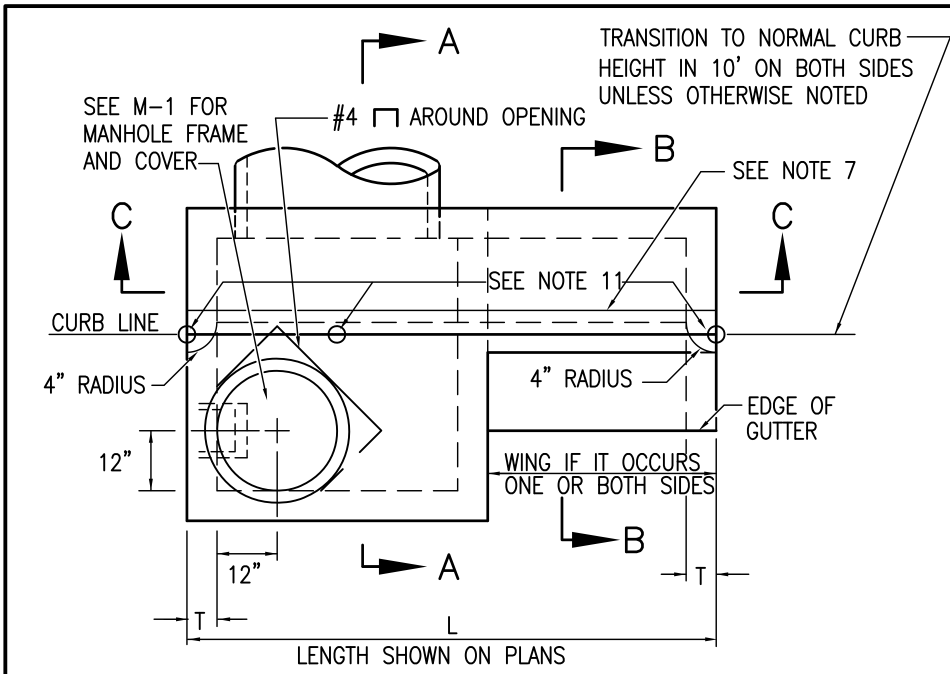
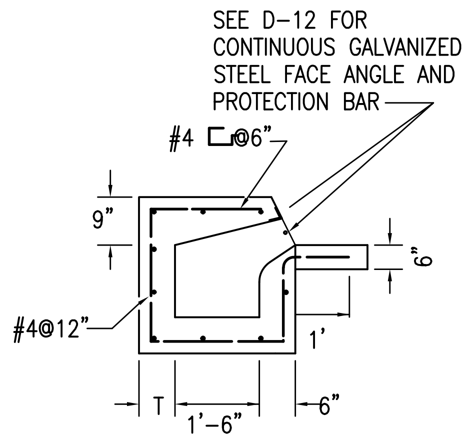
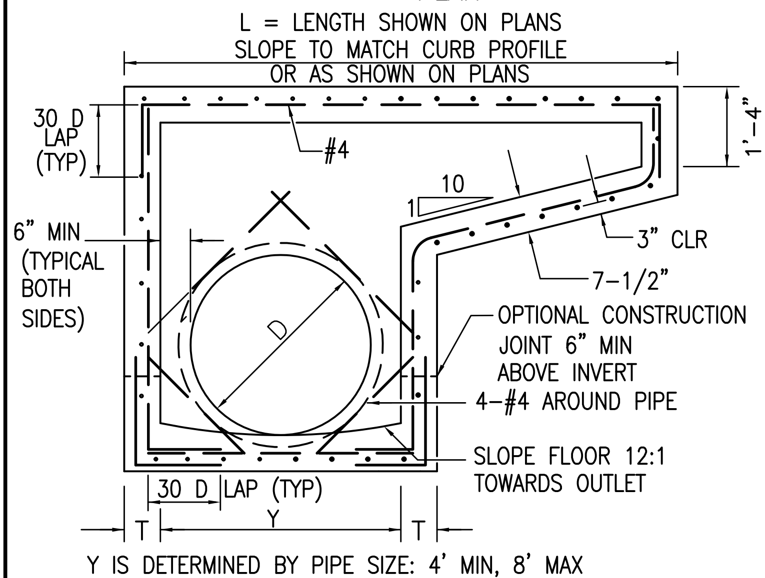
DRAINAGE SYSTEMS



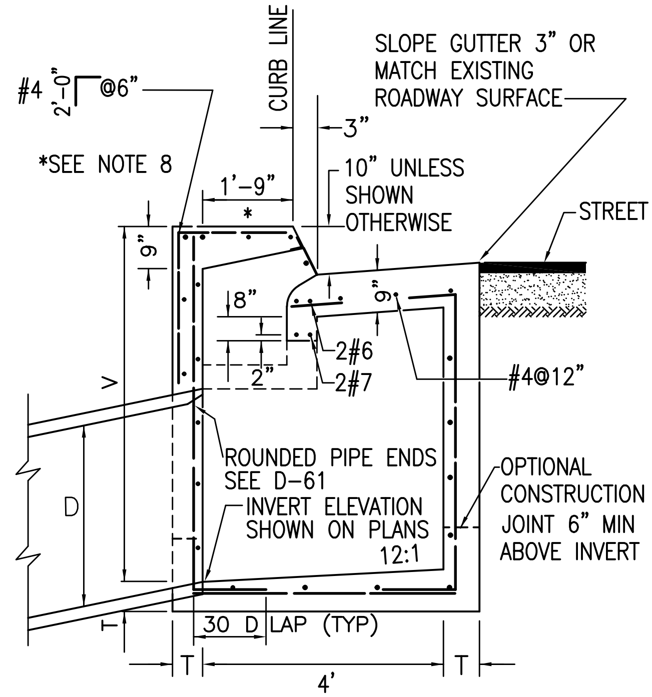
PLAN



SECTION B-B



SECTION C-C

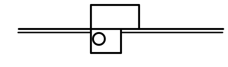


SECTION A-A

NOTES

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

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

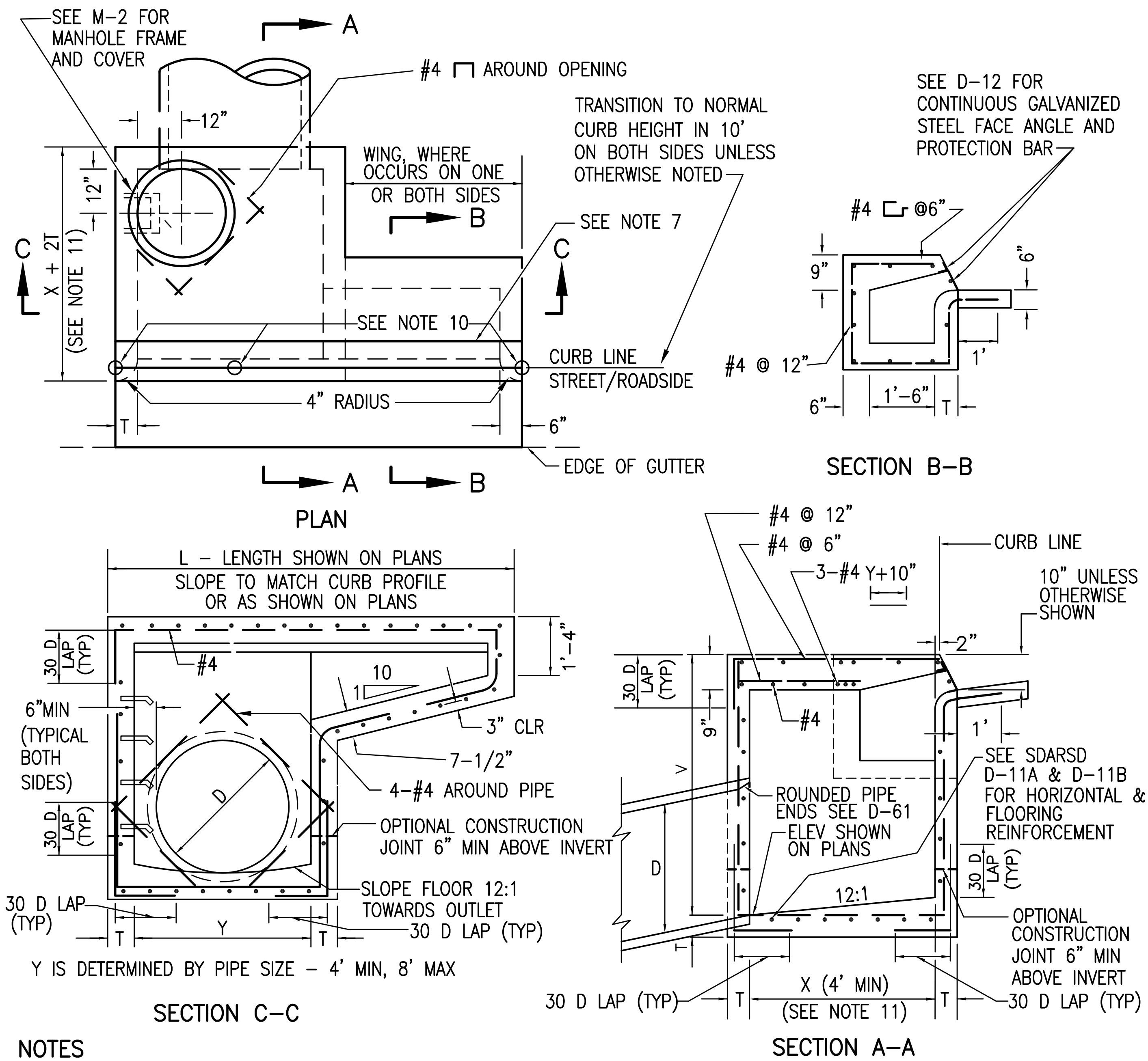
CURB INLET - TYPE A

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

03/24/2022

Chairperson R.C.E. 52241 Date

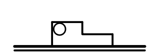
DRAWING NUMBER **D-01**



NOTES

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

LEGEND ON PLANS



Revision	By	Approved	Date
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SAN DIEGO REGIONAL STANDARD DRAWING

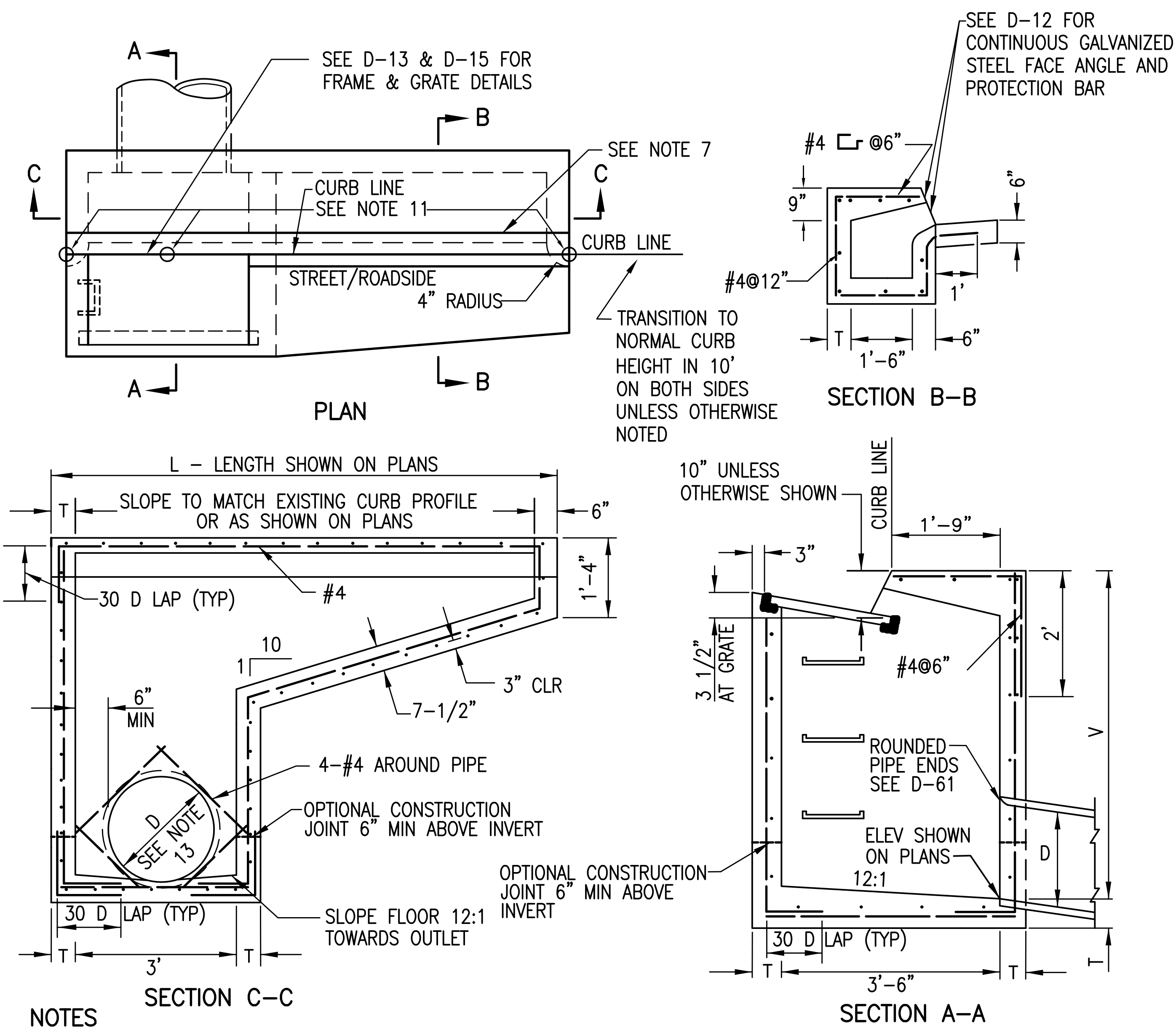
CURB INLET - TYPE B

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-02**



NOTES

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

LEGEND ON PLANS

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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SAN DIEGO REGIONAL STANDARD DRAWING

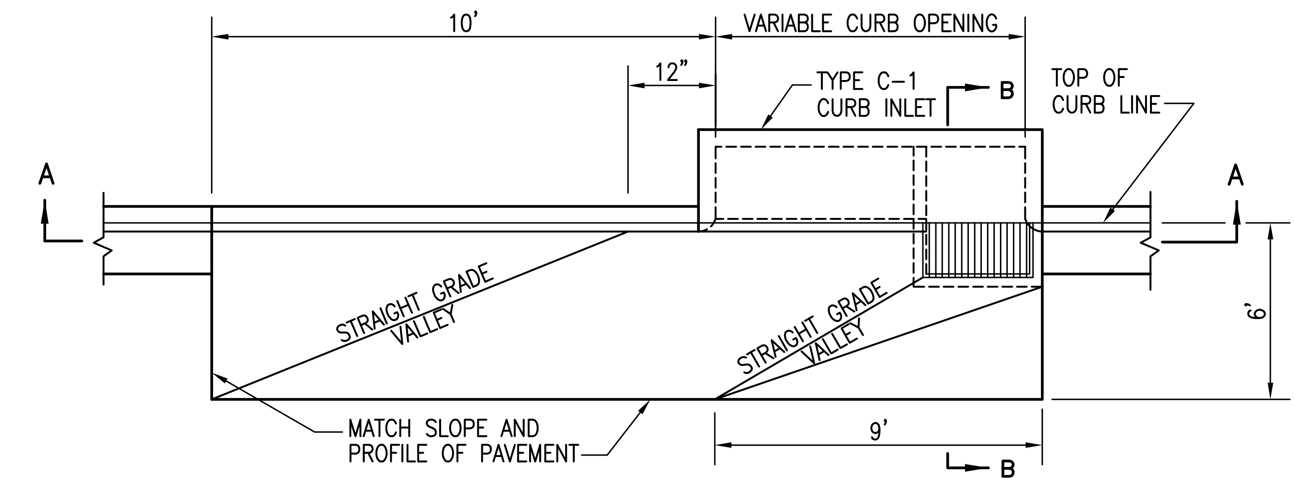
CURB INLET - TYPE C

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

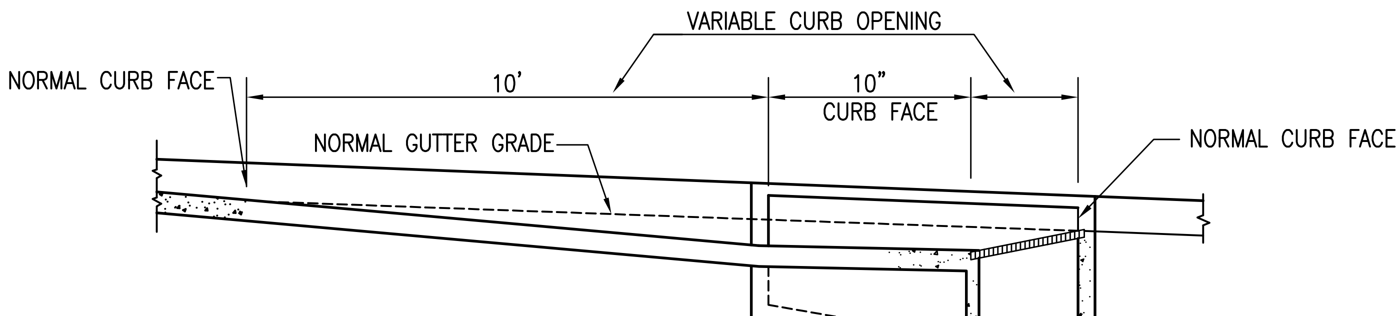
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

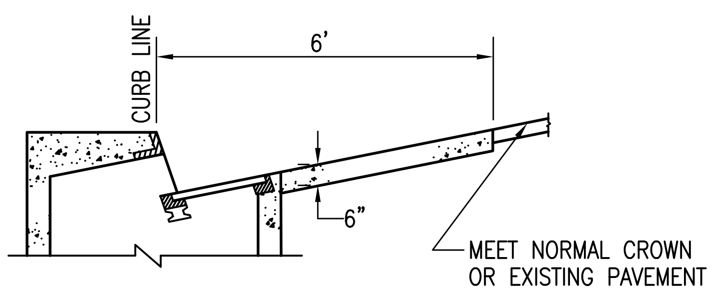
DRAWING NUMBER **D-03A**



PLAN



SECTION A–A

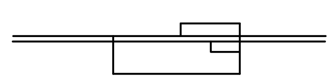


SECTION B–B

NOTES

1. CURB AND APRON TO BE MONOLITTHIC 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



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Edited	M.W.	M. Widelski	10/18
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SAN DIEGO REGIONAL STANDARD DRAWING

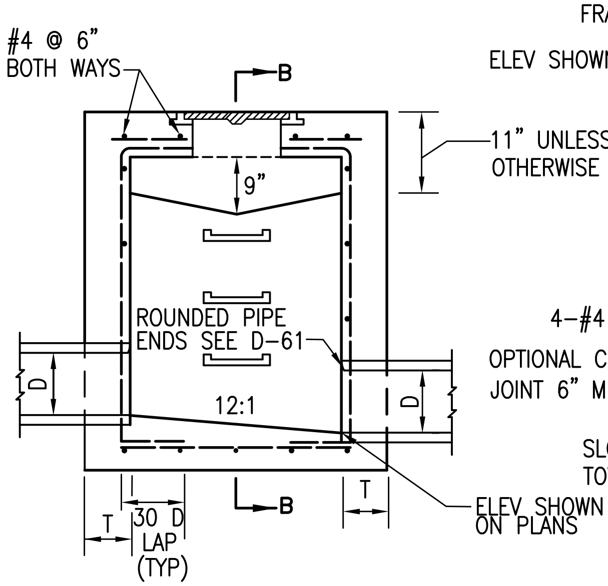
CONCRETE APRON FOR TYPE C CURB INLET

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

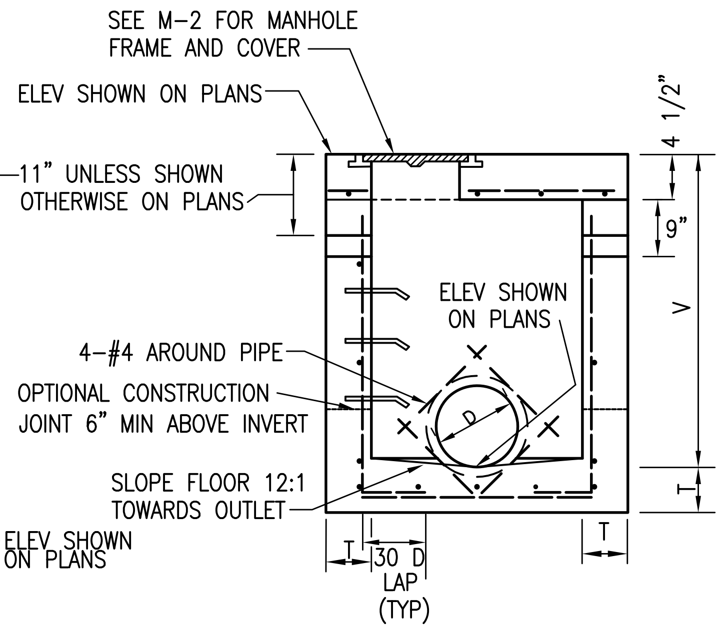
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

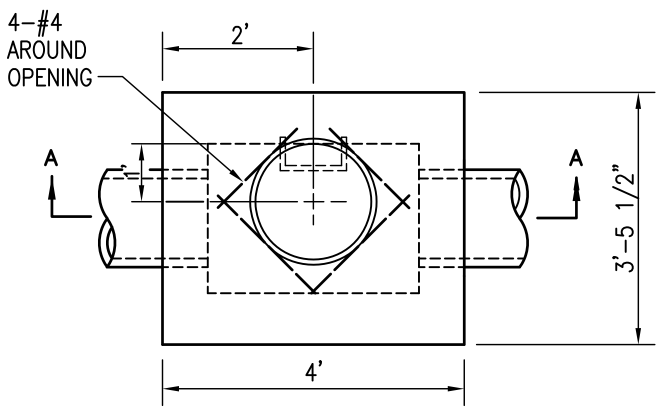
DRAWING NUMBER **D-03B**



SECTION A–A



SECTION B–B

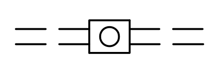


PLAN

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



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SAN DIEGO REGIONAL STANDARD DRAWING

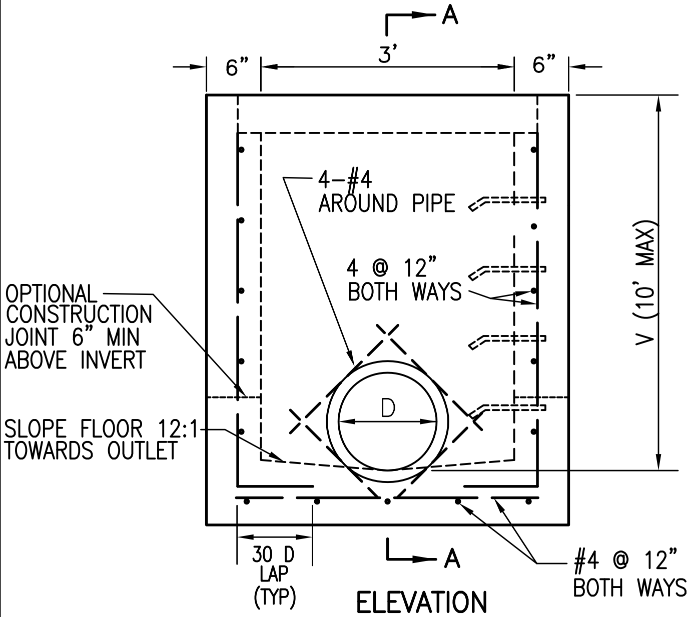
CATCH BASIN - TYPE F

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

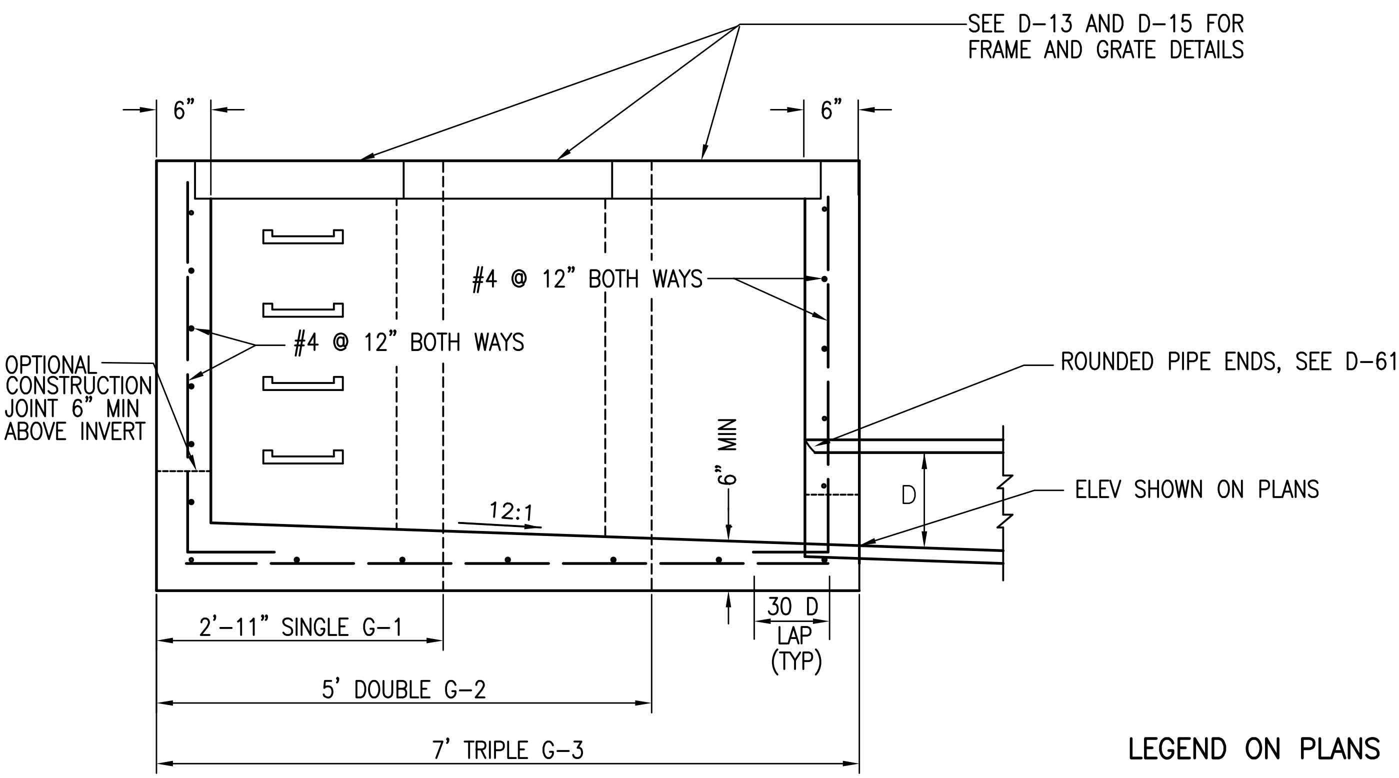
DRAWING NUMBER **D-07**



ELEVATION

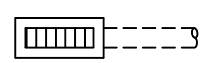
NOTES

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. ESPOSED 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.



SECTION A-A

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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SAN DIEGO REGIONAL STANDARD DRAWING

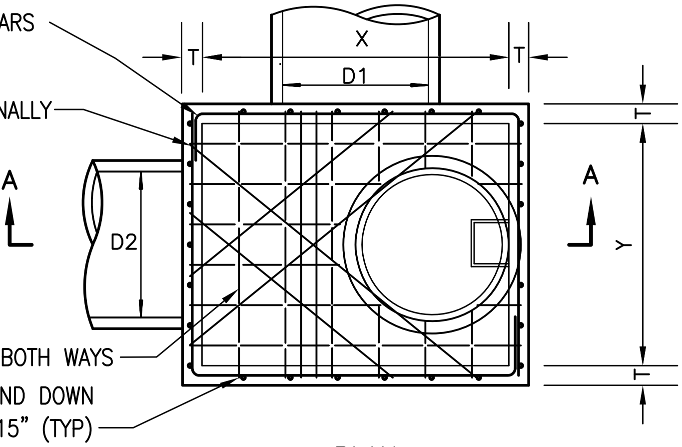
CATCH BASIN - TYPE G

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

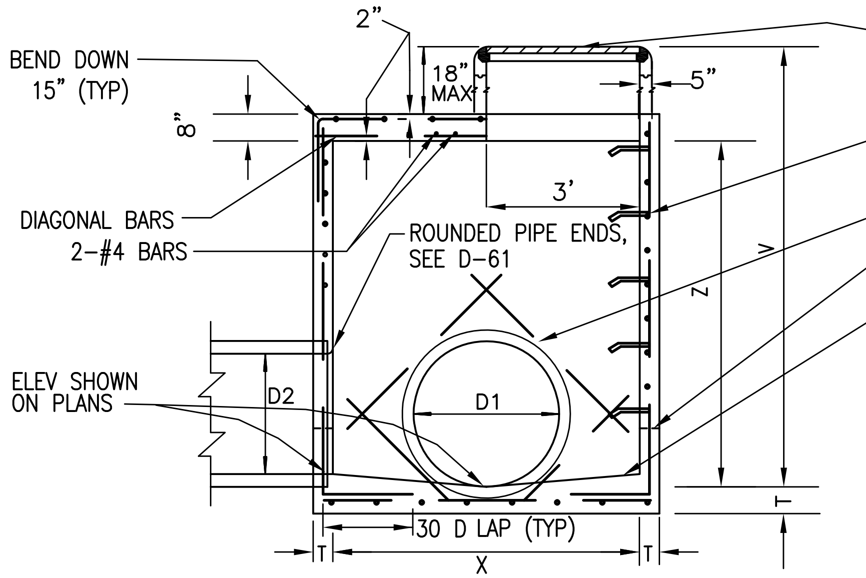
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-08**



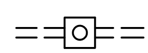
PLAN

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
ORIGINAL		Kercheval	12/75
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Edited	M.W.	M. Widelski	10/18
Edited	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

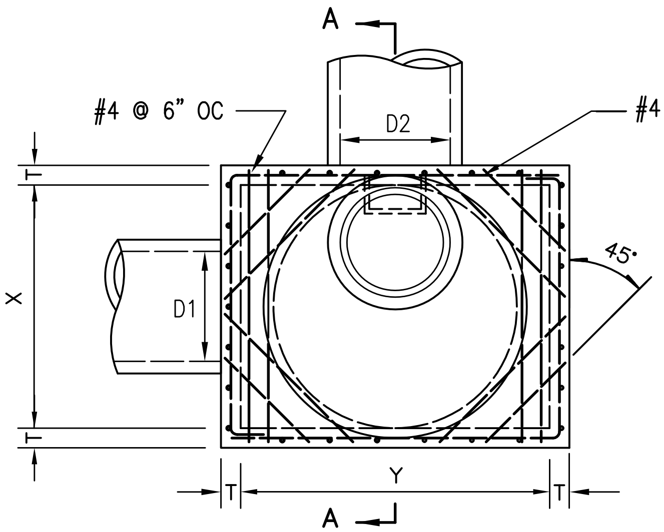
STORM DRAIN CLEANOUT - TYPE A

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

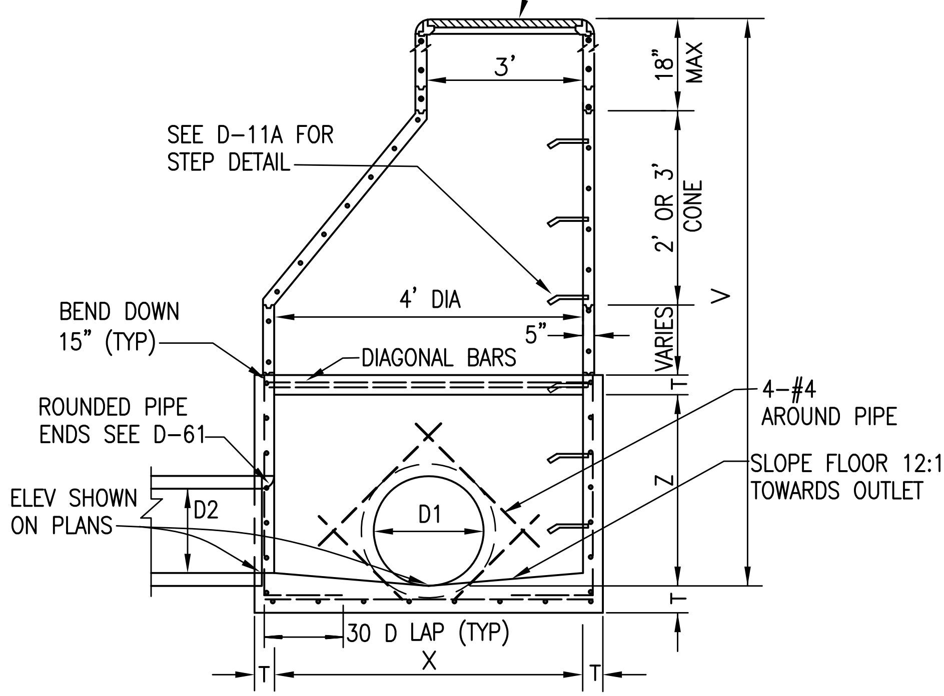
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-09**



PLAN

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

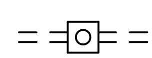


SECTION A–A

NOTES

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

LEGEND ON PLANS



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Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

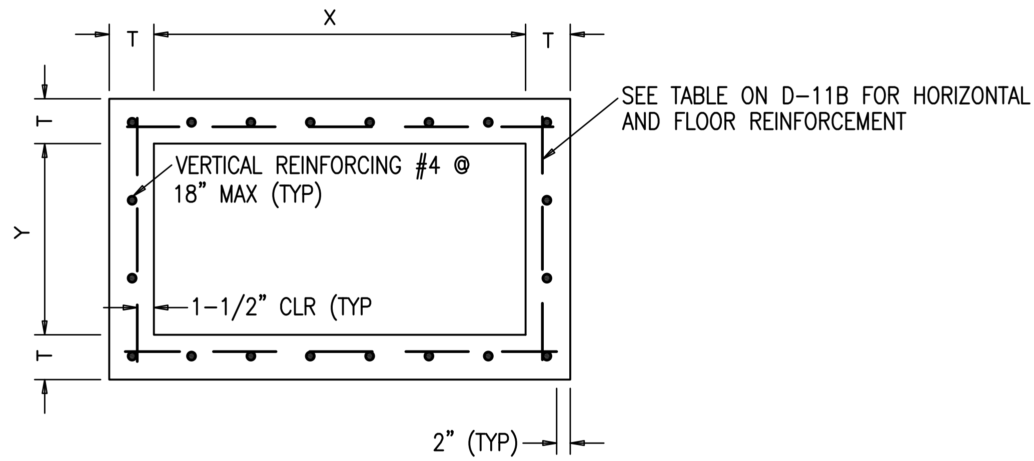
STORM DRAIN CLEANOUT - TYPE B

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

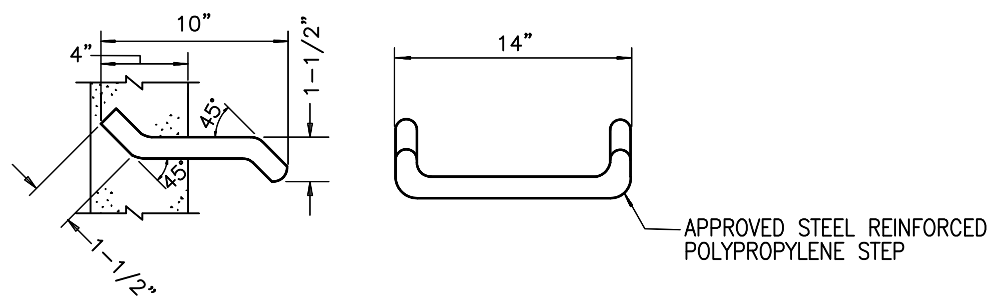
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-10**



TYPICAL BOX SECTION



STEP DETAIL

NOTES

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

Revision	By	Approved	Date
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SAN DIEGO REGIONAL STANDARD DRAWING

INLETS AND CLEANOUTS NOTES AND DETAILS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

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"

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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

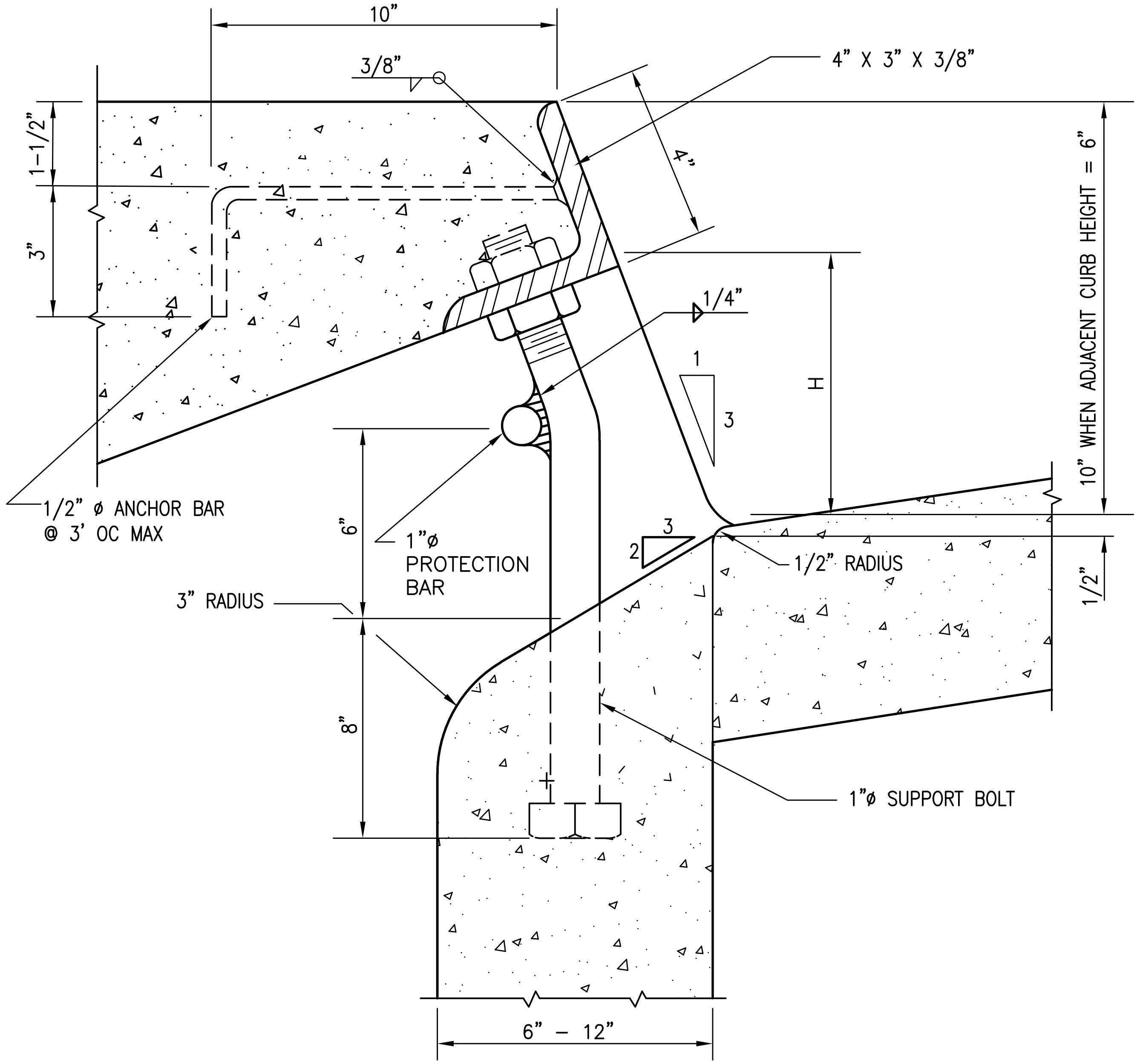
INLETS AND CLEANOUTS NOTES AND DETAILS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

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
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

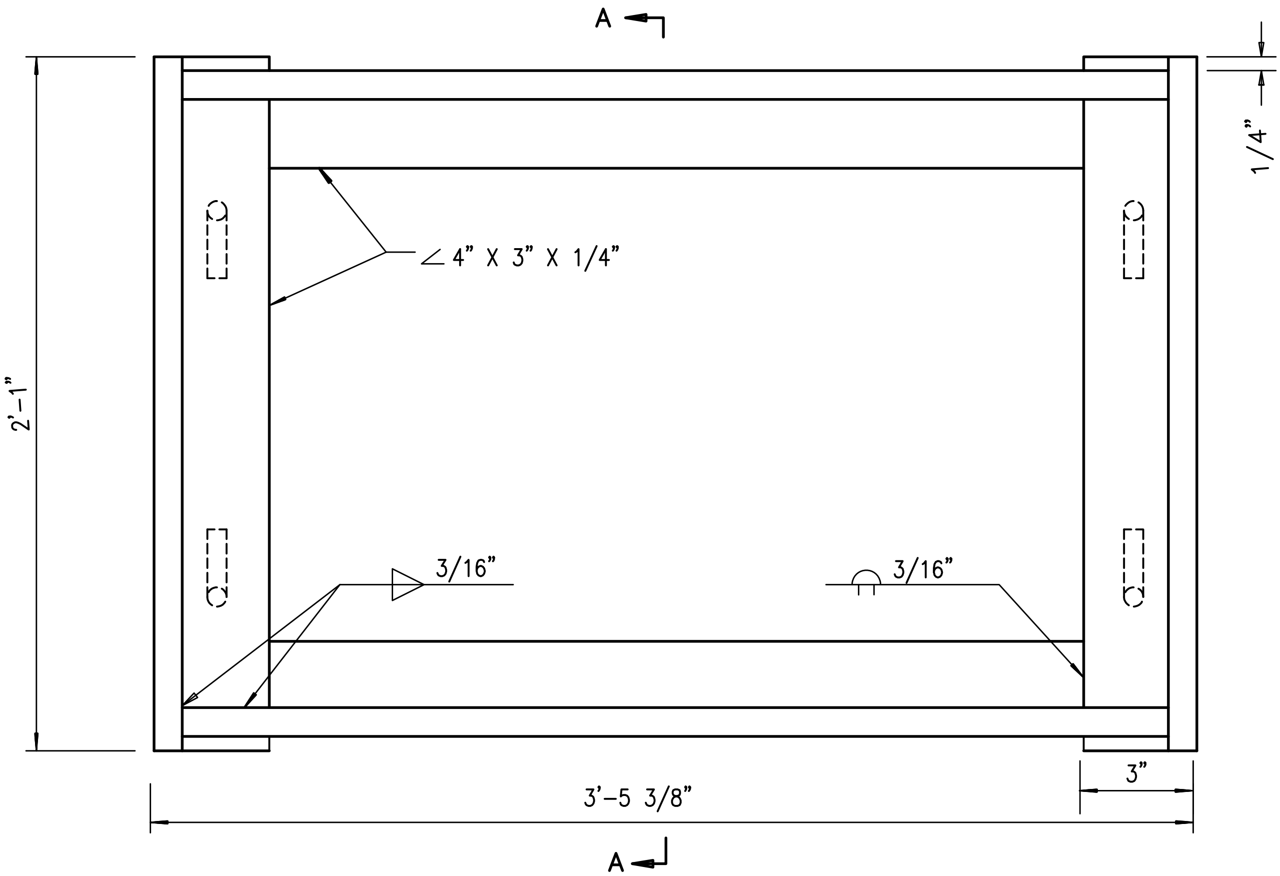
CURB INLET OPENING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

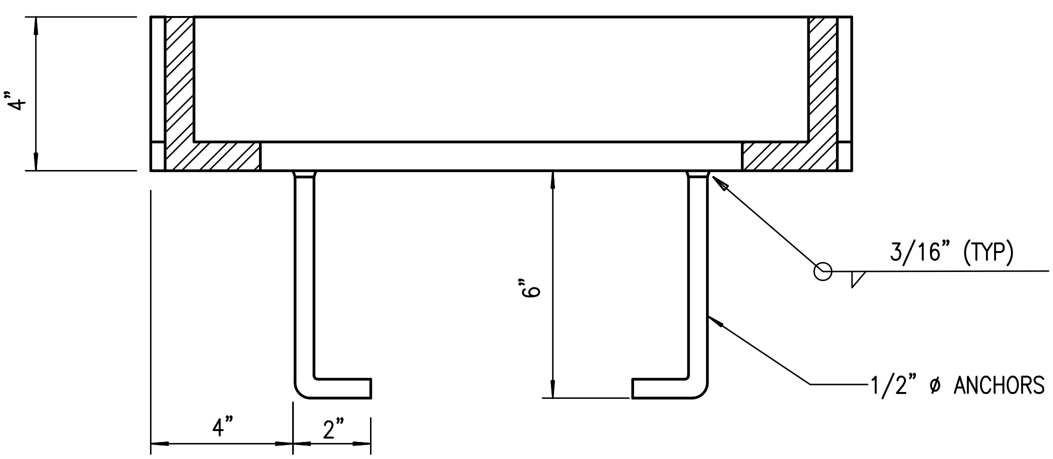
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-12**



PLAN



SECTION A–A

NOTE
HOT-DIP GALVANIZE ALL PARTS AFTER FABRICATION.

