Standard Plans for Public Works Construction

2021 Edition

eBook Version

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BY WAY OF EXPLANATION

This edition of *Standard Plans for Public Works Construction* is the fruition of several decades of intensive work by a multi-governmental agency subcommittee of the Public Works Standards, Inc.

These plans, representing the professional thinking of the leading public works officials and private members of the construction industry, were prepared to answer a need for uniform design governing public works construction performed for the many cities, counties and public agencies. This need dates back to the very founding of these governmental jurisdictions.

Uniform plans, embracing the most modern design and construction techniques, will greatly benefit both the general public and the private contracting industry. Such plans will eliminate conflicts and confusion, lower construction costs and encourage more competitive bidding by private contractors.

The prime sponsors of this effort have been the City and County of Los Angeles, County of Ventura, City and County of San Diego, City of Long Beach, City of Burbank and County of Orange. In the case of Los Angeles County, this includes the Road Department, Flood Control District, County Engineer/Facilities Department and the Sanitation Districts. In addition to these major organizations, numerous municipal agencies, large and small, served a key role on the various task forces.

The Standard Plans are to be used in conjunction with the *Standard Specifications for Public Works Construction* as a companion document. This latter document has been in existence since 1967 and is commonly referred to as the "*Greenbook*". The Standard Plans, being engineering plans, are subject to the provisions of Chapter 7, Division 3, Business and Professions Code, State of California when used in that state. As such, they must be approved by a registered professional engineer to indicate his or her responsibility for them. In addition, they do not have the legal effect of a contract document or construction plan until officially adopted by the particular user agency.

The plans are numbered with a three digit prefix and a single digit suffix. The first number denotes the section in which the plan is located. The suffix is used to denote changes. All plans when originally approved will bear the suffix "0". As they are amended, the suffix will be numbered to denote the change number.

The *Standard Plans for Public Works Construction* will be revised periodically and reprinted to reflect advanced thinking and the changing technology of the construction industry. Amendments and additions, together with an updated Table of Contents. Subsequent editions will be published as additional material is prepared. To this end, the Public Works Standards, Inc. will continue to study and recommend changes to both the *Standard Plans* and *Standard Specifications*.

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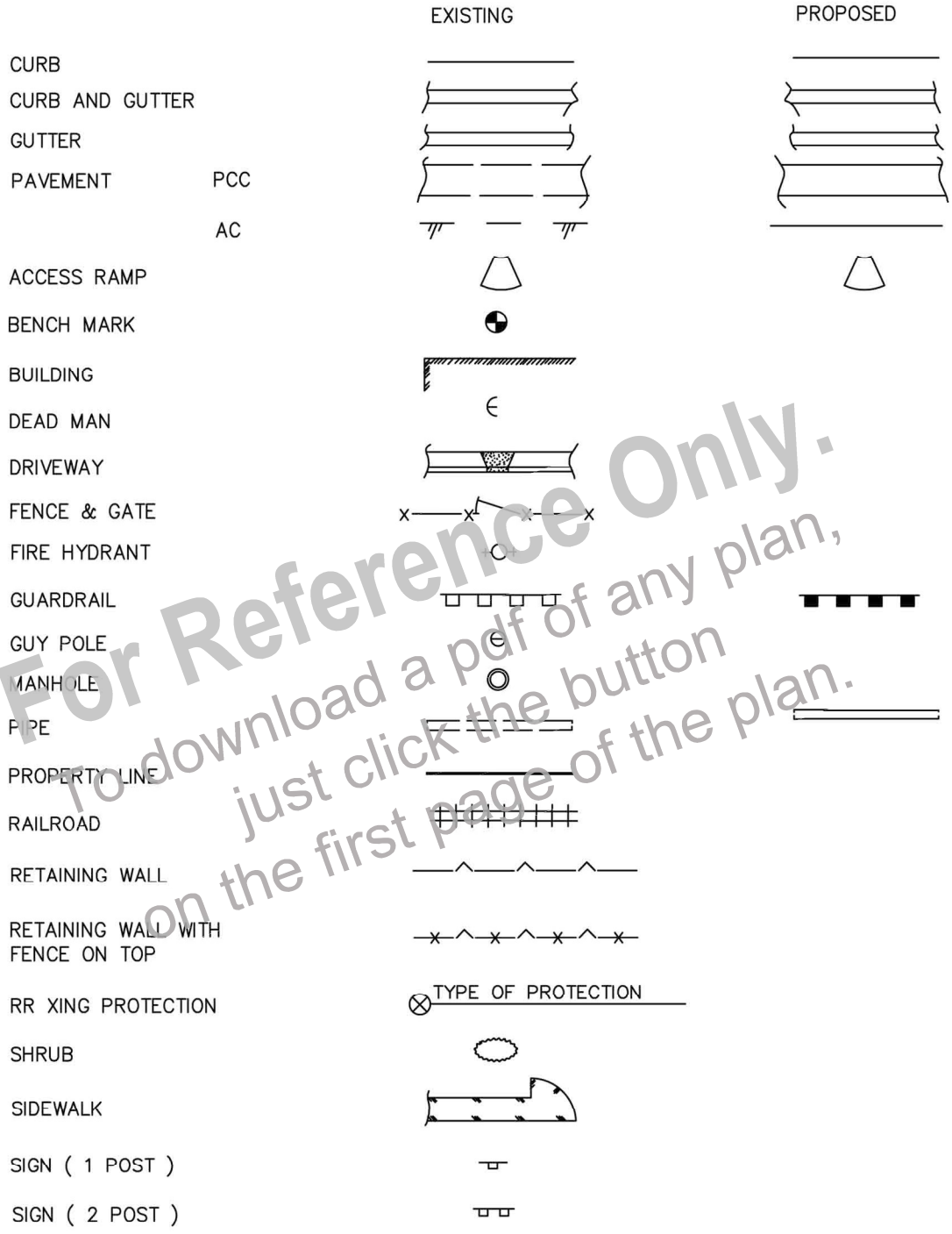
SECTION 100

Street Improvements

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CONVENTIONAL SYMBOLS FOR EXISTING TOPOGRAPHY



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TOPOGRAPHY SYMBOLS AND STANDARD ABBREVIATIONS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 100–2

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		EXISTING	PROPOSED
SIGNAL CONTROL BOX			
SIGNAL	FLASHING		
	TRAFFIC		
	LOOP		
SMALL STREAM OR DITCH			
SPRINKLER HEAD			
STREET LIGHT			
TREE	PALM		
	OAK		
	OTHER		
UTILITY POLE			
VALVE			
VAULT			
WALL	BRICK (BLOCK)		
	CONCRETE		
	STONE		
WELL			

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ABBREVIATIONS

AASHTO	American Association of State Highway Transportation Officials
ABS	
AC	Asphalt Concrete
APPROX	Approximately
AS	All Sides
ASTM	American Society for Testing Materials
ASS'Y	Assembly
BC	Begining of Curve
BCR	Begining of Curb Return
CB	Catch Basin
C'BORE	Centerbore
CIP	Cast Iron Pipe
CF	Curb Face
CL	Centerline
CMB	Crushed Miscellaneous Base
CONST	Construct, Construction
CONC	Concrete
CSP	Corrugated Steel Pipe
CU	Copper
D	Designation for RCP Load Rating
DIA	Diameter
EC	End of Curve
ECR	End of Curb Return
EF	Each Face
EL	Elevation
EXIST, EXST	Existing
EXP JT	Expansion Joint
f'c	Designation for Compressive Strength of Concrete
FG	Finished Ground
FL	Flowline
GP	Ground Profile
GALV	Galvanized
HEX	Hexagonal
ID	Inner Diameter
MAX	Maximum
MIN	Minimum
MH	Manhole
NC	National Coarse Thread Series
NO.	Number
NPT	(National Pipe Thread?)
OC	On Center
OD	Outer Diameter
OG	Original Ground

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ABBREVIATIONS (CONTINUED)

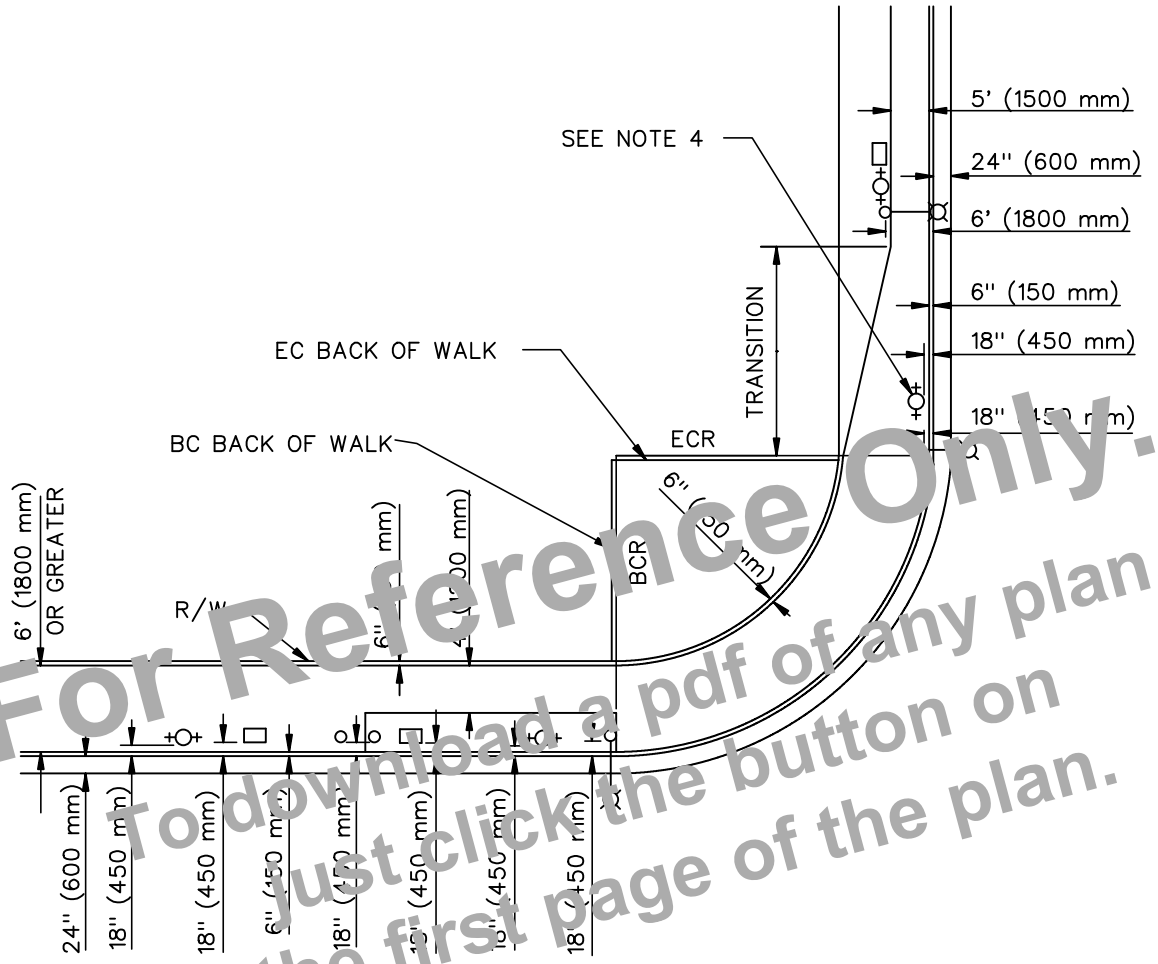
PCC	Portland Cement Concrete
PE	Polyethylene
PRCB	Precast Reinforced Concrete Box
PT	Point
PVMT	Pavement
R	Radius
RC	Reinforced Concrete
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe
REINF	Reinforced
RR	Railroad
R/W	Right of Way
SPPWC	Standard Plans for Public Works Construction
SSPWC	Standard Specifications for Public Works Construction
STD	Standard
STL	Steel
STR GR	Straight Grade
T&G	Tongue and Groove
TRANS	Transverse
TYP	Typical
VCP	Vitrified Clay Pipe
W/	With
WPJ	Weakened Plane Joint
XING	Crossing

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
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LEGEND

- FIRE HYDRANT (SEE NOTE 4)
- VENTS AND POLES
- STREET LIGHTS
- PEDESTAL

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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ABOVE-GROUND UTILITY LOCATION IN PARKWAY

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 101-3

SHEET 1 OF 2

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NOTES:

1. NO ABOVE–GROUND UTILITIES ARE ALLOWED IN CONCRETE SIDEWALKS LESS THAN 6' (1800 mm) WIDE.

2. WHEN SIDEWALK IS 6' (1800 mm) WIDE OR MORE, ABOVE–GROUND UTILITIES ARE ALLOWED AT LOCATIONS NOTED ON PLAN.

3. IN THE RETURN AND SIDEWALK TRANSITION AREAS, ONLY UTILITIES CONSISTING OF STREET LIGHTS, TRAFFIC SIGNALS AND FIRE HYDRANTS ARE ALLOWED.

4. FIRE HYDRANTS SHALL NOT BE PLACED AT THE SAME CURB RETURN OCCUPIED BY A STREET LIGHT.

5. PEDESTALS SHALL BE PLACED AT LOCATIONS APPROVED BY THE ENGINEER.

6. IN THE ABSENCE OF CURBS, THE FACE OF ALL ABOVE–GROUND STRUCTURES SHALL BE LOCATED A MINIMUM OF 10' (3000 mm) AWAY FROM THE TRAVELED WAY ON ALL RURAL HIGHWAYS AND 6' (1800 mm) ON RESIDENTIAL STREETS.

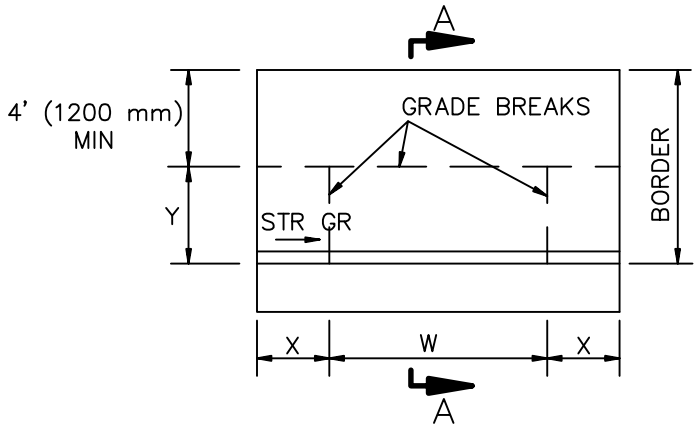
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
ABOVE–GROUND UTILITY LOCATION IN PARKWAY	**101–3**
	SHEET 2 OF 2

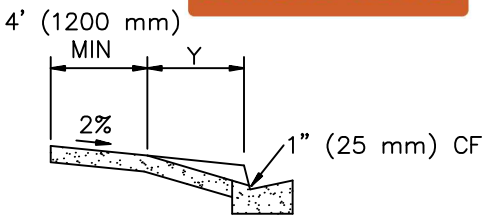
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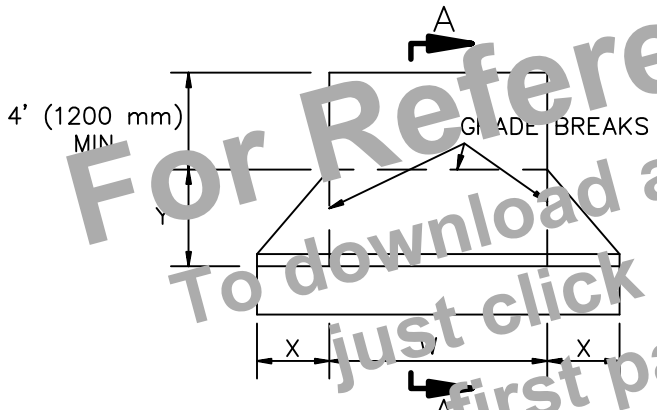


TYPE A

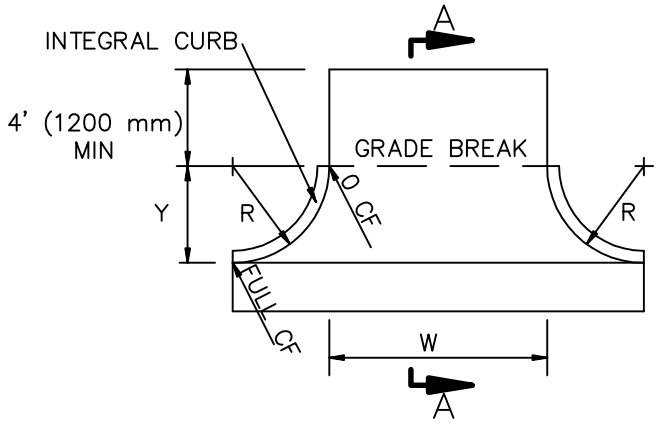


SECTION A–A

CURB FACE, inches (mm)	X, inches (mm)	Y, inches (mm)
6" (150) or less	3'–0" (900)	4'–0" (1200)
7" (175)	3'–6" (1050)	4'–9" (1425)
8" (200)	4'–0" (1200)	5'–8" (1700)
9" (225)	4'–6" (1350)	6'–6" (1950)
10" (250)	5'–0" (1500)	7'–3" (2175)
11" (275)	5'–6" (1650)	8'–0" (2400)
12" (300) or more	6'–0" (1800)	8'–9" (2625)



TYPE B



TYPE C

NOTES:

1. RESIDENTIAL DRIVEWAYS SHALL BE 4" (100 mm) THICK PCC.
2. COMMERCIAL DRIVEWAYS SHALL BE 6" (150 mm) THICK PCC.
3. WEAKENED PLANE JOINTS SHALL BE INSTALLED AT BOTH SIDES OF A DRIVEWAY AND AT 10' (3.0 m) INTERVALS.
4. CURB FOR TYPE C DRIVEWAY SHALL BE INTEGRAL AND MATCH ADJACENT CONSTRUCTION.
5. REFER TO LOCAL DEVELOPMENT REGULATIONS FOR AMERICANS WITH DISABILITIES ACCESS REQUIREMENTS AND MAXIMUM PERMITTED DRIVEWAY WIDTHS.

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DRIVEWAY APPROACHES

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

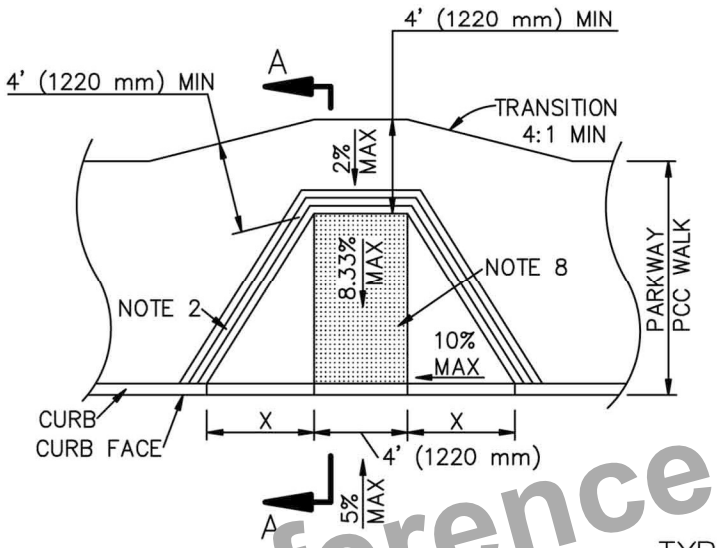
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SHEET 1 OF 1

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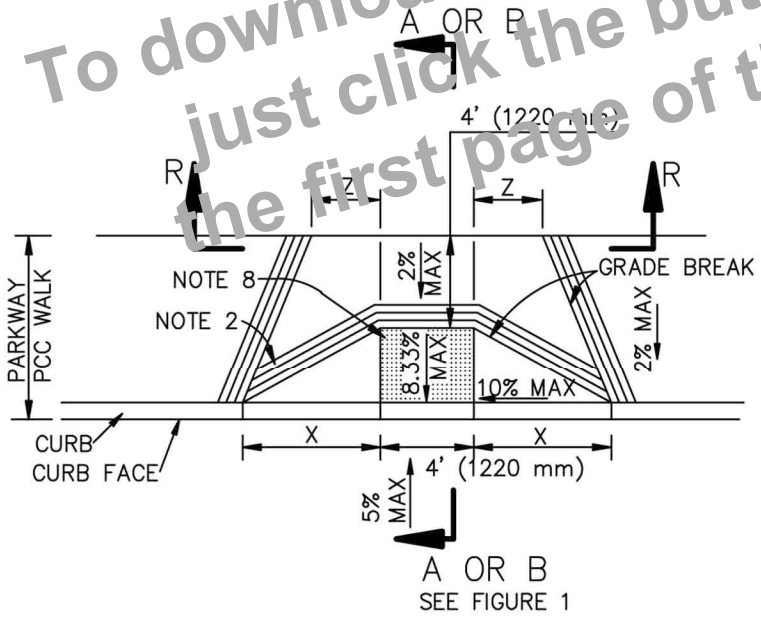
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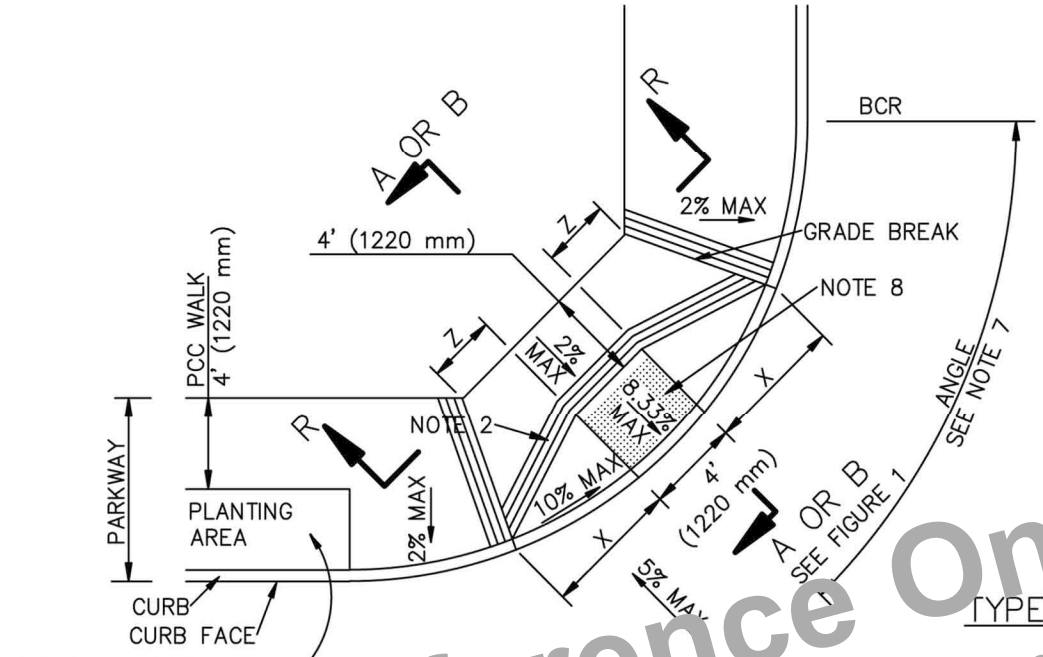
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CASE A

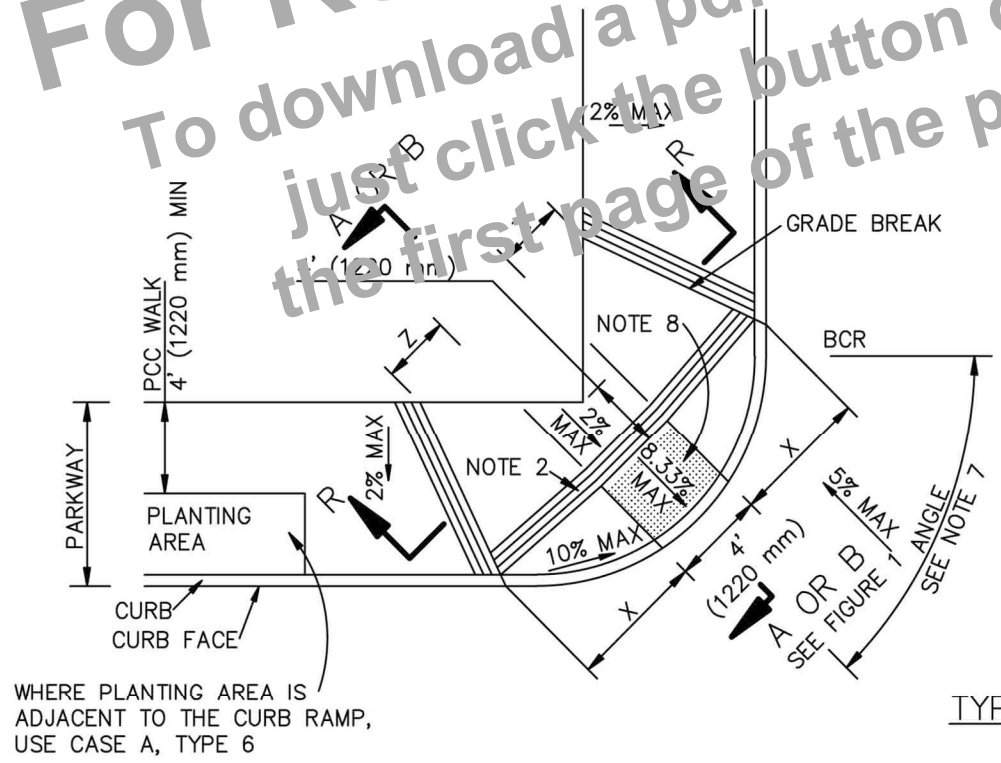
PARTS OF THIS STANDARD PLAN SHOW INSTALLATION FOR TYPICAL RETROFIT CONDITIONS, AND ARE NOT FULLY COMPLIANT WITH CALIFORNIA BUILDING CODE REQUIREMENTS FOR NEW DEVELOPMENT.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
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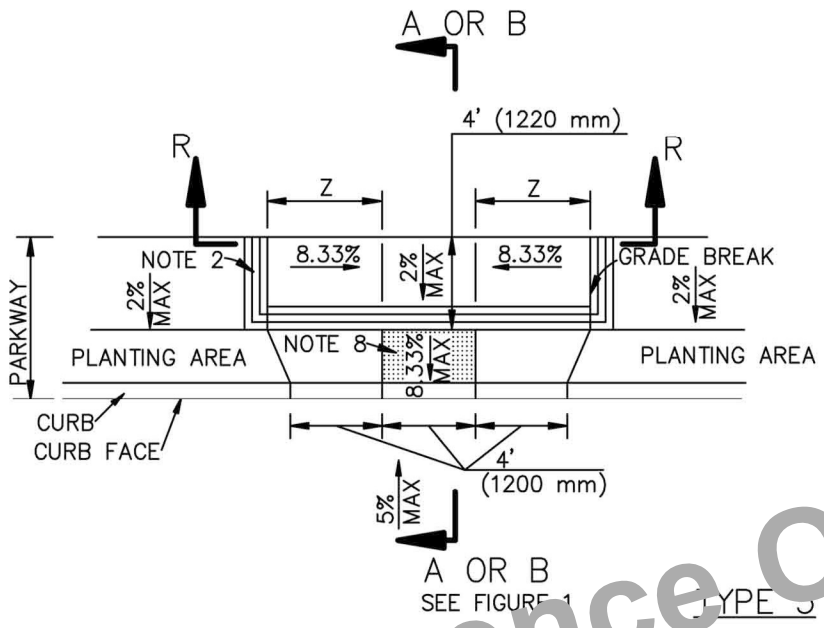
TYPE 4

CASE A

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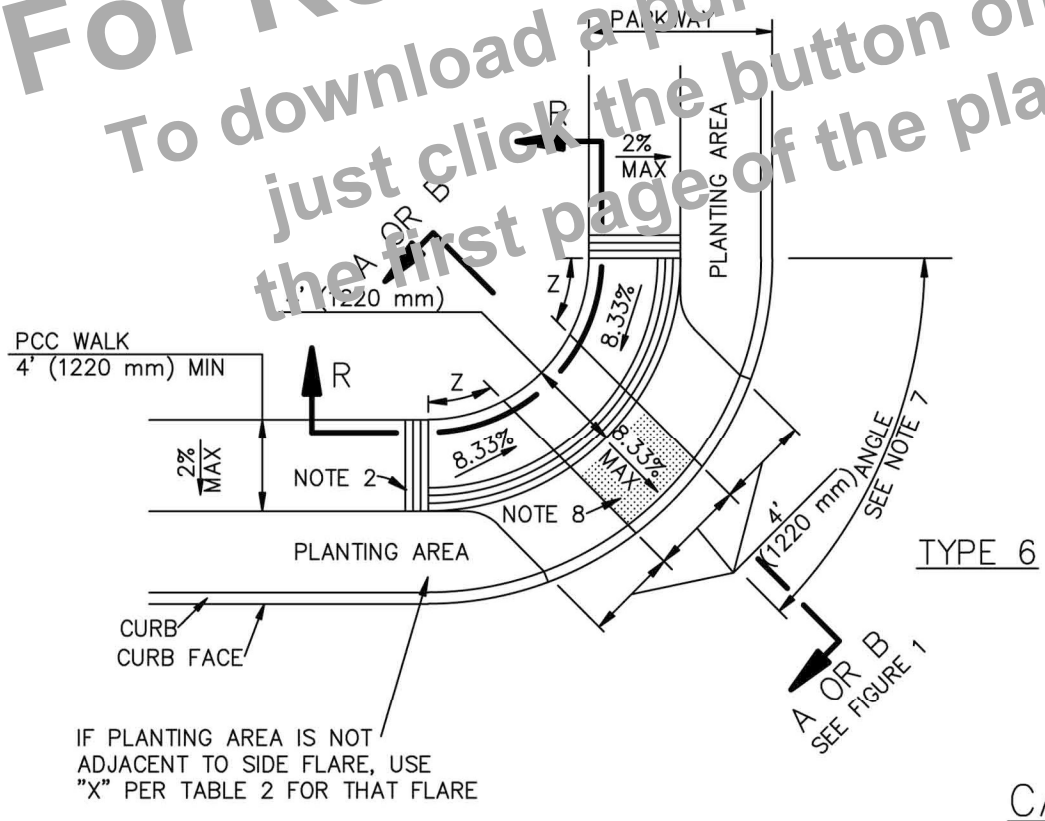
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 111–5
CURB RAMP	SHEET 2 OF 10

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TYPE 5

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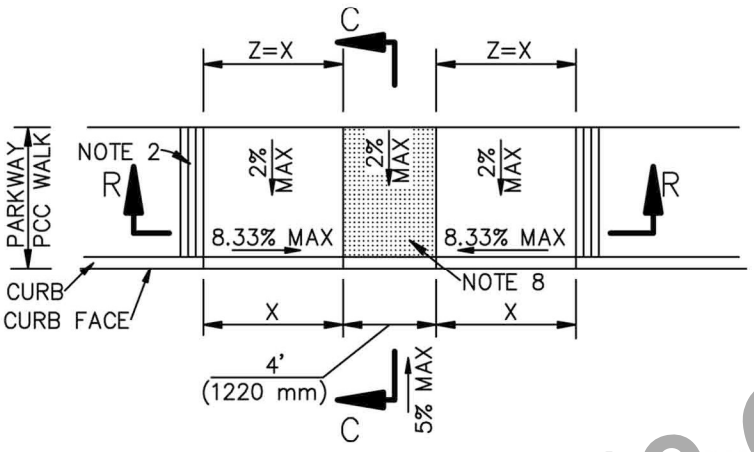


TYPE 6

CASE A

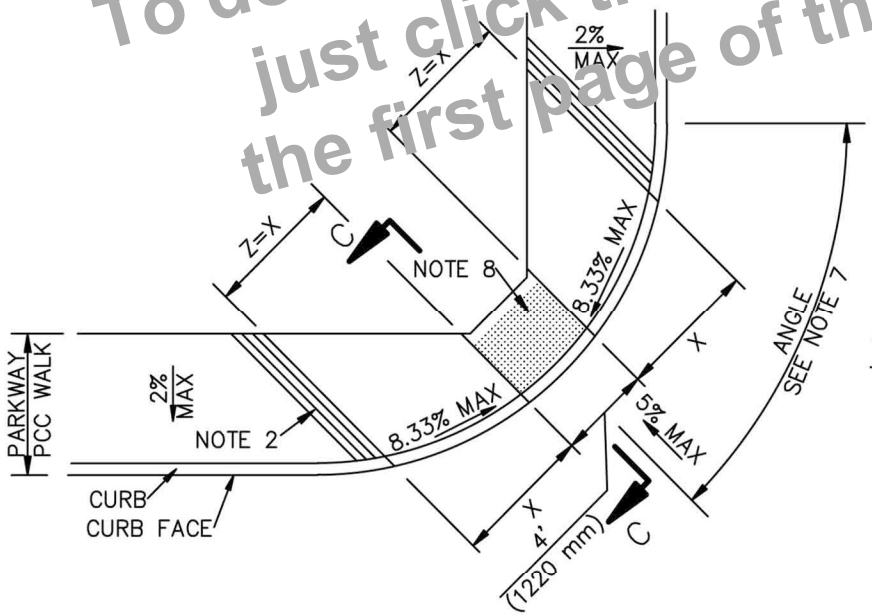
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 111–5
CURB RAMP	SHEET 3 OF 10

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TYPE 1

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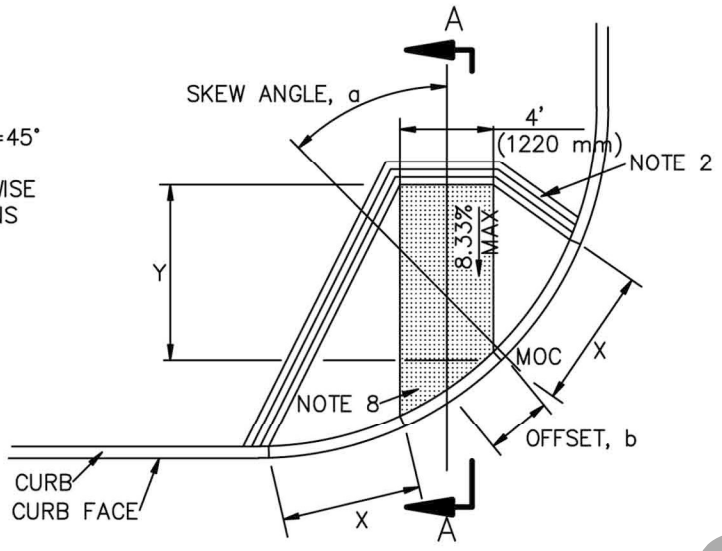
TYPE 2

CASE B

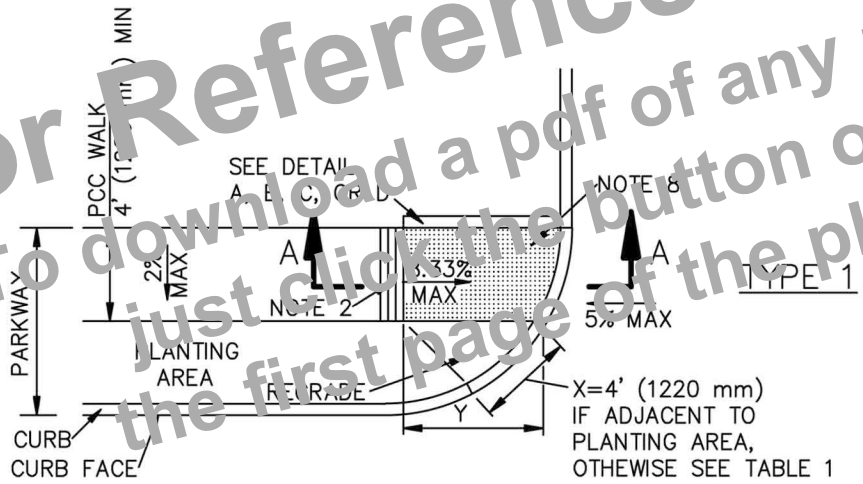
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB RAMP	**111–5**
	SHEET 4 OF 10

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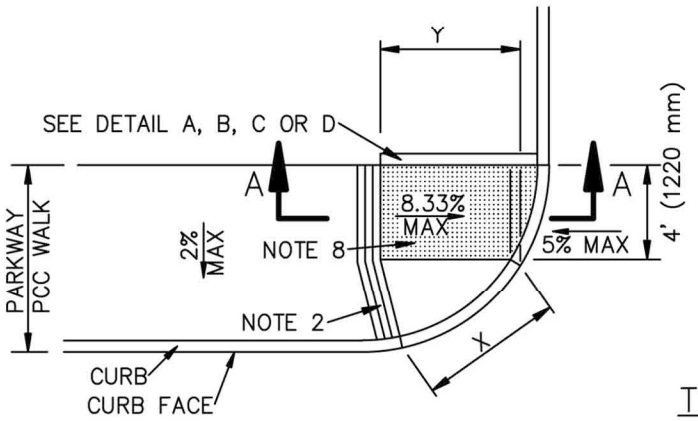
SKEW ANGLE α=45°
OFFSET b=0
UNLESS OTHERWISE
NOTED ON PLANS



CASE C



TYPE 1



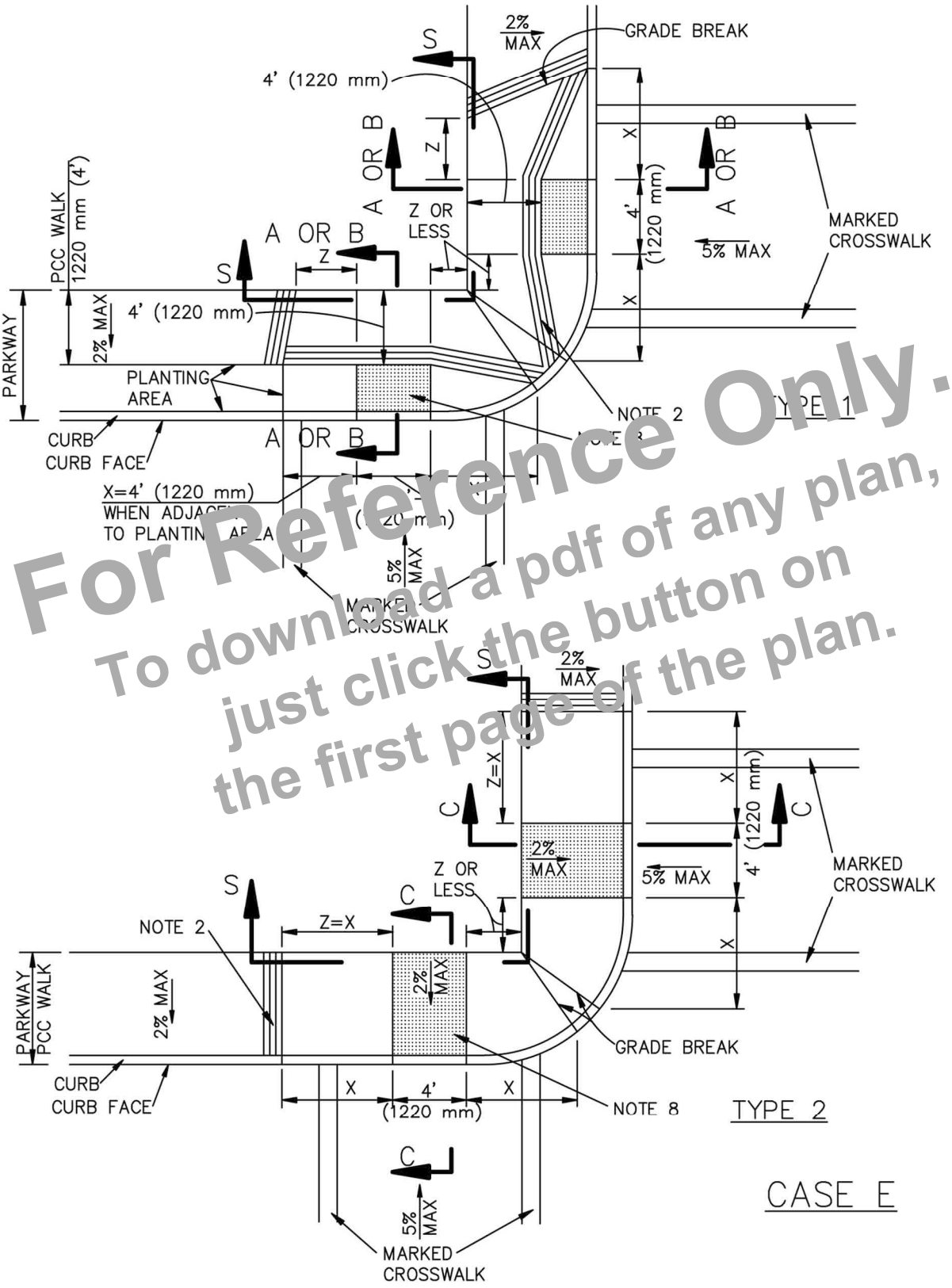
TYPE 2

CASE D

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 111–5
CURB RAMP	SHEET 5 OF 10

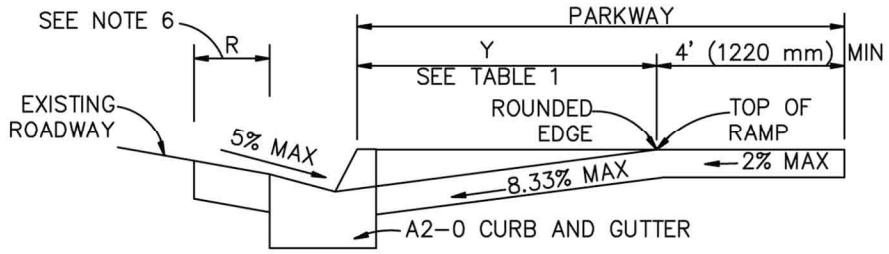
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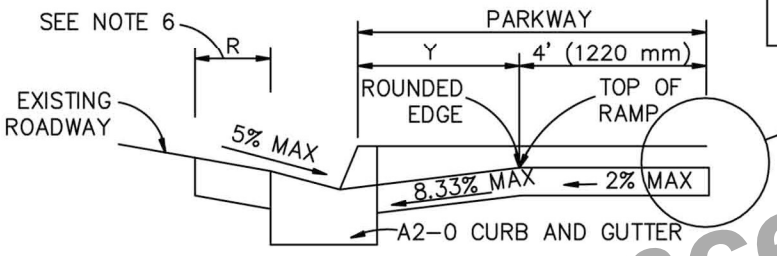
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 111–5
CURB RAMP	SHEET 6 OF 10

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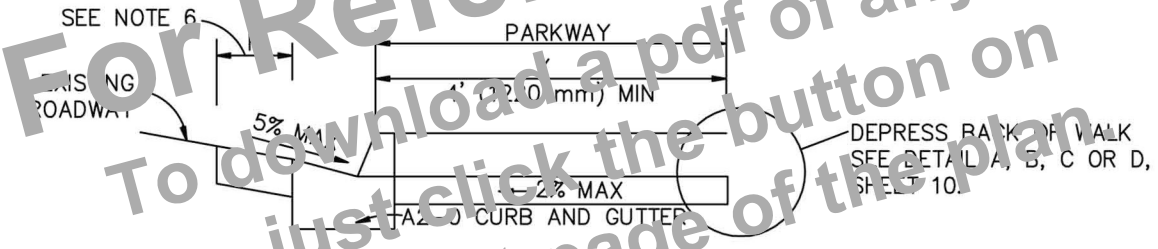


SECTION A–A

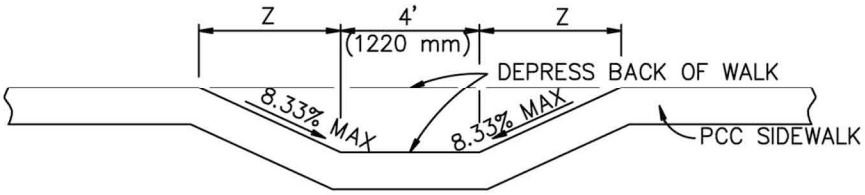
USE FIGURE 1 TO DETERMINE WHICH OF SECTIONS A–A, B–B OR C–C IS APPROPRIATE.



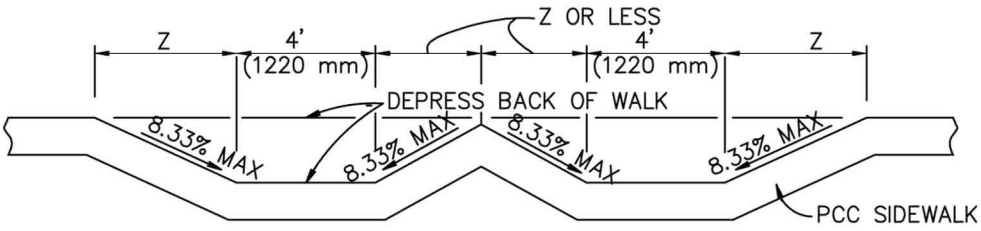
SECTION B–B



SECTION C–C



SECTION R–R



SECTION S–S

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 111–5
CURB RAMP	SHEET 7 OF 10

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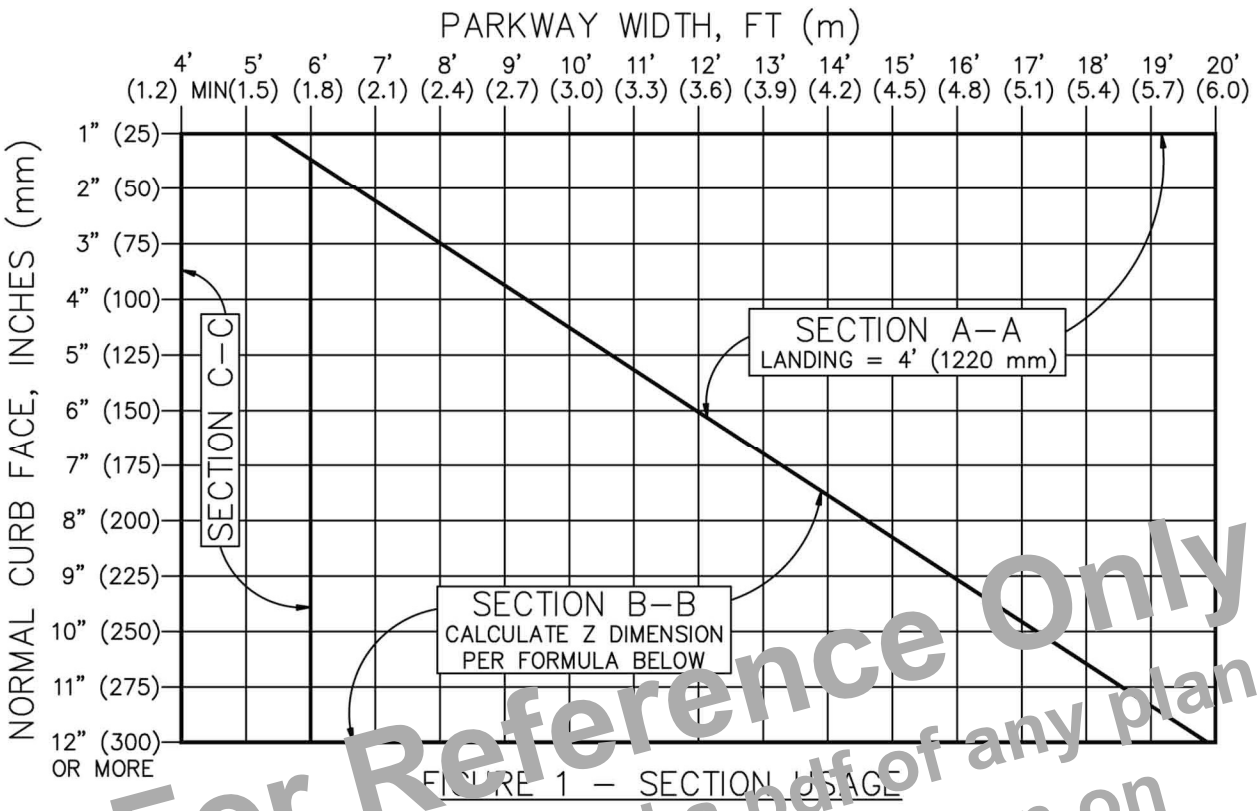


FIGURE 1 – SECTION USAGE

NORMAL CURB FACE, INCHES (mm)	SECTION X–X X, FT (mm)	SECTION Y–Y Y, FT (mm)
2" (50)	4.00' (1220) MIN	2.63' (790)
3" (75)	4.00' (1220) MIN	3.95' (1185)
4" (100)	4.00' (1220) MIN	5.26' (1580)
5" (125)	4.17' (1275)	6.58' (1975)
6" (150)	5.00' (1525)	7.90' (2370)
7" (175)	5.83' (1775)	9.21' (2765)
8" (200)	6.67' (2035)	10.53' (3160)
9" (225)	7.50' (2285)	11.84' (3555)
10" (250)	8.33' (2540)	13.16' (3950)
11" (275)	9.17' (2795)	14.47' (4340)
12" (300)	10.00' (3050)	15.79' (4735)

SEE SHEET 9 FOR STREET SLOPE ADJUSTMENT FACTORS, ALL STREETS

TABLE 1 – X AND Y VALUES

WHERE FIGURE 1 SHOWS USE OF SECTION B–B, FIGURE Z DIMENSION IS AS FOLLOWS:

W = PARKWAY WIDTH
L = LANDING WIDTH, 4' (1220 mm) TYP
Z = [(Y+L)–W] x 0.760

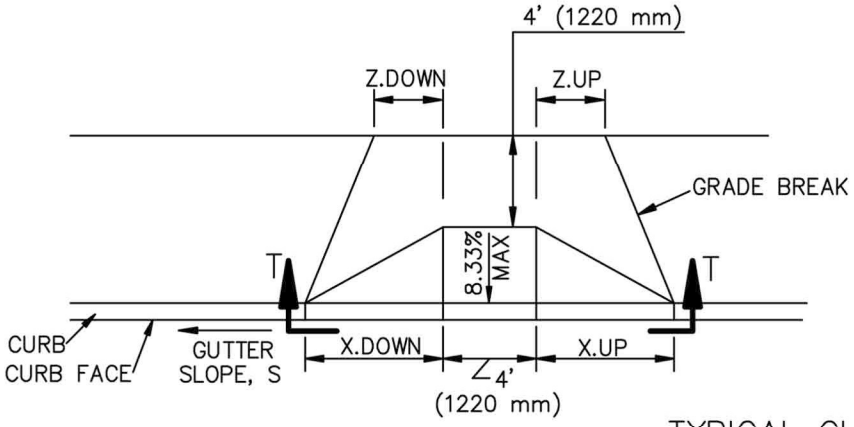
IF (Y+L) < W, THEN Z = 0

TABLE 1 REFERENCE FORMULAS:
X = CF / 8.333%
Y = CF / (8.333% – 2% WALK CROSS SLOPE)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 111–5
CURB RAMP	SHEET 8 OF 10

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TYPICAL CURB RAMP



SECTION T–T
SLOPED STREET

FOR SLOPED STREETS, MULTIPLY THE DIMENSIONS PARALLEL TO THE STREET, X AND Z, UPSTREAM AND DOWNSTREAM OF THE RAMP, BY THE FACTORS IN THE FOLLOWING TABLE.

FOR EXAMPLE, X.DOWN = X x K.DOWN

S	K.DOWN	K.UP
0%	1.000	1.000
0.2%	0.977	1.025
0.5%	0.943	1.064
1%	0.893	1.136
2%	0.806	1.316
3%	0.735	1.563
4%	0.676	1.923
5%	0.625	2.500

TABLE 2 – SLOPE ADJUSTMENTS

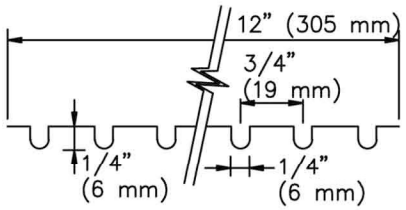
TABLE 2 REFERENCE FORMULAS:
K.DOWN = 8.333% / (8.333% + S)
K.UP = 8.333% / (8.333% – S)

STREET SLOPE ADJUSTMENTS

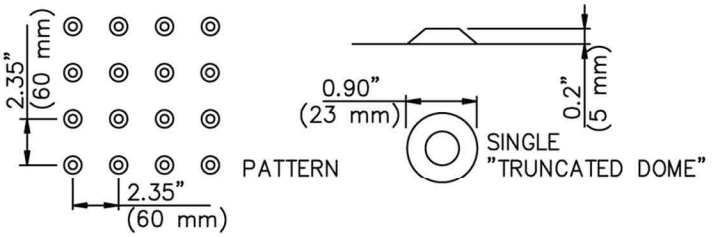
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB RAMP	**111–5**
	SHEET 9 OF 10

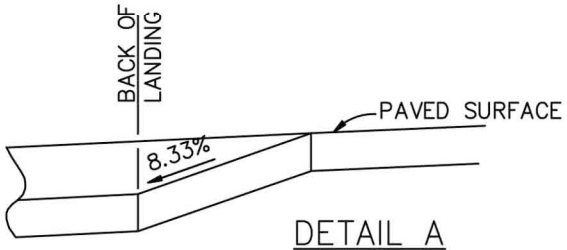
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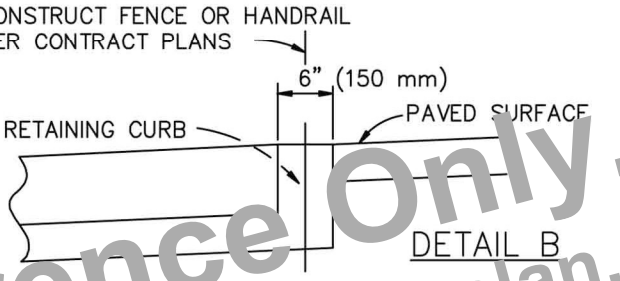
GROOVING DETAIL



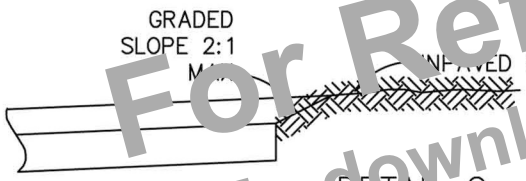
DETECTABLE WARNING DETAIL



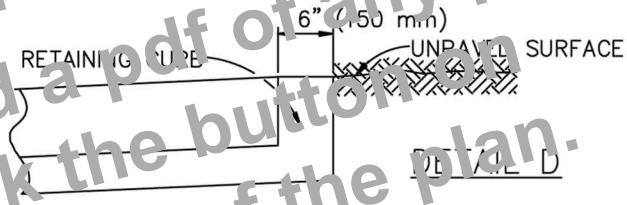
DETAIL A



DETAIL B



DETAIL C



DETAIL D

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GENERAL NOTES:

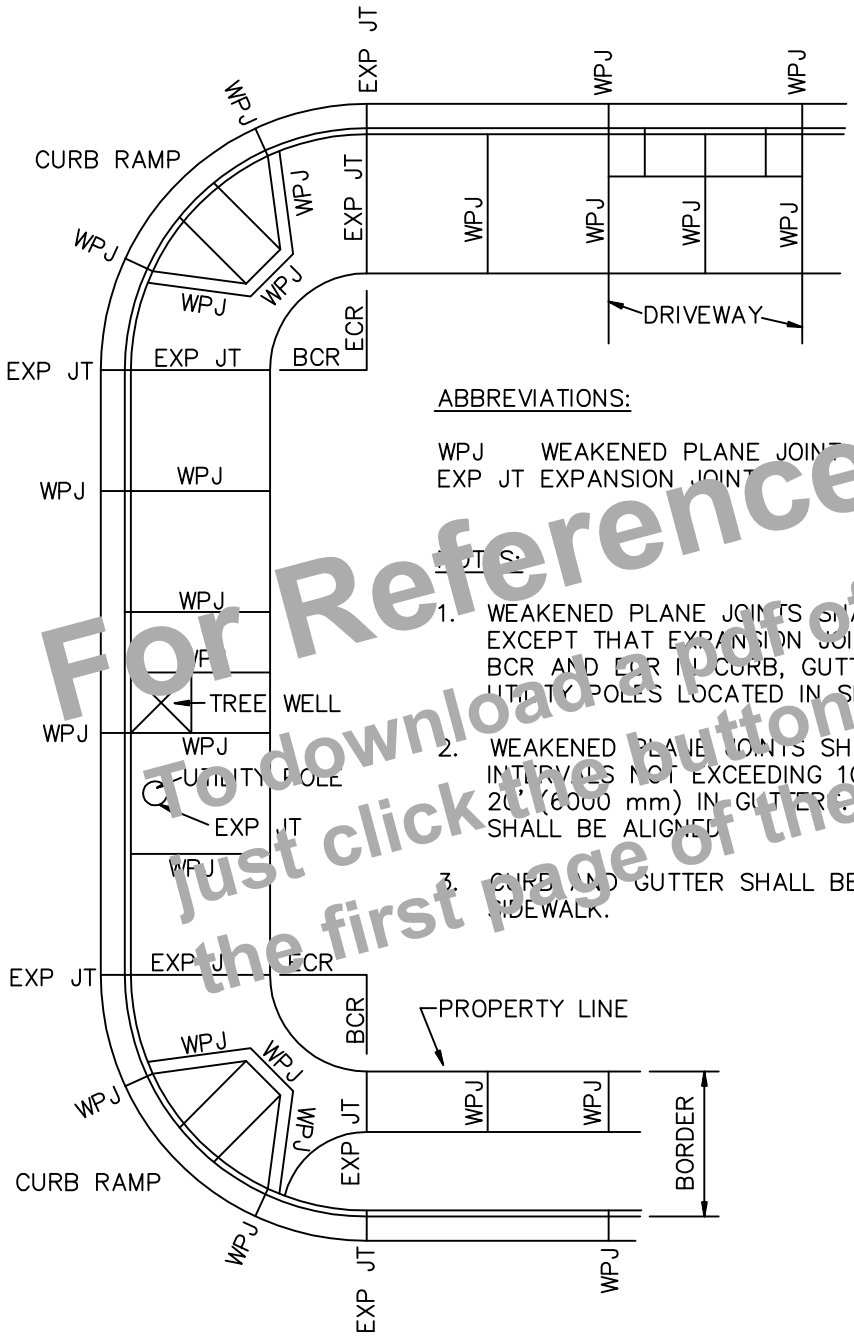
1. CONCRETE SHALL BE CLASS 520-C-2500 (310-C-17) CONFORMING TO SSPWC 201-1.1.2 AND SHALL BE 4" (100 mm) THICK.
2. THE RAMP SHALL HAVE A 12" (305 mm) WIDE BORDER WITH 1/4" (6 mm) GROOVES APPROXIMATELY 3/4" (19 mm) OC. SEE GROOVING DETAIL.
3. THE RAMP SURFACE SHALL HAVE A TRANSVERSE BROOMED SURFACE TEXTURE CONFORMING TO SSPWC 303-1.9.
4. USE DETAIL "A" OR "B" IF EXISTING SURFACE BEHIND LANDING IS PAVED.
5. USE DETAIL "C" OR "D" IF EXISTING SURFACE BEHIND LANDING IS UNPAVED.
6. R = 3' (900 mm) UNLESS OTHERWISE SHOWN ON PLAN. SEE SHEET 7.
7. ANGLE = $\Delta/2$ UNLESS OTHERWISE SHOWN ON PLAN.
8. CONSTRUCT DETECTABLE WARNING SURFACE PER DETAIL THIS SHEET. MATERIALS SHALL BE PER CONTRACT DOCUMENTS.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB RAMP	**111-5**
	SHEET 10 OF 10

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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.

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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

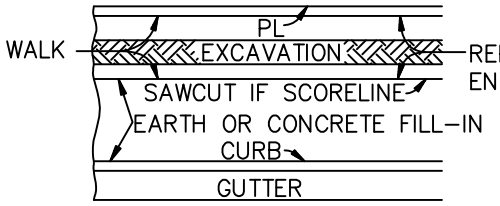
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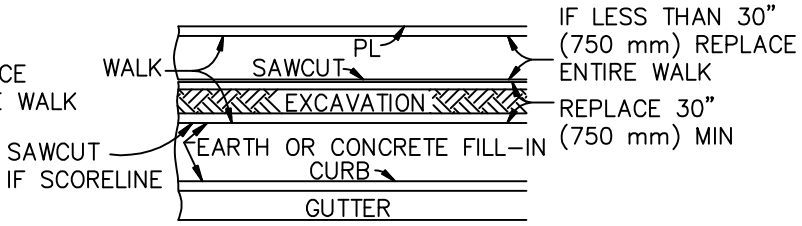
WALK OR FILL–IN REPLACEMENT FOR EXCAVATIO PARALLEL TO CURB OR PROPERTY LINE

WALK ADJACENT TO PROPERTY LINE

WALK LESS THAN 5' (1500 mm) WIDE

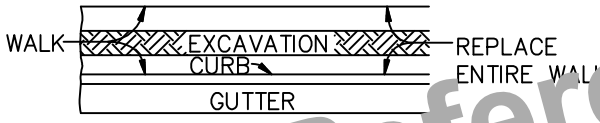


WALK 5' (1500 mm) WIDE OR MORE

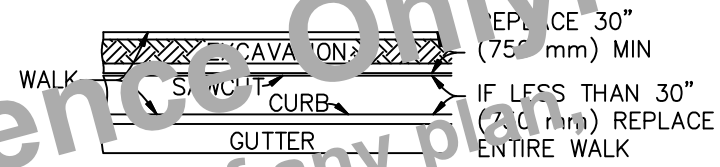


WALK ADJACENT TO CURB

WALK LESS THAN 5' (1500 mm) WIDE

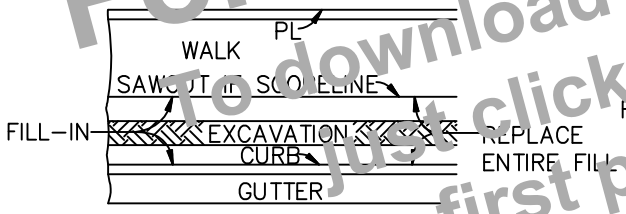


WALK 5' (1500 mm) WIDE OR MOR

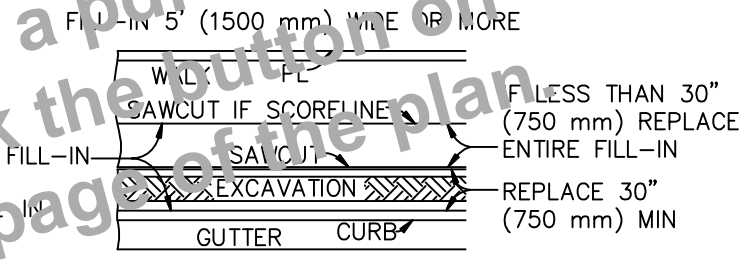


FILL–IN REPLACEMENT

FILL–IN LESS THAN 5' (1500 mm) WIDE

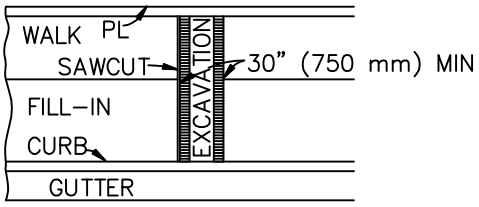


FILL–IN 5' (1500 mm) WIDE OR MORE



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WALK OR FILL–IN REPLACEMENT FOR EXCAVATIONS MADE NORMAL TO CURB OR PROPERTY LINE



THESE REQUIREMENTS ALSO APPLY TO ENDS OF PARALLEL EXCAVATIONS.

IF AN EXCAVATION FALLS WITHIN 30" (750 mm) OF AN EXPANSION JOINT, CONSTRUCTION JOINT, WEAKENED PLANE JOINT, OR EDGE, THE CONCRETE SHALL BE REMOVED AND REPLACED TO THE JOINT OR EDGE.

IF AN EXCAVATION FALLS WITHIN 12" (300 mm) OF A SCORELINE, THE CONCRETE SHALL BE REMOVED AND REPLACED TO THE SCORELINE. THE SCORELINE SHALL BE SAWCUT BEFORE CONCRETE REMOVAL.

THE MINIMUM LENGTH OF REPLACEMENT IN BOTH CASES SHALL BE 30" (750 mm).

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

SIDEWALK & DRIVEWAY REPLACEMENT

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 113–2

SHEET 1 OF 2

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NOTES

1. CONCRETE WALK, FILL–IN AND DRIVEWAYS REMOVED IN CONNECTION WITH CONSTRUCTION SHALL BE REPLACED TO NEATLY SAWED EDGES. ALL CUTS SHALL BE PARALLEL TO OR PERPENDICULAR TO THE CURB; ON CURVES, THE CUT SHALL BE RADIAL TO THE CURB.

2. DRIVEWAY APRONS IN WHICH THE "W" DISTANCE IS LESS THAN 11' (3300 mm) SHALL BE REPLACED IN THEIR ENTIRETY IF CUT IN ANY AREA.

3. DRIVEWAY APRONS IN WHICH THE "W" DISTANCE IS 11' (3300 mm') OR MORE MAY BE CUT WITHIN THE "W" SECTION. THE MINIMUM REPLACEMENT SHALL BE 30" (750 mm) IN LENGTH. THE MINIMUM DISTANCE ALLOWED BETWEEN SUCH CUTS SHALL BE 14' (4200 mm').

4. DRIVEWAY APRONS IN WHICH THE "W" DISTANCE IS 11' (3300 mm) OR MORE MAY BE CUT IN THE "X" OR "R" SECTION. REPLACEMENT SHALL BE THE ENTIRE "X" OR "R" SECTION.

5. DRIVEWAY APRONS SHALL BE REPLACED FROM THE BACK OF THE CURB TO THE FRONT EDGE OF THE WALK, EXCEPT, WHERE WALK IS ADJACENT TO CURB, REPLACEMENT SHALL BE FROM BACK OF CURB TO BACK OF WALK.

6. WALK PORTIONS OF DRIVEWAYS SHALL BE REPLACED AS SHOWN ABOVE FOR EXCAVATIONS MADE PARALLEL OR NORMAL TO CURB.

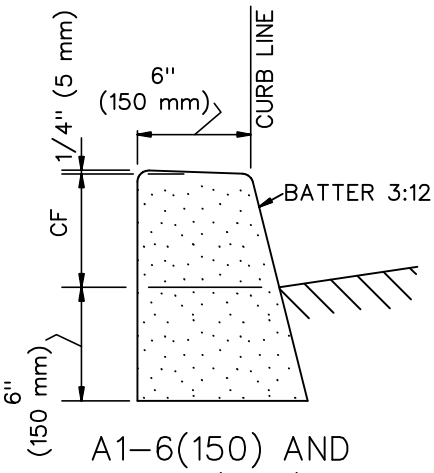
7. REPLACEMENT OF THE "X" OR "R" SECTION SHALL MATCH EXISTING CONSTRUCTION.

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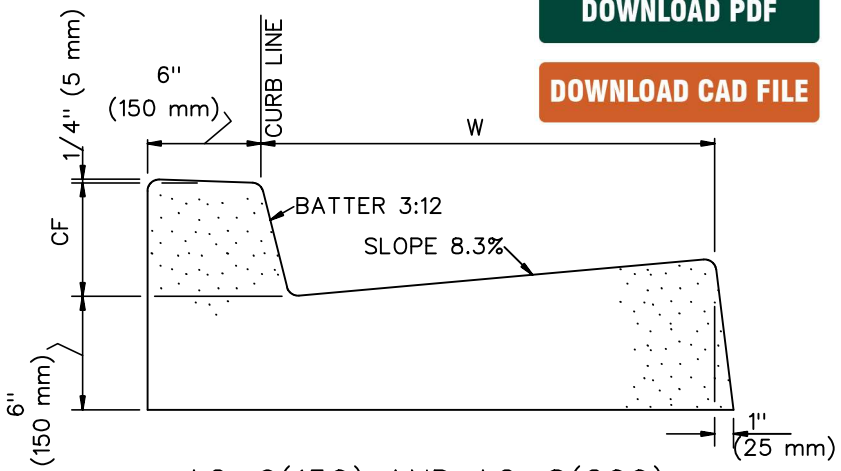
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 113–2 SHEET 2 OF 2
SIDEWALK & DRIVEWAY REPLACEMENT	

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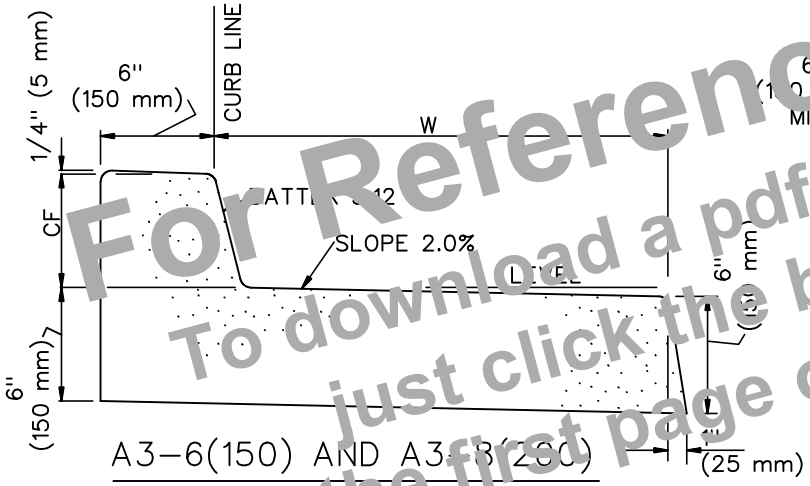
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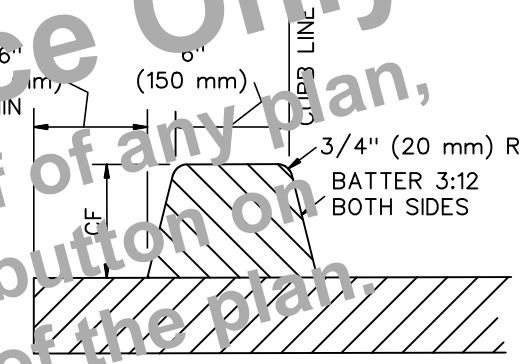
A1–6(150) AND
A1–8(200)



A2–6(150) AND A2–8(200)



A3–6(150) AND A3–8(200)

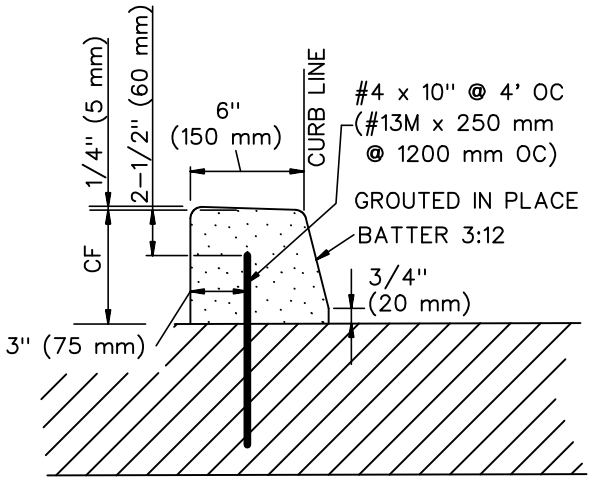


D1–6(150) AND
D1–8(200)

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NOTES:

1. THE LAST NUMBER IN THE DESIGNATION IS THE CURB FACE (CF) HEIGHT, INCHES (mm). IF SHOWN AS 'VAR' THE CURB FACE VARIES.
2. GUTTER WIDTH, W, IS 24" (600 mm) UNLESS OTHERWISE SPECIFIED.
3. TYPES A1, A2, A3 AND C1 SHALL BE CONSTRUCTED OF CONCRETE.
4. TYPE D1 CURB SHALL BE CONSTRUCTED OF 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 CONCRETE CURBS AND GUTTERS SHALL BE ROUNDED WITH A 1/2" (15 mm) RADIUS.



C1–6(150) AND C1–8(200)

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PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1986, 2009, 2021

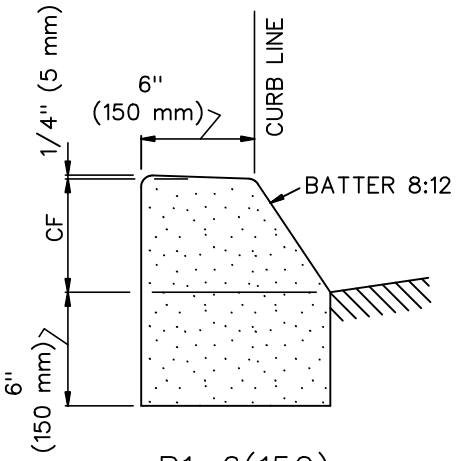
CURB AND GUTTER – BARRIER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

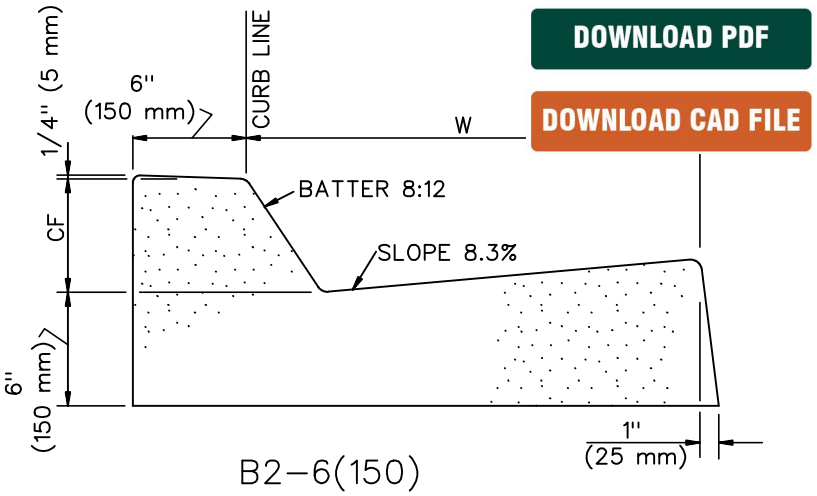
STANDARD PLAN
120–3
SHEET 1 OF 1

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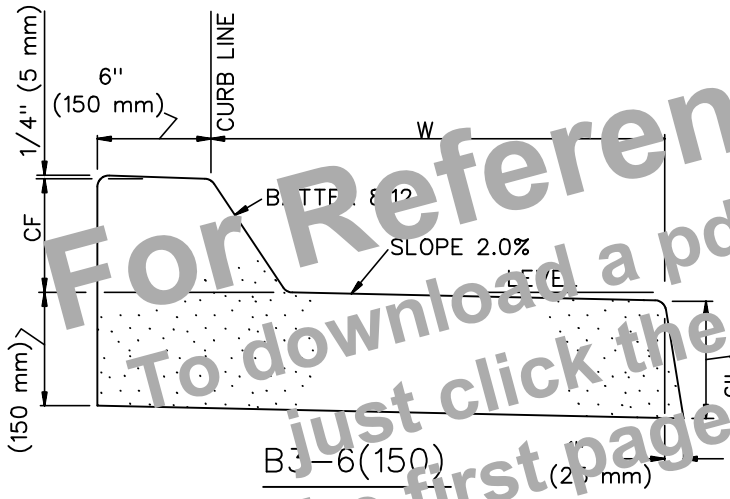
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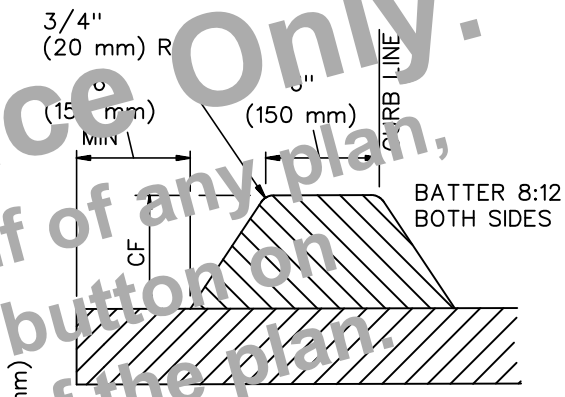
B1–6(150)



B2–6(150)



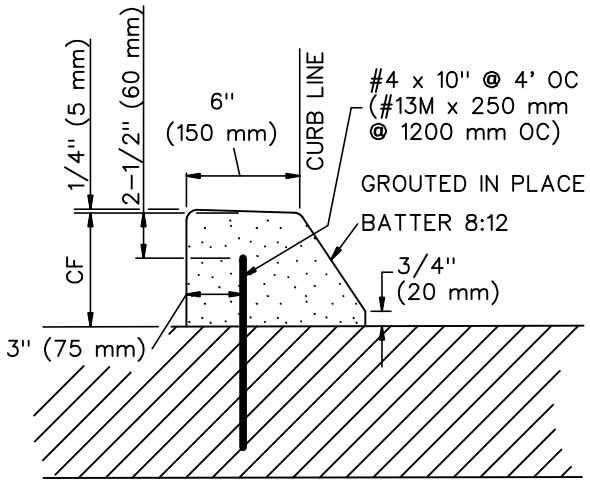
B3–6(150)



D2–6(150)

NOTES:

1. THE LAST NUMBER IN THE DESIGNATION IS THE CURB FACE (CF) HEIGHT, INCHES (mm). IF SHOWN AS 'VAR', THE CURB FACE VARIES.
2. GUTTER WIDTH, W, IS 24" (600 mm) UNLESS OTHERWISE SPECIFIED.
3. TYPES B1, B2, B3 AND C2 SHALL BE CONSTRUCTED OF CONCRETE.
4. TYPE D2 CURB SHALL BE CONSTRUCTED OF ASPHALT CONCRETE.
5. TYPE C2 CURB SHALL BE ANCHORED WITH STEEL DOWELS AS SHOWN OR WITH AN EPOXY APPROVED BY THE ENGINEER.
6. ALL EXPOSED CORNERS ON CONCRETE CURBS AND GUTTERS SHALL BE ROUNDED WITH A 1/2" (15 mm) RADIUS.



C2–6(150)

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CURB AND GUTTER – MOUNTABLE

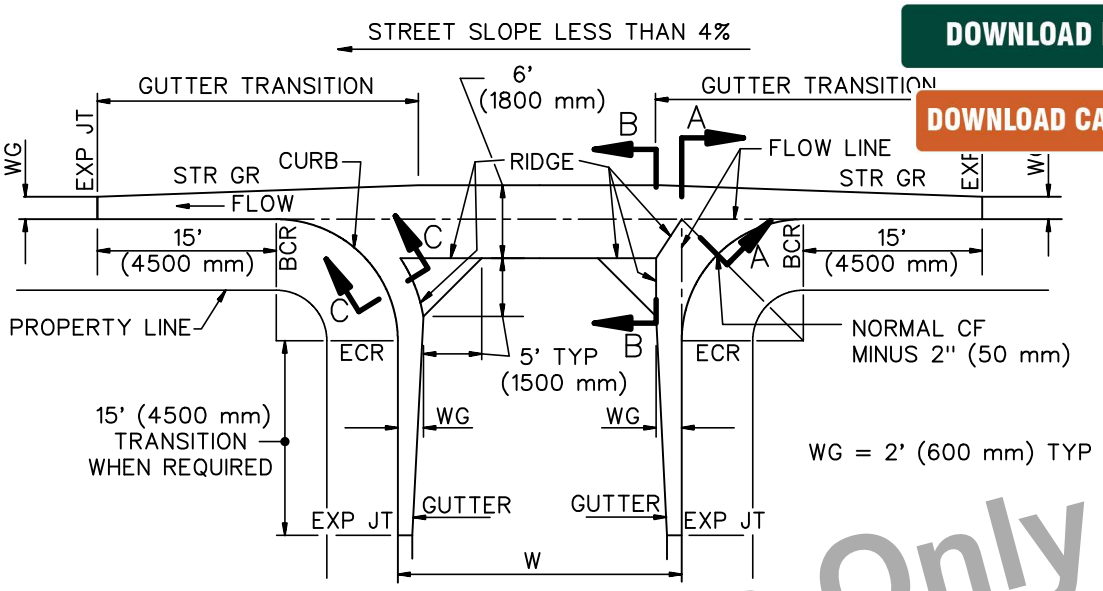
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 121–3

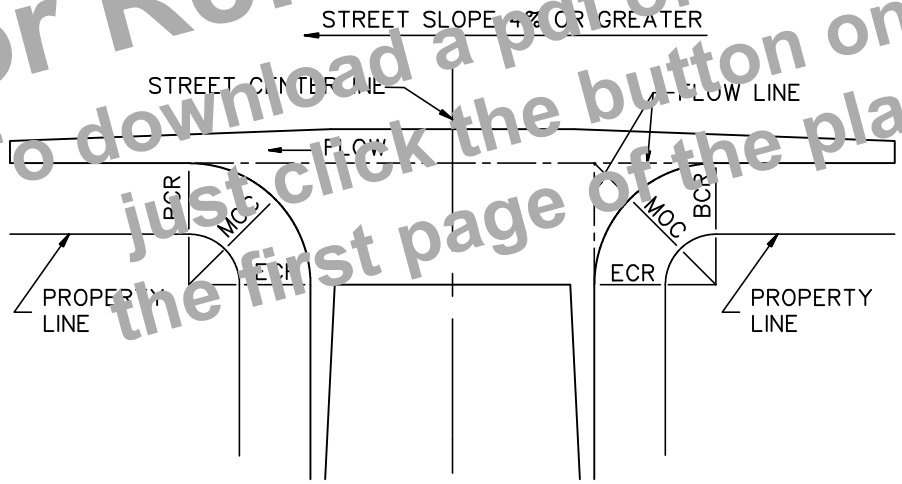
SHEET 1 OF 1

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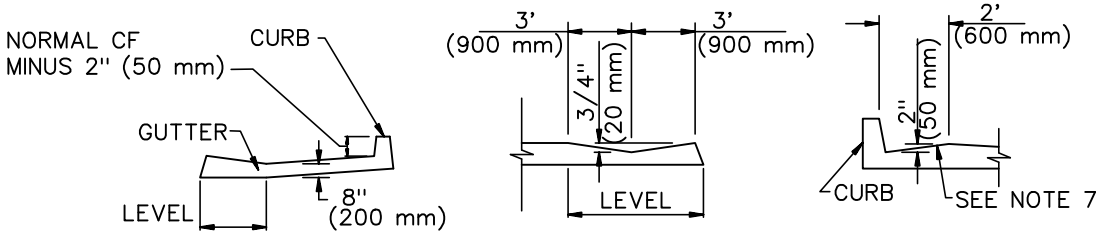
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TYPICAL CROSS GUTTER PLAN
STREET SLOPE LESS THAN 4%



TYPICAL CROSS GUTTER PLAN
STREET SLOPE 4% OR GREATER



SECTION A–A SECTION B–B SECTION C–C

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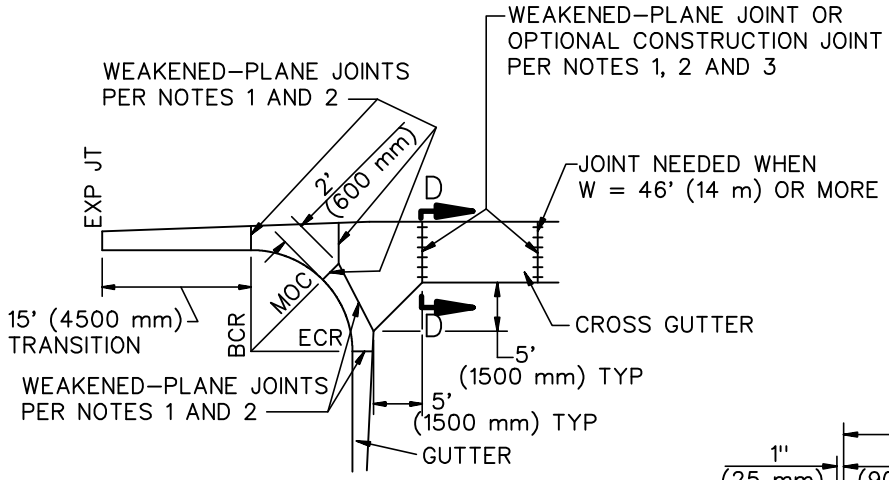
CROSS AND LONGITUDINAL GUTTERS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

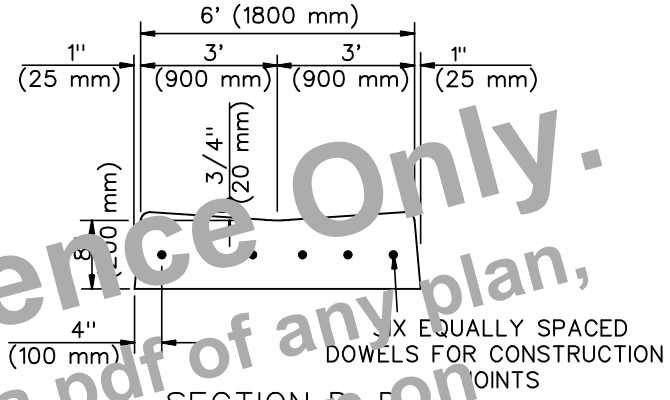
STANDARD PLAN
122–3
SHEET 1 OF 2

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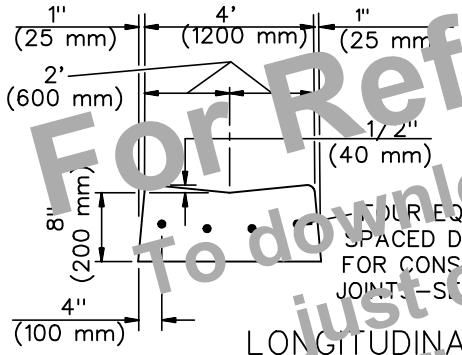
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TYPICAL JOINT PLAN



SECTION D–D



LONGITUDINAL GUTTER

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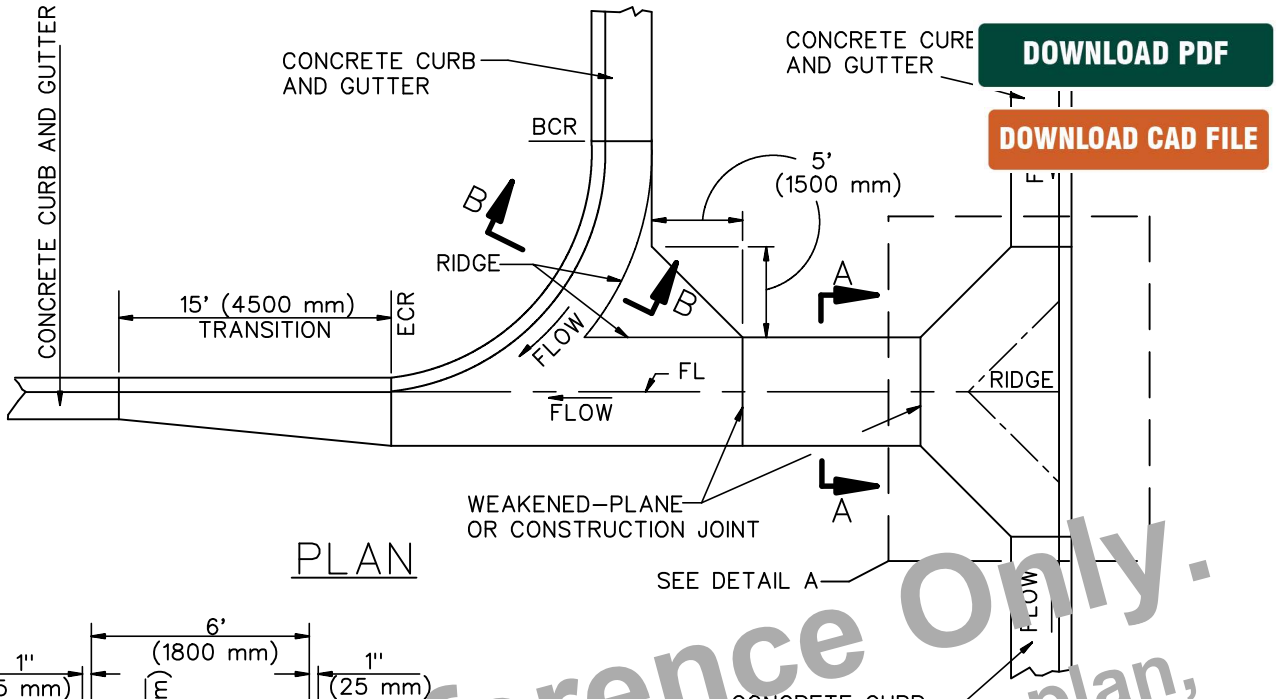
NOTES:

1. WEAKENED–PLANE AND/OR CONSTRUCTION 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 CONSTRUCTION JOINTS SHALL BE #4 BARS 18" LONG (#13M BARS 450 mm LONG).
4. PLACE A WEAKENED–PLANE OR CONSTRUCTION JOINT WHERE LONGITUDINAL ALLEY GUTTER JOINS CONCRETE ALLEY INTERSECTION.
5. ALL EXPOSED CORNERS ON PCC CURBS AND GUTTERS SHALL BE ROUNDED WITH 1/2" (15 mm) RADIUS.
6. CONCRETE SHALL BE INTEGRAL WITH CURB UNLESS OTHERWISE SPECIFIED.
7. ADJACENT TO CURB RAMPS, CONCRETE SLOPE SHALL BE 5% MAXIMUM FOR A DISTANCE OF 5 FEET (1525 mm) FROM THE CURB FACE FOR THE WIDTH OF THE WIDTH OF THE RAMP, NOT INCLUDING SIDE TRANSITION CURBS.

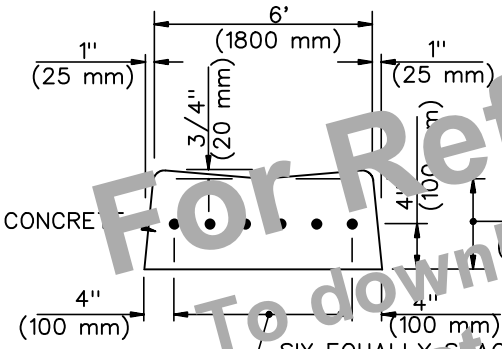
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CROSS AND LONGITUDINAL GUTTERS	**122–3**
	SHEET 2 OF 2

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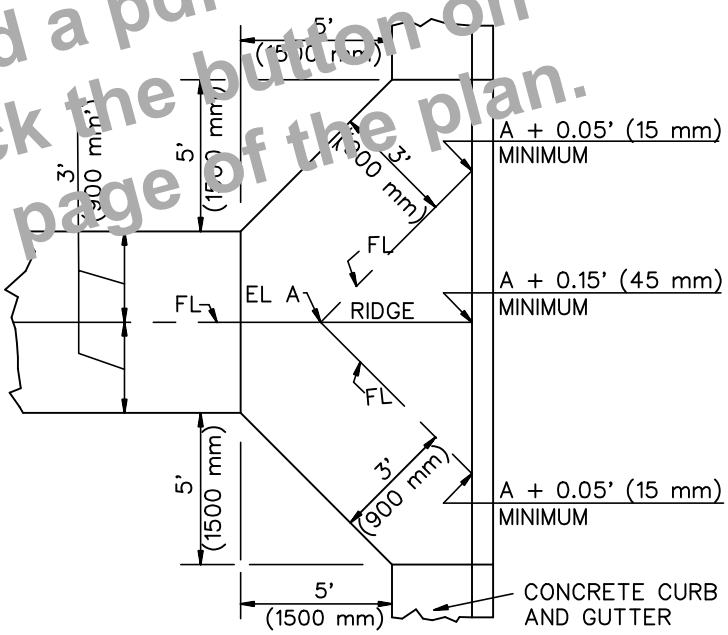
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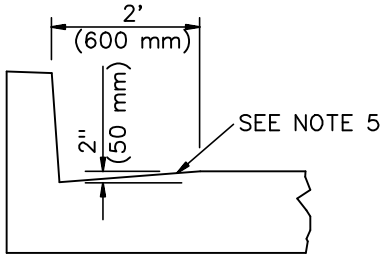


PLAN



SECTION A-A





SECTION B-B

DETAIL A

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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CROSS GUTTER AT T-INTERSECTIONS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 123-3

SHEET 1 OF 2

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NOTES:

1. 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.

2. DOWELS FOR CONSTRUCTION JOINTS SHALL BE #4 BARS 18" LONG (#13M BARS 450 mm LONG).

3. ALL EXPOSED CORNERS ON CONCRETE CURBS AND GUTTERS SHALL BE ROUNDED WITH 1/2" (15 mm) RADIUS.

4. CONCRETE SHALL BE INTEGRAL WITH CURB UNLESS OTHERWISE SPECIFIED.

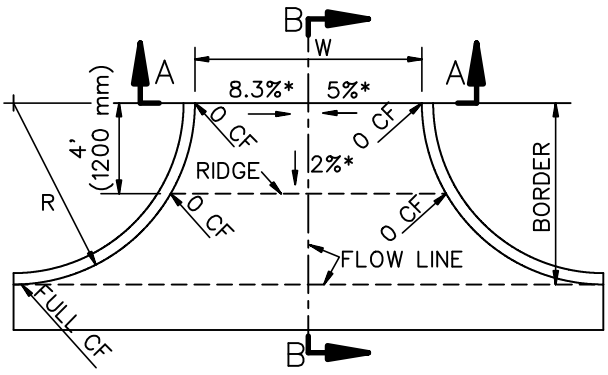
5. ADJACENT TO CURB RAMPS, CONCRETE SLOPE SHALL BE 5% MAXIMUM FOR A DISTANCE OF 5 FEET (1525 mm) FROM THE CURB FACE FOR THE WIDTH OF THE WIDTH OF THE RAMP, NOT INCLUDING SIDE TRANSITION CURBS.

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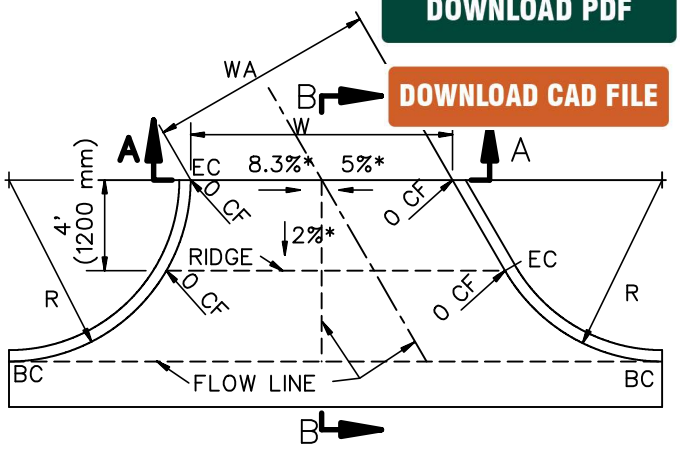
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CROSS GUTTER AT T–INTERSECTIONS	**123–3**
	SHEET 2 OF 2

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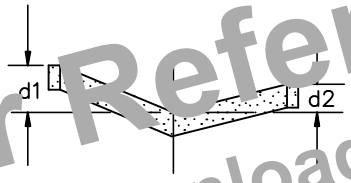
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CASE A
STANDARD APPROACH



CASE B
ANGLE APPROACH



SECTION
A–A



SECTION
B–B

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W, ft W, mm	8' (2400 mm)	10' (3000 mm)	15' (4500 mm)	20' (6000 mm)	25' (7500 mm)	30' (9000 mm)
d1, ft MAX	0.33' (100 mm)	0.42' (125 mm)	0.63' (188 mm)	0.83' (250 mm)	1.04' (313 mm)	1.25' (375 mm)
d2, ft MIN	0.17' (50 mm)	0.25' (75 mm)	0.25' (75 mm)	0.25' (75 mm)	0.25' (75 mm)	0.25' (75 mm)

NOTES:

1. ALLEY INTERSECTION SHALL BE CONSTRUCTED OF CONCRETE, CLASS 520–C–2500 (310–C–17), 6" (150 mm) THICK.
2. ASTERISKS (*) SHOW MAXIMUM GRADES.

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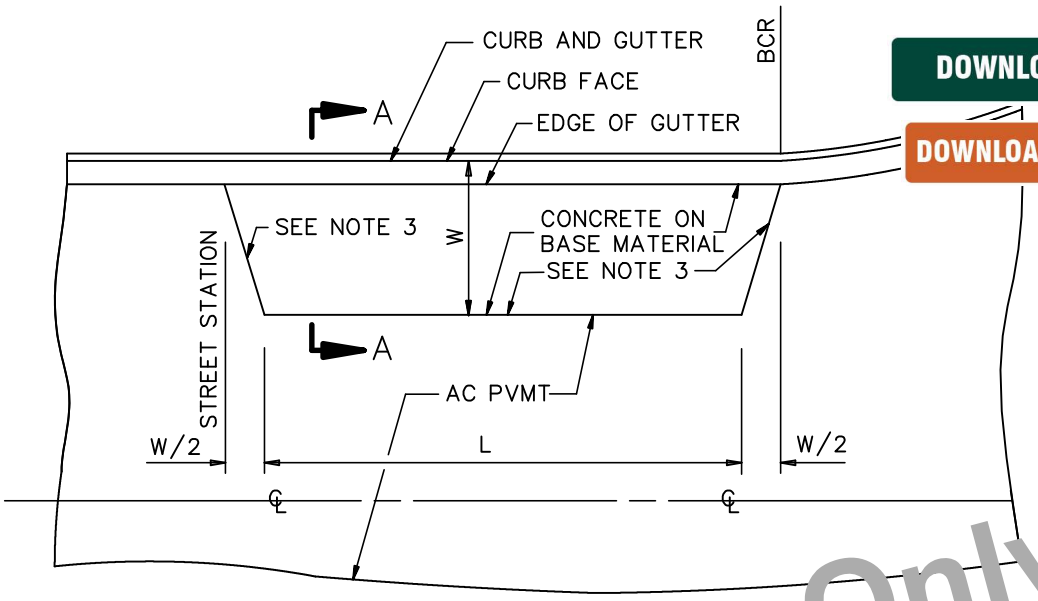
ALLEY INTERSECTION

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
130–3
SHEET 1 OF 1

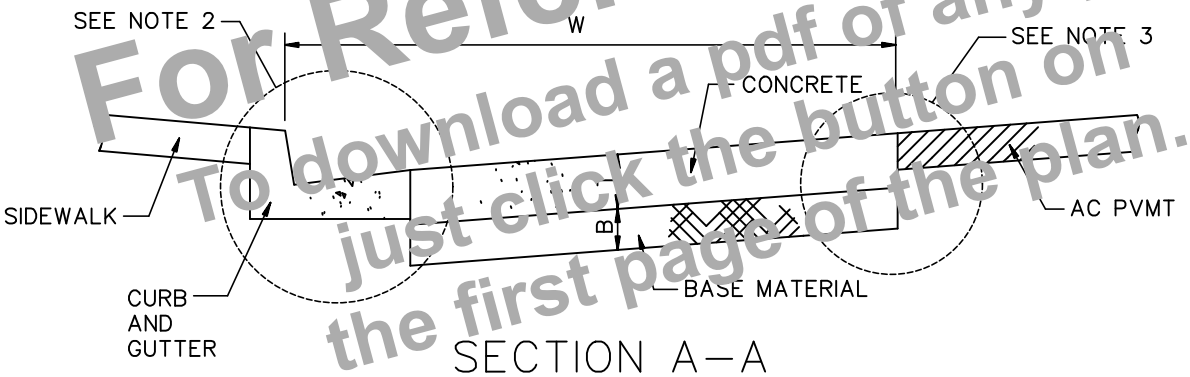
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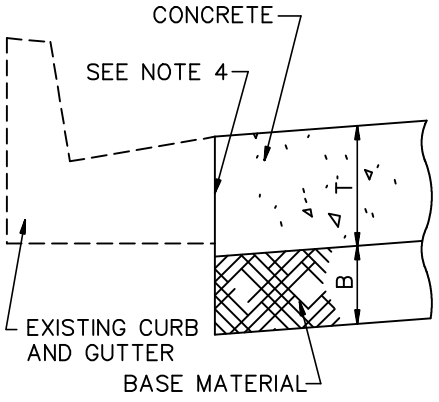


TYPICAL BUS PAD

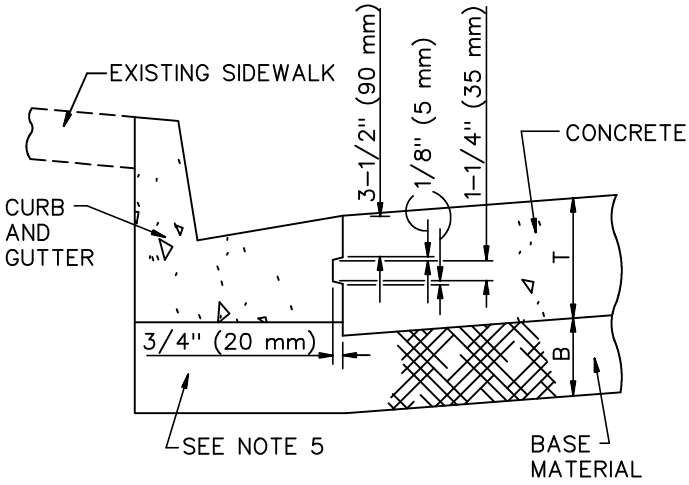
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SECTION A–A



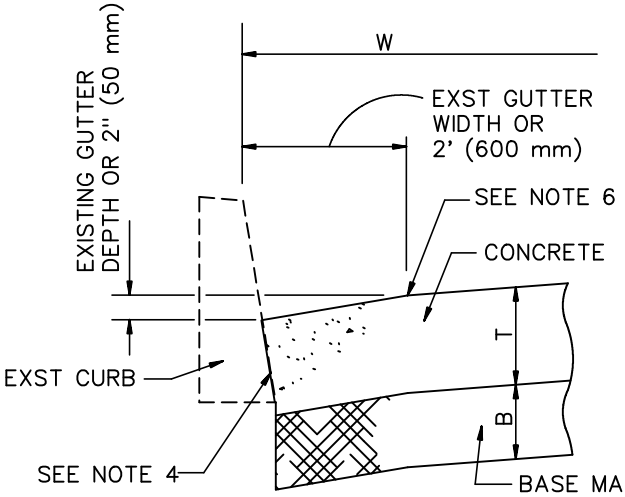
SECTION B–B



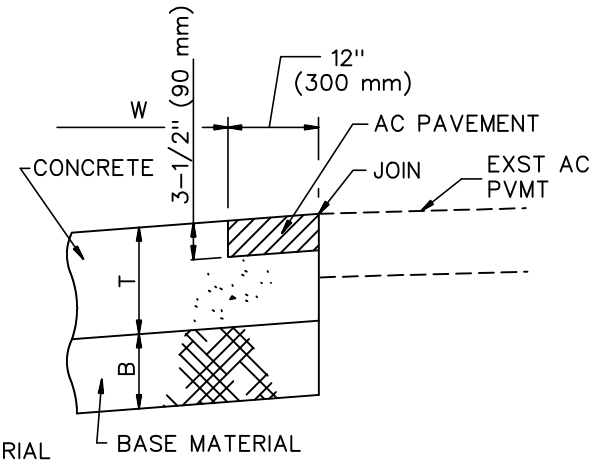
SECTION C–C

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1993 REV. 1996, 2009, 2021	**CONCRETE BUS PAD**	STANDARD PLAN **131–3**
	USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	SHEET 1 OF 2

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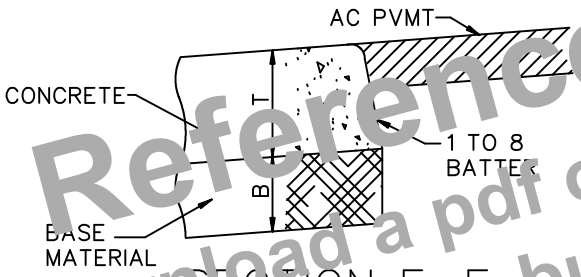


SECTION D–D



SECTION E–E

SEE NOTE 11



SECTION F–F

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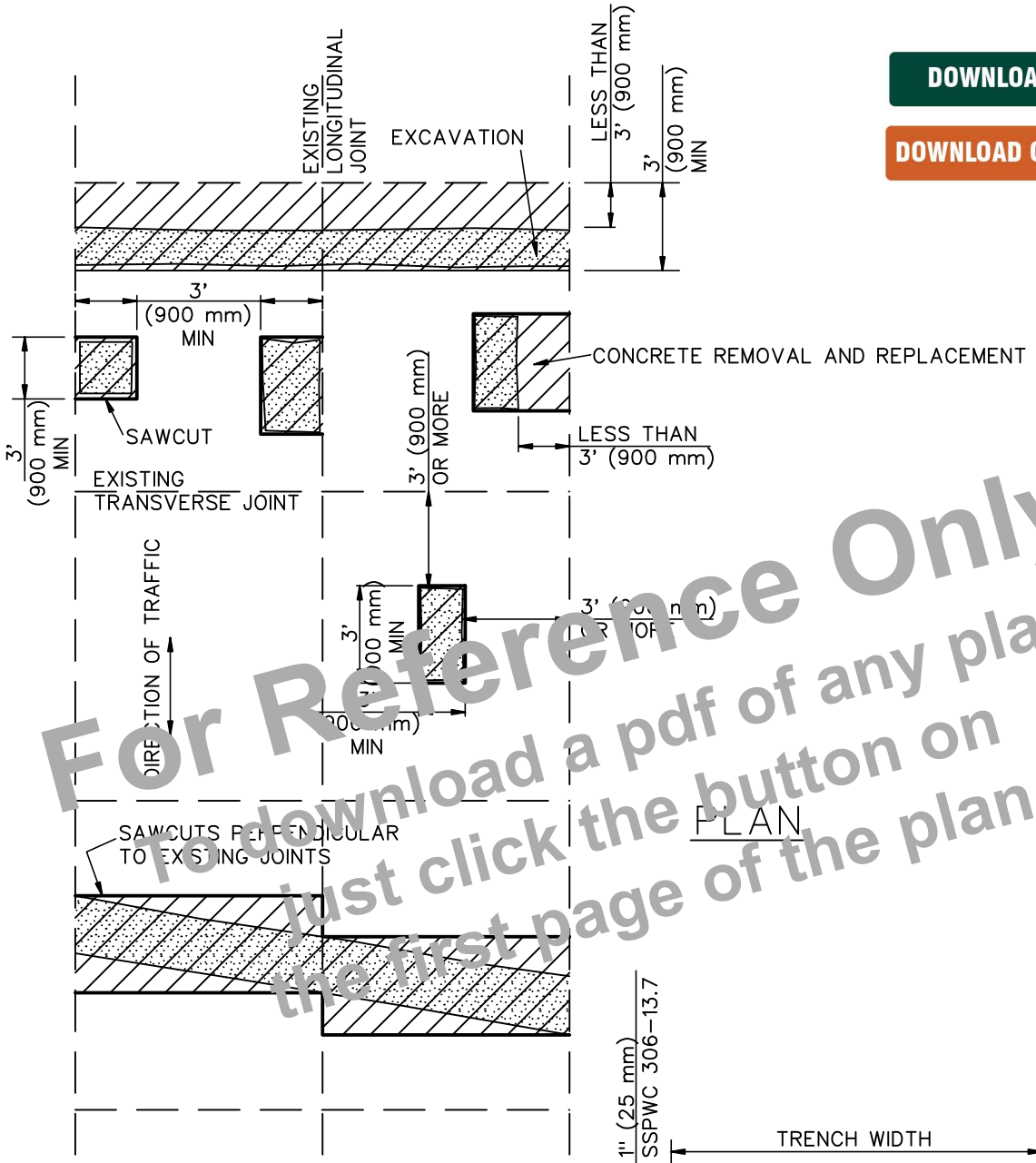
NOTES:

1. DIMENSIONS: (UNLESS OTHERWISE SHOWN)
   L = 85' (26 m) T = 8" (200 mm)
   W = 10' (3 m) B = 6" (150 mm)
2. USE SECTION B–B FOR EXISTING CURB AND GUTTER THAT IS TO REMAIN.
   USE SECTION C–C FOR NEW CURB AND GUTTER.
   USE SECTION D–D FOR EXISTING CURB THAT IS TO REMAIN.
3. USE SECTION E–E FOR EXISTING AC PAVEMENT.
   USE SECTION F–F FOR NEW AC PAVEMENT.
4. AT LOCATIONS WHERE CONCRETE PAVEMENT WILL ABUT EXISTING CONCRETE, AN EPOXY APPROVED BY THE ENGINEER SHALL BE APPLIED TO THE EXISTING CONCRETE SURFACES PRIOR TO CONCRETE PLACEMENT.
5. IF B + T IS EQUAL TO OR GREATER THAN 12" (300 mm), BASE MATERIAL SHALL EXTEND UNDER NEW CURB AND GUTTER.
6. CONSTRUCT LONGITUDINAL WEAKENED–PLANE JOINT TO MATCH ADJOINING EXISTING GUTTER WIDTH, OR 2' (600 mm) IF NO ADJOINING GUTTER EXISTS.
7. USE 2"x4" (50 x 100 mm) HEADER TO FORM 3–1/2" (90 mm) STEP. TOP OF HEADER SHALL BE SET TO LINE AND GRADE.
8. ALL EXPOSED PCC CORNERS SHALL BE ROUNDED WITH A 1/2" (15 mm) RADIUS.
9. SURFACE OF CONCRETE SHALL HAVE A ROUGH TRANSVERSE BROOM FINISH.
10. IF SPECIFIED, THE EXISTING PAVEMENT MAY BE NEATLY SAWCUT AROUND THE DIMENSIONS OF THE BUS PAD, AND CONCRETE POURED DIRECTLY USING THE EXISTING PAVEMENT AS A FORM. THE CONCRETE EDGES SHALL BE ROUNDED WITH A 1/2" (15 mm) RADIUS.
11. CONSTRUCT TRANSVERSE WEAKENED–PLANE JOINTS IN BUS PAD PAVEMENT AT APPROX. 10' (3 m) INTERVALS.
12. CONSTRUCT TRANSVERSE WEAKENED–PLANE JOINTS IN BUS PAD PAVEMENT AT ALL EXISTING CURB/CURB & GUTTER CONSTRUCTION JOINTS AND WEAKENED–PLANE JOINTS.

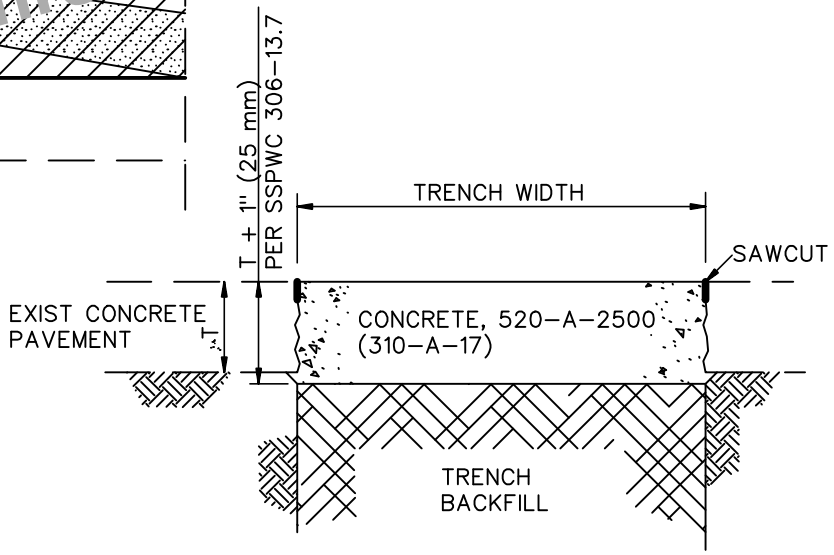
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CONCRETE BUS PAD	**131–3**
	SHEET 2 OF 2

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PLAN



REPLACEMENT SECTION

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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CONCRETE PAVEMENT REPLACEMENT

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 132-4

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NOTES:

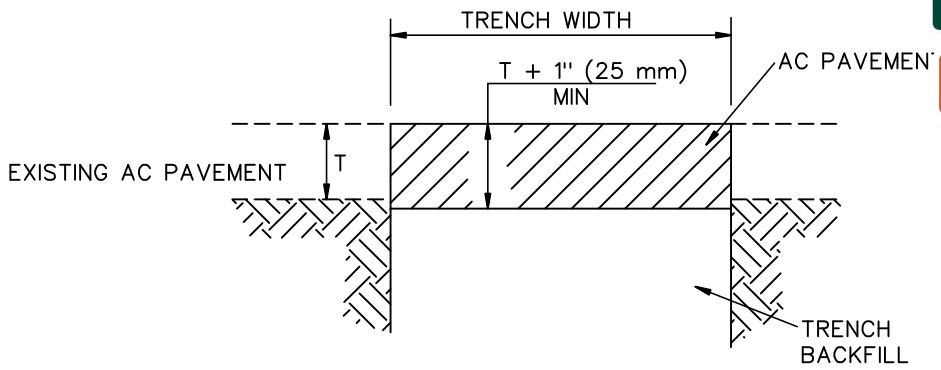
1. THE EXTENT OF REPAIRS FOR CONCRETE CUTS NOT SHOWN ON THIS STANDARD PLAN OR CUTS MADE WITHIN 3' (900 mm) OF EXISTING PATCHES, CRACKS, OR DETERIORATED SLABS SHALL BE DETERMINED BY THE ENGINEER.
2. CONCRETE PAVEMENT SHALL BE REMOVED PER SSPWC 401–3.1.
3. BACKFILL AND DENSIFICATION SHALL CONFORM TO SSPWC 306–1.3.
4. TEMPORARY RESURFACING SHALL BE PLACED PER SSPWC 306–1.5.1.

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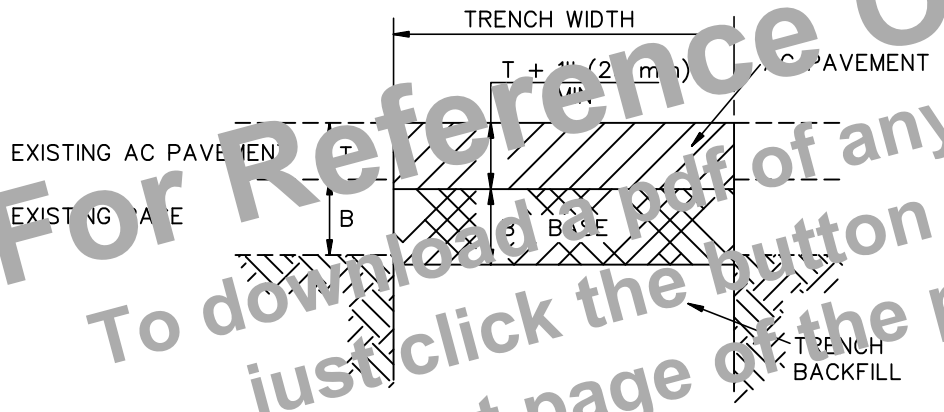
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CONCRETE PAVEMENT REPLACEMENT	132–4
	SHEET 2 OF 2

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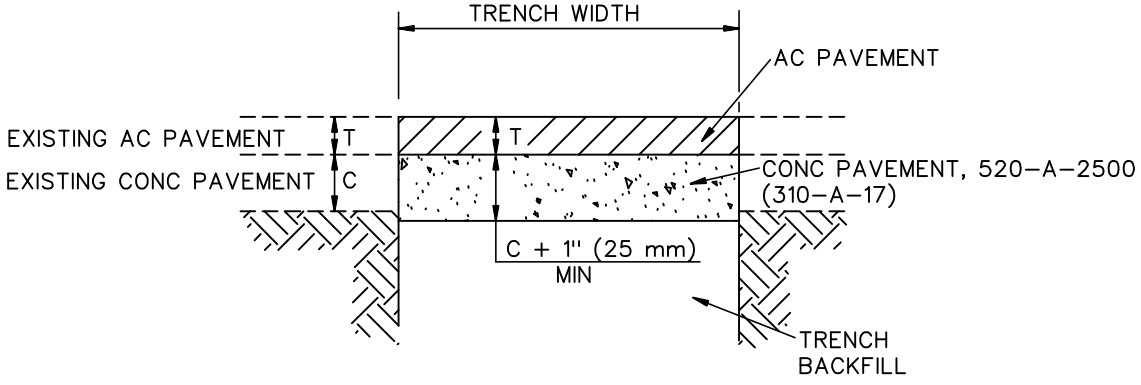
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CASE I – AC PVMT ON TRENCH BACKFILL



CASE II – AC PVMT ON BASE MATERIAL



CASE III – AC PVMT ON CONCRETE PVMT

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1993
REV. 1996, 2005, 2009, 2021

ASPHALT CONCRETE PAVEMENT REPLACEMENT

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
133-4
SHEET 1 OF 2

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NOTES:

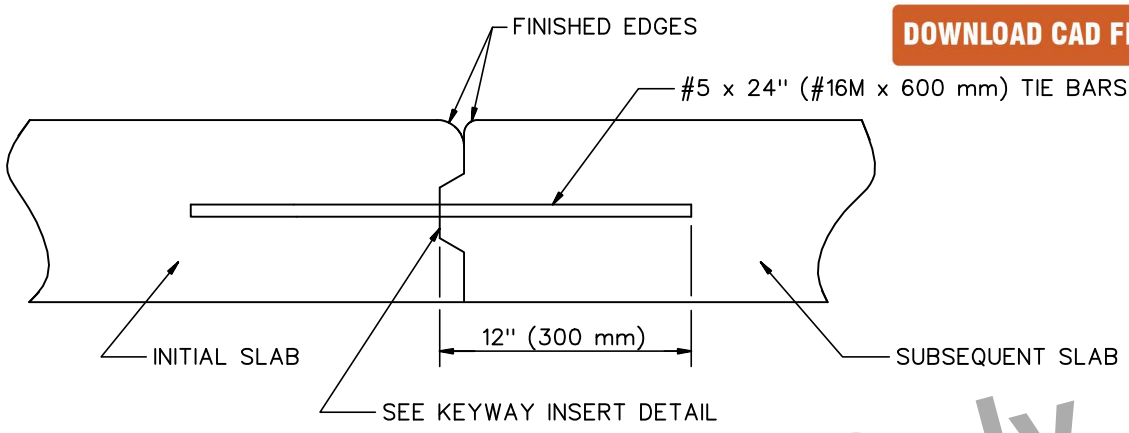
1. TRENCH BACKFILL AND DENSIFICATION SHALL CONFORM TO SSPWC 217–2 AND 306–12.
2. TRENCH RESURFACING SHALL BE PLACED PER SSPWC 306–13.

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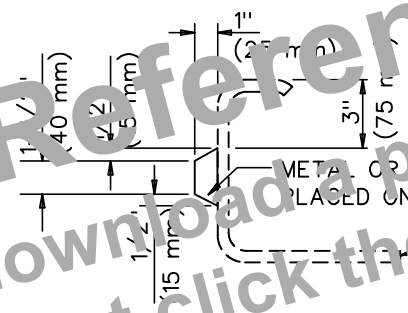
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
ASPHALT CONCRETE PAVEMENT REPLACEMENT	**133–4**
	SHEET 2 OF 2

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CONSTRUCTION JOINT WITH KEYWAY AND TIE BAR



KEYWAY INSERT DETAIL

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NOTES:

1. LONGITUDINAL JOINTS SHALL BE LOCATED AS SHOWN ON PLAN. CONSTRUCTION OR WEAKENED PLANE JOINTS MAY BE USED AT THE CONTRACTOR'S OPTION.
2. TRANSVERSE WEAKENED PLANE JOINTS SHALL BE CONSTRUCTED AT INTERVALS OF 15' (4500 mm) AND SHALL BE AT LEAST 5' (1500 mm) FROM ANY TRANSVERSE CONSTRUCTION JOINT. (SEE NOTE 5.)
3. TRANSVERSE CONSTRUCTION JOINTS SHALL BE CONSTRUCTED AS SHOWN HEREON AND AS DIRECTED BY THE ENGINEER.
4. SPACE TIE BARS AT 36" (900 mm) ON-CENTER FOR TRANSVERSE JOINTS AND 45" (1125 mm) FOR LONGITUDINAL JOINTS. PLACE IN MIDDLE THIRD OF SLAB.
5. CONCRETE PAVEMENT JOINTS SHALL CONFORM TO SSPWC 302-6.5.
6. CONSTRUCT CONSTRUCTION JOINTS IN THE APPROACH SLABS AT THE FIRST THREE TRANSVERSE JOINTS OF CONCRETE INTERSECTIONS.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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CONCRETE PAVEMENT JOINT DETAILS

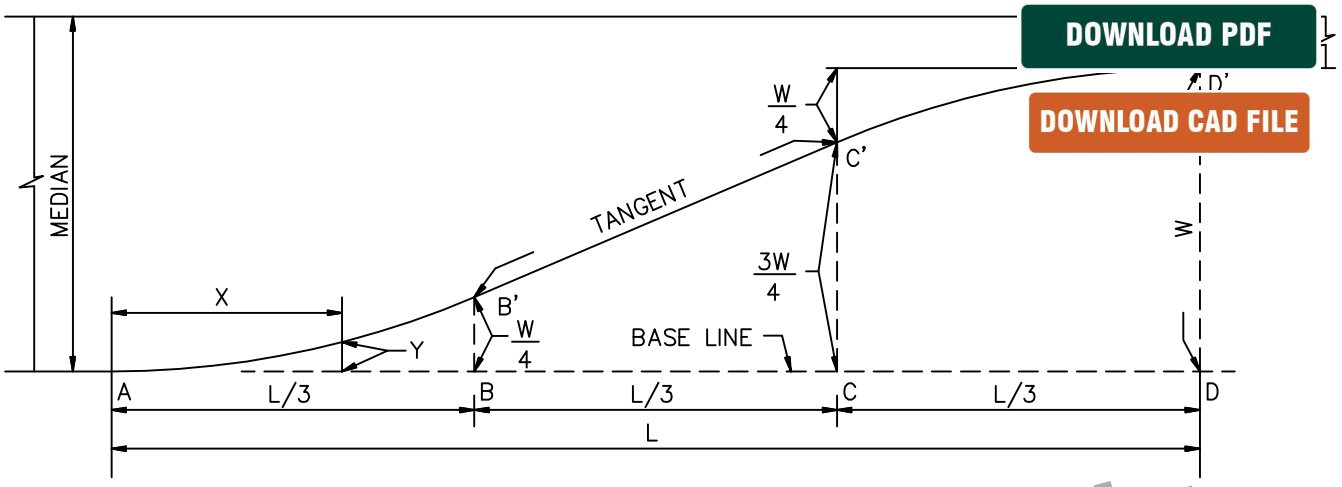
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 134-3

SHEET 1 OF 1

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

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)											
(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)

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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

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MEDIAN TAPER

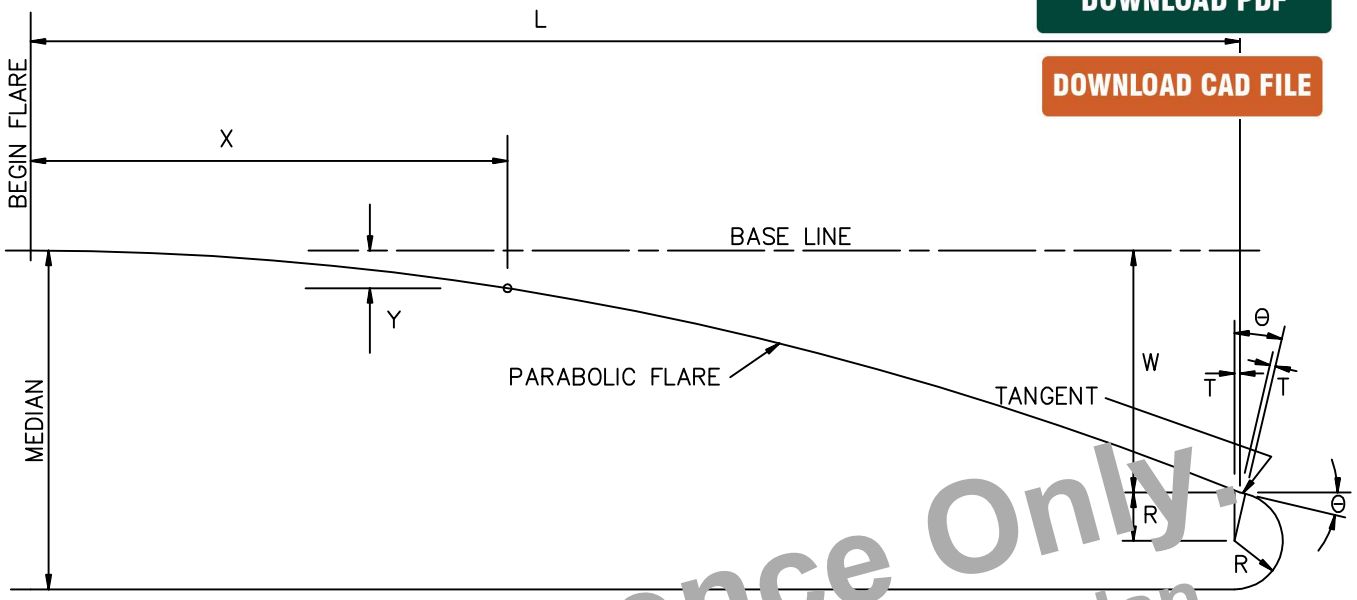
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 140–3

SHEET 1 OF 1

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

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

$TAN\ \frac{\Theta}{2} = \frac{2W}{L}$

$T = R\ TAN\ \frac{\Theta}{2}$

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

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MEDIAN FLARE

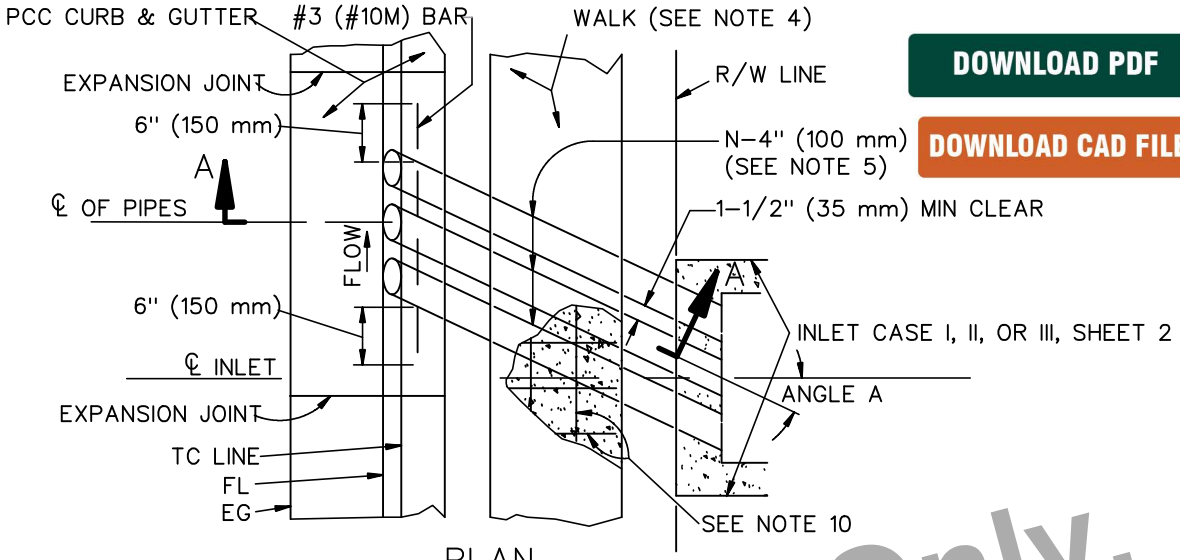
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 141–2

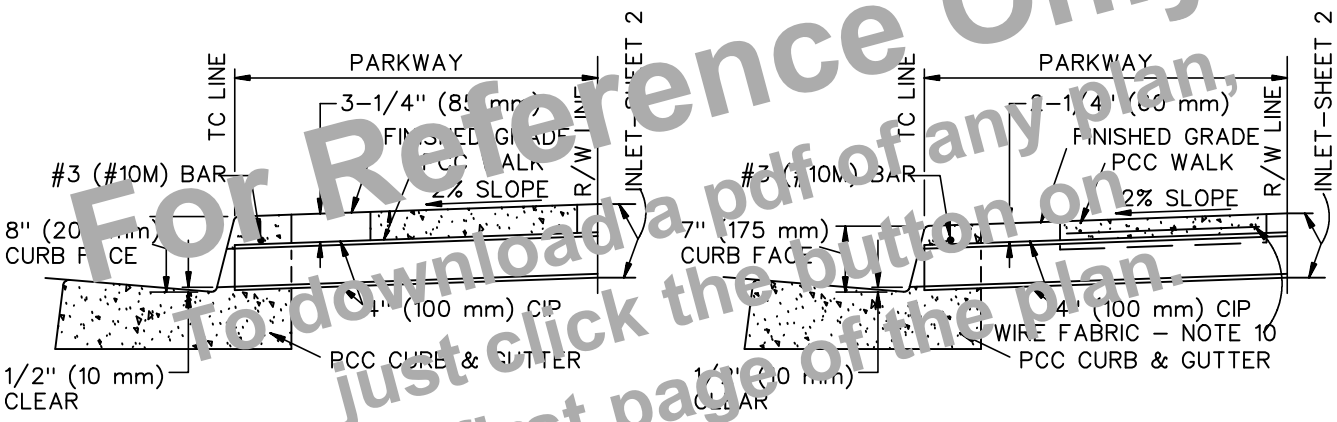
SHEET 1 OF 1

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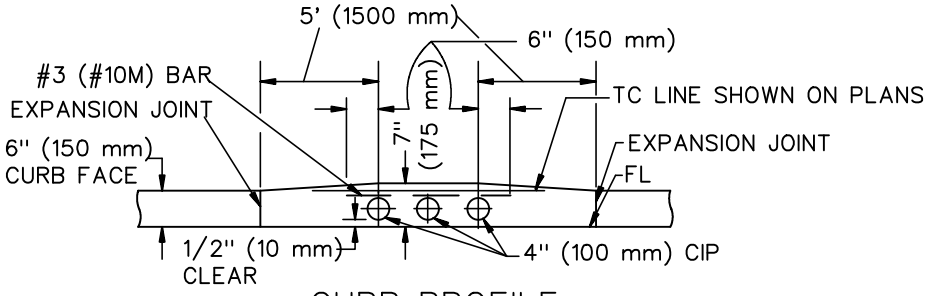
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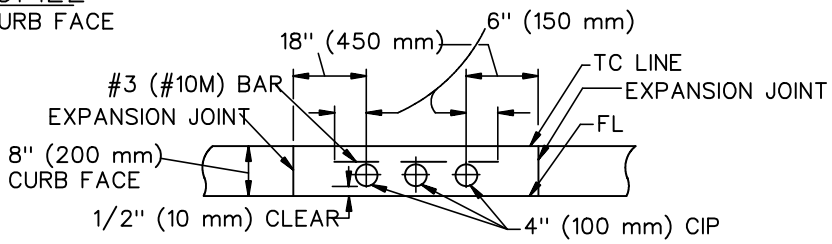
PLAN



SECTION A–A



CURB PROFILE
6" (150 mm) CURB FACE



NOTE: PROFILES APPLY TO ANY NUMBER OF PIPES

CURB PROFILE
8" (200 mm) CURB FACE

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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CURB DRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

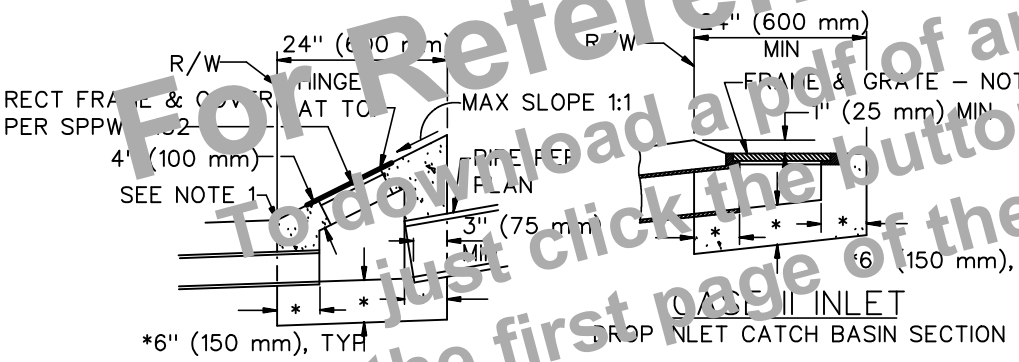
STANDARD PLAN
150–4
SHEET 1 OF 2

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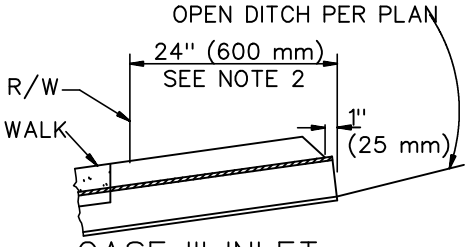
1. IF THE TOE OF SLOPE IS ALLOWED WITHIN THE R/W, CASE I INLET BEGINS AT THE TOE RATHER THAN THE R/W LINE.
2. FOR OPEN DITCH (CASE III INLET), THE 24" (600 mm) EXTENSION BEYOND THE R/W LINE IS NOT REQUIRED WHEN BACK OF WALK IS 24" (600 mm) OR MORE FROM THE R/W LINE; HOWEVER, PIPE SHALL EXTEND TO R/W LINE.
3. TOP OF INLET STRUCTURE (CASE I AND II) SHALL BE FLUSH WITH ADJACENT SURFACE WHERE PRACTICAL.
4. CONSTRUCT PCC WALK WHEN SPECIFIED ON PLAN.
5. "N" EQUALS NUMBER OF PIPES (MAXIMUM OF THREE) AS SPECIFIED ON PLAN.
6. INLET CASE TO BE SPECIFIED ON PLAN.
7. ANGLE A EQUALS 0°, UNLESS OTHERWISE SPECIFIED.
8. TYPE, DIMENSIONS AND ELEVATIONS OF PCC. CURB AND GUTTER PER PLAN.
9. UNLESS OTHERWISE SPECIFIED, FRAME AND GRATE FOR CASE II INLET SHALL BE GALVANIZED CAST IRON. WEIGHT OF FRAME AND GRATE SHALL BE 80 LBS (36 kg).
10. AT LOCATIONS WITH LESS THAN 8" (200 mm) CURB FACE, USE [illegible] GALVANIZED WIRE FABRIC. WIRE FABRIC SHALL EXTEND 8" (200 mm) BEYOND THE EDGE OF CAST IRON PIPES.

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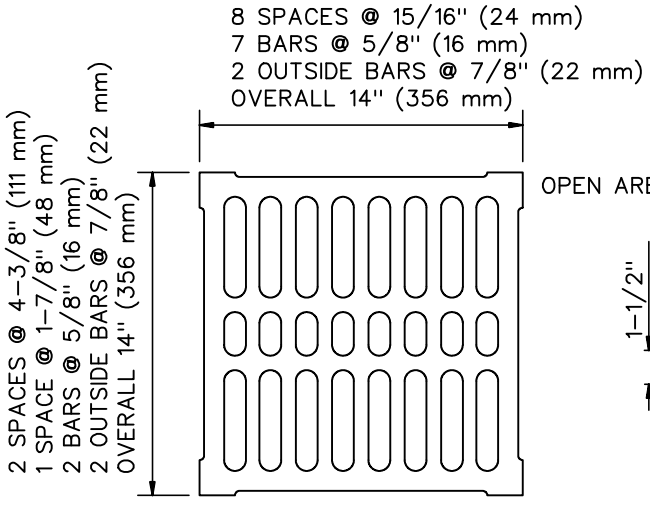


CASE I INLET
TRANSITION STRUCTURE SECTION

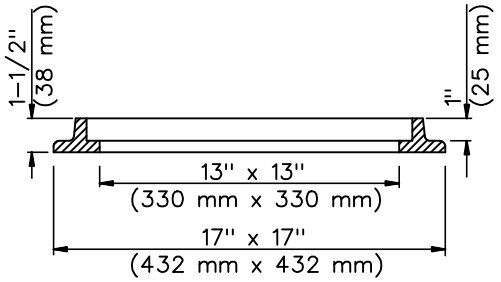
CASE II INLET
DROP INLET CATCH BASIN SECTION



CASE III INLET
GRADED DITCH SECTION



TOP OF GRATE



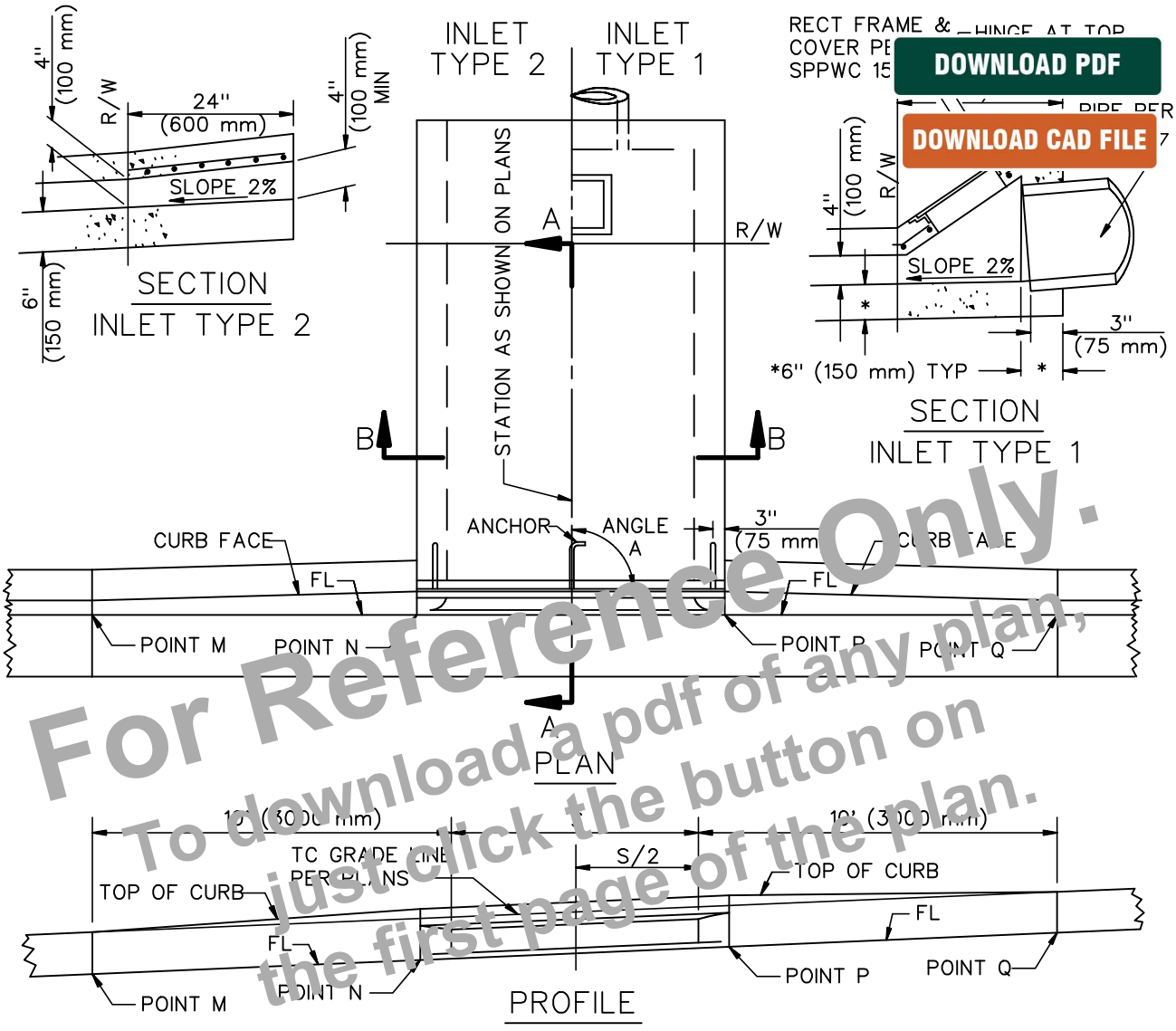
SECTION THRU FRAME

GRATE FOR CASE II INLET

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB DRAIN	**150-4**
	SHEET 2 OF 2

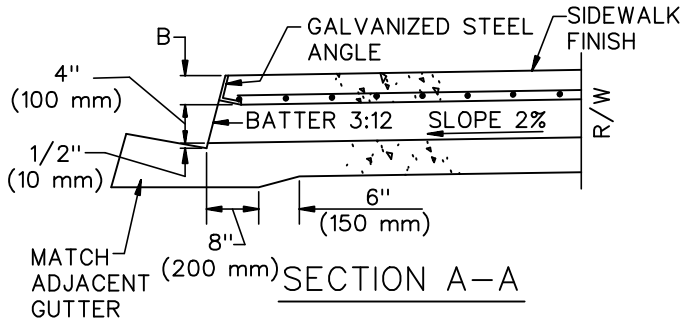
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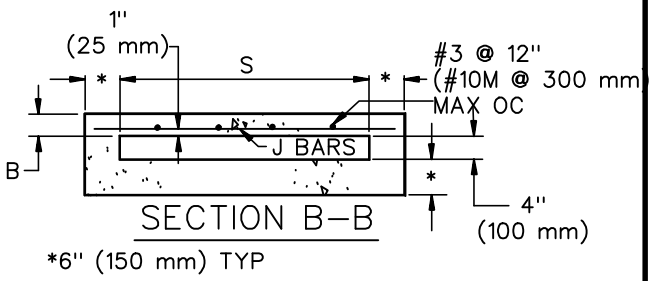
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S	J BAR SPACING	ANCHORS	NOTE
12" (300 mm)	7" (180 mm)	2	9
18" (450 mm)	7" (180 mm)	2	9
24" (600 mm)	7" (180 mm)	2	9
30" (750 mm)	7" (180 mm)	2	9
36" (900 mm)	7" (180 mm)	3	9
42" (1050 mm)	6" (150 mm)	3	9
48" (1200 mm)	5" (125 mm)	3	9
54" (1350 mm)	6–1/2" (165 mm)	3	10
60" (1500 mm)	5" (125 mm)	3	10
66" (1650 mm)	4" (100 mm)	3	10
72" (1800 mm)	3–1/2" (90 mm)	3	10





STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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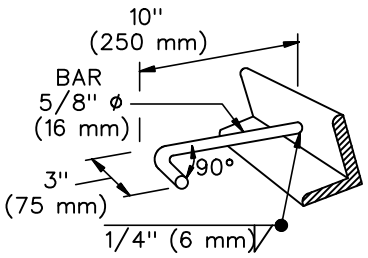
PARKWAY DRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 151–3

SHEET 1 OF 2

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DETAIL OF ANCHOR

NOTES

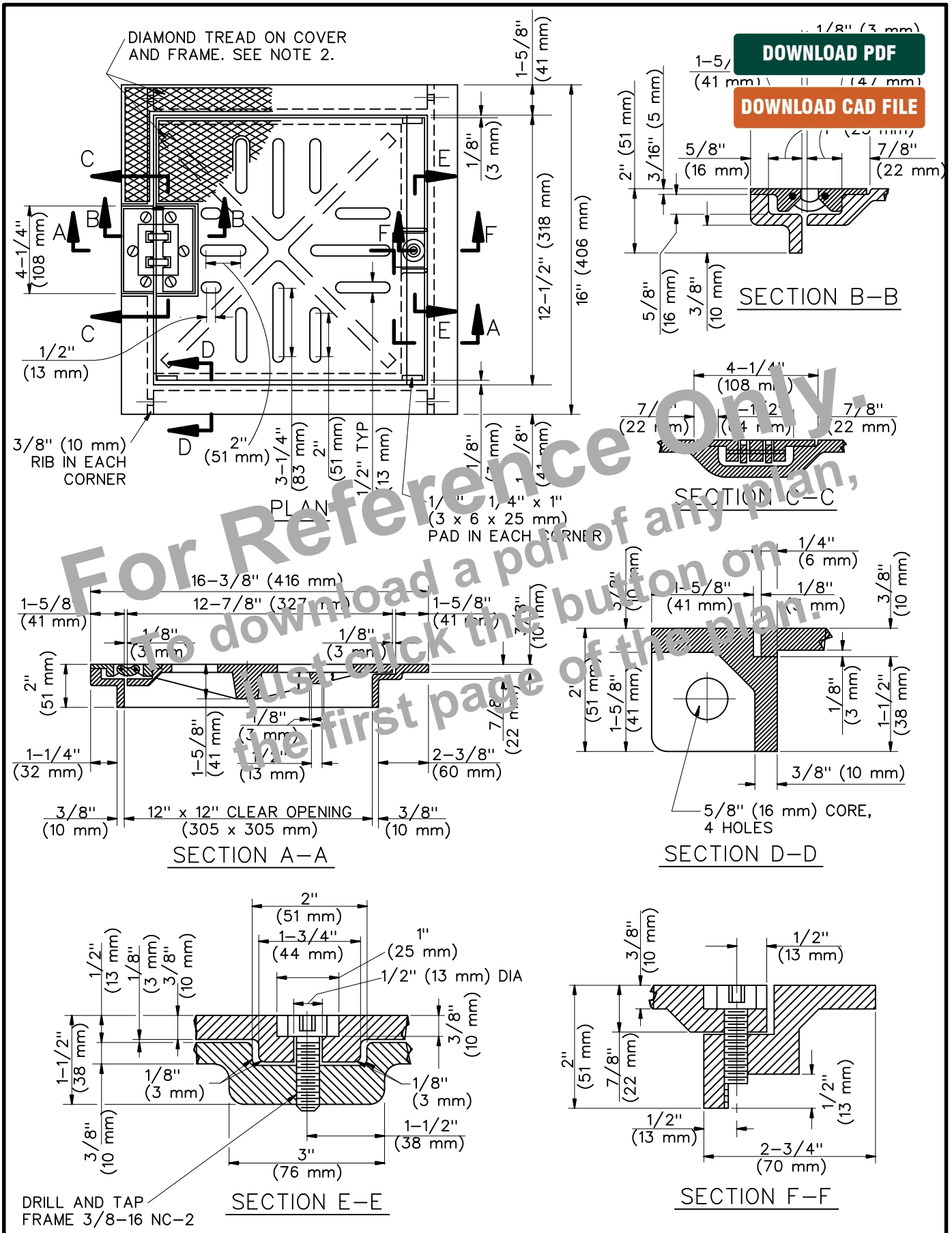
1. FLOOR OF BOX SHALL BE TROWLED SMOOTH.
2. IF THE TOE OF SLOPE IS ALLOWED WITHIN THE R/W, INLET TYPE 1 BEGINS AT THE TOE RATHER THAN AT THE R/W LINE.
3. FOR OPEN DITCH (TYPE 2), THE 24" (600 mm) EXTENSION BEYOND THE R/W LINE IS NOT REQUIRED WHEN FACE OF WALL IS 24" (600 mm) OR MORE FROM THE R/W LINE. HOWEVER, THE PARKWAY DRAIN SHALL EXTEND TO THE R/W LINE IN ANY EVENT.
4. TOP OF INLET STRUCTURE (TYPE 1 & 2) SHALL BE FLUSH WITH ADJACENT SURFACE WHERE PRACTICAL.
5. A HEADED STEEL STUD 5/8" DIA–3/8" WITH A 1" HEAD (16 x 160 mm, 25 mm HEAD) ATTACHED BY A FULL PENETRATION BUTT WELD MAY BE USED AS AN ALTERNATE ANCHOR.
6. NORMAL CURB FACE AT POINT M AND Q. CURB FACE IS B + 5" (125 mm) AT POINT N AND P.
7. THE 3" (75 mm) LEG OF THE 5/8" (16 mm) DIA ANCHORS SHALL BE PARALLEL TO THE TOP OF SIDEWALK.
8. J BARS ARE #3 (#10M).
9. FOR S = 48" (1200 mm) AND LESS, B = 3" (75 mm).
   USE 2–1/2" x 2" x 3/8" (64 x 51 x 9.5 mm) GALVANIZED STEEL ANGLE.
10. FOR S = 54" (1350 mm) OR MORE, B = 4" (100 mm).
    USE 3–1/2" x 3" x 1/2" (89 x 76 x 12.7 mm) GALVANIZED STEEL ANGLE.
11. ANGLE A EQUALS 90° UNLESS OTHERWISE SPECIFIED.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PARKWAY DRAIN	151–3
	SHEET 2 OF 2

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RECTANGULAR FRAME AND COVER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 152-3

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NOTES

1. FRAME AND COVER SHALL BE CAST IRON.
2. A PLAIN 1/4" (6 mm) BORDER SHALL BE TYPICAL FOR ALL BORDERS ON FRAME AND COVER.
3. ALL CASTING RADII SHALL BE 1/4" (6 mm) UNLESS OTHERWISE SHOWN.
4. WEIGHT OF FRAME AND COVER SHALL BE 43 LBS (19.5 kg).
5. USE ONE 3/8"–16x1" STAINLESS STEEL SOCKET CAP SCREW. APPLY HIGH ADHESIVE, OPEN GEAR GREASE TO THREADED PORTION PRIOR TO INSERTION.
6. USE 4" x 4" (102 mm x 102 mm) CAST ALUMINUM BUTT HINGE WITH SST PIN FOR 180° OPENING.

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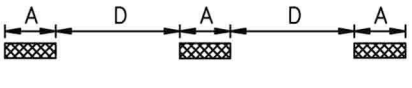
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
RECTANGULAR FRAME AND COVER	**152–3**
	SHEET 2 OF 2

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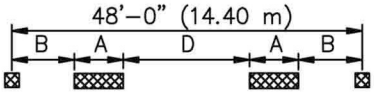
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CENTERLINES
(2 LANE HIGHWAYS)

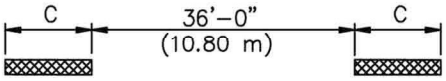
DETAIL 1



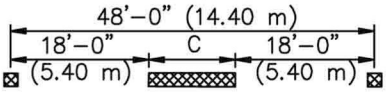
DETAIL 2



DETAIL 5



DETAIL 6

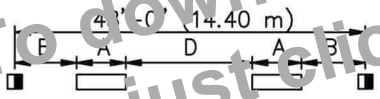


LANELINES
(MULTILANE HIGHWAYS)

DETAIL 8

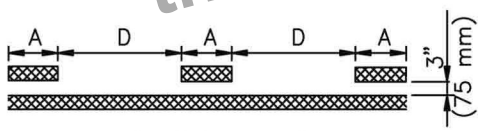


DETAIL 9

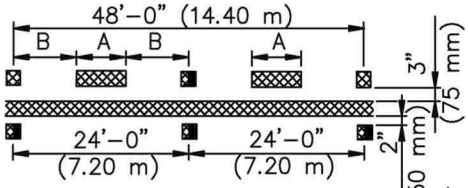


NO PASSING ZONES–ONE DIRECTION

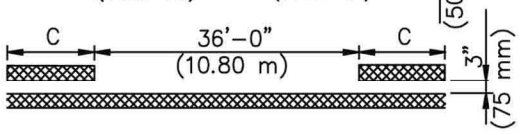
DETAIL 15



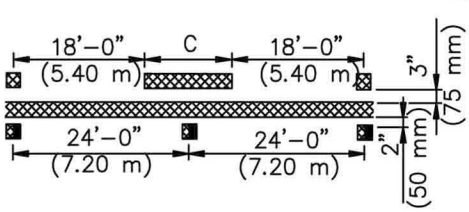
DETAIL 16



DETAIL 18



DETAIL 19

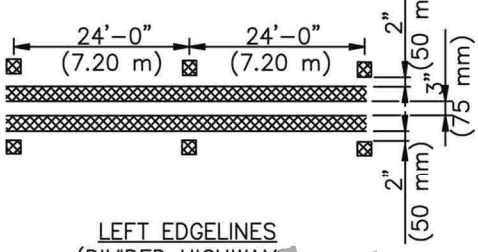


NO PASSING ZONES–TWO [illegible]

DETAIL 21



DETAIL 22



LEFT EDGELINES
(DIVIDED HIGHWAYS)

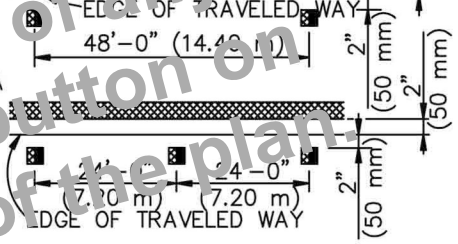
DETAIL 24



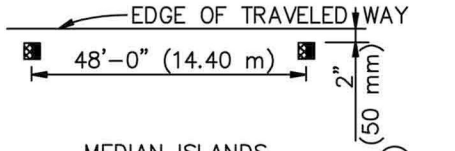
DETAIL 25



DETAIL 25A

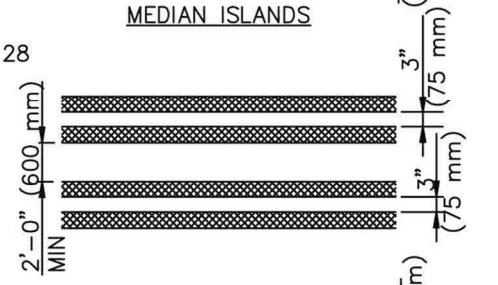


DETAIL 26

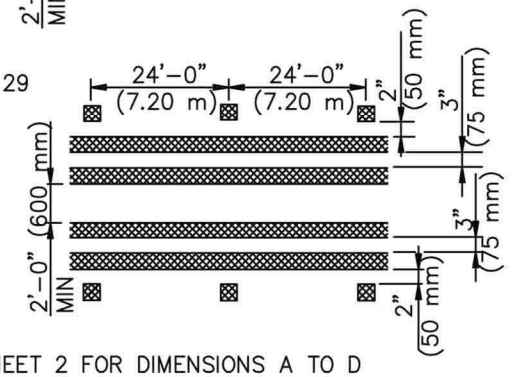


MEDIAN ISLANDS

DETAIL 28



DETAIL 29



SEE SHEET 2 FOR DIMENSIONS A TO D

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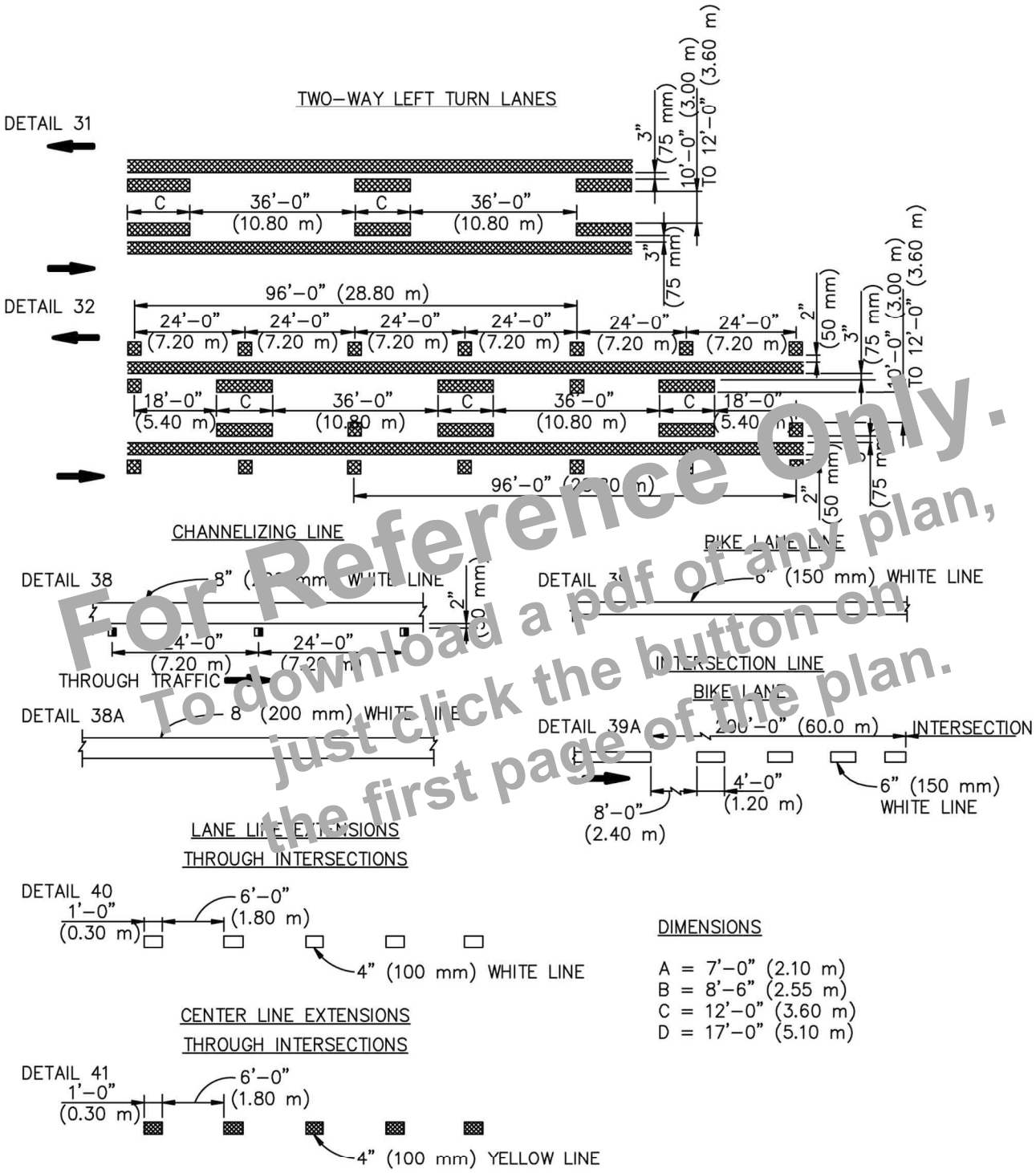
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PAVEMENT MARKERS AND TRAFFIC LINES

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 170–0

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PAVEMENT MARKERS AND TRAFFIC LINES	170–0
	SHEET 2 OF 4

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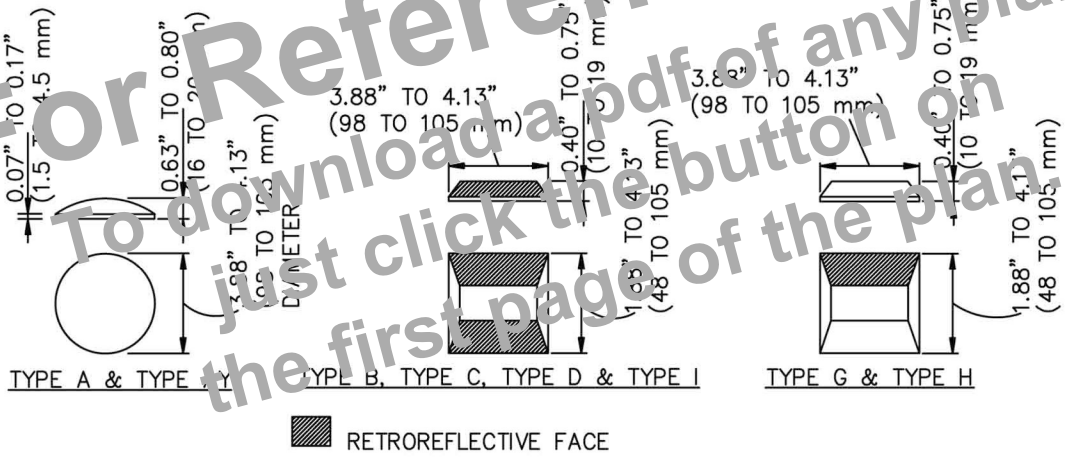
LEGEND

MARKERS

- TYPE A WHITE NON–REFLECTIVE
- TYPE AY YELLOW NON–REFLECTIVE
- TYPE B CLEAR TWO–WAY RETROREFLECTIVE
- TYPE RED / CLEAR RETROREFLECTIVE
- TYPE D YELLOW TWO–WAY RETROREFLECTIVE
- TYPE G CLEAR ONE–WAY RETROREFLECTIVE
- TYPE H YELLOW ONE–WAY RETROREFLECTIVE
- TYPE I BLUE TWO–WAY RETROREFLECTIVE

LINES

- 4" WHITE
- 4" YELLOW
- DIRECTION OF TRAVEL

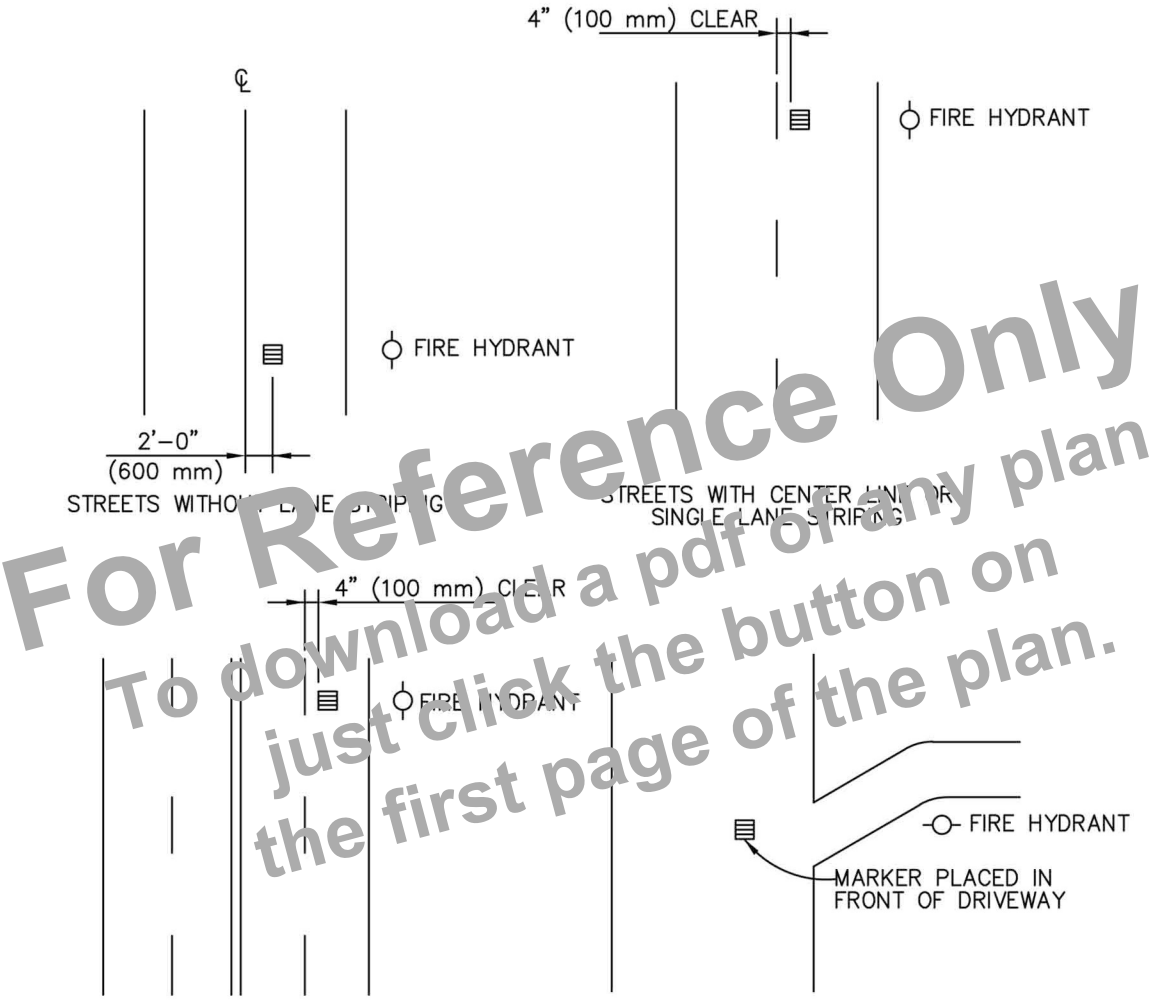


MARKER DETAILS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
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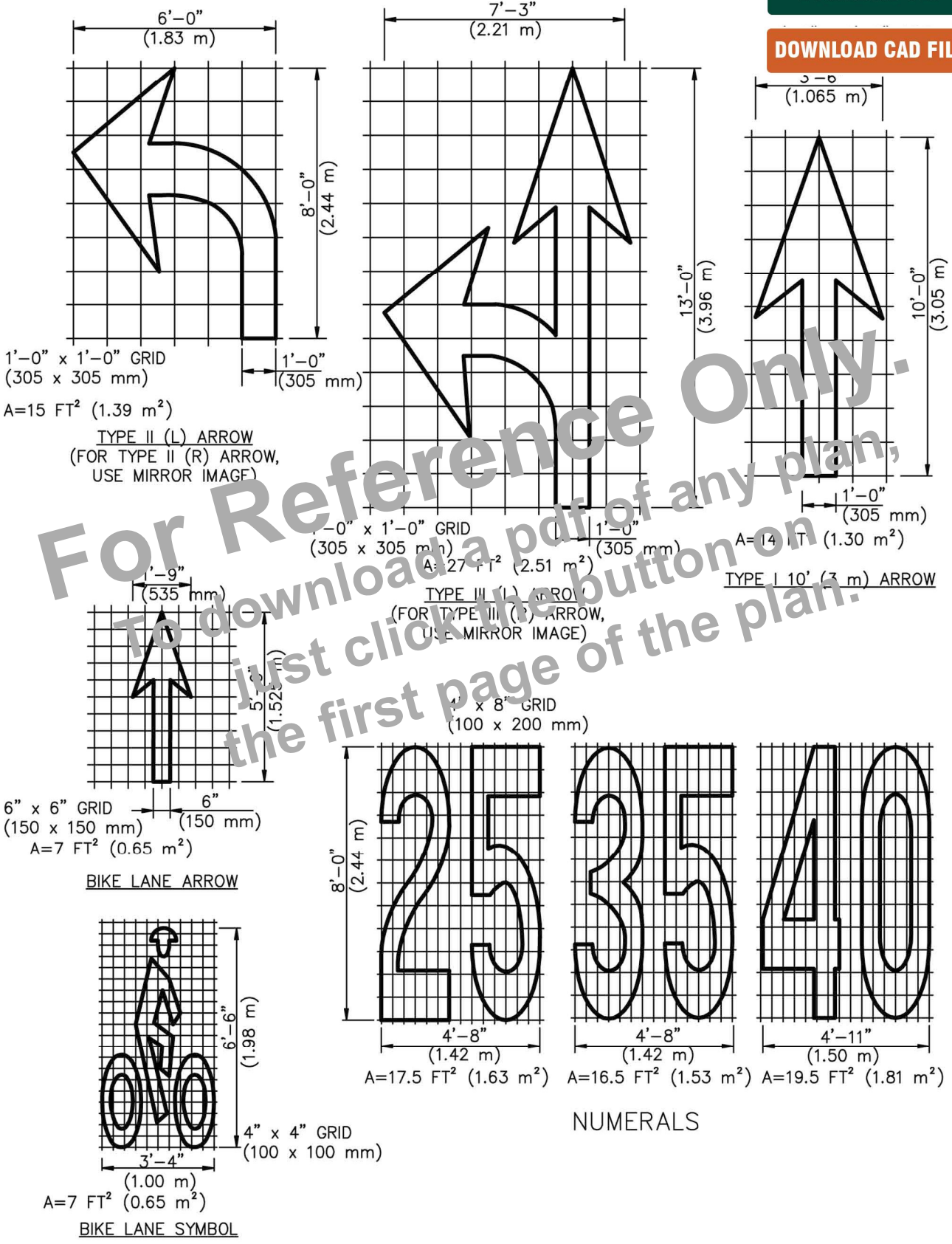
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FIRE HYDRANT MARKERS

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
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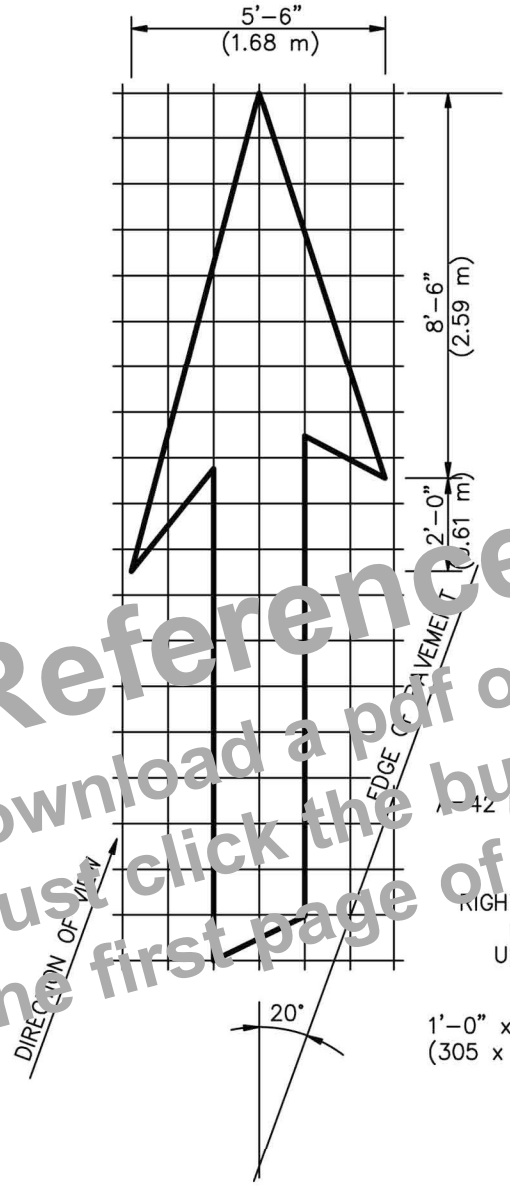
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PAVEMENT MARKINGS ARROWS AND SYMBOLS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 171–0

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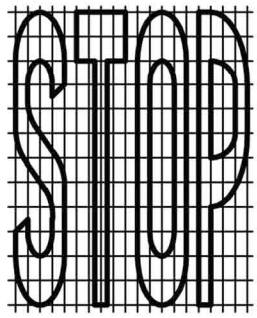
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NOTES:

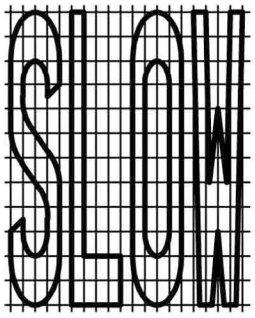
1. IF A MESSAGE CONSISTS OF MORE THAN ONE WORD, IT SHALL READ "UP"; THAT IS, THE FIRST WORD SHALL BE NEAREST THE DRIVER.
2. THE SPACE BETWEEN WORDS SHALL BE AT LEAST FOUR TIMES THE HEIGHT OF THE CHARACTERS FOR LOW SPEED ROADS, BUT NOT MORE THAN TEN TIMES THE HEIGHT OF THE CHARACTERS. THE SPACE MAY BE REDUCED APPROPRIATELY WHERE THERE IS LIMITED SPACE BECAUSE OF LOCAL CONDITIONS.
3. MINOR VARIATIONS IN DIMENSIONS MAY BE ACCEPTED BY THE ENGINEER.
4. PORTIONS OF A LETTER, NUMBER, OR SYMBOL MAY BE SEPARATED BY CONNECTING SEGMENTS NOT TO EXCEED 2" (50 mm) IN WIDTH.

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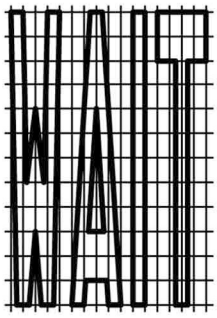
4" x 8" GRID
(100 x 200 mm)



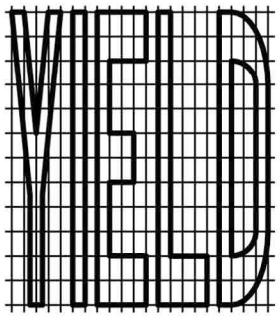
A=22 FT² (2.04 m²)



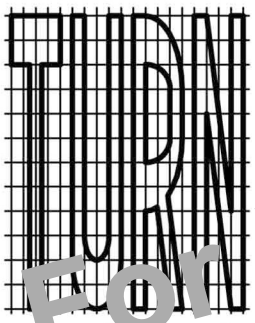
A=23 FT² (2.14 m²)



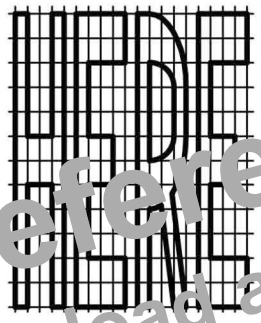
A=19 FT² (1.77 m²)



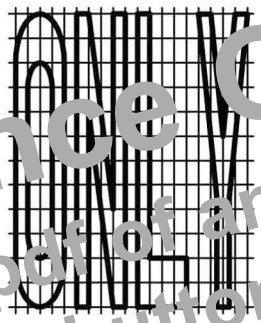
A=24 FT² (2.23 m²)



A=24 FT² (2.23 m²)



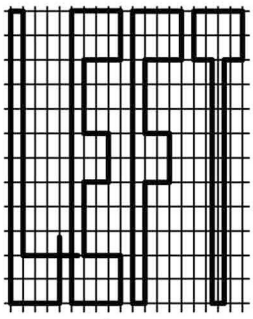
A=26 FT² (2.42 m²)



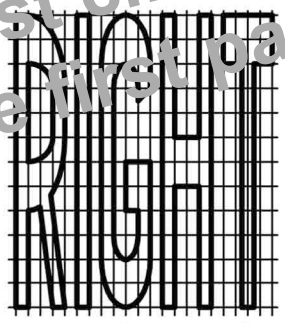
A=22 FT² (2.04 m²)



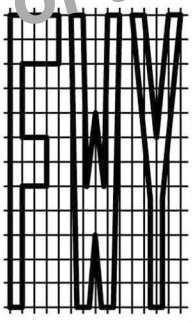
A=21 FT² (1.95 m²)



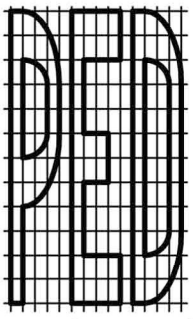
A=19 FT² (1.77 m²)



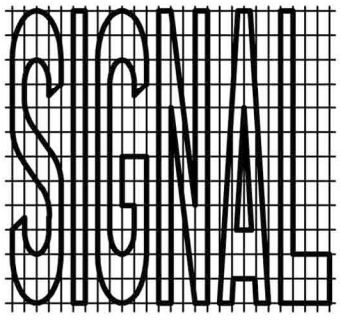
A=26 FT² (2.42 m²)



A=16 FT² (1.49 m²)



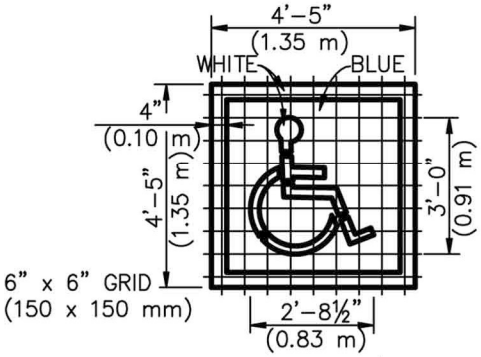
A=18 FT² (1.67 m²)



A=32 FT² (2.97 m²)



A=14 FT² (1.30 m²)



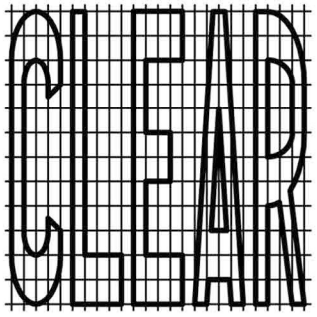
A(WHITE)=9 FT² (0.84 m²)
A(BLUE)=14 FT² (1.30 m²)

DISABLED PERSONS PARKING SYMBOL

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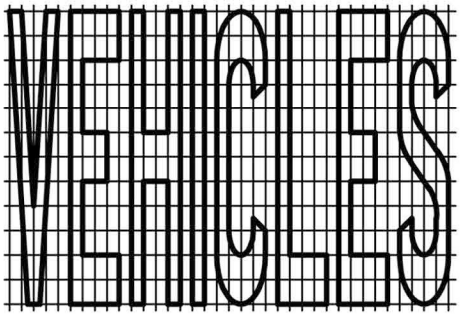
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
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	SHEET 3 OF 5

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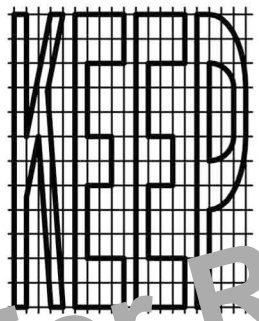


4" x 8" GRID
(100 x 200 mm)

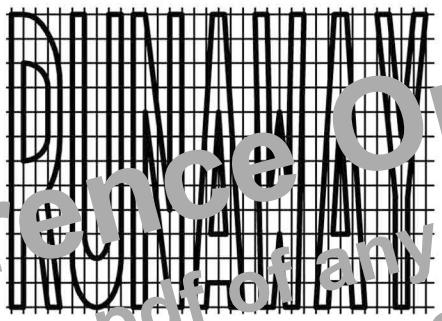
A=27 FT² (2.51 m²)



A=42 FT² (3.90 m²)



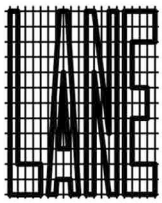
A=24 FT² (2.23 m²)



A=43 FT² (4.00 m²)



A=31 FT² (2.88 m²)

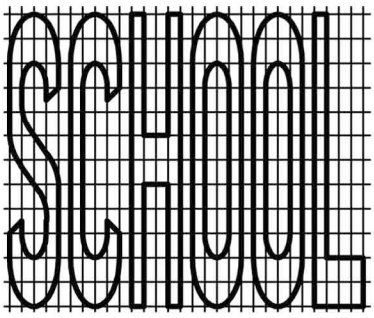


A=6 FT² (0.56 m²)



2" x 4" GRID
(50 x 100 mm)

A=5 FT² (0.47 m²)

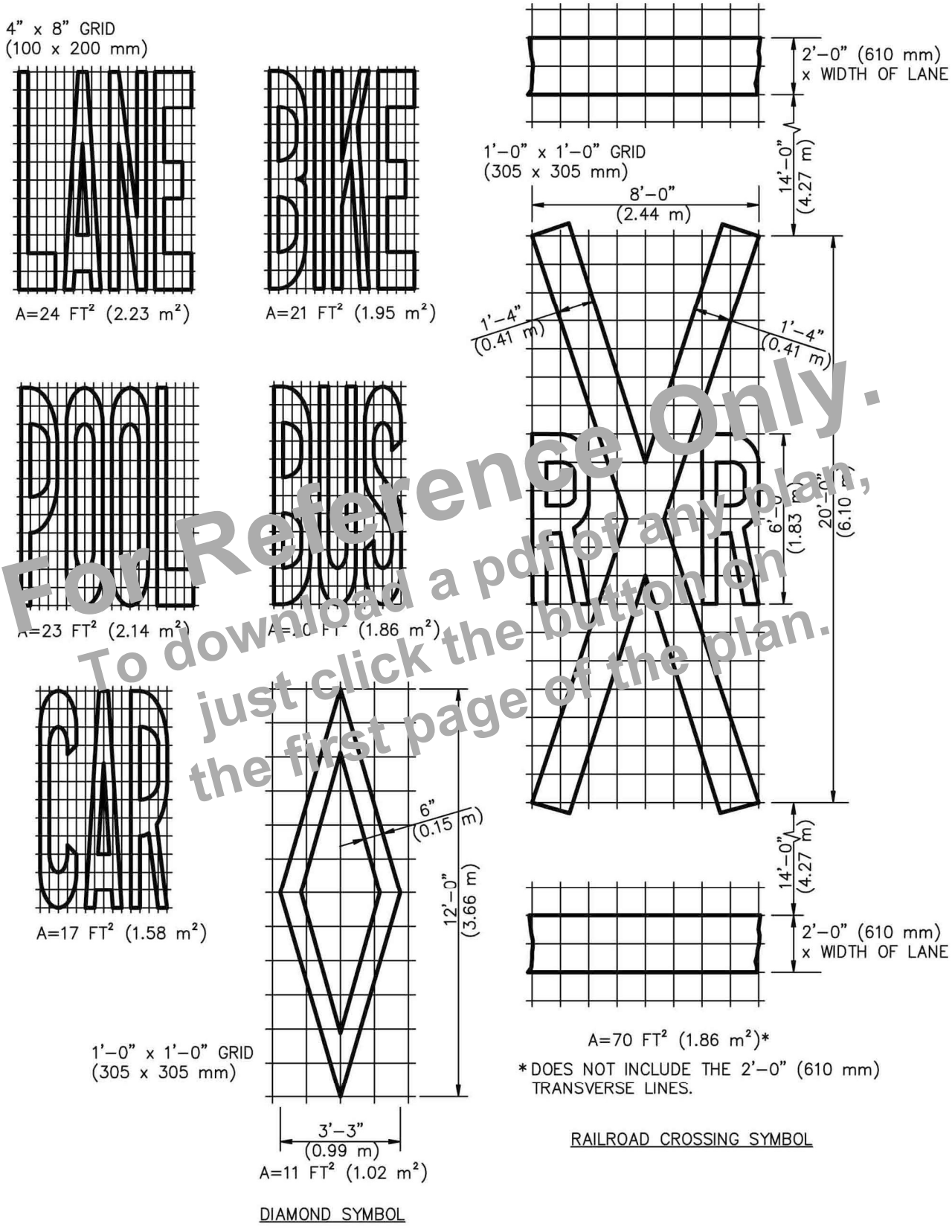


A=35 FT² (3.25 m²)

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PAVEMENT MARKINGS ARROWS AND SYMBOLS	171–0
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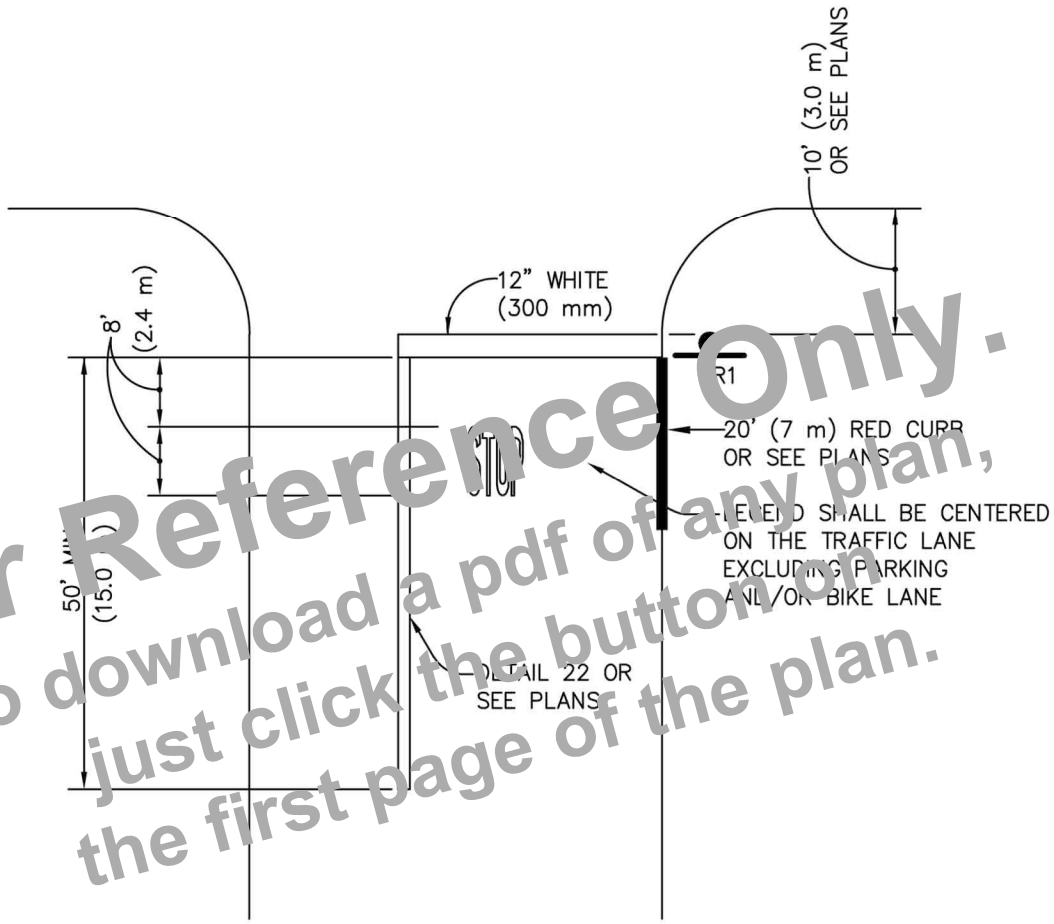
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2011

STOP AND STOP BAR

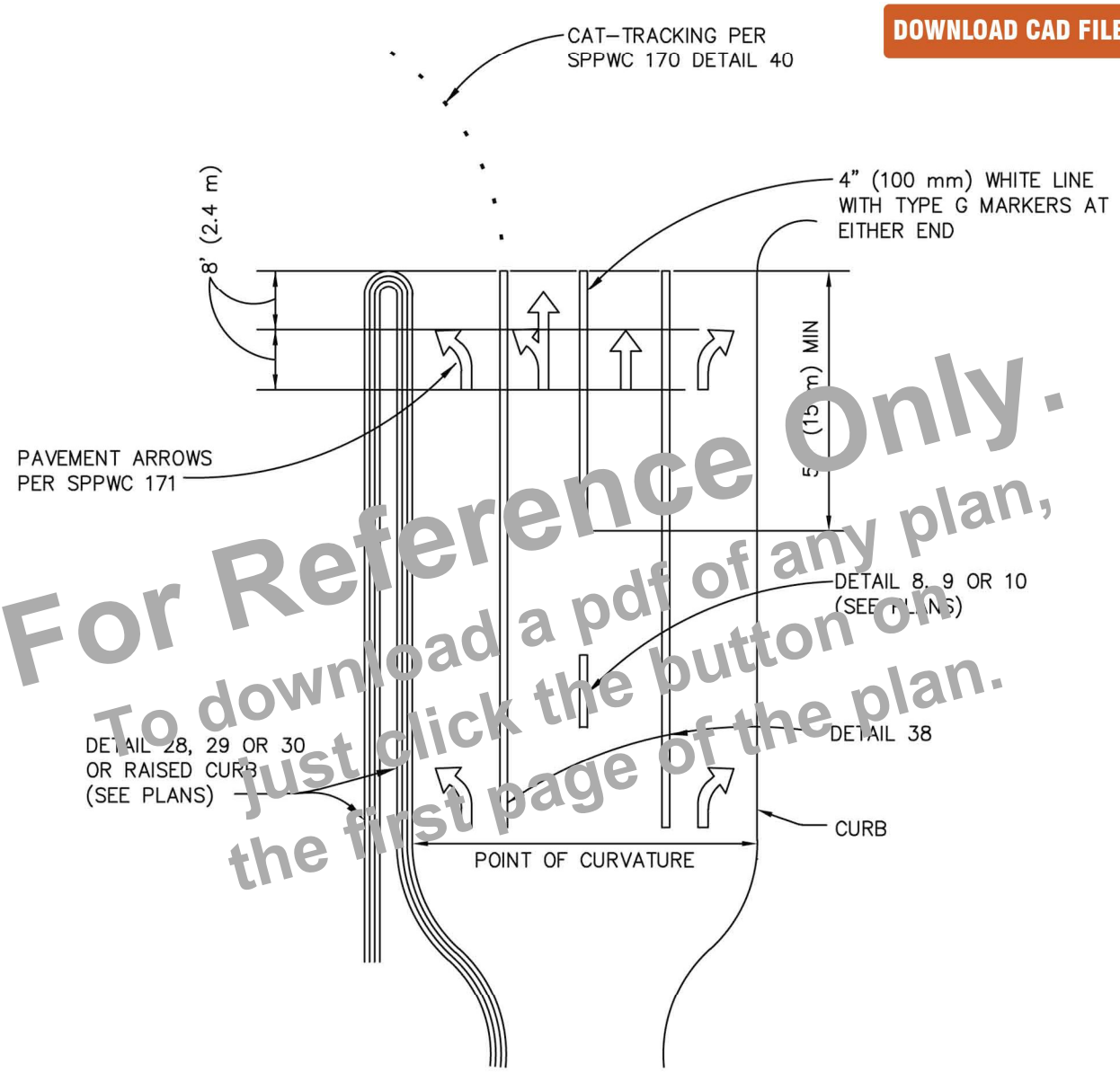
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
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SHEET 1 OF 1

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NOTES:

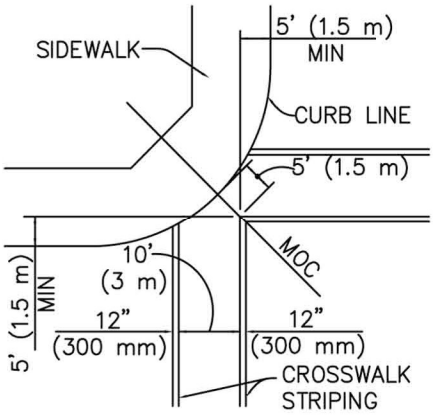
1. ARROWS SHALL BE INSTALLED AT THE BEGINNING OF ALL LEFT TURN AND RIGHT TURN POCKETS.
2. ARROWS SHALL OPTIONALLY BE INSTALLED AT THE END OF LEFT AND RIGHT TURN POCKETS 100' (30 m) OR MORE IN LENGTH.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 2011	**INTERSECTION APPROACH STRIPING** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **173–0** SHEET 1 OF 1

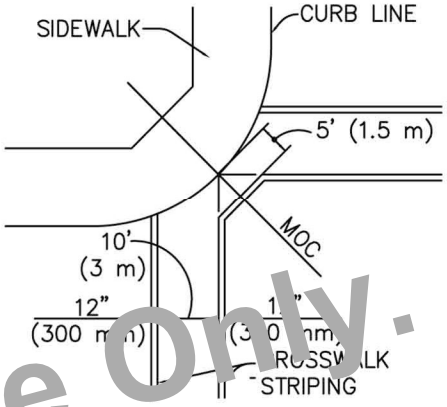
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CASE I

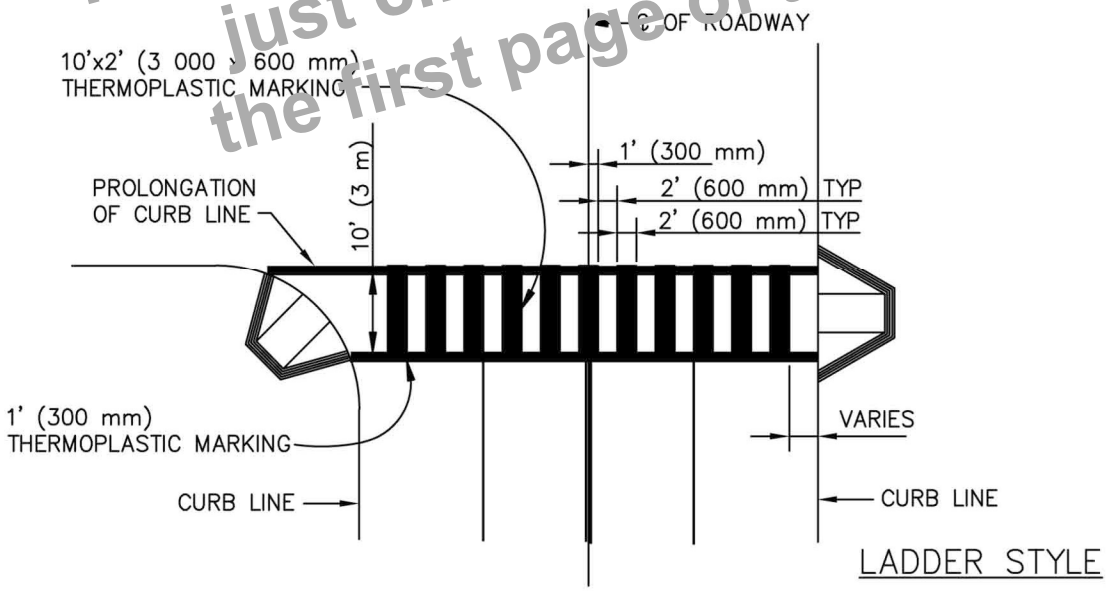


CASE II

NOTES:

1. ALL CROSSWALKS SHALL BE WHITE UNLESS NOTED OTHERWISE ON THE PLANS.
2. CASE II SHALL BE USED ONLY IF THE 5' (1.5 m) MINIMUM DIMENSION FOR CASE I CANNOT BE MAINTAINED.
3. CASE I SHALL BE USED WITH 90° DELTA AND 25' (7.5 m) OR GREATER CURB RETURN RADIUS.

