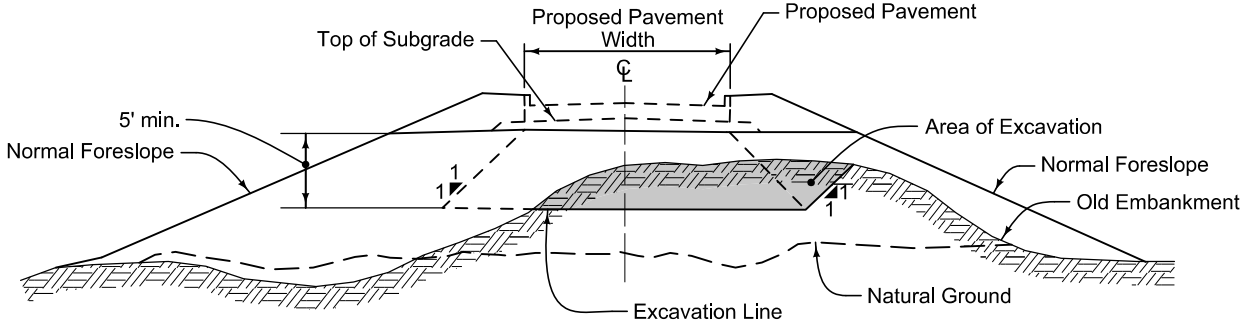
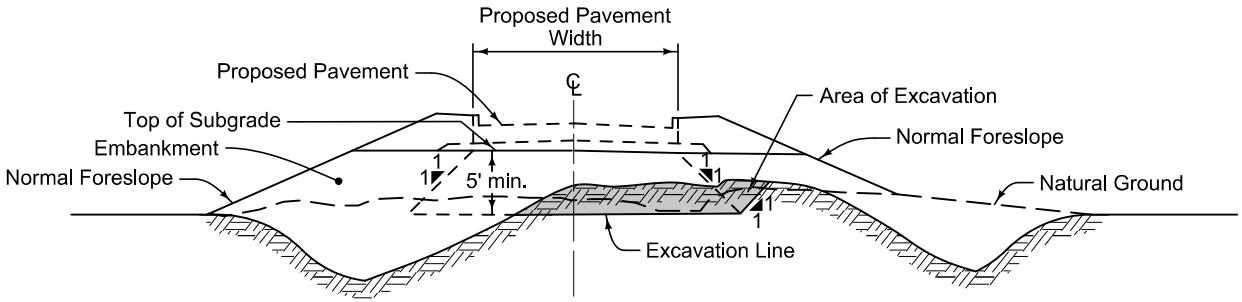
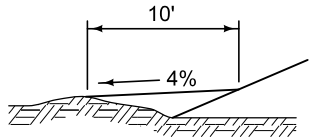


TYPICAL CROSS-SECTION: REBUILDING EMBANKMENT WHERE NATURAL GROUND IS GREATER THAN 5 FEET BELOW FINISHED GRADE LINE (1)

(1) Use only when new roadbed overlaps existing roadbed. Not for use on relocations or where new roadbed is to be built on natural ground.

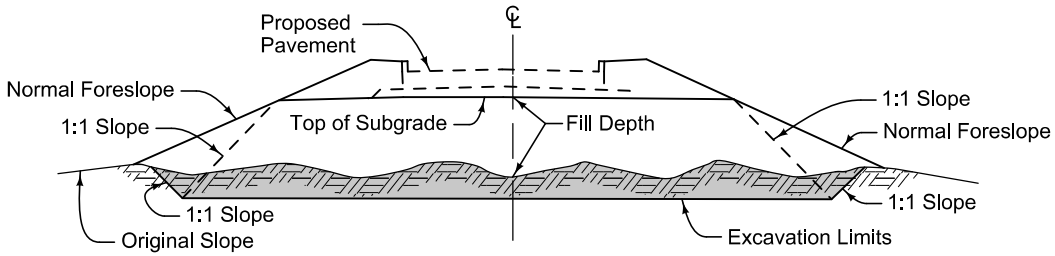


TYPICAL CROSS-SECTION: REBUILDING EMBANKMENT WHERE NATURAL GROUND IS LESS THAN 5 FEET BELOW FINISHED GRADE LINE (1)



TYPICAL TOE FILL CONSTRUCTION

Use care in setting toe fills. Ensure proper drainage in side ditches is maintained.



TYPICAL CROSS-SECTION: EXCAVATION OF PEAT, MUCK, OR OTHER MATERIAL NOT TO BE USED FOR THE CONSTRUCTION OF EMBANKMENTS

FIGURE 2010.101 | SHEET 1 OF 1

SUDAS

REVISION 3 10-21-14

2010.101

SHEET 1 of 1

SUDAS Standard Specifications

DETAILS OF EMBANKMENTS AND REBUILDING EMBANKMENTS

Refer to the contract documents for specific material and placement requirements.

(1) Required only when specified in the contract documents or when directed by the Engineer.

Key

OD = Outside diameter of pipe

D = Inside diameter of pipe

TW = Trench width at top of pipe

d = Depth of bedding material below pipe

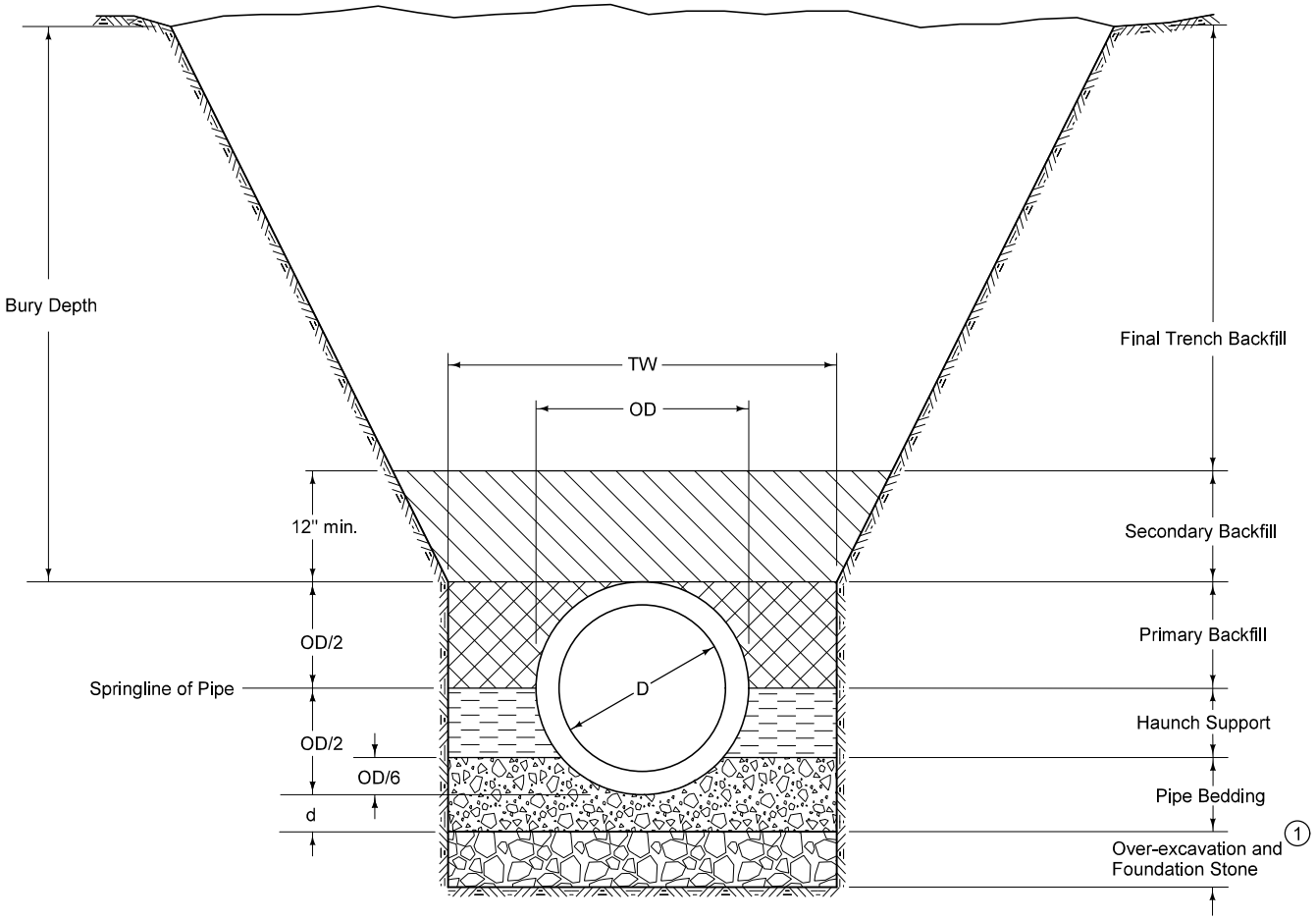


FIGURE 3010.101 SHEET 1OF 1

SUDAS | IOWADOT | REVISION 1 04-17-18

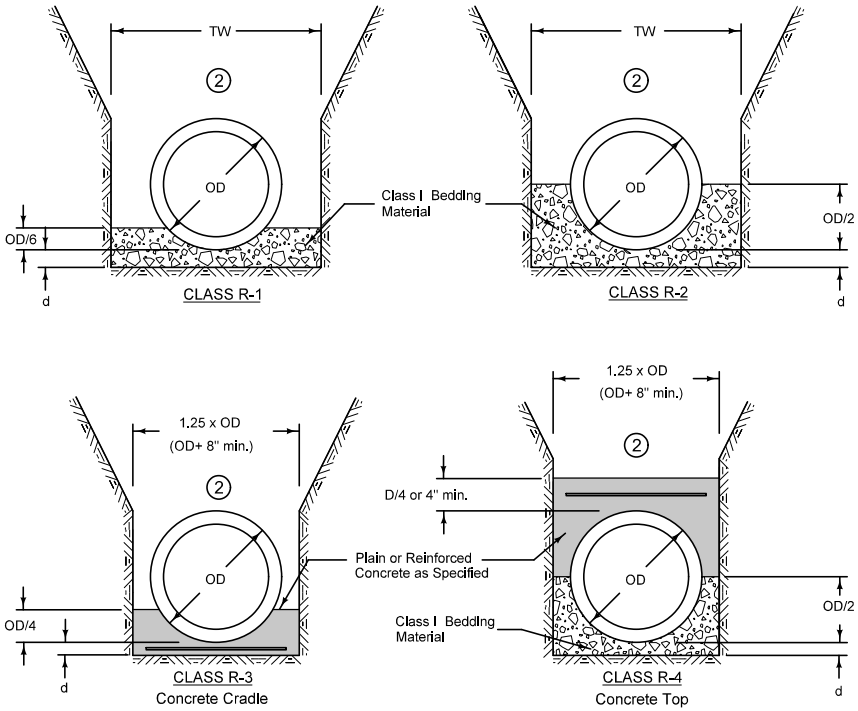
FIGURE 3010.101 | STANDARD ROAD PLAN | SW-101 | SHEET 1 of 1

REVISIONS: Replaced Iowa DOT and SUDAS logos.

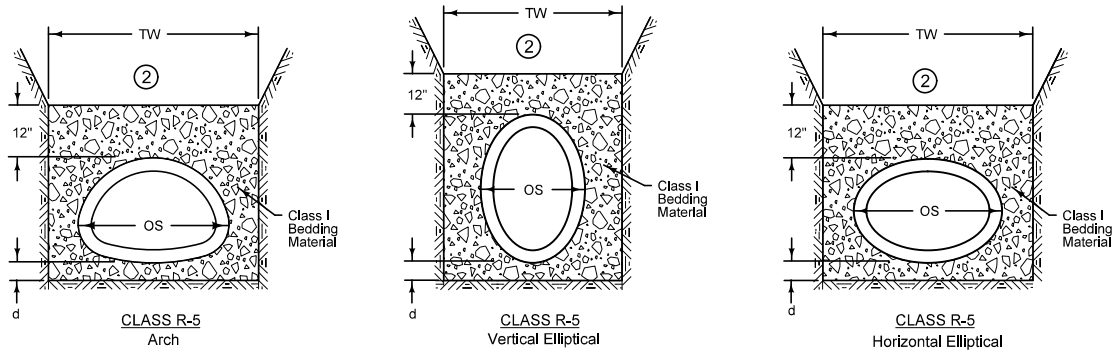
Paul D. Wigand, SUDAS DIRECTOR — Brian Smith, DESIGN METHODS ENGINEER

TRENCH BEDDING AND BACKFILL ZONES

RCP AND VCP CIRCULAR PIPE BEDDING ①



REINFORCED CONCRETE ARCH AND ELLIPTICAL PIPE BEDDING



Refer to sheet 2 for bury depth restrictions.

① Use Bedding Class R-1 or R-2 unless specified otherwise.

② Place remainder of bedding and backfill materials as specified in the contract documents.

Key

OD = Outside diameter of pipe

OS = Outside span of pipe

TW = Trench width at top of pipe:
Min. = OD+18 inches
Max.= 1.25xOD+12 inches OR
54 inches (whichever is greater)

d = Depth of bedding material below pipe:
OD/8 or OS/8, OR 4 inches
(whichever is greater)

FIGURE 3010.102 SHEET 1 OF 2

SUDAS | IOWA DOT

REVISION	
4	04-20-21

FIGURE 3010.102 | STANDARD ROAD PLAN | SW-102 | SHEET 1 of 2

REVISIONS: Added note DO NOT USE ON PRIMARY ROADWAYS.

Paul D. Wigard, SUDAS DIRECTOR | DESIGN METHODS ENGINEER

RIGID GRAVITY PIPE TRENCH BEDDING

ALLOWABLE BURY DEPTH

CLASS III RCP

Pipe Diameter (in)	Class R-1 Bedding	Class R-2 Bedding	Class R-3 & R-4 Bedding		
			No Steel	As=0.4%	As=1.0%
12	7'	10'	15'	19'	27'
15	8'	10'	16'	19'	27'
18	8'	11'	16'	20'	40'
21	8'	11'	18'	26'	40'
24	8'	12'	23'	36'	40'
27	10'	15'	30'	40'	40'
30	11'	15'	29'	40'	40'
33	11'	15'	28'	40'	40'
36	11'	15'	27'	40'	40'
42	11'	15'	26'	38'	40'
48	11'	15'	26'	36'	40'
54	11'	15'	25'	34'	40'
60	11'	15'	25'	33'	40'
66	11'	15'	24'	32'	40'
72	11'	15'	24'	32'	40'
As = Area of Steel Reinforcing					

CLASS IV RCP

Pipe Diameter (in)	Class R-1 Bedding	Class R-2 Bedding	Class R-3 & R-4 Bedding		
			No Steel	As=0.4%	As=1.0%
12	12'	15'	23'	28'	40'
15	12'	16'	23'	30'	40'
18	13'	16'	29'	40'	40'
21	13'	18'	40'	40'	40'
24	16'	23'	40'	40'	40'
27	19'	30'	40'	40'	40'
30	19'	29'	40'	40'	40'
33	19'	28'	40'	40'	40'
36	19'	28'	40'	40'	40'
42	18'	27'	40'	40'	40'
48	18'	26'	40'	40'	40'
54	18'	25'	40'	40'	40'
60	18'	25'	40'	40'	40'
66	18'	25'	40'	40'	40'
72	18'	24'	40'	40'	40'
As = Area of Steel Reinforcing					

CLASS V RCP

Pipe Diameter (in)	Class R-1 Bedding	Class R-2 Bedding	Class R-3 & R-4 Bedding		
			No Steel	As=0.4%	As=1.0%
12	18'	23'	35'	40'	40'
15	19'	24'	40'	40'	40'
18	19'	30'	40'	40'	40'
21	25'	40'	40'	40'	40'
24	34'	40'	40'	40'	40'
27	40'	40'	40'	40'	40'
30	40'	40'	40'	40'	40'
33	40'	40'	40'	40'	40'
36	40'	40'	40'	40'	40'
42	37'	40'	40'	40'	40'
48	35'	40'	40'	40'	40'
54	33'	40'	40'	40'	40'
60	32'	40'	40'	40'	40'
66	31'	40'	40'	40'	40'
72	31'	40'	40'	40'	40'
As = Area of Steel Reinforcing					

EXTRA STRENGTH VCP

Pipe Dia. (in)	Bedding Class				
	R-1	R-2	R-3 & R-4		
			No Steel	As=0.4%	As=1.0%
6	25'	30'	30'	30'	30'
8	20'	26'	30'	30'	30'
10	18'	23'	30'	30'	30'
12	16'	20'	30'	30'	30'
15	15'	19'	28'	30'	30'
18	14'	18'	30'	30'	30'
21	15'	22'	30'	30'	30'
24	18'	28'	30'	30'	30'
27	20'	30'	30'	30'	30'
30	19'	29'	30'	30'	30'
33	20'	30'	30'	30'	30'
36	20'	30'	30'	30'	30'
39	19'	29'	30'	30'	30'
42	18'	26'	30'	30'	30'
As = Area of Steel Reinforcing					

CONCRETE ARCH PIPE

Pipe Size (in x in)	Equiv. Dia. (in)	Pipe Class	
		A-III	A-IV
18 x 11	15	6'	11'
22 x 13	18	6'	11'
26 x 15	21	6'	13'
29 x 18	24	7'	15'
36 x 22	30	8'	15'
44 x 27	36	8'	14'
51 x 31	42	8'	15'
58 x 36	48	8'	15'
65 x 40	54	8'	15'
73 x 45	60	8'	14'
88 x 54	72	9'	14'
Based on Class R-5 bedding			

HORIZONTAL ELLIPTICAL RCP

Pipe Size (in x in)	Equiv. Dia. (in)	Pipe Class	
		HE-III	HE-IV
14 x 23	18	12'	22'
19 x 30	24	15'	29'
22 x 34	27	15'	28'
24 x 38	30	15'	27'
27 x 42	33	15'	27'
29 x 45	36	15'	26'
32 x 49	39	15'	26'
34 x 54	42	15'	25'
38 x 60	48	15'	25'
43 x 68	54	15'	24'
48 x 76	60	15'	24'
53 x 83	66	15'	24'
58 x 91	72	15'	24'
63 x 98	78	15'	23'
68 x 106	84	15'	23'
Based on Class R-5 bedding			

VERTICAL ELLIPTICAL RCP

Pipe Size (in x in)	Equiv. Dia. (in)	Pipe Class			
		VE-III	VE-IV	VE-V	VE-VI
23 x 14	18	10'	15'	22'	33'
30 x 19	24	10'	16'	34'	40'
34 x 22	27	11'	20'	40'	40'
38 x 24	30	12'	23'	40'	40'
42 x 27	33	15'	30'	40'	40'
45 x 29	36	15'	29'	40'	40'
49 x 32	39	15'	29'	40'	40'
54 x 34	42	15'	28'	40'	40'
60 x 38	48	15'	27'	40'	40'
68 x 43	54	15'	27'	40'	40'
76 x 48	60	15'	26'	40'	40'
83 x 53	66	15'	25'	40'	40'
91 x 58	72	15'	25'	40'	40'
98 x 63	78	15'	25'	40'	40'
106 x 68	84	15'	24'	40'	40'
Based on Class R-5 bedding					

FIGURE 3010.102 SHEET 2 OF 2

SUDAS | IOWADOT | REVISION 4 04-20-21

FIGURE 3010.102 | STANDARD ROAD PLAN | SW-102 | SHEET 2 of 2

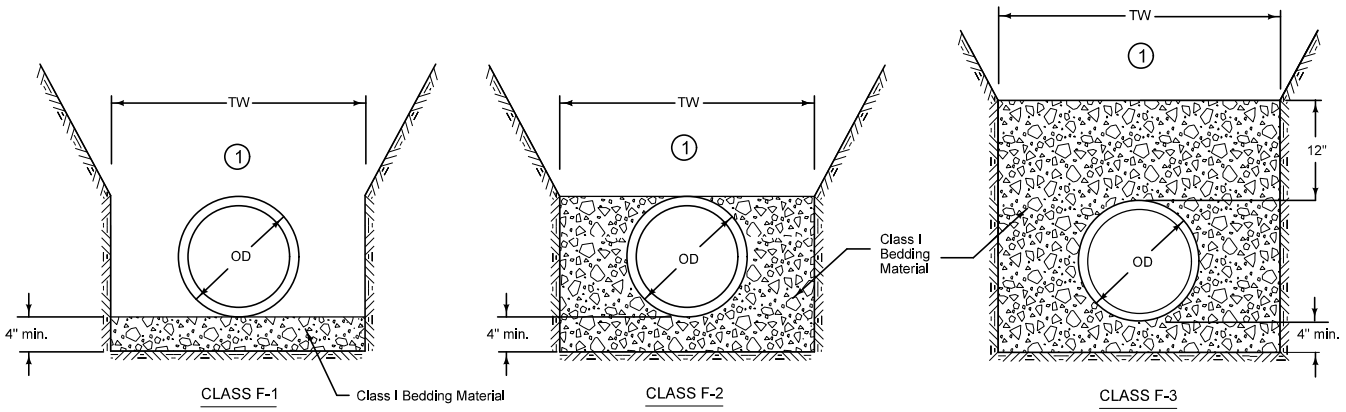
REVISIONS: Added note DO NOT USE ON PRIMARY ROADWAYS.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

RIGID GRAVITY PIPE TRENCH BEDDING

DO NOT USE ON PRIMARY ROADWAYS

BEDDING CLASSES



1. Place remainder of bedding and backfill materials as specified in the contract documents.
2. Minimum depth of bury 12 inches or as specified by the manufacturer.

ALLOWABLE BEDDING CLASSES

PIPE MATERIAL	STORM SEWER	SANITARY SEWER
Ductile Iron	F-1, F-2, F-3	F-1, F-2, F-3
HDPE	F-2, F-3	Not allowed
Polypropylene	F-2, F-3	F-3
PVC	F-2, F-3	F-3

Key

OD = Outside diameter of pipe

TW = Trench width at top of pipe:
Min. = OD+18 Inches OR 1.25xOD+12 Inches
(whichever is greater)

ALLOWABLE BURY DEPTH (2)

PVC PIPE

Pipe Diameter (in)	ASTM D 3034			ASTM F 679	ASTM F 949	ASTM F 1803	ASTM D 2680
	Solid Wall			Solid Wall	Corrug. Exterior	Closed Profile	Composite (Truss Type)
	SDR 23.5	SDR 26	SDR 35	SDR 35			
8	30'	28'	24'	---	24'	---	32'
10	30'	28'	24'	---	24'	---	32'
12	30'	28'	24'	---	24'	---	32'
15	30'	28'	24'	---	24'	---	32'
18	---	---	---	24'	24'	---	---
21	---	---	---	24'	24'	24'	---
24	---	---	---	24'	24'	24'	---
27	---	---	---	24'	---	24'	---
30	---	---	---	24'	24'	24'	---
33	---	---	---	24'	---	---	---
36	---	---	---	24'	24'	24'	---
42	---	---	---	24'	---	24'	---
48	---	---	---	24'	---	24'	---
54	---	---	---	---	---	24'	---
60	---	---	---	---	---	24'	---

DUCTILE IRON, AWWA C151, CLASS 52

Pipe Diameter (in)	Class F-1 Bedding	Class F-2 Bedding	Class F-3 Bedding
4	40'	40'	40'
6	40'	40'	40'
8	40'	40'	40'
10	40'	40'	40'
12	37'	40'	40'
14	31'	40'	40'
16	28'	37'	40'
18	25'	34'	40'
20	23'	32'	40'
24	20'	29'	38'
30	18'	23'	31'
36	18'	22'	30'
42	17'	21'	29'
48	16'	19'	27'
54	16'	19'	27'

HDPE PIPE

Pipe Diameter (in)	AASHTO M 294
12	8'
15	9'
18	9'
24	9'
30	9'
36	9'
42	8'
48	8'
54	8'
60	8'

POLYPROPYLENE PIPE

Pipe Diameter (In)	ASTM F 2764
12	24'
15	25'
18	22'
24	20'
30	22'
36	21'
42	22'
48	23'
54	21'
60	21'

SUDAS | IOWA DOT

REVISION: 4 | 04-20-21

FIGURE 3010.103 | STANDARD ROAD PLAN | SW-103

SHEET 1 of 1

REVISIONS: Added note DO NOT USE ON PRIMARY ROADWAYS.

Paul D. Wigand, SUDAS DIRECTOR

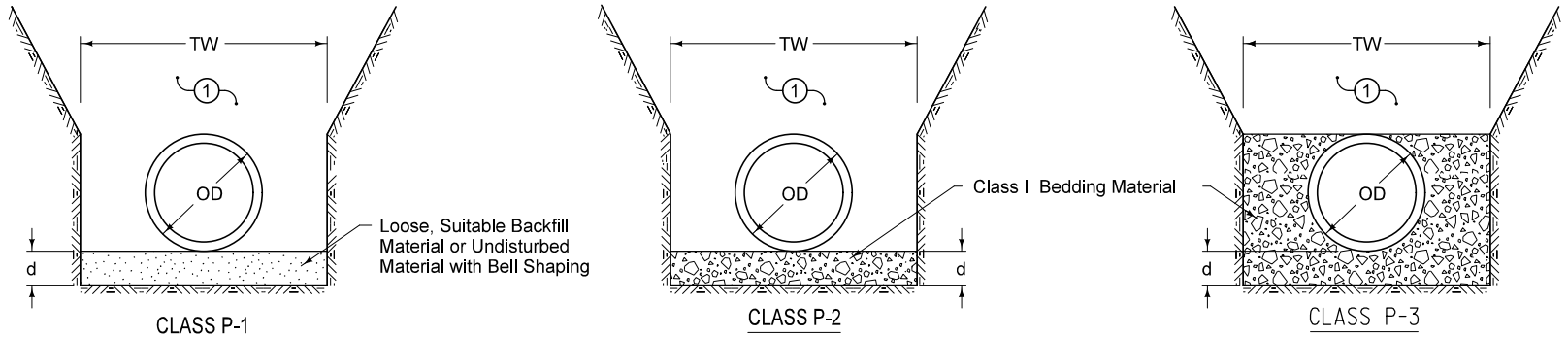
Stuart Nicholson, DESIGN METHODS ENGINEER

FLEXIBLE GRAVITY PIPE TRENCH BEDDING

FIGURE 3010.103 | SHEET 1 OF 1

DO NOT USE ON PRIMARY ROADWAYS

BEDDING CLASSES



ALLOWABLE BURY DEPTH

DUCTILE IRON, AWWA C151, CLASS 52

Pipe Diameter (inches)	Class P-1 Bedding	Class P-2 Bedding	Class P-3 Bedding
4	40'	40'	40'
6	40'	40'	40'
8	40'	40'	40'
10	36'	40'	40'
12	31'	40'	40'
14	26'	40'	40'
16	23'	37'	40'
18	20'	34'	40'
20	18'	32'	40'
24	16'	29'	38
30	13'	23'	31'
36	13'	22'	30'
42	13'	21'	29'
48	13'	19'	27'
54	13'	19'	27'

PVC, AWWA C900, DR18

Pipe Diameter (inches)	Class P-1 Bedding	Class P-2 Bedding	Class P-3 Bedding
4	19'	23'	40'
6	19'	23'	40'
8	19'	23'	40'
10	19'	23'	40'
12	19'	23'	40'
14	19'	23'	40'
16	19'	23'	40'
18	19'	23'	40'
20	19'	23'	40'
24	19'	23'	40'

(1) Place remainder of bedding and backfill material as specified in the contract documents.

Key

OD = Outside diameter of pipe

TW = Trench width at top of pipe:
Min. = OD+18 inches OR 1.25xOD+12 inches
(whichever is greater)

d = Depth of bedding material below pipe:
Min. = OD/8 OR 4 inches
(whichever is greater)

SUDAS | IOWADOT | REVISION 3 04-20-21

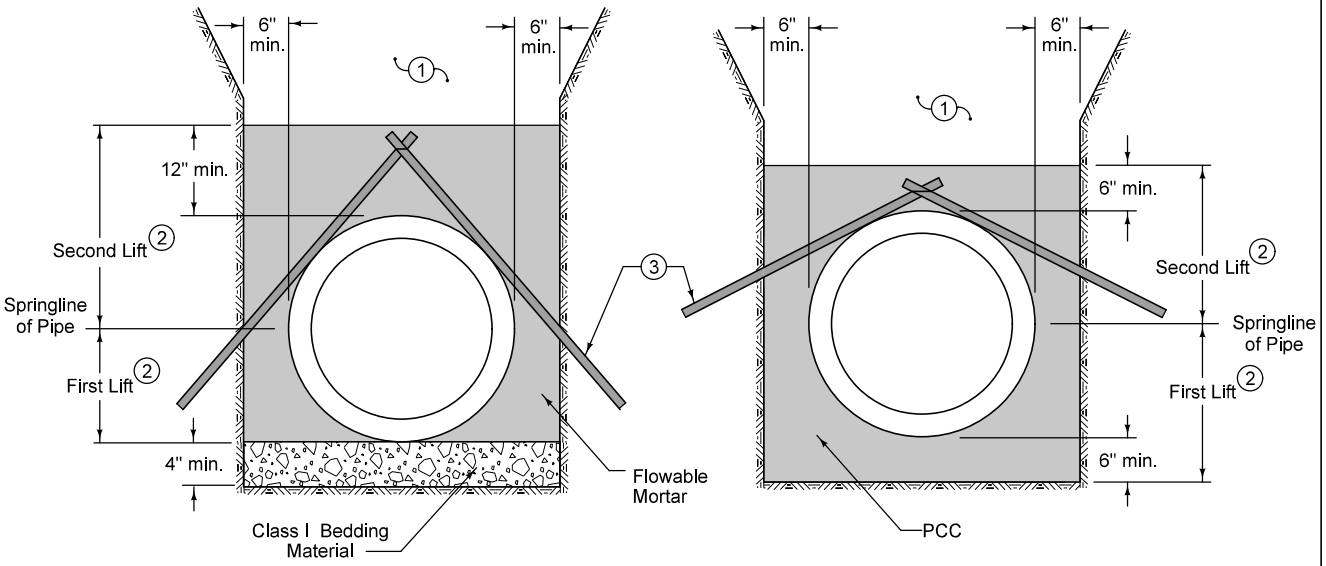
FIGURE 3010.104 | STANDARD ROAD PLAN | SW-104 | SHEET 1 of 1

REVISIONS: Added note DO NOT USE ON PRIMARY ROADWAYS.

Paul D. Wigant, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

PRESSURE PIPE TRENCH BEDDING

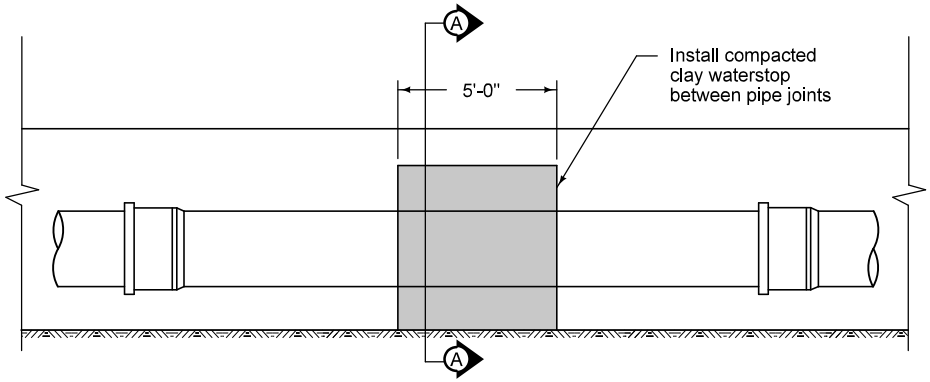
FIGURE 3010.104 SHEET 1OF 1



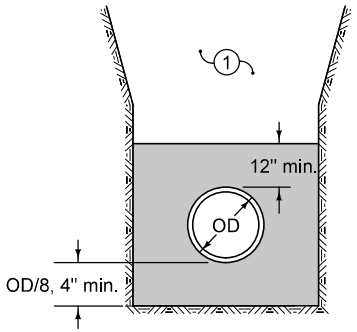
FLOWABLE MORTAR ENCASEMENT

PCC ENCASEMENT

1. Place remainder of bedding and backfill material as specified in the contract documents.
2. Place encasement material in two lifts, or as required to prevent pipe flotation. Allow previous lift to reach initial set prior to placing subsequent lifts.
3. Restrain pipe as necessary to prevent flotation.
4. When specified in the contract documents, install waterstops at a nominal spacing of 800 feet or at locations as specified by the Engineer.



