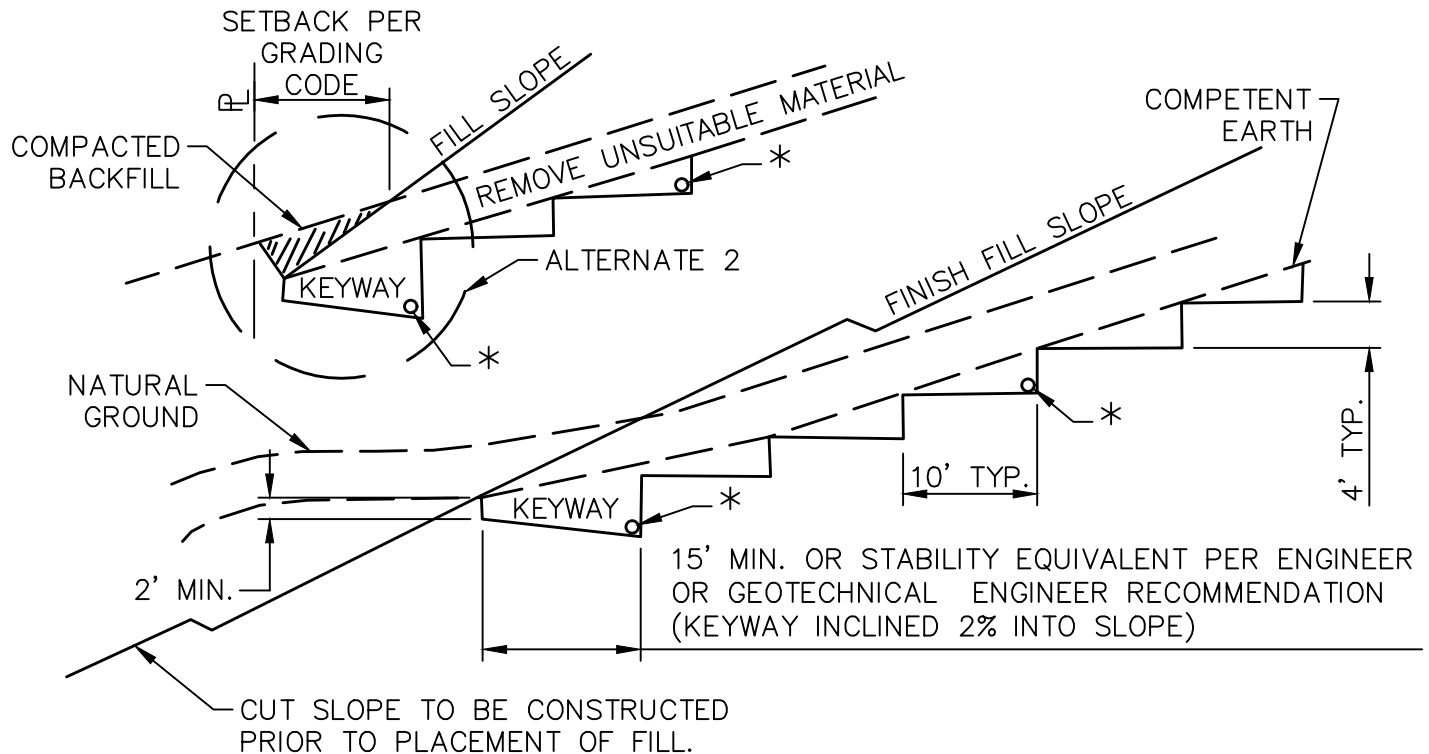
SHT. 3 OF 3

TERRACE AND DOWN DRAIN





### BENCHED FILL OVER NATURAL



### BENCHED FILL OVER CUT

- \* CONSTRUCT SUBDRAIN IN KEYWAY AND FOR BENCHES AT 15 VERTICAL FEET OR WHERE NEEDED BASED ON SEEPAGE OR POTENTIAL SEEPAGE ENCOUNTERED.

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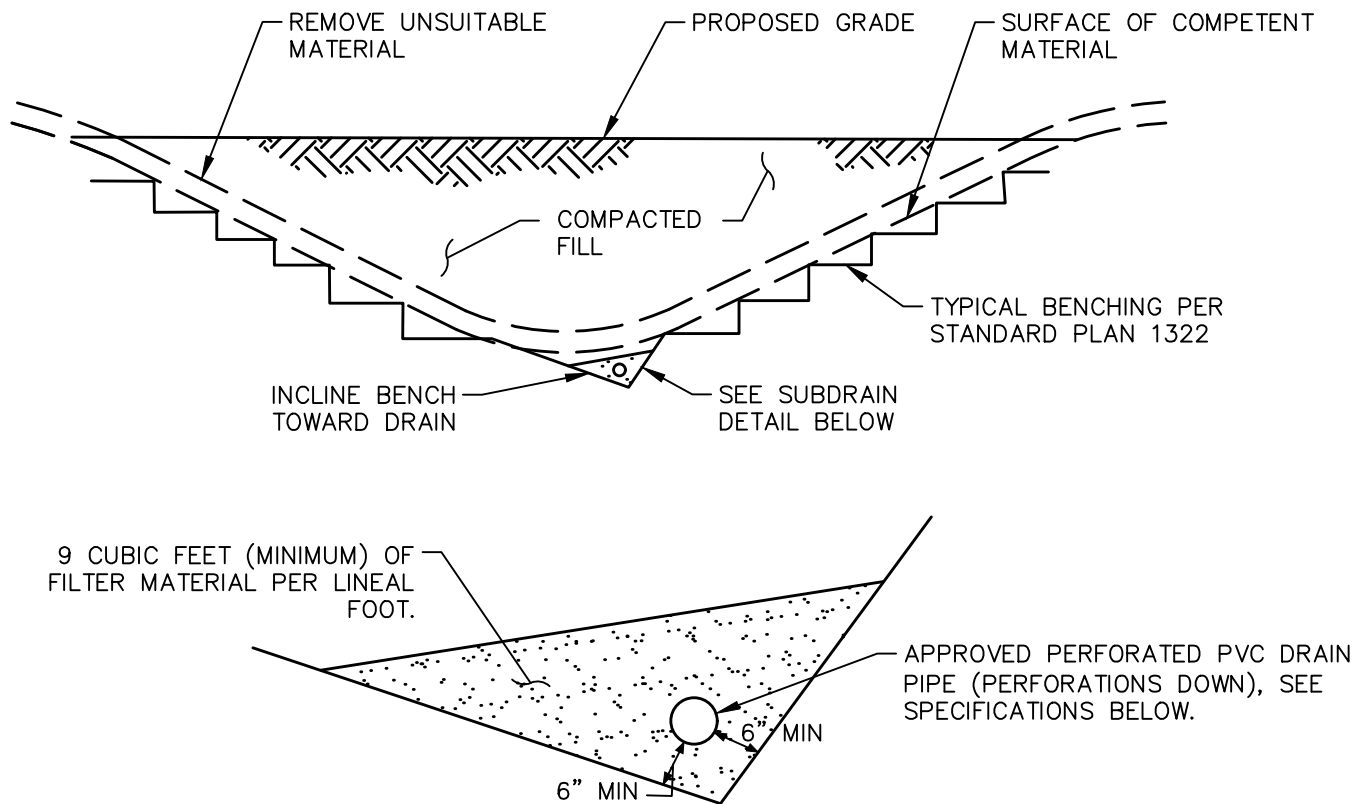
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BENCHING FOR COMPACTED FILL

SHT. 1 OF 1





SUBDRAIN DETAIL

NOTES:

1. IN THE ABSENCE OF A GEOTECHNICAL ENGINEER'S RECOMMENDATION, THIS STANDARD SHALL BE USED.
2. PIPE SPECIFICATIONS: DRAIN PIPE SHALL BE A MINIMUM OF 4-INCH DIAMETER (6-INCH MINIMUM FOR RUNS OF 500- FEET OR GREATER OR AS RECOMMENDED BY THE ENGINEER. PIPE SPECIFICATIONS SHALL CONFORM TO THE GREENBOOK OR AS APPROVED BY THE ENGINEER.
3. FILTER MATERIAL SHALL MEET THE FOLLOWING SPECIFICATIONS OR AS RECOMMENDED BY THE ENGINEER:

SIEVE SIZE                      PERCENTAGE PASSING

1"	_____	100
$\frac{3}{4}$ "	_____	90-100
$\frac{3}{8}$ "	_____	40-100
NO.4	_____	25-40
NO.8	_____	18-33
NO.30	_____	5-15
NO.50	_____	0-7
NO.200	_____	0-3

SUBDRAIN

4. ALTERNATIVE FILTER MATERIAL MAY CONSIST OF CLEAN  $\frac{3}{4}$ " INCH CRUSHED ROCK, WRAPPED IN TYPE I NON-WOVEN FILTER FABRIC PER STANDARD PLAN 1808 OR ENGINEER APPROVED EQUAL. USE PERFORATED PVC DRAIN PIPE PER NOTE 2 & DETAIL.

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Khalid Bazmi, County Engineer

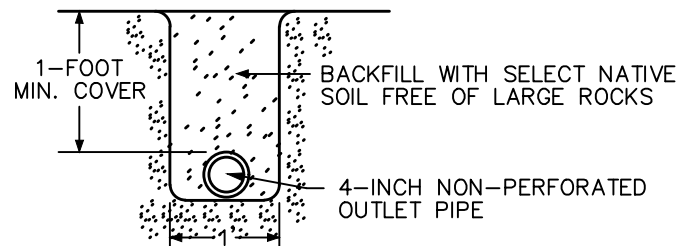
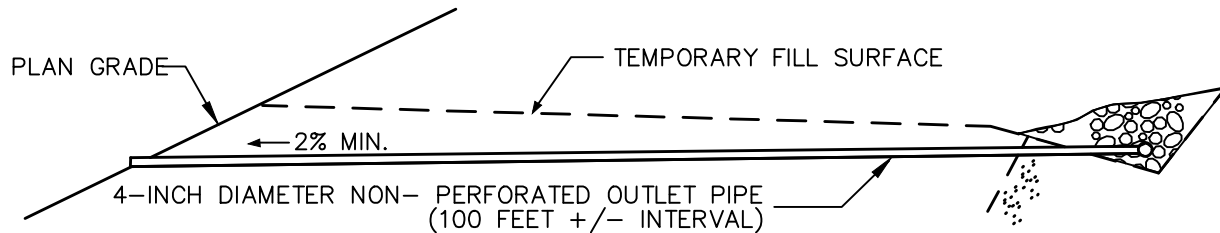
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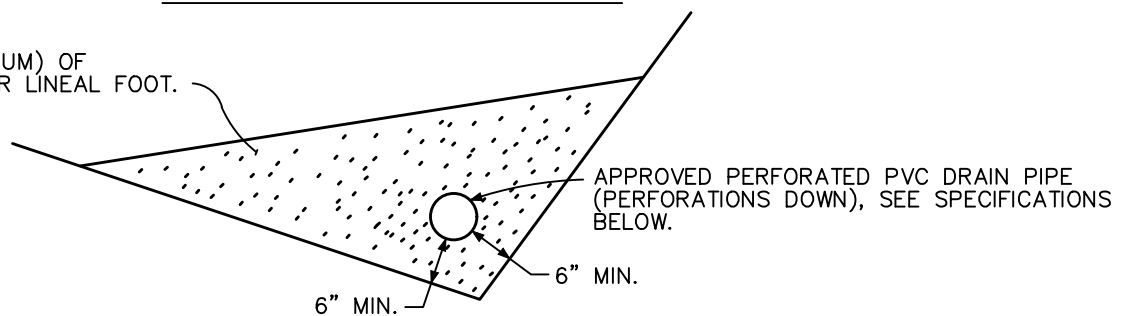
SHT. 1 OF 2

SUBDRAIN / BACKDRAIN



BACKDRAIN OUTLET PIPE

4 CUBIC FEET (MINIMUM) OF  
FILTER MATERIAL PER LINEAL FOOT.



BACKDRAIN DETAIL

NOTES:

1. IN THE ABSENCE OF A GEOTECHNICAL ENGINEER'S RECOMMENDATION, THIS STANDARD SHALL BE USED.
2. PIPE SPECIFICATIONS: DRAIN PIPE SHALL BE A MINIMUM OF 4-INCH DIAMETER (6-INCH MINIMUM FOR RUNS OF 500-Feet OR GREATER OR AS RECOMMENDED BY THE ENGINEER. PIPE SPECIFICATIONS SHALL CONFORM TO THE GREENBOOK OR AS APPROVED BY THE ENGINEER.
3. FILTER MATERIAL SHALL MEET THE FOLLOWING SPECIFICATIONS OR AS RECOMMENDED BY THE ENGINEER:

<u>SIEVE SIZE</u>	<u>PERCENTAGE PASSING</u>
1" _____	100
3/4" _____	90-100
3/8" _____	40-100
NO.4 _____	25-40
NO.8 _____	18-33
NO.30 _____	5-15
NO.50 _____	0-7
NO.200 _____	0-3

BACKDRAIN

4. ALTERNATIVE FILTER MATERIAL MAY CONSIST OF CLEAN 3/4" INCH CRUSHED ROCK, WRAPPED IN TYPE I NON-WOVEN FILTER FABRIC PER STANDARD PLAN 1808 OR ENGINEER APPROVED EQUAL. USE PERFORATED PVC DRAIN PIPE PER NOTE 2 & DETAIL.

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Khalid Bazmi, County Engineer

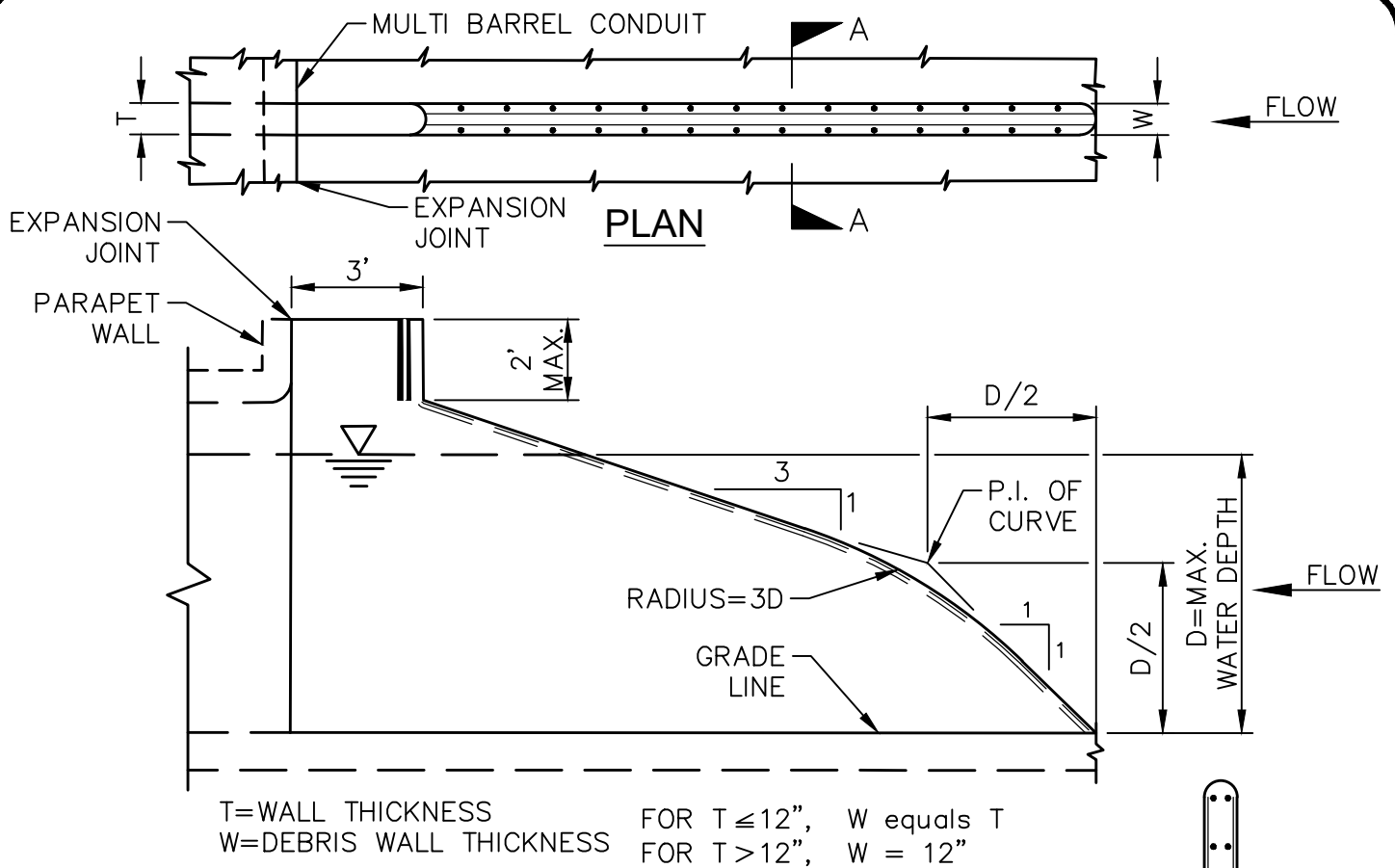
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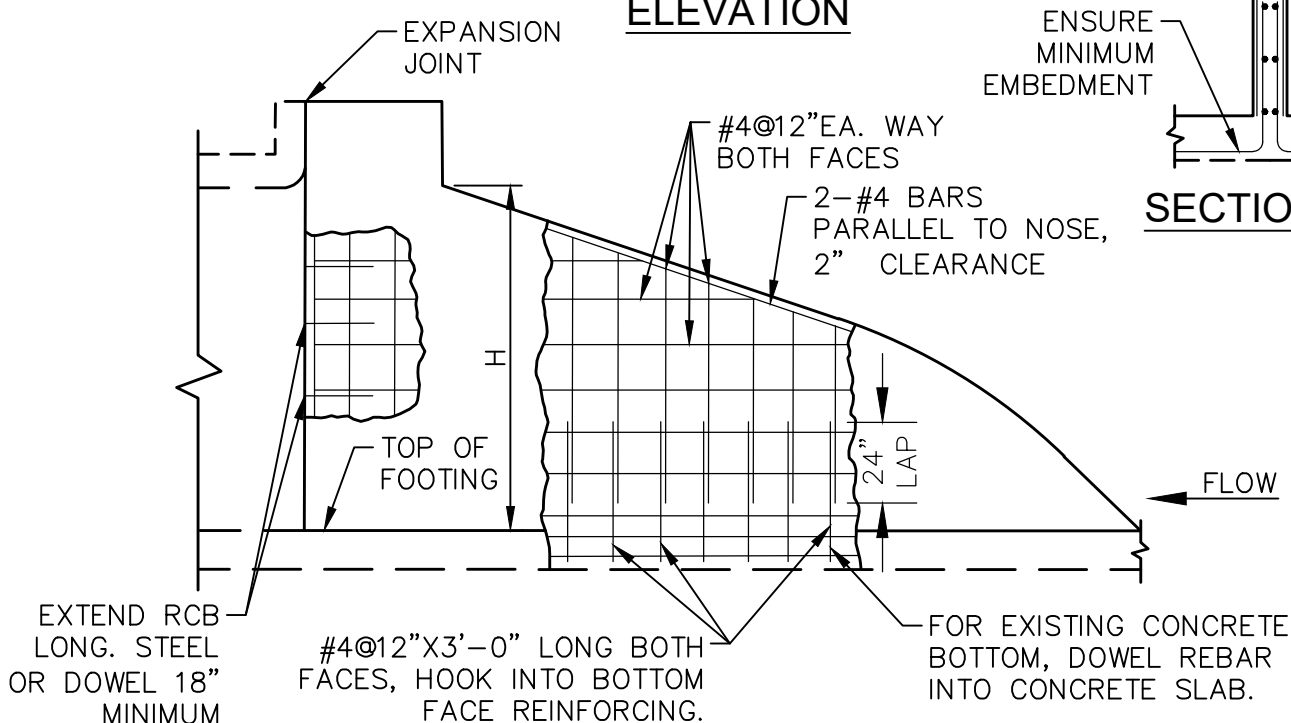
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SUBDRAIN / BACKDRAIN



## ELEVATION



## SECTION A-A

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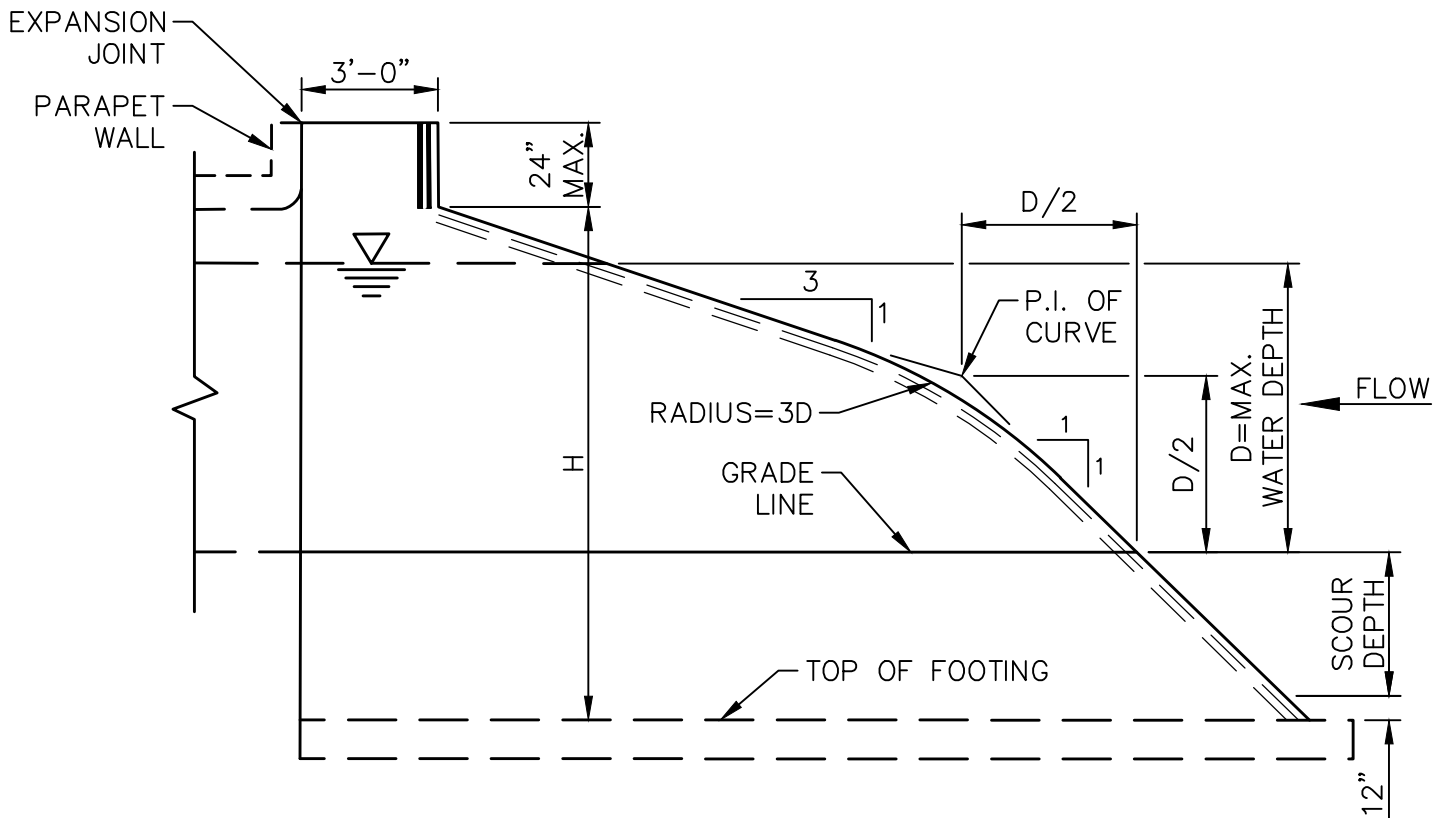
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SHT. 1 OF 2

DEBRIS WALL

## NOTES:

1. CONCRETE AND REINFORCING SHALL BE PER STD. PLAN 1803.
2. FOR HEIGHTS "H" GREATER THAN 12 FEET, SUBMIT STRUCTURAL CALCULATIONS.
3. FOR SOFT CHANNEL BOTTOM APPLICATIONS:
  - a. WALL FOOTING MUST BE DESIGNED TO ENSURE WALL STABILITY AS A FREE STANDING STRUCTURE.
  - b. TOP OF FOOTING MUST BE 12 INCHES BELOW MAXIMUM ANTICIPATED SCOUR DEPTH.
  - c. DEPTH "D" SHALL BE THE DISTANCE FROM THE DESIGN GRADELINE TO THE DESIGN WATERSURFACE. EXTEND 1:1 SLOPE FROM DESIGNED GRADELINE TO TOP OF FOOTING.



## SOFT CHANNEL BOTTOM APPLICATION

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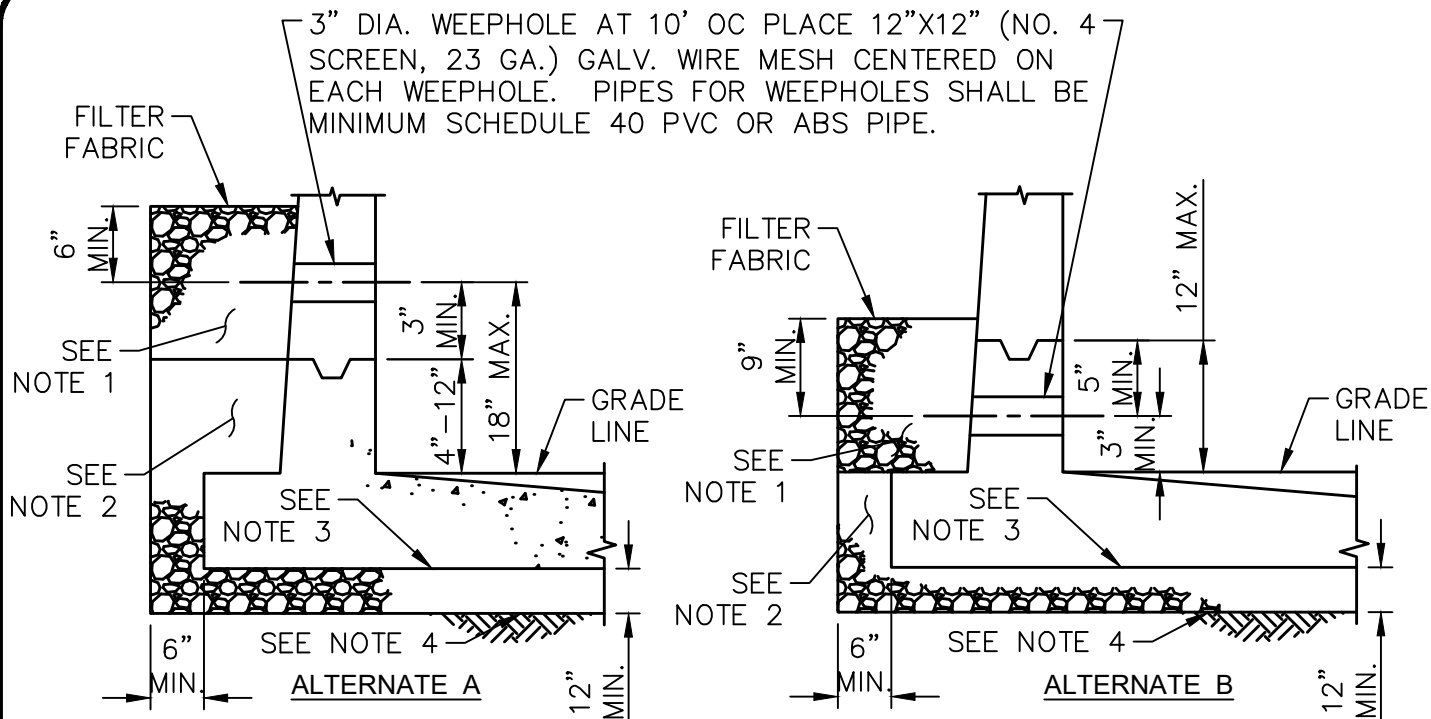
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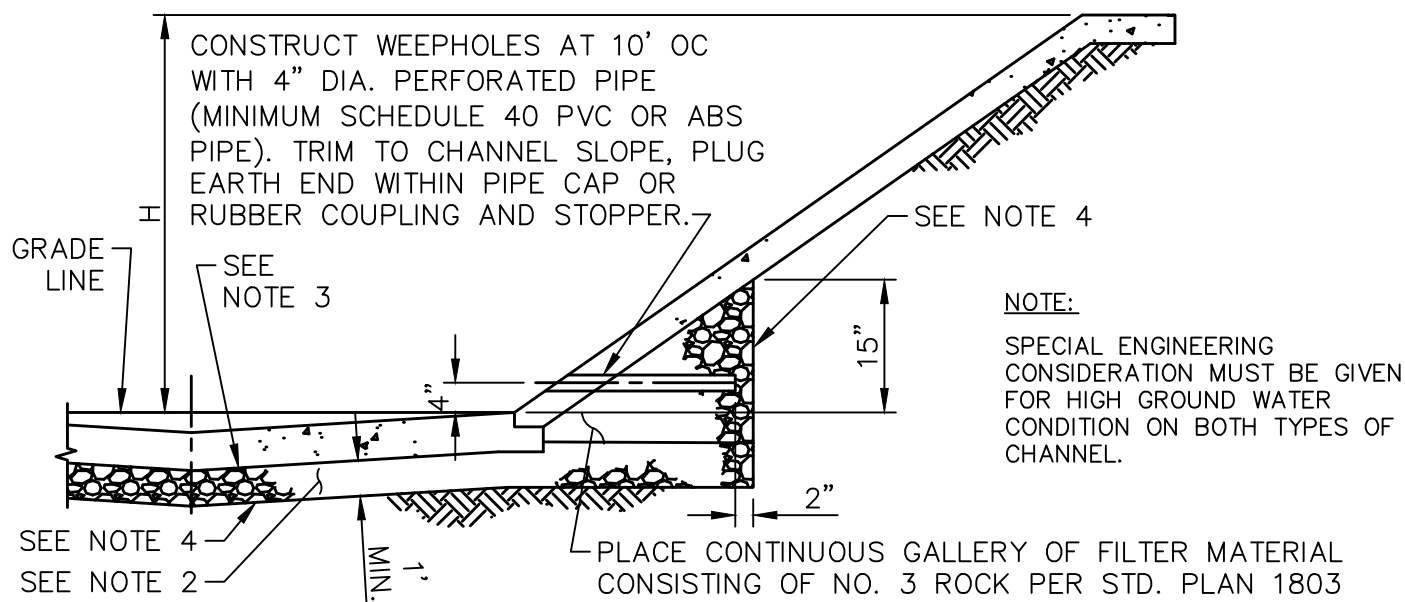
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DEBRIS WALL



**VERTICAL WALL CHANNEL**



**TRAPEZOIDAL CHANNEL**

**NOTES:**

1. PERVIOUS MATERIAL SHALL BE NO. 3 ROCK AS SPECIFIED IN STD. PLAN 1803 AND SHALL BE WRAPPED IN FILTER FABRIC AS SHOWN
2. NO. 3 ROCK PER STD. PLAN 1803
3. TYPE I NON-WOVEN FILTER FABRIC PER STD. PLAN 1808
4. TYPE II NON-WOVEN FILTER FABRIC PER STD. PLAN 1808

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1325

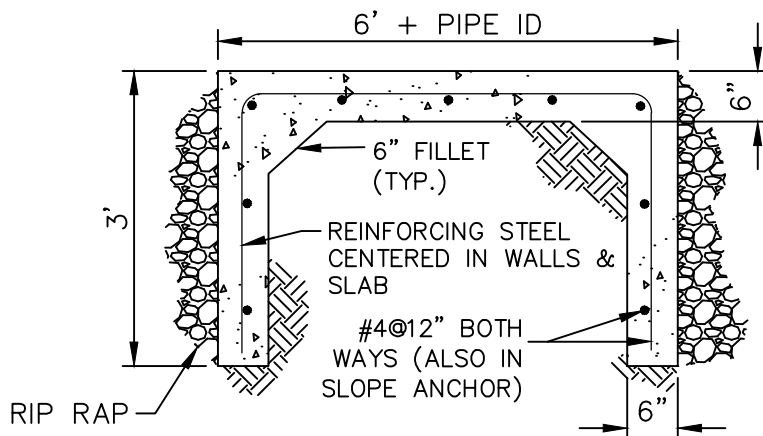
SHT. 1 OF 1

**CHANNEL WEEPHOLES AND DRAINAGE GALLERIES**

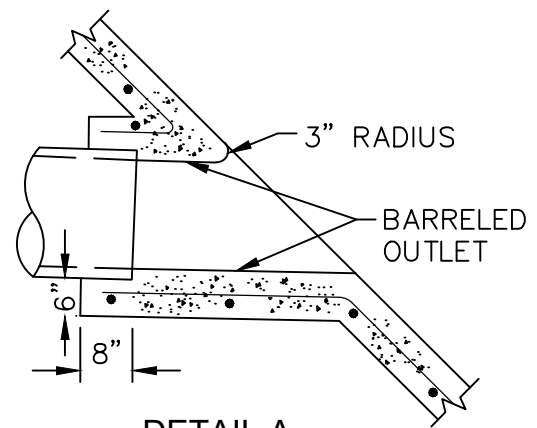




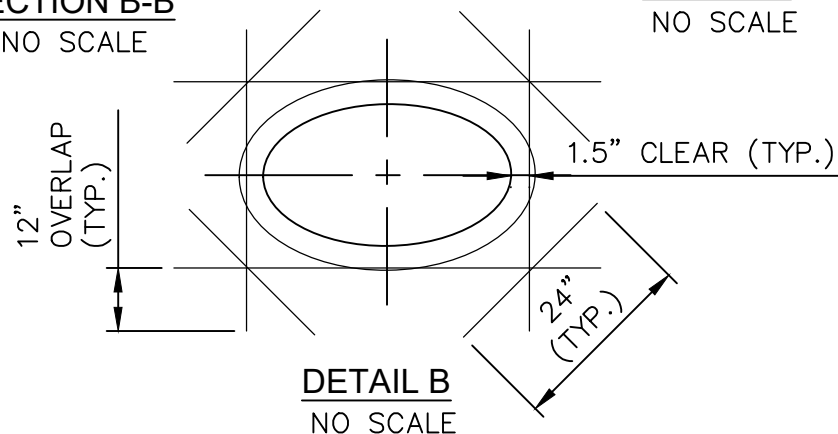
SHT. 1 OF 2



**SECTION B-B**  
NO SCALE



**DETAIL A**  
NO SCALE



**DETAIL B**  
NO SCALE

**NOTES:**

1. IF LATERAL FLOW EXCEEDS 10 PERCENT OF THE UPSTREAM FLOW, ANGLE  $\theta$  SHALL BE DETERMINED BY THE HYDRAULICS OF THE CONFLUENCE.
2. MAXIMUM SIDE SLOPE GRADIENT EQUALS 1.5 TO 1.0.
3. TERMINATE TRANSVERSE DIMENSION OF RIPRAP 10 FEET FROM TOE OF SLOPE. IF 10 FEET EXCEEDS 50 PERCENT OF CHANNEL BASE WIDTH, OR CHANNEL VELOCITY EXCEEDS 10 FPS RIPRAP 'X' FEET WIDE SHALL EXTEND ACROSS INVERT AND 4 FEET UP OPPOSITE SLOPE, PER SECTION A-A.
4. INCREASE DOWNSTREAM LIMIT OF INVERT RIPRAP BLANKET BY 'L' FEET IF LATERAL PIPE'S HORIZONTAL ENTRY ANGLE IS DEFLECTED FROM NORMAL.  $L = 2 \sin \theta$  (PIPE DIAMETER). IF 'W' EXCEEDS 50 PERCENT OF CHANNEL BASE WIDTH, OR CHANNEL VELOCITY EXCEEDS 10 FPS, RIPRAP SHALL EXTEND ACROSS ENTIRE INVERT. (MIN. W=10 FEET)
5. PROVIDE 1.5 INCH STEEL COVER.
6. PIPES 27 INCHES OR LARGER SHALL BE DESIGNED STRUCTURE.
7. FINISH EXPOSED SURFACE OF PCC WITH WOOD FLOAT.
8. IF VELOCITY EXCEEDS 12 FPS, DESIGN RIPRAP PER US ARMY CORP OF ENGINEERS (USACE) PUBLICATION NUMBER EM 1110-2-1601, CHAPTER 3.
9. PIPE SIZE TO BE DETERMINED BY ENGINEER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

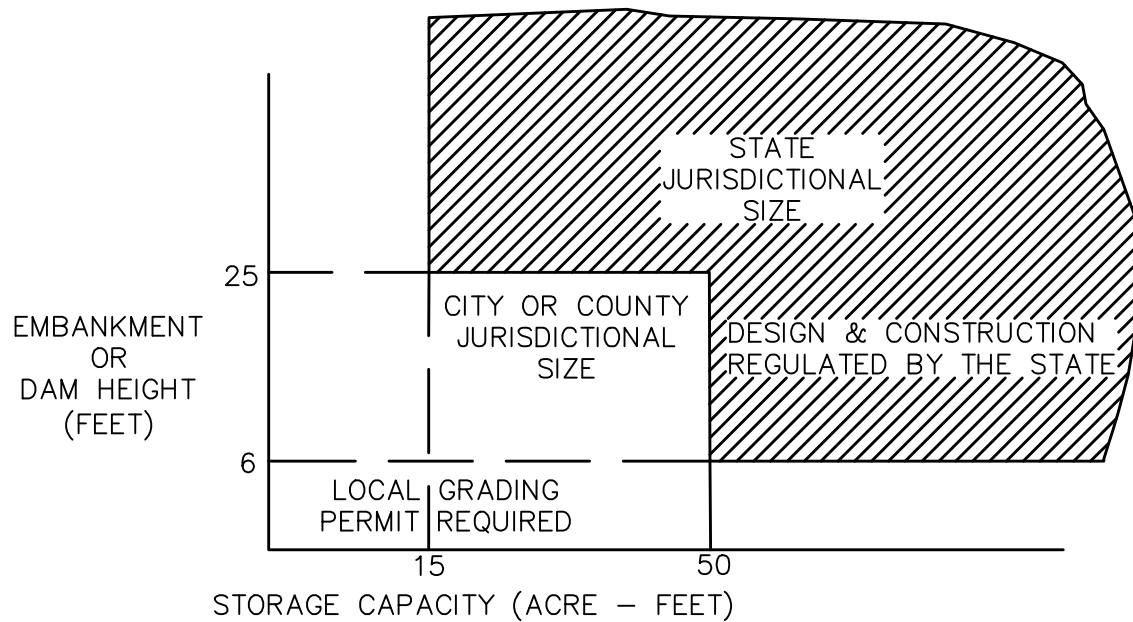
STD. PLAN

1326

SHT. 2 OF 2

PIPE ENTRANCE TO EARTH CHANNEL

## JURISDICTIONAL DAM SIZE



### EXHIBIT 1

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

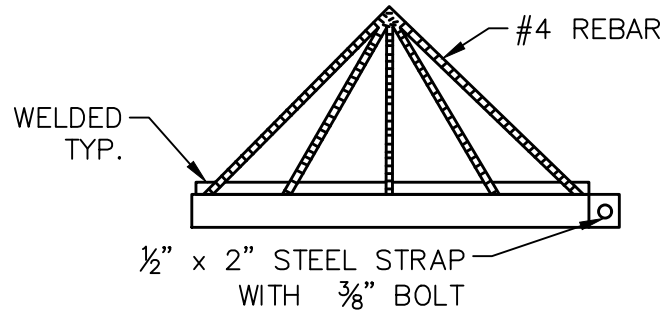
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

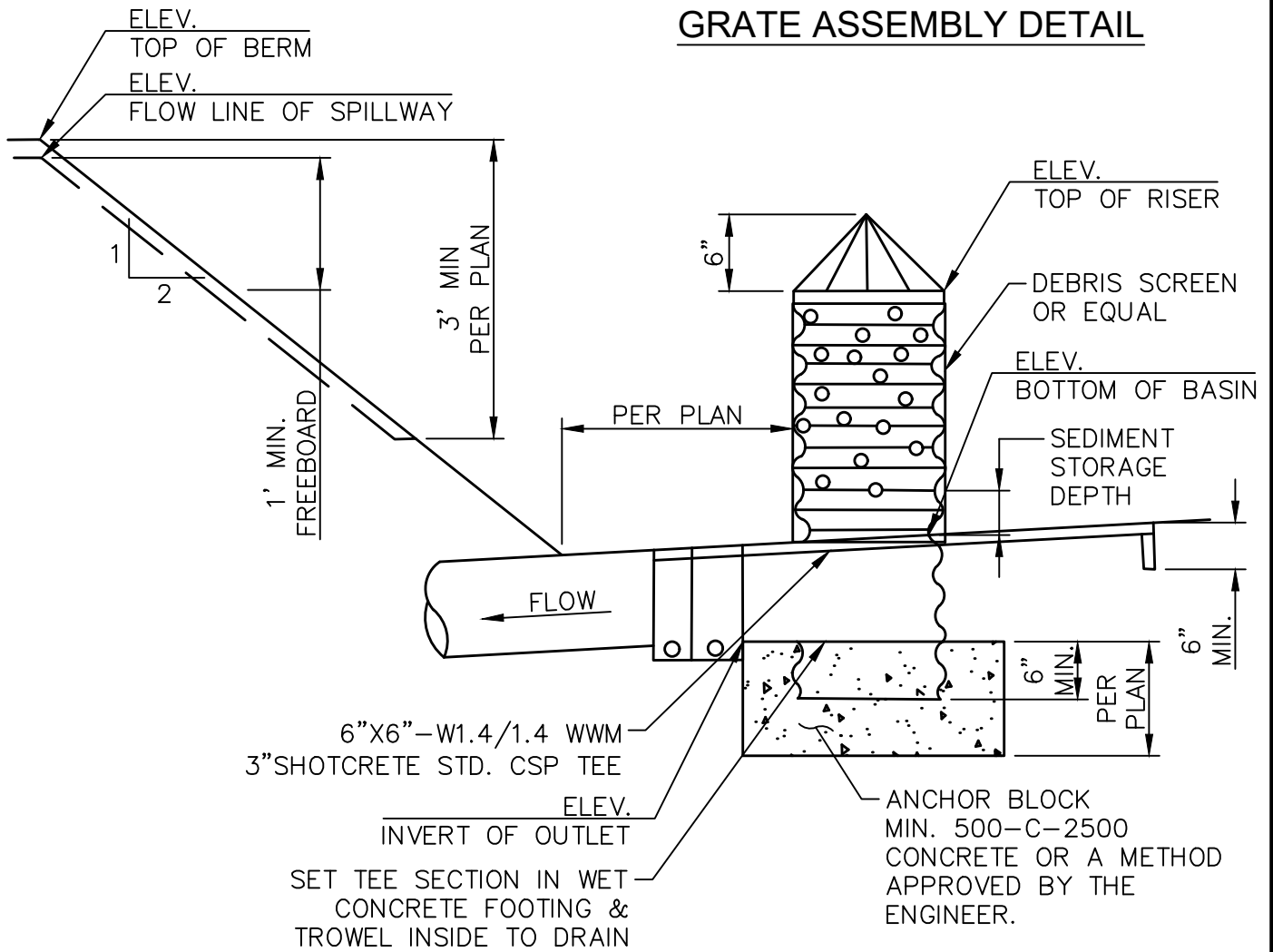
**1327**

SHT. 1 OF 4

**DESILTING BASIN**



GRATE ASSEMBLY DETAIL



DRAIN PIPE & RISER

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

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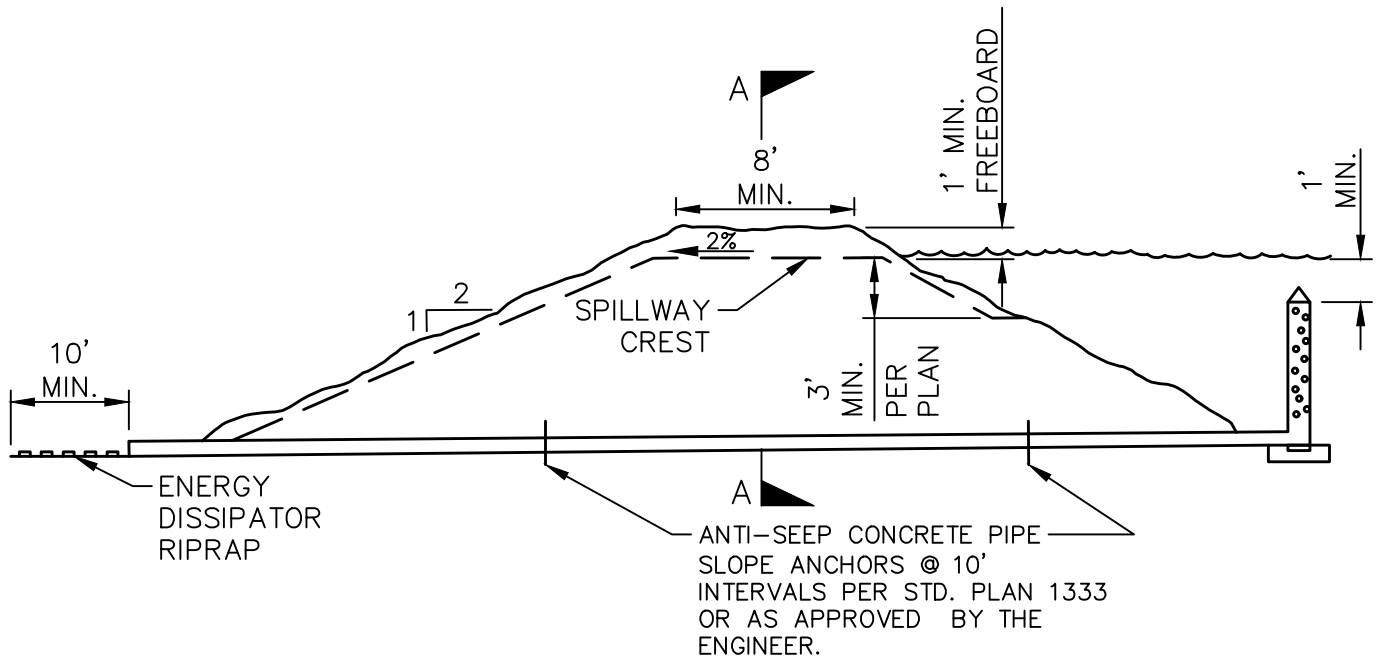
*Khalid Bazmi*  
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STD. PLAN

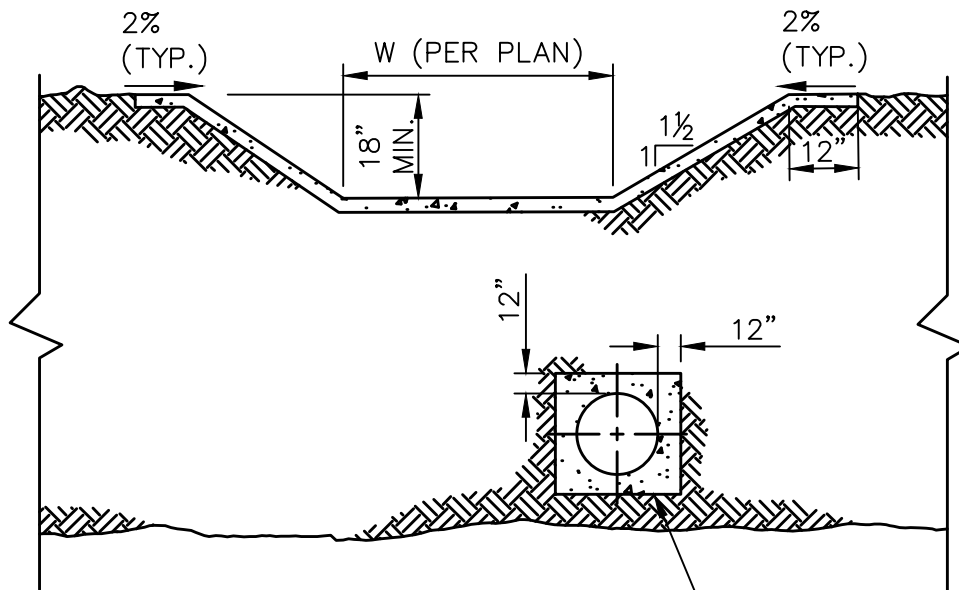
1327

SHT. 2 OF 4

DESILTING BASIN



### SECTION THROUGH EMBANKMENT



### SECTION A-A

ANTI-SEEP CONCRETE PIPE  
SLOPE ANCHORS @ 10'  
INTERVALS PER STD. PLAN  
1333 OR AS APPROVED  
BY THE ENGINEER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1327

SHT. 3 OF 4

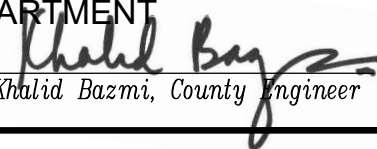
DESILTING BASIN

## GENERAL NOTES

1. SIZING AND DESIGN OF THE DESILTING BASIN SHALL BE BASED ON THE METHOD OUTLINED IN SE-2 OF THE CASQA CONSTRUCTION BMP HANDBOOK, LOCATED ON THE CASQA WEB PORTAL, WWW.CASQA.ORG, SEDIMENT CONTROL BMP SE-2.
2. DO NOT LOCATE THE BASIN IN A JURISDICTIONAL STREAM, OR IN A LIVE (RUNNING) STREAMBED.
3. BASIN SITES SHOULD BE LOCATED WHERE FAILURE OF THE STRUCTURE WILL NOT CAUSE LOSS OF LIFE, DAMAGE TO HOMES OR BUILDINGS, OR INTERRUPTION OF USE OR SERVICE OF PUBLIC ROADS OR UTILITIES. THE SIZE MAY BE LIMITED BY AVAILABILITY OF RIGHT-OF-WAY.
4. IF CERTAIN LIMITATIONS OF EMBANKMENT HEIGHT AND STORAGE CAPACITY ARE EXCEEDED. THE DESIGN OF A DESILTING BASIN MAY COME UNDER THE JURISDICTION OF, AND REQUIRE THE APPROVAL OF, THE CALIFORNIA DEPARTMENT OF WATER RESOURCES, DIVISION OF SAFETY OF DAMS (SEE EXHIBIT 1, SHEET 1 OF 4).
5. IT IS RECOMMENDED THAT STORM WATER DESILTING BASINS BE IN PLACE AND OPERATIONAL PRIOR TO THE START OF GENERAL CONSTRUCTION ACTIVITIES AND PRIOR TO THE STORM SEASON (OCTOBER 1ST THROUGH APRIL 15TH).
6. DESILTING BASIN STORM WATER RETENTION TIMES SHOULD NOT EXCEED 72 HOURS. BASIN DESIGN RETENTION TIMES GREATER THAN 72 HOURS SHALL BE TREATED AND MAINTAIN DAILY TO ELIMINATE MOSQUITOES AND OTHER WATER BORNE VECTORS, AND SHALL BE INSPECTED WEEKLY BY THE OCVCD OR AS SO DETERMINED BY OCVCD PERSONNEL.
7. ALL DESILTING BASINS MUST BE DESIGNED BY PROFESSIONAL CIVIL ENGINEER CURRENTLY AUTHORIZED AND LICENSED TO PRACTICE IN THE STATE OF CALIFORNIA.
8. PRIOR TO DESIGN OF BASIN, THE DESIGNER SHALL CONFER WITH THE LOCAL JURISDICTION TO DETERMINE IF ADDITIONAL REQUIREMENTS OR STANDARDS ARE REQUIRED. SOME LOCAL JURISDICTIONS MAY HAVE MORE STRINGENT REQUIREMENTS THAN THOSE INCLUDED HEREIN.

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Approved

  
Khalid Bazmi, County Engineer

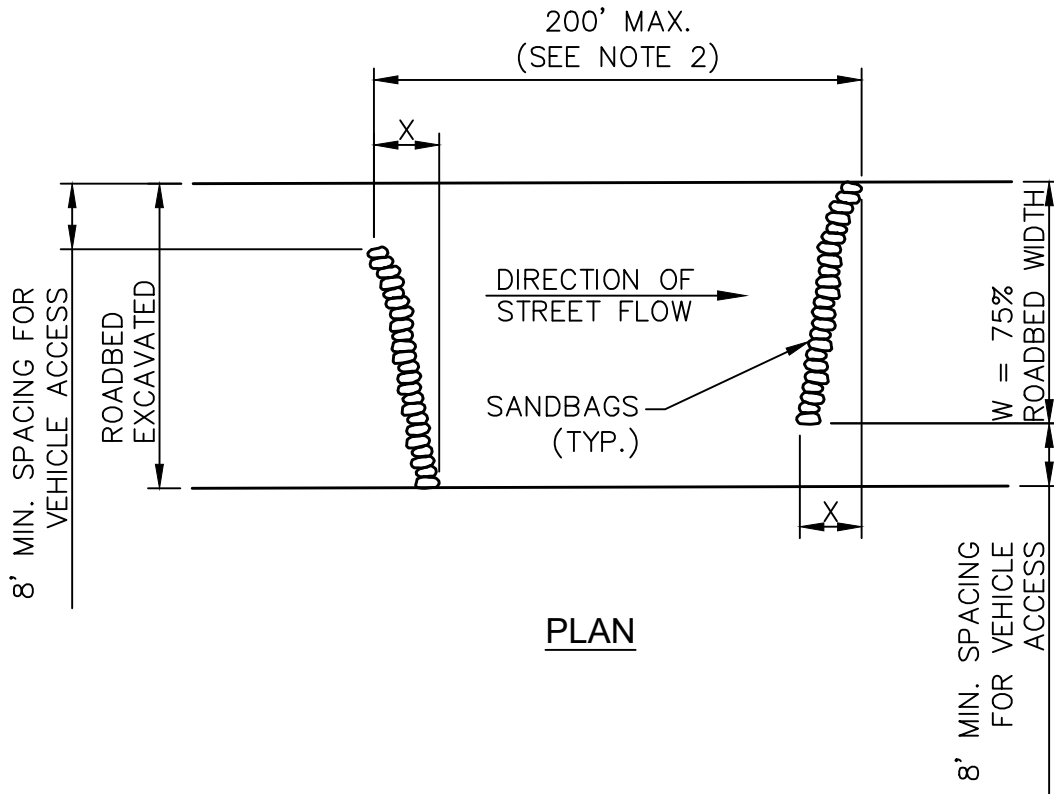
Revision: August 2018

**DESILTING BASIN**

STD. PLAN

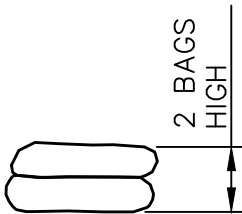
**1327**

SHT. 4 OF 4

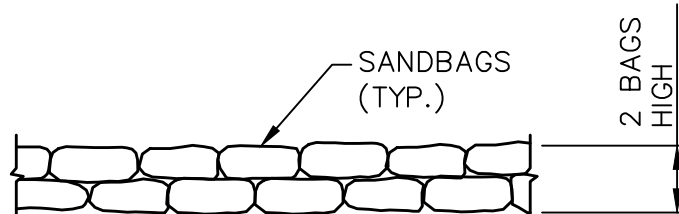


W	X
20'–30'	5'
31'–40'	7'
41'–50'	9'
51'–60'	10.5'
61'–70'	12'

PLAN



TYPICAL SECTION



TYPICAL ELEVATION

NOTES:

1. GRAVEL BAGS ARE ENCOURAGED OVER THE USE OF SANDBAGS AND MAY BE REQUIRED IN AREAS WHICH ARE PARTICULARLY SENSITIVE TO SEDIMENT DEPOSITION.
2. REQUIREMENTS AND SPACING OF VELOCITY REDUCERS FOR STREETS WITH GRADES OF LESS THAN 4 PERCENT SHALL BE AS SHOWN ON THE APPROVED EROSION CONTROL PLAN.
3. THIS STANDARD DETAIL SHALL BE USED AS SHOWN ON THE APPROVED EROSION CONTROL PLAN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

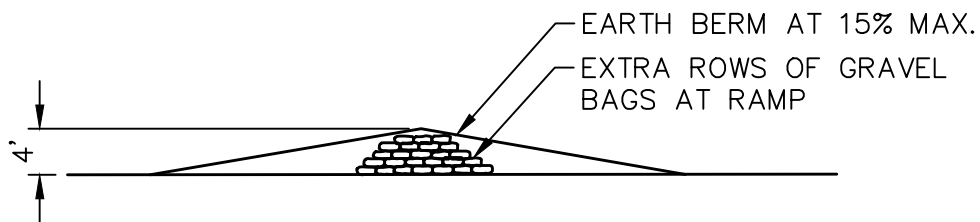
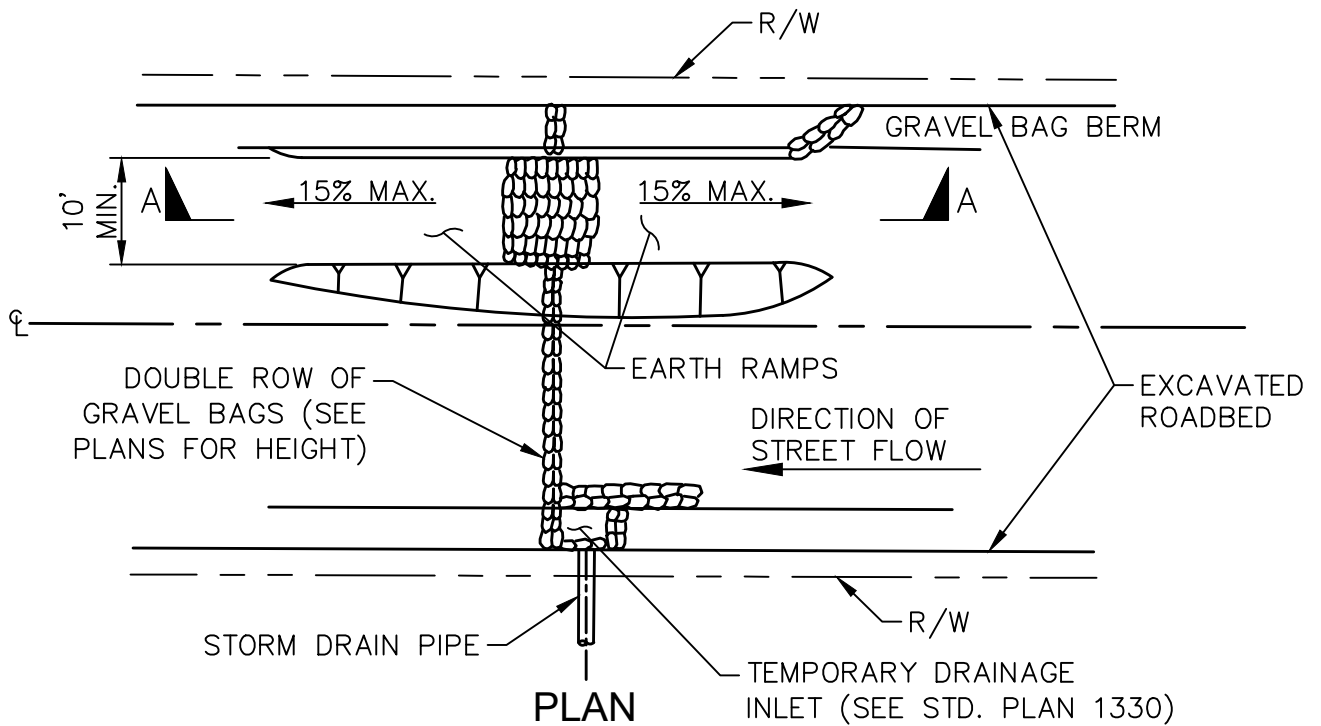
STD. PLAN

1328

SHT. 1 OF 1

SANDBAG VELOCITY REDUCER





**SECTION A-A**

**NOTES:**

1. STORAGE CAPACITY SHALL BE IN ACCORDANCE WITH CASQA CONSTRUCTION BMP HANDBOOK & THE DIMENSIONS OF THE STORAGE AREA SHALL BE SHOWN ON THE EROSION CONTROL PLAN.
2. GRAVEL BAGS ARE ENCOURAGED OVER SANDBAGS AND MAY BE REQUIRED IN AREAS WHICH ARE PARTICULARLY SENSITIVE TO SEDIMENT DEPOSITION.
3. THIS STANDARD DETAIL SHALL BE USED AS SHOWN ON THE APPROVED EROSION CONTROL PLAN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

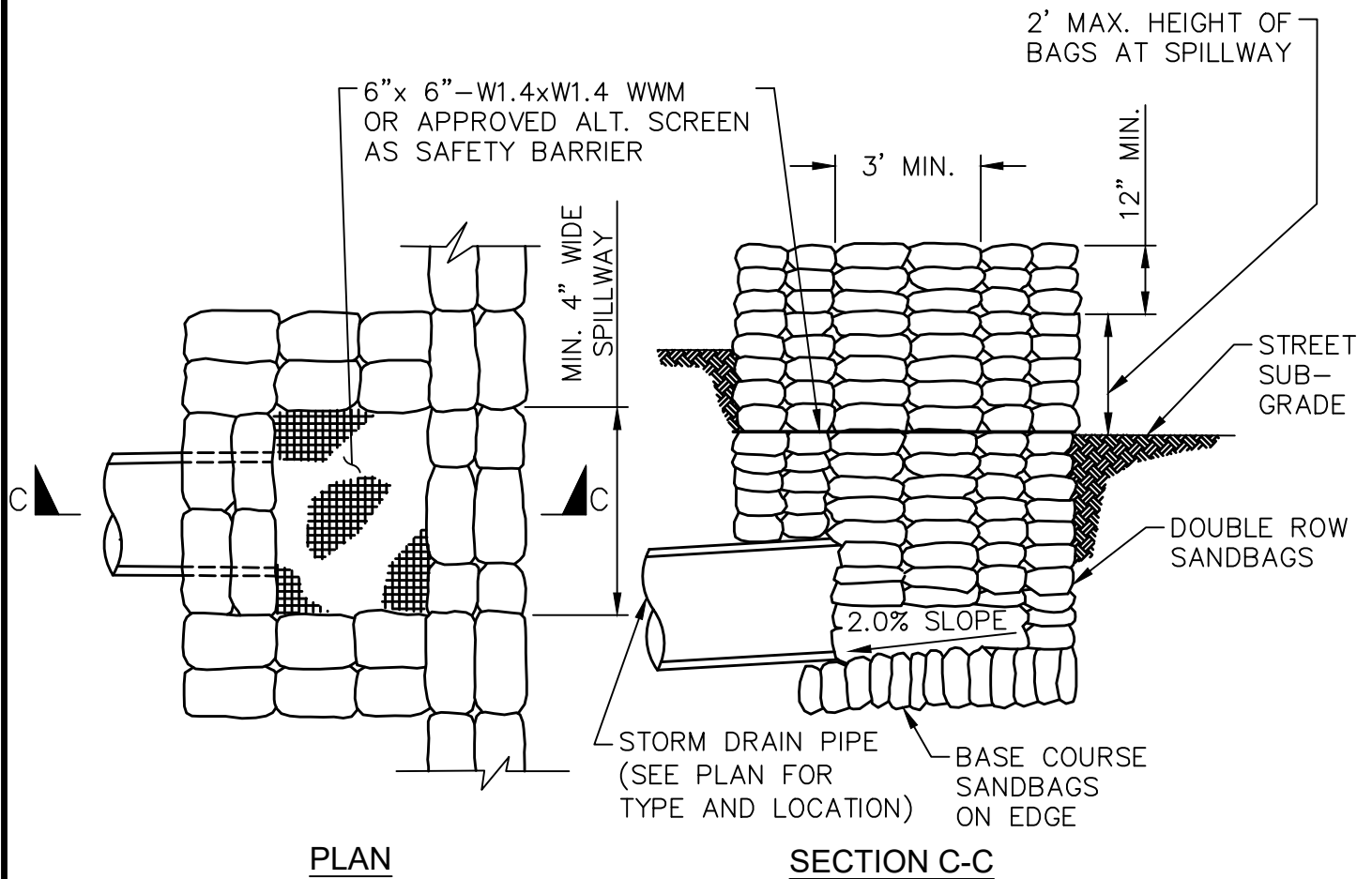
STD. PLAN

**1329**

SHT. 1 OF 1

**STREET DESILTING BASIN-VEHICLE ACCESS RAMP**





### NOTES:

1. GRAVEL BAGS ARE ENCOURAGED OVER THE USE OF SANDBAGS AND MAY BE REQUIRED IN AREAS WHICH ARE PARTICULARLY SENSITIVE TO SEDIMENT DEPOSITION.
2. A PORTION OF CATCH BASIN MAY BE CONSTRUCTED IN PLACE OF SANDBAGS.
3. THIS STANDARD DETAIL SHALL BE USED AS SHOWN ON THE APPROVED EROSION CONTROL PLAN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