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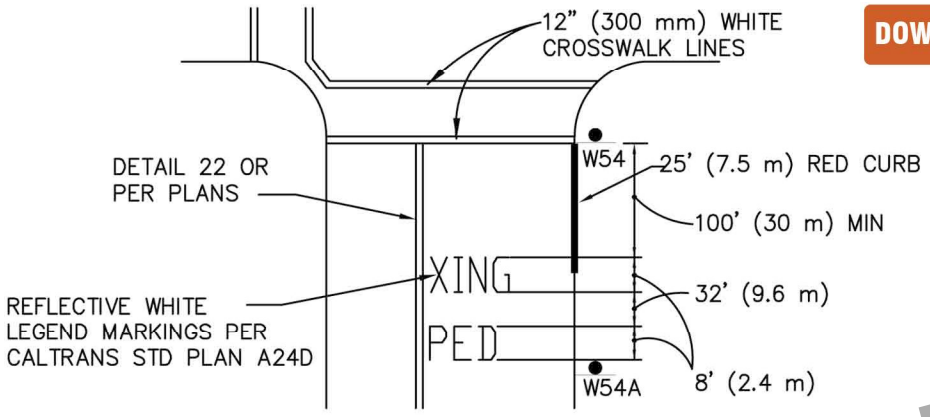


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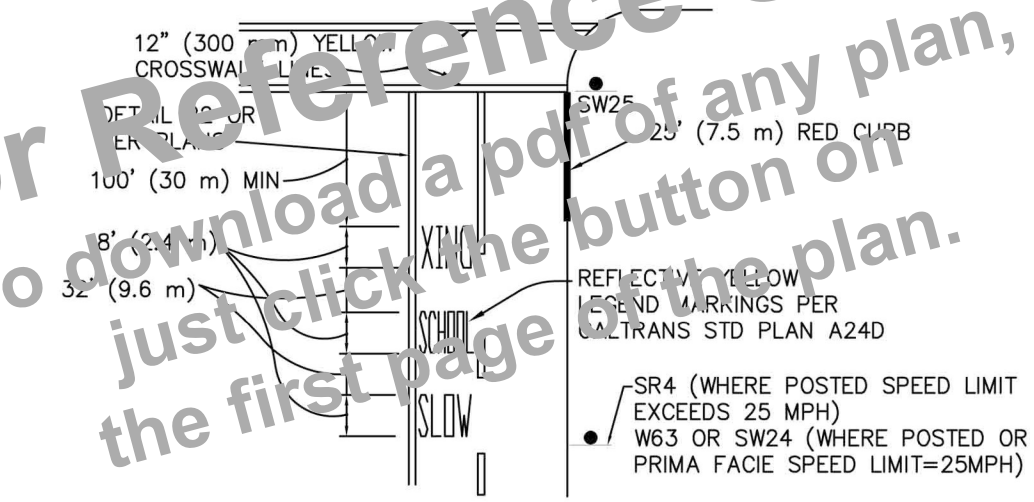
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 2011	**CROSSWALK STRIPING** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **174–0** SHEET 1 OF 1

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PEDESTRIAN MARKING AT CROSSWALK



PEDESTRIAN MARKING AT SCHOOL CROSSWALK

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NOTES:

1. LEGEND SHALL BE INSTALLED IN EACH TRAFFIC LANE APPROACHING A SCHOOL OR PEDESTRIAN CROSSING UNLESS THE PLANS SHOW A DOUBLE SET OF LEGEND MARKINGS INSTALLED IN ONE EXCEPTIONALLY WIDE LANE.
2. LEGEND SHALL BE CENTERED ON THE TRAFFIC LANE EXCLUDING PARKING AND/OR BIKE LANE.
3. MINIMUM RED CURB ON APPROACH CROSSWALK SHALL BE 25' (7.5 m), WITH 15' (4.5 m) ON DEPARTURE LEGS.
4. ALL SCHOOL AND PEDESTRIAN WARNING SIGNS (W54, W54A, W63, SW24, SW25 and SR4) SHALL BE HIGH-VISIBILITY FLOURESCENT YELLLOW-GREEN.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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PEDESTRIAN CROSSINGS

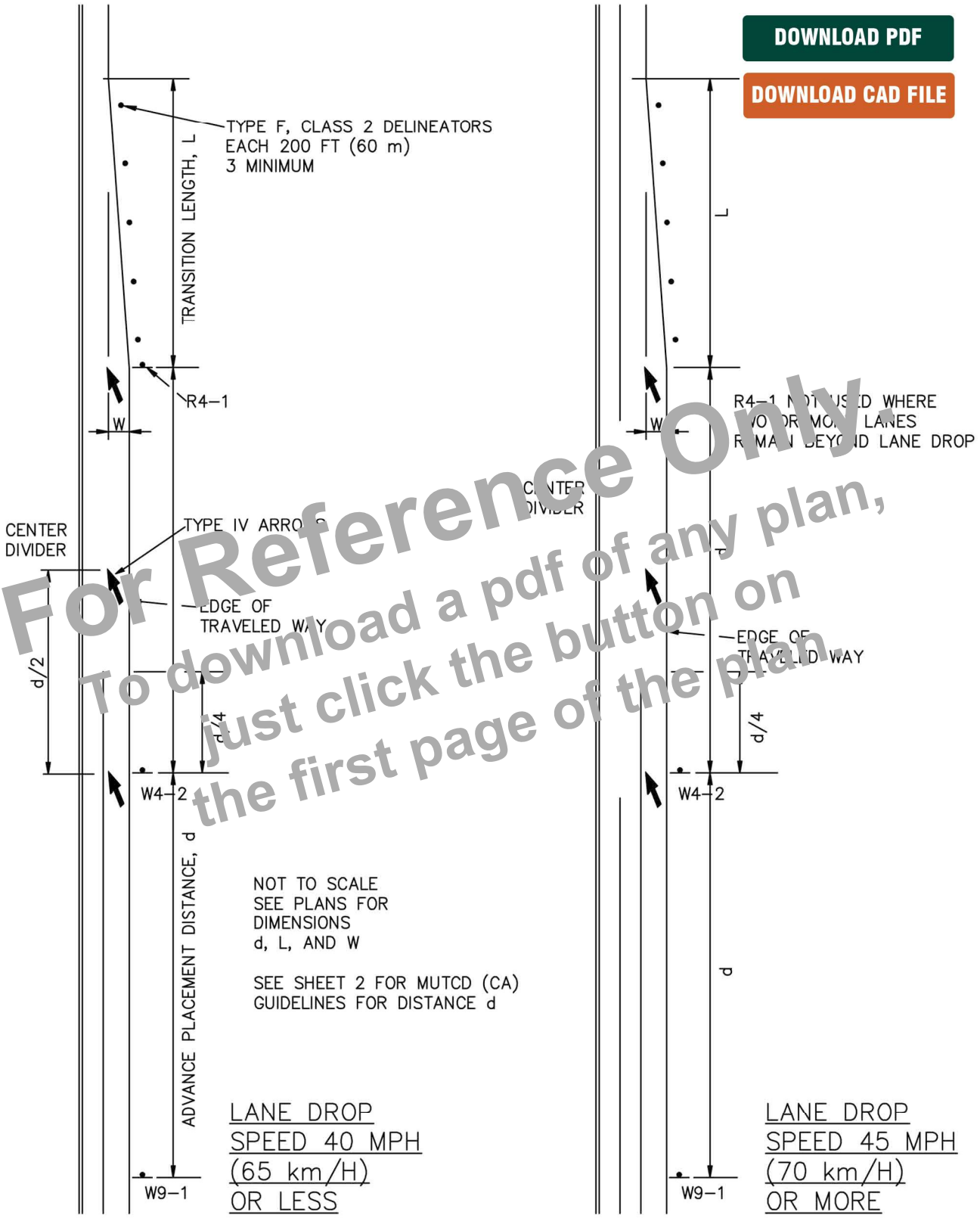
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 175-0

SHEET 1 OF 1

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LANE DROP
SPEED 40 MPH
(65 km/H)
OR LESS

LANE DROP
SPEED 45 MPH
(70 km/H)
OR MORE

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

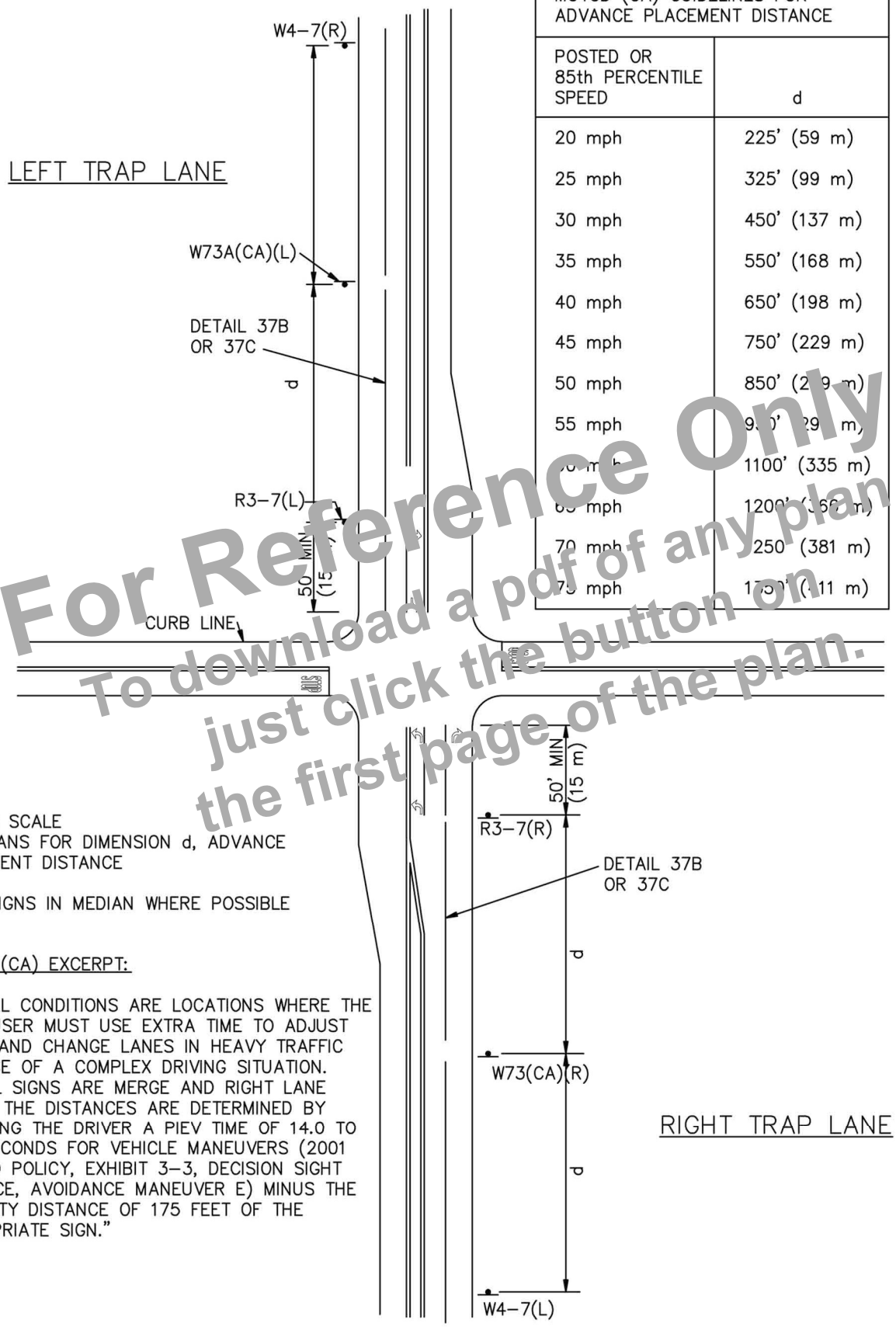
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2011

LANE REDUCTION MARKINGS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
176-0
SHEET 1 OF 2

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MUTCD (CA) GUIDELINES FOR ADVANCE PLACEMENT DISTANCE	
POSTED OR 85th PERCENTILE SPEED	d
20 mph	225' (59 m)
25 mph	325' (99 m)
30 mph	450' (137 m)
35 mph	550' (168 m)
40 mph	650' (198 m)
45 mph	750' (229 m)
50 mph	850' (2 9 m)
55 mph	9 0' 29 m)
[illegible]	1100' (335 m)
65 mph	1200' (66 m)
70 mph	250' (381 m)
75 mph	1 50' (11 m)

NOT TO SCALE
SEE PLANS FOR DIMENSION d, ADVANCE PLACEMENT DISTANCE

POST SIGNS IN MEDIAN WHERE POSSIBLE

MUTCD (CA) EXCERPT:

"TYPICAL CONDITIONS ARE LOCATIONS WHERE THE ROAD USER MUST USE EXTRA TIME TO ADJUST SPEED AND CHANGE LANES IN HEAVY TRAFFIC BECAUSE OF A COMPLEX DRIVING SITUATION. TYPICAL SIGNS ARE MERGE AND RIGHT LANE ENDS. THE DISTANCES ARE DETERMINED BY PROVIDING THE DRIVER A PIEV TIME OF 14.0 TO 14.5 SECONDS FOR VEHICLE MANEUVERS (2001 AASHTO POLICY, EXHIBIT 3-3, DECISION SIGHT DISTANCE, AVOIDANCE MANEUVER E) MINUS THE LEGIBILITY DISTANCE OF 175 FEET OF THE APPROPRIATE SIGN."

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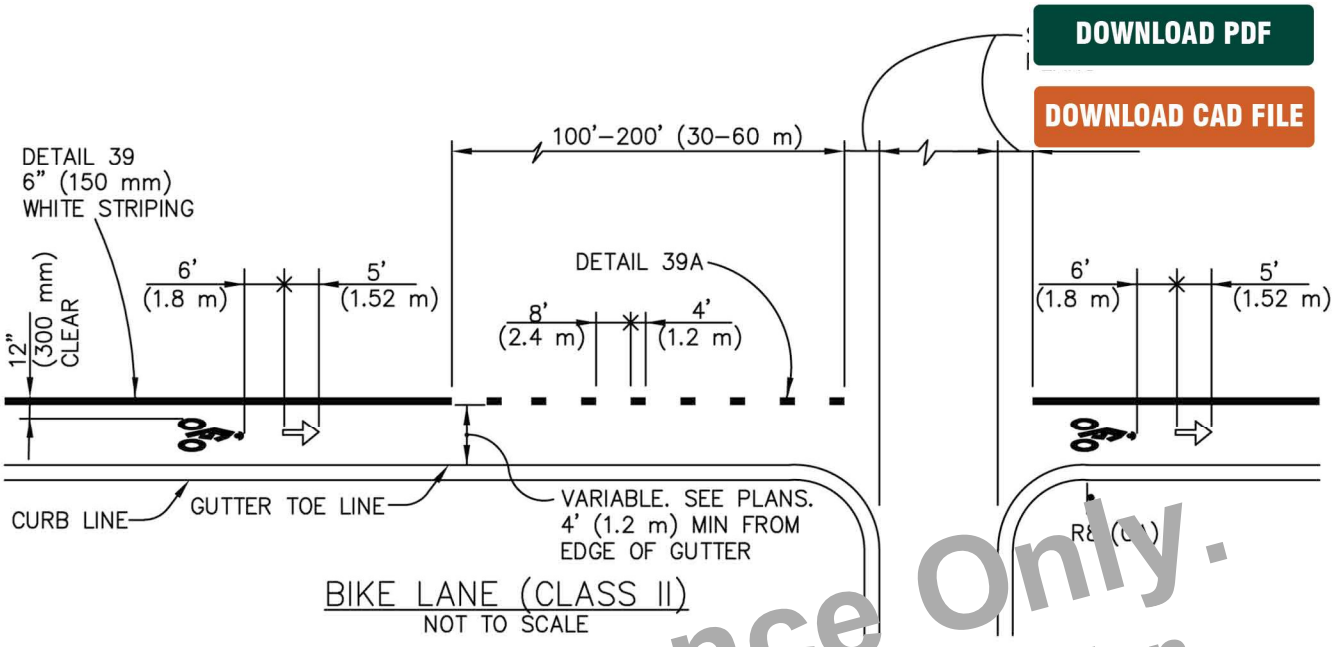
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

LANE REDUCTION MARKINGS

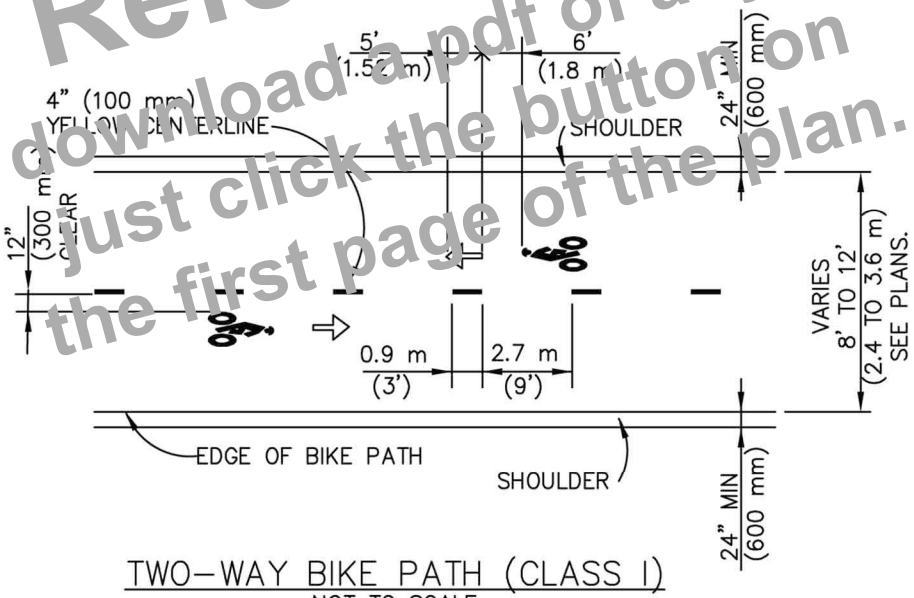
STANDARD PLAN
176-0
SHEET 2 OF 2

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BIKE LANE (CLASS II)
NOT TO SCALE



TWO–WAY BIKE PATH (CLASS I)
NOT TO SCALE

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NOTE:

ALL BICYCLE STRIPING AND MARKINGS SHALL BE WHITE REFLECTIVE PAINT EXCEPT AS NOTED FOR TWO–WAY BIKE PATH.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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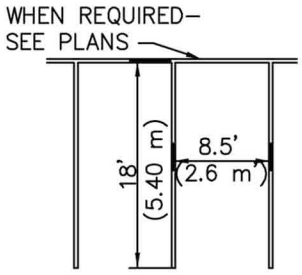
BIKE LANE MARKING & STRIPING

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

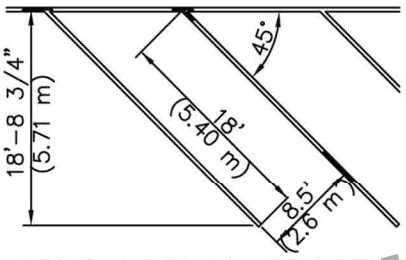
STANDARD PLAN
177–0
SHEET 1 OF 1

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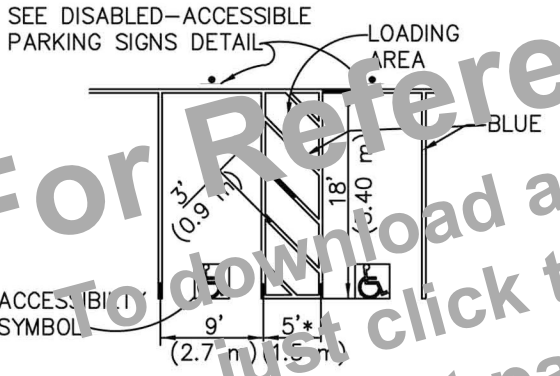
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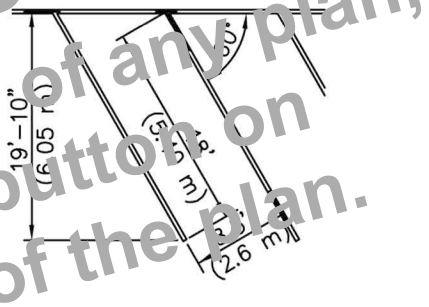
STANDARD SPACE DETAIL



45° DIAGONAL SPACE DETAIL



ACCESSIBLE SPACE DETAIL



60° DIAGONAL SPACE DETAIL

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* LOADING AREA SHALL BE 8' (2.40 m) WIDE ADJACENT TO VAN ACCESSIBLE PARKING SPACES – SEE PLANS.

NOTES:

1. STRIPING SHALL BE 4" (100 mm) WIDE WHITE NON–REFLECTORIZED PAINT, EXCEPT AS SHOWN. PAVEMENT MARKINGS SHALL ALSO BE NON–REFLECTORIZED PAINT.

2. SIGNS SHALL CONFORM TO SECTION 56, SIGNS, OF THE STATE STANDARD SPECIFICATIONS, AND THE STATE SPECIFICATIONS FOR ALUMINUM SINGLE SHEET PANEL SIGNS.

3. SEE LOCAL ZONING CODE FOR REQUIREMENTS FOR USAGE OF COMPACT AND ACCESSIBLE PARKING SPACES AND LOT LAYOUT.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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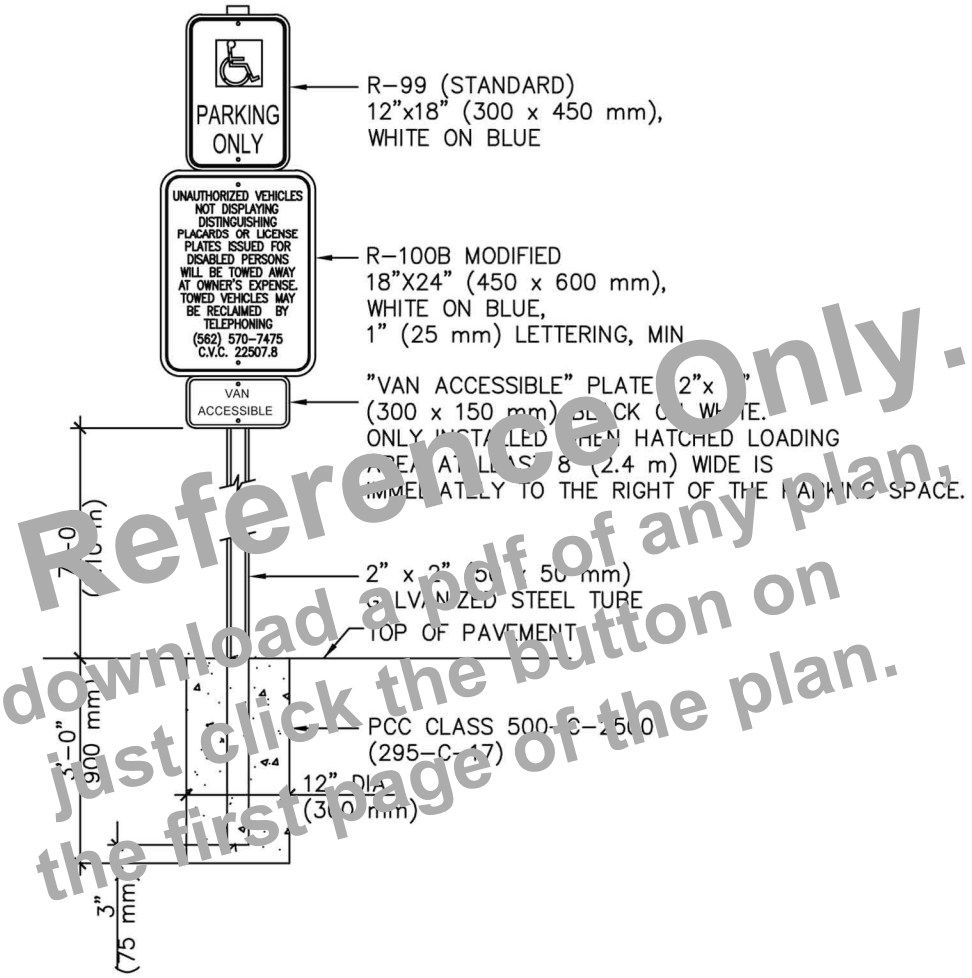
PARKING LOT STRIPING & SIGNING

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 180–0

SHEET 1 OF 2

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DISABLED–ACCESSIBLE PARKING SIGNS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PARKING LOT STRIPING & SIGNING	**180–0**
	SHEET 2 OF 2

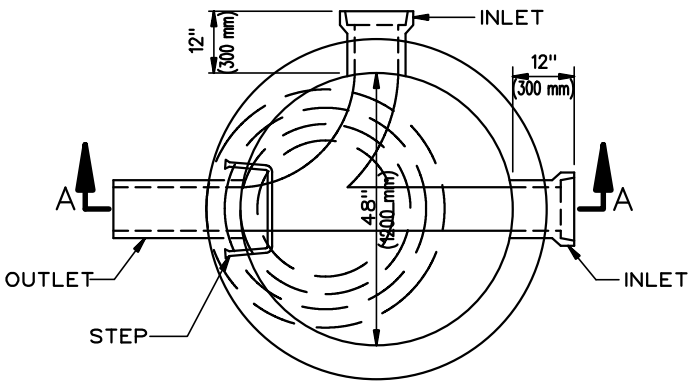
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SECTION 200

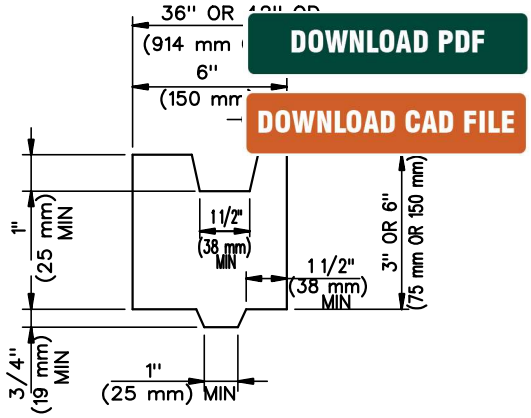
Sewers and Sanitation

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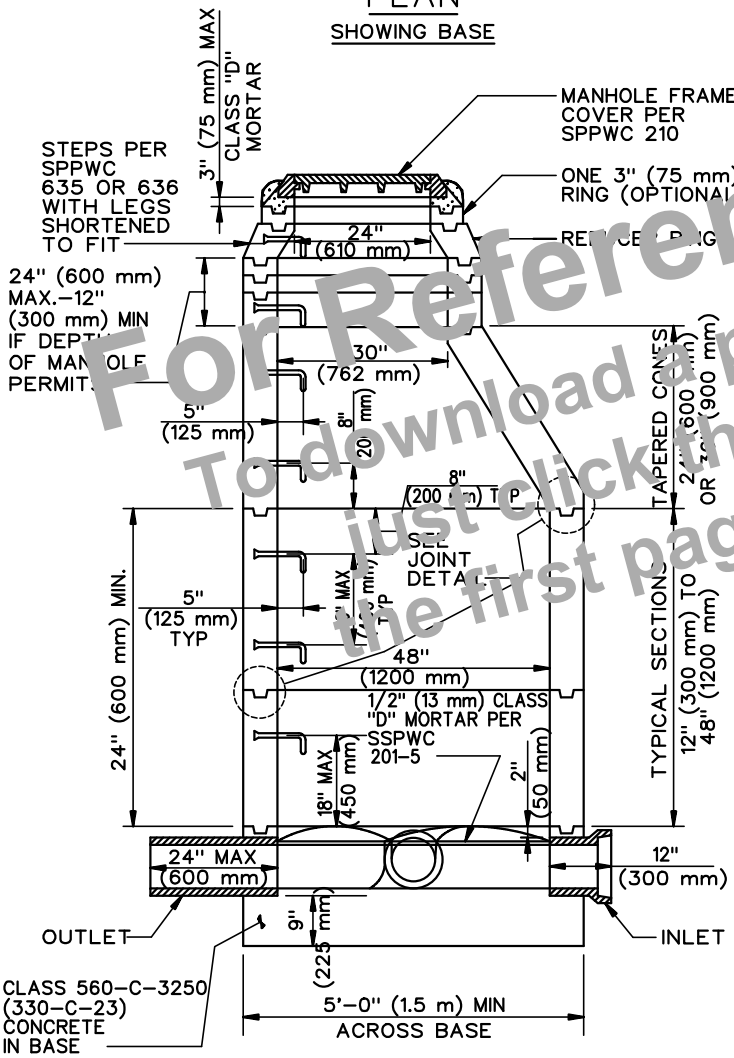
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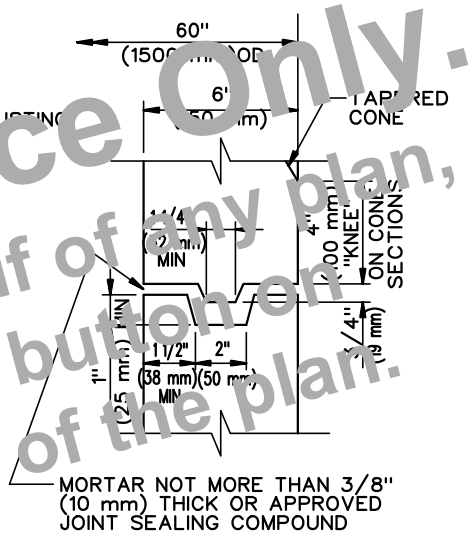
PLAN
SHOWING BASE



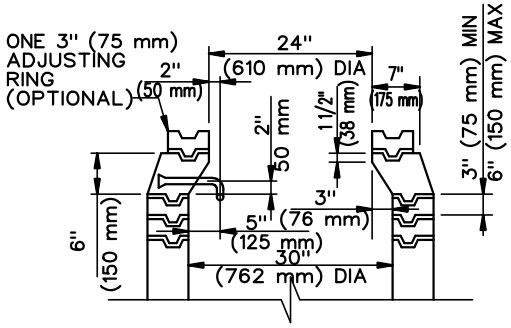
ADJUSTING
RING DETAIL



SECTION A–A



JOINT DETAIL
NON–REINFORCED



REDUCER RING AND
ADJUSTING RINGS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1993, 1995, 2009, 2021

PRECAST CONCRETE SEWER MANHOLE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
200–4
SHEET 1 OF 2

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NOTES:

1. EXCEPT AS NOTED HEREON, THE PRECAST UNITS SHALL BE MANUFACTURED AND TESTED IN ACCORDANCE WITH ASTM C478 (C478M). AS AN ALTERNATE CURING METHOD, THE UNITS MAY BE CURED USING SATURATED STEAM FOR A MINIMUM OF 12 HOURS FOLLOWED BY 6 DAYS OF WATER CURING OR MEMBRANE CURING. IF THE UNITS ARE CURED BY THE ALTERNATE METHOD, THEY SHALL NOT BE SHIPPED PRIOR TO 8 DAYS AFTER CASTING NOR UNTIL THE CONCRETE HAS ATTAINED A STRENGTH OF 3500 PSI (25 MPa)

2. MANHOLE STEPS SHALL CONFORM TO SPPWC 635 TYPE 1 OR 3 OR SPPWC 636. THE MANHOLE STEPS SHALL BE UNIFORMLY SPACED AT A MAXIMUM OF 16" (400 mm). THE LOWEST STEP SHALL BE PLACED NOT LESS THAN 8" (200 mm) NOR MORE THAN 18" (450 mm) ABOVE THE SHELF. THE STEPS SHALL PROJECT 5" (125 mm) INSIDE THE MANHOLE.

3. RISER SECTIONS MAY BE REINFORCED OR UNREINFORCED. REINFORCED SECTIONS SHALL BE REINFORCED IN ACCORDANCE WITH ASTM C478 (C478M) AND SHALL HAVE A MINIMUM WALL THICKNESS OF 5" (125 mm). UNREINFORCED RISER SECTIONS SHALL HAVE A MINIMUM WALL THICKNESS OF 6" (150 mm).

4. THE 24" x 48" (600 mm x 1200 mm) ECCENTRIC CONES MAY BE REINFORCED OR UNREINFORCED. IF REINFORCED, THE WALL THICKNESS SHALL BE NOT LESS THAN 5" (125 mm) IF UNREINFORCED, THE WALL THICKNESS SHALL NOT BE LESS THAN 6" (150 mm).

5. JOINTS SHALL BE TONGUE AND GROOVE. JOINTS FOR REINFORCED STRUCTURES SHALL CONFORM WITH ASTM C478 (C478M) SECTION 14.

6. PRECAST UNITS SHALL BE ASSEMBLED USING CLASS "B" MORTAR.

7. IF 30" (762 mm) DIAMETER MANHOLE FRAME AND COVER IS REQUIRED, IT SHALL BE INSTALLED WHERE THE REDUCER RING IS SHOWN IN THE SECTION.

8. FOR REINFORCED PRECAST STRUCTURES, ALL REINFORCEMENT SHALL HAVE A MINIMUM OF 2" (50 mm) OF COVER OVER THE STEEL ON THE INSIDE FACE.

9. THE TOP OPENING OF THE MANHOLE AND THE STEPS SHALL BE PLACED DIRECTLY OVER THE OUTLET OF THE STRUCTURE EXCEPT AS OTHERWISE NOTED ON PLANS.

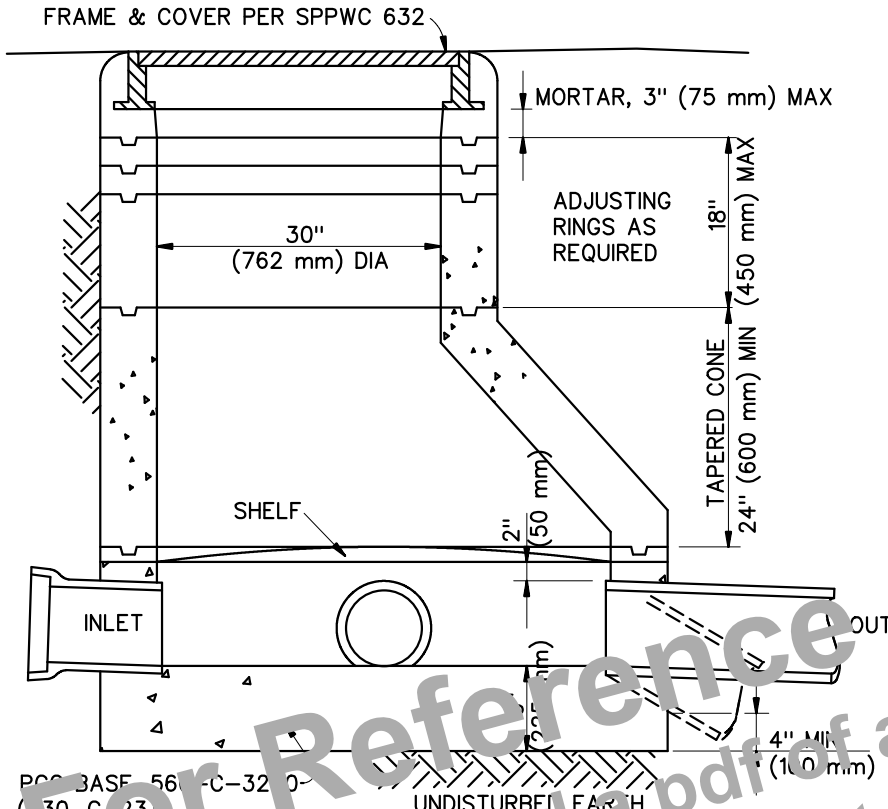
10. CONCRETE BASE AND STUB WALLS SHALL BE POURED IN ONE OPERATION TO A POINT 2" (50 mm) ABOVE THE INLET AND OUTLET PIPES. ALL PIPES SHALL BE RIGIDLY SUPPORTED BY TEMPORARY PIERS OR OTHER METHODS DURING THE OPERATION. CONCRETE SHALL SET FOR 24 HOURS BEFORE PLACING PRECAST UNITS.

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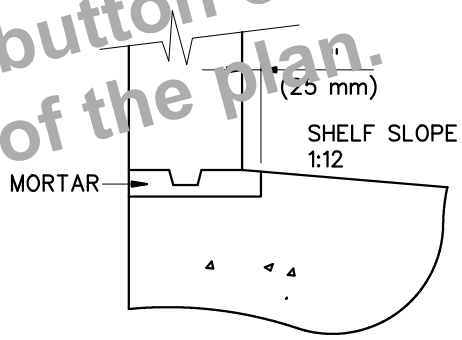
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST CONCRETE SEWER MANHOLE	**200–4**
	SHEET 2 OF 2

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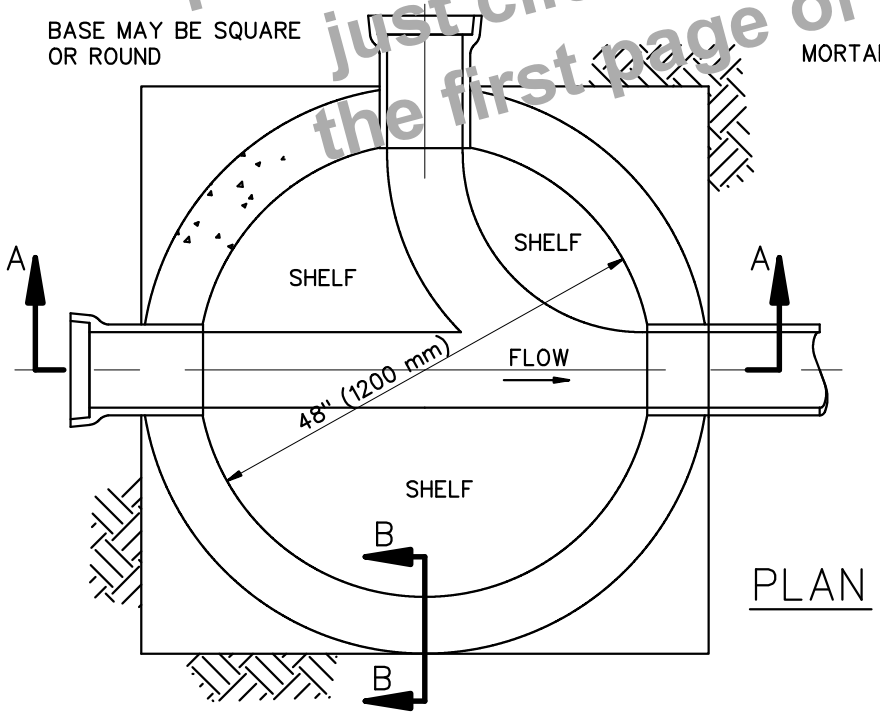
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SECTION A–A



SECTION B–B



PLAN

GENERAL NOTE:

EXCEPT AS SHOWN HEREON, MANHOLES SHALL CONFORM TO SPPWC 200.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1994 REV. 2005, 2009, 2021

PRECAST CONCRETE SHALLOW MANHOLE

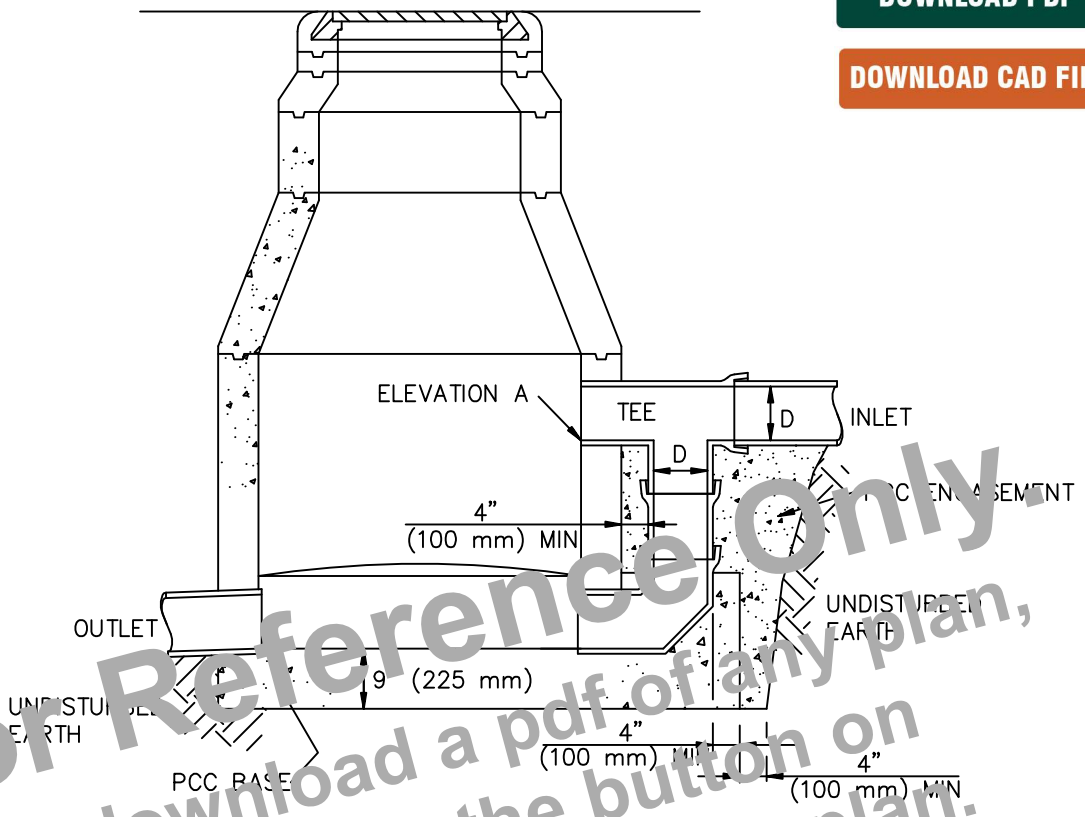
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 201–3

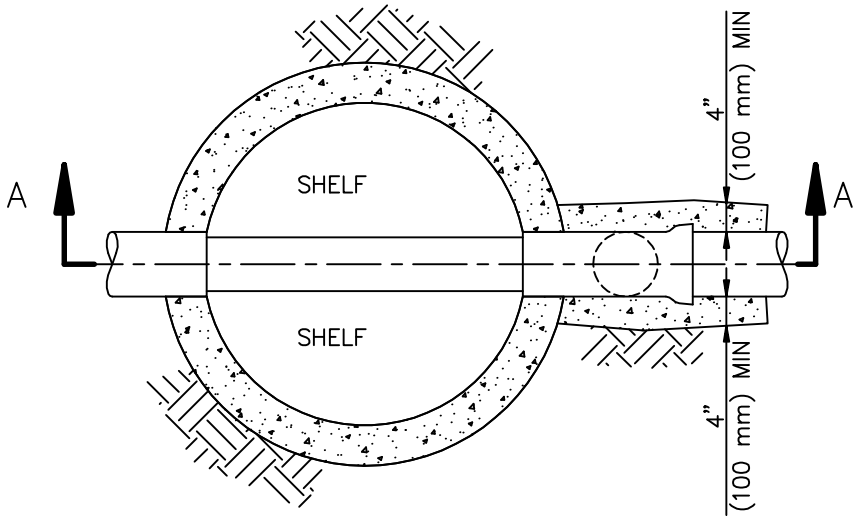
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SECTION A–A



PLAN

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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1993
REV. 2005, 2009

DROP SEWER MANHOLE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
202–2
SHEET 1 OF 2

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NOTES:

1. EXCEPT AS SHOWN ON THIS PLAN, MANHOLES SHALL CONFORM TO SPPWC 200 OR 203.

2. PIPE FOR THE DROP INLET SHALL BE THE SAME MATERIAL AS THE SEWER UNLESS APPROVED ADAPTERS ARE USED. IF SO, THE PIPE MAY BE VCP, ABS SOLID WALL, ABS COMPOSITE, PVC PLASTIC, OR POLYETHELYNE.

3. FOR BRICK MANHOLES, A BRICK ARCH IS ALSO REQUIRED OVER THE UPPER INLET PIPE.

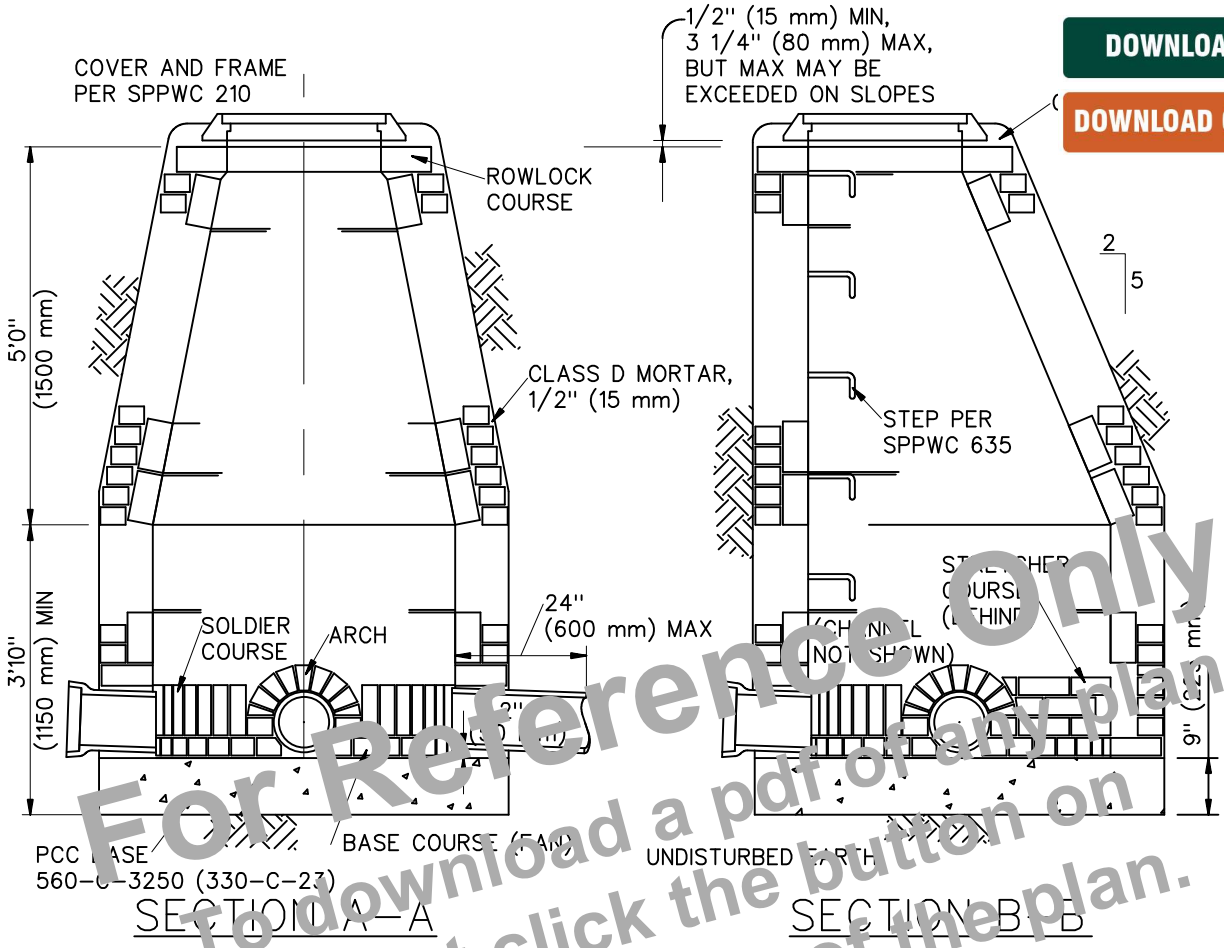
4. IF TWO OR MORE DROP INLETS ARE REQUIRED IN A SINGLE MANHOLE, EACH SHALL BE CONSTRUCTED SEPARATELY.

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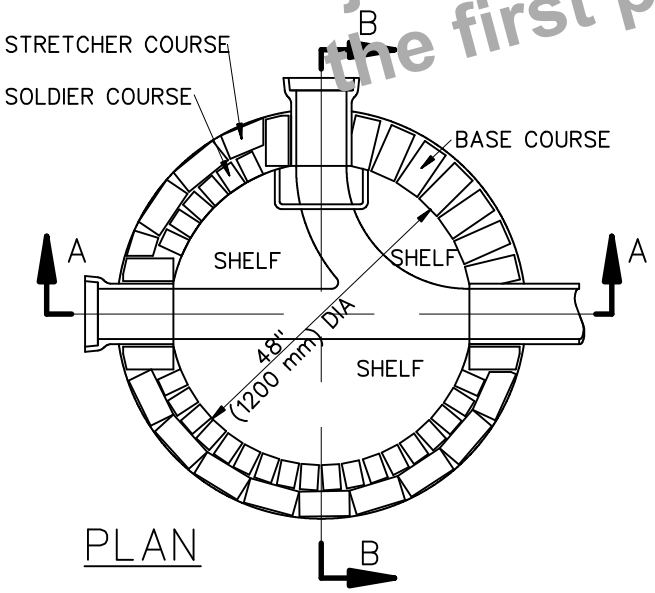
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
DROP SEWER MANHOLE	**202–2**
	SHEET 2 OF 2

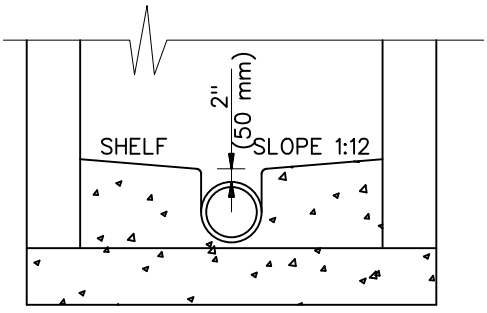
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CHANNEL
TYPICAL SECTION

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1993
REV. 2005, 2009, 2021

BRICK SEWER MANHOLE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
203-3
SHEET 1 OF 2

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NOTES:

1. CONCRETE BASE: DURING CONSTRUCTION, ALL PIPES SHALL BE RIGIDLY SUPPORTED BY BRICK PIERS 12" (300 mm) DEEP, LOCATED JUST OUTSIDE THE STRUCTURE. CONSTRUCT TOP OF CONCRETE BASE 2" (50 mm) BELOW INVERT OF LOWEST PIPE. FILL SPACE BENEATH PIPE WITH MORTAR AND SHOVE FROM BOTH SIDES WITH BASE COURSE BRICK TO FORM A WATER-TIGHT JOINT.

2. BASE OF FAN COURSE: LAY BRICK FLAT ON RADIAL LINES WITH TOPS TO SAME LEVEL.

3. ARCHES: LAY SPALLED BRICK ON EDGE TO FORM A TRUE RADIAL ARCH WITH FULL MORTAR JOINT AROUND ALL PIPE OPENINGS. TURN ARCH OF TWO SUCH COURSES OVER PIPES 15" (375 mm) OR MORE IN DIAMETER.

4. SOLDIER COURSES: LAY INSIDE BRICK ON RADIAL LINES WITH FIRST FOUR COURSES VERTICAL. LAY SUCCEEDING COURSES WITH A UNIFORM BATTER TO OBTAIN AN INSIDE DIAMETER OF 24" (600 mm) AT TOP OF LAST OR FRACTIONAL SOLDIER COURSE. USE SPLIT BRICK IN CLOSE SOLDIER COURSE.

5. STRETCHER COURSES: LAY OUTSIDE BRICK FLAT IN A DEEP BED OF MORTAR. SHOVE BRICK TOGETHER AGAINST ADJACENT SOLDIER COURSE.

6. ROWLOCK COURSE: LAY LAST COURSE OF BRICK ON EDGE ACROSS SOLDIER AND STRETCHER COURSES ON RADIAL LINES, WITH TOPS PARALLEL AND 4 1/2" (120 mm) BELOW FINISHED GRADE.

7. JOINTS: INSIDE JOINTS SHALL BE NEATLY STRUCK AND SHALL NOT EXCEED 3/8" (10 mm) IN THICKNESS.

8. STEPS: MANHOLE STEPS SHALL CONFORM WITH SPPWC 631 TYPE 3. THE TOP STEP SHALL BE PLACED JUST UNDER THE MANHOLE FRAME. THE LOWEST STEP SHALL BE PLACED BETWEEN 8" (200 mm) AND 24" (600 mm) ABOVE THE SHELF.

9. WALL THICKNESS: BRICKWORK SHALL BE 8" (200 mm) THICK TO A DEPTH OF 22' (6.5 m). BRICKWORK BELOW 22' (6.5 m) DEEP SHALL BE 12" (300 mm) THICK.

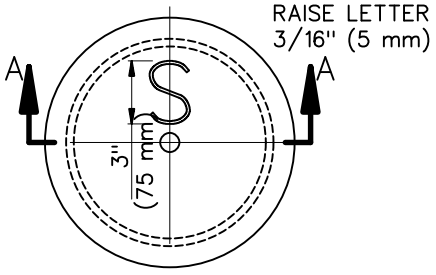
10. A FLEXIBLE JOINT SHALL BE INSTALLED AT THE FIRST JOINT FROM MANHOLE FOR ALL CONNECTIONS EXCEPT THOSE WITH REINFORCED CONCRETE PIPE.

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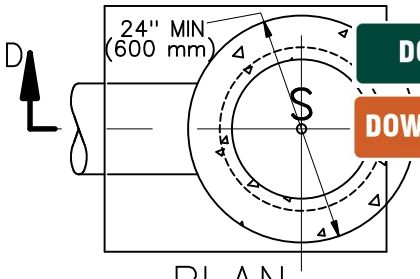
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
BRICK SEWER MANHOLE	**203-3**
	SHEET 2 OF 2

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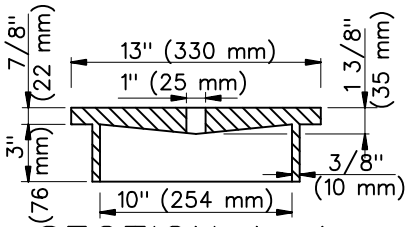
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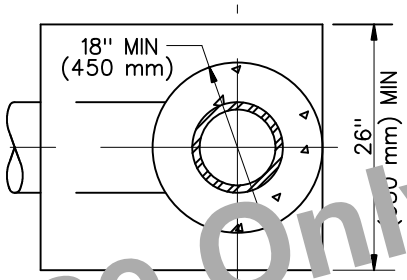
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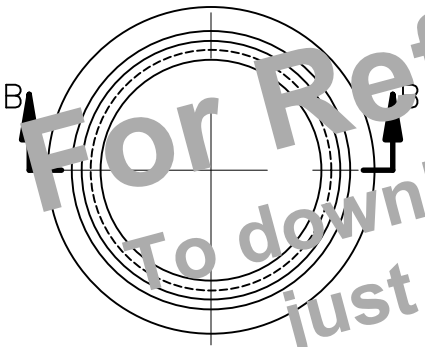
PLAN



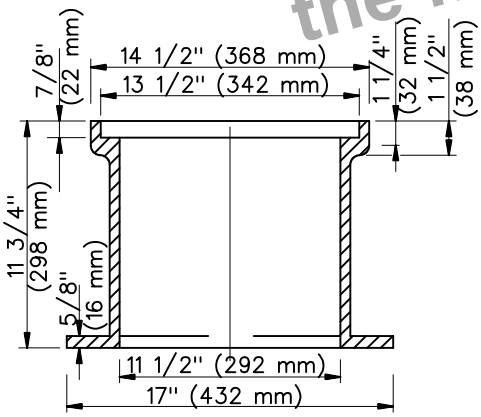
SECTION A–A



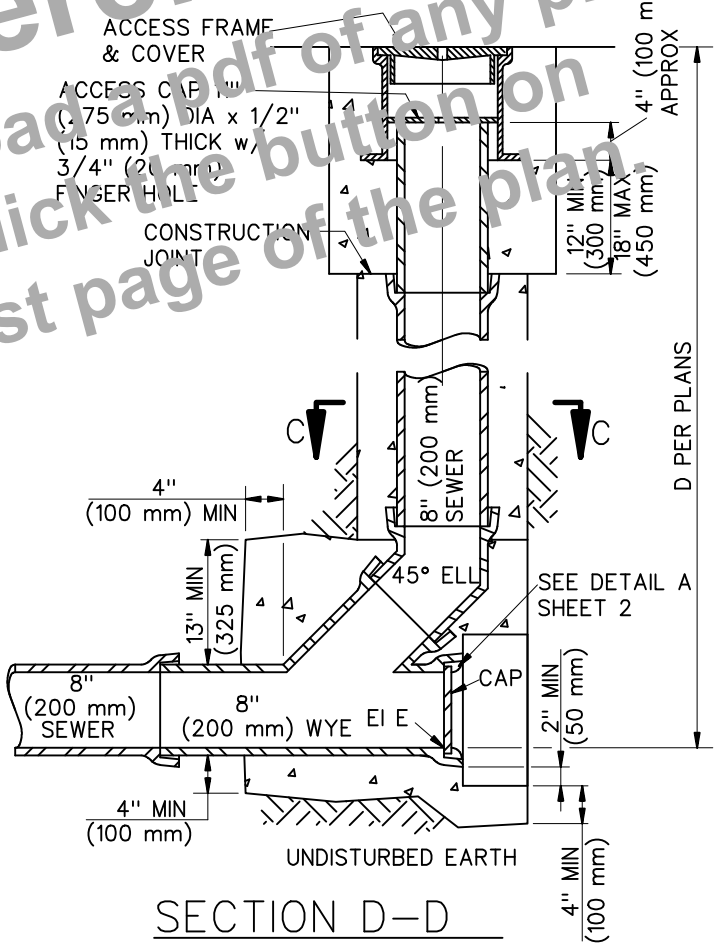
SECTION C–C



ACCESS FRAME



SECTION B–B



SECTION D–D

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

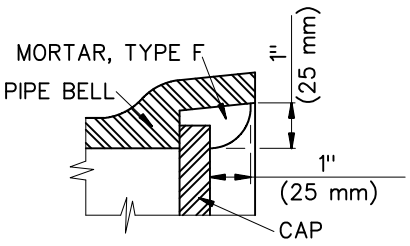
PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1993
REV. 2005, 2009, 2021

TERMINAL CLEANOUT STRUCTURE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
204–3
SHEET 1 OF 2

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DETAIL A

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NOTES:

1. VALUES OF DIMENSION D AND ELEVATION E SHALL BE AS SHOWN ON THE PLANS.

2. PIPE AND FITTINGS, UNLESS OTHERWISE NOTED, SHALL BE OF THE SAME MATERIALS AS THE SEWER, UNLESS APPROVED ALTERNATES ARE USED, AND MAY BE ANY OF THE FOLLOWING:
   A. PVC PIPE
   B. PE PIPE
   C. ABS SOLID WALL PIPE
   D. ABS COMPOSITE PIPE
   E. PVC PLASTIC PIPE

3. PIPE AND FITTINGS SHALL BE BEDDED AND ENCASED IN CONCRETE AS SHOWN. CONCRETE SHALL BE CLASS 450-C-2000 (265-C-14). JOIN AND ALIGN PIPE AND FITTINGS BEFORE PLACING CONCRETE. MAINTAIN ALIGNMENT WHILE PLACING AND ALLOWING CONCRETE TO SET.

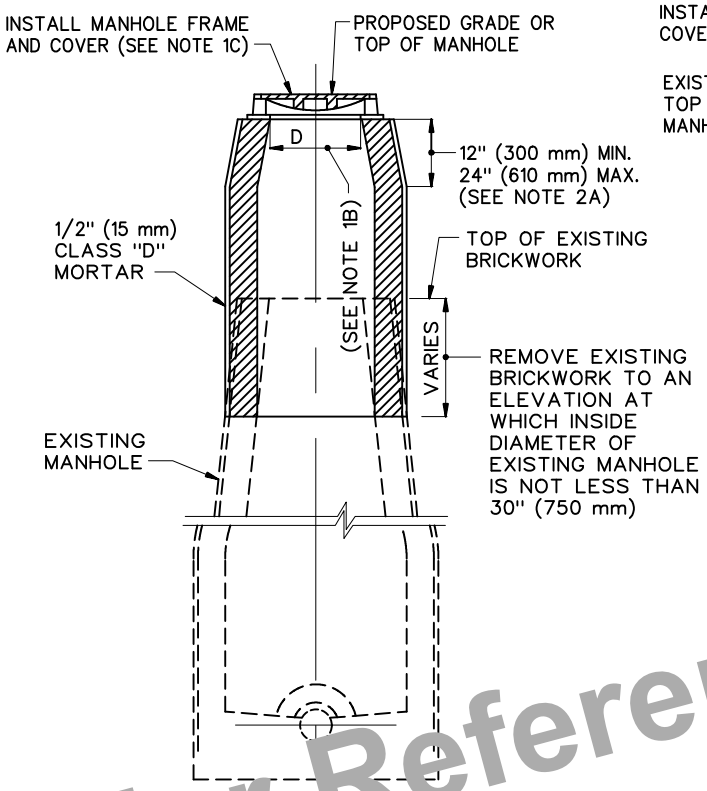
4. THE ACCESS FRAME, COVER AND CAP SHALL BE CAST IRON. FINGER HOLES MAY BE DRILLED OR BLOCKED OUT PRIOR TO CASTING. FINGER HOLES SHALL NOT BE PUNCHED OUT.

5. THE CONTRACTOR MAY PLACE EITHER CIRCULAR OR SQUARE CONCRETE PIPE WALL SUPPORTS.

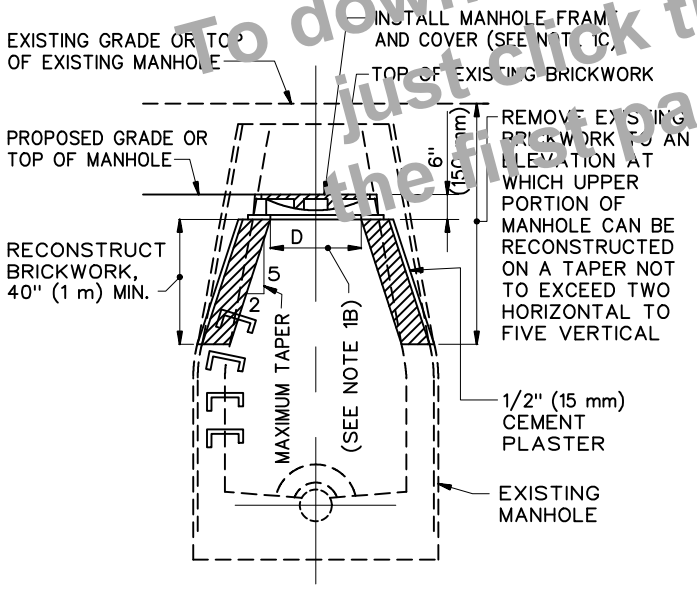
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TERMINAL CLEANOUT STRUCTURE	**204-3**
	SHEET 2 OF 2

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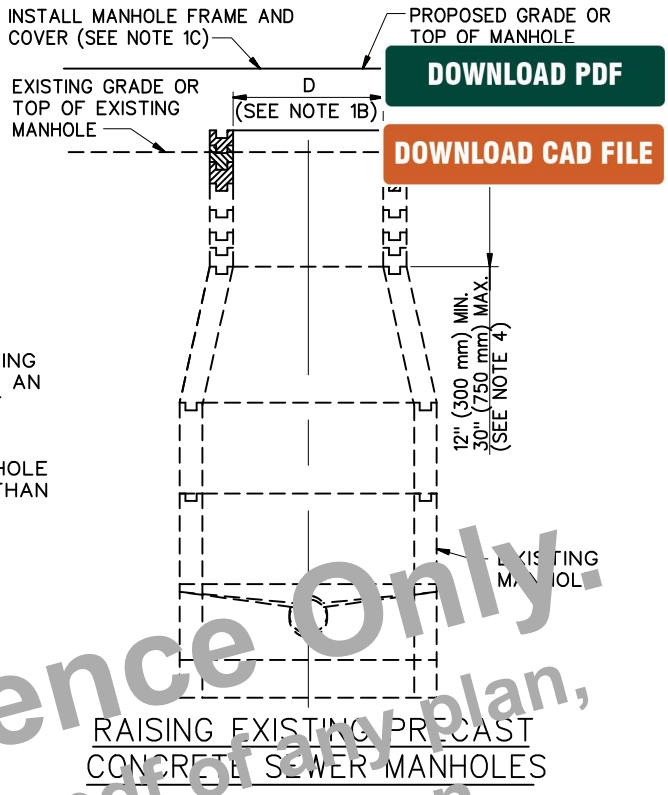


RAISING EXISTING BRICK MANHOLES

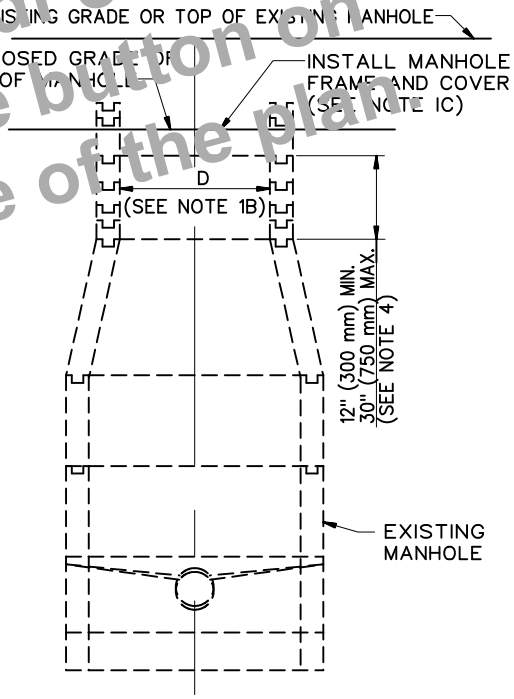


LOWERING EXISTING BRICK MANHOLES

BRICK MANHOLES



RAISING EXISTING PRECAST CONCRETE SEWER MANHOLES



LOWERING EXISTING PRECAST CONCRETE SEWER MANHOLES

PRECAST CONCRETE SEWER MANHOLES

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1996, 2009, 2021

SEWER MANHOLE ADJUSTMENT

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 205–3

SHEET 1 OF 3

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NOTES:

1. GENERAL
   A. EXCEPT AS INDICATED HEREON OR ON THE PLANS, MANHOLES SHALL CONFORM TO: SPPWC 200, PRECAST CONCRETE SEWER MANHOLE AND SPPWC 203, BRICK SEWER MANHOLE.

   B. DIMENSION "D" SHALL BE THE SAME AS THE SIZE OF MANHOLE FRAME AND COVER TO BE USED.

   C. THE CONTRACTOR MAY REUSE THE EXISTING MANHOLE FRAME AND COVER, UNLESS DAMAGED DURING THE WORK OR WHEN OTHERWISE SHOWN IN THE CONTRACT DOCUMENTS. ITEMS DAMAGED BY THE CONTRACTOR SHALL BE REPLACED WITH IDENTICAL NEW ITEMS AT NO EXPENSE TO THE AGENCY.

   D. EXISTING STEPS LOCATED WITHIN REMOVAL LIMITS SHALL BE REPLACED. WHEN REMOVAL OF EXISTING STEPS BEYOND THE MANHOLE REMOVAL LIMITS IS SHOWN ON THE PLANS, THE STEPS SHALL BE REMOVED TO A DEPTH OF 2" (50 mm) BEYOND THE INSIDE FACE OF THE BRICK MANHOLE AND THE HOLES SHALL BE FILLED WITH CLASS "D" MORTAR.

2. RAISING EXISTING BRICK MANHOLES

   A. BRICK MANHOLES TO BE RAISED LESS THAN 1' (300 mm) MAY BE EXTEND VERTICALLY, PROVIDED THAT AT A DEPTH OF 2 1/2' (750 mm) BELOW THE TOP OF THE MANHOLE AT ITS NEW ELEVATION, THE INSIDE DIAMETER OF THE MANHOLE IS 30" (750 mm) OR GREATER.

   B. BRICK MANHOLES TO BE RAISED LESS THAN 3 1/2" (90 mm) MAY BE RAISED BY APPLYING CLASS "D" MORTAR TO THE TOP OF THE EXISTING BRICKWORK. IF THE BRICK MANHOLE IS TO BE RAISED 3 1/2" (90 mm) OR MORE, A NEW COURSE OR COURSES OF BRICKWORK SHALL BE PLACED ON TOP OF THE EXISTING BRICKWORK.

3. LOWERING EXISTING BRICK MANHOLES

   A. WHERE A BRICK MANHOLE IS TO BE LOWERED LESS THAN 1' (300 mm), THE FRAME MAY BE RESET ON THE EXISTING BRICKWORK AND THE 40" (1 m) MINIMUM BRICKWORK RECONSTRUCTION OMITTED, PROVIDED THAT THE BASE OF THE FRAME DOES NOT OVERHANG THE BRICKWORK ON THE INSIDE SURFACE OF THE MANHOLE MORE THAN AN AVERAGE OF 1 1/2" (35 mm) IN ANY QUADRANT NOR MORE THAN 2" (50 mm) AT ANY POINT.

4. RAISING EXISTING PRECAST CONCRETE SEWER MANHOLES

   A. PRECAST CONCRETE MANHOLES TO BE RAISED LESS THAN 3" (75 mm) MAY BE RAISED BY APPLYING CLASS "D" MORTAR TO THE TOP OF THE EXISTING MANHOLE, PROVIDED THE TOTAL HEIGHT OF MORTAR, EXISTING AND NEWLY APPLIED, DOES NOT EXCEED 3" (75 mm).

   B. WHERE THE PRECAST CONCRETE MANHOLE IS TO BE RAISED 3" (75 mm) OR MORE, OR WHERE THE TOTAL HEIGHT OF MORTAR, EXISTING AND NEWLY APPLIED, WOULD EXCEED 3" (75 mm), GRADE RINGS SHALL BE UTILIZED. CLASS "D" MORTAR MAY BE USED FOR FINAL ADJUSTMENT, BUT NOT MORE THAN 3" (75 mm) IN HEIGHT. WHERE RAISING THE MANHOLE WOULD RESULT IN THE UPPER SEGMENT OF THE SHAFT BEING MORE THAN 30" (750 mm) IN HEIGHT, REMOVE THE REDUCER AND THE UPPER SEGMENT OF THE SHAFT, INSTALL ADDITIONAL RINGS OR PIPE TO THE LOWER SEGMENT OF THE SHAFT, AND REINSTALL THE REDUCER AND GRADE RINGS AS REQUIRED.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
SEWER MANHOLE ADJUSTMENT	**205–3**
	SHEET 2 OF 3

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5. LOWERING EXISTING PRECAST CONCRETE SEWER MANHOLES

A. REMOVE SUFFICIENT GRADE RINGS TO LOWER THE MANHOLES AS REQUIRED, APPLY CLASS "D" MORTAR TO A HEIGHT NOT EXCEEDING 3" (75 mm) FOR ADJUSTMENT TO FINAL GRADE.

B. WHERE REMOVAL OF GRADE RINGS WOULD RESULT IN THE UPPER SEGMENT OF THE SHAFT BEING LESS THAN 12" (300 mm) IN HEIGHT, REMOVE THE REDUCER AND SUFFICIENT SECTIONS OF THE LOWER SEGMENT OF THE SHAFT AND REINSTALL ANY NECESSARY SEGMENT OF THE LOWER SHAFT, THE REDUCER, AND THE GRADE RINGS TO CONFORM TO THE REQUIREMENTS OF THIS PLAN.

C. EXISTING GRADE RINGS NEED NOT BE REMOVED IF EXISTNG MORTAR IS REMOVED, AND AT LEAST 1 1/2" (35 mm) OF MORTAR MAY BE PLACED ON TOP OF THE EXISTING GRADE RINGS TO RESEAT THE FRAME.

6. REPLACEMENT OF BRICK REDUCER WITH PRECAST CONCRETE REDUCER AND SHAFT

UNLESS OTHERWISE INDICATED ON THE PLANS, THE CONTRACTOR MAY INSTALL A PRECAST CONCENTRIC CONCRETE REDUCER, CONCRETE GRADE RING, AND CONCRETE PIPE IN LIEU OF RECONSTRUCTING A BRICK REDUCER, PROVIDED:

A. THE MAXIMUM ID OF SEWER PIPE CONNECTED TO THE MANHOLE DOES NOT EXCEED 8" (200 mm).

B. THE CONTRACTOR SECURES PRIOR APPROVAL FROM THE ENGINEER TO INSTALL THE CONCENTRIC REDUCER ONTO THE MANHOLE SHAFT. THE ENGINEER MAY, AS PART OF THE INSTALLATION REQUIREMENTS, REQUIRE THE CONTRACTOR TO COAT THE INSIDE OF THE REDUCER, RINGS, AND PIPE WITH AN APPROVED COATING.

C. THE CONCRETE GRADE RINGS, THE CONCRETE REDUCER, AND ANY CONCRETE PIPE SHALL BE JOINED TOGETHER AND BEDDED ONTO THE EXISTING BRICK MANHOLE WITH CLASS "D" MORTAR. THE DEPTH, WIDTH, AND THICKNESS OF THE MORTAR SHALL BE OF SUFFICIENT DIMENSIONS TO PROPERLY AND ADEQUATELY JOIN AND BED THE COMPONENT PARTS.

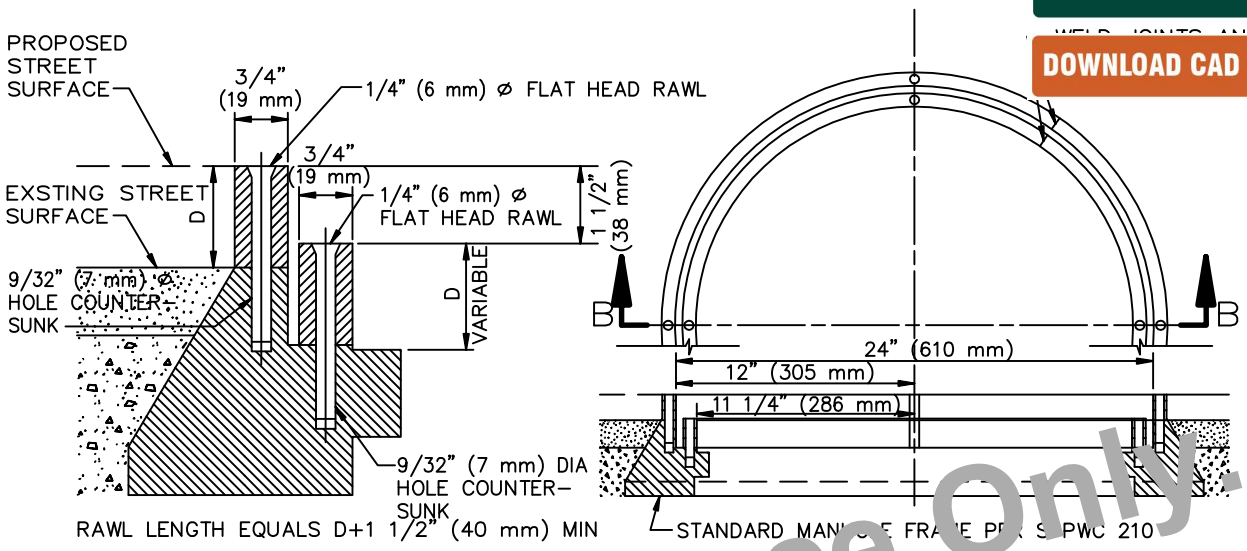
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
SEWER MANHOLE ADJUSTMENT	205-3
	SHEET 3 OF 3

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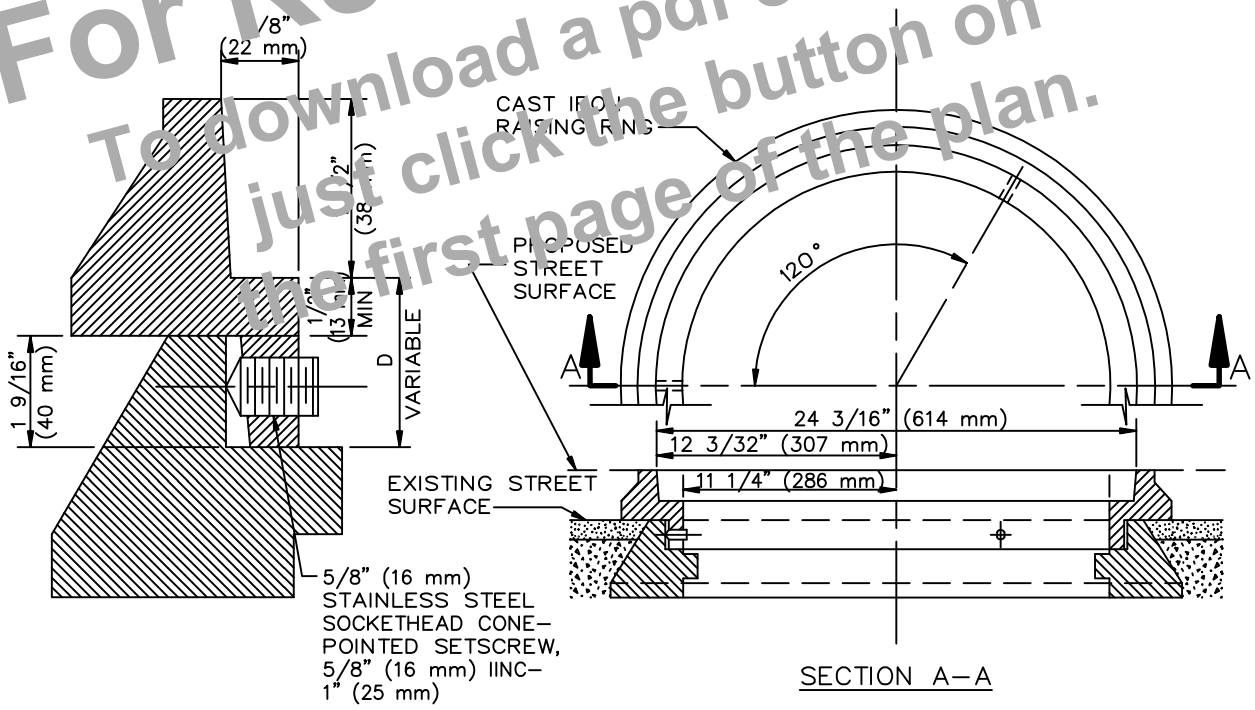
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RAISING RINGS TO BE MADE OF STEEL [illegible] MERCI



SECTION B–B

STEEL RAISING RINGS



SECTION A–A

CAST IRON RAISING RINGS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

MANHOLE RAISING RINGS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 206–2

SHEET 1 OF 2

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NOTES:

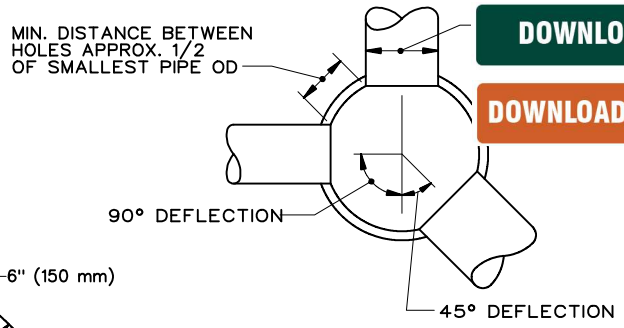
1. MACHINE SEATS FROM CAST IRON RINGS.
2. THE CAST IRON USED SHALL CONFORM TO SSPWC 206–3.
3. THE METAL RAISING RINGS MAY BE USED IN LIEU OF THE REGULAR METHOD OF ADJUSTMENT UTILIZING MORTAR OR BRICK AND MORTAR UNDER THE FOLLOWING CONDITIONS.
   A. ONLY ONE ADJUSTMENT WITH RAISING RINGS WILL BE ALLOWED ON ANY MANHOLE.
   B. MAXIMUM "D" SHALL BE 3" (75 mm).

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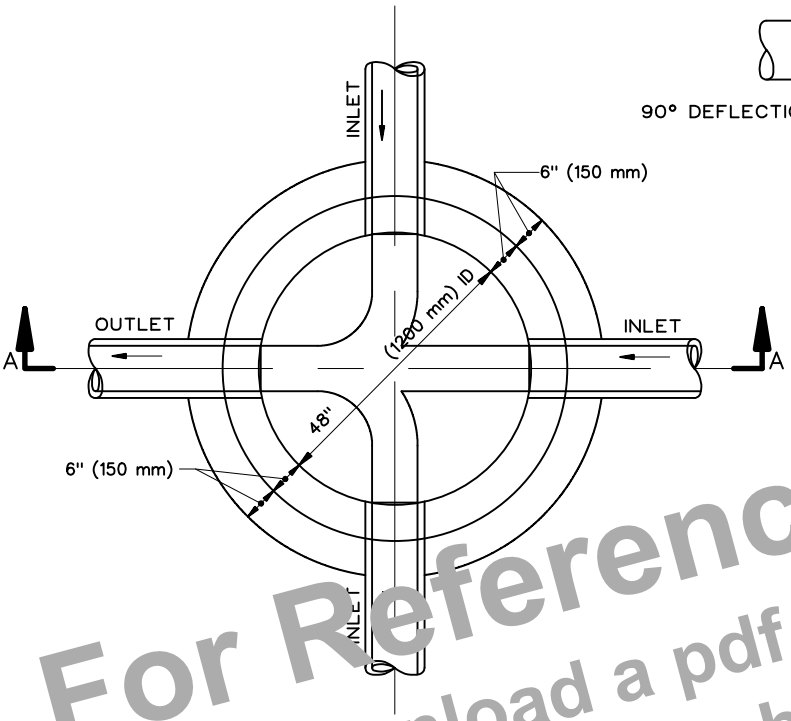
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MANHOLE RAISING RINGS	**206–2**
	SHEET 2 OF 2

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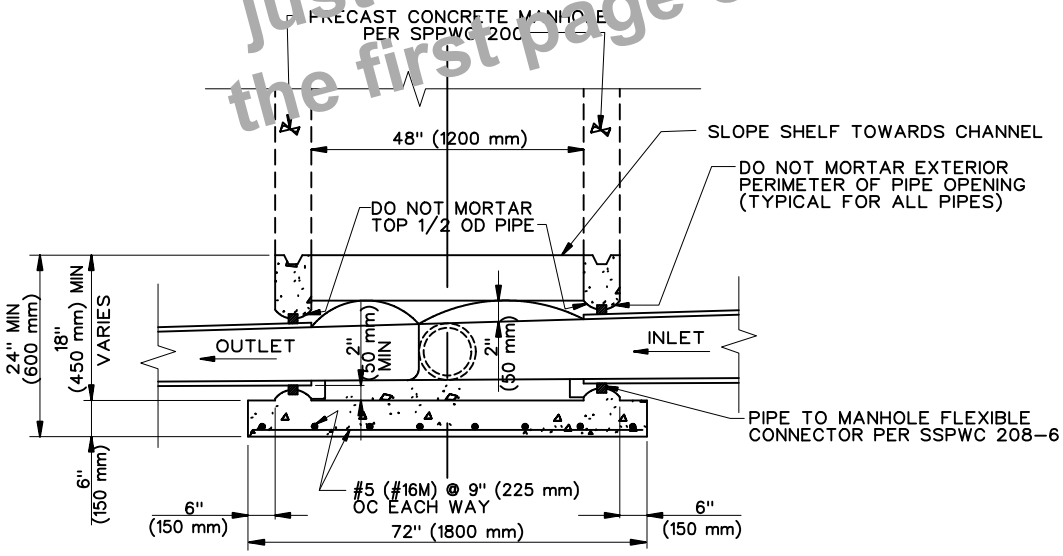
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PIPE SPACINGS



PLAN VIEW



SECTION A–A

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1993 REV. 1996, 2009, 2021

PRECAST REINFORCED CONCRETE MANHOLE BASE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 207–3

SHEET 1 OF 2

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NOTES

1. BEDDING SHALL BE EQUAL TO BEDDING FOR PIPE. HOWEVER, IF PIPE IS PLACED ON NATIVE MATERIAL, THE CONTRACTOR SHALL PLACE A 6" (150 mm) MINIMUM LAYER OF 1/2" (13 mm) CRUSHED ROCK BEFORE CONSTRUCTING THE BASE.

2. STUB WALLS AND BASE SHALL CONFORM TO ASTM C478 (C478M) AND SHALL HAVE A MINIMUM OF 2" (50 mm) OF COVER OVER THE STEEL ON THE INSIDE FACE.

3. CONCRETE MANHOLE BASE AND STUB WALLS SHALL BE POURED IN ONE OPERATION.

4. CONCRETE FOR PRECAST UNITS SHALL BE VIBRATED IN THE FORMS, CURED ACCORDING TO APPROVED PRACTICE EITHER BY STEAM, APPROVED PRACTICE EITHER BY STEAM, SPRINKLING, MEMBRANE SOLUTION, OR A COMBINATION THEREOF AND ACHEIVE A 28-DAY COMPRESSIVE STRENGTH OF 3500 PSI (25 MPa) OR GREATER.

5. INVERT CHANNELS AND SHELF MAY BE POURED AT THE PRODUCTION FACILITY OR IN THE FIELD AT THE OPTION OF THE CONTRACTOR.

6. THE DEPTH OF CHANNEL SHALL EQUAL THE PIPE DIAMETER FOR ALL SIZES OF PIPE. FOR SPECIAL CHANNELS IN TRAP OR CAUCING MANHOLES, SEE SPECIAL PLANS.

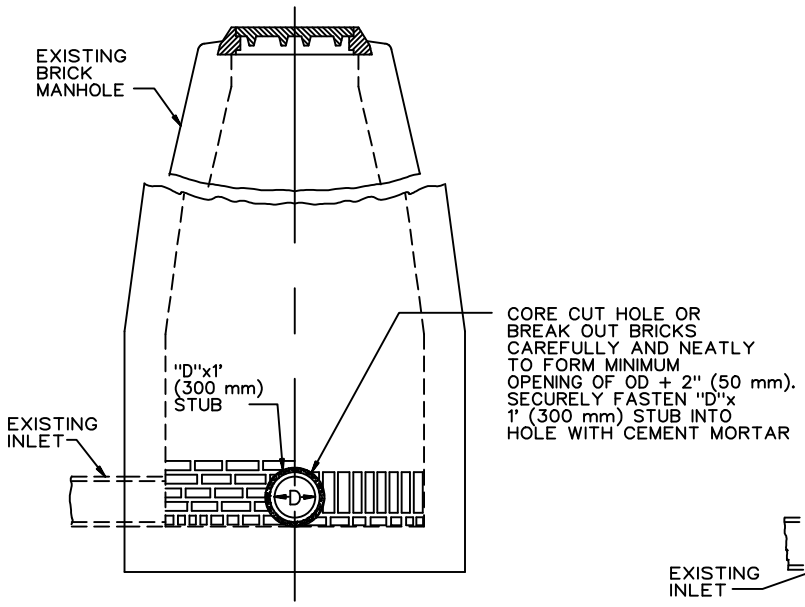
7. CEMENT MORTAR INSIDE JOINTS SHALL BE NEATLY STRUCK AND POINTED AND SHALL NOT EXCEED 3/8" (10 mm) IN THICKNESS.

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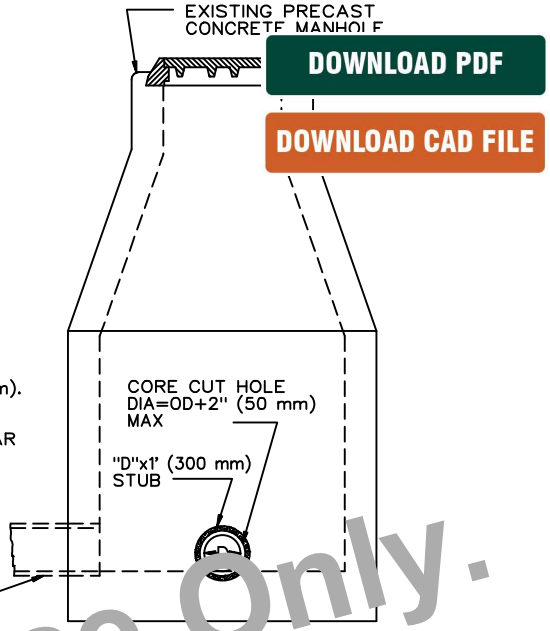
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE MAHOLE BASE	207-3
	SHEET 2 OF 2

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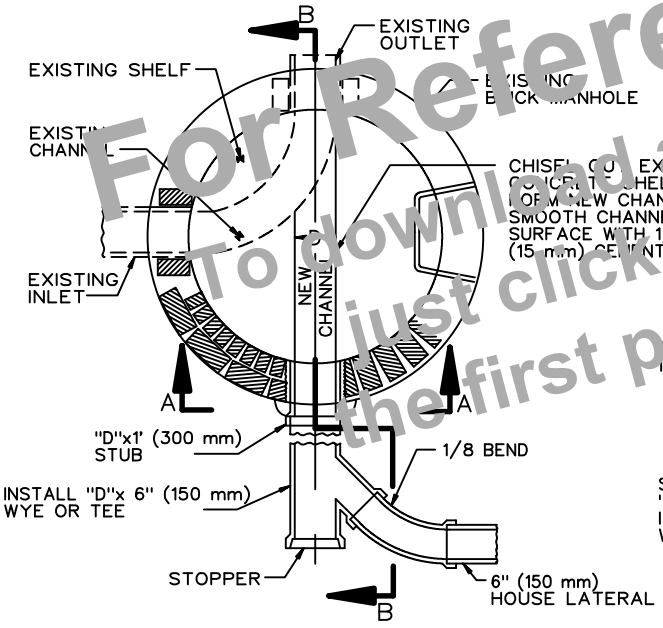
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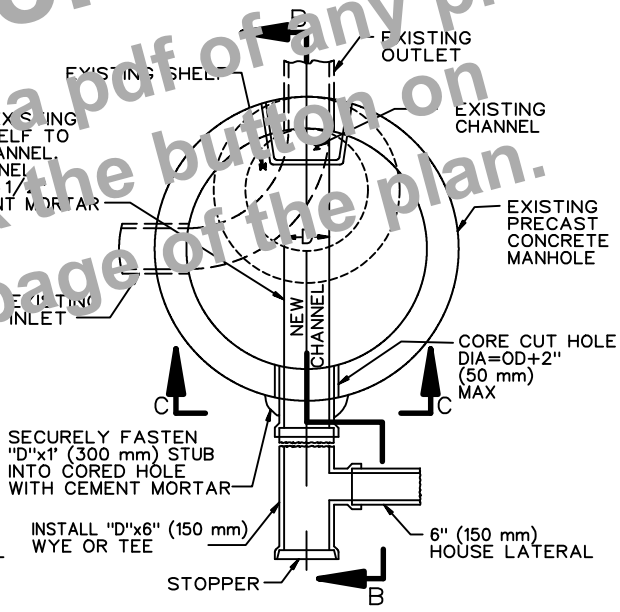
SECTIONAL ELEVATION A–A



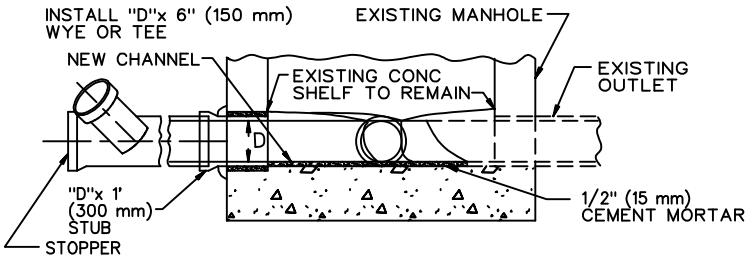
SECTIONAL ELEVATION C–C



SECTIONAL PLAN OF BASE



SECTIONAL PLAN OF BASE



SECTIONAL ELEVATION B–B
CHANNEL BASE

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984
REV. 1996, 2009, 2021

BREAKING INTO EXISTING MANHOLES

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
208–3
SHEET 1 OF 2

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NOTES:

1. INVERT ELEVATION OF "D" x 1' (300 mm) STUB AT THE INSIDE FACE OF MANHOLE TO BE 0.10' (30 mm) HIGHER THAN EXISTING OUTLET INVERT ELEVATION.

2. THE CORE CUT HOLE SHALL BE MADE WITH EQUIPMENT SPECIALLY DESIGNED TO CUT A SMOOTH HOLE WITHOUT SPALLING OR DAMAGE TO THE REINFORCING STEEL OR STRUCTURE.

3. "D" SHALL BE 8" (200 mm) MINIMUM.

4. CEMENT MORTAR SHALL BE CLASS "D" CONFORMING TO SSPWC 201-5.

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HOUSE LATERAL NOTES

1. WYE SHALL BE LAID WITH 1/8" (3 mm) RISE PER 1' (300 mm) AND 6" (150 mm) SPUR AT 45° FROM HORIZONTAL UNLESS OTHERWISE SHOWN ON THE PLANS.

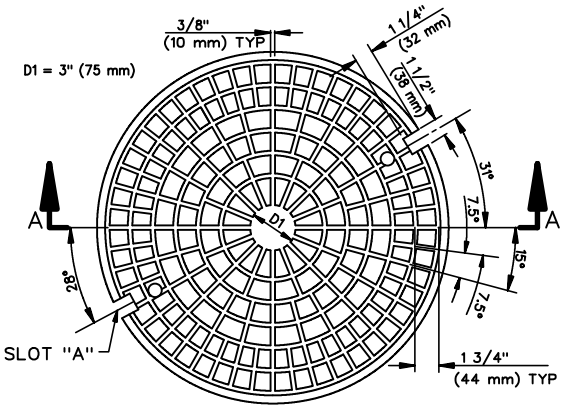
2. "D" X 4" (100 mm) WYE OR TEE AND 4" (100 mm) HOUSE LATERAL MAY BE SUBSTITUTED FOR "D" x 6" (150 mm) WYE OR TEE AND 6" (150 mm) HOUSE LATERAL.

3. USE TYPE "D" OR "G" JOINTS CONFORMING TO SSPWC 208-2.

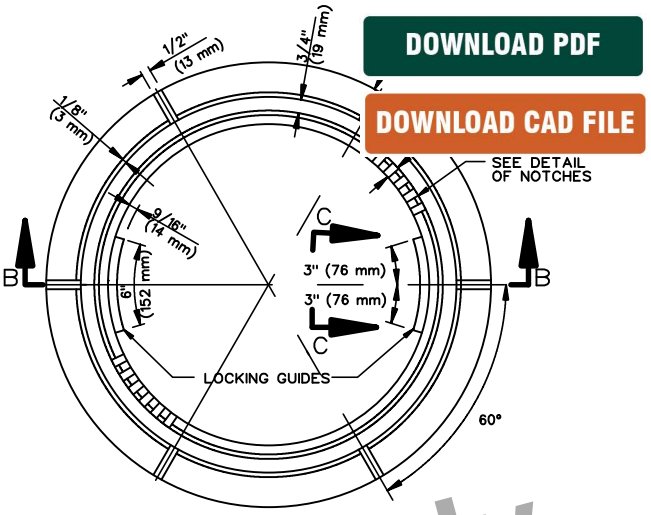
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
BREAKING INTO EXISTING MANHOLES	**208-3**
	SHEET 2 OF 2

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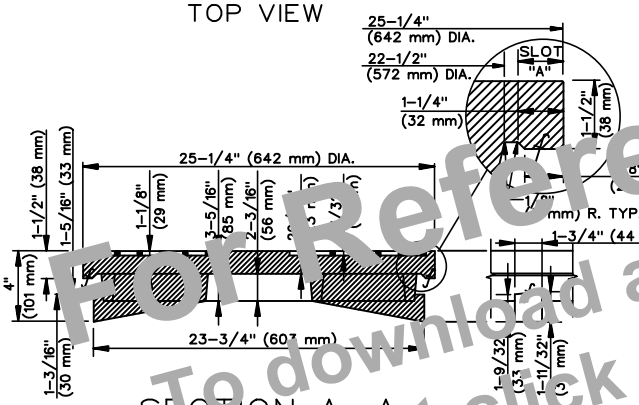
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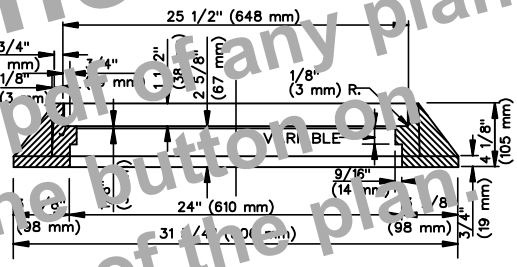
PLAN OF COVER
TOP VIEW



PLAN OF FRAME



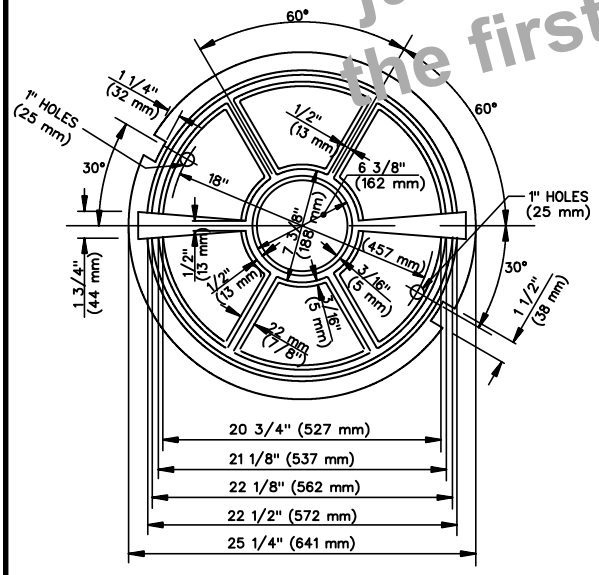
SECTION A–A



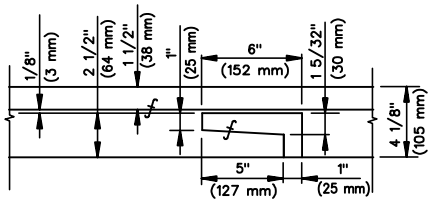
SECTION B–B

COVER LUG
END VIEW

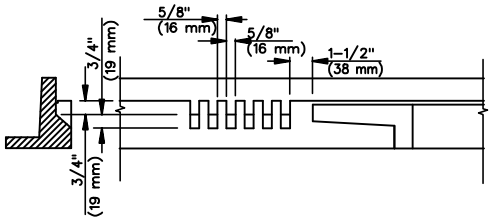
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PLAN OF COVER
BOTTOM VIEW



LOCKING GUIDE
SECTION C–C



DETAIL OF NOTCHES

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1993, 1996, 2009, 2021

24" (610 mm) MANHOLE FRAME AND COVER LOCKING TYPE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 210–4

SHEET 1 OF 2

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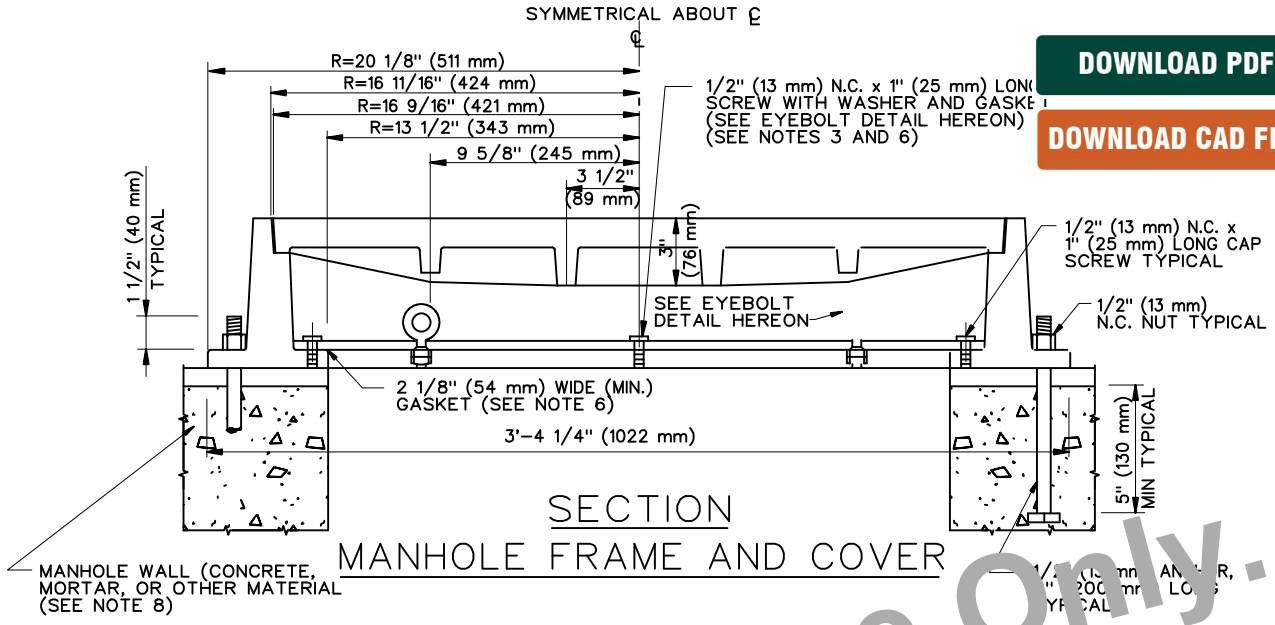
1. THE CAST IRON USED SHALL CONFORM TO ASTM A48 (A48M) CLASS 35B.
2. THE FRAME AND COVER SHALL BE COATED WITH ASPHALTUM OR BITUMINOUS PAINT AFTER TESTING AND INSPECTION.
3. COVERS SHALL BE CAST WITH THE LETTER "D" FOR STORM DRAINS AND "S" FOR SEWERS AND THE AGENCY IDENTIFICATION IN ACCORDANCE WITH INSTRUCTIONS FURNISHED BY THE AGENCY. THE LETTER "D" OR "S" SHALL BE APPROXIMATELY 2–1/2" (65 mm) HIGH WITH 1/2" (13 mm) 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 160 POUNDS (73 kg). WEIGHT OF COVER SHALL BE 200 POUNDS (91 kg). 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. 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 1" (25 mm) AT 90 DEGREES TO PICK HOLE AND INSTALL 3/4" x 3/4" (19 x 19 mm) STAINLESS STEEL SOCKET SET SCREWS WITH 3/8" (10 mm) RECESSED HEX HEAD. ALL THREADS SHALL BE NC.

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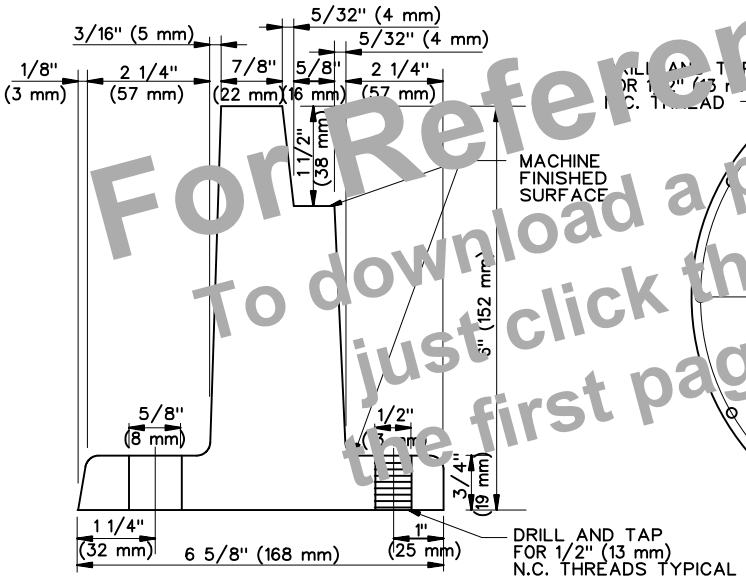
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
24" (610 mm) MANHOLE FRAME AND COVER LOCKING TYPE	210–4
	SHEET 2 OF 2

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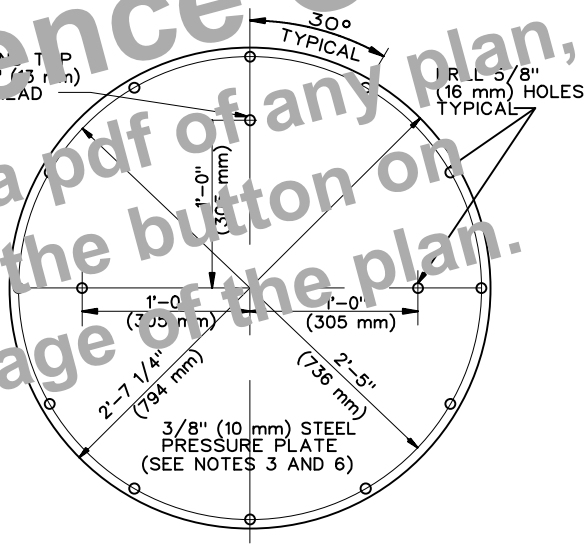
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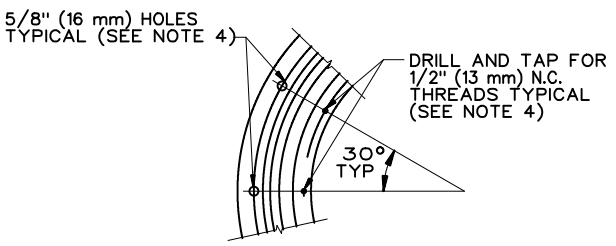
SECTION
MANHOLE FRAME AND COVER



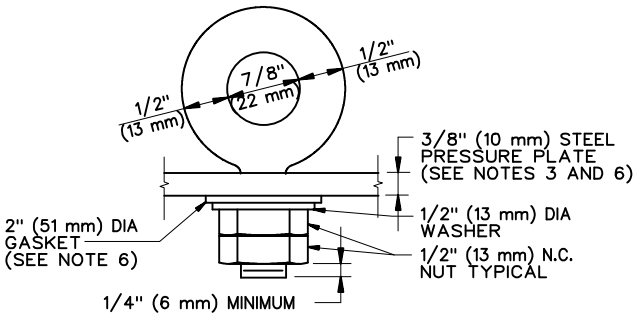
DETAIL OF FRAME



PRESSURE PLATE



DETAIL OF BOLT HOLE SPACING IN FRAME



EYEBOLT DETAIL
(2 REQUIRED)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1996, 2009, 2021

MANHOLE FRAME AND COVER – PRESSURE TYPE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 211–3

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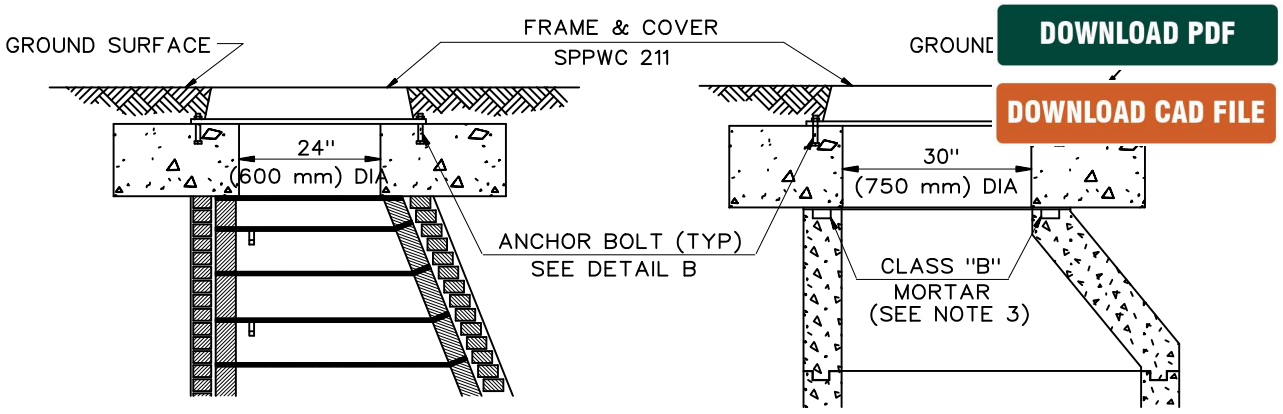
1. EXCEPT AS OTHERWISE INDICATED, THE MANHOLE FRAME AND COVER SHALL CONFORM TO SPPWC 632, 30" (762 mm) MANHOLE FRAME AND COVER.
2. THE PRESSURE PLATE SHALL BE STEEL CONFORMING TO ASTM A36 (A36M), AND SHALL BE GALVANIZED AFTER FABRICATION, BUT BEFORE INSTALLATION OF SCREWS AND BOLTS.
3. CAP SCREWS AND EYEBOLTS, INCLUDING WASHERS AND NUTS ATTACHED THERETO, SHALL BE FABRICATED FROM ANY SERIES 300 STAINLESS STEEL.
4. ALL HOLES IN CAST IRON SHALL BE DRILLED AFTER CASTING, OR PLUGGED PRIOR TO CASTING. THEY SHALL NOT BE PUNCHED.
5. IRON CASTINGS SHALL RECEIVE AN ASPHALTIC COATING AFTER FABRICATION.
6. GASKET MATERIAL SHALL BE 1/16" (2 mm) THICK NEOPRENE RUBBER. PRESSURE PLATE GASKET SHALL BE 29 7 1/4" (794 mm) O.D.
7. ALL NUTS AND BOLTS SHALL BE TIGHTENED TO A MINIMUM TORQUE OF 25 FOOT-POUND (34 Nm).
8. FRAME SHALL BE SET ON 1/2" (12.5 mm) THICK MINIMUM WET MORTAR BASE, CLASS "B" MORTAR.
9. MANHOLE FRAME AND COVER AND PRESSURE PLATE ASSEMBLIES SHALL BE FIT-TESTED PRIOR TO SHIPMENT TO THE WORK SITE AND MARKED "N" SETS.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MANHOLE FRAME AND COVER – PRESSURE TYPE	211–3
	SHEET 2 OF 2

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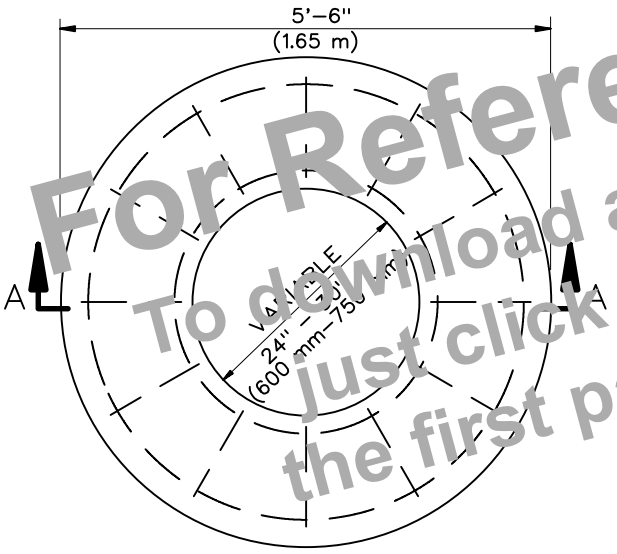
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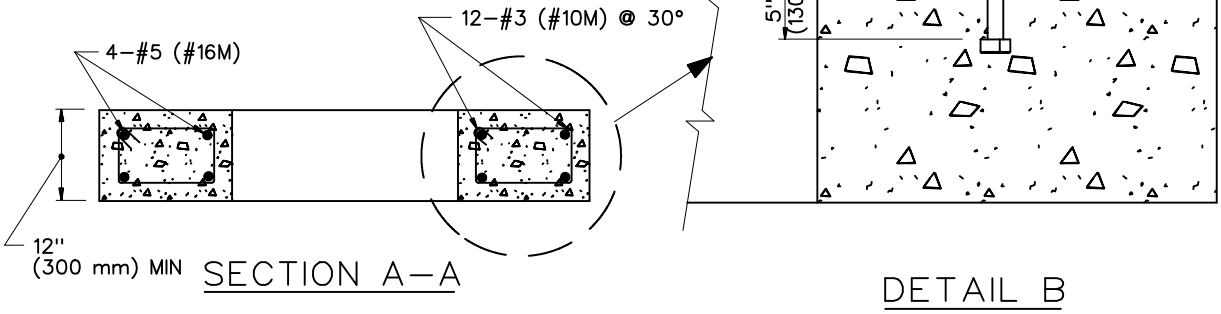
BRICK MANHOLE SHAFT

PRECAST CONCRETE CONE

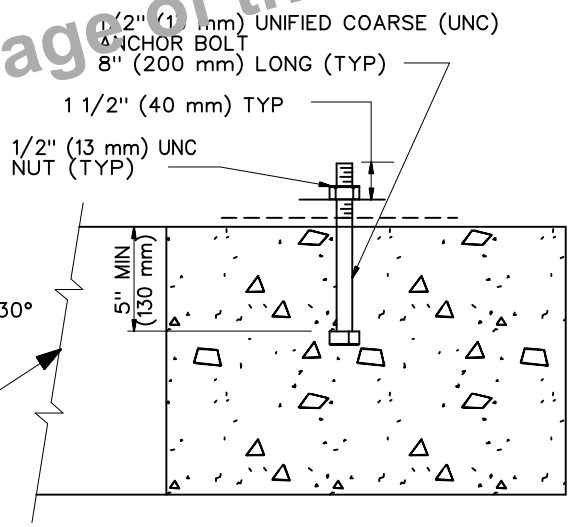
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PLAN



SECTION A–A



DETAIL B

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1996, 2009, 2021

ANCHOR SYSTEM FOR PRESSURE COVER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
212–3
SHEET 1 OF 2

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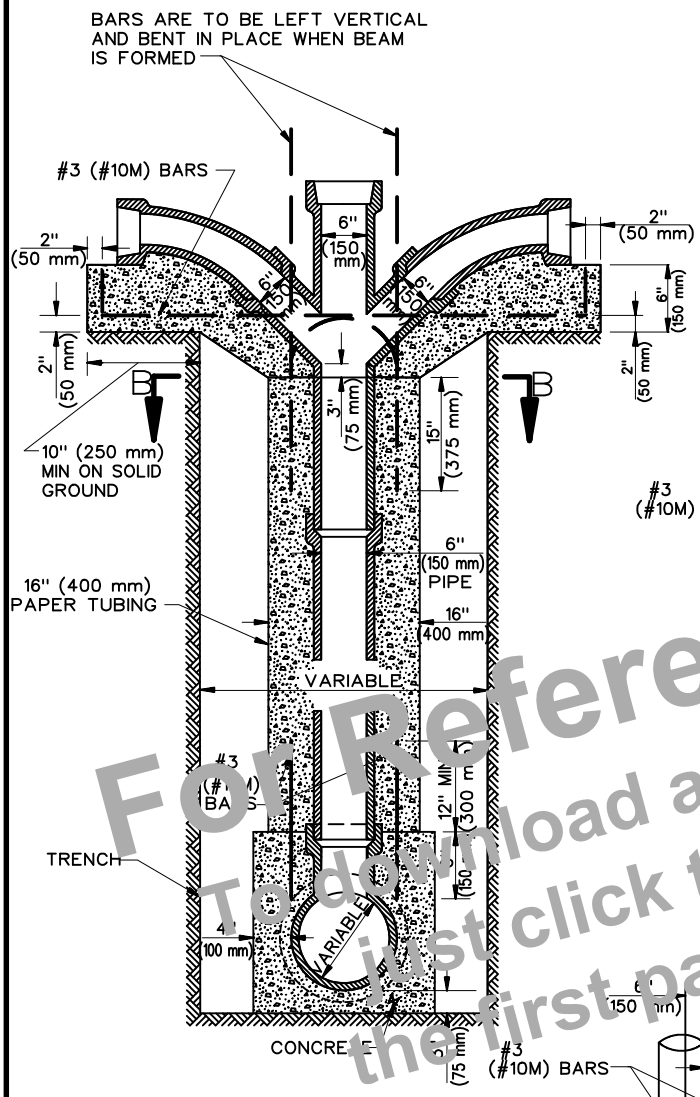
1. ANCHOR SYSTEM DESIGNED FOR LESS THAN 10' (3 m) OF HEAD.
2. MINIMUM EMBEDMENT OF 1/2" (13 mm) DIA ANCHOR BOLT WITH HEAD SHALL BE 5" (130 mm).
3. SET CONCRETE ANCHOR ON WET, CLASS "B" MORTAR ON TOP OF BRICK MANHOLE SHAFT OR PRECAST CONCRETE CONE.
4. UNLESS OTHERWISE NOTED, 1/2" (13 mm) DIA ANCHOR BOLTS AND NUTS ARE REQUIRED AND SHALL BE FABRICATED FROM ANY SERIES 300 STAINLESS STEEL.
5. NUTS ON ANCHOR BOLTS SHALL BE TIGHTENED TO A MINIMUM TORQUE OF 25 FOOT–POUNDS (34 Nm).

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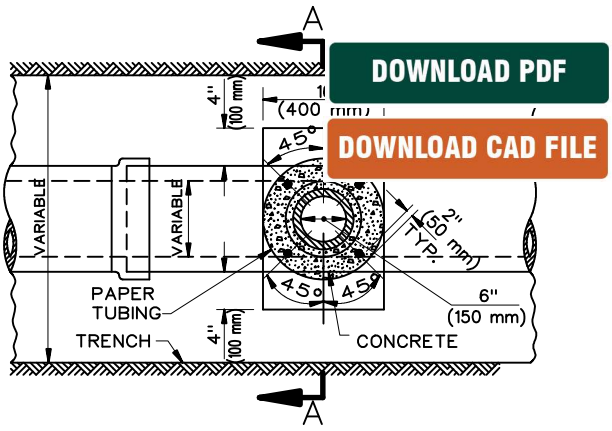
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
ANCHOR SYSTEM FOR PRESSURE COVER	**212–3**
	SHEET 2 OF 2

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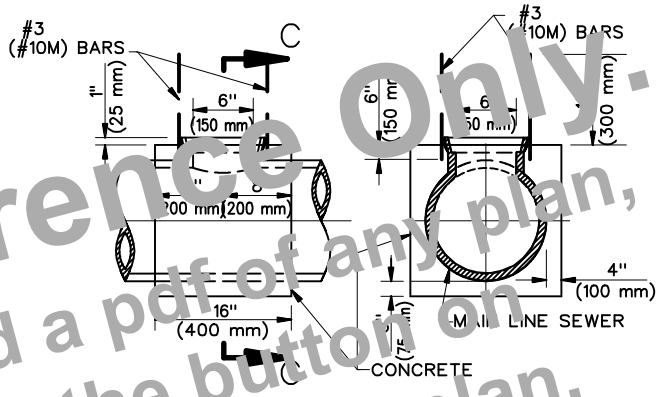
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SECTION A–A



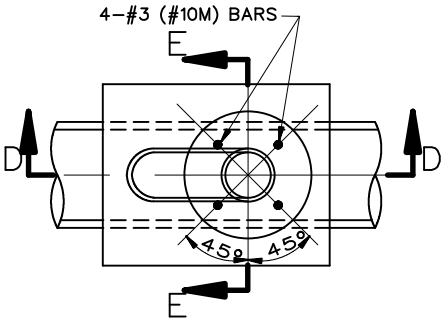
SECTION B–B



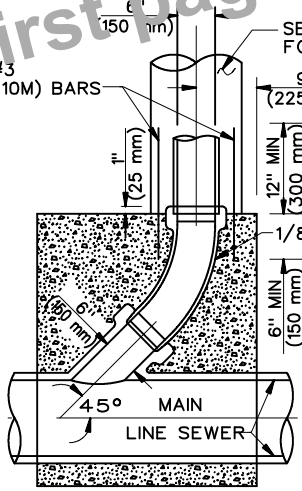
ELEVATION SECTION C–C

CHIMNEY BASE

CASE I



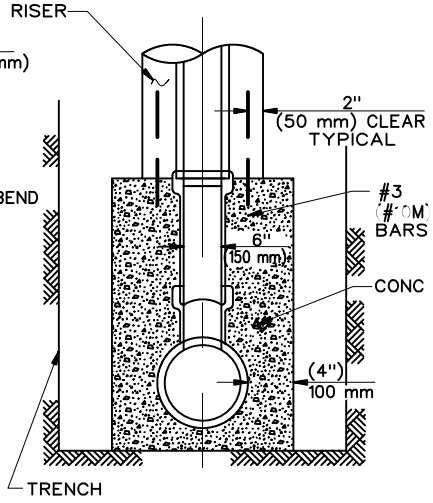
SECTION B–B



SECTION D–D

CHIMNEY BASE

CASE II



SECTION E–E

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1993, 1996, 2009, 2021

CHIMNEYS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 220–4

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NOTES

1. THE UPPER END OF THE CHIMNEY PIPE SHALL BE AT LEAST 8' (2.4 m) BELOW THE GRADE OF THE LOWER CURB.

2. NO CONNECTION SHALL BE MADE DIRECTLY TO TOP OF CHIMNEY PIPE.

3. WHERE ONE HOUSE LATERAL IS TO BE JOINED TO THE CHIMNEY PIPE, USE A SINGLE WYE AND FACE WYE TOWARDS PROPERTY TO BE SERVED.

4. WHERE TWO OR MORE HOUSE LATERALS ARE TO BE JOINED TO THE CHIMNEY PIPE, INSTALL WYE BRANCHES AS FOLLOWS:
   A. FOR TWO HOUSE LATERALS, ONE SERVING EACH SIDE OF STREET, USE A DOUBLE WYE BRANCH.
   B. FOR TWO HOUSE LATERALS SERVING THE SAME SIDE OF THE STREET, USE TWO SINGLE WYE'S STACKED WITH BRANCHES FACING THE PROPERTIES SERVED.
   C. FOR THREE OR FOUR HOUSE LATERALS, USE TWO DOUBLE WYE BRANCHES OR ONE DOUBLE AND ONE SINGLE WYE BRANCH STACKED.

5. EACH DOUBLE OR SINGLE WYE BRANCH AND EIGHTH BEND SHALL BE SUPPORTED BY A CONCRETE BEAM AS SHOWN.

6. FOR CHIMNEY BASE, 6" (150 mm) TEE BRANCH OR WYE SHALL BE INSTALLED VERTICALLY ON TOP OF THE MAIN LINE SEWER AS SHOWN. THE CHIMNEY BASE MUST BE POURED AND SET WITH DOWELS AS SHOWN 24 HOURS BEFORE THE CHIMNEY CONCRETE IS POURED.

7. ALL CONCRETE SHOWN SHALL BE CLASS 520-C-2500 (310-C-17).

8. CASE I SHALL BE FOR VITRIFIED CLAY PIPE ONLY.

9. CASE II SHALL BE FOR ALL ALLOWABLE PIPE MATERIALS.

10. FOR ABS PIPE USE SOLVENT WELDED JOINTS ONLY.

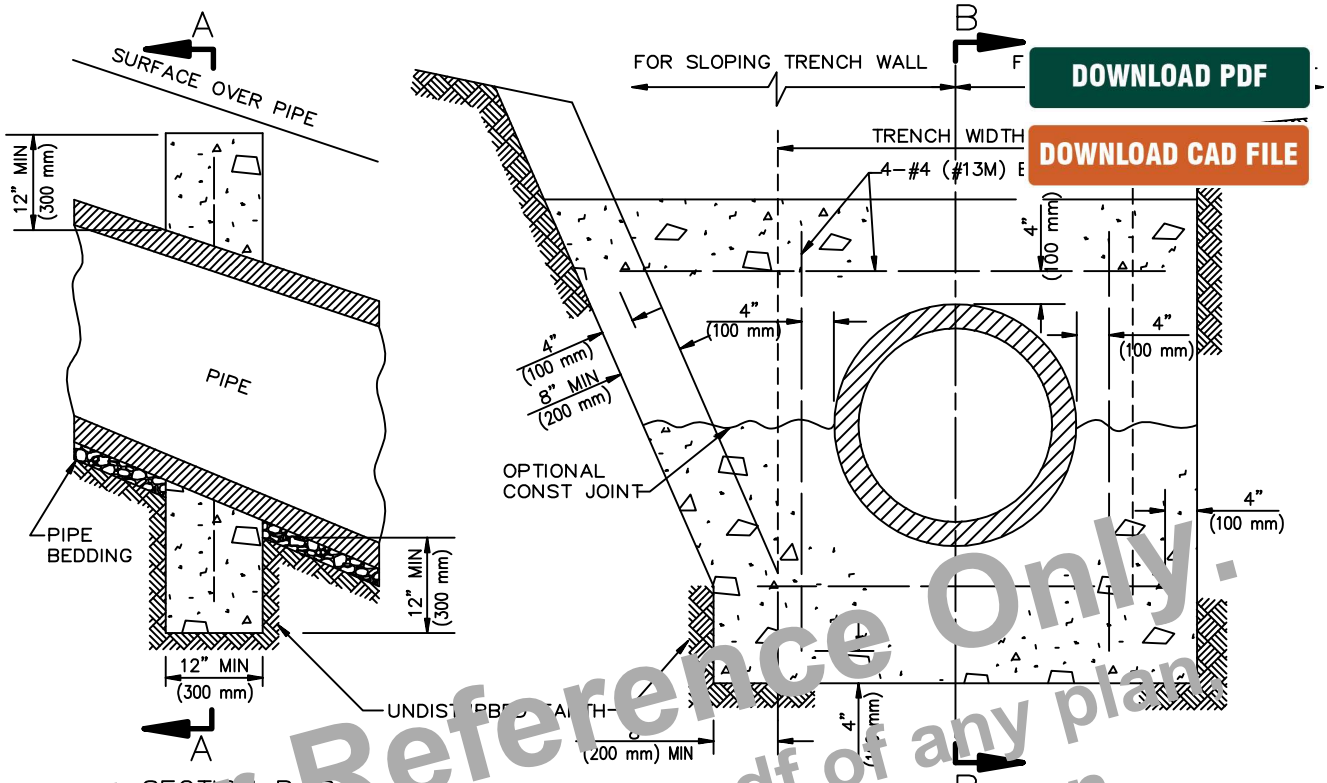
11. A CAP SHALL BE INSTALLED AT THE OPENING OF THE PIPE RISER AND AT EACH UNCONNECTED BRANCH, SEALED AROUND ITS CIRCUMFERENCE WITH 1" (25 mm) THICK TYPE "F" MORTAR.

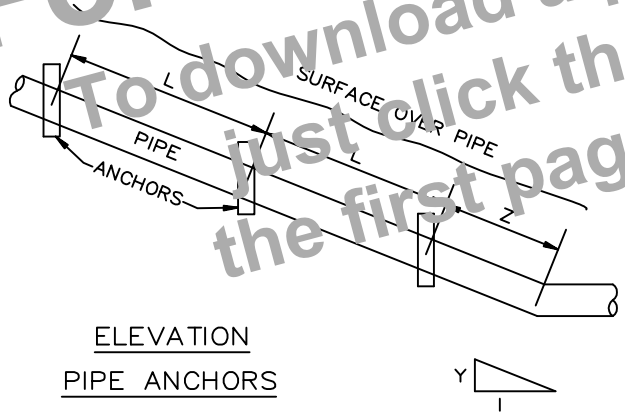
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CHIMNEYS	**220-4**
	SHEET 2 OF 2

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ELEVATION
PIPE ANCHORS

TABLE A

PIPE SLOPE(%) Y:1(100)	L DISTANCE (MAX)	Z DISTANCE (MAX)
100	12' (3.65 m)	4' (1.20 m)
67	14' (4.25 m)	8' (2.40 m)
50	16' (4.90 m)	12' (3.65 m)
40	18' (5.50 m)	18' (5.50 m)
33	20' (6.00 m)	20' (6.00 m)

ANCHORS

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NOTES:

1. ANCHORS SHALL BE CLASS 450-C-2000 (265-C-14) CONCRETE.
2. FOR CLAY PIPE, ANCHORS SHALL NOT BE PLACED WITHIN 6" (150 mm) OF THE PIPE JOINT.
3. TRENCH SHALL BE BACKFILL PER NOTE 4 ON SHEET 2.
4. SPACING OF ANCHORS FOR PIPE SLOPES BETWEEN VALUES SHOWN IN TABLE "A" MAY BE PROPORTIONED.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

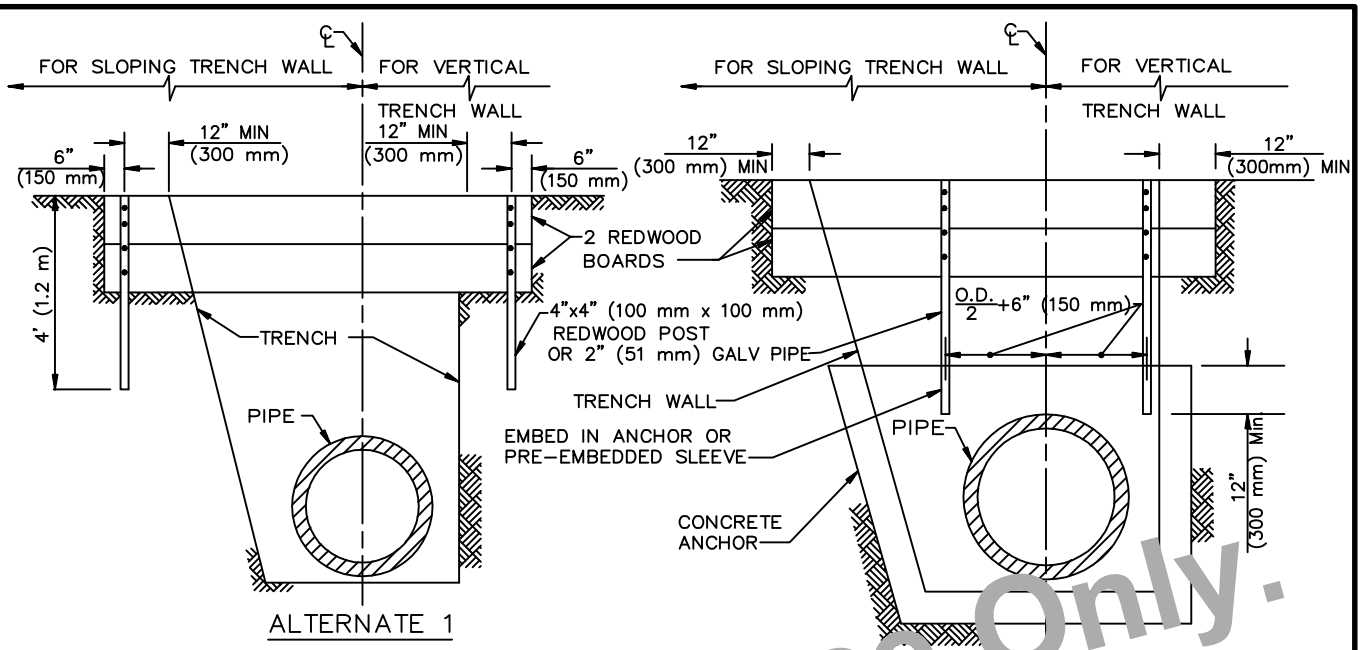
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PIPE ANCHORS AND BACKFILL STABILIZERS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

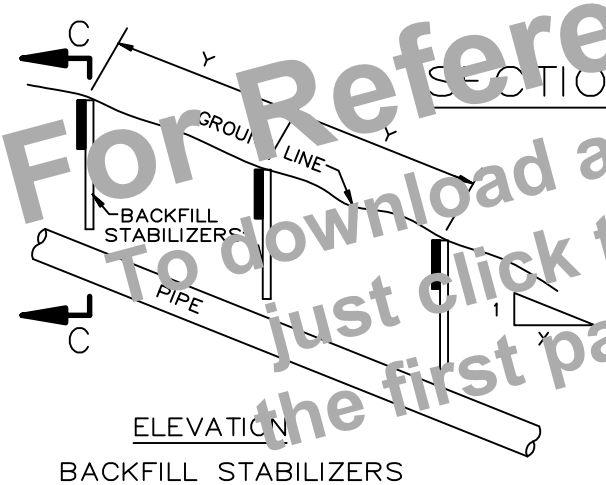
STANDARD PLAN 221-2

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ALTERNATE 1

ALTERNATE 2



SECTION C–C

ELEVATION
BACKFILL STABILIZERS

TABLE B

GROUND SLOPE	TABLE B Y (MAX)
1:1	5' (1.5 m)
1 1/2:1	9' (2.75 m)
2:1	12' (3.65 m)
2 1/2:1	16' (4.9 m)
3:1	20' (6.0 m)

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STABILIZERS

NOTES:

1. REDWOOD BOARDS SHALL BE 2" x 12" (50 x 300 mm) WHERE DEPTH OF COVER OVER PIPE PERMITS, OTHERWISE USE 2" x 10" (50 x 250 mm).
2. REDWOOD BOARDS SHALL BE PLACED ON THE HIGH GROUND SIDE OF THE POSTS.
3. EACH REDWOOD BOARD SHALL BE FASTENED BY USING 2–16d NAILS TO EACH REDWOOD POST OR A 3/8" (10 mm) BOLT AND NUT WITH WASHERS TO EACH GALVANIZED PIPE. ALL HARDWARE SHALL BE GALVANIZED.
4. TRENCH BACKFILL SHALL BE CONSOLIDATED BY MECHANICAL COMPACTION. IN LIEU OF MECHANICALLY COMPACTION, SOIL CEMENT MAY BE USED; HOWEVER, THE TOP 12" (300 mm) OF BACKFILL SHALL BE NATIVE SOIL, MECHANICALLY COMPACTED.
5. SPACING OF STABILIZERS FOR GROUND SLOPES BETWEEN VALUES SHOWN IN TABLE "B" MAY BE PROPORTIONED.
6. THE CONTRACTOR MAY, AT ITS OPTION, SUBSTITUTE DOUGLAS FIR FOR THE REDWOOD PROVIDED IT HAS BEEN TREATED WITH PRESERVATIVES.

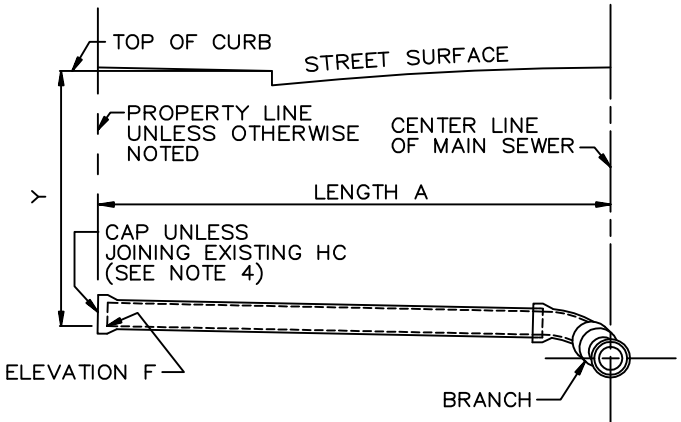
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PIPE ANCHORS AND BACKFILL STABILIZERS

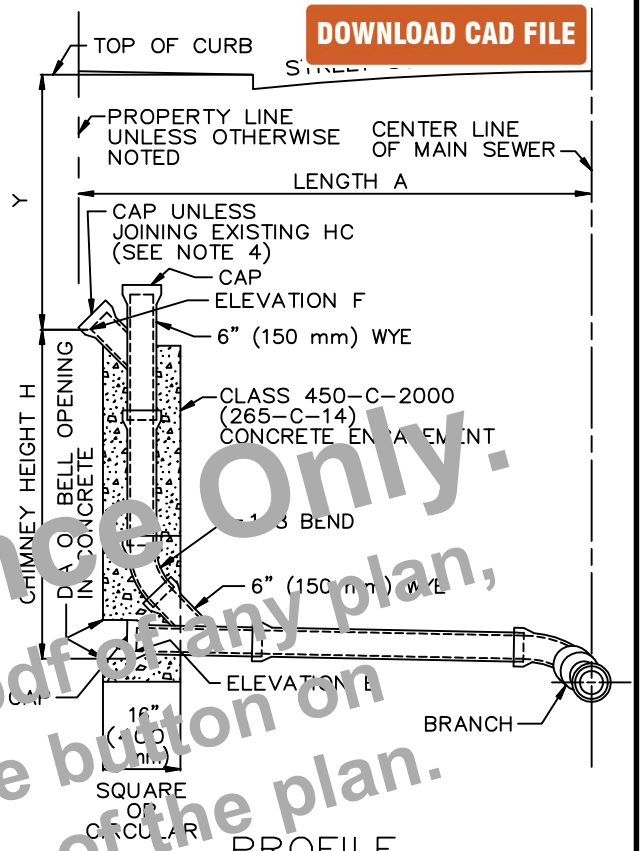
STANDARD PLAN
221–2
SHEET 2 OF 2

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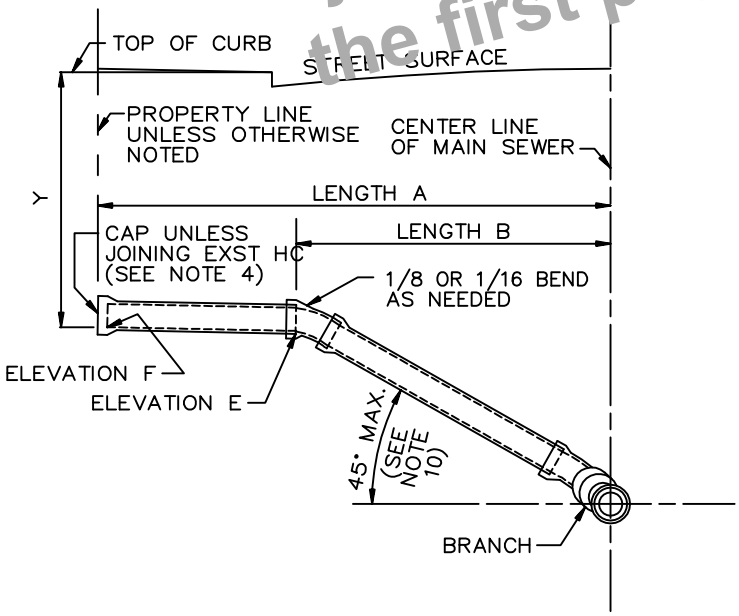
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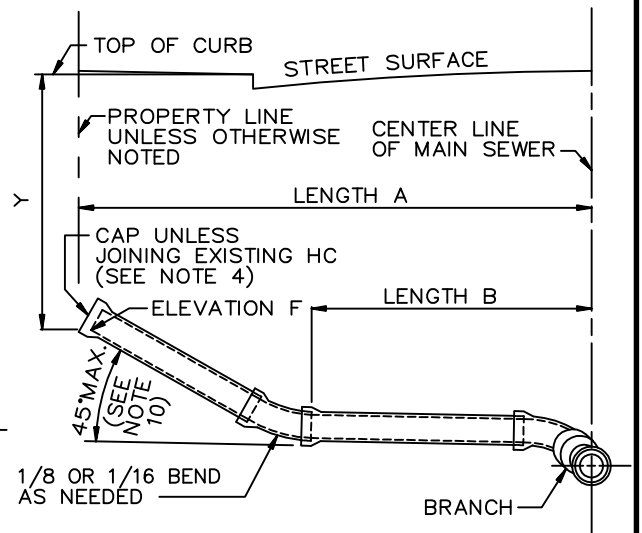
PROFILE
TYPE A



PROFILE
TYPE B



PROFILE
TYPE C



PROFILE
TYPE D

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

HOUSE CONNECTION SEWER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
222-2
SHEET 1 OF 2

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NOTES

1. EXCEPT AS OTHERWISE INDICATED ON THE PLANS, ALL HOUSE CONNECTION SEWERS SHALL BE TYPE "A" AND SHALL BE CONSTRUCTED ON STRAIGHT LINES AND GRADES BETWEEN CONTROL POINTS AND ELEVATIONS.

2. DIMENSIONS:
   A. Y = 6' (1.85 m)
   B. LENGTHS "A" AND "B" – SEE PLANS
   C. HEIGHT "H" – SEE PLANS
   D. ELEVATIONS "E" AND "F" – SEE PLANS

3. ALL HOUSE CONNECTION SEWER PIPE SHALL BE 150 mm (6") UNLESS OTHERWISE INDICATED AND MAY BE ANY OF THE FOLLOWING:

   A. VC PIPE
   B. PE PIPE
   C. ABS SOLID WALL PIPE
   D. ABS COMPOSITE PIPE
   E. PVC PLASTIC PIPE

   PROVIDED THAT CHANGES FROM ONE TYPE OF MATERIAL OR SIZE TO ANOTHER SHALL BE MADE ONLY BY MEANS OF SUITABLE ADAPTERS APPROVED BY THE ENGINEER.

4. THE UPPER END OF THE HOUSE CONNECTION SHALL BE SEALED BY INSTALLING A CAP AND SEALING THE CAP WITH 1" (25 mm) THICK TYPE "F" MORTAR AROUND THE CIRCUMFERENCE OF THE CAP.

5. EXCEPT AS CONTROLLED BY ELEVATIONS INDICATED ON THE PROJECT PLANS, THE MINIMUM SLOPE FOR ALL PIPE SHALL BE 2% (S=0.02 MINIMUM).

6. THE FIGURE IN A CIRCLE ON THE PLANS ADJACENT TO A HOUSE CONNECTION SEWER STATION INDICATES THE DEPTH IN FEET (METERS) BELOW THE EXISTING TOP OF CURB TO WHICH THE INVERT OF THE UPPER END OF THE HOUSE CONNECTION SEWER SHALL BE CONSTRUCTED. IF NO DEPTH IS INDICATED, THE INVERT OF THE UPPER END SHALL BE THE ELEVATION SHOWN ON THE PROFILE. WHERE NEITHER DEPTH NOR ELEVATION IS INDICATED, THE INVERT SHALL BE 6' (1.85 m) BELOW THE TOP OF THE EXISTING CURB.

7. BRANCHES SHALL BE EITHER TEES OR WYES AND SHALL BE ROTATED UPWARD FROM THE HORIZONTAL TO AN ANGLE OF 22–1/2° TO 45° WHEN TEES ARE USED. BENDS ARE NOT REQUIRED BUT MAY BE USED AT THE OPTION OF THE CONTRACTOR. WHEN THE BRANCH ROTATION DOES NOT CONFORM TO THE SLOPE OF THE HOUSE CONNECTION SEWER, PULLED JOINTS MAY BE USED FOR ADJUSTMENT.

8. THE MAXIMUM DEFLECTION AT EACH JOINT FOR 4" (100 mm) AND 6' (150 mm) VITRIFIED CLAY PIPE HOUSE CONNECTION SEWERS SHALL BE 4°, WHICH IS EQUAL TO A PULL OF 9/16" (14 mm) FOR A 6" (150 mm) PIPE AND 3/8" (10 mm) FOR A 4" (100 mm) PIPE. (PULL IS DEFINED AS THE SEPARATION OF THE ABUTTING PIPE ENDS ON THE CONVEX SIDE OF THE CURVE MEASURED AT THE OUTSIDE PIPE BARREL.)

9. CONNECTION OF A BUILDING SEWER SMALLER THAN 6" (150 mm) TO A 6" (150 mm) HOUSE CONNECTION SEWER SHALL BE MADE USING AN APPROVED INCREASER TEE OR AN INCREASER FOLLOWED BY A TEE.

10. ALL HOUSE CONNECTION SEWERS OR PORTIONS THEREOF CONSTRUCTED ON A SLOPE EXCEEDING 45° SHALL BE ANCHORED PER SPPWC 221.

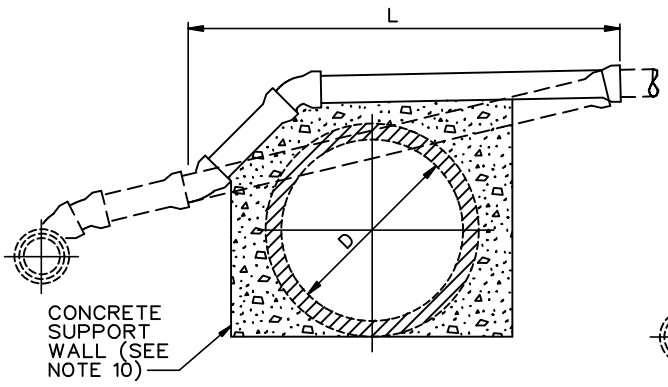
11. HOUSE CONNECTION SEWERS CONSTRUCTED PURSUANT TO A HOUSE CONNECTION PERMIT SHALL CONFORM TO ALL APPLICABLE STATUTES AND ORDINANCES.

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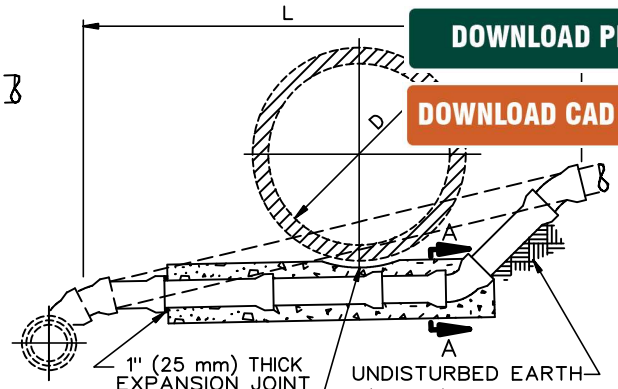
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 222–2 SHEET 2 OF 2
HOUSE CONNECTION SEWER	

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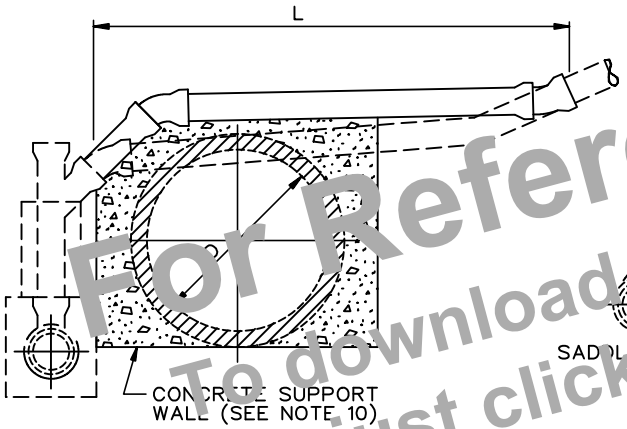
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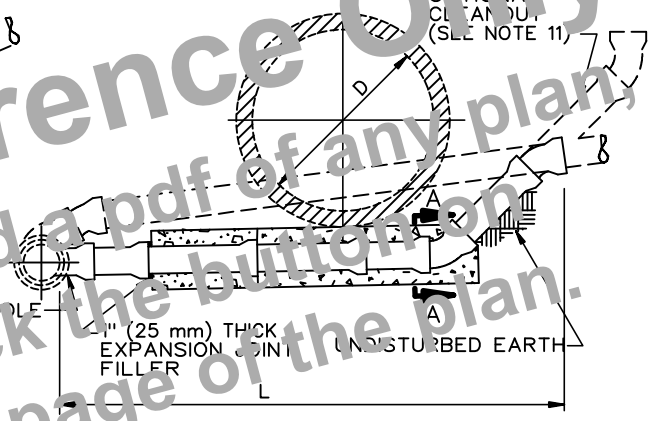
CASE A



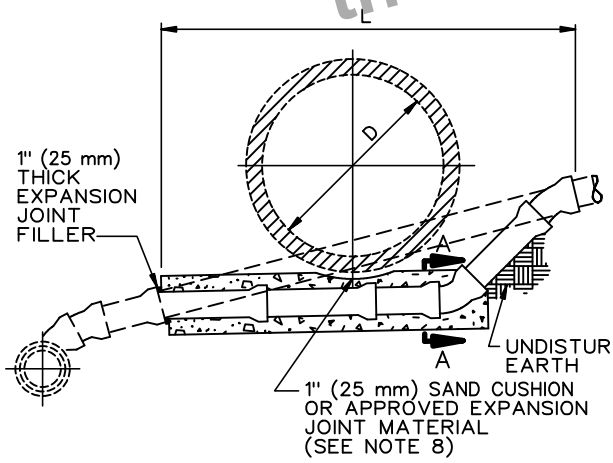
CASE D



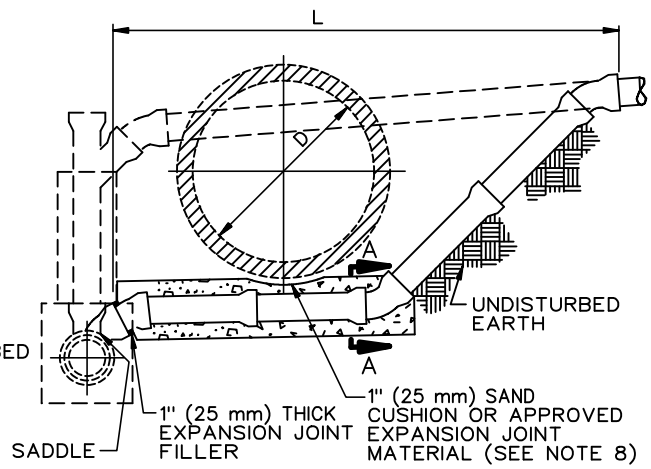
CASE B



CASE E



CASE C



CASE F

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

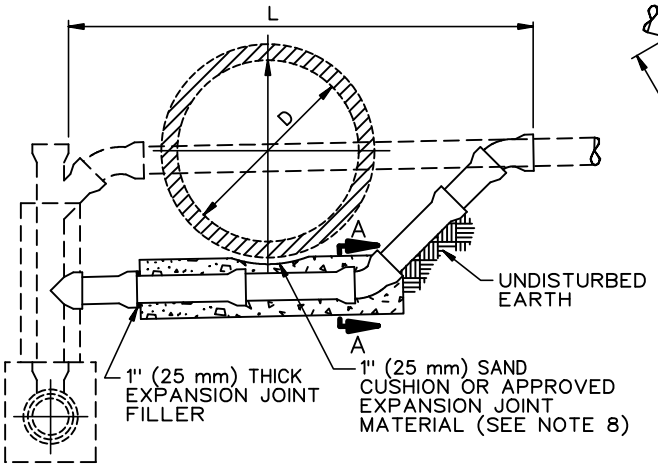
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HOUSE CONNECTION REMODELING

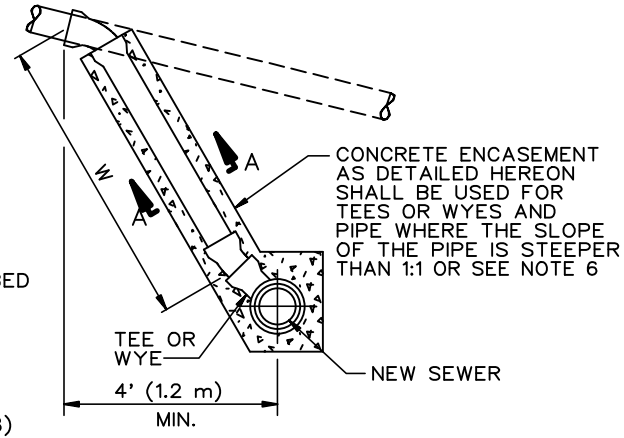
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
223-3
SHEET 1 OF 3

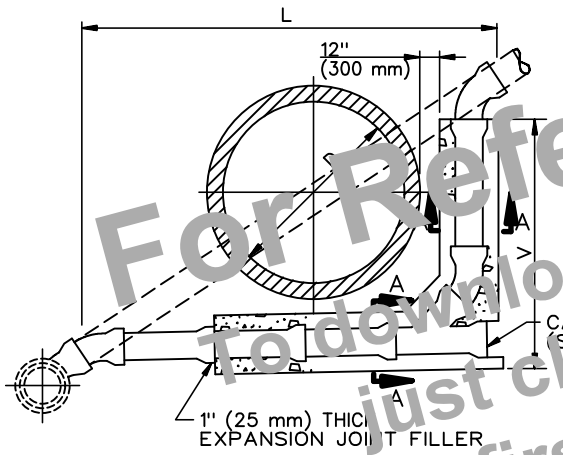
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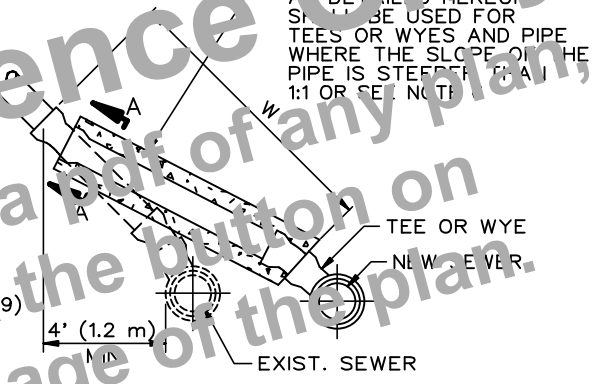
CASE G



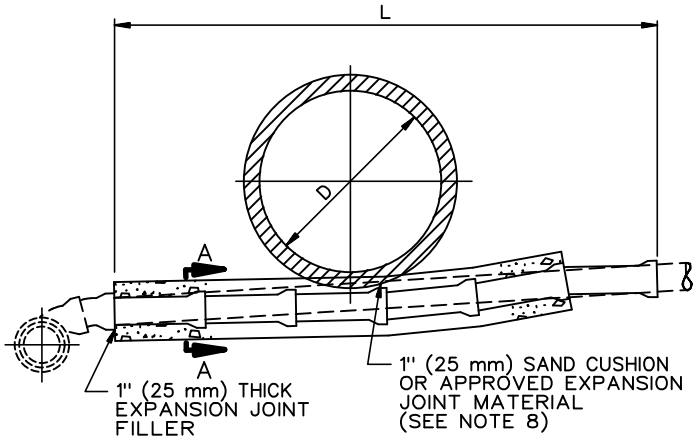
CASE R



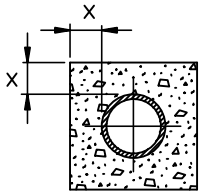
CASE H



CASE S



CASE K



NOMINAL DIAMETER OF PIPE INCHES (mm)	MINIMUM DIMENSIONS X INCHES (mm)
6 (150)	3 (75)
8 (200)	4 (100)
10 (250)	5 (125)
12 (300)	6 (150)

SECTION A–A
CONCRETE ENCASEMENT DETAIL
(SEE NOTE 5)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

HOUSE CONNECTION REMODELING

STANDARD PLAN
223–3
SHEET 2 OF 3

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NOTES

1. EXCEPT AS OTHERWISE INDICATED HEREON OR ON THE PLANS, HOUSE CONNECTION REMODELING SHALL CONFORM TO THE APPLICABLE PORTIONS OF SPPWC 222.

2. VALUES D, L, V, AND W SHALL BE AS SHOWN ON THE PLANS. (DIMENSION L IS THE HORIZONTAL LENGTH OF THE HOUSE CONNECTION REMODELING).

3. EXISTING SEWERS ARE INDICATED BY DASHED LINES. HOUSE CONNECTION SEWERS TO BE CONSTRUCTED ARE INDICATED BY SOLID LINES AND SHALL BE OF THE SAME MATERIAL AS THE EXISTING SEWER. THE CONTRACTOR MAY CONSTRUCT THE SEWER WITH OTHER MATERIALS ALLOWED BY SPPWC 222 PROVIDED APPROVED ADAPTORS ARE UTILIZED.

4. 1/16 (22.5°) OR 1/8 (45°) BENDS SHALL BE USED TO REMODEL OR CONSTRUCT ANY SEWER ON A CURVE OR AT ANY CHANGE IN ALIGNMENT. WHERE PHYSICAL OR GEO-METRIC LIMITATIONS PRECLUDE THE USE OF 1/16 (22.5°) OR 1/8 (45°) BENDS, THE CONTRACTOR SHALL SUBMIT THE PROPOSED METHOD OF REMODELING OR CONSTRUCTION TO THE ENGINEER FOR APPROVAL.

5. HOUSE CONNECTION SEWERS TO BE CONSTRUCTED UNDER A PROPOSED CONDUIT SHALL BE ENCASED IN CONCRETE AS SHOWN HEREON. WHEN THE HOUSE CONNECTION SEWER SLOPE EXCEEDS 1:1 THE CONTRACTOR MAY, AT ITS OPTION, PLACE A CIRCULAR CROSS SECTION WITH MINIMUM COVER EQUAL TO DIMENSION 'X' AS SHOWN ON SECTION A-A HEREON IN LIEU OF A SQUARE CROSS SECTION OF CONCRETE. CONCRETE BEDDING AND ENCASEMENT SHALL BE CLASS 450-C-2000 (250-C-14) AND SHALL EXTEND TO THE FIELD PIPE JOINT AT LEAST 1' (300 mm) BEYOND THE OD OF EACH SIDE OF THE PROPOSED CONDUIT.

6. FOR CASE R AND S WHEN THE SLOPE OF THE PIPE EXCEEDS 1:1, THE CONTRACTOR MAY, AT ITS OPTION, CONSTRUCT A CHIMNEY CONFORMING TO SPPWC 220 ON THE NEW SEWER IN LIEU OF CONSTRUCTING THE ENCASEMENT SHOWN HEREON.

7. FOR CASES E AND F, SADDLES SHALL BE CONNECTED EITHER TO THE LENGTH OF PIPE CONTAINING THE EXISTING TEE OR WYE OR TO THE ADJACENT DOWNSTREAM PIPE LENGTH.

8. CONDUITS TO BE INSTALLED OVER OR WITHIN 1" (25 mm) OF ANY CONCRETE ENCASEMENT OR STRUCTURE, WHETHER EXISTING OR TO BE PLACED IN CONFORMITY WITH THE REQUIREMENTS HEREIN, SHALL BE INSTALLED ON A 1" (25 mm) SAND CUSHION OR APPROVED EXPANSION JOINT MATERIAL. CONCRETE ENCASEMENT INSTALLED PURSUANT TO THIS STANDARD PLAN SHALL BE SEPARATED FROM EXISTING CONDUIT WITH 1" (25 mm) THICK EXPANSION JOINT MATERIAL.

9. THOSE PORTIONS OF AN ABANDONED PIPE LOCATED BENEATH OR WITHIN 150 mm (6") OF A RELOCATED HOUSE CONNECTION SEWER SHALL BE REMOVED. THE EXCAVATION SHALL BE REFILLED TO THE GRADE OF THE NEW PIPE INVERT WITH CLASS 100-E-100 (60-E-0.7) CONCRETE. THE CONTRACTOR MAY, AT ITS OPTION, SUBSTITUTE MECHANICALLY COMPACTED BACKFILL IN LIEU OF THE CLASS 100-E-100 (60-E-0.7) CONCRETE. THOSE PORTIONS OF ABANDONED PIPE NOT REMOVED SHALL BE SEALED. WHERE CAPS ARE USED, THEY SHALL BE SEALED BY FILLING THE SPACE ABOVE THE CAP WITH SAND AND A 1" (25 mm) THICK COATING OF TYPE "F" MORTAR.

10. SUPPORT WALLS SHALL CONFORM TO SPPWC 224.

11. WHEN INDICATED ON THE PLANS OR THE SPECIAL PROVISIONS, A CLEANOUT SHALL BE CONSTRUCTED IN CONJUNCTION WITH CASE E AS FOLLOWS:

    A. SUBSTITUTE A "Y" FOR THE 45° BEND.
    B. PLACE A 45° BEND ON THE UPPER END OF THE "Y".
    C. CAP TOP OF 45° BEND WITH A CAP AND SEAL WITH 1" (25 mm) THICK TYPE "F" MORTAR AROUND THE CIRCUMFERENCE OF THE CAP.

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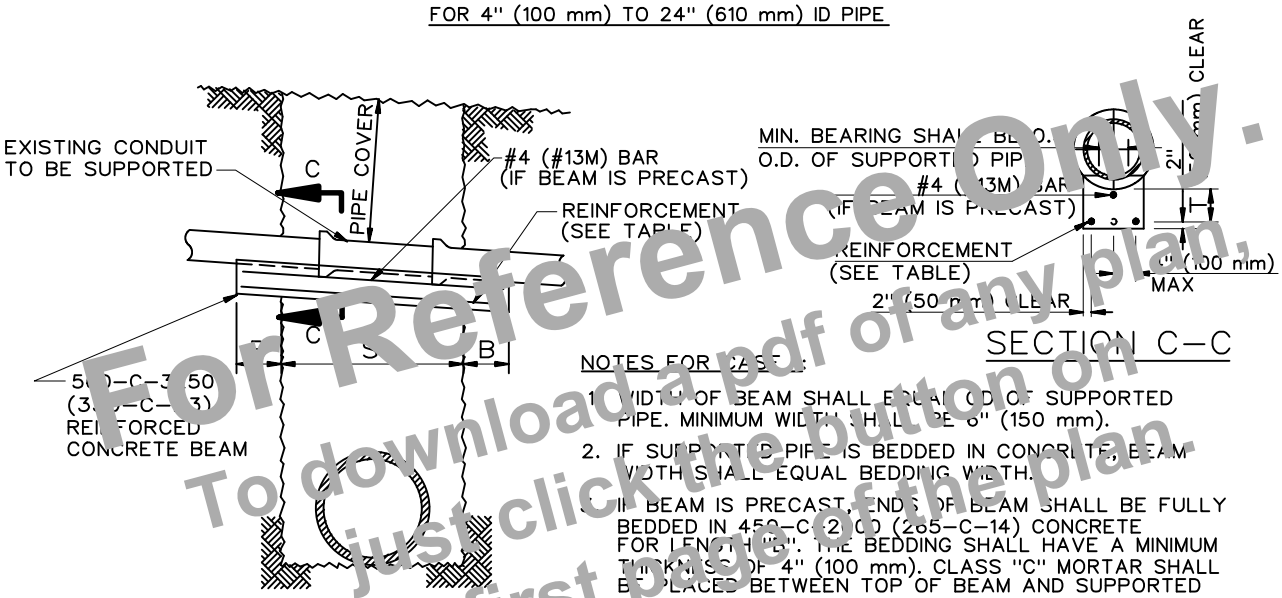
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
HOUSE CONNECTION REMODELING	**223-3**
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CASE 1
REINFORCED CONCRETE BEAM
FOR 4" (100 mm) TO 24" (610 mm) ID PIPE



SECTION C–C

NOTES FOR CASE 1:

1. WIDTH OF BEAM SHALL EQUAL O.D. OF SUPPORTED PIPE. MINIMUM WIDTH SHALL BE 6" (150 mm).
2. IF SUPPORTED PIPE IS BEDDED IN CONCRETE, BEAM WIDTH SHALL EQUAL BEDDING WIDTH.
3. IF BEAM IS PRECAST, ENDS OF BEAM SHALL BE FULLY BEDDED IN 450–C–2400 (265–C–14) CONCRETE FOR LENGTH "B". THE BEDDING SHALL HAVE A MINIMUM THICKNESS OF 4" (100 mm). CLASS "C" MORTAR SHALL BE PLACED BETWEEN TOP OF BEAM AND SUPPORTED PIPE TO PROVIDE MINIMUM BEARING SHOWN.
4. MAXIMUM SPACING OF BARS SHALL BE 4" (100 mm) OC.

SEE REINFORCED CONCRETE BEAM TABLE (DIMENSIONS AND REINFORCEMENT) ON SHEET 2, THIS PLAN.

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SUPPORTS FOR CONDUITS ACROSS TRENCHES

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
224–3
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REINFORCED CONCRETE BEAM (DIMENSIONS AND REINFORCEMENT)

S

PIPE DIAMETER	0' TO 8'-0" (0 m TO 2.4 m)			8'-0" TO 12'-0" (2.4 m TO 3.7 m)			12'-0" TO 16'-0" (3.7 m TO 4.9 m)			16'-0" TO 20'-0" (4.9 m TO 6.0 m)			20'-0" TO 25'-0" (6.0 m TO 7.6 m)		
	T	BARS	B	T	BARS	B	T	BARS	B	T	BARS	B	T	BARS	B
0" TO 4'-0" (0 TO 1.20 m)	8" (200 mm)	#4 (#13M)	1'-6" (0.50 m)	8" (200 mm)	#4 (#13M)	1'-6" (0.50 m)	9" (230 mm)	#4 (#13M)	1'-6" (0.50 m)	10" (255 mm)	#4 (#13M)	1'-6" (0.50 m)	10 1/2" (270 mm)	#4 (#13M)	1'-6" (0.50 m)
4'-0" TO 5'-0" (1.20 TO 1.50 m)	8" (200 mm)	#4 (#13M)	1'-6" (0.50 m)	9 1/2" (250 mm)	#4 (#13M)	1'-6" (0.50 m)	11" (280 mm)	#4 (#13M)	1'-6" (0.50 m)	12" (305 mm)	#4 (#13M)	1'-6" (0.50 m)	12 1/2" (320 mm)	#5 (#16M)	1'-6" (0.50 m)
5'-0" TO 6'-0" (1.50 TO 1.85 m)	9" (230 mm)	#4 (#13M)	1'-6" (0.50 m)	11" (280 mm)	#5 (#16M)	1'-6" (0.50 m)	12 1/2" (320 mm)	#5 (#16M)	1'-6" (0.50 m)	13 1/2" (340 mm)	#5 (#16M)	2'-0" (0.60 m)	14 1/2" (370 mm)	#5 (#16M)	2'-0" (0.60 m)
6'-0" TO 7'-0" (1.85 TO 2.15 m)	10" (255 mm)	#5 (#16M)	1'-6" (0.50 m)	12 1/2" (320 mm)	#5 (#16M)	2'-0" (0.60 m)	14 1/2" (370 mm)	#5 (#16M)	2'-0" (0.60 m)	15 1/2" (395 mm)	#5 (#16M)	2'-0" (0.60 m)	16 1/2" (420 mm)	#6 (#19M)	2'-0" (0.60 m)
7'-0" TO 8'-0" (2.15 TO 2.45 m)	11" (280 mm)	#5 (#16M)	1'-6" (0.50 m)	14" (355 mm)	#5 (#16M)	2'-0" (0.60 m)	16" (410 mm)	#5 (#16M)	2'-0" (0.60 m)	17 1/2" (445 mm)	#5 (#16M)	2'-6" (0.75 m)	19" (485 mm)	#6 (#19M)	2'-6" (0.75 m)
8'-0" TO 9'-0" (2.45 TO 2.75 m)	12 1/2" (320 mm)	#5 (#16M)	2'-0" (0.60 m)	15 1/2" (395 mm)	#6 (#19M)	2'-6" (0.75 m)	17 1/2" (445 mm)	#6 (#19M)	3'-0" (0.90 m)	19 1/2" (495 mm)	#6 (#19M)	2'-6" (0.75 m)	21" (535 mm)	#6 (#19M)	2'-6" (0.75 m)
9'-0" TO 10'-0" (2.75 TO 3.00 m)	13 1/2" (340 mm)	#6 (#19M)	2'-0" (0.60 m)	17" (430 mm)	#6 (#19M)	2'-6" (0.75 m)	19 1/2" (495 mm)	#6 (#19M)	3'-0" (0.90 m)	21 1/2" (545 mm)	#6 (#19M)	3'-0" (0.90 m)	23" (585 mm)	#6 (#19M)	3'-0" (0.90 m)
10'-0" TO 11'-0" (3.00 TO 3.35 m)	14 1/2" (370 mm)	#6 (#19M)	2'-6" (0.75 m)	18 1/2" (470 mm)	#6 (#19M)	3'-0" (0.90 m)	21" (535 mm)	#7 (#22M)	3'-0" (0.90 m)	23 1/2" (595 mm)	#7 (#22M)	3'-0" (0.90 m)	25" (635 mm)	#7 (#22M)	3'-0" (0.90 m)
11'-0" TO 12'-0" (3.35 TO 3.65 m)	15 1/2" (395 mm)	#6 (#19M)	2'-6" (0.75 m)	20" (510 mm)	#6 (#19M)	3'-0" (0.90 m)	23" (585 mm)	#7 (#22M)	3'-6" (1.10 m)	25 1/2" (650 mm)	#7 (#22M)	3'-6" (1.10 m)	27" (685 mm)	#7 (#22M)	3'-6" (1.10 m)
12'-0" TO 13'-0" (3.65 TO 4.00m)	17" (430 mm)	#6 (#19M)	3'-0" (0.90 m)	21 1/2" (545 mm)	#7 (#22M)	3'-6" (1.10 m)	25 1/2" (625 mm)	#7 (#22M)	3'-6" (1.10 m)	27 1/2" (700 mm)	#7 (#22M)	3'-6" (1.10 m)	29" (740 mm)	#7 (#22M)	4'-0" (1.20 m)
13'-1" TO 14'-0" (4.00 TO 4.25m)	18" (455 mm)	#7 (#22M)	3'-0" (0.90 m)	23" (585 mm)	#7 (#22M)	3'-6" (1.10 m)	29 1/2" (750 mm)	#7 (#22M)	4'-0" (1.20 m)	29 1/2" (750 mm)	#7 (#22M)	4'-0" (1.20 m)	31 1/2" (800 mm)	#7 (#22M)	4'-0" (1.20 m)
14'-0" TO 15'-0" (4.25 TO 4.60 m)	19" (485 mm)	#7 (#22M)	3'-0" (0.90 m)	25" (635 mm)	#7 (#22M)	4'-0" (1.20 m)	29" (710 mm)	#7 (#22M)	4'-0" (1.20 m)	31 1/2" (800 mm)	#7 (#22M)	4'-6" (1.40 m)			
15'-0" TO 16'-0" (4.60 TO 4.90 m)	20 1/2" (520 mm)	#7 (#22M)	3'-6" (1.10 m)	26 1/2" (675 mm)	#7 (#22M)	4'-0" (1.20 m)	30" (760 mm)	#8 (#25M)	4'-6" (1.40 m)						
16'-0" TO 17'-0" (4.90 TO 5.20 m)	21 1/2" (545 mm)	#7 (#22M)	3'-6" (1.10 m)	28" (710 mm)	#8 (#25M)	4'-6" (1.40 m)									
17'-0" TO 18'-0" (5.20 TO 5.50 m)	22 1/2" (570 mm)	#8 (#25M)	4'-6" (1.40 m)	29 1/2" (750 mm)	#8 (#25M)	4'-6" (1.40 m)									

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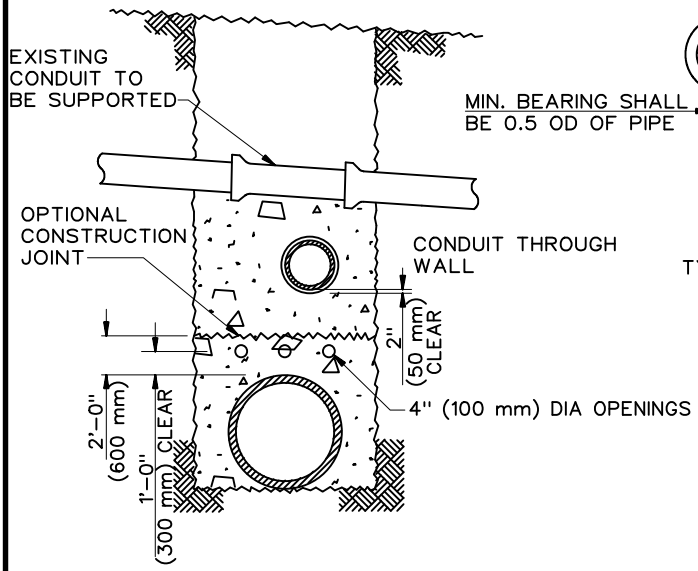
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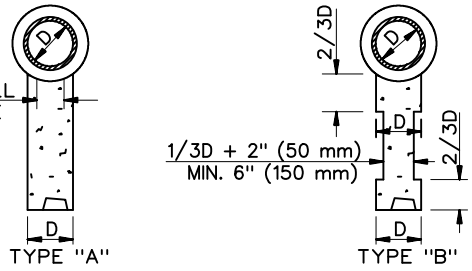
SUPPORTS FOR CONDUITS ACROSS TRENCHES

STANDARD PLAN
224-3
SHEET 2 OF 4

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CASE 2
CONCRETE WALL



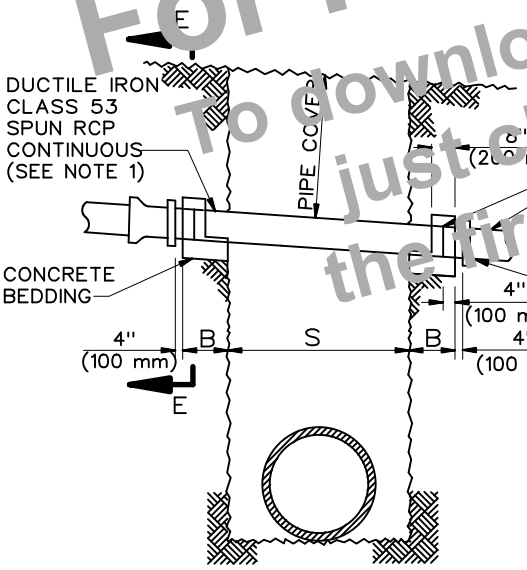


WALL SECTION

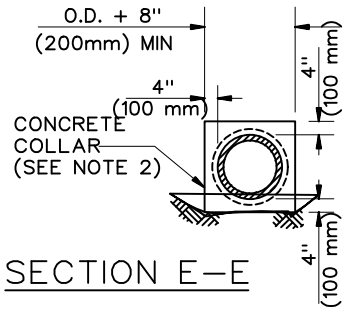
NOTES FOR CASE 2:

1. THE SUPPORTING WALL SHALL HAVE A FIRM BEARING ON THE SUBGRADE AND AGAINST THE SLIDES OF THE EXCAVATION.
2. ANY CONDUIT PASSING THROUGH THE WALL SHALL HAVE 2" (50 mm) CLEARANCE FROM THE WALL.
3. 4" (100 mm) DIA OPENING THROUGH THE WALL AT 2' (600 mm) OC HORIZONTALLY AND AT 5' (1.5 m) OC VERTICALLY SHALL BE PROVIDED TO PREVENT UNEQUAL PRESSURE RESULTING FROM UNTAMPED BACKFILL.
4. IF SUPPORTED PIPE IS BEDDED IN CONCRETE, MINIMUM THICKNESS OF WALL SHALL EQUAL BEDDING WIDTH.
5. BRICK WITH MORTAR JOINTS MAY BE USED IN LIEU OF CONCRETE FOR WALLS UP TO 5' (1.5 m) IN HEIGHT OR LENGTH.

CASE 3
DUCTILE IRON PIPE



FOR CLAY PIPE SEWERS CUT EXST PIPE AND JOIN WITH TYPE "D" JOINTS WITH ADAPTER RING, IF REQUIRED, ON EACH SIDE OF TRENCH OR REMOVE TO NEAREST JOINT BEYOND



SECTION E–E

NOTES FOR CASE 3:

1. 2000–D SPUN RCP OF SAME DIAMETER AS THE EXISTING PIPE MAY BE USED ONLY WHEN THE EXISTING PIPE IS NRCP OR RCP AND THE TRENCH WIDTH IS 5' (1.5 m) OR LESS.
2. THE CONCRETE COLLAR JOINT SHALL BE USED FOR JOINTS IN STORM DRAIN PIPE.

ALLOWABLE SPANS AND MIN. REQUIRED BEARING FOR DUCTILE IRON PIPE

DEPTH OF COVER	6" (150 mm) PIPE		8" (200 mm) PIPE		10" (250 mm) PIPE	
	S (Max)	B (Min)	S (Max)	B (Min)	S (Max)	B (Min)
8'–0" TO 16'–0" (2.45 TO 4.90 m)	11'–0" (3.35 m)	1'–6" (0.50 m)	13'–6" (4.10 m)	1'–6" (0.50 m)	16'–6" (5.03 m)	2'–0" (0.60 m)
8'–0" TO 16'–0" (2.45 TO 4.90 m)	8'–0" (2.45 m)	1'–6" (0.50 m)	10'–0" (3.00 m)	2'–0" (0.60 m)	12'–0" (3.65 m)	2'–0" (0.60 m)
16'–0" TO 25'–0" (4.90 TO 7.60 m)	7'–0" (2.15 m)	1'–6" (0.50 m)	9'–0" (2.75 m)	2'–0" (0.60 m)	10'–6" (3.20 m)	2'–6" (0.75 m)

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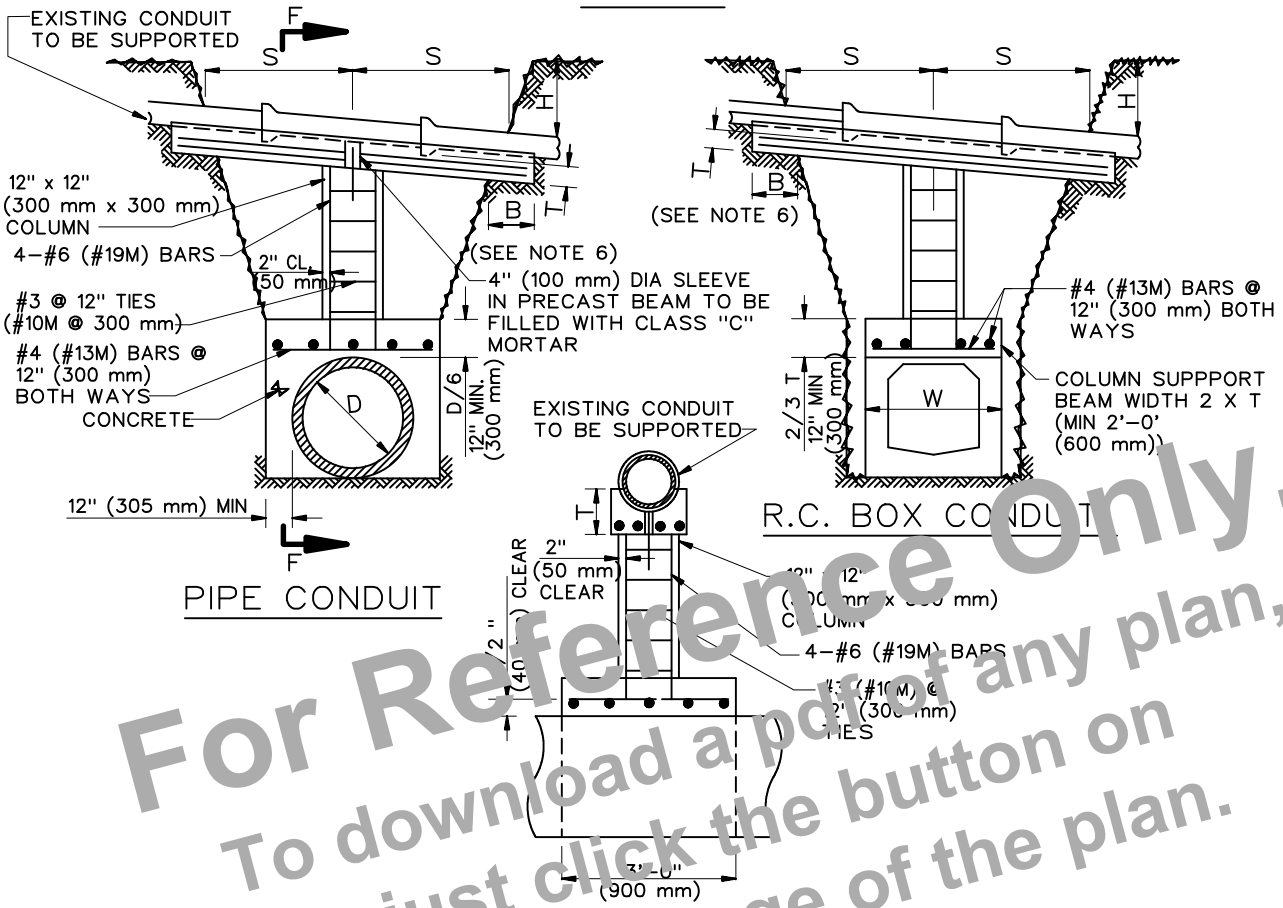
SUPPORTS FOR CONDUITS ACROSS TRENCHES

STANDARD PLAN 224–3

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COLUMN SUPPORT WITH REINFORCED CONCRETE BEAM

CASE 4



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NOTES FOR CASE 4:

1. SPAN "S" SHALL BE MAXIMUM 18' (5.5 m) FOR EARTH COVER 8' (2.45 m) OR LESS, 12' (3.65 m) FOR EARTH COVER 16' (4.9 m) OR LESS, AND 9' (3.0 m) FOR OVER 16' (4.9 m) EARTH COVER.
2. CONCRETE SHALL BE CLASS 560–C–3250 (330–C–23).
3. WHEN THE PIPE TO BE SUPPORTED CROSSES THE TRENCH ON A SKEW ANGLE, THE WALL OR BEAM WHICH SUPPORTS THE COLUMN SHALL BE CONSTRUCTED AT RIGHT ANGLE TO THE TRENCH.
4. SUPPORT SYSTEM MAY BE USED OVER CAST–IN–PLACE STRUCTURES.
5. BACKFILL ABOVE THE SUPPORT BEAM SHALL NOT BE PLACED UNTIL 72 HOURS AFTER THE SUPPORT IS POURED.
6. REINFORCED CONCRETE BEAM DIMENSIONED AND REINFORCED PER TABLE UNDER CASE 1.

