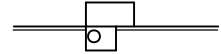


**NOTES**

1. SEE D-11A, D-11B, & D-12 FOR ADDITIONAL NOTES AND DETAILS.
2. TYPES ARE DESIGNED ON PLANS AS FOLLOWS: A (NO WING), A-1 (ONE WING), OR A-2 (TWO WINGS).
3. EXPOSED EDGES OF CONCRETE SHALL BE ROUNDED WITH A RADIUS OF 1/2".
4. STEPS SHALL BE INSTALLED WHEN V EXCEEDS 4'. SEE D-11A FOR DETAILS.
5. CONCRETE GUTTER TO MATCH ADJACENT GUTTERS.
6. AN EXPANSION JOINT SHALL BE PLACED AT THE ENDS OF THE INLET WHERE THE CURB IS TO ADJOIN.
7. PROVIDE 1/4" TOOLED GROOVE IN TOP SLAB IN LINE WITH BACK OF ADJACENT CURB.
8. SURFACE OF TOP SLAB TO MATCH SIDEWALK FINISH AND SLOPE.
9. MAINTAIN 1-1/2" CLEAR SPACING BETWEEN REINFORCING AND CONCRETE SURFACE UNLESS OTHERWISE NOTED.
10. IF REQUIRED BY LOCAL AGENCY, EXTEND TOP SLAB STEEL REINFORCEMENT 12" INTO ADJACENT SIDEWALK.
11. ELEVATIONS SHALL BE SHOWN ON PLANS WHERE INDICATED BY "O" SYMBOL.

**LEGEND ON PLANS**



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

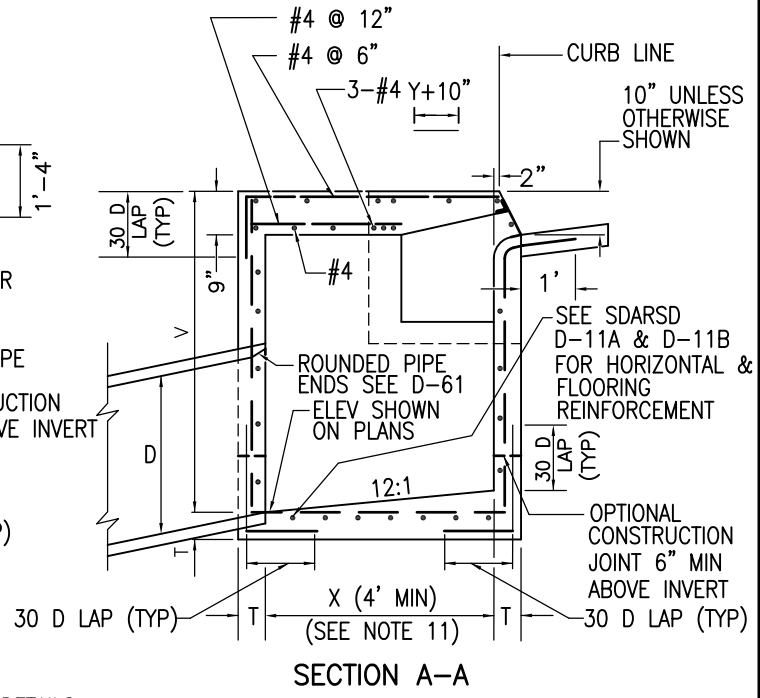
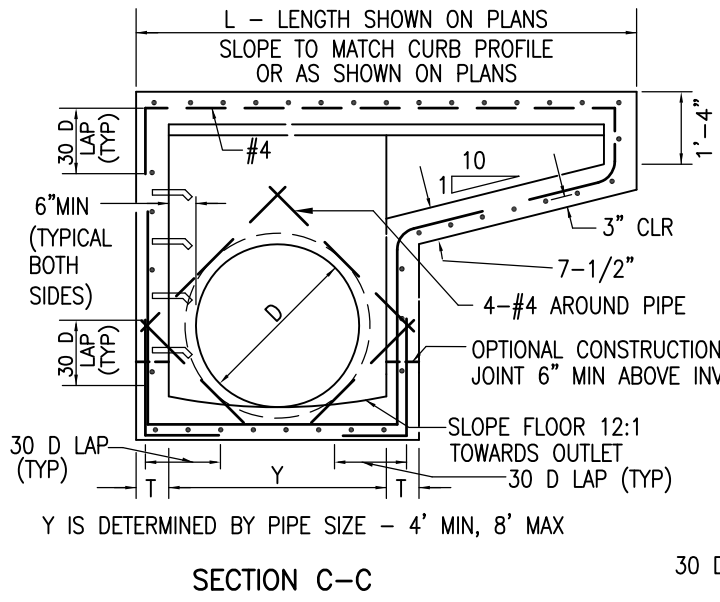
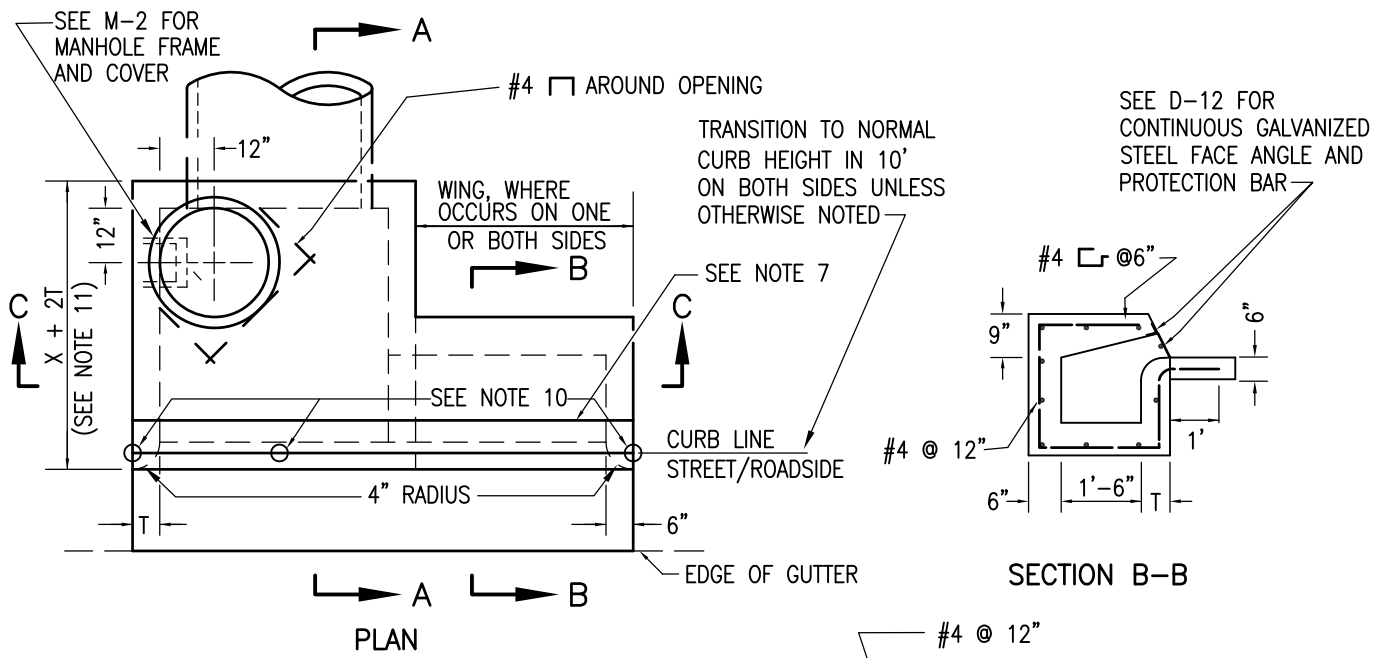
**SAN DIEGO REGIONAL STANDARD DRAWING**

**CURB INLET - TYPE A**

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

**DRAWING NUMBER D-01**




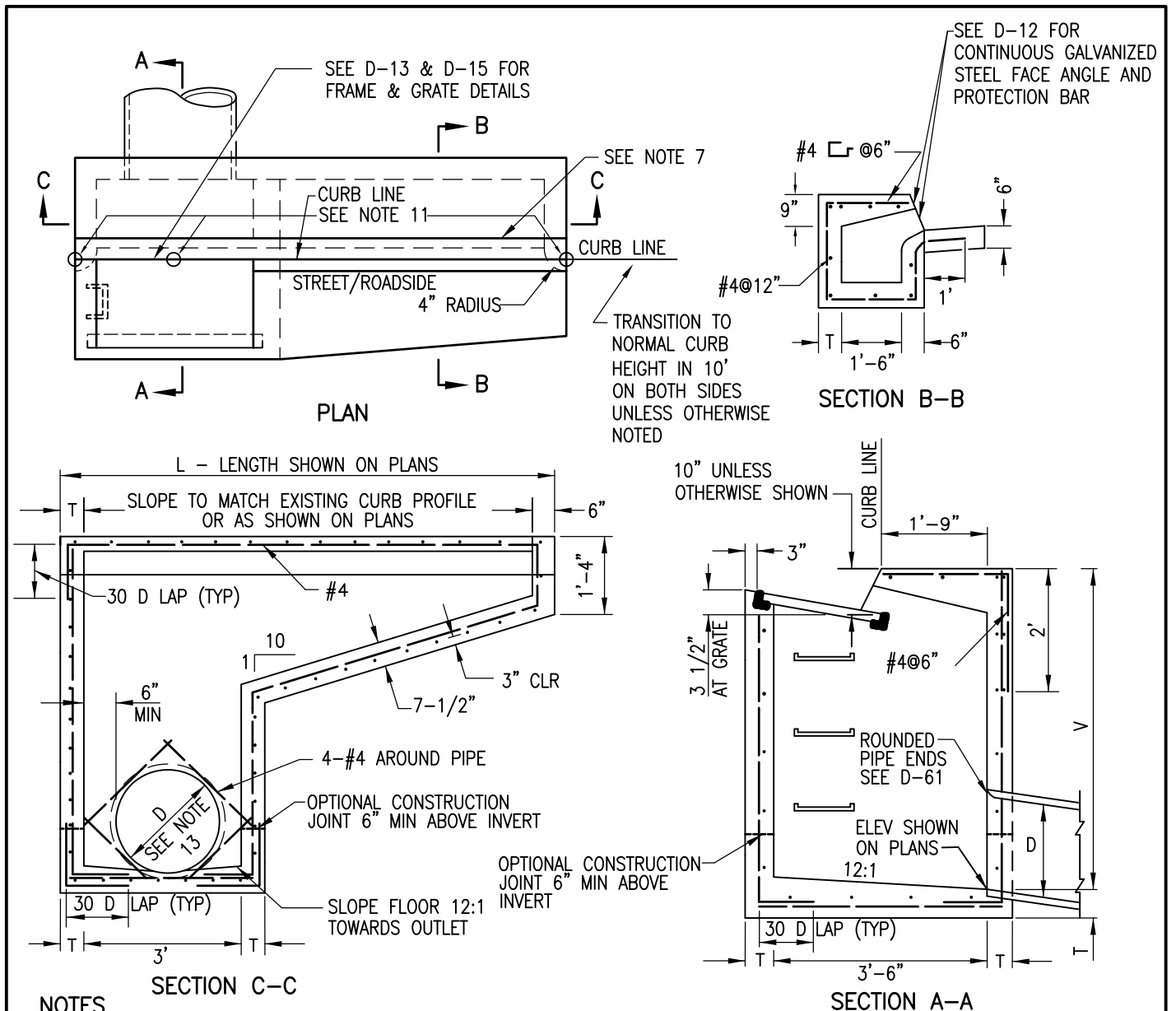
**NOTES**

1. SEE D-11A, D-11B & D-12 FOR ADDITIONAL NOTES AND DETAILS.
2. TYPES ARE DESIGNATED ON PLANS AS FOLLOWS: B (NO WING), B-1 (ONE WING) or B-2 (TWO WINGS).
3. MAINTAIN 1-1/2" CLEAR SPACING BETWEEN REINFORCING AND CONCRETE SURFACE UNLESS OTHERWISE NOTED.
4. STEPS SHALL BE INSTALLED WHEN V EXCEEDS 4'. SEE D-11A FOR DETAILS.
5. CONCRETE GUTTER TO MATCH ADJACENT GUTTERS.
6. AN EXPANSION JOINT SHALL BE PLACED AT THE ENDS OF THE INLET WHERE THE CURB IS TO ADJOIN.
7. PROVIDE 1/4" TOOLED GROOVE IN TOP SLAB IN LINE WITH BACK OF ADJACENT CURB.
8. SURFACE OF TOP SLAB TO MATCH SIDEWALK FINISH AND SLOPE.
9. IF REQUIRED BY LOCAL AGENCY, EXTEND TOP SLAB STEEL REINFORCEMENT 12" INTO ADJACENT SIDEWALK.
10. ELEVATIONS SHALL BE SHOWN ON PLANS WHERE INDICATED BY "O" SYMBOL.
11. IF REQUIRED BY LOCAL AGENCY, ENLARGE CURB INLET TOP TO WIDTH OF ADJACENT SIDEWALK (X + 2T NOT TO EXCEED 5'-6") BY LENGTH OF INLET INCLUDING WING(S). REINFORCING STEEL SHALL BE EXTENDED ACROSS ENLARGED TOP TO CLEAR DISTANCES SHOWN.

**LEGEND ON PLANS**



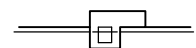
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		CURB INLET - TYPE B
Edited		T. Stanton	02/09		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
					 10/25/2018 Chairperson R.C.E. 19246 Date
					<b>DRAWING NUMBER</b> D-02




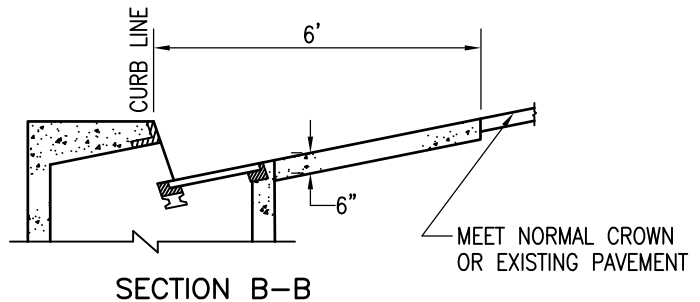
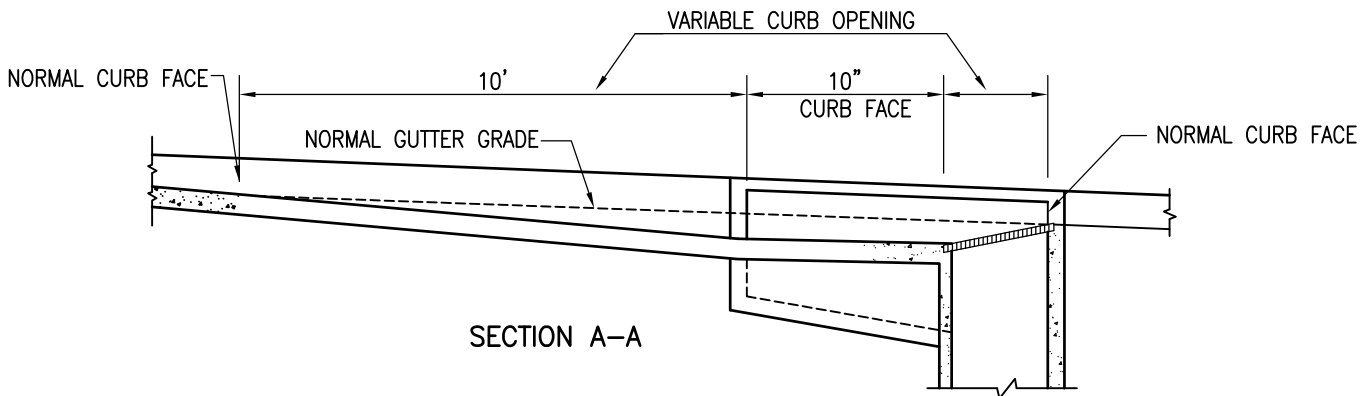
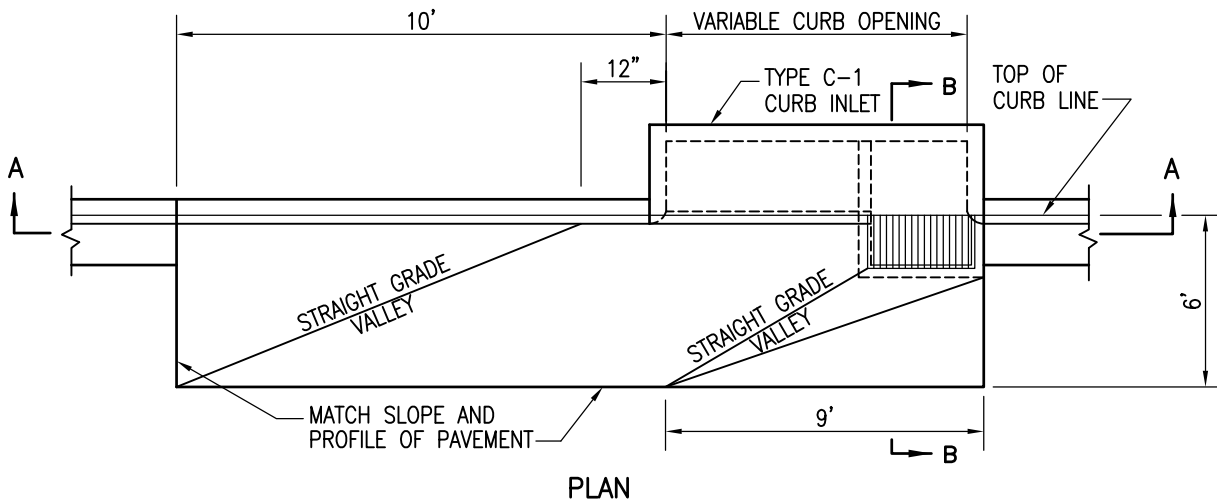
**NOTES**

1. SEE D-11A THROUGH D-15 FOR ADDITIONAL NOTES AND DETAILS.
2. TYPES ARE DESIGNATED ON PLANS AS FOLLOWS: C (NO WING), C-1 (ONE WING) or C-2 (TWO WINGS).
3. EXPOSED EDGES OF CONCRETE SHALL BE ROUNDED WITH A RADIUS OF 1/2".
4. STEPS SHALL BE INSTALLED WHEN V EXCEEDS 4'. SEE D-11A FOR DETAILS.
5. CONCRETE GUTTER TO MATCH ADJACENT GUTTERS.
6. AN EXPANSION JOINT SHALL BE PLACED AT THE ENDS OF THE INLET WHERE THE CURB IS TO ADJOIN.
7. PROVIDE 1/4" TOOLED GROOVE IN TOP SLAB IN LINE WITH BACK OF ADJACENT CURB.
8. SURFACE OF TOP SLAB TO MATCH SIDEWALK FINISH AND SLOPE.
9. MAINTAIN 1-1/2" CLEAR SPACING BETWEEN REINFORCING AND CONCRETE SURFACE UNLESS OTHERWISE NOTED.
10. WHERE INLET IS TO BE CONSTRUCTED ON GRADE AND CONCRETE APRON PER D-03B IS REQUIRED, LIFT DOWN-GRADE END OF GRATE AS SHOWN ON D-03B.
11. IF REQUIRED BY LOCAL AGENCY, EXTEND TOP SLAB STEEL REINFORCEMENT 12" INTO ADJACENT SIDEWALK.
12. ELEVATIONS SHALL BE SHOWN ON PLANS WHERE INDICATED BY "O" SYMBOL.
13. DIAMETER "D" SHALL BE 24" MAXIMUM; FOR LARGER DIAMETER PIPES THIS DRAWING MUST BE MODIFIED.

**LEGEND ON PLANS**



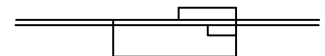
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		CURB INLET - TYPE C
Replaced D-3		T. Stanton	02/09		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
					 10/25/2018 Chairperson R.C.E. 19246 Date
					<b>DRAWING NUMBER</b> D-03A



**NOTES**

1. CURB AND APRON TO BE MONOLITHIC POUR.
2. USE OF FALSE HEADER AT VALLEYS AND SLOPE BREAK LINE IS OPTIONAL.
3. EXTEND VERTICAL STEEL FROM INLET STRUCTURE INTO CONCRETE APRON AS SHOWN ON SECTION B-B OF D-03A.
4. CONCRETE SHALL BE 520-C-2500.

**LEGEND ON PLANS**



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Replaced D-20		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

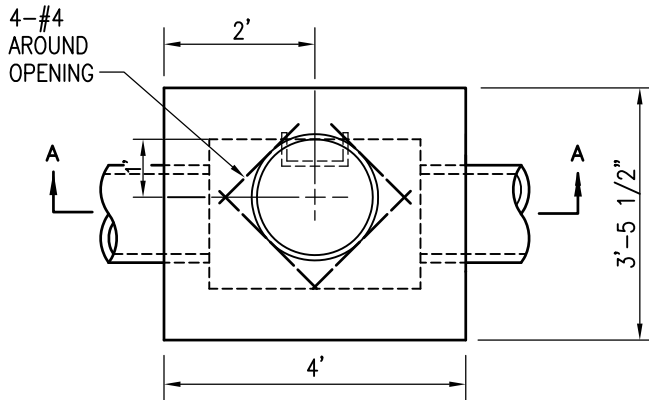
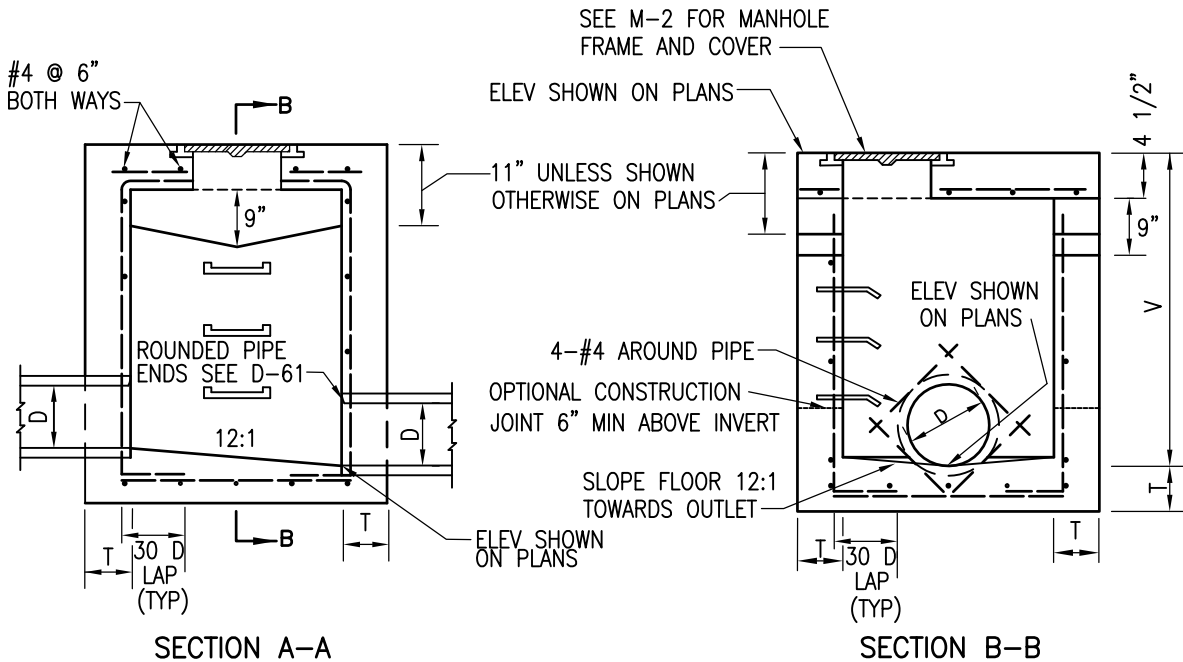
SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE APRON FOR TYPE C CURB INLET

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*T. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-03B



PLAN

NOTES

1. SEE D-11A & 11B FOR ADDITIONAL NOTES AND DETAILS.
2. WHEN V EXCEEDS 4' STEPS SHALL BE INSTALLED. SEE D-11A FOR DETAILS.
3. EXPOSED EDGES OF CONCRETE SHALL BE ROUNDED WITH A RADIUS OF 1/2".
4. CONSTRUCT OPENINGS ON BOTH SIDES UNLESS OTHERWISE SHOWN ON PLANS.
5. MAINTAIN 1-1/2" CLEAR SPACING BETWEEN REINFORCING AND CONCRETE SURFACE.
6. INSTALL 1" STEEL PROTECTION BAR ACROSS OPENING.
7. DIAMETER "D" SHALL BE 18" MAX, FOR LARGER DIAMETER PIPES THIS DRAWING MUST BE MODIFIED. PIPE DIAMETERS TO BE SHOWN ON PLANS.
8. IF CONSTRUCTED ADJACENT TO SIDEWALK, THE SURFACE OF THE TOP SLAB OF THE CATCH BASIN SHALL MATCH THE SIDEWALK SLOPE AND FINISH.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

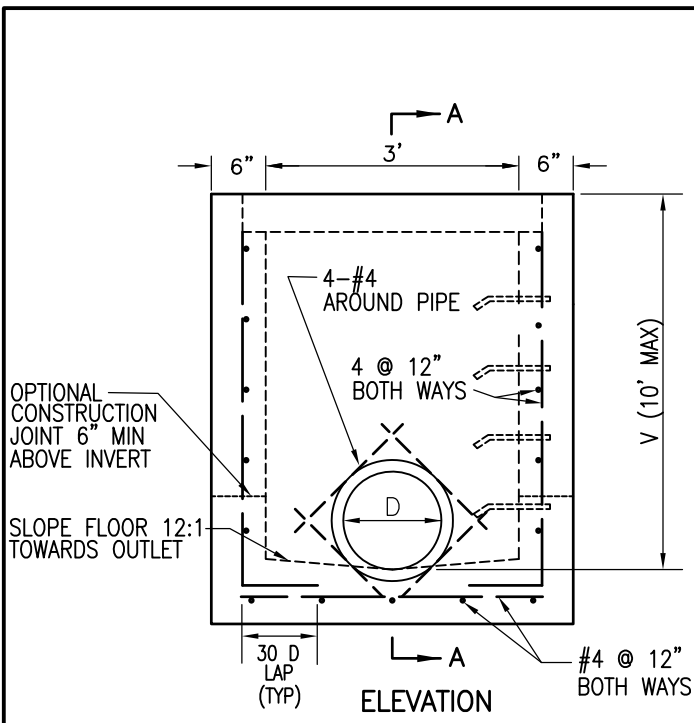
SAN DIEGO REGIONAL STANDARD DRAWING

CATCH BASIN - TYPE F

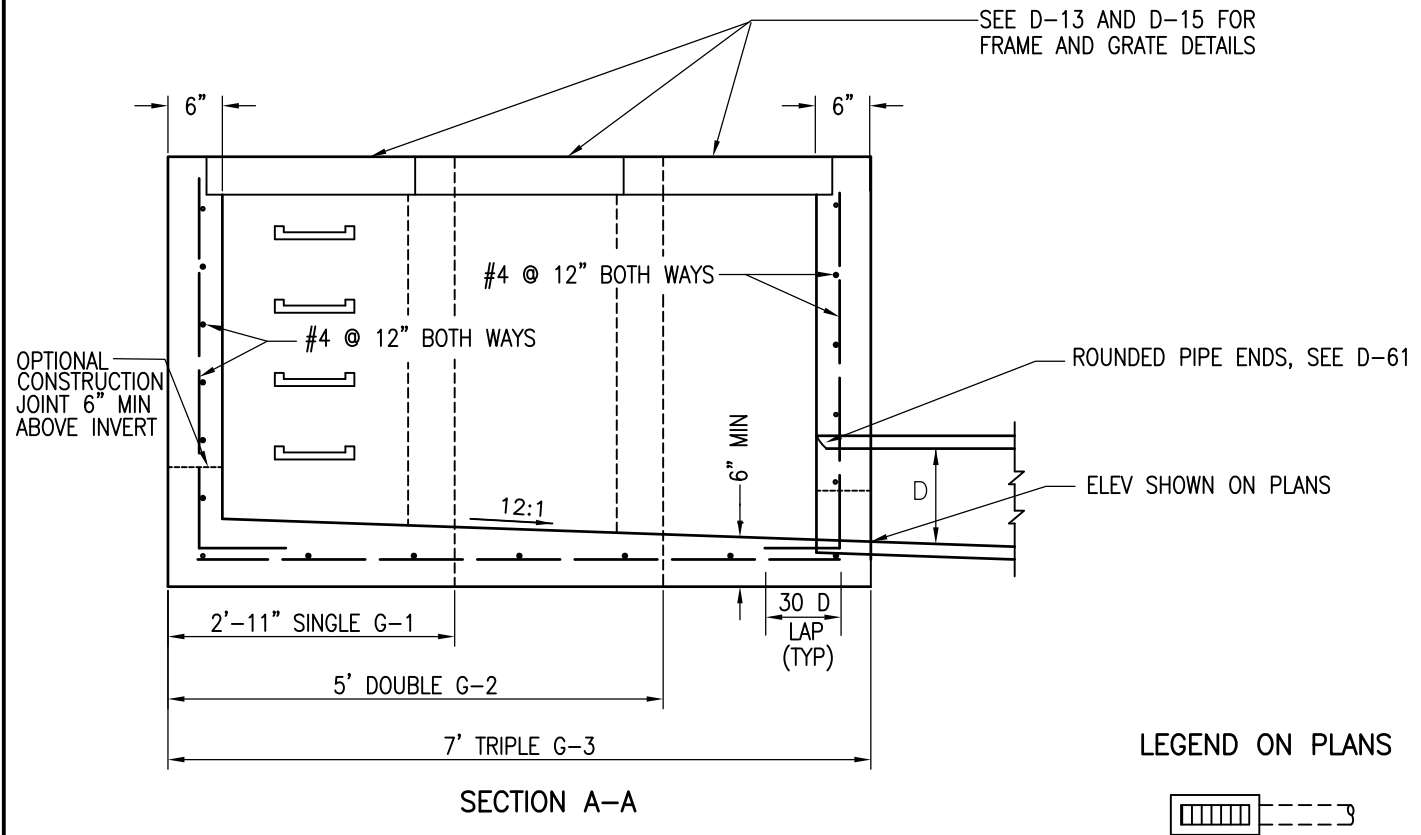
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*T. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-07



- NOTES**
1. SEE D-11A AND D-11B FOR ADDITIONAL NOTES AND DETAILS.
  2. STEPS SHALL BE INSTALLED WHEN V EXCEEDS 4'. SEE D-11A FOR DETAILS.
  3. MAINTAIN 1-1/2" CLEAR SPACING BETWEEN REINFORCING AND CONCRETE SURFACE.
  4. INCREASE IN ALLOWABLE DEPTH SUBJECT TO APPROVAL BY LOCAL AGENCY.
  5. SECTION A-A SHOWS 3 SIZES AND SHALL NOT IMPLY THAT AN INTERIOR WALL IS TO BE BUILT FOR THE STRUCTURES WITH DOUBLE OR TRIPLE FRAME AND GRATE.
  6. EXPOSED EDGES OF CONCRETE SHALL BE ROUNDED WITH RADIUS OF 1/2".
  7. DESIGNATE TYPES AS FOLLOWS: SINGLE G-1, DOUBLE G-2 OR TRIPLE G-3.
  8. ONLY END BEARING GRATES SHALL BE USED. SEE D-15.



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

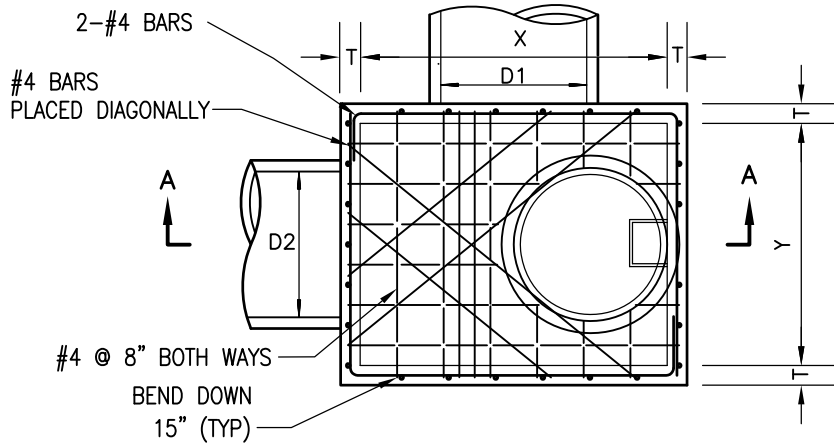
SAN DIEGO REGIONAL STANDARD DRAWING

CATCH BASIN - TYPE G

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

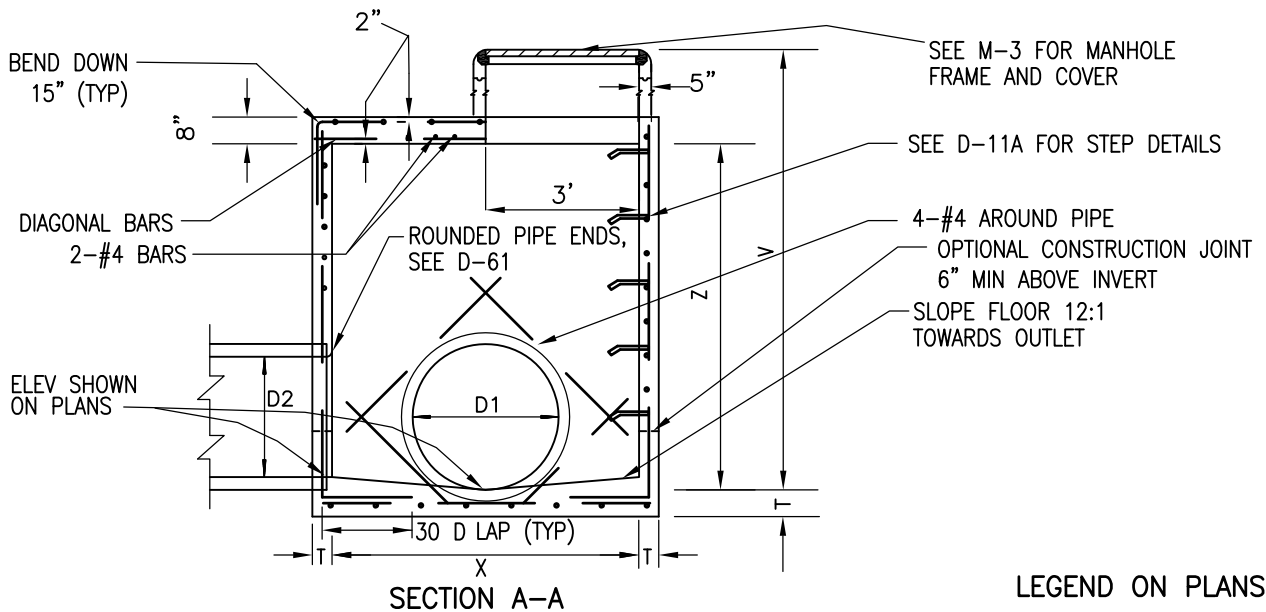
*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-08



PLAN

TYPE	PIPE DIAMETER (D1)	X	Y (SEE NOTE 8)	Z (Max)
A4	UP TO 39"	4'	4'	6'
A5	42" TO 48"	5'	4'	6'
A6	51" TO 60"	6'	4'	6'
A7	63" TO 66"	7'	4'	7'
A8	69" TO 78"	8'	4'	8'




SECTION A-A

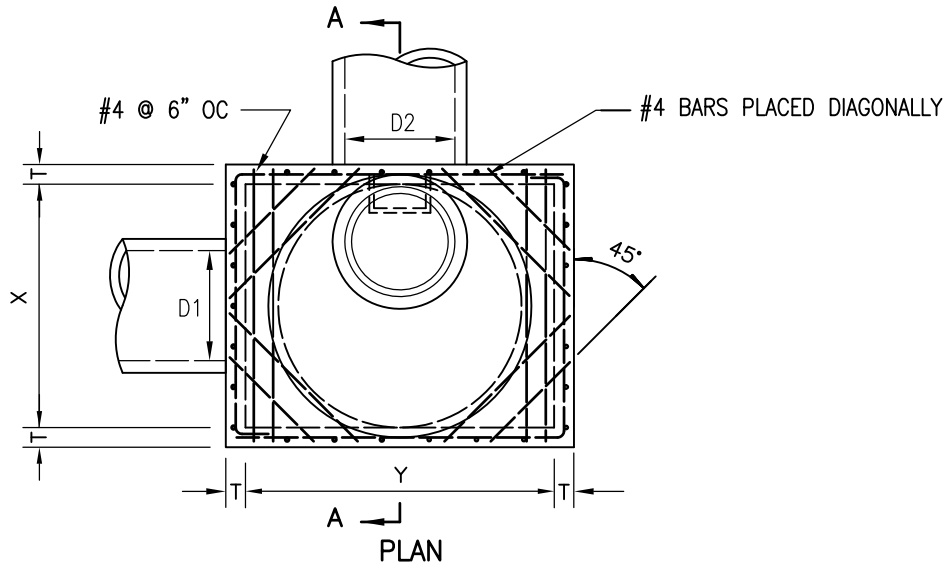
LEGEND ON PLANS



NOTES

1. SEE D-11A AND D-11B FOR ADDITIONAL NOTES AND DETAILS.
2. CONCRETE BASE SHALL BE 560-C-3250.
3. ALL PRECAST COMPONENTS SHALL BE REINFORCED WITH 1/4" DIAMETER STEEL, WOUND SPIRALLY ON 4' CENTERS.
4. ALL JOINTS SHALL BE SET IN CLASS C MORTAR.
5. MAINTAIN 1-1/2" CLEAR SPACING BETWEEN REINFORCING AND CONCRETE SURFACE UNLESS OTHERWISE NOTED.
6. EXPOSED EDGES OF CONCRETE SHALL BE ROUNDED WITH A 1/2" RADIUS.
7. MANHOLE COVER TO BE MARKED "STORM DRAIN".
8. MODIFICATIONS TO "Y" DIMENSION IS REQUIRED IF PIPE (D2) EXCEEDS 39".
9. IF CONSTRUCTED ADJACENT TO SIDEWALK, TOP OF MANHOLE AND SLAB TO MATCH SIDEWALK SLOPE AND FINISH.

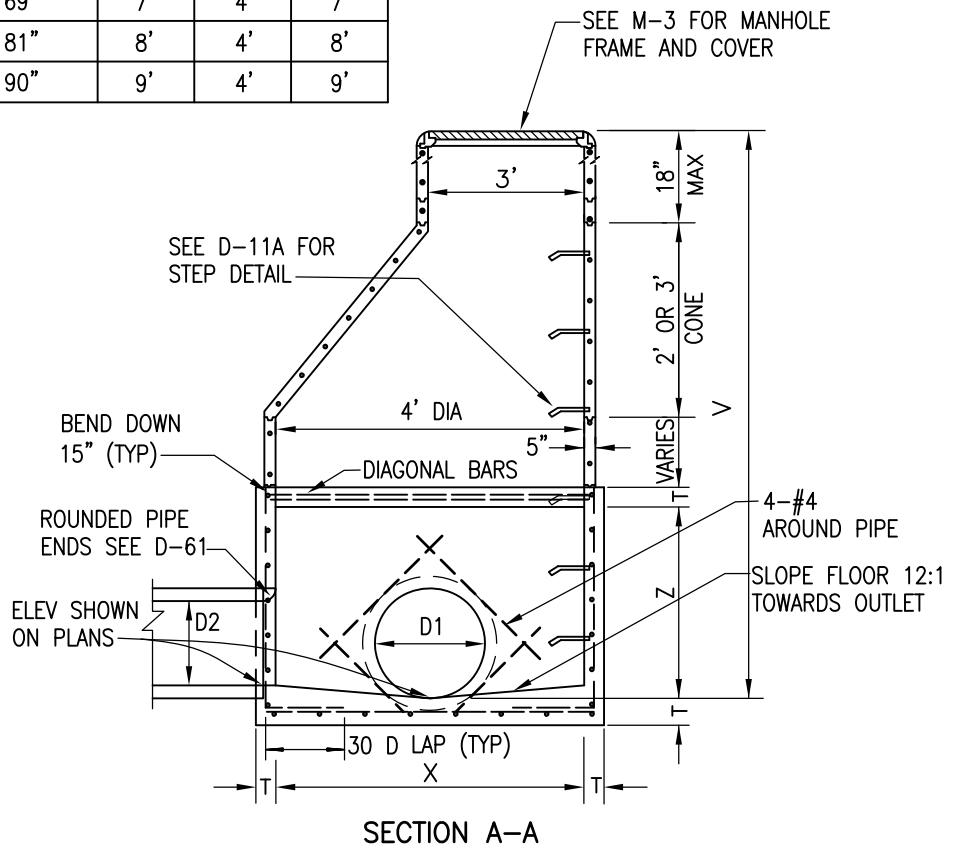
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	
ORIGINAL		Kercheval	12/75	STORM DRAIN CLEANOUT - TYPE A	
Edited		T. Stanton	02/09		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
				RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
				 10/25/2018 Chairperson R.C.E. 19246 Date	
				DRAWING NUMBER D-09	



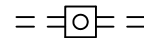
TYPE	PIPE DIAMETER (D1)	X	Y	Z
B5	UP TO 51"	5'	4'	5'
B6	54" to 60"	6'	4'	6'
B7	63" to 69"	7'	4'	7'
B8	72" to 81"	8'	4'	8'
B9	84" to 90"	9'	4'	9'

**NOTES**

1. SEE D-11A & D-11B FOR ADDITIONAL NOTES AND DETAILS.
2. ALL JOINTS SHALL BE SET IN CLASS C MORTAR.
3. ALL PRECAST COMPONENTS SHALL BE REINFORCED WITH 1/4" DIAMETER STEEL WOUND SPIRALLY ON 4" CENTERS.
4. MAINTAIN 1-1/2" CLEAR SPACING BETWEEN REINFORCING AND CONCRETE SURFACE.
5. CONCRETE BASE SHALL BE 560-C-3250.
6. EXPOSED EDGES OF CONCRETE SHALL BE ROUNDED WITH A 1/2" RADIUS.
7. MANHOLE COVER TO BE MARKED "STORM DRAIN".
8. MODIFICATIONS TO "Y" DIMENSION REQUIRED IF PIPE (D2) EXCEEDS 39".
9. IF CONSTRUCTED ADJACENT TO SIDEWALK, TOP OF MANHOLE TO MATCH SIDEWALK SLOPE.