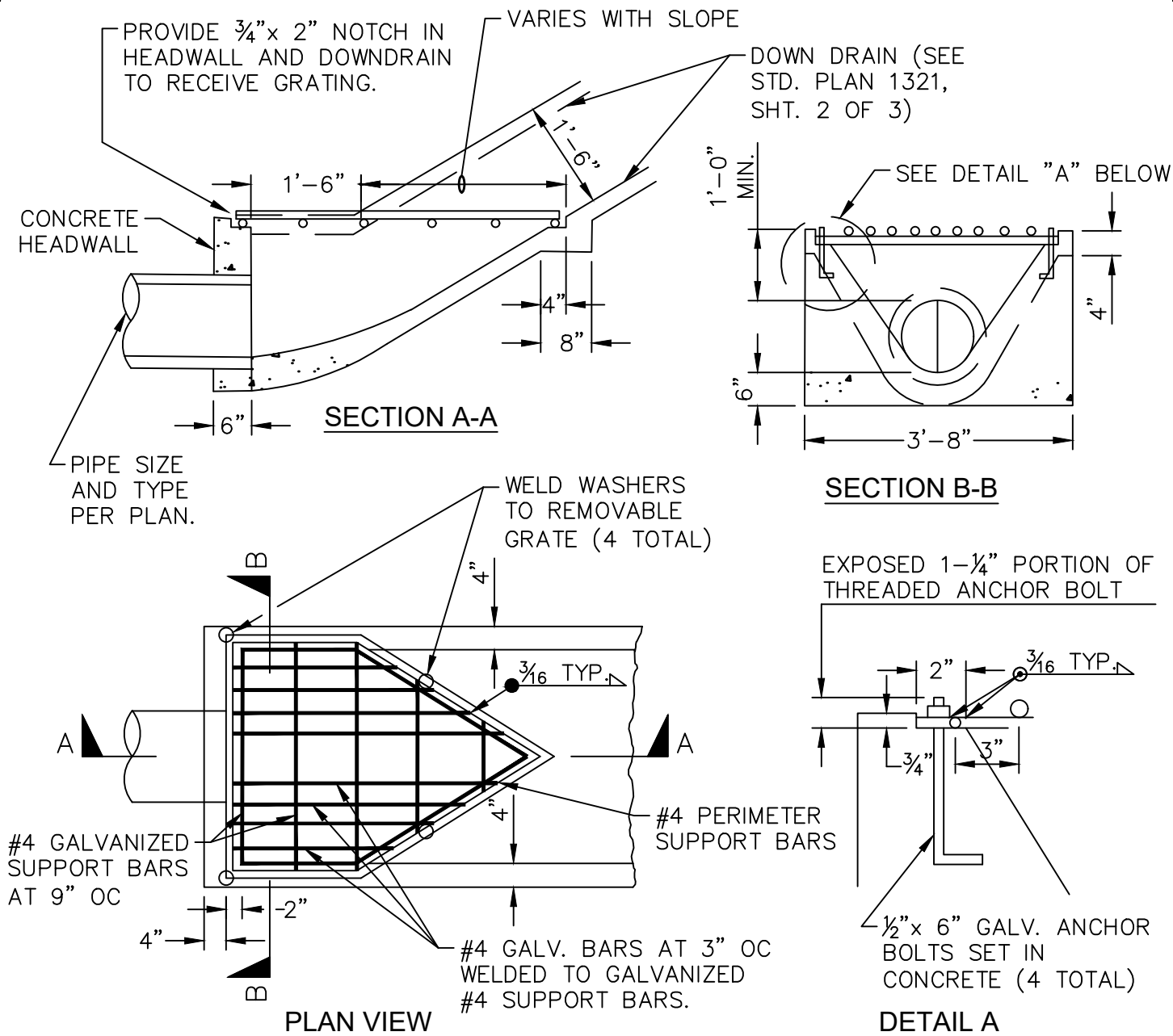
STD. PLAN

1330

SHT. 1 OF 1

TEMPORARY DRAINAGE INLET





#### NOTES:

1. GROUND SHALL BE PRE-WETTED TO THE SATISFACTION OF THE ENGINEER PRIOR TO PLACEMENT OF CONCRETE.
2. REINFORCING SHALL BE 6-INCH X 6-INCH - W 1.4 X W 1.4 WWM OR ENGINEER APPROVED EQUAL. REINFORCEMENT SHALL HAVE A MINIMUM OF 1-INCH CLEAR COVER AND SHALL BE PROPERLY FIXED AND SUPPORTED DURING PLACEMENT OF CONCRETE.
3. GRATE SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

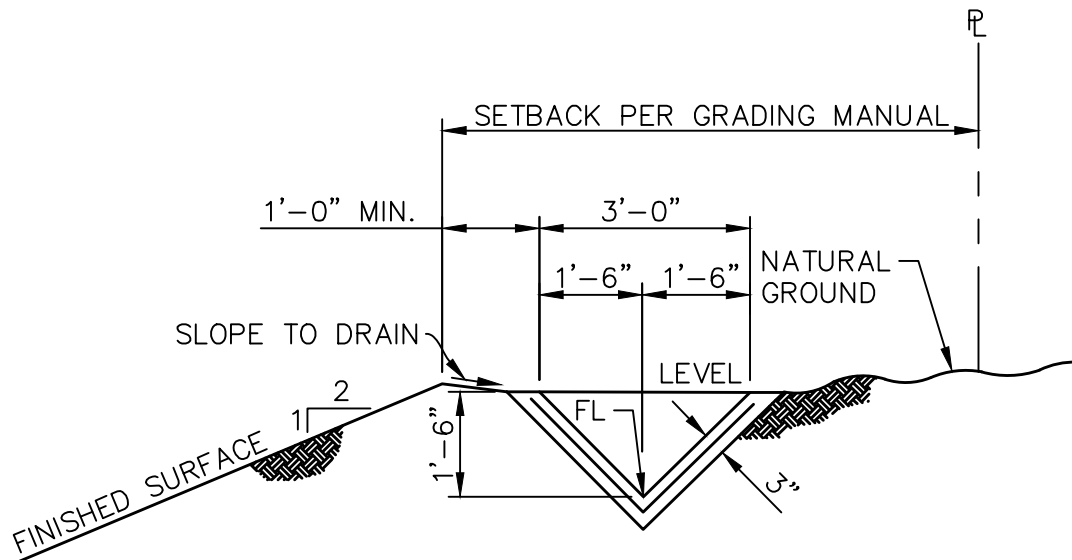
STD. PLAN

1331

SHT. 1 OF 1

DOWNDRAIN TO PIPE TRANSITION





#### NOTES:

1. CONCRETE SHALL BE TYPE II OR V, CLASS 520-C-2500 OR 520-C-2500P (IF PUMPED) CONFORMING TO THE REQUIREMENTS OF OCPW STANDARD PLAN 1803. AIR-PLACED CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF SECTION 303-2, "AIR-PLACED CONCRETE," AND METHOD OF PLACEMENT SHALL CONFORM TO SECTION 303-2.1.3, "METHOD B (SHOTCRETE)" OF THE GREENBOOK UNLESS OTHERWISE ALLOWED FOR BY THE ENGINEER.
2. REINFORCING SHALL BE 6-INCH X 6-INCH - W 1.4 X W 1.4 WWM OR ENGINEER APPROVED EQUAL. REINFORCEMENT SHALL HAVE A MINIMUM OF 1-INCH CLEAR COVER AND SHALL BE PROPERLY FIXED AND SUPPORTED DURING PLACEMENT OF CONCRETE.
3. GROUND SHALL BE PRE-WETTED TO THE SATISFACTION OF THE ENGINEER PRIOR TO PLACEMENT OF CONCRETE.
4. ANCHORS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD PLAN 1321 (SHEET 2) WHEN SLOPE EQUALS OR EXCEEDS 2:1.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

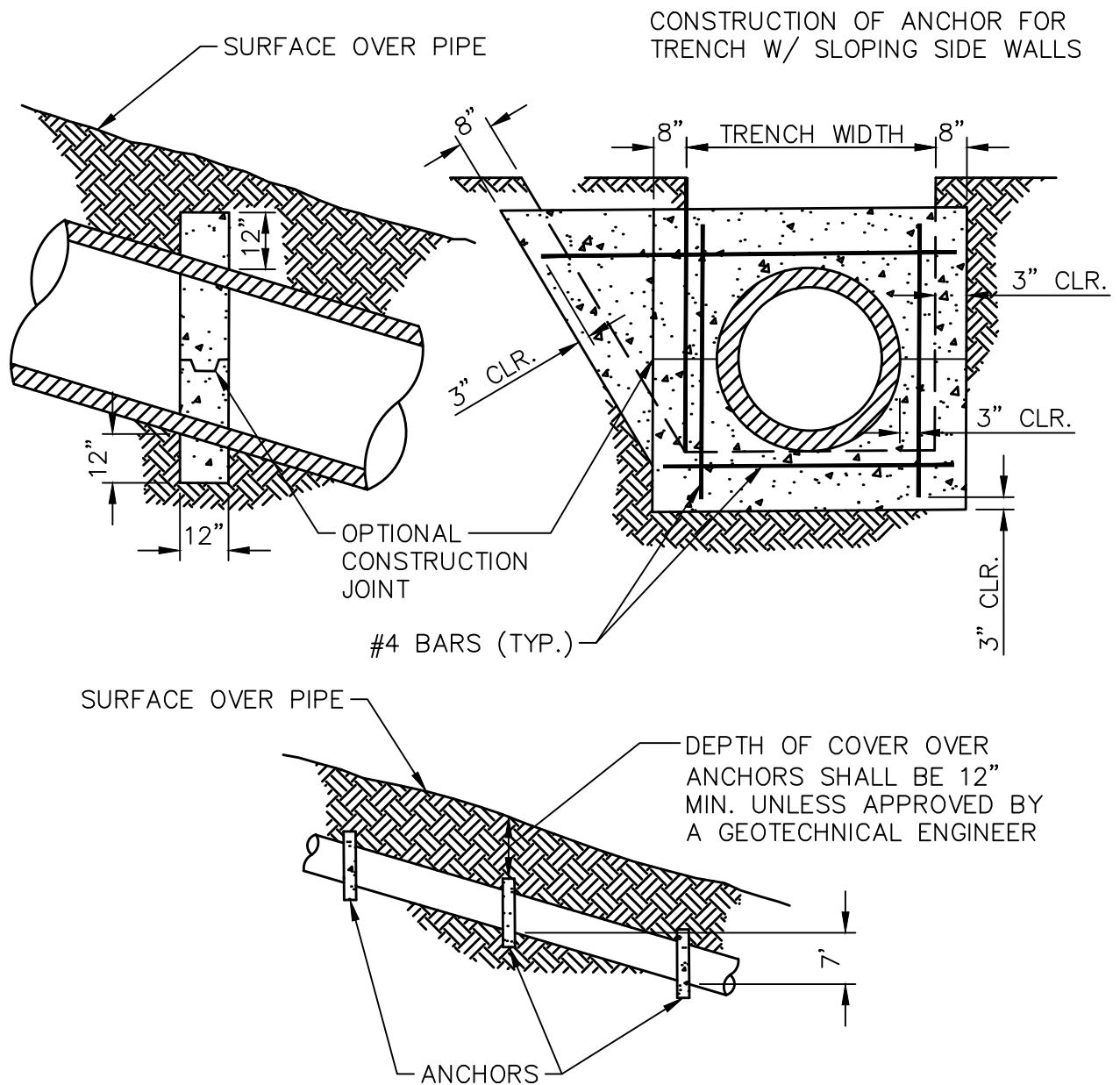
STD. PLAN

1332

SHT. 1 OF 1

INTERCEPTOR DRAIN





**NOTES:**

1. PIPE ANCHORS SHALL BE CONSTRUCTED AT 7 FEET VERTICAL INTERVAL ON ALL SLOPES OF 5:1 OR STEEPER.
2. ALL REINFORCING STEEL SHALL BE #4 BARS.
3. CONCRETE STRENGTH AND TYPE SHALL BE PER STD. PLAN 1803.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

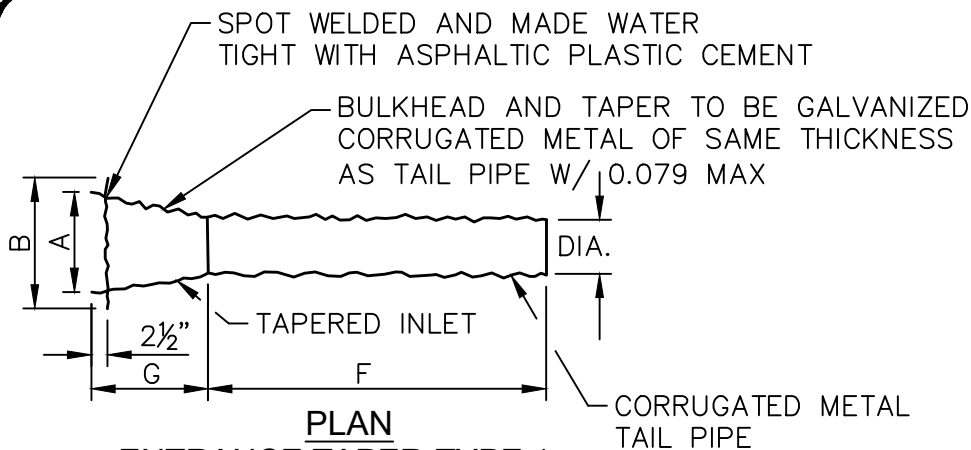
STD. PLAN

**1333**

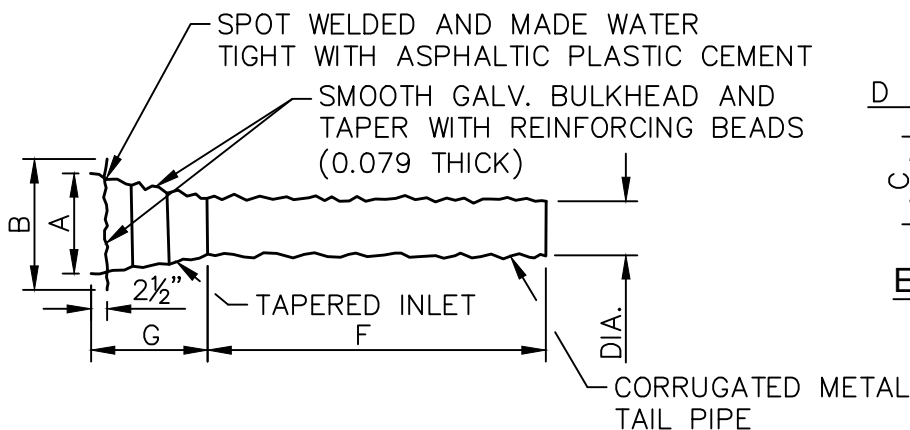
SHT. 1 OF 1

**CONCRETE PIPE SLOPE ANCHOR**

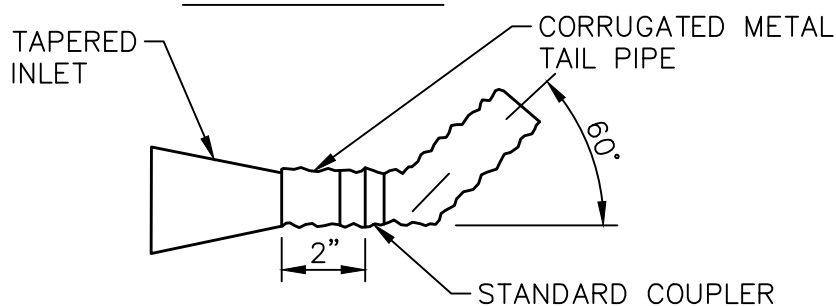




**PLAN**  
**ENTRANCE TAPER-TYPE 1**  
**ALTERNATIVE A**



**PLAN**  
**ENTRANCE TAPER-TYPE 1**  
**ALTERNATIVE B**



**ENTRANCE TAPER-TYPE 2**

**NOTE:**  
TAPERED INLET OF SAME CONSTRUCTION AND DIMENSIONS AS TYPE 1-ALTERNATIVE A OR B

**NOTES:**

TAIL PIPE SHALL BE SAME THICKNESS AS DOWNDRAIN PIPE. TAPER JOINTS MAY BE WELDED OR RIVETED.

DIMENSIONS TO BE AS TABULATED BELOW FOR TYPE 1, ALTERNATIVES A AND B

DIA	A	B	C	D	E	F	G
8"	16"	25 1/2"	15"	4 3/4"	5"	6'	2'
12"	18"	25 1/2"	19"	3 3/4"	5"	6'	2'
15"	21"	30"	23"	4 1/2"	6"	6'	2'
18"	24"	34"	27"	5"	7"	6'	2'
24"	34"	46"	35"	6"	9"	4'	4'

**ENTRANCE TAPER - TYPE 1**  
**ALTERNATIVE A & B**

**GALVANIZED STEEL OVERSIDE DRAIN**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

**1334**

SHT. 1 OF 4

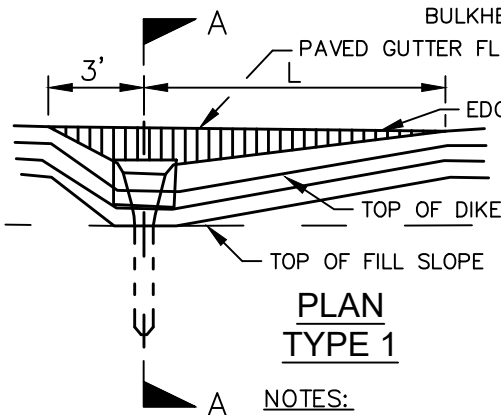
**OVERSIDE DRAINS**

CSP DIMENSIONS AS TABULATED BELOW

DIA.	MIN. L	M	N
8"	10'	18'	8"
12"	15'	20"	12"
15"	25'	24"	15"
18"	30'	30"	16"
24"	40'	36"	18"

P	10"	15"	18"	21"	27"
Q	8"	12"	15"	18"	24"

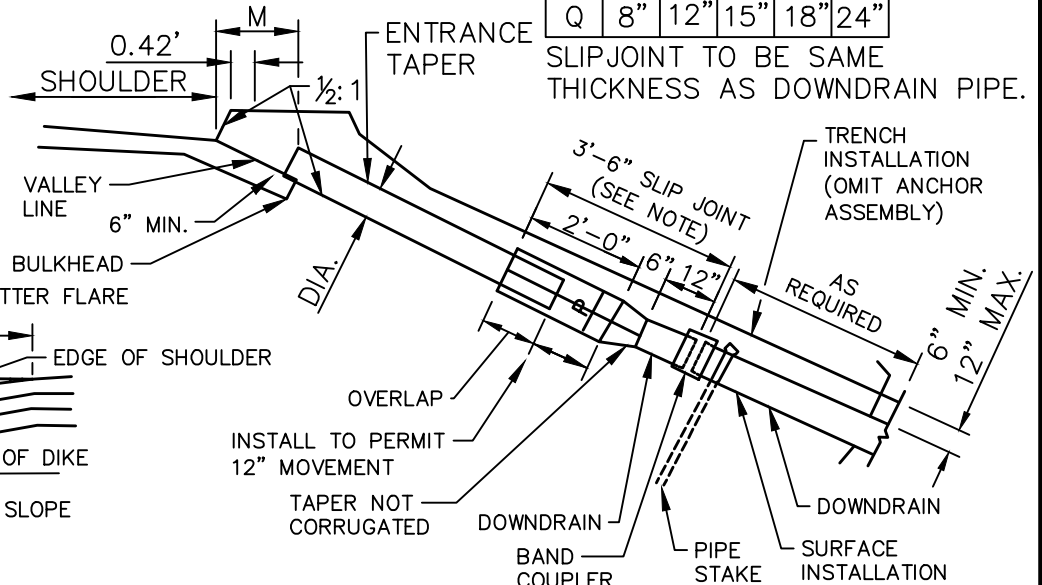
SLIPJOINT TO BE SAME THICKNESS AS DOWNDRAIN PIPE.



**PLAN  
TYPE 1**

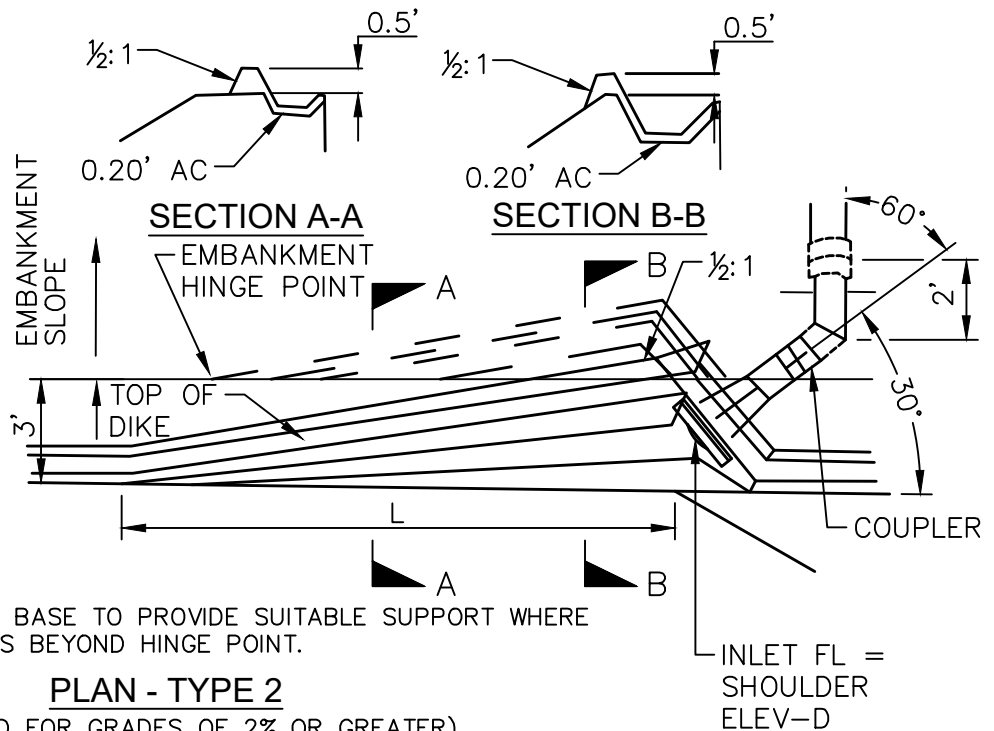
NOTES:

- (1) CABLE, SLIP JOINT OR ANCHOR ASSEMBLY TO BE PLACED WHEN SPECIFIED.
- (2) SLIP JOINT TO BE OMITTED WHEN COMPLETELY BURIED.
- (3) SLIP JOINT FOR TYPE 1 ENTRANCE TAPER SHOWN. TYPE 2 SIMILAR



**SECTION A-A (TYPE 1)**

DIA D	MIN. L
8"	15'
12"	20'
15"	30'
18"	35'
24"	45'



NOTE:

EXTEND DIKE BASE TO PROVIDE SUITABLE SUPPORT WHERE DIKE EXTENDS BEYOND HINGE POINT.

**PLAN - TYPE 2**

(RECOMMENDED FOR GRADES OF 2% OR GREATER)

**GALVANIZED STEEL OVERSIDE DRAIN**

SEE SHEET 3 OF 4 FOR ANCHOR ASSEMBLY

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

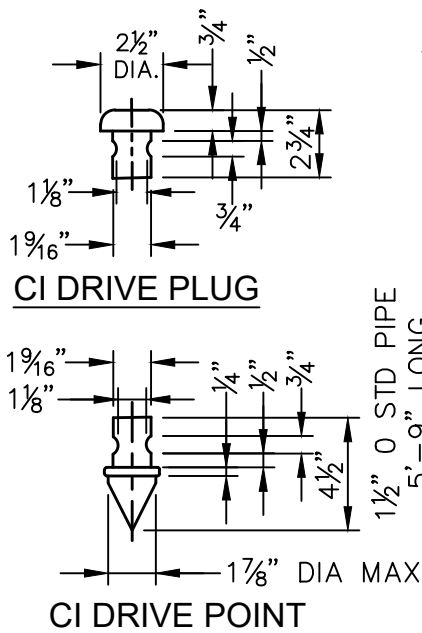
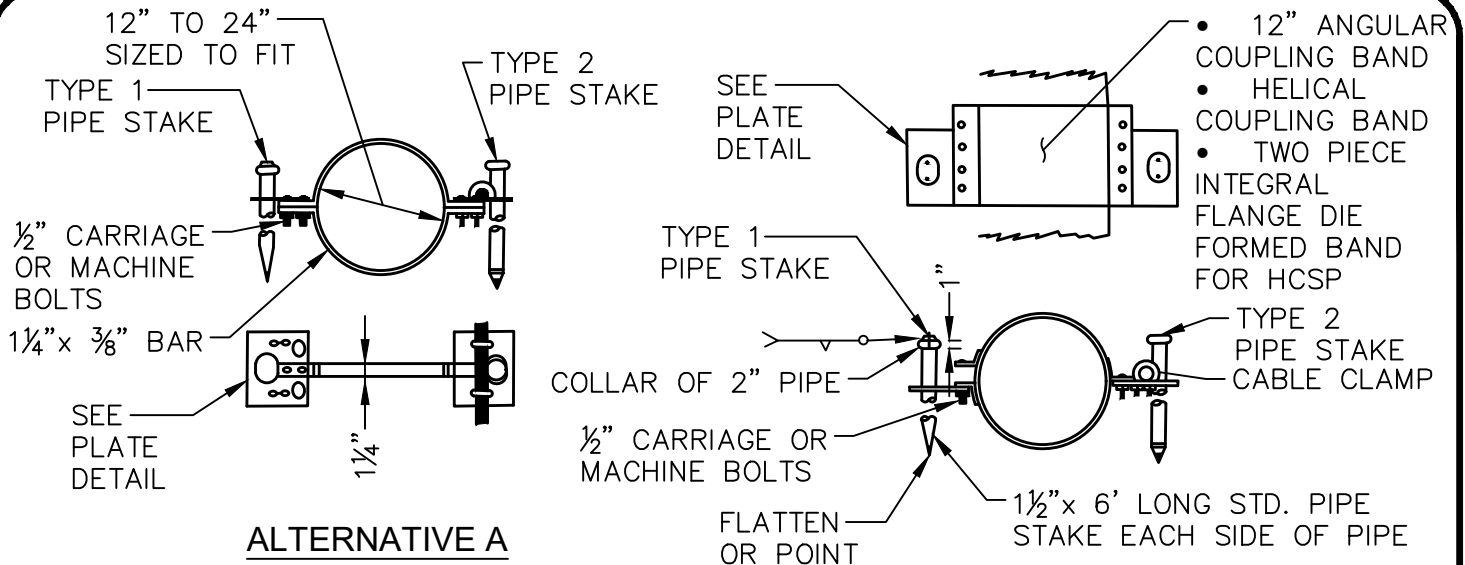
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STD. PLAN

**1334**

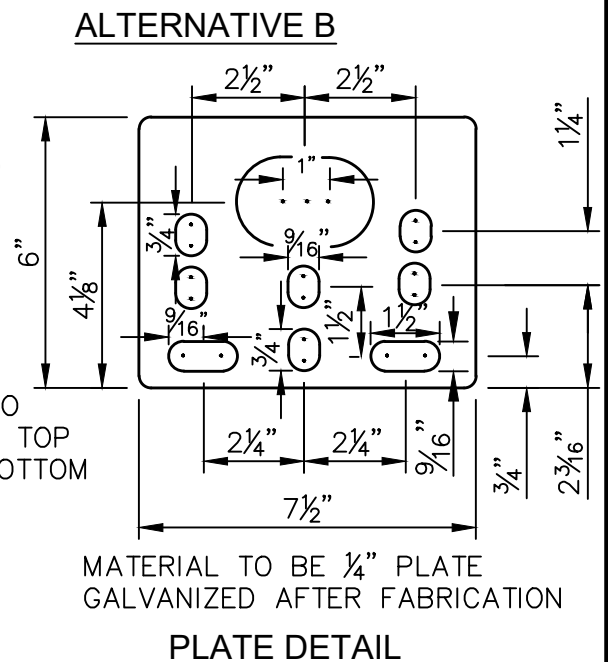
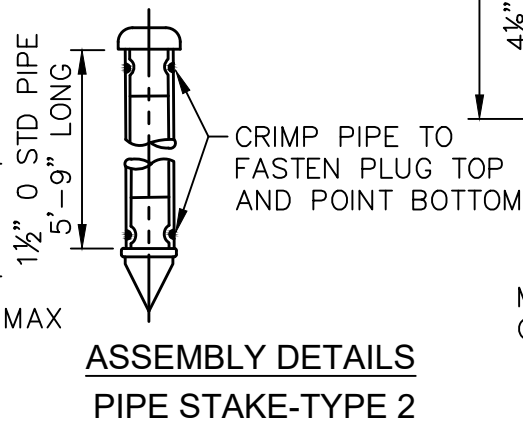
SHT. 2 OF 4

**OVERSIDE DRAINS**



### ANCHOR ASSEMBLY

NOTE:  
CABLE AND CABLE CLAMPS  
TO BE USED WHEN REQUIRED  
BY THE SPECIAL PROVISIONS



### NOTES:

1. FOR PAYMENT PURPOSES, AN ANCHOR ASSEMBLY SHALL INCLUDE TWO PIPE STAKES.
2. ALL PIPE STAKES AND HARDWARE TO BE GALVANIZED AFTER FABRICATION.
3. EITHER ALTERNATIVE A OR ALTERNATIVE B ANCHOR ASSEMBLIES AND TYPE 1 OR TYPE 2 PIPE STAKES MAY BE USED AT CONTRACTOR'S OPTION FOR CMP OR CAP ALTERNATIVE A ANCHOR ASSEMBLY, ONLY TO BE PLACED IN ANNULAR CORRUGATION, MAY BE PLACED ON ANNULAR OR REFORMED END HCSP COUPLING BAND IF SECURELY FASTENED ON DOWNSTREAM SIDE OF JOINT. ALTERNATIVE B ANCHOR ASSEMBLY TO BE FASTENED TO PIPE SECTION AND NOT TO BE A BAND COUPLER USED TO JOIN SECTIONS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

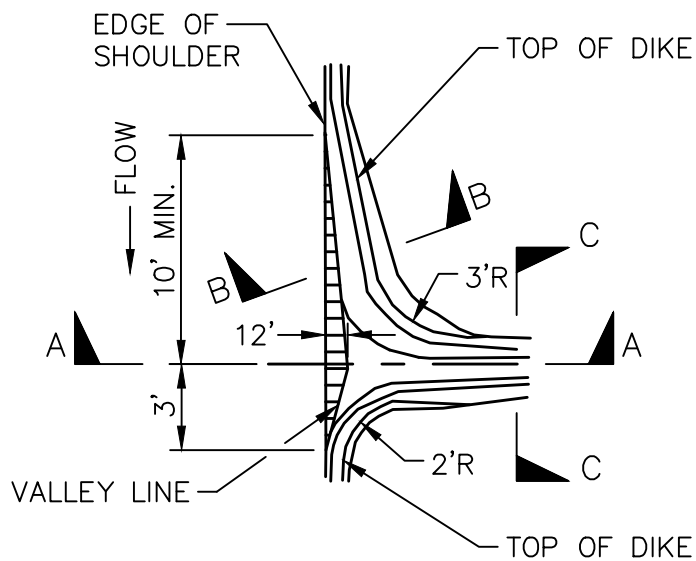
Revision: August 2018

STD. PLAN

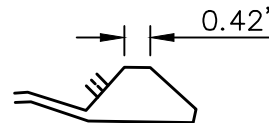
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SHT. 3 OF 4

OVERSIDE DRAINS



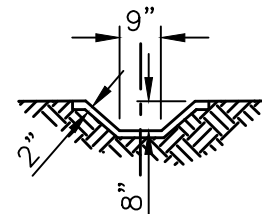
PLAN



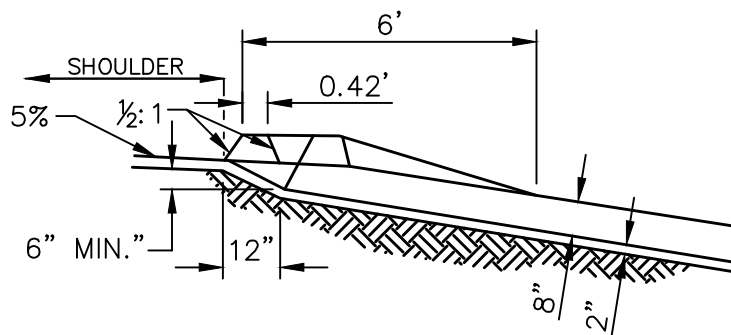
SECTION B-B

NOTE:

CROSS-SECTION OF SLOPE DITCH  
MAY BE SEMICIRCULAR, VEE OR  
TRAPEZOIDAL  
MIN TOP WIDTH = 25"  
MIN DEPTH = 8"



SECTION C-C



SECTION A-A

ASPHALT CONCRETE OVERSIDE DRAINS

TO BE USED ON FILL SLOPES FLATTER THAN 2:1. USE MIN 10' LENGTH  
OF GUTTER ON BOTH SIDES IN A SAG LOCATION

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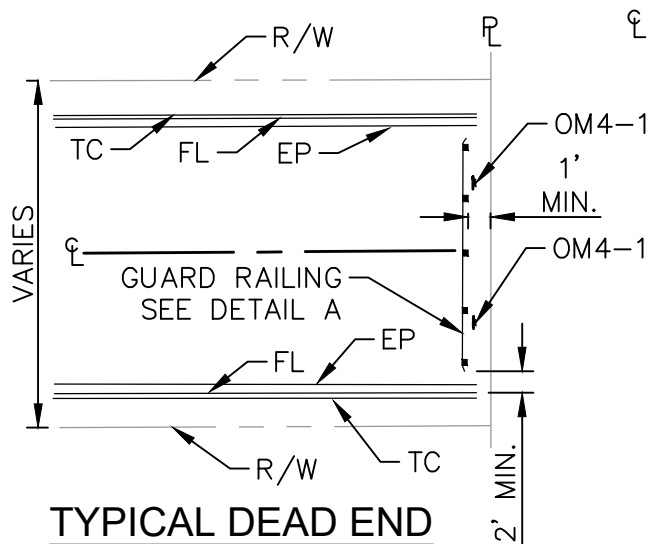
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

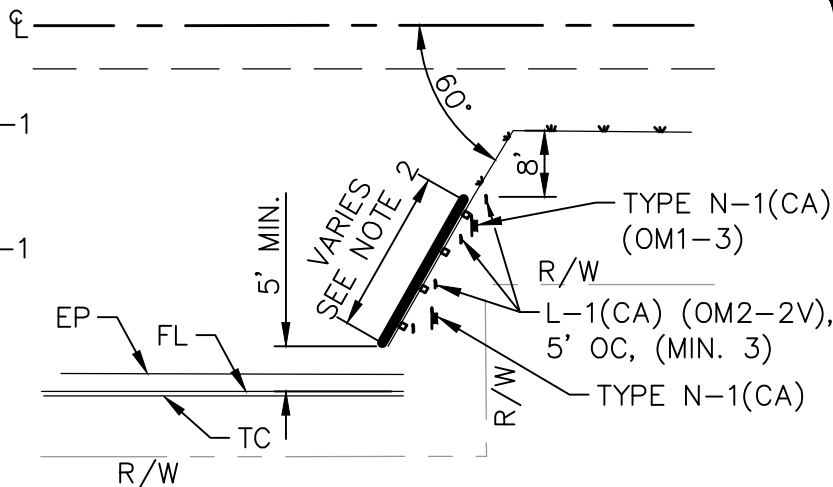
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SHT. 4 OF 4

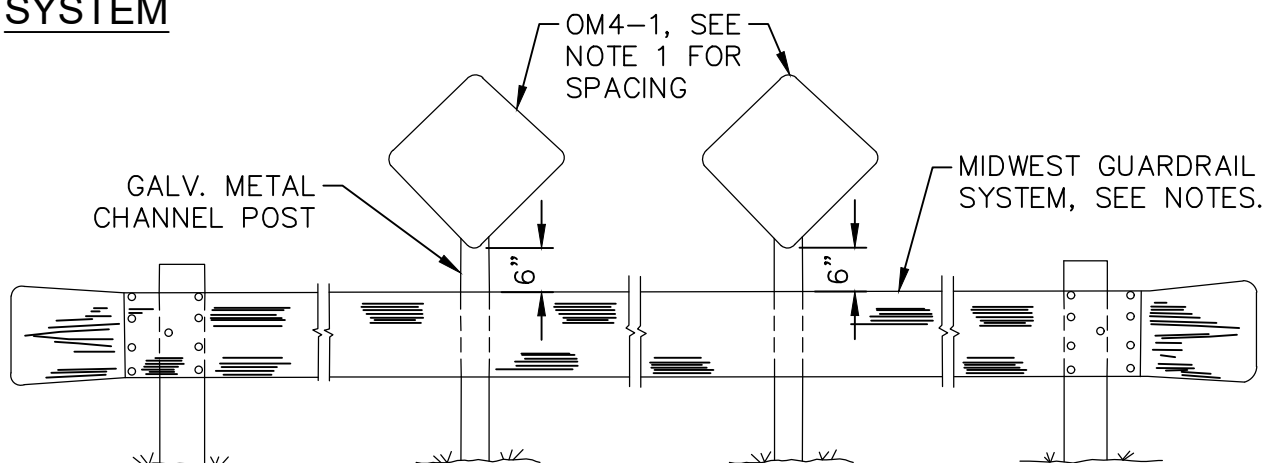
OVERSIDE DRAINS



**TYPICAL DEAD END  
WITH GUARDRAIL  
SYSTEM**



**TYPICAL WIDENED SECTION  
WITH GUARDRAIL SYSTEM**



**DETAIL A**

**NOTES:**

1. ONE TYPE OM4-1 SIGN SHALL BE PLACED IN THE CENTER OF EACH TRAVEL LANE IN A DEAD END SITUATION.
2. OM4-1, TYPE N-1(CA) (OM1-3), OR L-1(CA) (OM2-2V) OBJECT MARKERS SHALL BE PLACED AS SHOWN ON THE IMPROVEMENT PLANS. MIDWEST GUARDRAIL SYSTEM SHALL BE ADDED AT LOCATIONS WHERE GREATER DAMAGE WOULD BE INFLICTED ON A VEHICLE LEAVING THE ROAD THAN STRIKING THE RAILING, OR WHERE ESSENTIAL TO PROTECT EXISTING FACILITIES FROM THE INTRUSION OF A VEHICLE.
3. SEE CALTRANS STD. PLAN A77C4 THRU A77K2 (LATEST EDITION) FOR MIDWEST GUARDRAIL DETAILS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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*Khalid Bazmi*  
Khalid Bazmi, County Engineer

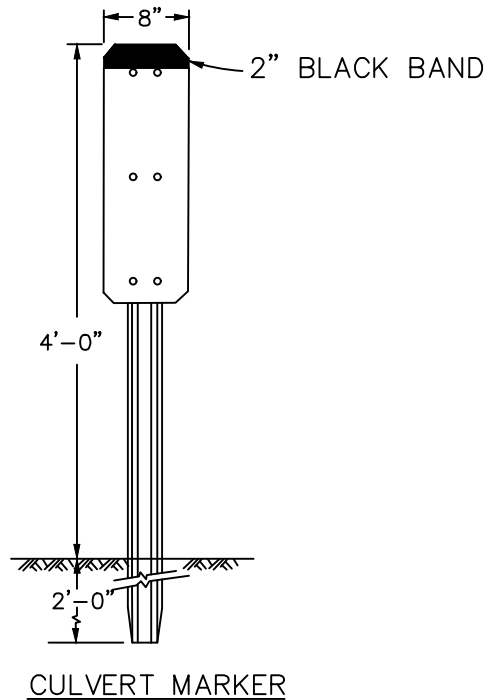
STD. PLAN

**1401**

SHT. 1 OF 1

**DEAD END AND WIDENED SECTION SIGNING**





NOTE:

CULVERT MARKERS ON COUNTY ROADS SHALL BE LOCATED AT THE EDGE OF SHOULDER OPPOSITE THE END OF CULVERT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

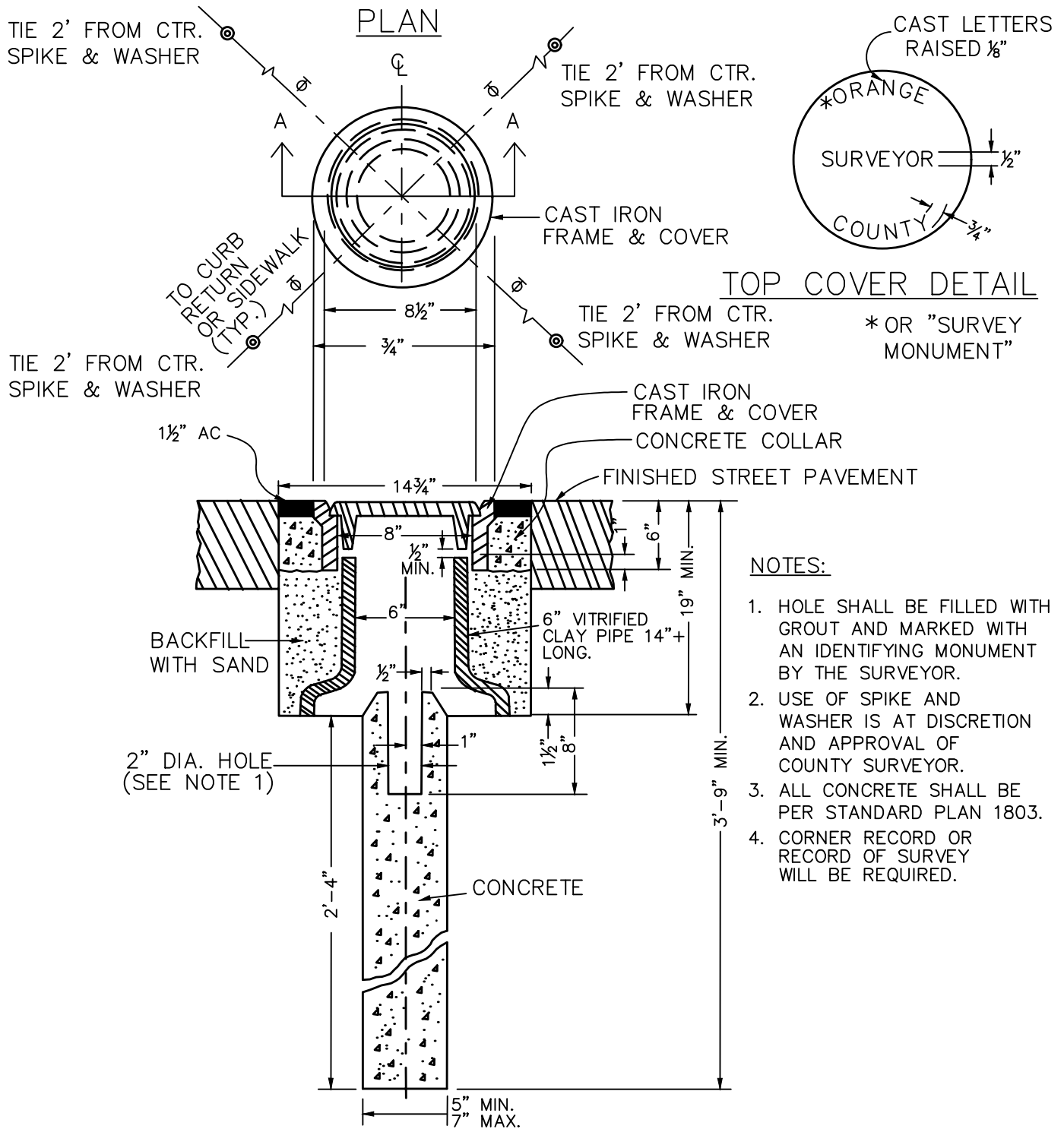
MARKERS

STD. PLAN

1402

SHT. 1 OF 1





**NOTES:**

1. HOLE SHALL BE FILLED WITH GROUT AND MARKED WITH AN IDENTIFYING MONUMENT BY THE SURVEYOR.
2. USE OF SPIKE AND WASHER IS AT DISCRETION AND APPROVAL OF COUNTY SURVEYOR.
3. ALL CONCRETE SHALL BE PER STANDARD PLAN 1803.
4. CORNER RECORD OR RECORD OF SURVEY WILL BE REQUIRED.

**SECTION A-A**  
**SURVEY MONUMENT TYPE "A"**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

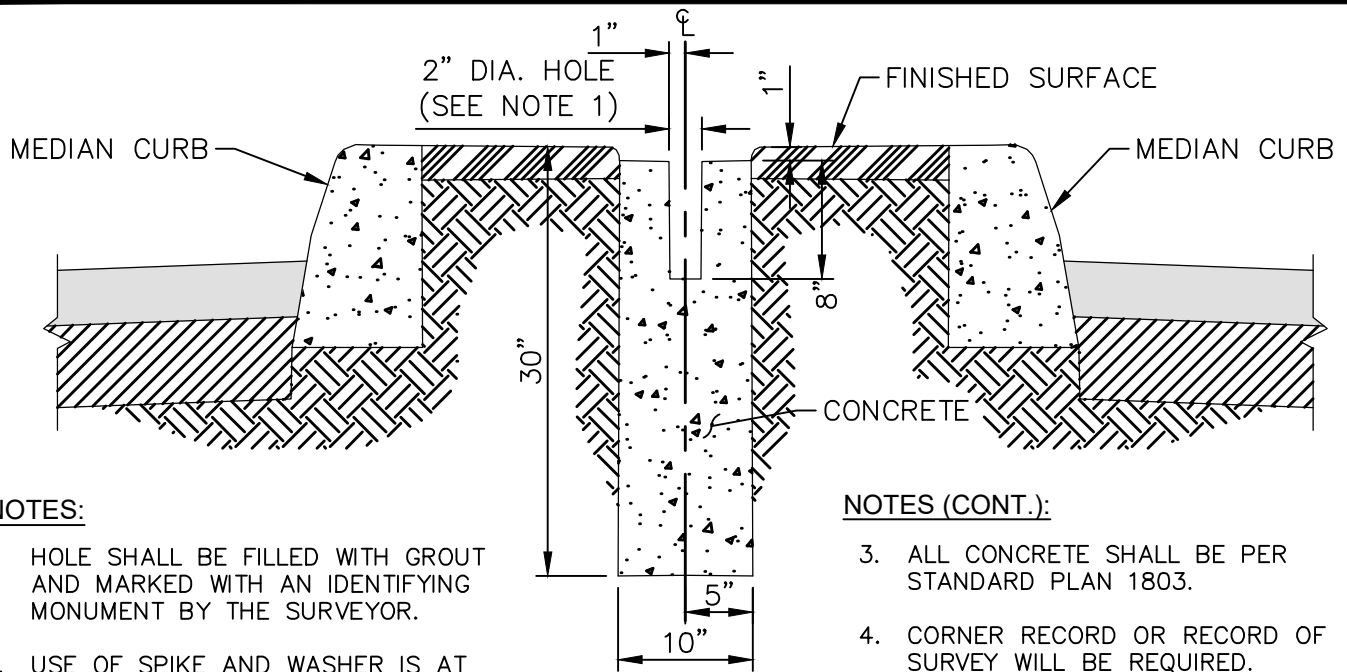
STD. PLAN

**1405**

SHT. 1 OF 1

**SURVEY MONUMENT TYPE "A"**





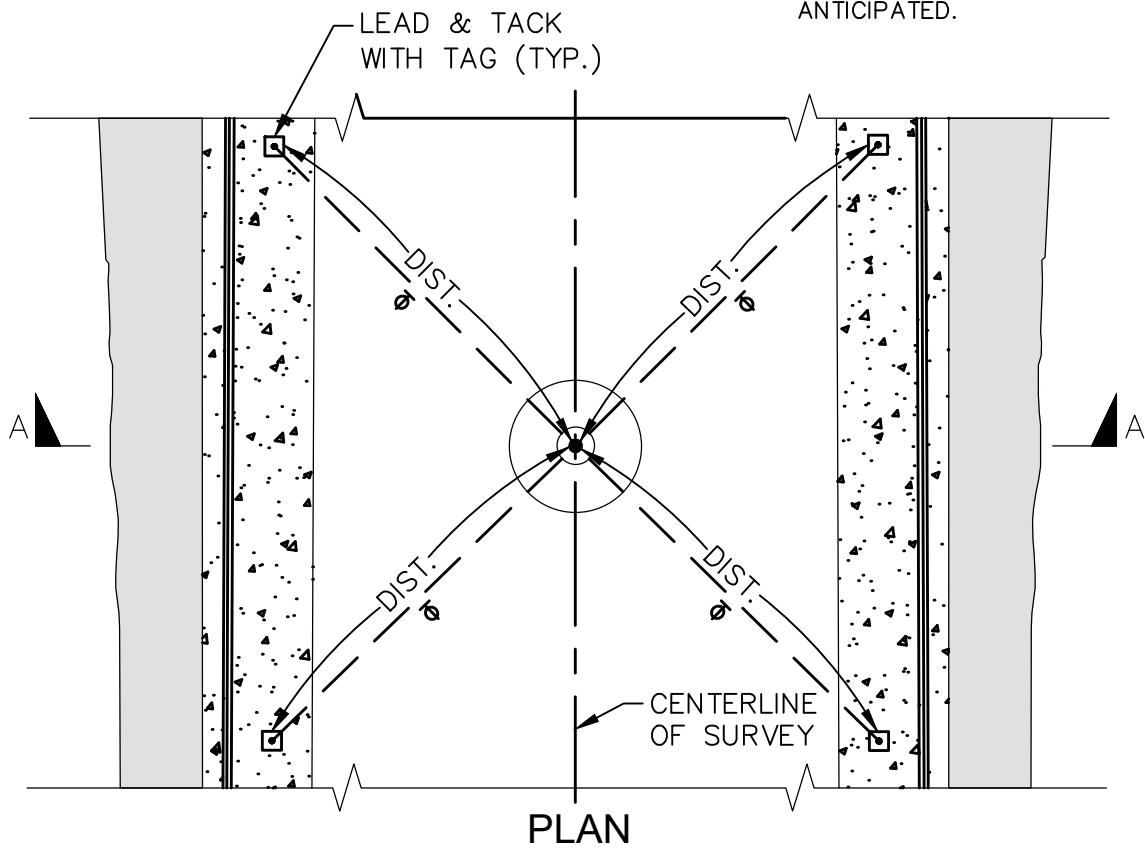
**NOTES:**

1. HOLE SHALL BE FILLED WITH GROUT AND MARKED WITH AN IDENTIFYING MONUMENT BY THE SURVEYOR.
2. USE OF SPIKE AND WASHER IS AT DISCRETION AND APPROVAL OF COUNTY SURVEYOR.

**NOTES (CONT.):**

3. ALL CONCRETE SHALL BE PER STANDARD PLAN 1803.
4. CORNER RECORD OR RECORD OF SURVEY WILL BE REQUIRED.
5. THIS TYPE OF MARKER TO BE INSTALLED ONLY IN SITUATIONS WHERE NO VEHICULAR TRAFFIC IS ANTICIPATED.

**SECTION A-A**



**PLAN**  
**SURVEY MONUMENT TYPE "B"**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

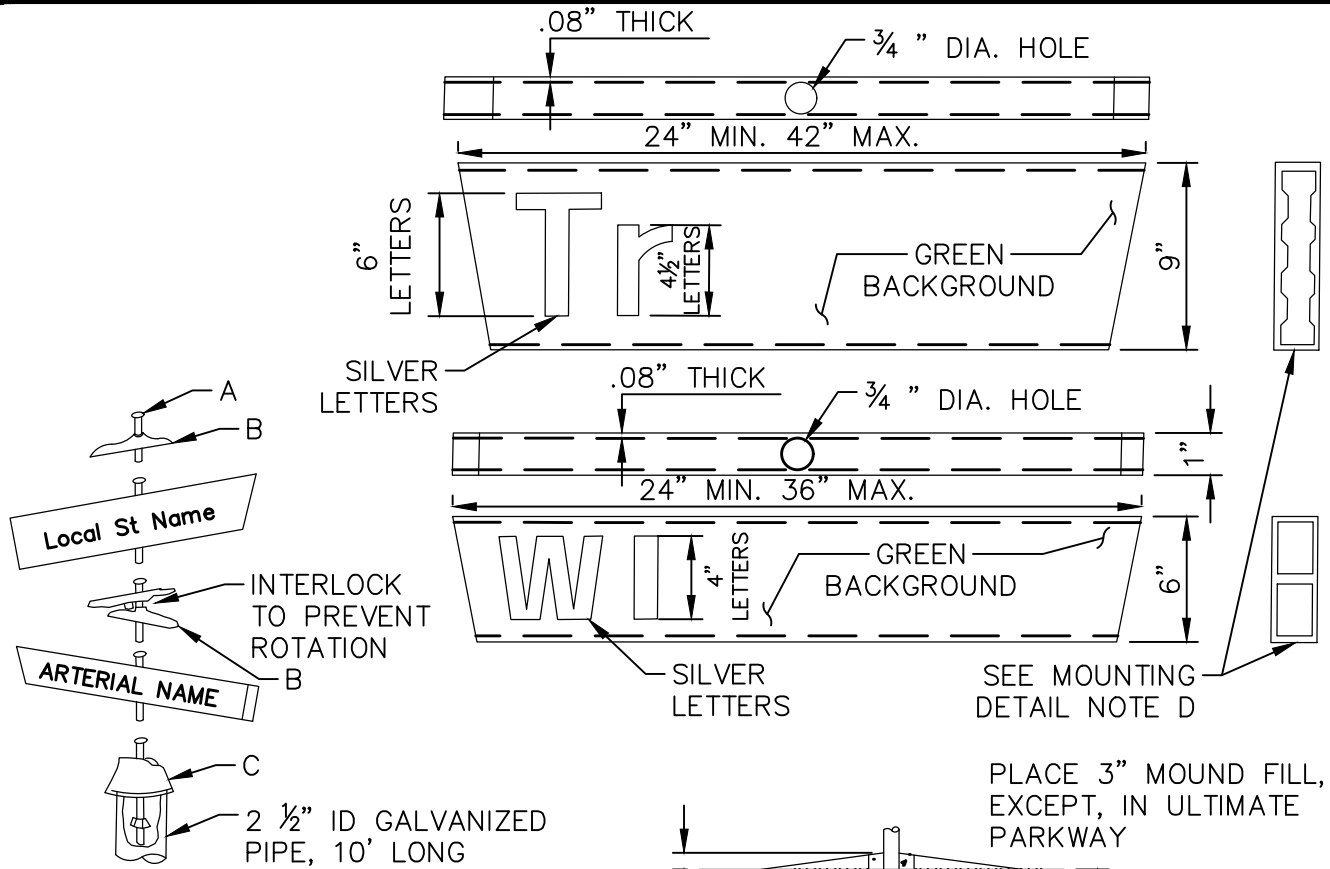
STD. PLAN

**1406**

SHT. 1 OF 1

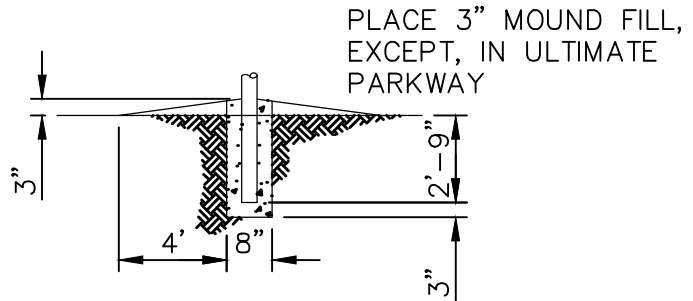
**SURVEY MONUMENT TYPE "B"**





## MOUNTING DETAIL

SEE BELOW FOR NOTES  
A, B, C, AND D.



## FOOTING DETAIL

### MOUNTING DETAIL NOTES:

- USE A  $\frac{5}{8}$  INCH X 18 INCH GALVANIZED MILD STEEL CARRIAGE BOLT FOR 6-INCH AND 9-INCH SIGN COMBINATION. USE A  $\frac{5}{8}$  INCH X 15 INCH CARRIAGE BOLT FOR 6-INCH AND 6-INCH SIGN COMBINATION. USE A  $\frac{5}{8}$  INCH X 21 INCH CARRIAGE BOLT FOR 9-INCH AND 9-INCH SIGN COMBINATION.
- ORNAMENTAL TOP AND CENTER ACROSS SADDLE SHALL BE ANODIZED AND CAST FROM ALUMINUM CASTING ALLOY 319.
- ANODIZED  $2\frac{1}{2}$  INCHES POST CAP, CAST FROM ALUMINUM CASTING ALLOY 319, WITH THREE (3)  $\frac{3}{8}$  INCH STAINLESS STEEL SET SCREWS. DRILL  $\frac{1}{4}$  INCH DIAMETER HOLE THROUGH CAP AND POST BETWEEN TWO SET SCREWS AND INSTALL  $\frac{1}{4}$  INCH X  $\frac{3}{4}$  INCH STEEL ROLL PIN.
- THE SIGN SHALL HAVE REINFORCING RIBS OR CROSS MEMBERS TO RETAIN THE RIGIDITY OF THE SIGN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1407

SHT. 1 OF 3

SPECIAL PROVISIONS - STREET NAME SIGN

#### NOTES:

1. EXACT LOCATIONS OF STREET NAME SIGNS ARE ON THE PROJECT PLANS. SEE SHEET 3 FOR PLACEMENT CRITERIA, AND STREET NAME SIGN NOTES.
2. ALUMINUM ALLOY FOR ALL COMPONENTS SHALL CONFORM TO SPECIFICATIONS PUBLISHED BY THE ALUMINUM ASSOCIATION.
3. THE 9-INCH SIGN SHALL FACE ARTERIAL TRAFFIC; THE 6-INCH SIGN SHALL FACE LOCAL STREET TRAFFIC.
4. SIGNS MUST CONFORM TO REQUIREMENTS SPECIFIED IN LATEST CA MUTCD.

#### MATERIAL

THE STREET NAME SIGN BLANK SHALL BE FABRICATED FROM NEW ALUMINUM SHEETS FROM 6061-T6 OR 5052-H38 ALLOYS CONFORMING TO ASTM B209 WITH A MINIMUM THICKNESS OF 0.080 INCH.

#### SIZE

THE SIGNS SHALL BE IN TWO SIZES:

1. FOR 6-INCH WIDE SIGNS, THE SIGN FACE SHALL BE FABRICATED IN SIX-INCH MULTIPLES FROM 24 INCHES TO 36 INCHES.
2. FOR 9-INCH WIDE SIGNS, THE SIGN FACE SHALL BE FABRICATED IN SIX-INCH MULTIPLES FROM 24 INCHES TO 42 INCHES.

#### FINISH

SIGN FACE SHALL BE OF WIDE ANGLE, SMOOTH SURFACE REFLECTIVE SHEETING, CONFORMING TO FEDERAL SPECIFICATIONS L-S-300A CLASSIFICATION 1.2 TYPE I (CLASS 1 OR 2) TABLE II REFLECTIVITY I. LEGEND SHALL BE SILVER WITH REVERSE SCREEN GREEN BACKGROUND. SHEETING SHALL BE BONDED TO SIGN BLANKS AND BE OF THE SAME SHAPE AND SIZE.

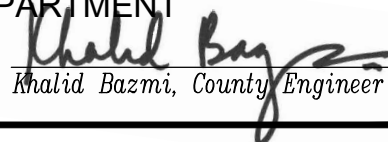
#### LETTERING

THE SIZE OF THE LETTERING DEPENDS UPON THE WIDTH OF SIGN BLANK.

1. THE 6-INCH WIDTH SIGN SHALL HAVE 4-INCH CAPITAL LETTERS
2. THE 9-INCH WIDTH SIGN SHALL HAVE 6-INCH CAPITAL LETTERS AND 4½-INCH LOWER CASE LETTERS.
3. THE STREET NAME SHALL BE CENTERED ON THE SIGN FACE.
4. STREET NAME PREFIXES (SUCH AS CALLE, CAMINO) SHALL BE SHOWN IN 2-INCH CAPITAL LETTERS; STREET NAME SUFFIXES (SUCH AS DRIVE, STREET, ROAD), SHALL BE SHOWN IN 2-INCH CAPITAL LETTERS; AND BLOCK NUMBERS SHALL NOT BE SHOWN.
5. SPACING OF LETTERS TO BE AS FOLLOWS:
  - A. THE END SPACE SHALL NOT BE LESS THAN ⅓ THE HEIGHT OF THE UPPER CASE LETTER BEING USED.
  - B. THE SPACING BETWEEN WORDS ON NAMES WITH TWO OR MORE WORDS SHALL BE NOT LESS THAN ⅔ THE HEIGHT OF THE UPPER CASE LETTER BEING USED.
  - C. THE SPACING BETWEEN LETTERS SHALL BE 1 TO 1½ TIMES THE STROKE WIDTH (WIDTH OF LETTERING MATERIAL), DEPENDENT UPON COMBINATION OF LETTERS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

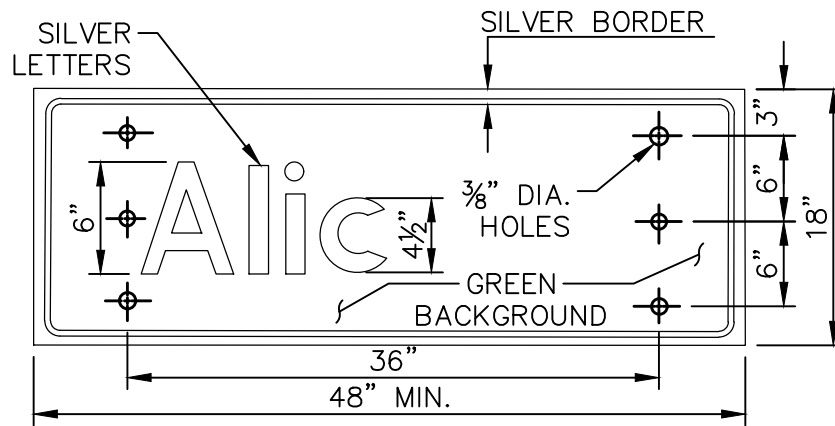
1407

SPECIAL PROVISIONS - STREET NAME SIGN

SHT. 2 OF 3

SHT. 3 OF 3





#### NOTES:

1. SIGNS MUST CONFORM TO REQUIREMENTS SPECIFIED IN LATEST CA MUTCD.
2. ALUMINUM ALLOY FOR ALL COMPONENTS SHALL CONFORM TO SPECIFICATIONS PUBLISHED BY THE ALUMINUM ASSOCIATION.
3. SEE STD. PLAN 1409 FOR SIGN PLACEMENT AND NOTES.
4. SEE STD. PLAN 1417 FOR SIGN POST INSTALLATION.