GENERAL NOTES

1. "S" IS THE SPAN OF THE PIPE SUPPORT MEASURED ALONG ITS CENTERLINE.
2. "B" IS THE LENGTH OF BEARING OF THE SUPPORT AGAINST UNDISTURBED EARTH MEASURED ALONG THE PIPE CENTERLINE.
3. CASE 2 SHALL BE USED FOR PARTIAL CROSSINGS, EXCEPT THAT WHERE THE DISTANCE FROM A SEWER CHIMNEY TO UN–DISTURBED EARTH IS 18" (450 mm) OR LESS, THE TRENCH BACKFILL MAY BE DENSIFIED TO 18" (450 mm) ABOVE A HOUSE CONNECTION SEWER AND THEN RE–EXCAVATED FOR THE PIPE INSTALLATION.
4. ANY SEWER OR STORM DRAIN EXPOSED OR PARTIALLY EXPOSED IN A TUNNEL EXCAVATION SHALL BE SUPPORTED WITH A WALL, CASE 2.
5. IF BEDDING IS REMOVED FROM AN EXISTING PIPE THAT WILL REMAIN IN PLACE, THE PIPE SHALL BE BEDDED WITH CONCRETE.
6. UNLESS OTHERWISE NOTED, CONCRETE SHALL BE CLASS 450–C–2000 (265–C–14).

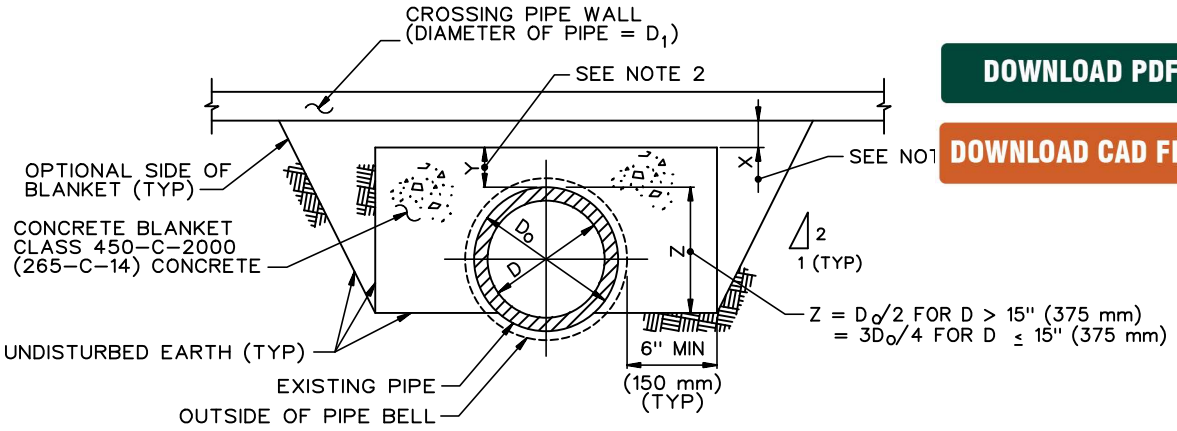
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

SUPPORTS FOR CONDUITS ACROSS TRENCHES

STANDARD PLAN
224–3
SHEET 4 OF 4

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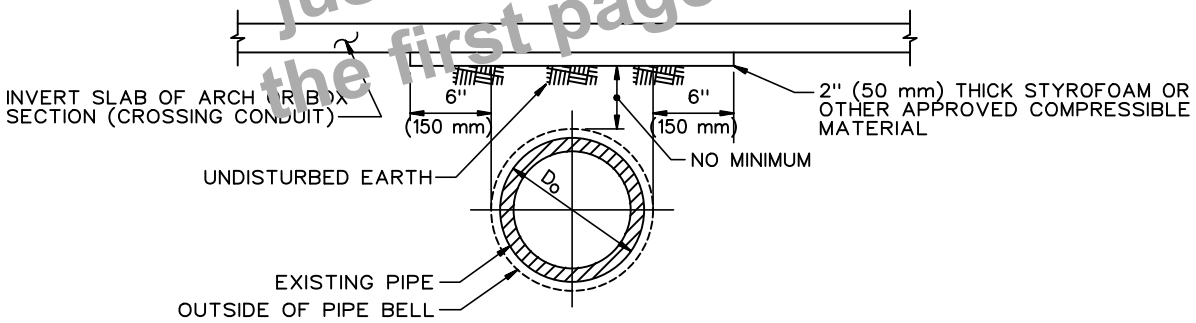


CONCRETE BLANKET
(FOR EXISTING PIPES CROSSED OVER BY A NEW PIPE)

NOTES:

1. CONCRETE BLANKET IS REQUIRED WHEN THE CLEARANCE BETWEEN THE TOP OF THE EXISTING PIPE AND THE BOTTOM OF THE CROSSING PIPE IS LESS THAN 18" (450 mm).
2. Y = D/6 (6" (150 mm) MIN). WHERE THE CLEARANCE BETWEEN THE TOP OF THE EXISTING PIPE AND THE BOTTOM OF THE CROSSING PIPE IS LESS THAN Y, THE CONCRETE SHALL BE PLACED BETWEEN THE PIPES AND AROUND THE SIDES OF THE CROSSING PIPE TO A LEVEL EQUAL TO Y ABOVE THE EXISTING PIPE, OR AS REQUIRED BY NOTE 3 BELOW, WHICHEVER IS HIGHER.
3. X = D/12, MINIMUM, TO PROVIDE BEDDING MATERIAL FOR THE CROSSING CONDUIT. WHEN Y IS LESS THAN THIS MINIMUM, THE CONCRETE SURFACE OF THE BLANKET SHALL BE RAISED TO MAKE CONTACT WITH THE LOWER 90° OF THE CROSSING PIPE.
4. THE BLANKET SHALL EXTEND LONGITUDINALLY TO THE FIRST JOINT BEYOND THE TRENCH EXCAVATION AT EACH END OF THE BLANKET, EXCEPT THAT THE BLANKET NEED NOT BE EXTENDED MORE THAN 4' (1.2 m) BEYOND THE TRENCH.
5. WHENEVER A PIPE BELL IS ENCOUNTERED WITHIN THE LIMITS OF THE BLANKET, ALL DIMENSIONS SHALL REFER TO THE BELL.

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COMPRESSIBLE BLANKET
(FOR EXISTING PIPES CROSSED OVER BY A NEW BOX OR ARCH)

NOTES:

1. COMPRESSIBLE BLANKET IS REQUIRED WHEN THE CLEARANCE BETWEEN THE TOP OF THE EXISTING PIPE AND THE BOTTOM OF THE CROSSING CONDUIT (BOX OR ARCH) IS LESS THAN 18" (450 mm).
2. THE BLANKET SHALL EXTEND LONGITUDINALLY FOR THE FULL CROSSING CONDUIT TRENCH WIDTH.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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BLANKET PROTECTION FOR PIPES

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 225-3

SHEET 1 OF 1

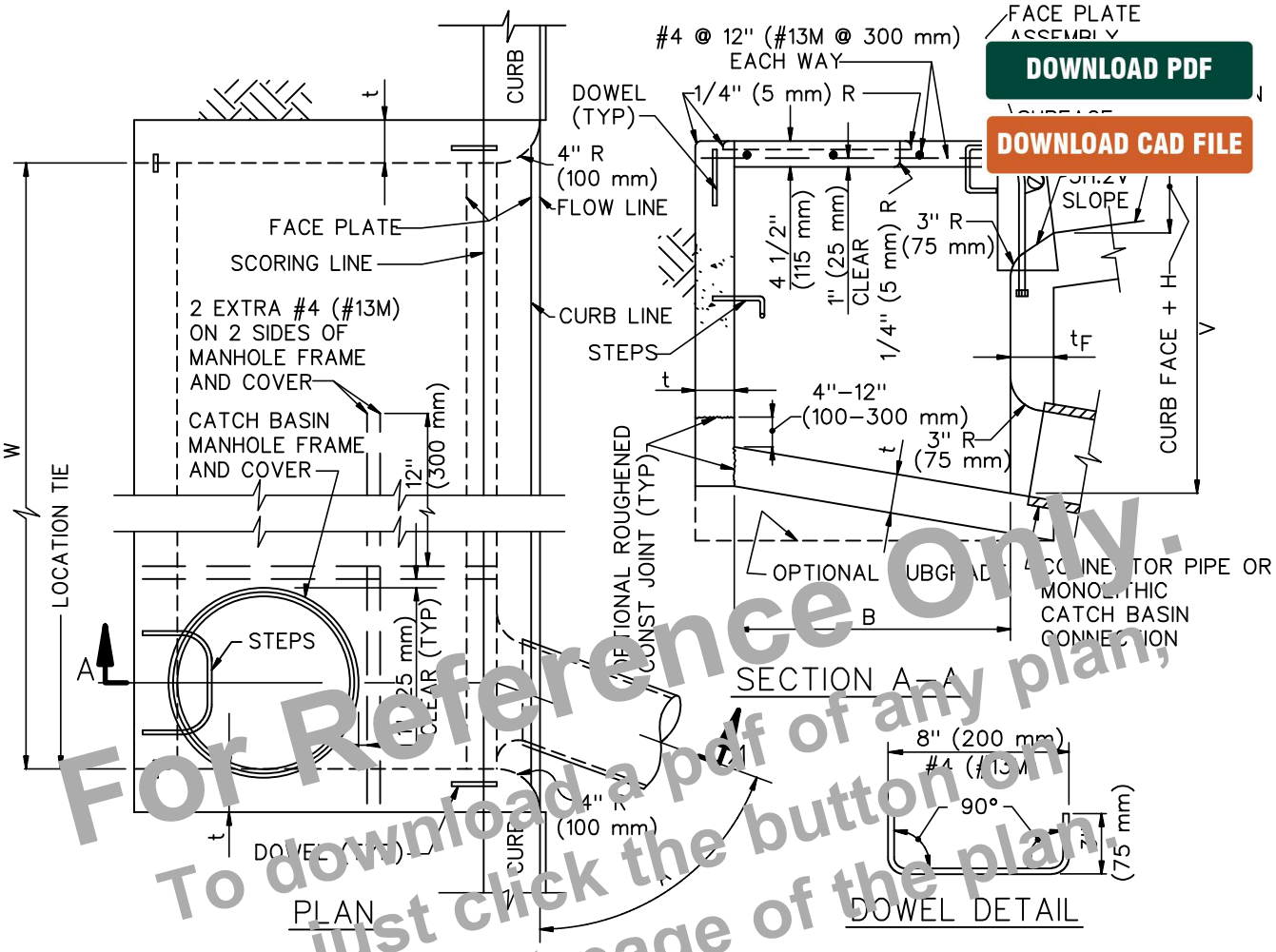
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SECTION 300

Flood Control and Storm Drain Facilities

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STRUCTURAL DATA							
WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS							
MAX W	MAX V	t	t_F	REINFORCMENT REQUIRED IN			
				FRONT WALL	REAR WALL	BOTTOM SLAB	END WALL
3.5' (1.0 m)	8' (2.4 m)	6" (150 mm)	6" (150 mm)	NO REINFORCEMENT REQUIRED			
3.5' (1.0 m)	12' (3.6 m)	8" (200 mm)	8" (200 mm)				
7' (2.0 m)	6' (1.8 m)	6" (150 mm)	6" (150 mm)				
7' (2.0 m)	12' (3.6 m)	8" (200 mm)	8" (200 mm)				
14' (4.0 m)	4' (1.2 m)	6" (150 mm)	6" (150 mm)	REINFORCEMENT REQUIRED			
	8' (2.4 m)	6" (150 mm)	8" (200 mm)				
	12' (3.6 m)	8" (200 mm)	10" (250 mm)				
21' (6 m) AND 28' (9 m)	4' (1.2 m)	6" (150 mm)	6" (150 mm)				
	6' (1.8 m)	6" (150 mm)	8" (200 mm)				
	8' (2.4 m)	8" (200 mm)	8" (200 mm)				
	10' (3.0 m)	8" (200 mm)	10" (250 mm)				
	12' (3.6 m)	8" (200 mm)	10" (250 mm)				

FOR W > 28' (9 m), V > 12' (3.6 m) OR B > 4' (1.2 m), SEE PLANS

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1992, 1996, 2009, 2021

CURB OPENING CATCH BASIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
300–4
SHEET 1 OF 2

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NOTES:

1. WHERE THE BASIN IS TO BE CONSTRUCTED WITHIN THE LIMITS OF EXISTING OR PROPOSED SIDEWALK OR IS CONTIGUOUS TO SUCH SIDEWALK, THE TOP SLAB OF THE BASIN MAY BE POURED EITHER MONOLITHIC WITH THE SIDEWALK OR SEPARATELY, USING THE SAME CLASS OF CONCRETE AS IN THE BASIN. WHEN POURED MONOLITHICALLY, THE SIDEWALK SHALL BE PROVIDED WITH A WEAKENED PLANE OR A 1" (25 mm) DEEP SAWCUT CONTINUOUSLY AROUND THE EXTERNAL PERIMETER OF THE CATCH BASIN WALLS, INCLUDING ACROSS THE FULL WIDTH OF THE SIDEWALK. SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE, GRADE, COLOR, FINISH, AND SCORING TO EXISTING OR PROPOSED CURB AND WALK ADJACENT TO THE BASIN.

2. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.

3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1V:12H MINIMUM AND 1V:3H MAXIMUM, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8%, 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.

4. DIMENSIONS:
   B = 3'–2" (970 mm) UNLESS OTHERWISE NOTED.
   V = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE CATCH BASIN AT THE OUTLET. 4.5' (1.35 m) UNLESS OTHERWISE NOTED.
   V_U = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT AT THE UPSTREAM END OF THE BASIN. IT SHALL BE DETERMINED BY THE REQUIREMENTS OF NOTE 3, BUT SHALL NOT BE LESS THAN CURB FACE PLUS 12" (300 mm).
   V_I = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE INLET, NOTED ON THE PLANS.
   H = 2" (50 mm) UNLESS OTHERWISE NOTED.
   W = NOTED ON THE PLANS.
   A = THE ANGLE IN DEGREES, INTERCEPTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.

5. PLACE CONNECTOR PIPES AS INDICATED ON THE PLANS. UNLESS OTHERWISE SPECIFIED, THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO ENSURE MINIMUM 3" (75 mm) PIPE EMBEDMENT, ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3" (75 mm) RADIUS OF ROUNDING OF STRUCTURAL CONCRETE, ALL AROUND, ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70° OR GREATER THAN 110°, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.

6. STEPS SHALL BE LOCATED AS SHOWN. IF THE CONNECTOR PIPE INTERFERES WITH THE STEPS, THEY SHALL BE LOCATED AT THE CENTERLINE OF THE DOWNSTREAM END WALL. STEPS SHALL BE SPACED 12" (300 mm) APART. THE TOP STEP SHALL BE 7" (175 mm) BELOW THE TOP OF THE MANHOLE AND PROJECT 2–1/2" (65 mm). ALL OTHER STEPS SHALL PROJECT 5" (125 mm).

7. DOWELS ARE REQUIRED AT EACH CORNER AND AT 7' (2.0 m) ON CENTER (MAXIMUM) ALONG THE BACKWALL.

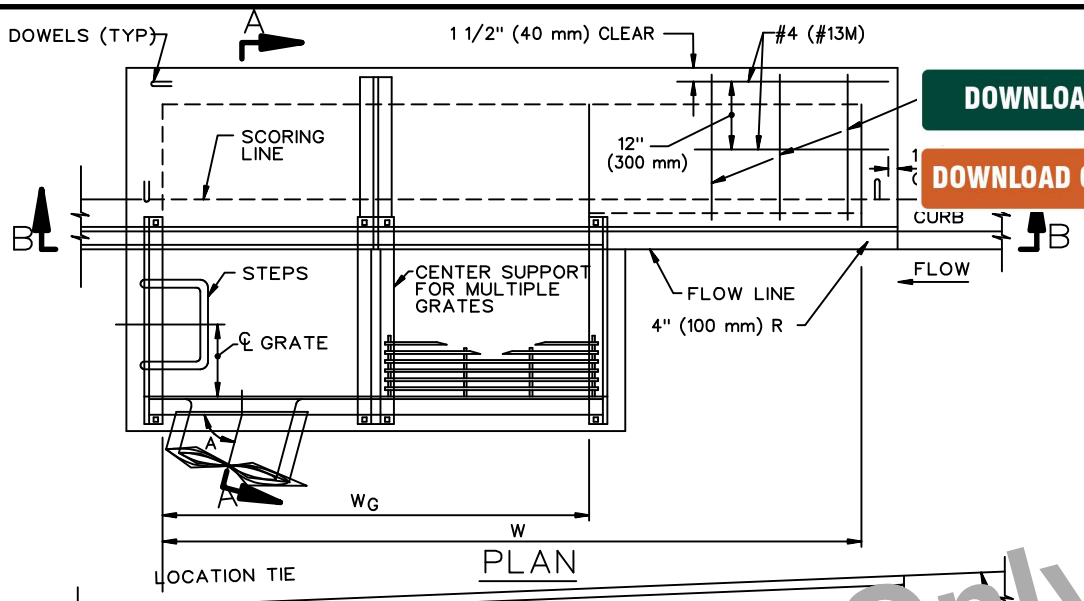
8. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:
   308 MONOLITHIC CATCH BASIN CONNECTION
   309 CATCH BASIN REINFORCEMENT
   310 CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR
   312 CATCH BASIN MANHOLE FRAME AND COVER
   635 STEEL STEP 636 POLYPROPYLENE PLASTIC STEP

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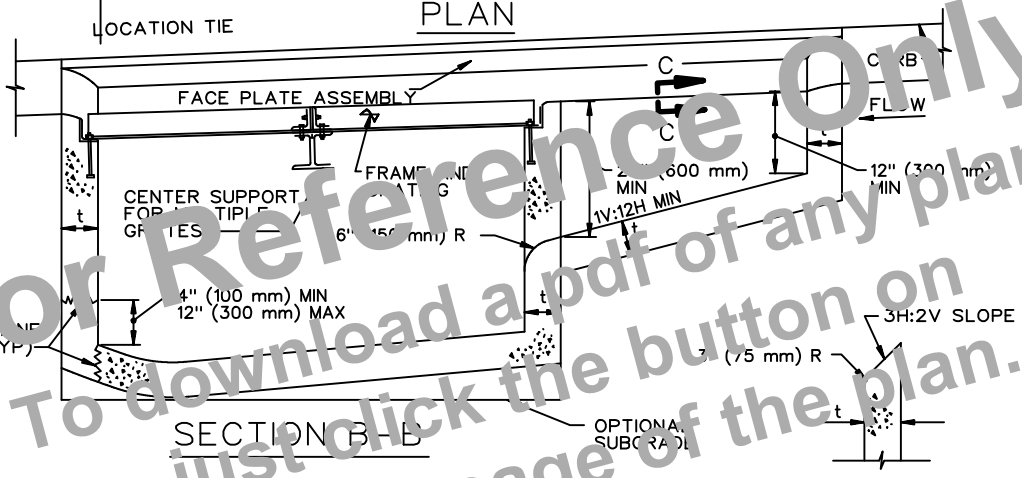
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB OPENING CATCH BASIN	**300–4**
	SHEET 2 OF 2

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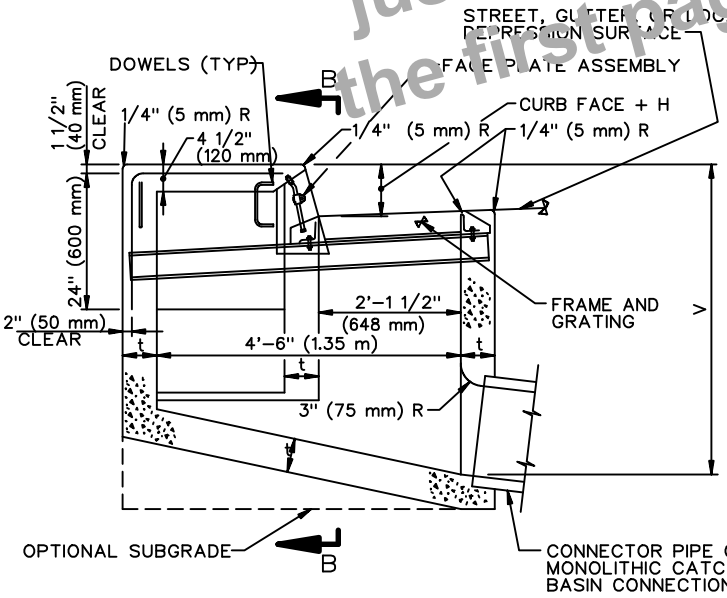


PLAN

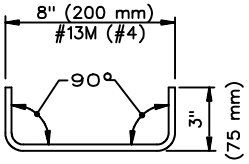


SECTION B–B

SECTION C–C



SECTION A–A



DOWEL DETAIL

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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CURB OPENING CATCH BASIN WITH GRATING(S) AND DEBRIS SKIMMER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 301–4

SHEET 1 OF 3

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STRUCTURAL DATA

WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS

MAXIMUM			t	WALL			FLOOR
W	GRATES	V		FRONT	REAR	END	
7' (2.0 m)	1	4' (1.2 m)	6" (150 mm)	NO REINFORCEMENT REQUIRED			
7' (2.0 m)	1	8' (2.4 m)	8" (200 mm)				
7' (2.0 m)	1	10' (3.0 m)	10" (250 mm)				
14' (4.0 m)	3	4' (1.2 m)	6" (150 mm)				
14' (4.0 m)	2	8' (2.4 m)	8" (200 mm)				
14' (4.0 m)	2	10' (3.0 m)	10" (250 mm)				
14' (4.0 m)	2	12' (3.5 m)	10" (250 mm)				
28' (9.0 m)	6	4' (1.2 m)	6" (150 mm)				
28' (9.0 m)	6	6' (1.8 m)	8" (200 mm)				
28' (9.0 m)	7	4' (1.2 m)	6" (150 mm)				
28' (9.0 m)	7	8' (2.4 m)	8" (200 mm)				
28' (9.0 m)	7	10' (3.0 m)	10" (250 mm)				
28' (9.0 m)	7	12' (3.5 m)	10" (250 m)				
FOR W > 28' (9 m), V > 12' (3.5 m) OR N[illegible] OF [illegible]ATES > [illegible] SEE PLANS							

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NOTES:

1. WHERE THE BASIN IS TO BE CONSTRUCTED WITHIN THE LIMITS OF EXISTING OR PROPOSED SIDEWALK OR IS CONTIGUOUS TO SUCH SIDEWALK, THE TOP SLAB OF THE BASIN MAY BE POURED EITHER MONOLITHIC WITH THE SIDEWALK OR SEPARATELY, USING THE SAME CLASS OF CONCRETE AS IN THE BASIN. WHEN POURED MONOLITHICALLY, THE SIDEWALK SHALL BE PROVIDED WITH A WEAKENED PLANE OR A 1" (25 mm) DEEP SAWCUT CONTINUOUSLY AROUND THE EXTERNAL PERIMETER OF THE CATCH BASIN WALLS, INCLUDING ACROSS THE FULL WIDTH OF THE SIDEWALK. SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE, GRADE, COLOR, FINISH, AND SCORING TO EXISTING OR PROPOSED CURB AND WALK ADJACENT TO THE BASIN.

2. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.

3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH. FLOOR OF GRATING PORTION SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1V:12H MINIMUM AND 1V:3H MAXIMUM, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8%, 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.

4. DIMENSIONS:

   V = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE CATCH BASIN AT THE OUTLET = 4.5' (1.35 m).

   V_I = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE INLET, NOTED ON THE PLANS.

   H = NOTED ON THE PLANS.

   W = 7' (2 m) UNLESS OTHERWISE NOTED ON THE PLANS.

   W_G = 2'–11 3/8" (900 mm) FOR ONE GRATING; ADD 2'–5 3/8" (751 mm) FOR EACH ADDITIONAL GRATING. ONE GRATING IS REQUIRED UNLESS OTHERWISE SHOWN ON THE PLANS.

   A = THE ANGLE, IN DEGREES, INTERSECTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.

5. PLACE CONNECTOR PIPES AS INDICATED ON THE PLANS. UNLESS OTHERWISE SPECIFIED, THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO ENSURE MINIMUM 3" (75 mm) PIPE EMBEDMENT ALL AROUND WITHIN THE CATCH BASIN WALL, AND 3" (75 mm) RADIUS OF ROUNDING OF STRUCTURE CONCRETE, ALL AROUND, ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70° OR GREATER THAN 110°, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.

6. STEPS SHALL BE LOCATED AS SHOWN. IF THE CONNECTOR PIPE INTERFERES WITH THE STEPS, THEY SHALL BE LOCATED ON THE FRONT WALL AT THE CENTERLINE OF THE DOWNSTREAM GRATING. STEPS SHALL BE SPACED 12" (300 mm) APART. THE TOP STEP SHALL BE 7" (175 mm) BELOW THE TOP OF THE GRATING AND PROJECT 2–1/2" (65 mm). ALL OTHER STEPS SHALL PROJECT 5" (130 mm).

7. DOWELS ARE REQUIRED AT EACH CORNER AND AT 7' (2 m) ON CENTER (MAXIMUM) ALONG THE BACKWALL.

8. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

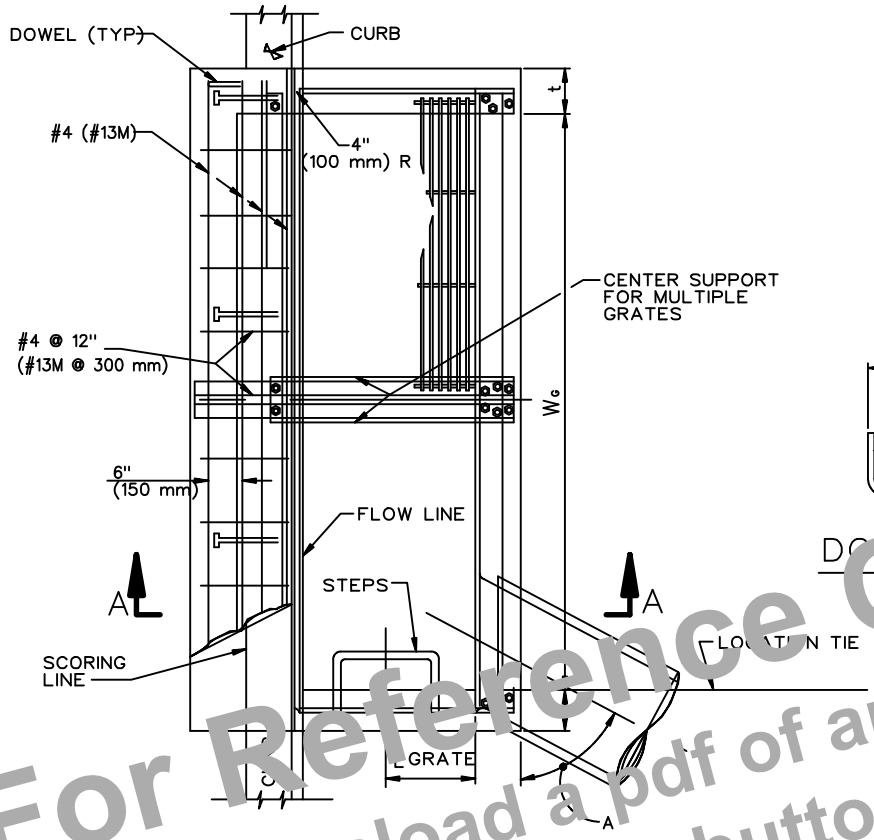
   308 MONOLITHIC CATCH BASIN CONNECTION
   309 CATCH BASIN REINFORCEMENT
   310 CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR
   311 FRAME AND GRATING FOR CATCH BASINS
   635 STEEL STEP
   636 POLYPROPYLENE PLASTIC STEP

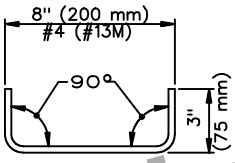
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB OPENING CATCH BASIN WITH GRATING(S) AND DEBRIS SKIMMER	**301–4**
	SHEET 3 OF 3

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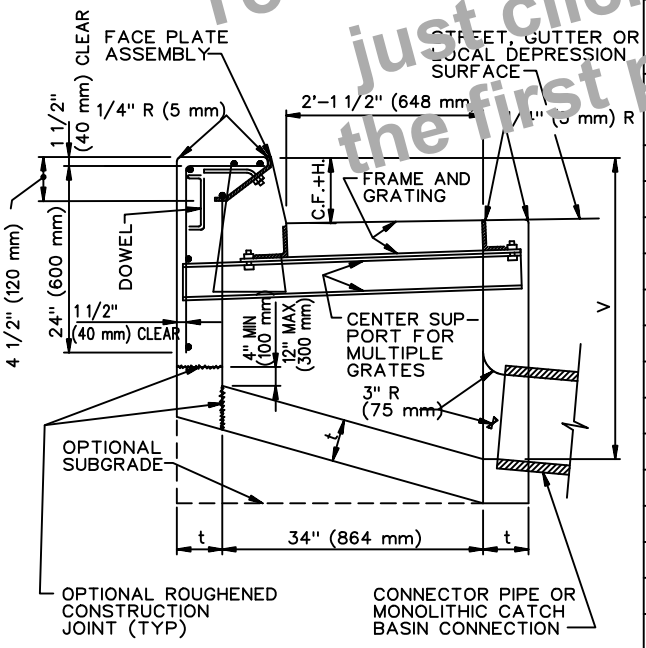




DOWEL DETAIL

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PLAN



SECTION A–A

STRUCTURAL DATA

WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS

NO. OF GRATES	MAXIMUM V	t	REINFORCEMENT FOR WALLS AND SLABS
1–2	4' (1.2 m)	6"(150 mm)	NOT REQUIRED
1–2	8' (2.4 m)	8"(200 mm)	
1–2	10' (3.0 m)	10"(250 mm)	
1–2	12' (3.5 m)	10"(250 mm)	REQUIRED
3–4	4' (1.2 m)	6"(150 mm)	NOT REQUIRED
3–4	7' (2.0 m)	8"(200 mm)	
3–4	8' (2.4 m)	8"(200 mm)	REQUIRED
3–4	12' (3.5 m)	10"(250 mm)	
5–6	4' (1.2 m)	6"(150 mm)	NOT REQUIRED
5–6	6' (1.8 m)	8"(200 mm)	
5–6	8' (2.4 m)	8"(200 mm)	REQUIRED
5–6	12' (3.5 m)	10"(250 mm)	
> 6	4' (1.2 m)	6"(150 mm)	
> 6	8' (2.4 m)	8"(200 mm)	
> 6	12' (3.5 m)	10"(250 mm)	

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1992, 1996, 2009, 2021

CURB OPENING CATCH BASIN WITH GRATING(S)

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
302–4
SHEET 1 OF 2

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NOTES:

1. WHERE THE BASIN IS TO BE CONSTRUCTED WITHIN THE LIMITS OF EXISTING OR PROPOSED SIDEWALK OR IS CONTIGUOUS TO SUCH SIDEWALK, THE TOP SLAB OF THE BASIN MAY BE POURED EITHER MONOLITHIC WITH THE SIDEWALK OR SEPARATELY, USING THE SAME CLASS OF CONCRETE AS IN THE BASIN. WHEN POURED MONOLITHICALLY, THE SIDEWALK SHALL BE PROVIDED WITH A WEAKENED PLANE OR A 1" (25 mm) DEEP SAWCUT CONTINUOUSLY AROUND THE EXTERNAL PERIMETER OF THE CATCH BASIN WALLS, INCLUDING ACROSS THE FULL WIDTH OF THE SIDEWALK. SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE, GRADE, COLOR, FINISH, AND SCORING TO EXISTING OR PROPOSED CURB AND WALK ADJACENT TO THE BASIN.

2. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.

3. ONE GRATING IS REQUIRED UNLESS OTHERWISE SHOWN ON THE PROJECT PLAN.

4. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1V:12H MINIMUM AND 1V:3H MAXIMUM, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8%, 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.

5. DIMENSIONS:

   V = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE CATCH BASIN AT THE OUTLET = 4.5' (1.35 m).

   V_u= THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT AT THE UPSTREAM END OF THE BASIN, AND SHALL BE DETERMINED BY THE REQUIREMENTS OF NOTE 4, BUT SHALL NOT BE LESS THAN CURB FACE PLUS 12" (300 mm).

   V_i = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE INLET, NOTED ON THE PLANS.

   H = NOTED ON THE PROJECT PLANS.

   W_o= 2'–11 3/8" (900 mm) FOR ONE GRATING; ADD 3'–5 3/8" (1051 mm) FOR EACH ADDITIONAL GRATING.

   A = THE ANGLE, IN DEGREES, INTERCEPTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.

6. PLACE CONNECTOR PIPES AS INDICATED ON THE PLANS. UNLESS OTHERWISE SPECIFIED, THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO ENSURE MINIMUM 3" (75 mm) PIPE EMBEDMENT, ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3" (75 mm) RADIUS OF ROUNDING OF STRUCTURE CONCRETE, ALL AROUND, ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70° OR GREATER THAN 110 °, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.

7. STEPS SHALL BE LOCATED AS SHOWN. IF THE CONNECTOR PIPE INTERFERES WITH THE STEPS, THEY SHALL BE LOCATED ON THE FRONT WALL AT THE CENTERLINE OF THE DOWNSTREAM GRATING. STEPS SHALL BE SPACED 12" (300 mm) APART. THE TOP STEP SHALL BE 7" (175 mm) BELOW THE TOP OF THE GRATING AND PROJECT 2 1/2" (65 mm). ALL OTHER STEPS SHALL PROJECT 5" (130 mm).

8. DOWELS ARE REQUIRED AT EACH CORNER AND AT 7' (2.0 m) ON CENTER (MAXIMUM) ALONG THE BACKWALL.

9. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

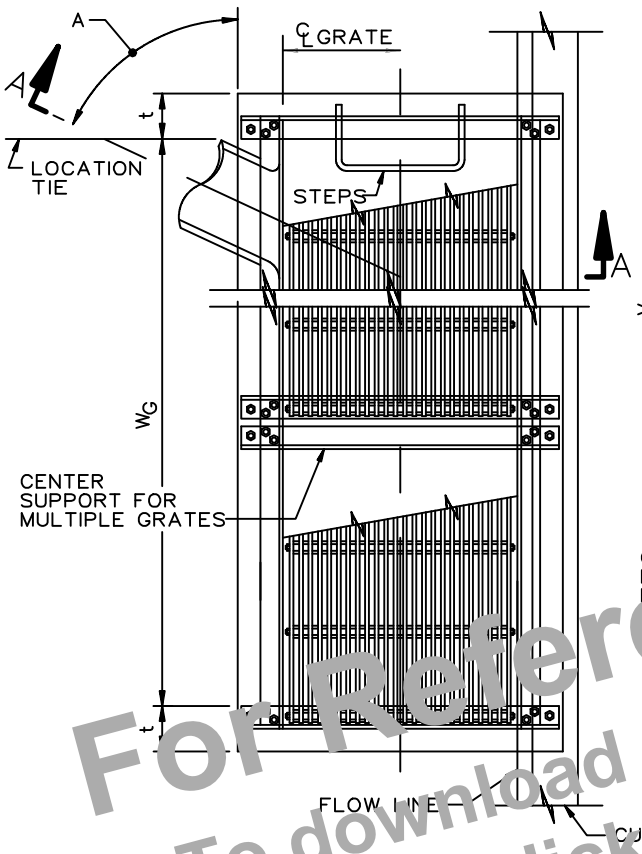
   308 MONOLITHIC CATCH BASIN CONNECTION
   309 CATCH BASIN REINFORCEMENT
   310 CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR
   311 FRAME AND GRATING FOR CATCH BASINS
   635 STEEL STEP
   636 POLYPROPYLENE PLASTIC STEP

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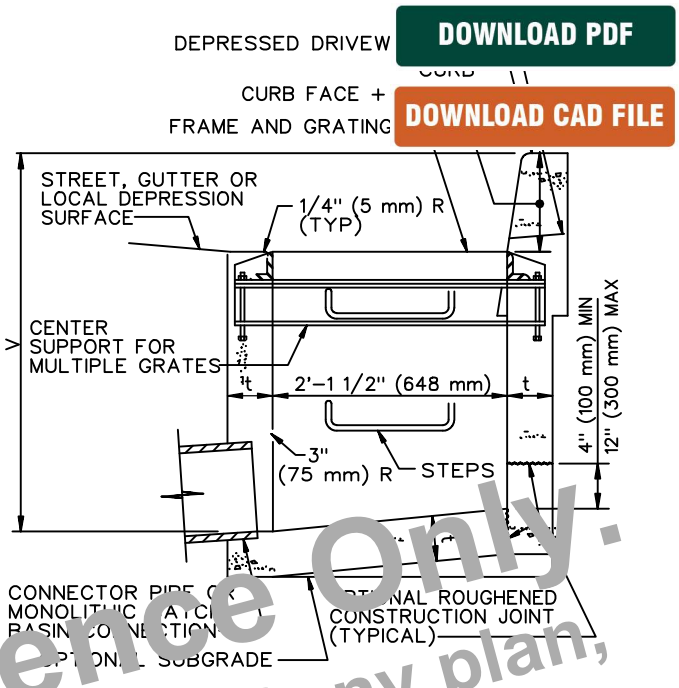
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB OPENING CATCH BASIN WITH GRATING(S)	**302–4**
	SHEET 2 OF 2

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PLAN



SECTION A–A

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STRUCTURAL DATA

WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS

NO. OF GRATES	MAX V	t	REINFORCEMENT FOR WALLS AND SLABS
1–2	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
1–2	8' (2.4 m)	8" (200 mm)	
1–2	10' (3.0 m)	10" (250 mm)	
1–2	12' (3.5 m)	10" (250 mm)	REQUIRED
3–4	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
3–4	7' (2.0 m)	8" (200 mm)	
3–4	8' (2.4 m)	8" (200 mm)	REQUIRED
3–4	12' (3.5 m)	10" (250 mm)	
5–6	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
5–6	6' (1.8 m)	8" (200 mm)	
5–6	8' (2.4 m)	8" (200 mm)	REQUIRED
5–6	12' (3.5 m)	8" (200 mm)	
> 6	4' (1.2 m)	6" (150 mm)	
> 6	8' (2.4 m)	8" (200 mm)	
> 6	12' (3.5 m)	10" (250 mm)	

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1992, 1996, 2009, 2021

CURBSIDE GRATING CATCH BASIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 303–4

SHEET 1 OF 2

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NOTES:

1. SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE GRADE, COLOR, FINISH, AND SCORING TO THE EXISTING OR PROPOSED CURB ADJACENT TO THE BASIN.

2. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.

3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1V:12H MINIMUM AND 1V:3H MAXIMUM, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8%, 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.

4. ONE GRATING IS REQUIRED UNLESS OTHERWISE SHOWN ON THE PLANS.

5. DIMENSIONS:

   V = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE CATCH BASIN AT THE OUTLET = 4.5' (1.35 m).

   V_U = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT AT THE UPSTREAM END OF THE BASIN. IT SHALL BE DETERMINED BY THE REQUIREMENTS OF NOTE 3, BUT SHALL NOT BE LESS THAN CURB FACE PLUS 12" (300 mm).

   V_I = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT AT THE INLET. NOTED ON THE PLANS.

   H = NOTED ON THE PLANS.

   W_G = 2'–11 3/8" (900 mm) FOR ONE GRATING; ADD 2'-5 7/8" ([illegible] mm) FOR EACH ADDITIONAL GRATING.

   A = THE ANGLE, IN DEGREES, INTERSECTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.

6. PLACE CONNECTOR PIPES AS INDICATED ON THE PLANS. UNLESS OTHERWISE SPECIFIED, THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO ENSURE A MINIMUM 3" (75 mm) PIPE EMBEDMENT, ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3" (75 mm) RADIUS OR ROUNDING OF STRUCTURE CONCRETE, ALL AROUND, ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70° OR GREATER THAN 110°, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.

7. STEPS SHALL BE LOCATED AS SHOWN. IF THE CONNECTOR PIPE INTERFERES WITH THE STEPS, THEY SHALL BE LOCATED AT THE CENTERLINE OF THE DOWNSTREAM GRATING. STEPS SHALL BE SPACED 12" (300 mm) APART. THE TOP STEP SHALL BE 7" (175 mm) BELOW THE TOP OF THE GRATING AND PROJECT 2 1/2" (65 mm). ALL OTHER STEPS SHALL PROJECT 5" (130 mm).

8. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

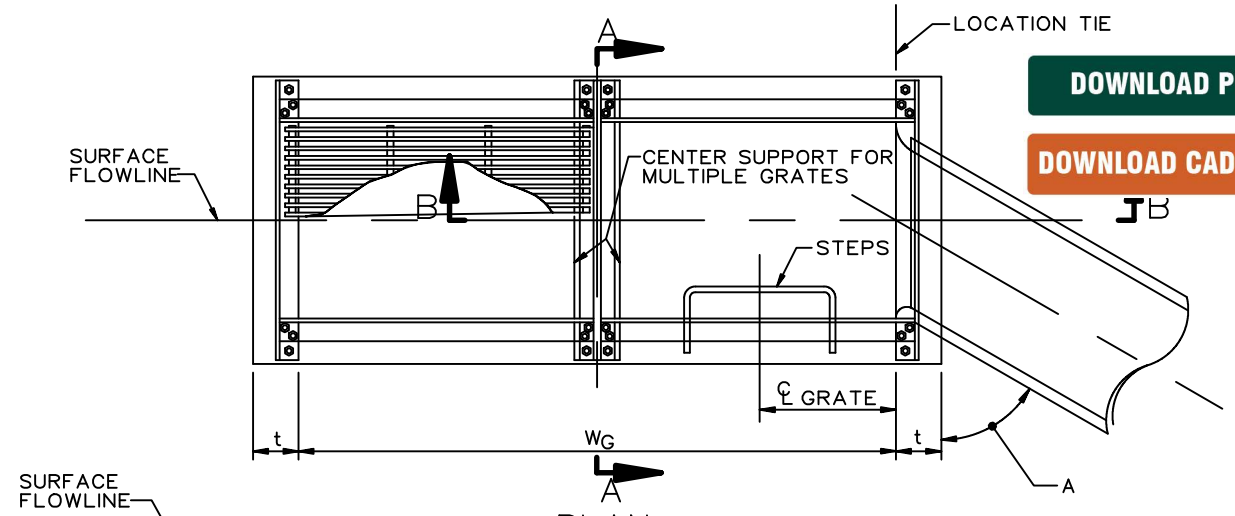
   308 MONOLITHIC CATCH BASIN CONNECTION
   309 CATCH BASIN REINFORCEMENT
   311 FRAME AND GRATING FOR CATCH BASINS
   635 STEEL STEP
   636 POLYPROPYLENE PLASTIC STEP

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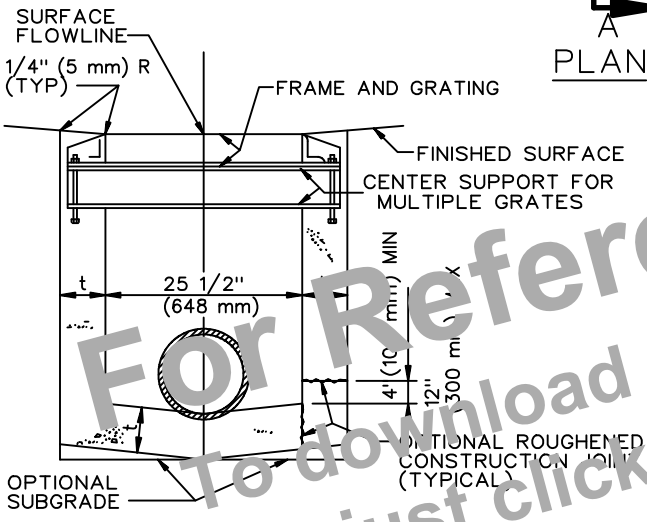
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURBSIDE GRATING CATCH BASIN	**303–4**
	SHEET 2 OF 2

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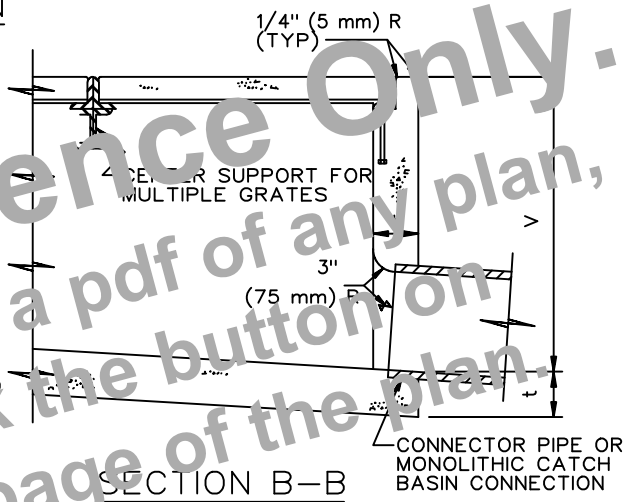
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PLAN



SECTION A–A



SECTION B–B

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STRUCTURAL DATA

WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS

NO. OF GRATES	MAX V	t	REINFORCEMENT FOR WALLS AND SLABS
1–2	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
1–2	8' (2.4 m)	8" (200 mm)	
1–2	10' (3.0 m)	10" (250 mm)	
1–2	12' (3.5 m)	10" (250 mm)	REQUIRED
3–4	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
3–4	7' (2.0 m)	8" (200 mm)	
3–4	8' (2.4 m)	8" (200 mm)	REQUIRED
3–4	12' (3.5 m)	10" (250 mm)	
5–6	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
5–6	6' (1.8 m)	8" (200 mm)	
5–6	8' (2.4 m)	8" (200 mm)	REQUIRED
5–6	12' (3.5 m)	10" (250 mm)	
> 6	4' (1.2 m)	6" (150 mm)	
> 6	8' (2.4 m)	8" (200 mm)	
> 6	12' (3.5 m)	10" (250 mm)	

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1992, 1996, 2009, 2021

GRATING CATCH BASIN – ALLEY (LONGITUDINAL)

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 304–4

SHEET 1 OF 2

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NOTES:

1. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.

2. ONE GRATING IS REQUIRED UNLESS OTHERWISE SHOWN ON THE PLANS.

3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1V:12H MINIMUM AND 1V:3H MAXIMUM, EXCEPT WHERE THE SURFACE GRADE EXCEEDS 8%, IN WHICH CASE THE LONGITUDINAL SLOPE OF THE FLOOR SHALL BE THE SAME AS THE SURFACE GRADE, SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.

4. DIMENSIONS:

   V = 3'–6" (1.0 m)

   V_U = THE DEPTH AT THE UPSTREAM END OF THE BASIN. IT SHALL BE DETERMINED BY THE REQUIREMENTS OF NOTE 3, BUT SHALL NOT BE LESS THAN 2.5' (750 mm).

   V_I = THE DEPTH AT THE INVERT OF THE INLET. NOTED ON THE PLANS.

   W_G = 2'–11 3/8" (900 mm) FOR ONE GRATING; ADD 3'–5 3/8" (1051 mm) FOR EACH ADDITIONAL GRATING.

   A = THE ANGLE, IN DEGREES, INTERCEPTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.

5. PLACE CONNECTOR PIPES AS INDICATED ON THE PLANS. UNLESS OTHERWISE SPECIFIED, THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO ENSURE MINIMUM (375 mm) PIPE EMBEDMENT, ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3" (75 mm) RADIUS OF ROUNDING OF STRUCTURE CONCRETE, ALL AROUND, ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70° OR GREATER THAN 110°, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.

6. STEPS SHALL BE LOCATED AS SHOWN. IF THE CONNECTOR PIPE INTERFERES WITH THE STEPS, THEY SHALL BE LOCATED ON THE OPPOSITE WALL AT THE CENTERLINE OF THE DOWNSTREAM GRATING. STEPS SHALL BE BE SPACED 12" (300 mm) APART. THE TOP STEP SHALL BE 7" (175 mm) BELOW THE TOP OF THE GRATING AND PROJECT 2 1/2" (65 mm). ALL OTHER STEPS SHALL PROJECT 5" (130 mm).

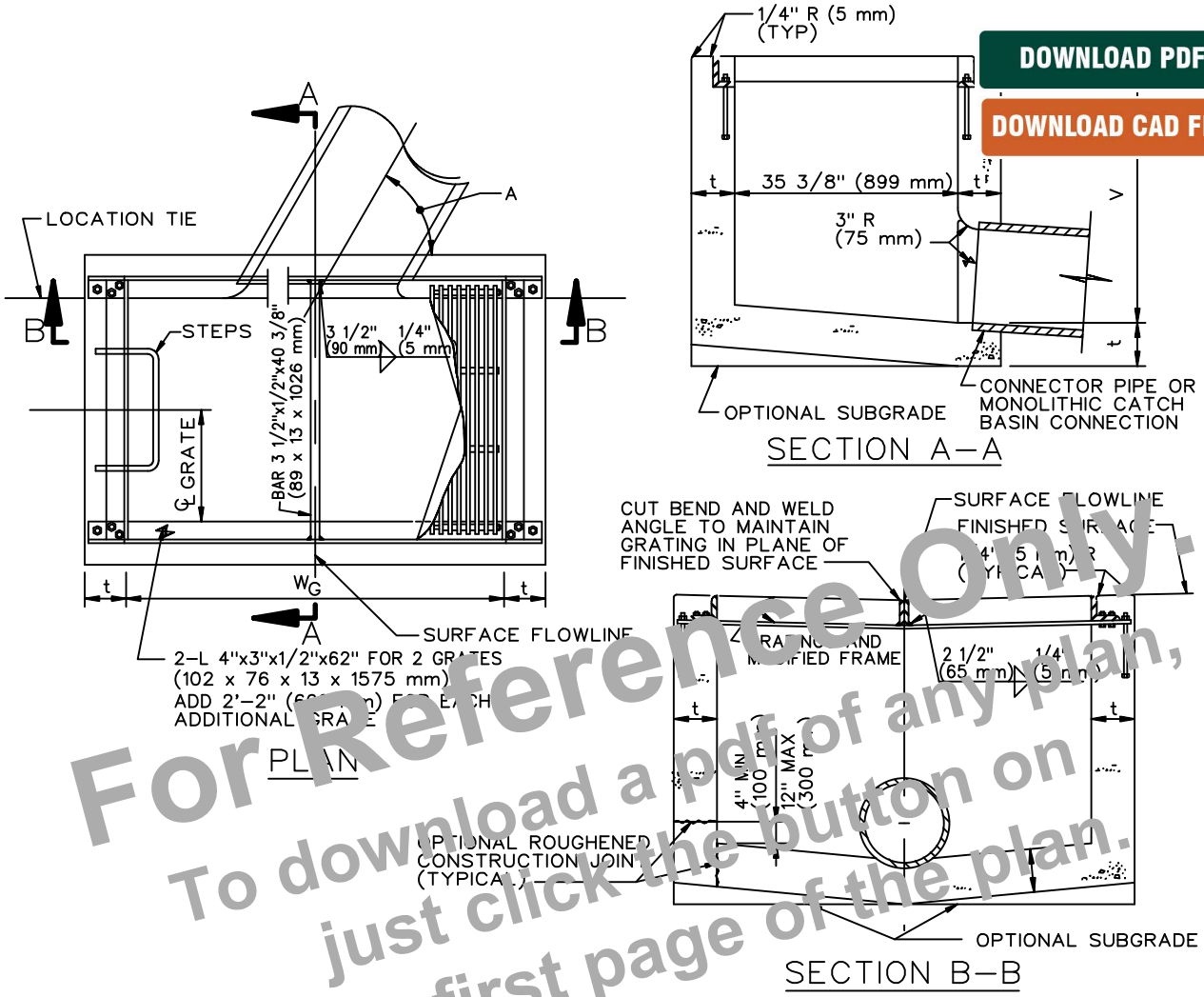
7. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:
   - 308 MONOLITHIC CATCH BASIN CONNECTION
   - 309 CATCH BASIN REINFORCEMENT
   - 311 FRAME AND GRATING FOR CATCH BASINS
   - 635 STEEL STEP
   - 636 POLYPROPYLENE PLASTIC STEP

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
GRATING CATCH BASIN – ALLEY (LONGITUDINAL)	**304–4** SHEET 2 OF 2

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STRUCTURAL DATA

WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS

NO. OF GRATES	MAX V	t	REINFORCEMENT FOR WALLS AND SLABS
2–3	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
2–3	8' (2.4 m)	8" (200 mm)	
2–3	10' (3.0 m)	10" (250 mm)	
2–3	12' (3.5 m)	10" (250 mm)	REQUIRED
4–6	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
4–6	7' (2.0 m)	8" (200 mm)	
4–6	8' (2.4 m)	8" (200 mm)	REQUIRED
4–6	12' (3.5 m)	10" (250 mm)	
7–9	4' (1.2 m)	6" (150 mm)	NOT REQUIRED
7–9	6' (1.8 m)	8" (200 mm)	
7–9	8' (2.4 m)	8" (200 mm)	REQUIRED
7–9	12' (3.5 m)	10" (250 mm)	
> 9	4' (1.2 m)	6" (150 mm)	
> 9	8' (2.4 m)	8" (200 mm)	
> 9	12' (3.5 m)	10" (250 mm)	

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1992, 1996, 2009, 2021

GRATING CATCH BASIN – ALLEY (TRANSVERSE)

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 305–4

SHEET 1 OF 2

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NOTES:

1. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.
2. TWO GRATINGS ARE REQUIRED UNLESS OTHERWISE SHOWN ON THE PLANS.
3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1V:12H MINIMUM AND 1V:3H MAXIMUM. SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.
4. DIMENSIONS:

   V = 3'–6" (1.0 m)

   V_I = THE DEPTH AT THE INVERT OF THE INLET. NOTED ON THE PLANS.

   V_U = THE DEPTH AT THE UPSTREAM END OF THE CATCH BASIN. IT SHALL BE DETERMINED BY THE REQUIREMENTS OF NOTE 3, BUT SHALL NOT BE LESS THAN 2'–6" (750 mm).

   W_G = 4'–3 1/2" (1308 mm) FOR TWO GRATINGS; ADD 2'–2" (660 mm) FOR EACH ADDITIONAL GRATING.

   A = THE ANGLE, IN DEGREES, INTERCEPTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.

5. PLACE CONNECTOR PIPES AS INDICATED ON THE PLANS. UNLESS OTHERWISE SPECIFIED, THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO ENSURE MINIMUM 7" (175 mm) PIPE EMBEDMENT, ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3" (75 mm) RADIUS OF ROUNDING OF STRUCTURE CONCRETE, ALL AROUND, ADJACENT TO PIPE END. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70° OR GREATER THAN 110°, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.
6. STEPS SHALL BE LOCATED AS SHOWN. IF THE CONNECTOR PIPE INTERFERES WITH THE STEPS, THEY SHALL BE LOCATED ON THE OPPOSITE WALL. STEPS SHALL BE SPACED 300 mm (12") APART. THE TOP STEP SHALL BE 7" (175 mm) BELOW THE TOP OF THE GRATING AND PROJECT 2–1/2" (65 mm). ALL OTHER STEPS SHALL PROJECT 5" (130 mm).
7. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

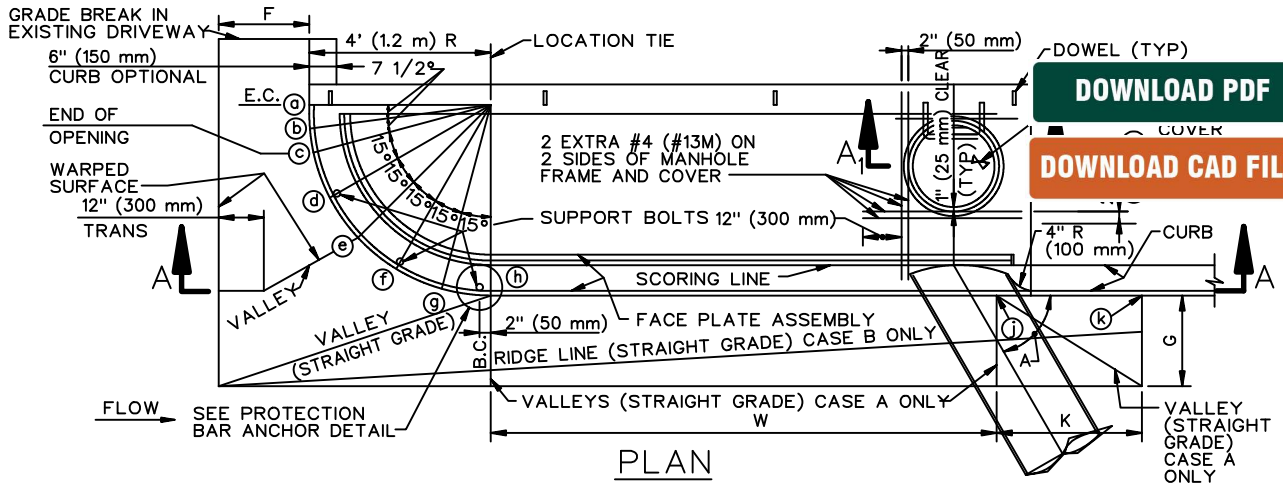
   308 MONOLITHIC CATCH BASIN CONNECTION
   309 CATCH BASIN REINFORCEMENT
   311 FRAME AND GRATING FOR CATCH BASINS
   635 STEEL STEP
   636 POLYPROPYLENE PLASTIC STEP

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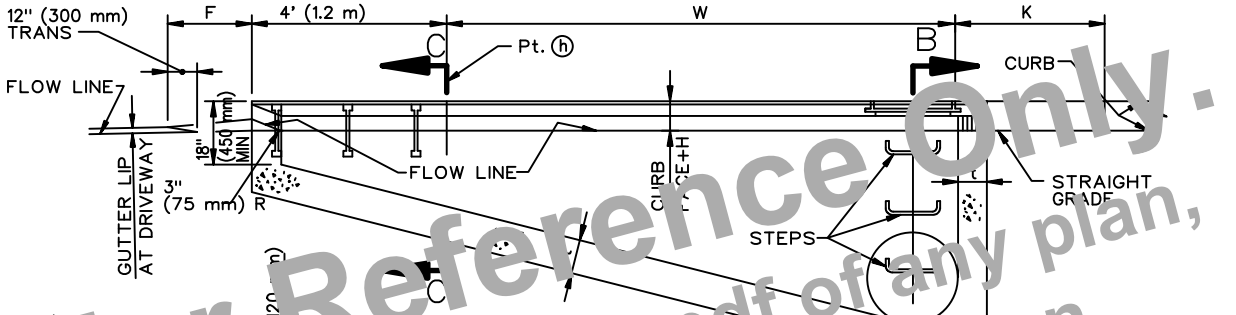
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
GRATING CATCH BASIN – ALLEY (TRANSVERSE)	**305–4**
	SHEET 2 OF 2

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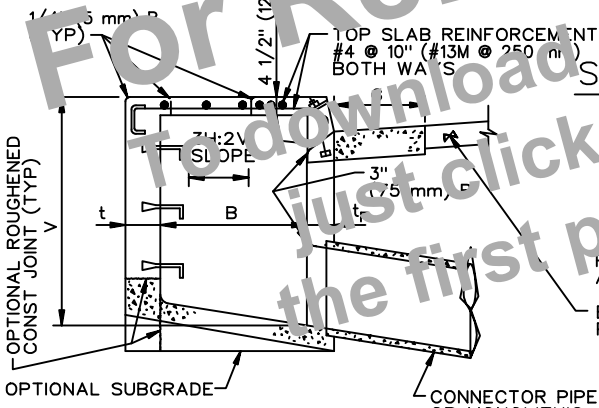
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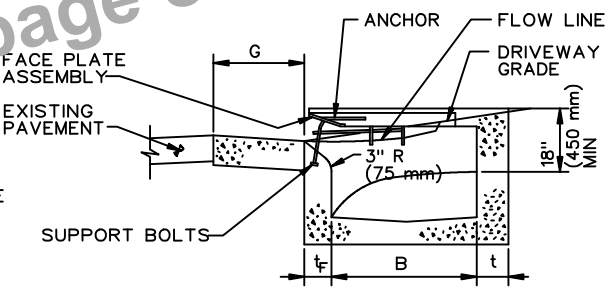
PLAN



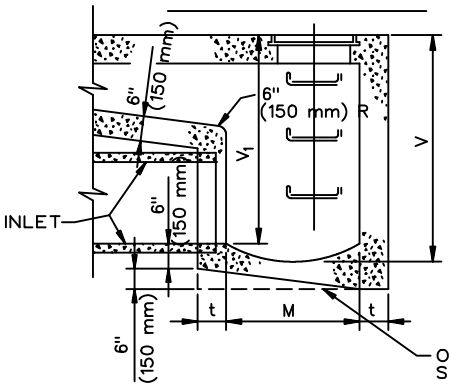
SECTION A–A



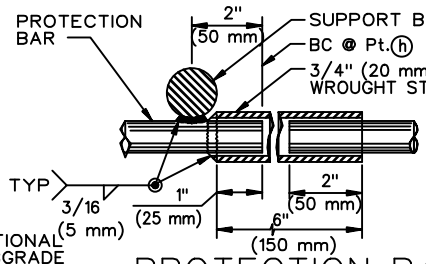
SECTION B–B



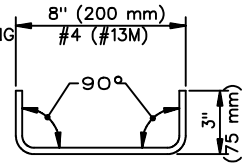
SECTION C–C



SECTION A1– A1
OUTLET CHAMBER



PROTECTION BAR
ANCHOR DETAIL



DOWEL DETAIL

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1992, 1996, 2009, 2021

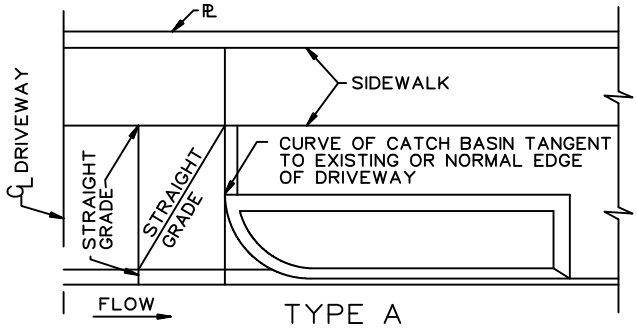
CURB OPENING CATCH BASIN AT DRIVEWAY

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

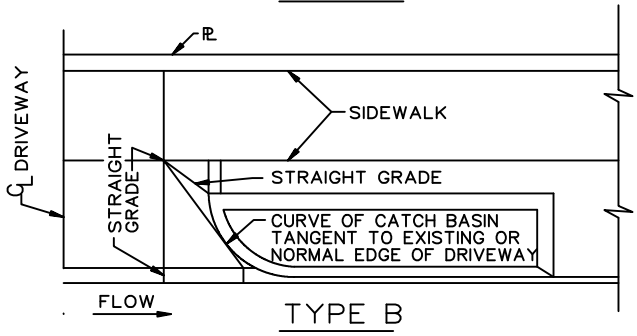
STANDARD PLAN 306–4

SHEET 1 OF 3

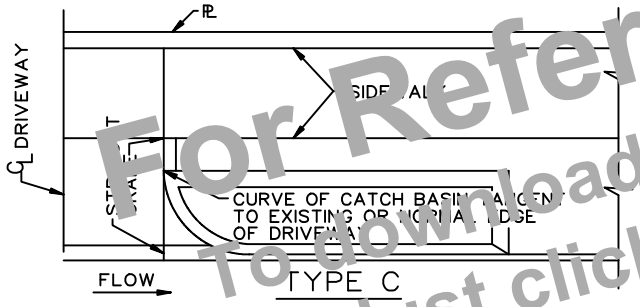
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TYPE A



TYPE B



TYPE C

CATCH BASIN LOCATION AT DRIVEWAYS

	DIMENSIONS FOR CASE A AND CASE B	
	CASE A	CASE B
G	WIDTH OF EXISTING GUTTER WITH A 24" (600 mm) MINIMUM	4'–0" (1200 mm)
H	2" (50 mm)	4" (100 mm)
F	2'–0" (600 mm)	3'–0" (900 mm)
K	3'–0" (900 mm)	5'–0" (1500 mm)

POINT	CURB FACE HEIGHT	
	CASE A	CASE B
a	2-1/2" (65 mm)	4" (100 mm)
b	4" (100 mm)	6" (150 mm)
c	5-1/2" (140 mm)	7–3/4" (195 mm)
d	8–1/2" (215 mm)	10–1/2" (265 mm)
e	10" (250 mm)	2'–0" (300 mm)
f	10" (250 mm)	12" (300 mm)
g	10" (250 mm)	12" (300 mm)
h	10" (250 mm)	12" (300 mm)
i	10" (250 mm)	12" (300 mm)
j	EXISTING	EXISTING

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STRUCTURAL DATA

WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS

MAX W	MAX V	t	t_F	REINFORCEMENT REQUIRED IN			
				FRONT WALL	REAR WALL	BOTTOM SLAB	END WALL
3.5' (1.0 m)	8' (2.4 m)	6" (150 mm)	6" (150 mm)	NO REINFORCEMENT REQUIRED			
3.5' (1.0 m)	12' (3.5 m)	8" (200 mm)	8" (200 mm)				
7' (2.0 m)	6' (1.8 m)	6" (150 mm)	6" (150 mm)				
7' (2.0 m)	12' (3.5 m)	8" (200 mm)	8" (200 mm)				
14' (4.0 m)	4' (1.2 m)	6" (150 mm)	6" (150 mm)				
14' (4.0 m)	8' (2.4 m)	6" (150 mm)	8" (200 mm)				
14' (4.0 m)	12' (3.5 m)	8" (200 mm)	10" (250 mm)				
21' (6 m) AND 28' (9 m)	4' (1.2 m)	6" (150 mm)	6" (150 mm)				
	6' (1.8 m)	6" (150 mm)	8" (200 mm)				
	8' (2.4 m)	8" (200 mm)	8" (200 mm)				
	10' (3.0 m)	8" (200 mm)	10" (250 mm)				
	12' (3.5 m)	8" (200 mm)	10" (250 mm)				

FOR W > 28' (9 m), V > 12' (3.5 m) OR B > 4' (1.2 m) SEE PLANS

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

CURB OPENING CATCH BASIN AT DRIVEWAY

STANDARD PLAN 306–4

SHEET 2 OF 3

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NOTES:

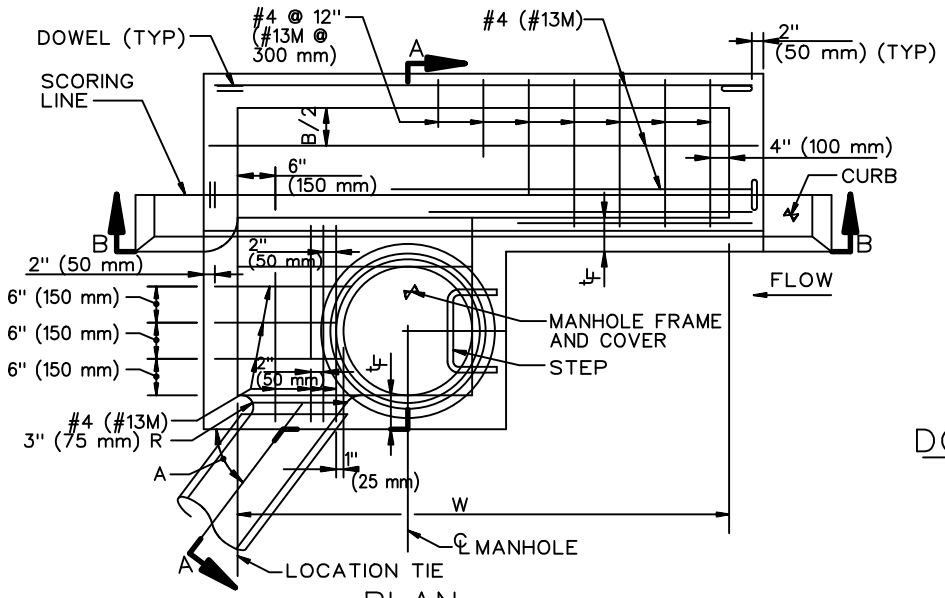
1. WHERE THE BASIN IS TO BE CONSTRUCTED WITHIN THE LIMITS OF EXISTING OR PROPOSED SIDEWALK OR IS CONTIGUOUS TO SUCH SIDEWALK, THE TOP SLAB OF THE BASIN MAY BE POURED EITHER MONOLITHIC WITH THE SIDEWALK OR SEPARATELY, USING THE SAME CLASS OF CONCRETE AS IN THE BASIN. WHEN POURED MONOLITHICALLY, THE SIDEWALK SHALL BE PROVIDED WITH A WEAKENED PLANE OR A 1" (25 mm) DEEP SAWCUT CONTINUOUSLY AROUND THE EXTERNAL PERIMETER OF THE CATCH BASIN WALLS, INCLUDING ACROSS THE FULL WIDTH OF THE SIDEWALK. SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE, GRADE, COLOR, FINISH, AND SCORING TO EXISTING OR PROPOSED CURB AND WALK ADJACENT TO THE BASIN.
2. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.
3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1V:12H MINIMUM AND 1V:3H MAXIMUM, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8%, 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.
4. CATCH BASIN SHALL BE CASE A UNLESS OTHERWISE SPECIFIED.
5. DIMENSIONS:
   - W = 10' (3 m)
   - B = 3'–2" (970 mm)
   - M = 3' (900 mm)
   - V = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE CATCH BASIN AT THE OUTLET = 5.0' (1.5 m).
   - V_I = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE INLET, NOTED ON THE PLANS.
   - A = THE ANGLE, IN DEGREES, INTERCEPTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.
6. PLACE CONNECTOR PIPES AS INDICATED ON THE PLANS. UNLESS OTHERWISE SPECIFIED, THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW AS NECESSARY TO ENSURE MINIMUM 3" (75 mm) PENETRATION ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3" (75 mm) RADIUS OF ROUNDING OF STRUCTURE CONCRETE, ALL AROUND AND ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70° OR GREATER THAN 110°, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.
7. STEPS SHALL BE LOCATED AS SHOWN. IF THE CONNECTOR PIPE INTERFERES WITH THE STEPS, THEY SHALL BE LOCATED AT THE CENTERLINE OF THE DOWNSTREAM WALL. STEPS SHALL BE SPACED 12" (300 mm) APART. THE TOP STEP SHALL BE 7" (175 mm) BELOW THE TOP OF THE MANHOLE AND PROJECT 2–1/2" (65 mm). ALL OTHER STEPS SHALL PROJECT 5" (130 mm).
8. DOWELS ARE REQUIRED AT EACH CORNER AND AT 7' (2.0 m) ON CENTER (MAXIMUM) ALONG THE BACKWALL.
9. WHEN CONNECTOR INLETS INTO THE UPSTREAM END OF THE CATCH BASIN, CONSTRUCT AN OUTLET CHAMBER AS SHOWN IN SECTION A_1–A_1.
10. FACE PLATE ASSEMBLY:
    THE FACE PLATE FOR THE CIRCULAR PORTION OF THE CATCH BASIN OPENING SHALL BE CAST STEEL OF MILD TO MEDIUM STRENGTH. SEGMENTED CASTINGS SHALL BE BEVELED AND BUTT WELDED TO THE REQUIRED FULL LENGTH ALONG A TRUE ARC AND SECURED TO THE TOP SLAB BY ANCHORS. ONE ANCHOR SHALL BE PLACED AT EACH END OF THE ASSEMBLY AND THE OTHERS SPACED EQUALLY BETWEEN THE END ANCHORS. THERE SHALL BE AT LEAST ONE ANCHOR ON EACH CASTING. BEND PROTECTION BAR TO 4' (1.2 m) RADIUS AROUND CURB RETURN. WELD TO SUPPORT BOLTS AT POINTS D, F, & H. END BAR AT POINT D.
11. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:
    - 308 MONOLITHIC CATCH BASIN CONNECTION
    - 309 CATCH BASIN REINFORCEMENT
    - 310 CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR
    - 312 CATCH BASIN MANHOLE FRAME AND COVER
    - 635 STEEL STEP
    - 636 POLYPROPYLENE PLASTIC STEP

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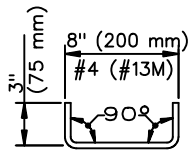
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB OPENING CATCH BASIN AT DRIVEWAY	**306–4**
	SHEET 3 OF 3

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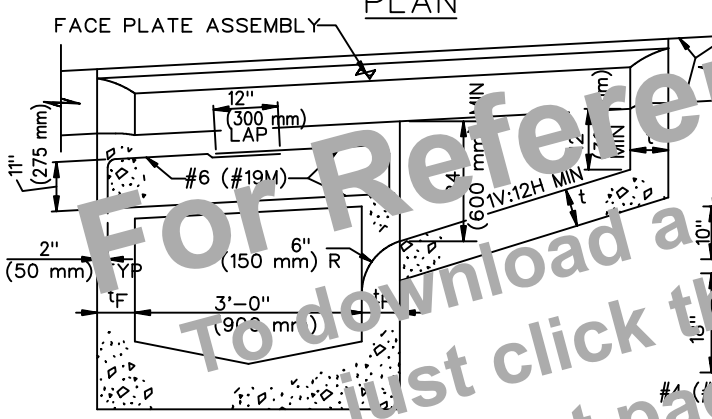
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PLAN

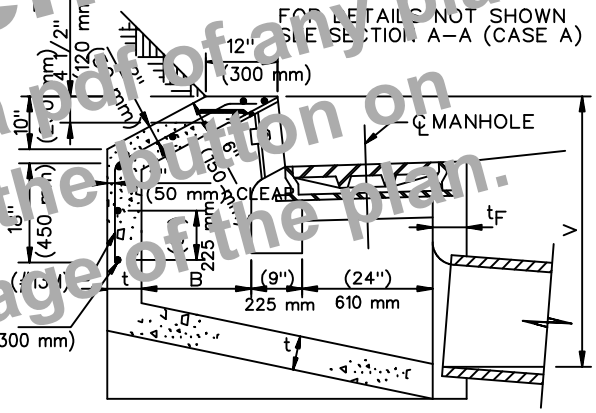


DOWEL DETAIL

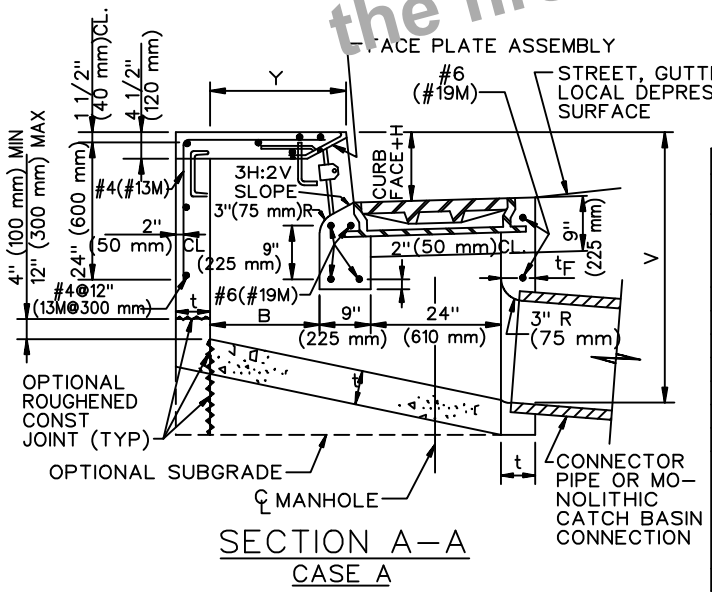


SECTION B–B

NOTE:
FOR DETAILS NOT SHOWN SEE SECTION A–A (CASE A)



SECTION A–A
CASE B



SECTION A–A
CASE A

STRUCTURAL DATA

WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS

MAX W	MAX V	t	t_F	REINFORCEMENT REQUIRED IN			
				FRONT WALL	REAR WALL	BOTTOM SLAB	END WALL
3.5' (1.0 m)	8' (2.4 m)	6" (150 mm)	6" (150 mm)	NO REINFORCEMENT REQUIRED			
3.5' (1.0 m)	12' (3.5 m)	8" (200 mm)	8" (200 mm)				
7' (2.0 m)	6' (1.8 m)	6" (150 mm)	6" (150 mm)				
7' (2.0 m)	12' (3.5 m)	8" (200 mm)	8" (200 mm)				
14' (4.0 m)	4' (1.2 m)	6" (150 mm)	6" (150 mm)				
14' (4.0 m)	8' (2.4 m)	6" (150 mm)	8" (200 mm)				
14' (4.0 m)	12' (3.5 m)	8" (200 mm)	10" (250 mm)				
21'(6 m) AND 28'(9 m)	4' (1.2 m)	6" (150 mm)	6" (150 mm)	REINFORCEMENT REQUIRED			
	6' (1.8 m)	6" (150 mm)	8" (200 mm)				
	8' (2.4 m)	8" (200 mm)	8" (200 mm)				
	10' (3.0 m)	8" (200 mm)	10" (250 mm)				
	12' (3.5 m)	8" (200 mm)	10" (250 mm)				

FOR W > 28'(9 m), V > 12'(3.5 m) OR B > 4'(1.2 m) SEE PLANS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1992, 1996, 2009, 2021

CURB OPENING CATCH BASIN WITH MANHOLE IN STREET

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 307–4

SHEET 1 OF 2

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NOTES:

1. WHERE THE BASIN IS TO BE CONSTRUCTED WITHIN THE LIMITS OF EXISTING OR PROPOSED SIDEWALK OR IS CONTIGUOUS TO SUCH SIDEWALK, THE TOP SLAB OF THE BASIN MAY BE POURED EITHER MONOLITHIC WITH THE SIDEWALK OR SEPARATELY, USING THE SAME CLASS OF CONCRETE AS IN THE BASIN. WHEN POURED MONOLITHICALLY, THE SIDEWALK SHALL BE PROVIDED WITH A WEAKENED PLANE OR A 1" (25 mm) DEEP SAWCUT CONTINUOUSLY AROUND THE EXTERNAL PERIMETER OF THE CATCH BASIN WALLS, INCLUDING ACROSS THE FULL WIDTH OF THE SIDEWALK. SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE, GRADE, COLOR, FINISH, AND SCORING TO EXISTING OR PROPOSED CURB AND WALK ADJACENT TO THE BASIN.

2. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.

3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH, FLOOR OF MANHOLE CHAMBER SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1V:12H MINIMUM AND 1V:3H MAXIMUM SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.

4. CATCH BASIN SHALL BE CASE A UNLESS OTHERWISE SPECIFIED.

5. DIMENSIONS:

   W = 7' (2 m)

   B = 20" (500 mm)

   Y = 24" (600 mm)

   V = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE CATCH BASIN AT THE OUTLET = 4.5' (1.75 m).

   V_I = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE INLET, NOTED ON THE PLANS.

   H = NOTED ON THE PLANS.

   A = THE ANGLE IN DEGREES, INTERCEPTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.

6. PLACE CONNECTOR PIPES AS INDICATED ON THE PLANS. UNLESS OTHERWISE SPECIFIED, THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO ENSURE MINIMUM 3" (75 mm) PIPE EMBEDMENT, ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3" (75 mm) RADIUS OF ROUNDING OF STRUCTURE CONCRETE, ALL AROUND, ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70° OR GREATER THAN 110°, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.

7. STEPS SHALL BE LOCATED AS SHOWN. IF THE CONNECTOR PIPE INTERFERES WITH THE STEPS, THEY SHALL BE LOCATED ON THE FRONT WALL OF THE MANHOLE CHAMBER OR THE DOWNSTREAM WALL OF THE MANHOLE CHAMBER AND THE MANHOLE MOVED DOWNSTREAM 12" (300 mm). STEPS SHALL BE SPACED 12" (300 mm) APART. THE TOP STEP SHALL BE 7" (175 mm) BELOW THE TOP OF THE MANHOLE AND PROJECT 2–1/2" (65 mm). ALL OTHER STEPS SHALL PROJECT 5" (130 mm).

8. DOWELS ARE REQUIRED AT EACH CORNER AND AT 7' (2.0 m) ON CENTER (MAXIMUM) ALONG THE BACKWALL.

9. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

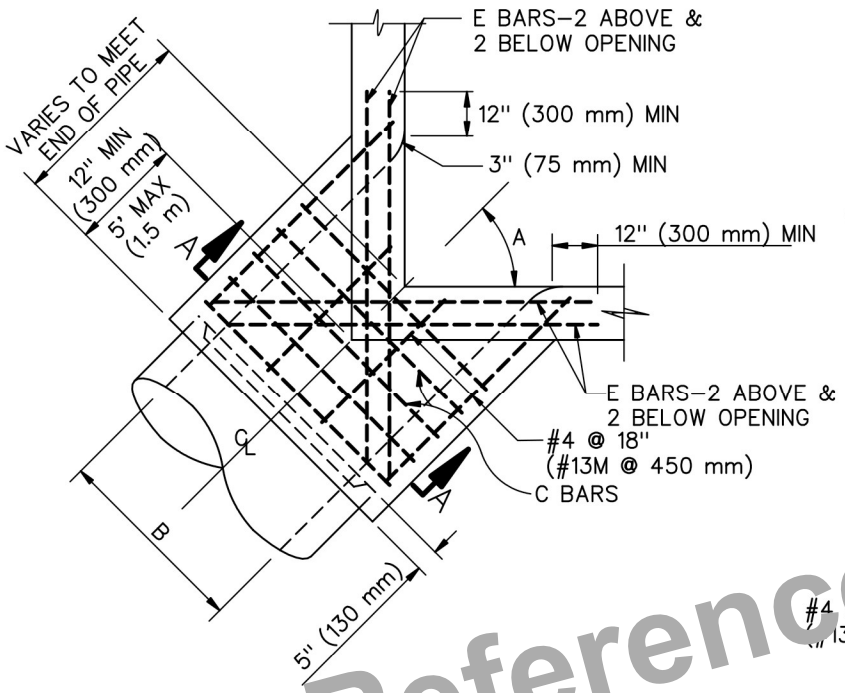
   308 MONOLITHIC CATCH BASIN CONNECTION
   309 CATCH BASIN REINFORCEMENT
   310 CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR
   630 24" (610 mm) MANHOLE FRAME AND COVER
   635 STEEL STEP

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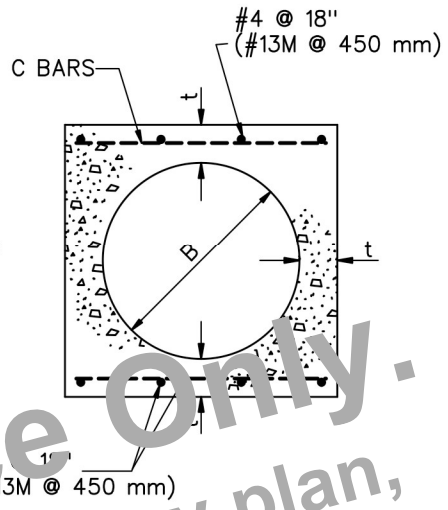
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CURB OPENING CATCH BASIN WITH MANHOLE IN STREET	**307–4**
	SHEET 2 OF 2

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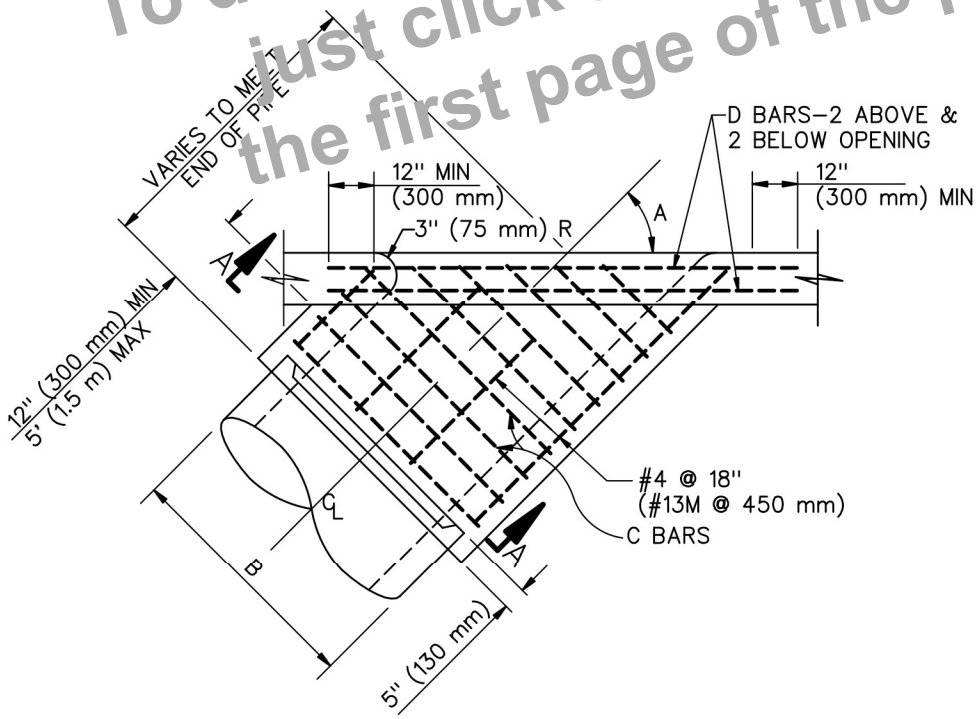


PLAN
CORNER CONNECTION



SECTION A–A

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PLAN
SIDE CONNECTION

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1996, 2009, 2021

MONOLITHIC CATCH BASIN CONNECTION

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
308–3
SHEET 1 OF 2

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STRUCTURAL DATA							
B	t	C BARS	D&E BARS	B	t	C BARS	D&E BARS
12" (300 mm)	4" (115 mm)	#4 @ 6" (#13M @ 150 mm)	#5 (#16M)	42" (1050 mm)	7 1/2" (190 mm)	#5 @ 6" (#16M @ 150 mm)	#6 (#19M)
15" (375 mm)	4–1/4" (115 mm)			45" (1125 mm)	7 3/4" (215 mm)		
18" (450 mm)	4–1/2" (115 mm)			48" (1200 mm)	8" (215 mm)		
21" (525 mm)	5" (140 mm)			51" (1275 mm)	8 1/2" (215 mm)		
24" (600 mm)	5 1/4" (140 mm)			54" (1350 mm)	9" (240 mm)		
27" (675 mm)	5 1/2" (140 mm)			57" (1425 mm)	9 1/4" (240 mm)		
30" (750 mm)	6" (165 mm)			60" (1500 mm)	9 1/2" (240 mm)		
33" (825 mm)	6 1/4" (165 mm)			63" (1575 mm)	10" (260 mm)		
36" (900 mm)	6 1/2" (165 mm)			66" (1650 mm)	10 1/4" (260 mm)		
39" (975 mm)	7" (190 mm)			69" (1725 mm)	11 3/4" (280 mm)		
				72" (1800 mm)	11" (280 mm)		
FOR B GREATER THAN 72" (1800 mm) SEE PLANS							

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NOTES

1. REINFORCING STEEL SHALL BE 1–1/2" (40 mm) CLEAR FROM FACE OF CONCRETE UNLESS OTHERWISE SHOWN.

2. REINFORCING STEEL FOR INSIDE FACE OF CATCH BASIN SHALL BE CUT AT CENTER OF OPENING AND BENT INTO WALLS OF MONOLITHIC CATCH BASIN CONNECTION. REINFORCING STEEL FOR OUTSIDE FACE OF CATCH BASIN SHALL BE CUT 2" (50 mm) CLEAR OF OPENING.

3. CONNECTION SHALL BE PLACED MONOLITHIC WITH CATCH BASIN. THE ROUNDED EDGE OF OUTLET SHALL BE CONSTRUCTED BY PLACING CONCRETE WITH THE SAME CLASS OF CONCRETE AS THE CATCH BASIN AGAINST A CURVED FORM WITH A RADIUS OF 3" (75 mm).

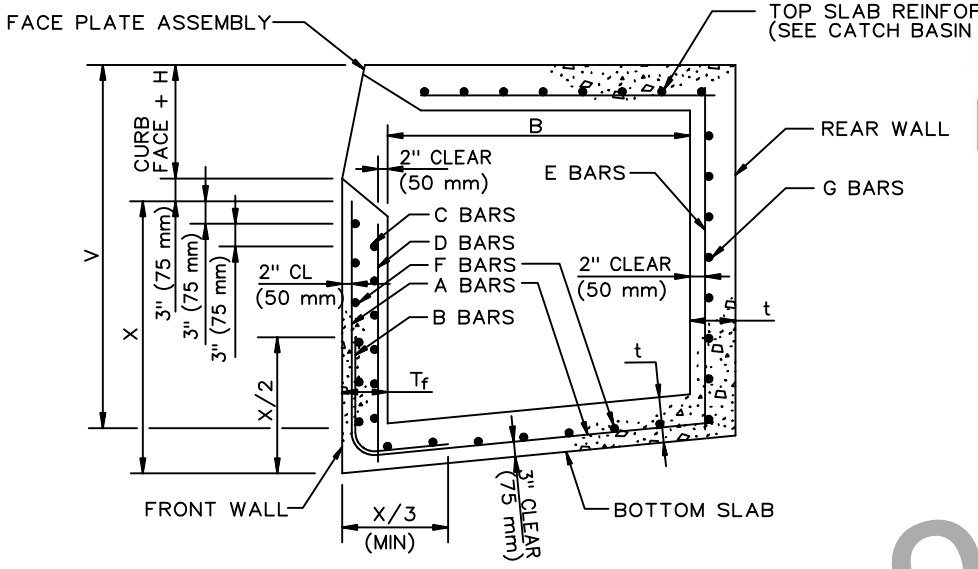
4. CONNECTIONS SHALL BE CONSTRUCTED WHEN:

   (A) PIPES INLET OR OUTLET THROUGH CORNER OF CATCH BASIN

   (B) ANGLE A FOR PIPES THROUGH 30" (750 mm) IN DIAMETER IS LESS THAN 70° OR GREATER THAN 110°.

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TYPICAL REINFORCEMENT DETAILS

MAX. W	MAX. V	t	tf	A & B BARS	C BARS	D BARS	E BARS	F BARS	G BARS
3.5' (1 m)	[illegible]	6" [illegible]	[illegible] (50 mm)	—	—	—	—	—	—
3.5' (1 m)	[illegible]	[illegible]	[illegible] (200 mm)	—	—	—	—	—	—
7' (2 m)	6' (1.8m)	6" (150 mm)	6" (150 mm)	—	—	—	—	—	—
7' (2 m)	12' (3.5m)	8" (200 mm)	[illegible] (200 mm)	—	—	—	—	—	—
14' (4 m)	4' (1.2m)	6" (150 mm)	6" (150 mm)	—	#4 @ 12" (13M @ 300 mm)	#4 @ 18" (13M @ 450 mm)	—	—	—
14' (4 m)	8' (2.4m)	6" (150 mm)	8" (200 mm)	—	#4 @ 12" (13M @ 300 mm)	#4 @ 18" (13M @ 450 mm)	—	—	—
14' (4 m)	12' (3.5 m)	8" (200 mm)	10" (250 mm)	—	#4 @ 6" (13M @ 150 mm)	#4 @ 18" (13M @ 450 mm)	—	—	—
28' (9 m)	4' (1.2m)	6" (150 mm)	6" (150 mm)	#4 @ 24" (13M @ 600 mm)	—	—	—	#4 @ 18" (13M @ 450 mm)	—
28' (9 m)	5' (1.5m)	6" (150 mm)	8" (200 mm)	#4 @ 24" (13M @ 600 mm)	—	—	—	#4 @ 18" (13M @ 450 mm)	—
28' (9 m)	6' (1.8m)	6" (150 mm)	8" (200 mm)	#4 @ 18" (13M @ 450 mm)	—	—	—	#4 @ 18" (13M @ 450 mm)	—
28' (9 m)	7' (2.1m)	8" (200 mm)	8" (200 mm)	#4 @ 17" (13M @ 425 mm)	—	—	—	#4 @ 18" (13M @ 450 mm)	—
28' (9 m)	8' (2.4m)	8" (200 mm)	8" (200 mm)	#4 @ 13" (13M @ 325 mm)	—	—	—	#4 @ 18" (13M @ 450 mm)	—
28' (9 m)	9' (2.7m)	8" (200 mm)	10" (250 mm)	#4 @ 15" (13M @ 375 mm)	—	—	—	#4 @ 18" (13M @ 450 mm)	—
28' (9 m)	10' (3.0m)	8" (200 mm)	10" (250 mm)	#4 @ 12" (13M @ 300 mm)	—	—	—	#4 @ 18" (13M @ 450 mm)	—
28' (9 m)	11' (3.3m)	8" (200 mm)	10" (250 mm)	#5 @ 15" (16M @ 375 mm)	—	—	#4 @ 10" (13M @ 250 mm)	#4 @ 18" (13M @ 450 mm)	#4 @ 18" (13M @ 450 mm)
28' (9 m)	12' (3.5m)	8" (200 mm)	10" (250 mm)	#4 @ 18" (13M @ 450 mm)	—	—	#4 @ 10" (13M @ 250 mm)	#4 @ 18" (13M @ 450 mm)	#4 @ 18" (13M @ 450 mm)
FOR W > 28' (9 m) OR B > 4' (1200 mm) SEE PLANS									

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CURB OPENING CATCH BASIN REINFORCEMENT

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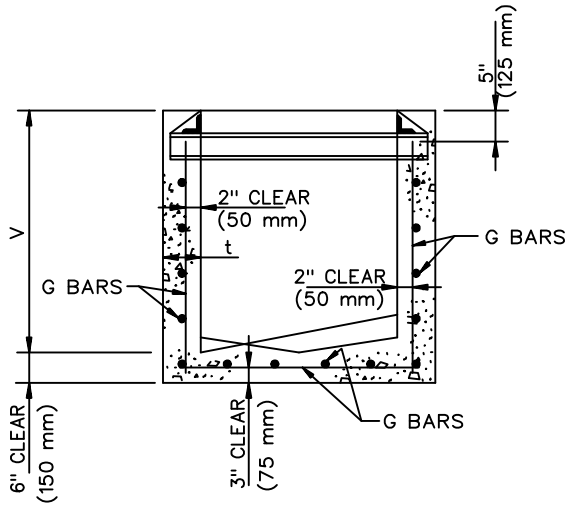
CATCH BASIN REINFORCEMENT

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 309–3

SHEET 1 OF 2

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TYPICAL REINFORCEMENT DETAILS

V MAX	t	SIDE AND END WALL STEEL G BARS
(1.2 m)	(100 mm)	#4 @ 10" (#13M @ 250 mm)
8 (2.4 m)	8" (200 mm)	#4 @ 6" (#13M @ 150 mm)
12 (3.5 m)	10" (250 mm)	#5 @ 6" (#16M @ 150 mm)
FOR V > 12' (3.5 m) SEE PLANS		

GRATING CATCH BASIN REINFORCEMENT

NOTE:

UNLESS OTHERWISE SPECIFIED, REINFORCEMENT FOR CURB OPENINGS AND GRATING CATCH BASINS SHALL TERMINATE 2" (50 mm) FROM FACE OF CONCRETE.

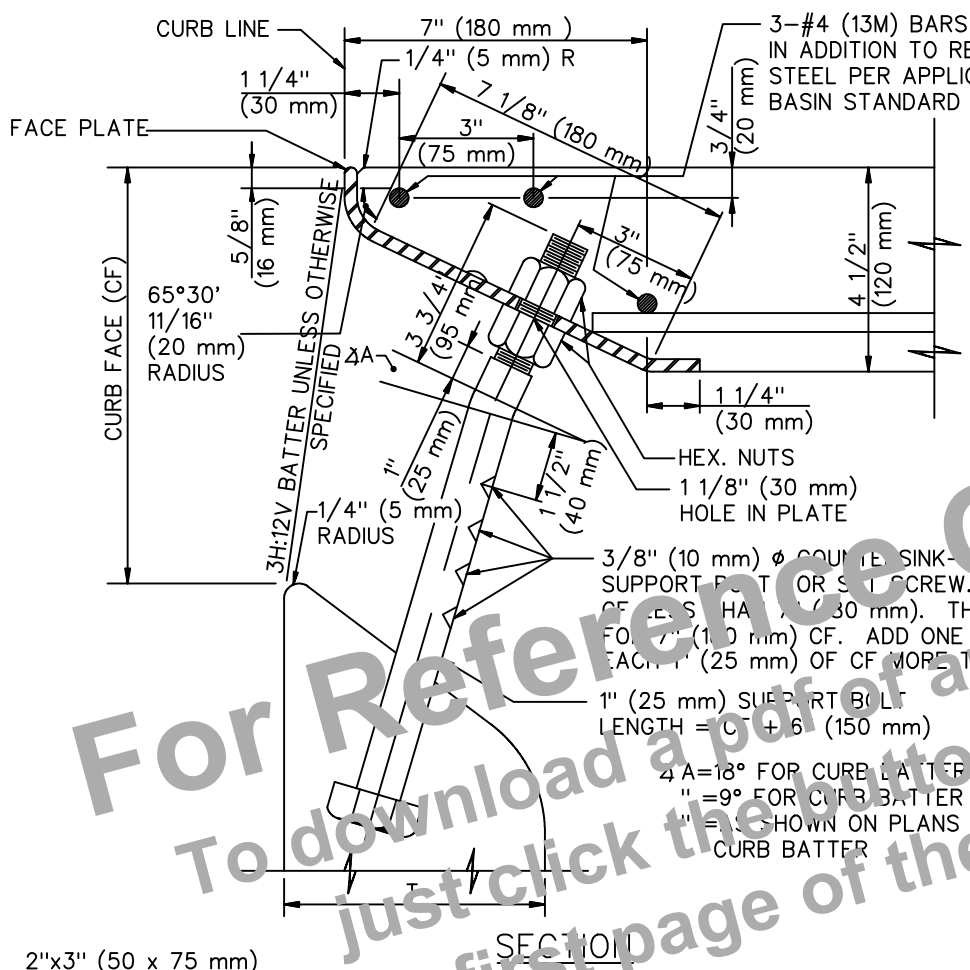
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CATCH BASIN REINFORCEMENT	**309–3**
	SHEET 2 OF 2

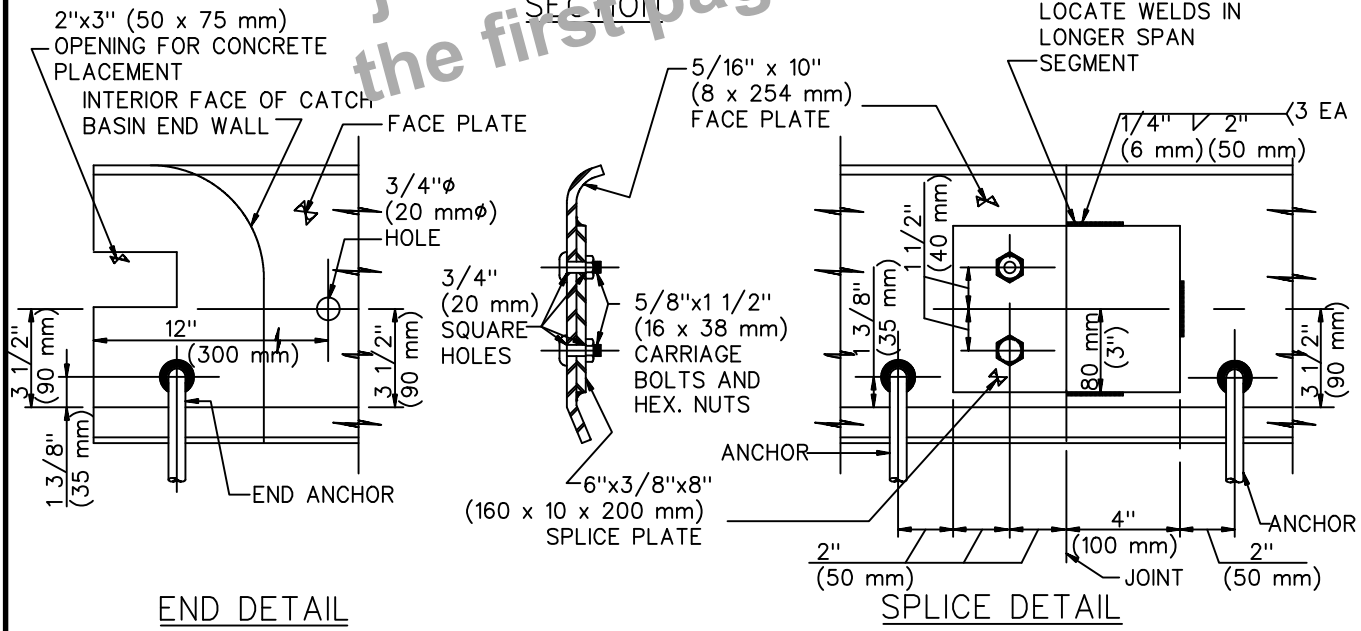
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SUPPORT BOLT AND FACE PLATE 4 1/2" (120 mm) TOP SLAB

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SECTION



END DETAIL

SPLICE DETAIL

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR

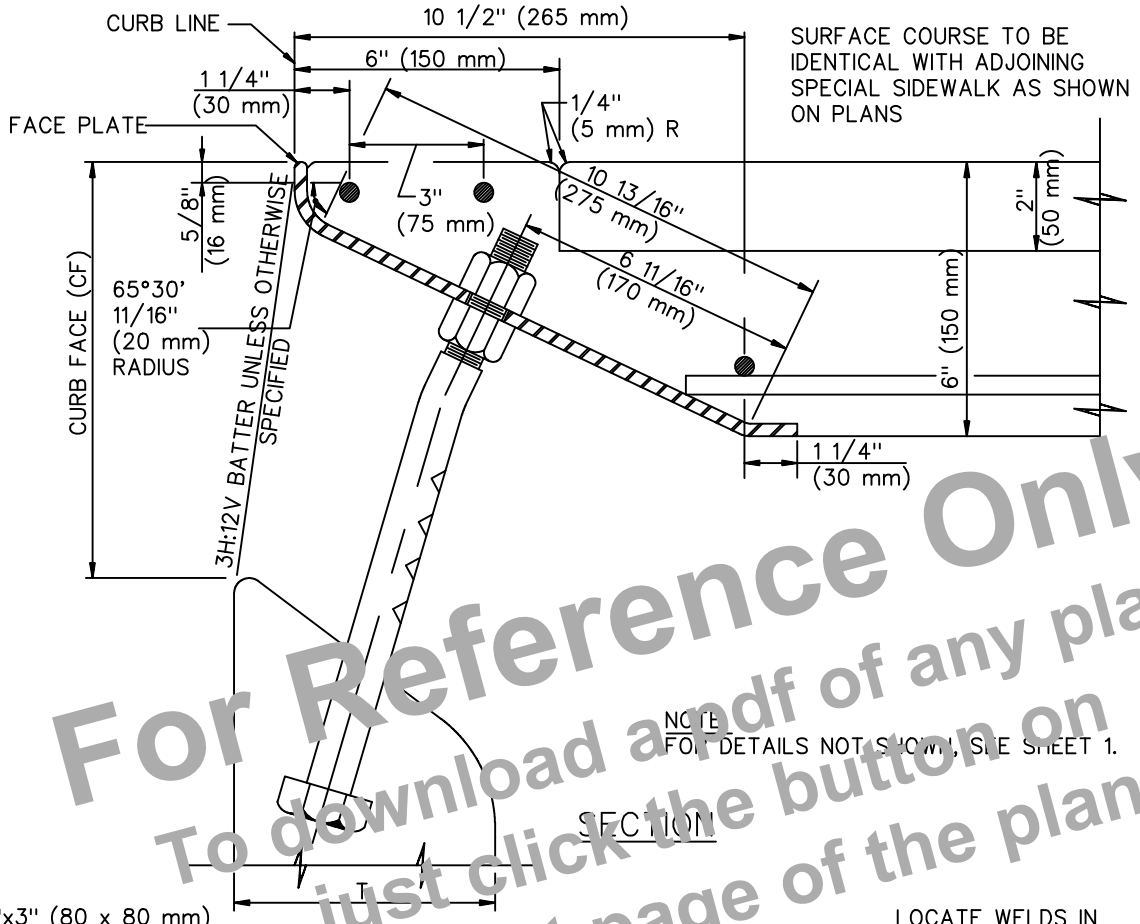
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

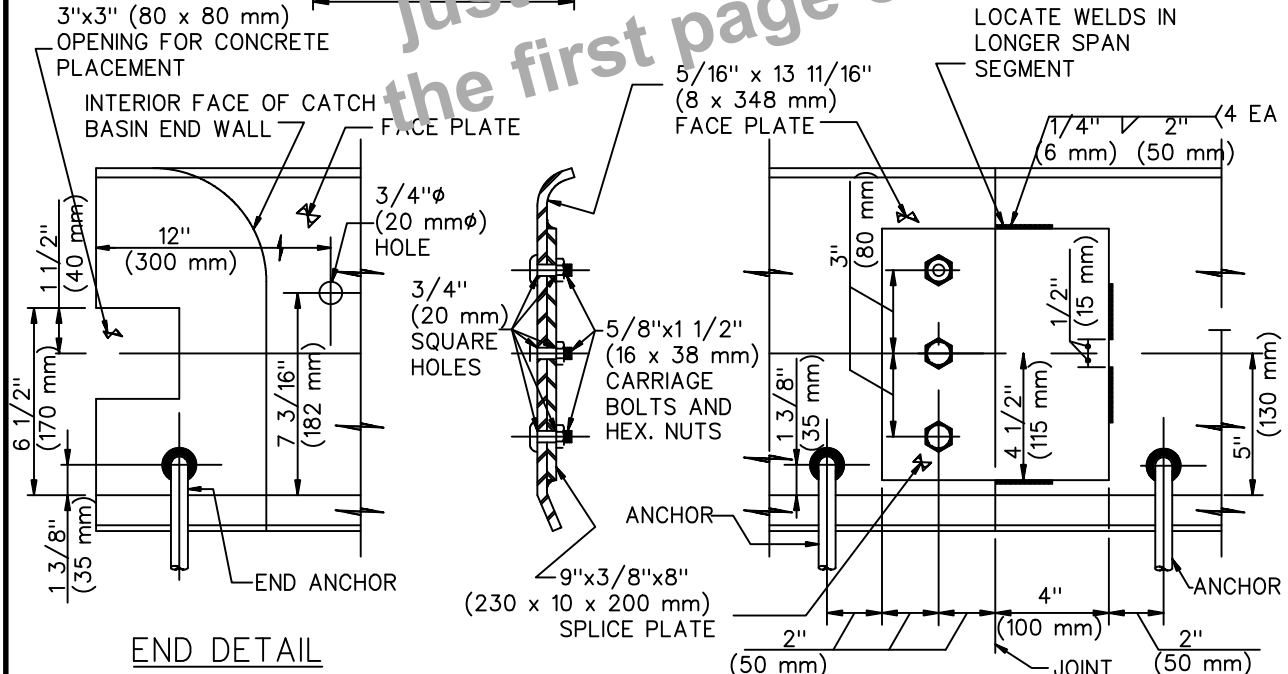
STANDARD PLAN 310-4

SHEET 1 OF 6

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SUPPORT BOLT AND FACE PLATE 150 mm (6") TOP SLAB



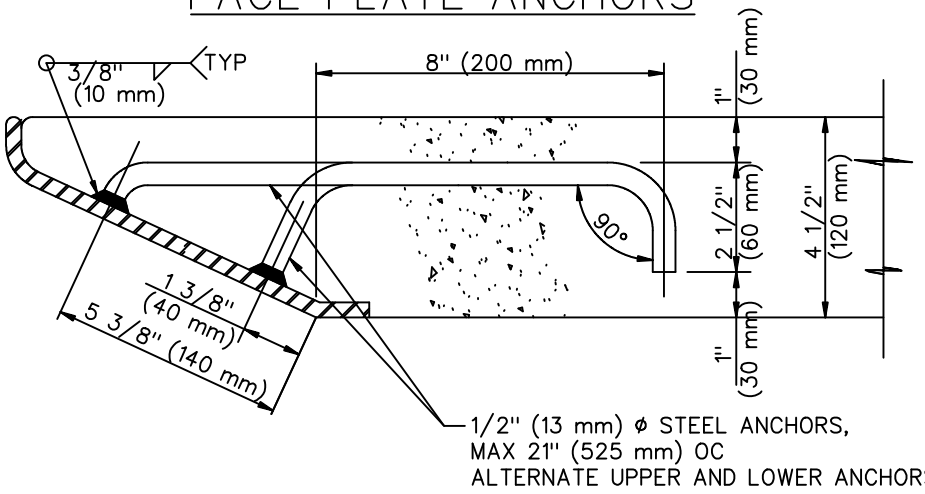


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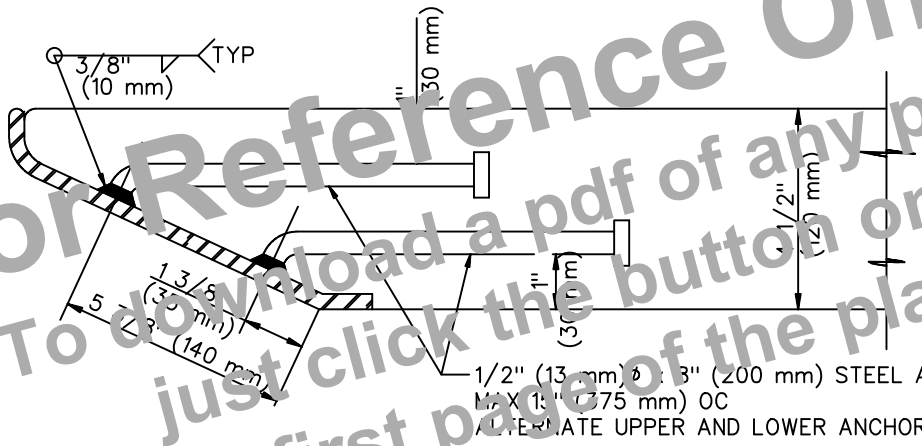
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR	**310–4**
	SHEET 2 OF 6

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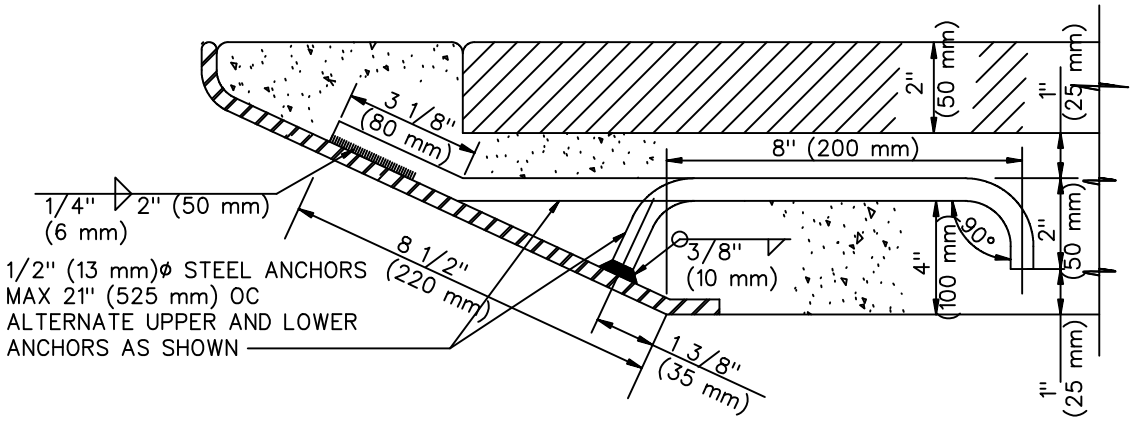
FACE PLATE ANCHORS



HOOK ANCHOR – 4 1/2" (120 mm) TOP SLAB



ROUND HEAD ANCHOR – 4 1/2" (120 mm) TOP SLAB



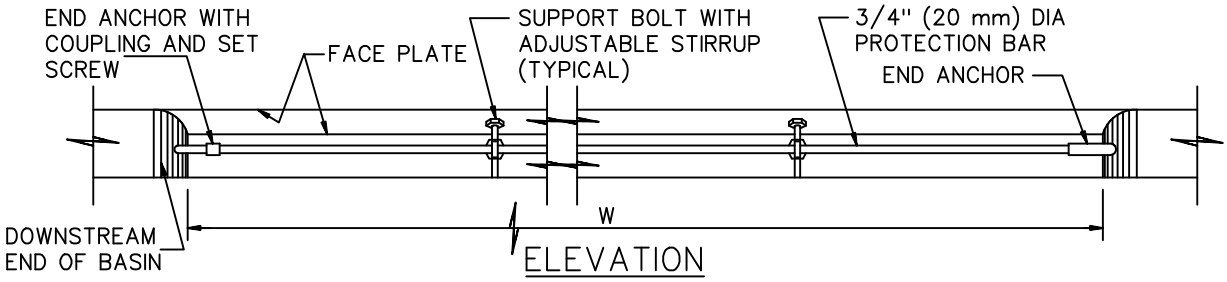
HOOK ANCHOR – 6" (150 mm) TOP SLAB

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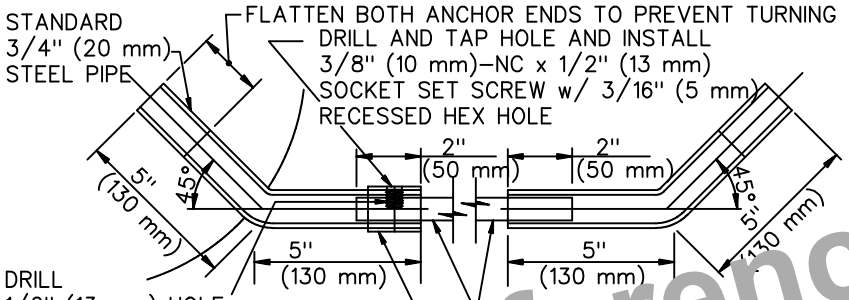
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR	310–4
	SHEET 3 OF 6

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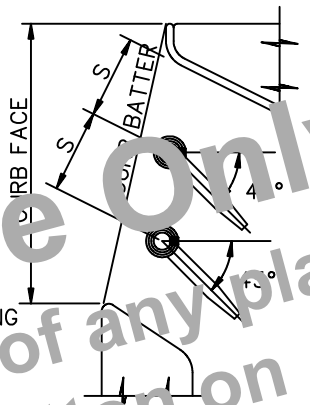
PROTECTION BAR AND SUPPORT BOLT(S) WITH ADJUSTABLE STIRRUP(S) – (TYPE A)



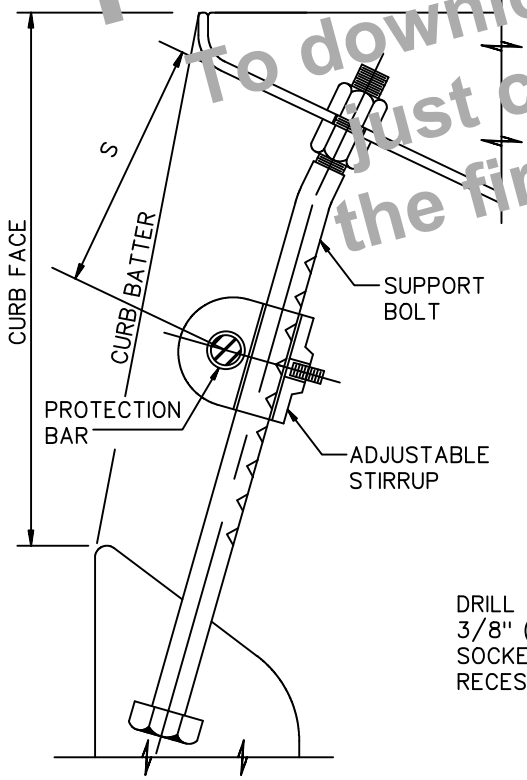
ELEVATION



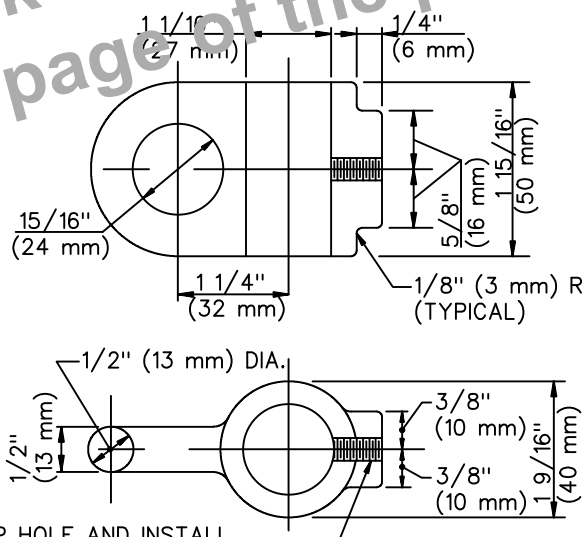
END ANCHOR DETAIL



DOUBLE PROTECTION BAR DETAIL



PROTECTION BAR & STIRRUP LOCATION



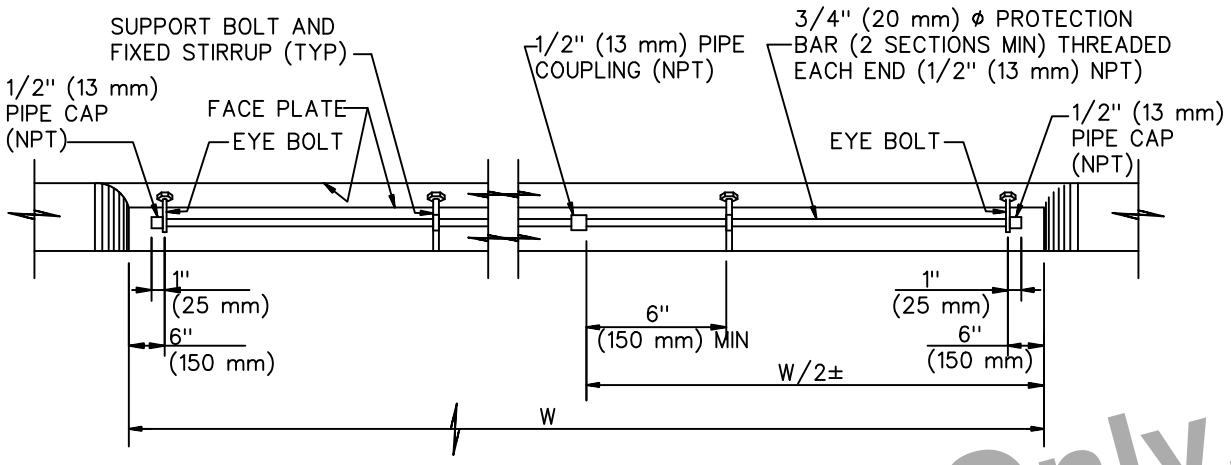
STIRRUP DETAIL

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR	**310–4**
	SHEET 4 OF 6

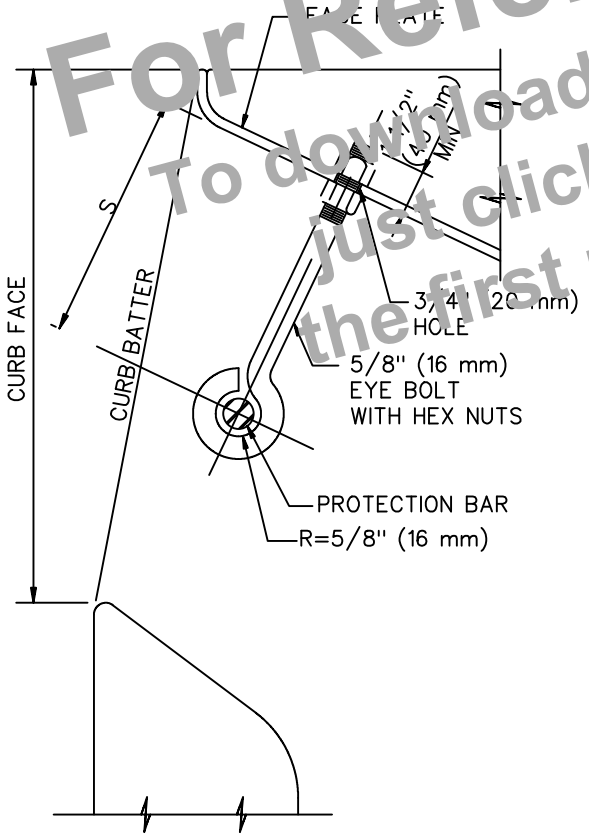
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PROTECTION BAR AND SUPPORT BOLT(S) WITH FIXED STIRRUP(S) – (TYPE B)

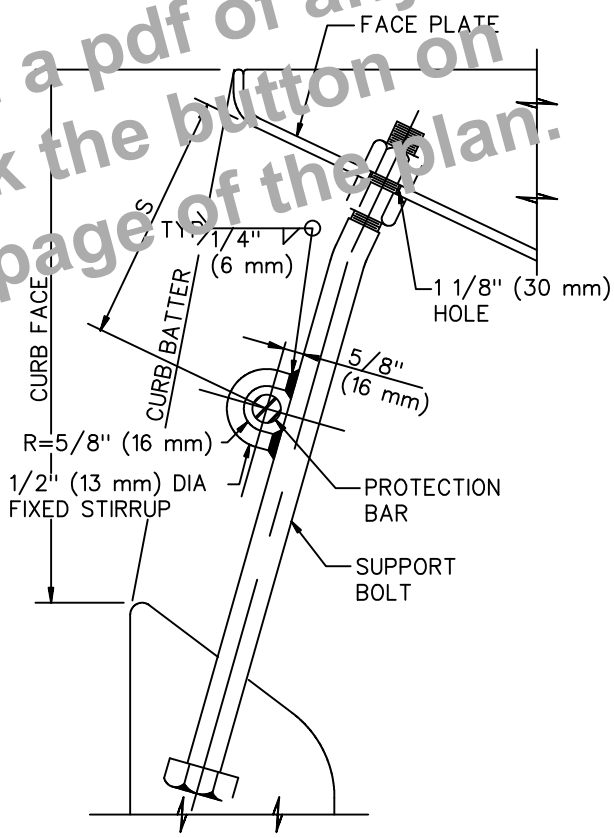


ELEVATION

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EYE BOLT DETAIL



STIRRUP DETAIL

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 310–4
CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR	SHEET 5 OF 6

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NOTES:

GENERAL

1. ALL PARTS SHALL BE STEEL, EXCEPT SET SCREWS, WHICH SHALL BE STAINLESS STEEL OR BRASS.
2. EXCLUDING SET SCREWS, ALL EXPOSED METAL PARTS SHALL BE GALVANIZED AFTER FABRICATION.
3. CURB FACE SHALL BE AS NOTED ON THE PLANS.
4. CURB BATTER SHALL BE 3:12 UNLESS OTHERWISE SPECIFIED.

FACE PLATE

5. FACE PLATE LENGTHS SHALL BE CATCH BASIN W PLUS 12" (300 mm) EXCEPT AS MODIFIED FOR A "CURB OPENING CATCH BASIN AT DRIVEWAY".
6. WHEN THE LENGTH OF THE FACE PLATE IS BETWEEN 22' (6.5 m) AND 43' (13 m), TWO SECTIONS MAY BE USED. WHEN THE LENGTH EXCEEDS 43' (13 m), THREE SECTIONS MAY BE USED. SECTIONS SHALL BE SPLICED ACCORDING TO THE APPLICABLE SPLICE DETAIL. SPLICE SHALL BE PLACED 1' (300 mm) FROM A SUPPORT BOLT.
7. WHERE CATCH BASINS ARE TO BE CONSTRUCTED ON CURVES, THE MAXIMUM CHORD LENGTH FOR THE FACE PLATE SHALL BE SUCH THAT THE MAXIMUM PERPENDICULAR DISTANCE TO THE TRUE CURVE SHALL NOT EXCEED 1" (25 mm). WHERE MORE THAN ONE CHORD IS REQUIRED, CHORD LENGTHS SHALL BE EQUAL. CHORD SECTIONS SHALL BE SPLICED ACCORDING TO THE APPLICABLE SPLICE DETAIL (MODIFIED TO FIT THE CHORD DEFLECTION) AND A SUPPORT BOLT SHALL BE PLACED 1' (300 mm) FROM THE SPLICE.
8. ROUND HEAD ANCHORS FOR THE FACE PLATE SHALL BE NELSON H-4F SHEAR CONNECTOR (NSN WELDING SYSTEMS DIVISION SHEAR CONNECTOR OR EQUAL.

SUPPORT BOLT

9. SUPPORT BOLTS ARE REQUIRED WHEN THE LENGTH OF THE CATCH BASIN OPENING IS 7' (2 m) OR GREATER, AND SHALL BE EVENLY SPACED ACROSS THE OPENING. SPACING SHALL NOT BE LESS THAN 3'-6" (1 m) ON CENTER NOR GREATER THAN 5' (1.5 m) ON CENTER.

STIRRUP

10. FOR TYPE A MATERIAL SHALL BE CAST STEEL.

PROTECTION BAR

11. TYPE A SHALL BE USED UNLESS OTHERWISE SPECIFIED.
12. FOR TYPE A, THE BAR SHALL BE CUT TO FIT IN THE FIELD. WHEN "W" IS OVER 21' (6 m), THE PROTECTION BAR SHALL CONSIST OF 2 OR MORE SECTIONS. A SPECIAL CONNECTOR BETWEEN THE PROTECTION BAR PIECES SHALL CONSIST OF A 5" (125 mm) LENGTH OF STANDARD 3/4" (20 mm) PIPE WITH STANDARD COUPLINGS FULLY THREADED ONTO EACH END DRILLED AND TAPPED FOR A SOCKET SET SCREW AS DETAILED FOR THE DOWNSTREAM END ANCHOR.
13. FOR TYPE B, THE BAR SHALL BE TWO PIECES. TWO EYE BOLTS AND A WELDED STIRRUP ON EACH SUPPORT BOLT ARE REQUIRED.
14. NUMBER OF PROTECTION BARS AND LOCATIONS ARE AS FOLLOWS:

CURB BATTER	MAXIMUM CURB FACE, INCHES (mm)													S DIMENSION
	6" (150)	7" (175)	8" (200)	9" (225)	10" (250)	11" (275)	12" (300)	13" (325)	14" (350)	15" (375)	16" (400)	17" (425)	18" (450)	
0:12	0	0	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	4.5" (115)	5.5" (140)	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	4.5" (115)	
1:12	0	0	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	4.5" (115)	5.5" (140)	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	5.5" (140)	
2:12	0	0	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	5.5" (140)	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	5.5" (140)	5.5" (140)	
3:12	0	0	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	5.5" (140)	3.5" (90)	4.5" (115)	4.5" (115)	5.5" (140)	5.5" (140)	4.5" (115)	
4:12	0	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	5.5" (140)	3.5" (90)	3.5" (90)	4.5" (115)	4.5" (115)	5.5" (140)	4.5" (115)	4.5" (115)	
	0	1					2*					3*		
	NUMBER OF PROTECTION BARS													

FOR OTHER CURB FACE OR BATTER SEE PLANS
* TYPE A PROTECTION BAR ONLY

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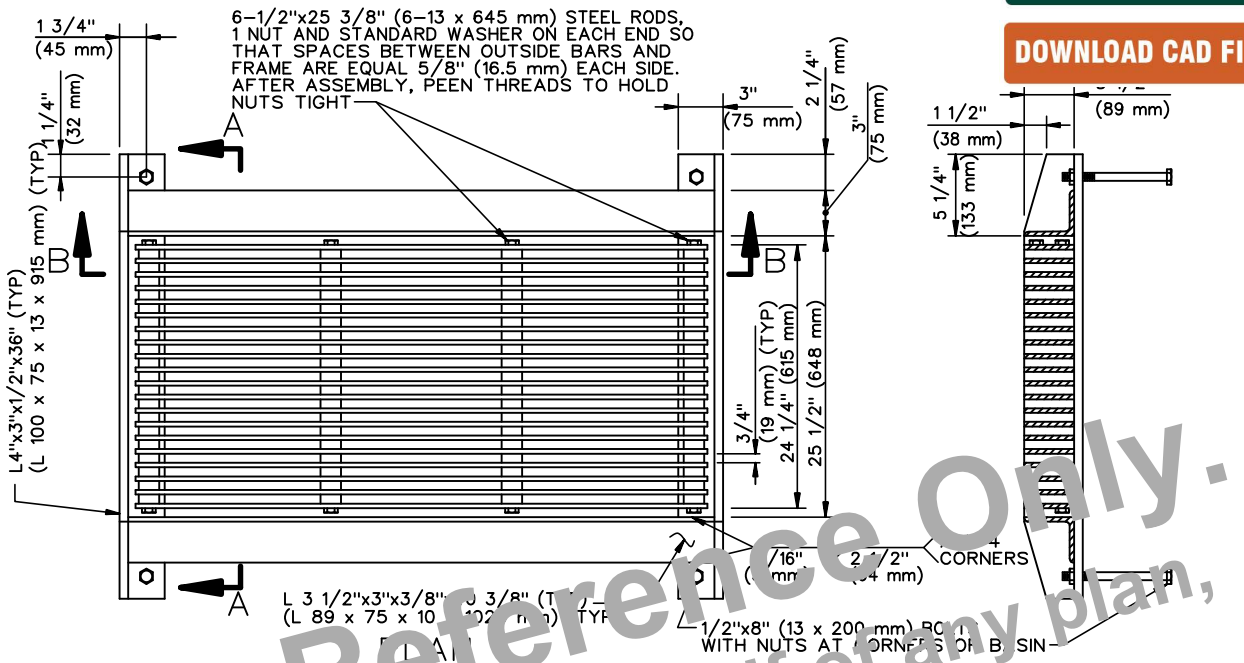
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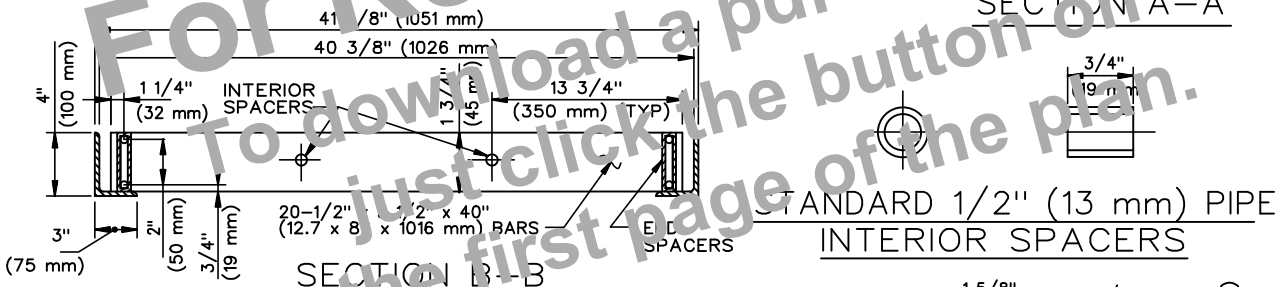
CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR

STANDARD PLAN
310-4
SHEET 6 OF 6

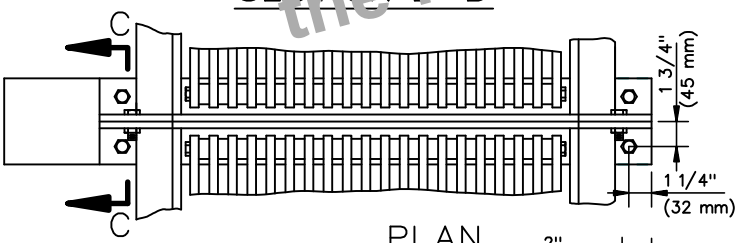
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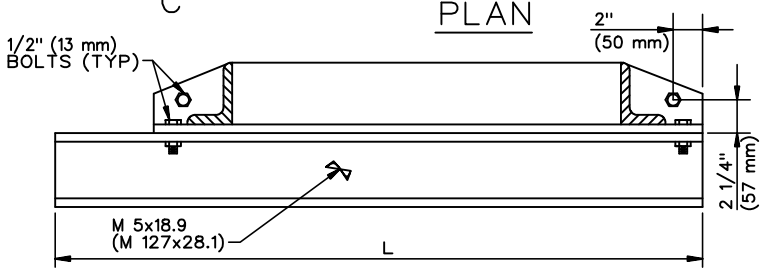




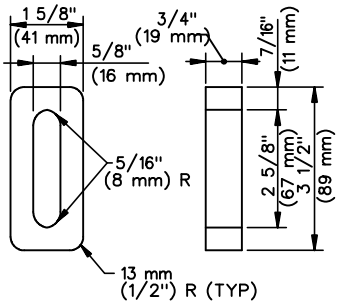
SECTION B-B



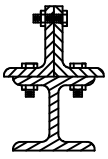
PLAN



ELEVATION
CENTER SUPPORT ASSEMBLY



END SPACERS



SECTION C-C

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1993, 1996, 2009, 2021

FRAME AND GRATING FOR CATCH BASINS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 311-4

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NOTES:

1. ALL PARTS SHALL BE STEEL, EXCEPT THAT END SPACERS MAY BE CAST IRON.
2. ALL PARTS SHALL BE GALVANIZED AFTER FABRICATION, EXCEPT THAT GRATINGS SHALL BE ASSEMBLED AFTER COMPONENT PARTS ARE GALVANIZED.
3. ALL DIMENSIONS ARE FINISHED DIMENSIONS AND INCLUDE GALVANIZING.
4. ALL BOLT HOLES SHALL BE 16 mm (5/8") DIAMETER.
5. ALL THREADS SHALL BE NATIONAL COARSE SERIES (NC).
6. CENTER SUPPORT ASSEMBLY REQUIRED WHEN TWO OR MORE GRATINGS ARE SPECIFIED ON PLANS.

   L = 64" (1626 mm) FOR CURB OPENING CATCH BASIN WITH GRATING(S) AND DEBRIS SKIMMER (SPPWC 301).

   L = 44" (1118 mm) FOR CURB OPENING CATCH BASIN WITH GRATING(S) (SPPWC 302.)

   L = 36" (914 mm) FOR CURBSIDE GRATING CATCH BASIN (SPPWC 303).

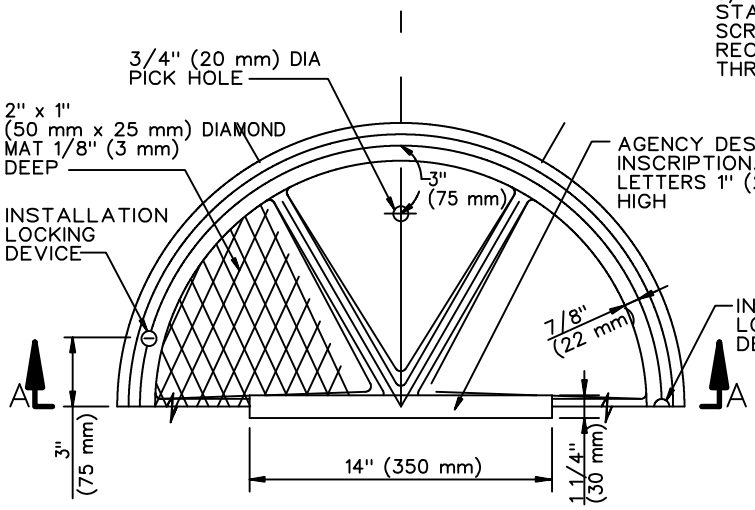
   L = 36" (914 mm) FOR GRATING CATCH BASIN–ALLEY (LONGITUDINAL) (SPPWC 304

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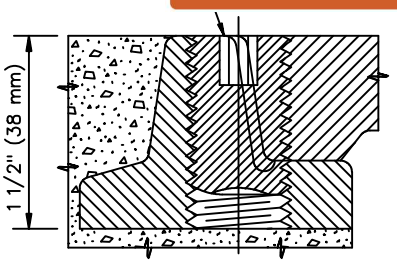
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
FRAME AND GRATING FOR CATCH BASINS	**311–4**
	SHEET 2 OF 2

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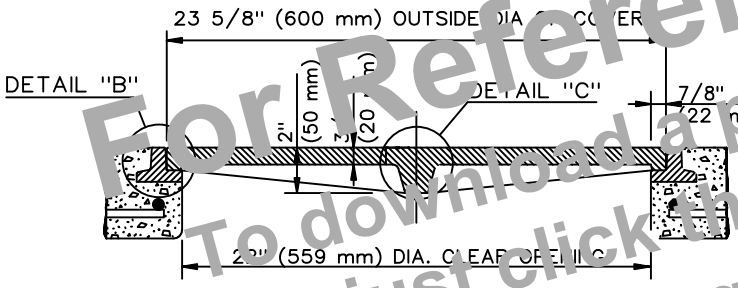
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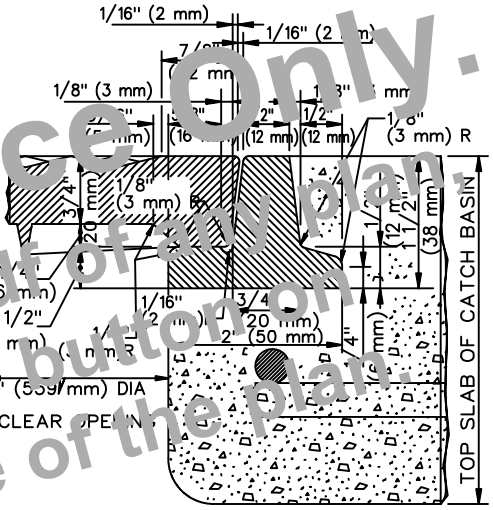
PLAN



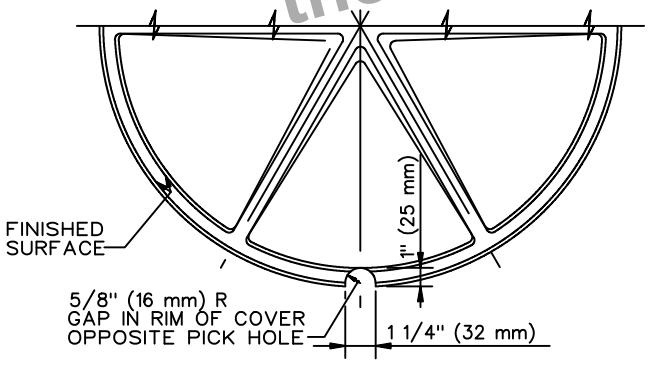
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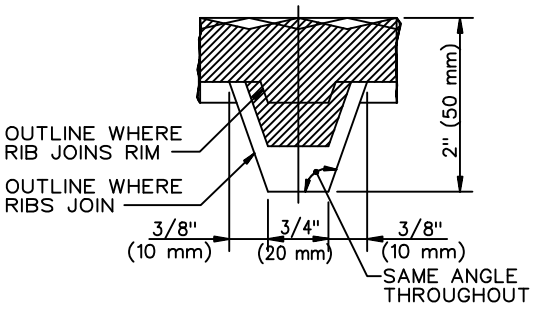
SECTION A–A



DETAIL "B"



BOTTOM OF MANHOLE COVER



DETAIL "C"

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1993, 1996, 2006, 2009, 2021

CATCH BASIN
MANHOLE FRAME AND COVER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
312–5
SHEET 1 OF 2

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NOTES

1. THE CAST IRON USED SHALL CONFORM TO ASTM A48 (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.

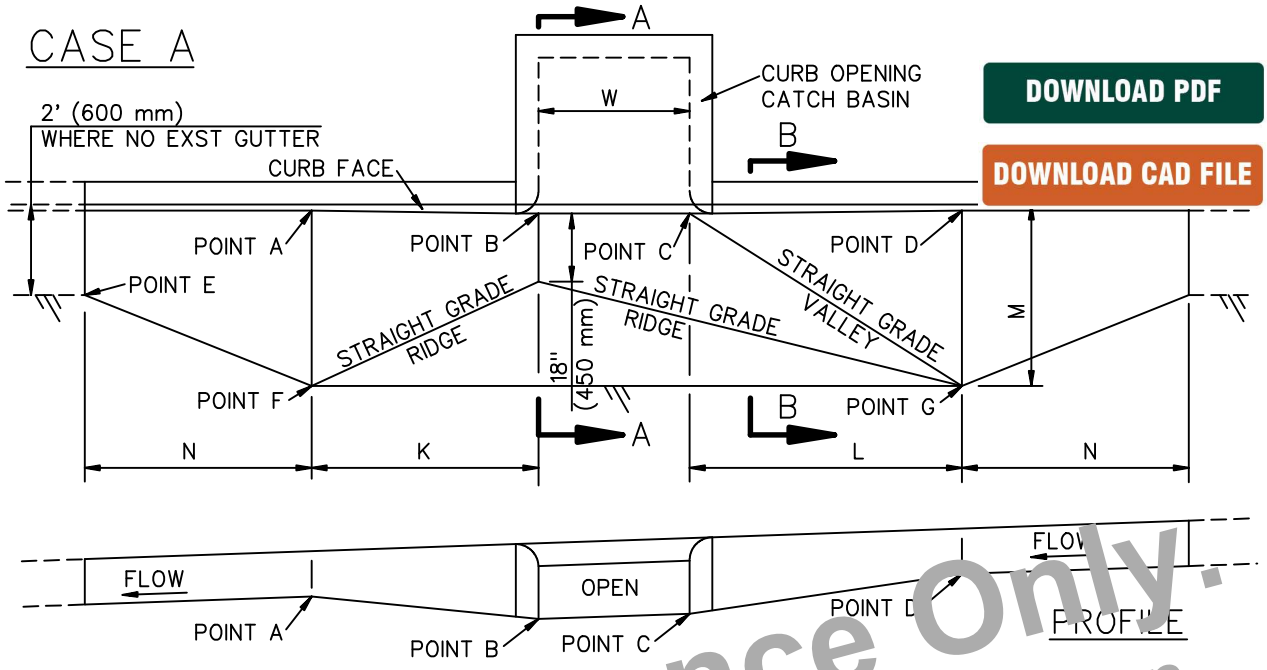
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CATCH BASIN MANHOLE FRAME AND COVER	**312–5**
	SHEET 2 OF 2

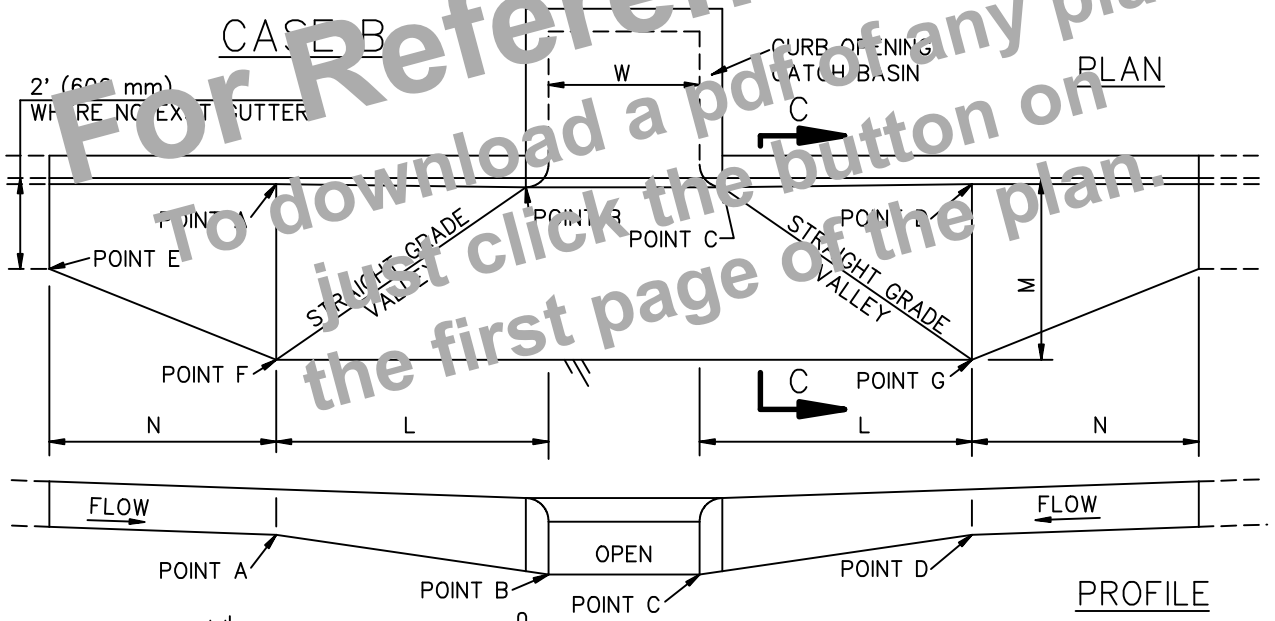
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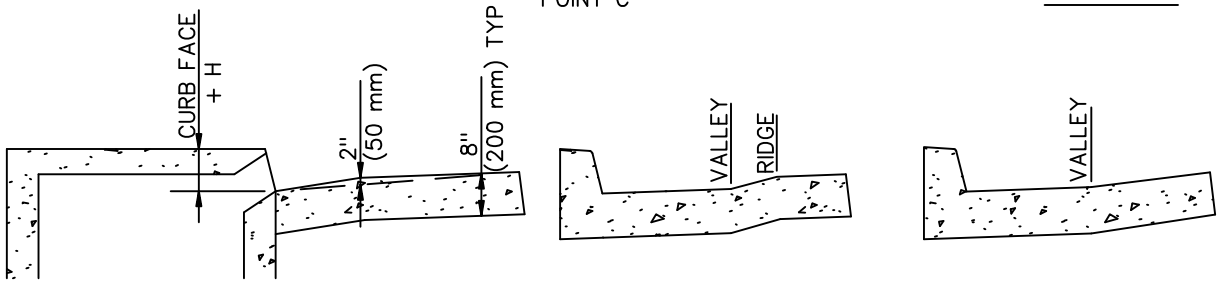
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CASE A



CASE B





SECTION A–A SECTION B–B SECTION C–C

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1996, 2005, 2009, 2021

LOCAL DEPRESSIONS AT CATCH BASINS

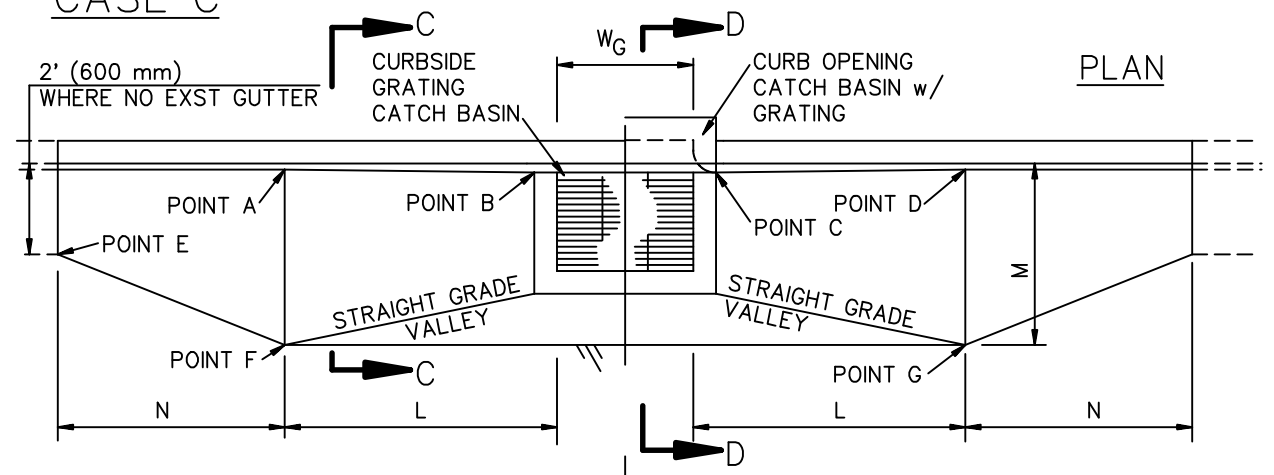
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

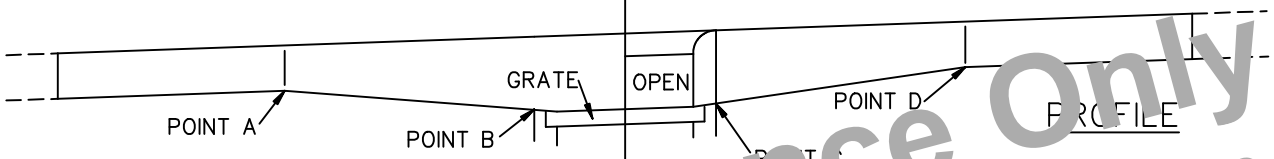
STANDARD PLAN 313–4

SHEET 1 OF 4

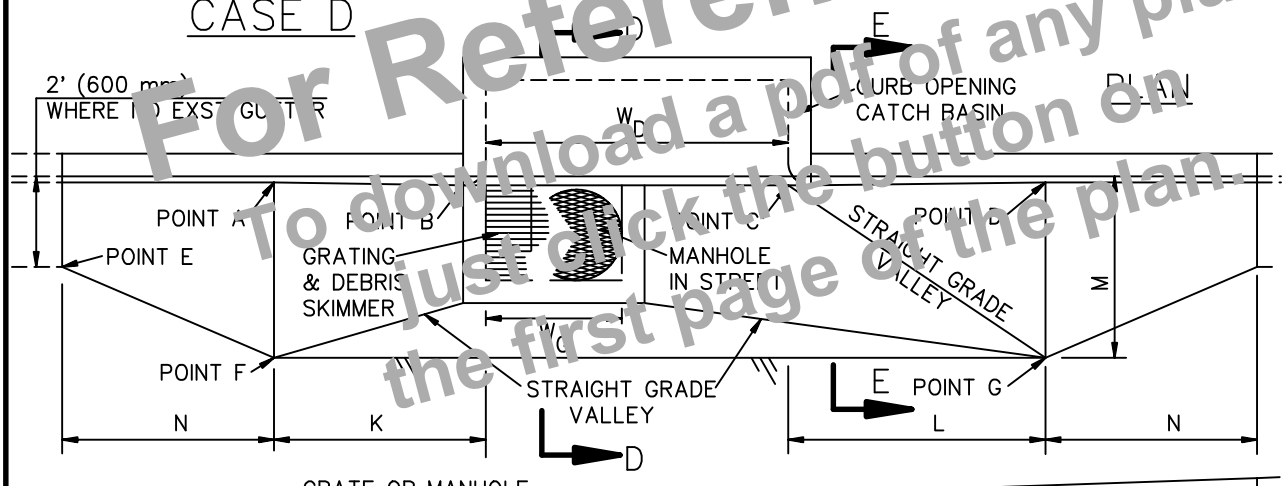
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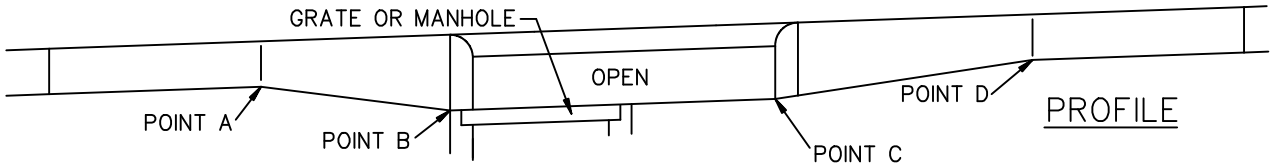
CASE C

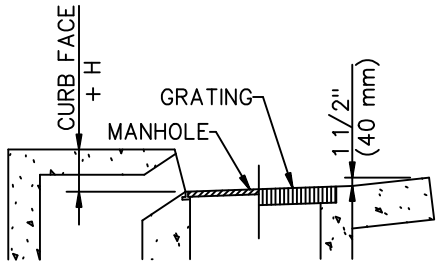




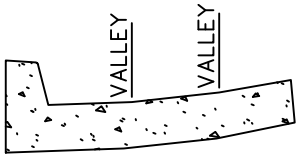
CASE D







SECTION D–D

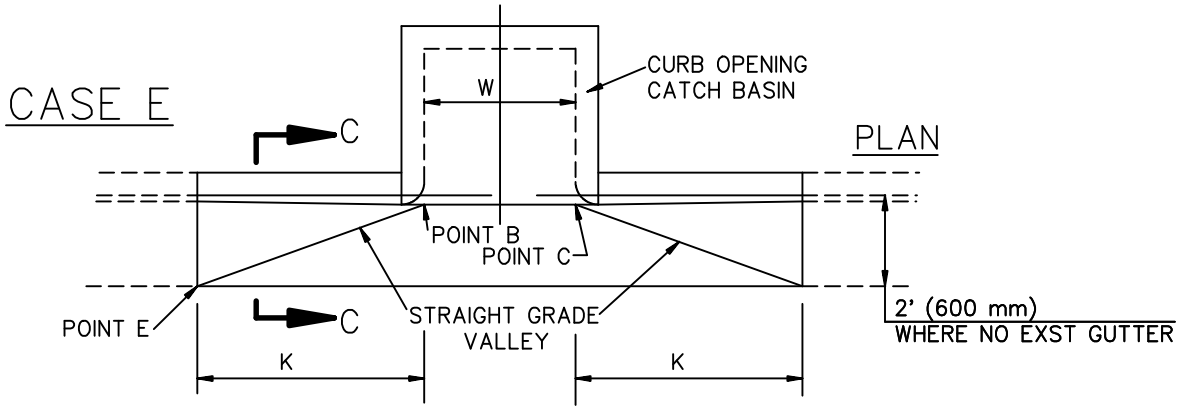


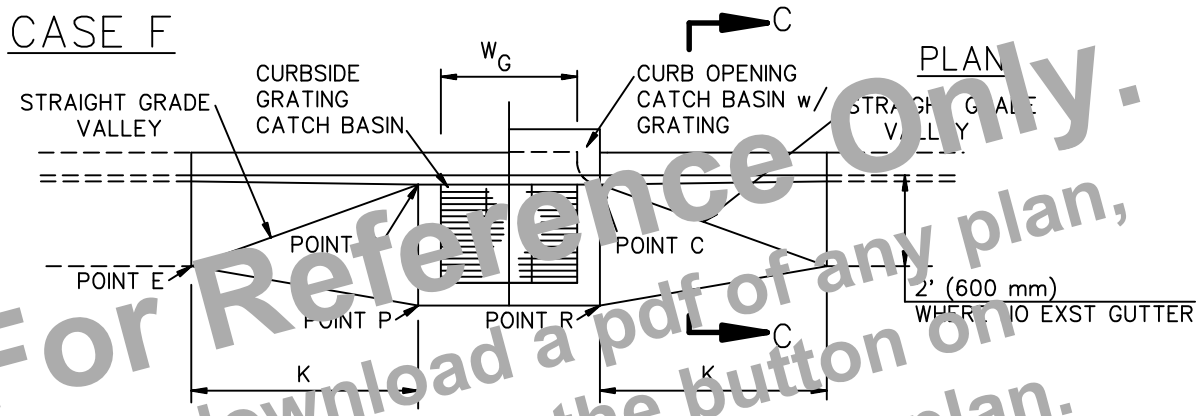
SECTION E–E

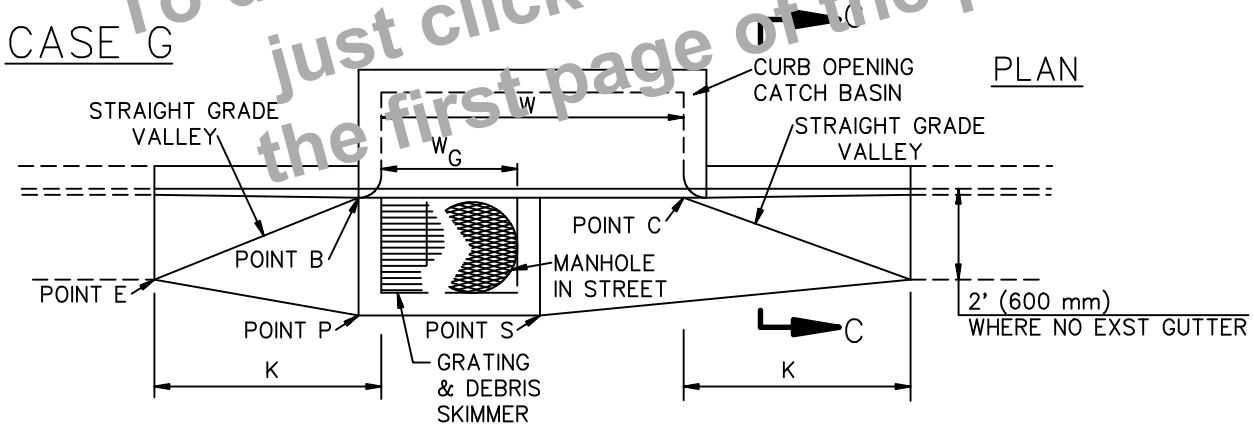
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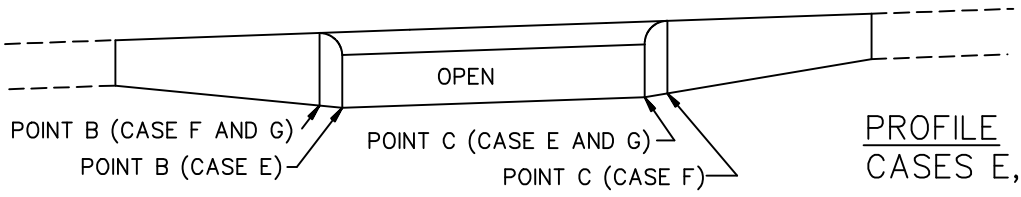
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
LOCAL DEPRESSIONS AT CATCH BASINS	313–4
	SHEET 2 OF 4

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

LOCAL DEPRESSIONS AT CATCH BASINS

STANDARD PLAN
313-4
SHEET 3 OF 4

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NOTES:

1. ALL EXPOSED EDGES SHALL BE ROUNDED TO A 1/2" (15 mm) RADIUS.

2. THE CURB FACE AT POINTS A AND D SHALL BE THE NORMAL CURB FACE OF THE ADJACENT CURB AT THE ENDS OF THE LOCAL DEPRESSION. THE CURB FACE AT POINTS B AND C SHALL BE THE NORMAL CURB FACE OF THE ADJACENT CURB AT THE ENDS OF THE LOCAL DEPRESSION PLUS H (SEE APPLICABLE CATCH BASIN STANDARD PLAN.)

3. IN EXISTING STREETS WHERE NO PAVEMENT RECONSTRUCTION IS SPECIFIED ON THE PLANS, THE ELEVATION OF THE OUTER EDGE OF THE LOCAL DEPRESSION SHALL MEET THE FINISHED STREET SURFACE.

4. IN NEW STREETS OR IN EXISTING STREETS WHERE PAVEMENT RECONSTRUCTION IS SPECIFIED ON THE PLANS:

   THE ELEVATIONS OF POINTS F AND G SHALL BE SET H1 HIGHER THAN THE GUTTER FLOW LINE ELEVATIONS AT POINTS A AND D, RESPECTIVELY.

   THE ELEVATIONS OF POINTS P AND R SHALL BE SET H2 HIGHER THAN THE GUTTER FLOW LINE ELEVATIONS AT POINTS B AND C, RESPECTIVELY.

   THE ELEVATION OF POINT S SHALL BE SET H2 HIGHER THAN THE ELEVATION AT THE NEAREST GUTTER FLOW LINE.

   WHERE THERE IS NO GUTTER ADJACENT TO THE LOCAL DEPRESSION, THE ELEVATION OF POINT E SHALL BE SET H3 HIGHER THAN THE ELEVATION AT THE NEAREST TOE OF CURB.

5. DIMENSIONS:

   H, H1, H2 AND H3 SHALL BE AS NOTED ON THE PLANS.

   G = 24" (600 mm)

   K = 5'–0" (1500 mm)

   L = 6'–0" (1800 mm)

   M = 4'–0" (1200 mm)

   N = 5'–0" (1500 mm)

   W = WIDTH OF CURB OPENING FOR CATCH BASIN

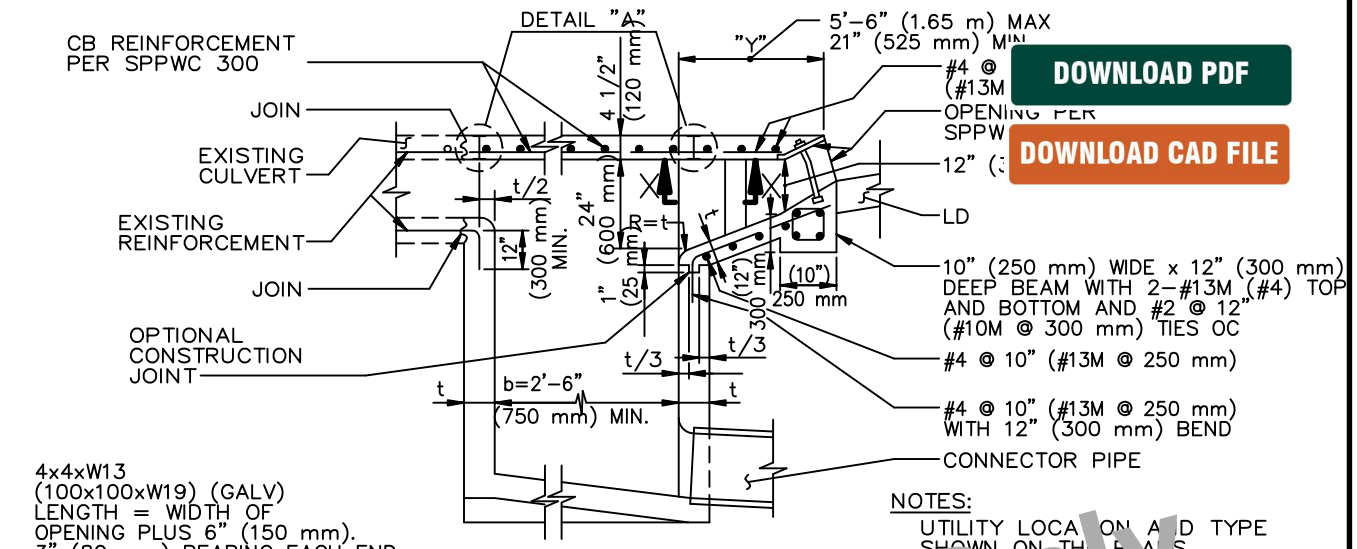
   W_G = WIDTH OF GRATING(S) FOR CATCH BASIN

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
LOCAL DEPRESSIONS AT CATCH BASINS	**313–4**
	SHEET 4 OF 4

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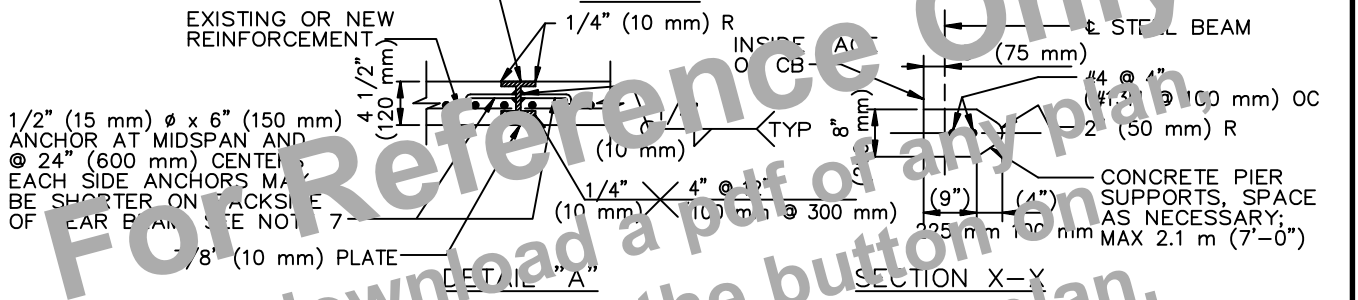
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SECTION

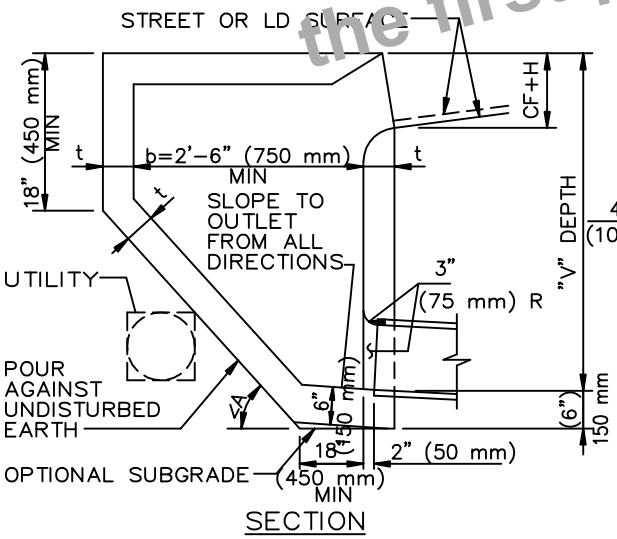
4x4xW13 (100x100xW19) (GALV) LENGTH = WIDTH OF OPENING PLUS 6" (150 mm). 3" (80 mm) BEARING EACH END

NOTES:
UTILITY LOCATION AND TYPE SHOWN ON THE PLANS.

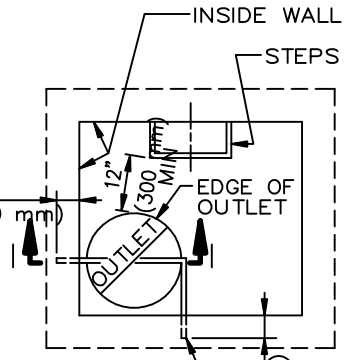


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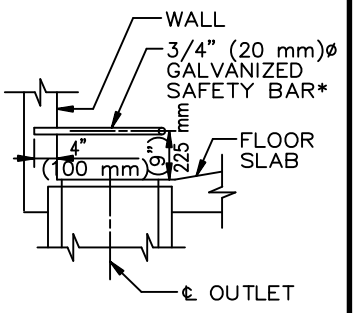
CASE 1
CATCH BASIN MODIFICATION WITH REAR CULVERT ENTRANCE AND/OR ENTRANCE PROJECTION



SECTION



PLAN



SECTION 1-1

*NOTE:
SAFETY BAR SHALL BE 3/4" (20 mm) DIA GALV, HOT-ROLLED STEEL CONFORMING TO ASTM A36M (A36)

CASE 2
CATCH BASIN MODIFICATION TO AVOID EXISTING UTILITY

CASE 3
SAFETY BAR FOR DROP OUTLET CATCH BASIN

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1992 REV. 1993, 1996, 2009

MODIFICATIONS FOR SIDE OPENING CATCH-BASIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
314-3
SHEET 1 OF 2

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NOTES

1. MODIFICATIONS ARE TO BE USED AS REQUIRED BY THE PLANS. ANY ADDITIONAL CHANGES ARE SUBJECT TO THE APPROVAL OF THE ENGINEER.

2. DETAILS NOT SHOWN SHALL BE PER THE APPLICABLE CATCH BASIN STANDARD PLANS.

3. REFER TO THE PLANS FOR DETAILS OF THE UTILITY AND CULVERT.

4. INTERFERING PORTIONS OF EXISTING CULVERTS SHALL BE REMOVED ON A LINE NORMAL TO THE CULVERT CENTER LINE AND A PORTION OF THE CULVERT RECONSTRUCTED IF REQUIRED. SAWCUTTING SHALL BE USED TO PROVIDE A NEAT JOINT ON THE EXPOSED SURFACE AND TRANSVERSE STEEL SHALL BE RETAINED.

5. PLACE STEPS IN END WALL OF CATCH BASIN UNLESS OTHERWISE SHOWN.

6. WHEN REINFORCEMENT IS REQUIRED BY SPPWC 309, IT SHALL BE PLACED TO THE CONFIGURATION OF THE MODIFIED BASIN. IF ANGLE A EXCEEDS 45° THE SLOPING PORTION OF THE INVERT SHALL BE REINFORCED AS THE REAR WALL. LENGTH OF BARS SHALL BE INCREASED AS NECESSARY.

7. ELECTRICALLY WELDED STUDS 1/4" x 8" (15 mm x 200 mm), NELSON H4F OR EQUAL MAY BE USED IN LIEU OF THE DEFORMED BAR ANCHORS. IF THE TOP SLABS OF THE CATCH BASIN AND THE CULVERT ARE NOT IN THE SAME PLANE THE ANCHORS ON THE CULVERT SIDE SHALL BE OMITTED.

8. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

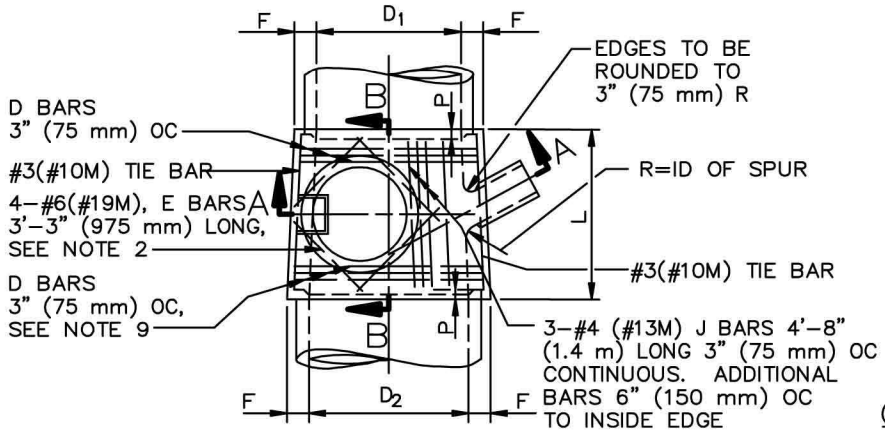
   300 CURB OPENING CATCH BASIN
   308 MONOLITHIC CATCH BASIN CONNECTION
   309 CATCH BASIN REINFORCEMENT
   310 CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR
   312 CATCH BASIN MANHOLE FRAME AND COVER
   635 STEEL STEP
   636 POLYPROPYLENE PLASTIC STEP

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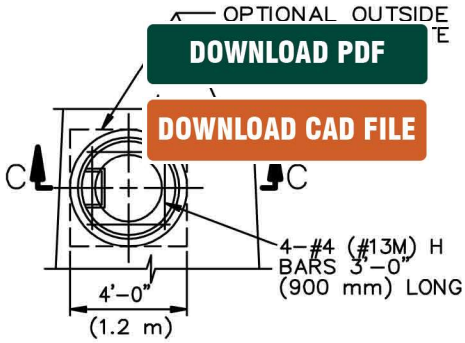
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MODIFICATIONS FOR SIDE OPENING CATCH-BASIN	314-3
	SHEET 2 OF 2

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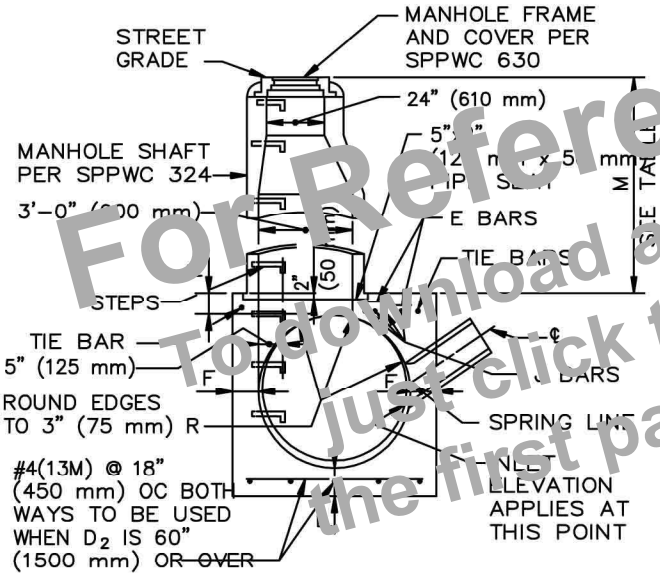
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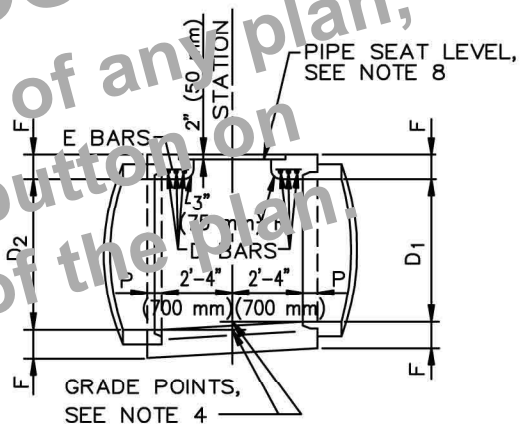
PLAN
(SHAFT NOT SHOWN)



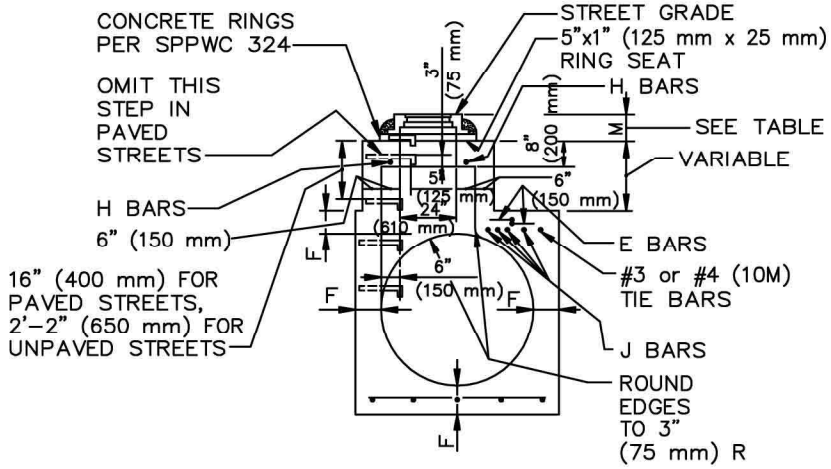
DETAIL "N"
(RINGS AND COVER NOT SHOWN)
(SEE NOTE 1)



SECTION A–A



SECTION B–B



SECTION C–C

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

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

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 320–2

SHEET 1 OF 4

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TABLE OF VALUES FOR F	
D_2	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)

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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
MANHOLE PIPE–TO–PIPE **MAIN LINE ID = 36" (900 mm) OR LARGER**	**320–2** SHEET 2 OF 4

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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_1 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_1 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_2=96" (2400 mm) OR LESS, L=5'–6" (1.7 m), P=5" (130 mm)
   B. D_2 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_2=39" (975 mm) OR LESS, #5 (#16M) FOR D_2= 42" (1050 mm) TO 84" (2100 mm) INCLUSIVE AND #6 (#19M) FOR D_2= 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.

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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:

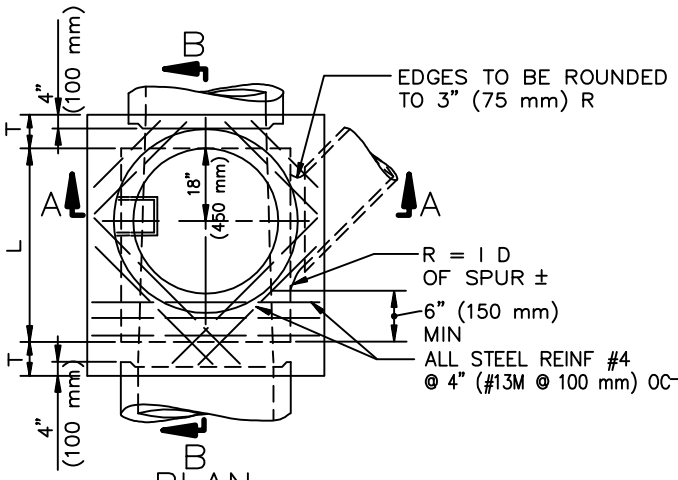
324	MANHOLE SHAFT – WITH ECCENTRIC REDUCER
326	MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
328	PRESSURE MANHOLE SHAFT – WITH ECCENTRIC
329	PRESSURE MANHOLE SHAFT 36" (914 mm) WITHOUT REDUCER
630	24" (610 mm) MANHOLE FRAME AND COVER
633	36" (914 mm) MANHOLE FRAME AND COVER
635	STEEL STEP
636	POLYPROPYLENE PLASTIC STEP

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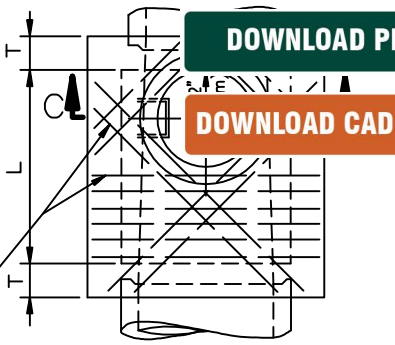
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MANHOLE PIPE–TO–PIPE MAIN LINE ID = 36" (900 mm) OR LARGER	320–2 SHEET 4 OF 4

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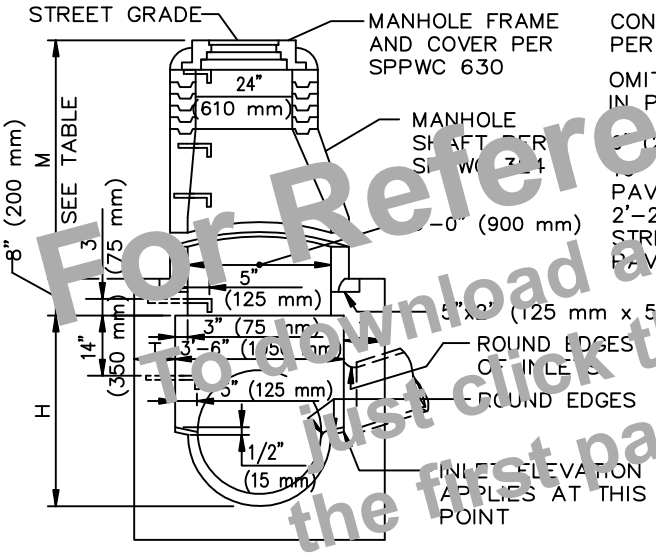
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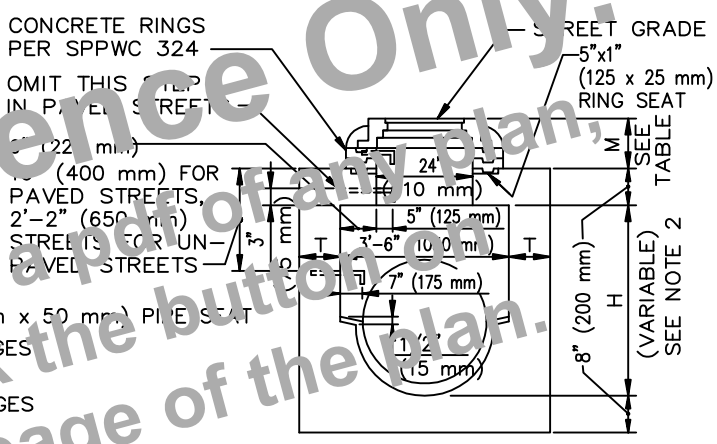
PLAN
(SHAFT NOT SHOWN)



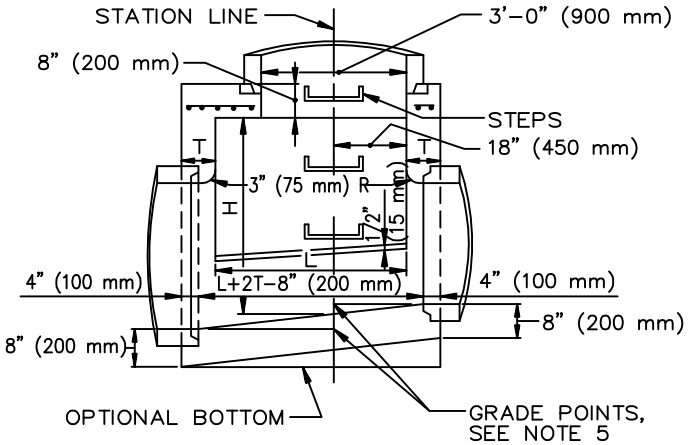
DETAIL "N" PLAN
(RINGS AND COVER NOT SHOWN)
SEE NOTE 1



SECTION A–A



SECTION C–C



SECTION B–B

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

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

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

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 321–2

SHEET 1 OF 3

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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 NEAT 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.

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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

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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.