**LEGEND ON PLANS**



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reformatted		T. Stanton	04/06
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	M.W.	M. Wideliski	10/18

**SAN DIEGO REGIONAL STANDARD DRAWING**

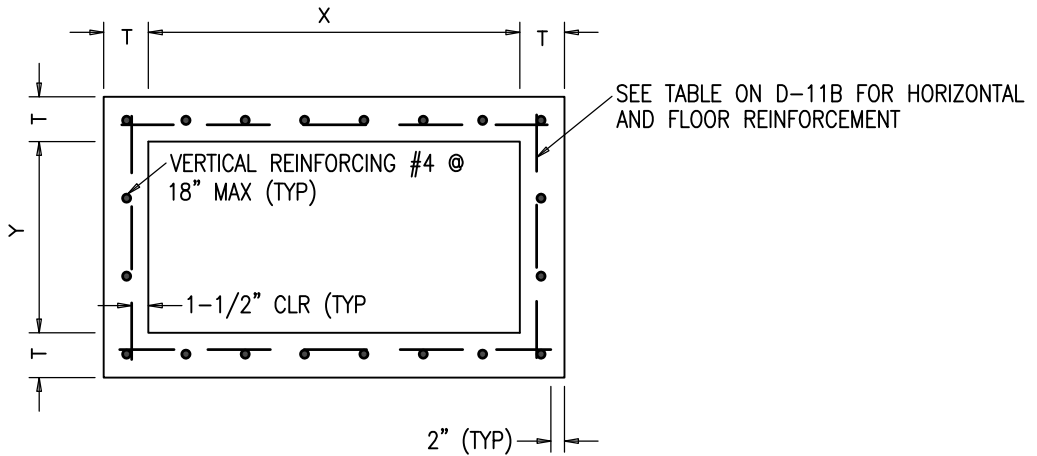
**STORM DRAIN CLEANOUT - TYPE B**

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

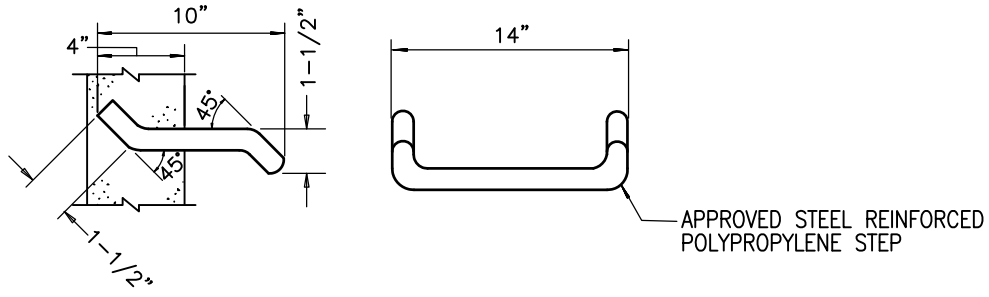
*T. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER **D-10**





TYPICAL BOX SECTION



STEP DETAIL

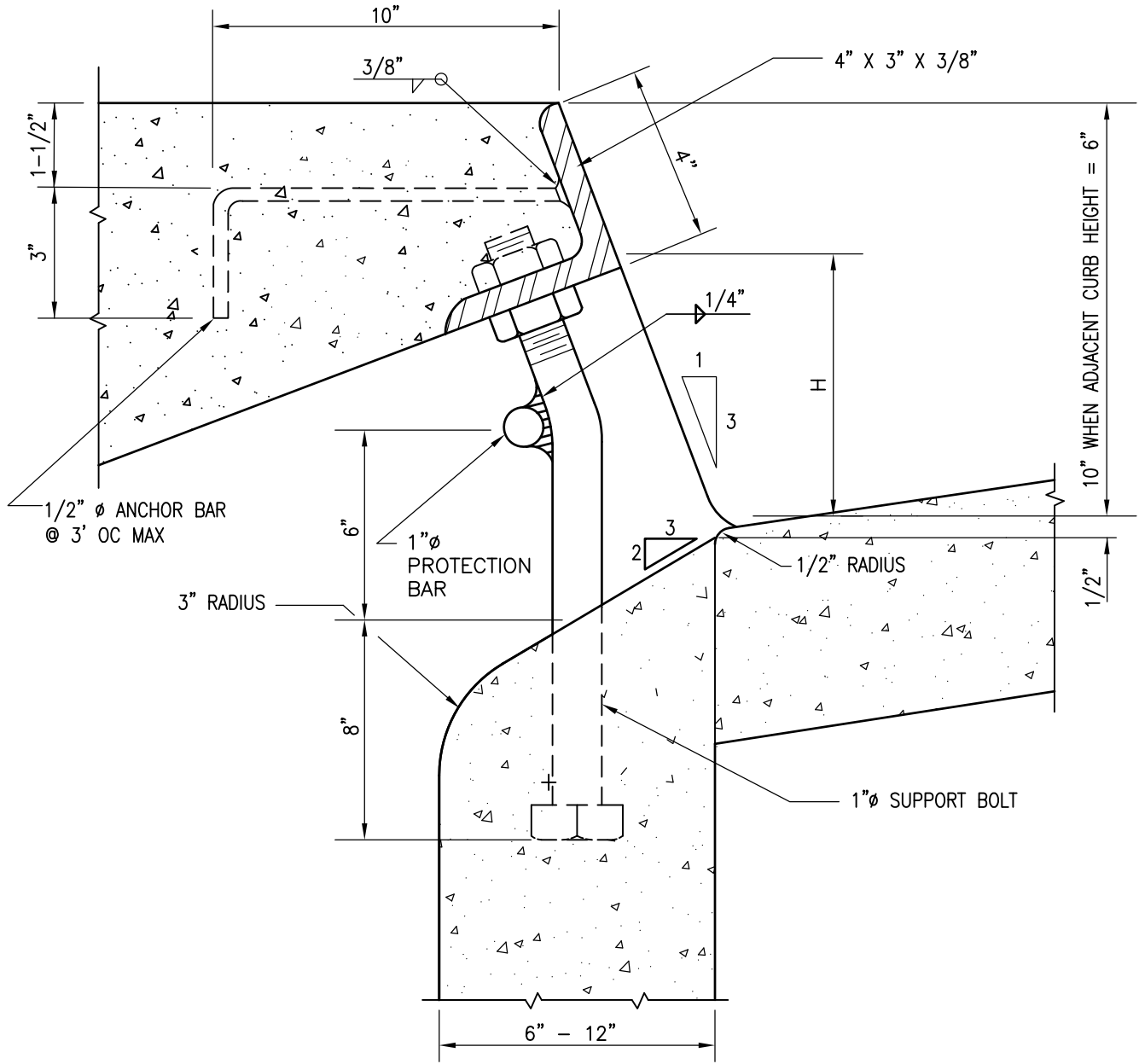
**NOTES**

1. CONCRETE SHALL BE 560-C-3250 UNLESS OTHERWISE NOTED.
2. REINFORCING STEEL SHALL COMPLY WITH THIS DRAWING (D-11A AND D-11B) UNLESS OTHERWISE SPECIFIED.
3. REINFORCING STEEL SHALL BE INTERMEDIATE GRADE DEFORMED BARS CONFORMING TO LATEST ASTM SPECIFICATIONS.
4. BENDS SHALL BE IN ACCORDANCE WITH LATEST ACI CODE.
5. MINIMUM SPLICE LENGTH FOR REINFORCING SHALL BE 30 DIAMETERS.
6. FLOOR SHALL HAVE A WOOD TROWEL FINISH AND, EXCEPT WHERE USED AS JUNCTION BOXES, SHALL HAVE A MINIMUM SLOPE OF 1:12 TOWARD THE OUTLET.
7. DEPTH V IS MEASURED FROM THE TOP OF THE STRUCTURE TO THE FLOWLINE OF THE BOX.
8. WALL THICKNESS AND REINFORCING STEEL REQUIRED MAY BE DECREASED IN ACCORDANCE WITH TABLE ON D-11B.
9. WALL THICKNESS SHALL BE STEPPED ON THE OUTSIDE OF THE BOX.
10. WHEN THE STRUCTURE DEPTH V EXCEEDS 4', STEPS SHALL BE CAST INTO THE WALL AT 15" INTERVALS FROM 15" ABOVE FLOOR TO WITHIN 12" OF TOP OF STRUCTURE. WHERE POSSIBLE, PLACE STEPS IN WALL WITHOUT PIPE OPENING, OTHERWISE OVER OPENING OF SMALLEST DIAMETER.
11. ALTERNATE STEP MAY BE AN APPROVED STEEL REINFORCED POLYPROPYLENE STEP.
12. UPON APPROVAL OF THE AGENCY, THE USE OF PRECAST STORM STRUCTURES IS ACCEPTABLE AS AN ALTERNATE TO CAST-IN-PLACE. PRECAST UNITS SHALL CONFORM TO ASTM STANDARDS AND BE MANUFACTURED IN A PERMANENT FACILITY DESIGNED FOR THAT PURPOSE.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		INLETS AND CLEANOUTS NOTES AND DETAILS
Edited		T. Stanton	02/09	DRAWING NUMBER	
Edited	S.S.	T. Regello	03/11	D-11A	
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		

BOX SECTION REINFORCEMENT (HORIZONTAL AND FLOOR)			
MAXIMUM SPAN X OR Y	DEPTH V	THICKNESS T	HORIZONTAL AND FLOOR REINFORCEMENT SIZE AND SPACING
3' TO 4'	4'	6"	#4 @ 18"
4'-1" TO 7'			#4 @ 12"
7'-1" TO 8'			#4 @ 8"
3' TO 4'	4'-1" TO 8'	6"	#4 @ 18"
4'-1" TO 5'			#4 @ 12"
5'-1" TO 6'			#4 @ 8"
6'-1" TO 8'			#4 @ 6"
3' TO 4'	8'-1" TO 12'	6"	#4 @ 15"
4'-1" TO 5'		8"	#4 @ 12"
5'-1" TO 6'			#4 @ 8"
6'-1" TO 8'			#4 @ 6"
3' TO 4'	12'-1" TO 16'	8"	#4 @ 12"
4'-1" TO 5'			#4 @ 12"
5'-1" TO 6'			#4 @ 8"
6'-1" TO 7'			#4 @ 6"
7'-1" TO 8'			#5 @ 8"
3' TO 4'	16'-1" TO 20'	8"	#4 @ 12"
4'-1" TO 5'		10"	#4 @ 12"
5'-1" TO 6'			#4 @ 8"
6'-1" TO 7'			#4 @ 6"
7'-1" TO 8'			#5 @ 8"
3' TO 4'	20'-1" TO 24'	8"	#4 @ 12"
4'-1" TO 5'		10"	#4 @ 12"
5'-1" TO 6'			#4 @ 8"
6'-1" TO 7'			#4 @ 6"
7'-1" TO 8'			12"

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75		INLETS AND CLEANOUTS NOTES AND DETAILS	<i>M. Heaton</i> 10/25/2018
Reformatted		T. Stanton	04/06	Chairperson R.C.E. 19246 Date		
Edited	S.S.	T. Regello	03/11	DRAWING		D-11B
Edited	T.R.	T. Regello	10/15	NUMBER		
Edited	M.W.	M. Widelski	10/18			



**NOTES**

1. FACE ANGLE SHALL BE CAST CONTINUOUSLY INTO STRUCTURE FOR THE ENTIRE LENGTH "L".
2. ALL EXPOSED METAL PARTS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
3. WHEN CURB INLET OPENING HEIGHT (H) EXCEEDS 6", INSTALL 1"Ø STEEL PROTECTION BAR. STEEL PROTECTION BAR SHALL BE EMBEDDED 8" INTO CURB INLET.
4. INSTALL ADDITIONAL BARS AT 3-1/2" CLEAR SPACING ABOVE FIRST STEEL PROTECTION BAR WHEN OPENING EXCEEDS 13".
5. WHEN CURB INLET OPENING LENGTH EXCEEDS 8' INSTALL 1"Ø STEEL SUPPORT BOLTS SPACED AT NOT MORE THAN 5' OC.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

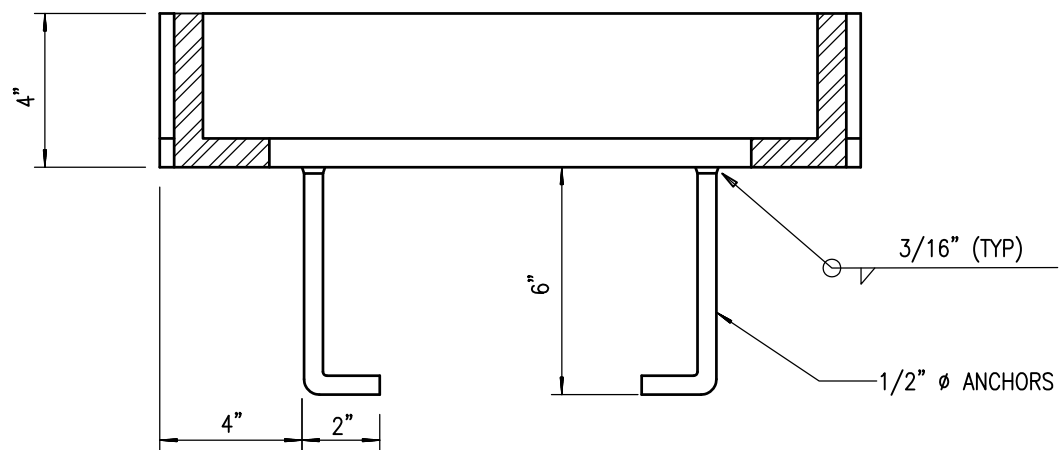
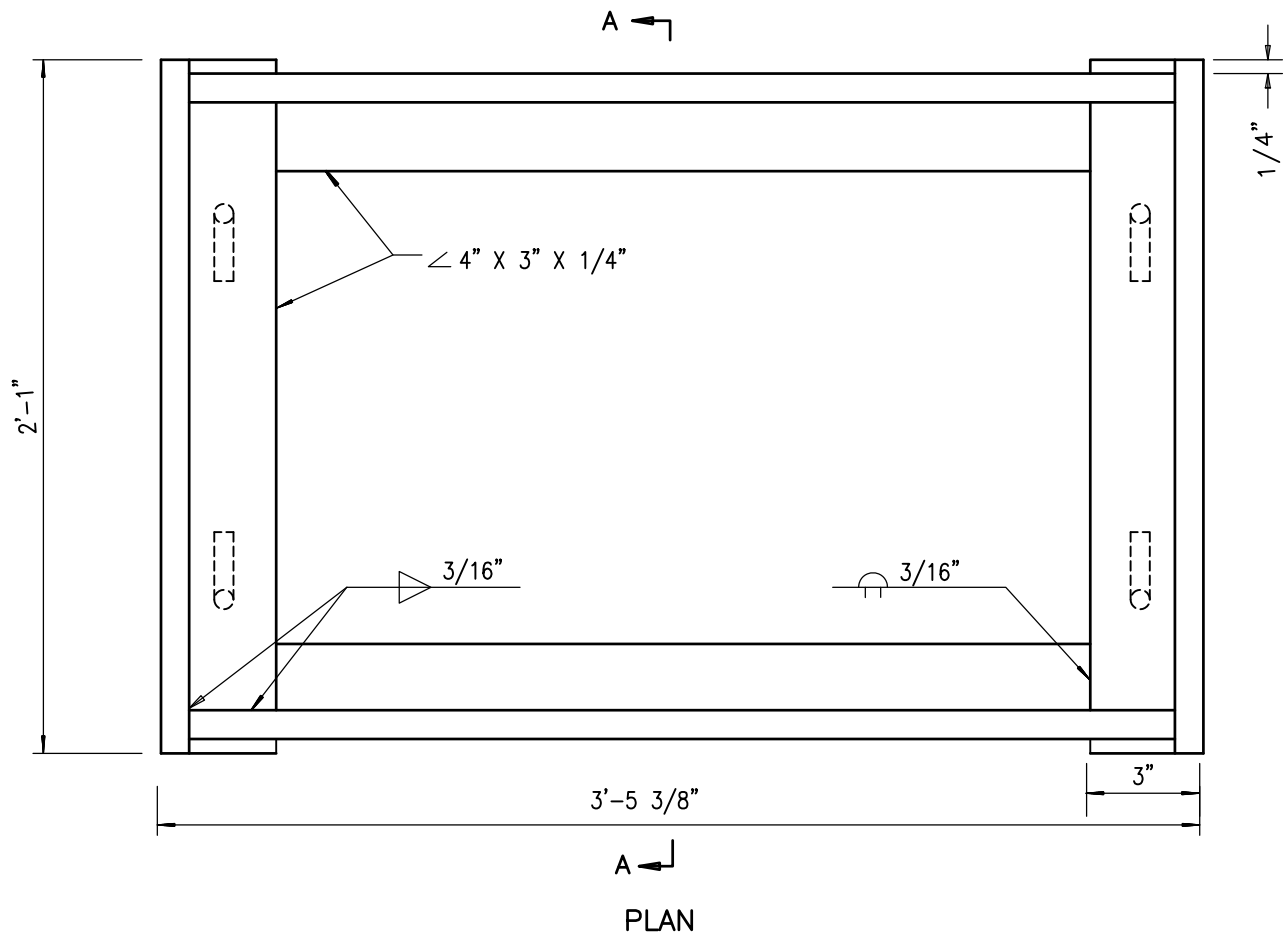
SAN DIEGO REGIONAL STANDARD DRAWING

CURB INLET OPENING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

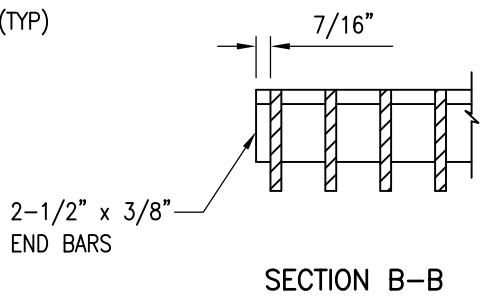
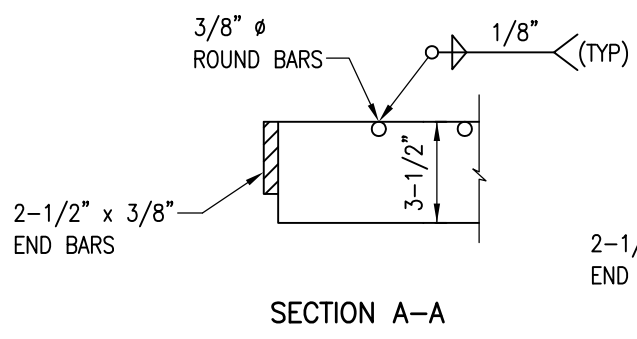
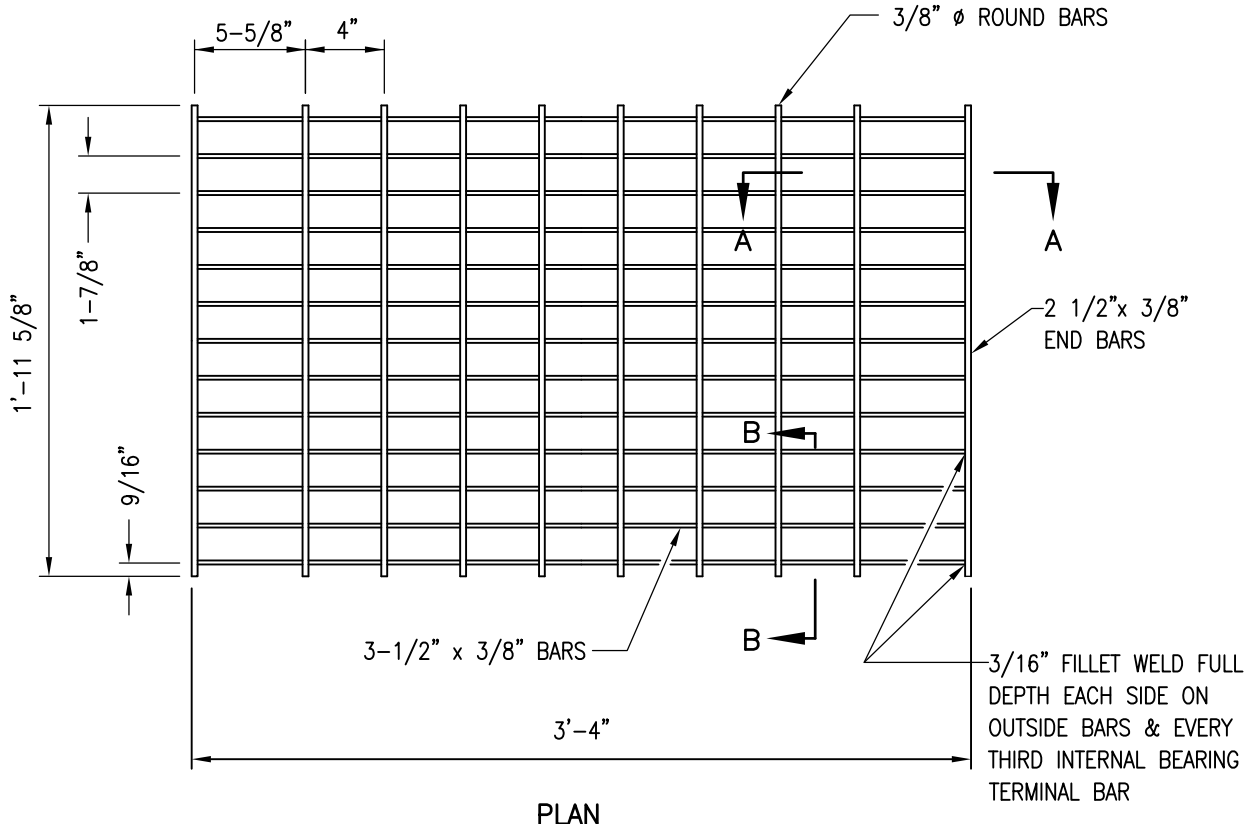
*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-12



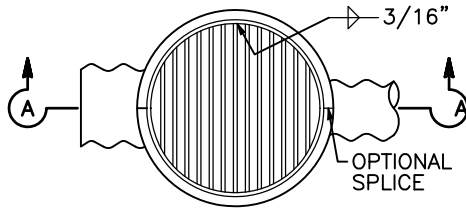
**NOTE**  
HOT-DIP GALVANIZE ALL PARTS AFTER FABRICATION.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		WELDED STEEL GRATE FRAME
Edited		T. Stanton	02/09	Chairperson R.C.E. 19246 Date	
Edited	S.S.	T. Regello	03/11	DRAWING NUMBER	
Edited	T.R.	T. Regello	10/15	D-13	
Edited	M.W.	M. Widelski	10/18		

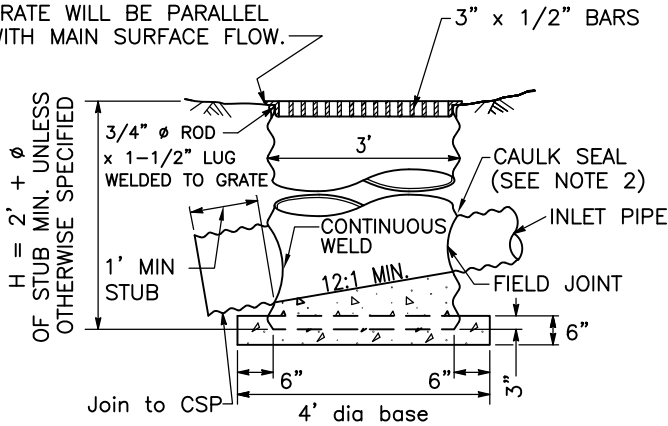


- NOTES**
1. HOT-DIP GALVANIZE ALL PARTS AFTER FABRICATION.
  2. DIMENSIONS ARE TO CENTERLINE OF BARS UNLESS OTHERWISE NOTED.
  3. NOT TO BE USED IN PEDESTRIAN AREAS.
  4. WEIGHT: 200 POUNDS +/-.

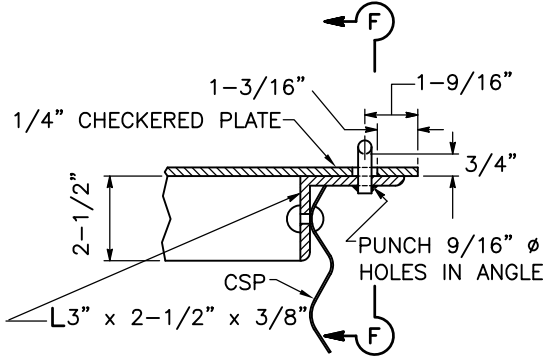
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75		DRAINAGE STRUCTURE GRATE	<i>M. Stanton</i> 10/25/2018
Edited		T. Stanton	02/09	Chairperson R.C.E. 19246 Date		
Edited	S.S.	T. Regello	03/11	DRAWING NUMBER		D-15
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			



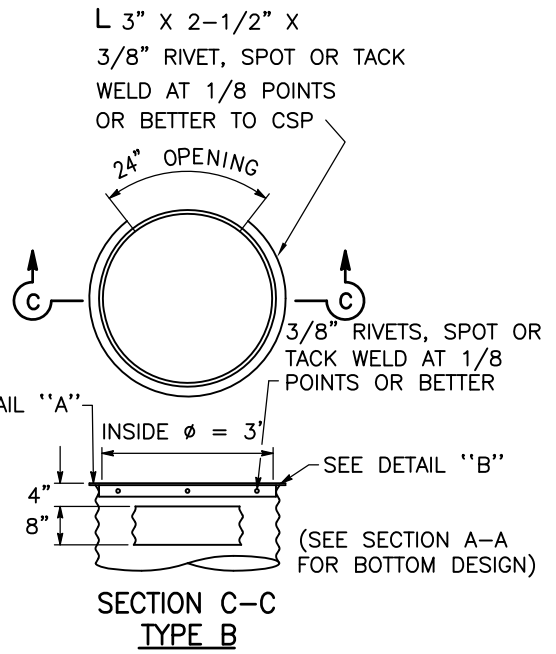
PUNCH 1" HOLE IN CSP.  
PLACE PIPE SO BARS OF  
GRATE WILL BE PARALLEL  
WITH MAIN SURFACE FLOW.



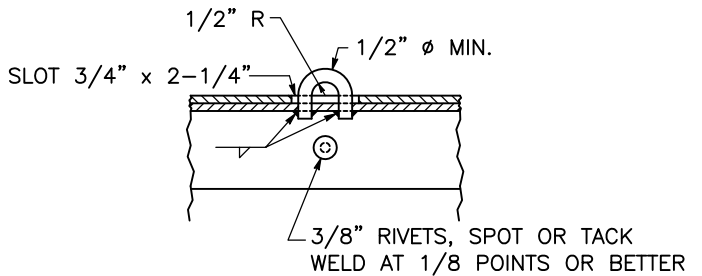
SECTION A-A  
TYPE A



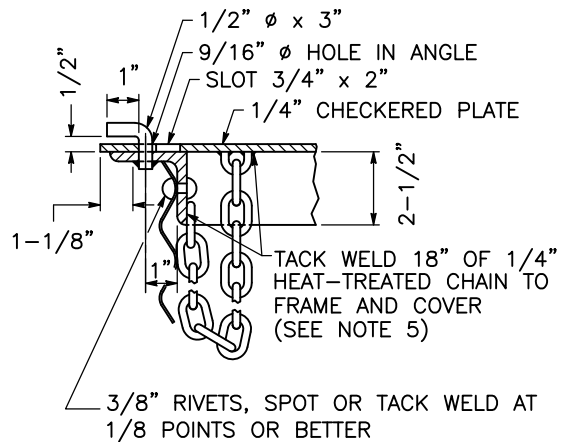
DETAIL "B"



SECTION C-C  
TYPE B



SECTION F-F



DETAIL "A"

**NOTES**

1. ALL COMPONENTS SHALL BE GALVANIZED.
2. INLET AND OUTLET PIPES SHALL BE SET AT FACTORY AND POSITIONED AS SHOWN ON PLANS.
3. SEE D-17B FOR LADDER AND STEP DETAILS.
4. SEE D-17A FOR ADDITIONAL GRATE DETAILS.
5. GRATE TO BE PROVIDED WHEN SPECIFIED.
6. GRATE DETAIL SHALL BE AS SHOWN ON D-17A UNLESS OTHERWISE APPROVED BY AGENCY.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

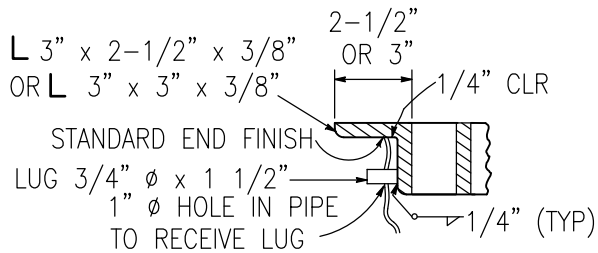
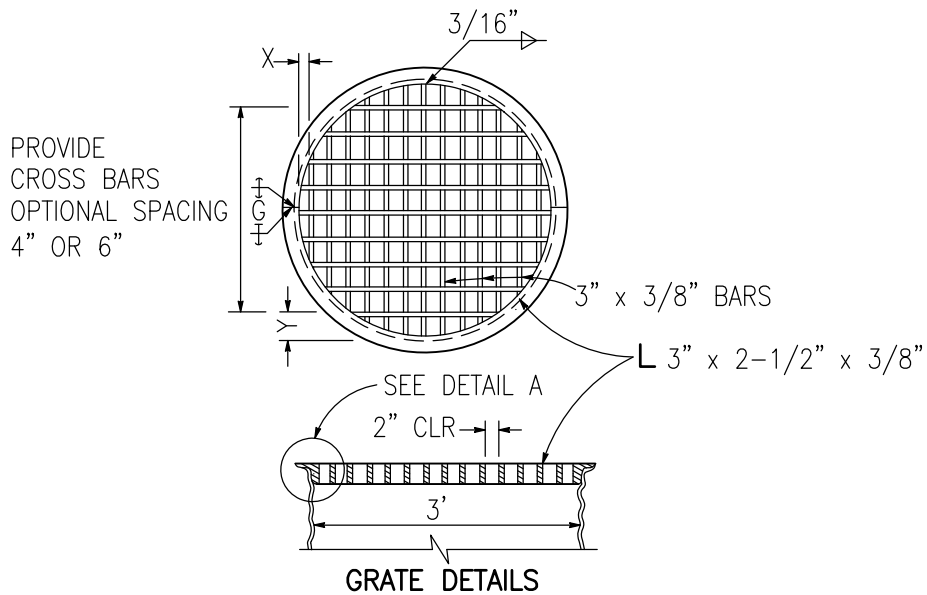
SAN DIEGO REGIONAL STANDARD DRAWING

CORRUGATED STEEL PIPE INLETS  
TYPES A AND B

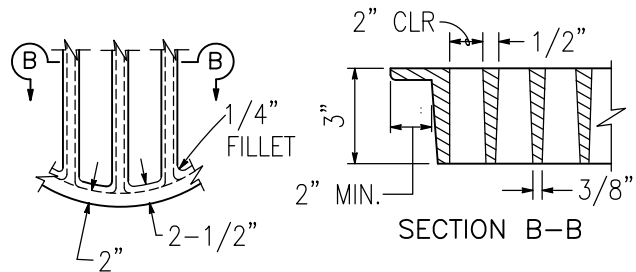
RECOMMENDED BY THE SAN DIEGO  
REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

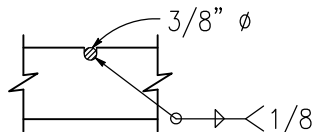
DRAWING  
NUMBER D-16



DETAIL A

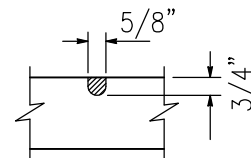


ALTERNATIVE CAST NODULAR IRON GRATE  
OR CAST STEEL GRATE



3/8"  $\phi$  CROSS BARS MAY BE FILLET WELDED,  
RESISTANCE WELDED OR ELECTROFORGED TO  
BEARING BARS.

CROSS BAR DETAIL TYPE  
WELDED STEEL GRATE



CROSS BAR DETAIL  
ALTERNATIVE CAST NODULAR  
IRON GRATE OR CAST STEEL GRATE

GRATE BAR SPACING TABLE

TYPE	NO. OF BARS	CLEAR BAR SPACING	X	Y	
				4" SPACING	6" SPACING
WELDED STEEL	15	2"	9/16"	3-3/4"	5-3/4"
CAST	13	2"	2-1/8"	3-3/4"	5-3/4"

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

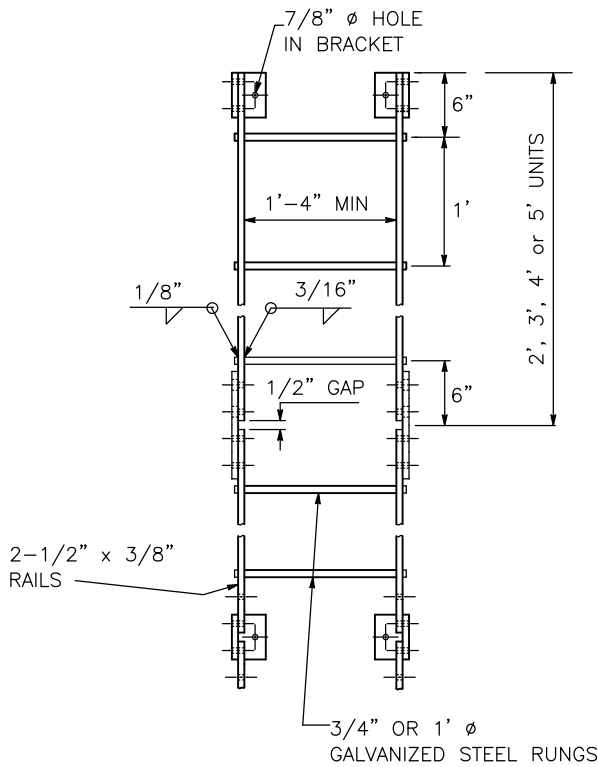
CORRUGATED STEEL PIPE INLETS,  
DETAILS

RECOMMENDED BY THE SAN DIEGO  
REGIONAL STANDARDS COMMITTEE

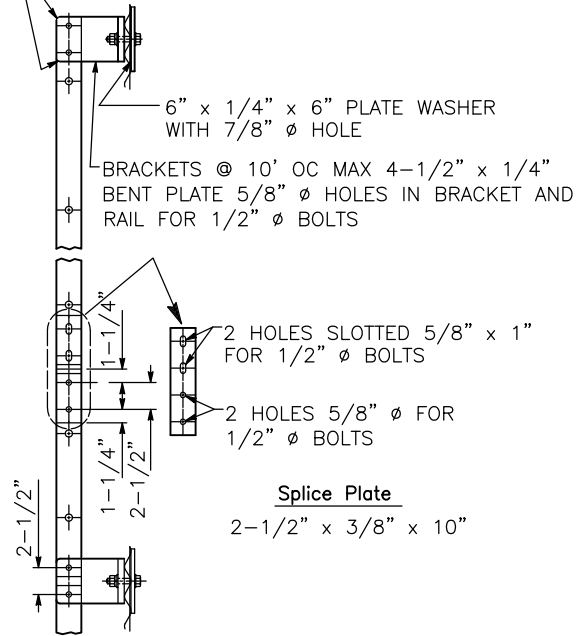
*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING  
NUMBER D-17A

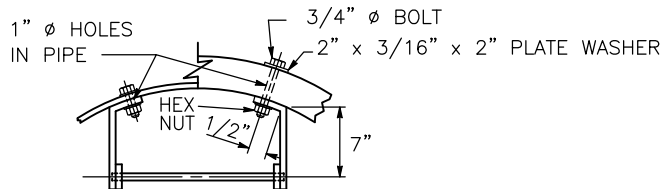
GRIND ALL EXPOSED  
CORNERS 1/4" RADIUS



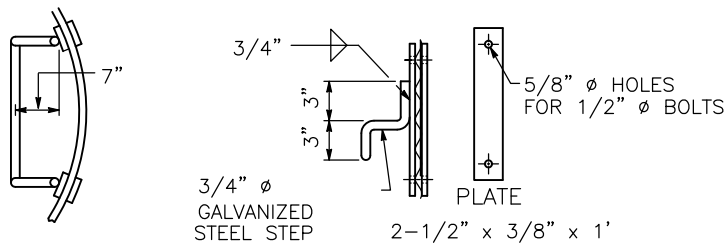
FRONT VIEW



SIDE VIEW



LADDER DETAIL  
H=5' OR GREATER



STEP DETAIL  
H=3'-6" TO 4'-11"

**NOTE**

SEE NOTE 3 ON D-16 FOR  
LADDER REQUIREMENTS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

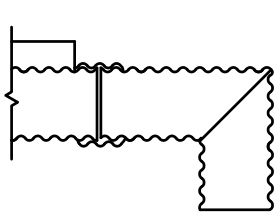
CORRUGATED STEEL PIPE INLETS,  
DETAILS

RECOMMENDED BY THE SAN DIEGO  
REGIONAL STANDARDS COMMITTEE

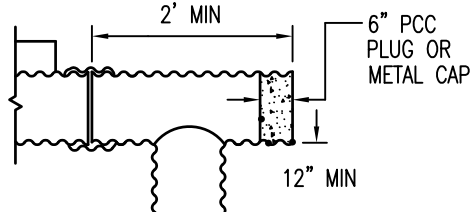
*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING  
NUMBER D-17B

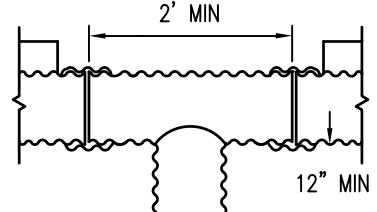




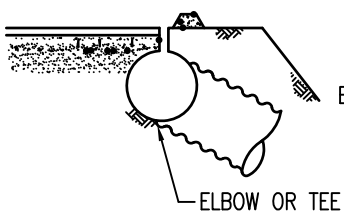
ELBOW



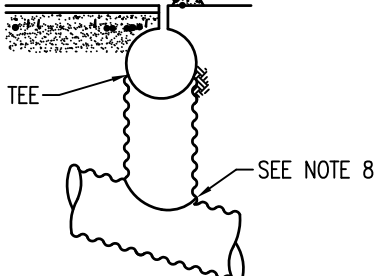
TEE



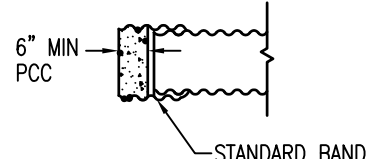
TEE-SAG CONDITION



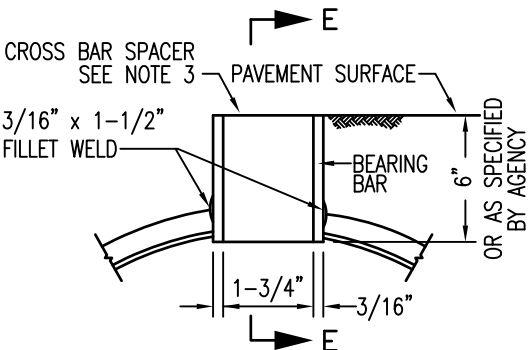
OVERSIDE DRAIN



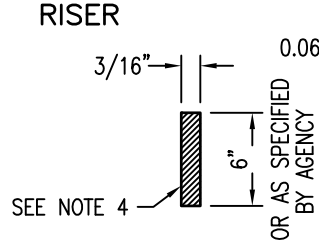
RISER



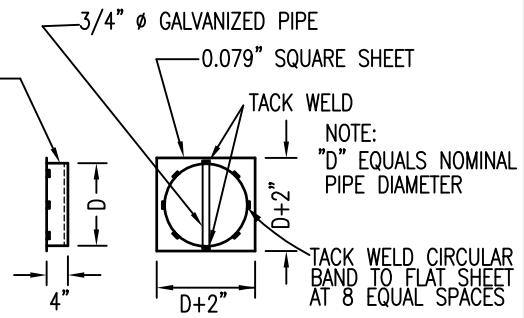
BAND PLUG



SECTION D-D  
GRATE SLOT DETAIL



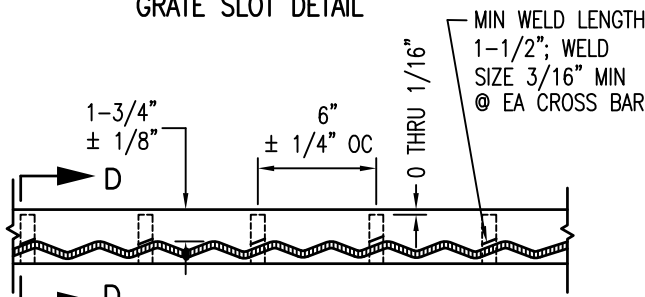
SECTION E-E



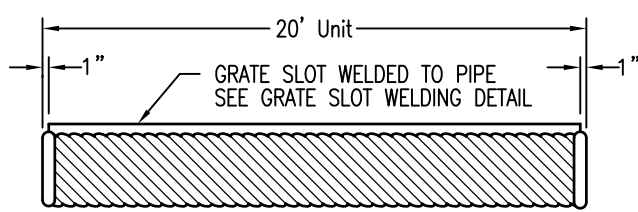
METAL CAP DETAIL

NOTES

1. DRAIN SEAMS MAY BE CONSTRUCTED BY RIVETING OR RESISTANCE SPOT-WELDING, CONTINUOUS HELICAL LOCK SEAM OR HELICAL WELDING SEAM AT EQUAL CENTERS.
2. EACH DRAIN SECTION SHALL BE ASSEMBLED WITH STANDARD COUPLING BANDS.
3. CROSS BAR SPACER OF GRATE SHALL BE PRESSURE FUSED OR PLUG WELDED TO BEARING BARS IN SUCH A MANNER AS TO DEVELOP THE STRENGTH OF THE CROSS BAR SPACER.
4. CROSS BAR SPACER (SECTION E-E) MAY DIFFER FROM THAT SHOWN PROVIDED SECTION AREA IS EQUAL OR GREATER.
5. GRATE MATERIAL SHALL BE A WELDABLE GRADE OF STEEL COMPLYING TO THE REQUIREMENTS OF ASTM A 36.
6. THE MAXIMUM VARIANCE FROM A STRAIGHT LINE FROM THE EXTREME TOP CORNERS OF THE BEARING BAR SHALL BE 1/2" IN 20'.
7. INSTALLATION LENGTHS SHALL BE 10' OR MULTIPLES THEREOF.
8. EITHER FIELD JOINT SEALED WITH A PLIABLE MIXTURE OF SAND, PORTLAND CEMENT AND EMULSIFIED ASPHALT (MIXTURE OF 1 PART PORTLAND CEMENT, 3 - 5 PARTS SAND AND 1-1/2 PARTS SSI EMULSIFIED ASPHALT), OR CONTINUOUS WELD.



GRATE SLOT WELDING DETAIL



GRATE SLOT DRAIN

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

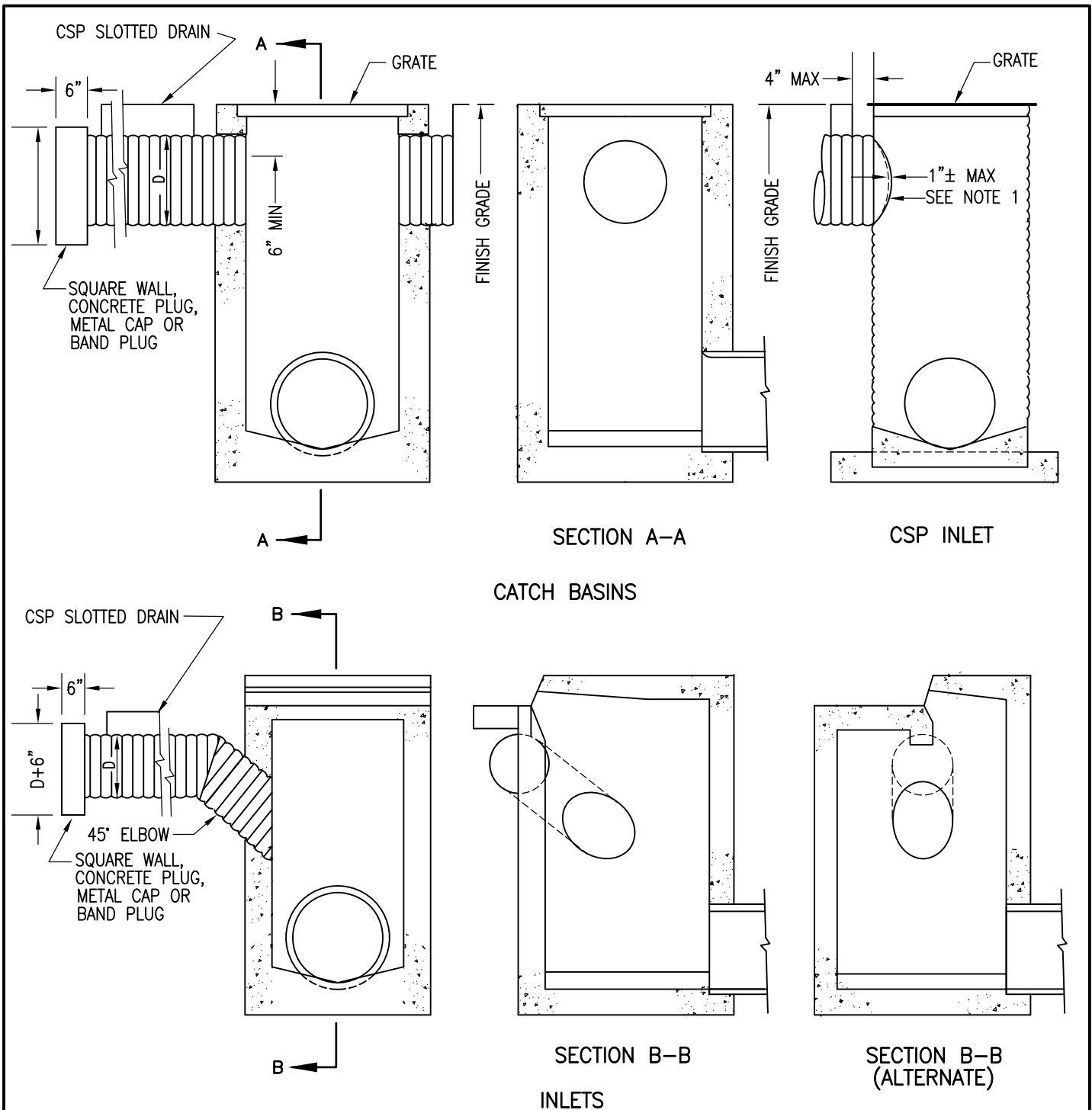
SAN DIEGO REGIONAL STANDARD DRAWING

SLOTTED CORRUGATED STEEL PIPE DRAINS  
12" THROUGH 24"

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

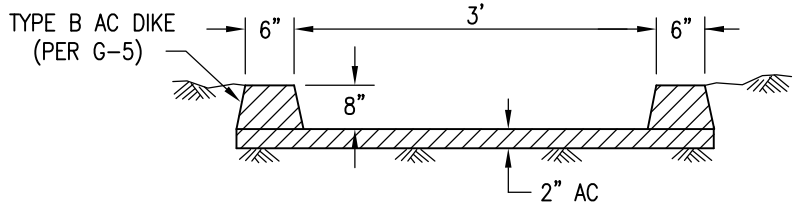
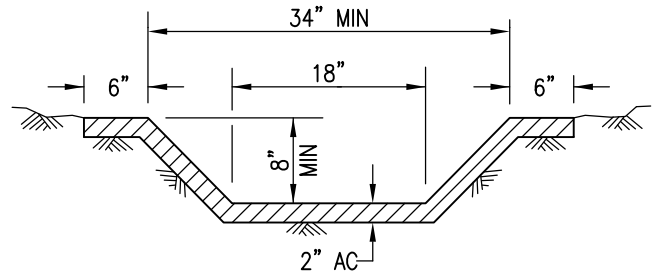
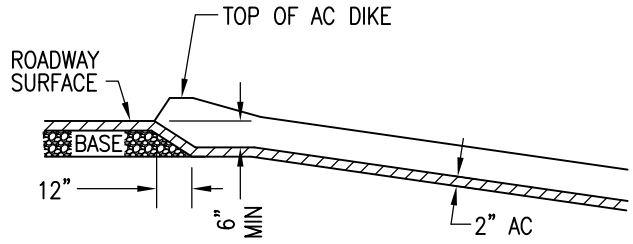
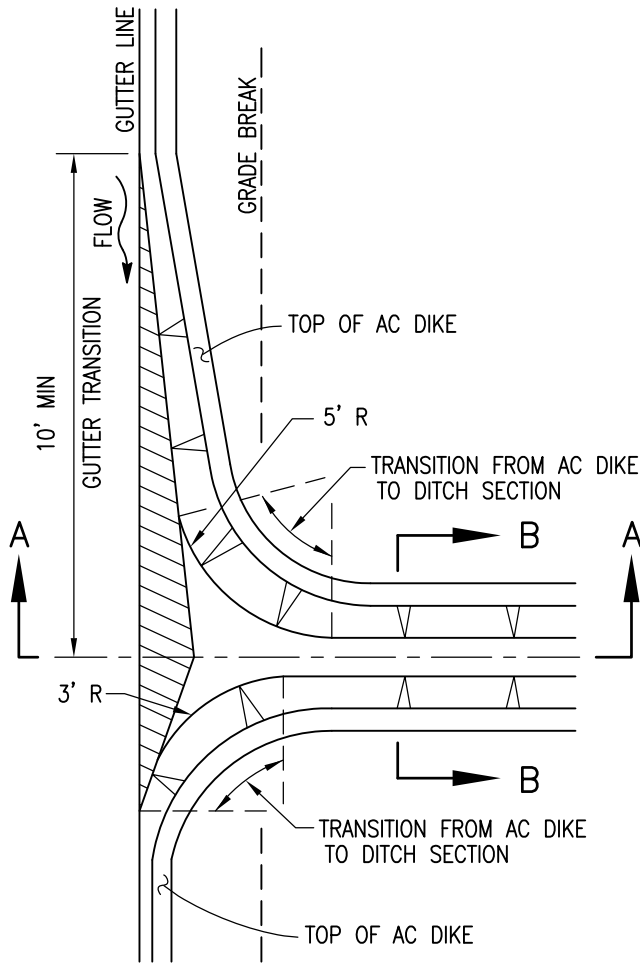
DRAWING NUMBER D-18



**NOTES**

1. EITHER FIELD JOINT WITH A PLIABLE MIXTURE OF SAND, PORTLAND CEMENT AND EMULSIFIED ASPHALT (MIXTURE OF 1 PART PORTLAND CEMENT, 3-5 PARTS SAND AND 1-1/2 PARTS SSI EMULSIFIED ASPHALT), OR CONTINUOUS WELD.
2. SEE D-18 FOR ADDITIONAL NOTES AND DETAILS.
3. SLOTTED DRAIN INSTALLATIONS SHALL BE ENCASED WITH 6" PCC 520-C-2500 ALL AROUND AND SHALL BE POURED MONOLITHICALLY WITH THE CURB AND GUTTER.