#### MATERIAL

THE STREET NAME SIGN BLANK SHALL BE FABRICATED FROM NEW ALUMINUM SHEETS FROM 6061-T6 OR 5155H36 ANODIZED ALUMINUM ALLOY EXTRUSION.

#### SIZE

THE SIGN FACE SHALL BE FABRICATED WITH A HEIGHT OF 18 INCHES AND A MINIMUM WIDTH OF 48 INCHES. THICKNESS SHALL BE 0.080 INCH OR 0.063 INCH WITH BACK FRAME.

#### FINISH

SIGN FACE SHALL BE OF WIDE ANGLE, SMOOTH SURFACE REFLECTIVE SHEETING, CONFORMING TO FEDERAL SPECIFICATION L-S-300A CLASSIFICATION 1.2 TYPE I (CLASS 1 OR 2) TABLE II REFLECTIVITY 1. LEGEND SHALL BE SILVER WITH REVERSE SCREEN GREEN BACKGROUND. SHEETING SHALL BE BONDED TO REFLECTIVE ALUMINUM ALLOY SIGN BLANKS AND BE OF THE SAME SHAPE AND SIZE.

#### LETTERING

1. THE SIZE, STYLE, AND SPACING, OF LETTERS SHALL CONFORM TO THE LATEST CA MUTCD, FOR A "G7-2" ADVANCE STREET NAME PLAQUE. ABBREVIATED SUFFIXES (I.E., BLVD, AVE, PKWY) SHALL BE SHOWN. THE STREET NAME SHALL BE CENTERED ON THE SIGN FACE.
2. 8-INCH CAPITAL LETTERS AND 6-INCH LOWER CASE LETTERS SHALL BE USED ON LARGER SIGNS IN CONFORMANCE WITH CALTRANS TRAFFIC MANUAL FOR RURAL ROADS WITH HIGH SPEED TRAFFIC. USE OF THIS SIGN SHALL BE DIRECTED BY THE ENGINEER.
3. SPACING OF LETTERS SHALL BE AS FOLLOWS:
  - (A) THE END SPACING, SPACING BETWEEN WORDS OF NAMES WITH TWO OR MORE WORDS, AND SPACING BETWEEN STREET NAME AND SUFFIX SHALL BE NOT LESS THAN THE HEIGHT OF THE UPPER CASE LETTER BEING USED.
  - (B) THE SPACING BETWEEN LETTERS SHALL BE 1 TO 1½ TIMES THE STROKE WIDTH (WIDTH OF LETTERING MATERIAL), DEPENDENT ON COMBINATION OF LETTERS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

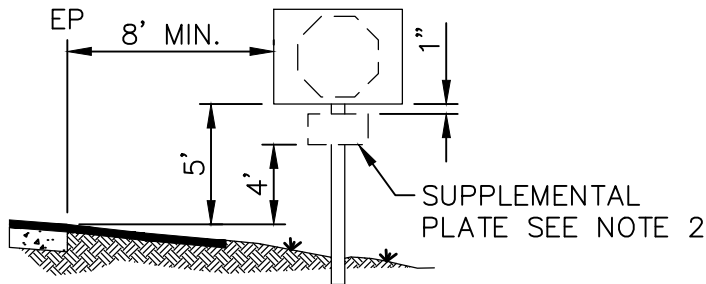
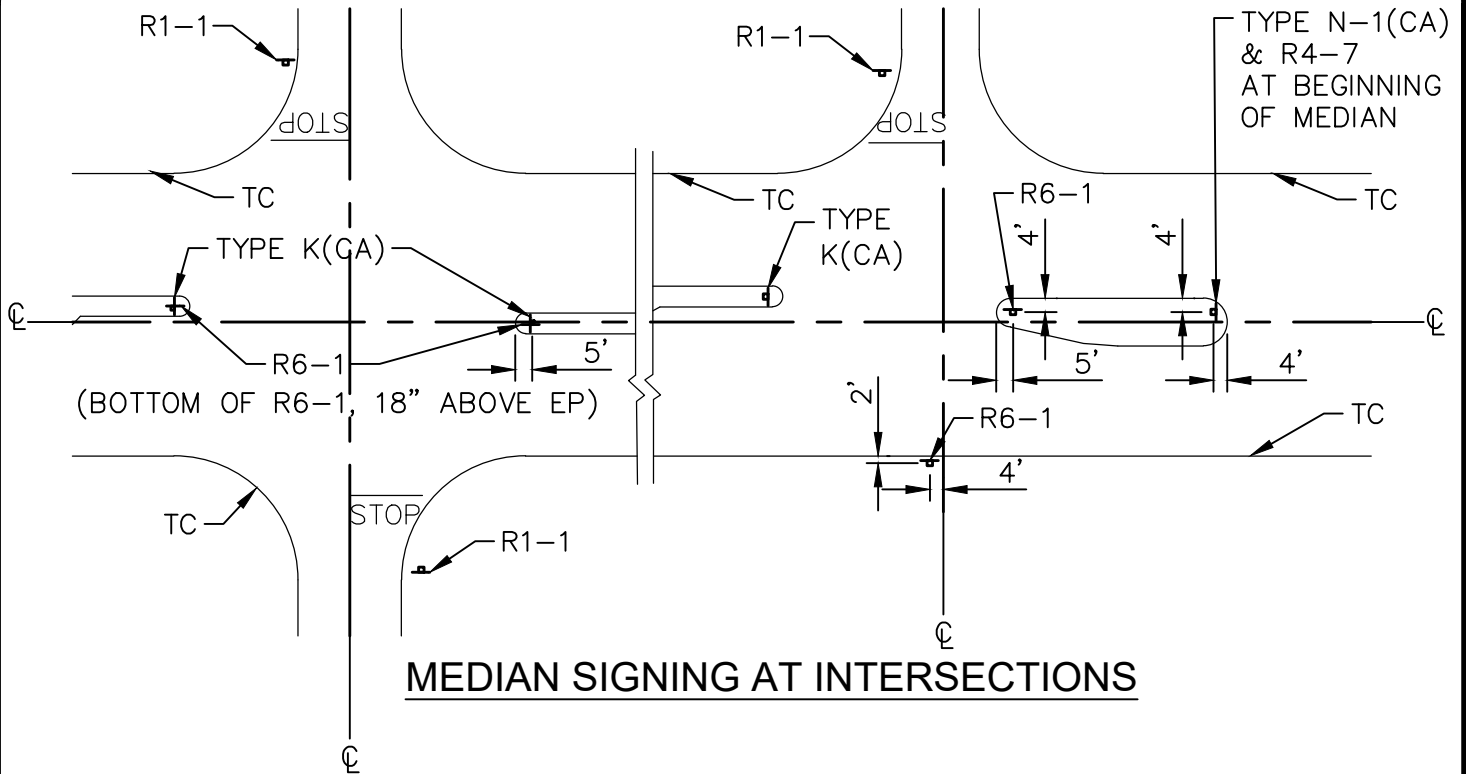
STD. PLAN

1408

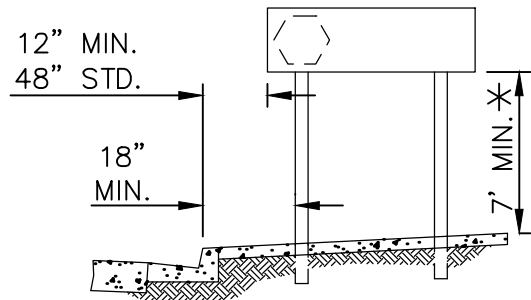
SHT. 1 OF 1

ADVANCE STREET NAME PLAQUE



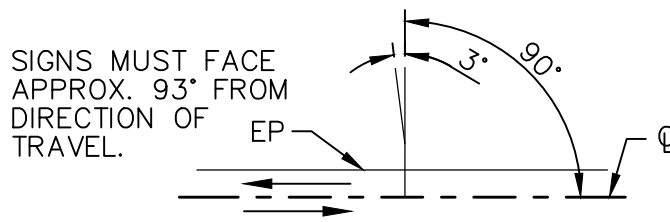


**SHOULDER LOCATIONS**



**PARKWAY LOCATIONS**

\* 8' MINIMUM IF DESIGNATED BIKE ROUTE.



**PLAN VIEW**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

**1409**

SHT. 1 OF 2

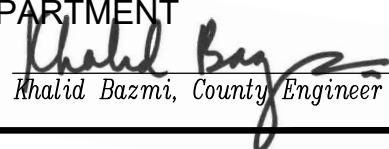
**TRAFFIC SIGN PLACEMENT**

NOTES:

1. SEE SHOULDER AND PARKWAY LOCATION DETAILS FOR STANDARD MOUNTING HEIGHTS. EXCEPTIONS SHOULD BE MADE TO AVOID SIGHT RESTRICTIONS OR UNDESIRABLE CONDITIONS, AT THE DIRECTION OF THE ENGINEER.
2. WHEN SUPPLEMENTAL PLATE IS USED, THE 4 FOOT MOUNTING HEIGHT SHALL SUPERSEDE THE 5 FOOT MOUNTING HEIGHT AT SHOULDER LOCATIONS.
3. SIGN MATERIAL AND REFLECTIVITY SHALL BE PER CALTRANS STANDARD SPECIFICATIONS AND CA MUTCD.
4. SIGN SIZE SHALL BE PER CA MUTCD AND CALTRANS SIGN SPECIFICATIONS SUBJECT TO THE APPROVAL OF THE ENGINEER.
5. PARKWAY AND SHOULDER SIGNS HAVING A HORIZONTAL WIDTH 48 INCHES OR GREATER SHALL BE DUAL-POST MOUNTED. SIGNS LESS THAN 48 INCHES IN WIDTH SHALL BE MOUNTED ON A SINGLE POST. POST(S) SHALL BE SQUARE PERFORATED STEEL TUBING WITH BREAKAWAY BASE EXCEPT WHEN MOUNTED ON SAME POST AS STREET NAME SIGN. SEE PLAN VIEW FOR ANGULAR PLACEMENT OF SIGNS. SEE STD. PLAN 1417 FOR SQUARE PERFORATED STEEL TUBING DETAIL.
6. ADVANCE STREET NAME SIGNS PLACED IN MEDIANS SHALL BE 2 FEET FROM THE EDGE OF THE TRAVELED WAY, AND BE LOCATED APPROX. 300 FEET FROM THE INTERSECTION OR 100 FEET FROM THE BEGINNING OF A LEFT TURN POCKET. SIGN MOUNTING HEIGHT SHALL BE 5 FEET ABOVE MEDIAN SURFACE OR AS DIRECTED BY THE ENGINEER. POSTS FOR ADVANCED STREET NAME SIGNS SHALL BE SQUARE PERFORATED STEEL TUBING OR 4 INCH BY 4 INCH REDWOOD.
7. SIZING OF R1-1 ("STOP") SIGNS SHALL CONFORM TO THE FOLLOWING:
  - 24 INCHES – LOCAL TO LOCAL INTERSECTION WITH LOW APPROACH SPEED AND GOOD VISIBILITY.
  - 30 INCHES – STANDARD SIZE.
  - 36 INCHES – WHERE THE APPROACH WIDTH IS GREATER THAN 30 FEET, DUAL SIGNS SHALL BE USED WHERE THERE IS A RAISED MEDIAN AND APPROACH WIDTH IS GREATER THAN 30 FEET.
  - 48 INCHES – WHERE THE ENGINEER DETERMINES THERE IS DEMONSTRATED OR POTENTIAL ACCIDENT PROBLEM.
8. SEE CA MUTCD FOR ADDITIONAL INFORMATION.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

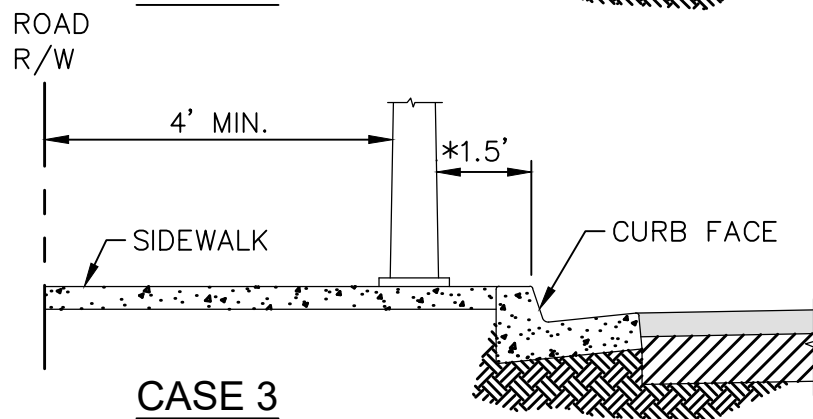
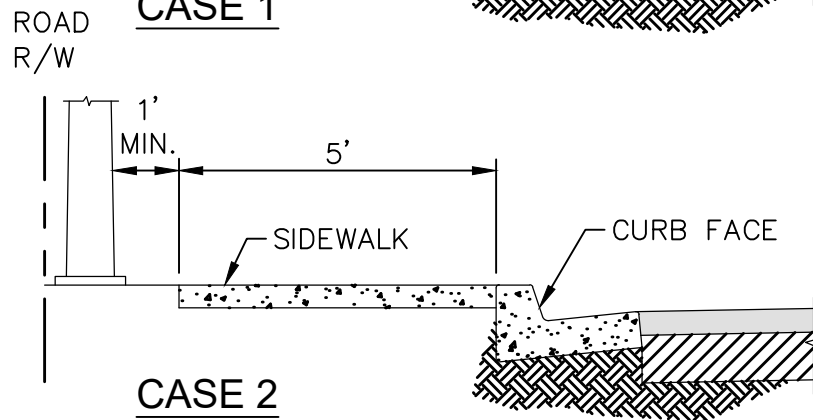
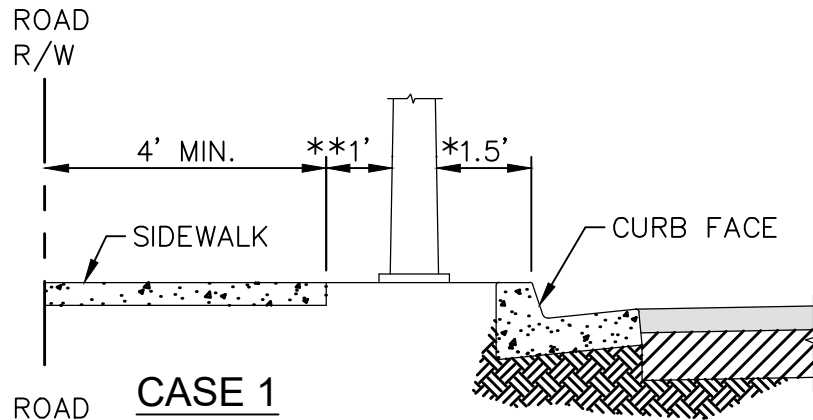
Revision: August 2018

TRAFFIC SIGN PLACEMENT

STD. PLAN

1409

SHT. 2 OF 2



\* SEE NOTE 1

\*\*1' WHEN R/W WIDTH IS SUFFICIENT; OTHERWISE, USE CASE 3.

**NOTES:**

1. HYDRANTS MUST BE LOCATED WITHIN THREE FEET OF THE EDGE OF A FIRE ACCESS ROADWAY. CLEARANCE SHALL BE PROVIDED TO A DISTANCE NO LESS THAN THREE FEET FROM THE PERIMETER OF THE HYDRANT PER OCFA GUIDELINE B-09 SECTION 8C.
2. FOR ANY VERTICAL OBSTRUCTION THE MINIMUM CLEARANCE FROM THE CURB FACE SHALL BE 1.5 FEET, MAILBOXES EXEMPT.
3. THE MINIMUM WIDTH OF CLEAR SIDEWALK SHALL BE FOUR (4) FEET FROM ANY VERTICAL OBSTRUCTION, OR UTILITY VAULT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

**1410**

SHT. 1 OF 1

**PARKWAY OBSTRUCTION**



## STREET LIGHTING

### GENERAL

SAFETY LIGHTING SHALL BE PROVIDED IN ACCORDANCE WITH STD. PLAN 1411 AT INTERSECTIONS AND ALL OTHER LOCATIONS WHERE ILLUMINATION IS JUSTIFIED BY THE NEED FOR SIGHT DISTANCE, AS DETERMINED BY THE ENGINEER. RESIDENTIAL STREET LIGHTING WHEN SPECIFIED SHALL BE PROVIDED IN ACCORDANCE WITH STD. PLAN 1411.

ALL STREET LIGHT LAYOUTS AND LIGHTING DESIGNS SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.

FOR THE PURPOSES OF THIS PLAN, A COMMUTER STREET SHALL BE CONSIDERED TO BE A LOCAL STREET.

### ELECTROLIERS

ELECTROLIERS SHALL BE OF THE TYPE PROVIDED BY THE SERVING UTILITIES, OR AS APPROVED BY THE ENGINEER AND THE SERVING UTILITY WHERE AESTHETIC CONSIDERATIONS ARE WARRANTED.

ELECTROLIERS SHALL BE PLACED AT LOT LINES WHENEVER PRACTICAL.

AT INTERSECTIONS, WHERE PRACTICAL, ELECTROLIERS SHALL BE PLACED NEAR THE END OF THE CURB RETURN ON THE FAR RIGHT SIDE OF THE INTERSECTION. AT A T-INTERSECTION, AN ELECTROLIER SHALL BE PLACED AT THE HEAD OF THE INTERSECTION OR AT ALTERNATE LOCATIONS NEAR THE END OF CURB RETURN ON EITHER THE FAR RIGHT OR THE FAR LEFT SIDE OF THE INTERSECTION.

ELECTROLIERS IN MEDIAN ISLANDS SHALL NOT BE PLACED CLOSER THAN 100 FEET FROM AN ARTERIAL HIGHWAY OR COLLECTOR STREET INTERSECTION. ELECTROLIERS SHALL NOT BE PLACED IN MEDIAN ISLANDS LESS THAN SIX (6) FEET IN WIDTH.

ELECTROLIERS SHALL BE PLACED ALTERNATELY ON EACH SIDE OF THE ROADWAY WHEN INSTALLED ALONG THE SIDES OF A ROADWAY.

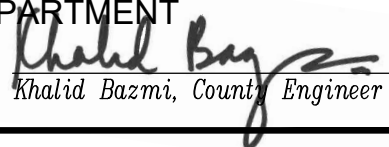
ELECTROLIERS SHALL BE SPACED IN ACCORDANCE WITH THE FOLLOWING:

### ELECTROLIERS

<u>LOCATION</u>	<u>MINIMUM HPSV LAMP SIZE (LUMENS)</u>	<u>ELECTROLIERS</u>	<u>SPACING (FEET)</u>
A. INTERSECTION OF TWO LOCAL STREETS	5,800	1	n/a
B. T INTERSECTION OF LOCAL STREET WITH ARTERIAL HIGHWAY	22,000	1	n/a
C. 4-WAY INTERSECTION OF LOCAL STREET WITH ARTERIAL HIGHWAY	22,000	2	n/a
D. INTERSECTION OF TWO ARTERIAL HIGHWAYS	30,000	4	n/a
E. LOCAL STREETS	5,800	1	300

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1411

STREET LIGHTING

SHT. 1 OF 3

<u>LOCATION</u>	<u>MINIMUM HPSV LAMP SIZE (LUMENS)</u>	<u>ELECTROLIERS</u>	<u>SPACING (FEET)</u>
F. LOCAL STREET CUL-DE-SAC	5,800	1	n/a
G. SECONDARY HIGHWAY	16,000	1	200
H. PRIMARY HIGHWAY			
WITH RAISED MEDIAN	9,500 (double)	1	200
WITHOUT RAISED MEDIANS	16,000	1	200
I. MAJOR HIGHWAY			
WITH RAISED MEDIAN	9,500 (double)	1	180
WITHOUT RAISED MEDIANS	22,000	1	200

### LUMINAIRES AND MAST ARMS

LUMINAIRES SHALL BE OF THE TYPE USED BY THE SERVING UTILITY.

LUMINAIRES AT SIGNALIZED INTERSECTIONS SHALL BE EQUIPPED WITH GLARE SHIELDS OR HAVE INTEGRAL CUTOFF FEATURES.

LUMINAIRES SHALL BE MOUNTED ON EXISTING WOOD POLES WHERE:

- A. THE PROXIMITY OR NUMBER OF EXISTING WOOD POLES WITHIN THE RIGHT-OF-WAY PRECLUDES THE INSTALLATION OF ADDITIONAL POLES.
- B. TEMPORARY LIGHTING IS TO BE INSTALLED IN UNDEVELOPED AREAS.

MOUNTING HEIGHT OF LUMINAIRES SHALL CONFORM TO THE FOLLOWING:

- A. 30-FOOT MINIMUM FOR GREATER THAN 9,500 LUMENS.
- B. 25-FOOT MINIMUM FOR 9,500 LUMENS OR LESS.

MINIMUM LENGTH OF MAST ARMS SHALL CONFORM TO THE FOLLOWING:

- A. 6-FOOT MINIMUM FOR GREATER THAN 9,500 LUMENS.
- B. 4-FOOT MINIMUM FOR 9,500 LUMENS AND LESS, EXCEPT FOR MISSION BELL LUMINAIRES' INSTALLATION.

### LAMPS

LAMPS SHALL BE HIGH PRESSURE SODIUM VAPOR (HPSV) OR LED LIGHTING WITH EQUIVALENT LUMENS, IN ACCORDANCE WITH LOCAL JURISDICTION STANDARDS.

### MISCELLANEOUS MATERIALS AND WORKMANSHIP

MATERIAL AND WORK SHALL CONFORM TO OR EXCEED THE APPLICABLE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE, THE ELECTRICAL SAFETY ORDERS OF THE DEPARTMENT OF INDUSTRIAL SAFETY, STATE OF CALIFORNIA, AND THE AMERICAN SOCIETY FOR TESTING MATERIALS.

IN ADDITION TO THE ABOVE, NON-UTILITY-OWNED STREET LIGHTING INSTALLATIONS SHALL CONFORM TO THE LATEST EDITION OF SECTION 700 OF THE GREENBOOK AND THIS STANDARD PLAN.

THE CONSTRUCTION PRACTICES AND MATERIALS USED FOR STREET LIGHTS OWNED BY UTILITIES SUBJECT TO THE REGULATION OF THE CALIFORNIA PUBLIC UTILITIES COMMISSION ARE SPECIFIED EXCLUSIVELY BY THE ORDERS OF THE COMMISSION. ALL STREET LIGHTS OWNED BY REGULATED UTILITIES SHALL CONFORM TO OR EXCEED THE REQUIREMENTS OF GENERAL ORDERS 95 AND 128.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1411

SHT. 2 OF 3

STREET LIGHTING

SERVICE AND MAINTENANCE

SERVICES AND MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE OWNER OF THE LIGHTING FACILITY.

DESIGN CRITERIA - ILLUMINATION LEVEL

GENERAL

REQUIRED SPACING AND LUMEN LEVELS MAY BE MODIFIED ON AN EXCEPTIONAL BASIS FOR PURPOSES OF CRIME PREVENTION OR ENERGY SAVINGS. ALL MODIFICATIONS SHALL MEET THE LIGHTING LEVELS SPECIFIED BELOW AND SHALL BE SUPPORTED BY ADEQUATE CALCULATIONS APPROVED BY THE ENGINEER. CONSISTENCY OF ELECTROLIER SPACING AND LAMP LUMEN LEVELS SHALL BE MAINTAINED ALONG ALL HIGHWAYS WHENEVER POSSIBLE.

LIGHTING LEVELS SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

ARTERIAL HIGHWAYS:

<u>DESCRIPTION</u>	<u>AVERAGE HORIZONTAL FOOTCANDLES</u>
ARTERIAL HIGHWAYS	0.40
SIDEWALKS (ROADSIDE)	0.25
ON-ROAD BIKEWAYS (MARKED)	0.25
OFF-ROAD WALKWAYS AND BIKE PATHS	0.25
PEDESTRIAN TUNNELS	4.0
PEDESTRIAN OVERPASSES	0.3
PEDESTRIAN STAIRWAYS	0.6

LOCAL STREETS

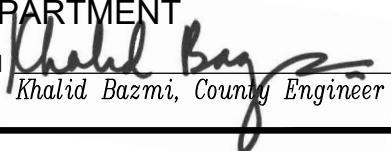
THE AVERAGE LIGHTING LEVEL SHALL NOT EXCEED 0.25 HORIZONTAL FOOTCANDLES.

UNIFORMITY

THE ILLUMINATION LEVELS IN THE ABOVE TABLE ARE MINIMUMS AND PROVIDE EFFECTIVE VISIBILITY ONLY WHEN COMBINED WITH UNIFORMITY OF ILLUMINATION. UNIFORMITY MAY BE EXPRESSED IN SEVERAL WAYS. THE AVERAGE LEVEL-TO-MINIMUM POINT METHOD USES THE AVERAGE ILLUMINATION OF THE ROADWAY DESIGN AREA BETWEEN TWO ADJACENT LUMINAIRES DIVIDED BY THE LOWEST VALUE AT ANY POINT IN THE AREA EXCEPT ON LOCAL STREETS. UNDER THIS METHOD THE AVERAGE-TO-MINIMUM RATIO SHALL NOT EXCEED 6 TO 1.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

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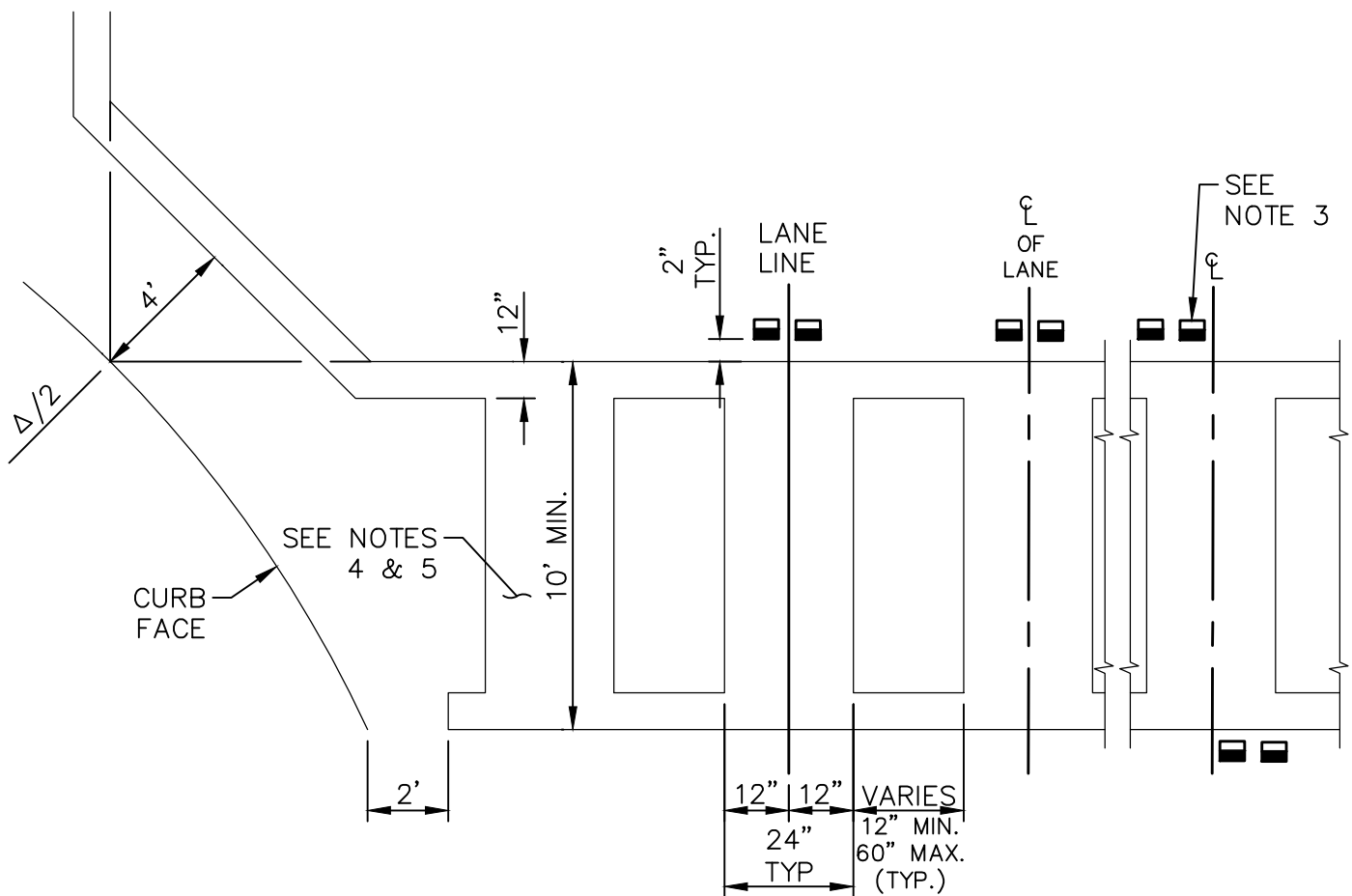
**STREET LIGHTING**

STD. PLAN

**1411**

SHT. 3 OF 3





#### NOTES:

1. TEN (10) FEET MINIMUM CROSSWALK CONSISTS OF TWO PARALLEL ONE FOOT WIDE WHITE LINES (YELLOW IN A SCHOOL ZONE).
2. LADDER BARS SHOULD BE USED ONLY WHERE ADDED VISIBILITY IS NEEDED SUCH AS SCHOOL ZONES, MIDBLOCK, OR AN UNCONTROLLED INTERSECTION AS DETERMINED BY THE ENGINEER.
3. ONE WAY REFLECTIVE RAISED PAVEMENT MARKERS SHALL BE USED TO SUPPLEMENT LADDER BAR STRIPES WHERE ADDITIONAL VISIBILITY IS NEEDED AT NIGHT, SUCH AS A POORLY LIT STREET. USE CLEAR TYPE G RPM'S FOR A WHITE CROSSWALK, AND YELLOW TYPE H FOR A YELLOW CROSSWALK.
4. INTENT OF LONGITUDINAL SPACING OF LADDER BARS IS TO PLACE THEM ALONG LANE LINES AND IN THE CENTER OF LANES TO AVOID VEHICLE WHEEL PATHS. LADDER BARS SHALL BE CONTINUED ACROSS THE ENTIRE ROADWAY WIDTH, WITH THE LAST FULL BAR (NO PARTIAL BARS) 2 FEET FROM CURB FACE.
5. AT SKEWED INTERSECTIONS, THE LADDER BARS SHALL BE PARALLEL TO THE LANE LINES, NOT PERPENDICULAR TO THE CROSSWALK LINES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

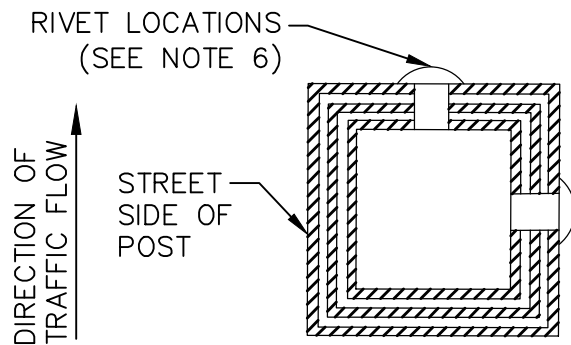
STD. PLAN

1416

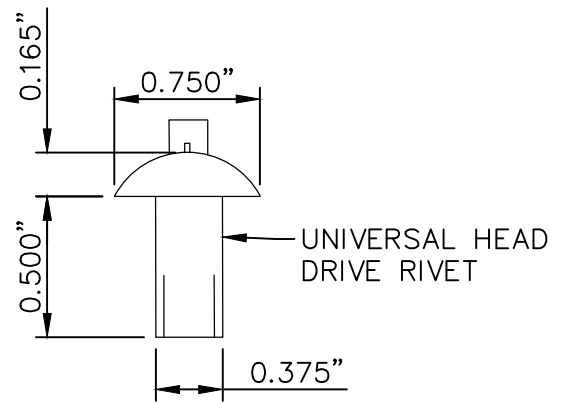
SHT. 1 OF 1

CROSSWALK DETAIL

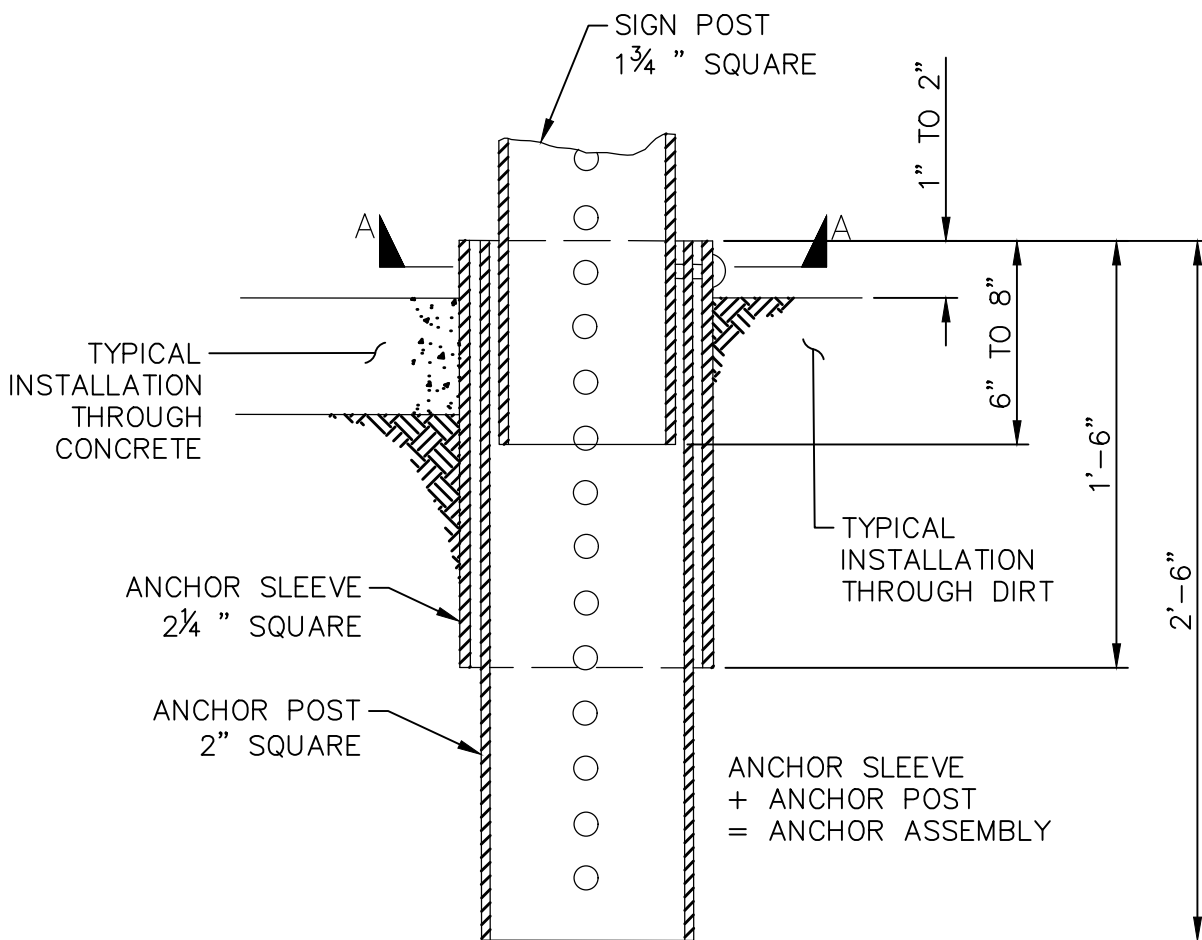




SECTION A-A



RIVET DETAIL



TYPICAL SECTION

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revised: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1417

SHT. 1 OF 2

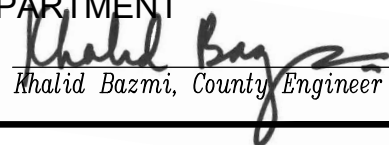
SIGN POST INSTALLATION

NOTES:

1. SQUARE PERFORATED STEEL TUBE POSTS WITH BREAK-AWAY BASE, "TELESPAR" OR EQUAL, SHALL BE USED FOR ALL TRAFFIC CONTROL AND INFORMATIONAL SIGNS WITHIN ROAD RIGHT-OF-WAY, WITH THE EXCEPTION OF STREET NAME SIGNS PER STANDARD PLAN 1407 AND 1409.
2. THE NUMBER OF POSTS REQUIRED FOR SIGN INSTALLATION SHALL BE DETERMINED BY THE AREA OF THE SIGN OR COMBINATION OF SIGNS TO BE INSTALLED. A SINGLE POST SHALL BE USED WHERE BOTH THE LENGTH AND WIDTH ARE LESS THAN 48 INCHES, WITH THE EXCEPTION OF A 48 INCH X 48 INCH STOP SIGN. DOUBLE POSTS SHALL BE USED WHERE EITHER THE LENGTH OR THE WIDTH EXCEEDS 48 INCHES.
3. THE ANCHOR ASSEMBLY SHALL CONSIST OF A 2 INCH SQUARE BY 2 FOOT-6 INCH ANCHOR POST AND A 2¼ INCH SQUARE BY 1 FOOT-6 INCH ANCHOR SLEEVE.
4. THE ANCHOR ASSEMBLY, CONSISTING OF THE ANCHOR POST AND ANCHOR SLEEVE, SHALL BE DRIVEN SIMULTANEOUSLY UNTIL ONLY 1 INCH TO 2 INCHES REMAINS ABOVE GROUND LEVEL. THE TOPS OF BOTH PIECES SHALL BE FLUSH.
5. ALL DIRT SHALL BE REMOVED FROM THE INSIDE TOP 8 INCH OF THE ANCHOR ASSEMBLY TO ALLOW FOR INSTALLATION OF THE SIGN POST.
6. INSTALL THE 1¾ INCH SQUARE SIGN POST 6 INCHES TO 8 INCHES INTO THE ANCHOR ASSEMBLY AND SECURE IN PLACE WITH TWO ⅝ INCH UNIVERSAL HEAD DRIVE RIVETS AS SHOWN. THE RIVETS SHALL BE INSTALLED ON THE SIDE OPPOSITE TRAFFIC FLOW AND THE SIDE AWAY FROM TRAFFIC AS SHOWN IN ORDER TO ACHIEVE THE MAXIMUM BREAK-AWAY EFFECT.
7. INSTALLATION ACCORDING TO THESE REQUIREMENTS IS ESSENTIAL TO MAINTAIN THE BREAK-AWAY CHARACTERISTICS OF THE POST SYSTEM. **UNDER NO CIRCUMSTANCES** SHALL THE ANCHOR ASSEMBLY BE SECURED IN CONCRETE FOOTINGS.
8. ALL CONCRETE SHALL BE PER STANDARD PLAN 1803.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revised: August 2018

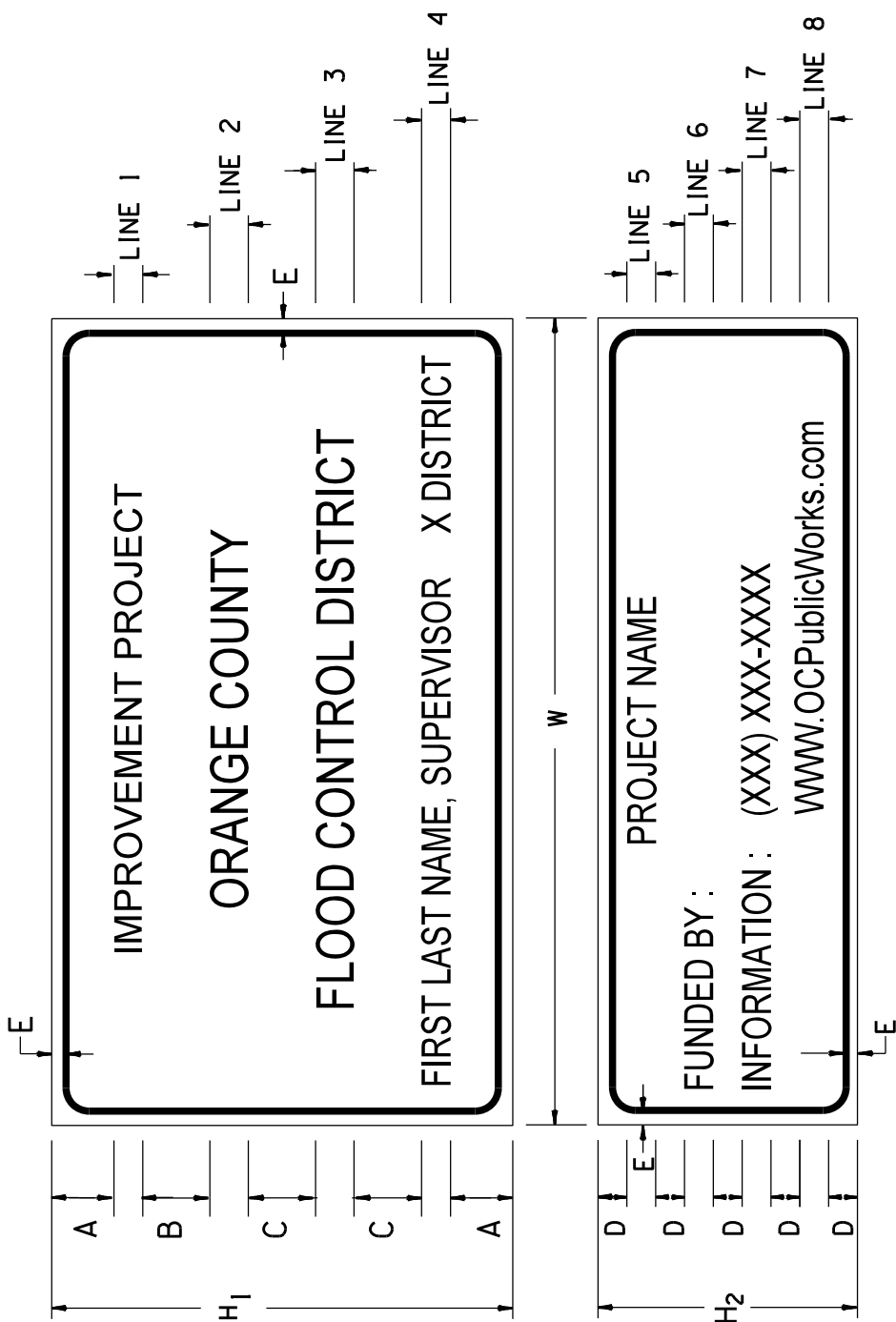
STD. PLAN

1417

SHT. 2 OF 2

SIGN POST INSTALLATION





SIGN SIZE	SIGN DIMENSIONS (INCHES)							LETTER HEIGHT (IN.)		INSTALLATION DIMENSIONS (IN.)				
	W	H <sub>1</sub>	H <sub>2</sub>	A	B	C	D	E			X	Y	Z	POST SIZE
LARGE	144	72	36	9	11	11	4	1 1/2	5	6	6	4	4	84 72 30 6 x 8
MEDIUM	84	48	27	6 1/2	7	7	3	1 1/2	3	4	4	3	3	54 60 15 6 x 6 *
SMALL	48	30	20 1/2	4	4	4	2 1/2	1	2	3	3	2	2	36 42 6 4 x 4

**NOTE:** IF MORE THAN ONE LINE IS NECESSARY FOR A MESSAGE, A SECOND LINE AND SPACE SHALL BE ADDED. THE HEIGHT OF THE SIGN SHALL ALSO BE INCREASED.

\* IF SUPPLEMENTAL PLATE NOT USED WITH THIS SIGN, POST CAN BE REDUCED TO 4 FOOT x 6 FOOT AND Y REDUCED TO 54 INCHES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

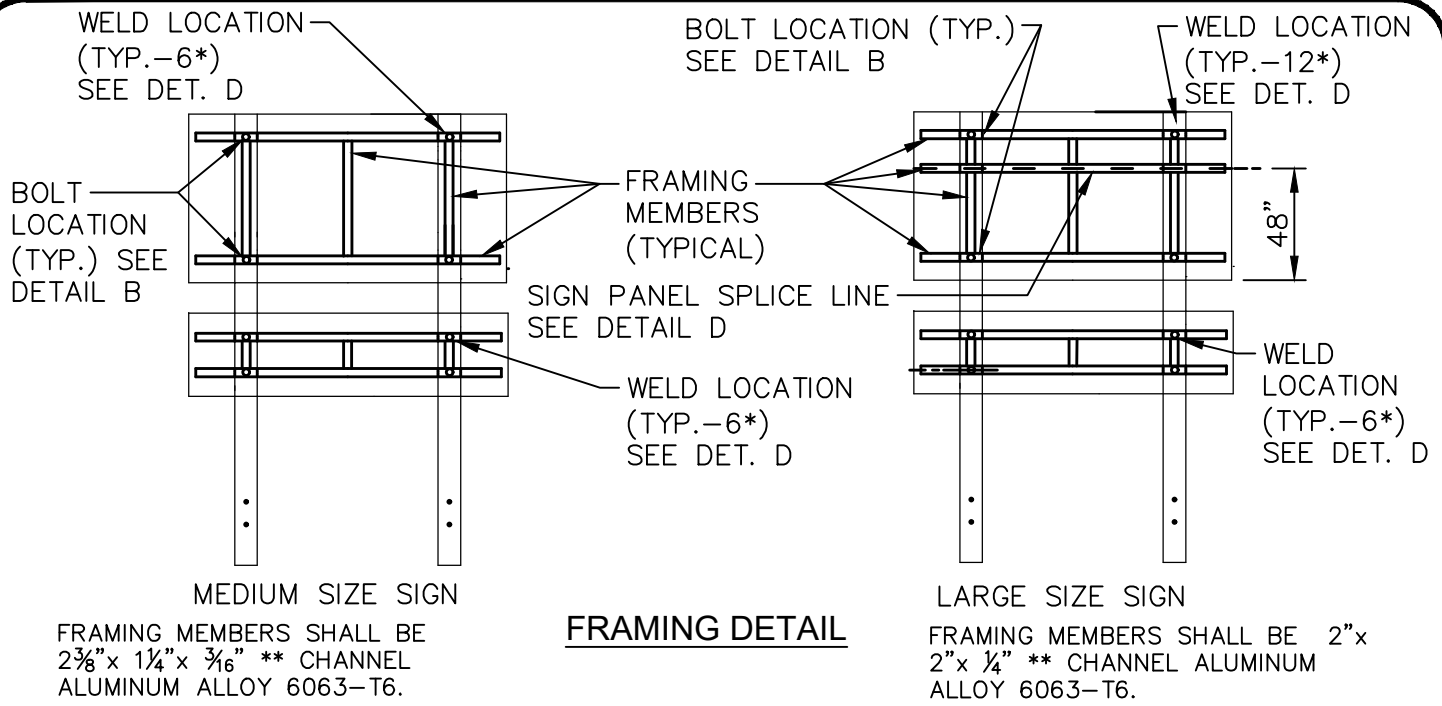
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1418

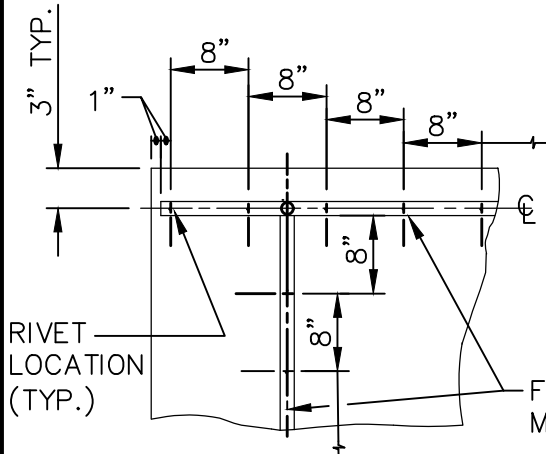
SHT. 2 OF 5

PROJECT INFORMATION SIGN

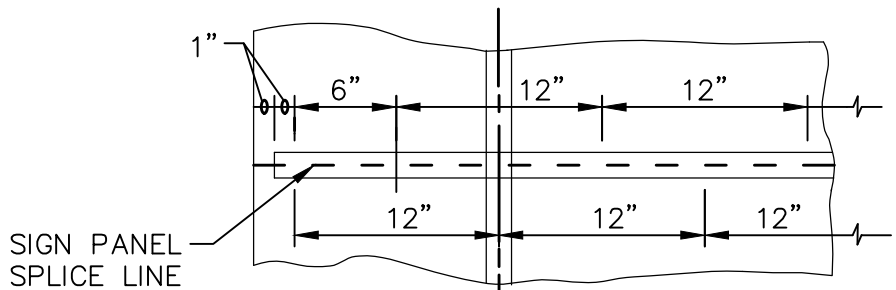
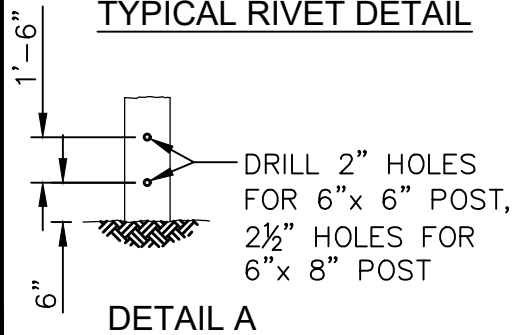


\* NUMBERS REPRESENT THE TOTAL NUMBER OF WELDS FOR THIS FRAME.

\*\* 1 3/4" x 1 1/2" x 1/8" RECTANGULAR TUBING ALUMINUM ALLOY 6063-T6 MAY BE SUBSTITUTED BUT MORE THAN ONE SIZE AND TYPE OF FRAMING MATERIAL USED ON ONE SIGN SHALL NOT BE PERMITTED.



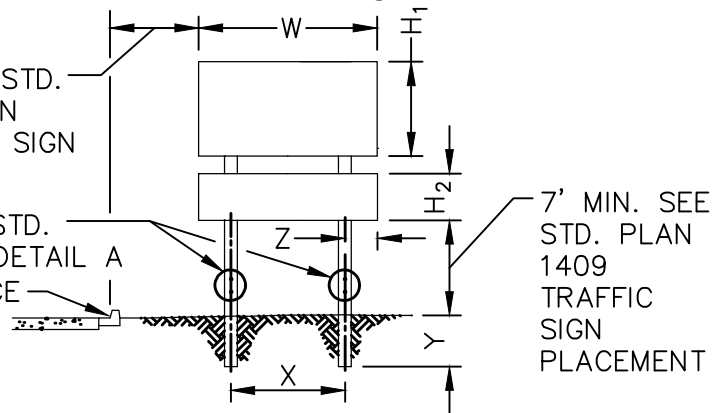
**TYPICAL RIVET DETAIL**



**RIVET DETAIL AT SPLICE  
DETAIL C**

FRAMING MEMBERS  
12" MIN. 48" STD. SEE STD. PLAN 1409 TRAFFIC SIGN PLACEMENT

48" STD. SEE DETAIL A  
CURB FACE



**INSTALLATION DETAIL**

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

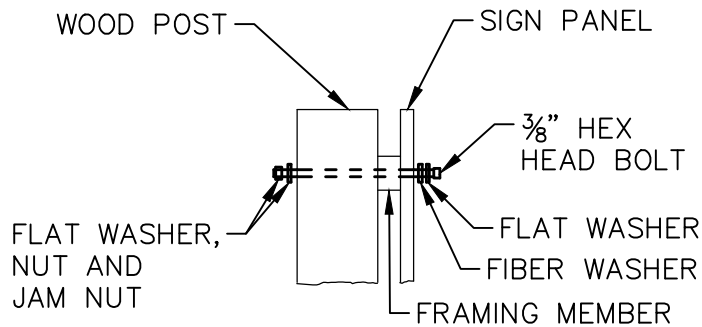
Revision: August 2018

**PROJECT INFORMATION SIGN**

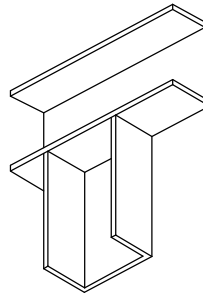
STD. PLAN

**1418**

SHT. 3 OF 5



**TYPICAL BOLT INSTALLATION  
DETAIL B**



FILLET WELD ALL AROUND IN AND OUT ON MATERIAL 2" AND LARGER. GRIND BEADS FLUSH FRONT AND BACK. WELD AROUND OUTSIDE ONLY ON 1" MATERIAL.

FOR RECTANGULAR TUBING, WELD ALL AROUND AND GRIND WHERE WELD CONTACTS SIGN PANEL.

**WELD DETAIL  
DETAIL D**

**NOTES:**

1. INSTALL PROJECT INFORMATION SIGNS FOR COUNTY FUNDED PROJECTS IF PROJECT COST IS GREATER THAN \$100,000 AND THE TIME TO COMPLETE PROJECT IS GREATER THAN 30 DAYS FOR ANY ONE SITE.
2. LOCATE SIGNS ON THE MAJOR STREET APPROACHES TO THE PROJECTS AT THE BEGINNING OF THE CONSTRUCTION ZONE. LOCATIONS SHALL BE SHOWN ON THE CONSTRUCTION PLANS OR AS DIRECTED BY THE ENGINEER.
3. INSTALL SIGNS PRIOR TO THE DATE THAT CONSTRUCTION BEGINS AND REMOVE THEM WHEN CONSTRUCTION IS COMPLETE.
4. CRITERIA FOR DETERMINING SIZE OF PROJECT INFORMATION SIGN (SIZE SHALL BE SHOWN ON CONSTRUCTION PLANS) :
  - A. 12 FEET BY 6 FEET – TYPICAL SIGN USED FOR ASSESSMENT DISTRICT PROJECTS, COMMUNITY FACILITIES PROJECTS AND CORRIDOR PROJECTS, WHERE THERE IS ADEQUATE SPACE TO INSTALL THEM.
  - B. 7 FEET BY 4 FEET – TYPICAL SIGN USED FOR ALL OTHER PROJECTS; I.E., ROAD, FLOOD, PARKS, HCS, ETC.
  - C. 4 FEET BY 2 FEET-6 INCHES – APPLICABLE TO PROJECTS WHERE SPACE IS LIMITED.
5. CRITERIA FOR SIGN FABRICATION
  - A. SIGNS SHALL BE FABRICATED WITH 0.080 INCH THICK CLEAR ANODIZED ALUMINUM OR AN ALTERNATE MATERIAL APPROVED BY THE ENGINEER.
  - B. LARGE AND MEDIUM SIGN PANELS SHALL BE REINFORCED ON THE BACK AS SHOWN ON THE DETAILS ON SHT 3. SMALL SIGN PANELS DO NOT REQUIRE FRAMING REINFORCEMENT.
  - C. EXPOSED PORTION OF THE FASTENING HARDWARE ON THE FACE OF THE SIGN SHALL BE PAINTED USING TOUCH UP ENAMEL THAT MATCHES THE BACKGROUND.
  - D. SIGNS SHALL HAVE REFLECTORIZED WHITE CAPITAL LETTERS AND BORDER LINE (1/2 INCH BORDER ON SMALL SIGNS AND 1 INCH BORDER ON MEDIUM AND LARGE SIGNS) ON STANDARD STATE HIGHWAY SERVICE SIGNING BLUE ACRYLIC ENAMEL BACKGROUND (PANTONE 293C) THAT WILL LAST 3-5 YEARS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1418

SHT. 4 OF 5

PROJECT INFORMATION SIGN

NOTES (CONTINUED):

5. (CONTINUED)

E. MESSAGE ON SIGNS SHALL BE STANDARDIZED AS MUCH AS POSSIBLE. A MOCK UP OF THE MESSAGE ON THE SIGN SHALL BE SHOWN ON THE PLANS OR INCORPORATED INTO THE SPECIAL PROVISIONS.

- 1) LINE 1 – USE STANDARD TITLES OR AS SPECIFIED ON PLANS OR IN THE SPECIAL PROVISIONS; I.E., "ROAD IMPROVEMENT", "ROAD EXTENSION", "PARK PROJECT", "DRAINAGE IMPROVEMENT", "HOUSING AND COMMUNITY DEVELOPMENT", ETC; FOR ORANGE COUNTY FLOOD CONTROL DISTRICT PROJECTS USE "IMPROVEMENT PROJECT".
- 2) LINE 2 – USE "COUNTY OF ORANGE"; FOR ORANGE COUNTY FLOOD CONTROL DISTRICT PROJECTS USE "ORANGE COUNTY".
- 3) LINE 3 – USE COUNTY LOGO FURNISHED BY COUNTY AFTER SIGN HAS BEEN FABRICATED OR INSTALLED; FOR ORANGE COUNTY FLOOD CONTROL DISTRICT PROJECTS USE "FLOOD CONTROL DISTRICT". COUNTY LOGO SHALL NOT BE USED ON "ORANGE COUNTY FLOOD CONTROL DISTRICT" PROJECTS.
- 4) LINE 4 – USE THE SUPERVISOR'S FULL NAME FOLLOWED BY THE WORD "SUPERVISOR" FOLLOWED BY THE SUPERVISOR'S DISTRICT NUMBER, I.E. "1ST DISTRICT", "2ND DISTRICT", "3RD DISTRICT", "4TH DISTRICT", OR "5TH DISTRICT".

F. MESSAGE ON SUPPLEMENTAL PLATE. IF THERE IS INADEQUATE VERTICAL CLEARANCE OR OTHER CONSTRAINTS, THE SUPPLEMENTAL PLATE MAY BE OMITTED IF DIRECTED BY THE ENGINEER. A MOCK UP OF THE MESSAGE ON THE SUPPLEMENTAL PLATE SHALL BE SHOWN ON THE PLANS OR INCORPORATED INTO THE SPECIAL PROVISIONS.

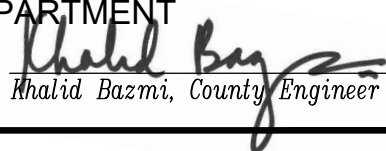
- 1) LINE 5 – USE PROJECT NAME.
- 2) LINE 6 – USE THE WORDS "FUNDED BY:" FOLLOWED BY THE FUNDING SOURCE.
- 3) LINE 7 – USE THE WORD "INFORMATION:" FOLLOWED BY THE PHONE NUMBER TO CALL FOR INFORMATION.
- 4) LINE 8 – OC PUBLIC WORKS WEBSITE

6. CRITERIA FOR SIGN INSTALLATION:

- A. SIGNS SHALL BE PLACED PER STANDARD PLAN 1409 AND THE DETAIL ON SHEET 1. SIGHT DISTANCE SHALL BE MAINTAINED PER STANDARD PLAN 1117.
- B. SIGN PANELS SHALL BE BOLTED TO THE WOOD POSTS USING THE APPROPRIATE LENGTH INCH BOLTS AND FLAT WASHERS, NUTS AND JAM NUTS AS SHOWN ON DETAIL B, SHT
- C. MEDIUM AND LARGE SIGNS SHALL BE INSTALLED ON TWO WOOD POSTS (SEE DETAIL ON SHT. 2 FOR APPROPRIATE SIZE OF POSTS). POSTS SHALL BE CONSTRUCTED OF HEART GRADE REDWOOD, HEART GRADE DOUGLAS FIR OR AN ALTERNATE MATERIAL APPROVED BY THE ENGINEER.
- D. SMALL SIGNS SHALL BE INSTALLED ON TWO 1 POSTS PER STANDARD PLAN 1417 OR TWO 4 INCHES BY 4 INCHES NOMINAL SIZE WOOD POSTS. SEE 6.C. ABOVE FOR ACCEPTABLE MATERIAL FOR THE WOOD POSTS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

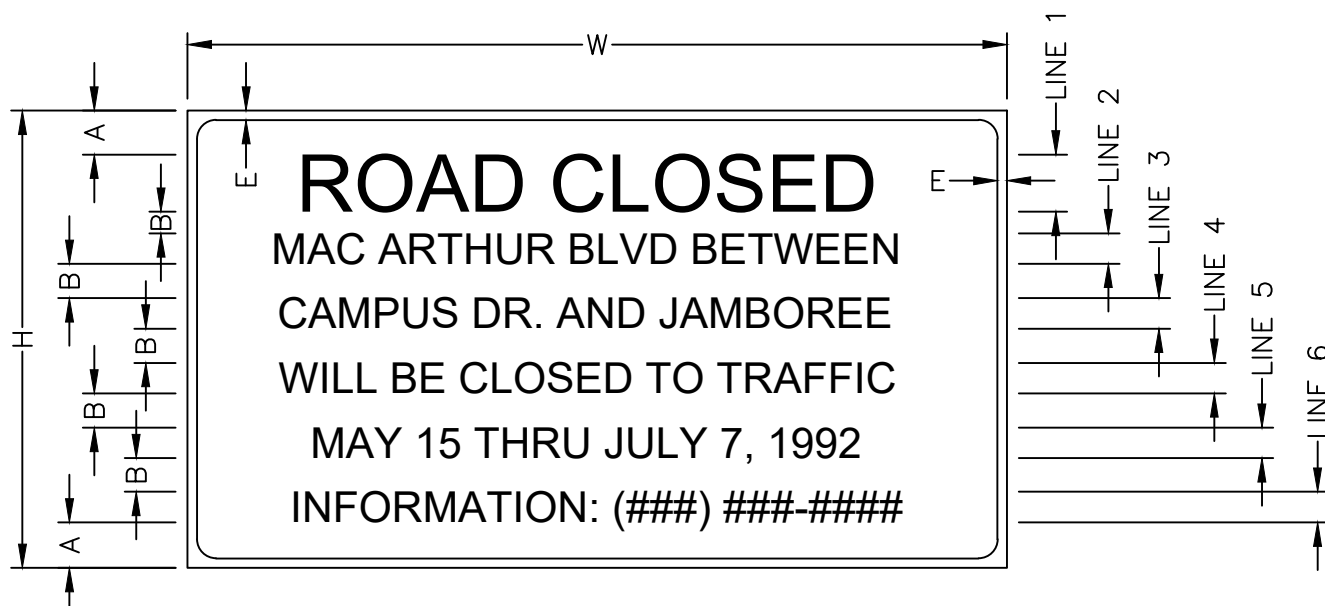
STD. PLAN

1418

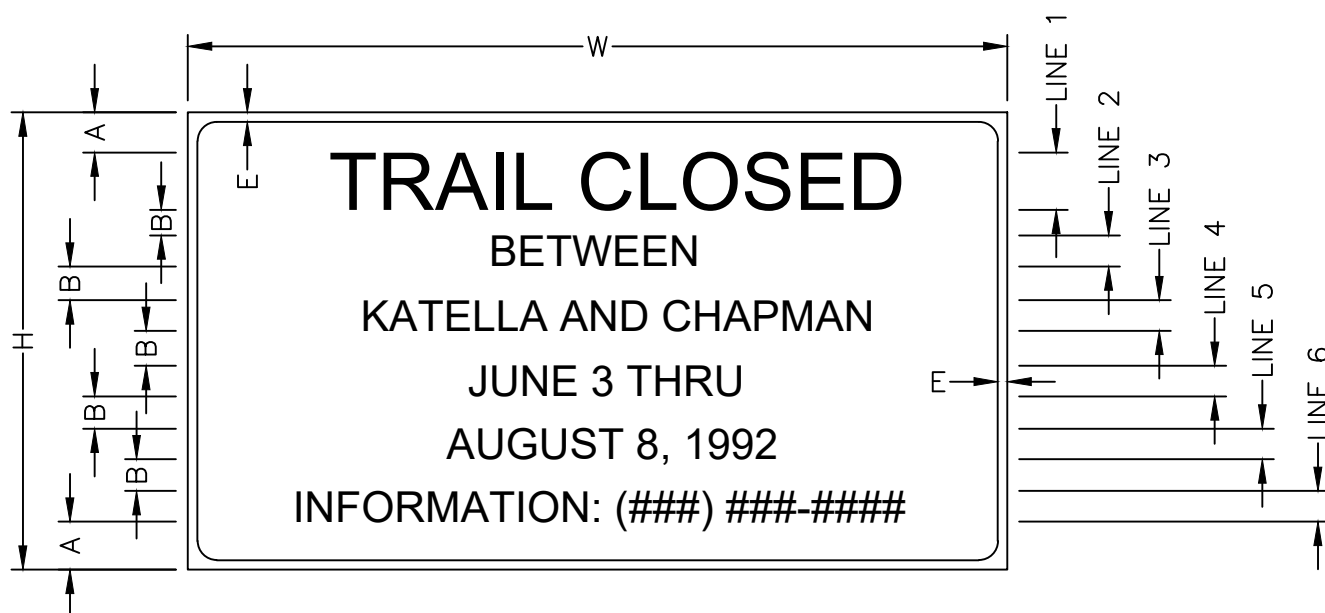
SHT. 5 OF 5

PROJECT INFORMATION SIGN





SIGN DIMENSIONS (INCHES)					LETTER HEIGHT (INCHES)		INSTALLATION DIMENSIONS (INCHES)			
W	H	A	B	E	LINE NUMBER		X	Y	Z	POST SIZE
84	48	3½	3	1½	1	2-6	54	60	15	6x6
					6	4				



SIGN DIMENSIONS (INCHES)					LETTER HEIGHT (INCHES)		INSTALLATION DIMENSIONS (INCHES)			
W	H	A	B	E	LINE NUMBER		X	Y	Z	POST SIZE
84	48	3½	3	1½	1	2-6	54	60	15	6x6
					6	4				

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1419

ROAD / TRAIL CLOSURE SIGN

SHT. 1 OF 2

NOTES:

1. INSTALL ROAD/TRAIL CLOSURE SIGN IF THE TIME TO COMPLETE PROJECT WHICH REQUIRES CLOSURE IS GREATER THAN 30 DAYS FOR ANY ONE SITE. ROAD/TRAIL CLOSURE SIGN IS TO HAVE ORANGE BACKGROUND WITH BLACK LETTERING AND 1 INCH BORDER.
2. IN EMERGENCY SITUATIONS WHEN DURATION OF CLOSURE IS NOT KNOWN, OR LESS THAN 30 DAYS, CALTRANS STANDARD C2 "ROAD CLOSED" SIGN SHALL BE USED OR "TRAIL CLOSED" (48 INCH X 30 INCH) SIGN IF APPLICABLE. "TRAIL CLOSED" SIGN IS TO HAVE WHITE BACKGROUND WITH BLACK LETTERING AND 1 INCH BORDER.