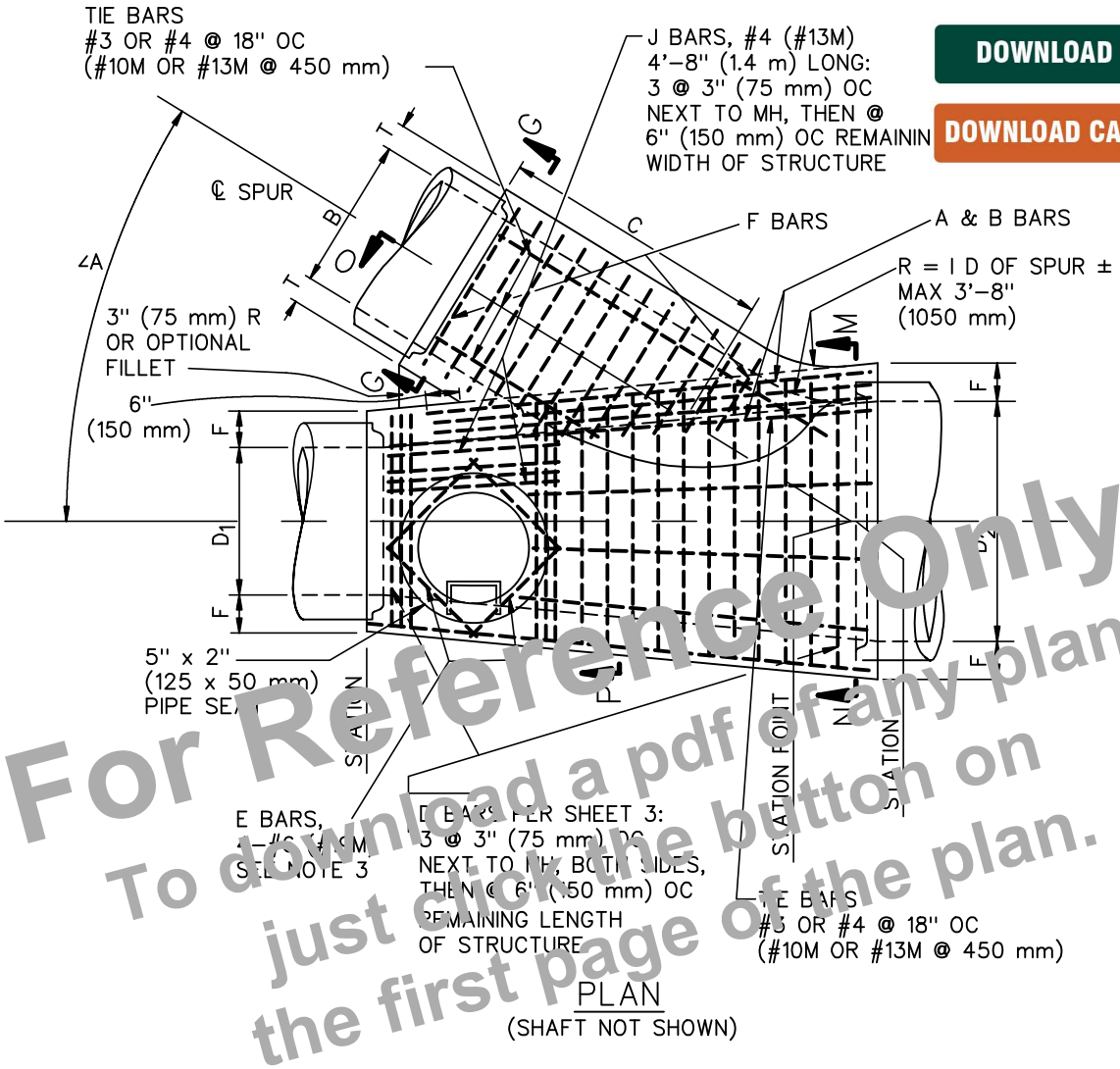
17. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:
    324 MANHOLE SHAFT – WITH ECCENTRIC REDUCER
    326 MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
    328 PRESSURE MANHOLE SHAFT – WITH ECCENTRIC
    329 PRESSURE MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
    630 24" (610 mm) MANHOLE FRAME AND COVER
    633 36" (900 mm) MANHOLE FRAME AND COVER
    635 STEEL STEP
    636 POLYPROPYLENE PLASTIC STEP

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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 3 OF 3

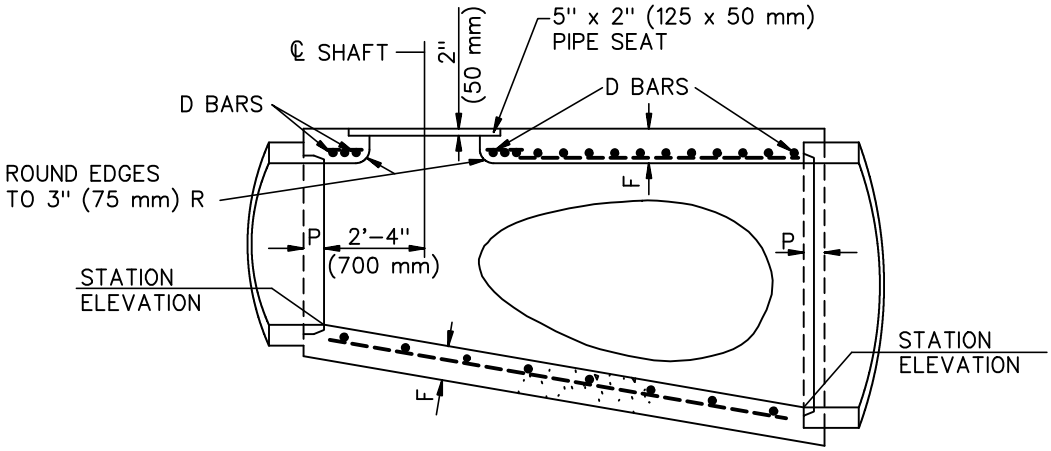
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LONGITUDINAL SECTION

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

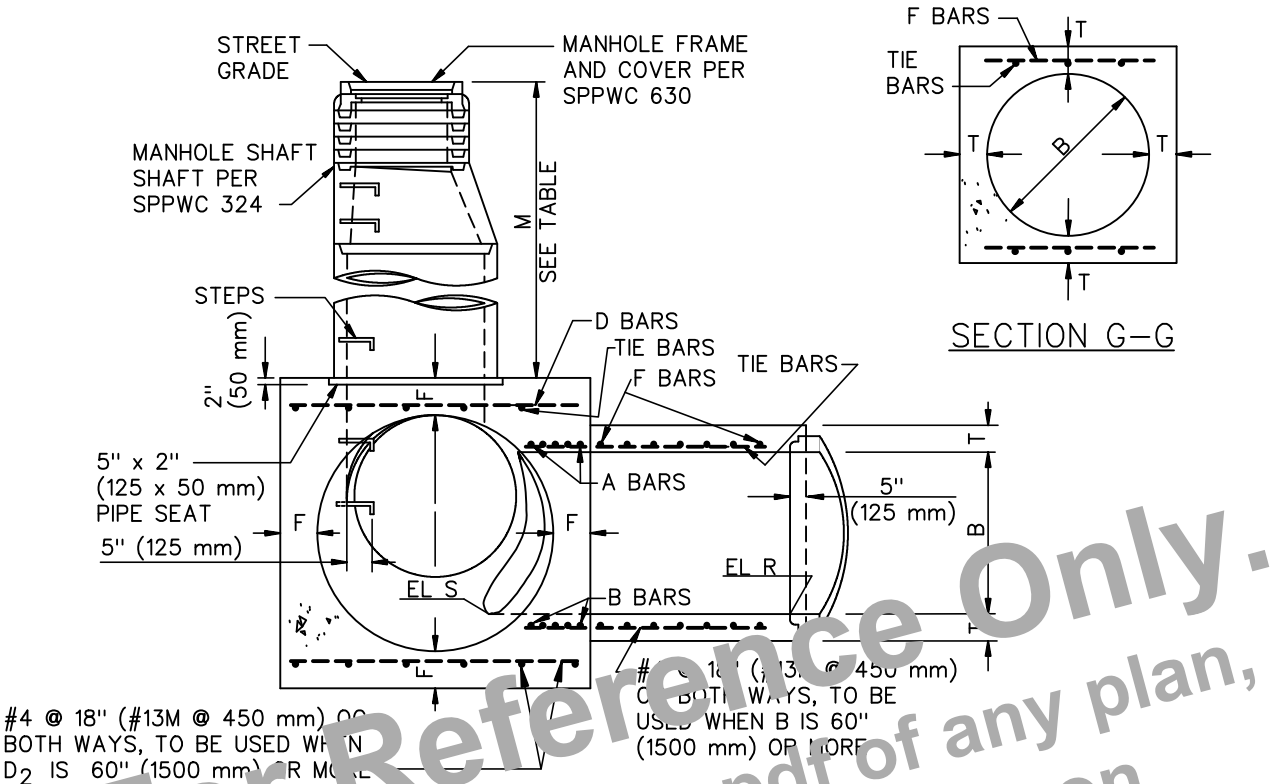
PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1992
REV. 1996, 2009, 2021

MANHOLE – PIPE TO PIPE (LARGE SIDE INLET)

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
322–3
SHEET 1 OF 4

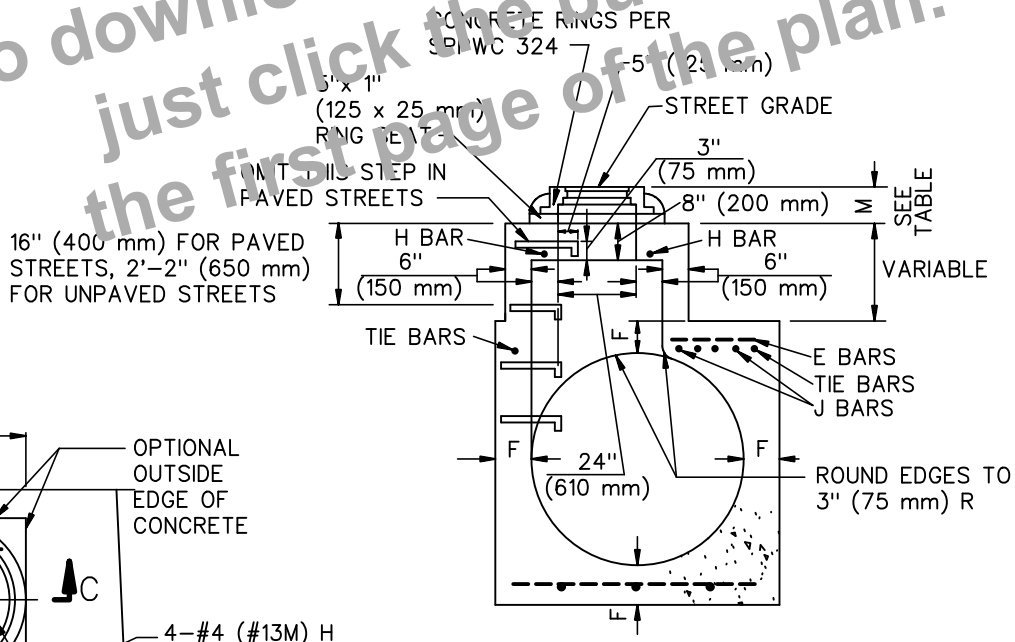
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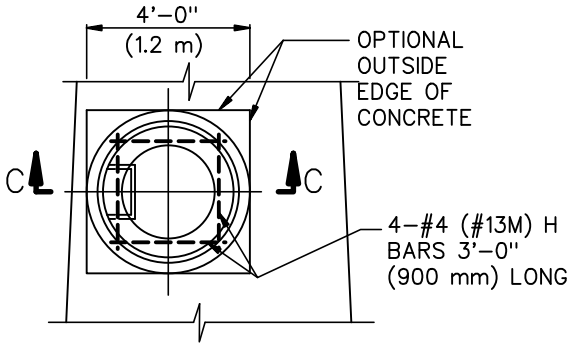
SECTION N–M–P–C

SECTION G–G

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SECTION C–C



DETAIL N

MONOLITHIC MANHOLE SHAFT
(RINGS AND COVER NOT SHOWN)
SEE NOTE 2

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MANHOLE – PIPE TO PIPE (LARGE SIDE INLET)	**322–3**
	SHEET 2 OF 4

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TABLE OF BAR SIZES		
D2 OR B	A & B	D OR F
12"–39" (300 – 975 mm)	#5 @ 3" (#16M @ 75 mm)	#4 @ 6" (#13M @ 150 mm)
42"–84" (1050 – 2100 mm)	#6 @ 3" (#19M @ 75 mm)	#5 @ 6" (#16M @ 150 mm)
90"–144" (2250 – 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)		1060 mm (3'–6")
C–C	11" (282 mm)	8–1/2" (217 mm)	16" (410 mm)	15" (380 mm)

TABLE OF VALUES FOR F	
D2	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	
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)
26" (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)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

MANHOLE – PIPE TO PIPE (LARGE SIDE INLET)

STANDARD PLAN
322–3
SHEET 3 OF 4

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NOTES

1. VALUES FOR A, B, C, D1, D2, 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 D1 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 D1 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 F SPUR MUST BE APPROVED BY THE ENGINEER.

5. P SHALL BE 5" (125 mm) FOR D2=96" (2400 mm) OR LESS AND 8" (200 mm) FOR D2 OVER 96" (2400 mm).

6. 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.

7. FLOOR OF MANHOLE SHALL BE STEEL–TROWLED 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" TO 15" (350 TO 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:

    - o THIS STANDARD PLAN IS USED WHEN SPPWC 320 IS INADEQUATE.
    - o MAIN LINE = 900 mm (36") INSIDE DIAMETER OR LARGER.
    - o LATERAL = 300 mm (12") TO 3600 mm (144") INSIDE DIAMETER; HOWEVER, THE INSIDE DIAMETER SHALL NOT EXCEED THE INSIDE DIAMETER OF THE MAIN LINE.

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 – 900 mm (36") 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:

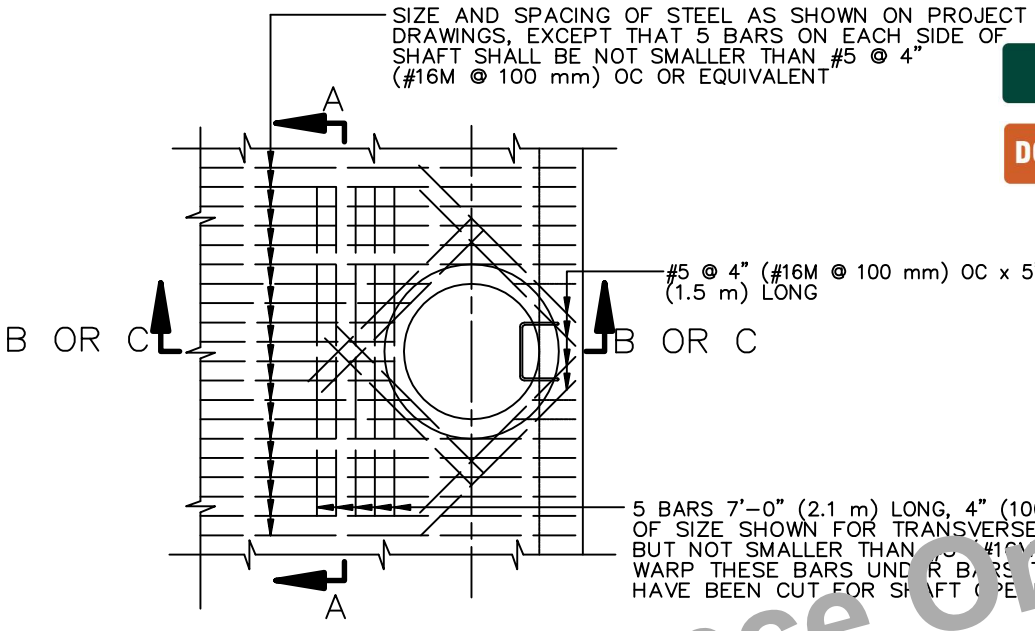
324	MANHOLE SHAFT – WITH ECCENTRIC REDUCER
326	MANHOLE SHAFT – 900 mm (36") WITHOUT REDUCER
328	PRESSURE MANHOLE SHAFT – WITH ECCENTRIC REDUCER
329	PRESSURE MANHOLE SHAFT – 914 mm (36") WITHOUT REDUCER
630	610 mm (24") MANHOLE FRAME AND COVER
633	914 mm (36") MANHOLE FRAME AND COVER
635	STEEL STEP
636	POLYPROPYLENE PLASTIC STEP

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MANHOLE – PIPE TO PIPE (LARGE SIDE INLET)	**322–3**
	SHEET 4 OF 4

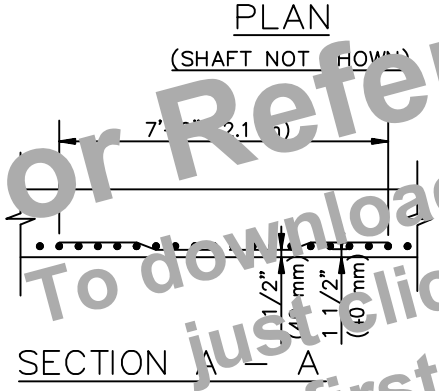
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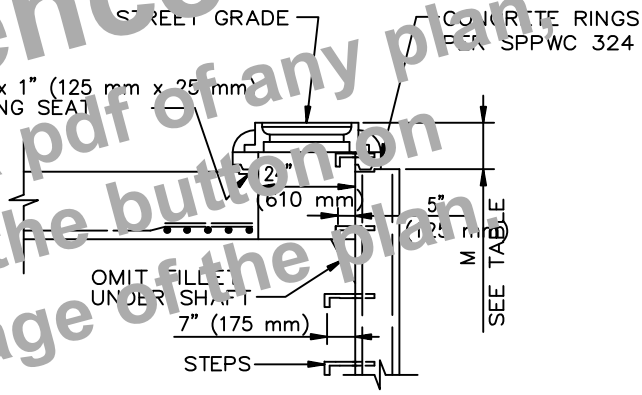


PLAN

(SHAFT NOT SHOWN)

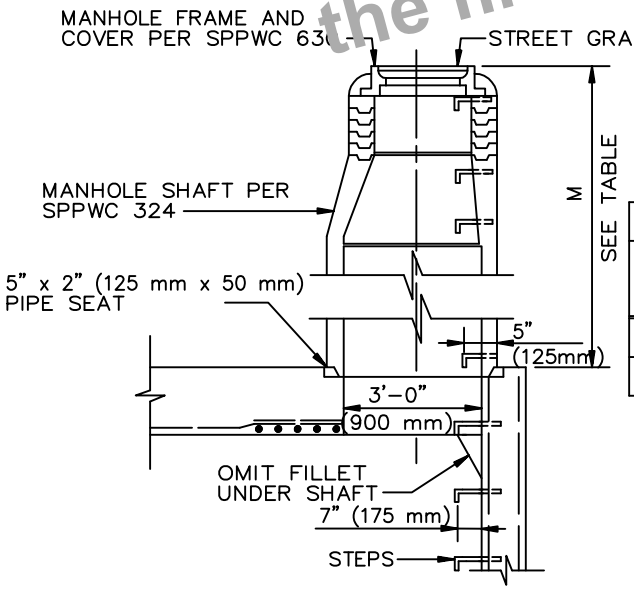


SECTION A – A



SECTION C – C

SEE NOTE 1



SECTION B – B

TABLE OF VALUES FOR M (SEE NOTE 1)				
SECTION	PAVED STREET		UNPAVED STREET	
	MAX	MIN	MAX	MIN
B – B	–	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)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

MANHOLE – CONCRETE BOX STORM DRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 323-2

SHEET 1 OF 2

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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.

2. STATIONS OF MANHOLES SHOWN ON PLANS. APPLY AT CENTERLINE LINE OF SHAFT. ELEVATIONS ARE SHOWN AT CENTERLINE OF SHAFT.

3. REINFORCEMENT SHALL CONFORM TO ASTM A 615, GRADE 40 (ASTM A 615M, GRADE 300), AND SHALL TERMINATE 40 mm (1 1/2") CLEAR OF CONCRETE SURFACES UNLESS OTHERWISE SHOWN.

4. 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.

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

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

7. WHERE A MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER IS SPECIFIED REFER TO SPPWC 326.

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

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

10. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

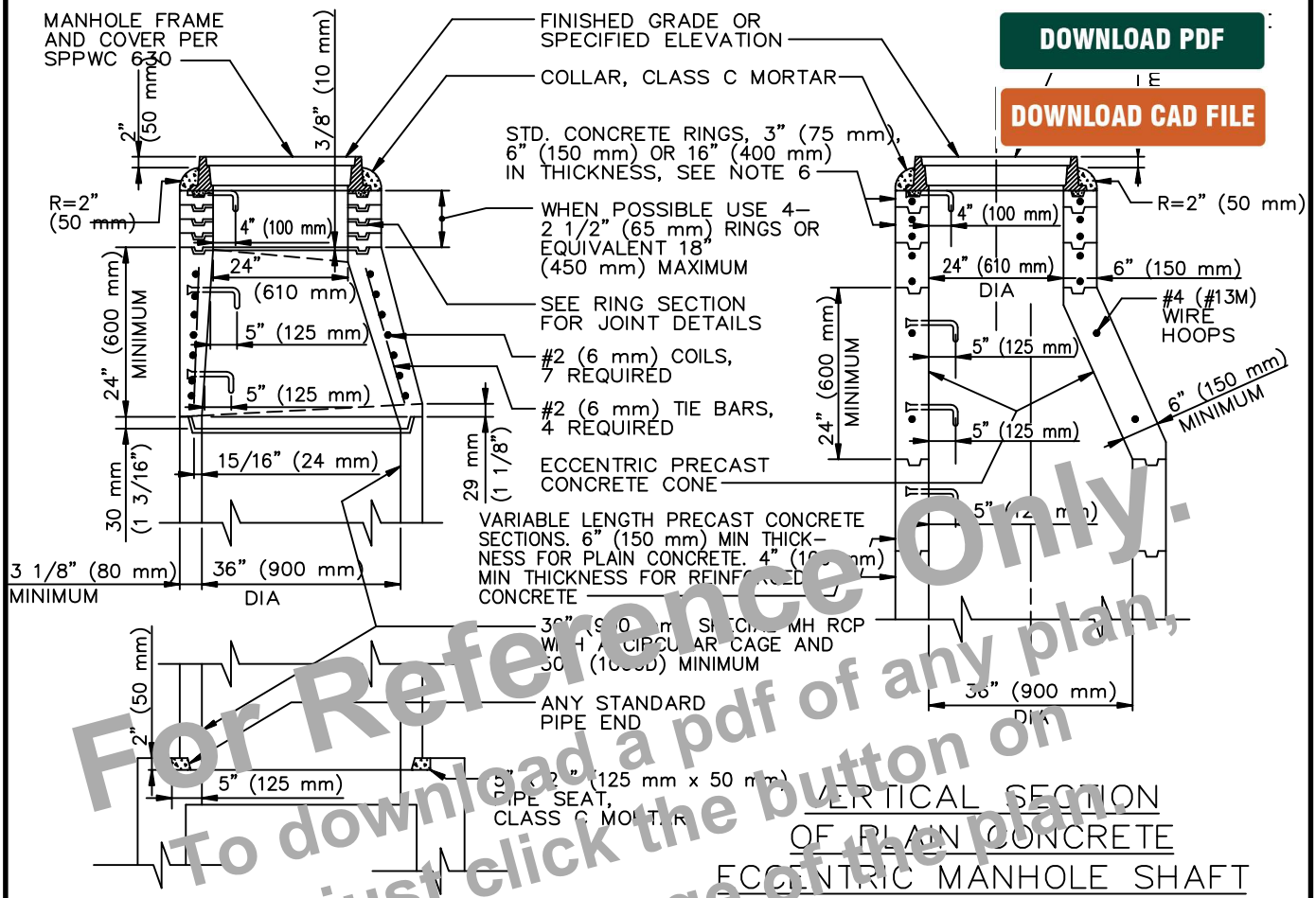
    324 MANHOLE SHAFT – WITH ECCENTRIC REDUCER
    326 MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
    328 PRESSURE MANHOLE SHAFT – WITH ECCENTRIC
    329 PRESSURE MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
    630 24" (600 mm) MANHOLE FRAME AND COVER
    633 36" (900 mm) MANHOLE FRAME AND COVER
    635 STEEL STEP
    636 POLYPROPYLENE PLASTIC STEP

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MANHOLE – CONCRETE BOX STRORM DRAIN	323–2
	SHEET 2 OF 2

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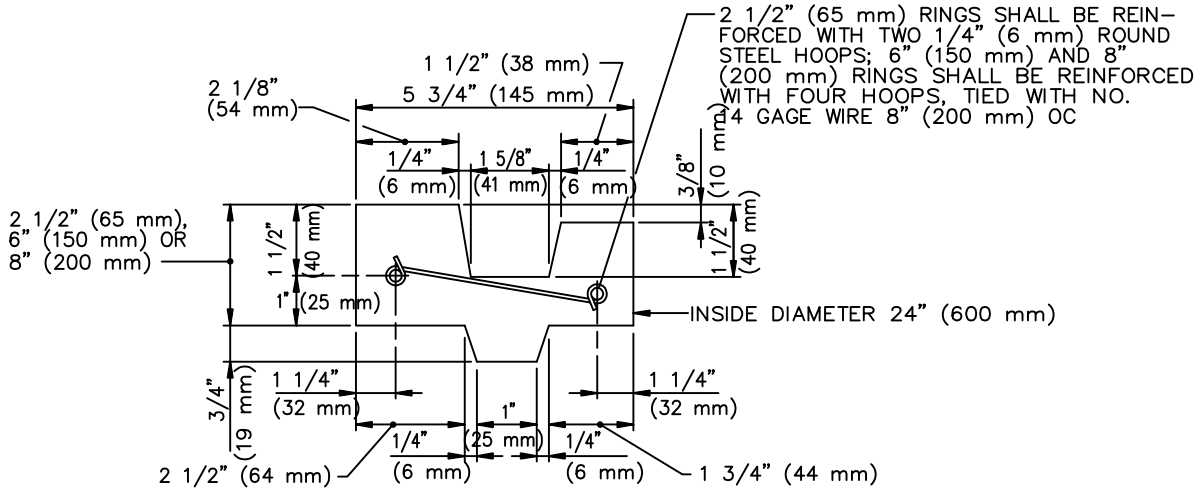
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VERTICAL SECTION OF REINFORCED CONCRETE ECCENTRIC MANHOLE SHAFT

VERTICAL SECTION OF PLAIN CONCRETE ECCENTRIC MANHOLE SHAFT

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CROSS SECTION OF REINFORCED CONCRETE RING

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

MANHOLE SHAFT WITH ECCENTRIC REDUCER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 324-2

SHEET 1 OF 2

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NOTES

1. UNLESS OTHERWISE INDICATED THIS STRUCTURE SHALL CONFORM TO ASTM C 478M (ASTM C 478) AND ALL CONCRETE SHALL BE PER SSPWC 201–1.2.

2. MANHOLE FRAME AND COVER SHALL CONFORM TO SPPWC 630.

3. 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.

4. 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.

5. STEPS SHALL CONFORM TO SPPWC 635 OR 636. THE TOP STEP SHALL BE PLACED DIRECTLY BENEATH THE MANHOLE FRAME. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14" (350 mm) TO 15" (375 mm) O.C.

6. THE ECCENTRIC MANHOLE SHAFT REDUCER AND RINGS MAY BE PLAIN CONCRETE. FOR PLAIN CONCRETE SECTIONS THE MINIMUM THICKNESS SHALL BE 6" (150 mm).

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 AND THE ECCENTRIC REDUCER 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). WHEN SAFETY LEDGE IS REQUIRED AND MANHOLE SHAFT IS LESS THAN 12' (4 m) SPPWC 326 MUST BE USED.

10. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

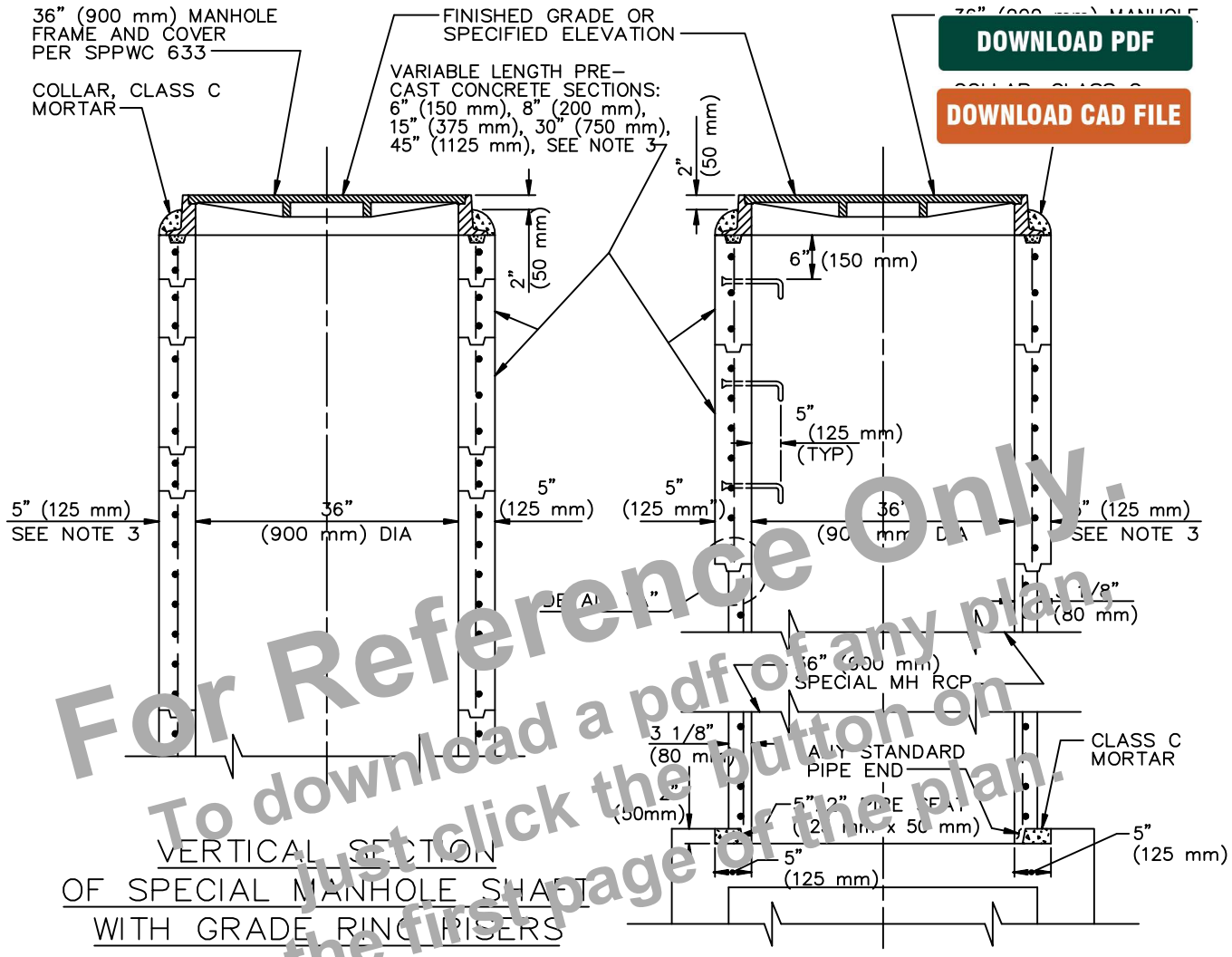
    630 24" (600 mm) MANHOLE FRAME AND COVER
    635 STEEL STEP
    636 POLYPROPYLENE PLASTIC STEP

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN METRIC
MANHOLE SHAFT WITH ECCENTRIC REDUCER	324–2
	SHEET 2 OF 2

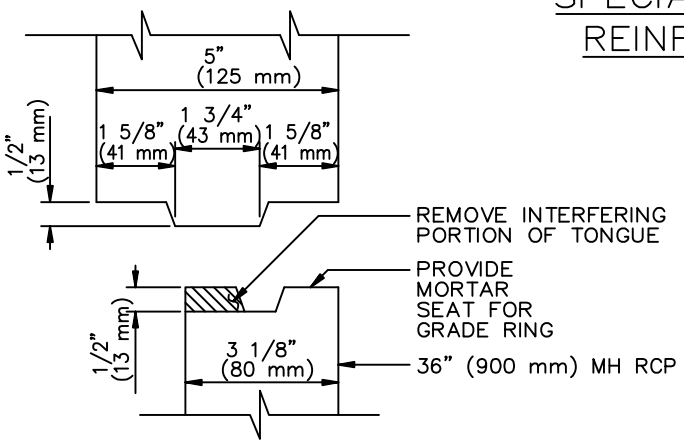
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VERTICAL SECTION OF SPECIAL MANHOLE SHAFT WITH GRADE RING RISERS

VERTICAL SECTION OF SPECIAL MANHOLE SHAFT WITH REINFORCED CONCRETE PIPE



DETAIL "A"

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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

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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) O.C.

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:

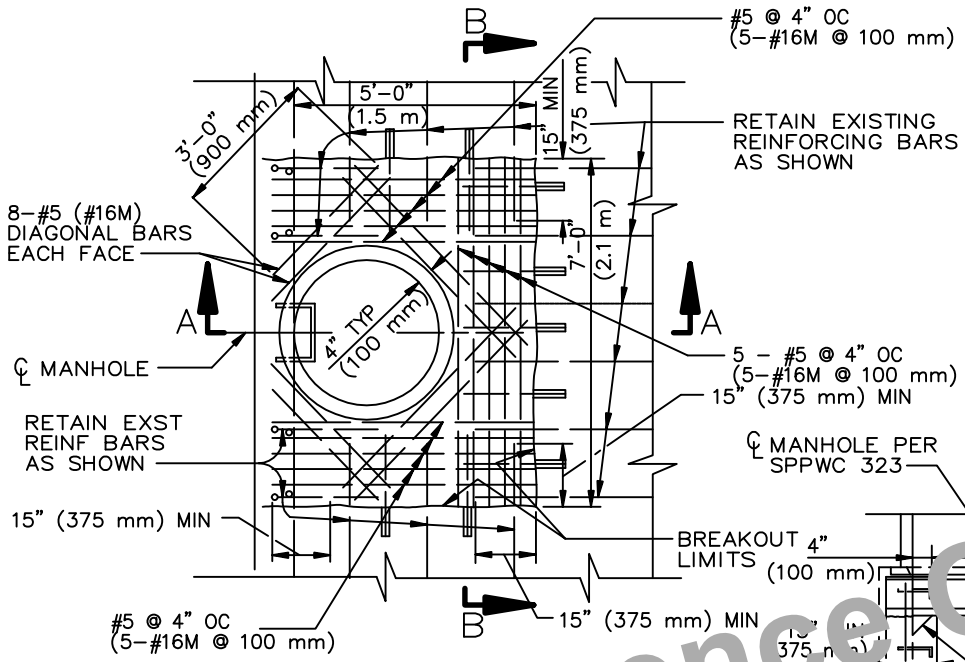
    633 36" (900 mm) MANHOLE FRAME AND COVER
    635 STEEL STEP
    636 POLYPROPYLENE PLASTIC STEP

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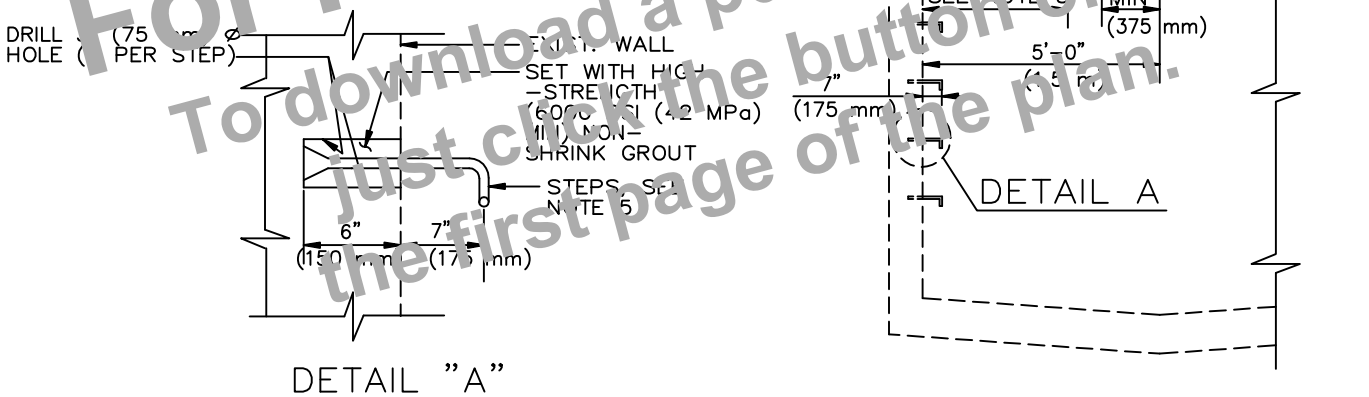
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MANHOLE SHAFT 36"(900 mm) WITHOUT REDUCER	326-2
	SHEET 2 OF 2

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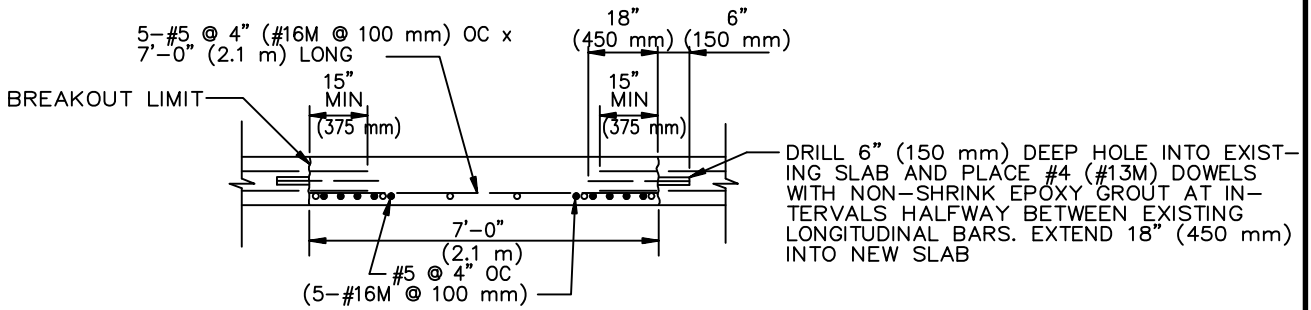
MANHOLE DETAIL



DETAIL "A"

PLACEMENT OF STEEL STEP IN EXISTING RCB

SECTION A–A



SECTION B–B

LEGEND

- ∘ EXISTING REINFORCING BARS
- • ADDED REINFORCING BARS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE
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GREENBOOK COMMITTEE
1992
REV. 1996, 2009

MANHOLE FOR EXISTING RCB

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
327–2
SHEET 1 OF 3

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NOTES

1. THIS STRUCTURE MAY BE USED WHEN THE DEPTH OF COVER IS NO GREATER THAN THE DESIGN COVER OF EXISTING RCB. IF THIS DEPTH IS EXCEEDED, OR PROPOSED MANHOLE SHAFT EXCEEDS 36" (900 mm) IN DIAMETER A DETAILED PLAN WITH CALCULATIONS PREPARED BY A CIVIL OR STRUCTURAL ENGINEER REGISTERED IN THE STATE OF CALIFORNIA SHOWING THE PROPOSED MANHOLE SHALL BE SUBMITTED TO THE AGENCY FOR APPROVAL.

2. STRUCTURAL NOTES.
   - A. DIMENSIONS FROM FACE OF CONCRETE TO REINFORCING STEEL ARE TO CENTER OF BAR UNLESS OTHERWISE SHOWN.
   - B. CONCRETE DIMENSIONS SHALL BE MEASURED HORIZONTALLY OR VERTICALLY ON THE PROFILE, AND PARALLEL TO OR AT RIGHT ANGLES (OR RADIALLY) TO CENTER LINE OF CONDUIT ON THE PLAN EXCEPT AS OTHERWISE SHOWN.
   - C. ALL BAR BENDS AND HOOKS SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE". LATEST EDITION."
   - D. PLACING OF REINFORCEMENT SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE". LATEST EDITION.
   - E. TRANSVERSE REINFORCING STEEL SHALL TERMINATE 1 1/2" (40 mm) FROM THE CONCRETE SURFACES UNLESS OTHERWISE SHOWN.
   - F. NO SPLICES IN TRANSVERSE STEEL REINFORCEMENT SHALL BE PERMITTED OTHER THAN SHOWN ON THE PLANS.
   - G. ALL STRUCTURAL CONCRETE SHALL BE PORTLAND CEMENT CONCRETE WITH A 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI (28 MPa).
   - H. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A ASTM A 615, GRADE 40 (615M, GRADE 300).

3. WHERE REINFORCEMENT IS REQUIRED TO EXTEND THROUGH THE NEW JOINT, CONCRETE SHALL BE REMOVED IN THE FOLLOWING SEQUENCE:
   - A. A SAW CUT SHALL BE MADE 1 1/2" (40 mm) DEEP AT THE REMOVAL LIMITS. CARE SHALL BE EXERCISED IN SAWING AT THE REMOVAL LIMITS SO AS NOT TO CUT THE REINFORCING STEEL WHICH SHALL BE RETAINED AND EXTENDED INTO THE NEW CONSTRUCTION AS INDICATED ON THE PLANS.
   - B. USING HAND-HELD EQUIPMENT THE CONCRETE SHALL BE CAREFULLY REMOVED FOR THE FULL DEPTH OF THE WALL OR SLAB AND FOR A MINIMUM DISTANCE FROM THE SAW CUT EQUAL TO THE LONGEST EXTENSION OF THE EXISTING BARS TO BE EXTENDED INTO THE NEW CONSTRUCTION. THIS EXTENSION SHALL BE 30 BAR DIAMETERS UNLESS OTHERWISE SHOWN.
   - C. EXISTING REINFORCEMENT SHALL BE CUT TO THE REQUIRED BAR EXTENSION.
   - D. THE REMAINING CONCRETE MAY BE REMOVED BY ANY SUITABLE METHOD, UPON APPROVAL OF THE ENGINEER, WHO SHALL BE THE SOLE JUDGE OF THE USE OF ANY CONCRETE REMOVAL EQUIPMENT. EXPLOSIVES, WRECKING BALL OR OTHER SIMILAR DEVICES WHICH ARE LIKELY TO DAMAGE THE CONCRETE TO BE LEFT IN PLACE SHALL NOT BE USED.
   - E. INTERNAL SUPPORT OF THE EXISTING RCB SHALL BE PROVIDED DURING THE REMOVAL AND RECONSTRUCTION OF THE TOP SLAB. A DETAILED PLAN WITH CALCULATIONS PREPARED BY A CIVIL OR STRUCTURAL ENGINEER REGISTERED IN THE STATE OF CALIFORNIA SHOWING THE TEMPORARY SUPPORT SYSTEM SHALL BE SUBMITTED AND APPROVED BY THE AGENCY PRIOR TO THE START OF REMOVAL WORK.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 327-2 SHEET 2 OF 3
MANHOLE FOR EXISTING RCB	

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4. WHEN THE MANHOLE OPENING IS 24" (610 mm), THE BREAKOUT LIMIT DIMENSIONS MAY BE REDUCED FROM 5'–0" x 7'–0" (1.5 m x 2.1 m) TO 4'–0" x 6'–0" (1.2 m x 1.8 m).

5. STEPS SHALL CONFORM TO SPPWC 635. UNLESS OTHERWISE SHOWN STEPS SHALL BE SPACED 14" (350 mm) TO 15" (375 mm) OC. THE LOWEST STEP SHALL NOT BE MORE THAN 24" (600 mm) ABOVE THE INVERT.

6. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

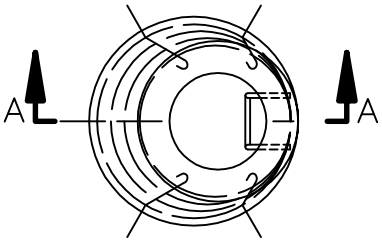
323	MANHOLE – CONCRETE BOX STORM DRAIN
630	24" (610 mm) MANHOLE FRAME AND COVER
635	STEEL STEP

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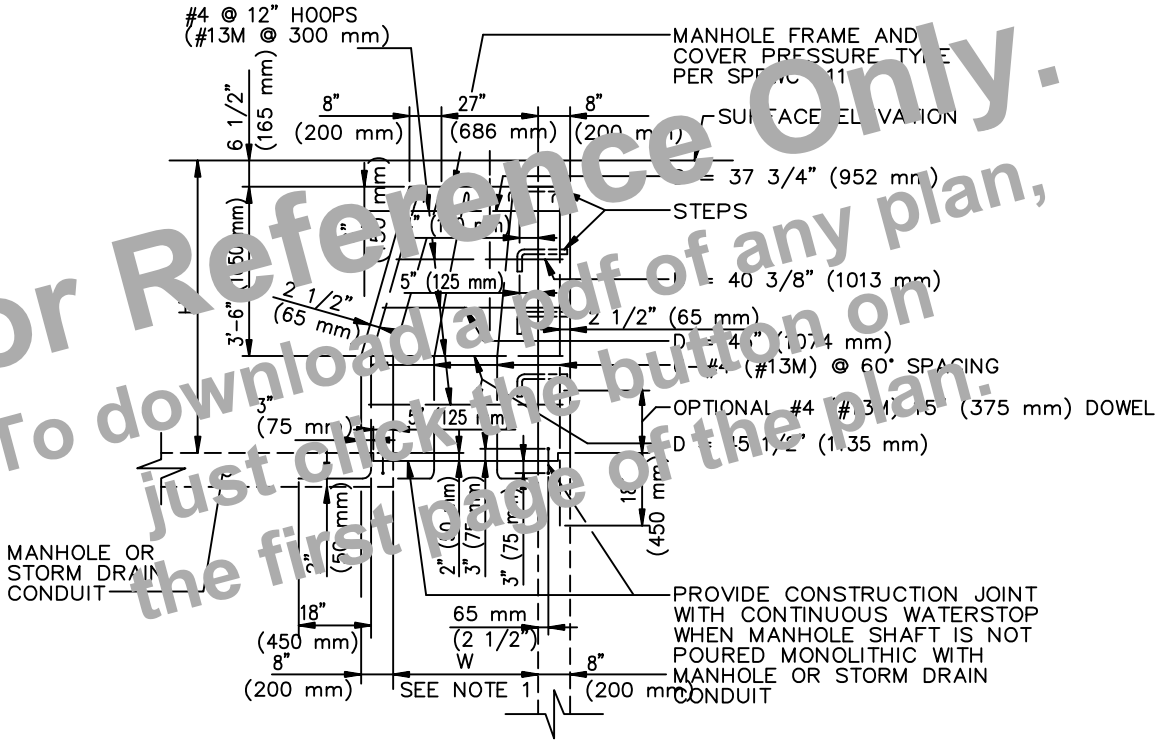
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 327–2 SHEET 3 OF 3
MANHOLE FOR EXISTING RCB	

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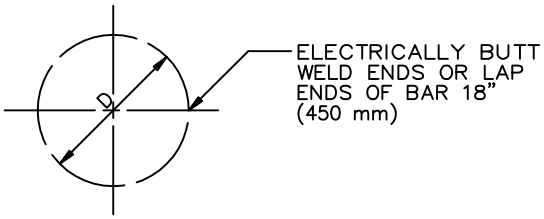
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PLAN



SECTION A–A



#4 (#13M) HOOP BARS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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GREENBOOK COMMITTEE
1992
REV. 1996, 2009

PRESSURE MANHOLE SHAFT WITH ECCENTRIC REDUCER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
328–2
SHEET 1 OF 2

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NOTES

1. IF H IS LESS THAN 18" (450 mm), W=27" (675 mm)
   IF H IS BETWEEN 18" (450 mm) AND 2'–6" (750 mm), W=2'–6" (750 mm).
   IF H IS 2'–6" (750 mm) OR MORE, W=3'–0" (900 mm).
   IF H IS MORE THAN 4'–0 1/2" (1215 mm), BRING WALL VERTICALLY TO 4'–0 1/2" (1215 mm) BELOW SURFACE AND TAPER FROM 3'–0" (900 mm) TO 27" (675 mm) AS SHOWN.

2. THIS STRUCTURE SHALL BE USED WITH MANHOLE FRAME AND COVER PRESSURE TYPE, SPPWC 211. IT MAY BE USED FOR HYDROSTATIC HEADS UP TO 25' (7.5 m) ABOVE THE STEEL PLATE.

3. THE VERTICAL SIDE OF THE MANHOLE SHAFT AND THE ECCENTRIC REDUCER SHALL BE LOCATED ABOVE AND IN LINE WITH THE SIDE OF THE STORM DRAIN CONDUIT.

4. 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.

5. STEPS SHALL CONFORM TO SPPWC 635 OR 636. THE TOP STEP SHALL BE PLACED DIRECTLY BENEATH THE MANHOLE FRAME. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 14" (350 mm) TO 15" (375 mm) O.C.

6. SEE CONTRACT SPECIFICATIONS FOR PHYSICAL REQUIREMENTS OF WATERSTOP.

7. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

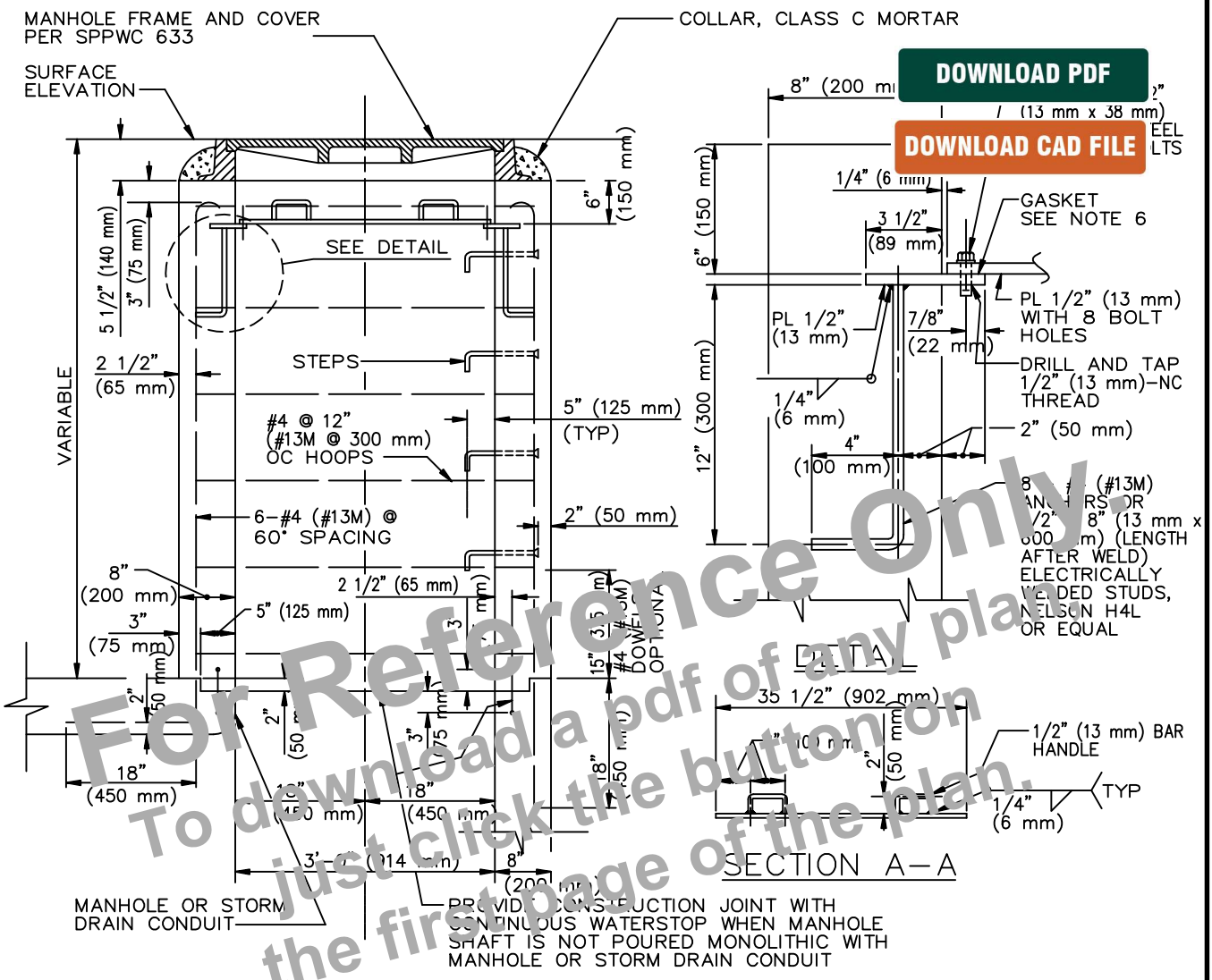
   211 MANHOLE FRAME AND COVER PRESSURE TYPE
   635 STEEL STEP
   636 POLYPROPYLENE PLASTIC STEP

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRESSURE MANHOLE SHAFT WITH ECCENTRIC REDUCER	328–2
	SHEET 2 OF 2

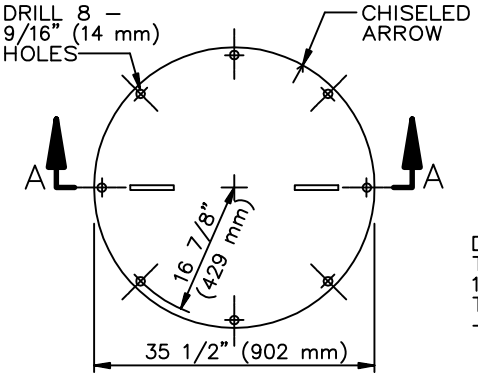
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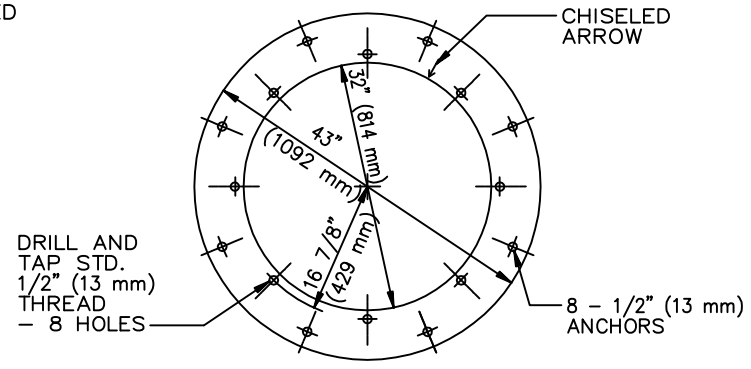


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VERTICAL SECTION OF SPECIAL PRESSURE MANHOLE SHAFT



PLAN
PRESSURE PLATE



PLAN
PRESSURE PLATE RING

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1992 REV. 1996, 2009	**PRESSURE MANHOLE SHAFT AND PRESSURE PLATE DETAIL 36" (914 mm) WITHOUT REDUCER** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **329-2** SHEET 1 OF 2

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NOTES

1. THIS STRUCTURE MAY BE USED FOR HYDROSTATIC HEADS UP TO 25' (7.5 m) ABOVE THE PRESSURE PLATE.

2. 36" (914 mm) MANHOLE FRAME AND COVER PER SPPWC 633 SHALL BE USED.

3. REINFORCEMENT SHALL BE PER ASTM A 615, GRADE 40 AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACES UNLESS OTHERWISE SHOWN. HOOPS MAY BE ELECTRICALLY BUTT WELDED OR THE ENDS LAPPED 18" (450 mm).

4. THE MANHOLE SHAFT SHALL BE LOCATED ABOVE AND IN LINE WITH THE SIDE OF THE CONDUIT BELOW.

5. STEPS SHALL CONFORM TO SPPWC 635 OR 636. UNLESS OTHERWISE SHOWN, STEPS SHALL BE UNIFORMLY SPACED 15" (350 mm) TO 15" (375 mm) OC.

6. GASKET MATERIAL SHALL BE NEOPRENE (OR EQUAL) 1/16" (2 mm) THICK BY 1 1/4" (32 mm) WIDE.

7. BOLTS SHALL BE STAINLESS STEEL CONFORMING TO ASTM A 320 (ASTM A 320M) GRADE B8.

8. PRESSURE PLATE AND PRESSURE PLATE RING SHALL BE STEEL CONFORMING TO ASTM A 36 (ASTM A 36M) AND SHALL BE GALVANIZED. PLATES SHALL BE MARKED IN SETS AND A CHISELED ARROW STAMPED ON BOTH PLATES AFTER DRILLING AND TAPPING, TO FACILITATE FIELD ASSEMBLY.

9. SEE CONTRACT SPECIFICATIONS FOR PHYSICAL REQUIREMENTS OF WATERSTOP.

10. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

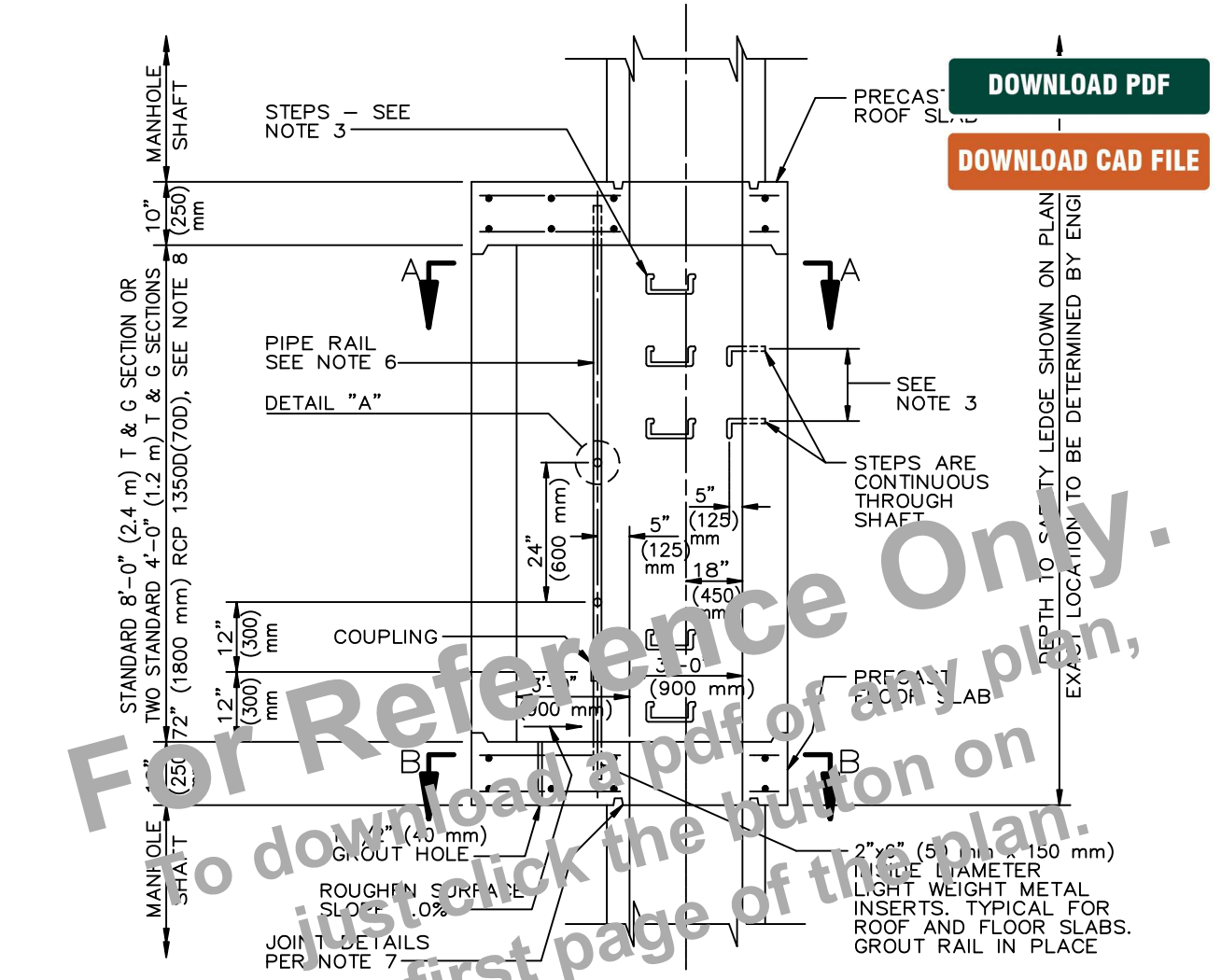
    633 36" (914 mm) MANHOLE FRAME AND COVER
    635 STEEL STEP
    636 POLYPROPYLENE PLASTIC STEP

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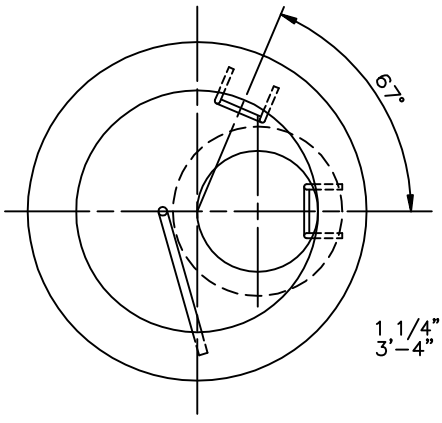
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRESSURE MANHOLE SHAFT AND PRESSURE PLATE DETAIL 36" (914mm) WITHOUT REDUCER	329–2
	SHEET 2 OF 2

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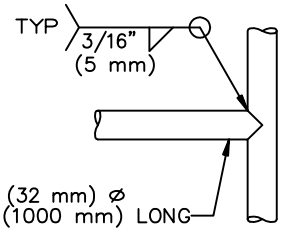
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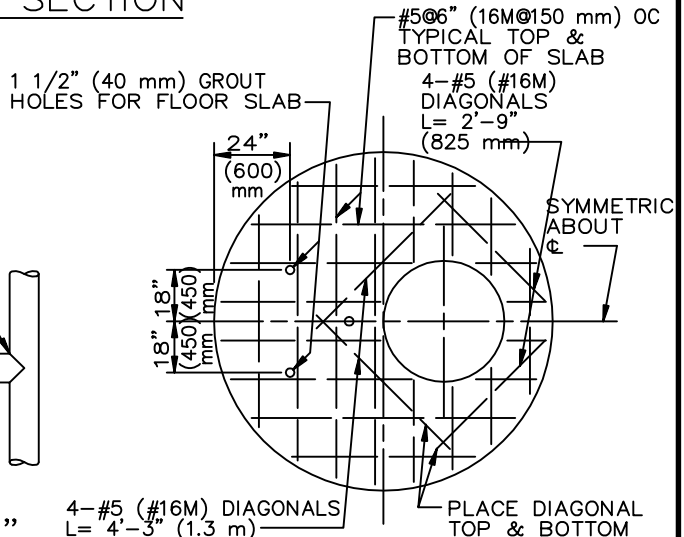
VERTICAL SECTION



SECTION A–A



DETAIL "A"
ROTATED 90°



SECTION B–B
REINFORCEMENT DETAILS
FOR FLOOR AND ROOF SLABS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

MANHOLE SHAFT SAFETY LEDGE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 330–2

SHEET 1 OF 2

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NOTES

1. MANHOLE SHAFT SAFETY LEDGE WILL BE NOTED ON THE PLANS WHEN REQUIRED. IT IS TO BE CONSTRUCTED WHEN DEPTH OF MANHOLE TO INVERT IS GREATER THAN 20' (6 m) AND MANHOLE SHAFT IS GREATER THAN 10' (3 m).

2. A SAFETY LEDGE SHALL NOT BE USED IF A PRESSURE MANHOLE IS REQUIRED.

3. STEPS SHALL CONFORM TO SPPWC 635 OR 636 AND SHALL BE ANCHORED 4" (100 mm) IN THE WALL OF THE STRUCTURE. STEPS SHALL BE PLACED TO MATCH THE SPACING OF THE MANHOLE SHAFT.

4. REINFORCEMENT SHALL BE PER ASTM A 615, GRADE 40 (ASTM A 615M GRADE 300) AND SHALL TERMINATE 2" (50 mm) CLEAR OF CONCRETE SURFACE UNLESS OTHERWISE SHOWN.

5. GROUT HOLES, PIPE AND FITTINGS SHALL BE PROVIDED IN THE FLOOR SLAB. PRESSURE GROUTING SHALL BE USED TO FILL VOIDS AND TO SECURE UNIFORM BEARING. THE GROUT SHALL BE NEAT CEMENT GROUT AND GROUTING PRESSURES SHALL BE AS DETERMINED IN THE FIELD BY THE ENGINEER.

6. PIPE RAIL SHALL BE FABRICATED OF 1 1/4" (32 mm) STANDARD GALVANIZED PIPE COMPOSED OF TWO SECTIONS 7'-6" (2.25 m) & 18" (450 mm) IN LENGTH JOINED BY A GALVANIZED COUPLING. THE COUPLING SHALL BE THREADED A MINIMUM OF 2" (50 mm) ON EACH PIPE LENGTH.

7. ROOF AND FLOOR SLABS SHALL BE PRECAST AND KEYED FOR REINFORCED CONCRETE PIPE SECTIONS AS SHOWN. ALL JOINTS SHALL BE FILLED WITH CLASS C MORTAR AND NEATLY POINTED OR WIPED ON THE INSIDE.

8. 72" (1800 mm) RCP SHALL BE PROVIDED WITH TWO CIRCULAR CAGES OF REINFORCEMENT.

9. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

   324 MANHOLE SHAFT – WITH ECCENTRIC REDUCER
   326 MANHOLE SHAFT – 36" (900 mm) WITHOUT REDUCER
   635 STEEL STEP
   636 POLYPROPYLENE PLASTIC STEP

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 330–2 SHEET 2 OF 2
MANHOLE SHAFT SAFETY LEDGE	

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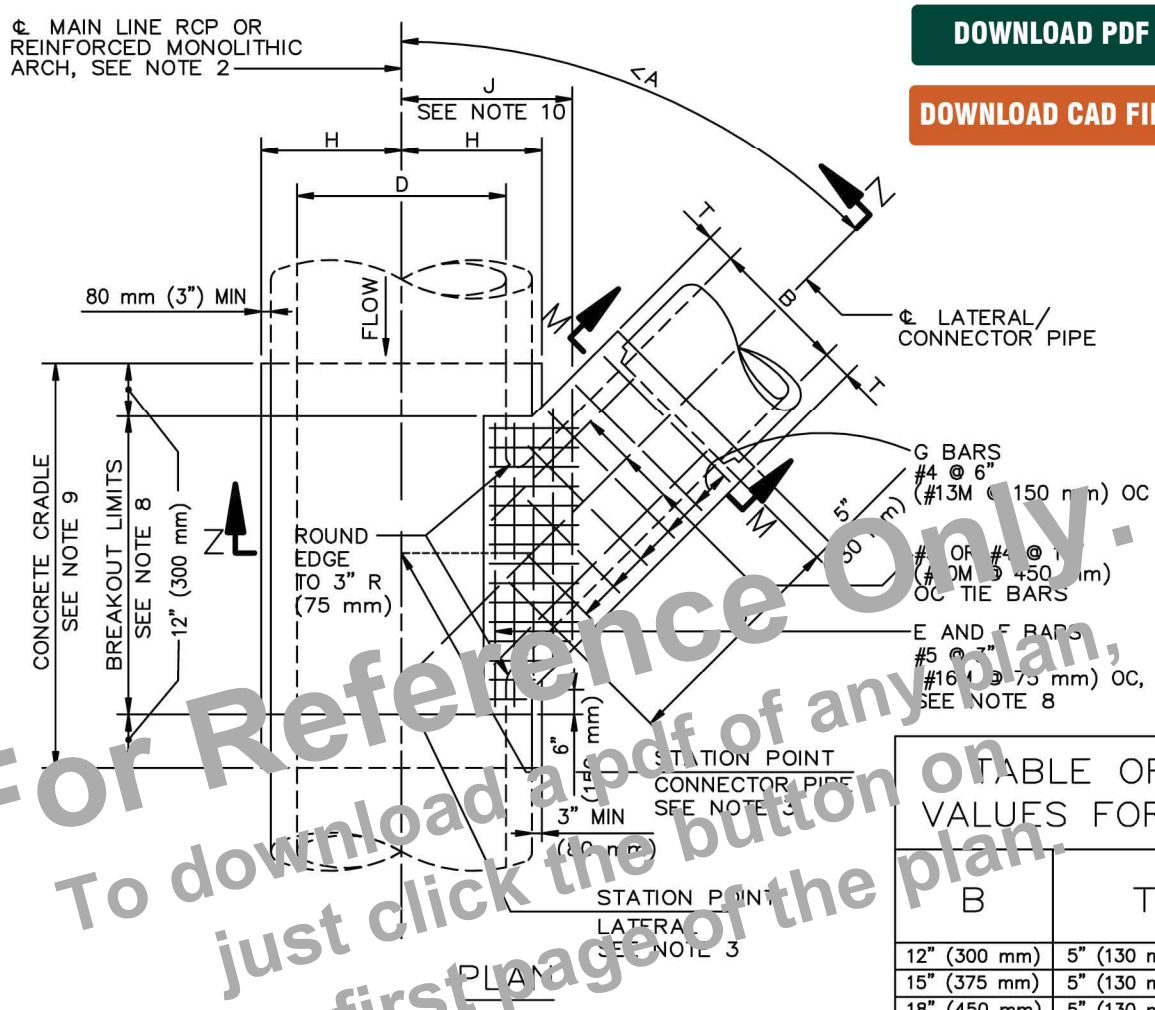
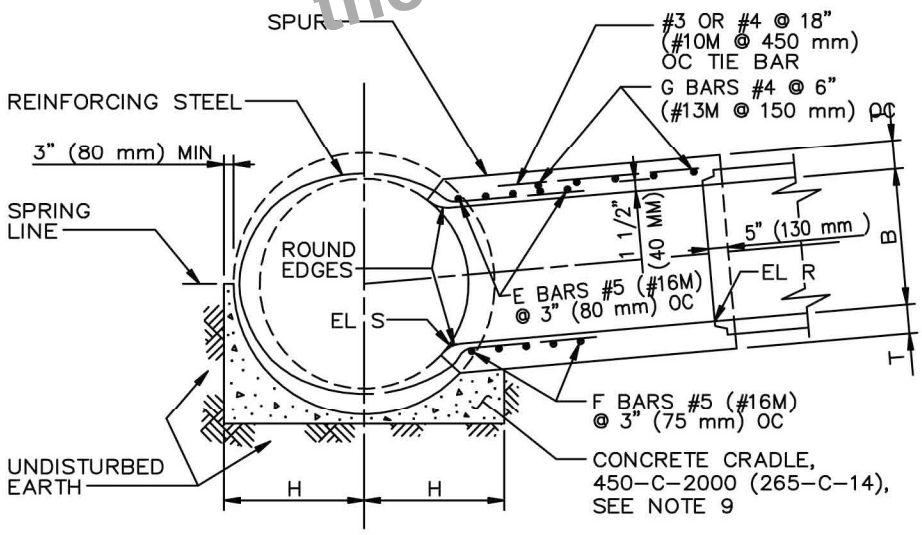
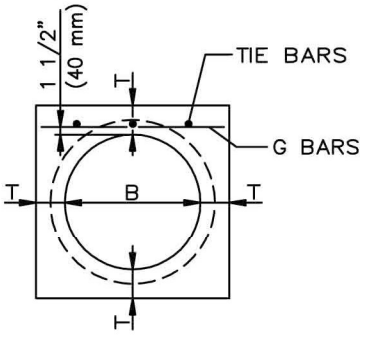


TABLE OF VALUES FOR T	
B	T
12" (300 mm)	5" (130 mm)
15" (375 mm)	5" (130 mm)
18" (450 mm)	5" (130 mm)
21" (525 mm)	5" (130 mm)
24" (600 mm)	5 1/2" (140 mm)
27" (675 mm)	5 1/2" (140 mm)
30" (750 mm)	6" (150 mm)
33" (825 mm)	6 1/2" (170 mm)
36" (900 mm)	6 1/2" (170 mm)
39" (975 mm)	7" (180 mm)



SECTION Z–Z



SECTION M–M

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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

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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° 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 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).

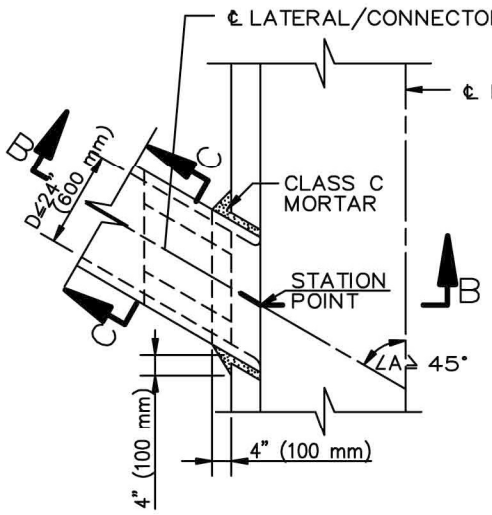
11. FLOOR OF THE SPUR SHALL BE STEEL-TROWELED TO THE SPRING LINE OF THE SPUR.

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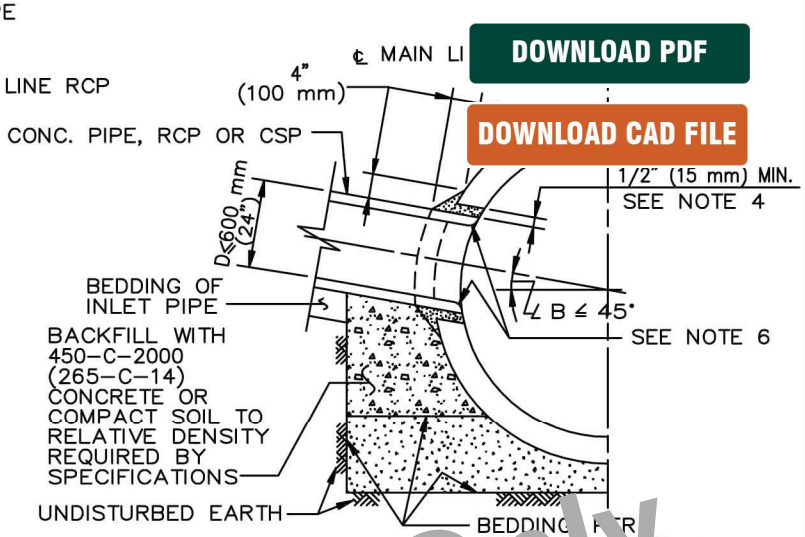
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
JUNCTION STRUCTURE–PIPE TO PIPE INLET ID≥24" (600 mm) OR OD>1/2 MAIN LINE ID	331–3 SHEET 2 OF 2

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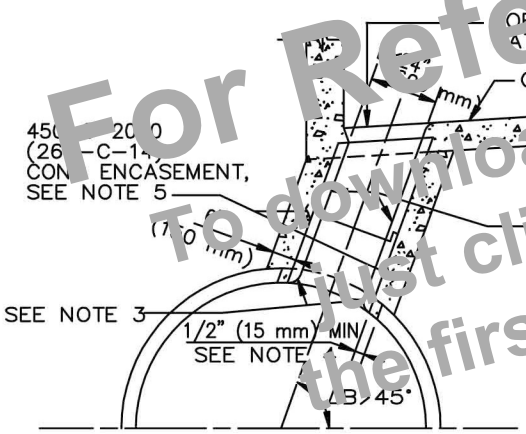
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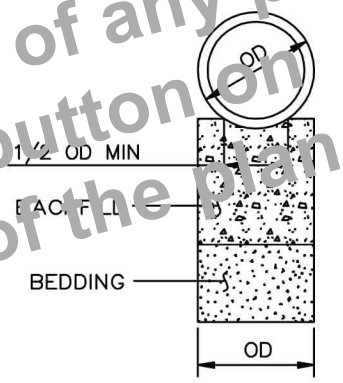
CASE 1
PLAN



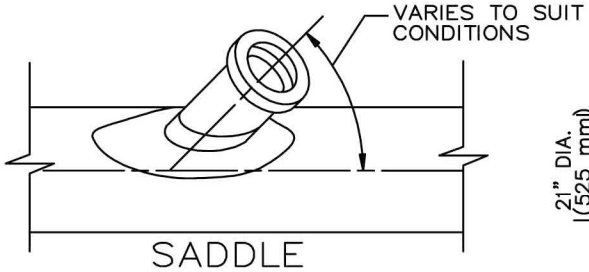
CASE 1
SECTION B–B



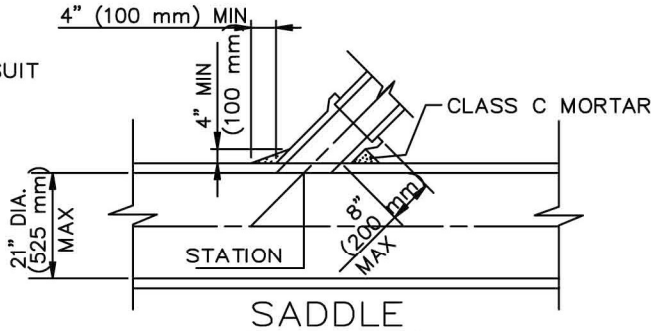
CASE 2
(SEE NOTES 9 & 10)



CASE 1
SECTION C–C



SADDLE
PLAN



SADDLE
SECTION

CASE 3
SADDLE CONNECTION

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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

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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

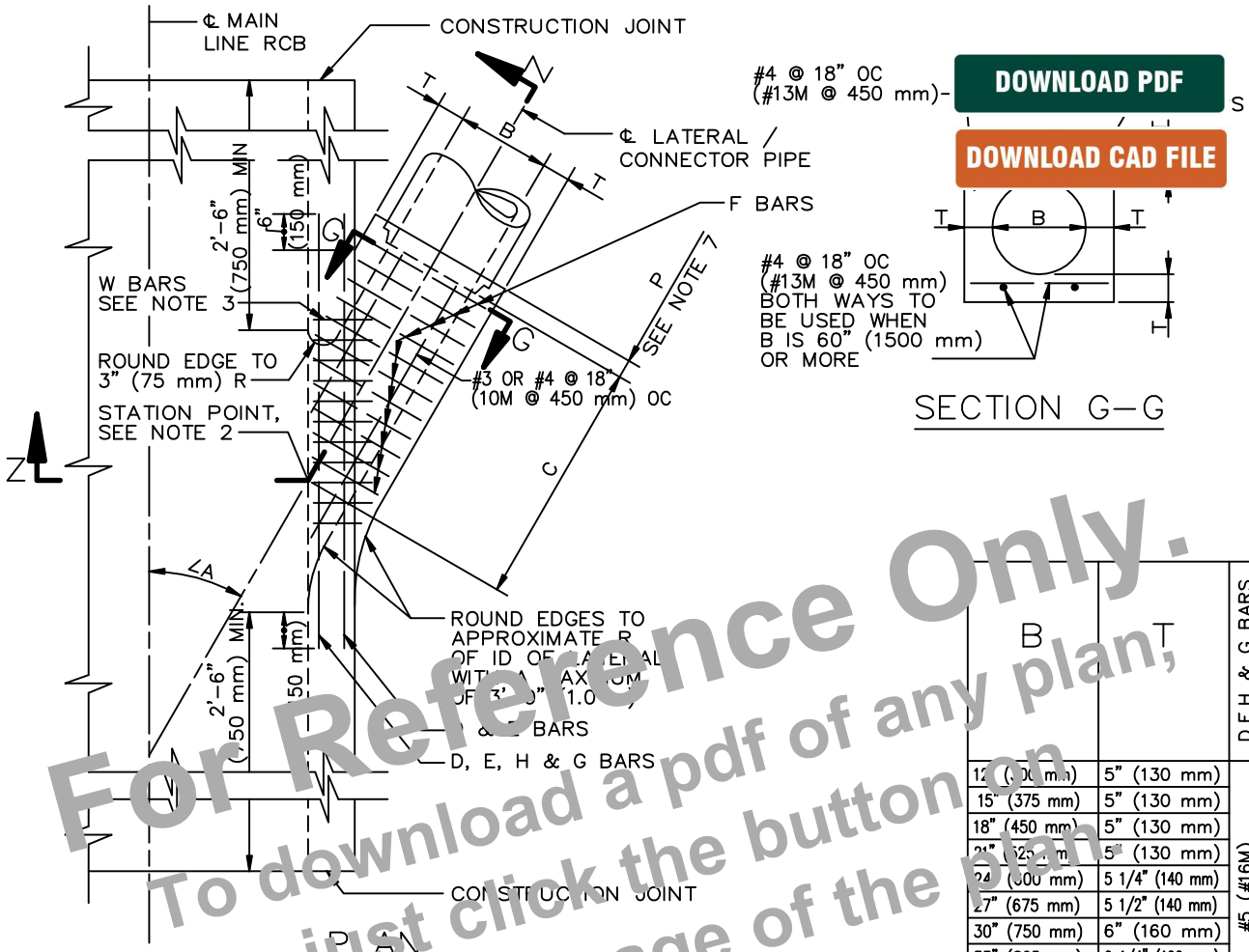
11. CONNECTIONS TO PIPES 21" (525 mm) OR LESS IN DIAMETER WITHOUT JUNCTION STRUCTURES OR PRECAST Y BRANCHES SHALL BE MADE WITH SADDLES.
12. THE OUTSIDE DIAMETER OF THE INLET PIPE SHALL NOT EXCEED ONE–HALF THE INSIDE DIAMETER OF THE MAIN LINE.
13. TRIM OR CUT SADDLE TO FIT SNUGLY OVER THE OUTSIDE OF THE 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.

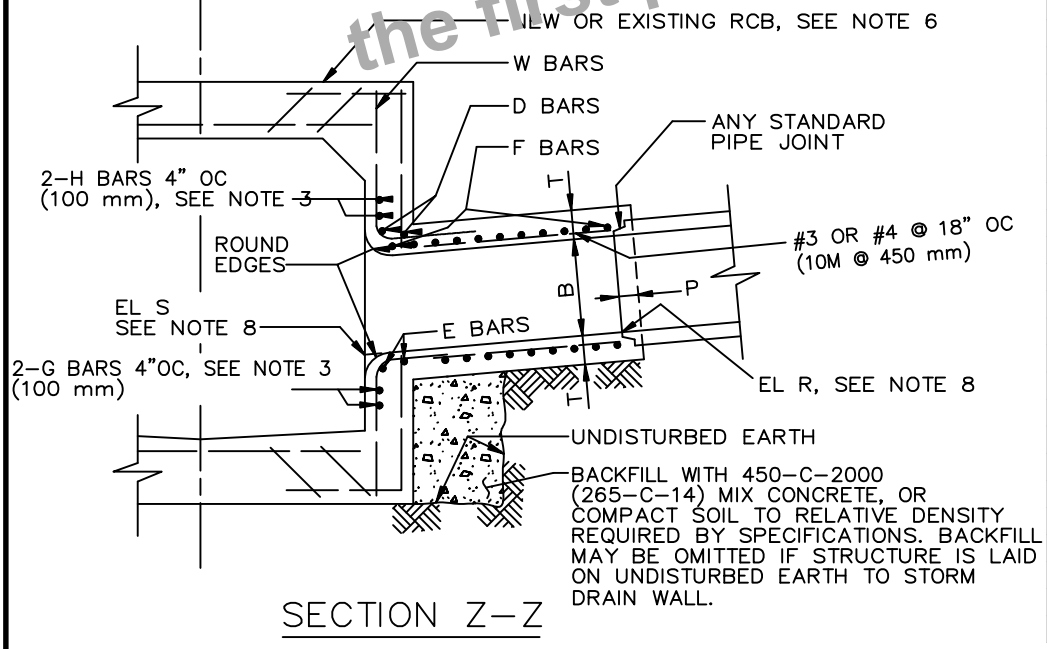
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
JUNCTION STRUCTURE – PIPE TO PIPE (ID ≤ 24" (600 mm))	332–2
	SHEET 2 OF 2

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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)		
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)	#6 (#19M)	#5 @ 6" (#16M @ 150 mm) OC
45" (1125 mm)	7 3/4" (200 mm)		
48" (1220 mm)	8" (210 mm)		
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)		
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)	#7 (#22M)	#5 @ 6" (#16M @ 150 mm) OC
96" (2440 mm)	14" (360 mm)		
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)		
138" (3450 mm)	17 1/2" (450 mm)		
144" (3600 mm)	18" (460 mm)		

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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

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NOTES

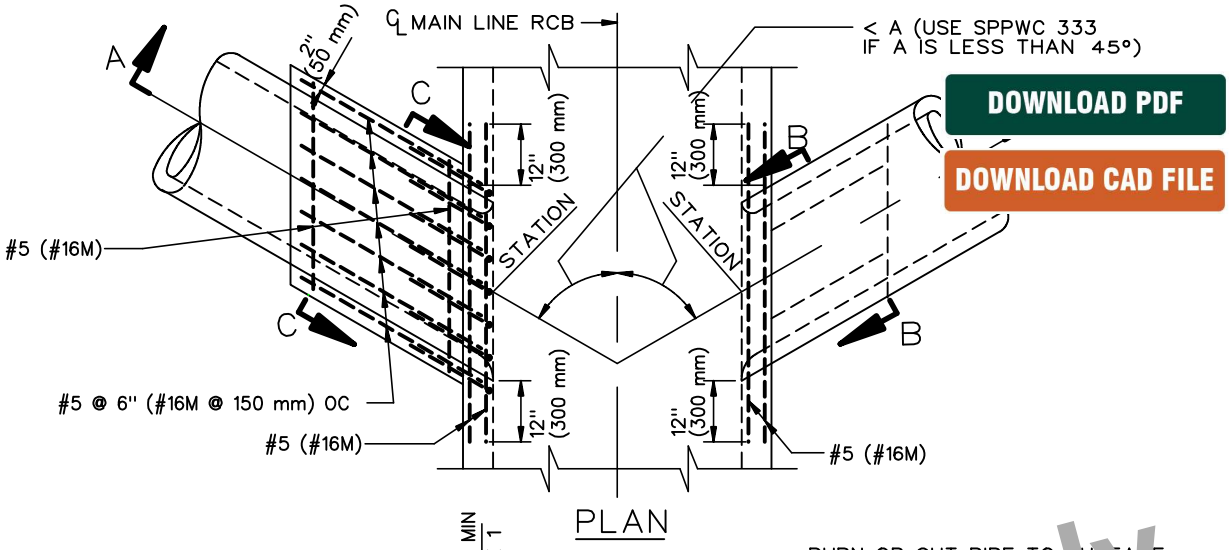
1. VALUES FOR A, B AND C SHALL BE SHOWN ON THE PLANS. ELEVATION R AND ELEVATION S SHALL BE SHOWN WHEN REQUIRED PER NOTE 8.
2. STATIONS SPECIFIED ON THE PLANS APPLY AT THE INTERSECTION OF CENTERLINES OF MAIN LINE AND LATERALS, EXCEPT THAT STATIONS FOR CATCH BASIN CONNECTOR PIPES APPLY AT INSIDE WALL OF 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" (125 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 THE FLOOR OF THE RCB AT THE INSIDE FACE

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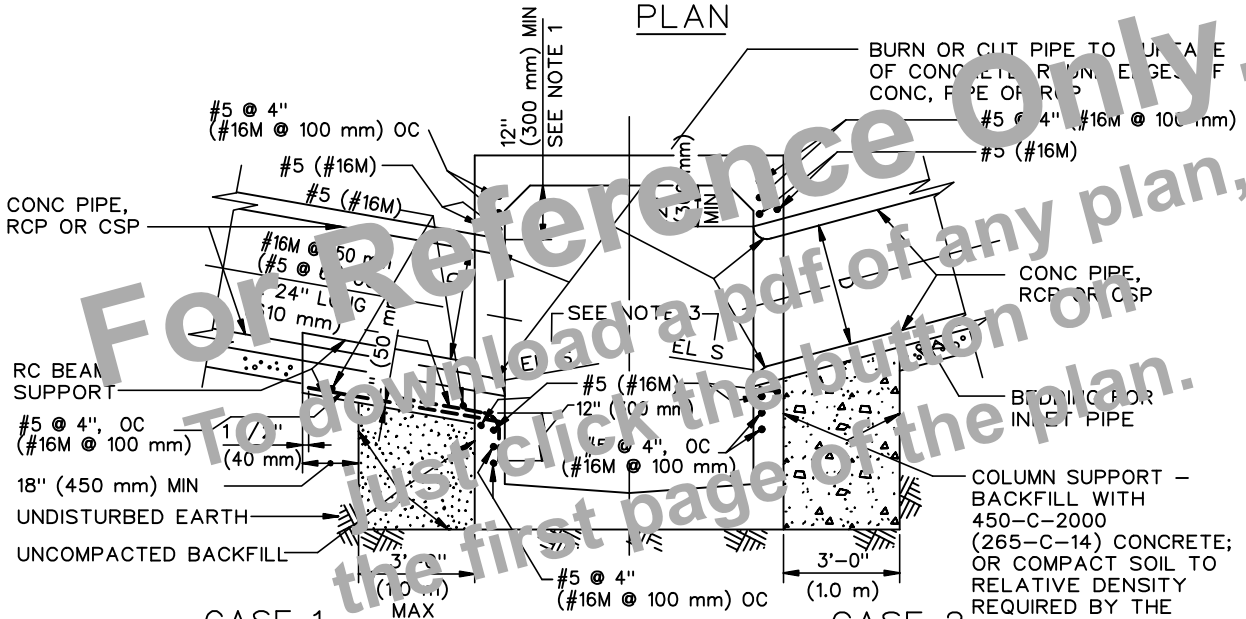
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 333–2 SHEET 2 OF 2
JUNCTION STRUCTURE – PIPE TO RCB	

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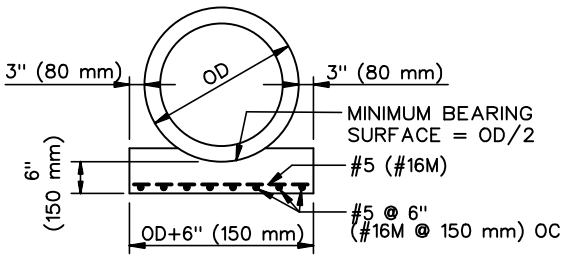
PLAN



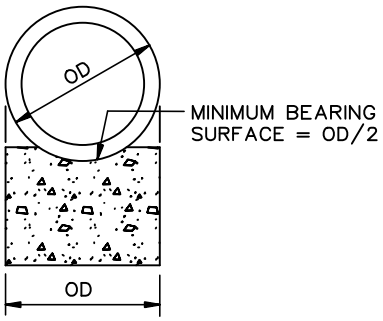
CASE 1
BEAM SUPPORT
D = 30" (750 mm) MAX

SECTION A–A

CASE 2
COLUMN SUPPORT
D = 30" (750 mm) MAX



SECTION C–C



SECTION B–B

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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JUNCTION STRUCTURE – PIPE TO RCB [INLET ID ≤ 30" (750 mm)]

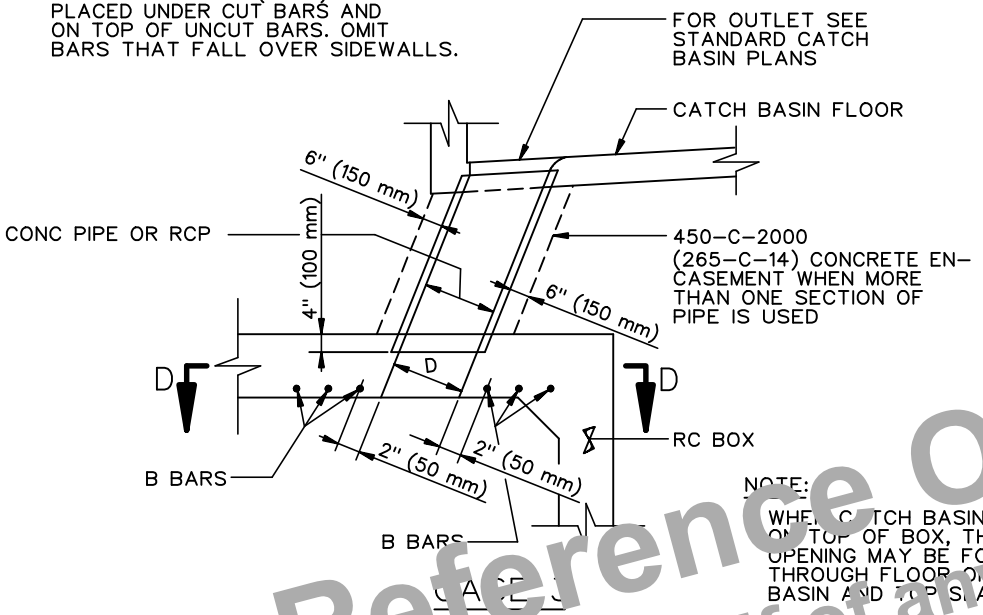
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 334–2

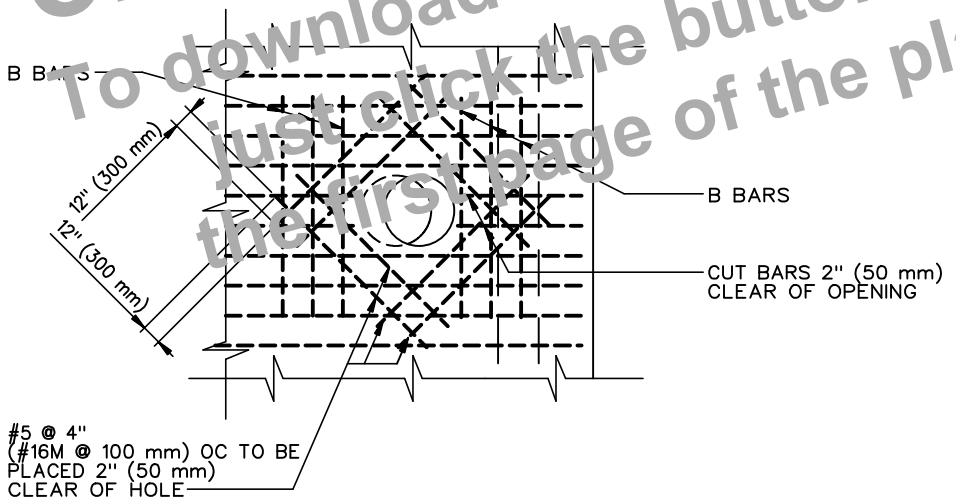
SHEET 1 OF 3

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B BARS – #6 @ 4" (#19M @ 100 mm) OC, LENGTH = D+3'–0" (1.0 m) PLACED UNDER CUT BARS AND ON TOP OF UNCUT BARS. OMIT BARS THAT FALL OVER SIDEWALLS.



TOP SLAB ENTRANCE
D = 30" (750 mm) MAX



SECTION D–D

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
JUNCTION STRUCTURE – PIPE TO RCB [INLET ID ≤ 30" (750 mm)]	**334–2**
	SHEET 2 OF 3

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NOTES

1. USE JUNCTION STRUCTURE PER SPPWC 333 INSTEAD OF THIS JUNCTION STRUCTURE UNDER ANY ONE OF THE FOLLOWING CONDITIONS:

   a. DIAMETER OF INLET PIPE EXCEEDS 30" (750 mm).

   b. TOP OF PIPE IS LESS THAN 12" (300 mm) BELOW SOFFIT OF BOX.

   c. FLOW LINE OF PIPE IS LESS THAN 13" (225 mm) ABOVE FLOOR OF THE BOX AT INSIDE FACE.

   d. ANGLE A IS LESS THAN 45°.

2. ALL CSP AND FITTINGS SHALL BE GALVANIZED.

3. ELEVATION S SHALL BE SPECIFIED ON PLANS ONLY IF THE TOP OF PIPE IS MORE THAN 12" (300 mm) BELOW SOFFIT OF BOX.

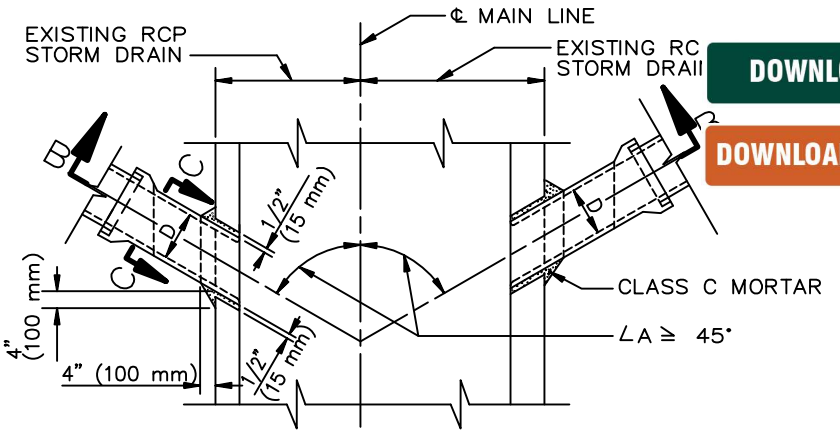
4. LATERALS OR CONNECTOR PIPES 24" (600 mm) OR LESS IN DIAMETER SHALL BE NOT MORE THAN 5' (1.5 m) ABOVE THE INVERT. LATERALS OR CONNECTOR PIPES 27" (675 mm) OR LARGER IN DIAMETER SHALL BE NOT MORE THAN 18" (450 mm) ABOVE THE INVERT, WITH THE EXCEPTION THAT CATCH BASIN CONNECTOR PIPES LESS THAN 50' (15 m) IN LENGTH SHALL BE NOT MORE THAN 5' (1.5 m) ABOVE THE INVERT.

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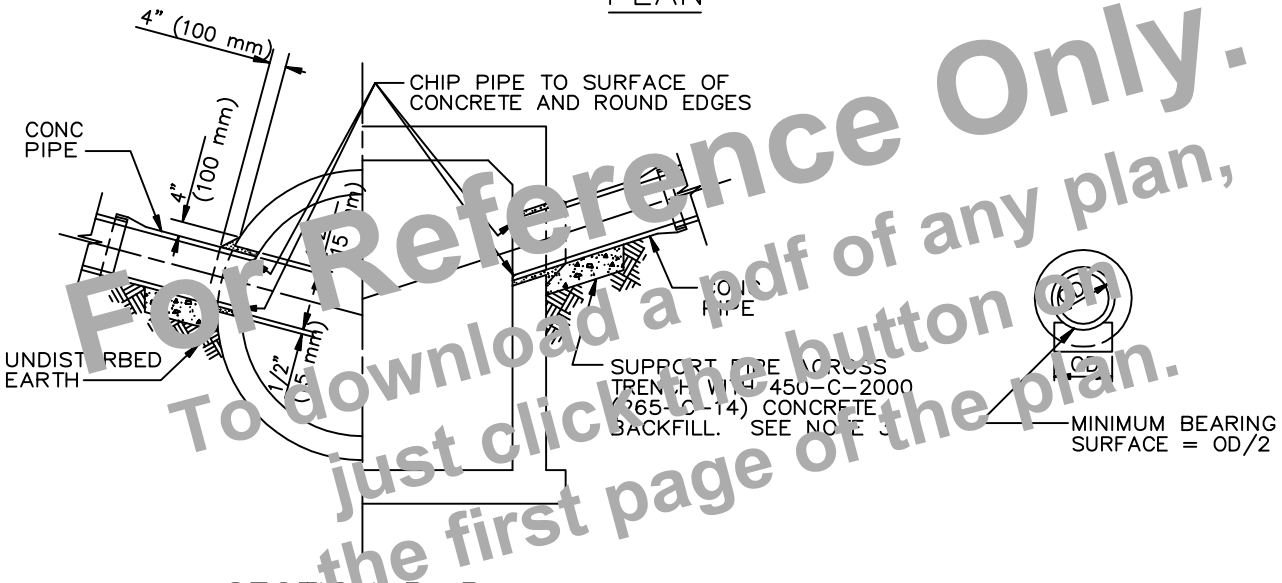
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
JUNCTION STRUCTURE – PIPE TO RCB [INLET ID ≤ 30" (750 mm)]	**334–2**
	SHEET 3 OF 3

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PLAN



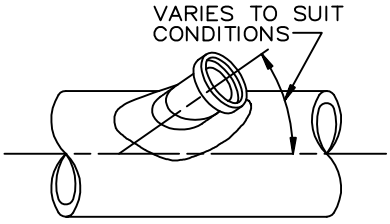
SECTION B–B

SECTION C–C

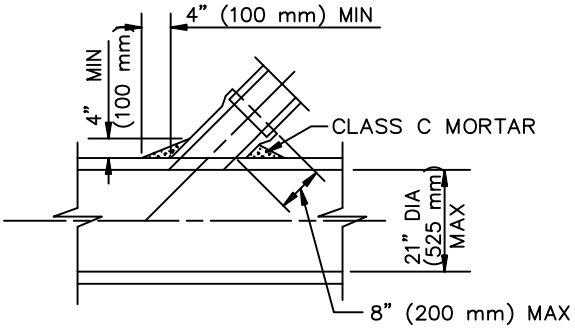
CASE 1

PLAIN CONCRETE PIPE

D = 24" (600 mm) MAX



SADDLE PLAN



SADDLE SECTION

CASE 2

SADDLE CONNECTION

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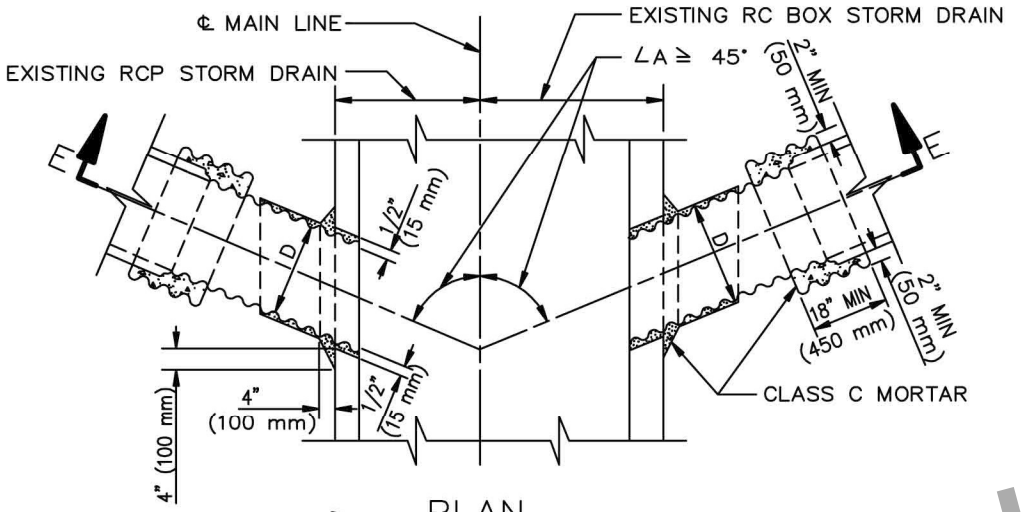
PIPE CONNECTIONS TO EXISTING STORM DRAINS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

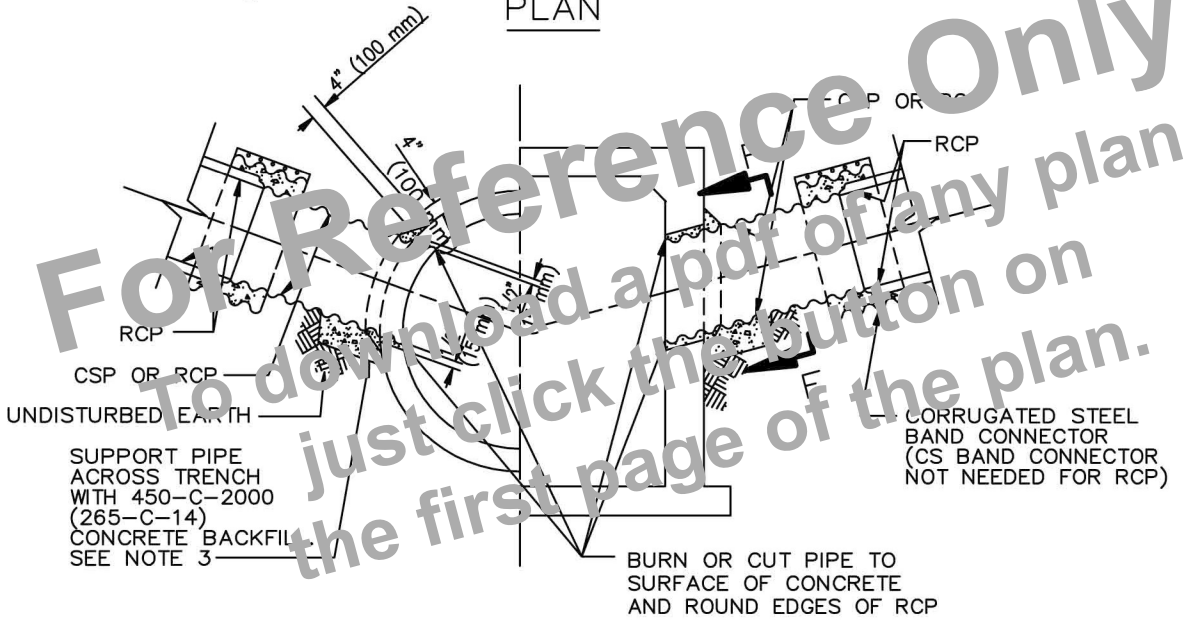
STANDARD PLAN 335–2

SHEET 1 OF 3

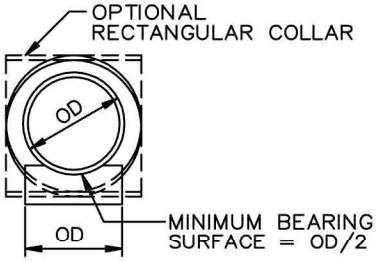
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PLAN



SECTION E–E



SECTION F–F

DIAMETER OF CSP	MIN GAGE
15" (375 mm) – 21" (525 mm)	16
24" (600 mm)	14

CASE 3

RCP OR CSP

D = 24" (600 mm) MAX

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PIPE CONNECTIONS TO EXISTING STORM DRAINS	335–2
	SHEET 2 OF 3

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NOTES

CASE 1 AND CASE 3

1. OUTSIDE DIAMETER OF THE CONNECTOR PIPE SHALL NOT BE GREATER THAN 1/2 THE INSIDE DIAMETER OF THE RCP MAIN LINE.
2. INSIDE DIAMETER D OF THE CONNECTOR PIPE SHALL NOT BE GREATER THAN 24" (600 mm).
3. THE MINIMUM OPENING INTO THE EXISTING STORM DRAIN SHALL BE THE OUTSIDE DIAMETER OF THE CONNECTING PIPE PLUS 1" (30 mm). THE CONCRETE BACKFILL SUPPORTING THE CONNECTING PIPE MAY BE OMITTED IF THE PIPE IS LAID ON UNDISTURBED EARTH TO STORM DRAIN WALL.
4. ALL CSP AND FITTINGS SHALL BE GALVANIZED. BAND CONNECTORS MAY BE 2 GAGES LIGHTER THAN THE PIPE, BUT WITH A MINIMUM GAGE OF 16. THEY SHALL BE CONNECTED AT THE END BY ANGLES HAVING MINIMUM DIMENSIONS OF 2"x2"x3/16" (50 mm x 50 mm x 5 mm) AND 5 1/2" (140 mm) BOLTS.
5. WHEN JOINING A RCP CONNECTOR PIPE TO A CSP CONNECTOR PIPE, THE INSIDE DIAMETER D OF THE CSP SHALL BE AT LEAST EQUAL TO BUT NOT MORE THAN 3" (75 mm) GREATER THAN THAT OF THE RCP.
6. CONNECTOR PIPES SHALL BE NOT MORE THAN 5' (1.5 m) ABOVE THE INVERT.
7. CONNECTOR PIPES SHALL ENTER MAIN LINE RCP RADIALLY.
8. WHEN CONNECTING TO A RCB, SPPWC 335 SHALL BE USED IF THE TOP OF THE CONNECTOR PIPE IS LESS THAN 12" (300 mm) BELOW THE SOFFIT OF THE RCB OR THE FLOW LINE OF THE PIPE IS LESS THAN 13" (330 mm) ABOVE THE FLOOR OF THE RCB AT THE INSIDE FACE.

CASE 2

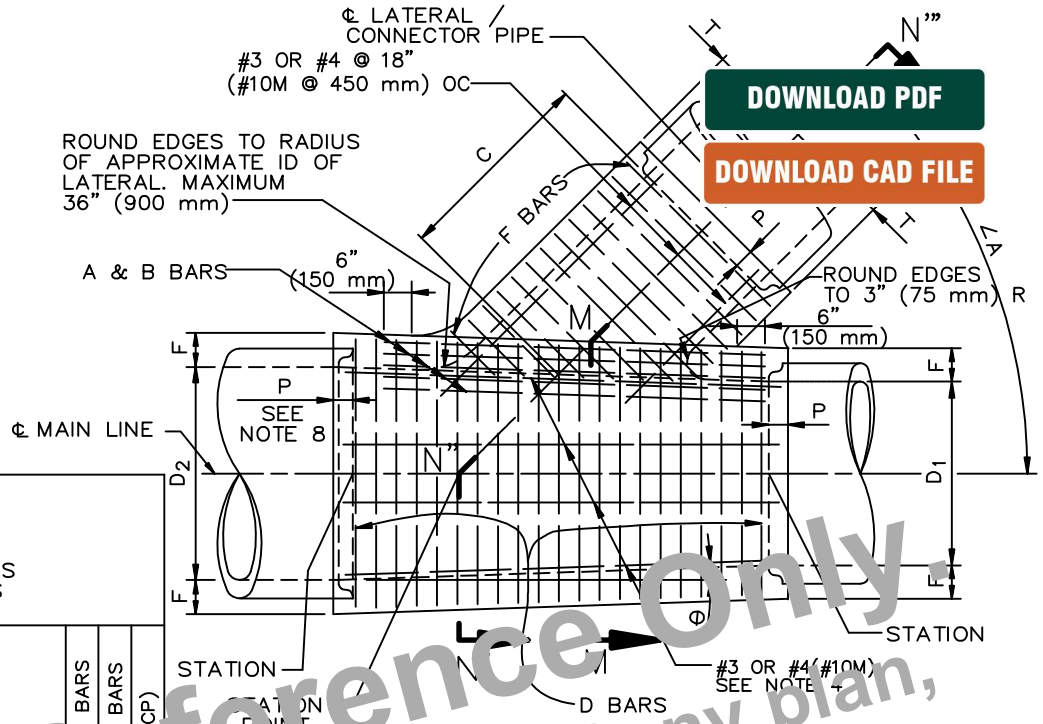
9. SADDLE CONNECTIONS SHALL BE USED WHEN CONNECTING TO PIPES 21" (525 mm) OR LESS IN DIAMETER WITHOUT THE USE OF JUNCTION STRUCTURES OR PRECAST Y BRANCHES.
10. TRIM OR CUT SADDLE TO FIT SNUGLY OVER THE OUTSIDE OF THE MAIN PIPE SO ITS AXIS WILL BE ON THE LINE AND GRADE OF THE CONNECTING PIPE.
11. THE 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.
12. THE CONNECTOR PIPE SHALL BE SUPPORTED AS SHOWN IN CASE 1 AND CASE 3.

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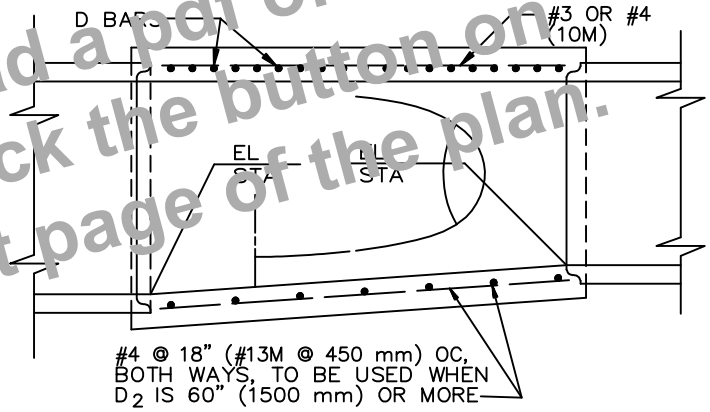
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PIPE CONNECTIONS TO EXISTING STORM DRAINS	335–2
	SHEET 3 OF 3

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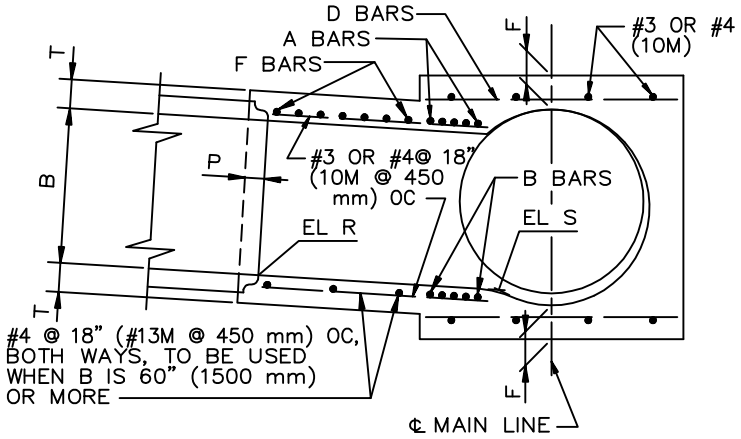
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PLAN



LONGITUDINAL SECTION



SECTION N'–N"–N'''
PROJECTED ON M–M–N'''

TABLE

FOR DIMENSIONS AND BAR SIZES

D_2 OR B (INCHES)	D_2 OR B (mm)	F OR T (INCHES)	F OR T (mm)	F BARS	D BARS	F (RCP)
12	300	4	110	#6 @ 3" (#19M @ 75 mm) OC	#5 @ 6" (#16M @ 150 mm) OC	5" (125 mm)
15	375	4 1/4	110			
18	450	4 1/2	110			
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			
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			
78	1950	11 3/4	300			
84	2100	12 1/2	320			
90	2250	13 1/4	340	#7@3" (22M @ 75 mm) OC	#6@6" (19M @ 150 mm) OC	8" (200 mm)
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			
138	3450	17 1/2	450			
144	3600	18	460			

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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

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NOTES

1. THE HORIZONTAL ANGLE OF CONVERGENCE OR DIVERGENCE, θ, SHALL NOT EXCEED 5° 45'.

2. VALUES FOR A, B, C, D_1 AND D_2 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 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.

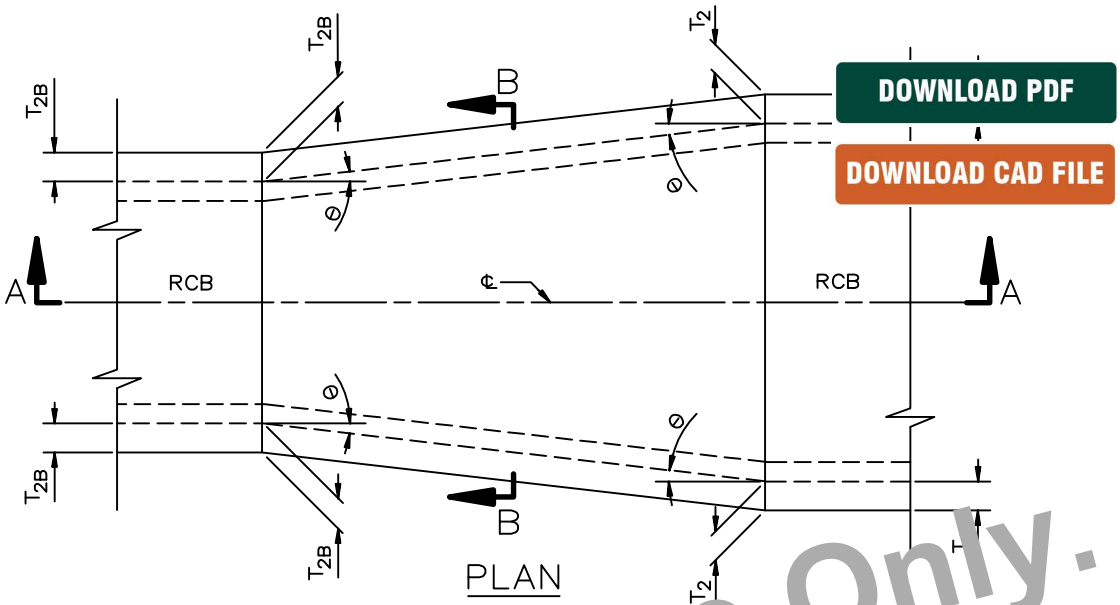
11. THE MAXIMUM COVER ABOVE THIS STRUCTURE SHALL BE 25' (7.5 m). IF THE COVER EXCEEDS 25' (7.5 m') A SPECIAL STRUCTURE SHALL BE DESIGNED FOR THE COVER AND DETAILED ON THE PLANS.

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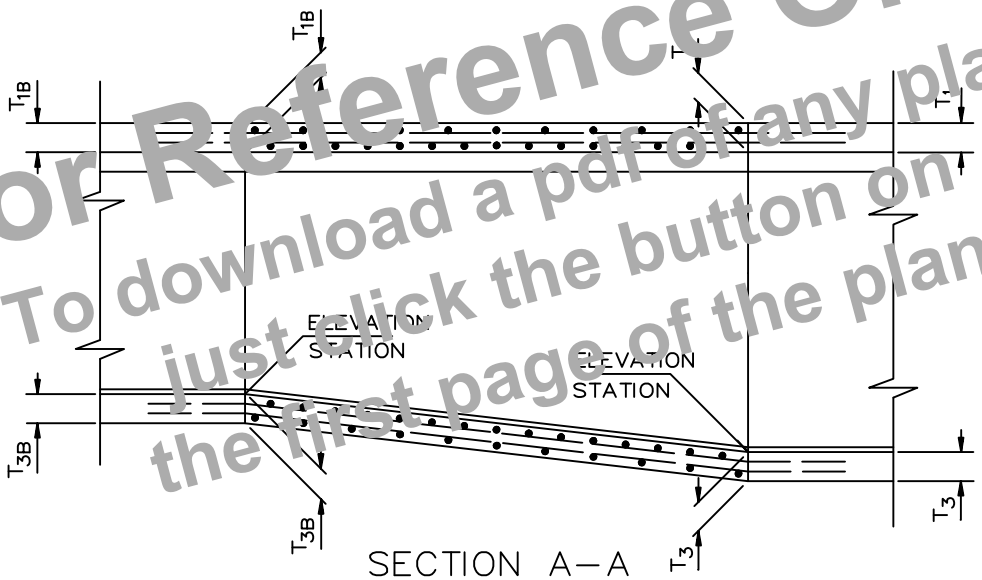
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TRANSITION STRUCTURE PIPE TO PIPE	340–2
	SHEET 2 OF 2

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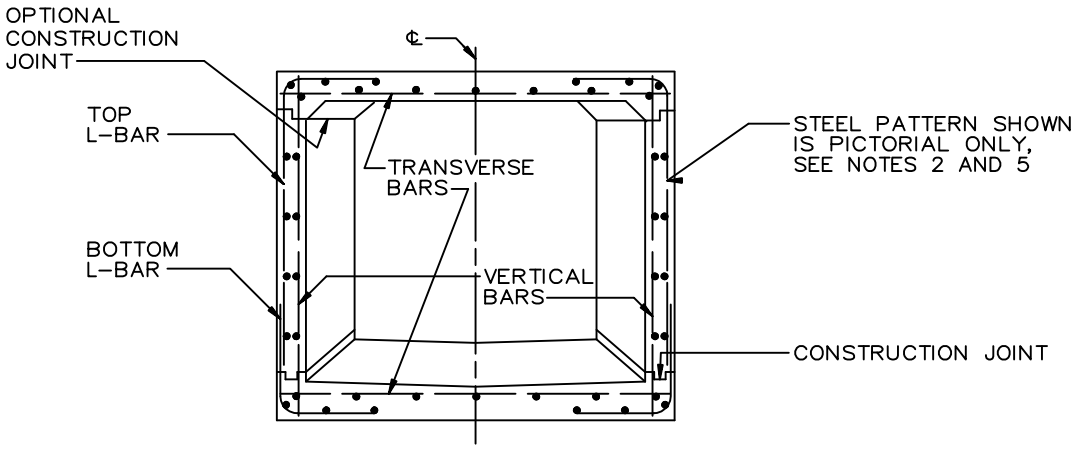
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PLAN



SECTION A–A



SECTION B–B

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

TRANSITION STRUCTURE
SINGLE RCB TO SINGLE RCB

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
341–2
SHEET 1 OF 2

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NOTES

1. THE HORIZONTAL ANGLE OF DIVERGENCE OR CONVERGENCE, θ, SHALL NOT EXCEED 5° 45'.

2. THE REINFORCING STEEL BAR SIZE, SPACING AND COVER OVER THE STEEL OF STRAIGHT TRANSVERSE BARS IN TOP AND BOTTOM SLABS, OF L-BARS IN TOP AND BOTTOM CORNERS, OF STRAIGHT VERTICAL BARS IN SIDEWALLS AND/OR LONGITUDINAL DISTRIBUTION AND TIE BARS IN TOP OR BOTTOM SLABS OR SIDE WALLS SHALL BE THOSE OF WHICHEVER ADJOINING RCB SECTION PROVIDES THE GREATER STEEL AREA FOR EACH TYPE OF BAR AND GREATEST COVER. THE BAR LENGTHS SHALL VARY UNIFORMLY THROUGHOUT THE TRANSITION.

3. THE THICKNESS OF THE WALLS AND SLABS SHALL BE THOSE OF THE ADJOINING RCB SECTION AT EACH END OF THE TRANSITION AND SHALL VARY UNIFORMLY BETWEEN THE TWO ENDS.

4. f'_c = 4000 PSI (28 MPa) AT 28 DAYS AND THE CONCRETE SHALL BE THE SAME MIX AS THE ADJACENT RCB.

5. ALL STEEL EXCEPT LONGITUDINAL STEEL SHALL BE GRADE 60 (400) BILLET STEEL CONFORMING TO ASTM A 615 (A 615 M) AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACE UNLESS OTHERWISE SHOWN.

6. THE TRANSITION STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STRUCTURAL NOTES APPLYING TO RCB STRUCTURES SHOWN ON THE PLANS.

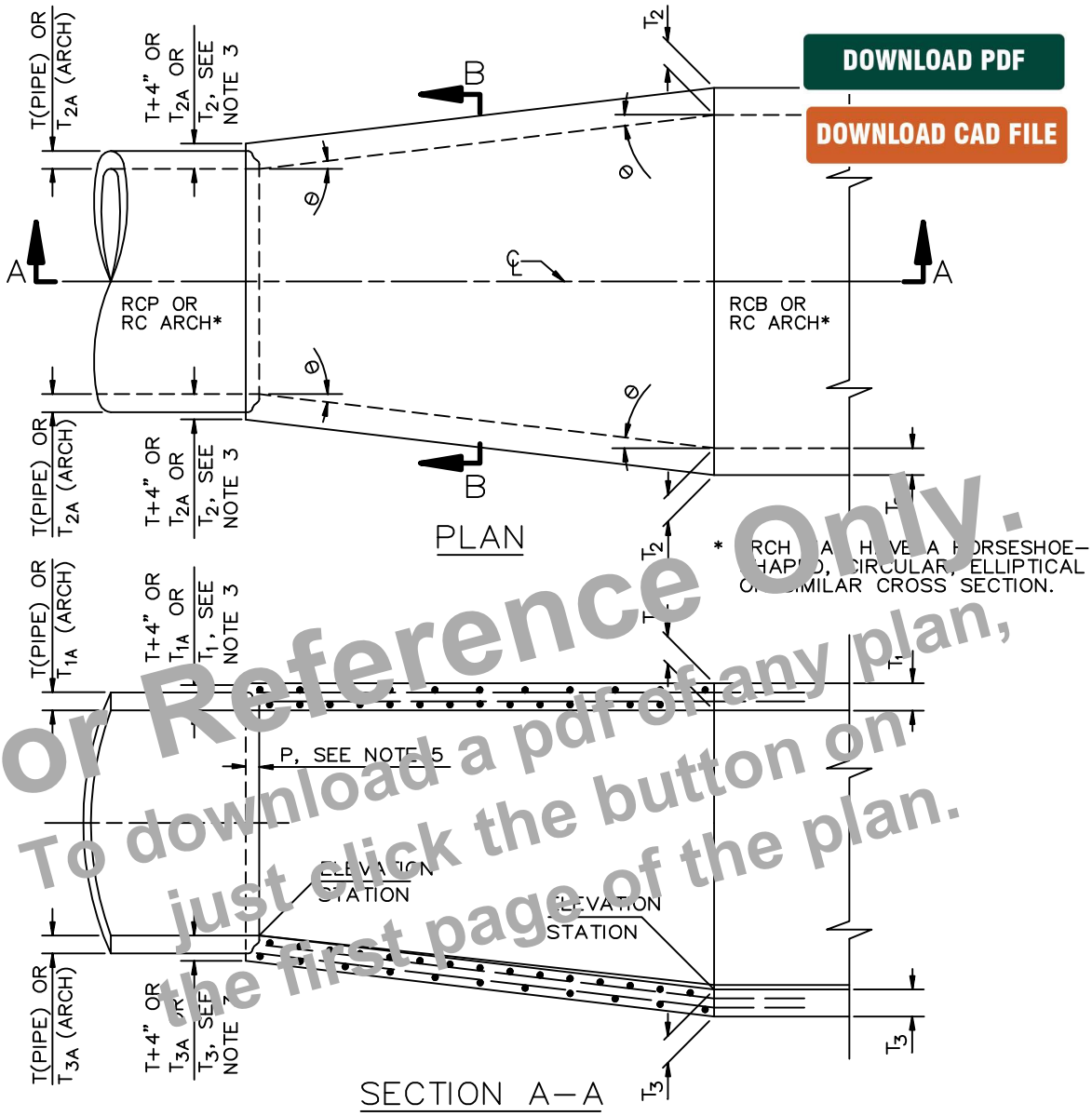
7. DETAILS OF CONSTRUCTION JOINTS AND KEYWAYS SHALL BE AS SHOWN ON THE PLANS FOR SINGLE RCB STRUCTURES.

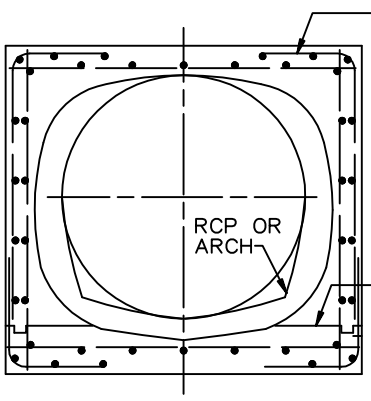
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TRANSITION STRUCTURE SINGLE RCB TO SINGLE RCB	**341-2** SHEET 2 OF 2

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SECTION B–B

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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TRANSITION STRUCTURE RCB TO PIPE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 342–2

SHEET 1 OF 2

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NOTES

1. THE HORIZONTAL ANGLE OF DIVERGENCE OR CONVERGENCE, θ, SHALL NOT EXCEED 5° 45'.

2. REINFORCING STEEL BAR SIZES, SPACING, PATTERN AND COVER OVER THE STEEL SHALL BE AS FOLLOWS:
   RCB TO RCP AND RCB TO ARCH – THAT OF RCB SECTION.
   ARCH TO RCP – THAT OF ARCH SECTION.
   ARCH TO ARCH – THAT OF ARCH SECTION HAVING THE THICKER WALLS. THE BAR LENGTHS SHALL VARY UNIFORMLY THROUGHOUT THE TRANSITION.

3. THE CONCRETE THICKNESS SHALL BE AS FOLLOWS:
   RCB TO RCP AND ARCH TO RCP – THAT OF ARCH OR RCB SECTION UNLESS THE WALL THICKNESS OF THE RCP PLUS 100 mm (4") GREATER, IN WHICH CASE THE CONCRETE THICKNESS SHALL VARY UNIFORMLY FROM THAT OF THE ARCH OR RCB SECTION TO THAT OF THE RCP WALL PLUS 100 mm (4").

   RCB TO ARCH AND ARCH TO ARCH – THAT OF THE ADJOINING RCB OR ARCH SECTION AT EACH END OF THE TRANSITION AND SHALL VARY UNIFORMLY BETWEEN THE TWO ENDS.

4. THE INTERIOR SURFACE SHALL BE SMOOTH AND VARY UNIFORMLY BETWEEN THE TWO ADJOINING SECTIONS.

5. AT RCP JUNCTURE, EMBEDMENT P SHALL BE 130 mm (5") FOR PIPE SIZE OF 2400 mm (96") OR LESS, AND 200 mm (8") FOR PIPE SIZES OVER 2400 mm (96").

6. f'_c = 28 MPa (4000 PSI) AT 28 DAYS AND THE CONCRETE SHALL BE THE SAME MIX AS THE ADJACENT RCB.

7. ALL STEEL, EXCEPT LONGITUDINAL STEEL SHALL BE GRADE 400 (60) BILLET STEEL CONFORMING TO ASTM A 615 M (A 615) AND SHALL TERMINATE 40 mm (1 1/2") CLEAR OF CONCRETE SURFACE UNLESS OTHERWISE SHOWN.

8. KEYED CONSTRUCTION JOINTS OF THE SAME DIMENSIONS AS THOSE OF THE RCB OR ARCH SECTION MAY BE CARRIED THROUGH THE TRANSITION STRUCTURE AT THE CONTRACTOR'S OPTION. SEE SECTION B–B.

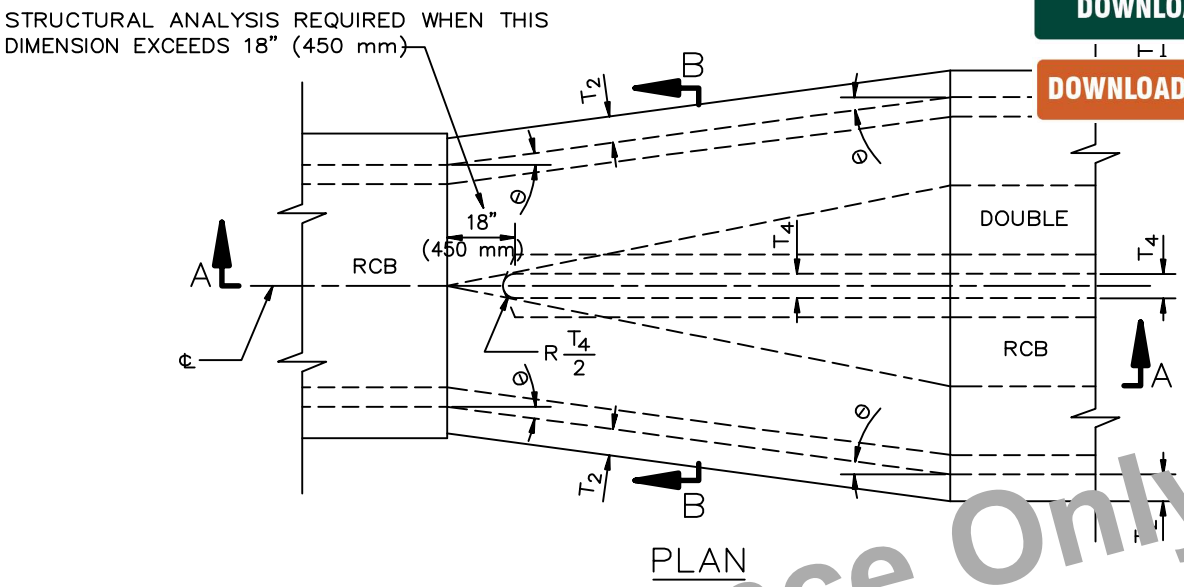
9. THE TRANSITION STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE THE STRUCTURAL NOTES APPLYING TO RCB OR ARCH STRUCTURES SHOWN ON THE PLANS.

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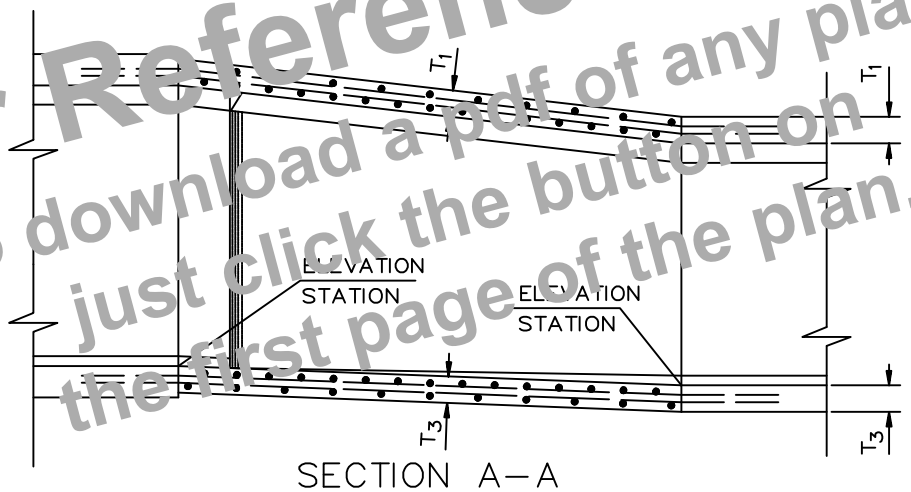
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TRANSITION STRUCTURE RCB TO PIPE	**342–2**
	SHEET 2 OF 2

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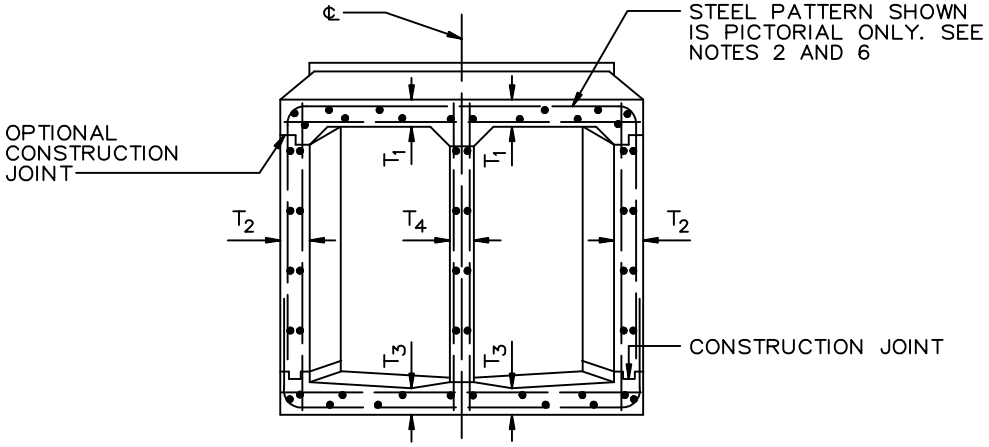
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PLAN



SECTION A–A



SECTION B–B

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

TRANSITION STRUCTURE SINGLE RCB TO DOUBLE RCB

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 343–2

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NOTES

1. THE HORIZONTAL ANGLE OF DIVERGENCE OR CONVERGENCE, θ, SHALL NOT EXCEED 5° 45'.

2. REINFORCING STEEL BAR SIZE, SPACING AND OUTSIDE COVER SHALL BE THAT OF DOUBLE RCB SECTION. FOR CURVED TRANSITIONS, SPACE BARS ON CENTER LINE AND PLACE TRANSVERSE STEEL RADIALLY. THE BAR LENGTHS AND DIMENSIONS SHALL VARY UNIFORMLY THROUGHOUT TRANSITION. LONGITUDINAL BARS SHALL BE CONTINUED THROUGH THE JOINTS WITH THE TRANSITION STRUCTURE.

3. THE CONCRETE THICKNESS SHALL BE THAT OF THE DOUBLE RCB SECTION.

4. PLAN AS SHOWN IS FOR DOUBLE RCB SECTION DOWNSTREAM. WHEN DOUBLE RCB SECTION IS UPSTREAM TAPER THE LAST 24" (600 mm) OF CENTER WALL TO END IN 1 1/2" (40 mm) RADIUS.

5. f'_c = 4000 PSI (28 MPa) AT 28 DAYS MIN. THE CONCRETE SHALL BE THE SAME MIX AS THE ADJACENT RCB.

6. ALL STEEL, EXCEPT LONGITUDINAL STEEL SHALL BE GRADE 60 (400) BILLET STEEL CONFORMING TO ASTM A 615 (A 615 M) AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACES UNLESS OTHERWISE SHOWN.

7. TRANSVERSE JOINTS, ALWAYS, AS DETAILED FOR LONGITUDINAL JOINT KEYWAYS AT BASE OF OUTER WALLS ON THE PLANS, SHALL BE PLACED IN BOTH SLABS AND WALLS AT THE END OF EACH POUR.

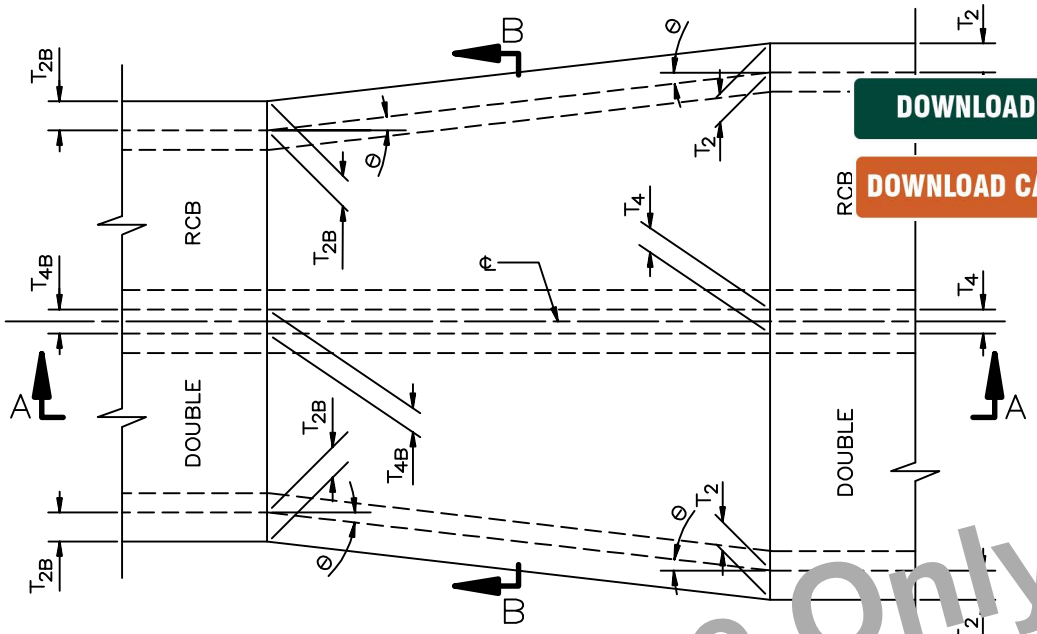
8. THE TRANSITION STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STRUCTURAL NOTES APPLYING TO RCB STRUCTURES SHOWN ON THE PLANS.

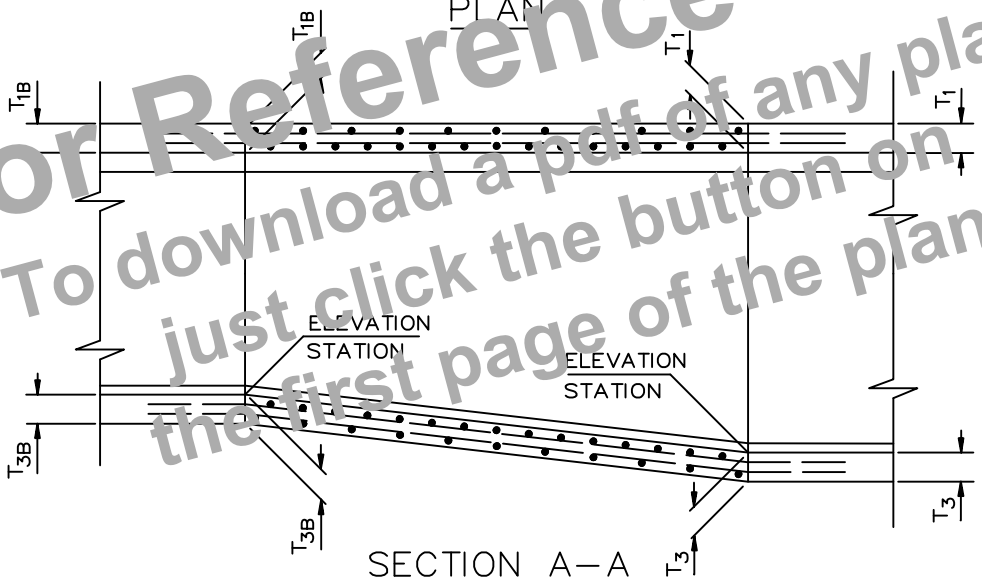
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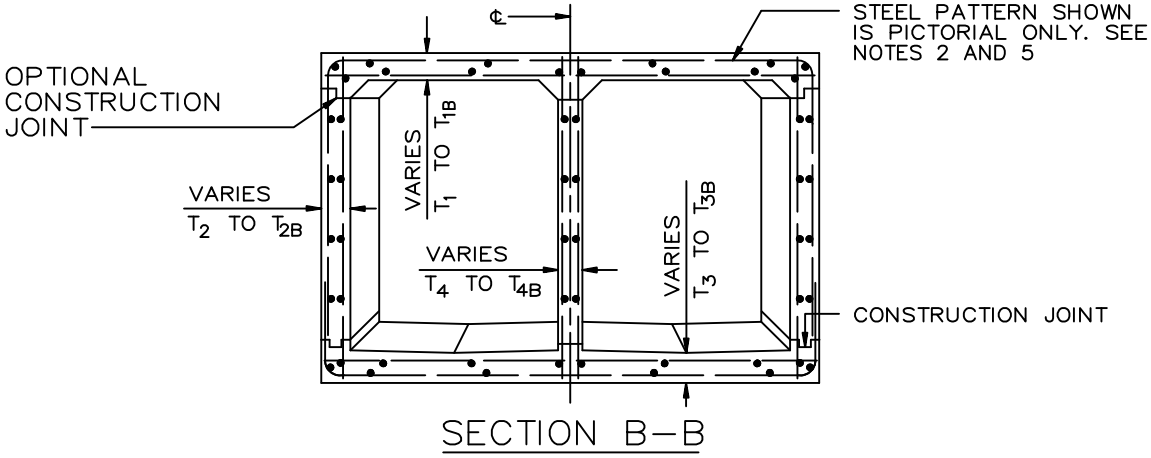
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TRANSITION STRUCTURE SINGLE RCB TO DOUBLE RCB	**343–2** SHEET 2 OF 2

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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TRANSITION STRUCTURE DOUBLE RCB TO DOUBLE RCB

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 344–2

SHEET 1 OF 2

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NOTES

1. HORIZONTAL ANGLE OF DIVERGENCE OR CONVERGENCE, θ, SHALL NOT EXCEED 5° 45'.

2. REINFORCING STEEL BAR SIZE, SPACING, LENGTHS, AND OUTSIDE COVER SHALL BE THAT OF WHICHEVER ADJOINING DOUBLE RCB SECTION PROVIDES THE GREATER STEEL AREA FOR EACH TYPE OF BAR. LONGITUDINAL BARS SHALL BE CONTINUED THROUGH THE JOINTS WITH THE TRANSITION STRUCTURE.

3. THE THICKNESS OF THE WALLS AND SLABS SHALL BE THOSE OF THE ADJOINING DOUBLE RCB SECTION AT EACH END OF THE TRANSITION AND SHALL VARY UNIFORMLY BETWEEN THE TWO ENDS.

4. f'_c = 4,000 PSI (28 MPa) AT 28 DAYS AND THE CONCRETE SHALL BE THE SAME MIX AS THE ADJACENT RCB.

5. ALL STEEL, EXCEPT LONGITUDINAL STEEL SHALL BE GRADE 60 (400) BILLET STEEL CONFORMING TO ASTM A 615 (A 615M) AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACE UNLESS OTHERWISE SHOWN.

6. TRANSVERSE JOINT KEYWAYS, AS DETAILED FOR LONGITUDINAL JOINT KEYWAYS AT EACH OF OUTER WALLS ON THE PLANS, SHALL BE PLACED IN BOTH SLABS AND WALLS AT THE END OF EACH POUR.

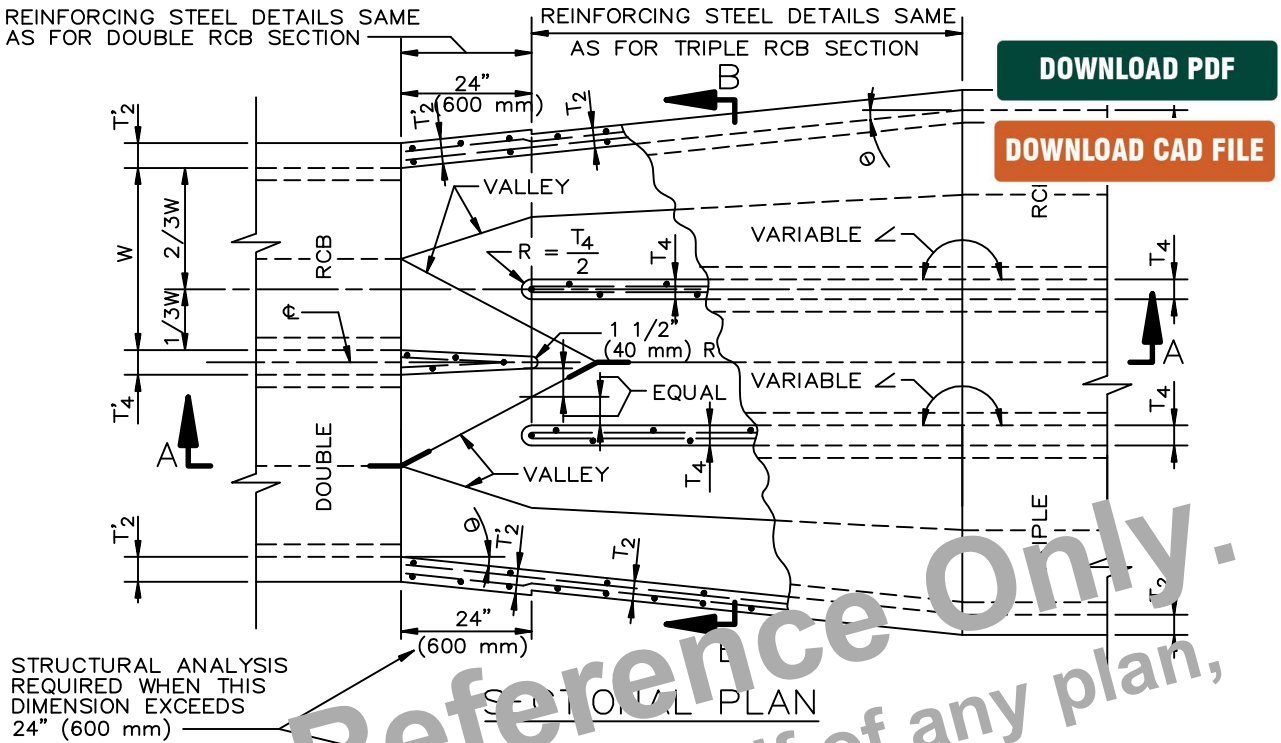
7. THE TRANSITION STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STRUCTURAL NOTES APPLYING TO DOUBLE RCB STRUCTURES SHOWN ON THE PLANS.

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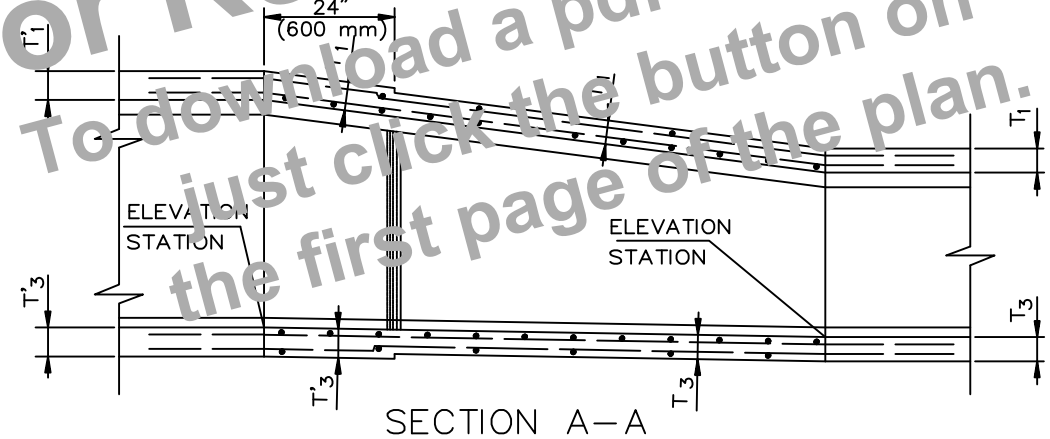
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TRANSITION STRUCTURE DOUBLE RCB TO DOUBLE RCB	**344–2** SHEET 2 OF 2

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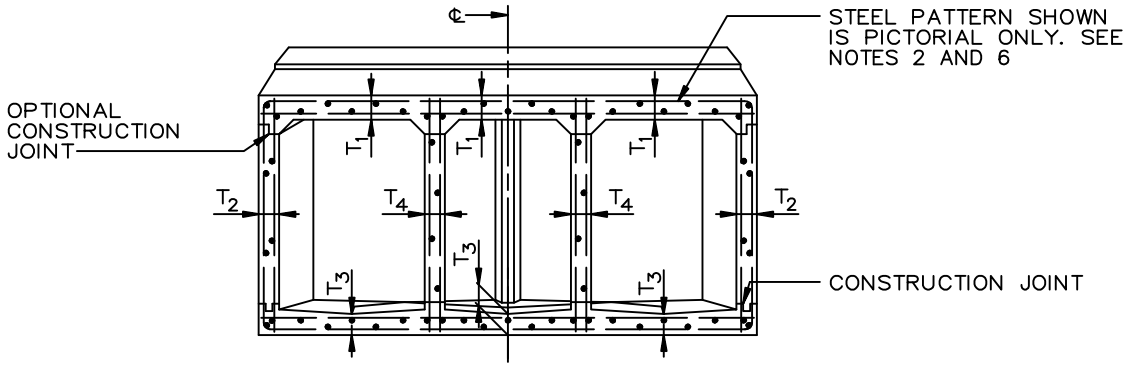
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SECTIONAL PLAN



SECTION A–A



SECTION B–B

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

TRANSITION STRUCTURE DOUBLE RCB TO TRIPLE RCB

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 345–2

SHEET 1 OF 2

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NOTES

1. HORIZONTAL ANGLE OF DIVERGENCE OR CONVERGENCE, θ, SHALL NOT EXCEED 5° 45'.

2. REINFORCING BAR STEEL SIZE, SPACING, AND OUTSIDE COVER SHALL BE THAT OF THE ADJOINING RCB SECTION WITHIN THE LIMITS INDICATED ON THE PLANS. FOR CURVED TRANSITIONS SPACE BARS ON CENTER LINE, AND PLACE TRANSVERSE STEEL RADIALLY. BAR LENGTHS AND DIMENSIONS SHALL VARY UNIFORMLY THROUGHOUT TRANSITION. LONGITUDINAL BARS SHALL BE CONTINUED THROUGH THE JOINTS WITH THE TRANSITION STRUCTURE.

3. CONCRETE THICKNESS SHALL BE THAT OF ADJOINING RCB SECTION WITHIN THE LIMITS INDICATED ON THE PLANS.

4. PLAN AS SHOWN IS FOR TRIPLE RCB SECTION DOWNSTREAM. WHEN TRIPLE RCB SECTION IS UPSTREAM REVERSE THE RADIUS AT ENDS OF DIVISION WALLS AS FOLLOWS:
   (A) TAPER THE LAST 24" (600 mm) OF TRIPLE RCB DIVISION WALLS TO END IN 1 1/2" (40 mm) RADIUS
   (B) THE 24" (600 mm) EXTENSION OF OUTER WALL OF DOUBLE RCB SHALL BE OF UNIFORM THICKNESS T4, ENDING IN RADIUS = 1/2 T4.

5. f'c = 4000 PSI (28 MPa) AT 28 DAYS AND CONCRETE SHALL BE THE SAME MIX AS THE ADJACENT RCB.

6. ALL STEEL, EXCEPT LONGITUDINAL STEEL SHALL BE GRADE 60 (420) BILLET STEEL CONFORMING TO ASTM A 615 (A 615M) AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACE UNLESS OTHERWISE SHOWN.

7. TRANSVERSE JOINT KEYWAYS, AS DETAILED FOR LONGITUDINAL JOINT KEYWAYS AT BASE OF OUTER WALLS ON THE PLANS, SHALL BE PLACED IN BOTH SLABS AND WALLS AT THE END OF EACH POUR.

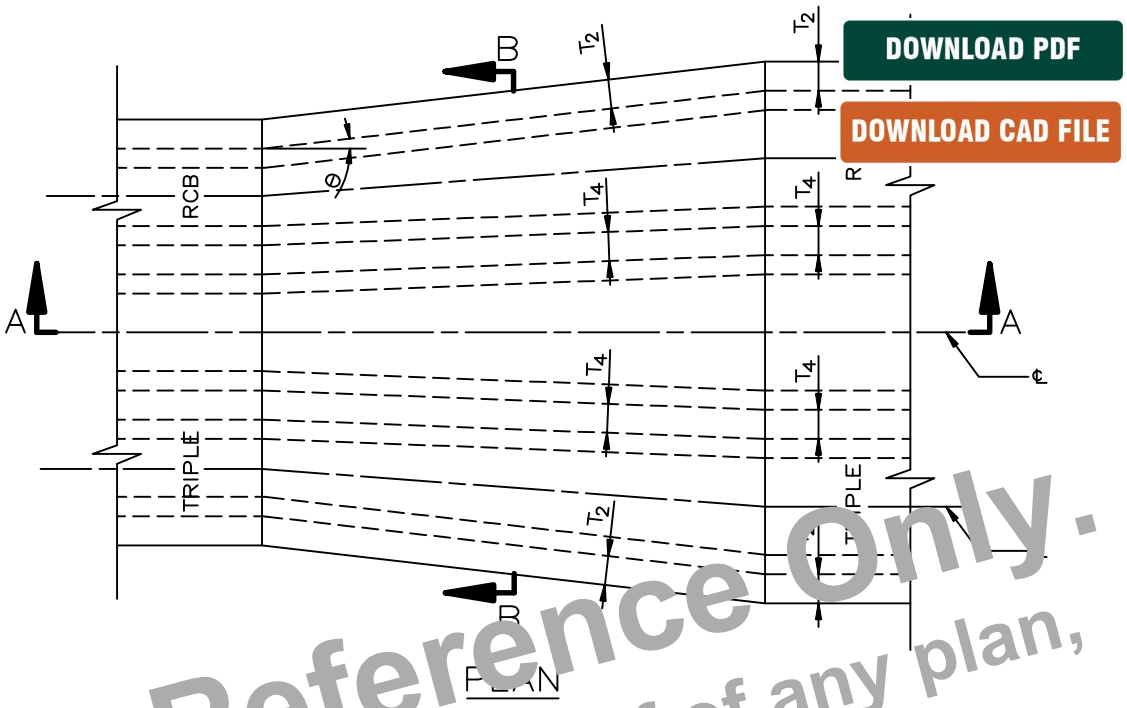
8. THE TRANSITION STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STRUCTURAL NOTES APPLYING TO THE RCB STRUCTURES SHOWN ON THE PLANS.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TRANSITION STRUCTURE DOUBLE RCB TO TRIPLE RCB	**345–2** SHEET 2 OF 2

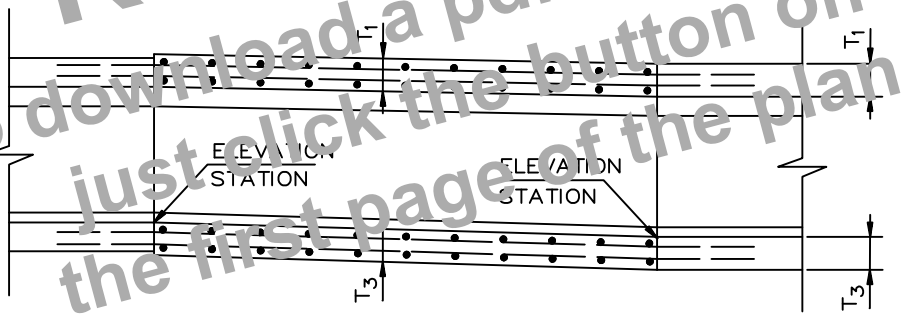
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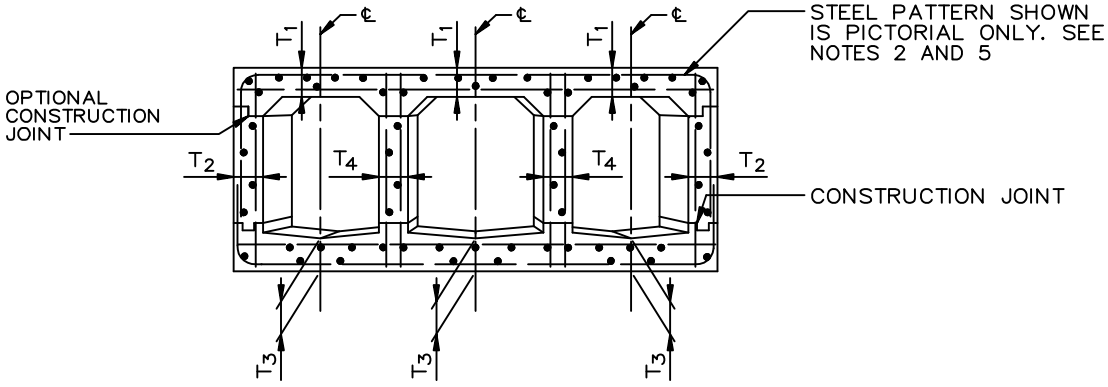


PLAN

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SECTION A–A



SECTION B–B

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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TRANSITION STRUCTURE TRIPLE RCB TO TRIPLE RCB INLETS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 346–2

SHEET 1 OF 2

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NOTES

1. THE HORIZONTAL ANGLE OF DIVERGENCE OR CONVERGENCE, θ, SHALL NOT EXCEED 5° 45'.

2. REINFORCING STEEL BAR SIZE, SPACING AND OUTSIDE COVER SHALL BE THAT OF THE LARGER SECTION. FOR CURVED TRANSITIONS, SPACE BARS ON CENTERLINE AND PLACE TRANSVERSE STEEL RADIALLY. BAR LENGTHS AND DIMENSIONS SHALL VARY UNIFORMLY THROUGHOUT TRANSITION. LONGITUDINAL BARS SHALL BE CONTINUED THROUGH THE JOINTS WITH THE TRANSITION STRUCTURE.

3. THE CONCRETE THICKNESS SHALL BE THAT OF THE LARGER RCB SECTION.

4. f'_c = 4000 PSI (28 MPa) AT 28 DAYS AND THE CONCRETE SHALL BE THE SAME MIX AS THE ADJACENT RCB.

5. ALL STEEL, EXCEPT LONGITUDINAL STEEL SHALL BE GRADE 60 (400) BILLET STEEL CONFORMING TO ASTM A 615 (A 615 M) AND SHALL TERMINATE 1 1/2" (40 mm) CLEAR OF CONCRETE SURFACE UNLESS OTHERWISE SHOWN.

6. TRANSVERSE JOINT KEYWAYS, AS DETAILED FOR LONGITUDINAL JOINT KEYWAYS AT BASE OF OUTER WALLS ON THE PLANS, SHALL BE PLACED IN BOTH SLABS AND WALLS AT THE END OF EACH POUR.

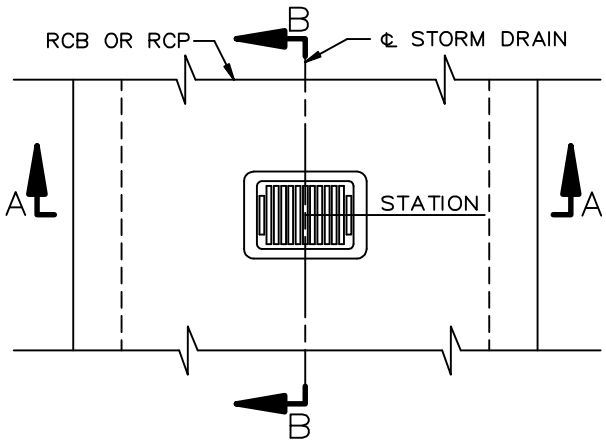
7. THE TRANSITION STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STRUCTURAL NOTES APPLYING TO RCB STRUCTURES SHOWN ON THE PLANS.

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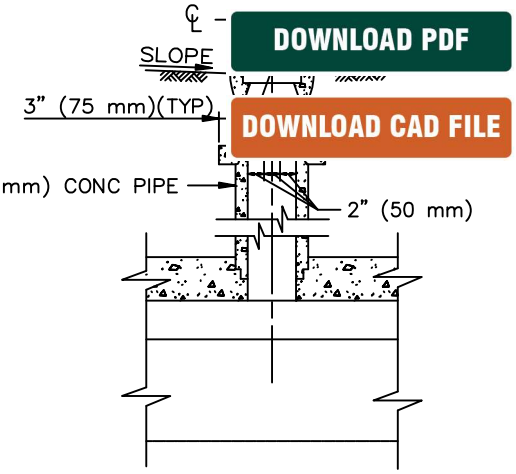
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TRANSITION STRUCTURE TRIPLE RCB TO TRIPLE RCB INLETS	**346–2** SHEET 2 OF 2

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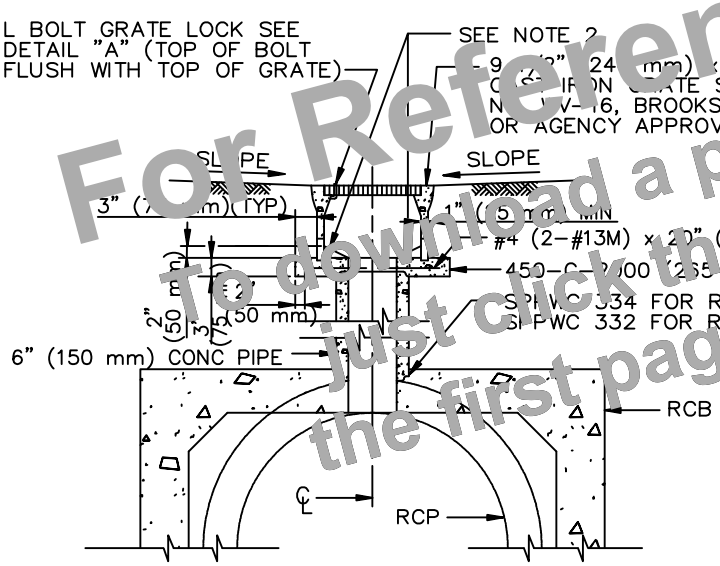
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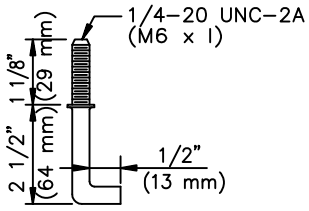
PLAN



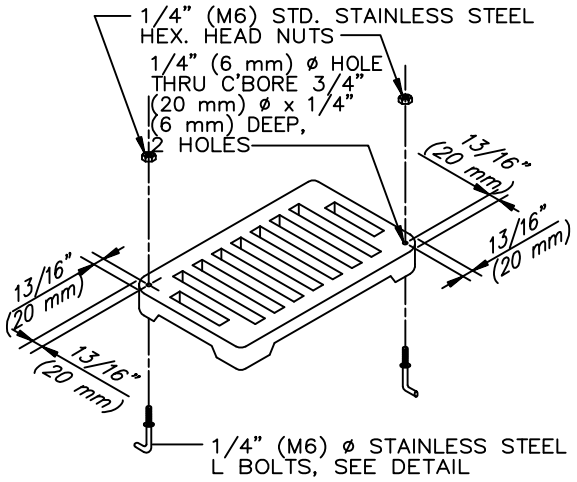
SECTION B – B



SECTION A – A



DETAIL OF L BOLT



DETAIL "A"

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1996, 2009	**YARD INLET**	STANDARD PLAN **350–2**
	USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	SHEET 1 OF 2

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NOTES

1. CONNECTOR PIPE

   LOCATE PIPE AS INDICATED ON SHEET 1.

2. CONCRETE

   FLOOR OF BASIN SHALL SLOPE FROM ALL WALLS TO THE OUTLET AND SHALL BE GIVEN A STEEL TROWELED SURFACE FINISH.

   3" (75 mm) THICK CONCRETE ENCASEMENT SHALL BE USED IN LIEU OF 6" (150 mm) THICK CONCRETE ENCASEMENT WHEN REQUIRED BY SPPWC 332 OR 334.

3. GENERAL

   GRATING AND BASIN ARE NOT DESIGNED FOR VEHICULAR TRAFFIC AND SHALL NOT BE USED IN LOCATIONS WHERE SUCH TRAFFIC WILL OCCUR.

   EMBED UTILITY BOX 1/2" (15 mm) INTO CONCRETE COLLAR. SEAL PIPE SLOTS IN UTILITY BOX WALLS WITH CONCRETE.

4. THE FOLLOWING SPPWC ARE INCORPORATED HEREIN:

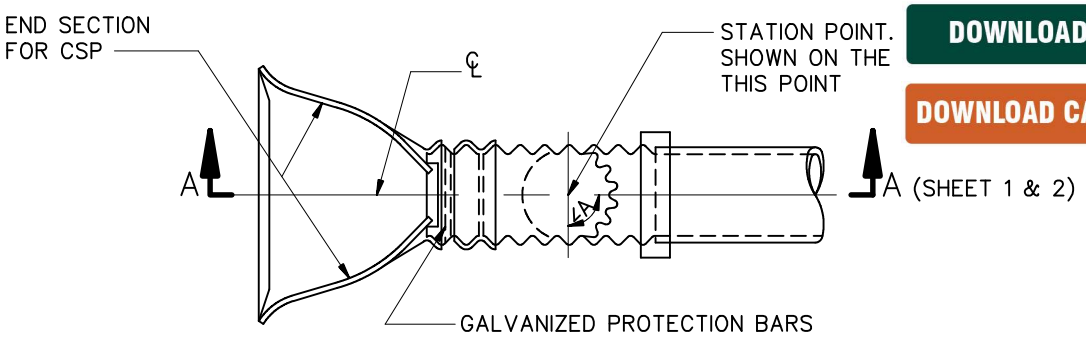
   332 JUNCTION STRUCTURE PIPE TO PIPE (INLET I.D. ≤ 24" (600 mm))
   334 JUNCTION STRUCTURE PIPE TO BOX (INLET I.D. ≤ 30" (750 mm))

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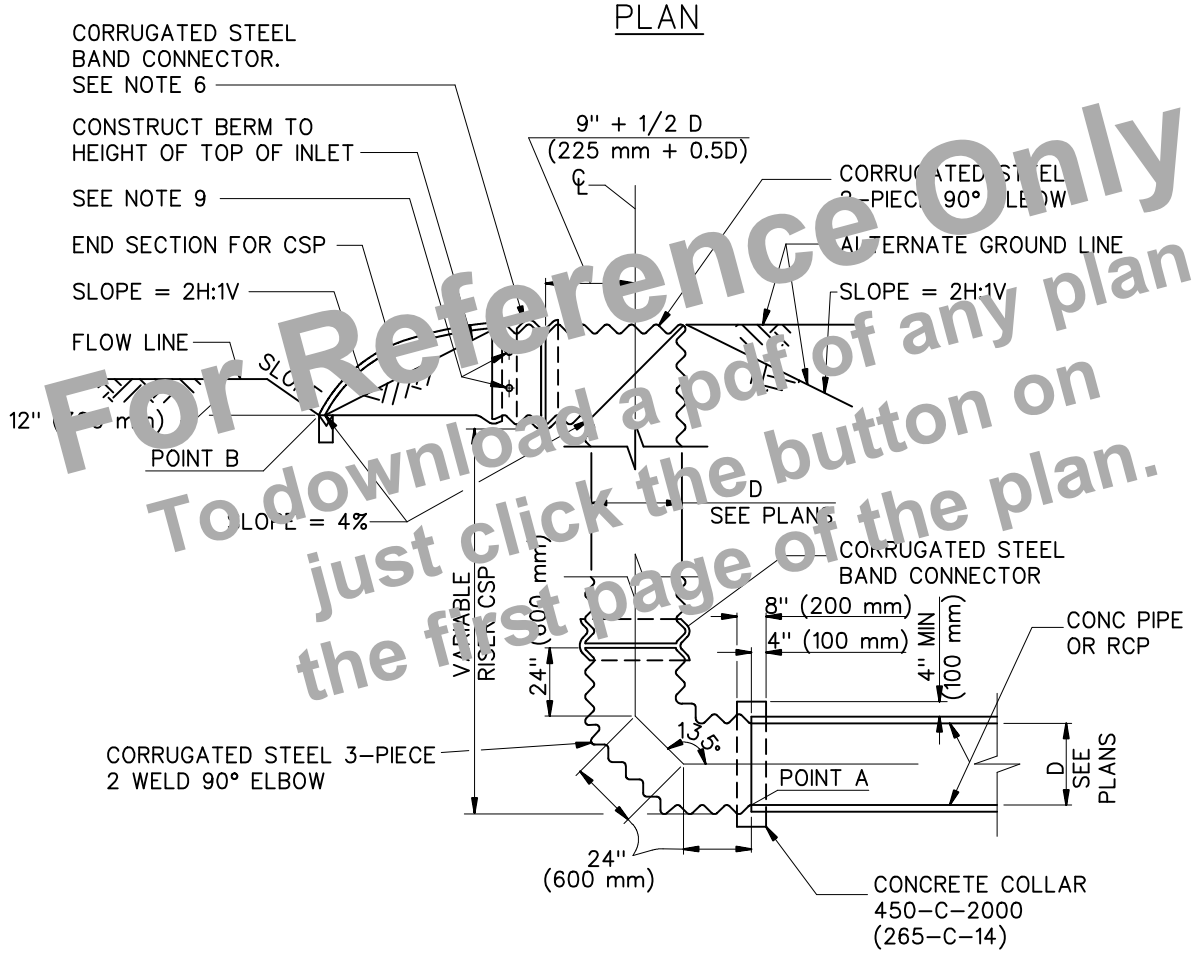
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 350–2 SHEET 2 OF 2
YARD INLET	

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PLAN



CASE 1
SECTION A–A

NOTE:
FOR CASE 2 & 3, SEE SHEET 2.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

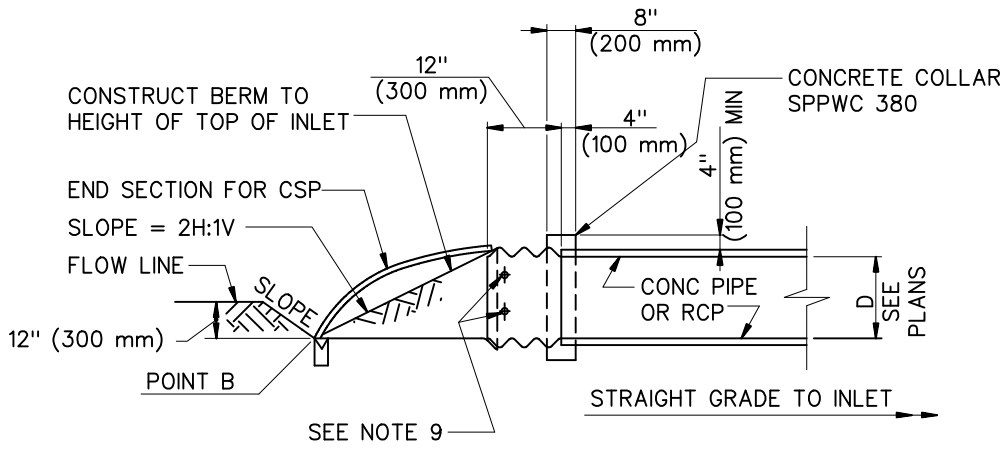
PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1996, 2009, 2021

CSP FLARED INLET

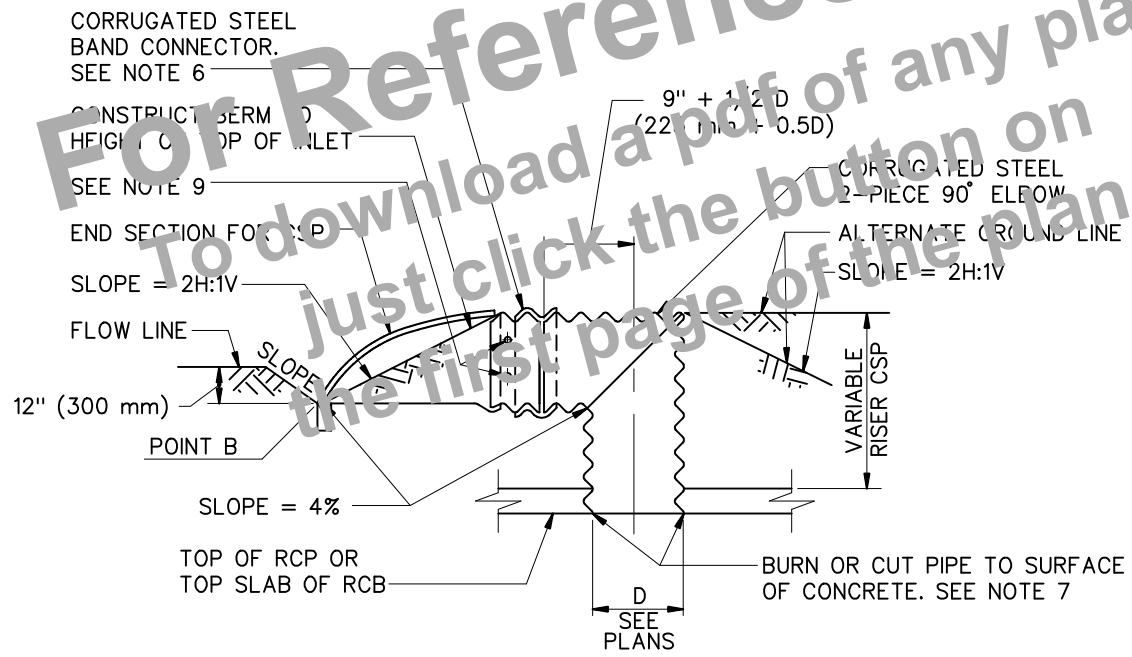
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
351–3
SHEET 1 OF 3

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CASE 2
SECTION A–A (SHEET 1)



CASE 3
SECTION A–A (SHEET 1)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CSP FLARED INLET	**351–3**
	SHEET 2 OF 3

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NOTES

1. ANGLE A MAY BE ANY ANGLE AS REQUIRED.

2. ELEVATION OF POINT A SHOWN ON PLANS.

3. POINT B SHALL BE PLACED 12" (300 mm) BELOW THE FLOW LINE OF EXISTING DITCH UNLESS OTHERWISE SPECIFIED ON PLANS. SLOPE SHALL BE SET IN FIELD BY THE ENGINEER.

4. THE HEIGHT OF THE RISER FOR CASE 1 & 3 SHALL VARY AS DETERMINED BY THE ELEVATION OF POINTS A & B, OR BY THE TOP OF STORM DRAIN CONDUIT AND ELEVATION OF POINT B.

5. CORRUGATED STEEL BAND CONNECTOR IS NOT REQUIRED FOR INLET SIZES 24" (600 mm) DIAMETER OR LESS.

6. IN ALL CASES, CONNECTION TO THE STORM DRAIN CONDUIT SHALL BE IN ACCORDANCE WITH THE APPLICABLE JUNCTION STRUCTURE, TRANSITION STRUCTURE, OR MANHOLE.

7. ALL CSP AND FITTINGS SHALL BE GALVANIZED.

8. PUNCH HOLES IN CSP AND WELD 3/4" (20 mm) GALVANIZED BARS HORIZONTALLY IN PLACE ACROSS OPENING.

9. COAT WELDED, CUT AND ABRADED SURFACES AS SPECIFIED IN SSPWC 210-3.5.

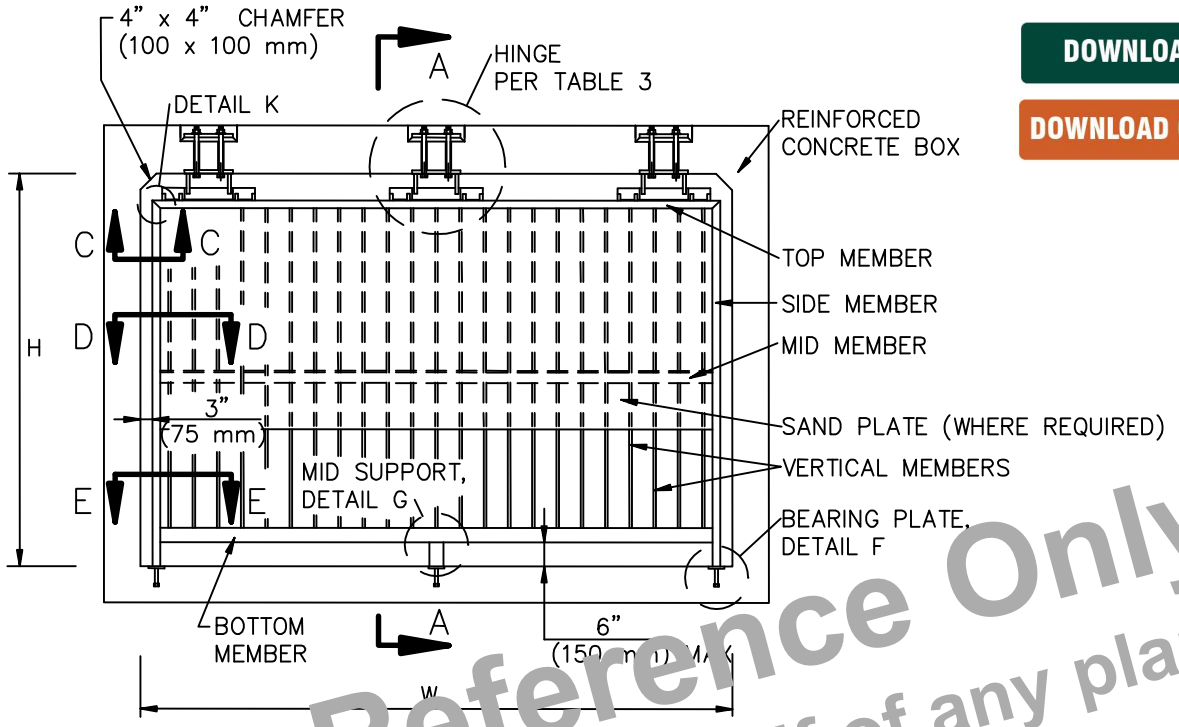
10. INLET SHALL NOT BE USED IN WATER COURSES SUBJECT TO DEBRIS FLOWS. A STRUCTURE HAVING A PROTECTION BARRIER SHOULD BE USED.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CSP FLARED INLET	**351-3**
	SHEET 3 OF 3

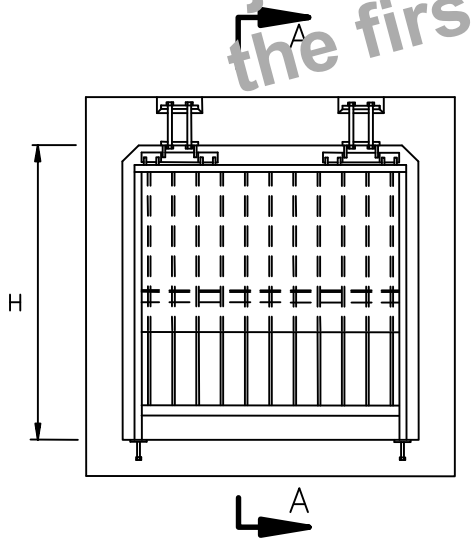
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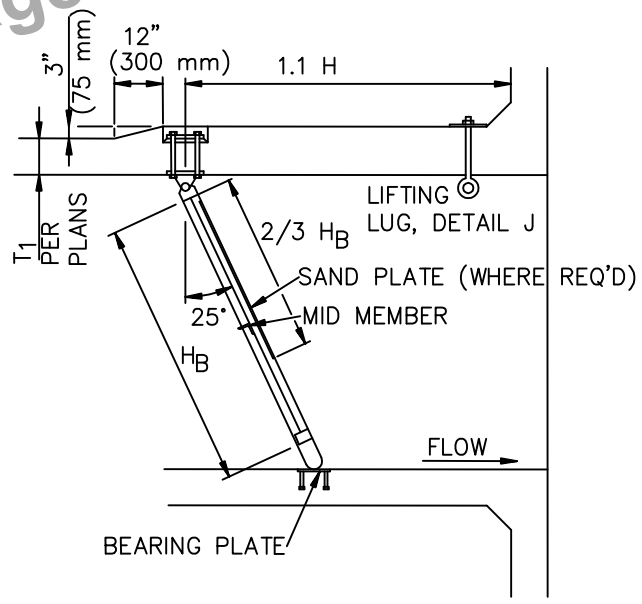


THREE-HINGED INLET/OUTLET BARRIER
FOR RCB

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TWO-HINGED
INLET/OUTLET BARRIER
FOR RCB



SECTION A-A

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

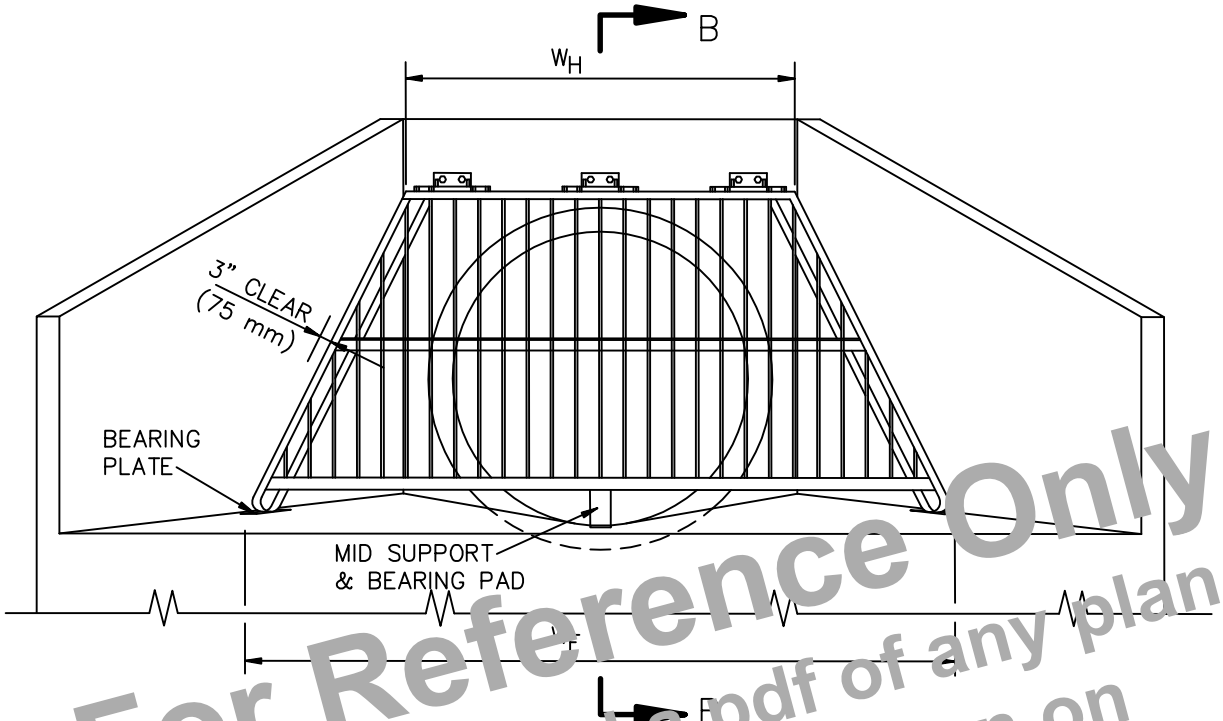
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1993
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SLOPED PROTECTION BARRIER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

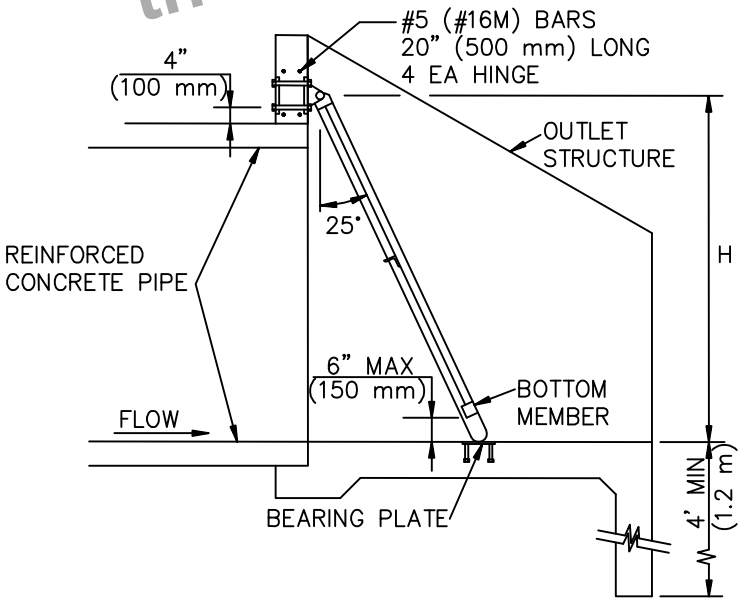
STANDARD PLAN
360-2
SHEET 1 OF 8

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TRAPEZOIDAL OUTLET BARRIER
FOR RCP

FOR TRAPEZOIDAL OUTLET BARRIERS, USE W_H TO DETERMINE NUMBER AND SIZE OF HINGES AND USE W_F TO DETERMINE REQUIRED FRAME MEMBER SIZES.