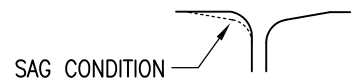
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		SLOTTED DRAIN CONNECTIONS TO STANDARD INLETS
Edited		T. Stanton	02/09		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18	DRAWING NUMBER <b>D-19</b>	



**NOTES**

1. AC SPILLWAY MAY BE USED WHEN FILL IS 10' OR LESS, AND WHERE FILL SLOPE IS 1-1/2:1 OR FLATTER.
2. USE 10' MIN LENGTH OF GUTTER TRANSITION ON EACH SIDE OF DOWNDRAIN IN SAG CONDITION.
3. CROSS SECTIONAL AREA OF DITCH (SECTION B-B) MAY BE TRAPEZOIDAL OR SEMI-CIRCULAR; SEMI-CIRCULAR SECTIONAL AREA MUST PROVIDE AN EQUAL FLOW CAPACITY AS TRAPEZOIDAL.

**LEGEND ON PLANS**



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

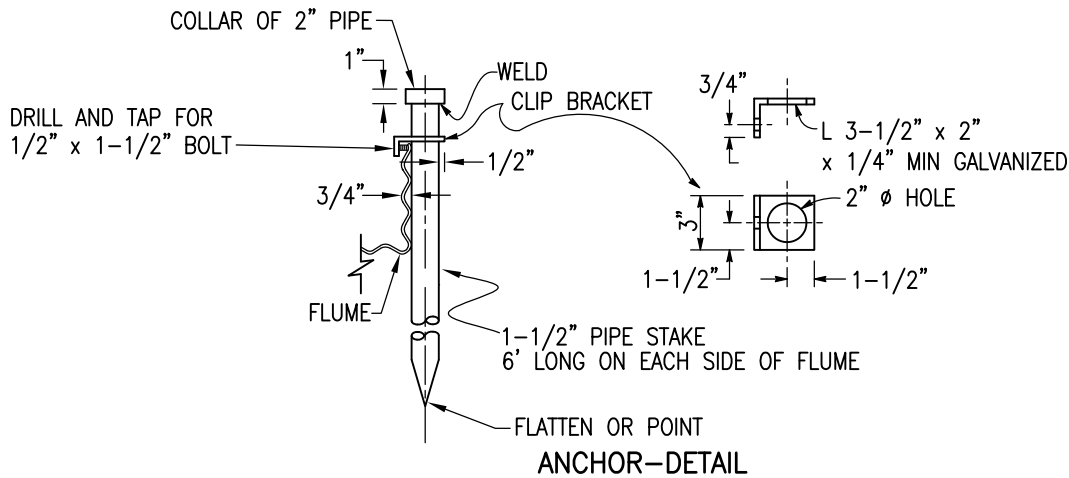
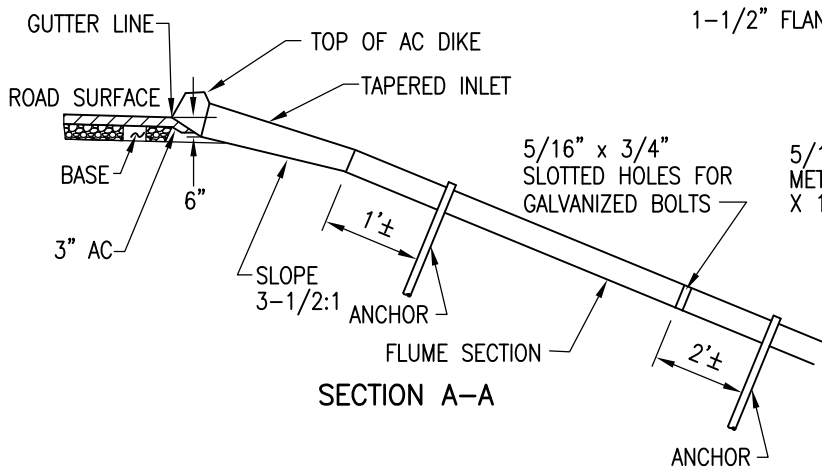
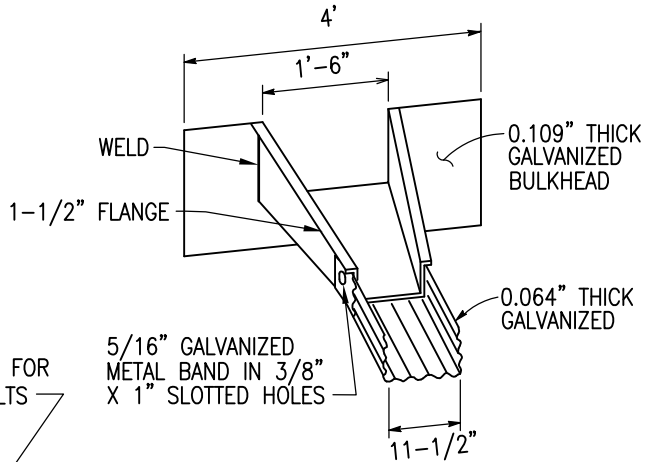
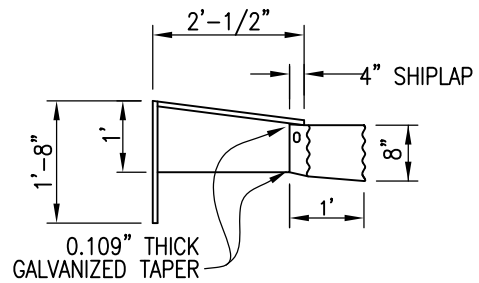
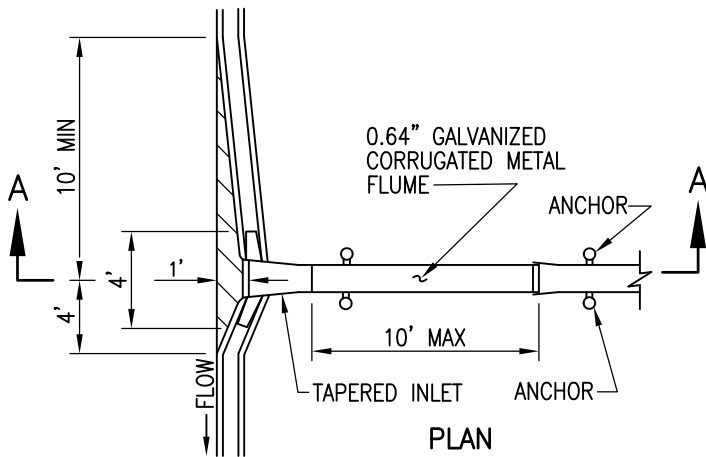
SAN DIEGO REGIONAL STANDARD DRAWING

ASPHALT CONCRETE SPILLWAY

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*T. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

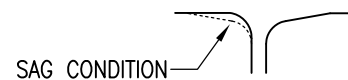
DRAWING NUMBER D-22




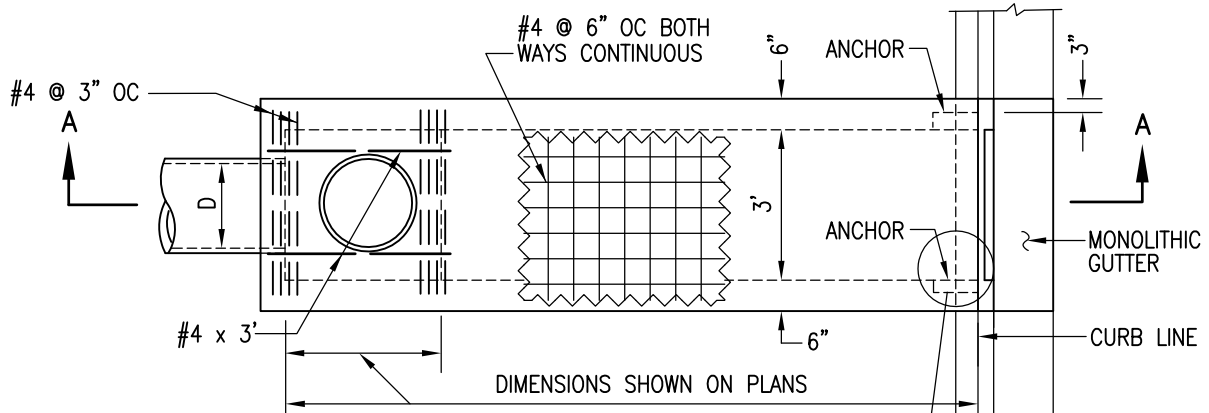
**NOTES**

1. DOWNDRAIN FLUME MAY BE USED WHERE FILL SLOPE IS 1-1/2:1 OR FLATTER.
2. USE 10' MIN LENGTH OF GUTTER TRANSITION ON EACH SIDE OF DOWNDRAIN IN SAG CONDITION.
3. ALL METAL PARTS TO BE GALVANIZED AFTER FABRICATION.

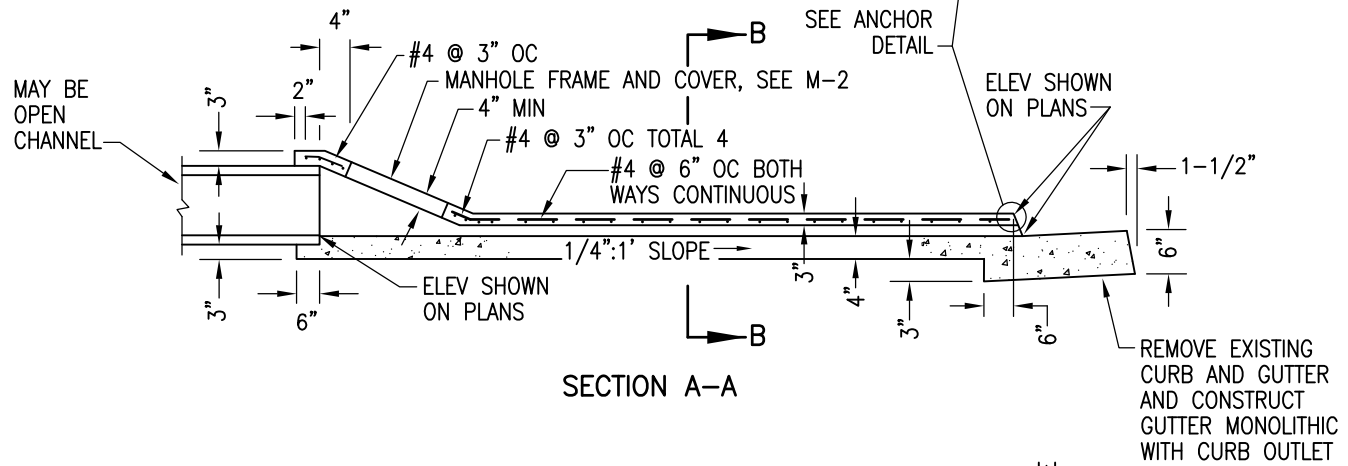
**LEGEND ON PLANS**



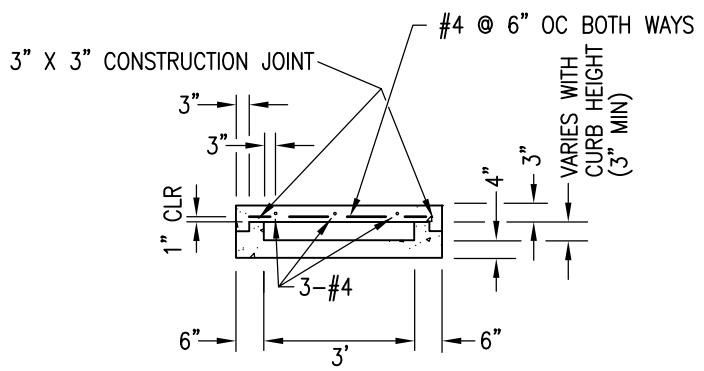
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited		T. Stanton	02/09	TAPERED INLET AND DOWNDRAIN FLUME	 10/25/2018 Chairperson R.C.E. 19246 Date
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
				DRAWING NUMBER	D-23



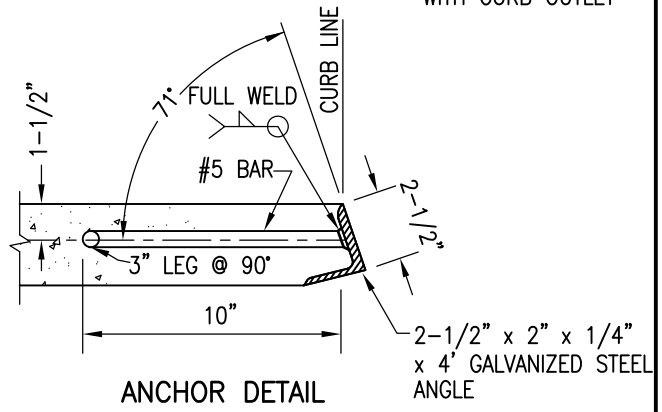
PLAN



SECTION A-A



SECTION B-B

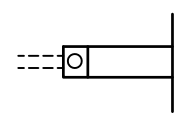


ANCHOR DETAIL

NOTES

1. CONCRETE SHALL BE 560-C-3250.
2. D = INSIDE DIAMETER OF PIPE OR DEPTH OF CHANNEL.
3. SECTION TO BE SLOPED Laterally WITH TOP CONFORMING TO THE GRADES OF THE EXISTING SIDEWALK AND CURB.
4. MANHOLE FRAME AND COVER MAY BE DELETED WITH OPEN CHANNEL.
5. TROWEL FINISH TOP SURFACE AND REPRODUCE MARKINGS OF EXISTING SIDEWALK AND CURB.
6. TROWEL FINISH FLOOR OF OUTLET.
7. PROVIDE 1/4" TOOLED GROOVE IN TOP SLAB IN LINE WITH BACK OF ADJACENT CURB.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Revised		T.Stanton	11/08
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

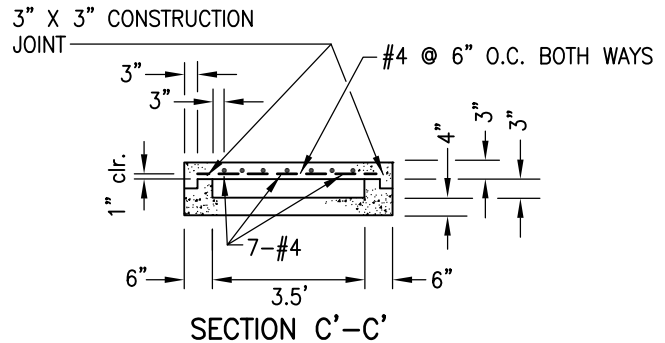
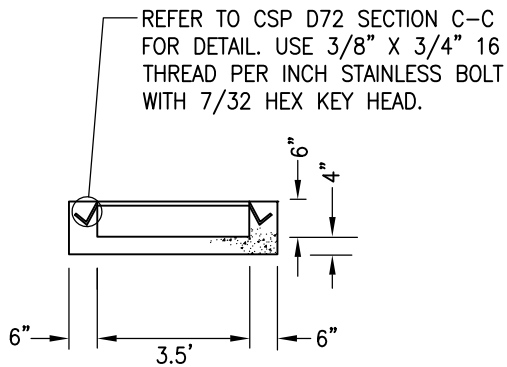
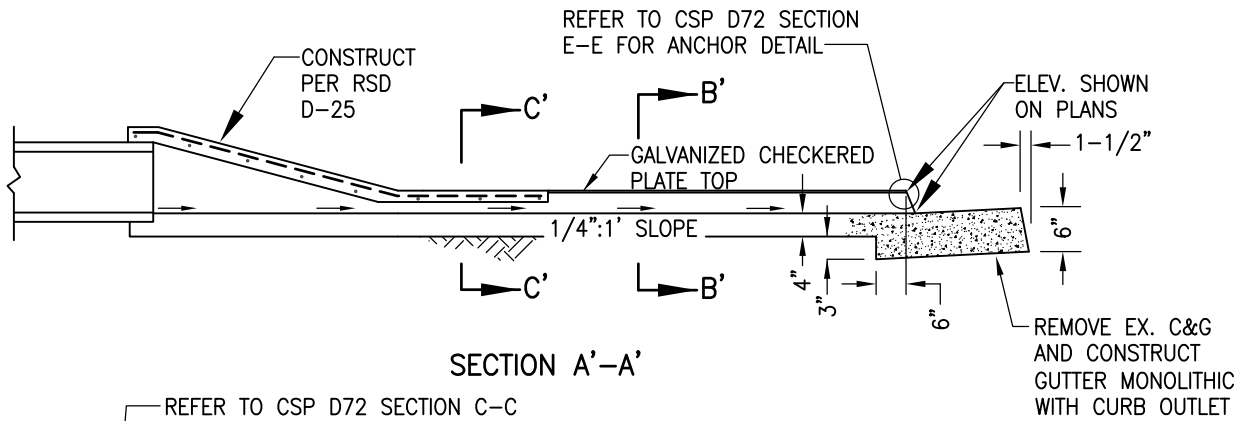
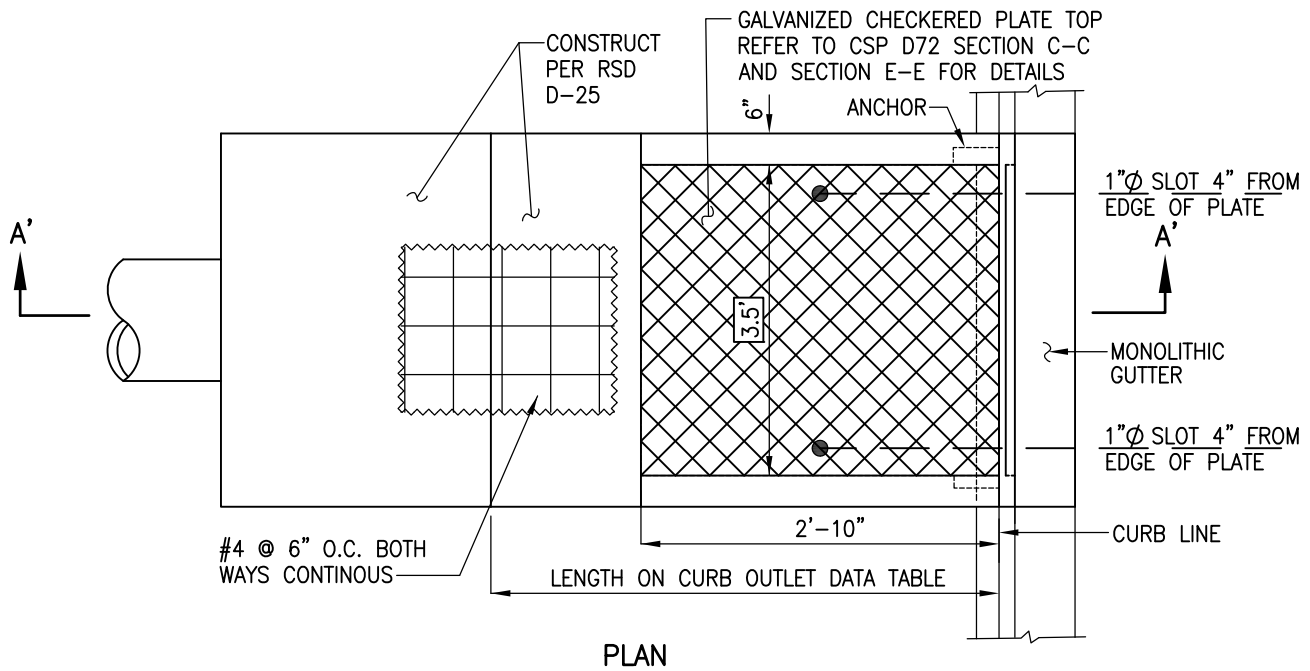
SAN DIEGO REGIONAL STANDARD DRAWING

CURB OUTLET - TYPE A

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER **D-25A**



**NOTES**

1. CONCRETE SHALL BE 560-C-3250.
2. SECTION TO BE SLOPED LATERALLY WITH TOP CONFORMING TO THE GRADES OF THE EXISTING SIDEWALK AND CURB.
3. TROWEL FINISH TOP SURFACE AND REPRODUCE MARKINGS OF EXISTING SIDEWALK AND CURB.
4. TROWEL FINISH FLOOR OF OUTLET.

Revision	By	Approved	Date
ORIGINAL		Widelski	8/18
Edited	M.W.	M. Widelski	10/18

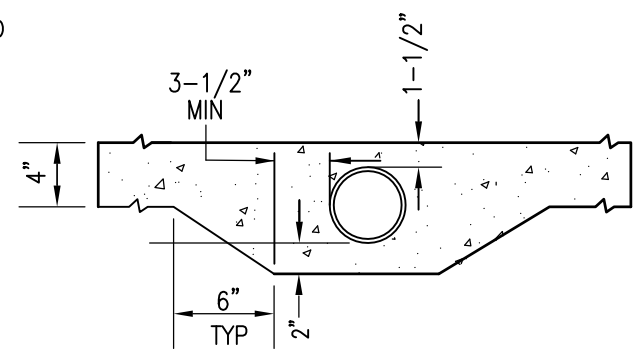
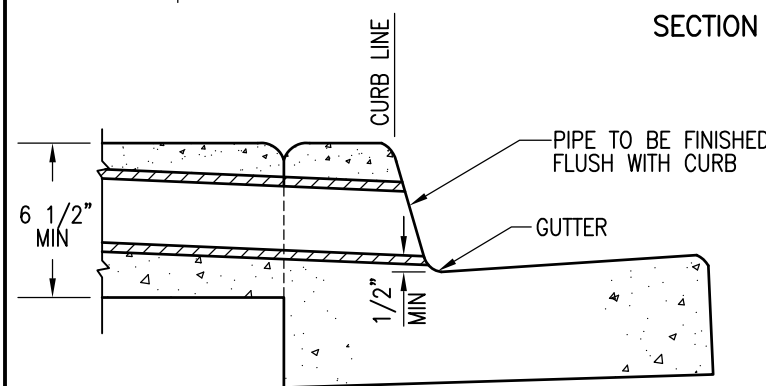
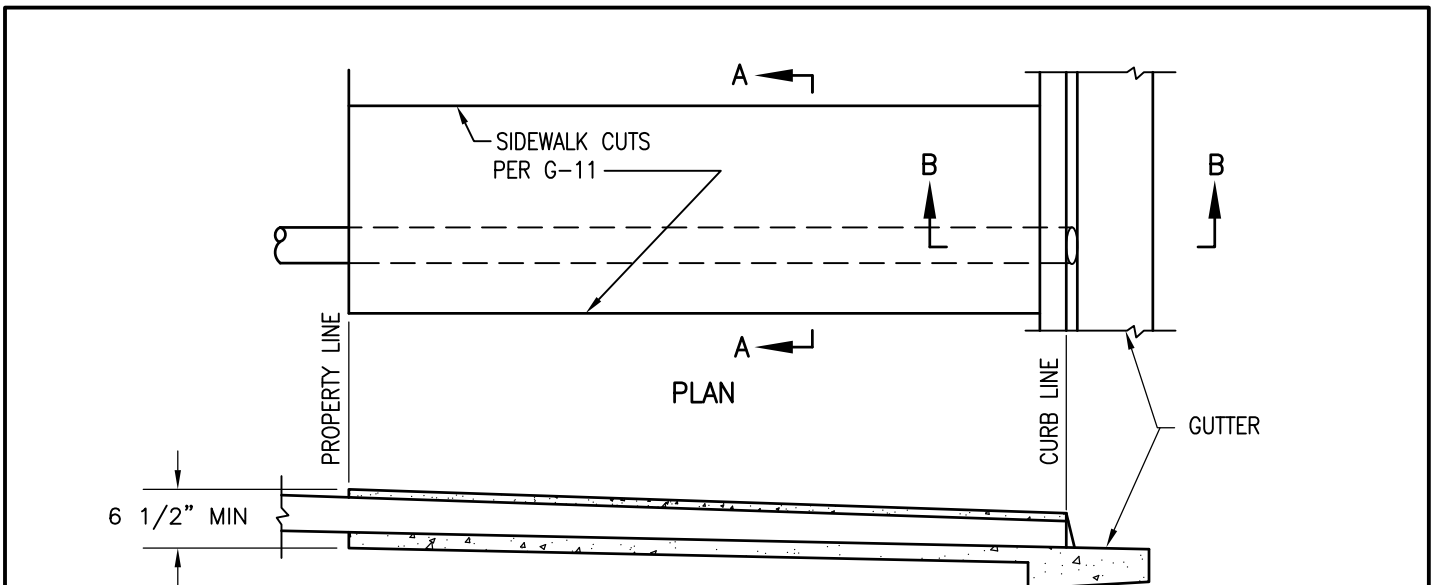
**SAN DIEGO REGIONAL STANDARD DRAWING**

**MODIFIED CURB OUTLET – TYPE B**

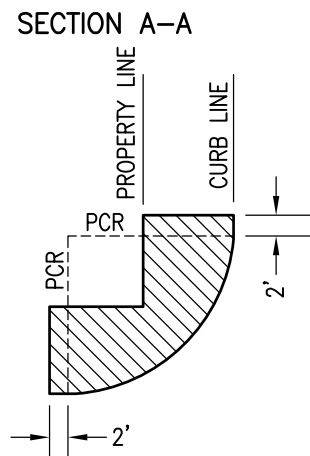
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

**DRAWING NUMBER D-25B**



APPROVED DRAIN PIPE SIZES	
PIPE SIZE	CURB HEIGHT AT CURB FACE
3"	6" TO 8"
4"	8"
6"	10"



**NOTES**

1. PIPE SHALL BE ONE CONTINUOUS LENGTH FROM PROPERTY LINE TO CURB LINE.
2. MULTIPLE PIPES TO BE SET A MINIMUM DISTANCE OF D/2 APART (3 MAX).
3. CONCRETE SHALL BE 520-C-2500.
4. PIPE SHALL BE CIRCULAR RIGID PLASTIC OR APPROVED EQUAL.
5. CORING OF EXISTING CURB MAY BE USED AS AN ALTERNATIVE.
6. PROVIDE 1/4" TOOLED GROOVE IN TOP SLAB IN LINE WITH BACK OF ADJACENT CURB.

DRAIN SHALL NOT BE CONSTRUCTED WITHIN THE HATCHED AREA  
**BLOCK CORNER**

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reformatted		T.Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

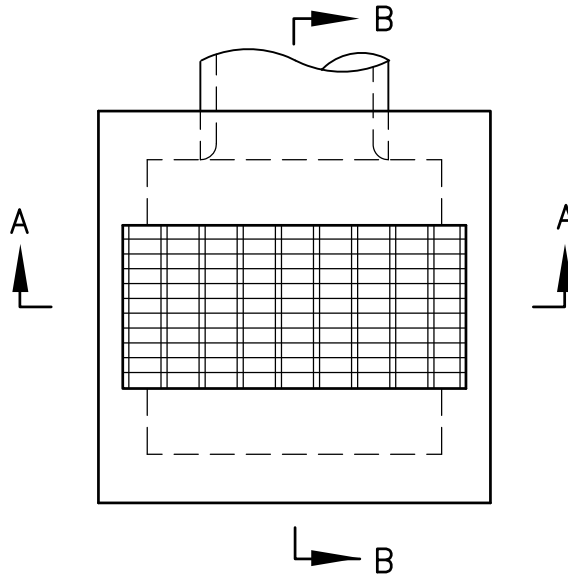
SAN DIEGO REGIONAL STANDARD DRAWING

SIDEWALK UNDERDRAIN PIPE

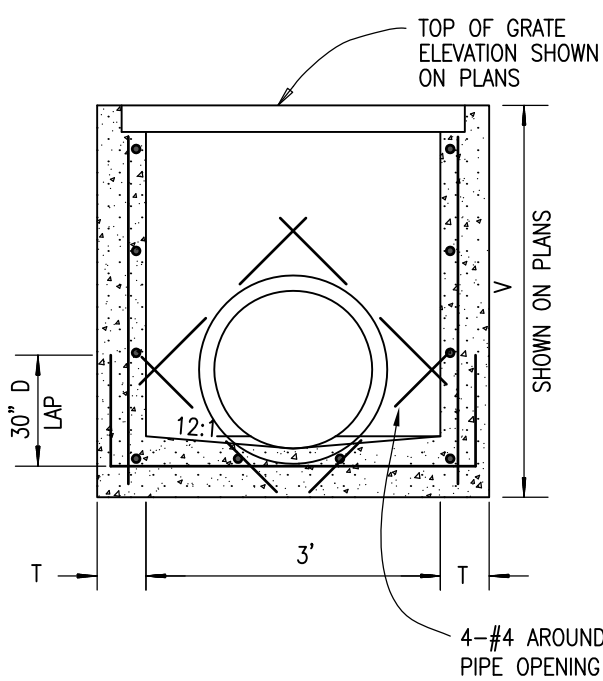
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

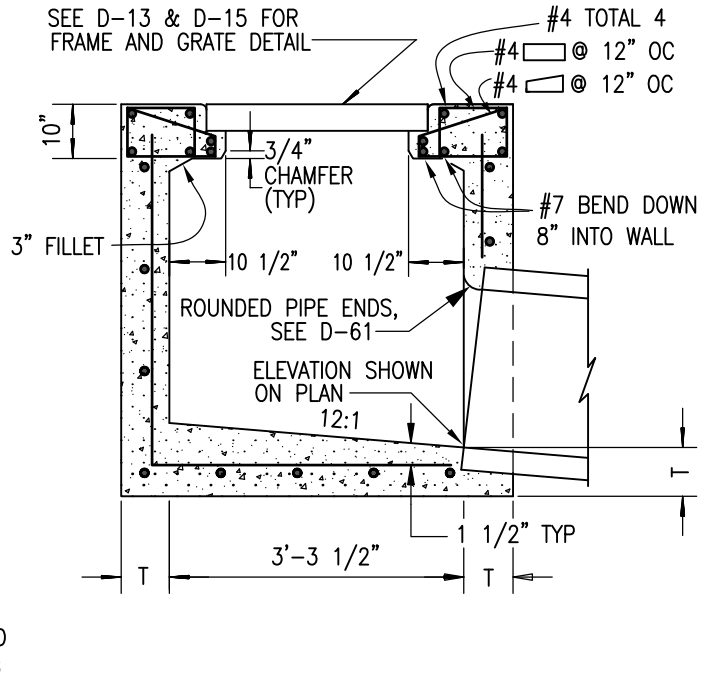
DRAWING NUMBER D-27



PLAN



SECTION A-A

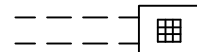


SECTION B-B

NOTES

1. A TYPE I CATCH BASIN IS SPECIFIED FOR LARGE DIAMETER PIPES OR FOR HEAVY TRAFFIC LOADS (NOTES EXTRA STEEL REINFORCEMENT IN UPPER CORNERS).
2. SEE D-11A & D-11B FOR ADDITIONAL NOTES AND DETAILS.
3. WHEN V EXCEEDS 4', STEPS SHALL BE INSTALLED PER D-11A.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Solomon	7/79
Reformatted		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

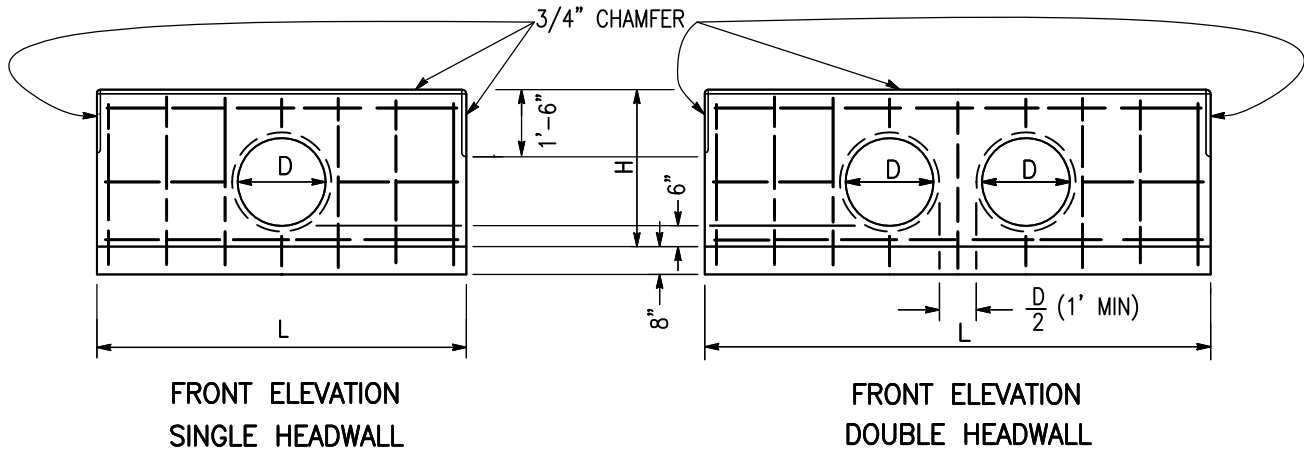
CATCH BASIN - TYPE I

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

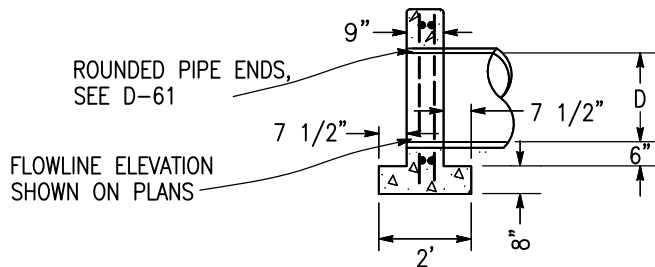
DRAWING NUMBER D-29





FRONT ELEVATION  
SINGLE HEADWALL

FRONT ELEVATION  
DOUBLE HEADWALL



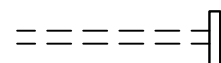
SECTION, SINGLE &  
DOUBLE HEADWALLS

D	H	SINGLE			DOUBLE		
		L	STEEL (POUNDS)	CONCRETE (C.Y.)	L	STEEL (POUNDS)	CONCRETE (C.Y.)
12"	2'-8"	5'	35	0.60	8'	50	0.94
15"	2'-11"	6'	40	0.75	9'-6"	60	1.17
18"	3'-2"	7'	50	0.91	10'-6"	75	1.35
21"	3'-5"	7'-6"	60	1.02	11'-6"	90	1.52
24"	3'-8"	8'-6"	75	1.20	12'-6"	100	1.72
27"	3'-11"	9'-6"	85	1.39	14'	115	2.00
30"	4'-2"	10'	85	1.52	15'	126	2.21
33"	4'-5"	11'	100	1.73	16'	130	2.42
36"	4'-8"	12'	105	1.95	17'	145	2.65
39"	4'-11"	12'-6"	130	2.09	18'	170	2.88
42"	5'-2"	13'-6"	140	2.34	19'	185	3.13
45"	5'-5"	14'-6"	150	2.60	20'	195	3.38
48"	5'-8"	15'	160	2.75	21'	200	3.64
51"	5'-11"	16'	180	3.03	22'-6"	225	4.02
54"	6'-2"	17'	190	3.31	23'-6"	240	4.30

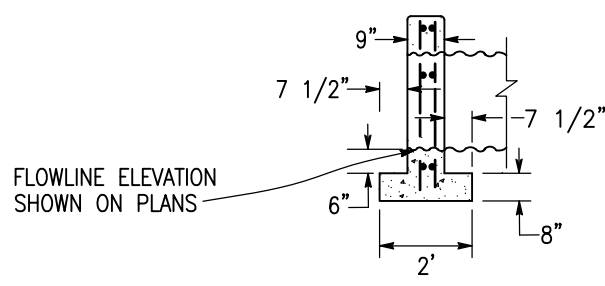
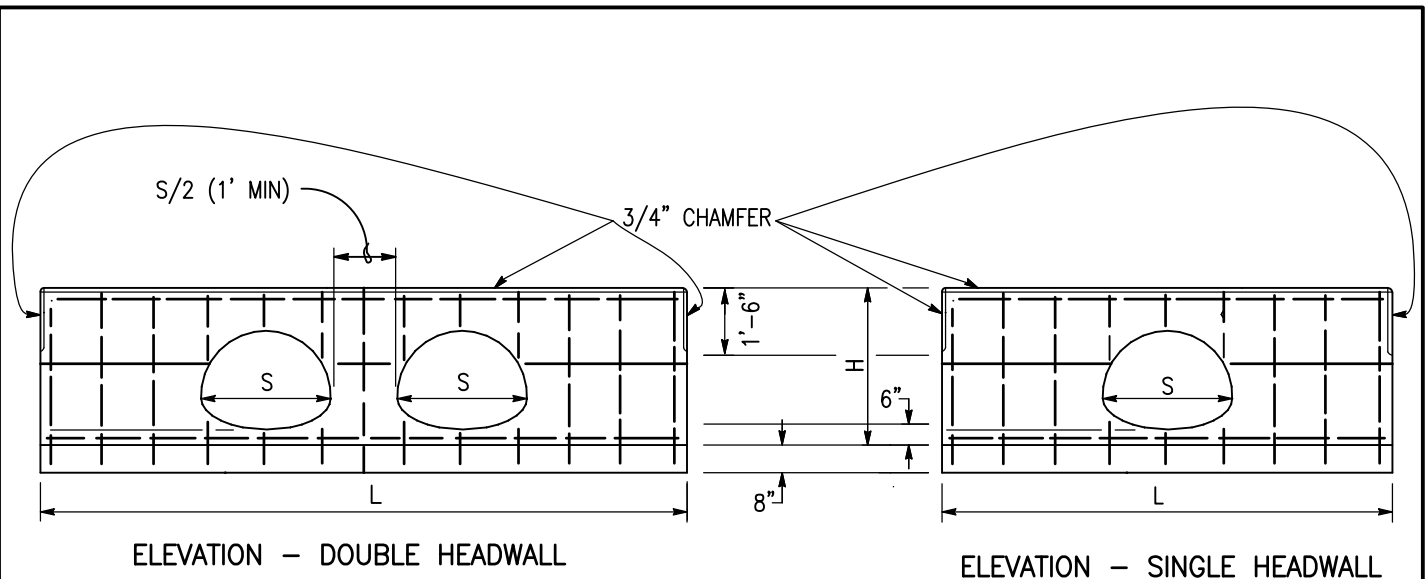
NOTES

1. CONCRETE SHALL BE 560-C-3250.
2. ALL REINFORCING SHALL BE #4 BARS. ALL VERTICAL AND HORIZONTAL TIE BARS @ 18" MAXIMUM SPACING.
3. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

LEGEND ON PLANS



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		STRAIGHT HEADWALL - TYPE A [CIRCULAR PIPE]
Edited		T. Stanton	02/09	DRAWING NUMBER D-30	
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		

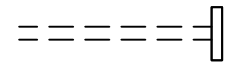


C.S.P. ARCH SIZE (INCHES)	SINGLE				DOUBLE		
	H (FT/IN)	L (FT/IN)	STEEL (POUNDS)	CONCRETE (C.Y.)	L (FT/IN)	STEEL (POUNDS)	CONCRETE (C.Y.)
18x11	2'-7"	5'-6"	37	0.64	8'	52	0.91
21x15	2'-11"	6'-6"	45	0.80	10'	60	1.22
24x18	3'-2"	7'-6"	50	0.96	11'-6"	70	1.45
28x20	3'-4"	8'-6"	60	1.12	13'-6"	90	1.76
35x24	3'-8"	10'-6"	85	1.47	15'-6"	120	2.16
42x29	4'-1"	12'-6"	110	1.76	18'	145	2.57
49x33	4'-5"	14'-6"	130	2.26	21'	170	3.13
57x38	4'-10"	17'	155	2.81	24'-6"	210	3.86
64x43	5'-3"	19'	175	3.31	27'	230	4.42
71x47	5'-7"	21'	195	3.81	30'	255	5.09

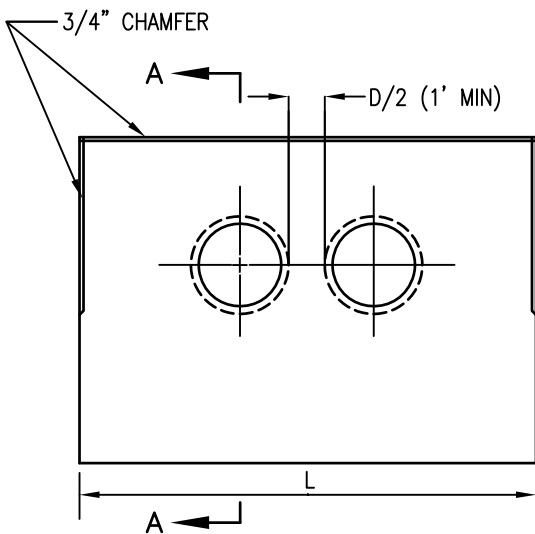
**NOTES**

1. CONCRETE SHALL BE 560-C-3250.
2. ALL REINFORCING SHALL BE #4 BARS. ALL VERTICAL AND HORIZONTAL TIE BARS @ 18" MAXIMUM SPACING.
3. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

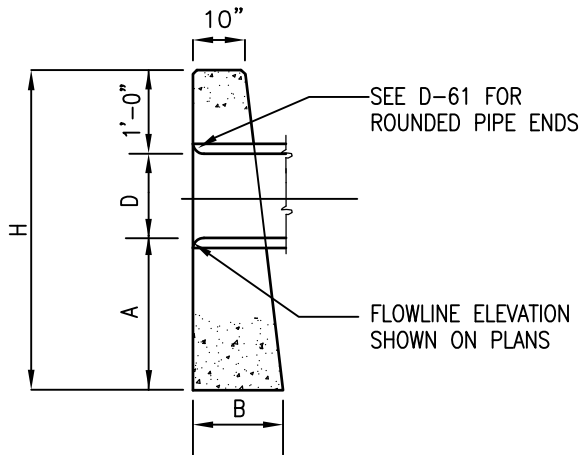
**LEGEND ON PLANS**



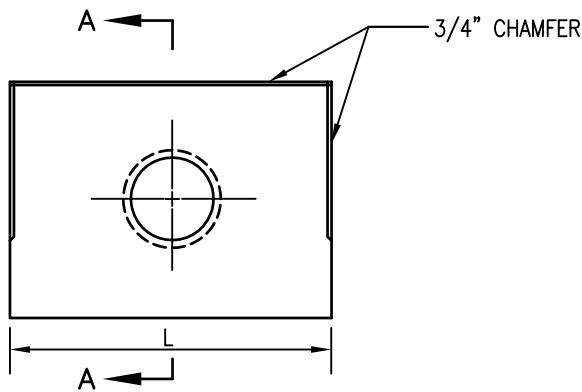
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		STRAIGHT HEADWALL - TYPE A [CORRUGATED STEEL PIPE - ARCH]
Edited		T. Stanton	02/09	DRAWING NUMBER D-31	
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		



DOUBLE PIPE ELEVATION



SECTION A-A



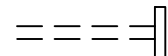
SINGLE PIPE ELEVATION

D	A	B	H	SINGLE		DOUBLE	
				L	CONCRETE (C.Y.)	L	CONCRETE (C.Y.)
12"	2'	1'	4'	4'	0.45	5'-8"	.62
15"	2'	1'-1"	4'-3"	5'	0.63	7'-1"	.85
18"	2'	1'-2"	4'-6"	6'	0.83	8'-6"	1.12
24"	2'-6"	1'-5"	5'-6"	8'	1.54	11'-4"	2.09
30"	2'-6"	1'-9"	6'	10'	2.41	14'-2"	3.26
36"	3'	2'	7'	12'	3.74	17'	5.05