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

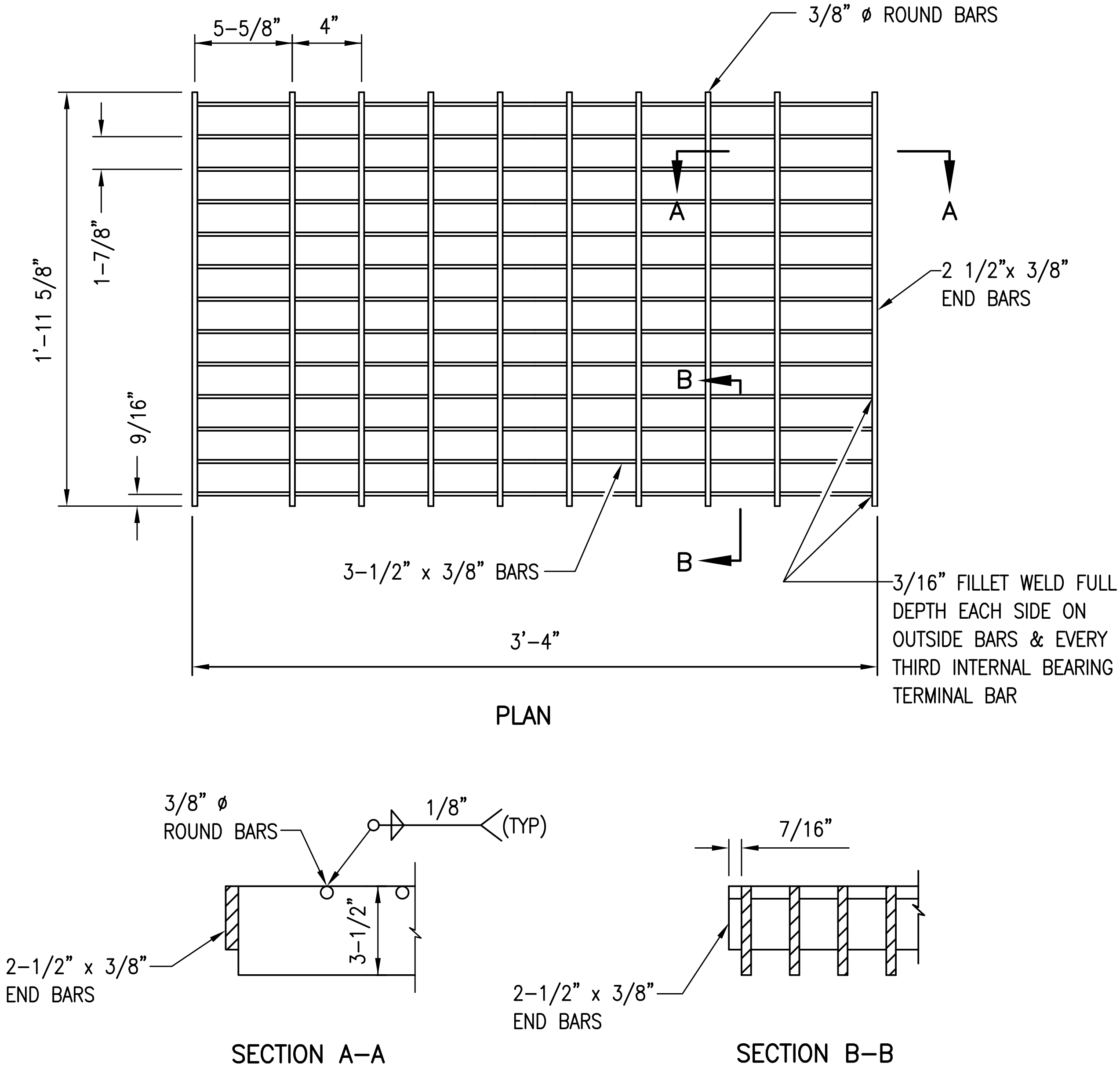
SAN DIEGO REGIONAL STANDARD DRAWING

WELDED STEEL GRATE FRAME

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-13**



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
ORIGINAL		Kercheval	12/75
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SAN DIEGO REGIONAL STANDARD DRAWING

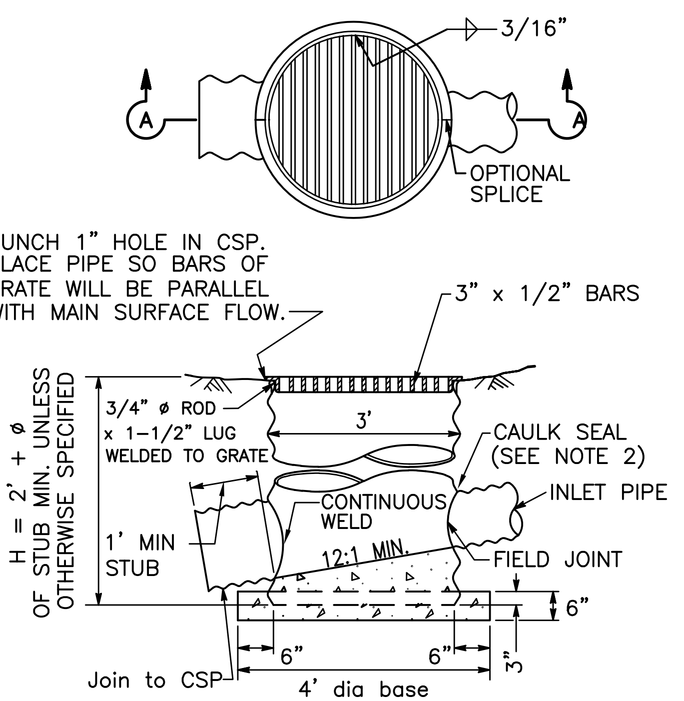
DRAINAGE STRUCTURE GRATE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

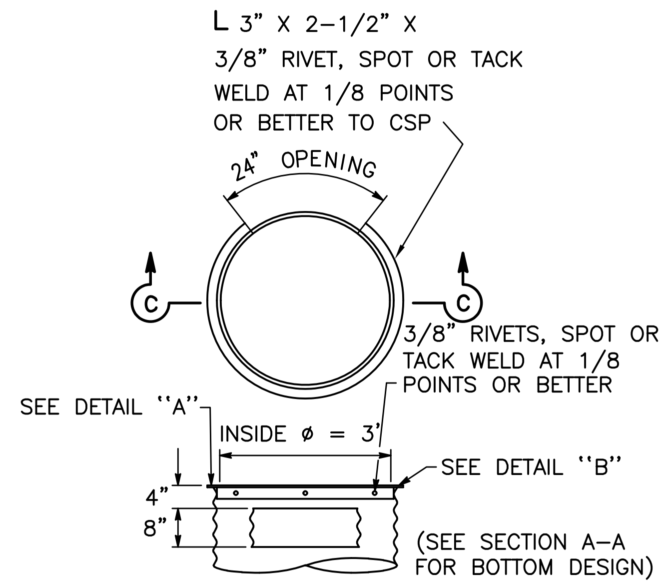
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

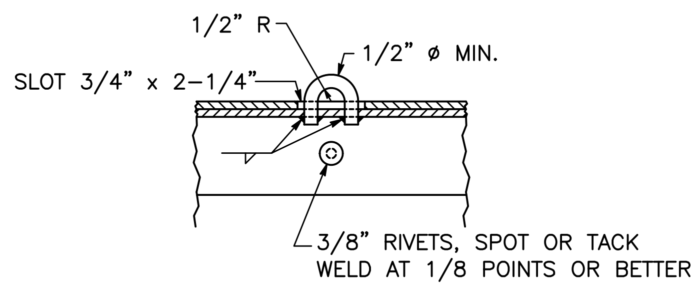
DRAWING NUMBER **D-15**



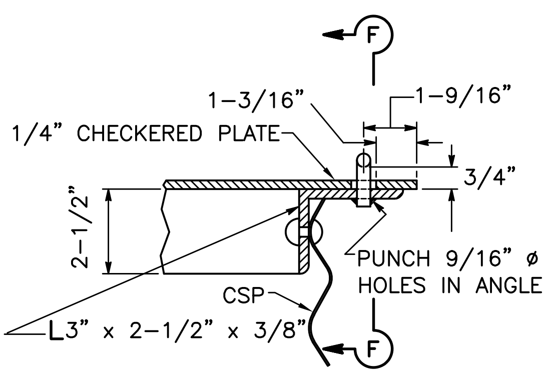
SECTION A–A
TYPE A



SECTION C–C
TYPE B



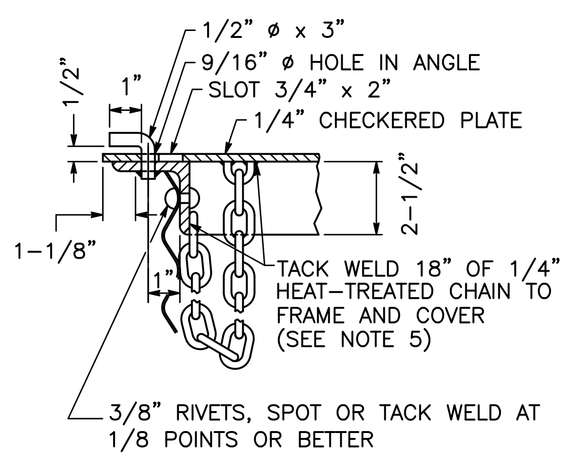
SECTION F–F



DETAIL "B"

NOTES

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



DETAIL "A"

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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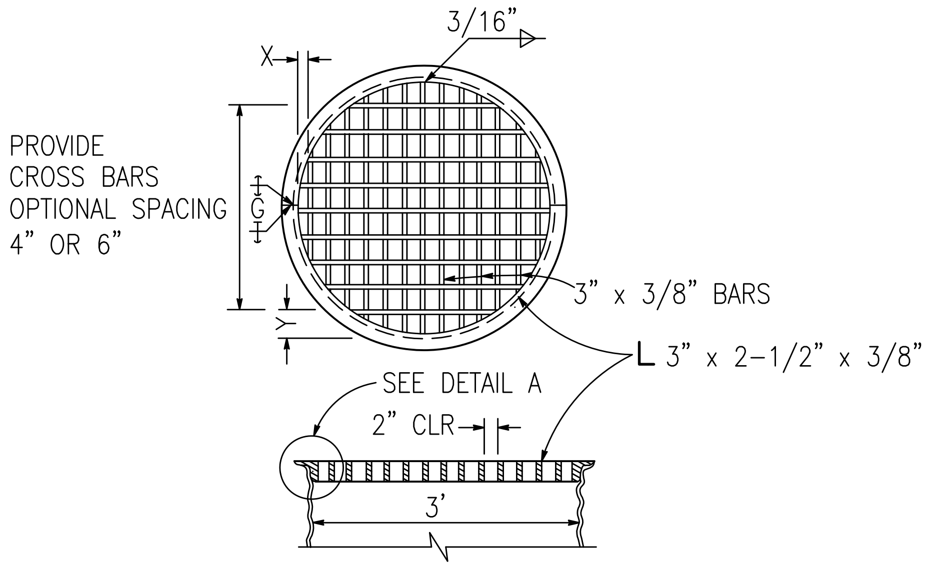
SAN DIEGO REGIONAL STANDARD DRAWING

CORRUGATED STEEL PIPE INLETS TYPES A AND B

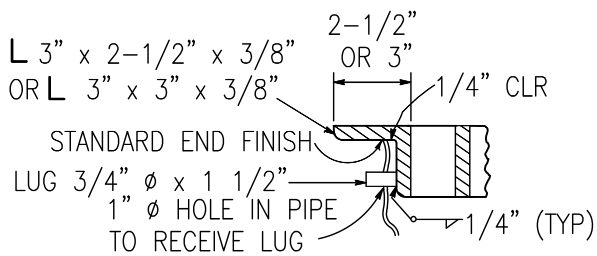
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

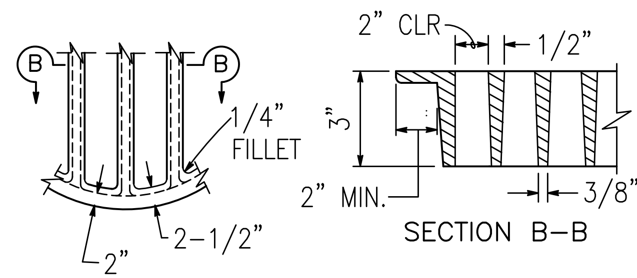
DRAWING NUMBER **D-16**



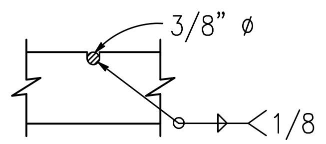
GRATE DETAILS



DETAIL A

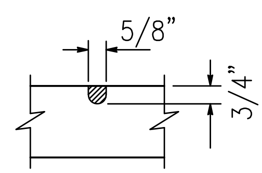


ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE



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

CROSS BAR DETAIL TYPE WELDED STEEL GRATE



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

GRATE BAR SPACING TABLE

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

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SAN DIEGO REGIONAL STANDARD DRAWING

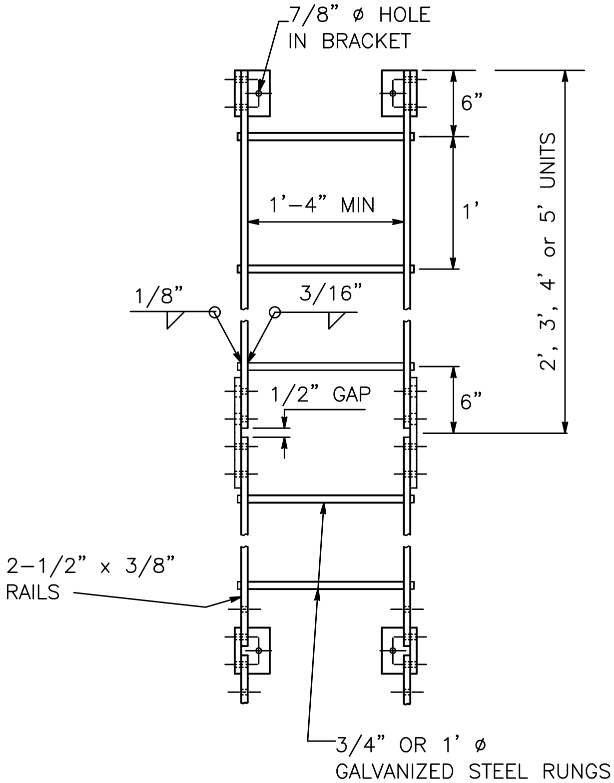
CORRUGATED STEEL PIPE INLETS, DETAILS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

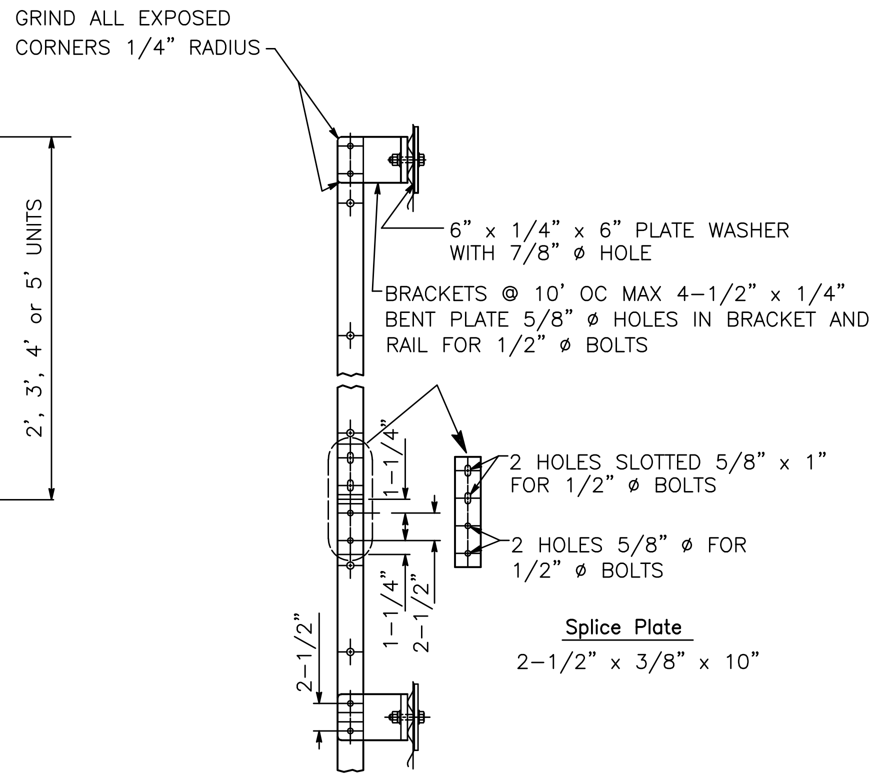
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

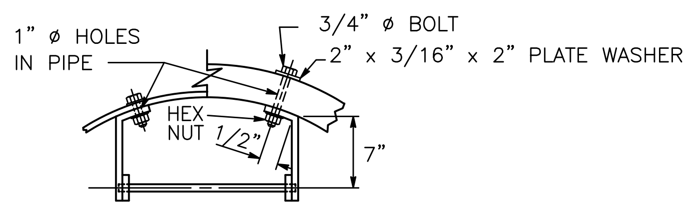
DRAWING NUMBER **D-17A**



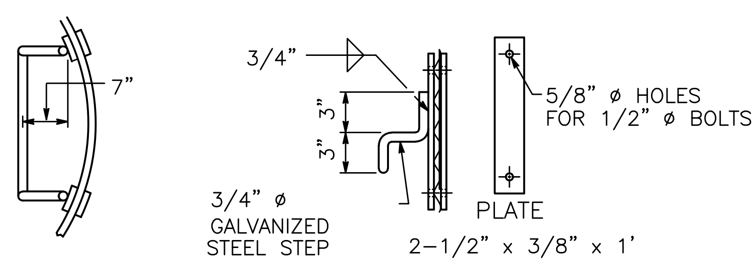
FRONT VIEW



SIDE VIEW



LADDER DETAIL
H=5' OR GREATER



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

NOTE

SEE NOTE 3 ON D–16 FOR LADDER REQUIREMENTS.

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ORIGINAL		Kercheval	12/75
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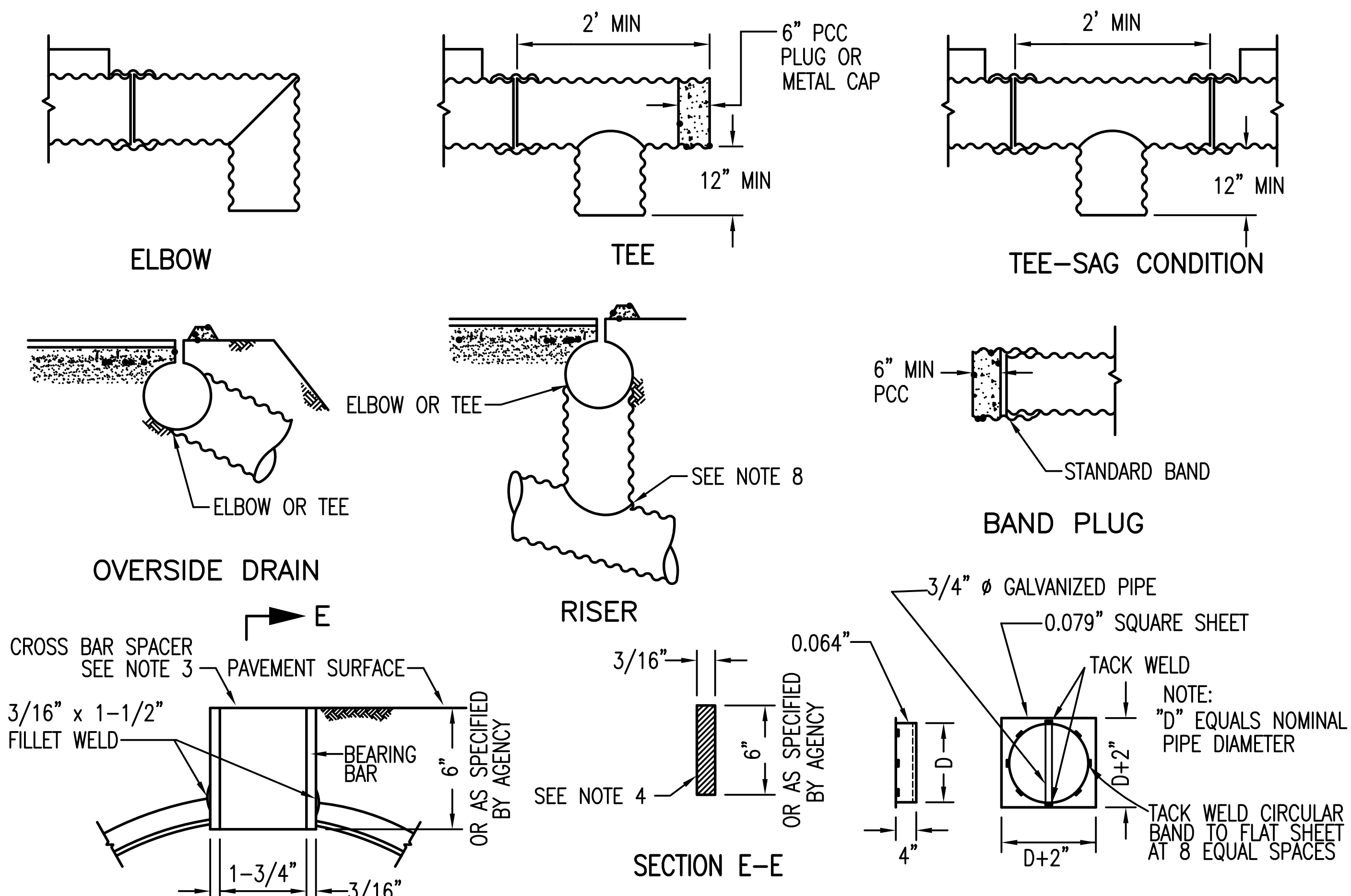
SAN DIEGO REGIONAL STANDARD DRAWING

CORRUGATED STEEL PIPE INLETS, DETAILS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

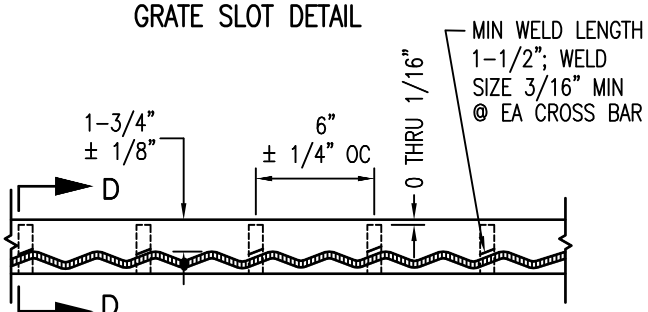
Samson Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-17B**

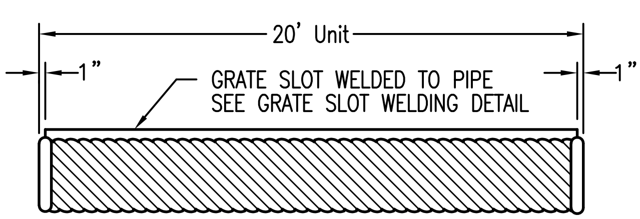


METAL CAP DETAIL

SECTION D-D
GRATE SLOT DETAIL



GRATE SLOT WELDING DETAIL



GRATE SLOT DRAIN

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.

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

SAN DIEGO REGIONAL STANDARD DRAWING

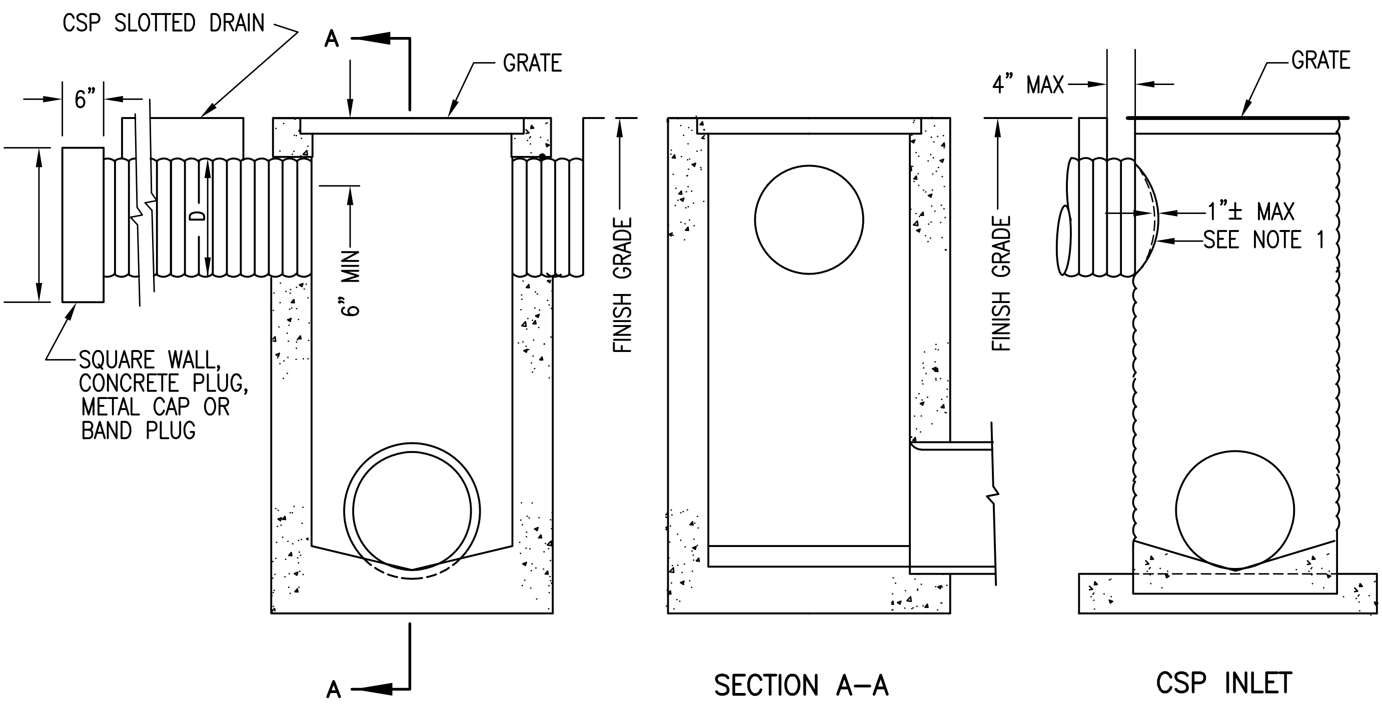
SLOTTED CORRUGATED STEEL PIPE DRAINS
12" THROUGH 24"

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

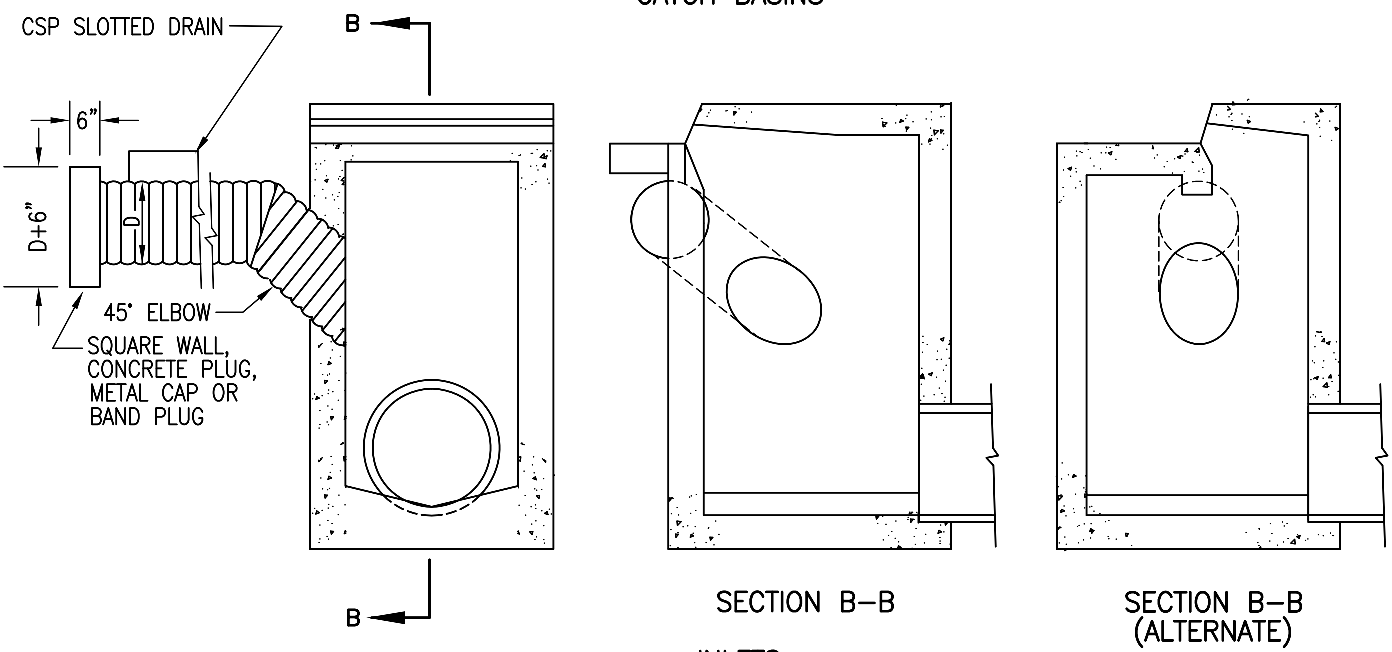
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-18**



CATCH BASINS



INLETS

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
ORIGINAL		Kercheval	12/75
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Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

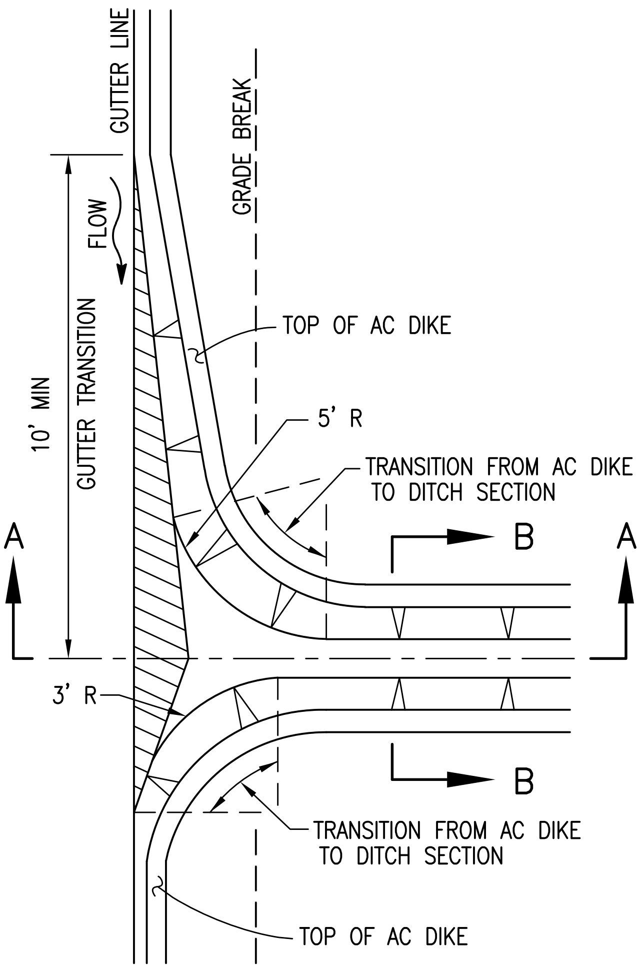
SLOTTED DRAIN CONNECTIONS TO STANDARD INLETS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

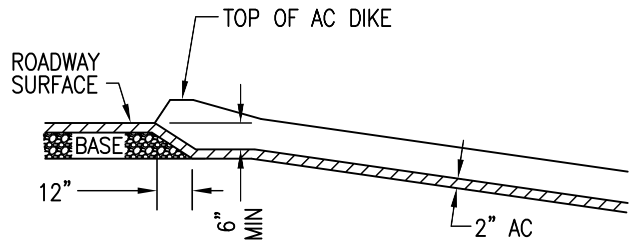
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

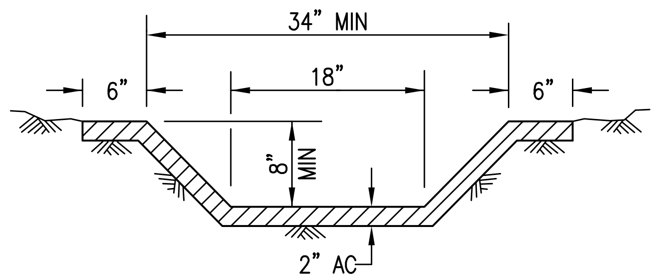
DRAWING NUMBER **D-19**



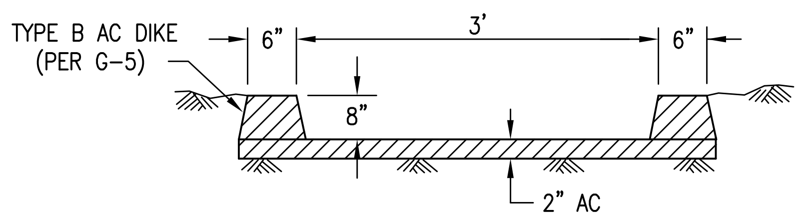
PLAN



SECTION A–A



SECTION B–B

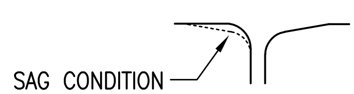


ALTERNATE SECTION B–B

NOTES

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

LEGEND ON PLANS



Revision	By	Approved	Date
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Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

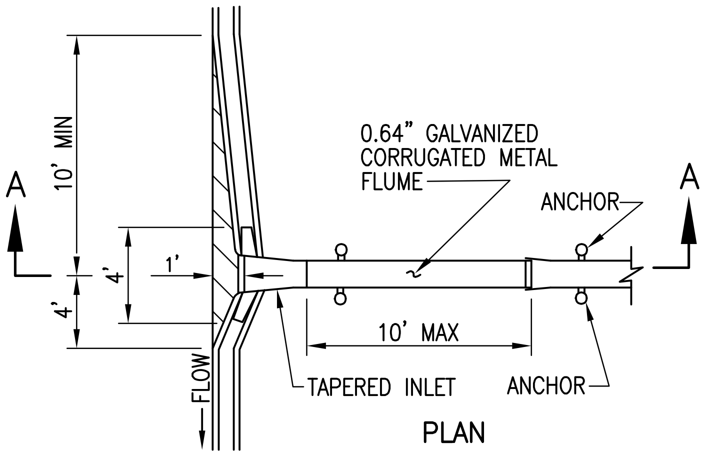
ASPHALT CONCRETE SPILLWAY

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

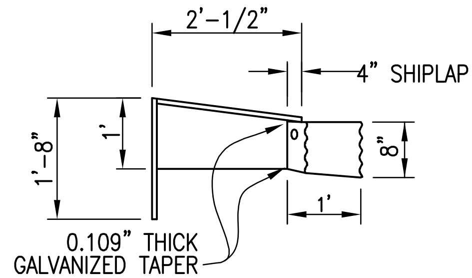
Samson Engeda 03/24/2022

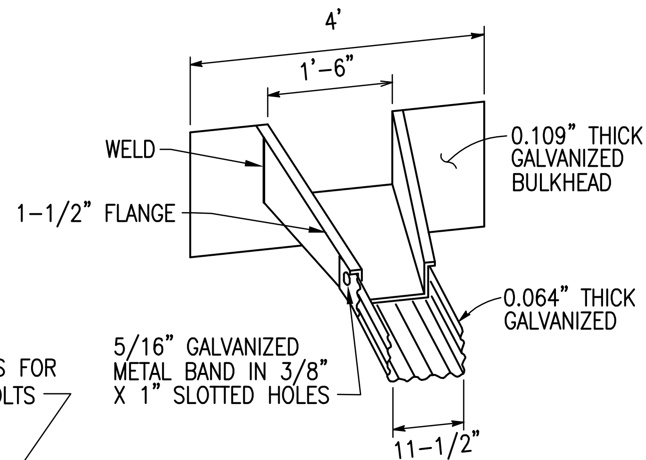
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-22**