PROFILE



SECTION A-A

WATERSTOP FOR TRENCHES 4

FIGURE 3010.105 SHEET 1 OF 1

SUDAS | IOWA DOT

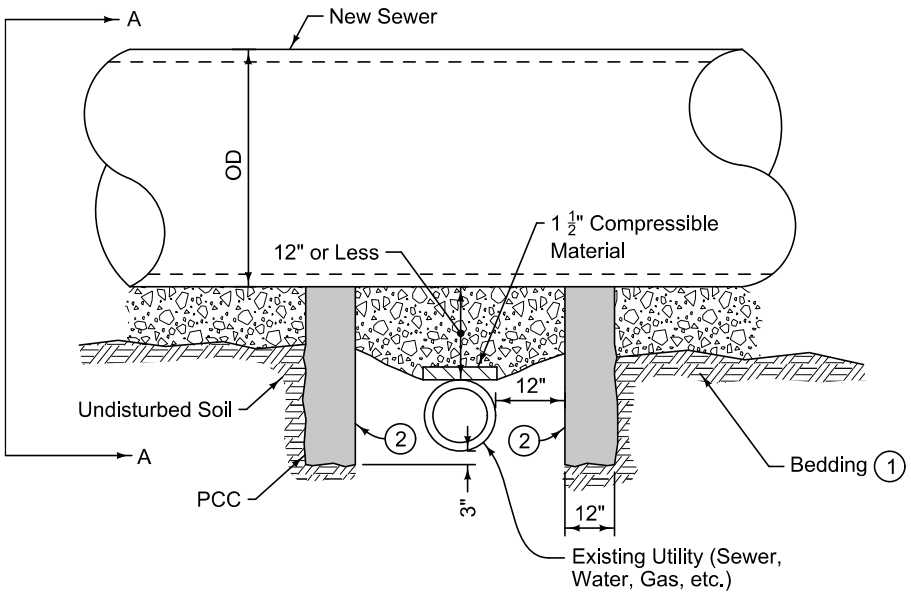
REVISION	
2	04-17-18

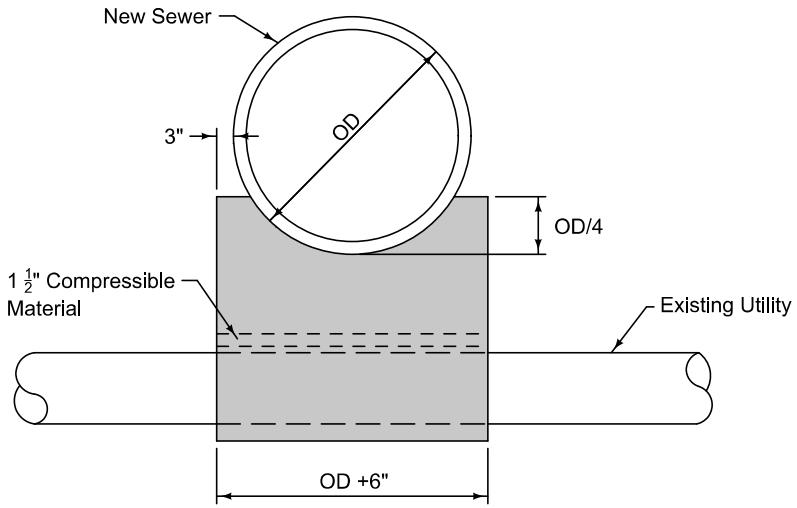
FIGURE 3010.105 | STANDARD ROAD PLAN | SW-105 | SHEET 1 of 1

REVISIONS: Replaced Iowa DOT and SUDAS logos.

Paul D. Wigand, SUDAS DIRECTOR | Brian Smith, DESIGN METHODS ENGINEER

MISCELLANEOUS PIPE BEDDING





SECTION A-A

Install pipe support for all new sewers 12 inches in diameter or larger when clearance between bottom of new sewer and top of existing line is 12 inches or less.

1. Comply with Figure 3010.101.
2. Form interior surface of footings. Keep the 12 inch utility clear zone free of concrete.

OD = Outside pipe diameter

FIGURE 3010.901 | SHEET 1 OF 1

SUDAS

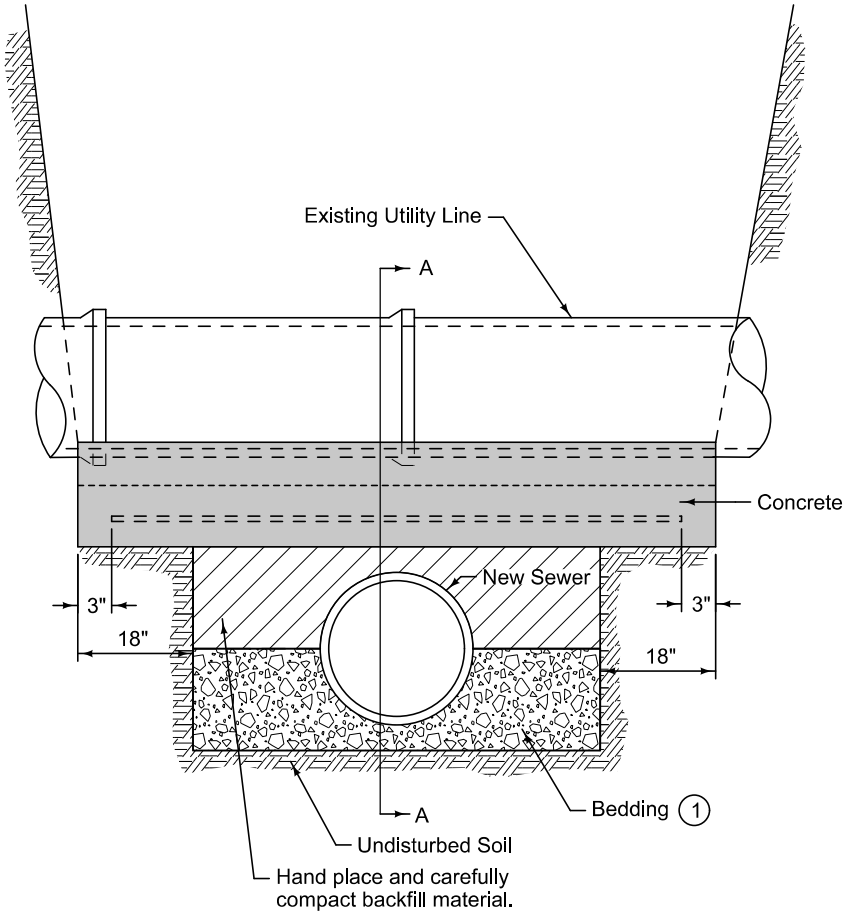
REVISION	
1	10-21-14

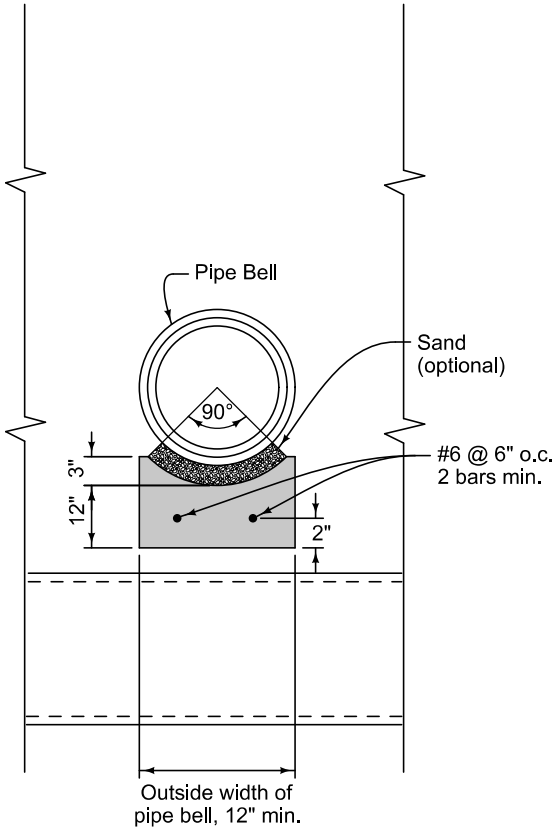
3010.901

SHEET 1 of 1

SUDAS Standard Specifications

SEWER PIPE SUPPORT
OVER EXISTING UTILITY LINE





SECTION A-A

Use reinforced concrete beam utility line support when new sewer excavation is crossing under an existing utility line (sewer lines, water lines, gas lines, etc.) as directed by the Engineer.

Allow concrete to cure a minimum of 48 hours before placing backfill material.

Special design required for trench width greater than 7 feet or trench depth greater than 15 feet.

(1) Comply with Figure 3010.101.

FIGURE 3010.902

SHEET 1 OF 1

SUDAS

REVISION	
1	10-21-14

3010.902

SHEET 1 of 1

SUDAS Standard Specifications

REINFORCED PCC BEAM
UTILITY LINE SUPPORT

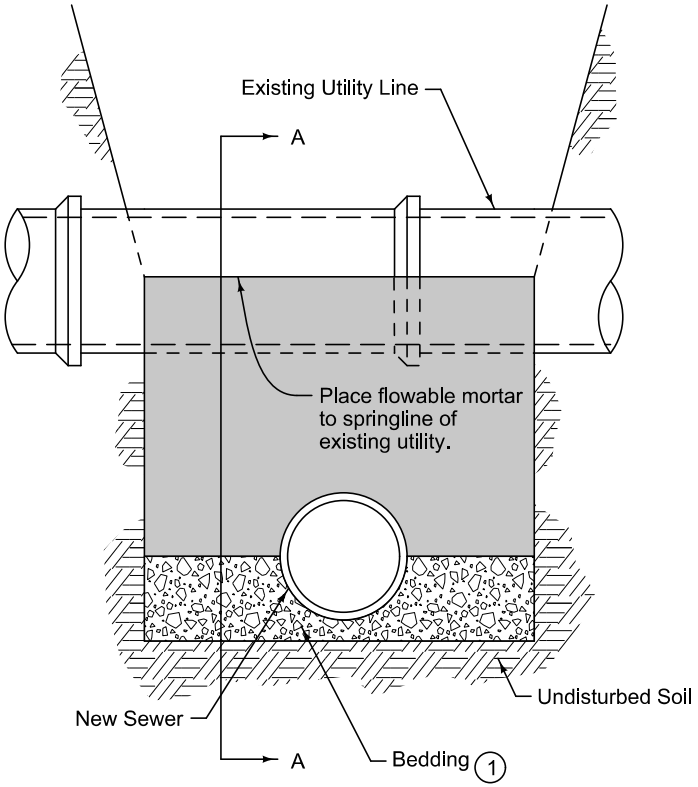
Use flowable mortar utility line support when new utility excavation is crossing under an existing utility line (sewer lines, water lines, gas lines, etc.) as directed by the Engineer.

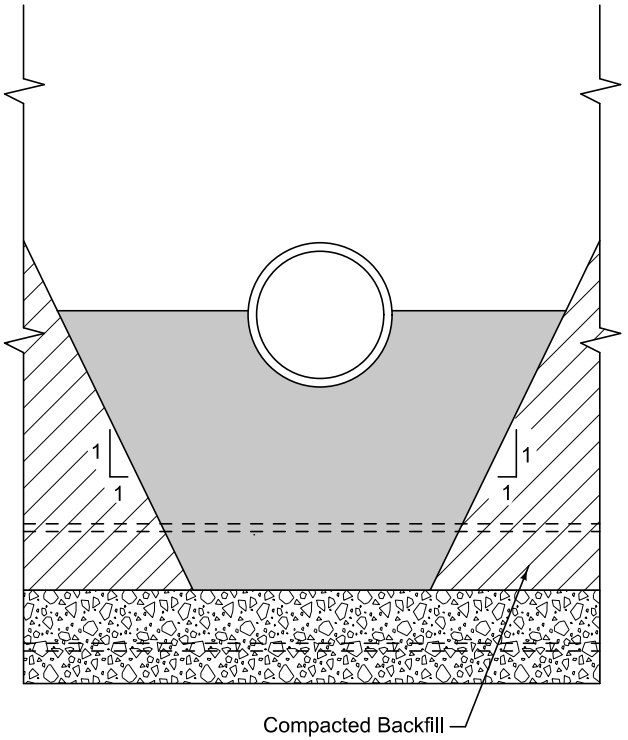
Allow flowable mortar fill to cure a minimum of 24 hours before placing backfill material.

Trim uncompacted backfill material away from slopes before pouring flowable mortar.

Side slopes of flowable mortar fill to be 1:1 or greater. See Section A-A

(1) Comply with Figure 3010.101





SECTION A-A

FIGURE 3010.903

SHEET 1 OF 1

SUDAS

REVISION	
1	10-21-14

3010.903

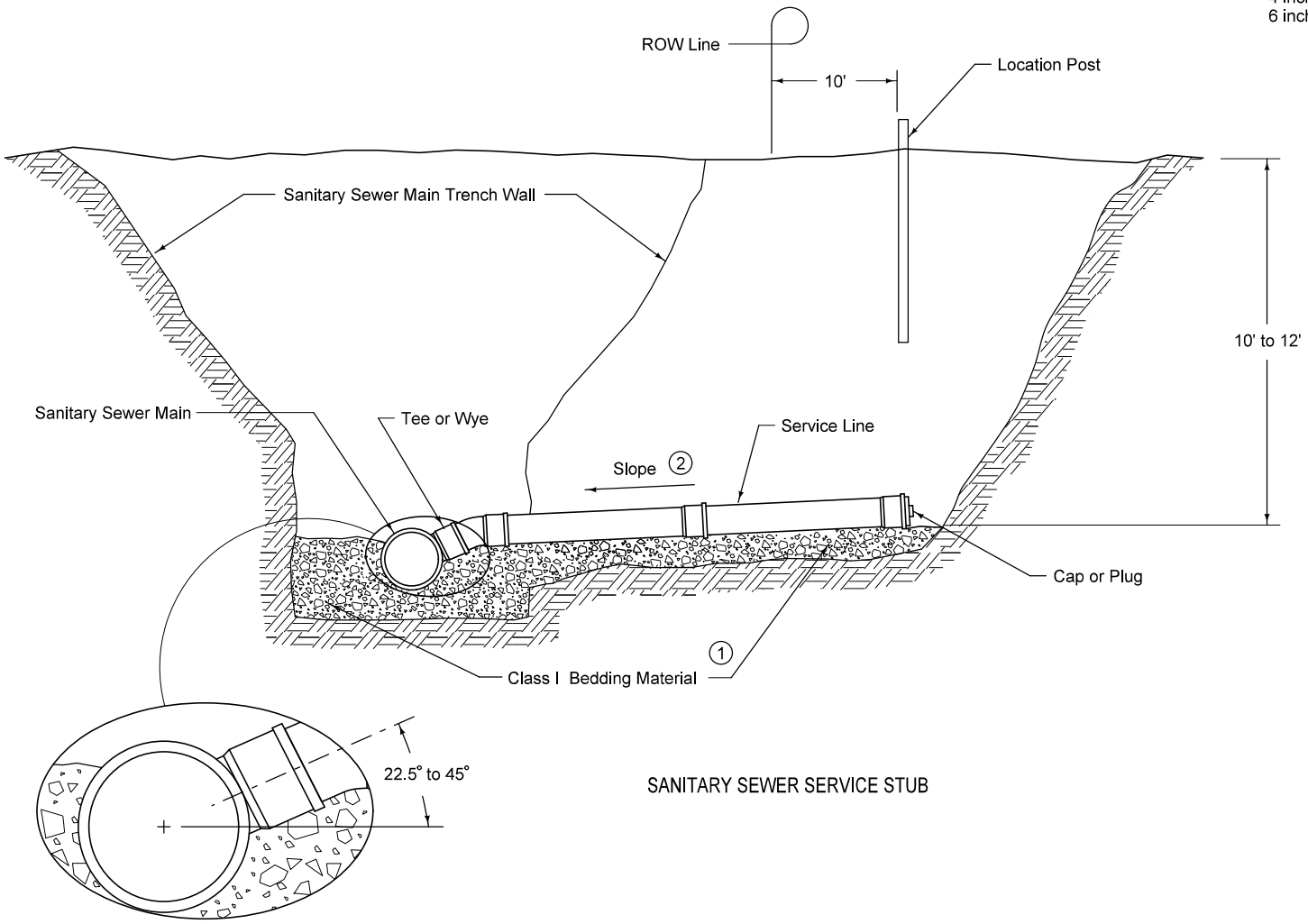
SHEET 1 of 1

SUDAS Standard Specifications

FLOWABLE MORTAR FILL
UTILITY LINE SUPPORT

① Place bedding and backfill material as required for sewer main.

② Service Line Slope:
4 inch: 2% to 5%
6 inch and greater: 1% to 5%



SANITARY SEWER SERVICE STUB

FIGURE 4010.201 | SHEET 1 OF 2

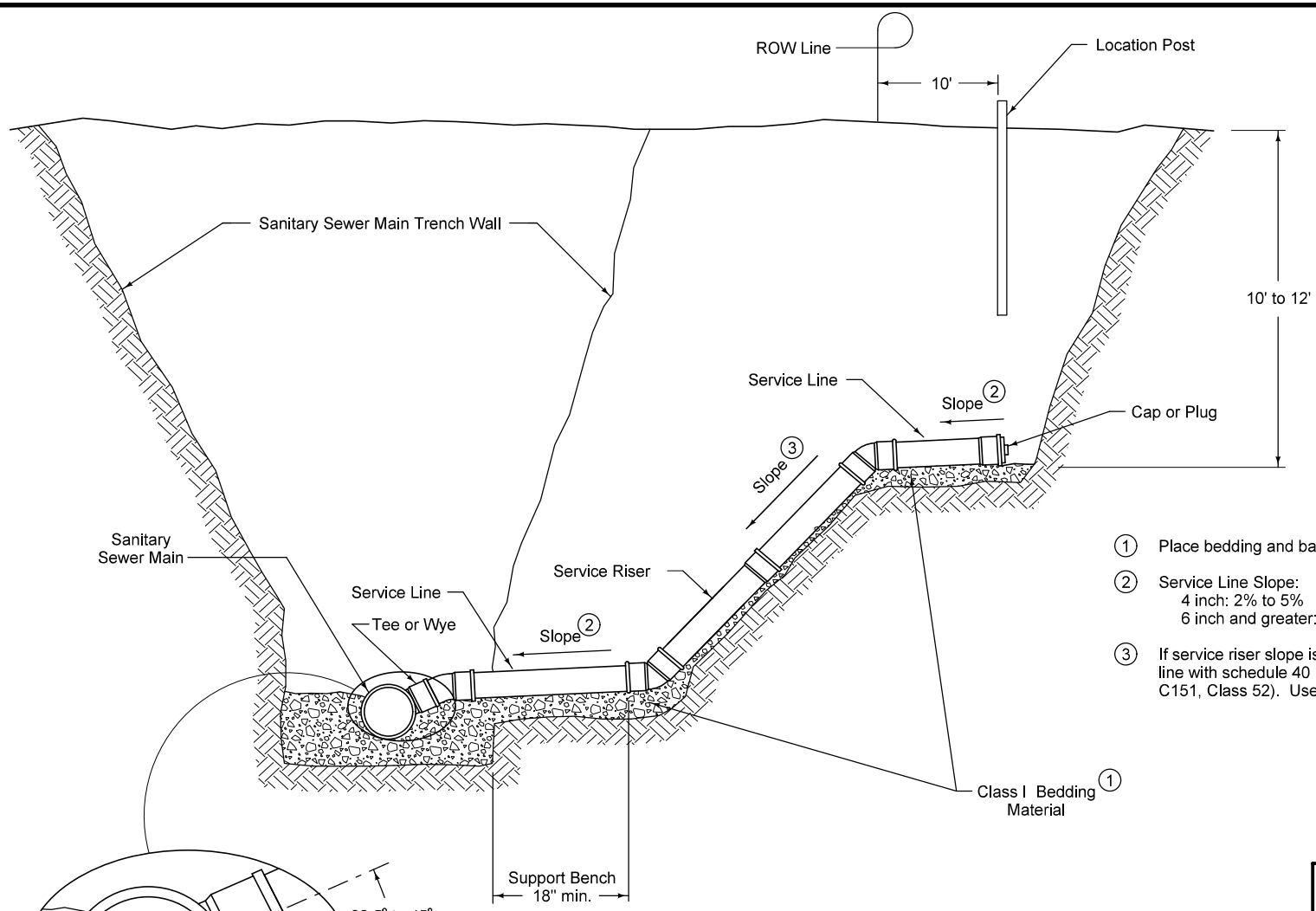
SUDAS	IOWA DOT	REVISION 2 04-21-20
FIGURE 4010.201	STANDARD ROAD PLAN	SW-201
		SHEET 1 of 2

REVISIONS: Changed 1 to I on Bedding Material

Paul D. Wigand
SUDAS DIRECTOR

DESIGN METHODS ENGINEER

SANITARY SEWER SERVICE STUB



SANITARY SEWER SERVICE STUB WITH RISER

1. Place bedding and backfill material as required for sewer main.
2. Service Line Slope:
   4 inch: 2% to 5%
   6 inch and greater: 1% to 5%
3. If service riser slope is steeper than 1:1, construct riser of entire service line with schedule 40 PVC (ASTM D 1785) or ductile iron (AWWA C151, Class 52). Use single length of pipe for riser, if possible.

FIGURE 4010.201 | SHEET 2 OF 2

SUDAS | IOWA DOT

REVISION	
2	04-21-20

FIGURE 4010.201 | STANDARD ROAD PLAN | SW-201 | SHEET 2 of 2

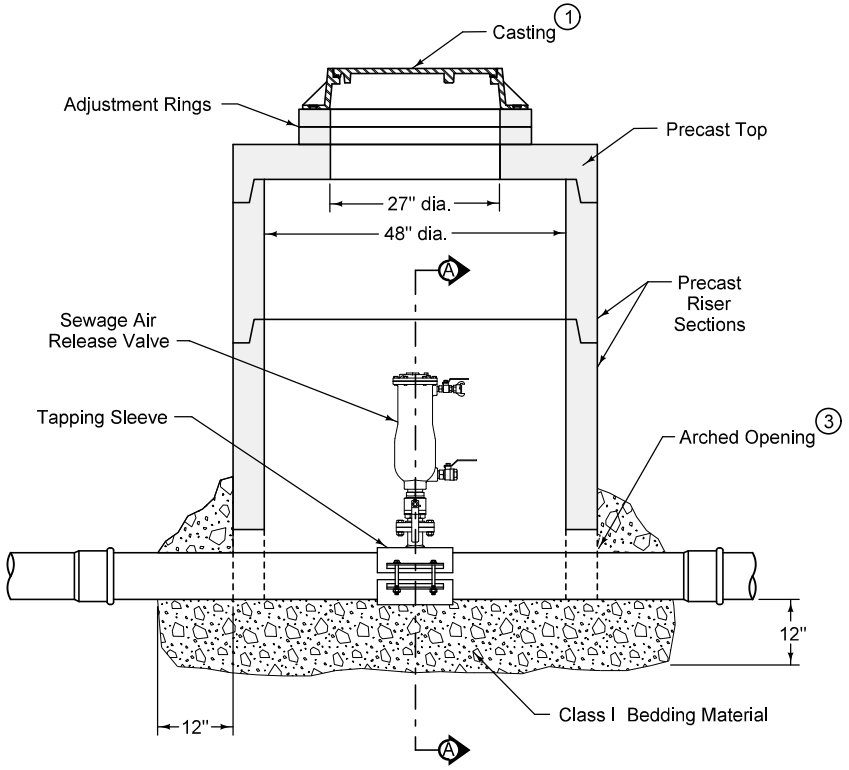
REVISIONS: Changed 1 to I on Bedding Material.

Paul D. Wigand, SUDAS DIRECTOR

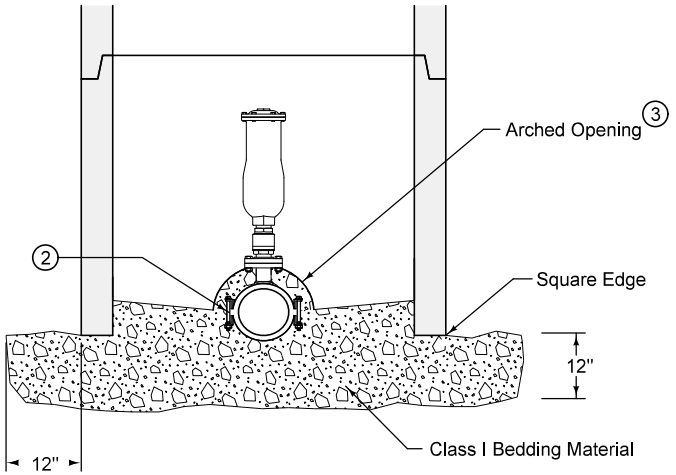
Stuart Nicholson, DESIGN METHODS ENGINEER

SANITARY SEWER SERVICE STUB

1. SW-601 Type A or SW-602 Type G casting.
2. Place bedding material to springline of pipe.
3. Prevent riser from bearing on pipe by providing an arched opening with a diameter up to 6 inches larger than pipe diameter.



TYPICAL SECTION



SECTION A-A

SUDAS	IOWADOT	REVISION 2 04-21-20
FIGURE 4010.202	STANDARD ROAD PLAN	SW-202 SHEET 1 of 1

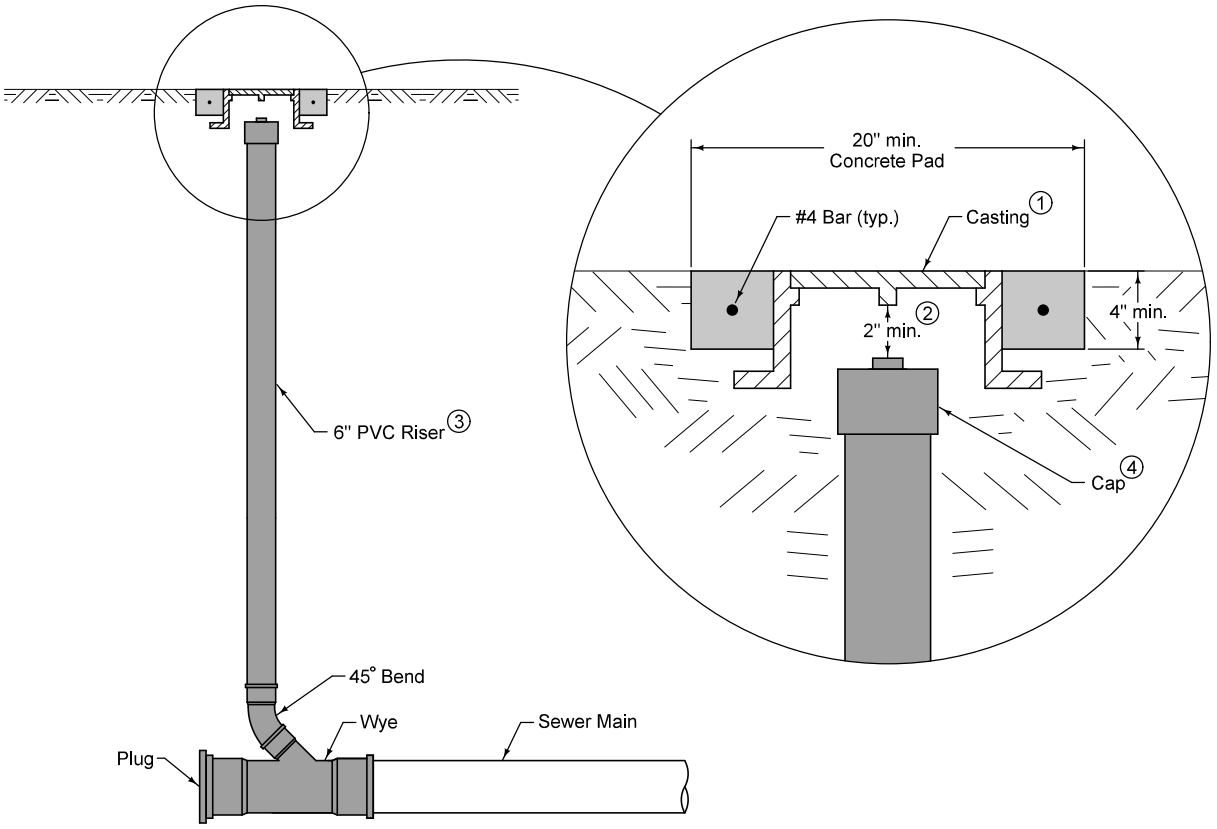
REVISIONS: Changed 1 to I on Bedding Material.

Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

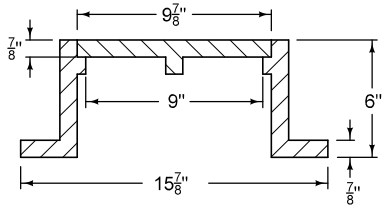
SEWAGE AIR RELEASE VALVE PIT

FIGURE 4010.202 SHEET 1 OF 1

1. Standard duty casting complying with AASHTO M 306. Mark lid with "Sanitary" or "Sanitary C.O."
2. Do not allow casting to bear on top of riser pipe.
3. 6 inch PVC Service Pipe
4. Threaded PVC cap or iron body ferrule with brass screw plug



CLEANOUT



CASTING 1

(Dimensions are nominal)

SUDAS	IOWA DOT	REVISION 1 04-17-18
FIGURE 4010.203	STANDARD ROAD PLAN	SW-203 SHEET 1 of 1

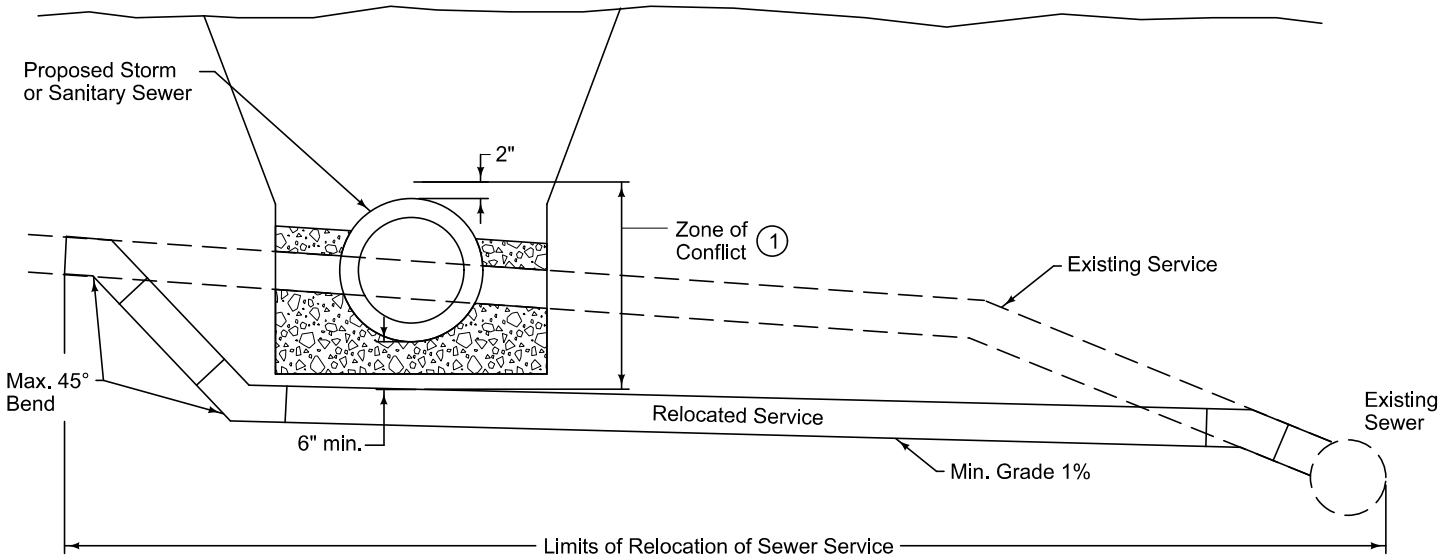
REVISIONS: Replaced Iowa DOT and SUDAS logos.

Paul D. Wigand, SUDAS DIRECTOR — Brian Smith, DESIGN METHODS ENGINEER

SANITARY SEWER CLEANOUT

FIGURE 4010.203 SHEET 1 OF 1

(1) Zone of conflict is from 6 inches below the bottom of sewer pipe to 2 inches above the top of pipe.



	Service Status	Contractor's Responsibility	Compensation
1.	Service located outside zone of conflict	Provide protection; if damaged, repair according to local government's plumbing code	Incidental to other work
2.	Service located in zone of conflict	Relocate service according to Section 4010, 3.07	Bid item; sanitary sewer service relocation
3.	Service located in zone of conflict, but elevations do not allow simple relocation as detailed above; special design required	Relocate service as directed by the Engineer	Change order

FIGURE 4010.901 | SHEET 1 OF 1

SUDAS

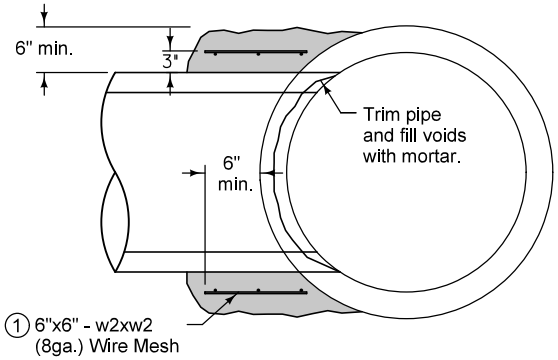
REVISION 1 10-21-14

4010.901

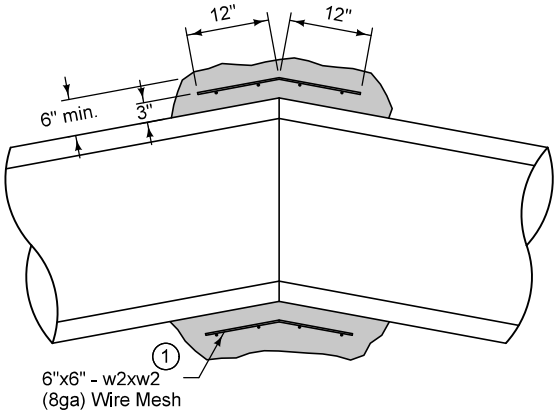
SHEET 1 of 1

SUDAS Standard Specifications

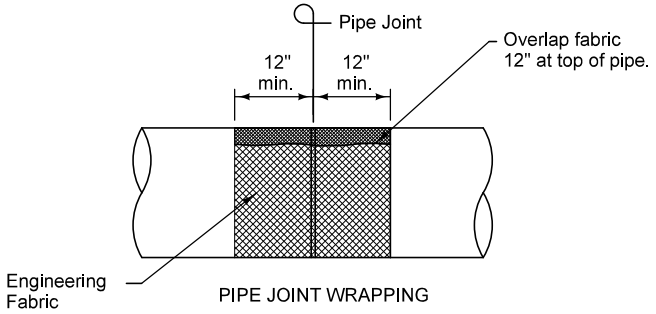
RELOCATE SANITARY SEWER SERVICE IN CONFLICT WITH NEW SEWER



TYPE PC-1 CONCONCRETE COLLAR CONNECTION

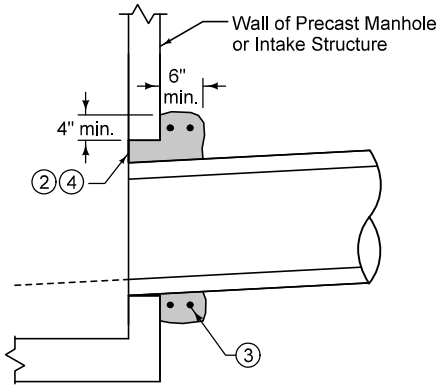


TYPE PC-2 CONCRETE COLLAR CONNECTION

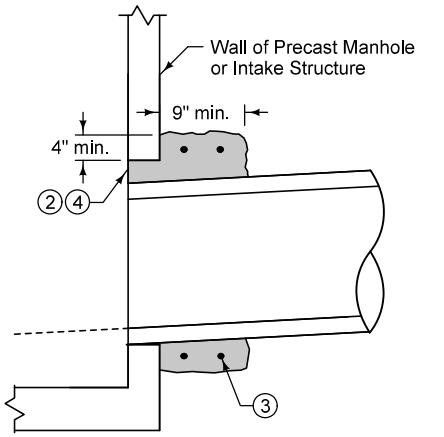


PIPE JOINT WRAPPING

PIPE TO PIPE CONNECTION



CONCRETE COLLAR FOR PIPES 12" AND SMALLER



CONCRETE COLLAR FOR PIPES GREATER THAN 12"

PIPE TO STRUCTURE CONNECTION

1. Lap ends of wire mesh a minimum of 6 inches.
2. Concrete collar is required when annular space between the outside of the pipe and the wall of the structure is 2 inches or greater.
3. Provide two #4 hoop bars in concrete collar. Lap bars a minimum of 6 inches.
4. Trowel concrete flush with inside wall of structure.

