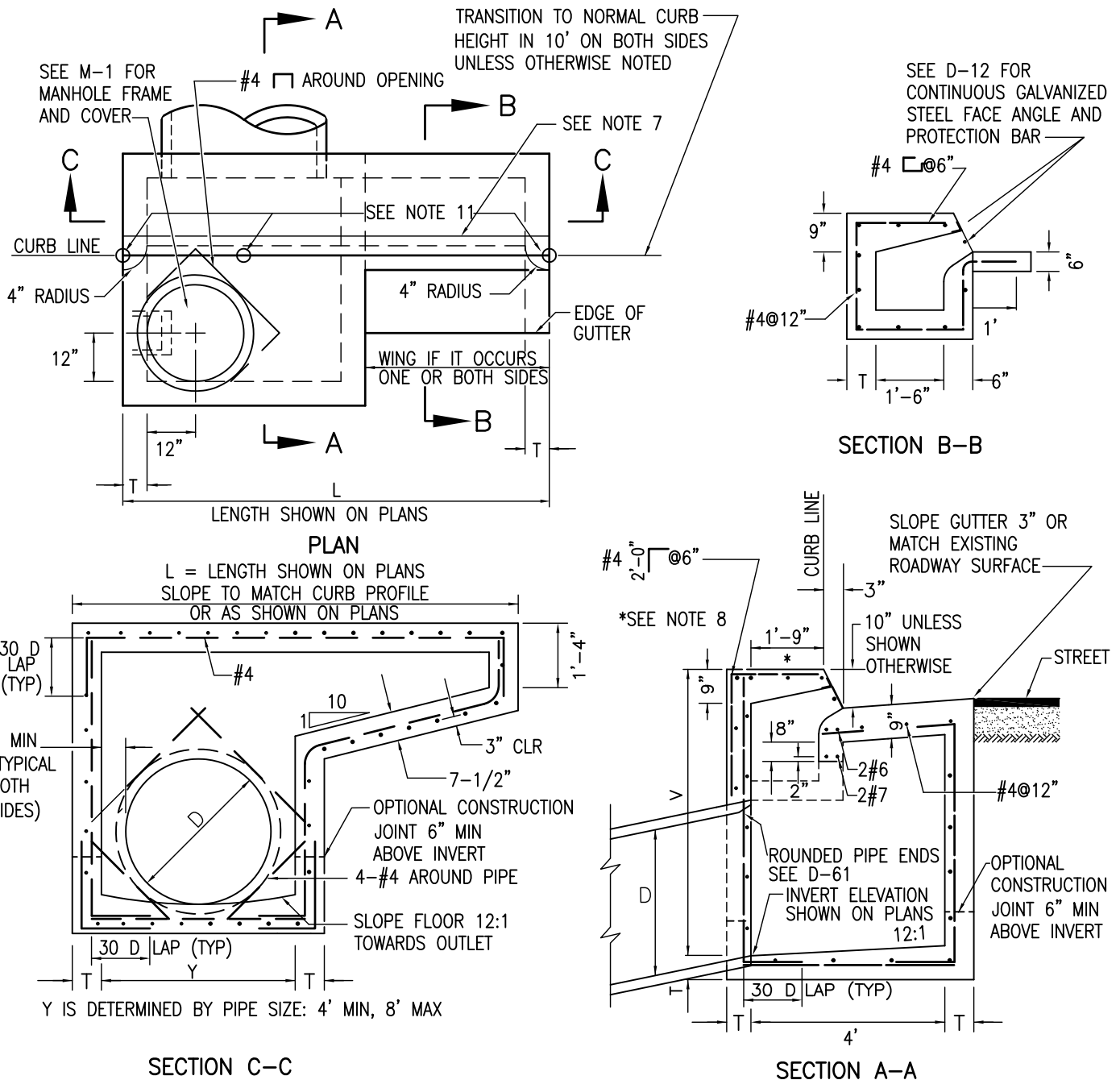


DRAINAGE SYSTEMS

DRAINAGE SYSTEMS

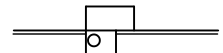
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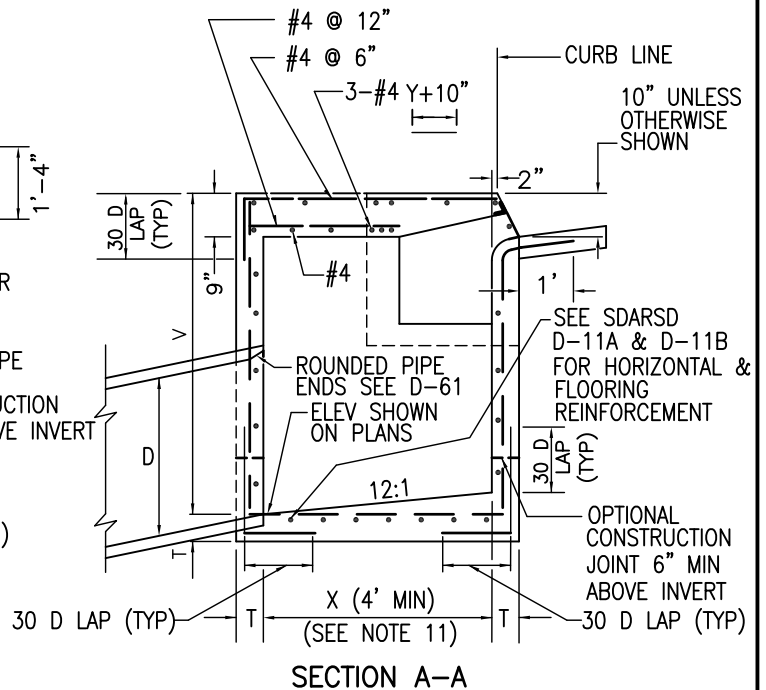
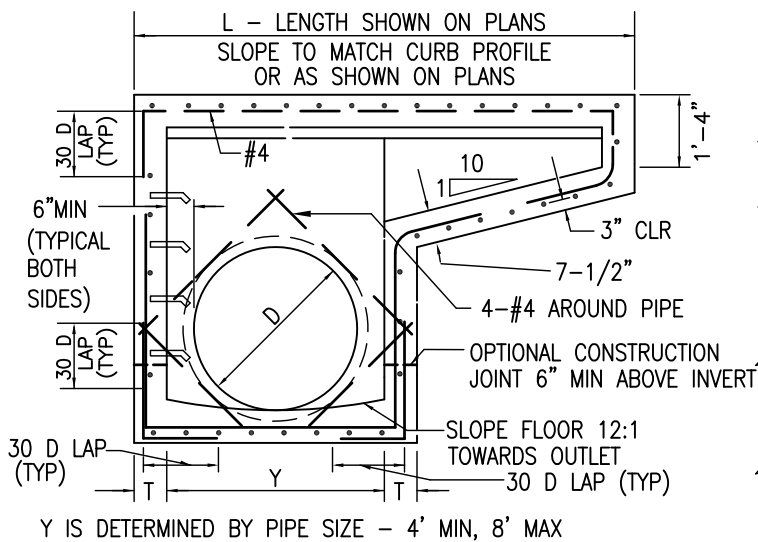
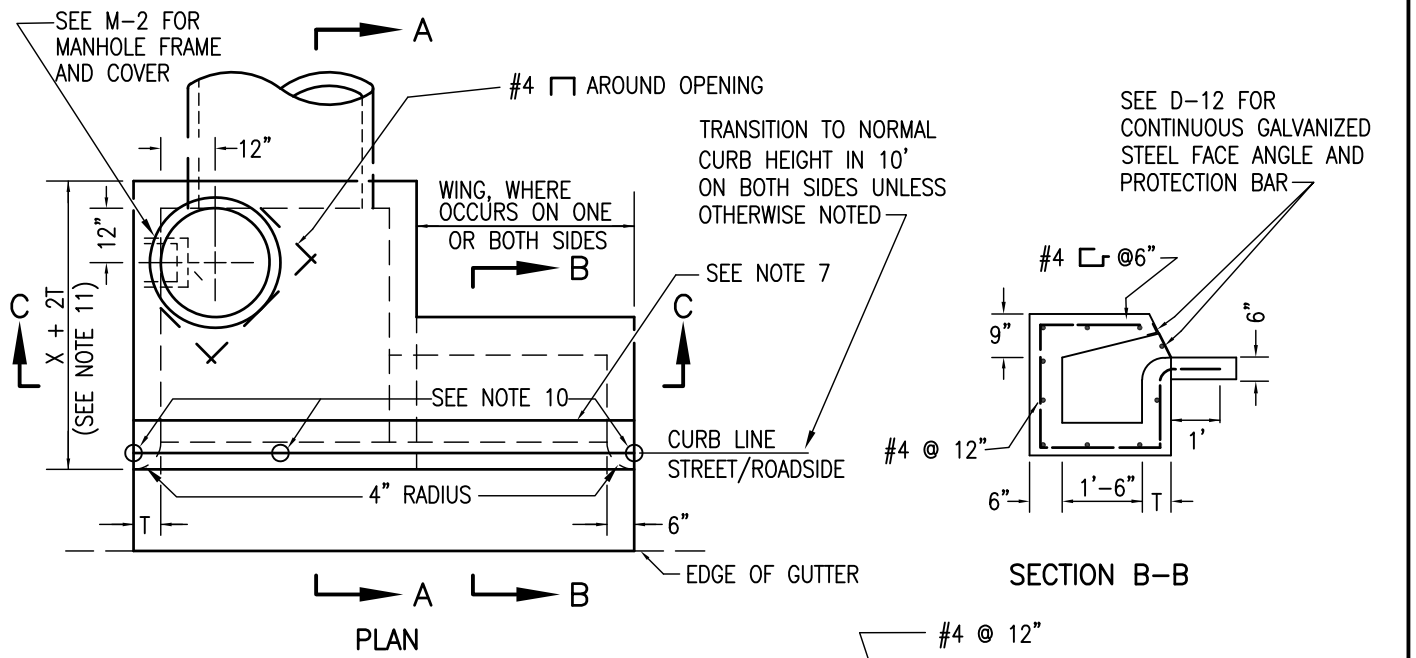
NOTES

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

LEGEND ON PLANS



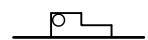
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75			
Edited	T.R.	T. Regello	10/15	CURB INLET - TYPE A	 03/24/2022	
Edited	M.W.	M. Widelski	10/18		Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER	D-01



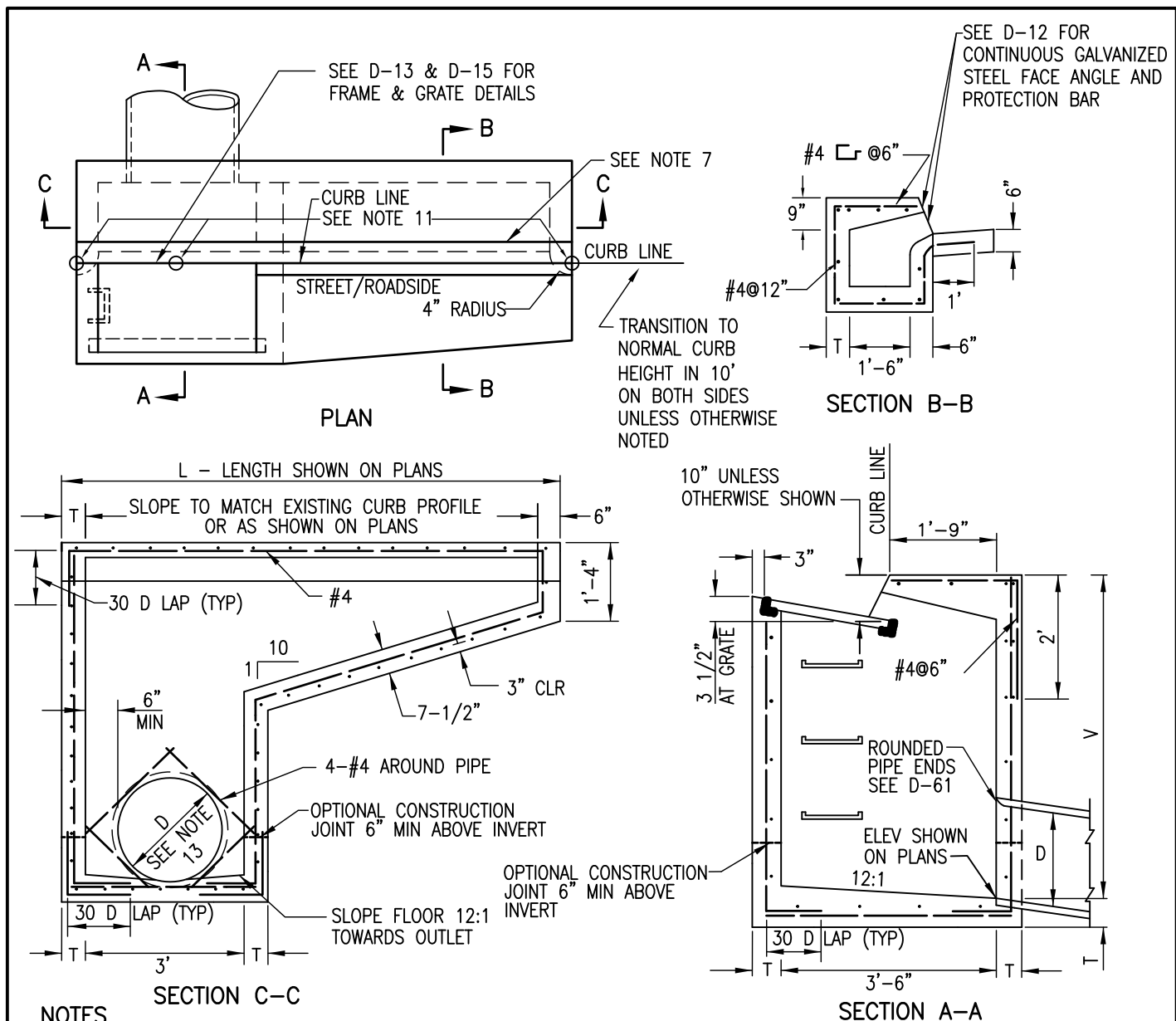
NOTES

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



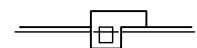
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75			
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
Reviewed	RP	S. Engeda	03/22			
				CURB INLET - TYPE B		Chairperson R.C.E. 52241 Date
						DRAWING NUMBER D-02



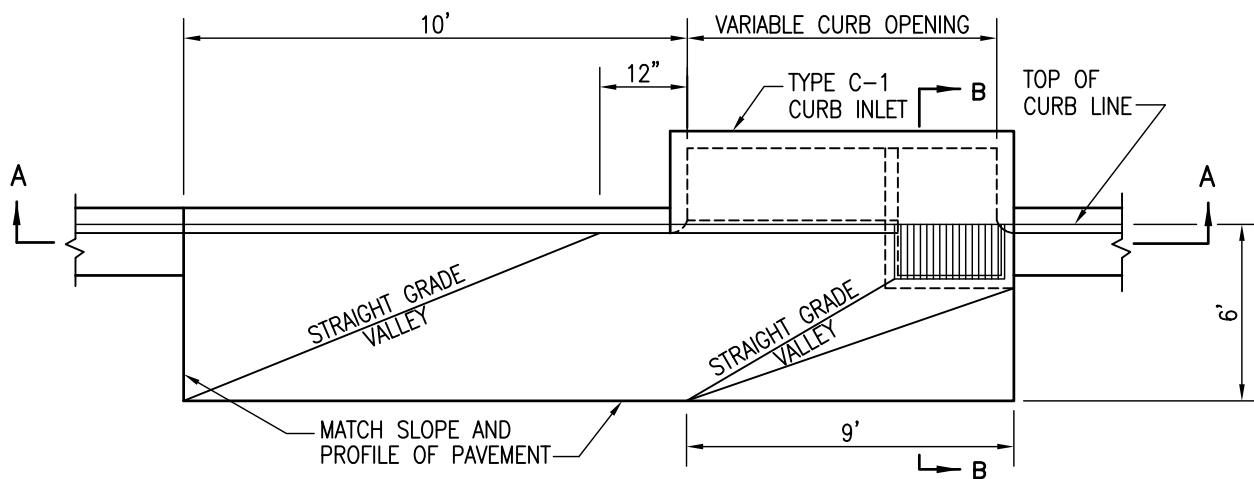
NOTES

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

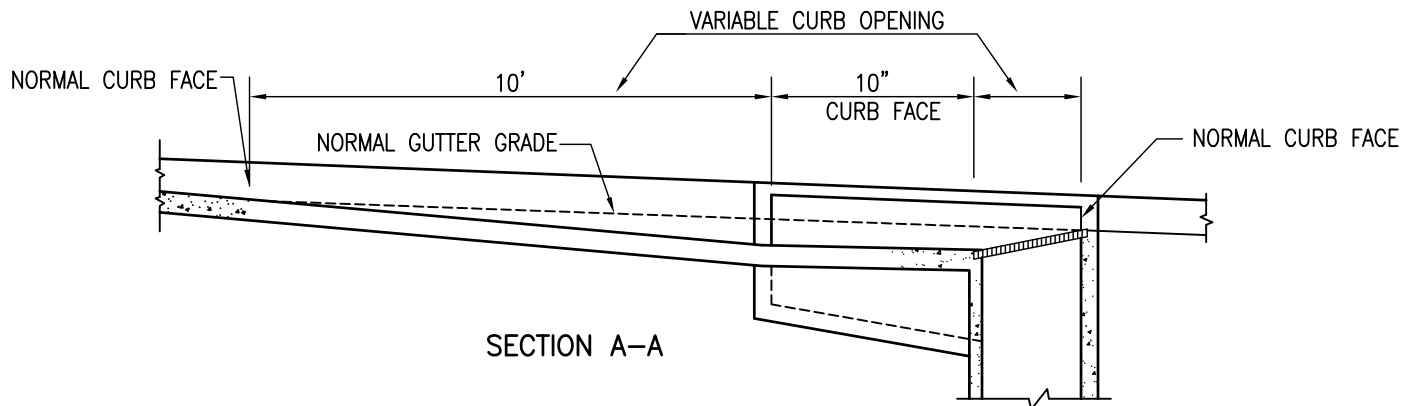
LEGEND ON PLANS



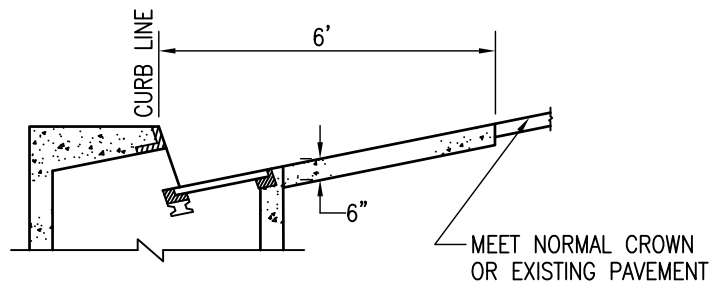
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	CURB INLET - TYPE C	<i>Samuel Engeda</i> 03/24/2022
Edited	M.W.	M. Widelksi	10/18		Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER D-03A



PLAN



SECTION A-A



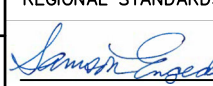
SECTION B-B

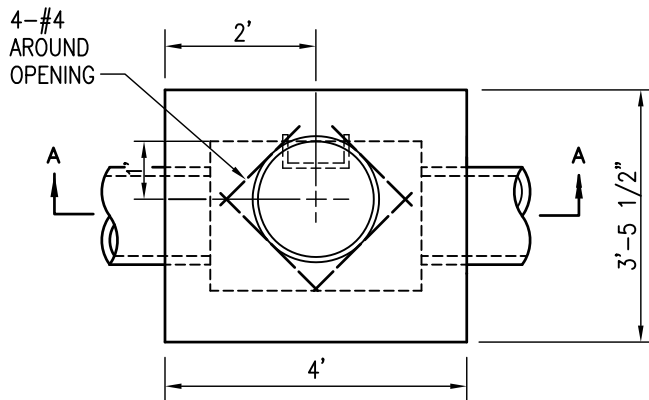
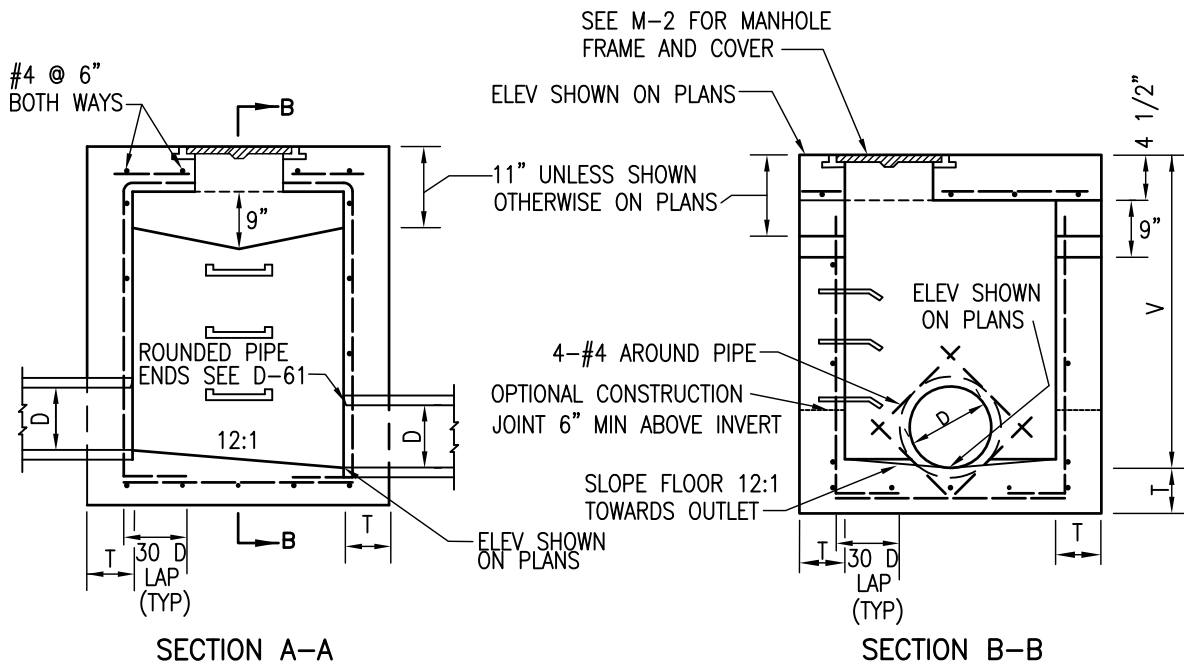
NOTES

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	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	CONCRETE APRON FOR TYPE C CURB INLET	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-03B

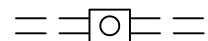


PLAN

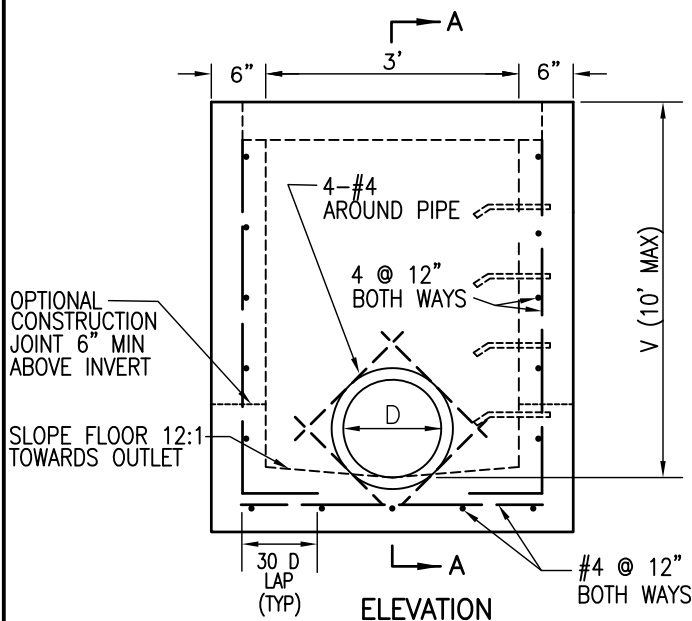
NOTES

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

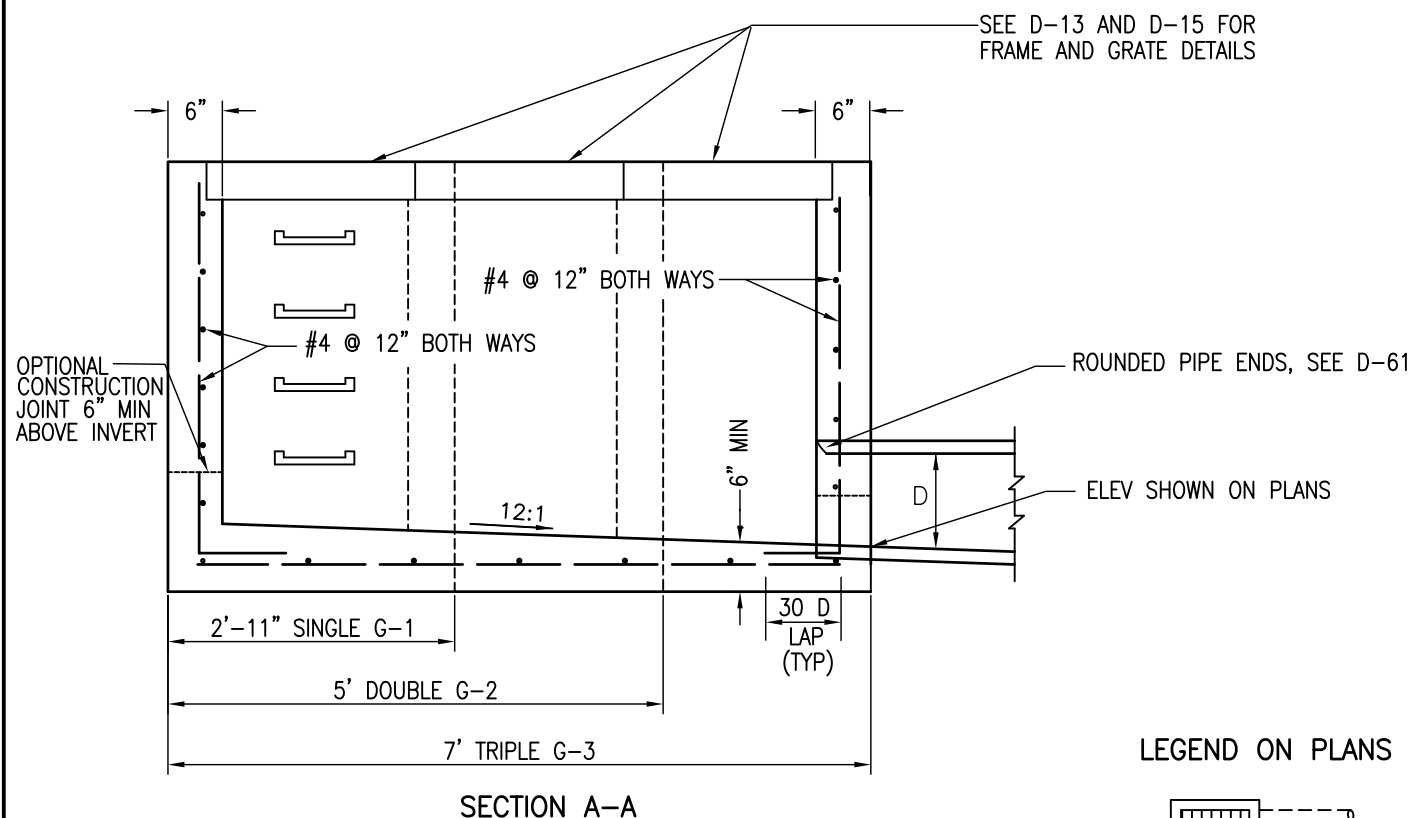


Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	CATCH BASIN - TYPE F		 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Wideliski	10/18			
Reviewed	RP	S. Engeda	03/22			
						DRAWING NUMBER D-07

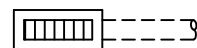


NOTES

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.



LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

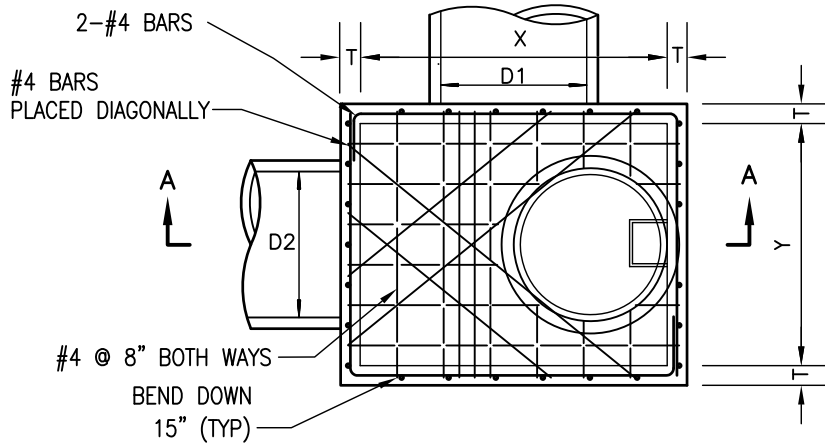
SAN DIEGO REGIONAL STANDARD DRAWING

CATCH BASIN - TYPE G

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

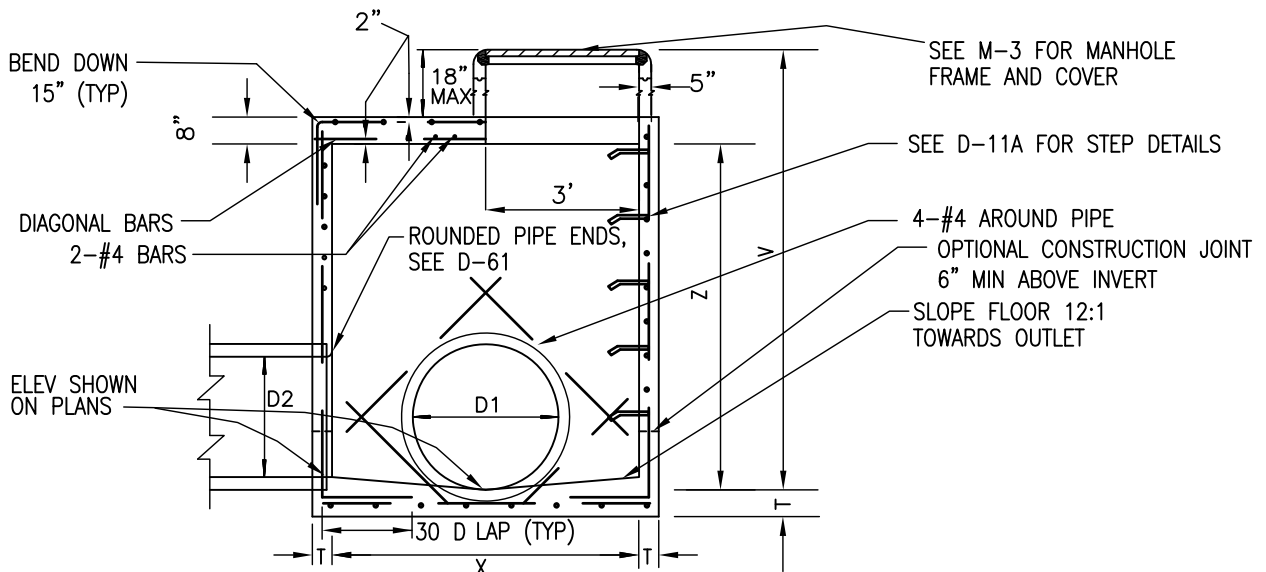
Susan Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-08**



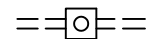
PLAN

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

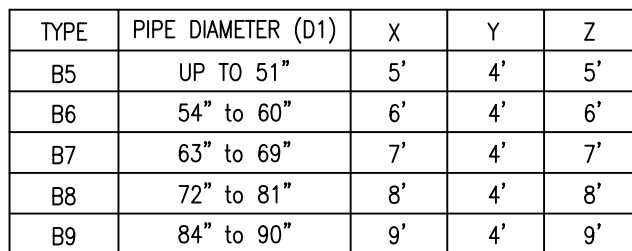
LEGEND ON PLANS



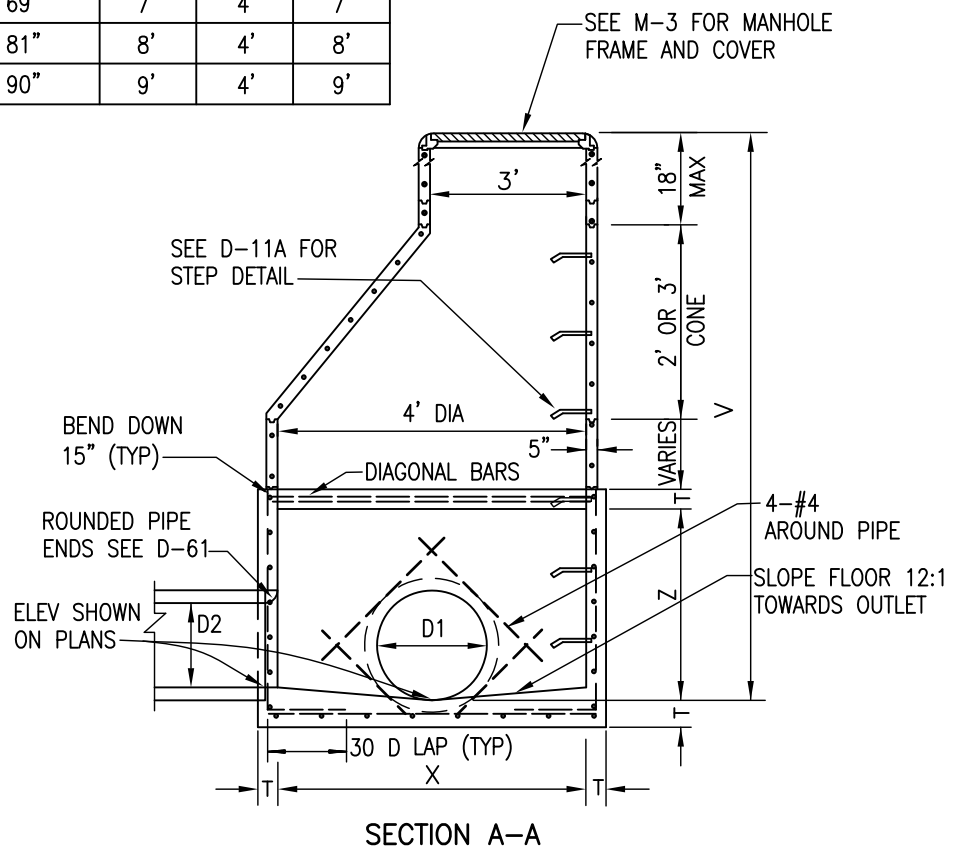
NOTES

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.

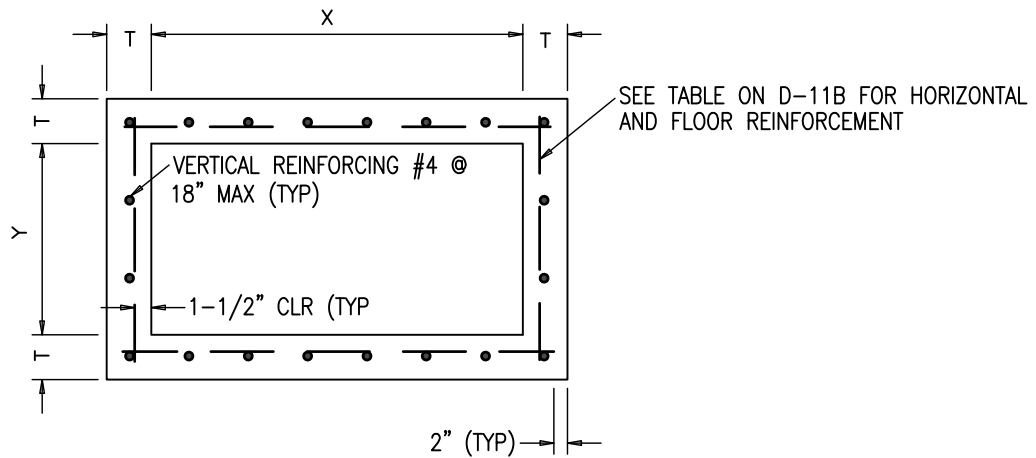
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	STORM DRAIN CLEANOUT - TYPE A		
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelksi	10/18			
Edited	RP	S. Engeda	03/22			
						 03/24/2022 Chairperson R.C.E. 52241 Date
						DRAWING NUMBER D-09



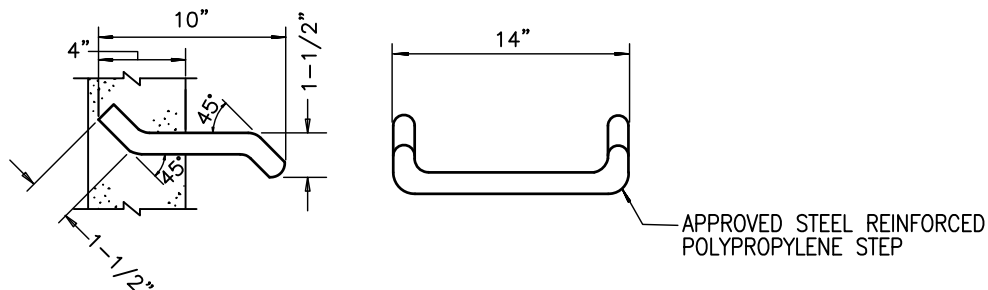
1. SEE D-11A & D-11B FOR ADDITIONAL NOTES AND DETAILS.
2. ALL JOINTS SHALL BE SET IN CLASS C MORTAR.
3. ALL PRECAST COMPONENTS SHALL BE REINFORCED WITH 1/4" DIAMETER STEEL WOUND SPIRALLY ON 4" CENTERS.
4. MAINTAIN 1-1/2" CLEAR SPACING BETWEEN REINFORCING AND CONCRETE SURFACE.
5. CONCRETE BASE SHALL BE 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.