NOTES

1. CONCRETE SHALL BE 560-C-3250.
2. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	T. Regello	10/18

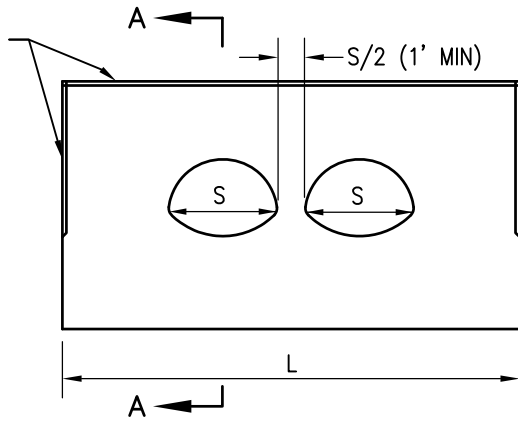
SAN DIEGO REGIONAL STANDARD DRAWING

STRAIGHT HEADWALL - TYPE B  
[CIRCULAR PIPE]

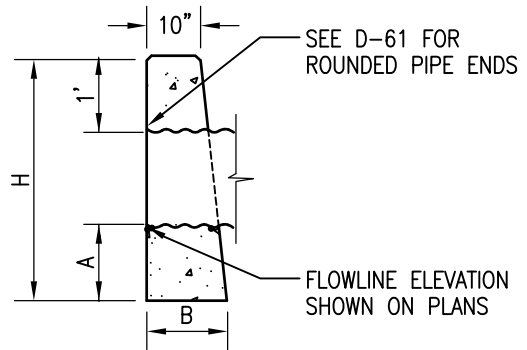
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*T. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

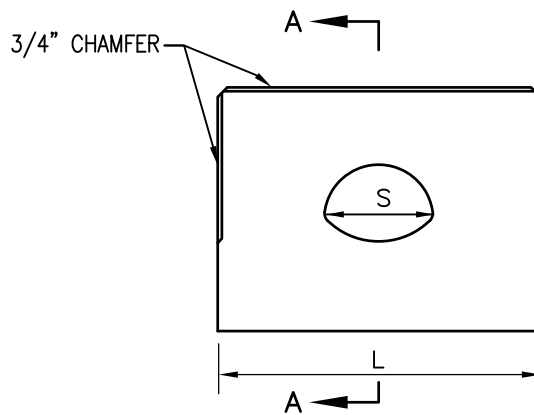
DRAWING NUMBER D-32



DOUBLE PIPE  
ELEVATION



SECTION A-A



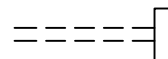
SINGLE PIPE  
ELEVATION

CSP ARCH SIZE	A	B	H	SINGLE		DOUBLE	
				L	CONCRETE (C.Y.)	L	CONCRETE (C.Y.)
18" x 11"	2'	1'-2"	3'-11"	6'	0.83	7'-3"	0.97
21" x 15"	2'	1'-4"	4'-3"	7'	1.08	9'-8"	1.46
24" x 18"	2'	1'-6"	4'-6"	8'	1.41	11'-6"	1.98
28" x 20"	2'-6"	1'-8"	5'-2"	9'	1.97	12'-6"	2.66
35" x 24"	2'-6"	2'	5'-6"	10'	2.56	14'-5"	3.60

NOTES

1. CONCRETE SHALL BE 560-C-3250.
2. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	T.R.	M. Widelski	10/18

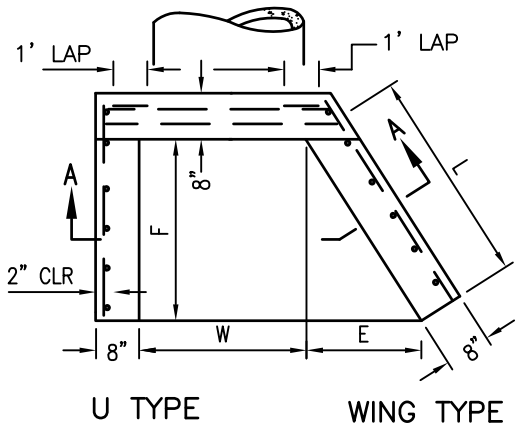
SAN DIEGO REGIONAL STANDARD DRAWING

STRAIGHT HEADWALL - TYPE B  
[CORRUGATED STEEL PIPE - ARCH]

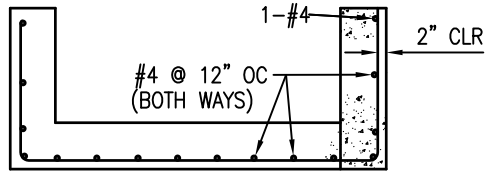
RECOMMENDED BY THE SAN DIEGO  
REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

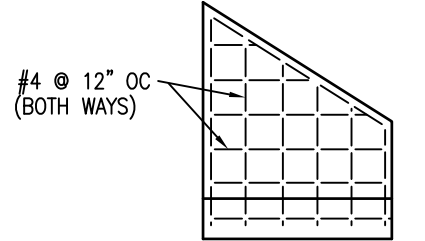
DRAWING  
NUMBER D-33



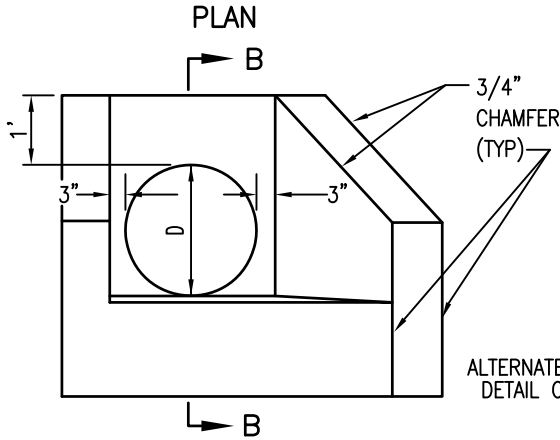
U TYPE WING TYPE



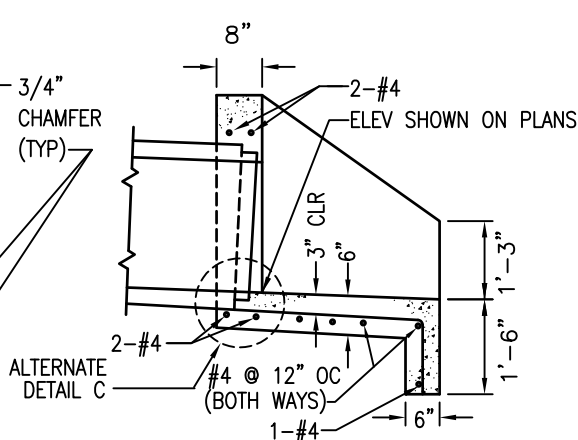
SECTION A-A



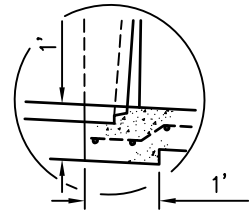
WING WALL REINFORCING



ELEVATION



SECTION B-B



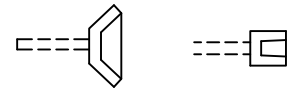
ALT DETAIL C

Ø OF PIPE	DIMENSIONS			SINGLE PIPE				DOUBLE PIPE					
				W	U TYPE		WING TYPE		W	U TYPE		WING TYPE	
	L	E	F		CONC. (CY)	STEEL (LBS)	CONC. (CY)	STEEL (LBS)		CONC. (CY)	STEEL (LBS)	CONC. (CY)	STEEL (LBS)
18"	2'-3 1/8"	1'-3"	1'-10 1/2"	2'	0.55	35	0.63	43	AS SHOWN ON PLANS	0.82	53	0.90	61
24"	3'-1 7/8"	1'-9"	2'-7 1/2"	2'-6"	0.79	47	0.93	60		1.22	73	1.36	86
30"	4'-5/8"	2'-3"	3'-4 1/2"	3'	1.05	71	1.29	85		1.66	109	1.92	123
36"	4'-11 1/2"	2'-9"	4'-1 1/2"	3'-6"	1.33	88	1.69	114		2.19	136	2.55	162

NOTES

1. CONCRETE SHALL BE 560-C-3250.
2. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.
3. MULTIPLE PIPES SHALL BE SET A DISTANCE OF D/2, WITH A 1' MIN BETWEEN OUTSIDE DIAMETERS OF PIPES.
4. TOP OF HEADWALL SHALL BE PLACED APPROXIMATELY PARALLEL TO PROFILE GRADE WHEN THE GRADE IS 3% OR MORE.
5. SKEWED PIPES: DIMENSION W SHALL BE INCREASED IN WIDTH OR LENGTH DUE TO SKEW OR MULTIPLE PIPES.
6. USE ALTERNATE DETAIL C FOR PIPE WALL THICKNESS GREATER THAN 3".

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reformatted		T. Stanton	04/06
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15

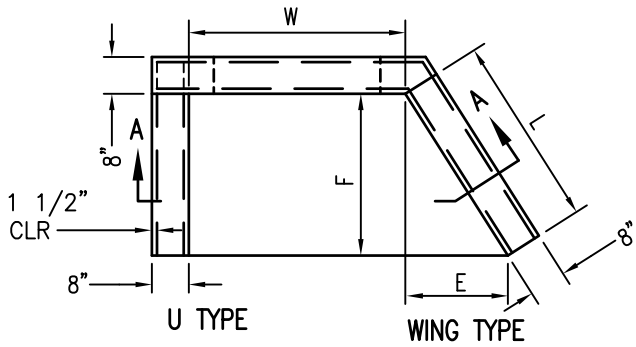
SAN DIEGO REGIONAL STANDARD DRAWING

WING AND U TYPE HEADWALLS FOR 18" TO 36" PIPES

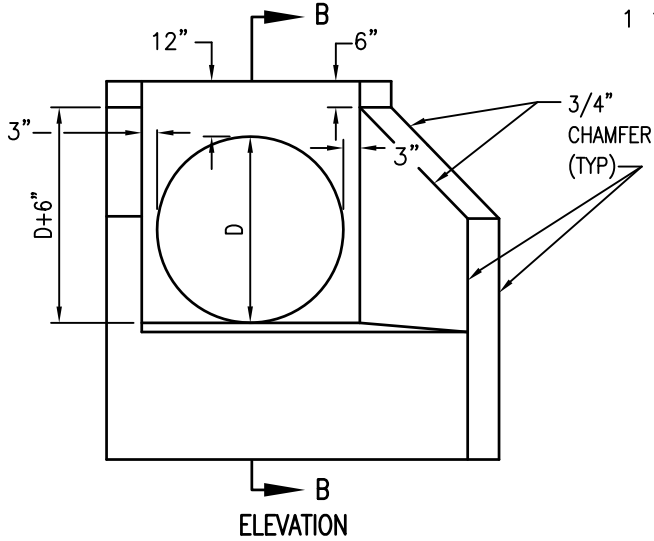
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

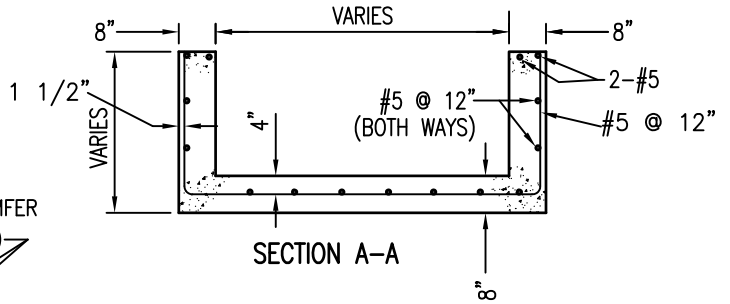
DRAWING NUMBER D-34



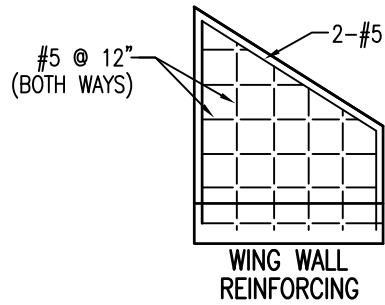
PLAN



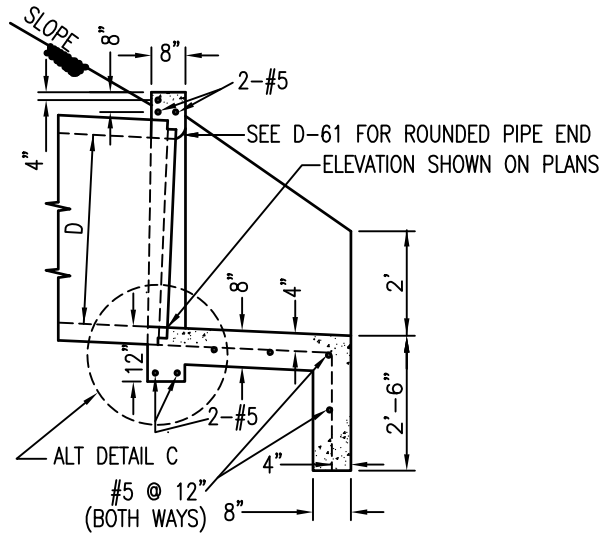
B ELEVATION



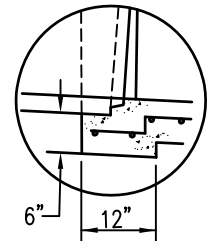
SECTION A-A



WING WALL REINFORCING

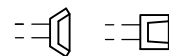


SECTION B-B



ALT DETAIL C

LEGEND ON PLANS



NOTE

SEE D-35B FOR DIMENSION TABLE AND GENERAL NOTES.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

WING AND U TYPE HEADWALLS  
FOR 42" TO 84" PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-35A

**TABLE OF DIMENSIONS AND QUANTITIES  
FOR HEADWALLS SHOWN ON D-35A**

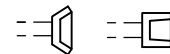
NOTE: DIMENSIONS E AND L APPLY TO WING TYPE ONLY.


Ø OF PIPE	DIMENSIONS			SINGLE PIPE				DOUBLE PIPE					
				W	U TYPE		WING TYPE		W	U TYPE		WING TYPE	
	L	E	F		CONC. (CY)	STEEL (LBS)	CONC. (CY)	STEEL (LBS)		CONC. (CY)	STEEL (LBS)	CONC. (CY)	STEEL (LBS)
42"	3'-7 1/4"	2'	3'	4'	1.57	117	1.90	135	10'	2.69	190	3.16	214
48"	4'-6"	2'-6"	3'-9"	4'-6"	1.97	153	2.48	184	11'-4"	3.43	252	4.06	288
54"	5'-4 7/8"	3'	4'-6"	5'	2.41	190	3.07	246	12'-8"	4.24	319	5.06	368
60"	6'-3 3/4"	3'-6"	5'-3"	5'-6"	2.88	239	3.75	294	14'	5.13	386	6.17	442
66"	7'-2 1/2"	4'	6'	6'	3.38	294	4.52	356	15'-4"	6.08	454	7.20	516
72"	8'-1 3/8"	4'-6"	6'-9"	6'-6"	3.93	368	5.52	417	16'-8"	7.11	522	8.30	588
78"	9'	5'	7'-6"	7'	4.50	444	6.70	503	18'	8.20	595	9.50	693
84"	9'-10 3/4"	5'-6"	8'-3"	7'-6"	5.21	540	8.15	619	19'-4"	9.50	687	10.80	786

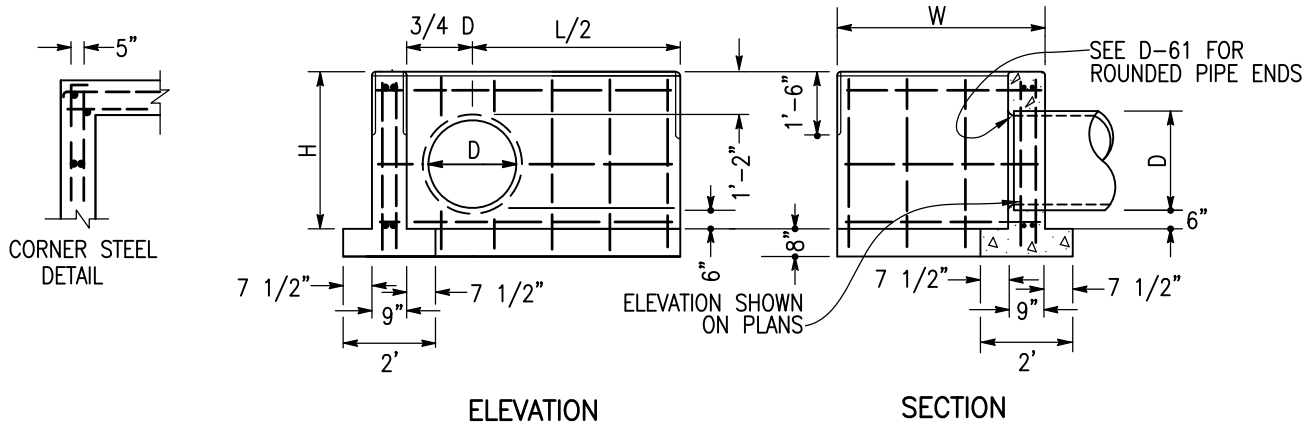
**NOTES**

1. SKEWED PIPES: DIMENSION W TO BE INCREASED TO TAKE CARE OF INCREASED WIDTH OR LENGTH DUE TO SKEW OF MULTIPLE PIPES.
2. TOP OF HEADWALL SHALL BE PLACED APPROXIMATELY PARALLEL TO PROFILE GRADE WHEN THE GRADE IS 3% OR MORE.
3. CONCRETE SHALL BE 560-C-3250.
4. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.
5. MULTIPLE PIPES SHALL BE SET A DISTANCE OF D/2, WITH A 1' MINIMUM, BETWEEN OUTSIDE DIAMETERS OF PIPES.
6. USE ALTERNATE DETAIL C FOR PIPE WALL THICKNESS GREATER THAN 3".

**LEGEND ON PLANS**



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited		T. Stanton	02/09	WING AND U TYPE HEADWALLS FOR 42" TO 84" PIPE	 10/25/2018 Chairperson R.C.E. 19246 Date
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
				DRAWING NUMBER	D-35B

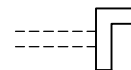


D	H	L/2	W									
			3'-4"		4'-10"		6'-4"		7'-10"		9'-4"	
			STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)
12"	2'-8"	2'-6"	50	0.79	60	0.98	—	—	—	—	—	—
15"	2'-11"	3'	55	0.91	65	1.11	—	—	—	—	—	—
18"	3'-2"	3'-6"	65	1.04	75	1.25	—	—	—	—	—	—
21"	3'-5"	3'-9"	75	1.15	90	1.36	—	—	—	—	—	—
24"	3'-8"	4'-3"	85	1.29	100	1.51	110	1.74	—	—	—	—
27"	3'-11"	4'-9"	90	1.44	105	1.67	115	1.91	—	—	—	—
30"	4'-2"	5'	95	1.55	110	1.80	120	2.05	135	2.29	—	—
33"	4'-5"	5'-6"	105	1.71	120	1.97	135	2.23	150	2.48	—	—
36"	4'-8"	6'	110	1.88	125	2.15	140	2.41	155	2.68	170	2.95
39"	4'-11"	6'-3"	—	—	150	2.28	170	2.56	185	2.84	200	3.12
42"	5'-2"	6'-9"	—	—	155	2.42	175	2.76	190	3.05	210	3.34
45"	5'-5"	7'-3"	—	—	—	—	180	2.97	200	3.27	215	3.57
48"	5'-8"	7'-6"	—	—	—	—	190	3.13	216	3.44	230	3.75
51"	5'-11"	8'	—	—	—	—	—	—	220	3.67	235	3.99
54"	6'-2"	8'-6"	—	—	—	—	—	—	235	3.91	250	4.24

**NOTES**

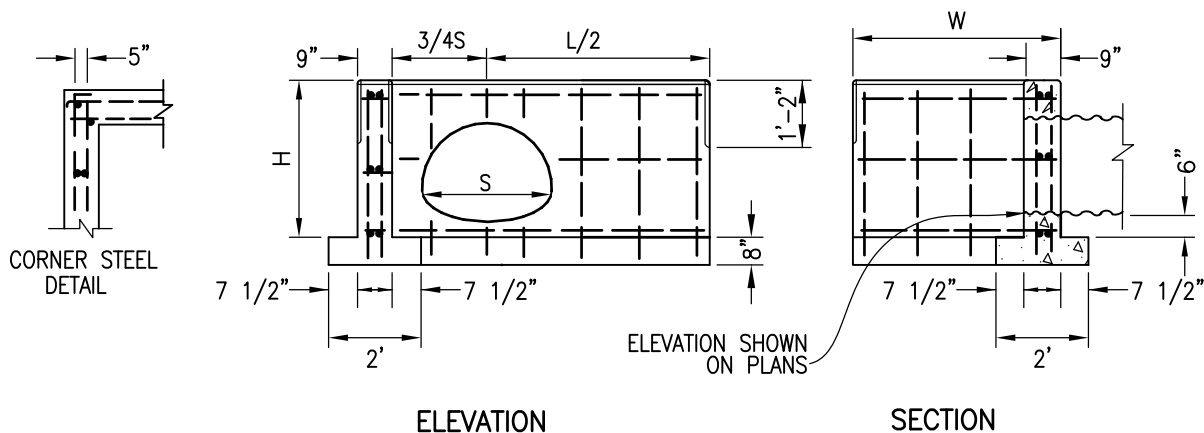
1. CONCRETE SHALL BE 560-C-3250.
2. ALL REINFORCING STEEL SHALL BE #4 BARS. ALL VERTICAL AND HORIZONTAL TIE BARS SHALL HAVE 18" MAXIMUM SPACING.
3. WHEN MULTIPLE PIPES ARE USED, THE DISTANCE BETWEEN PIPES SHALL BE D/2 (1' MIN). THE DIMENSION L/2 IS FROM THE CENTER OF THE PIPE TO THE END OF THE HEADWALL AS SHOWN.
4. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

**LEGEND ON PLANS**



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		L TYPE HEADWALLS [CIRCULAR PIPES]
Edited		T. Stanton	02/09		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18	DRAWING NUMBER D-36	



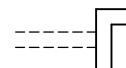


CSP ARCH SIZE	H	L/2	LENGTH OF W									
			3'-4"		4'-10"		6'-4"		7'-10"		9'-4"	
			STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)
18"x11"	2'-7"	2'-9"	50	0.84	60	1.03	70	1.21	80	1.39	90	1.57
21"x15"	2'-11"	3'-3"	60	1.00	65	1.18	75	1.38	90	1.58	100	1.77
24"x18"	3'-2"	3'-9"	60	1.07	70	1.32	80	1.53	95	1.74	110	1.94
28"x20"	3'-4"	4'-3"	70	1.26	80	1.47	90	1.68	100	1.90	115	2.11
35"x24"	3'-8"	5'-3"	100	1.51	110	1.74	120	1.97	140	2.20	155	2.42
42"x29"	4'-1"	6'-3"	115	1.82	130	2.06	140	2.31	155	2.55	170	2.83
49"x33"	4'-5"	7'-3"	130	2.12	145	2.37	155	2.64	170	2.90	185	3.15
57"x38"	4'-10"	8'-6"	145	2.52	160	2.79	175	3.07	190	3.35	205	3.61
64"x43"	5'-3"	9'-6"	185	2.89	200	3.11	215	3.48	235	3.77	250	4.06
71"x47"	5'-7"	10'-6"	200	3.25	215	3.56	235	3.86	250	4.17	270	4.48

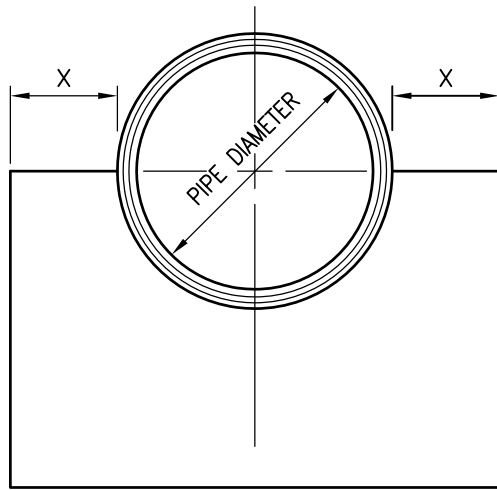
**NOTES**

1. CONCRETE SHALL BE 560-C-3250.
2. ALL REINFORCING STEEL SHALL BE #4 BARS. ALL VERTICAL AND HORIZONTAL TIE BARS SHALL HAVE 18" MAXIMUM SPACING.
3. WHEN MULTIPLE PIPES ARE USED, THE DISTANCE BETWEEN PIPES SHALL BE S/2 (1' MIN). THE DIMENSION L/2 IS FROM THE CENTER OF THE PIPE TO THE END OF THE HEADWALL AS SHOWN.
4. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

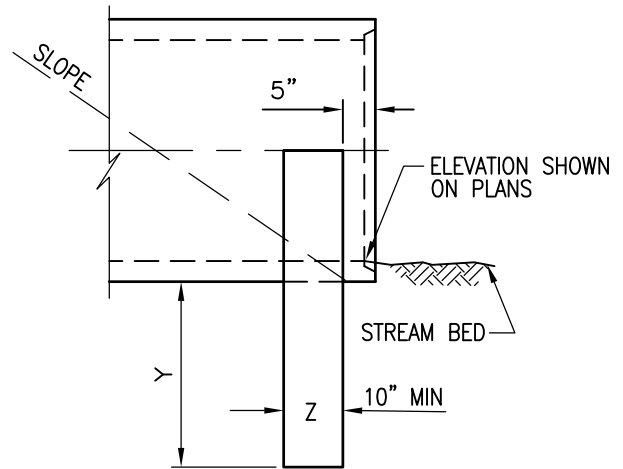
**LEGEND ON PLANS**



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Reformatted		T. Stanton	04/06	L TYPE HEADWALLS [CORRUGATED STEEL PIPE - ARCH]	<i>M. Heaton</i> 10/25/2018 Chairperson R.C.E. 19246 Date
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
					DRAWING NUMBER D-37



FACE ELEVATION



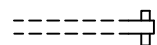
SIDE ELEVATION

PIPE DIAMETER	X	Y	Z
12" TO 24"	1'	2'	10"
21" TO 36"	1'-6"	2'-6"	12"
39" TO 48"	2'	3'	12"
51" TO 60"	2'-6"	3'	14"
63" & LARGER	3'	3'	14"

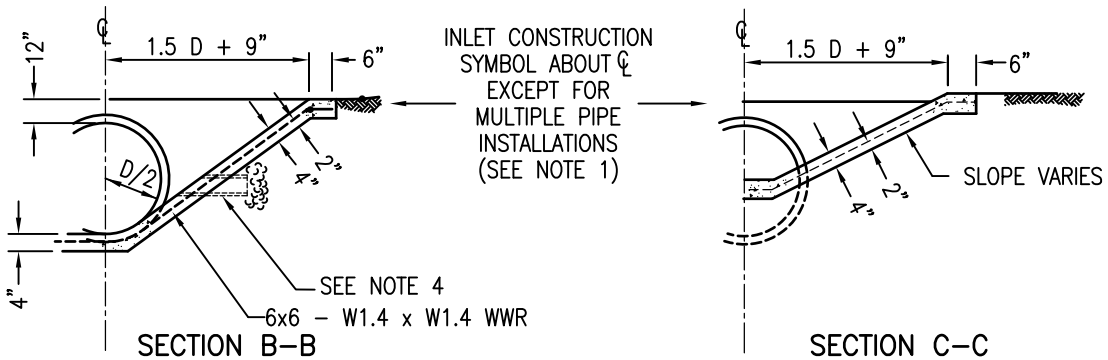
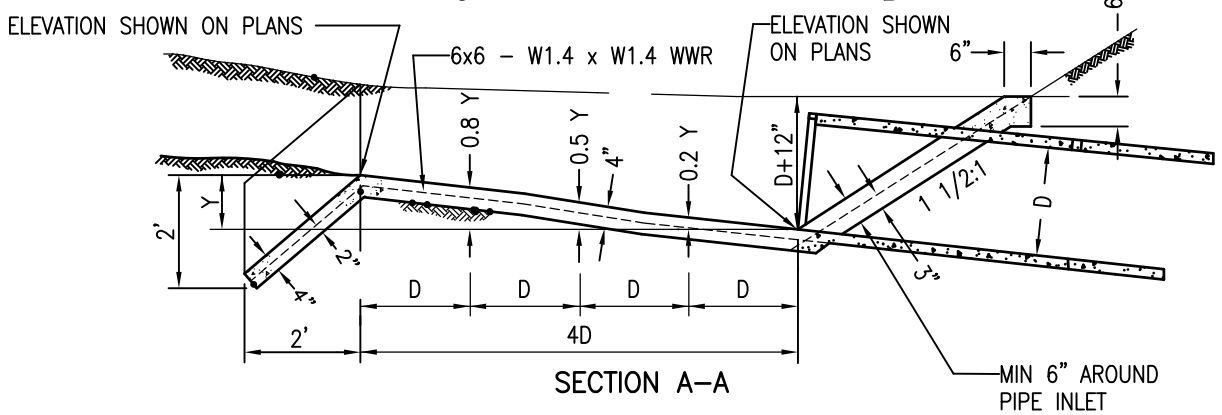
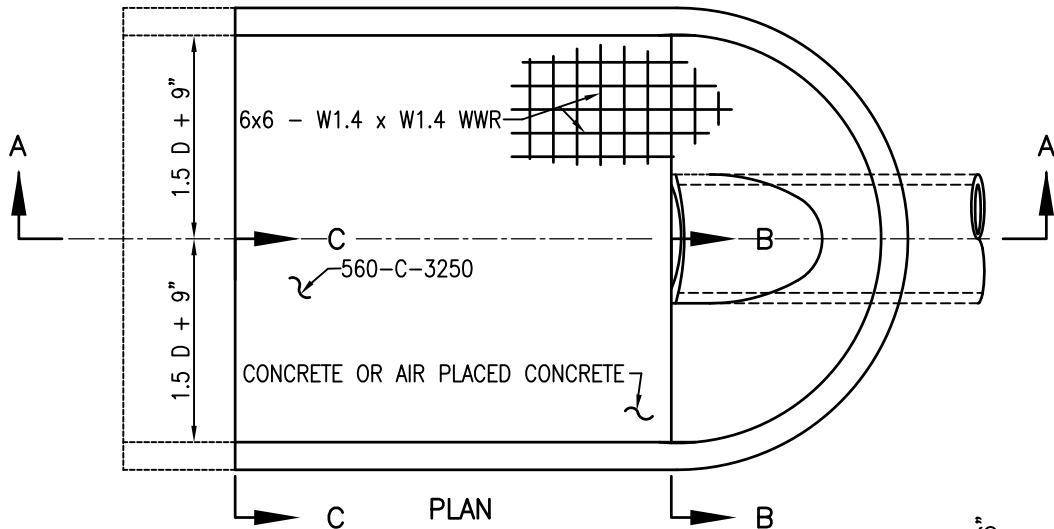
**NOTES**

1. USE A CURTAIN WALL AT THE END OF A CULVERT INSTEAD OF A HEADWALL WHEN IT IS LIKELY THAT THE CULVERT WILL BE EXTENDED IN THE NEAR FUTURE, OR WHEN A HEADWALL IS NOT NEEDED TO RETAIN THE PIPE BACKFILL.
2. CONCRETE SHALL BE 560-C-3250.
3. KEEP THE PIPE-END CLEAR OF OBSTRUCTIONS TO PERMIT EASY PLACING OF CULVERT EXTENSION.

**LEGEND ON PLANS**



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		CURTAIN WALL
Reformatted		T. Stanton	04/06		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
					 10/25/2018 Chairperson R.C.E. 19246 Date
					DRAWING NUMBER D-38



**NOTES**

1. WHEN MORE THAN ONE PIPE IS USED THE PROFILE VIEW SHOWN SHALL HOLD THE DISTANCE ACROSS ALL PIPE OPENINGS. SECTION A-A AND B-B SHALL BE FROM THE OUTERMOST PIPE. THE DISTANCE BETWEEN PIPES SHALL BE  $D/2$  FOR ROUND AND  $SPAN/3$  FOR ARCH PIPE (1' MINIMUM).
2. CULVERT SHALL BE CUT OFF EVEN WITH APRON SURFACE WHEN REQUIRED BY THE AGENCY.
3. USE INLET APRON ONLY WHERE A FLARED END SECTION CANNOT BE UTILIZED.
4. PLACE WEEP HOLES WHEN REQUIRED BY AGENCY.

**LEGEND ON PLANS**



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reformatted		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

INLET APRON FOR CULVERTS  
UP TO 42" DIAMETER

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

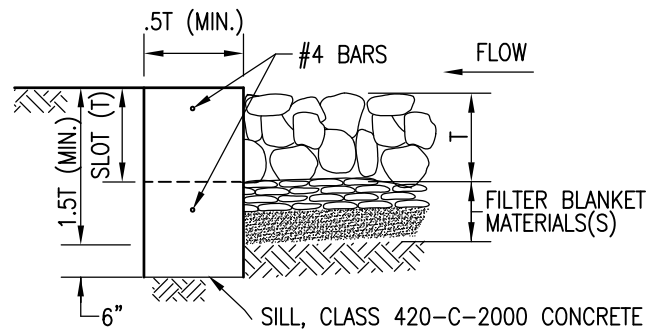
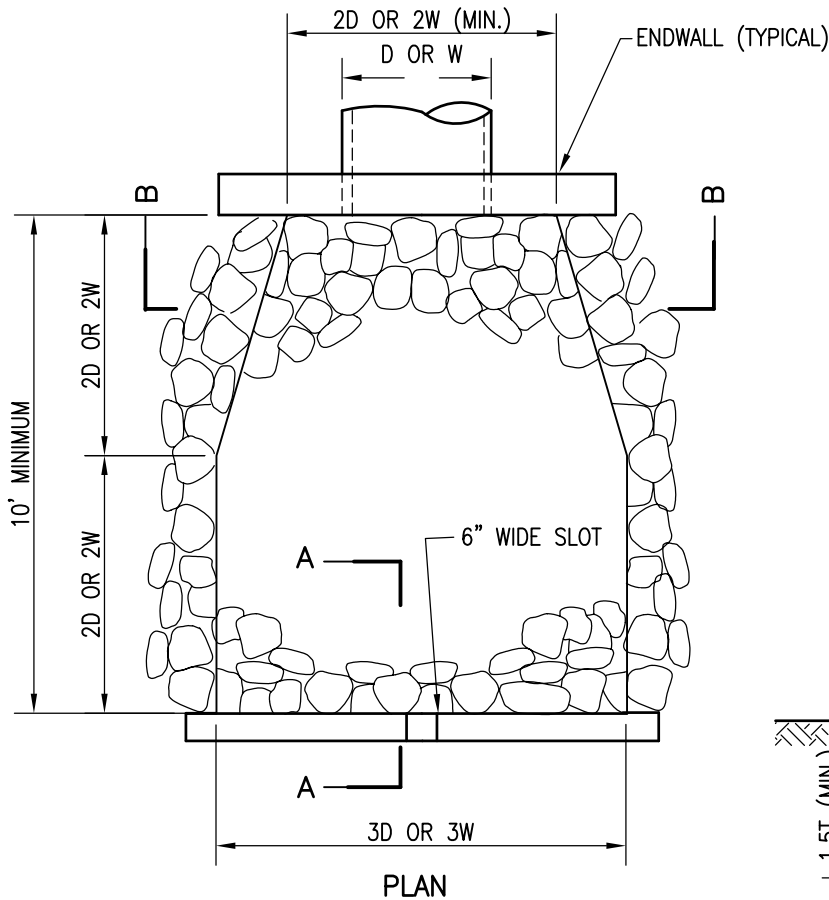
DRAWING NUMBER D-39

TABLE 7-1 (BELOW) PER JULY 2005  
SAN DIEGO COUNTY DRAINAGE DESIGN MANUAL

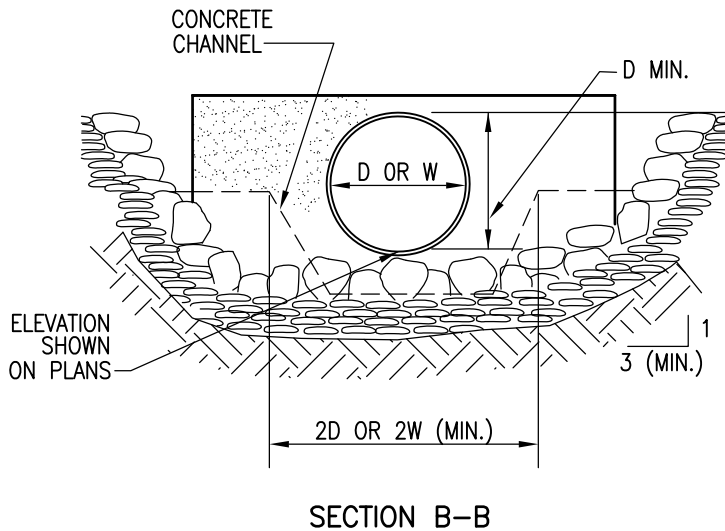
DESIGN VELOCITY (FT/SEC) *	ROCK CLASS	RIP-RAP THICKNESS "T" (MIN)
6-10	NO. 2 BACKING	1.1 FT
10-12	1/4 TON	2.7 FT
12-14	1/2 TON	3.5 FT
14-16	1 TON	4.4 FT
16-18	2 TON	5.4 FT

\* OVER 20 FT/SEC REQUIRES SPECIAL DESIGN

D = PIPE DIAMETER  $\phi$   
W = BOTTOM WIDTH OF CHANNEL



SECTION A-A



SECTION B-B

NOTES

- PLANS SHALL SPECIFY:  
(A) ROCK CLASS AND RIP-RAP THICKNESS (T). T SHALL BE AT LEAST 1.5 TIMES THE NOMINAL EQUIVALENT DIAMETER OF STONE ( $d_{50}$ ) OF THE SPECIFIED RIP-RAP.  
(B) FILTER BLANKET MATERIAL, NUMBER OF LAYERS AND THICKNESS.
- RIP-RAP SHALL BE EITHER QUARRY STONE OR BROKEN CONCRETE (IF SHOWN ON PLANS). COBBLES ARE NOT ACCEPTABLE.
- RIP-RAP SHALL BE PLACED OVER FILTER BLANKET MATERIAL, WHICH MAY BE EITHER GRANULAR MATERIAL OR NON-WOVEN GEOTEXTILE FILTER FABRIC; MATERIAL AT WEIGHT SPECIFIED IN PLANS OR SPECIFICATIONS.
- SEE TABLE 200-1.7 IN THE SAN DIEGO REGIONAL SUPPLEMENT TO GREENBOOK FOR SELECTION OF FILTER BLANKET.
- RIP-RAP ENERGY DISSIPATORS SHALL BE DESIGNATED AS EITHER TYPE 1 OR TYPE 2. TYPE 1 SHALL BE WITH CONCRETE SILL; TYPE 2 SHALL BE WITHOUT SILL.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Add Rip Rap Table		S. Brady	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

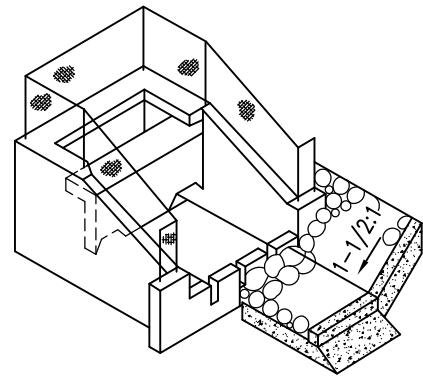
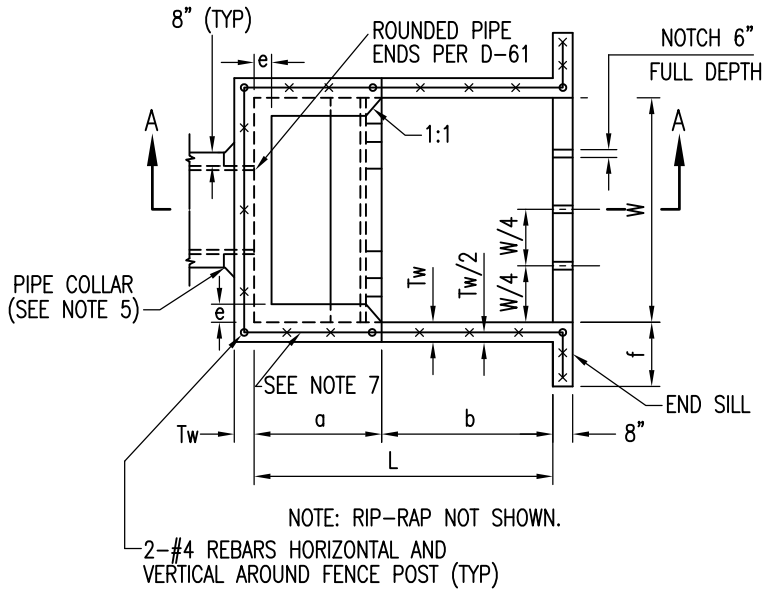
SAN DIEGO REGIONAL STANDARD DRAWING

RIP RAP  
ENERGY DISSIPATER

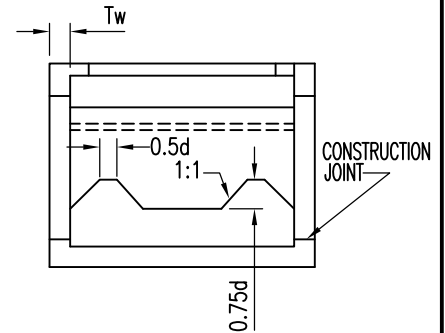
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

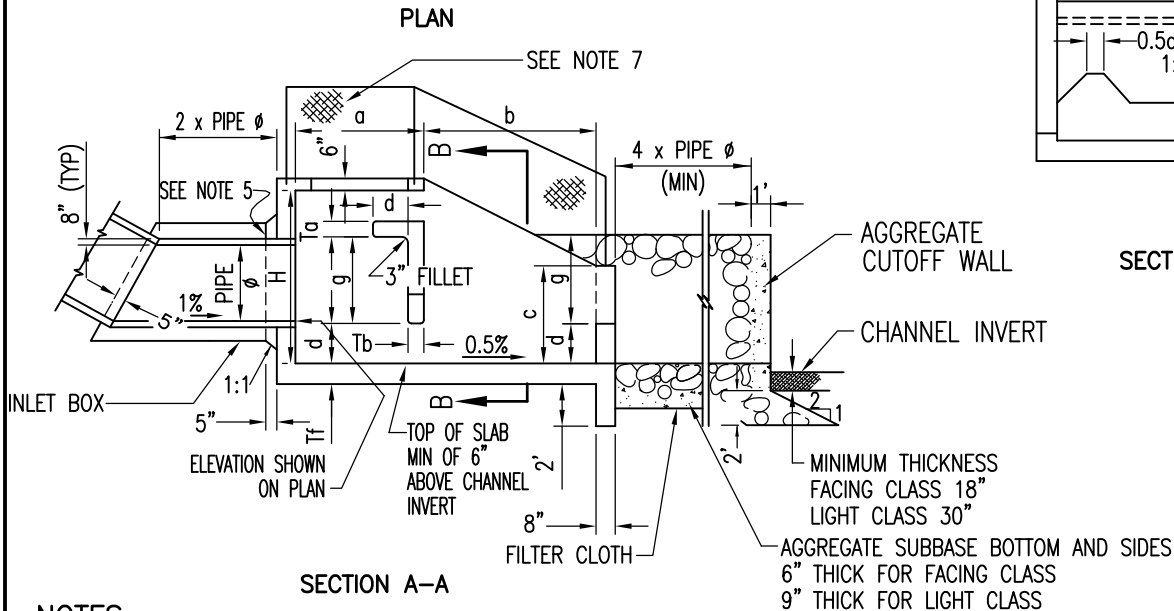
DRAWING NUMBER D-40



PICTORIAL VIEW




SECTION B-B



NOTES


1. DESIGN: EQUIVALENT FLUID PRESSURE (EARTH LOADING) = 60 PCF  
MAXIMUM OUTLET VELOCITY = 35 FPS
2. CONCRETE SAHLL BE 560-C-3250.
3. REINFORCING SHALL CONFORM TO ASTM DESIGNATION A615 AND MAY BE GRADE 40 OR 60. REINFORCING SHALL BE PLACED TO HAVE 2" OF CONCRETE COVER UNLESS NOTED OTHERWISE. SPLICES SHALL NOT BE PERMITTED EXCEPT AS INDICATED ON THE PLANS.
4. FOR PIPE GRADES NOT EXCEEDING 20%, INLET BOX MAY BE OMITTED.
5. CONSTRUCT PIPE COLLAR AS SHOWN IF INLET BOX IS OMITTED.
6. UNLESS NOTED OTHERWISE, ALL REINFORCING BAR BENDS SHALL BE FABRICATED WITH STANDARD HOOKS.
7. EMBED FIVE FOOT HIGH CHAIN LINK FENCING POST 18" DEEP INTO WALLS AND ENCASE WITH CLASS B MORTAR.
8. IN SANDY AND SILTY SOIL:
  - A) RIP-RAP AND AGGREGATE BASE CUTOFF WALL REQUIRED AT THE END OF ROCK APRON.
  - B) FILTER CLOTH (POLYFILTER X OR EQUIVALENT) SHALL BE INSTALLED ON NATIVE SOIL BASE, MINIMUM OF 1 FT OVERLAPS AT JOINTS.
9. RIP-RAP AND SUBBASE CLASSIFICATION SHALL BE SHOWN ON PLANS.