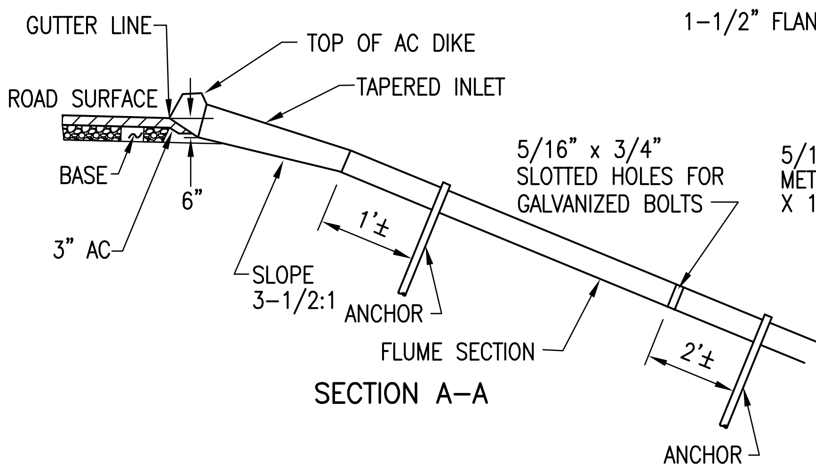


PLAN

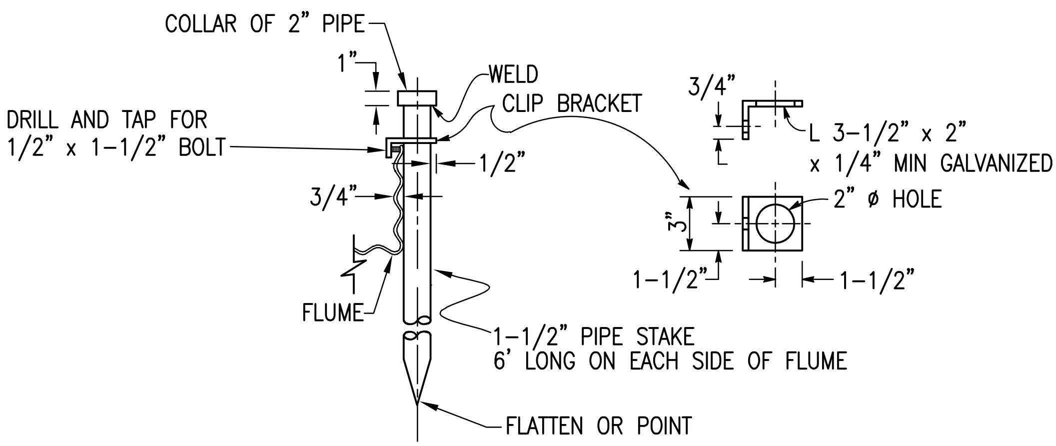




TAPERED INLET



SECTION A-A

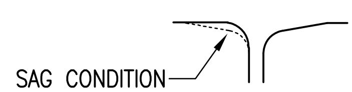


ANCHOR-DETAIL

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



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SAN DIEGO REGIONAL STANDARD DRAWING

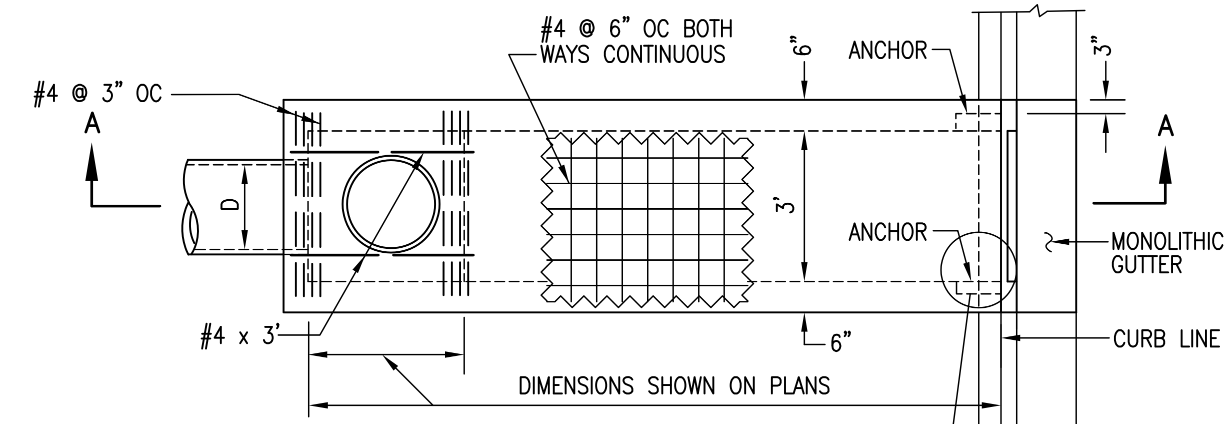
TAPERED INLET AND DOWNDRAIN FLUME

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

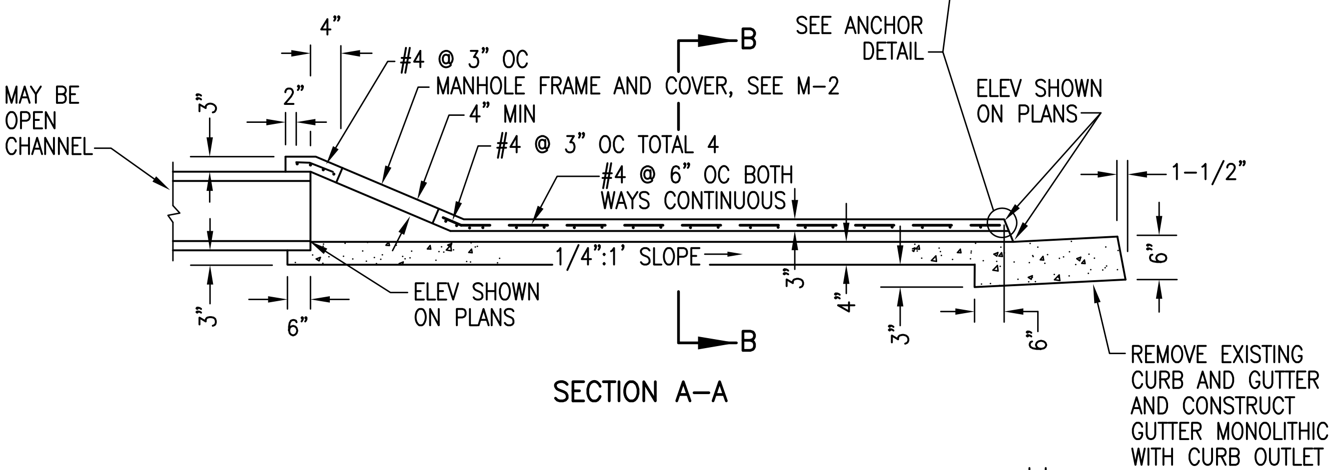
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

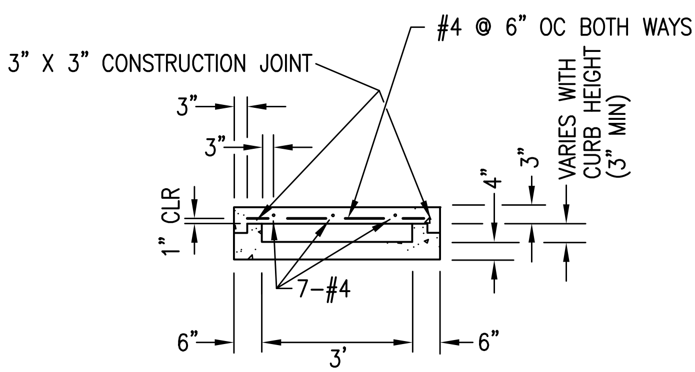
DRAWING NUMBER **D-23**



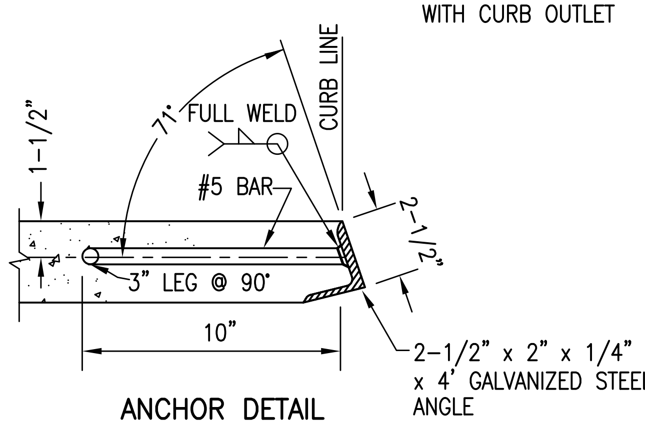
PLAN



SECTION A–A



SECTION B–B

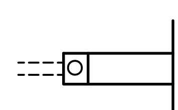


ANCHOR DETAIL

NOTES

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

LEGEND ON PLANS



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Edited	M.W	M. Widelski	10/18
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SAN DIEGO REGIONAL STANDARD DRAWING

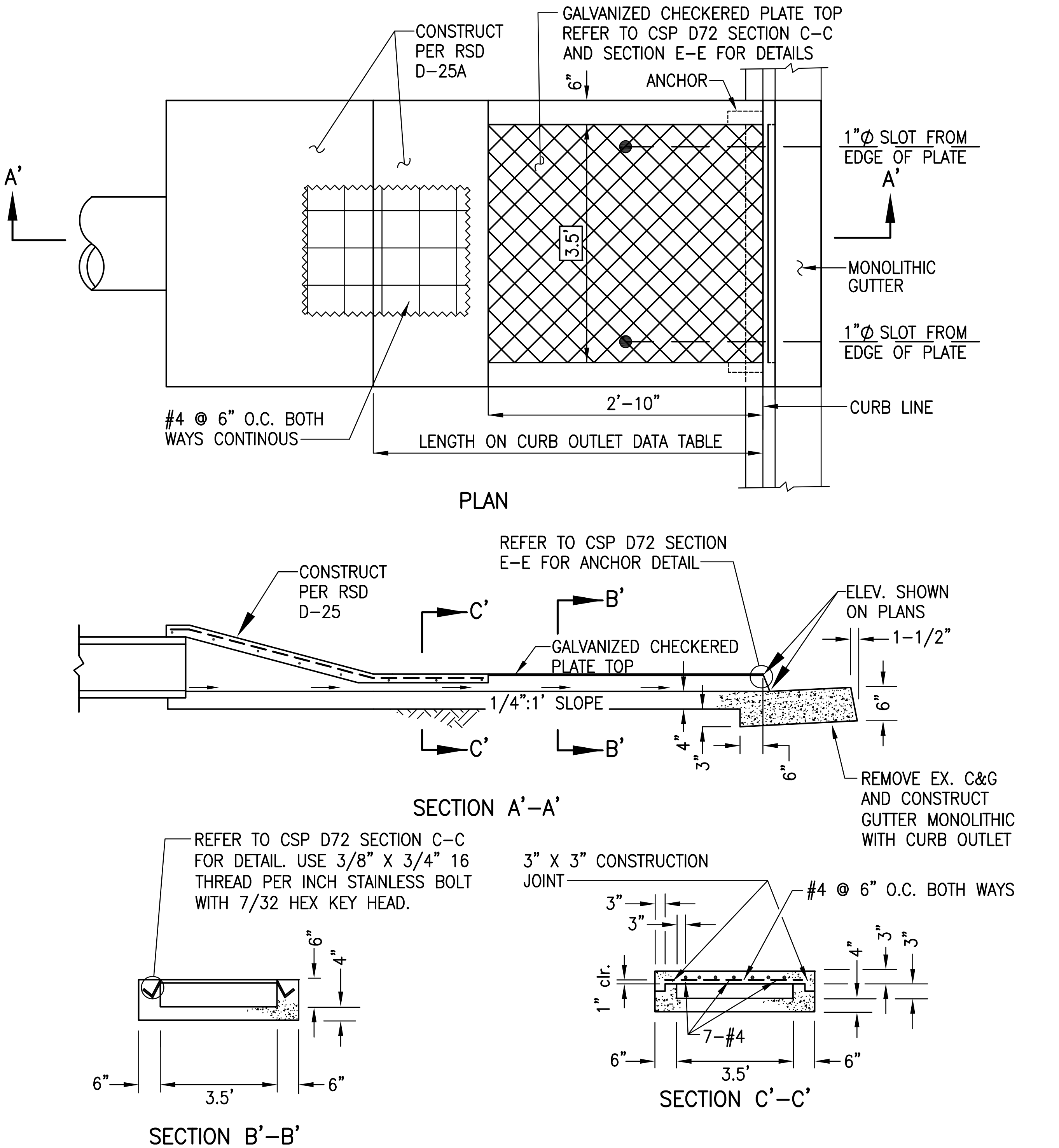
CURB OUTLET - TYPE A

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson 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
ORIGINAL		Widelski	8/18
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

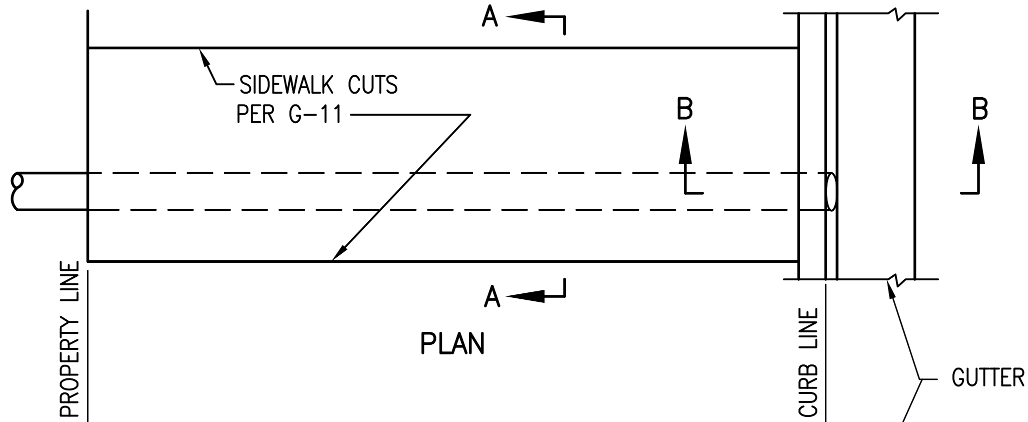
MODIFIED CURB OUTLET – TYPE B

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

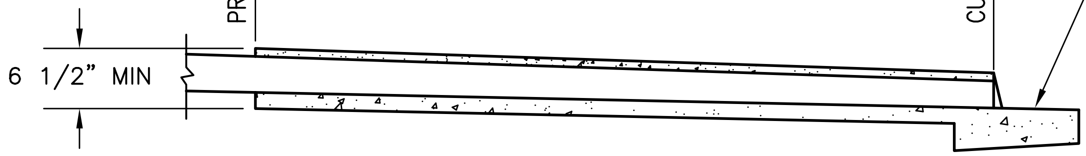
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

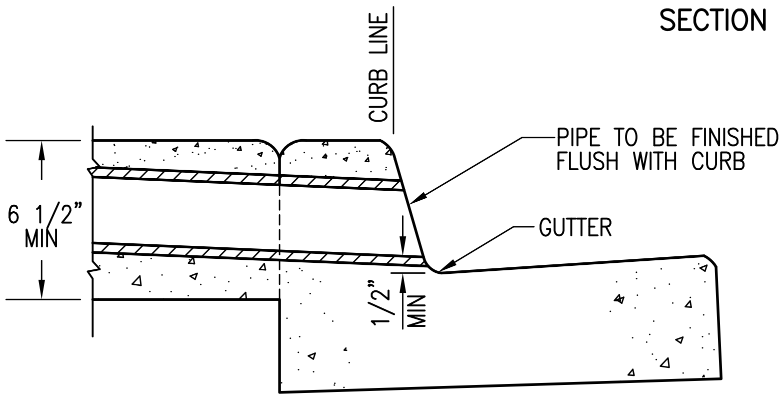
DRAWING NUMBER D-25B



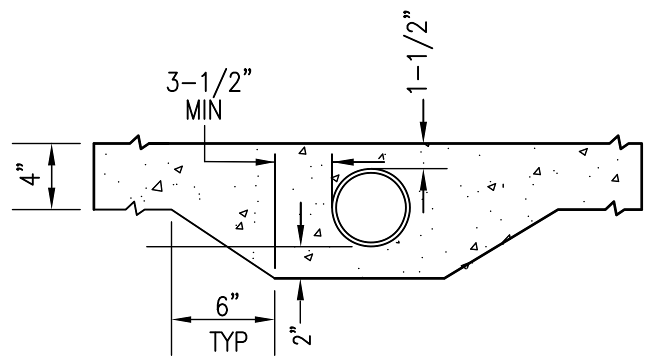
PLAN



SECTION

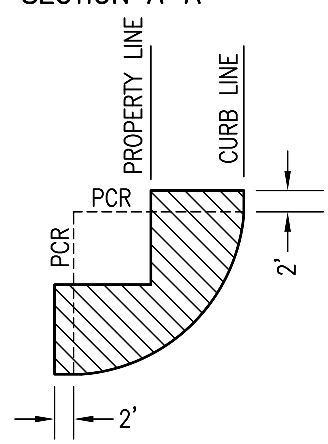


SECTION B–B



SECTION A–A

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



DRAIN SHALL NOT BE CONSTRUCTED WITHIN THE HATCHED AREA

BLOCK CORNER

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.

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

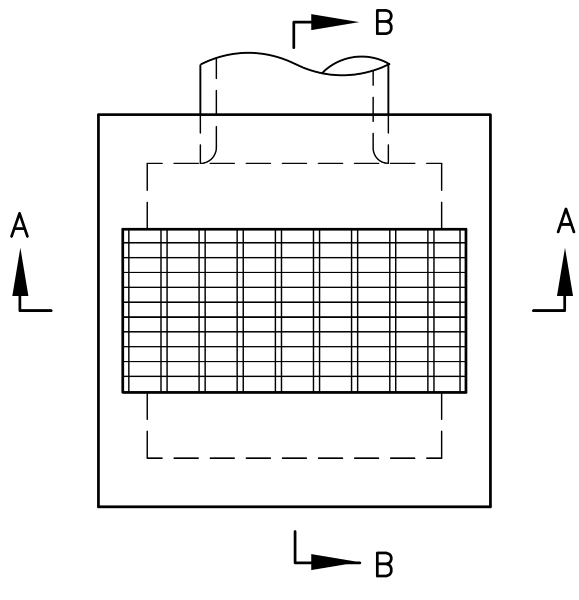
SIDEWALK UNDERDRAIN PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

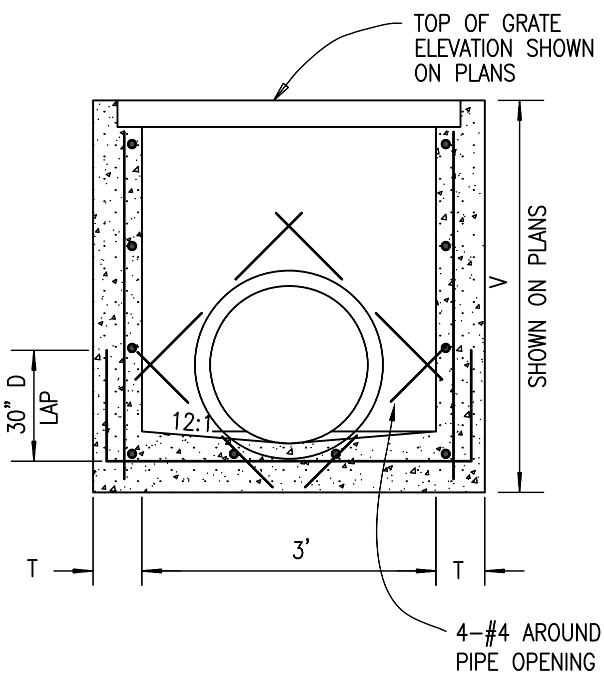
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

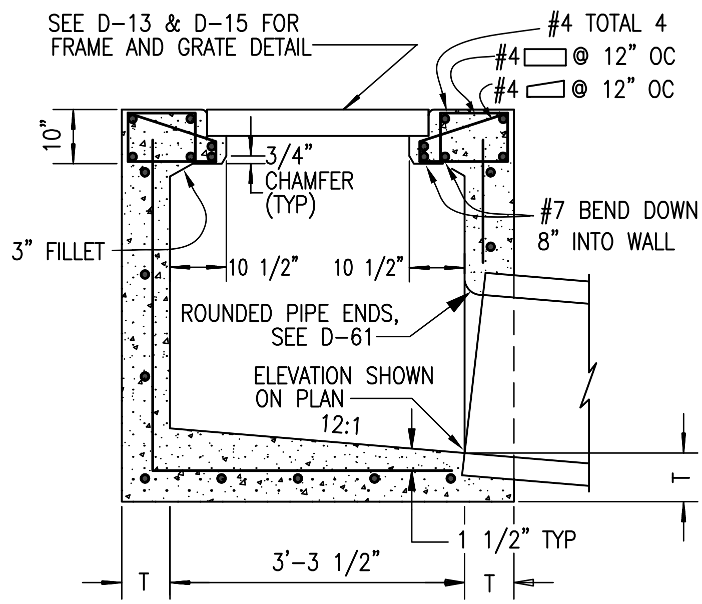
DRAWING NUMBER **D-27**



PLAN



SECTION A–A

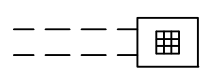


SECTION B–B

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
ORIGINAL		Solomon	7/79
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

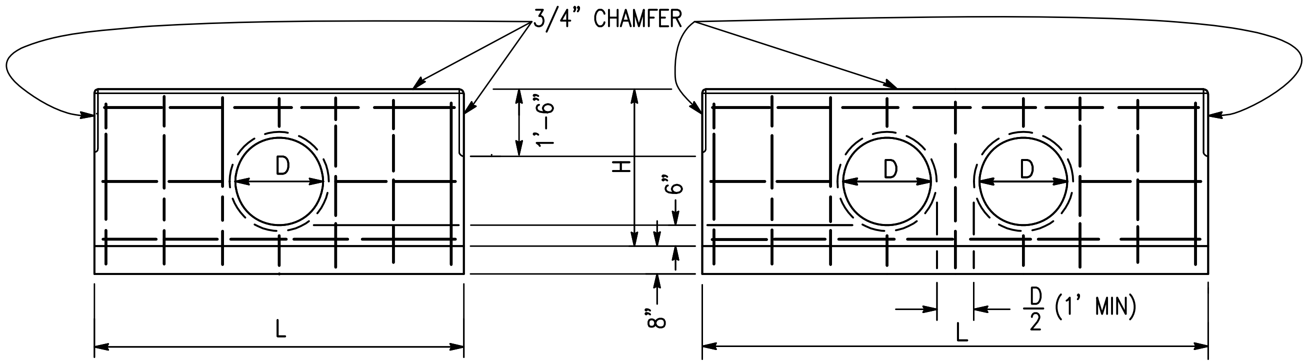
CATCH BASIN - TYPE I

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

03/24/2022

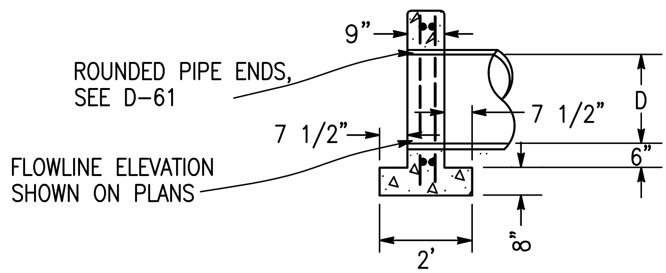
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-29**



FRONT ELEVATION
SINGLE HEADWALL

FRONT ELEVATION
DOUBLE HEADWALL



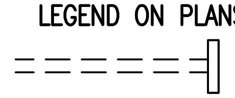
SECTION, SINGLE &
DOUBLE HEADWALLS

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

NOTES

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

LEGEND ON PLANS



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

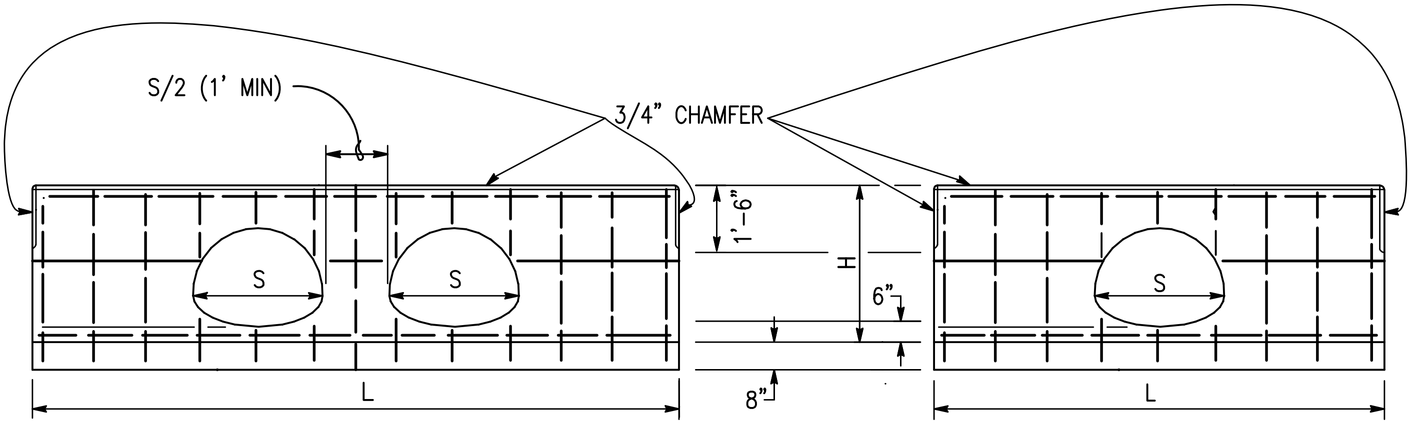
SAN DIEGO REGIONAL STANDARD DRAWING

STRAIGHT HEADWALL - TYPE A (CIRCULAR PIPE)

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

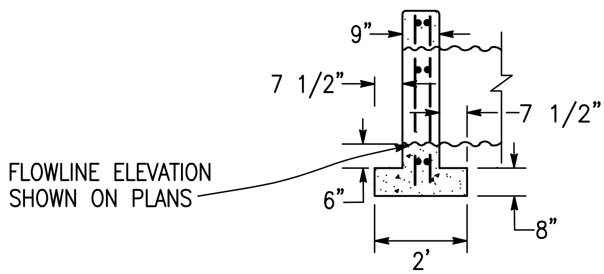
Samson Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-30**



ELEVATION – DOUBLE HEADWALL

ELEVATION – SINGLE HEADWALL



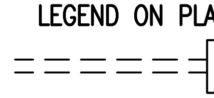
SECTION, SINGLE & DOUBLE HEADWALLS

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
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

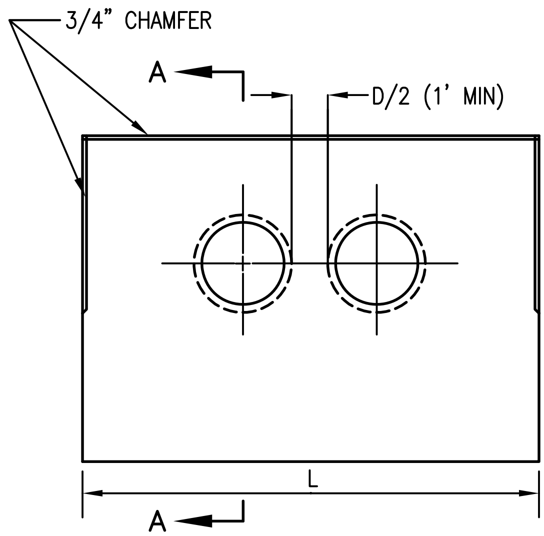
STRAIGHT HEADWALL - TYPE A (CORRUGATED STEEL PIPE - ARCH)

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

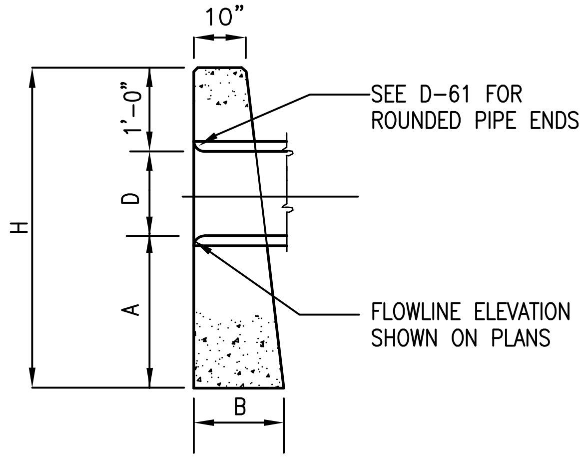
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

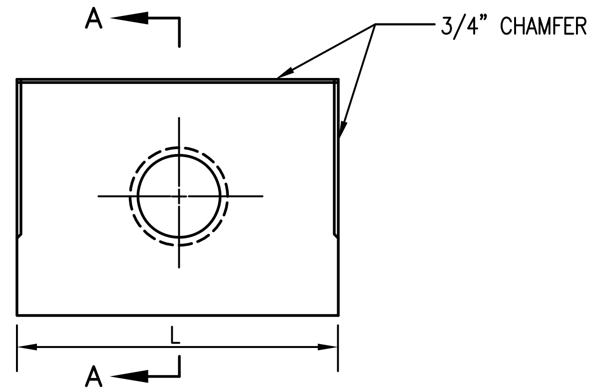
DRAWING NUMBER **D-31**



DOUBLE PIPE
ELEVATION



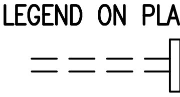
SECTION A–A



SINGLE PIPE
ELEVATION

D	A	B	H	SINGLE L	SINGLE CONCRETE (C.Y.)	DOUBLE L	DOUBLE 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

LEGEND ON PLANS



NOTES

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

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

SAN DIEGO REGIONAL STANDARD DRAWING

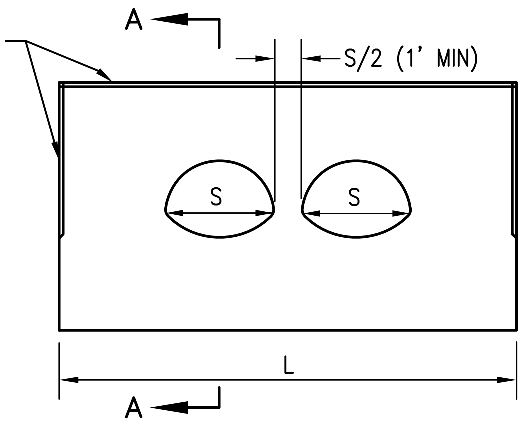
STRAIGHT HEADWALL - TYPE B (CIRCULAR PIPE)

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

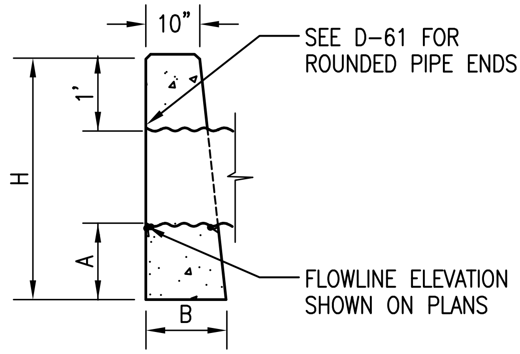
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

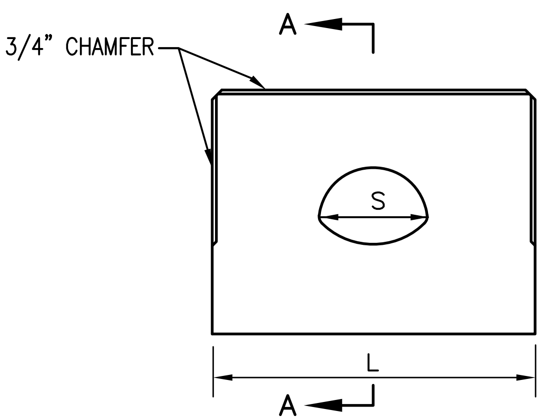
DRAWING NUMBER **D-32**



DOUBLE PIPE ELEVATION



SECTION A–A



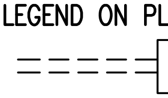
SINGLE PIPE ELEVATION

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

SAN DIEGO REGIONAL STANDARD DRAWING

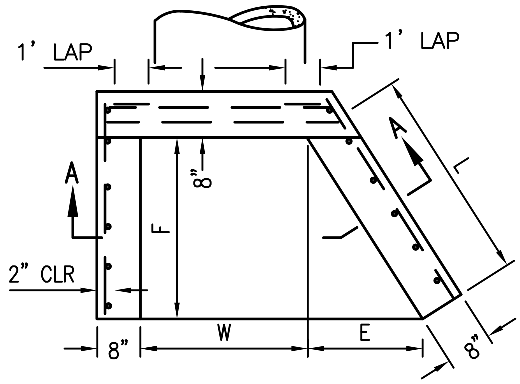
STRAIGHT HEADWALL - TYPE B [CORRUGATED STEEL PIPE - ARCH]

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

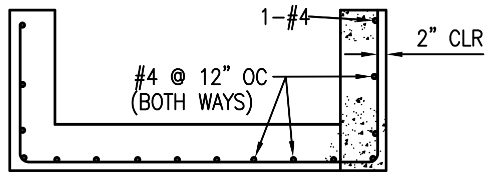
DRAWING NUMBER **D-33**



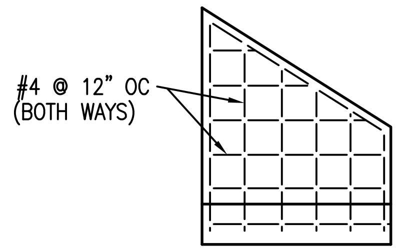
U TYPE

WING TYPE

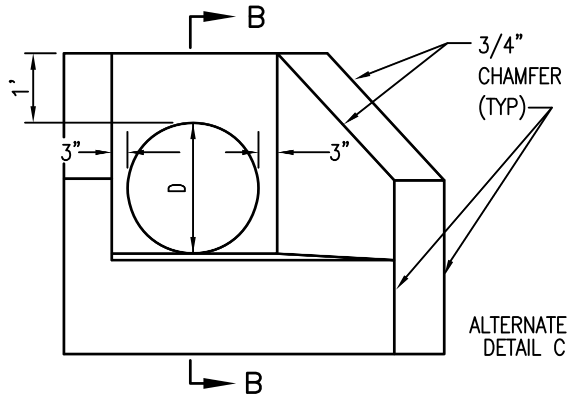
PLAN



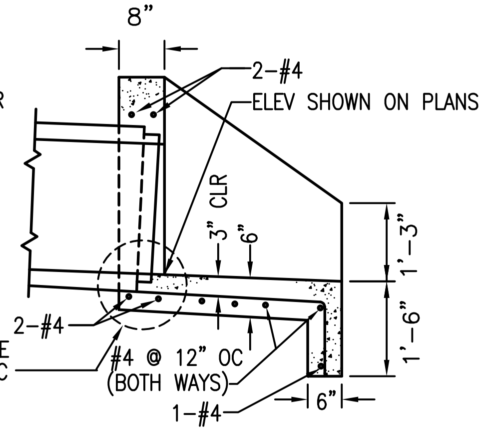
SECTION A–A



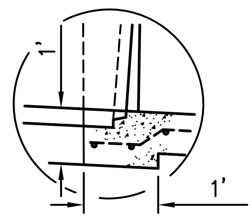
WING WALL REINFORCING



ELEVATION



SECTION B–B



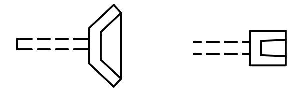
ALT DETAIL C

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

NOTES

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

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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

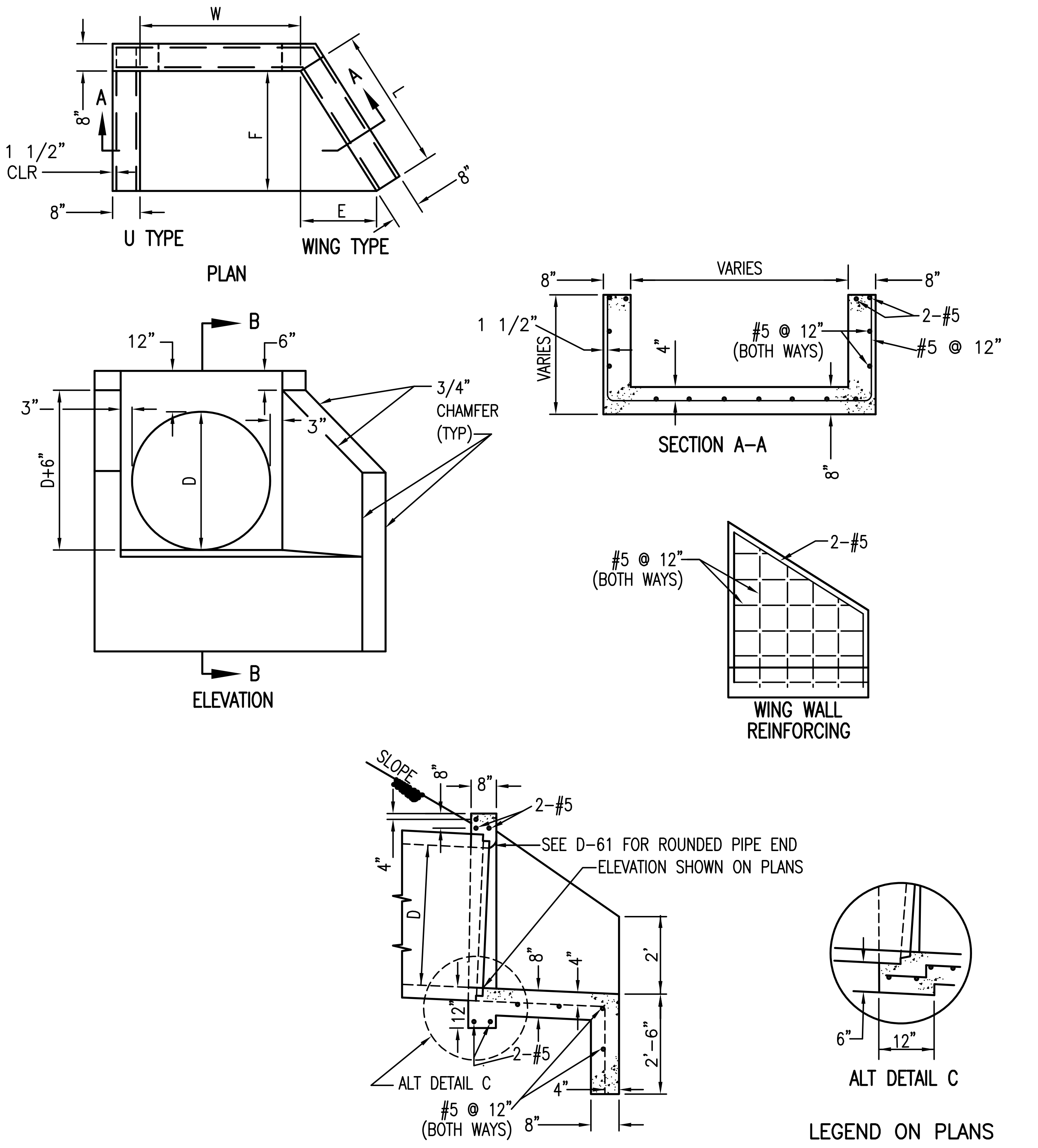
WING AND U TYPE HEADWALLS FOR 18" TO 36" PIPES

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

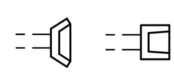
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-34**



LEGEND ON PLANS



NOTE

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

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

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

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-35A**

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

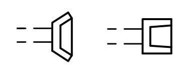
NOTE: DIMENSIONS E AND L APPLY TO WING TYPE ONLY.