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Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	S.S.	T. Regello	03/11	STORM DRAIN CLEANOUT - TYPE B	 03/24/2022
Edited	M.W.	M. Widski	10/18		Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER D-10



TYPICAL BOX SECTION



STEP DETAIL

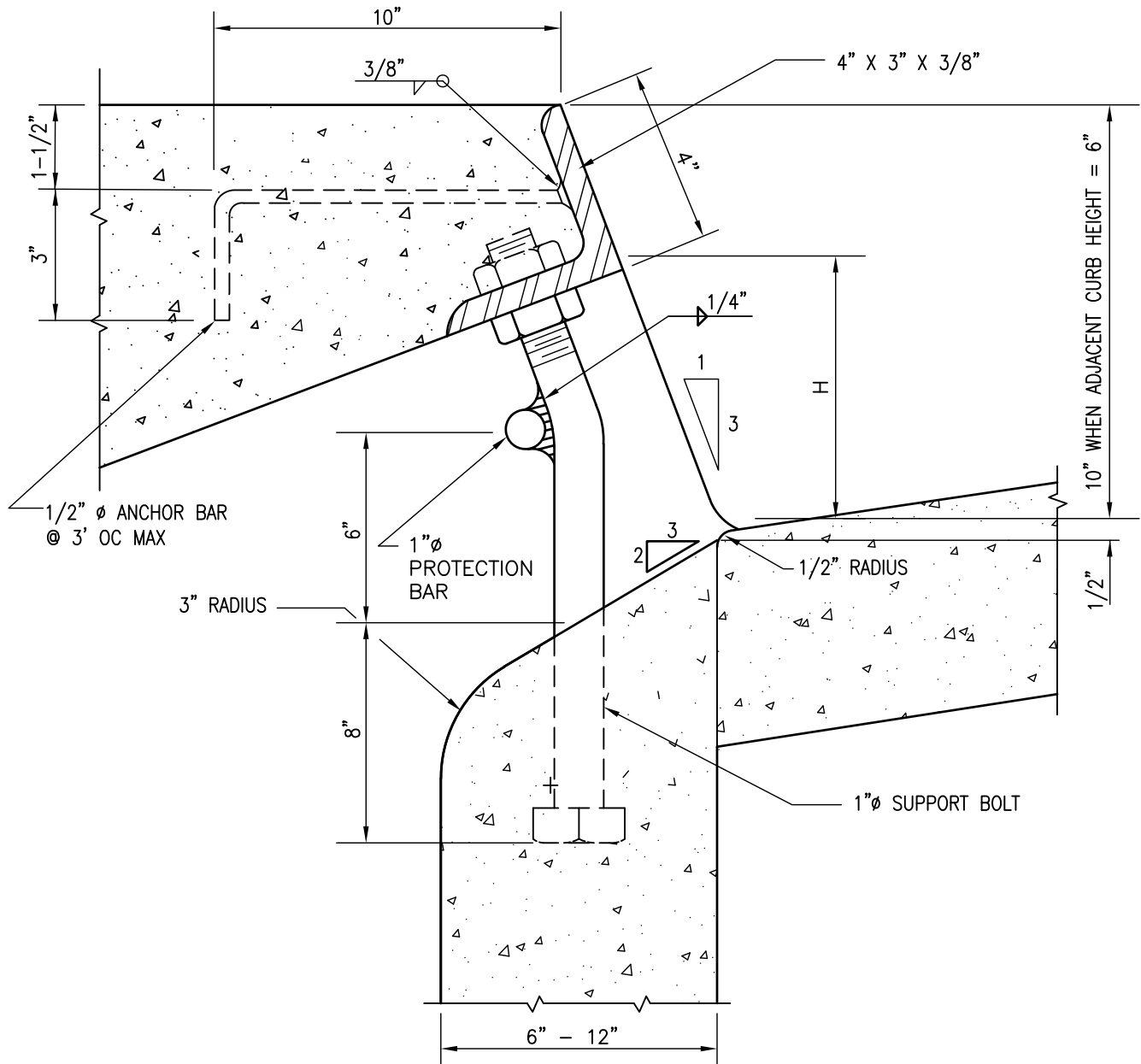
NOTES

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			
Edited	T.R.	T. Regello	10/15	INLETS AND CLEANOUTS NOTES AND DETAILS	 03/24/2022	
Edited	M.W.	M. Widelski	10/18		Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER	D-11A

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"	#5 @ 8"

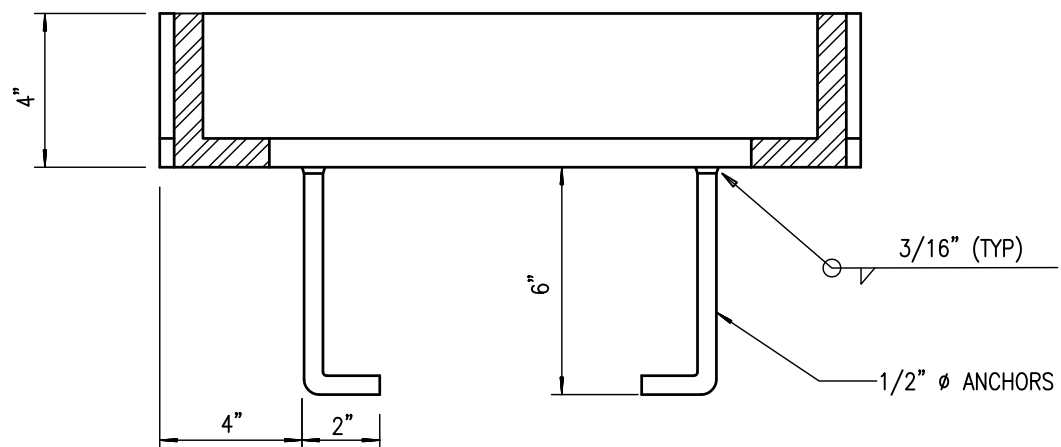
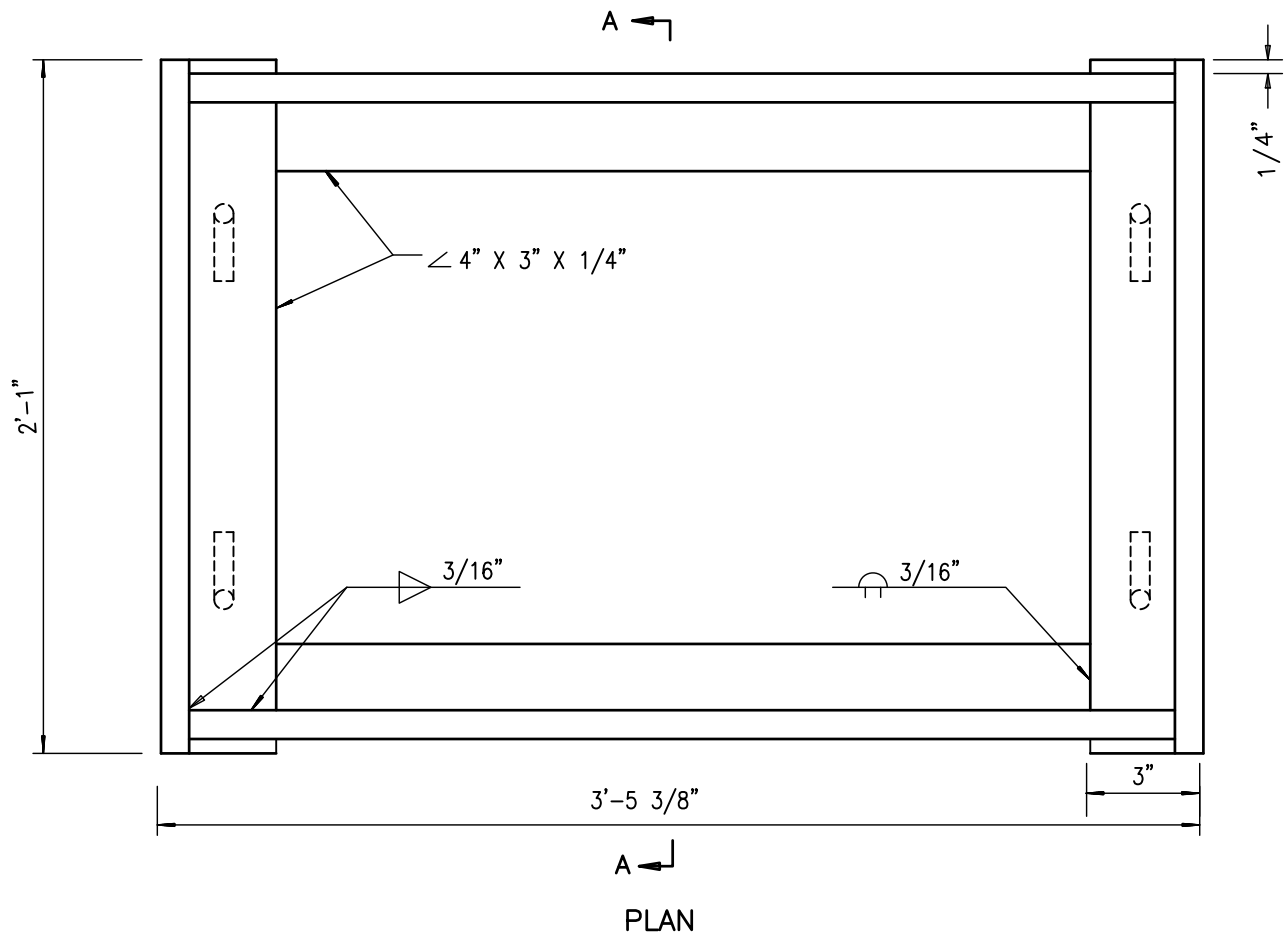
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	INLETS AND CLEANOUTS NOTES AND DETAILS	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-11B



NOTES

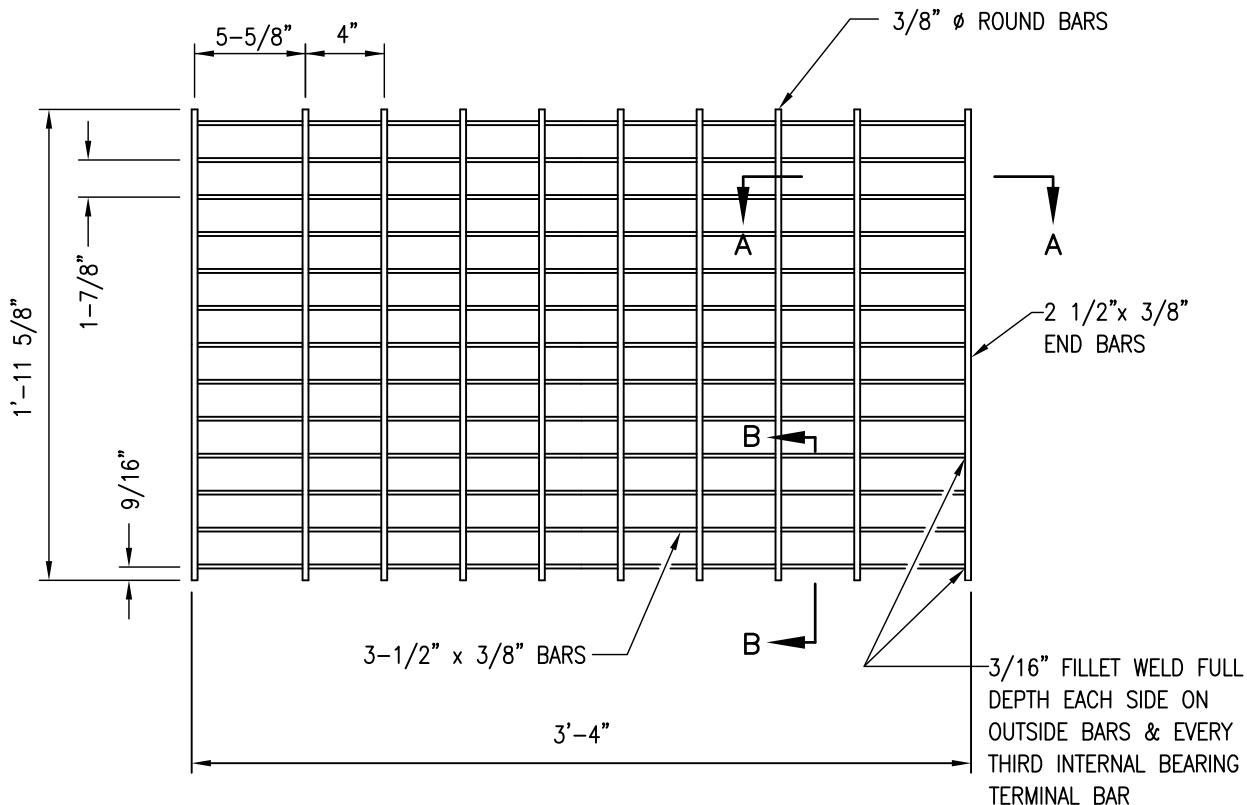
1. FACE ANGLE SHALL BE CAST CONTINUOUSLY INTO STRUCTURE FOR THE ENTIRE LENGTH "L".
2. ALL EXPOSED METAL PARTS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
3. WHEN CURB INLET OPENING HEIGHT (H) EXCEEDS 6", INSTALL 1" Ø STEEL PROTECTION BAR. STEEL PROTECTION BAR SHALL BE EMBEDDED 8" INTO CURB INLET.
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	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	CURB INLET OPENING	 03/24/2022
Edited	M.W	M. Widelski	10/18		Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER
					D-12

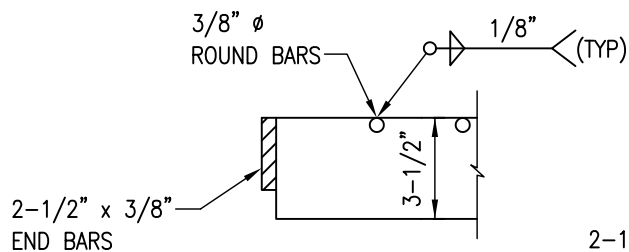


NOTE
HOT-DIP GALVANIZE ALL PARTS AFTER FABRICATION.

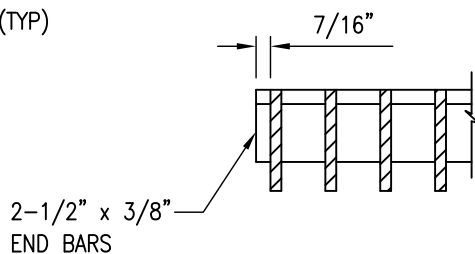
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	WELDED STEEL GRATE FRAME	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-13



PLAN



SECTION A-A

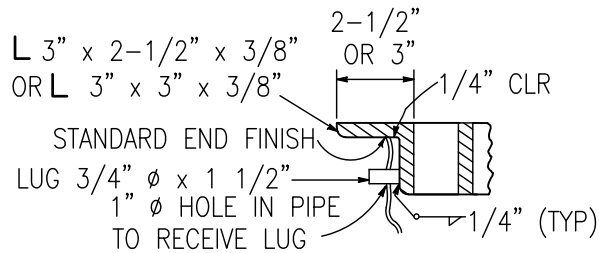
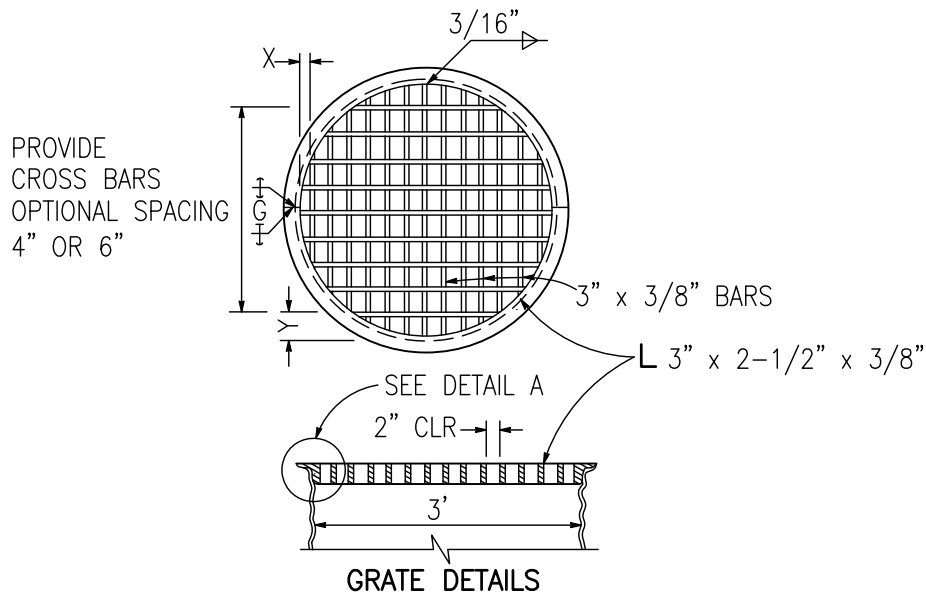


SECTION B-B

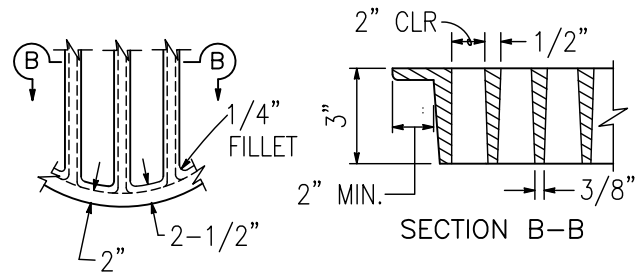
NOTES

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 +/-.

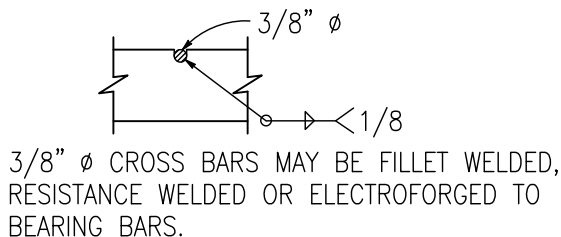
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75		DRAINAGE STRUCTURE GRATE	 03/24/2022
Edited	T.R.	T. Regello	10/15	Chairperson R.C.E. 52241		Date
Edited	M.W.	M. Widelski	10/18	DRAWING NUMBER		D-15
Reviewed	RP	S. Engeda	03/22			



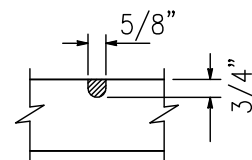
DETAIL A



ALTERNATIVE CAST NODULAR IRON GRATE
OR CAST STEEL GRATE



CROSS BAR DETAIL TYPE
WELDED STEEL GRATE

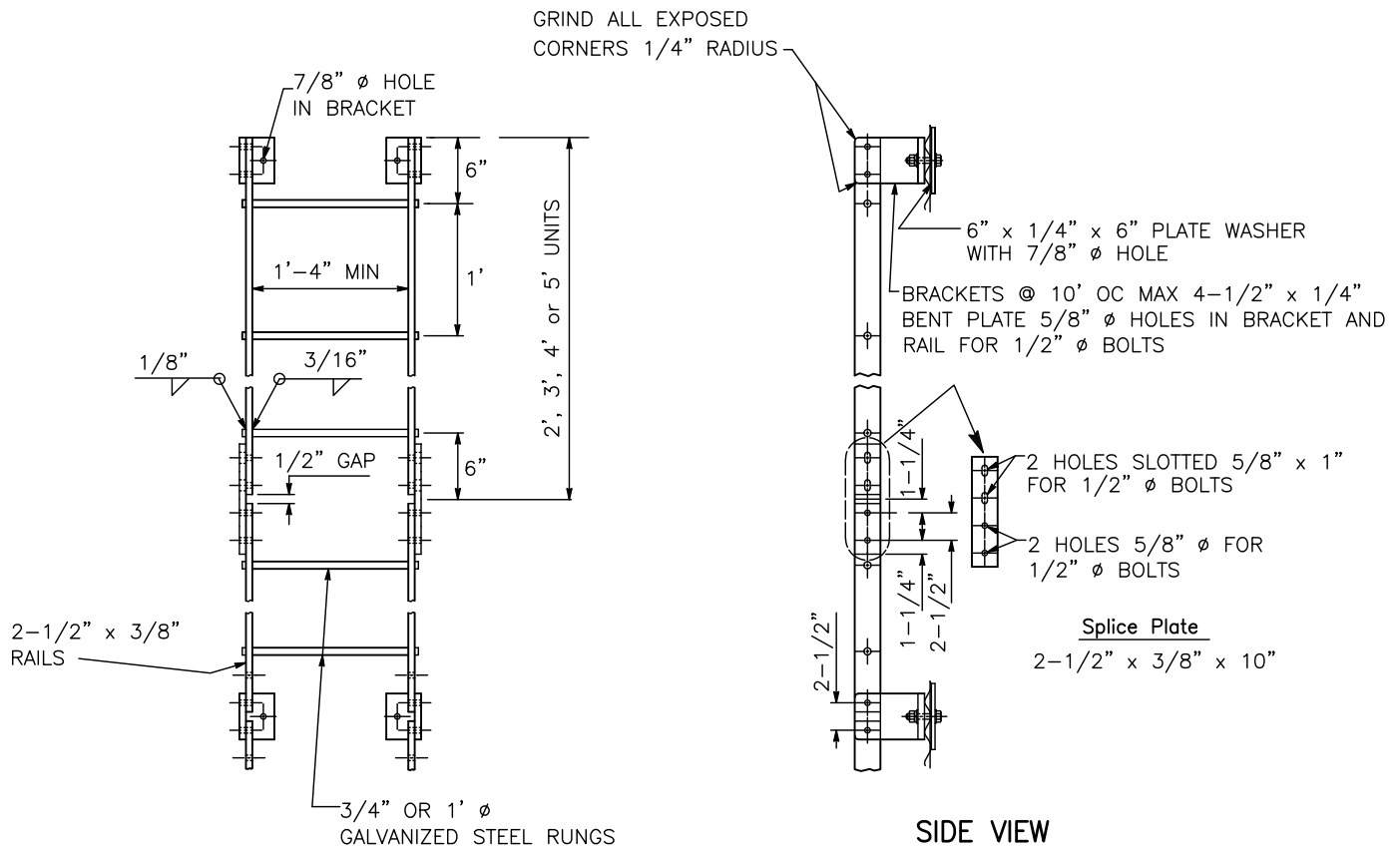


CROSS BAR DETAIL
ALTERNATIVE CAST NODULAR
IRON GRATE OR CAST STEEL GRATE

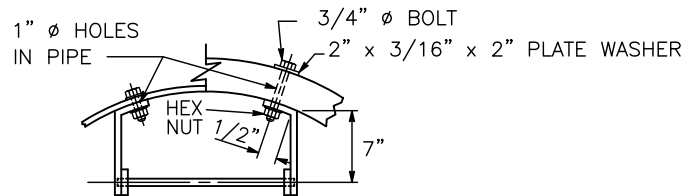
GRATE BAR SPACING TABLE

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"

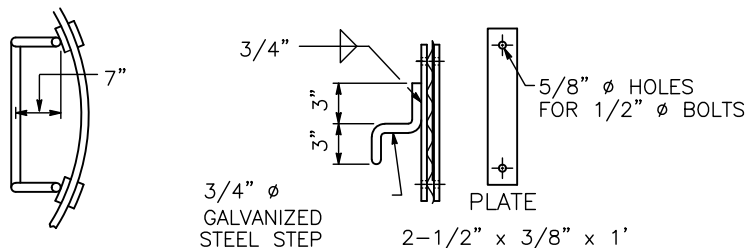
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	CORRUGATED STEEL PIPE INLETS, DETAILS	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-17A



FRONT VIEW



LADDER DETAIL
H=5' OR GREATER

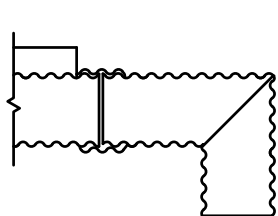


STEP DETAIL
H=3'-6" TO 4'-11"

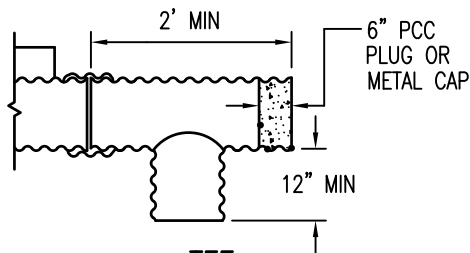
NOTE

SEE NOTE 3 ON D-16 FOR LADDER REQUIREMENTS.

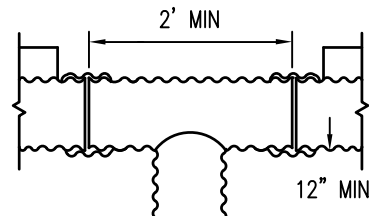
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	CORRUGATED STEEL PIPE INLETS, DETAILS	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-17B



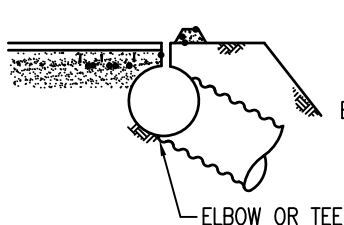
ELBOW



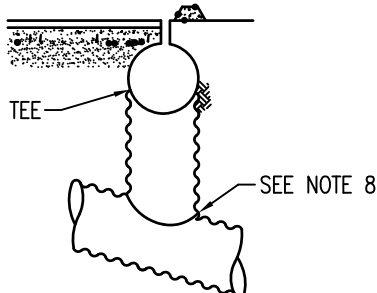
TEE



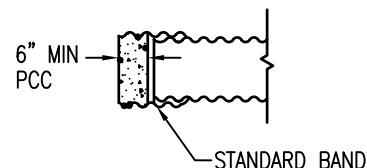
TEE-SAG CONDITION



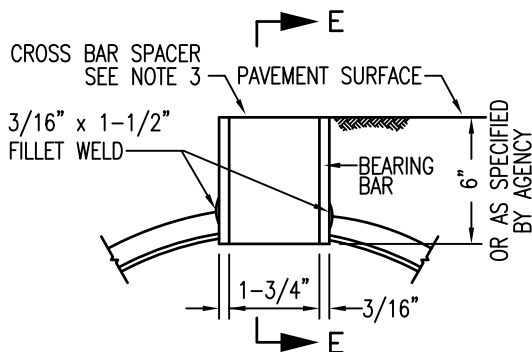
OVERSIDE DRAIN



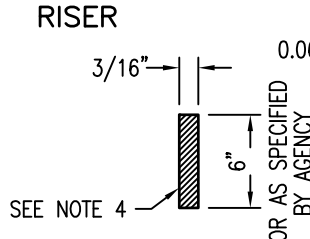
RISER



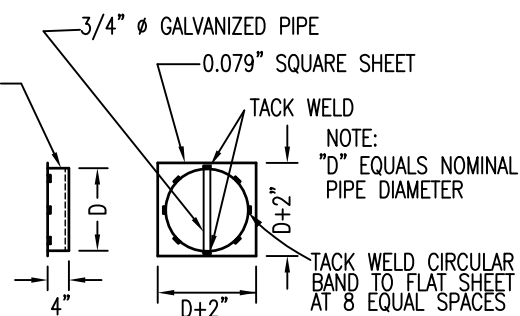
BAND PLUG



SECTION D-D
GRATE SLOT DETAIL



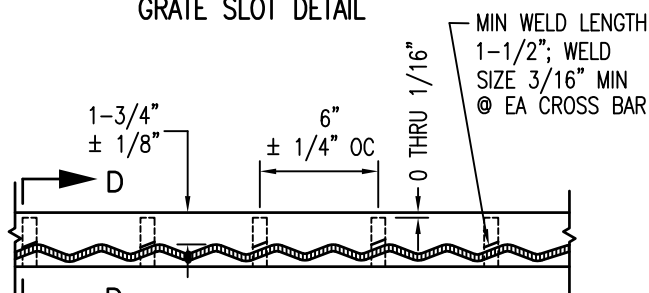
SECTION E-E



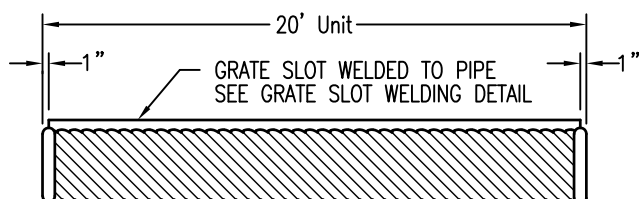
METAL CAP DETAIL

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.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

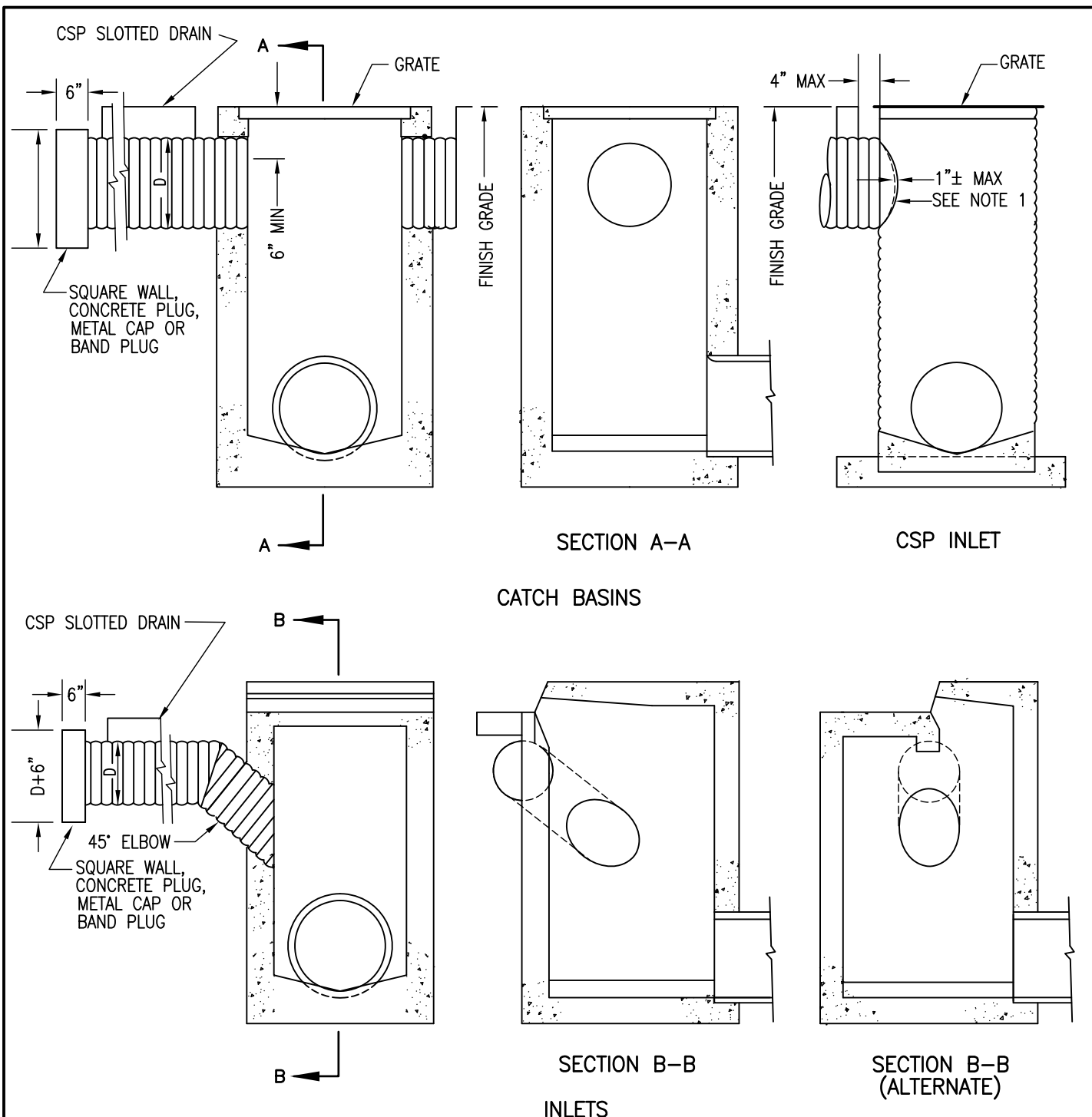
SAN DIEGO REGIONAL STANDARD DRAWING

SLOTTED CORRUGATED STEEL PIPE DRAINS 12" THROUGH 24"

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Susan Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

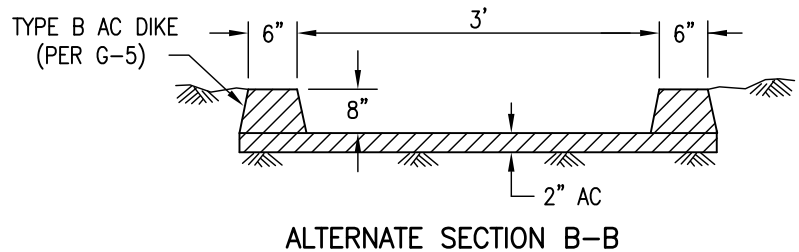
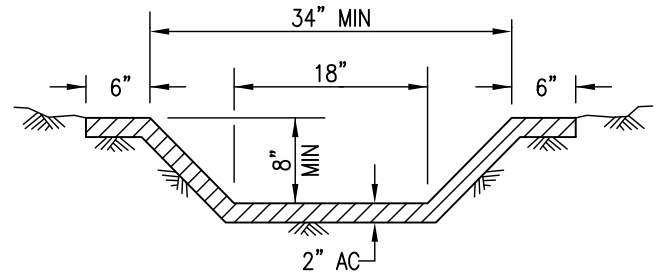
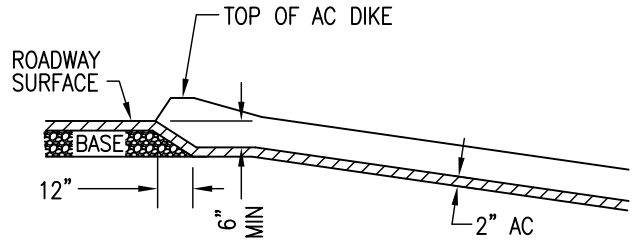
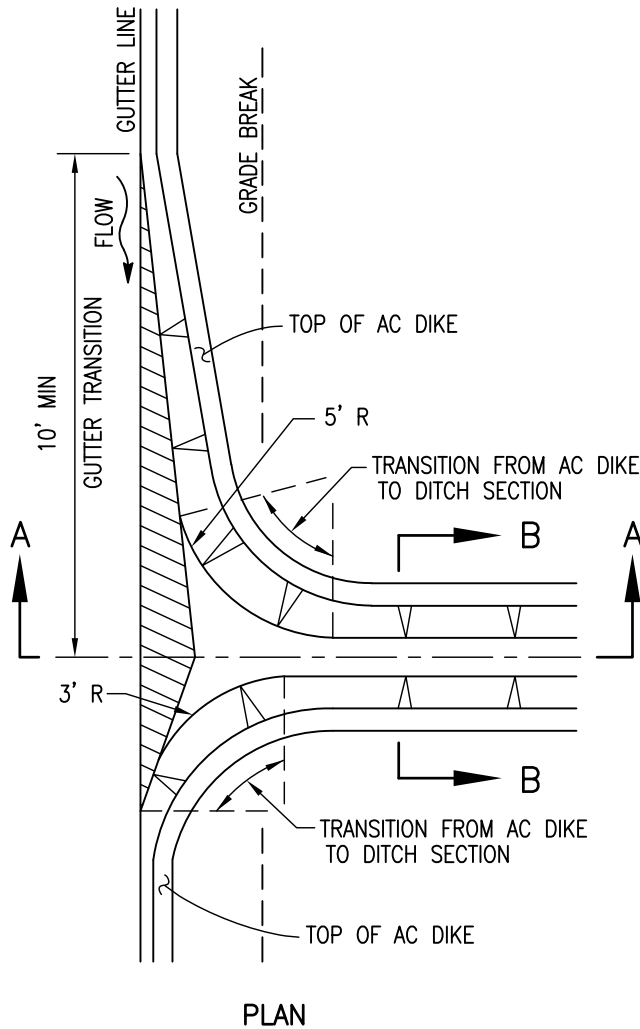
DRAWING
NUMBER **D-18**



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.