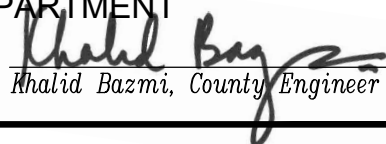


(48" x 30")

3. SIGN SHALL BE INSTALLED 2 WEEKS PRIOR TO DATE THAT CONSTRUCTION BEGINS AND REMOVED WHEN ROAD OR TRAIL IS OPENED TO TRAFFIC.
4. LOCATION OF SIGNS SHALL BE IN CONFORMANCE WITH INSTALLATION DETAILS OF STD. PLAN 1418 AND AS SHOWN ON THE CONSTRUCTION PLANS OR AS DIRECTED BY THE ENGINEER.
5. CRITERIA FOR SIGN FABRICATION:
  - A. SIGNS SHALL BE FABRICATED WITH 0.080 INCH THICK CLEAR ANODIZED ALUMINUM OR AN ALTERNATE MATERIAL APPROVED BY THE ENGINEER.
  - B. SIGN PANELS SHALL BE REINFORCED ON THE BACK AND INSTALLED PER DETAILS FOR MEDIUM SIZE SIGNS OF STD. PLAN 1418.
  - C. EXPOSED PORTIONS OF THE FASTENING HARDWARE ON THE FACE OF THE SIGN SHALL BE PAINTED USING TOUCH-UP ENAMEL THAT MATCHES THE BACKGROUND.
  - D. MESSAGE ON SIGNS SHALL BE STANDARDIZED AS MUCH AS POSSIBLE. A MOCK UP OF THE MESSAGE ON THE SIGN SHALL BE SHOWN ON THE PLANS OR INCORPORATED INTO THE SPECIAL PROVISIONS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

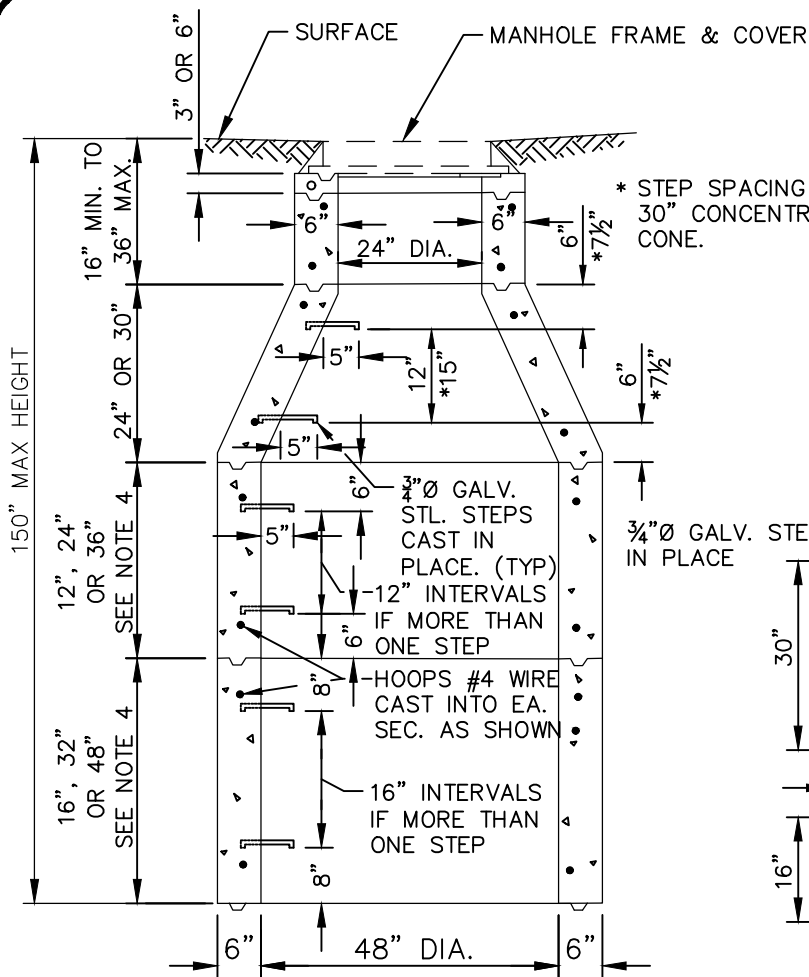
Revision: August 2018

STD. PLAN

1419

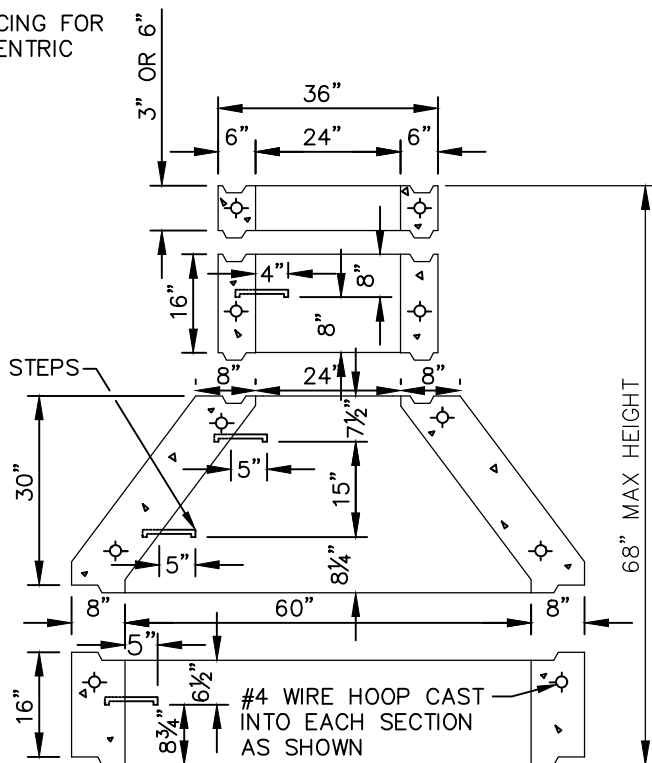
SHT. 2 OF 2

ROAD / TRAIL CLOSURE SIGN



TYPICAL SECTION

48" ID CONCENTRIC  
CONCRETE MANHOLE



TYPICAL SECTION

60" ID CONCENTRIC  
CONCRETE MANHOLE

NOTES:

1. CONSTRUCTION SHALL BE IN ACCORDANCE WITH GREENBOOK SECTION 303.
2. SEE STD. PLAN 630-3-OC FOR MANHOLE FRAME & COVER DETAIL.
3. SEE STD. PLAN 1507 FOR MANHOLE STEP DETAILS. MAX. SPACING = 17 INCHES.
4. THE MANHOLE PIPES AND GRADE RINGS SHALL BE ARRANGED IN ORDER OF LONGER TO SHORTER LENGTHS FROM BOTTOM TO TOP.
5. MANHOLE DETAILS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
6. PAVEMENT SURFACE SHALL BE FINISHED  $\frac{1}{4}$  INCH ABOVE MANHOLE FRAME.
7. TOP OF CONE SHALL BE PLACED A MINIMUM OF 6 INCH BELOW BOTTOM OF ROADWAY STRUCTURAL SECTION OR A MINIMUM OF 16 INCHES BELOW FINISH GRADE, WHICHEVER IS GREATEST.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

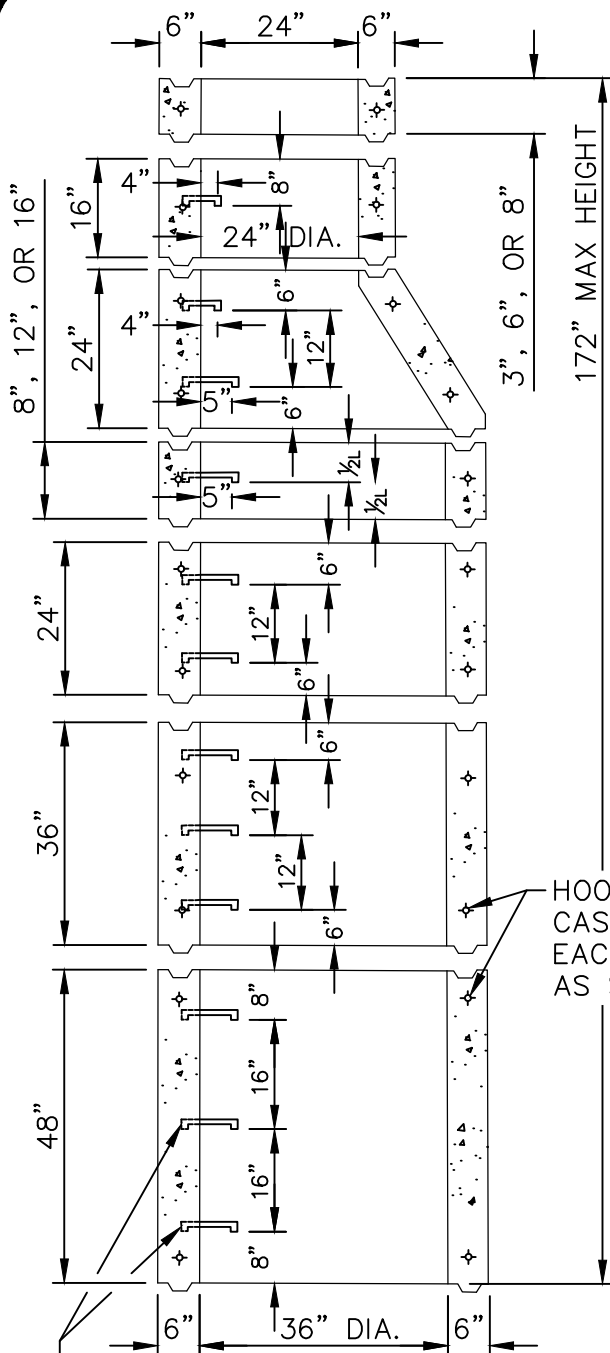
STD. PLAN

1501

NON-REINF. CONC. CONCENTRIC CONE MANHOLE

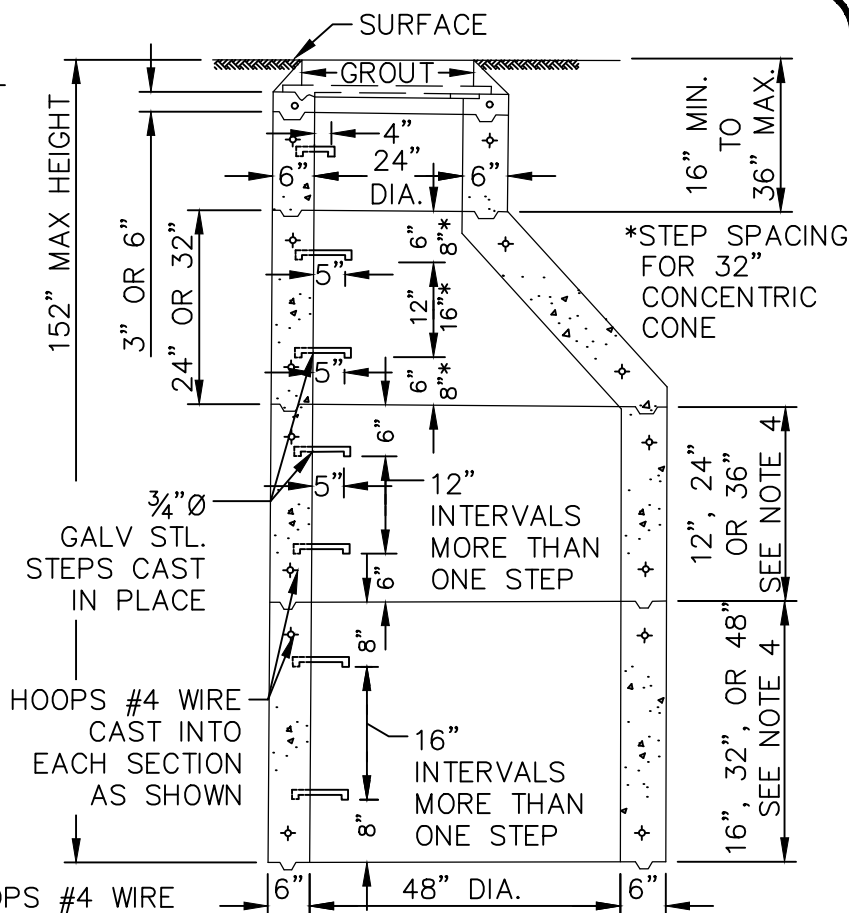
SHT. 1 OF 1





**TYPICAL SECTION 36" ID  
ECCENTRIC CONE MANHOLE**

$\frac{3}{4}$ "  $\varnothing$  GALV.  
STL. STEPS  
CAST IN PLACE



**TYPICAL SECTION 48" ID  
ECCENTRIC CONE MANHOLE**

NOTES:

1. SEE STD. PLAN 630-3-OC FOR MANHOLE FRAME AND COVER DETAILS.
2. SEE STD. PLAN 1507 FOR MANHOLE STEPS DETAILS. MAX. SPACING=17 INCHES.
3. CONSTRUCTION SHALL BE IN ACCORDANCE WITH GREENBOOK SECTION 303.
4. THE MANHOLE PIPES AND GRADE RINGS SHALL BE ARRANGED IN ORDER OF LONGER TO SHORTER LENGTHS FROM BOTTOM TO TOP.
5. MANHOLE HEIGHT DETAILS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
6. PAVEMENT TO BE FINISHED  $\frac{1}{4}$  INCH ABOVE MANHOLE FRAME.
7. TOP OF CONE SHALL BE PLACED A MINIMUM OF 6 INCHES BELOW BOTTOM OF ROADWAY STRUCTURAL SECTION OR A MINIMUM OF 16 INCHES BELOW FINISH GRADE, WHICHEVER IS GREATEST.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

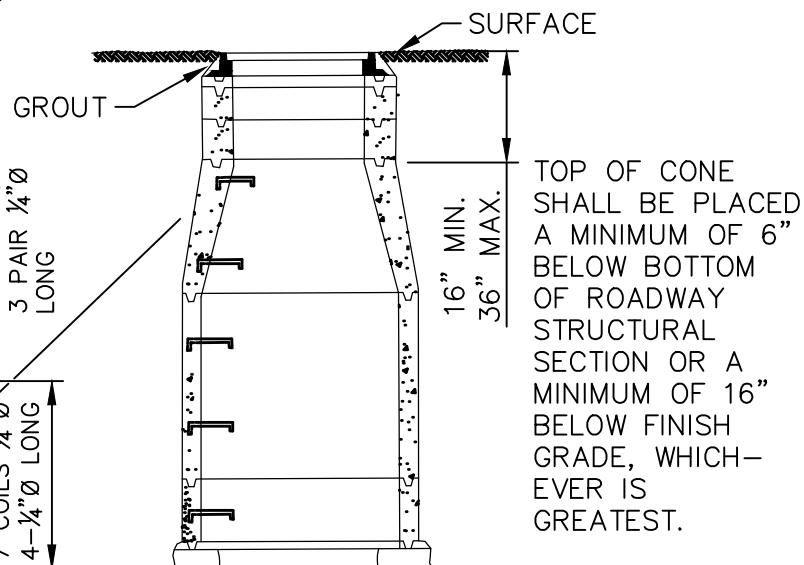
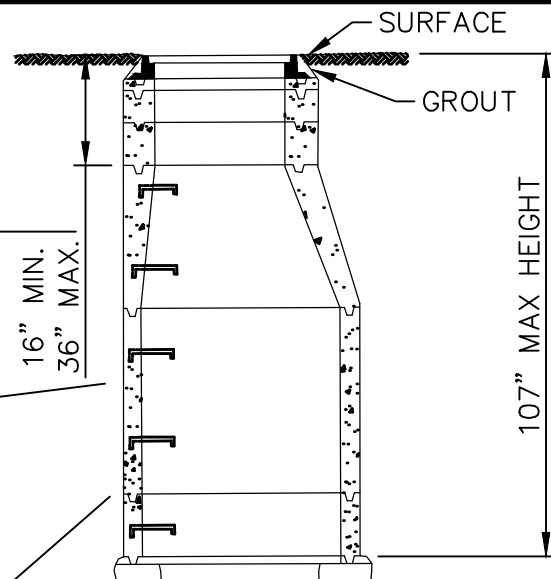
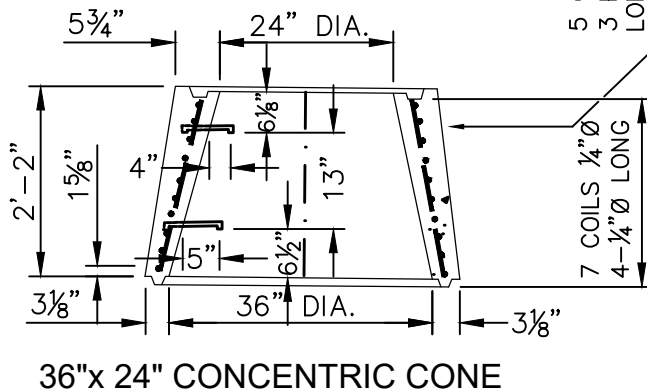
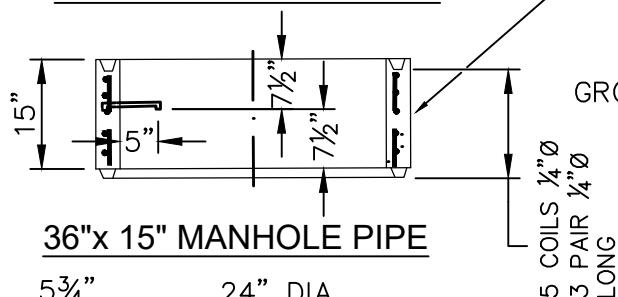
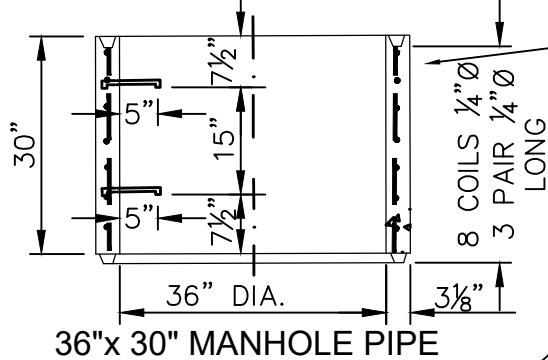
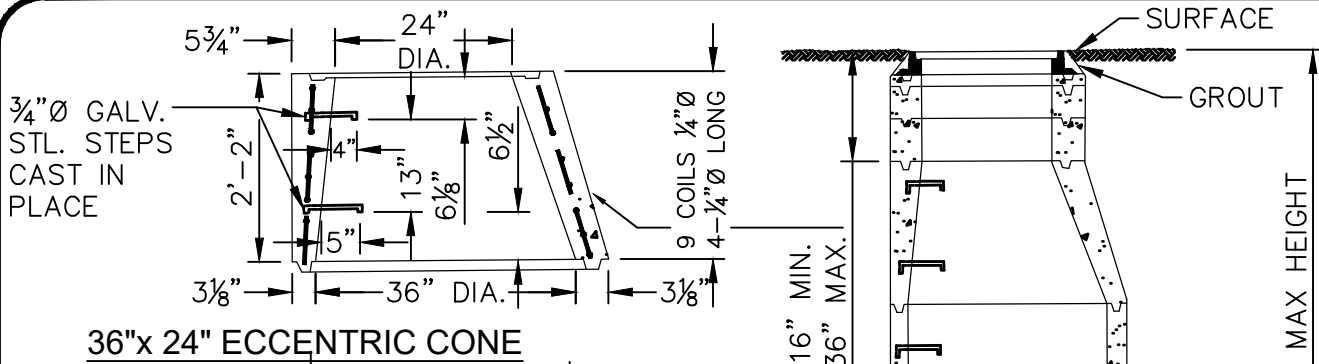
STD. PLAN

**1502**

SHT. 1 OF 1

**NON-REINF. CONC. ECCENTRIC CONE MANHOLE**





#### NOTES:

1. SEE STD PLAN 630-3-OC FOR MANHOLE FRAME AND COVER DETAILS.
2. SEE STD. PLAN 1507 FOR MANHOLE STEP DETAILS.
3. CONSTRUCTION SHALL BE IN ACCORDANCE WITH GREENBOOK SECTION 303.
4. THE MANHOLE PIPES AND GRADE RINGS SHALL BE ARRANGED IN ORDER OF LONGER TO SHORTER LENGTHS FROM BOTTOM TO TOP.
5. MANHOLE HEIGHT DETAILS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
6. PAVEMENT SHALL BE FINISHED.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

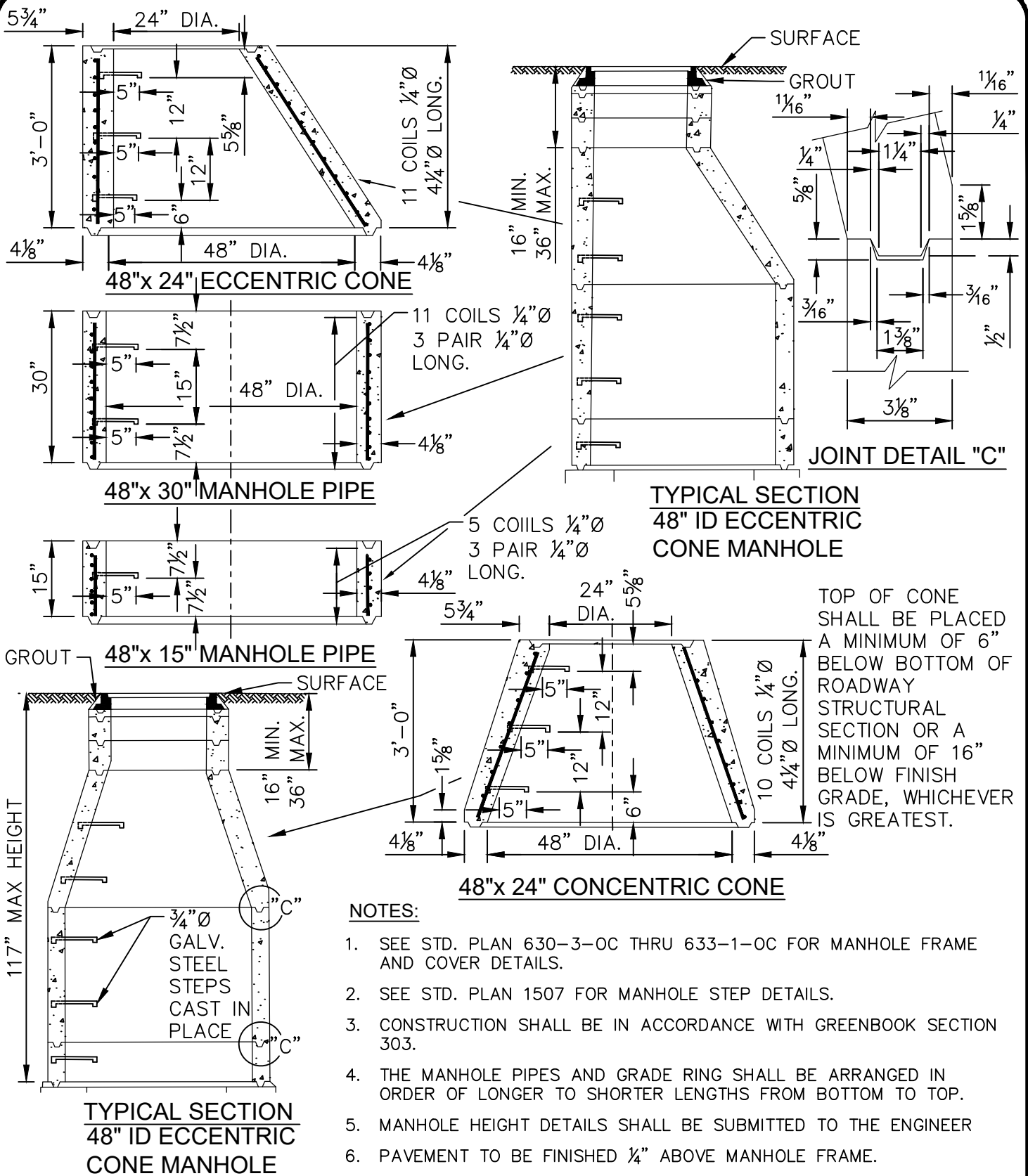
STD. PLAN

1503

36" REINFORCED CONCRETE MANHOLE

SHT. 1 OF 1





COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

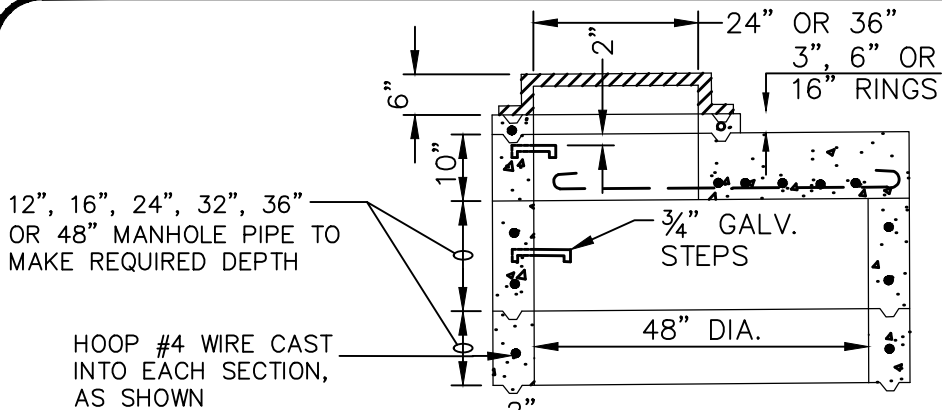
48" REINFORCED CONCRETE MANHOLE

STD. PLAN

1504

SHT. 1 OF 1

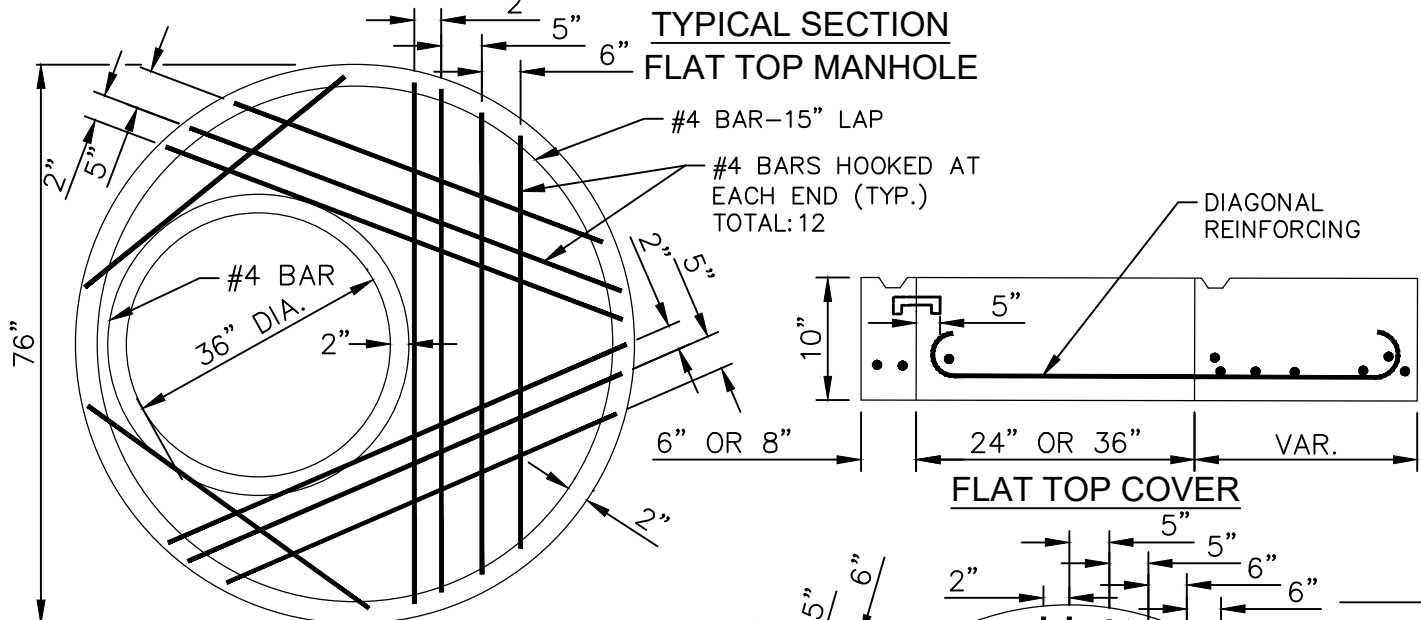




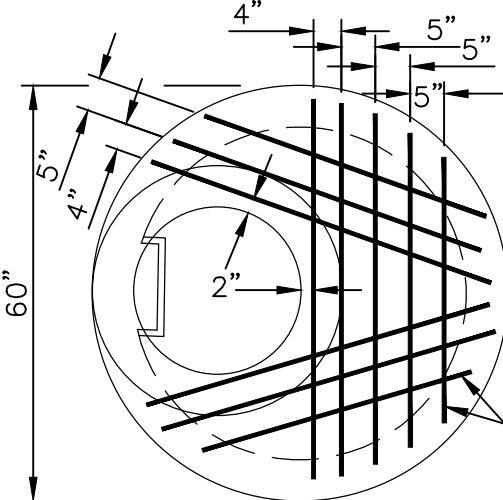
#### NOTES:

1. FOR MANHOLE FRAME & COVER SEE STD. PLAN 630-3-OC & 633-1-OC.
2. FOR MANHOLE STEPS SEE STD. PLAN 1507.
3. FOR RING & MANHOLE PIPE SECTIONS SEE STD. PLAN 1501.
4. CONSTRUCTION SHALL BE IN ACCORDANCE WITH GREENBOOK SECTION 303.

#### TYPICAL SECTION FLAT TOP MANHOLE



#### PLAN OF 60" COVER WITH 36" ACCESS



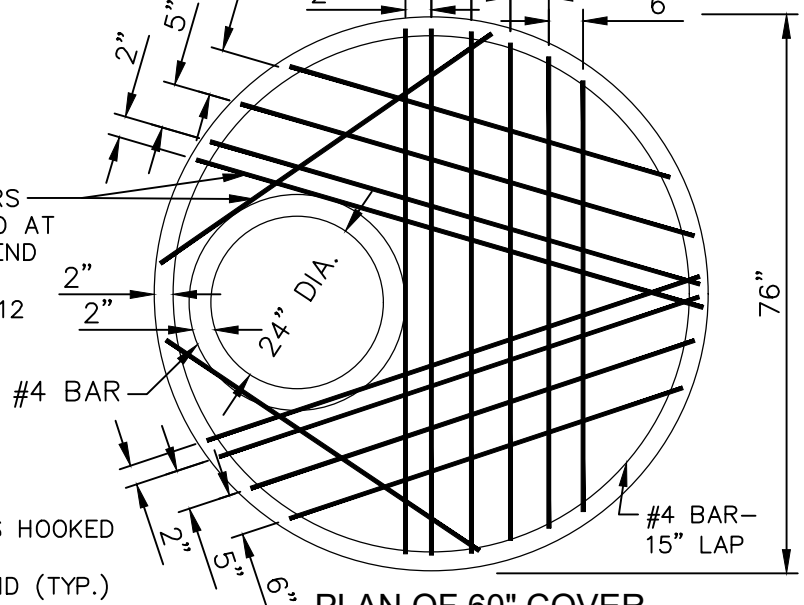
#### PLAN OF 48" COVER WITH 24" ACCESS

#4 BARS  
HOOKED AT  
EACH END  
(TYP.)  
TOTAL: 12

#5 BARS HOOKED  
AT  
EACH END (TYP.)  
TOTAL: 11

#4 BAR

#### PLAN OF 60" COVER WITH 24" ACCESS



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

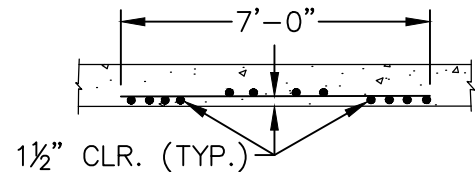
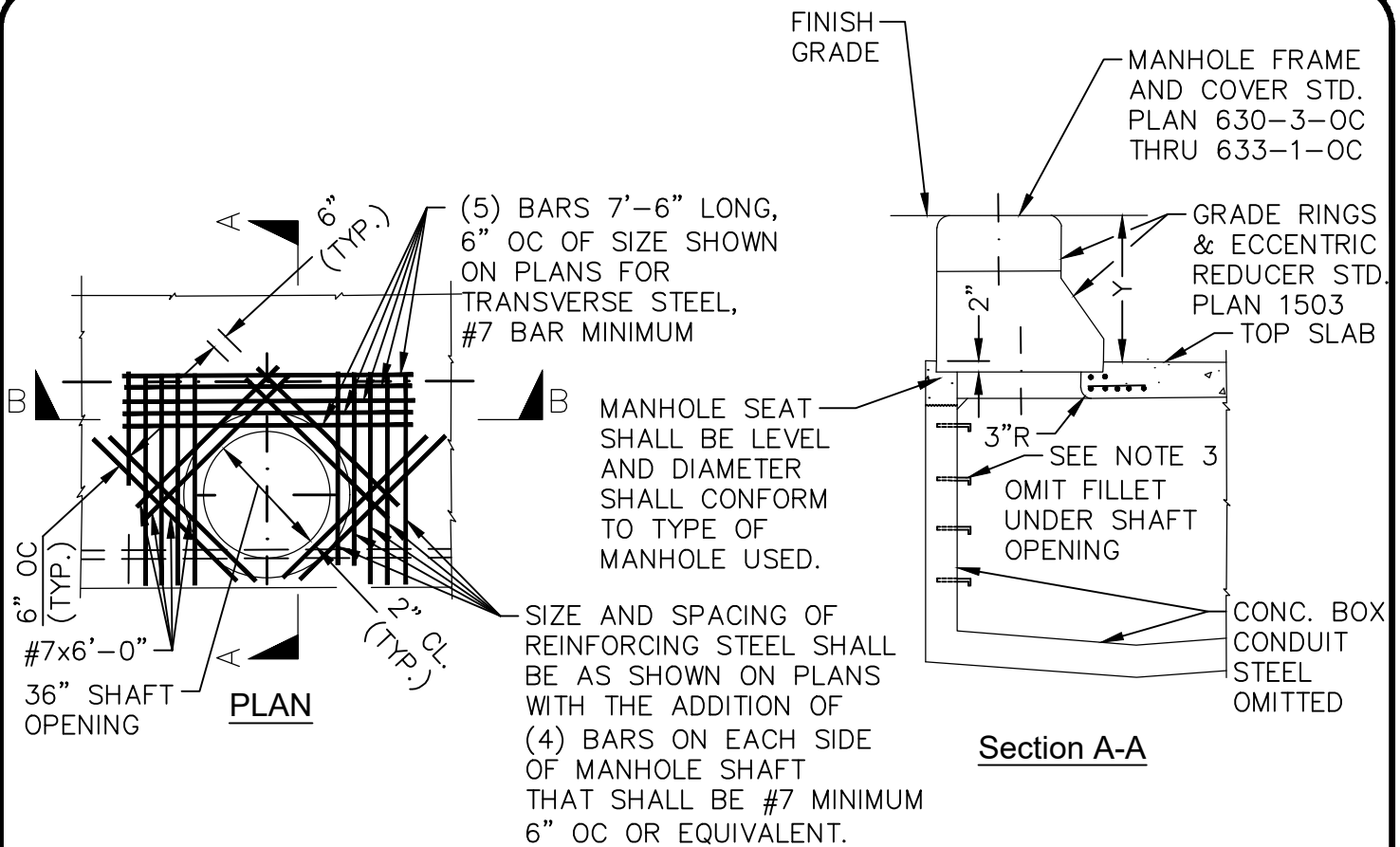
STD. PLAN

1505

SHT. 1 OF 1

FLAT TOP MANHOLE COVERS





**Section B-B**  
(TOP SLAB ONLY)

**NOTES:**

1. MANHOLE SHAFT CENTERLINES ARE SHOWN ON PLANS.
2. ALL REINFORCING STEEL SHOWN SHALL BE PLACED IN BOTTOM FACE ONLY.
3. SEE STD. PLAN 1507 FOR STEP PLACEMENT AND EMBEDMENT DETAILS.
4. ALL STEEL REINFORCEMENT SHALL BE 1 1/2 INCH CLEAR, UNLESS OTHERWISE NOTED
5. WHEN DEPTH Y FROM STREET GRADE TO TOP OF MANHOLE SEAT IS LESS THAN 2 FEET-10 1/2 INCHES IN PAVED STREETS OR 3 FEET 6 INCHES IN UNPAVED STREETS, CONSTRUCT 2-FOOT DIAMETER SHAFT USING CONCRETE RINGS AS PER STD. PLAN 1502, OTHERWISE CONSTRUCT 3-FOOT DIAMETER SHAFT AS SHOWN ON THIS PLAN.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

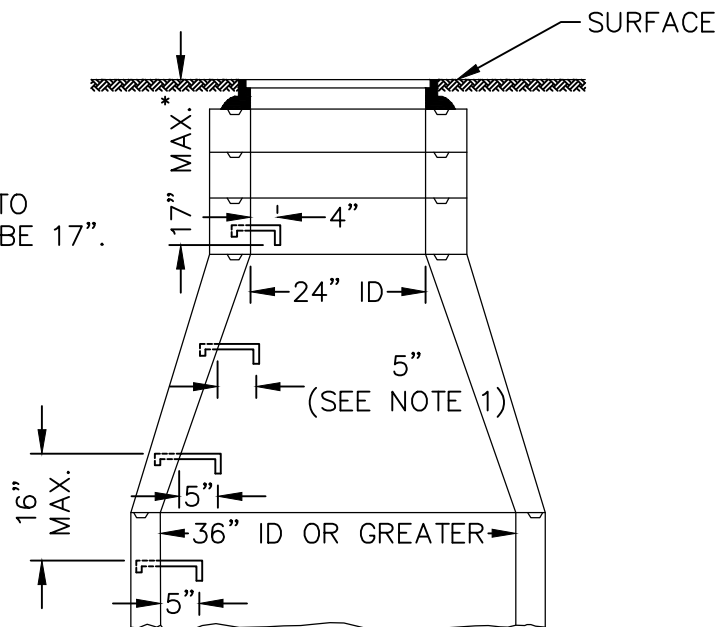
**1506**

**REINFORCED CONCRETE BOX MANHOLE**

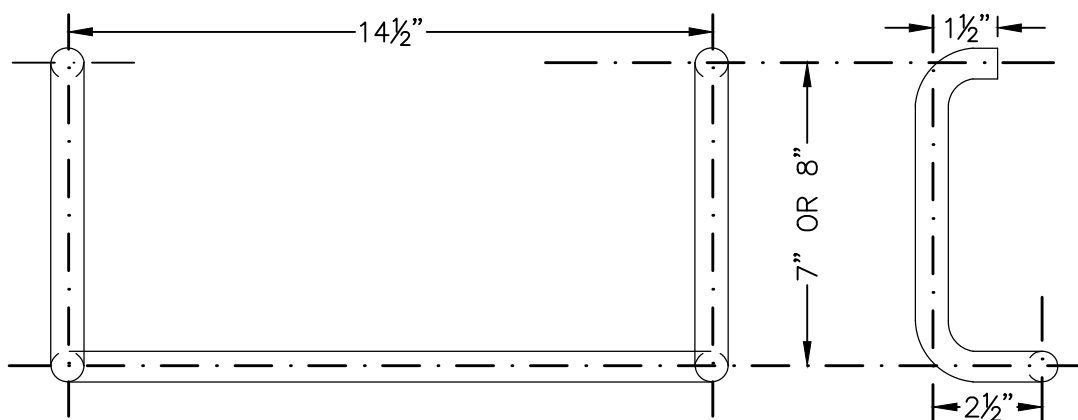
SHT. 1 OF 1



\* THE MAXIMUM DISTANCE FROM SURFACE GRADE TO FIRST STEP THE SHALL BE 17".



TYPICAL MANHOLE



NOTES:

1. SEE STD. PLAN 1501, 1502, 1503, 1504, 1505, OR 1506 FOR MANHOLE STEP SPACING AND PLACEMENT.
2. STEPS 7 INCHES IN LENGTH SHALL BE USED IN 24 INCH ID UNITS.  
STEPS 8 INCHES IN LENGTH SHALL BE USED IN 36 INCH ID UNITS.  
STEPS 8 INCHES IN LENGTH SHALL BE USED IN 48 INCH ID UNITS.
3. MATERIAL SHALL BE 3/4 INCH DIA. STEEL CONFORMING TO ASTM A615 GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123.
4. STEPS SHALL HAVE A MINIMUM OF 4 INCH PROJECTION FROM POINT OF EMBEDMENT AND A MINIMUM OF 3 INCH EMBEDMENT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

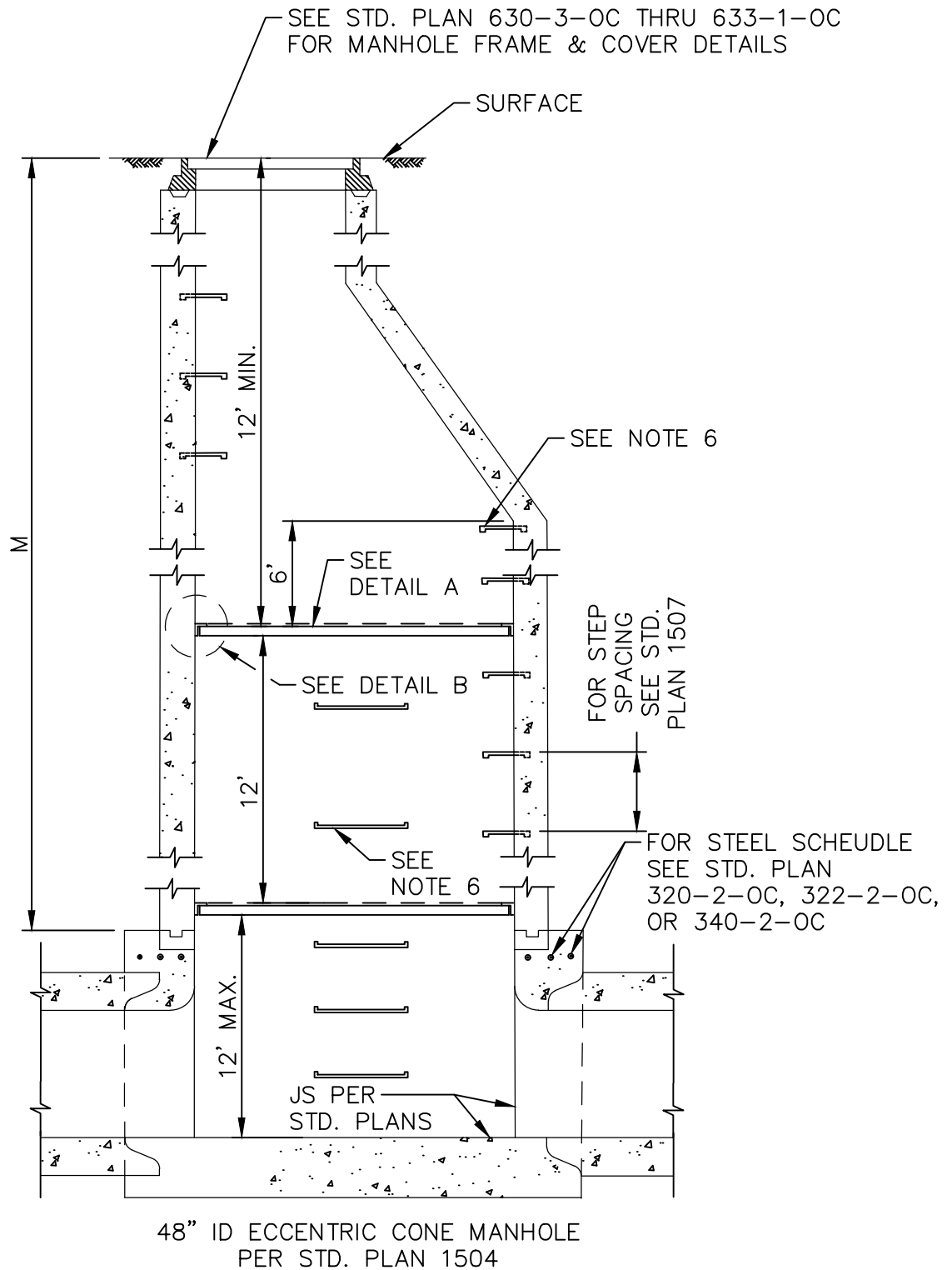
MANHOLE STEPS

STD. PLAN

1507

SHT. 1 OF 1





COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

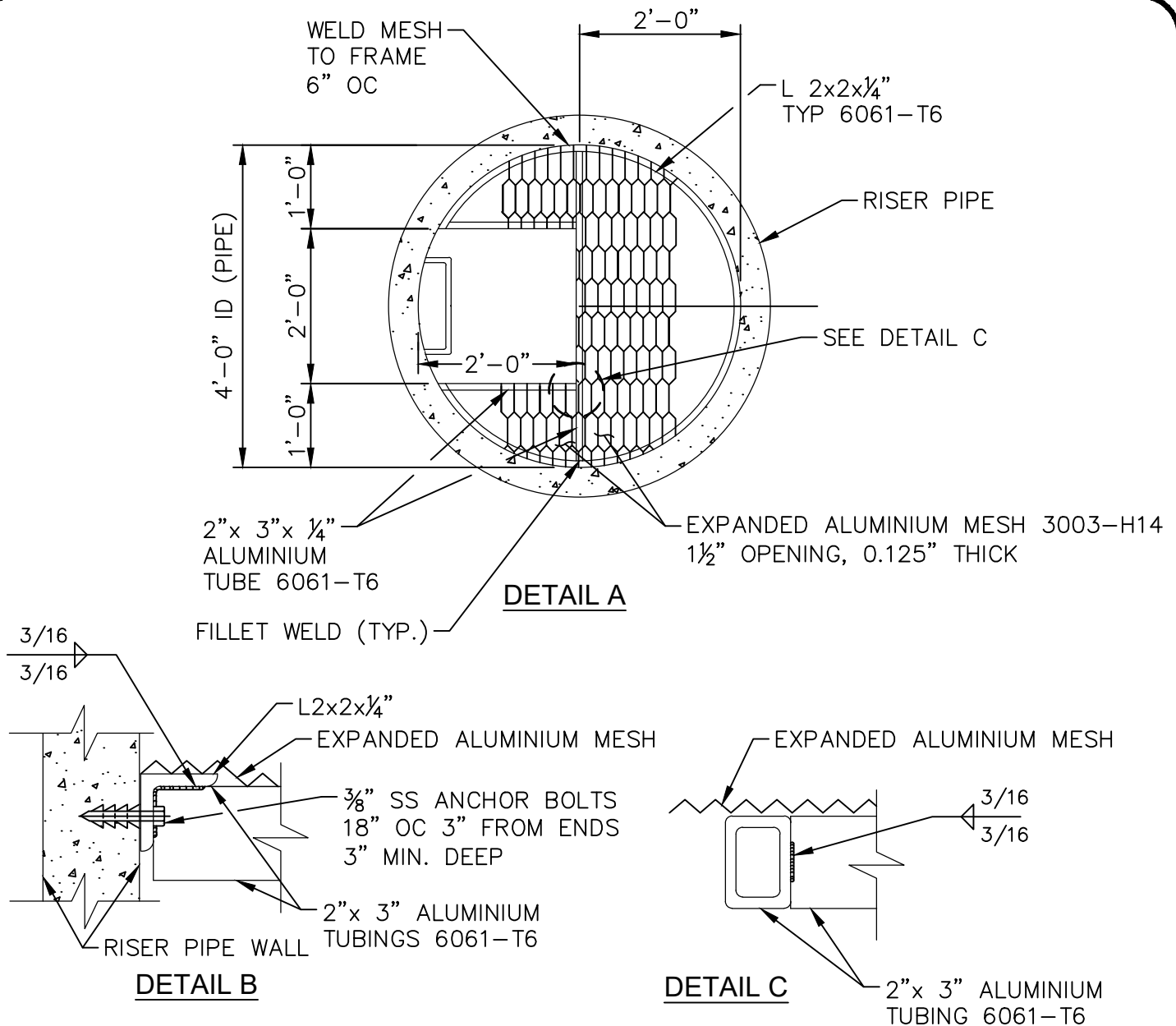
*Khalid Bazmi*  
Khalid Bazmi, County Engineer

STD. PLAN

1508

SHT. 1 OF 2

DEEP MANHOLE LANDINGS



**NOTES:**

1. SPACING DIMENSIONS BETWEEN LANDINGS TO START AT BOTTOM OF HOLE.
2. ROTATE PLATFORM OPENING 90 DEGREE MINIMUM FROM OPENING BELOW.
3. WELDS TO BE HELI-ARC PER AWS SPECS.
4. FOR BASE SEE STD. PLAN 320-2-OC.
5. FOR PIPE & CONE SEE STD. PLAN 1504.
6. STEPS TO EXTEND MINIMUM FEET ABOVE LANDING FOR USE AS HANDHOLDS.
7. DESIGN LIVE LOAD : 150 PSF.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

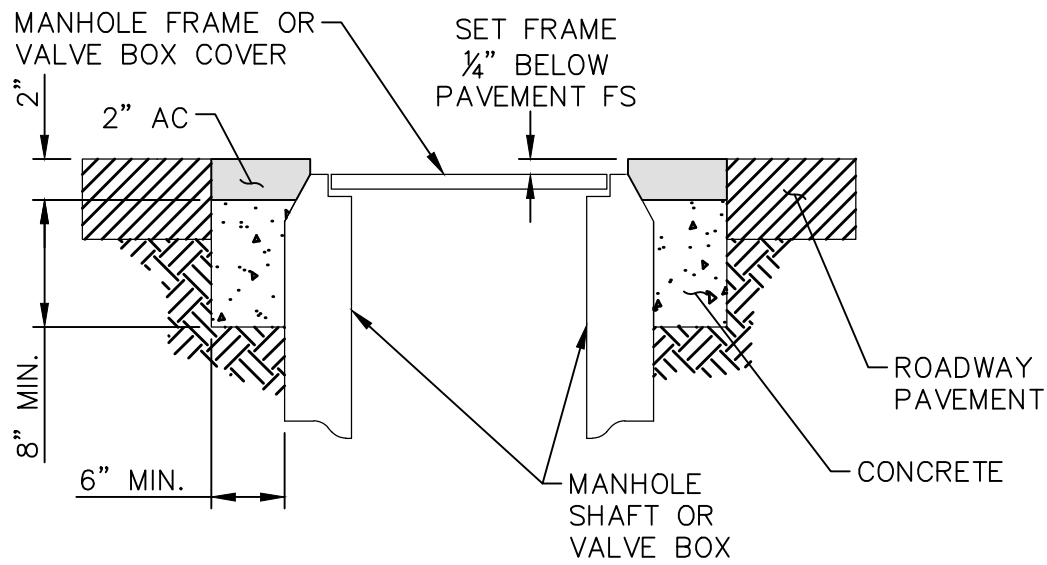
Revision: August 2018

STD. PLAN

1508

SHT. 2 OF 2

DEEP MANHOLE LANDINGS



### MANHOLE / VALVE COVER

#### LEGEND:



EXISTING PAVEMENT



NEW PAVEMENT

#### NOTE:

1. FRAME AND COVER TO BE SET 1/4 INCH BELOW FINISHED SURFACE OF SURROUNDING ROADWAY PAVEMENT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1509

MANHOLE/VALVE COVER ADJUSTMENT TO GRADE DETAIL

SHT. 1 OF 1



PERMANENT PAVED SURFACE  
(SEE NOTE 4)

$\frac{1}{2}$ " WIDE CONTINUOUS PLASTIC  
IDENTIFICATION TAPE

PVC CONDUIT

FINISHED GRADE

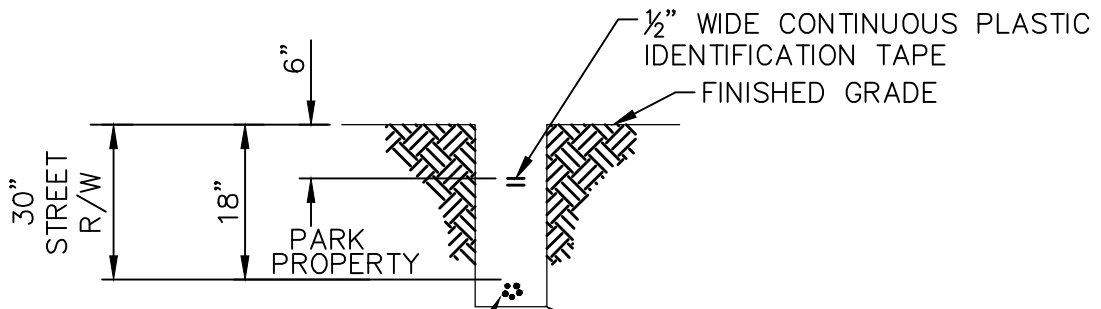
18" FOR RIGID NON-METALLIC  
CONDUIT APPROVED FOR  
DIRECT BURIAL. 24" FOR  
DIRECT BURIED CABLE WITHIN  
PARK PROPERTY.

12" MIN.

30" WITHIN  
STREET R/W

TRENCH WIDTH AS NECESSARY FOR MULTIPLE  
CONDUIT INSTALLATION, PROVIDE MIN  $\frac{1}{2}$ "  
CONDUIT SIZE GAP/CLEAR BETWEEN CONDUITS  
VERTICALLY AND HORIZONTALLY

### HIGH VOLTAGE WIRING (50-600 VOLT)



DIRECT BURIAL CABLES. SEE NOTE 3.

TRENCH WIDTH AS NECESSARY

TIE AT 10 FOOT INTERVALS. PROVIDE EXPANSION  
COIL IN EACH WIRE AT 100 FOOT INTERVALS AND  
IN EACH PULL BOX AND VALVE BOX.

### LOW VOLTAGE WIRING (0-50 VOLT)

#### NOTES:

1. BACKFILL AND COMPACT ALL TRENCHES PER GREENBOOK SECTION 306.
2. REPLACE PAVED SURFACES PER GREENBOOK SECTION 302.
3. PLACE LOW VOLTAGE WIRING IN CONDUIT UNDER PAVED SURFACES.
4. IN PERMANENT PAVED AREAS WITHIN PARK PROPERTY, COVER MAY BE DECREASED BY 6 INCHES.
5. ALL SPLICES SHALL BE WEATHERPROOF AND LOCATED IN PULL BOXES.
6. CONDUCTORS SHALL BE SPLICED OR JOINED WITH UL APPROVED DEVICES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

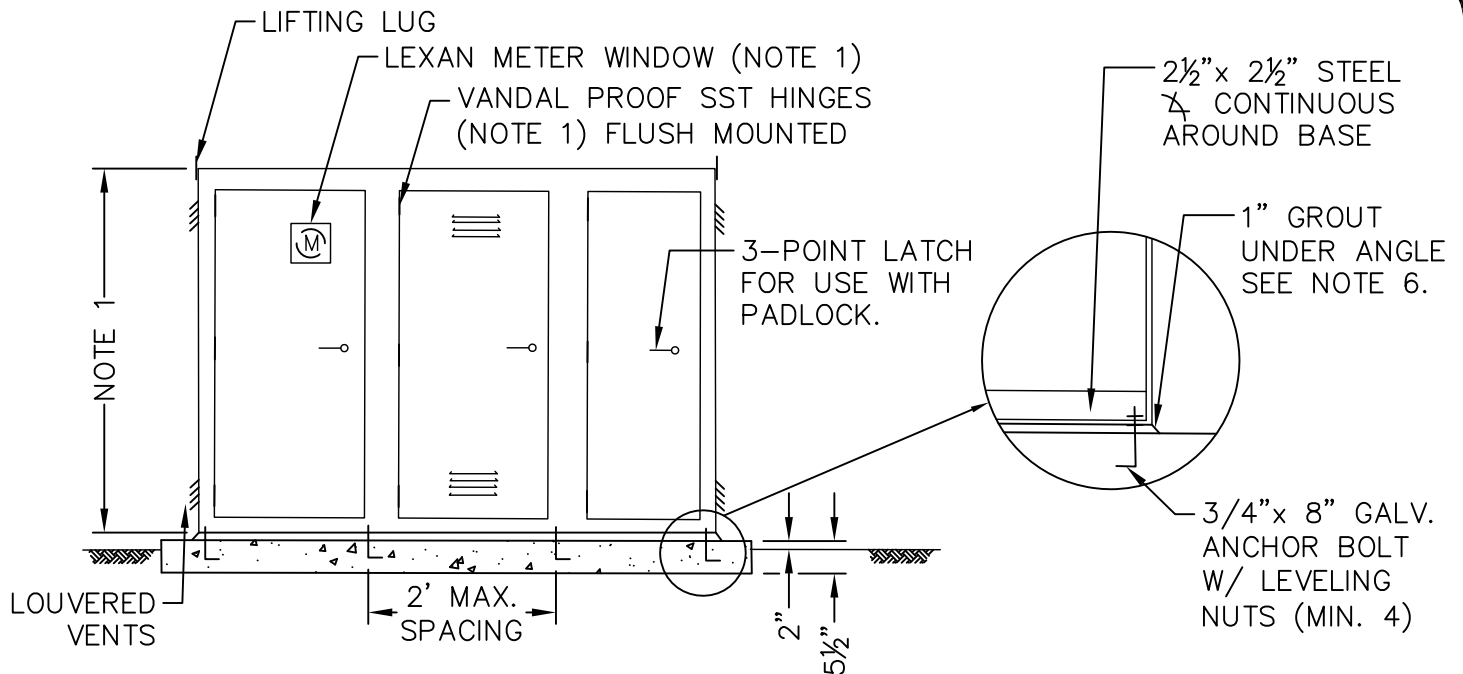
STD. PLAN

1602

SHT. 1 OF 1

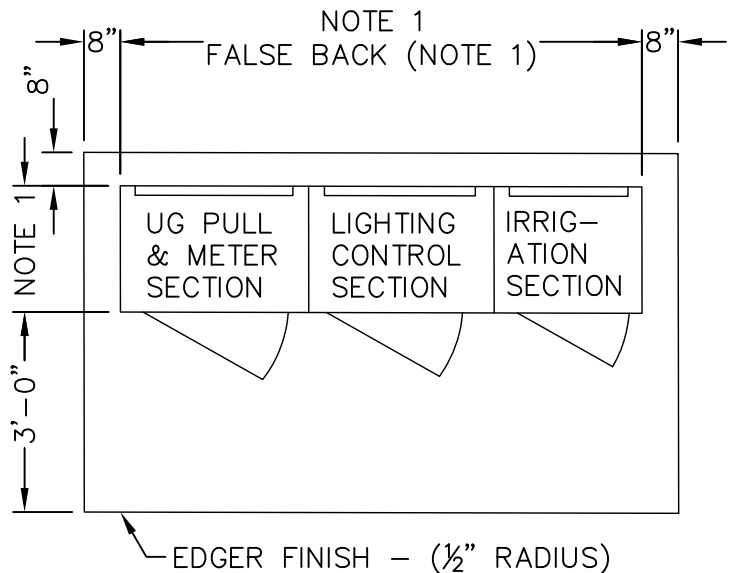
BURIED ELECTRICAL WIRING ON PARK PROPERTY





#### NOTES:

1. DIMENSIONS AND DETAILS OF ELECTRICAL ENCLOSURE SHALL BE PER APPROVED SHOP DRAWINGS.
2. ELECTRICAL ENCLOSURE SHALL BE WEATHERTIGHT AND OF 10 GAGE GALVANIZED STEEL ALL WELDED CONSTRUCTION.
3. PAINT INSIDE AND OUTSIDE PER SPECIAL PROVISIONS. BOTTOM EXTERIOR OF CABINET SHALL BE PAINTED WITH TWO COATS OF ASPHALTIC OR COAL TAR EPOXY PAINT. COLOR SHALL BE DARK GREEN OR SHALL MATCH STRUCTURE.
4. COMPACT EARTH TO 90 PERCENT RELATIVE COMPACTION UNDER SLAB.
5. CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH STANDARD PLAN 1803 AND GREENBOOK SECTION 303.
6. PROVIDE AN APPROVED SEALANT AROUND THE BASE OF THE ELECTRICAL ENCLOSURE.
7. ALL EQUIPMENT SHALL BE UL CERTIFIED.