SUDAS | IOWADOT | REVISION 2 04-17-18

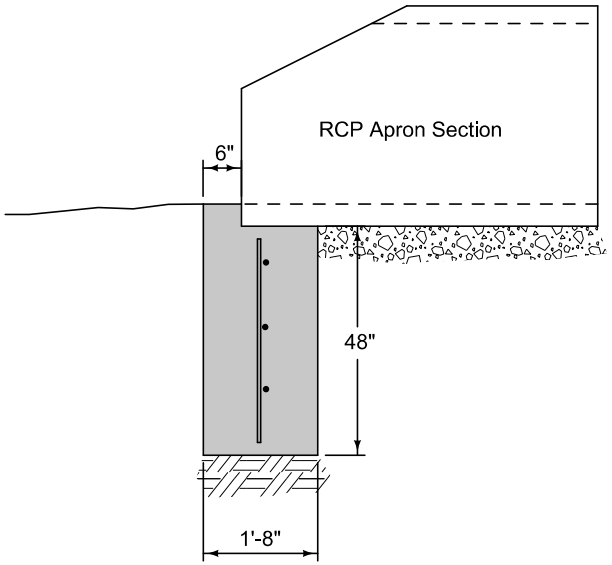
FIGURE 4020.211 | STANDARD ROAD PLAN | SW-211 | SHEET 1 of 1

REVISIONS: Removed 'Invert' callout on Pipe to Structure View. Redrawn and replaced old Iowa DOT and SUDAS logos with new logos.

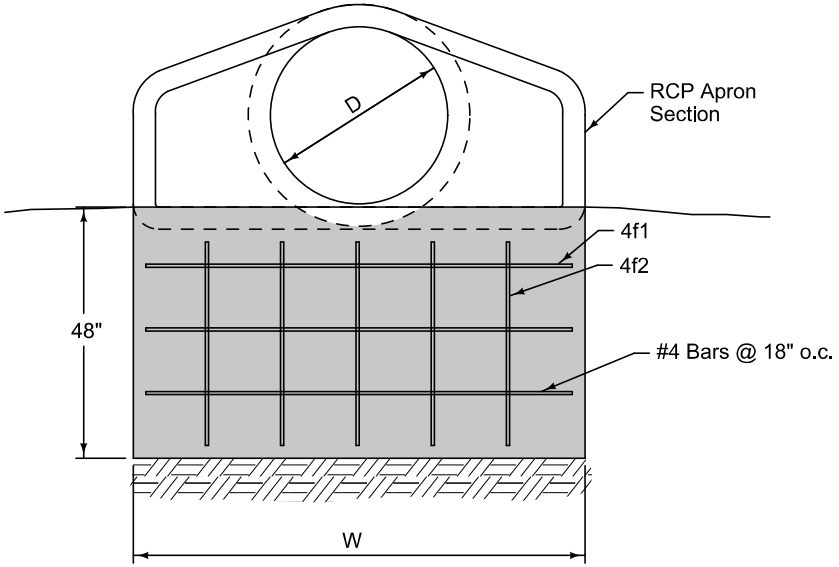
Paul D. Wigand, SUDAS DIRECTOR — Brian Smith, DESIGN METHODS ENGINEER

STORM SEWER PIPE CONNECTIONS

FIGURE 4020.211 | SHEET 1 OF 1



TYPICAL SECTION



ELEVATION

REINFORCING BAR LIST

D	W	Mark	Size	Length	Count
12"	2'-4"	4f1	4	2'-0"	3
		4f2	4	3'-8"	2
15"	2'-10 ½"	4f1	4	2'-6 ½"	3
		4f2	4	3'-8"	2
18"	3'-5"	4f1	4	3'-1"	3
		4f2	4	3'-8"	3
24"	4'-6"	4f1	4	4'-2"	3
		4f2	4	3'-8"	3
30"	5'-7"	4f1	4	5'-3"	3
		4f2	4	3'-8"	4
36"	6'-8"	4f1	4	6'-4"	3
		4f2	4	3'-8"	5
42"	7'-3"	4f1	4	6'-11"	3
		4f2	4	3'-8"	5

D	W	Mark	Size	Length	Count
48"	7'-10"	4f1	4	7'-6"	3
		4f2	4	3'-8"	6
54"	8'-5"	4f1	4	8'-1"	3
		4f2	4	3'-8"	6
60"	8'-11"	4f1	4	8'-7"	3
		4f2	4	3'-8"	6
66"	8'-11"	4f1	4	8'-7"	3
		4f2	4	3'-8"	6
72"	10'-0"	4f1	4	9'-8"	3
		4f2	4	3'-8"	7
78"	10'-7"	4f1	4	10'-3"	3
		4f2	4	3'-8"	7
84"	11'-1"	4f1	4	10'-9"	3
		4f2	4	3'-8"	8

FIGURE 4030.221 | SHEET 1 OF 1

SUDAS

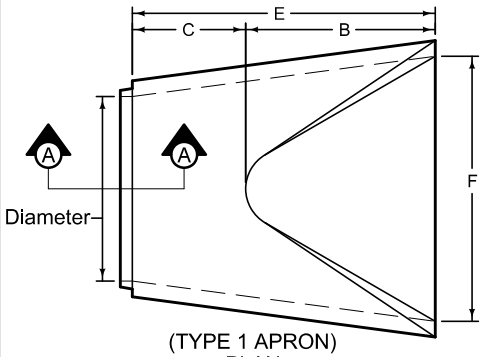
REVISION	
1	10-21-14

4030.221

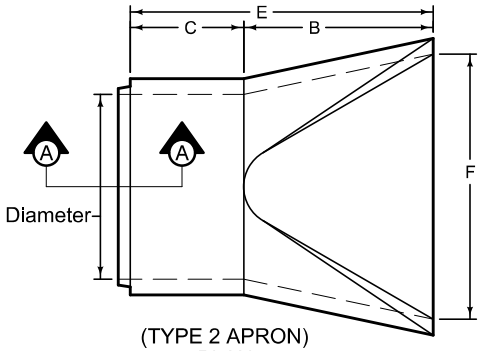
SHEET 1 of 1

SUDAS Standard Specifications

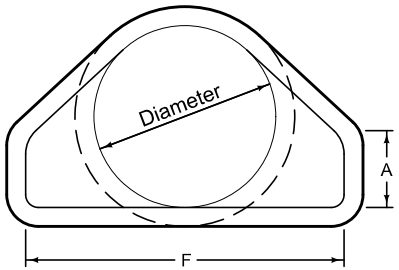
RCP APRON SECTION FOOTING



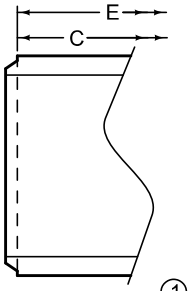
(TYPE 1 APRON)
PLAN



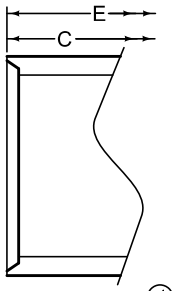
(TYPE 2 APRON)
PLAN



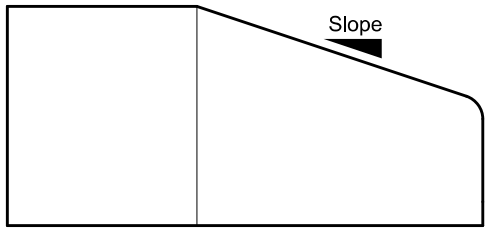
(TYPE 1 AND TYPE 2 APRONS)
END VIEW



SECTION A-A ①
TONGUE END DETAIL



SECTION A-A ①
GROOVE END DETAIL



SIDE VIEW

Dimension 'E' shown is the minimum and is considered the design length. Adjust for any difference between the actual length of concrete apron installed and the length indicated below for the length of concrete culvert pipe furnished.

① Tongue end used on inlet end section. Groove end used on outlet end section.

TYPE 1 APRONS						
DIAM.	SLOPE	A	B	MINIMUM		F
				C	E	
12"	2.4:1	4"	2'-0"	4'-⅞"	6'-⅞"	2'-0"
15"	2.4:1	6"	2'-3"	3'-10"	6'-1"	2'-6"
18"	2.3:1	9"	2'-3"	3'-10"	6'-1"	3'-0"
21"	2.4:1	9"	3'-0 "	3'-1½"	6'-1½"	3'-5"
24"	2.5:1	9½"	3'-7½"	2'-6"	6'-1½"	4'-0"
27"	2.5:1	10½"	4'-1 "	2'-0"	6'-1½"	4'-4"
30"	2.5:1	12"	4'-6"	1'-7¾"	6'-1¾"	5'-0"
36"	2.5:1	15"	5'-3"	2'-9"	8'-0"	6'-0"
42"	2.5:1	21"	5'-3"	2'-9"	8'-0"	6'-6"
48"	2.5:1	24"	6'-0"	2'-0"	8'-0"	7'-0"
54"	1.8:1	27"	5'-0"	3'-0"	8'-0"	7'-6"
60"	1.6:1	29½"	5'-0"	3'-0"	8'-0"	8'-0"
66"	1.7:1	30"	6'-0"	2'-3"	8'-3"	8'-0"
72"	1.6:1	30"	6'-6"	1'-9"	8'-3"	9'-0"
78"	1.8:1	36"	7'-6"	1'-9"	9'-3"	9'-6"
84"	1.3:1	29½"	6'-9"	2'-6½"	9'-3½"	10'-0"

TYPE 2 APRONS						
DIAM.	SLOPE	A	B	MINIMUM		F
				C	E	
12"	2.4:1	4"	2'-0"	4'-⅞"	6'-⅞"	2'-0"
15"	2.4:1	6"	2'-3"	3'-10"	6'-1"	2'-6"
18"	2.3:1	9"	2'-3"	3'-10"	6'-1"	3'-0"
21"	2.4:1	9"	3'-0"	3'-1½"	6'-1½"	3'-5"
24"	2.5:1	9½"	3'-7½"	2'-6"	6'-1½"	4'-0"
27"	2.5:1	10½"	4'-1 "	2'-0"	6'-1½"	4'-4"
30"	2.5:1	12"	4'-6"	1'-7¾"	6'-1¾"	5'-0"
36"	2.5:1	15"	5'-3"	2'-9"	8'-0"	6'-0"
42"	2.5:1	21"	5'-3"	2'-9"	8'-0"	6'-6"
48"	2.5:1	24"	6'-0"	2'-0"	8'-0"	7'-0"
54"	1.9:1	24½"	5'-5"	2'-7"	8'-0"	7'-6"
60"	1.4:1	24½"	5'-0"	3'-0"	8'-0"	8'-0"
66"	1.7:1	30"	6'-0"	2'-3"	8'-3"	8'-0"
72"	1.4:1	24"	6'-6"	1'-9"	8'-3"	9'-0"
78"	1.8:1	36"	7'-6"	1'-9"	9'-3"	9'-6"
84"	1.5:1	23½"	7'-6½"	1'-9"	9'-3½"	10'-0"

FIGURE 4030.222 | SHEET 1 OF 1

SUDAS

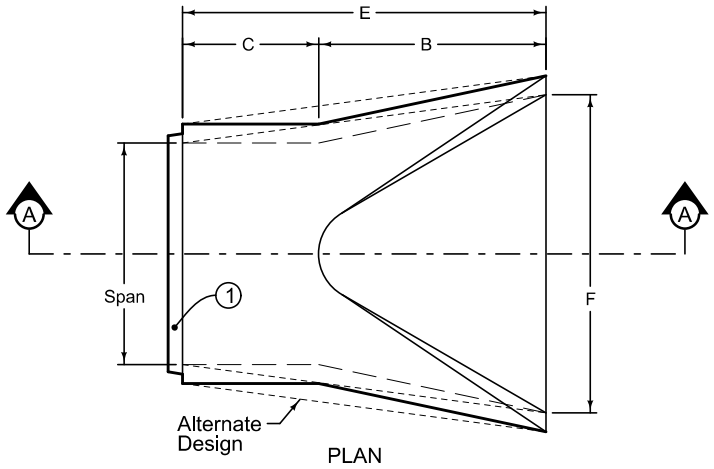
REVISION
New 10-18-16

4030.222

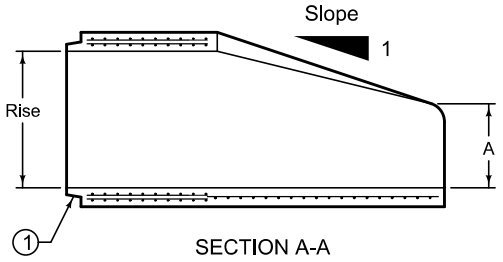
SHEET 1 of 1

SUDAS Standard Specifications

CIRCULAR CONCRETE APRONS



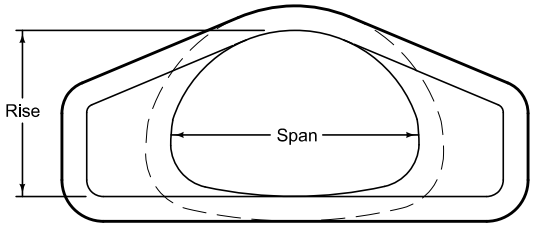
PLAN



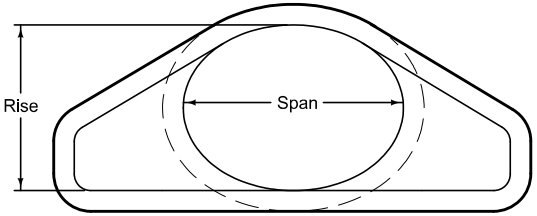
SECTION A-A

Dimension 'E' shown is the minimum and is considered the design length. Adjust for any difference between the actual length of concrete apron installed and the length indicated below for the length of concrete culvert pipe furnished.

(1) Tongue end used on inlet end section. Groove end used on outlet end section.



END (ARCH)



END (ELLIPTICAL)

EQUIVALENT DIAMETER Inches	SLOPE	APPROXIMATE DIMENSIONS Inches				
		A	B	C	E	F
18	3:1	7	27	45	72	36
24	3:1	$8\frac{1}{2}$	39	33	72	48
30	3:1	$9\frac{1}{2}$	50	46	96	60
36	3:1	$11\frac{1}{8}$	60	36	96	72
42	3:1	$15\frac{13}{16}$	60	36	96	78
48	3:1	21	60	36	96	84
54	3:1	$25\frac{1}{2}$	60	36	96	90
60	3:1	31	60	36	96	96
72	2:1	31	60	39	99	120
84	2:1	$21\frac{1}{2}$	83	19	102	144

ARCH PIPE

EQUIVALENT DIAMETER Inches	SLOPE	APPROXIMATE DIMENSIONS Inches				
		A	B	C	E	F
18	3:1	$7\frac{1}{2}$	27	45	72	36
24	3:1	$8\frac{1}{2}$	39	33	72	48
30	3:1	$9\frac{1}{2}$	54	18	72	60
36	2.5 to 1	$11\frac{1}{8}$	60	24	84	72
42	2.5 to 1	$15\frac{3}{4}$	60	36	96	78
48	2.5 to 1	21	60	36	96	84
54	2.5 to 1	$25\frac{1}{2}$	60	36	96	90
60	2.5 to 1	30	60	36	96	96
72	2.5 to 1	36	63	33	96	108
90	1.6 to 1	$36\frac{1}{2}$	58	38	96	113

ELLIPTICAL PIPE

FIGURE 4030.223 | SHEET 1 OF 1

SUDAS

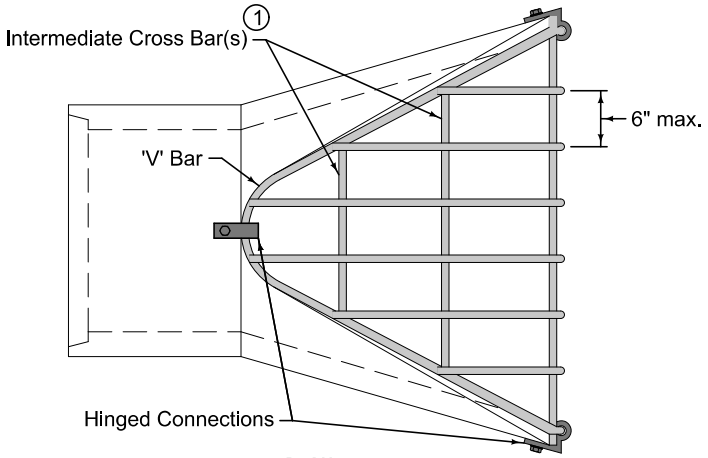
REVISION
New 10-18-16

4030.223

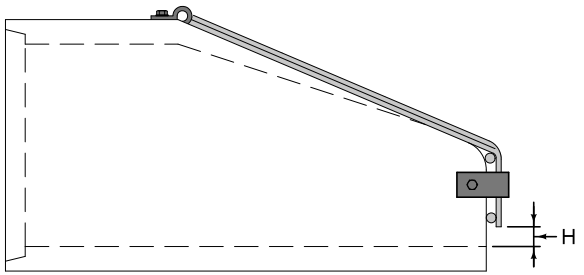
SHEET 1 of 1

SUDAS Standard Specifications

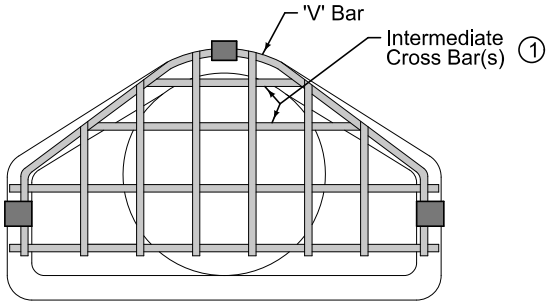
ARCH AND ELLIPTICAL CONCRETE PIPE APRONS



PLAN



PROFILE



FRONT

Provide guard dimensions to fit with type of apron provided. Ensure 'V' Bar completely rests on apron.

① All guards must include at least one intermediate cross bar. If pipe diameter, or equivalent diameter, is 60 inches or greater, use two intermediate cross bars equally spaced.

ROUND		ARCH		ELLIPTICAL	
PIPE SIZE	H	EQUIVALENT DIAMETER	H	EQUIVALENT DIAMETER	H
12"	$2\frac{1}{2}$"	18" to 24"	4"	18"	3"
15"	3"	30" to 36"	5"	24"	4"
18" - 24"	4"	42" to 54"	6"	30" to 36"	5"
27" - 36"	5"	60" to 72"	7"	42" to 54"	6"
42" - 54"	6"			60"	7"
60" - 72"	7"				
78" - 90"	8"				

BAR SIZES				
	PIPE SIZE (DIA. or EQUIV.)	HOLE DIA. REQ'D.	BOLT DIA.	BAR SIZE
ROUND	12" - 24"	$\frac{3}{4}$"	$\frac{5}{8}$"	$\frac{3}{4}$"
	27" - 48"	$\frac{7}{8}$"	$\frac{3}{4}$"	1"
	54" - 90"	$1\frac{1}{8}$"	1"	$1\frac{1}{4}$"
ARCH	up to 24" eq.	$\frac{3}{4}$"	$\frac{5}{8}$"	$\frac{3}{4}$"
	30" to 48"	$\frac{7}{8}$"	$\frac{3}{4}$"	1"
	54" to 72"	$1\frac{1}{8}$"	1"	$1\frac{1}{4}$"
ELLIPTICAL	up to 24" eq.	$\frac{3}{4}$"	$\frac{5}{8}$"	$\frac{3}{4}$"
	30" to 48"	$\frac{7}{8}$"	$\frac{3}{4}$"	1"
	54" to 60"	$1\frac{1}{8}$"	1"	$1\frac{1}{4}$"
BOLT LENGTH = PIPE WALL THICKNESS + $2\frac{1}{2}$"				

SUDAS

REVISION
New 10-18-16

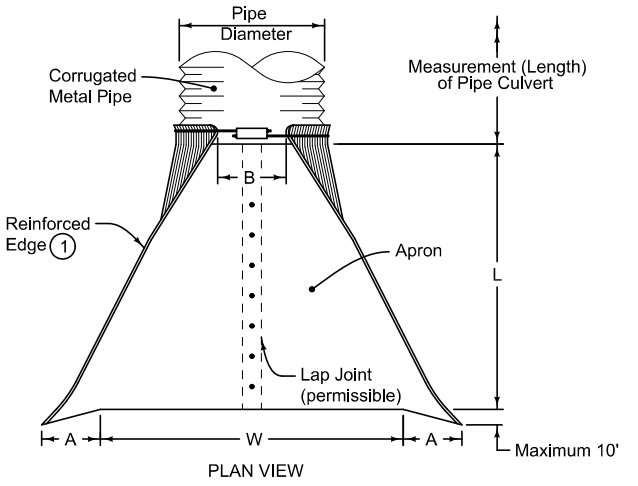
4030.224

SHEET 1 of 1

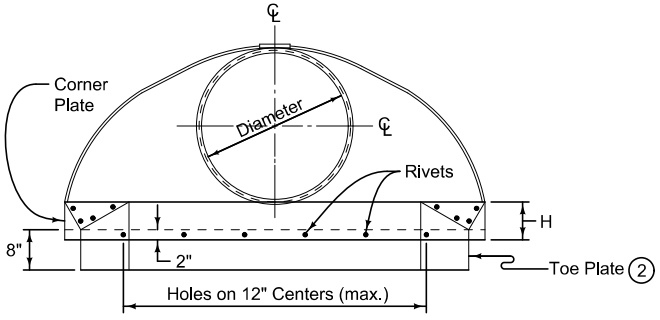
SUDAS Standard Specifications

CONCRETE PIPE APRON GUARD

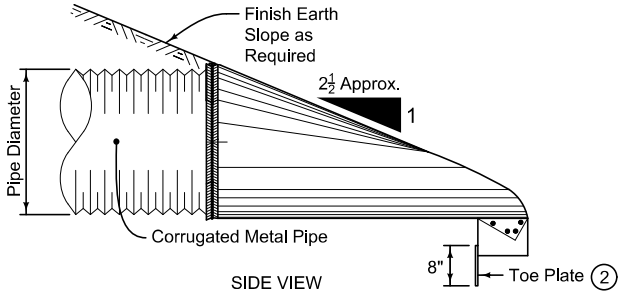
FIGURE 4030.224 | SHEET 1 OF 1



PLAN VIEW

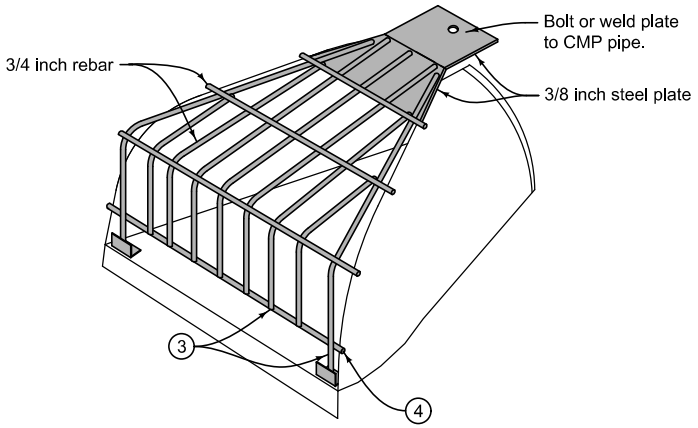


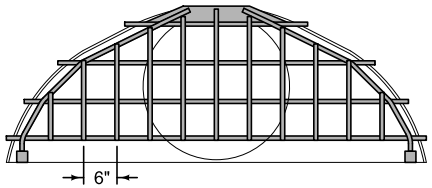
END VIEW



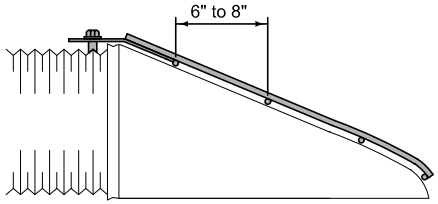
SIDE VIEW

METAL PIPE APRON





END VIEW



SIDE VIEW

METAL APRONS GUARD

1. On sizes 60 inches and larger, supplement the reinforced edge with a galvanized stiffener angle attached with bolts.
2. Install a galvanized toe plate (of the same gage metal as apron) on all aprons 24 inch diameter and larger.
3. Hold inside bars up 3 inches off bottom of apron. Extend outside bars to bottom of apron and attach to 2 inch by 2 inch by 1/4 inch steel angle.
4. When specified, extend bottom cross bar through apron.

DIMENSIONS					
PIPE DIAM.	A (±1")	B MAX.	H (±1")	L (±1½")	W (±2")
6"	4½"	1"	3"	8¾"	12"
8"	5⅞"	3"	4"	14¼"	16"
10"	7½"	6"	6"	21"	24"
12"	4¾"	6"	6"	21"	24"
15"	6"	8"	6"	26"	30"
18"	7"	9"	6"	31"	36"
21"	8¼"	11"	6"	36"	42"
24"	9½"	12"	6"	42"	48"
30"	12"	15"	7½"	52½"	60"
36"	14"	18"	9"	63"	72"
42"	16"	21"	10½"	73½"	84"
48"	18"	27"	12"	84"	90"
54"	18"	30"	12"	84"	102"
60"	18"	33"	12"	87"	114"
66"	18"	36"	12"	87"	120"
72"	18"	39"	12"	87"	126"
78"	18"	42"	12"	87"	132"
84"	18"	45"	12"	87"	138"
90"	24"	37"	11"	87"	144"
96"	25"	35"	12"	87"	150"

SUDAS

REVISION
New 10-18-16

4030.225

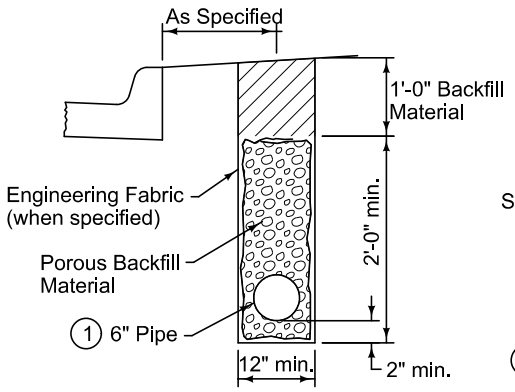
SHEET 1 of 1

SUDAS Standard Specifications

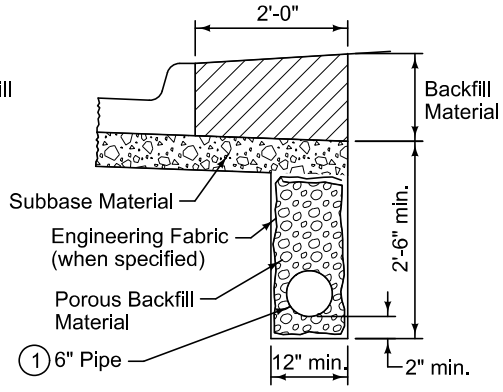
METAL PIPE APRONS AND APRON GUARDS

FIGURE 4030.225

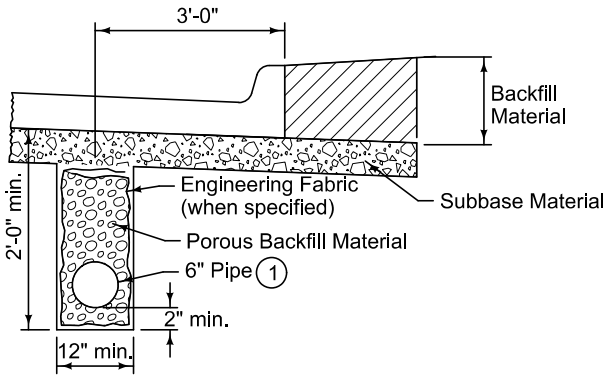
SHEET 1 OF 1



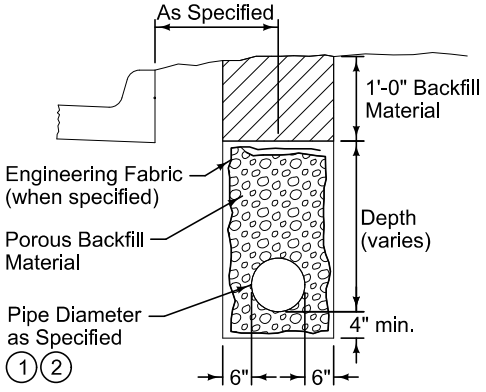
CASE A
TYPE 1



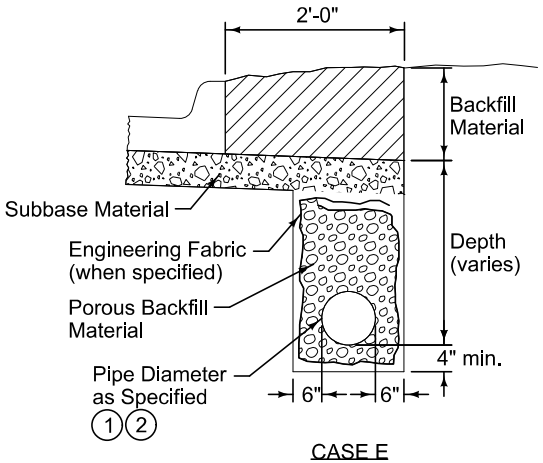
CASE B
TYPE 1



CASE C
TYPE 1



CASE D
TYPE 2



CASE E
TYPE 2

Type 1 installation is for longitudinal subdrain only. Type 2 installation is for combination subdrain/footing drain collectors.

1. Place perforations down for all installations.
2. When concrete pipe is specified, wrap pipe joints with engineering fabric. Do not apply joint sealant. Comply with Figure 4020.211

SUDAS

REVISION	
1	10-21-14

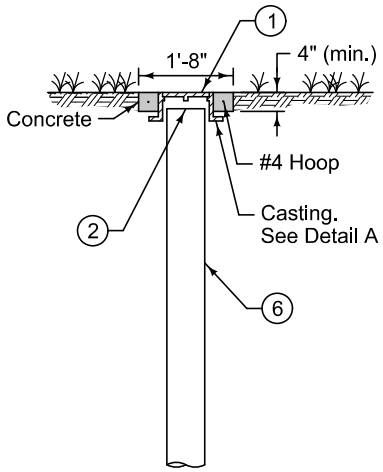
4040.231

SHEET 1 of 1

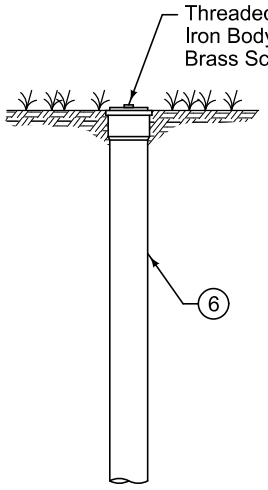
SUDAS Standard Specifications

SUBDRAINS

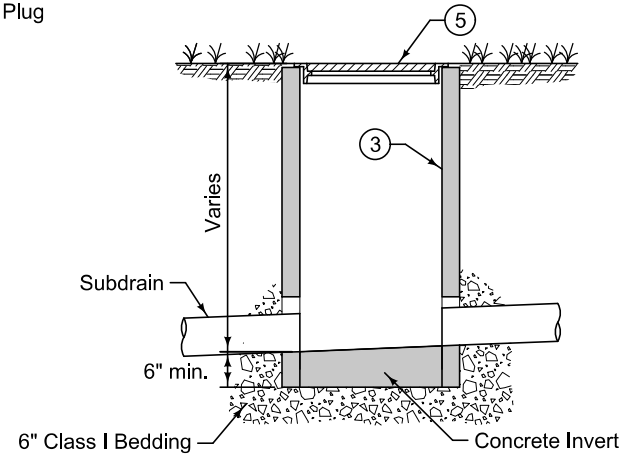
FIGURE 4040.231 | SHEET 1 OF 1



TYPE A-1 CLEANOUT



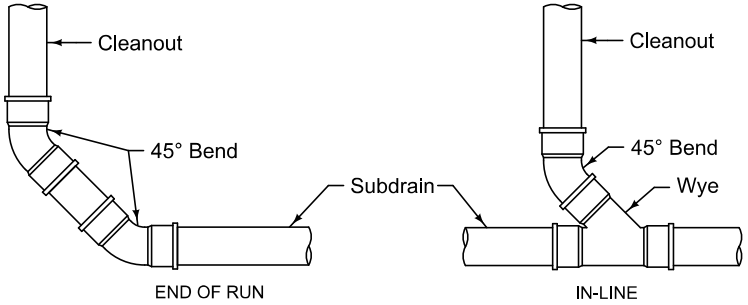
TYPE A-2 CLEANOUT



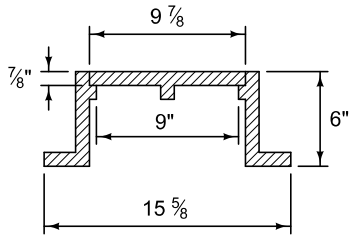
TYPE B CLEANOUT

Use in non-traffic areas.