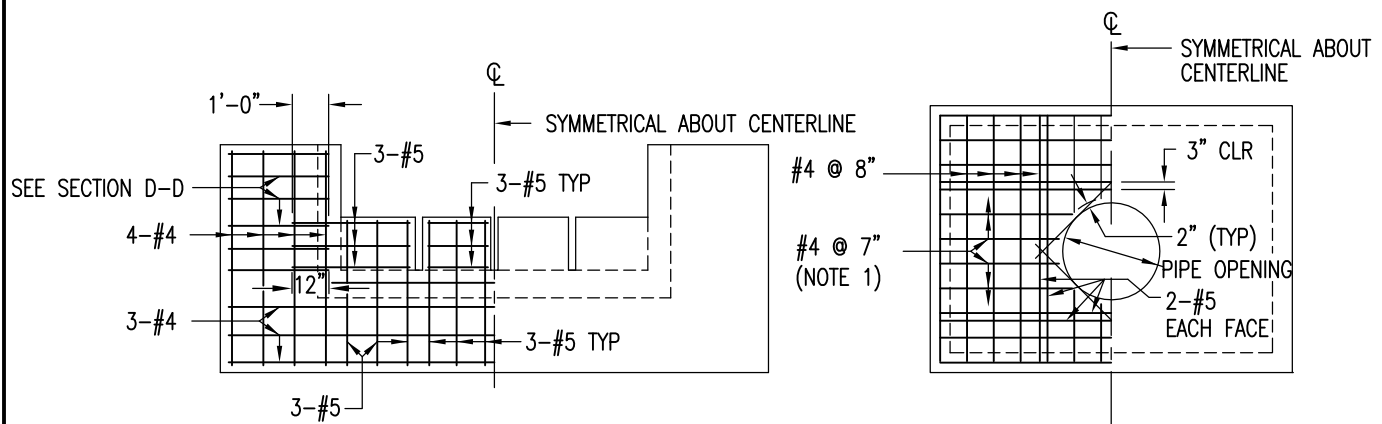
SEE D-41B FOR DIMENSIONS.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	CONCRETE ENERGY DISSIPATER		 Chairperson R.C.E. 19246 Date
Edited		T. Stanton	02/09			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
				DRAWING NUMBER		D-41A

**CONCRETE ENERGY DISSIPATER DIMENSION TABLE  
(SEE D-41A FOR STRUCTURE DETAILS)**

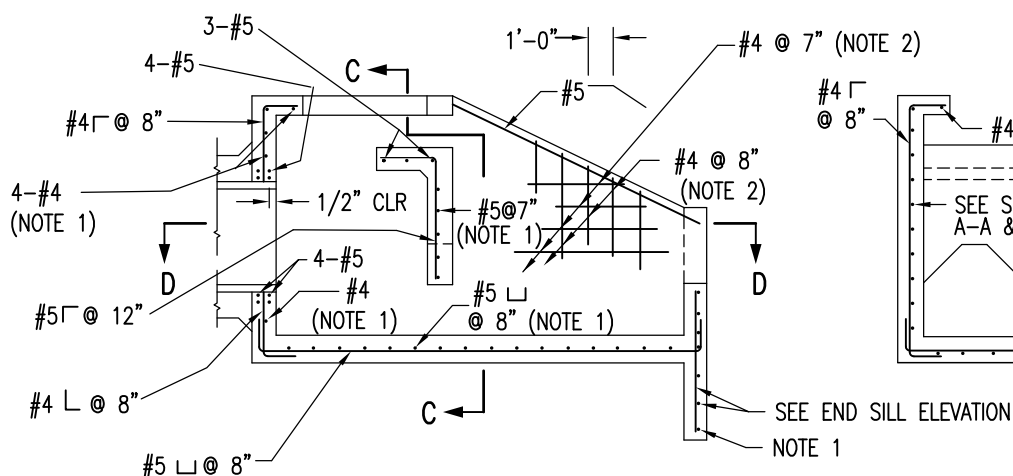
PIPE Ø (IN)	18	24	30	36	42	48	54	60	72
AREA (SF)	1.77	3.14	4.91	7.07	9.62	12.57	15.90	19.63	28.27
MAX Q (CFS)	21	38	59	85	115	151	191	236	339
W	5'-6"	6'-9"	8'	9'-3"	10'-6"	11'-9"	13'	14'-3"	16'-6"
H	4'-3"	5'-3"	6'-3"	7'-3"	8'	9'	9'-9"	10'-9"	12'-3"
L	7'-4"	9'	10'-8"	12'-4"	14'	15'-8"	17'-4"	19'	22'
a	3'-3"	3'-11"	4'-7"	5'-3"	6'	6'-9"	7'-4"	8'	9'-3"
b	4'-1"	5'-1"	6'-1"	7'-1"	8'	8'-11"	10'	11'	12'-9"
c	2'-4"	2'-10"	3'-4"	3'-10"	4'-5"	4'-11"	5'-5"	5'-11"	6'-11"
d	0'-11"	1'-2"	1'-4"	1'-7"	1'-9"	2'	2'-2"	2'-5"	2'-9"
e	0'-6"	0'-6"	0'-8"	0'-8"	0'-10"	0'-10"	1'	1'	1'-3"
f	1'-6"	2'	2'-6"	3'	3'	3'	3'	3'	3'
g	2'-1"	2'-6"	3'	3'-6"	3'-11"	4'-5"	4'-11"	5'-4"	6'-2"
Tf	8"		10"			12"			
Tb	7"		9 1/2"			10 1/2"			
Tw	7"		9 1/2"			10 1/2"			
Ta	7"		8"						

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited		T. Stanton	02/09	CONCRETE ENERGY DISSIPATER	 10/25/2018
Edited	S.S.	T. Regello	03/11		Chairperson R.C.E. 19246 Date
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
					DRAWING NUMBER D-41B

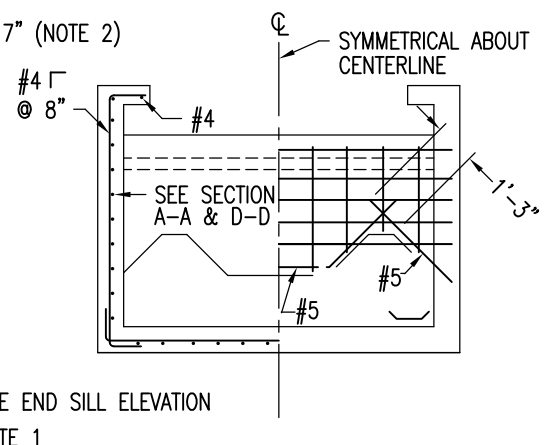


END SILL ELEVATION

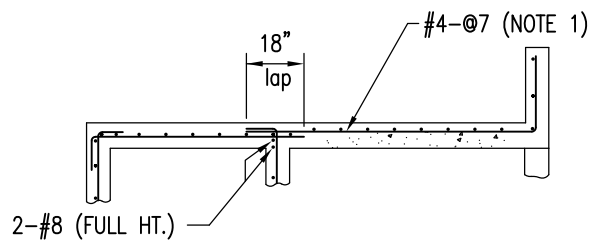
HEADWALL ELEVATION



SECTION A-A




SECTION C-C

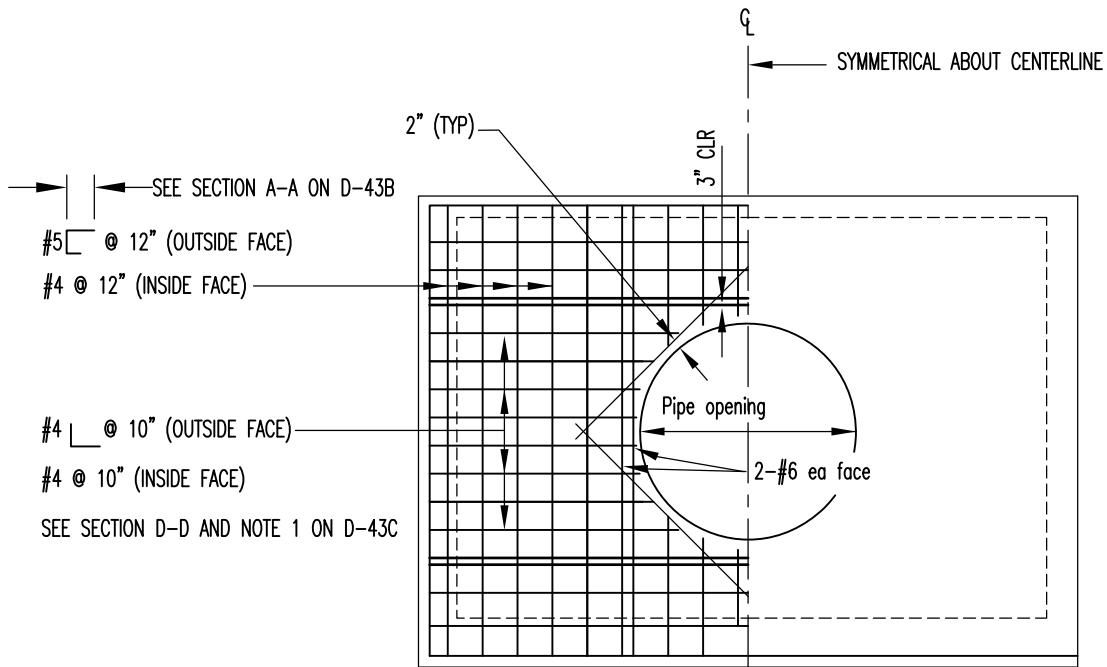


SECTION D-D

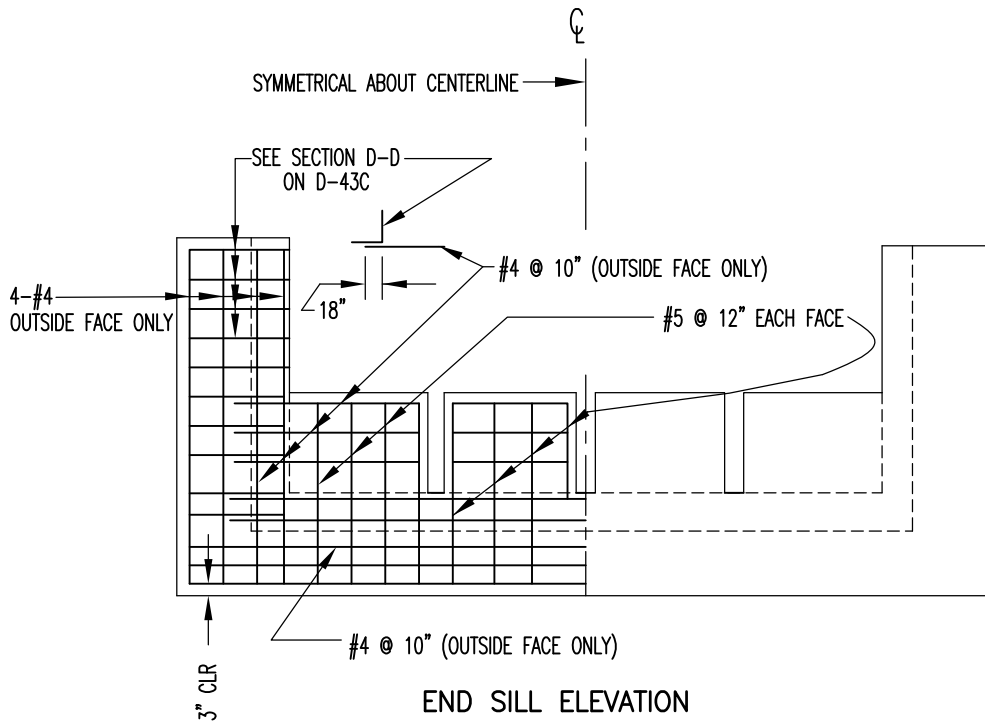
NOTES

1. PLACE REINFORCING, AS NOTED, AT CENTER OF WALL (OR SLAB).
2. MATCH LOCATION OF REINFORCING WITH THAT IN HEADWALL, END SILL AND FOUNDATION SLAB.
3. ALL REINFORCING SHALL BE PLACED WITH 2" CONCRETE COVER, UNLESS NOTED OTHERWISE.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	CONCRETE ENERGY DISSIPATER [REINFORCEMENT] 18" TO 30" DIAMETER PIPE		
Edited		T. Stanton	02/09			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
						 10/25/2018 Chairperson R.C.E. 19246 Date
						DRAWING NUMBER D-42



HEADWALL ELEVATION



END SILL ELEVATION

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

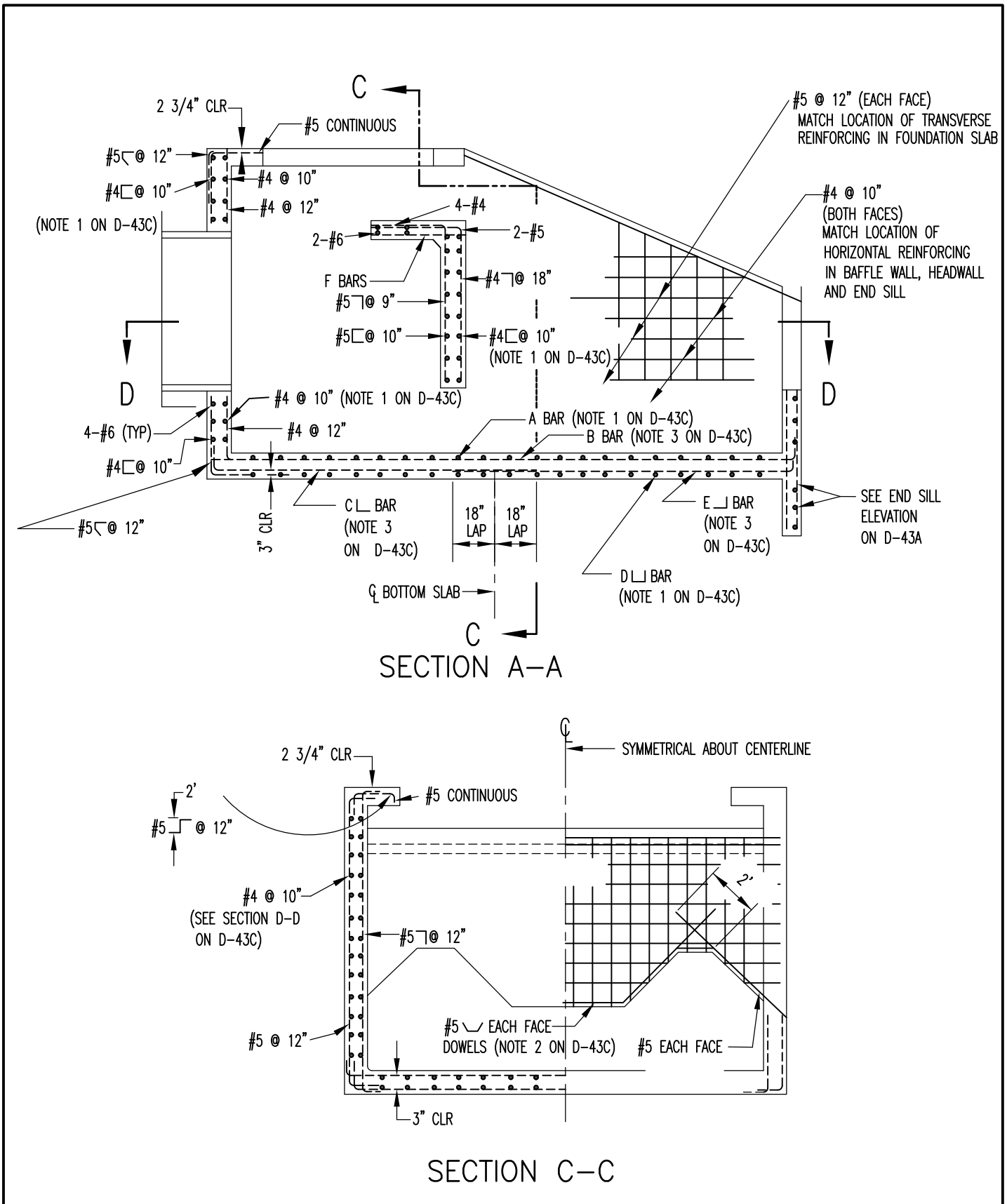
CONCRETE ENERGY DISSIPATER  
[REINFORCEMENT]  
36" TO 72" DIAMETER PIPE

RECOMMENDED BY THE SAN DIEGO  
REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-43A





Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

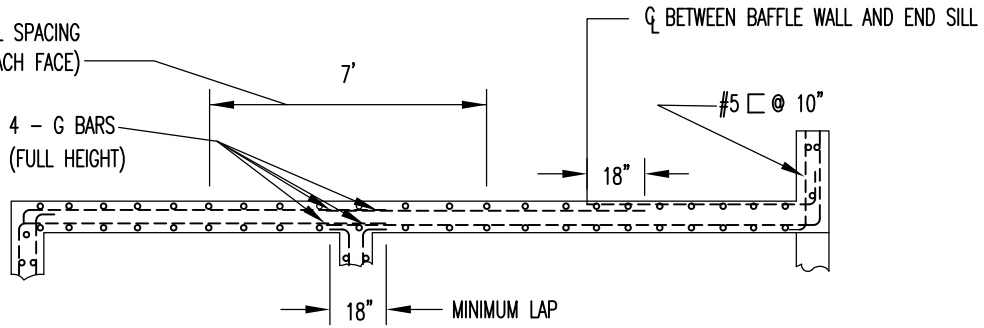
CONCRETE ENERGY DISSIPATER  
[REINFORCEMENT]  
36" TO 72" DIAMETER PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER **D-43B**

ADD #4 @ 20" VERTICAL SPACING  
TO REINFORCING SHOWN (EACH FACE)




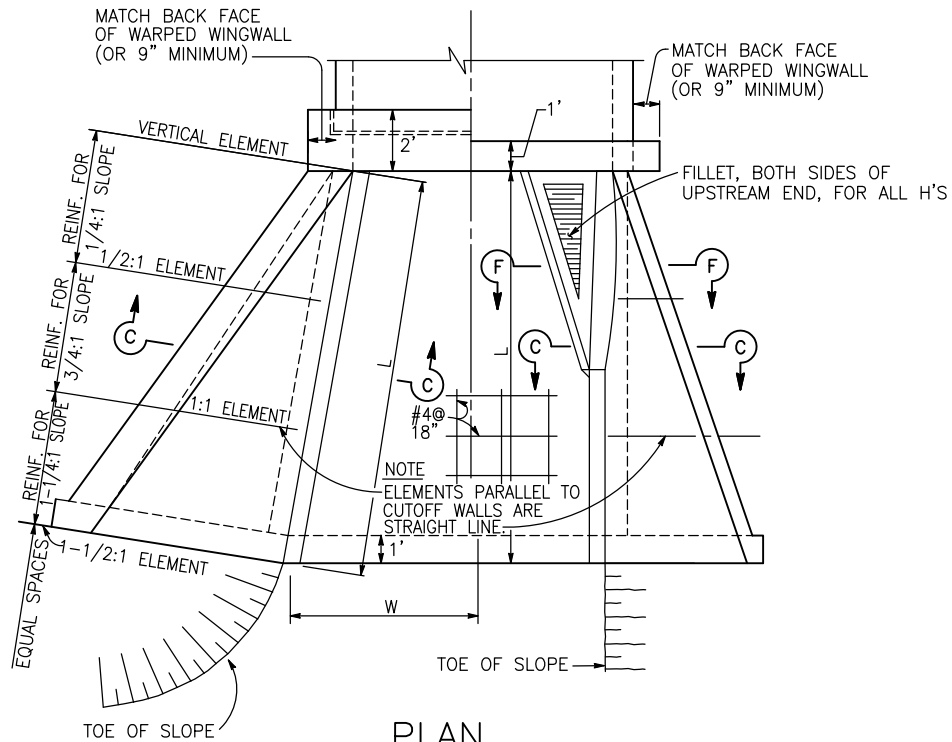
### SECTION D-D

PIPE $\phi$ (IN.)	36"	42"	48"	54"	60"	72"
A BAR	# 5 @ 12"		#6 @ 12"		#7 @ 12"	
B BAR	# 5 @ 12"			#6 @ 12"		
C BAR	# 4 @ 12"			#5 @ 12"		
D BAR	# 4 @ 12"		#5 @ 12"		#6 @ 12"	
E BAR	# 4 @ 12"			#5 @ 12"		
F BAR	# 4 @ 9"			#5 @ 9"		#6 @ 9"
G BAR		# 7			# 11	

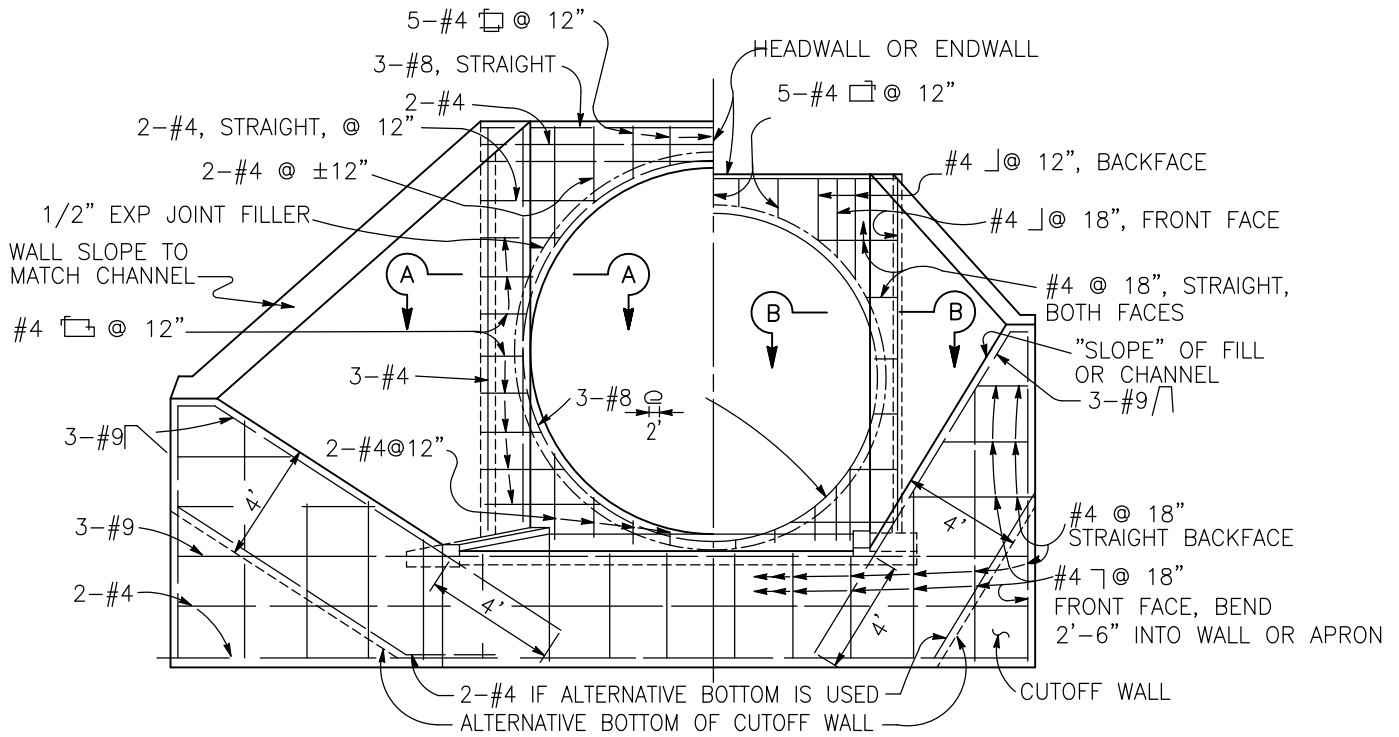
#### NOTES

1. MATCH LOCATION OF SIDEWALL REINFORCING.
2. DOWELS WITH SAME SIZE AND SPACING AS WALL REINFORCING MAY BE USED IN LIEU OF CONTINUOUS BARS AT CONTRACTOR'S OPTION.
3. MATCH LOCATION OF HEADWALL OR END SILL REINFORCING.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	CONCRETE ENERGY DISSIPATER [REINFORCEMENT] 36" TO 72" DIAMETER PIPE		
Edited		T. Stanton	02/09			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
						 10/25/2018 Chairperson R.C.E. 19246 Date
						DRAWING NUMBER D-43C



PLAN



TYPICAL FOR MAXIMUM H > 10'

TYPICAL FOR MAXIMUM H ≤ 10'

END ELEVATION

NOTE

SEE NOTES ON D-44D.

IF AT UPSTREAM END, FILLET IS NOT SHOWN

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reformatted		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

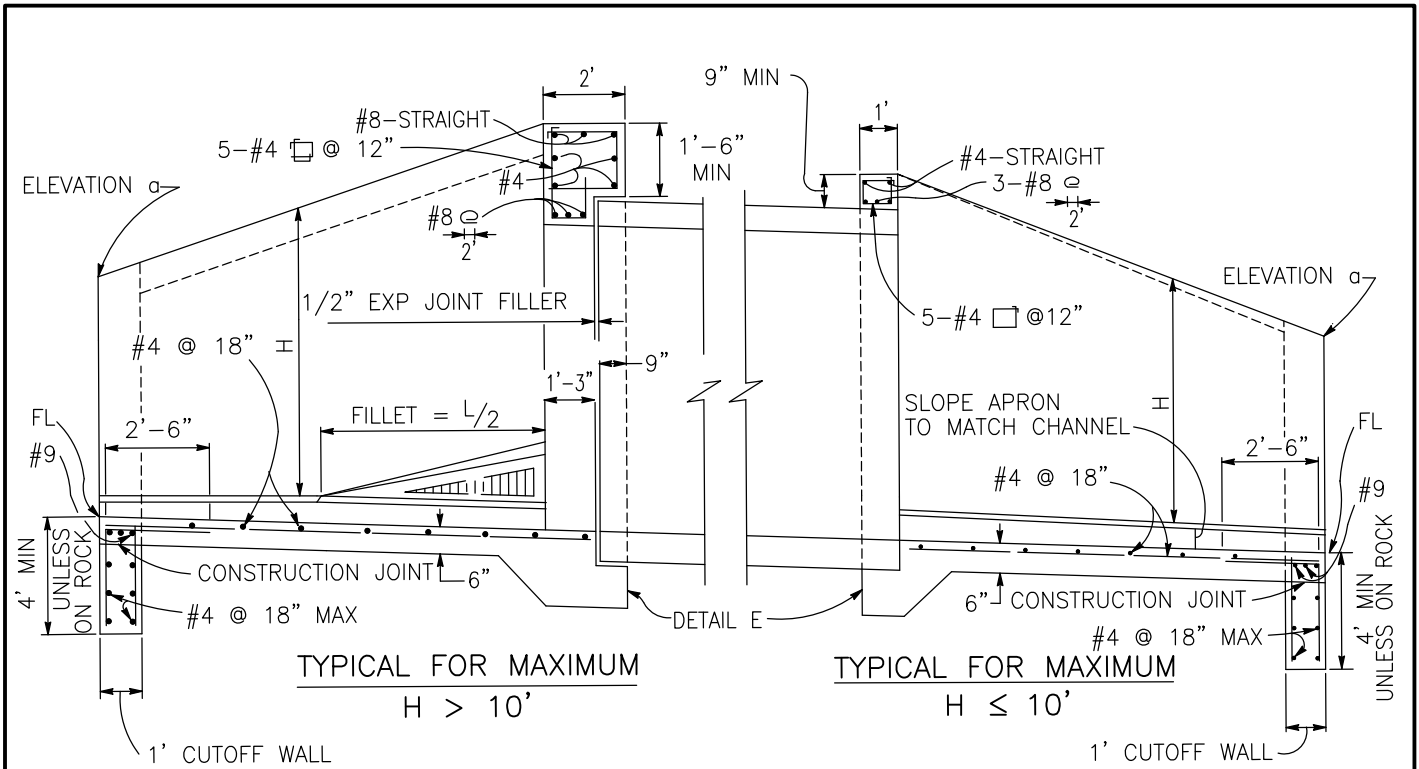
SAN DIEGO REGIONAL STANDARD DRAWING

PIPE CULVERT - HEADWALLS,  
ENDWALLS & WARPED WINGWALLS

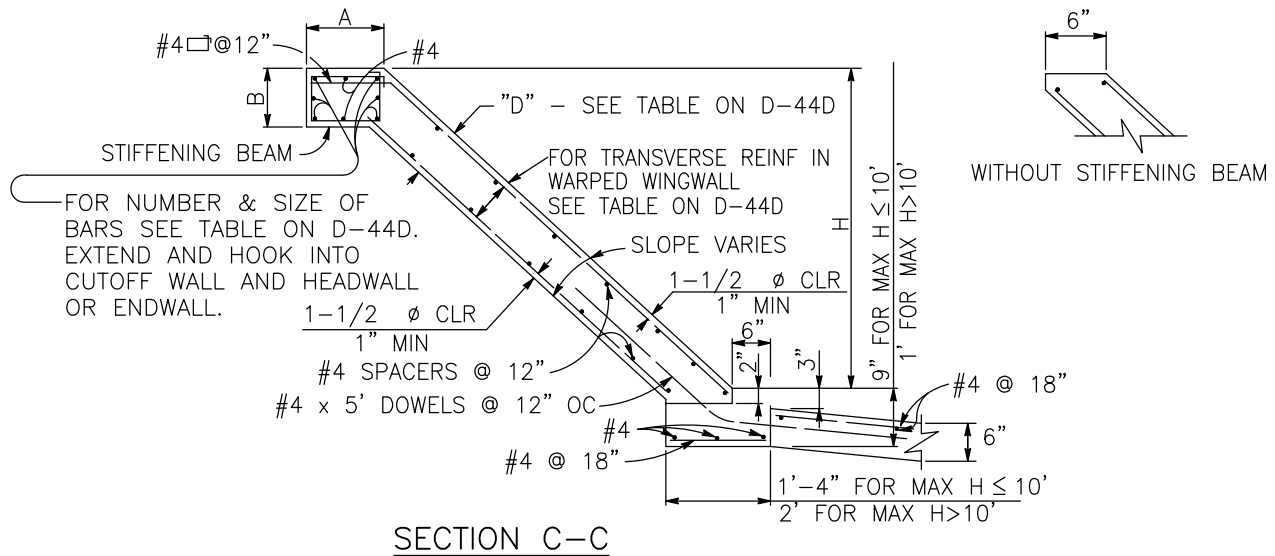
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-44A



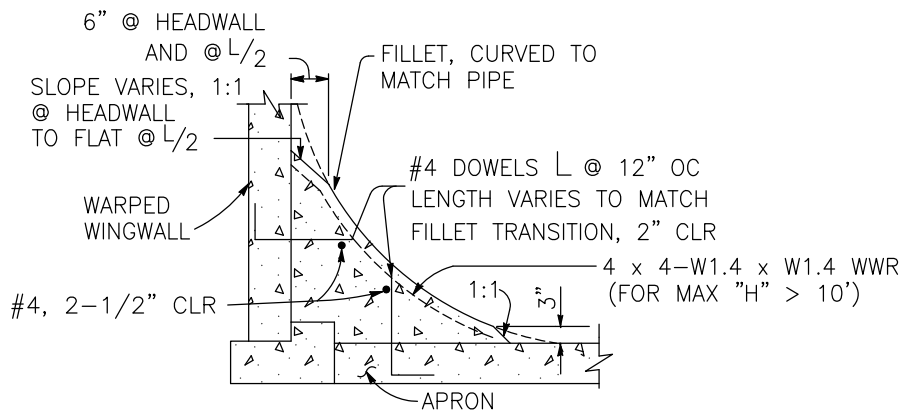
**PART LONGITUDINAL SECTION**



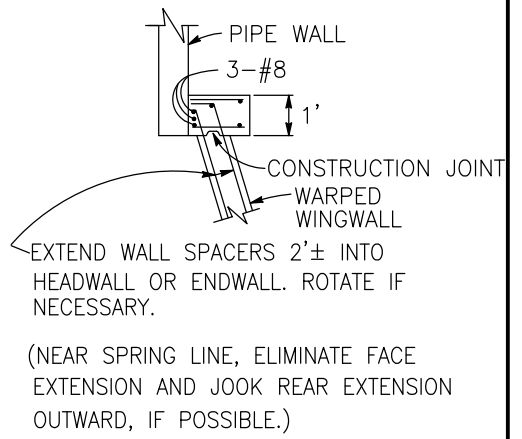
**NOTES**

1. RCP IS SHOWN. WHEN USING METAL PIPE ELIMINATE THE EXPANSION JOINT AND USE HOOK BOLTS @ 19"± SPACING (SIZE AND LENGTH PROVIDED BY MANUFACTURER).
2. WHERE ABASION IS ANTICIPATED, INCREASE APRON THICKNESS TO 7" MINIMUM TO PROVIDE 2" MINIMUM REINFORCEMENT COVERAGE.

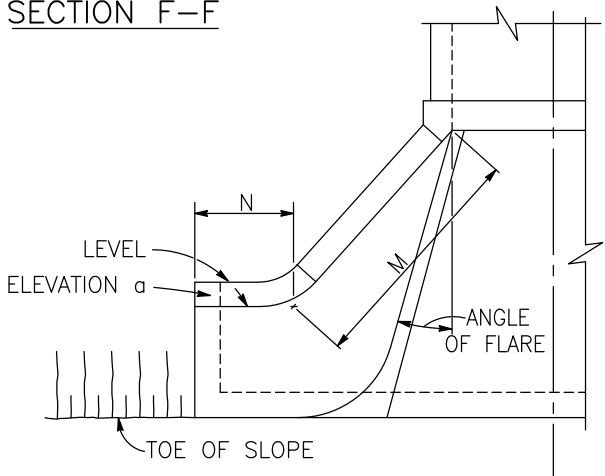
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Reformatted		T. Stanton	04/06	PIPE CULVERT – HEADWALLS, ENDWALLS & WARPED WINGWALLS	<i>M. Stanton</i> 10/25/2018 Chairperson R.C.E. 19246 Date
Edited	S.S.	T. Regello	03/11		DRAWING NUMBER D-44B
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		



SECTION F-F

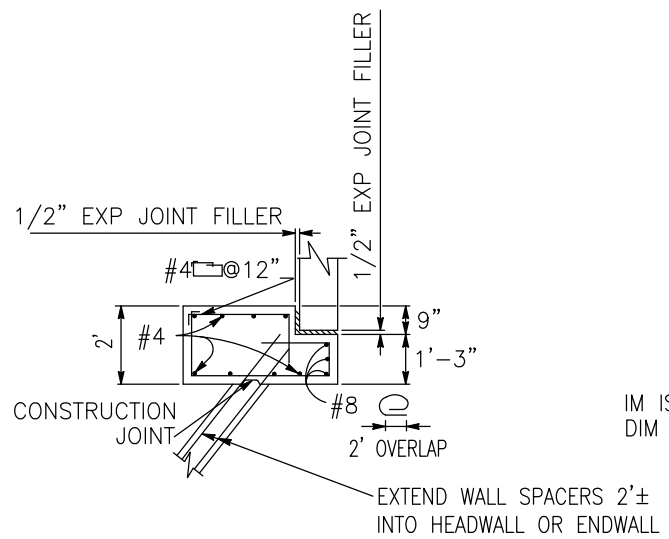


SECTION B-B

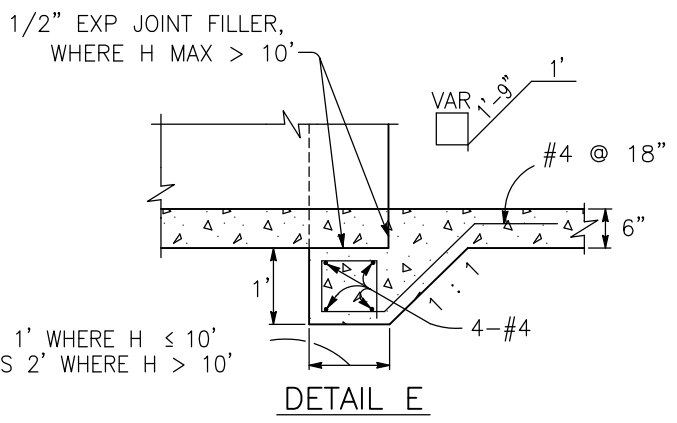


ALTERNATIVE WARPED WINGWALL

USE WHERE ADDITIONAL PROTECTION TO TOE OF EMBANKMENT IS REQUIRED. IF AT UPSTREAM END, FILLET IS NOT SHOWN.



SECTION A-A



DETAIL E

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		PIPE CULVERT – HEADWALLS, ENDWALLS & WARPED WINGWALLS
Reformatted		T. Stanton	04/06		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
					 10/25/2018 Chairperson R.C.E. 19246 Date
					DRAWING NUMBER D-44C

**WARPED WINGWALLS (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS OTHERWISE NOTED)**

ELEMENT SLOPE	H	WALL DIMENSIONS AND REINFORCING										STIFFENING BEAM DIMENSIONS AND REINFORCING									
		8' OR LESS	10'	12'	14'	16'	18'	20'	2' OR MORE	12'	14'	16'	18'	20'	25'	30'	35'	40' OR MORE			
1/4:1	FRONT FACE REINF #4@12	#4@7	#5@7	#4@12	#5@5	#6@6	#7@7	#4@12	#4@12	#4@12	#4@12	#7@6	#7@6	NO BEAM. PLACE 2-#6 IN EACH FACE ALONG TOP OF WALL.							
3/4:1	FRONT FACE REINF #4@12	#4@12	#4@12	#4@12	#4@10	#4@10	#4@8	#4@12	#4@12	#4@10	#4@7	#4@6	#4@6	A = 1'							
1-1/4:1	FRONT FACE REINF #4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	B = 9"							
D AT CUTOFF WALL	FRONT FACE REINF #4@8	#4@8	#4@8	#4@5	#5@6	#6@7	#6@7	#6@7	#6@7	#6@7	#6@7	#6@7	#6@7	TOTAL 6-#6							
D AT CULVERT	FRONT FACE REINF #4@8	#4@8	#4@8	#4@5	#5@6	#6@7	#6@7	#6@7	#6@7	#6@7	#6@7	#6@7	#6@7	TOTAL 6-#7							
														TOTAL 6-#8							
														TOTAL 8-#9							

**NOTES**

1. WALLS DESIGNED FOR 2' SURCHARGE; EARTH DENSITY = 120 # / CF; EQUIVALENT FLUID PRESSURE = 36 #/CF
2. VARY "D" AT WARPED WALL UNIFORMLY FROM THAT AT CUTOFF WALL TO THAT AT CULVERT, FOR MAXIMUM H > 12'.
3. DIMENSIONS "L", "W", "H", "M", "N", "ELEVATION α", "ANGLE OF FLARE", AND END "SLOPE" (AS APPLY) ARE SHOWN ON THE PLANS.
4. ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED 3/4".

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

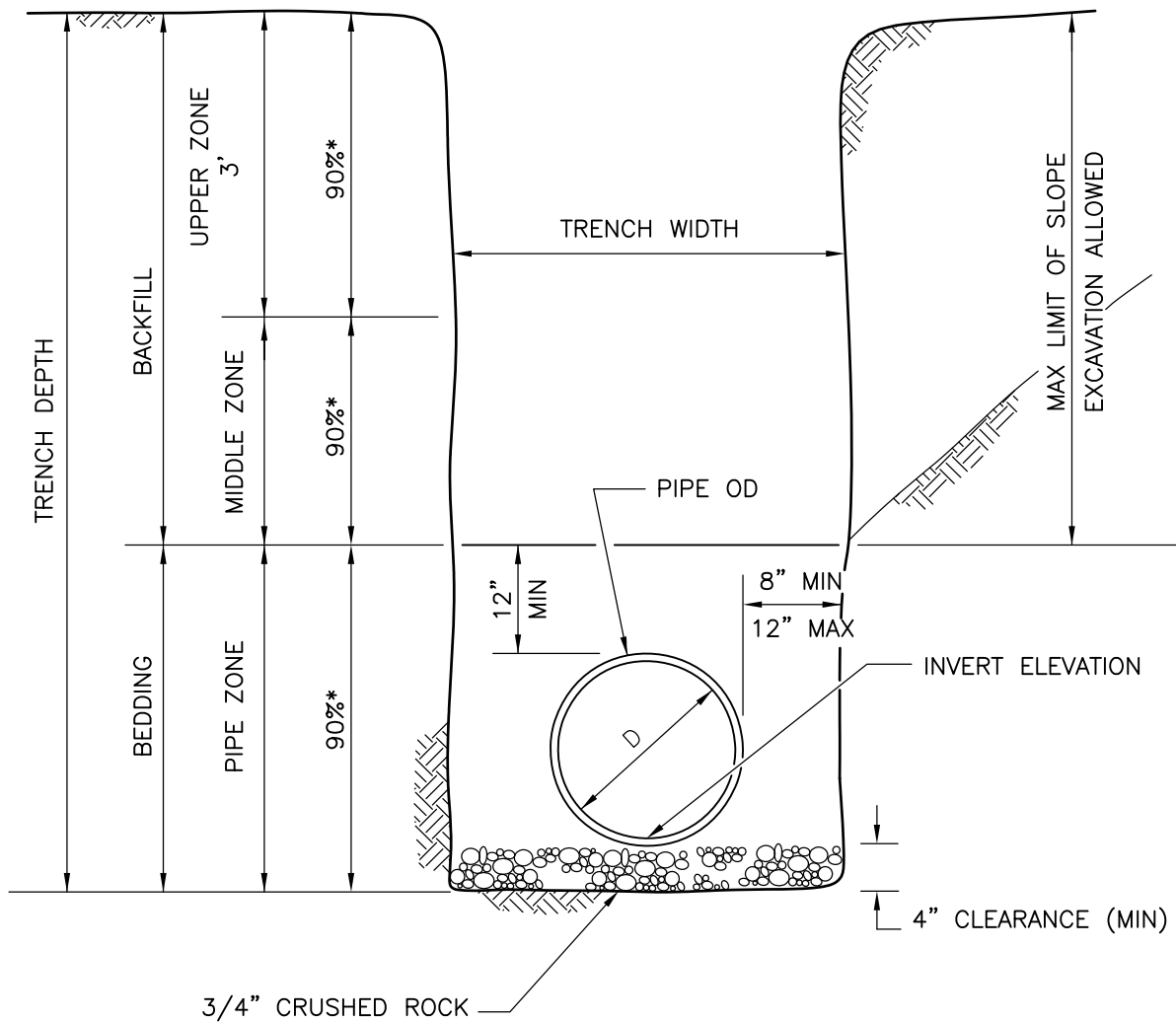
PIPE CULVERT – HEADWALLS,  
ENDWALLS & WARPED WINGWALLS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-44D





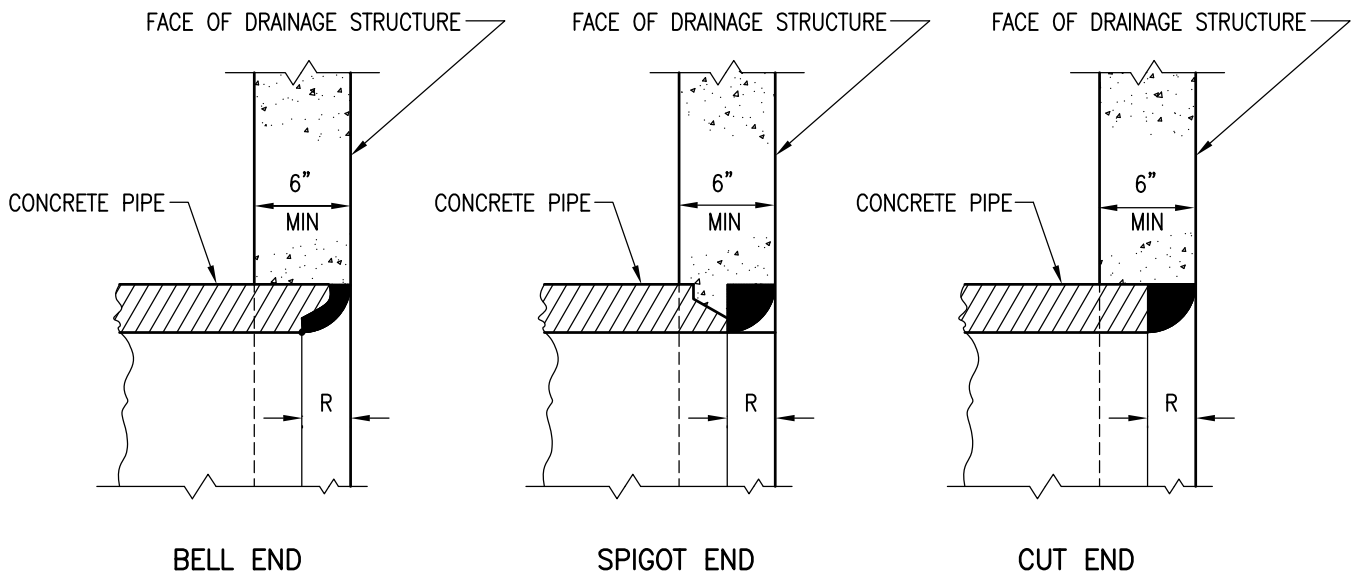
SECTION

NOTES

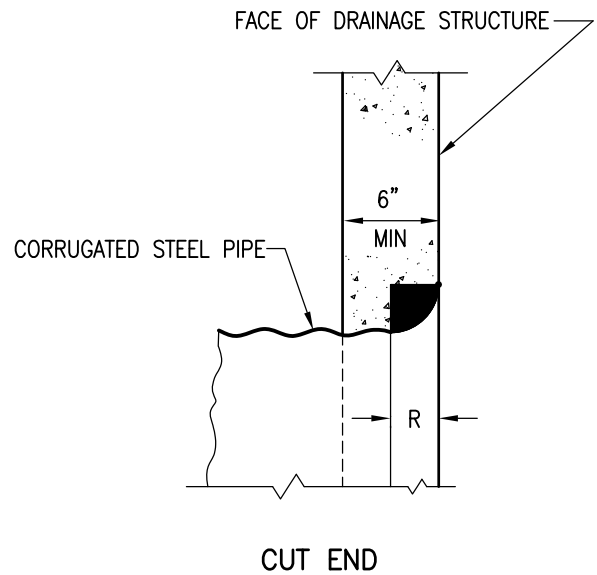
1. SEE G-24A AND G-24B OR G-25 FOR RESURFACING DETAILS ON IMPROVED STREETS.
2. (\*) INDICATES MINIMUM RELATIVE COMPACTION.
3. TOP 12" OF TRENCH BACKFILL IN STREET SECTION SHALL BE 95% RELATIVE COMPACTION UNLESS SPECIFIED OTHERWISE.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		PIPE BEDDING AND TRENCH BACKFILL FOR STORM DRAINS
Reformatted		T. Stanton	04/06	<i>M. Heaton</i> 10/25/2018	
Edited	S.S.	T. Regello	03/11	Chairperson R.C.E. 19246 Date	
Edited	T.R.	T. Regello	10/15	DRAWING NUMBER	
Edited	M.W.	M. Widelski	10/18	D-60	





R = THICKNESS OF PIPE

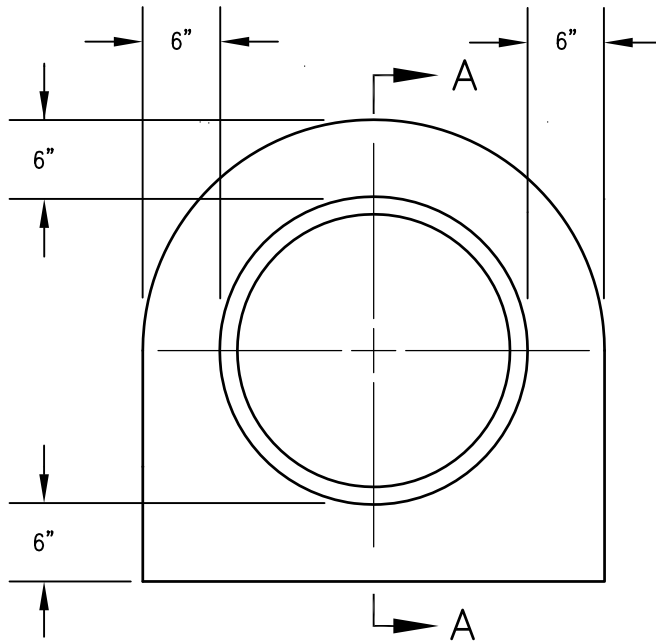


R =  $\frac{\text{INSIDE DIAMETER OF PIPE}}{10}$

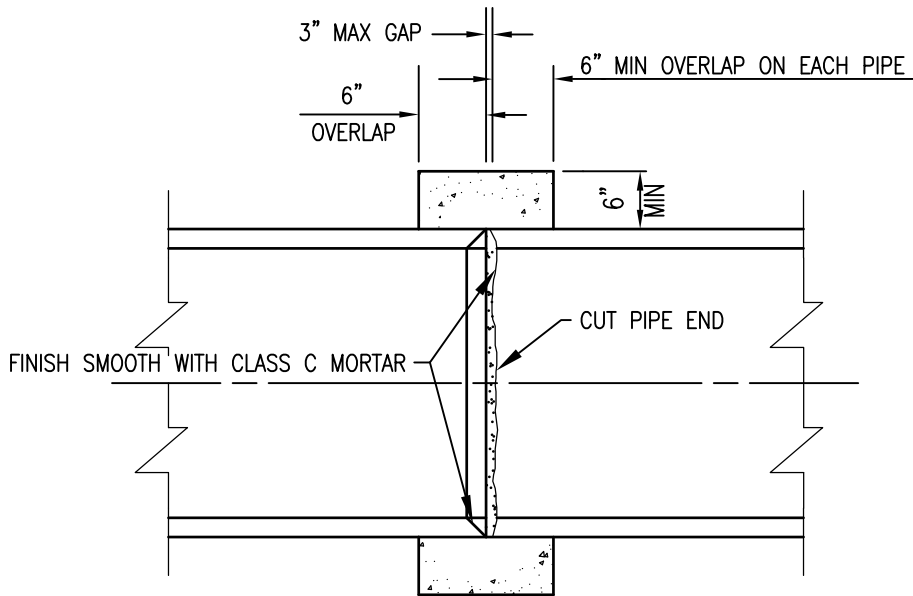
**NOTE**

THE ROUNDED AREAS MAY BE BUILT UP OF CEMENT MORTAR OR POURED IN PLACE WITH THE DRAINAGE STRUCTURE.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		<b>ROUNDED PIPE ENDS IN DRAINAGE STRUCTURES</b>
Reviewed		T. Stanton	04/06	DRAWING NUMBER	
Edited	S.S.	T. Regello	03/11	D-61	
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		



ELEVATION

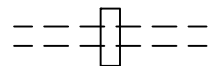


SECTION A-A

NOTES

1. PIPE COLLAR DOES NOT HAVE TO BE FINISHED IF COVERED.
2. CONCRETE SHALL BE 560-C-3250.
3. AN INTERNAL FORM SHALL BE USED WHERE GAP EXCEEDS 3" BUT IS NOT MORE THAN 6".