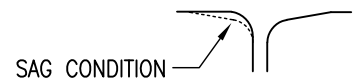
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	SLOTTED DRAIN CONNECTIONS TO STANDARD INLETS		
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
Reviewed	RP	S. Engeda	03/22			
						<i>Samantha Engeda</i> 03/24/2022
						Chairperson R.C.E. 52241 Date
						DRAWING NUMBER D-19



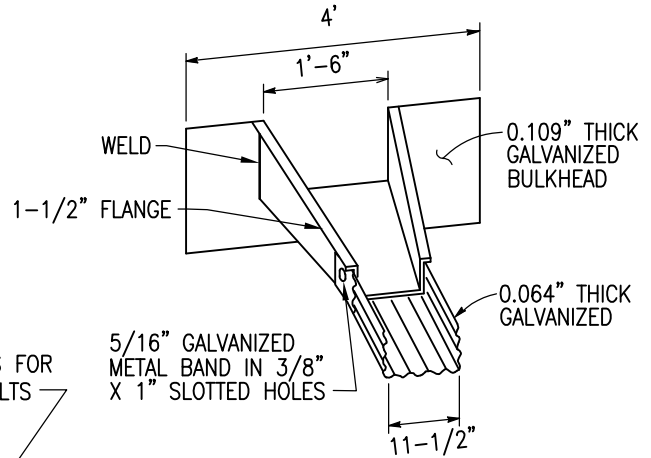
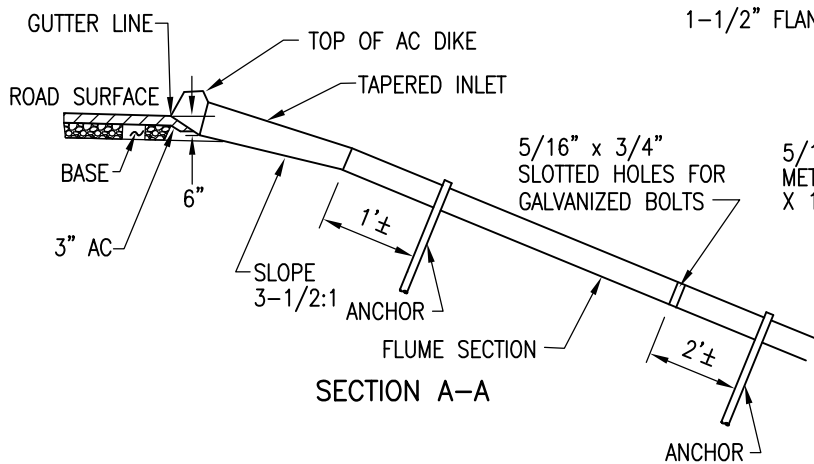
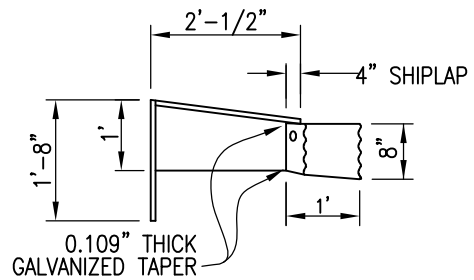
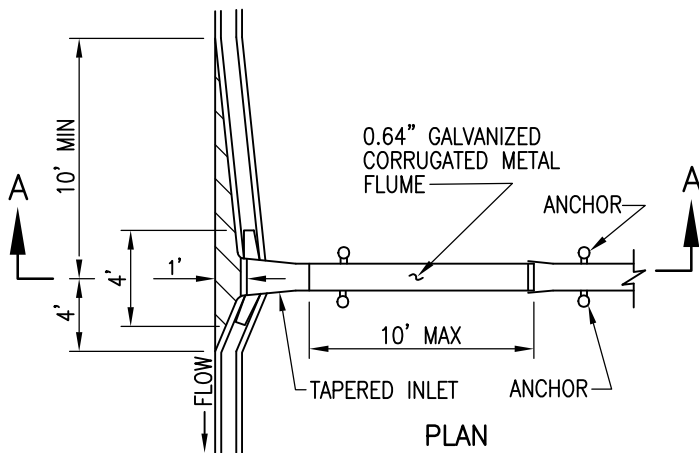
NOTES

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.

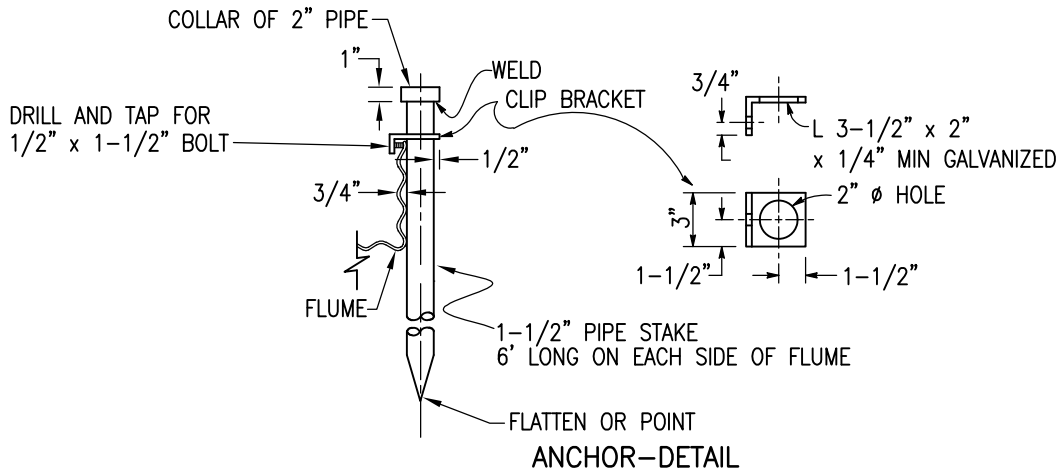
LEGEND ON PLANS



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	ASPHALT CONCRETE SPILLWAY	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelksi	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-22



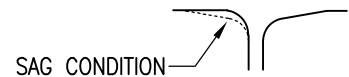
TAPERED INLET



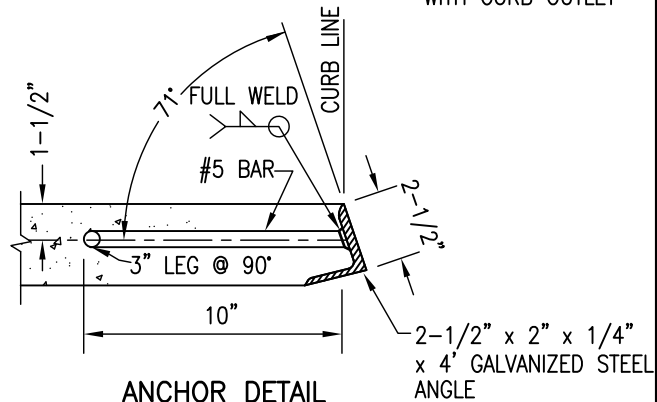
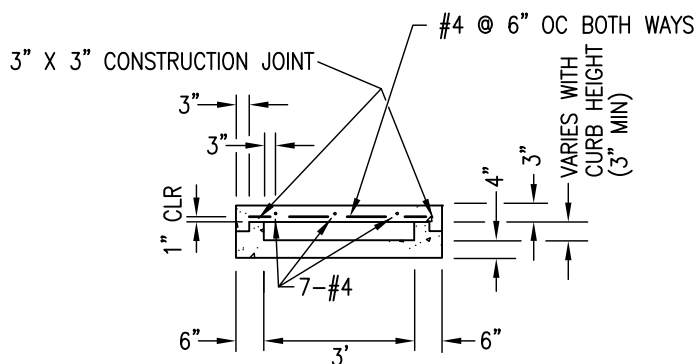
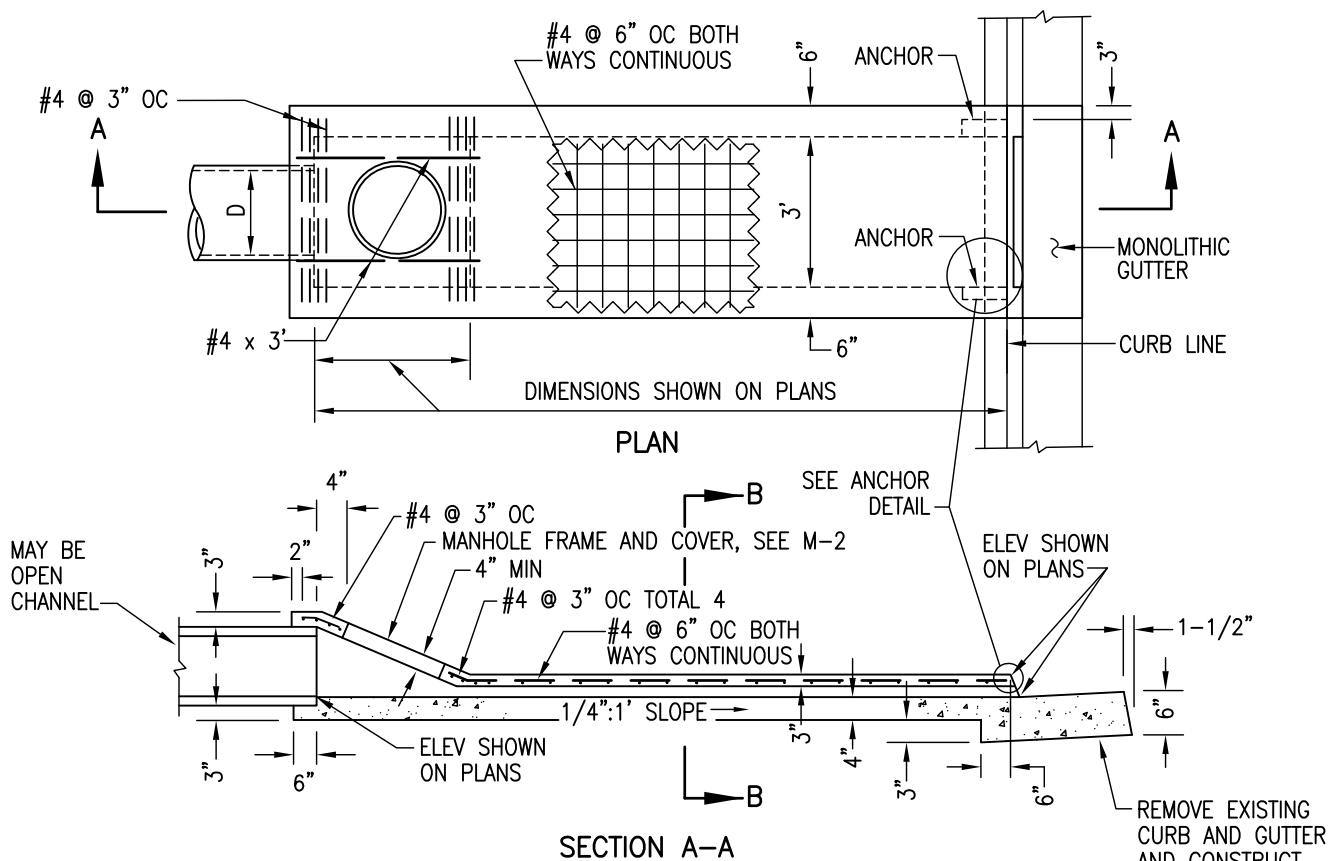
NOTES

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



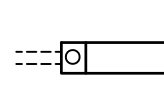
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75			
Edited	T.R.	T. Regello	10/15	TAPERED INLET AND DOWNDRAIN FLUME	 03/24/2022	
Edited	M.W.	M. Widelski	10/18		Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER	D-23



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\"

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Edited	RP	S. Engeda	03/22

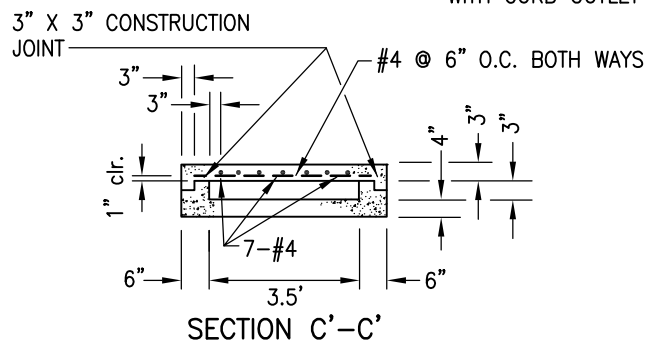
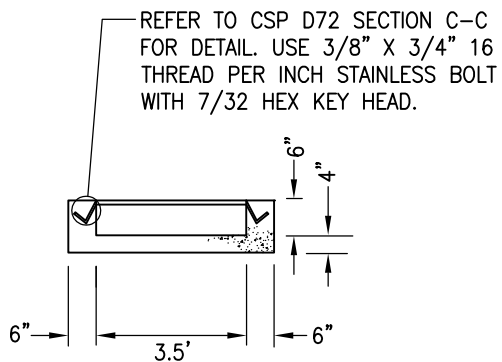
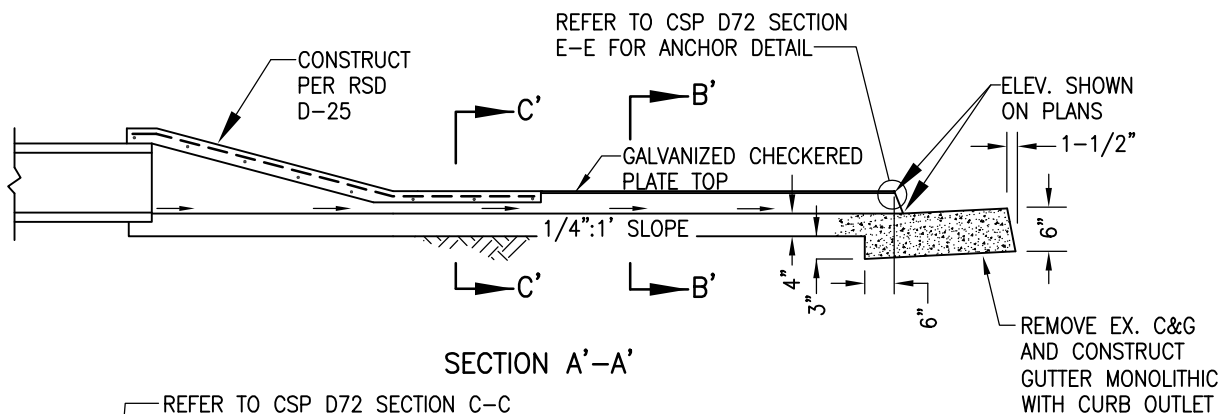
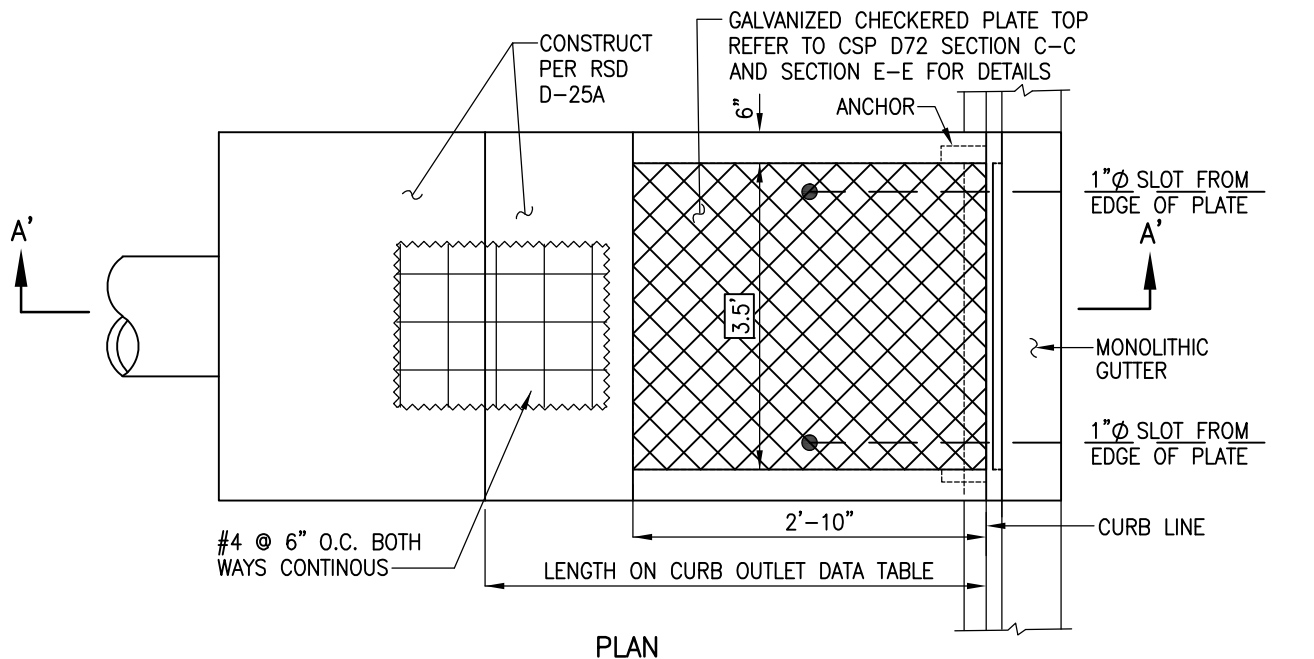
SAN DIEGO REGIONAL STANDARD DRAWING

CURB OUTLET - TYPE A

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samsir Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

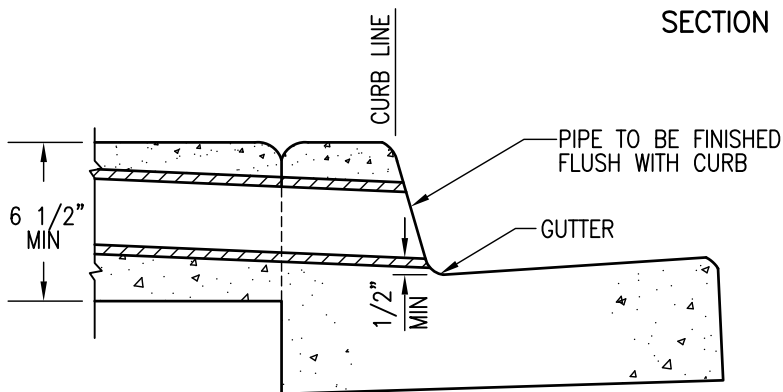
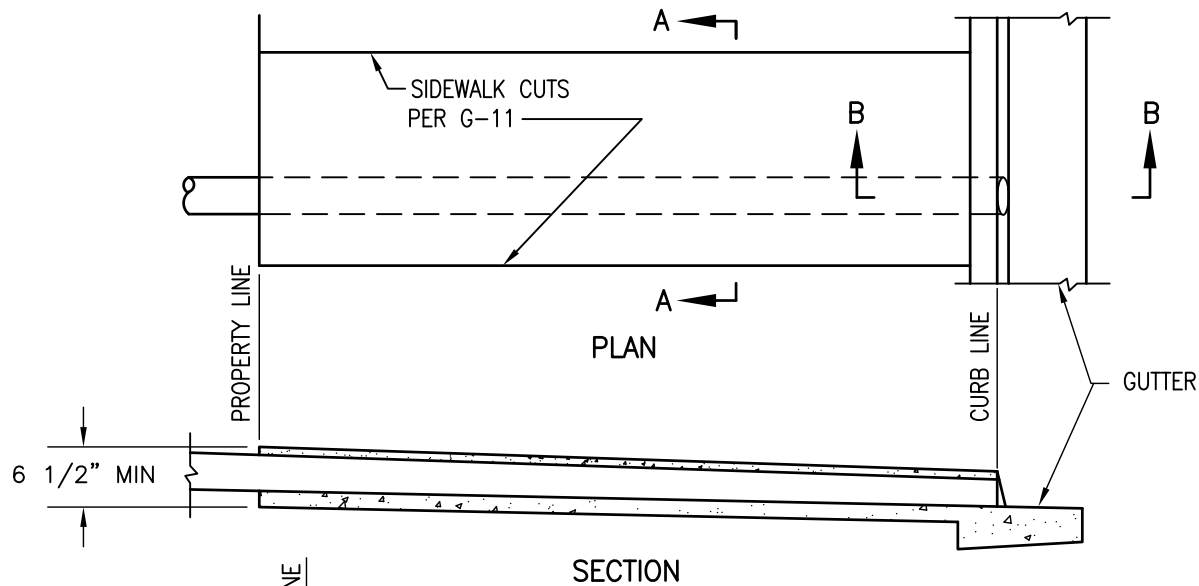
DRAWING
NUMBER **D-25A**



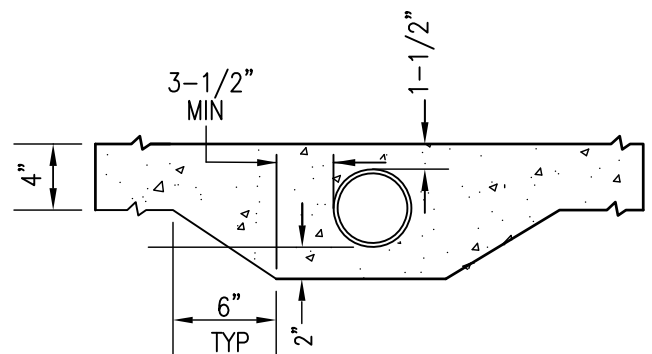
NOTES

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	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Widelski	8/18		
Edited	M.W.	M. Widelski	10/18	MODIFIED CURB OUTLET - TYPE B	 03/24/2022 Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-25B



SECTION B-B

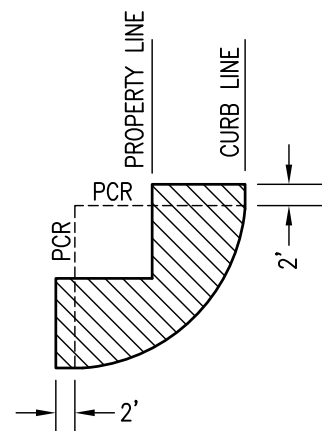


SECTION A-A

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

NOTES

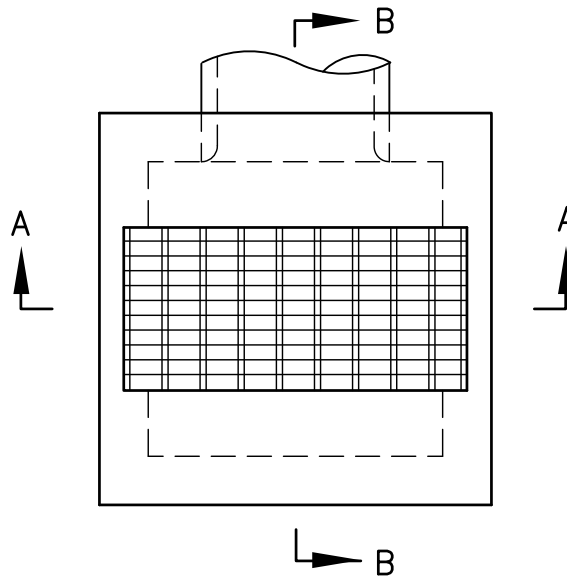
1. PIPE SHALL BE ONE CONTINUOUS LENGTH FROM PROPERTY LINE TO CURB LINE.
2. MULTIPLE PIPES TO BE SET A MINIMUM DISTANCE OF D/2 APART (3 MAX).
3. CONCRETE SHALL BE 520-C-2500.
4. PIPE SHALL BE CIRCULAR RIGID PLASTIC OR APPROVED EQUAL.
5. CORING OF EXISTING CURB MAY BE USED AS AN ALTERNATIVE.
6. PROVIDE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



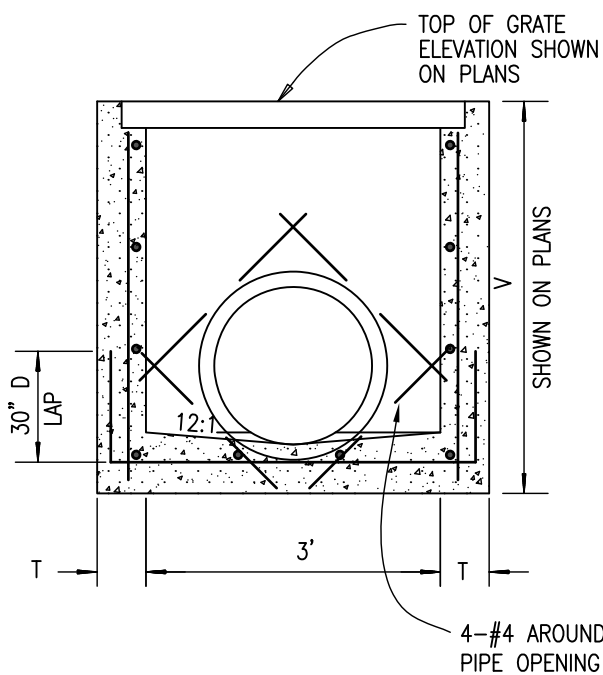
DRAIN SHALL NOT BE CONSTRUCTED
WITHIN THE HATCHED AREA

BLOCK CORNER

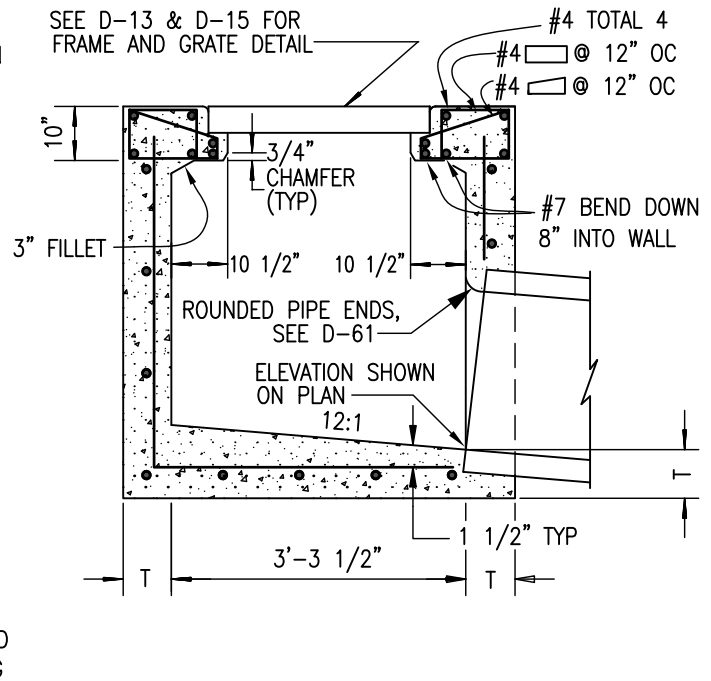
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	SIDEWALK UNDERDRAIN PIPE		
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widdelski	10/18			
Reviewed	RP	S. Engeda	03/22			
						<i>Samson Engeda</i> 03/24/2022 Chairperson R.C.E. 52241 Date
						DRAWING NUMBER D-27



PLAN



SECTION A-A

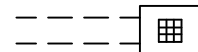


SECTION B-B

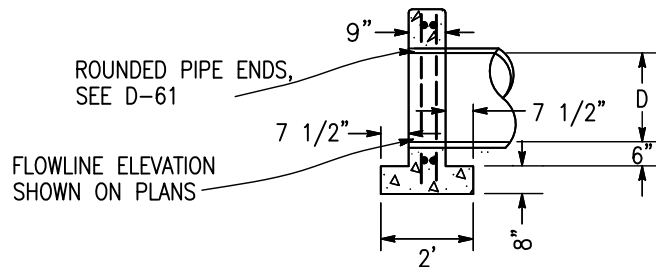
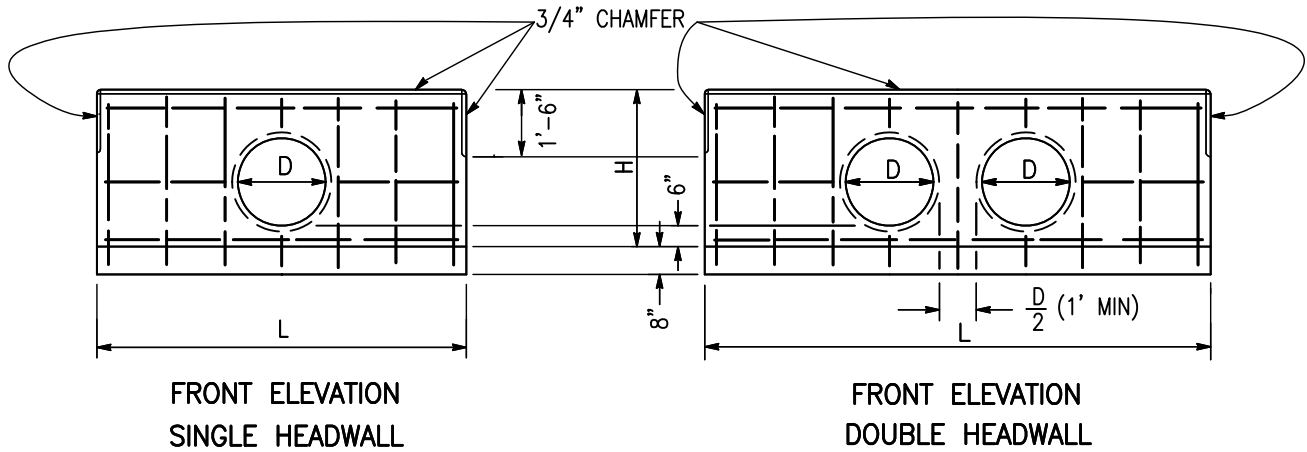
NOTES

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	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Solomon	7/79		
Edited	T.R.	T. Regello	10/15	CATCH BASIN - TYPE I	 03/24/2022
Edited	M.W.	M. Widelski	10/18		Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER D-29

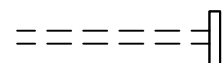


D	H	SINGLE			DOUBLE		
		L	STEEL (POUNDS)	CONCRETE (C.Y.)	L	STEEL (POUNDS)	CONCRETE (C.Y.)
12"	2'-8"	5'	35	0.60	8'	50	0.94
15"	2'-11"	6'	40	0.75	9'-6"	60	1.17
18"	3'-2"	7'	50	0.91	10'-6"	75	1.35
21"	3'-5"	7'-6"	60	1.02	11'-6"	90	1.52
24"	3'-8"	8'-6"	75	1.20	12'-6"	100	1.72
27"	3'-11"	9'-6"	85	1.39	14'	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

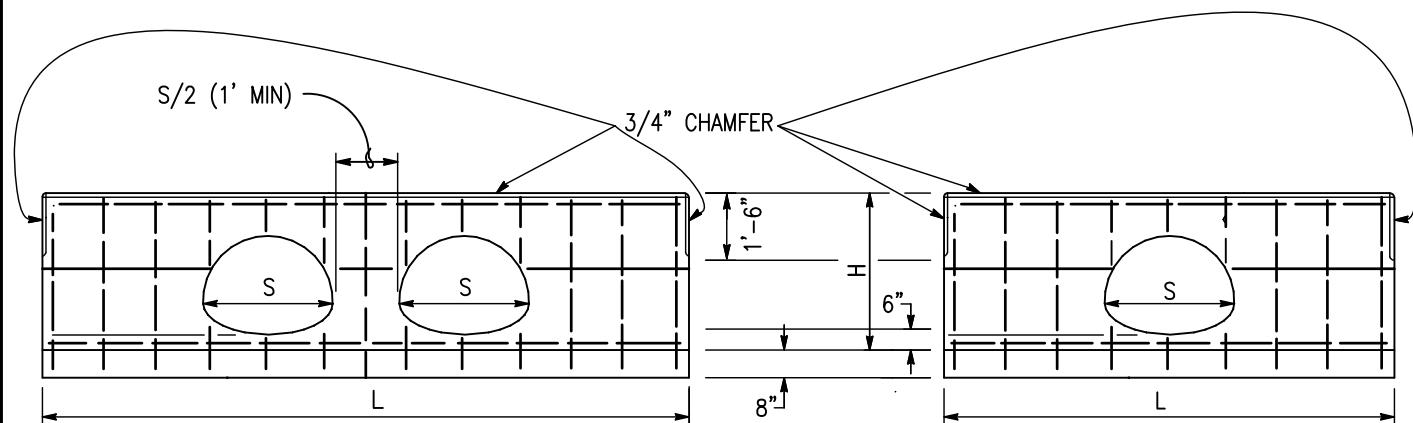
NOTES

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

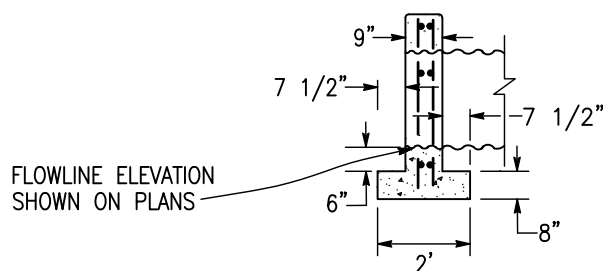


Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75				
Edited	T.R.	T. Regello	10/15	STRAIGHT HEADWALL - TYPE A (CIRCULAR PIPE)		Chairperson R.C.E. 52241 Date	
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER	D-30



ELEVATION - DOUBLE HEADWALL

ELEVATION - SINGLE HEADWALL



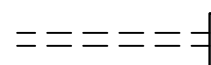
SECTION, SINGLE &
DOUBLE HEADWALLS

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

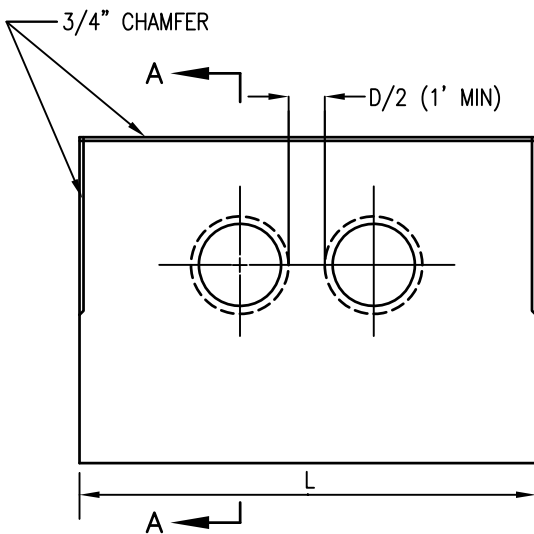
NOTES

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.