1. Light duty casting. Label lid with "Storm" or "Storm C.O."
2. Do not allow casting to bear on top of riser pipe; provide 2 inch clearance, minimum.
3. A manufactured cleanout may be used in lieu of a Type B cleanout, if approved by the Engineer.
4. Design is intended for use in conjunction with 8 inch PVC riser pipe. Other sized caps may be used with smaller pipe, as approved by the Engineer.
5. Provide Type G casting, as required to fit pipe size.
6. PVC riser pipe; match diameter of subdrain (8 inches maximum).



TYPE A CLEANOUT CONNECTIONS



DETAIL A (1)(4)
(Dimensions are nominal)

FIGURE 4040.232 | SHEET 1 OF 1

SUDAS

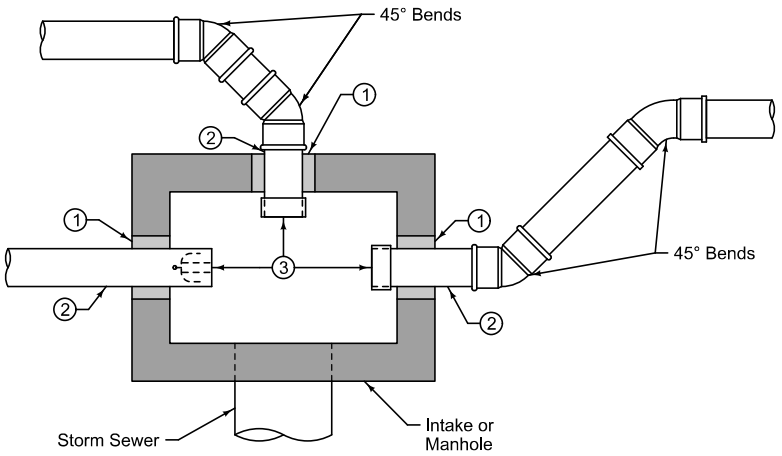
REVISION
3 | 2020 Edition

4040.232

SHEET 1 of 1

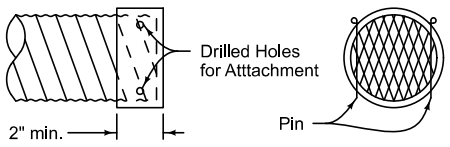
SUDAS Standard Specifications

SUBDRAIN CLEANOUTS

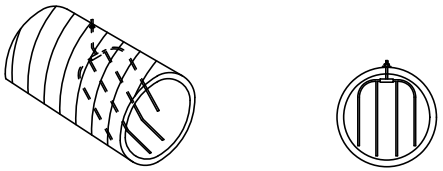


PLAN VIEW

OUTLET INTO STRUCTURE

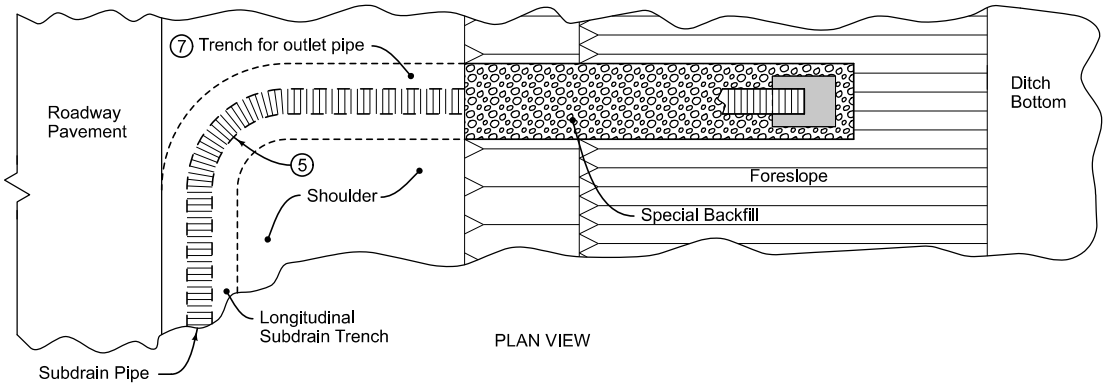


REMOVABLE GRATE

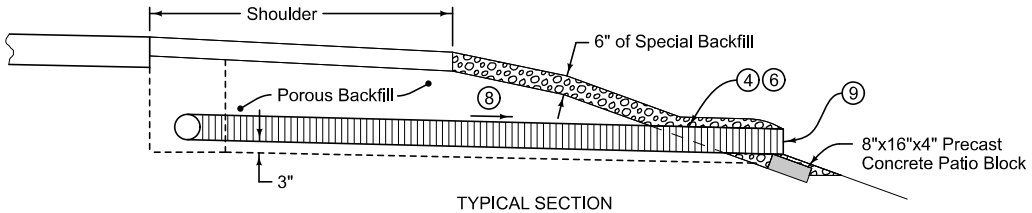


REMOVABLE FORK (9)

RODENT GUARD DETAILS



PLAN VIEW



TYPICAL SECTION

SUBDRAIN OUTLET TO DITCH

Transverse and backslope subdrains require only single outlets. Install double outlet pipes on all longitudinal subdrain systems, except at the beginning and end of the system. At these locations, install a single outlet pipe.

1. Fill annular space with non-shrink grout.
2. Outlets through intake walls to be CMP; corrugated, double-walled HDPE; or PVC.
3. Extend outlet pipe into structure as required to install removable rodent guard.
4. Construct subdrain outlet to ditch with the same type and size of pipe as used for the subdrain.
5. Provide a minimum 1 foot radius for all bends or use two 45° fittings
6. If a CMP outlet is specified in the contract documents, construct the final 10 to 12 feet of the subdrain outlet to ditch with CMP 2 inches larger than the subdrain pipe. Connect pipes with a manufactured coupler or concrete collar.
7. Provide a minimum trench width of 12 inches for a single outlet and 24 inches for a double outlet.
8. Provide a 6 inch minimum drop in elevation between longitudinal subdrain and outlet.
9. For subdrain outlet to ditch, only use fork type rodent guard.

FIGURE 4040.233

SHEET 1 OF 1

SUDAS

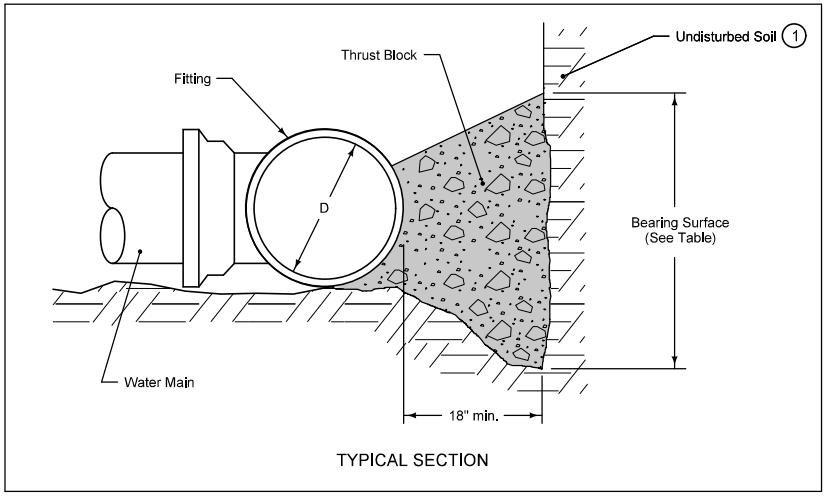
REVISION	
5	2025 Edition

4040.233

SHEET 1 of 1

SUDAS Standard Specifications

SUBDRAIN OUTLETS

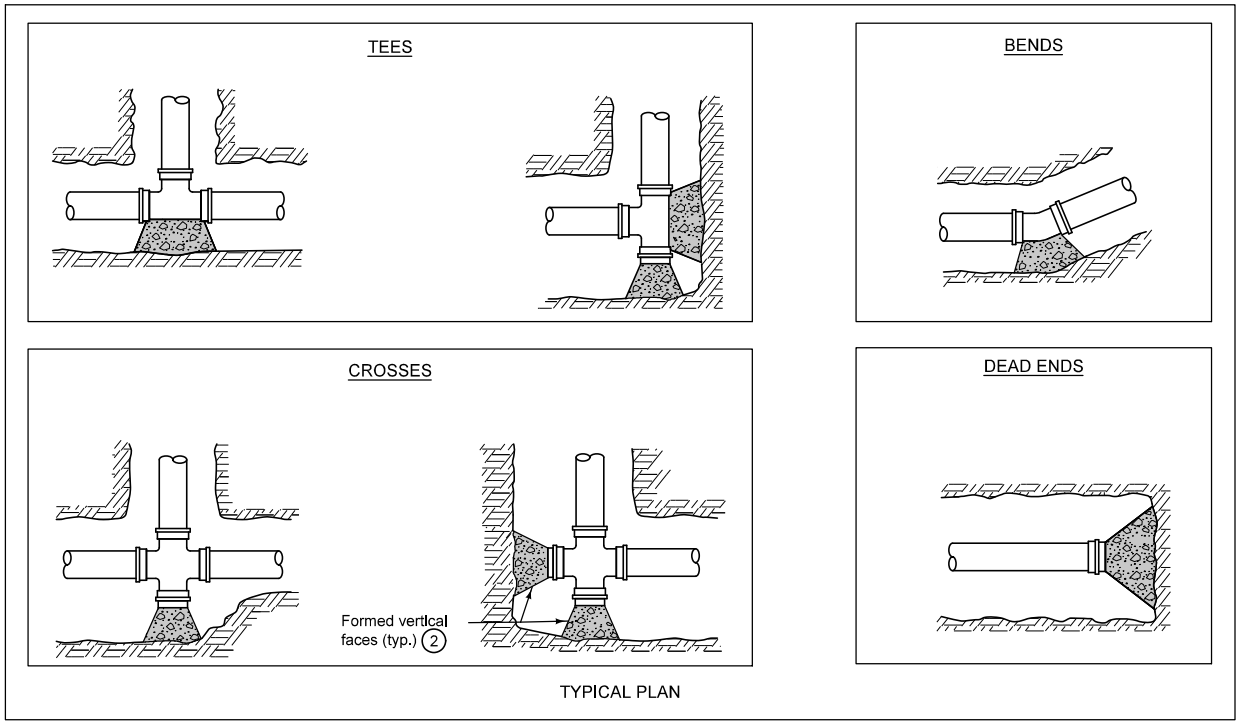


TYPICAL SECTION

Encase all fittings in polyethylene wrap. Do not allow concrete to directly contact joints or fitting bolts.

(1) Extend thrust blocks to undisturbed soil. Excavation into trench wall may be necessary.

(2) Form vertical surfaces of poured concrete thrust blocks except on bearing surface.



TYPICAL PLAN

Diameter of Pipe, D (inches)	MINIMUM BEARING SURFACE (sf)				
	Bends				Tees and Dead Ends
	$11\frac{1}{4}^{\circ}$	$22\frac{1}{2}^{\circ}$	45°	90°	
4	1	2	3	4	3
6	2	3	5	8	6
8	2	4	8	14	10
10	3	6	12	21	15
12	5	9	16	30	21
14	6	11	22	40	28
16	7	14	28	51	36
18	9	18	35	64	45
20	11	22	42	78	55
24	16	31	61	111	79
30	24	48	93	171	121
36	34	68	133	245	173

Minimum surface area based on water pressure of 150 psi and allowable soil pressure of 1,000 psf.

SUDAS

INTERIM

REVISION 2 01-01-26

FIGURE 5010.101 | **STANDARD ROAD PLAN** | **WM-101**

SHEET 1 of 2

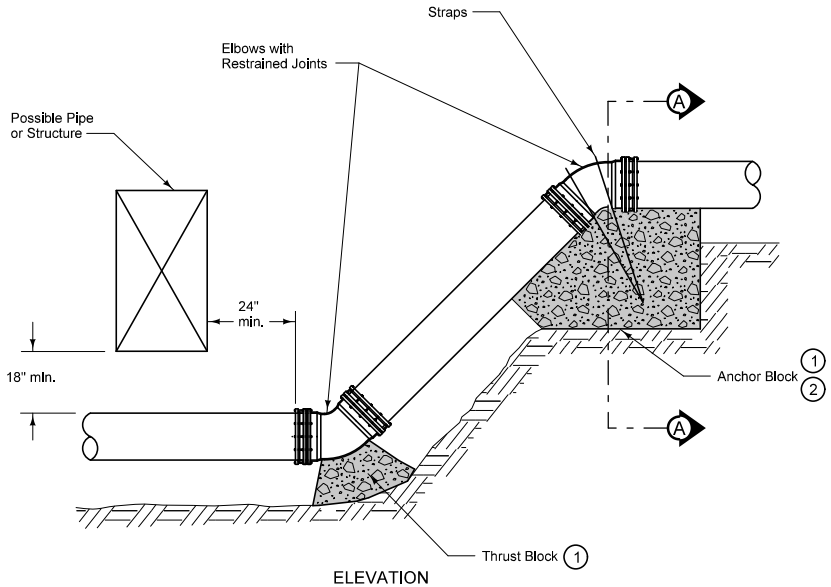
REVISIONS: Updated table and notes to match SUDAS.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

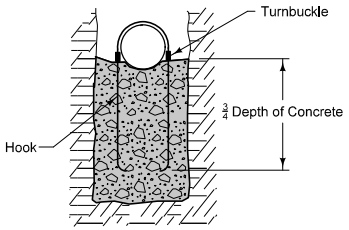
THRUST BLOCKS

FIGURE 5010.101 | SHEET 1 OF 2

CHANGES IN PIPE DEPTH



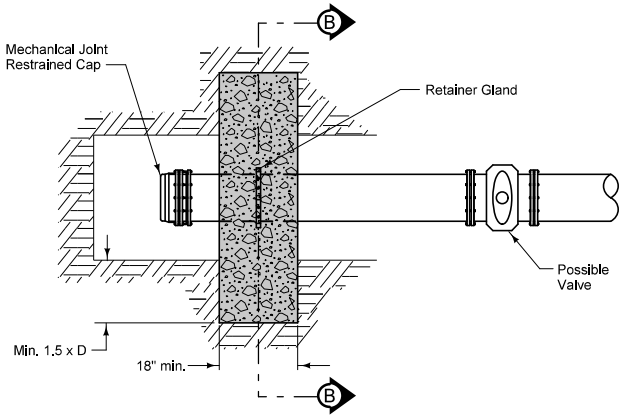
ELEVATION



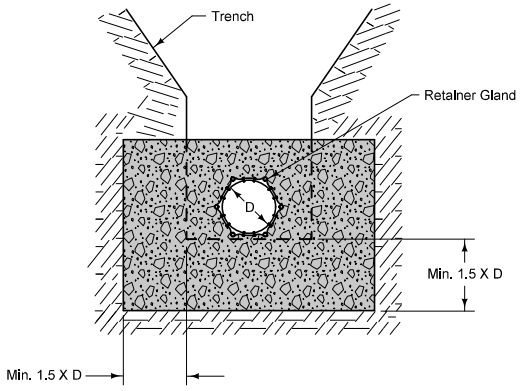
SECTION A-A

DEAD ENDS (ALTERNATE METHOD)

Use only when allowed by the Engineer, or when specified in the contract documents.



PLAN



SECTION B-B

Encase all fittings in polyethylene wrap. Do not allow concrete to directly contact joints or fitting bolts.

1. Fittings are shown with both restrained joints and thrust/anchor blocks. These methods can be used independently or in conjunction with each other. Install as specified.
2. Anchor block sizes and shapes are detailed on individual plan sheets.

SUDAS	INTERIM	REVISION 2 01-01-26
FIGURE 5010.101	STANDARD ROAD PLAN	WM-101
		SHEET 2 of 2

REVISIONS: Updated table and notes to match SUDAS.

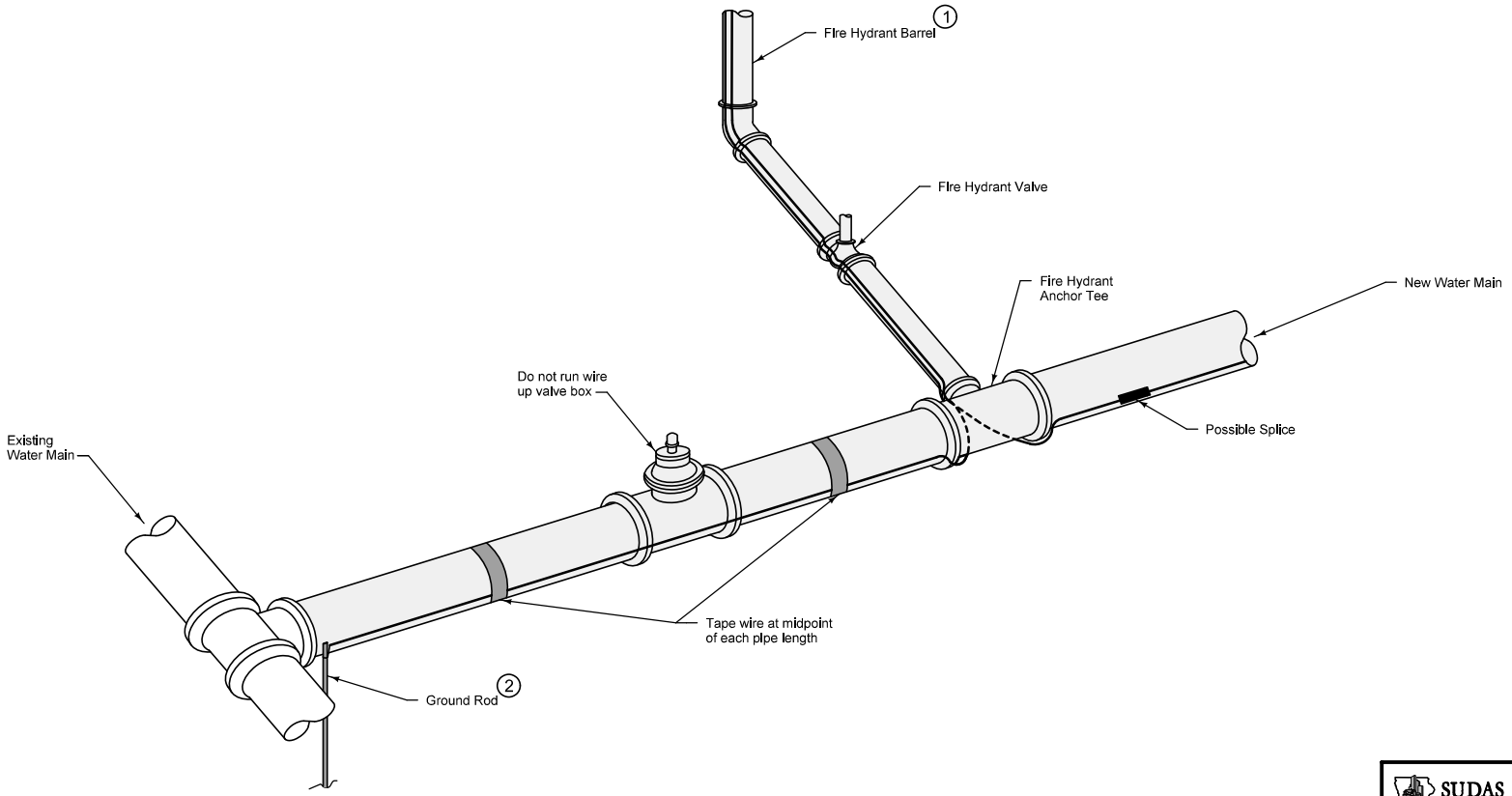
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

THRUST BLOCKS

FIGURE 5010.101 | SHEET 2 OF 2

① Extend tracer wire up fire hydrant barrel to internal terminals of tracer wire station and back down. Refer to WM-201 for details of fire hydrant assembly.

② Clamp tracer wire to ground rod at system termination points.



TYPICAL INSTALLATION

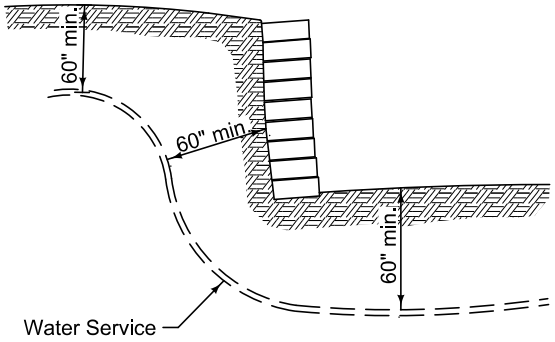
FIGURE 5010.102 SHEET 1OF 1

SUDAS	IOWADOT	REVISION 1 10-18-16
FIGURE 5010.102	STANDARD ROAD PLAN	WM-102 SHEET 1 of 1

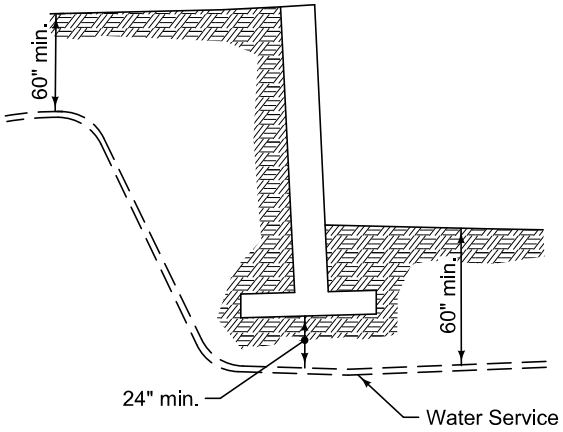
REVISIONS: Replaced Iowa DOT and SUDAS logos with new logos.

Paul D. Wigand SUDAS DIRECTOR — Brian Smith DESIGN METHODS ENGINEER

TRACER SYSTEM

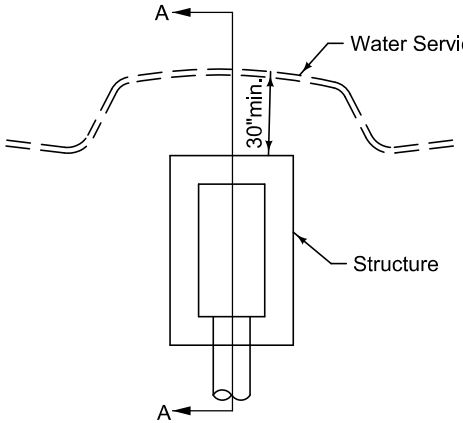


SECTION

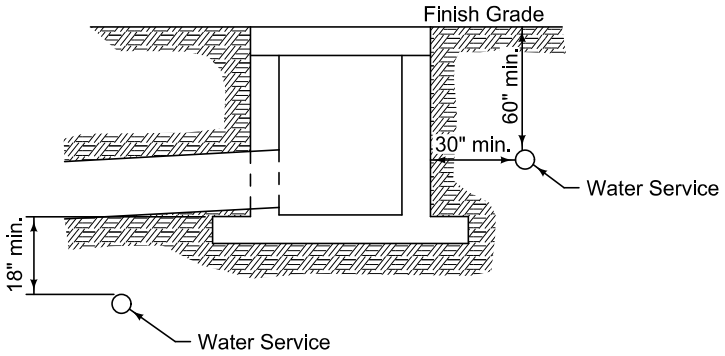


SECTION

This figure details minimum required clearances between structure and water service lines. Adjust location of water services as directed by the Engineer to maintain the clearances shown.



PLAN VIEW



SECTION

FIGURE 5010.901 | SHEET 1 OF 1

SUDAS

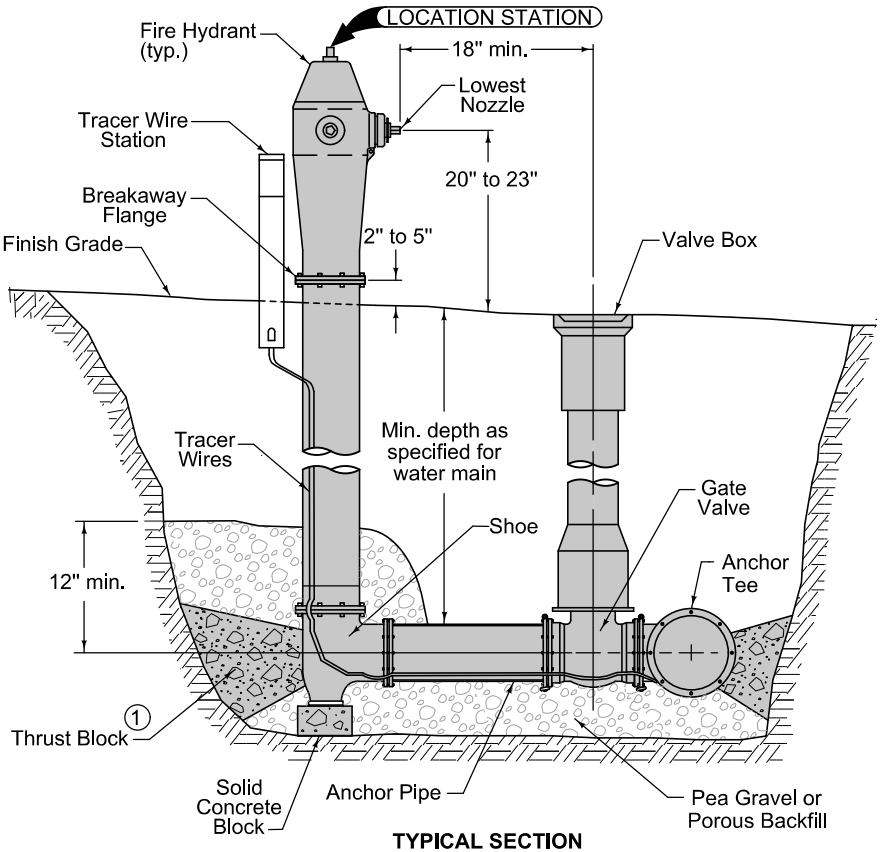
REVISION 1 10-21-14

5010.901

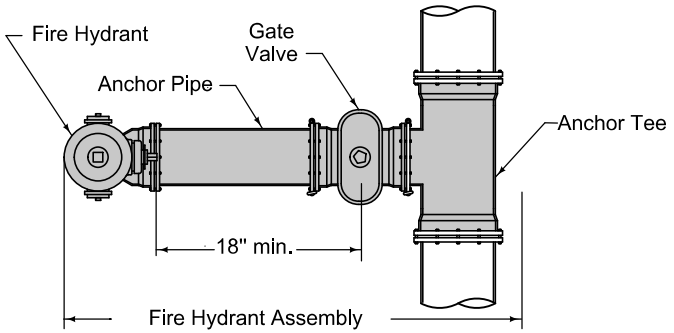
SHEET 1 of 1

SUDAS Standard Specifications

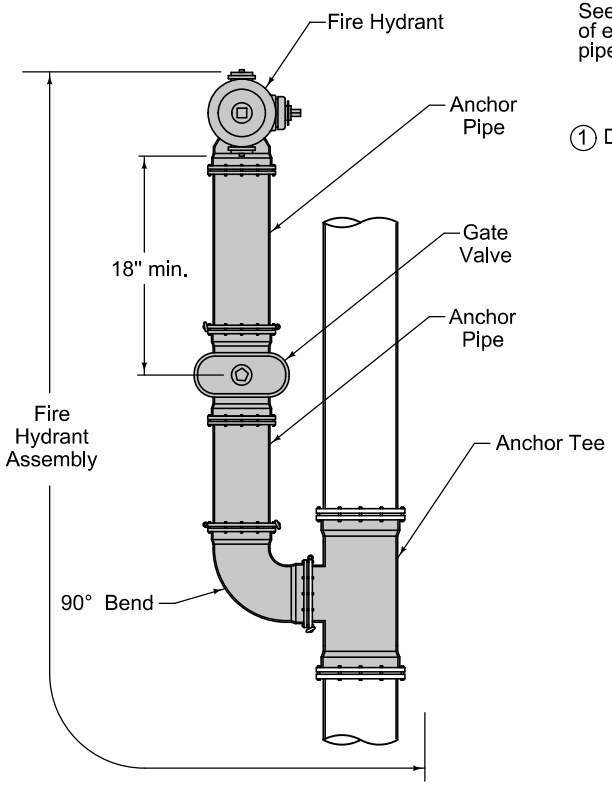
MINIMUM CLEARANCE BETWEEN WATER SERVICE AND STRUCTURE



TYPICAL SECTION



TYPICAL PLAN



ALTERNATE PLAN

Use ductile iron pipe with restrained mechanical joints for fire hydrant assembly and anchor tee.

All shaded items are included in the Fire Hydrant Assembly bid item.

See the contract documents for the location of each hydrant and the length of ancoring pipe.

(1) Do not cover drain holes or tracer wire.

SUDAS	IOWADOT	REVISION 4 04-19-22
FIGURE 5020.201	STANDARD ROAD PLAN	WM-201 SHEET 1 of 1

REVISIONS: Added general note for location and length.

Paul D. Wigand, SUDAS DIRECTOR — Steven Nichols, DESIGN METHODS ENGINEER

FIRE HYDRANT ASSEMBLY

FIGURE 5020.201 SHEET 1OF 1

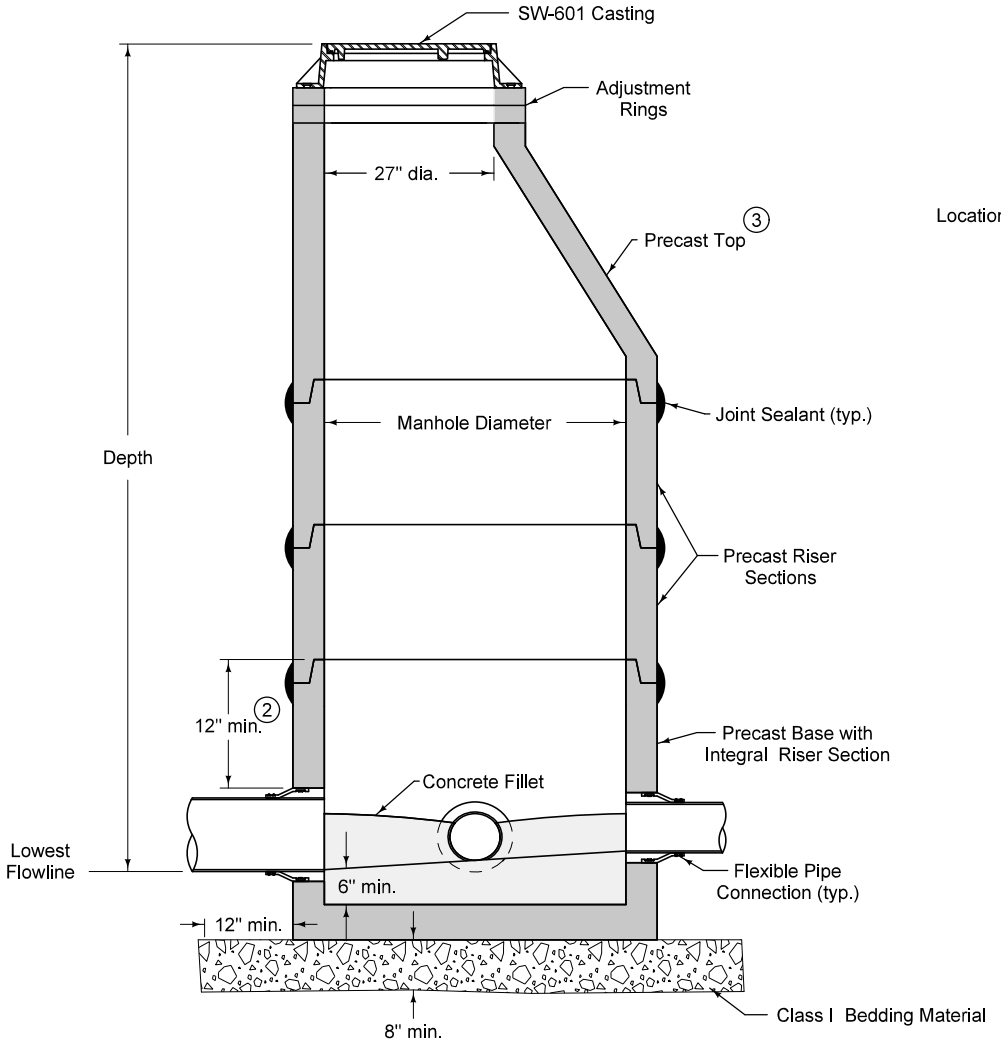
If manhole depth exceeds 20 feet, install steps.