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

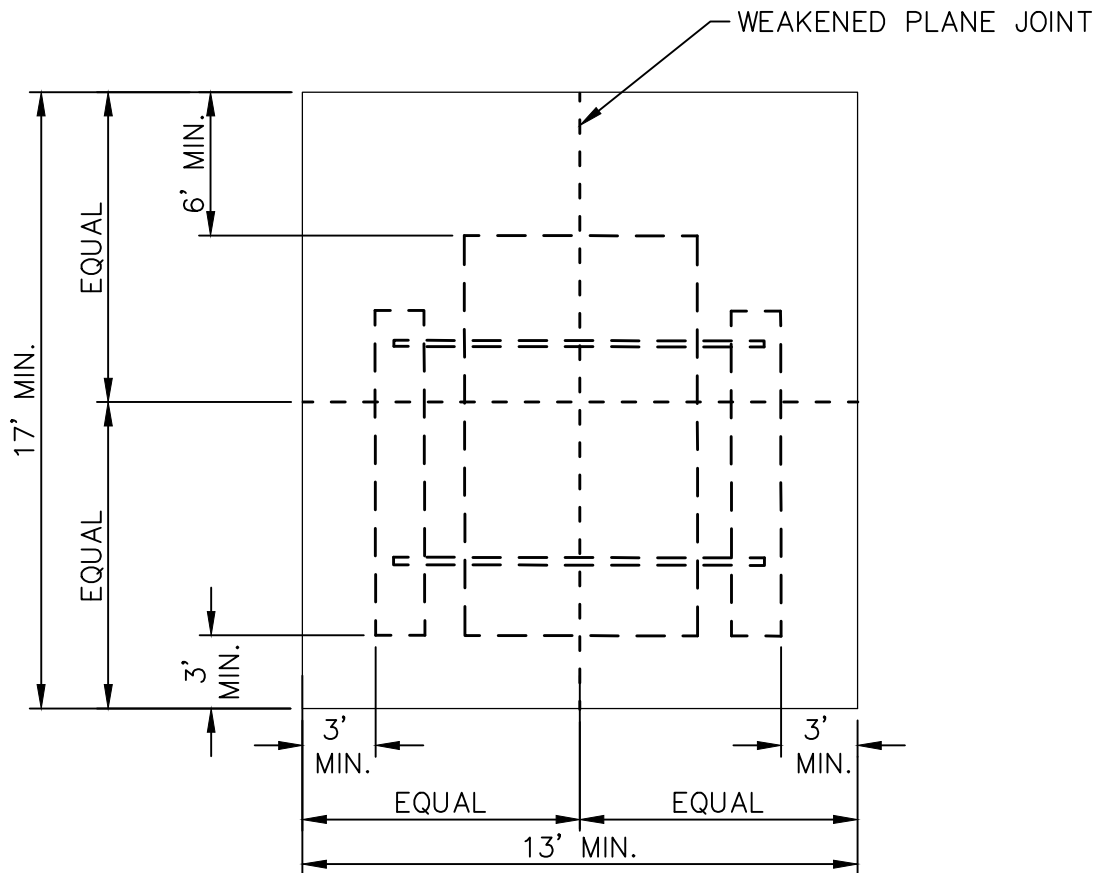
STD. PLAN

1603

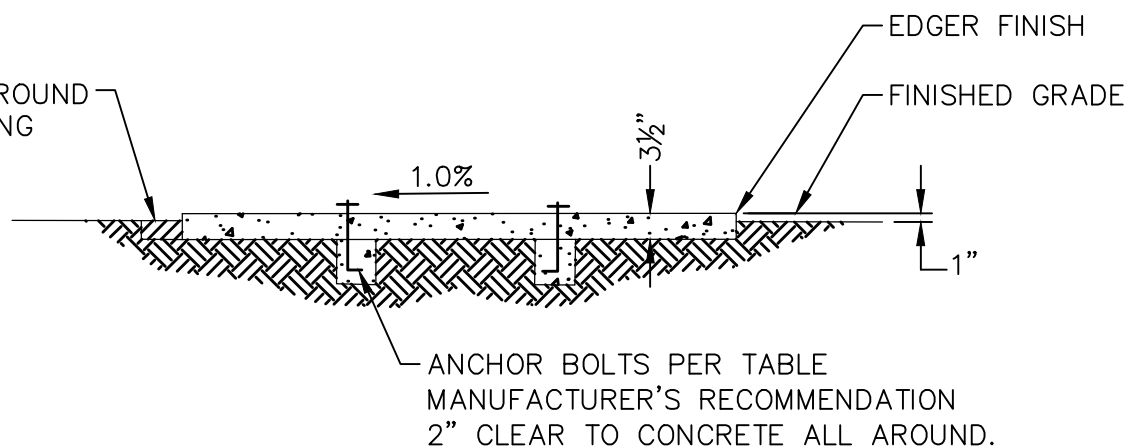
SHT. 1 OF 1

ELECTRICAL ENCLOSURE





SCARIFY 12" ALL AROUND  
PRIOR TO REPLANTING



**NOTES:**

1. CONCRETE WORK SHALL BE TYPE II OR V, CLASS 520-C-2500 CONFORMING TO STANDARD PLAN 1803 AND GREENBOOK SECTION 303.
2. LIGHT BROOM FINISH UNLESS OTHERWISE SPECIFIED.
3. PICNIC TABLE SLAB SHALL BE IN COMPLIANCE WITH ADA REQUIREMENTS WHERE ADJACENT TO PEDESTRIAN PATH OF TRAVEL.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

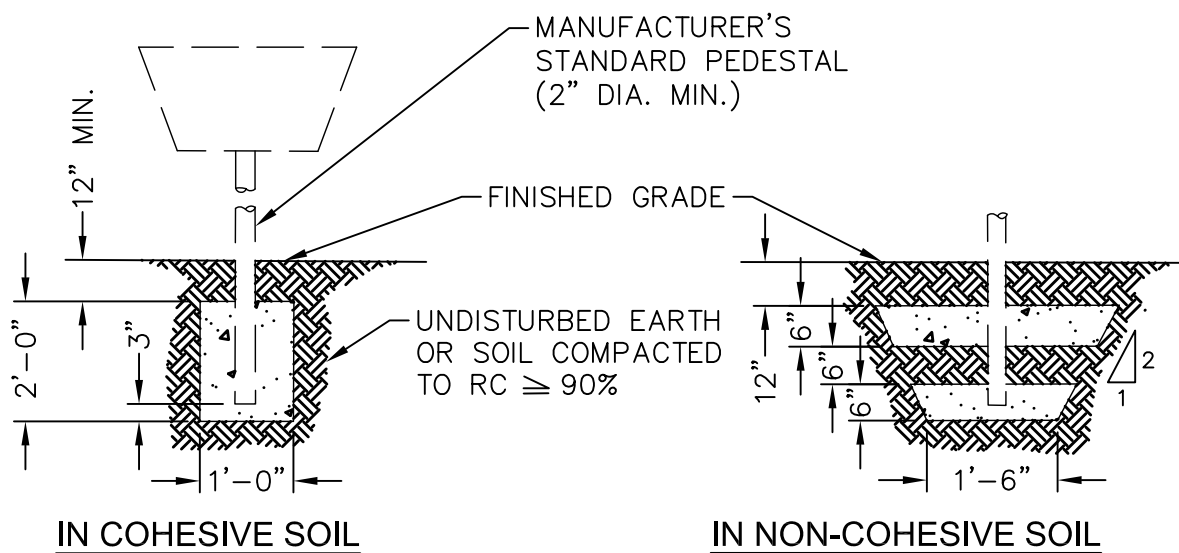
**PICNIC TABLE SLAB**

STD. PLAN

**1611**

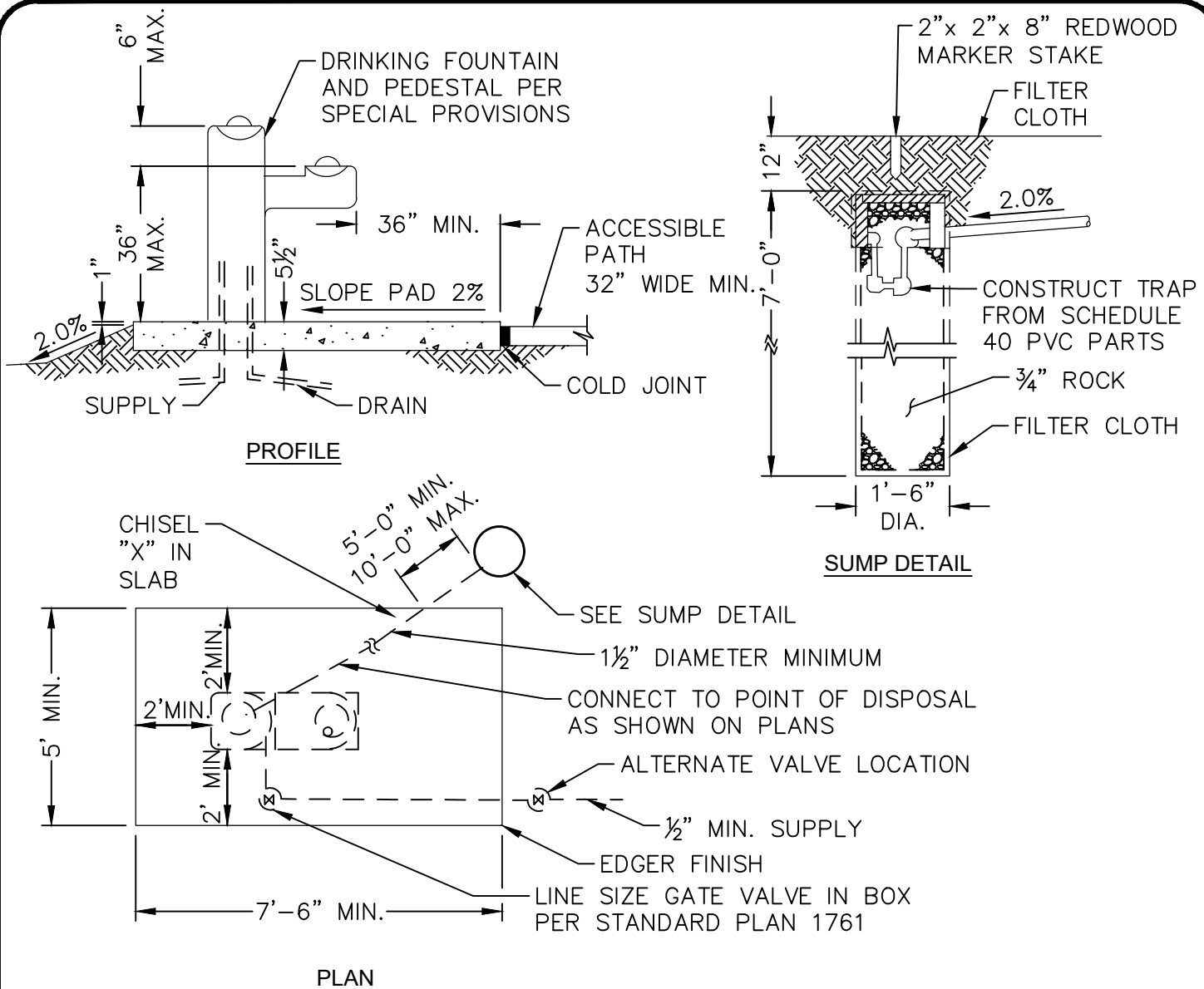
SHT. 1 OF 1





## TRASH RECEPTACLE INSTALLATION





#### NOTES:

1. CONCRETE WORK SHALL BE TYPE II OR V, CLASS 520-C-2500 CONFORMING TO STANDARD PLAN 1803 AND GREENBOOK SECTION 303.
2. COMPACT SOIL TO 90 PERCENT RELATIVE COMPACTION UNDER SLAB AND ABOVE SUMP PER STANDARD PLAN 1801.
3. FILTER CLOTH SHALL BE PER STANDARD PLAN 1808.
4. WHERE A DRINKING FOUNTAIN IS LOCATED WITHIN 200 FEET OF A SEWER, THE DRINKING FOUNTAIN DRAIN SHALL BE CONNECTED TO THE SEWER, UNLESS A SUMP IS CALLED FOR ON THE APPROVED PLANS. (SEE COUNTY ADAPTED AND AMENDED PLUMBING CODE FOR LIMITATIONS ON THE USE OF A SUMP FOR OVERFLOW DRAINAGE).
5. DRINKING FOUNTAIN SHALL BE IN COMPLIANCE WITH ADA REQUIREMENTS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

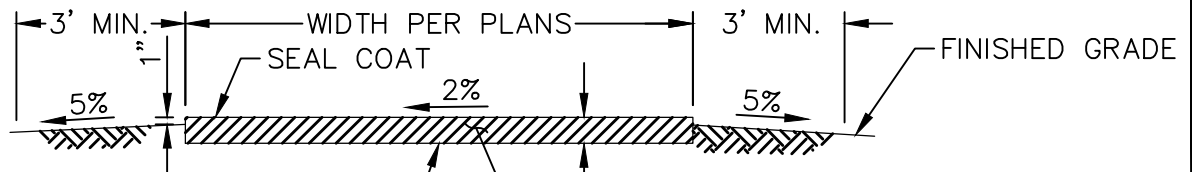
STD. PLAN

1613

SHT. 1 OF 1

DRINKING FOUNTAIN AND SUMP





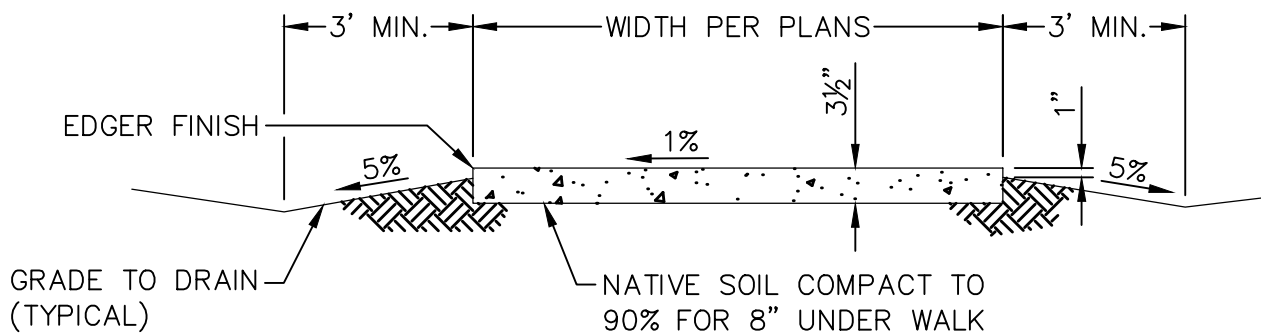
NATIVE SOIL COMPACT TO 90% RELATIVE COMPACTION FOR 6" UNDER WALK

AC PER STANDARD PLAN 1805

T PER TABLE

SOIL R-VALUE	SECTION T
<25	0.35' AC OR 0.20' AC/0.35' AB
>25	0.30' AC OR 0.20' AC/0.30' AB

### ASPHALT CONCRETE WALK



### PORTLAND CEMENT CONCRETE WALK

(NOT FOR HIGHWAY USE)

#### NOTES:

1. PCC WORK SHALL CONFORM TO STANDARD PLANS 1803 AND 1205 AND THE GREENBOOK SECTION 303.
2. FOR ANY VERTICAL OBSTRUCTION, THE MINIMUM HORIZONTAL CLEARANCE FROM EDGE OF WALK SHALL BE 18 INCHES.
3. SEE STANDARD PLANS 1804 AND 1805 FOR BASE AND ASPHALT CONCRETE MATERIAL SPECIFICATIONS.
4. PLACE NON-MIGRATING SOIL STERILANT UNDER AC.
5. AC WORK SHALL CONFORM TO STD PLAN 1805 AND GREENBOOK SECTION 302.
6. AB SHALL CONFORM TO STD PLAN 1804 AND GREENBOOK SECTION 301.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

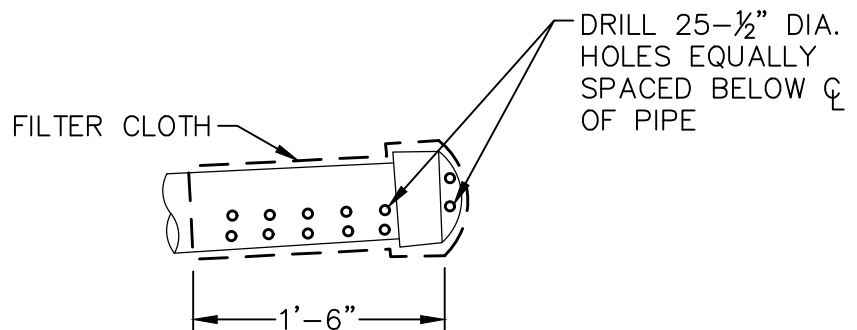
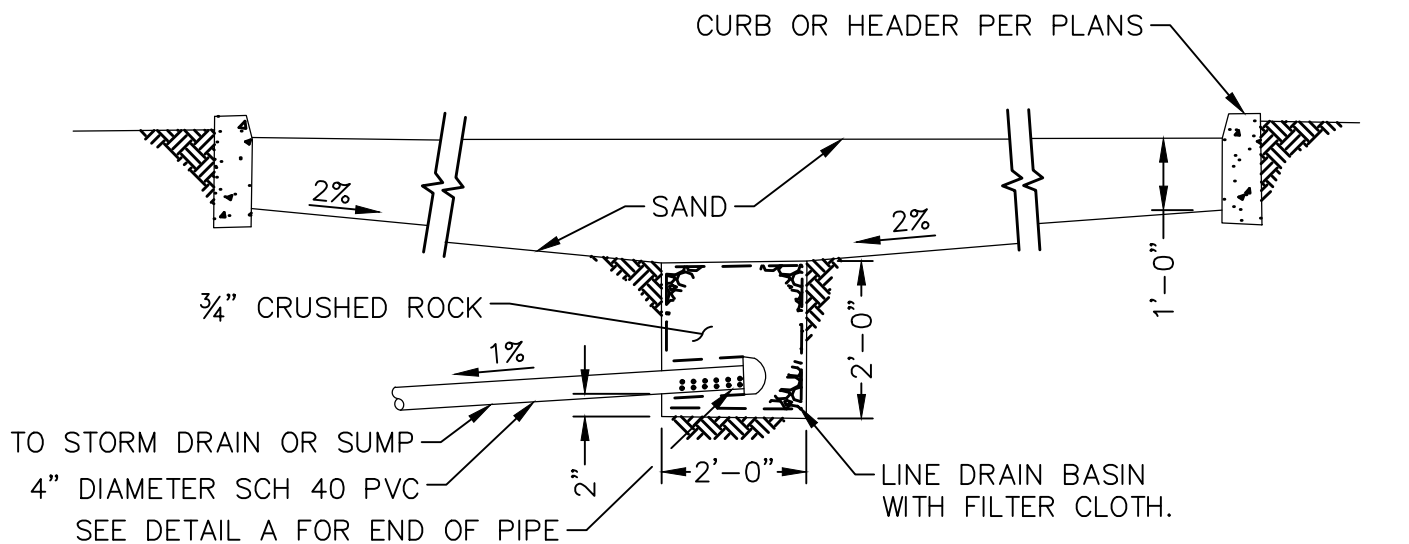
STD. PLAN

1621

SHT. 1 OF 1

ASPHALT AND CONCRETE WALKS





DETAIL A

NOTES:

1. MAXIMUM AREA SERVED BY ONE DRAIN BASIN IS 2,000 SF.
2. FILTER CLOTH SHALL BE PER STD. PLAN 1808.
3. FINAL DRAIN LOCATION TO BE DETERMINED BY THE ENGINEER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

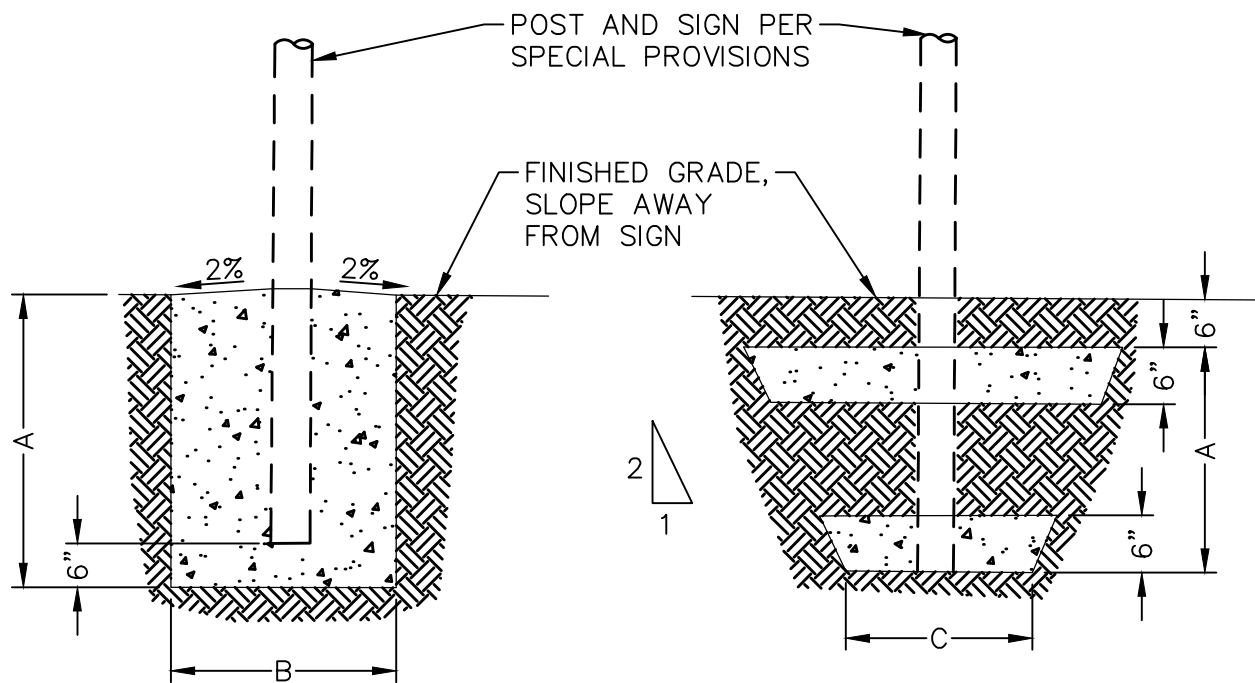
STD. PLAN

1631

SHT. 1 OF 1

PLAY LOT DRAIN





INSTALLATION  
IN COHESIVE SOIL

INSTALLATION  
IN NON-COHESIVE SOIL

SIGN AREA	A	B	C
UP TO 4 SF	3'	2'	1'-6"
4 - 8 SF	3'	3'	2'-0"

NOTES:

1. PLACE CONCRETE AGAINST UNDISTURBED EARTH.
2. CONCRETE WORK SHALL BE TYPE II OR V, CLASS 520-C-2500 CONFORMING TO STANDARD PLAN 1803 AND GREENBOOK SECTION 303.
3. WOOD POSTS SHALL BE PRESSURE TREATED SELECT DOUGLAS FIR OR REDWOOD. STEEL POSTS SHALL BE HOT DIP GALVANIZED.
4. FOOTING MAY BE ROUND OR SQUARE.
5. DISTANCE FROM TOP OF SIGN TO FINISHED GRADE SHALL NOT EXCEED 5 FEET.
6. SLOPE TOP OF COHESIVE SOIL FOOTING TO DRAIN AWAY FROM POST AT 2 PERCENT MINIMUM.
7. EXPOSED CONCRETE SHALL BE MEDIUM BROOM FINISH.
8. SOIL CONDITIONS SHALL BE VERIFIED BY QUALIFIED ENGINEER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

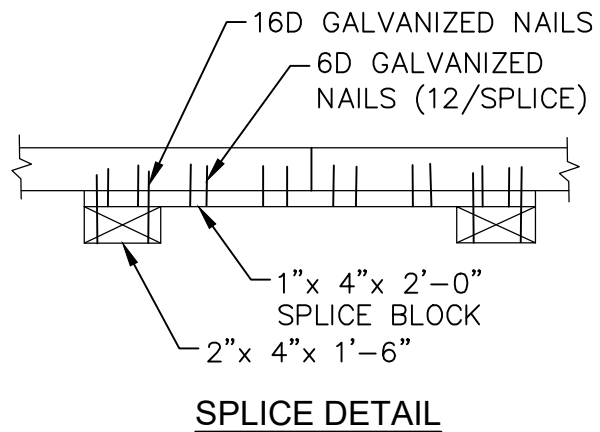
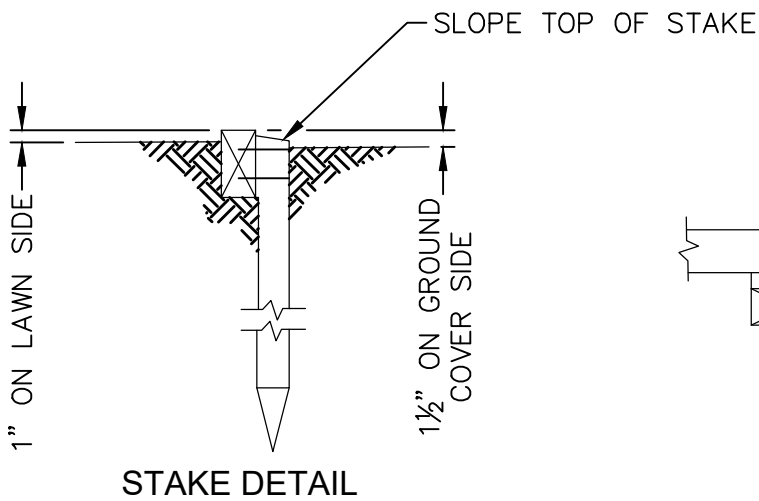
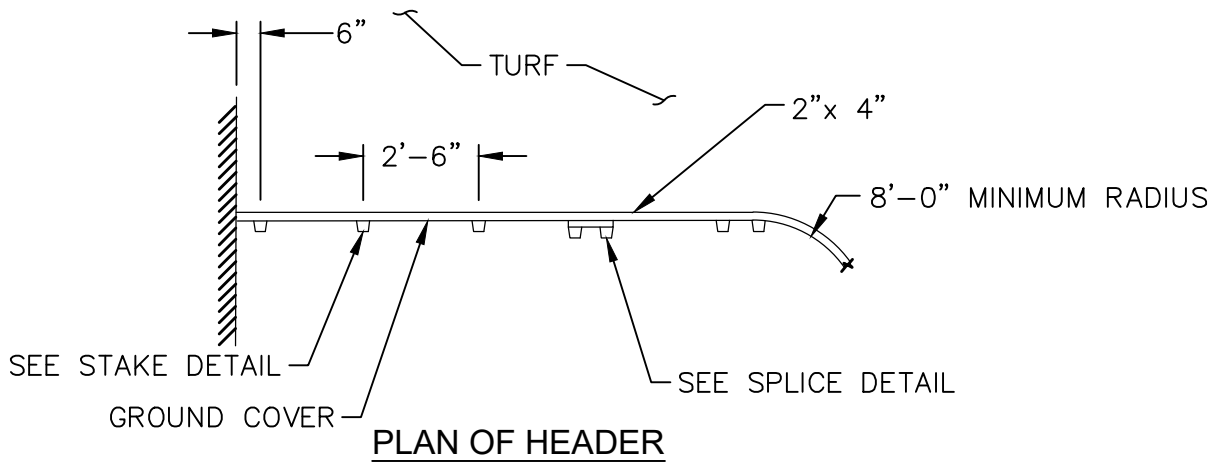
**SIGN FOOTING**

STD. PLAN

**1641**

SHT. 1 OF 1





**NOTES:**

1. HEADERS AND STAKES SHALL BE REDWOOD, RECYCLED PLASTIC OR PRESSURE TREATED DOUGLAS FIR. PRESSURE TREATMENT PER GREENBOOK.
2. USE THREE LAMINATED 1/2 INCH BY 4 INCH BOARDS FOR CURVED HEADER BOARDS.
3. USE GALVANIZED FASTENERS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

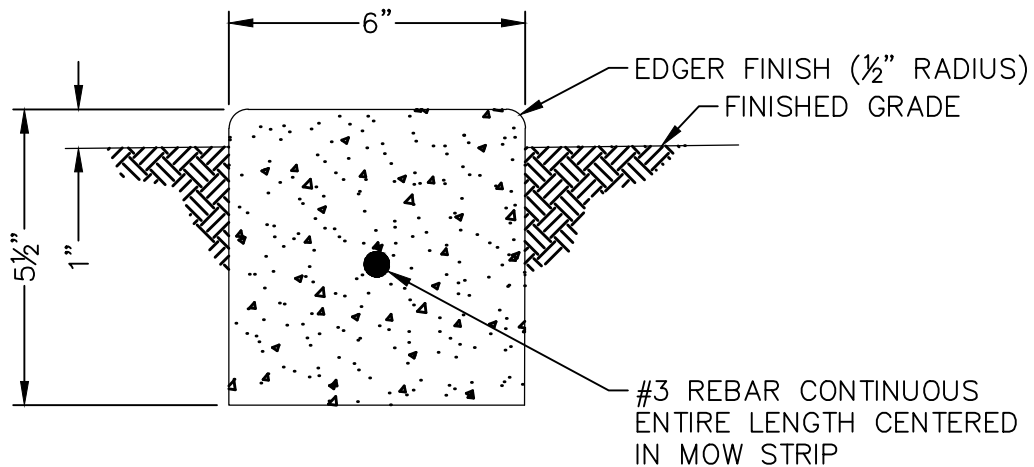
**HEADER DETAILS**

STD. PLAN

**1682**

SHT. 1 OF 1





**NOTES:**

1. CONCRETE WORK SHALL BE TYPE II OR V, CLASS 520-C-2500 CONFORMING TO STANDARD PLAN 1803 AND GREENBOOK SECTION 303.
2. PROVIDE WEAKENED PLANE JOINTS AT 10 FEET MAXIMUM SPACING, AT ANGLE POINTS, AND AT BEGINNING AND END OF CURVE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

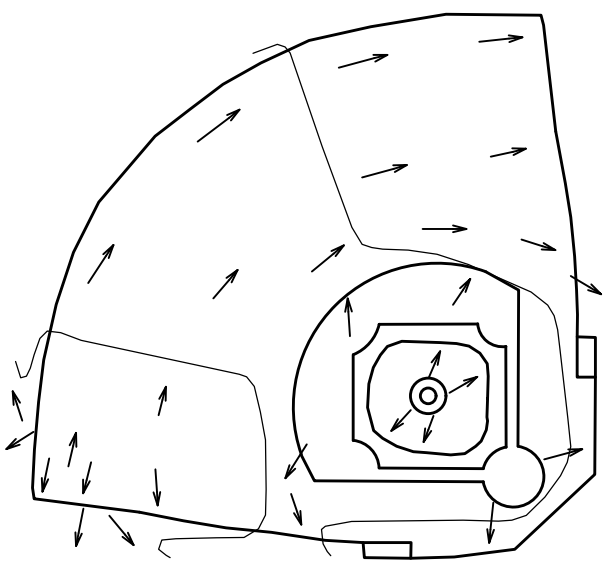
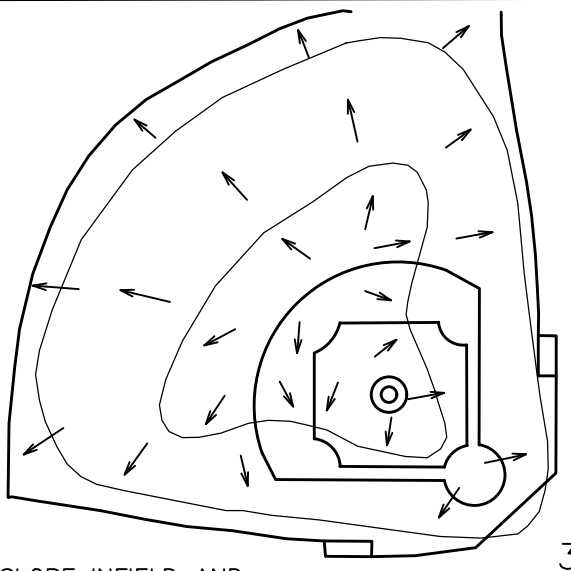
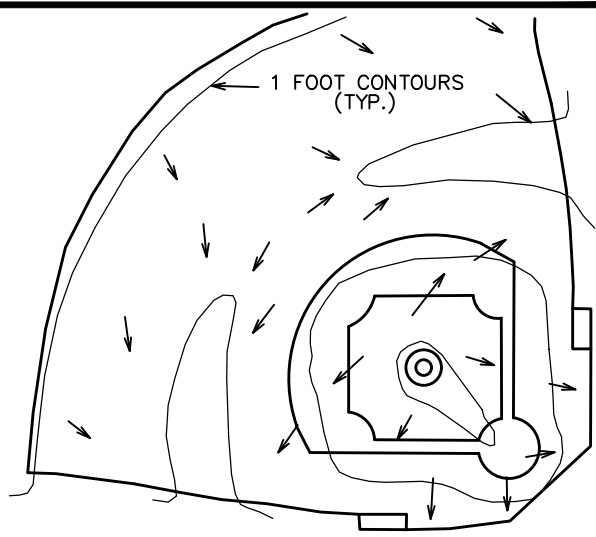
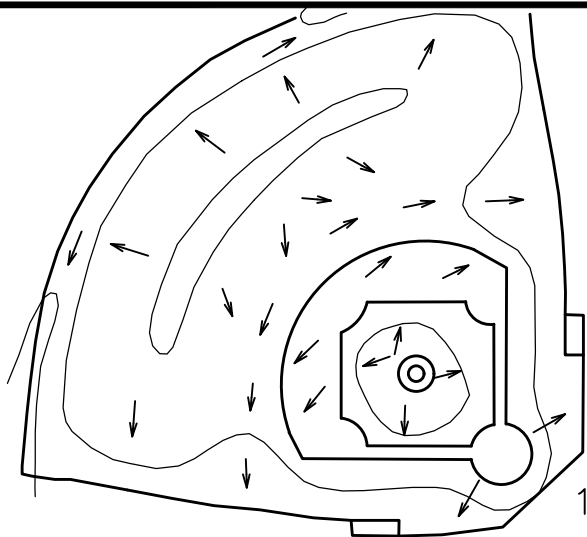
**MOW STRIP**

STD. PLAN

**1685**

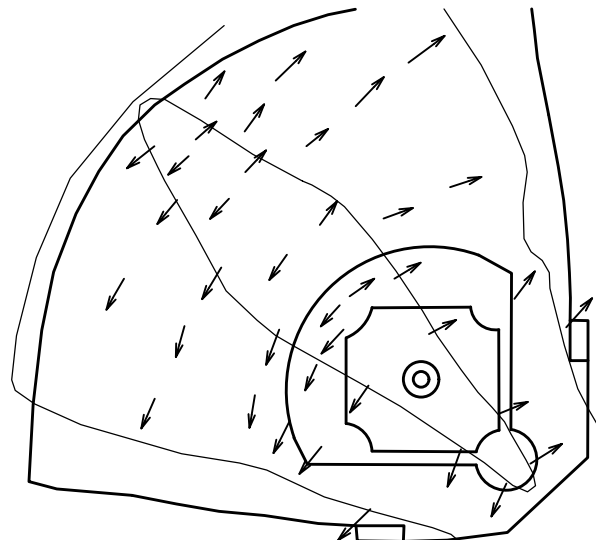
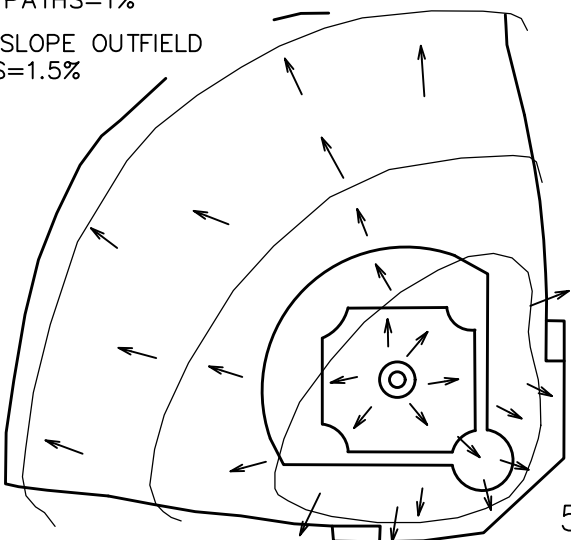
SHT. 1 OF 1





**NOTES:**

1. MAX. SLOPE INFIELD AND BASE PATHS=1%
2. MAX. SLOPE OUTFIELD AREAS=1.5%



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1690

BASEBALL DIAMOND DRAINAGE PATTERNS

SHT. 1 OF 1



## GENERAL

TREES PLANTED WITHIN THE STREET RIGHT-OF-WAY OR TREES PLANTED WITHIN SIX (6) FEET OF ANY STRUCTURE WHICH IS WITHIN THE RIGHT-OF-WAY SHALL BE SUBJECT TO THE CONDITIONS OF THIS STANDARD PLAN FOR PARKWAY AND MEDIAN TREES. IT IS REQUIRED THAT A LANDSCAPE PLAN BE PREPARED BY A LICENSED LANDSCAPE ARCHITECT EXCEPT FOR IMPROVEMENTS INVOLVING ONE SINGLE FAMILY RESIDENCE. THE PLAN SHALL SHOW ALL PROPOSED PLANTING AND IRRIGATION DETAILS AND THE MINIMUM PROPOSED PLANTING DISTANCE FROM ANY STRUCTURE FOR EACH SPECIES OF TREE.

## DEFINITIONS

STRUCTURE: ANY PERMANENT IMPROVEMENT; CURB, GUTTER, SIDEWALK, LIGHT POST, UNDERGROUND STRUCTURE, ETC.  
PLANTING WIDTH: THE MINIMUM ALLOWABLE DISTANCE BETWEEN STRUCTURES IN WHICH A TREE CAN BE PLANTED (I.E., BACK OF CURB TO BACK OF CURB OR BACK OF CURB TO SIDEWALK).  
SPACING: THE MINIMUM ALLOWABLE DISTANCE BETWEEN TREES.

## USE OF TREE LIST AND OTHER TREES

SELECTION FROM THE LIST FOR SITE SUITABILITY SHALL BE THE RESPONSIBILITY OF THE LANDSCAPE ARCHITECT PREPARING THE PLANS. TREES NOT SHOWN ON THE LIST MAY BE ALLOWED WITH WRITTEN APPROVAL FROM THE DIRECTOR OF ORANGE COUNTY PUBLIC WORKS. A WRITTEN REQUEST DOCUMENTING THE SUITABILITY OF THE PROPOSED TREE SHALL ACCOMPANY THE LANDSCAPE PLANS.

## PLANTING CRITERIA

1. TREES SHALL BE PLACED IN ACCORDANCE WITH STD. PLAN 520-4 AND THE FOLLOWING CRITERIA:

### HORIZONTAL PLANE:

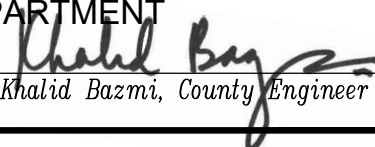
A) NO TREE SHALL BE PLANTED WITHIN:

- FIFTY (50) FEET FROM AN INTERSECTING STREET MEASURED FROM THE INTERSECTING RIGHT-OF-WAY LINES.
- THIRTY-FIVE (35) FEET FROM A STREET LIGHT OR A COMMERCIAL, INDUSTRIAL OR MULTI-UNIT RESIDENTIAL (MORE THAN FOUR UNITS) DRIVEWAY.
- TEN (10) FEET FROM ANY SINGLE FAMILY OR MULTI-UNIT (FOUR UNITS OR LESS) DRIVEWAY, UTILITY POLE, FIRE HYDRANT, UTILITY SERVICE OR ROADWAY SIGN.
- FIVE (5) FEET FROM ANY WALKWAY CONNECTION OR BUILDING ENTRANCE.

B) TREES SHALL NOT BE PLANTED IN A PARKWAY OR MEDIAN SMALLER IN WIDTH THAN THE MINIMUM PLANTING WIDTH DENOTED ON THE LIST FOR EACH SPECIES.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1700

STREET TREE LIST

SHT. 1 OF 7

C) TREES SHALL NOT BE PLANTED CLOSER TO THE BACK OF CURB OR EDGE OF SIDEWALK THAN ONE-HALF (1/2) THE MINIMUM ALLOWABLE PLANTING WIDTH DENOTED ON THE LIST FOR EACH SPECIES, AND IN NO CASE SHALL TREES BE PLANTED CLOSER THAN TWO AND ONE-HALF (2 1/2) FEET FROM THE BACK OF SIDEWALK WHERE SIDEWALK ABUTS THE CURB.

VERTICAL PLANE

A) TREES PLANTED UNDER OR ADJACENT TO UTILITY LINES SHALL BE SPECIES SELECTED WITH A MATURE GROWTH HEIGHT WHICH WILL NOT CONFLICT WITH THE OVERHEAD UTILITY LINES.

B) TREES SHALL BE PRUNED TO MEET THE FOLLOWING MINIMUM STANDARDS:

- ALL TRAFFIC CONTROL OR INFORMATIONAL SIGNS (OFFICIAL) SHALL BE CLEARLY VISIBLE.
- ALL BRANCHES OVERHANGING ROADWAY (BEYOND CURB FACE) SHALL HAVE A FOURTEEN (14) FOOT MINIMUM CLEARANCE.
- ALL BRANCHES OVERHANGING WALKWAYS SHALL HAVE A NINE (9) FOOT MINIMUM CLEARANCE.

2. TREES PLANTED WITHIN PARKWAYS OR TREE WELLS SHALL BE PLANTED IN ACCORDANCE WITH STANDARD PLANS 518-3-OC AND 1708.

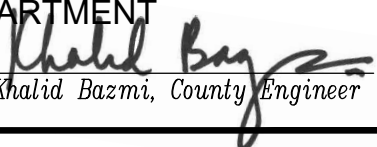
3. TREE WELLS WILL BE PERMITTED ONLY WHERE A MINIMUM OF FOUR (4) FEET OF CLEAR SIDEWALK IS PROVIDED IN ACCORDANCE WITH STANDARD PLAN 1410, AND SHALL COMPLY WITH STANDARD PLAN 519-3-OC.

4. CONTINUED MAINTENANCE INCLUDING TRIMMING, SPRAYING AND, IF NECESSARY, REMOVAL AND REPLANTING OF STREET TREES INSTALLED UNDER THE TERMS OF AN ENCROACHMENT PERMIT SHALL BE THE RESPONSIBILITY OF THE PERMITTEE.

5. FAILURE TO INSTALL IN ACCORDANCE WITH THIS STANDARD PLAN, TO INSTALL WITHOUT AN ENCROACHMENT PERMIT, OR TO PROPERLY MAINTAIN AS REQUIRED SHALL BE SUBJECT TO PROVISIONS OF THE CALIFORNIA STREETS AND HIGHWAYS CODE AUTHORIZING CORRECTIVE ACTION BY THE DIRECTOR OF ORANGE COUNTY PUBLIC WORKS AT THE EXPENSE OF THE PERMITTEE OR PROPERTY OWNER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

**STREET TREE LIST**

STD. PLAN

**1700**

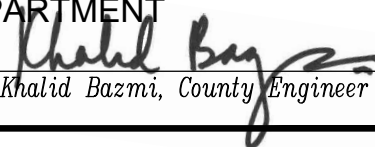
SHT. 2 OF 7

# PARKWAY AND STREET MEDIAN TREES

<u>BOTANICAL NAME</u>				MINIMUM			
<u>COMMON NAME</u>	<u>TYPE</u>	<u>HEIGHT</u>	<u>SPREAD</u>	<u>PLANTING</u>	<u>SPACING</u>	<u>SPECIAL CONDITIONS</u>	
				<u>WIDTH</u>			
(ALL DIMENSIONS ARE IN FEET)							
AGONIS FLEXUOSA AUSTRALIAN WILLOW, PEPPERMINT	E	35	25	10	40	DROUGHT TOLERANT	
ALNUS RHOMBIFOLIA WHITE ALDER	D	50+	30+	10	40	DEEP WATERING REQ'D	
ARBUTUS X 'MARINA' MARINA MADRONE	E	35	35	4	40	LIKES GOOD DRAINAGE BEAUTIFUL PEELING BARK	
ARCHONTOPHOENIX CUNNINGHAMIANA (KING PALM)	P	40	15	10	50	LOW MAINTENANCE MODERATE WATER	
BAUHNIA BLAKEANA HONG KONG ORCHID TREE	D	30	25	4	30	NEEDS DEEP WATERING SHOWY FLOWERS	
BRACHYCHITON ACERIFOLIUS FLAME TREE	D	60	30	10	45	DROUGHT TOLERANT ONCE ESTABLISHED	
BRACHYCHITON POPULNEUS BOTTLE TREE	E	45	30	10	45	DROUGHT TOLERANT	
BRAHEA ARMATA MEXICAN BLUE PALM	P	40	12	4	30	DROUGHT TOLERANT	
BRAHEA EDULIS GUADALUPE PALM	P	30	15	4	30	DROUGHT TOLERANT	
CALODENDRON CAPENSIS CAPE CHESTNUT	E	45	40	10	50	DROUGHT RESISTANT MAUVE FLOWERS	
CEDRUS ATLANTICA ATLAS CEDAR	E	45	30	10	40	MOIST SOILS, TOLERANT OF DRY, SANDY SOILS	
CHAMAEROPS HUMILIS MEDITERRANEAN FAN PALM	P	20	15	10	10	LOW MAINTENANCE	
DRACAENA DRACO DRAGON TREE	E	20	20	10	30	SINGLE OR MULTIPLE TRUNK	
ELAEOCARPUS DECIPIENS JAPANESE BLUEBERRY TREE	E	40	15	5	15	BLOOMS IN SUMMER	

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1700


SHT. 3 OF 7

STREET TREE LIST

<u>BOTANICAL NAME</u> <u>COMMON NAME</u>	<u>TYPE</u>	<u>HEIGHT</u>	<u>SPREAD</u>	<u>MINIMUM PLANTING WIDTH</u>	<u>SPACING</u>	<u>SPECIAL CONDITIONS</u>
(ALL DIMENSIONS ARE IN FEET)						
ERIOBOTRYA DEFLEXA BRONZE LOQUAT	E	-20	-20	4	25	Fruit can be messy
ERYTHRINA CAFFRA KAFFIR-BLOOM CORAL TREE	D	40	45	10	50	Deep watering req'd
ERYTHRINA CORALLIODES NAKED CORAL TREE	D	30	30	10	45	Deep watering req'd
EUCALYPTUS CITRIODORA LEMON-SCENTED GUM	E	50	35	6	45	Well-drained soil
EUCALYPTUS CLADOCALYX SUGAR GUM	E	60	35	6	45	Moderately drought tolerant
EUCALYPTUS FICIFOLIA RED FLOWERING GUM	E	40	25	6	35	DROUGHT TOLERANT
EUCALYPTUS LEUCOXYLON WHITE IRONBARK	E	50	35	6	45	DROUGHT TOLERANT
EUCALYPTUS MACULATA SPOTTED GUM	E	50	35	6	40	DROUGHT TOLERANT
EUCALYPTUS NICHOLLI WILLOWLEAF PEPPERMINT	E	40	30	6	30	DROUGHT TOLERANT
EUCALYPTUS POLYANTHEMOS SILVER DOLLAR GUM	E	45	25	6	40	DROUGHT TOLERANT
EUCALYPTUS RUDIS DESERT GUM	E	45	35	6	40	DROUGHT TOLERANT
EUCALYPTUS SIDEROXYLON RED IRONBARK	E	60	40	6	45	DROUGHT TOLERANT
GEIJERA PARVIFLORA AUSTRALIAN WILLOW	E	40	35	4	40	
GINGKO BILOBA GINGKO TREE	D	45	25	4	35	MALE PLANTS ONLY
JUBAEA CHILENSIS CHILEAN NINE PALM	P	70	15	10	10	DROUGHT TOLERANT

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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SHT. 4 OF 7

STREET TREE LIST

<u>BOTANICAL NAME</u>				MINIMUM			
<u>COMMON NAME</u>	<u>TYPE</u>	<u>HEIGHT</u>	<u>SPREAD</u>	<u>PLANTING</u> <u>WIDTH</u>	<u>SPACING</u>	<u>SPECIAL CONDITIONS</u>	
(ALL DIMENSIONS ARE IN FEET)							
KOELREUTERIA BIPINNATA CHINESE LANTERN TREE	D	35	25	6	40	LATE SUMMER FLOWER CLUSTERS	
LAGERSTROEMIA HYBRID 'MIAMI' CRAPE MYRTLE	D	25	12	5	12	HOT-PINK MILDEW RESISTANT	
LAGERSATROEMIA HYBRID 'MUSKOGEE' CRAPE MYRTLE	D	25	12	5	12	LIGHT LAVENDER MILDEW RESISTANT	
LAGERSTROEMIA HYBRID 'NATCHEZ' CRAPE MYRTLE	D	25	12	5	12	WHITE MILDEW RESISTANT	
LAGERSTROEMIA HYBRID 'TUSCORORA' CRAPE MYRTLE	D	25	12	5	12	PINK-RED MILDEW RESISTANT	
LAGERSTROEMIA HYBRID 'TUSKEGEE' CRAPE MYRTLE	D	25	12	5	12	PINK-RED MILDEW RESISTANT	
LAGERSTROEMIA INDICA CRAPE MYRTLE	D	25	30	3	30	TOLERATES DRY CONDITIONS	
LAURUS NOBILIS SWEET BAY	E	20	20	5	20	FREQUENT WATERING IN WELL-DRAINED SOIL	
LIQUIDAMBAR ORIENTALIS ORIENTAL SWEET GUM	D	30	25	4	30	DEEP WATERING REQ'D	
LIQUIDAMBAR STYRACIFLUA AMERICAN SWEET GUM	D	50	25	4	35	DEEP WATERING REQ'D	
LITHOCARPUS DENSIFLORA TANBARK OAK	E	50	35	6	45	COOL-MOIST COASTAL AIR WELL-DRAINED SOIL	
LYANTHAMNUS F. ASPLENIFOLIUS CATALINA IRONWOOD	E	30+	20+	6	30	CALIFORNIA NATIVE	
MAGNOLIA GRANDIFLORA SOUTHERN MAGNOLIA	E	60	40	6	50	WELL-DRAINED, ACIDIC SOILS	
MELALEUCA QUINQUENERVIA CAJEPUT TREE	E	35	25	4	40	MODERATE TO REGULAR WATER WIND AND SALT TOLERANT	
METROSIDEROS EXCELSUS NEW ZEALAND CHRISTMAS TREE	E	30	25	6	30	GOOD NEAR COAST	
OLEA EUROPAEA (FRUITLESS) EUROPEAN OLIVE	E	35	30	14	40	MODERATE WATER	

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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SHT. 5 OF 7

STREET TREE LIST

<u>BOTANICAL NAME</u>	<u>COMMON NAME</u>	<u>TYPE</u>	<u>HEIGHT</u>	<u>SPREAD</u>	<u>MINIMUM PLANTING WIDTH</u>	<u>SPACING</u>	<u>SPECIAL CONDITIONS</u>
(ALL DIMENSIONS ARE IN FEET)							
PHOENIX CANARIENSIS CANARY ISLAND DATE PALM	P	60	35	12	50	DROUGHT TOLERANT ONCE ESTABLISHED	
PINDO PALM JELLY PALM BUTIA CAPITATA	P	20	15	6	10	TOLERATES HEAT, ARIDITY & POOR SOIL	
PINUS CANARIENSIS CANARY ISLAND PINE	E	60	30	6	45		
PINUS PATULA JELECOTE PINE	E	70	45	14	45	LOW MAINTENANCE	
PITTOSPORUM VIRIDIFLORUM CAPE PITTOSPORUM	E	25	15	4	35	MODERATE WATER	
PLATANUS ACERIFOLIA LONDON PLANE TREE	D	50	35	4	40	MODERATE WATER DO NOT OVER WATER	
PODOCARPUS GRACILIOR FERN PINE	E	35	20	4	35		
PODOCARPUS GRACILIOR YEW PINE	E	30	12	5	12	WELL DRAINED SOIL	
PODOCARPUS HENKELII LONG LEAFED YELLOW WOOD	E	40	18	5	18	MODERATE WATER	
PYRUS CALLERYANA 'BRADFORD' BRADFORD PEAR	D	50	30	5	30	BRITTLE SUSCEPTIBLE WIND DAMAGE/BREAKAGE	
QUERCUS AGRIFOLIA COAST LIVE OAK	E	50	35	14	50		
QUERCUS ILEX HOLLY OAK	E	50	40	6	40		
QUERCUS SUBER CORK OAK	E	50	45	14	45		
QUERCUS ENGELMANII MESA OAK	E	60	50	14	50		
RHUS LANCEA AFRICAN SUMAC	E	-30	-25	4	30		
STENOCARPUS SINUATIS FIREWHEEL TREE	E	30	15	4	30	MODERATE WATER DO NOT OVER WATER	

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

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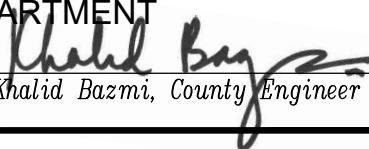
SHT. 6 OF 7

STREET TREE LIST

<u>BOTANICAL NAME</u>				<u>MINIMUM</u>			
<u>COMMON NAME</u>	<u>TYPE</u>	<u>HEIGHT</u>	<u>SPREAD</u>	<u>PLANTING</u>	<u>SPACING</u>	<u>SPECIAL CONDITIONS</u>	
				<u>WIDTH</u>			
(ALL DIMENSIONS ARE IN FEET)							
TIPUANA TIPU TIPU TREE	D	25	20	6	30	MODERATE WATER	
TRACHYCARPUS FORTUNEI WINDMILL PALM	P	25	10	3	25	DROUGHT TOLERANT	
TRISTANIA CONFERTA BRISBANE BOX	E	45	25	4	40	DROUGHT RESISTANT	
ULMUS PARVIFOLIA 'SEMPERVIRENS' EVERGREEN CHINESE ELM	E	40+	30+	4	40		
UMBELLULARIA CALIFORNICA CALIFORNIA BAY LAUREL	E	25	20	6	35	MOIST SOIL	

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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SHT. 7 OF 7

STREET TREE LIST



## GENERAL

WHEN DROUGHT TOLERANT LANDSCAPING IS REQUIRED, THE OBJECTIVE IS TO PROVIDE LANDSCAPING WHICH IS AESTHETIC INITIALLY AND WILL RETAIN ITS AESTHETIC APPEAL WITH TIME, YET IS LOWER IN MAINTENANCE AND WATER REQUIREMENTS THAN TRADITIONAL PLANTING. IT IS REQUIRED THAT A LANDSCAPE PLAN BE DEVELOPED BY A LICENSED LANDSCAPE ARCHITECT AND THAT AN ANNUAL WATERING SCHEDULE, SHOWING SEASONAL WATER REQUIREMENTS, BE A PART OF THE PLAN.

## DROUGHT TOLERANT PLANT LIST

THE DROUGHT TOLERANT PLANT LIST (SEE SHEETS 3 – 12) IDENTIFIES THOSE PLANTS WHICH THE OC PUBLIC WORKS HAS DETERMINED ARE DROUGHT TOLERANT.

## DROUGHT TOLERANCE

IN ORDER TO CLARIFY ITEMS, THE FOLLOWING CLASSIFICATIONS ARE USED IN THE COUNTY'S DROUGHT TOLERANT PLANT LIST:

### PLANT TYPE

### INCHES/YR.\*

### ACRE FT./YR.\*

NO SUMMER WATER PLANTS (NSW)  
LOW SUMMER WATER PLANTS (LSW)

0  
1–24

0  
2

\* THE AMOUNT OF WATER NEEDED BEYOND WINTER RAINFALL TO MAINTAIN ESTABLISHED PLANTS. IT SHOULD BE NOTED THAT PLANTS RATED AS NO SUMMER WATER MAY REQUIRE TEMPORARY WATERING FOR ONE GROWING SEASON TO BECOME ESTABLISHED. DETERMINATION OF TEMPORARY WATERING REQUIREMENTS IS THE RESPONSIBILITY OF THE LANDSCAPE ARCHITECT PREPARING THE PLANS.

## AVAILABILITY OF PLANT MATERIAL

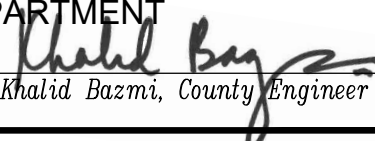
PLANT AVAILABILITY WAS NOT A FACTOR IN COMPILING THE LIST. IT IS HOPED THAT THERE WILL BE MORE INCENTIVE TO PROPAGATE MATERIAL NOT AVAILABLE TODAY. IT SHALL BE THE RESPONSIBILITY OF THE LANDSCAPE ARCHITECT TO VERIFY AVAILABILITY OF PLANT MATERIAL BEFORE SPECIFYING.

## USE OF PLANT LIST

SELECTION FROM THE LIST FOR SITE SUITABILITY IS THE RESPONSIBILITY OF THE LANDSCAPE ARCHITECT PREPARING THE PLANS. PLANS ARE TO BE IN COMPLIANCE WITH ORANGE COUNTY FIRE AUTHORITY REQUIREMENTS AND APPROVED BY OCPW.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

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SHT. 1 OF 12

DROUGHT TOLERANT PLANTS

**USE OF OTHER PLANTS**

IN AREAS WHERE DROUGHT TOLERANT PLANTS ARE REQUIRED, PLANTS NOT SHOWN ON THE LIST MAY BE INCLUDED ON THE PLANTING PLAN WITH WRITTEN APPROVAL BY THE DIRECTOR OF OC PUBLIC WORKS. A WRITTEN REQUEST DOCUMENTING THE SUITABILITY OF THE PROPOSED PLANT MATERIAL SHALL ACCOMPANY THE LANDSCAPE PLANS.

**STREET TREE LIST**

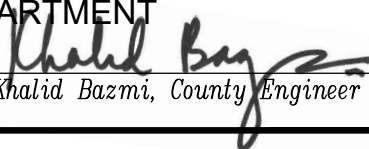
STREET TREES IN PARKWAYS AND STREET MEDIAN ISLANDS SHALL CONFORM TO STANDARD PLAN 1700.