ø OF PIPE	DIMENSIONS			SINGLE PIPE					DOUBLE PIPE				
					U TYPE		WING TYPE			U TYPE		WING TYPE	
	L	E	F	W	CONC. (CY)	STEEL (LBS)	CONC. (CY)	STEEL (LBS)	W	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 SKEWOF 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
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

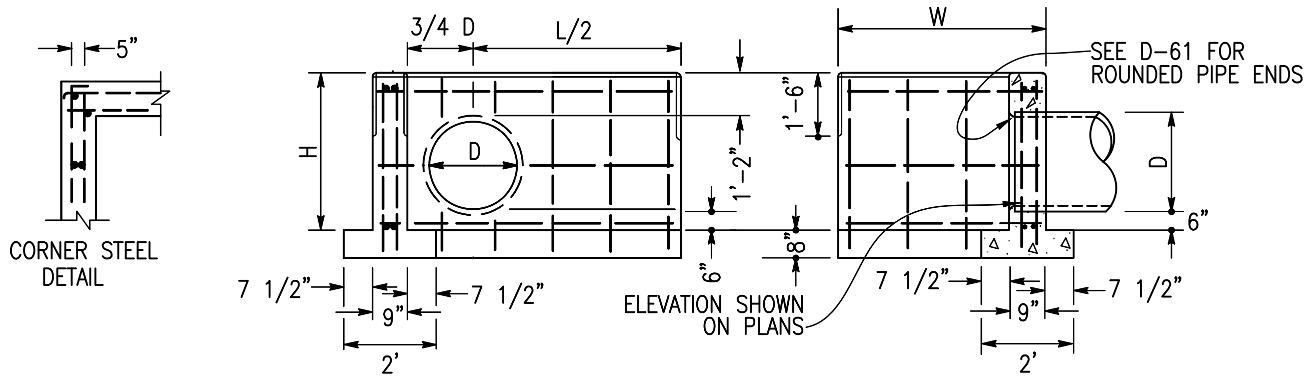
WING AND U TYPE HEADWALLS FOR 42" TO 84" PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-35B**



ELEVATION

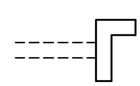
SECTION

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 REINFORCEING 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 PIPETO THE END OF THE HEADWALL AS SHOWN.
4. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

LEGEND ON PLANS



Revision	By	Approved	Date
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Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

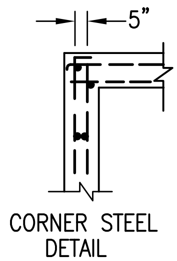
L TYPE HEADWALLS (CIRCULAR PIPES)

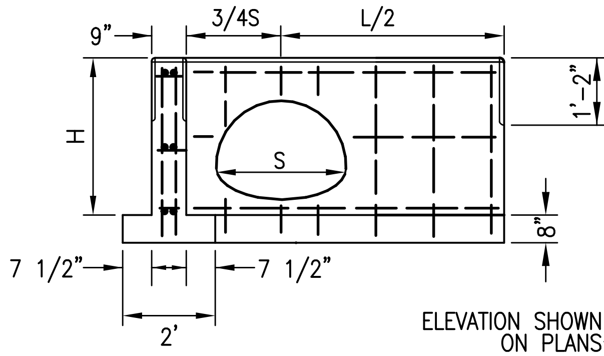
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

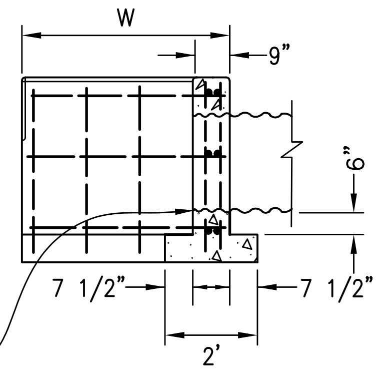
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-36**





ELEVATION



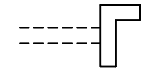
SECTION

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

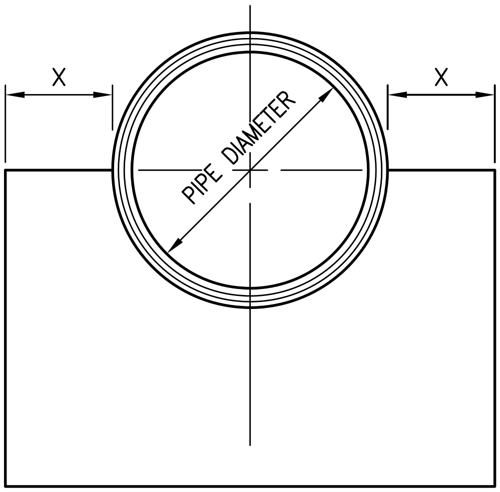
SAN DIEGO REGIONAL STANDARD DRAWING

L TYPE HEADWALLS (CORRUGATED STEEL PIPE - ARCH)

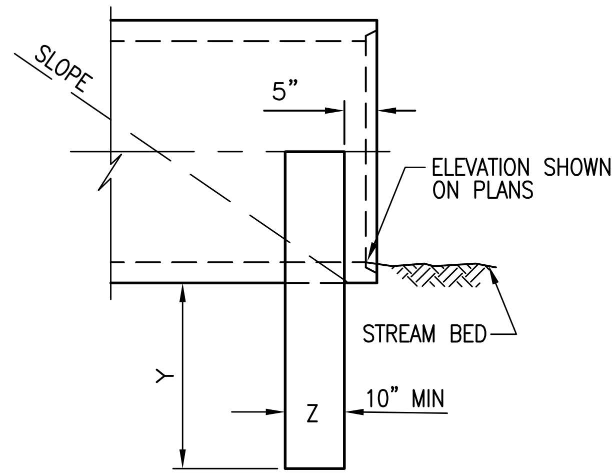
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-37**



FACE ELEVATION



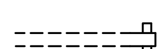
SIDE ELEVATION

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

NOTES

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

LEGEND ON PLANS



Revision	By	Approved	Date
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Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

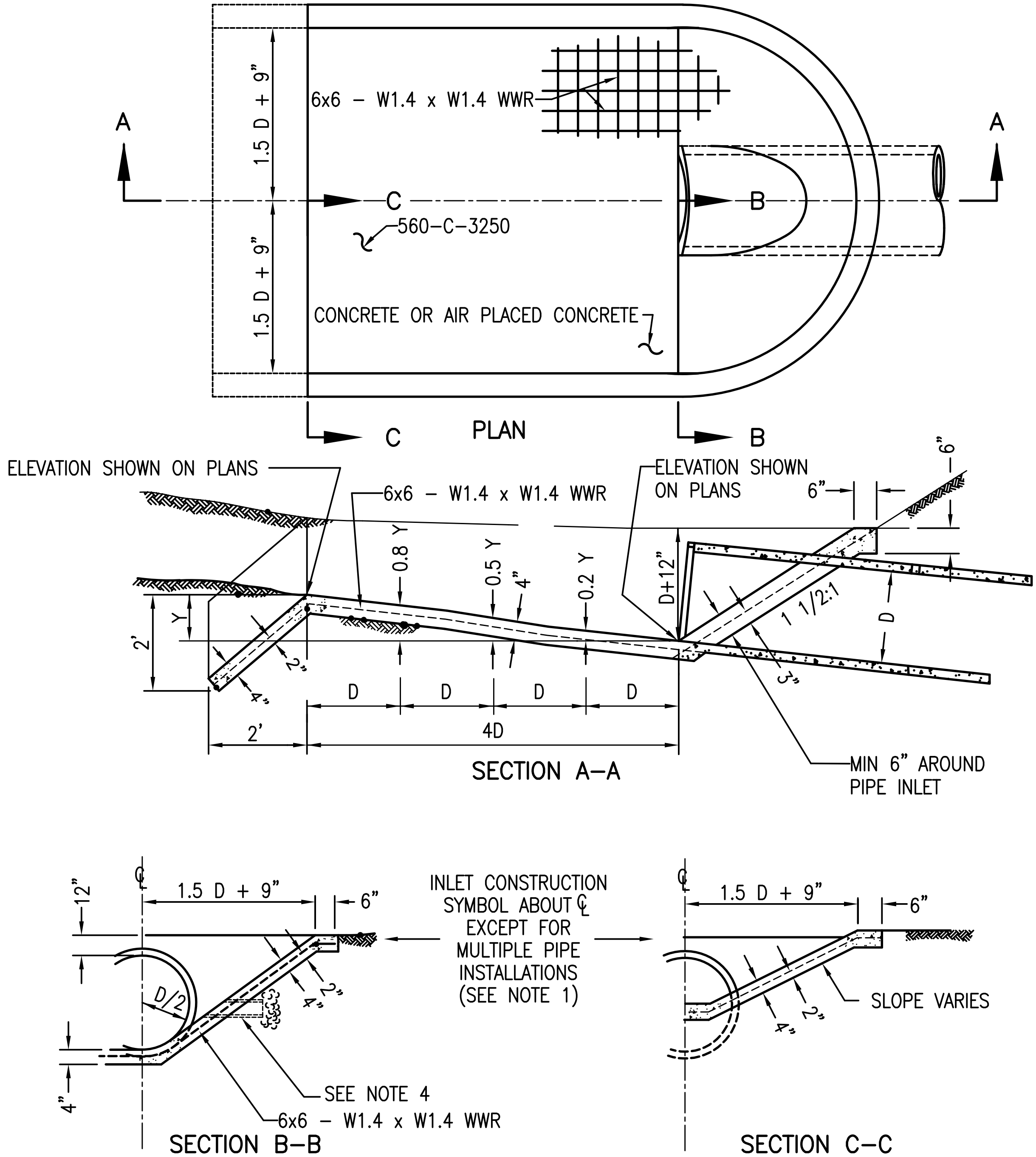
CURTAIN WALL

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

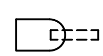
DRAWING NUMBER **D-38**



NOTES

1. WHEN MORE THAN ONE PIPE IS USED THE PROFILE VIEW SHOWN SHALLHOLD 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



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

SAN DIEGO REGIONAL STANDARD DRAWING

INLET APRON FOR CULVERTS UP TO 42" DIAMETER

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

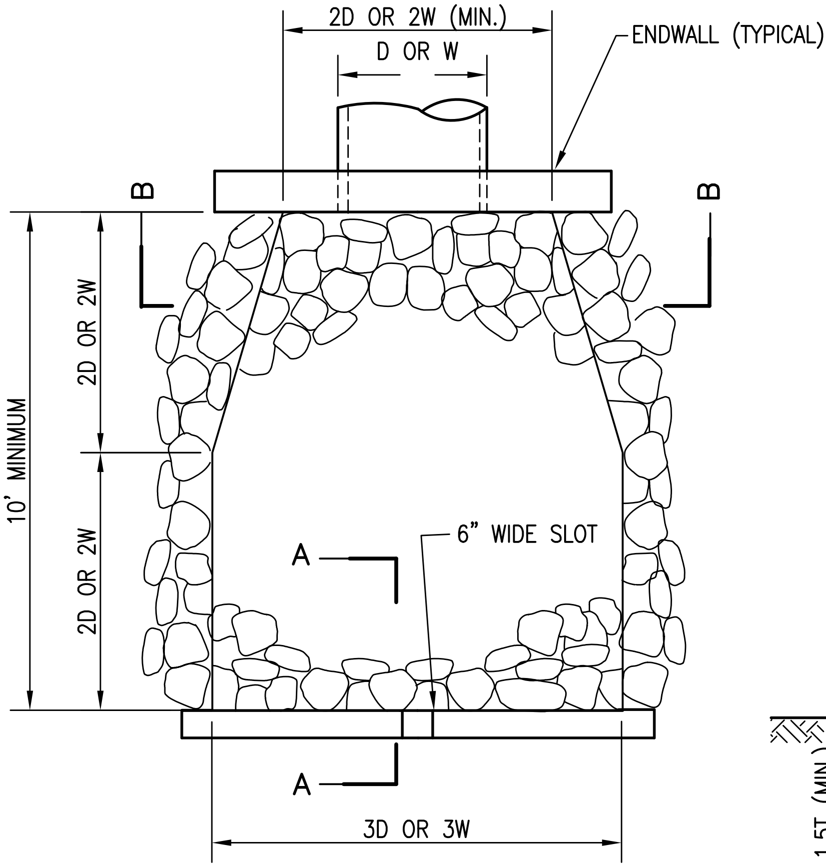
DRAWING NUMBER **D-39**

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

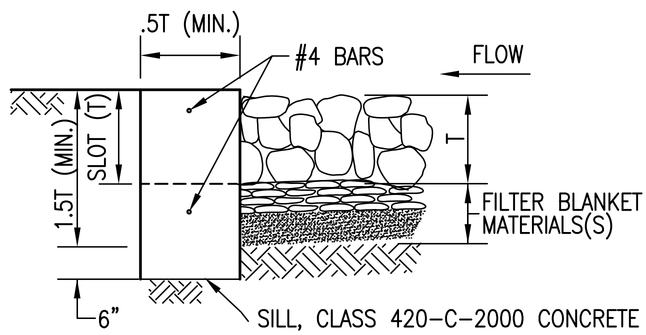
DESIGN VELOCITY (FT/SEC) *	ROCK CLASS	RIP-RAP THICKNESS "T" (MIN)
6-10	NO. 2 BACKING	1.1 FT
10-12	1/4 TON	2.7 FT
12-14	1/2 TON	3.5 FT
14-16	1 TON	4.4 FT
16-18	2 TON	5.4 FT

* OVER 20 FT/SEC REQUIRES SPECIAL DESIGN

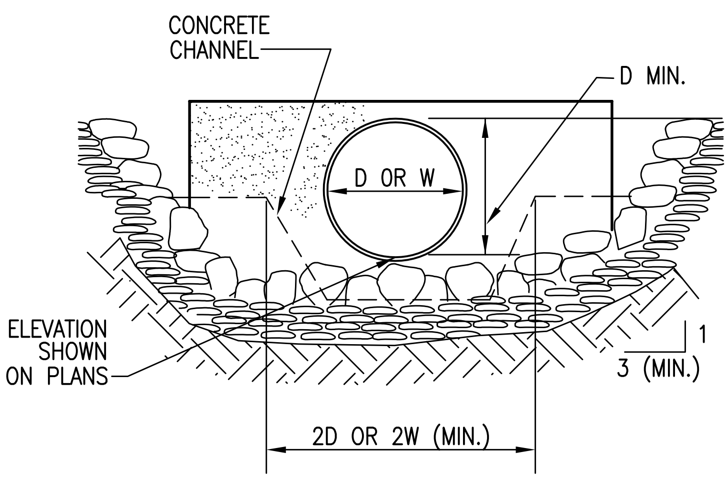
D = PIPE DIAMETER ø
W = BOTTOM WIDTH OF CHANNEL



PLAN



SECTION A-A



SECTION B-B

NOTES

1. 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.
2. RIP-RAP SHALL BE EITHER QUARRY STONE OR BROKEN CONCRETE (IF SHOWN ON PLANS). COBBLES ARE NOT ACCEPTABLE.
3. 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.
4. SEE TABLE 200-1.7 IN THE SAN DIEGO REGIONAL SUPPLEMENT TO GREENBOOK FOR SELECTION OF FILTER BLANKET.
5. RIP-RAP ENERGY DISSIPATERS SHALL BE DESIGNATED AS EITHER TYPE 1 OR TYPE 2. TYPE 1 SHALL BE WITH CONCRETE SILL; TYPE 2 SHALL BE WITHOUT SILL.

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

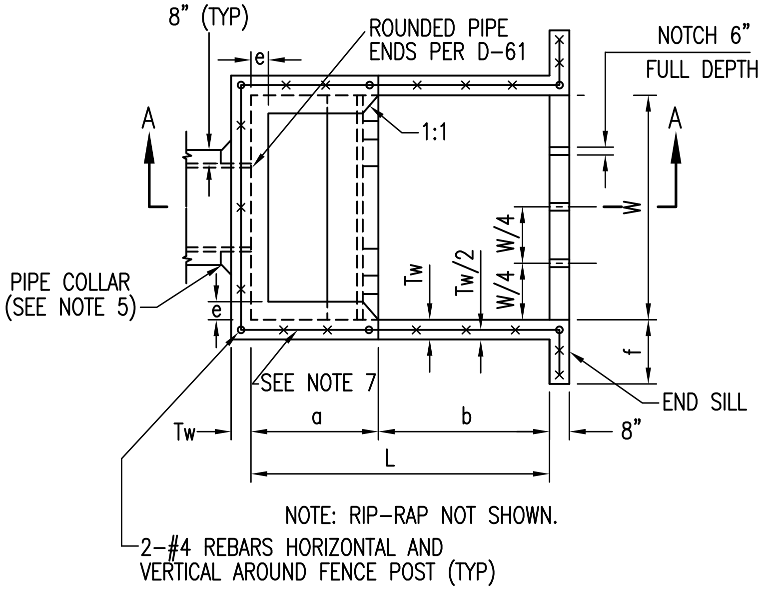
SAN DIEGO REGIONAL STANDARD DRAWING

RIP RAP ENERGY DISSIPATER

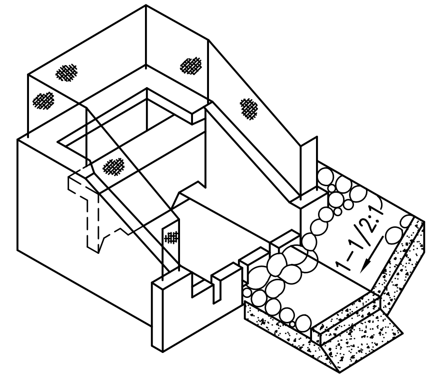
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

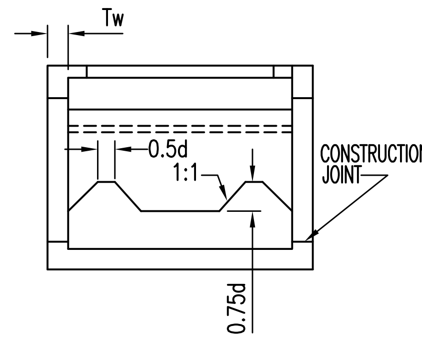
DRAWING NUMBER **D-40**



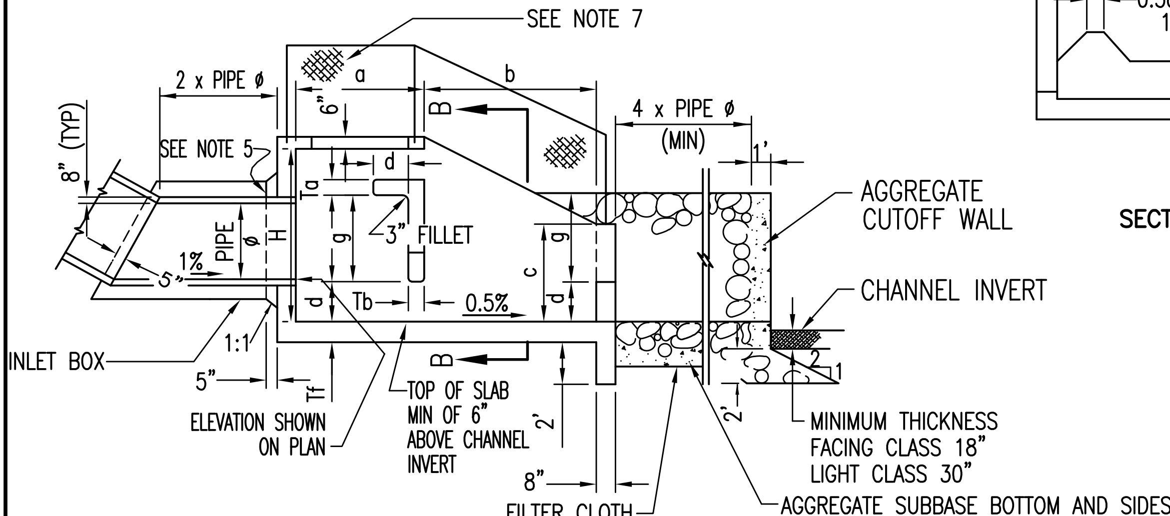
PLAN



PICTORIAL VIEW



SECTION B–B



SECTION A–A

NOTES

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

SEE D-41B FOR DIMENSIONS.

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ORIGINAL		Kercheval	12/75
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Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE ENERGY DISSIPATER

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-41A**

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

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

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Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

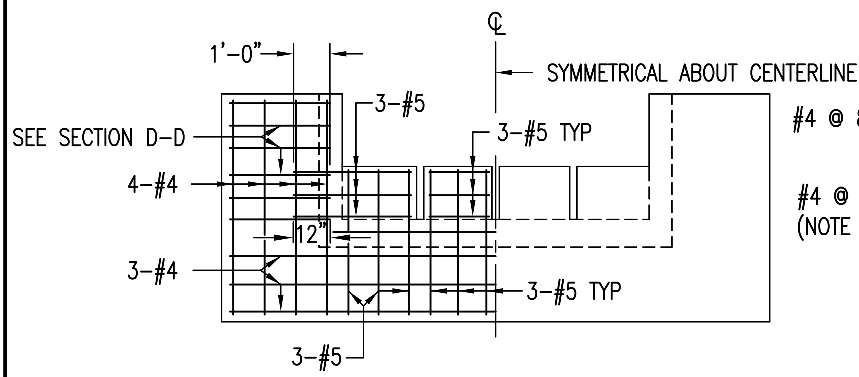
CONCRETE ENERGY DISSIPATER

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

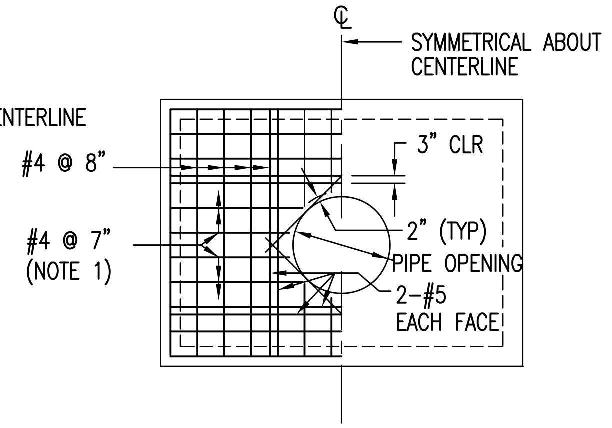
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

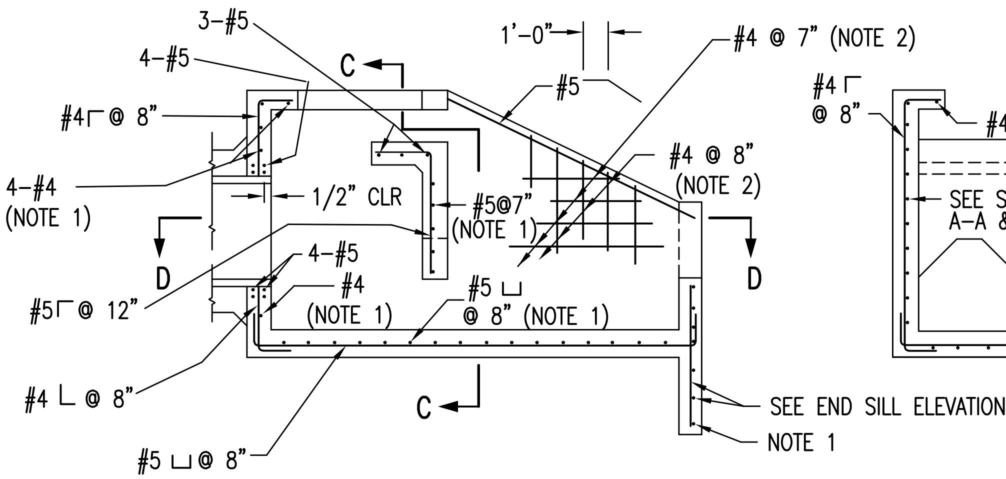
DRAWING NUMBER **D-41B**



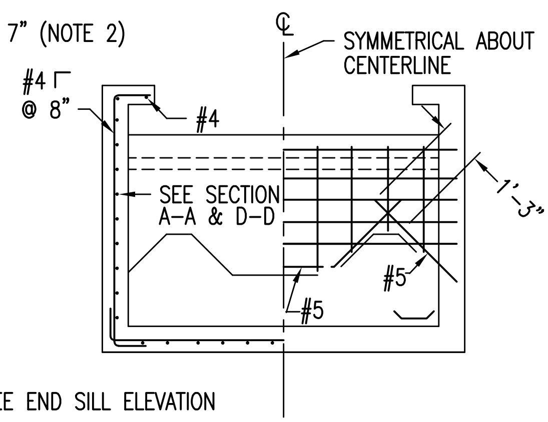
END SILL ELEVATION



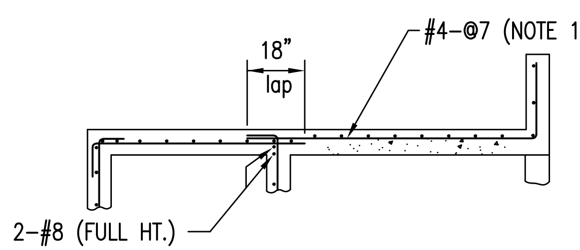
HEADWALL ELEVATION



SECTION A-A



SECTION C-C



SECTION D-D

NOTES

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

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ORIGINAL		Kercheval	12/75
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SAN DIEGO REGIONAL STANDARD DRAWING

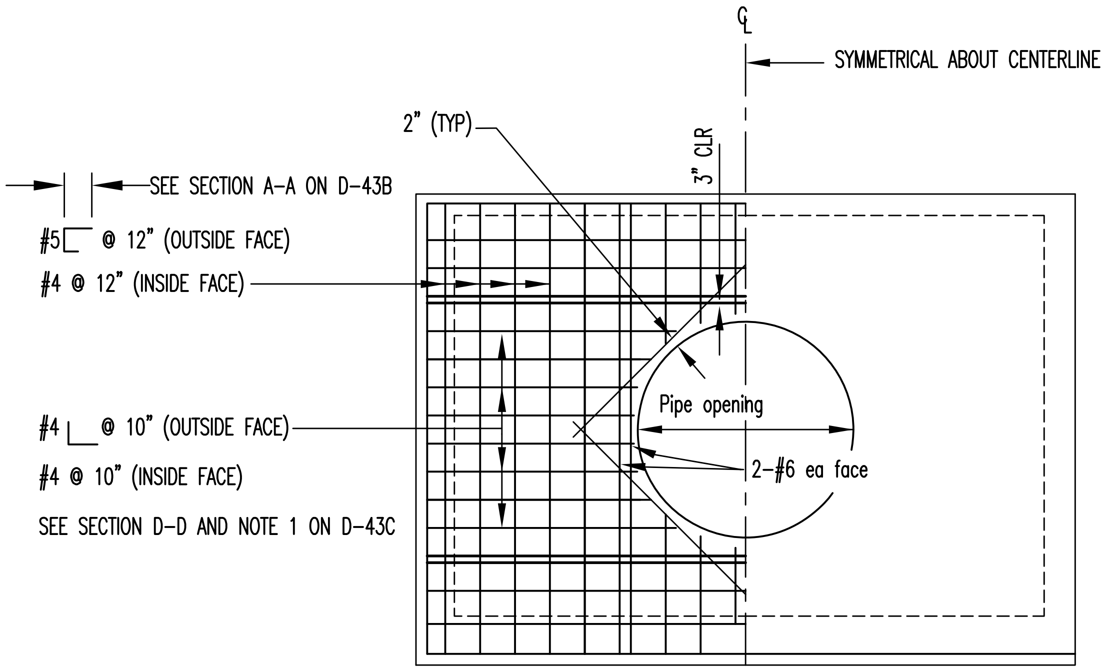
CONCRETE ENERGY DISSIPATER [REINFORCEMENT] 18" TO 30" DIAMETER PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

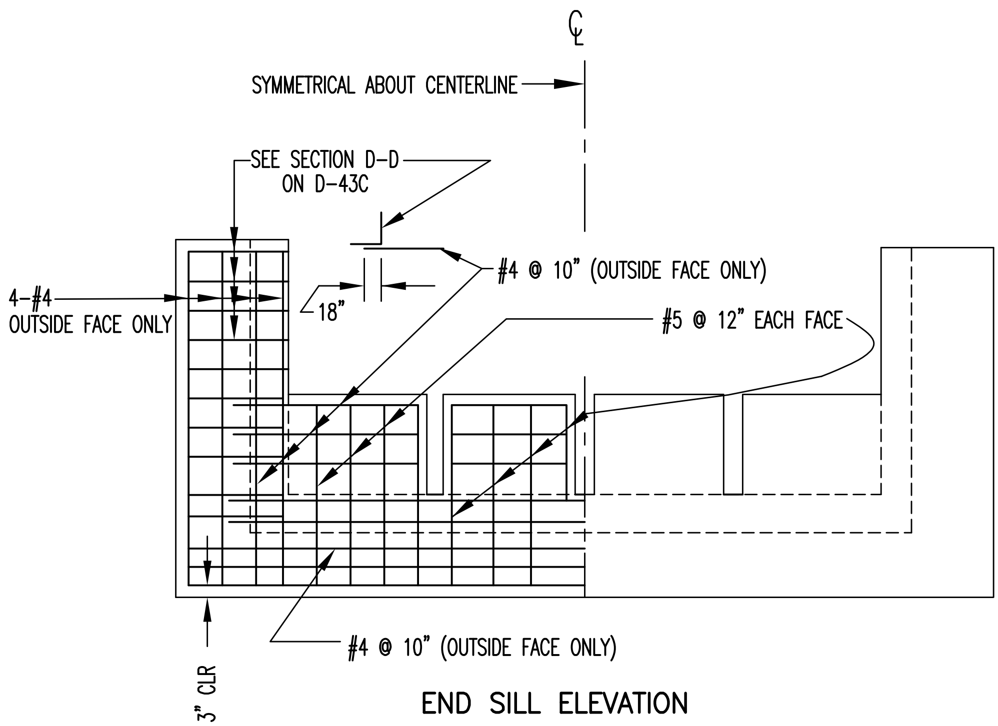
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **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

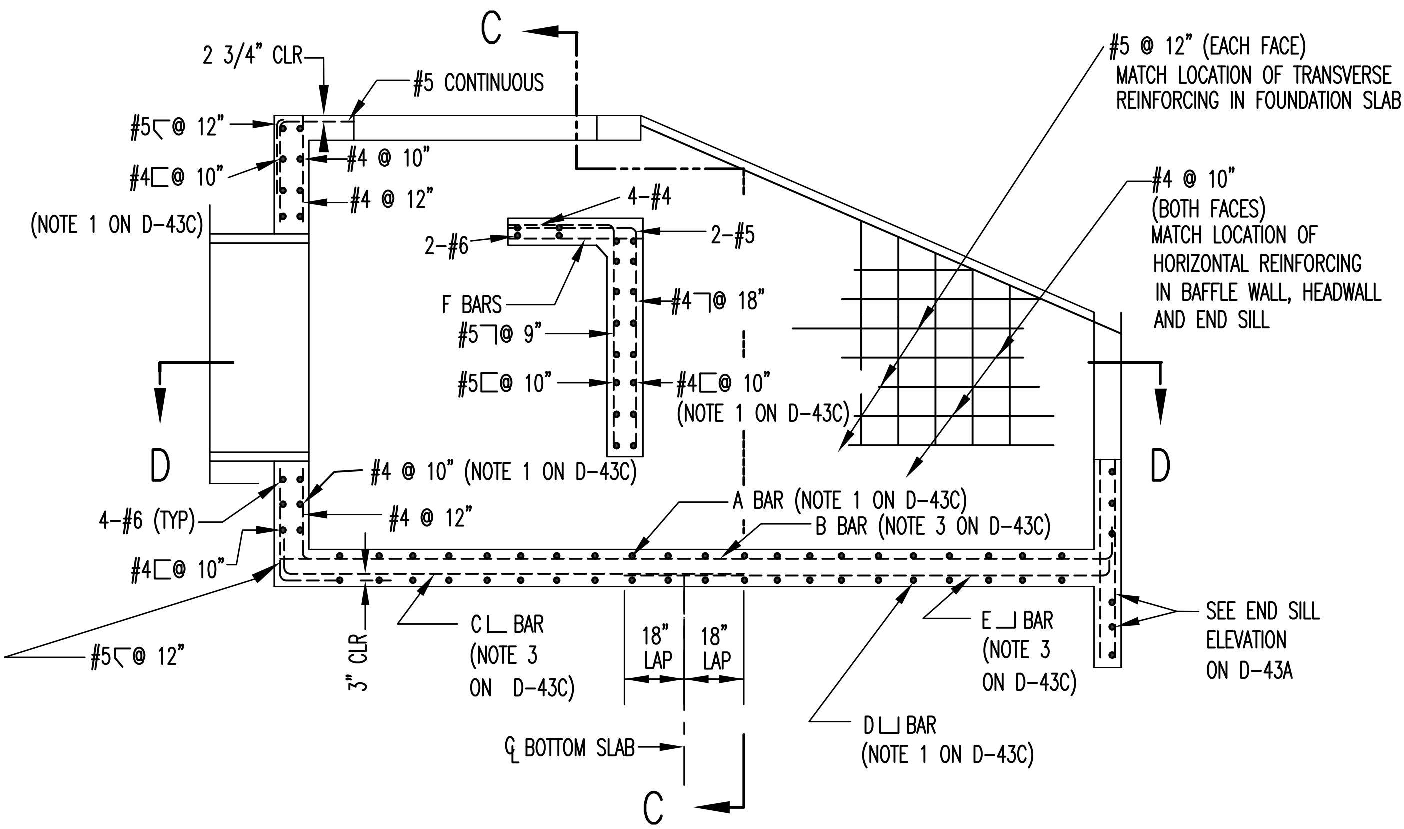
CONCRETE ENERGY DISSIPATER [REINFORCEMENT] 36" TO 72" DIAMETER PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

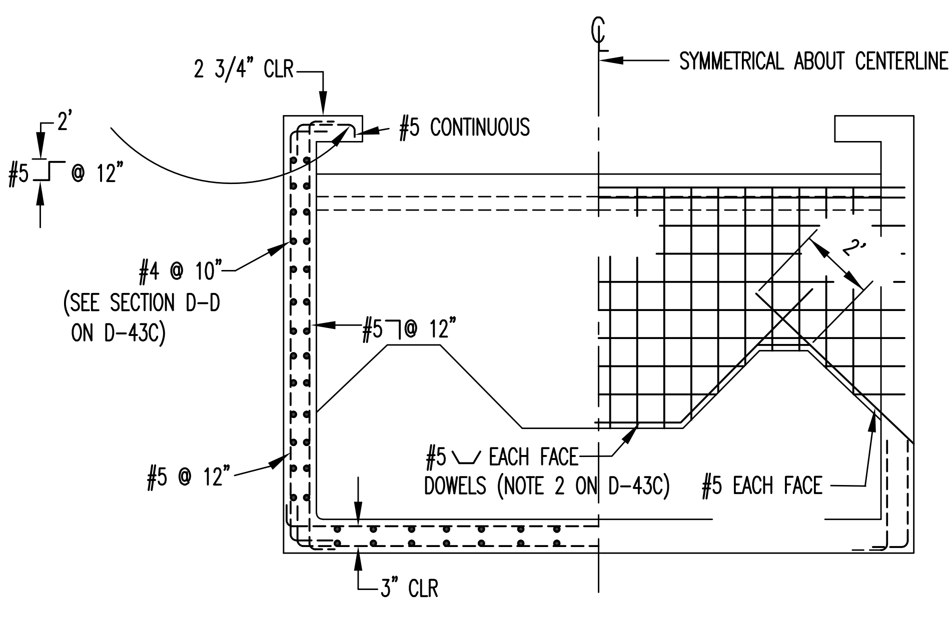
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-43A**



SECTION A–A



SECTION C–C

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

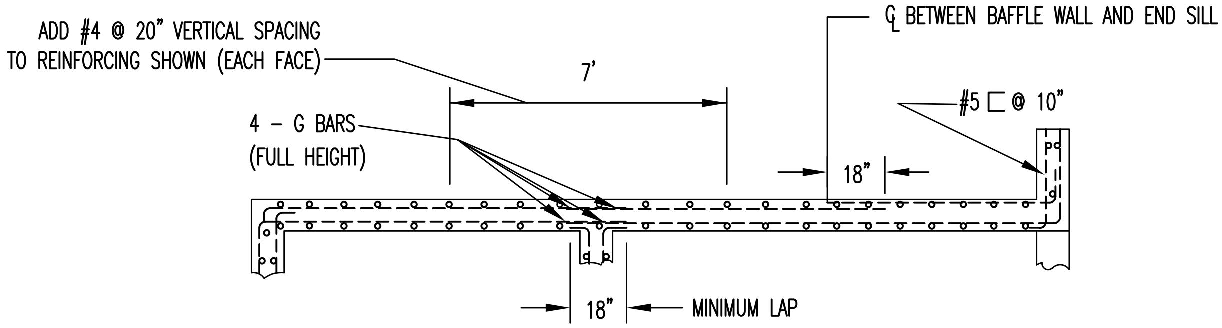
CONCRETE ENERGY DISSIPATER
[REINFORCEMENT]
36" TO 72" DIAMETER PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-43B**



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

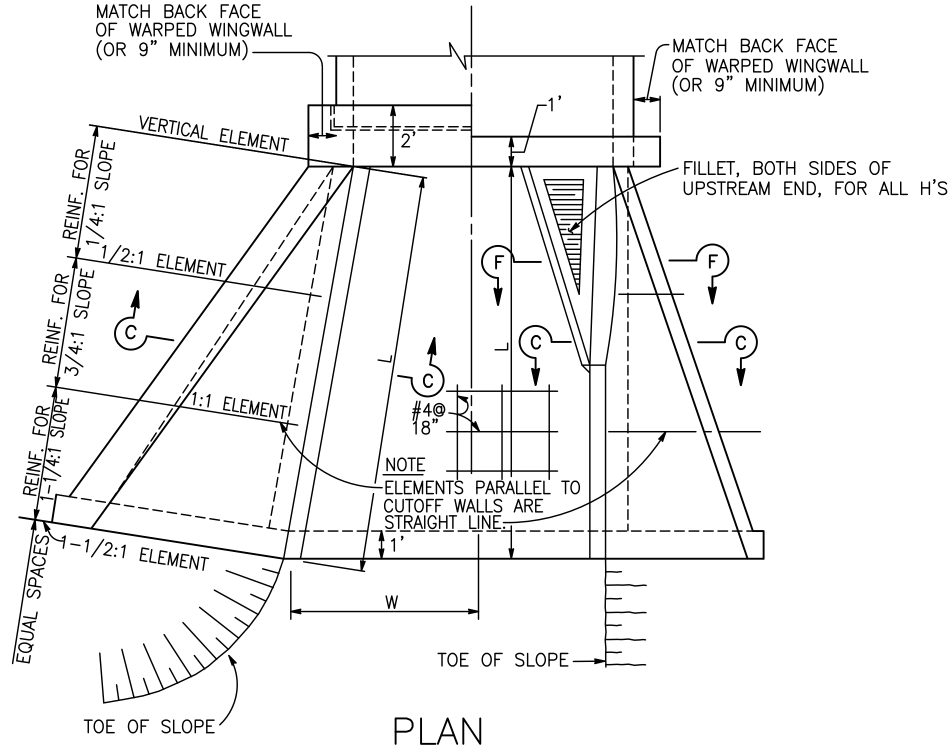
SAN DIEGO REGIONAL STANDARD DRAWING

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

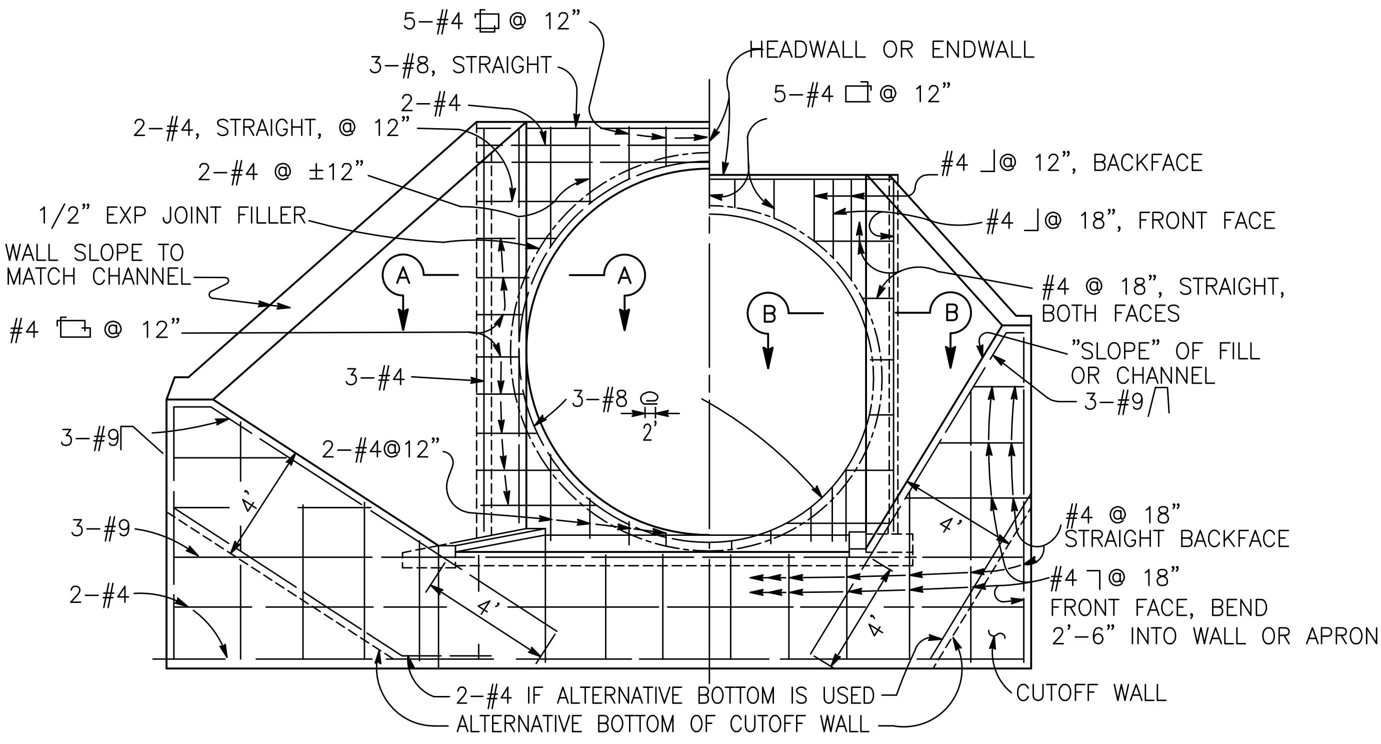
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-43C**



PLAN



TYPICAL FOR MAXIMUM H > 10'

TYPICAL FOR MAXIMUM H ≤ 10'

END ELEVATION

IF AT UPSTREAM END, FILLET IS NOT SHOWN

NOTE

SEE NOTES ON D-44D.