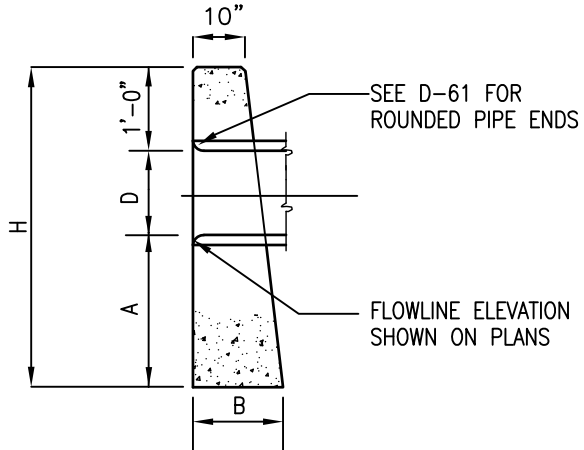
LEGEND ON PLANS



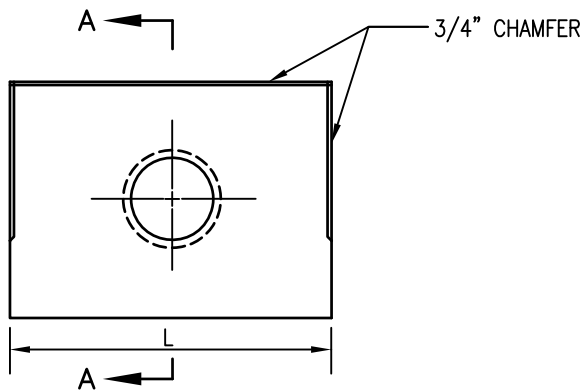
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75				
Edited	T.R.	T. Regello	10/15	STRAIGHT HEADWALL - TYPE A [CORRUGATED STEEL PIPE - ARCH]		 03/24/2022	
Edited	M.W.	M. Widelski	10/18			Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22			DRAWING NUMBER D-31	



DOUBLE PIPE
ELEVATION



SECTION A-A



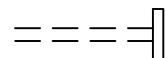
SINGLE PIPE
ELEVATION

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

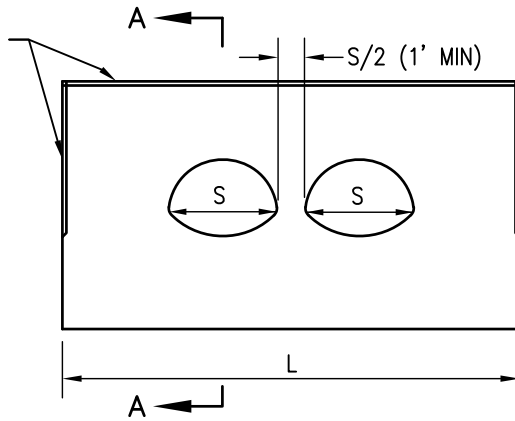
NOTES

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

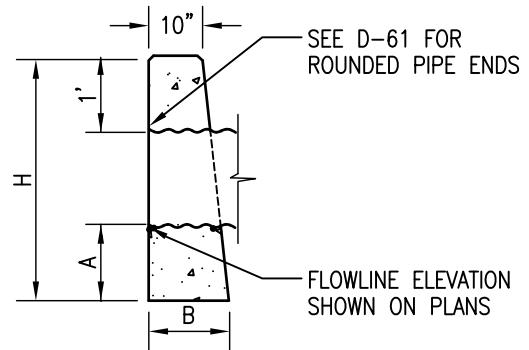
LEGEND ON PLANS



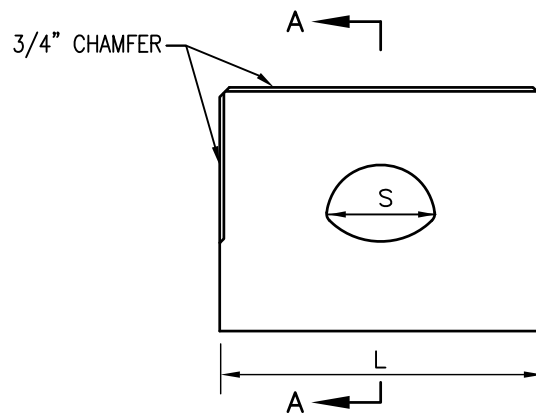
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	STRAIGHT HEADWALL - TYPE B (CIRCULAR PIPE)		
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	T. Regello	10/18			
Reviewed	RP	S. Engeda	03/22			
						 03/24/2022 Chairperson R.C.E. 52241 Date
						DRAWING NUMBER D-32



DOUBLE PIPE
ELEVATION



SECTION A-A



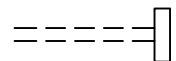
SINGLE PIPE
ELEVATION

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

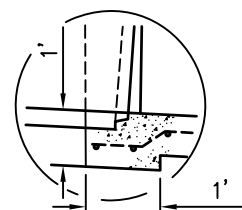
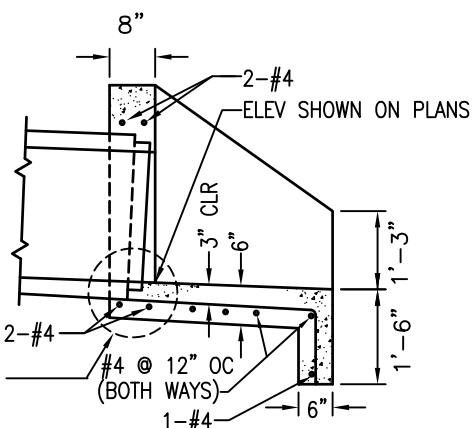
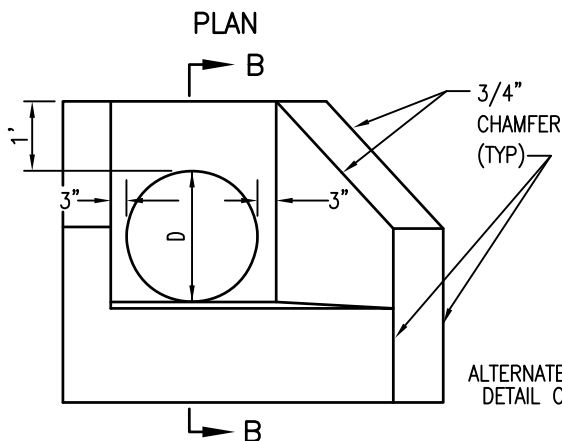
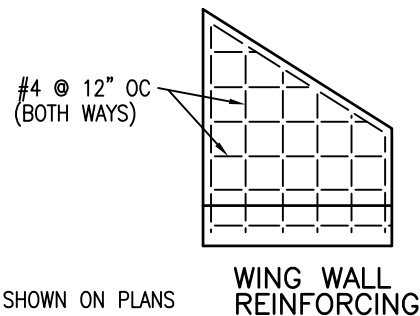
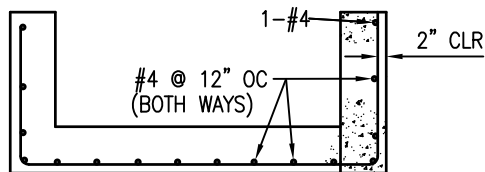
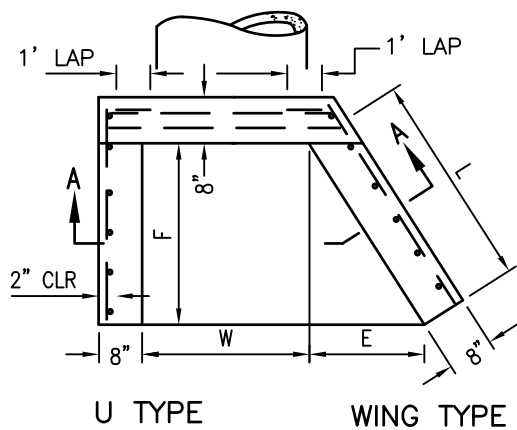
NOTES

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

LEGEND ON PLANS



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75	STRAIGHT HEADWALL - TYPE B [CORRUGATED STEEL PIPE - ARCH]		 03/24/2022 Chairperson R.C.E. 52241 Date	
Edited	T.R.	T. Regello	10/15				
Edited	T.R.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER D-33	



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
Edited	S.S.	T. Regello	03/11
Edited	T.R.	T. Regello	10/15
Reviewed	RP	S. Engeda	03/22

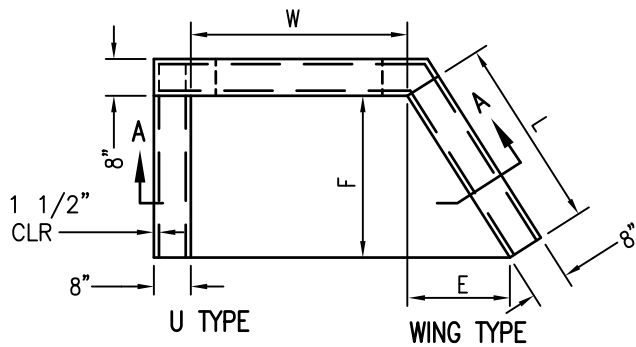
SAN DIEGO REGIONAL STANDARD DRAWING

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

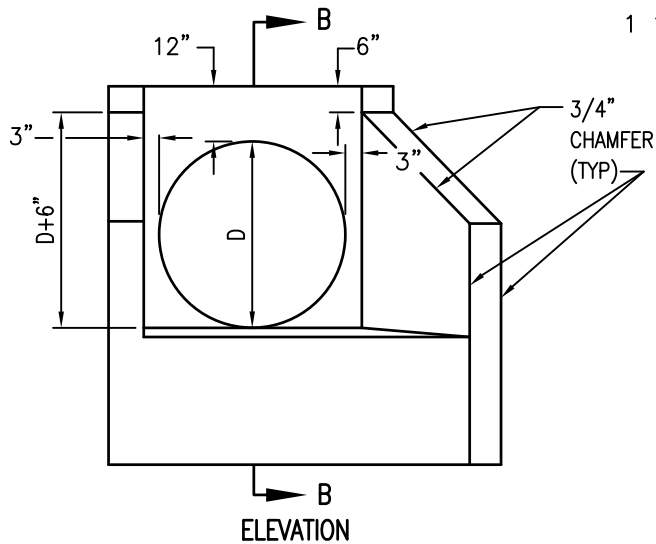
RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samsin Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

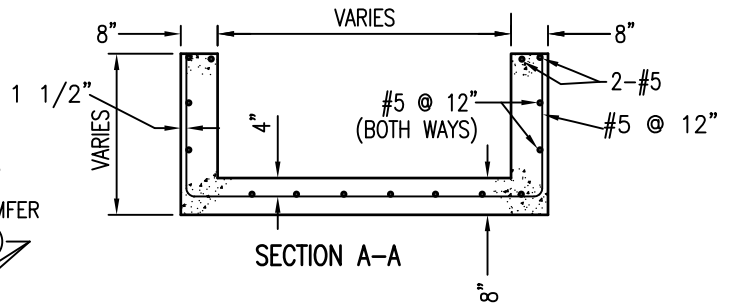
DRAWING
NUMBER **D-34**



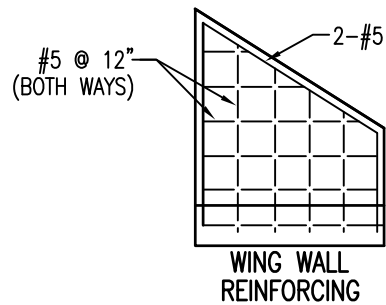
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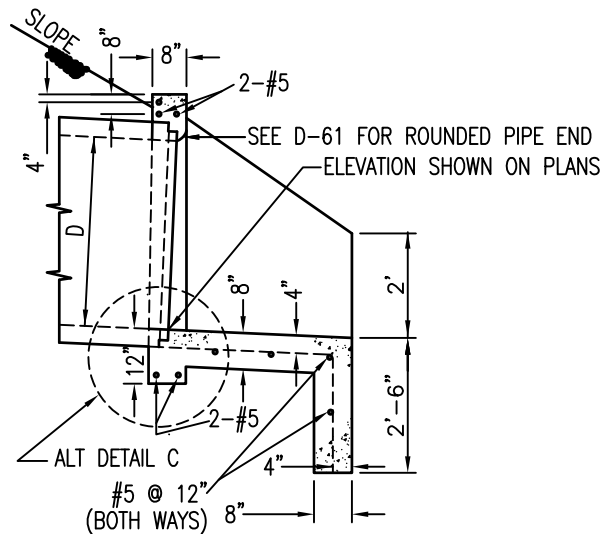
ELEVATION



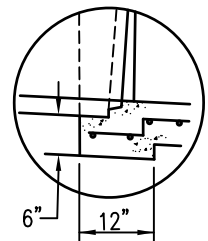
SECTION A-A



WING WALL
REINFORCING

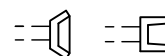


SECTION B-B



ALT DETAIL C

LEGEND ON PLANS



NOTE

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

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	WING AND U TYPE HEADWALLS FOR 42" TO 84" PIPE		
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
Reviewed	RP	S. Engeda	03/22			
						 03/24/2022 Chairperson R.C.E. 52241 Date
						DRAWING NUMBER D-35A

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

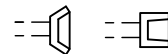
NOTE: DIMENSIONS E AND L APPLY TO WING TYPE ONLY.

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

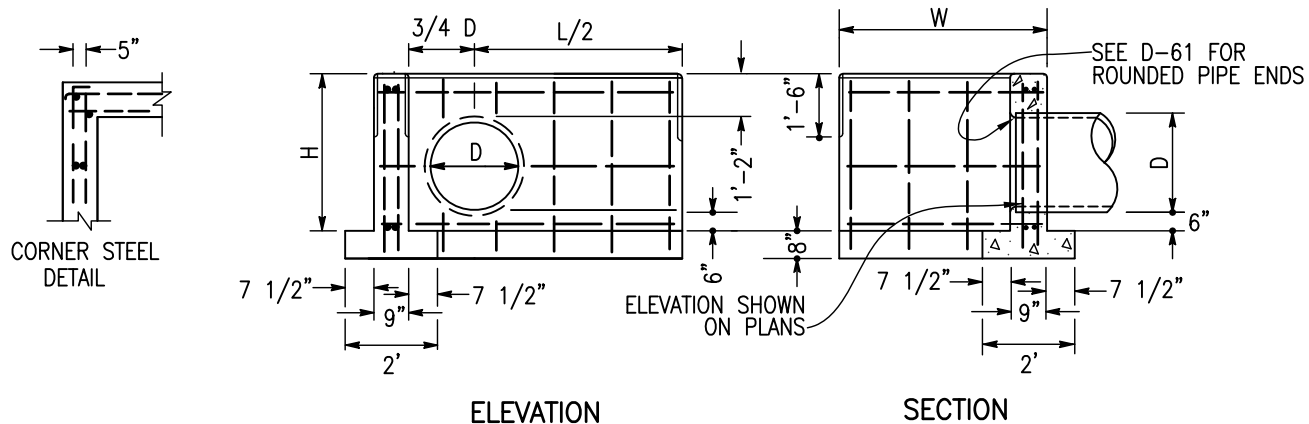
NOTES

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.R.	T. Regello	10/15	WING AND U TYPE HEADWALLS FOR 42" TO 84" PIPE		 03/24/2022	
Edited	M.W.	M. Widelski	10/18			Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22			DRAWING NUMBER D-35B	

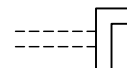


D	H	L/2	W									
			3'-4"		4'-10"		6'-4"		7'-10"		9'-4"	
			STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)
12"	2'-8"	2'-6"	50	0.79	60	0.98	—	—	—	—	—	—
15"	2'-11"	3'	55	0.91	65	1.11	—	—	—	—	—	—
18"	3'-2"	3'-6"	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

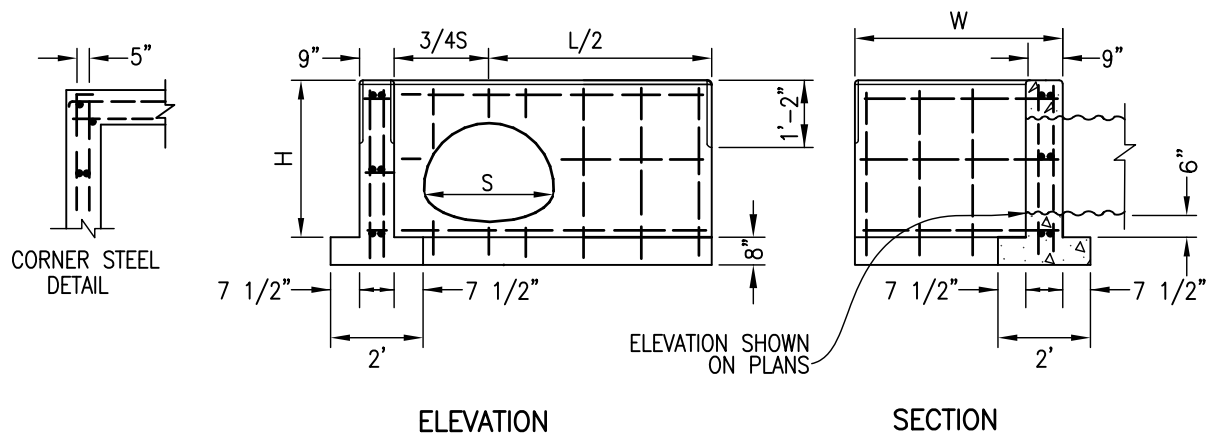
NOTES

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)		 03/24/2022 Chairperson R.C.E. 52241 Date	
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widski	10/18			DRAWING NUMBER D-36	
Reviewed	RP	S. Engeda	03/22				

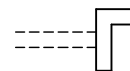


CSP ARCH SIZE	H	L/2	LENGTH OF W									
			3'-4"		4'-10"		6'-4"		7'-10"		9'-4"	
			STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)	STEEL (LBS)	CONCRETE (C.Y.)
18"x11"	2'-7"	2'-9"	50	0.84	60	1.03	70	1.21	80	1.39	90	1.57
21"x15"	2'-11"	3'-3"	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

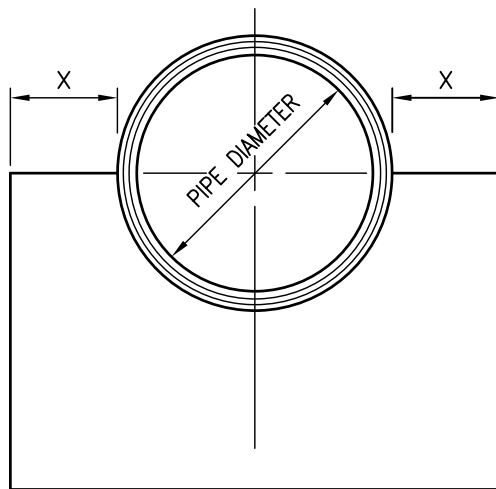
NOTES

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.

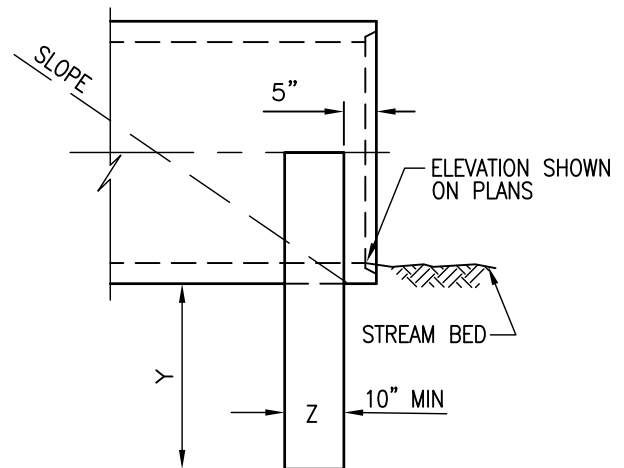
LEGEND ON PLANS



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75	L TYPE HEADWALLS [CORRUGATED STEEL PIPE - ARCH]		 03/24/2022	
Edited	T.R.	T. Regello	10/15			Chairperson R.C.E. 52241 Date	
Edited	M.W.	M. Widelski	10/18			DRAWING NUMBER D-37	
Reviewed	RP	S. Engeda	03/22				



FACE ELEVATION



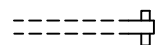
SIDE ELEVATION

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"

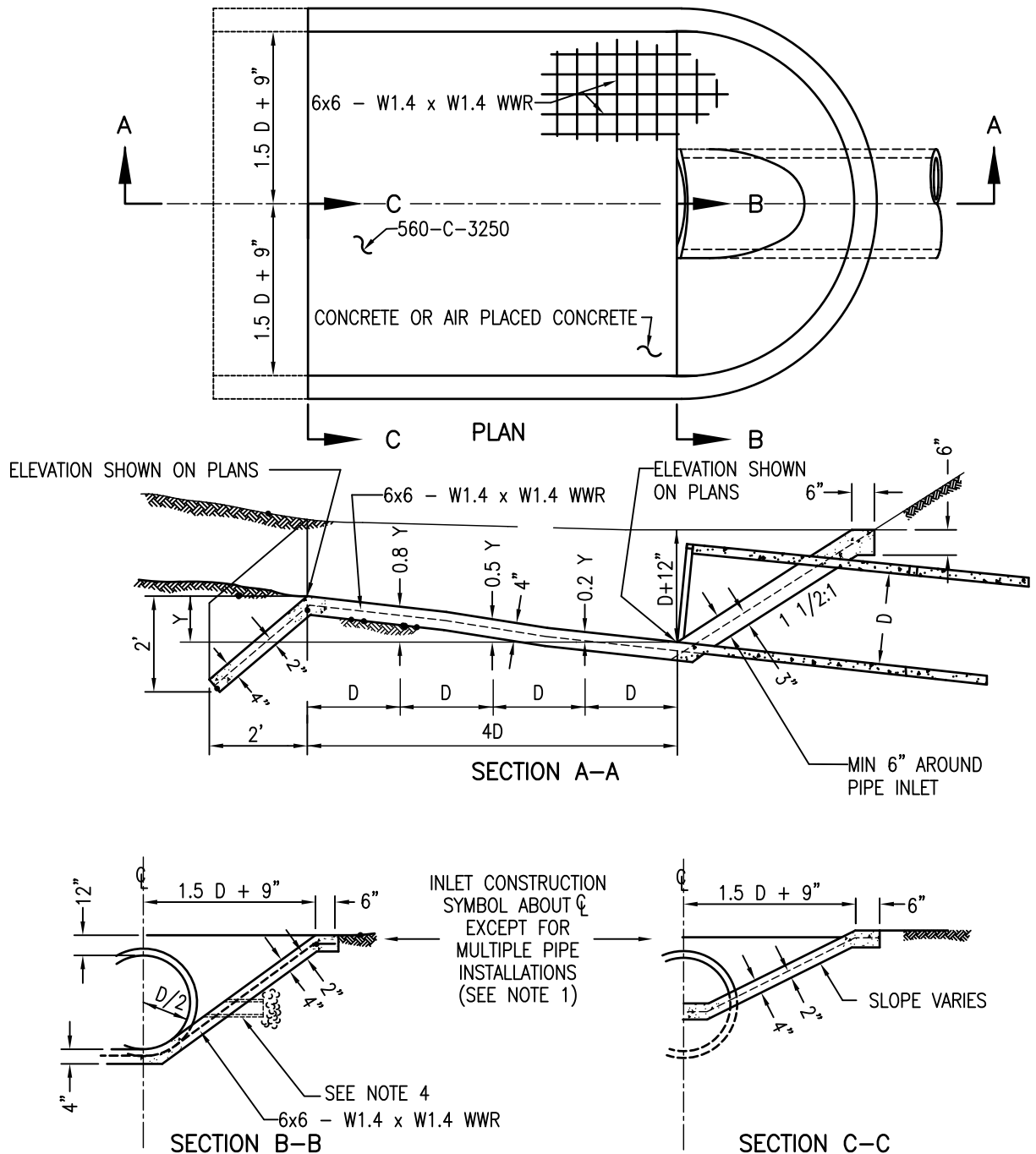
NOTES

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		
Edited	T.R.	T. Regello	10/15	CURTAIN WALL	 03/24/2022
Edited	M.W	M. Widelski	10/18		Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		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	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	INLET APRON FOR CULVERTS UP TO 42" DIAMETER		 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
Reviewed	RP	S. Engeda	03/22			
						DRAWING NUMBER D-39

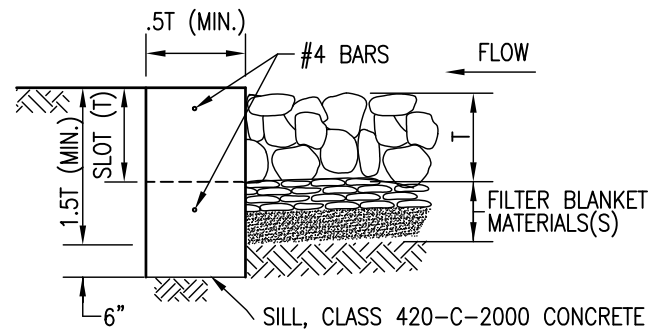
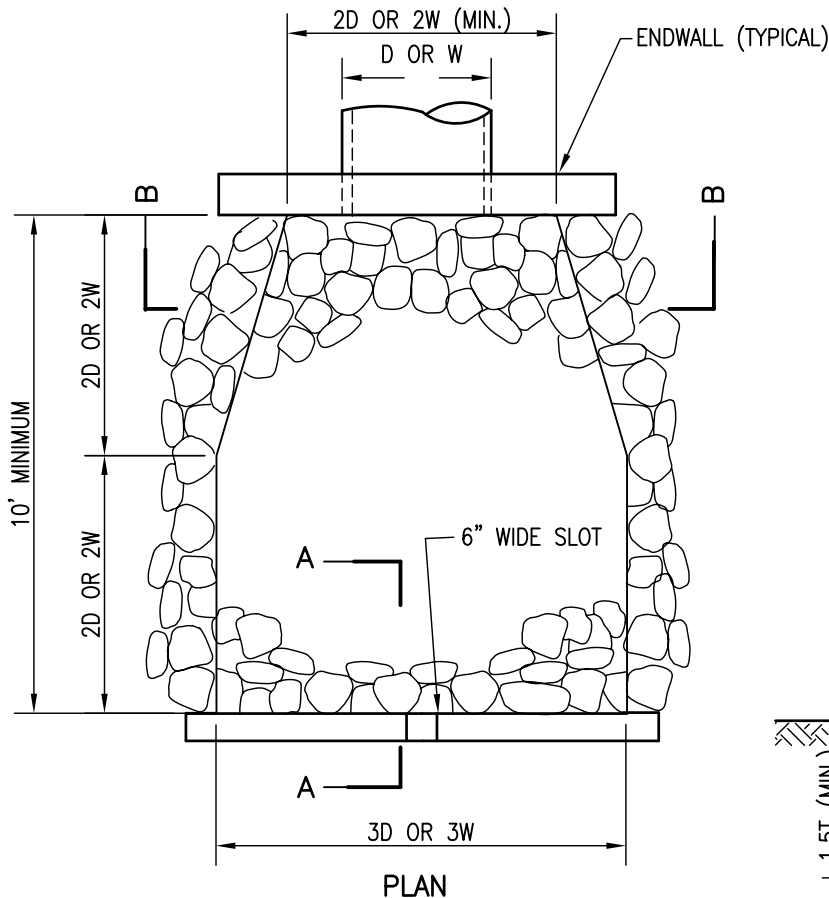
TABLE 7-1 (BELOW) PER JULY 2005
SAN DIEGO COUNTY DRAINAGE DESIGN MANUAL

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 ϕ

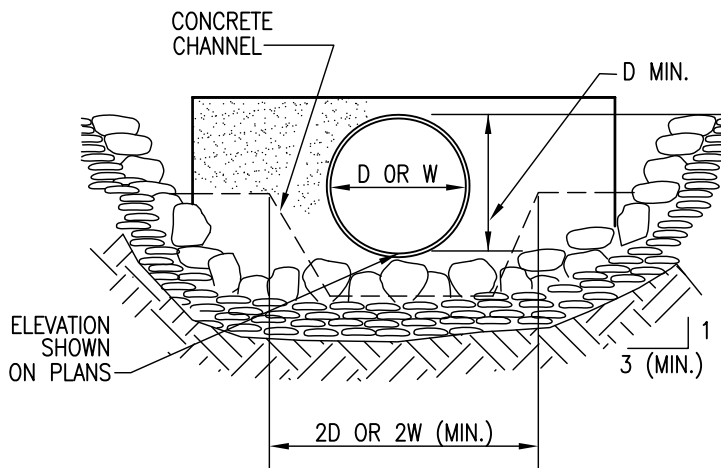
W = BOTTOM WIDTH OF CHANNEL



SECTION A-A

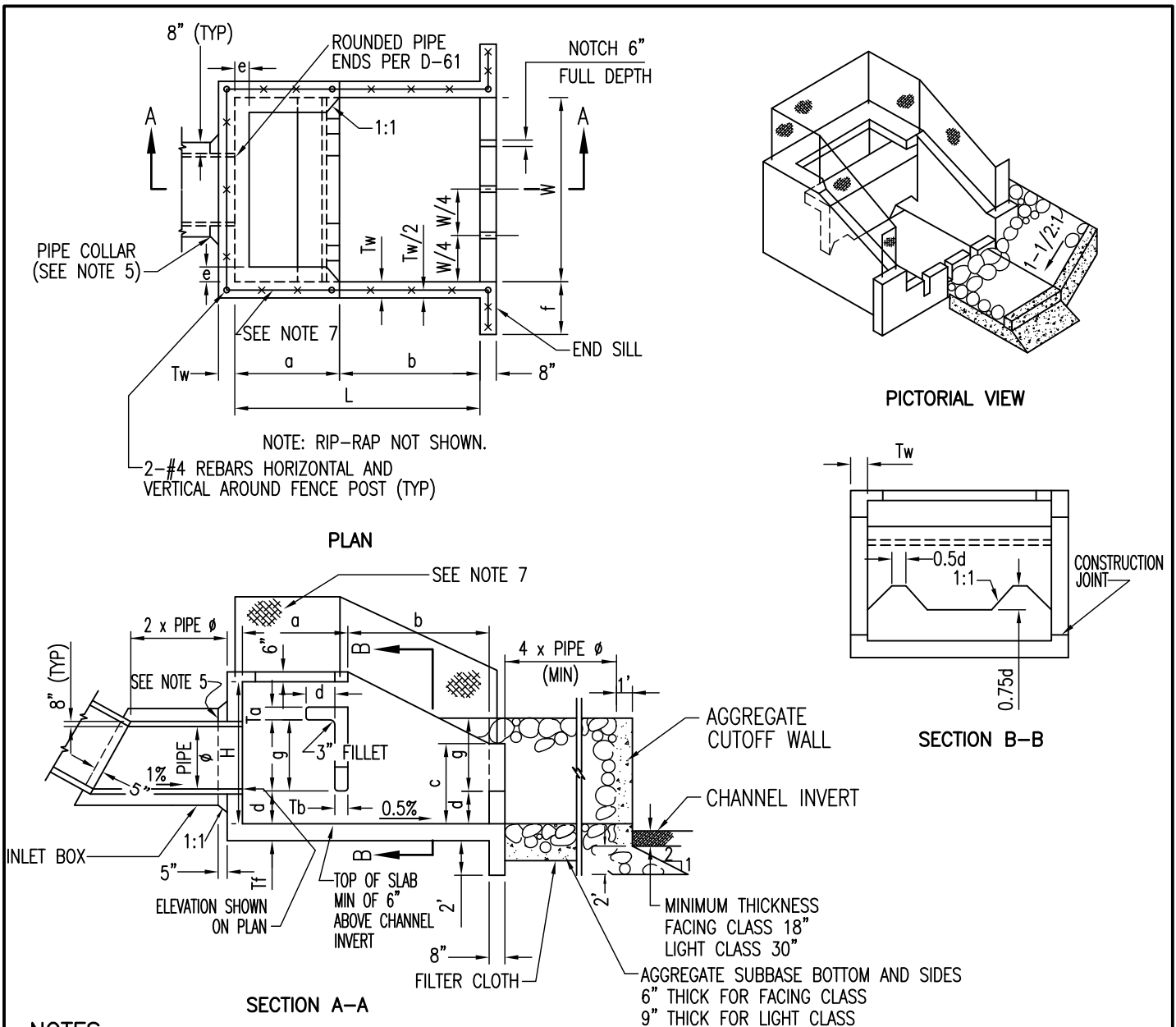
NOTES

- 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.



SECTION B-B

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75			
Edited	T.R.	T. Regello	10/15	RIP RAP ENERGY DISSIPATER	 03/24/2022	
Edited	M.W.	M. Widelski	10/18		Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER	D-40



NOTES

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

SEE D-41B FOR DIMENSIONS.

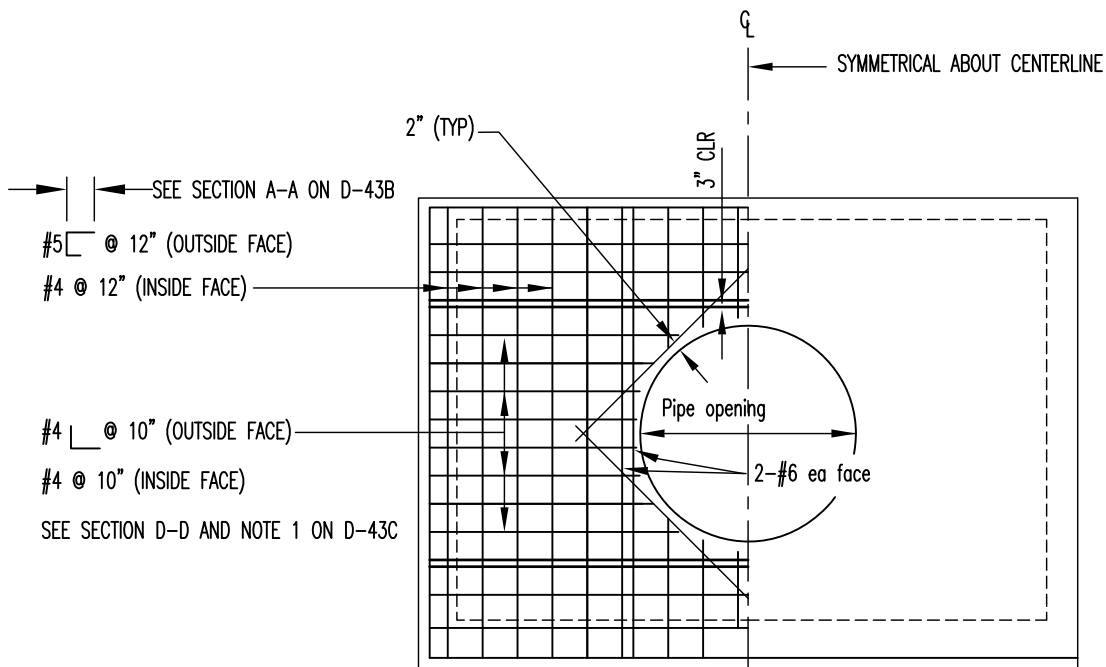
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75	CONCRETE ENERGY DISSIPATER		<i>Samsir Engeda</i> 03/24/2022 Chairperson R.C.E. 52241 Date	D-41A
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER	

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

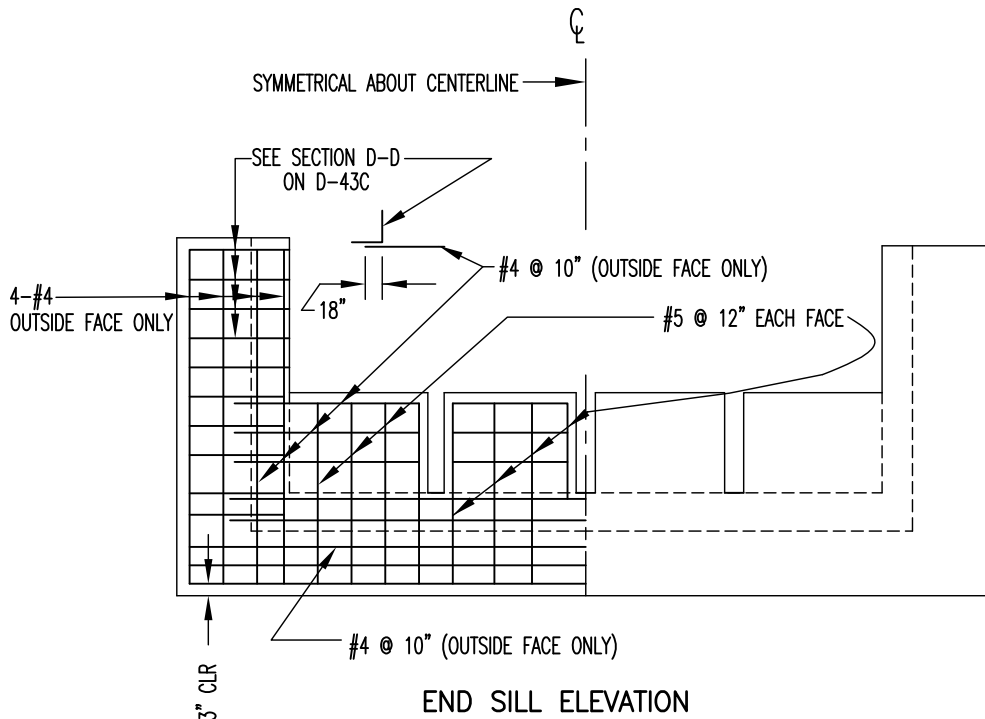
PIPE Ø (IN)	18	24	30	36	42	48	54	60	72
AREA (SF)	1.77	3.14	4.91	7.07	9.62	12.57	15.90	19.63	28.27
MAX Q (CFS)	21	38	59	85	115	151	191	236	339
W	5'-6"	6'-9"	8'	9'-3"	10'-6"	11'-9"	13'	14'-3"	16'-6"
H	4'-3"	5'-3"	6'-3"	7'-3"	8'	9'	9'-9"	10'-9"	12'-3"
L	7'-4"	9'	10'-8"	12'-4"	14'	15'-8"	17'-4"	19'	22'
a	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.R.	T. Regello	10/15	CONCRETE ENERGY DISSIPATER		<i>Saman Engeda</i> 03/24/2022	
Edited	M.W.	M. Widelski	10/18			Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22			DRAWING NUMBER D-41B	