**INTERSECTION SIGHT DISTANCE**

SIGHT DISTANCES SHALL BE MAINTAINED PER THE STANDARDS SET FORTH IN STANDARD PLAN 1117 & AASHTO.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1701

DROUGHT TOLERANT PLANTS

SHT. 2 OF 12

# ORANGE COUNTY PUBLIC WORKS

## DROUGHT TOLERANT PLANT LIST STANDARD PLAN NO. 1701

### **LEGEND**

NSW - No Summer Water

FR - Fire Retarding

NCN - No Common Name

LSW - Low Summer Water

CT- Clay Tolerant

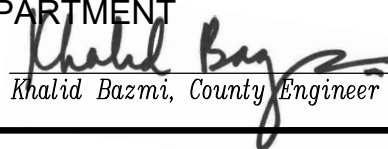
GC - Ground Cover

Plant dimensions are considered ultimate size and are expressed as height x width

BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Acacia baileyana / Bailey Acacia	Shrub/ Tree	LSW	Most acacias need well drained soil
Acacia cultriformis / Knife Acacia	Shrub/ Tree	LSW	Susceptible to Black Spot, Caterpillars, Powdery Mildew, Root Rot, Scales.
Acacia podalyriaefolia / Pearl Acacia	Shrub	LSW	12'-20', spread 15-20', yellow flowers
Acacia pycnantha / Golden Wattle	Tree	LSW	12'-20', spread 15-20', yellow flowers
Acacia retinodes / Water Wattle	Shrub	LSW	High Allergen
Acacia redolens 'Desert Carpet'	Shrub	NSW, FR	Great ground cover on slopes
Acacia redolens 'Prostrata' / Low Boy Acacia	Shrub	LSW	Rapid coverage on slopes and for erosion control
Achillea filipendulina / Golden Yarrow	GC	LSW	2' tall, yellow flower clusters
Achillea millefolium / Common Yarrow	GC	LSW	3' tall, white flower clusters
Achillea tomentosa / Wooly Yarrow	GC	LSW	4"-5" tall
Aeonium arboreum 'Zwartkop' / NCN	Succulent	LSW	4' x 2', yellow flower
Aeonium decorum / NCN	Succulent	LSW, FR	1' x 2', pink flower
Aeonium haworthii / NCN	Succulent	LSW	2' x 2', pale yellow flower
Aeonium 'Pseudotabulaeforme' / NCN	Succulent	LSW	1'-1.5' x 1.5', yellow flowers
Aeonium simsii / NCN	Succulent	LSW, FR	Light shade inland, full sun on coast
Aeonium urbicum 'Dinner Plate' / NCN	Succulent	LSW	6' x 3', pink or white flowers
Agave Americana / Century plant	Succulent	LSW, FR	5'-7' x 8"-12", spike-like leaves
Agave americana 'Variegata' / Variegated Century Plant	Succulent	LSW, FR	7' x 12', spike-like leaves
Agave attenuata / Foxtail Agave	Succulent	NSW, FR	5' x 8', spike leaves
Agave vilmoriniana / Octopus Agave	Succulent	NSW, FR	3'-4' x 3'-4'
Agave vilmoriniana 'Variegata' / Variegated Octopus Agave	Succulent	NSW, FR	4' x 4'
Agonis flexuosa / Peppermint tree	Tree	LSW, CT	25'-35' x 10'-15'
Aloe arborescens / Tree Aloe	Succulent	LSW, FR	Large shrub or small tree, up to 16 feet, saw tooth edges
Aloe brevifolia / Short Leaf Aloe	Succulent	LSW	2' x 2', orange/red flower
Aloe striata / Coral Aloe	Succulent	NSW, FR	3' x 2', spike-like leaves, should consider other
Aloe vera / Medicinal Aloe	Succulent	NSW, FR	5' x 8', spike-like leaves, should consider other
Alyogyne huegelii / Blue Hibiscus	Shrub	LSW	Not a true hibiscus
Anigozanthus 'Bush Gold' / Kangaroo Paw	Shrub	LSW	Striking tubular flowers in golden yellow
Anigozanthus 'Harmony' / Kangaroo Paw	Shrub	LSW	Striking tubular flowers in red and yellow

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1701

SHT. 3 OF 12

DROUGHT TOLERANT PLANTS

BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Arbutus menziesii / Madrone	Tree	LSW	Native to California
Arbutus unedo / Strawberry Tree	Tree	LSW	White Flowers - Low water
Arctostaphylos andersonii pallida / Pale Heartleaf Manzanita	Shrub	NSW	Arctostaphylos require good drains no salts in soil or water, no fertilizer
Arctostaphylos densiflora "Howard McMinn" / Sonoma Manzanita	GC	LSW	8' x 12', attracts birds
Arctostaphylos edmundsii / Little Sur Manzanita	GC	LSW, FR	1' x 5', red berries
Arctostaphylos franciscana / Francis Manzanita	Shrub	LSW	Proposed endangered
Arctostaphylos hookeri / Monterey Manzanita	Shrub	LSW	4' x 6'+, good on hillsides
Arctostaphylos pumila / Dune Manzanita	Shrub/ GC	LSW	3' x -4', attracts birds
Arctostaphylos pungens / Manzanita	Shrub	NSW	Tolerates alkaline soil, sand and clay
Arctostaphylos uva-ursi / Bearberry	GC	LSW	12" x 15', salt air tolerant
Atriplex canescens / Four-Wing Saltbush	Shrub	NSW, FR	Heat and salt tolerant
Atriplex glauca / Waxy Saltbush	Shrub	LSW	Perennial, introduced
Atriplex lentiformis breweri / Brewer Saltbush	Shrub/GC	NSW, FR, CT	Highly adaptable
Baccharis 'Centennial' / Trailing Desert Broom	Shrub	LSW, FR	Resistant to root rot.
Baccharis pilularis "Twin Peaks" / Dwarf Coyote Brush	Shrub	LSW, FR	2' x 6'. Dark green leaves. Good bank stabilization
Baccharis pilularis 'Pigeon Point' / Dwarf Coyote Brush	Shrub	LSW, FR	3' x 9'. Lighter green and faster than Twin Peaks.
Baccharis pilularis ssp. consanguinea / Chaparral Broom	Shrub	NSW, CT	6' x 5', upright variety
Berberis darwinii / Darwin's Barberry	Shrub	LSW	10' x 7', thorny
Berberis dictyota / Chaparral Barberry	Shrub	LSW	Use only male plant
Berberis fremontii / Fremont Barberry	Shrub	LSW	8' x 8'
Berberis mentorensis / Mentor Barberry	Shrub	LSW	Naturalizes
Berberis nevinii / Nevin Barberry	Shrub	LSW, CT	10' x 12', yellow flowers
Berberis pinnata / Coast Barberry	Shrub	LSW	3' x 3', slow growing
Bougainvillea spectabilis / Bougainvillea	Shrub	LSW, FR	Thorny, not recommended along sidewalks, messy
Brachychiton acerifolius / Flame Tree	Tree	LSW	Brachychiton need deep soils
Brachychiton populneus / Bottle Tree	Tree	LSW	40' x 20', messy high maintenance
Brahea armata / Mexican Blue Palm	Palm	LSW, FR, CT	Slow to 40' x 20'
Brahea brandegeei / San Jose Hesper Palm	Palm	NSW, FR, CT	Slow to 40' x 15'
Brahea edulis / Guadalupe Palm	Palm	NSW, FR, CT	Slow to 30' x 15'
Caesalpinia gilliesii / Yellow Bird of Paradise	Shrub	LSW	8' x 6', fast growing
Caesalpinia spinosa / Tara Gum	Shrub	LSW	5' x 5', not hardy
Calliandra eriophylla / Fairy Duster	Shrub	LSW	3' x 3', native
Callistemon citrinus / Lemon Bottlebrush	Shrub/ Tree	LSW	Messy pollen drop, high maintenance
Callistemon rigidus / Stiff Bottlebrush	Shrub/ Tree	LSW	Messy pollen drop, high maintenance

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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SHT. 4 OF 12

DROUGHT TOLERANT PLANTS

BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Callistemon viminalis / Weeping Bottlebrush	Shrub/ Tree	LSW	Messy pollen drop, high maintenance
Calocedrus decurrens / Incense Cedar	Tree	LSW, CT	No summer water at full maturity-30 years+
Calothamnus quadrifidus / Net Bush	Shrub	LSW	3' x 3', pine like needles, flowers messy
Cassia artemisioides / Feathery Cassia	Shrub	LSW	6' x 5', yellow flowers, low maintenance
Cassia odorata / Spreading Cassia	Tree	LSW	8' x 12', bright yellow flowers
Ceanothus 'Concha' / Ceanothus	Shrub	LSW	7' x 8', one of the best for gardens
Ceanothus 'Dark Star' / Ceanothus	Shrub	LSW	6' x 10'
Ceanothus griseus horizontalis / Carmel Creeper	GC	LSW	1.5'-2.5', spread 5'-15', light blue flowers, low maintenance
Ceanothus g. h. 'Yankee Point' / Carmel Creeper	GC	LSW	3' x 10' great ground cover
Ceanothus impressus 'Joyce Coulter' / Ceanothus	Shrub	LSW	5' x 12', one of the best bloomers
Ceanothus 'Ray Hartman' / Ceanothus	Shrub	LSW	To 20' x 20'
Centaurea gymnocarpa / Dusty Miller	Shrub	LSW	3' x 3', low maintenance
Ceratonia siliqua / Carob	Tree	NSW, FR	50' x 50'
Cercidium floridum / Blue Palo Verde	Tree	NSW, FR	35' x 35'
Cercidium microphyllum / Little Leaf Palo Verde	Tree	NSW, FR	20' x 18', twiggy branches
Cercis occidentalis / Western Redbud	Shrub	LSW	15' x 15'
Cercocarpus betuloides / Mountain Mahogany	Shrub	NSW	15' x 15'
Chamaelaucium uncinatum / Geraldton Waxflower	Shrub	LSW	8' x 6'
Carex sprissa / San Diego Sedge	Shrub	LSW	Low water, grass-like
Cistus corbariensis / White Rockrose	Shrub	LSW, FR	Cistus require good drainage.
Cistus x cypruis / Cyprus Sunrose	Shrub	LSW, FR	6' x 5', white flowers
Cistus incanus / Hairy Rockrose	Shrub	LSW, FR	4' x 4', pink flowers
Cistus purpureus / Purple Rockrose	Shrub	LSW, FR	4', spread 4-6', rose/purple flowers
Cistus salvifolius / Sageleaf Rockrose	Shrub	LSW, FR	3' x 3', white flowers
Cistus ladanifer / Gum Rockrose	Shrub	LSW, FR	3' x 3', white flowers
Cistus corsicus	Shrub	LSW, FR	3' x 6', mauve/purple flower
Comarostaphylis diversifolia / Summer Holly	Shrub	NSW	Needs summer water to establish
Convolvulus cneorum / Bush Morning Glory	Shrub	LSW	2' x 4', rapid growth
Convolvulus sabatius / Ground Morning Glory	Shrub	LSW	12" x 3', blue flower
Coprosma kirkii / Creeping Mirror Plant	Shrub/ GC	LSW, CT	Tolerates saline soil, subject to dieback after 3-4 years
Cordyline indivisa / Blue Dracaena	Tree	LSW, CT	25' x 10', reddish sword-like leaves
Cotinus coggygria / Smoke Tree	Tree	LSW	15' x 15', dark purple foliage
Cotoneaster congestus / Pyrenees Cotoneaster	Shrub	LSW	12" x 3', red berries
Cotoneaster horizontalis / Rock Cotoneaster	Shrub	LSW	3' x 15', red berries
Crassula arborescens / Silver Dollar Plant	Succulent	NSW, FR	Pink & white flowers
Crassula ovata (C. argentea) / Jade Plant	Succulent	NSW, FR	6' x 3', pink & white flowers
Cupressus forbesii / Tecate Cypress	Tree	NSW, CT	15' x 8', evergreen
Cupressus sempervirens / Italian Cypress	Tree	NSW	60' x 10'
Dalea spinosa / Smoke Tree	Tree	NSW	Tolerates inland heat

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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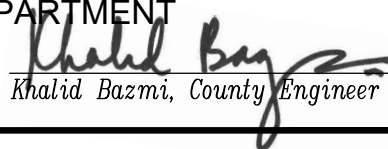
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DROUGHT TOLERANT PLANTS

BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Dasylium quadrangulatum (D. longissima) / Mexican Grass Tree	Shrub	NSW, FR	Needs well drained soils.
Dasylium wheeleri / Desert Spoon	Shrub	NSW, FR	Needs well drained soils.
Delosperma 'Alba' / White Trailing Iceplant	GC	LSW, FR	Good ground and bank cover
Dendromecon harfordii / Island Bush Poppy	Shrub	LSW	Needs good drainage, short lived
Dietes bicolor / Fortnight Lily	Shrub	LSW	3' x 3', pale yellow flower
Dietes iridioides (D. vegeta) / African Iris	Shrub	LSW, CT	4' x 4', whitish flowers
Dodonaea viscosa / Hopseed Bush	Shrub	LSW, CT	15' x 15', hardy evergreen
Echeveria elegans / Hens and Chicks	Succulent	LSW	12" x 12", pink flowers
Echium candicans (E. fastuosum) / Pride of Madeira	Shrub	LSW	Good for coastal plantings
Elaeagnus pungens / Silverberry	Shrub	LSW	Tolerates heat and wind
Encelia californica / Bush Sunflower	Perennial	NSW	Cut back after spring bloom
Encelia farinosa / Incienso	Perennial	NSW	3' x 3', yellow flowers
Eriobotrya japonica / Loquat	Tree	LSW	Needs good drainage
Eriobotrya deflexa / Bronze Loquat	Tree	LSW	20' x 15'
Eriogonum arborescens / Santa Cruz Island Buckwheat	Shrub	NSW	Hydro-seeding, naturalize on slopes
Eriogonum crocatum / Saffron Buckwheat	Shrub	NSW	3' x 3'
Eriogonum fasciculatum / California Buckwheat	Shrub	NSW	3' x 3', good erosion control
Eriogonum giganteum / St. Catherine's Lace	Shrub	NSW	3'-4', spread 3-4', pink flowers
Eriogonum grande rubescens / Red Buckwheat	Shrub	NSW	12" x 3' mounds, pink flowers
Eriogonum umbellatum / Sulfur Flower	Shrub	NSW	12" x 3' yellow flowers
Eriophyllum confertiflorum / Golden Yarrow	Perennial	LSW, CT	Naturalizes
Eriophyllum nevini / Catalina Silver Lace	Perennial	LSW, CT	Naturalizes
Escallonia bifida / White Escallonia	Shrub	LSW	12' x 15', white flowers
Escallonia laevis / Pink Escallonia	Shrub	LSW	20' x 15'
Escallonia x exoniensis 'Fradesi'	Shrub	LSW	6' x 6'
Eschscholzia californica / California Poppy	Perennial	LSW	12" x 12", sandy, loamy soil, California state flower
Eucalyptus citriodora / Lemon Scented Gum	Tree	LSW, CT	50' x 35'
Eucalyptus cladocalyx / Sugar Gum	Tree	LSW, CT	40' x 20', messy high maintenance
Eucalyptus ficifolia / Red Flowering Gum	Tree	LSW	40' x 40', showy
Eucalyptus leucoxylon / White ironbark	Tree	LSW, CT	50' x 35'
Eucalyptus nicholii / Nichol's Willow-Leafed Peppermint	Tree	LSW, CT	40' x 30', weeping
Eucalyptus polyanthemus / Silver Dollar Gum	Tree	LSW, CT	60' x 40'
Eucalyptus rudis / Flooded Gum	Tree	LSW, CT	45' x 35'
Eucalyptus sideroxylon / Red Ironbark	Tree	LSW	80' x 50'
Eucalyptus viminalis / Manna Gum	Tree	LSW	100' x 40', shedding bark
Fallugia paradoxa / Apache Plume	Shrub	LSW	4' x 4', eco friendly
Feijoa sellowiana / Pineapple guava	Shrub/ Sm. Tree	LSW	15' x 15' pinkish flowers
Festuca californica / California Fescue	Perennial Grass	LSW	Flower stalks Late Spring Early Summer
Festuca glauca / Common Blue Fescue	Perennial Grass	LSW	10" x 10", blue-green grass

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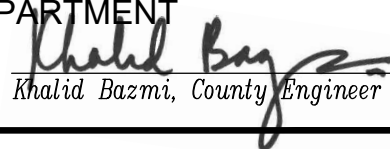
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DROUGHT TOLERANT PLANTS

BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Festuca glauca 'Elijah Blue' / Dwarf Blue Fescue	Perennial Grass	LSW	10" x 10", blue-green grass
Fremontodendron californicum / Common Flannel Bush	Shrub	NSW	Fremontodendron need excellent drainage
Fremontodendron mexicanum / Southern Flannel Bush	Shrub	NSW	10' x 15', yellow flowers
Fremontodendron hybrids "California Glory", 'Pacific Sunset', 'San Gabriel'	Shrub	NSW	Cross between F. californica and F. mexicana
Galvezia speciosa / Island Bush Snapdragon	Shrub	LSW, CT	5' x 10', red flowers
Garrya elliptica / Coast Silktassel	Shrub	LSW	10' x 10'
Garrya fremontii / Fremont Silktassel	Shrub	LSW	Flowering shrub, native
Gazania hybrids / South African Daisy	GC	LSW, FR	12" clumps
Gazania rigens leucolaena / Trailing Gazania	GC	LSW	Spreading
Geijera parviflora / Australian Willow	Tree	LSW	35' x 20'
Grevillea banksii / NCN	Shrub	LSW	9' x 6', red flowers
Grevillea 'Canberra' / NCN	Shrub	LSW	12" x 15' red flowers
Grevillea lanigera / Woolly Grevillea	Shrub	LSW	5' x 5', red/brown flowers
Grevillea 'Noellii' / NCN	Shrub	LSW	4' x 5', pink/white flowers
Grevillea robusta / Silk Oak	Tree	LSW	50' x 40', brittle branches
Grevillea rosmarinifolia / Rosemary Grevillea	Shrub	LSW	4' x 4', reddish flowers
Grevillea thelemanniana / Hummingbird Bush	Shrub	LSW	6' x 6', red flower
Hakea laurina / Pincushion Tree	Shrub/ Tree	LSW	25' x 30', round crimson pincushions stuck with golden pins
Hakea suaveolens / Sweet Hakea	Shrub	LSW	20' x 15'
x Halimolcistus sahucii / Sahuc Rockrose	Shrub	NSW	White flowers with prominent yellow stamens
Helianthemum nummularium / Sunrose	Shrub	LSW, CT	12" x 18", hardy perennial
Helianthemum scoparium / Rushrose	Shrub	LSW, CT	Best along coast
Hesperaloe parviflora / Red Yucca	Shrub	LSW, FR	3' x 4' low maintenance
Heteromeles arbutifolia / Toyon	Shrub/ Tree	LSW, FR, CT	8' x 5', red berries
Heuchera sanguinea / Coral Bells	GC	LSW	OC Native
Hypericum beanii / St. John's Wort	Shrub	LSW	Drought tolerant on coast
Hyptis emoryi / Desert Lavender	Shrub	NSW	Needs good drainage
Isomeris arborea / Bladder Pod	Shrub	LSW	Good in desert climate
Iva hayesiana / San Diego Marsh-Elder	Shrub		2' x 6' fast growing
Juglans californica / California Black Walnut	Tree	LSW	30' x 20'
Juglans c. hindsii / California Black Walnut	Tree	LSW	Used as commercial rootstock for English Walnut
Juniperus spp./Junipers	G.C Shrub, tree	LSW, CT	Many species and varieties, dieback concerns
Koelreuteria paniculata/Golden Rain Tree	Tree	LSW, CT	Showy yellow flowers
Lagerstroemia indica / Crape Myrtle	Tree	LSW, CT	Subject to mildew along coast. Several varieties
Lampranthus aurantiacus / Bush Iceplant	GC	LSW, CT	Not recommended on steep slopes
Lampranthus filicaulis / Redondo Creeper	GC	LSW, CT	2' x 2', pink violet/lavender flower

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DROUGHT TOLERANT PLANTS

BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Lampranthus spectabilis / Trailing iceplant	GC	LSW, CT	12" x 2'
Lantana camara / Lantana	Shrub	LSW	Water deeply but infrequently
Lantana montevidensis / Trailing Lantana	Shrub	LSW, CT	2' x 10', purple flowers
Lavandula angustifolia / English Lavender	Shrub	LSW, FR	2' x 2', blue-purple flowers
Lavandula dentata / French Lavendar	Shrub	LSW, CT	Long blooming season
Lavandula stoechas / Spanish Lavender	Shrub	LSW, FR	3' x 3' with bloom, dark purple flowers
Lavandula vera / Lavender	Shrub	LSW, CT	2' x 2', purple flowers
Lavatera assurgentiflora / Tree Mallow	Shrub	LSW	8' x 12', short-lived
Leptodactylon californicum / Prickly Phlox	Shrub	LSW	1-3', spread 1-3', pink flowers
Leptospermum laevigatum / Australian Tea Tree	Tree	LSW	30' x 30', small white flowers
Leptospermum scoparium / New Zealand Tea Tree	Shrub	LSW	Good drainage required, invasive
Leucophyllum frutescens / Texas Ranger	Shrub	LSW	Shorter lived in cultivation
Leymus condensatus / Giant Wild Rye	Shrub	LSW	Silver/gray foliage
Limonium perezii / Sea Lavender	Shrub	LSW, FR, CT	3' x 3', different color flowers
Lithocarpus densiflorus / Tanbark Oak	Tree	LSW	Good near coast
Lonicera japonica / Common Honeysuckle	GC	LSW, CT	Can be invasive
Lupinus arboreus / Lupine	Shrub	NSW	Needs well drained soils.
Lupinus macrocarpus densiflorus / Lupine	Shrub	LSW	Short lived, best along coast
Lupinus nanus / Sky Lupine	Shrub	NSW	Annual purple/blue flower
Lyonothamnus floribundus asplenifolius / Fernleaf Catalina Ironwood	Tree	LSW	Needs good drainage, Red peeling bark
Malephora lutea / Trailing Iceplant	GC	LSW	Becomes difficult to control
Maytenus boaria / Mayten Tree	Tree	LSW, CT	Best along coast
Melaleuca armillaris / Drooping Melaleuca	Shrub	LSW, CT	Melaleuca excellent along seacoast.
Melaleuca decussata / Lilac Melaleuca	Shrub	LSW, CT	20' x 20', light lavender flowers
Melaleuca elliptica / Granite Bottlebrush	Shrub	LSW, CT	16' x 15', reddish flowers
Melaleuca ericifolia / Heath Melaleuca	Shrub	LSW, CT	30 x 15', messy
Melaleuca linariifolia / Flaxleaf Paperbark	Tree	LSW, CT	30' x 20'
Melaleuca nesophila / Pink Melaleuca	Tree	LSW, CT	20' x 12' mauve flowers. Good near coast
Melaleuca quinquenervia / Cajeput Tree	Tree	LSW, CT	40' x 25', white flowers
Melaleuca styphelioides / Black Tea Tree	Tree	LSW	40' x 20', white flowers
Metrosideros excelsus / New Zealand Christmas Tree	Shrub/ Tree	LSW, CT	30' x 30' rounded red flowers
Mimulus aurantiacus / Monkey Flower	Perennial		3' x 3', orange flower
Miscanthus transmorrisonensis / Evergreen Miscanthus	Grass	LSW	6' x 4', fast growing
Muhlenbergia capillaris 'Regal Mist' / Pink Muhly	Grass	LSW	4' x 4', large, purplish inflorescences, up to 12 in.
Muhlenbergia rigens / Deer Grass	Grass	LSW	3' x 3', sharp leaves
Muhlenbergia rigida 'Nashville' / Purple Muhly	Grass	LSW	3' x 3'
Myrica californica / Pacific Wax Myrtle	Shrub		15' x 15'
Myoporum parvifolium 'prostrata'	GC	LSW, FR	12" x 9' white flower. Resistant to thrips.

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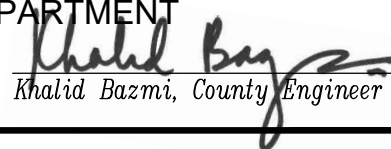
DROUGHT TOLERANT PLANTS

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BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Myrtus communis / Common Myrtle	Shrub	LSW, CT	5' x 4', white flowers
Nasella lepida / Foothill Needle Grass	Grass	NSW, FR	Perennial
Nasella pulchra / Purple Needle Grass	Grass	NSW, FR	Perennial
Nasella tenuissima (Stipa) / Mexican Feather Grass	Grass	LSW	2' x 2', native bunch grass
Nerium oleander / Oleander	Shrub	LSW, CT	Subject to leaf gall in large groupings. Poisonous
Nolina longifolia / Mexican Grass Tree	Shrub	LSW	10' x 6', white flowers
Nolina parryi /NCN	Shrub	LSW	8' x 4', serrated leaves
Olea europaea 'Swan Hill' / Fruitless Olive	Tree	LSW	Needs good drainage
Opuntia littoralis / Prickly Pear	Cacti	NSW, FR	Native, cactus thorns keep away from sidewalks
Osmanthus fragrans / Sweet Olive	Shrub	LSW, CT	10' x 6', white flowers
Parkinsonia aculeata / Mexican Palo Verde	Tree	NSW	15' x 15', yellow flowers
Pennisetum messiacum / Red Bunny Tails	Grass	LSW	3' x 3', pink flowers, annual
Pennisetum orientale / Fountain Grass	Grass	LSW	Cut back to ground in winter.
Pennisetum setaceum 'Red Riding Hood' / Dwarf Purple Fountain Grass	Grass	LSW	Cut back to ground in winter. Seldom self sowing
Pennisetum setaceum 'Rubrum' / Purple Fountain Grass	Grass	LSW	Cut back to ground in winter. Seldom self sowing
Penstemon heterophyllus 'Margarita' / Penstemon	Shrub	LSW	Sky blue flowers
Penstemon spectabilis / Royal Beard Tongue	Shrub	LSW	4' x 3', Rose/purple flowers
Phormium tenax / New Zealand Flax	Shrub	NSW, CT	10' x 6', red flowers
Photinia x fraseri / Photinia	Shrub	LSW	15' x 15'
Photinia serratifolia (P.serrulata) / Chinese Photinia	Shrub	LSW	40' x 30', white flower, mildew on coast
Phyla nodiflora / Lippia	GC	LSW	12" x 12", purple flowers
Pinus brutia / Calabrian Pine	Tree	LSW, CT	80' x 25', thrives in heat, wind, poor soil
Pinus canariensis / Canary Island Pine	Tree	LSW	80' x 30', needs good drainage
Pinus eldarica / Mondell Pine	Tree	LSW	80' x 30', good in desert
Pinus halepensis / Aleppo Pine	Tree	NSW	60' x 40', low maintenance
Pinus pinea / Italian Stone Pine	Tree	NSW	80' x 60', heat tolerant
Pinus torreyana / Torrey Pine	Tree	LSW, CT	60' x 40', native to San Diego coast
Pistacia atlantica / Mt. Atlas Pistache	Tree	LSW, CT	Pistacia need deep well drained soil
Pistacia chinensis / Chinese Pistache	Tree	LSW, CT	35' x 35'
Pittosporum crassifolium / NCN	Shrub	LSW	Tolerates seaside conditions
Pittosporum phillyreoides / Willow Pittosporum	Tree	LSW, CT	20' x 15', weeping appearance
Pittosporum rhombifolia / Queensland Pittosporum	Shrub/ Tree	LSW	35' x 35'
Pittosporum t. 'Crème de Mint' / Variegated Dwarf Tobira	Shrub	LSW	3' x 3', does not look good sheared.
Pittosporum t. 'Variegata' / Variegated Tobira	Shrub	LSW	Does not look good sheared.

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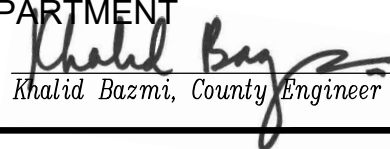
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DROUGHT TOLERANT PLANTS

BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Pittosporum t. 'Wheeler's Dwarf' / Wheeler's Dwarf Tobira	Shrub	LSW	Does not look good sheared.-
Pittosporum tenuifolium 'Silver Sheen' /NCN	Shrub	LSW	16' x 8'
Pittosporum viridifolium / Cape Pittosporum	Shrub/ Tree	LSW	25' x 25'
Platanus mexicana / Mexican Sycamore	Tree	LSW, FR, CT	Riparian area, open branches
Platanus racemosa / California Sycamore	Tree	LSW, FR, CT	Native, riparian area
Plumbago auriculata / Cape Plumbago	Shrub	LSW, CT	Needs good drainage
Portulacaria afra / Elephant's Food	Shrub	LSW, FR, CT	6' x 4', pale pink flowers
Prunus caroliniana / Carolina Laurel Cherry	Shrub	LSW	36' x 20', cream/white flowers
Prunus ilicifolia / Hollyleaf Cherry	Shrub	NSW	Takes extreme drought
Prunus lyonii / Catalina Cherry	Shrub/ Tree	NSW	45' x 30', low maintenance
Psidium littorale / Strawberry Guava	Shrub	LSW	20' x 15'
Pterocarya stenoptera / Chinese Wingnut	Tree	LSW	Good in compacted soil / high traffic areas
Pyracantha spp. / Firethorn	Shrub	LSW	12' x 12', red berries. Several hybrids to choose from.
Pyrostegia venusta (P. ignea) / Flame Vine	Vine	LSW, CT	12" x 10', orange flowers. Thrives in heat
Quercus agrifolia / Coast Live Oak	Tree	NSW, CT	All Quercus require good drainage. 70' x 70'
Quercus douglasi / Blue Oak	Tree	NSW	50' x 40'
Quercus engelmannii / Mesa oak	Tree	NSW, CT	50' x 50'
Quercus ilex / Holly Oak	Tree	LSW, FR	Clay, loam, sandy soils
Quercus kelloggii / California Black Oak	Tree	LSW	Native, tolerates rich acidic soils 50', deciduous
Quercus lobata / Valley Oak	Tree	NSW, CT	35' x 35', deciduous
Quercus suber / Cork Oak	Tree	NSW, CT	60' x 50'
Quercus virginiana / Southern Live Oak	Tree	LSW, FR	80' x 160'. Best oak for lawns
Rhamnus alaternus / Italian Buckthorn	Shrub	LSW	Require good drainage
Rhamnus californica / Coffeeberry	Shrub	LSW, CT	Require good drainage
Rhamnus Crocea / Redberry	Shrub		4'-10', drought tollerant
Rhapheolipis indica 'Ballerina' / Indian Hawthorn	Shrub	LSW, FR	3' x 3', pink flowers
Rhapheolipis indica 'Clara' / Indian Hawthorn	Shrub	LSW, FR	4'-5', spread 4'-5', white
Rhapheolipis indica 'Pinkie' / Indian Hawthorn	Shrub	LSW, FR	5' x 6', pink flowers
Rhus integrifolia / Lemonade Berry	Shrub	NSW	8' x 20', lilac flowers
Rhus lancea / African Sumac	Tree	LSW	25' x 25', greenish-white flowers
Rhus laurina / Laurel Sumac	Shrub	NSW	18' x 18', privacy hedge
Rhus ovata / Sugar Bush	Shrub	NSW	20' x 20', attracts wildlife
Ribes indecorum / White Flowering Currant	Shrub	LSW	All Ribes prefer shade
Ribes sanguineum / Red Flowering Currant	Shrub	LSW	12' x 12', pink flowers
Ribes speciosum / Fuchsia-Flowered Currant	Shrub	LSW	12' x 12', red flowers
Ribes viburnifolium / Evergreen Currant	Shrub	LSW	3' x 8', purple/pink flowers

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## DROUGHT TOLERANT PLANTS

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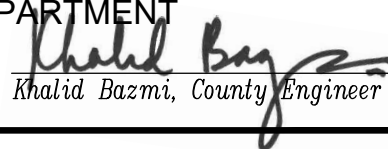
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BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Robinia x ambigua / Locust	Tree	LSW	Robinia have invasive roots, naturalize easily
Romneya coulteri / Matilija Poppy	Shrub	NSW	8' x 6', showy white flowers
Rosa californica / California Wild Rose	Shrub	LSW	Native, up to 20' tall
Rosa banksiae / Lady Banks' Rose	Shrub	LSW	Disease resistant
Rosa 'Flower Carpet' / Carpet Rose	Shrub	LSW	Prune at end of dormant season
Rosmarinus officinalis 'Arp' / Rosemary	Shrub	LSW	5' x 3'
Rosmarinus officinalis 'Huntington Carpet' / Rosemary	Shrub	LSW	2' x 8', fragrant
Rosmarinus officinalis 'Prostratus' / Dwarf Rosemary	Shrub	LSW, FR	3' x 6', attracts bees
Rosmarinus officinalis 'Tuscan Blue' / Rosemary	GC	LSW	6' x 4', attracts birds
Salvia apiana / White Sage	Shrub	NSW	Salvias are highly flammable
Salvia clevelandii / California Blue Sage	Shrub	NSW	4' x 8', blue flowers
Salvia greggii / Autumn Sage	Shrub	LSW, FR	3' x 3', perennial
Salvia leucantha / Mexican Bush Sage	Shrub	LSW	Cut back hard before Spring.
Salvia leucophylla / Purple Sage	Shrub	NSW, CT	5' x 8', erosion control
Salvia sonomensis / Creeping Sage	GC	LSW	3' x 3', lavender flowers
Sambucus mexicana / Blue Elderberry	Shrub/ Tree	LSW	25' x 25', cream flowers
Santolina chamaecyparissus / Lavender Cotton	Shrub	LSW, CT	3' x 3', yellow flowers, deer tolerant
Santolina virens / Green Lavender Cotton	Shrub	LSW, FR	2' x 3', creamy yellow flowers
Schinus molle / California Pepper	Tree	LSW, CT	40' x 40',
Sedum album / Green Stonecrop	Succulent	LSW, FR	Well-drained soil
Sedum confusum / Stonecrop	Succulent	LSW, FR	12" x 12", showy flower
Sedum dendroideum / Stonecrop	Succulent	NSW, FR	3' x 4', easy care
Sedum rubrotinctum / Pork and Beans	Succulent	LSW, FR	12" x 12"
Sedum spathulifolium / Stonecrop	Succulent	NSW	California native
Senecio cineraria / Dusty Miller	Shrub	LSW	3' x 3', yellow flowers
Senecio mandraliscae / NCN	Succulent	NSW	2' x 3', low maintenance
Senecio serpens / NCN	Shrub	LSW	12" x 3', white flowers
Simmondsia chinensis / Jojoba	Shrub	LSW	6' x 10'
Solanum jasminoides / Potato Vine	vine	LSW, CT	15'-20' vining, light blue/white flowers
Stenocereus thurberi / Organ Pipe Cactus	Grass	LSW, FR	20' x 12'. Needs good drainage
Tagetes lemmonii / Bush Marigold	Shrub	LSW	Flowers winter/spring
Tecomaria capensis / Cape honeysuckle	Shrub	LSW	8' x 5', orange flowers. Heat, wind, salt air
Teucrium chamaedrys / Germander	GC	LSW, FR, CT	Lavender Flowers in Spring
Teucrium fruticans / Bush Germander	Shrub	LSW, CT	8' x 10', blue flowers
Trachycarpus fortunei / Windmill Palm	Tree	LSW, CT	
Trichostema lanatum / Woolly Blue Curls	Shrub	NSW	Needs good drainage
Tristania conferta / Brisbane Box	Tree	LSW, CT	40' x 30', reddish bark
Umbellularia californica / California Laurel	Tree	LSW	70' x 40', pale yellow flowers
Verbena spp. and hybrids / Verbena	GC	LSW, CT	2' x 2', hardy
Viburnum suspensum / Sandankwa	Shrub		Pinkish/Peer resistant white flowers
Viburnum tinus / Laurustinus	Shrub	LSW	Susceptible to pests.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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## DROUGHT TOLERANT PLANTS

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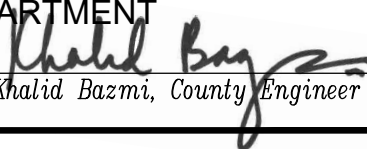
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BOTANICAL / COMMON NAME	TYPE	QUALITIES	REMARKS
Vitex agnus-castus / Chaste Tree	Shrub	LSW, CT	15' x 15', purplish flowers
Washingtonia filifera / California Fan Palm	Tree	NSW, CT	50' x 15', hardy
Westringia fruticosa / Coast Rosemary	Shrub	LSW, FR	6' x 12', white flowers
Xylosma congestum / Shiny Xylosma	Shrub/ Tree	LSW, CT	20' x 15', low maintenance
Xylosma congestum 'Compacta' / Compact Shiny Xylosma	Shrub	LSW, FR	5' x 5', hedge
Yucca aloifolia / Spanish Bayonet	Shrub	LSW, FR	Sharp leaves
Yucca elephantipes / Giant Yucca	Shrub	NSW, FR	Sharp leaves. Well drained soil
Yucca filamentosa / Adam's Needle	Shrub	LSW, FR	Sharp leaves
Yucca flaccida 'Golden Sword' / Golden Sword Yucca	Shrub	LSW, FR	Sharp leaves
Yucca gloriosa / Spanish Dagger	Shrub	LSW, FR	Sharp leaves
Yucca recurvifolia (Y. pendula) / Yucca	Shrub	NSW, FR	Sharp leaves.
Yucca whipplei / Our Lord's Candle	Shrub	LSW, FR	Native
Zauschneria californica / California Fuchsia	Perennial	LSW	3' x 5', attracts hummingbirds
Zelkova serrata / Sawleaf Zelkova	Tree	LSW	60' x 70', Susceptible to Dutch Elm Disease
Ziziphus jujuba / Jujube	Tree	LSW, CT	Needs deep soils & deep watering

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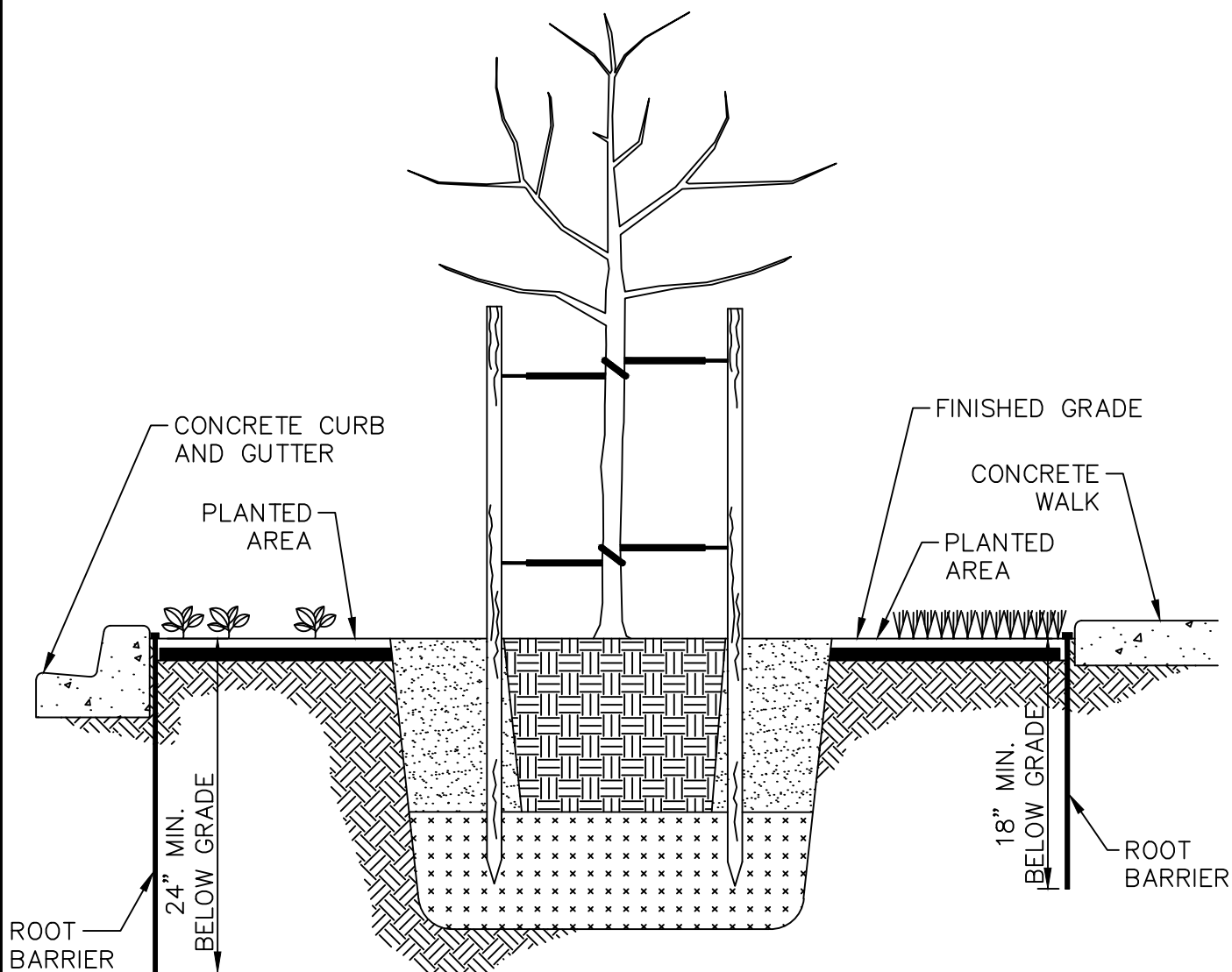
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DROUGHT TOLERANT PLANTS

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#### NOTES:

1. TOP OF ROOT CONTROL BARRIER MUST BE AT GRADE.
2. POSITION ROOT CONTROL BARRIER ADJACENT TO STRUCTURE.
3. RAISED ROOT DEFLECTORS MUST BE FACING PLANTED AREA.
4. PROVIDE A MIN. OF 12 INCHES OF ROOT BARRIER EACH SIDE OF TREE TRUNK.
5. TREE PLANTING AND STAKING SHALL BE PERFORMED IN ACCORDANCE WITH OCPW STANDARD PLAN 518-3-OC.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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SHT. 1 OF 2

TREE ROOT BARRIER

## NOTES:

### I. TREE TRIMMING

PRIOR TO ROOT PRUNING, EACH TREE SHALL BE TRIMMED TO REDUCE ITS OVERALL SIZE BY ONE-THIRD ( $1/3$ ) AND TO PROMOTE IMPROVED GROWTH. TRIMMING SHALL ALSO PROVIDE:

- A. REMOVAL OF ALL DEAD, DAMAGED, DISEASED, OR STRUCTURALLY DEFICIENT LIMBS;
- B. THINNING TO REDUCE INTERIOR WIND RESISTANCE;
- C. VERTICAL CLEARANCE OF 14.0 FEET OVER ROADWAYS AND 9.0 FEET OVER SIDEWALKS;
- D. VISUAL CLEARANCE AROUND ALL TRAFFIC CONTROL DEVICES AND SIGNS;
- E. AN OVERALL BALANCED APPEARANCE;
- F. TRIMMING SHALL BE DONE UNDER THE SUPERVISION OF A LICENSED ARBORIST IN ACCORDANCE WITH CURRENT ARBORIST STANDARDS.

### II. ROOT PRUNING

ROOT PRUNING CUTS SHALL BE MADE IMMEDIATELY ADJACENT TO THE SIDEWALK AND SHALL BE 4 INCHES WIDE, 16 INCHES DEEP (MEASURED FROM THE TOP OF THE FINAL GRADE OF THE SIDEWALK) AND 16 INCHES LONG, CENTERED 8 INCHES EITHER SIDE OF THE CENTER OF THE TREE. THE BOTTOM 13 INCHES OF THE ROOT PRUNE CUT SHALL BE FILLED WITH PEA GRAVEL, TO PROMOTE DEEPER WATERING, WITH THE TOP 3 INCHES FILLED WITH NATIVE SOIL FREE FROM ROCKS OR OTHER MATERIALS THAT WOULD INTERFERE WITH LANDSCAPE MAINTENANCE TASKS. AT LEAST 18 MONTHS SHALL TRANSPIRE BEFORE ROOT PRUNING THE OPPOSITE SIDE OF THE TREE. IN GENERAL, ROOT PRUNING WOULD NOT BE PERFORMED ADJACENT TO THE CURB DUE TO THE NORMAL DEPTH OF THE CURB.

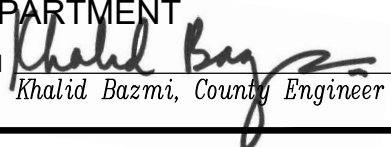
### III. ROOT CONTROL BARRIER

BARRIER SHALL BE FABRICATED FROM A HIGH DENSITY, HIGH IMPACT PLASTIC, I.E. POLYSTYRENE, POLYETHYLENE, POLYVINYL CHLORIDE, (PVC), OR ACRYLONITRILE-BUTADIENE-STYRENE (ABS). THE INTERIOR SURFACE SHALL HAVE  $\frac{1}{2}$  INCH HIGH (MINIMUM) RAISED VERTICAL RIBS SPACES 6 INCHES TO 8 INCHES APART THE FULL DEPTH OF THE BARRIER AND SHALL BE EXPRESSLY DESIGNED FOR ROOT DEFLECTION.

BARRIER USED FOR ROOT PRUNING SHALL HAVE A MINIMUM DEPTH OF 12 INCHES WITH A MINIMUM THICKNESS OF 0.06 INCH. BARRIERS SHALL BE 16 FEET LONG IN ONE CONTINUOUS PIECE (PREFERRED) OR IN A COMBINATION OF PIECES SECURELY FASTENED WITH ADHESIVE AT LAP JOINT POINTS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

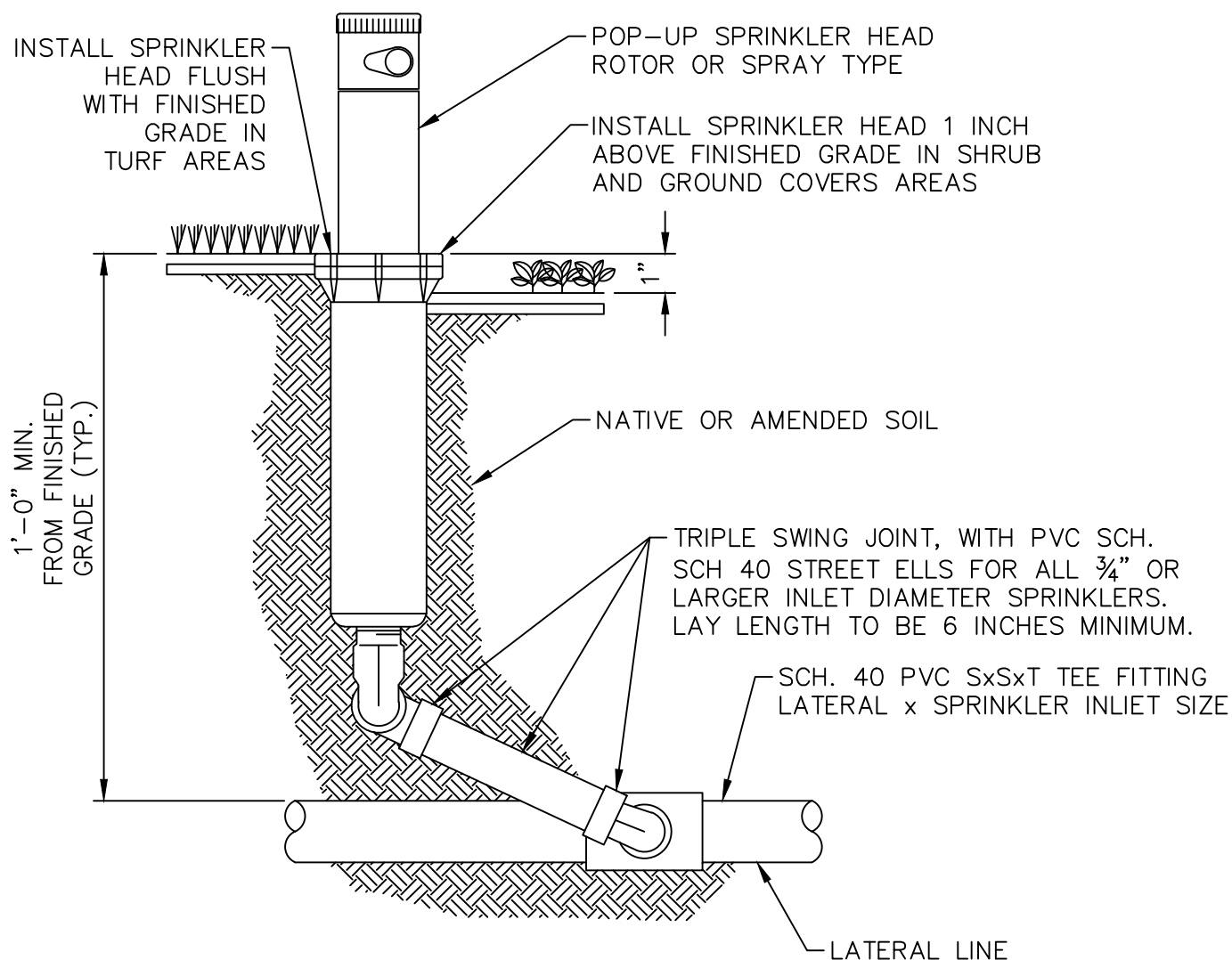
Revision: August 2018

STD. PLAN

1708

SHT. 2 OF 2

TREE ROOT BARRIER



#### NOTES:

1. INSTALL SPRINKLER HEADS 24 INCHES FROM PAVING EDGE
2. INSTALL SPRINKLER HEADS 3' FROM PAVING EDGE WHERE PERMISSIBLE BY THE COUNTY OF ORANGE WATER EFFICIENT LANDSCAPE ORDINANCE, SECTION 2.6(A)(1)(U).
3. INSTALL SPRINKLER HEADS PLUMB, ADJUST NOZZLE STREAM TO COVER LANDSCAPE AREA WITHOUT OVERSPRAY ONTO PAVING, FENCES, WALLS OR BUILDINGS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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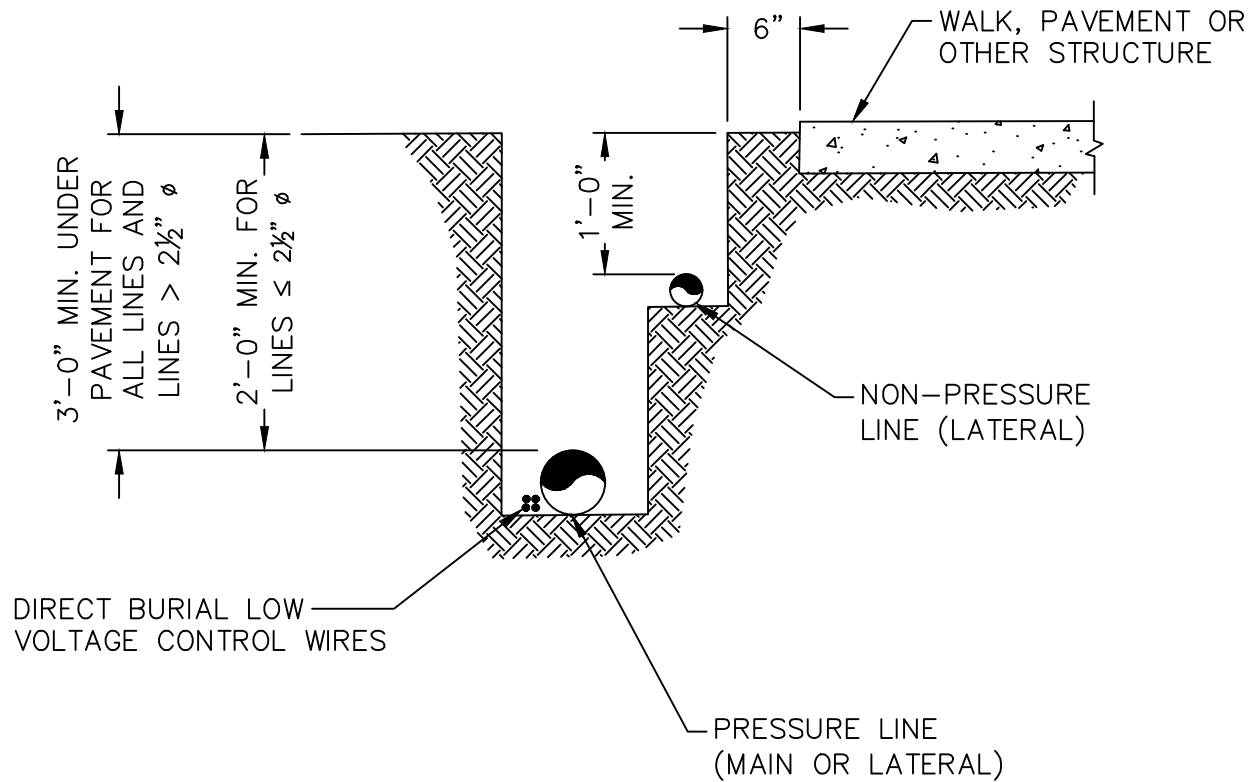
STD. PLAN

1753

SHT. 1 OF 1

POP-UP SPRINKLER (6 INCH)





#### NOTES:

1. TRENCHING AND BACKFILLING SHALL BE PER GREENBOOK.
2. MINIMUM BACKFILL RELATIVE COMPACTION SHALL BE 90 PERCENT PER STANDARD PLAN 1801.
3. BUNDLE CONTROL WIRES TOGETHER AND TAPE TO PIPE AT 10 FOOT INTERVALS.
4. INSTALL IDENTIFICATION WARNING TAPE PER STANDARD PLAN 1602.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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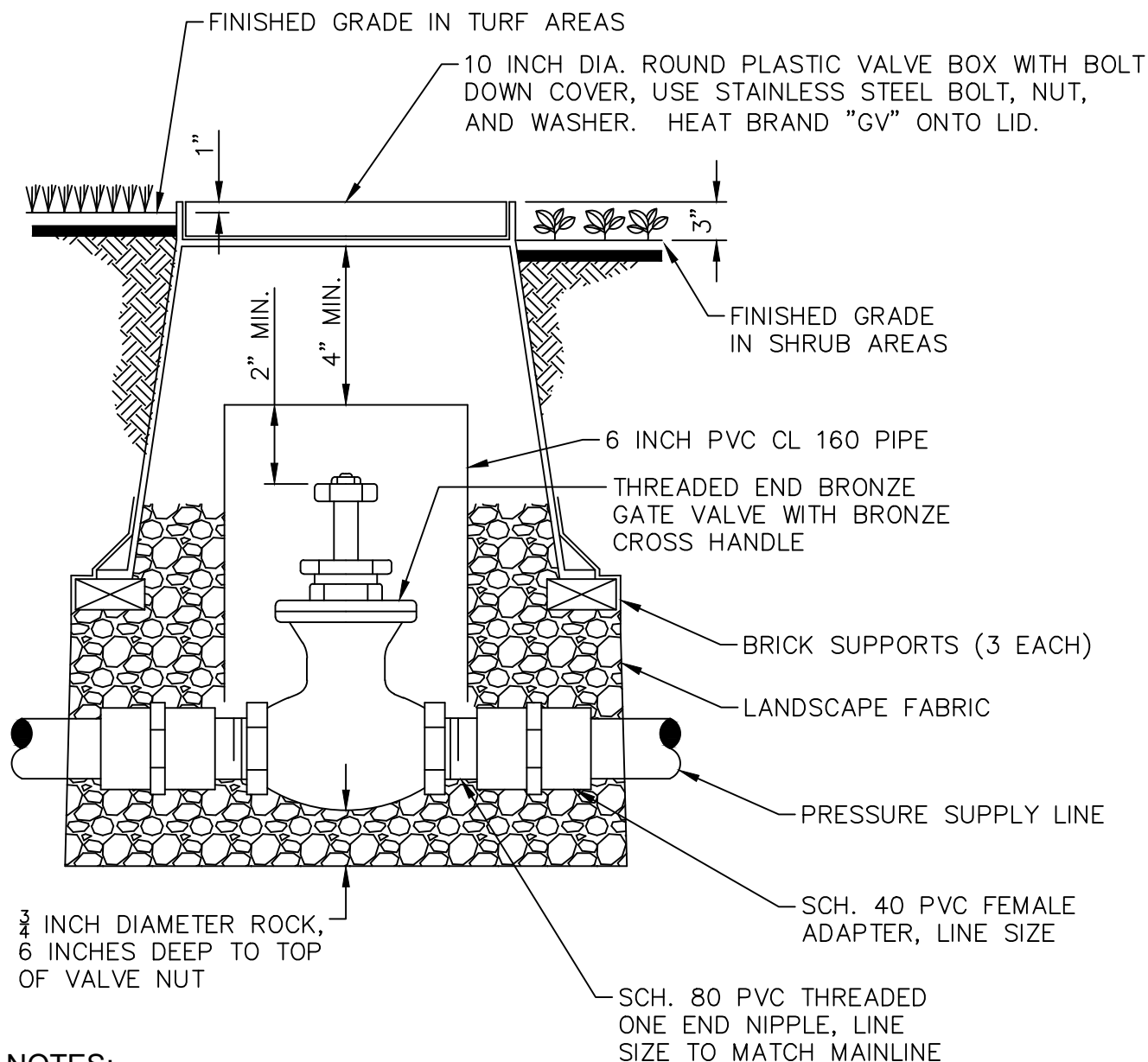
STD. PLAN

1760

IRRIGATION LINE TRENCHING

SHT. 1 OF 1





#### NOTES:

1. INSTALL VALVE BOX AND PIPE EXTENSION AS REQUIRED TO ACHIEVE PROPER VALVE INSTALLATION AT MAIN LINE DEPTH.
2. WRAP LANDSCAPE FABRIC AROUND SIDES AND BOTTOM OF BOX TO COVER ALL OPENINGS.
3. RECYCLED WATER SYSTEMS SHALL CONFORM TO THE LATEST CALIFORNIA PLUMBING CODE CHAPTER 16, PART II.

GATE VALVE 2 INCHES AND SMALLER

SYMBOL ON PLAN



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

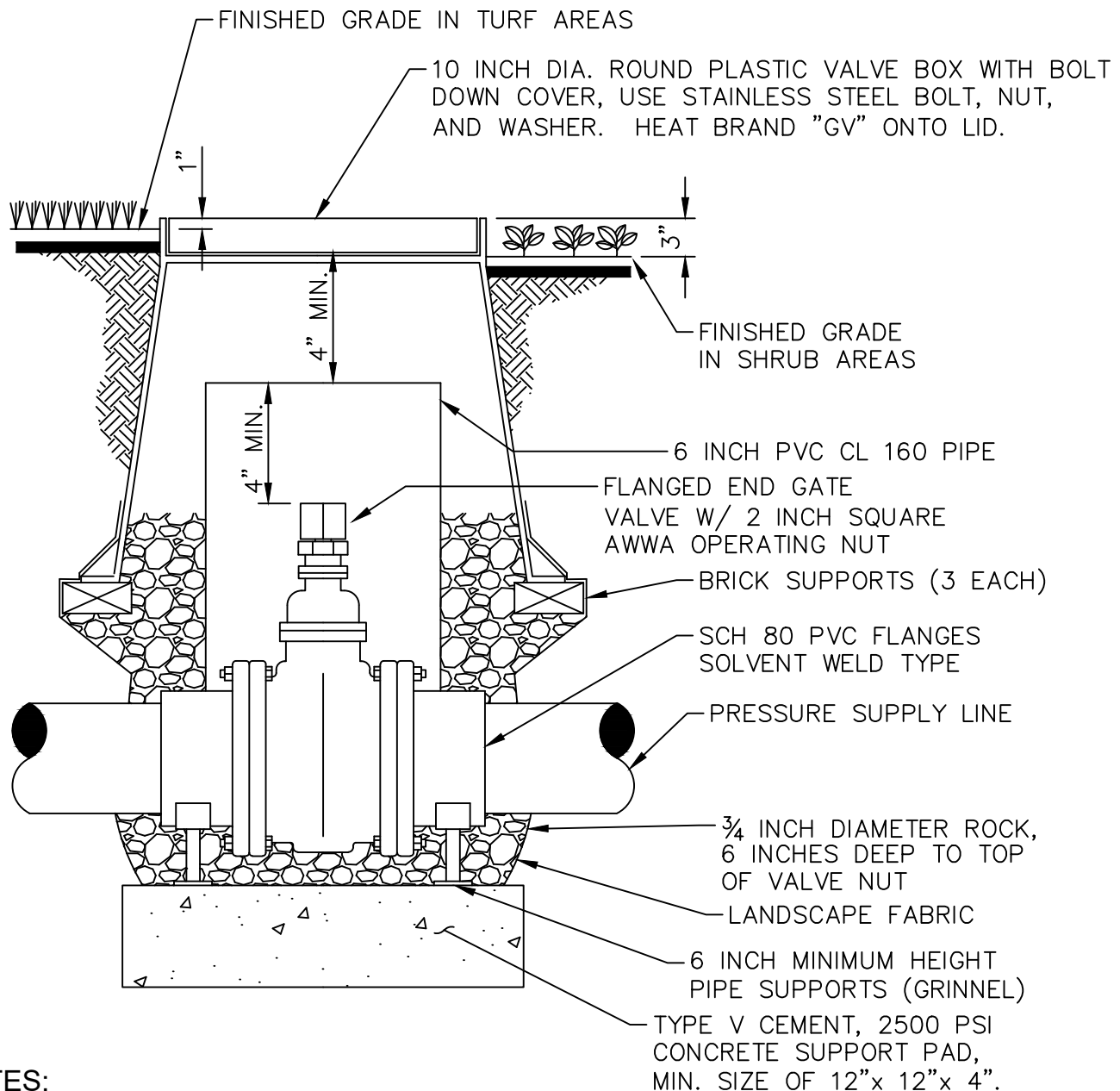
Revision: August 2018

STD. PLAN

1761

GATE VALVE

SHT. 1 OF 3



#### NOTES:

1. CONTRACTOR TO PROVIDE ONE 5 FOOT LONG TEE WRENCH WITH SQUARE NUT ADAPTER FOR THE OPERATION OF GATE VALVES
2. INSTALL VALVE BOX AND PIPE EXTENSION AS REQUIRED TO ACHIEVE PROPER VALVE INSTALLATION AT MAIN LINE DEPTH.
3. WRAP LANDSCAPE FABRIC AROUND SIDES AND BOTTOM OF BOX TO COVER ALL OPENINGS.
4. RECYCLED WATER SYSTEMS SHALL CONFORM TO THE LATEST CALIFORNIA PLUMBING CODE CHAPTER 16, PART II.