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

SAN DIEGO REGIONAL STANDARD DRAWING

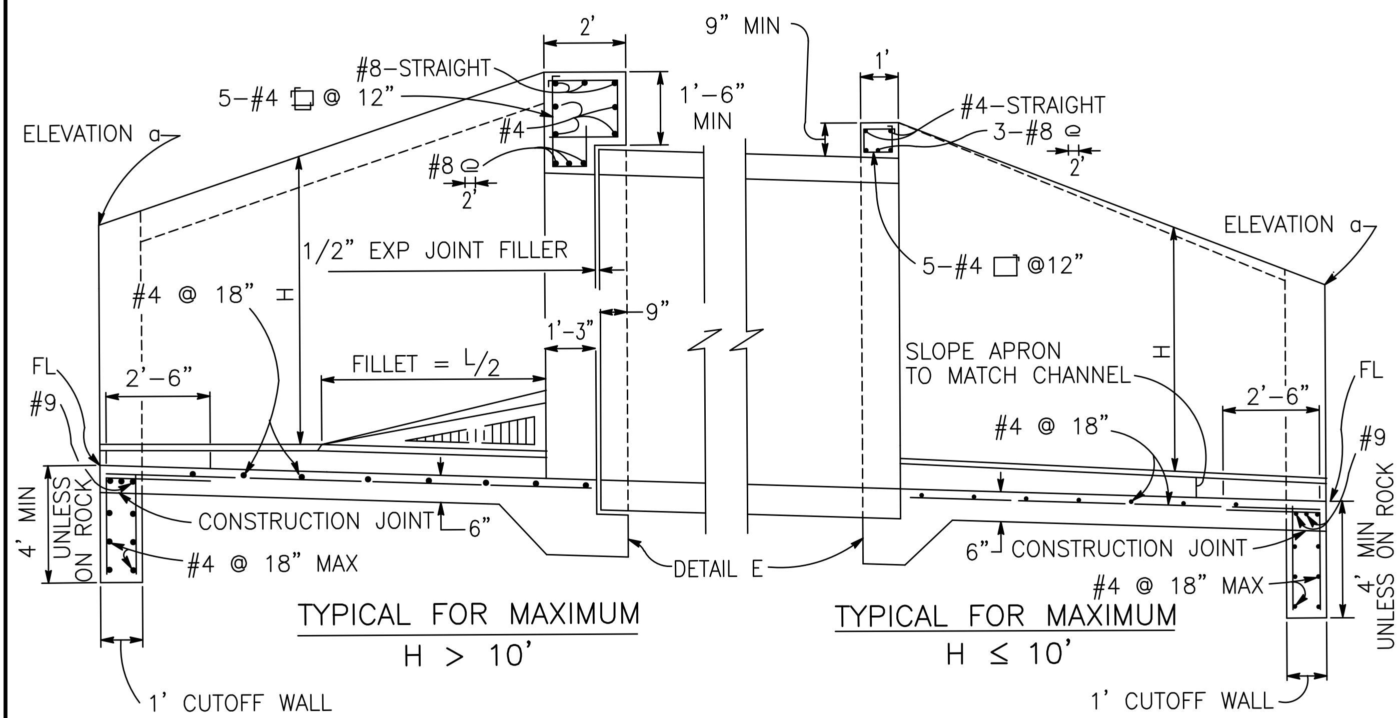
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

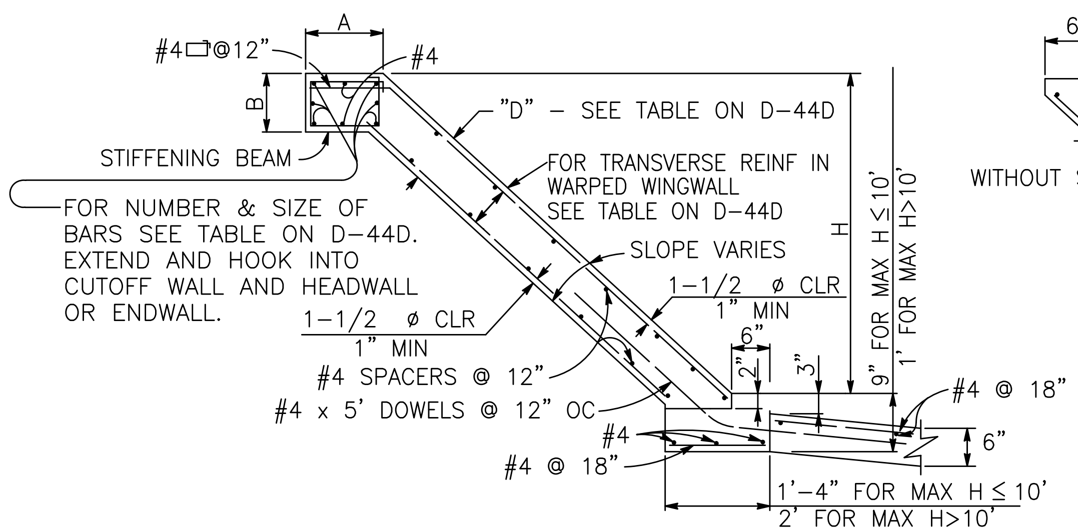
Chairperson R.C.E. 52241 Date

PIPE CULVERT - HEADWALLS, ENDWALLS & WARPED WINGWALLS

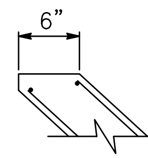
DRAWING NUMBER **D-44A**



PART LONGITUDINAL SECTION



SECTION C–C



WITHOUT STIFFENING BEAM

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
ORIGINAL		Kercheval	12/75
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SAN DIEGO REGIONAL STANDARD DRAWING

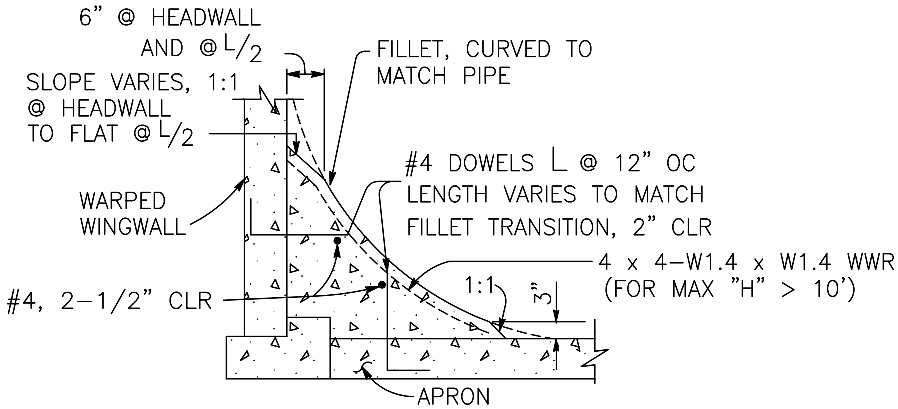
PIPE CULVERT - HEADWALLS, ENDWALLS & WARPED WINGWALLS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

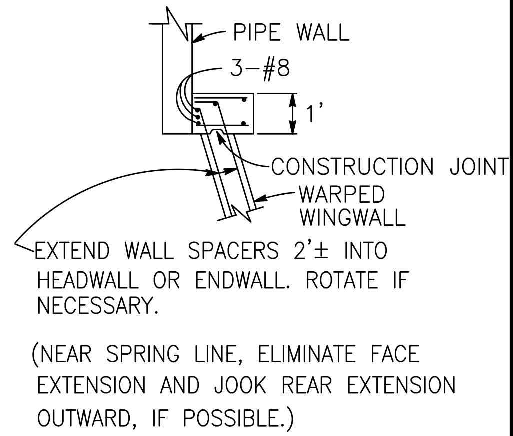
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

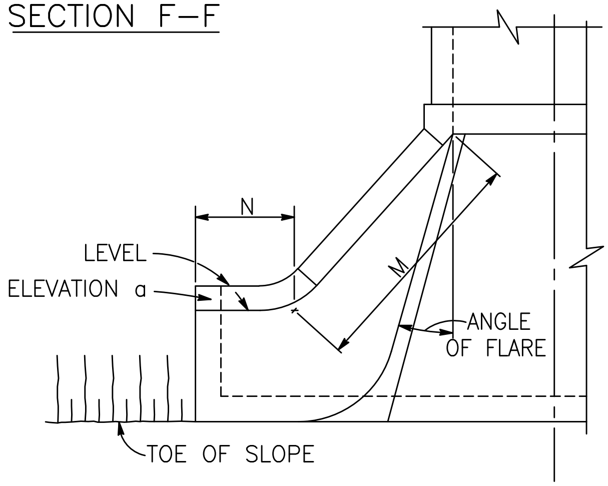
DRAWING NUMBER **D-44B**



SECTION F–F

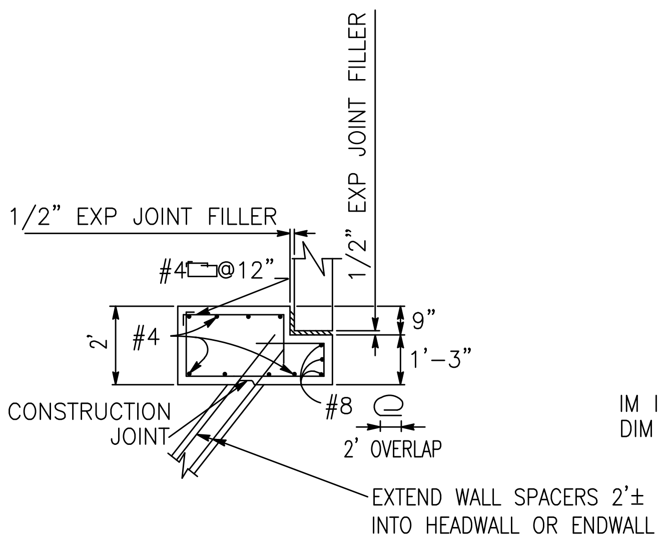


SECTION B–B

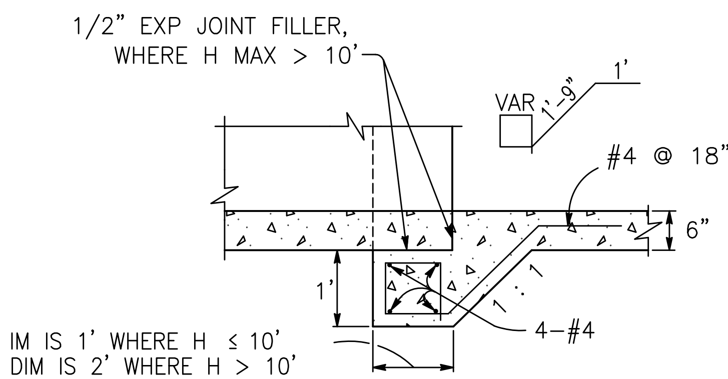


ALTERNATIVE WARPED WINGWALL

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
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

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-44C**

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

WALL DIMENSIONS AND REINFORCING

ELEMENT SLOPE	H	8'OR LESS	10'	12'	14'	16'	18'	20'
1/4:1	FRONT FACE REINF REAR FACE REINF	#4@12 #4@12	#4@ 7 #4@12	#5@ 7 #4@12	#5@ 5 #4@12	#6@ 6 #4@12	#7@ 7 #4@12	#7@ 6 #4@12
3/4:1	FRONT FACE REINF REAR FACE REINF	#4@12 #4@12	#4@12 #4@12	#4@12 #4@12	#4@12 #4@10	#4@10 #4@ 7	#4@ 8 #4@ 6	#4@ 6 #5@ 8
1-1/4:1	FRONT FACE REINF REAR FACE REINF	#4@12 #4@ 8	#4@12 #4@ 8	#4@12 #4@ 5	#4@12 #5@ 6	#4@12 #6@ 7	#4@12 #6@ 6	#4@12 #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			A= 1'					
10'	WALL.			B= 9"					
12'						A= 1'-6"			
14'		TOTAL 6-#6			B= 1'			A= 1'-10"	
16'					TOTAL 6-#7		B=1'		A=2'
18'						TOTAL 6-#8		B= 1'-6"	
20'							TOTAL 8-#9		

NOTES

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

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

SAN DIEGO REGIONAL STANDARD DRAWING

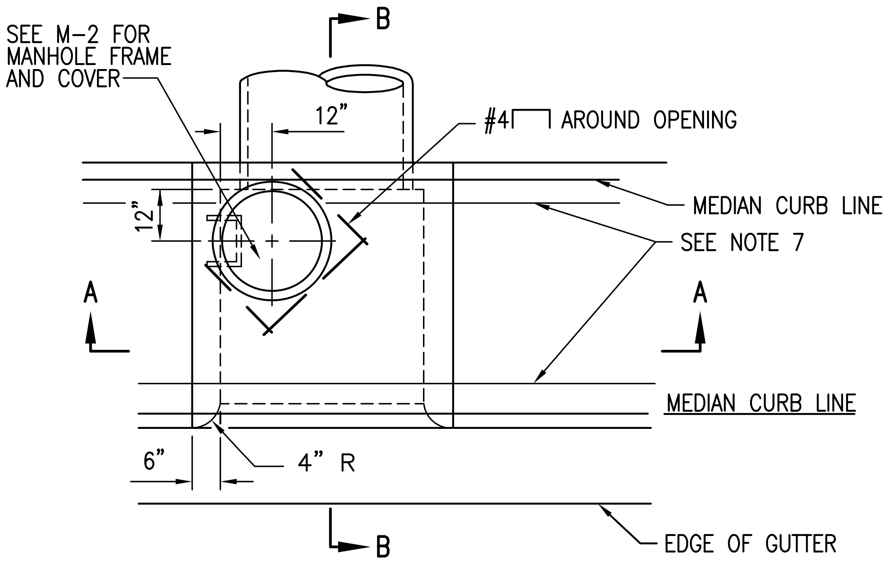
PIPE CULVERT - HEADWALLS, ENDWALLS & WARPED WINGWALLS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

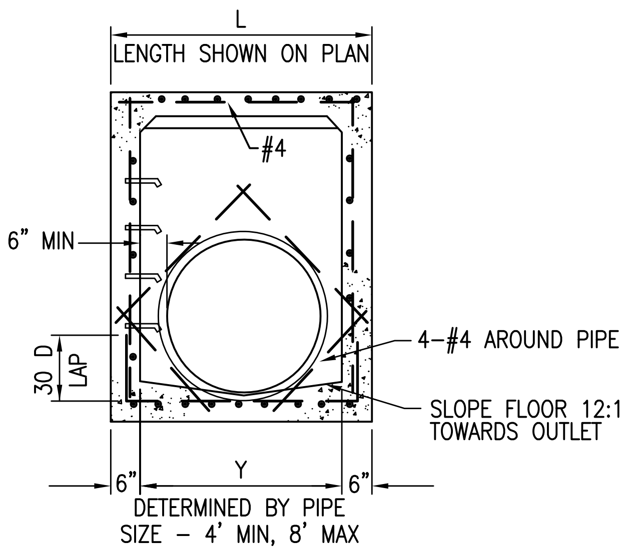
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

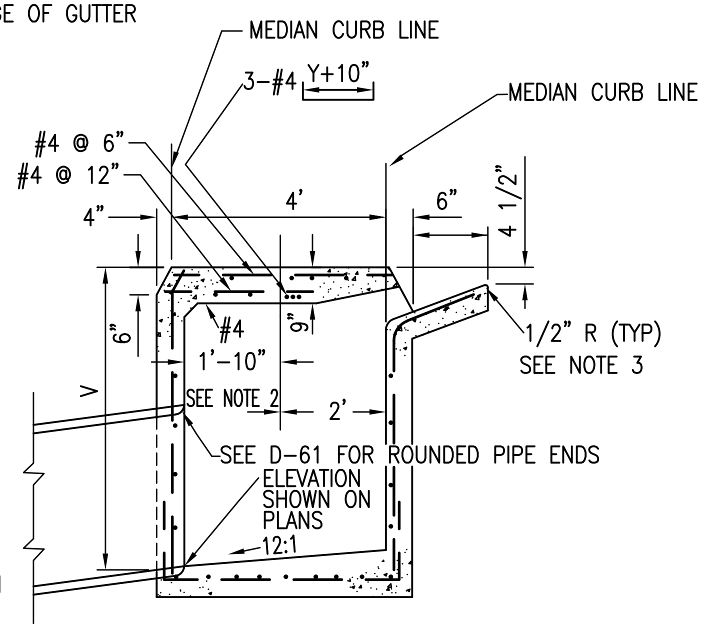
DRAWING NUMBER **D-44D**



PLAN



SECTION A–A

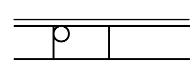


SECTION B–B

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 BETWEN 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. Widelski	10/18
Reviewed	RP	C. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

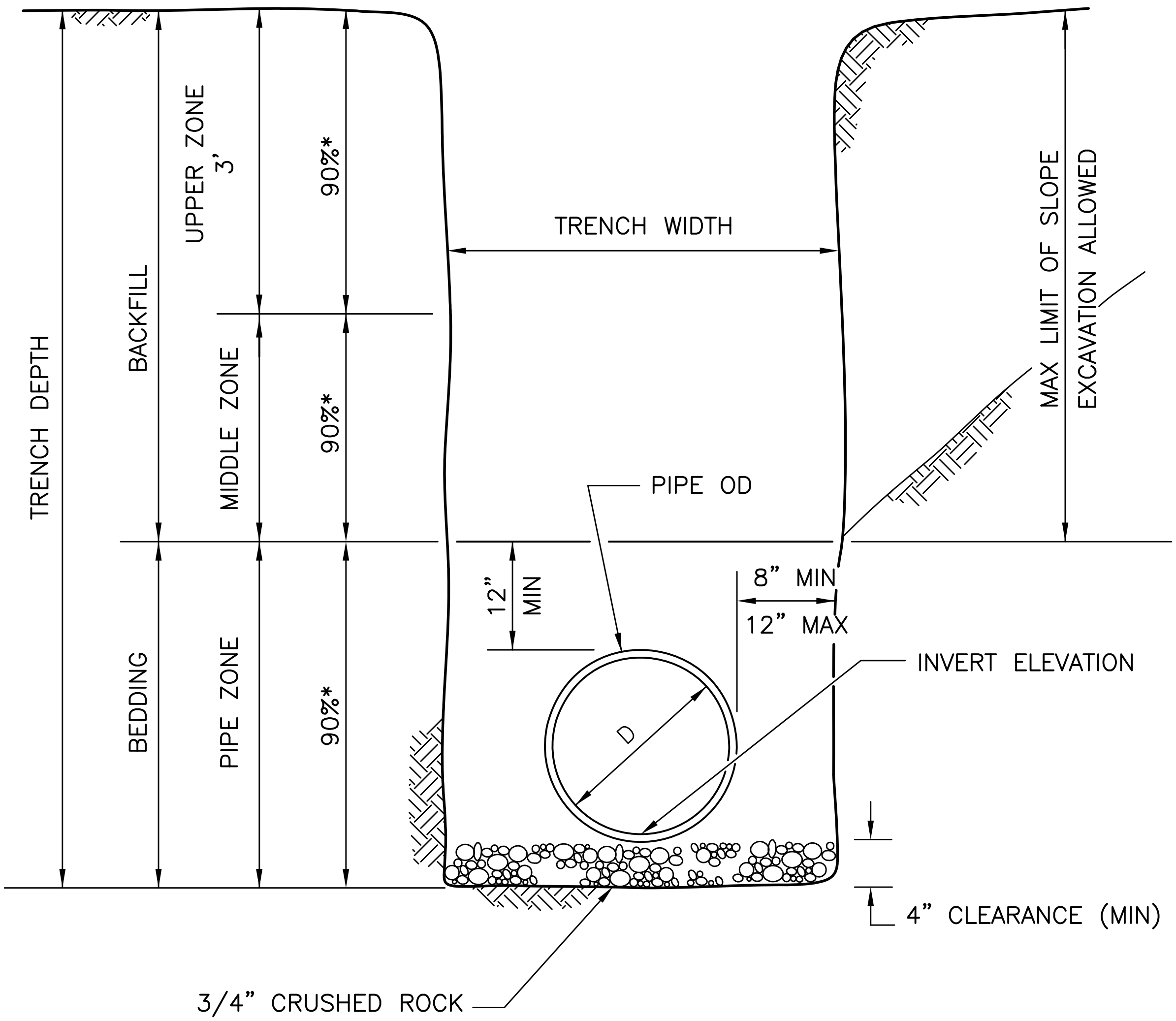
MEDIAN CURB INLET - TYPE J

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-45**



SECTION

NOTES

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

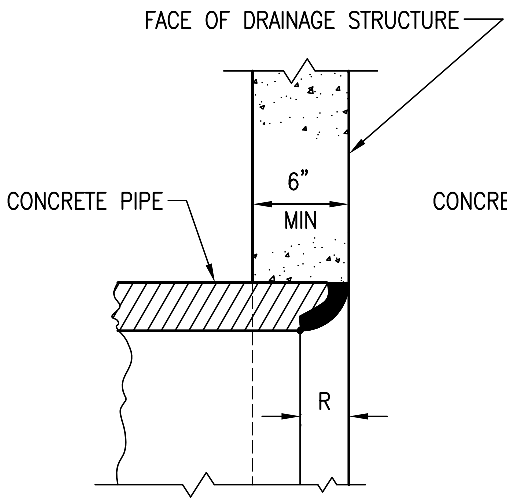
PIPE BEDDING AND TRENCH BACKFILL FOR STORM DRAINS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

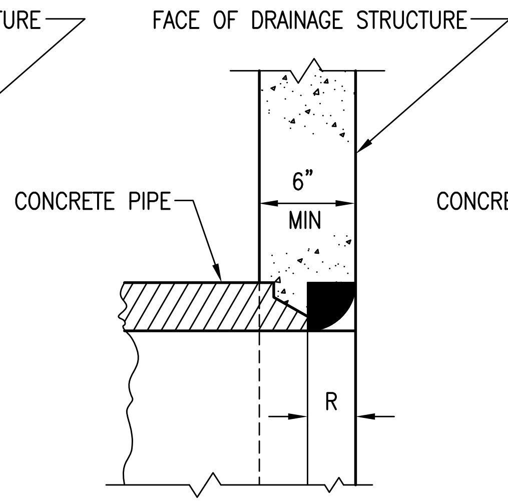
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

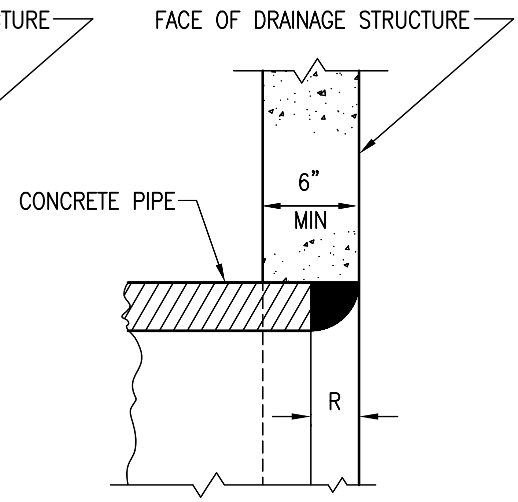
DRAWING NUMBER **D-60**



BELL END

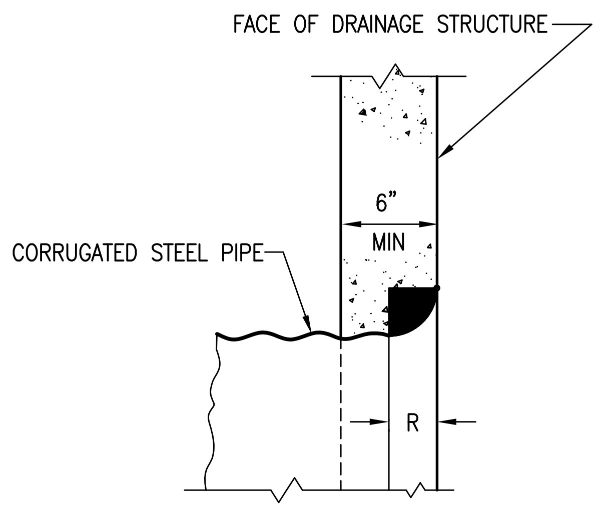


SPIGOT END



CUT END

R = THICKNESS OF PIPE



CUT END

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

NOTE

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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SAN DIEGO REGIONAL STANDARD DRAWING

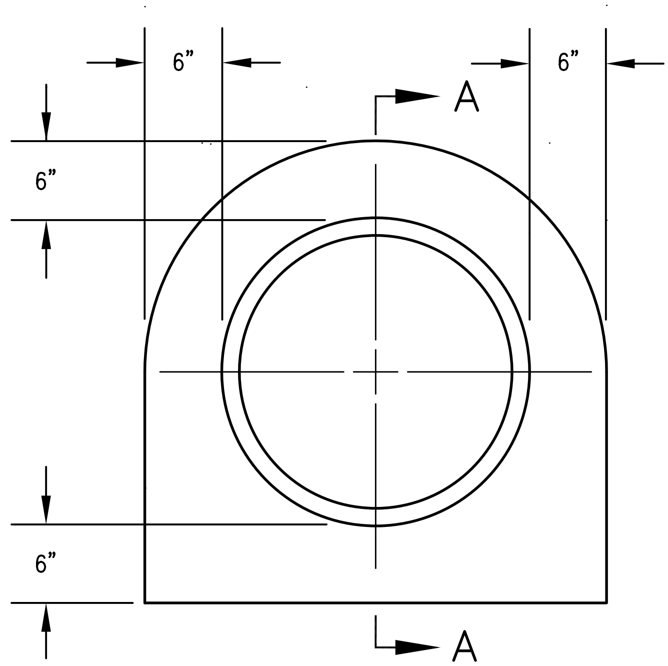
ROUNDED PIPE ENDS IN DRAINAGE STRUCTURES

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

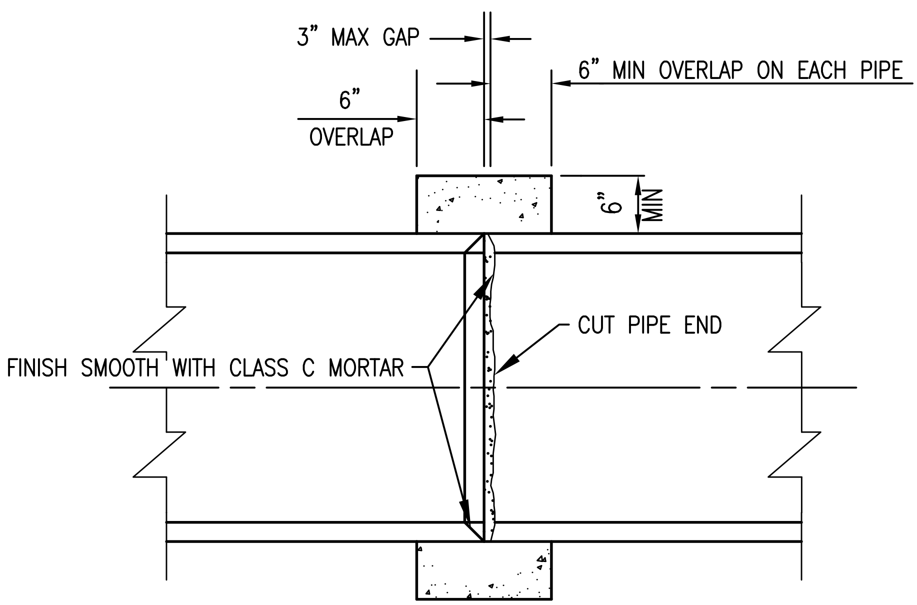
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-61**



ELEVATION

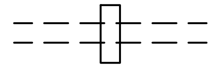


SECTION A–A

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
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Edited	M.W.	M. Widelski	10/18
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SAN DIEGO REGIONAL STANDARD DRAWING

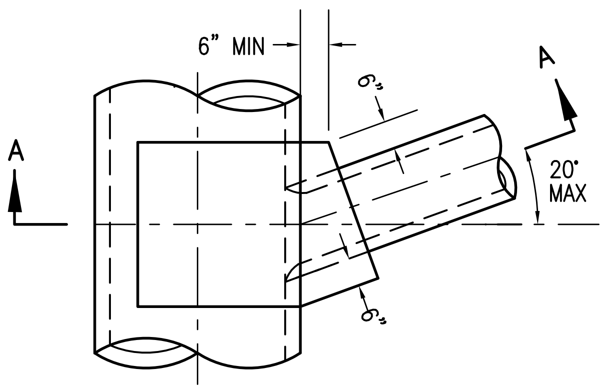
PIPE COLLAR

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

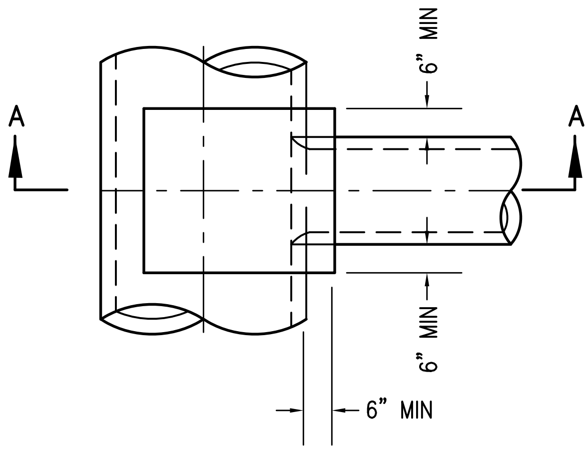
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

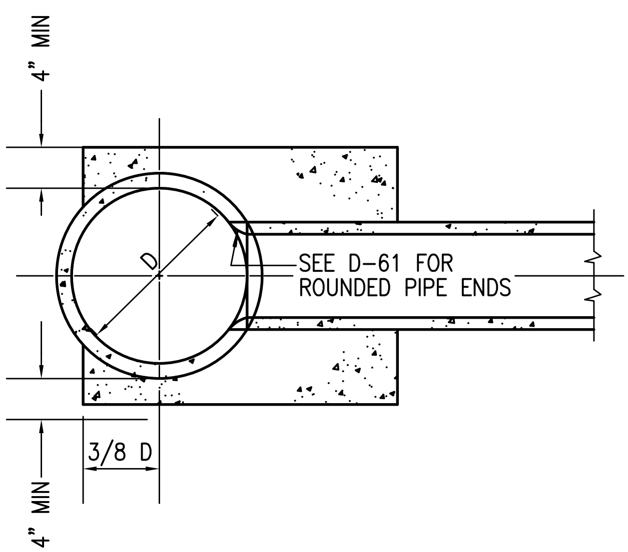
DRAWING NUMBER **D-62**



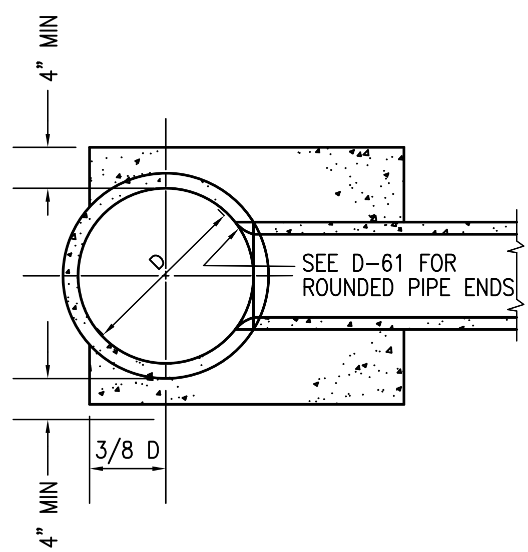
PLAN
SKEWED CONNECTION



PLAN



SECTION A–A

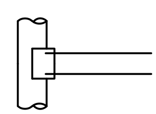


SECTION B–B

NOTES

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

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

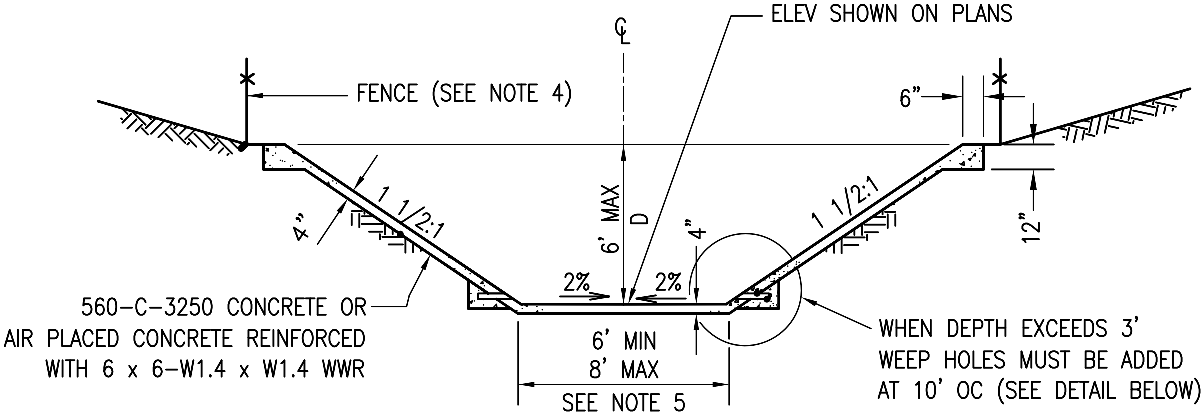
CONCRETE LUG

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

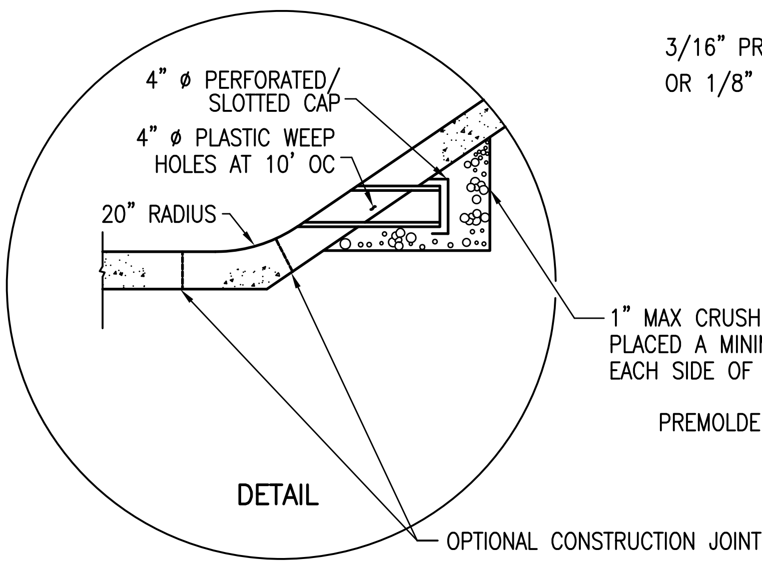
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

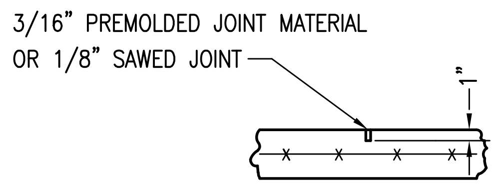
DRAWING NUMBER **D-63**



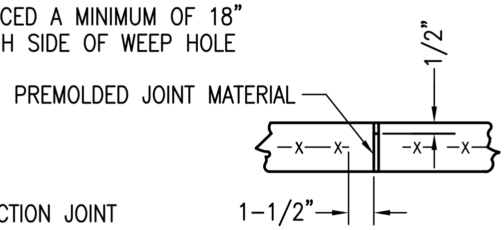
TYPICAL SECTION



DETAIL



WEAKENED PLANE JOINT



EXPANSION JOINT

NOTES

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

LEGEND ON PLANS

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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

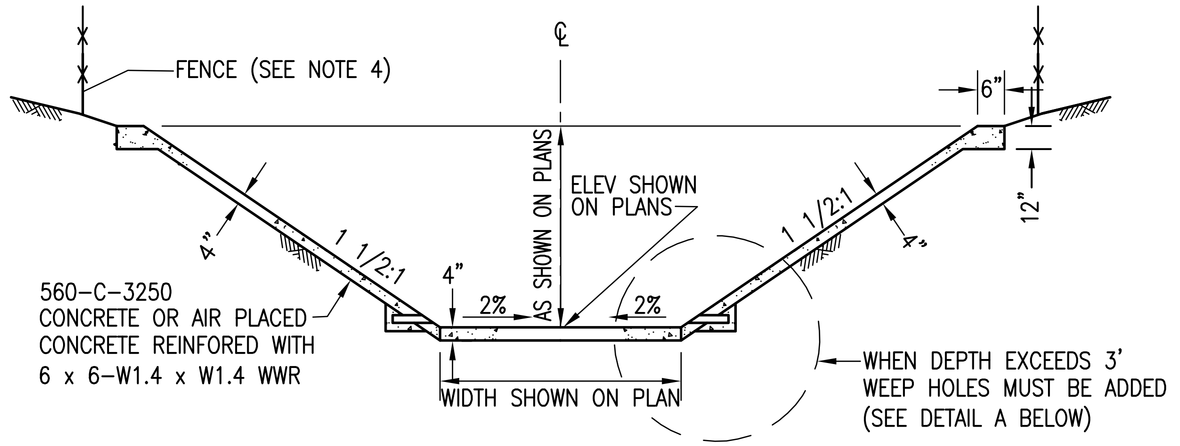
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