D-42



HEADWALL ELEVATION



END SILL ELEVATION

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

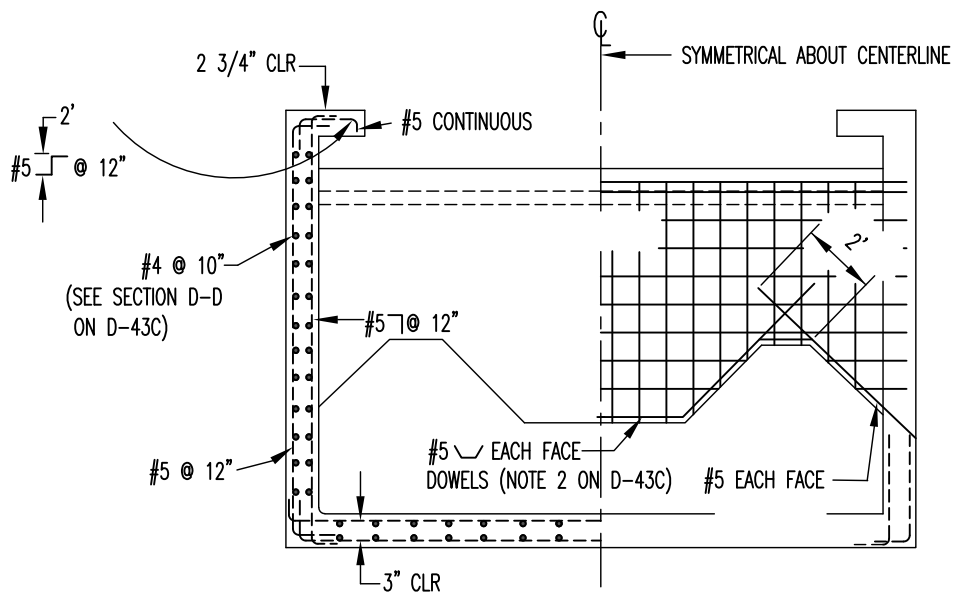
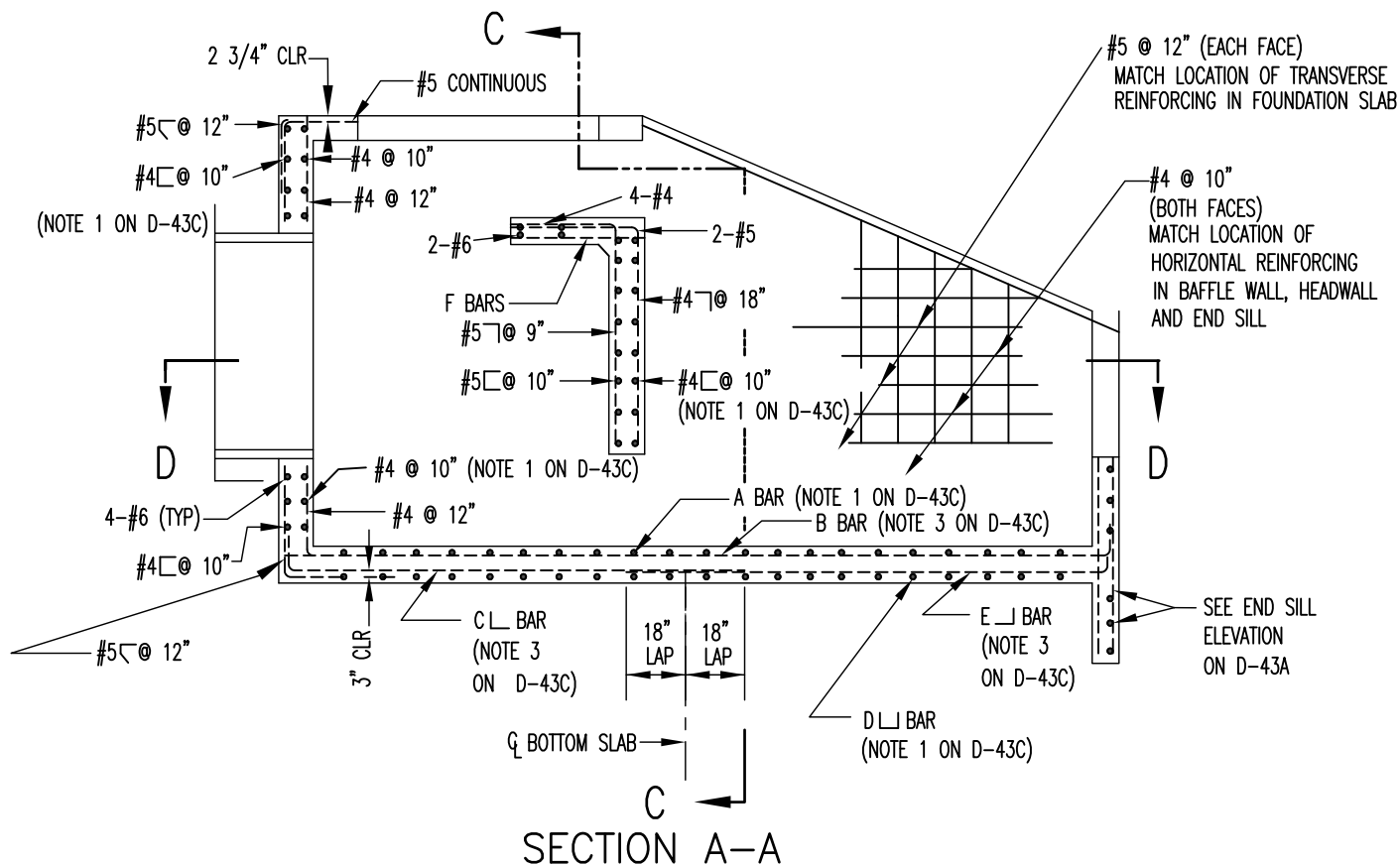
**CONCRETE ENERGY DISSIPATER
(REINFORCEMENT)
36" TO 72" DIAMETER PIPE**

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samantha Engeda 03/24/2022

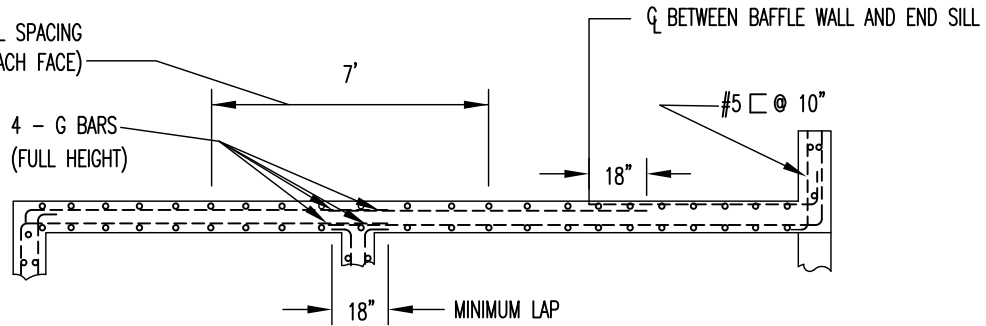
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-43A**



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		 03/24/2022 Chairperson R.C.E. 52241 Date	
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER	D-43B

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



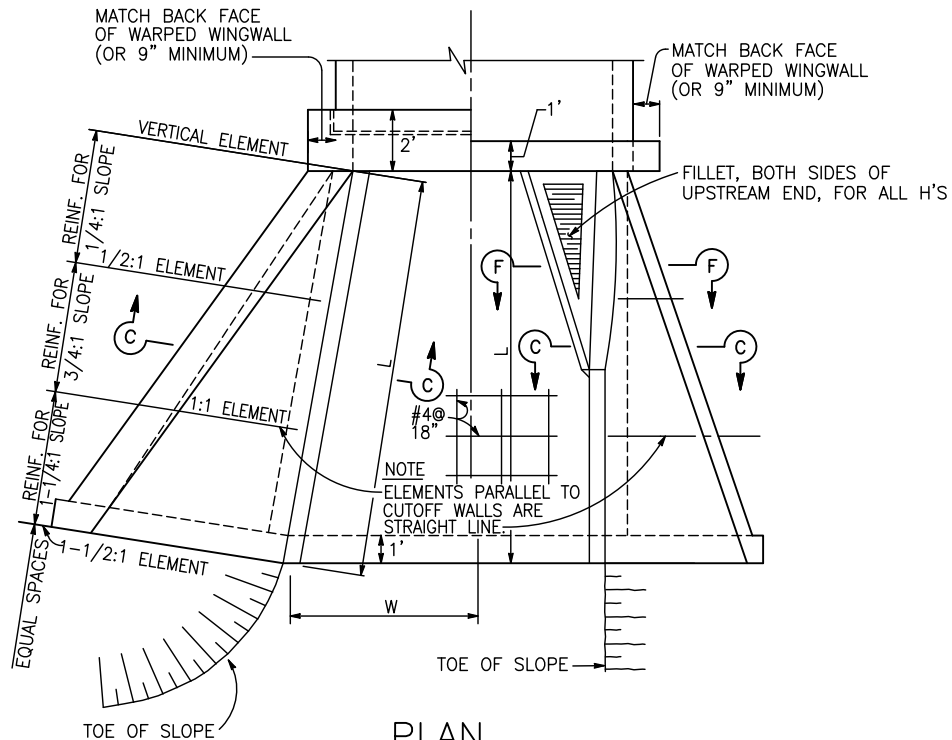
SECTION D-D

PIPE Ø (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		

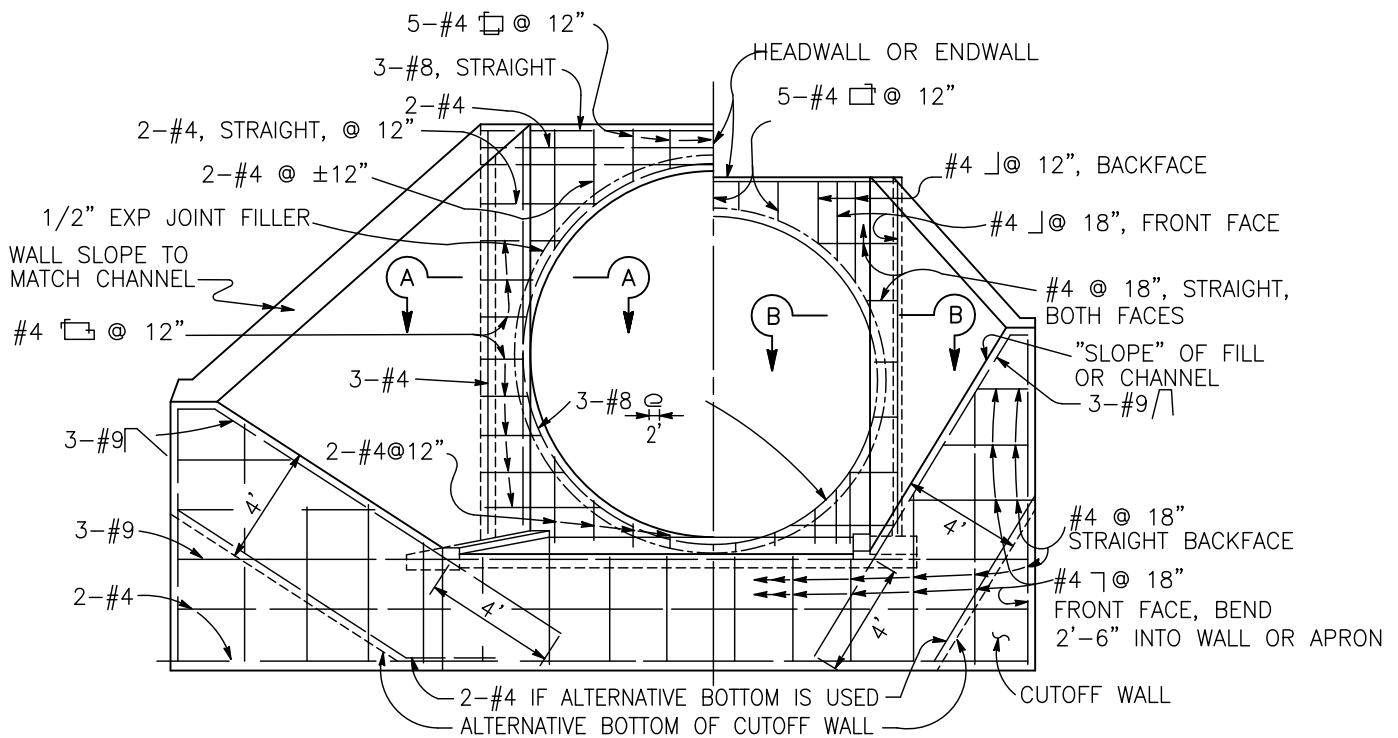
NOTES

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		 03/24/2022 Chairperson R.C.E. 52241 Date	
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						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
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

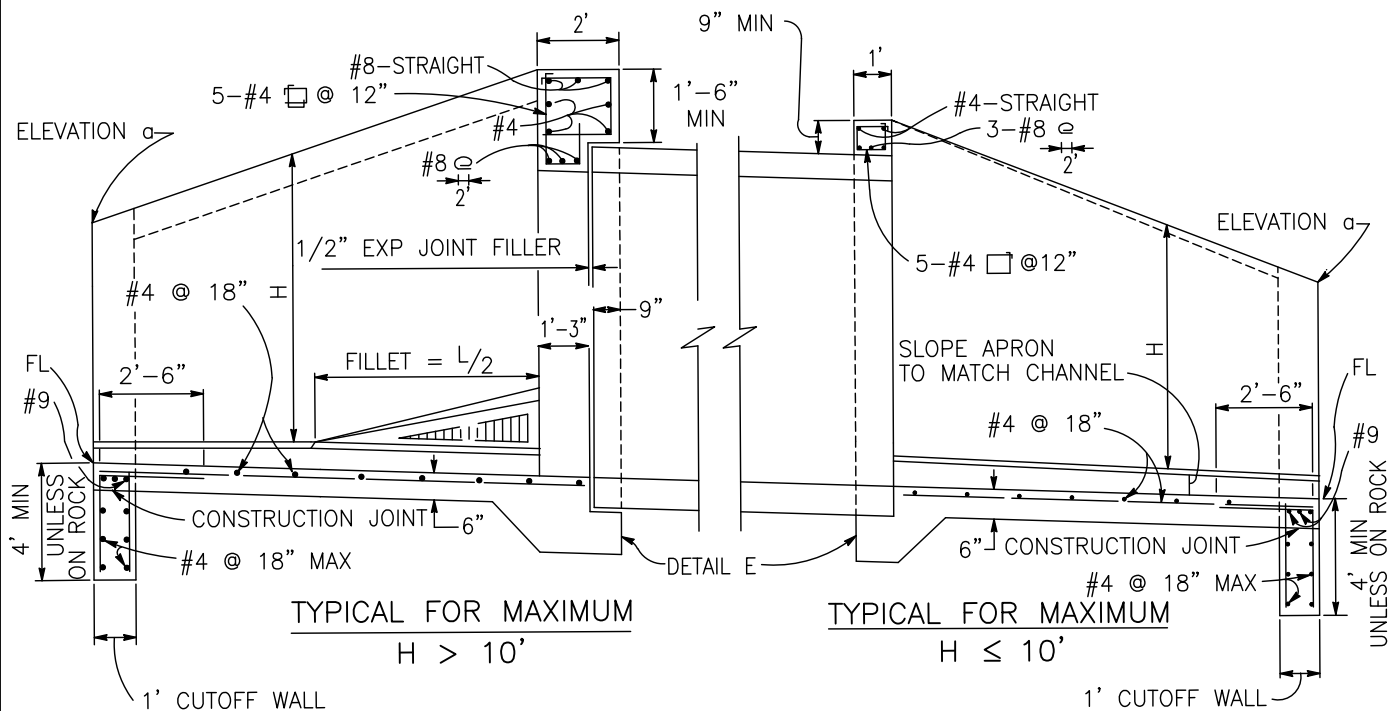
PIPE CULVERT - HEADWALLS,
ENDWALLS & WARPED WINGWALLS

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

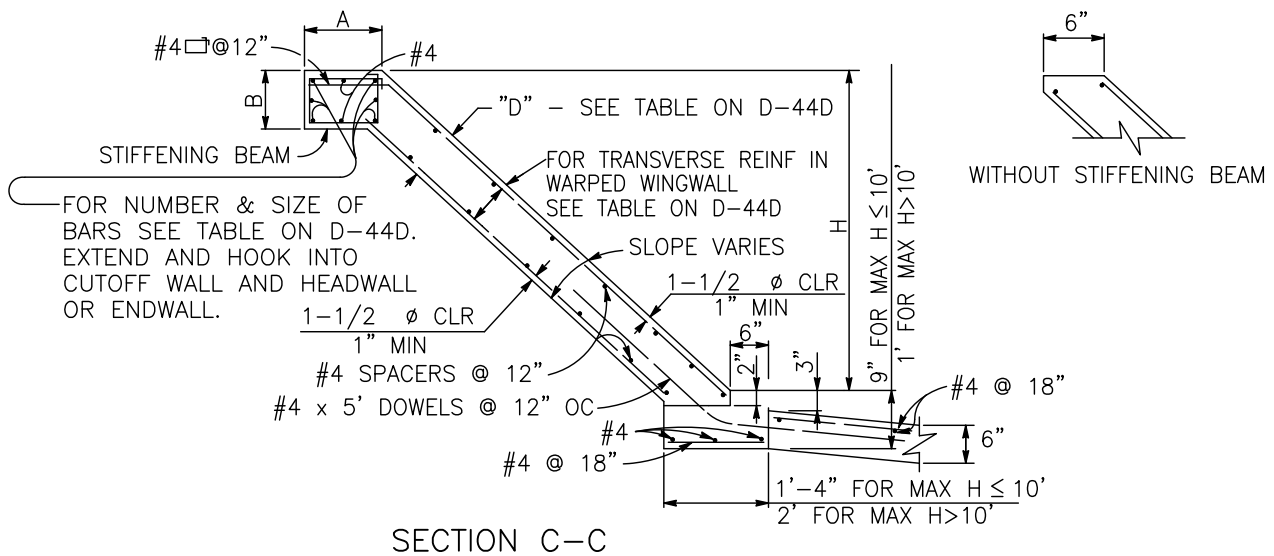
Samsir Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-44A**



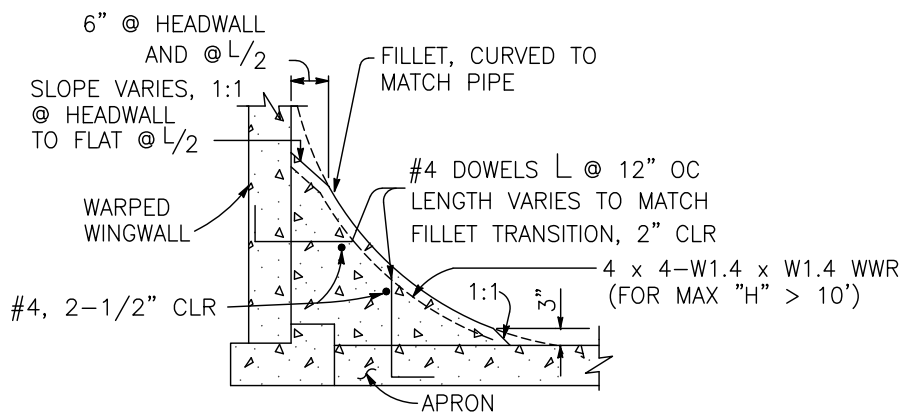
PART LONGITUDINAL SECTION



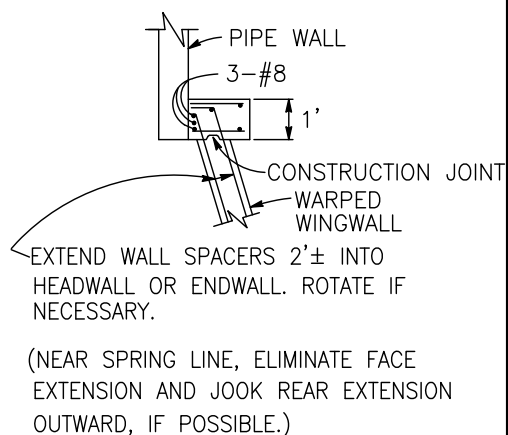
NOTES

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.

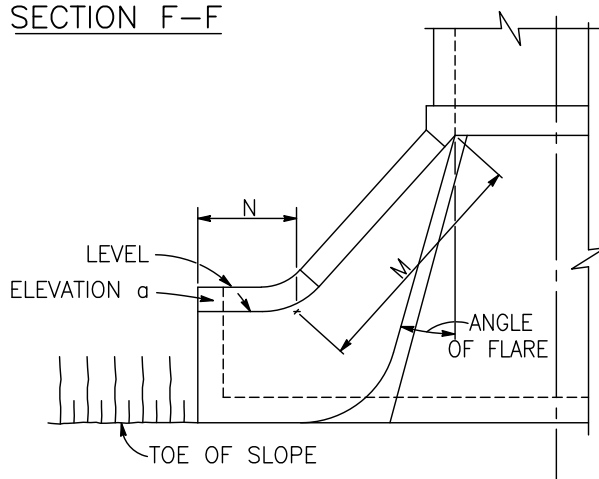
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75	PIPE CULVERT - HEADWALLS, ENDWALLS & WARPED WINGWALLS		 03/24/2022 Chairperson R.C.E. 52241 Date	D-44B
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER	



SECTION F-F

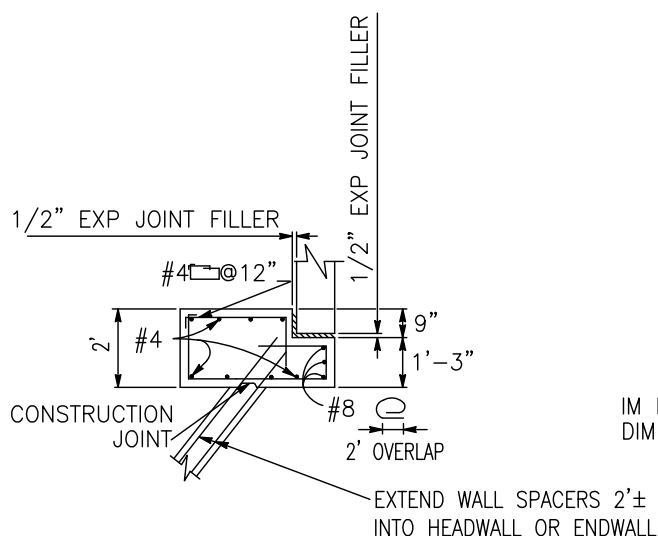


SECTION B-B

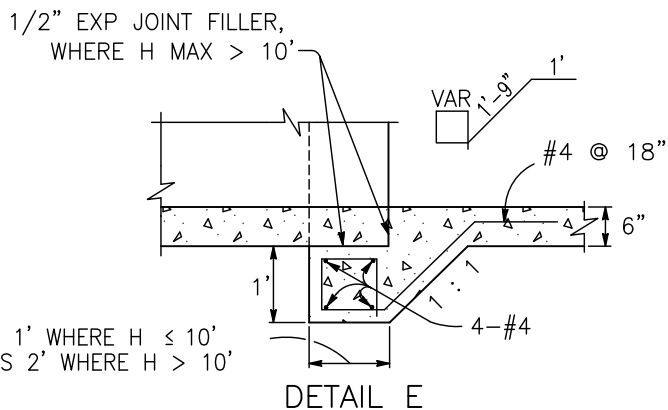


ALTERNATIVE WARPED WINGWALL

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		 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
Reviewed	RP	S. Engeda	03/22			
						DRAWING NUMBER D-44C

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

**PIPE CULVERT - HEADWALLS,
ENDWALLS & WARPED WINGWALLS**

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

 03/24/2022
Chairperson R.C.E. 52241 Date

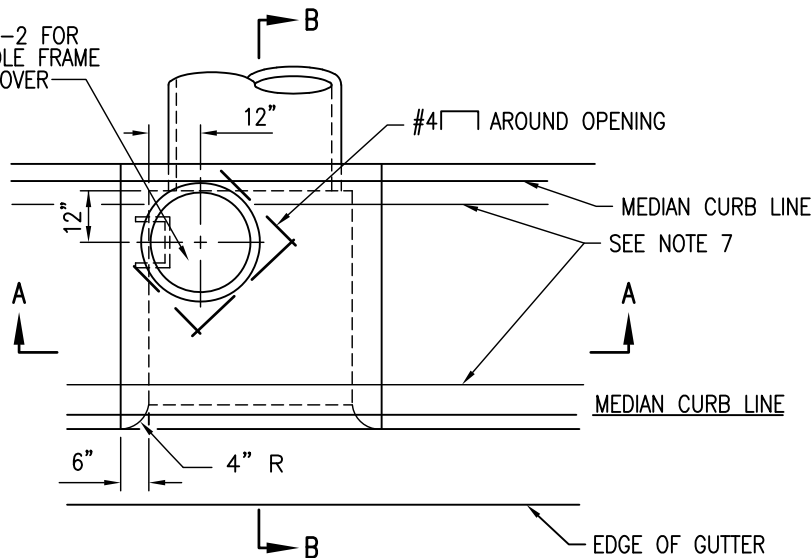
DRAWING
NUMBER **D-44D**

WARPED WINGWALLS (ALL MEASUREMENTS IN FEET AND/OR INCHES UNLESS OTHERWISE NOTED)																			
WALL DIMENSIONS AND REINFORCING										STIFFENING BEAM DIMENSIONS AND REINFORCING									
ELEMENT SLOPE	H	8'OR LESS	10'	12'	14'	16'	18'	20'	H MAX	12'	14'	16'	18'	20'	25'	30'	35'	40' OR MORE	
1/4:1	FRONT FACE REINF	#4@12	#4@7	#5@7	#5@5	#6@6	#7@7	#7@6	6'	NO BEAM. PLACE 2-#6 IN EACH									
	REAR FACE REINF	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12		FACE ALONG TOP OF WALL.									
3/4:1	FRONT FACE REINF	#4@12	#4@12	#4@12	#4@12	#4@10	#4@8	#4@6	10'	A= 1'									
	REAR FACE REINF	#4@12	#4@12	#4@12	#4@10	#4@7	#4@6	#5@8		B= 9"									
1-1/4:1	FRONT FACE REINF	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	#4@12	14'	TOTAL 6-#6									A= 1'-10"
	REAR FACE REINF	#4@8	#4@8	#4@5	#5@6	#6@7	#6@6	#7@6		TOTAL 6-#7									B= 1'
D AT CUTOFF WALL	D AT CUTOFF WALL	6"	6"	6"	7-1/2"	8"	9-1/2"	11"	16'	TOTAL 6-#8									A= 2'
		6"	6"	6"	8"	9-1/2"	11"	1'-1"		TOTAL 8-#9									B= 1'-6"

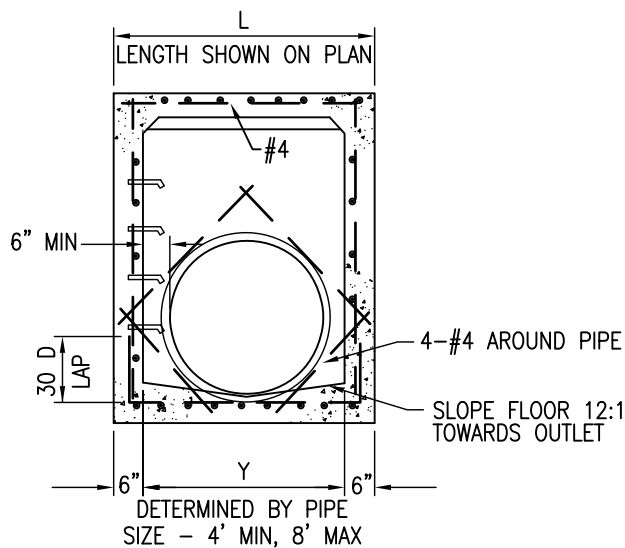
NOTES

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".

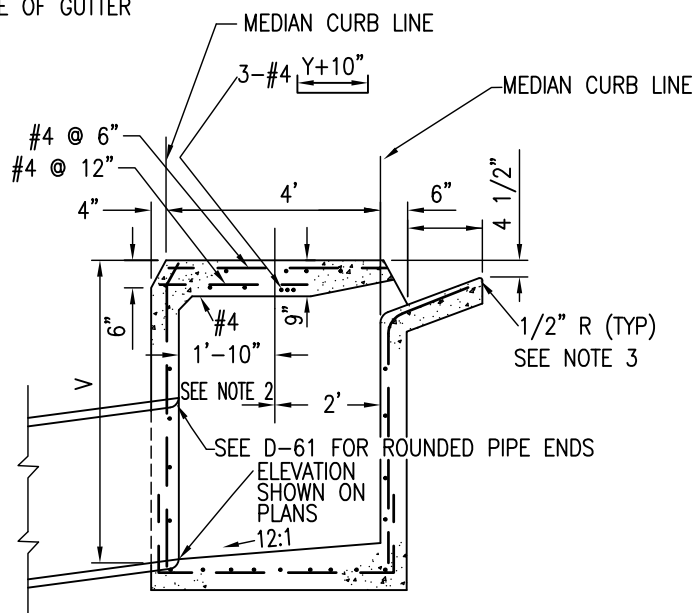
SEE M-2 FOR
MANHOLE FRAME
AND COVER



PLAN



SECTION A-A

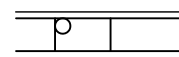


SECTION B-B

NOTES

1. SEE D-11A, D-11B & D-12 FOR ADDITIONAL NOTES AND DETAILS.
2. DIMENSION SHOWN BECOMES 2' WHEN OPENING ON BOTH SIDES. ADJUST MANHOLE AS REQUIRED.
3. EXPOSED EDGES OF CONCRETE SHALL BE ROUNDED WITH A RADIUS OF 1/2".
4. WHEN V EXCEEDS 4' STEPS SHALL BE INSTALLED. SEE D-11A FOR DETAILS.
5. CONCRETE GUTTER TO MATCH SLOPE AND FINISH OF ADJACENT GUTTERS.
6. AN EXPANSION JOINT SHALL BE PLACED AT THE ENDS OF THE INLET WHERE THE MEDIAN CURB IS TO ADJOIN (UNLESS SPECIFIED OTHERWISE).
7. PROVIDE 1/4" TOOLED GROOVE IN TOP SLAB IN LINE WITH BACK OF ADJACENT MEDIAN CURB.
8. MAINTAIN 1 1/2" CLEAR SPACING BETWEEN REINFORCING AND SURFACE UNLESS OTHERWISE NOTED.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		H. Hecht	10/82
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelksi	10/18
Reviewed	RP	C. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

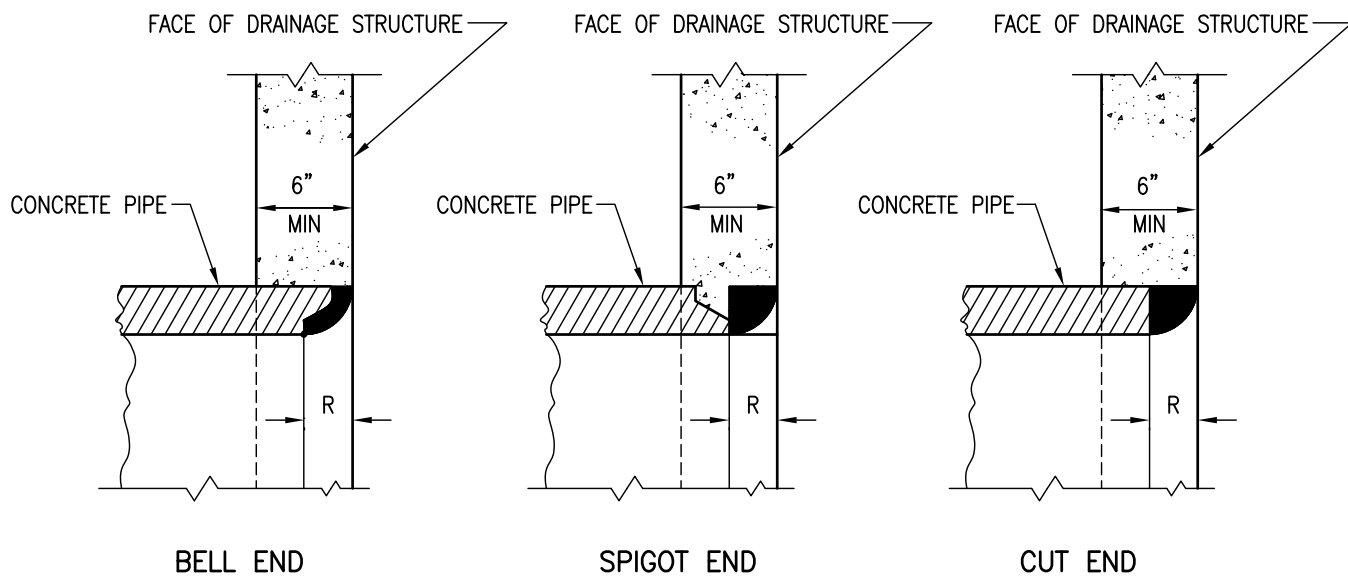
MEDIAN CURB INLET - TYPE J

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

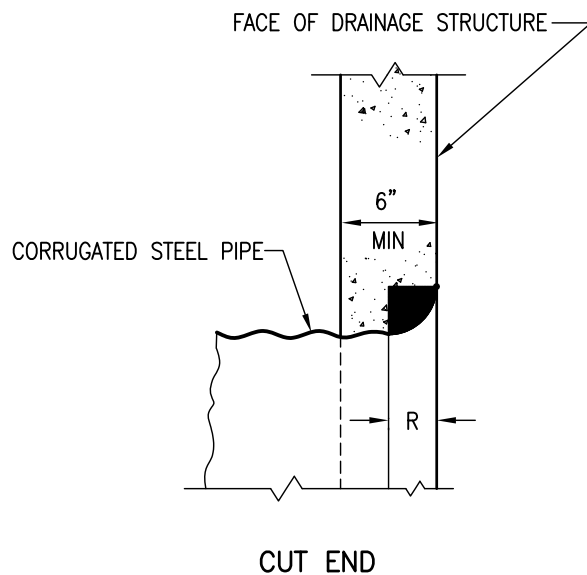
Samson Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-45**

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	PIPE BEDDING AND TRENCH BACKFILL FOR STORM DRAINS	 03/24/2022
Edited	M.W.	M. Widdelski	10/18		Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER D-60



R = THICKNESS OF PIPE

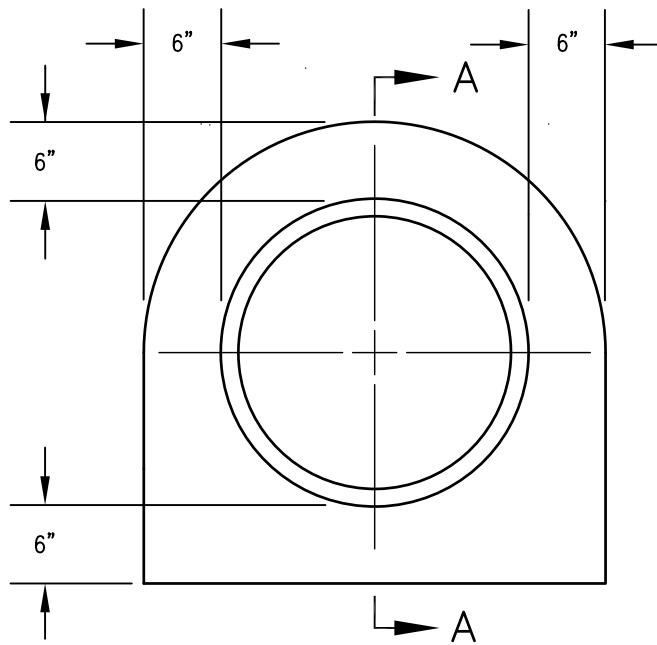


R = $\frac{\text{INSIDE DIAMETER OF PIPE}}{10}$

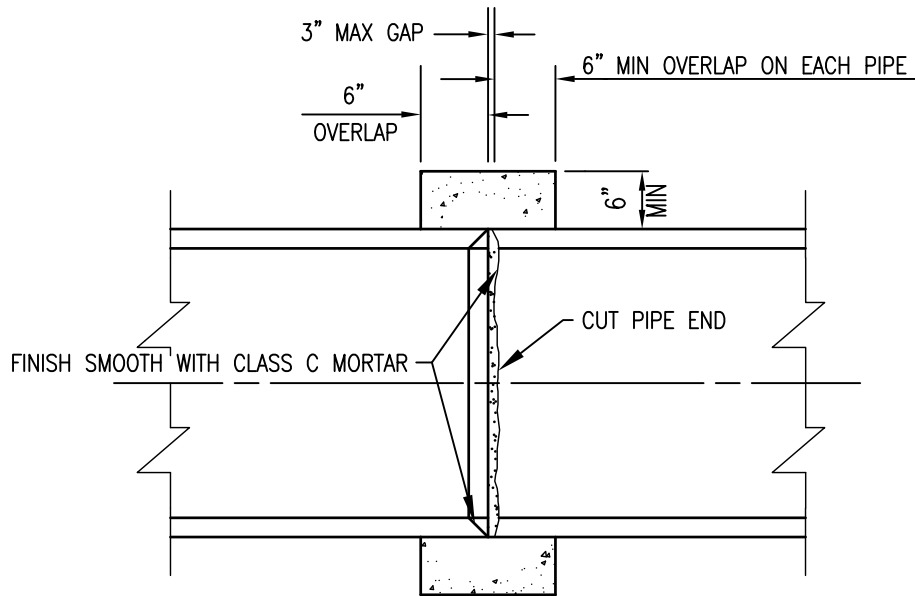
NOTE

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	ROUNDED PIPE ENDS IN DRAINAGE STRUCTURES		 03/24/2022 Chairperson R.C.E. 52241 Date	
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER D-61	



ELEVATION

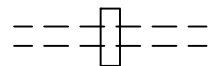


SECTION A-A

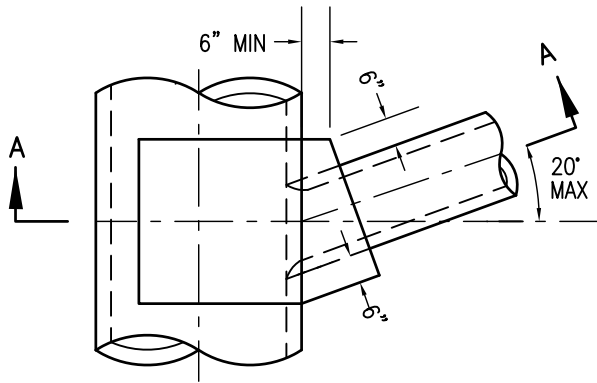
NOTES

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".