Install infiltration barrier.

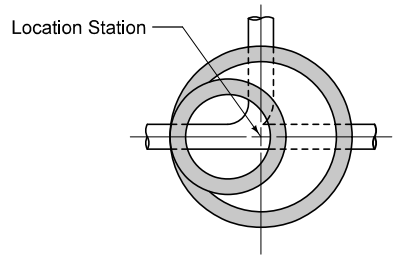
(1) For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.

(2) 12 inch minimum riser height above all pipe openings.

(3) When specified, provide an eccentric flat top In Lieu of eccentric cone section.



TYPICAL SECTION



PLAN

Manhole Diameter (inches)	Maximum Pipe Diameter (inches) for 2 Pipes (1)	
	At 180° Separation	At 90° Separation
48	24	18
60	36	24
72	42	30
84	48	36
96	60	42

FIGURE 6010.301 SHEET 1 OF 1

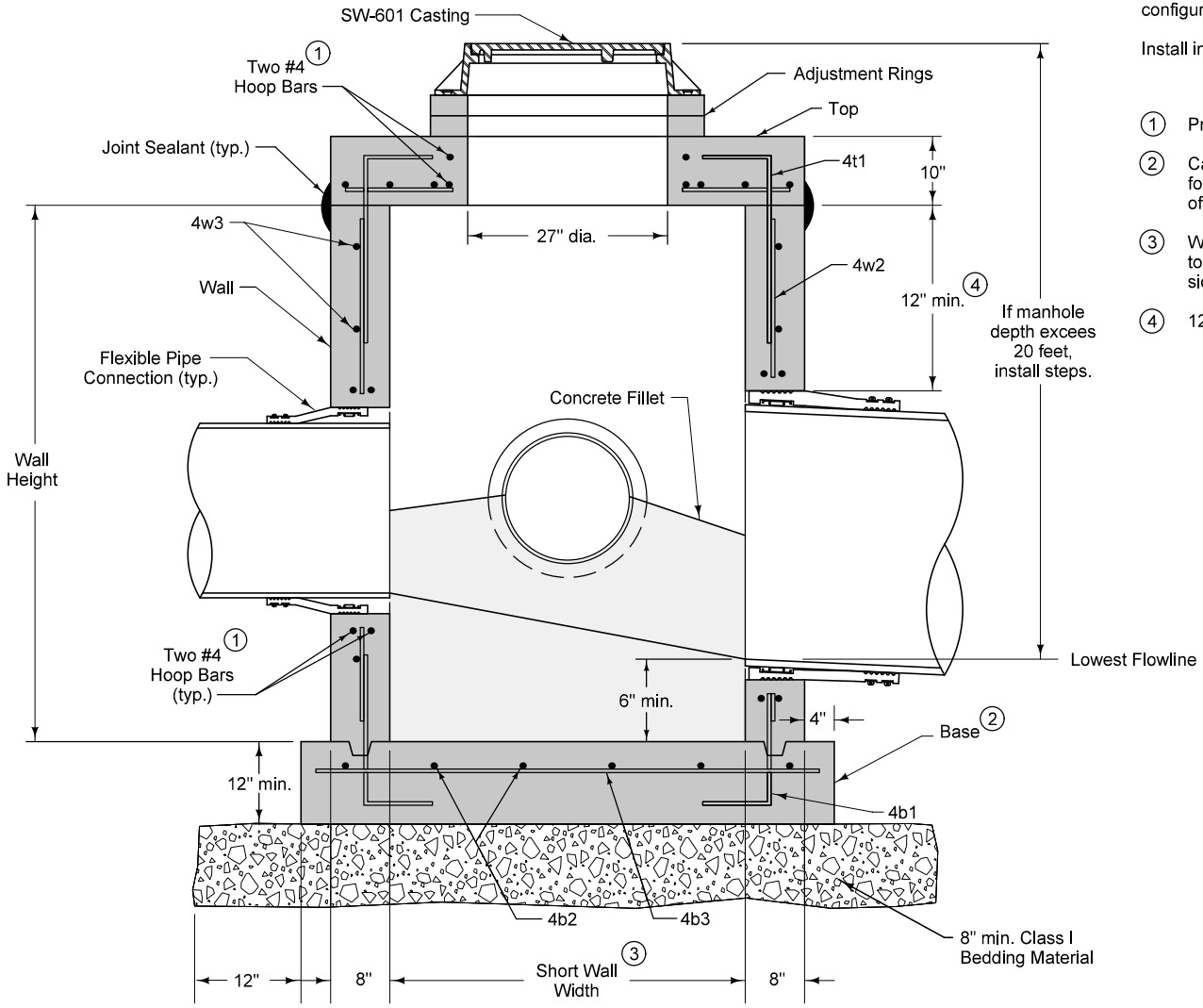
SUDAS | IOWADOT | REVISION 5 10-18-22

FIGURE 6010.301 | STANDARD ROAD PLAN | SW-301 | SHEET 1 of 1

REVISIONS: Added circle note 3.

Paul D. Wigand, SUDAS DIRECTOR | Steven Nichols, DESIGN METHODS ENGINEER

CIRCULAR SANITARY SEWER MANHOLE



TYPICAL SECTION

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

Install infiltration barrier.

(1) Provide two #4 hoop bars at top opening and at all pipe openings.

(2) Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

(3) Wall widths vary with pipe diameter and range from 4 feet minimum to 9 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

(4) 12 inch minimum wall height above all pipe openings.

FIGURE 6010.302 | SHEET 1 OF 2

SUDAS	IOWADOT	REVISION 3	04-20-21
FIGURE 6010.302	STANDARD ROAD PLAN	SW-302	SHEET 1 of 2

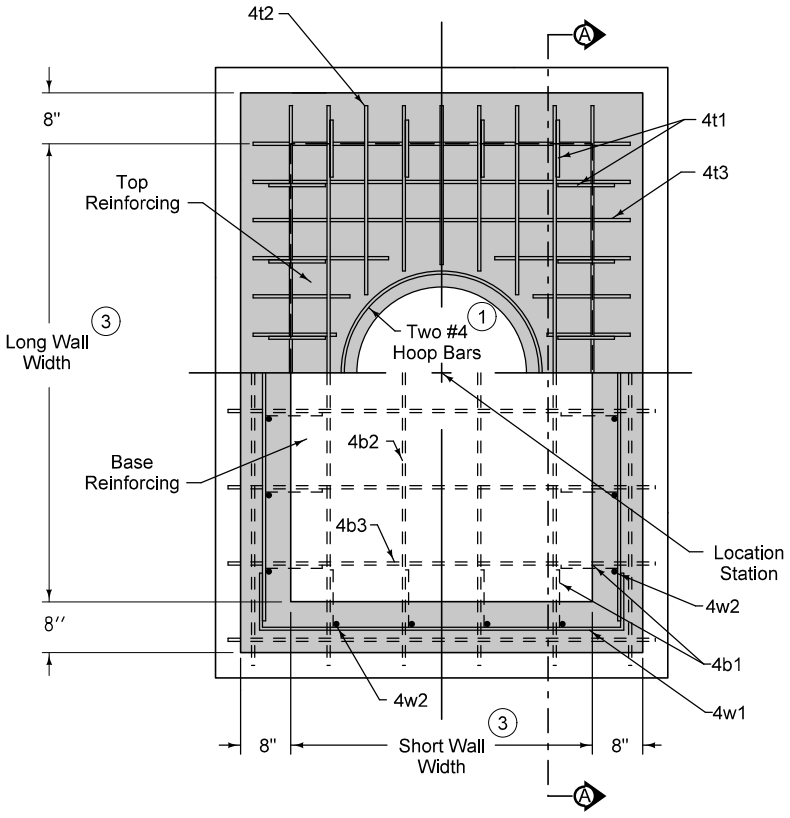
REVISIONS: Added infiltration barrier note.

Paul D. Wigand
SUDAS DIRECTOR

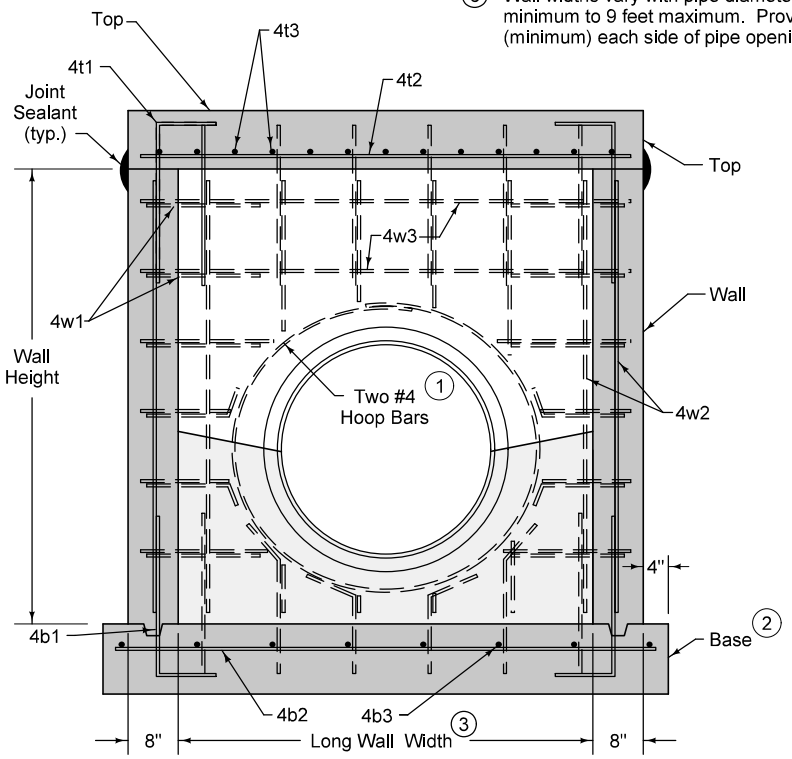
Stuart Nicholson
DESIGN METHODS ENGINEER

RECTANGULAR SANITARY SEWER MANHOLE

1. Provide two #4 hoop bars at top opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. Wall widths vary with pipe diameter and range from 4 feet minimum to 9 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

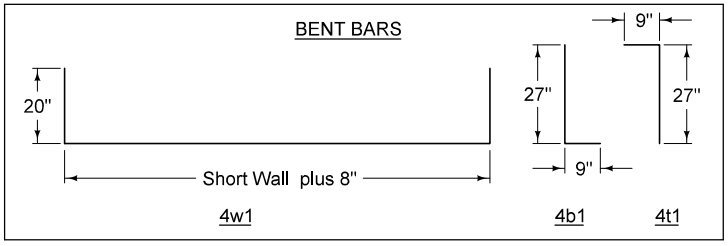


PLAN



SECTION A-A

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
4b1	4	Base	⌟	36"	12"
4b2	4	Base	—	Long Wall plus 18"	12"
4b3	4	Base	—	Short Wall plus 18"	12"
4t1	4	Top	⌝	36"	12"
4t2	4	Top	—	Long Wall plus 12"	6"
4t3	4	Top	—	Short Wall plus 12"	6"
4w1	4	Wall	⌐¬	Short Wall plus 48"	12"
4w2	4	Wall	—	Wall Height minus 4"	12"
4w3	4	Wall	—	Long Wall plus 12"	12"



SUDAS | IOWADOT | REVISION 3 04-20-21

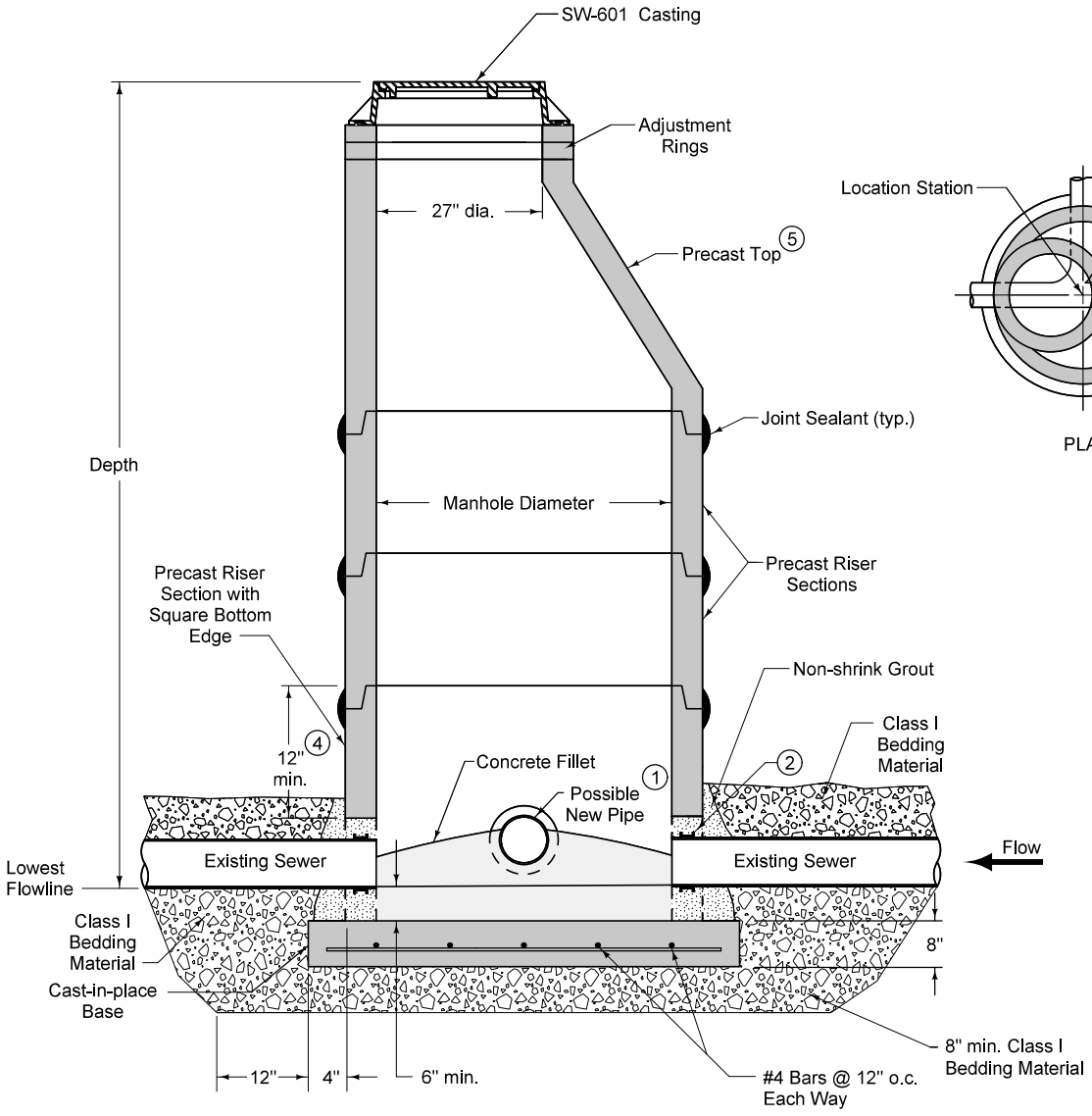
FIGURE 6010.302 | STANDARD ROAD PLAN | SW-302 | SHEET 2 of 2

REVISIONS: Added Infiltration barrier note.

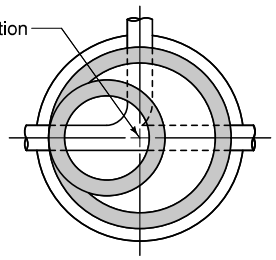
Paul D. Wigand, SUDAS DIRECTOR | DESIGN METHODS ENGINEER

RECTANGULAR SANITARY SEWER MANHOLE

FIGURE 6010.302 SHEET 2 OF 2



TYPICAL SECTION



PLAN

If manhole depth exceeds 20 feet, install steps.

Install infiltration barrier.

(1) For new pipe connections, provide cored opening with flexible pipe connector.

(2) For existing pipe connections, provide an arched opening with a diameter up to 6 inches larger than outside diameter of pipe. Install waterstop around existing pipe. Fill void between pipe and opening with non-shrink grout.

(3) For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.

(4) 12 inch minimum riser height above all pipe openings.

(5) When specified, provide an eccentric flat to In Lieu of eccentric cone section.

Manhole Diameter (inches)	Maximum Pipe Diameter (inches) for 2 Pipes (3)	
	At 180° Separation	At 90° Separation
48	24	18
60	36	24
72	42	30
84	48	36
96	60	42

FIGURE 6010.303 SHEET 1 OF 1

SUDAS | IOWA DOT

REVISION 5 10-18-22

FIGURE 6010.303 | STANDARD ROAD PLAN | SW-303

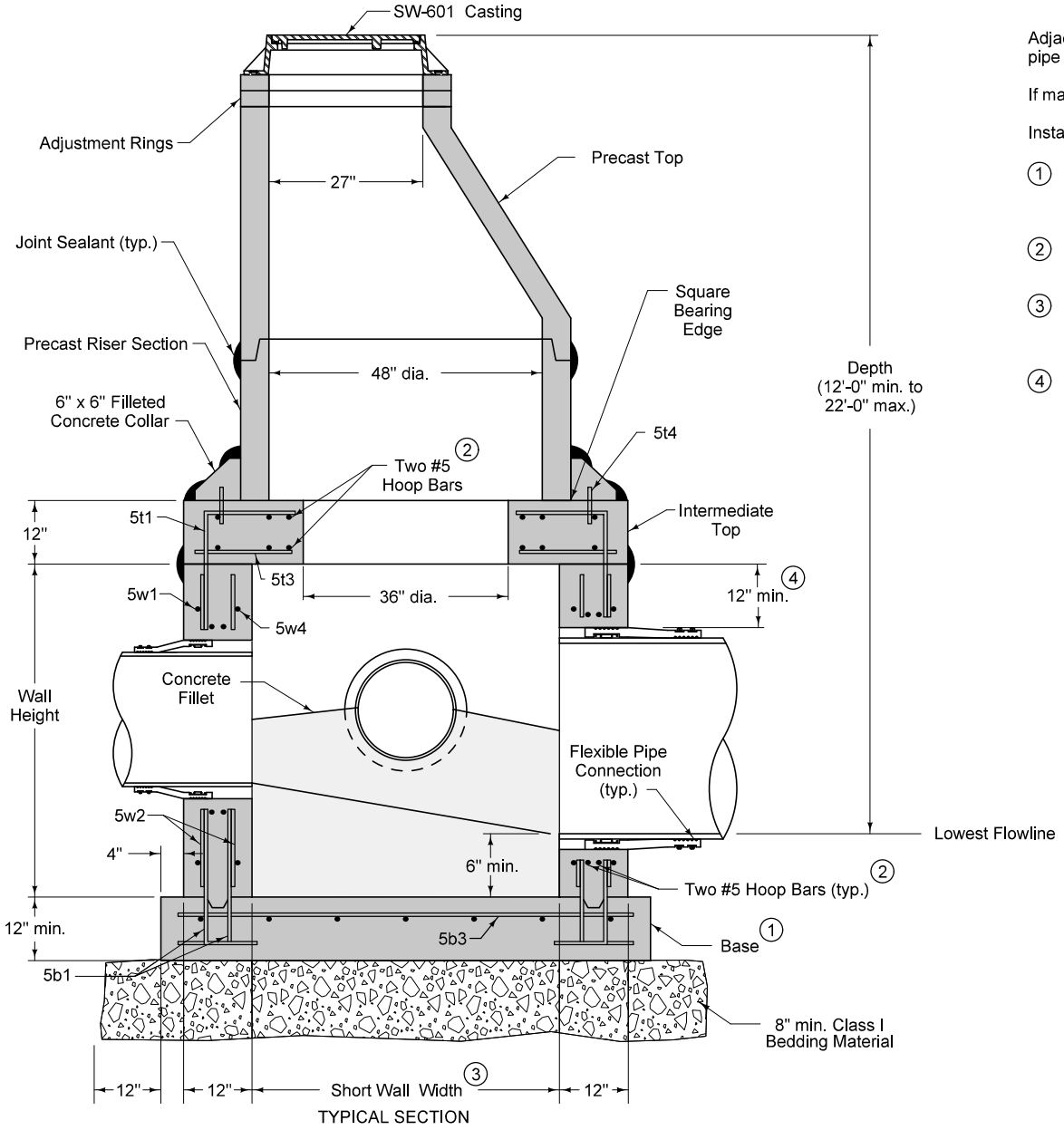
SHEET 1 of 1

REVISIONS: Added circle note 5.

Paul D. Wigand
SUDAS DIRECTOR

Steven Nichols
DESIGN METHODS ENGINEER

SANITARY SEWER MANHOLE OVER EXISTING SEWER



TYPICAL SECTION

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

If manhole depth exceeds 20 feet, install steps.

Install infiltration barrier.

(1) Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

(2) Provide two #5 hoop bars at intermediate top opening and at all pipe openings.

(3) Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

(4) 12 inch minimum wall height above all pipe openings.

FIGURE 6010.304 SHEET 1 OF 2

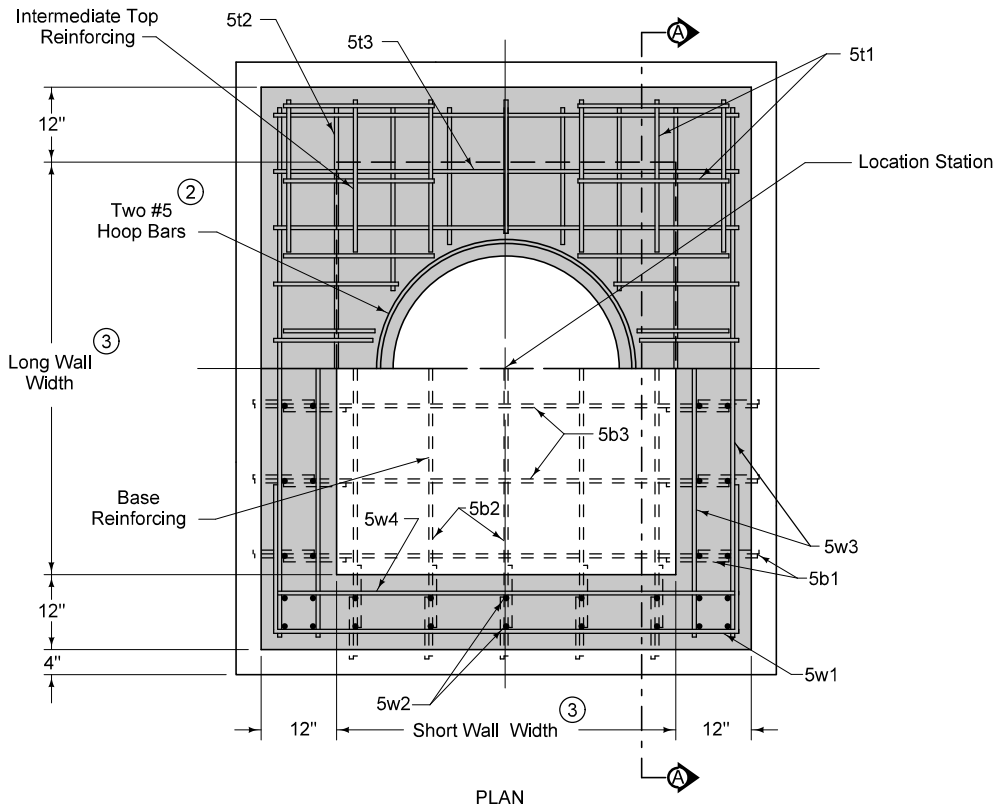
SUDAS | IOWADOT | REVISION 4 04-20-21

FIGURE 6010.304 | STANDARD ROAD PLAN | SW-304 | SHEET 1 of 2

REVISIONS: Added manhole depth note and infiltration barrier note.

Paul D. Wigand, SUDAS DIRECTOR — DESIGN METHODS ENGINEER

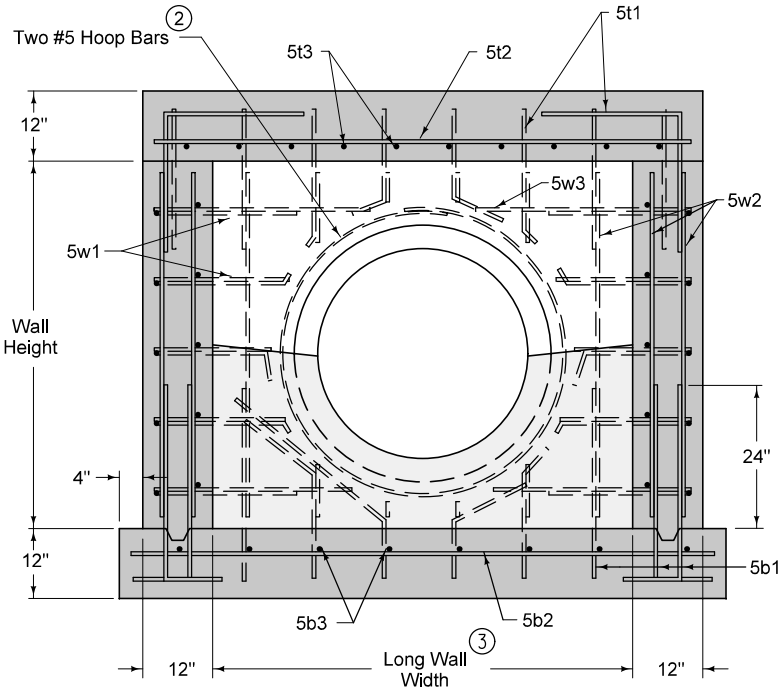
RECTANGULAR BASE/ CIRCULAR TOP SANITARY SEWER MANHOLE



PLAN

2 Provide two #5 hoop bars at intermediate top opening and at all pipe openings.

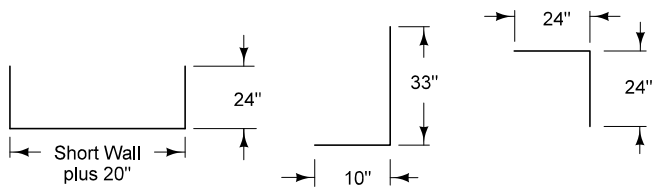
3 Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall opening (minimum) each side of pipe opening.



SECTION A-A

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
5t1	5	Top	L	48"	12"
5t2	5	Top	—	Long Wall plus 20"	9"
5t3	5	Top	—	Short Wall plus 20"	9"
5t4	5	Top	—	8"	12"
5b1	5	Base	L	43"	12"
5b2	5	Base	—	Long Wall plus 26"	12"
5b3	5	Base	—	Short Wall plus 26"	12"
5w1	5	Top	⌐	Short Wall plus 68"	12"
5w2	5	Top	—	Wall Height minus 4"	12"
5w3	5	Top	—	Long Wall plus 20"	12"
5w4	5	Top	—	Short Wall plus 20"	12"

BENT BARS



SUDAS | IOWADOT | REVISION 4 04-20-21

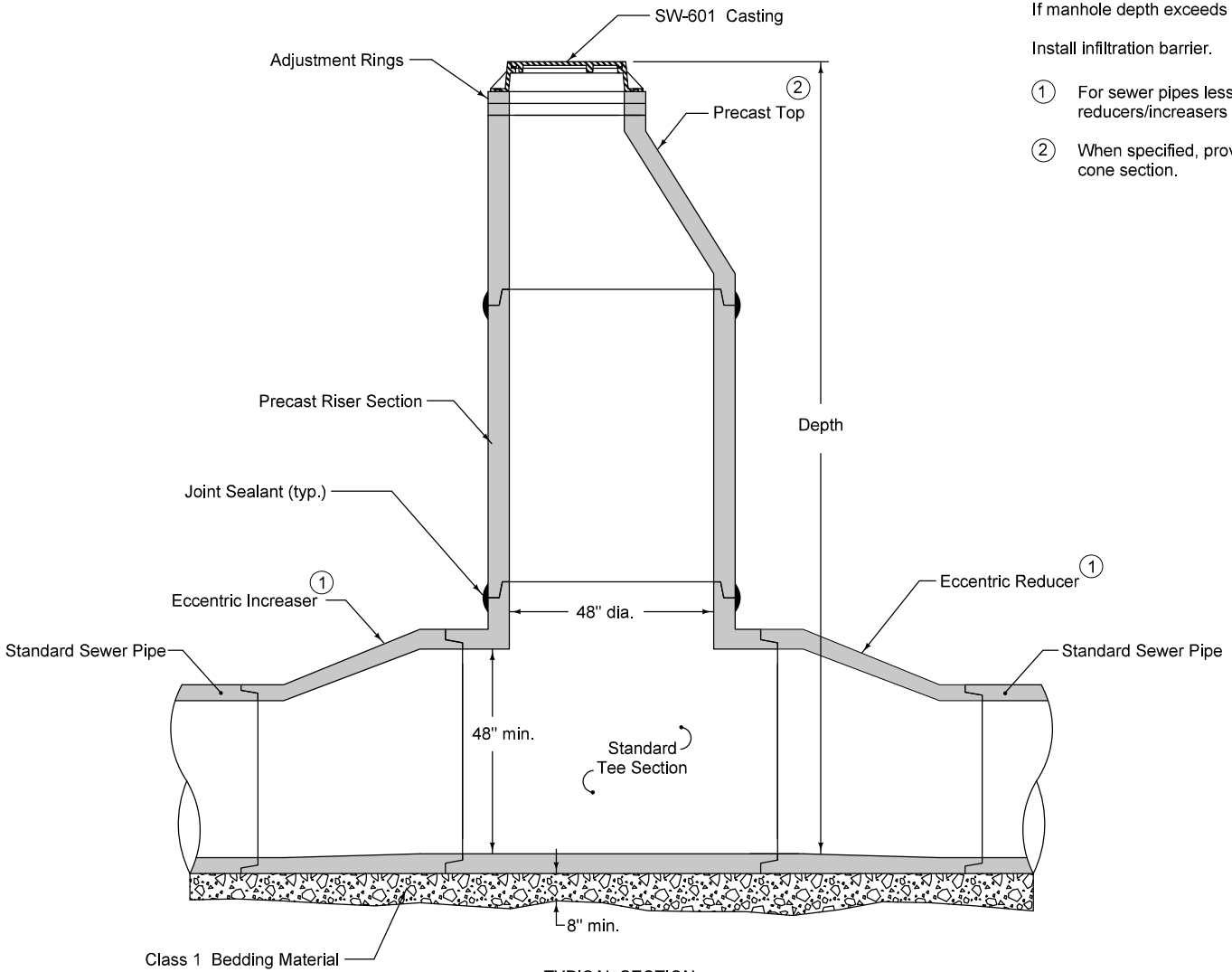
FIGURE 6010.304 | STANDARD ROAD PLAN | SW-304 | SHEET 2 of 2

REVISIONS: Added manhole depth note and Infiltration barrier note.

Paul D. Wigand, SUDAS DIRECTOR — DESIGN METHODS ENGINEER

RECTANGULAR BASE/ CIRCULAR TOP SANITARY SEWER MANHOLE

FIGURE 6010.304 SHEET 2 OF 2



TYPICAL SECTION

1

STANDARD TEE

If manhole depth exceeds 20 feet, install steps.

Install infiltration barrier.

1. For sewer pipes less than 48 inches in diameter, install eccentric reducers/increasers with a standard tee or utilize a composite tee.

2. When specified, provide an eccentric flat top In Lieu of eccentric cone section.

SUDAS	IOWA DOT	REVISION 4 10-18-22
FIGURE 6010.305	STANDARD ROAD PLAN	SW-305
		SHEET 1 of 2

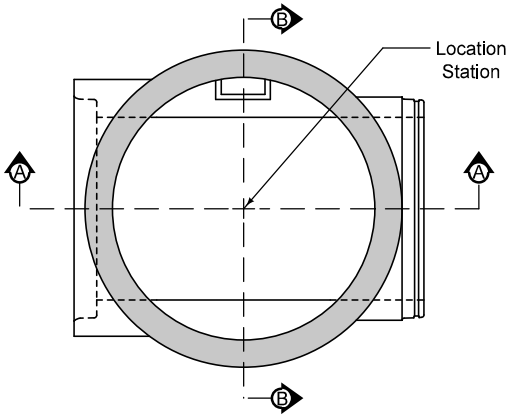
REVISIONS: Added circle note 2.