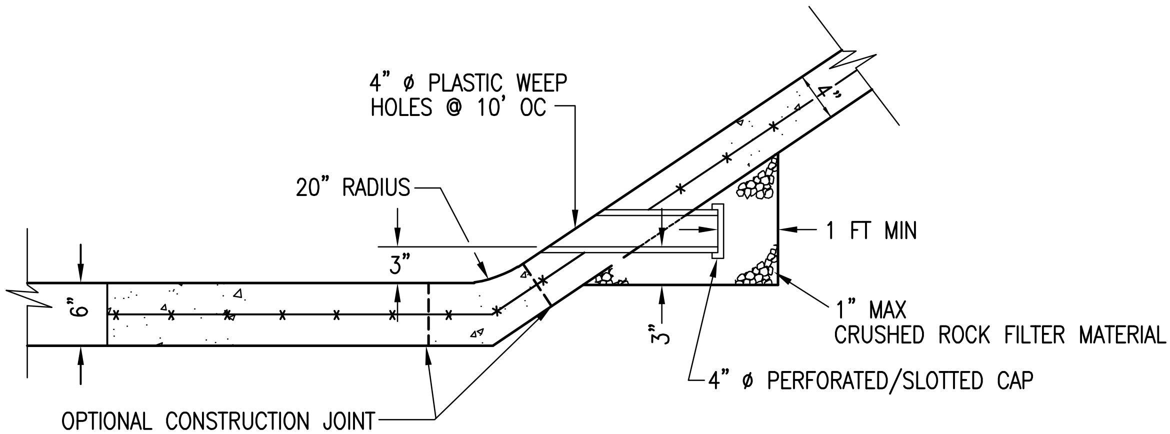
Chairperson R.C.E. 52241 Date

MINOR DRAINAGE CHANNEL

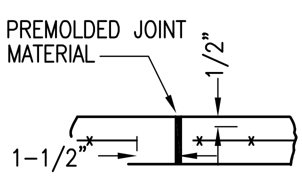
DRAWING NUMBER **D-70**



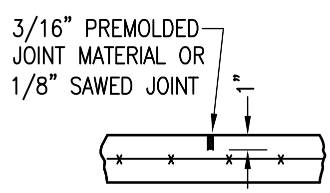
TYPICAL SECTION



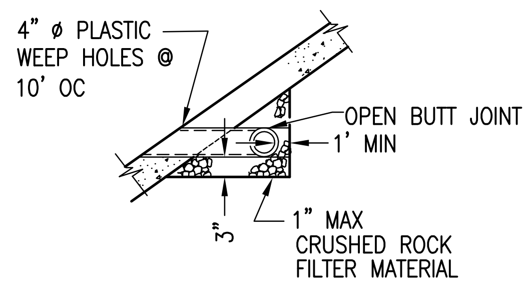
DETAIL A



EXPANSION JOINT



WEAKENED PLANE JOINT

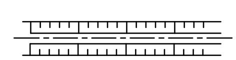


ALTERNATE CONTINUOUS DRAIN

NOTES

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

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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

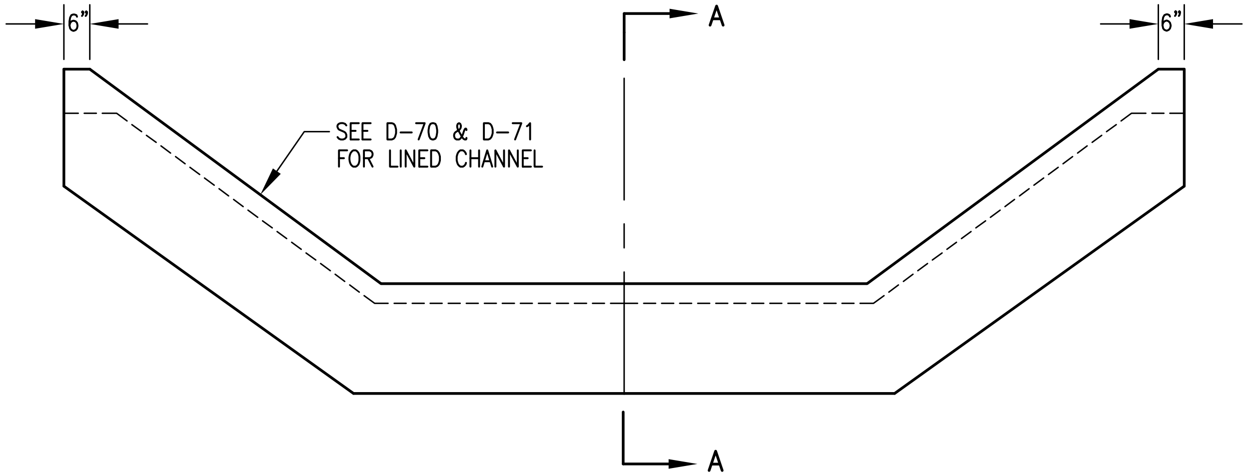
MAJOR DRAINAGE CHANNEL

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

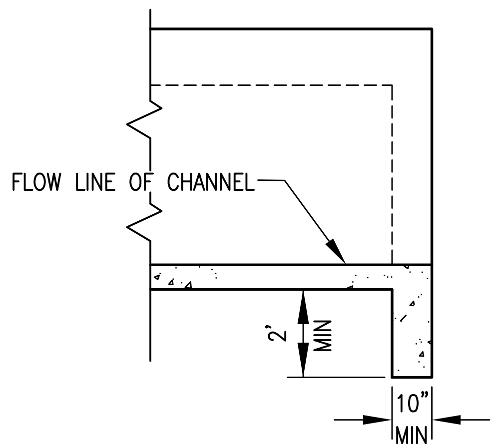
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-71**

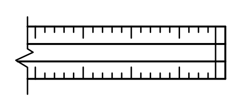


ELEVATION



SECTION A-A

LEGEND ON PLANS



NOTES

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

Revision	By	Approved	Date
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

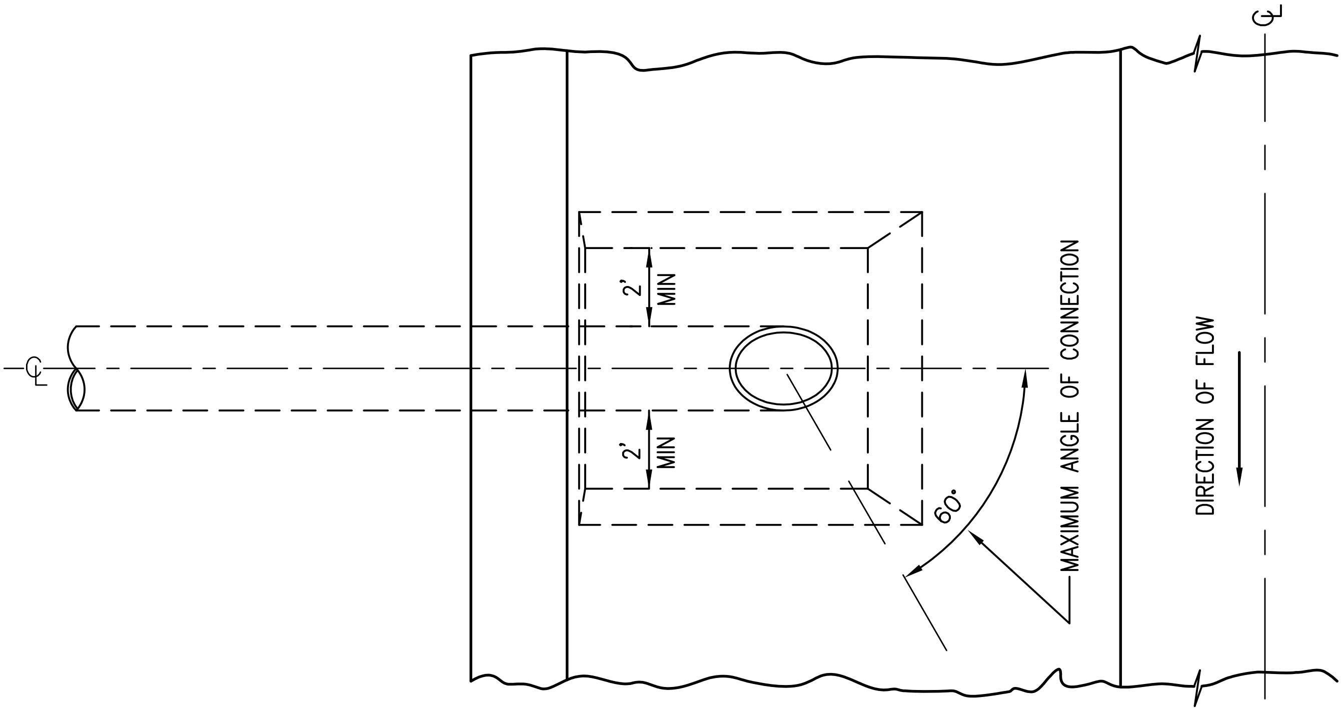
CUTOFF WALL FOR DRAINAGE CHANNEL

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

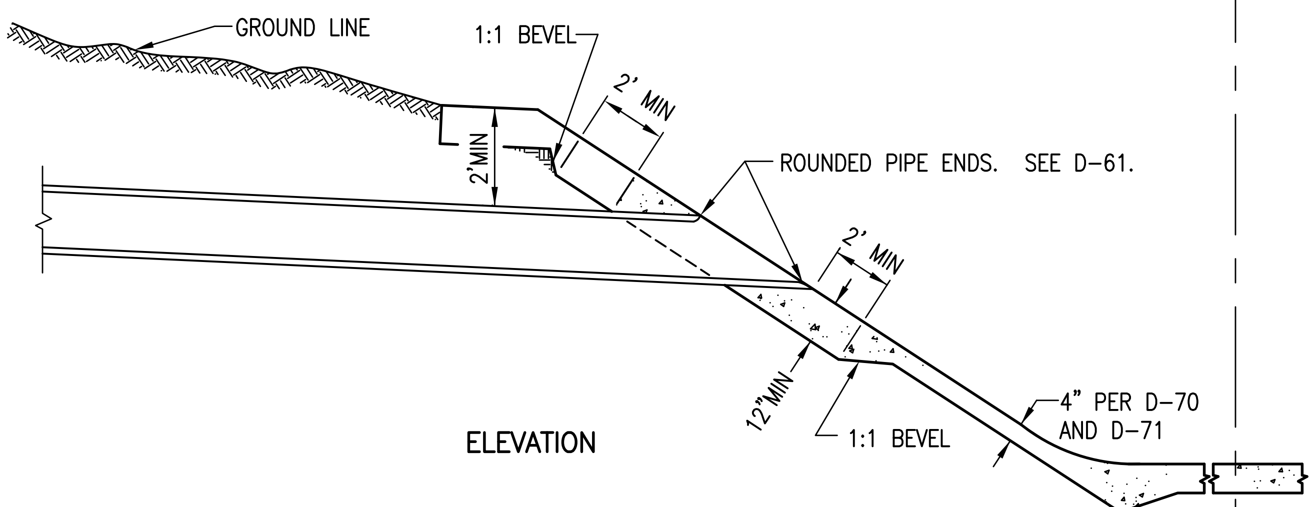
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-72**



PLAN

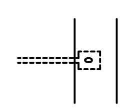


ELEVATION

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
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Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

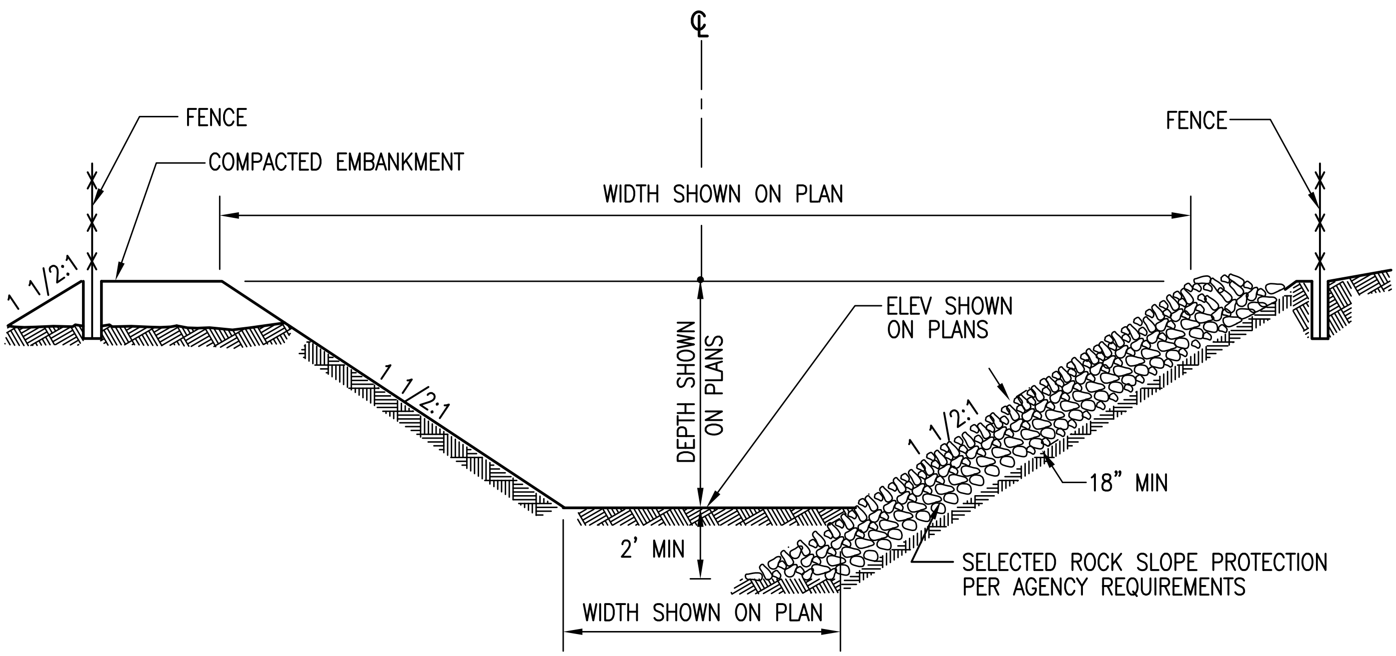
PIPE TO CHANNEL CONNECTION

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-73**

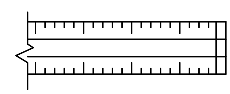


SECTION

NOTE

THE FOLLWING SHALL BE SPECIFIED BY AGENCY AND INCLUDED IN THE PLAN DESIGN:
A) LOW FLOW CHANNEL LOCATION
B) FILTER BLANKET THICKNESS, TYPE AND LOCATION
C) CUTOFF WALL
D) FENCE

LEGEND ON PLANS



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

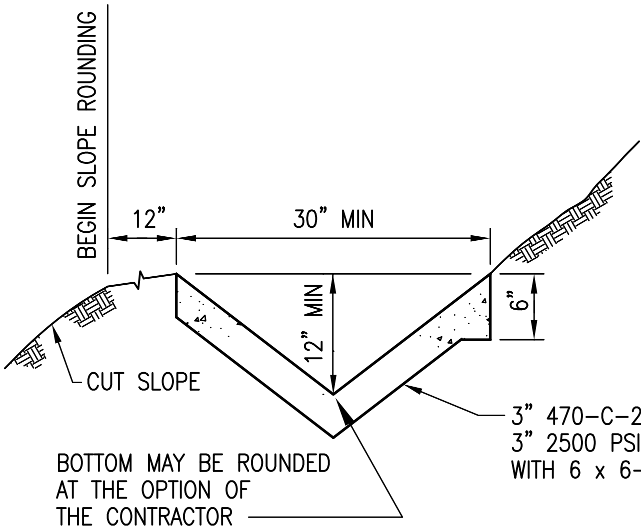
SAN DIEGO REGIONAL STANDARD DRAWING

GRADED EARTH CHANNEL

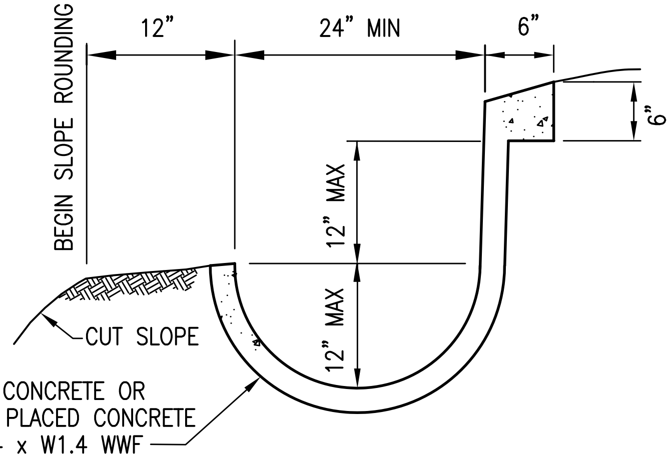
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-74**

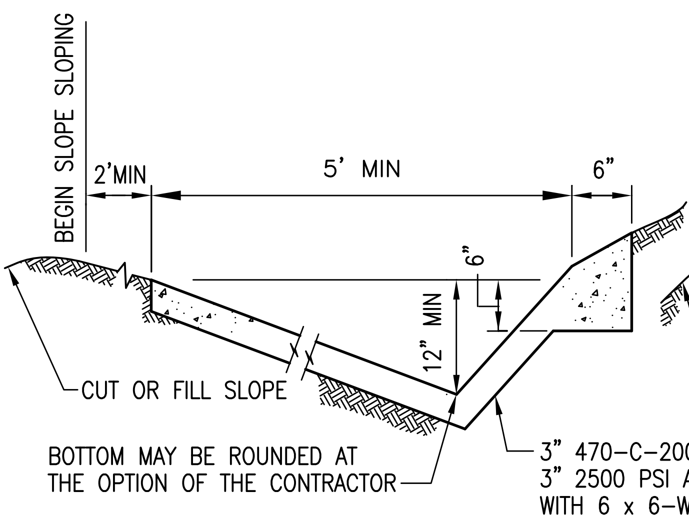


TYPE A

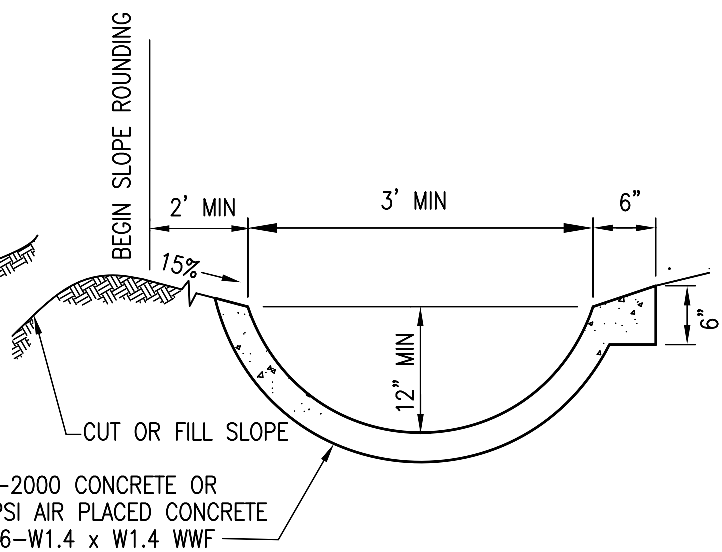


TYPE B

BROW DITCH



TYPE C



TYPE D

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

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-75**

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

	SPAN	2'		3'			4'						5'											
	HEIGHT	1'-6"	2'	2'	3'		2'	3'		4'			2'		3'		4'				5'			
	STRENGTH CLASSIFICATION	A	A	A	A	B	A	A	B	A	B	C	A	B	A	B	A	B	C	D	A	B	C	D
	MAX FILL OVER TOP	66		38	38	66	28	28	37	28	37	50	12	27	12	27	11	26	35	46	11	25	35	46
CONC.	Top Slab T_1	6	6	6 1/4	6 1/4	8	7	7	8	7	8	9	7 1/2	8	7 1/2	8	7 1/2	8	9 1/2	10 1/2	7 1/2	8	9 1/2	10 1/2
CONC.	Bottom Slab T_2	6	6	6 1/4	6 1/4	8	7	7	8	7	8	9	6	8	6	8	6	8	10	10 3/4	6	8	10	10 3/4
CONC.	Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel	"a" Size Bar "	4	4	4	4	5	5	5	5	5	5	6	5	5	5	5	5	5	6	6	5	5	6	6
Reinforcing Steel	"a" Spacing	3 1/2	3 1/2	3 1/2	3 1/2	4	5	5	4 1/2	5	4 1/2	5	4	4	4	4	4	4	5	4 1/2	4	4	5	4 1/2
Reinforcing Steel	"a" Length	3–2	3–2	4–2	4–2	4–3	5–3	5–3	5–3	5–3	5–3	5–2	6–3	6–3	6–3	6–3	6–3	6–3	6–2	6–2	6–3	6–3	6–2	6–2
Reinforcing Steel	"d" Dist. Bars Top Slab–No. of	2	2	3	3	2	3	5	3	3	3	3	7	3	7	3	7	3		3	7	3		3
Reinforcing Steel	"d" Dist. Bars Bottom Slab–No. of	2	2	2	2	2	3	3		3		3	3		3		3			3	3	3		3
Reinforcing Steel	"e" Bars Spacing	18	18	18	18	12 1/4	18	18	18	17	13	9 1/2	18	18	18	18	18	17	13	11	18	12	8 1/2	6 1/2
	Spacers Number	12	12	12	12		12	12		14			14		14		14				16			
QUAN.	Concrete: C.Y. per lin. ft.	0.17	0.18	0.23	0.27	0.31	0.29	0.33	0.36	0.36	0.40	0.43	0.32	0.37	0.36	0.41	0.40	0.44	0.51	0.54	0.43	0.48	0.55	0.57
QUAN.	Reinf. lbs per lin. ft.	27	29	34	36	46	44	45	47	48	52	64	57	56	59	57	61	60	68	75	63	65	77	87

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. 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

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-76A**

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	A	B	C	A	B	C	D	A	B	C	D	E	A	B	C	D	E
MAX FILL OVER TOP			10	18	10	18	10	18	25	9	18	25	36	9	17	25	36	45	9	17	25	36	45
CONC.	TOP SLAB	T_1	8 1/4	8 1/4	8 1/4	8 1/4	8 1/4	8 1/4	9 1/4	8 1/4	8 1/4	9 1/4	11	8 1/4	8 1/4	9 1/4	11	12	8 1/4	8 1/4	9 1/4	11	12
CONC.	BOTTOM SLAB	T_2	6 3/4	8	6 3/4	8	6 3/4	8	9 3/4	7 1/4	8 1/4	10	11 1/4	7 1/4	8 1/4	10 1/2	11 1/4	12 1/4	7 1/4	8 1/4	10 1/2	11 1/4	12 1/4
CONC.	SIDEWALLS	T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6 1/4	7	6	6	6 1/4	7	7 3/4
REINFORCING STEEL	"a"	SIZE BAR #	5	5	5	5	5	5	6	5	5	6	6	5	5	6	7	7	5	5	6	7	7
REINFORCING STEEL	"a"	SPACING	4	4	4	4	4	4	5	4	4	5	4 1/2	4	4	5	5 1/2	5	4	4	5	5 1/2	5
REINFORCING STEEL	"a"	LENGTH	7-3	7-3	7-3	7-3	7-3	7-3	7-2	7-3	7-3	7-2	7-2	7-3	7-3	7-2	7-3	7-5	7-3	7-3	7-2	7-5	7-6
REINFORCING STEEL	"d" DIST. BARS	TOP SLAB-NO. OF	7	4	7	4	7	4		7	4		4	7	4		4	4	7	4		4	4
REINFORCING STEEL	"d" DIST. BARS	BTOOM SLAB-NO. OF	4		4		4			4			4	4			4	4	4			4	4
REINFORCING STEEL	"e" BARS	SPACING	18	18	18	18	18	18	17	18	15 1/2	11 1/2	8 1/2	17	10 1/2	7 1/2	6	5	12	7 1/2	7	5	4 1/2
REINFORCING STEEL	SPACERS	NUMBER	12		12		14			16				16					18				
QUAN.	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	0.56	0.58	0.65	0.71	0.78	0.59	0.61	0.70	0.78	0.88
QUAN.	REINFORCING LBS. PER LIN. FT.		64	63	66	65	69	67	74	70	70	80	91	73	78	92	112	127	81	90	99	126	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

03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-76B**

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

		SPAN	7'												
		HEIGHT	3'		4'		5'			6'			7'		
		STRENGTH CLASSIFICATION	A	B	A	B	A	B	C	A	B	C	A	B	C
		MAX FILL OVER TOP	16	26	16	26	16	26	35	16	26	35	16	26	35
CONC.		TOP SLAB T_1	7 1/4	8 1/4	7 1/4	8 1/4	7 1/4	8 1/4	9 3/4	7 1/4	8 1/4	9 3/4	7 1/4	8 1/4	9 3/4
CONC.		BOTTOM SLAB T_2	7 1/2	8 3/4	7 1/2	8 3/4	7 1/2	8 3/4	10 1/2	7 1/2	8 3/4	10 1/2	7 1/2	8 3/4	10 1/2
CONC.		SIDEWALLS T_3	6	7	6	7	6	7	8 1/2	6	7	8 1/2	6	7	8 1/2
REINFORCING STEEL	"a"	SIZE BAR #	5	5	5	5	5	5	6	5	5	6	5	5	6
		SPACING	9	7	9	7	9	7	9	9	7	9	9	7	9
		LENGTH	6–8	6–9	6–8	6–9	6–8	6–9	6–10	6–8	6–9	6–10	6–8	6–9	6–10
	"b"	SIZE BAR #	5	5	5	5	5	5	6	5	5	6	5	5	6
		SPACING	9	7	9	7	9	7	9	9	7	9	9	7	9
		DIMENSION "X"	1–3	1–4	1–3	1–4	1–3	1–4	1–8	1–3	1–4	1–8	1–3	1–4	1–8
		LENGTH	3–1	3–2	3–1	3–2	3–1	3–2	3–10	3–1	3–2	3–10	3–1	3–2	3–10
	"c"	SIZE BAR #	5	5	5	5	5	5	6	5	5	6	5	5	6
		SPACING	9	7	9	7	9	7	9	9	7	9	9	7	9
		DIMENSION "Y"	1–10	1–11	1–10	1–11	1–10	1–11	2–3	1–10	1–11	2–3	1–10	1–11	2–3
		LENGTH	5–2	5–4	6–2	6–4	7–2	7–4	7–10	8–2	8–4	8–10	9–2	9–4	9–10
	"c_1"	SIZE BAR #	5	5	5	5	5	5	6	5	5	6	5	5	6
		SPACING	9	7	9	7	9	7	9	9	7	9	9	7	9
		DIMENSION "Y"	1–10	1–11	1–10	1–11	1–10	1–11	2–3	1–10	1–11	2–3	1–10	1–11	2–3
		LENGTH	3–8	3–10	3–8	3–10	3–8	3–10	4–6	3–8	3–10	4–6	3–8	3–10	4–6
	"d" BARS	TOP SLAB–NO. OF	7	4	7	4	7	4	4	7	4	4	7	4	4
		BOTTOM SLAB–NO. OF	4	4	4	4	4	4	4	4	4	4	4	4	4
	"e" BARS	SPACING	18	18	18	18	18	18	18	18	18	18	18	18	18
	SPACERS	TOTAL NUMBER	24		28		28			32			36		
QUAN.		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	0.89
QUAN.		REINFORCING LBS. PER LIN. FT.	107	130	114	138	118	143	168	125	150	176	132	158	184

NOTE

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

Revision	By	Approved	Date
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-76C**

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	C	A	B	C	A	B	C
MAX FILL OVER TOP			13	21	13	21	13	21	13	21	31	13	21	31	13	21	31
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	10 1/4	7 1/4	8 1/2	10 1/4	7 1/4	8 1/2	10 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	11 1/2	7 1/4	9 1/2	11 1/2	7 1/4	9 1/2	11 1/2
	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	9 3/4	6 1/2	7 1/2	9 3/4	6 1/2	7 1/2	9 3/4
REINFORCING STEEL	"a"	SIZE BAR #	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
		SPACING	9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
		LENGTH	7–7	7–8	7–7	7–8	7–7	7–8	7–7	7–8	7–10	7–7	7–8	7–10	7–7	7–8	7–10
	"b"	SIZE BAR #	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
		SPACING	9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
		DIMENSION "X"	1–6	1–7	1–6	1–7	1–6	1–7	1–6	1–7	1–8	1–6	1–7	1–8	1–6	1–7	1–8
		LENGTH	3–4	3–5	3–4	3–5	3–4	3–5	3–4	3–5	3–10	3–4	3–5	3–10	3–4	3–5	3–10
	"c"	SIZE BAR #	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
		SPACING	9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
		DIMENSION "Y"	2	2–5	2	2–5	2	2–5	2	2–5	2–8	2	2–5	2–8	2	2–5	2–8
		LENGTH	5–4	5–10	6–4	6–10	7–4	7–10	8–4	8–10	9–3	9–4	9–10	10–3	10–4	10–10	11–3
	"c_1"	SIZE BAR #	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
		SPACING	9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
		DIMENSION "Y"	2	2–5	2	2–5	2	2–5	2	2–5	2–8	2	2–3	2–8	2	2–5	2–8
		LENGTH	3–9	4–5	3–9	4–5	3–9	4–5	3–9	4–5	5	3–9	4–5	5	3–9	4–5	5
	"d" BARS	TOP SLAB–NO. OF	7	5	7	5	7	5	7	5	5	7	5	5	7	5	5
		BOTTOM SLAB–NO. OF	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	"e" BARS	SPACING	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	SPACERS	TOTAL NUMBER	28		32		32		36			40			40		
QUAN.	CONCRETE: C.Y. PER LIN. FT.		0.52	0.65	0.56	0.70	0.60	0.74	0.65	0.79	1.0	0.69	0.83	1.06	0.73	0.88	1.12
	REINFORCING LBS. PER LIN. FT.		118	146	125	154	129	139	136	167	211	143	174	220	147	179	225

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

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-76D**

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	C	A	B	C	A	B	C
MAX FILL OVER TOP			9	18	9	18	9	18	9	18	8	18	28	8	18	28	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 1/2	9 3/4	8 1/2	9 3/4	12 1/4	8 1/2	9 3/4	12 1/4	8 1/2	9 3/4	12 1/4
CONC.	Bottom Slab	T_2	8 3/4	10 1/2	9	10 3/4	9	10 3/4	9 1/4	11	9 1/4	11	13 1/4	9 1/4	11	13 1/4	9 1/4	11	13 1/4
CONC.	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	11 1/2	8	9 1/2	11 1/2	9	9 1/2	11 1/2
REINFORCING STEEL	"a"	SIZE BAR #	6	6	6	6	6	6	6	6	6	6	7	6	6	7	6	6	7
REINFORCING STEEL	"a"	SPACING	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
REINFORCING STEEL	"a"	LENGTH	9–5	9–8	9–5	9–8	9–5	9–8	9–5	9–8	9–5	9–8	9–9	9–6	9–8	9–9	9–5	9–8	9–9
REINFORCING STEEL	"b"	SIZE BAR #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
REINFORCING STEEL	"b"	SPACING	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
REINFORCING STEEL	"b"	DIMENSION "X"	2	2	2	2	2	2	2	2	2	2	2–6	2	2	2–6	2	2	2–6
REINFORCING STEEL	"b"	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	4–2	4–8	3–10	4–2	4–8
REINFORCING STEEL	"c"	SIZE BAR #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
REINFORCING STEEL	"c"	SPACING	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
REINFORCING STEEL	"c"	DIMENSION "Y"	2–8	3–4	2–8	3–4	2–8	3–4	2–8	3–4	2–8	3–4	3–6	2–8	3–4	3–6	2–8	3–4	3–6
REINFORCING STEEL	"c"	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	12–10	13–3	13–1	13–10	14–3
REINFORCING STEEL	"c_1"	SIZE BAR #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
REINFORCING STEEL	"c_1"	SPACING	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
REINFORCING STEEL	"c_1"	DIMENSION "Y"	2–8	3–4	2–8	3–4	2–8	3–4	2–8	3–4	2–8	3–4	3–6	2–8	3–4	3–6	2–8	3–4	3–6
REINFORCING STEEL	"c_1"	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	4–7	5–8	6–2
REINFORCING STEEL	"d" BARS	TOP SLAB–NO. OF	9	5	9	5	9	5	9	5	9	5	5	9	5	5	9	5	5
REINFORCING STEEL	"d" BARS	BOTTOM SLAB–NO. OF	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
REINFORCING STEEL	"e" BARS	SPACING	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
REINFORCING STEEL	SPACERS	TOTAL NUMBER	32		34		36		40		40			44			48		
QUAN.	CONCRETE: C.Y. PER LIN. FT.		0.75	0.94	0.82	1.08	0.86	1.08	0.92	1.15	0.97	1.21	1.50	1.06	1.26	1.57	1.18	1.32	1.65
QUAN.	REINFORCING LBS. PER LIN. FT.		143	221	148	228	154	235	160	244	164	250	265	170	259	273	178	267	281

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

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

DRAWING NUMBER **D-76E**

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	C	A	B	C	A	B	C
MAX FILL OVER TOP			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	9	11 1/4	13 1/4	9	11 1/4	13 1/4
CONC.	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	9	12 1/4	14 3/4	9	12 1/4	14 3/4
CONC.	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	9	10 1/2	12 1/2	9	10 1/2	12 1/2
REINFORCING STEEL	"a"	SIZE BAR #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
REINFORCING STEEL	"a"	SPACING	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
REINFORCING STEEL	"a"	LENGTH	11-3	11-6	11-3	11-6	11-3	11-6	11-4	11-6	11-8	11-5	11-6	11-8	11-5	11-6	11-8
REINFORCING STEEL	"b"	SIZE BAR #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
REINFORCING STEEL	"b"	SPACING	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
REINFORCING STEEL	"b"	DIMENSION "X"	2-8	3	2-8	3	2-8	3	2-8	3	3	2-8	3	3	2-8	3	3
REINFORCING STEEL	"b"	LENGTH	4-10	5-7	4-10	5-7	4-10	5-7	4-10	5-7	5-7	4-10	5-7	5-7	4-10	5-7	5-7
REINFORCING STEEL	"c"	SIZE BAR #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
REINFORCING STEEL	"c"	SPACING	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
REINFORCING STEEL	"c"	DIMENSION "Y"	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9
REINFORCING STEEL	"c"	LENGTH	10-2	10-4	11-2	11-4	12-2	12-4	13-2	13-4	13-6	14-2	14-4	14-6	16-2	16-4	16-6
REINFORCING STEEL	"c_1"	SIZE BAR #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
REINFORCING STEEL	"c_1"	SPACING	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
REINFORCING STEEL	"c_1"	DIMENSION "Y"	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9
REINFORCING STEEL	"c_1"	LENGTH	5-11	6-5	5-11	6-5	5-11	6-6	5-11	6-6	6-8	5-11	6-6	6-8	5-11	6-6	6-8
REINFORCING STEEL	"d" BARS	TOP SLAB-NO. OF	10	6	10	6	10	6	10	6	6	10	6	6	10	6	6
REINFORCING STEEL	"d" BARS	BOTTOM SLAB-NO. OF	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"e" BARS	SPACING	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
REINFORCING STEEL	SPACERS	TOTAL NUMBER	36		44		44		44			48			52		
QUAN.	CONCRETE: C.Y. PER LIN. FT.		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
QUAN.	REINFORCING LBS. PER LIN. FT.		203	293	213	304	218	311	223	317	387	231	326	397	243	341	415

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

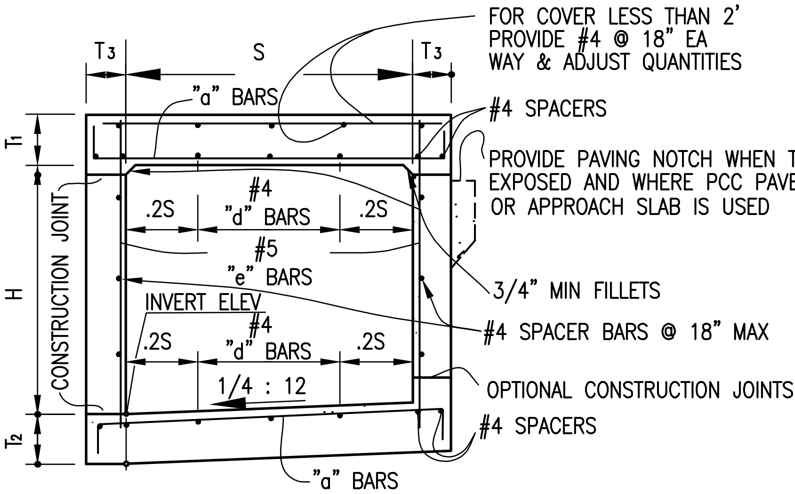
SAN DIEGO REGIONAL STANDARD DRAWING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

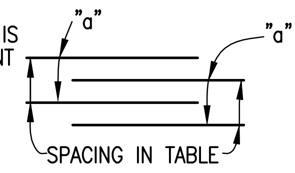
03/24/2022
Chairperson R.C.E. 52241 Date

SINGLE BOX CULVERT DETAILS No.1

DRAWING NUMBER **D-76F**

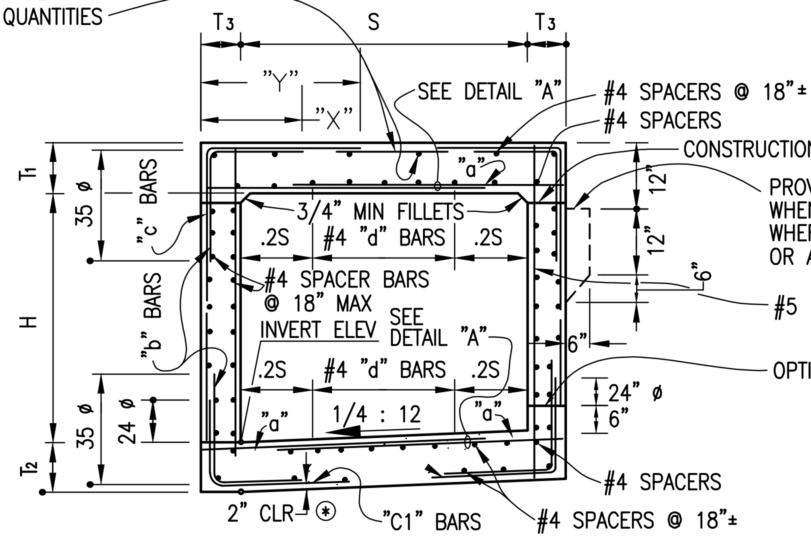


TYPICAL SECTIONS 2' THRU 6' SPANS

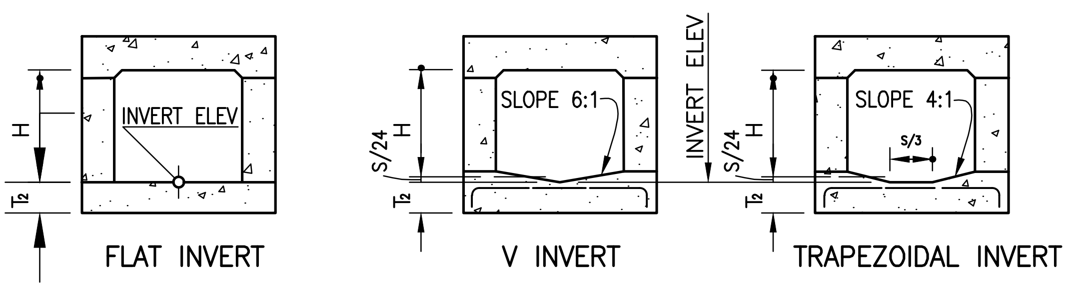


DETAIL "A"

⊛ FOR REINFORCEING CLEARANCE, EXCEPT AT BOTTOM, SEE "MISCELLANEOUS DETAILS," ON D-81A AND D-81B



TYPICAL SECTIONS 7' THRU 12' SPANS



ALTERNATIVE INVERTS
(WHEN SPECIFIED 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