GATE VALVE 2 1/2 INCHES AND LARGER

SYMBOL ON PLAN



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

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GATE VALVE

STD. PLAN

1761

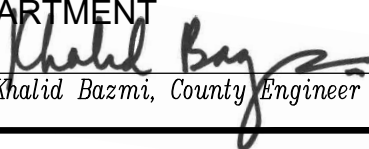
SHT. 2 OF 3

## GENERAL NOTES

1. VALVES UP TO 2 INCHES DIAMETER SHALL HAVE MALLEABLE IRON "TEE" HANDLES. VALVES LARGER THAN 2 INCHES SHALL HAVE SQUARE OPERATING NUTS.
2. PROVIDE TWO OPERATING KEYS TO VALVES BURIED 18 INCHES OR DEEPER.
3. ALL GATE VALVES AND ENCLOSURES SHALL BE LOCATED OUTSIDE THE DESIGNATED PLAYING FIELD (I.E., BALL DIAMOND, SOCCER, ETC.)
4. VALVE BOX SHALL BE ONE OF THE FOLLOWING CASES AS SPECIFIED ON PLANS  
  
CASE 1: CONCRETE BOX WITH CONCRETE COVER  
CASE 2: CONCRETE BOX WITH LOCKING CAST IRON COVER  
CASE 3: PLASTIC BOX WITH LOCKING PLASTIC COVER

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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Khalid Bazmi, County Engineer

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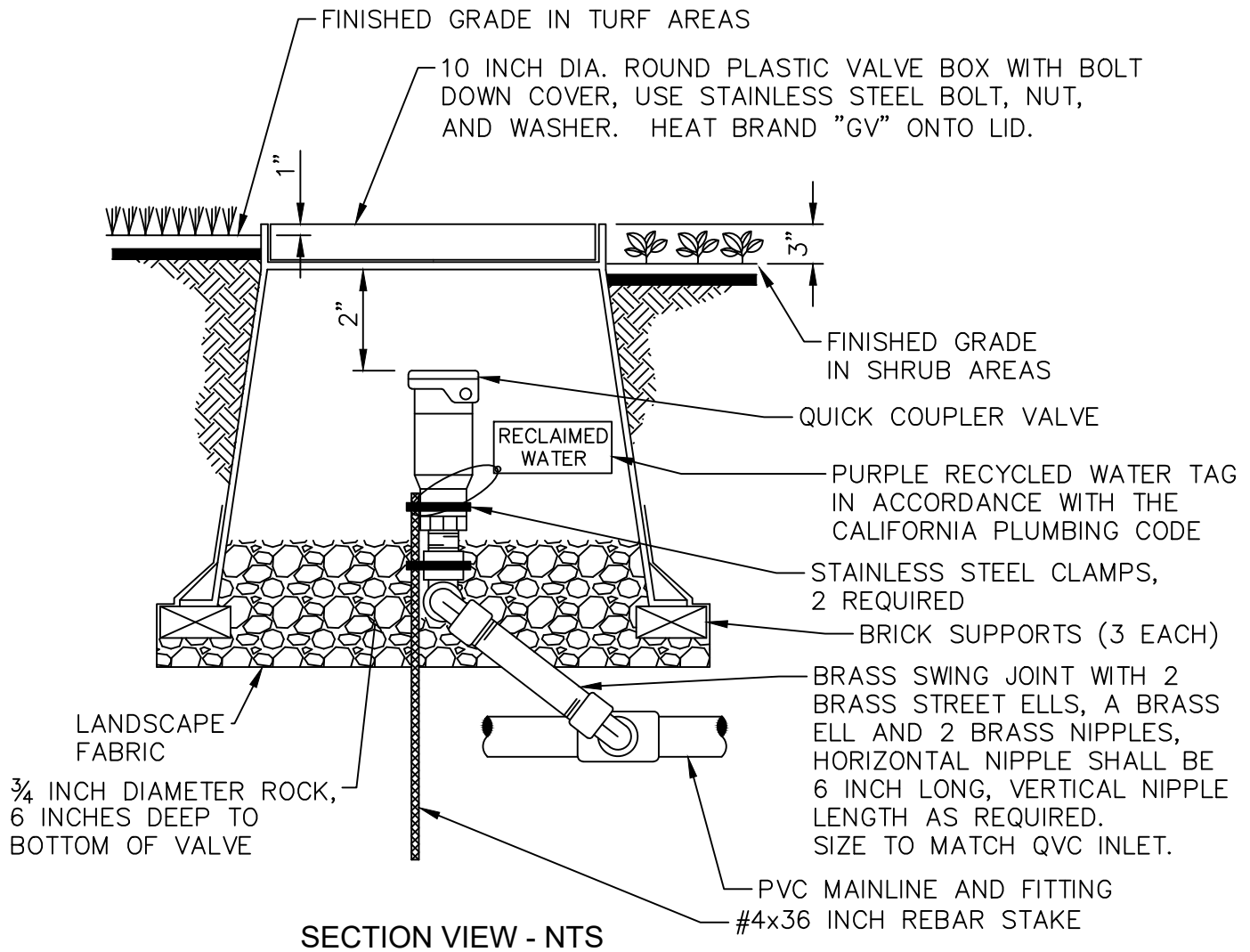
**GATE VALVE**

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**1761**

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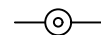




#### NOTES:

1. USE TEFLON TAPE ON ALL THREADED FITTINGS.
2. QUICK COUPLER KEY MUST CLEAR VALVE BOX.
3. WRAP LANDSCAPE FABRIC AROUND SIDES AND BOTTOM OF BOX TO COVER ALL OPENINGS.
4. RECYCLED WATER SYSTEMS SHALL CONFORM TO THE LATEST CALIFORNIA PLUMBING CODE CHAPTER 16, PART II

SYMBOL ON PLAN



COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

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SHT. 1 OF 1

QUICK COUPLER VALVE IN BOX

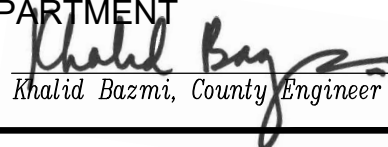


## GENERAL NOTES

1. ALL WORK, EXCEPT MIDWEST GUARDRAIL SYSTEMS, BRIDGE AND TRAFFIC SIGNAL WORK, SHALL CONFORM TO THE GREENBOOK, THE STANDARD PLANS OF OCPW AND THE CA MUTCD FOR USE IN PERFORMANCE OF WORK UPON HIGHWAYS, AND EACH OF THE MOST RECENT DATE ADOPTED BY THE BOARD OF SUPERVISORS OF THE COUNTY OF ORANGE.
2. ALL WORK PERTAINING TO MIDWEST GUARDRAIL SYSTEMS, BRIDGE, AND TRAFFIC SIGNAL WORK SHALL CONFORM TO THE FOLLOWING PORTIONS OF CALTRANS STANDARD SPECIFICATIONS, LATEST EDITION UNLESS SUPERSEDED BY A NEWER EDITION ADOPTED BY THE BOARD OF SUPERVISORS OF THE COUNTY OF ORANGE.
  - a. SIGNAL, LIGHTING AND ELECTRICAL SYSTEMS: SECTION 86.
  - b. PAVEMENT MARKERS: SECTION 85.
  - c. MIDWEST GUARD RAILING: SECTION 82-2.02
  - d. BRIDGES: SECTION 15-4, 19, 42, 49 THROUGH 52, 55, 57, 58, 67, 72-6, 75, 83, 90, AND 95.
  - e. CA MUTCD: PARTS 5, 6, AND 7
3. DEVELOPER SHALL MEAN THE SUBDIVISION DEVELOPER, PERMITTEE, OR SHALL MEAN CONTRACTOR IN THE CASE OF A PUBLIC WORKS CONTRACT WITH THE COUNTY OF ORANGE.
4. THE DEVELOPER SHALL OBTAIN AN ENCROACHMENT PERMIT FROM OCPW PRIOR TO WORK WITHIN PUBLIC RIGHT-OF-WAY.
5. THE DEVELOPER SHALL TELEPHONE OCPW AT LEAST 48 HOURS PRIOR TO STARTING CONSTRUCTION WORK SUBJECT TO OCPW INSPECTION. THE DEVELOPER SHALL TELEPHONE OCPW AT LEAST 48 HOURS PRIOR TO STARTING GRADING OR BRUSHING WORK SUBJECT TO A GRADING PERMIT.
6. ALL UNDERGROUND UTILITIES SHALL BE INSTALLED PRIOR TO SURFACING OF STREETS. THE INSTALLATION OF ALL UNDERGROUND FACILITIES CROSSING EXISTING ARTERIAL HIGHWAYS REQUIRES BORING OR JACKING, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
7. MAILBOXES SHALL BE INSTALLED IN LOCATIONS APPROVED BY THE LOCAL POSTMASTER AND PER THE LATEST EDITION OF THE OCPW STANDARD PLANS.
8. CORRESPONDING STATE OF CALIFORNIA TEST METHODS MAY BE SUBSTITUTED FOR DESIGNATED ASTM TEST METHODS FOR WORK SUBJECT TO OCPW INSPECTION, EXCEPT AS NOTED IN NOTE 9 HEREIN.
9. RELATIVE COMPACTION: FOR WORK SUBJECT TO OCPW INSPECTION, IN-PLACE DENSITY SHALL BE DETERMINED BY CALIFORNIA TEST METHOD 231, PART I. LABORATORY MAXIMUM DENSITY SHALL BE DETERMINED BY CALIFORNIA TEST METHOD 216, PART II. PRIVATE LABORATORIES PERFORMING RELATIVE COMPACTION TESTING FOR OCPW SHALL PROVIDE A CALTRANS LABORATORY CERTIFICATION AND CERTIFICATION(S) FOR EACH TECHNICIAN PERFORMING THESE COMPACTION TEST PRIOR TO THE START OF WORK.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1801

SHT. 1 OF 3

**SPECIAL PROVISIONS - GENERAL NOTES**

## GENERAL NOTES (continued)

10. STRUCTURAL SECTION REQUIREMENTS FOR PRIVATE AND PUBLIC ROADS CREATED BY A TRACT MAP OR PARCEL MAP SHALL BE DETERMINED BY THE ENGINEER. SUBGRADE COMPACTION REQUIREMENTS RECOMMENDED BY THE PROJECT GEOTECHNICAL ENGINEER MAY BE MODIFIED BY THE ENGINEER WHEN NECESSARY FOR STRUCTURAL SECTION DESIGN. STRUCTURAL SECTION REQUIREMENTS FOR COMMERCIAL OR INDUSTRIAL DRIVEWAYS AND PARKING AREAS SUBJECT TO THE INSPECTION OF OCPW, SHALL BE APPROVED IN ACCORDANCE WITH THE REQUIREMENTS OF THE ORANGE COUNTY GRADING AND EXCAVATION CODE.
11. IF DRIVEWAY DEPRESSIONS ARE MADE IN ANY CURB, DRIVEWAY APPROACHES ARE THEN CONSIDERED TO BE PART OF THE IMPROVEMENT PLAN AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF THE OCPW STANDARD PLANS.
12. MONUMENTS ARE TO BE SET PER THE REQUIREMENTS OF THE SUBDIVISION MAP ACT, THE LAND SURVEYORS' ACT, THE COUNTY OF ORANGE SUBDIVISION CODE AND IN ACCORDANCE WITH THE RULES AND PROCEDURES APPROVED BY THE COUNTY SURVEYOR. ALL LOT CORNERS AND TRACT BOUNDARIES SHALL BE LOCATED AND MONUMENTED IN ACCORDANCE WITH THE RECORDED TRACT MAP AND A WRITTEN CONFIRMATION TO THAT EFFECT SHALL BE SUBMITTED TO THE COUNTY SURVEYOR'S OFFICE BY THE PROJECT CIVIL ENGINEER. IN CASES WHERE BUILDINGS ARE BUILT ON PROPERTY LINES, THE CIVIL ENGINEER MUST CERTIFY THAT THE BUILDINGS ARE LOCATED IN COMPLIANCE WITH THE APPROVED PLOT PLAN. IN CASES WHERE STRUCTURES (I.E. WALLS, FENCES) ARE BUILT UPON PROPERTY CORNERS AND MONUMENTS CANNOT BE SET AS INDICATED ON THE TRACT MAP, A CERTIFICATE OF CORRECTION SHALL BE FILED WITH THE COUNTY SURVEYOR'S OFFICE AND UPON APPROVAL BY THE COUNTY SURVEYOR, RECORDED WITH THE COUNTY RECORDER'S OFFICE.
13. TREES SHALL NOT BE PLANTED IN ORANGE COUNTY RIGHT-OF-WAY UNLESS A PERMIT HAS BEEN OBTAINED FROM OCPW. SEE OCPW STANDARD PLAN 1117 FOR LOCATION RESTRICTIONS AT INTERSECTIONS, AND OCPW STANDARD PLAN 1700 FOR GUIDELINES AND CRITERIA.
14. ADVERTISING SIGNS WILL NOT BE PERMITTED WITHIN STREET RIGHT-OF-WAY PER ORANGE COUNTY CODIFIED ORDINANCE 6-1-69.
15. JOINS BETWEEN NEW PAVEMENT AND EXISTING PAVEMENT SHALL BE MADE BY SAWCUTTING OR COLD PLANING (MINIMUM 1½ INCHES) EXISTING PAVEMENT TO EFFECT A NEAT JOIN, OR AS DIRECTED BY THE ENGINEER. TRANSVERSE JOINTS ON ARTERIAL HIGHWAYS SHALL BE AT 20 DEGREES TO PERPENDICULAR.
16. NEW APPLICATIONS OF PAINT SHALL BE APPLIED IN TWO EQUAL THICKNESSES AND SHALL INCLUDE 50 PERCENT OF THE REQUIRED BEADS WITH EACH APPLICATION. WHEN APPLIED TO NEW ASPHALT PAVEMENT, PAINT SHALL HAVE A MINIMUM SEVEN DAY PERIOD BETWEEN APPLICATIONS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
17. APPROVED TRAFFIC HANDLING/TRAFFIC CONTROL PLANS ARE REQUIRED AS DETERMINED BY THE ENGINEER OR OCPW. PLANS SHALL BE PREPARED PER THE LATEST CA MUTCD.
18. CONCRETE REMOVAL AND REPLACEMENT (R&R) FOR CURB, GUTTER, CROSS GUTTER, AND SIDEWALK SHALL BE FROM JOINT TO JOINT.
19. INLET STRUCTURE DECKS AND LOCAL DEPRESSIONS SHALL NOT BE CONSTRUCTED WITHOUT ADJACENT CURB AND GUTTER IN PLACE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Revision: August 2018

Approved

  
Khalid Bazmi, County Engineer

STD. PLAN

1801

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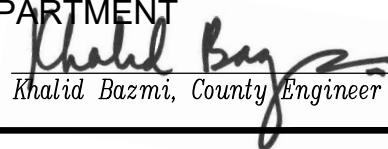
**SPECIAL PROVISIONS - GENERAL NOTES**

## GENERAL NOTES (continued)

20. MODEL SITE TRAP FENCES WILL NOT BE ALLOWED TO OBSTRUCT THE FLOW OF PEDESTRIAN OR VEHICULAR TRAFFIC UNLESS OTHERWISE APPROVED BY THE ENGINEER. ALL FENCING SHALL BE BEHIND THE SIDEWALK.
21. WITH CONTRACTOR'S REQUEST FOR USE OF MATERIALS, CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CONSTRUCTION MATERIALS TESTING VERIFYING COMPLIANCE WITH SPECIFICATIONS AND SHALL SUBMIT TEST RESULTS. COUNTY WILL PERFORM QUALITY ACCEPTANCE TESTING AS DETERMINED NECESSARY. ACCEPTANCE OF MATERIALS WILL BE BASED ON GRADE SAMPLES.
22. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH RETESTING OF FAILED MATERIALS TESTS OR COMPACTION TESTS. CONTRACTOR SHALL REIMBURSE COUNTY PRIOR TO ACCEPTANCE OF WORK.
23. FOR COUNTY PROJECTS, CONTRACTOR SHALL ENDEAVOR AND DEMONSTRATE GOOD FAITH EFFORTS TO UTILIZE REGIONAL MATERIALS, LABOR AND BUSINESSES.
24. FOR COUNTY PROJECTS, CONTRACTOR SHALL USE RECYCLED WATER, SUBJECT TO AVAILABILITY AND IN COMPLIANCE WITH COUNTY AND STATE PUBLIC HEALTH REGULATIONS; UNLESS OTHERWISE APPROVED BY THE ENGINEER.
25. FOR COUNTY PROJECTS, CONTRACTOR SHALL MAKE USE OF RECYCLED MATERIALS AND MATERIALS WITH RECYCLED CONTENT AS FIRST OPTION AND SUBJECT TO ENGINEER'S APPROVAL OF MATERIALS.
26. ALL WATER QUALITY LOW IMPACT DEVELOPMENT (LID) BMP DESIGNS SHALL REFERENCE THE LATEST CASQA MANUAL FOR DESIGN CRITERIA.
27. ALL STORM DRAIN SIGNAGE SHALL FOLLOW THE LATEST EDITION OF THE CASQA STORM WATER BMP HANDBOOK FOR SD-13.
  - STORM DRAIN MARKERS SHALL BE INSTALLED PER ALMETER INDUSTRIES, INC. 9005 SERIES.
  - CONTRACTOR SHALL COORDINATE WITH OCPW OPERATION & MAINTENANCE FOR CB ID NUMBERS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

**SPECIAL PROVISIONS - GENERAL NOTES**

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**1801**

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## LIME TREATED SOIL

TRADITIONAL LIME TREATMENT IS NOT APPLICABLE FOR EXPANSIVE SOILS WITH PLASTICITY INDEX (PI) GREATER THAN 15 AND WITH THE ELEVATED SULFATE LEVEL OF 3,000 PPM OR GREATER.

LIME TREATMENT SHALL MEET THE REQUIREMENTS OF SECTION 301-5, "LIME-TREATED SOIL", OF THE GREENBOOK AND THESE SPECIAL PROVISIONS. LIME SHALL BE QUICKLIME.

CONTRACTOR'S ENGINEER (WHO SHALL BE A REGISTERED CIVIL ENGINEER CURRENTLY LICENSED BY THE STATE OF CALIFORNIA) SHALL PERFORM A MIX DESIGN AND PROPOSE THE OPTIMUM LIME CONTENT FOR APPROVAL BY THE ENGINEER.

THE LIME SPREAD RATE SHALL NOT VARY MORE THAN 20 PERCENT FROM THE DESIGNATED SPREAD RATE IN LIEU OF THE 10 PERCENT REQUIREMENT AS STATED IN SECTION 301-5.6, "SPREADING LIME," OF THE GREENBOOK.

A MINIMUM OF 2 PASSES WITH THE MIXER WILL BE REQUIRED. NOT LESS THAN 16 HOURS SHALL ELAPSE FOLLOWING THE FIRST MIXING PASS BEFORE STARTING THE SECOND MIXING PASS.

LIME TREATED MATERIAL SHALL BE COMPACTED WITHIN 54 HOURS AFTER START OF MIXING AND SHALL BE COMPACTED TO NOT LESS THAN 95 PERCENT RELATIVE COMPACTION UNDER AC OR 90 PERCENT RELATIVE COMPACTION UNDER AB UNLESS OTHERWISE ALLOWED FOR BY THE ENGINEER.

## CEMENT TREATED PULVERIZED MATERIAL


CEMENT TREATED PULVERIZED MATERIAL SHALL MEET THE REQUIREMENT OF SECTION 301-3, "PORTLAND CEMENT TREATED MIXTURES", OF THE GREENBOOK AND THESE SPECIAL PROVISIONS:

THE AC SURFACE AND UNDERLYING BASE MATERIALS SHALL BE PULVERIZED SUCH THAT 100 PERCENT OF THE MATERIAL WILL PASS A 2-INCH SIEVE AND A MINIMUM OF 90 PERCENT WILL PASS A 1½ INCH SIEVE. THE FINE MATERIAL SHALL NOT BE LESS THAN 55 PERCENT PASSING NO. 4 SIEVE. THE MATERIAL SHALL NOT BE DELETERIOUS IN ITS REACTION WITH CEMENT.

TRIMMING AND DISPOSAL OF EXCESS MATERIALS, IF REQUIRED, WILL BE PERFORMED ON THE INTIMATE MIXTURE OF PULVERIZED ASPHALT CONCRETE, BASE MATERIALS AND SUBGRADE SOIL PRIOR TO CEMENT TREATMENT. A STANDARD SOIL-CEMENT MIX DESIGN PROCEDURE SHOULD BE FOLLOWED TO DETERMINE THE PROPER AMOUNT OF CEMENT FOR THE PULVERIZED MATERIAL, AS WELL AS THE DETERMINATION OF MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT. CEMENT TYPE MAY BE BASED ON LABORATORY SOIL-SULFATE STUDY. CONTRACTOR'S ENGINEER SHALL SUBMIT THE PERCENTAGE (%) OF CEMENT ANALYSIS TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION ACTIVITY. CONTRACTOR'S ENGINEER (WHO SHALL BE A REGISTERED CIVIL ENGINEER CURRENTLY LICENSED BY THE STATE OF CALIFORNIA) SHALL PERFORM A MIX DESIGN AND PROPOSE THE OPTIMUM CEMENT CONTENT FOR THE APPROVAL BY THE ENGINEER.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

Revision: August 2018

STD. PLAN

1802

SPECIAL PROVISIONS - SOIL AND BASE TREATMENT

SHT. 1 OF 1



## SECTION 1. MATERIALS

CONCRETE STRENGTH AND CORRESPONDING CONCRETE CLASS FOR ALL CONCRETE STRUCTURES AND OTHER MISCELLANEOUS CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF SECTION 201-1.1.2 (REFER TO TABLE 201-1.1.2) AND SECTION 201-1.1.3 (REFER TO TABLE 201-1.1.3) OF THE GREENBOOK. IN ADDITION, PORTLAND CEMENT CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF SECTION 201-1, "PORTLAND CEMENT CONCRETE", OF THE GREENBOOK AND THESE SPECIAL PROVISIONS.

AGGREGATE USED IN CONCRETE SHALL NOT CONTAIN ANY DELETERIOUS AMOUNTS OF GYPSUM, PYRITE, ZEOLITES, OR ANY UNSTABLE OR AMORPHOUS SILICA INCLUDING AMOUNTS EXCEEDING 5 PERCENT OPTICALLY STRAINED, HIGHLY METAMORPHIC, MICROFRACTURED, MICROCRYSTALLINE OR CRYPTOCRYSTALLINE QUARTZ; 1 PERCENT TRIDYMITITE OR CRISTOBALITE; 3 PERCENT CHERT, CHALCEDONY, VOLCANIC GLASS OR SYNTHETIC GLASS; OR 0.5 PERCENT OPAL.

THE CEMENT TYPE REQUIREMENT, SECTION 201-1.2.1, "CEMENT", SHALL BE TYPE II, III, V OR IP (MS) AS DETERMINED BY THE ENGINEER. TYPE II, III, V OR IP (MS) CEMENTS SHALL CONFORM TO ASTM C150 AND THE LOW ALKALI REQUIREMENTS OF TABLE 1A THEREIN. TYPE IP (MS) CEMENT SHALL ALSO CONFORM TO THE REQUIREMENTS FOR TYPE IP (MS) CEMENT OF ASTM C595, AND SHALL BE COMPRISED OF AN INTIMATE MIXTURE OF TYPE II CEMENT AND NOT MORE THAN 20 PERCENT BY MASS OF A POZZOLANIC MATERIAL.

FOR THE MITIGATION OF ALKALI-SILICA REACTION POTENTIAL, 20 PERCENT BY MASS OF THE REQUIRED PORTLAND CEMENT IN CONCRETE SHALL BE REPLACED WITH FLY ASH: UP TO A TOTAL OF 30 PERCENT FLY ASH OF THE REQUIRED PORTLAND CEMENT MAY BE USED IN A PREQUALIFIED MIX DESIGN PER SECTION 201-1.1.4, "CONCRETE SPECIFIED BY COMPRESSIVE STRENGTH", OF THE GREENBOOK. THE TOTAL MASS OF PORTLAND CEMENT MAY BE REDUCED BY 5 PERCENT IF AN APPROVED WATER REDUCER IS ADDED. FLY ASH SHALL CONFORM TO SECTION 201-1.2.5.3, "FLY ASH". (NOTE: THE CEMENT TOTAL MASS OF PORTLAND CEMENT AND 20 PERCENT FLY ASH AND APPROVED WATER REDUCER SHALL BE THE SAME AS FOUND IN THE "CONCRETE CLASS" PORTION OF TABLE 201-1.1.2 IN SECTION 201-1.1.2, "CONCRETE SPECIFIED BY CLASS AND ALTERNATE CLASS".

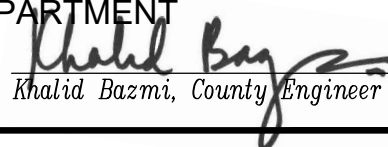
CONCRETE SPECIFIED BY ALTERNATE CLASS SHALL BE PER SECTION 201-1 AND TABLE 201-1.1.2 EXCEPT THAT WHERE FLY ASH IS USED OR REQUIRED AND ADDITIONAL FLY ASH EQUAL TO 5 PERCENT OF THE REQUIRED PORTLAND CEMENT MASS SHALL BE ADDED TO AMOUNTS LISTED IN THE TABLE FOR ALTERNATE CLASS. ALTERNATE CLASS CONCRETE WHICH WILL BE USED FOR NON-STRUCTURAL APPLICATIONS-I.E. PAVEMENT, CURB, GUTTER, SIDEWALKS PIPE BEDDING, BACKFILL, CLSM, ETC.-MAY ALSO INCLUDE RECLAIMED CONCRETE MATERIAL IN ACCORDANCE WITH SECTION V. RECLAIMED HYDRAULIC CONCRETE OF THESE SPECIAL PROVISIONS.

POZZOLAN SHALL CONFORM TO ASTM C618, CLASS F. CLASS C FLY ASH MAY BE USED IF APPROVED BY THE OCPW ENGINEER OR GEOTECHNICAL ENGINEER, IN ACCORDANCE WITH SECTION 201-1.2.5, "SUPPLEMENTARY CEMENTITIOUS MATERIALS".

IN DETERMINING THE MAXIMUM AMOUNT OF FREE WATER THAT MAY BE USED IN CONCRETE, POZZOLAN SHALL BE CONSIDERED TO BE CEMENT. IN DETERMINING THE AMOUNT OF TOTAL CEMENT, CEMENT SHALL BE THE TOTAL MASS OF FLY ASH AND PORTLAND CEMENT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

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SHT. 1 OF 9

**SPECIAL PROVISION - PORTLAND CEMENT CONCRETE**

THE TOTAL AMOUNT OF PORTLAND CEMENT IN THE TOTAL MASS SHALL NOT EXCEED 700 LBS. PER CUBIC YARD. THE CLEANNESS VALUE REQUIREMENT OF SECTION 200-1.4, "COARSE AGGREGATE FOR PORTLAND CEMENT CONCRETE", SHALL BE REPLACED WITH THE FOLLOWING:

<u>TESTS</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
CLEANNESS VALUE	CALIF. 227	
INDIVIDUAL TEST		70 MIN.
MOVING AVERAGE		75 MIN.

THE SAND EQUIVALENT REQUIREMENT OF SECTION 200-1.5.3, "SAND FOR PORTLAND CEMENT CONCRETE", SHALL BE REPLACED WITH THE FOLLOWING:

<u>TESTS</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
SAND EQUIVALENT	CALIF. 217	
INDIVIDUAL TEST		70 MIN.
MOVING AVERAGE		75 MIN.

EVALUATION OF MOVING AVERAGE FOR SAND EQUIVALENT AND CLEANNESS VALUE RESULTS SHALL CONFORM TO THE PROVISIONS OF SECTION 200-1.1.2, "STATISTICAL TESTING".

IN LIEU OF THE PROVISIONS OF SECTION 300-11.3.1, "CONCRETE" FOR CONCRETED (GROUTED) STONE SLOPE PROTECTION (RIPRAP) SHALL BE 650-EFW-3250P.

## SECTION II. GENERAL PROVISIONS

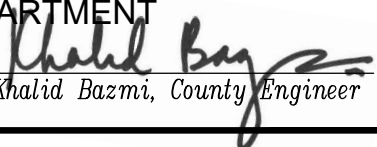
ADD TO SECTION 303-1.2, "SUBGRADE FOR CONCRETE STRUCTURES", OF THE GREENBOOK, THE FOLLOWING: IF THE PLANS AND SPECIFICATIONS FOR THE PROJECT PROVIDE FOR THE CONSTRUCTION OF GRAVEL (DRAIN) MATERIAL, WHICH WILL BE THE SUBGRADE FOR THE CONCRETE, CONTRACTOR SHALL FURNISH NON-WOVEN FILTER FABRIC TYPE I PER OCPW STANDARD PLAN 1808 ON TOP OF THE GRAVEL (DRAIN) MATERIAL AS A SEPARATOR. THE PLACEMENT OF STEEL REINFORCEMENT AND OF CONCRETE SHALL FOLLOW THE INSTALLATION OF THE GEOTEXTILE FABRIC AS CLOSELY AS POSSIBLE. THE GRAVEL (DRAIN) MATERIAL SHALL BE KEPT FREE FROM WATER TO PREVENT ANY PORTION OF CONCRETE MATERIAL BEING DEPOSITED IN WATER.

A RANGE OF LOCALLY AVAILABLE GRADATIONS, D1 THROUGH D5, IS GIVEN IN THE TABLE BELOW FOR SELECTION BY THE DESIGN ENGINEER FOR COMPATIBILITY WITH THE SUBGRADE. IF NO GRADATION OR THICKNESS IS SPECIFIED, THE GRAVEL (DRAIN) SHALL BE 1.0 FOOT THICK AND D3 GRADING.

THE CONTRACTOR SHALL PLACE GRAVEL (DRAIN) MATERIAL UNDER CONCRETE CHANNEL CULVERT INVERTS, PIER EXTENSION AND RETAINING WALL FOOTINGS, AND OTHER LOCATIONS AS SHOWN ON THE PLANS, IN ORDER TO PROVIDE A STABLE SUBGRADE AND TO PERMIT THE FLOW OF GROUNDWATER.

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Approved

  
Khalid Bazmi, County Engineer

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**SPECIAL PROVISION - PORTLAND CEMENT CONCRETE**

THE COMPOSITION OF GRAVEL (DRAIN) MATERIAL SHALL CONFORM TO THE FOLLOWING GRADING REQUIREMENTS WHEN DETERMINED BY CALIFORNIA TEST METHOD 202:

SCREEN OR SIEVE SIZE	D1	D2	D3	D4	D5
3"		100	100	100	100
1 1/2"	100	95-100	90-100	90-100	85-100
1"			65-100		5-60
3/4"	90-100	50-100	50-90	20-60	0-30
3/8"	60-100	15-55	0-50	0-20	0-5
No. 4	5-50	0-25	0-10	0-5	
No. 8	0-10		0-5		
No. 16	0-5				
No. 200		0-3			
APPROXIMATE	(No. 4 ROCK)	(No. 3 & No. 4 1:1)	(No. 3 ROCK)	(No. 2 & No. 3 1:1)	(No. 2 ROCK)

THE APPROXIMATE COMPOSITIONS ARE GIVEN FOR INFORMATION PURPOSES ONLY; THE GRADING LIMITS SPECIFIED ABOVE SHALL CONTROL.

THE CONTRACTOR SHALL EXCAVATE TO THE SUBGRADE DIMENSIONS AND GRADES SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. WHERE POOR SOIL CONDITIONS ARE ENCOUNTERED DUE TO SOFT, SPONGY OR OTHER UNSTABLE MATERIAL OR BY GROUNDWATER, ALL SUCH UNSTABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH GRAVEL (DRAIN) MATERIAL, COMPACTED BACKFILL, AND CONTRACTOR SHALL PLACE A NON-WOVEN FILTER FABRIC TYPE II PER OCPW STANDARD PLAN 1808 BELOW THE GRAVEL (DRAIN) MATERIAL AS A SEPARATOR, AT THE DIRECTION OF THE ENGINEER.

ADD TO SECTION 303-1.3, "FORMS", THE FOLLOWING: TANGENT SECTIONS FOR FORMED WALL SURFACE SHALL RESULT IN CONCRETE SURFACE 1 FREE OF ANY UNEVENNESS GREATER THAN 1/4 INCH WHEN CHECKED WITH A TEN FOOT STRAIGHTEDGE.

FORMS FOR COVERED CONDUIT OR OPEN CHANNEL CURVED SECTIONS SHALL BE CONSTRUCTED ALONG THE ARC OF THE CURVE. THE FINISHED SURFACE SHALL FOLLOW THE ARC OF THE CURVE.

IF PERMITTED BY THE ENGINEER, COVERED CONDUIT CURVED SECTIONS MAY USE CHORD PANEL. ENDS OF THE CHORD PANEL SHALL BE ON THE ARC OF THE CURVE.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

*Khalid Bazmi*  
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SPECIAL PROVISION - PORTLAND CEMENT CONCRETE

ADD TO SECTION 303-1.7.1, "GENERAL", OF THE GREENBOOK, THE FOLLOWING:

REINFORCING STEEL SHALL BE GRADE 60, NEW BILLET STEEL, CONFORMING TO ASTM A615, AND SHALL BE OF THE SAME GRADE THROUGHOUT THE STRUCTURE. ALUMINUM AND PLASTIC SUPPORTS FOR REINFORCEMENT SHALL NOT BE USED. ONLY CONCRETE (DOBIES) STEEL REINFORCEMENT SUPPORTS SHALL BE USED UNLESS OTHERWISE SPECIFIED BY THE ENGINEER.

BARS SHALL BE ACCURATELY SPACED AS SHOWN ON THE PLANS, AND SPACING OF THE FIRST BAR IMMEDIATELY ADJACENT TO A TRANSVERSE CONSTRUCTION JOINT SHALL BE ONE-HALF THE REQUIRED SPACING SHOWN ON THE PLANS. IN NO CASE SHALL THE CLEAR DISTANCE BETWEEN PARALLEL BARS BE LESS THAN 2.5 DIAMETERS OF THE BAR OR A MINIMUM OF TWO INCHES.

UNLESS OTHERWISE SHOWN ON THE PLANS, EMBEDMENT OF REINFORCING STEEL (OTHER THAN STIRRUPS) SHALL BE 1½ INCHES CLEAR FOR #8 BARS AND SMALLER, AND SHALL BE TWO INCHES CLEAR FOR #9 BARS OR LARGER. WHERE PLACEMENT OF REINFORCING STEEL REQUIRES ALTERNATE BARS OF DIFFERENT SIZE, EMBEDMENT REQUIREMENTS SHALL BE GOVERNED BY THE LARGER BAR. STIRRUPS AND SPACERS SHALL BE EMBEDDED NOT LESS THAN ONE INCH CLEAR DEPTH. MEASUREMENT OF EMBEDMENT SHALL BE FROM THE OUTSIDE OF THE BAR TO THE NEAREST CONCRETE FACE.

TACK WELDING OR BUTT WELDING IN REINFORCING BARS WILL NOT BE PERMITTED. HOWEVER, MECHANICAL BUTT SPLICING PER SECTION 52-6.03C(2), "MECHANICAL SPLICES", OF THE CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATION MAY BE ALLOWED AT THE DISCRETION OF THE ENGINEER.

ADD TO SECTION 303-1.7.2, "SPLICING", THE FOLLOWING: REINFORCING BARS MAY BE CONTINUOUS AT LOCATIONS WHERE SPLICES ARE SHOWN ON THE PLANS, AT THE OPTION OF THE CONTRACTOR. THE LOCATION OF SPLICES, EXCEPT WHERE SHOWN ON THE PLANS, SHALL BE DETERMINED BY THE CONTRACTOR AS APPROVED BY THE ENGINEER BASED UPON USING AVAILABLE COMMERCIAL LENGTHS WHERE PRACTICABLE.


UNLESS OTHERWISE SHOWN ON THE PLANS OR APPROVED BY THE ENGINEER, SPLICES IN ADJACENT REINFORCING BARS SHALL BE STAGGERED. THE MINIMUM DISTANCE BETWEEN STAGGERED SPLICES FOR REINFORCING BARS #11 OR SMALLER SHALL BE THE LENGTH REQUIRED FOR A LAPPED SPlice IN THE BAR.

SPLICES SHALL CONSIST OF PLACING THE REINFORCING BARS IN CONTACT AND WIRING THEM TOGETHER IN SUCH A MANNER AS TO MAINTAIN THE ALIGNMENT OF THE BARS AND TO PROVIDE MINIMUM CLEARANCES. THICKNESS GREATER THAN SIX (6) INCHES SHALL BE KEYED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

NO LAPPED SPLICES WILL BE PERMITTED AT LOCATIONS WHERE THE CONCRETE SECTION IS NOT SUFFICIENT TO PROVIDE MINIMUM CLEAR DISTANCE OF TWO INCHES BETWEEN THE SPlice AND THE NEAREST ADJACENT BAR. THE CLEARANCE TO THE SURFACE OF THE CONCRETE SHALL NOT BE REDUCED.

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Khalid Bazmi, County Engineer

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SPECIAL PROVISION - PORTLAND CEMENT CONCRETE

THE LENGTH OF LAPPED SPLICES SHALL BE AS FOLLOWS: REINFORCING BARS #8 OR SMALLER, SHALL BE LAPPED AT LEAST 45 DIAMETERS OF THE SMALLER BAR JOINED, AND REINFORCING BARS #9, #10, AND #11 SHALL BE LAPPED AT LEAST 60 DIAMETERS OF THE SMALLER BAR JOINED, EXCEPT WHEN OTHERWISE SHOWN ON THE PLANS.

WHERE BUNDLED BARS ARE SPECIFIED, SPLICES SHALL CONFORM TO THE FOLLOWING:

1. IN BUNDLES OF TWO BARS, THE LENGTH OF LAPPED SPLICE SHALL BE 1.2 TIMES THE LENGTH OF SINGLE BAR LAPPED SPLICE.
2. IN BUNDLES OF THREE BARS, THE LENGTH OF LAPPED SPLICE SHALL BE 1.33 TIMES THE LENGTH OF SINGLE BAR LAPPED SPLICE.

SPIRAL REINFORCEMENT SHALL BE LAPPED AT LEAST 80 DIAMETERS. SPIRAL REINFORCEMENTS AT SPLICES AND AT ENDS SHALL BE TERMINATED BY A 135 DEGREE HOOK WITH A 10 INCH HOOK AROUND AN INTERSECTING BAR.

SPLICES OF TENSILE REINFORCEMENT AT POINTS OF MAXIMUM STRESS SHALL BE AVOIDED; HOWEVER, ANY PROPOSED DEVIATION FROM SPLICES SHOWN ON THE PLANS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

ADD TO SECTION 303-1.8, "PLACING CONCRETE", THE FOLLOWING:

1. CONCRETE FOR GIRDER SPANS SHALL BE PLACED IN NOT LESS THAN TWO OPERATIONS.
2. THE LAST OPERATION SHALL CONSIST OF PLACING THE TOP DECK SLAB.
3. AT LEAST FIVE DAYS SHALL ELAPSE BETWEEN EACH OPERATION, UNLESS OTHERWISE PERMITTED BY THE ENGINEER.

WHEN CONCRETE IS TO BE DEPOSITED IN A MEMBER LESS THAN 16 INCHES IN WIDTH, THE USE OF DOUBLE BELTING TO PREVENT SEGREGATION OF THE CONCRETE SHALL BE PERMITTED. IN LIEU OF PIPES OR TREMIES, EACH BELT SHALL EXTEND EQUIDISTANT INTO THE FORMS TO A POINT WHERE CONCRETE SHALL NOT FALL MORE THAN SIX FEET. WHEN PLACED IN THE FORMS, THE BELTS SHALL BE ALIGNED DIRECTLY OPPOSITE EACH OTHER.

ADD TO SECTION 303-1.8.6, "JOINTS", THE FOLLOWING:

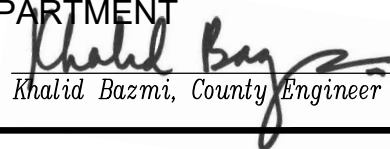
UNLESS OTHERWISE SPECIFIED, TRANSVERSE CONSTRUCTION JOINTS SHALL BE PLACED IN ALL REINFORCED SECTIONS AT INTERVALS OF NOT LESS THAN 10 FEET OR MORE THAN 50 FEET. THE JOINTS SHALL BE IN THE SAME PLANE FOR THE ENTIRE STRUCTURE, AND FOR CONCRETE THICKNESS GREATER THAN 6 INCHES SHALL BE KEYED AS DIRECTED BY THE ENGINEER.

CONSTRUCTION OF ALL REINFORCED CONCRETE SECTIONS (INCLUDING INVERTS) SHALL BE BY THE ALTERNATE PANEL METHOD, AND NO CONTINUOUS PLACEMENT THROUGH JOINTS WILL BE PERMITTED. AFTER PLACEMENT OF ALL CONCRETE IN A PANEL OR A SECTION ON ONE SIDE OF THE JOINT HAS BEEN COMPLETED, PLACEMENT OF CONCRETE ON THE OTHER SIDE OF THE JOINT SHALL BE DELAYED AS DIRECTED BY THE ENGINEER; BUT IN NO EVENT SHALL THE DELAY BE LESS THAN EIGHT HOURS.

IN LIEU OF SAW CUTTING, AS SPECIFIED IN SECTION 201-3 "EXPANSION JOINT FILLER AND JOINT SEALANTS", JOINT SEALANT GROOVES SHALL BE FORMED AS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.

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Khalid Bazmi, County Engineer

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SPECIAL PROVISION - PORTLAND CEMENT CONCRETE

ADD TO SECTION 303-1.9, "SURFACE FINISHES", THE FOLLOWING:

THE LONGITUDINAL AND TRANSVERSE CHANNEL INVERT ELEVATION SHALL NOT VARY FROM TRUE LINE AND GRADE MORE THAN  $\frac{1}{2}$  INCH. THE UNEVENNESS SHALL NOT BE MORE THAN  $\frac{1}{4}$  INCH WHEN CHECKED WITH A 10-FOOT STRAIGHTEDGE. TOP OF CHANNEL WALL AND CHANNEL SIDE SLOPE ELEVATION SHALL NOT VARY FROM TRUE LINE AND GRADE MORE THAN  $\frac{1}{2}$  INCH. UNEVENNESS SHALL NOT BE MORE THAN  $\frac{1}{2}$  INCH WHEN CHECKED WITH A 10-FOOT STRAIGHTEDGE.

ANY SURFACES WHICH FAIL TO CONFORM TO THE ABOVE TOLERANCES SHALL BE GROUND IN ACCORDANCE WITH THE BEST STANDARD PRACTICE UNTIL TOLERANCES ARE MET. GRINDING SHALL NOT REDUCE THE CONCRETE COVER ON REINFORCING STEEL TO LESS THAN  $1\frac{1}{2}$  INCHES. PORTIONS OF INVERTS WHICH CANNOT BE CORRECTED SATISFACTORILY BY GRINDING SHALL BE REMOVED AND REPLACED.

EXCEPT AS SPECIFIED ABOVE, VERTICAL OR HORIZONTAL POSITION OF STRUCTURES AS SHOWN ON THE PLANS OR AS SPECIFIED IN THESE SPECIFICATIONS, SHALL NOT VARY MORE THAN  $\frac{1}{2}$  INCH FROM TRUE POSITION. ELEVATION AT INLET LIPS SHALL NOT VARY MORE THAN  $\frac{1}{4}$  INCH FROM ELEVATIONS SHOWN ON THE PLANS WHEN CHECKED WITH A 10-FOOT STRAIGHTEDGE.

THE 10-FOOT STRAIGHTEDGE OR TEMPLATE SHALL BE FURNISHED BY THE CONTRACTOR AND SHALL BE READILY AVAILABLE PRIOR TO PLACING CONCRETE.

ADD TO SECTION 303-1.9.2, "ORDINARY SURFACE FINISH", THE FOLLOWING:

ORDINARY SURFACE FINISH SHALL NOT APPLY TO ROCK POCKETS WHICH, IN THE OPINION OF THE ENGINEER, ARE OF SUCH AN EXTENT OR CHARACTER AS TO AFFECT THE STRENGTH OF THE STRUCTURE MATERIALLY OR TO ENDANGER THE LIFE OF THE STEEL REINFORCEMENT. IN SUCH CASES, THE ENGINEER MAY DECLARE THE CONCRETE DEFECTIVE AND REQUIRE THE REMOVAL AND REPLACEMENT OF THE PORTION OF THE STRUCTURE AFFECTED.

ADD TO SECTION 303-5.5.1, "GENERAL", THE FOLLOWING:

THE TOP AND FACE OF THE FINISHED CURB SHALL BE TRUE AND STRAIGHT, AND THE TOP SURFACE SHALL BE OF UNIFORM WIDTH, FREE FROM HUMPS, SAGS, OR OTHER IRREGULARITIES. WHEN A 10-FOOT STRAIGHTEDGE IS LED ON THE TOP OR FACE OF THE CURB, OR ON THE SURFACE OF THE GUTTERS, THE SURFACE SHALL NOT VARY MORE THAN 0.01-FOOT FROM THE EDGE OF THE STRAIGHTEDGE, EXCEPT AT GRADE CHANGES OR CURVES.

### SECTION III. REQUIREMENTS FOR SEA WATER OR SULFATE SOILS CONTACT

UNLESS OTHERWISE SHOWN ON THE PLANS OR AS REQUIRED IN THE SPECIAL PROVISIONS, THE MANUFACTURE AND CURING OF PORTLAND CEMENT CONCRETE UNDER THE FOLLOWING CONDITIONS SHALL APPLY:

A PROPOSED MIX DESIGN SHALL BE SUBMITTED TO THE OCPW ENGINEER OR GEOTECHNICAL ENGINEER FOR APPROVAL. THIS MIX DESIGN SHALL HAVE THE FOLLOWING CHARACTERISTICS:

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Approved

  
Khalid Bazmi, County Engineer

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**SPECIAL PROVISION - PORTLAND CEMENT CONCRETE**

A. GENERAL:

1. THE THICKNESS OF CONCRETE OVER THE REINFORCEMENT SHALL BE 3 INCHES WHERE THE CONCRETE IS DEPOSITED AGAINST THE EARTH WITHOUT FORMS, AND 2 INCHES IF FORMED.
2. FORMS SHALL NOT BE REMOVED PRIOR TO 24 HOURS AFTER CONCRETE PLACEMENT AND IN NO EVENT SOONER THAN AS SPECIFIED IN SECTIONS 303-1.4.5, "CHANNELS AND ARCH SECTIONS" AND SECTION 303-1.5, "REMOVAL OF FORMS FOR CAST-IN-PLACE REINFORCED CONCRETE BOX (CIPRCB) SECTIONS".
3. SOIL SULFATE CONTENT SHALL BE DETERMINED BY CALIFORNIA TEST METHOD 417 (1978) MODIFIED TO A 10:1 DILUTION.

B. SEA WATER OR BRACKISH WATER CONTACT:

1. CONCRETE SHALL BE 800-CSE-5000, TYPE V CEMENT.
2. THE CEMENT CONTENT SHALL INCLUDE 20 PERCENT CLASS F FLY ASH.
3. THE WATER:CEMENT RATIO SHALL BE 0.40.
4. THE MIX SHALL CONTAIN REINFORCING FIBERS IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS.

C. MODERATE EXPOSURE SULFATE SOILS CONTACT:

SOLUBLE SO<sub>4</sub> CONTENT OF SOIL FROM 1,500 TO 10,000 PPM :

1. CONCRETE SHALL BE 658-CME-4500P, TYPE V CEMENT
2. A SUBSTITUTION OF 20 PERCENT CLASS F FLY ASH OF THE REQUIRED CEMENT CONTENT SHALL BE MADE
3. THE WATER:CEMENT RATIO SHALL BE 0.45
4. CONCRETE SPECIFIED BY SPECIAL EXPOSURE, TABLE 201-1.1.3, MODERATE EXPOSURE.

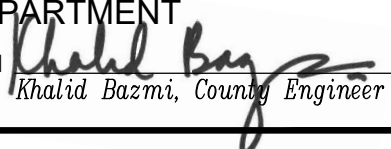
D. SEVERE EXPOSURE SULFATE SOILS CONTACT:

SOLUBLE SO<sub>4</sub> CONTENT OF SOIL THAT EXCEEDS 10,000 PPM:

1. CONCRETE SHALL BE 750-CSE-5000P, TYPE V CEMENT
2. A SUBSTITUTION OF 20 PERCENT CLASS F FLY ASH OF THE REQUIRED CEMENT CONTENT SHALL BE MADE
3. THE WATER:CEMENT RATIO SHALL BE 0.40
4. CONCRETE SPECIFIED BY SPECIAL EXPOSURE, TABLE 201-1.1.3, SEVERE EXPOSURE.

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SPECIAL PROVISION - PORTLAND CEMENT CONCRETE

## SECTION IV. AIR PLACED CONCRETE

AIR-PLACED CONCRETE SHALL COMPLY WITH SECTION 303-2, "AIR-PLACED CONCRETE", AND THESE SPECIAL PROVISIONS. CONCRETE SPECIFIED BY CLASS AND ALTERNATE CLASS, TABLE 201-1.1.2, AIR PLACED CONCRETE, METHOD B. THE CONCRETE CLASS SHALL BE 650-EFW-3250P.

THE STRENGTH OF AIR-PLACED CONCRETE SHALL BE DETERMINED FROM CORES CUT FROM TEST PANELS IN ACCORDANCE WITH THE FOURTH PARAGRAPH OF SECTION 303-2.4, "TESTS."

## SECTION V. RECLAIMED HYDRAULIC CONCRETE

RECLAIMED CONCRETE MATERIAL MAY BE USED IN CONCRETE MIXTURES IN ACCORDANCE WITH THIS SECTION WHEN APPROVED BY THE OCPW ENGINEER OR GEOTECHNICAL ENGINEER. RECLAIMED CONCRETE MATERIAL MAY BE EITHER:

1. RECLAIMED PLASTIC PORTLAND CEMENT CONCRETE (RPPCC)  
OR
2. RECLAIMED NON-PLASTIC PORTLAND CEMENT CONCRETE MATERIALS

THE CONTRACTOR IS REQUIRED TO MAINTAIN SUITABLE EQUIPMENT TO CLASSIFY, DOCUMENT, AND PROPORTION RECLAIMED CONCRETE MATERIAL USED IN CONCRETE MIXTURES. THE ADDITION AND CHARACTERISTICS OF RECLAIMED CONCRETE MATERIAL WILL BE MONITORED IN SUCH A MANNER SO TO ENSURE THAT THE FINAL PORTLAND CEMENT CONCRETE COMPOSITE CONFORMS TO THE SPECIFICATIONS FOR ITS CLASS AND USE. THE OCPW ENGINEER OR GEOTECHNICAL ENGINEER WILL APPROVE ALL NEW OR NEWLY IMPLEMENTED PROCESSES.

THE CONTRACTOR SHALL EVALUATE ALL MIX DESIGNS BY LABORATORY OR FIELD TRIAL BATCHES. EACH TRIAL BATCH SHALL CONFORM TO THE MATERIALS, PROPORTIONS, AND SLUMP AS PROPOSED BY THE MIX DESIGN. WHEN APPROVED BY THE ENGINEER, TRIAL BATCHES MAY BE PLACED IN THE WORK AT DESIGNATED LOCATIONS WHERE CONCRETE OF LOWER QUALITY IS SPECIFIED. CONCRETE SO PLACED WILL BE CONSIDERED FOR THE PURPOSE OF PAYMENT TO BE THE TYPE OF CONCRETE SPECIFIED AT THAT LOCATION. A MINIMUM OF TEN TEST CYLINDERS SHALL BE MOLDED FROM THE TRIAL BATCH AT THE MAXIMUM WATER CONTENT INDICATED BY THE MIX DESIGN. FIVE OF THE CYLINDERS SHALL BE TESTED AT 7 DAYS SO TO ESTABLISH 7-DAY AVERAGE COMPRESSIVE STRENGTH INFORMATION. THE REMAINING FIVE CYLINDERS SHALL BE TESTED AT NO MORE THAN 28 DAYS AFTER MOLDING AND THE AVERAGE COMPRESSIVE STRENGTH OF THE FIVE CYLINDERS FOR FIELD TEST BATCHES SHALL BE AT LEAST 600 PSI GREATER THAN THE SPECIFIED STRENGTH. FOR LABORATORY PREPARED TEST BATCHES THE COMPRESSIVE STRENGTH OF THE FIVE CYLINDERS SHALL BE 1,000 PSI GREATER THAN THE SPECIFIED STRENGTH. THE MINIMUM STRENGTH OF ANY ONE CYLINDER SHALL NOT BE LESS THAN THE SPECIFIED STRENGTH. CHANGES IN SOURCE OF MATERIALS OR ESTABLISHED PROCEDURES MAY REQUIRE NEW TRIAL BATCHES.

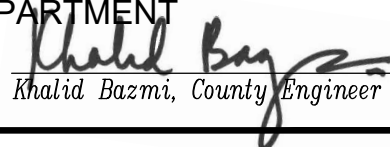
RECLAIMED CONCRETE MATERIAL SHALL NOT BE USED FOR SEA WATER OR SULFATE SOILS CONTACT. MIXTURES ARE NOT NORMALLY RECOMMENDED FOR USE IN PORTLAND CEMENT CONCRETE WHERE ARCHITECTURAL AESTHETICS ARE A CONCERN.

RECLAIMED PLASTIC PORTLAND CEMENT CONCRETE (RPPCC)

A MAXIMUM OF 15 PERCENT BY VOLUME OF RECLAIMED PLASTIC PORTLAND CEMENT CONCRETE CONFORMING TO THIS SECTION MAY BE INCORPORATED INTO FRESH PORTLAND CEMENT CONCRETE. EACH WEIGHMASTER CERTIFICATE SHALL SHOW THE EXACT VOLUME OF RPPCC IN ADDITION TO THE WEIGHMASTER CERTIFICATE REQUIREMENTS OF SECTION 201-1.4.3, "TRANSIT MIXERS".

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**SPECIAL PROVISION - PORTLAND CEMENT CONCRETE**

RPPCC MAY BE ANY UN-HARDENED PORTLAND CEMENT CONCRETE PROVIDED ITS DESIGN STRENGTH IS 2,000 PSI OR GREATER, ITS CONSTITUENT MATERIAL CONFORMS TO SECTION 201-1.2, "MATERIALS", AND IT HAS NOT ATTAINED OR HAS BEEN DELAYED FROM ATTAINING INITIAL SET EITHER BY TIME OR BY THE INCORPORATION OF SET-DELAYING CHEMICAL ADMIXTURES. WHEN SET-DELAYING CHEMICAL ADMIXTURES ARE USED, THEY WILL BE USED AT THE MANUFACTURERS RECOMMENDED DOSAGE RATES AND HAVE A PROVEN HISTORY OF SPECIFICALLY MAINTAINING AND EXTENDING BOTH PLASTICITY AND SET. THE CONTRACTOR WILL MAINTAIN PROCESS DOCUMENTATION, MIX DESIGNS, AND SUPPORTIVE CONCRETE TEST DATA AND SHALL PROVIDE THE INFORMATION TO THE ENGINEER UPON REQUEST.

RPPCC WILL BE PROPORTIONED BY VOLUME IN ACCORDANCE WITH SECTION 201-1.3, "PROPORTIONING", RPPCC MAY BE ADDED AT ANY POINT DURING THE PROPORTIONING PROCESS THAT RESULTS IN A CONSISTENT, UNIFORM, AND HOMOGENEOUS FINAL PRODUCT. FOR DESIGN AND PROPORTIONING PURPOSES, ALL RPPCC WILL BE CONSIDERED AS A 2,000 PSI MIXTURE, CONSISTING OF 470 POUNDS OF CEMENTITIOUS MATERIAL. ADDITIONAL PORTLAND CEMENT WILL BE ADDED TO ACHIEVE THE MINIMUM PORTLAND CEMENT CONTENT AND/OR STRENGTH AS REQUIRED FOR A MIXTURE'S CLASS AND USE. THE QUANTITY AND/OR CONSTITUENT MATERIALS OF THE RPPCC SHALL BE MONITORED AND PROPORTIONED SUCH THAT THE FINAL PORTLAND CEMENT CONCRETE GRADATION CONFORMS TO THE REQUIREMENTS OF SECTION 201-1.3.2, "COMBINED AGGREGATE GRADINGS".

#### RECLAIMED NON-PLASTIC PORTLAND CEMENT CONCRETE MATERIALS

NON-PLASTIC PORTLAND CEMENT CONCRETE MATERIALS SHALL CONSIST OF AN INDIVIDUAL AMOUNT OF OR A COMBINATION OF MATERIALS RESULTING FROM THE RECLAIMING OF PORTLAND CEMENT CONCRETE. BEFORE RECLAMATION, THESE MATERIALS SHALL CONFORM TO SECTION 201-1.2, "MATERIALS". THE RECLAIMED MATERIALS SHALL BE DESIGNATED AS EITHER RECLAIMED AGGREGATES (RA) OR RECLAIMED WATER (RW).

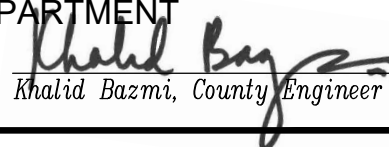
A MAXIMUM OF 30 PERCENT RA BY WEIGHT OF TOTAL AGGREGATE MAY BE INCORPORATED GRADED PORTLAND CEMENT CONCRETE AND/OR RECLAIMED, NATURALLY OCCURRING MINERAL AGGREGATES. RECLAIMED NATURALLY OCCURRING MINERAL AGGREGATES MAY CONTAIN MINOR RESIDUAL AMOUNTS OF PORTLAND CEMENT CONCRETE COMPONENTS AS A RESULT OF RECLAMATION. WHEN CRUSHED PORTLAND CEMENT CONCRETE IS USED AS RA, IT SHALL, WHEN COMBINED WITH NON-RECLAIMED AGGREGATES AT THE PROPOSED PERCENTAGE OF USE CONFORM TO SECTION 201-1.2.2, "AGGREGATES", AND THESE SPECIAL PROVISIONS. WHEN LESS THAN 15 PERCENT RA BY WEIGHT OF TOTAL AGGREGATE IS USED, THE REQUIREMENTS OF SECTION 201-1.2.2, "AGGREGATES", MAY BE WAIVED PROVIDED THE FINAL PORTLAND CEMENT CONCRETE GRADATION CONFORMS TO THE REQUIREMENTS OF SECTION 201-1.3.2, "COMBINED AGGREGATE GRADINGS".

A MAXIMUM OF 35 PERCENT RW BY WEIGHT OF BATCH WATER MAY BE INCORPORATED INTO FRESH PORTLAND CEMENT CONCRETE. RW MAY CONSIST OF NON-DELETERIOUS AMOUNTS OF HYDRATED AND UN-HYDRATED PORTLAND CEMENT, ADMIXTURES, MINOR AMOUNTS OF FLY ASH AND FINE AGGREGATE. THE RECLAMATION PROCESS FOR RW SHALL INCLUDE A MECHANISM TO ENSURE UNIFORMITY AND HOMOGENEITY OF THE RW.

RA AND RW WILL BE PROPORTIONED BY WEIGHT IN ACCORDANCE WITH SECTION 201-1.3, "PROPORTIONING". RA AND RW MAY BE ADDED AT ANY POINT DURING THE PROPORTIONING PROCESS THAT RESULTS IN A CONSISTENT, UNIFORM, AND HOMOGENEOUS FINAL PRODUCT.

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**SPECIAL PROVISION - PORTLAND CEMENT CONCRETE**



## SECTION I. MATERIALS

UNTREATED BASE MATERIALS SHALL MEET THE REQUIREMENTS OF SECTION 200-2, "UNTREATED BASE MATERIALS", AND THESE SPECIAL PROVISIONS.

IN LIEU OF THE SECOND SENTENCE OF SECTION 200-2.5.1, "GENERAL", AT LEAST 65 PERCENT, BY WEIGHT, OF THE MATERIAL RETAINED ON THE NO. 4 SIEVE SHALL BE CRUSHED PARTICLES AS DETERMINED BY CALIFORNIA TEST METHOD 205.

EVALUATION OF GRADATION AND SAND EQUIVALENT TEST RESULTS SHALL CONFORM TO THE PROVISIONS OF SECTION 200-2.1, "GENERAL". THE GRADATION AND SAND EQUIVALENT REQUIREMENTS OF SECTIONS 200-2.2, "CRUSHED AGGREGATE BASE", 200-2.4, "CRUSHED MISCELLANEOUS BASE", 200-2.5, "PROCESSED MISCELLANEOUS BASE", AND 200-2.6, "SELECT SUBBASE", SHALL BE THE MOVING AVERAGE REQUIREMENTS. INDIVIDUAL TEST REQUIREMENTS FOR GRADATION AND SAND EQUIVALENT SHALL BE AS DETERMINED BY THE OCPW MATERIALS LABORATORY.

## SECTION II. GENERAL PROVISIONS

ADD TO SECTION 301-2.1, "GENERAL", THE FOLLOWING: UNTREATED BASE MATERIAL FOR PAVEMENT, CROSS GUTTERS, SPANDRELS AND SIMILAR TYPES OF IMPROVEMENTS, SHALL BE CONSTRUCTED OF MATERIAL AS SPECIFIED HEREIN.

THE MATERIAL GRADING SHALL BE EITHER COARSE OR FINE AS SPECIFIED IN SECTION 200-2.5.2, "GRADING", OF THE GREENBOOK, AT THE OPTION OF THE CONTRACTOR. CHANGES FROM ONE GRADING TO ANOTHER SHALL NOT BE MADE DURING THE PROGRESS OF THE WORK, UNLESS PERMITTED BY THE ENGINEER.

REVISE SECTION 301-2.2, "SPREADING", AS FOLLOWS:

DELETE THE LAST TWO SENTENCES IN PARAGRAPH 2 AND ADD THE FOLLOWING:

1. AT THE TIME UNTREATED BASE MATERIAL IS SPREAD, IT MAY HAVE A MOISTURE CONTENT SUFFICIENT TO OBTAIN THE REQUIRED COMPACTION. SUCH MOISTURE SHALL BE UNIFORMLY DISTRIBUTED THROUGHOUT THE MATERIAL.
2. TAILGATE SPREADING BY DUMP TRUCKS WILL NOT BE PERMITTED EXCEPT FOR SPOT DUMPING AND IN AREAS NOT READILY ACCESSIBLE TO SPREADING EQUIPMENT.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

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SPECIAL PROVISIONS-UNTREATED BASE MATERIALS

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## SECTION I. MATERIALS

ASPHALT CONCRETE (AC) SHALL MEET THE REQUIREMENTS OF SECTION 203-6, "ASPHALT CONCRETE", OF THE GREENBOOK AND THESE SPECIAL PROVISIONS. COARSE AGGREGATE SHALL CONSIST OF MATERIAL OF WHICH AT LEAST 75 PERCENT BY WEIGHT SHALL BE CRUSHED PARTICLES IN LIEU OF THE REQUIREMENTS OF SECTION 203-6.2, "MATERIALS".

THE PERFORMANCE GRADE OF PAVING ASPHALT SHALL BE PG 64-10 OR PG 70-10 AS DETERMINED BY THE ENGINEER. COPIES OF TEST REPORTS ON PAVING GRADE ASPHALT, AS DEFINED BY SECTION 203-1.3, "TEST REPORTS AND CERTIFICATION", SHALL BE AVAILABLE FOR EACH SHIPMENT.

PROPOSED ASPHALT CONCRETE JOB MIX FORMULA(S) SHALL BE DETERMINED BY CALIFORNIA TEST METHOD 367, METHOD OF TEST FOR DETERMINING OPTIMUM BITUMEN CONTENT. JOB MIX FORMULAS AND SUPPORTING CALIFORNIA TEST METHOD 367 TEST DATA SHALL BE SUBMITTED TO THE OCPW ENGINEER OR GEOTECHNICAL ENGINEER FOR APPROVAL ANNUALLY IN JANUARY UNLESS OTHERWISE APPROVED BY THE OCPW MATERIALS LABORATORY. IN NO CASE SHALL THE JOB MIX FORMULA, AND ITS SUPPORTING TEST DATA, BE MORE THAN TWO YEARS OLD. THE AGGREGATES USED FOR DETERMINING THE PROPOSED JOB MIX FORMULAS SHALL BE FROM THE SAME SOURCE AS WILL BE USED IN ACTUAL PRODUCTION. CHANGES IN AGGREGATE SOURCE, PAVING ASPHALT SOURCE OR PERFORMANCE GRADE SHALL NOT BE PERMITTED UNLESS A PRE-APPROVED JOB MIX FORMULA FOR THE CHANGED AGGREGATE OR PAVING ASPHALT SOURCE(S) IS ON FILE WITH THE OCPW. SUBMITTALS OF ALL JOB MIX FORMULAS FOR APPROVAL SHALL BE MADE AT LEAST 20 DAYS PRIOR TO INTENDED USE.

AS A GENERAL GUIDELINE THE REQUIRED GRADATION FOR ORANGE COUNTY ASPHALT CONCRETE MIX DESIGNS WILL BE AS FOLLOWS:

### ARTERIAL HIGHWAYS

$\frac{1}{2}$ " (III-C2-PG 64-10) SURFACE COURSE  
 $\frac{3}{4}$ " (III-B3-PG 64-10) SURFACE COURSE\*  
 $\frac{3}{4}$ " (III-B2-PG 64-10) BASE COURSE

### BIKE TRAIL (OFF ROAD)

$\frac{3}{8}$ " (III-D-PG 64-10) SURFACE COURSE\*  
 $\frac{1}{2}$ " (III-C3-PG 64-10) BASE AND SURFACE COURSE

### NON-ARTERIAL STREETS

$\frac{1}{2}$ " (III-C2-PG 64-10) SURFACE COURSE  
 $\frac{3}{4}$ " (III-B3-PG 64-10) BASE COURSE

### ASPHALT CONCRETE DIKES

$\frac{3}{8}$ " (III-D-PG 70-10) SURFACE COURSE MIX WITH ONE PERCENT ADDITIONAL BINDER IN A MIX DESIGN APPROVED BY OC PUBLIC WORKS MATERIALS LABORATORY

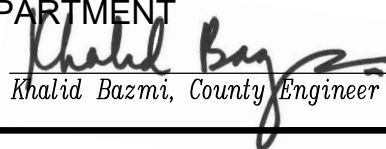
\* USE ONLY WHEN REQUIRED BY THE ENGINEER.

ASPHALT CONCRETE LOAD TICKETS SHALL CLEARLY SHOW THE MIX DESIGNATION FOR THE APPROVED JOB MIX FORMULA

THE GRADATION FOR THE PROJECT ASPHALT CONCRETE JOB MIX FORMULA SHALL BE WITHIN THE SPECIFICATION RANGE AS SET FORTH IN SECTION 203-6, "ASPHALT CONCRETE", AND TABLE 203-6.5.4(A). DEVIATIONS FROM THE APPROVED PERCENTAGE PASSING EACH APPLICABLE JOB MIX FORMULA SIEVE SIZE SHALL BE LIMITED TO FOLLOWING AND IN NO CASE SHALL THE SUM OF THE ABSOLUTE VALUES OF THE DEVIATIONS EXCEED 15:

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**SPECIAL PROVISIONS - ASPHALT CONCRETE**

ACCEPTABLE DEVIATION FROM JOB MIX FORMULA

SIEVE	ACCEPTABLE DEVIATION
1"	±3%
¾"	±5%
⅜"	±6%
No. 4	±6%
No. 8	±5%
No. 30	±5%
No. 200	±3%

DELETE THE THIRD SENTENCE OF SECTION 203-6.11. "ACCEPTANCE". AND ADD THE FOLLOWING:  
THE ASPHALT BINDER CONTENT SHALL BE WITHIN 0.4 PERCENT ABOVE OR BELOW THE TARGET BINDER RATIO (OPTIMUM BITUMEN CONTENT) IN THE APPROVED MIX DESIGN.

ASPHALT CONCRETE SUPPLIERS SHALL MAINTAIN RECORDS OF EACH AGGREGATE AND ASPHALT PAVING SHIPMENT RECEIVED. PAVING ASPHALT RECORDS SHALL INCLUDE PERFORMANCE GRADE TEST DATA. THESE RECORDS SHALL BE MAINTAINED CURRENT AND BE READILY ACCESSIBLE TO THE ENGINEER AT THE PLANT SITE UPON REQUEST. THE RECORDS SHALL INCLUDE BUT NOT BE LIMITED TO: AGGREGATE OR PAVING ASPHALT SOURCE OF ORIGIN, LOCATION RECEIVED AND THE DATE SHIPPED.

THE SAND EQUIVALENT AND STABILOMETER-VALUE (S-VALUE) REQUIREMENTS OF SECTION 203-6.5, "TYPE III ASPHALT CONCRETE MIXTURES", SHALL BE THE MOVING AVERAGE REQUIREMENTS. INDIVIDUAL TEST REQUIREMENTS FOR SAND EQUIVALENT AND S-VALUE SHALL BE AS DETERMINED BY THE OCPW MATERIALS LABORATORY.

## SECTION II. GENERAL PROVISIONS

ADD TO SECTION 302-5.1, "GENERAL", THE FOLLOWING: THE COMBINED AGGREGATE GRADING FOR ASPHALT CONCRETE PLACED ON MISCELLANEOUS AREAS SHALL CONFORM TO THE GRADATION FOR THE ASPHALT CONCRETE PLACED ON THE TRAVELED WAY, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. THE AMOUNT OF ASPHALT BINDER USED IN THE ASPHALT CONCRETE PLACED IN GUTTER, GUTTER FLARES, OVERSIDE DRAINS, AND APRONS AT THE ENDS OF DRAINAGE STRUCTURES, UNLESS OTHERWISE DIRECTED BY THE ENGINEER, SHALL BE INCREASED ONE PERCENT BY WEIGHT OF THE AGGREGATE OVER THE AMOUNT OF ASPHALT BINDER USED IN THE ASPHALT CONCRETE PLACED ON THE TRAVELED WAY.