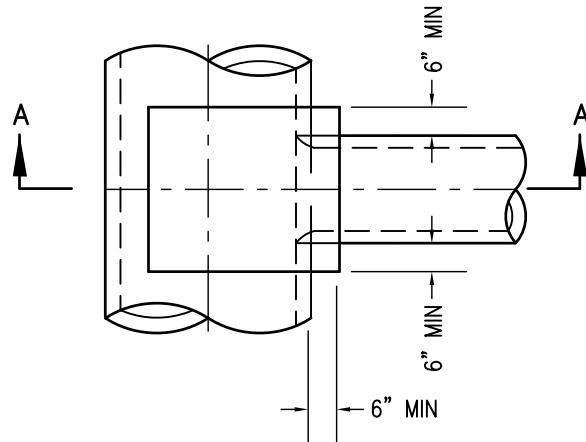
LEGEND ON PLANS



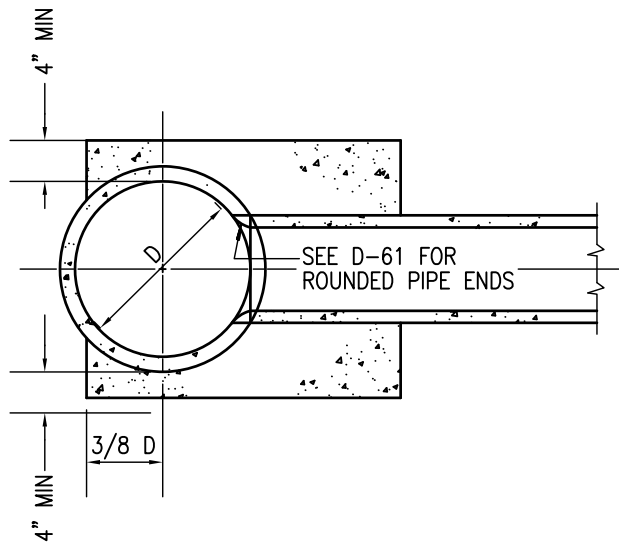
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	PIPE COLLAR	<i>Samsin Engeda</i> 03/24/2022
Edited	M.W.	M. Widelski	10/18		Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-62



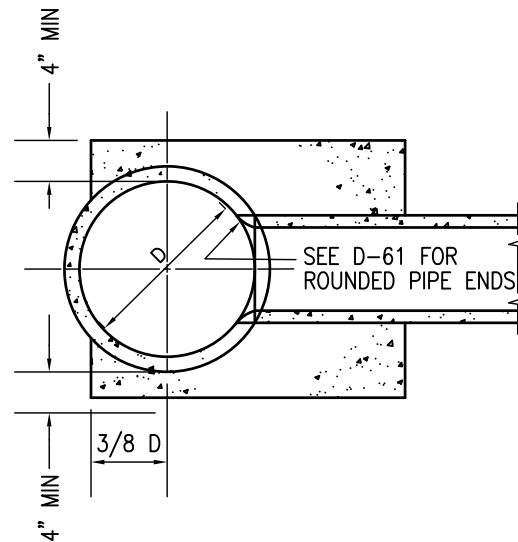
PLAN
SKEWED CONNECTION



PLAN



SECTION A-A

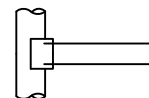


SECTION B-B

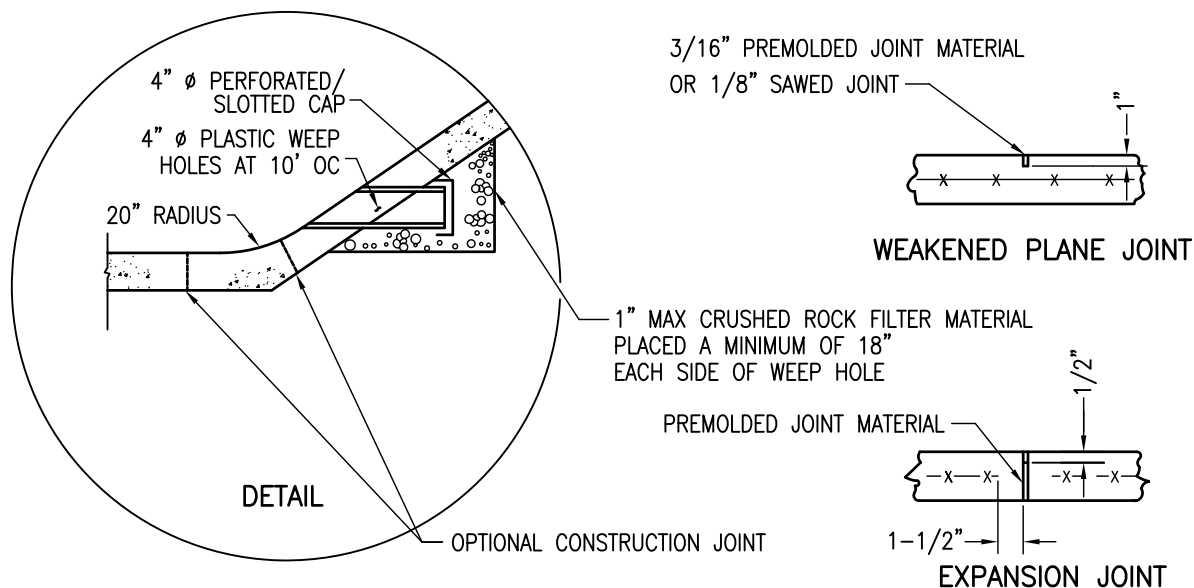
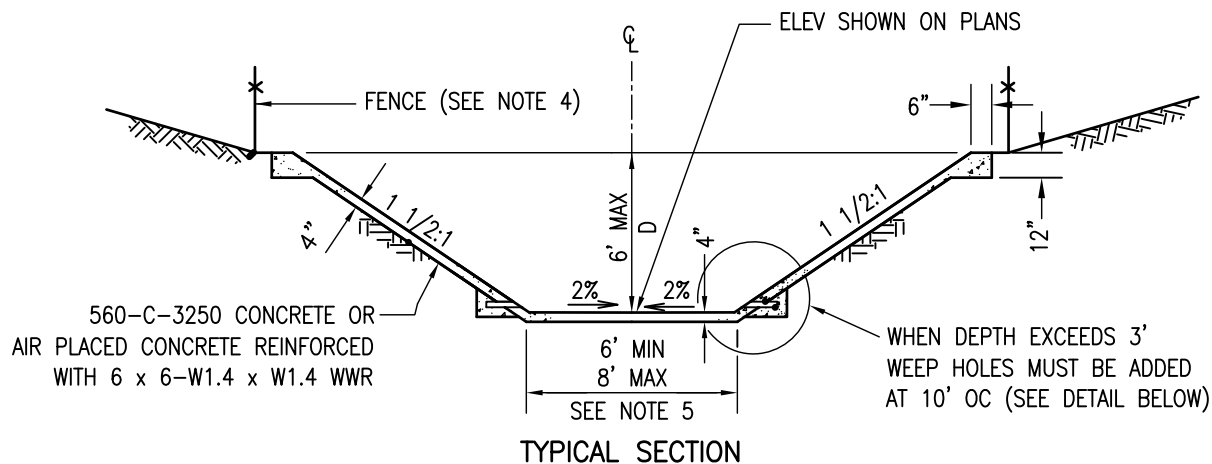
NOTES

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



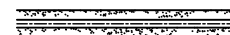
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	CONCRETE LUG	 03/24/2022
Edited	M.W.	M. Widelski	10/18		Chairperson R.C.E. 52241 Date
Reviewed	RP	S. Engeda	03/22		DRAWING NUMBER
					D-63



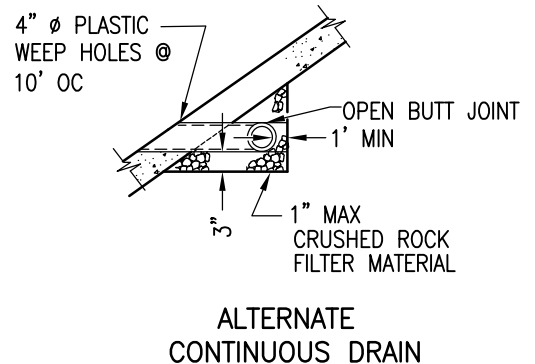
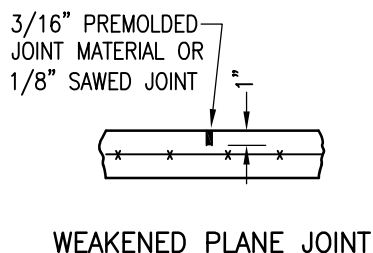
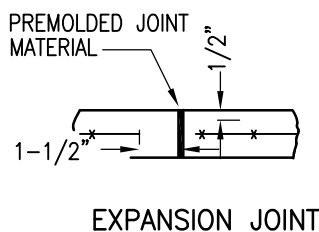
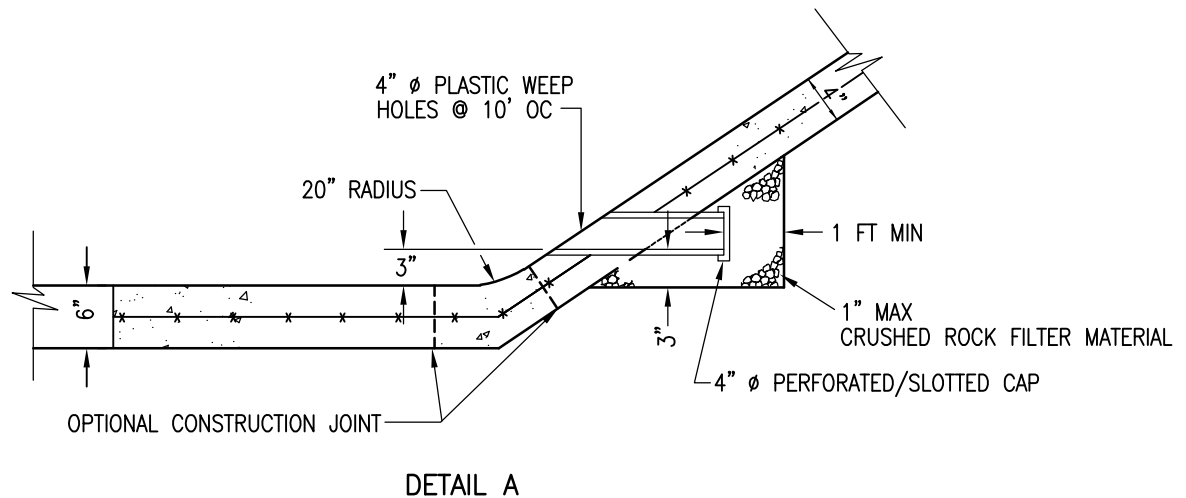
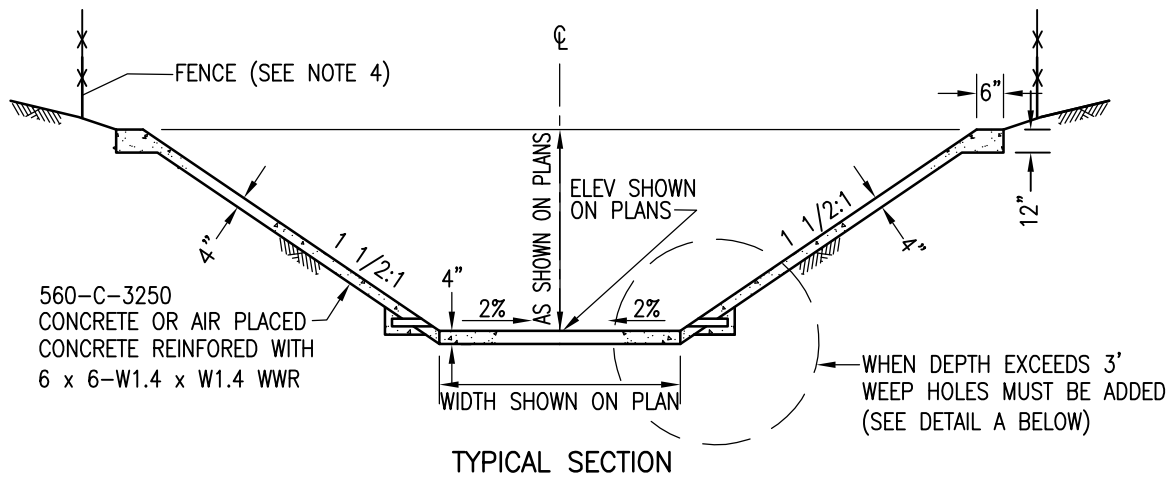
NOTES

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	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	MINOR DRAINAGE CHANNEL	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-70



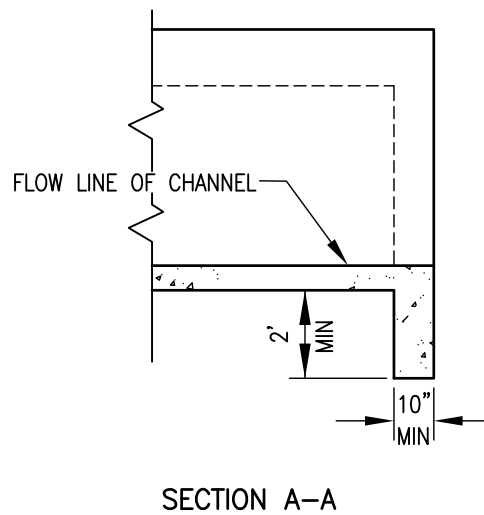
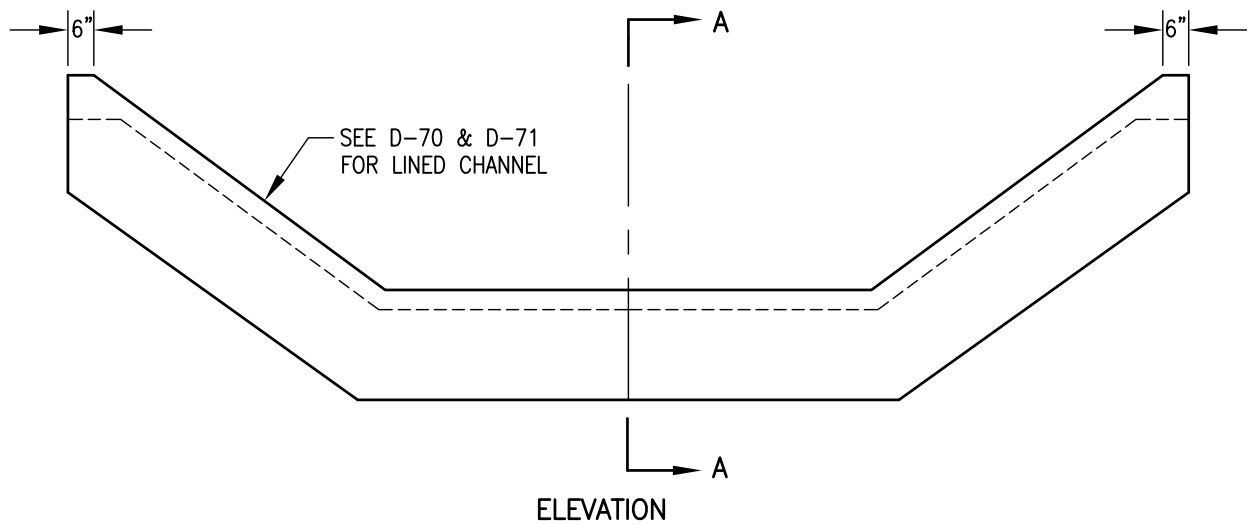
NOTES

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



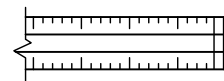
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	MAJOR DRAINAGE CHANNEL	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-71



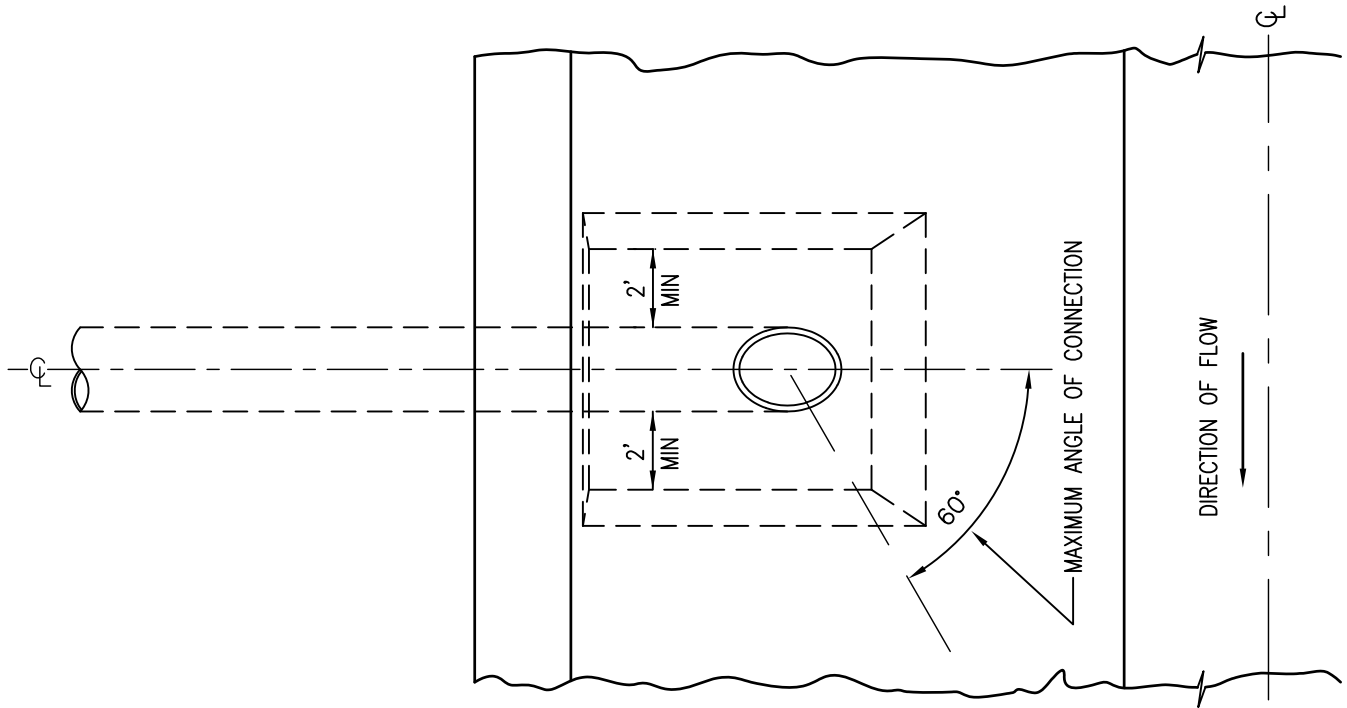
NOTES

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.

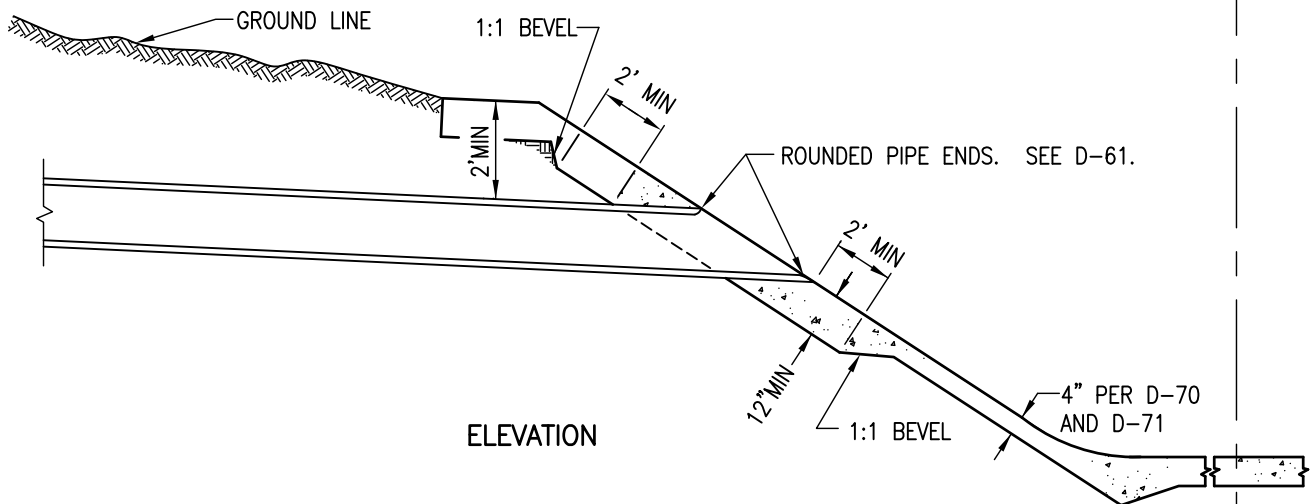
LEGEND ON PLANS



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		 03/24/2022 Chairperson R.C.E. 52241 Date	
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER D-72	



PLAN

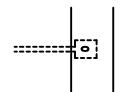


ELEVATION

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
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

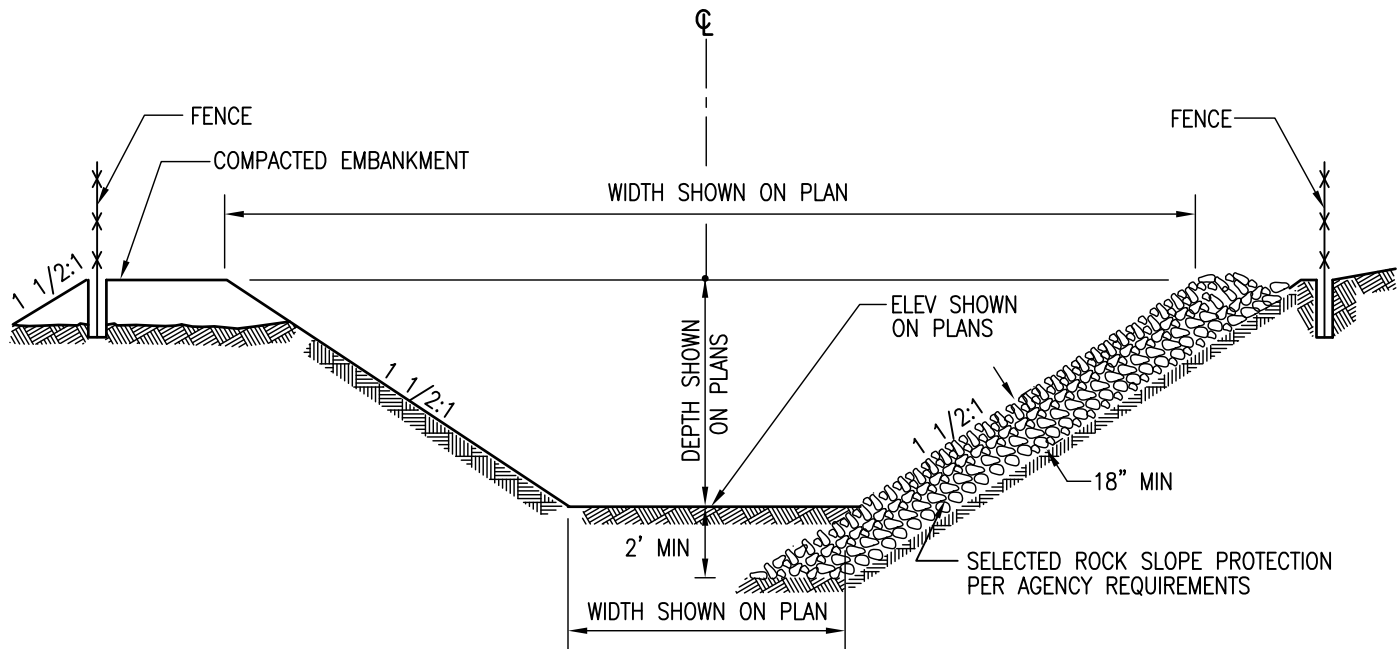
SAN DIEGO REGIONAL STANDARD DRAWING

PIPE TO CHANNEL CONNECTION

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Susan Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-73**



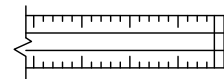
SECTION

NOTE

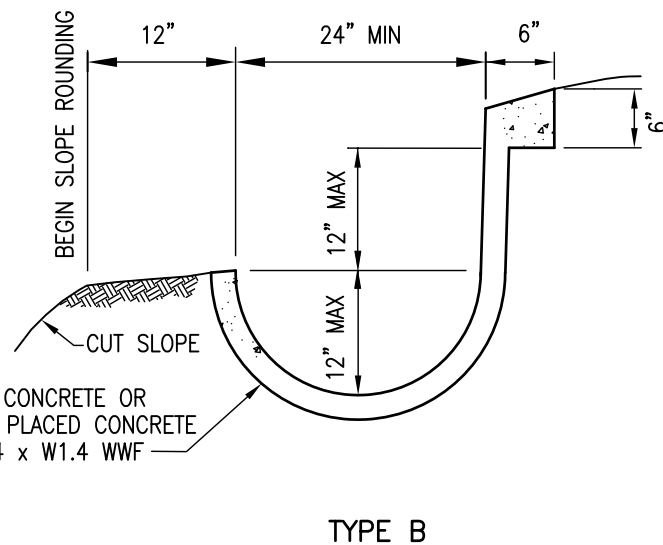
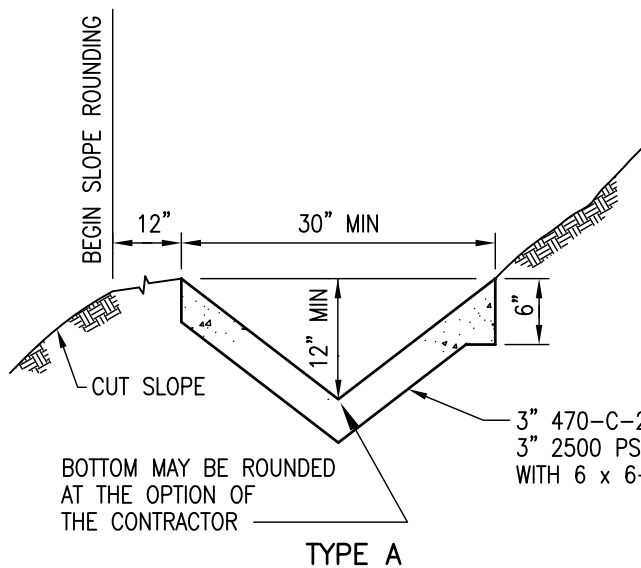
THE FOLLOWING SHALL BE SPECIFIED BY AGENCY AND INCLUDED IN THE PLAN DESIGN:

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

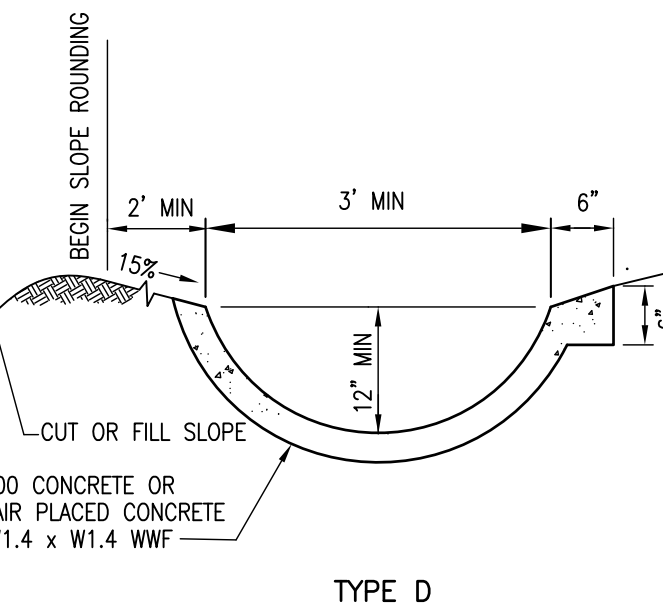
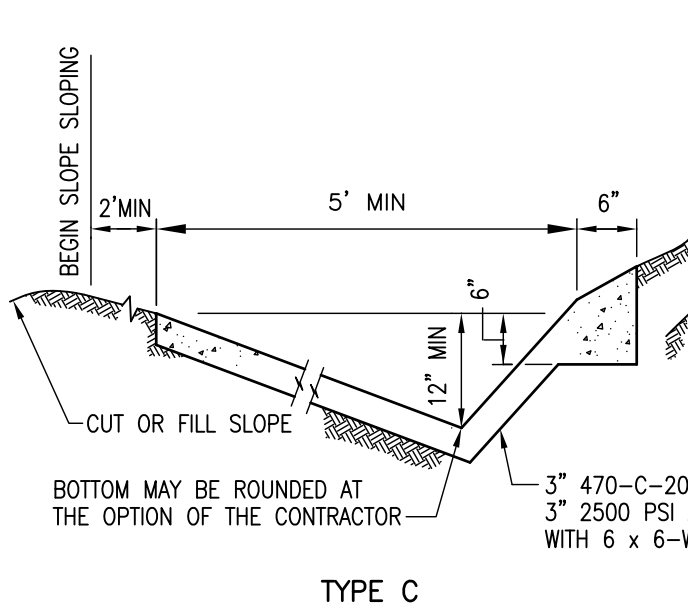
LEGEND ON PLANS



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	GRADED EARTH CHANNEL	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					DRAWING NUMBER D-74



BROW DITCH

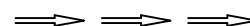


TERRACE DITCH

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
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

DRAINAGE DITCHES

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Somesh Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-75**

Revision	By	Approved	Date
ORIGINAL		A.Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

SINGLE BOX CULVERT DETAILS No.1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samantha Engeda 03/24/2022

Chairperson R.C.E. 52241 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'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'	2'
HEIGHT	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
STRENGTH CLASSIFICATION																								
MAX FILL OVER TOP																								
Top Slab	T1	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Bottom Slab	T2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
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
Size Bar "		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Spacing		3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2
Length		3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2	3-2
"d" Dist. Bars		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		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Spacing		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Number		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Concrete: C.Y. per lin. ft.		0.17	0.18	0.23	0.27	0.31	0.36	0.40	0.43	0.47	0.51	0.54	0.58	0.62	0.66	0.70	0.74	0.78	0.82	0.86	0.90	0.94	0.98	1.02
Reinf. lbs per lin. ft.		27	29	34	36	46	44	45	47	48	52	54	56	58	60	62	64	66	68	70	72	74	76	78

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.

Revision	By	Approved	Date
ORIGINAL		A.Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelksi	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

**SINGLE BOX CULVERT
DETAILS No.1**

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

 03/24/2022
Chairperson R.C.E. 52241 Date

**DRAWING
NUMBER D-76B**

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

SPAN		6'																	
HEIGHT		2'			3'			4'			5'			6'			7'		
STRENGTH CLASSIFICATION		A	B		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP		10	18		10	18	25	9	18	25	9	18	25	9	17	25	9	17	25
TOP SLAB	T ₁	8	1/4	8	1/4	8	1/4	8	1/4	8	1/4	8	1/4	8	1/4	8	1/4	8	1/4
BOTTOM SLAB	T ₂	6	3/4	8	6	3/4	8	6	3/4	8	6	3/4	8	6	3/4	8	6	3/4	8
SIDEWALLS	T ₃	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
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		7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4	7	4
BARS BTOM SLAB-NO. OF		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	17	18	15	1/2	11	1/2	8	1/2	17	10	1/2	7	1/2
SPACERS NUMBER		12	12	12	12	12	14	12	12	12	16	16	16	16	16	16	16	16	18
CONCRETE: C.Y. PER LIN. FT.		0.40	0.42	0.43	0.46	0.47	0.50	0.58	0.52	0.54	0.60	0.66	0.66	0.56	0.58	0.65	0.71	0.78	0.88
REINFORCING LBS. PER LIN. FT.		64	63	66	65	69	67	74	70	70	80	91	91	73	78	92	112	127	139

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.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

SINGLE BOX CULVERT DETAILS No.1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samsir Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-76C**

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

SPAN		7'											
HEIGHT		3'			4'			5'			6'		
STRENGTH CLASSIFICATION		A	B	C	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP		16	26	35	16	26	35	16	26	35	16	26	35
TOP SLAB		T ₁	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
BOTTOM SLAB		T ₂	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
SIDEWALLS		T ₃	6	7	6	7	6	7	6	7	6	7	6
"a"	SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5
	SPACING	9	7	9	9	7	9	9	7	9	9	7	9
	LENGTH	6-8	6-9	6-8	6-8	6-9	6-8	6-9	6-8	6-9	6-8	6-9	6-8
"b"	SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5
	SPACING	9	7	9	9	7	9	9	7	9	9	7	9
	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
"c"	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
	SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5
	SPACING	9	7	9	9	7	9	9	7	9	9	7	9
"c ₁ "	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
	LENGTH	5-2	5-4	5-2	5-4	5-2	5-4	5-2	5-4	5-2	5-4	5-2	5-4
	SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5	5
"d"	SPACING	9	7	9	9	7	9	9	7	9	9	7	9
	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
	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
"e"	TOP SLAB-NO. OF BARS	7	4	7	4	7	4	7	4	7	4	7	4
	BOTTOM SLAB-NO. OF BARS	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
SPACERS TOTAL NUMBER		24	28	28	28	28	28	28	28	28	28	28	28
CONCRETE: C.Y. PER LIN. FT.		0.47	0.56	0.51	0.60	0.55	0.64	0.78	0.58	0.68	0.84	0.62	0.73
REINFORCING LBS. PER LIN. FT.		107	130	114	138	118	143	168	125	150	176	132	158

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.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

**SINGLE BOX CULVERT
DETAILS No.1**

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-76D**

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

SPAN		8'																	
HEIGHT		3'			4'			5'			6'			7'			8'		
STRENGTH CLASSIFICATION		A	B		A	B		A	B		A	B		A	B		A	B	
MAX FILL OVER TOP		13	21		13	21		13	21		13	21		13	21		13	21	
CONC.	TOP SLAB	T ₁	7 1/4	8 1/2	7 1/4	8 1/2	7 1/4	8 1/2	7 1/4	8 1/2	7 1/4	8 1/2	7 1/4	8 1/2	7 1/4	8 1/2	7 1/4	8 1/2	7 1/4
	BOTTOM SLAB	T ₂	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4
	SIDEWALLS	T ₃	6 1/2	7 1/2	6 1/2	7 1/2	6 1/2	7 1/2	6 1/2	7 1/2	6 1/2	7 1/2	6 1/2	7 1/2	6 1/2	7 1/2	6 1/2	7 1/2	6 1/2
REINFORCING STEEL	SIZE BAR #	5	5		5	5		5	5		5	5		5	5		5	5	
	SPACING	9	7		9	7		9	7		9	7		9	7		9	7	
	LENGTH	7-7	7-8		7-7	7-8		7-7	7-8		7-7	7-8		7-7	7-8		7-7	7-8	
	SIZE BAR #	5	5		5	5		5	5		5	5		5	5		5	5	
	SPACING	9	7		9	7		9	7		9	7		9	7		9	7	
	DIMENSION "X"	1-6	1-7		1-6	1-7		1-6	1-7		1-6	1-7		1-6	1-7		1-6	1-7	
	LENGTH	3-4	3-5		3-4	3-5		3-4	3-5		3-4	3-5		3-4	3-5		3-4	3-5	
	SIZE BAR #	5	5		5	5		5	5		5	5		5	5		5	5	
	SPACING	9	7		9	7		9	7		9	7		9	7		9	7	
	DIMENSION "Y"	2	2-5		2	2-5		2	2-5		2	2-5		2	2-5		2	2-5	
	LENGTH	5-4	5-10		6-4	6-10		7-4	7-10		8-4	8-10		9-4	9-10		10-4	10-11	
	SIZE BAR #	5	5		5	5		5	5		5	5		5	5		5	5	
	SPACING	9	7		9	7		9	7		9	7		9	7		9	7	
	DIMENSION "Y"	2	2-5		2	2-5		2	2-5		2	2-5		2	2-3		2	2-5	
	LENGTH	3-9	4-5		3-9	4-5		3-9	4-5		3-9	4-5		3-9	4-5		3-9	4-5	
"d" TOP SLAB-NO. OF BARS	7	5		7	5		7	5		7	5		7	5		7	5		
"e" BOTTOM SLAB-NO. OF BARS	5	5		5	5		5	5		5	5		5	5		5	5		
"e" BARS	18	18		18	18		18	18		18	18		18	18		18	18		
SPACING	28			32			32			36			40			40			
SPACERS/ TOTAL NUMBER		28			32			32			36			40			40		
CONCRETE: C.Y. PER LIN. FT.		0.52	0.65		0.56	0.70		0.60	0.74		0.65	0.79		0.69	0.83		0.73	0.88	
REINFORCING LBS. PER LIN. FT.		118	146		125	154		129	139		136	167		143	174		147	179	
QUAN.																			