SINGLE BOX CULVERT DETAILS NO.2

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-76G**

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

			4'										
HEIGHT			2'			3'				4'			
STRENGTH CLASSIFICATION			A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP			11	21	32	11	23	34	46	11	23	34	46
CONC.	TOP SLAB	T_1	6 1/2	6 1/2	7 1/4	6 1/2	6 1/2	7 1/2	8 1/2	6 1/2	6 1/2	7 1/2	8 1/2
CONC.	BOTTOM SLAB	T_2	6	7 1/4	8 1/2	6	7 1/2	8 1/2	9 1/2	6	7 1/2	8 1/2	9 1/2
CONC.	SIDEWALLS	T_3	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"a"	SIZE BAR #	5	4	4	5	4	4	4	5	4	4	4
REINFORCING STEEL	"a"	SPACING	11	11	9	11	10 1/2	8 1/2	7 1/2	11	10 1/2	8 1/2	7 1/2
REINFORCING STEEL	"a"	LENGTH	10–3	10–2	10–2	10–3	10–2	10–2	10–2	10–3	10–2	10–2	10–2
REINFORCING STEEL	"b" or "b_1"	SIZE BAR #	5	5	5	5	5	5	5	5	5	5	5
REINFORCING STEEL	"b" or "b_1"	SPACING	11	11	9	11	10 1/2	8 1/2	7 1/2	11	10 1/2	8 1/2	7 1/2
REINFORCING STEEL	"b" or "b_1"	LENGTH "b"	9–4	9–4	9–6	9–4	9–4	9–6	9–7	9–4	9–4	9–6	9–7
REINFORCING STEEL	"b" or "b_1"	LENGTH "b_1"	9–4	9–5	9–6	9–4	9–4	9–6	9–7	9–4	9–4	9–6	9–7
REINFORCING STEEL	"c"	SIZE BAR #	4	5	5	4	5	5	5	4	5	5	5
REINFORCING STEEL	"c"	SPACING	11	11	9	11	10 1/2	8 1/2	7 1/2	11	10 1/2	8 1/2	7 1/2
REINFORCING STEEL	"c"	LENGTH	4–6	4–6	4–6	4–6	4–6	4–6	4–6	4–6	4–6	4–6	4–6
REINFORCING STEEL	"d" DIST BARS	TOP SLAB–TOT. NO.	10	6	6	10	6	6	6	10	6	6	6
REINFORCING STEEL	"d" DIST BARS	BOTTOM SLAB–TOT. NO.	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"e" BARS	SIZE BAR #	4	4	4	4	4	4	4	4	4	4	5
REINFORCING STEEL	"e" BARS	SPACING	18	18	18	18	18	16	12	18	12	9	10
REINFORCING STEEL	SPACERS	NUMBER	23			26				29			
QUAN.	CONCRETE: C.Y. PER LIN. FT.		0.47	0.51	0.57	0.53	0.57	0.63	0.69	0.59	0.63	0.69	0.75
QUAN.	REINFORCING LBS. PER LIN. FT.		81	74	84	84	79	91	101	87	85	99	111

NOTE

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.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

03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-77A**

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

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			6	36	36	6	24	36	6	23	34	46	6	23	34	46
CONC.	TOP SDAB	T_1	6 3/4	7 3/4	9 1/4	6 3/4	7 3/4	9 1/4	6 3/4	7 3/4	9 1/4	10 1/4	6 3/4	7 3/4	9 1/4	10 1/4
CONC.	BOTTOM SLAB	T_2	6 1/2	8 3/4	10 1/4	6 1/2	8 3/4	10 1/4	6 1/2	8 3/4	10 1/4	11 1/4	6 1/2	8 3/4	10 1/4	11 1/4
CONC.	SIDEWALLS	T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"a"	SIZE BAR #	5	4	4	5	4	4	5	4	4	4	5	4	4	4
REINFORCING STEEL	"a"	SPACING	10	8 1/2	10	10	8 1/2	10	10	8 1/2	10	9	10	8 1/2	10 1/2	9
REINFORCING STEEL	"a"	LENGTH	12–3	12–2	12–2	12–3	12–2	12–2	12–3	12–2	12–2	12–2	12–3	12–2	12–2	12–2
REINFORCING STEEL	"b" or "b_1"	SIZE BAR #	5	5	6	5	5	6	5	5	6	6	5	5	6	6
REINFORCING STEEL	"b" or "b_1"	SPACING	10	8 1/2	10	10	8 1/2	10	10	8 1/2	10	9	10	8 1/2	10 1/2	9
REINFORCING STEEL	"b" or "b_1"	LENGTH "b"	11–5	11–6	11–7	11–5	11–6	11–7	11–5	11–6	11–7	11–8	11–5	11–6	11–7	11–8
REINFORCING STEEL	"b" or "b_1"	LENGTH "b_1"	11–4	11–6	11–7	11–4	11–6	11–7	11–4	11–6	11–7	11–8	11–4	11–6	11–7	11–8
REINFORCING STEEL	"c"	SIZE BAR #	4	5	6	4	5	6	4	5	6	6	4	5	6	6
REINFORCING STEEL	"c"	SPACING	10	8 1/2	10	10	8 1/2	10	10	8 1/2	10	9	10	8 1/2	10 1/2	9
REINFORCING STEEL	"c"	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	5–6	5–6
REINFORCING STEEL	"d" DIST BARS	TOP SLAB–TOT. NO.	12	6	6	12	6	6	12	6	6	6	12	6	6	6
REINFORCING STEEL	"d" DIST BARS	BOTTOM SLAB–TOT. NO.	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"e" BARS	SIZE BAR #	4	4	4	4	4	4	4	4	4	5	4	4	5	6
REINFORCING STEEL	"e" BARS	SPACING	18	18	18	18	18	16	18	12	10	10 1/2	18	8 1/2	9	9
REINFORCING STEEL	SPACERS	NUMBER	23			26			29				32			
QUAN.	CONCRETE: C.Y. PER LIN. FT.		0.58	0.69	0.80	0.63	0.75	0.86	0.69	0.80	0.89	0.98	0.74	0.86	0.97	1.04
QUAN.	REINFORCING LBS. PER LIN. FT.		99	100	109	103	104	112	106	109	119	133	109	116	126	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.	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

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-77B**

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

SPAN			6'													
HEIGHT			3'			4'			5'				6'			
STRENGTH CLASSIFICATION			A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP			4	20	34	4	20	34	4	19	33	43	4	19	33	43
CONC.	Top Slab	T_1	7 1/4	8 1/4	10 1/2	7 1/4	8 1/4	10 1/2	7 1/4	8 1/4	10 1/2	12	7 1/4	8 1/4	10 1/2	12
CONC.	Bottom Slab	T_2	7 1/4	9 1/2	11 1/2	7 1/4	9 1/2	11 1/2	7 1/4	9 1/2	11 1/2	12 3/4	7 1/4	9 1/2	11 1/2	12 3/4
CONC.	Sidewalls	T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	7 1/2
REINFORCING STEEL	"a"	SIZE BAR #	5	4	4	5	4	4	5	4	4	4	5	4	4	4
REINFORCING STEEL	"a"	SPACING	9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	10 1/2	9 1/2	11	8 1/2	10 1/2
REINFORCING STEEL	"a"	LENGTH	14-3	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-2	14-3	14-2	14-2	14-8
REINFORCING STEEL	"b" or "b_1"	SIZE BAR #	5	6	6	5	6	6	5	6	6	7	5	6	6	7
REINFORCING STEEL	"b" or "b_1"	SPACING	9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	10 1/2	9 1/2	11	8 1/2	10 1/2
REINFORCING STEEL	"b" or "b_1"	LENGTH "b"	13-6	13-6	13-8	13-6	13-6	13-8	13-6	13-6	13-8	13-9	13-6	13-6	13-8	14-2
REINFORCING STEEL	"b" or "b_1"	LENGTH "b_1"	13-5	13-7	13-8	13-5	13-7	13-8	13-5	13-6	13-8	13-9	13-6	13-6	13-8	14-2
REINFORCING STEEL	"c"	SIZE BAR #	4	6	6	4	6	6	4	6	6	7	4	6	6	7
REINFORCING STEEL	"c"	SPACING	9 1/2	11	8 1/2	9 1/2	11	8 1/2	9 1/2	11	8 1/2	10 1/2	9 1/2	11	8 1/2	10 1/2
REINFORCING STEEL	"c"	LENGTH	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-8
REINFORCING STEEL	"d" DIST BARS	TOP SLAB-TOT. NO.	12	6	6	12	6	6	12	6	6	6	12	6	6	6
REINFORCING STEEL	"d" DIST BARS	BOTTOM SLAB-TOT. NO.	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"e" BARS	SIZE BAR #	4	4	4	4	4	4	4	4	5	5	4	5	6	6
REINFORCING STEEL	"e" BARS	SPACING	18	18	16	18	14	8 1/2	18	10	9 1/2	7	18	11	9	6
REINFORCING STEEL	SPACERS	NUMBER	30			33			36				36			
QUAN.	CONCRETE: C.Y. PER LIN. FT.		0.77	0.90	1.08	0.82	0.96	1.13	0.88	1.01	1.19	1.30	0.93	1.07	1.25	1.47
QUAN.	REINFORCING LBS. PER LIN. FT.		121	119	147	125	124	155	128	131	164	175	129	137	177	201

NOTE

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.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

S. Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-77C**

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

SPAN		8'																
HEIGHT		4'			5'			6'			7'				8'			
STRENGTH CLASSIFICATION		A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP		3	14	25	3	14	25	3	14	25	3	14	25	37	3	14	25	37
CONC.	TOP SLAB T_1	8 1/2	9 1/2	12	8 1/2	9 1/2	12	8 1/2	9 1/2	12	8 1/2	9 1/2	12 1/4	14 1/4	8 1/2	9 1/2	12 1/4	14 1/4
CONC.	BOTTOM SLAB T_2	7 1/2	10 1/2	12 3/4	7 1/2	10 1/2	12 3/4	7 1/2	10 1/2	12 3/4	7 1/2	10 3/4	13	15	7 1/2	10 3/4	13	15
CONC.	SIDEWALLS T_3	6	6	6	6	6	6	6	6	6	7	7	7	8	7	7	8	8 1/2
REINFORCING STEEL "a"	SIZE BAR #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4
REINFORCING STEEL "a"	SPACING	12	9 1/2	10 1/2	12	9 1/2	10	12	9 1/2	10	11 1/2	9 1/2	10	8 1/2	11 1/2	9 1/2	10	8 1/2
REINFORCING STEEL "a"	LENGTH	18–4	18–2	18–2	18–4	18–2	18–2	18–4	18–2	18–2	18–7	18–5	18–5	18–8	18–7	18–5	18–8	18–10
REINFORCING STEEL "b" or "b_1"	SIZE BAR #	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7
REINFORCING STEEL "b" or "b_1"	SPACING	12	9 1/2	10 1/2	12	9 1/2	10	12	9 1/2	10	11 1/2	9 1/2	10	8 1/2	11 1/2	9 1/2	10	8 1/2
REINFORCING STEEL "b" or "b_1"	LENGTH "b"	17–7	17–8	17–9	17–7	17–8	17–9	17–7	17–8	17–9	17–10	17–10	18	18–5	17–10	17–10	18–3	18–6
REINFORCING STEEL "b" or "b_1"	LENGTH "b_1"	17–5	17–8	17–9	17–5	17–8	17–9	17–5	17–8	17–9	17–10	17–10	18	18–5	17–8	17–11	18	18–7
REINFORCING STEEL "c"	SIZE BAR #	4	6	7	4	6	7	4	6	7	4	6	7	7	4	6	7	7
REINFORCING STEEL "c"	SPACING	12	9 1/2	10 1/2	12	9 1/2	10	12	9 1/2	10	11 1/2	9 1/2	10	8 1/2	11 1/2	9 1/2	10	8 1/2
REINFORCING STEEL "c"	LENGTH	8–6	8–6	8–6	8–6	8–6	8–6	8–6	8–6	8–6	8–7	8–7	8–7	8–8	8–7	8–7	8–8	8–9
REINFORCING STEEL "d" DIST BARS	TOP SLAB–TOT. NO.	16	8	8	16	8	8	16	8	8	16	8	8	8	16	8	8	8
REINFORCING STEEL "d" DIST BARS	BOTTOM SLAB–TOT. NO.	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
REINFORCING STEEL "e" BARS	SIZE BAR #	4	4	5	4	4	5	4	5	6	4	5	6	7	4	5	7	7
REINFORCING STEEL "e" BARS	SPACING	18	18	10 1/2	18	12	10	18	11 1/2	10	14	9 1/2	7 1/2	8 1/2	11 1/2	8 1/2	7 1/2	9
REINFORCING STEEL SPACERS	NUMBER	41			44			44			47			56	50		60	
QUAN.	CONCRETE: C.Y. PER LIN. FT.	1.08	1.30	1.55	1.14	1.37	1.61	1.19	1.42	1.66	1.32	1.56	1.83	2.14	1.39	1.62	1.99	2.27
QUAN.	REINFORCING LBS. PER LIN. FT.	169	175	200	172	181	218	173	188	229	185	199	248	299	191	207	284	314

NOTE

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

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

03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-77D**

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	D	A	B	C	D
MAX FILL OVER TOP	2	17	30	2	17	30	2	17	30	2	16	29	36	2	16	29	36
CONC. TOP SLAB T_1	8 3/4	12 3/4	16	8 3/4	12 3/4	16	8 3/4	12 3/4	16	8 3/4	12 3/4	16	17 1/4	8 3/4	12 3/4	16	17 1/2
CONC. BOTTOM SLAB T_2	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	18 1/4	8 3/4	13 1/2	16 1/2	18 1/2
CONC. SIDEWALLS T_3	6	6	6	6	6	6	6	6 1/2	7	7	7	7 1/2	7 1/2	8	8	9	10
REINFORCING STEEL "a" SIZE BAR #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4
"a" SPACING	11	10	10	11	9 1/2	10	11	9 1/2	10	11	10	10	9	11	10	10	9
"a" 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	22–10	22–8	22–11	23–2
"b" or "b_1" SIZE BAR #	6	7	8	6	7	8	6	7	8	6	7	8	8	6	7	8	8
"b" or "b_1" SPACING	11	10	10	11	9 1/2	10	11	9 1/2	10	11	10	10	9	11	10	10	9
LENGTH "b"	21–7	21–10	22	21–7	21–10	22	21–7	21–11	22–3	21–10	22–1	22–4	22–9	22–1	22–4	22–9	23–1
LENGTH "b_1"	21–5	21–10	22	21–5	21–10	22	21–5	21–11	22–3	21–9	22	22–4	22–9	22	22–3	22–8	23–2
"c" SIZE BAR #	6	7	8	6	7	8	6	7	8	6	7	8	8	6	7	8	8
"c" SPACING	11	10	10	11	9 1/2	10	11	9 1/2	10	11	10	10	9	11	10	10	9
"c" 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	10–9	10–8	10–8	10–9	10–10
"d" DIST BARS TOP SLAB–TOT. NO.	18	10	10	18	10	10	18	10	10	18	10	10	10	18	10	10	10
"d" DIST BARS BOTTOM SLAB–TOT. NO.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" BARS SIZE BAR #	4	4	5	4	4	5	4	4	6	4	5	6	7	4	6	6	7
"e" BARS SPACING	18	10	10	18	6	6 1/2	14	6	8	11	8 1/2	6	6	7 1/2	7	5 1/2	5
SPACERS NUMBER	48			48			51			54			64	68			
QUAN. 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	3.04	1.92	2.51	3.05	3.41
QUAN. REINFORCING LBS. PER LIN. FT.	236	254	310	238	274	324	243	280	339	252	278	355	430	279	327	400	476

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.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

03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-77E**

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	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. TOP SLAB T_1	10	14	17 1/2	10	14 1/.4	17 1/2	10 1/4	14 1/4	17 3/4	10 1/4	14 1/2	17 3/4	20 3/4	10 1/4	14 1/2	17 3/4	20 3/4	10 1/4	14 1/2	18 1/4	21 1/4
CONC. BOTTOM SLAB T_2	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
CONC. SIDEWALLS T_3	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 "a" SIZE BAR #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	6	4	4	4
"a" SPACING	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
"a" LENGTH	26-4	26-2	26-4	26-7	26-5	26-5	26-10	26-8	26-10	27-1	26-11	26-11	27-1	27-1	26-11	27-3	27-5	27-1	27-2	27-5	27-8
"b" or "b_1" SIZE BAR #	6	8	8	6	8	8	6	8	8	6	8	8	9	6	8	8	9	6	8	8	9
"b" or "b_1" SPACING	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
LENGTH "b"	25-8	25-10	26-3	25-11	26-1	26-4	26-2	26-4	26-9	26-5	26-8	26-10	27-4	26-5	26-8	27-2	27-6	26-5	26-11	27-5	27-10
LENGTH "b_1"	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	27-11
"c" SIZE BAR #	5	8	8	5	8	8	5	8	8	5	8	8	9	5	8	8	9	5	8	8	9
"c" SPACING	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
"c" LENGTH	12-6	12-6	12-7	12-7	12-7	12-7	12-8	12-8	12-9	12-9	12-9	12-9	12-10	12-9	12-9	12-10	12-11	12-9	12-10	12-11	13
"d" DIST BARS TOP SLAB-TOT. NO.	24	10	10	24	10	10	24	10	10	24	10	10	10	24	10	10	10	24	10	10	10
"d" DIST BARS BOTTOM SLAB-TOT. NO.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" BARS SIZE BAR #	4	4	5	4	4	5	4	4	5	4	5	7	8	4	7	8	8	6	7	8	9
"e" BARS SPACING	18	8	8	15	6	6 1/2	12	5 1/2	6	9	7 1/2	8 1/2	8	8 1/2	11	8 1/2	9	12	8	7	7
SPACERS NUMBER	52			55			68			68				72				76			
QUAN. 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
QUAN. 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

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

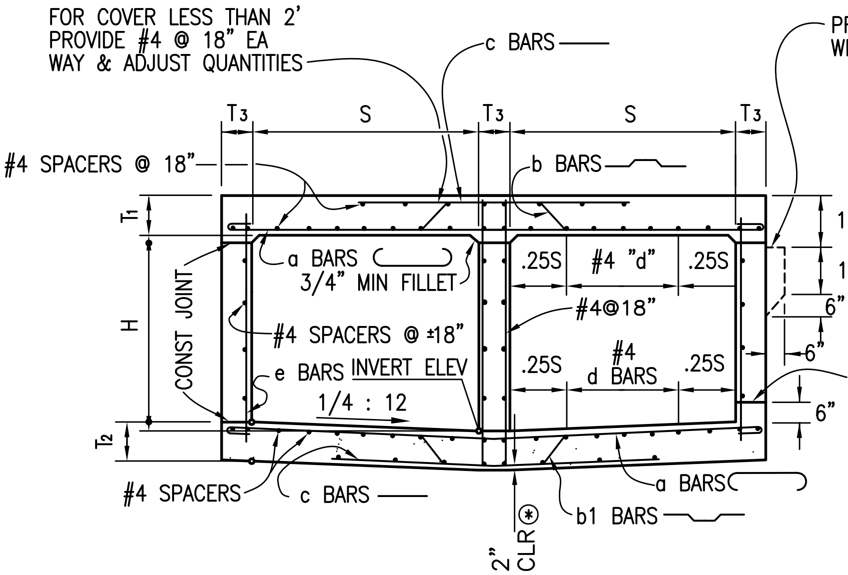
DOUBLE BOX CULVERT DETAILS No. 1

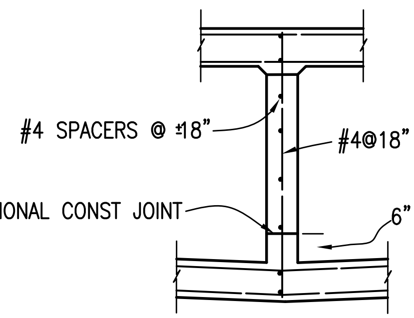
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-77F**



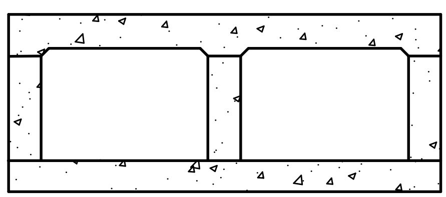


REINFORCEMENT FOR INTERIOR WALLS UNDER 8"

TYPICAL SECTION

(SHOWING REINFORCEMENT FOR INTERIOR WALLS 8" AND OVER)

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



"FLAT INVERT" ALTERNATIVE

(WHEN SPECIFIED)

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

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT
DETAILS NO. 2

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

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
CONC.	TOP SLAB	T_1	6 1/4	6 1/4	7 1/4	6 1/4	6 1/4	7 1/4	6 1/4	6 1/4	7 1/4
CONC.	BOTTOM SLAB	T_2	6	7	8 1/4	6	7	8 1/4	6	7	8 1/4
CONC.	SIDEWALLS	T_3	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"a"	SIZE BAR #	5	4	5	5	4	5	5	4	5
REINFORCING STEEL	"a"	SPACING	11	11 1/2	13	11	11 1/2	13	11	11 1/2	13
REINFORCING STEEL	"a"	LENGTH	14-9	14-8	14-9	14-9	14-8	14-9	14-9	14-8	14-9
REINFORCING STEEL	"b" or "b_1"	SIZE BAR #	5	5	6	5	5	6	5	5	6
REINFORCING STEEL	"b" or "b_1"	SPACING	11	11 1/2	13	11	11 1/2	13	11	11 1/2	13
REINFORCING STEEL	"b" or "b_1"	LENGTH "b"	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-3
REINFORCING STEEL	"b" or "b_1"	LENGTH "b_1"	14	14-2	14-3	14	14-2	14-3	14	14-2	14-3
REINFORCING STEEL	"c"	SIZE BAR #	4	5	6	4	5	6	4	5	6
REINFORCING STEEL	"c"	SPACING	11	11 1/2	13	11	11 1/2	13	11	11 1/2	13
REINFORCING STEEL	"c"	LENGTH	9	9	9	9	9	9	9	9	9
REINFORCING STEEL	"d" DIST BARS	TOP SLAB-TOT. #	15	9	9	15	9	9	15	9	9
REINFORCING STEEL	"d" DIST BARS	BOTTOM SLAB-TOT. #	9	9	9	9	9	9	9	9	9
REINFORCING STEEL	"e" BARS	SIZE BAR #	4	4	4	4	4	4	4	4	5
REINFORCING STEEL	"e" BARS	SPACING	18	18	18	18	18	13	18	11 1/2	13
REINFORCING STEEL	SPACERS	NUMBER	34			38			42		
QUAN.	CONCRETE: C.Y. PER LIN. FT.		0.67	0.71	0.81	0.75	0.79	0.89	0.82	0.86	0.96
QUAN.	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
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

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

DRAWING NUMBER **D-78A**

SPAN 5' (ALL MEASUREMENST 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	T_1	6 3/4	6 3/4	7 1/2	6 3/4	6 3/4	7 1/2	6 3/4	6 3/4	7 1/2	8 1/2	6 3/4	6 3/4	7 1/2	8 1/2
	BOTTOM SLAB	T_2	6 1/4	7 1/4	8 1/2	6 1/4	7 1/4	8 1/2	6 1/4	7 1/4	8 1/2	9 1/2	6 1/4	7 1/2	8 1/2	9 1/2
	SIDEWALLS	T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"a"	SIZE BAR #	5	4	5	5	4	5	5	4	5	5	5	4	5	5
		SPACING	10	11 1/2	13	10	11 1/2	13	10	11	13	11 1/2	10	11	13	11 1/2
		LENGTH	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-9	17-8	17-9	17-9
	"b" or "b_1"	SIZE BAR #	5	5	6	5	5	6	5	5	6	6	5	5	6	6
		SPACING	10	11 1/2	13	10	11 1/2	13	10	11	13	11 1/2	10	11	13	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	17-5
		LENGTH "b_1"	17	17-2	17-4	17	17-2	17-4	17	17-2	17-4	17-5	17	17-2	17-4	17-5
	"c"	SIZE BAR #	4	5	6	4	5	6	4	5	6	6	4	5	6	6
		SPACING	10	11 1/2	13	10	11 1/2	13	10	11	13	11 1/2	10	11	13	11 1/2
		LENGTH	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	"d" DIST BARS	TOP SLAB-TOT. #	18	9	9	18	9	9	18	9	9	9	18	9	9	9
		BOTTOM SLAB-TOT. #	9	9	9	9	9	9	9	9	9	9	9	9	9	9
	"e" BARS	SIZE BAR #	4	4	4	4	4	4	4	4	4	5	4	4	4	6
		SPACING	18	18	18	18	18	18	18	17	11 1/2	11 1/2	18	11	4	11 1/2
	SPACERS	NUMBER	34			38			38				42			
QUAN.	CONCRETE: C.Y. PER LIN. FT.		0.82	0.87	0.98	0.90	0.95	1.05	0.97	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	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 REINFORDING 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

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-78B**

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

SPAN			6'													
HEIGHT			3'			4'			5'				6'			
STRENGTH CLASSIFICATION			A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP			3	13	23	3	13	23	3	13	23	30	3	13	23	30
CONC.	TOP SLAB	T_1	7 1/2	7 1/2	8 1/4	7 1/2	7 1/2	8 1/4	7 1/2	7 1/2	8 1/4	9 1/4	7 1/2	7 1/2	8 1/4	9 1/4
CONC.	BOTTOM SLAB	T_2	6	7 3/4	9 1/4	6	7 3/4	9 1/4	6	8	9 1/4	10	6	8	9 1/4	10 1/4
CONC.	SIDEWALLS	T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"a"	SIZE BAR #	6	5	5	6	5	5	6	5	5	5	6	5	5	5
REINFORCING STEEL	"a"	SPACING	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	10	13	14	11 1/2	10
REINFORCING STEEL	"a"	LENGTH	20–10	20–9	20–9	20–10	20–9	20–9	20–10	20–9	20–9	20–9	20–10	20–9	20–9	20–9
REINFORCING STEEL	"b" or "b_1"	SIZE BAR #	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"b" or "b_1"	SPACING	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	10	13	14	11 1/2	10
REINFORCING STEEL	"b" or "b_1"	LENGTH "b"	20–3	20–3	20–5	20–3	20–3	20–5	20–3	20–3	20–5	20–6	20–3	20–3	20–5	20–6
REINFORCING STEEL	"b" or "b_1"	LENGTH "b_1"	20	20–2	20–5	20	20–2	20–5	20	20–2	20–5	20–6	20	20	20–5	20–7
REINFORCING STEEL	"c"	SIZE BAR #	4	6	6	4	6	6	4	6	6	6	4	6	6	6
REINFORCING STEEL	"c"	SPACING	13	14	11 1/2	13	14	11 1/2	13	14	11 1/2	10	13	14	11 1/2	10
REINFORCING STEEL	"c"	LENGTH	13	13	13	13	13	13	13	13	13	13	13	13	13	13
REINFORCING STEEL	"d" DIST BARS	TOP SLAB–TOT. #	18	9	9	18	9	9	18	9	9	9	18	9	9	9
REINFORCING STEEL	"d" DIST BARS	BOTTOM SLAB–TOT. #	9	9	9	9	9	9	9	9	9	9	9	9	9	9
REINFORCING STEEL	"e" BARS	SIZE BAR #	4	4	4	4	4	4	4	4	5	5	4	4	6	6
REINFORCING STEEL	"e" BARS	SPACING	18	18	18	18	18	11 1/2	18	11 1/2	12	10	18	8	12	10
REINFORCING STEEL	SPACERS	NUMBER	40			40			52				48			
QUAN.	CONCRETE: C.Y. PER LIN. FT.		1.05	1.15	1.29	1.12	1.23	1.37	1.19	1.32	1.44	1.55	1.27	1.39	1.52	1.64
QUAN.	REINFORCING LBS. PER LIN. FT.		181	168	196	183	170	200	187	177	209	235	192	187	221	249

NOTE

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.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

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-78C**

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

SPAN		8'																
HEIGHT		4'			5'			6'			7'				8'			
STRENGTH CLASSIFICATION		A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP		2	11	20	2	11	20	2	11	20	2	11	20	28	2	11	20	28
CONC.	TOP SLAB T_1	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	10 1/4	8 1/4	8 1/4	10 1/4	11 1/2	8 1/4	8 1/4	10 1/4	11 1/2
CONC.	BOTTOM SLAB T_2	6 1/2	9	11	6 1/2	9 1/4	11	6 1/2	9 1/4	11	6 3/4	9 1/4	11	12 1/4	6 3/4	9 1/4	11	12 1/4
CONC.	SIDEWALLS T_3	6	6	6	6	6	6	6	6	6	6	6	6 1/2	6 1/2	7	7	7 1/2	8 1/2
REINFORCING STEEL "a"	SIZE BAR #	6	5	5	6	5	5	6	5	5	6	5	5	6	6	5	5	6
REINFORCING STEEL "a"	SPACING	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	10 1/2	11 1/2	11 1/2	12	10 1/2
REINFORCING STEEL "a"	LENGTH	26–10	26–9	26–9	26–10	26–9	26–9	26–10	26–9	26–9	26–10	26–9	26–11	27–4	27–2	27–1	27–3	27–8
REINFORCING STEEL "b" or "b_1"	SIZE BAR #	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7
REINFORCING STEEL "b" or "b_1"	SPACING	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	10 1/2	11 1/2	11 1/2	12	10 1/2
REINFORCING STEEL "b" or "b_1"	LENGTH "b"	26–5	26–5	26–7	26–5	26–5	26–7	26–5	26–5	26–7	26–5	26–5	26–9	27–3	26–9	26–9	27–1	27–7
REINFORCING STEEL "b" or "b_1"	LENGTH "b_1"	26	26–4	26–7	26	26–5	26–7	26	26–5	26–7	26–1	26–5	26–9	27–3	26–5	26–9	27–1	27–7
REINFORCING STEEL "c"	SIZE BAR #	4	6	7	4	6	7	4	6	7	4	6	7	7	4	6	7	7
REINFORCING STEEL "c"	SPACING	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	11 1/2	12	12	10 1/2	11 1/2	11 1/2	12	10 1/2
REINFORCING STEEL "c"	LENGTH	17	17	17	17	17	17	17	17	17	17	17	17–1	17–3	17–2	17–2	17–3	17–5
REINFORCING STEEL "d" DIST BARS	TOP SLAB–TOT. #	24	12	12	24	12	12	24	12	12	24	12	12	12	24	12	12	12
REINFORCING STEEL "d" DIST BARS	BOTTOM SLAB–TOT. #	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
REINFORCING STEEL "e" BARS	SIZE BAR #	4	4	4	4	4	5	4	5	6	4	6	7	7	4	6	7	7
REINFORCING STEEL "e" BARS	SPACING	18	18	12	18	12	12	18	12	12	11 1/2	12	12	10 1/2	11 1/2	11 1/2	12	10 1/2
REINFORCING STEEL SPACERS	NUMBER	58			62			62			66				70			88
QUAN.	CONCRETE: C.Y. PER LIN. FT.	1.47	1.67	1.99	1.54	1.76	2.06	1.62	1.84	2.14	1.71	1.91	2.26	2.57	1.90	2.10	2.46	2.79
QUAN.	REINFORCING LBS. PER LIN. FT.	261	250	301	266	257	310	267	264	320	276	277	336	409	283	295	347	441

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 10' (ALL EASUREMENTS 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	D	A	B	C	D
MAX FILL OVER TOP		2	11	20	2	11	20	2	11	20	2	11	20	28	2	11	20	28
CONC.	TOP SLAB T_1	9	10	12	9	10	12	9	10	12	9	10	12	14 1/4	9	10 1/4	12 1/2	14 1/2
CONC.	BOTTOM SLAB T_2	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	15	8	11	13 1/2	15
CONC.	SIDEWALLS T_3	6	6	6	6	6	6	6	6	6 1/2	7	7	7 1/2	8 1/2	8	8 1/2	9	10
REINFORCING STEEL "a"	SIZE BAR #	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	6	7
"a"	SPACING	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	11	10 1/2	13	10	11
"a"	LENGTH	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	33-2	33-2	33-4	33-8	33-6	33-8	33-10	34-2
"b" or "b_1"	SIZE BAR #	6	7	7	6	7	7	6	7	7	6	7	7	8	6	7	7	8
"b" or "b_1"	SPACING	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	11	10 1/2	13	10	11
"b" or "b_1"	LENGTH "b"	32-6	32-7	32-10	32-6	32-7	32-10	32-6	32-7	33	32-10	32-11	33-4	33-11	32-2	33-5	33-11	34-5
"b" or "b_1"	LENGTH "b_1"	32-2	32-7	32-11	32-2	32-7	32-11	32-2	32-7	33-1	32-6	32-11	33-5	33-11	32-11	33-5	33-11	34-5
"c"	SIZE BAR #	5	7	7	5	7	7	5	7	7	5	7	7	8	5	7	7	8
"c"	SPACING	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	10 1/2	13	10	11	10 1/2	13	10	11
"c"	LENGTH	21	21	21	21	21	21	21	21	21-1	21-2	21-2	21-3	21-5	21-4	21-5	21-6	21-8
"d" DIST BARS	TOP SLAB-TOT. #	27	15	15	27	15	15	27	15	15	27	15	15	15	27	15	15	15
"d" DIST BARS	BOTTOM SLAB-TOT. #	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
"e" BARS	SIZE BAR #	4	4	5	4	5	6	4	6	7	4	6	7	8	5	6	8	8
"e" BARS	SPACING	18	13	10	18	13	10	13	13	10	10 1/2	12	10	11	10 1/2	9	10	9
SPACERS	NUMBER	68			68			72			76			94	102			
QUAN.	CONCRETE: C.Y. PER LIN. FT.	1.98	2.40	2.82	2.06	2.48	2.90	2.13	2.55	3.03	2.34	2.77	3.23	3.78	2.68	3.18	3.73	4.22
QUAN.	REINFORCING LBS. PER LIN. FT.	358	372	470	359	379	482	367	391	502	377	402	514	590	421	453	577	632

NOTE

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.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-78E**

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

		6'			7'			8'			9'				10'				12'			
SPAN		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	10	18	2	10	18	2	10	18	2	11	20	30	2	11	20	30	2	11	20	30
CONC.	TOP SLAB T_1	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	12	14 3/4	17 3/4
CONC.	BOTTOM SLAB T_2	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	12 3/4	15 3/4	18 1/4
CONC.	SIDEWALLS T_3	6	6	6 1/2	6	6	7	7	7	7 1/2	8	8	9	10	8	8	9	10 1/2	9	9	10 1/2	12
REINFORCING STEEL "a"	SIZE BAR #	7	6	7	7	6	7	7	6	7	7	6	7	8	7	6	7	8	7	6	7	8
REINFORCING STEEL "a"	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	10 1/2	11	11 1/2
REINFORCING STEEL "a"	LENGTH	39–1	38–10	39–3	39–1	38–10	39–5	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	40–7	41–6
REINFORCING STEEL "b" or "b1"	SIZE BAR #	7	7	8	7	7	8	7	7	8	7	7	8	9	7	7	8	9	7	7	8	9
REINFORCING STEEL "b" or "b1"	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	10 1/2	11	11 1/2
REINFORCING STEEL "b" or "b1"	LENGTH "b"	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	39–10	40–8	41–6
REINFORCING STEEL "b" or "b1"	LENGTH "b_1"	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	39–10	40–9	41–6
REINFORCING STEEL "c"	SIZE BAR #	6	7	8	6	7	8	6	7	8	6	7	8	9	6	7	8	9	6	7	8	9
REINFORCING STEEL "c"	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	10 1/2	11	11 1/2
REINFORCING STEEL "c"	LENGTH	25	25	25–1	25	25	25–2	25–2	25–2	25–3	25–4	25–4	25–6	25–8	25–4	25–4	25–6	25–9	25–6	25–6	25–9	26
REINFORCING STEEL "d" DIST BARS	TOP SLAB–TOT. #	36	15	15	36	15	15	36	15	15	36	15	15	15	36	15	15	15	36	15	15	15
REINFORCING STEEL "d" DIST BARS	BOTTOM SLAB–TOT. #	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
REINFORCING STEEL "e" BARS	SIZE BAR #	4	4	6	4	4	6	4	4	6	4	6	7	8	5	7	8	8	6	7	9	9
REINFORCING STEEL "e" BARS	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	9	11	9
SPACERS	NUMBER	76			80			84			104				110				116			
QUAN.	CONCRETE: C.Y. PER LIN. FT.	2.60	3.18	3.82	2.70	3.26	3.98	2.88	3.45	4.13	3.13	3.79	4.61	5.45	3.23	3.89	4.72	5.65	3.62	4.28	5.24	6.18
QUAN.	REINFORCING LBS. PER LIN. FT.	489	505	628	497	516	637	505	527	654	536	582	719	872	548	606	745	939	575	636	793	963

NOTE

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

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

SAN DIEGO REGIONAL STANDARD DRAWING

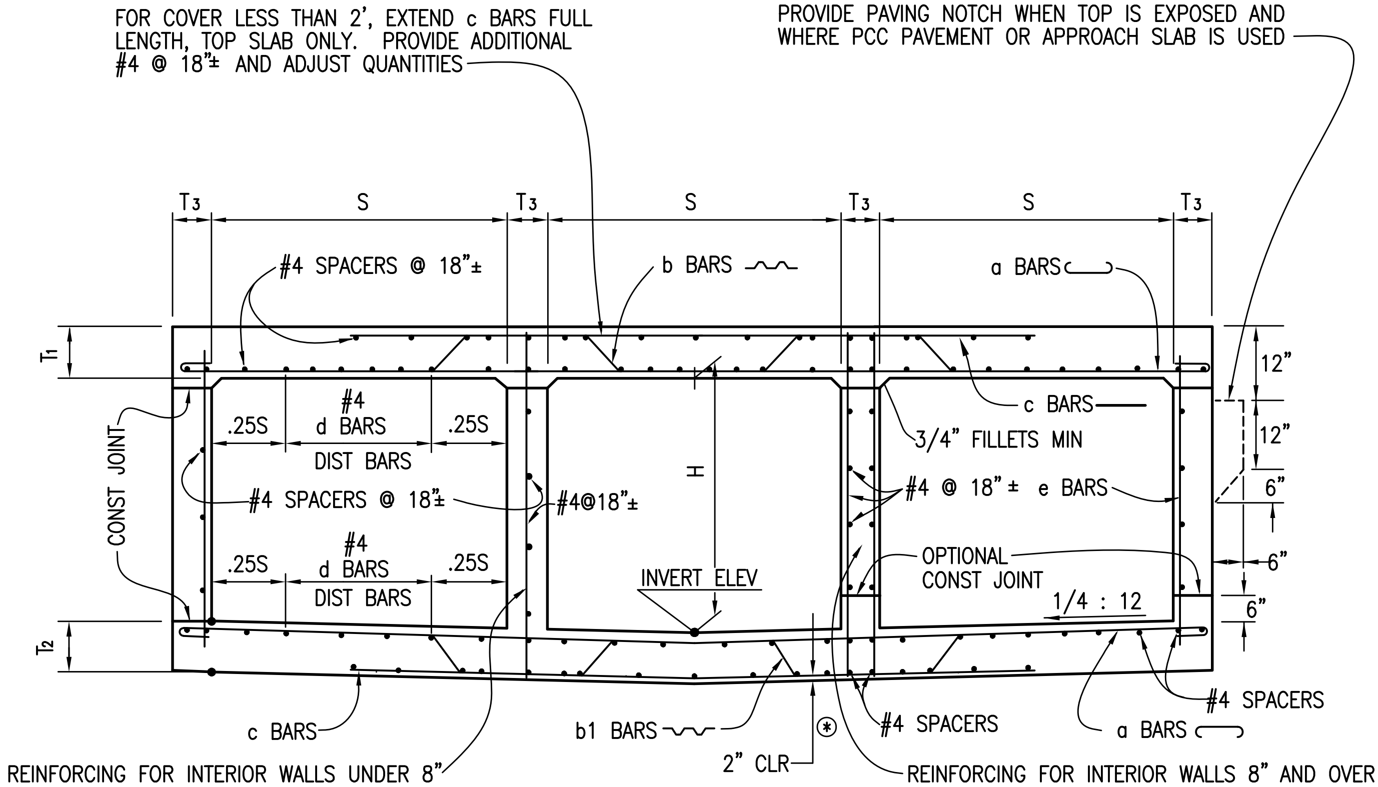
TRIPLE BOX CULVERT DETAILS No. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