THE ASPHALT CONCRETE TO BE PLACED IN AREAS WHICH ARE DESIGNATED ON THE PLANS AS MISCELLANEOUS AREAS MAY BE SPREAD IN ONE LAYER. THE MATERIAL SHALL BE COMPACTED TO THE REQUIRED LINES, GRADES AND CROSS-SECTIONS.

DIKES SHALL BE SHAPED AND COMPACTED WITH AN EXTRUSION MACHINE OR OTHER EQUIPMENT CAPABLE OF SHAPING AND COMPACTING THE MATERIAL TO THE REQUIRED CROSS-SECTIONS.

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**SPECIAL PROVISIONS - ASPHALT CONCRETE**

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IN ADVANCE OF PLACING ASPHALT CONCRETE DIKE ON ASPHALT SURFACING, THE SURFACE SHALL BE BROOMED CLEAN OF ALL LOOSE AND EXTRANEIOUS MATERIAL AND A TACK COAT SHALL BE APPLIED.

IF THE FINISHED SURFACE OF THE ASPHALT CONCRETE ON THE TRAFFIC LANES DOES NOT MEET THE SPECIFIED SURFACE TOLERANCES, IT SHALL BE BROUGHT WITHIN TOLERANCES BY EITHER: (1) ABRASIVE GRINDING AND GROOVING (FOLLOWED BY FOG SEAL ON THE AREAS WHICH HAVE BEEN GROUND), (2) PLACING AN OVERLAY OF ASPHALT CONCRETE, OR (3) REMOVAL AND REPLACEMENT. THE METHOD SHALL BE SELECTED BY THE ENGINEER.

DELETE SECTION 302-5.3, "PRIME COAT", AND SUBSTITUTE THE FOLLOWING: WHEN SPECIFIED OR REQUIRED BY THE PROJECT PLANS, SPECIAL PROVISIONS, OR AS DIRECTED BY THE ENGINEER, A PRIME COAT CONSISTING OF GRADE SC-70 OR SC-250 LIQUID ASPHALT SHALL BE APPLIED TO THE SURFACE OF THE PREPARED BASE OR SUBBASE PRIOR TO PLACING ASPHALT CONCRETE AT THE RATE BETWEEN 0.10 AND 0.25 GALLON PER SQUARE YARD.

MODIFY SECTION 302-5.4, "TACK COAT", AS FOLLOWS: A TACK COAT OF SS-1H TYPE EMULSIFIED ASPHALT, WHERE STIPULATED ON THE PLANS AND SPECIFICATIONS OR REQUIRED BY THE ENGINEER, SHALL BE APPLIED IN ACCORDANCE WITH SECTION 302-5.4, "TACK COAT", MAY BE USED ONLY WHEN APPROVED BY THE ENGINEER. PAVING ASPHALT WHEN, APPROVED, SHALL BE SPREAD IN ACCORDANCE WITH PREVISIONS OF SECTION 203-1, "PAVING ASPHALT".

ADD TO SECTION 302-5.5, "DISTRIBUTION AND SPREADING", THE FOLLOWING: TARPAULINS SHALL BE USED TO COVER ALL LOADS, WHEN DIRECTED BY THE ENGINEER.

UNLESS OTHERWISE PERMITTED BY THE ENGINEER, THE TOP LAYER OF ASPHALT CONCRETE FOR SHOULDERS, TAPERS, TRANSITIONS, ROAD CONNECTIONS, PRIVATE DRIVES, CURVE WIDENINGS, TURNOUTS LEFT TURN POCKETS AND OTHER SUCH AREAS, SHALL NOT BE SPREAD BEFORE THE TOP LAYER OF ASPHALT CONCRETE FOR THE ADJOINING THROUGH LANE HAS BEEN SPREAD AND COMPACTED. AT LOCATIONS WHERE THE NUMBER OF LANES ARE CHANGED, THE TOP LAYER FOR THE THROUGH LANE SHALL BE PAVED FIRST. TRACKS OR WHEELS OF SPREADING EQUIPMENT SHALL NOT BE OPERATED ON THE TOP LAYER OF ASPHALT CONCRETE IN ANY AREA UNTIL FINAL COMPACTION HAS BEEN COMPLETED OR UNLESS DIRECTED BY THE ENGINEER.


UNLESS OTHERWISE SPECIFIED IN THE APPROVED PAVEMENT DESIGN REPORT, THE TOP LAYER OF ASPHALT CONCRETE SHALL NOT EXCEED 0.20-FOOT IN COMPACTED THICKNESS. EACH LANE OF THE TOP LAYER, ONCE COMMENCED, SHALL BE PLACED WITHOUT INTERRUPTION.

UNLESS SPECIFICALLY PROVIDED FOR IN THE SPECIAL PROVISIONS, BOTTOM DUMPS SHALL NOT BE USED IN THE PAVING OPERATION FOR TOP LAYER PAVING OF ASPHALT CONCRETE ON ARTERIAL HIGHWAYS.

ALL SCREED EXTENSIONS FOR PAVING MACHINES SHALL BE PROVIDED WITH A TAMPER, ROLLER OR OTHER SUITABLE COMPACTING DEVICES.

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Approved

  
Khalid Bazmi, County Engineer

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SPECIAL PROVISIONS - ASPHALT CONCRETE

UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE PAVING MACHINES SHALL HAVE A SUITABLE OPERATIONAL JOINT COMPACTING DEVICE IN PLACE AND USE WHEN PLACING THE TOP LAYER OF ASPHALT CONCRETE ON ARTERIAL HIGHWAYS.

ADD TO SECTION 302-5.6, "ROLLING", THE FOLLOWING: THREE-WHEELED ROLLERS AS SPECIFIED IN SECTION 302-5.6.1 "GENERAL", SHALL NOT BE PERMITTED. PNEUMATIC ROLLERS SHALL BE REQUIRED ON LOWER LAYERS ONLY. PNEUMATIC ROLLERS MAY BE USED FOR INTERMEDIATE ROLLING ON FINISH COURSE PAVING FOR ARTERIAL HIGHWAYS WITH THE APPROVAL OF THE ENGINEER.

FOR SUBDIVISION AND PERMIT WORK WITHIN THE COUNTY, THE FINAL OR SURFACE LAYER OF THE ASPHALT CONCRETE SHALL NOT BE PLACED UNTIL ALL ON-SITE IMPROVEMENTS HAVE BEEN COMPLETED, INCLUDING ALL GRADING AND UNTIL ALL UNACCEPTABLE CONCRETE IS REMOVED AND REPLACED AT THE DIRECTION OF THE ENGINEER.

ALL MANHOLE, VALVE AND VAULT COVERS SHALL BE FINISHED  $\frac{1}{4}$  INCH BELOW FINISHED GRADE.

WHEN SPECIFIED OR DIRECTED BY THE ENGINEER, A FOG SEAL OF SS-1H OR CSS-1H TYPE EMULSIFIED ASPHALT SHALL BE APPLIED TO THE FINISHED SURFACE OF ASPHALT CONCRETE PAVEMENT AT A RATE OF 0.05 TO 0.10 GALLON PER SQUARE YARD AS DETERMINED BY THE ENGINEER. ADDITIONAL WATER SHALL BE ADDED TO THE MATERIAL AND MIXED THEREWITH IN SUCH A PROPORTION THAT THE RESULTING MIXTURE WILL CONTAIN NOT MORE THAN 50 PERCENT OF THE ADDED WATER, THE EXACT QUANTITY OF ADDED WATER SHALL BE DETERMINED BY THE ENGINEER. THE RATE OF APPLICATION OF THE RESULTING MIXTURE SHALL BE THAT THE UNDILUTED EMULSION WILL BE SPREAD AT THE SPECIFIED RATE. PRIOR TO PLACEMENT OF THE FOG SEAL, ALL DIRT, MUD, TRASH, OR OTHER LOOSE MATERIAL SHALL BE CLEANED FROM THE AREA TO BE COVERED. ALL ASPHALT CONCRETE PAVING IN LOCAL AND PRIVATE STREETS SHALL REQUIRE A FOG SEAL.

### SECTION III. DEEP LIFT PAVING

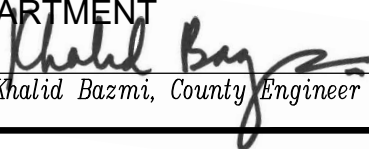
IN ADDITION TO THE PROVISIONS OF SECTIONS I AND II FOR ASPHALT CONCRETE PAVEMENT, THE FOLLOWING PROVISIONS SHALL BE ADHERED TO WHEN CONSTRUCTING ASPHALT CONCRETE PAVEMENT, DEEP LIFT SECTION, WHERE SHOWN ON THE PLANS OR SPECIFIED BY THE ENGINEER.

ASPHALT CONCRETE BASE SHALL BE SPREAD AT A TEMPERATURE OF NOT LESS THAN 230°F NOR MORE THAN 300°F UNLESS A HIGHER TEMPERATURE IS ORDERED BY THE ENGINEER AND SHALL BE SPREAD AND COMPACTED IN LAYERS NOT TO EXCEED 0.50-FOOT IN COMPACTED THICKNESS. WHEN MORE THAN ONE LAYER OF BASE COURSE IS REQUIRED, THE LAYERS SHALL BE OF EQUAL THICKNESS. THE FOLLOWING SHALL APPLY TO SPREADING:

1. EACH LAYER SHALL BE SPREAD WITH AN APPROVED SPREADING DEVICE WHICH WILL DEPOSIT A UNIFORM LAYER FOR MINIMUM OF ONE TRAFFIC LANE WIDTH. A MOTOR GRADER SHALL NOT BE USED AS THE SPREADING DEVICE.
2. THE MINIMUM TEMPERATURE OF ASPHALT CONCRETE FOR COMPLETION OF THE INITIAL BREAKDOWN COMPACTION SHALL BE 225°F.
3. INITIAL OR BREAKDOWN COMPACTION SHALL BE PERFORMED WITH TWO-OR-THREE-AXLE TANDEM ROLLER WITH A MASS OF NO LESS THAN 12 TONS.

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**SPECIAL PROVISIONS - ASPHALT CONCRETE**

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4. FOR COUNTY-FUNDED CONSTRUCTION CONTRACTS, THE INITIAL OR BREAKDOWN ROLLING SHALL BE IMMEDIATELY FOLLOWED BY A MOTOR GRADER WITH ADDITIONAL MATERIAL TO LEVEL IRREGULARITIES AND PROVIDE A UNIFORM SURFACE FOR SUBSEQUENT LAYERS. ADDITIONAL ROLLING SHALL PROCEED DIRECTLY BEHIND THE MOTOR GRADERS WITH A PNEUMATIC-TIRED ROLLER WHILE THE TEMPERATURE OF THE ASPHALT CONCRETE IS ABOVE 180°F.
5. FOR SUBDIVISION AND PERMIT WORK WITHIN THE COUNTY, WHEN THREE OR MORE COURSES ARE REQUIRED, DEPTHS OF THE NEXT COURSE SHALL BE PAINTED FOR THE TOP TWO COURSES AT INTERVALS NOT TO EXCEED 50 FEET AS DIRECTED BY THE ENGINEER.
6. THE SUBSEQUENT LAYERS OF ASPHALT CONCRETE SHALL NOT BE SPREAD WHEN THE UNDERLYING LAYER IS ABOVE 150°F.

#### SECTION IV. BIKE TRAIL PAVING

THE AMOUNT OF ASPHALT BINDER USED IN THE ASPHALT CONCRETE PLACED FOR OFF ROAD BIKE TRAIL PAVING SHALL BE INCREASED ONE PERCENT BY MASS OF THE AGGREGATE OVER THE AMOUNT OF THE ASPHALT BINDER USED IN THE ASPHALT CONCRETE IF PLACED AS ROADWAY PAVING.

\*ASPHALT CONCRETE PAVEMENT FOR THE BIKE TRAIL MAY BE PLACED IN ONE LIFT BY A SELF-PROPELLED MACHINE. ALL OTHER PROVISIONS OF SECTION I AND II SHALL APPLY.

- \* S-VALUE REQUIREMENTS WILL BE DETERMINED BY THE OCPW ENGINEER OR GEOTECHNICAL ENGINEER.

#### SECTION V. RUBBERIZED ASPHALT GAP GRADED MIXES

PROPOSED JOB MIX FORMULAS SHALL BE ESTABLISHED BY CALIFORNIA TEST METHOD 367, METHOD OF TEST FOR DETERMINING OPTIMUM BITUMEN CONTENT AS SET FORTH IN SECTION I HEREIN. AGGREGATE GRADATIONS, BINDER AND RUBBER CONTENT SHALL BE AS GENERALLY SET FORTH IN THE GREENBOOK.

#### SECTION VI. POROUS ASPHALT CONCRETE

POROUS ASPHALT CONCRETE MATERIAL SHALL MEET THE REQUIREMENT OF SECTION 203, "BITUMINOUS MATERIALS", SECTION 302, "ROADWAY SURFACING", AND THESE SPECIAL PROVISIONS.

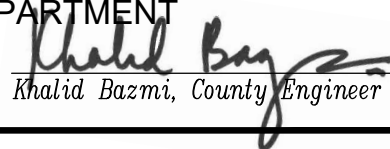
POROUS ASPHALT CONCRETE SHALL BE THE PRODUCT OF MIXING OPEN-GRADED MINERAL AGGREGATE WITH PAVING ASPHALT AT A CENTRAL MIXING PLANT TO YIELD A NON-STRUCTURAL MATERIAL INTENDED FOR AREAS WHICH CAN BE EFFECTIVELY RESTRICTED FROM HEAVY LOADING AND HIGH TRAFFIC VOLUMES.

#### SECTION VII. WARM MIX ASPHALT CONCRETE

WARM MIX ASPHALT CONCRETE MATERIAL SHALL MEET THE REQUIREMENTS OF THESE SPECIAL PROVISIONS.

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Khalid Bazmi, County Engineer

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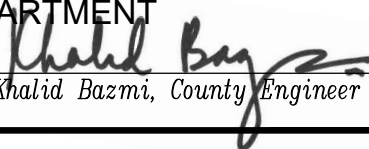
**SPECIAL PROVISIONS - ASPHALT CONCRETE**

WHEN USING WARM MIX ASPHALT (WMA) TECHNOLOGIES, THE MINIMUM TEMPERATURE OF THE COMPLETE PAVING ASPHALT MIXTURE MAY BE LOWERED TO 121°C (250°F). THE ASPHALT PLANT IS TO BE EQUIPPED WITH THE PROPER EQUIPMENT TO MAKE WARM MIX ASPHALT CONCRETE BY EITHER THE FOAMING, CHEMICAL ADDITIVE, OR ORGANIC ADDITIVE (WAX) METHODS. FOR ALL THE ABOVE WMA METHODS, PAVING ASPHALT CONCRETE MAY BE PRODUCED AT 121°C TO 143°C (250°F TO 290°F) AND THE PRODUCTION TEMPERATURE WILL BE DEPENDENT ON ASPHALT BINDER GRADE. THE TEMPERATURE OF WINDROW WARM MIX ASPHALT SHALL NOT FALL BELOW 118°C (245°F).

IN PLACE COMPACTION OF WARM MIX ASPHALT CONCRETE MAY BE PERFORMED AT TEMPERATURES BELOW THOSE EMPLOYED FOR CONVENTIONAL HOT MIX ASPHALT CONCRETE AND SHOULD BE COMPLETED BEFORE THE IN PLACE WMA TEMPERATURE REACHES 66°C (150°F). WMA SHALL NOT BE PLACED UNLESS THE ATMOSPHERIC TEMPERATURE IS AT LEAST 10°C (50°F) AND RISING OR DURING UNSUITABLE WEATHER.

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SPECIAL PROVISIONS - ASPHALT CONCRETE

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## SECTION I.      STRUCTURAL EXCAVATION AND BACKFILL

DELETE THE THIRD PARAGRAPH IN SECTION 300-3.3, "FOUNDATION MATERIAL TREATMENT" OF THE GREENBOOK, BEGINNING "WHERE THE ORIGINAL..." AND SUBSTITUTE THE FOLLOWING:

RELATIVE COMPACTION OF NOT LESS THAN 95 PERCENT SHALL BE OBTAINED FOR EMBANKMENT UNDER BRIDGE AND RETAINING WALL FOOTINGS WITHOUT PILE FOUNDATIONS WITHIN THE LIMITS ESTABLISHED BY INCLINED PLANES SLOPING 1.5 HORIZONTAL TO 1 VERTICAL OUT AND DOWN FROM LINES ONE FOOT OUTSIDE THE BOTTOM EDGES OF THE FOOTING:

ADD TO SECTION 300-3.5, "STRUCTURE BACKFILL", THE FOLLOWING PARAGRAPHS:

BACKFILL AT BRIDGE ABUTMENTS SHALL HAVE A RELATIVE COMPACTION REQUIREMENT OF NOT LESS THAN 95 PERCENT.

COMPACTION EQUIPMENT OR METHODS WHICH MAY CAUSE EXCESSIVE DISPLACEMENT OR MAY DAMAGE STRUCTURES, SUCH AS SLEEVE TAMPERS (STOMPERS), SHALL NOT BE USED.

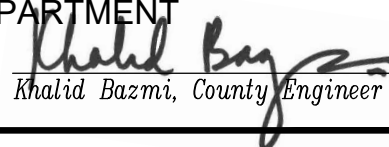
## SECTION I.      SUBGRADE TOLERANCES

SECTION 301-1.4, "SUBGRADE TOLERANCES", SHALL BE DELETED, AND THE FOLLOWING SHALL BE ADDED:

SUBGRADE FOR PAVEMENT, SIDEWALK, CURB AND GUTTER, DRIVEWAYS, OR OTHER ROADWAY STRUCTURES SHALL NOT VARY MORE THAN 0.05 FOOT FROM THE SPECIFIED GRADE AND CROSS SECTION. SUBGRADE FOR SUBBASE OR BASE MATERIALS SHALL NOT VARY MORE THAN 0.10 FOOT FROM THE SPECIFIED GRADE AND CROSS SECTION. VARIATIONS WITHIN THE ABOVE-SPECIFIED TOLERANCES SHALL BE COMPENSATING SO THAT THE AVERAGE GRADE AND CROSS-SECTION SPECIFIED ARE MET.

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SPECIAL PROVISIONS - EARTHWORK

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## PATTERN-STAMPED MEDIAN PAVING

CONCRETE MEDIAN PAVEMENT SHALL BE IMPRINTED WITH THE BOMANITE COBBLESTONE PATTERN (WITHOUT GROUT) OR AN APPROVED EQUIVALENT.

IMPRINTING OF THE CONCRETE SHALL BE DONE IN A UNIFORM MANNER WITH DEPTH AND WIDTH OF IMPRINT BEING 1/2-INCH, HAVING NO MORE THAN 1/8-INCH VARIANCE FROM ONE AREA TO ANOTHER. IMPRINT VALLEYS SHALL BE FREE FROM RIDGES.

COLORS HARDENER SHALL BE TERRA COTTA (A-29) "LITHOCHROME COLOR HARDENER" AS MANUFACTURED BY L.M. SCOFIELD COMPANY, LOS ANGELES, CALIFORNIA OR AN APPROVED EQUIVALENT. THE MINIMUM RATE OF APPLICATION OF THE HARDENER SHALL BE 60 POUNDS PER 100 SQUARE FEET.

COLORWAX CURING AND FINISHING COMPOUND SHALL BE TERRA COTTA "LITHOCHROME COLOR-WAX" AS MANUFACTURED BY L.M. SCOFIELD COMPANY, LOS ANGELES, CALIFORNIA, OR AN APPROVED EQUIVALENT. MINIMUM APPLICATION COVERAGE SHALL BE 600 SQUARE FEET PER GALLON OF UNTHINNED COLORWAX.

FINAL COLOR APPEARANCE SHALL BE UNIFORM THROUGHOUT THE ENTIRE SURFACE AREA. ALL SURFACES THAT ARE NOT UNIFORM IN COLOR AND SURFACE TEXTURE WILL BE REJECTED.

## INTERLOCKING CONCRETE PAVERS

GENERALLY THE INSTALLATION SHOULD BE BASED ON THE MANUFACTURER SPECIFICATIONS OR GUIDELINES.

INTERLOCKING CONCRETE PAVERS SHALL CONFORM TO ASTM C1634 AND SHALL BE GRADE N-1. PAVERS SHALL BE NORMAL WEIGHT CLASSIFICATION AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI, AND SHALL BE OF THE SIZE AND SHAPE INDICATED ON THE PLANS. THE COLOR OF THE PAVERS SHALL BE TERRA COTTA OR ENGINEER APPROVED EQUAL. TWO SAMPLES OF EACH KIND AND COLOR OF PAVER TO BE USED SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL AT LEAST 48 HOURS PRIOR TO PLACEMENT OF PAVERS. ALL PROPOSED STRUCTURAL SECTIONS MUST BE REVIEWED AND APPROVED BY THE OCPW ENGINEER OR GEOTECHNICAL ENGINEER.

MATERIALS SHALL BE DELIVERED, STORED, AND HANDLED IN A MANNER TO PREVENT DAMAGE BY BREAKAGE, WATER OR MOISTURE OR THE INCLUSION OF FOREIGN PARTICLES. NO MATERIALS SHALL BE DUMPED OR STORED ON THE GROUND. MATERIALS SHALL BE STORED ON A CLEAN SURFACE OR PLATFORM AS REQUIRED AND SHALL BE PROTECTED FROM DETERIORATION AND FOREIGN MATTER.

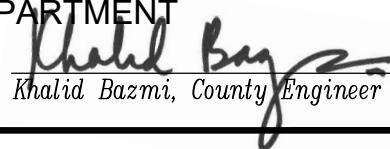
PAVERS SHALL BE CLEAN AND FREE OF DUST, DIRT OR OTHER FOREIGN MATERIALS BEFORE LAYING.

CONCRETE PAVERS SHALL BE LAID IN THE PATTERN INDICATED ON THE PLANS. PATTERNS SHALL NOT BE MIXED.

PAVERS SHALL BE LAID PLUMB, LEVEL, AND TRUE TO LINE. CORNERS AND ANGLES SHALL BE SQUARE UNLESS OTHERWISE INDICATED ON THE PLANS OR DIRECTED BY THE ENGINEER.

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**SPECIAL PROVISIONS - CONCRETE MEDIAN PAVING**

## INTERLOCKING CONCRETE PAVERS (Continued)

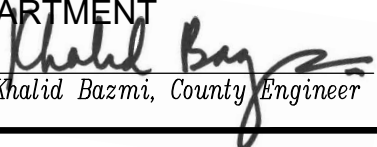
PAVERS SHALL BE LAID AND WORKED OUT TO PROPERLY COINCIDE AND ALIGN WITH ADJACENT WORK. NO FRACTIONAL PARTS OF PAVERS WILL BE PERMITTED IN THE WORK WHERE WHOLE PAVERS CAN BE USED.

THE LAYING OF PAVERS SHALL START IN ONE CORNER. PAVERS SHALL BE PLACED ALONG ONE SIDE OF THE WORKING AREA IN THE INDICATED PATTERN. PAVING UNITS SHALL BE PLACED CAREFULLY ON THE SAND BED AND SHALL BE PLACED TIGHT TOGETHER AND LEVEL.

PAVERS SHALL BE USED AS A BASE FROM WHICH TO WORK TO AVOID WALKING IN OR DISTURBING THE SAND BED. PAVING UNIT JOINTS SHALL BE FILLED BY SPREADING DRY, CLEAN, WASHED PLASTER SAND ON TOP OF THE PAVERS AND SWEEPING THE PLASTER SAND INTO THE JOINTS. THE ENTIRE PAVED AREA SHALL BE WET DOWN WITH A WATER HOSE, WASHING EXCESS SAND INTO THE JOINTS. THIS PROCEDURE SHALL BE REPEATED AS NECESSARY TO FILL THE JOINTS FLUSH WITH THE TOP OF THE PAVERS.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

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SPECIAL PROVISIONS - CONCRETE MEDIAN PAVING

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## GEOTEXTILES SPECIFICATION

### DEFINITIONS

GEOTEXTILE. SYNTHETIC FABRIC USED IN CIVIL ENGINEERING APPLICATIONS SERVING THE PRIMARY FUNCTION OF DRAINAGE AND FILTRATION, EROSION CONTROL, SEPARATION, PAVEMENT REINFORCEMENT, AND SHALL BE IN ACCORDANCE WITH SECTION 213-5, "GEOTEXTILES AND GEOGRIDS".

NONWOVEN GEOTEXTILES SHALL CONSIST OF LONG CHAIN, POLYMERIC FILAMENTS OF POLYPROPYLENE, POLYESTER, OR NYLON. THE FABRIC SHALL BE A STABLE NETWORK OF FIBERS WHICH RETAIN THEIR POSITIONS RELATIVE TO EACH OTHER.

WOVEN GEOTEXTILES SHALL CONSIST OF LONG CHAIN POLYMERIC MONOFILAMENTS, SLIT FILM TAPES OR MULTIFILAMENTS OF TAPE AND NONWOVEN YARN OF POLYPROPYLENE, POLYESTER OR NYLON. THE FABRIC SHALL BE WOVEN INTO A STABLE NETWORK AND THE EDGES OF THE FABRIC SHALL BE SELVEDGED OR SURGED IN SUCH A WAY THAT THE FABRIC WILL NOT UNRAVEL OR FRAY DURING INSTALLATION OR USAGE.

### GEOSYNTHETICS

PHYSICAL PROPERTIES. GEOTEXTILES SHALL MEET THE REQUIREMENTS FOR THE TYPE INDICATED IN THE TABLE ON PAGE 5. THE TABLES IN SECTION 213-5, "GEOTEXTILES AND GEOGRIDS", SHALL BE USED AS REFERENCE.

IDENTIFICATION. GEOTEXTILES SHALL BE FURNISHED IN ROLLS WRAPPED WITH PROTECTIVE COVERING TO PROTECT THEM AGAINST ULTRAVIOLET RADIATION AND ABRASION. TORN WRAPPERS SHALL BE REPAIRED WITHIN 48-HOURS USING AN APPROVED PROTECTIVE COVERING. EACH ROLL OF FABRIC SHALL BE MARKED OR TAGGED TO IDENTIFY THE MANUFACTURER, TYPE, LENGTH, WIDTH, AND PRODUCTION IDENTIFICATION NUMBER.

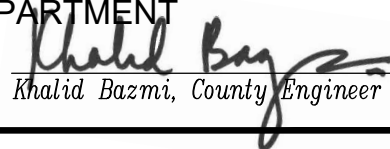
SAMPLING AND TEST COMPLIANCE. A LABORATORY SHALL BE MAINTAINED AT OR NEAR THE POINT OF MANUFACTURE TO ENSURE QUALITY CONTROL IN ACCORDANCE WITH ASTM AND OTHER APPLICABLE TESTING PROCEDURES. THE LABORATORY SHALL BE APPROVED BY THE ENGINEER. THE LABORATORY SHALL MAINTAIN RECORDS OF ITS' QUALITY CONTROL RESULTS.

A MANUFACTURER'S CERTIFICATE SHALL ACCOMPANY THE SHIPMENT AND BE DELIVERED TO THE ENGINEER PRIOR TO INSTALLATION. THE CERTIFICATE SHALL INCLUDE: (A) NAME OF MANUFACTURER; (B) CHEMICAL COMPOSITION; (C) PRODUCT DESCRIPTION; (D) LOT NUMBER AND TEST RESULTS; AND (E) SIGNATURE OF AN AUTHORIZED OFFICIAL. A UNIT IS 600 SQUARE YARDS OR ONE ROLL, WHICHEVER IS LESS. A LOT IS THE UNITS PRODUCED BY A SINGLE MACHINE ON A SINGLE SHIFT WITHOUT INTERRUPTION BUT NOT TO EXCEED 1,000 UNITS. THE NUMBER OF UNITS TESTED WITHIN A LOT SHALL BE EQUAL TO, BUT NOT LESS THAN, THE CUBE FOOT OF THE UNITS IN THAT LOT (FRACTIONS OF A NUMBER TO BE ROUNDED OFF TO THE NEXT HIGHER WHOLE HIGHER NUMBER). UNLESS A GREATER NUMBER OF TESTS ARE REQUIRED BY THESE OR OTHER APPLICABLE SPECIFICATIONS, A MINIMUM OF 8 TESTS SHALL BE PERFORMED IN EACH OF THE PRINCIPAL DIRECTIONS FOR EACH UNIT TESTED. THE AVERAGE OF TEST VALUES MAY NOT BE LESS THAN SPECIFIED. IN THE EVENT OF ANY FAILURE, THE ENTIRE LOT WILL BE REJECTED.

STORAGE AND HANDLING. FABRIC SHALL BE STORED ON CLEAN, DRY SURFACES, FREE OF FOREIGN SUBSTANCES SUCH AS GREASE, OIL, PAINT, EPOXY, CEMENT OR ANY OTHER SUBSTANCES WHICH WOULD HAVE A DELETERIOUS EFFECT ON THE FABRIC. WHEN STORED IN OUTDOOR AREAS, FABRIC SHALL BE KEPT 1 FOOT MINIMUM ABOVE GROUND LEVEL. THE CONTRACTOR SHALL KEEP THE FABRIC IN ITS PROTECTIVE COVERING UNTIL IT IS READY FOR INSTALLATION. OPENED ROLLS SHALL BE COVERED BY A WATERPROOF COVER. NO HOOKS, TONGS, OR OTHER SHARP TOOLS OR INSTRUMENTS SHALL BE USED.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

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**SPECIAL PROVISIONS - GEOTEXTILES**

WHEN HANDLING ANY FABRIC. FABRIC MAY BE UNLOADED OR HANDLED IN ONE OF FOLLOWING WAYS:

- 1) BY PLACING SLINGS UNDER THE ROLLS;
- 2) BY USING A POLE INSERTED THROUGH A HOLLOW CORE, PROVIDED THE POLE EXTENDS 1 FOOT MINIMUM BEYOND EACH END OF THE CORE, AND LIFTING AND HANDLING DEVICES ARE ATTACHED TO ONLY THAT PORTION OF THE POLE LOCATED OUTSIDE THE ENDS OF THE CORE;
- 3) BY HAND.

## DRAINAGE AND FILTRATION

DRAINS. GEOTEXTILES FOR TRENCH DRAINS, EDGE DRAINS, INTERCEPTOR DRAINS, ETC., SHALL BE PLACED IN ACCORDANCE WITH THE FOLLOWING PROVISIONS.

PLACEMENT. FABRIC SHALL BE PLACED IN THE TRENCH ACCORDING TO THE PROJECT PLANS. THE FABRIC SHALL BE PLACED LOOSELY AND SEATED FIRMLY INTO THE CORNERS. IF HEAT BONDED FABRIC IS USED, THE BONDED SIDE SHALL BE PLACED TO THE INSIDE OF THE TRENCH AND THE FUZZY SIDE SHALL FACE THE OUTSIDE OF THE TRENCH, AGAINST THE NATIVE SOIL. OVERLAPPING, IF NECESSARY, SHALL BE A MINIMUM OF 12 INCHES. DAMAGED FABRIC SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE BY PLACING NEW FABRIC OVER THE DAMAGED AREA THAT MEETS THE OVERLAP REQUIREMENTS. FABRICS SHALL BE COVERED AS SOON AS POSSIBLE AFTER BEING PLACED, BUT NOT LATER THAN THREE (3) CALENDAR DAYS AFTER PLACEMENT. FABRICS LEFT UNCOVERED FOR MORE THAN THREE (3) CALENDAR DAYS SHALL BE REMOVED AND REJECTED.

TRENCH SIDES AND BASE SHALL BE EXCAVATED TO PROVIDE A SMOOTH SURFACE FREE OF OBSTRUCTIONS AND DEBRIS.

AFTER PLACEMENT OF THE GRANULAR FILL, THE TWO EDGES OF THE GEOTEXTILE PROTRUDING AT THE TOP OF THE TRENCH SHALL BE OVERLAPPED ONE FOOT ON TOP OF THE GRANULAR FILL, AND THEN SOIL OR OTHER MATERIALS REQUIRED BY THE PROJECT PLANS, SHALL BE COMPACTED IN THE TRENCH TO THE REQUIRED GRADE.

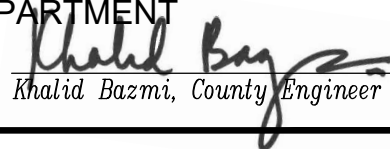
## EROSION CONTROL

BANK AND SHORE PROTECTION. GEOTEXTILES FOR SILT CONTROL, BANK AND SHORE PROTECTION SHALL BE PLACED IN ACCORDANCE WITH THE FOLLOWING PROVISIONS.

PLACEMENT. PRIOR TO PLACEMENT OF FABRIC, THE CONTRACTOR SHALL CONSTRUCT A SUBGRADE IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. THE FABRIC SHALL BE PLACED LOOSELY, (NOT IN A STRETCHED CONDITION) ALIGNED, AND PLACED IN A MANNER TO MINIMIZE WRINKLING. ADJACENT BORDERS AND ENDS OF FABRIC SHALL BE OVERLAPPED A MINIMUM OF 18 INCHES OR STITCHED WHEN USING NONWOVEN FABRICS WITH A GRAB TENSILE STRENGTH OF 90 LBS. OR WOVEN FABRICS WITH A GRAB TENSILE STRENGTH OF 200 LBS. OR LESS. BORDERS AND ENDS SHALL BE OVERLAPPED 36 INCHES OR STITCHED FOR NONWOVEN FABRICS WITH A GRAB TENSILE STRENGTH GREATER THAN 90 LBS. OR WOVEN FABRICS WITH A GRAB TENSILE STRENGTH GREATER THAN 200 LBS. IF THE FABRIC IS OVERLAPPED, THE UPSTREAM OR HIGHER PANEL SHALL OVERLAP THE DOWNSTREAM OR LOWER PANEL. WHEN STITCHED, THE SEAM SHALL HAVE SEAM BREAKING STRENGTH OF NOT LESS THAN 80 PERCENT OF THE MINIMUM REQUIRED FABRIC STRENGTH. THE SIZE AND COMPOSITION OF THE STITCHING MATERIAL AND STITCHING PATTERN SHALL BE APPROVED BY THE ENGINEER. THE STITCHING YARN SHALL BE OF A CONTRASTING COLOR.

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**SPECIAL PROVISIONS - GEOTEXTILES**

ANCHORING OF THE FABRIC AT TERMINAL ENDS AND TOP AND BOTTOM OF THE SLOPE SHALL BE ACCOMPLISHED THROUGH THE USE OF KEY TRENCHES OR APRONS AS SHOWN SHOWN ON THE PLANS. IF THE GEOTEXTILE IS PLACED IN A VERTICAL DIRECTION ON THE SLOPE, THERE SHALL BE NO END JOINTS BETWEEN ROLLS.

THE FABRIC SHALL BE SECURED WITH PINS PLACED ON 6 FOOT CENTERS AT THE MIDPOINT OF THE OVERLAPS AND ALONG THE TOP EDGE OF THE SLOPE. SPACING OF PINS SHALL BE REDUCED TO ELIMINATE TEARING OF THE FABRIC. PINS SHALL BE A MINIMUM OF 12 INCHES LONG OR OF SUFFICIENT LENGTH TO PREVENT PIN MOVEMENT.

THE OUTER STONE COVER SHALL BE THICK ENOUGH TO COMPLETELY PREVENT PENETRATION OF SUNLIGHT, UNLESS A BEDDING LAYER OF AGGREGATE PARTICLES GREATER IN SIZE THAN THE OPENINGS IN THE OUTER STONE COVER IS INSTALLED FIRST.

EQUIPMENT OR VEHICLES SHALL NOT BE OPERATED ON THE FABRIC. DAMAGED FABRIC SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE BY PLACING NEW FABRIC OVER THE DAMAGED AREA IN A MANNER THAT MEETS THE OVERLAP REQUIREMENTS.

FABRICS SHALL BE COVERED AS SOON AS POSSIBLE AFTER BEING PLACED, BUT NOT LATER THAN THREE (3) CALENDAR DAYS AFTER PLACEMENT. FABRICS LEFT UNCOVERED FOR MORE THAN THREE (3) CALENDAR DAYS SHALL BE REMOVED AND REJECTED.

## **MEASUREMENT AND PAYMENT**

GEOTEXTILES SHALL BE MEASURED FOR PAYMENT BY THE SQUARE YARD OF FABRIC PLACED, NOT INCLUDING ANY ADDITIONAL FABRIC FOR OVERLAPS OR SPLICES. PAYMENT SHALL INCLUDE COMPENSATION FOR LABOR, MATERIAL, EQUIPMENT, OVERLAPS, AND PERFORMING ALL OPERATIONS NECESSARY TO PLACE THE FABRIC ACCORDING TO THE PLANS AND SPECIFICATIONS.

## **SEPARATION**

SUBGRADE ENHANCEMENT. GEOTEXTILES FOR SUBGRADE ENHANCEMENT SHALL BE PLACED IN ACCORDANCE WITH THE FOLLOWING PROVISIONS.

PLACEMENT. DURING GRADING OPERATIONS, CARE SHOULD BE TAKEN NOT TO DISTURB OR SCARIFY THE SUBGRADE. THIS MAY REQUIRE USE OF LIGHTWEIGHT DOZERS, ETC., FOR LOW STRENGTH SOILS SUCH AS SATURATED COHESIONLESS OR LOW COHESION SOILS.

ONCE THE SUBGRADE ALONG A PARTICULAR SEGMENT OF ALIGNMENT HAS BEEN PREPARED THE GEOTEXTILE SHALL BE UNROLLED IN LINE WITH THE PLACEMENT OF NEW AGGREGATE. THE FABRIC SHOULD NOT BE DRAGGED ACROSS THE SUBGRADE, AND THE ENTIRE FABRIC SHOULD BE PLACED AND ROLLED OUT AS SMOOTHLY AS POSSIBLE.

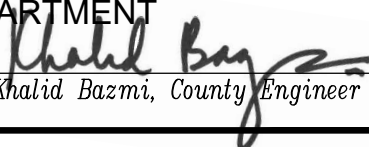
PARALLEL ROLLS OF FABRIC SHALL BE OVERLAPPED 18 INCHES OR SEWN IF REQUIRED BY THE PLANS OR SPECIFICATIONS.

THE FABRIC SHALL BE SECURED WITH PINS PLACED ON 6 FOOT CENTERS AT THE MIDPOINT OF ALL OVERLAPS AND AT THE EDGES TO MAINTAIN THEM DURING CONSTRUCTION ACTIVITIES. SPACING OF PINS SHALL BE REDUCED IF NECESSARY TO ELIMINATE TEARING AND MOVEMENT OF THE FABRIC.

OVERLAPS AT THE ENDS OF ROLLS SHALL BE IN THE DIRECTION OF THE AGGREGATE PLACEMENT WITH THE PREVIOUS ROLL ON TOP.

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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**SPECIAL PROVISIONS - GEOTEXTILES**

WHEN FABRIC INTERSECTS AN EXISTING AREA, THE FABRIC SHALL EXTEND TO THE EDGE OF THE OLD SYSTEM, AND THE END OF THE FABRIC SHALL BE ANCHORED.

ON PAVEMENT SUBGRADE, FABRIC WIDTHS SHALL BE SELECTED SUCH THAT OVERLAPS OF PARALLEL ROLLS OCCUR AT THE CENTERLINE AND AT LANE LINES. OVERLAPS SHALL NOT BE PLACED ALONG ANTICIPATED MAIN WHEEL PATH LOCATIONS. THE BASE AGGREGATE SHALL BE PLACED ON THE FABRIC IN SUCH A MANNER THAT WHEEL RUTTING OF AGGREGATE OVER THE FABRIC IS LIMITED TO  $\frac{1}{2}$  INCH. LIGHTWEIGHT DOZERS SHALL BE USED IF NECESSARY. EQUIPMENT SHALL NOT BE ALLOWED DIRECTLY ON THE FABRIC.

BEFORE COVERING, THE CONDITION OF THE FABRIC SHOULD BE OBSERVED BY THE ENGINEER TO DETERMINE THAT NO HOLES OR RIPS EXIST IN THE FABRIC. ALL SUCH OCCURRENCES SHALL BE REPAIRED BY PLACING A NEW LAYER OF FABRIC EXTENDING BEYOND THE DEFECT IN ALL DIRECTIONS A DISTANCE EQUAL TO THE MINIMUM OVERLAP REQUIRED FOR ADJACENT ROLLS.

## PAVEMENT REINFORCEMENT

GEOTEXTILES FOR PAVEMENT REINFORCEMENT SHALL BE PLACED AND PAID FOR IN ACCORDANCE WITH SECTIONS 213-4, "PAVING FABRIC", AND 302-7, "PAVEMENT FABRIC".

## USAGE

FOLLOWING ARE THE NORMAL USAGES FOR EACH TYPE FABRIC. SPECIAL CONDITIONS MAY REQUIRE A DETERMINATION BY THE DESIGN ENGINEER.

### DRAINAGE AND FILTRATION:

- SUBDRAINS — TYPE I NONWOVEN FABRIC
- TRENCH DRAINS,
- EDGE DRAINS,
- INTERCEPTOR
- DRAINS, ETC.

### SEPARATION:

- SUBGRADE — FLOOD CONTROL CHANNEL:
  - TYPE I NONWOVEN FABRIC ON TOP OF GRAVEL BLANKET.
  - TYPE II NONWOVEN FABRIC ON TOP OF SOFT NATIVE SOIL.
  - TYPE III NONWOVEN FABRIC ON TOP OF LOOSE, MUCKY NATIVE SOIL.
- ENHANCEMENT — ROADWAY SECTION:
  - TYPE I WOVEN OR NONWOVEN FABRIC ON TOP OF FIRM MATERIAL.
  - TYPE II WOVEN OR NONWOVEN FABRIC ON TOP OF SOFT MATERIAL.
  - TYPE III WOVEN OR NONWOVEN FABRIC ON TOP OF LOOSE, MUCKY MATERIAL.

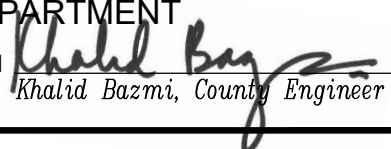
### EROSION CONTROL:

- SILT FENCE — TYPE I WOVEN OR NONWOVEN FABRIC.
- BANK PROTECTION — TYPE III NONWOVEN FABRIC BELOW RIPRAP.
- SHORE PROTECTION — TYPE III NONWOVEN FABRIC BELOW ARMOR STONE.

### REINFORCEMENT: PAVEMENT

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SPECIAL PROVISIONS - GEOTEXTILES

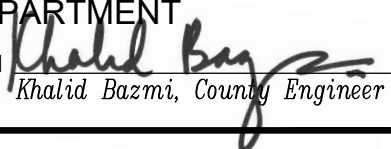
## TABLE OF MINIMUM TEST RESULTS

		NON-WOVEN			WOVEN			
TYPE		I	II	III	I	II	III	PAV'T. REINF.
PROPERTY	TEST REFERENCE							
GRAB STRENGTH, * lbs., Min.	ASTM D4632	90	180	280	90	200	270	90
ELONGATION, (at peak load) %, Min.	ASTM D4632	50	50	50	25	25	25	40 to 100
PUNCTURE STRENGTH, lbs., Min.	ASTM D3787	45	80	110	30	70	110	N/A
PERMITTIVITY, Sec-1, Min.	ASTM D4491	0.7	0.7	0.7	0.02	0.02	0.02	N/A
BURST STRENGTH, psi, Min.	ASTM D3786	180	320	400	200	400	500	N/A
ULTRAVIOLET RESISTANCE, % Str. Retained/ Weatherometer Hrs.	ASTM D4355	70/ /500	70/ /500	70/ /500	70/ /500	70/ /500	70/ /500	N/A
WEIGHT, oz/sq. yd.		N/A	N/A	N/A	N/A	N/A	N/A	3.5 to 5.0
FABRIC THICKNESS, mils		N/A	N/A	N/A	N/A	N/A	N/A	30 to 50

\* MINIMUM ROLL AVERAGE IN THE WEAKEST PRINCIPAL DIRECTION.

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**SPECIAL PROVISIONS - GEOTEXTILES**

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## GENERAL:

STONEWORK SHALL CONFORM TO THESE SPECIAL PROVISIONS IN ADDITION TO THE PROVISIONS OF SECTION 200-1.6, "STONE FOR RIPRAP", OF THE GREENBOOK (EXCEPT AS MODIFIED HEREIN), AND SHALL COVER APPLICATIONS NOT EXCEEDING 200 TONS FOR OUTLETS, INLAND CHANNELS, AND EMERGENCY USE. FOR APPLICATIONS GREATER THAN 200 TONS, A FILTER DESIGN, FOUNDATION, GRADATION, AND SUPPORTING CALCULATIONS FOLLOWING THE PROCEDURES SPECIFIED IN THE EM 1110-2-1601 BY THE U.S. ARMY CORPS OF ENGINEERS, "HYDRAULIC DESIGN OF FLOOD CONTROL CHANNELS," CHAPTER 3 AND SUPPORTING SECTIONS/APPENDICES (LATEST EDITION) SHALL BE SUBMITTED TO THE ENGINEER SIGNED AND STAMPED BY A REGISTERED CIVIL ENGINEER CURRENTLY LICENSED TO PRACTICE IN THE STATE OF CALIFORNIA.

STONE SHALL BE ANGULAR AND THE GREATEST DIMENSION OF EACH PIECE SHALL NOT BE GREATER THAN THREE TIMES THE THICKNESS.

STONE SHALL BE SOUND, DURABLE, HARD, RESISTANT TO ABRASION, AND FREE FROM LAMINATIONS, WEAK CLEAVAGE PLANES, AND THE UNDESIRABLE EFFECTS OF WEATHERING. IT SHALL NOT DISINTEGRATE FROM THE ACTION OF AIR, WATER, OR FROM HANDLING AND PLACING. IT SHALL BE CLEAN AND FREE FROM DELETERIOUS IMPURITIES, SUCH AS ALKALI, SOIL, CLAY, REFUSE AND OTHER COATINGS.

VISUAL EVALUATION OF THE QUARRY, INCLUDING EXAMINATION OF PLANT SAMPLES AND DIAMOND DRILL CORE SAMPLES, SUITABLE TESTS AND SERVICE RECORDS MAY BE USED TO DETERMINE THE ACCEPTABILITY OF THE STONE.

STONE FOR RIPRAP SHALL BE QUARRY STONE OR ON-SITE MATERIAL WHICH HAS BEEN TESTED AND APPROVED TO THE SATISFACTION OF THE ENGINEER.

THE FOLLOWING QUALITY REQUIREMENTS AS DETERMINED BY LABORATORY TESTS SHALL APPLY, IN LIEU OF TABLE 200-1.6.2 OF THE GREENBOOK :

### GRADATION:

<u>WEIGHT</u> (Lbs.)	<u>PERCENT LIGHTER THAN</u>
1800	100%
700	90 - 100
500	50 - 90
200	0 - 15

THE FOLLOWING QUALITY REQUIREMENTS SHALL APPLY, IN LIEU OF TABLE 200-1.6.3 OF THE GREENBOOK:

<u>TEST</u>	<u>TEST METHOD</u>	<u>REQUIREMENT</u>
APPARENT SPECIFIC GRAVITY	Calif. 206	2.62 Min.
ABSORPTION	Calif. 206	4.2% Max.
DURABILITY LOS	Calif. 229	52 Min.
ANGELES ABRASIONS	Calif. 211	45% max. LOSS AFTER 500 REVOLUTION, GRADING A

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**SPECIAL PROVISIONS - STONEWORK**

THICKNESS OF THE STONework LAYER, MEASURED PERPENDICULAR TO THE SLOPE SHALL BE AS FOLLOWS:

DRY, NON-TURBULENT FLOW LOCATIONS:	33"
DRY, TURBULENT FLOW LOCATIONS:	48"
UNDER WATER:	48"

## SLOPE PREPARATION:

FOUNDATION PREPARATION: EXISTING STONE ADJACENT TO NEW PLACEMENT SHALL BE RESET AND KEYED A MINIMUM OF 10 FEET OR AS SPECIFIED ON THE PLANS, TO PROVIDE A FIRM INTERLOCKING OF NEW STONE AND EXISTING STONE.

FILTER FABRIC: A NON-WOVEN FILTER FABRIC TYPE II (BANK PROTECTION) OR TYPE III (SHORE PROTECTION FOR CHANNEL VELOCITIES ABOVE 10 FPS) PER OCPW STANDARD PLAN 1808 SHALL BE PLACED BETWEEN THE EXISTING OR GRADED SOIL LAYER AND THE GRAVEL BEDDING AND ROCK REVETMENT AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER. FILTER FABRIC SHALL BE PLACED OVER THE SOIL LAYER AT THE LOCATIONS INDICATED ON THE DRAWINGS. FILTER FABRIC SHALL BE PLACED FROM A POINT BEYOND THE TOE OF THE ROCK BASE AND CONTINUE UP THE SLOPE TO THE TOP, WHERE IT SHALL BE ANCHORED AS INDICATED ON THE PLANS. AT THE TOE, SUFFICIENT FABRIC SHALL BE PROVIDED TO MAKE A 3-FOOT FOLD BACK OVER A LAYER OF STONES OF THE TYPE INDICATED. ROCK REVETMENT SHALL NOT BE DIRECTLY PLACED ON TOP OF THE FILTER FABRIC OR DROPPED ON THE GRAVEL BEDDING FROM A HEIGHT GREATER THAN THREE FEET.

GRAVEL BEDDING: PLACE A MINIMUM OF 6 INCH GRAVEL BASE MATERIAL OVER THE FILTER CLOTH AS INDICATED ON THE PLANS. GRAVEL SHALL BE PLACED SO THAT UNIFORM GRADATION IS MAINTAINED AND THE FILTER FABRIC IS NOT DAMAGED. GRADATION SHALL BE D3 OR NO. 3 ROCK AS SPECIFIED PER OCPW STANDARD PLAN 1803 UNLESS OTHERWISE SPECIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

GRAVEL BASE MATERIAL AND SOIL SHALL BE WITHIN PLUS-OR-MINUS 0.1 FOOT OF PLAN GRADE MEASURED PERPENDICULAR TO THE SLOPE, INDICATED FOR EACH TYPE OF MATERIAL.

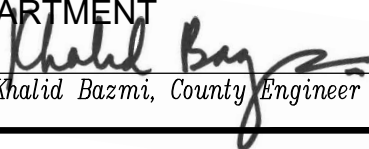
## STONE PLACEMENT:

STONE NOT SUITABLE AS TO QUALITY AND/OR SIZE DISTRIBUTION FOR ANY CLASS REQUIRED TO COMPLETE THE WORK SHALL BE PROMPTLY REMOVED FROM THE CONSTRUCTION.

PLACE STONE OF THE SIZE INDICATED BY BUCKET OR INDIVIDUAL STONE TO THE DIMENSIONS AND LOCATIONS INDICATED ON THE DRAWINGS. STONE SHALL BE PLACED WITHIN 0.5 FEET OF PLAN GRADE, MEASURED PERPENDICULAR TO THE SLOPE.

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SPECIAL PROVISIONS - STONework

## STONE:

STONE SHALL BE CAREFULLY KEYED AND SET IN A TIGHT AND INTERLOCKING CONFIGURATION TO FORM A STABLE LAYER OF RIPRAP.

PLACEMENT SHALL START AT THE BOTTOM OF THE SLOPE AND WORK UPWARD. STONE SHALL NOT BE DUMPED FROM HEIGHTS GREATER THAN ONE STONE DIAMETER NOR PLACEMENT METHODS EMPLOYED THAT MAY CAUSE MISPLACEMENT OF STONE OR PUNCTURE OF FILTER FABRIC.

EACH LOAD OF STONE SHALL BE REASONABLY WELL GRADED FROM THE SMALLEST TO THE MAXIMUM SIZE SPECIFIED.

STONE FOR RIPRAP SHALL BE PLACED IN A MANNER WHICH WILL PRODUCE A REASONABLY WELL-GRADED MASS OF STONE WITH THE MINIMUM PRACTICABLE PERCENTAGE OF VOIDS. THE ENTIRE MASS OF STONE SHALL BE PLACED IN CONFORMANCE WITH THE LINES, GRADES, AND THICKNESS SHOWN ON THE PLANS. RIPRAP SHALL BE PLACED TO ITS FULL COURSE THICKNESS IN ONE OPERATION AND IN A MANNER TO AVOID DISPLACING THE UNDERLYING MATERIAL. PLACING OF RIPRAP IN LAYERS BY DUMPING INTO CHUTES OR BY SIMILAR METHODS LIKELY TO CAUSE SEGREGATION, WILL NOT BE PERMITTED. SELF-PROPELLED EQUIPMENT SHALL NOT BE USED ON EMBANKMENT SLOPES. IF VELOCITY EXCEEDS 12 FPS, DESIGN RIPRAP PER US ACE PUBLICATION NUMBER EM 1110-2-1601, CHAPTER 3.

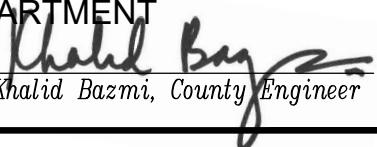
WHEN SPECIAL PLACEMENT METHODS ARE REQUIRED THE CONTRACTOR IS TO ENSURE THAT THE STONE SHALL HAVE A MINIMUM THREE POINTS OF CONTACT WITH OTHER STONE.

## GROUT:

IF GROUT IS SPECIFIED FOR FILLING THE INTERSTICES, IT SHALL BE A 610-E-2000G CONCRETE MIX.

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SPECIAL PROVISIONS - STONework

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TO ACCOMMODATE EXCAVATION WORK AND MAINTAIN TRAFFIC SAFETY, STEEL PLATE BRIDGING MAY BE NECESSARY. ALL CONDITIONS FOR USE OF STEEL PLATE BRIDGING SHOULD BE SET FORTH IN THE PROJECT SPECIAL PROVISIONS.

CONSIDERATION OF STEEL PLATE BRIDGING SHOULD TAKE INTO ACCOUNT THE FOLLOWING FACTORS:


1. TRAFFIC SPEED.
2. TRAFFIC VOLUME AND COMPOSITION.
3. DURATION AND DIMENSIONS (WIDTH AND LENGTH) OF PROPOSED EXCAVATIONS.
4. WEATHER CONDITIONS.

WHEN BACKFILLING OPERATIONS OF AN EXCAVATION IN THE TRAVELED WAY, WHETHER TRANSVERSE OR LONGITUDINAL, CANNOT BE PROPERLY COMPLETED WITHIN A WORK DAY, STEEL PLATE BRIDGING WITH A NON-SKID SURFACE AND SHORING MAY BE REQUIRED TO PRESERVE UNOBSTRUCTED TRAFFIC FLOW. IN SUCH CASES, THE FOLLOWING CONDITIONS SHALL APPLY:

1. STEEL PLATES USED FOR BRIDGING MUST EXTEND A MINIMUM OF 12 INCHES BEYOND THE EDGES OF THE TRENCH.
2. STEEL PLATE BRIDGING SHALL BE INSTALLED TO OPERATE WITH MINIMUM NOISE.
3. THE TRENCH SHALL BE ADEQUATELY SHORED TO SUPPORT THE BRIDGING AND TRAFFIC LOADS. (SEE STATE OF CALIFORNIA DOT TRENCHING AND SHORING MANUAL)
4. TEMPORARY PAVING WITH COLD ASPHALT CONCRETE SHALL BE USED TO FEATHER THE EDGES OF THE PLATES, IF PLATE INSTALLATION BY METHOD 2 DESCRIBED BELOW.
5. BRIDGING SHALL BE SECURED AGAINST DISPLACEMENT BY USING ADJUSTABLE CLEATS, SHIMS, OR OTHER DEVICES.
6. PRE-CONSTRUCTION MEETING PRIOR TO START OF WORK IS REQUIRED.
7. TRENCH STEEL PLATING AND TEMPORARY ASPHALT SHALL BE ON JOBSITE BEFORE TRENCHING BEGINS.
8. REPLACEMENT OF ROADWAY SECTION AND SURFACING WILL BE PER COUNTY OF ORANGE STANDARDS AND TO THE SATISFACTION OF THE INSPECTOR.
9. TRENCHING OR "OPEN-CUT" IN COUNTY OF ORANGE ARTERIAL HIGHWAY IS PROHIBITED BY ARTICLE 3, SECTION 6-3-60 (C) OF CODIFIED ORDINANCES FOR THE COUNTY OF ORANGE, CALIFORNIA. "EXCAVATION OR TRENCHING OF PAVEMENT ON AN ARTERIAL HIGHWAY WILL ONLY BE PERMITTED WHEN PHYSICAL CONDITIONS MAKE BORING OR TUNNELING IMPOSSIBLE..."

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

Approved

  
Khalid Bazmi, County Engineer

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**SPECIAL PROVISIONS - STEEL PLATE BRIDGING**

STEEL PLATE BRIDGING AND SHORING SHALL BE INSTALLED USING EITHER METHOD 1 OR 2 :

METHOD 1:

FOR POSTED SPEEDS OF 45 MPH OR GREATER:

THE PAVEMENT SHALL BE COLD PLANED TO A DEPTH EQUAL TO THE THICKNESS OF THE PLATE AND TO A WIDTH AND LENGTH EQUAL TO THE DIMENSIONS OF THE PLATE.

APPROACH PLATE(S) AND ENDING PLATE (IF LONGITUDINAL PLACEMENT) SHALL BE ATTACHED TO THE ROADWAY BY A MINIMUM OF 2 DOWELS PRE-DRILLED INTO THE CORNERS OF THE PLATE AND DRILLED 2 INCHES INTO THE PAVEMENT. SUBSEQUENT PLATES ARE TO BE BUTTED TOGETHER AND TACK WELDED TO EACH OTHER.

METHOD 2:

FOR POSTED SPEEDS LESS THAN 45 MPH:

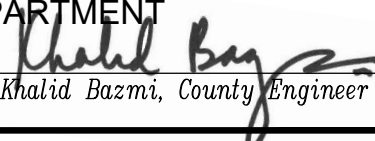
APPROACH PLATE(S) AND ENDING PLATE (IF LONGITUDINAL PLACEMENT) SHALL BE ATTACHED TO THE ROADWAY BY A MINIMUM OF 2 DOWELS PRE-DRILLED INTO THE CORNERS OF THE PLATE AND DRILLED 2 INCHES INTO THE PAVEMENT. SUBSEQUENT PLATES ARE TO BE BUTTED AND TACK WELDED TO EACH OTHER. FINE GRADED ASPHALT CONCRETE SHALL BE COMPACTED TO FORM RAMPS, MAXIMUM SLOPE 8.5 PERCENT WITH A MINIMUM 12 INCHES TAPER TO COVER ALL EDGES OF THE STEEL PLATES. WHEN STEEL PLATES ARE REMOVED, THE DOWEL HOLES IN THE PAVEMENT SHALL BE BACKFILLED WITH EITHER GRADED FINES OF ASPHALT CONCRETE MIX, CONCRETE SLURRY, EPOXY OR AN EQUIVALENT THAT IS SATISFACTORY TO THE COUNTY INSPECTOR.

THE CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE OF THE STEEL PLATES, SHORING, ASPHALT CONCRETE RAMPS AND ENSURING THAT THEY MEET MINIMUM SPECIFICATIONS. UNLESS SPECIFICALLY NOTED OR GRANTED IN THE SPECIAL PROVISIONS, OR APPROVED BY THE ENGINEER OR REPRESENTATIVE, STEEL PLATE BRIDGING SHALL NOT EXCEED FOUR (4) CONSECUTIVE WORKING DAYS IN ANY GIVEN WEEK. BACKFILLING OF EXCAVATIONS SHALL BE COVERED WITH A MINIMUM 3 INCHES TEMPORARY LAYER OF COLD ASPHALT CONCRETE. PAVEMENT SHALL BE PLACED PER OCPW STANDARDS.

THE FOLLOWING TABLE SHOWS THE MINIMAL THICKNESS OF STEEL PLATE BRIDGING REQUIRED FOR A GIVEN TRENCH WIDTH (A-36 GRADE STEEL, DESIGNED FOR HL-93 TRUCK LOADING PER AASHTO LRFD BRIDGE DESIGN SPECIFICATION, 4TH EDITION WITH CALIFORNIA AMENDMENTS).

COUNTY OF ORANGE, OC PUBLIC WORKS DEPARTMENT

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SPECIAL PROVISIONS - STEEL PLATE BRIDGING

## TRENCH WIDTH

## MINIMUM PLATE THICKNESS

10"	1/2"
1'-11"	3/4"
2'-7"	7/8"
3'-5"	1"
5'-3"	1 3/4"

NOTE: FOR SPANS GREATER THAN 5 FEET-3 INCHES, A STRUCTURAL DESIGN SHALL BE PREPARED AND STAMPED BY A CALIFORNIA REGISTERED CIVIL ENGINEER.

ALL STEEL PLATES WITHIN THE RIGHT OF WAY WHETHER USED IN OR OUT OF THE TRAVELED WAY SHALL BE WITHOUT DEFORMATION, INSPECTORS CAN DETERMINE THE TRUENESS OF STEEL PLATES BY USING A STRAIGHT EDGE AND SHOULD REJECT ANY PLATE THAT IS PERMANENTLY DEFORMED.

STEEL PLATES USED IN THE TRAVELED PORTION OF THE HIGHWAY SHALL HAVE A SURFACE THAT WAS MANUFACTURED WITH A NOMINAL COEFFICIENT OF FRICTION (COF) OF 0.35 AS DETERMINED BY CALIFORNIA TEST METHOD 342 (SEE APPENDIX H. CALTRANS ENCROACHMENT PERMITS MANUAL). MANUFACTURER SHALL ISSUE A CERTIFICATE OF COMPLIANCE THAT CONFORMS TO CALIFORNIA TEST METHOD 342. IF A DIFFERENT TEST METHOD IS USED, THE CONTRACTOR SHALL DETERMINE WHAT AMOUNT OF SURFACE WEAR IS ACCEPTABLE, AND INDEPENDENTLY ASCERTAIN WHEN TO REMOVE, TEST, OR RESURFACE AN INDIVIDUAL PLATE.

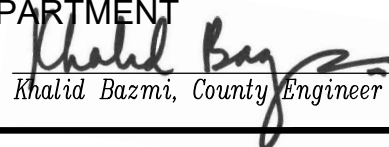
A ROUGH ROAD SIGN (W8-8) WITH BLACK LETTERING ON AN ORANGE BACKGROUND MAY BE USED IN ADVANCE OF STEEL PLATE BRIDGING. THIS SIGN IS USED ALONG WITH ANY OTHER REQUIRED CONSTRUCTION SIGNING.

SURFACING REQUIREMENTS ARE NOT NECESSARY FOR STEEL PLATES USED IN PARKING STRIPS, ON SHOULDERS NOT USED FOR TURNING MOVEMENTS, OR ON CONNECTING DRIVEWAYS, ETC., NOT OPEN TO THE PUBLIC.

OCPW STEEL PLATE BRIDGING PROVISIONS ARE BASED UPON STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION ENCROACHMENT PERMIT STEEL PLATE BRIDGING UTILITY PROVISIONS TR-0157 (REV. 07/2009) AS PREVIOUSLY SPECIFIED BY AUTHORITY OF DEPARTMENTAL POLICY MEMO FOR USE OF STEEL PLATE FOR BRIDGING, 2007.

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**SPECIAL PROVISIONS - STEEL PLATE BRIDGING**