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

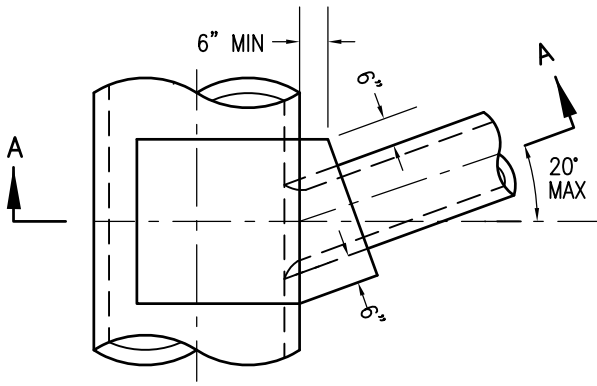
SAN DIEGO REGIONAL STANDARD DRAWING

PIPE COLLAR

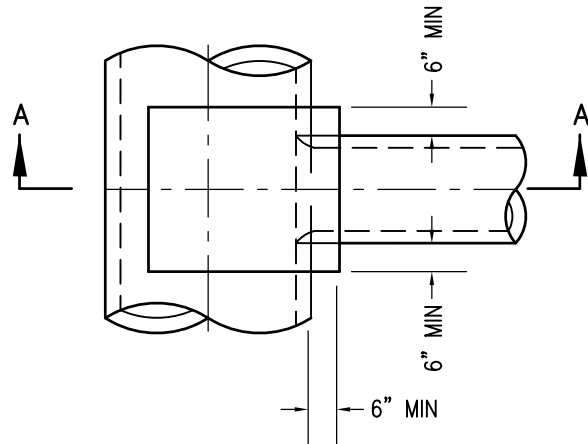
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

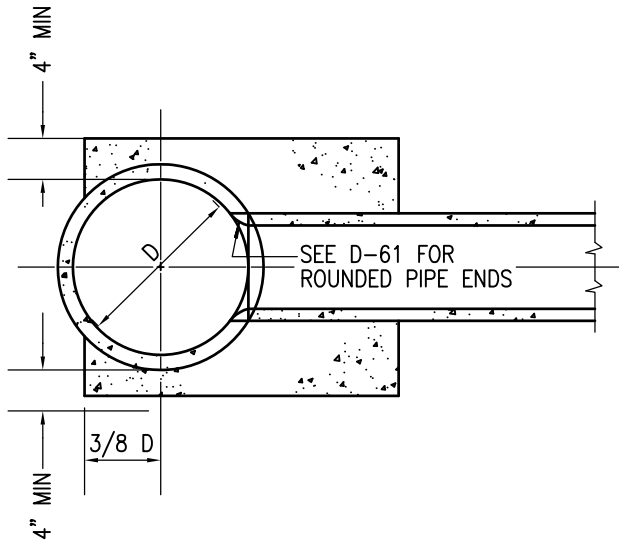
DRAWING NUMBER D-62



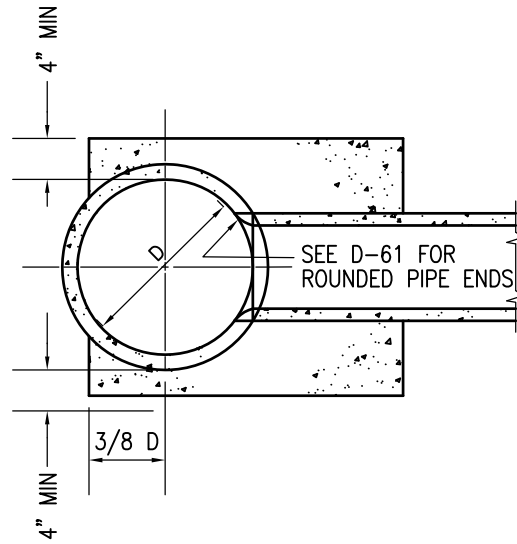
PLAN  
SKEWED CONNECTION



PLAN



SECTION A-A

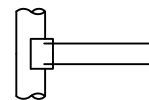


SECTION B-B

NOTES

1. THE END OF THE CONNECTING PIPE SHALL NOT PROJECT INTO THE WATERWAY OF THE LARGER PIPE.
2. THE LARGER PIPE SHALL NOT BE LESS THAN 24" ID.
3. THE OD OF THE SMALLER PIPE SHALL NOT BE MORE THAN 2/3 THE SIZE OF THE ID OF THE LARGER PIPE.
4. CONCRETE SHALL BE 470-C-2000.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

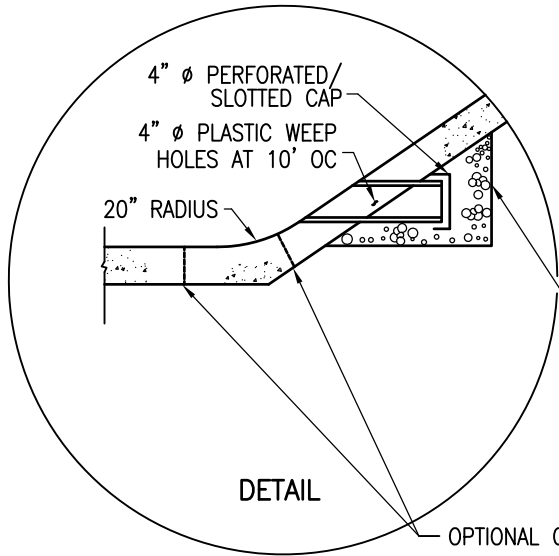
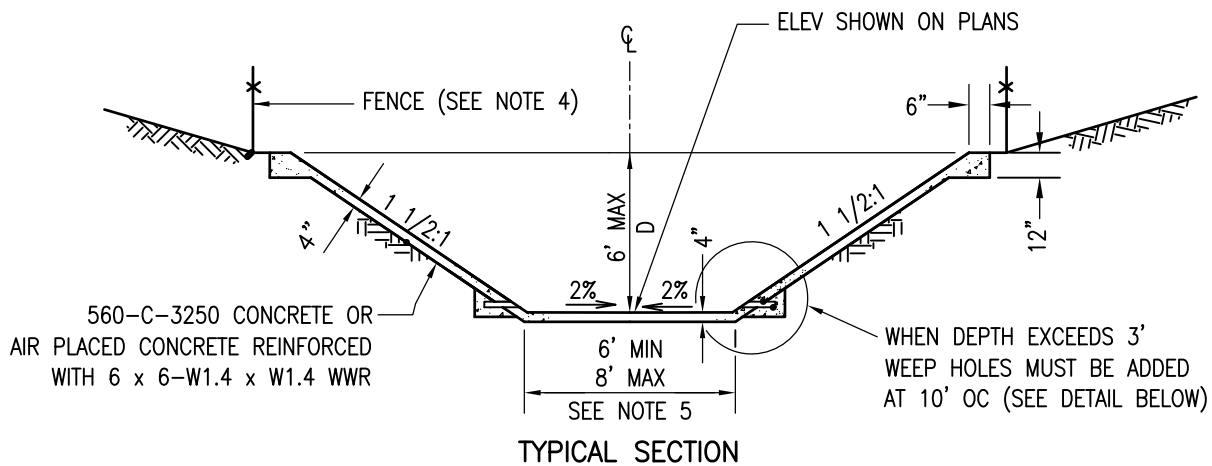
SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE LUG

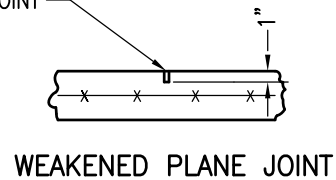
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-63

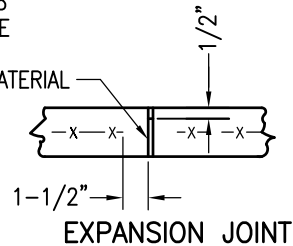


3/16" PREMOLDED JOINT MATERIAL OR 1/8" SAWED JOINT



1" MAX CRUSHED ROCK FILTER MATERIAL PLACED A MINIMUM OF 18" EACH SIDE OF WEEP HOLE

PREMOLDED JOINT MATERIAL

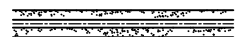


OPTIONAL CONSTRUCTION JOINT

**NOTES**

1. CLAY PIPE MAY BE SUBSTITUTED FOR PLASTIC PIPE AT WEEP HOLES.
2. WEAKENED PLANE JOINTS SHALL BE PLACED EVERY 12' TO 15'. EXPANSION JOINT SHALL BE PLACED AT ALL CHANGES OF SECTION AND AT ENDS OF CURVES.
3. CUTOFF WALLS SHALL BE CONSTRUCTED AT EACH END OF THE CHANNEL ALONG THE FULL WIDTH OF THE SECTION. SEE D-72.
4. CHAINLINK FENCE INSTALLATION SHALL BE AS REQUIRED BY AGENCY.
5. SEE D-71 FOR BOTTOM WIDTHS GREATER THAN 8 FEET.
6. MINIMUM REINFORCEMENT IS SHOWN.
7. ALTERNATE INVERT: 2% CROSS SECTIONAL SLOPE TOWARD ONE SIDE OF CHANNEL.

**LEGEND ON PLANS**



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reformatted		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

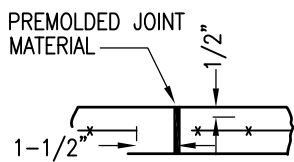
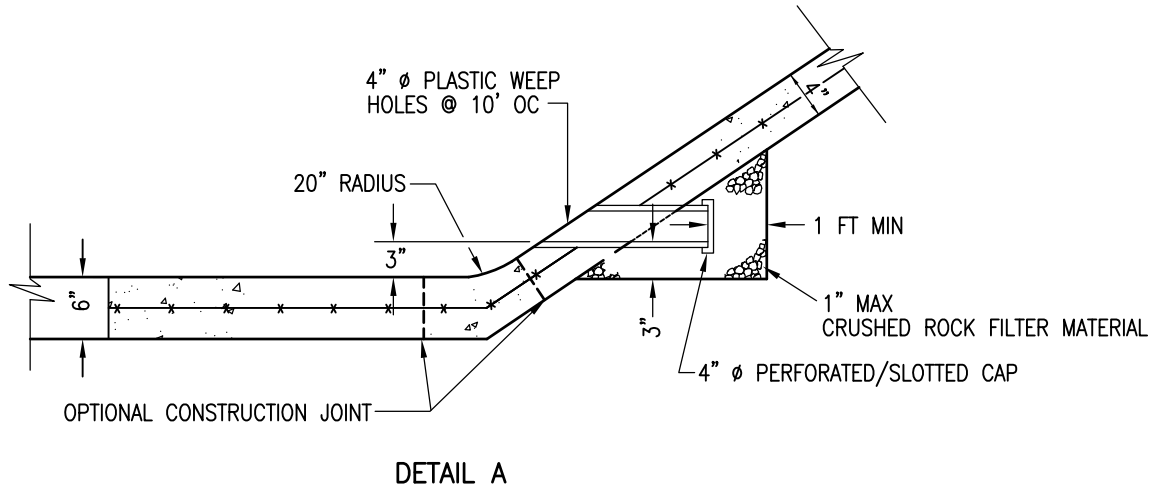
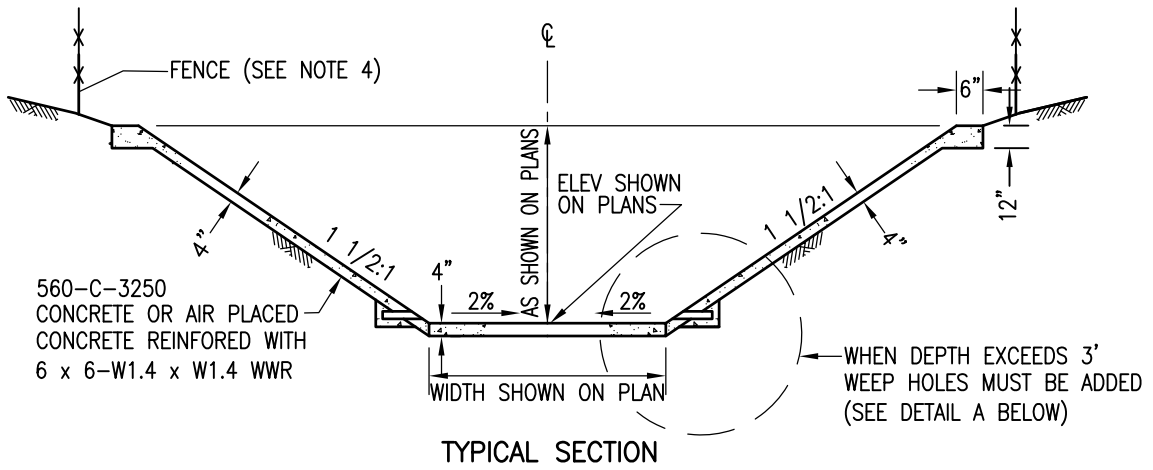
SAN DIEGO REGIONAL STANDARD DRAWING

MINOR DRAINAGE CHANNEL

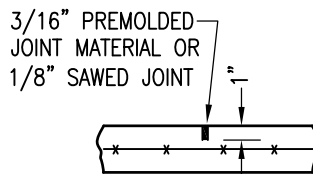
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

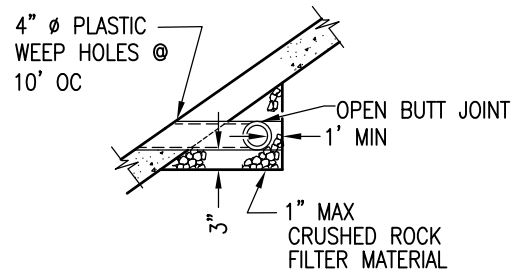
DRAWING NUMBER D-70



EXPANSION JOINT



WEAKENED PLANE JOINT



ALTERNATE CONTINUOUS DRAIN

NOTES

1. CLAY PIPE MAY BE SUBSTITUTED FOR PLASTIC PIPE AT WEEP HOLES.
2. WEAKENED PLANE JOINT SHALL BE PLACED EVERY 12' TO 15'. EXPANSION JOINTS SHALL BE PLACED AT ALL CHANGES OF SECTION AND AT ENDS OF CURVES.
3. CUTOFF WALLS SHALL BE CONSTRUCTED AT EACH END OF THE CHANNEL ALONG THE FULL WIDTH OF SECTION. SEE D-72.
4. CHAINLINK FENCE SHALL BE INSTALLED AS REQUIRED BY AGENCY.
5. MINIMUM REINFORCEMENT IS SHOWN.
6. MINIMUM BOTTOM WIDTH SHALL BE 6' TO FACILITATE CLEANING.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

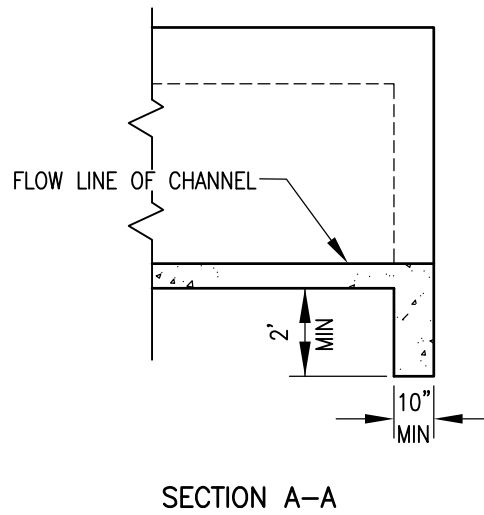
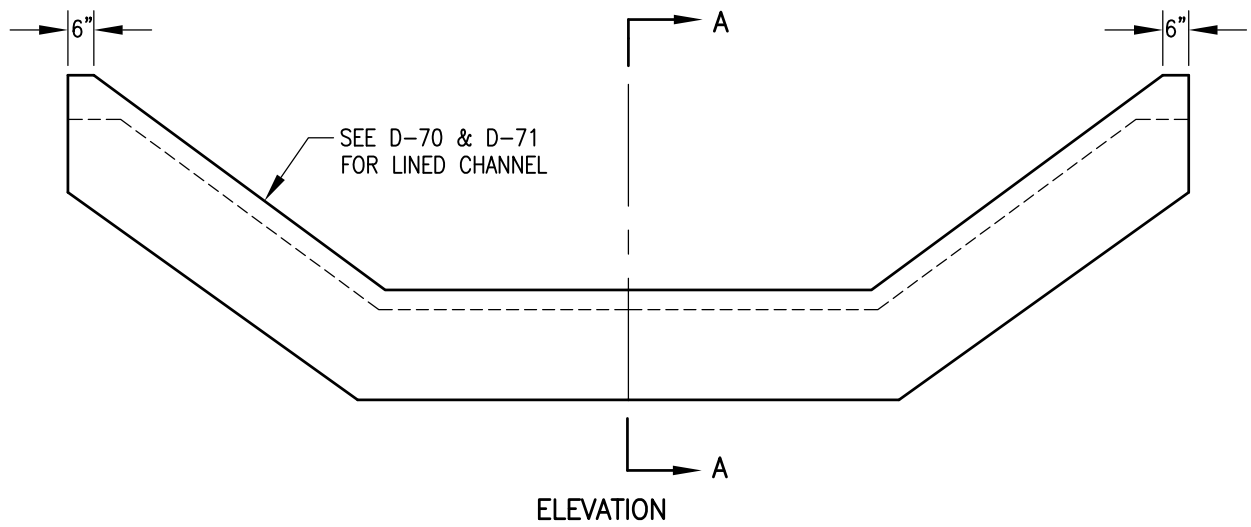
SAN DIEGO REGIONAL STANDARD DRAWING

MAJOR DRAINAGE CHANNEL

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*T. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-71



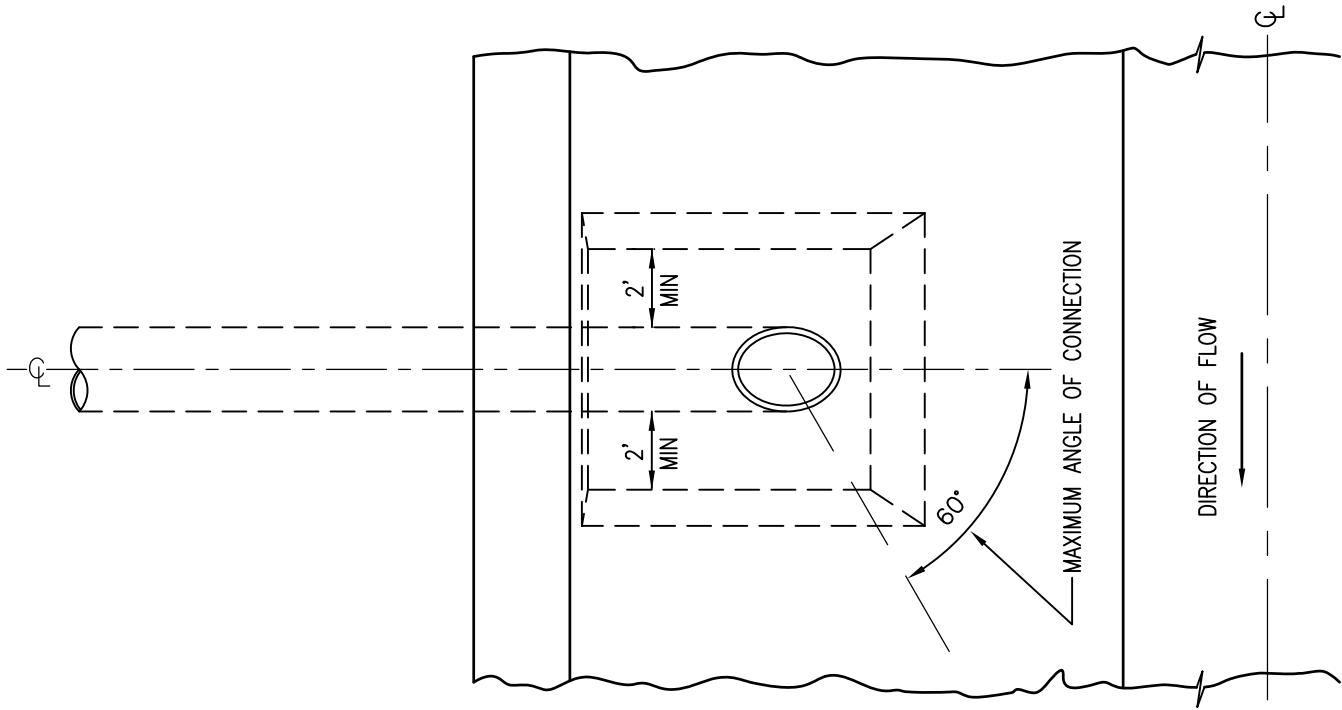
LEGEND ON PLANS



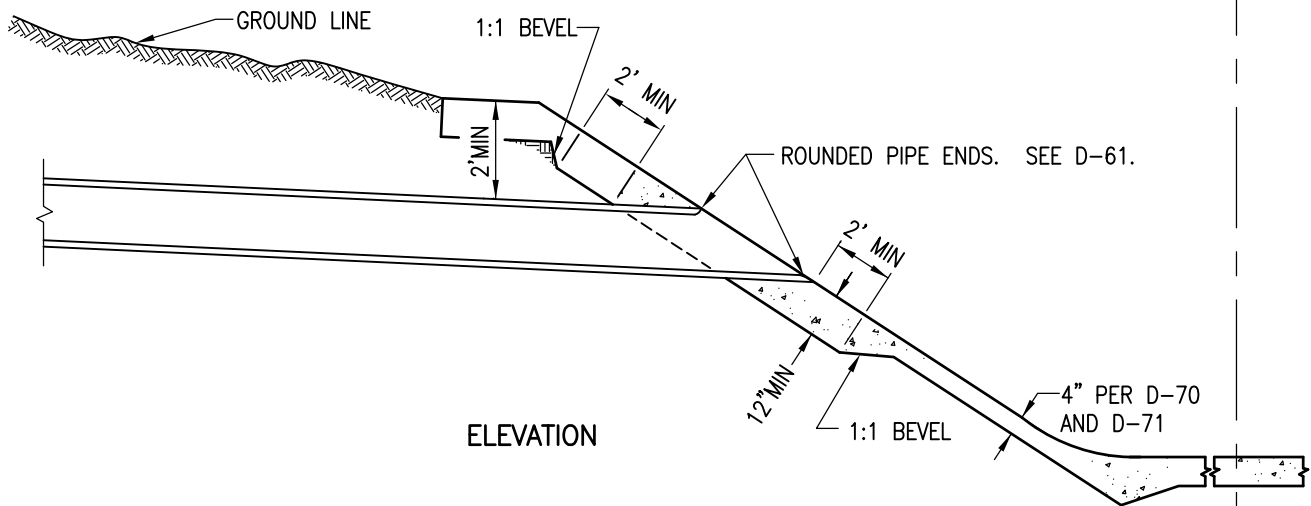
NOTES

1. THICKNESS AND WALL DEPTH SHALL BE AS SHOWN ON PLAN.
2. REINFORCING IN CUTOFF WALL SHALL BE THE SAME AS THAT REQUIRED IN CHANNEL.
3. CONCRETE SHALL BE 560-C-3250.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	CUTOFF WALL FOR DRAINAGE CHANNEL		 10/25/2018 Chairperson R.C.E. 19246 Date
Reviewed		T. Stanton	04/06			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			DRAWING NUMBER



PLAN

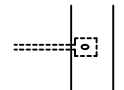


ELEVATION

NOTES:

1. CONCRETE SHALL BE 560-C-3250.
2. PIPE SHALL CONNECT TO CHANNEL AS HIGH AS POSSIBLE AND NOT BE CONSTRUCTED DIRECTLY ABOVE A WEEP HOLE.
3. THE MAXIMUM ANGLE OF CONNECTION IS 60° DOWNSTREAM. IN NO CASE SHALL THE PIPE ANGLE UPSTREAM.
4. INSTALL 6 x 6-W1.4 x W1.4 WWR IN CONCRETE AROUND PIPE.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

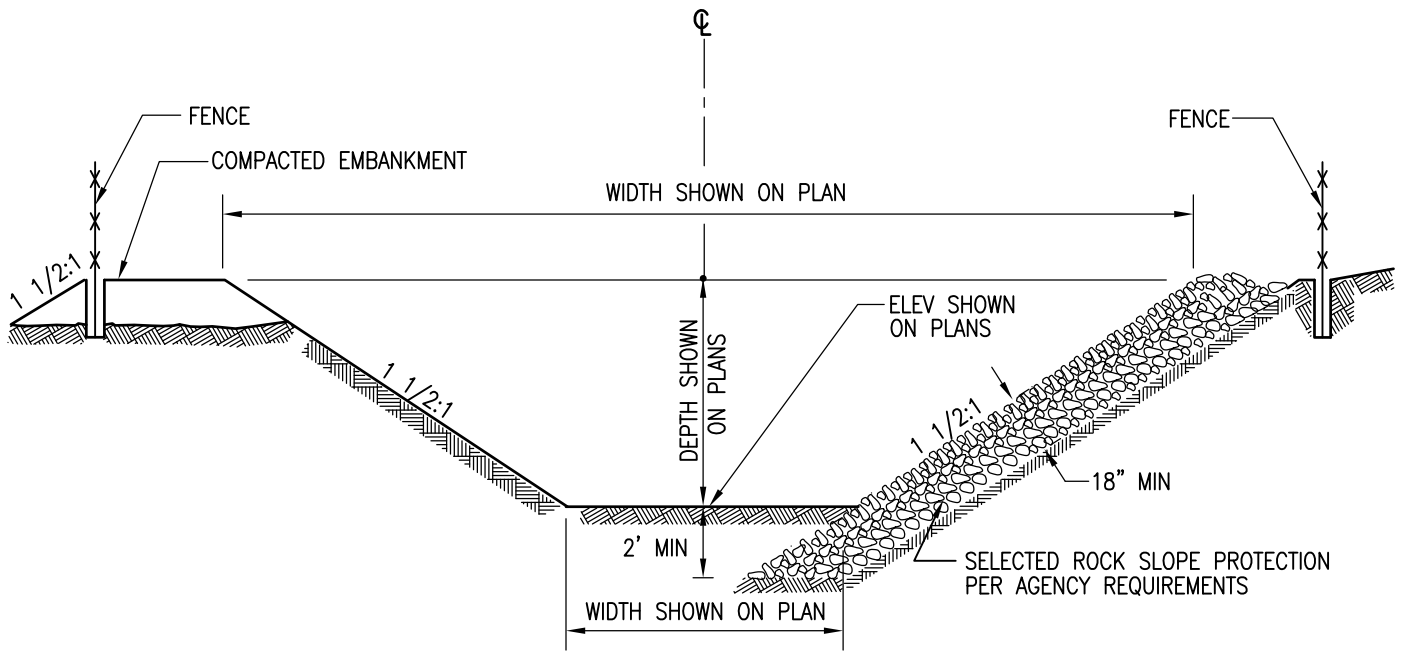
SAN DIEGO REGIONAL STANDARD DRAWING

PIPE TO CHANNEL CONNECTION

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-73



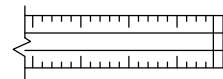
SECTION

**NOTE**

THE FOLLOWING SHALL BE SPECIFIED BY AGENCY AND INCLUDED IN THE PLAN DESIGN:

- A) LOW FLOW CHANNEL LOCATION
- B) FILTER BLANKET THICKNESS, TYPE AND LOCATION
- C) CUTOFF WALL
- D) FENCE

**LEGEND ON PLANS**



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

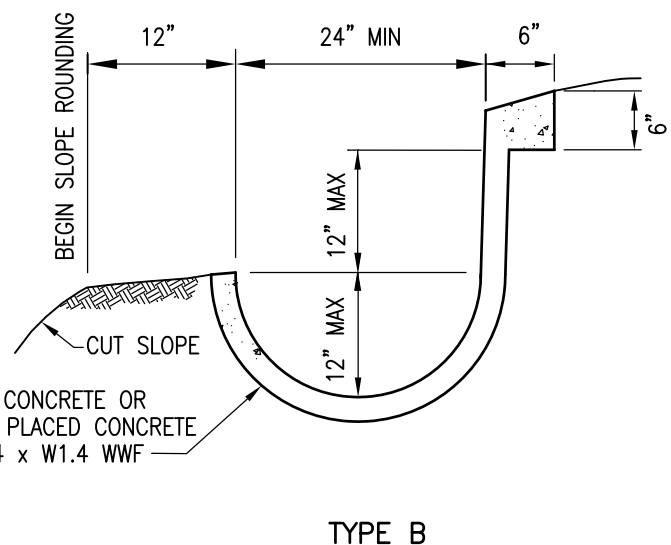
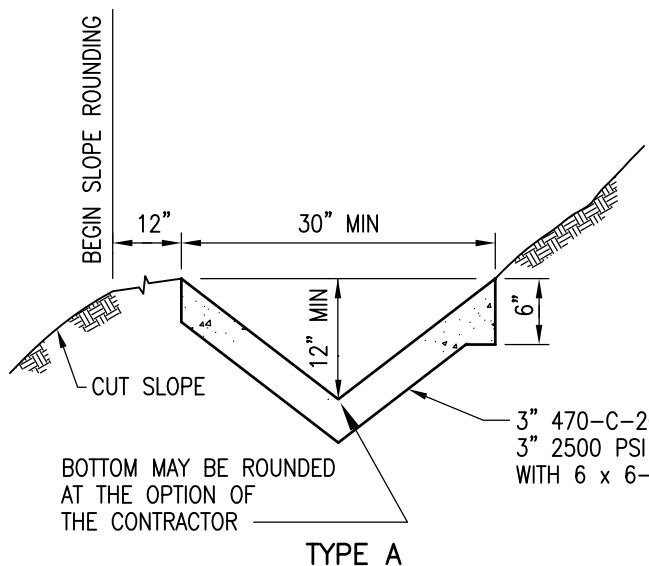
GRADED EARTH CHANNEL

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-74





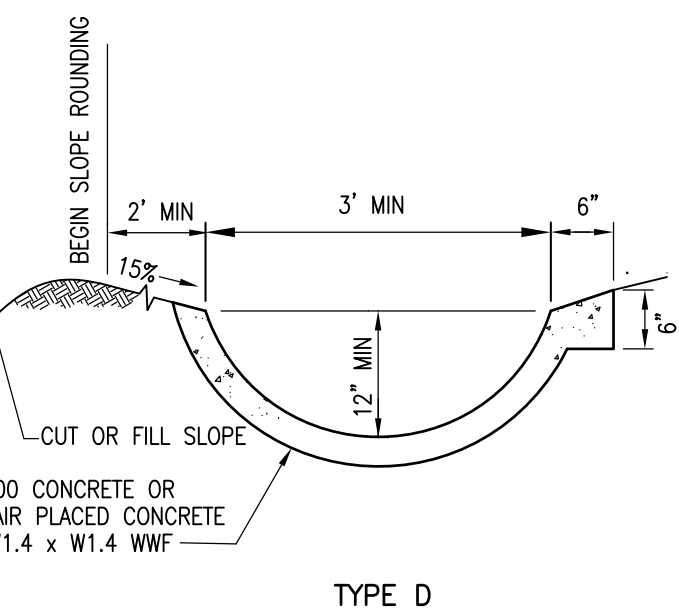
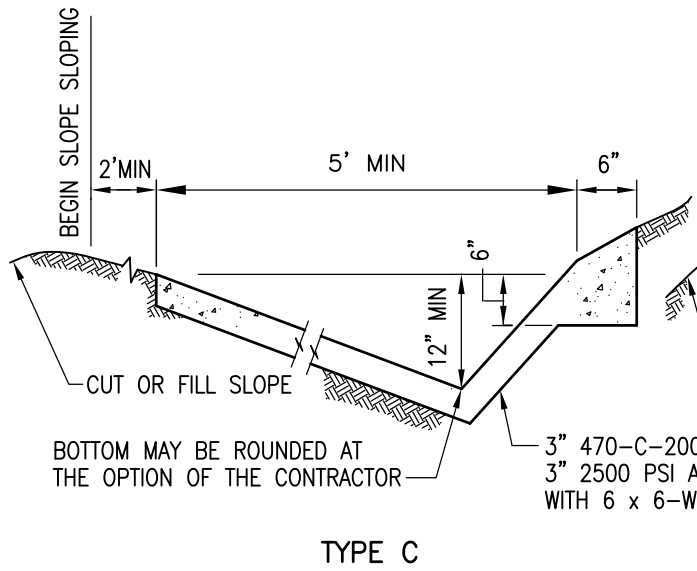
TYPE A

TYPE B

BROW DITCH

3" 470-C-2000 CONCRETE OR  
3" 2500 PSI AIR PLACED CONCRETE  
WITH 6 x 6-W1.4 x W1.4 WWF

BOTTOM MAY BE ROUNDED  
AT THE OPTION OF  
THE CONTRACTOR



TYPE C

TYPE D

TERRACE DITCH

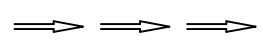
3" 470-C-2000 CONCRETE OR  
3" 2500 PSI AIR PLACED CONCRETE  
WITH 6 x 6-W1.4 x W1.4 WWF

BOTTOM MAY BE ROUNDED  
AT THE OPTION OF THE CONTRACTOR

NOTES

1. LONGITUDINAL SLOPE OF LINED DITCH SHALL BE 2% MINIMUM.
2. USE A 6" THICKENED EDGE ON BOTH SIDES OF THE DRAINAGE DITCH WHEN THE DRAINAGE DITCH IS BUILT DOWN A GRADED SLOPE.

LEGEND ON PLANS



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Reviewed		T. Stanton	04/06	DRAINAGE DITCHES	10/25/2018 Chairperson R.C.E. 19246 Date
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
				DRAWING NUMBER	D-75

Revision	By	Approved	Date
ORIGINAL		A.Kercheval	12/75
Edited		T. Stanton	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

SINGLE BOX CULVERT  
DETAILS No.1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-76A

SPANS UP TO 5' (all measurements in feet and/or inches)

SPAN	2'			3'			4'			5'																	
	1'-6"	2'	2'	2'	3'	3'	2'	3'	3'	2'	3'	3'	4'	4'	5'												
HEIGHT	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	C	D									
STRENGTH CLASSIFICATION																											
MAX FILL OVER TOP	66	38	38	66	28	28	37	50	12	27	12	27	11	26	35	46	11	25	35	46							
Top Slab	T1	6	6	6	1/4	1/4	8	7	7	8	7	8	7	1/2	8	7	1/2	8	7	1/2	8	7	1/2	10	1/2		
Bottom Slab	T2	6	6	6	1/4	1/4	8	7	7	8	7	8	7	1/2	8	7	1/2	10	1/2	7	1/2	8	7	1/2	10	3/4	
Sidewalls	T3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
Size Bar "	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	
"a" Spacing	3	1/2	3	1/2	3	1/2	3	1/2	4	5	4	1/2	5	4	1/2	5	4	1/2	5	4	4	4	4	4	4	4	4
Length	3-2	3-2	4-2	4-2	5-3	5-3	5-3	5-2	5-3	5-3	5-3	5-3	5-3	5-3	6-3	6-3	6-2	6-2	6-3	6-3	6-3	6-3	6-3	6-3	6-2	6-2	
"d" Dist. Bars	2	2	3	3	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Top Slab-No. of Bars	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Bottom Slab-No. of Bars	18	18	18	12	1/4	18	18	17	13	9	1/2	18	18	18	18	18	17	13	13	11	18	12	8	1/2	16	1/2	
Spacing	12	12	12	12	12	12	12	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	16	
Number	0.17	0.18	0.23	0.27	0.31	0.29	0.33	0.40	0.36	0.40	0.43	0.32	0.37	0.44	0.51	0.54	0.43	0.48	0.55	0.57	0.57	0.57	0.57	0.57	0.57	0.57	
Concrete: C.Y. per lin. ft.	27	29	34	36	46	44	48	52	64	64	64	57	56	60	68	75	63	65	77	87	87	87	87	87	87	87	
Reinf. lbs per lin. ft.																											

NOTE

For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities.

SPANS 6' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	6'																	
	2'			3'			4'			5'			6'			7'		
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP	10	18	18	10	18	18	10	18	25	9	17	25	9	17	25	9	17	25
TOP SLAB	T1			T1			T1			T1			T1			T1		
BOTTOM SLAB	T2			T2			T2			T2			T2			T2		
SIDEWALLS	T3			T3			T3			T3			T3			T3		
SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
SPACING	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
LENGTH	7-3	7-3	7-3	7-3	7-3	7-2	7-3	7-3	7-2	7-3	7-3	7-2	7-3	7-3	7-2	7-3	7-3	7-2
"d" DIST. TOP SLAB-NO. OF BARS	7	4	4	7	4	4	7	4	4	7	4	4	7	4	4	7	4	4
"e" BARS	18	18	18	18	18	18	18	18	17	18	15 1/2	11 1/2	18	10 1/2	17 1/2	17	10 1/2	17 1/2
SPACERS	12	12	12	12	12	14	14	14	16	16	16	16	16	16	16	16	16	18
CONCRETE: C.Y. PER LIN. FT.	0.40	0.42	0.43	0.43	0.46	0.47	0.50	0.58	0.58	0.52	0.54	0.60	0.66	0.56	0.58	0.65	0.71	0.78
REINFORCING LBS. PER LIN. FT.	64	63	66	66	65	69	67	74	70	70	80	80	91	73	78	92	112	127

**NOTE**  
 FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY.

Revision	By	Approved	Date
ORIGINAL		A.Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

SINGLE BOX CULVERT  
 DETAILS No.1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE


*M. Stanton* 10/25/2018  
 Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-76B

SPAN 7' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	7'																	
	3'		4'		5'		6'		7'		7'							
HEIGHT	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	C	
STRENGTH CLASSIFICATION	16	26	16	26	16	26	16	26	16	26	16	26	16	26	16	26	35	
MAX FILL OVER TOP																		
TOP SLAB	T <sub>1</sub>	7 1/4	8 1/4	7 1/4	8 1/4	7 1/4	8 1/4	7 1/4	8 1/4	7 1/4	8 1/4	7 1/4	8 1/4	7 1/4	8 1/4	7 1/4	8 1/4	3/4
BOTTOM SLAB	T <sub>2</sub>	7 1/2	8 3/4	7 1/2	8 3/4	7 1/2	8 3/4	7 1/2	8 3/4	7 1/2	8 3/4	7 1/2	8 3/4	7 1/2	8 3/4	7 1/2	8 3/4	10 1/2
SIDEWALLS	T <sub>3</sub>	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	8 1/2
"a" SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6
"a" SPACING	9	7	9	7	9	7	9	7	9	7	9	7	9	7	9	7	9	9
"a" LENGTH	6-8	6-9	6-8	6-9	6-8	6-9	6-8	6-9	6-8	6-9	6-8	6-9	6-8	6-9	6-8	6-9	6-8	6-10
"b" SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6
"b" SPACING	9	7	9	7	9	7	9	7	9	7	9	7	9	7	9	7	9	9
"b" DIMENSION "X"	1-3	1-4	1-3	1-4	1-3	1-4	1-3	1-4	1-3	1-4	1-3	1-4	1-3	1-4	1-3	1-4	1-3	1-4
"b" LENGTH	3-1	3-2	3-1	3-2	3-1	3-2	3-1	3-2	3-1	3-2	3-1	3-2	3-1	3-2	3-1	3-2	3-1	3-10
"c" SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6
"c" SPACING	9	7	9	7	9	7	9	7	9	7	9	7	9	7	9	7	9	9
"c" DIMENSION "Y"	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11
"c" LENGTH	5-2	5-4	6-2	6-4	7-2	7-4	7-2	7-4	7-2	7-4	7-2	7-4	7-2	7-4	7-2	7-4	7-2	8-10
"c" SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6
"c" SPACING	9	7	9	7	9	7	9	7	9	7	9	7	9	7	9	7	9	9
"c" DIMENSION "Y"	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11	1-10	1-11
"c" LENGTH	3-8	3-10	3-8	3-10	3-8	3-10	3-8	3-10	3-8	3-10	3-8	3-10	3-8	3-10	3-8	3-10	3-8	3-10
"d" TOP SLAB-NO. OF BARS	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
"d" BOTTOM SLAB-NO. OF BARS	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
"e" BARS SPACING	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
SPACERS TOTAL NUMBER	24		28		28		28		28		28		28		28		36	
CONCRETE: C.Y. PER LIN. FT.	0.47	0.56	0.51	0.60	0.55	0.64	0.58	0.68	0.62	0.72	0.66	0.76	0.70	0.80	0.74	0.84	0.88	0.89
REINFORCING LBS. PER LIN. FT.	107	130	114	138	118	143	125	150	132	158	140	176	148	184	156	192	200	184

**NOTE**  
 FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING  SINGLE BOX CULVERT DETAILS No.1	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE   10/25/2018 Chairperson R.C.E. 19246 Date
ORIGINAL		A. Kercheval	12/75		
Edited		T. Regello	02/09		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18	DRAWING NUMBER	D-76C



SPAN 10' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	10'														
	4'		5'		6'		7'		8'		9'		10'		
HEIGHT	A	B	A	B	A	B	A	B	A	B	A	B	A	B	C
STRENGTH CLASSIFICATION															
MAX FILL OVER TOP															
TOP SLAB															
Bottom Slab															
Sidewalls															
"a"															
"b"															
"c"															
"c <sub>1</sub> "															
"d"															
"e"															
SPACERS															
TOTAL NUMBER															
CONCRETE: C.Y. PER LIN. FT.															
REINFORCING LBS. PER LIN. FT.															