Paul D. Wigard, SUDAS DIRECTOR

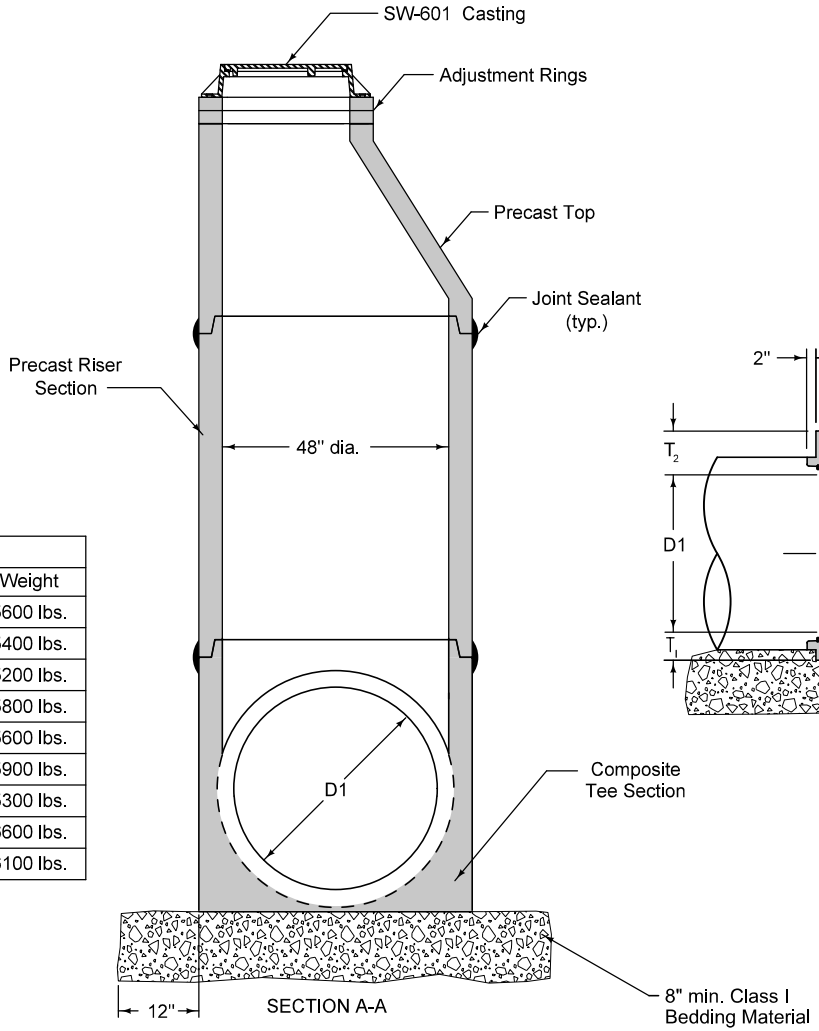
DESIGN METHODS ENGINEER

TEE-SECTION
SANITARY SEWER MANHOLE

FIGURE 6010.305 SHEET 1 OF 2

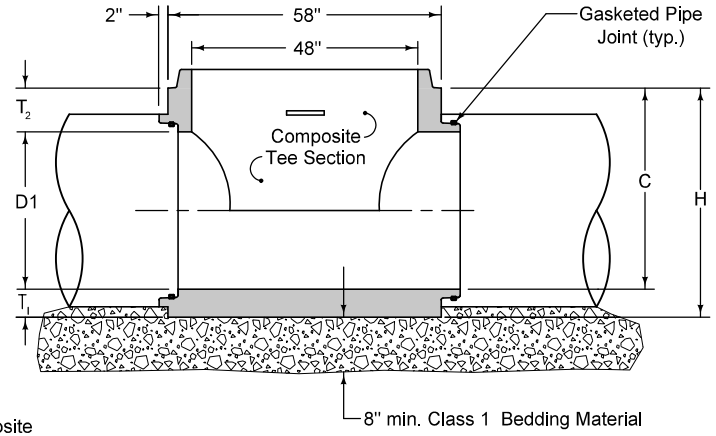


PLAN



SECTION A-A

Install infiltration barrier.



SECTION B-B

COMPOSITE TEE DIMENSIONS						
Size	D1	H	T_1	T_2	C	Weight
48" on 12"	12"	50"	$8\frac{1}{2}$"	$29\frac{1}{2}$"	$41\frac{1}{2}$"	5600 lbs.
48" on 15"	15"	50"	7"	28"	43"	5400 lbs.
48" on 18"	18"	50"	$5\frac{1}{2}$"	$26\frac{1}{2}$"	$44\frac{1}{2}$"	5200 lbs.
48" on 21"	21"	48"	$9\frac{1}{2}$"	$17\frac{1}{2}$"	$38\frac{1}{2}$"	5800 lbs.
48" on 24"	24"	48"	8"	16"	40"	5600 lbs.
48" on 27"	27"	48"	$9\frac{1}{2}$"	$11\frac{1}{2}$"	$38\frac{1}{2}$"	5900 lbs.
48" on 30"	30"	48"	8"	10"	40"	5300 lbs.
48" on 33"	33"	54"	$9\frac{1}{2}$"	$11\frac{1}{2}$"	$44\frac{1}{2}$"	6600 lbs.
48" on 36"	36"	54"	8"	10"	46"	6100 lbs.

COMPOSITE TEE

Alternate to standard tee with eccentric reducer (for pipes 36" and smaller).

SUDAS | IOWADOT

REVISION: 4 | 10-18-22

FIGURE 6010.305 | STANDARD ROAD PLAN | SW-305

SHEET 2 of 2

REVISIONS: Added circle note 2.

Paul D. Wigand, SUDAS DIRECTOR

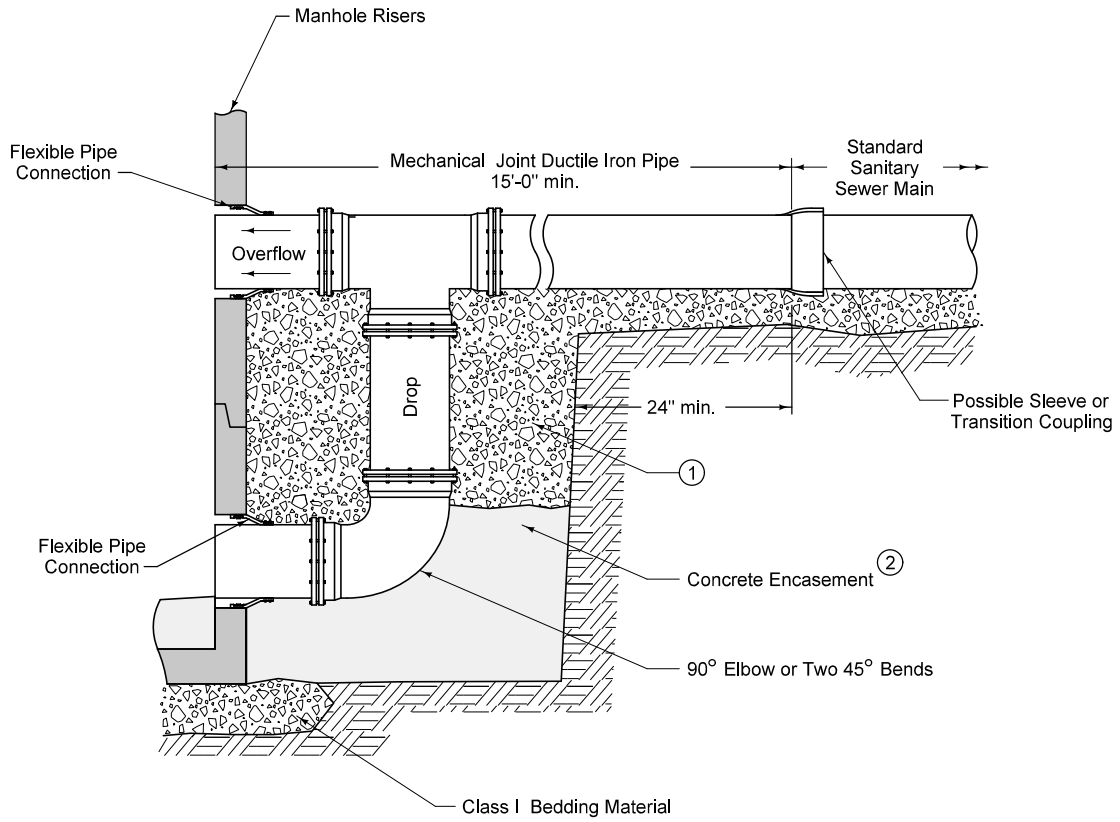
Stuart Nicholson, DESIGN METHODS ENGINEER

TEE-SECTION
SANITARY SEWER MANHOLE

FIGURE 6010.305 SHEET 2 OF 2

Figure 6010.306

RESERVED FOR FUTURE USE



Construct drop and overflow from ductile iron pipe of same diameter specified for sewer main. Provide mechanical joints for all ductile iron pipe and fittings.

1. Place Class I bedding material, CLSM, flowable mortar, or concrete from top of elbow to bottom of sewer main.
2. Encase elbow in concrete. 12 inches minimum on all sides.

SUDAS | IOWADOT

REVISION 2 04-21-20

FIGURE 6010.307 | STANDARD ROAD PLAN | SW-307

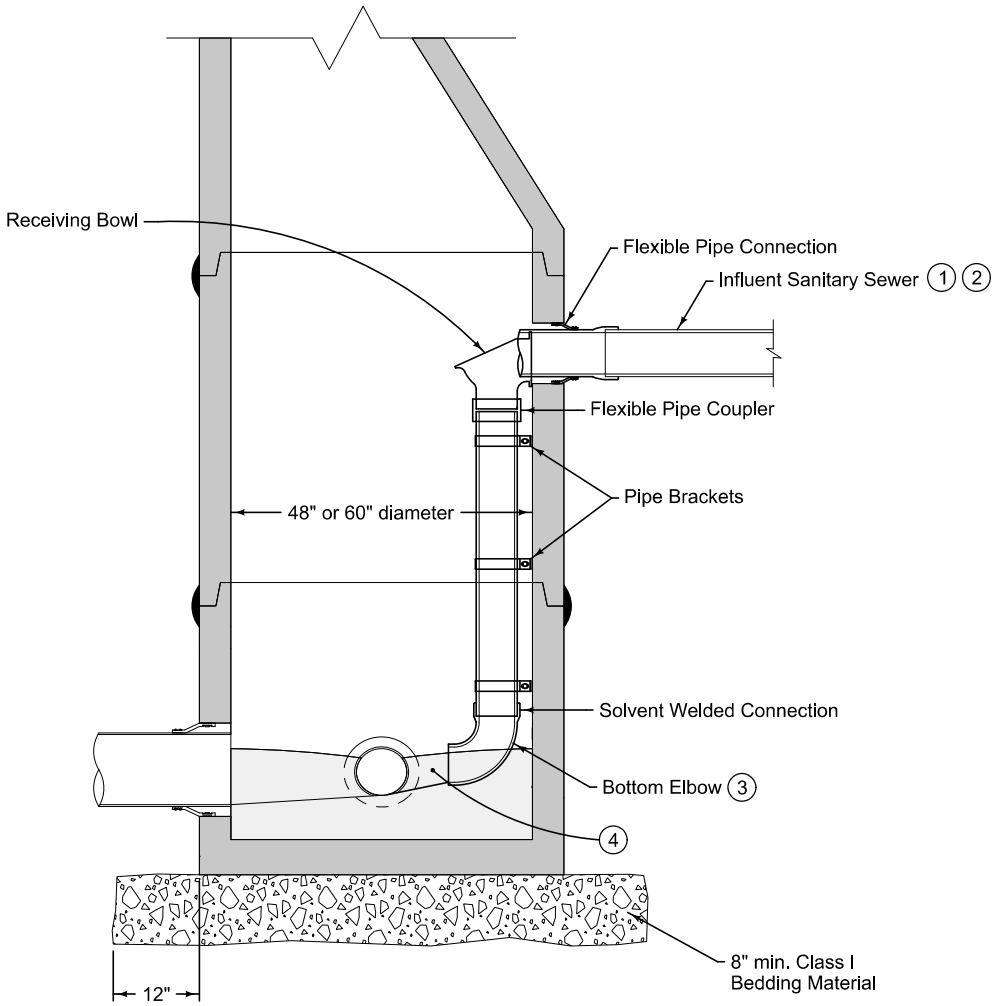
SHEET 1 of 1

REVISIONS: Changed 1 to I on Bedding Material in Note 1. Added EXTERNAL to title.

Paul D. Wigand, SUDAS DIRECTOR | DESIGN METHODS ENGINEER

EXTERNAL DROP CONNECTION FOR SANITARY SEWER MANHOLE

FIGURE 6010.307 SHEET 1 OF 1



1. Core drill openings at least 12 inches from existing manhole joints.
2. Install flexible pipe coupler or pipe joint on new sanitary sewer 18 to 24 inches from outside of manhole wall.
3. Align elbow so discharge is directed at outlet pipe or at 45 degrees to manhole flow.
4. Reshape fillet to provide a smooth transition and to direct flow to outlet.

FIGURE 6010.308 | SHEET 1 OF 1

SUDAS | IOWADOT

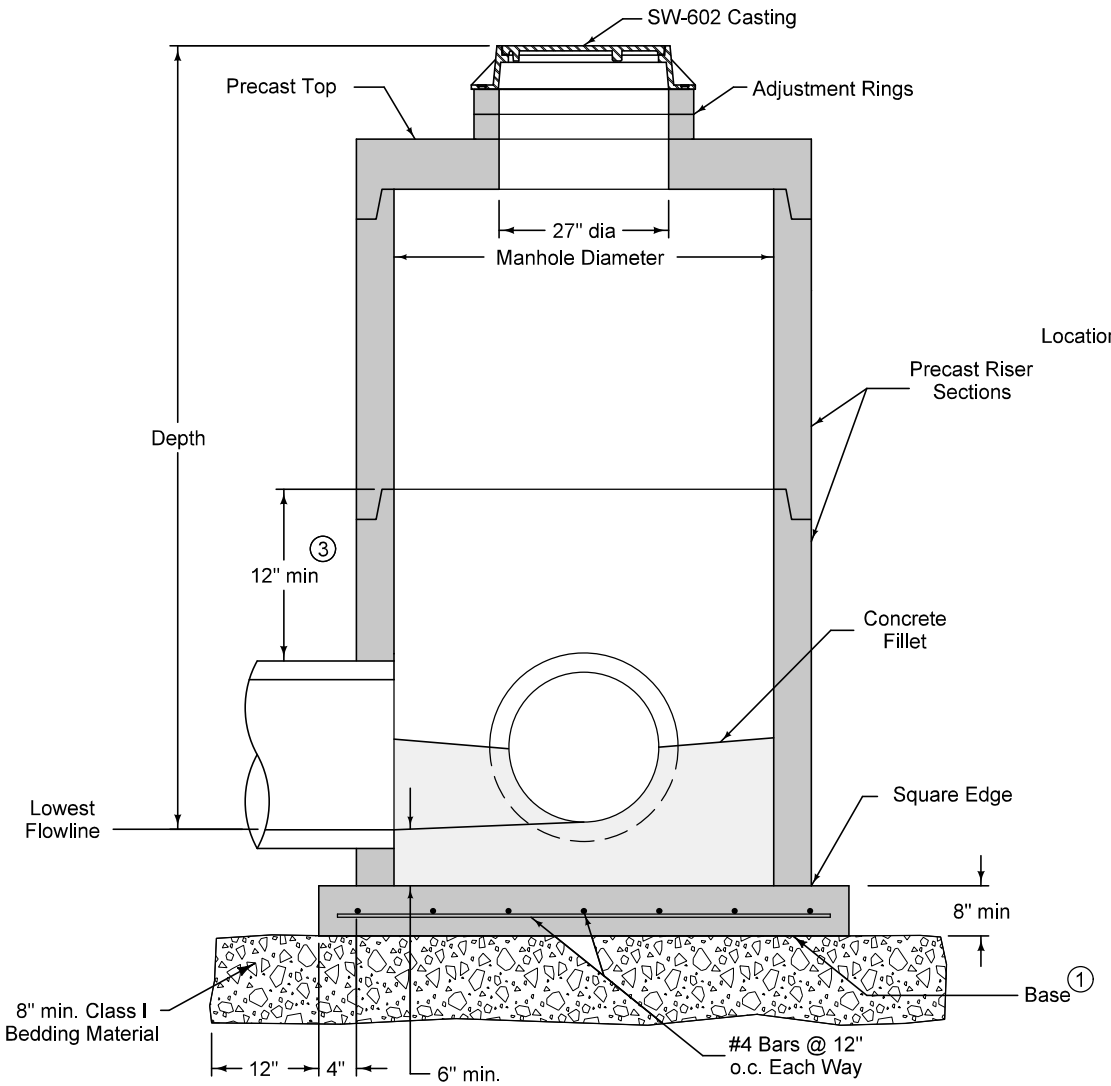
REVISION	
1	04-20-21

FIGURE 6010.308 | STANDARD ROAD PLAN | SW-308 | SHEET 1 of 1

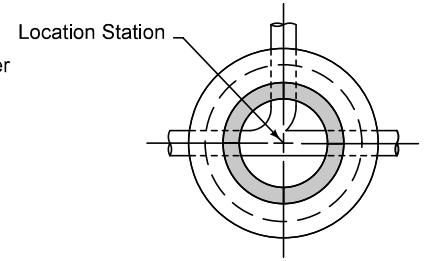
REVISIONS: Deleted top of manhole.

Paul D. Wigand, SUDAS DIRECTOR | Stuart Nicholson, DESIGN METHODS ENGINEER

INTERNAL DROP CONNECTION FOR SANITARY SEWER MANHOLE



TYPICAL SECTION



PLAN

If manhole depth exceeds 20 feet, install steps.

①Cast-in-place base shown. If base is precast integral with bottom riser, the footprint of the base is not required to extend beyond the outer edge of the riser.

②For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.

③12 inch minimum riser height above all pipe openings.

Manhole Diameter (inches)	Maximum Pipe Diameter② (inches) for 2 Pipes	
	At 180° Separation	At 90° Separation
48	24	18
60	36	24
72	42	30
84	48	36
96	60	42

FIGURE 6010.401 SHEET 1OF 1

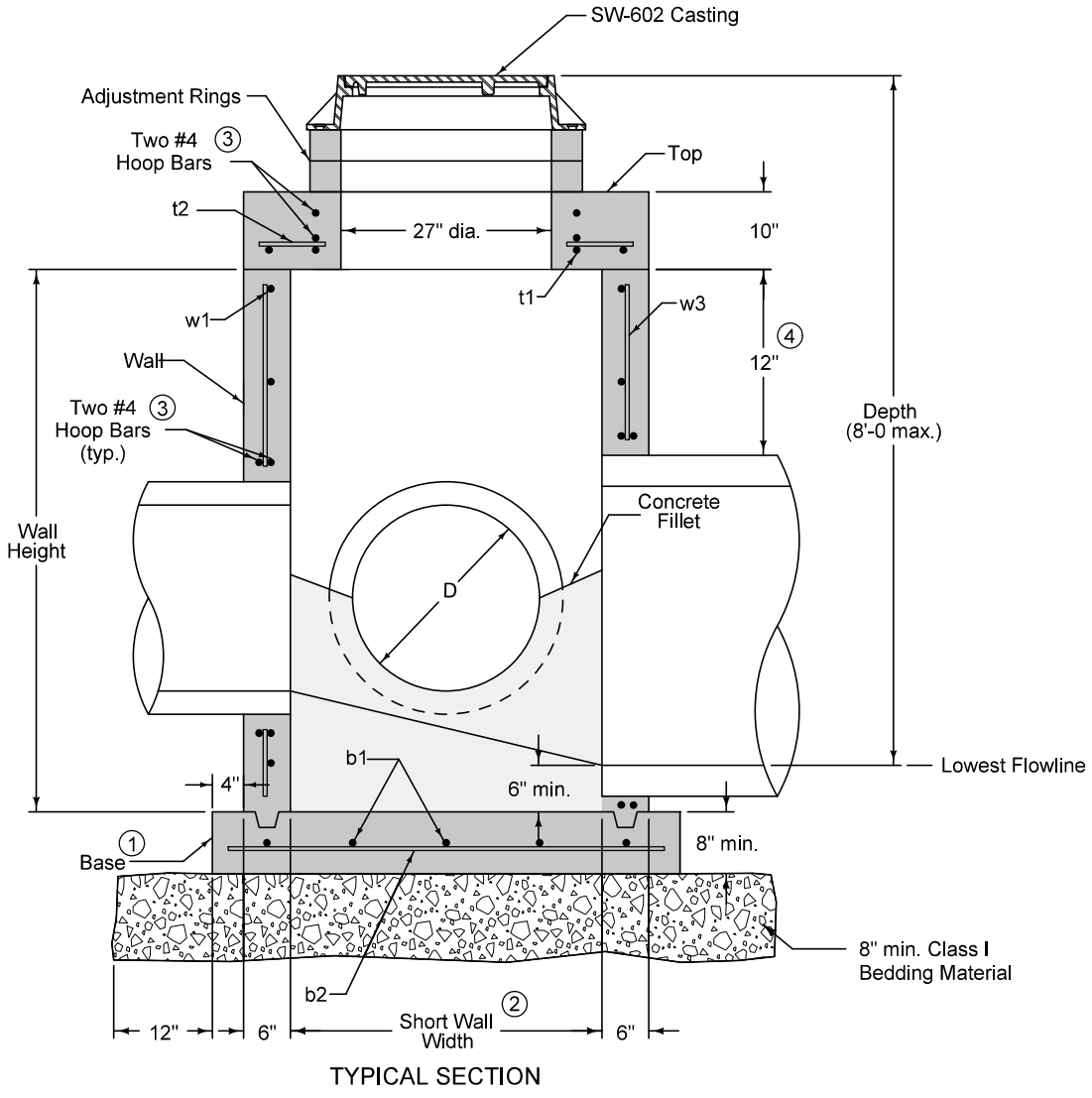
SUDAS | IOWADOT | REVISION 3 04-20-21

FIGURE 6010.401 | STANDARD ROAD PLAN | SW-401 | SHEET 1 of 1

REVISIONS: Added manhole depth note.

Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

CIRCULAR STORM SEWER MANHOLE



TYPICAL SECTION

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

① Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

② Wall widths vary with pipe diameter and range from 40 inches minimum to 77 inches maximum. Provide 6 inches of wall width (minimum) each side of pipe opening.

③ Provide two #4 hoop bars at top opening and at all pipe openings.

④ 12 inch minimum wall height above all pipes.

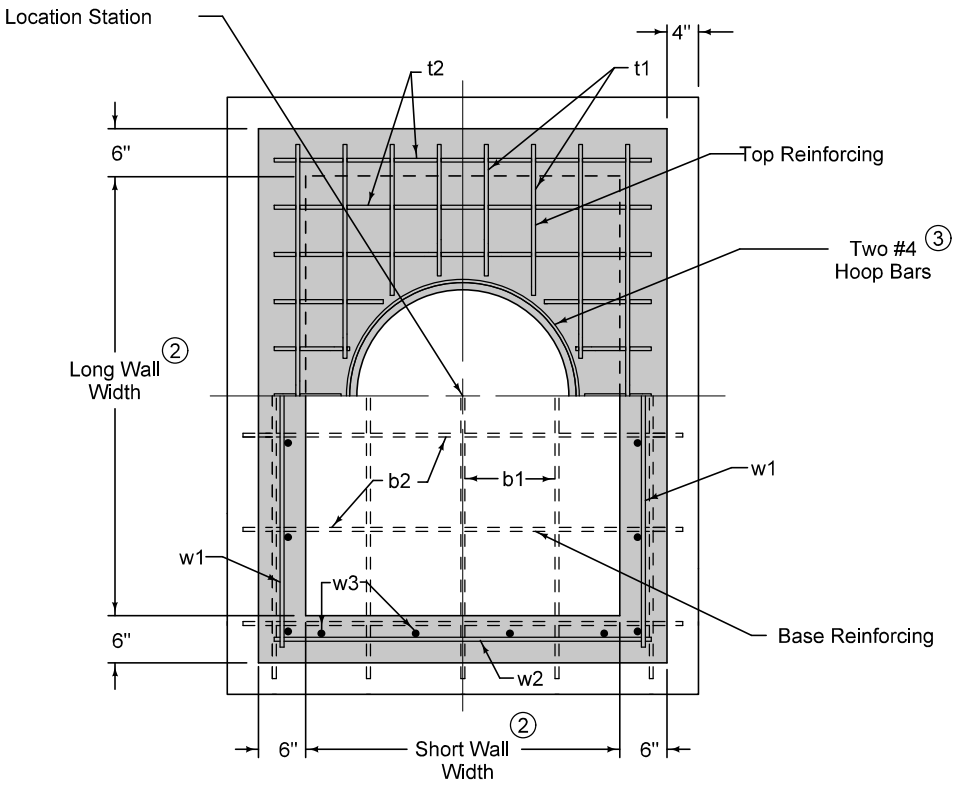
SUDAS	IOWA DOT	REVISION 2 04-21-20
FIGURE 6010.402	STANDARD ROAD PLAN	SW-402
		SHEET 1 of 2

REVISIONS: Added Class I Bedding Material.

Paul D. Wigand — SUDAS DIRECTOR
Stuart Nicholson — DESIGN METHODS ENGINEER

RECTANGULAR STORM SEWER MANHOLE

FIGURE 6010.402 SHEET 1 OF 2



PLAN

② Wall widths vary with pipe diameter and range from 40" minimum to 77" maximum. Provide 6" of wall width (minimum) each side of pipe opening.

③ Provide two #4 hoop bars at top opening and at all pipe openings.

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
t1	See Table	Top	——	Long Wall plus 8"	6"
t2	See Table	Top	——	Short Wall plus 8"	6"
b1	See Table	Base	——	Long Wall plus 14"	12"
b2	See Table	Base	——	Short Wall plus 14"	12"
w1	See Table	Walls	——	Long Wall plus 8"	12"
w2	See Table	Walls	——	Short Wall plus 8"	12"
w3	See Table	Walls	——	Wall Height minus 4"	12"

Diameter of Largest Pipe, D	Minimum Bar Size
48" or 54"	6
33" to 42"	5
30" or smaller	4

FIGURE 6010.402 SHEET 2 OF 2

SUDAS | IOWADOT | REVISION 2 04-21-20

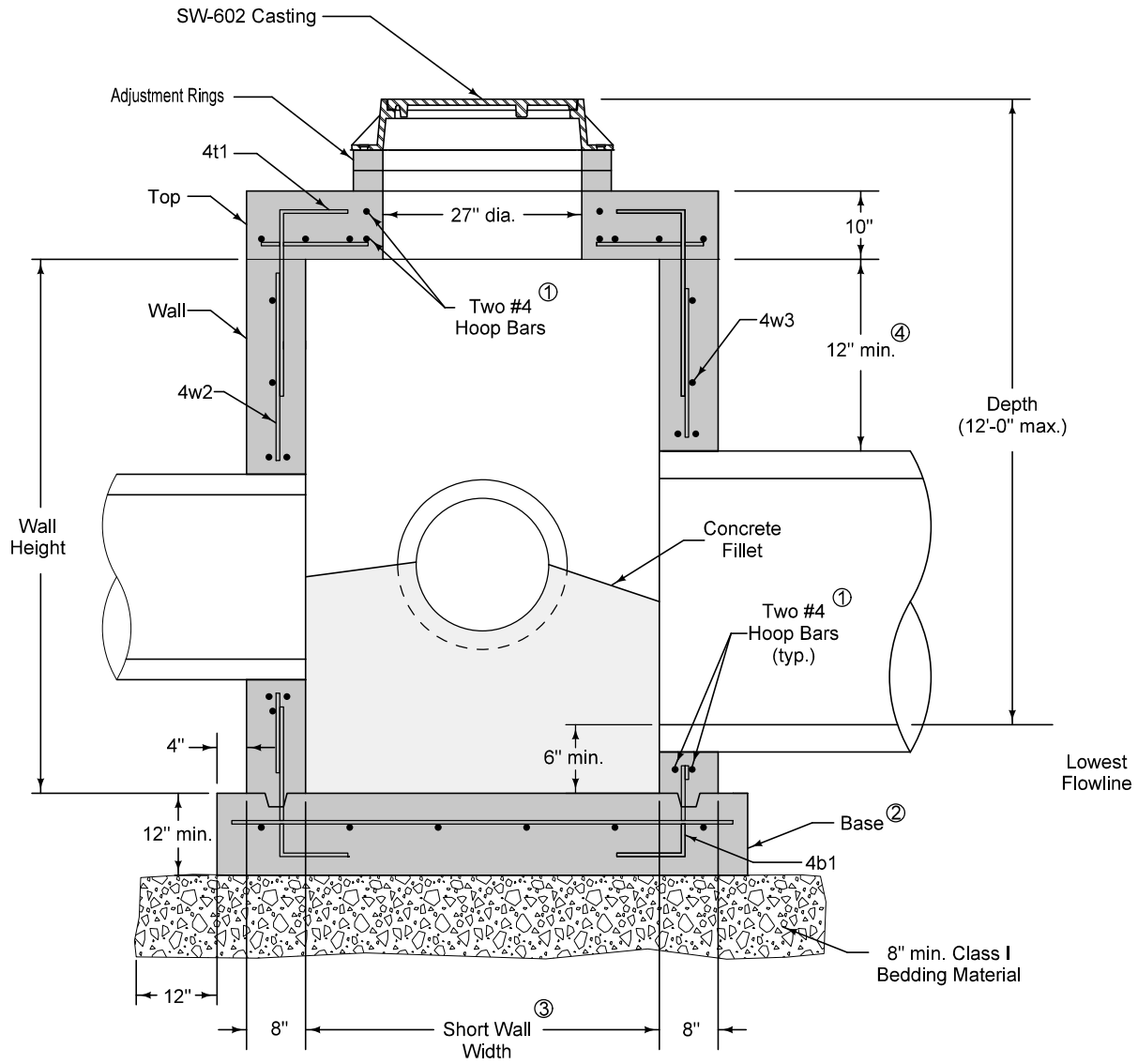
FIGURE 6010.402 | STANDARD ROAD PLAN | SW-402 | SHEET 2 of 2

REVISIONS: Added Class I Bedding Material.

Paul D. Wigand
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

RECTANGULAR STORM SEWER MANHOLE



TYPICAL SECTION

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

① Provide two #4 hoop bars at top opening and at all pipe openings.

② Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

③ Wall widths vary with pipe diameter and range from 4 feet minimum to 9 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

④ 12 inch minimum wall height above all pipes.

SUDAS	IOWA DOT	REVISION 2	04-21-20
FIGURE 6010.403	STANDARD ROAD PLAN	SW-403	SHEET 1 of 2

REVISIONS: Added Class I Bedding Material.

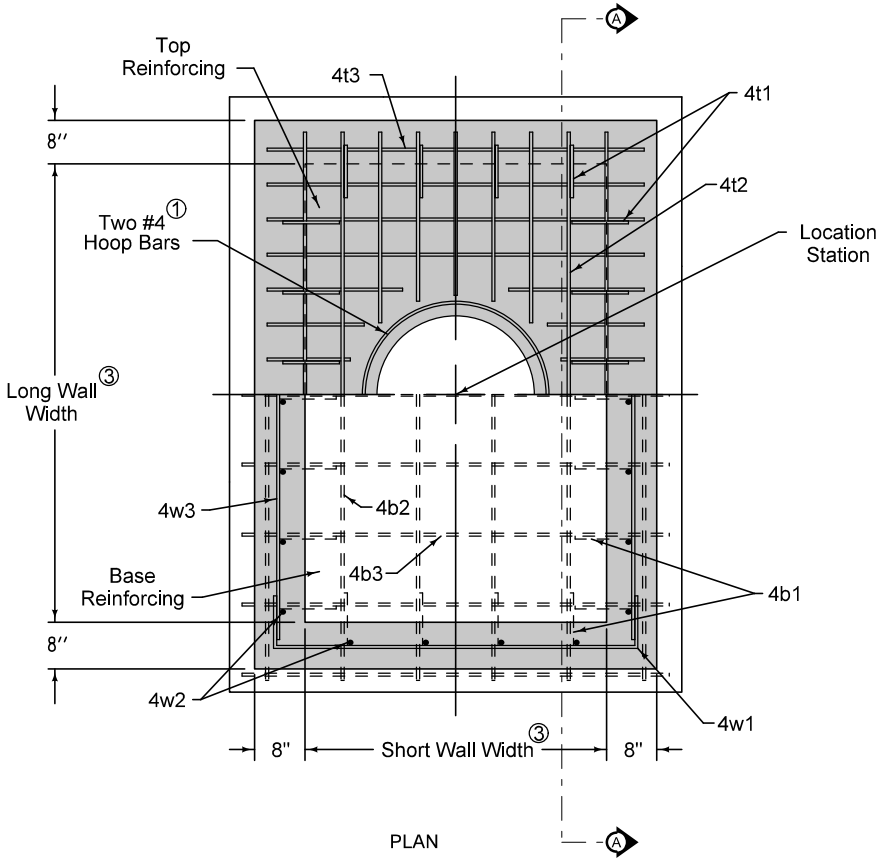
Paul D. Wigand — SUDAS DIRECTOR
Stuart Nielsen — DESIGN METHODS ENGINEER

DEEP WELL RECTANGULAR STORM SEWER MANHOLE

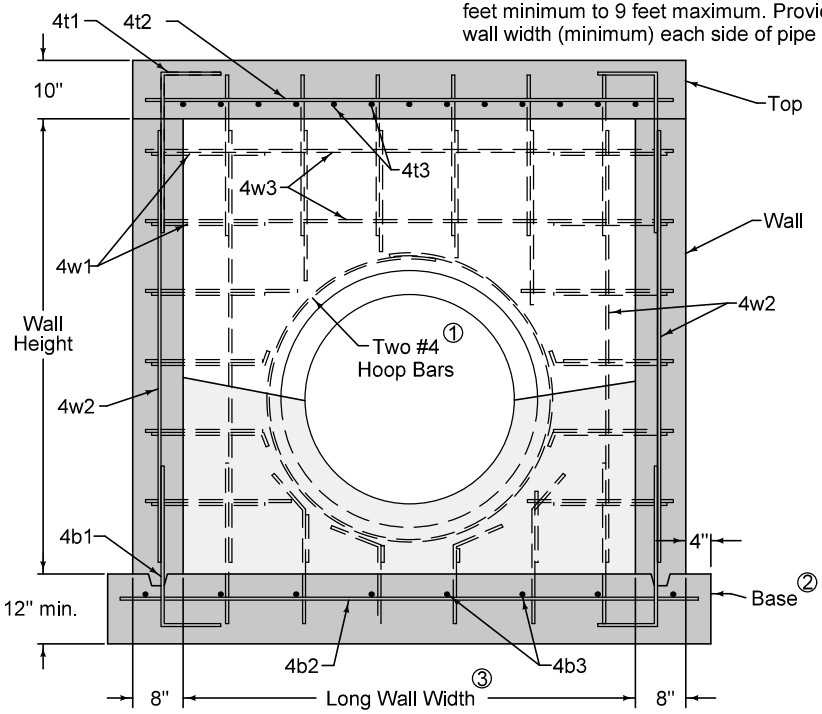
① Provide two #4 hoop bars at top opening and at all pipe openings.

② Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of walls.

③ Wall widths vary with pipe diameter and range from 4 feet minimum to 9 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

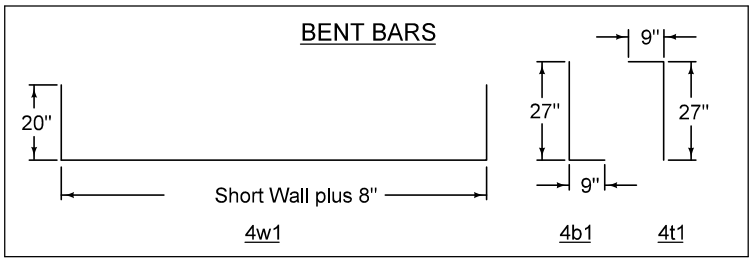


PLAN



SECTION A-A

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
4t1	4	Top	⌐	36"	12"
4t2	4	Top	—	Long Wall plus 12"	6"
4t3	4	Top	—	Short Wall plus 12"	6"
4b1	4	Base	L	36"	12"
4b2	4	Base	—	Long Wall plus 18"	12"
4b3	4	Base	—	Short Wall plus 18"	12"
4w1	4	Walls	⌐¬	Short Wall plus 48"	12"
4w2	4	Walls	—	Wall Height minus 4"	12"
4w3	4	Walls	—	Long Wall plus 12"	12"



SUDAS | IOWA DOT | REVISION 2 04-21-20

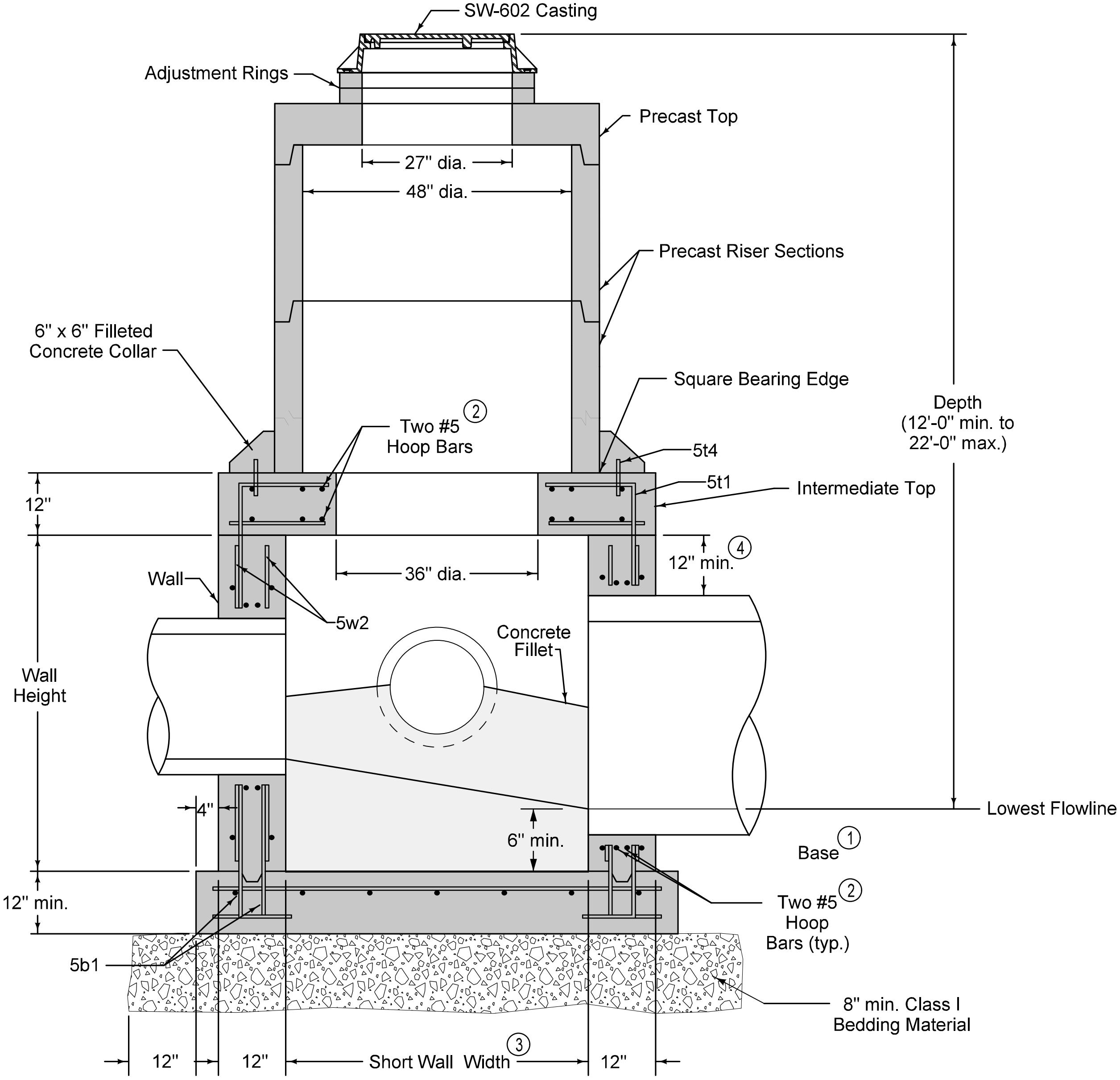
FIGURE 6010.403 | STANDARD ROAD PLAN | SW-403 | SHEET 2 of 2

REVISIONS: Added Class I Bedding Material.

Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

DEEP WELL RECTANGULAR STORM SEWER MANHOLE

FIGURE 6010.403 SHEET 2 OF 2



TYPICAL SECTION

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

If manhole depth exceeds 20 feet, install steps.

① Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

② Provide two #5 hoop bars at intermediate top opening and at all pipe openings.

③ Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

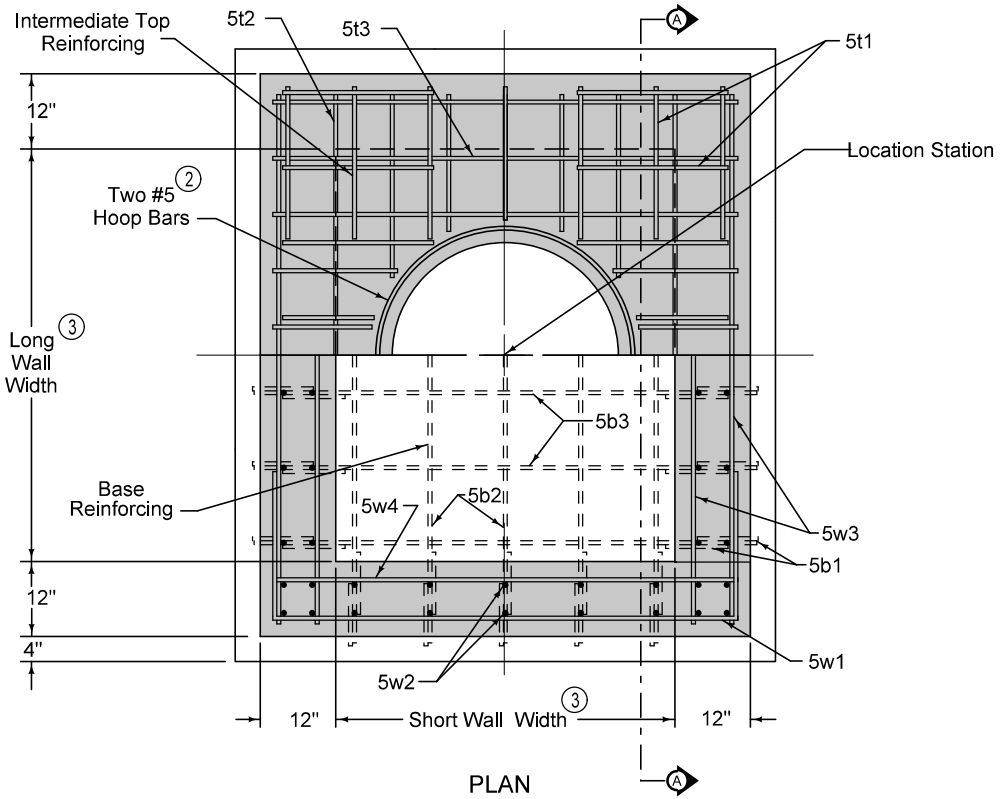
④ 12 inch minimum wall height above all pipes.

SUDAS	IOWADOT	REVISION 4 04-20-21
FIGURE 6010.404	STANDARD ROAD PLAN	SW-404 SHEET 1 of 2

REVISIONS: Added manhole depth note.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

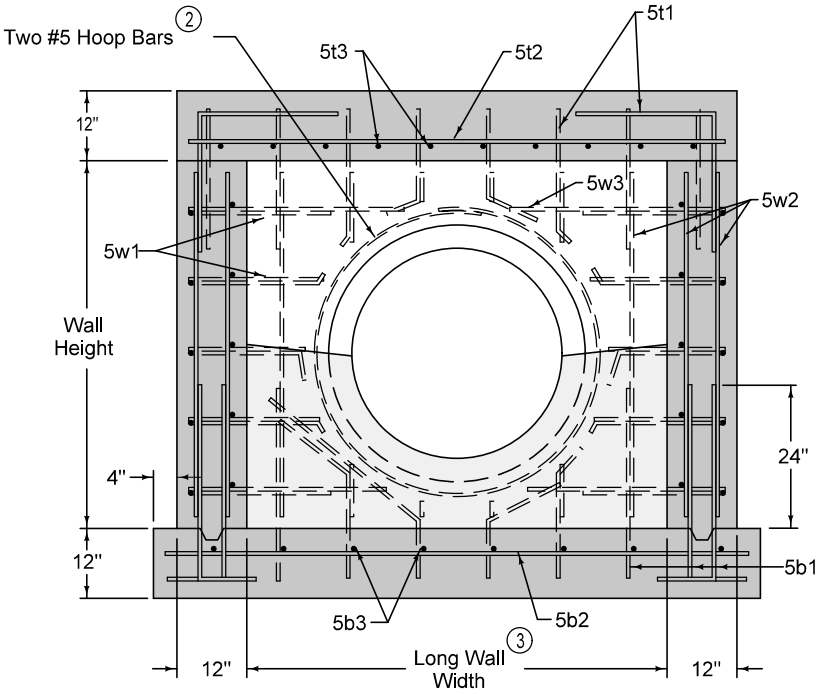
RECTANGULAR BASE/ CIRCULAR TOP STORM SEWER MANHOLE



PLAN

② Provide two #5 hoop bars at intermediate top opening and at all pipe openings.

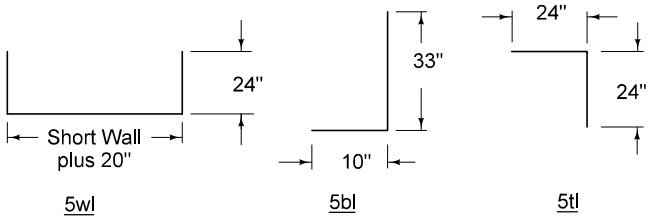
③ Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.



SECTION A-A

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
5t1	5	Top	L	48"	12"
5t2	5	Top	—	Long Wall plus 20"	9"
5t3	5	Top	—	Short Wall plus 20"	9"
5t4	5	Top	—	8"	12"
5b1	5	Base	L	43"	12"
5b2	5	Base	—	Long Wall plus 26"	12"
5b3	5	Base	—	Short Wall plus 26"	12"
5w1	5	Wall	⌐	Short Wall plus 68"	12"
5w2	5	Wall	—	Wall Height minus 4"	12"
5w3	5	Wall	—	Long Wall plus 20"	12"
5w4	5	Wall	—	Short Wall plus 20"	12"

BENT BARS



SUDAS | IOWADOT | REVISION 4 04-20-21

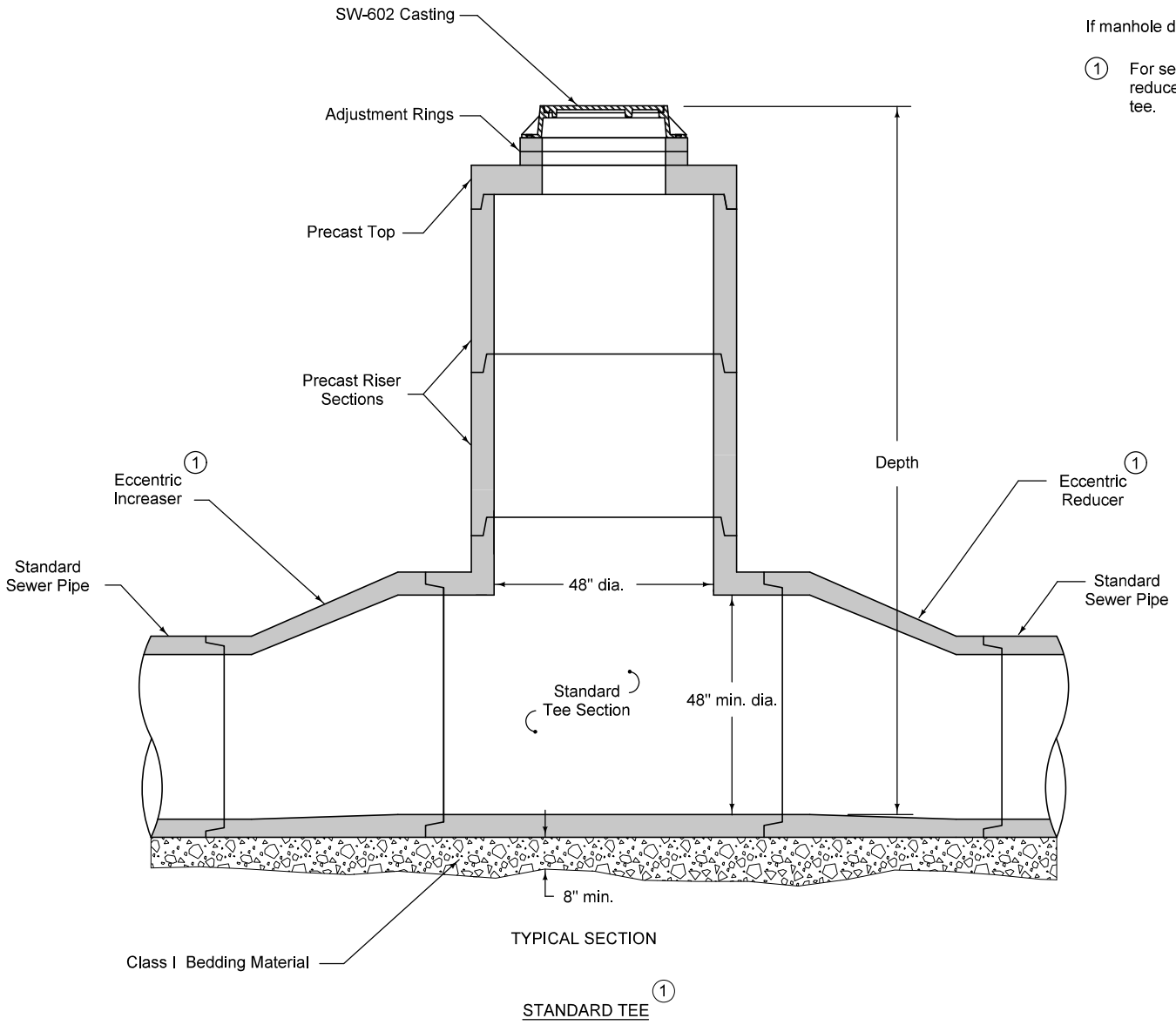
FIGURE 6010.404 | STANDARD ROAD PLAN | SW-404 | SHEET 2 of 2

REVISIONS: Added manhole depth note.

Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

RECTANGULAR BASE/ CIRCULAR TOP STORM SEWER MANHOLE

FIGURE 6010.404 | SHEET 2 OF 2



TYPICAL SECTION

STANDARD TEE 1

If manhole depth exceeds 20 feet, install steps.

1 For sewer pipes less than 48 inch diameter, install eccentric reducers/increasers with a standard tee or utilize a composite tee.

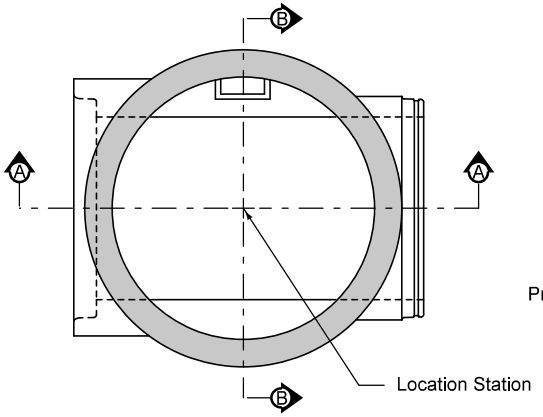
SUDAS	IOWA DOT	REVISION 4 04-20-21
FIGURE 6010.405	STANDARD ROAD PLAN	SW-405
		SHEET 1 of 2

REVISIONS: Added manhole depth note.

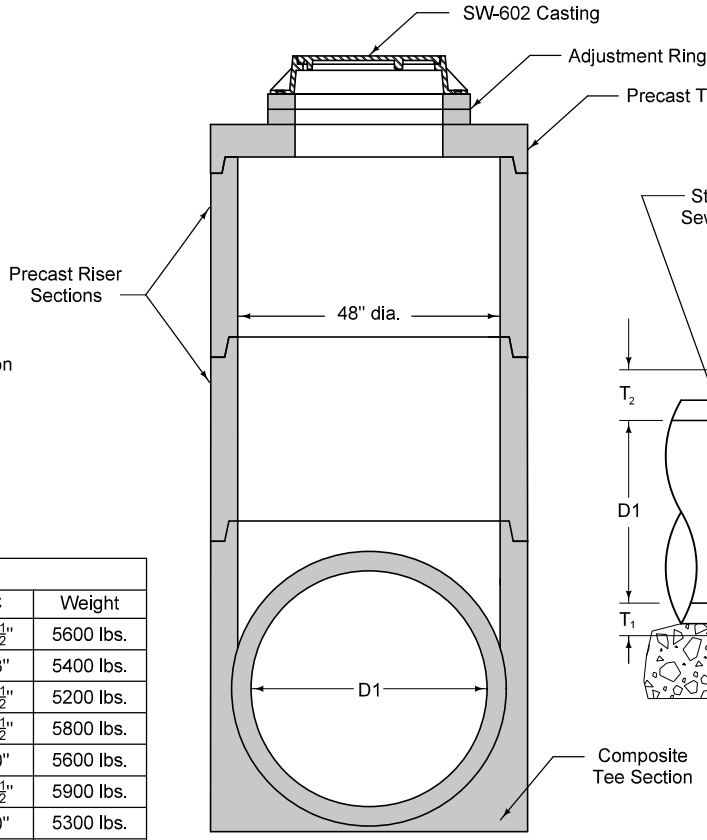
Paul D. Wigard — SUDAS DIRECTOR
Stuart Nicholson — DESIGN METHODS ENGINEER

TEE-SECTION
STORM SEWER MANHOLE

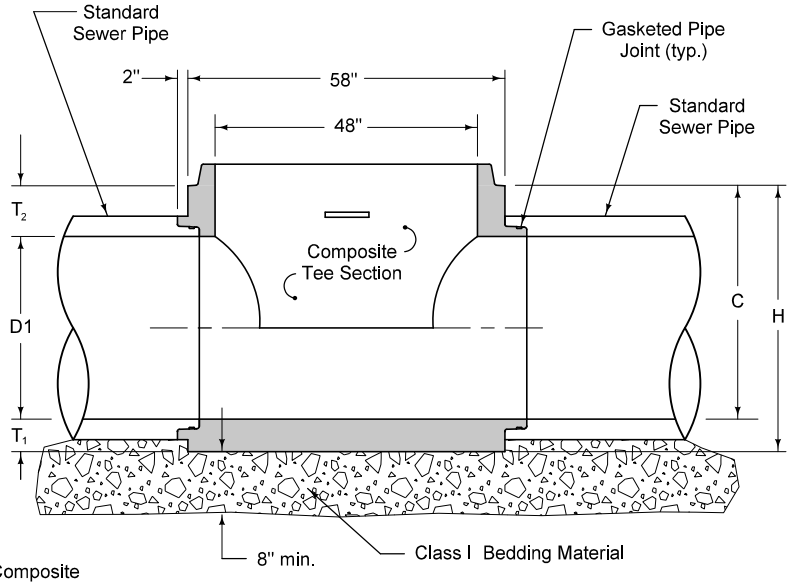
FIGURE 6010.405 SHEET 1 OF 2



PLAN



SECTION B-B



SECTION A-A

COMPOSITE TEE DIMENSIONS						
Size	D1	H	T_1	T_2	C	Weight
48" on 12"	12"	50"	$8\frac{1}{2}$"	$29\frac{1}{2}$"	$41\frac{1}{2}$"	5600 lbs.
48" on 15"	15"	50"	7"	28"	43"	5400 lbs.
48" on 18"	18"	50"	$5\frac{1}{2}$"	$26\frac{1}{2}$"	$44\frac{1}{2}$"	5200 lbs.
48" on 21"	21"	48"	$9\frac{1}{2}$"	$17\frac{1}{2}$"	$38\frac{1}{2}$"	5800 lbs.
48" on 24"	24"	48"	8"	16"	40"	5600 lbs.
48" on 27"	27"	48"	$9\frac{1}{2}$"	$11\frac{1}{2}$"	$38\frac{1}{2}$"	5900 lbs.
48" on 30"	30"	48"	8"	10"	40"	5300 lbs.
48" on 33"	33"	54"	$9\frac{1}{2}$"	$11\frac{1}{2}$"	$44\frac{1}{2}$"	6600 lbs.
48" on 36"	36"	54"	8"	10"	46"	6100 lbs.

COMPOSITE TEE

Alternate to standard tee with eccentric reducer (for pipes 36" and smaller).

FIGURE 6010.405 SHEET 2 OF 2

SUDAS | IOWADOT | REVISION 4 04-20-21

FIGURE 6010.405 | STANDARD ROAD PLAN | SW-405 | SHEET 2 of 2

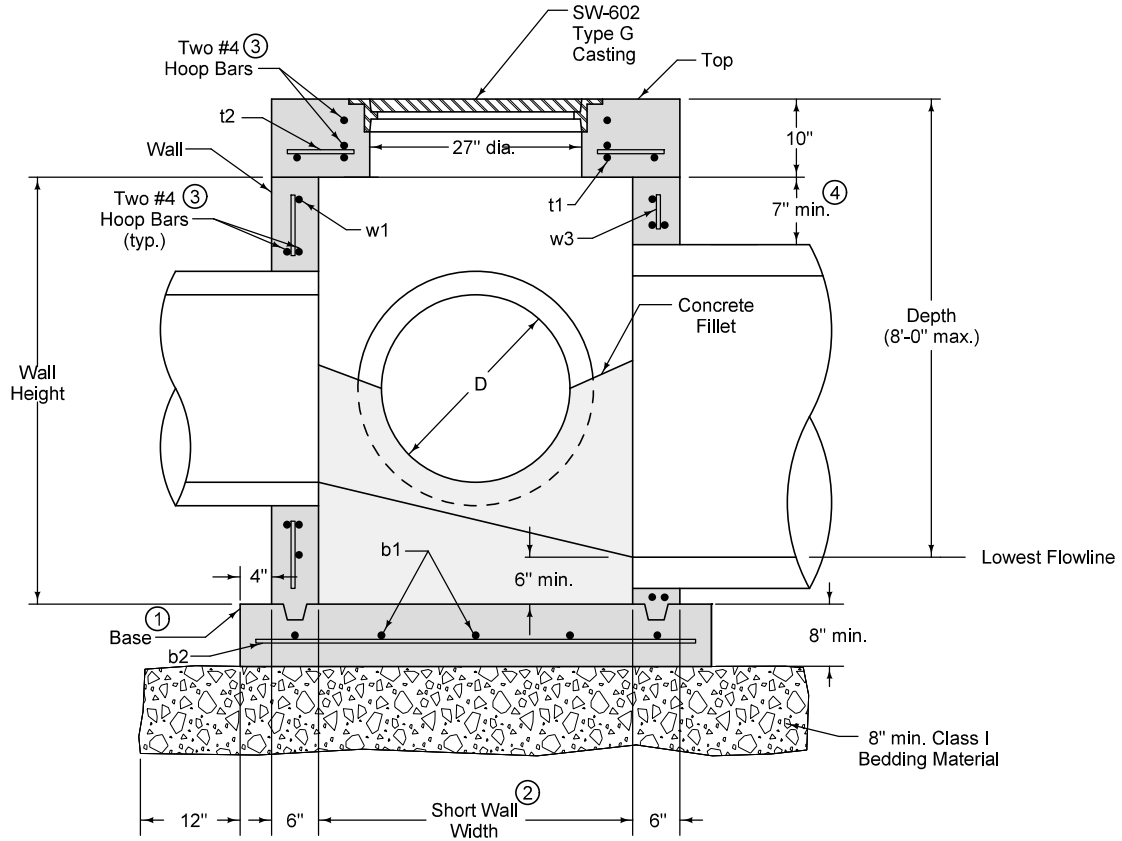
REVISIONS: Added manhole depth note.

Paul D. Wigand, SUDAS DIRECTOR

Stuart Nicholson, DESIGN METHODS ENGINEER

TEE-SECTION
STORM SEWER MANHOLE

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.



TYPICAL SECTION

① Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

② Wall widths vary with pipe diameter and range from 40 inches minimum to 77 inches maximum. Provide 6 inches of wall width (minimum) each side of pipe opening.

③ Provide two #4 hoop bars at top opening and at all pipe openings.

④ 7 inch minimum wall height above all pipes.

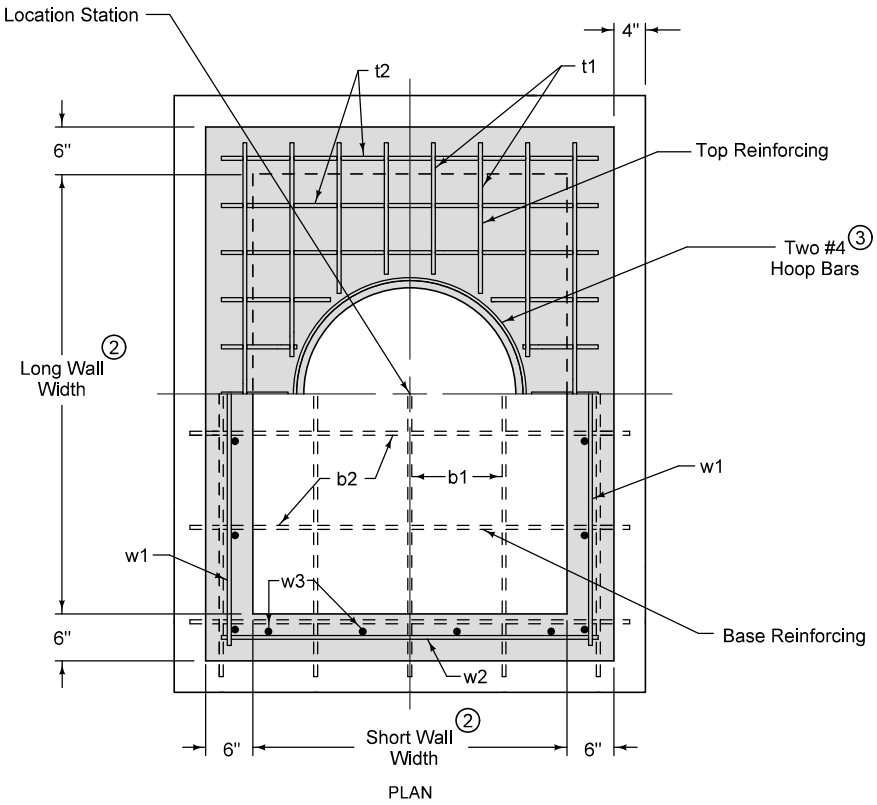
FIGURE 6010.406 SHEET 1 OF 2

SUDAS	IOWA DOT	REVISION 2 04-21-20
FIGURE 6010.406	STANDARD ROAD PLAN	SW-406
		SHEET 1 of 2

REVISIONS: Added Class I Bedding Material.

Paul D. Wigard — SUDAS DIRECTOR
Stuart Nicholson — DESIGN METHODS ENGINEER

SHALLOW RECTANGULAR STORM SEWER MANHOLE



PLAN

② Wall widths vary with pipe diameter and range from 40 inches minimum to 77 inches maximum. Provide 6 inches of wall width (minimum) each side of pipe opening.

③ Provide two #4 hoop bars at top opening and at all pipe openings.

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
t1	See Table	Top	——	Long Wall plus 8"	6"
t2	See Table	Top	——	Short Wall plus 8"	6"
b1	See Table	Base	——	Long Wall plus 14"	12"
b2	See Table	Base	——	Short Wall plus 14"	12"
w1	See Table	Walls	——	Long Wall plus 8"	12"*
w2	See Table	Walls	——	Short Wall plus 8"	12"
w3	See Table	Walls	——	Wall Height minus 4"	12"

*Place a minimum of one w1 bar above each pipe opening

Diameter of Largest Pipe, D	Minimum Bar Size
48" or 54"	6
33" to 42"	5
30" or smaller	4

FIGURE 6010.406 SHEET 2 OF 2

SUDAS | IOWADOT | REVISION 2 04-21-20

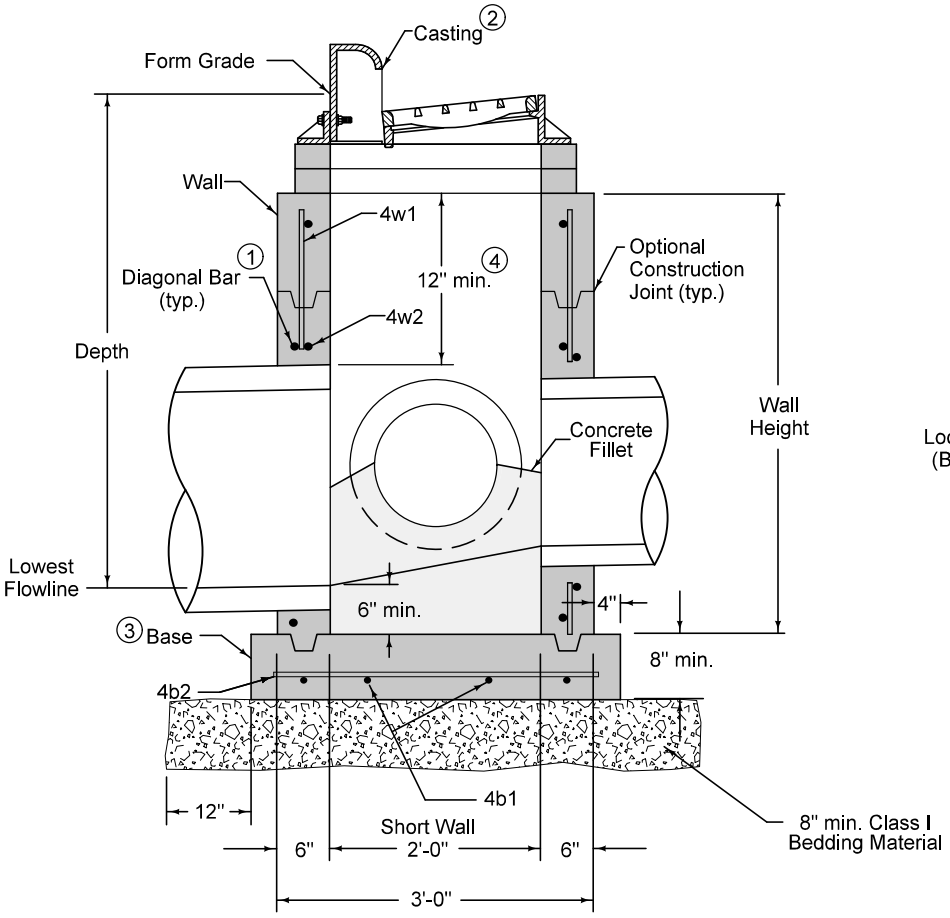
FIGURE 6010.406 | STANDARD ROAD PLAN | SW-406 | SHEET 2 of 2

REVISIONS: Added Class I Bedding Material.

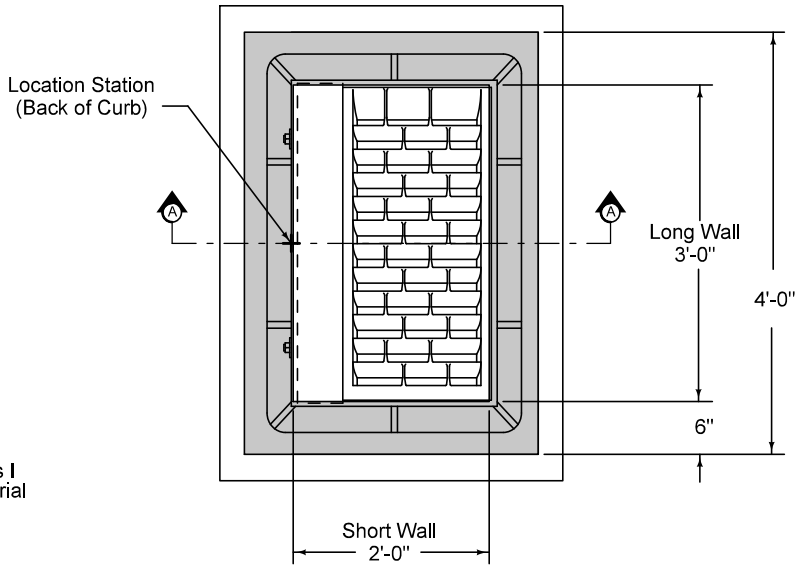
Paul D. Wigand, SUDAS DIRECTOR

Stuart Nicholson, DESIGN METHODS ENGINEER

SHALLOW RECTANGULAR STORM SEWER MANHOLE



SECTION A-A



PLAN

Refer to SW-514 for boxout details.