SECTION B–B

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
SLOPED PROTECTION BARRIER	**360–2**
	SHEET 2 OF 8

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TABLE 1 – STANDARD INLET/OUTLET

BOX SIZE, W x H	VERTICAL BARS, (mm)	TOP MEMBER	SIDE MEMBERS	BOTTOM MEMBER
4'x4' (1.2 x 1.2 m)	1"x1/2" (25 x 13)	C 4x7.25 (C 102 x 10.8)	C 4x7.25 (C 102 x 10.8)	TS 2x2x0.250 (TS 51 x 51 x 6)
4'x6' (1.2 x 1.8)	2"x1/2" (51 x 13)	C 4x7.25 (C 102 x 10.8)	C 4x7.25 (C 102 x 10.8)	TS 2x2x0.250 (TS 51 x 51 x 6)
4'x8' (1.2 x 2.4)	3"x1/2" (76 x 13)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3x3x0.250 (TS 76 x 76 x 6)
6'x4' (1.8 x 1.2)	1"x1/2" (25 x 13)	C 4x7.25 (C 102 x 10.8)	C 4x7.25 (C 102 x 10.8)	TS 2x2x0.250 (TS 51 x 51 x 6)
6'x6' (1.8 x 1.8)	2"x1/2" (51 x 13)	C 4x7.25 (C 102 x 10.8)	C 4x7.25 (C 102 x 10.8)	TS 2.5x2.5x0.250 (TS 64 x 64 x 6)
6'x8' (1.8 x 2.4)	3"x1/2" (76 x 13)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3.5x3.5x0.250 (TS 89 x 89 x 6)
6'x10' (1.8 x 3.0)	4 1/2"x1/2" (114 x 13)	C 6x10.5 (C 152 x 15.6)	C 6x10.5 (C 152 x 15.6)	TS 4.5x4.5x0.250 (TS 114 x 114 x 6)
8'x4' (2.4 x 1.2)	1"x1/2" (25 x 13)	C 4x7.25 (C 102 x 10.8)	C 4x7.25 (C 102 x 10.8)	TS 2x2x0.250 (TS 51 x 51 x 6)
8'x6' (2.4 x 1.8)	2"x1/2" (51 x 13)	C 4x7.25 (C 102 x 10.8)	C 4x7.25 (C 102 x 10.8)	TS 2.5x2.5x0.250 (TS 64 x 64 x 6)
8'x8' (2.4 x 2.4)	3"x1/2" (76 x 13)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3x3x0.250 (TS 76 x 76 x 6)
8'x10' (2.4 x 3.0)	4 1/2"x1/2" (114 x 13)	C 6x10.5 (C 152 x 15.6)	C 6x10.5 (C 152 x 15.6)	TS 4.5x4.5x0.250 (TS 114 x 114 x 6)
10'x6' (3.0 x 1.8)	2"x1/2" (51 x 13)	C 4x7.25 (C 102 x 10.8)	C 4x7.25 (C 102 x 10.8)	TS 2.5x2.5x0.250 (TS 64 x 64 x 6)
10'x8' (3.0 x 2.4)	3"x1/2" (76 x 13)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3.5x3.5x0.250 (TS 89 x 89 x 6)
10'x10' (3.0 x 3.0)	4 1/2"x1/2" (114 x 13)	C 6x10.5 (C 152 x 15.6)	C 6x10.5 (C 152 x 15.6)	TS 4.5x4.5x0.250 (TS 114 x 114 x 6)
12'x6' (3.6 x 1.8)	2"x1/2" (51 x 13)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3x3x0.250 (TS 76 x 76 x 6)
12'x8' (3.6 x 2.4)	3"x1/2" (76 x 13)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3.5x3.5x0.250 (TS 89 x 89 x 6)
12'x10' (3.6 x 3.0)	4 1/2"x1/2" (114 x 13)	C 6x10.5 (C 152 x 15.6)	C 6x10.5 (C 152 x 15.6)	TS 4.5x4.5x0.250 (TS 114 x 114 x 6)
14'x6' (4.2 x 1.8)	2"x1/2" (51 x 13)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3x3x0.250 (TS 76 x 76 x 6)
14'x8' (4.2 x 2.4)	3"x1/2" (76 x 13)	C 6x10.5 (C 152 x 15.6)	C 6x10.5 (C 152 x 15.6)	TS 4x4x0.250 (TS 102 x 102 x 6)
14'x10' (4.2 x 3.0 m)	4 1/2"x1/2" (114 x 13)	C 7x12.25 (C 178 x 18.2)	C 7x12.25 (C 178 x 18.2)	TS 5x5x0.250 (TS 127 x 127 x 6)

TABLE 2 – OCEAN OUTLET

BOX SIZE, W x H	VERTICAL BARS, (mm)	TOP MEMBER	SIDE MEMBERS	BOTTOM MEMBER
4'x4' (1.2 x 1.2 m)	2 1/2"x5/8" (64 x 16)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3x3x0.250 (TS 76 x 76 x 6)
4'x6' (1.2 x 1.8)	3 3/4"x5/8" (95 x 16)	C 6x13 (C 152 x 19.3)	C 6x8.2 (C 152 x 15.2)	TS 4x2x0.313 (TS 102 x 51 x 8)
4'x8' (1.2 x 2.4)	5 1/4"x5/8" (133 x 16)	C 8x18.75 (C 203 x 27.9)	C 8x11.5 (C 203 x 17.1)	TS 6x2x0.250 (TS 152 x 51 x 6)
6'x4' (1.8 x 1.2)	2 1/2"x5/8" (64 x 16)	C 6x13 (C 152 x 19.3)	C 6x8.2 (C 152 x 15.2)	TS 4x3x0.313 (TS 102 x 76 x 8)
6'x6' (1.8 x 1.8)	3 3/4"x5/8" (95 x 16)	C 6x13 (C 152 x 19.3)	C 6x8.2 (C 152 x 15.2)	TS 4x4x0.500 (TS 102 x 102 x 13)
6'x8' (1.8 x 2.4)	5 1/4"x5/8" (133 x 16)	C 8x18.75 (C 203 x 27.9)	C 8x11.5 (C 203 x 17.1)	TS 6x4x0.375 (TS 152 x 102 x 1)
6'x10' (1.8 x 3.0)	6 1/2"x5/8" (165 x 16)	C 9x20 (C 229 x 29.8)	C 9x13.4 (C 229 x 19.9)	TS 7x4x0.375 (TS 178 x 102 x 10)
8'x4' (2.4 x 1.2)	2 1/2"x5/8" (64 x 16)	C 5x9 (C 127 x 13.4)	C 5x9 (C 127 x 13.4)	TS 3x3x0.250 (TS 76 x 76 x 6)
8'x6' (2.4 x 1.8)	3 3/4"x5/8" (95 x 16)	C 6x13 (C 152 x 19.3)	C 6x8.2 (C 152 x 15.2)	TS 4x3x0.250 (TS 102 x 76 x 6)
8'x8' (2.4 x 2.4)	5 1/4"x5/8" (133 x 16)	C 8x18.75 (C 203 x 27.9)	C 8x11.5 (C 203 x 17.1)	TS 6x2x0.250 (TS 152 x 51 x 6)
8'x10' (2.4 x 3.0)	6 1/2"x5/8" (165 x 16)	C 9x20 (C 229 x 29.8)	C 9x13.4 (C 229 x 19.9)	TS 7x3x0.250 (TS 178 x 76 x 6)
10'x6' (3.0 x 1.8)	3 3/4"x5/8" (95 x 16)	C 6x13 (C 152 x 19.3)	C 6x8.2 (C 152 x 15.2)	TS 4x4x0.313 (TS 102 x 102 x 8)
10'x8' (3.0 x 2.4)	5 1/4"x5/8" (133 x 16)	C 8x18.75 (C 203 x 27.9)	C 8x11.5 (C 203 x 17.1)	TS 6x4x0.313 (TS 152 x 102 x 8)
10'x10' (3.0 x 3.0)	6 1/2"x5/8" (165 x 16)	C 9x20 (C 229 x 29.8)	C 9x13.4 (C 229 x 19.9)	TS 7x3x0.313 (TS 178 x 76 x 8)
12'x6' (3.6 x 1.8)	3 3/4"x5/8" (95 x 16)	C 7x14.75 (C 178 x 22.0)	C 7x9.8 (C 178 x 14.6)	TS 5x4x0.313 (TS 127 x 102 x 8)
12'x8' (3.6 x 2.4)	5 1/4"x5/8" (133 x 16)	C 8x18.75 (C 203 x 27.9)	C 8x11.5 (C 203 x 17.1)	TS 6x4x0.375 (TS 152 x 102 x 10)
12'x10' (3.6 x 3.0)	6 1/2"x5/8" (165 x 16)	C 9x20 (C 229 x 29.8)	C 9x13.4 (C 229 x 19.9)	TS 7x4x0.375 (TS 178 x 102 x 10)
14'x6' (4.2 x 1.8)	3 3/4"x5/8" (95 x 16)	C 8x18.75 (C 203 x 27.9)	C 8x11.5 (C 203 x 17.1)	TS 6x4x0.375 (TS 152 x 102 x 10)
14'x8' (4.2 x 2.4)	5 1/4"x5/8" (133 x 16)	C 8x18.75 (C 203 x 27.9)	C 8x11.5 (C 203 x 17.1)	TS 6x6x0.375 (TS 152 x 512 x 10)
14'x10' (4.2 x 3.0 m)	6 1/2"x5/8" (165 x 16)	C 9x20 (C 229 x 29.8)	C 9x13.4 (C 229 x 19.9)	TS 7x5x0.500 (TS 178 x 127 x 13)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

SLOPED PROTECTION BARRIER

STANDARD PLAN 360–2

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TABLE 3 – HINGES		
BOX SIZE, W x H	NO. OF HINGES	HINGE SIZE
4'x4' (1.2 x 1.2 m)	2	12" (300)
4'x6' (1.2 x 1.8)	2	12" (300)
4'x8' (1.2 x 2.4)	2	12" (300)
6'x4' (1.8 x 1.2)	2	18" (450)
6'x6' (1.8 x 1.8)	2	18" (450)
6'x8' (1.8 x 2.4)	2	18" (450)
6'x10' (1.8 x 3.0)	2	18" (450)
8'x4' (2.4 x 1.2)	3	12" (300)
8'x6' (2.4 x 1.8)	3	12" (300)
8'x8' (2.4 x 2.4)	3	12" (300)
8'x10' (2.4 x 3.0)	3	12" (300)
10'x6' (3.0 x 1.8)	3	18" (450)
10'x8' (3.0 x 2.4)	3	18" (450)
10'x10' (3.0 x 3.0)	3	18" (450)
12'x6' (3.6 x 1.8)	3	24" (600)
12'x8' (3.6 x 2.4)	3	24" (600)
12'x10' (3.6 x 3.0)	3	24" (600)
14'x6' (4.2 x 1.8)	3	24" (600)
14'x8' (4.2 x 2.4)	3	24" (600)
14'x10' (4.2 x 3.0 m)	3	24" (600)

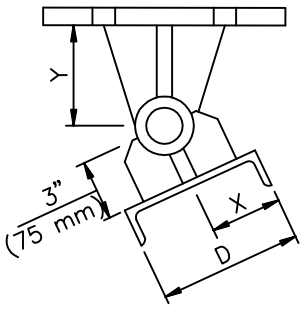
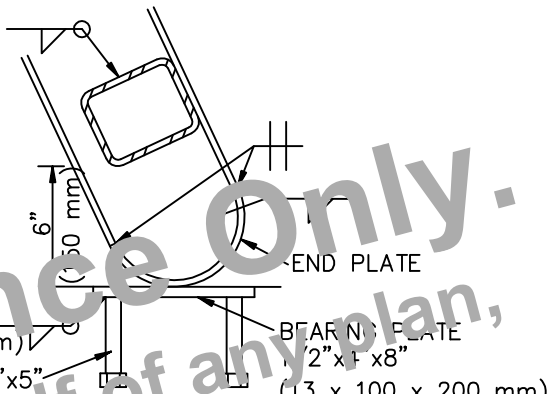


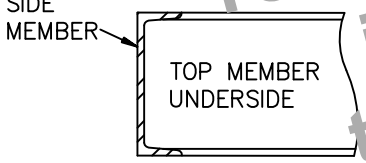
TABLE 4 – HINGE CLEARANCES (mm)		
D	X	Y
4" (10)	2" (50)	3" (75)
5" (127)	2 1/2" (65)	3 1/2" (90)
6" (152)	3" (75)	4" (100)
7" (178)	3 1/2" (90)	4 1/2" (115)
8" (203)	4" (100)	5" (125)
9" (229)	4" (100)	5" (125)



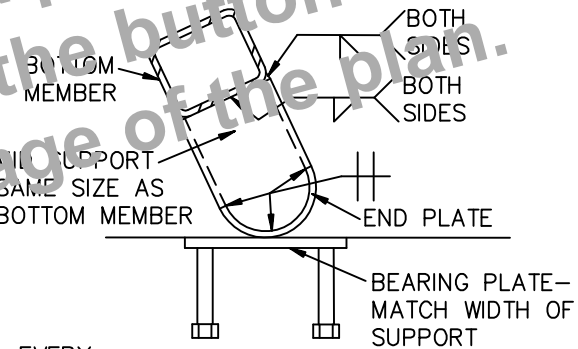
DETAIL F



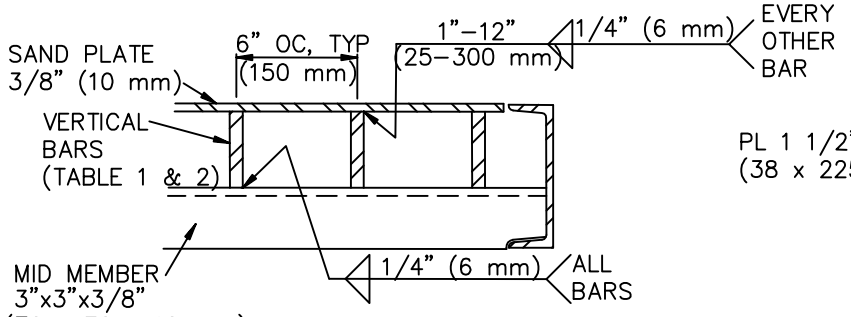
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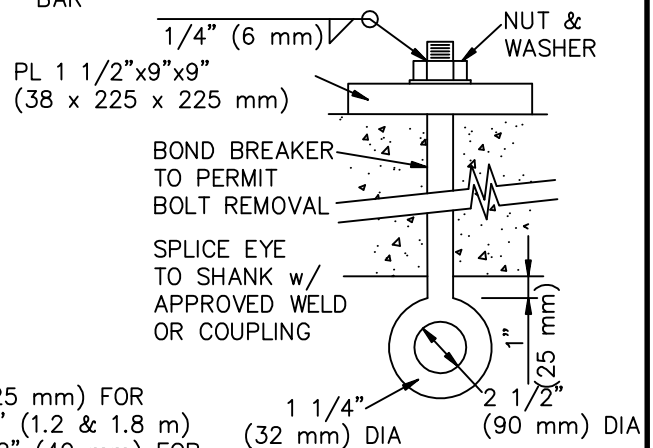
SECTION C–C



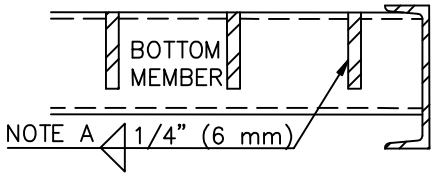
DETAIL G



SECTION D–D



DETAIL J



SECTION E–E

NOTE A:
WELDS 1" (25 mm) FOR
H = 4' & 6' (1.2 & 1.8 m)
WELDS 1 1/2" (40 mm) FOR
H = 8' & 10' (2.4 & 3.0 m)

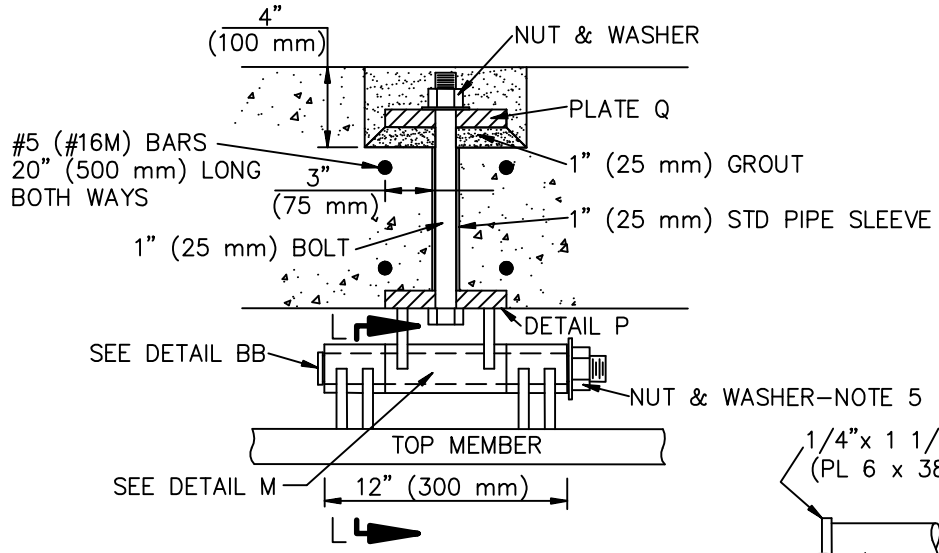
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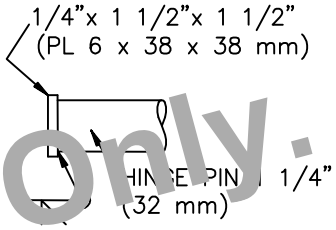
SLOPED PROTECTION BARRIER

STANDARD PLAN
360–2
SHEET 4 OF 8

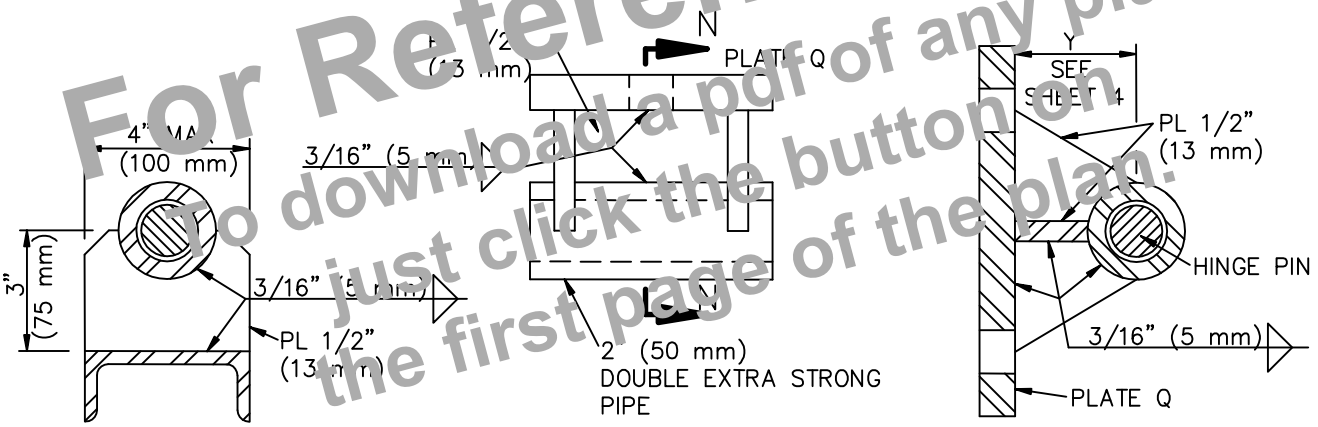
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12" (300 mm) HINGE



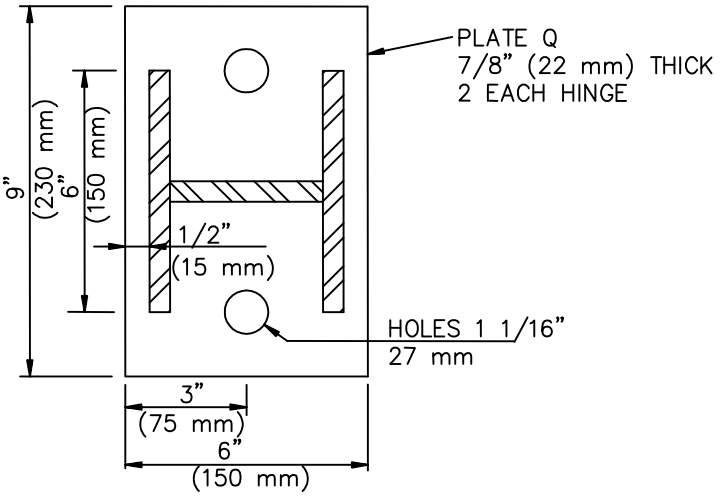
DETAIL BB



SECTION L–L

DETAIL M

SECTION N–N

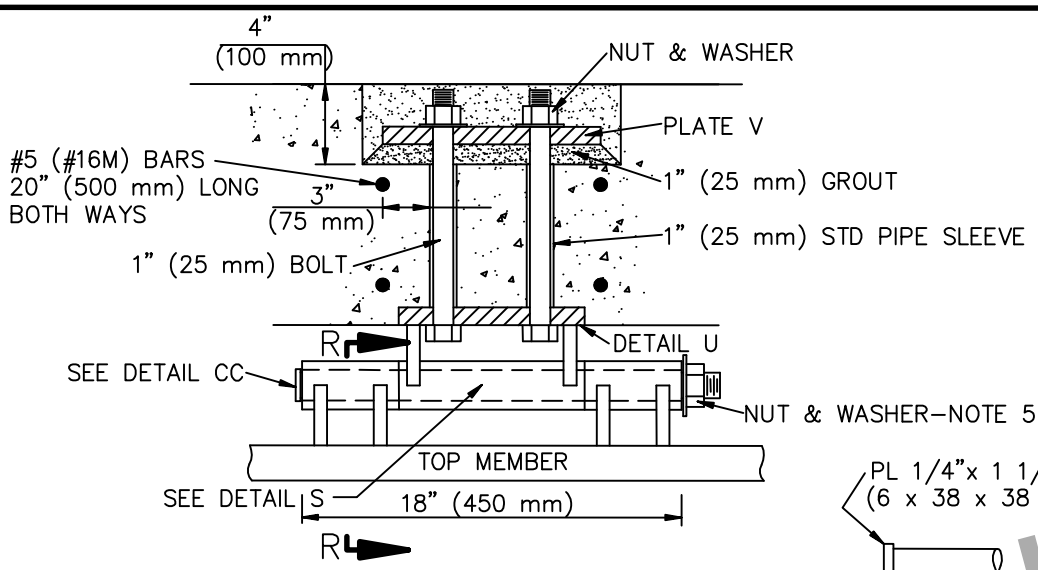


DETAIL P

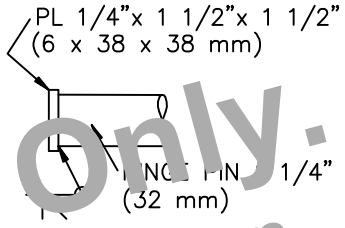
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
SLOPED PROTECTION BARRIER	**360–2**
	SHEET 5 OF 8

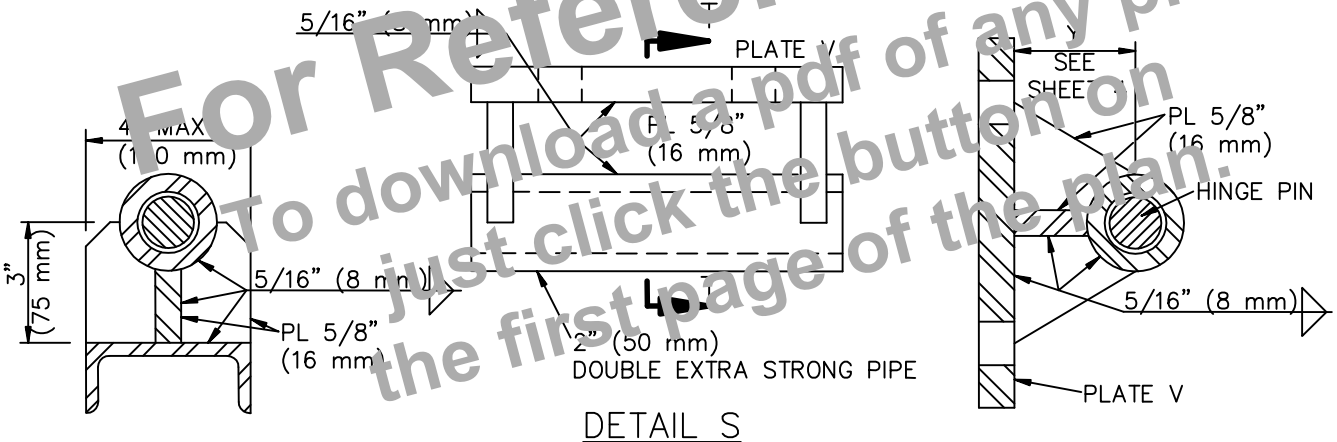
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18" (450 mm) HINGE



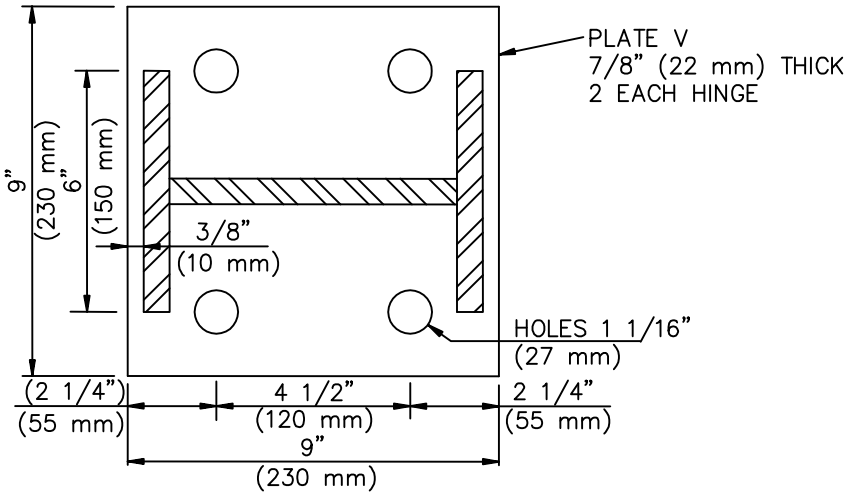
DETAIL CC



DETAIL S

SECTION R–R

SECTION T–T

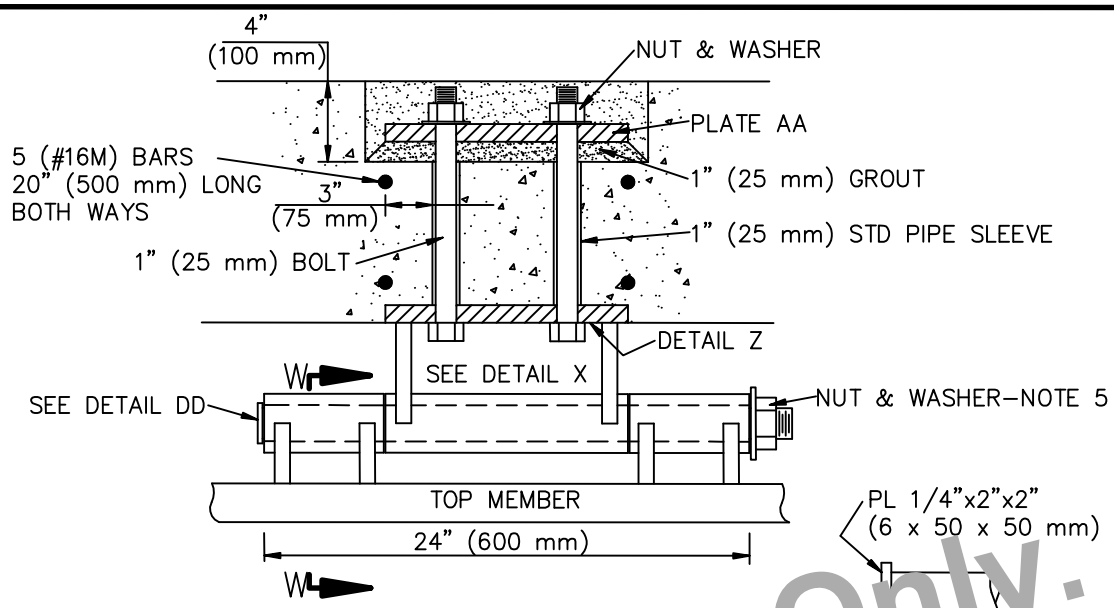


DETAIL U

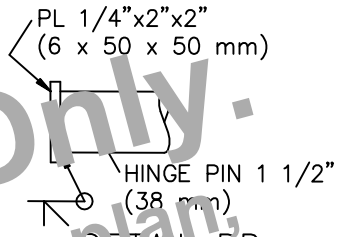
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SLOPED PROTECTION BARRIER	**360–2**
	SHEET 6 OF 8

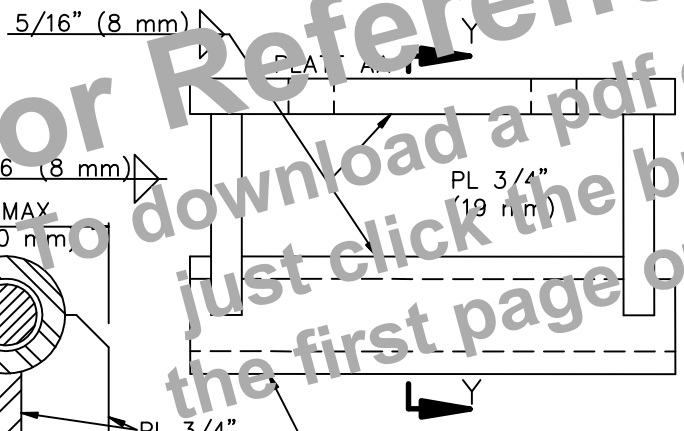
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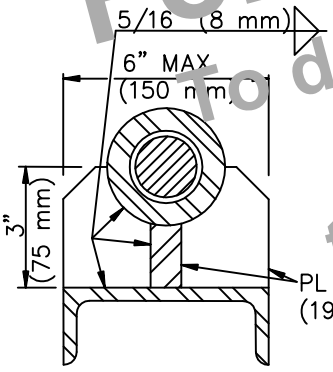
24" (600 mm) HINGE



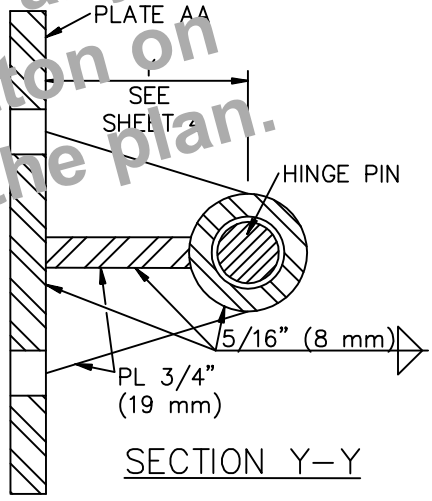
DETAIL DD



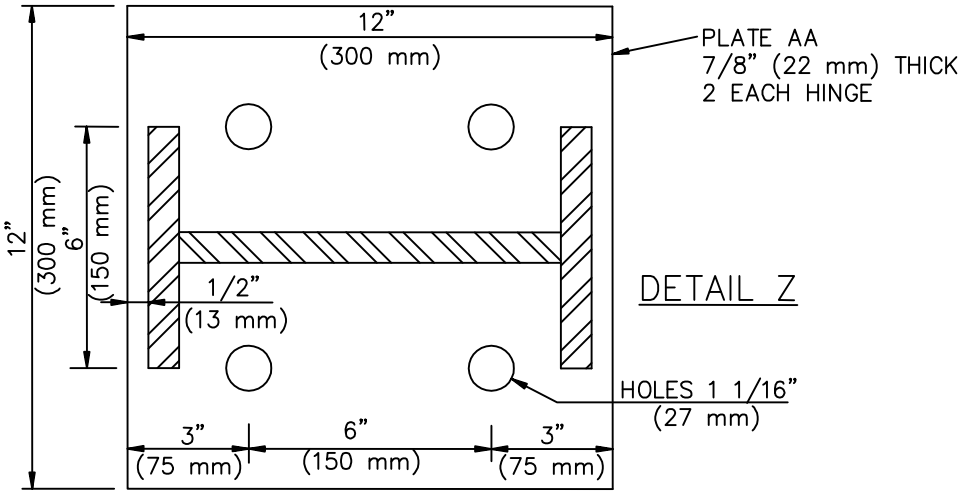
DETAIL X



SECTION W–W



SECTION Y–Y



DETAIL Z

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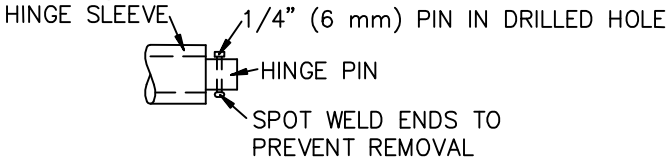
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SLOPED PROTECTION BARRIER	**360–2**
	SHEET 7 OF 8

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NOTES:

1. SUBMIT FABRICATION ("SHOP") DRAWINGS FOR APPROVAL PER SSPWC 2–5.3.3.
2. WHENEVER THE REINFORCED CONCRETE BOX SIZE FALLS BETWEEN SIZES SHOWN IN THE TABLES, USE THE HINGE AND MEMBER SIZING FOR THE LARGER BOX SIZE SHOWN.
3. FRAME MEMBERS SHALL BE ASTM A 36 STEEL OR BETTER.
4. HINGE ASSEMBLIES AND BEARING PADS SHALL BE STAINLESS STEEL.
5. MAKE NECESSARY MODIFICATIONS TO ALLOW THE SIMPLE REMOVAL OR INSERTION OF HINGE PINS FOR INSTALLATION OR REMOVAL OF THE PROTECTION BARRIER. THREAD THE END OF HINGE PINS SO THAT NUTS AND LOCK WASHERS ARE FLUSH WITH THE HINGE SLEEVE PIPE. DAMAGE THE THREADS BEYOND THE NUT FACE TO PREVENT LOOSENING. SEE ALSO ALTERNATE DETAIL BELOW.
6. GALVANIZE FRAME MEMBERS AFTER FABRICATION.
7. MINIMIZE OR ELIMINATE WELDING AFTER GALVANIZING. REPAIR POST–FABRICATION WELDS IN ACCORDANCE WITH SSPWC 210–3.5.
8. INSTALL A MID SUPPORT FOR BARRIERS WITH THREE HINGES.
9. INSTALL SAND PLATES AT OCEAN OUTLETS.
10. DESIGN LOADS:
    A. INLET/OUTLET BARRIER: BULKED EQUIVALENT FLUID DENSITY = 85 PCF
    B. OCEAN OUTLET
        1. 1,800 PSF (86 kPa) OVER SAND PLATE AREA
        2. 600 PSF (29 kPa) OVER LOWER OPEN AREA

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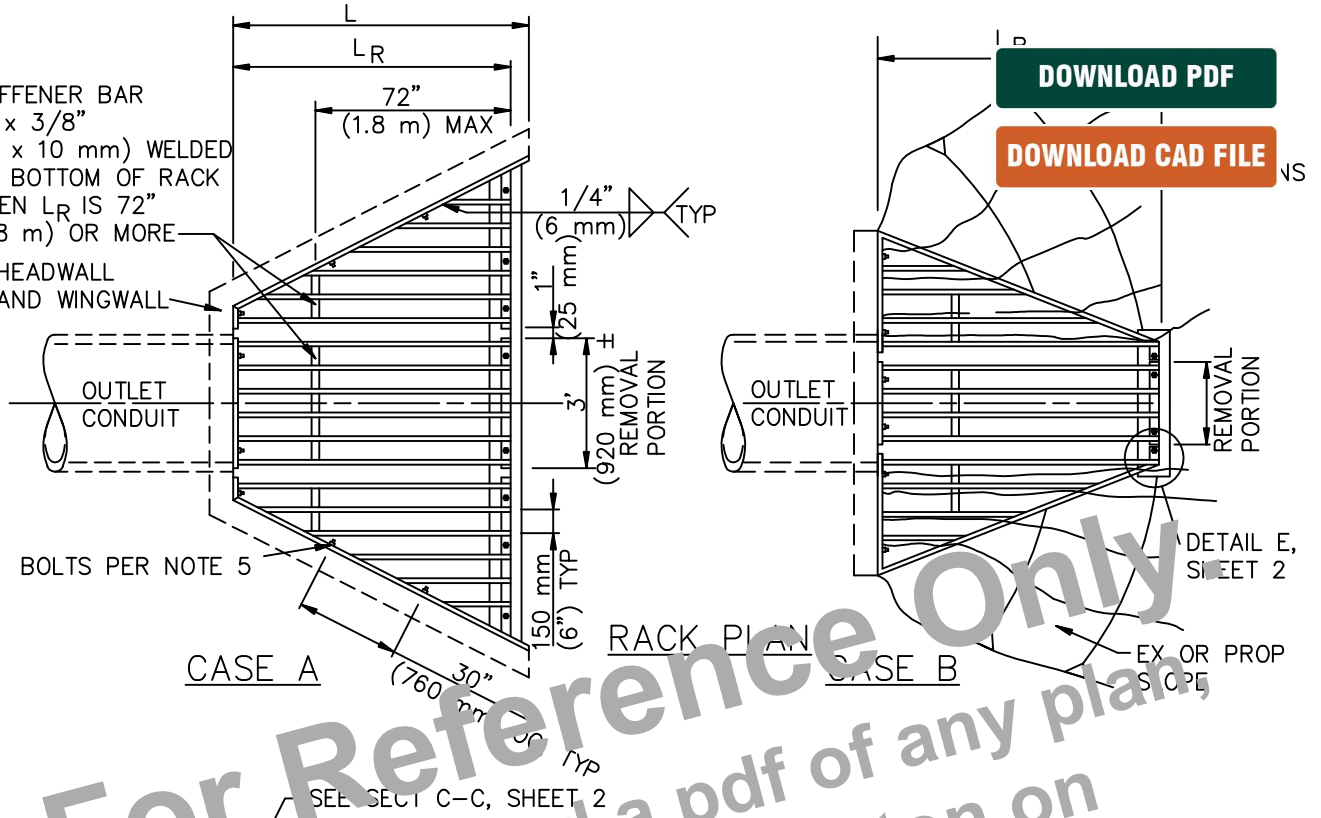
ALTERNATE HINGE PIN ATTACHMENT

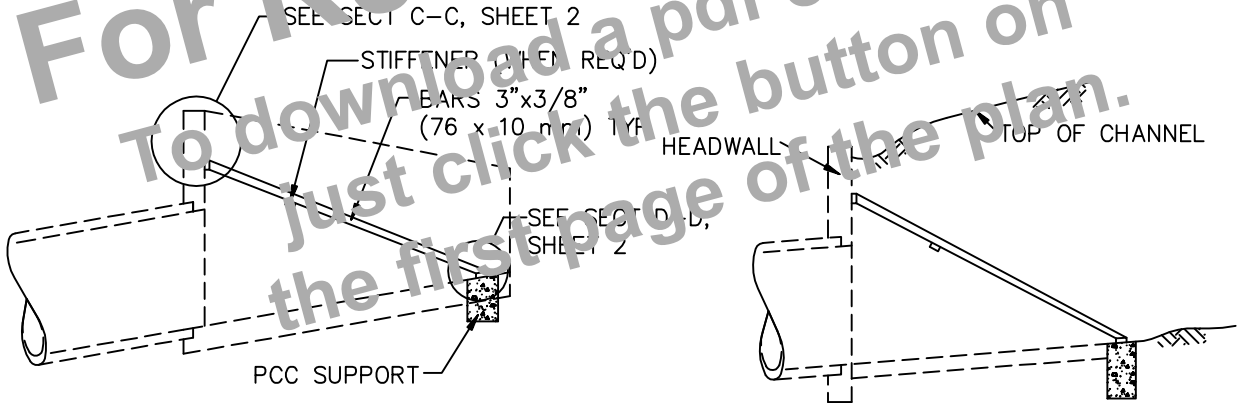
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SLOPED PROTECTION BARRIER	

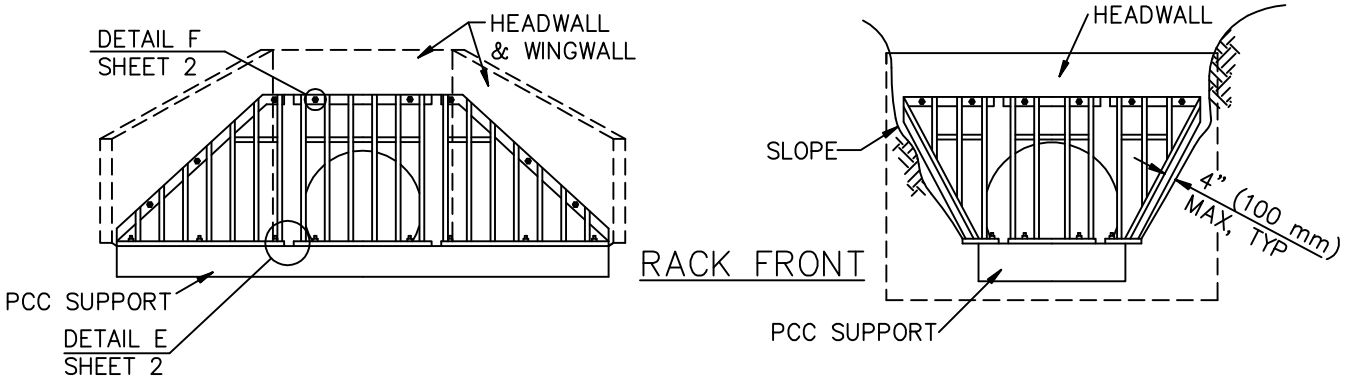
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RACK SECTION



RACK FRONT

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

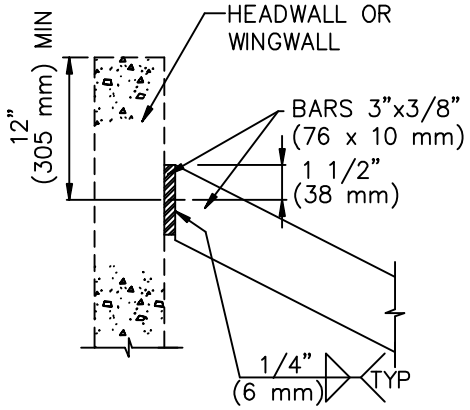
PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1993
REV. 2005, 2009

TRASH RACK (INCLINED)

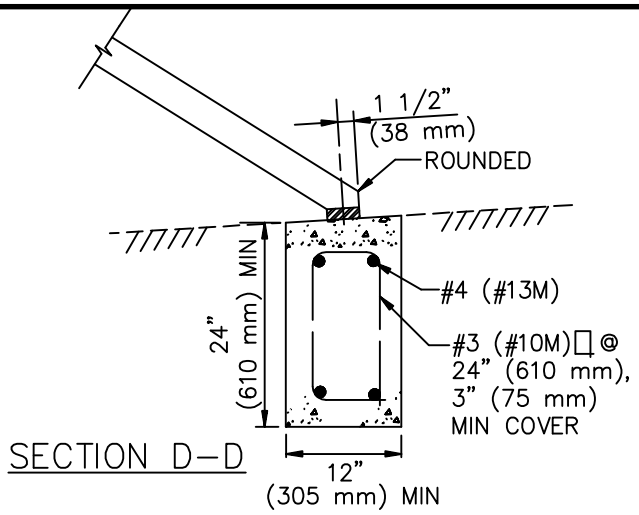
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
361–2
SHEET 1 OF 2

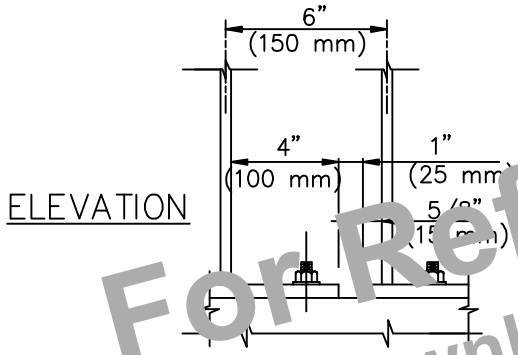
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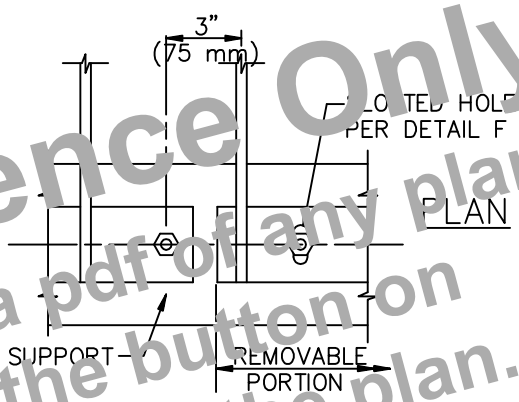
SECTION C–C



SECTION D–D

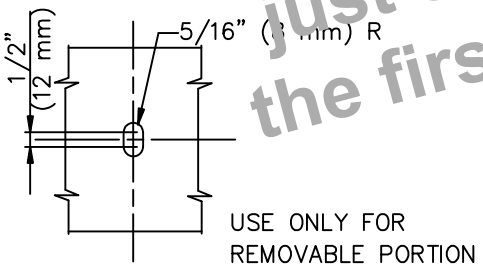


ELEVATION

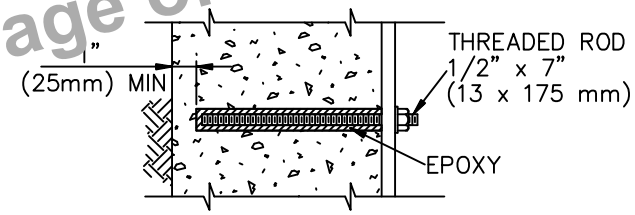


PLAN

DETAIL E



DETAIL F



RETROFIT ATTACHMENT

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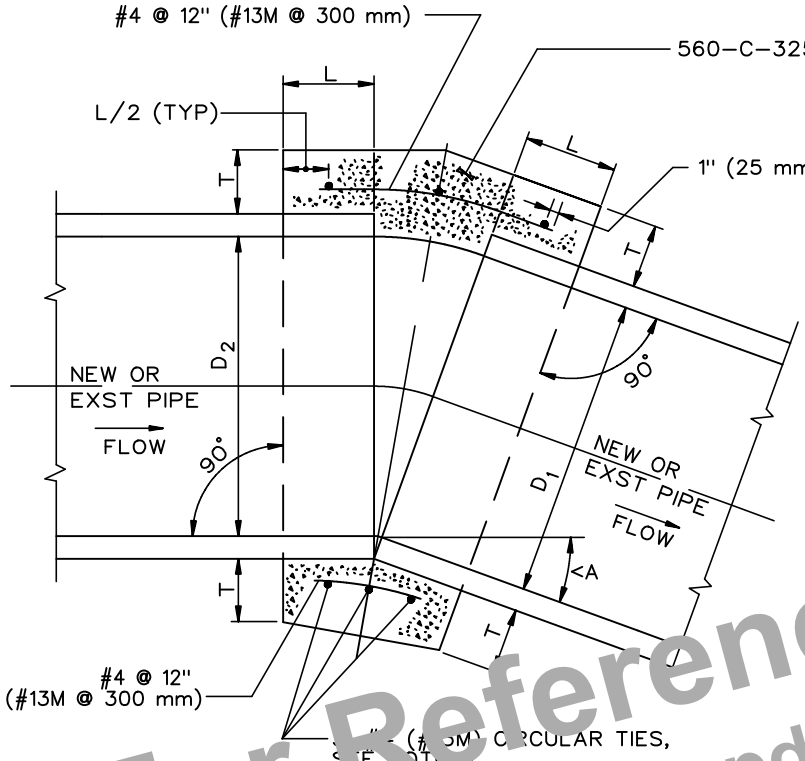
NOTES

1. MAXIMUM SIZE OF OUTLET FOR THIS RACK IS 48" (1200 mm) PIPE OR 48" (1.2 m) WIDE RCB. MAXIMUM LENGTH OF RACK L_R IS 10'–0" (3 m).
2. ADJUST L_R SO THAT THE SLOPE OF THE RACK IS APPROXIMATELY 2 HORIZONTAL TO 1 VERTICAL.
3. THE PCC SUPPORT IS NOT NEEDED IF THE INLET STRUCTURE HAS A SUITABLE CUTOFF WALL. THE PCC SUPPORT SHALL NOT REPLACE THE CUTOFF WALL.
4. GALVANIZE RACK AFTER FABRICATION.
5. BOLTS SHALL BE 1/2"x7" (13 x 175 mm). BOLTS FOR REMOVABLE PORTION SHALL BE STAINLESS STEEL. PROVIDE WASHERS AT EACH BOLT.
6. SUBMIT SHOP DRAWINGS PER SSPWC 2–5.3.3. FOR RETROFIT WORK, INCLUDE DETAILS FOR ATTACHMENT TO EXISTING STRUCTURE.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 361–2 SHEET 2 OF 2
TRASH RACK (INCLINED)	

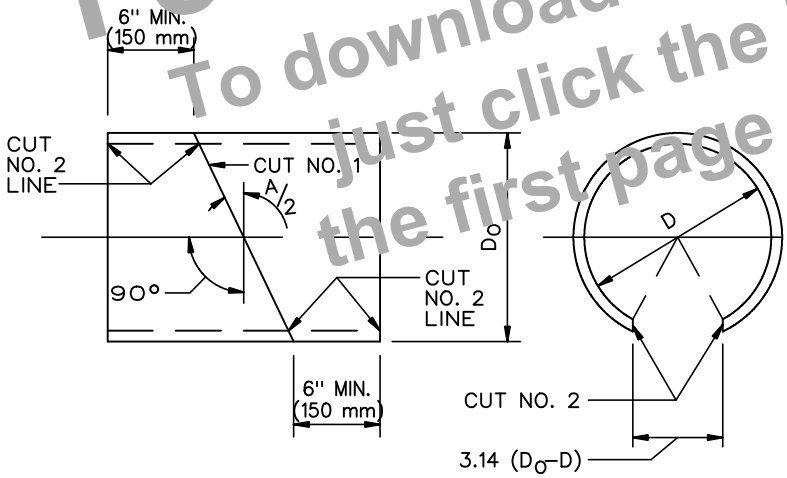
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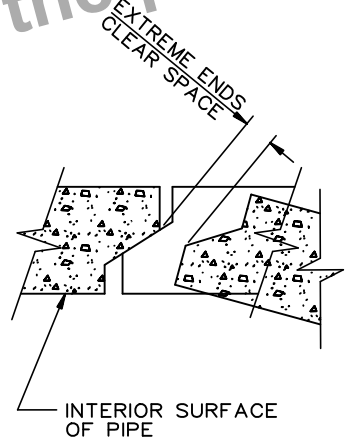
D	L	T
12" (300 mm)	12" (300 mm)	4" (100 mm)
18" (450 mm)	12" (300 mm)	5" (125 mm)
24" (600 mm)	12" (300 mm)	6" (150 mm)
30" (750 mm)	18" (450 mm)	7" (175 mm)
36" (900 mm)	18" (450 mm)	9" (225 mm)
42" (1050 mm)	18" (450 mm)	9" (225 mm)
48" (1200 mm)	18" (450 mm)	10" (250 mm)
54" (1350 mm)	21" (525 mm)	10" (250 mm)
60" (1500 mm)	21" (525 mm)	11" (275 mm)
66" (1650 mm)	21" (525 mm)	11" (275 mm)
72" (1800 mm)	24" (600 mm)	12" (300 mm)

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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_O-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

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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 306-7.3.2.1.

   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 IN TEXTS AND WHEN D_1 IS GREATER THAN D_2 JOIN SKEWS

5. FOR PIPE LARGER THAN 72" (1800 mm) SPECIAL COLLAR DETAILS ARE REQUIRED.

6. FOR PIPE SIZES 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+(2X WALL THICKNESS)+1".

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.

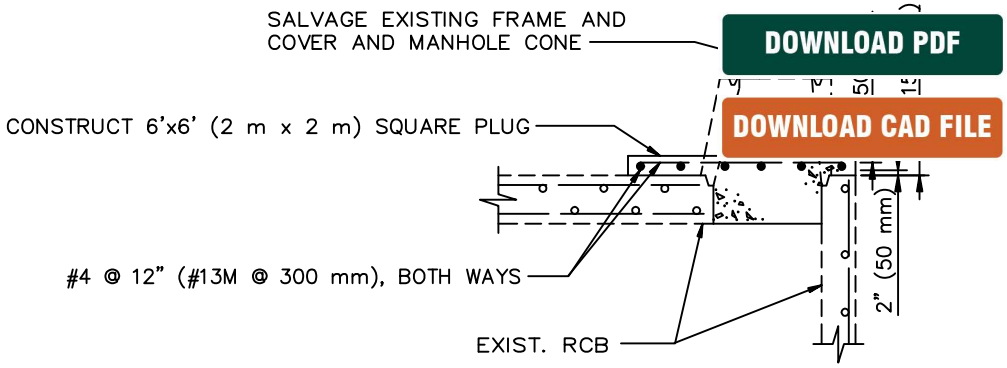
10. WHERE THE PIPE IS 21" (525 mm) OR LESS IN DIAMETER AN INTERIOR FORM OF UNSEALED SONO-TUBE OR EQUAL SHALL BE USED TO PROVIDE A SMOOTH INTERIOR JOINT. THE PAPER FORM MAY BE LEFT IN PLACE (SEE DETAIL A). WHEN THE PIPE IS 24" (600 mm) OR LARGER A REMOVABLE INTERIOR FORM SHALL BE USED OR THE INTERIOR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

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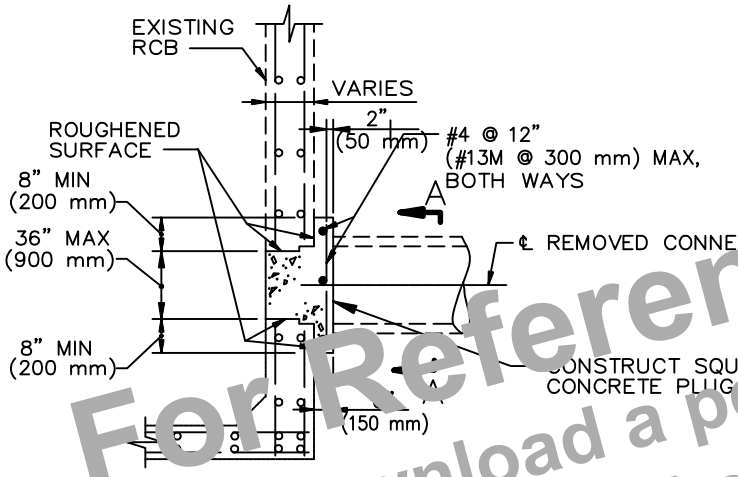
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CONCRETE COLLAR FOR RCP 12" (300 mm) THROUGH 72" (1800 mm)	380-4
	SHEET 2 OF 2

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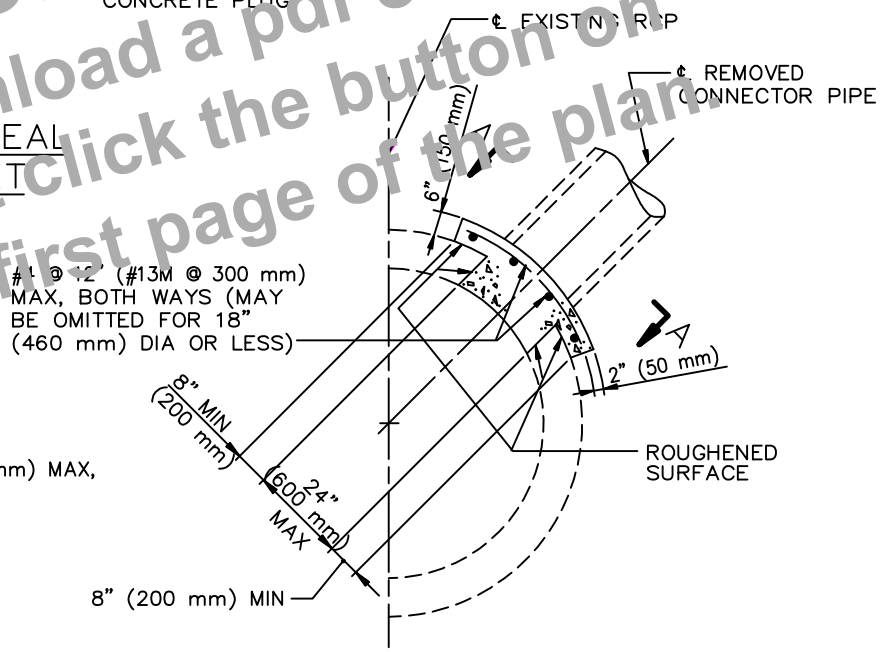
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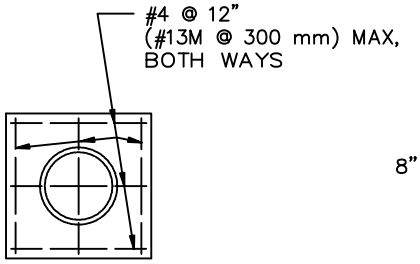


MANHOLE ABANDONMENT SEAL FOR RCB



ABANDONMENT SEAL FOR RCB INLET





SECTION A–A

ABANDONMENT SEAL FOR RCP INLET

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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ABANDONMENT SEALS FOR MANHOLES AND INLETS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

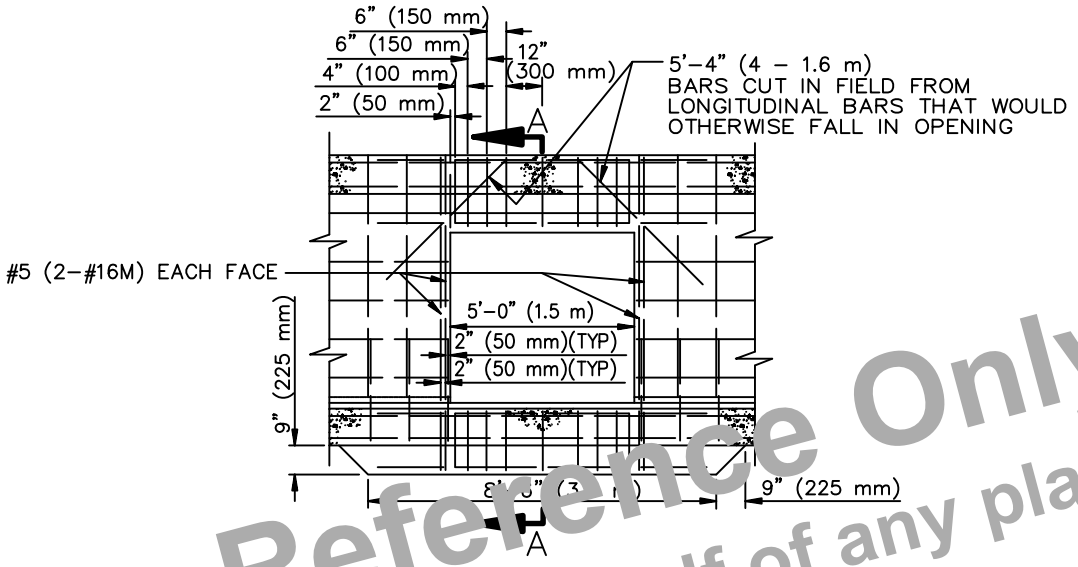
STANDARD PLAN 381–2

SHEET 1 OF 1

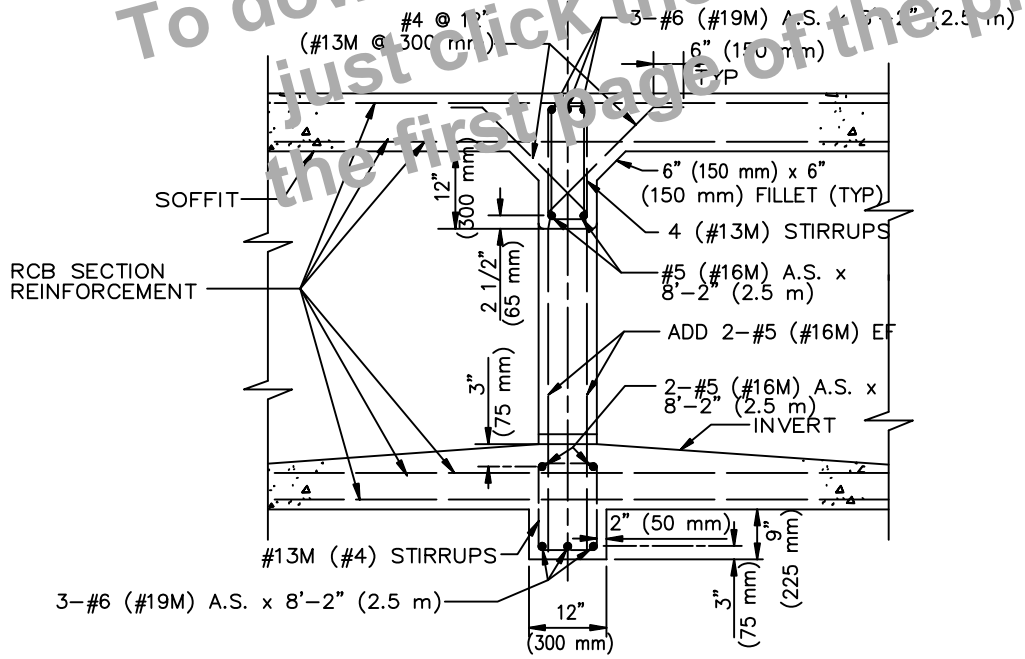
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ELEVATION



SECTION A-A

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

WINDOW DETAILS FOR MULTIPLE RCB STRUCTURES

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 382-2

SHEET 1 OF 2

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NOTES

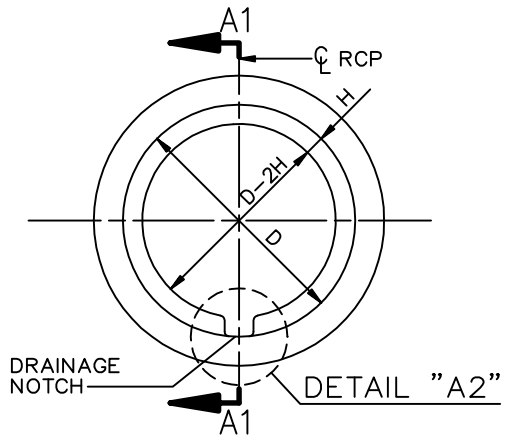
1. THIS STRUCTURE MAY BE USED WHERE:
   a. DEPTH OF COVER DOES NOT EXCEED 10' (3.0 m).
   b. CLEAR SPAN OF ONE BARREL DOES NOT EXCEED 12' (3.6 m). WHEN THESE LIMITS ARE EXCEEDED, WINDOW OPENING DETAILS SHALL BE AS SHOWN ON PLANS.
2. LONGITUDINAL BARS SHALL BE CUT IN THE FIELD 2" (50 mm) FROM OPENING.
3. ROUND ALL EDGES TO 2" (50 mm) RADIUS.
4. NO TRANSVERSE CONSTRUCTION JOINT SHALL BE PLACED WITHIN 5'–0" (1.5 m) OF WINDOW.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
WINDOW DETAILS FOR MULTIPLE RCB STRUCTURES	**382–2**
	SHEET 2 OF 2

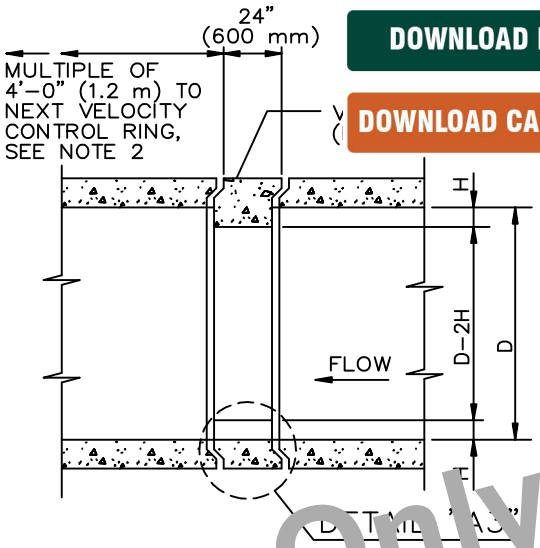
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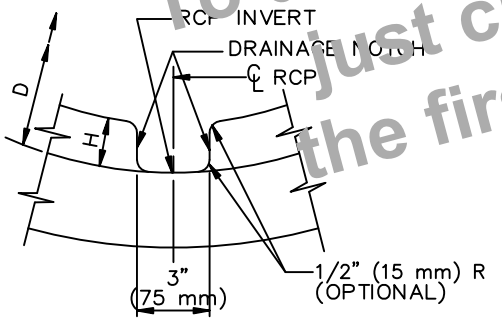
NOTE:
PLATE AND ANCHOR BOLTS NOT SHOWN.

PRECAST RCP SECTION
LOOKING UPSTREAM

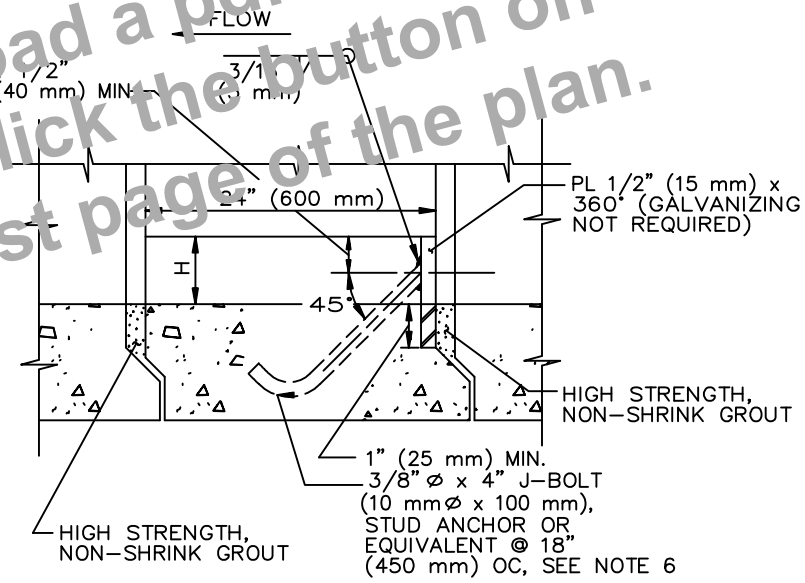


SECTION A1–A1

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DETAIL "A2"



NOTE:
PLATE AND ANCHOR BOLTS NOT SHOWN.

DETAIL "A3"

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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VELOCITY CONTROL RING PRECAST RCP SECTION

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 383–2

SHEET 1 OF 2

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NOTES

1. DRAINAGE NOTCH OF VELOCITY CONTROL PRECAST SECTIONS SHALL BE PLACED ON THE RCP INVERT AND CENTERED ON THE RCP CENTERLINE.

2. THE LOCATION AND SPACING OF THE VELOCITY CONTROL RINGS ARE SHOWN ON THE PLANS. THE SPACING BETWEEN THE RINGS UPSTREAM TO DOWNSTREAM SHALL BE A MULTIPLE OF 4'–0" (1.2 m).

3. PRECAST RCP VELOCITY CONTROL RINGS SHALL BE MANUFACTURED PER SSPWC 207–2. REINFORCING STEEL CAGES SHALL BE THE SAME AS THAT OF THE ADJACENT RCP EXCEPT THAT AN ADDITIONAL CAGE MAY BE ADDED. THE RING NEED NOT BE D–LOAD TESTED.

4. VALUES D AND H ARE SHOWN ON THE PLANS. THE VALUE H SHALL BE A MULTIPLE OF 1 1/2" (37.5 mm).

5. THE MINIMUM INSIDE DIAMETER (D–2H) SHALL BE [illegible]" ([illegible] mm).

6. #3 (#10M) REINFORCING STEEL BARS 12" ([illegible] mm) LONG WELDED TO THE REINFORCING CAGES MAY BE USED IN PLACE OF THE J BOLTS OR STUD ANCHORS.

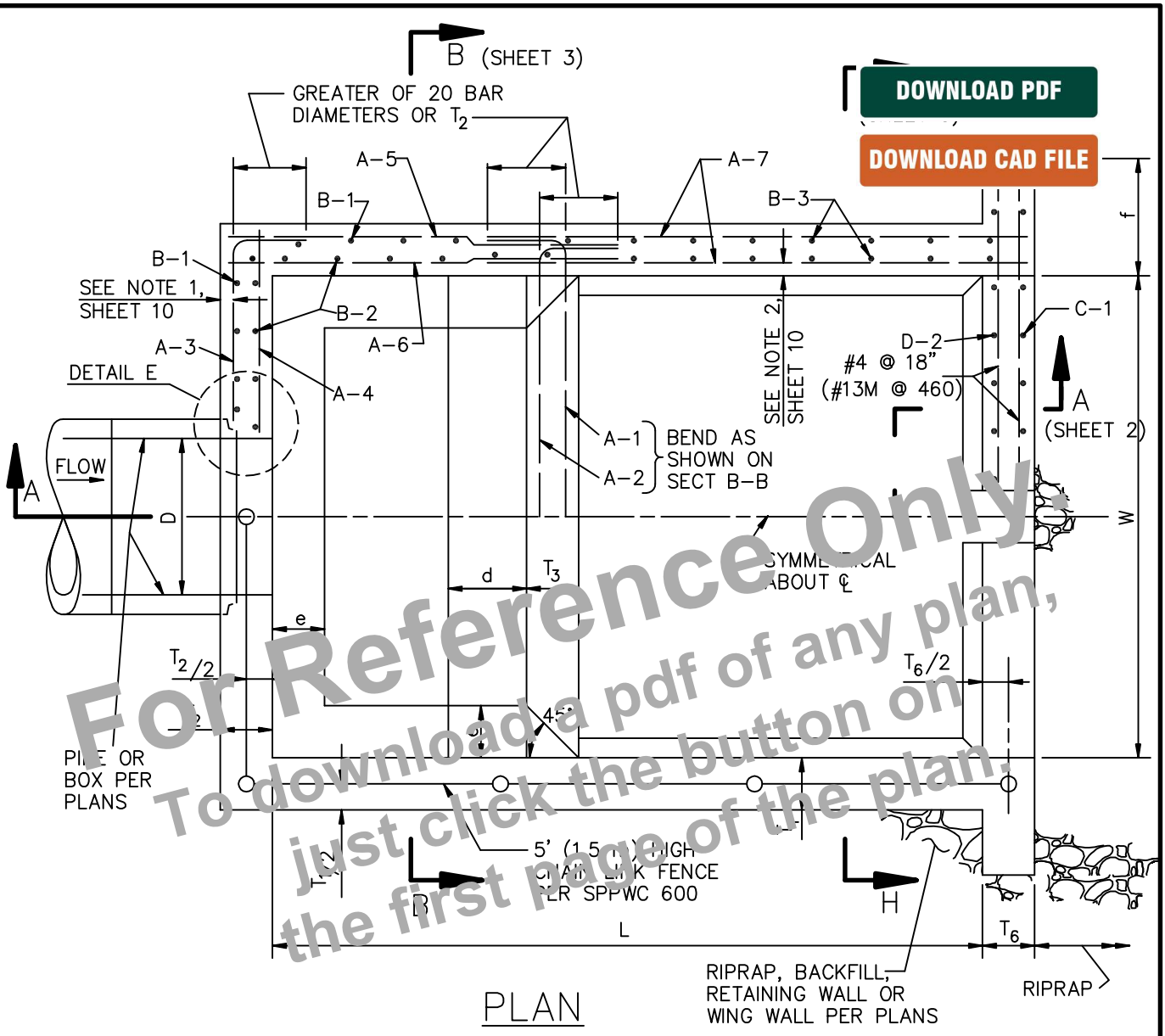
7. CONCRETE STRENGTH FOR VELOCITY RINGS SHALL BE 5,000 PSI (35 MPa) AT 28 DAYS.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
VELOCITY CONTROL RING PRECAST RCB SECTION	383–2
	SHEET 2 OF 2

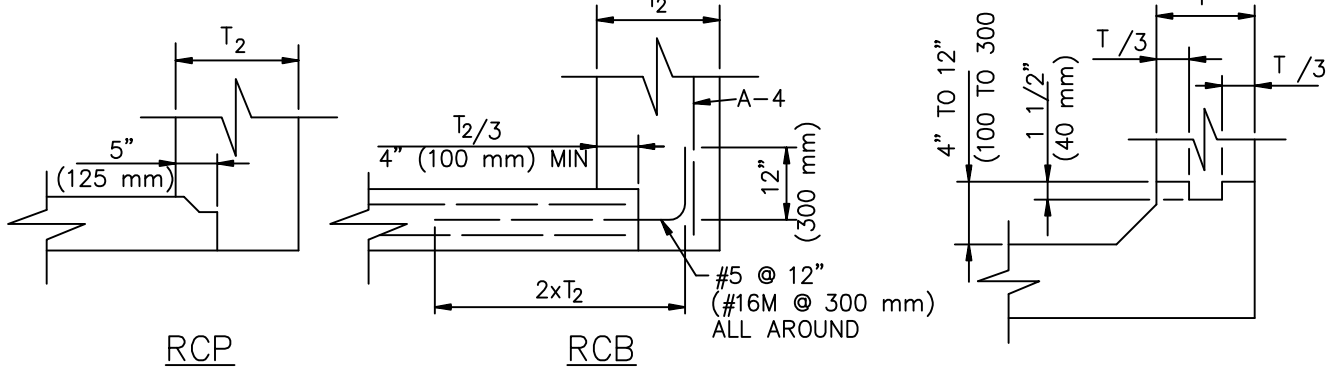
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RCP

RCB

DETAIL E

DETAIL F (SHEET 3)

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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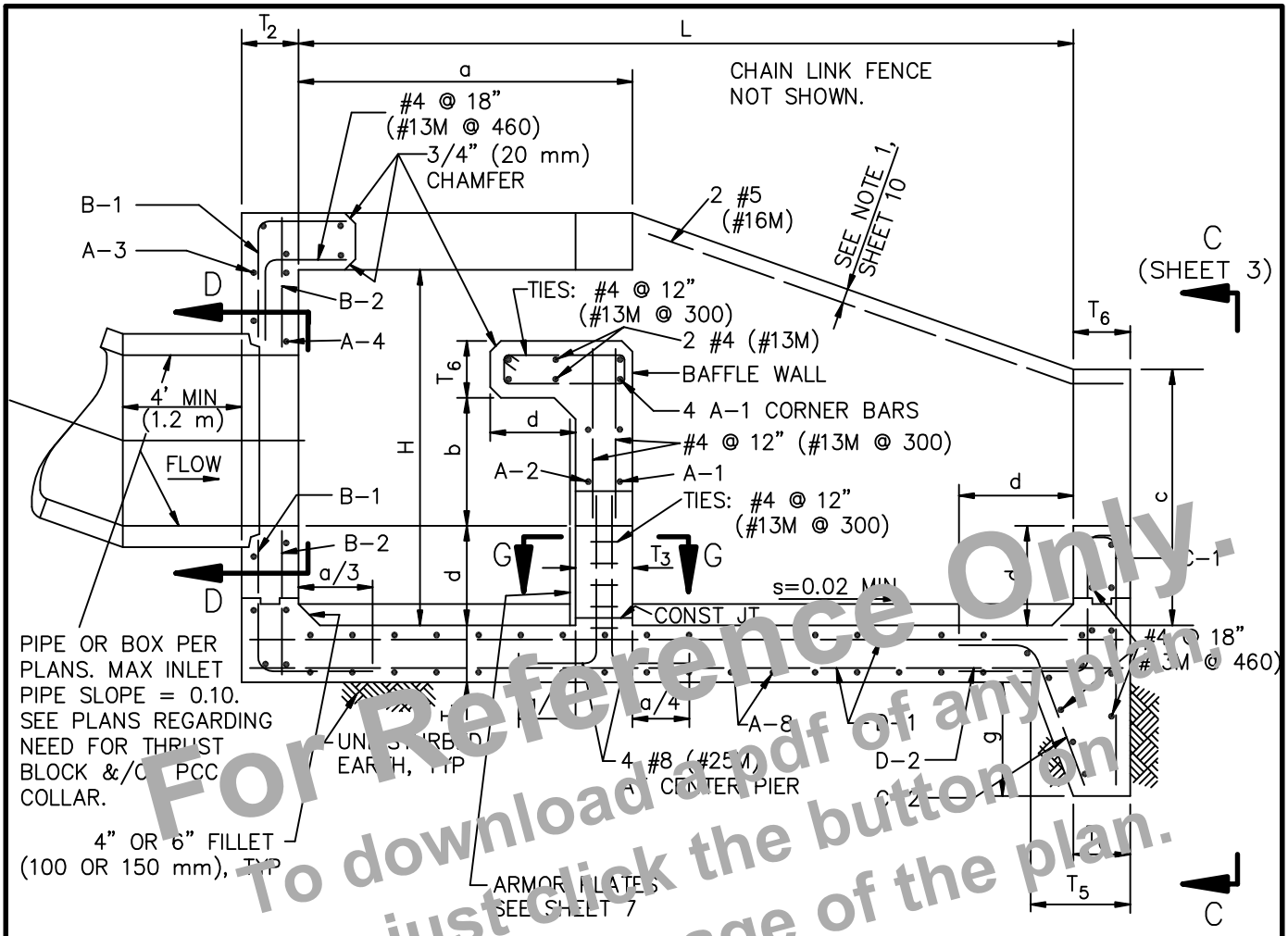
ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

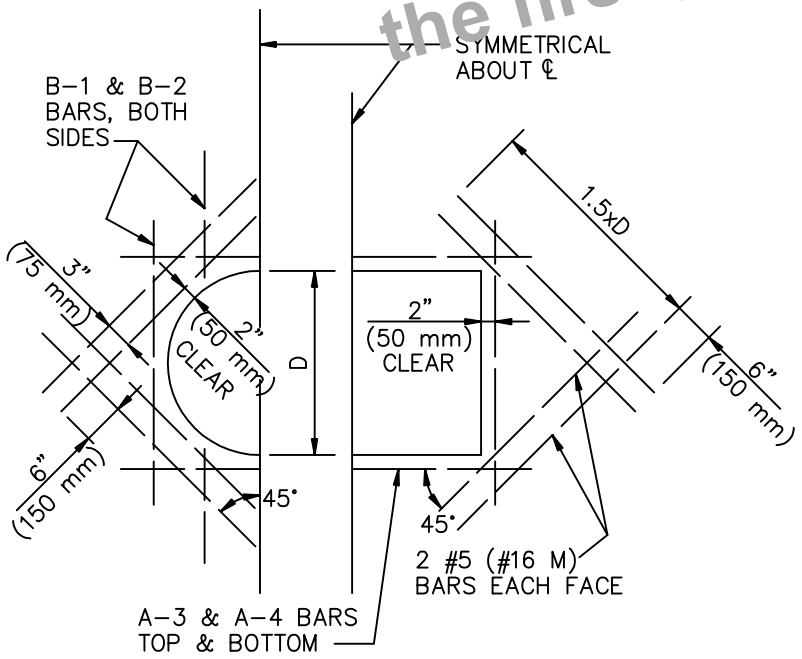
STANDARD PLAN 384–3

SHEET 1 OF 10

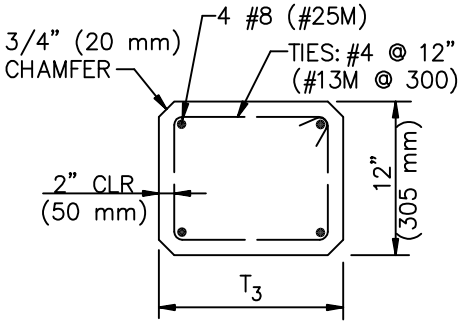
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SECTION A–A



SECTION D–D



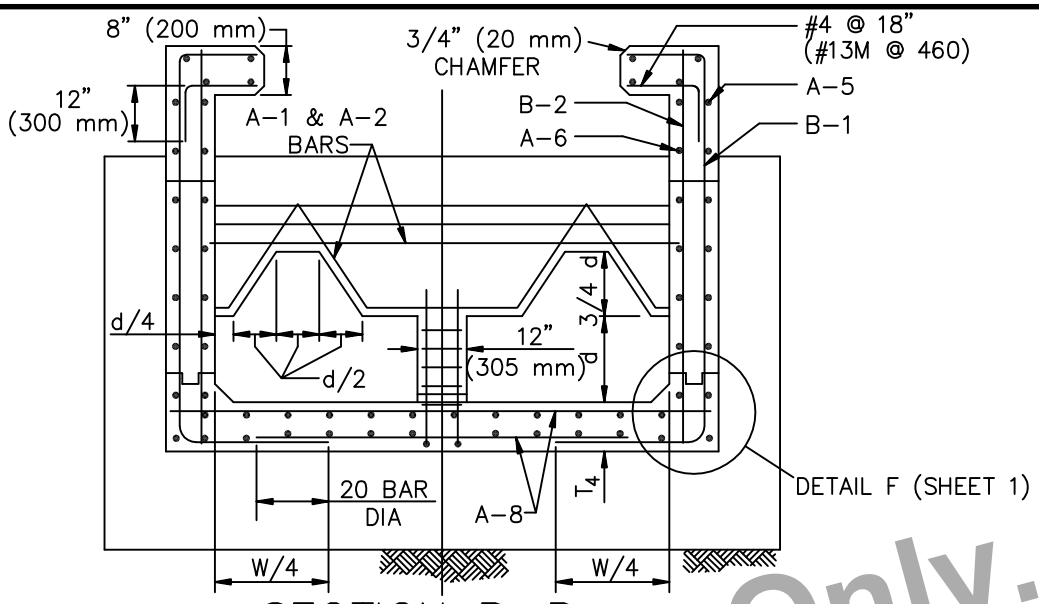
NOTE: ARMOR PLATE NOT SHOWN.

SECTION G–G

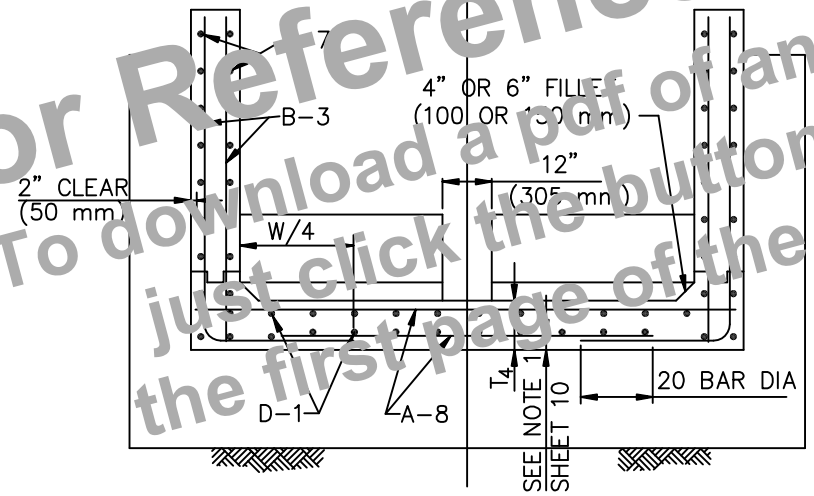
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL	**384–3**
	SHEET 2 OF 10

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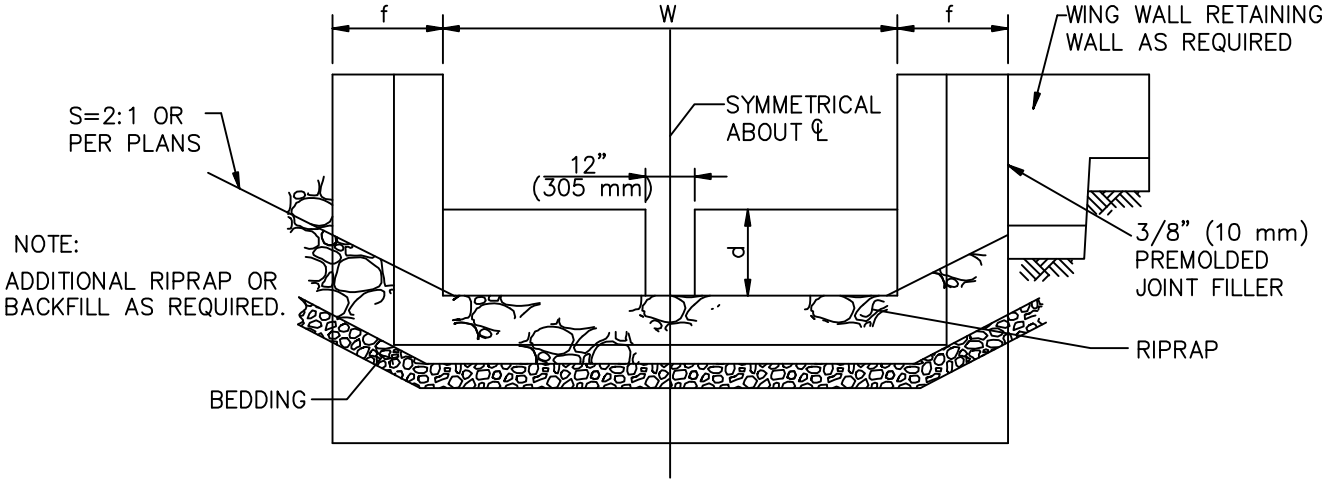
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SECTION B-B (SHEET 1)



SECTION H-H (SHEET 1)



SECTION C-C (SHEET 2)

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL	**384-3**
	SHEET 3 OF 10

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*SEE NOTES, SHEET 10

	WIDTH	(4'–0")	(1220)	6'–0"	(1830)	8'–0"	(2440)
DIMENSIONS	H	(3'–0")	(910)	4'–6"	(1370)	6'–0"	(1830)
	L	(5'–6")	(1680)	8'–0"	(2440)	11'–0"	(3510)
	a	(2'–0")	(610)	3'–0"	(910)	4'–0"	(1220)
	b	(1'–6")	(460)	2'–3"	(690)	3'–0"	(910)
	c	(2'–0")	(610)	3'–0"	(910)	4'–0"	(1220)
	d	(0'–8")	(200)	1'–0"	(300)	1'–4"	(410)
	e	(0'–4")	(100)	0'–6"	(150)	0'–8"	(200)
	f	(2'–0")	(610)	2'–0"	(610)	2'–0"	(610)
	g	(3'–0")	(910)	3'–0"	(910)	3'–0"	(910)
	T1*	(8")	(200)	8"	(200)	8"	(200)
	T2	(8")	(200)	8"	(200)	8"	(200)
	T3	(8")	(200)	8"	(200)	8"	(200)
	T4*	(8")	(200)	8"	(200)	8"	(200)
	T5	(9")	(230)	9"	(230)	9"	(230)
	T6	(9")	(230)	9"	(230)	9"	(230)
BAR DESIGNATION	WORKING STRESS DESIGN						
	A–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#5 @ 12"	(#16M @ 300)
	A–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#5 @ 12"	(#16M @ 300)
	A–3	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–4	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–5	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–6	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#5 @ 12"	(#16M @ 300)
	A–7	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	A–8	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–3	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	C–1	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	C–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	D–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	D–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	STRENGTH DESIGN						
	A–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	A–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	A–3	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–4	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–5	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–6	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	A–7	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	A–8	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–3	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	C–1	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	C–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	D–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	D–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	DESIGN LOAD, IMPACT	225 PSF	(10.8 kPa)	300 PSF	(14.4 kPa)	375 PSF	(18.0 kPa)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL

STANDARD PLAN 384–3

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*SEE NOTES, SHEET 10

	WIDTH	10'–0"	(3050)	12'–0"	(3660)	14'–0"	(4270)
DIMENSIONS	H	7'–6"	(2290)	9'–0"	(2740)	10'–6"	(3200)
	L	13'–6"	(4110)	16'–0"	(4880)	18'–6"	(5640)
	a	5'–0"	(1520)	6'–0"	(1830)	7'–0"	(2130)
	b	3'–9"	(1140)	4'–6"	(1370)	5'–3"	(1600)
	c	5'–0"	(1520)	6'–0"	(1830)	7'–0"	(2130)
	d	1'–8"	(510)	2'–0"	(610)	2'–4"	(710)
	e	0'–10"	(250)	1'–0"	(300)	1'–2"	(360)
	f	2'–0"	(610)	2'–6"	(760)	3'–0"	(910)
	g	4'–0"	(1220)	5'–0"	(1520)	5'–6"	(1680)
	T1*	9"	(230)	9"	(230)	10"	(250)
	T2	8"	(200)	8"	(200)	10"	(250)
	T3	8"	(200)	10"	(250)	12"	(300)
	T4*	8"	(200)	8.5"	(220)	8.5"	(220)
	T5	9"	(230)	9"	(230)	9"	(230)
	T6	9"	(230)	9"	(2300	9"	(230)
BAR DESIGNATION	WORKING STRESS DESIGN						
	A–1	#6 @ 12"	(#19M @ 300)	#8 @ 18"	(#29M @ 460)	#8 @ 12"	(#25M @ 300)
	A–2	#7 @ 12"	(#22M @ 300)	#9 @ 18"	(#29M @ 460)	#8 @ 12"	(#25M @ 300)
	A–3	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 12"	(#13M @ 300)
	A–4	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–5	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 12"	(#13M @ 300)
	A–6	#7 @ 12"	(#22M @ 300)	#8 @ 12"	(#25M @ 300)	#9 @ 12"	(#29M @ 300)
	A–7	#5 @ 14"	(#16M @ 360)	#5 @ 12"	(#16M @ 300)	#5 @ 10"	(#16M @ 250)
	A–8	#5 @ 11"	(#16M @ 275)	#7 @ 12"	(#22M @ 300)	#8 @ 12"	(#25M @ 300)
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–3	#6 @ 18"	(#19M @ 460)	#5 @ 12"	(#16M @ 300)	#6 @ 15"	(#19M @ 380)
	C–1	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	C–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	D–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	D–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	STRENGTH DESIGN						
	A–1	#5 @ 12"	(#16M @ 300)	#6 @ 12"	(#19M @ 300)	#8 @ 18"	(#25M @ 460)
	A–2	#6 @ 12"	(#19M @ 300)	#6 @ 12"	(#19M @ 300)	#8 @ 18"	(#25M @ 460)
	A–3	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–4	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–5	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	A–6	#6 @ 12"	(#19M @ 300)	#7 @ 12"	(#22M @ 300)	#8 @ 12"	(#25M @ 300)
	A–7	#5 @ 14"	(#16M @ 360)	#5 @ 12"	(#16M @ 300)	#5 @ 10"	(#16M @ 250)
	A–8	#4 @ 12"	(#13M @ 300)	#5 @ 12"	(#16M @ 300)	#6 @ 11"	(#19M @ 275)
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–3	#6 @ 18"	(#19M @ 460)	#5 @ 12"	(#16M @ 300)	#6 @ 15"	(#19M @ 380)
	C–1	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	C–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	D–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	D–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)
	DESIGN LOAD, IMPACT	450 PSF	(21.5 kPa)	525 PSF	(25.1 kPa)	600 PSF	(28.7 kPa)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL

STANDARD PLAN 384–3

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*SEE NOTES, SHEET 10

	WIDTH	16'–0"	(4880)	18'–0"	(5490)	20'–0"	(6100)
DIMENSIONS	H	12'–0"	(3660)	13'–6"	(4110)	15'–0"	(4570)
	L	21'–6"	(6550)	24'–0"	(7320)	26'–6"	(8080)
	a	8'–0"	(2440)	9'–0"	(2740)	10'–0"	(3050)
	b	6'–0"	(1830)	6'–9"	(2060)	7'–6"	(2290)
	c	8'–0"	(2440)	9'–0"	(2740)	10'–0"	(3050)
	d	2'–8"	(810)	3'–0"	(910)	3'–4"	(1020)
	e	1'–4"	(410)	1'–6"	(460)	1'–8"	(510)
	f	3'–6"	(1070)	3'–6"	(1070)	3'–6"	(1070)
	g	6'–0"	(1830)	7'–0"	(2130)	7'–6"	(2290)
	T1*	12"	(300)	13"	(330)	14"	(360)
	T2	10"	(250)	12"	(300)	12"	(300)
	T3	13"	(330)	14"	(360)	16"	(410)
	T4*	9.5"	(240)	10.5"	(270)	(11.5")	(290)
	T5	10"	(250)	11"	(280)	(13")	(33[illegible])
	T6	9"	(230)	9"	(230)	(")	(230)
BAR DESIGNATION	WORKING STRESS DESIGN						
	A–1	#9 @ 12"	(#29M @ 300)	#8 @ 6"	(#[illegible]M @ 300)	#10 @ 12"	(#25M @ 150)
	A–2	#9 @ 12"	(#29M @ 300)	#[illegible] @ 6"	(#22M @ 150)	#7 @ 6"	(#22M @ 150)
	A–3	#5 @ 12"	(#[illegible]M @ 300)	#4 @ 6"	(#16M @ 300)	#[illegible] @ 12"	(#13M @ 150)
	A–4	#4 @ 18"	(#13M @ 460)	#4 @ 12"	(#13M @ 460)	#4 @ 18"	(#13M @ 300)
	A–5	#5 @ 12"	(#16M @ 300)	#5 @ 12"	(#16M @ 300)	#5 @ 12"	(#16M @ 300)
	A–6	#[illegible] @ 12"	(#29M @ 300)	#9 @ 6"	(#25M @ 150)	#8 @ 6"	(#29M @ 150)
	A–7	#6 @ 12"	(#19M @ 300)	#7 @ 14"	(#16M @ 200)	#5 @ 8"	(#22M @ 360)
	A–8	#9 @ 12"	(#29M @ 300)	#8 @ 7"	(#25M @ 300)	#8 @ 8"	(#25M @ 175)
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–3	#6 @ 12"	(#19M @ 300)	#7 @ 14"	(#22M @ 410)	#7 @ 16"	(#22M @ 360)
	C–1	#4 @ 15"	(#13M @ 380)	#4 @ 13"	(#13M @ 330)	#4 @ 13"	(#13M @ 330)
	C–2	#4 @ 15"	(#13M @ 380)	#4 @ 13"	(#13M @ 330)	#4 @ 13"	(#13M @ 330)
	D–1	#4 @ 12"	(#13M @ 300)	#[illegible] @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	D–2	#4 @ 18"	(#13M @ 460)	#6 @ 13"	(#13M @ 300)	#4 @ 12"	(#19M @ 330)
	STRENGTH DESIGN						
	A–1	#8 @ 12"	(#25M @ 300)	#9 @ 12"	(#29M @ 300)	#8 @ 8"	(#25M @ 200)
	A–2	#8 @ 12"	(#25M @ 300)	#6 @ 6"	(#19M @ 150)	#7 @ 8"	(#22M @ 200)
	A–3	#4 @ 12"	(#13M @ 300)	#5 @ 12"	(#16M @ 300)	#4 @ 8"	(#13M @ 200)
	A–4	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#4 @ 16"	(#13M @ 410)
	A–5	#4 @ 12"	(#13M @ 300)	#5 @ 12"	(#16M @ 300)	#4 @ 8"	(#13M @ 200)
	A–6	#6 @ 6"	(#19M @ 150)	#9 @ 12"	(#29M @ 300)	#6 @ 4"	(#19M @ 100)
	A–7	#6 @ 12"	(#19M @ 300)	#5 @ 8"	(#16M @ 200)	#7 @ 14"	(#22M @ 360)
	A–8	#7 @ 12"	(#22M @ 300)	#8 @ 14"	(#25M @ 360)	#8 @ 12"	(#25M @ 300)
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–3	#6 @ 12"	(#19M @ 300)	#7 @ 16"	(#22M @ 410)	#7 @ 14"	(#22M @ 360)
	C–1	#4 @ 15"	(#13M @ 380)	#4 @ 13"	(#13M @ 330)	#4 @ 13"	(#13M @ 330)
	C–2	#4 @ 15"	(#13M @ 380)	#4 @ 13"	(#13M @ 330)	#4 @ 13"	(#13M @ 330)
	D–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	D–2	#4 @ 18"	(#13M @ 460)	#4 @ 18"	(#13M @ 460)	#5 @ 14"	(#16M @ 360)
	DESIGN LOAD, IMPACT	675 PSF	(32.3 kPa)	750 PSF	(35.9 kPa)	825 PSF	(39.5 kPa)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL

STANDARD PLAN 384–3

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*SEE NOTES, SHEET 10

	WIDTH	22'–0"	(6710)	24'–0"	(7320)	26'–0"	(7920)
DIMENSIONS	H	16'–6"	(5030)	18'–0"	(5490)	19'–6"	(5940)
	L	29'–6"	(8990)	32'–0"	(9750)	35'–0"	(10670)
	a	11'–0"	(3350)	12'–0"	(3660)	13'–0"	(3960)
	b	8'–3"	(2510)	9'–0"	(2740)	9'–9"	(2790)
	c	11'–0"	(3350)	12'–0"	(3660)	13'–0"	(3960)
	d	3'–8"	(1120)	4'–0"	(1220)	4'–4"	(1320)
	e	1'–10"	(560)	2'–0"	(610)	2'–2"	(660)
	f	4'–0"	(1220)	4'–6"	(1370)	4'–6"	(1370)
	g	8'–0"	(2440)	8'–6"	(2590)	9'–6"	(2900)
	T1*	15"	(380)	17"	(430)	18"	(460)
	T2	13"	(330)	13"	(330)	13"	(330)
	T3	17"	(430)	18"	(460)	21"	(530)
	T4*	13"	(330)	14"	(360)	15"	(380)
	T5	15"	(380)	17"	(430)	19"	(480)
	T6	9"	(230)	9"	(230)	9"	(230)
BAR DESIGNATION	WORKING STRESS DESIGN						
	A–1	#9 @ 6"	(#29M @ 150)	#9 @ 6"	(#29M @ 150)	#8 @ 4"	(#25M @ 100)
	A–2	#8 @ 6"	(#25M @ 150)	#9 @ 6"	(#29M @ 150)	#9 @ 6"	(#29M @ 150)
	A–3	#4 @ 6"	(#13M @ 150)	#5 @ 6"	(#16M @ 150)	#6 @ 8"	(#19M @ 200)
	A–4	#4 @ 12"	(#13M @ 300)	#5 @ 12"	(#16M @ 300)	#6 @ 16"	(#19M @ 410)
	A–5	#5 @ 12"	(#16M @ 300)	#4 @ 6"	(#13M @ 150)	#8 @ 16"	(#25M @ 410)
	A–6	#9 @ 6"	(#29M @ 150)	#10 @ 6"	(#32M @ 150)	#5 @ 4"	(#29M @ 100)
	A–7	#8 @ 16"	(#25M @ 410)	#7 @ 12"	(#22M @ 300)	#6 @ 8"	(#19M @ 200)
	A–8	#9 @ 8"	(#29M @ 200)	#9 @ 7"	(#29M @ 175)	#9 @ 6"	(#29M @ 150)
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	B–3	#8 @ 18"	(#25M @ 460)	#7 @ 12"	(#22M @ 300)	#7 @ 12"	(#22M @ 300)
	C–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#5 @ 16"	(#16M @ 410)
	C–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#5 @ 16"	(#16M @ 410)
	D–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	D–2	#8 @ 18"	(#25M @ 460)	#9 @ 18"	(#29M @ 460)	#8 @ 14"	(#25M @ 360)
	STRENGTH DESIGN						
	A–1	#9 @ 8"	(#29M @ 200)	(#10 @ 9")	(#29M @ 200)	#9 @ 8"	#32M @ 225
	A–2	#8 @ 8"	(#25M @ 200)	(#9 @ 8")	(#29M @ 200)	#9 @ 8"	#29M @ 200
	A–3	#4 @ 8"	(#13M @ 200)	(#8 @ 16")	(#16M @ 200)	#5 @ 8"	#25M @ 410
	A–4	#4 @ 16"	(#13M @ 410)	(#5 @ 16")	(#13M @ 410)	#4 @ 16"	#16M @ 410
	A–5	#5 @ 8"	(#16M @ 200)	(#5 @ 8")	(#16M @ 200)	#5 @ 8"	#16M @ 200
	A–6	#9 @ 8"	(#29M @ 200)	(#8 @ 4")	(#29M @ 150)	#9 @ 6"	#25M @ 100
	A–7	#8 @ 16"	(#25M @ 410)	(#6 @ 8")	(#22M @ 300)	#7 @ 12"	#19M @ 200
	A–8	#8 @ 11"	(#25M @ 275)	(#8 @ 8")	(#29M @ 300)	#9 @ 12"	#25M @ 200
	B–1	#4 @ 12"	(#13M @ 300)	(#4 @ 12")	(#13M @ 300)	#4 @ 12"	#13M @ 300
	B–2	#4 @ 12"	(#13M @ 300)	(#4 @ 12")	(#13M @ 300)	#4 @ 12"	#13M @ 300
	B–3	#8 @ 18"	(#25M @ 460)	(#7 @ 12")	(#22M @ 300)	#7 @ 12"	#22M @ 300
	C–1	#4 @ 12"	(#13M @ 300)	(#5 @ 16")	(#13M @ 300)	#4 @ 12"	#16M @ 410
	C–2	#4 @ 12"	(#13M @ 300)	(#5 @ 16")	(#13M @ 300)	#4 @ 12"	#16M @ 410
	D–1	#4 @ 12"	(#13M @ 300)	(#4 @ 12")	(#13M @ 300)	#4 @ 12"	#13M @ 300
	D–2	#6 @ 14"	(#19M @ 360)	(#8 @ 15")	(#22M @ 360)	#7 @ 14"	#25M @ 380
	DESIGN LOAD, IMPACT	900 PSF	(43.1 kPa)	950 PSF	(45.5 kPa)	1000 PSF	(47.9 kPa)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL

STANDARD PLAN 384–3

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*SEE NOTES, SHEET 10

	WIDTH	28'–0"	(8530)	30'–0"	(9140)	32'–0"	(9750)
DIMENSIONS	H	21'–0"	(6400)	22'–6"	(6860)	24'–0"	(7320)
	L	37'–6"	(11430)	40'–0"	(12190)	42'–6"	(12950)
	a	14'–0"	(4270)	15'–0"	(4570)	16'–0"	(4880)
	b	10'–6"	(3200)	11'–3"	(3430)	12'–0"	(3660)
	c	14'–0"	(4270)	15'–0"	(4570)	16'–0"	(4880)
	d	4'–8"	(1420)	5'–0"	(1520)	5'–4"	(1630)
	e	2'–4"	(710)	2'–6"	(760)	2'–8"	(810)
	f	5'–0"	(1520)	5'–6"	(1680)	6'–0"	(1830)
	g	10'–0"	(3050)	10'–6"	(3200)	11'–0"	(3350)
	T1*	20"	(510)	22"	(560)	25"	(640)
	T2	14"	(360)	14"	(360)	14"	(360)
	T3	23"	(580)	24"	(610)	26"	(660)
	T4*	17"	(430)	18.5"	(470)	20"	(510)
	T5	21"	(530)	24"	(610)	26"	(660)
	T6	9"	(230)	10"	(250)	11"	(280)
BAR DESIGNATION	WORKING STRESS DESIGN						
	A–1	#9 @ 4"	(#29M @ 100)	#10 @ 4"	(#32M @ 100)	(#10 @ 4")	#32M @ 100
	A–2	#8 @ 4"	(#25M @ 100)	#9 @ 4"	(#29M @ 100)	(#9 @ 4")	#29M @ 100
	A–3	#6 @ 8"	(#19M @ 200)	#5 @ 4"	(#16M @ 100)	(#5 @ 4")	#16M @ 100
	A–4	#6 @ 12"	(#19M @ 300)	#7 @ 12"	(#22M @ 300)	(#6 @ 8")	#19M @ 200
	A–5	#7 @ 12"	(#22M @ 300)	#7 @ 12"	(#22M @ 300)	(#8 @ 12")	#25M @ 300
	A–6	#9 @ 4"	(#29M @ 100)	#9 @ 4"	(#29M @ 100)	(#10 @ 4")	#32M @ 100
	A–7	#8 @ 13"	(#25M @ 330)	#8 @ 12"	(#25M @ 300)	(#8 @ 10")	#25M @ 250
	A–8	#8 @ 4"	(#25M @ 100)	#9 @ 5"	(#29M @ 125)	(#9 @ 4")	#29M @ 100
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	(#4 @ 10")	#13M @ 250
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	(#4 @ 10")	#13M @ 250
	B–3	#8 @ 14"	(#25M @ 360)	#8 @ 12"	(#25M @ 300)	(#8 @ 11")	#25M @ 275
	C–1	#5 @ 15"	(#16M @ 380)	#5 @ 12"	(#16M @ 300)	(#5 @ 12")	#16M @ 300
	C–2	#5 @ 15"	(#16M @ 380)	#5 @ 12"	(#16M @ 300)	(#5 @ 12")	#16M @ 300
	D–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	(#4 @ 12")	#13M @ 300
	D–2	#8 @ 11"	(#25M @ 275)	#9 @ 13"	(#29M @ 330)	(#8 @ 10")	#25M @ 250
	STRENGTH DESIGN						
	A–1	#9 @ 6"	(#29M @ 150)	#8 @ 4"	(#25M @ 100)	#9 @ 5"	(#29M @ 125)
	A–2	#9 @ 8"	(#29M @ 200)	#10 @ 8"	(#32M @ 200)	#8 @ 5"	(#25M @ 125)
	A–3	#9 @ 12"	(#29M @ 300)	#7 @ 8"	(#22M @ 200)	#8 @ 10"	(#25M @ 250)
	A–4	#8 @ 12"	(#25M @ 300)	#5 @ 8"	(#16M @ 200)	#4 @ 5"	(#13M @ 125)
	A–5	#7 @ 12"	(#22M @ 300)	#4 @ 4"	(#13M @ 100)	#5 @ 5"	(#16M @ 125)
	A–6	#8 @ 4"	(#25M @ 100)	#8 @ 4"	(#25M @ 100)	#10 @ 5"	(#32M @ 125)
	A–7	#8 @ 13"	(#25M @ 330)	#8 @ 12"	(#25M @ 300)	#8 @ 10"	(#25M @ 250)
	A–8	#8 @ 7"	(#25M @ 175)	#9 @ 8"	(#29M @ 200)	#8 @ 6"	(#25M @ 150)
	B–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 10"	(#13M @ 250)
	B–2	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 10"	(#13M @ 250)
	B–3	#8 @ 14"	(#25M @ 360)	#8 @ 12"	(#25M @ 300)	#8 @ 11"	(#25M @ 275)
	C–1	#5 @ 15"	(#16M @ 380)	#5 @ 12"	(#16M @ 300)	#5 @ 12"	(#16M @ 300)
	C–2	#5 @ 15"	(#16M @ 380)	#5 @ 12"	(#16M @ 300)	#5 @ 12"	(#16M @ 300)
	D–1	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)	#4 @ 12"	(#13M @ 300)
	D–2	#8 @ 15"	(#25M @ 380)	#8 @ 15"	(#25M @ 380)	#9 @ 18"	(#29M @ 460)
	DESIGN LOAD, IMPACT	1100 PSF	(52.7 kPa)	1200 PSF	(57.5 kPa)	1300 PSF	(62.2 kPa)

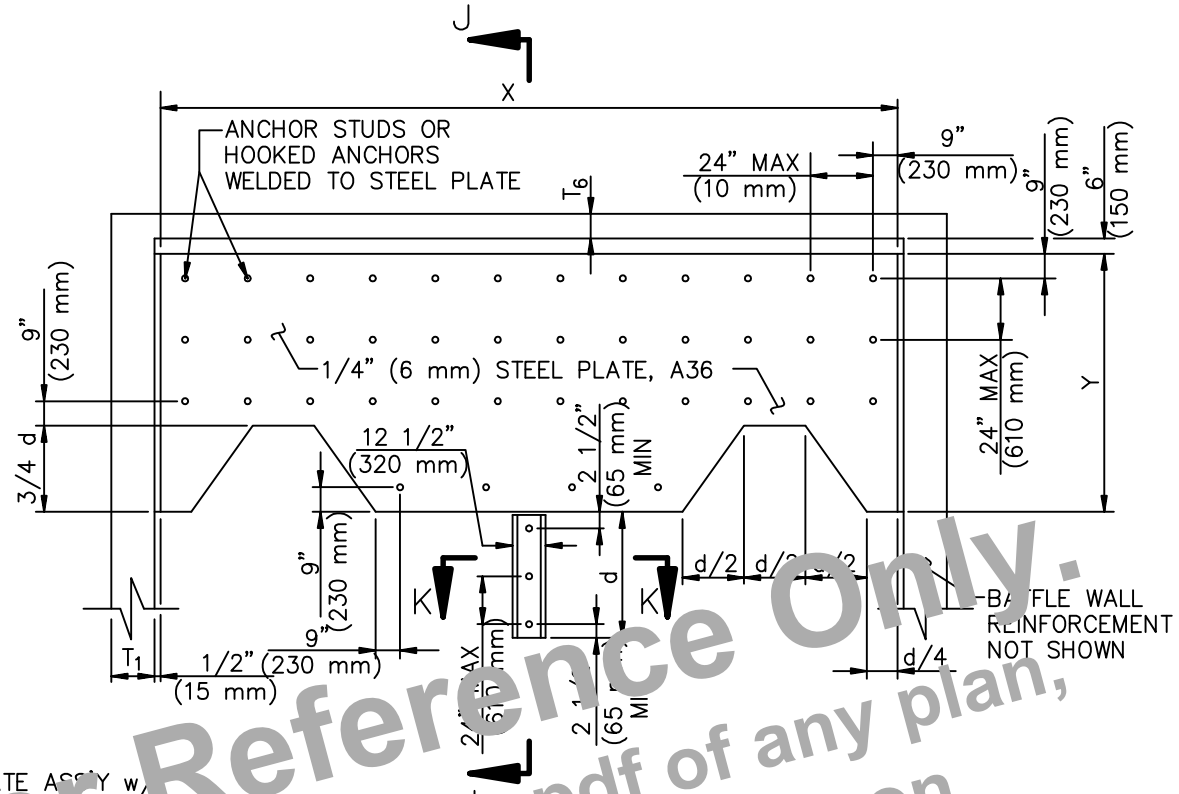
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL

STANDARD PLAN 384–3

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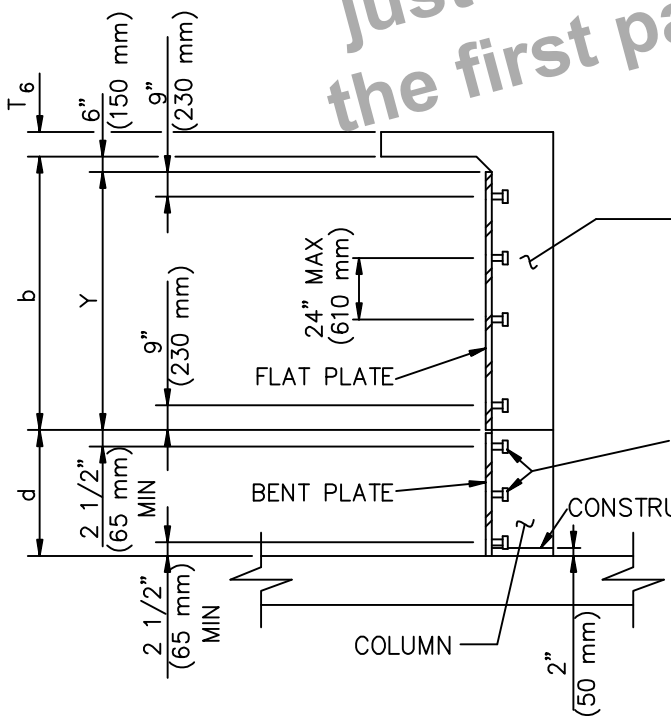


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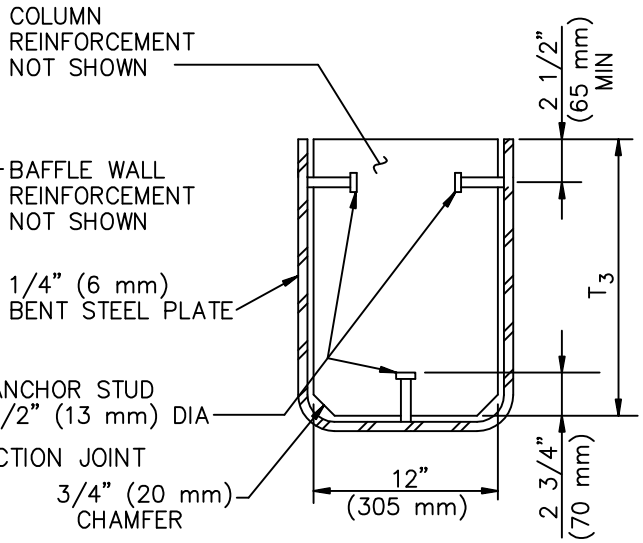
ARMOR PLATE ASSY w/ WELDED STUD ANCHORS SHALL BE EMBEDDED INTO WET CONCRETE.

ARMOR PLATE DETAIL (SHT 2)

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SECTION J–J



SECTION K–K

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL	**384–3**
	SHEET 9 OF 10

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ARMOR PLATE ANCHORS

WIDTH, (mm)	TOTAL BENT PLATE ANCHORS	FLAT PLATE ANCHORS							X, (mm)	Y, (mm)
		ROW 1	ROW 2	ROW 3	ROW 4	ROW 5	ROW 6	ROW 7		
4'–0" (1220)	6	3	3						3'–11" (1190)	1'–0" (310)
6'–0" (1830)	6	4	4						5'–11" (1800)	1'–9" (540)
8'–0" (2440)	6	7	5	2					7'–11" (2410)	2'–6" (760)
10'–0" (3050)	6	9	6	3					9'–11" (3020)	3'–3" (990)
12'–0" (3660)	6	12	7	2	3				11'–11" (3630)	4'–0" (1220)
14'–0" (4270)	6	14	8	2	4				13'–11" (4240)	4'–9" (1450)
16'–0" (4880)	9	15	9	2	4				15'–11" (4850)	5'–6" (1680)
18'–0" (5490)	9	18	10	2	2	4			17'–11" (5460)	6'–3" (1910)
20'–0" (6100)	9	20	11	2	2	5			19'–11" (6070)	7'–0" (2140)
22'–0" (6710)	9	23	12	2	2	2	5		21'–11" (6680)	7'–9" (2360)
24'–0" (7320)	9	25	13	2	2	2	6		23'–11" (7290)	8'–6" (2590)
26'–0" (7930)	9	28	14	2	2	2	6		25'–11" (7890)	9'–3" (2820)
28'–0" (8530)	12	29	15	2	2	2	2	6	27'–11" (8500)	10'–0" (3050)
30'–0" (9140)	12	31	16	2	2	2	2	7	29'–11" (9130)	10'–9" (3280)
32'–0" (9750)	12	32	17	2	2	2	2	7	31'–11" (9720)	11'–6" (3510)

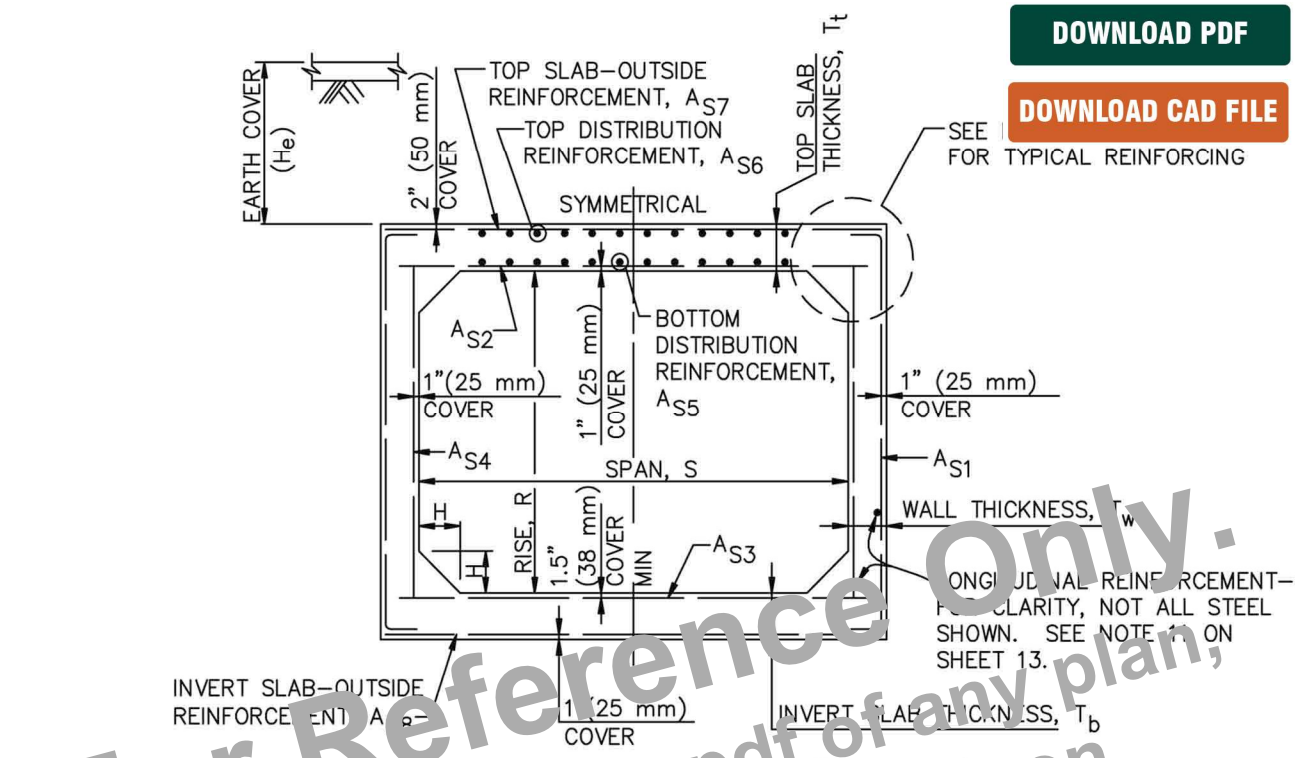
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NOTES:

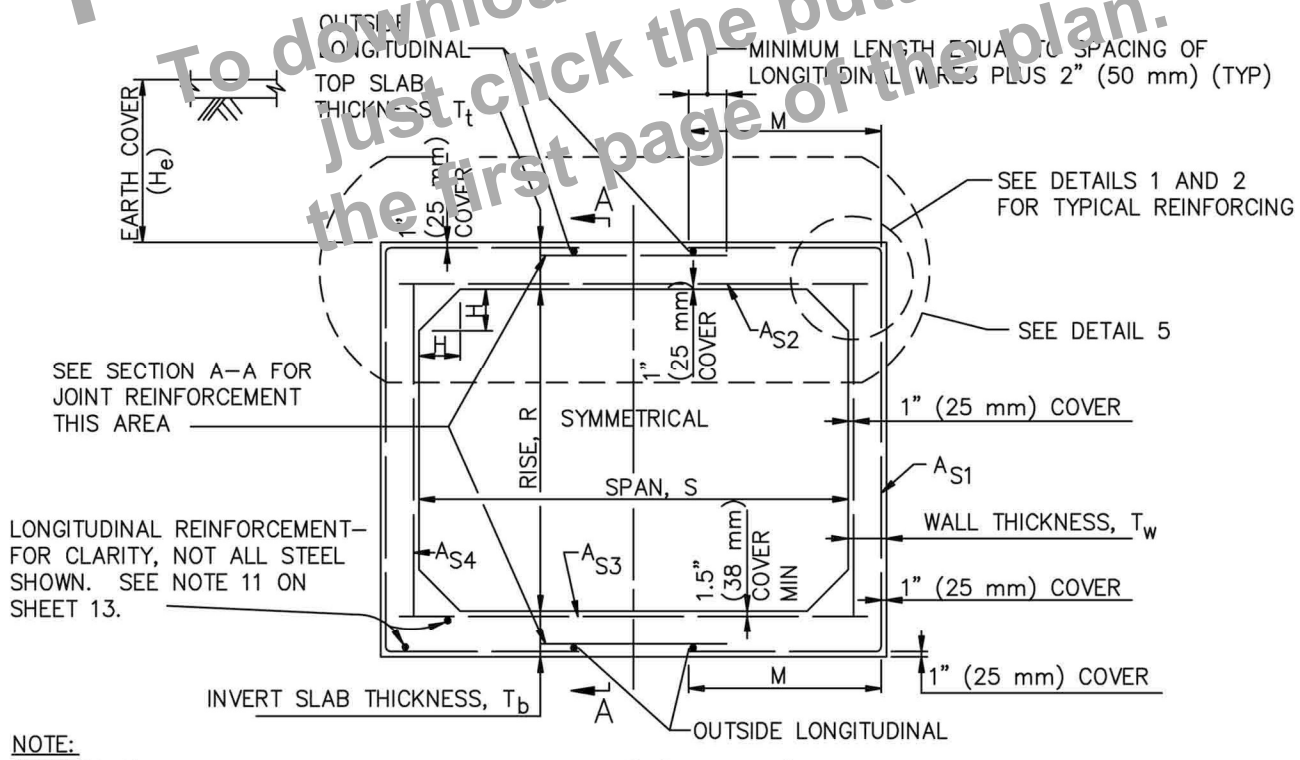
1. PCC COVER FOR RE–BAR SHALL BE 2" (50 mm), EXCEPT AS OTHERWISE NOTED. WHEN PCC WILL BE POURED AGAINST BARE EARTH, HOWEVER, INCREASE WALL THICKNESS SHOWN IN TABLES BY 1" (25 mm) AND INCREASE PCC COVER TO 3" (75 mm).
2. PCC COVER FOR RE–BAR WITHIN IMPACT CHAMBER SHALL BE 2–1/2" (65 mm).
3. TABULATED METRIC REINFORCING BAR SPACING IS IN MILLIMETERS.

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EARTH COVER LESS THAN 24"(600 mm)



NOTE:
HAUNCH, H = WALL THICKNESS

EARTH COVER 24" (610 mm) AND GREATER

TYPICAL BOX SECTIONS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

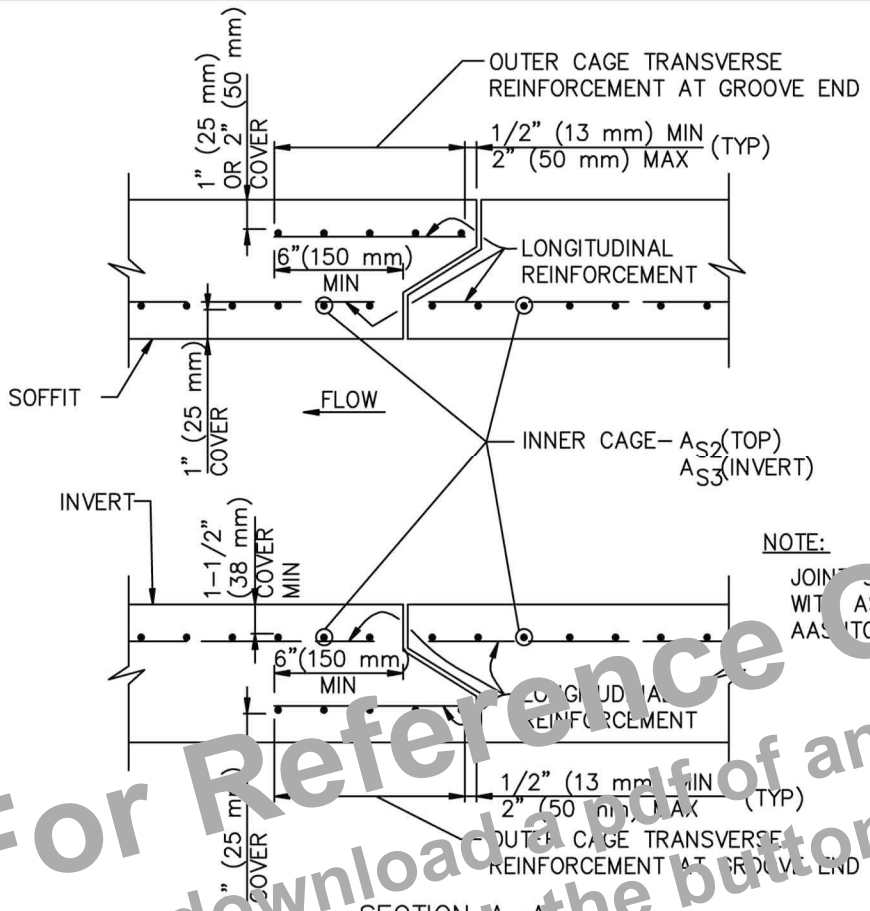
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 2008 REV. 2013

PRECAST REINFORCED CONCRETE BOX

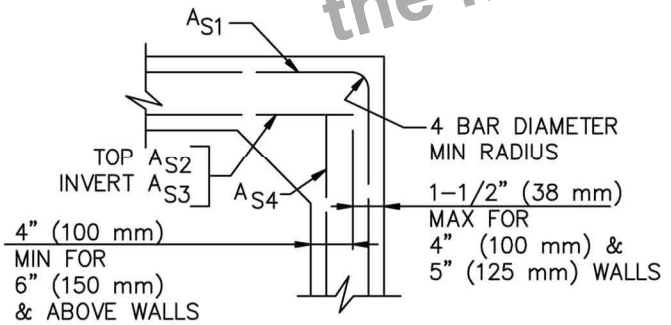
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 390–1

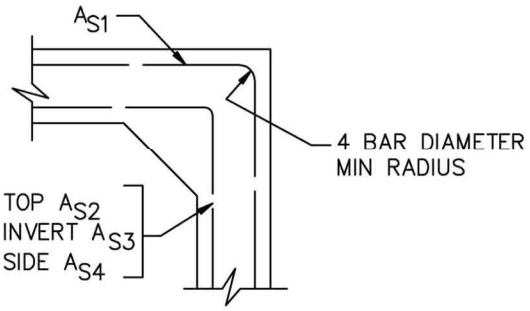
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SECTION A–A
TOP AND INVERT SLAB JOINT REINFORCEMENT



DETAIL 1
INNER REINFORCEMENT

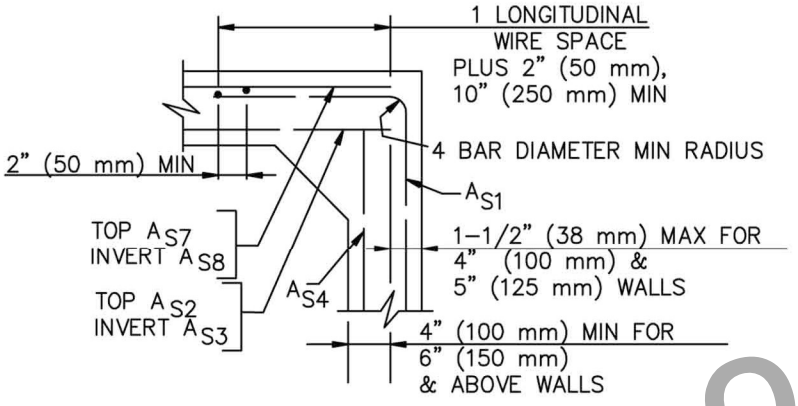


DETAIL 2
OPTION

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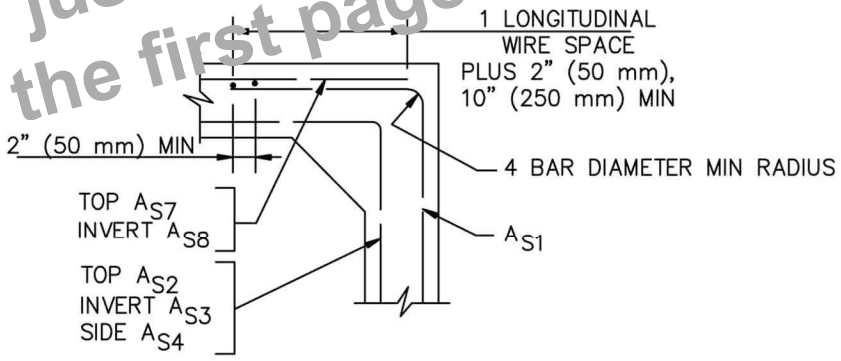
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE BOX	390–1
	SHEET 2 OF 42

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DETAIL 3
REINFORCEMENT ARRANGEMENT

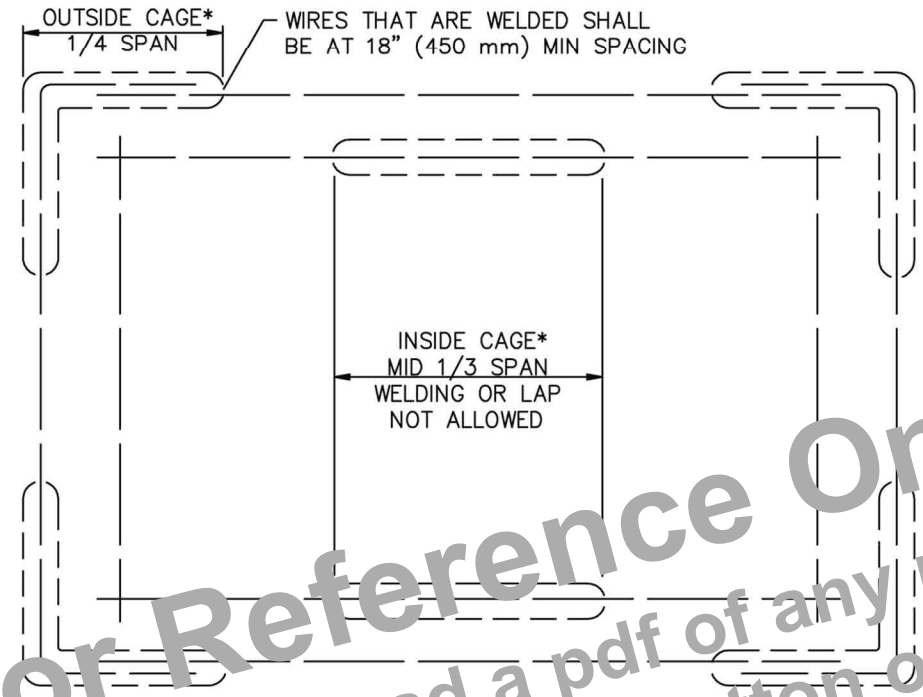
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DETAIL 4
OPTION

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE BOX	390–1
	SHEET 3 OF 42

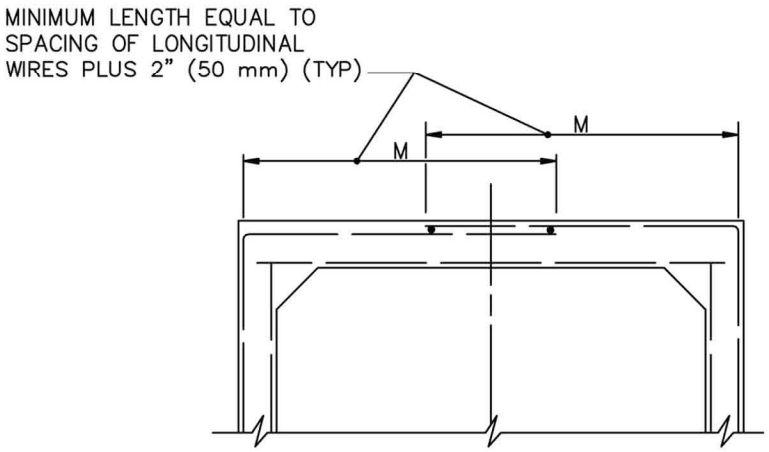
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CRITICAL ZONES OF HIGH STRESS
WHERE WELDING IS RESTRICTED

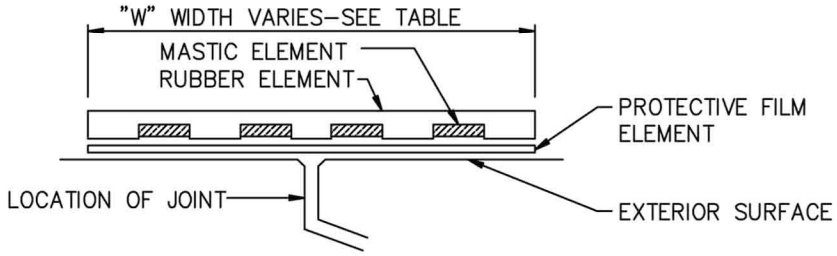
*INDICATES NO-SPLICE ZONES



DETAIL 5
OPTION

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE BOX	390–1
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EXTERNAL SEALING BAND SCHEMATIC

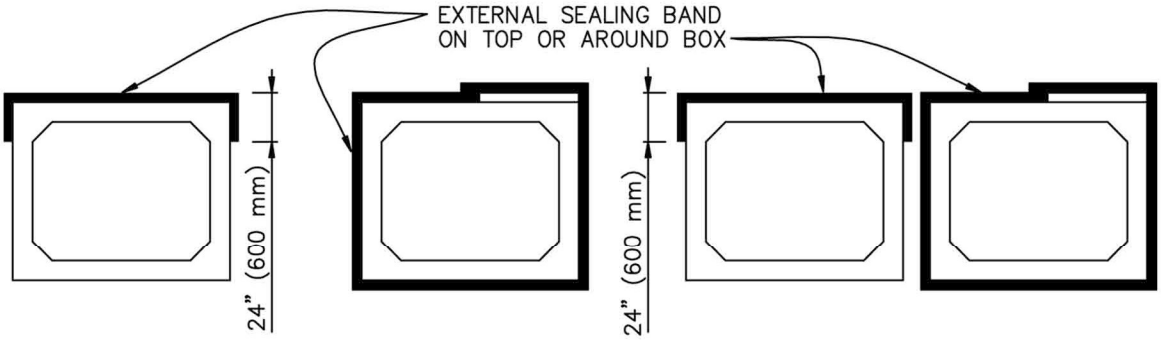
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TABLE

SPAN, "S" (mm)		"W" EXTERNAL SEALING BAND WIDTH INCHES	(mm)
4–6	1200–1800	9	225
7–8	2100–2400	11	275
10–12	3000–3600	14	350

NOTES:

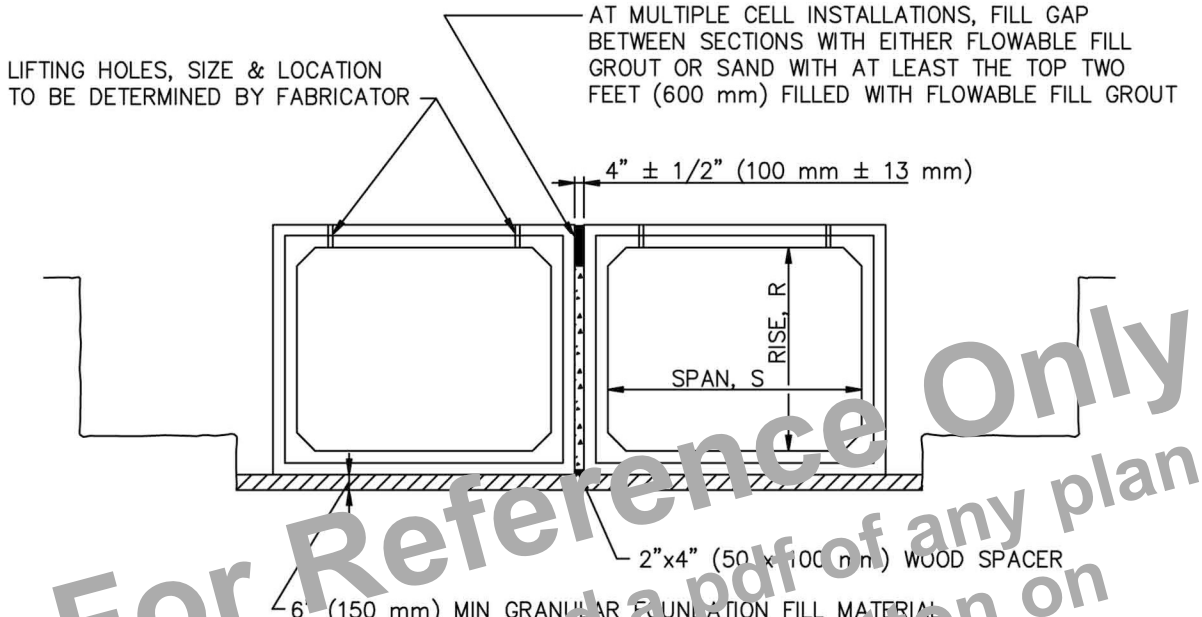
1. THE INSIDE SURFACE OF THE PRCB SOFFIT SHALL BE MARKED "TOP".
2. "W" MINIMUM SHALL EQUAL THE WALL THICKNESS. "W" MAXIMUM SHALL BE 8" (200 mm) FOR SPANS THROUGH 8' (2400 mm) AND 14" (350 mm) FOR SPANS OVER 8' (2500 mm).
3. FOR EXTERNAL SEALING BAND APPLICATIONS SEE BELOW.



SINGLE BOX MULTIPLE BOXES

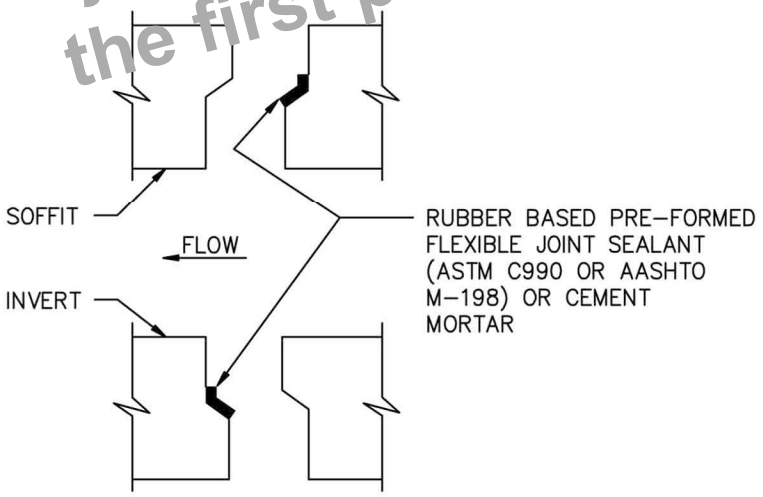
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 390–1
PRECAST REINFORCED CONCRETE BOX	SHEET 5 OF 42

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TYPICAL SECTION

SHOWS INSTALLATION OF MULTI-CELL LOCATIONS. SINGLE CELL INSTALLATION IS SIMILAR.



TYPICAL JOINT DETAIL

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE BOX	**390-1**
	SHEET 6 OF 42

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LEGEND

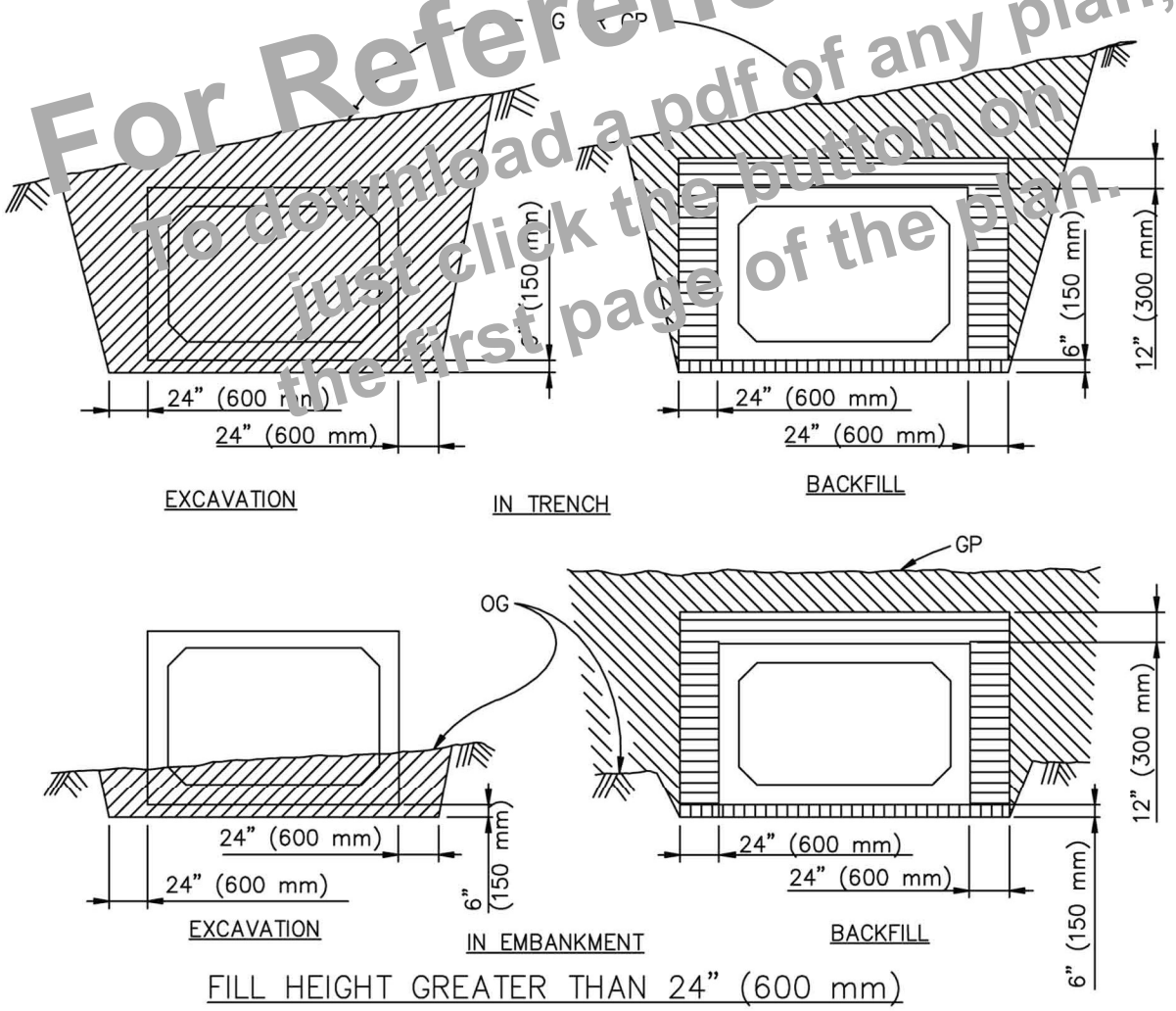
STRUCTURE EXCAVATION	LEVELING BED MATERIAL
STRUCTURE BACKFILL 95% RELATIVE COMPACTION	ROADWAY STRUCTURAL SECTION
ROADWAY EMBANKMENT	ORIGINAL GROUND
SLURRY CEMENT BACKFILL	FLOWABLE FILL GROUT (SEE TYPICAL SECTION ON SHEET 6)

TYPICAL NOTES:

1. SLOPE OR SHORE EXCAVATION SIDES AS DETERMINED BY THE ENGINEER
2. DIMENSIONS SHOWN ARE MINIMUM.
3. CONSTRUCTION OF ROADWAY STRUCTURAL SECTION SHALL NOT DISTURB THE SEALING BAND INSTALLATION.

OG = ORIGINAL GROUND GP = GROUND PROFILE

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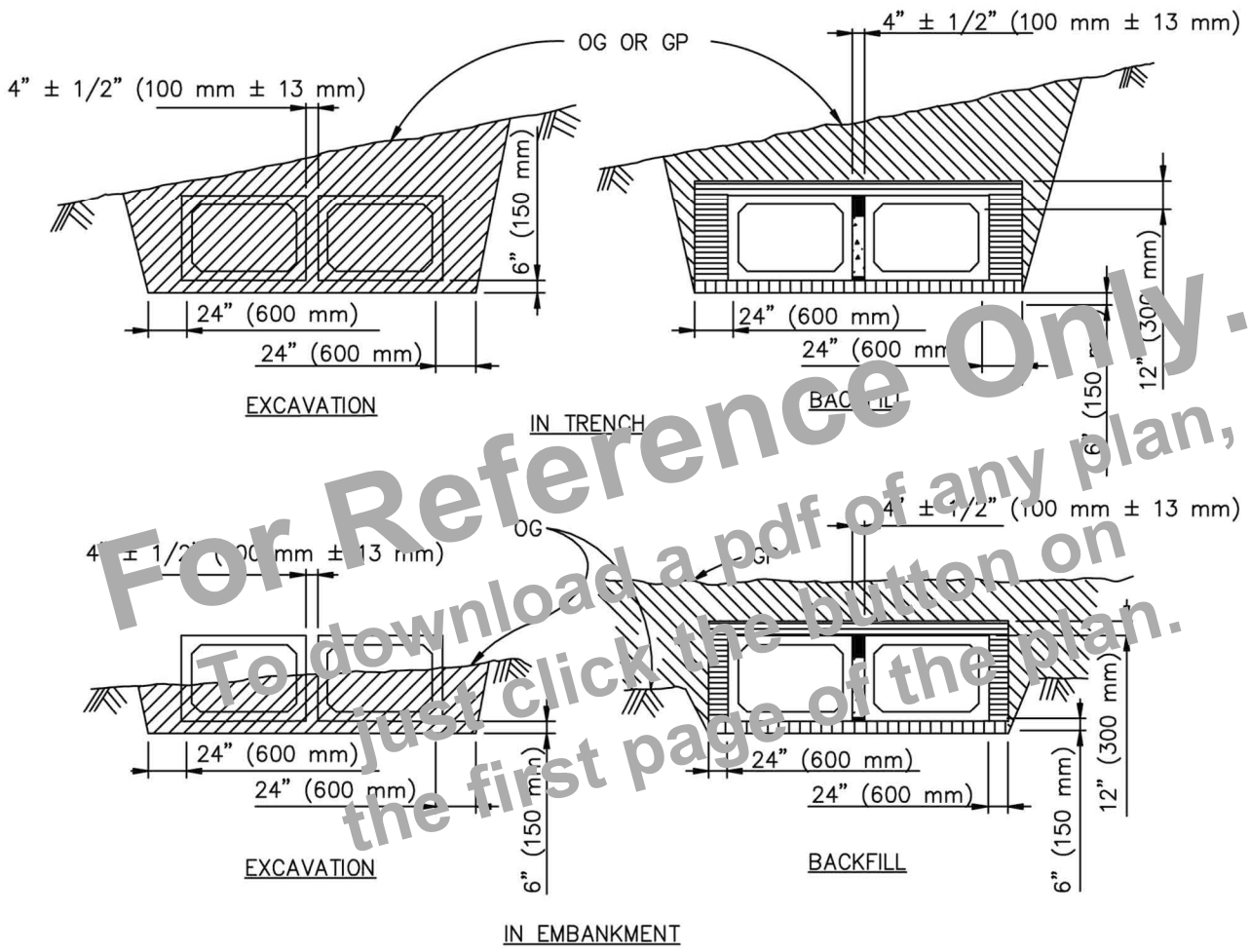


FILL HEIGHT GREATER THAN 24" (600 mm)

EXCAVATION AND BACKFILL DETAILS 1

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE BOX	**390–1**
	SHEET 7 OF 42

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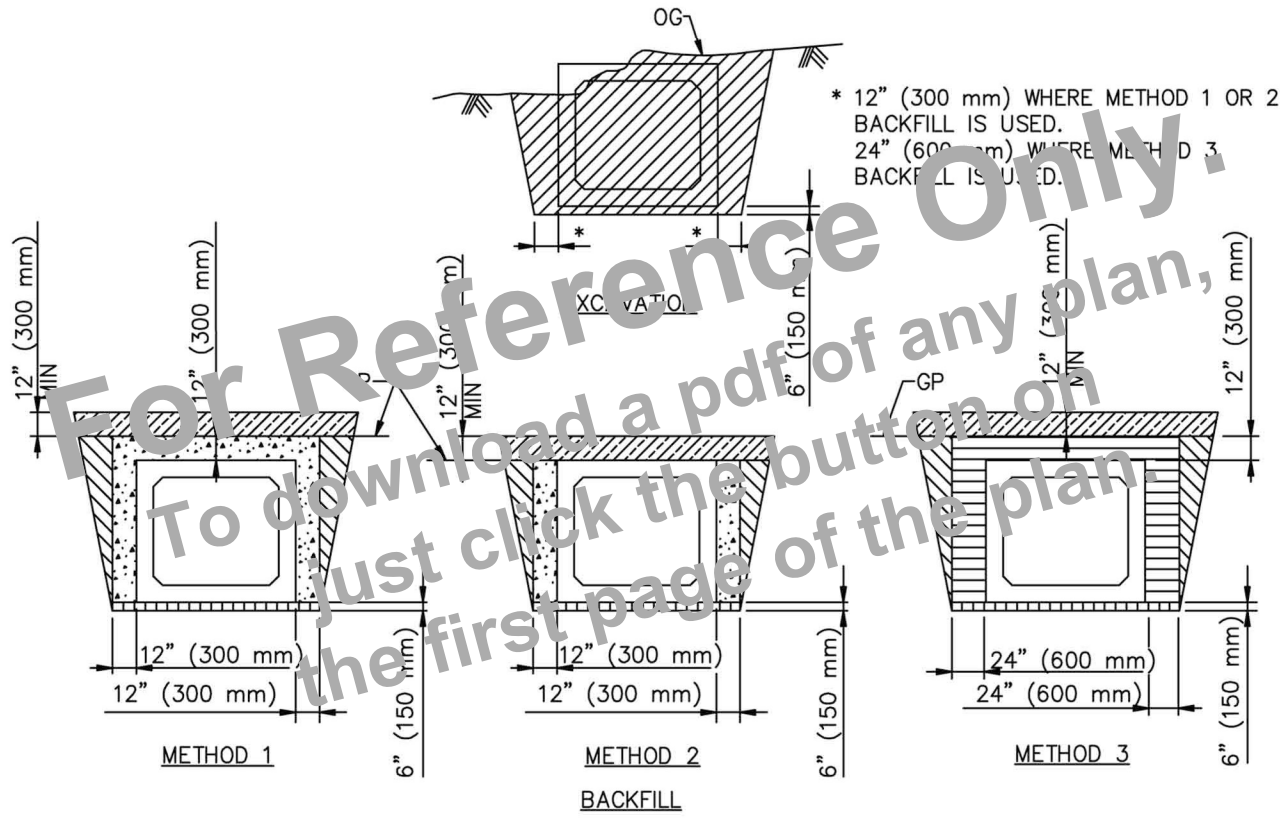
FILL HEIGHT GREATER THAN 24" (600 mm)

EXCAVATION AND BACKFILL DETAILS 2

NOTE: SEE LEGEND AND TYPICAL NOTES ON SHEET 7

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE BOX	390–1
	SHEET 8 OF 42

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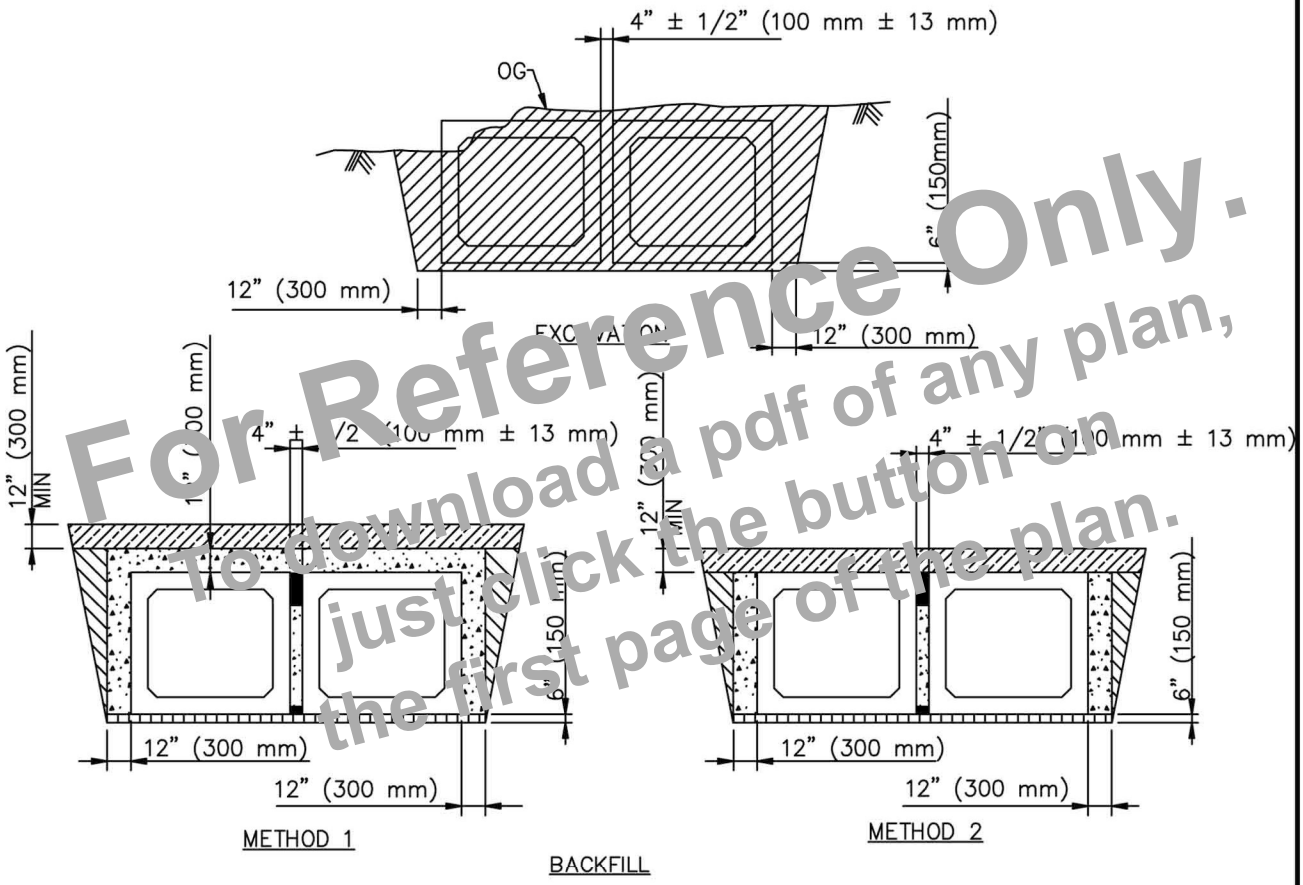
FILL HEIGHT 24"(600 mm) OR LESS
EXCAVATION AND BACKFILL DETAILS 3

NOTE: SEE LEGEND AND TYPICAL NOTES ON SHEET 7

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE BOX	390–1
	SHEET 9 OF 42

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FILL HEIGHT 24" (600 mm) OR LESS

EXCAVATION AND BACKFILL DETAILS 4

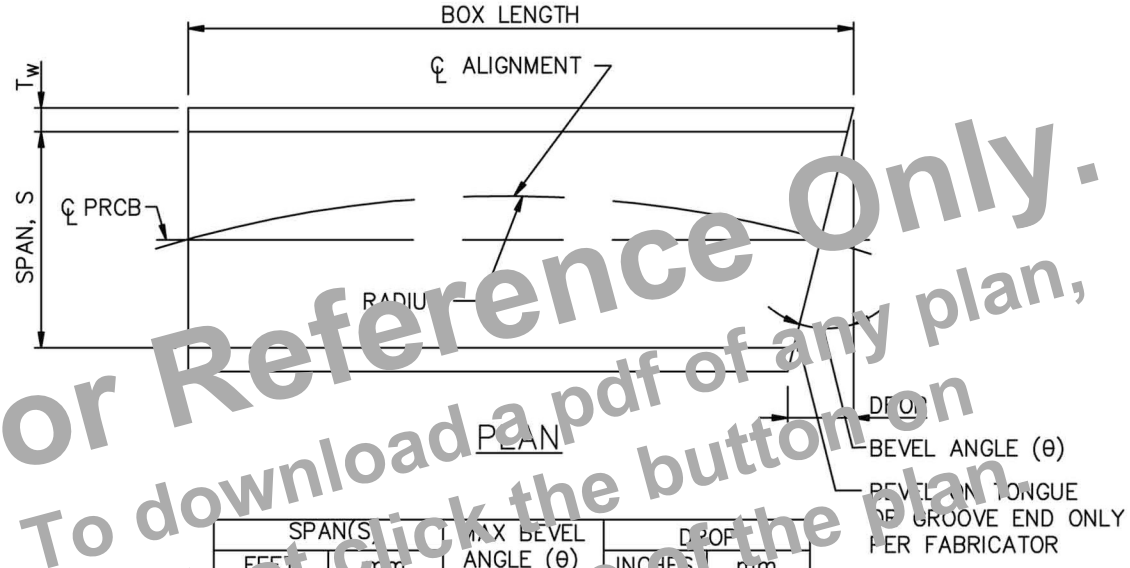
NOTE: SEE LEGEND AND TYPICAL NOTES ON SHEET 7

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 390–1
PRECAST REINFORCED CONCRETE BOX	SHEET 10 OF 42

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PLAN

SPAN(S)		MAX BEVEL ANGLE (θ)	DROP	
FEET	mm		INCHES	mm
3	900	5	3.85	97
4	1200	5	5.07	125
5	1500	5	6.30	158
6	1800	5	7.52	188
7	2100	3	5.20	130
8	2400	3	5.87	147
9	2700	3	6.60	165
10	3000	3	7.33	183
11	3300	3	8.07	200
12	3600	3	8.80	220

SPAN(S)		BOX LENGTH		MIN RADIUS	
FEET	mm	FEET	mm	FEET	m
3 THROUGH 6	900 THROUGH 1800	4	1200	45	14
		6	1800	67.5	20.6
		8	2400	90	27
7 THROUGH 12	2100 THROUGH 3600	4	1200	75	23
		6	1800	112.5	34.3
		8	2400	150	46

PRECAST REINFORCED CONCRETE BOX BEVELS

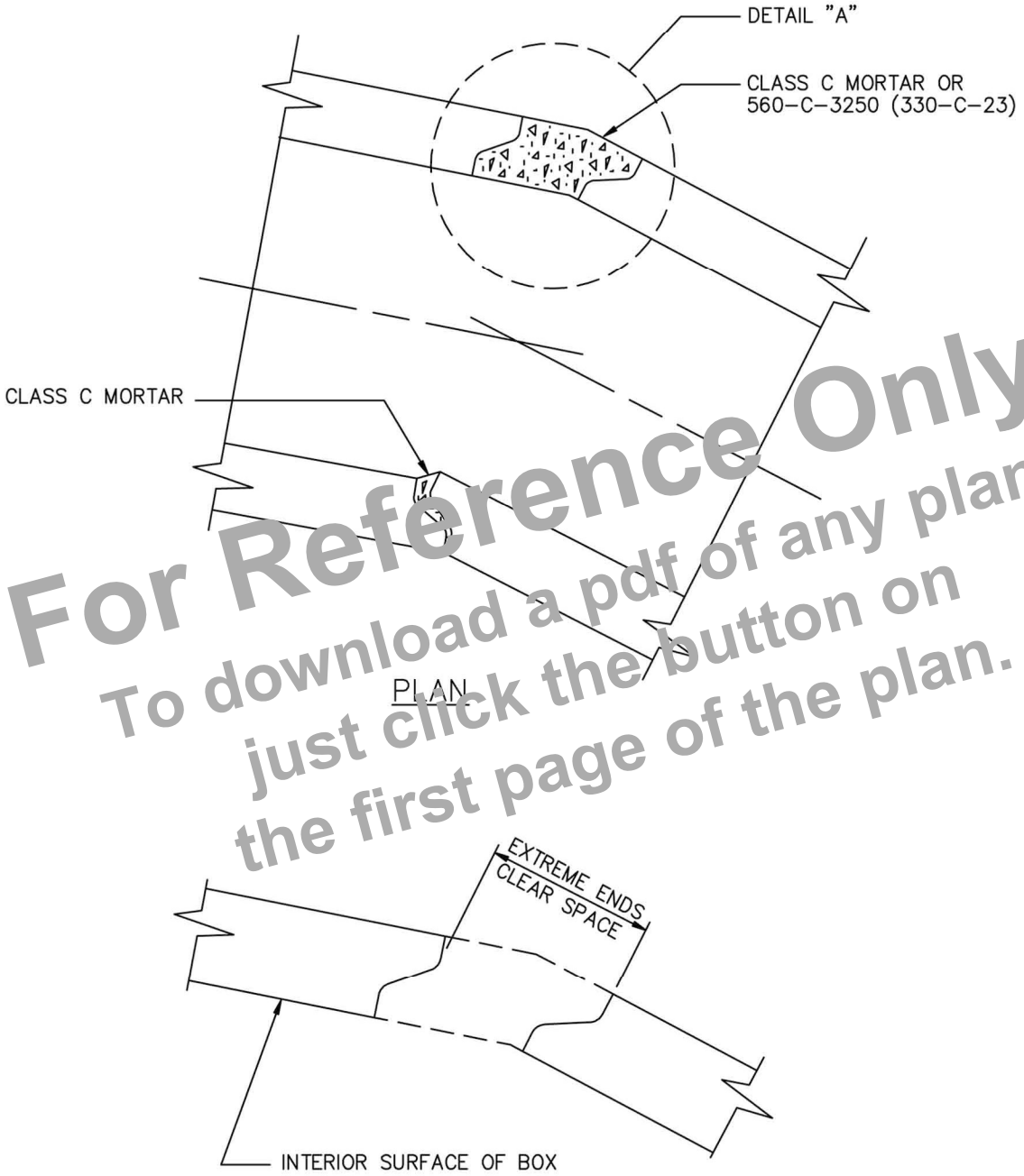
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PRECAST REINFORCED CONCRETE BOX

STANDARD PLAN 390–1

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PLAN

DETAIL "A"

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PRECAST REINFORCED CONCRETE BOX PULLED

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PRECAST REINFORCED CONCRETE BOX	390-1
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NOTES:

1. STEEL COVER SHALL BE FROM THE FACE OF THE BAR OR WIRE TO THE FACE OF THE CONCRETE.
2. STEEL COVER FROM THE TOP OF INVERT SLAB SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

VELOCITY		STEEL COVER		MINIMUM 28-DAY CONCRETE STRENGTH	
FPS	(m/s)	INCHES	(mm)		
< 5	(< 1.5)	1.5	(38)	5,000 PSI	(35 MPa)
5 TO 20	(1.5 TO 6)	2.0	(50)	5,000 PSI	(35 MPa)
> 20 TO 40	(> 6 TO 12)	2.5	(63)	5,000 PSI	(35 MPa)
> 40	(> 12)	NOT ALLOWED		NOT ALLOWED	

FPS: FEET PER SECOND
m/s: METERS PER SECOND

3. STEEL COVER FROM THE TOP OF INVERT SLAB MAY BE INCREASED FOR PRCB SUBJECT TO THE ACTION OF SEAWATER, HARMFUL GROUNDWATER, OR APPRECIABLE DEBRIS FLOWS.
4. STEEL COVER GREATER THAN 2.5 INCHES (63 mm) MAY RESULT IN DELAMINATION OF CONCRETE. SEE THE PLANS FOR SACRIFICIAL STEEL TO PREVENT SLABBING WHEN THE STEEL COVER EXCEEDS 2.5 INCHES (63 mm).
5. PRCB SHALL NOT BE PERMITTED WHEN THE MAXIMUM GROUND WATER TABLE IS LOCATED 1 FEET (300 mm) BELOW THE BOTTOM OF INVERT OR HIGHER, OR THE HYDRAULIC GRADE LINE IS MORE THAN 4 FEET (1200 mm) ABOVE THE SOFFIT.
6. PRCB WITH RISE LARGER THAN 12 FEET (3600 mm) AND SPAN GREATER THAN 12 FEET (3600 mm) SPAN TO 24 FEET (7200 mm), MUST HAVE A SPECIAL DESIGN SUBMITTED FOR REVIEW AND ARE SUBJECT TO APPROVAL BY THE ENGINEER.
7. THE DESIGN TABLES IN THIS STANDARD PLAN DO NOT ACCOUNT FOR TEMPERATURE VARIATIONS, UNBALANCED LATERAL LOADS, RAILROAD LOADING OR LOADING DUE TO OTHER TEMPORARY OR PERMANENT STRUCTURES. SPECIAL DESIGN FOR THESE LOADS, IF APPLICABLE, MUST BE SUBMITTED FOR REVIEW AND ARE SUBJECT TO APPROVAL BY THE ENGINEER.
8. DESIGN CRITERIA: AASHTO SPECIFICATIONS FOR HIGHWAY BRIDGES, CURRENT LFD EDITION, EXCEPT THE LOAD FACTOR FOR DEAD LOAD (β_D) AND EARTH PRESSURE (β_E) = 1.4
9. THE JOINTS OF THE SECTIONS SHALL BE OF SUCH DESIGN THAT THEY WILL WITHSTAND THE FORCES CAUSED BY THE COMPRESSION OF THE SEALANT WHEN JOINED, WITHOUT CRACKING OR FRACTURING WHEN TESTED.
10. IF STEEL BARS GRADE 60 (GRADE 420) ARE USED IN LIEU OF WELDED WIRE REINFORCEMENT, THE STEEL AREAS PRESENTED SHALL BE INCREASED TO ACCOUNT FOR THE DIFFERENCES IN STEEL YIELD STRENGTH, STEEL SPACING, CONCRETE COVER, AND CRACK CONTROL.
11. WHEN USING WELDED WIRE REINFORCEMENT, THE INDIVIDUAL LONGITUDINAL WIRE SHALL HAVE AN AREA OF AT LEAST 40 PERCENT OF THE INDIVIDUAL TRANSVERSE WIRE AND 8" (200 mm) MAXIMUM SPACING.
12. THE INSIDE TRANSVERSE REINFORCEMENT SHALL EXTEND INTO THE TONGUE PORTION OF THE JOINT AND THE OUTSIDE TRANSVERSE REINFORCEMENT SHALL EXTEND INTO THE GROOVE PORTION OF THE JOINT.
13. THE CLEAR DISTANCE OF THE END TRANVERSE WIRES SHALL BE NOT LESS THAN 1/2 INCH (12 mm) NOR MORE THAN 2 INCHES (50 mm) FROM THE ENDS OF THE PRCB SECTION.
14. REINFORCEMENT MAY BE ASSEMBLED USING ANY COMBINATION OF SINGLE OR MULTIPLE LAYERS OF WELDED-WIRE REINFORCEMENT.
15. A COMMON RENFORCEMENT UNIT MAY BE USED FOR BOTH A_{S2} (OR A_{S3}) AND A_{S4}, AND ALSO FOR BOTH A_{S7} (OR A_{S8}) AND A_{S1}, WITH THE LARGEST AREA REQUIRMENT GOVERNING, BENDING THE REINFORCEMENT 90 DEGREES AT THE CORNERS AND WAIVING THE EXTENSION REQUIREMENTS SHOWN IN DETAILS 1 THROUGH 4.
16. WHEN A SINGLE CAGE OF MULTIPLE TRANSVERSE STEEL IS USED FOR A_{S2} (OR A_{S3}) AND A_{S4} REINFORCEMENT, THE SLAB OR WALL REQUIRING THE LARGER STEEL AREA SHALL HAVE THIS ADDITIONAL TRANSVERSE STEEL EXTENDNG THE FULL LENGTH OF THE SLAB OR WALL.

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17. WELDED WIRE REINFORCEMENT SHALL BE COMPOSED OF TRANSVERSE AND LONGITUDINAL WIRES WITH SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE PRCB SECTION TO MAINTAIN THE SHAPE AND POSITION OF REINFORCEMENT.

18. THE ENDS OF THE LONGITUDINAL DISTRIBUTION REINFORCEMENT SHALL NOT BE MORE THAN 2 INCHES (50 mm) FROM THE ENDS OF THE PRCB SECTION.

19. THE ENDS OF THE LONGITUDINALS, STIRRUPS, AND SPACERS USED TO POSITION THE REINFORCEMENT MAY BE EXPOSED TO CONTACT WITH FORMS.

20. THE OVERLAP MEASURED BETWEEN THE OUTERMOST LONGITUINDAL WIRES OF EACH WELDED WIRE REINFORCEMENT SHEET SHALL NOT BE LESS THAN THE SPACING OF THE LONGITUDINAL WIRES PLUS 2 INCHES (50 mm) NOR LESS THAN 10 INCHES (250 mm).

21. IF A_{S1} IS EXTENDED TO THE MIDDLE OF EITHER SLAB AND CONNECTED, WELDED SPLICES ARE ALLOWED IN THE CONNECTION.

22. WHEN USED, A_{S7} AND A_{S8} SHALL BE LAPPED WITH A_{S1} AS SHOWN ON DETAILS 3 AND 4.

23. SPLICES IN THE TRANSVERSE REINFORCEMENT SHALL BE MADE BY LAPPING. IF WELDS ARE MADE TO TRANSVERSE REINFORCEMENT, THEY SHALL BE MADE ONLY TO SELECTED TRANSVERSE WIRES THAT ARE NOT LESS THAN 18 INCHES (460 mm) APART ALONG THE LONGITUDINAL AXIS OF THE PRCB SECTION. ALSO, WHEN SPACERS ARE WELDED TO TRANSVERSE WIRES, THEY SHALL BE WELDED ONLY TO THE SELECTED TRANSVERSE WIRES.

24. THERE SHALL BE NO WELDING TO OTHER TRANSVERSE WIRES EXCEPT A_{S4} MAY BE LAPPED AND WELDED AT ANY LOCATION OR CONNECTED BY WELDING AT THE CORNERS TO A_{S2} AND A_{S3}.

25. NO WELDS OR LAPS SHALL BE MADE TO A_{S2} OR A_{S3} TRANSVERSE WIRES IN THE MIDDLE THIRD OF THE SPAN.

26. WHEN DISTRIBUTION REINFORCEMENT IS TO BE FASTENED TO A CAGE BY WELDING, IT SHALL BE WELDED ONLY TO LONGITUDINAL WIRES AND ONLY NEAR THE ENDS OF THE PRCB SECTION.

27. THE SPACING CENTER TO CENTER OF THE TRANSVERSE WIRES SHALL BE NOT LESS THAN 2 INCHES (50 mm) NOR MORE THAN 4 INCHES (100 mm).

28. THE SPACING CENTER TO CENTER OF THE LONGITUDINAL WIRES SHALL BE NOT MORE THAN 8 INCHES (200 mm).

29. OUTER CAGE TRANSVERSE REINFORCEMENT AS SHOWN SHALL BE PLACED IN THE TOP AND BOTTOM SLABS AT THE GROOVE PORTION OF THE JOINT WHEN A_{S1} IS NOT CONTINUOUS OVER THE SPAN.

30. IF STEEL BARS (GRADE 60) ARE USED IN LIEU OF WELDED WIRE REINFORCEMENT, THE STEEL AREAS SHALL BE INCREASED TO ACCOUNT FOR THE DIFFERENCE IN STEEL YIELD STRENGTH, STEEL SPACING, CONCRETE COVER, AND CRACK CONTROL BETWEEN THE WELDED WIRE REINFORCEMENT AND STEEL BARS.

31. IN LIEU OF PERFORMING A SPECIAL DESIGN FOR THE SPECIFIC CASE WHERE THE ACTUAL HAUNCH DIMENSIONS ARE LARGER THAN THE STANDARD DIMENSIONS AND VERTICAL AND HORIZONTAL HAUNCH DIMENSIONS ARE EQUAL, THE A_{S1} STEEL AREA SHALL BE INCREASED 1 PERCENT FOR EVERY 5 PERCENT INCREASE IN THE HAUNCH DIMENSION OVER THAT SPECIFIED, AND A_{S2} AND A_{S3} SHALL BE REDUCED BY AN EQUAL PERCENTAGE.

NOTE:

SHEETS 16 TO 24 HAVE 1.5 INCHES (38 mm) OF STEEL COVER AT THE TOP OF INVERT SLAB.
SHEETS 25 TO 33 HAVE 2.0 INCHES (50 mm) OF STEEL COVER AT THE TOP OF INVERT SLAB.
SHEETS 34 TO 42 HAVE 2.5 INCHES (63 mm) OF STEEL COVER AT THE TOP OF INVERT SLAB.