**NOTE**  
 FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY.

Revision	By	Approved	Date
ORIGINAL		A.Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

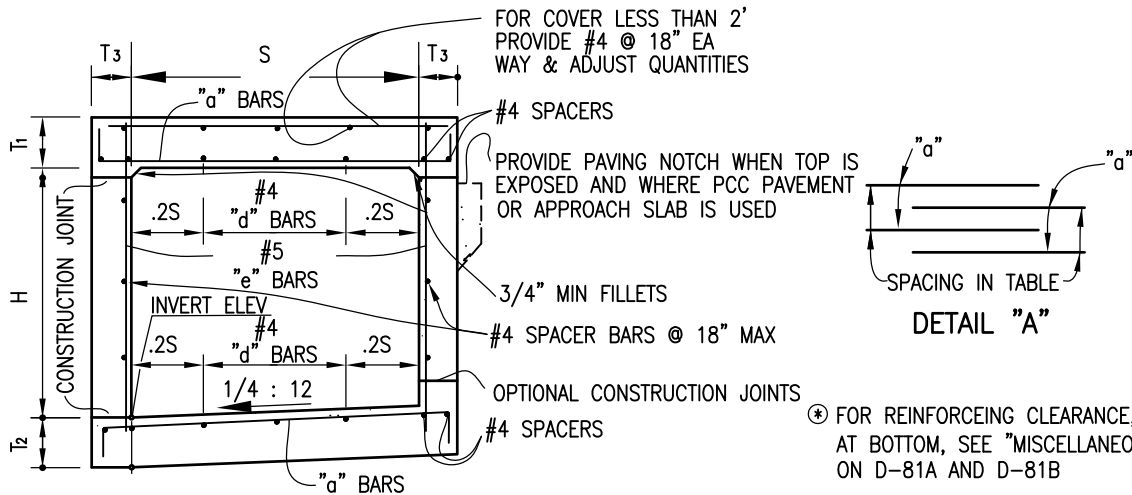
SINGLE BOX CULVERT  
 DETAILS No.1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. A. Hanton* 10/25/2018  
 Chairperson R.C.E. 19246 Date

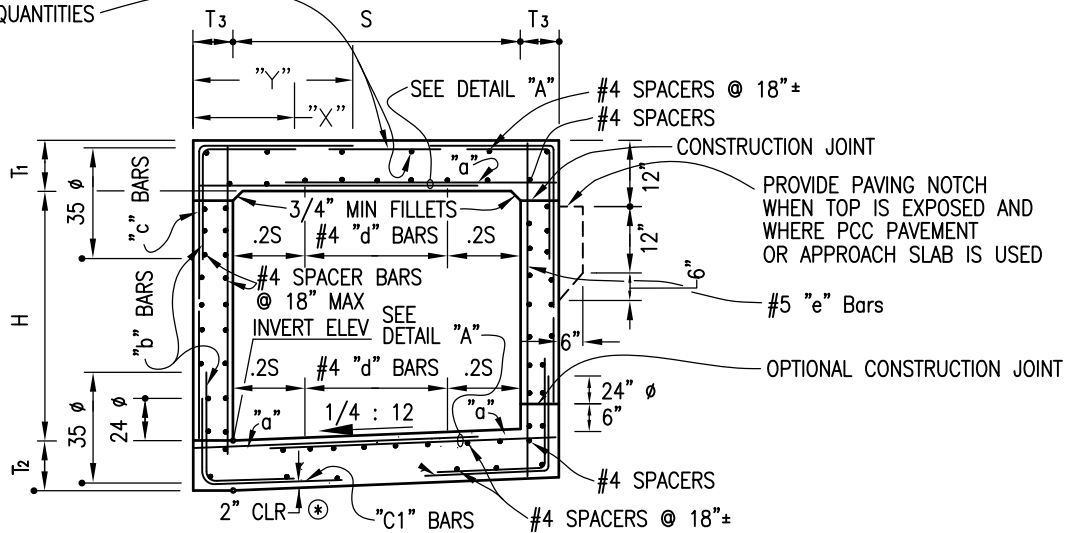
DRAWING NUMBER D-76E



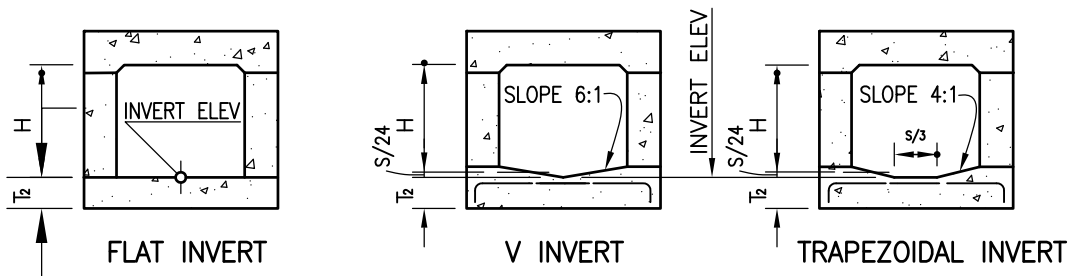


TYPICAL SECTIONS 2' THRU 6' SPANS

FOR COVER LESS THAN 2' PROVIDE #4 @ 18" EA WAY & ADJUST QUANTITIES



TYPICAL SECTIONS 7' THRU 12' SPANS



ALTERNATIVE INVERTS  
(WHEN SPECIFIED ON PLANS)

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

SINGLE BOX CULVERT  
DETAILS NO.2

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-76G



SPAN 4' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	4'											
	2'				3'				4'			
HEIGHT	A	B	C	D	A	B	C	D	A	B	C	D
STRENGTH CLASSIFICATION	11	21	32	46	11	23	34	46	11	23	34	46
MAX FILL OVER TOP	11	21	32	46	11	23	34	46	11	23	34	46
TOP SLAB	6 1/2	7 1/4	7 1/4	8 1/2	6 1/2	7 1/2	7 1/2	8 1/2	6 1/2	7 1/2	7 1/2	8 1/2
BOTTOM SLAB	6	7 1/4	8 1/2	9 1/2	6	7 1/2	8 1/2	9 1/2	6	7 1/2	8 1/2	9 1/2
SIDEWALLS	6	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	5	4	4	4	5	4	4	4	5	4	4	4
SPACING	11	11	9	9	11	10 1/2	8 1/2	7 1/2	11	10 1/2	8 1/2	7 1/2
LENGTH	10-3	10-2	10-2	10-2	10-3	10-2	10-2	10-2	10-3	10-2	10-2	10-2
SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5
SPACING	11	11	9	9	11	10 1/2	8 1/2	7 1/2	11	10 1/2	8 1/2	7 1/2
LENGTH "b"	9-4	9-4	9-6	9-6	9-4	9-4	9-6	9-7	9-4	9-4	9-6	9-7
LENGTH "b1"	9-4	9-5	9-6	9-6	9-4	9-4	9-6	9-7	9-4	9-4	9-6	9-7
SIZE BAR #	4	5	5	5	4	5	5	5	4	5	5	5
SPACING	11	11	9	9	11	10 1/2	8 1/2	7 1/2	11	10 1/2	8 1/2	7 1/2
LENGTH	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6
"d" DIST BARS	10	6	6	6	10	6	6	6	10	6	6	6
BOTTOM SLAB-TOT. NO.	6	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	4	4	4	4	4	4	4	4	4	4	4	4
SPACING	18	18	18	18	18	18	16	12	18	12	9	10
SPACERS NUMBER	23											
CONCRETE: C.Y. PER LIN. FT.	0.47	0.51	0.57	0.69	0.53	0.57	0.63	0.69	0.59	0.63	0.69	0.75
REINFORCING LBS. PER LIN. FT.	81	74	84	101	84	79	91	101	87	85	99	111

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR BOTH CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. A. Hanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER **D-77A**

SPAN 5' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	5'										
	2'		3'		4'		5'				
HEIGHT	A	B	C	A	B	C	D	A	B	C	D
STRENGTH CLASSIFICATION	6	36	36	6	24	36	46	6	23	34	46
MAX FILL OVER TOP	6	3/4	9 1/4	6 3/4	7 3/4	9 1/4	10 1/4	6 3/4	7 3/4	9 1/4	10 1/4
TOP SDAB	T1	6 3/4	9 1/4	6 3/4	7 3/4	9 1/4	10 1/4	6 3/4	7 3/4	9 1/4	10 1/4
BOTTOM SLAB	I2	6 1/2	8 3/4	10 1/4	6 1/2	8 3/4	10 1/4	6 1/2	8 3/4	10 1/4	11 1/4
SIDEWALLS	I3	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	5	4	4	5	4	4	4	5	4	4	4
SPACING	10	8 1/2	10	10	8 1/2	10	9	10	8 1/2	10	10 1/2
LENGTH	12-3	12-2	12-2	12-3	12-2	12-2	12-2	12-3	12-2	12-2	12-2
SIZE BAR #	5	5	6	5	5	6	6	5	5	5	6
SPACING	10	8 1/2	10	10	8 1/2	10	9	10	8 1/2	10	10 1/2
LENGTH "b"	11-5	11-6	11-7	11-5	11-6	11-7	11-8	11-5	11-6	11-7	11-8
LENGTH "b1"	11-4	11-6	11-7	11-4	11-6	11-7	11-8	11-4	11-6	11-7	11-8
SIZE BAR #	4	5	6	4	5	6	6	4	5	6	6
SPACING	10	8 1/2	10	10	8 1/2	10	9	10	8 1/2	10	10 1/2
LENGTH	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6
TOP SLAB-TOT. NO.	12	6	6	12	6	6	6	12	6	6	6
BOTTOM SLAB-TOT. NO.	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	4	4	4	4	4	4	5	4	4	4	5
BARS	18	18	18	18	18	16	10 1/2	18	12	10	10 1/2
SPACING	23	23	26	26	26	26	29	26	26	26	32
QUAN.	0.58	0.69	0.80	0.63	0.75	0.86	0.98	0.69	0.80	0.89	0.98
CONCRETE: C.Y. PER LIN. FT.	99	100	109	103	104	112	133	106	109	119	133
REINFORCING LBS. PER LIN. FT.											

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR BOTH CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING  
NUMBER D-77B

SPAN 6' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	6'													
	3'			4'			5'			6'				
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	D	
STRENGTH CLASSIFICATION	4	20	34	4	20	34	4	19	33	4	19	33	43	
MAX FILL OVER TOP														
Top Slab	T1	7 1/4	8 1/4	10 1/2	7 1/4	8 1/4	10 1/2	7 1/4	8 1/4	10 1/2	7 1/4	8 1/4	10 1/2	12
Bottom Slab	T2	7 1/4	9 1/2	11 1/2	7 1/4	9 1/2	11 1/2	7 1/4	9 1/2	11 1/2	7 1/4	9 1/2	11 1/2	12 3/4
Sidewalls	T3	6	6	6	6	6	6	6	6	6	6	6	6	7 1/2
"a"		5	4	4	5	4	4	5	4	4	5	4	4	4
"b"		9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	10 1/2
"b" or "b1"		14-3	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-8
"c"		5	6	6	5	6	6	5	6	6	5	6	6	7
SPACING	9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	10 1/2	
LENGTH	13-6	13-6	13-8	13-6	13-6	13-8	13-6	13-6	13-8	13-6	13-6	13-8	13-8	
SIZE BAR #	13-5	13-7	13-8	13-5	13-7	13-8	13-5	13-6	13-8	13-5	13-6	13-8	13-8	
REINFORCING STEEL	4	6	6	4	6	6	4	6	6	4	6	6	7	
SPACING	9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	10 1/2	
LENGTH	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	
"d" DIST BARS	12	6	6	12	6	6	12	6	6	12	6	6	6	
"e" BARS	6	6	6	6	6	6	6	6	6	6	6	6	6	
SPACING	4	4	4	4	4	4	4	4	4	4	4	4	5	
SPACERS NUMBER	18	18	16	18	14	8 1/2	18	10	9 1/2	18	11	9	6	
CONCRETE: C.Y. PER LIN. FT.	0.77	0.90	1.08	0.82	0.96	1.13	0.88	1.01	1.19	0.93	1.07	1.25	1.47	
REINFORCING LBS. PER LIN. FT.	121	119	147	125	124	155	128	131	164	129	137	177	201	

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR BOTH CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-77C

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. A. Hanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-77D

SPAN 8' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	8'															
	4'			5'			6'			7'			8'			
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	D
STRENGTH CLASSIFICATION	3	14	25	3	14	25	3	14	25	3	14	25	3	14	25	37
MAX FILL OVER TOP																
TOP SLAB	8 1/2	9 1/2	12	8 1/2	9 1/2	12	8 1/2	9 1/2	12	8 1/2	9 1/2	12 1/4	8 1/2	9 1/2	12 1/4	14 1/4
BOTTOM SLAB	7 1/2	10 1/2	12 3/4	7 1/2	10 1/2	12 3/4	7 1/2	10 1/2	12 3/4	7 1/2	10 3/4	13	7 1/2	10 3/4	13	15
SIDEWALLS	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T4
SIZE BAR #	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"a"	6	4	4	6	4	4	6	4	4	6	4	4	6	4	4	4
SPACING	12	9 1/2	10 1/2	12	9 1/2	10	12	9 1/2	10	11 1/2	9 1/2	10	11 1/2	9 1/2	10	8 1/2
LENGTH	18-4	18-2	18-2	18-4	18-2	18-2	18-4	18-2	18-2	18-4	18-2	18-2	18-7	18-5	18-5	18-10
SIZE BAR #	6	6	7	6	6	7	6	6	7	6	6	7	6	6	7	6
SPACING	12	9 1/2	10 1/2	12	9 1/2	10	12	9 1/2	10	11 1/2	9 1/2	10	11 1/2	9 1/2	10	8 1/2
LENGTH	17-7	17-8	17-9	17-7	17-8	17-9	17-7	17-8	17-9	17-7	17-8	17-9	17-10	17-10	17-10	18-3
"b" or "b1"	17-5	17-8	17-9	17-5	17-8	17-9	17-5	17-8	17-9	17-5	17-8	17-9	17-10	17-10	17-11	18
SIZE BAR #	4	6	7	4	6	7	4	6	7	4	6	7	4	6	7	7
SPACING	12	9 1/2	10 1/2	12	9 1/2	10	12	9 1/2	10	11 1/2	9 1/2	10	11 1/2	9 1/2	10	8 1/2
LENGTH	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-7	8-7	8-7	8-7	8-7	8-7	8-9
"d" DIST BARS	16	8	8	16	8	8	16	8	8	16	8	8	16	8	8	8
BOTTOM SLAB-TOT. NO.	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
SIZE BAR #	4	4	5	4	4	5	4	4	5	4	5	6	4	5	7	7
BARS	18	18	10 1/2	18	12	10	18	11 1/2	10	14	9 1/2	7 1/2	11 1/2	8 1/2	7 1/2	9
SPACING																
SPACERS NUMBER	41			44			44			47			50			60
CONCRETE: C.Y. PER LIN. FT.	1.08	1.30	1.55	1.14	1.37	1.61	1.19	1.42	1.66	1.32	1.56	1.83	1.39	1.62	1.99	2.27
REINFORCING LBS. PER LIN. FT.	169	175	200	172	181	218	173	188	229	185	199	248	191	207	284	314

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR BOTH CELLS.

SPAN 10' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	10'																		
	5'			6'			7'			8'			10'						
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	D
MAX FILL OVER TOP	2	17	30	2	17	30	2	17	30	2	16	29	2	16	29	2	16	29	36
TOP SLAB	8 3/4	12 3/4	16	8 3/4	12 3/4	16	8 3/4	12 3/4	16	8 3/4	12 3/4	16	8 3/4	12 3/4	16	8 3/4	12 3/4	16	17 1/2
BOTTOM SLAB	8 1/4	13 1/2	16 1/2	8 1/4	13 1/2	16 1/2	8 1/4	13 3/4	16 3/4	8 1/4	13 3/4	16 3/4	8 3/4	13 1/2	18 1/4	8 3/4	13 1/2	16 1/2	18 1/2
SIDEWALLS	6	6	6	6	6	6	6	6 1/2	7	7	7	7 1/2	7	7 1/2	7 1/2	8	8	9	10
"a" SIZE BAR #	6	4	4	6	4	4	6	4	4	6	4	4	6	4	4	6	4	4	4
"a" SPACING	11	10	10	11	9 1/2	10	11	9 1/2	10	11	10	10	11	10	10	11	10	10	9
LENGTH	22-4	22-2	22-2	22-4	22-2	22-2	22-4	22-4	22-5	22-4	22-4	22-5	22-7	22-5	22-7	22-10	22-8	22-11	23-2
"b" SIZE BAR #	6	7	8	6	7	8	6	7	8	6	7	8	6	7	8	6	7	8	8
"b" SPACING	11	10	10	11	9 1/2	10	11	9 1/2	10	11	9 1/2	10	11	10	10	11	10	10	9
LENGTH "b" or "b1"	21-7	21-10	22	21-7	21-10	22	21-7	21-11	22-3	21-7	21-11	22-3	21-10	22-1	22-4	22-9	22-1	22-9	23-1
LENGTH "b1"	21-5	21-10	22	21-5	21-10	22	21-5	21-11	22-3	21-5	21-11	22-3	21-9	22	22-4	22-9	22	22-8	23-2
"c" SIZE BAR #	6	7	8	6	7	8	6	7	8	6	7	8	6	7	8	6	7	8	8
"c" SPACING	11	10	10	11	9 1/2	10	11	9 1/2	10	11	9 1/2	10	11	10	10	11	10	10	9
LENGTH	10-6	10-6	10-6	10-6	10-6	10-6	10-6	10-7	10-7	10-7	10-7	10-7	10-7	10-7	10-8	10-8	10-8	10-9	10-10
"d" DIST TOP SLAB-TOT. NO. BARS	18	10	10	18	10	10	18	10	10	18	10	10	18	10	10	18	10	10	10
BOTTOM SLAB-TOT. NO. BARS	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" SIZE BAR #	4	4	5	4	4	5	4	4	5	4	4	5	4	4	5	4	4	5	6
"e" SPACING	18	10	10	18	6	6 1/2	14	6	6 1/2	14	6	6 1/2	11	8 1/2	6	7 1/2	7	5 1/2	5
SPACERS NUMBER	48			48			51			54			64			68			
CONCRETE: C.Y. PER LIN. FT.	1.40	2.05	2.46	1.45	2.07	2.48	1.51	2.18	2.64	1.68	2.27	2.74	1.68	2.27	2.74	1.92	2.51	3.05	3.41
REINFORCING LBS. PER LIN. FT.	236	254	310	238	274	324	243	280	339	252	278	355	252	278	355	279	327	400	476

**NOTE**  
 FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLAB, WALL DIMENSIONS AND REINFORCING STEEL.  
 MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR BOTH CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT  
 DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. A. Heaton* 10/25/2018  
 Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-77E

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. A. Hanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-77F

SPAN 12' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

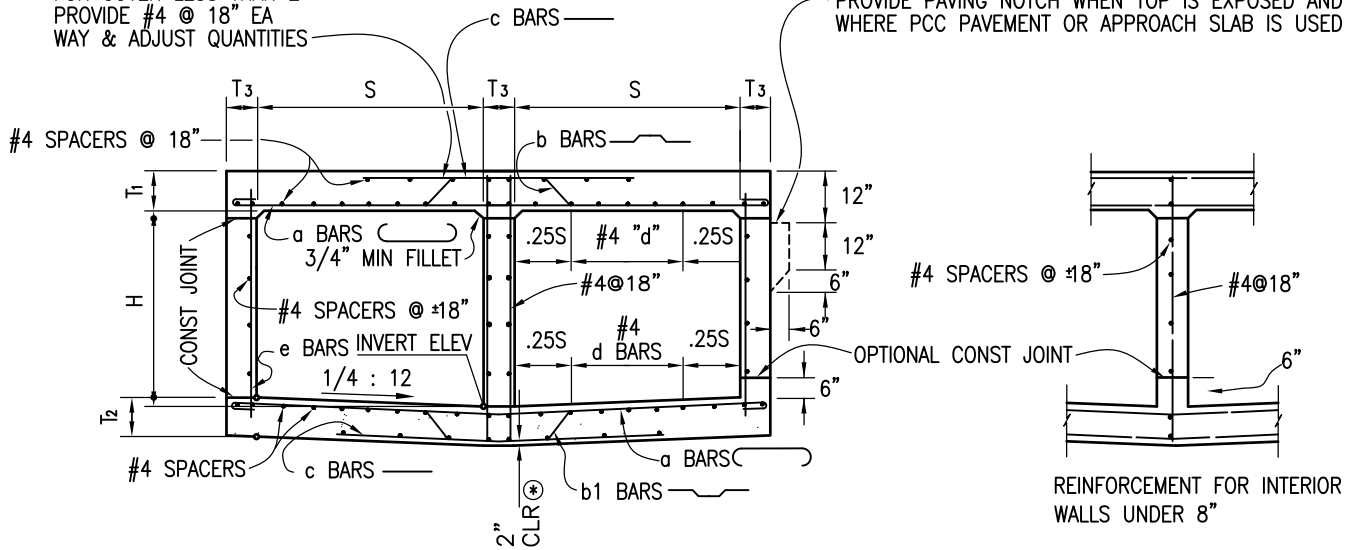
SPAN	12'																			
	6'			7'			8'			9'			10'			12'				
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	D	
STRENGTH CLASSIFICATION																				
MAX. FILL OVER TOP	2	14	26	2	14	26	2	14	26	2	14	26	2	14	26	2	14	26	36	
CONC. TOP SLAB	T <sub>1</sub>	10	14	17 1/2	10	14 1/4	17 1/2	10 1/4	14 1/4	17 3/4	10 1/4	14 1/2	17 3/4	10 1/4	14 1/2	17 3/4	10 1/4	14 1/2	18 1/4	21 1/4
CONC. BOTTOM SLAB	T <sub>2</sub>	9 1/4	14 3/4	18	9 1/4	15	18 1/4	9 3/4	15	18 1/2	10 1/4	15 1/4	18 3/4	10 1/4	15 1/4	18 3/4	10 1/2	15 1/4	19 1/4	22
CONC. SIDEWALLS	T <sub>3</sub>	6	6	6 1/2	7	7	7	8	8	8 1/2	9	9	9	9	9	9 1/2	11	11	11	12
SIZE BAR #	6	4	4	6	4	4	6	4	4	6	4	4	6	4	4	6	4	4	4	
SPACING	9	11 1/2	9	9	11 1/2	9	9	11	8 1/2	9	11	8 1/2	9	11	8 1/2	9	11	8 1/2	9	
LENGTH	26-4	26-2	26-4	26-7	26-5	26-5	26-10	26-8	26-10	27-1	26-11	26-11	27-1	26-11	27-3	27-5	27-1	27-2	27-5	
SIZE BAR #	6	8	8	6	8	8	6	8	8	6	8	8	6	8	8	6	8	8	9	
SPACING	9	11 1/2	9	9	11 1/2	9	9	11	8 1/2	9	11	8 1/2	9	11	8 1/2	9	11	8 1/2	9	
LENGTH	25-8	25-10	26-3	25-11	26-1	26-4	26-2	26-4	26-9	26-5	26-9	26-9	26-4	26-8	27-2	27-6	26-5	26-11	27-10	
SIZE BAR #	5	8	8	5	8	8	5	8	8	5	8	8	5	8	8	5	8	8	9	
SPACING	9	11 1/2	9	9	11 1/2	9	9	11	8 1/2	9	11	8 1/2	9	11	8 1/2	9	11	8 1/2	9	
LENGTH	12-6	12-6	12-7	12-7	12-7	12-7	12-8	12-8	12-9	12-9	12-9	12-9	12-9	12-9	12-11	12-9	12-10	12-11	13	
"d" DIST BARS	24	10	10	24	10	10	24	10	10	24	10	10	24	10	10	24	10	10	10	
BOTTOM SLAB-TOT. NO.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
SIZE BAR #	4	4	5	4	4	5	4	4	5	4	5	7	4	5	7	4	7	8	8	
SPACING	18	8	8	15	6	6 1/2	12	5 1/2	6	9	7 1/2	8 1/2	8	8 1/2	8 1/2	8	8 1/2	8	7	
SPACERS NUMBER	52																			
CONCRETE: C.Y. PER LIN. FT.	1.84	2.59	3.16	1.97	2.77	3.28	2.19	2.93	3.59	2.38	0.74	3.69	4.25	2.48	3.23	3.86	4.49	5.67	4.92	
REINFORCING LBS. PER LIN. FT.	309	317	401	316	330	415	336	363	460	345	374	485	578	351	394	519	582	731	673	

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR BOTH CELLS.

FOR COVER LESS THAN 2'  
 PROVIDE #4 @ 18" EA  
 WAY & ADJUST QUANTITIES

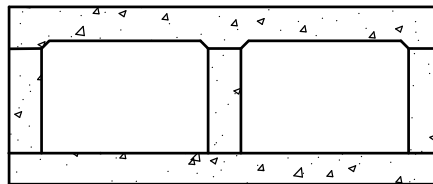
PROVIDE PAVING NOTCH WHEN TOP IS EXPOSED AND  
 WHERE PCC PAVEMENT OR APPROACH SLAB IS USED



**TYPICAL SECTION**

(SHOWING REINFORCEMENT FOR INTERIOR WALLS 8" AND OVER)

⊙ FOR REINFORCEMENT CLEARANCE, EXCEPT AT BOTTOM, SEE "MISCELLANEOUS DETAILS," ON D-81A AND D-81B.



**"FLAT INVERT" ALTERNATIVE**  
 (WHEN SPECIFIED)

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	T. Regello	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT  
 DETAILS NO. 2

RECOMMENDED BY THE SAN DIEGO  
 REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
 Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-77G

SPAN 4' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	4'								
	2'			3'			4'		
HEIGHT	A	B	C	A	B	C	A	B	C
STRENGTH CLASSIFICATION	10	24	38	10	24	38	10	24	38
MAX FILL OVER TOP	6 1/4	6 1/4	7 1/4	6 1/4	6 1/4	7 1/4	6 1/4	6 1/4	7 1/4
CONC. TOP SLAB	T1	6	7	8 1/4	6	7	8 1/4	6	7
BOTTOM SLAB	T2	6	6	6	6	6	6	6	6
SIDEWALLS	T3	5	4	5	4	5	5	4	5
"a"	11	11 1/2	13	11	11 1/2	13	11	11 1/2	13
SPACING	14-9	14-8	14-9	14-9	14-8	14-9	14-9	14-8	14-9
LENGTH	5	5	6	5	5	6	5	5	6
"b"	11	11 1/2	13	11	11 1/2	13	11	11 1/2	13
SPACING	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-3
LENGTH "b"	14	14-2	14-3	14	14-2	14-3	14	14-2	14-3
LENGTH "b1"	4	5	6	4	5	6	4	5	6
"c"	11	11 1/2	13	11	11 1/2	13	11	11 1/2	13
SPACING	9	9	9	9	9	9	9	9	9
LENGTH	15	9	9	15	9	9	15	9	9
"d" DIST	9	9	9	9	9	9	9	9	9
TOP SLAB-TOT. #	4	4	4	4	4	4	4	4	4
BARS	18	18	18	18	18	18	18	18	18
BOTTOM SLAB-TOT. #	34	34	34	34	34	34	34	34	34
BARS	0.67	0.71	0.81	0.75	0.79	0.89	0.82	0.86	0.96
CONCRETE: C.Y. PER LIN. FT.	122	110	133	127	115	138	131	122	147
REINFORCING LBS PER LIN. FT.	42								
SPACERS NUMBER	42								
REINFORCING STEEL	42								
QUAN.	42								

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR ALL CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. A. Hanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-78A



SPAN 5' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS OTHERWISE NOTED)

SPAN	5'														
	2'			3'			4'			5'					
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
STRENGTH CLASSIFICATION	8	17	26	8	17	26	8	17	26	8	17	26	8	17	26
MAX FILL OVER TOP	8	17	26	8	17	26	8	17	26	8	17	26	8	17	26
TOP SLAB	6 3/4	6 3/4	7 1/2	6 3/4	6 3/4	7 1/2	6 3/4	6 3/4	7 1/2	6 3/4	6 3/4	7 1/2	6 3/4	6 3/4	7 1/2
BOTTOM SLAB	6 1/4	7 1/4	8 1/2	6 1/4	7 1/4	8 1/2	6 1/4	7 1/4	8 1/2	6 1/4	7 1/4	8 1/2	6 1/4	7 1/4	8 1/2
CONC SIDEWALLS	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	5	4	5	5	4	5	5	4	5	5	4	5	5	4	5
SPACING	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13
LENGTH	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-8	17-9
SIZE BAR #	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6
SPACING	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13
LENGTH "b" or "b1"	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3
LENGTH "b1"	17	17-2	17-4	17	17-2	17-4	17	17-2	17-4	17	17-2	17-4	17	17-2	17-4
SIZE BAR #	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
SPACING	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13	10	11 1/2	13
LENGTH	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
"d" DIST TOP SLAB-TOT. #	18	9	9	18	9	9	18	9	9	18	9	9	18	9	9
BARS BOTTOM SLAB-TOT. #	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
SIZE BAR #	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
BARS	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
SPACING	34	34	38	34	34	38	34	34	38	34	34	38	34	34	38
SPACERS NUMBER	0.82	0.87	0.98	0.90	0.95	1.05	0.97	1.02	1.13	1.04	1.11	1.23	1.04	1.11	1.20
CONCRETE: C.Y. PER LIN. FT.	150	126	153	155	130	157	157	136	161	161	143	181	161	143	171
REINFORCING LBS. PER LIN. FT.	150	126	153	155	130	157	157	136	161	161	143	181	161	143	171
QUAN	150	126	153	155	130	157	157	136	161	161	143	181	161	143	171

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR ALL CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Wideliski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-78B

SPAN 6' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	6'												
	3'			4'			5'			6'			
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	D
STRENGTH CLASSIFICATION	3	13	23	3	13	23	3	13	23	3	13	23	30
MAX FILL OVER TOP	3	13	23	3	13	23	3	13	23	3	13	23	30
TOP SLAB	7 1/2	7 1/2	8 1/4	7 1/2	7 1/2	8 1/4	7 1/2	7 1/2	8 1/4	7 1/2	7 1/2	8 1/4	9 1/4
BOTTOM SLAB	6	7 3/4	9 1/4	6	7 3/4	9 1/4	6	8	9 1/4	6	8	9 1/4	10 1/4
SIDEWALLS	6	6	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	6	5	5	6	5	5	6	5	5	6	5	5	5
SPACING	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	10
LENGTH	20-10	20-9	20-9	20-10	20-9	20-9	20-10	20-9	20-9	20-10	20-9	20-9	20-9
SIZE BAR #	6	6	6	6	6	6	6	6	6	6	6	6	6
SPACING	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	10
LENGTH "b"	20-3	20-3	20-5	20-3	20-3	20-5	20-3	20-3	20-5	20-3	20-3	20-5	20-6
LENGTH "b1"	20	20-2	20-5	20	20-2	20-5	20	20-2	20-5	20	20	20-5	20-7
SIZE BAR #	4	6	6	4	6	6	4	6	6	4	6	6	6
SPACING	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	10
LENGTH	13	13	13	13	13	13	13	13	13	13	13	13	13
"d" DIST TOP SLAB-TOT. #	18	9	9	18	9	9	18	9	9	18	9	9	9
BARS BOTTOM SLAB-TOT. #	9	9	9	9	9	9	9	9	9	9	9	9	9
SIZE BAR #	4	4	4	4	4	4	4	4	4	4	4	4	6
BARS	18	18	18	18	18	18	18	18	18	18	18	18	10
SPACING	40	40	40	40	40	40	40	40	40	40	40	40	48
SPACERS NUMBER	40	40	40	40	40	40	40	40	40	40	40	40	48
CONCRETE: C.Y. PER LIN. FT.	1.05	1.15	1.29	1.12	1.23	1.37	1.19	1.32	1.44	1.27	1.39	1.52	1.64
REINFORCING LBS. PER LIN. FT.	181	168	196	183	170	200	187	177	209	192	187	221	249

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR ALL CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. A. Hanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-78C

SPAN 8' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	8'																	
	4'			5'			6'			7'			8'					
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
STRENGTH CLASSIFICATION																		
MAX FILL OVER TOP	2	11	20	2	11	20	2	11	20	2	11	20	2	11	20	2	11	20
TOP SLAB	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	10 1/4
BOTTOM SLAB	6 1/2	9	11	6 1/2	9 1/4	11	6 1/2	9 1/4	11	6 3/4	9 1/4	11	6 3/4	9 1/4	11	6 3/4	9 1/4	11
SIDEWALLS	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5
SPACING	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12
LENGTH	26-10	26-9	26-9	26-10	26-9	26-9	26-10	26-9	26-9	26-10	26-9	26-9	26-10	26-9	26-9	27-2	27-1	27-3
SIZE BAR #	6	6	7	6	6	7	6	6	7	6	6	7	6	6	7	6	6	7
SPACING	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12
LENGTH "b" or "b1"	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-9	27-1
LENGTH "b1"	26	26-4	26-7	26	26-5	26-7	26	26-5	26-7	26	26-5	26-7	26-1	26-5	26-9	26-5	26-9	27-1
SIZE BAR #	4	6	7	4	6	7	4	6	7	4	6	7	4	6	7	4	6	7
SPACING	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	11 1/2	12
LENGTH	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17-2	17-2	17-3
"d" DIST TOP SLAB-TOT. #	24	12	12	24	12	12	24	12	12	24	12	12	24	12	12	24	12	12
BARS BOTTOM SLAB-TOT. #	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
SIZE BAR #	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
BARS	18	18	12	18	12	12	18	12	12	18	12	12	18	12	12	11 1/2	11 1/2	12
SPACING																		
SPACERS NUMBER	58			62			62			66			70			88		
CONCRETE: C.Y. PER LIN. FT.	1.47	1.67	1.99	1.54	1.76	2.06	1.62	1.84	2.14	1.71	1.91	2.26	1.90	2.10	2.46	2.10	2.46	2.79
REINFORCING LBS. PER LIN. FT.	261	250	301	266	257	310	267	264	320	276	277	336	283	295	347	283	295	347

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR ALL CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT  
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-78D

SPAN 10' (ALL EASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	10'																
	5'			6'			7'			8'			10'				
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	D	
STRENGTH CLASSIFICATION																	
MAX. FILL OVER TOP	2	11	20	2	11	20	2	11	20	2	11	20	2	11	20	28	
TOP SLAB																	
BOTTOM SLAB	T1	9	10	12	9	10	12	9	10	12	9	10	12	9	10	12	14 1/2
SIDEWALLS	T2	7 1/2	10 3/4	13	7 1/2	10 3/4	13	7 1/2	10 3/4	13	7 3/4	11	13	8	11	13	15
CONC.	T3	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	8 1/2
SIZE BAR #																	
SPACING	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	
LENGTH	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	33-2	33-4	33-8	33-8	
SIZE BAR #	6	7	7	6	7	7	6	7	7	6	7	7	6	7	7	7	
SPACING	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	
LENGTH "b"	32-6	32-7	32-10	32-6	32-7	32-10	32-6	32-7	32-10	32-6	32-7	32-10	32-10	33-4	33-11	33-11	
LENGTH "b1"	32-2	32-7	32-11	32-2	32-7	32-11	32-2	32-7	32-11	32-2	32-7	32-11	32-6	32-11	33-5	33-5	
SIZE BAR #	5	7	7	5	7	7	5	7	7	5	7	7	5	7	7	7	
SPACING	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	
LENGTH	21	21	21	21	21	21	21	21	21	21	21	21	21-2	21-3	21-5	21-5	
"d" DIST	27	15	15	27	15	15	27	15	15	27	15	15	27	15	15	15	
BARS	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
SIZE BAR #	4	4	5	4	5	6	4	6	7	4	6	7	4	6	7	8	
BARS	18	13	10	18	13	10	13	13	10	10 1/2	12	10	10 1/2	10	11	10	
SPACING																	
SPACERS NUMBER																	
CONCRETE: C.Y. PER LIN. FT.	1.98	2.40	2.82	2.06	2.48	2.90	2.13	2.55	3.03	2.34	2.77	3.23	2.68	3.18	3.73	4.22	
REINFORCING LBS. PER LIN. FT.	358	372	470	359	379	482	367	391	502	377	402	514	421	453	577	632	

**NOTE**  
 FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR ALL CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT  
 DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
 Chairperson R.C.E. 19246 Date

DRAWING NUMBER **D-78E**

SPAN 12' (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS NOTED OTHERWISE)

SPAN	12'																				
	6'			7'			8'			9'			10'			12'					
HEIGHT	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	D		
STRENGTH CLASSIFICATION	2	10	18	2	10	18	2	10	18	2	11	20	2	11	20	2	11	20	30		
MAX FILL OVER TOP	10 1/4	11 1/2	14	10 1/4	11 1/2	14	10 1/4	11 1/2	14	10 1/4	12	14 3/4	17 3/4	10 1/4	12	14 3/4	17 3/4	18 1/4	3/4		
TOP SLAB	8 1/4	12	14 1/2	8 1/2	12	14 3/4	8 1/2	12	14 3/4	8 3/4	12 1/2	15 1/2	18 1/4	8 3/4	12 1/2	15 1/2	18 1/4	18 1/4	1/4		
BOTTOM SLAB	6	6	6 1/2	6	6	6 1/2	6	6	6 1/2	6	6	6 1/2	6	6	6 1/2	6	6	6 1/2	9		
SIDEWALLS	7	6	7	7	6	7	7	6	7	7	6	7	7	6	7	7	6	7	8		
SIZE BAR #	12	11	11 1/2	12	11	11 1/2	12	11	11 1/2	12	10 1/2	12	10 1/2	12	10 1/2	12	10 1/2	11	11 1/2		
SPACING	39-1	38-10	39-3	39-1	38-10	39-3	39-1	38-10	39-3	39-7	39-9	39-6	40-1	39-9	39-6	40-1	40-1	39-10	41-6		
LENGTH	7	7	8	7	7	8	7	7	8	7	7	8	9	7	7	8	9	7	8	9	
SIZE BAR #	12	11	11 1/2	12	11	11 1/2	12	11	11 1/2	12	10 1/2	12	10 1/2	12	10 1/2	12	10 1/2	11	11 1/2		
SPACING	38-7	38-9	39-3	38-7	38-9	39-3	38-7	38-9	39-3	39-7	39-7	39-6	40-2	39-7	39-6	40-2	41	39-10	41-6		
LENGTH "b"	38-3	38-7	39-2	38-3	38-9	39-5	38-7	39-1	39-7	39-7	39-1	39-6	40-2	39-7	39-6	40-2	41	39-4	41-6		
LENGTH "b1"	6	7	8	6	7	8	6	7	8	6	7	8	9	6	7	8	9	6	7	8	
SIZE BAR #	12	11	11 1/2	12	11	11 1/2	12	11	11 1/2	12	10 1/2	12	10 1/2	12	10 1/2	12	10 1/2	11	11 1/2		
SPACING	25	25	25-1	25	25	25-2	25-2	25-2	25-3	25-4	25-4	25-6	25-8	25-4	25-4	25-6	25-9	25-6	25-9		
LENGTH	36	15	15	36	15	15	36	15	15	36	15	15	15	36	15	15	15	36	15		
"d" DIST TOP SLAB-TOT. #	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15		
BARS BOTTOM SLAB-TOT. #	4	4	6	4	4	6	4	4	6	4	4	6	6	4	4	6	7	8	8		
SIZE BAR #	18	7	11 1/2	12	5 3/4	11 1/2	12	5 1/2	9	10	10 1/2	11	11 1/2	12	10 1/2	11	6 1/2	12	9		
BARS	110																				
SPACERS NUMBER	84																				
CONCRETE: C.Y. PER LIN. FT.	2.60	3.18	3.82	2.70	3.26	3.98	2.88	3.45	4.13	3.13	3.79	4.61	5.45	3.23	3.89	4.72	5.65	3.62	4.28	5.24	6.18
REINFORCING LBS. PER LIN. FT.	489	505	628	497	516	637	505	527	654	536	582	719	872	548	606	745	939	575	636	793	963

NOTE

FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR ALL CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited		T. Regello	02/09
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT  
DETAILS No. 1

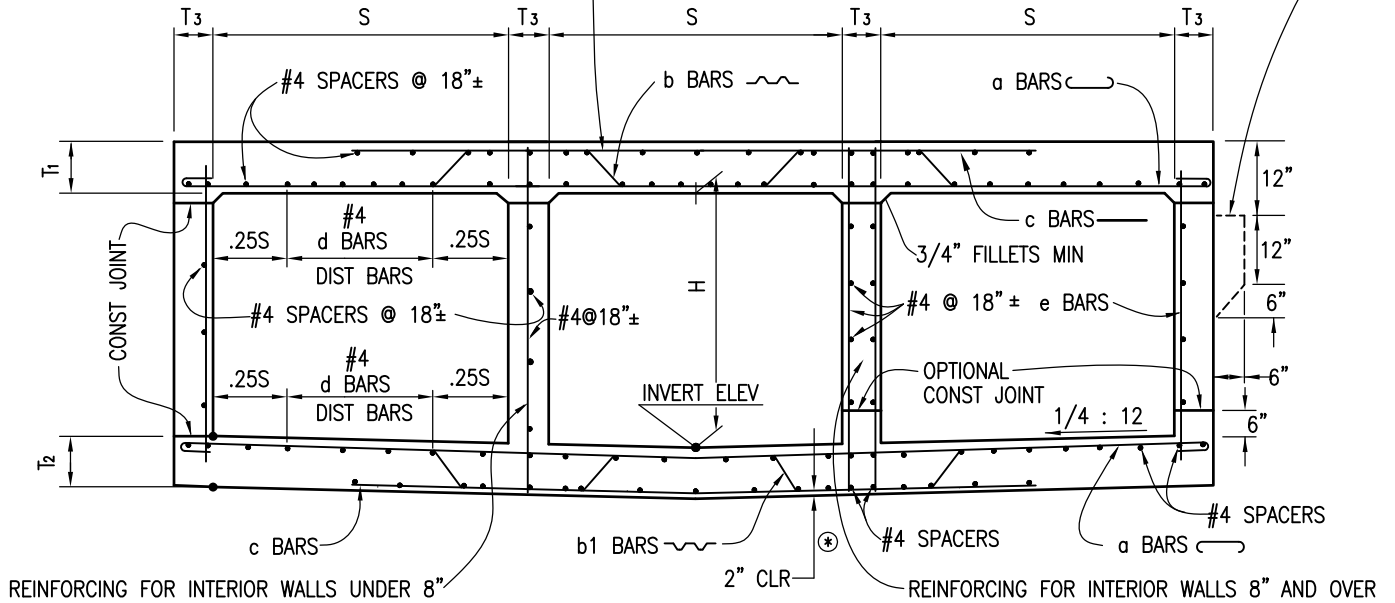
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. A. Hanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-78F

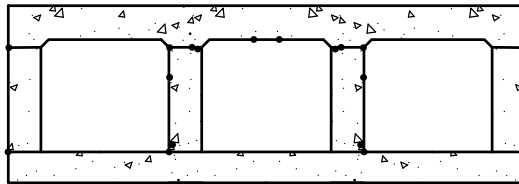
FOR COVER LESS THAN 2', EXTEND c BARS FULL LENGTH, TOP SLAB ONLY. PROVIDE ADDITIONAL #4 @ 18"± AND ADJUST QUANTITIES

PROVIDE PAVING NOTCH WHEN TOP IS EXPOSED AND WHERE PCC PAVEMENT OR APPROACH SLAB IS USED



TYPICAL SECTION

⊗ FOR REINFORCEMENT CLEARANCE, EXCEPT AT BOTTOM, SEE "MISCELLANEOUS DETAILS" ON D-81A AND D-81B.