NOTE
FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE 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.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

SINGLE BOX CULVERT DETAILS No.1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samantha Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-76E**

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

SPAN		10'																						
HEIGHT		4'			5'			6'			7'			8'			9'			10'				
STRENGTH CLASSIFICATION		A	B		A	B		A	B		A	B		A	B		A	B		A	B	C		
MAX FILL OVER TOP		9	18		9	18		9	18		9	18		8	18		8	18		8	18	28		
CONC.	TOP SLAB	T ₁	8	9 1/2	8 1/4	9 3/4	8 1/4	9 3/4	8 1/4	9 3/4	8 1/4	9 3/4	8 1/4	9 3/4	8 1/4	9 3/4	8 1/4	9 3/4	8 1/4	9 3/4	8 1/4	12 1/4		
	Bottom Slab	T ₂	8	3/4	10 1/2	9	10 3/4	9	10 3/4	9	10 3/4	9	10 3/4	9	10 3/4	9	10 3/4	9	10 3/4	9	10 3/4	11		
	Sidewalls	T ₃	7	1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	7 1/4	9 1/2	11 1/2		
REINFORCING STEEL	SIZE BAR #	6	6		6	6		6	6		6	6		6	6		6	6		6	6	7		
	SPACING	11	8		11	8		11	8		11	8		11	8		11	8		11	8	9		
	LENGTH	9-5	9-8		9-5	9-8		9-5	9-8		9-5	9-8		9-5	9-8		9-6	9-8		9-5	9-8	9-9		
	SIZE BAR #	5	6		5	6		5	6		5	6		5	6		5	6		5	6	6		
	SPACING	11	8		11	8		11	8		11	8		11	8		11	8		11	8	9		
	DIMENSION "X"	2	2		2	2		2	2		2	2		2	2		2	2		2	2	2		
	LENGTH	3-10	4-2		3-10	4-2		3-10	4-2		3-10	4-2		3-10	4-2		4-8	3-10		4-8	3-10	4-2		
	SIZE BAR #	5	6		5	6		5	6		5	6		5	6		5	6		5	6	6		
	SPACING	11	8		11	8		11	8		11	8		11	8		11	8		11	8	9		
	DIMENSION "Y"	2-8	3-4		2-8	3-4		2-8	3-4		2-8	3-4		2-8	3-4		2-8	3-4		2-8	3-4	3-6		
	LENGTH	6-11	7-10		8-1	8-10		9-1	9-10		10-1	10-10		11-1	11-10		12-3	12-1		13-3	13-1	13-10		
	"a"	SIZE BAR #	5	6		5	6		5	6		5	6		5	6		5	6		5	6	6	
SPACING		11	8		11	8		11	8		11	8		11	8		11	8		11	8	9		
DIMENSION "Y"		2-8	3-4		2-8	3-4		2-8	3-4		2-8	3-4		2-8	3-4		2-8	3-4		2-8	3-4	3-6		
LENGTH		4-7	5-8		4-7	5-8		4-7	5-8		4-7	5-8		4-7	5-8		6	4-7		5-8	6	6-2		
TOP SLAB-NO. OF BARS		9	5		9	5		9	5		9	5		9	5		5	5		5	5	5		
"b"	BOTTOM SLAB-NO. OF BARS	5	5		5	5		5	5		5	5		5	5		5	5		5	5	5		
	"e" BARS	18	18		18	18		18	18		18	18		18	18		18	18		18	18	18		
SPACERS		32			34			36			40			40			44			48				
TOTAL NUMBER		0.75			0.82			0.86			0.92			0.97			1.06			1.26			1.57	
CONCRETE: C.Y. PER LIN. FT.		143			221			148			228			154			235			160			244	
REINFORCING: IRS. PFR IN. FT.		143			221			148			228			154			235			160			244	

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.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

**SINGLE BOX CULVERT
DETAILS No.1**

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

 03/24/2022

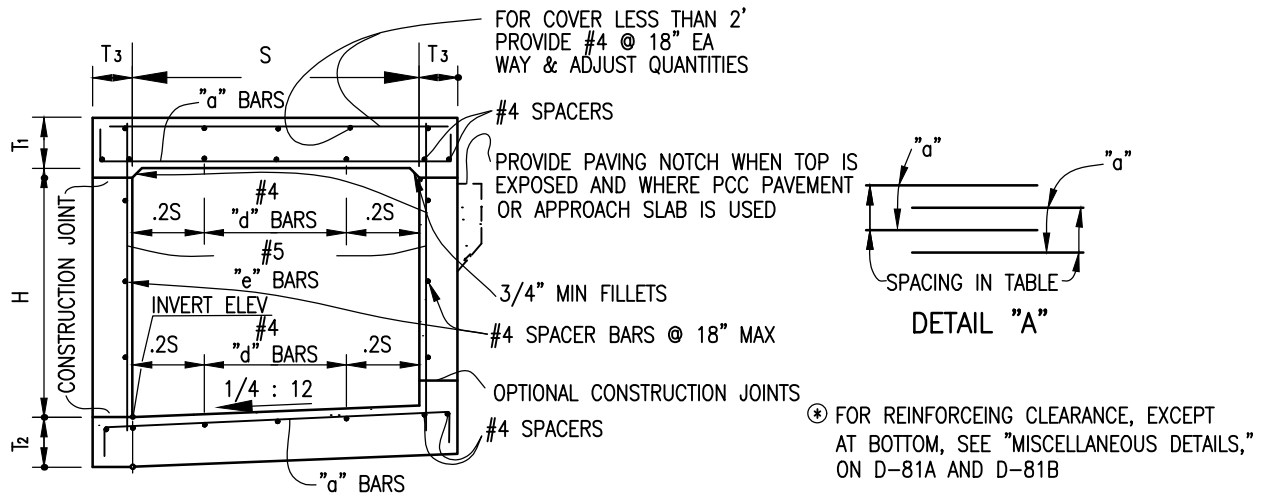
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-76F**

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

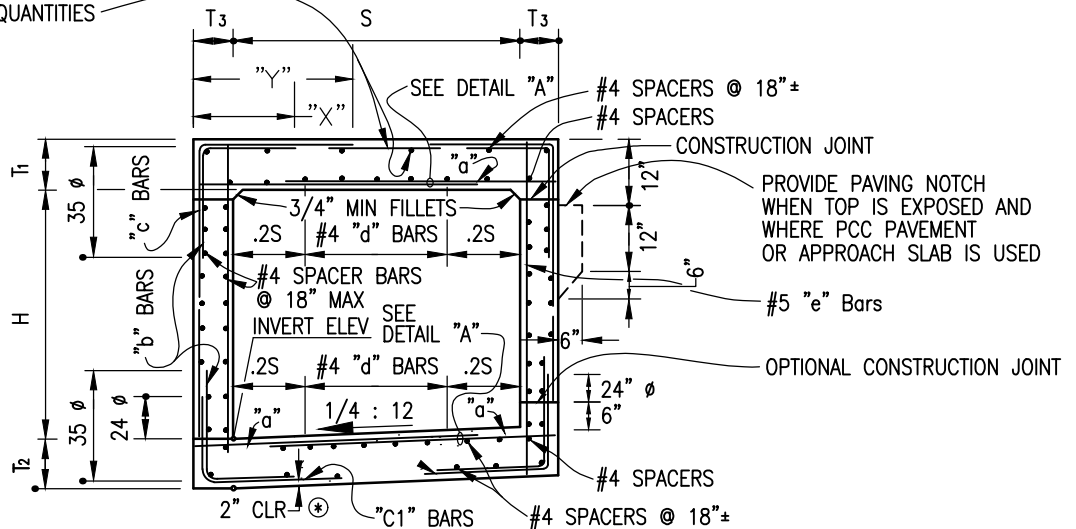
SPAN		12'																		
HEIGHT		6'			7'			8'			9'			10'			12'			
STRENGTH CLASSIFICATION		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	C		
MAX FILL OVER TOP		5	16	5	16	5	16	5	16	5	16	24	5	16	24	5	16	24		
CONC.	TOP SLAB	T ₁	8	3/4	11	1/4	8	3/4	11	1/4	8	3/4	11	1/4	9	11	1/4	13	1/4	
	BOTTOM SLAB	T ₂	8	3/4	12	1/4	8	3/4	12	1/4	8	3/4	12	1/4	9	12	1/4	14	3/4	
	SIDEWALKS	T ₃	7	1/2	10	1/2	7	1/2	10	1/2	7	1/2	10	1/2	8	10	1/2	12	1/2	
REINFORCING STEEL	SIZE BAR #		6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	
	SPACING		11	10	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8	
	LENGTH		11	3	11	6	11	3	11	6	11	3	11	6	11	3	11	6	11	
	SIZE BAR #	"b"	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	
	SPACING		11	10	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8	
	DIMENSION "X"		2	8	3	2	8	3	2	8	3	2	8	3	2	8	3	2	8	3
	LENGTH		4	10	5	7	4	10	5	7	4	10	5	7	4	10	5	7	4	10
	SIZE BAR #	"c"	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	7
	SPACING		11	10	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8	
	DIMENSION "Y"		3	9	3	9	3	9	3	9	3	9	3	9	3	9	3	9	3	9
REINFORCING STEEL	LENGTH		10	2	10	4	11	2	11	4	12	2	12	4	13	2	13	4	14	2
	SIZE BAR #	"c ₁ "	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7
	SPACING		11	10	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8	
	DIMENSION "Y"		3	9	3	9	3	9	3	9	3	9	3	9	3	9	3	9	3	9
	LENGTH		5	11	6	5	11	6	5	11	6	6	8	5	11	6	6	8	5	11
	TOP SLAB-NO. OF BARS	"d"	10	6	10	6	10	6	10	6	10	6	10	6	10	6	10	6	10	6
	BOTTOM SLAB-NO. OF BARS		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	SPACING	"e"	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	SPACERS		36		44		44		44		44		44		48		52		52	
	TOTAL NUMBER		0.99	1.38	1.03	1.44	1.08	1.52	1.18	1.58	1.90	1.30	1.65	1.98	1.41	1.78	2.13	1.41	1.78	2.13
CONCRETE: C.Y. PER LIN. FT.		203	293	213	304	218	311	223	317	387	231	326	397	243	341	415	243	341	415	
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.

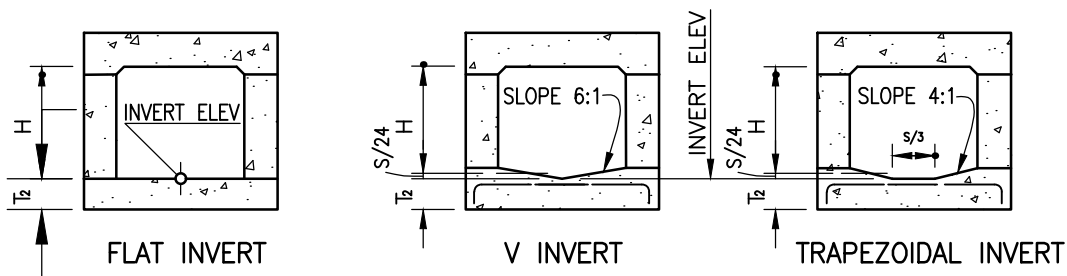


TYPICAL SECTIONS 2' THRU 6' SPANS

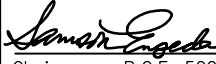
FOR COVER LESS THAN 2' PROVIDE
#4 @ 18" EA WAY & ADJUST QUANTITIES



TYPICAL SECTIONS 7' THRU 12' SPANS



ALTERNATIVE INVERTS (WHEN SPECIFIED ON PLANS)

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	SINGLE BOX CULVERT DETAILS NO.2		 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
Reviewed	RP	S. Engeda	03/22			
						DRAWING NUMBER D-76G

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Wideliski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT

DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Saman Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

**DRAWING
NUMBER D-77A**

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

SPAN		4'									
HEIGHT		2'					3'				
STRENGTH CLASSIFICATION		A	B	C			A	B	C	D	
MAX FILL OVER TOP		11	21	32			11	23	34	46	
TOP SLAB	T1	6 1/2	6 1/2	7 1/4	6 1/2	6 1/2	6 1/2	6 1/2	7 1/2	8 1/2	8 1/2
BOTTOM SLAB	T2	6	7 1/4	8 1/2	6	7 1/2	6	7 1/2	8 1/2	9 1/2	9 1/2
SIDEWALLS	T3	6	6	6	6	6	6	6	6	6	6
"a"	SIZE BAR #	5	4	4	5	4	5	4	4	4	4
"a"	SPACING	11	11	9	11	10 1/2	11	10 1/2	8 1/2	7 1/2	7 1/2
"b"	LENGTH	10-3	10-2	10-2	10-3	10-2	10-3	10-2	10-2	10-2	10-2
"b"	SIZE BAR #	5	5	5	5	5	5	5	5	5	5
"b"	SPACING	11	11	9	11	10 1/2	11	10 1/2	8 1/2	7 1/2	7 1/2
"b"	LENGTH	9-4	9-4	9-6	9-4	9-4	9-4	9-4	9-6	9-7	9-7
"b"	LENGTH	9-4	9-5	9-6	9-4	9-4	9-4	9-4	9-6	9-7	9-7
"c"	SIZE BAR #	4	5	5	4	5	4	5	5	5	5
"c"	SPACING	11	11	9	11	10 1/2	11	10 1/2	8 1/2	7 1/2	7 1/2
"c"	LENGTH	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6
"d" DIST	TOP SLAB-TOT. NO.	10	6	6	10	6	10	6	6	6	6
"d" BARS	BOTTOM SLAB-TOT. NO.	6	6	6	6	6	6	6	6	6	6
"e" BARS	SIZE BAR #	4	4	4	4	4	4	4	4	4	4
"e" BARS	SPACING	18	18	18	18	18	18	18	16	12	10
SPACERS	NUMBER	23					26				
CONCRETE: C.Y. PER LIN. FT.		0.47	0.51	0.57	0.53	0.57	0.53	0.57	0.63	0.69	0.75
REINFORCING LBS. PER LIN. FT.		81	74	84	84	79	84	79	91	101	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.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Saman Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-77B**

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

SPAN		5'											
HEIGHT		2'				3'				4'			
STRENGTH CLASSIFICATION		A	B	C		A	B	C	D	A	B	C	D
MAX FILL OVER TOP		6	36	36		6	24	36	46	6	23	34	46
TOP SDAB	T ₁	6 3/4	7 3/4	9 1/4	6 3/4	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	T ₂	6 1/2	8 3/4	10 1/4	6 1/2	6 1/2	8 3/4	10 1/4	11 1/4	6 1/2	8 3/4	10 1/4	11 1/4
SIDEWALLS	T ₃	6	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	"a"	5	4	4	5	5	4	4	4	5	4	4	4
SPACING		10	8 1/2	10	10	10	8 1/2	10	9	10	8 1/2	10 1/2	9
LENGTH		12-3	12-2	12-2	12-3	12-2	12-2	12-2	12-2	12-3	12-2	12-2	12-2
SIZE BAR #	"b"	5	5	6	5	5	5	6	6	5	5	6	6
SPACING		10	8 1/2	10	10	10	8 1/2	10	9	10	8 1/2	10 1/2	9
LENGTH "b"		11-5	11-6	11-7	11-5	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	11-4	11-6	11-7	11-8	11-4	11-6	11-7	11-8
SIZE BAR #	"c"	4	5	6	4	4	5	6	6	4	5	6	6
SPACING		10	8 1/2	10	10	10	8 1/2	10	9	10	8 1/2	10 1/2	9
LENGTH		5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6
"d" DIST TOP SLAB-TOT. NO.		12	6	6	12	12	6	6	6	12	6	6	6
BARS BOTTOM SLAB-TOT. NO.		6	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #	"e"	4	4	4	4	4	4	4	5	4	4	5	6
BARS		18	18	18	18	18	18	16	10 1/2	18	8 1/2	9	9
SPACING		23	23	23	23	26	26	26	29	26	26	32	32
SPACERS NUMBER													
CONCRETE: C.Y. PER LIN. FT.		0.58	0.69	0.80	0.63	0.63	0.75	0.86	0.98	0.69	0.80	0.89	0.97
REINFORCING LBS. PER LIN. FT.		99	100	109	103	103	104	112	133	106	109	119	126
QUAN.													148

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.R.	M. Regello	10/15
Edited	M.W.	M. Widelksi	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT

DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE


03/24/2022

Chairperson R.C.E. 52241
Date

DRAWING
NUMBER

D-77C

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

6'														
SPAN			3'			4'			5'			6'		
HEIGHT														
STRENGTH CLASSIFICATION														
MAX FILL OVER TOP														
T1														
T2														
T3														
SIZE BAR #														
SPACING														
LENGTH														
SIZE BAR #														
SPACING														
LENGTH "b"														
LENGTH "b1"														
SIZE BAR #														
SPACING														
LENGTH														
TOP SLAB-TOT. NO.														
BOTTOM SLAB-TOT. NO.														
SIZE BAR #														
SPACING														
SPACERS 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. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR BOTH CELLS.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W	M. Widelksi	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT

DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER

D-77D

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

SPAN		8'											
HEIGHT		4'				5'				6'			
		A	B	C		A	B	C		A	B	C	D
STRENGTH CLASSIFICATION		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 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 3/4	13	15
SIDEWALLS		6	6	6		6	6	6		7	7	7	8 1/2
SIZE BAR #		6	4	4		6	4	4		6	4	4	4
SPACING		12	9 1/2	10 1/2		12	9 1/2	10		11 1/2	9 1/2	10 1/2	8 1/2
LENGTH		18-4	18-2	18-2		18-4	18-2	18-2		18-7	18-5	18-8	18-10
SIZE BAR #		6	6	7		6	6	7		6	6	7	7
SPACING		12	9 1/2	10 1/2		12	9 1/2	10		11 1/2	9 1/2	10 1/2	8 1/2
LENGTH "b" or "b1"		17-7	17-8	17-9		17-7	17-8	17-9		17-10	17-10	17-10	18-3
LENGTH "b1"		17-5	17-8	17-9		17-5	17-8	17-9		17-10	17-10	18	18-7
SIZE BAR #		4	6	7		4	6	7		4	6	7	7
SPACING		12	9 1/2	10 1/2		12	9 1/2	10		11 1/2	9 1/2	10 1/2	8 1/2
LENGTH		8-6	8-6	8-6		8-6	8-6	8-6		8-7	8-7	8-8	8-9
TOP SLAB-TOT. NO. BARS		16	8	8		16	8	8		16	8	8	8
BOTTOM SLAB-TOT. NO. BARS		8	8	8		8	8	8		8	8	8	8
SIZE BAR #		4	4	5		4	4	5		4	4	5	7
SPACING		18	18	10 1/2		18	12	10		14	9 1/2	7 1/2	7 1/2
SPACERS NUMBER		41				44							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	2.14
REINFORCING LBS. PER LIN. FT.		169	175	200		172	181	218		185	199	248	299
QUAN.													

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.R.	T. Regello	10/15
Edited	M.W.	M. Wideliski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT
DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
<i>Saman Engeda</i>	03/24/2022
Chairperson R.C.E. 52241 Date	
DRAWING NUMBER	D-77E

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

SPAN		10'																				
HEIGHT		5'				6'				7'				8'				10'				
STRENGTH CLASSIFICATION		A	B	C		A	B	C		A	B	C		A	B	C		A	B	C		
MAX FILL OVER TOP		2	17	30		2	17	30		2	17	30		2	16	29	36		2	16	29	36
CONC.	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		
	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 3/4	13 1/2	16 1/2		8 3/4	13 1/2	16 1/2		
	SIDEWALLS	6	6	6		6	6	6		6	6 1/2	7		7	7	7 1/2		8	8	9		
REINFORCING STEEL	"a" 	6	4	4		6	4	4		6	4	4		6	4	4		6	4	4		
	SPACING	11	10	10		11	9 1/2	10		11	9 1/2	10		11	10	10		11	10	10		
	LENGTH	22-4	22-2	22-2		22-4	22-2	22-2		22-4	22-4	22-5		22-7	22-5	22-7		22-10	22-8	22-11		
	SIZE BAR #	6	7	8		6	7	8		6	7	8		6	7	8		6	7	8		
	SPACING	11	10	10		11	9 1/2	10		11	9 1/2	10		11	10	10		11	10	10		
	LENGTH "b" or "b ₁ " 	21-7	21-10	22		21-7	21-10	22		21-7	21-11	22-3		21-10	22-1	22-4		22-9	22-4	22-9		
	LENGTH "b ₁ "	21-5	21-10	22		21-5	21-10	22		21-5	21-11	22-3		21-9	22	22-4		22	22-3	22-8		
	SIZE BAR #	6	7	8		6	7	8		6	7	8		6	7	8		6	7	8		
	SPACING	11	10	10		11	9 1/2	10		11	9 1/2	10		11	10	10		11	10	10		
	LENGTH	10-6	10-6	10-6		10-6	10-6	10-6		10-6	10-7	10-7		10-7	10-7	10-8		10-8	10-8	10-9		
SPACERS	"d" DIST	18	10	10		18	10	10		18	10	10		18	10	10		18	10	10		
	TOP SLAB-TOT. NO.																					
	BARS	10	10	10		10	10	10		10	10	10		10	10	10		10	10	10		
	BOTTOM SLAB-TOT. NO.																					
	BARS	4	4	5		4	4	5		4	4	6		4	5	6		4	6	7		
QUAN.	SIZE BAR #																					
	SPACING	18	10	10		18	6	6 1/2		14	6	8		11	8 1/2	6		7 1/2	7	5 1/2		
NUMBER		48				48				51				54				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		1.92	2.51	3.05		
REINFORCING LBS. PER LIN. FT.		236	254	310		238	274	324		243	280	339		252	278	355		279	327	400		
476																						

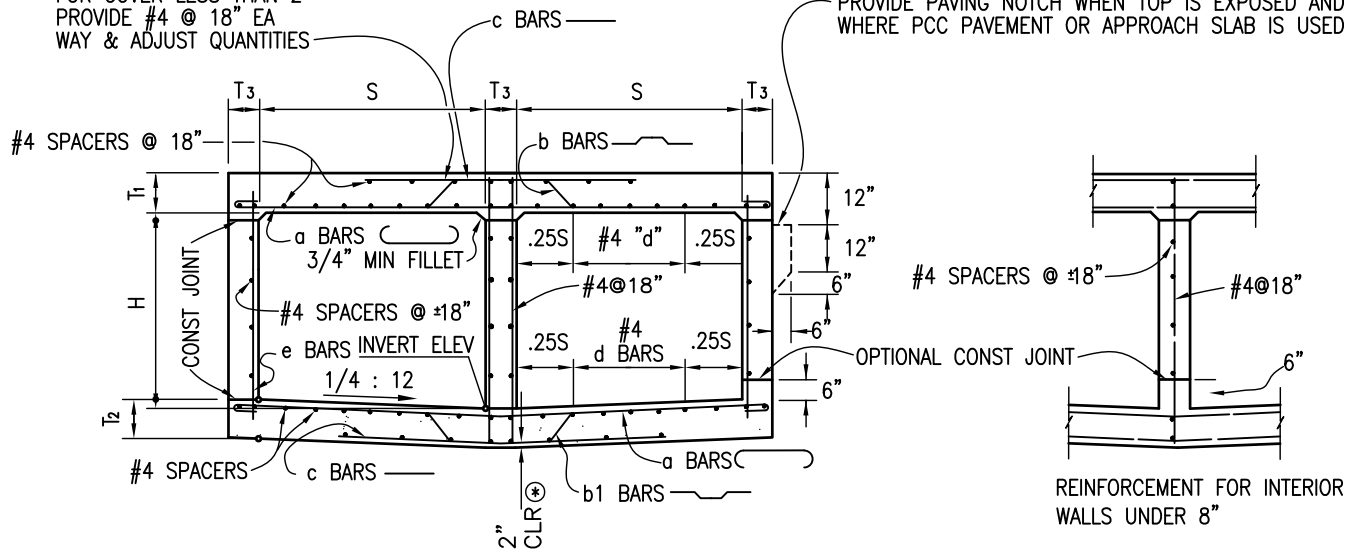
SAN DIEGO REGIONAL STANDARD DRAWING
DOUBLE BOX CULVERT DETAILS No. 1

SPAN		12'																							
HEIGHT		6'				7'				8'				9'				10'				12'			
STRENGTH CLASSIFICATION		A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	D			
MAX FILL OVER TOP		2	14	26	2	14	26	2	14	26	2	14	26	36	2	14	26	36	2	14	26	36			
CONC.	T1	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 1/4	17 3/4	20 3/4	10 1/4	14 1/4	17 3/4	20 3/4	10 1/4	14 1/2	18 1/4	21 1/4			
	T2	9 1/4	14 3/4	18	9 1/4	15	18 1/4	9 3/4	15	18 1/2	10	15 1/4	18 3/4	21 1/4	10 1/4	15 1/4	18 3/4	21 1/2	10 1/2	15 1/4	19 1/4	22			
	T3	6	6	6 1/2	7	7	7	8	8	8 1/2	9	9	9	10	9	9	9 1/2	11	9	10	11	12			
REINFORCING STEEL	SIZE BAR #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	6	4	4	4			
	"a" 	9	11 1/2	9	9	11 1/2	9	9	11	8 1/2	9	11	8 1/2	9	9	11	8 1/2	9	9	11	8 1/2	9			
	SPACING	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	27-1	26-11	27-3	27-5	27-1	27-2	27-5	27-8			
	LENGTH	6	8	8	6	8	8	6	8	8	8	6	8	8	9	6	8	8	9	6	8	9			
	"b" 	9	11 1/2	9	9	11 1/2	9	9	11	8 1/2	9	11	8 1/2	9	9	11	8 1/2	9	9	11	8 1/2	9			
	SPACING	25-8	25-10	26-3	25-11	26-1	26-4	26-2	26-4	26-9	26-5	26-5	26-8	26-10	27-4	26-5	26-8	27-2	27-6	26-5	26-11	27-5			
REINFORCING STEEL	"b" 	25-6	25-10	26-3	25-9	26-2	26-4	26-1	26-5	26-9	26-4	26-8	26-11	27-4	26-4	26-8	27-2	27-7	26-4	26-11	27-5	27-10			
	LENGTH "b1"	5	8	8	5	8	8	5	8	8	5	8	8	9	5	8	8	9	5	8	8	9			
	SIZE BAR #	9	11 1/2	9	9	11 1/2	9	9	11	8 1/2	9	11	8 1/2	9	9	11	8 1/2	9	9	11	8 1/2	9			
	SPACING	12-6	12-6	12-7	12-7	12-7	12-7	12-8	12-8	12-9	12-9	12-9	12-9	12-10	12-9	12-9	12-10	12-11	12-9	12-10	12-11	13			
	LENGTH	24	10	10	24	10	10	24	10	10	24	10	10	10	24	10	10	10	24	10	10	10			
	"b" DIST BARS	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10			
REINFORCING STEEL	"e" 	4	4	5	4	4	5	4	4	5	4	4	5	7	8	4	7	8	6	7	8	9			
	SIZE BAR #	18	8	8	15	6	6 1/2	12	5 1/2	6	9	7 1/2	8 1/2	8	8 1/2	11	8 1/2	9	12	8	7	7			
	SPACING	52																							
SPACERS	NUMBER	52				55				68				68				72				76			
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	2.67	3.53	4.30	4.92			
	REINFORCING LBS. PER LIN. FT.	309	317	401	316	330	415	336	363	460	345	374	485	578	351	394	519	582	371	427	567	673			

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

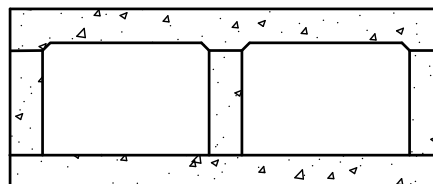
PROVIDE PAVING NOTCH WHEN TOP IS EXPOSED AND
WHERE PCC PAVEMENT OR APPROACH SLAB IS USED



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	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75				
Edited	T.R.	T. Regello	10/15	DOUBLE BOX CULVERT DETAILS NO. 2		Samsin Engeda 03/24/2022	
Edited	M.W	T. Regello	10/18			Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22			DRAWING NUMBER	
						D-77G	

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

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

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	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75	TRIPLE BOX CULVERT DETAILS No. 1		 03/24/2022 Chairperson R.C.E. 52241 Date	D-78A
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER	

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelksi	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samantha Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER

D-78B

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

SPAN		5'																
HEIGHT		2'				3'				4'				5'				
STRENGTH CLASSIFICATION		A	B	C		A	B	C		A	B	C	D		A	B	C	D
MAX FILL OVER TOP		8	17	26		8	17	26		8	17	26	35		8	17	26	35
CONC	TOP SLAB	T1	6 3/4	6 3/4	7 1/2	6 3/4	6 3/4	7 1/2	6 3/4	6 3/4	6 3/4	7 1/2	8 1/2	6 3/4	6 3/4	6 3/4	7 1/2	8 1/2
	BOTTOM SLAB	T2	6 1/4	7 1/4	8 1/2	6 1/4	7 1/4	8 1/2	6 1/4	7 1/4	7 1/4	8 1/2	9 1/2	6 1/4	7 1/4	7 1/2	8 1/2	9 1/2
	SIDEWALLS	T3	6	6	6	6	6	6	6 1/2	6 1/4	6	6	6	6	6	6	6	6
REINFORCING STEEL	SIZE BAR #		5	4	5	5	4	5	5	5	4	5	5	5	5	4	5	5
	SPACING		10	11 1/2	13	10	11 1/2	13	10	11	11	13	11 1/2	10	11	13	11 1/2	11 1/2
	LENGTH		17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-8	17-8	17-9	17-9	17-9	17-9	17-8	17-9	17-9
	SIZE BAR #		5	5	6	5	5	6	5	5	5	6	6	5	5	5	6	6
	SPACING		10	11 1/2	13	10	11 1/2	13	10	11	11	13	11 1/2	10	11	13	11 1/2	11 1/2
	LENGTH "b"		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	17-5
	LENGTH "b1"		17	17-2	17-4	17	17-2	17-4	17	17-2	17-2	17-4	17-5	17	17-2	17-2	17-4	17-5
	SIZE BAR #		4	5	6	4	5	6	4	5	4	5	6	6	4	5	6	6
	SPACING		10	11 1/2	13	10	11 1/2	13	10	11	11	13	11 1/2	10	11	13	11 1/2	11 1/2
	LENGTH		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
BARS	"d" DIST		18	9	9	18	9	9	18	9	9	9	9	18	9	9	9	9
	TOP SLAB-TOT. #		9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
BARS	BOTTOM SLAB-TOT. #		4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	6
	SIZE BAR #		18	18	18	18	18	18	18	18	17	11 1/2	11 1/2	18	11	4	4	11 1/2
SPACING			34			38			38				38					42
SPACERS NUMBER																		
CONCRETE: C.Y. PER LIN. FT.			0.82	0.87	0.98	0.90	0.95	1.05	0.97	1.02	1.02	1.13	1.23	1.04	1.11	1.20	1.31	
REINFORCING LBS. PER LIN. FT.			150	126	153	155	130	157	157	136	161	161	181	161	143	171	192	

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.R.	T. Regello	10/15
Edited	M.W.	M. Widelksi	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samantha Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-78C**

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

SPAN		6'											
HEIGHT		3'				4'				5'			
STRENGTH CLASSIFICATION		A	B	C		A	B	C		A	B	C	D
MAX FILL OVER TOP		3	13	23		3	13	23		3	13	23	30
TOP SLAB		T1	7 1/2	7 1/2	8 1/4	7 1/2	7 1/2	8 1/4	9 1/4	7 1/2	7 1/2	8 1/4	9 1/4
BOTTOM SLAB		T2	6	7 3/4	9 1/4	6	7 3/4	9 1/4	6	8	9 1/4	10	10 1/4
SIDEWALLS		T3	6	6	6	6	6	6	6	6	6	6	6
SIZE BAR #		6	5	5	5	6	5	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
LENGTH		20-10	20-9	20-9	20-10	20-9	20-9	20-9	20-10	20-9	20-9	20-10	20-9
SIZE BAR #		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
LENGTH "b" or "b1"		20-3	20-3	20-5	20-3	20-3	20-3	20-5	20-3	20-3	20-3	20-3	20-6
LENGTH "b1"		20	20-2	20-5	20	20-2	20-2	20-5	20	20-2	20-2	20	20-7
SIZE BAR #		4	6	6	4	4	6	6	4	6	6	4	6
SPACING		13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2
LENGTH		13	13	13	13	13	13	13	13	13	13	13	13
TOP SLAB-TOT. #		18	9	9	9	18	9	9	18	9	9	18	9
BOTTOM SLAB-TOT. #		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
SPACING		18	18	18	18	18	18	11 1/2	18	11 1/2	12	10	10
SPACERS NUMBER		40				40				52			
CONCRETE: C.Y. PER LIN. FT.		1.05	1.15	1.29	1.12	1.23	1.37	1.37	1.19	1.32	1.44	1.55	1.64
REINFORCING LBS. PER LIN. FT.		181	168	196	183	170	200	200	187	177	209	235	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.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

**TRIPLE BOX CULVERT
DETAILS No. 1**

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-78D**

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

SPAN		8'											
HEIGHT		4'				5'				6'			
STRENGTH CLASSIFICATION	MAX FILL OVER TOP	A	B	C		A	B	C		A	B	C	D
		2	11	20		2	11	20		2	11	20	28
CONC.	TOP SLAB	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	8 1/4	10 1/4	11 1/2
	BOTTOM SLAB	6 1/2	9	11	6 1/2	9 1/4	11	6 1/2	9 1/4	6 3/4	9 1/4	11	12 1/4
	SIDEWALLS	6	6	6	6	6	6	6	6	6	6	6 1/2	7
REINFORCING STEEL	SIZE BAR #	6	5	5	6	5	5	5	6	5	5	5	6
	SPACING	11 1/2	12	12	11 1/2	12	12	12	11 1/2	12	12	10 1/2	11 1/2
QUAN.	LENGTH	26-10	26-9	26-9	26-10	26-9	26-9	26-9	26-10	26-9	26-10	27-4	27-8
	SIZE BAR #	6	6	7	6	6	6	7	6	6	6	7	7
REINFORCING STEEL	SPACING	11 1/2	12	12	11 1/2	12	12	12	11 1/2	12	12	10 1/2	11 1/2
	LENGTH "b"	26-5	26-5	26-7	26-5	26-5	26-5	26-7	26-5	26-5	26-5	27-3	27-7
REINFORCING STEEL	LENGTH "b ₁ "	26	26-4	26-7	26	26-5	26-7	26-7	26	26-5	26-1	26-9	27-1
	LENGTH "b ₁ "	4	6	7	4	6	7	7	4	6	6	7	7
REINFORCING STEEL	SIZE BAR #	11 1/2	12	12	11 1/2	12	12	12	11 1/2	12	12	10 1/2	11 1/2
	SPACING	17	17	17	17	17	17	17	17	17	17	17-1	17-3
REINFORCING STEEL	LENGTH	24	12	12	24	12	12	12	24	12	12	12	12
	TOP SLAB-TOT. #	12	12	12	12	12	12	12	12	12	12	12	12
REINFORCING STEEL	BOTTOM SLAB-TOT. #	4	4	4	4	4	4	4	4	4	4	4	4
	SIZE BAR #	18	18	12	18	12	12	12	18	12	12	10 1/2	11 1/2
REINFORCING STEEL	BARS	58	58	58	58	62	62	62	58	62	62	66	70
	SPACERS	1.47	1.67	1.99	1.54	1.76	2.06	1.62	1.71	1.91	1.90	2.10	2.46
REINFORCING STEEL	CONCRETE: C.Y. PER LIN. FT.	261	250	301	266	257	310	267	276	277	283	295	347
	REINFORCING LBS. PER LIN. FT.	261	250	301	266	257	310	267	276	277	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.R.	T. Regello	10/15
Edited	M.W.	M. Widelksi	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

**TRIPLE BOX CULVERT
DETAILS No. 1**

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-78E**

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

SPAN	HEIGHT	10'											
		5'			6'			7'			8'		
STRENGTH CLASSIFICATION		A	B	C	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP		2	11	20	2	11	20	2	11	20	2	11	20
TOP SLAB	T1	9	10	12	9	10	12	9	10	12	9	10	12
BOTTOM SLAB	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 1/2
SIDEWALLS	T3	6	6	6	6	6	6	6	6	6 1/2	7	7 1/2	8 1/2
SIZE BAR #		6	6	6	6	6	6	6	6	6	6	6	6
SPACING		10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10
LENGTH		32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	33-2	33-6	33-10
SIZE BAR #		6	7	7	6	7	7	6	7	7	6	7	7
SPACING		10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10
LENGTH "b"		32-6	32-7	32-10	32-6	32-7	32-10	32-6	32-7	33	32-10	32-11	32-5
LENGTH "b1"		32-2	32-7	32-11	32-2	32-7	32-11	32-2	32-7	33-1	32-6	32-11	32-5
SIZE BAR #		5	7	7	5	7	7	5	7	7	5	7	7
SPACING		10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10
LENGTH		21	21	21	21	21	21	21	21	21-1	21-2	21-5	21-6
"d" DIST TOP SLAB-TOT. #		27	15	15	27	15	15	27	15	15	27	15	15
BARS BOTTOM SLAB-TOT. #		15	15	15	15	15	15	15	15	15	15	15	15
SIZE BAR #		4	4	5	4	4	5	4	4	6	4	5	6
SPACING		18	13	10	18	13	10	13	13	10	10 1/2	10 1/2	9
SPACERS NUMBER		68	68	68	68	68	68	72	72	72	76	94	102
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	3.18
REINFORCING LBS. PER LIN. FT.		358	372	470	359	379	482	367	391	502	377	402	453
QUAN.													