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SPECIFIC CRITERIA USED FOR TABLES

MATERIAL PROPERTIES:	
WELDED WIRE REINFORCEMENT, MINIMUM SPECIFIED YIELD STRESS	65,000 PSI (450 MPa)
DEFORMED BARS, MINIMUM SPECIFIED YIELD STRESS	60,000 PSI (420 MPa)
CONCRETE, MINIMUM SPECIFIED COMPRESSIVE STRENGTH	5,000 PSI (35 MPa)
SOIL DATA:	
UNIT WEIGHT	120 lbf/ft^3 (20 kN/m^3)
RATIO OF LATERAL TO VERTICAL PRESSURE FROM WEIGHT TO EARTH	0.50 MAX TO 0.25 MIN
ADDITIONAL LATERAL PRESSURE FROM APPROACHING TRUCK WHEELS	$700/H_e$, lbf/ft^2 ($10/H_e$, kN/m^2) OR 800 lbf/ft^2 (39 kN/m^2) WHEN H_e < 1 FEET (300 mm), WHERE H_e = EARTH COVER, FEET (mm)
EXTERNAL WATER TABLE	BELOW BOX SECTION INVERT
SOIL STRUCTURE INTERACTION FACTOR	1.15
CAPACITY REDUCTION FACTORS (FROM AASHTO BRIDGE SPECIFICATIONS):	
SHEAR	.90
AXIAL COMPRESSION COMBINED WITH BENDING	0.95
LOADING DATA:	
LOAD FACTOR = $\delta(\beta_D \quad \beta_L)$	δ = 1.0 β_D = 1.40 FOR DEAD LOADS β_L = 1.67 FOR LIVE LOADS
TRUCK AXLE LOAD:	
HS20 (MS18)	32,000 lbf (142 kN)
IMPACT (VARIABLE WITH DEPTH) (FROM AASHTO BRIDGE SPECIFICATIONS):	0 TO 30%
UNIFORM INTERNAL PRESSURE	0.0
DEPTH OF WATER IN BOX SECTION	EQUAL TO INSIDE HEIGHT
EXTERNAL GROUND WATER PRESSURE	0.0
STRUCTURAL ARRANGEMENT:	
CONCRETE COVER OVER STEEL	1.0 INCH (25 mm)
TOP SLAB	1.0 INCH (25 mm) FOR FILL HEIGHT 2 FEET (600 mm) AND GREATER, 2.0 INCHES (50 mm) FOR FILL HEIGHTS UNDER 2 FEET (600 mm)
SLAB THICKNESS	FOR FILL HEIGHTS GREATER THAN 2 FEET (600 mm), 1/12 TIMES INSIDE SPAN PLUS 1.0 INCH (25 mm) UP TO 7–FOOT (2100 mm) SPAN, 1/12 INSIDE SPAN ABOVE 7–FOOT (2100 mm) SPAN
SIDE WALL THICKNESS	1/12 TIMES INSIDE SPAN PLUS 1.0 INCH (25 mm) UP TO 7–FOOT (2100 mm) SPAN, 1/12 INSIDE SPAN ABOVE 7–FOOT SPAN (2100 mm)
MINIMUM HAUNCH DIMENSIONS	VERTICAL AND HORIZONTAL DIMENSIONS BOTH EQUAL TO WALL THICKNESS
TRANSVERSE WIRE SPACING	4.0 INCHES (100 mm) MAX
MINIMUM REINFORCING INSIDE FACE SLABS AND SIDE WALLS, OUTSIDE FACE SIDE WALLS AND CORNERS OF SLABS	0.002 x GROSS AREA

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SPAN, S	RISE, R	T_t TOP	T_b BOTTOM	T_w SIDE	H HAUNCH	TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)							
FEET (mm)	FEET (mm)	INCHES (mm)	INCHES (mm)	INCHES (mm)	INCHES (mm)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}
3 (900)	2 (600)	7 (175)	6 (150)	4 (100)	4 (100)	0.17 (360)	0.38 (804)	0.23 (487)	0.10 (212)	0.22 (466)	0.17 (360)	0.17 (360)	0.14 (296)
3 (900)	3 (900)	7 (175)	6 (150)	4 (100)	4 (100)	0.17 (360)	0.40 (847)	0.25 (529)	0.10 (212)	0.23 (487)	0.17 (360)	0.17 (360)	0.14 (296)
4 (1200)	2 (600)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.40 (847)	0.22 (466)	0.12 (254)	0.21 (445)	0.18 (381)	0.18 (381)	0.14 (296)
4 (1200)	3 (900)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.45 (953)	0.26 (550)	0.12 (254)	0.23 (487)	0.18 (381)	0.18 (381)	0.14 (296)
4 (1200)	4 (1200)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.47 (995)	0.28 (593)	0.12 (254)	0.25 (529)	0.18 (381)	0.18 (381)	0.14 (296)
5 (1500)	3 (900)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.44 (931)	0.24 (508)	0.14 (296)	0.22 (466)	0.19 (402)	0.19 (402)	0.17 (360)
5 (1500)	4 (1200)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.48 (1016)	0.27 (572)	0.14 (296)	0.24 (508)	0.19 (402)	0.19 (402)	0.17 (360)
5 (1500)	5 (1500)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.50 (1059)	0.29 (614)	0.14 (296)	0.25 (529)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	3 (900)	8 (200)	7 (175)	7 (175)	7 (175)	0.23 (487)	0.45 (953)	0.26 (550)	0.17 (360)	0.22 (466)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	4 (1200)	8 (200)	7 (175)	7 (175)	7 (175)	0.19 (402)	0.49 (1037)	0.29 (614)	0.17 (360)	0.23 (487)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	5 (1500)	8 (200)	7 (175)	7 (175)	7 (175)	0.19 (402)	0.52 (1101)	0.29 (614)	0.17 (360)	0.25 (529)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	6 (1800)	8 (200)	7 (175)	7 (175)	7 (175)	0.19 (402)	0.54 (1143)	0.30 (635)	0.17 (360)	0.26 (550)	0.19 (402)	0.19 (402)	0.17 (360)
7 (2100)	4 (1200)	8 (200)	8 (200)	8 (200)	8 (200)	0.26 (550)	0.49 (1037)	0.25 (529)	0.19 (402)	0.23 (487)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	5 (1500)	8 (200)	8 (200)	8 (200)	8 (200)	0.23 (487)	0.52 (1101)	0.31 (656)	0.19 (402)	0.24 (508)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	6 (1800)	8 (200)	8 (200)	8 (200)	8 (200)	0.21 (445)	0.54 (1143)	0.33 (698)	0.19 (402)	0.26 (550)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	7 (2100)	8 (200)	8 (200)	8 (200)	8 (200)	0.19 (402)	0.56 (1186)	0.36 (762)	0.19 (402)	0.27 (572)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	4 (1200)	8 (200)	8 (200)	8 (200)	8 (200)	0.31 (656)	0.53 (1122)	0.32 (677)	0.19 (402)	0.25 (529)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	5 (1500)	8 (200)	8 (200)	8 (200)	8 (200)	0.28 (593)	0.57 (1207)	0.35 (741)	0.19 (402)	0.26 (550)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	6 (1800)	8 (200)	8 (200)	8 (200)	8 (200)	0.26 (550)	0.59 (1249)	0.37 (783)	0.22 (466)	0.28 (593)	0.22 (466)	0.19 (402)	0.19 (402)
8 (2400)	7 (2100)	8 (200)	8 (200)	8 (200)	8 (200)	0.24 (508)	0.62 (1313)	0.40 (847)	0.24 (508)	0.29 (614)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	8 (2400)	8 (200)	8 (200)	8 (200)	8 (200)	0.22 (466)	0.64 (1355)	0.42 (889)	0.24 (508)	0.30 (635)	0.19 (402)	0.19 (402)	0.19 (402)
9 (2700)	5 (1500)	9 (225)	9 (225)	9 (225)	9 (225)	0.29 (614)	0.53 (1122)	0.33 (698)	0.22 (466)	0.25 (529)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	6 (1800)	9 (225)	9 (225)	9 (225)	9 (225)	0.27 (572)	0.56 (1186)	0.35 (741)	0.22 (466)	0.26 (550)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	7 (2100)	9 (225)	9 (225)	9 (225)	9 (225)	0.25 (529)	0.58 (1228)	0.38 (804)	0.22 (466)	0.27 (572)	0.22 (466)	0.22 (466)	0.22 (466)

SHALLOW COVER BOXES – COVER 0' TO 2' (0 TO 600 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PRECAST REINFORCED CONCRETE BOX

STANDARD PLAN
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SPAN, S	RISE, R	T_t	T_b	T_w	H	TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)							
FEET (mm)	FEET (mm)	TOP INCHES (mm)	BOTTOM INCHES (mm)	SIDE INCHES (mm)	HAUNCH INCHES (mm)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}
9 (2700)	8 (2400)	9 (225)	9 (225)	9 (225)	9 (225)	0.23 (487)	0.60 (1270)	0.41 (868)	0.22 (466)	0.28 (593)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	9 (2700)	9 (225)	9 (225)	9 (225)	9 (225)	0.24 (508)	0.62 (1312)	0.44 (931)	0.27 (572)	0.28 (593)	0.22 (466)	0.22 (466)	0.22 (466)
10 (3000)	5 (1500)	10 (250)	10 (250)	10 (250)	10 (250)	0.29 (614)	0.51 (1080)	0.34 (720)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	6 (1800)	10 (250)	10 (250)	10 (250)	10 (250)	0.27 (572)	0.53 (1122)	0.37 (783)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	7 (2100)	10 (250)	10 (250)	10 (250)	10 (250)	0.25 (529)	0.55 (1164)	0.40 (847)	0.24 (508)	0.25 (529)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	8 (2400)	10 (250)	10 (250)	10 (250)	10 (250)	0.24 (508)	0.57 (1207)	0.43 (910)	0.24 (508)	0.26 (550)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	9 (2700)	10 (250)	10 (250)	10 (250)	10 (250)	0.24 (508)	0.59 (1249)	0.46 (974)	0.25 (529)	0.27 (572)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	10 (3000)	10 (250)	10 (250)	10 (250)	10 (250)	0.26 (550)	0.60 (1270)	0.49 (1037)	0.30 (635)	0.28 (593)	0.24 (508)	0.24 (508)	0.24 (508)
12 (3600)	4 (1200)	12 (300)	12 (300)	12 (300)	12 (300)	0.37 (785)	0.44 (931)	0.37 (783)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	5 (1500)	12 (300)	12 (300)	12 (300)	12 (300)	0.35 (741)	0.46 (974)	0.39 (826)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	6 (1800)	12 (300)	12 (300)	12 (300)	12 (300)	0.33 (699)	0.49 (1037)	0.39 (826)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	7 (2100)	12 (300)	12 (300)	12 (300)	12 (300)	0.31 (656)	0.51 (1080)	0.43 (910)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	8 (2400)	12 (300)	12 (300)	12 (300)	12 (300)	0.30 (635)	0.52 (1101)	0.46 (974)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	9 (2700)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.54 (1143)	0.49 (1037)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	10 (3000)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.55 (1164)	0.52 (1101)	0.29 (614)	0.30 (635)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	11 (3300)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.57 (1207)	0.55 (1164)	0.30 (635)	0.31 (656)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	12 (3600)	12 (300)	12 (300)	12 (300)	12 (300)	0.31 (656)	0.58 (1228)	0.58 (1228)	0.30 (635)	0.32 (677)	0.29 (614)	0.29 (614)	0.29 (614)

SHALLOW COVER BOXES – COVER 0' TO 2' (0 TO 610 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PRECAST REINFORCED CONCRETE BOX

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
3' x 2' x 4" (900 x 600 x 100 mm)							4' x 3' x 5" (1200 x 900 x 125 mm)						
3	(915)	0.13 (275)	0.21 (445)	0.26 (550)	0.10 (217)	31 (775)	3	(915) *	0.17 (360)	0.25 (529)	0.28 (593)	0.12 (254)	38 (950)
5	(1525)	0.10 (217)	0.10 (217)	0.11 (233)	0.10 (217)	31 (775)	5	(1525) *	0.12 (254)	0.12 (254)	0.15 (318)	0.12 (254)	38 (950)
10	(3000) *	0.10 (217)	0.11 (233)	0.14 (296)	0.10 (217)	31 (775)	10	*	0.12 (254)	0.15 (318)	0.19 (402)	0.12 (254)	38 (950)
15	(4500) *	0.10 (217)	0.16 (339)	0.20 (423)	0.10 (217)	31 (775)	15	(4500) *	0.12 (254)	0.23 (489)	0.27 (572)	0.12 (254)	38 (950)
20	(6000) *	0.12 (254)	0.22 (466)	0.25 (529)	0.10 (217)	31 (775)	20	(6000) *	0.16 (339)	0.30 (635)	0.36 (762)	0.12 (254)	38 (950)
25	(7500) *	0.16 (339)	0.28 (593)	0.35 (741)	0.10 (217)	31 (775)	25	(7500) *	0.20 (423)	0.38 (804)	0.46 (974)	0.12 (254)	38 (950)
3' x 3' x 4" (900 x 900 x 100 mm)							4' x 4' x 5" (1200 x 1200 x 125 mm)						
3	(915)	0.10 (217)	0.25 (529)	0.31 (656)	0.10 (217)	31 (775)	3	(915)	0.14 (296)	0.31 (656)	0.32 (677)	0.12 (254)	38 (950)
5	(1525)	0.10 (217)	0.11 (233)	0.12 (254)	0.10 (217)	31 (775)	5	(1525)	0.12 (254)	0.17 (360)	0.15 (318)	0.12 (254)	38 (950)
10	(3000) *	0.10 (217)	0.11 (233)	0.14 (296)	0.10 (217)	31 (775)	10	(3000) *	0.12 (254)	0.15 (318)	0.19 (402)	0.12 (254)	38 (950)
15	(4500) *	0.10 (217)	0.16 (339)	0.21 (445)	0.10 (217)	31 (775)	15	(4500) *	0.12 (254)	0.22 (466)	0.27 (572)	0.12 (254)	38 (950)
20	(6000) *	0.10 (217)	0.22 (466)	0.28 (593)	0.10 (217)	31 (775)	20	(6000) *	0.13 (275)	0.30 (635)	0.36 (762)	0.12 (254)	38 (950)
25	(7500) *	0.11 (233)	0.28 (593)	0.36 (762)	0.10 (217)	31 (775)	25	(7500) *	0.16 (339)	0.38 (804)	0.46 (974)	0.12 (254)	38 (950)
4' x 2' x 5" (1200 x 600 x 125 mm)							5' x 3' x 6" (1500 x 900 x 150 mm)						
3	(915)	0.21 (445)	0.23 (489)	0.23 (489)	0.12 (254)	38 (950)	3	(915)	0.21 (445)	0.29 (614)	0.25 (529)	0.14 (296)	45 (1125)
5	(1525)	0.12 (254)	0.12 (254)	0.13 (275)	0.12 (254)	38 (950)	5	(1525)	0.14 (296)	0.15 (318)	0.17 (360)	0.14 (296)	36 (900)
10	(3000) *	0.12 (254)	0.14 (296)	0.16 (339)	0.12 (254)	38 (950)	10	(3000)	0.14 (296)	0.18 (381)	0.22 (466)	0.14 (296)	36 (900)
15	(4500) *	0.16 (339)	0.20 (423)	0.24 (508)	0.12 (254)	38 (950)	15	(4500)	0.18 (381)	0.27 (572)	0.32 (677)	0.14 (296)	35 (875)
20	(6000) *	0.22 (466)	0.27 (572)	0.32 (677)	0.12 (254)	38 (950)	20	(6000)	0.25 (529)	0.36 (762)	0.42 (889)	0.14 (296)	35 (875)
25	(7500) *	0.28 (593)	0.34 (720)	0.40 (847)	0.12 (254)	38 (950)	25	(7500) *	0.32 (677)	0.46 (974)	0.53 (1122)	0.14 (296)	35 (875)

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PRECAST REINFORCED CONCRETE BOX

STANDARD PLAN
390–1
SHEET 18 OF 42

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x * WHERE NOTED, SUBMIT DETAILS FOR HAUNCH, WALL AND SLAB THICKNESS TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
5' x 4' x 6" (1500 x 1200 x 150 mm)							6' x 4' x 7" (1800 x 1200 x 175 mm)						
3	(915)	0.18 (381)	0.33 (699)	0.28 (593)	0.14 (296)	45 (1125)	3	(915)	0.22 (466)	0.33 (699)	0.27 (572)	0.17 (360)	43 (1075)
5	(1525)	0.14 (296)	0.16 (339)	0.19 (402)	0.14 (296)	45 (1125)	5	(1525)	0.17 (360)	0.18 (381)	0.21 (445)	0.17 (360)	40 (1000)
10	(3000)	0.14 (296)	0.20 (423)	0.24 (508)	0.14 (296)	39 (900)	10	(3000)	0.17 (360)	0.22 (466)	0.27 (572)	0.17 (360)	39 (975)
15	(4500)	0.15 (318)	0.29 (614)	0.34 (720)	0.14 (296)	35 (875)	15	(4500)	0.21 (445)	0.33 (699)	0.39 (826)	0.17 (360)	38 (950)
20	(6000)	0.20 (423)	0.39 (826)	0.45 (953)	0.14 (296)	35 (875)	20	(6000)	0.28 (593)	0.44 (931)	0.50 (1059)	0.17 (360)	38 (950)
25	(7500) *	0.25 (529)	0.49 (1037)	0.57 (1207)	0.14 (296)	35 (875)	25	(7500) *	0.35 (741)	0.56 (1186)	0.64 (1335)	0.17 (360)	38 (950)
5' x 5' x 6" (1500 x 1500 x 150 mm)							6' x 5' x 7" (1800 x 1500 x 175 mm)						
3	(915)	0.16 (339)	0.35 (741)	0.31 (656)	0.14 (296)	45 (1125)	3	(915)	0.19 (402)	0.36 (762)	0.30 (635)	0.17 (360)	52 (1300)
5	(1525)	0.14 (296)	0.17 (360)	0.20 (423)	0.14 (296)	45 (1125)	5	(1525)	0.17 (360)	0.20 (423)	0.23 (487)	0.17 (360)	43 (1075)
10	(3000)	0.14 (296)	0.20 (423)	0.25 (529)	0.14 (296)	40 (1125)	10	(3000)	0.17 (360)	0.24 (508)	0.29 (614)	0.17 (360)	39 (975)
15	(4500)	0.14 (296)	0.29 (614)	0.35 (741)	0.14 (296)	36 (900)	15	(4500)	0.18 (381)	0.35 (741)	0.42 (889)	0.17 (360)	38 (950)
20	(6000)	0.17 (360)	0.39 (826)	0.46 (974)	0.14 (296)	35 (875)	20	(6000)	0.24 (508)	0.47 (995)	0.54 (1143)	0.17 (360)	38 (950)
25	(7500) *	0.21 (445)	0.49 (1037)	0.58 (1228)	0.14 (296)	35 (875)	25	(7500) *	0.30 (635)	0.59 (1249)	0.68 (1439)	0.17 (360)	38 (950)
6' x 3' x 7" (1800 x 900 x 175 mm)							6' x 6' x 7" (1800 x 1800 x 175 mm)						
3	(915)	0.24 (508)	0.29 (614)	0.24 (508)	0.17 (360)	43 (1075)	3	(915)	0.17 (360)	0.38 (804)	0.32 (677)	0.17 (360)	52 (1300)
5	(1525)	0.17 (360)	0.17 (360)	0.16 (339)	0.17 (360)	40 (1000)	5	(1525)	0.17 (360)	0.20 (423)	0.24 (508)	0.17 (360)	52 (1300)
10	(3000)	0.17 (360)	0.21 (445)	0.25 (529)	0.17 (360)	39 (975)	10	(3000)	0.17 (360)	0.23 (487)	0.29 (614)	0.17 (360)	43 (1075)
15	(4500)	0.25 (529)	0.31 (656)	0.36 (762)	0.17 (360)	38 (950)	15	(4500)	0.17 (360)	0.34 (720)	0.41 (868)	0.17 (360)	39 (975)
20	(6000)	0.34 (720)	0.41 (868)	0.47 (995)	0.17 (360)	38 (950)	20	(6000)	0.21 (445)	0.46 (974)	0.54 (1143)	0.17 (360)	38 (950)
25	(7500) *	0.44 (931)	0.52 (1101)	0.58 (1228)	0.17 (360)	38 (950)	25	(7500) *	0.27 (572)	0.58 (1228)	0.67 (1418)	0.17 (360)	38 (950)

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PRECAST REINFORCED CONCRETE BOX

STANDARD PLAN
390–1
SHEET 19 OF 42

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
7' x 4' x 8" (2100 x 1200 x 200 mm)							7' x 7' x 8" (2100 x 2100 x 200 mm)						
3	(915)	0.24 (508)	0.33 (699)	0.33 (699)	0.19 (402)	47 (1175)	3	(915)	0.19 (402)	0.41 (868)	0.41 (868)	0.19 (402)	59 (1475)
5	(1525)	0.19 (402)	0.21 (445)	0.24 (508)	0.19 (402)	43 (1075)	5	(1525)	0.19 (402)	0.25 (529)	0.30 (635)	0.19 (402)	59 (1475)
10	(3000)	0.19 (402)	0.26 (550)	0.31 (656)	0.19 (402)	43 (1075)	10	(3000)	0.19 (402)	0.29 (614)	0.36 (762)	0.19 (402)	47 (1175)
15	(4500)	0.28 (593)	0.38 (804)	0.44 (931)	0.19 (402)	41 (1025)	15	(4500)	0.20 (423)	0.42 (889)	0.50 (1058)	0.19 (402)	43 (1075)
20	(6000)	0.37 (783)	0.51 (1080)	0.57 (1207)	0.19 (402)	41 (1025)	20	(6000)	0.26 (550)	0.56 (1185)	0.65 (1376)	0.19 (402)	41 (1025)
25	(7500) *	0.47 (995)	0.64 (1355)	0.71 (1503)	0.19 (402)	41 (1025)	25	(7500) *	0.32 (677)	0.70 (1482)	0.80 (1693)	0.19 (402)	41 (1025)
7' x 5' x 8" (2100 x 1500 x 200 mm)							8' x 4' x 8" (2400 x 1200 x 200 mm)						
3	(915)	0.22 (466)	0.36 (762)	0.36 (762)	0.19 (402)	59 (1475)	3	(915)	0.32 (677)	0.39 (826)	0.38 (804)	0.19 (402)	50 (1250)
5	(1525)	0.19 (402)	0.23 (489)	0.26 (550)	0.19 (402)	43 (1075)	5	(1525)	0.22 (466)	0.26 (550)	0.29 (614)	0.19 (402)	45 (1125)
10	(3000)	0.19 (402)	0.28 (593)	0.33 (699)	0.19 (402)	43 (1075)	10	(3000)	0.28 (593)	0.33 (699)	0.39 (826)	0.19 (402)	45 (1125)
15	(4500)	0.24 (508)	0.41 (868)	0.48 (1016)	0.19 (402)	41 (1025)	15	(4500)	0.42 (889)	0.49 (1037)	0.56 (1185)	0.19 (402)	41 (1025)
20	(6000)	0.32 (677)	0.54 (1143)	0.62 (1312)	0.19 (402)	41 (1025)	20	(6000) *	0.57 (1207)	0.65 (1376)	0.73 (1545)	0.19 (402)	41 (1025)
25	(7500) *	0.40 (847)	0.68 (1438)	0.76 (1609)	0.19 (402)	41 (1025)	25	(7500) *	0.71 (1545)	0.83 (1757)	0.92 (1947)	0.19 (402)	41 (1025)
7' x 6' x 8" (2100 x 1200 x 200 mm)							8' x 5' x 8" (2400 x 1500 x 200 mm)						
3	(915)	0.20 (423)	0.39 (826)	0.39 (826)	0.19 (402)	59 (1475)	3	(915)	0.28 (593)	0.42 (889)	0.42 (889)	0.19 (402)	50 (1250)
5	(1525)	0.19 (402)	0.24 (508)	0.28 (593)	0.19 (402)	47 (1175)	5	(1525)	0.20 (423)	0.28 (593)	0.33 (699)	0.19 (402)	50 (1250)
10	(3000)	0.19 (402)	0.29 (614)	0.35 (741)	0.19 (402)	43 (1075)	10	(3000)	0.25 (529)	0.35 (741)	0.42 (889)	0.19 (402)	45 (1125)
15	(4500)	0.21 (445)	0.42 (889)	0.50 (1058)	0.19 (402)	41 (1025)	15	(4500)	0.37 (783)	0.52 (1101)	0.60 (1270)	0.19 (402)	41 (1025)
20	(6000)	0.28 (593)	0.55 (1164)	0.64 (1355)	0.19 (402)	41 (1025)	20	(6000) *	0.49 (1037)	0.70 (1482)	0.79 (1672)	0.19 (402)	41 (1025)
25	(7500) *	0.35 (741)	0.70 (1482)	0.79 (1672)	0.19 (402)	41 (1025)	25	(7500) *	0.63 (1334)	0.89 (1884)	1.00 (2117)	0.19 (402)	41 (1025)

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STANDARD PLAN
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SHEET 20 OF 42

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
8' x 6' x 8" (2400 x 1800 x 200 mm)							9' x 5' x 9" (2700 x 1500 x 225 mm)						
3	(915)	0.25 (529)	0.45 (953)	0.45 (953)	0.19 (402)	55 (1375)	3	(915)	0.34 (720)	0.44 (931)	0.58 (1228)	0.22 (466)	54 (1350)
5	(1525)	0.19 (402)	0.30 (635)	0.35 (741)	0.19 (402)	50 (1250)	5	(1525)	0.24 (508)	0.30 (635)	0.35 (741)	0.22 (466)	49 (1225)
10	(3000)	0.23 (489)	0.37 (783)	0.45 (953)	0.19 (402)	45 (1125)	10	(3000)	0.30 (635)	0.38 (804)	0.46 (974)	0.22 (466)	49 (1225)
15	(4500)	0.33 (699)	0.55 (1164)	0.63 (1334)	0.19 (402)	41 (1025)	15	(4500)	0.44 (931)	0.56 (1185)	0.62 (1312)	0.22 (466)	44 (1100)
20	(6000) *	0.44 (931)	0.73 (1545)	0.83 (1757)	0.19 (402)	41 (1025)	20	(6000) *	0.59 (1249)	0.75 (1588)	0.85 (1799)	0.22 (466)	44 (1100)
25	(7500) *	0.56 (1185)	0.93 (1969)	1.05 (2223)	0.19 (402)	41 (1025)	25	(7500) *	0.76 (1609)	0.95 (2011)	1.05 (2223)	0.22 (466)	44 (1100)
8' x 7' x 8" (2400 x 2100 x 200 mm)							9' x 6' x 9" (3300 x 1800 x 225 mm)						
3	(915)	0.23 (489)	0.47 (995)	0.49 (1037)	0.19 (402)	56 (1650)	3	(915)	0.37 (783)	0.47 (995)	0.52 (1101)	0.22 (466)	59 (1475)
5	(1525)	0.19 (402)	0.31 (656)	0.37 (783)	0.19 (402)	50 (1375)	5	(1525)	0.32 (677)	0.32 (677)	0.37 (783)	0.22 (466)	54 (1350)
10	(3000)	0.21 (445)	0.38 (804)	0.46 (974)	0.19 (402)	45 (1125)	10	(3000)	0.34 (508)	0.40 (847)	0.49 (1037)	0.22 (466)	49 (1225)
15	(4500)	0.30 (635)	0.56 (1185)	0.65 (1376)	0.19 (402)	41 (1025)	15	(4500)	0.40 (847)	0.59 (1249)	0.69 (1461)	0.22 (466)	44 (1100)
20	(6000) *	0.40 (847)	0.75 (1588)	0.86 (1821)	0.19 (402)	41 (1025)	20	(6000) *	0.51 (1022)	0.79 (1672)	0.89 (1884)	0.22 (466)	44 (1100)
25	(7500) *	0.51 (1080)	0.95 (2011)	1.08 (2286)	0.19 (402)	41 (1025)	25	(7500) *	0.68 (1438)	1.00 (2117)	1.12 (2371)	0.22 (466)	44 (1100)
8' x 8' x 8" (2400 x 2400 x 200 mm)							9' x 7' x 9" (3300 x 2100 x 225 mm)						
3	(915)	0.22 (466)	0.49 (1037)	0.52 (1101)	0.19 (402)	65 (1625)	3	(915)	0.28 (592)	0.49 (1037)	0.53 (1122)	0.22 (466)	59 (1475)
5	(1525)	0.19 (402)	0.33 (699)	0.39 (826)	0.19 (402)	65 (1625)	5	(1525)	0.22 (466)	0.34 (720)	0.40 (847)	0.22 (466)	54 (1350)
10	(3000)	0.20 (423)	0.39 (826)	0.48 (1016)	0.19 (402)	50 (1250)	10	(3000)	0.25 (529)	0.42 (889)	0.51 (1080)	0.22 (466)	49 (1225)
15	(4500)	0.29 (614)	0.56 (1185)	0.66 (1397)	0.19 (402)	45 (1125)	15	(4500)	0.36 (762)	0.61 (1291)	0.72 (1524)	0.22 (466)	44 (1100)
20	(6000) *	0.38 (804)	0.75 (1588)	0.87 (1482)	0.19 (402)	45 (1125)	20	(6000) *	0.48 (1016)	0.82 (1736)	0.93 (1969)	0.22 (466)	44 (1100)
25	(7500) *	0.48 (1016)	0.95 (2011)	1.09 (2308)	0.19 (402)	45 (1125)	25	(7500) *	0.61 (1291)	1.04 (2202)	1.17 (2477)	0.22 (466)	44 (1100)

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PRECAST REINFORCED CONCRETE BOX

STANDARD PLAN
390–1
SHEET 21 OF 42

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
9' x 8' x 9" (2700 x 2400 x 225 mm)							10' x 6' x 10" (3300 x 1800 x 250 mm)						
3	(915)	0.26 (550)	0.51 (1080)	0.57 (1207)	0.22 (466)	72 (1800)	3	(915)	0.35 (741)	0.49 (1037)	0.52 (1101)	0.24 (508)	58 (1450)
5	(1525)	0.22 (466)	0.35 (741)	0.42 (889)	0.22 (466)	59 (1475)	5	(1525)	0.26 (550)	0.34 (720)	0.40 (868)	0.24 (508)	52 (1300)
10	(3000)	0.24 (508)	0.43 (910)	0.53 (1122)	0.22 (466)	54 (1350)	10	(3000)	0.32 (677)	0.44 (931)	0.52 (1101)	0.24 (508)	52 (1300)
15	(4500)	0.34 (720)	0.63 (1334)	0.74 (1566)	0.22 (466)	44 (1100)	15	(4500)	0.47 (995)	0.64 (1355)	0.74 (1566)	0.24 (508)	47 (1175)
20	(6000) *	0.45 (953)	0.83 (1757)	0.95 (2011)	0.22 (466)	44 (1100)	20	(6000) *	0.63 (1334)	0.85 (1799)	0.96 (2032)	0.24 (508)	47 (1175)
25	(7500) *	0.57 (1207)	1.05 (2223)	1.19 (2519)	0.22 (466)	44 (1100)	25	(7500) *	0.80 (1693)	1.07 (2265)	1.18 (2498)	0.24 (508)	47 (1175)
9' x 9' x 9" (2700 x 2700 x 225 mm)							10' x 7' x 10" (3000 x 2100 x 250 mm)						
3	(915)	0.25 (529)	0.53 (1122)	0.60 (1270)	0.22 (466)	72 (1800)	3	(915)	0.32 (677)	0.51 (1080)	0.56 (1185)	0.24 (508)	64 (1600)
5	(1525)	0.22 (466)	0.37 (783)	0.44 (931)	0.22 (466)	72 (1800)	5	(1525)	0.24 (508)	0.36 (762)	0.43 (910)	0.24 (508)	58 (1450)
10	(3000)	0.23 (487)	0.43 (910)	0.54 (1143)	0.22 (466)	59 (1475)	10	(3000)	0.30 (635)	0.46 (974)	0.55 (1164)	0.24 (508)	52 (1300)
15	(4500)	0.32 (677)	0.63 (1334)	0.75 (1588)	0.22 (466)	49 (1225)	15	(4500)	0.43 (910)	0.67 (1418)	0.78 (1651)	0.24 (508)	47 (1175)
20	(6000) *	0.43 (910)	0.84 (1778)	0.96 (2032)	0.22 (466)	49 (1225)	20	(6000) *	0.57 (1207)	0.89 (1884)	1.01 (2138)	0.24 (508)	47 (1175)
25	(7500) *	0.54 (1143)	1.05 (2223)	1.20 (2540)	0.22 (466)	44 (1100)	25	(7500) *	0.71 (1545)	1.12 (2371)	1.24 (2625)	0.24 (508)	47 (1175)
10' x 5' x 10" (3000 x 1500 x 250 mm)							10' x 8' x 10" (3000 x 2400 x 250 mm)						
3	(915)	0.38 (804)	0.46 (974)	0.48 (1016)	0.24 (508)	58 (1450)	3	(915)	0.30 (635)	0.54 (1143)	0.60 (1270)	0.24 (508)	64 (1600)
5	(1525)	0.28 (593)	0.32 (677)	0.37 (783)	0.24 (508)	52 (1300)	5	(1525)	0.21 (445)	0.38 (804)	0.46 (974)	0.24 (508)	58 (1450)
10	(3000)	0.35 (741)	0.41 (868)	0.49 (1037)	0.24 (508)	52 (1300)	10	(3000)	0.28 (593)	0.47 (995)	0.58 (1228)	0.24 (508)	52 (1300)
15	(4500)	0.52 (1101)	0.60 (1270)	0.70 (1482)	0.24 (508)	47 (1175)	15	(4500)	0.40 (868)	0.68 (1439)	0.81 (1715)	0.24 (508)	47 (1175)
20	(6000) *	0.70 (1482)	0.80 (1693)	0.91 (1926)	0.24 (508)	47 (1175)	20	(6000) *	0.53 (1122)	0.91 (1926)	1.04 (2201)	0.24 (508)	47 (1175)
25	(7500) *	0.90 (1905)	1.01 (2138)	1.11 (2350)	0.24 (508)	47 (1175)	25	(7500) *	0.67 (1418)	1.15 (2434)	1.28 (2709)	0.24 (508)	47 (1175)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
10' x 9' x 10" (3000 x 2700 x 250 mm)							12' x 5' x 12" (3600 x 1500 x 300 mm)						
3	(915)	0.28 (593)	0.56 (1185)	0.64 (1355)	0.24 (508)	79 (1975)	3	(915)	0.47 (995)	0.48 (1016)	0.50 (1059)	0.29 (614)	73 (1825)
5	(1525)	0.24 (508)	0.39 (826)	0.48 (1016)	0.24 (508)	64 (1600)	5	(1525)	0.37 (783)	0.36 (762)	0.42 (889)	0.29 (614)	66 (1650)
10	(3000)	0.27 (572)	0.48 (1016)	0.60 (1270)	0.24 (508)	59 (1450)	10	(3000)	0.47 (995)	0.46 (974)	0.56 (1186)	0.29 (614)	59 (1475)
15	(4500)	0.38 (804)	0.69 (1461)	0.83 (1757)	0.24 (508)	47 (1175)	15	(4500)	0.69 (1461)	0.67 (1418)	0.79 (1672)	0.29 (614)	59 (1475)
20	(6000) *	0.50 (1058)	0.92 (1947)	1.06 (2244)	0.24 (508)	47 (1175)	20	(6000) *	0.92 (1947)	0.89 (1884)	1.02 (2159)	0.29 (614)	59 (1475)
25	(7500) *	0.63 (1334)	1.16 (2455)	1.31 (2773)	0.24 (508)	47 (1175)	25	(7500) *	1.18 (2498)	1.12 (2371)	1.25 (2646)	0.29 (614)	59 (1475)
10' x 10' x 10" (3000 x 3000 x 250 mm)							12' x [illegible] 12" (3600 x 1800 x 300 mm)						
3	(915)	0.27 (572)	0.57 (1207)	0.68 (1439)	0.24 (508)	79 (1975)	3	(915)	[illegible] (931)	0.52 (1101)	0.54 (1143)	0.29 (614)	66 (1650)
5	(1525)	0.24 (508)	0.41 (868)	0.50 (1058)	0.24 (508)	70 (1750)	5	(1525)	[illegible] (720)	0.39 (826)	0.46 (974)	0.29 (614)	59 (1475)
10	(3000)	0.26 (550)	0.48 (1016)	0.61 (1291)	0.24 (508)	60 (1600)	10	(3000)	[illegible] (910)	0.49 (1037)	0.60 (1270)	0.29 (614)	59 (1475)
15	(4500)	0.36 (762)	0.70 (1482)	0.84 (1778)	0.24 (508)	52 (1300)	15	(4500)	[illegible] (1334)	0.72 (1524)	0.85 (1799)	0.29 (614)	53 (1325)
20	(6000) *	0.48 (1016)	0.92 (1947)	1.07 (2265)	0.24 (508)	52 (1300)	20	(6000) *	[illegible] (1778)	0.95 (2011)	1.09 (2307)	0.29 (614)	53 (1325)
25	(7500) *	0.60 (1270)	1.16 (2455)	1.32 (2794)	0.24 (508)	47 (1175)	25	(7500) *	1.07 (2265)	1.20 (2540)	1.34 (2836)	0.29 (614)	53 (1325)
12' x 4' x 12" (3600 x 1200 x 300 mm)							12' x [illegible]' x 12" (360[illegible] x 2100 x 300 mm)						
3	(915)	0.50 (1058)	0.44 (931)	0.45 (953)	0.29 (614)	73 (1825)	[illegible]	(915)	0.41 [illegible]	0.55 (1164)	0.59 (1249)	0.29 (614)	66 (1650)
5	(1525)	0.40 (847)	0.33 (699)	0.38 (804)	0.29 (614)	66 (1650)	[illegible]	(1525)	0.32 (677)	0.41 (868)	0.49 (1037)	0.29 (614)	59 (1475)
10	(3000)	0.51 (1080)	0.42 (889)	0.51 (1080)	0.29 (614)	59 (1475)	10	(3000)	0.40 (847)	[illegible].52 (1101)	0.64 (1355)	0.29 (614)	59 (1475)
15	(4500)	0.76 (1609)	0.61 (1291)	0.72 (1524)	0.29 (614)	59 (1475)	15	(4500)	0.58 (1229)	0.76 (1609)	0.89 (1884)	0.29 (614)	53 (1325)
20	(6000)	1.03 (2180)	0.81 (1715)	0.94 (1990)	0.29 (614)	59 (1475)	20	(6000) *	0.77 (1630)	1.00 (2117)	1.15 (2434)	0.29 (614)	53 (1325)
25	(7500) *	1.32 (2794)	1.02 (2159)	1.15 (2434)	0.29 (614)	59 (1475)	25	(7500) *	0.97 (2053)	1.26 (2667)	1.41 (2985)	0.29 (614)	53 (1325)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 1.5 INCHES (38 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
12' x 8' x 12" (3600 x 2400 x 300 mm)							12' x 11' x 12" (3600 x 3300 x 300 mm)						
3	(915)	0.39 (826)	0.58 (1228)	0.63 (1334)	0.29 (614)	66 (1650)	3	(915)	0.35 (741)	0.66 (1397)	0.75 (1588)	0.29 (614)	93 (2325)
5	(1525)	0.30 (635)	0.43 (910)	0.52 (1101)	0.29 (614)	59 (1475)	5	(1525)	0.29 (614)	0.48 (1016)	0.61 (1291)	0.29 (614)	80 (2000)
10	(3000)	0.38 (804)	0.54 (1143)	0.67 (1418)	0.29 (614)	59 (1475)	10	(3000)	0.33 (699)	0.58 (1228)	0.74 (1566)	0.29 (614)	73 (1825)
15	(4500)	0.54 (1143)	0.79 (1672)	0.93 (1969)	0.29 (614)	53 (1325)	15	(4500)	0.46 (974)	0.84 (779)	1.02 (2159)	0.29 (614)	59 (1475)
20	(6000) *	0.71 (1503)	1.04 (2201)	1.20 (2540)	0.29 (614)	53 (1325)	20	(6000) *	0.60 (1270)	1.10 (2328)	1.29 (2731)	0.29 (614)	59 (1475)
25	(7500) *	0.90 (1905)	1.31 (2773)	1.47 (3112)	0.29 (614)	53 (1325)	25	(7500) *	0.75 (1588)	1.38 (2921)	1.56 (3302)	0.29 (614)	59 (1475)
12' x 9' x 12" (3600 x 2700 x 300 mm)							12' x 12' x 12" (3600 x 3600 x 300 mm)						
3	(915)	0.37 (783)	0.61 (1291)	0.67 (1418)	0.29 (614)	80 (2000)	3	(915)	0.31 (656)	0.69 (1461)	0.79 (1672)	0.29 (614)	93 (2325)
5	(1525)	0.29 (614)	0.45 (953)	0.55 (1164)	0.29 (614)	66 (1650)	5	(1525)	0.29 (614)	0.50 (1058)	0.63 (1334)	0.29 (614)	80 (2000)
10	(3000)	0.36 (762)	0.56 (1185)	0.70 (1482)	0.29 (614)	59 (1475)	10	(3000)	0.32 (677)	0.59 (1249)	0.76 (1609)	0.29 (614)	73 (1825)
15	(4500)	0.50 (1058)	0.81 (1715)	0.97 (2053)	0.29 (614)	53 (1325)	15	(4500)	0.45 (953)	0.84 (1778)	1.03 (2180)	0.29 (614)	59 (1475)
20	(6000) *	0.66 (1397)	1.07 (2265)	1.24 (2625)	0.29 (614)	53 (1325)	20	(6000) *	0.58 (1228)	1.11 (2350)	1.30 (2752)	0.29 (614)	59 (1475)
25	(7500) *	0.84 (1778)	1.35 (2858)	1.51 (3196)	0.29 (614)	53 (1325)	25	(7500) *	0.71 (1545)	1.38 (2921)	1.58 (3344)	0.29 (614)	59 (1475)
12' x 10' x 12" (3600 x 3000 x 300 mm)													
3	(915)	0.34 (720)	0.64 (1355)	0.71 (1503)	0.29 (614)	80 (2000)							
5	(1525)	0.29 (614)	0.47 (995)	0.58 (1228)	0.29 (614)	66 (1650)							
10	(3000)	0.34 (720)	0.57 (1207)	0.72 (1524)	0.29 (614)	59 (1475)							
15	(4500)	0.48 (1016)	0.83 (1757)	1.00 (2117)	0.29 (614)	53 (1325)							
20	(6000) *	0.63 (1334)	1.09 (2307)	1.27 (2688)	0.29 (614)	53 (1325)							
25	(7500) *	0.79 (1672)	1.37 (2900)	1.54 (3260)	0.29 (614)	53 (1325)							

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SPAN, S	RISE, R	T_t TOP	T_b BOTTOM	T_w SIDE	H HAUNCH	TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)							
FEET (mm)	FEET (mm)	INCHES (mm)	INCHES (mm)	INCHES (mm)	INCHES (mm)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}
3 (900)	2 (600)	7 (175)	6 (150)	4 (100)	4 (100)	0.17 (360)	0.37 (783)	0.26 (550)	0.10 (212)	0.22 (466)	0.17 (360)	0.17 (360)	0.14 (296)
3 (900)	3 (900)	7 (175)	6 (150)	4 (100)	4 (100)	0.17 (360)	0.40 (847)	0.28 (593)	0.10 (212)	0.23 (487)	0.17 (360)	0.17 (360)	0.14 (296)
4 (1200)	2 (600)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.40 (847)	0.25 (529)	0.12 (254)	0.21 (445)	0.18 (381)	0.18 (381)	0.14 (296)
4 (1200)	3 (900)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.44 (931)	0.29 (614)	0.12 (254)	0.23 (487)	0.18 (381)	0.18 (381)	0.14 (296)
4 (1200)	4 (1200)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.46 (974)	0.32 (677)	0.12 (254)	0.25 (529)	0.18 (381)	0.18 (381)	0.14 (296)
5 (1500)	3 (900)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.44 (931)	0.26 (550)	0.14 (296)	0.22 (466)	0.19 (402)	0.19 (402)	0.17 (360)
5 (1500)	4 (1200)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.47 (995)	0.29 (614)	0.14 (296)	0.24 (508)	0.19 (402)	0.19 (402)	0.17 (360)
5 (1500)	5 (1500)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.50 (1059)	0.32 (677)	0.14 (296)	0.25 (529)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	3 (900)	8 (200)	7 (175)	7 (175)	7 (175)	0.23 (487)	0.45 (953)	0.29 (614)	0.17 (360)	0.19 (402)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	4 (1200)	8 (200)	7 (175)	7 (175)	7 (175)	0.19 (402)	0.49 (1037)	0.32 (677)	0.17 (360)	0.24 (508)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	5 (1500)	8 (200)	7 (175)	7 (175)	7 (175)	0.19 (402)	0.52 (1101)	0.34 (719)	0.17 (360)	0.25 (529)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	6 (1800)	8 (200)	7 (175)	7 (175)	7 (175)	0.19 (402)	0.54 (1143)	0.36 (762)	0.17 (360)	0.26 (550)	0.19 (402)	0.19 (402)	0.17 (360)
7 (2100)	4 (1200)	8 (200)	8 (200)	8 (200)	8 (200)	0.26 (550)	0.49 (1037)	0.25 (529)	0.19 (402)	0.23 (487)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	5 (1500)	8 (200)	8 (200)	8 (200)	8 (200)	0.23 (487)	0.52 (1101)	0.34 (720)	0.19 (402)	0.24 (508)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	6 (1800)	8 (200)	8 (200)	8 (200)	8 (200)	0.21 (445)	0.54 (1143)	0.37 (783)	0.19 (402)	0.26 (550)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	7 (2100)	8 (200)	8 (200)	8 (200)	8 (200)	0.19 (402)	0.56 (1186)	0.39 (826)	0.19 (402)	0.27 (572)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	4 (1200)	8 (200)	8 (200)	8 (200)	8 (200)	0.31 (656)	0.53 (1122)	0.35 (741)	0.19 (402)	0.25 (529)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	5 (1500)	8 (200)	8 (200)	8 (200)	8 (200)	0.28 (593)	0.57 (1207)	0.39 (826)	0.19 (402)	0.26 (550)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	6 (1800)	8 (200)	8 (200)	8 (200)	8 (200)	0.26 (550)	0.59 (1249)	0.42 (889)	0.19 (402)	0.28 (593)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	7 (2100)	8 (200)	8 (200)	8 (200)	8 (200)	0.24 (508)	0.62 (1313)	0.45 (953)	0.19 (402)	0.29 (614)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	8 (2400)	8 (200)	8 (200)	8 (200)	8 (200)	0.22 (466)	0.64 (1335)	0.49 (1037)	0.19 (402)	0.30 (635)	0.19 (402)	0.19 (402)	0.19 (402)
9 (2700)	5 (1500)	9 (225)	9 (225)	9 (225)	9 (225)	0.29 (614)	0.53 (1122)	0.40 (847)	0.22 (466)	0.25 (529)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	6 (1800)	9 (225)	9 (225)	9 (225)	9 (225)	0.27 (572)	0.56 (1186)	0.42 (889)	0.22 (466)	0.26 (550)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	7 (2100)	9 (225)	9 (225)	9 (225)	9 (225)	0.25 (529)	0.58 (1228)	0.45 (953)	0.22 (466)	0.27 (572)	0.22 (466)	0.22 (466)	0.22 (466)

SHALLOW COVER BOXES – COVER 0' TO 2' (0 TO 600 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

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SPAN, S	RISE, R	T_t TOP	T_b BOTTOM	T_w SIDE	H HAUNCH	TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)							
FEET (mm)	FEET (mm)	INCHES (mm)	INCHES (mm)	INCHES (mm)	INCHES (mm)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}
9 (2700)	8 (2400)	9 (225)	9 (225)	9 (225)	9 (225)	0.23 (487)	0.60 (1270)	0.48 (1016)	0.22 (466)	0.28 (593)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	9 (2700)	9 (225)	9 (225)	9 (225)	9 (225)	0.25 (529)	0.62 (1313)	0.54 (1143)	0.27 (572)	0.28 (593)	0.22 (466)	0.22 (466)	0.22 (466)
10 (3000)	5 (1500)	10 (250)	10 (250)	10 (250)	10 (250)	0.29 (614)	0.51 (1080)	0.38 (804)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	6 (1800)	10 (250)	10 (250)	10 (250)	10 (250)	0.27 (572)	0.53 (1122)	0.42 (889)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	7 (2100)	10 (250)	10 (250)	10 (250)	10 (250)	0.25 (529)	0.55 (1164)	0.45 (953)	0.24 (508)	0.25 (529)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	8 (2400)	10 (250)	10 (250)	10 (250)	10 (250)	0.24 (508)	0.57 (1207)	0.48 (1016)	0.24 (508)	0.26 (550)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	9 (2700)	10 (250)	10 (250)	10 (250)	10 (250)	0.24 (508)	0.59 (1249)	0.57 (1207)	0.24 (508)	0.27 (572)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	10 (3000)	10 (250)	10 (250)	10 (250)	10 (250)	0.26 (550)	0.60 (1270)	0.60 (1270)	0.30 (635)	0.28 (593)	0.24 (508)	0.24 (508)	0.24 (508)
12 (3600)	4 (1200)	12 (300)	12 (300)	12 (300)	12 (300)	0.40 (847)	0.41 (931)	0.41 (931)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	5 (1500)	12 (300)	12 (300)	12 (300)	12 (300)	0.35 (741)	0.46 (974)	0.46 (974)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	6 (1800)	12 (300)	12 (300)	12 (300)	12 (300)	0.33 (699)	0.49 (1037)	0.49 (1037)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	7 (2100)	12 (300)	12 (300)	12 (300)	12 (300)	0.31 (656)	0.51 (1080)	0.53 (1122)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	8 (2400)	12 (300)	12 (300)	12 (300)	12 (300)	0.30 (635)	0.52 (1101)	0.57 (1207)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	9 (2700)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.54 (1143)	0.60 (1270)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	10 (3000)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.55 (1164)	0.64 (1354)	0.29 (614)	0.30 (635)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	11 (3300)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.51 (1207)	0.68 (1439)	0.29 (614)	0.31 (656)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	12 (3600)	12 (300)	12 (300)	12 (300)	12 (300)	0.31 (656)	0.58 (1228)	0.72 (1524)	0.29 (614)	0.32 (677)	0.29 (614)	0.29 (614)	0.29 (614)

SHALLOW COVER BOXES – COVER 0' TO 2' (0 TO 610 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
3' x 2' x 4" (900 x 600 x 100 mm)							3' x 3' x 5" (1200 x 900 x 125 mm)						
3	(915)	0.12 (254)	0.21 (445)	0.33 (699)	0.10 (217)	31 (775)	3	(915)	0.16 (339)	0.28 (593)	0.33 (699)	0.12 (254)	38 (950)
5	(1525)	0.10 (217)	0.10 (217)	0.17 (360)	0.10 (217)	31 (775)	5	(1525)	0.12 (254)	0.15 (318)	0.23 (487)	0.12 (254)	38 (950)
10	(3000)	0.10 (217)	0.12 (254)	0.24 (508)	0.10 (217)	31 (775)	10	(3000)	0.12 (254)	0.17 (360)	0.28 (593)	0.12 (254)	38 (950)
15	(4500)	0.10 (217)	0.18 (381)	0.33 (699)	0.10 (217)	31 (775)	15	(4500)	0.12 (254)	0.24 (508)	0.40 (847)	0.12 (254)	38 (950)
20	(6000) *	0.13 (275)	0.23 (487)	0.43 (910)	0.10 (217)	31 (775)	20	(6000) *	0.16 (339)	0.31 (656)	0.51 (1080)	0.12 (254)	38 (950)
							25	(7500) *	0.21 (445)	0.39 (826)	0.62 (1312)	0.12 (254)	38 (950)
3' x 3' x 4" (900 x 900 x 100 mm)							4' x 3' x 5" (1200 x 1200 x 125 mm)						
3	(915)	0.10 (217)	0.25 (529)	0.39 (826)	0.10 (217)	31 (775)	3	(915)	0.13 (275)	0.31 (656)	0.37 (783)	0.12 (254)	38 (950)
5	(1525)	0.10 (217)	0.12 (254)	0.21 (445)	0.10 (217)	31 (775)	5	(1525)	0.12 (254)	0.16 (339)	0.16 (339)	0.12 (254)	38 (950)
10	(3000)	0.10 (217)	0.13 (275)	0.24 (508)	0.10 (217)	31 (775)	10	(3000)	0.12 (254)	0.17 (360)	0.30 (635)	0.12 (254)	38 (950)
15	(4500)	0.10 (217)	0.18 (381)	0.34 (720)	0.10 (217)	31 (775)	15	(4500)	0.12 (254)	0.24 (508)	0.41 (868)	0.12 (254)	38 (950)
20	(6000) *	0.10 (217)	0.24 (508)	0.43 (910)	0.10 (217)	31 (775)	20	(6000) *	0.16 (339)	0.32 (677)	0.52 (1101)	0.12 (254)	38 (950)
							25	(7500) *	0.16 (339)	0.48 (1016)	0.64 (1355)	0.12 (254)	38 (950)
4' x 2' x 5" (1200 x 600 x 125 mm)							5' x 3' x 6" (1500 x 900 x 150 mm)						
3	(915)	0.21 (445)	0.23 (489)	0.27 (572)	0.12 (254)	38 (950)	3	(915)	0.21 (	0.29 (614)	0.30 (635)	0.14 (296)	45 (1125)
5	(1525)	0.12 (254)	0.13 (275)	0.19 (402)	0.12 (254)	38 (950)	5	(1525)	0.14 (296)	0.17 (360)	0.25 (529)	0.14 (296)	36 (900)
10	(3000)	0.12 (254)	0.15 (318)	0.25 (529)	0.12 (254)	38 (950)	10	(3000)	0.14 (296)	0.20 (423)	0.32 (677)	0.14 (296)	36 (900)
15	(4500)	0.17 (360)	0.21 (445)	0.35 (741)	0.12 (254)	38 (950)	15	(4500)	0.19 (402)	0.29 (614)	0.44 (931)	0.12 (254)	35 (875)
20	(6000)	0.23 (487)	0.28 (593)	0.45 (953)	0.12 (254)	38 (950)	20	(6000) *	0.25 (529)	0.37 (783)	0.57 (1207)	0.12 (254)	35 (875)
25	(7500) *	0.29 (614)	0.35 (741)	0.56 (1185)	0.12 (254)	38 (950)	25	(7500) *	0.32 (677)	0.47 (995)	0.70 (1482)	0.12 (254)	35 (875)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
5' x 4' x 6" (1500 x 1200 x 150 mm)							5' x 4' x 7" (1800 x 1200 x 175 mm)						
3	(915)	0.18 (381)	0.33 (699)	0.34 (720)	0.14 (296)	45 (1125)	3	(915)	0.22 (466)	0.33 (699)	0.33 (699)	0.17 (360)	43 (1075)
5	(1525)	0.14 (296)	0.19 (402)	0.29 (614)	0.14 (296)	45 (1125)	5	(1525)	0.17 (360)	0.22 (466)	0.31 (656)	0.17 (360)	40 (1000)
10	(3000)	0.14 (296)	0.22 (466)	0.35 (741)	0.14 (296)	36 (900)	10	(3000)	0.17 (360)	0.25 (529)	0.39 (826)	0.17 (360)	39 (975)
15	(4500)	0.15 (318)	0.31 (656)	0.48 (1016)	0.14 (296)	35 (875)	15	(4500)	0.22 (466)	0.32 (677)	0.54 (1143)	0.17 (360)	39 (975)
20	(6000) *	0.20 (423)	0.40 (847)	0.62 (1312)	0.12 (254)	35 (875)	20	(6000) *	0.29 (614)	0.47 (995)	0.69 (1461)	0.17 (360)	38 (850)
25	(7500) *	0.25 (529)	0.50 (1058)	0.75 (1588)	0.12 (254)	35 (875)	25	(7500) *	0.36 (762)	0.58 (1228)	0.85 (1799)	0.17 (360)	38 (850)
5' x 5' x 6" (1500 x 1500 x 150 mm)							5' x 5' x 7" (1800 x 1500 x 175 mm)						
3	(915)	0.16 (339)	0.35 (741)	0.37 (783)	0.14 (296)	45 (1125)	3	(915)	0.19 (402)	0.36 (762)	0.36 (762)	0.17 (360)	52 (1300)
5	(1525)	0.14 (296)	0.21 (445)	0.31 (656)	0.14 (296)	45 (1125)	5	(1525)	0.17 (360)	0.24 (508)	0.35 (741)	0.17 (360)	43 (1075)
10	(3000)	0.14 (296)	0.22 (466)	0.36 (762)	0.14 (296)	36 (900)	10	(3000)	0.17 (360)	0.37 (783)	0.42 (889)	0.17 (360)	39 (975)
15	(4500)	0.14 (296)	0.31 (656)	0.49 (1037)	0.14 (296)	35 (875)	15	(4500)	0.22 (402)	0.37 (783)	0.59 (1249)	0.17 (360)	38 (950)
20	(6000) *	0.17 (360)	0.40 (847)	0.63 (1334)	0.14 (296)	35 (875)	20	(6000) *	0.24 (508)	0.49 (1037)	0.73 (1545)	0.17 (360)	38 (950)
25	(7500) *	0.22 (466)	0.50 (1058)	0.76 (1609)	0.14 (296)	35 (875)	25	(7500) *	0.[illegible] (556)	0.60 (1270)	0.89 (1884)	0.17 (360)	38 (950)
6' x 3' x 7" (1800 x 900 x 175 mm)							6' x 6' x 7" (1800 x 1800 x 175 mm)						
3	(915)	0.24 (508)	0.29 (614)	0.29 (614)	0.17 (360)	43 (1075)	3	(915)	0.17 [illegible]	0.38 (804)	0.40 (847)	0.17 (360)	52 (1300)
5	(1525)	0.17 (360)	0.19 (402)	0.27 (572)	0.17 (360)	40 (1000)	5	(1525)	0.17 [illegible]	0.25 (529)	0.37 (783)	0.17 (360)	52 (1300)
10	(3000)	0.19 (402)	0.23 (489)	0.35 (741)	0.17 (360)	39 (975)	10	(3000)	0.17 [illegible]	0.27 (572)	0.43 (910)	0.17 (360)	43 (1075)
15	(4500)	0.27 (572)	0.32 (677)	0.49 (1037)	0.17 (360)	38 (950)	15	(4500)	0.17 [illegible]	[illegible] (804)	0.58 (1228)	0.17 (360)	39 (975)
20	(6000) *	0.36 (762)	0.42 (889)	0.63 (1334)	0.17 (360)	38 (950)	20	(6000) *	0.22 [illegible]	0.49 (1037)	0.74 (1567)	0.17 (360)	38 (950)
25	(7500) *	0.45 (953)	0.53 (1122)	0.78 (1651)	0.17 (360)	38 (950)	25	(7500) *	0.27 (572)	0.61 (1291)	0.89 (1884)	0.17 (360)	38 (950)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x * WHERE NOTED, SUBMIT DETAILS FOR HAUNCH, WALL AND SLAB THICKNESS TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM	TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}			A_{S1}	A_{S2}	A_{S3}	A_{S4}	
7' x 4' x 8" (2100 x 1200 x 200 mm)							7' x 7' x 8" (2100 x 2100 x 200 mm)					
3	(915)	0.24 (508)	0.33 (699)	0.38 (804)	0.19 (402)	47 (1175)	3 (915)	0.19 (402)	0.41 (868)	0.50 (1058)	0.19 (402)	59 (1475)
5	(1525)	0.19 (402)	0.24 (508)	0.24 (508)	0.19 (402)	43 (1075)	5 (1525)	0.19 (402)	0.27 (572)	0.44 (931)	0.19 (402)	59 (1475)
10	(3000)	0.21 (445)	0.28 (593)	0.43 (910)	0.19 (402)	47 (1175)	10 (3000)	0.19 (402)	0.32 (677)	0.50 (1058)	0.19 (402)	47 (1175)
15	(4500)	0.38 (804)	0.52 (1101)	0.76 (1609)	0.19 (402)	41 (1025)	15 (4500)	0.20 (423)	0.44 (931)	0.68 (1439)	0.19 (402)	43 (1075)
20	(6000)	0.39 (826)	0.52 (1101)	0.76 (1609)	0.19 (402)	41 (1025)	20 (6000)	0.26 (550)	0.58 (1228)	0.86 (1820)	0.19 (402)	41 (1025)
25	(7500) *	0.49 (1037)	0.65 (1376)	0.94 (1990)	0.19 (402)	41 (1025)	25 (7500) *	0.33 (699)	0.71 (1503)	1.03 (2180)	0.19 (402)	41 (1025)
7' x 5' x 8" (2100 x 1500 x 200 mm)							8' x 8" (2400 x 1200 x 200 mm)					
3	(915)	0.22 (466)	0.36 (762)	0.42 (889)	0.19 (402)	59 (1475)	3 (915)	0.31 (656)	0.39 (826)	0.45 (953)	0.19 (402)	50 (1250)
5	(1525)	0.19 (402)	0.27 (572)	0.38 (804)	0.19 (402)	47 (1175)	5 (1525)	0.25 (529)	0.31 (656)	0.42 (889)	0.19 (402)	45 (1125)
10	(3000)	0.19 (402)	0.30 (635)	0.40 (847)	0.19 (402)	43 (1075)	10 (3000)	0.31 (656)	0.36 (762)	0.54 (1143)	0.19 (402)	45 (1125)
15	(4500)	0.25 (529)	0.43 (910)	0.64 (1355)	0.19 (402)	41 (1025)	15 (4500)	0.44 (931)	0.51 (1080)	0.75 (1588)	0.19 (402)	41 (1025)
20	(6000)	0.33 (699)	0.56 (1185)	0.82 (1736)	0.19 (402)	41 (1025)	20 (6000) *	0.57 (1228)	0.67 (1418)	0.97 (2053)	0.19 (402)	41 (1025)
25	(7500) *	0.41 (868)	0.69 (1461)	0.99 (2096)	0.19 (402)	41 (1025)	25 (7500) *	0.75 (1588)	0.84 (1778)	1.18 (2498)	0.19 (402)	41 (1025)
7' x 6' x 8" (2100 x 1200 x 200 mm)							8' x 8" (2400 x 1500 x 200 mm)					
3	(915)	0.20 (423)	0.39 (826)	0.46 (974)	0.19 (402)	59 (1475)	3 (915)	0.27 (572)	0.72 (1524)	0.50 (1058)	0.19 (402)	50 (1250)
5	(1525)	0.19 (402)	0.28 (593)	0.41 (868)	0.19 (402)	47 (1175)	5 (1525)	0.23 (487)	0.33 (699)	0.46 (974)	0.19 (402)	50 (1250)
10	(3000)	0.19 (402)	0.32 (677)	0.49 (1037)	0.19 (402)	43 (1075)	10 (3000)	0.27 (572)	0.39 (826)	0.59 (1249)	0.19 (402)	45 (1125)
15	(4500)	0.22 (466)	0.44 (931)	0.66 (1397)	0.19 (402)	41 (1025)	15 (4500)	0.38 (804)	0.55 (1164)	0.81 (1715)	0.19 (402)	41 (1025)
20	(6000) *	0.29 (614)	0.57 (1207)	0.84 (1778)	0.19 (402)	41 (1025)	20 (6000) *	0.51 (1080)	0.72 (1524)	1.04 (2201)	0.19 (402)	41 (1025)
25	(7500) *	0.36 (762)	0.71 (1503)	1.03 (2180)	0.19 (402)	41 (1025)	25 (7500) *	0.65 (1376)	0.91 (1926)	1.27 (2688)	0.19 (402)	41 (1025)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM	TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}			A_{S1}	A_{S2}	A_{S3}	A_{S4}	
8' x 6' x 8" (2400 x 1800 x 200 mm)							9' x 5' x 9" (2700 x 1500 x 225 mm)					
3	(915)	0.25 (529)	0.45 (953)	0.54 (1122)	0.19 (402)	55 (1375)	3 (915)	0.34 (720)	0.44 (931)	0.54 (1143)	0.22 (466)	54 (1350)
5	(1525)	0.21 (445)	0.36 (762)	0.50 (1058)	0.19 (402)	50 (1250)	5 (1525)	0.28 (593)	0.35 (741)	0.29 (614)	0.22 (466)	49 (1225)
10	(3000)	0.25 (529)	0.41 (868)	0.62 (1312)	0.19 (402)	45 (1125)	10 (3000)	0.33 (699)	0.42 (889)	0.62 (1312)	0.22 (466)	49 (1225)
15	(4500)	0.35 (741)	0.58 (1228)	0.85 (1799)	0.19 (402)	41 (1025)	15 (4500)	0.46 (974)	0.59 (1249)	0.86 (1820)	0.22 (466)	44 (1100)
20	(6000) *	0.45 (953)	0.76 (1609)	1.08 (2286)	0.19 (402)	41 (1025)	20 (6000) *	0.61 (1291)	0.78 (1651)	1.10 (2328)	0.22 (466)	44 (1100)
25	(7500) *	0.57 (1207)	0.95 (2011)	1.32 (2794)	0.19 (402)	41 (1025)	25 (7500) *	0.78 (1651)	0.97 (2053)	1.34 (2836)	0.22 (466)	44 (1100)
8' x 7' x 8" (2400 x 2100 x 200 mm)							9' x 6' x 9" (3300 x 1800 x 225 mm)					
3	(915)	0.23 (489)	0.47 (995)	0.58 (1228)	0.19 (402)	65 (1375)	3 (915)	0.30 (635)	0.47 (995)	0.58 (1228)	0.22 (466)	59 (1475)
5	(1525)	0.19 (402)	0.38 (804)	0.54 (1143)	0.19 (402)	65 (1375)	5 (1525)	0.25 (529)	0.38 (804)	0.53 (1122)	0.22 (466)	54 (1350)
10	(3000)	0.23 (487)	0.42 (889)	0.65 (1376)	0.19 (402)	45 (1125)	10 (3000)	0.30 (635)	0.44 (931)	0.66 (1397)	0.22 (466)	49 (1225)
15	(4500)	0.32 (677)	0.59 (1249)	0.88 (1863)	0.19 (402)	41 (1025)	15 (4500)	0.42 (889)	0.62 (1312)	0.91 (1926)	0.22 (466)	44 (1100)
20	(6000) *	0.42 (889)	0.77 (1630)	1.11 (2350)	0.19 (402)	41 (1025)	20 (6000) *	0.55 (1164)	0.82 (1736)	1.16 (2455)	0.22 (466)	44 (1100)
25	(7500) *	0.52 (1101)	0.97 (2053)	1.35 (2858)	0.19 (402)	41 (1025)	25 (7500) *	0.67 (1161)	1.02 (2159)	1.42 (3006)	0.22 (466)	44 (1100)
8' x 8' x 8" (2400 x 2400 x 200 mm)							9' x 7' x 9" (2700 x 2100 x 225 mm)					
3	(915)	0.22 (466)	0.49 (1037)	0.62 (1312)	0.19 (402)	65 (1625)	3 (915)	0.28 (593)	0.49 (1037)	0.63 (1334)	0.22 (466)	59 (1475)
5	(1525)	0.19 (402)	0.40 (847)	0.57 (1207)	0.19 (402)	65 (1625)	5 (1525)	0.23 (487)	0.41 (868)	0.57 (1207)	0.22 (466)	54 (1350)
10	(3000)	0.22 (466)	0.43 (910)	0.66 (1397)	0.19 (402)	50 (1250)	10 (3000)	0.27 (572)	0.46 (974)	0.70 (1482)	0.22 (466)	49 (1225)
15	(4500)	0.30 (635)	0.59 (1249)	0.89 (1884)	0.19 (402)	45 (1125)	15 (4500)	0.38 (804)	0.65 (1376)	0.95 (2011)	0.22 (466)	44 (1100)
20	(6000) *	0.39 (826)	0.77 (1630)	1.12 (2371)	0.19 (402)	45 (1125)	20 (6000) *	0.50 (1058)	0.85 (1799)	1.21 (2561)	0.22 (466)	44 (1100)
25	(7500) *	0.49 (1037)	0.97 (2053)	1.36 (2879)	0.19 (402)	45 (1125)	25 (7500) *	0.63 (1334)	1.06 (2244)	1.46 (3090)	0.22 (466)	44 (1100)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
9' x 8' x 9" (2700 x 2400 x 225 mm)							12' x 6' x 10" (3300 x 1800 x 250 mm)						
3	(915)	0.26 (550)	0.51 (1080)	0.67 (1418)	0.22 (466)	72 (1800)	3	(915)	0.34 (720)	0.49 (1037)	0.63 (1334)	0.24 (508)	58 (1450)
5	(1525)	0.22 (466)	0.43 (910)	0.61 (1291)	0.22 (466)	59 (1475)	5	(1525)	0.30 (635)	0.41 (868)	0.56 (1185)	0.24 (508)	52 (1300)
10	(3000)	0.26 (550)	0.47 (995)	0.72 (1524)	0.22 (466)	51 (1350)	10	(3000)	0.35 (741)	0.48 (1016)	0.71 (1503)	0.24 (508)	52 (1300)
15	(4500)	0.36 (762)	0.66 (1397)	0.98 (2074)	0.22 (466)	44 (1120)	15	(4500)	0.49 (1037)	0.67 (1418)	0.97 (2053)	0.24 (508)	47 (1175)
20	(6000) *	0.46 (974)	0.86 (1820)	1.23 (2604)	0.22 (466)	44 (1120)	20	(6000) *	0.65 (1376)	0.88 (1863)	1.24 (2625)	0.24 (508)	47 (1175)
25	(7500) *	0.58 (1228)	1.07 (2265)	1.49 (3154)	0.22 (466)	44 (1120)	25	(7500) *	0.82 (1736)	1.09 (2307)	1.51 (3196)	0.24 (508)	47 (1175)
9' x 9' x 9" (2700 x 2700 x 225 mm)							10' x 7' x 10" (3000 x 2100 x 250 mm)						
3	(915)	0.25 (529)	0.53 (1122)	0.71 (1503)	0.22 (466)	72 (1800)	3	(915)	0.32 (677)	0.51 (1080)	0.67 (1417)	0.24 (508)	64 (1600)
5	(1525)	0.22 (466)	0.44 (931)	0.64 (1355)	0.22 (466)	72 (1800)	5	(1525)	0.28 (593)	0.43 (910)	0.60 (1270)	0.24 (508)	58 (1450)
10	(3000)	0.25 (529)	0.48 (1016)	0.74 (1567)	0.22 (466)	59 (1475)	10	(3000)	0.32 (677)	0.50 (1058)	0.75 (1588)	0.24 (508)	52 (1300)
15	(4500)	0.34 (720)	0.66 (1397)	0.99 (2096)	0.22 (466)	49 (1225)	15	(4500)	0.45 (953)	0.70 (1482)	1.02 (2059)	0.24 (508)	47 (1175)
20	(6000) *	0.44 (931)	0.86 (1820)	1.25 (2646)	0.22 (466)	49 (1225)	20	(6000) *	0.59 (1249)	0.91 (1926)	1.29 (2731)	0.24 (508)	47 (1175)
25	(7500) *	0.55 (1164)	1.08 (2286)	1.50 (3175)	0.22 (466)	44 (1100)	25	(7500) *	0.74 (1567)	1.14 (2413)	1.57 (3323)	0.24 (508)	47 (1175)
10' x 5' x 10" (3000 x 1500 x 250 mm)							10' x 8' x 10" (3000 x 2400 x 250 mm)						
3	(915)	0.38 (804)	0.46 (974)	0.57 (1207)	0.24 (508)	58 (1450)	3	(915)	0.30 ( )	0.54 (1143)	0.72 (1270)	0.24 (508)	64 (1600)
5	(1525)	0.32 (677)	0.38 (804)	0.52 (1101)	0.24 (508)	52 (1300)	5	(1525)	0.26 (550)	0.46 (974)	0.64 (974)	0.24 (508)	58 (1450)
10	(3000)	0.39 (826)	0.45 (953)	0.66 (1397)	0.24 (508)	52 (1300)	10	(3000)	0.30 (635)	0.52 (1101)	0.78 (1228)	0.24 (508)	52 (1300)
15	(4500)	0.54 (1143)	0.63 (1334)	0.91 (1926)	0.24 (508)	47 (1175)	15	(4500)	0.42 (890)	0.72 (1524)	1.05 (2223)	0.24 (508)	47 (1175)
20	(6000) *	0.72 (1524)	0.82 (1736)	1.17 (2477)	0.24 (508)	47 (1175)	20	(6000) *	0.54 (1143)	0.94 (1990)	1.33 (2815)	0.24 (508)	47 (1175)
25	(7500) *	0.91 (1926)	1.03 (2180)	1.42 (3006)	0.24 (508)	47 (1175)	25	(7500) *	0.68 (1439)	1.17 (2477)	1.62 (3429)	0.24 (508)	47 (1175)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
10' x 9' x 10" (3000 x 2700 x 250 mm)							12' x 5' x 12" (3600 x 1500 x 300 mm)						
3	(915)	0.28 (593)	0.56 (1185)	0.76 (1609)	0.24 (508)	79 (1975)	3	(915)	0.47 (995)	0.48 (1016)	0.61 (1291)	0.29 (614)	73 (1825)
5	(1525)	0.24 (508)	0.47 (995)	0.68 (1439)	0.24 (508)	64 (1600)	5	(1525)	0.42 (889)	0.52 (1101)	0.57 (1207)	0.29 (614)	66 (1650)
10	(3000)	0.29 (614)	0.53 (1122)	0.81 (1715)	0.24 (508)	58 (1450)	10	(3000)	0.51 (1080)	0.50 (1058)	0.71 (1503)	0.29 (614)	59 (1475)
15	(4500)	0.39 (826)	0.73 (1545)	1.08 (2286)	0.24 (508)	47 (1175)	15	(4500)	0.72 (1524)	0.70 (1482)	1.01 (2138)	0.29 (614)	59 (1475)
20	(6000) *	0.51 (1080)	0.95 (2011)	1.36 (2879)	0.24 (508)	47 (1175)	20	(6000) *	0.95 (2011)	0.91 (1926)	1.29 (2731)	0.29 (614)	59 (1475)
25	(7500) *	0.64 (1355)	1.18 (2498)	1.64 (3471)	0.24 (508)	47 (1175)	25	(7500) *	1.21 (2561)	1.14 (2413)	1.57 (3323)	0.29 (614)	59 (1475)
10' x 10' x 10" (3000 x 3000 x 250 mm)							12' x 6' x 12" (3600 x 1800 x 300 mm)						
3	(915)	0.26 (550)	0.57 (1207)	0.80 (1693)	0.24 (508)	79 (1975)	3	(915)	0.44 (931)	0.52 (1101)	0.66 (1397)	0.29 (614)	66 (1650)
5	(1525)	0.24 (508)	0.50 (1058)	0.72 (1524)	0.24 (508)	70 (1750)	5	(1525)	0.39 (826)	0.45 (953)	0.62 (1312)	0.29 (614)	59 (1475)
10	(3000)	0.28 (593)	0.54 (1143)	0.83 (1757)	0.24 (508)	64 (1600)	10	(3000)	0.47 (995)	0.54 (1143)	0.79 (1672)	0.29 (614)	59 (1475)
15	(4500)	0.38 (804)	0.74 (1567)	1.19 (2519)	0.24 (508)	52 (1300)	15	(4500)	0.66 (1397)	0.75 (1588)	1.08 (2286)	0.29 (614)	53 (1325)
20	(6000) *	0.49 (1037)	0.95 (2011)	1.38 (2921)	0.24 (508)	52 (1300)	20	(6000) *	0.86 (1820)	0.98 (2074)	1.38 (2921)	0.29 (614)	53 (1325)
25	(7500) *	0.61 (1291)	1.19 (2519)	1.65 (3493)	0.24 (508)	47 (1175)	25	(7500) *	1.07 (2307)	1.22 (2582)	1.68 (3556)	0.29 (614)	53 (1325)
12' x 4' x 12" (3600 x 1200 x 300 mm)							12' x 7' x 12" (3600 x 2100 x 300 mm)						
3	(915)	0.31 (656)	0.69 (1461)	0.95 (2011)	0.29 (614)	73 (1825)	3	(915)	0.41 (868)	0.55 (1164)	0.77 (1630)	0.29 (614)	66 (1650)
5	(1525)	0.46 (974)	0.53 (1122)	0.80 (1693)	0.29 (614)	66 (1650)	5	(1525)	0.37 (783)	0.49 (1037)	0.67 (1418)	0.29 (614)	59 (1475)
10	(3000)	0.56 (1185)	0.46 (974)	0.67 (1418)	0.29 (614)	59 (1475)	10	(3000)	0.44 (931)	0.57 (1207)	0.84 (1778)	0.29 (614)	59 (1475)
15	(4500)	0.80 (1693)	0.64 (1355)	0.92 (1947)	0.29 (614)	59 (1475)	15	(4500)	0.60 (1270)	0.79 (1672)	1.15 (2434)	0.29 (614)	53 (1325)
20	(6000)	1.06 (2244)	0.83 (1757)	1.18 (2498)	0.29 (614)	59 (1475)	20	(6000) *	0.79 (1672)	1.03 (2180)	1.46 (3090)	0.29 (614)	53 (1325)
25	(7500) *	1.35 (2858)	1.03 (2180)	1.44 (2434)	0.29 (614)	59 (1475)	25	(7500) *	0.99 (2096)	1.28 (2731)	1.77 (3747)	0.29 (614)	53 (1325)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.0 INCHES (50 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
12' x 8' x 12" (3600 x 2400 x 300 mm)							12' x 11' x 12" (3600 x 3300 x 300 mm)						
3	(915)	0.38 (804)	0.58 (1228)	0.76 (1609)	0.29 (614)	66 (1650)	3	(915)	0.32 (677)	0.66 (1397)	0.90 (1905)	0.29 (614)	93 (2325)
5	(1525)	0.35 (741)	0.51 (1080)	0.72 (1524)	0.29 (614)	59 (1475)	5	(1525)	0.31 (656)	0.58 (1228)	0.84 (1778)	0.29 (614)	80 (2000)
10	(3000)	0.41 (868)	0.59 (1249)	0.89 (1884)	0.29 (614)	59 (1475)	10	(3000)	0.35 (741)	0.64 (1355)	0.99 (2096)	0.29 (614)	73 (1825)
15	(4500)	0.56 (1186)	0.83 (1757)	1.20 (2540)	0.29 (614)	53 (1325)	15	(4500)	0.48 (1016)	0.88 (1863)	1.31 (2773)	0.29 (614)	59 (1475)
20	(6000) *	0.73 (1545)	1.07 (2265)	1.52 (3217)	0.29 (614)	53 (1325)	20	(6000) *	0.62 (1312)	1.14 (2413)	1.63 (3450)	0.29 (614)	59 (1475)
25	(7500) *	0.92 (1947)	1.34 (2836)	1.84 (3895)	0.29 (614)	53 (1325)	25	(7500) *	0.77 (1630)	1.41 (2985)	1.96 (4159)	0.29 (614)	59 (1475)
12' x 9' x 12" (3600 x 2700 x 300 mm)							12' x 12' x 12" (3600 x 3600 x 300 mm)						
3	(915)	0.36 (762)	0.61 (1291)	0.81 (1715)	0.29 (614)	80 (2000)	3	(915)	0.31 (656)	0.65 (1376)	0.95 (2011)	0.29 (614)	93 (2325)
5	(1525)	0.33 (699)	0.54 (1143)	0.76 (1609)	0.29 (614)	66 (1650)	5	(1525)	0.29 (614)	0.60 (1270)	0.88 (1863)	0.29 (614)	80 (2000)
10	(3000)	0.39 (826)	0.61 (1291)	0.92 (1947)	0.29 (614)	59 (1475)	10	(3000)	0.34 (720)	0.65 (1376)	1.01 (2138)	0.29 (614)	73 (1825)
15	(4500)	0.53 (1122)	0.85 (1799)	1.24 (2625)	0.29 (614)	53 (1325)	15	(4500)	0.46 (974)	0.89 (1884)	1.33 (2815)	0.29 (614)	59 (1475)
20	(6000) *	0.68 (1439)	1.10 (2328)	1.57 (3323)	0.29 (614)	53 (1325)	20	(6000) *	0.60 (1270)	1.14 (2413)	1.65 (3493)	0.29 (614)	59 (1475)
25	(7500) *	0.85 (1799)	1.37 (2900)	1.90 (4022)	0.29 (614)	53 (1325)	25	(7500) *	0.74 (1567)	1.41 (2985)	1.96 (4159)	0.29 (614)	59 (1475)
12' x 10' x 12" (3600 x 3000 x 300 mm)													
3	(915)	0.34 (720)	0.63 (1334)	0.75 (1588)	0.29 (614)	80 (2000)							
5	(1525)	0.31 (656)	0.56 (1185)	0.80 (1693)	0.29 (614)	66 (1650)							
10	(3000)	0.37 (783)	0.63 (1334)	0.96 (2032)	0.29 (614)	59 (1475)							
15	(4500)	0.50 (1058)	0.87 (1842)	1.27 (2688)	0.29 (614)	53 (1325)							
20	(6000) *	0.64 (1355)	1.13 (2307)	1.60 (3387)	0.29 (614)	53 (1325)							
25	(7500) *	0.80 (1693)	1.40 (2963)	1.94 (4106)	0.29 (614)	53 (1325)							

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SPAN, S	RISE, R	T_t TOP	T_b BOTTOM	T_w SIDE	H HAUNCH	TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)							
FEET (mm)	FEET (mm)	INCHES (mm)	INCHES (mm)	INCHES (mm)	INCHES (mm)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}
3 (900)	2 (600)	7 (175)	6 (150)	4 (100)	4 (100)	0.17 (360)	0.38 (804)	0.30 (635)	0.10 (212)	0.22 (466)	0.17 (360)	0.17 (360)	0.14 (296)
3 (900)	3 (900)	7 (175)	6 (150)	4 (100)	4 (100)	0.17 (360)	0.40 (847)	0.32 (677)	0.10 (212)	0.23 (487)	0.17 (360)	0.17 (360)	0.14 (296)
4 (1200)	2 (600)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.40 (847)	0.29 (614)	0.12 (254)	0.21 (445)	0.18 (381)	0.18 (381)	0.14 (296)
4 (1200)	3 (900)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.45 (953)	0.34 (720)	0.12 (254)	0.23 (487)	0.18 (381)	0.18 (381)	0.14 (296)
4 (1200)	4 (1200)	7.5 (190)	6 (150)	5 (125)	5 (125)	0.18 (381)	0.47 (995)	0.36 (762)	0.12 (254)	0.25 (529)	0.18 (381)	0.18 (381)	0.14 (296)
5 (1500)	3 (900)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.44 (931)	0.34 (720)	0.14 (296)	0.22 (466)	0.19 (402)	0.19 (402)	0.17 (360)
5 (1500)	4 (1200)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.48 (1016)	0.33 (699)	0.14 (296)	0.24 (508)	0.19 (402)	0.19 (402)	0.17 (360)
5 (1500)	5 (1500)	8 (200)	7 (175)	6 (150)	6 (150)	0.19 (402)	0.50 (1059)	0.35 (741)	0.14 (296)	0.25 (529)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	3 (900)	8 (200)	7 (175)	7 (175)	7 (175)	0.23 (487)	0.45 (953)	0.32 (677)	0.17 (360)	0.22 (466)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	4 (1200)	8 (200)	7 (175)	7 (175)	7 (175)	0.23 (487)	0.49 (1037)	0.36 (762)	0.17 (360)	0.23 (487)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	5 (1500)	8 (200)	7 (175)	7 (175)	7 (175)	0.19 (402)	0.52 (1101)	0.37 (783)	0.17 (360)	0.25 (529)	0.19 (402)	0.19 (402)	0.17 (360)
6 (1800)	6 (1800)	8 (200)	7 (175)	7 (175)	7 (175)	0.19 (402)	0.54 (1143)	0.39 (826)	0.17 (360)	0.26 (550)	0.19 (402)	0.19 (402)	0.17 (360)
7 (2100)	4 (1200)	8 (200)	8 (200)	8 (200)	8 (200)	0.26 (550)	0.49 (1037)	0.34 (720)	0.19 (402)	0.23 (487)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	5 (1500)	8 (200)	8 (200)	8 (200)	8 (200)	0.23 (487)	0.52 (1101)	0.38 (804)	0.19 (402)	0.24 (508)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	6 (1800)	8 (200)	8 (200)	8 (200)	8 (200)	0.21 (445)	0.54 (1143)	0.41 (868)	0.19 (402)	0.26 (550)	0.19 (402)	0.19 (402)	0.19 (402)
7 (2100)	7 (2100)	8 (200)	8 (200)	8 (200)	8 (200)	0.19 (402)	0.56 (1186)	0.44 (931)	0.19 (402)	0.27 (572)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	4 (1200)	8 (200)	8 (200)	8 (200)	8 (200)	0.31 (656)	0.53 (1122)	0.38 (804)	0.19 (402)	0.25 (529)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	5 (1500)	8 (200)	8 (200)	8 (200)	8 (200)	0.28 (593)	0.57 (1207)	0.43 (910)	0.19 (402)	0.26 (550)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	6 (1800)	8 (200)	8 (200)	8 (200)	8 (200)	0.26 (550)	0.59 (1249)	0.46 (974)	0.19 (402)	0.28 (593)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	7 (2100)	8 (200)	8 (200)	8 (200)	8 (200)	0.24 (508)	0.62 (1313)	0.51 (1080)	0.19 (402)	0.29 (614)	0.19 (402)	0.19 (402)	0.19 (402)
8 (2400)	8 (2400)	8 (200)	8 (200)	8 (200)	8 (200)	0.22 (466)	0.64 (1354)	0.55 (1164)	0.24 (508)	0.30 (635)	0.19 (402)	0.19 (402)	0.19 (402)
9 (2700)	5 (1500)	9 (225)	9 (225)	9 (225)	9 (225)	0.29 (614)	0.53 (1122)	0.43 (910)	0.22 (466)	0.25 (529)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	6 (1800)	9 (225)	9 (225)	9 (225)	9 (225)	0.27 (572)	0.56 (1186)	0.47 (995)	0.22 (466)	0.26 (550)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	7 (2100)	9 (225)	9 (225)	9 (225)	9 (225)	0.25 (529)	0.58 (1228)	0.51 (1080)	0.22 (466)	0.27 (572)	0.22 (466)	0.22 (466)	0.22 (466)

SHALLOW COVER BOXES – COVER 0' TO 2' (0 TO 600 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

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PRECAST REINFORCED CONCRETE BOX

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SPAN, S	RISE, R	T_t	T_b	T_w	H	TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)							
FEET (mm)	FEET (mm)	TOP INCHES (mm)	BOTTOM INCHES (mm)	SIDE INCHES (mm)	HAUNCH INCHES (mm)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}
9 (2700)	8 (2400)	9 (225)	9 (225)	9 (225)	9 (225)	0.23 (487)	0.60 (1270)	0.54 (1143)	0.22 (466)	0.28 (593)	0.22 (466)	0.22 (466)	0.22 (466)
9 (2700)	9 (2700)	9 (225)	9 (225)	9 (225)	9 (225)	0.24 (508)	0.62 (1313)	0.58 (1228)	0.27 (572)	0.28 (593)	0.22 (466)	0.22 (466)	0.22 (466)
10 (3000)	5 (1500)	10 (250)	10 (250)	10 (250)	10 (250)	0.29 (614)	0.51 (1080)	0.45 (953)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	6 (1800)	10 (250)	10 (250)	10 (250)	10 (250)	0.27 (572)	0.53 (1122)	0.49 (1037)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	7 (2100)	10 (250)	10 (250)	10 (250)	10 (250)	0.25 (529)	0.55 (1164)	0.52 (1101)	0.24 (508)	0.25 (529)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	8 (2400)	10 (250)	10 (250)	10 (250)	10 (250)	0.24 (508)	0.57 (1207)	0.57 (1207)	0.24 (508)	0.26 (550)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	9 (2700)	10 (250)	10 (250)	10 (250)	10 (250)	0.24 (508)	0.59 (1249)	0.60 (1270)	0.25 (529)	0.27 (572)	0.24 (508)	0.24 (508)	0.24 (508)
10 (3000)	10 (3000)	10 (250)	10 (250)	10 (250)	10 (250)	0.26 (550)	0.60 (1270)	0.64 (1355)	0.30 (635)	0.28 (593)	0.24 (508)	0.24 (508)	0.24 (508)
12 (3600)	4 (1200)	12 (300)	12 (300)	12 (300)	12 (300)	0.37 (785)	0.44 (931)	0.42 (889)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	5 (1500)	12 (300)	12 (300)	12 (300)	12 (300)	0.35 (741)	0.46 (973)	0.47 (995)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	6 (1800)	12 (300)	12 (300)	12 (300)	12 (300)	0.33 (699)	0.49 (1037)	0.51 (1080)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	7 (2100)	12 (300)	12 (300)	12 (300)	12 (300)	0.31 (656)	0.51 (1080)	0.55 (1164)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	8 (2400)	12 (300)	12 (300)	12 (300)	12 (300)	0.30 (635)	0.52 (1101)	0.60 (1270)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	9 (2700)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.54 (1143)	0.64 (1355)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	10 (3000)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.55 (1164)	0.68 (1439)	0.29 (614)	0.30 (635)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	11 (3300)	12 (300)	12 (300)	12 (300)	12 (300)	0.29 (614)	0.57 (1207)	0.72 (1524)	0.30 (635)	0.31 (656)	0.29 (614)	0.29 (614)	0.29 (614)
12 (3600)	12 (3600)	12 (300)	12 (300)	12 (300)	12 (300)	0.31 (656)	0.58 (1228)	0.76 (1609)	0.32 (677)	0.32 (677)	0.29 (614)	0.29 (614)	0.29 (614)

SHALLOW COVER BOXES – COVER 0' TO 2' (0 TO 610 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
3' x 2' x 4" (900 x 600 x 100 mm)							4' x 3' x 5" (1200 x 900 x 125 mm)						
3	(915)	0.13 (275)	0.21 (445)	0.25 (529)	0.10 (217)	31 (775)	3	(915) *	0.17 (360)	0.28 (593)	0.41 (868)	0.12 (254)	38 (950)
5	(1525) *	0.10 (217)	0.10 (217)	0.22 (466)	0.10 (217)	31 (775)	5	(1525) *	0.12 (254)	0.12 (254)	0.25 (529)	0.12 (254)	38 (950)
10	(3000) *	0.10 (217)	0.11 (233)	0.28 (593)	0.10 (217)	31 (775)	10	(3000) *	0.12 (254)	0.15 (318)	0.32 (677)	0.12 (254)	38 (950)
							15	(4500) *	0.12 (254)	0.23 (489)	0.46 (974)	0.12 (254)	38 (950)
3' x 3' x 4" (900 x 900 x 100 mm)							4' x 4' x 5" (1200 x 1200 x 125 mm)						
3	(915)	0.10 (217)	0.25 (529)	0.27 (572)	0.10 (217)	31 (775)	3	(915)	0.14 (296)	0.31 (656)	0.45 (953)	0.12 (254)	38 (950)
5	(1525) *	0.10 (217)	0.10 (217)	0.23 (487)	0.10 (217)	31 (775)	5	(1525) *	0.12 (254)	0.14 (296)	0.26 (550)	0.12 (254)	38 (950)
10	(3000) *	0.10 (217)	0.11 (233)	0.29 (614)	0.10 (217)	31 (775)	10	(3000) *	0.12 (254)	0.15 (318)	0.32 (677)	0.12 (254)	38 (950)
							15	(4500) *	0.12 (254)	0.22 (466)	0.46 (974)	0.12 (254)	38 (950)
4' x 2' x 5" (1200 x 600 x 125 mm)							5' x 3' x 6" (1500 x 900 x 150 mm)						
3	(915) *	0.19 (402)	0.23 (489)	0.34 (720)	0.12 (254)	38 (950)	3	(915)	0.14 (296)	0.29 (614)	0.34 (720)	0.14 (296)	45 (1125)
5	(1525) *	0.12 (254)	0.12 (254)	0.21 (445)	0.12 (254)	38 (950)	5	(1525)	0.14 (296)	0.15 (318)	0.26 (550)	0.14 (296)	36 (900)
10	(3000) *	0.12 (254)	0.14 (296)	0.28 (593)	0.12 (254)	38 (950)	10	(3000)	0.14 (296)	0.18 (381)	0.34 (720)	0.14 (296)	36 (900)
15	(4500) *	0.16 (339)	0.20 (423)	0.41 (868)	0.12 (254)	38 (950)	15	(4500) *	0.18 (381)	0.27 (572)	0.49 (1037)	0.14 (296)	35 (875)
20	(6000) *	0.22 (466)	0.27 (572)	0.54 (1143)	0.12 (254)	38 (950)	20	(6000) *	0.25 (529)	0.36 (762)	0.64 (1355)	0.14 (296)	35 (875)
							25	(7500) *	0.32 (677)	0.46 (974)	0.80 (1693)	0.14 (296)	35 (875)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
5' x 4' x 6" (1500 x 1200 x 150 mm)							6' x 4' x 7" (1800 x 1200 x 175 mm)						
3	(915)	0.18 (381)	0.33 (699)	0.39 (826)	0.14 (296)	45 (1125)	3	(915)	0.22 (466)	0.33 (699)	0.36 (762)	0.17 (360)	43 (1075)
5	(1525)	0.14 (296)	0.16 (339)	0.29 (614)	0.14 (296)	45 (1125)	5	(1525)	0.17 (360)	0.18 (381)	0.30 (635)	0.17 (360)	40 (1000)
10	(3000)	0.14 (296)	0.20 (423)	0.37 (783)	0.14 (296)	39 (900)	10	(3000)	0.17 (360)	0.22 (466)	0.39 (826)	0.17 (360)	39 (975)
15	(4500)	0.15 (318)	0.29 (614)	0.53 (1122)	0.14 (296)	35 (875)	15	(4500)	0.21 (445)	0.33 (699)	0.57 (1207)	0.17 (360)	38 (850)
20	(6000) *	0.20 (423)	0.39 (826)	0.69 (1461)	0.14 (296)	35 (875)	20	(6000) *	0.28 (593)	0.44 (931)	0.74 (1567)	0.17 (360)	38 (850)
							25	(7500) *	0.35 (741)	0.56 (1185)	0.91 (1926)	0.17 (360)	38 (850)
5' x 5' x 6" (1500 x 1500 x 150 mm)							6' x 5' x 7" (1800 x 1500 x 175 mm)						
3	(915)	0.16 (339)	0.35 (741)	0.43 (910)	0.14 (296)	45 (1125)	3	(915)	0.19 (402)	0.36 (762)	0.41 (868)	0.17 (360)	52 (1300)
5	(1525)	0.14 (296)	0.17 (360)	0.31 (656)	0.14 (296)	45 (1125)	5	(1525)	0.17 (360)	0.20 (423)	0.34 (720)	0.17 (360)	43 (1075)
10	(3000)	0.14 (296)	0.20 (423)	0.38 (804)	0.14 (296)	40 (1125)	10	(3000)	0.17 (360)	0.24 (508)	0.43 (910)	0.17 (360)	39 (975)
15	(4500)	0.14 (296)	0.29 (614)	0.54 (1143)	0.14 (296)	36 (900)	15	(4500)	0.18 (381)	0.35 (741)	0.61 (1291)	0.17 (360)	38 (950)
20	(6000) *	0.17 (360)	0.39 (826)	0.70 (1482)	0.14 (296)	35 (875)	20	(6000) *	0.24 (508)	0.47 (995)	0.79 (1672)	0.17 (360)	38 (950)
							25	(7500) *	0.30 (635)	0.59 (1249)	0.97 (2053)	0.17 (360)	38 (950)
6' x 3' x 7" (1800 x 900 x 175 mm)							6' x 6' x 7" (1800 x 1800 x 175 mm)						
3	(915)	0.24 (508)	0.30 (635)	0.32 (677)	0.17 (360)	43 (1075)	3	(915)	0.17 (360)	0.38 (804)	0.43 (910)	0.17 (360)	52 (1300)
5	(1525)	0.17 (360)	0.17 (360)	0.27 (572)	0.17 (360)	40 (1000)	5	(1525)	0.17 (360)	0.20 (423)	0.35 (741)	0.17 (360)	52 (1300)
10	(3000)	0.17 (360)	0.21 (445)	0.36 (762)	0.17 (360)	39 (975)	10	(3000)	0.17 (360)	0.24 (508)	0.43 (910)	0.17 (360)	43 (1075)
15	(4500)	0.25 (529)	0.31 (656)	0.52 (1101)	0.17 (360)	38 (950)	15	(4500)	0.17 (360)	0.34 (720)	0.60 (1270)	0.17 (360)	39 (975)
20	(6000) *	0.34 (720)	0.41 (868)	0.68 (1439)	0.17 (360)	38 (950)	20	(6000) *	0.21 (445)	0.46 (974)	0.78 (1651)	0.17 (360)	38 (950)
25	(7500) *	0.44 (931)	0.52 (1101)	0.84 (1778)	0.17 (360)	38 (950)	25	(7500) *	0.25 (529)	0.58 (1228)	0.96 (2032)	0.17 (360)	38 (950)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM	TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)				M INCHES (mm)
	A_{S1}	A_{S2}	A_{S3}	A_{S4}	
7' x 4' x 8" (2100 x 1200 x 200 mm)					
3 (915)	0.24 (508)	0.33 (699)	0.41 (868)	0.19 (402)	47 (1175)
5 (1525)	0.19 (402)	0.21 (445)	0.33 (699)	0.19 (402)	43 (1075)
10 (3000)	0.19 (402)	0.26 (550)	0.43 (910)	0.19 (402)	43 (1075)
15 (4500)	0.28 (593)	0.38 (804)	0.62 (1312)	0.19 (402)	41 (1025)
20 (6000) *	0.37 (783)	0.51 (1080)	0.81 (1715)	0.19 (402)	41 (1025)
25 (7500) *	0.47 (995)	0.64 (1355)	1.00 (2117)	0.19 (402)	41 (1025)
7' x 5' x 8" (2100 x 1500 x 200 mm)					
3 (915)	0.22 (466)	0.36 (762)	0.46 (974)	0.19 (402)	59 (1475)
5 (1525)	0.19 (402)	0.23 (489)	0.37 (783)	0.19 (402)	43 (1075)
10 (3000)	0.19 (402)	0.28 (593)	0.47 (995)	0.19 (402)	43 (1075)
15 (4500)	0.24 (508)	0.41 (868)	0.67 (1418)	0.19 (402)	41 (1025)
20 (6000) *	0.32 (677)	0.54 (1143)	0.87 (1842)	0.19 (402)	41 (1025)
25 (7500) *	0.40 (847)	0.68 (1438)	1.07 (2265)	0.19 (402)	41 (1025)
7' x 6' x 8" (2100 x 1200 x 200 mm)					
3 (915)	0.20 (423)	0.39 (826)	0.50 (1058)	0.19 (402)	59 (1475)
5 (1525)	0.19 (402)	0.24 (508)	0.40 (847)	0.19 (402)	47 (1175)
10 (3000)	0.19 (402)	0.29 (614)	0.49 (1037)	0.19 (402)	43 (1075)
15 (4500)	0.21 (445)	0.41 (868)	0.70 (1482)	0.19 (402)	41 (1025)
20 (6000) *	0.28 (593)	0.55 (1164)	0.90 (1905)	0.19 (402)	41 (1025)
25 (7500) *	0.33 (699)	0.70 (1482)	1.10 (2328)	0.19 (402)	41 (1025)

H_e EARTH COVER FT (mm) MAXIMUM	TRANSVERSE REINFORCEMENT AREA, IN^2/ FT (mm^2/ m)				M INCHES (mm)
	A_{S1}	A_{S2}	A_{S3}	A_{S4}	
7' x 7' x 8" (2100 x 2100 x 200 mm)					
3 (915)	0.19 (402)	0.41 (868)	0.54 (1143)	0.19 (402)	59 (1475)
5 (1525)	0.19 (402)	0.25 (529)	0.42 (889)	0.19 (402)	59 (1475)
10 (3000)	0.19 (402)	0.29 (614)	0.51 (1080)	0.19 (402)	47 (1175)
15 (4500)	0.19 (402)	0.42 (889)	0.71 (1503)	0.19 (402)	43 (1075)
20 (6000) *	0.26 (550)	0.56 (1185)	0.91 (1926)	0.19 (402)	41 (1025)
25 (7500) *	0.32 (677)	0.70 (1482)	1.11 (2350)	0.19 (402)	41 (1025)
8' x 4' x 8" (2400 x 1200 x 200 mm)					
3 (915)	0.32 (677)	0.39 (826)	0.49 (1037)	0.19 (402)	50 (1250)
5 (1525)	0.22 (466)	0.26 (550)	0.41 (868)	0.19 (402)	45 (1125)
10 (3000)	0.28 (593)	0.33 (699)	0.55 (1164)	0.19 (402)	45 (1125)
15 (4500)	0.42 (889)	0.49 (1037)	0.79 (1672)	0.19 (402)	41 (1025)
20 (6000) *	0.57 (1207)	0.65 (1376)	1.03 (2180)	0.19 (402)	41 (1025)
25 (7500) *	0.71 (1545)	0.83 (1757)	1.27 (2688)	0.19 (402)	41 (1025)
8' x 5' x 8" (2400 x 1500 x 200 mm)					
3 (915)	0.28 (593)	0.42 (889)	0.55 (1164)	0.19 (402)	50 (1250)
5 (1525)	0.20 (423)	0.28 (593)	0.46 (974)	0.19 (402)	50 (1250)
10 (3000)	0.25 (529)	0.35 (741)	0.60 (1270)	0.19 (402)	45 (1125)
15 (4500)	0.37 (783)	0.52 (1101)	0.85 (1799)	0.19 (402)	41 (1025)
20 (6000) *	0.49 (1037)	0.70 (1482)	1.11 (2350)	0.19 (402)	41 (1025)
25 (7500) *	0.63 (1334)	0.89 (1884)	1.36 (2879)	0.19 (402)	41 (1025)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
8' x 6' x 8" (2400 x 1800 x 200 mm)							9' x 5' x 9" (2700 x 1500 x 225 mm)						
3	(915)	0.25 (529)	0.45 (953)	0.59 (1249)	0.19 (402)	55 (1375)	3	(915)	0.34 (720)	0.44 (931)	0.58 (1228)	0.22 (466)	54 (1350)
5	(1525)	0.19 (402)	0.30 (635)	0.50 (1058)	0.19 (402)	50 (1250)	5	(1525)	0.24 (508)	0.30 (635)	0.48 (1016)	0.22 (466)	49 (1225)
10	(3000)	0.23 (489)	0.37 (783)	0.63 (1334)	0.19 (402)	45 (1125)	10	(3000)	0.30 (635)	0.38 (804)	0.63 (1334)	0.22 (466)	49 (1225)
15	(4500)	0.33 (699)	0.55 (1164)	0.89 (1884)	0.19 (402)	41 (1025)	15	(4500)	0.44 (931)	0.56 (1185)	0.89 (1884)	0.22 (466)	44 (1100)
20	(6000) *	0.44 (931)	0.73 (1545)	1.16 (2455)	0.19 (402)	41 (1025)	20	(6000) *	0.59 (1249)	0.75 (1588)	1.16 (2455)	0.22 (466)	44 (1100)
							25	(7500) *	0.76 (1609)	0.95 (2011)	1.43 (3027)	0.22 (466)	44 (1100)
8' x 7' x 8" (2400 x 2100 x 200 mm)							9' x [illegible] x 9" (3300 x 1800 x 225 mm)						
3	(915)	0.23 (489)	0.47 (995)	0.64 (1355)	0.19 (402)	55 (1625)	3	(915)	0.37 (783)	0.47 (995)	0.71 (1503)	0.22 (466)	59 (1475)
5	(1525)	0.19 (402)	0.31 (656)	0.53 (1122)	0.19 (402)	50 (1375)	5	(1525)	[illegible] (466)	0.32 (677)	0.51 (1080)	0.22 (466)	54 (1350)
10	(3000)	0.21 (445)	0.38 (804)	0.65 (1376)	0.19 (402)	40 (1125)	10	(3000)	[illegible] (572)	0.40 (847)	0.67 (1418)	0.22 (466)	49 (1225)
15	(4500)	0.30 (635)	0.56 (1185)	0.92 (1947)	0.19 (402)	41 (1025)	15	(4500)	[illegible] (347)	0.59 (1249)	0.95 (2011)	0.22 (466)	44 (1100)
20	(6000) *	0.40 (847)	0.75 (1588)	1.19 (2519)	0.19 (402)	41 (1025)	20	(6000) *	0.5[illegible] (422)	0.79 (1672)	1.23 (2604)	0.22 (466)	44 (1100)
							25	(7500) *	0.68 (1438)	1.00 (2117)	1.51 (1080)	0.22 (466)	44 (1100)
8' x 8' x 8" (2400 x 2400 x 200 mm)							9' x [illegible]' x 9" ([illegible] x 2100 x 225 mm)						
3	(915)	0.22 (466)	0.49 (1037)	0.68 (1439)	0.19 (402)	65 (1625)	[illegible]	(915)	0.28 ([illegible])	0.49 (1037)	0.68 (1439)	0.22 (466)	59 (1475)
5	(1525)	0.19 (402)	0.33 (699)	0.55 (1164)	0.19 (402)	65 (1625)	[illegible]	(1525)	0.22 (466)	0.34 (720)	0.55 (1164)	0.22 (466)	54 (1350)
10	(3000)	0.20 (423)	0.39 (826)	0.67 (1418)	0.19 (402)	50 (1250)	10	(3000)	[illegible]25 (529)	[illegible]42 (889)	0.70 (1482)	0.22 (466)	49 (1225)
15	(4500)	0.29 (614)	0.56 (1185)	0.94 (1990)	0.19 (402)	45 (1125)	15	(4500)	[illegible]36 (762)	0.61 (1291)	0.98 (2074)	0.22 (466)	44 (1100)
20	(6000) *	0.38 (804)	0.75 (1588)	1.20 (2540)	0.19 (402)	45 (1125)	20	(6000) *	0.48 (1016)	0.82 (1736)	1.27 (2688)	0.22 (466)	44 (1100)
							25	(7500) *	0.61 (1291)	1.04 (2202)	1.56 (3302)	0.22 (466)	44 (1100)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x
HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR
TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM	TRANSVERSE REINFORCEMENT AREA, IN 2/ FT (mm 2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}			A_{S1}	A_{S2}	A_{S3}	A_{S4}	
9' x 8' x 9" (2700 x 2400 x 225 mm)							10' x 6' x 10" (3300 x 1800 x 250 mm)					
3	(915)	0.26 (550)	0.51 (1080)	0.73 (1545)	0.22 (466)	72 (1800)	3 (915)	0.35 (741)	0.49 (1037)	0.67 (1418)	0.24 (508)	58 (1450)
5	(1525)	0.22 (466)	0.35 (741)	0.58 (1228)	0.22 (466)	59 (1475)	5 (1525)	0.26 (550)	0.34 (720)	0.54 (1143)	0.24 (508)	52 (1300)
10	(3000)	0.24 (508)	0.43 (910)	0.72 (1524)	0.22 (466)	54 (1350)	10 (3000)	0.32 (677)	0.44 (931)	0.70 (1482)	0.24 (508)	52 (1300)
15	(4500)	0.34 (720)	0.63 (1334)	1.01 (2138)	0.22 (466)	44 (1100)	15 (4500)	0.47 (995)	0.63 (1334)	1.00 (2117)	0.24 (508)	47 (1175)
20	(6000) *	0.45 (953)	0.83 (1757)	1.30 (2752)	0.22 (466)	44 (1100)	20 (6000) *	0.63 (1334)	0.85 (1799)	1.29 (2731)	0.24 (508)	47 (1175)
25	(7500) *	0.57 (1207)	1.05 (2223)	1.59 (3366)	0.22 (466)	44 (1100)	25 (7500) *	0.80 (1693)	1.07 (2265)	1.59 (3366)	0.24 (508)	47 (1175)
9' x 9' x 9" (2700 x 2700 x 225 mm)							10' x 7' x 10" (3000 x 2100 x 250 mm)					
3	(915)	0.25 (529)	0.53 (1122)	0.77 (1630)	0.22 (466)	72 (1800)	3 (915)	0.32 (677)	0.51 (1080)	0.71 (1503)	0.24 (508)	64 (1600)
5	(1525)	0.22 (466)	0.37 (783)	0.61 (1291)	0.22 (466)	52 (1800)	5 (1525)	0.24 (508)	0.35 (741)	0.56 (1185)	0.24 (508)	58 (1450)
10	(3000)	0.23 (487)	0.43 (910)	0.74 (1567)	0.22 (466)	50 (1475)	10 (3000)	0.30 (635)	0.47 (995)	0.75 (1588)	0.24 (508)	52 (1300)
15	(4500)	0.32 (677)	0.63 (1334)	1.03 (2180)	0.22 (466)	45 (1225)	15 (4500)	0.42 (889)	0.65 (1376)	1.02 (2159)	0.24 (508)	47 (1175)
20	(6000) *	0.43 (910)	0.84 (1778)	1.31 (2773)	0.22 (466)	49 (1225)	20 (6000) *	0.54 (1143)	0.84 (1778)	1.28 (2709)	0.24 (508)	47 (1175)
							25 (7500) *	0.67 (1418)	1.04 (2201)	1.56 (3302)	0.24 (508)	47 (1175)
10' x 5' x 10" (3000 x 1500 x 250 mm)							10' x 8' x 10" (3000 x 2400 x 250 mm)					
3	(915)	0.38 (804)	0.46 (974)	0.61 (1291)	0.24 (508)	58 (1450)	3 (915)	0.30 (635)	0.54 (1143)	0.77 (1630)	0.24 (508)	64 (1600)
5	(1525)	0.28 (593)	0.32 (677)	0.50 (1058)	0.24 (508)	52 (1300)	5 (1525)	0.24 (508)	0.38 (804)	0.61 (1291)	0.24 (508)	58 (1450)
10	(3000)	0.35 (741)	0.41 (868)	0.66 (1397)	0.24 (508)	52 (1300)	10 (3000)	0.28 (593)	0.47 (995)	0.77 (1630)	0.24 (508)	52 (1300)
15	(4500)	0.52 (1101)	0.60 (1270)	0.94 (1990)	0.24 (508)	47 (1175)	15 (4500)	0.40 (868)	0.68 (1439)	1.08 (2286)	0.24 (508)	47 (1175)
20	(6000) *	0.70 (1482)	0.80 (1693)	1.22 (2582)	0.24 (508)	47 (1175)	20 (6000) *	0.53 (1122)	0.91 (1926)	1.39 (2942)	0.24 (508)	47 (1175)
25	(7500) *	0.90 (1905)	1.01 (2138)	1.50 (3175)	0.24 (508)	47 (1175)	25 (7500) *	0.67 (1418)	1.15 (2434)	1.70 (3598)	0.24 (508)	47 (1175)

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM		TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m)				M INCHES (mm)
		A_{S1}	A_{S2}	A_{S3}	A_{S4}				A_{S1}	A_{S2}	A_{S3}	A_{S4}	
10' x 9' x 10" (3000 x 2700 x 250 mm)							12' x 5' x 12" (3600 x 1500 x 300 mm)						
3	(915)	0.28 (593)	0.56 (1185)	0.81 (1715)	0.24 (508)	79 (1975)	3	(915)	0.47 (995)	0.48 (1016)	0.64 (1355)	0.29 (614)	73 (1825)
5	(1525)	0.24 (508)	0.39 (826)	0.64 (1355)	0.24 (508)	64 (1600)	5	(1525)	0.37 (783)	0.36 (762)	0.55 (1164)	0.29 (614)	66 (1650)
10	(3000)	0.27 (572)	0.48 (1016)	0.80 (1693)	0.24 (508)	59 (1450)	10	(3000)	0.47 (995)	0.46 (974)	0.72 (1524)	0.29 (614)	59 (1475)
15	(4500)	0.38 (804)	0.63 (1334)	1.11 (2350)	0.24 (508)	47 (1175)	15	(4500)	0.69 (1461)	0.67 (1418)	1.03 (2180)	0.29 (614)	59 (1475)
20	(6000) *	0.50 (1058)	0.92 (1947)	1.42 (3006)	0.24 (508)	47 (1175)	20	(6000) *	0.92 (1947)	0.89 (1884)	1.33 (2815)	0.29 (614)	59 (1475)
25	(7500) *	0.63 (1334)	1.16 (2455)	1.73 (3662)	0.24 (508)	47 (1175)	25	(7500) *	1.18 (2498)	1.12 (2371)	1.64 (3471)	0.29 (614)	59 (1475)
10' x 10' x 10" (3000 x 3000 x 250 mm)							12' x [illegible] 12" (3600 x 1800 x 300 mm)						
3	(915)	0.27 (572)	0.57 (1207)	0.86 (1820)	0.24 (508)	79 (1975)	3	(915)	0.44 (931)	0.52 (1101)	0.70 (1482)	0.29 (614)	66 (1650)
5	(1525)	0.24 (508)	0.41 (868)	0.67 (1418)	0.24 (508)	70 (1750)	5	(1525)	[illegible] (720)	0.39 (826)	0.60 (1270)	0.29 (614)	59 (1475)
10	(3000)	0.26 (550)	0.48 (1016)	0.82 (1736)	0.24 (508)	60 (1600)	10	(3000)	[illegible] (910)	0.49 (1037)	0.78 (1651)	0.29 (614)	59 (1475)
15	(4500)	0.36 (762)	0.70 (1482)	1.13 (2392)	0.24 (508)	52 (1300)	15	(4500)	[illegible] (1334)	0.72 (1524)	1.10 (2328)	0.29 (614)	53 (1325)
20	(6000) *	0.48 (1016)	0.92 (1947)	1.46 (3090)	0.24 (508)	52 (1300)	20	(6000) *	[illegible] (1778)	0.95 (2011)	1.43 (3027)	0.29 (614)	53 (1325)
25	(7500) *	0.60 (1270)	1.06 (2244)	1.74 (3683)	0.24 (508)	47 (1175)	25	(7500) *	1.07 (2265)	1.20 (2540)	1.75 (3704)	0.29 (614)	53 (1325)
12' x 4' x 12" (3600 x 1200 x 300 mm)							12' x [illegible]' x 12" (360[illegible] x 2100 x 300 mm)						
3	(915)	0.50 (1058)	0.44 (931)	0.58 (1228)	0.29 (614)	73 (1825)	[illegible]	(915)	0.41 [illegible]	0.55 (1164)	0.75 (1588)	0.29 (614)	66 (1650)
5	(1525)	0.40 (847)	0.33 (699)	0.50 (1058)	0.29 (614)	66 (1650)	[illegible]	(1525)	0.32 (677)	0.41 (868)	0.64 (1355)	0.29 (614)	59 (1475)
10	(3000)	0.51 (1080)	0.42 (889)	0.66 (1397)	0.29 (614)	59 (1475)	10	(3000)	0.40 (847)	[illegible].2 (1101)	0.83 (1757)	0.29 (614)	59 (1475)
15	(4500)	0.76 (1609)	0.61 (1291)	0.94 (1990)	0.29 (614)	59 (1475)	15	(4500)	[illegible].58 (1226)	0.76 (1609)	1.17 (2477)	0.29 (614)	53 (1325)
20	(6000)	1.03 (2180)	0.81 (1715)	1.22 (2582)	0.29 (614)	59 (1475)	20	(6000) *	0.77 (1630)	1.00 (2117)	1.50 (3175)	0.29 (614)	53 (1325)
25	(7500) *	1.32 (2794)	1.02 (2159)	1.50 (3175)	0.29 (614)	59 (1475)	25	(7500) *	0.97 (2053)	1.26 (2667)	1.84 (3895)	0.29 (614)	53 (1325)

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PRECAST REINFORCED CONCRETE BOX

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SHEET 41 OF 42

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EARTH COVER MORE THAN 2' (610 mm)
STEEL COVER 2.5 INCHES (63 mm) AT TOP OF INVERT SLAB

DIMENSIONS SHOWN ARE SPAN x RISE x HAUNCH, WALL AND SLAB THICKNESS

* WHERE NOTED, SUBMIT DETAILS FOR TOP SLAB SHEAR REINFORCEMENT

H_e EARTH COVER FT (mm) MAXIMUM	TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m) A_{S1}	A_{S2}	A_{S3}	A_{S4}	M INCHES (mm)	H_e EARTH COVER FT (mm) MAXIMUM	TRANSVERSE REINFORCEMENT AREA, IN2/ FT (mm2/ m) A_{S1}	A_{S2}	A_{S3}	A_{S4}	M INCHES (mm)
12' x 8' x 12" (3600 x 2400 x 300 mm)						12' x 11' x 12" (3600 x 3300 x 300 mm)					
3 (915)	0.39 (826)	0.58 (1228)	0.81 (1715)	0.29 (614)	66 (1650)	3 (915)	0.35 (741)	0.66 (1397)	0.95 (2011)	0.29 (614)	93 (2325)
5 (1525)	0.30 (635)	0.43 (910)	0.68 (1439)	0.29 (614)	59 (1475)	5 (1525)	0.29 (614)	0.48 (1016)	0.79 (1672)	0.29 (614)	80 (2000)
10 (3000)	0.38 (804)	0.54 (1143)	0.87 (1842)	0.29 (614)	59 (1475)	10 (3000)	0.33 (699)	0.58 (1228)	0.97 (2053)	0.29 (614)	73 (1825)
15 (4500)	0.54 (1143)	0.79 (1672)	1.22 (2582)	0.29 (614)	53 (1325)	15 (4500)	0.46 (974)	0.84 (779)	1.33 (2815)	0.29 (614)	59 (1475)
20 (6000) *	0.71 (1503)	1.04 (2201)	1.57 (3323)	0.29 (614)	53 (1325)	20 (6000) *	0.60 (1270)	1.10 (2328)	1.68 (3556)	0.29 (614)	59 (1475)
25 (7500) *	0.90 (1905)	1.31 (2773)	1.91 (4043)	0.29 (614)	53 (1325)	25 (7500) *	0.75 (1588)	1.38 (2921)	2.04 (4318)	0.29 (614)	59 (1475)
12' x 9' x 12" (3600 x 2700 x 300 mm)						12' x 12' x 12" (3600 x 3600 x 300 mm)					
3 (915)	0.37 (783)	0.61 (1291)	0.86 (1820)	0.29 (614)	80 (2000)	3 (915)	0.31 (656)	0.69 (1461)	1.00 (2117)	0.29 (614)	93 (2325)
5 (1525)	0.29 (614)	0.45 (953)	0.72 (1524)	0.29 (614)	66 (1650)	5 (1525)	0.29 (614)	0.50 (1058)	0.83 (1757)	0.29 (614)	80 (2000)
10 (3000)	0.36 (762)	0.56 (1185)	0.91 (1926)	0.29 (614)	59 (1475)	10 (3000)	0.32 (677)	0.59 (1249)	1.00 (2117)	0.29 (614)	73 (1825)
15 (4500)	0.50 (1058)	0.81 (1715)	1.26 (2667)	0.29 (614)	53 (1325)	15 (4500)	0.45 (953)	0.84 (779)	1.35 (2858)	0.29 (614)	59 (1475)
20 (6000) *	0.66 (1397)	1.07 (2265)	1.62 (3429)	0.29 (614)	53 (1325)	20 (6000) *	0.58 (1228)	1.11 (2350)	1.70 (3598)	0.29 (614)	59 (1475)
25 (7500) *	0.84 (1778)	1.35 (2858)	1.97 (4170)	0.29 (614)	53 (1325)	25 (7500) *	0.71 (1545)	1.38 (2921)	2.05 (4339)	0.29 (614)	59 (1475)
12' x 10' x 12" (3600 x 3000 x 300 mm)											
3 (915)	0.34 (720)	0.64 (1355)	0.90 (1905)	0.29 (614)	80 (2000)						
5 (1525)	0.29 (614)	0.47 (995)	0.76 (1609)	0.29 (614)	66 (1650)						
10 (3000)	0.34 (720)	0.57 (1207)	0.94 (1990)	0.29 (614)	59 (1475)						
15 (4500)	0.48 (1016)	0.83 (1757)	1.30 (2752)	0.29 (614)	53 (1325)						
20 (6000) *	0.63 (1334)	1.09 (2307)	1.65 (3493)	0.29 (614)	53 (1325)						
25 (7500) *	0.79 (1672)	1.37 (2900)	2.01 (4255)	0.29 (614)	53 (1325)						

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PRECAST REINFORCED CONCRETE BOX

STANDARD PLAN
390–1
SHEET 42 OF 42

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SECTION 500

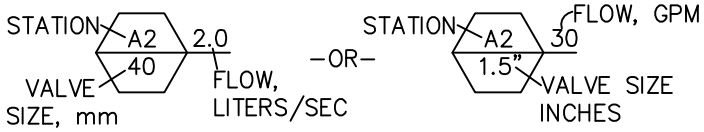
Landscaping and Irrigation Systems

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POINT OF CONNECTION	POC
WATER METER	M
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	BPA
VACUUM BREAKER ASSEMBLY – ATMOSPHERIC TYPE	
VACUUM BREAKER ASSEMBLY – PRESSURE TYPE	
PRESSURE REGULATOR	
PRESSURE RELIEF	
PUMP	P
Y–STRAINER	
THRUST BLOCK	TB
ANGLE VALVE	
GATE VALVE	
QUICK COUPLER VALVE – ABOVE GRADE	
QUICK COUPLER VALVE – BELOW GRADE	
HOSE BIBB	
REMOTE CONTROL VALVE	

RCV STATION INFORMATION



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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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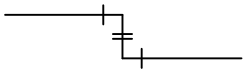
LANDSCAPE IRRIGATION SYMBOLS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

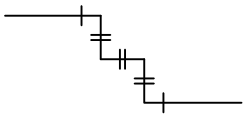
STANDARD PLAN 500–2

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SWING JOINT ASSEMBLY – SINGLE

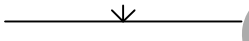


SWING JOINT ASSEMBLY – DOUBLE

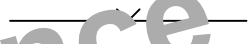


SHRUB HEAD*

1/4 CIRCLE



1/2 CIRCLE



LAWN HEAD*

1/4 CIRCLE



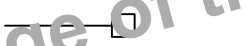
1/2 CIRCLE



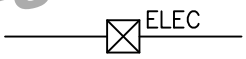
FULL



BUBBLER HEAD



ELECTRICAL METER CABINET



AUTOMATIC CONTROLLER & CABINET



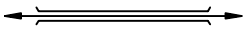
ELECTRICAL CONDUIT



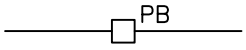
CONTROL WIRES – DIRECT BURIAL



CONTROL WIRES – IN CONDUIT



PULL BOX



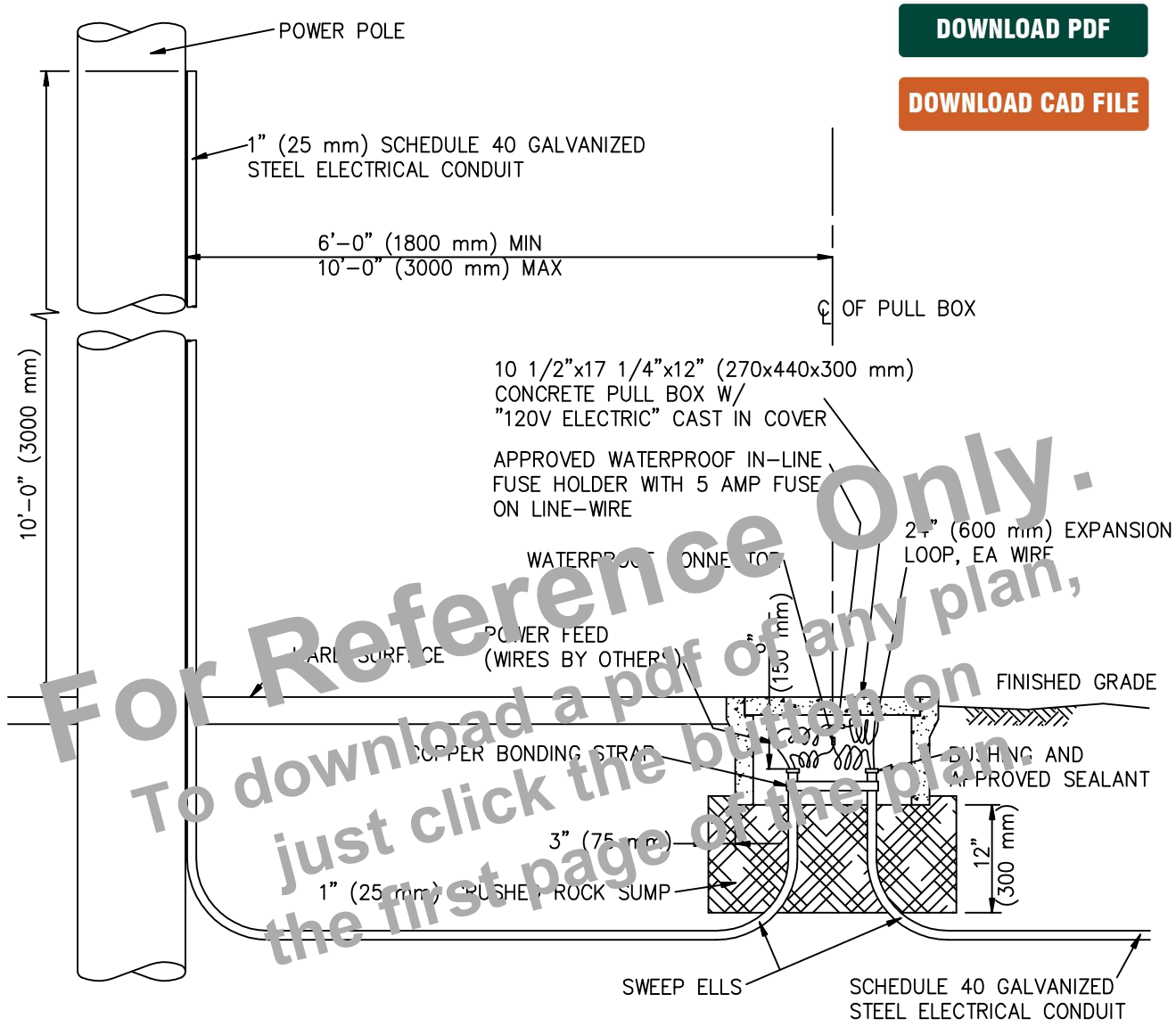
*SEE PLANS FOR SYMBOLS USED FOR MULTIPLE TYPES AND SIZES

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
LANDSCAPE IRRIGATION SYMBOLS	**500–2**
	SHEET 2 OF 2

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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

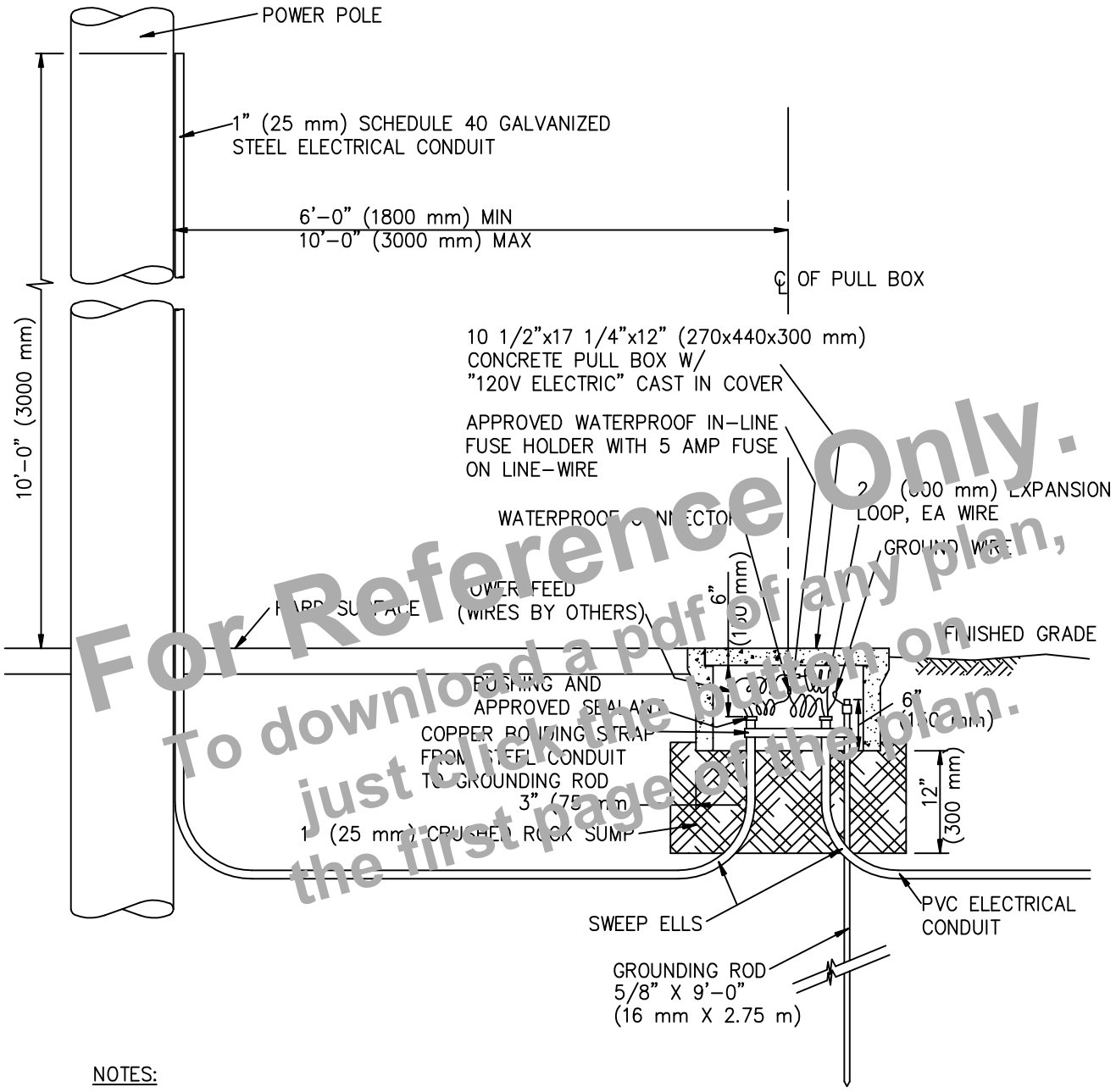
PROMULGATED BY THE
PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1996, 2005, 2009

ELECTRICAL SERVICE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
501-3
SHEET 1 OF 3

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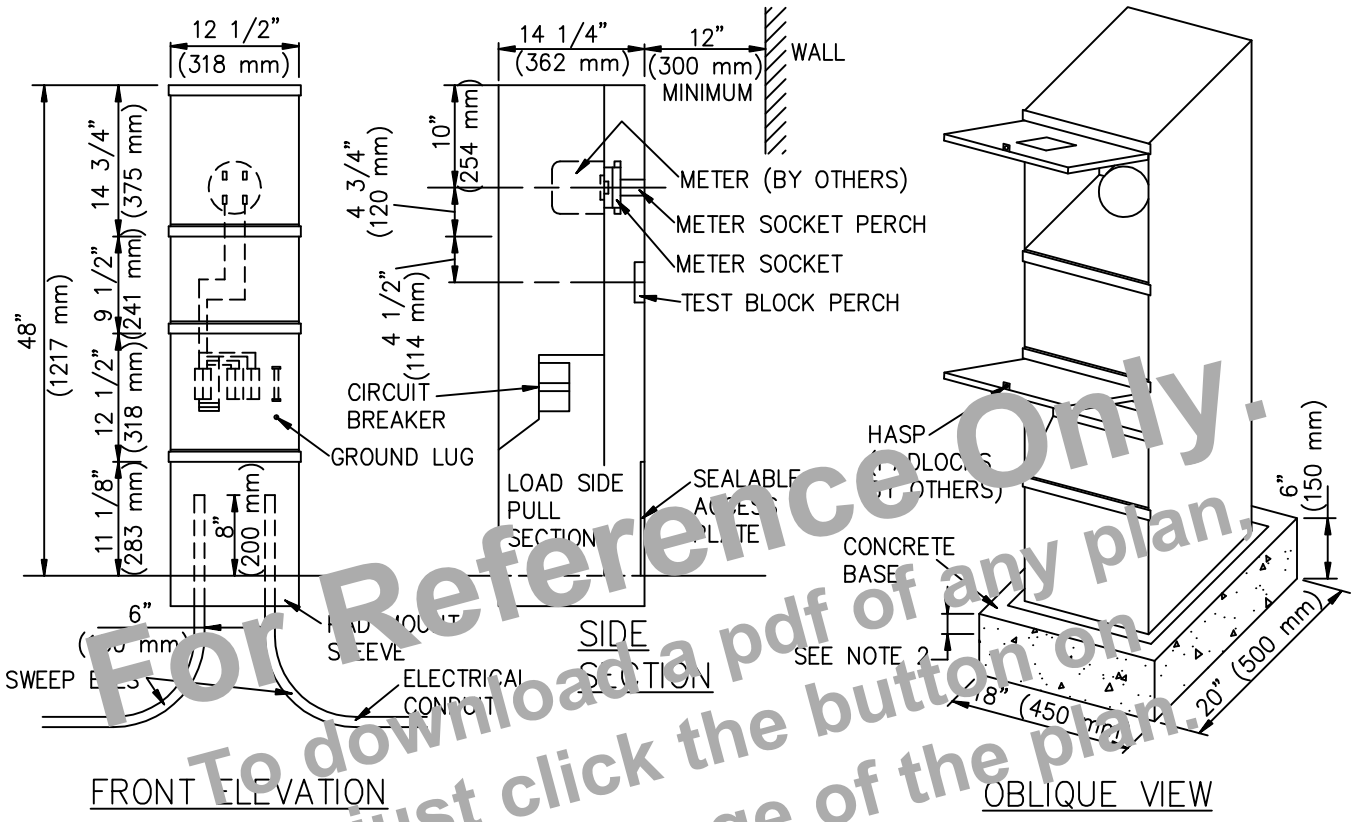
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NOTES:

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	STANDARD PLAN
ELECTRICAL SERVICE	**501-3**
	SHEET 2 OF 3

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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.

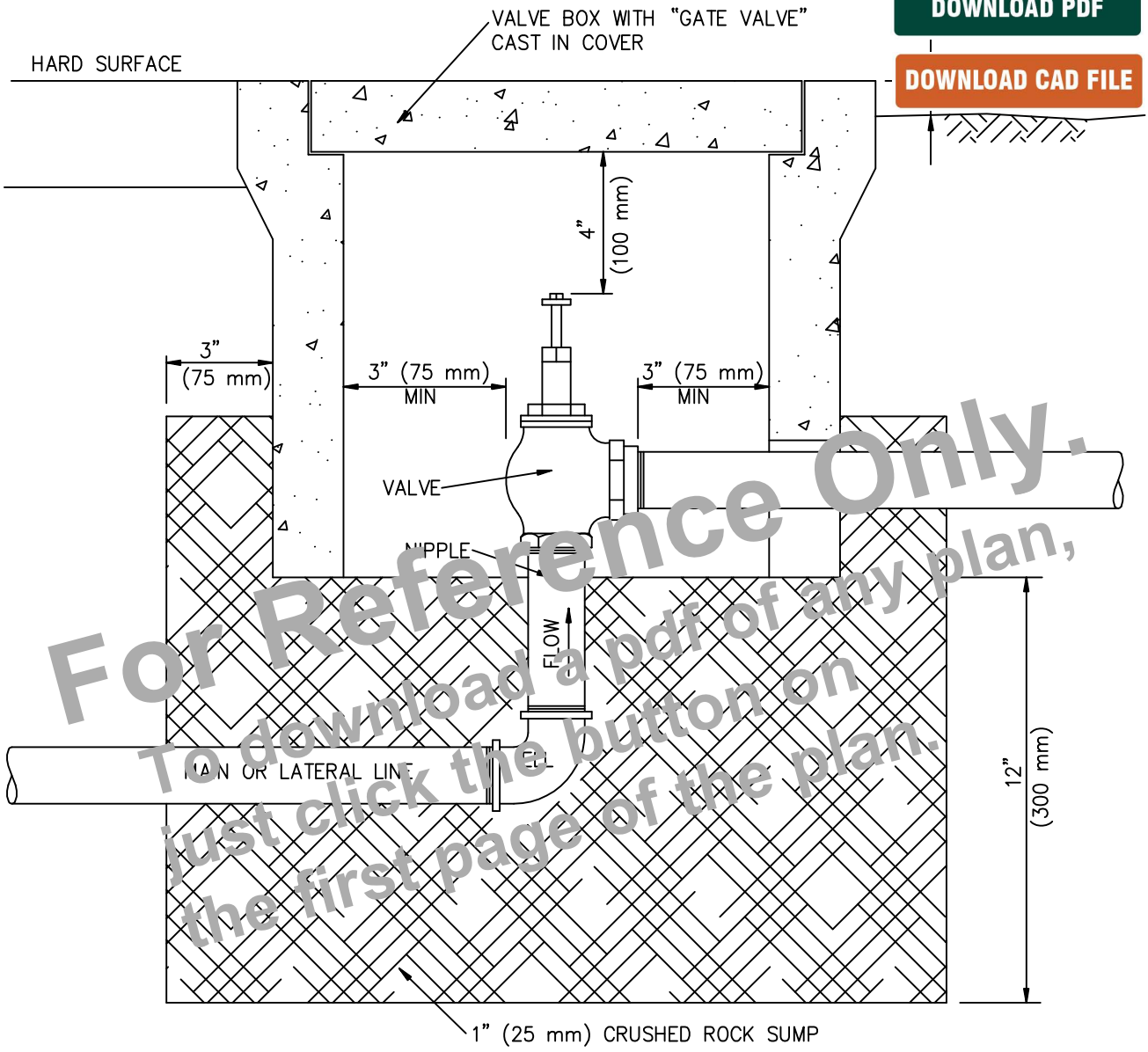
5. MATERIAL (UNLESS OTHERWISE NOTED):
   BODY – 12 GAGE (2.75 mm) GALVANIZED STEEL. DEAD FRONT AND COVERS – 16 GAGE (1.61 mm) GALVANIZED STEEL. FINISH – IRON PHOSPHATE DIP, ZINC CHROMATE PRIME, GREEN BAKED ENAMEL SURFACE.

6. CABINET SHALL INCLUDE 2 POLE MAIN CIRCUIT BREAKER, 100 A.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
ELECTRICAL SERVICE	**501-3**
	SHEET 3 OF 3

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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

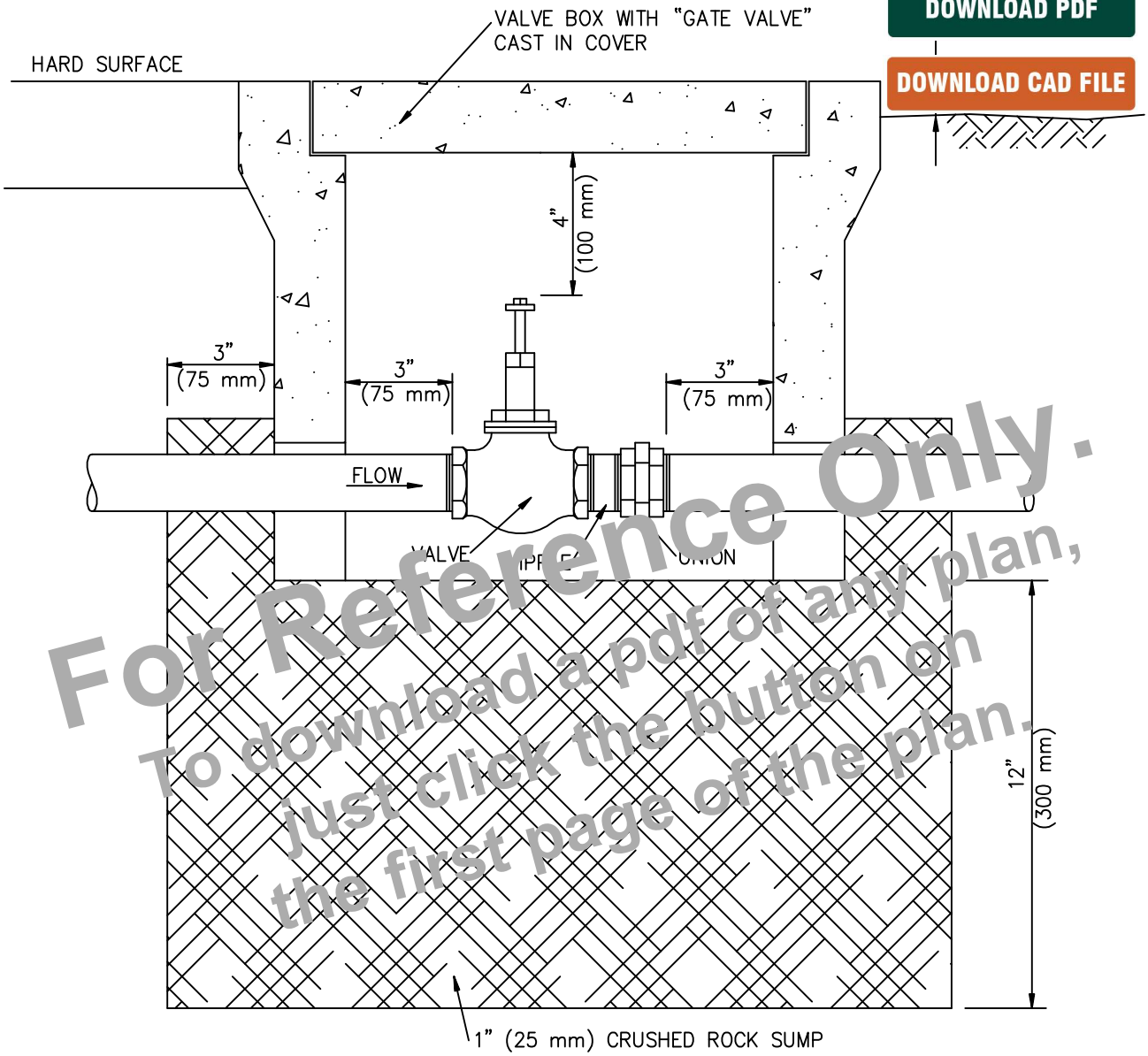
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 502-3

SHEET 1 OF 1

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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

GATE VALVE

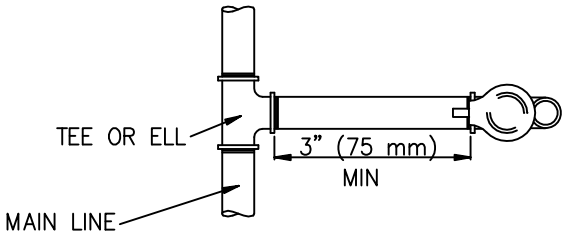
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 503-3

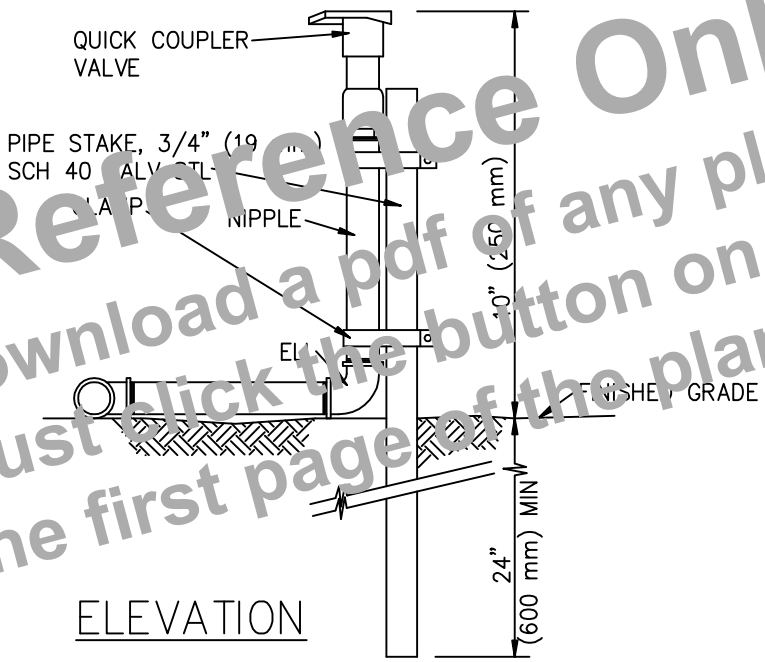
SHEET 1 OF 1

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PLAN



ELEVATION

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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

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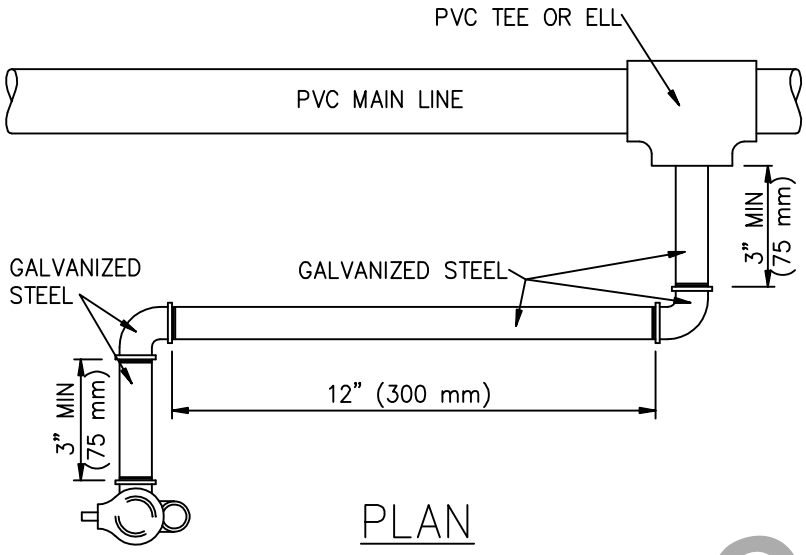
QUICK COUPLER VALVE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

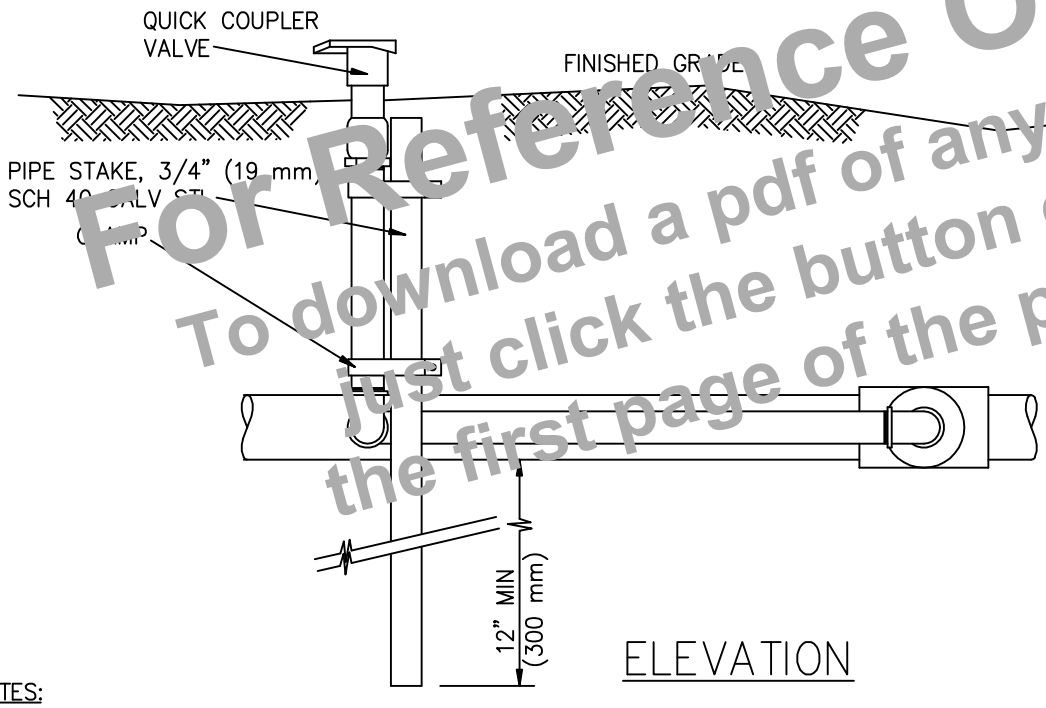
STANDARD PLAN 504-3

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PLAN



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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.

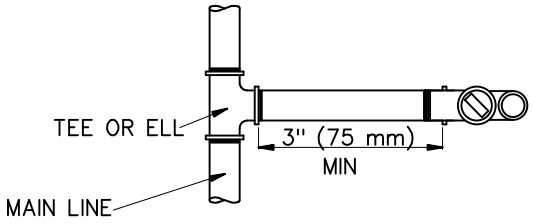
SYMBOL ON PLAN

BELOW–GRADE PIPING INSTALLATION

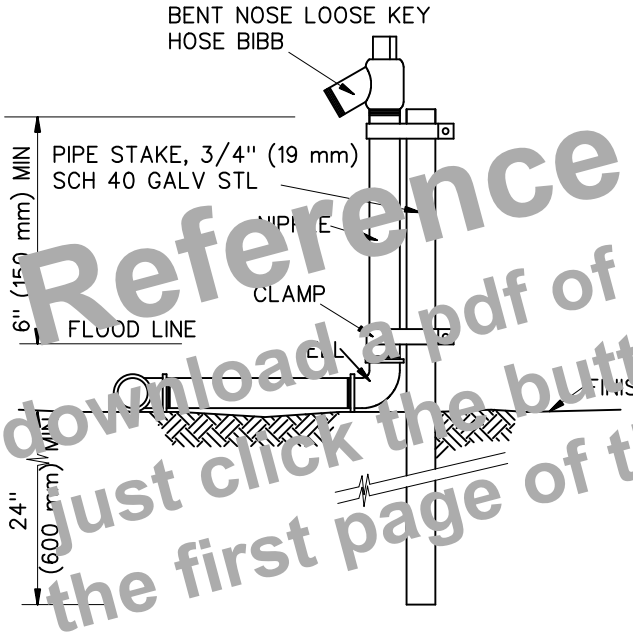
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
QUICK COUPLER VALVE	**504–3**
	SHEET 2 OF 2

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PLAN



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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, 2006, 2009, 2021

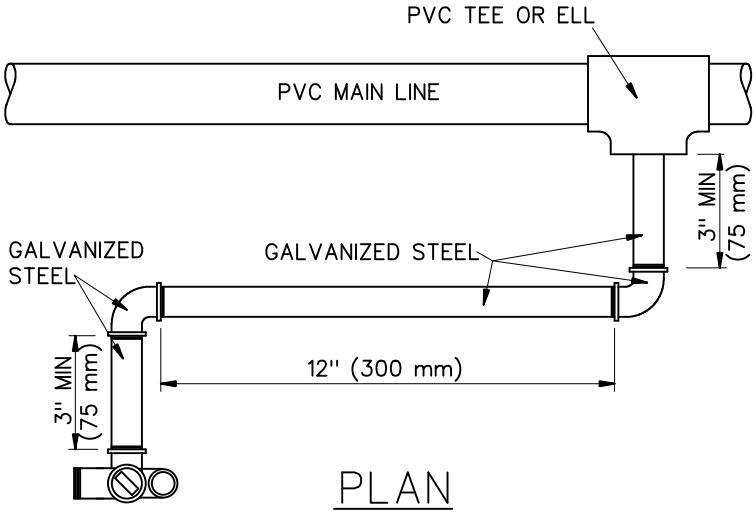
HOSE BIBB VALVE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

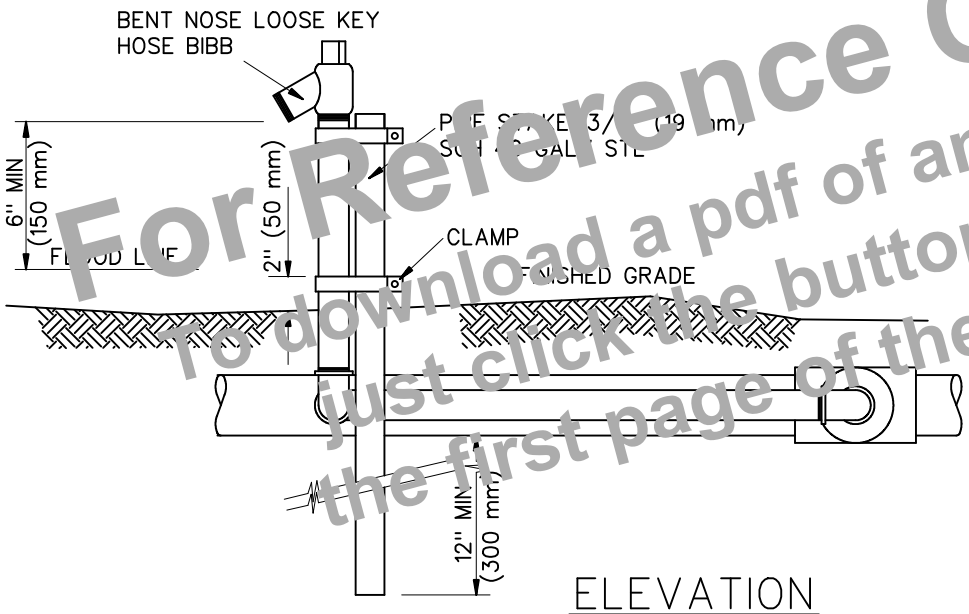
STANDARD PLAN 505-4

SHEET 1 OF 2

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PLAN



ELEVATION

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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

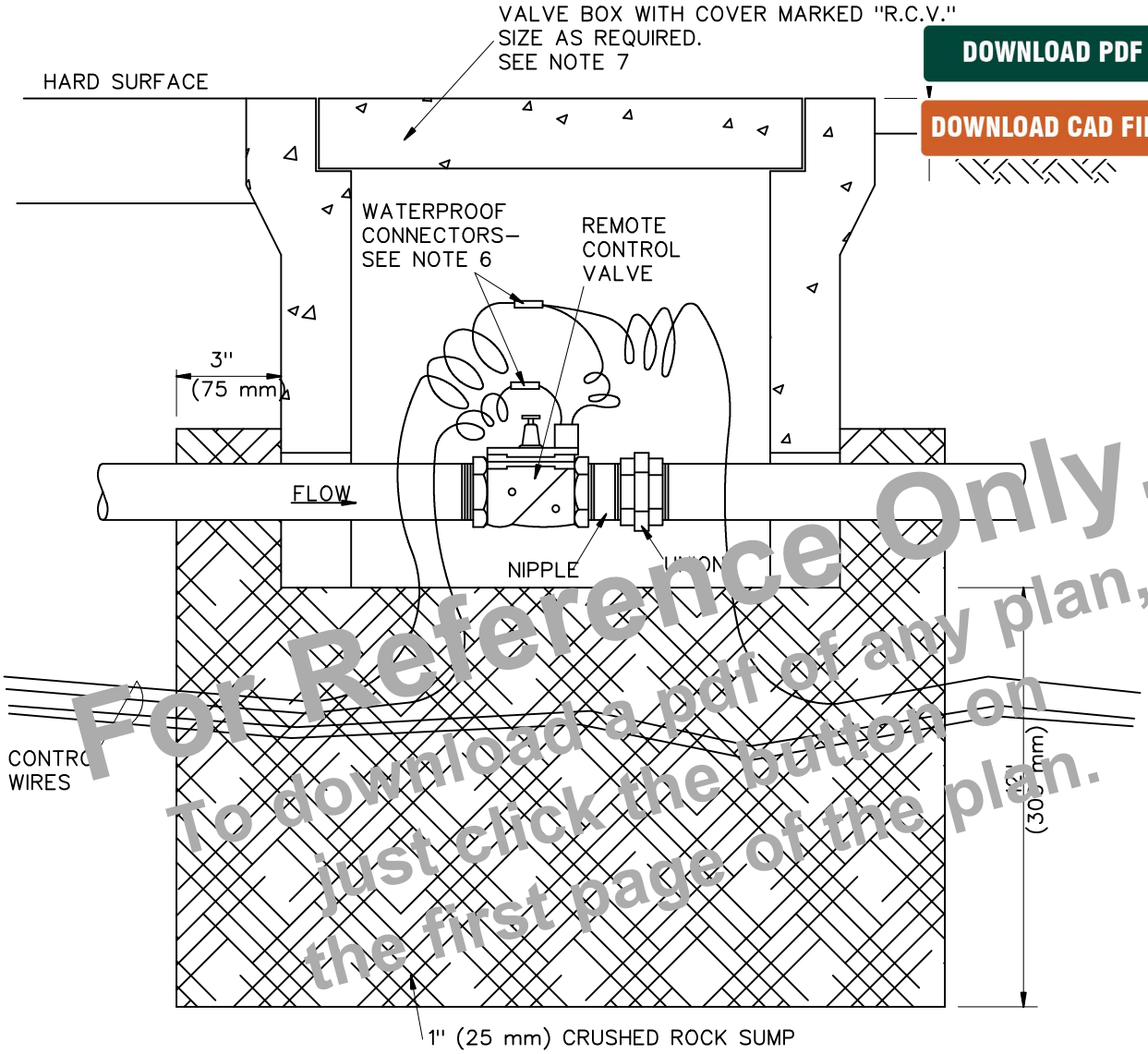
SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
HOSE BIBB VALVE	**505-4**
	SHEET 2 OF 2

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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

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PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1996, 2005, 2009, 2021

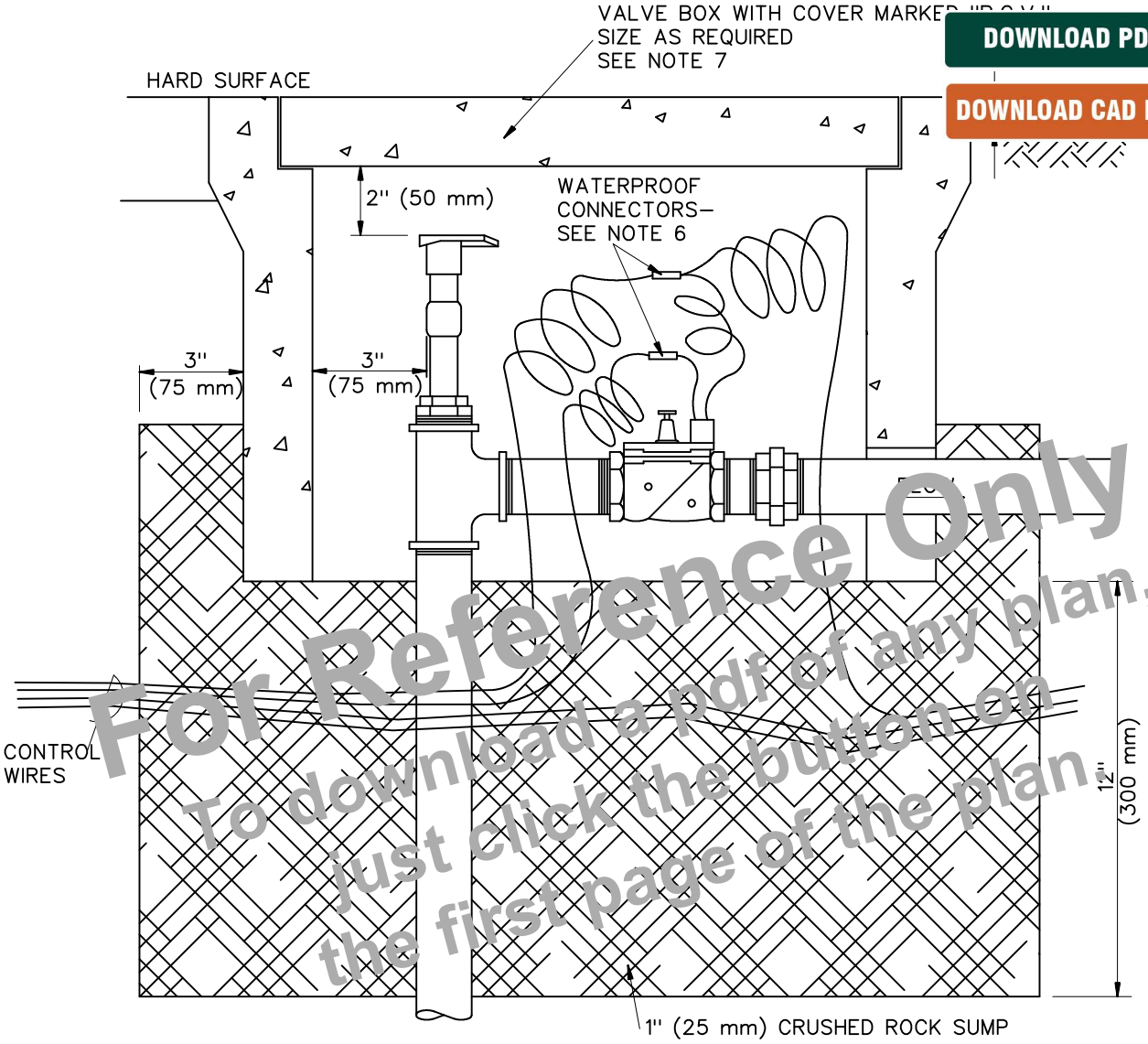
REMOTE CONTROL VALVE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
506–4
SHEET 1 OF 1

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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

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GREENBOOK COMMITTEE
1984
REV. 1996, 2005, 2009, 2021

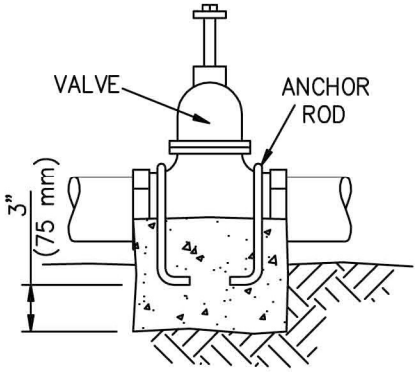
REMOTE CONTROL VALVE WITH QUICK COUPLER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

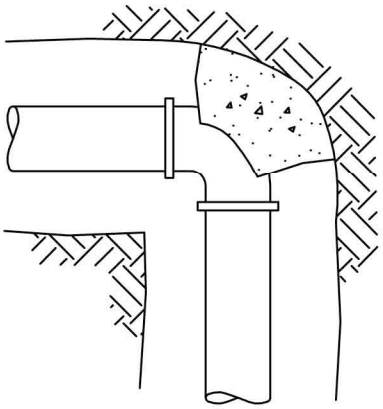
STANDARD PLAN
507–4
SHEET 1 OF 1

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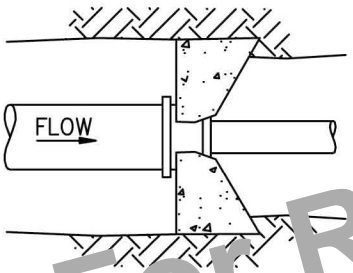
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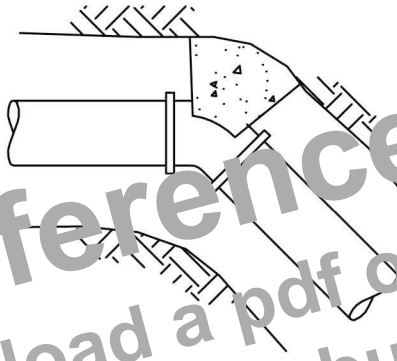


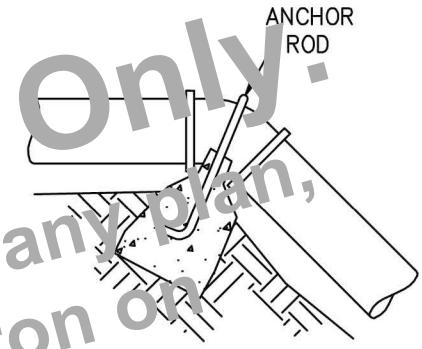
ELEVATION



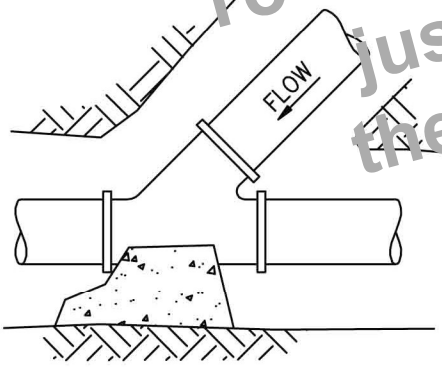


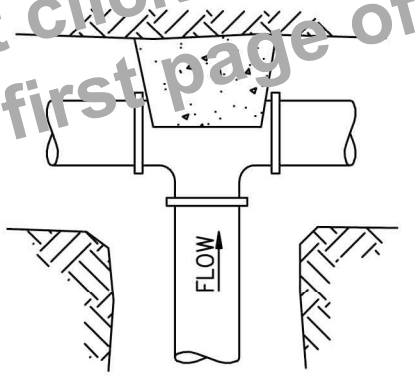


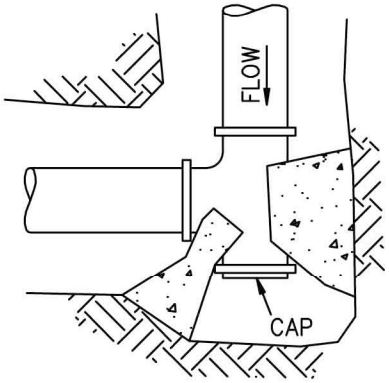


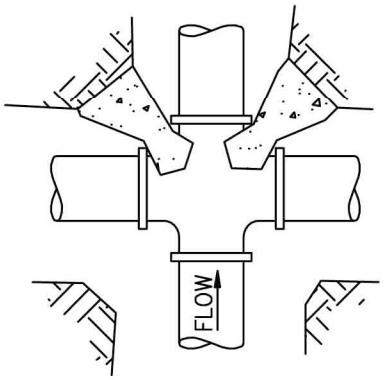


ELEVATION









NOTES:

1. THRUST BLOCKS SHALL BE USED FOR PLASTIC PIPE 3" (75 mm) DIAMETER OR LARGER.
2. THRUST BLOCKS SHALL BE PCC, 450-C-2000 (265-C-14).
3. ANCHOR RODS SHALL BE GALVANIZED STEEL, 1/2" (12 mm) DIAMETER, WRAPPED AROUND PIPE.
4. SIZE OF THRUST BLOCKS SHALL BE AS SHOWN ON PLANS.
5. ALL VIEWS ARE PLAN VIEW UNLESS OTHERWISE SHOWN.

SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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THRUST BLOCKS FOR PLASTIC PIPE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

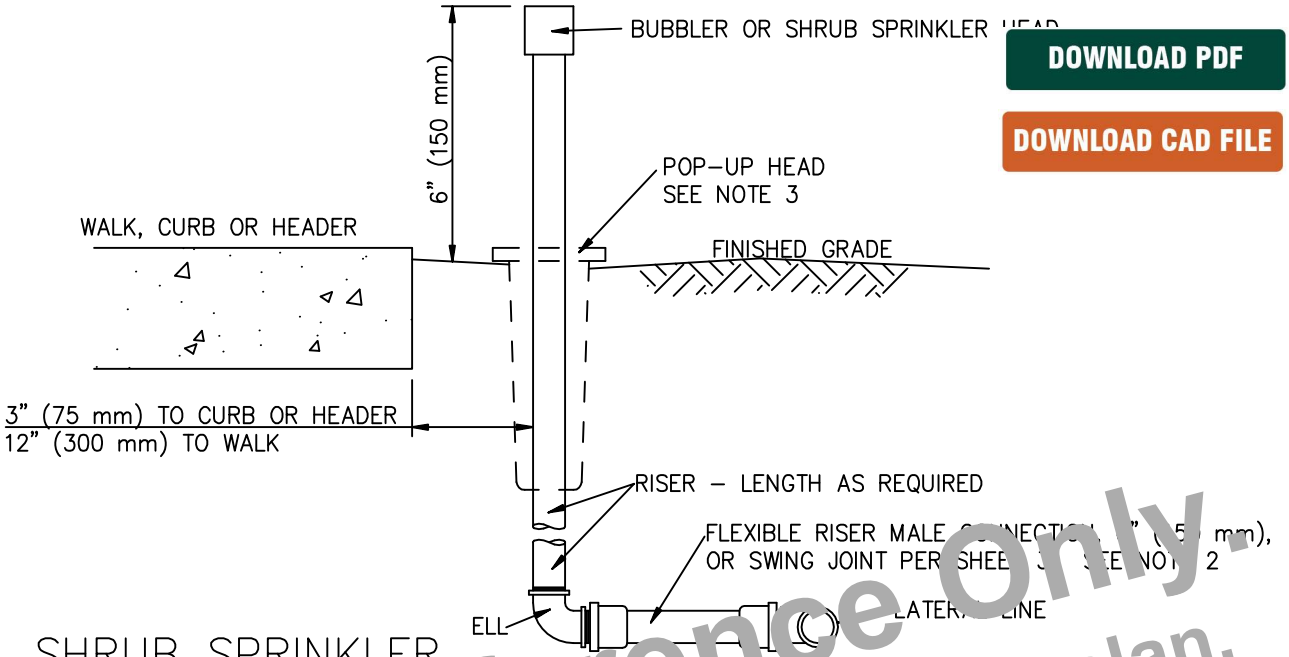
STANDARD PLAN 508-3

SHEET 1 OF 1

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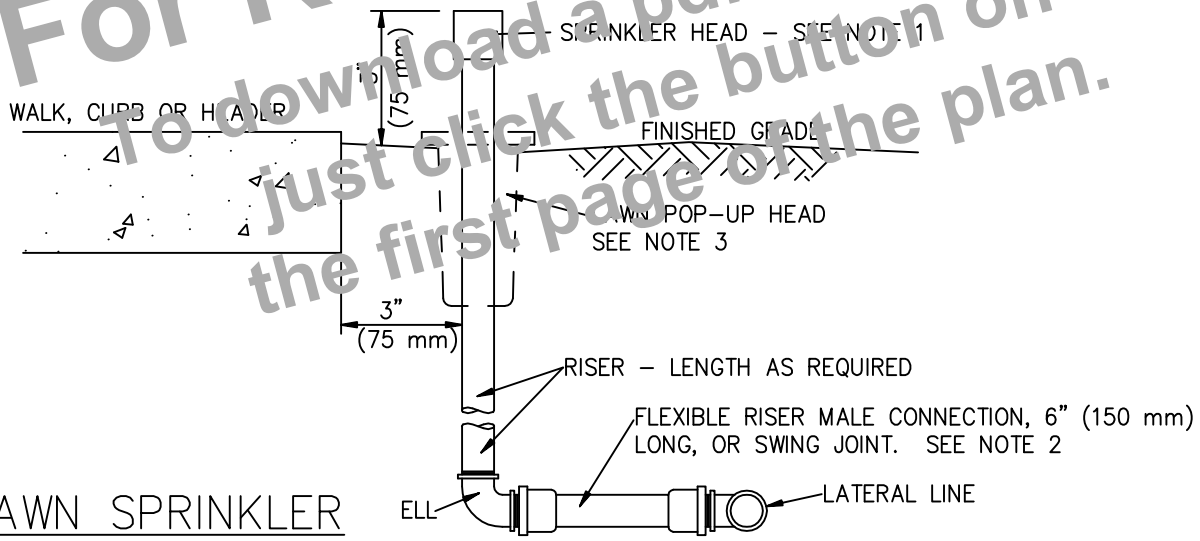
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SHRUB SPRINKLER

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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

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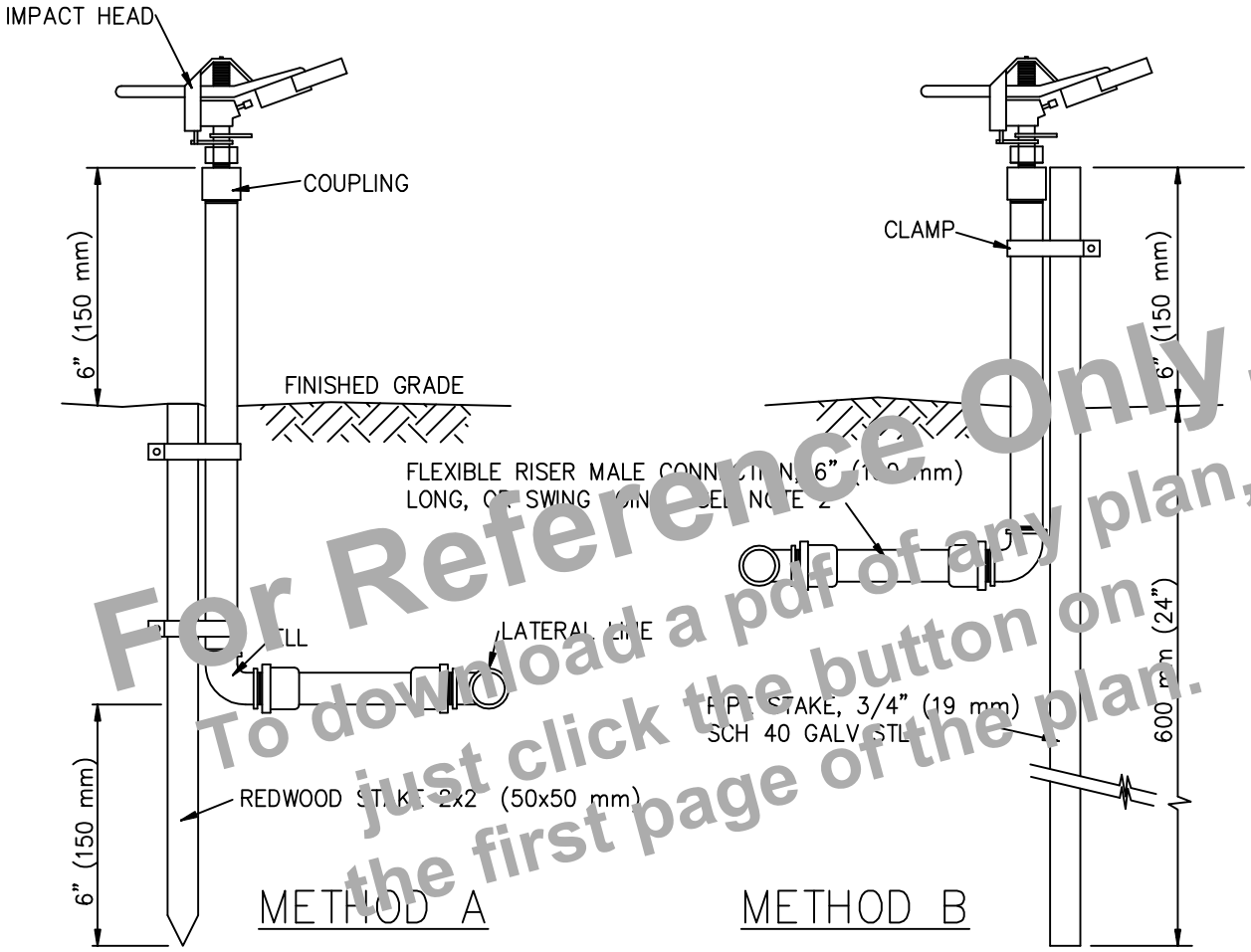
IRRIGATION SPRINKLER HEAD

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 509-3

SHEET 1 OF 3

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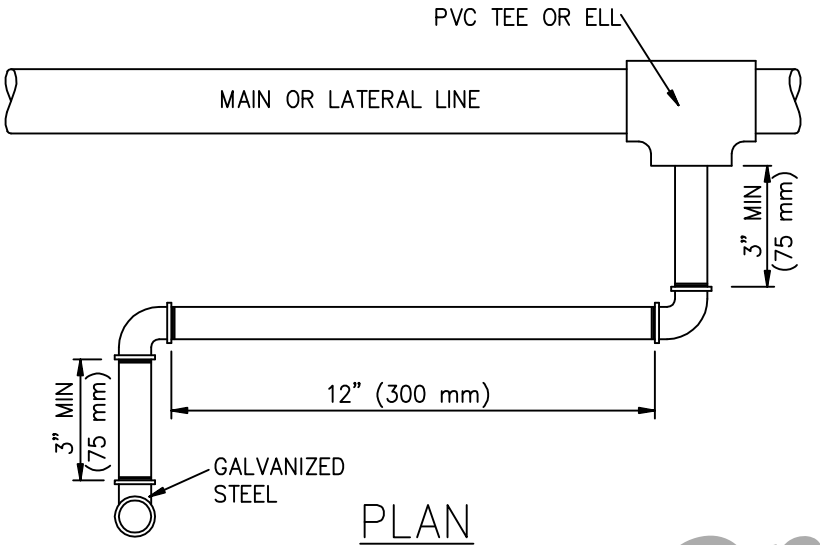
NOTES:

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.

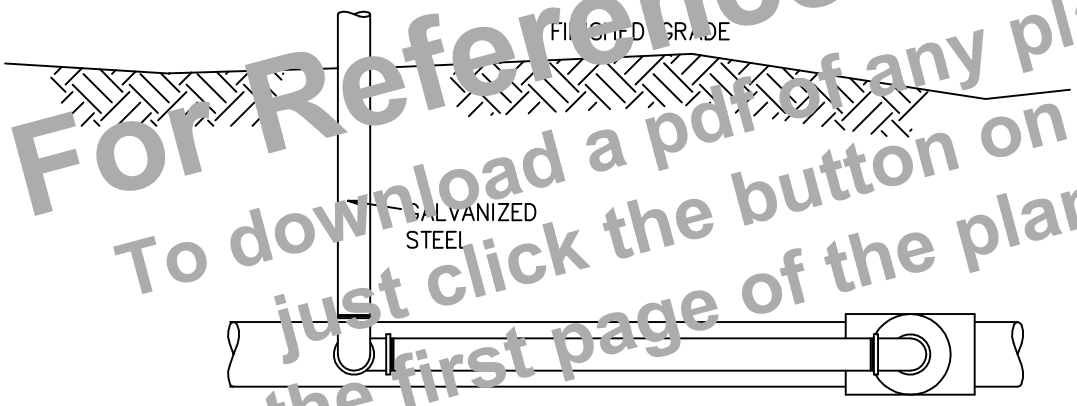
IMPACT SPRINKLER

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
IRRIGATION SPRINKLER HEAD	**509-3**
	SHEET 2 OF 3

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PLAN



ELEVATION

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NOTES:

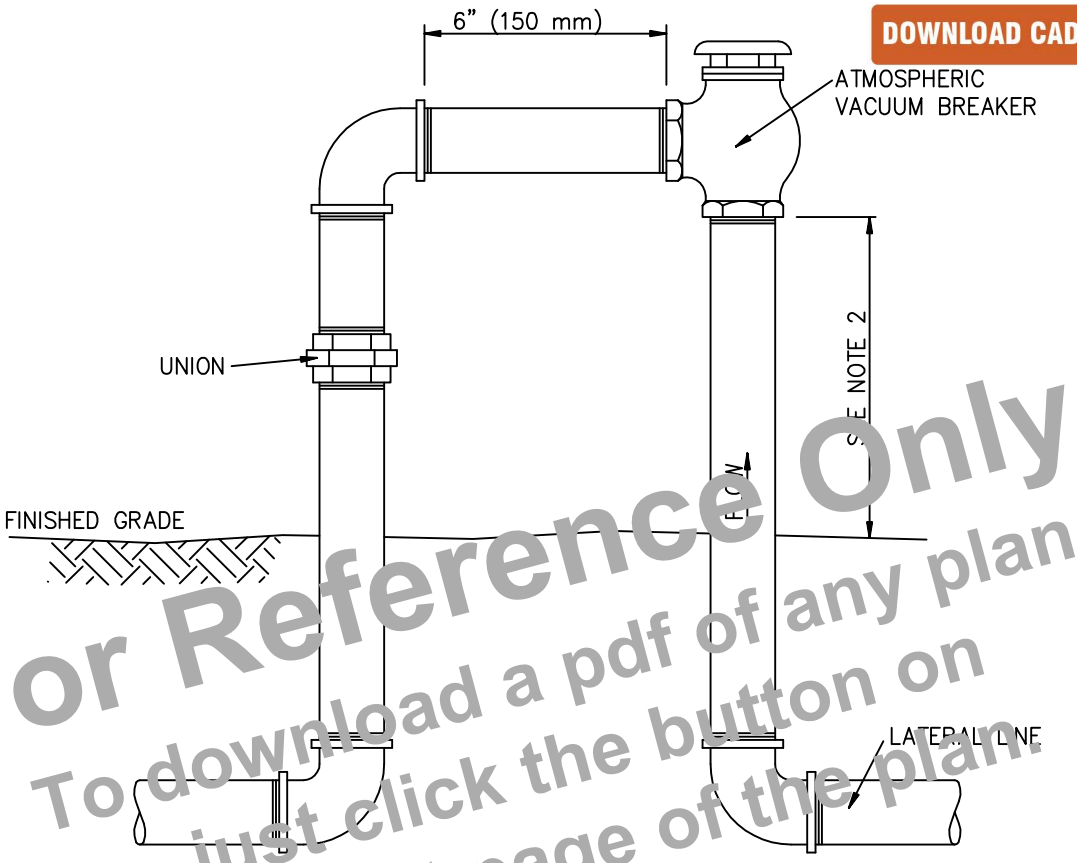
PIPE AND FITTINGS SHALL BE SCHEDULE 80 PVC UNLESS SHOWN OTHERWISE. GALVANIZED STEEL PIPE AND FITTINGS SHALL BE SCHEDULE 40.

SWING JOINT DETAIL

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
IRRIGATION SPRINKLER HEAD	**509–3**
	SHEET 3 OF 3

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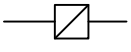
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ATMOSPHERIC TYPE, 2" (50 mm) AND SMALLER

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

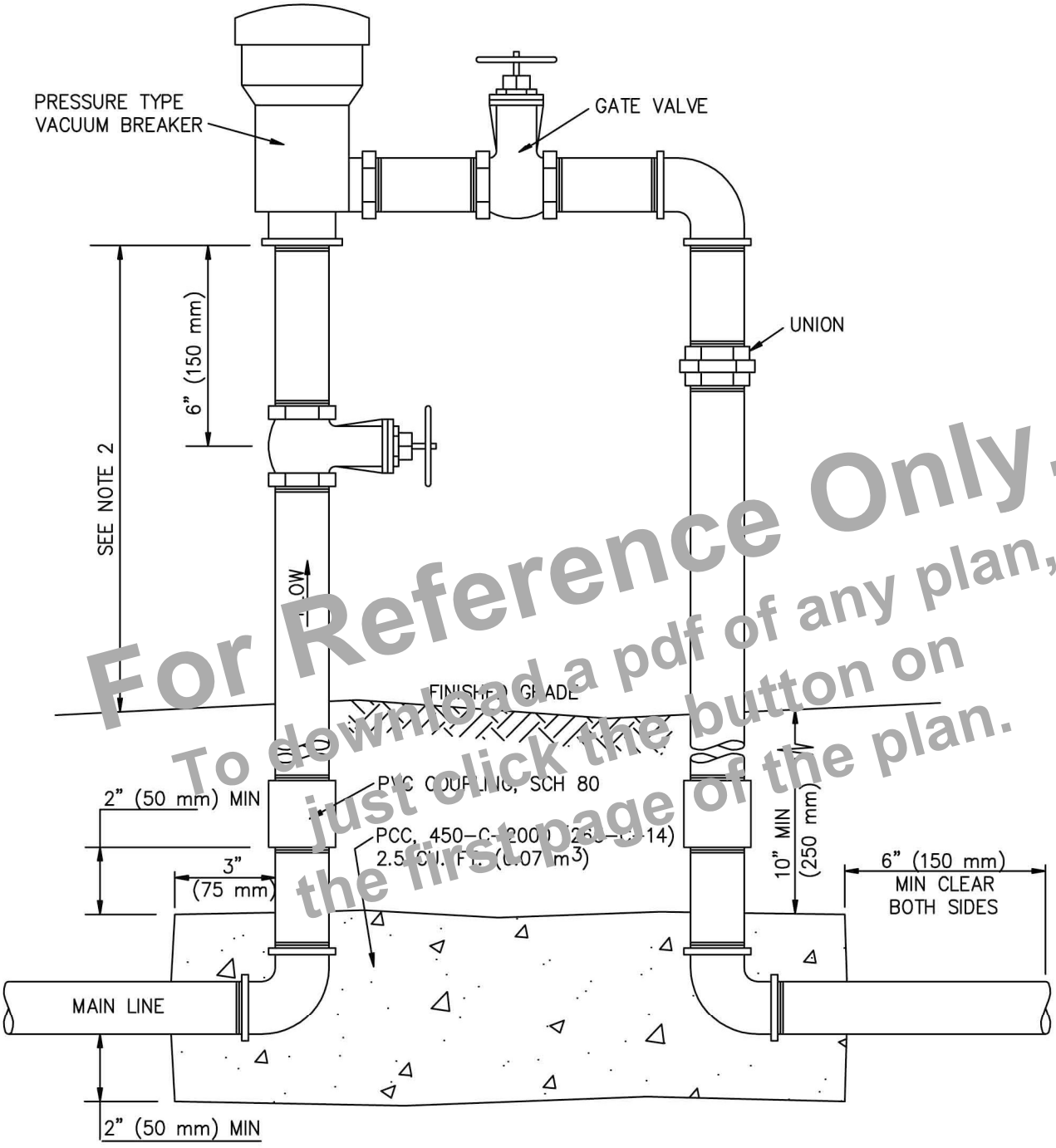
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1984
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VACUUM BREAKER ASSEMBLY

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
510-3
SHEET 1 OF 2

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PRESSURE TYPE, 2" (50 mm) AND SMALLER

NOTES:

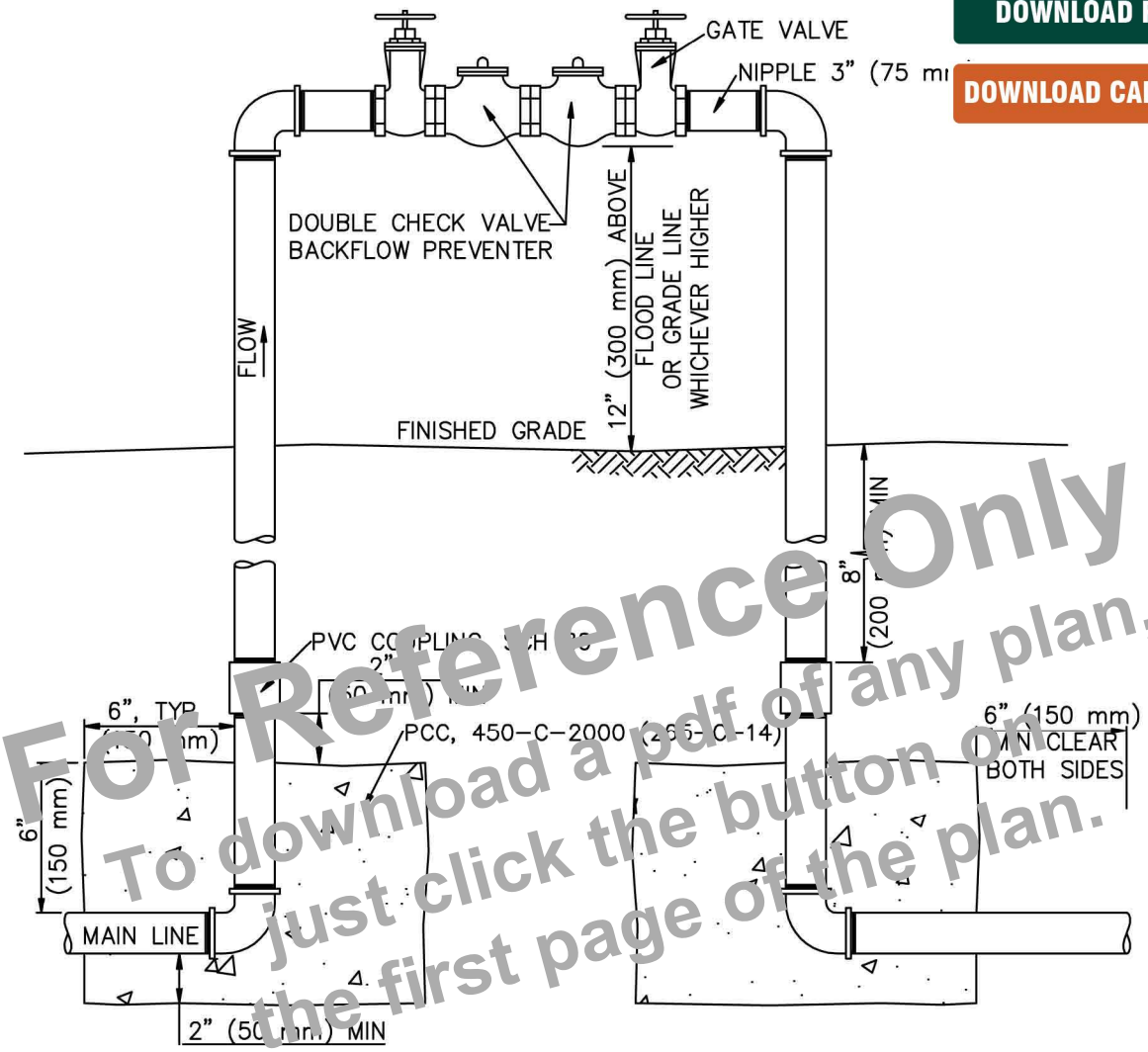
1. PIPE AND FITTINGS SHALL BE SCHEDULE 40 GALVANIZED STEEL UNLESS OTHERWISE NOTED.
2. PRESSURE TYPE VACUUM BREAKER SHALL BE INSTALLED AT LEAST 12" (300 mm) ABOVE THE HIGHEST OUTLET OR THE FLOOD LINE, WHICHEVER IS HIGHER. PRESSURE TYPE VACUUM BREAKERS SHALL NOT BE SUBJECTED TO BACK PRESSURE OR DRAINAGE.
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	STANDARD PLAN 510-3
VACUUM BREAKER ASSEMBLY	SHEET 2 OF 2

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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



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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BACKFLOW PREVENTER ASSEMBLY DOUBLE CHECK TYPE

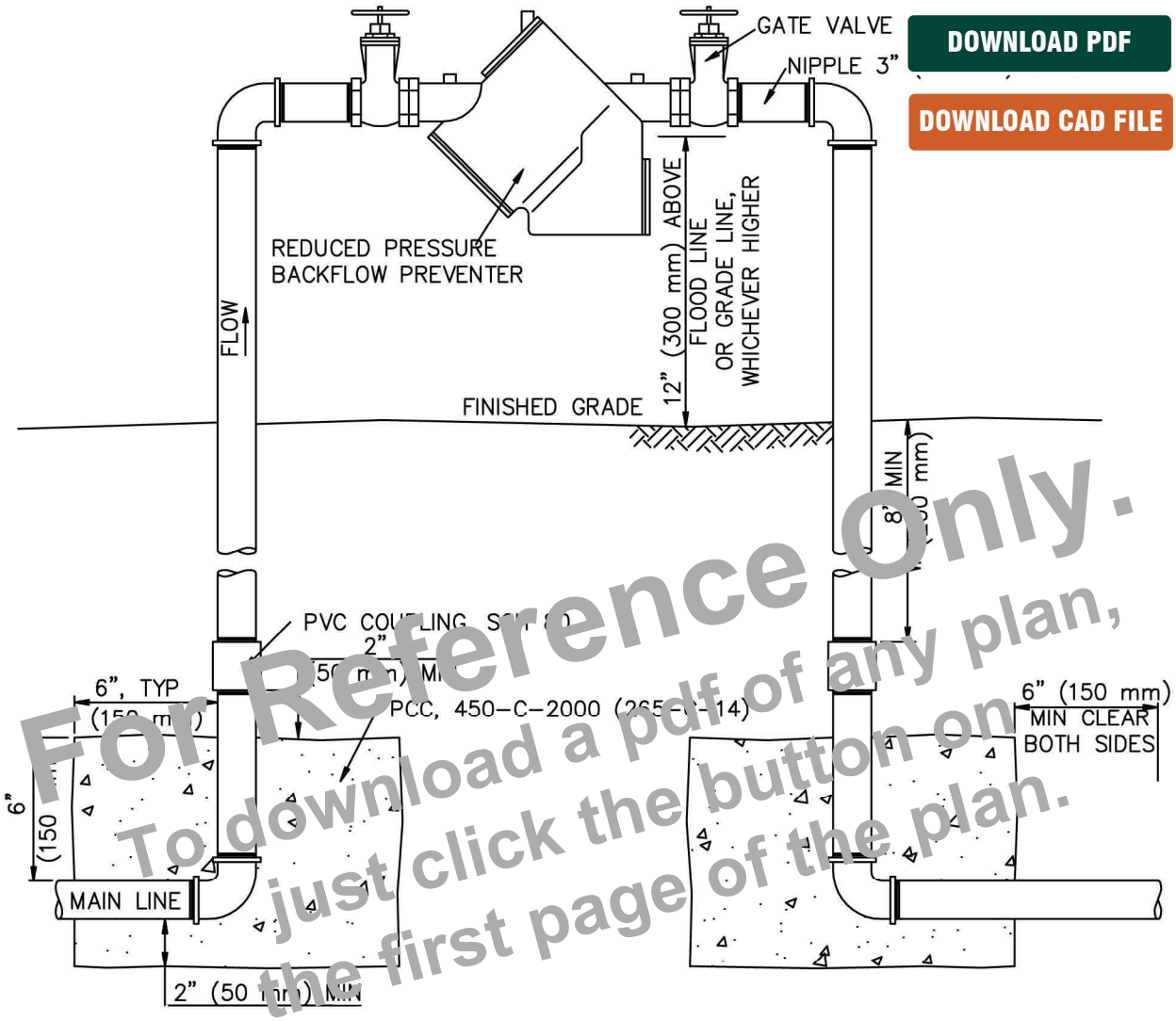
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 511-3

SHEET 1 OF 1

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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

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BACKFLOW PREVENTER ASSEMBLY REDUCED PRESSURE TYPE

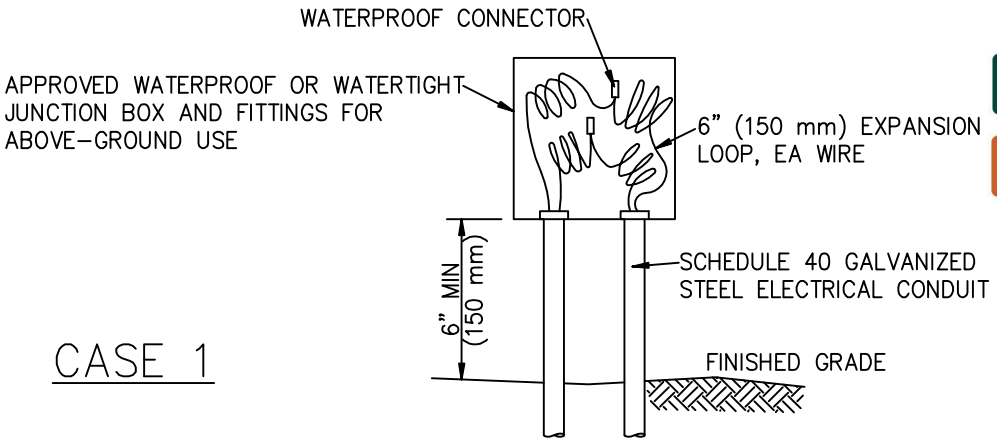
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 512-3

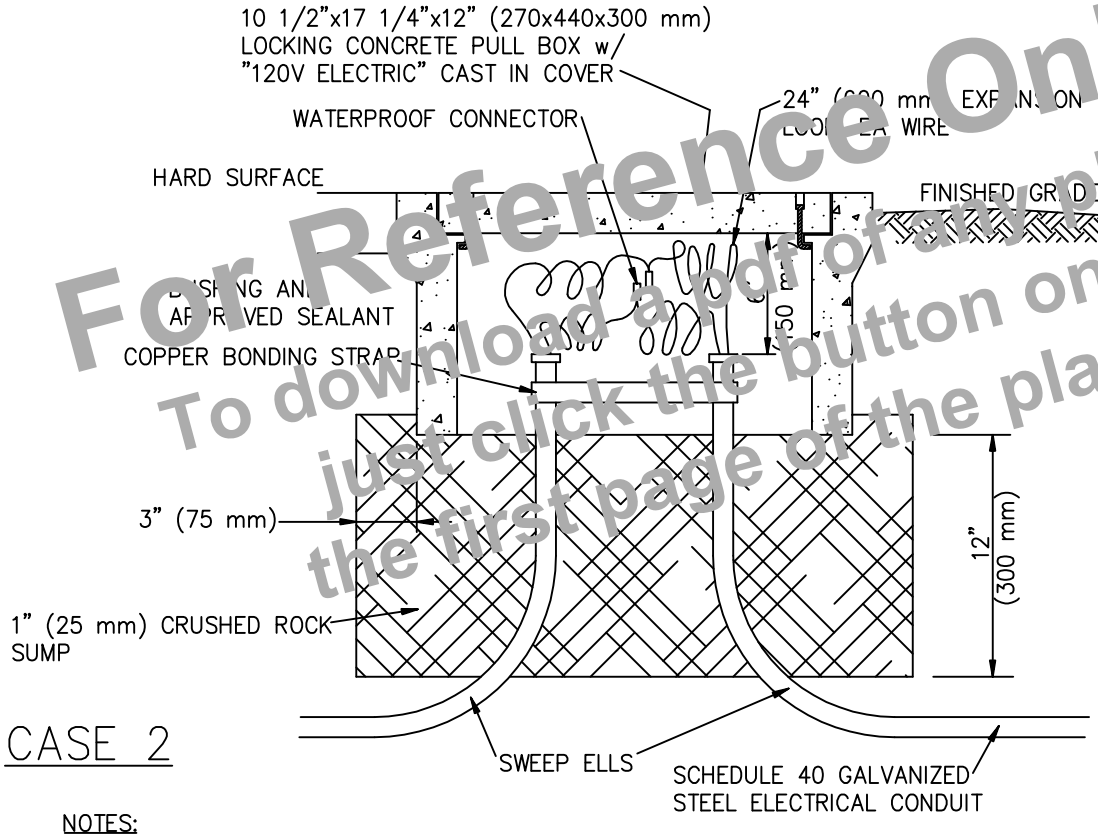
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CASE 1



CASE 2

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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 APPROPIATE GROUND WIRES ARE INSTALLED.

HIGH VOLTAGE INSTALLATION

SYMBOL ON PLAN
PB

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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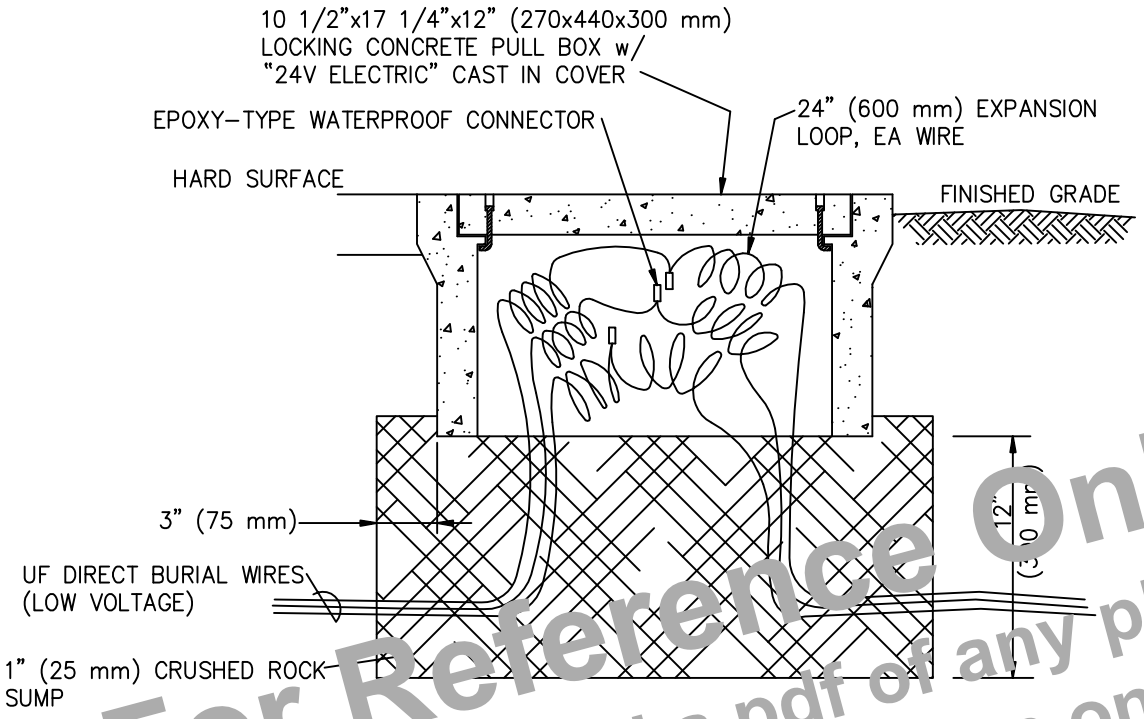
ELECTRICAL PULL BOX

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 513-3

SHEET 1 OF 2

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NOTES:

1. AREA AROUND BOX MAY BE PLANTED, HARD SURFACE, OR A COMBINATION OF BOTH.

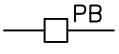
2. TOP OF BOX:
   AT GRADE FOR HARD SURFACE
   1/2" (12 mm) ABOVE GRADE FOR LAWN
   1" (25 mm) ABOVE GRADE FOR GROUND COVER OR SHRUBS

3. CRUSHED ROCK SHALL COVER ELECTRICAL BOX SIDE OPENINGS TO PREVENT SOIL ENTRY.

4. LOW VOLTAGE WIRES UNDER ROADWAY SHALL BE WITHIN CONTINUOUS CONDUIT WITH 90° SWEEP ELLS TERMINATING WITHIN PULL BOXES. SEE PLANS FOR SIZE AND TYPE OF BOXES.