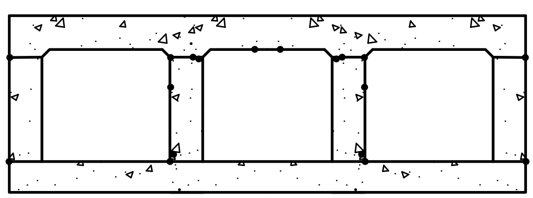
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-78F**



TYPICAL SECTION

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



FLAT INVERT ALTERNATIVE

(WHEN SPECIFIED)

NOTES

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

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

SAN DIEGO REGIONAL STANDARD DRAWING

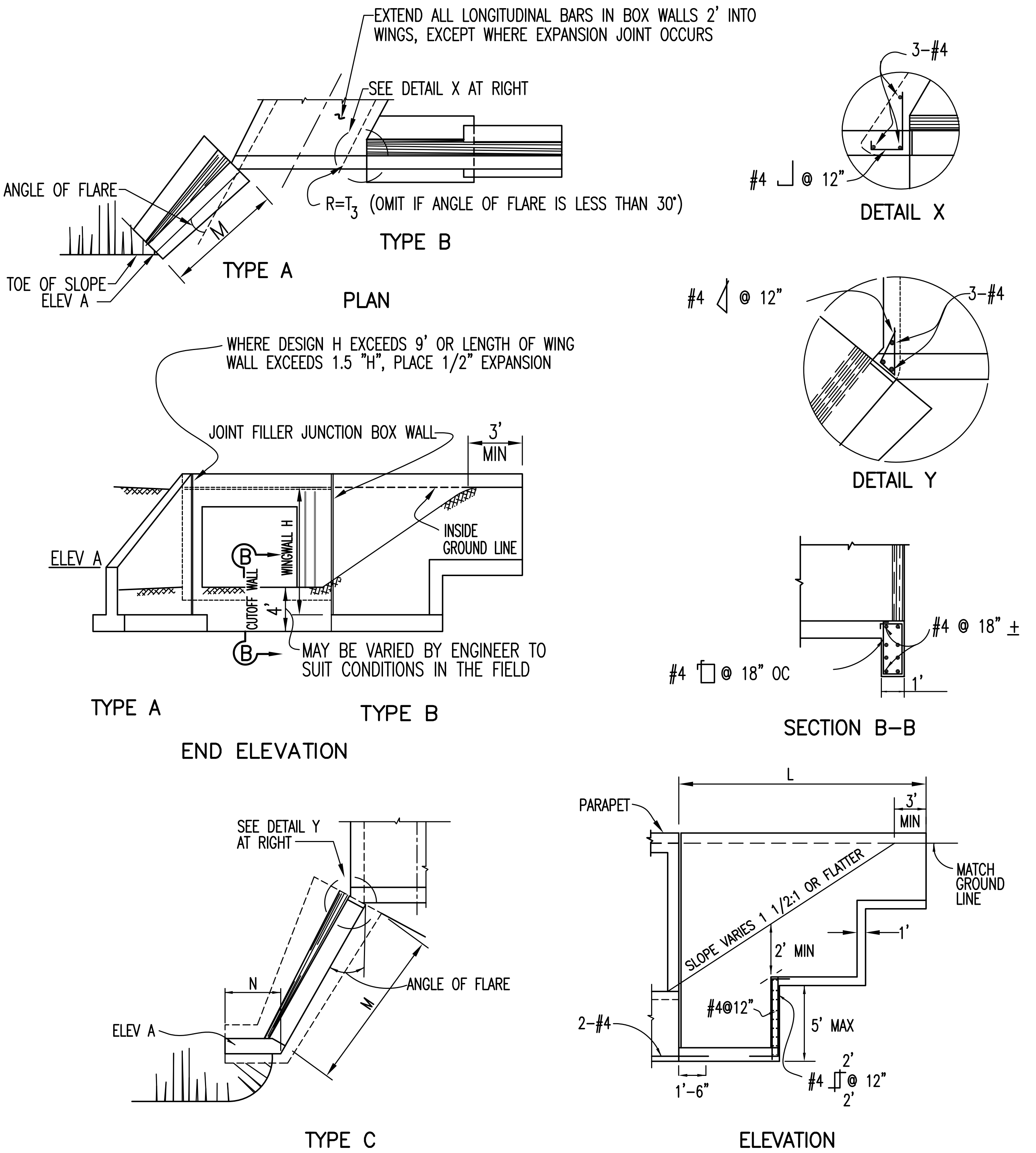
TRIPLE BOX CULVERT DETAILS NO.2

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-78G**



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

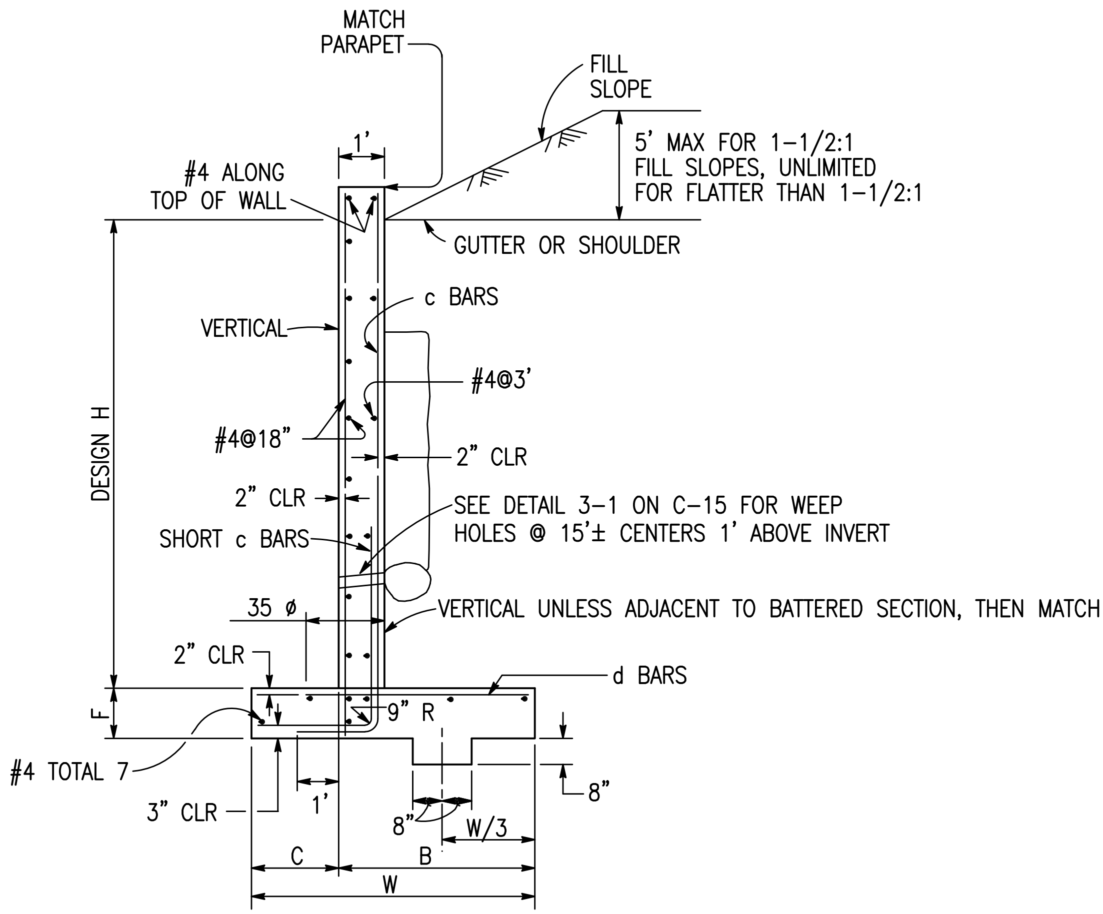
SAN DIEGO REGIONAL STANDARD DRAWING

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

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-79A**

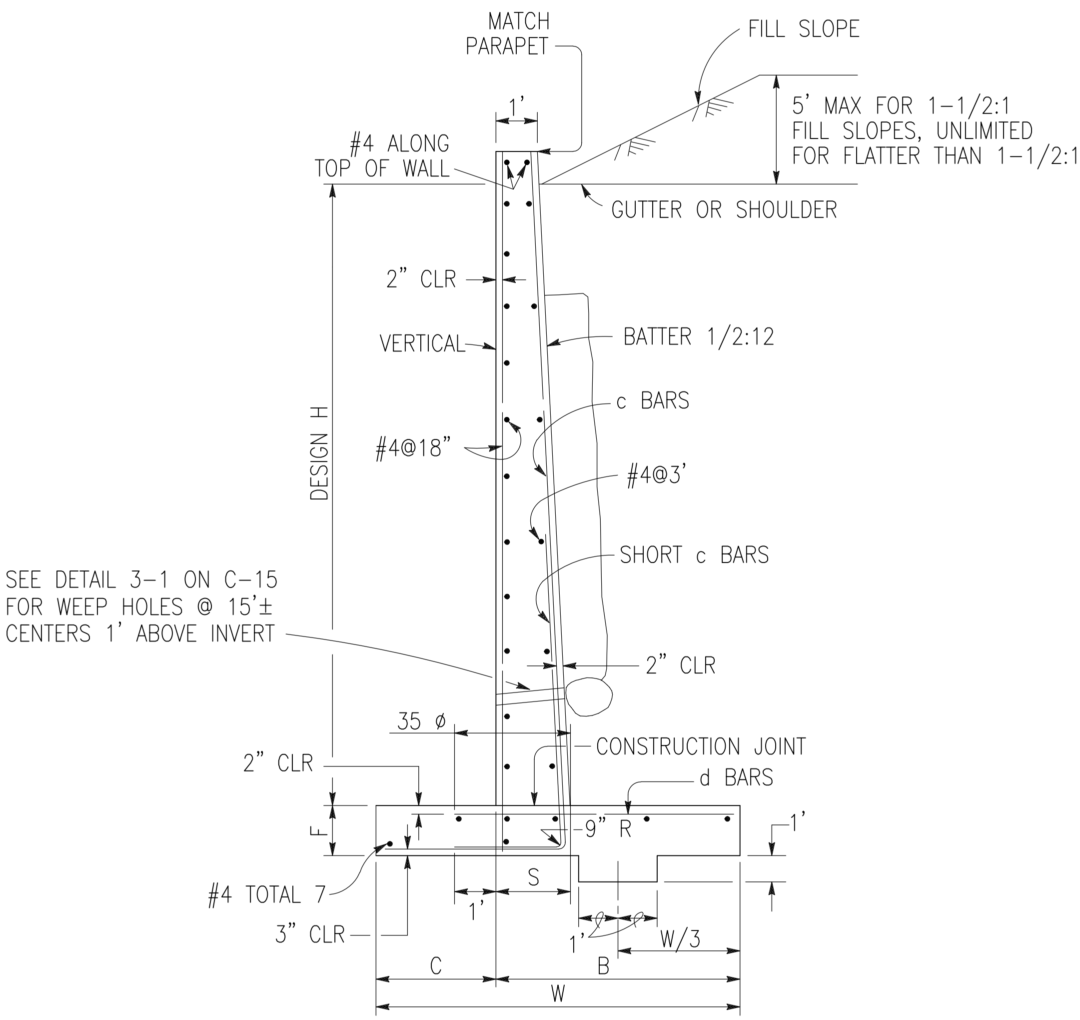


TYPICAL SECTION
H=4' THROUGH 12'

NOTE

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

Revision	By	Approved	Date		
ORIGINAL		Kercheval	12/75	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
Edited	T.R.	T. Regello	10/15	**BOX CULVERT WINGWALL TYPES A, B & C DETAILS NO. 2**	03/24/2022 Chairperson R.C.E. 52241 Date
Edited	M.W.	M. Widelski	10/18		DRAWING NUMBER **D-79B**
Reviewed	RP	S. Engeda	03/22		



TYPICAL SECTION
H=13' THROUGH 16'

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

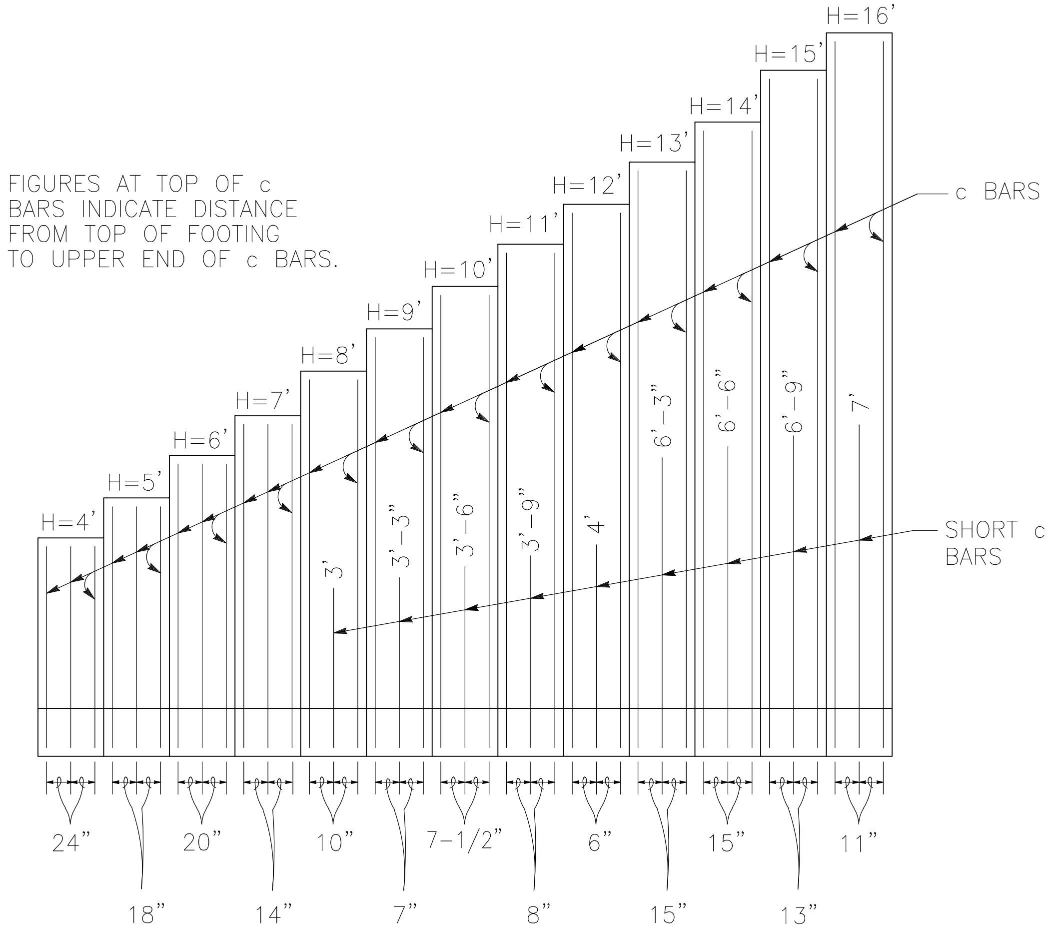
SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WINGWALL
TYPES A, B & C
DETAILS NO. 3

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-79C**



TYPICAL LAYOUT EXAMPLE 1

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

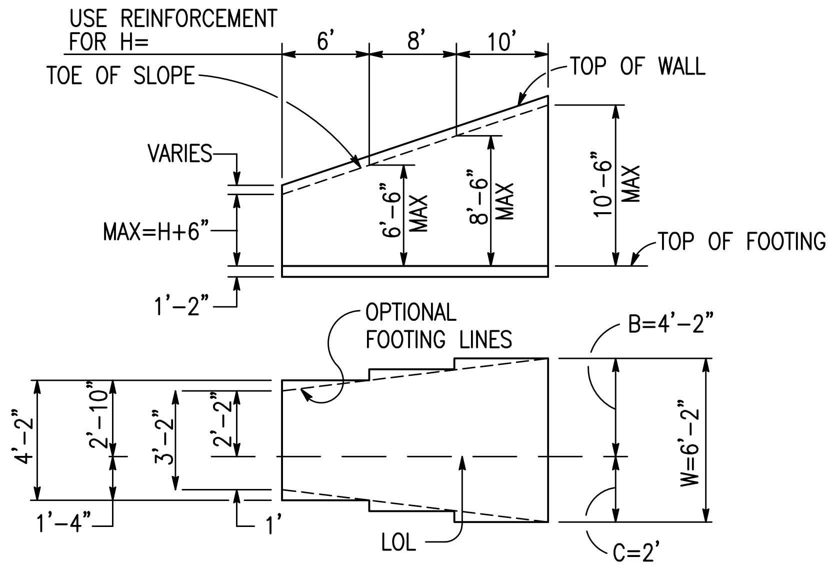
BOX CULVERT WINGWALL
TYPES A, B & C
DETAILS NO. 4

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-79D**



TYPICAL LAYOUT EXAMPLE 2

NOTES

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

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
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SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WINGWALL
TYPES A, B & C
DETAILS NO. 5

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

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 ½"	1'–7"	1'–7 ½"	1'–8"
c BARS	#4@24	#4@18	#5@20	#5@14	#5@10	#5@7	#6@7½	#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
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
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SAN DIEGO REGIONAL STANDARD DRAWING

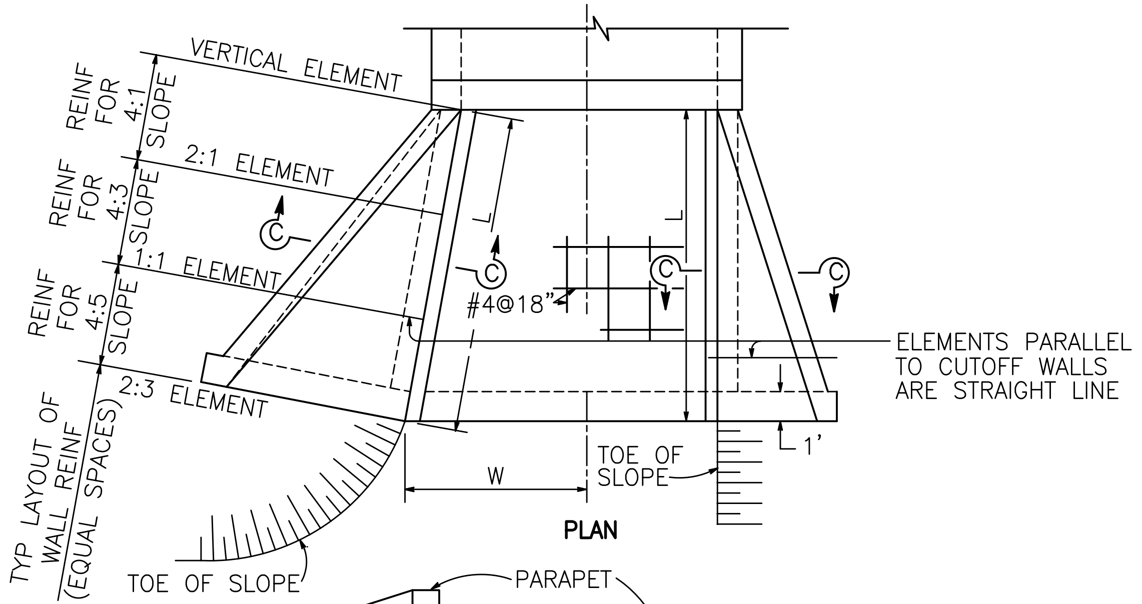
BOX CULVERT WINGWALL
TYPES A, B & C
DETAILS NO. 6

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

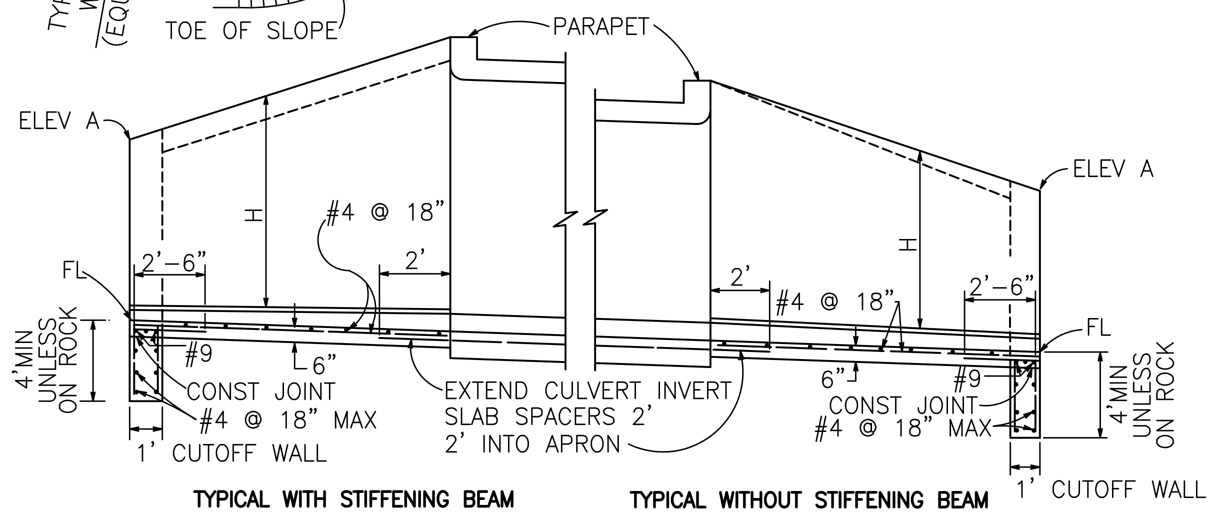
03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-79F**



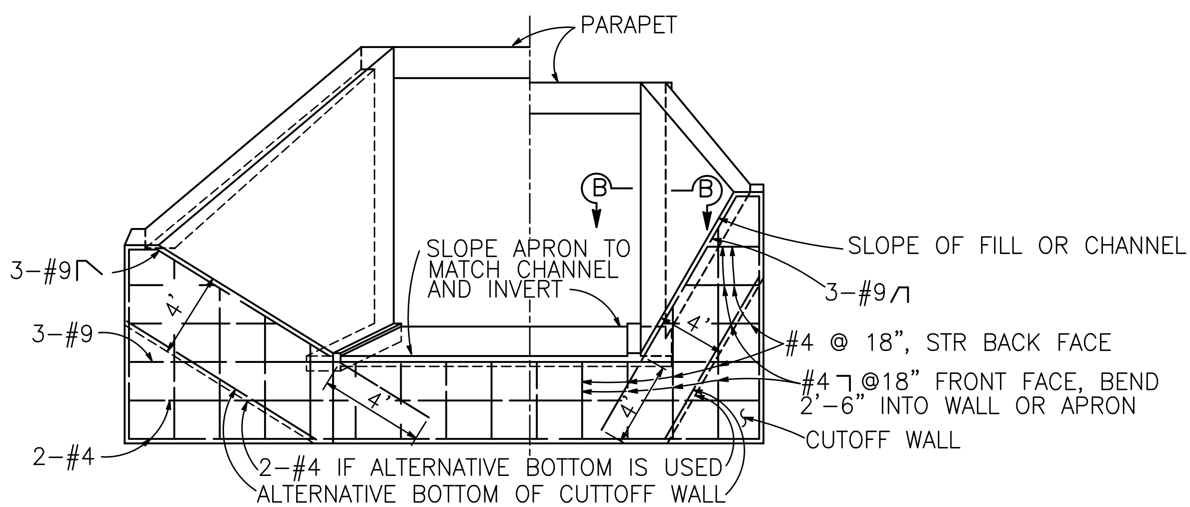
PLAN



TYPICAL WITH STIFFENING BEAM

TYPICAL WITHOUT STIFFENING BEAM

PART LONGITUDAL SECTION



END 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

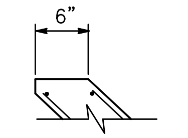
SAN DIEGO REGIONAL STANDARD DRAWING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

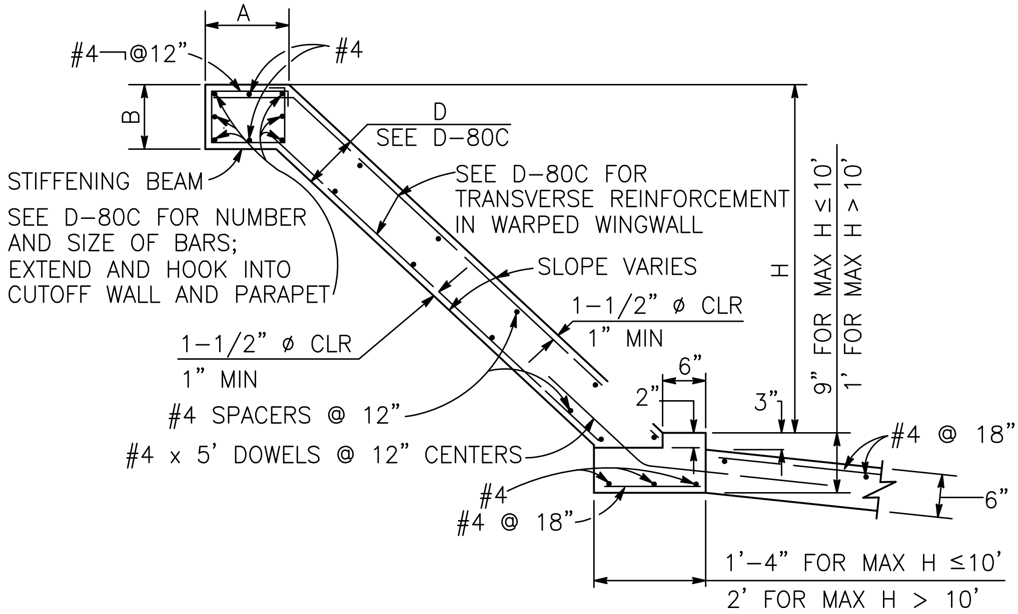
Samson Engeda 03/24/2022
Chairperson R.C.E. 52241 Date

BOX CULVERT WARPED WINGWALL DETAILS NO. 1

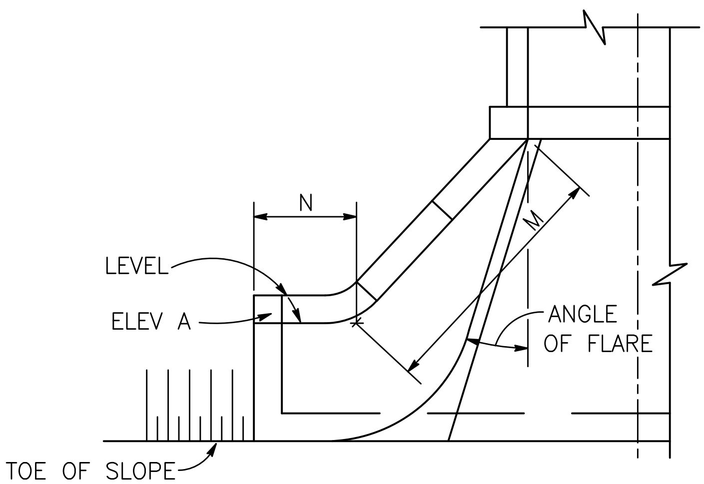
DRAWING NUMBER **D-80A**



WITHOUT STIFFENING BEAM

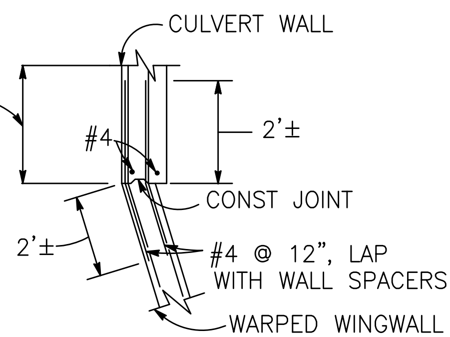


SECTION C–C



ALTERNATIVE WARPED WINGWALL

USE WHERE ADDITIONAL PROTECTION TO TOE OF EMBANKMENT IS REQUIRED



SECTION B–B

NOTES

1. WALLS DESIGNED FOR 2' SURCHARGE; EARTH DENSITY = 120 LBS./CU. FT.; EQUIVALENT FLUID PRESSURE = 36 LBS./CU. FT.
2. VARY D OF WARPED WALL 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
ORIGINAL		A.Kercheval	12/75
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Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WARPED WINGWALL DETAILS No. 2

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-80B**

WALL DIMENSIONS AND REINFORCING								
ELEMENT SLOPE	H	8' OR LESS	10'	12'	14'	16'	18'	20'
1/4:1	FRONT FACE REINF REAR FACE REINF	#4@12 #4@12	#4@ 7 #4@12	#5@ 7 #4@12	#5@ 5 #4@12	#6@ 6 #4@12	#7@ 7 #4@12	#7@ 6 #4@12
3/4:1	FRONT FACE REINF REAR FACE REINF	#4@12 #4@12	#4@12 #4@12	#4@12 #4@12	#4@12 #4@10	#4@10 #4@ 7	#4@ 8 #4@ 6	#4@ 6 #5@ 8
1-1/4:1	FRONT FACE REINF REAR FACE REINF	#4@12 #4@ 8	#4@12 #4@ 8	#4@12 #4@ 5	#4@12 #5@ 6	#4@12 #6@ 7	#4@12 #6@ 6	#4@12 #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"		A=1'-6"			
14'		TOTAL 6-#6				B=1'		A=1'-10"	
16'				TOTAL 6-#7			B=1'		A=2'
18'						TOTAL 6-#8		B=1'-6"	
20'							TOTAL 8-#9		

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

SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WARPED WINGWALL DETAILS No. 3

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-80C**

GENERAL NOTES

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

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

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

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

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

CONSTRUCTION NOTES

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

EXPANSION JOINTS: Bottom Slab - No expansion joints shall be placed.
Top Slab and Walls - When cover is less than span length, place 1/2" expansion joint filler at 50'± centers outside the paved roadway lanes and place weakened plane joints per Detail A of Weakened Planes Detail 3-2 of C-15 at 30'± centers under paved roadway lanes. When cover depth is greater than span length, place 1/2" expansion joint filler at 30'± centers and additional 1/2" expansion joints at locations of change of foundation character as directed by the Engineer.

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

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

DESIGN NOTES

SPECIFICATIONS
DESIGN: AASHTO's publication titled A Policy on Geomeric 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: Fs = 20,000 psi, N = 10
Fc = 1,200 psi

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

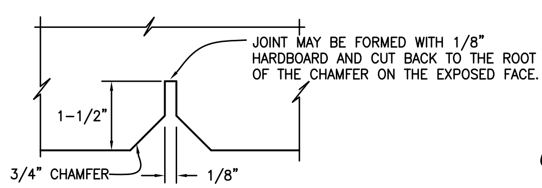
Distribution "d" bars expressed as a percent of main positive reinforcement.

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

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

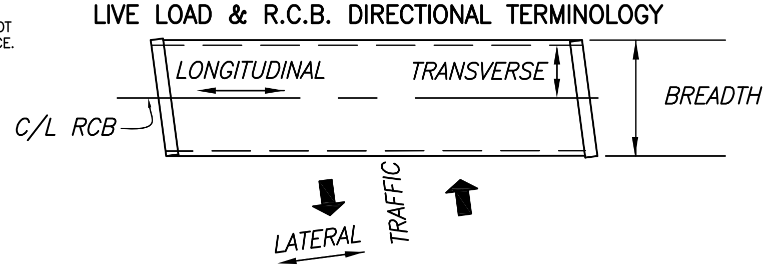
USE OF STANDARD DRAWING

"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.



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

LIVE LOAD & R.C.B. DIRECTIONAL TERMINOLOGY



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

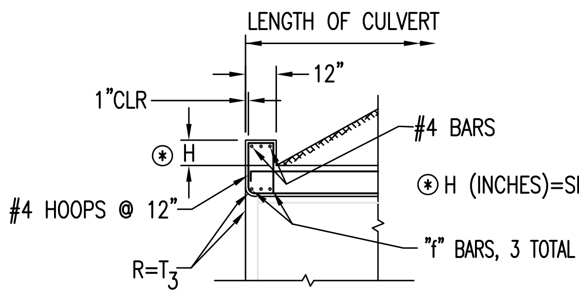
SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT MISCELLANEOUS DETAILS No. 1

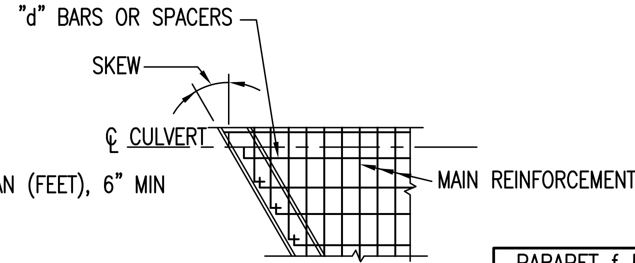
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

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

DRAWING NUMBER **D-81A**



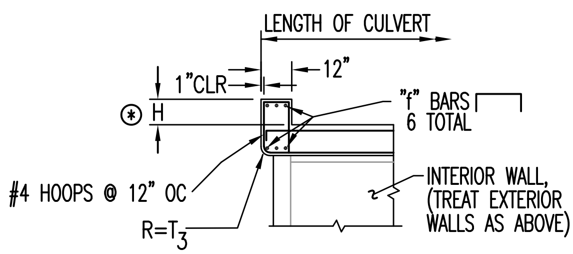
PART SECTION



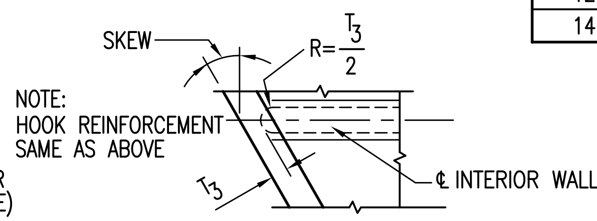
PART PLAN–SKEWED

PARAPET DETAILS FOR SINGLE SPAN CULVERTS

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

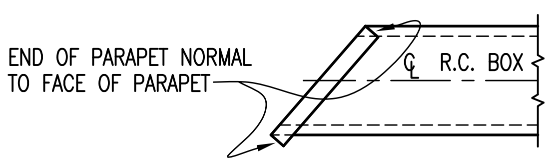


PART SECTION

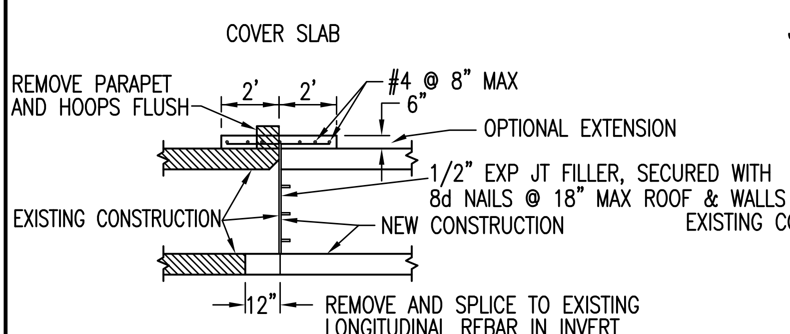


PART PLAN–SKEWED

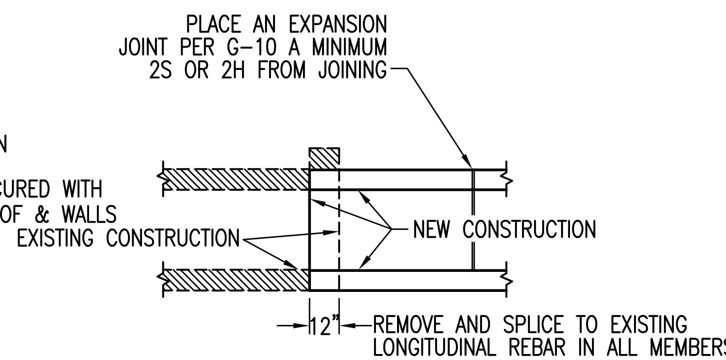
PARAPET DETAILS FOR MULTIPLE SPAN CULVERTS



PARAPET DETAIL FOR SKEWED CULVERTS W/O WINGWALLS



COVER: 1' AND GREATER



COVER: EXPOSED TOP AND LESS THAN 1'

CULVERT EXTENSION

20° SKEW MAXIMUM

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

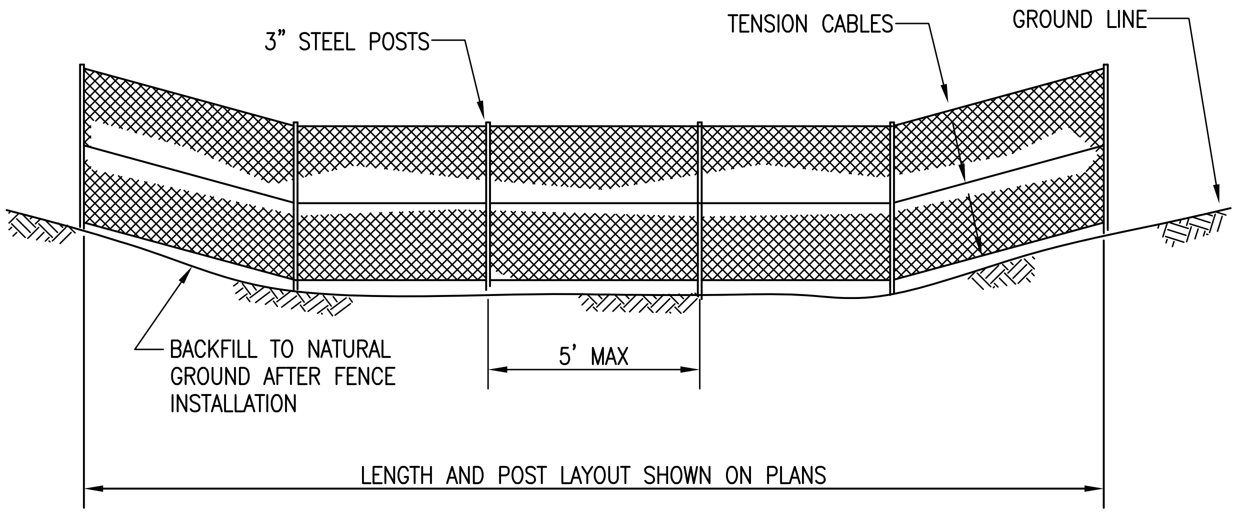
MISCELLANEOUS DETAILS NO. 2

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

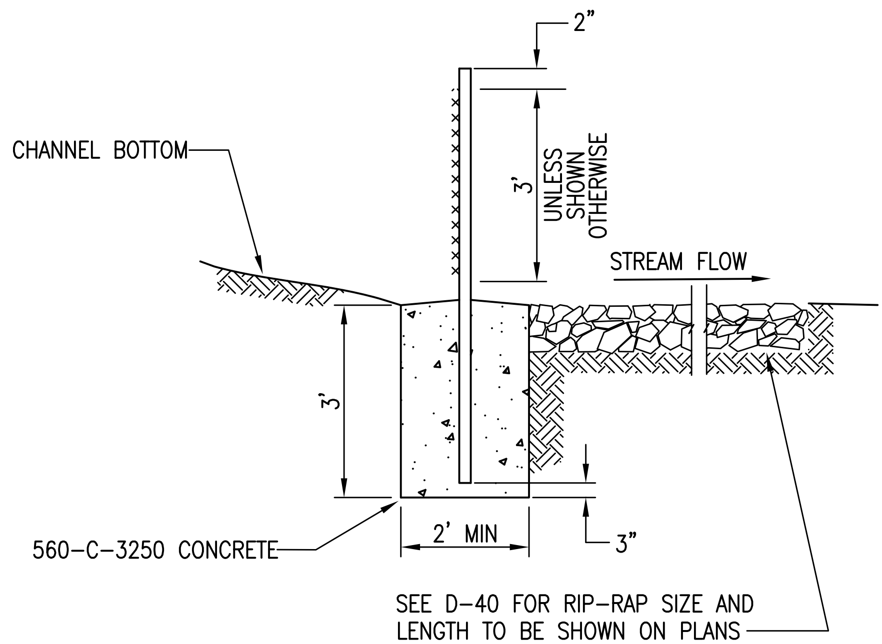
Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-81B**



ELEVATION



SECTION

NOTES

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

LEGEND ON PLANS

Revision	By	Approved	Date
ORIGINAL		H. Hecht	10/82
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

DEBRIS FENCE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Samson Engeda 03/24/2022

Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-82**