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.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samantha Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-78F**

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

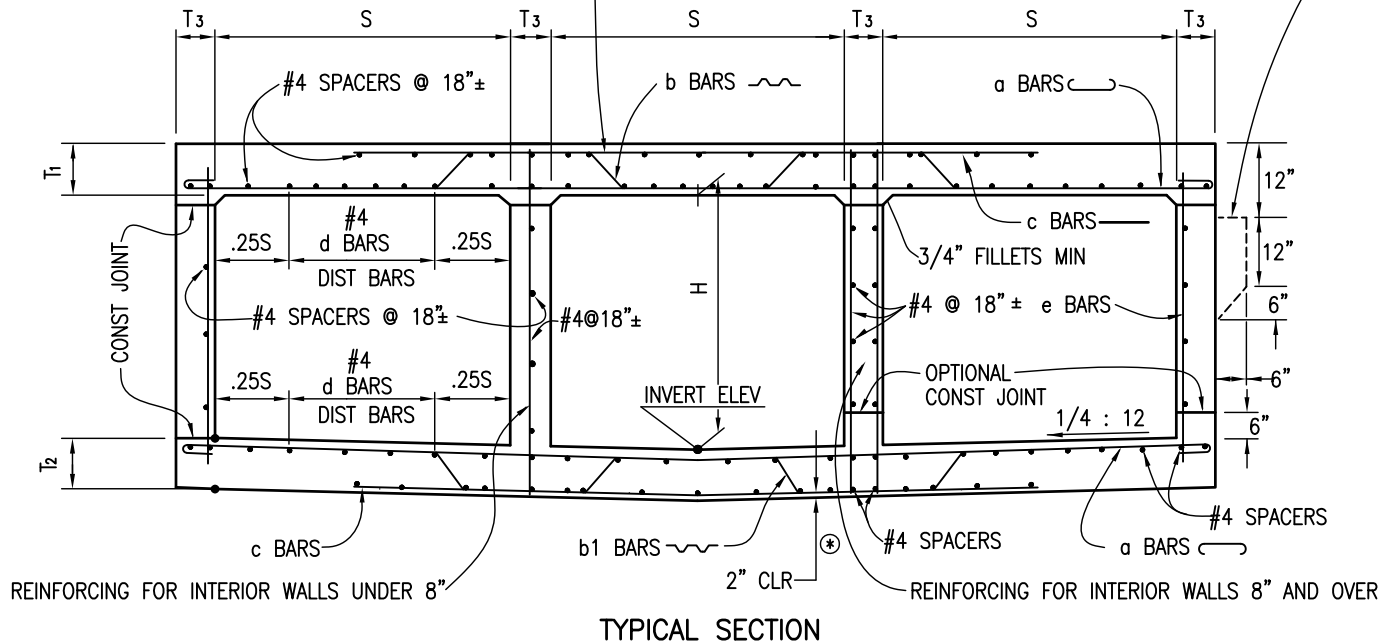
SPAN		12'																		
HEIGHT		6'			7'			8'			9'			10'			12'			
STRENGTH CLASSIFICATION		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	D
MAX FILL OVER TOP		2	10	18	2	10	18	2	10	18	2	11	20	30	2	11	20	30	2	11
CONC.	TOP SLAB	T1	10 1/4	11 1/2	14	10 1/4	11 1/2	14	10 1/4	11 1/2	14	10 1/4	12	14 3/4	17 3/4	10 1/4	12	14 3/4	17 3/4	10 1/4
	BOTTOM SLAB	T2	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	9
	SIDEWALLS	T3	6	6	6 1/2	6	6	6 1/2	7	7	7 1/2	8	8	9	10	8	8	9	10 1/2	9
REINFORCING STEEL	SIZE BAR #		7	6	7	7	6	7	7	6	7	7	6	7	8	7	6	7	8	7
	SPACING		12	11	11 1/2	12	11	11 1/2	12	11	11 1/2	12	10 1/2	11	11 1/2	12	10 1/2	11	11 1/2	12
	LENGTH		39-1	38-10	39-3	39-1	38-10	39-5	39-2	39-7	39-9	39-6	40-1	40-10	39-9	39-6	40-1	41	40-1	39-10
REINFORCING STEEL	SIZE BAR #		7	7	8	7	7	8	7	7	8	7	8	9	7	7	8	9	7	8
	SPACING		12	11	11 1/2	12	11	11 1/2	12	11	11 1/2	12	10 1/2	11	11 1/2	12	10 1/2	11	11 1/2	12
	LENGTH "b" or "b1"		38-7	38-9	39-3	38-7	38-9	39-5	38-11	39-1	39-7	39-3	39-6	40-2	40-10	39-3	39-6	40-2	41	39-7
REINFORCING STEEL	LENGTH "b1"		38-3	38-7	39-2	38-3	38-9	39-5	38-7	39-1	39-7	39	39-6	40-2	40-10	39	39-6	40-2	41	39-4
	SIZE BAR #		6	7	8	6	7	8	6	7	8	6	7	8	9	6	7	8	9	6
	SPACING		12	11	11 1/2	12	11	11 1/2	12	11	11 1/2	12	10 1/2	11	11 1/2	12	10 1/2	11	11 1/2	12
REINFORCING STEEL	LENGTH		25	25	25-1	25	25	25-2	25-2	25-3	25-4	25-4	25-4	25-6	25-8	25-4	25-4	25-6	25-9	26
	TOP SLAB-TOT. #		36	15	15	36	15	15	36	15	15	36	15	15	15	36	15	15	36	15
	BOTTOM SLAB-TOT. #		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
REINFORCING STEEL	SIZE BAR #		4	4	6	4	4	6	4	4	6	4	6	7	8	5	7	8	8	6
	SPACING		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
	SPACERS NUMBER		76	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
REINFORCING STEEL	CONCRETE: C.Y. PER LIN. FT.		2.60																	
	REINFORCING LBS. PER LIN. FT.		489	505	628	497	516	637	505	527	654	536	582	719	872	548	606	745	939	575

NOTE

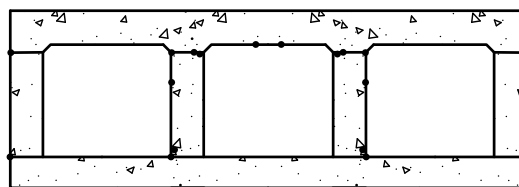
FOR BOXES OF HEIGHT LESS THAN THAT SHOWN IN TABLE, USE NEXT GREATER TABLE HEIGHT SLABS, WALL DIMENSIONS AND REINFORCING STEEL. MAKE CHANGES TO BAR LENGTHS AND NUMBER OF SPACERS AND QUANTITIES AS NECESSARY. NUMBER OF "d" BARS IN TABLE IS SLAB TOTAL FOR ALL CELLS.

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



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

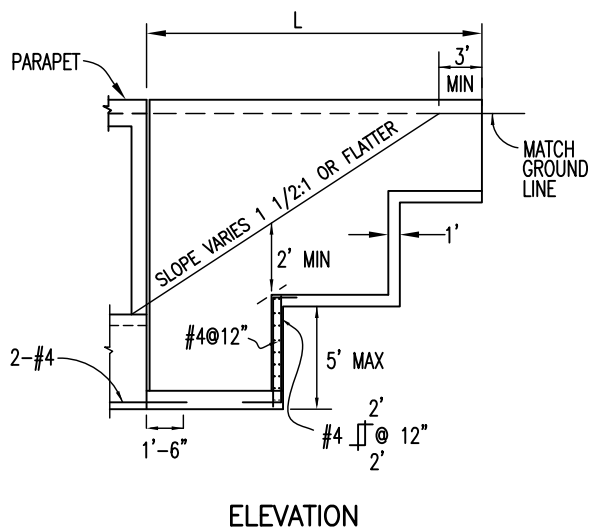
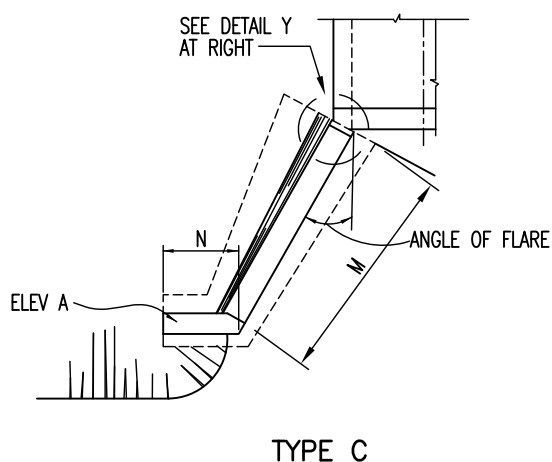
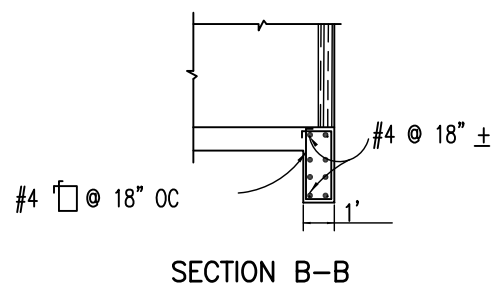
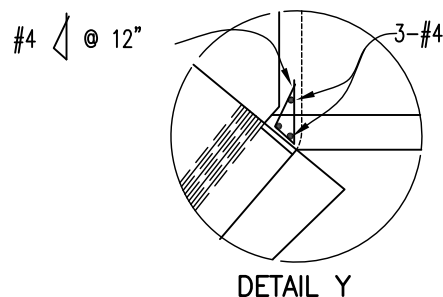
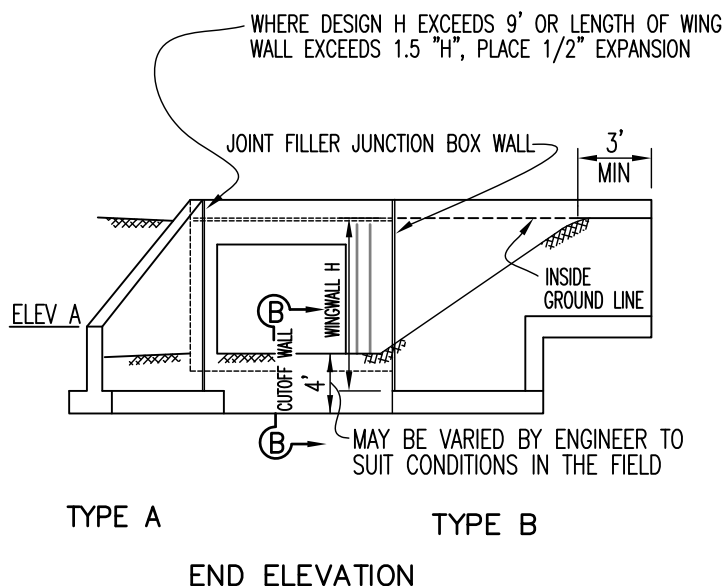
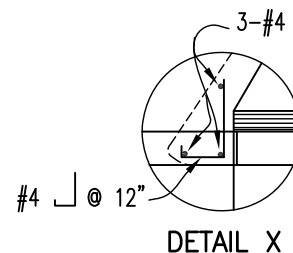
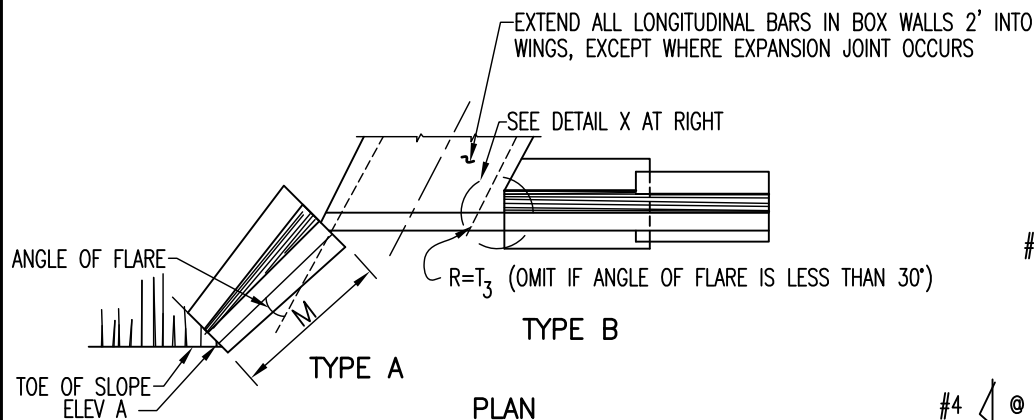


FLAT INVERT ALTERNATIVE
(WHEN SPECIFIED)

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		<i>Samsin Engeda</i> 03/24/2022 Chairperson R.C.E. 52241 Date	D-78G
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER	



NOTE

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WINGWALL TYPES A, B & C DETAILS NO. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

Samantha Engeda 03/24/2022

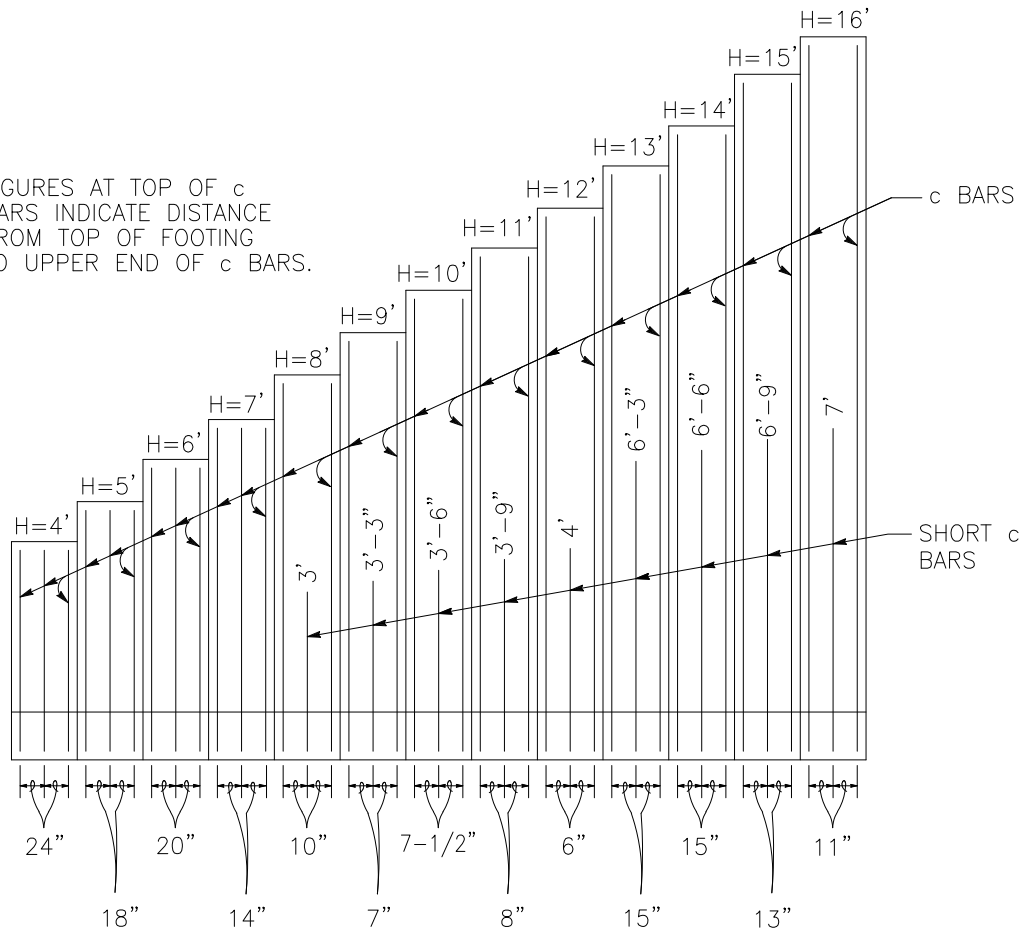
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-79A**

DRAWING NUMBER **D-79B**

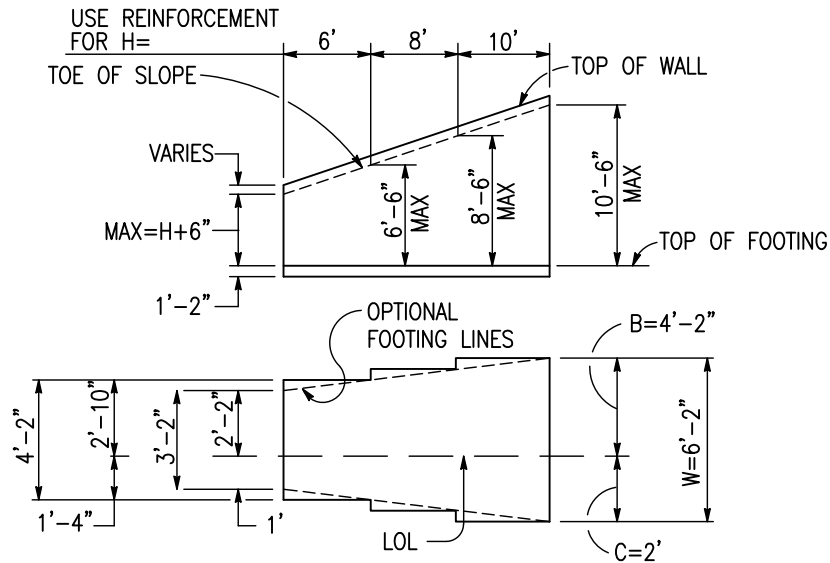
Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

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		 03/24/2022 Chairperson R.C.E. 52241 Date	DRAWING NUMBER D-79D
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				



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.

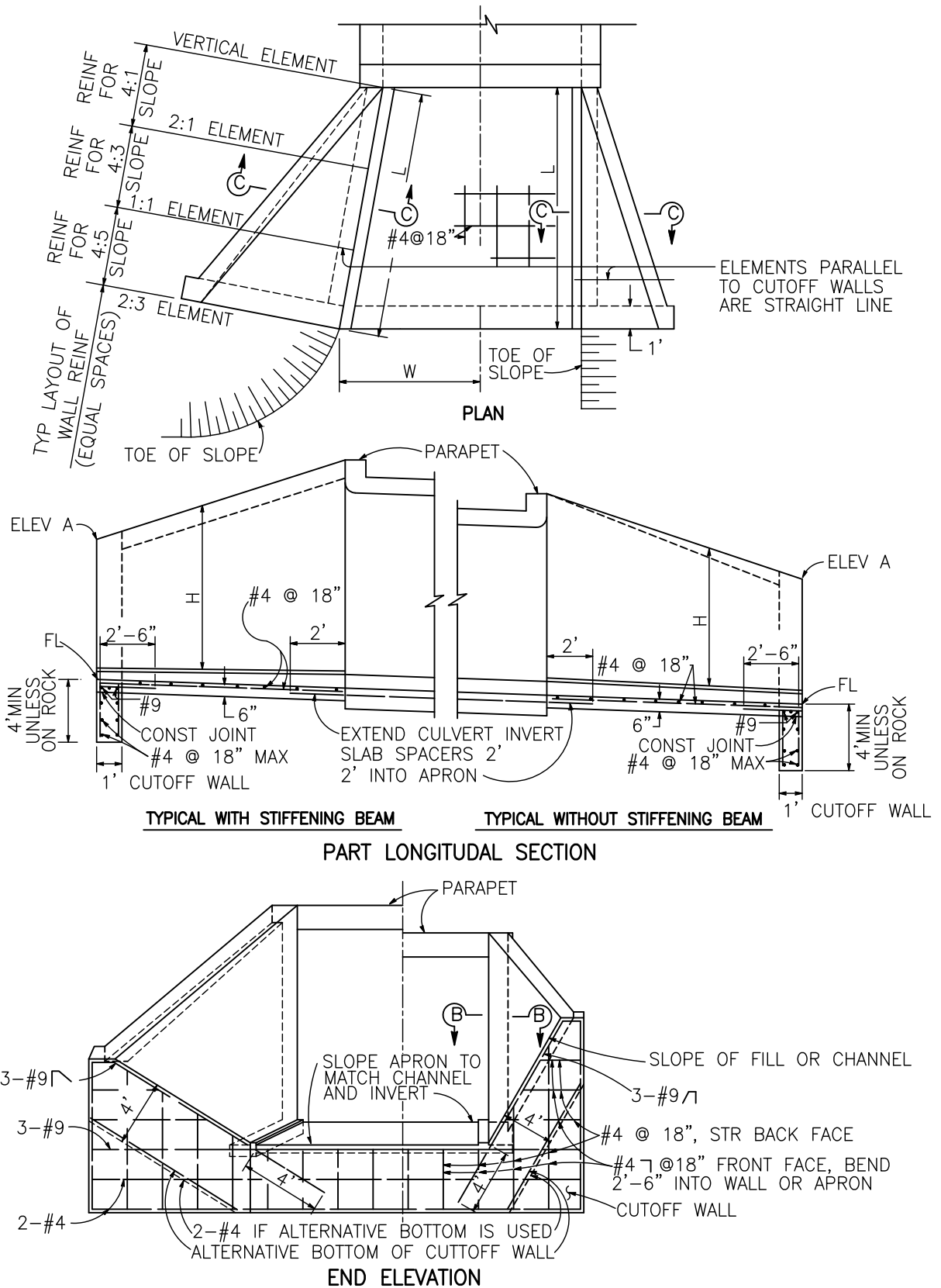
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75				
Edited	T.R.	T. Regello	10/15	BOX CULVERT WINGWALL TYPES A, B & C DETAILS NO. 5		 03/24/2022	
Edited	M.W.	M. Widelski	10/18			Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22			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				
Edited	T.R.	T. Regello	10/15	BOX CULVERT WINGWALL TYPES A, B & C DETAILS NO. 6		 03/24/2022	
Edited	M.W.	M. Widelski	10/18			Chairperson R.C.E. 52241 Date	
Reviewed	RP	S. Engeda	03/22			DRAWING NUMBER D-79F	



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

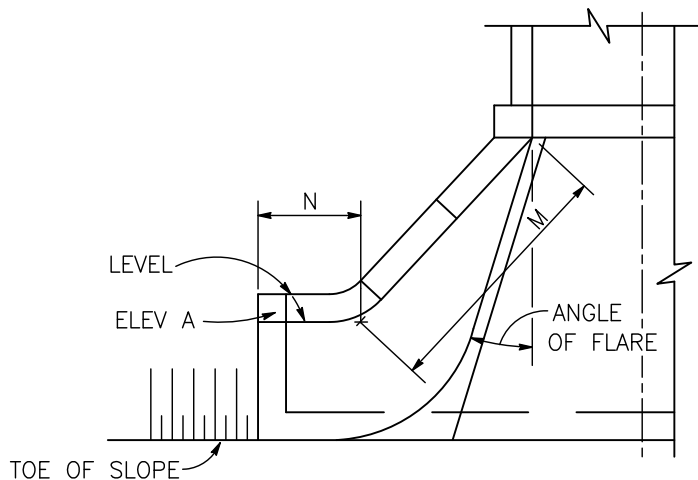
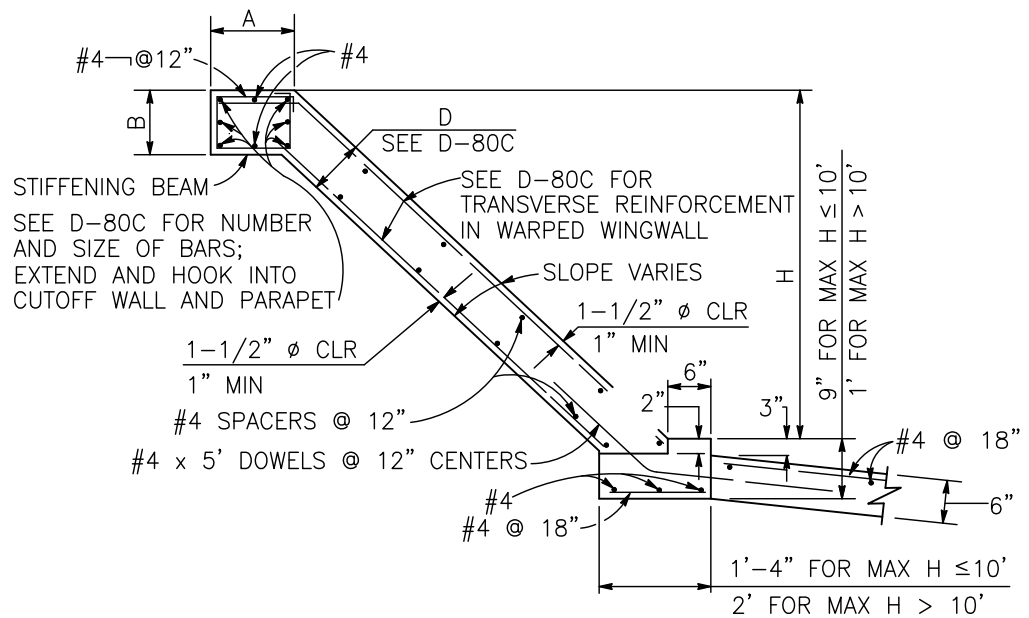
BOX CULVERT WARPED WINGWALL DETAILS NO. 1

RECOMMENDED BY THE SAN DIEGO
REGIONAL STANDARDS COMMITTEE

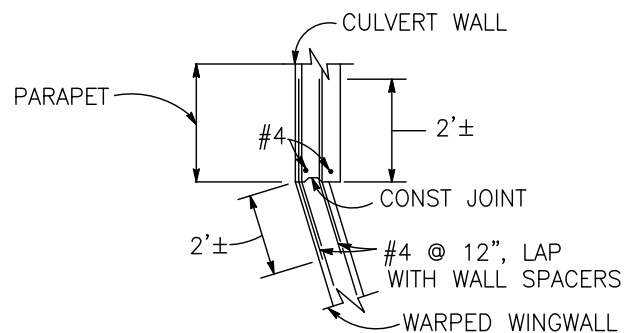
Samantha Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING
NUMBER **D-80A**

6"
WITHOUT
STIFFENING
BEAM



USE WHERE ADDITIONAL PROTECTION
TO TOE OF EMBANKMENT IS REQUIRED



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 INIFORMLY 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	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		A. Kercheval	12/75		
Edited	T.R.	T. Regello	10/15	BOX CULVERT WARPED WINGWALL DETAILS No. 2	 03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		
Reviewed	RP	S. Engeda	03/22		
					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. A=1'								
12'		B=9"								
14'		TOTAL 6-#6 A=1'-6"								
16'		B=1'								
18'		TOTAL 6-#7 A=1'-10"								
20'		TOTAL 6-#8 B=1' A=2'								
		TOTAL 8-#9 B=1'-6"								

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		A.Kercheval	12/75	BOX CULVERT WARPED WINGWALL DETAILS No. 3		 03/24/2022 Chairperson R.C.E. 52241 Date	D-80C
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelski	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER	

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

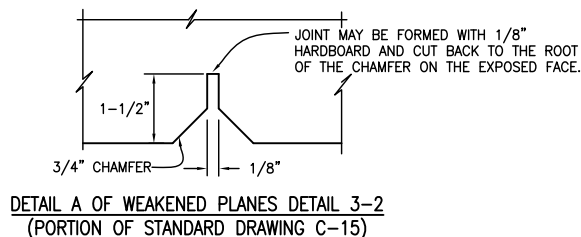
CONCRETE: Bottom slab & walls shall be Class 560-B-3250. Top slab shall be Class 560-C-3250.

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.



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.

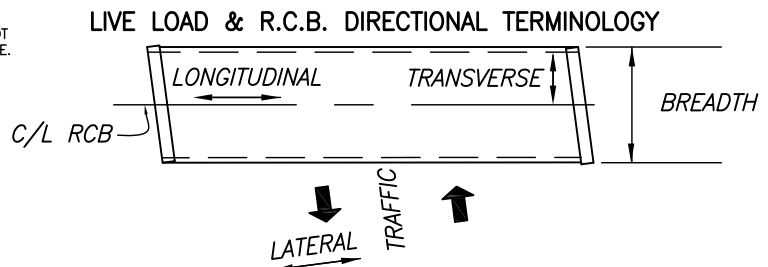
Distribution "d" bars expressed as a percent of main positive reinforcement.

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

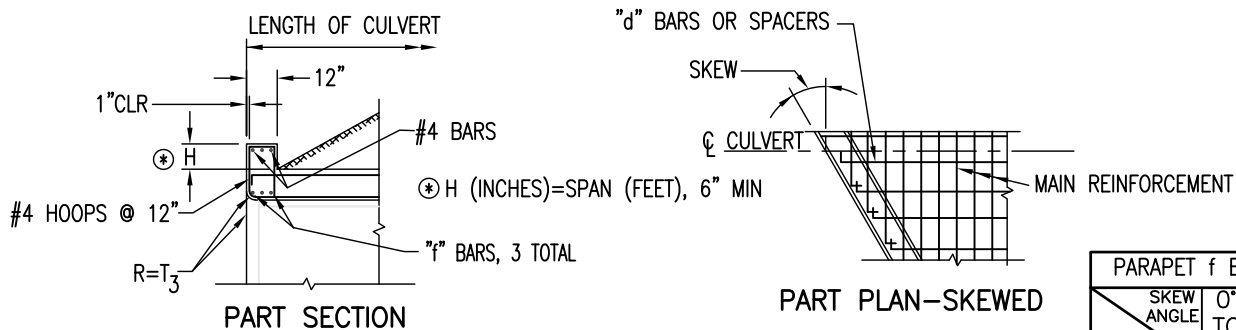
Classification "B" to "E": Top and bottom slabs #4 @ 18" max.

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.

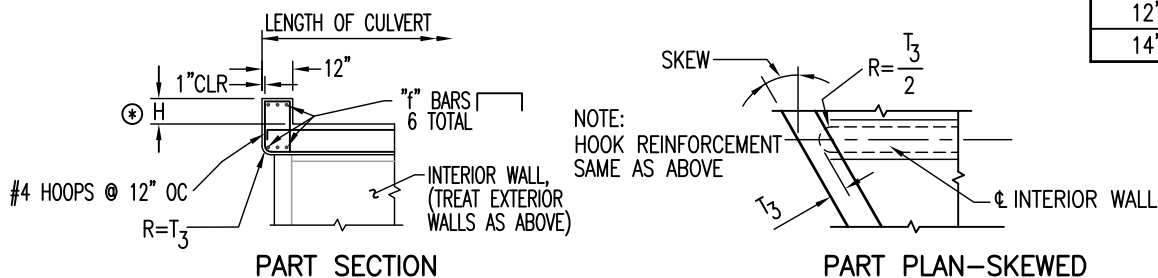


Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		Kercheval	12/75	BOX CULVERT MISCELLANEOUS DETAILS No. 1		
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
Reviewed	RP	S. Engeda	03/22			
						 03/24/2022 Chairperson R.C.E. 52241 Date
						DRAWING NUMBER D-81A

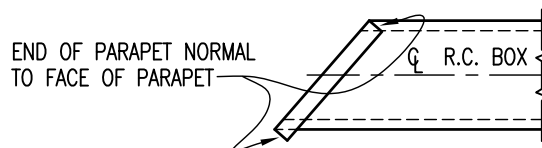


PARAPET DETAILS FOR SINGLE SPAN CULVERTS

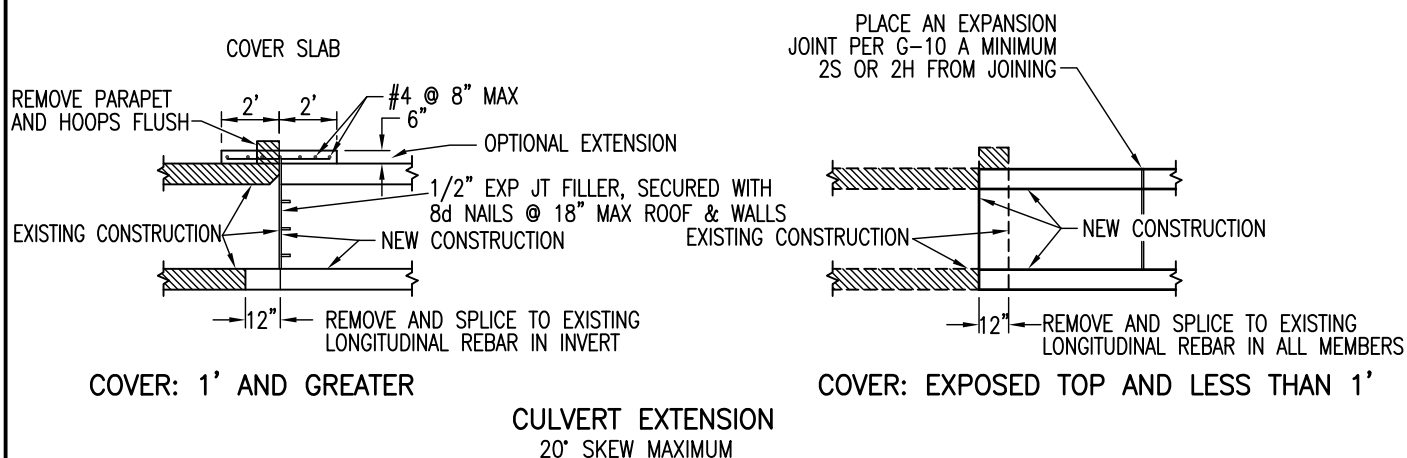
PARAPET f BAR SIZE			
SPAN (S)	SKEW ANGLE	0° TO 15°	16° TO 30°
	31° TO 45°		
4'		#4	#4
6'		#4	#4
8'		#4	#5
10'		#5	#6
12'		#6	#7
14'		#7	#8



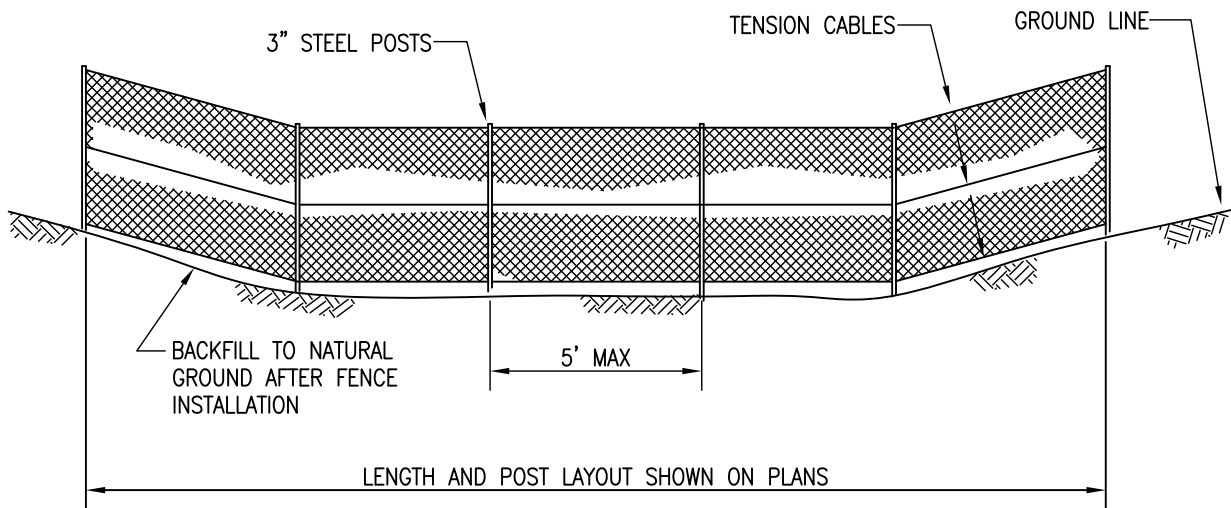
PARAPET DETAILS FOR MULTIPLE SPAN CULVERTS



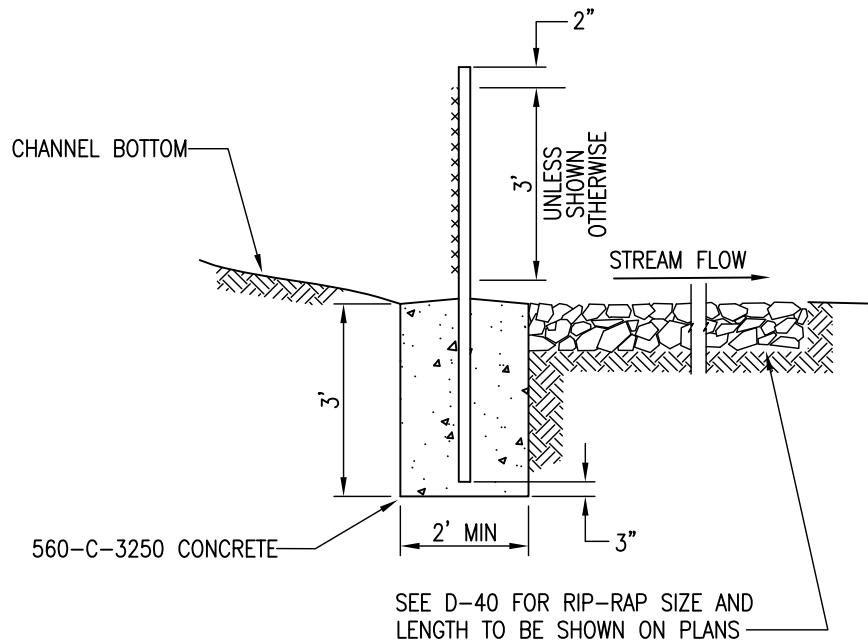
PARAPET DETAIL FOR SKEWED CULVERTS W/O WINGWALLS



Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	
ORIGINAL		Kercheval	12/75	BOX CULVERT MISCELLANEOUS DETAILS NO. 2		Chairperson R.C.E. 52241 Date 03/24/2022	
Edited	T.R.	T. Regello	10/15				
Edited	M.W.	M. Widelksi	10/18				
Reviewed	RP	S. Engeda	03/22				
						DRAWING NUMBER D-81B	



ELEVATION

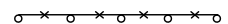


SECTION

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" ϕ 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	SAN DIEGO REGIONAL STANDARD DRAWING		RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
ORIGINAL		H. Hecht	10/82	DEBRIS FENCE		
Edited	T.R.	T. Regello	10/15			
Edited	M.W.	M. Widelski	10/18			
Reviewed	RP	S. Engeda	03/22			
						 03/24/2022
						Chairperson R.C.E. 52241 Date
						DRAWING NUMBER D-82