LOW VOLTAGE INSTALLATION

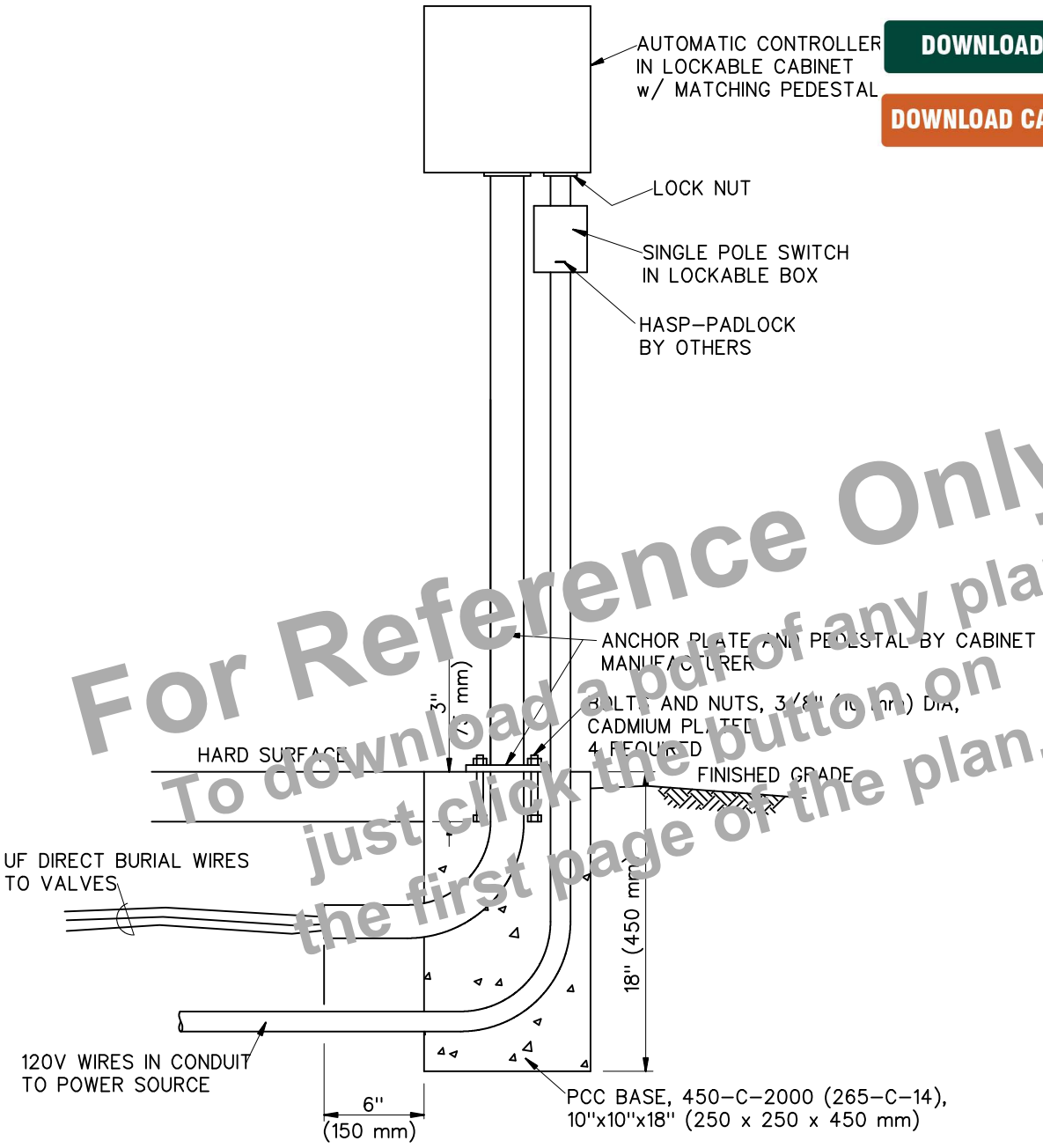
SYMBOL ON PLAN



STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
ELECTRICAL PULL BOX	**513–3**
	SHEET 2 OF 2

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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

A

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

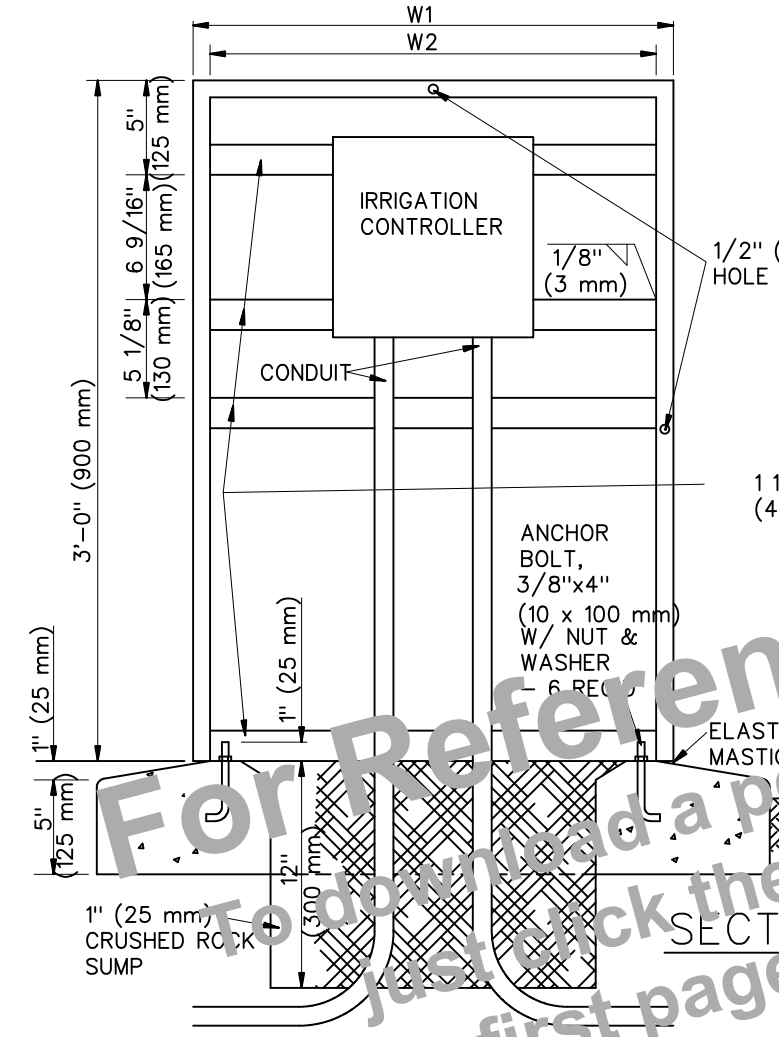
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IRRIGATION CONTROLLER ENCLOSURE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

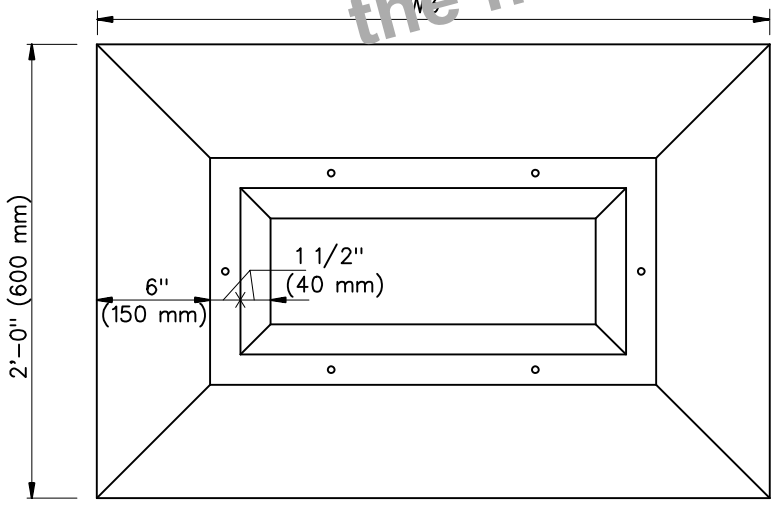
STANDARD PLAN
514–4
SHEET 1 OF 4

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COVER, TOP VIEW

SECTION



PLAN OF CONCRETE BASE

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).

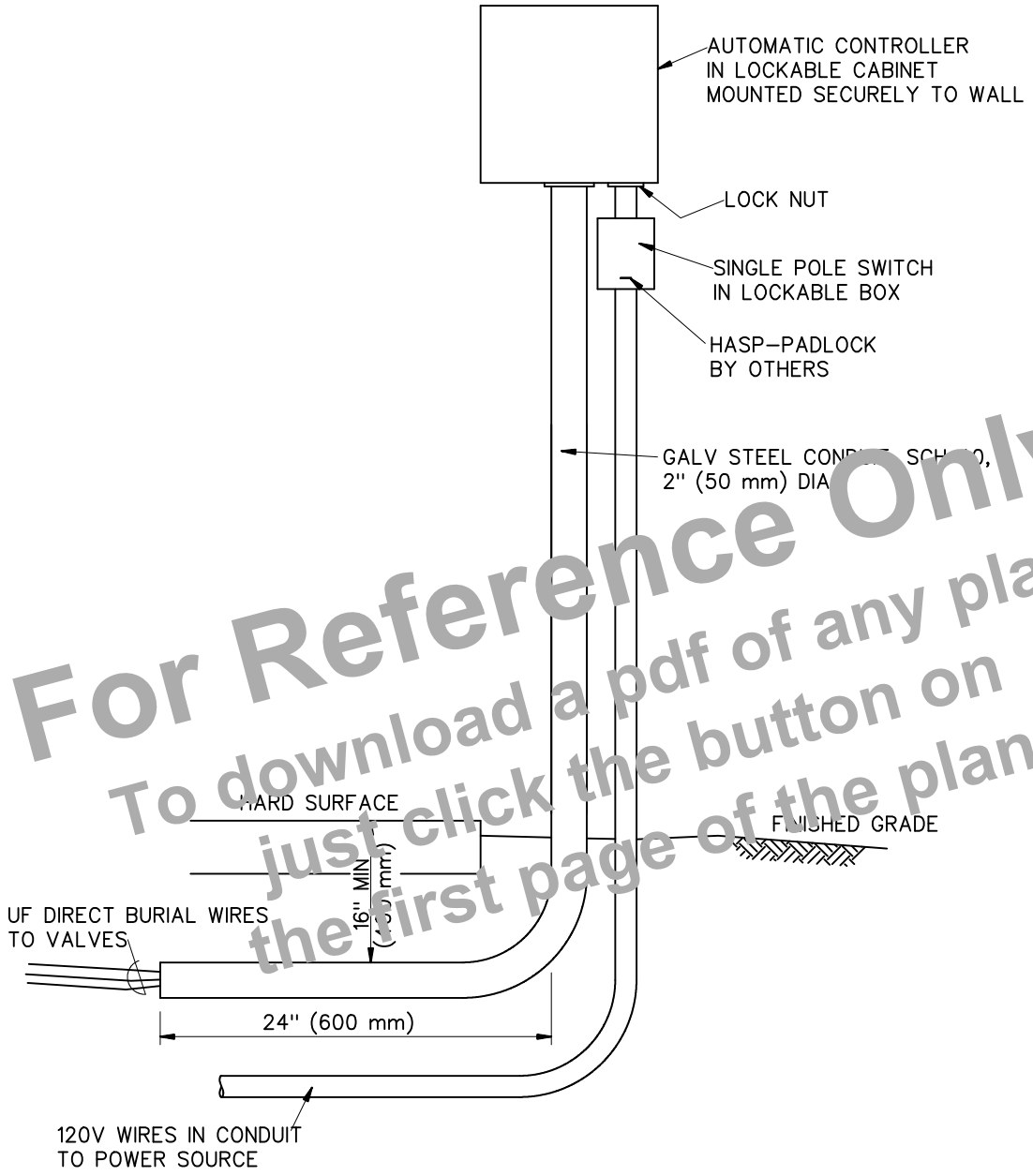
SYMBOL ON PLAN

A

PEDESTAL MOUNT - TYPE B

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WALL MOUNT – TYPE C

SYMBOL ON PLAN

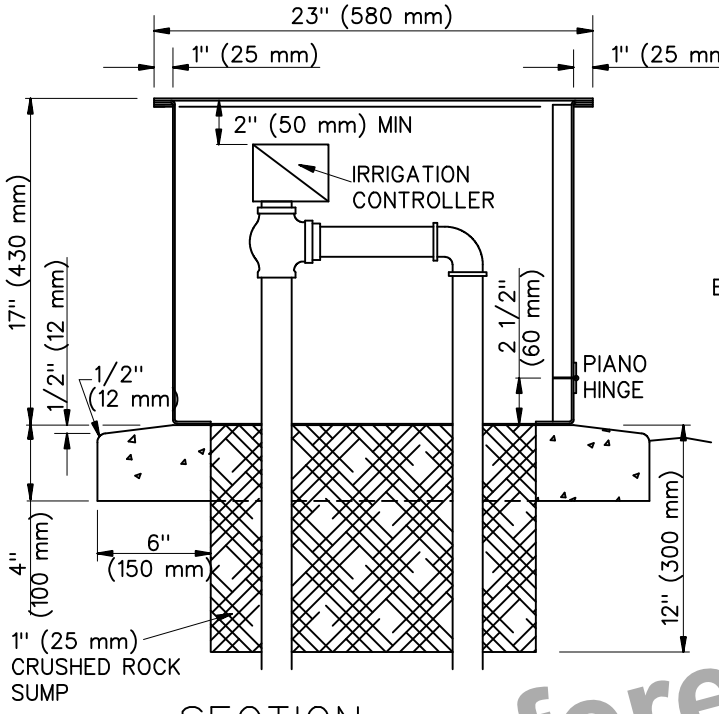
A

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

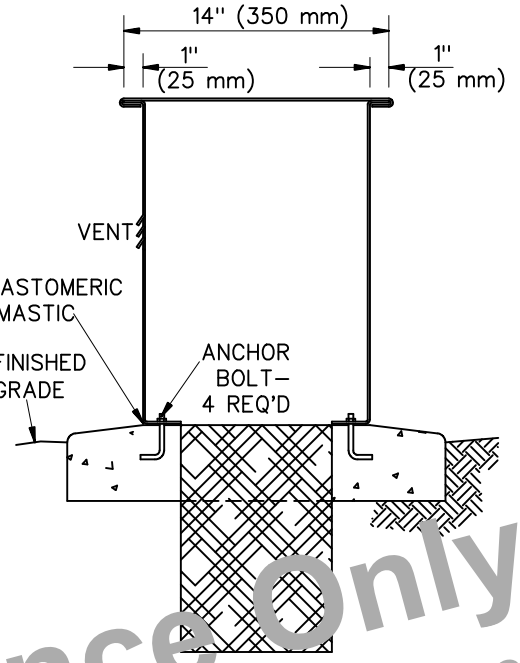
IRRIGATION CONTROLLER ENCLOSURE

STANDARD PLAN
514–4
SHEET 3 OF 4

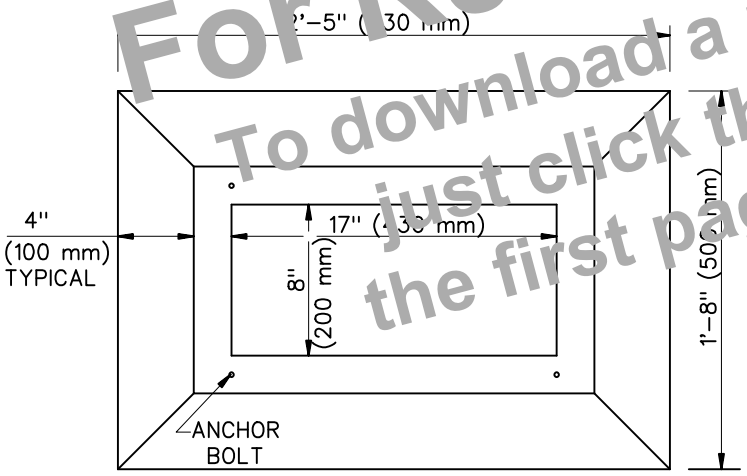
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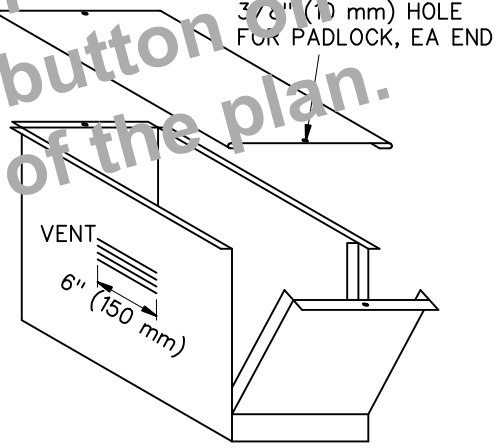
SECTION



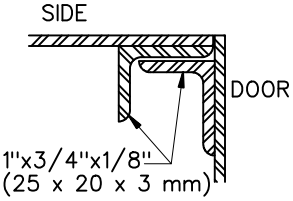
END VIEW



PLAN OF CONCRETE BASE



OBLIQUE VIEW



CORNER DETAIL

NOTES:

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

TYPE D

SYMBOL ON PLAN

A

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

IRRIGATION CONTROLLER ENCLOSURE

STANDARD PLAN

514–4

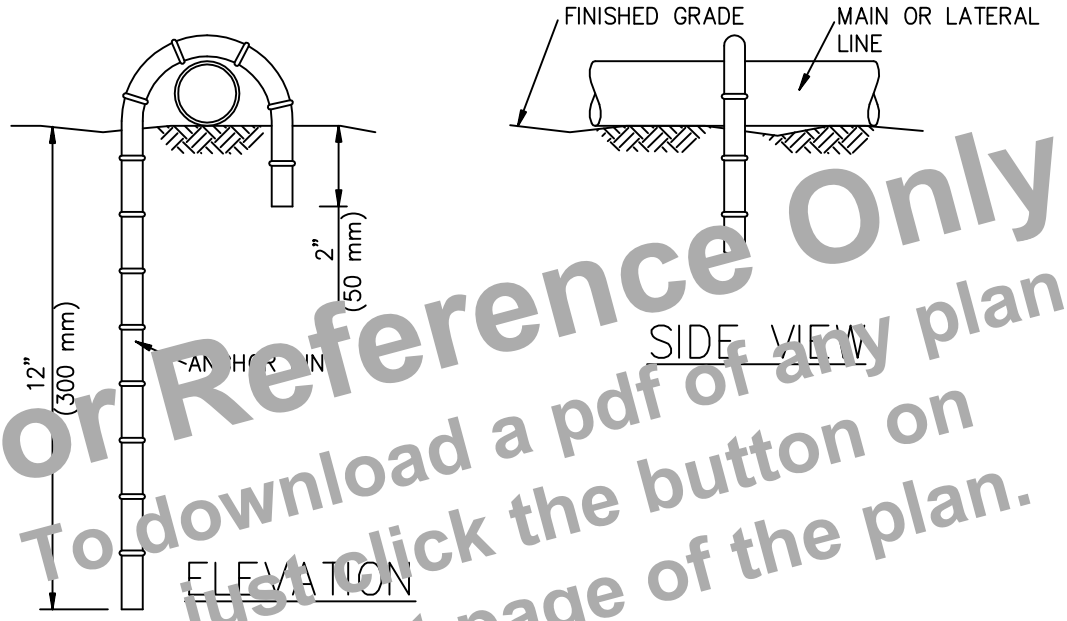
SHEET 4 OF 4

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NOTES:

1. PINS SHALL BE #4 (#13M) REINFORCING BARS.
2. PINS SHALL BE PLACED 10' (3 m) APART FOR MAIN LINE.
3. PINS SHALL BE PLACED NO MORE THAN 15' (4.5 m) APART FOR LATERAL LINE.
4. ON SLOPES, THE 12" (300 mm) LEG OF THE PIN SHALL BE PLACED ON THE DOWNHILL SIDE.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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PIPE PINNING

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

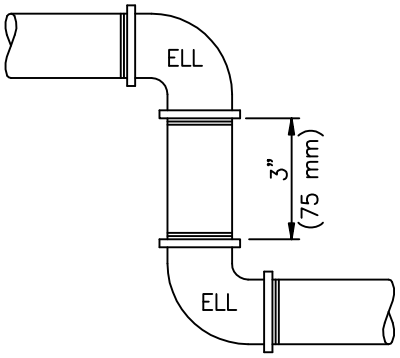
STANDARD PLAN 515-3

SHEET 1 OF 1

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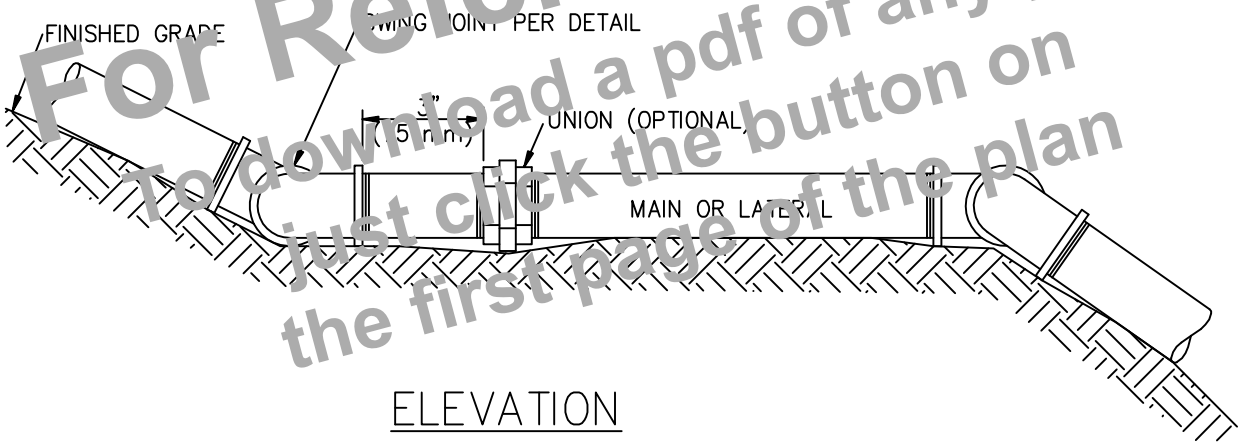
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SWING JOINT PLAN DETAIL

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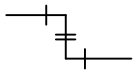


ELEVATION

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.

SYMBOL ON PLAN



SINGLE SWING JOINT ASSEMBLY

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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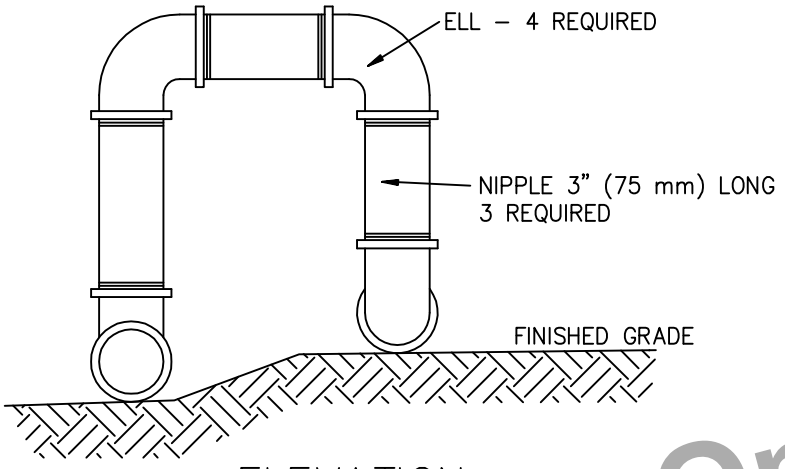
SWING JOINT ASSEMBLY

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 517-3

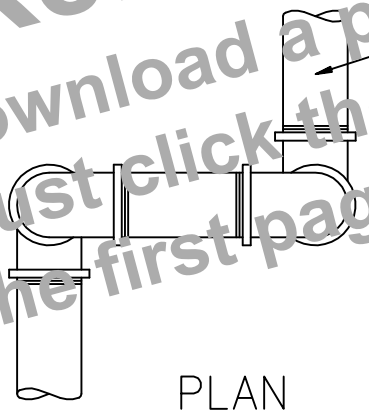
SHEET 1 OF 2

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ELEVATION

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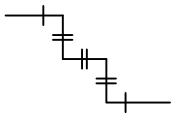
PLAN

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

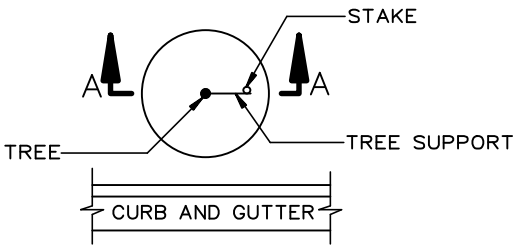
SYMBOL ON PLAN



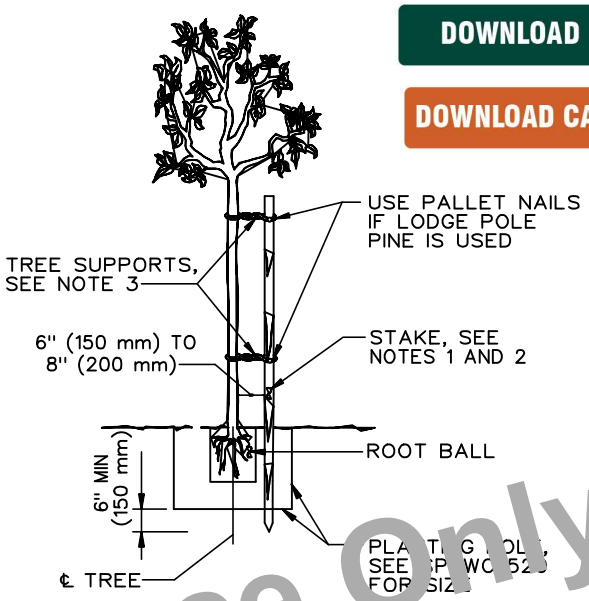
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
SWING JOINT ASSEMBLY	**517–3**
	SHEET 2 OF 2

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PLAN



SECTION A–A

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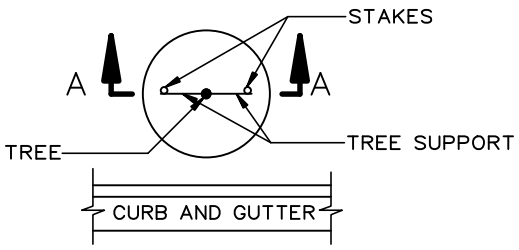
SINGLE STAKING

NOTES:

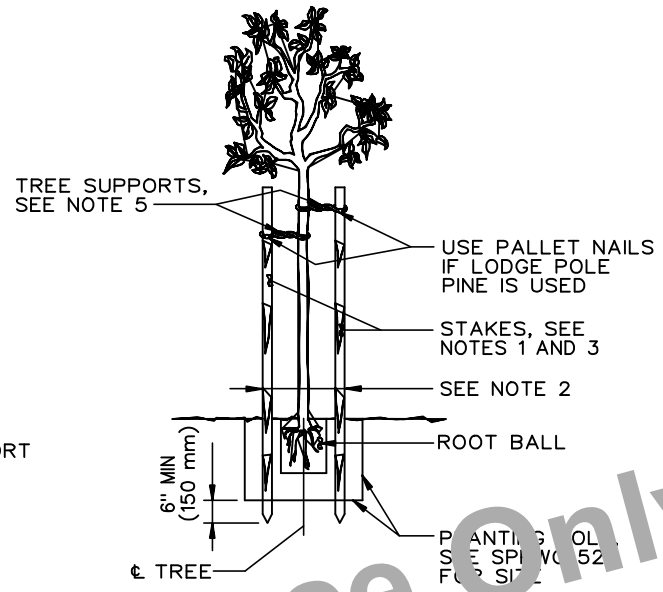
1. STAKE SHALL BE EITHER 2" (50 mm) DIAMETER LODGE POLE PINE TREATED WITH COPPER NAPTHANATE OR PRESSURE TREATED WITH CHROMATED COPPER ARSENATE, OR GALVANIZED STEEL PIPE PER SSPWC 801–4.6.1 (METHOD A).
2. HEIGHT OF STAKE SHALL BE 10' (3 m); HOWEVER, IT SHALL NOT BE HIGHER THAN THE TOP OF THE TREE.
3. TREE SUPPORTS SHALL BE PER SSPWC 801–4.6.1.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1996, 2006, 2009, 2021	**TREE STAKING** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **518–4** SHEET 1 OF 3

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PLAN



SECTION A–A

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"–48" (900 – 1200 mm) BOX	SEE NOTE 4

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DOUBLE STAKING

NOTES:

1. STAKE SHALL BE EITHER 50 mm (2") DIAMETER LODGE POLE PINE, TREATED WITH COPPER NAPTHANATE OR PRESSURE TREATED WITH CHROMATED COPPER ARSENATE, OR GALVANIZED STEEL PIPE, PER SSPWC 801–4.6.1 (METHOD A).

2. PLACE STAKES 18" (450 mm) APART FOR 15 GAL (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 801–4.6.1.

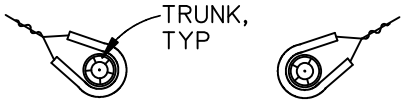
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TREE STAKING	**518–4**
	SHEET 2 OF 3

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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

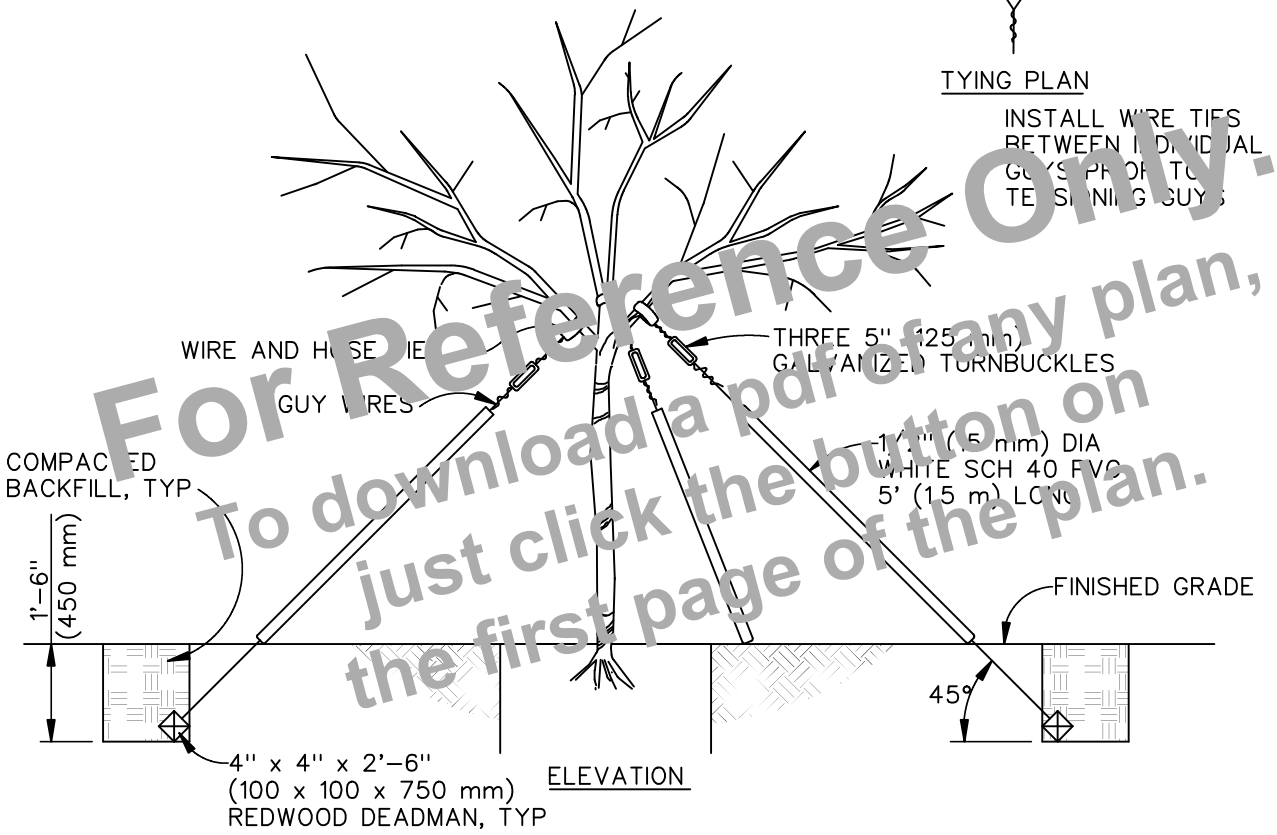


LOOP HOSES
1" (25 mm) GREATER THAN TRUNK DIA



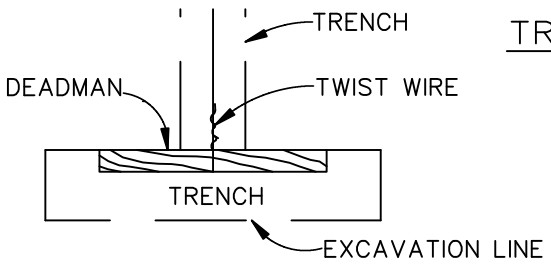
TYING PLAN

INSTALL WIRE TIES BETWEEN INDIVIDUAL GUYS PRIOR TO TENSIONING GUYS

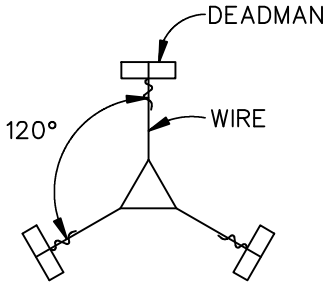


ELEVATION

TREE GUYING



PLAN
DEADMAN



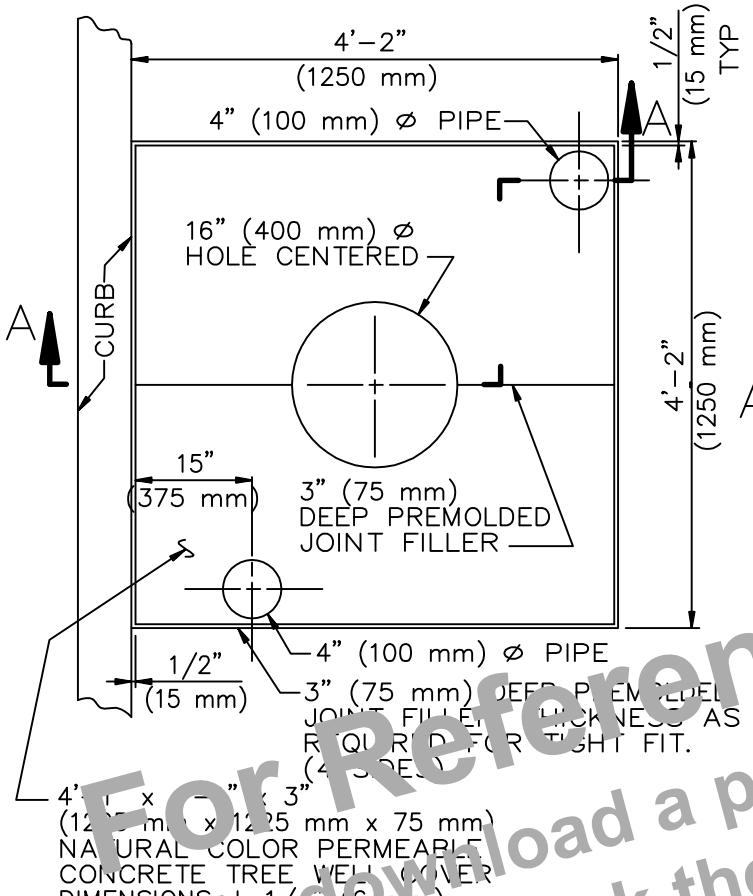
PLAN
DEADMAN PLACEMENT

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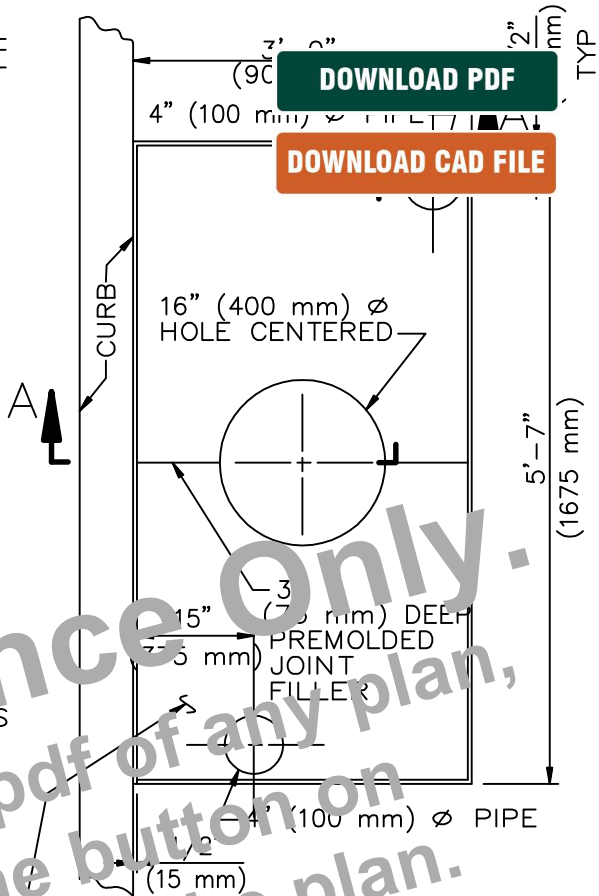
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TREE STAKING	**518–4**
	SHEET 3 OF 3

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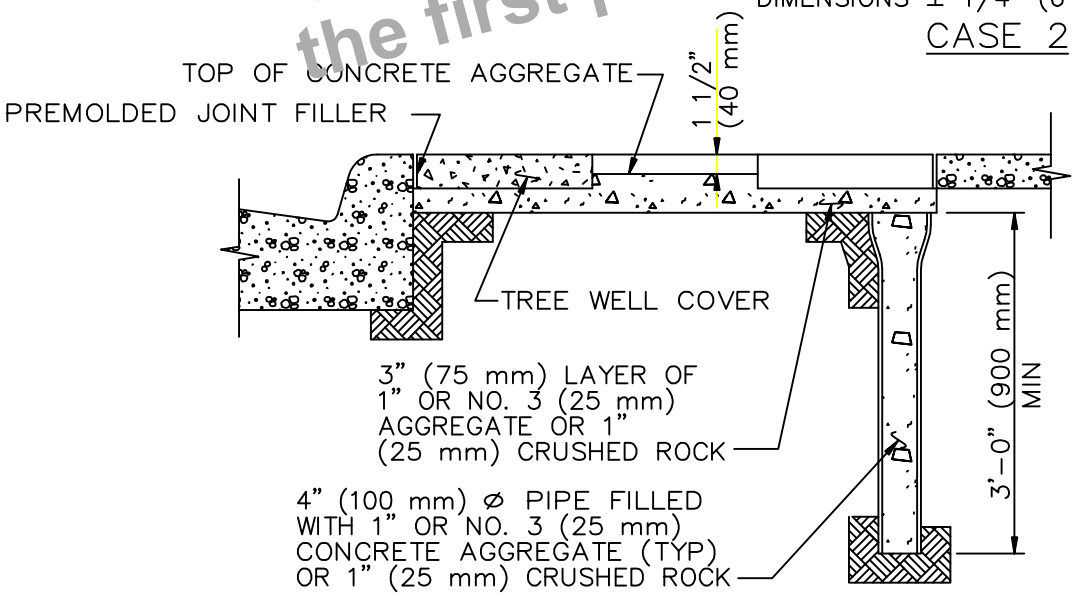
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CASE 1



CASE 2



SECTION A–A

NOTE:

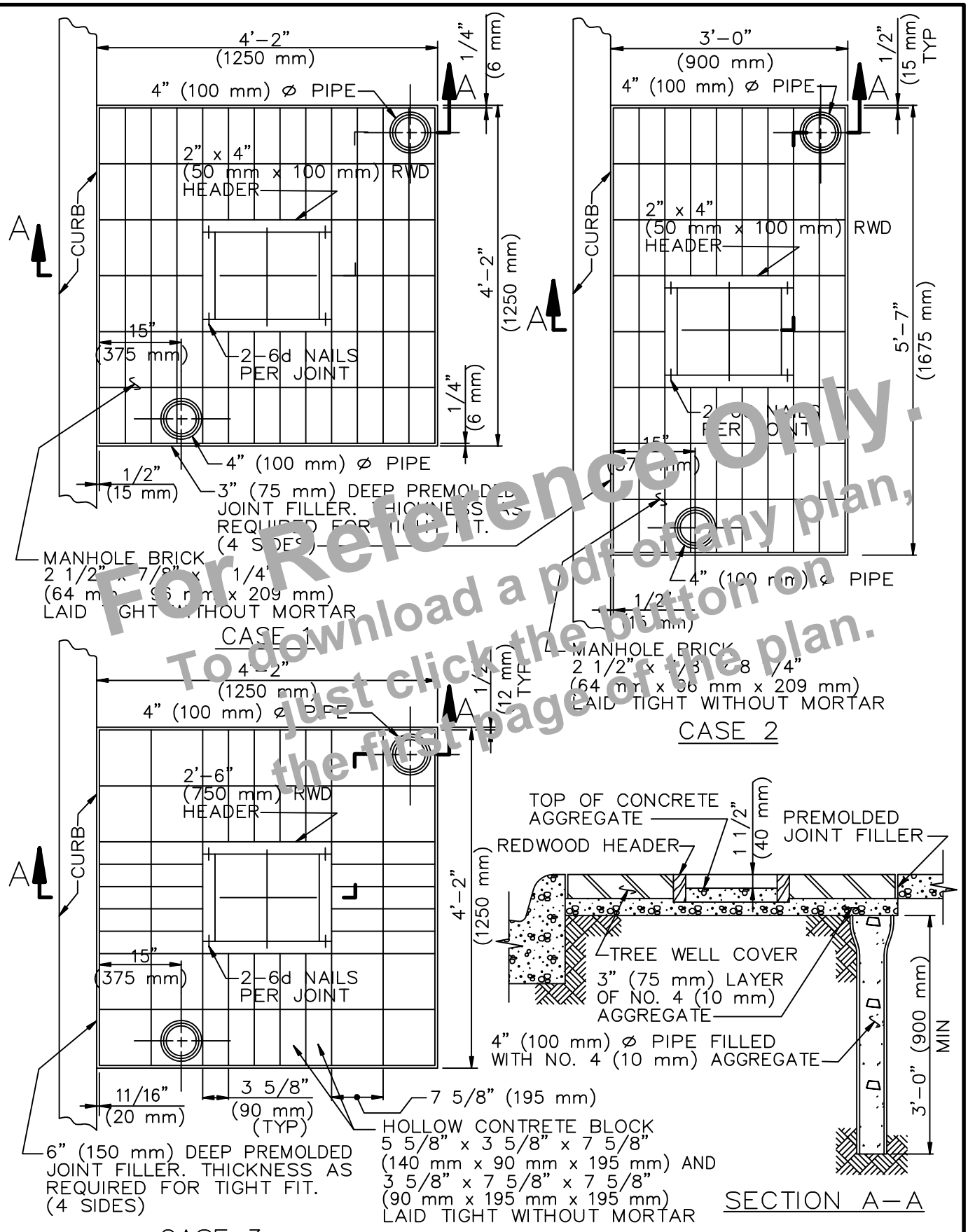
SEE SHEETS 3 AND 7 FOR NOTES PERTAINING TO THIS SHEET.

TYPE 1

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1996, 2005, 2009	**TREE WELL**	STANDARD PLAN **519–3**
	USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	SHEET 1 OF 7

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TYPE 2

NOTE:

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

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TREE WELL	**519–3** SHEET 2 OF 7

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NOTES FOR TYPE 1 TREE WELL

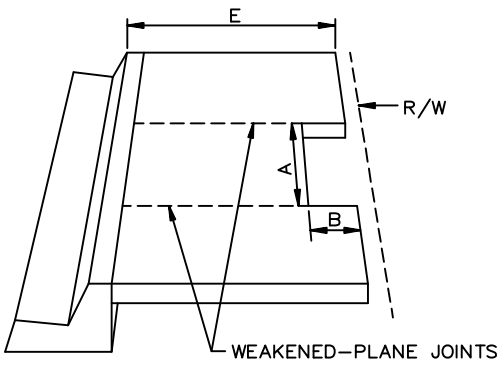
1. THE COVER SHALL BE MADE OF PERMEABLE CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 1200 PSI (8.5 MPa) AND SHALL BE CAST–IN PLACE OR PRECAST "AGRIPERM" OR EQUIVALENT. CAST–IN–PLACE CONCRETE SHALL CONSIST OF ONE PART CEMENT TO FOUR PARTS 3/8" (10 mm) GRAVEL AND APPROXIMATE 4 GALLONS (15 LITERS) OF 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. A 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.

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NOTES FOR TYPE 2 TREE WELL

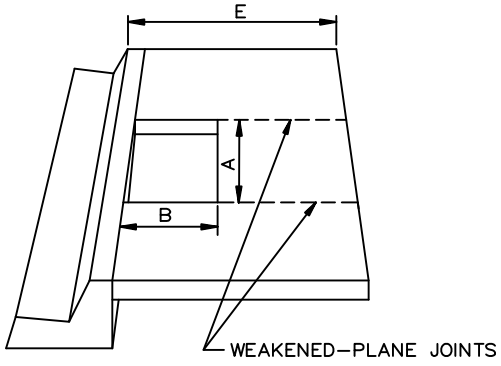
1. EXISTING SIDEWALK SHALL BE CAREFULLY SAWCUT PREPARATORY TO LAYING OF CONCRETE BLOCKS OR BRICK. SAWCUT OVER–RUNS SHALL BE CLEANED AND FILLED WITH EPOXY APPROVED BY THE ENGINEER AND FINISHED TO SIDEWALK GRADE.
2. THE PIPE MAY BE CIP, ACP, VCP, ABS, PVC, GALV STL OR ASPHALT IMPREGNATED FIBER DUCT, AND 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.

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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



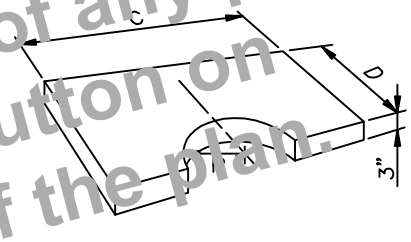
2 COVERS REQUIRED

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

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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'–0" (1500 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)

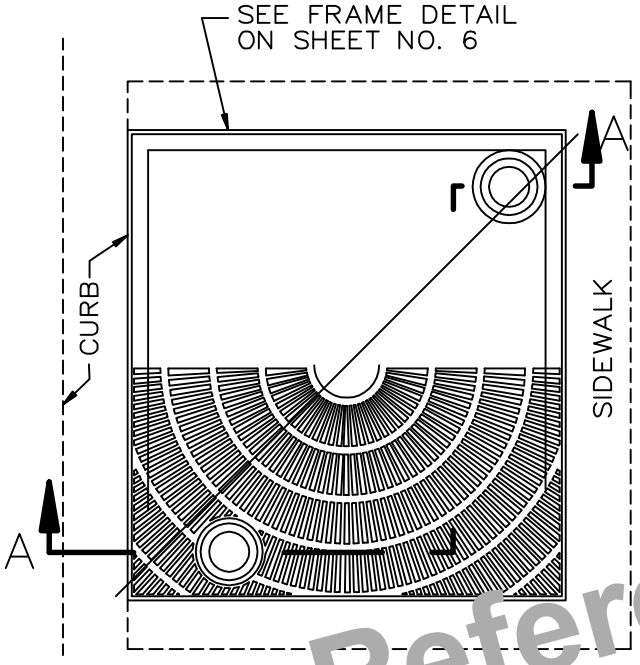
NOTES FOR TYPE 3 TREE WELL

1. SEE SHEET 7 FOR NOTES PERTAINING TO THE SHEET.
2. 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.

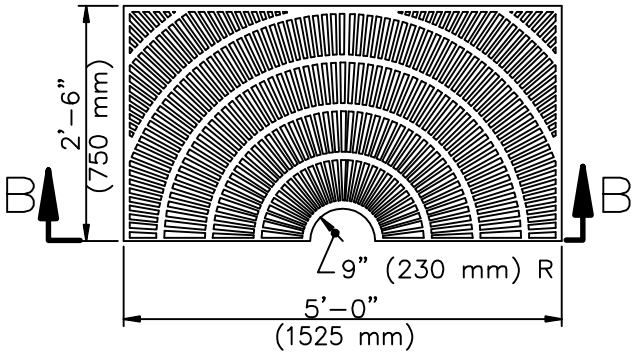
TYPE 3

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TREE WELL	519–3
	SHEET 4 OF 7

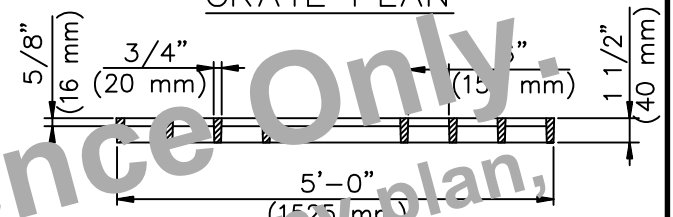
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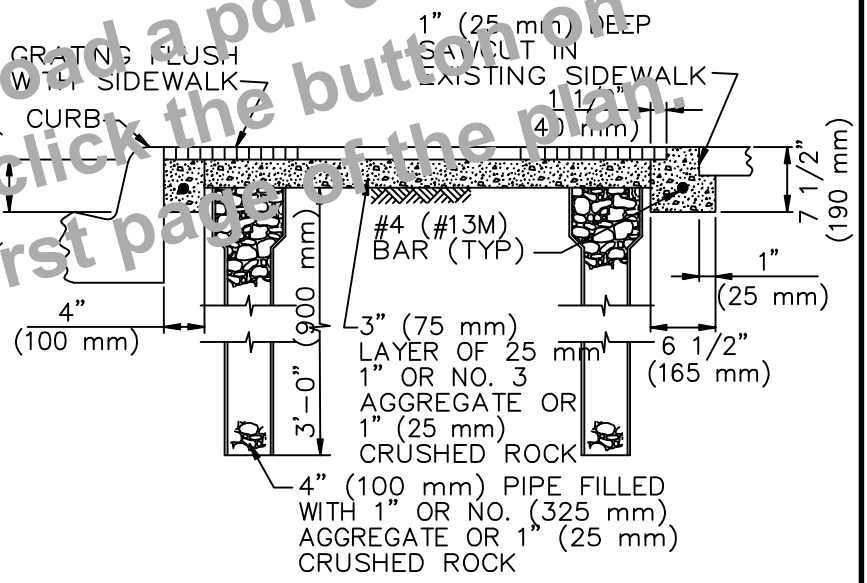
PLAN



GRATE PLAN



SECTION B–B



SECTION A–A

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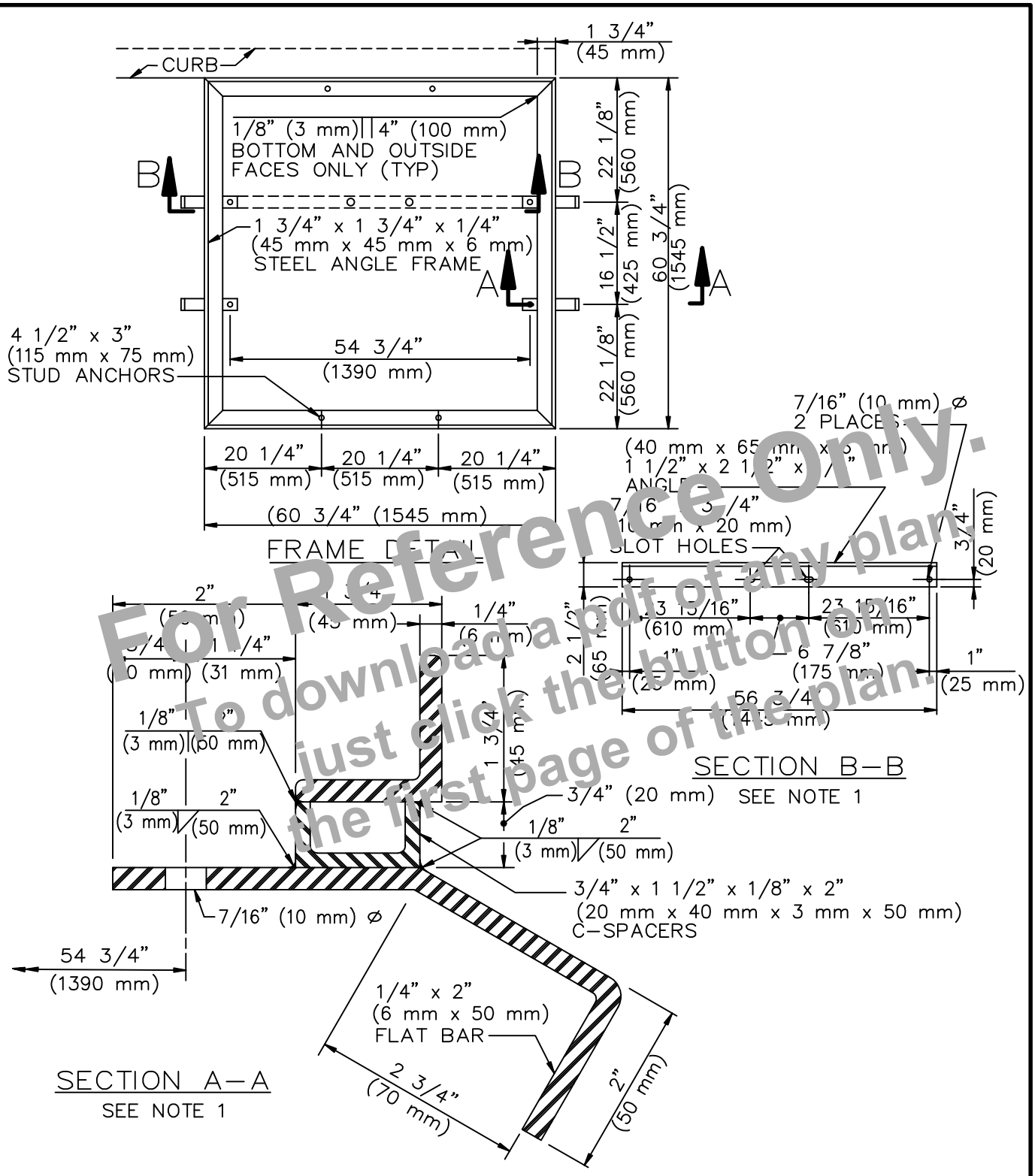
NOTES FOR TYPE 4 TREE WELL

1. GRATE MATERIAL TO BE CAST IRON.
2. GRATE PATTERN AS SPECIFIED ON PLANS OR IN SPECIFICATIONS.
3. EXISTING SIDEWALK SHALL BE CAREFULLY SAWCUT PREPARATORY TO LAYING OF FRAME. SAWCUT OVER–RUNS SHALL BE CLEANED AND FILLED WITH EPOXY APPROVED BY THE ENGINEER AND FINISHED TO SIDEWALK GRADE.
4. THE PIPE MAY BE CIP, ACP, VCP, ABS, PVC, GALV STL OR ASPHALT IMPREGNATED FIBER DUCT, AND IT MAY BE BELL OR PLAIN END.
5. AFTER ALL OTHER WORK PERTINENT TO PLANTING HAS BEEN COMPLETED. EACH TREE SHALL BE WATERED IMMEDIATELY WITH A MINIMUM OF 75 LITERS (20 GALLONS) 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 AND 3" (75 mm) CONCRETE AGGREGATE SHALL BE PLACED AND GRADED.

TYPE 4

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 519–3
TREE WELL	SHEET 5 OF 7

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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	STANDARD PLAN 519-3
TREE WELL	SHEET 6 OF 7

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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.

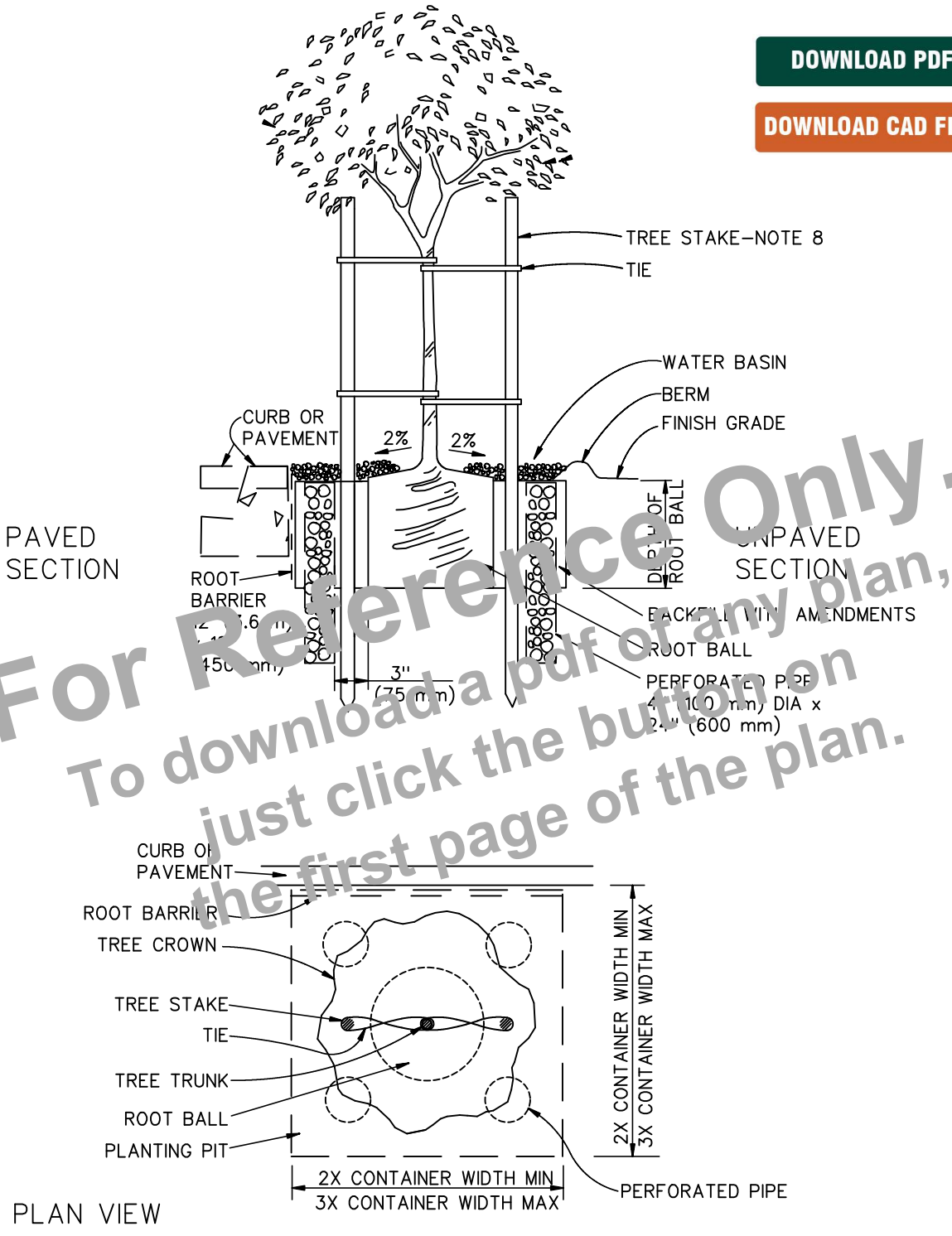
7. LOCATION OF TREE WELL SUBJECT TO CHANGE AT THE DIRECTION OF THE ENGINEER.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TREE WELL	519-3
	SHEET 7 OF 7

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UNPAVED PARKWAY
15 GAL (55 L) OR 24" (600 mm) BOX

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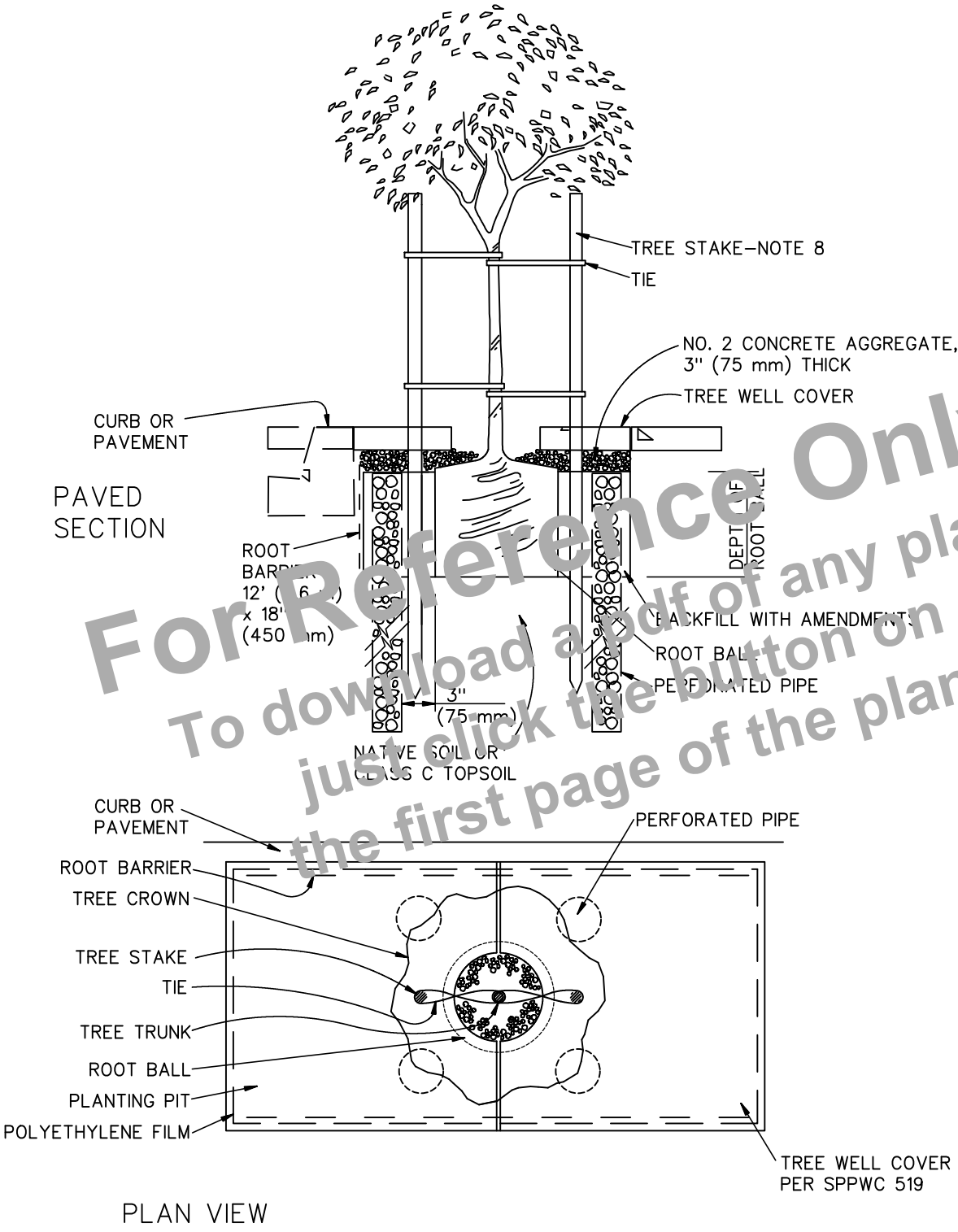
TREE PLANTING

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 520–5

SHEET 1 OF 4

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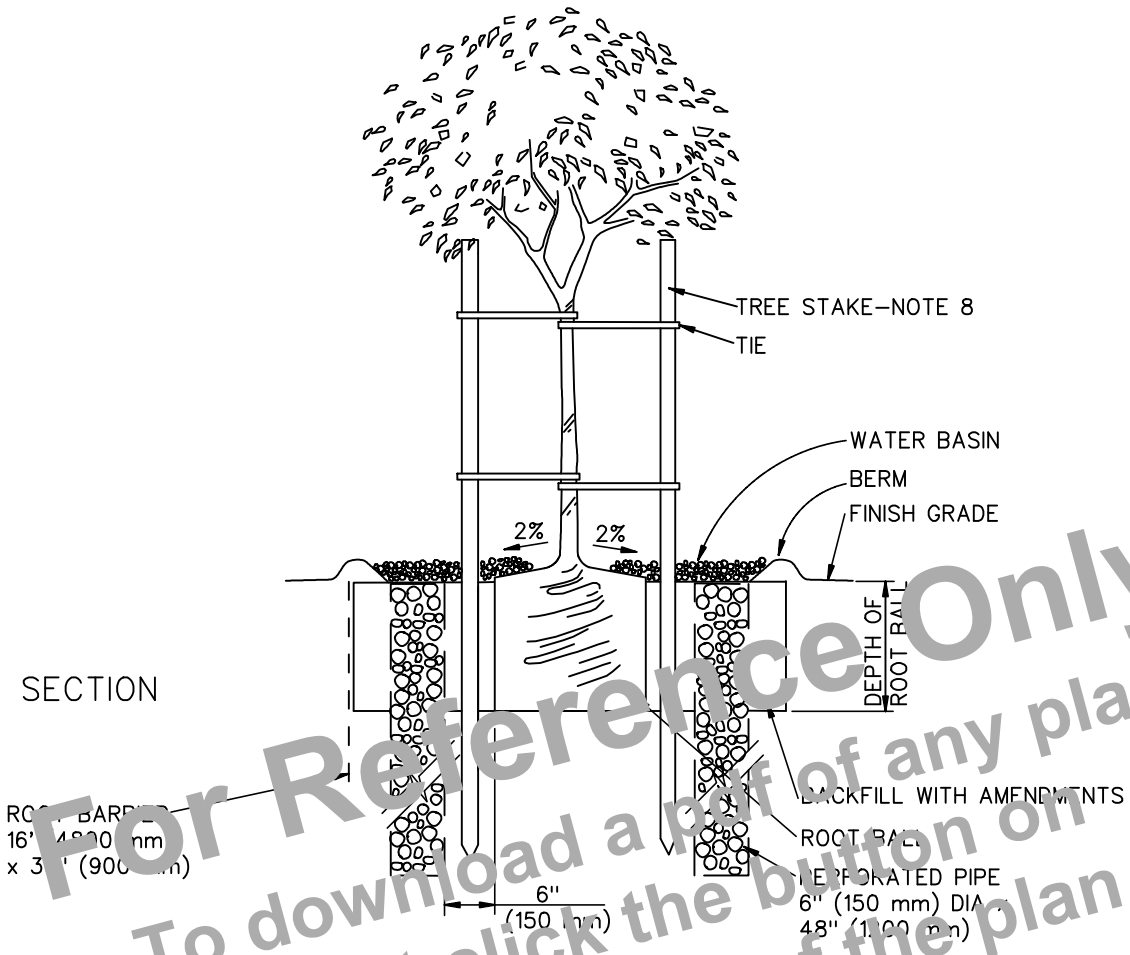


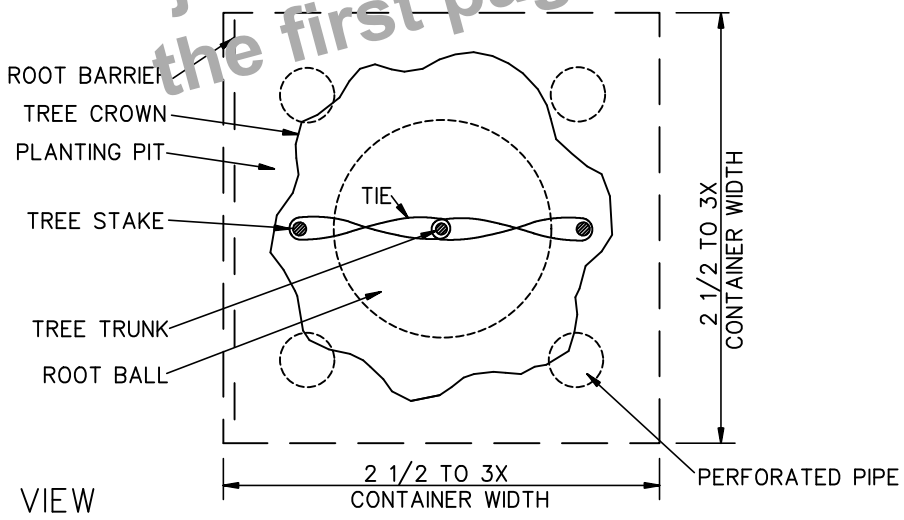
SIDEWALK TREE WELL
15 GAL (55 L) OR 24" (600 mm) BOX

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TREE PLANTING	**520–5**
	SHEET 2 OF 4

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

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN 520–5
TREE PLANTING	SHEET 3 OF 4

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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 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 CONCRETE AGGREGATE 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 CONCRETE AGGREGATE OR TYPE 1 MULCH PER THE SPECIAL PROVISIONS. KEEP CONCRETE AGGREGATE 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 SSPWC 513.

9. FASTEN TREE TO STAKES PER 801.4.6, TWO TIES PER STAKE.

10. AFTER PLANTING, PRUNE THE TREE AS APPROVED BY THE ENGINEER.

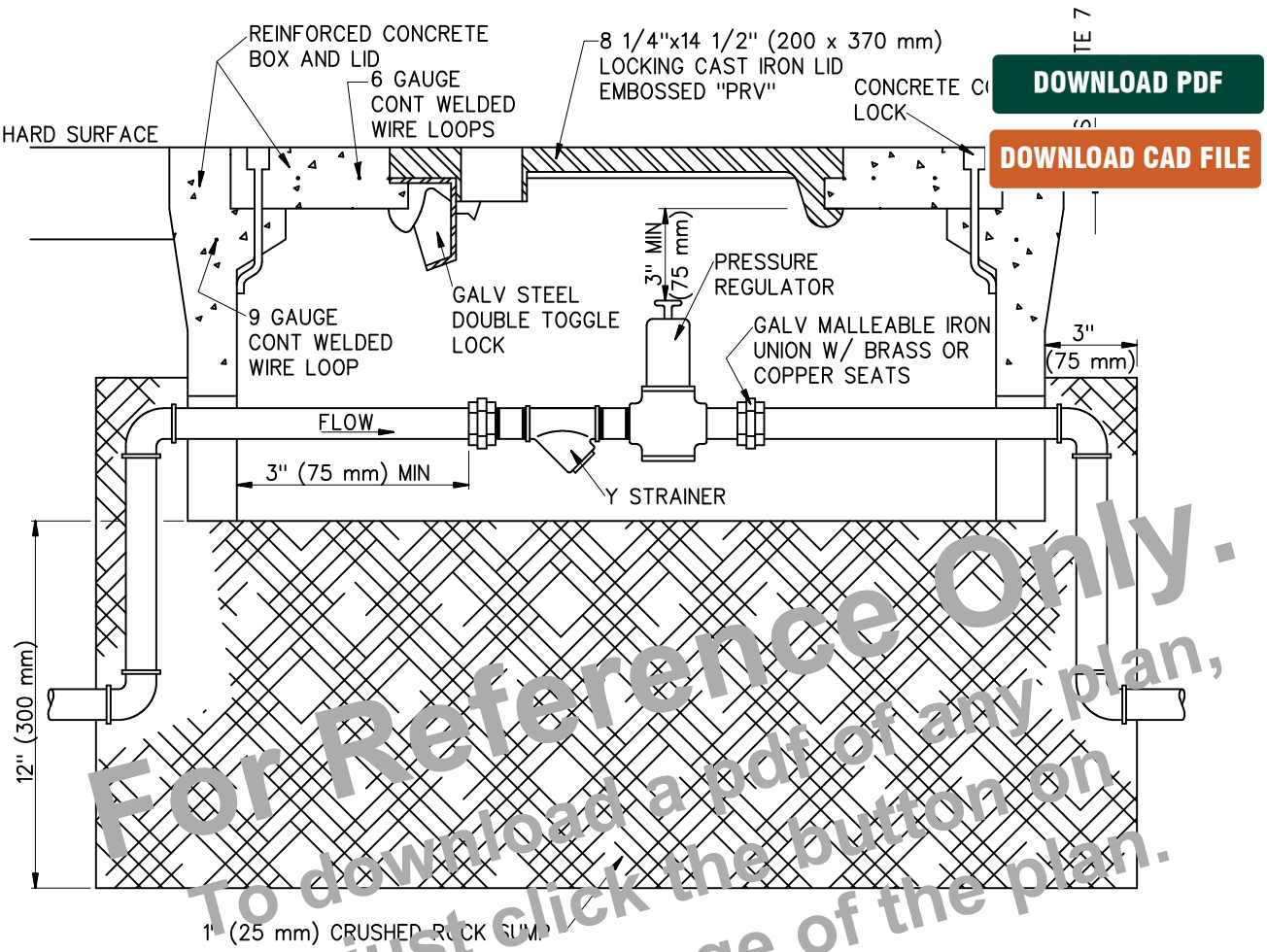
11. POLYETHYLENE FILM, WHERE SHOWN, SHALL BE 6 MIL (0.15 mm) THICK. LINE ALL FOUR SIDES OF PLANTING PIT.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TREE PLANTING	**520-5**
	SHEET 4 OF 4

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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

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PRESSURE REGULATOR INSTALLATION

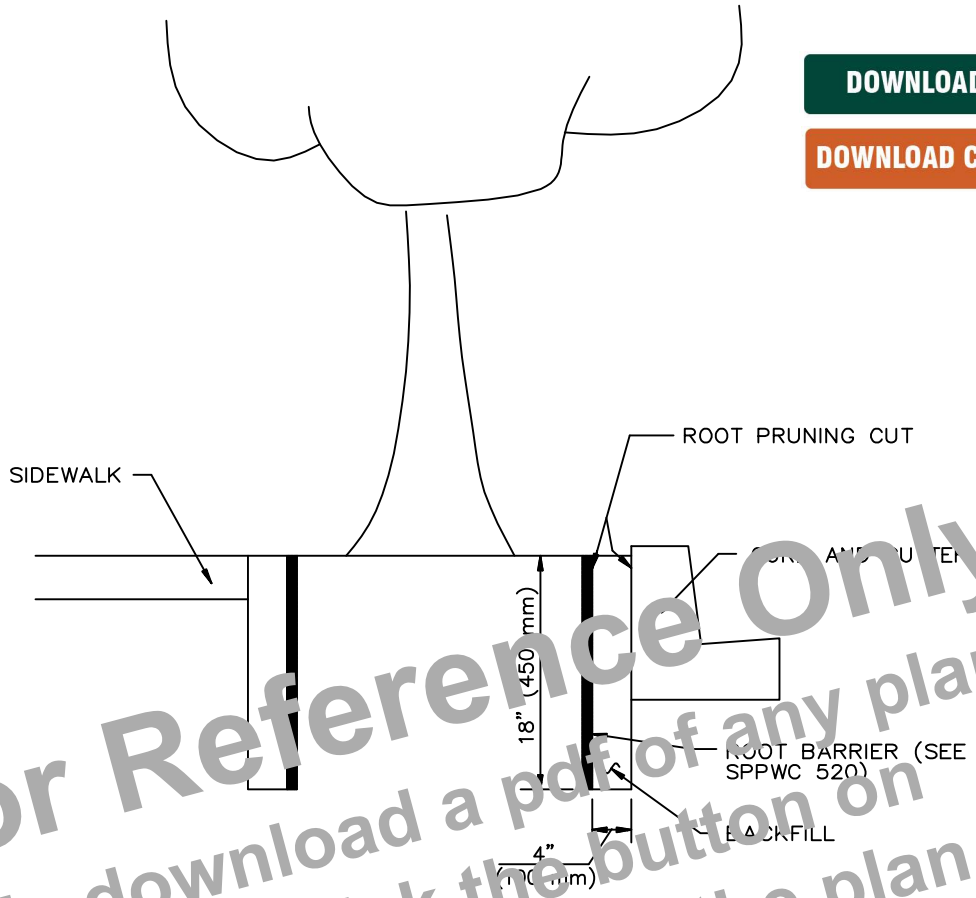
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 521–4

SHEET 1 OF 1

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NOTES:

1. WHERE EXISTING PARKWAY TREES HAVE BEEN ROOT PRUNED, INSTALL CONTINUOUS, LINEAL ROOT BARRIER ADJACENT TO THE CURB AND/OR SIDEWALK.
2. LENGTH AND LOCATION OF ROOT BARRIER SHALL BE DETERMINED BY ENGINEER.
3. ROOT SEALER SHALL BE APPROVED BY THE ENGINEER AT LEAST 48 HOURS IN ADVANCE OF THE PRUNING OPERATION. IT SHALL BE APPLIED TO ALL CUT ROOT AREAS WHICH ARE LARGER THAN 2" (50 mm) IN DIAMETER. THE SEALER SHALL BE APPLIED AS SOON AS PRACTICAL AFTER THE CUTS HAVE BEEN MADE.
4. ROOT BARRIERS SHALL BE FABRICATED FROM A HIGH DENSITY, HIGH IMPACT PLASTIC AND BE EXPRESSLY DESIGNED FOR THE PURPOSE OF ROOT DEFLECTION.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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ROOT PRUNING

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

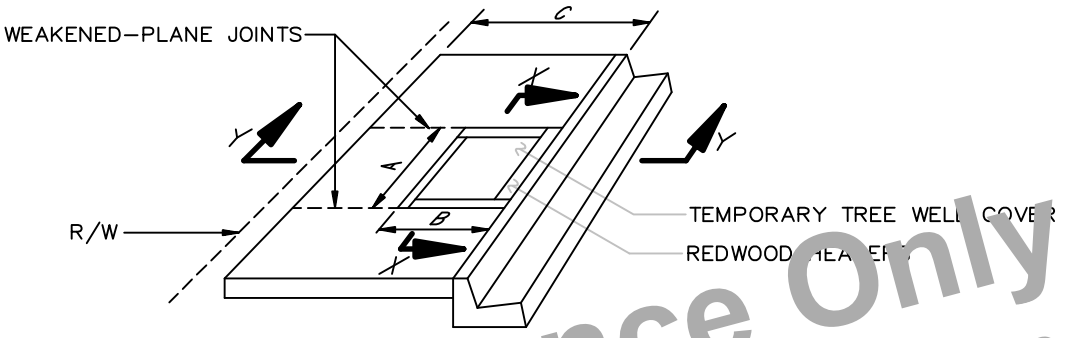
STANDARD PLAN 523–2

SHEET 1 OF 1

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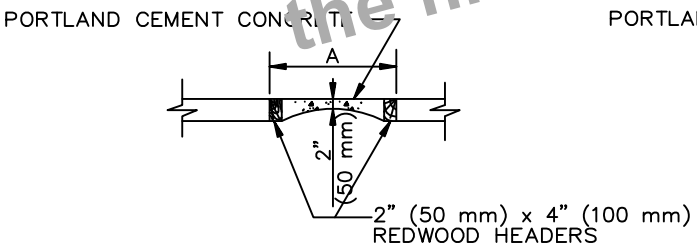
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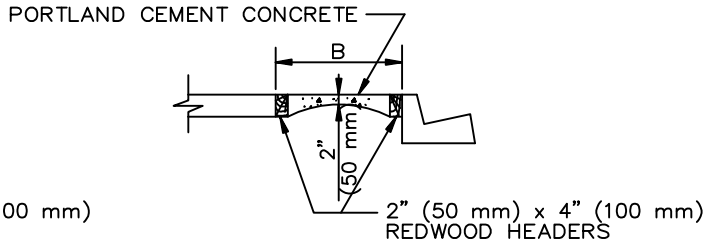


CASE 3: A=3' (900 mm) B=3' (900 mm) C=6'–6" (1980 mm) MIN
CASE 4: A=4' (1200 mm) B=4' (1200 mm) C=7'–6"(2250 mm) MIN

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SECTION X–X



SECTION Y–Y

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARD, INC. GREENBOOK COMMITTEE 1984 REV. 1996, 2009	**TEMPORARY TREE WELL COVER** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **524–2** SHEET 1 OF 2

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NOTES

1. TREE WELLS SHALL 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 THE 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. TEMPORARY TREE WELL COVER SHALL BE TAPERED TO A 2" (50 mm) THICKNESS AT THE CENTER FOR EASE OF BREAKING AND REMOVAL.

4. TEMPORARY TREE WELL COVER SHALL BE POURED IN PLACE. FINISH TO BE IDENTICAL WITH ADJACENT PCC WALK.

5. TEMPORARY TREE WELL COVER SHALL BE CAST 3 UNLESS OTHERWISE SPECIFIED.

6. LOCATION OF TREE WELLS SUBJECT TO CHANGE AT THE DIRECTION OF THE ENGINEER.

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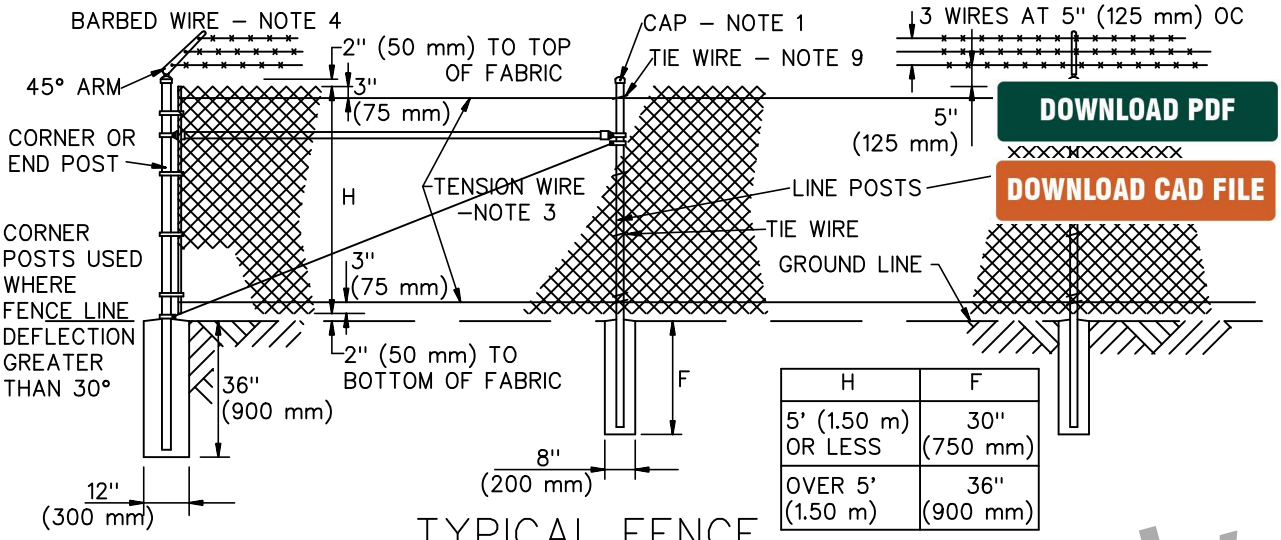
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
TEMPORARY TREE WELL COVER	524-2
	SHEET 2 OF 2

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SECTION 600

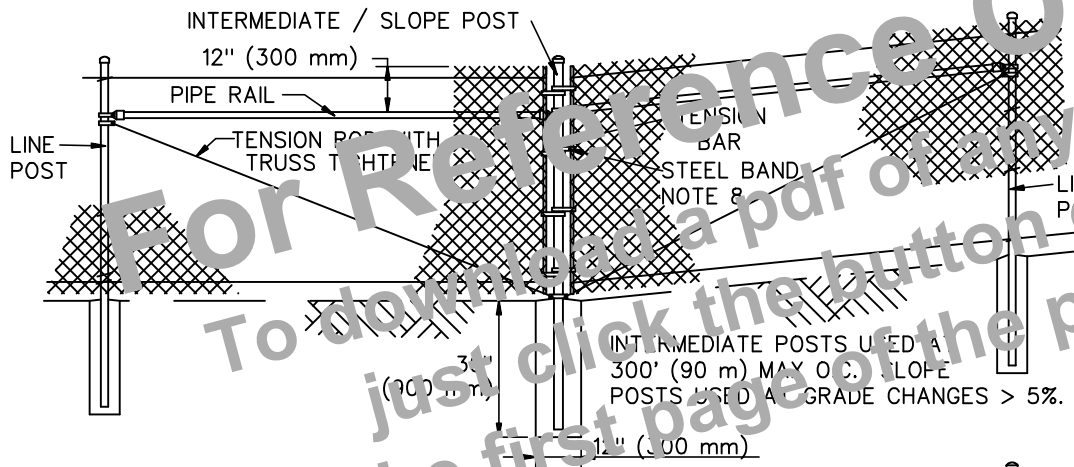
General Facilities

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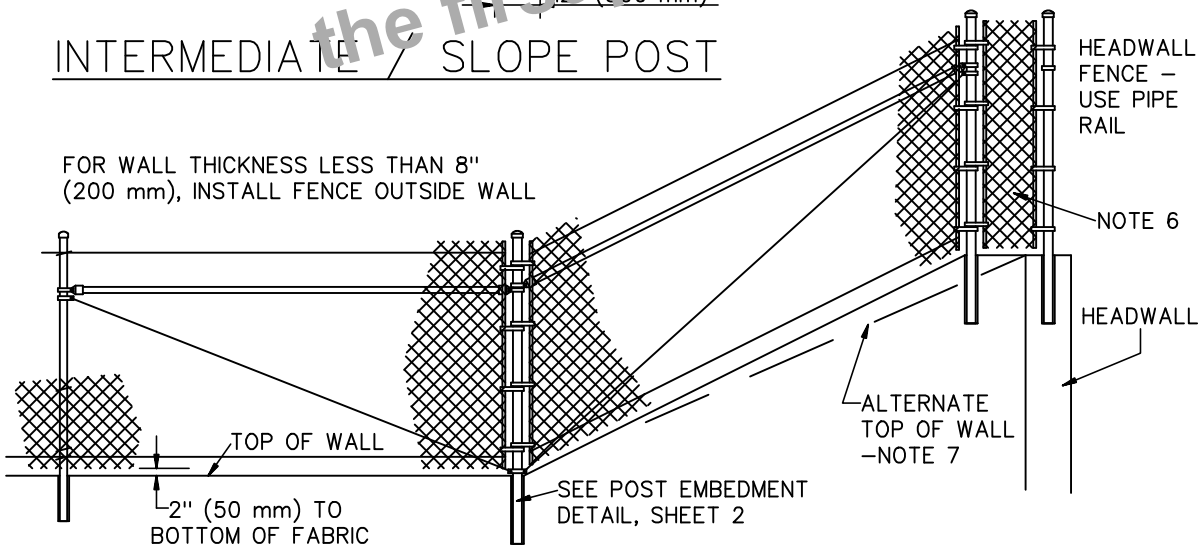


H	F
5' (1.50 m) OR LESS	30" (750 mm)
OVER 5' (1.50 m)	36" (900 mm)

TYPICAL FENCE



INTERMEDIATE / SLOPE POST



CHANNEL WALL AND WINGWALL AT HEADWALL

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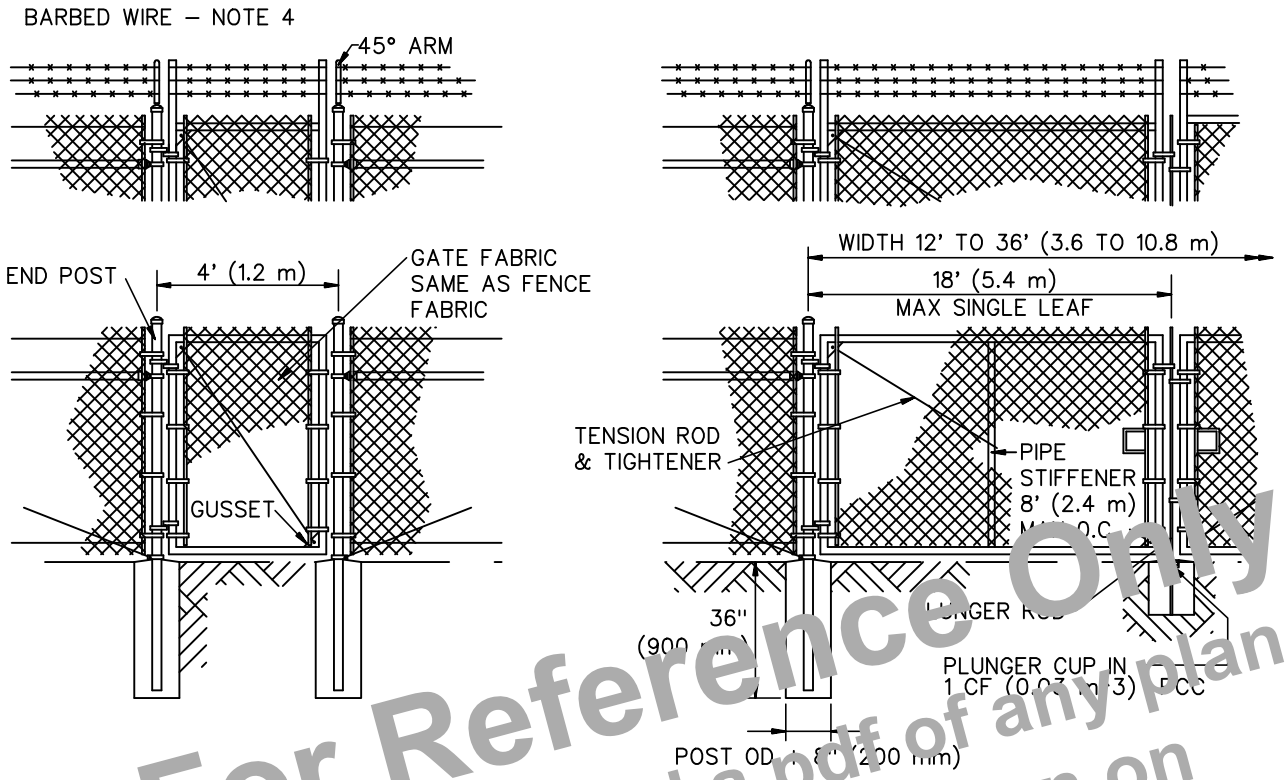
CHAIN LINK FENCE AND GATES

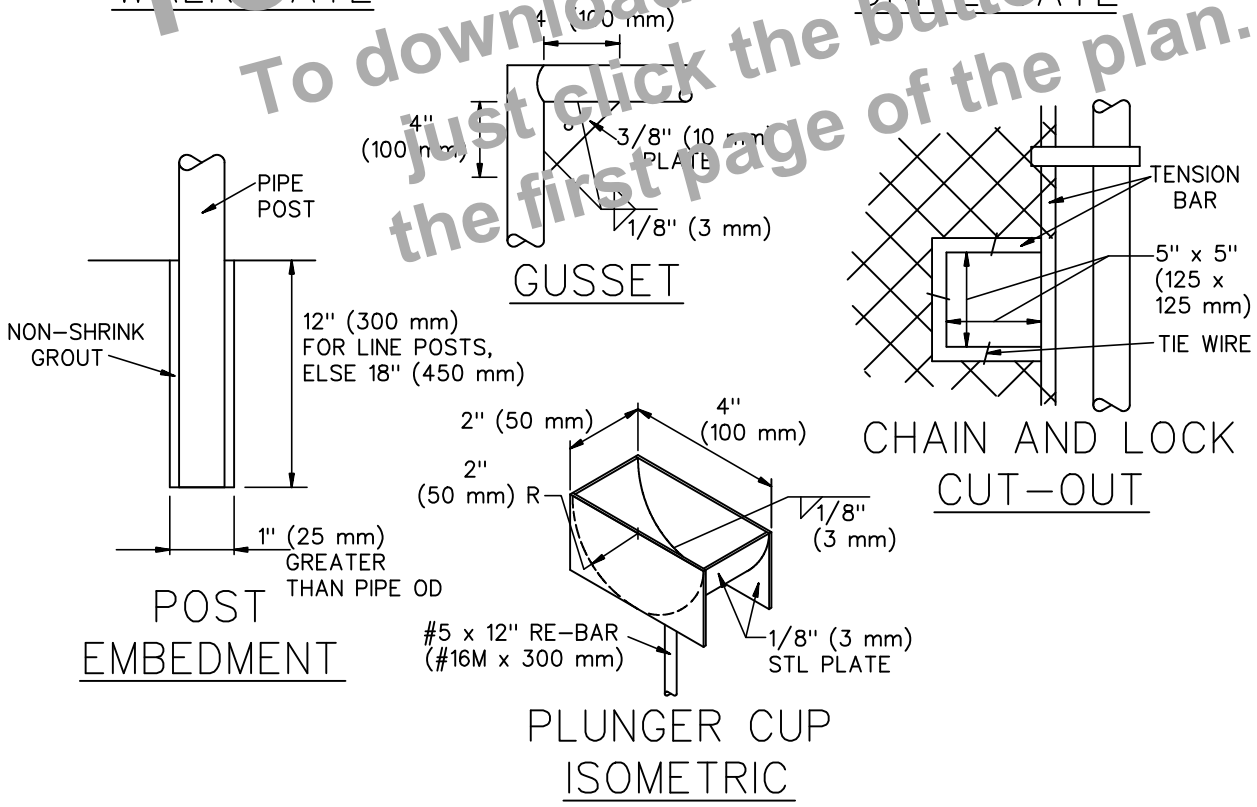
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 600–4

SHEET 1 OF 3

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CHAIN LINK FENCE AND GATES	**600–4**
	SHEET 2 OF 3

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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 WHERE TOP OF CHANNEL WALL IS CONSTRUCTED AS SHOWN FOR ALTERNATE "B".

8. STEEL BANDS AT TENSION BARS SHALL BE 1/3" x 1" (3 x 25 mm), MINIMUM, SPACED AT MAXIMUM 15" (400 mm).

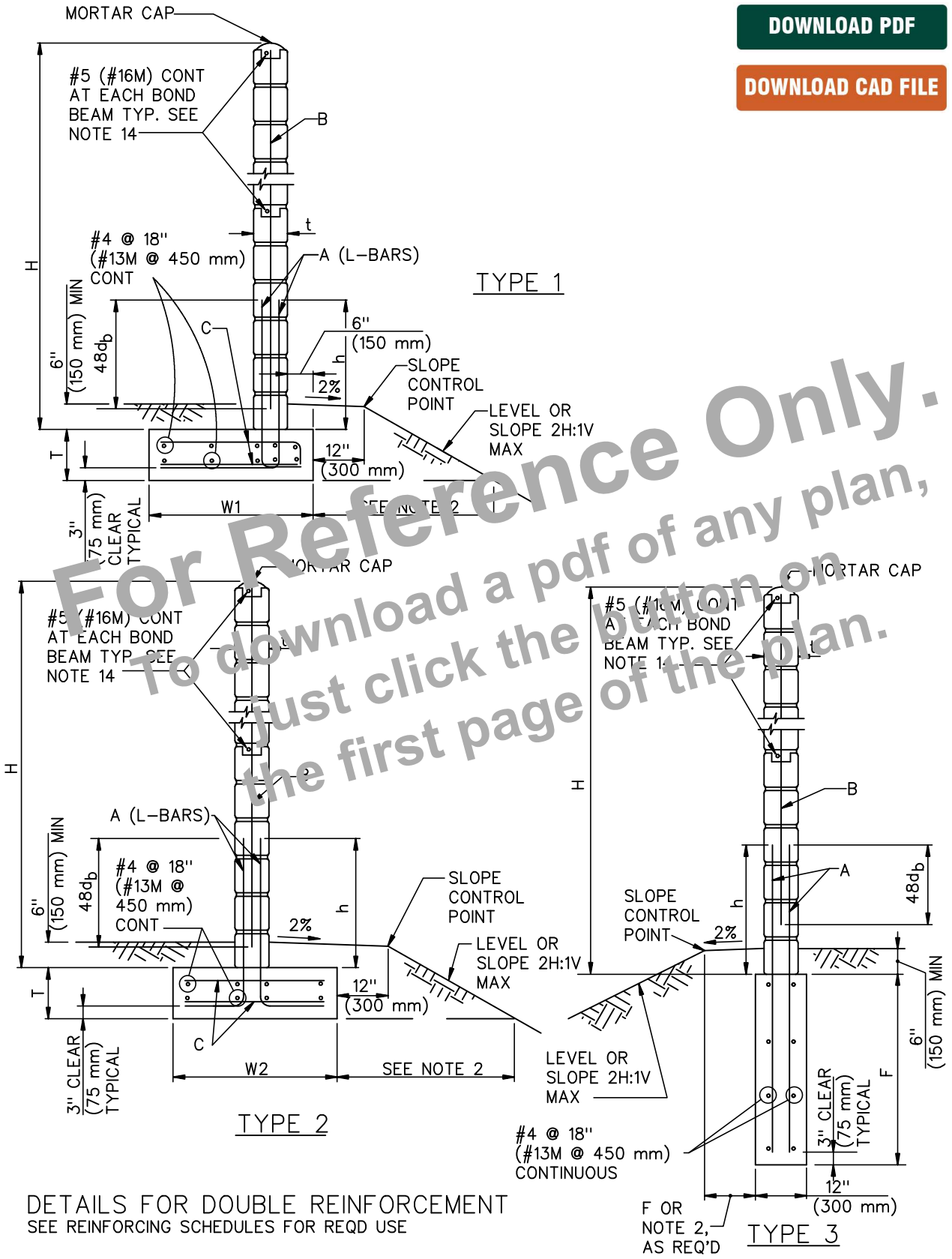
9. SECURE TENSION WIRES TO EACH LINE POST WITH TIE WIRES.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
CHAIN LINK FENCE AND GATES	**600–4**
	SHEET 3 OF 3

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DETAILS FOR DOUBLE REINFORCEMENT
SEE REINFORCING SCHEDULES FOR REQD USE

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

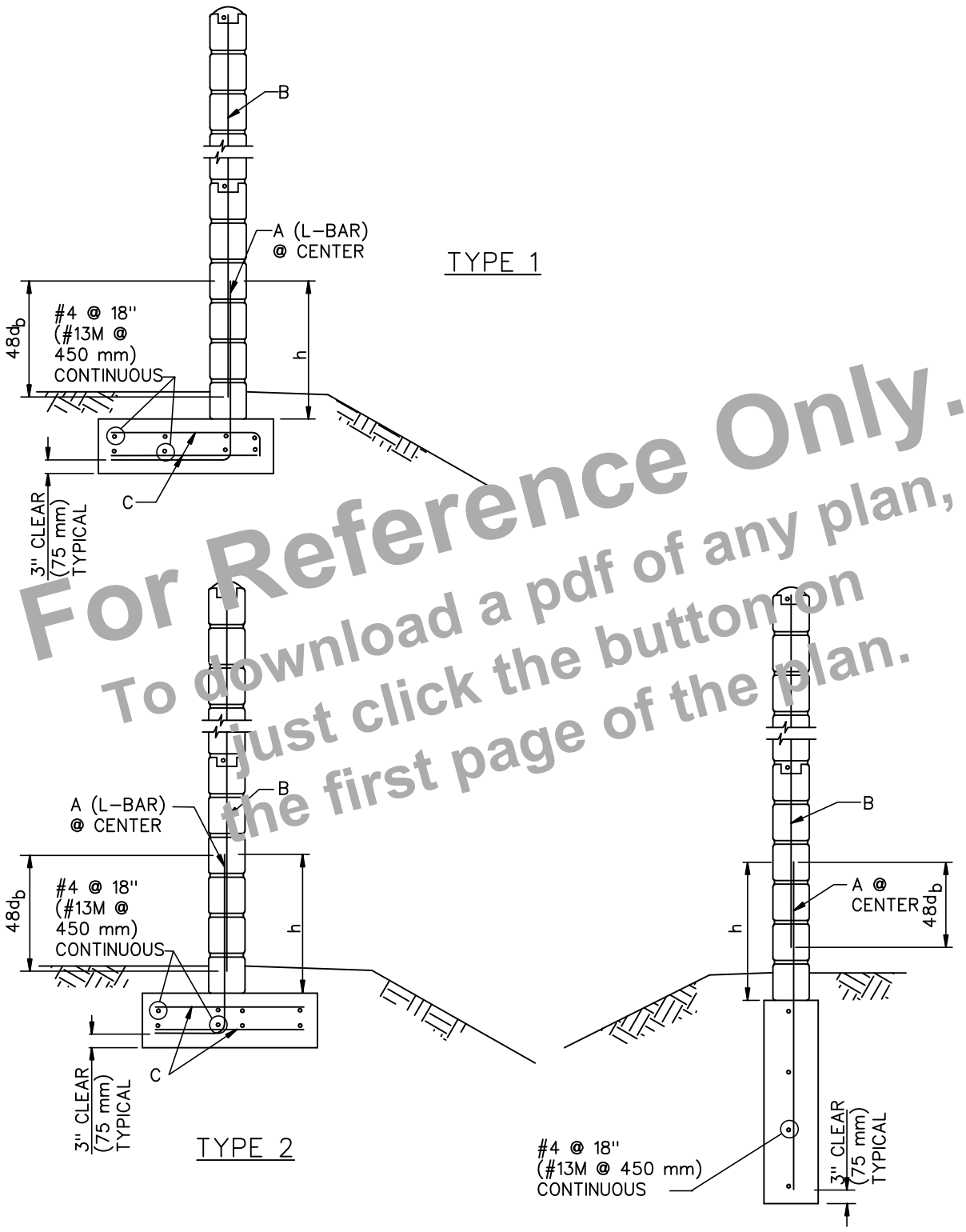
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REINFORCED CONCRETE BLOCK WALL

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 601–5

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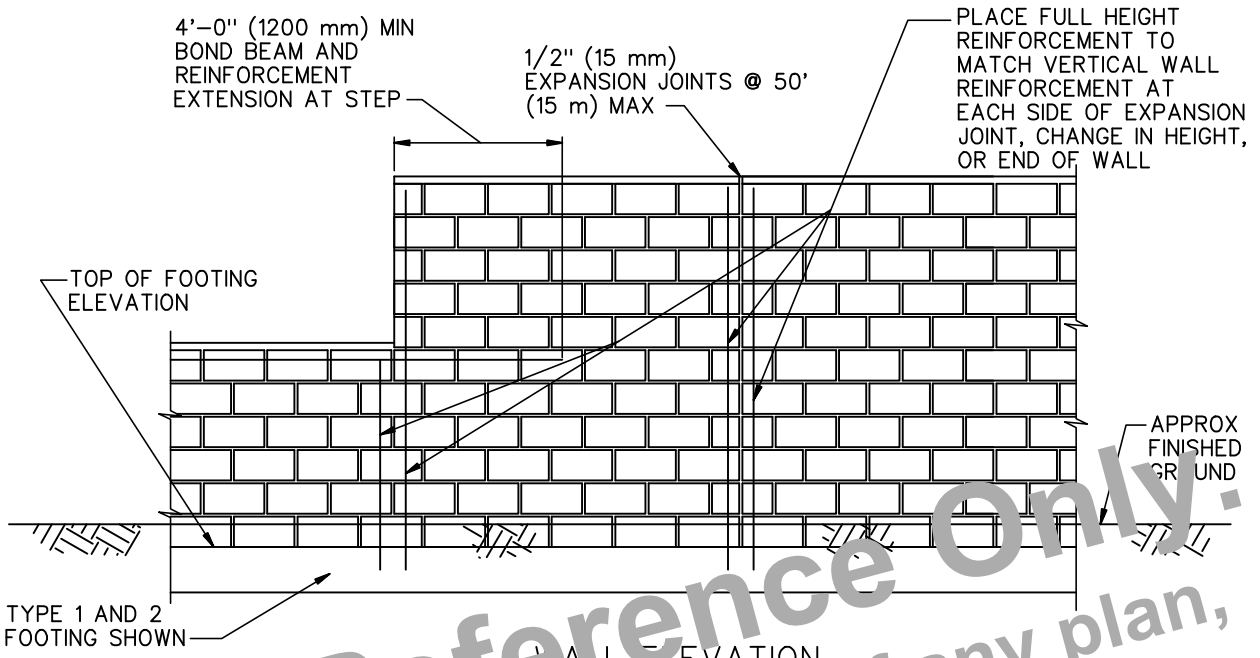


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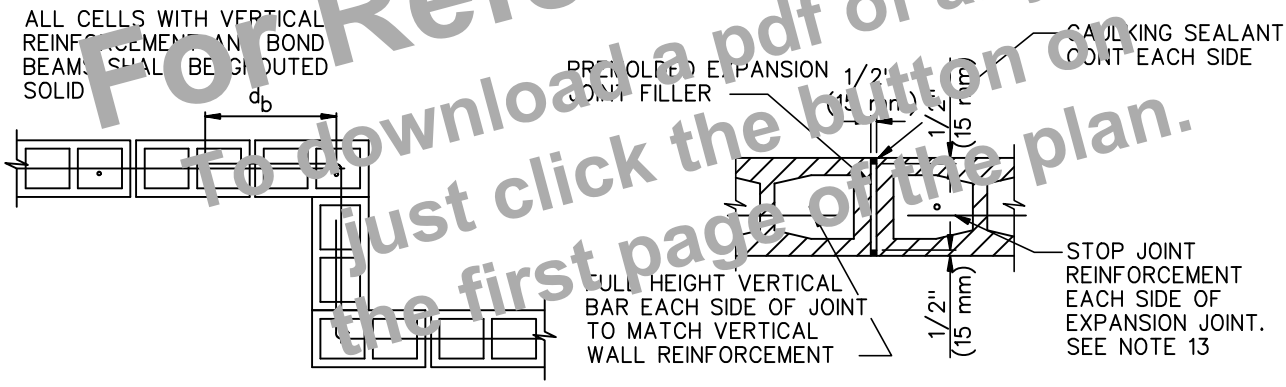
DETAILS FOR SINGLE REINFORCEMENT
SEE REINFORCING SCHEDULES FOR ALLOWED USE
SEE SHEET 1 FOR OTHER DIMENSIONS AND DETAILS

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE BLOCK WALL	**601-5**
	SHEET 2 OF 6

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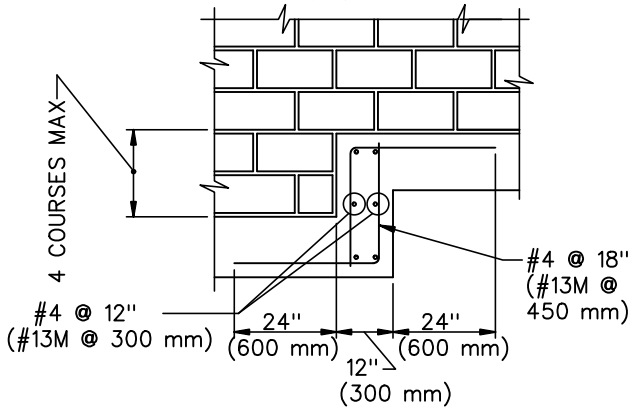


WALL ELEVATION



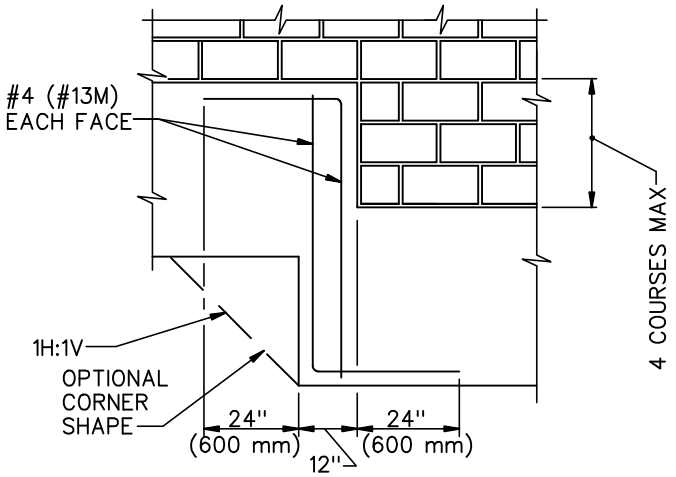
CORNER DETAIL

NOTE:
SINGLE VERTICAL REINFORCING BARS SHALL BE CENTERED IN CELLS. DOUBLE ROWS OF VERTICAL REINFORCING BARS SHALL HAVE THE REINFORCEMENT PLACED IN EACH FACE (EF).



SPREAD FOOTING
TYPE 1 AND 2

EXPANSION JOINT DETAIL



TRENCH FOOTING
TYPE 3

FOOTING STEP DETAILS

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

REINFORCED CONCRETE BLOCK WALL

STANDARD PLAN
601–5
SHEET 3 OF 6

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LATERAL LOAD = 15 PSF (720 Pa)									
STEM		FOOTING				REINFORCING BARS			
						CUTOFF	SPACING, O.C.		
H	t	T	W1 (TYPE 1)	W2 (TYPE 2)	F (TYPE 3)	h	A	B	C
6'–0" (1.8 m)	6" (150 mm)	12" (300 mm)	2'–3" (675 mm)	2'–3" (675 mm)	2'–9" (825 mm)	30" (750 mm)	#4 @ 48"* (#13M@1200*)	#4 @ 48" (#13M@1200)	#4 @ 48" (#13M@1200)
8'–0" (2.4 m)	8" (200 mm)	12" (300 mm)	2'–9" (825 mm)	2'–6" (750 mm)	3'–3" (975 mm)	30" (750 mm)	#4 @ 32"* (#13M@800*)	#4 @ 32" (#13M@800)	#4 @ 32" (#13M@800)
10'–0" (3.0 m)	8" (200 mm)	12" (300 mm)	3'–9" (1125 mm)	3'–0" (900 mm)	3'–9" (1125 mm)	30" (750 mm)	#4 @ 32"EF (#13M@800EF)	#4 @ 32" (#13M@800)	#4 @ 32" (#13M@800)

LATERAL LOAD = 20 PSF (960 Pa)									
STEM		FOOTING				REINFORCING BARS			
						CUTOFF	SPACING, O.C.		
H	t	T	W1 (TYPE 1)	W2 (TYPE 2)	F (TYPE 3)	h	A	B	C
6'–0" (1.8 m)	6" (150 mm)	12" 300 mm	2'–9" (825 mm)	2'–6" (750 mm)	3'–3" (975 mm)	30" (750 mm)	#5 @ 32"* (#16M@800*)	#4 @ 32" (#13M@800)	#4 @ 32" (#13M@800)
8'–0" (2.4 m)	8" (200 mm)	12" 300 mm	3'–3" (975 mm)	3'–0" (900 mm)	3'–9" (1125 mm)	30" (750 mm)	#4 @ 32"EF (#13M@800EF)	#4 @ 32" (#13M@800)	#4 @ 32" (#13M@800)
10'–0" (3.0 m)	8" (200 mm)	12" 300 mm	4'–3" (1275 mm)	3'–6" (1050 mm)	4'–3" (1275 mm)	42" (1050 mm)	#5 @ 32"EF (#16M@800EF)	#4 @ 32" (#13M@800)	#5 @ 32" (#16M@800)

LATERAL LOAD = 25 PSF (1200 Pa)									
STEM		FOOTING				REINFORCING BARS			
						CUTOFF	SPACING, O.C.		
H	t	T	W1 (TYPE 1)	W2 (TYPE 2)	F (TYPE 3)	h	A	B	C
6'–0" (1.8 m)	6" (150 mm)	12" (300 mm)	3'–0" (900 mm)	2'–9" (825 mm)	3'–6" (1050 mm)	30" (750 mm)	#5 @ 16"* (#16M@400*)	#4 @ 32" (#13M@800)	#4 @ 32" (#13M@800)
8'–0" (2.4 m)	8" (200 mm)	12" (300 mm)	3'–9" (1125 mm)	3'–3" (975 mm)	4'–0" (1200 mm)	30" (750 mm)	#4 @ 16"EF (#13M@400EF)	#4 @ 32" (#13M@800)	#4 @ 32" (#13M@800)
10'–0" (3.0 m)	8" (200 mm)	12" (300 mm)	4'–9" (1425 mm)	4'–0" (1200 mm)	4'–9" (1425 mm)	50" (1250 mm)	#5 @ 16"EF (#16M@400EF)	#4 @ 32" (#13M@800)	#5 @ 32" (#16M@800)

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NOTES

1. SINGLE VERTICAL REINFORCING BARS SHALL BE CENTERED IN CELL.
2. * FOR SINGLE A–BARS IN FOUNDATION, SEE SHEET 2.
3. DOUBLE ROWS OF VERTICAL REINFORCING WHERE INDICATED SHALL BE PLACED AT EACH FACE (EF).

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DESIGN CRITERIA:

MATERIALS DESIGN DATA:

REINFORCING STEEL ..... fy = 60 KSI (420 MPa)

CONCRETE 28TH-DAY STRENGTH:
FOOTING ..... f 'c = 2,500 PSI (17 MPa)

CONCRETE MASONRY:
PARTIALLY GROUTED ..... f 'm = 1,500 PSI (10 MPa)

DESIGN CODE: ..... GOVERNING BUILDING CODE

DESIGN METHOD:

CONCRETE ..... ULTIMATE STRENGTH METHOD
CONCRETE MASONRY ..... WORKING STRESS METHOD

FOUNDATION:

ALLOWABLE SOIL BEARING PRESSURE ..... 1,000 PSF (48 kPa)
ALLOWABLE LATERAL SOIL BEARING PRESSURE ..... 100 PSF / FT OF DEPTH
(157 kPa / m OF DEPTH)
LATERAL SLIDING RESISTANCE AT CONTACT AREA ..... 130 PSF (6.2 kPa)
BUT NOT TO EXCEED 0.40 X DL
SOIL DENSITY ..... 110 PCF (1760 kg/m^ 3)
FACTORS OF SAFETY FOR SPREAD FOOTING (BASED ON SERVICE LOAD CONDITIONS):
OVERTURNING ..... 1.75 MINIMUM
SLIDING ..... 1.5 MINIMUM

ONE THIRD INCREASE IS ALLOWED FOR SHORT TERM LOADS.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE BLOCK WALL	**601-5**
	SHEET 5 OF 6

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GENERAL NOTES:

1. CONSULT WITH LOCAL GOVERNING AGENCY FOR DETERMINATION OF LATERAL LOAD AND WALL TYPE LISTED IN TABLES, FOR PROJECT–SPECIFIC USE.

2. DISTANCE OF THE FOOTING FROM DESCENDING SLOPE SHALL BE PER LATEST GOVERNING BUILDING CODE OR PER AGENCY REQUIREMENTS.

3. GROUND LINE TO BE AT THE SAME ELEVATION ON BOTH SIDES OF THE WALL. WALL SHALL NOT BE USED TO RETAIN EARTH.

4. USE TABULAR INFORMATION FOR THE NEXT HIGHER H FOR INTERMEDIATE WALL HEIGHTS THAT ARE BETWEEN THE H'S GIVEN.

5. CONCRETE SHALL BE 500–C–2500 (295–C–17) PER SSPWC 201–1.1.2.

6. REINFORCING SHALL BE LAPPED A MINIMUM 48 BAR DIA. GRADE 60 (420M), UNLESS OTHERWISE SPECIFIED, PER SSPWC 201–2 AND 303–4.1.3. JOINT REINFORCING WIRE: ASTM A1064 (A1064M).

7. REINFORCED CONCRETE CONSTRUCTION SHALL CONFORM TO SSPWC 303–1.

8. FOR TYPE OF BLOCKS, BOND PATTERN AND JOINT FINISH SEE PROJECT PLANS.

9. MASONRY CONSTRUCTION SHALL CONFORM TO SSPWC 303–4.

10. HOLLOW MASONRY UNITS SHALL BE ASTM C90, TYPE I, NORMAL WEIGHT CONFORMING TO SSPWC 202–2.2.

11. MORTAR AND GROUT SHALL CONFORM TO SSPWC 202–3.

12. PROVIDE FULL MORTAR BED AT THE BOTTOM OF THE FIRST COURSE AND OMIT MORTAR BETWEEN VERTICAL JOINTS OF LOWEST EXPOSED COURSE.

13. WHEN BLOCKS ARE LAID IN STACKED BOND, CONTINUOUS HORIZONTAL JOINT REINFORCEMENT SPACED AT 2'–0" (600 mm) OC SHALL BE PROVIDED IN ADDITION TO THE BOND BEAM REINFORCEMENT PER SSPWC 303–4.1.2, LOCATE REINFORCEMENT IN JOINTS THAT ARE APPROXIMATE MIDPOINT BETWEEN BOND BEAMS.

14. BOND BEAMS SHALL BE PLACED AT TOP OF WALL AND SUBSEQUENTLY SPACED NOT TO EXCEED 4'–0" (1200 mm) O.C. BELOW.

15. ONLY CELLS WITH REINFORCING BARS SHALL BE GROUTED PER SSPWC 303–4.1.3.

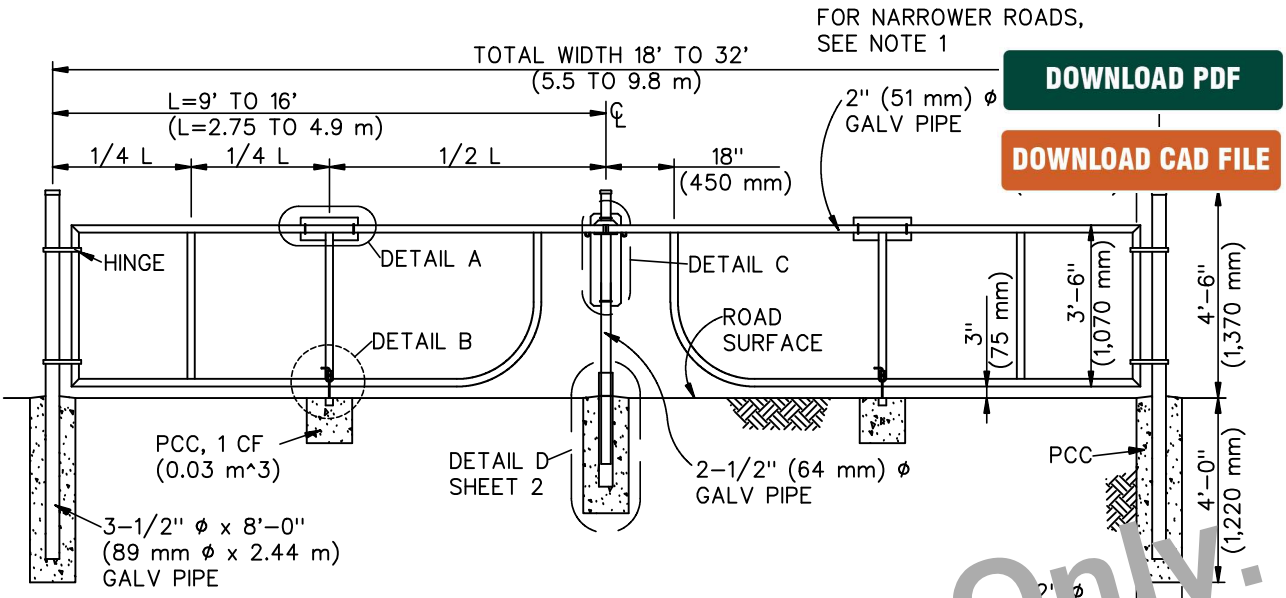
16. HORIZONTAL JOINTS SHALL BE TOOLED CONCAVE OR WEATHERED. VERTICAL JOINTS SHALL BE TOOLED CONCAVE OR RAKED. WEATHERED AND RAKED JOINTS ARE NOT PERMITTED FOR SLUMPED BLOCKS.

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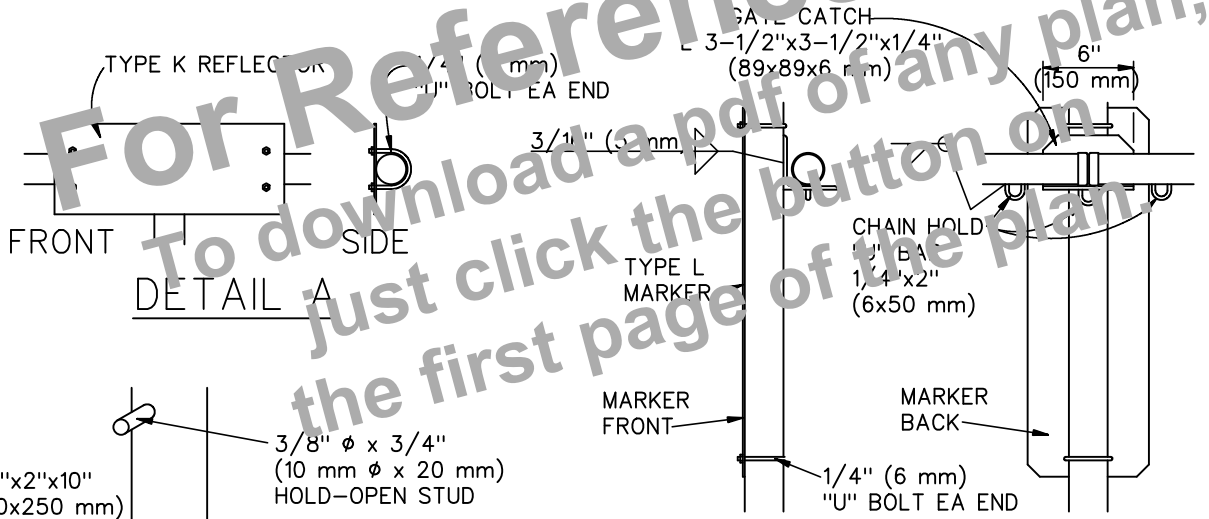
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE BLOCK WALL	**601–5**
	SHEET 6 OF 6

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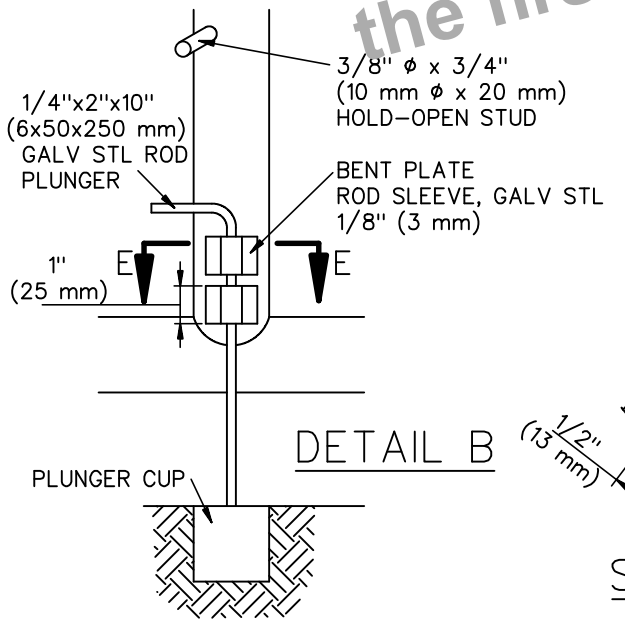
ELEVATION



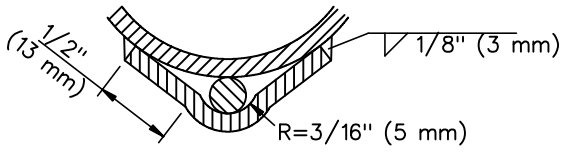
DETAIL A

SIDE VIEW

DETAIL C



DETAIL B



SECTION E-E

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1993 REV. 1996, 2005, 2009, 2021

STANDARD PIPE GATE FOR ACCESS ROADS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 602-4

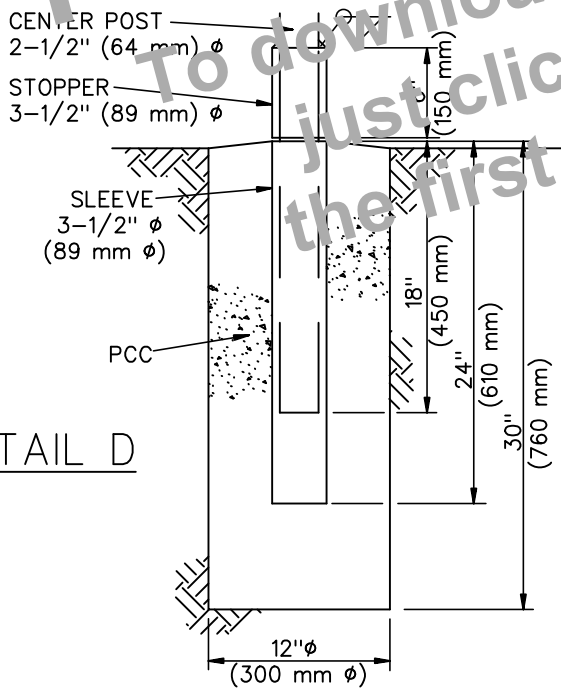
SHEET 1 OF 2

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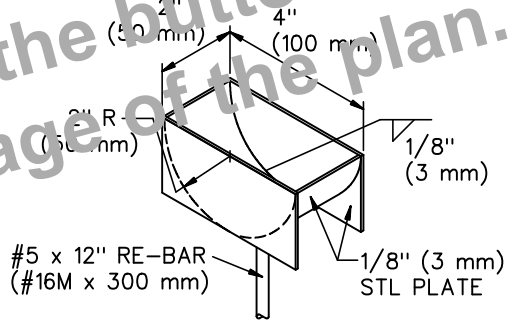
NOTES:

1. FOR ROADWAYS 16'–0" (4.8 m) WIDE OR LESS, USE A SINGLE GATE. PLACE THE ANGLE CATCH ON A PERMANENT END POST.
2. PIPE SHALL BE STANDARD WEIGHT, PER AISC STANDARDS.
3. CUT THE PIPE TO PROVIDE A CLOSE FIT OF THE JOINTS.
4. USE 100% PENETRATION WELDS FOR PIPE CONNECTIONS.
5. PAINT GATE WITH ONE COAT OF ALUMINUM PAINT AFTER FABRICATION.
6. GATE HINGES SHALL BE HEAVY DUTY, MALLEABLE IRON OR STEEL, INDUSTRIAL SERVICE TYPE, WITH 270° SWING.
7. TYPE K AND TYPE L MARKERS SHALL CONFORM TO THE LATEST EDITION OF THE CALIFORNIA MUTCD. THE REFLECTORS SHALL BE FILM–TYPE.
8. SECURE NUTS AT U BOLT ENDS FROM REMOVAL BY WELDING OR PEENING AFTER INSTALLING MARKERS.

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DETAIL D

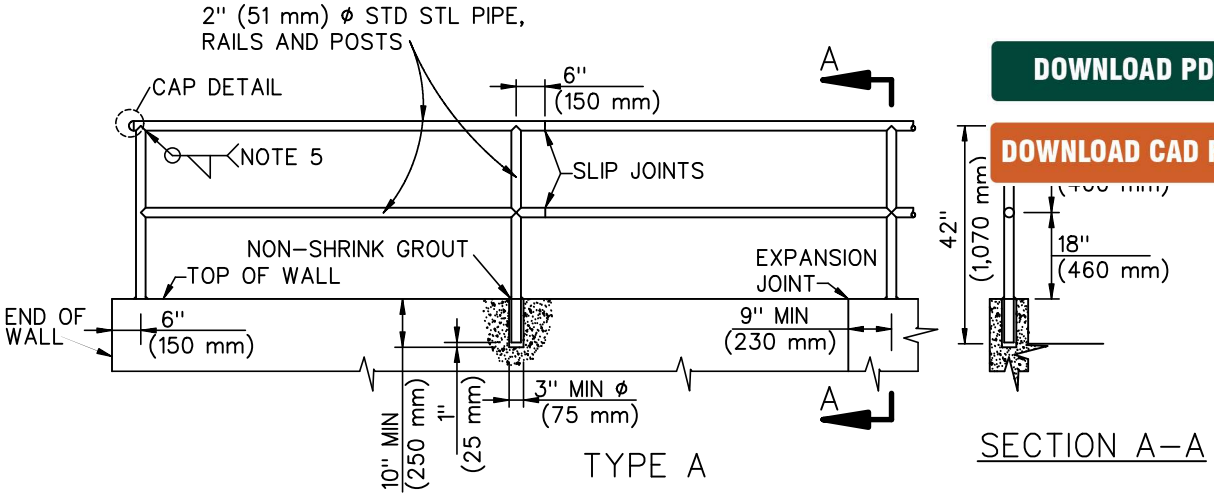


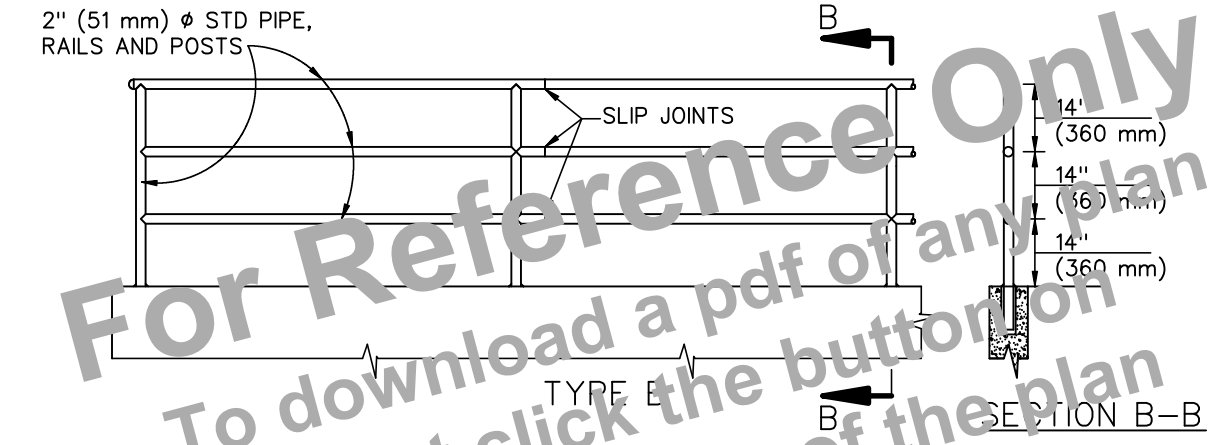
PLUNGER CUP ISOMETRIC

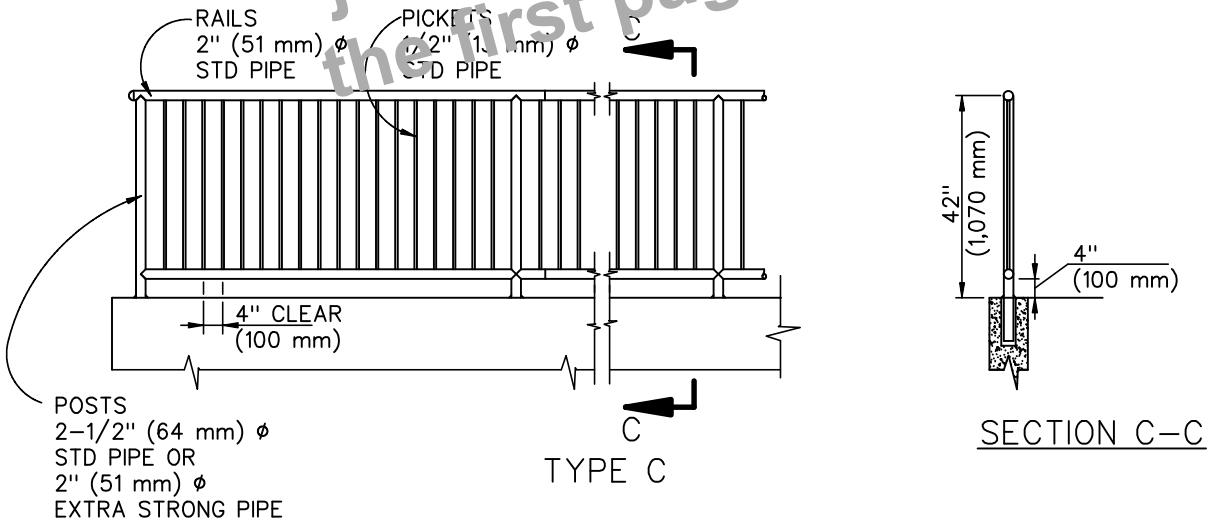
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
STANDARD PIPE GATE FOR ACCESS ROADS	**602–4**
	SHEET 2 OF 2

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ELEVATION

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SEE CALIFORNIA BUILDING CODE
FOR HANDRAIL AND OTHER REQUIREMENTS
FOR HANDICAPPED ACCESSIBLE RAMPS OTHER
THAN CURB RAMPS

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

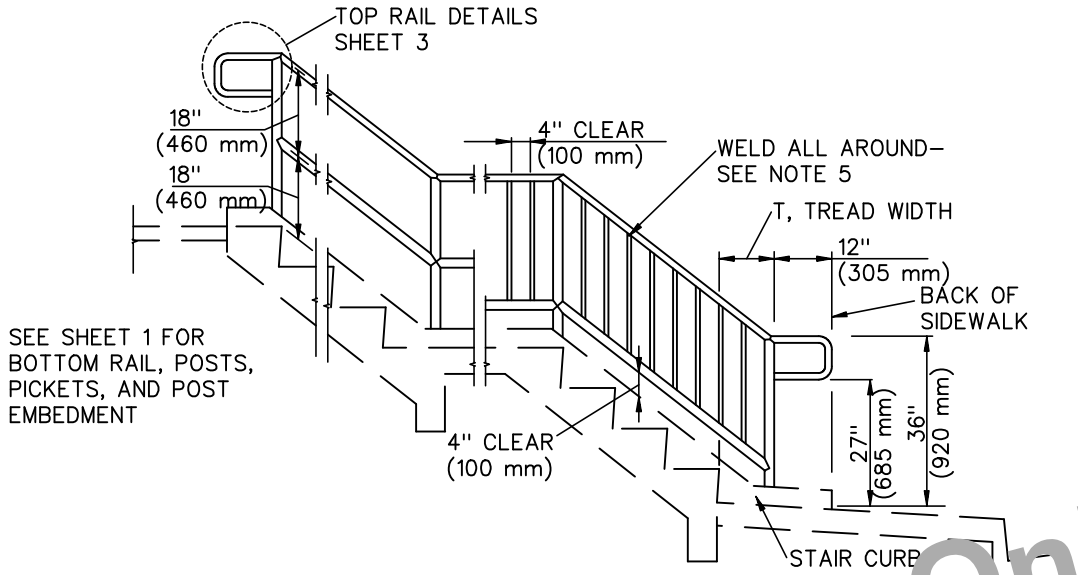
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PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1993
REV. 1996, 2006, 2009, 2013, 2021

METAL HAND RAILINGS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
606-5
SHEET 1 OF 3

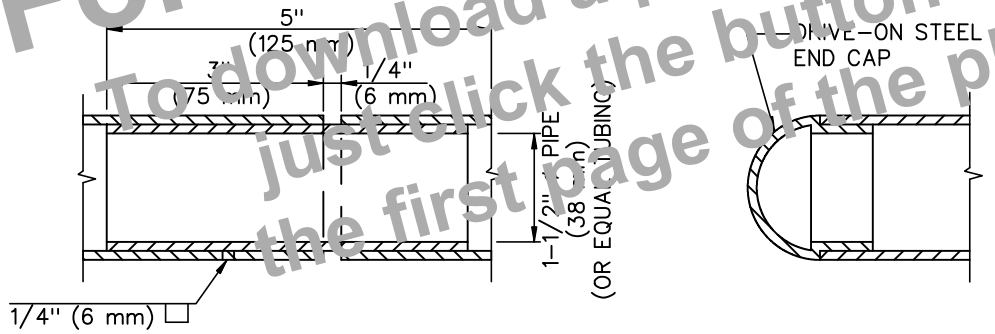
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TYPE A TYPE C

HANDRAIL INSTALLATION ON STAIRWAYS

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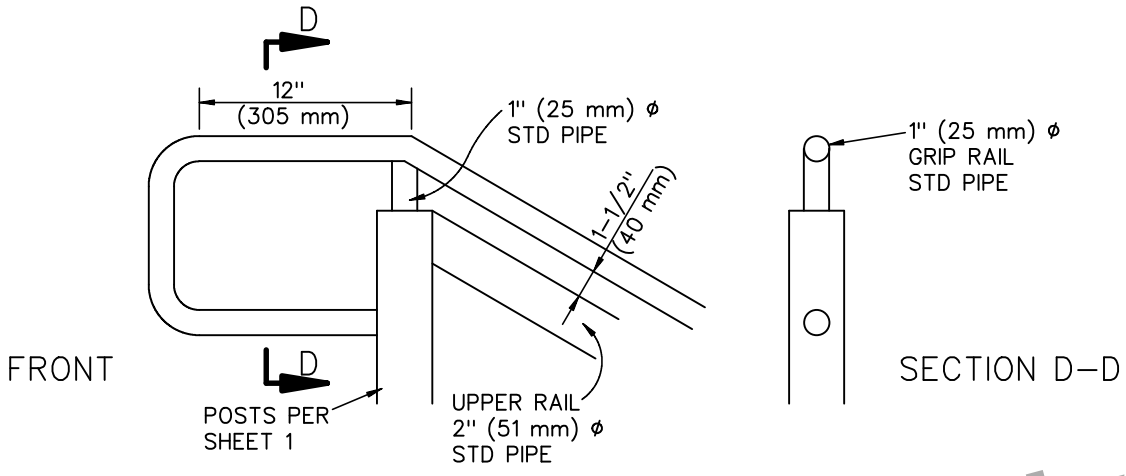
SLIP JOINT DETAIL CAP DETAIL FOR RAIL END

NOTES:

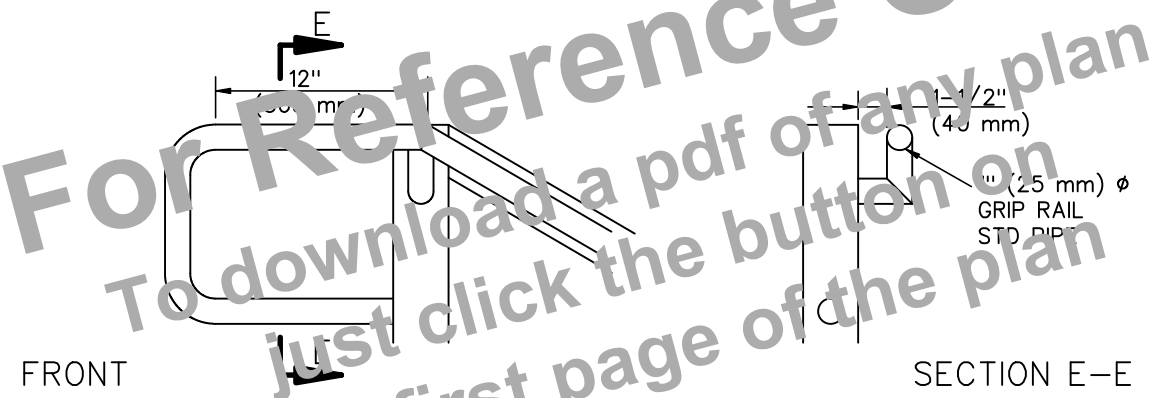
1. USE TYPE C WHERE ADJACENT GRADE IS MORE THAN 2'–6" (760 mm) BELOW LANDING OR SIDEWALK FINISHED SURFACE.
2. RAILS, POSTS, AND PICKETS SHALL BE GALVANIZED STEEL PIPE.
3. PROVIDE SLIP JOINTS AT STAIRWAY EXPANSION JOINTS, 24' (7.3 m) MAXIMUM.
4. MAXIMUM SPACING OF POSTS SHALL BE 8'–0" (2.44 m) ON STRAIGHT ALIGNMENTS, AND 6'–0" (1.83 m) ON CURVED ALIGNMENTS WITH LESS THAN 30' (9.1 m) RADIUS. MAKE SPACING UNIFORM BETWEEN CHANGES IN ALIGNMENT.
5. WELDS SHALL BE SLOT OR FILLET WELDS EQUAL TO THICKNESS OF PIPE. WELD ALL JOINTS ALL AROUND.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
METAL HAND RAILINGS	**606–5**
	SHEET 2 OF 3

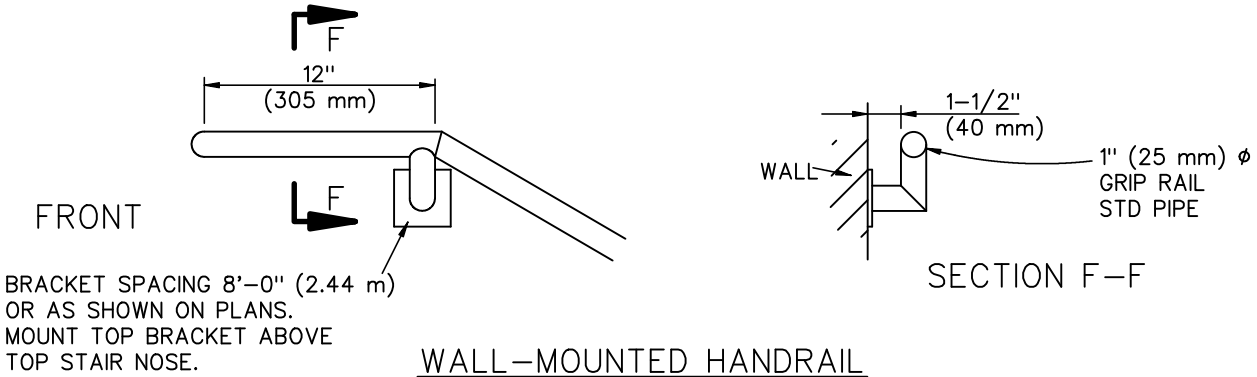
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TOP RAIL TYPE 1



TOP RAIL TYPE 2



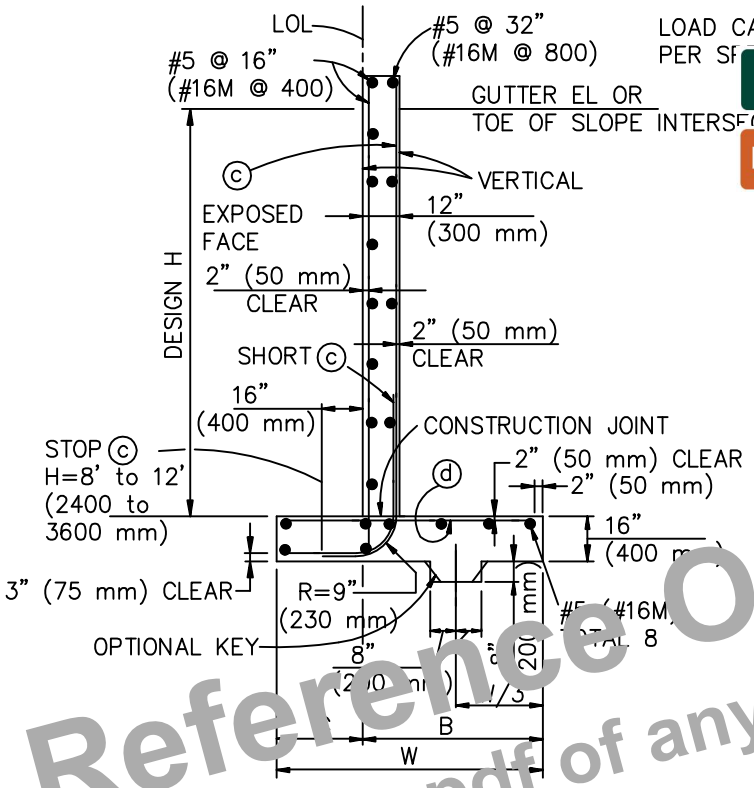
WALL-MOUNTED HANDRAIL

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
METAL HAND RAILINGS	**606-5**
	SHEET 3 OF 3

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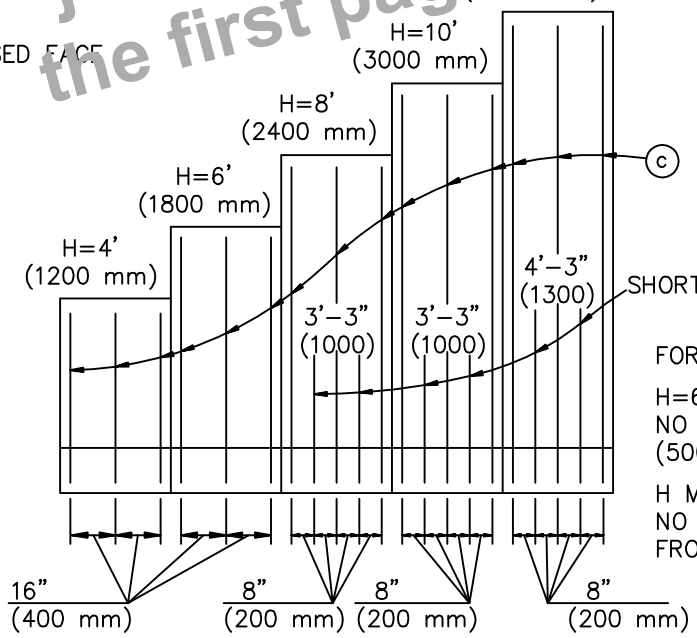


SECTION

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NUMBER ABOVE SHORT c BARS IS DISTANCE, INCHES (mm), FROM TOP OF FOOTING TO END OF SHORT BARS

BARS ALONG EXPOSED FACE NOT SHOWN



FOR c AND SHORT c BARS

H=6' (1800 mm) OR LESS:
NO SPLICES WITHIN 20"
(500 mm) FROM TOP OF FOOTING

H MORE THAN 6' (1800 mm):
NO SPLICES WITHIN H/4
FROM TOP OF FOOTING

ELEVATION

SIMILAR TO CALTRANS TYPE 1A

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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GREENBOOK COMMITTEE
1993
REV. 1996, 2005, 2009

REINFORCED CONCRETE RETAINING WALL TYPE 1

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
610-3
SHEET 1 OF 2

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TABLE OF REINFORCING STEEL, DIMENSIONS AND DATA

DESIGN H	4' (1200 mm)	6' (1800 mm)	8' (2400 mm)	10' (3000 mm)	12' (3600 mm)
W	3'–2" (1000)	4'–2" (1300)	5'–2" (1600)	6'–2" (1900)	7'–2" (2200)
C	1'–0" (300)	1'–4" (400)	1'–8" (500)	2'–0" (600)	[illegible] (700)
B	2'–2" (700)	2'–10" (900)	3'–6" (1100)	[illegible] (1300)	4'–10 (1500)
ⓒBARS	#5 @ 16" (#16M @ 400)	#5 @ [illegible]" (#16M @ [illegible]00)	#5 @ 8" (#16M @ 200)	#6 @ 8" (#19M @ 200)	#6 @ 8" (#25M @ 200)
ⓓBARS	#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#5 @ 8" (#16M @ 200)	#6 @ 8" (#19M @ 200)
CASE I TOE PRESSURE, psf (kPa)	1590 (75)	1990 (95)	2240 (110)	2550 (125)	2840 (135)
CASE II TOE PRESSURE, psf (kPa)	1060 (50)	1460 (70)	1860 (90)	2280 (110)	2700 (130)

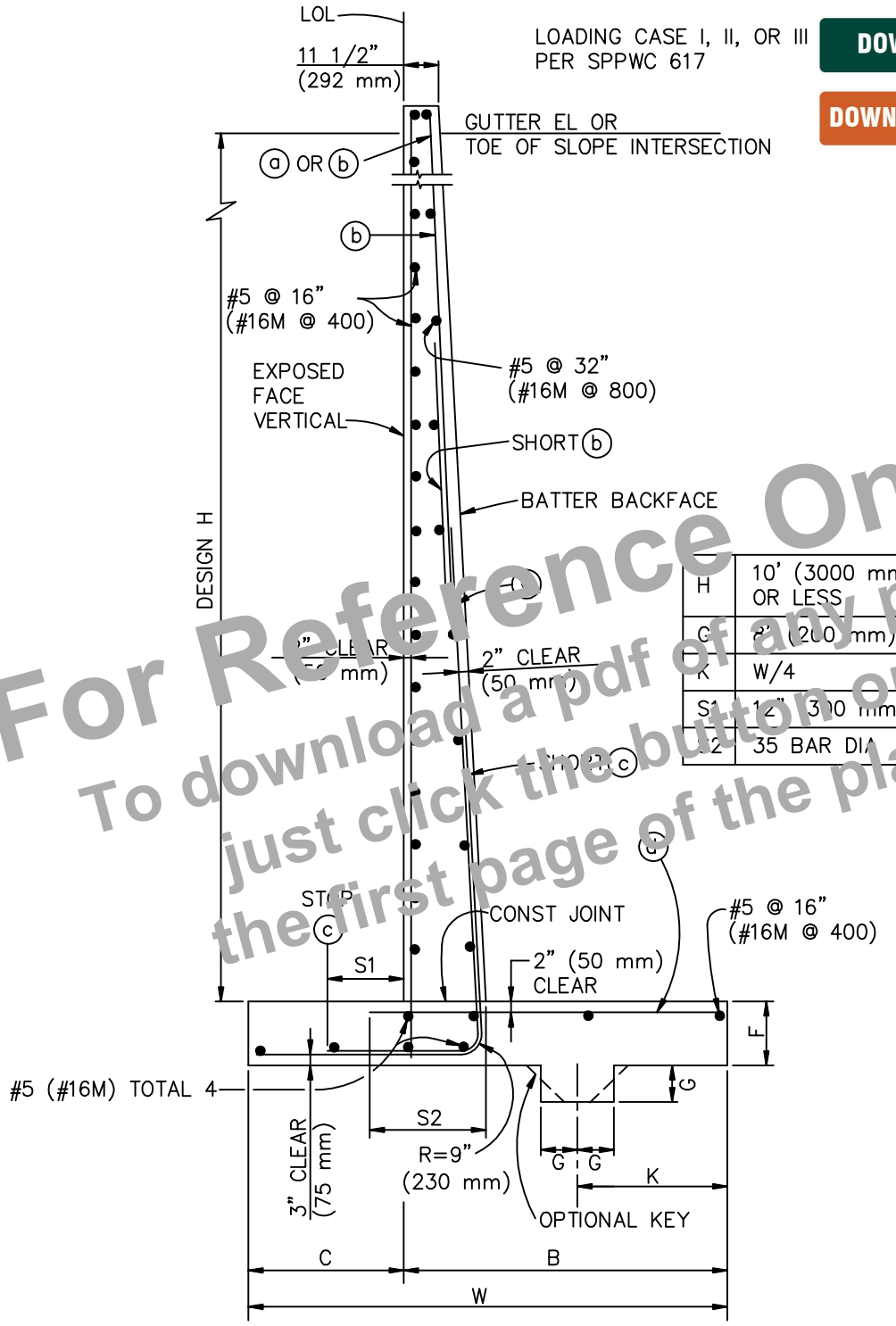
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NOTES:

1. SEE SPPWC 617 FOR STANDARD WALL DETAILS.
2. METRIC REINFORCING BAR SPACING IS IN MILLIMETERS.

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H	10' (3000 mm) OR LESS	MORE THAN 10' (3000 mm)
G	8" (200 mm)	12" (300 mm)
K	W/4	W/3
S1	12" (300 mm)	32" (800 mm)
S2	35 BAR DIA	45 BAR DIA

SECTION

NOTE:

SEE SPPWC 617 FOR STANDARD WALL DETAILS.

SIMILAR TO CALTRANS TYPE 1

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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1993
REV. 1996, 2005, 2009

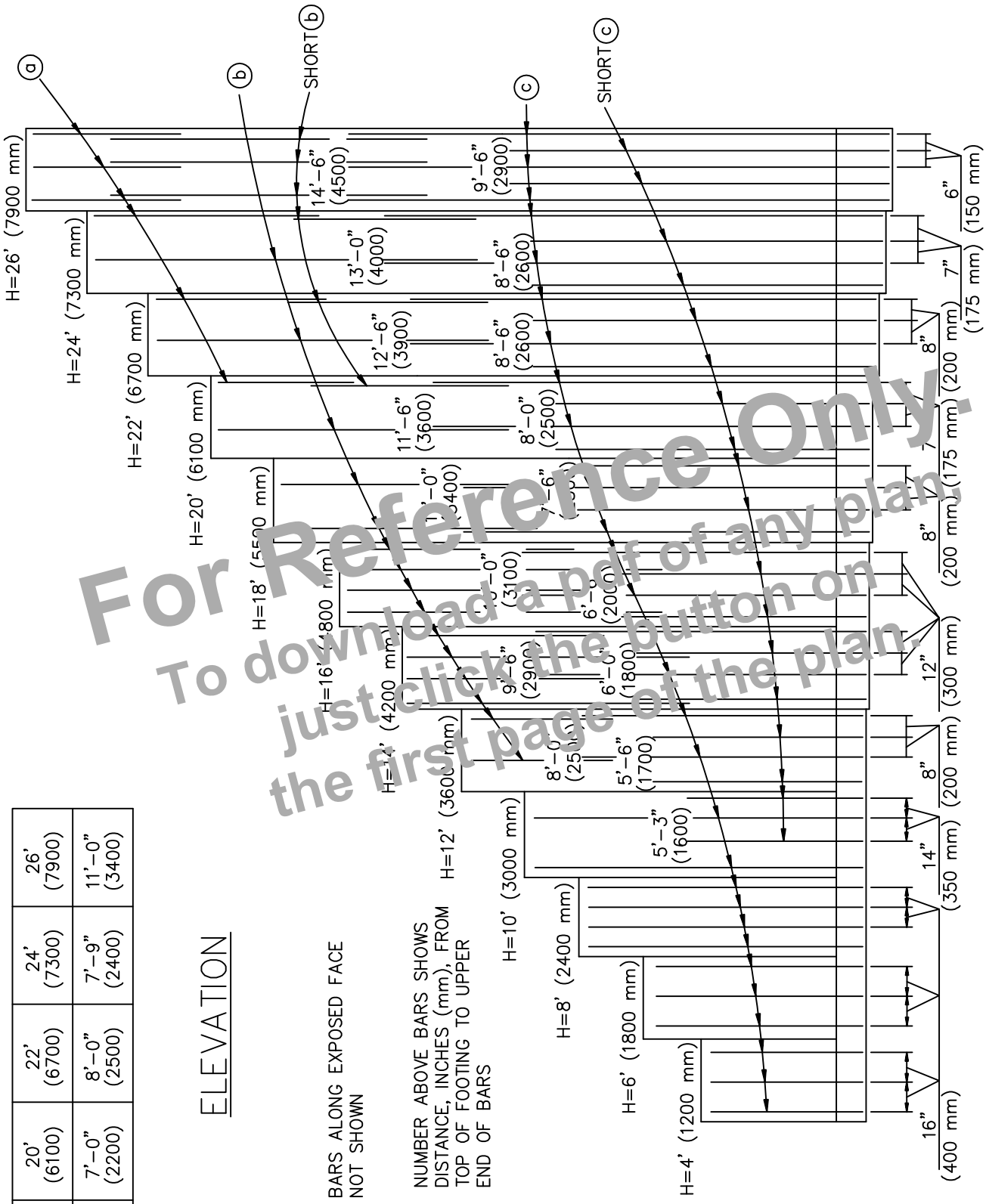
REINFORCED CONCRETE RETAINING WALL TYPE 2

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
611–3
SHEET 1 OF 3

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ELEVATION

BARS ALONG EXPOSED FACE
NOT SHOWN

NUMBER ABOVE BARS SHOWS
DISTANCE, INCHES (mm), FROM
TOP OF FOOTING TO UPPER
END OF BARS

H, FT (mm)	20' (6100)	22' (6700)	24' (7300)	26' (7900)
SHORT (b) LENGTH	7'-0" (2200)	8'-0" (2500)	7'-9" (2400)	11'-0" (3400)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

REINFORCED CONCRETE RETAINING WALL TYPE 2

STANDARD PLAN
611-3
SHEET 2 OF 3

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TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

DESIGN H		4' (1200 mm)	6' (1800)	8' (2400)	10' (3000)	12' (3600)	14' (4200)
W		3'–2" (1000)	4'–2" (1300)	5'–2" (1600)	6'–2" (1900)	7'–2" (2200)	8'–0" (2450)
C		1'–0" (300)	1'–4" (400)	1'–8" (500)	2'–0" (600)	2'–4" (700)	2'–8" (800)
B		2'–2" (700)	2'–10" (900)	3'–6" (1100)	4'–2" (1300)	4'–10" (1500)	5'–4" (1650)
F		1'–4" (400)	1'–4" (400)	1'–4" (400)	1'–4" (400)	1'–4" (400)	1'–6" (450)
BATTER		100: 4	100: 4	100: 4	100: 4	100: 4	100: 4
ⓐ BARS		—	—	—	—	—	—
ⓑ BARS		—	—	—	—	#5 @ 16" (#16M @ 400)	#5 @ 12" (#16M @ 300)
ⓒ BARS		#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#6 @ 14" (#19M @ 350)	#6 @ 8" (#19M @ 200)	#8 @ 12" (#25M @ 300)
ⓓ BARS		#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#6 @ 14" (#19M @ 350)	#6 @ 8" (#16M @ 200)	#8 @ 12" (#25M @ 300)
TOE PRESSURE	LOAD CASE I	1600 psf (80 kPa)	1[illegible] (90)	2[illegible] (105)	2500 (120)	2[illegible] (135)	3300 (160)
	LOAD CASE II	1100 (55)	1500 (70)	2000 (95)	2300 (110)	2700 (130)	3300 (160)
	LOAD CASE III	1300 (65)	1[illegible] (80)	2100 (100)	2[illegible] (120)	2900 (140)	3400 (165)

DESIGN H		16' (4800)	18' (5500)	20' (6100)	22' (6700)	24' (7300)	26' (7900)
W		9'–0" (2750)	10'–0" (3050)	11'–0" (3350)	12'–0" (3700)	13'–3" (4050)	14'–3" (4350)
C		3'–0" (900)	3'–4" (1000)	3'–8" (1100)	4'–0" (1200)	4'–5" (1350)	4'–9" (1450)
B		6'–0" (1850)	6'–8" (2050)	7'–4" (2250)	8'–0" (2500)	8'–10" (2700)	9'–6" (2900)
F		1'–6" (450)	1'–6" (450)	1'–6" (450)	1'–8" (500)	1'–10" (550)	2'–2" (650)
BATTER		100: 4	100: 4	100: 4	100: 4	100: 5	100: 6
ⓐ BARS		—	—	#5 @ 28" (#16M @ 700)	#5 @ 32" (#16M @ 800)	#5 @ 28" (#16M @ 700)	#5 @ 12" (#16M @ 300)
ⓑ BARS		#5 @ 12" (#16M @ 300)	#6 @ 16" (#19M @ 400)	#8 @ 14" (#25M @ 350)	#8 @ 16" (#25M @ 400)	#8 @ 14" (#25M @ 350)	#8 @ 12" (#25M @ 300)
ⓒ BARS		#9 @ 12" (#29M @ 300)	#9 @ 8" (#29M @ 200)	#9 @ 7" (#29M @ 175)	#11 @ 8" (#36M @ 200)	#11 @ 7" (#36M @ 175)	#11 @ 6" (#36M @ 150)
ⓓ BARS		#9 @ 12" (#29M @ 300)	#9 @ 8" (#29M @ 200)	#8 @ 7" (#29M @ 175)	#11 @ 8" (#36M @ 200)	#11 @ 7" (#36M @ 175)	#11 @ 6" (#36M @ 150)
TOE PRESSURE	LOAD CASE I	3500 psf (450 kPa)	4000 (450)	4300 (205)	4600 (220)	4900 (235)	5300 (255)
	LOAD CASE II	3600 (175)	4200 (200)	4700 (225)	5500 (265)	5900 (285)	6500 (310)
	LOAD CASE III	3800 (180)	4300 (205)	4800 (230)	5400 (260)	5800 (280)	6500 psf (310 kPa)

METRIC REINFORCING BAR SPACING IS IN MILLIMETERS

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REINFORCED CONCRETE RETAINING WALL TYPE 2

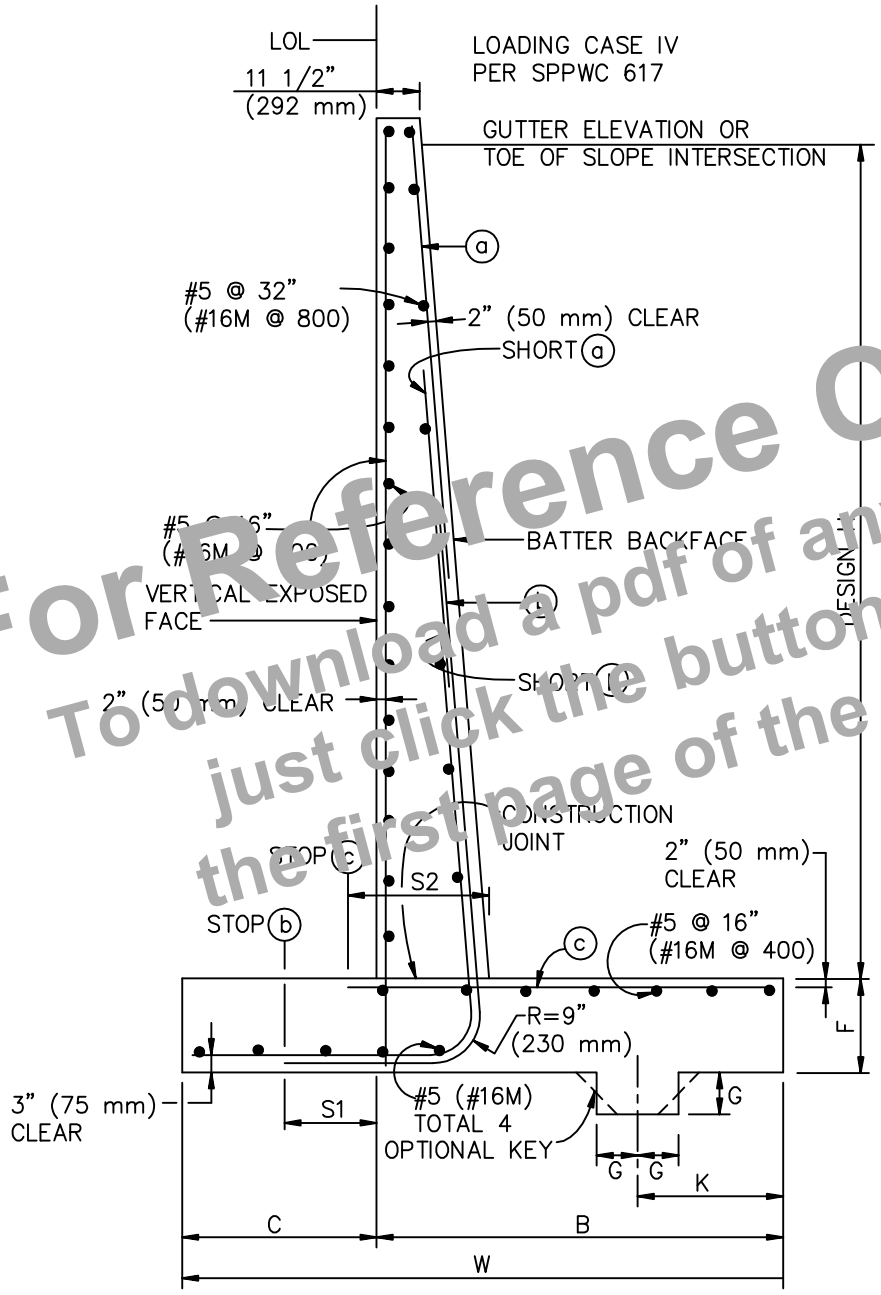
STANDARD PLAN 611–3

SHEET 3 OF 3

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NOTE:

SEE SPPWC 617 FOR STANDARD WALL DETAILS.

SIMILAR TO CALTRANS TYPE 2

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

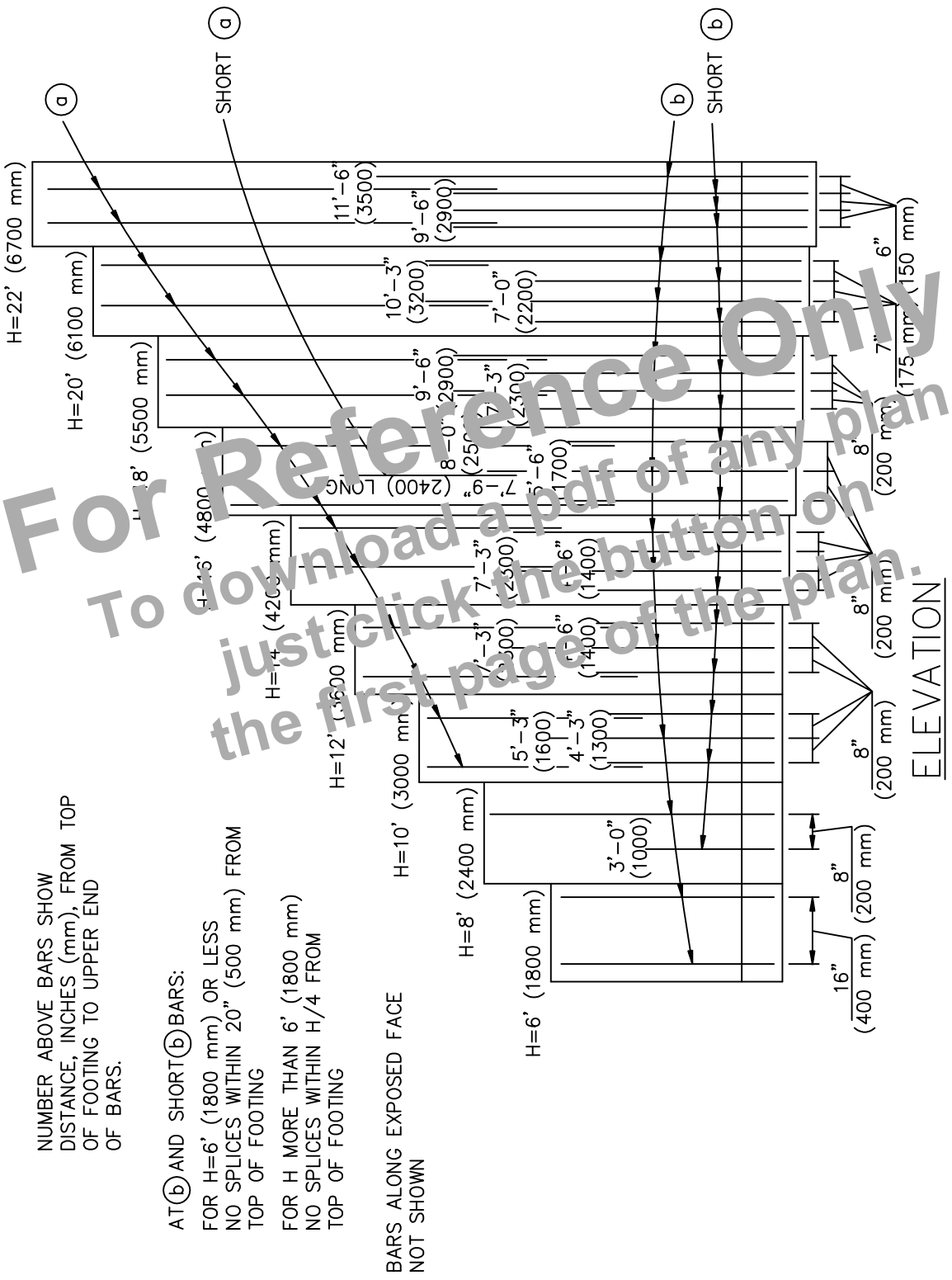
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1993
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REINFORCED CONCRETE RETAINING WALL TYPE 3

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
612–3
SHEET 1 OF 3

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NUMBER ABOVE BARS SHOW DISTANCE, INCHES (mm), FROM TOP OF FOOTING TO UPPER END OF BARS.

AT ⓑ AND SHORT ⓑ BARS:

FOR H=6' (1800 mm) OR LESS NO SPLICES WITHIN 20" (500 mm) FROM TOP OF FOOTING

FOR H MORE THAN 6' (1800 mm) NO SPLICES WITHIN H/4 FROM TOP OF FOOTING

BARS ALONG EXPOSED FACE NOT SHOWN

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL TYPE 3	612-3
	SHEET 2 OF 3

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TABLE OF REINFORCING STEEL, DIMENSIONS AND DATA

DESIGN H	6' (1800 mm)	8' (2400)	10' (3000)	12' (3600)	14' (4200)	16' (4800)	18' (5500)	20' (6100)	22' (6700)
W	3'–10" (1200)	5'–3" (1600)	6'–7" (2000)	8'–1" (2500)	9'–10" (3000)	11'–4" (3500)	13'–0" (4000)	14'–10" (4600)	17'–6" (5400)
C	1'–4" (400)	1'–7" (500)	1'–10" (550)	2'–1" (650)	2'–6" (750)	2'–10" (850)	3'–1" (950)	3'–8" (1150)	4'–4" (1350)
B	2'–6" (800)	3'–8" (1100)	4'–9" (1450)	6'–0" (1850)	7'–4" (2250)	8'–6" (2650)	9'–11" (3050)	11'–2" (3450)	13'–2" (4050)
F	1'–4" (400)	1'–4" (400)	1'–4" (400)	1'–4" (400)	1'–6" (450)	1'–10" (550)	2'–2" (650)	2'–6" (750)	2'–10" (850)
G	12" (300)	12" (300)	12" (300)	18" (450)	18" (450)	18" (450)	18" (450)	18" (450)	18" (450)
K	W/4	W/4	W/4	W/3	W/3	W/3	W/3	W/3	W/3
S1	14" (350)	16" (400)	16" (400)	18" (450)	18" (450)	32" (800)	32" (800)	32" (800)	32" (800)
S2	35 BAR DIA	35 BAR DIA	35 BAR DIA	35 BAR DIA	35 BAR DIA	45 BAR DIA	45 BAR DIA	45 BAR DIA	45 BAR DIA
BATTER	100: 4	100: 4	100: 4	100: 4	100: 4	100: 4	100: 5	100: 6	100: 7
ⓐ BARS	———	———	#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#6 @ 12" (#19M @ 300)	#8 @ 16" (#25M @ 400)	#8 @ 16" (#25M @ 400)	(#8 @ 14") (#25M @ 350)	#8 @ 12" (#25M @ 300)
ⓑ BARS	#5 @ 16" (#16M @ 400)	#5 @ 8" (#16M @ 200)	#6 @ 8" (#19M @ 200)	#8 @ 8" (#25M @ 200)	#8 @ 8" (#25M @ 200)	#11 @ 8" (#36M @ 200)	#11 @ 8" (#36M @ 200)	(#11 @ 7") (#36M @ 175)	#11 @ 6" (#36M @ 150)
ⓒ BARS	#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#6 @ 16" (#19M @ 400)	#6 @ 8" (#19M @ 200)	#6 @ 8" (#19M @ 200)	#8 @ 8" (#25M @ 200)	#8 @ 8" (#25M @ 200)	(#8 @ 7") (#25M @ 175)	#8 @ 6" (#25M @ 150)
TOE PRESS. LOAD CASE IV	2540 psf (125 kPa)	3170 (155)	3880 (185)	4470 (215)	4950 (240)	5720 (275)	6540 (315)	(6970) 335	6990 (335)

METRIC REINFORCING BAR SPACING IS IN MILLIMETERS

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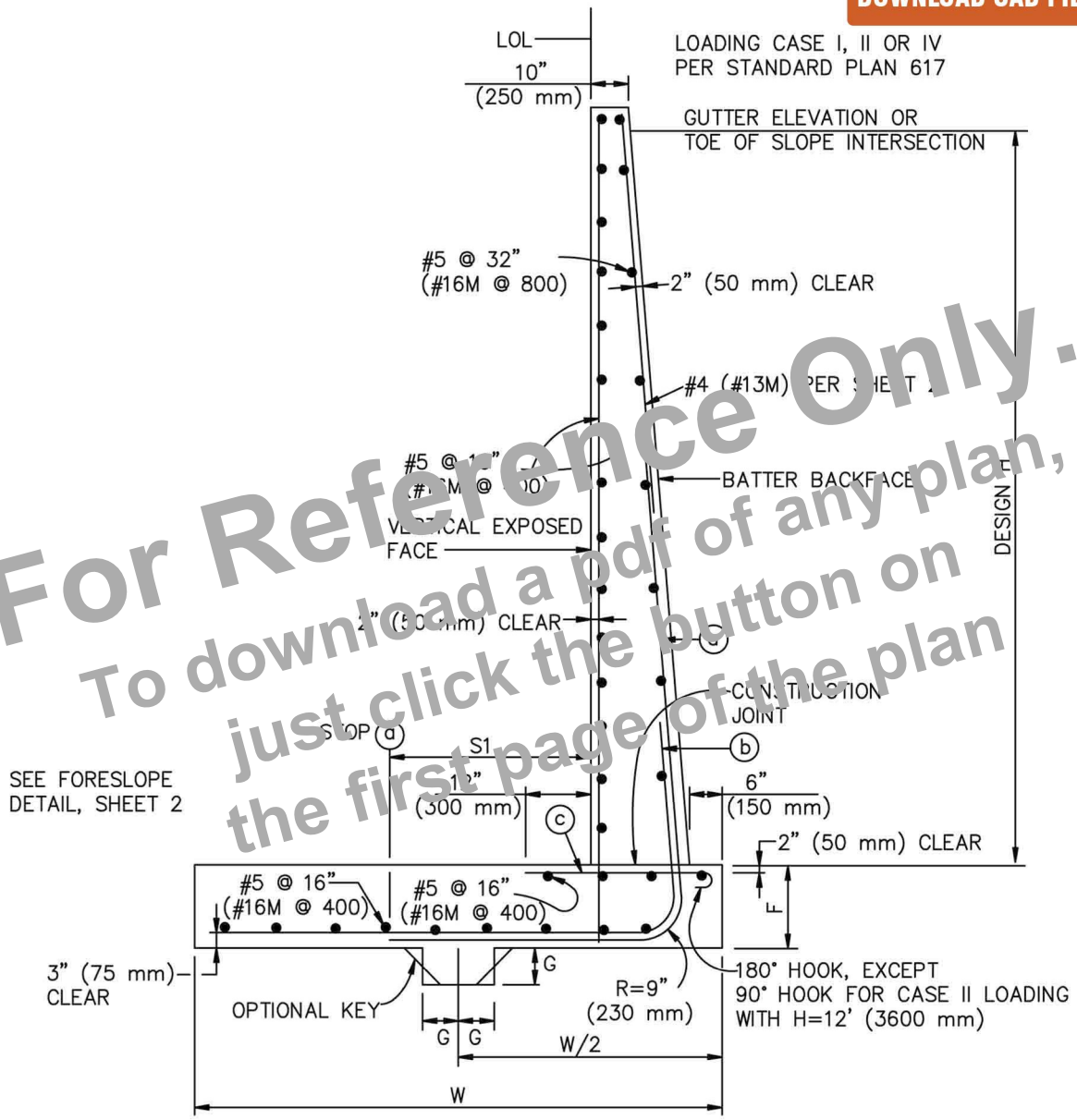
REINFORCED CONCRETE RETAINING WALL TYPE 3

STANDARD PLAN
612–3
SHEET 3 OF 3

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NO SIMILAR CALTRANS TYPE

NOTES:

FOR H LT 8' (2400 mm) S1 = C−2" (S1 = C−50 mm)
FOR H GE 8' (2400 mm) S1 = W/3

SEE SPPWC 617 FOR STANDARD WALL DETAILS.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

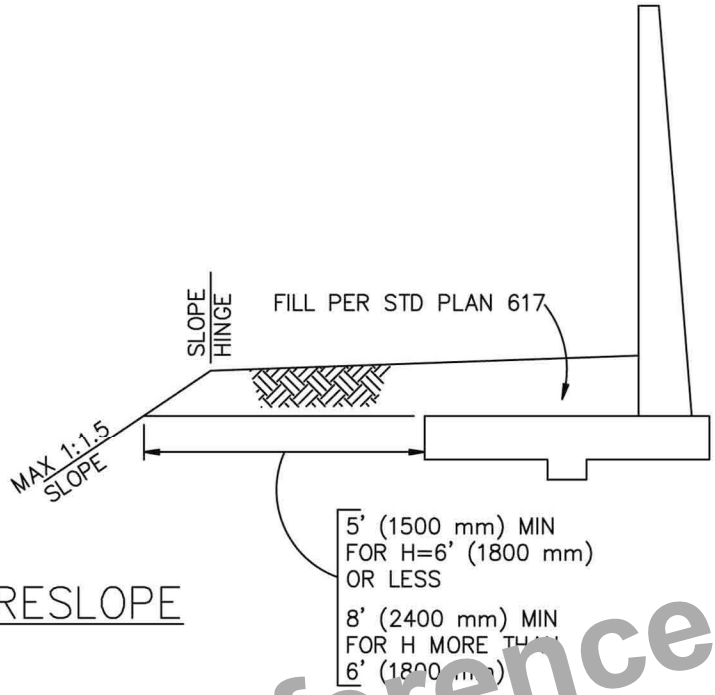
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PUBLIC WORKS STANDARDS INC.
GREENBOOK COMMITTEE
1984
REV. 1993, 2010

REINFORCED CONRETE RETAINING WALL TYPE 4

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

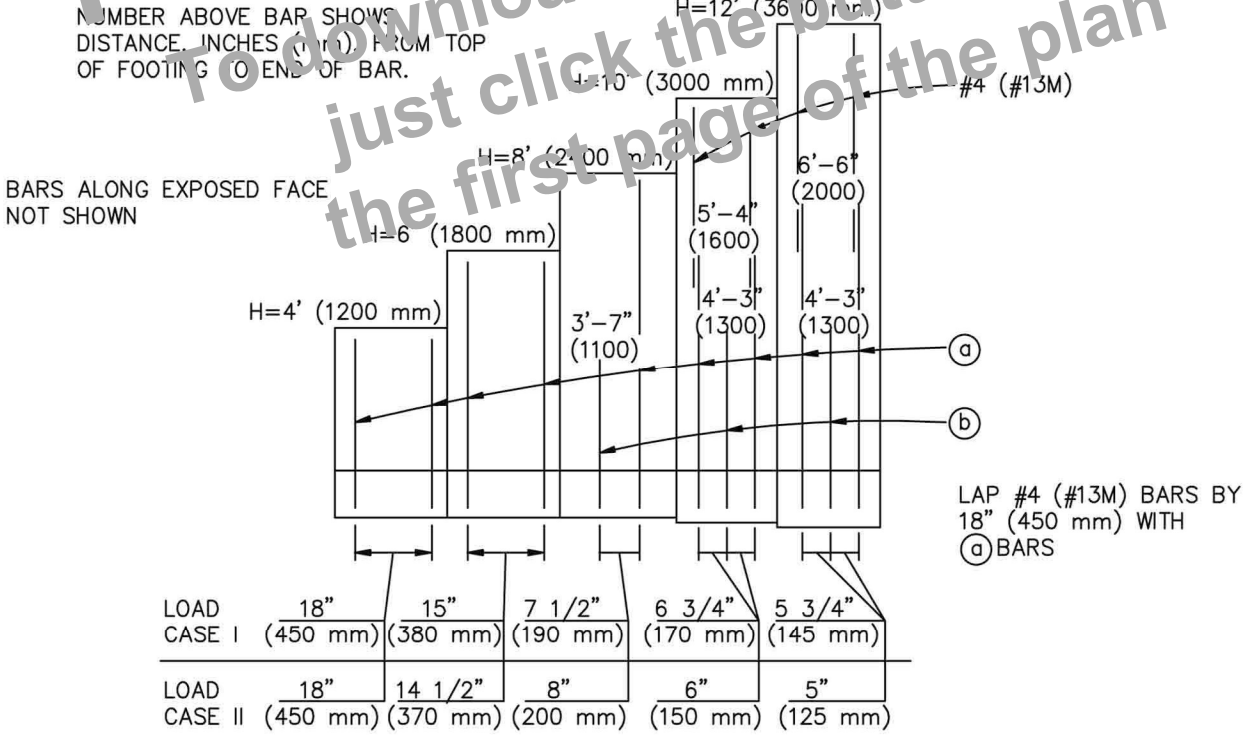
STANDARD PLAN
613−4
SHEET 1 OF 3

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FORESLOPE

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ELEVATION

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL TYPE 4	**613-4**
	SHEET 2 OF 3

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LOAD CASE I OR II

H	4' (1200 mm)	6' (1800)	8' (2400)	10' (3000)	12' (3600)
W	3'–8" (1120)	5'–3" (1600)	7'–1" (2160)	9'–4" (2840)	11'–9" (3580)
F	0'–10" (250)	0'–10" (250)	0'–10" (250)	0'–11" (280)	1'–1" (330)
C	2'–4" (710)	3'–11" (1190)	5'–9" (1750)	8'–0" (2440)	10'–5" (3180)
G	8" (200)	8" (200)	8" (200)	12" (300)	12" (300)
BATTER	NONE	NONE	NONE	NONE	100:1
ⓐ BARS	#4 @ 18" (#13M @ 450)	#5 @ 15" (#16M @ 380)	#4 @ 15" (#13M @ 380)	#5 @ 13 1/2" (#16M @ 340)	#6 @ 11 1/2" (#19M @ 290)
ⓑ BARS	———	———	#6 @ 15" (#19M @ 380)	#7 @ 13 1/2" (#22M @ 340)	#7 @ 11 1/2" (#22M @ 290)
ⓒ BARS	#4 @ 18" (#13M @ 450)	#4 @ 15" (#13M @ 380)	#4 @ 15" (#13M @ 380)	#4 @ 13 1/2" (#13M @ 340)	#4 @ 11 1/2" (#13M @ 290)
TOE SOIL PRESSURE	630 psf (30 kPa)	630 (30)	660 (30)	660 (30)	700 (35)

LOAD CASE IV

H	4' (1200 mm)	6' (1800)	8' (2400)	10' (3000)	12' (3600)
W	3'–8" (1120)	5'–3" (1600)	7'–1" (2160)	9'–4" (2840)	11'–10" (3600)
F	0'–10" (250)	0'–10" 250	0'–10" 250	1'–0" 300	1'–3" 380
C	2'–4" (710)	3'–11" (1190)	5'–9" (1750)	8'–0" (2440)	10'–5" (3180)
G	8" (200)	8" (200)	8" (200)	12" (300)	12" (300)
BATTER	NONE	NONE	NONE	100:1	100:2
ⓐ BARS	#4 @ 18" (#13M @ 450)	#5 @ 14 1/2" (#16M @ 370)	#4 @ 16" (#13M @ 400)	#5 @ 12" (#16M @ 300)	#6 @ 10" (#19M @ 250)
ⓑ BARS	———	———	#7 @ 16" (#22M @ 400)	#7 @ 12" (#22M @ 300)	#7 @ 10" (#22M @ 250)
ⓒ BARS	#4 @ 18" (#13M @ 450)	#4 @ 14 1/2" (#13M @ 370)	#4 @ 16" (#13M @ 400)	#4 @ 12" (#13M @ 300)	#4 @ 10" (#13M @ 250)
TOE SOIL PRESSURE	490 psf (25 kPa)	560 (25)	610 (30)	680 (35)	750 (35)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

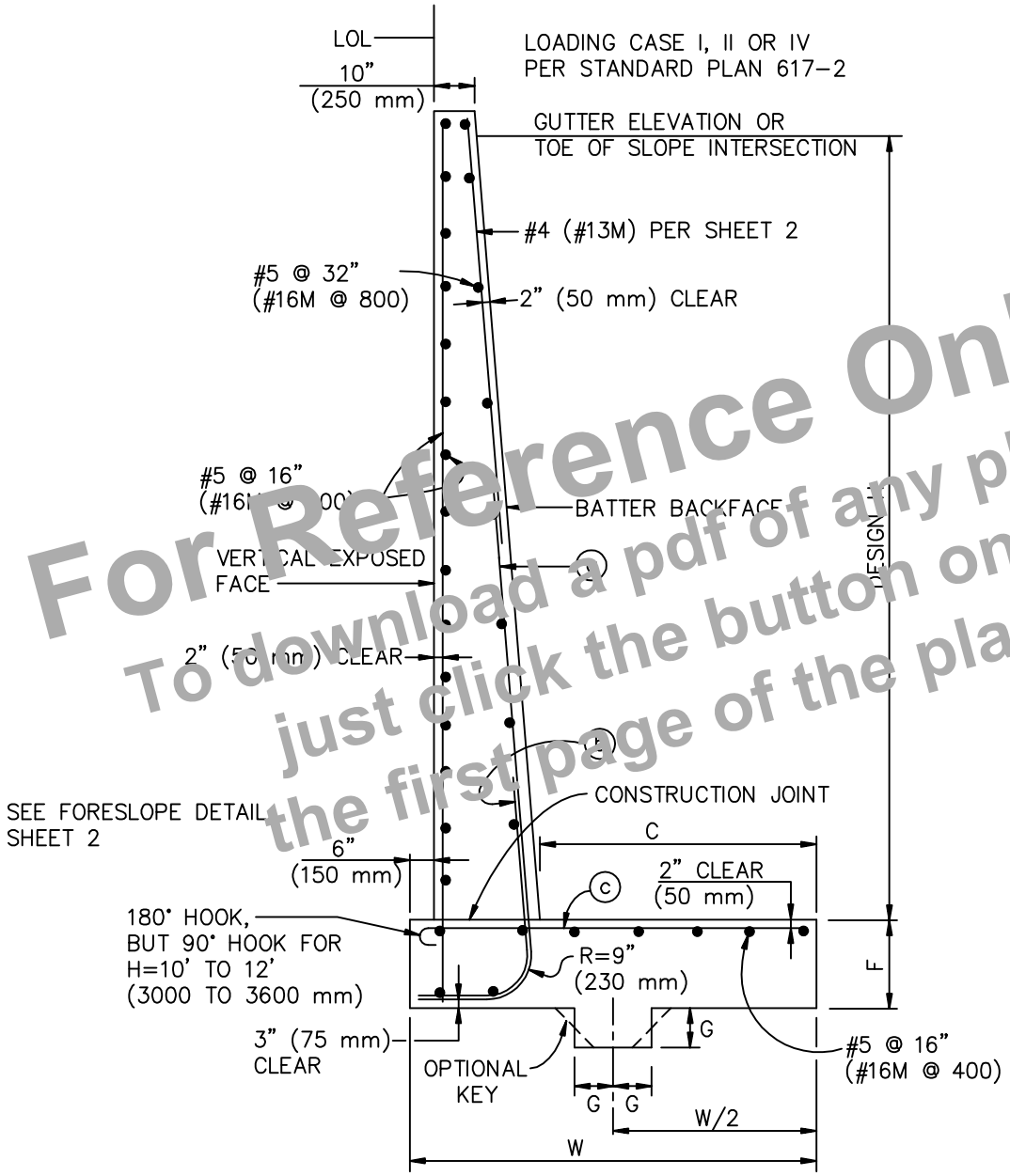
REINFORCED CONCRETE RETAINING WALL TYPE 4

STANDARD PLAN 613–4

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NOTE:

SEE SPPWC 617 FOR STANDARD WALL DETAILS.