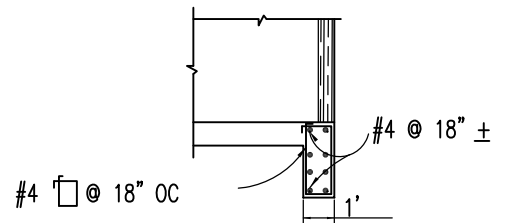
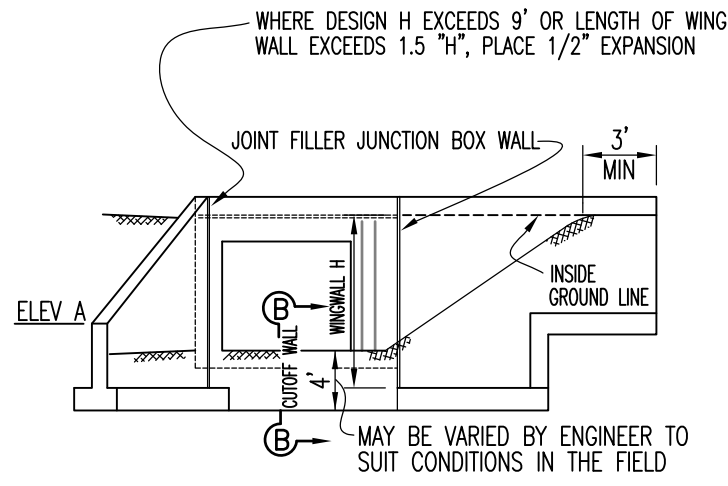
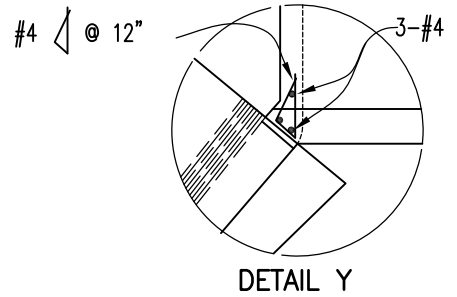
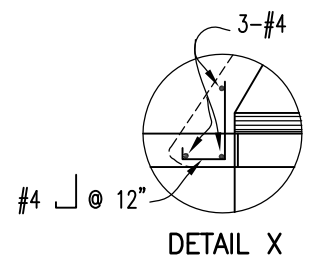
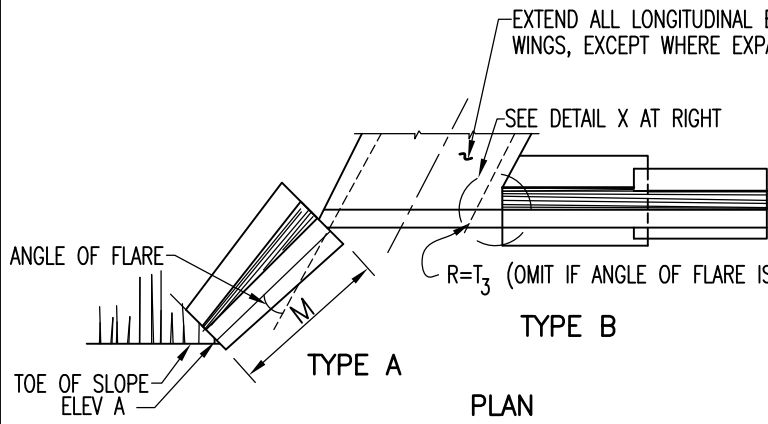


FLAT INVERT ALTERNATIVE  
(WHEN SPECIFIED)

NOTES

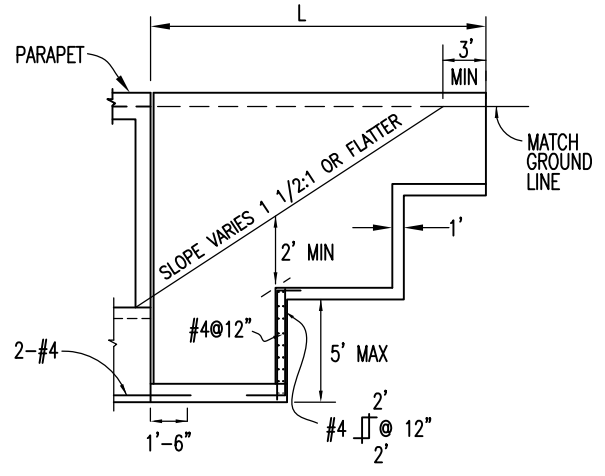
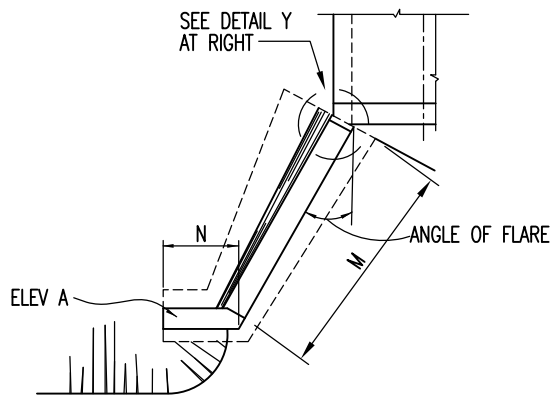
1. SPACERS SHALL BE #4 @ 18" OC IN TOP SLAB AND SIDEWALL MATS.
2. REMAINING #4 SPACERS SHALL BE QUALLY DISTRIBUTED IN BOTTOM SLAB MATS.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	TRIPLE BOX CULVERT DETAILS NO.2		 Chairperson R.C.E. 19246 Date
Reviewed		T. Stanton	04/06			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
				DRAWING NUMBER		D-78G



TYPE A TYPE B  
END ELEVATION

SECTION B-B

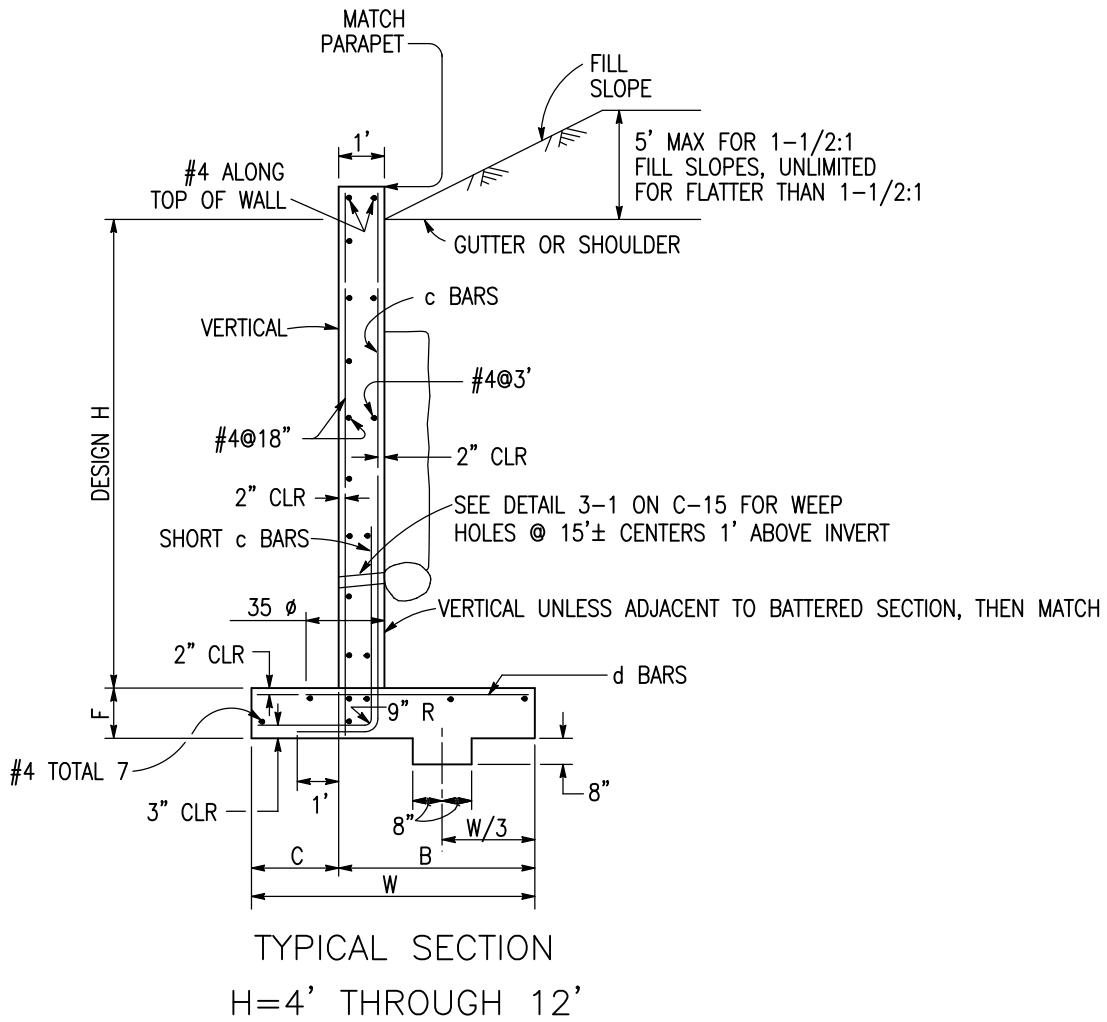


TYPE C

ELEVATION


**NOTE**  
USE TYPE 2 RETAINING WALL WHERE 1 1/2:1 SURCHARGE EXCEEDS 5'.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	<b>BOX CULVERT WINGWALL TYPES A, B &amp; C DETAILS NO. 1</b>		 Chairperson R.C.E. 19246 Date
Reviewed		T. Stanton	04/06			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
				DRAWING NUMBER		D-79A



**NOTE**

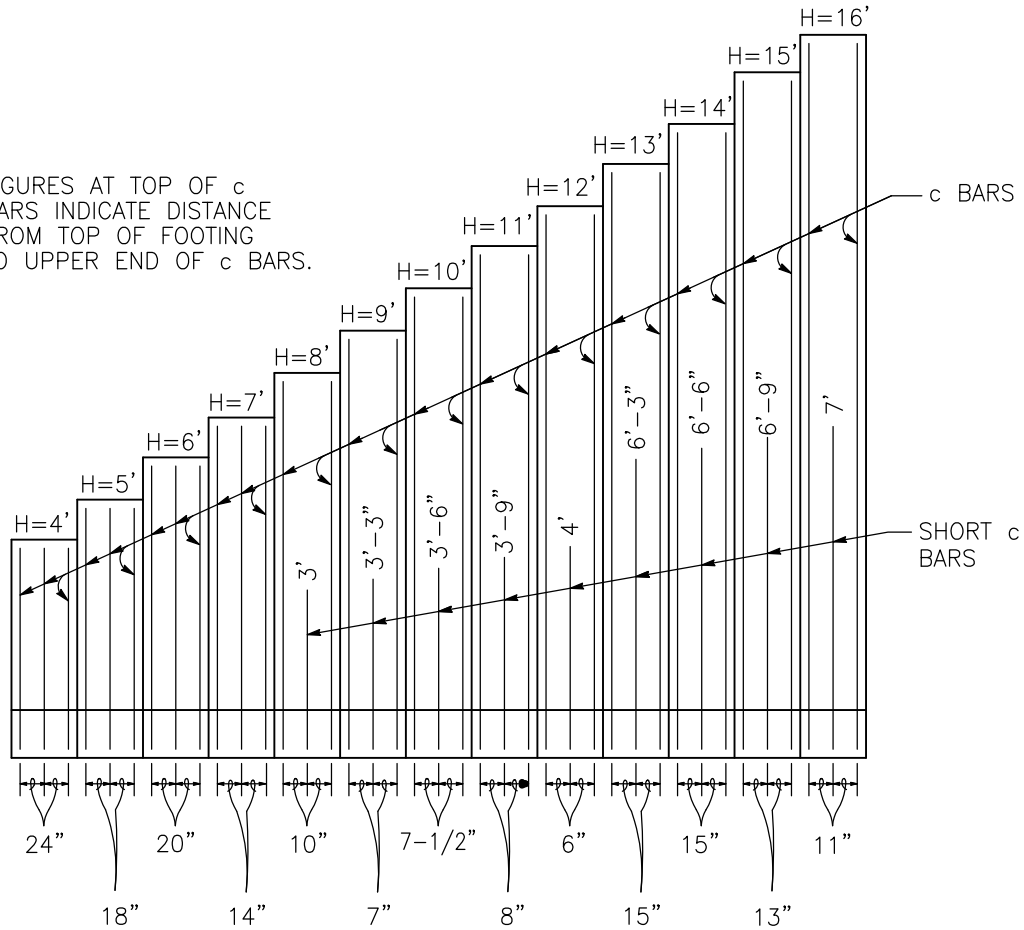
SEE D-79C IF BOX CULVERT WINGWALL HEIGHT EXCEEDS 12'.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	BOX CULVERT WINGWALL TYPES A, B & C DETAILS NO. 2		 Chairperson R.C.E. 19246 Date
Reviewed		T. Stanton	04/06			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			DRAWING NUMBER <b>D-79B</b>




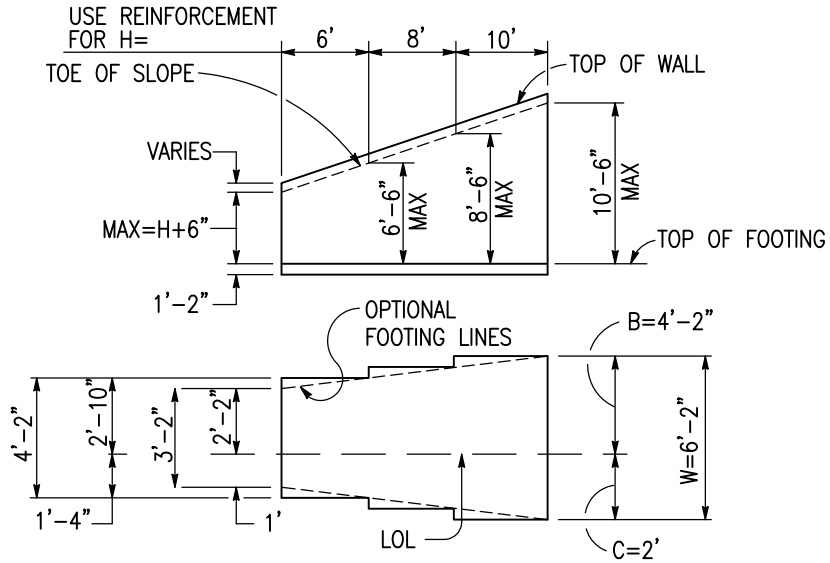


FIGURES AT TOP OF c BARS INDICATE DISTANCE FROM TOP OF FOOTING TO UPPER END OF c BARS.



TYPICAL LAYOUT EXAMPLE 1


Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	BOX CULVERT WINGWALL TYPES A, B & C DETAILS NO. 4		 10/25/2018 Chairperson R.C.E. 19246 Date
Edited		T. Regello	02/09			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			DRAWING NUMBER D-79D



TYPICAL LAYOUT EXAMPLE 2

NOTES

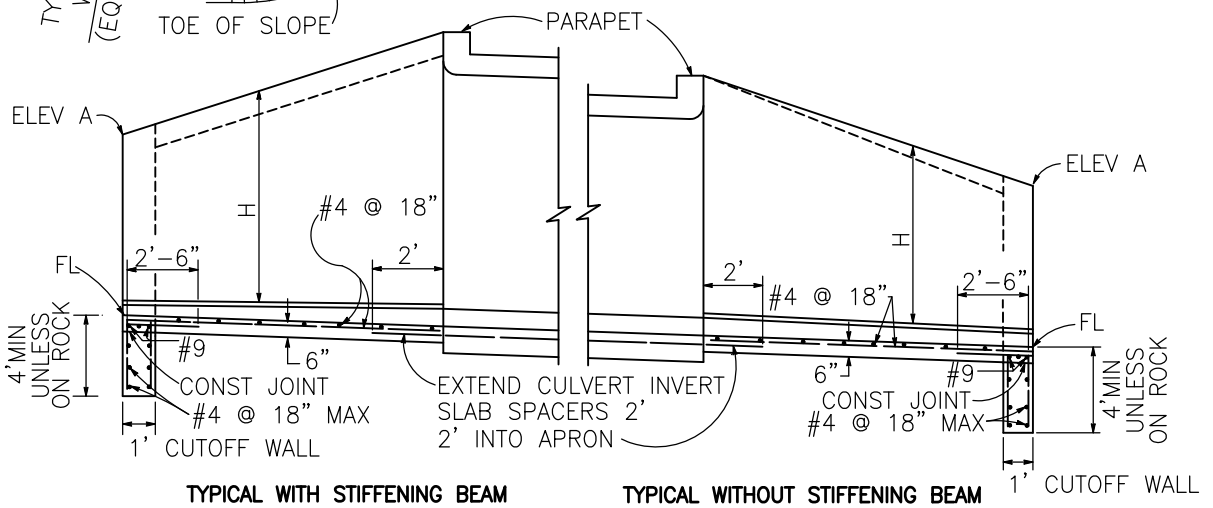
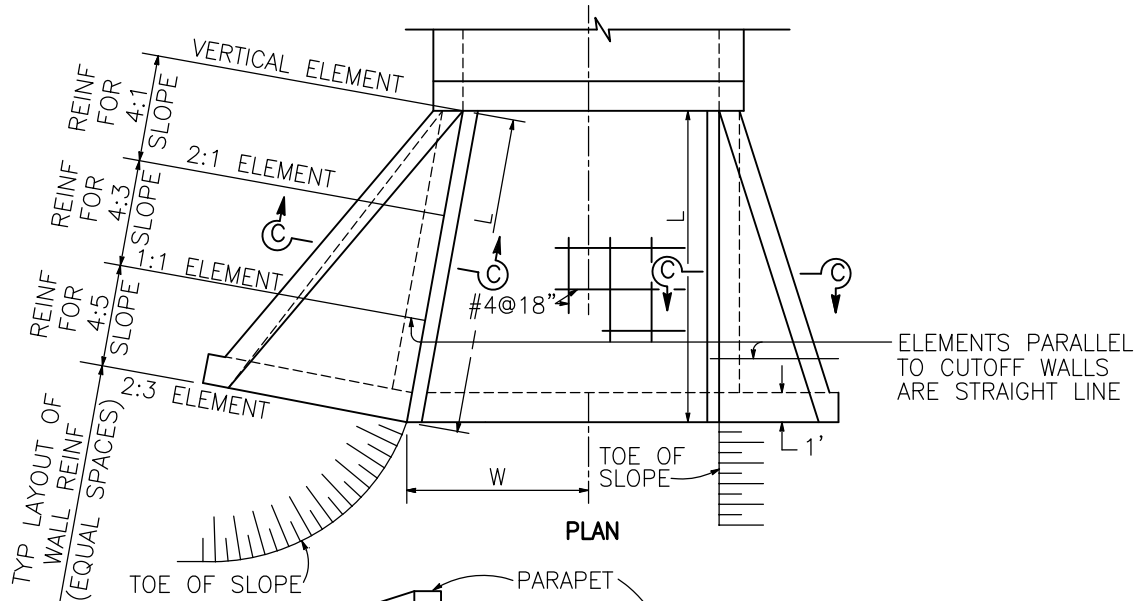
1. UNIT STRESSES:  $F_s = 20,000$  PSI,  $F_c = 1,200$  PSI,  $N = 10$ . MAXIMUM TOE PRESSURE = 1-1/2 TONS/SQ. FT. ELEVATIONS, LENGTH AND ANGLE OF FLARE OF WINGS MAY BE VARIED BY THE ENGINEER TO SUIT CONDITIONS ENCOUNTERED IN THE FIELD.
2. WALLS DESIGNED FOR 2' LIVE LOAD SURCHARGE, 1-1/2:1 SLOPING NOT TO EXCEED 5' IN ELEVATION PLUS 2' LIVE LOAD SURCHARGE, OR UNLIMITED 2:1 SURCHARGE. DIMENSIONS H, L, M, N, ELEVATION A AND ANGLE OF FLARE (AS APPLY) ARE SHOWN ON THE PLANS.
3. WALL HEIGHT MAY BE EXCEEDED BY 6" BEFORE GOING TO NEXT GREATER H. ELIMINATE CUTOFF WALL IF ADJACENT CHANNEL IS PAVED AND SKEW IS 20° MAXIMUM.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	BOX CULVERT WINGWALL TYPES A, B & C DETAILS NO. 5		 Chairperson R.C.E. 19246 Date 10/25/2018
Edited		T. Regello	02/09			
Edited	S.S.	T. Regello	03/11			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
				DRAWING NUMBER		D-79E

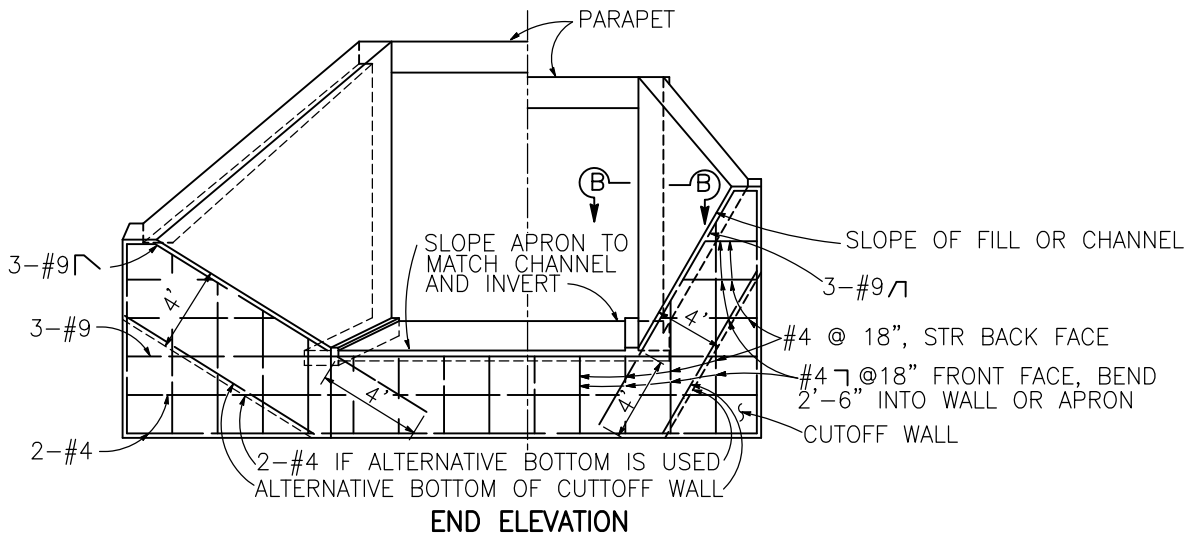
H	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'
W	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"	9'-2"
C	1'	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'
B	2'-2"	2'-6"	2'-10"	3'-2"	3'-6"	3'-10"	4'-2"	4'-6"	4'-10"	5'-2"	5'-6"	5'-10"	6'-2"
F	←————— 1'-2" —————→												
BATTER	←————— NONE —————→										←————— 1/2 : 12 —————→		
S	1'	1'	1'	1'	1'	1'	1'	1'	1'	1'-6 1/2"	1'-7"	1'-7 1/2"	1'-8"
c BARS	#4@24	#4@18	#5@20	#5@14	#5@10	#5@7	#6@7 1/2	#7@8	#7@6	#9@15	#10@15	#10@13	#10@11
d BARS	#4@24	#4@18	#5@20	#5@14	#5@10	#6@14	#7@15	#8@16	#7@12	#8@15	#9@15	#10@13	#9@11
CONC CY/LF	0.32	0.38	0.44	0.49	0.55	0.61	0.67	0.73	0.79	1.02	1.10	1.18	1.26
REINF #/LF	13	16	19	25	30	37	49	62	76	73	90	104	125

**NOTE**  
QUANTITIES DO NOT INCLUDE THAT PORTION ABOVE THE DESIGN H LIMIT.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75		BOX CULVERT WINGWALL TYPES A, B & C DETAILS NO. 6	<i>M. Heaton</i> 10/25/2018
Edited		T. Regello	02/09	Chairperson R.C.E. 19246 Date		
Edited	S.S.	T. Regello	03/11	DRAWING NUMBER		D-79F
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			



PART LONGITUDINAL SECTION



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

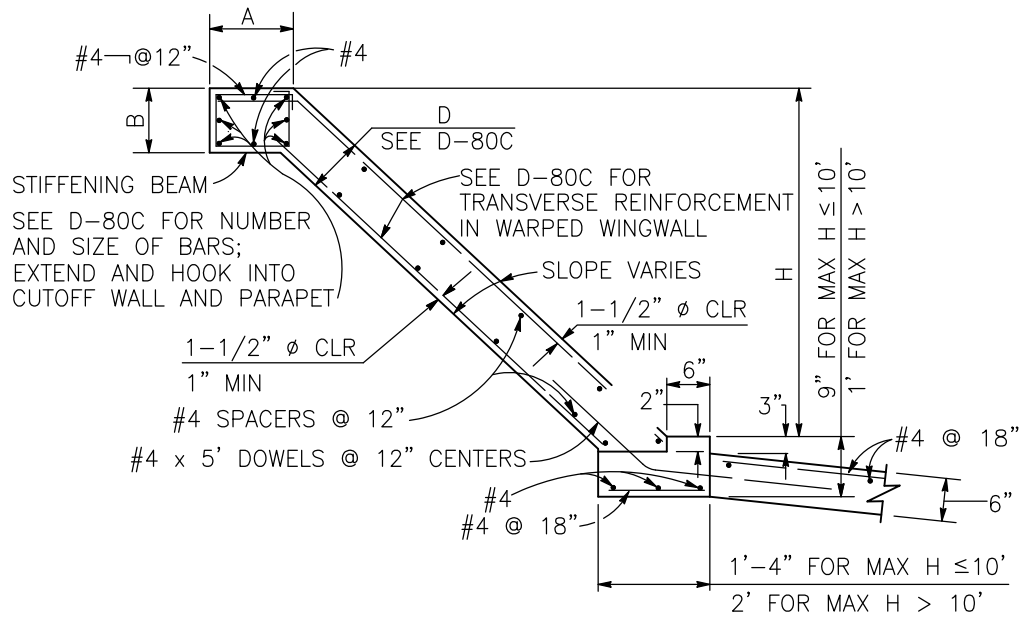
SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WARPED WINGWALL  
 DETAILS NO. 1

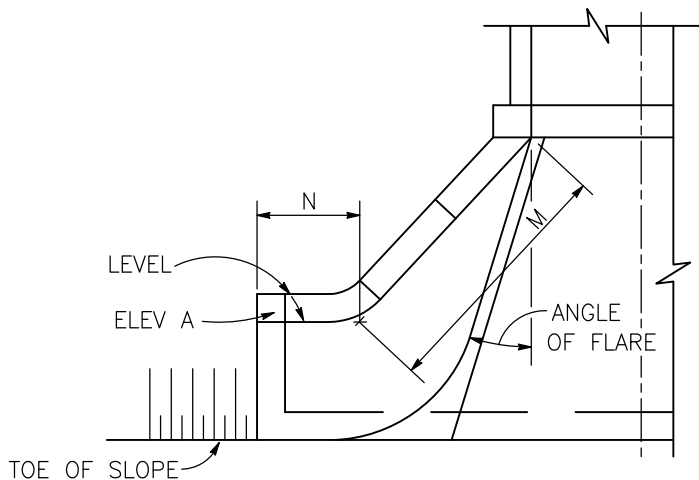
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*T. Stanton* 10/25/2018  
 Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-80A

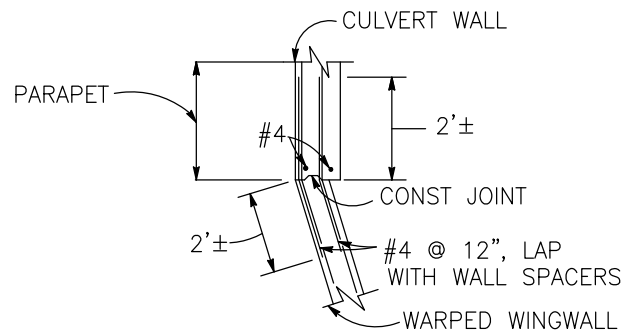


SECTION C-C



ALTERNATIVE WARPED WINGWALL

USE WHERE ADDITIONAL PROTECTION TO TOE OF EMBANKMENT IS REQUIRED



SECTION B-B

NOTES

1. WALLS DESIGNED FOR 2' SURCHARGE; EARTH DENSITY = 120 LBS./CU. FT.; EQUIVALENT FLUID PRESSURE = 36 LBS./CU. FT.
2. VARY D OF WARPED WALL UNIFORMLY FROM THAT AT CUTOFF WALL TO THAT AT CULVERT, FOR MAXIMUM H > 12'.
3. WHERE ABRASION IS ANTICIPATED INCREASE APRON THICKNESS TO 7" MINIMUM TO PROVIDE 2" MINIMUM REINFORCEMENT COVERAGE.
4. DIMENSIONS L, W, H, M, N, ELEVATION A, ANGLE OF FLARE, AND END SLOPE (AS APPLY) ARE SHOWN ON THE PLANS.
5. CONCRETE SHALL BE 560-C-3250 AND REINFORCING STEEL SHALL BE MINIMUM GRADE 40 (UNLESS SPECIFIED OTHERWISE).

Revision	By	Approved	Date
ORIGINAL		A.Kercheval	12/75
Reformatted		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WARPED WINGWALL  
DETAILS No. 2

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-80B

WALL DIMENSIONS AND REINFORCING								
ELEMENT SLOPE	H	8' OR LESS	10'	12'	14'	16'	18'	20'
1/4:1	FRONT FACE REINF	#4@12	#4@ 7	#5@ 7	#5@ 5	#6@ 6	#7@ 7	#7@ 6
	REAR FACE REINF	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12
3/4:1	FRONT FACE REINF	#4@12	#4@12	#4@12	#4@12	#4@10	#4@ 8	#4@ 6
	REAR FACE REINF	#4@12	#4@12	#4@12	#4@10	#4@ 7	#4@ 6	#5@ 8
1-1/4:1	FRONT FACE REINF	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12
	REAR FACE REINF	#4@ 8	#4@ 8	#4@ 5	#5@ 6	#6@ 7	#6@ 6	#7@ 6
D AT CUTOFF WALL		6"	6"	6"	7-1/2"	8"	9-1/2"	11"
D AT CULVERT		6"	6"	6"	8"	9-1/2"	11"	1'-1"

STIFFENING BEAM DIMENSIONS AND REINFORCING										
H MAX	L	12'	14'	16'	18'	20'	25'	30'	35'	40' OR MORE
6'		NO BEAM. PLACE 2-#6 IN EACH								
8'		FACE ALONG TOP OF								
10'		WALL.								
12'		A=1'								
14'		B=9"								
16'		TOTAL 6-#6								
18'		TOTAL 6-#7								
20'		TOTAL 8-#9								

Revision	By	Approved	Date
ORIGINAL		A.Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WARPED WINGWALL  
DETAILS No. 3

RECOMMENDED BY THE SAN DIEGO  
REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING  
NUMBER D-80C

## GENERAL NOTES

**QUANTITIES:** Quantities are for the sloped invert slab and do not include splices in the longitudinal bars, nor temperature reinforcement for exposed top culvert, nor concrete or reinforcement for parapets or cutoff walls.

**SPECIAL COVERAGE:** Box standard plans are not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition.

**DESIGNATION:** Show on plans as span x height-strength classification x length (e.g. 4 x 4-A x 60'), followed by alternatives.

**ALTERNATIVES:** Invert will be sloped unless "Trapezoidal Invert", "Flat Invert" or "V Invert" is included in designation. Ends of culvert will be rounded unless "Square Ends" are designated. Parapets will be as shown unless "\_\_\_ ft. parapet" is designated in plans. Such designations may be different for inlet and outlet ends.

**REINFORCEMENT PLACEMENT:** Main Reinforcement is positioned transverse or, for curved culverts, radial. When radial reinforcing spacing is measured along C/L.

## CONSTRUCTION NOTES

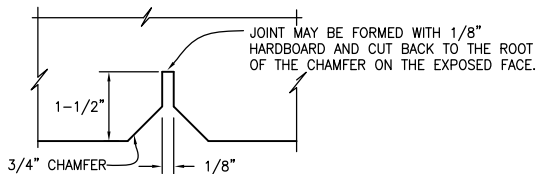
**CONCRETE:** Bottom slab & walls shall be Class 560-B-3250. Top slab shall be Class 560-C-3250.

**EXPANSION JOINTS:** Bottom Slab - No expansion joints shall be placed.

Top Slab and Walls - When cover is less than span length, place 1/2" expansion joint filler at 50'± centers outside the paved roadway lanes and place weakened plane joints per Detail A of Weakened Planes Detail 3-2 of C-15 at 30'± centers under paved roadway lanes. When cover depth is greater than span length, place 1/2" expansion joint filler at 30'± centers and additional 1/2" expansion joints at locations of change of foundation character as directed by the Engineer.

**CONSTRUCTION LOADS:** Not permitted until concrete has reached a strength of 3,000 p.s.i. or age of 28 days, whichever occurs first, and falsework plans have been submitted by the Contractor to the Engineer and approved.

**CONSTRUCTION JOINTS:** Temporary joints may be permitted if normal (or radial) to C/L of RCB. Otherwise, the Contractor is to submit a proposal for consideration.



DETAIL A OF WEAKENED PLANES DETAIL 3-2  
(PORTION OF STANDARD DRAWING C-15)

## DESIGN NOTES

### SPECIFICATIONS

**DESIGN:** AASHTO's publication titled A Policy on Geometric Design of Highways, dated 1984, with revisions as supplemented by State of California Bridge Planning and Design Manual.

Sections designed for culvert in a trench on hard foundation or culvert untrenched on yielding foundation. Special design will be required for culverts on piles or rock foundations.

### LOADING

**LIVE LOAD:** For legal highway loads, use HS20-44 or alternative with 30% impact for all cover depths with no impact on invert.

**COVER LESS THAN 2':** Wheel load distribution on the top slab is  $E=0.175S+3.2'$  longitudinally and concentrated along the span. Wheel load distribution on the invert slab is 7.5' longitudinally and uniformly over the breadth of the culvert.

**COVER 2' OR MORE:** Wheel loads distributed uniformly over a square, the sides of which are 1.75 times the depth of cover, but not less longitudinally than E on the top slab, or 7.5' on the invert slab when such areas from several wheel concentrations overlap. The total load shall be considered as uniformly distributed over the area defined by the outside limits of the individual areas, but the overall longitudinal dimension shall not exceed the total length of the supporting slab. Neglect live load, on single spans when cover is more than 8' and exceeds span, and on multiple spans when cover exceeds distance between exterior walls.

**DEAD LOAD:** Earth load of 120 pcf and an equivalent fluid pressure of 36 pcf, reduced to 84 pcf and 25 pcf respectively for clear spans of 20' or less.

**UNIT STRESSES:**  $F_s = 20,000$  psi,  $N = 10$   
 $F_c = 1,200$  psi

Reinforcement embedment is 1-1/2 dia. clear, min 1" and in 1/4" increments, except as noted.

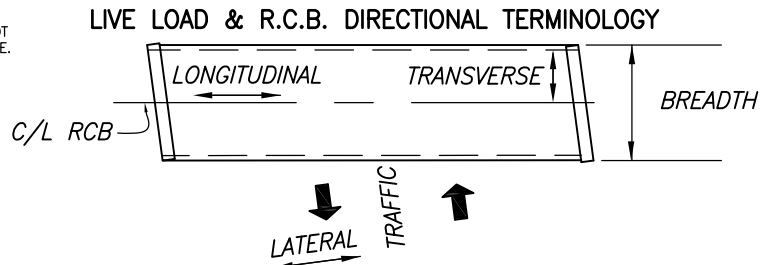
Distribution "d" bars expressed as a percent of main positive reinforcement.


Classification "A" top slab =  $\frac{100}{\sqrt{\text{SPAN}}}$ , max. 50% (unless traffic longitudinal)

Classification "B" to "E": Top and bottom slabs #4 @ 18" max.

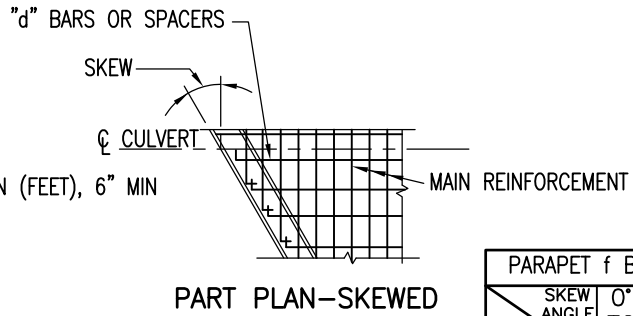
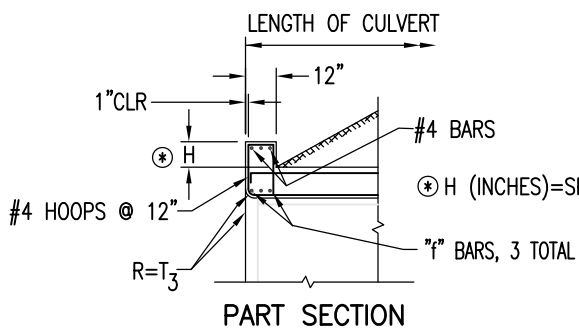
### USE OF STANDARD DRAWING

"Strength Classification," as symbolized by the letters ("A", "B", "C" or "D") at the top of the data table is merely a convenient designation for a particular structural section for a culvert of any given opening. It is dictated by the cover or depth of fill over the the top slab.



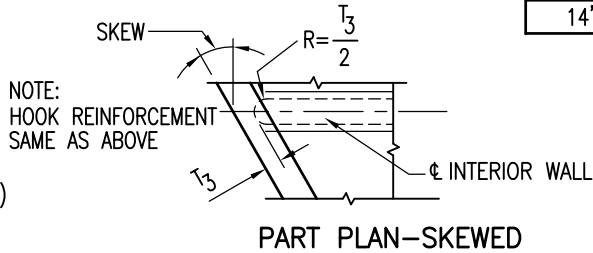
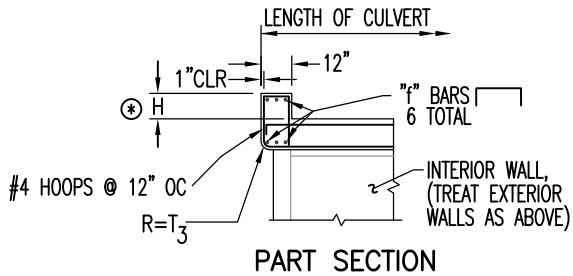
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	
ORIGINAL		Kercheval	12/75	<b>BOX CULVERT</b> <b>MISCELLANEOUS DETAILS No. 1</b>	
Reviewed		T. Stanton	04/06		
Edited	S.S.	T. Regello	03/11		
Edited	T.R.	T. Regello	10/15		
Edited	M.W.	M. Widelski	10/18		
				RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE  10/25/2018 Chairperson R.C.E. 19246 Date	
				DRAWING NUMBER <b>D-81A</b>	



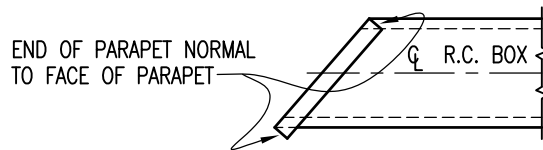


PARAPET DETAILS FOR SINGLE SPAN CULVERTS

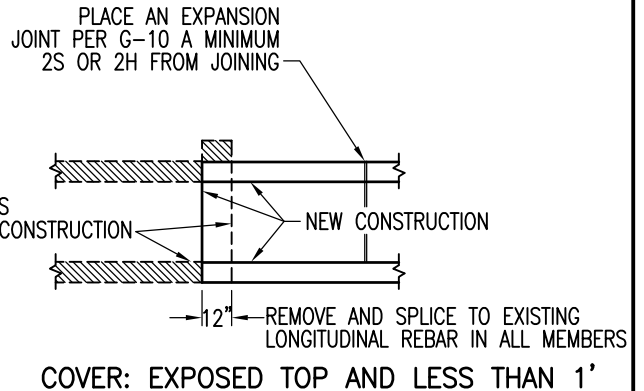
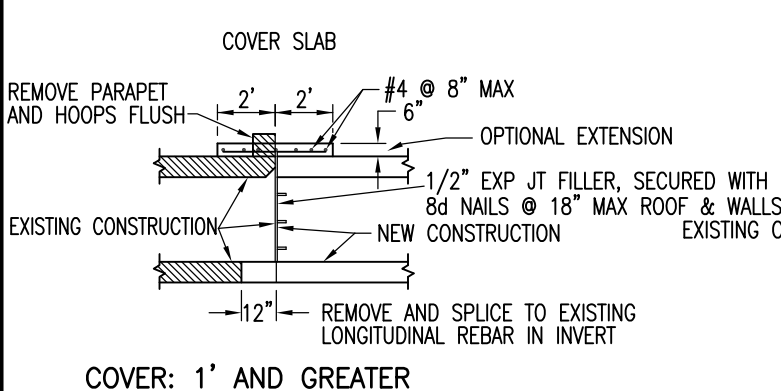
PARAPET f BAR SIZE				
SPAN (S)	SKEW ANGLE	0° TO 15°	16° TO 30°	31° TO 45°
	4'		#4	#4
6'		#4	#4	#5
8'		#4	#5	#6
10'		#5	#6	#7
12'		#6	#7	#8
14'		#7	#8	#9



PARAPET DETAILS FOR MULTIPLE SPAN CULVERTS



PARAPET DETAIL FOR SKEWED CULVERTS W/O WINGWALLS



CULVERT EXTENSION  
20° SKEW MAXIMUM

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

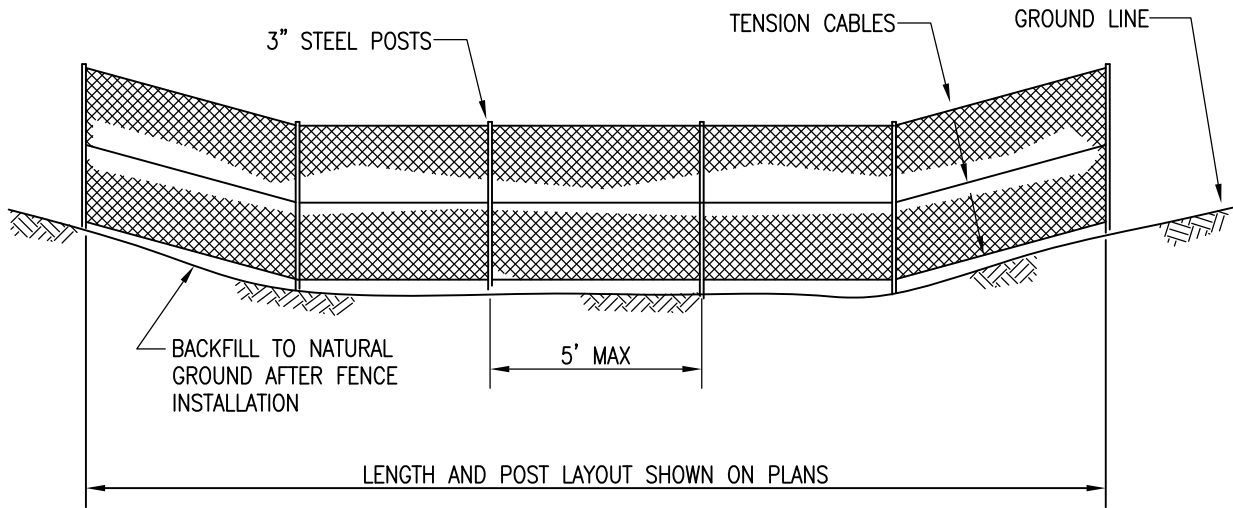
SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT  
MISCELLANEOUS DETAILS NO. 2

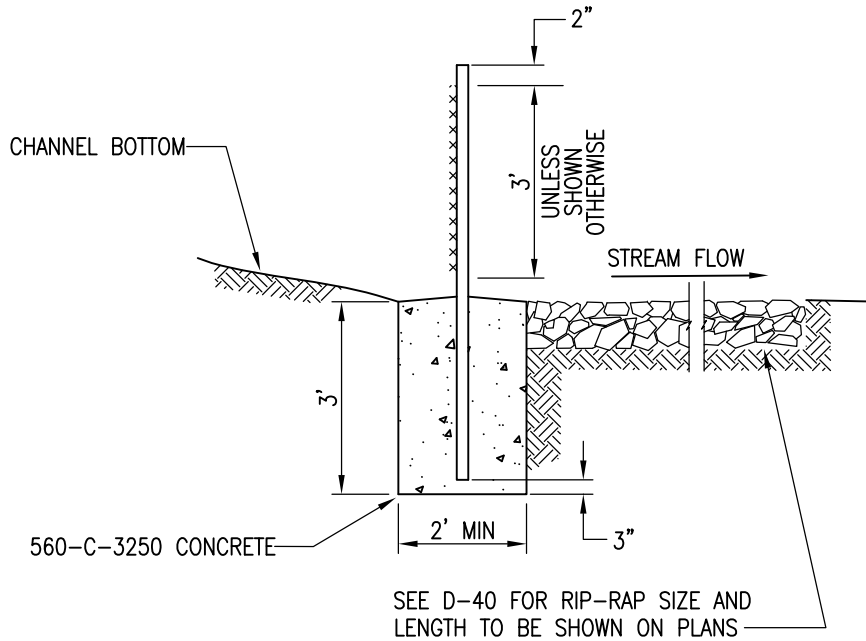
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*T. Stanton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-81B



ELEVATION

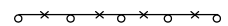


SECTION

NOTES

1. FENCE FABRIC SHALL BE 2" mesh, 9 GAGE GALVANIZED STEEL WIRE, PLACED ON THE UPSTREAM SIDE OF THE POSTS AND TENSION CABLES.
2. TENSION CABLE SHALL BE 5/16"  $\phi$  STEEL @ 18" OC, SECURED AT ENDS WITH CABLE CLAMPS. SECURE FENCE TO CABLE WITH 12 GAGE GALVANIZED STEEL WIRE LOOPED @ 6" OC.
3. POSTS SHALL BE 3" STEEL PIPE, 5.79 LBS./FT. FILL WITH MORTAR AFTER PLACING.
4. FENCE FABRIC SHALL BE SECURED TO POSTS WITH 9 GAGE WIRE CLIPS @ 9" OC.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		H. Hecht	10/82
Reviewed		T. Stanton	04/06
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18

SAN DIEGO REGIONAL STANDARD DRAWING

DEBRIS FENCE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

*M. Heaton* 10/25/2018  
Chairperson R.C.E. 19246 Date

DRAWING NUMBER D-82