NO SIMILAR CALTRANS TYPE

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

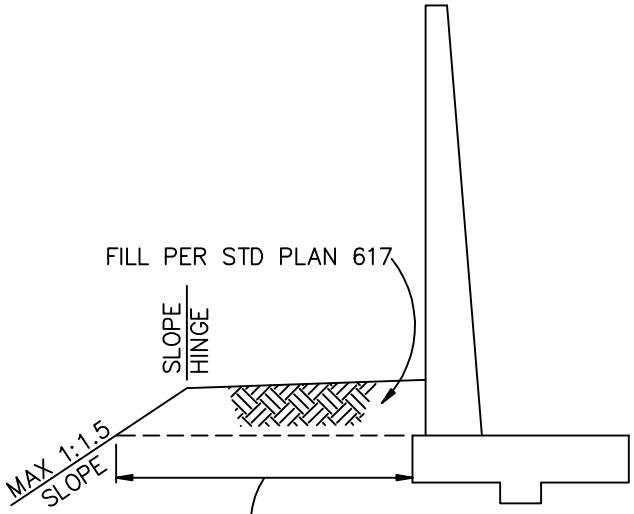
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1984
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REINFORCED CONCRETE RETAINING WALL TYPE 5

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
614-3
SHEET 1 OF 3

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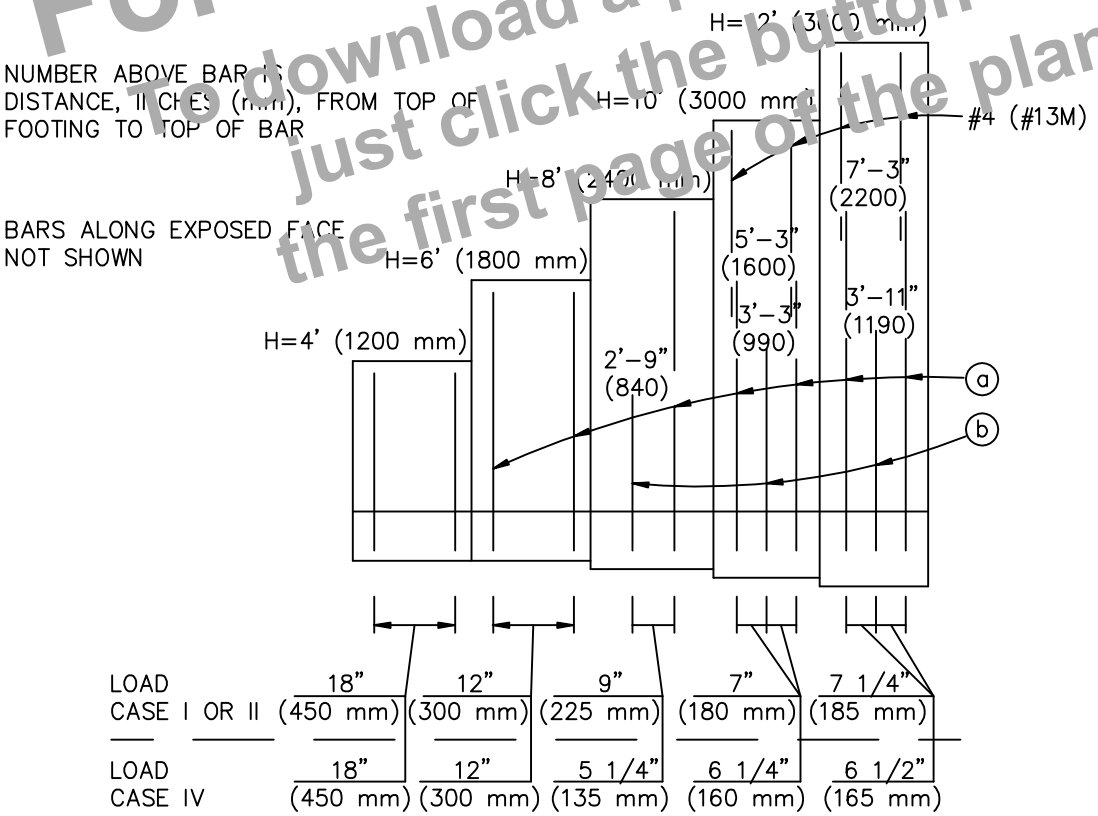


5' (1500 mm) MIN
FOR H=6' (1800 mm)
OR LESS

8' (2400 mm) MIN
FOR H MORE THAN
5' (1800 mm)

FORESLOPE

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ELEVATION

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL TYPE 5	614-3
	SHEET 2 OF 3

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LOAD CASE I OR II

H	4' (1200 mm)	6' (1800)	8' (2400)	10' (3000)	12' (3600)
W	3'–8" (1120)	4'–10" (1470)	6'–0" (1830)	7'–2" (2180)	8'–4" (2540)
F	0'–10" (250)	0'–10" (250)	0'–10" (250)	0'–10" (250)	1'–0" (300)
C	2'–4" (710)	3'–6" (1070)	4'–8" (1420)	5'–10" (1780)	6'–10" (2080)
G	8" (200)	8" (200)	8" (200)	8" (200)	12" (300)
BATTER	NONE	NONE	NONE	NONE	100:1.5
ⓐ BARS	#4 @ 18" (#13M @ 460)	#4 @ 12" (#13M @ 300)	#5 @ 18" (#16M @ 460)	#6 @ 14" (#19M @ 360)	#7 @ 12 1/2" (#22M @ 370)
ⓑ BARS	————	————	#5 @ 18" (#16M @ 460)	#6 @ 12" (#19M @ 360)	#7 @ 14 1/2" (#22M @ 370)
ⓒ BARS	#4 @ 18" (#13M @ 460)	#5 @ 12" (#16M @ 300)	#6 @ 18" (#25M @ 460)	#9 @ 14" (#29M @ 360)	#10 @ 14 1/2" (#32M @ 370)
TOE SOIL PRESSURE	1110 psf (55 kPa)	1580 (75)	2040 (100)	2500 (120)	3050 (145)

LOAD CASE IV

H	4' (1200 mm)	6' (1800)	8' (2400)	10' (3000)	12' (3600)
W	3'–8" (1120)	5'–8" (1730)	7'–11" (2410)	10'–3" (3120)	12'–8" (3860)
F	0'–10" (250)	0'–10" (250)	0'–11" (275)	1'–0" (300)	1'–2" (350)
C	2'–4" (710)	4'–4" (1320)	6'–7" (2010)	8'–10" (2690)	11'–1" (3380)
G	8" (200)	8" (200)	8" (200)	8" (200)	12" (300)
BATTER	NONE	NONE	NONE	100:1	100:2
ⓐ BARS	#4 @ 18" (#13M @ 450)	#4 @ 12" (#13M @ 305)	#4 @ 10 1/2" (#13M @ 265)	#6 @ 12 1/2" (#19M @ 315)	#7 @ 13" (#22M @ 330)
ⓑ BARS	————	————	#4 @ 10 1/2" (#13M @ 265)	#6 @ 12 1/2" (#19M @ 315)	#7 @ 13" (#22M @ 330)
ⓒ BARS	#4 @ 18" (#13M @ 450)	#4 @ 12" (#13M @ 305)	#5 @ 10 1/2" (#16M @ 265)	#7 @ 12 1/2" (#22M @ 315)	#9 @ 13" (#29M @ 330)
TOE SOIL PRESSURE	1480 psf (70 kPa)	2220 (105)	3120 (150)	4120 (195)	5170 (250)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

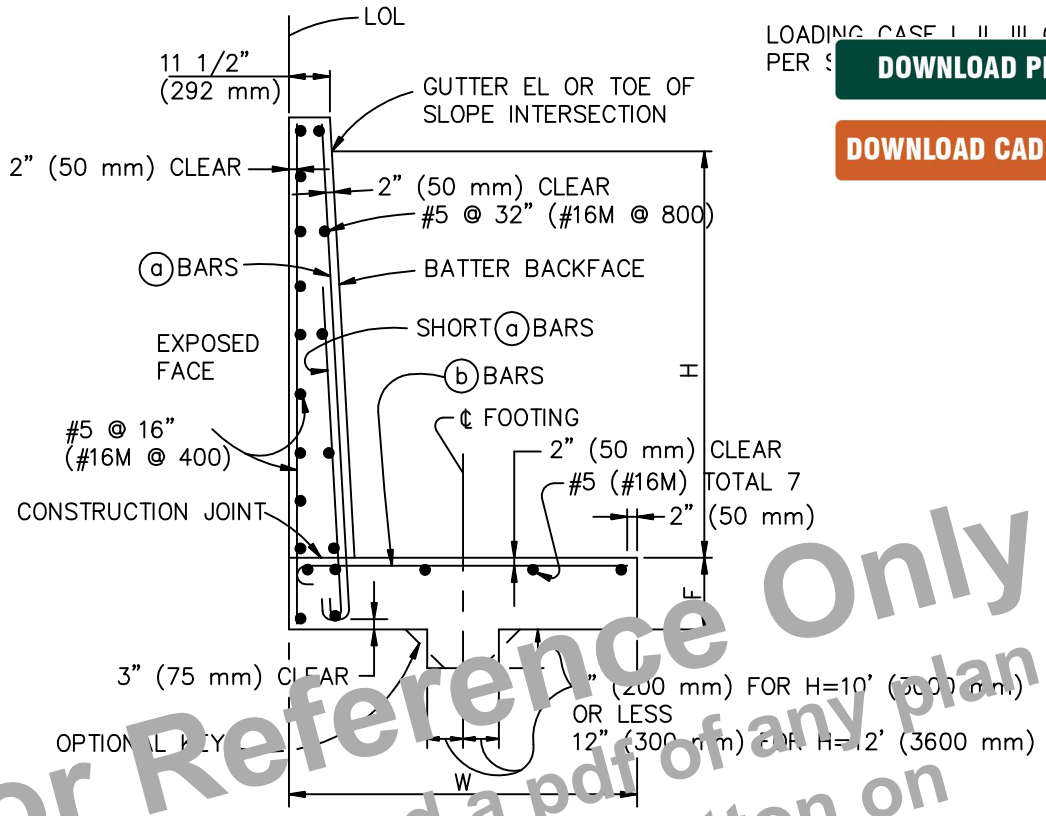
REINFORCED CONCRETE RETAINING WALL TYPE 5

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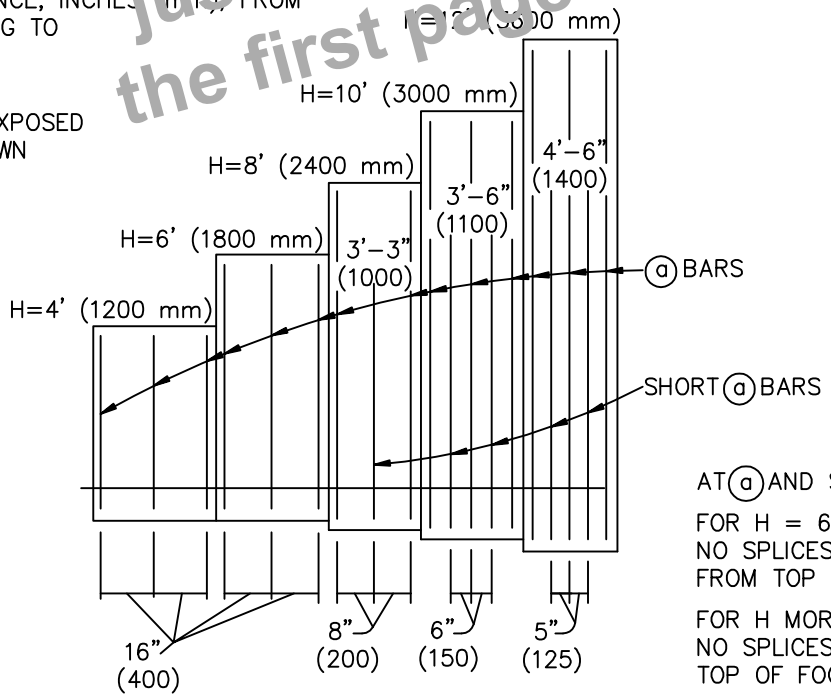
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SECTION

NUMBER ABOVE SHORT ⓐ BARS IS DISTANCE, INCHES (mm), FROM TOP OF FOOTING TO END OF BARS

BARS ALONG EXPOSED FACE NOT SHOWN



ELEVATION

AT ⓐ AND SHORT ⓐ BARS:

FOR H = 6' (1800 mm) OR LESS, NO SPLICES WITHIN 20" (500 mm) FROM TOP OF FOOTING.

FOR H MORE THAN 6' (1800 mm), NO SPLICES WITHIN H/4 FROM TOP OF FOOTING.

SIMILAR TO CALTRANS TYPE 5

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1991, 1996, 2005, 2009

REINFORCED CONCRETE RETAINING WALL TYPE 6

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 615–4

SHEET 1 OF 2

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TABLE OF REINFORCING STEEL, DIMENSIONS AND DATA

DESIGN H		4' (1200 mm)	6' (1800)	8' (2400)	10' (3000)	12' (3600)
W		4'–0" (1250)	5'–0" (1550)	6'–6" (2000)	8'–0" (2450)	9'–6" (2900)
F		16" (400)	16" (400)	18" (450)	18" (450)	22" (550)
BATTER		NONE	NONE	NONE	100:3	100:6
ⓐ BARS		#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#5 @ 12" (#16M @ 300)	#5 @ 10" (#16M @ 250)
SHORT ⓐ BARS		———	———	#5 @ 16" (#16M @ 400)	#5 @ 1[illegible] (#16M @ [illegible]00)	#5 @ 10" (#16M @ 250)
ⓑ BARS		#5 @ 16" (#16M @ 400)	#5 @ 16" (#16M @ 400)	#5 @ 8[illegible] (#16M @ [illegible]00)	#5 @ 6" (#16M @ 150)	#5 @ 5" (#16M @ 125)
TOE PRESSURE	CASE I psf (kPa)	1600 (80)	2200 (105)	2500 (120)	3000 (145)	3500 (170)
	CASE II psf (kPa)	1500 (75)	2100 (100)	2700 (130)	3400 (165)	4100 (195)
	CASE III psf (kPa)	1600 (80)	2300 (110)	2900 (140)	3800 (185)	4400 (210)
	CASE IV psf (kPa)	2000 (95)	3200 (150)	4200 (200)	5300 (255)	6500 (310)

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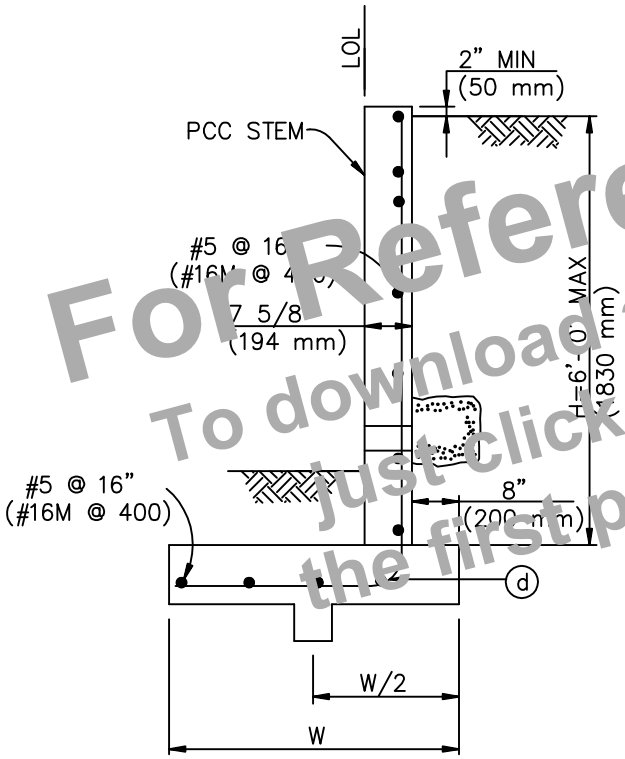
NOTES:

1. SEE SPPWC 617 FOR STANDARD WALL DETAILS.
2. METRIC REINFORCING BAR SPACING IS IN MILLIMETERS.

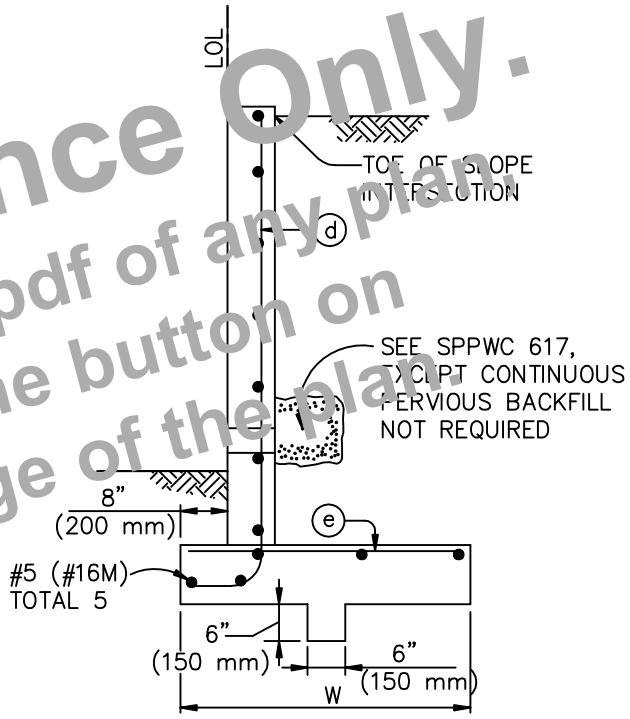
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DESIGN LOADING
CASE I OR II PER
SPPWC 617



TYPE 7A



TYPE 7B

AT (d) BARS, NO SPLICES WITHIN
20" (500 mm) FROM TOP OF FOOTING

NOTES:

1. SEE SPPWC 617 FOR STANDARD WALL DETAILS.
2. METRIC REINFORCING BAR SPACING IS IN MILLIMETERS.

SIMILAR TO CALTRANS TYPE 6

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1993 REV. 1996, 2005, 2009	**REINFORCED CONCRETE RETAINING WALL TYPE 7** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **616-3** SHEET 1 OF 2

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TYPE 7A WALL

DESIGN H	3'–4" (1020 mm)	4'–0" (1220)	4'–8" (1420)	5'–4" 1630	6'–0" (1830)
W	3'–2" (1000)	3'–6" (1100)	3'–10" (1200)	4'–2" (1300)	4'–6" (1400)
ⓓ BARS	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 300)

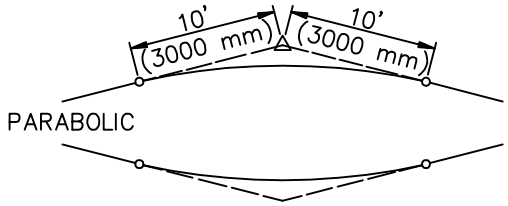
TYPE 7B WALL

DESIGN H	3'–4" (1020 mm)	4'–0" (1220)	4'–8" (1420)	5'–4" (1630)	6'–0" (1830)
W	2'–8" (850)	3'–0" (950)	3'–4" (1050)	3'–8" (1150)	4'–0" (1250)
ⓓ BARS	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 12" (#16M @ 300)
ⓔ BARS	(#5 @ 15") (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 12" (#16M @ 300)

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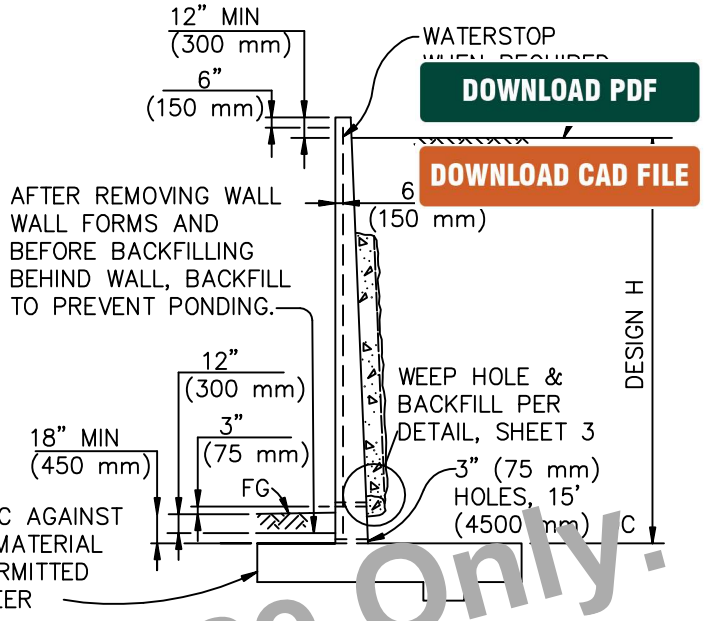
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL TYPE 7	**616–3**
	SHEET 2 OF 2

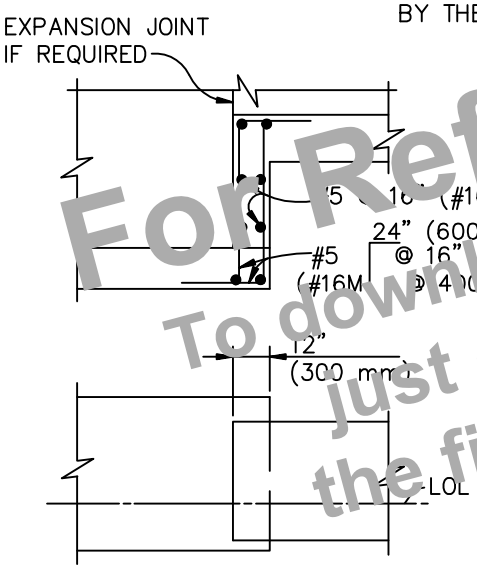
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VERTICAL CURVE AT TOP OF WALL SLOPE CHANGE

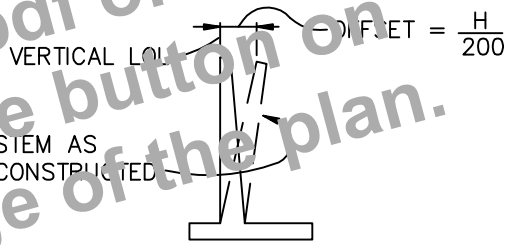
USE WHERE SHOWN ON THE PLANS





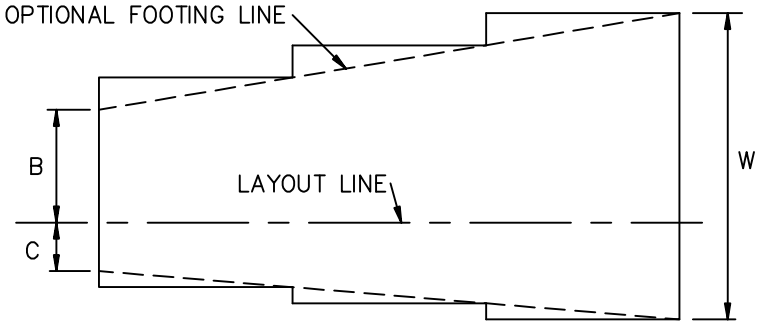
FOOTING STEP

DESIGN AND DRAINAGE



APPROXIMATE WALL OFFSET VALUES

VALUES FOR OFFSETING FORMS WILL BE DETERMINED BY THE ENGINEER



TYPICAL FOOTING LAYOUT

SIMILAR TO CALTRANS STD PLANS B0-3, B3-8 AND B3-9

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

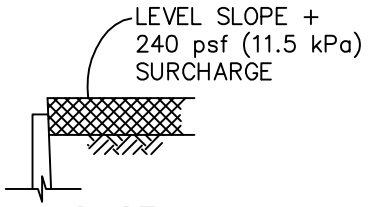
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GREENBOOK COMMITTEE
1993
REV. 1996, 2005, 2009

REINFORCED CONCRETE RETAINING WALL DETAILS

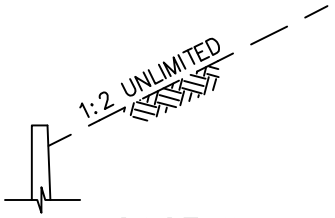
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
617-3
SHEET 1 OF 8

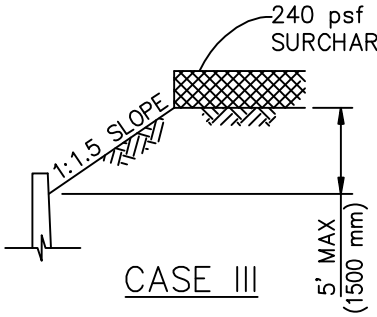
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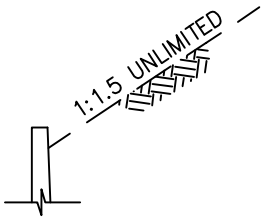
CASE I



CASE II



CASE III



CASE IV

DESIGN LOADING CASES

DESIGN CONDITIONS:

DESIGN H MAY BE EXCEEDED BY 6" (150 mm) BEFORE USING VALUES SHOWN FOR NEXT GREATER H.

SPECIAL FOOTING DESIGN IS REQUIRED WHERE FOUNDATION MATERIAL IS INCAPABLE OF SUPPORTING TOE PRESSURES SHOWN ON WALL STANDARD PLANS.

RETURN WALL NOT REQUIRED IF NOT SHOWN ON PLANS.

DESIGN DATA:

f'_c = 1,300 psi (10 MPa) f_y = 3,250 psi (25 MPa) f_s = 24 ksi (168 MPa)

n = 10 SOIL WEIGHT = 120 pcf (19 kN/m³)

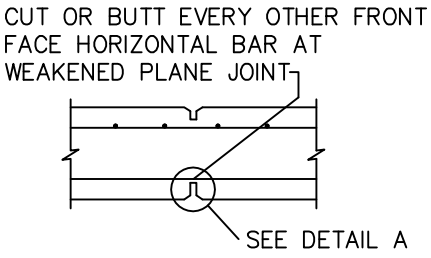
240 psf (11.5 kPa) SURCHARGE:

EQUIVALENT FLUID PRESSURE =

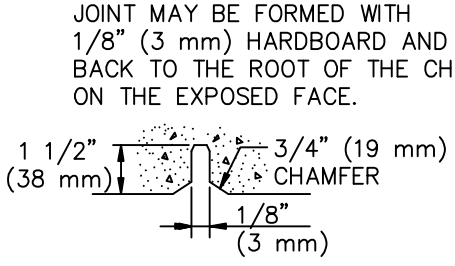
36 psf/ft (5.6 kPa/m) MAXIMUM FOR DETERMINATION OF TOE PRESSURE.

27 psf/ft (4.2 kPa/m) MINIMUM FOR DETERMINATION OF HEEL PRESSURE.

EARTH PRESSURES FOR 1:2 UNLIMITED SLOPE, 1:1.5 SLOPE, AND 1:1.5 UNLIMITED SLOPE DETERMINED FROM RANKINE'S FORMULA WITH ø = 33°42'.



SECTION



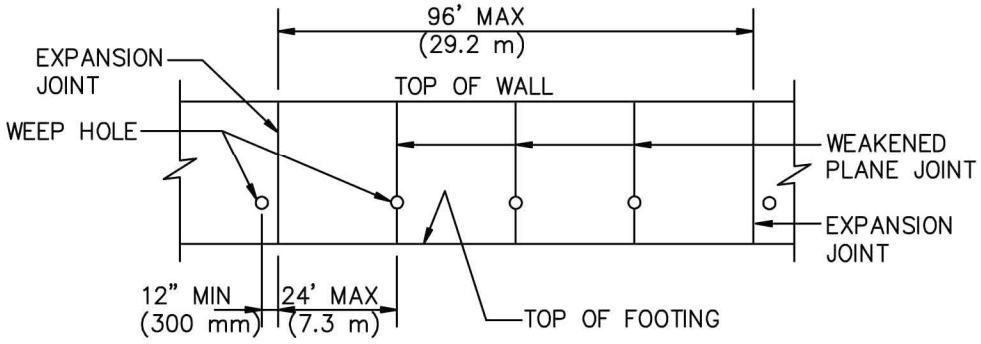
DETAIL A

WEAKENED PLANE JOINT

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL DETAILS	617–3
	SHEET 2 OF 8

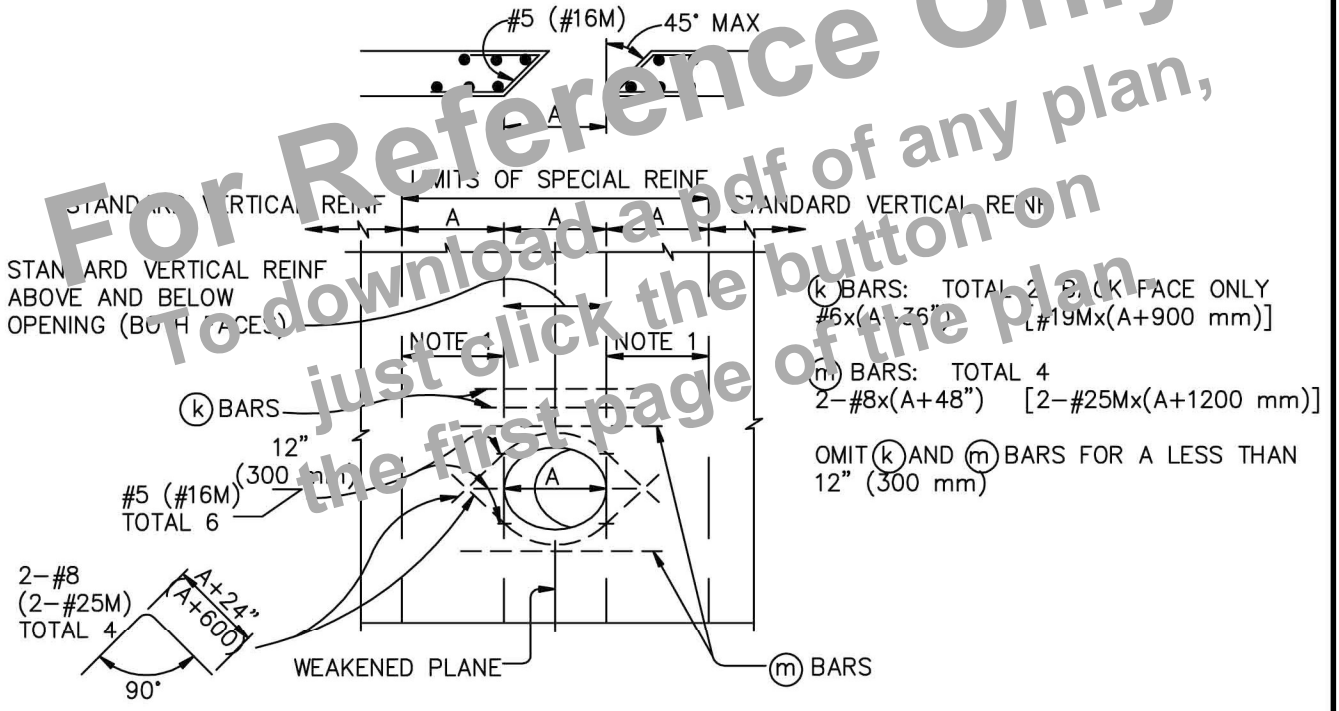
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WALL EXPANSION JOINTS AND WEAKENED PLANES

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RETAINING WALL UTILITY OPENING

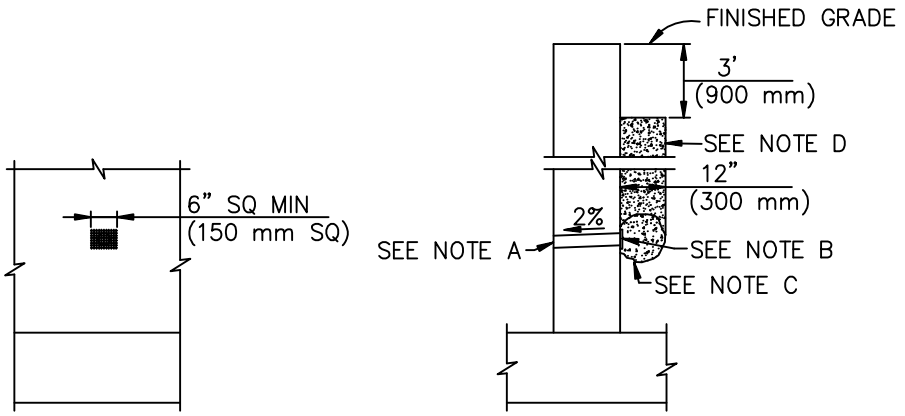
MAX SIZE OF OPENING A=48" (1200 mm)

NOTES:

1. STANDARD VERTICAL REINFORCEMENT PLUS ADDITIONAL VERTICAL BARS MATCHING SIZE AND NUMBER OF BARS CUT BY THE OPENING. PLACE HALF ON EACH SIDE. EXTEND THE ADDITIONAL BARS INTO THE FOOTING THE SAME AS THE OTHER VERTICAL WALL REINFORCEMENT AND TO A MINIMUM OF 60 BAR DIAMETERS ABOVE THE TOP OF UTILITY OPENING IF WALL HEIGHT PERMITS. BUNDLE BARS AS REQUIRED.
2. HORIZONTAL REINFORCEMENT IS STANDARD EXCEPT AS SHOWN.
3. ALL REINFORCEMENT SHALL CLEAR OPENING BY 2" (50 mm) MIN.
4. ADJUST EXPANSION JOINT LOCATIONS TO FALL OUTSIDE THE LIMITS OF SPECIAL REINFORCING.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL DETAILS	**617–3**
	SHEET 3 OF 8

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ELEVATION SECTION

WEEP HOLE AND PERVIOUS BACKFILL

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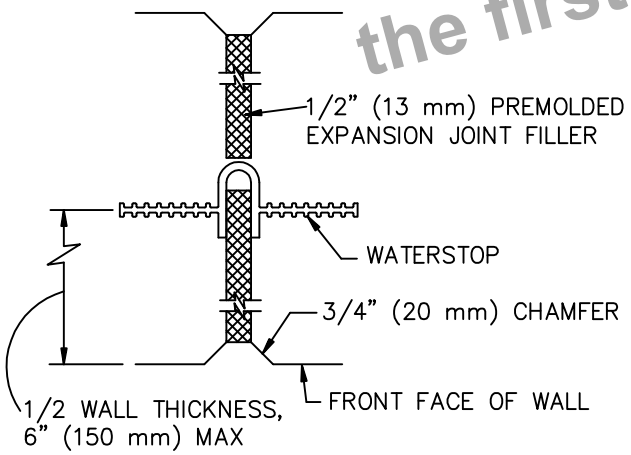
NOTES

A. 4" (100 mm) DIA DRAINS EACH 25' (7.6 m) MAX. FOR WALLS ADJACENT TO SIDEWALKS OR CURBS, PROVIDE CURB DRAINS PER SPPWC 154 OR 151. PLACE EXPOSED WALL DRAINS AT LEAST 3" (75 mm) ABOVE FINISHED GRADE.

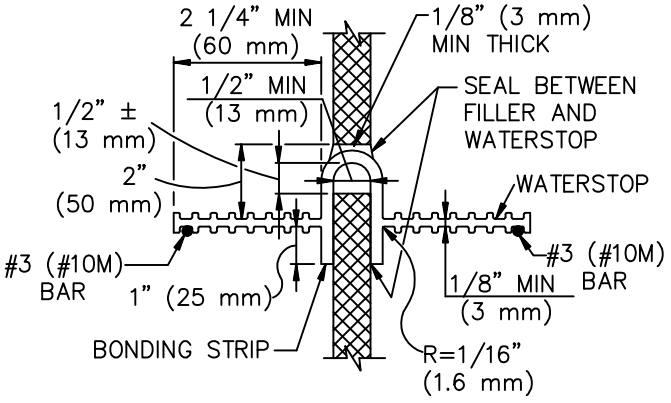
B. ALUMINUM OR GALV STEEL WIRE MESH HARDWARE CLOTH WIRES 0.03" (0.64 mm) DIA. EACH (6 mm) ANCHOR FIRMLY TO BACKFACE.

C. 1 CF (0.03 m^3) PERVIOUS BACKFILL MATERIAL IN NONWOVEN FILTER FABRIC, SECURELY TIED.

D. PERVIOUS BACKFILL MATERIAL CONTINUOUS BEHIND RETAINING WALL.



WALL EXPANSION JOINT



WATERSTOP

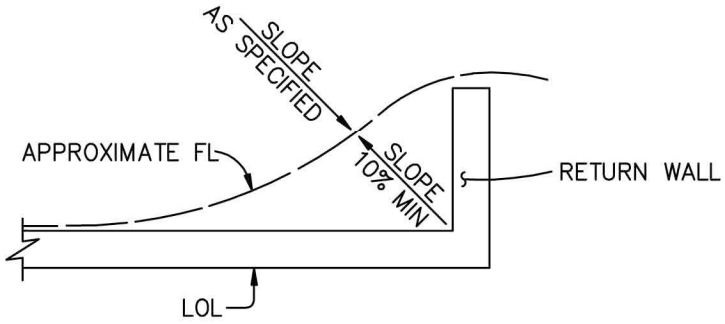
WATERSTOP NOTES:

1. HOLES PERMITTED IN THE OUTER 1/2" (13 mm) OF THE WEB FOR WIRE, RINGS, ETC. TIE WEB TO #3 (#10M) REBARS EACH 16" (400 mm) MAX TO SUPPORT THE WATERSTOP IN POSITION DURING PCC PLACEMENT OR SUBMIT ALTERNATIVE TO ENGINEER FOR APPROVAL.

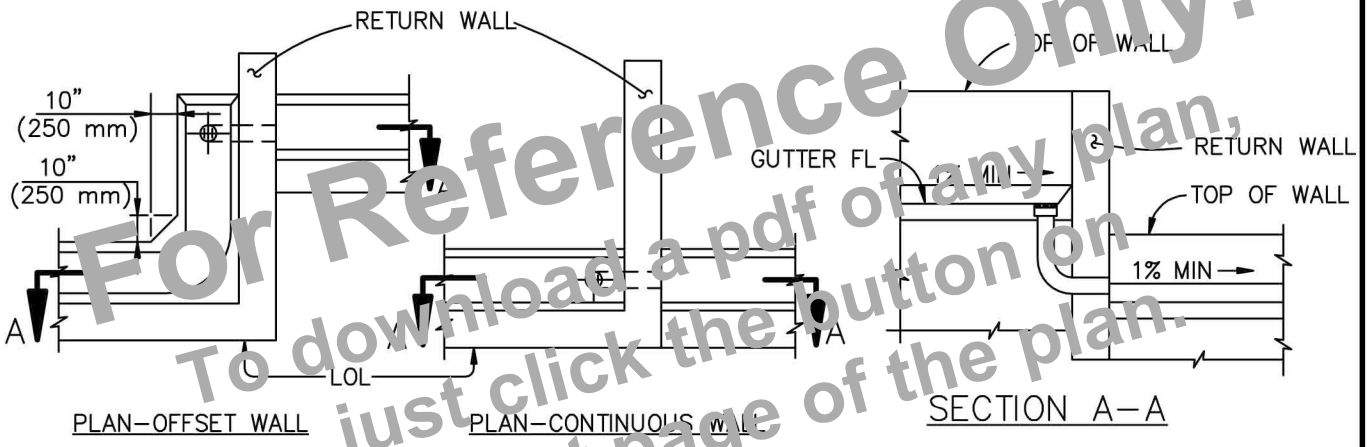
2. WATERSTOP SHALL HAVE 5 OR MORE PAIRS OF RAISED RIBS TO PROVIDE 0.1 SQ IN (65 mm^2) MINIMUM RIB CROSS-SECTION AREA ON EACH HALF OF THE WATERSTOP

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL DETAILS	**617-3**
	SHEET 4 OF 8

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WALL DRAINAGE
WHERE GUTTER NOT REQUIRED

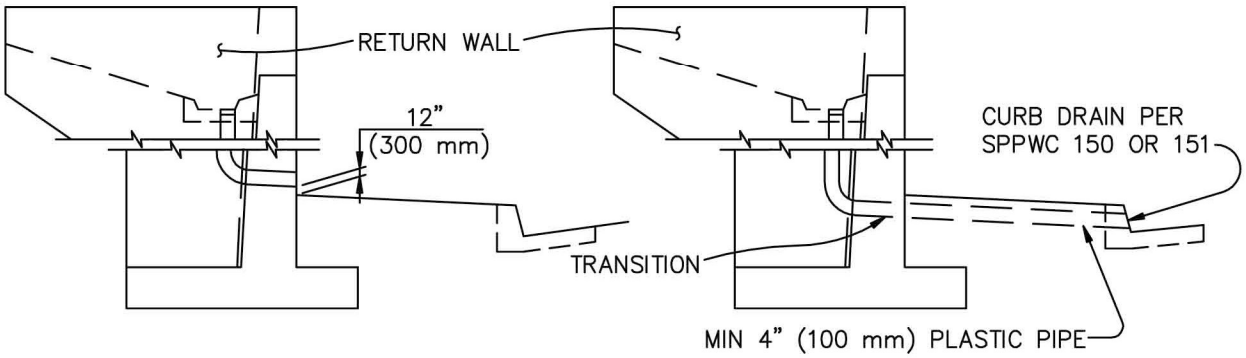


PLAN–OFFSET WALL PLAN–CONTINUOUS WALL

DRAIN THROUGH RETURN WALL

SECTION A–A

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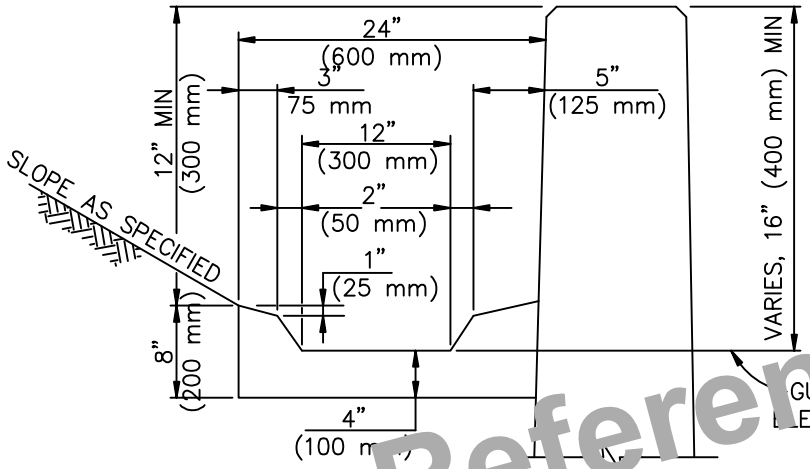
WALL GUTTER OUTLET
TO FACE OF WALL

CURB DRAIN AREA SHALL BE AT LEAST THAT OF PIPE FROM WALL GUTTER

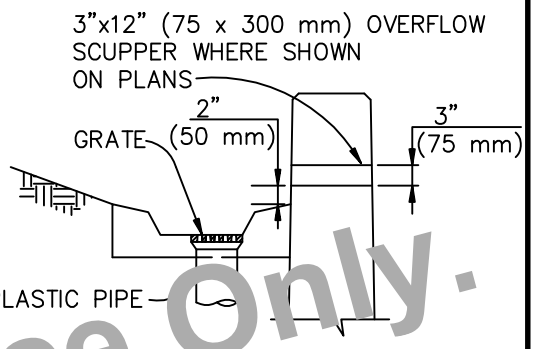
WALL GUTTER OUTLET TO CURB

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL DETAILS	**617–3**
	SHEET 5 OF 8

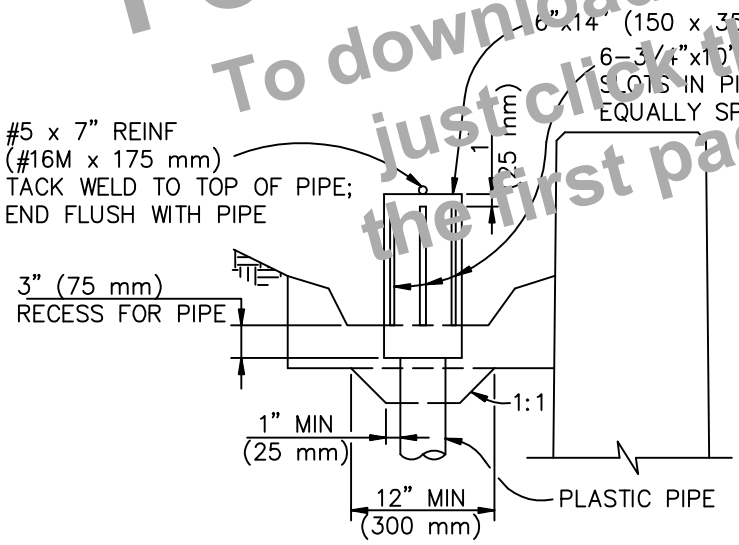
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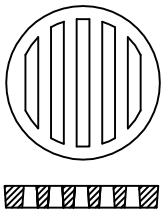
TYPICAL GUTTER DETAIL



WALL DRAIN DETAIL



WALL DRAIN WITH PIPE DOME



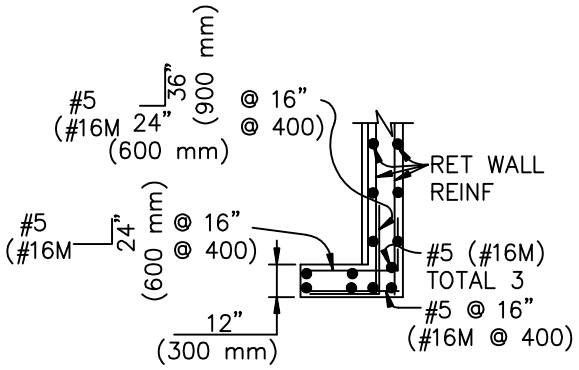
GRATE DETAIL

SIZE TO FIT STANDARD HUBS

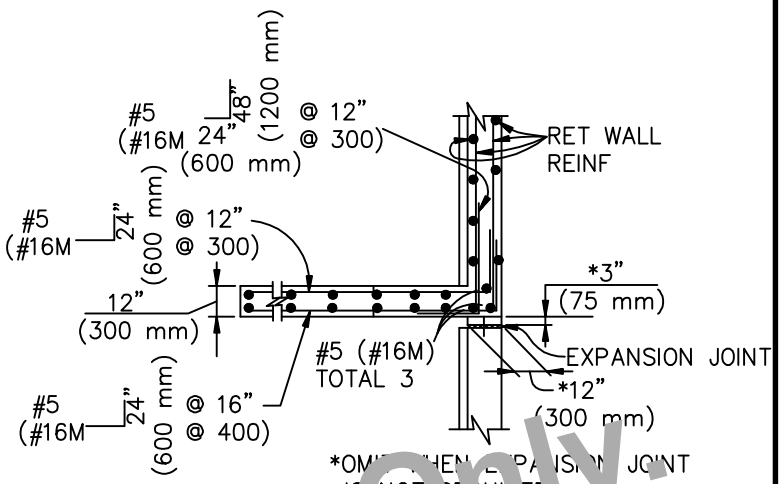
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL DETAILS	617-3
	SHEET 6 OF 8

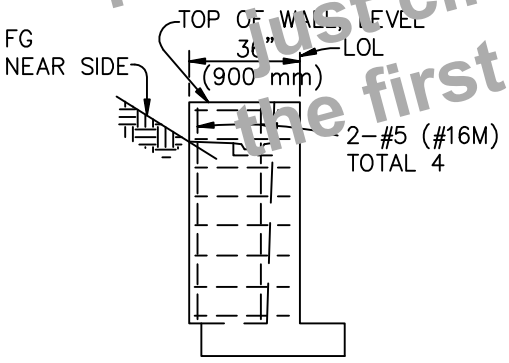
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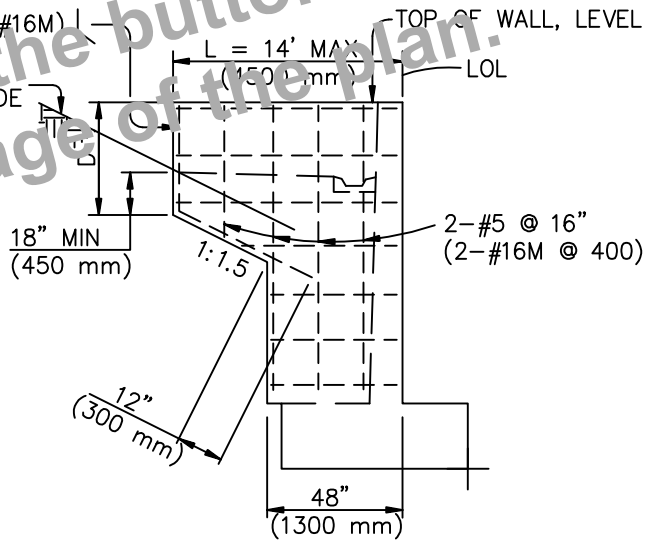
PLAN
RETURN WALL TYPE "D"



PLAN
RETURN WALL TYPE "A"



ELEVATION
RETURN WALL TYPE "D"
USE WHERE H=6' (1800 mm) OR LESS



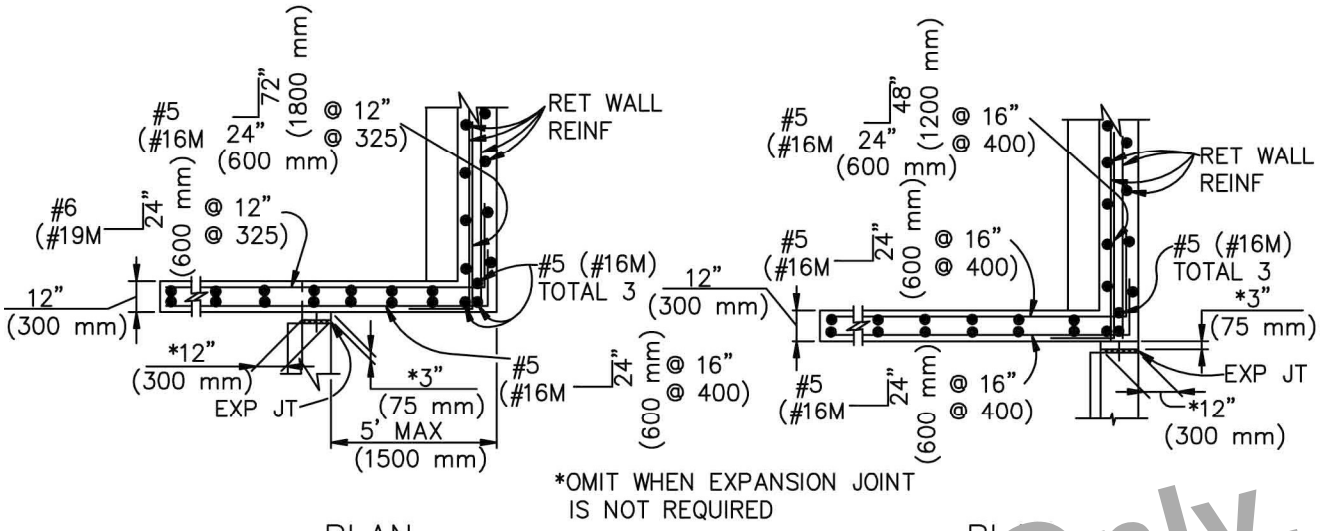
ELEVATION
RETURN WALL TYPE "A"
USE WHERE H=8' (2400 mm) OR LESS

METRIC REINFORCING BAR
SPACING IS IN MILLIMETERS

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL DETAILS	**617-3**
	SHEET 7 OF 8

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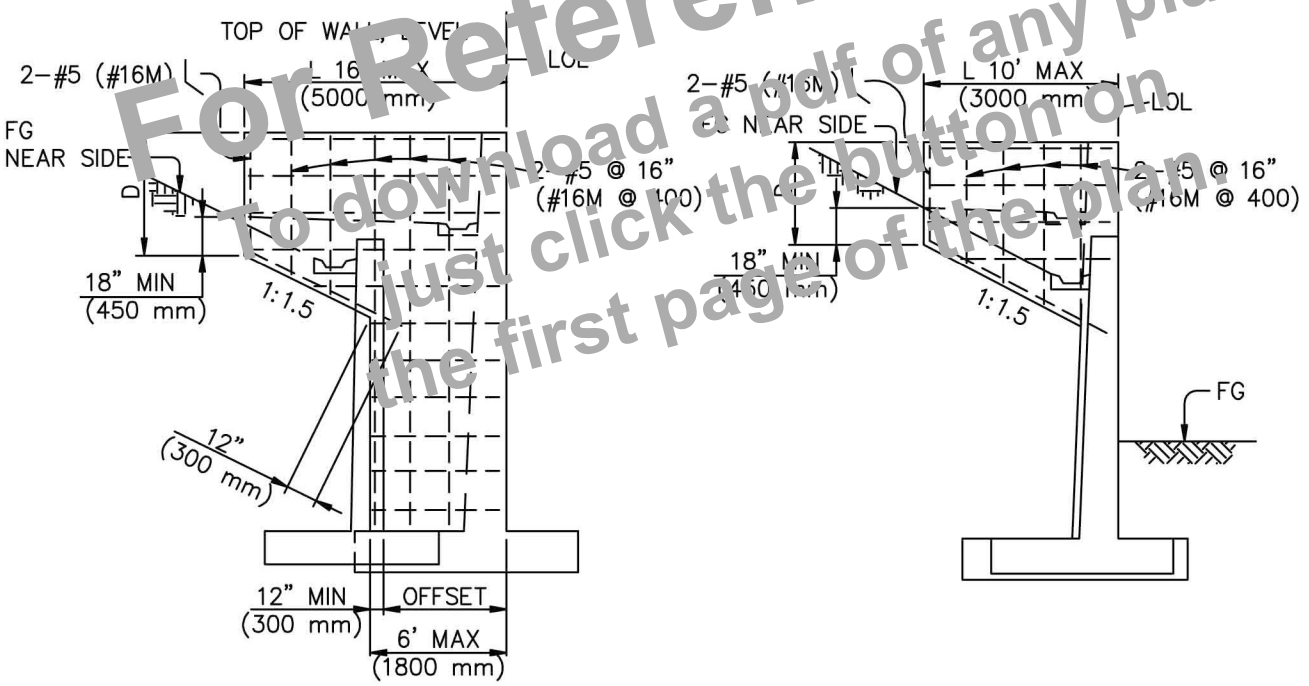
*OMIT WHEN EXPANSION JOINT IS NOT REQUIRED

PLAN

RETURN WALL TYPE "B"

PLAN

RETURN WALL TYPE "C"



ELEVATION

RETURN WALL TYPE "B"

USE AT OFFSET WALLS WHERE H=10' (3000 mm) OR MORE

ELEVATION

RETURN WALL TYPE "C"

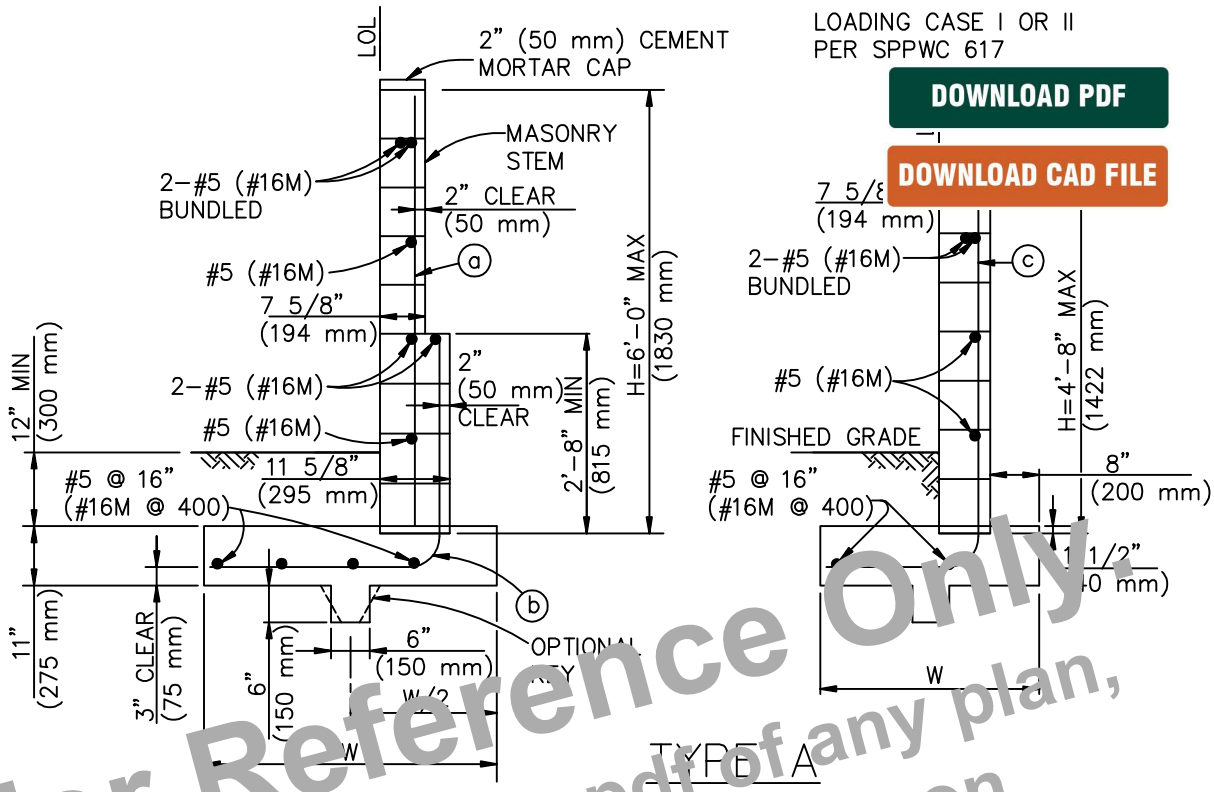
USE AT STRAIGHT WALLS WHERE H=10' (3000 mm) OR MORE

METRIC REINFORCING BAR SPACING IS IN MILLIMETERS

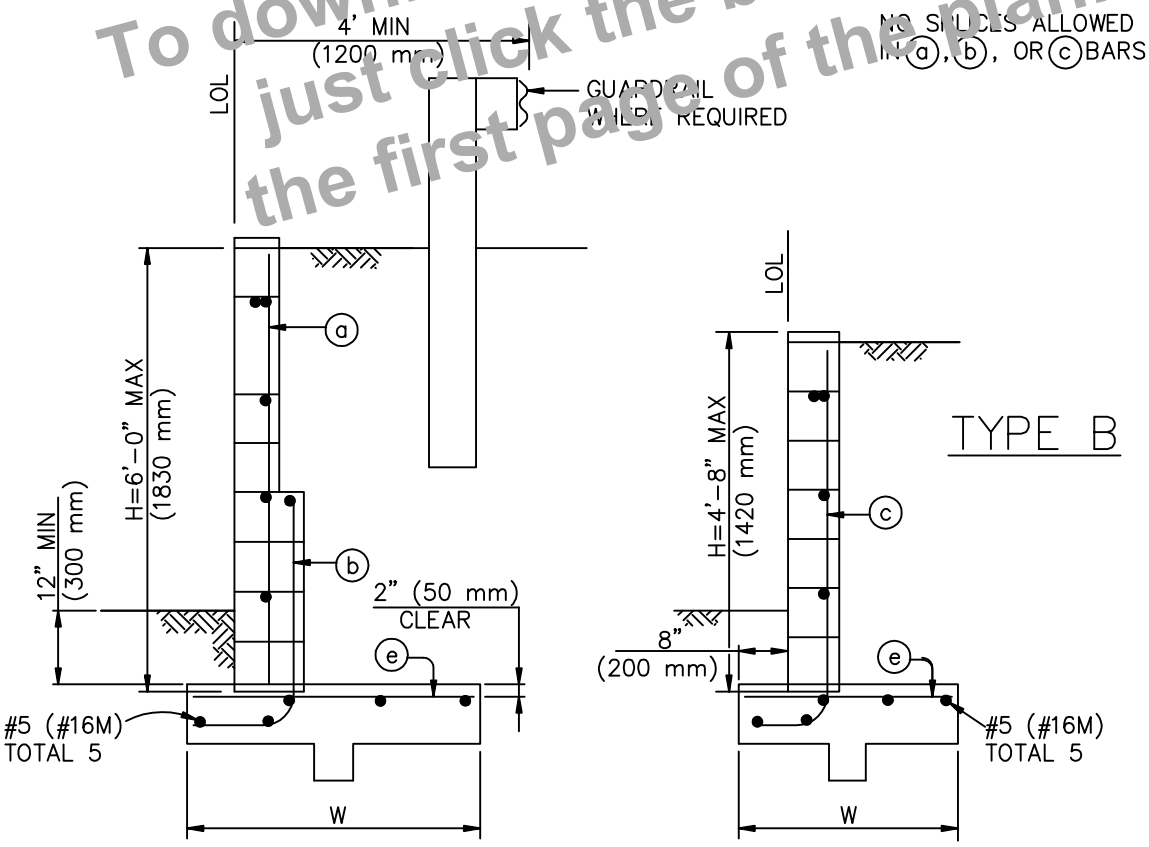
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE RETAINING WALL DETAILS	**617-3**
	SHEET 8 OF 8

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SIMILAR TO CALTRANS TYPE 6

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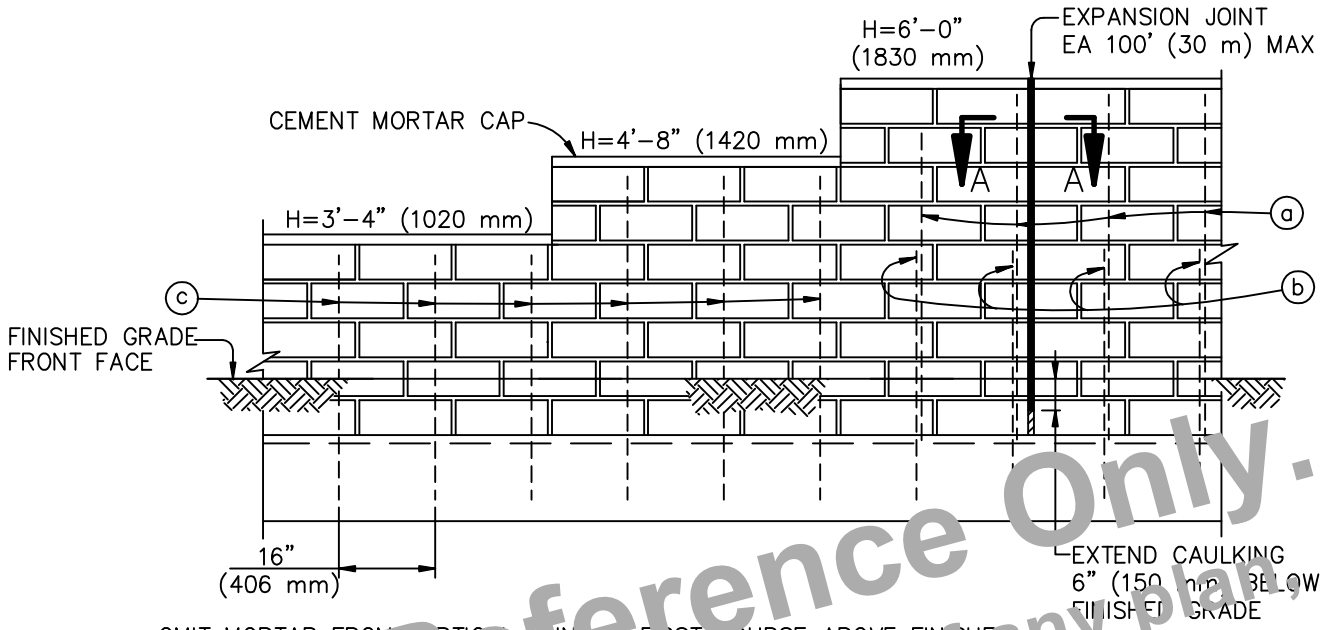
MASONRY RETAINING WALL

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 618–3

SHEET 1 OF 3

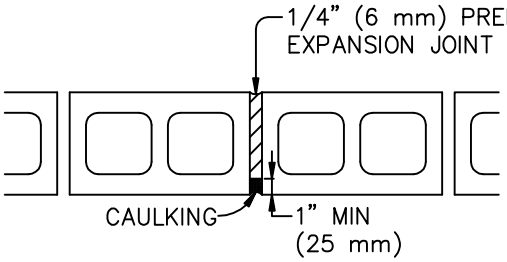
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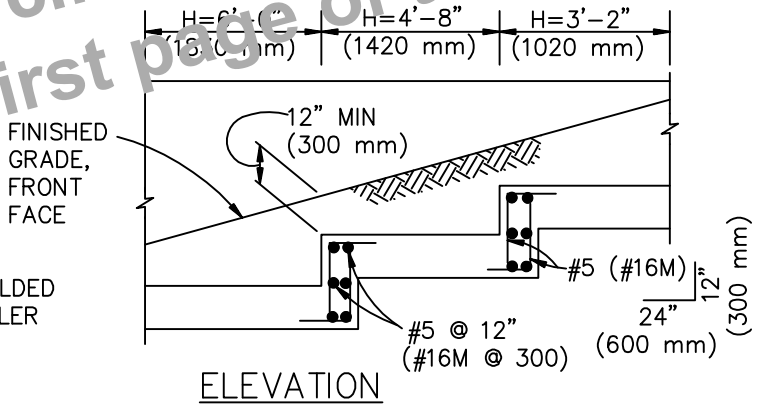
OMIT MORTAR FROM VERTICAL JOINTS IN FIRST COURSE ABOVE FINISHED GRADE AT 2'-8" (813 mm) CENTERS FOR WEEP HOLES. FILL ALL CELLS WITH GROUT.

ELEVATION

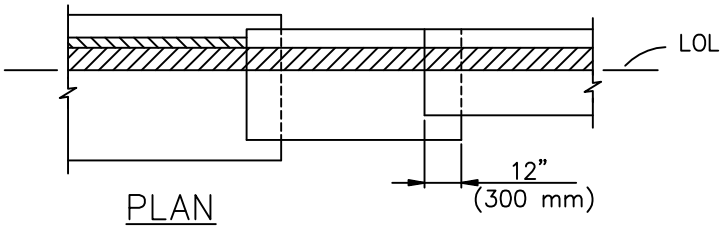
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SECTION A-A



ELEVATION



PLAN

FOOTING STEP DETAILS

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
MASONRY RETAINING WALL	**618-3**
	SHEET 2 OF 3

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TYPE A WALL

DESIGN H	3'–4" (1020)	4'–0" (1220)	4'–8" (1420)	5'–4" (1630)	6'–0" (1830)
W	3'–2" (1000 mm)	3'–6" (1100)	3'–10" (1200)	4'–2" (1300)	4'–6" (1400)
ⓐ BARS	———	———	———	#5 @ 16" (#16M @ 406)	#5 @ 16" (#16M @ 406)
ⓑ BARS	———	———	———	#5 @ 16" (#16M @ 406)	#5 @ 16" (#16M @ 406)
ⓒ BARS	#5 @ 16" (#16M @ 406)	#5 @ 16" (#16M @ 406)	#5 @ 16" (#16M @ 406)	———	———

TYPE B WALL

DESIGN H	3'–4" (1020 mm)	4'–0" (1220)	4'–8" (1420)	5'–4" (1630)	6'–0" (1830)
W	2'–8" (850)	3'–0" (950)	3'–4" (1050)	3'–8" (1150)	4'–0" (1250)
ⓐ BARS	———	———	———	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)
ⓑ BARS	———	———	———	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)
ⓒ BARS	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	———	———
ⓔ BARS	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 15" (#16M @ 375)	#5 @ 12" (#16M @ 300)

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DESIGN DATA (SEE SPPWC 617 FOR PCC, STEEL, AND OTHER SOIL DATA)

f_m = 500 psi (3.5 MPa) f'_m = 1500 psi (10.5 MPa)

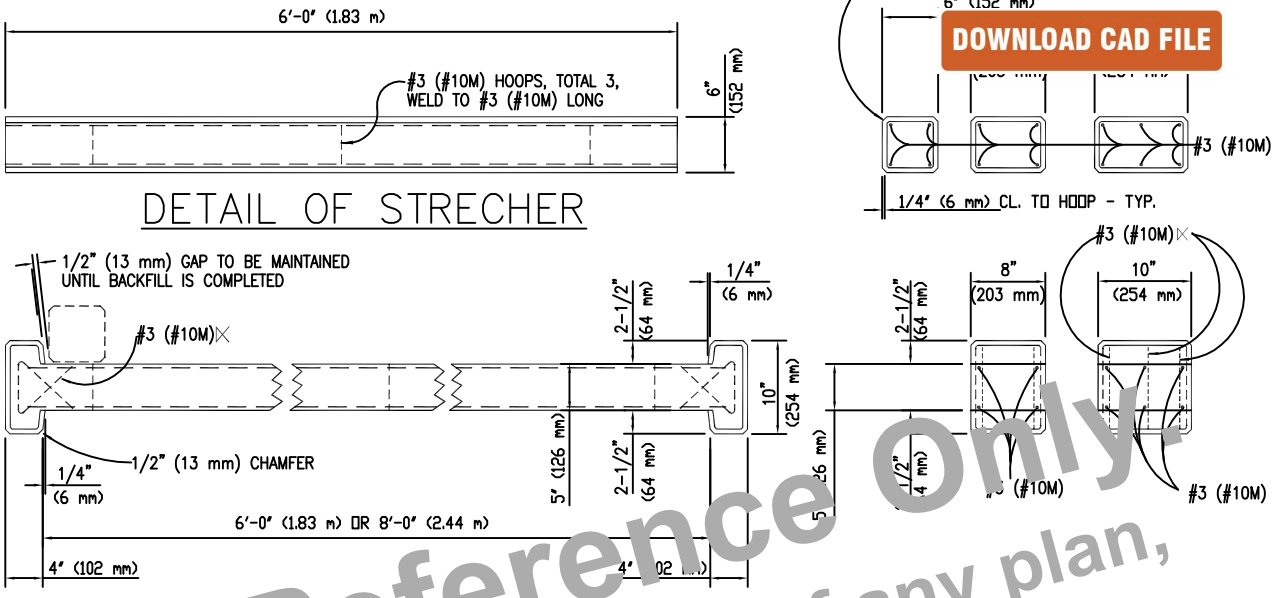
REQUIRED SOIL BEARING CAPACITY 2000 psf (95 kPa)

NOTES:

1. SEE SPPWC 617 FOR STANDARD WALL DETAILS.
2. METRIC REINFORCING BAR SPACING IS IN MILLIMETERS.

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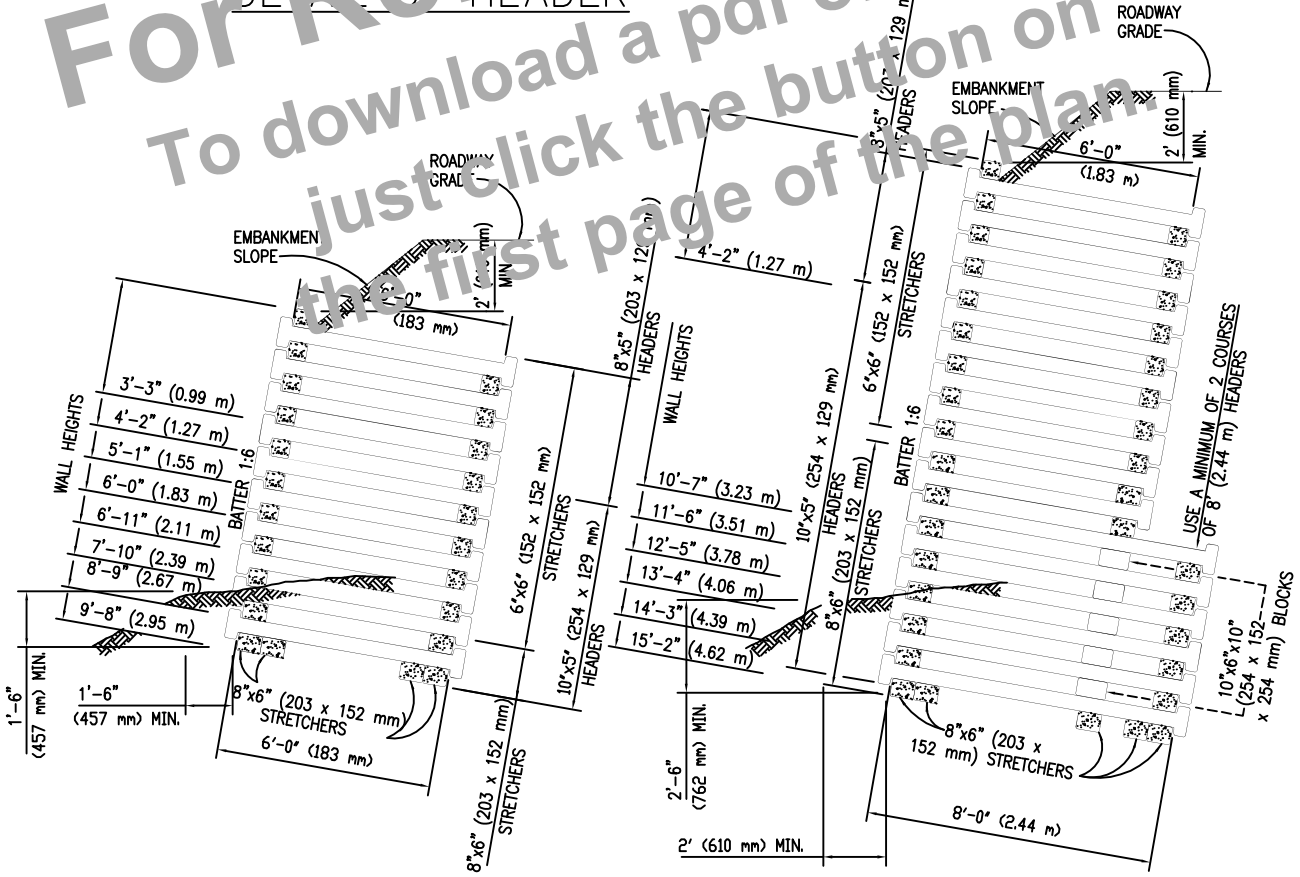
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DETAIL OF STRECHER

DETAIL OF HEADER

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TYPE A

WALLS 9'–8" (2.95 m) OR LESS IN HEIGHT

TYPE B

WALLS BETWEEN 10'–7" (3.23 m) AND 15'–2" (4.62 m) IN HEIGHT

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

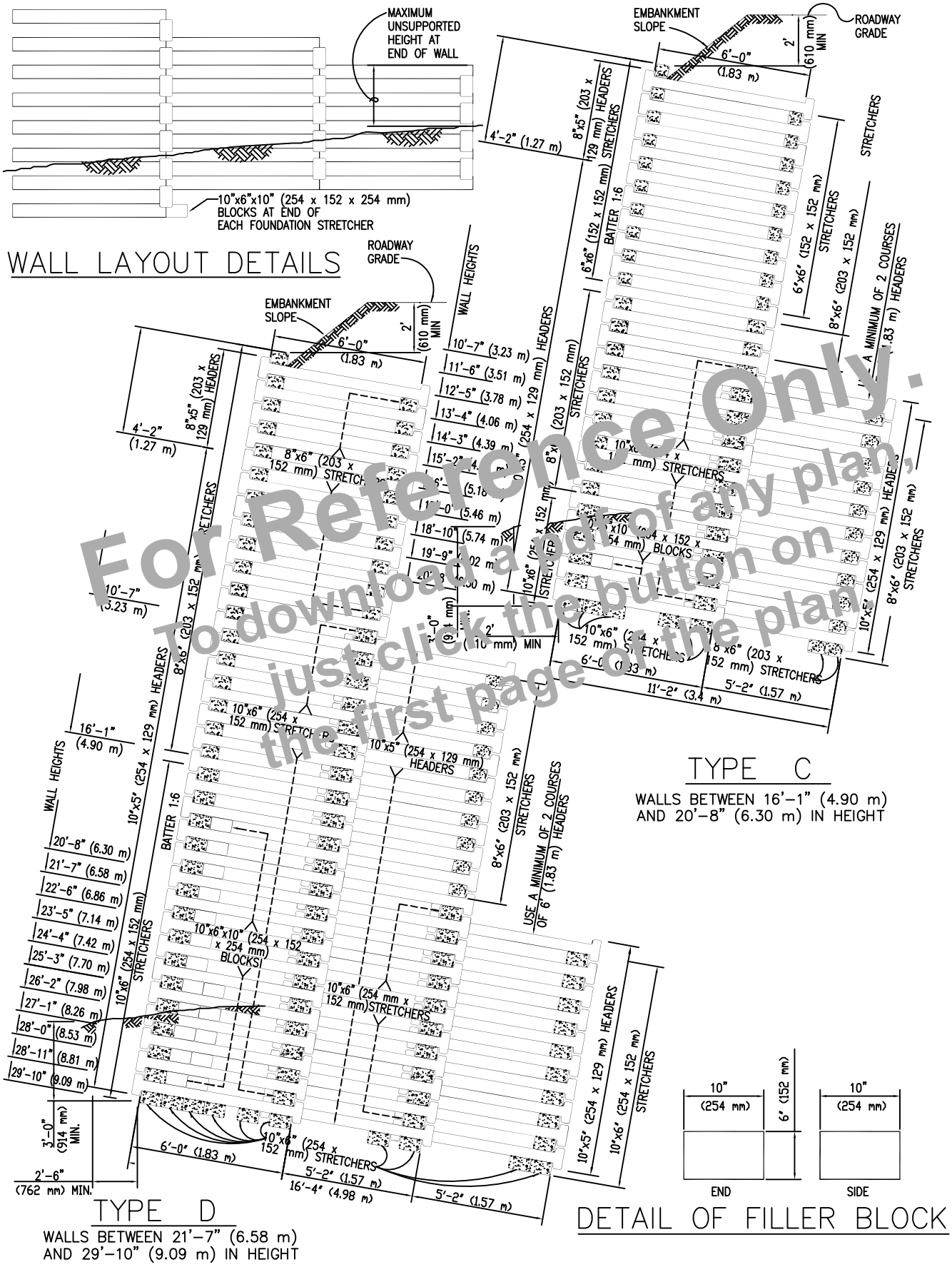
REINFORCED CONCRETE CRIB WALL

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 619–2

SHEET 1 OF 6

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

REINFORCED CONCRETE CRIB WALL

STANDARD PLAN
619-2
SHEET 2 OF 6

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REINFORCED CONCRETE CRIB WALL

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 619-2

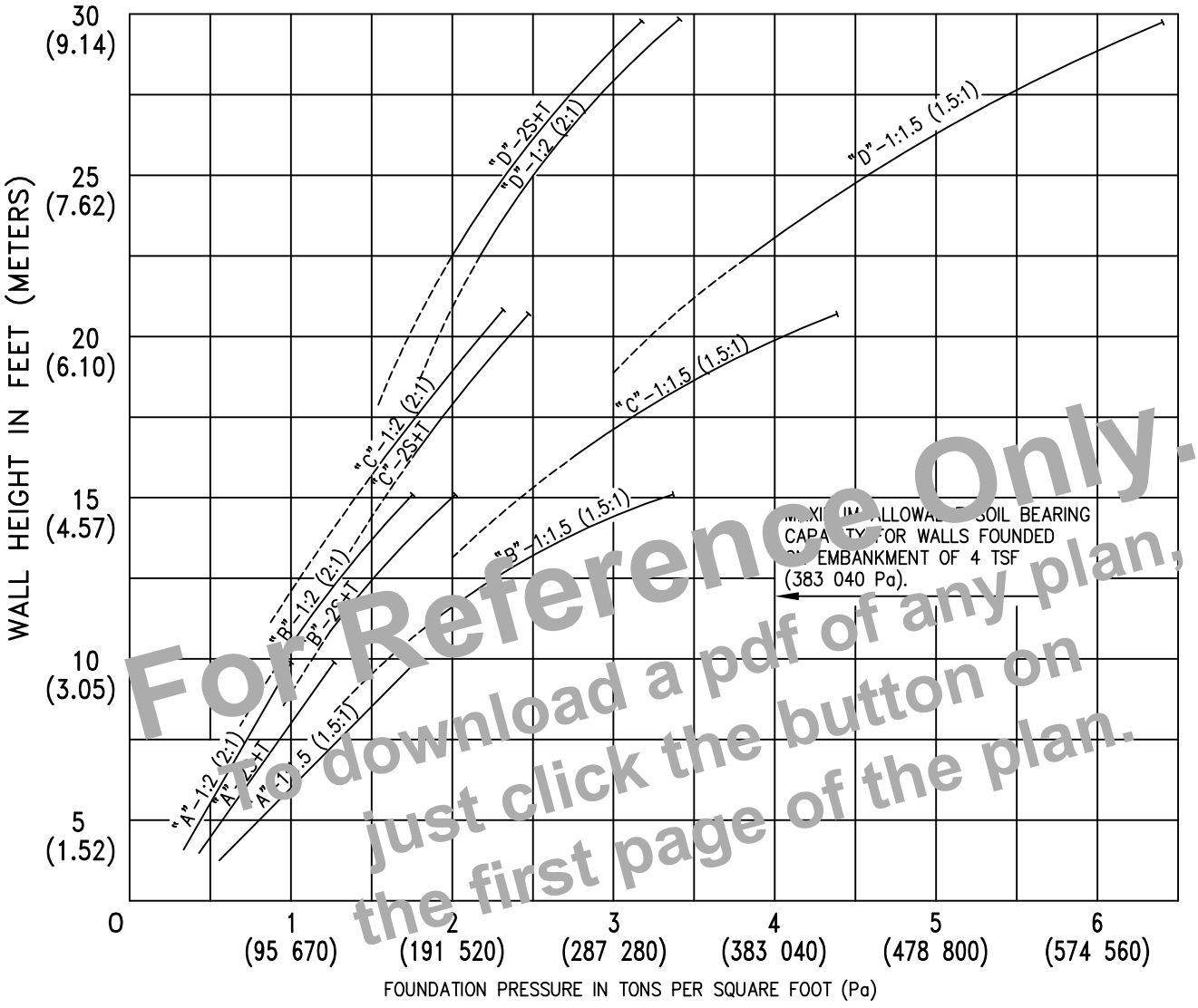
SHEET 3 OF 6

NUMBER OF UNITS REQUIRED FOR ONE INTERMEDIATE 6' (1.83 m) PANEL OF HEIGHTS AS SHOWN IN SHEETS 1 & 2

HEIGHT OF WALL	FRONT CRIB						1ST ANCHOR CRIB			2ND ANCHOR CRIB		ONE COMPLETE PANEL					
	HEADERS		STRETCHERS			BLOCKS	HDRS.	STRETCHERS		HDRS.	STRS.	HEADERS		STRETCHERS			BLOCKS
	8"x5" (203 x 129 mm)	10"x5" (254 x 129 mm)	6"x6" (152 x 152 mm)	8"x6" (203 x 152 mm)	10"x6" (254 x 152 mm)	10"x6"x10" (254 x 254 x 152 mm)	10"x5" (254 x 129 mm)	8"x6" (203 x 152 mm)	10"x6" (254 x 152 mm)	10"x5" (254 x 129 mm)	10"x6" (254 x 152 mm)	8"x5" (203 x 129 mm)	10"x5" (254 x 129 mm)	6"x6" (152 x 152 mm)	8"x6" (203 x 152 mm)	10"x6" (254 x 152 mm)	10"x6"x10" (254 x 254 x 152 mm)
3'-3" (0.99 m)	3		9									3		9			
4'-2" (1.27 m)	4		11	NOTE: USE 8"x6" (203 x 152 mm) STRETCHER WITH VERTICAL WALLS								4		11	NOTE: USE 8"x6" (203 x 152 mm) STRETCHER WITH VERTICAL WALLS		
5'-1" (1.55 m)	4	1	13									4	1	13			
6'-0" (1.83 m)	4	2	15									4	2	15			
6'-11" (2.11 m)	4	3	17									4	3	17			
7'-10" (2.39 m)	4	4	19									4	4	19			
8'-9" (2.67 m)	4	5	17	4								4	5	17	4		
9'-8" (2.95 m)	4	6	17	6								4	6	17	6		
10'-7" (3.23 m)	4	7	17	9		1						4	7	17	9		1
11'-6" (3.51 m)	4	8	17	11		1						4	8	17	11		1
12'-5" (3.78 m)	4	9	17	13		2						4	9	17	13		2
13'-4" (4.06 m)	4	10	17	15		3						4	10	17	15		3
14'-3" (4.34 m)	4	11	17	17		4						4	11	17	17		4
15'-2" (4.62 m)	4	12	17	19		5						4	12	17	19		5
16'-1" (4.90 m)	4	13	17	11	10		6	7				4	19	17	18	10	
17'-0" (5.18 m)	4	14	17	11	12		7	8				4	21	17	19	12	
17'-11" (5.46 m)	4	15	17	11	14		8	9				4	23	17	20	14	
18'-10" (5.74 m)	4	16	17	11	16		9	10				4	25	17	21	16	
19'-9" (6.02 m)	4	17	17	11	18	1	10	11				4	27	17	22	18	1
20'-8" (6.30 m)	4	18	17	11	20	2	11	12				4	29	17	23	20	2
21'-7" (6.58 m)	4	19	17	11	23	3	12	13		2	3	4	33	17	21	29	3
22'-6" (6.86 m)	4	20	17	11	25	4	13	10	4	3	4	4	35	17	21	32	4
23'-5" (7.14 m)	4	21	17	11	27	5	14	10	5	3	4	4	38	17	21	36	5
24'-4" (7.42 m)	4	22	17	11	29	6	15	10	6	4	5	4	41	17	21	40	6
25'-3" (7.70 m)	4	23	17	11	31	7	16	10	7	5	6	4	44	17	21	44	7
26'-2" (7.98 m)	4	24	17	11	33	9	17	10	8	6	7	4	47	17	21	48	9
27'-1" (8.26 m)	4	25	17	11	35	11	18	10	9	7	8	4	50	17	21	52	11
28'-0" (8.53 m)	4	26	17	11	37	13	19	10	10	8	9	4	53	17	21	56	13
28'-11" (8.81 m)	4	27	17	11	39	15	20	10	11	9	10	4	56	17	21	60	15
29'-10" (9.09 m)	4	28	17	11	41	17	21	10	12	10	11	4	59	17	21	64	17

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1:6 BATTERED WALL

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DESIGN CRITERIA:

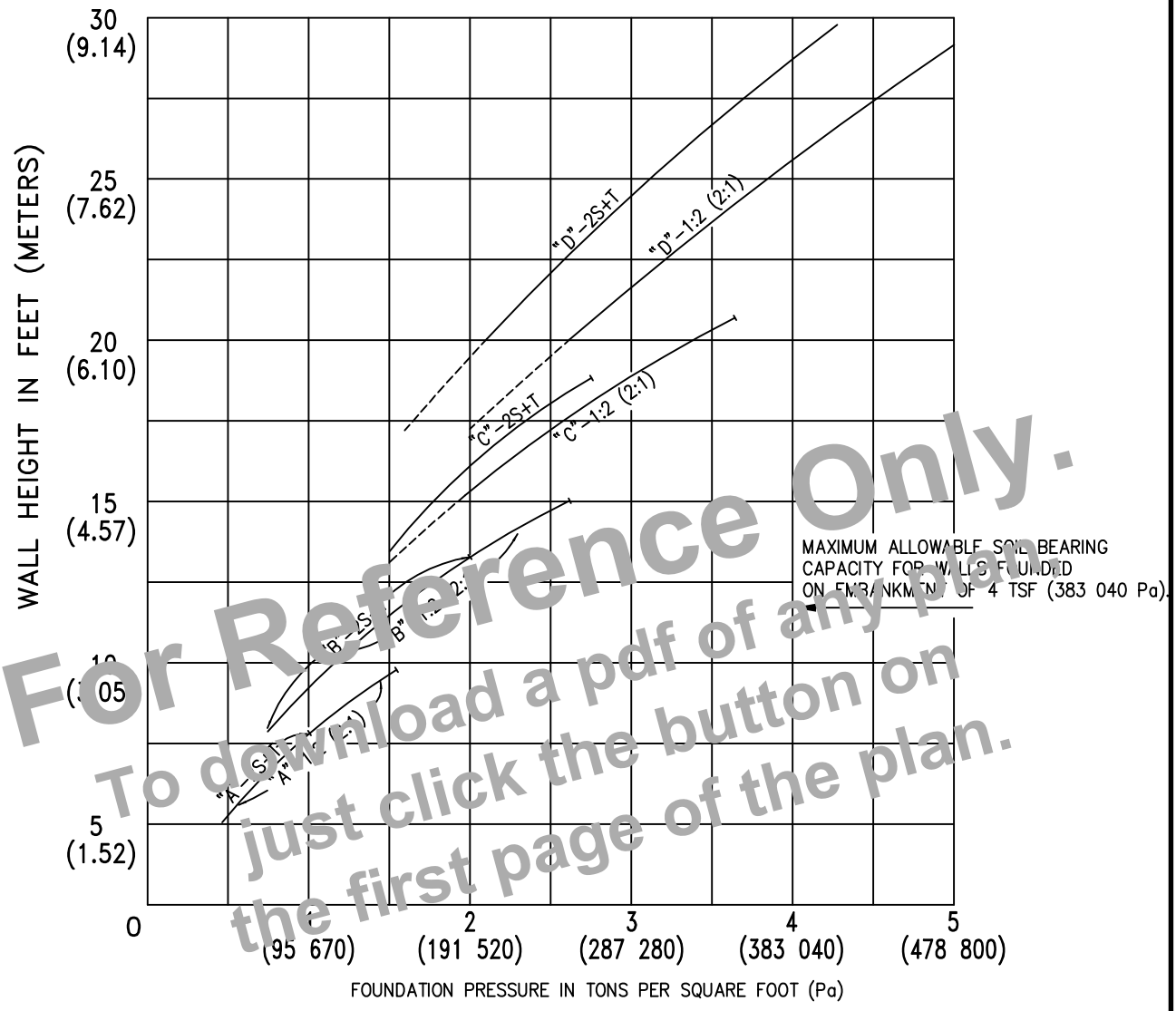
1. WALL BASE IN EMBANKMENT: A MINIMUM DEPTH OF 5' (1.52 m) OF EMBANKMENT AT 95% RELATIVE SOIL COMPACTION IS REQUIRED BELOW THE BASE OF ALL WALLS IN ORDER TO CONSTITUTE AN EMBANKMENT CONDITION. WHEN THE FOUNDATION PRESSURE IS BETWEEN 2.5 TSF (239 400 Pa) AND 4.0 TSF (383 040 Pa) EMBANKMENT BELOW THE WALL SHALL CONSIST OF "STRUCTURAL BACKFILL" MATERIAL. RELATIVE COMPACTION SHALL BE 95%.

2. WALL BASE IN ORIGINAL GROUND: ALLOWABLE SOIL AT TOE OF WALL SHALL BE DETERMINED BY FOUNDATION SITE INVESTIGATION WALLS THAT ARE TO RETAIN CUT SLOPES SHALL BE DESIGNED FOR LATERAL AND TOE PRESSURES DETERMINED FROM SITE INVESTIGATION DATA. OVERALL STABILITY OF SLOPE WITH WALL IN PLACE MUST BE ANALYZED. IF ORIGINAL GROUND SLOPES AWAY FROM TOE OF WALL, REDUCTION IN ALLOWABLE BEARING CAPACITY DUE TO SLOPE MUST BE CONSIDERED. WALLS SHALL NOT BE FOUNDED IN ORIGINAL GROUND HAVING AN ALLOWABLE BEARING CAPACITY OF LESS THAN 1.5 TSF (143 640 Pa). CONSIDERATION SHOULD BE GIVEN TO REMOVAL AND REPLACEMENT OF UNSUITABLE MATERIAL WITH "STRUCTURAL BACKFILL" MATERIAL. RELATIVE COMPACTION SHALL BE 95%.

3. DESIGN DATA: WEIGHT OF SOIL = 120 PCF (1920 kg/m^3). FOR 2' (610 mm) LEVEL SURCHARGE WITH TRAFFIC LOADING, AN EQUIVALENT FLUID PRESSURE OF 36 PCF (1724 Pa) WAS USED. EARTH PRESSURE FOR 1:2 (2:1) SLOPE AND 1:1 1/2 (1 1/2:1) UNLIMITED SLOPES DETERMINED FROM RANKINE'S FORMULA WITH ϕ = 33°42'.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE CRIB WALL	619–2
	SHEET 4 OF 6

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VERTICAL WALL

LEGEND FOR GRAPHS:

A, B, C, D = WALL TYPE

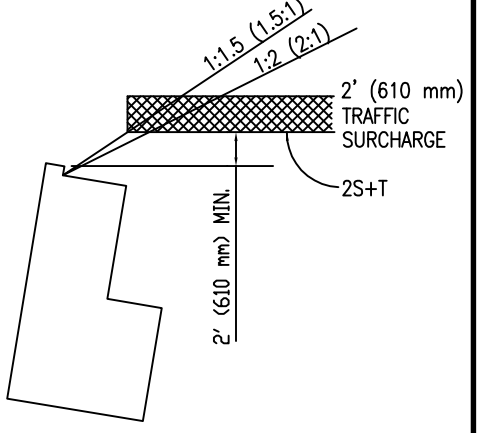
2S+T = 2' (610 mm) LEVEL SURCHARGE WITH TRAFFIC LOADING

1:2 (2:1) = 1:2 (2:1) SLOPE ABOVE WALL

1:2.5 (2.5:1) = 1:1.5 (1.5:1) SLOPE ABOVE WALL

115' (35.05 m) MAX. DIFFERENCE IN ELEVATION FROM TOE OF WALL TO TOP OF SLOPE.

SOLID LINES INDICATED NORMAL RANGE OF WALL USE. UPPER END AT LINE INDICATES MAXIMUM WALL HEIGHT FOR A GIVEN WALL TYPE AND LOADING.



DESIGN SURCHARGES

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

REINFORCED CONCRETE CRIB WALL

STANDARD PLAN
619–2
SHEET 5 OF 6

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DESIGN EXAMPLES:

EXAMPLE NO. 1

GIVEN: WALL HEIGHT 24' (7.32 m)
1:2 (2:1) EMBANKMENT SLOPE TO BE RETAINED. BASE FOUNDED IN EMBANKMENT.

SELECT: EITHER VERTICAL OR BATTERED "D" WALL. BOTH WALLS REQUIRE 5' (1.52 m) DEPTH EMBANKMENT OF 95% COMPACTION BELOW BASE. HOWEVER, FOR THE VERTICAL WALL WITH A FOUNDATION PRESSURE OF 3.0 TSF (287 280 Pa) EMBANKMENT MATERIAL MUST BE "STRUCTURAL BACKFILL" (SEE DESIGN NOTE 1)

EXAMPLE NO. 2

GIVEN: WALL HEIGHT 20' (6.10 m)
1:2 (2:1) CUT SLOPE TO BE RETAINED. FOUNDATION SITE INVESTIGATION INDICATES LATERAL PRESSURE FROM MATERIAL ABOVE WILL BE EQUIVALENT TO 1:2 (2:1) EMBANKMENT SLOPE, AND THE ALLOWABLE SOIL BEARING CAPACITY IS 2.5 TSF (239 400 Pa).

SELECT: BATTERED "C" WALL. ALSO A VERTICAL "D" WALL CAN BE USED. BY INCREASING THE ALLOWABLE BEARING CAPACITY OF THE ORIGINAL GROUND (SEE DESIGN NOTE 2) A VERTICAL "C" WALL CAN BE USED.

EXAMPLE NO. 3

GIVEN: WALL HEIGHT 9' (2.74 m)
2' (610 mm) LEVEL SURCHARGE WITH TRAFFIC LOADING TO BE RETAINED. BASE FOUNDED IN EMBANKMENT.

SELECT: BATTERED "A" WALL OR VERTICAL "B" WALL. IF VERTICAL "B" IS USED THE ACTUAL HEIGHT OF THE WALL WILL BE 9'–8" (2.95 m). THE FIRST STEP IN THE WALL WILL BE 7'–10" (2.39 m), WHICH IS THE LIMITING HEIGHT OF THE "A" WALL FOR THE 2S+T SURCHARGE. A MINIMUM OF 2 COURSES OF 8' (2.44 m) HEADERS IS PROVIDED.

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DESIGN CRITERIA:

1. WALLS 12'–5" (3.78 m) OR LESS IN HEIGHT MAY BE CONSTRUCTED WITH NO BATTER.

2. UNITS SHOWN IN TABLE ARE FOR INTERMEDIATE PANELS. IN COMPUTING A WALL OF SAY 7 PANELS, IT IS NECESSARY TO REMEMBER THAT 7+1 OR 8 VERTICAL ROWS OF HEADERS ARE REQUIRED. IN ADDITION, ANOTHER VERTICAL ROW OF HEADERS MUST BE ADDED WHENEVER, IN CASE OF LONG WALLS, THE WALL IS "BROKEN" AT PANEL POINTS OF APPROXIMATELY 96 FEET (29.26 m). TABLE OF NUMBER OF UNITS REQUIRED APPLY TO BATTERED WALLS.

3. FOR BATTERED WALLS, STEPS IN WIDTH ARE TO BE MADE AT THE WALL HEIGHTS SHOWN ON THIS SHEET WHEN THE NEXT LOWER LEVEL CONSISTS OF AT LEAST 2 COURSES OF HEADERS. FOR VERTICAL WALLS, STEPS IN WIDTH ARE TO BE MADE AT THE LIMITING TOTAL HEIGHT FOR EACH WALL SHOWN ON THE GRAPHS ON THE DESIGN DATA SHEET PROVIDING THE NEXT LOWER LEVEL CONSISTS OF AT LEAST 2 COURSES OF HEADERS.

4. f'_c = 3250 PSI (22 392 kPa), f_y = 40,000 PSI (275 600 kPa).

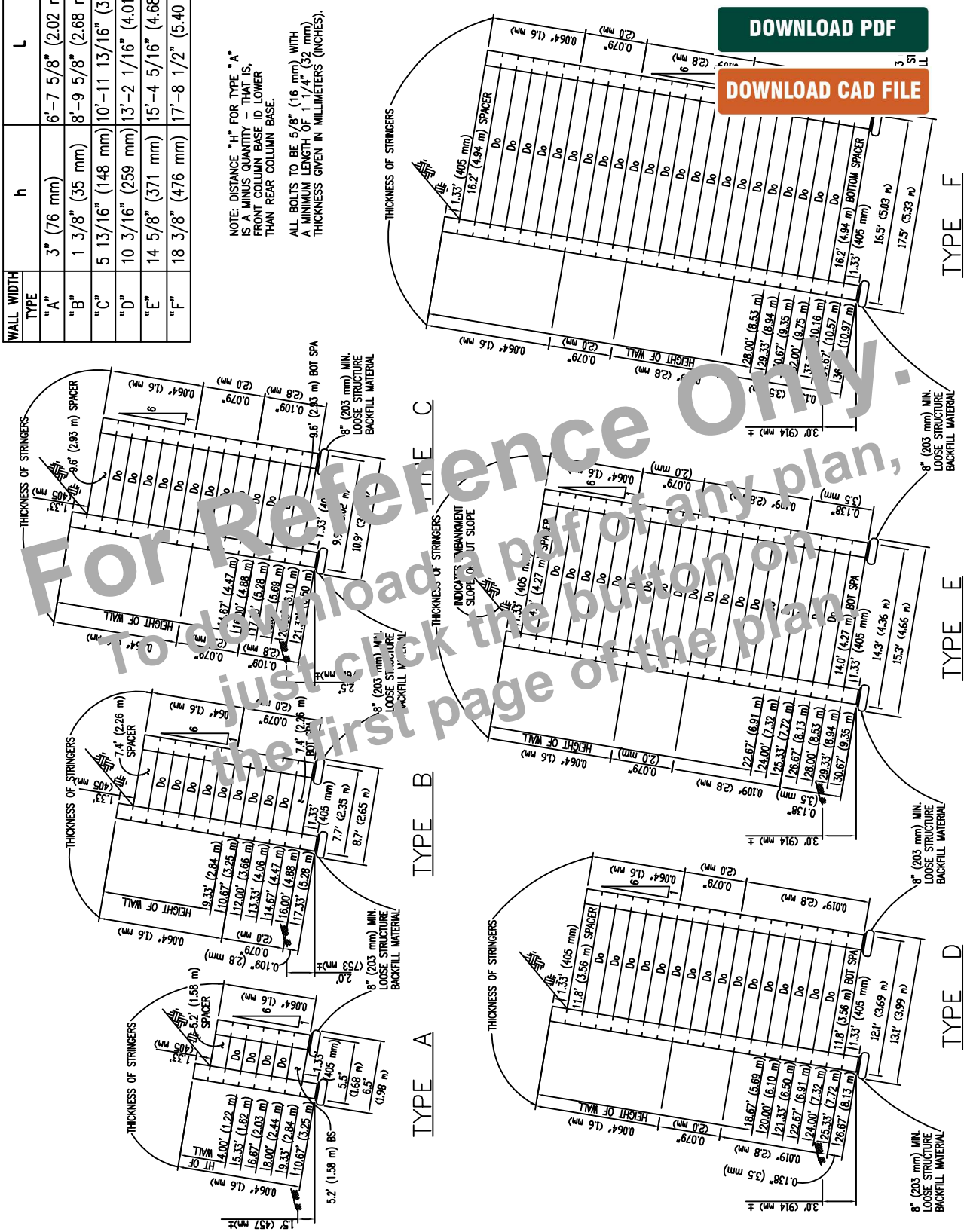
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WALL WIDTH TYPE	h	L
"A"	3" (76 mm)	6'-7 5/8" (2.02 m)
"B"	1 3/8" (35 mm)	8'-9 5/8" (2.68 m)
"C"	5 13/16" (148 mm)	10'-11 13/16" (3.35 m)
"D"	10 3/16" (259 mm)	13'-2 1/16" (4.01 m)
"E"	14 5/8" (371 mm)	15'-4 5/16" (4.68 m)
"F"	18 3/8" (476 mm)	17'-8 1/2" (5.40 m)

NOTE: DISTANCE "H" FOR TYPE "A" IS A MINUS QUANTITY - THAT IS, FRONT COLUMN BASE IS LOWER THAN REAR COLUMN BASE.

ALL BOLTS TO BE 5/8" (16 mm) WITH A MINIMUM LENGTH OF 1 1/4" (32 mm) THICKNESS GIVEN IN MILLIMETERS (INCHES).



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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

STEEL CRIB WALL

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 620-2

SHEET 1 OF 7

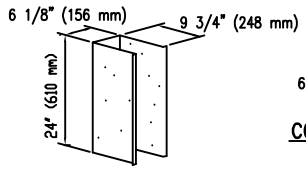
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

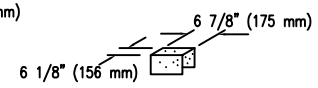
STEEL CRIB WALL

STANDARD PLAN 620-2

SHEET 2 OF 7
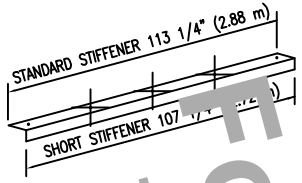


COLUMN SPLICE PLATE
0.138" (3.5 mm)

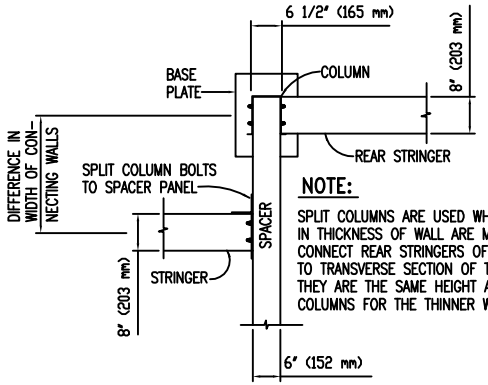


COLUMN CAP – 0.109" (2.8 mm)

NOTE: COLUMN CAP TO BE PLACED IF REQUESTED BY THE ENGR.



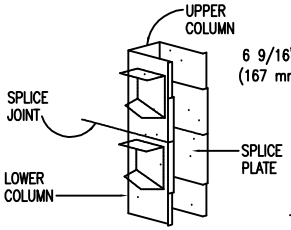
STRINGER STIFFENER – 0.168" (4.3 mm)



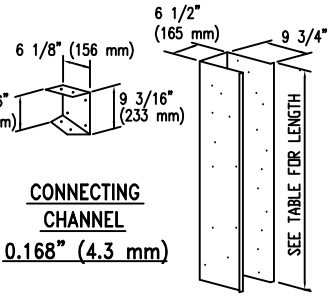
NOTE:

SPLIT COLUMNS ARE USED WHERE CHANGES IN THICKNESS OF WALL ARE MADE TO CONNECT REAR STRINGERS OF THINNER WALL TO TRANSVERSE SECTION OF THICKER WALL. THEY ARE THE SAME HEIGHT AS THE REAR COLUMNS FOR THE THINNER WALL.

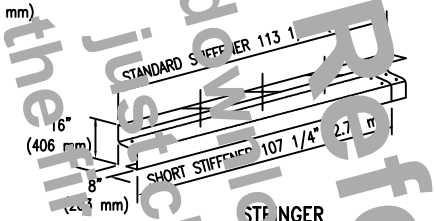
DETAIL
SPLIT COLUMN ATTACHMENT



ASSEMBLY AT
COLUMN SPLICE



COLUMN
0.168" (4.3 mm)



STRINGER



SPACER

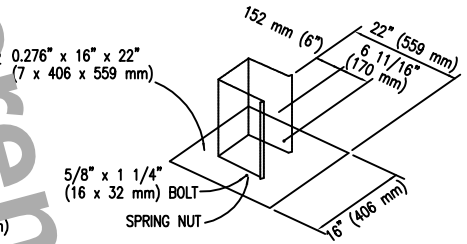


BOTTOM SPACER

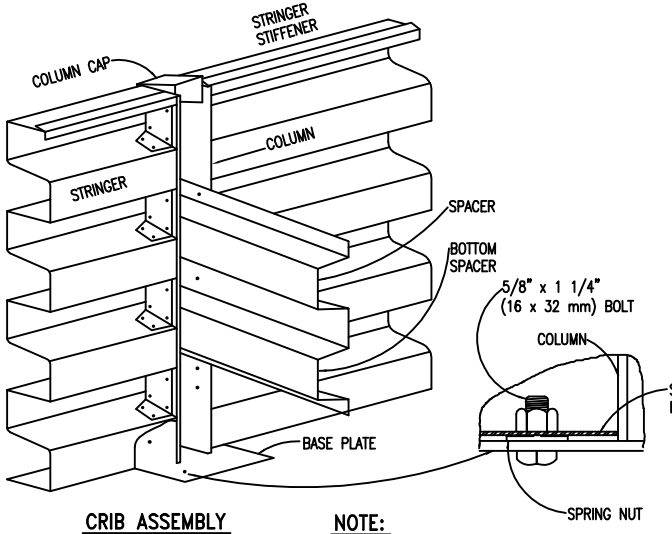
NOTE: SEE TABLE ON SHEET NO. 6 FOR THICKNESS AND LENGTH.

GENERAL NOTES:

DESIGN "TYPE" TO BE SHOWN ON ALL CRIB LAYOUTS.
FOR DESIGN DATA SEE SHEETS NO. 4 AND NO. 5.



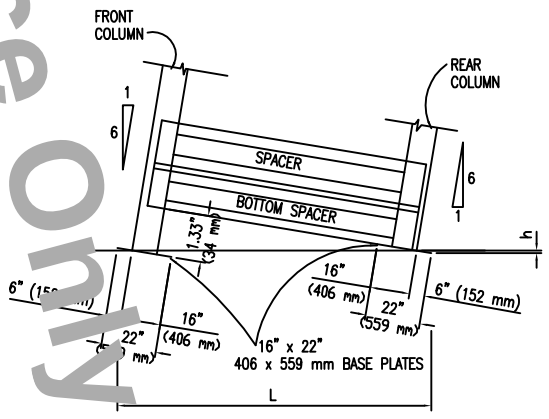
BASE PLATE ARRANGEMENT



CRIB ASSEMBLY
FRONT COLUMN
REAR COLUMN SIMILAR

NOTE:

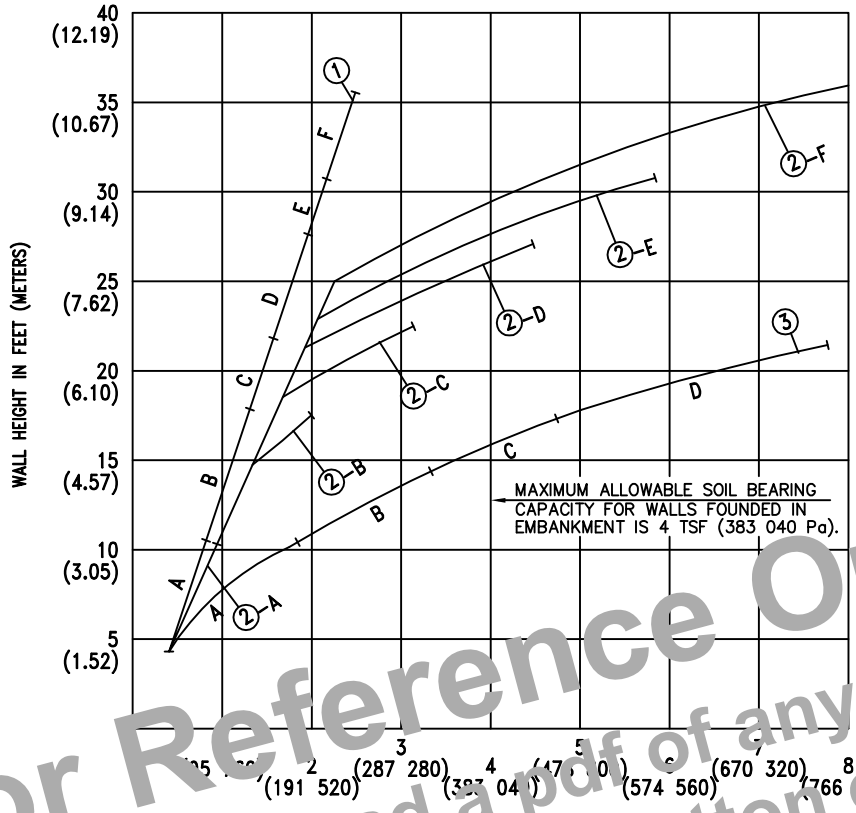
BEFORE SETTING BASE PLATE INSERT BOLT AND FASTEN WITH SPRING NUT.



DETAIL BASE PLATE PLACEMENT

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DESIGN EXAMPLES

EXAMPLE NO. 1

GIVEN: WALL HEIGHT 24' (7.32 m).
1:2 (2:1) EMBANKMENT SLOPE TO BE RETAINED.
115' (35.05 m) MAXIMUM FROM TOE OF WALL TO TOP OF SLOPE.
BASE IN EMBANKMENT (5' (1.52 m) DEPTH MIN.).

SELECT: 1:6 BATTERED WALL. VERTICAL WALL NOT PERMITTED. "D" WALL SELECTED.
MAXIMUM HEIGHT ON GRAPH IS 26.00' (7.92 m) AT 4 TSF (383 040 Pa). SINCE THE FOUNDATION PRESSURE IS 3.2 TSF (306 432 Pa) AT 24.00' (7.32 m), THE WALL MUST BE FOUNDED ON A 5 FOOT (1.52 m) THICKNESS OF "STRUCTURE BACKFILL" (SEE DESIGN NOTE 1). A DRAINAGE SYSTEM BEHIND THIS WALL WILL BE REQUIRED.

EXAMPLE NO. 2

GIVEN: WALL HEIGHT 29' (8.84 m).
1:2 (2:1) CUT SLOPE TO BE RETAINED. FOUNDATION SITE INVESTIGATION INDICATES LATERAL PRESSURE FROM MATERIAL ABOVE WILL BE EQUIVALENT TO 1:2 (2:1) EMBANKMENT SLOPE. BASE IN EXCAVATION LEVEL AT TOE OF WALL. FOUNDATION INVESTIGATION DETERMINES THE ALLOWABLE SOIL BEARING CAPACITY AT 3 TSF (287 280 Pa).

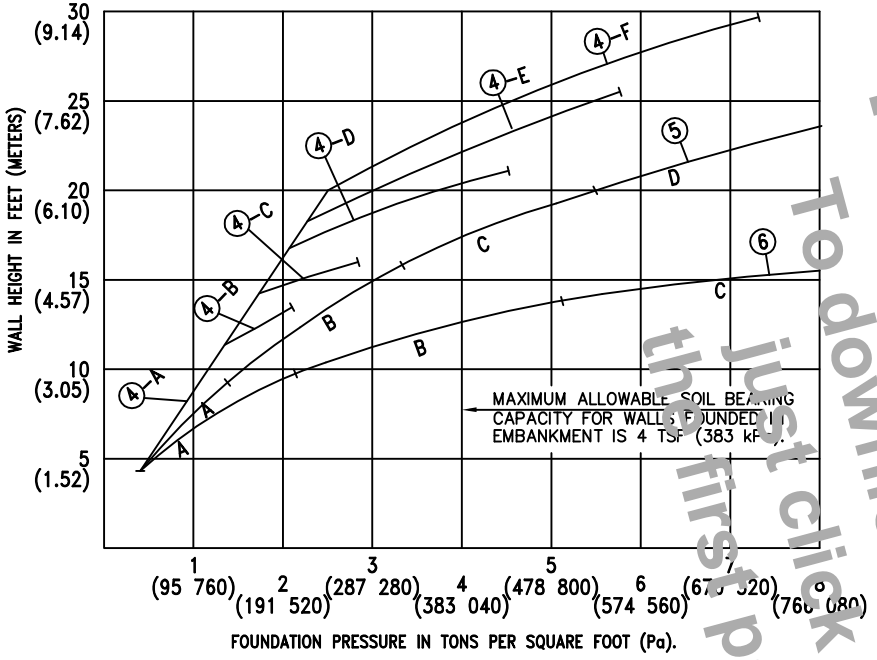
SELECT: BATTERED "F" WALL MAXIMUM HEIGHT AT 4 TSF (383 040 Pa) IS 29' (8.84 m), THEREFORE THE REPLACEMENT OF 5 FOOT (1.52 m) EXCAVATION WITH "STRUCTURE BACKFILL" TO INCREASE THE ALLOWABLE SOIL BEARING CAPACITY TO 4 TSF (383 040 Pa) IS REQUIRED (SEE DESIGN NOTE 1). A DRAINAGE SYSTEM FOR THIS WALL SHOULD BE INVESTIGATED.

EXAMPLE NO. 3

GIVEN: WALL HEIGHT 15' (4.57 m).
1:1.5 (1.5:1) EMBANKMENT SLOPE 18' (5.49 m) ABOVE TOP OF WALL TO BE RETAINED BASE ON ORIGINAL GROUND FOUNDATION INVESTIGATION DETERMINES ALLOWABLE SOIL BEARING CAPACITY AT 2 TSF (191 520 Pa).
BASE IN EMBANKMENT (6' (1.52 m) DEPTH MIN.).

SELECT: LOADING CONDITIONS INTERPOLATED AS BETWEEN 1:1.5 (1.5:1) AND 1:2 (2:1) EMBANKMENT SLOPE.
USE A TYPE "B" BATTERED WALL OR A TYPE "C" VERTICAL WALL. HOWEVER, IF THE TYPE "C" WALL IS USED 5' (1.52 m) OF EXCAVATION MUST BE REPLACED TO INCREASE THE ALLOWABLE SOIL BEARING CAPACITY TO 4 TSF (383 040 Pa). (SEE DESIGN NOTE 1).

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VERTICAL WALL

SURCHARGE / BATTER	LEVEL 2' (610 mm) MIN. SURCHARGE	1:2 (2:1) WITH FINITE* SURCHARGE	1:1.5 (1.5:1) WITH FINITE* SURCHARGE
WALL ON 1:6 BATTER	① 2' (610 mm) 2S	② 1:2 (2:1) 1:2 (2:1)	③ 1:1.5 (1.5:1) 1:1.5 (1.5:1)
WALL VERTICAL	④ 2' (610 mm) 2S	⑤ 1:2 (2:1) 1:2 (2:1)	⑥ 1:1.5 (1.5:1) 1:1.5 (1.5:1)

*115' (35.05 m) MAXIMUM DIFFERENCE IN ELEVATION FROM TOE TO WALL TO TOP OF SLOPE
A,B,C,D,E,F = WALL TYPE
////// INDICATES 2' (610 mm) MIN. SURCHARGE ABOVE "ROADWAY GRADE"

LEGEND FOR GRAPHS

UPPER END OF LINE INDICATES MAXIMUM WALL HEIGHT FOR A GIVEN WALL TYPE

DESIGN CRITERIA:

WALL BASE IN EMBANKMENT: A MINIMUM DEPTH OF 5' (1.52 m) OF EMBANKMENT AT 95% RELATIVE SOIL COMPACTION IS REQUIRED BELOW THE BASE OF ALL WALLS IN ORDER TO CONSTITUTE AN EMBANKMENT CONDITION. WHEN THE FOUNDATION PRESSURE IS BETWEEN 2.5 TONS/S.F. (239 400 Pa) AND 4.0 TONS/S.F. (383 040 Pa), EMBANKMENT BELOW THE WALL SHALL CONSIST OF "STRUCTURE BACKFILL" MATERIAL AS SET FORTH IN SECTION 300-3.5 OF THE STANDARD SPECIFICATIONS. THE LIMITS OF RELATIVE COMPACTION (95%) SHALL BE AS SET FORTH IN SECTION 300-3.5OF THE STANDARD SPECIFICATIONS.

2. WALLS IN ORIGINAL GROUND: ALLOWABLE SOIL PRESSURE AT TOE OF WALL SHALL BE DETERMINED BY FOUNDATION SITE INVESTIGATION. WALLS THAT ARE TO RETAIN CUT SLOPES SHALL BE DESIGNED FOR LATERAL AND TOE PRESSURES DETERMINED FROM SITE INVESTIGATION DATA. OVERALL STABILITY OF SLOPE WITH WALL IN PLACE MUST BE ANALYZED. IF ORIGINAL GROUND SLOPES AWAY FROM TOE OF WALL, REDUCTION IN ALLOWABLE BEARING CAPACITY DUE TO SLOPE MUST BE CONSIDERED. WALLS SHALL NOT BE FOUNDED IN ORIGINAL GROUND HAVING AN ALLOWABLE BEARING CAPACITY OF LESS THAN 1.5 TONS/S.F. (143 640 Pa). CONSIDERATION SHOULD BE GIVEN TO REMOVAL AND REPLACEMENT OF UNSUITABLE MATERIAL WITH "STRUCTURE BACKFILL" MATERIAL. RELATIVE COMPACTION SHALL BE 95%.

3. DRAINAGE:
   A. INTERNAL: SECTION 300-3.5 OF THE STANDARD SPECIFICATIONS.
   B. EXTERNAL: WHERE THE COMBINED HEIGHT OF WALL AND OVERFILL (MEASURED ALONG FACE OF WALL AND VERTICALLY FROM THE TOE OF FILL TO TOP OF FILL) EXCEEDS 25' (7.62 m). A SYSTEM TO DRAIN WATER AWAY FROM THE BACK FACE OF WALL SHALL BE PROVIDED. THE TYPE AND EXTENT OF THIS SYSTEM WILL DEPEND ON THE TYPE OF BACKFILL MATERIAL EXPECTED TO BE USED, THE COMBINED HEIGHT OF WALL AND BACKFILL, AND THE LOCATION OF THE WATER TABLE IN THE AREA.

4. SLOPING SURCHARGE LIMITATIONS: THE MAXIMUM HEIGHT OF FILL BEHIND ANY WALL, OR FAMILY OF WALLS, SHALL NOT EXCEED 115' (35.02 m) (MEASURED VERTICALLY FROM THE TOE OF THE BOTTOM WALL TO THE TOP OF FILL BEHIND THE UPPERMOST WALL). FOR A FAMILY OF WALLS THE SLOPE OF A LINE DRAWN FROM THE TOP OF THE FRONT FACE OF BOTTOM WALL TO THE TOP OF THE FRONT FACE OF ANY INTERMEDIATE OR TOP WALL, IN NO CASE EXCEED 1:1.5 (1.5:1).

5. MATERIAL SPECIFICATIONS:
   STEEL SHEETS:
   AASHTO M218
   45,000 ULTIMATE
   33,000 YIELD
   20% ELONGATION
   BOLTS: ASTM A307, GRADE A.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

STEEL CRIB WALL

STANDARD PLAN 620-2

SHEET 4 OF 7

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STEEL CRIB WALL

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 620-2

SHEET 5 OF 7

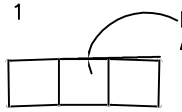
CURVATURE CHART – 1 TO 6 BATTER

THIS DATA, OMITTING HEIGHT RESTRICTIONS, CAN BE USED FOR VERTICAL WALLS

DESIGN	Type "A" BASE WIDTH 5.5' (1.7 m)	Type "B" BASE WIDTH 7.7' (2.4 m)	Type "C" BASE WIDTH 9.9' (3.0 m)	Type "D" BASE WIDTH 12.1' (3.7 m)	Type "E" BASE WIDTH 14.3' (4.4 m)	Type "F" BASE WIDTH 16.5' (5.0 m)	HEIGHT
METHOD 1 ANGLE	0° to 0°26'	0° to 0°20'	0° to 0°14'	0° to 0°12'	0° to 0°10'	0° to 0°8'	
METHOD 2 ANGLE	4°59' to 5°25'	3°34' to 3°54'	2°47' to 3°01'	2°16' to 2°28'	1°55' to 2°05'	1°18' to 1°26'	
HIEGHT IN FEET (m)	36' (11.0) 32' (9.8) 28' (8.5) 24' (7.3) 20' (6,1) 16' (4.9) 12' (3.6) 8' (2.4) 4' (1.2)						36' (11.0 m) 32' (9.8 m) 28' (8.5 m) 24' (7.3 m) 20' (20.1 m) 16' (4.9 m) 12' (3.7 m) 8' (2.4 m) 4' (1.2 m)
METHOD 3 or 4	METHOD 2	METHOD 2	METHOD 2	METHOD 2	METHOD 2	METHOD 2	
METHOD 1	METHOD 2 3 4 6 9 12 CELLS/EA SHORT PANEL*	METHOD 2 3 4 6 9 12 CELLS/EA SHORT PANEL*	METHOD 3 6 9 12 CELLS/EA SHORT PANEL*	METHOD 5 8 12 CELLS/EA SHORT PANEL*	METHOD 3 4 6 8 12 CELLS/EA SHORT PANEL*	METHOD 3 4 6 8 12 CELLS/EA SHORT PANEL*	
RADIUS x 100' (30.5 m)	2 4 6 8 10 14 18	4 6 8 10 14 20 26	6 8 12 26 20	7 10 12 16 20 25 30	8 10 14 20 30 40 50	8 16 24 32 40 48 56	
DEGREE OF CURVE	25 20 15 10 5 3	15 10 5 2	10 5 2	8 2 1	5 1		

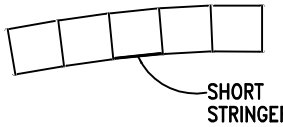
EXAMPLE– To build a Type "D" wall 20.00' (6.1 m) high on a 1400' (425 m) radius curve, use Method 2 with one set of short stringers in each group of five panel sections.

METHOD 1



USE NORMAL PLAY IN BOLT HOLES OF STANDARD PARTS. MAXIMUM DEFLECTION SHOWN AT TOP OF TABLE CAN BE OBTAINED AT EACH COLUMN IN VERTICAL OR BATTERED WALLS. CHART SHOWS SMALLEST RADIUS WHICH CAN BE USED FOR EACH DESIGN OF WALL

METHOD 2



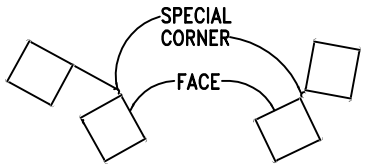
USE SHORT PANEL SECTIONS 9'–6" (2.9 m) FACE OR REAR) IN ADDITION TO PLAY IN BOLT HOLES CURVATURE CHART INDICATES NUMBER # OF BINS IN EACH GROUP, INCLUDING A MODIFIED BIN, NECESSARY TO BUILD A CURVED WALL AT A REQUIRED HEIGHT AND RADIUS.

METHOD 3



USE STRINGERS FIELD CUR (WITH S[illegible] AND DRILLED TO FIT WALL DIMENSIONS AS IT IS ASSEMBLED. ANY RADIUS CAN BE FITTED ON ANY HEIGHT OF WALL, BATTERED OR VERTICAL, GENERALLY STANDARD PANELS ARE USED BETWEEN FIELD CUT PANELS. WITH VERY SHORT RADII THE SPACING OF THE TRANSVERSE SECTIONS CAN BE SHORTENED SO THAT TWO SPACES CAN BE CUT FROM EACH STRINGER. THIS METHOD IS APPLICABLE TO LARGE SINGLE DEFLECTIONS.

METHOD 4



USE SPECIAL SHOP FABRICATED CORNER CONNECTION PIECES. BATTER, HEIGHT, ANGLE, TURN, AND BASE WIDTH DETERMINE THE DIRECTION OF DIMENSION LIMITATIONS APPLICABLE ON THIS METHOD. MANUFACTURER SHOULD BE CONTACTED BEFORE DETAILING DESIGN FOR A SPECIFIC TURN. REAR STRINGERS ARE OMITTED AND IT MAY BE NECESSARY TO INCREASE THE BASE WIDTH OF ADJACENT BINS TO PROVIDE NEEDED STABILITY. THIS METHOD IS AN ALTERNATIVE FOR METHOD 3.

RIGHT ANGLE TURNS IN VERTICAL WALLS CAN BE MADE BY STARTING A NEW WALL AT THE REAR OF THE FIRST WALL AND USING THE END TRANSVERSE SECTION FOR A FACE PANEL.

RIGHT ANGLE TURNS IN BATTERED WALLS CAN BE MADE BY ERECTING ONE COMPLETE BIN VERTICALLY IN THE CORNER.

NOTE – USE GRAPHS SHOWN ON STEEL CRIB WALL SHEET NO. 3 TO DETERMINE BASE WIDTH TO HEIGHT RATIO FOR THE VARIOUS SURCHARGES ON BOTH VERTICAL AND BATTER WALLS.

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NOTE: THIS TABLE APPLIES ONLY TO STANDARD PANEL SECTIONS AND INCLUDES UNITS FOR BOTH FRONT AND REAR OF A 10 ELEMENT OF WALL.

UNITS REQUIRED PER TRANSVERSE SECTION

UNITS REQUIRED PER PANEL SECTION

WALL HEIGHT	BEARING PLATE	FRONT COLUMN HEIGHT IN FEET (METERS)				REAR COLUMN HEIGHT IN FEET (METERS)				TOTAL COLUMN LENGTH IN FEET (METERS)	COLUMN SPLICE	COLUMN CAP	SPACERS THICKNESS & LENGTH					BOTTOM SPACERS THICKNESS & LENGTH					STRINGERS				ST'R	WALL HEIGHT
		1ST LIFT	2ND LIFT	3RD LIFT	TOTAL HEIGHT	1ST LIFT	2ND LIFT	3RD LIFT	TOTAL HEIGHT				0.064" 1.6 mm	0.079" 2.0 mm	0.109" 2.8 mm	16.2' 4.94 m	14.0' 4.27 m	0.064" 1.6 mm	0.079" 2.0 mm	0.109" 2.8 mm	16.2' 4.94 m	14.0' 4.27 m	0.064" 1.6 mm	0.079" 2.0 mm	0.109" 2.8 mm	0.138" 3.5 mm	ST'F	
FEET (m)	16"x22" (406 x 559 mm)												5.2' 1.58 m	7.4' 2.25 m	9.6' 2.93 m			5.2' 1.58 m	7.4' 2.25 m	9.6' 2.93 m	11.8' 3.60 m	14.0' 4.27 m	9.5' 2.89 m	9.5' 2.89 m	9.5' 2.89 m	9.5' 2.89 m	9.5' 2.89 m	FEET (METERS)
4.00 (1.22)	2	4.00 (1.22)			4.00 (1.22)	1.33 (0.41)			1.33 (0.41)	5.33 (1.63)		1						1					4				1	4.00 (1.22)
5.33 (1.62)	2	5.33 (1.62)			5.33 (1.62)	2.67 (0.81)			2.67 (0.81)	8.00 (2.43)		1	1					1					6				1	5.33 (1.62)
6.67 (2.03)	2	6.67 (2.03)			6.67 (2.03)	4.00 (1.22)			4.00 (1.22)	10.67 (3.25)		1	2					1					8				1	6.67 (2.03)
8.00 (2.44)	2	8.00 (2.44)			8.00 (2.44)	5.33 (1.62)			5.33 (1.62)	13.33 (4.06)		1	3					1					10				1	8.00 (2.44)
9.33 (2.84)	2	9.33 (2.84)			9.33 (2.84)	6.67 (2.03)			6.67 (2.03)	16.00 (4.87)		1	4					1					12				1	9.33 (2.84)
10.67 (3.25)	2	10.67 (3.25)			10.67 (3.25)	8.00 (2.44)			8.00 (2.44)	18.67 (5.69)		1	5					1	1				14				1	10.67 (3.25)
12.00 (3.66)	2	12.00 (3.66)			12.00 (3.66)	9.33 (2.84)			9.33 (2.84)	21.33 (6.50)		1	6						1					14	2			1	12.00 (3.66)
13.33 (4.06)	2	8.00 (2.44)	5.33 (1.62)		13.33 (4.06)	10.67 (3.25)			10.67 (3.25)	24.00 (7.31)		1	7						1					14	4			1	13.33 (4.06)
14.67 (4.47)	2	8.00 (2.44)	6.67 (2.03)		14.67 (4.47)	12.00 (3.66)			12.00 (3.66)	26.67 (8.13)		1	8						1	1				14	6			1	14.67 (4.47)
16.00 (4.88)	2	8.00 (2.44)	8.00 (2.44)		16.00 (4.88)	8.00 (2.44)	5.33 (1.62)		13.33 (4.06)	29.33 (8.94)	2	1	9						1	1				14	8			1	16.00 (4.88)
17.33 (5.28)	2	12.00 (3.66)	5.33 (1.62)		17.33 (5.28)	8.00 (2.44)	6.67 (2.03)		14.67 (4.47)	32.00 (9.75)	2	1	10						1	1				14	8	2		1	17.33 (5.28)
18.67 (5.69)	2	12.00 (3.66)	6.67 (2.03)		18.67 (5.69)	8.00 (2.44)	8.00 (2.44)		16.00 (4.88)	34.67 (10.57)	2	1	11						1	1				14	8	4		1	18.67 (5.69)
20.00 (6.10)	2	12.00 (3.66)	8.00 (2.44)		20.00 (6.10)	12.00 (3.66)	5.33 (1.62)		17.33 (5.28)	37.33 (11.38)	2	1	12						1	1				14	8	6		1	20.00 (6.10)
21.33 (6.50)	2	12.00 (3.66)	9.33 (2.84)		21.33 (6.50)	12.00 (3.66)	6.67 (2.03)		18.67 (5.69)	40.00 (12.19)	2	1	13						1	1				14	8	8		1	21.33 (6.50)
22.67 (6.91)	2	12.00 (3.66)	10.67 (3.25)		22.67 (6.91)	12.00 (3.66)	8.00 (2.44)		20.67 (6.30)	42.67 (13.01)	2	1	14	14					1	1				14	8	10		1	22.67 (6.91)
24.00 (7.32)	2	12.00 (3.66)	12.00 (3.66)		24.00 (7.32)	12.00 (3.66)	9.33 (2.84)		21.33 (6.50)	45.33 (13.82)	2	1	15	15					1	1				14	8	12		1	24.00 (7.32)
25.33 (7.72)	2	12.00 (3.66)	8.00 (2.44)	5.33 (1.62)	25.33 (7.72)	12.00 (3.66)	10.67 (3.25)		22.67 (6.91)	48.00 (14.63)	3	1	16	16					1	1				14	8	14		1	25.33 (7.72)
26.67 (8.13)	2	12.00 (3.66)	8.00 (2.44)	6.67 (2.03)	26.67 (8.13)	12.00 (3.66)	12.00 (3.66)		24.00 (7.32)	50.67 (15.44)	3	1	17	17					1	1				14	8	14	2	1	26.67 (8.13)
28.00 (8.53)	2	12.00 (3.66)	8.00 (2.44)	8.00 (2.44)	28.00 (8.53)	12.00 (3.66)	8.00 (2.44)	5.33 (1.62)	25.33 (7.72)	53.33 (16.26)	4	1	18	18					1	1				14	8	14	4	1	28.00 (8.53)
29.33 (8.94)	2	12.00 (3.66)	12.00 (3.66)	5.33 (1.62)	29.33 (8.94)	12.00 (3.66)	8.00 (2.44)	6.67 (2.03)	26.67 (8.13)	56.00 (17.07)	4	1	19	19					1	1				14	8	14	6	1	29.33 (8.94)
30.67 (9.35)	2	12.00 (3.66)	12.00 (3.66)	6.67 (2.03)	30.67 (9.35)	12.00 (3.66)	8.00 (2.44)	8.00 (2.44)	28.00 (8.53)	58.67 (17.88)	4	1	20	20					1	1				14	8	14	8	1	30.67 (9.35)
32.00 (9.75)	2	12.00 (3.66)	12.00 (3.66)	8.00 (2.44)	32.00 (9.75)	12.00 (3.66)	12.00 (3.66)	5.33 (1.62)	29.33 (8.94)	61.34 (18.70)	4	1	21	21						1				14	8	14	10	1	32.00 (9.75)
33.33 (10.16)	2	12.00 (3.66)	12.00 (3.66)	9.33 (2.84)	33.33 (10.16)	12.00 (3.66)	12.00 (3.66)	6.67 (2.03)	30.67 (9.35)	64.01 (19.51)	4	1	22	22						1				14	8	14	12	1	33.33 (10.16)
34.67 (10.57)	2	12.00 (3.66)	12.00 (3.66)	10.67 (3.25)	34.67 (10.57)	12.00 (3.66)	12.00 (3.66)	8.00 (2.44)	32.00 (9.75)	66.68 (20.32)	4	1	23	23						1				14	8	14	14	1	34.67 (10.57)
36.00 (10.97)	2	12.00 (3.66)	12.00 (3.66)	12.00 (3.66)	36.00 (10.97)	12.00 (3.66)	12.00 (3.66)	9.33 (2.84)	33.33 (10.16)	69.35 (21.14)	4	1	24	24						1				14	8	14	16	1	36.00 (10.97)

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

STEEL CRIB WALL

STANDARD PLAN
620–2
SHEET 6 OF 7

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UNITS REQUIRED PER SHORT PANEL SECTION

WALL HEIGHT	SHORT STRINGERS IN FRONT OF WALL								SHORT STD	SHORT STRINGERS IN REAR OF WALL								STD. STD
	0.064" (1.6 mm)		0.079" (2.0 mm)		0.109" (2.8 mm)		0.138" (3.5 mm)			0.064" (1.6 mm)		0.079" (2.0 mm)		0.109" (2.8 mm)		0.138" (3.5 mm)		
	STD	SHORT	STD	SHORT	STD	SHORT	STD	SHORT		STD	SHORT	STD	SHORT	STD	SHORT	STD	SHORT	
FEET (METERS)	9.5' (2.90 m)	9.0' (2.74 m)	9.5' (2.90 m)	9.0' (2.74 m)	9.5' (2.90 m)	9.0' (2.74 m)	9.5' (2.90 m)	9.0' (2.74 m)	STD'F	9.5' (2.90 m)	9.0' (2.74 m)	9.5' (2.90 m)	9.0' (2.74 m)	9.5' (2.90 m)	9.0' (2.74 m)	9.5' (2.90 m)	9.0' (2.74 m)	STD'F
4.00 (1.22)	1	3							1	3	1							1
5.33 (1.62)	2	4							1	4	2							1
6.67 (2.03)	3	5							1	5	3							1
8.00 (2.44)	4	6							1	6	4							1
9.33 (2.84)	5	7							1	7	5							1
10.67 (3.25)	6	8							1	8	6							1
12.00 (3.66)	6	8							1	8	6							1
13.33 (4.06)	6	8	2	2					1	8	6	2	2					1
14.67 (4.47)	6	8	3	3					1	8	6	3	3					1
16.00 (4.88)	6	8	4	4					1	8	6	4	4					1
17.33 (5.28)	6	8	4	4	1	1			1	8	6	4	4	1	1			1
18.67 (5.69)	6	8	4	4	2	2			1	8	6	4	4	2	2			1
20.00 (6.10)	6	8	4	4	3	3			1	8	6	4	4	3	3			1
21.33 (6.50)	6	8	4	4	4	4			1	8	6	4	4	4	4			1
22.67 (6.91)	6	8	4	4	5	5			1	8	6	4	4	5	5			1
24.00 (7.32)	6	8	4	4	6	6			1	8	6	4	4	6	6			1
25.33 (7.72)	6	8	4	4	7	7			1	8	6	4	4	7	7			1
26.67 (8.13)	6	8	4	4	7	7	1	1	1	8	6	4	4	7	7	1	1	1
28.00 (8.53)	6	8	4	4	7	7	2	2	1	8	6	4	4	7	7	2	2	1
29.33 (8.94)	6	8	4	4	7	7	3	3	1	8	6	4	4	7	7	3	3	1
30.67 (9.35)	6	8	4	4	7	7	4	4	1	8	6	4	4	7	7	4	4	1
32.00 (9.75)	6	8	4	4	7	7	5	5	1	8	6	4	4	7	7	5	5	1
33.33 (10.16)	6	8	4	4	7	7	6	6	1	8	6	4	4	7	7	6	6	1
34.67 (10.57)	6	8	4	4	7	7	7	7	1	8	6	4	4	7	7	7	7	1
36.00 (10.97)	6	8	4	4	7	7	8	8	1	8	6	4	4	7	7	8	8	1

NOTE: THIS TABLE APPLIES ONLY TO SHORT PANEL SECTIONS FOR CURVED WALLS AND INCLUDES UNITS FOR BOTH FRONT AND REAR OF A 9.5 ELEMENT OF WALL.

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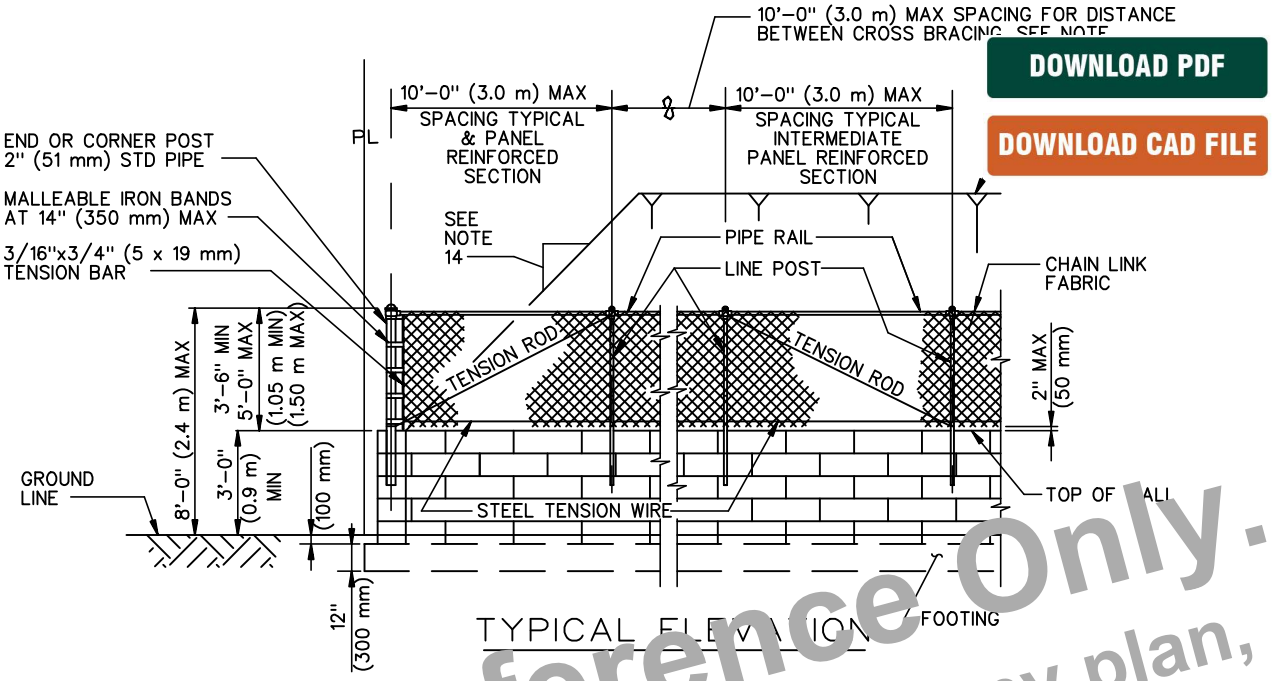
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

STEEL CRIB WALL

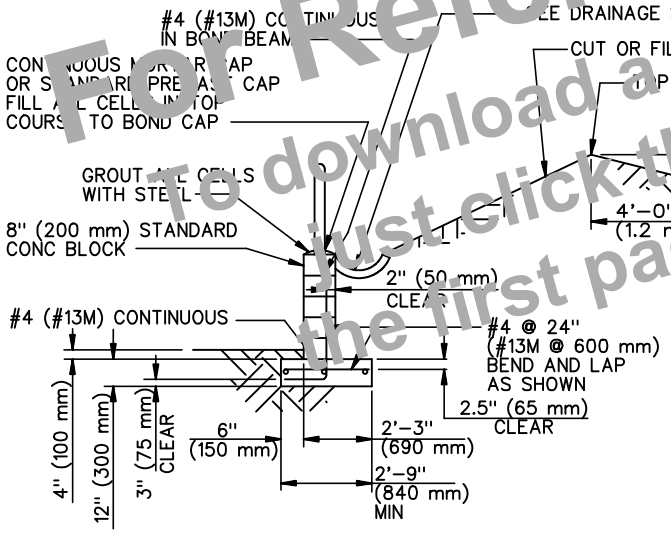
STANDARD PLAN
620–2
SHEET 7 OF 7

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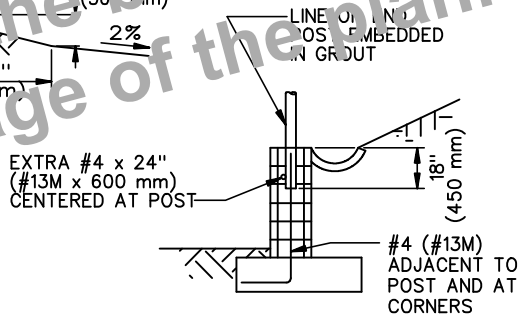
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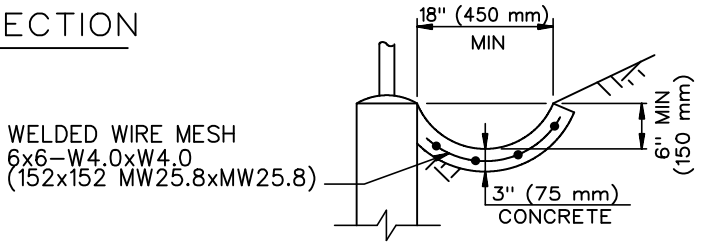
TYPICAL ELEVATION



TYPICAL WALL SECTION



WALL SECTION AT POST



DRAINAGE SWALE DETAIL

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1993 REV. 1996, 2009, 2021

REINFORCED CONCRETE BLOCK WALL AND CHAIN LINK FENCE COMBINATION

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 621–3

SHEET 1 OF 2

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NOTES:

1. THE BLOCK WALL SHALL BE CONSTRUCTED IN ACCORDANCE WITH SSPWC 303–4.1.
2. USE STANDARD 8" (200 mm) WIDE NORMAL WEIGHT CONCRETE BLOCK PER SSPWC 202–2.
3. USE CONCRETE BOND BEAM BLOCK WHERE HORIZONTAL STEEL IS CALLED FOR.
4. MORTAR, GROUT AND WATER SHALL CONFORM TO SSPWC 202–2.
5. REINFORCING STEEL SHALL BE GRADE 40 (GRADE 300) PER SSPWC 201–2.
6. ALL BLOCKS SHALL BE LAID UP IN MORTAR HEAD AND BED JOINTS FOR FULL THICKNESS OF FACE SHELLS. WEBS OF EACH COURSE SHALL CENTER ON WEBS OF COURSES BELOW. OMIT HEAD JOINT IN GRADE COURSE.
7. PLACE A MINIMUM 4" (100 mm) LAYER OF NO. 4 CONCRETE AGGREGATE BETWEEN THE SOIL BACKFILL AND THE OPEN HEAD JOINT.
8. ALL CELLS IN WHICH STEEL IS PLACED SHALL BE FILLED WITH GROUT.
9. CONCRETE SHALL BE 520–A–2500 (310–A–17) PER SSPWC 201-1.1.2.
10. POUR FOOTING AGAINST UNDISTURBED NATURAL SOIL OR SOIL THAT HAS BEEN COMPACTED TO 90% OPTIMUM DENSITY PER ASTM D1557-78.
11. CHAIN LINK FENCING SHALL BE CONSTRUCTED IN ACCORDANCE WITH SSPWC 304–3.
12. PROVIDE OPEN HEAD JOINTS AT INTERVALS NO GREATER THAN 48" (1.2 m). WHERE WALL IS LOCATED ADJACENT TO A SIDEWALK, PROVIDE 2" ø (50 mm ø) WEEP HOLES UNDER SIDEWALK.
13. WELDED WIRE MESH SHALL CONFORM TO SSPWC 201-2.2.3.

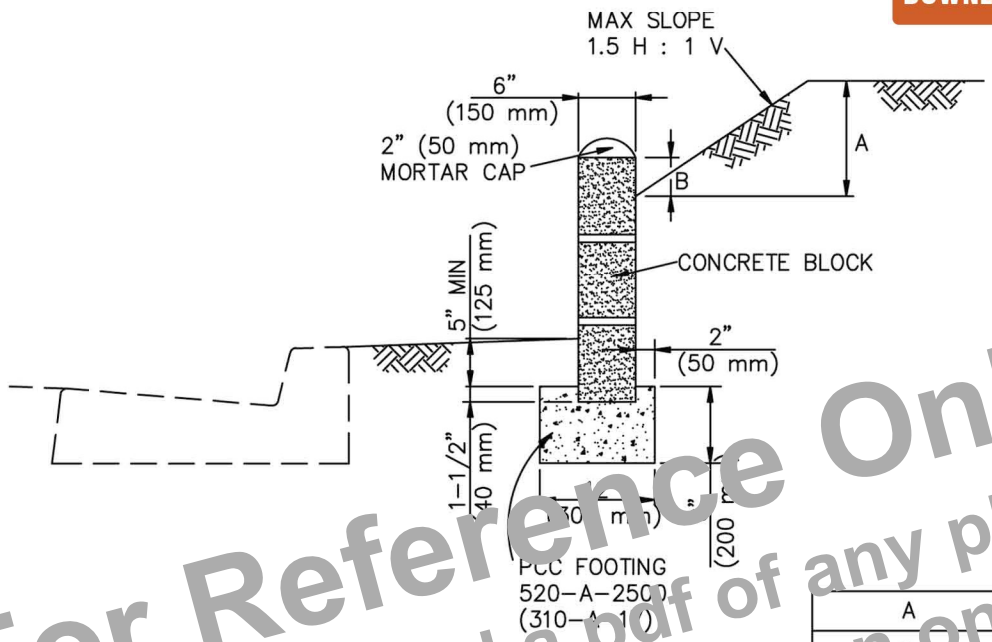
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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE BLOCK WALL AND CHAIN LINK FENCE COMBINATION	**621–3**
	SHEET 2 OF 2

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A	B
6" TO 6" (150 TO 150 mm)	2" (50 mm)
6" TO 16" (150 TO 400 mm)	4" (100 mm)
17" TO 48" (410 TO 1200 mm)	6" (150 mm)

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NOTES

1. MAX HEIGHT OF WALL IS 3 COURSES OF 8" (200 mm) HIGH BLOCK.
2. NO LIVE-LOAD SURCHARGE SHALL BE ALLOWED ON RETAINED SOIL.
3. POUR FOOTING AGAINST UNDISTURBED EARTH.
4. TOP OF FOOTING MAY BE PLACED AT SAME GRADE AS STREET IF STREET GRADE IS UNIFORM AND 5% MAX.
5. PLACE CONCRETE BLOCKS IMMEDIATELY AFTER POURING THE FOOTING. FILL ALL CELLS SOLID WITH GROUT AND ROD SO THAT GROUT IS MONOLITHIC WITH FOOTING.
6. IN FIRST COURSE ABOVE FINISHED GRADE, OMIT MORTAR FROM VERTICAL JOINTS EACH 32" (800 mm) TO SERVE AS WEEP HOLES.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1993 REV. 1996, 2005, 2009, 2010

CONCRETE BLOCK SLOUGH WALL

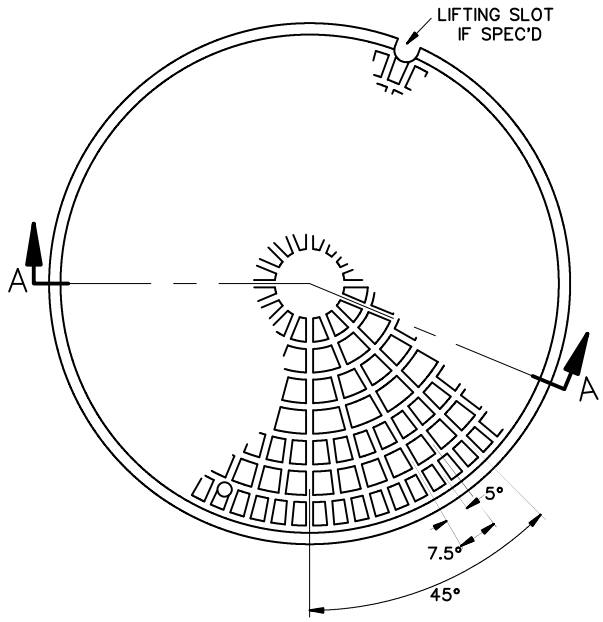
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 622-4

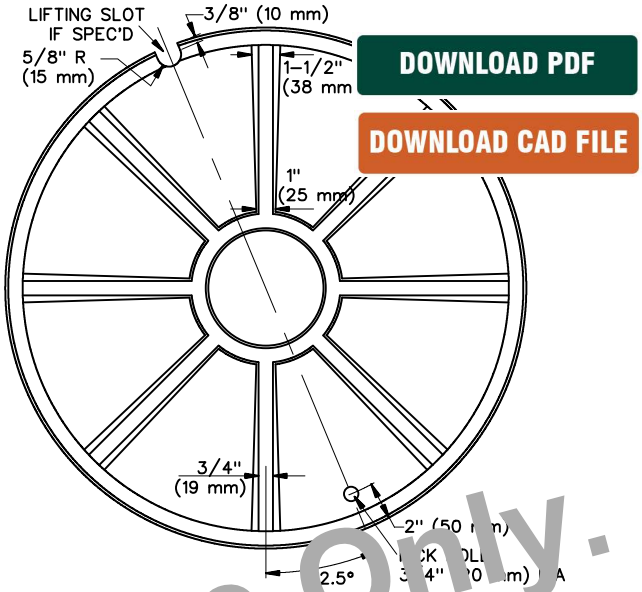
SHEET 1 OF 1

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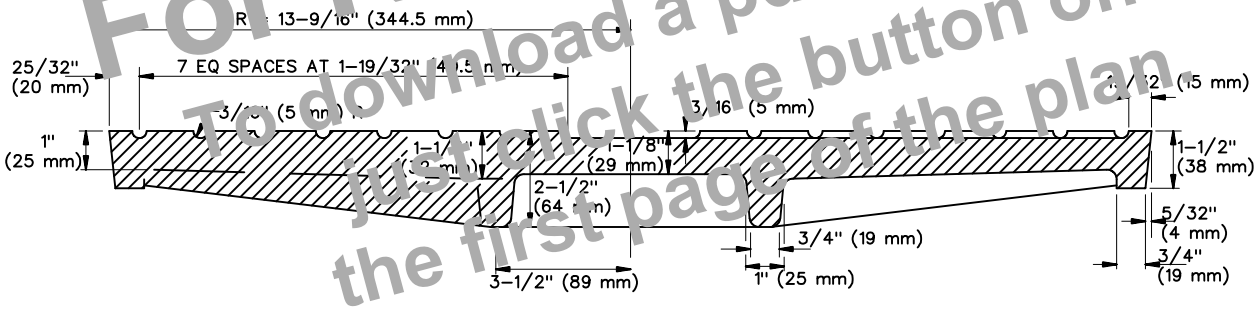


TOP OF COVER

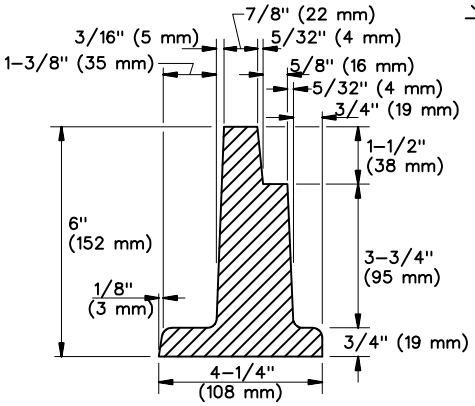


BOTTOM OF COVER

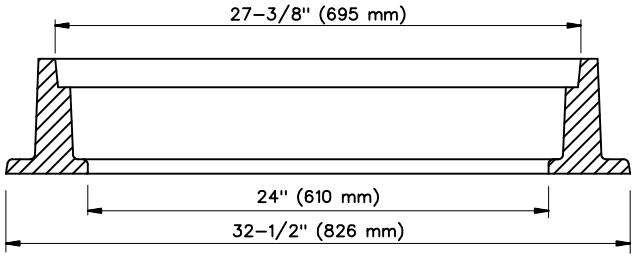
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SECTION A-A



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, 2021

24" (610 mm) MANHOLE FRAME AND COVER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
630-5
SHEET 1 OF 2

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NOTES:

1. THE CAST IRON USED SHALL CONFORM TO ASTM A48 (A48M) 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 THE AGENCY'S REQUIREMENTS. 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.

5. WEIGHT OF FRAME SHALL BE 260 LBS (118 kg). WEIGHT OF COVER SHALL BE 175 LBS (79 kg). ACTUAL WEIGHT 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.

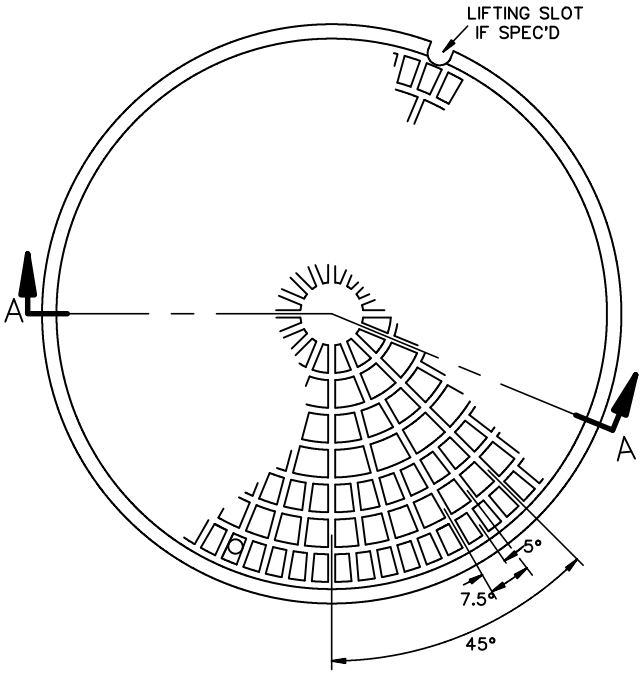
7. COVERS FOR MANHOLES LOCATED IN EASEMENTS, ALLEYS, PARKWAYS AND ALL PLACES OTHER THAN PAVED STREETS SHALL BE PROVIDED WITH SOCKET SET SCREW LOCKING DEVICES. DRILL AND TAP TWO HOLES TO A DEPTH OF 1" (25 mm) AT 90 DEGREES TO PICK HOLE AND INSTALL 3/4" x 3/4" (20 x 20 mm) STAINLESS STEEL SOCKET–SET SCREWS WITH 3/8" (10 mm) RECESSED HEX HEAD. ALL THREADS SHALL BE UNIFIED COARSE (UNC).

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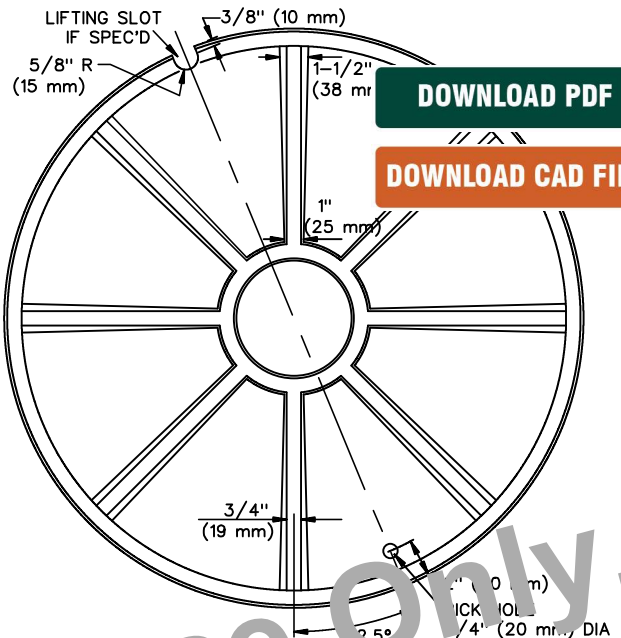
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
24" (610 mm) MANHOLE FRAME AND COVER	**630–5**
	SHEET 2 OF 2

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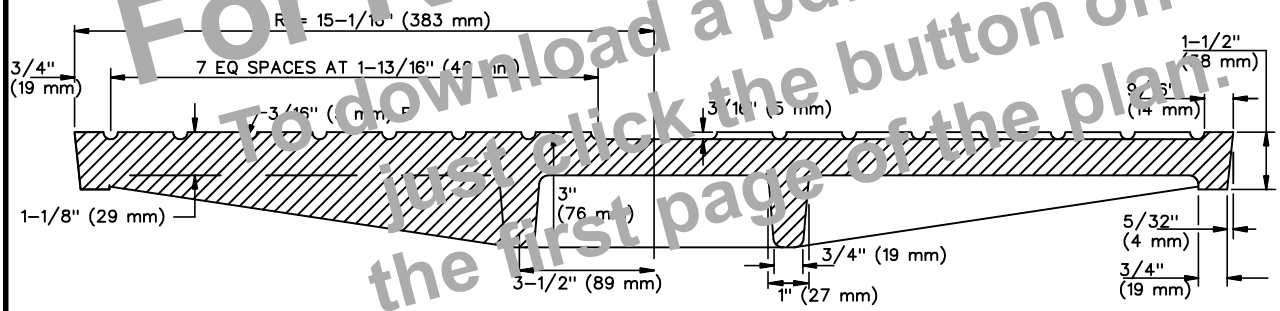


TOP OF COVER

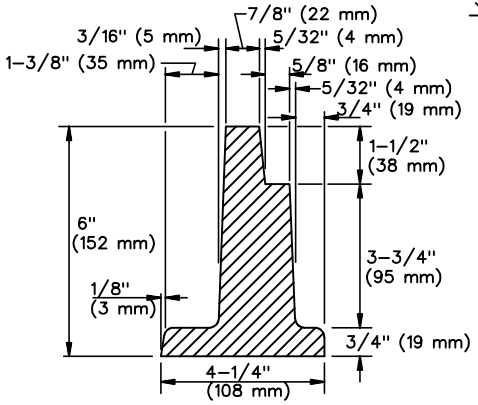


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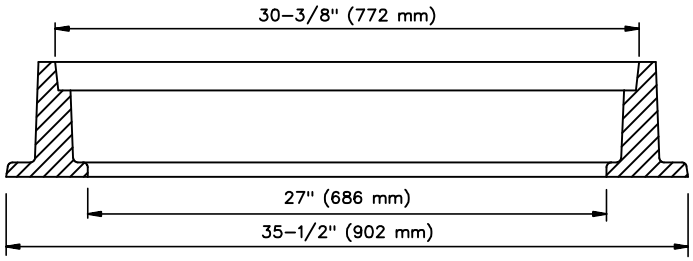
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SECTION A–A



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, 2021

27" (686 mm) MANHOLE FRAME AND COVER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
631–5
SHEET 1 OF 2

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NOTES:

1. THE CAST IRON USED SHALL CONFORM TO ASTM A48 (A48M) 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 THE AGENCY'S REQUIREMENTS. 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.

5. WEIGHT OF FRAME SHALL BE 280 LBS (127 kg). WEIGHT OF COVER SHALL BE 230 LBS (104 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.

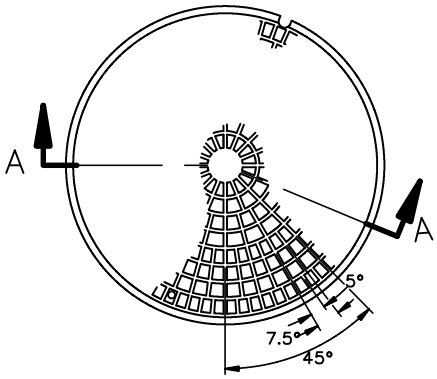
7. COVERS FOR MANHOLES LOCATED IN EASEMENTS, ALLEYS, PARKWAYS AND ALL PLACES OTHER THAN PAVED STREETS SHALL BE PROVIDED WITH SOCKET-SET SCREW LOCKING DEVICES. DRILL AND TAP TWO HOLES TO A DEPTH OF 1" (25 mm) AT 90 DEGREES TO NICK HOLE AND INSTALL 3/4" x 3/4" (20 x 20 mm) STAINLESS STEEL SOCKET-SET SCREWS WITH 3/8" (10 mm) RECESSED HEX HEAD. ALL THREADS SHALL BE UNIFIED COARSE (UNC).

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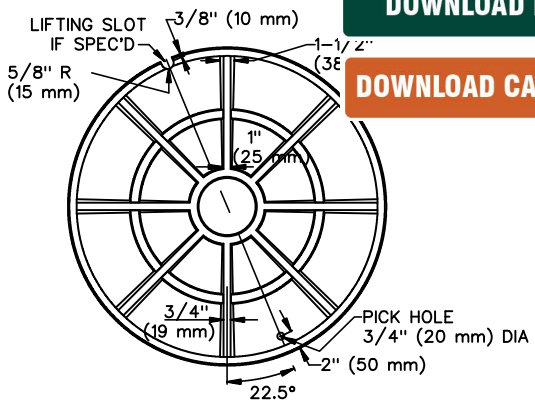
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
27" (686 mm) MANHOLE FRAME AND COVER	**631–5**
	SHEET 2 OF 2

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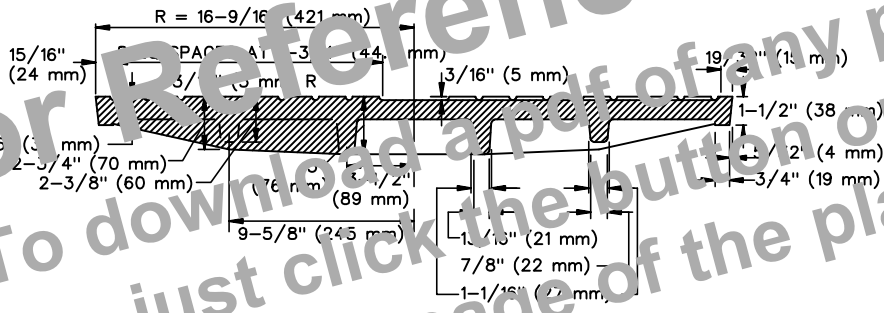


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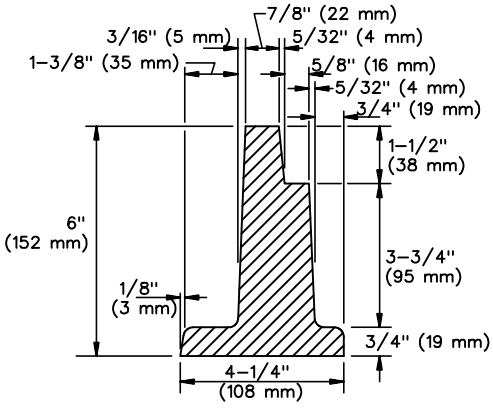


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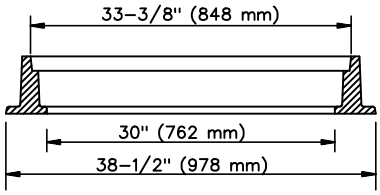
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SECTION A–A



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, 2021

30" (762 mm) MANHOLE FRAME AND COVER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
632-5
SHEET 1 OF 2

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NOTES:

1. THE CAST IRON USED SHALL CONFORM TO ASTM A48 (A48M) 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 THE AGENCY'S REQUIREMENTS. 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.

5. WEIGHT OF FRAME SHALL BE 320 LBS (145 kg). WEIGHT OF COVER SHALL BE 305 LBS (138 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.

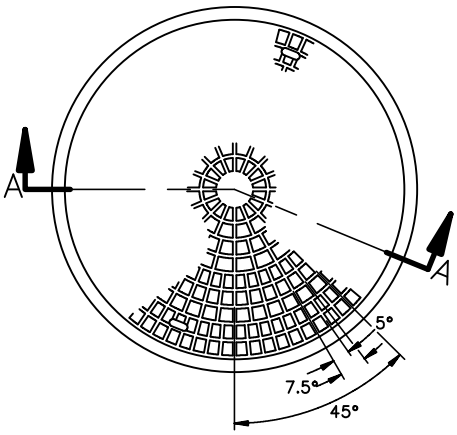
7. COVERS FOR MANHOLES LOCATED IN EASEMENTS, ALLEYS, PARKWAYS AND ALL PLACES OTHER THAN PAVED STREETS SHALL BE PROVIDED WITH SOCKET SET SCREW LOCKING DEVICES. DRILL AND TAP TWO HOLES TO A DEPTH OF 1" (25 mm) AT 90 DEGREES TO PICK HOLE AND INSTALL 3/4" x 3/4" (20 x 20 mm) STAINLESS STEEL SOCKET–SET SCREWS WITH 3/8" (10 mm) RECESSED HEX HEAD. ALL THREADS SHALL BE UNIFIED COARSE (UNC).

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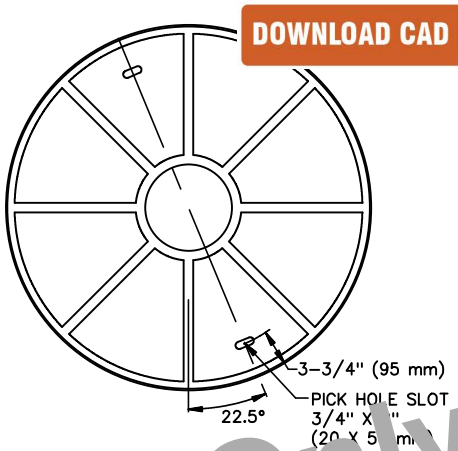
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
30" (762 mm) MANHOLE FRAME AND COVER	**632–5**
	SHEET 2 OF 2

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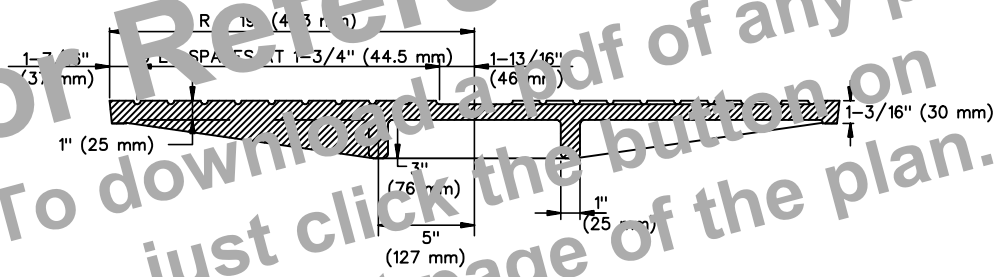


TOP OF COVER

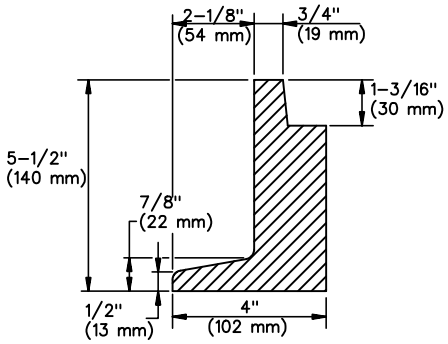


BOTTOM OF COVER

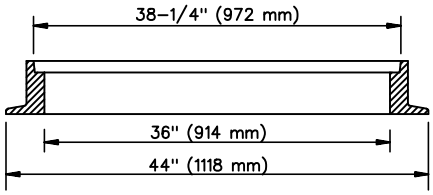
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SECTION A–A



FRAME DETAIL



SECTION THRU FRAME

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1984 REV. 1992, 1996, 2009, 2011, 2021

36" (914 mm) MANHOLE FRAME AND COVER

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 633–5

SHEET 1 OF 2

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NOTES:

1. THE CAST IRON USED SHALL CONFORM TO ASTM A48 (A48M) 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 THE AGENCY'S REQUIREMENTS. 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.

5. WEIGHT OF FRAME SHALL BE 335 LBS (152 kg). WEIGHT OF COVER SHALL BE 340 LBS (154 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.

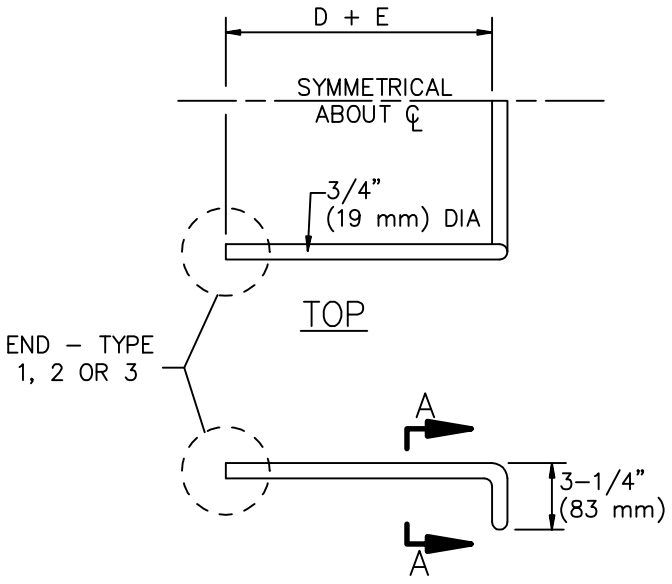
7. COVERS FOR MANHOLES LOCATED IN EASEMENTS, ALLEYS, PARKWAYS AND ALL PLACES OTHER THAN PAVED STREETS SHALL BE PROVIDED WITH SOCKET SET SCREW LOCKING DEVICES. DRILL AND TAP TWO HOLES TO A DEPTH OF 1" (25 mm) AT 90 DEGREES TO PICK HOLE AND INSTALL 3/4" x 3/4" (20 x 20 mm) STAINLESS STEEL SOCKET–SET SCREWS WITH 3/8" (10 mm) RECESSED HEX HEAD. ALL THREADS SHALL BE UNIFIED COARSE (UNC).

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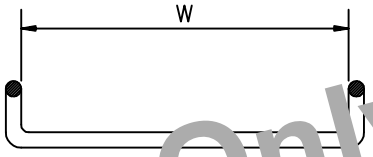
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
36" (914 mm) MANHOLE FRAME AND COVER	**633–5**
	SHEET 2 OF 2

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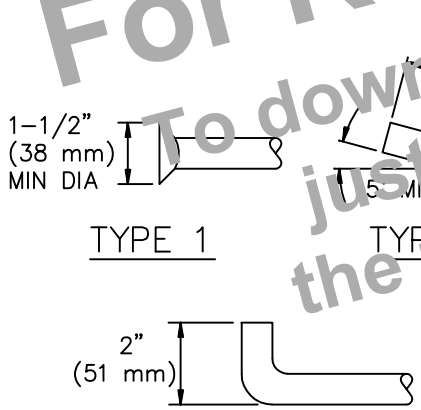


SIDE

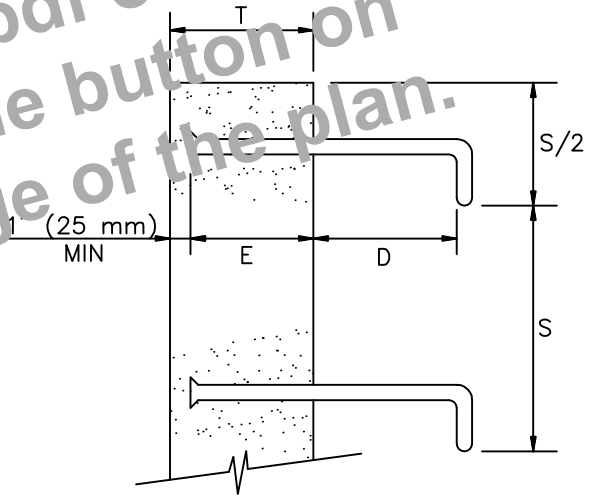


SECTION A–A

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END DETAILS–SIDE VIEW



INSTALLATION DETAIL

UNLESS OTHERWISE NOTED:

D = 7" (175 mm)
E = 6" (150 mm) OR T – 1" (25 mm), WHICHEVER IS LESS
MINIMUM E IS 3" (75 mm)
S = 12" (300 mm) MAX, EVENLY SPACED
W = 16" (400 mm) MIN

FOR MANHOLES AND UNDERGROUND VAULTS:
S = 16" (400 mm) MAX, EVENLY SPACED
W = 14" (350 mm) MIN

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

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

STEEL STEP

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN
635–3
SHEET 1 OF 2

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NOTES:

1. STEPS SHALL BE STEEL CONFORMING TO ASTM A307 AND SHALL BE GALVANIZED AFTER FABRICATION. UNLESS OTHERWISE NOTED, STEPS MAY ALSO BE POLYPROPYLENE STEPS, STEEL REINFORCED, CONFORMING TO SPPWC 636.

2. IF STAINLESS STEEL STEPS ARE REQUIRED, THE MATERIAL SHALL CONFORM TO ASTM A276, 300 SERIES.

3. STEP ENDS MAY BE TYPE 1, 2 OR 3, AS SHOWN.

4. BOTTOM STEP SHALL BE A MAXIMUM OF 2' (600 mm) ABOVE FLOOR OR SHELF.

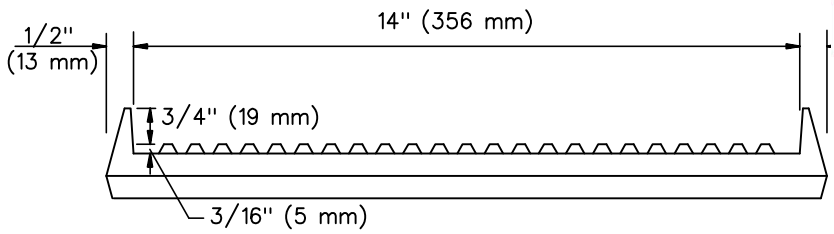
5. STEPS WITH TYPE 1 OR 2 ENDS MAY BE CAST IN PLACE, OR PLACED IN THE CENTER OF 1–1/2" (40 mm) MIN DIA DRILLED OR FORMED HOLES AND SET WITH HIGH STRENGTH NON–SHRINK GROUT, 6000 PSI (40 MPa) MIN. STEPS WITH TYPE 3 ENDS SHALL BE CAST–IN–PLACE.

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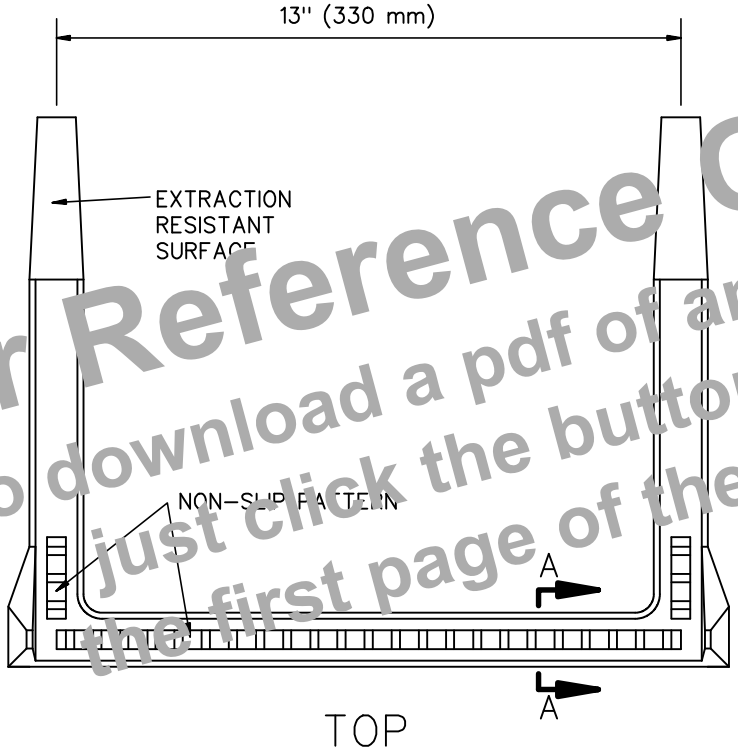
STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
STEEL STEP	**635–3**
	SHEET 2 OF 2

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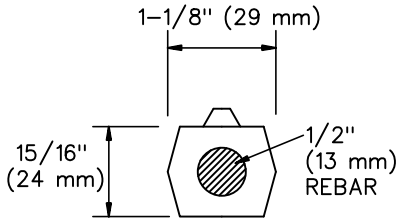
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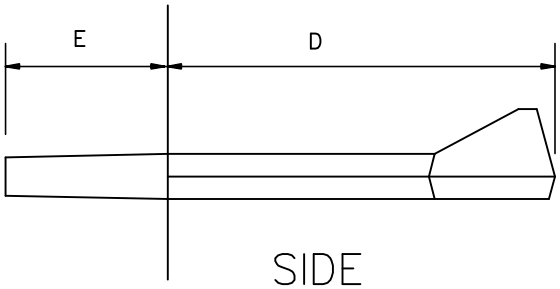
FRONT



TOP



SECTION A-A



SIDE

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1991 REV. 1996, 2009, 2021	**POLYPROPYLENE-PLASTIC STEP** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **636-3** SHEET 1 OF 2

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NOTES:

1. STEPS SHALL BE STEEL–REINFORCED COPOLYMER POLYPROPYLENE PLASTIC CONFORMING TO:

   (A) ASTM D478 AND C497, EXCEPT THAT THE MINIMUM HORIZONTAL PULLOUT LOAD SHALL BE 1,500 LBS (6.7 kN).
   (B) ASTM A615 GRADE 60 DEFORMED REINFORCING STEEL BAR.
   (C) CALIFORNIA CODE OF REGULATIONS TITLE 8, GENERAL INDUSTRY SAFETY ORDERS.

2. STEPS SHALL BE CAPABLE OF WITHSTANDING AN IMPACT LOAD OF 70 FT–LBS (95 N.m) AT 20°F (–7°C) WITHOUT CRACKING OR FRACTURING.

3. THE MINIMUM TOTAL CROSS–SECTIONAL AREA OF THE EXPOSED PORTION OF THE STEP, INCLUDING THE DEFORMED STEEL BAR AND EXCLUDING THE NON–SLIP TREAD SURFACE, SHALL BE 1.0 SQ IN (645 mm^2).

4. THE ENTIRE POLYPROPYLENE PLASTIC MATERIAL SURROUNDING THE REINFORCING STEEL BAR SHALL BE CAST MONOLITHICALLY. MINIMUM COVER SHALL BE 3/16" (5 mm).

5. A CERTIFICATE OF COMPLIANCE CONFORMING TO SSPWC 4–5 SHALL BE SUBMITTED TO THE ENGINEER CONCURRENTLY WITH A REQUEST FOR APPROVAL. MATERIAL TEST DATA SHALL BE INCLUDED.

6. E[illegible]3-3/8" (86 mm). FOR VAULTS AND MANHOLES, D = 5–1/2" (140 mm). FOR OTHER INSTALLATIONS, D = 7–1/2" (190 mm). THESE DIMENSIONS MAY BE PLUS OR MINUS 1/4" (6 mm).

7. STEPS SHALL BE EVENLY SPACED. MINIMUM VERTICAL SPACING OF STEPS SHALL BE 16" (400 mm), WITH THE BOTTOM STEP A MAXIMUM OF 2' (600 mm) ABOVE FLOOR OR SHELF.

8. IF TAPERED STEPS ARE INSTALLED INTO STRAIGHT DRILLED OR FORMED HOLES, APPROVED NON–SHRINK GROUT SHALL BE INJECTED INTO THE HOLE PRIOR TO INSTALLATION. HOLES SHALL BE STRAIGHT AND PARALLEL. EXCEPT AS OTHERWISE NOTED, STEPS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDED PROCEDURES.

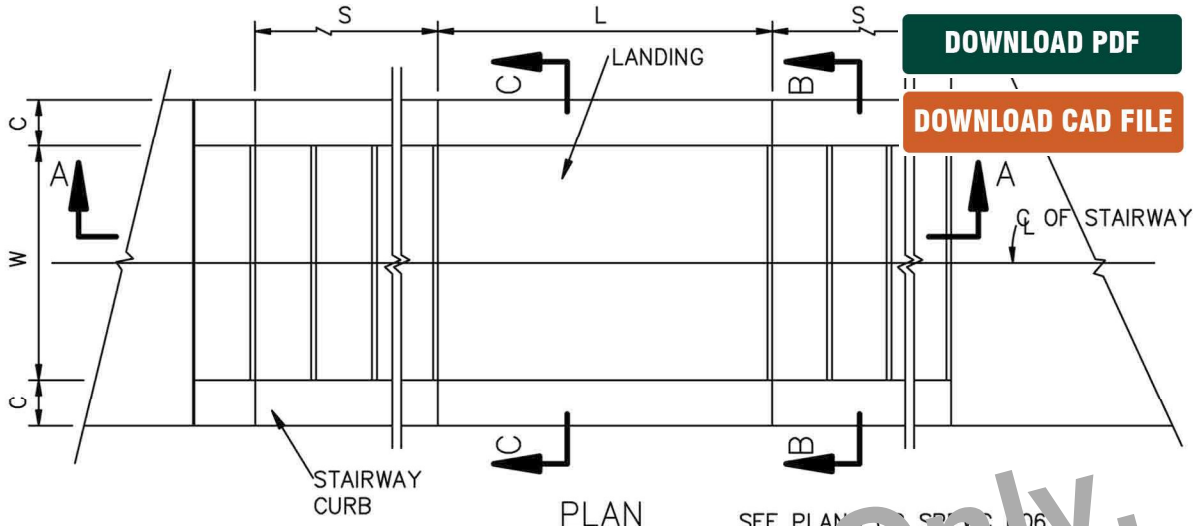
9. A DROP STEP WITH A MINIMUM DROP OF 3/4" (19 mm) MAY BE USED. THE DROP STEP SHALL MEET ALL OTHER CRITERIA OF THIS PLAN.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
POLYPROPYLENE–PLASTIC STEP	**636–3**
	SHEET 2 OF 2

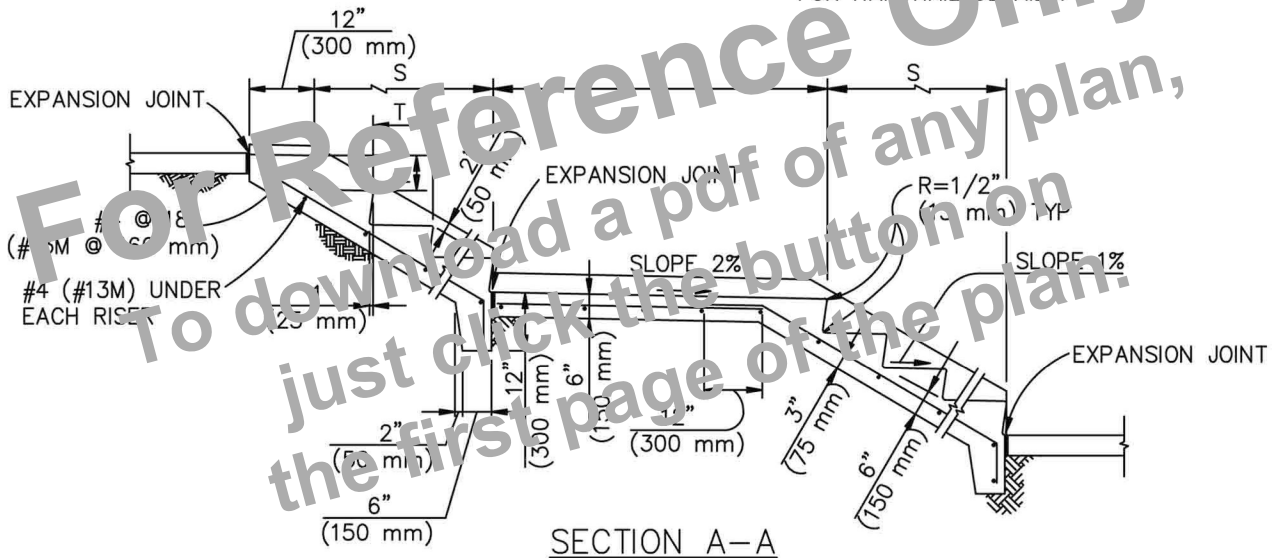
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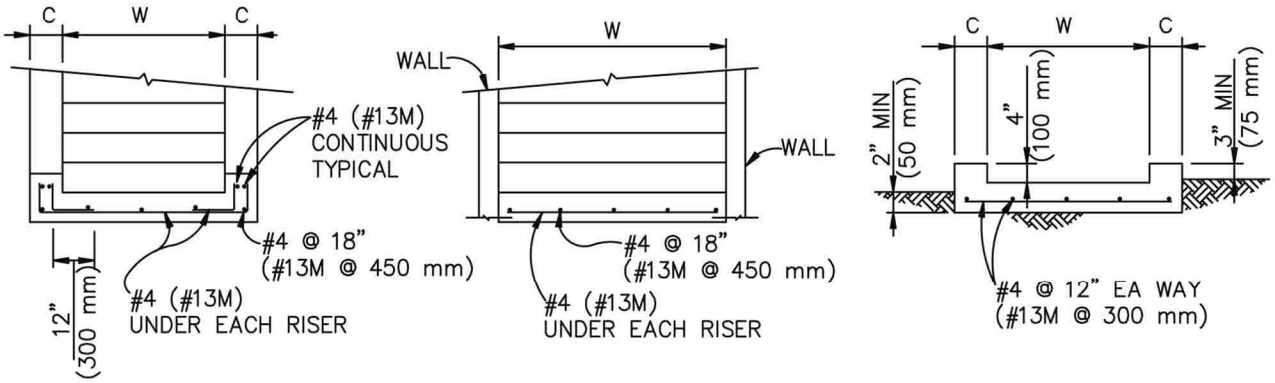
PLAN

SEE PLAN[illegible] FOR HAN[illegible]RAIL DETAILS.



SECTION A–A

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TYPE A

TYPE B

SECTION B–B

SECTION C–C

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1993 REV. 1996, 2006, 2009, 2013	**REINFORCED CONCRETE STAIRWAY**	STANDARD PLAN **640–4**
	USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	SHEET 1 OF 2

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NOTES:

1. SEE THE PLANS FOR THE FOLLOWING INFORMATION:
   TYPE OF STAIRWAY AND LOCATION
   W = WIDTH OF STAIRWAY
   L = LENGTH OF LANDINGS
   T = LENGTH OF TREAD, 11" (280 mm) MIN
   R = HEIGHT OF RISER, 4" TO 7" (100 TO 180 mm)
   C = WIDTH OF CURB
   S = LENGTH OF STAIRWAY FLIGHT

2. CONCRETE FINISH FOR EXPOSED SURFACES SHALL BE CLASS I, EXCEPT THAT TREADS AND LANDINGS SHALL BE TROWELLED SMOOTH AND GIVEN A FINE BROOM FINISH IN A DIRECTION PERPENDICULAR TO THE CENTERLINE OF THE STAIRWAY. THE BROOM FINISH SHALL BE BROUGHT TO THE NOSE OF THE TREADS AND LANDINGS.

3. ONE HANDRAIL ON EACH SIDE IS REQUIRED FOR STAIRWAYS 4' (1.22 m) WIDE OR LESS. TWO REQUIRED HANDRAILS ARE REQUIRED FOR WIDER STAIRWAYS.

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STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
REINFORCED CONCRETE STAIRWAY	**640–4**
	SHEET 2 OF 2

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