1. Install four #4 diagonal bars at all pipe openings.
2. SW-603 Type R unless Type Q is specified in the contract documents.
3. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
4. 12 inch minimum wall height above all pipes.

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Length	Count	Spacing
4w1	4	Walls	———	Wall Height minus 4"	14	12"
4w2	4	Long Walls	———	3'-8"	Varies	12"
4w3	4	Short Walls	———	2'-8"	Varies	12"
4b1	4	Base	———	4'-2"	4	10"
4b2	4	Base	———	3'-2"	5	10"

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	15"	18"
Long Wall	24"	30"

SUDAS | IOWA DOT | REVISION 3 04-21-20

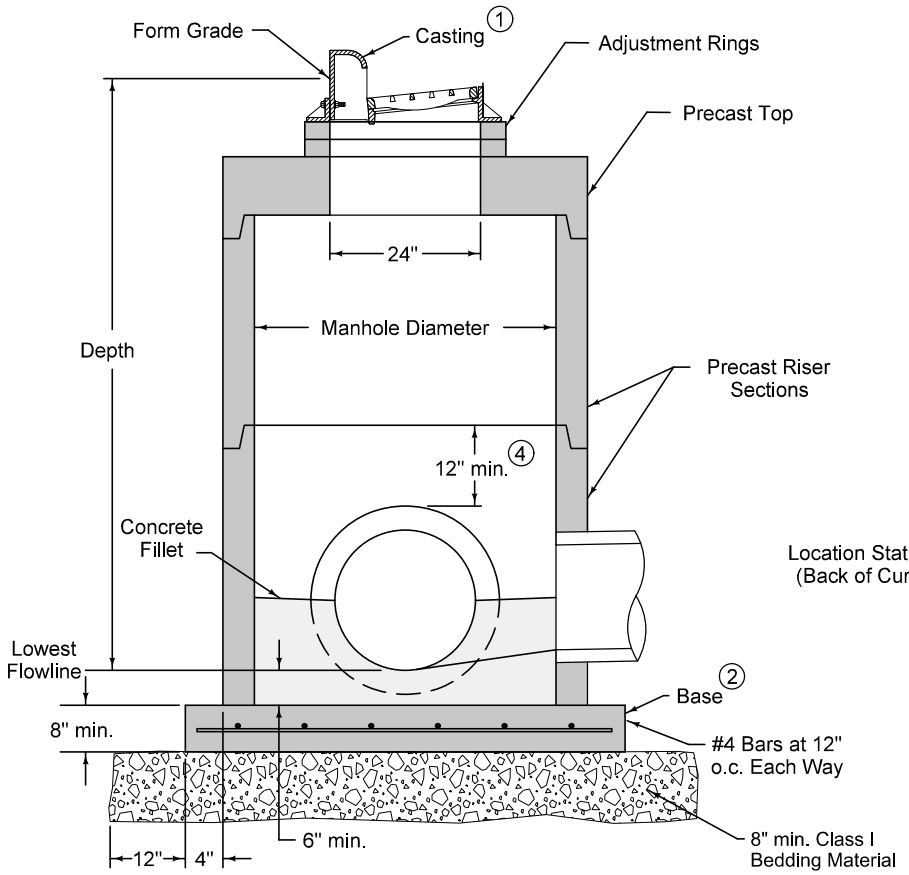
FIGURE 6010.501 | STANDARD ROAD PLAN | SW-501 | SHEET 1 of 1

REVISIONS: Added Class I Bedding Material.

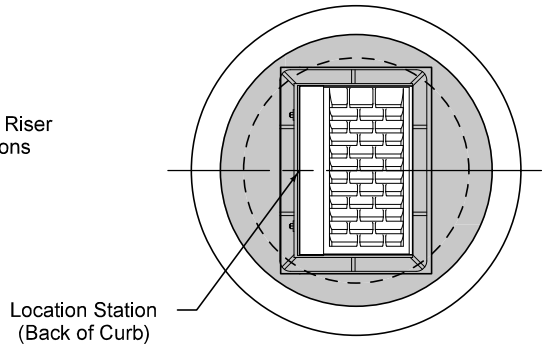
Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE

FIGURE 6010.501 | SHEET 1 OF 1



TYPICAL SECTION



PLAN

Refer to SW-514 for boxout details.

① SW-603 Type R unless Type Q is specified in the contract documents.

② Cast-in-place base shown. Base may be square. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

③ For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.

④ 12 inch minimum riser height above all pipes.

Manhole Diameter (inches)	Maximum Pipe Diameter ③ (inches) for 2 Pipes	
	at 180° Separation	at 90° Separation
48	24	18
60	36	24
72	42	30
84	48	36
96	60	42

SUDAS | IOWA DOT

REVISION: 1 | 04-21-20

FIGURE 6010.502 | STANDARD ROAD PLAN | SW-502 | SHEET 1 of 1

REVISIONS: Added Class I Bedding Material.

Paul D. Wigand, SUDAS DIRECTOR

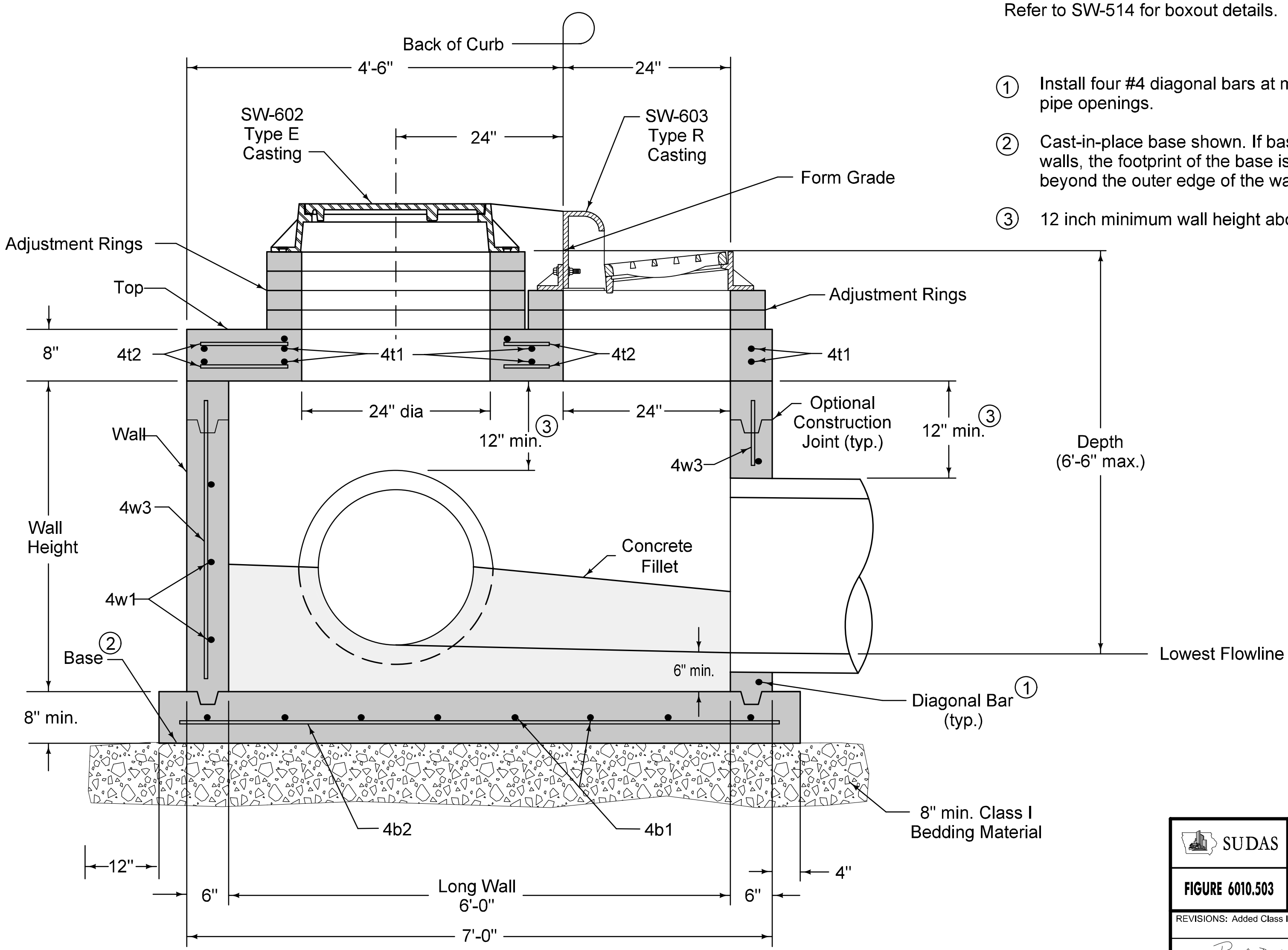
Stuart Nicholson, DESIGN METHODS ENGINEER

CIRCULAR SINGLE GRATE INTAKE

FIGURE 6010.502 SHEET 1 OF 1

Refer to SW-514 for boxout details.

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.



TYPICAL SECTION

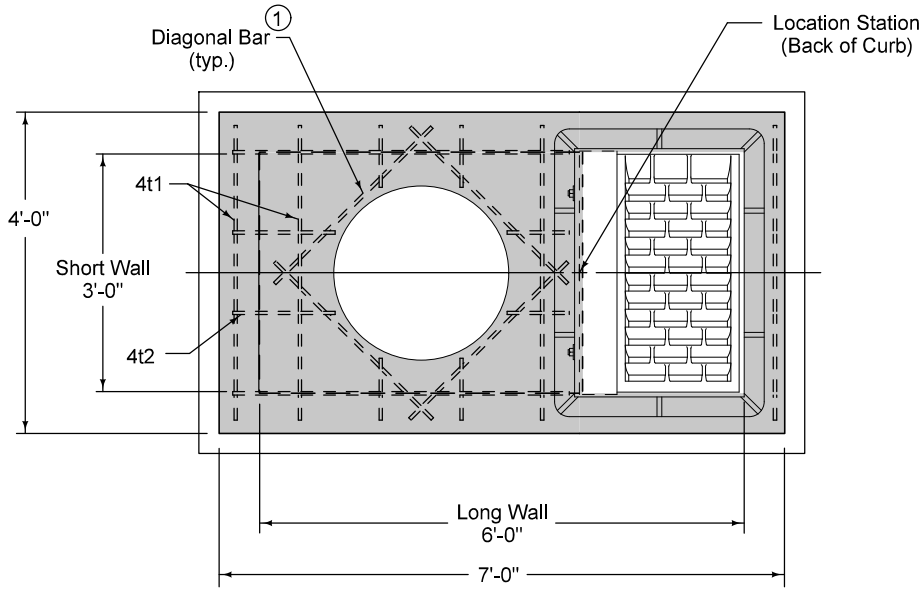
SUDAS	IOWADOT	REVISION: 3 04-21-20
FIGURE 6010.503	STANDARD ROAD PLAN	SW-503 SHEET 1 of 2

REVISIONS: Added Class I Bedding Material.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE WITH MANHOLE

① Install four #4 diagonal bars at manhole opening and at all pipe openings.



PLAN

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4t1	4	Top	——	12	3'-8"	12"
4t2	4	Top	——	8	4'-2"	12"
4b1	4	Base	——	7	4'-2"	13"
4b2	4	Base	——	5	7'-2"	10"
4w1	4	Short Walls	——	Varies	3'-8"	12"
4w2	4	Long Walls	——	Varies	6'-8"	12"
4w3	4	Walls	——	18	Wall Height minus 4"	13"

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	24"	30"
Long Wall	30"	36"

SUDAS | IOWADOT | REVISION 3 04-21-20

FIGURE 6010.503 | STANDARD ROAD PLAN | SW-503 | SHEET 2 of 2

REVISIONS: Added Class I Bedding Material.

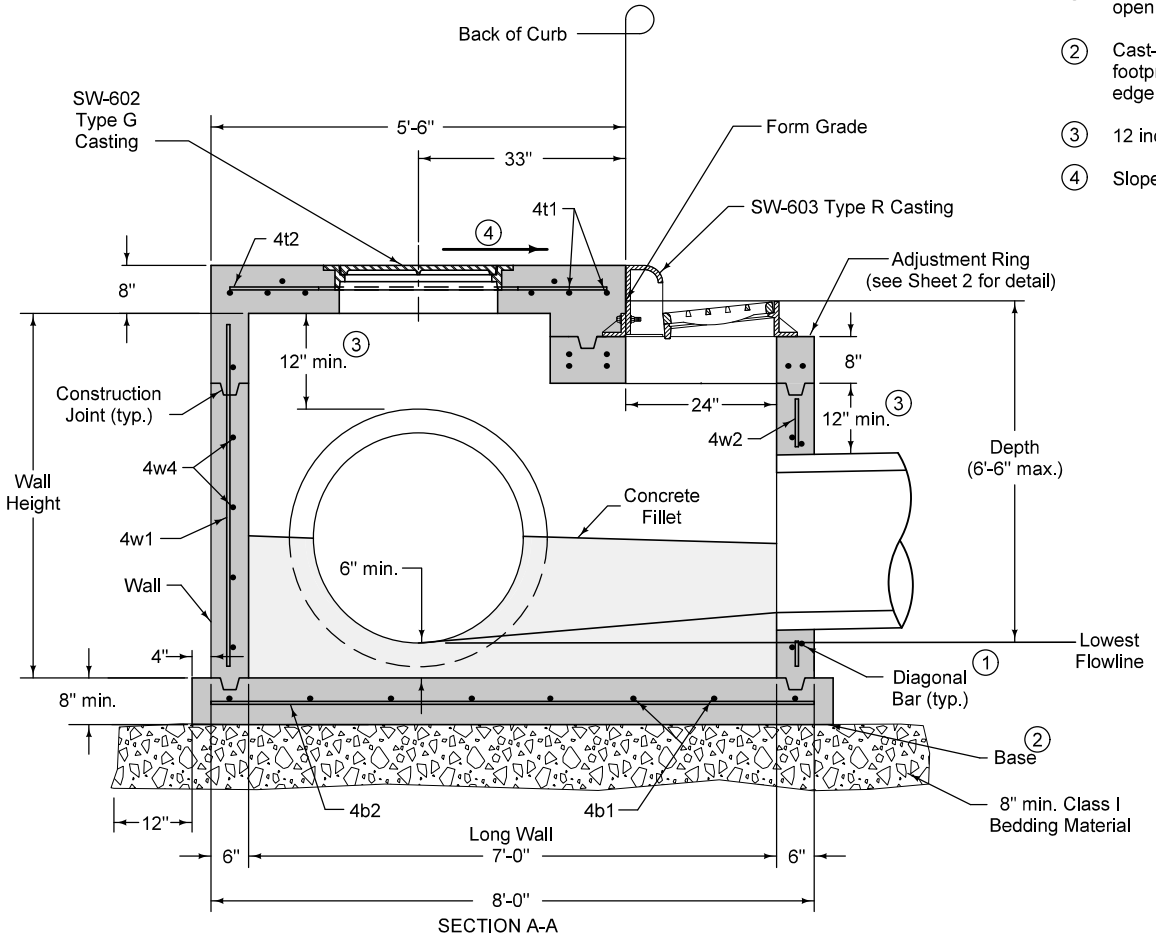
Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE WITH MANHOLE

FIGURE 6010.503 SHEET 2 OF 2

Refer to SW-514 for boxout details.

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.
4. Slope of 1.5% or as specified in the contract documents.



SECTION A-A

FIGURE 6010.504 | SHEET 1 OF 2

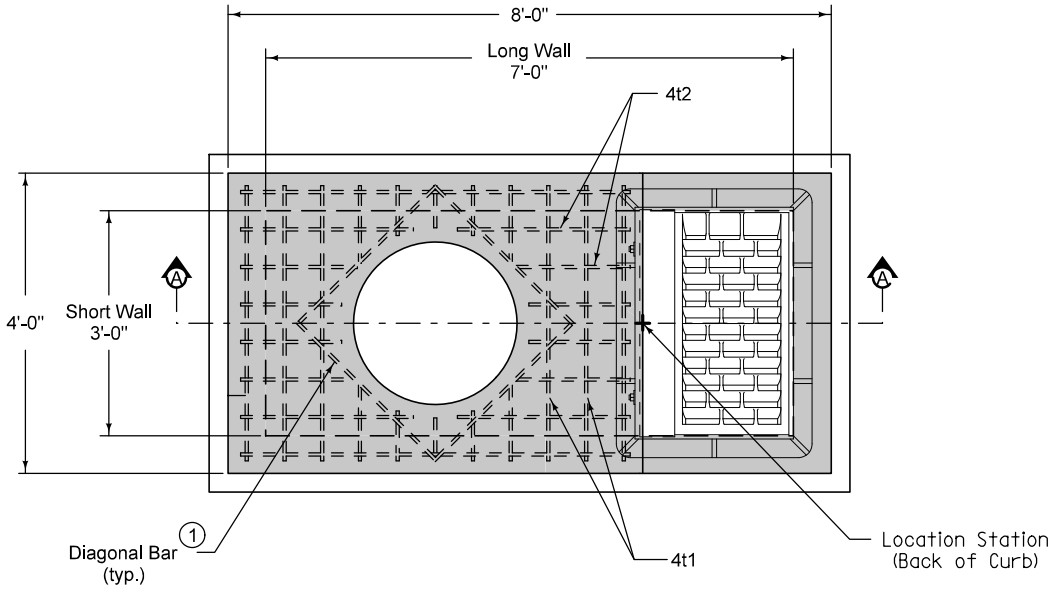
SUDAS	IOWA DOT	REVISION 4 04-21-20
FIGURE 6010.504	STANDARD ROAD PLAN	SW-504 SHEET 1 of 2

REVISIONS: Added Class I Bedding Material.

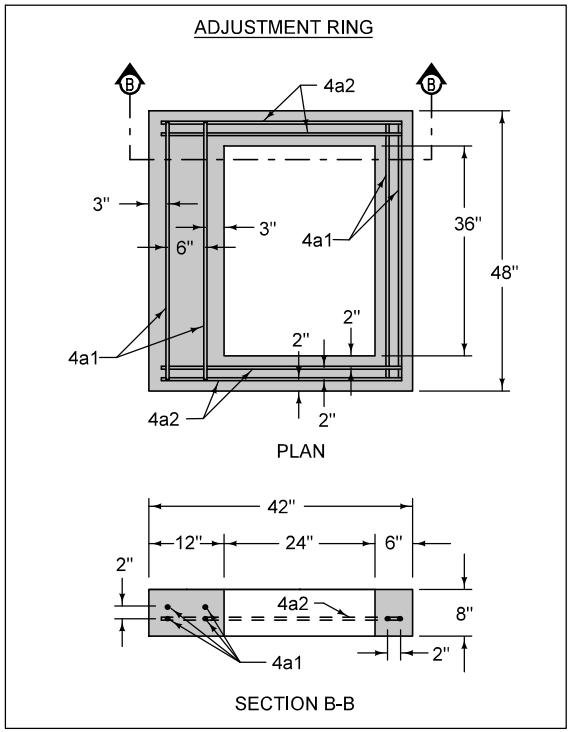
Paul D. Wigard, SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE WITH FLUSH-TOP MANHOLE

① Install four #4 diagonal bars at manhole opening and at all pipe openings.



PLAN



REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4t1	4	Top	——	1 1	3'-8"	6"
4t2	4	Top	——	8	5'-2"	6"
4b1	4	Base	——	8	4'-2"	13"
4b2	4	Base	——	5	8'-2"	10"
4a1	4	Adj. Ring	——	6	3'-8"	See Adj. Ring Plan
4a2	4	Adj. Ring	——	4	3'-2"	See Adj. Ring Plan
4w1	4	Walls	——	13	Wall Height minus 4"	12"
4w2	4	Walls	——	1 1	Wall Height minus 16"	12"
4w3	4	Long Walls	——	Varies	7'-8"	12"
4w4	4	Short Walls	——	Varies	3'-8"	12"

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	18"	24"
Long Wall	30"	36"

SUDAS | IOWADOT | REVISION 4 04-21-20

FIGURE 6010.504 | STANDARD ROAD PLAN | SW-504 | SHEET 2 of 2

REVISIONS: Added Class I Bedding Material.

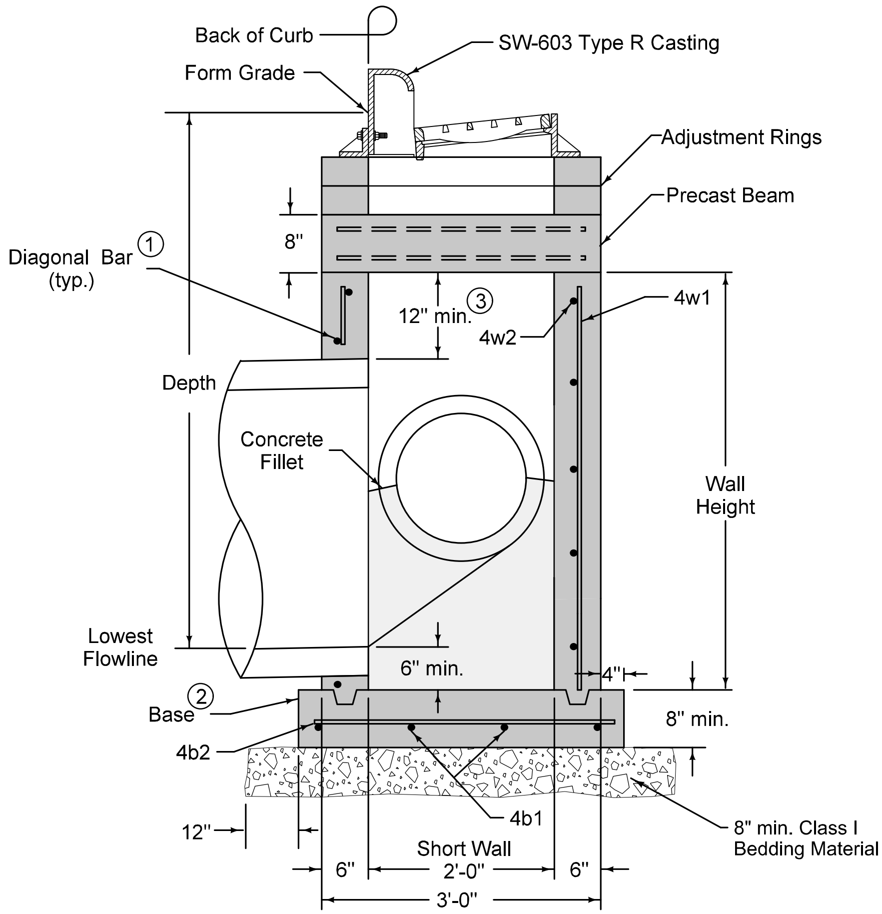
Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE WITH FLUSH-TOP MANHOLE

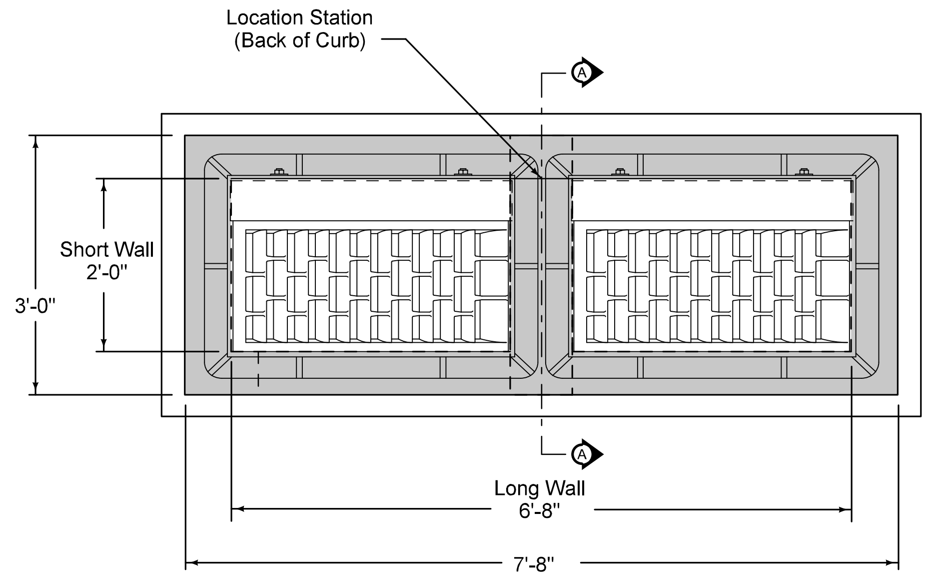
FIGURE 6010.504 | SHEET 2 OF 2

Refer to SW-514 for boxout details.

1. Install four #4 diagonal bars at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.



SECTION A-A



PLAN

SUDAS	IOWADOT	REVISION 3 04-21-20
FIGURE 6010.505	STANDARD ROAD PLAN	SW-505 SHEET 1 of 2

REVISIONS: Added Class I Bedding Material.

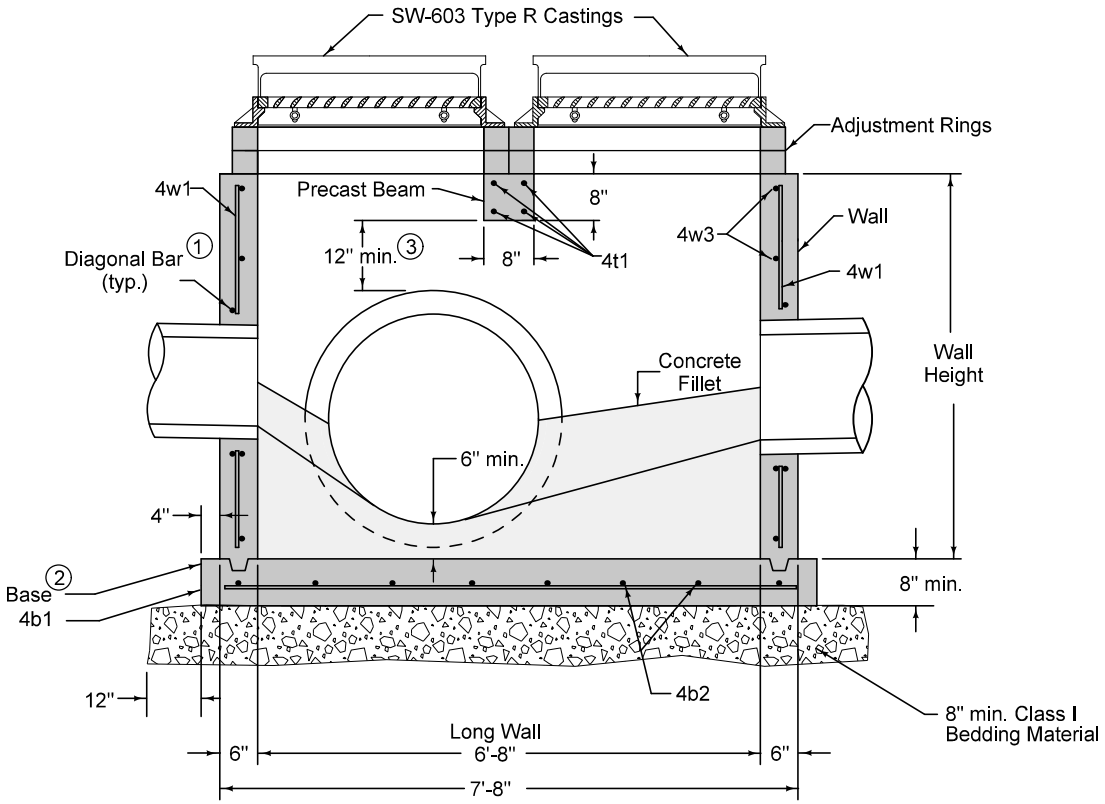
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

DOUBLE GRATE INTAKE

① Install four #4 diagonal bars at all pipe openings.

② Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

③ 12 inch minimum wall height above all pipes.



TYPICAL SECTION

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4t1	4	Beam	——	4	2'-8"	4"
4b1	4	Base	——	4	7'-10"	10"
4b2	4	Base	——	8	3'-2"	12"
4w1	4	Walls	——	20	Wall Height minus 4"	12"
4w2	4	Long Walls	——	Varies	7'-4"	12"
4w3	4	Short Walls	——	Varies	2'-8"	12"

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	15"	18"
Long Wall	60"	66"

SUDAS | IOWADOT | REVISION 3 04-21-20

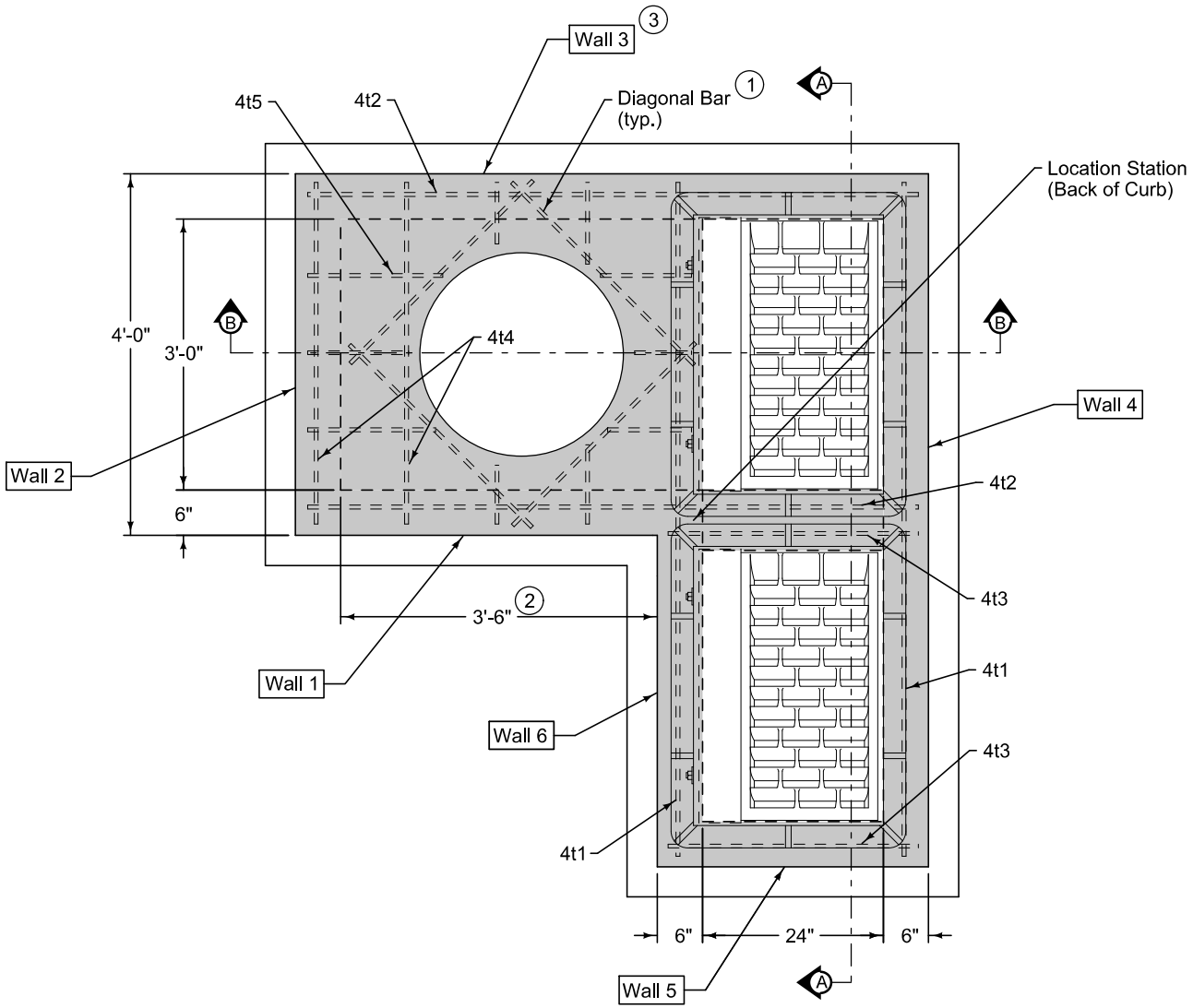
FIGURE 6010.505 | STANDARD ROAD PLAN | SW-505 | SHEET 2 of 2

REVISIONS: Added Class I Bedding Material.

Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

DOUBLE GRATE INTAKE

FIGURE 6010.505 SHEET 2 OF 2



PLAN

Maximum pipe diameters are set based on maximum structure depth of 6 feet-6 inches and the objective of placement of the centerline of the pipe on the centerline of the manhole opening for maintenance purposes.

Refer to SW-514 for boxout details.

(1) Install four #4 diagonal bars at manhole opening and at all pipe openings.

(2) If Wall 1 is widened to 4 feet, the maximum pipe diameter can be increased to 36 inches.

(3) If Wall 1 is widened to 4 feet, the maximum pipe diameter in Wall 3 can be increased to 42 inches.

MAXIMUM PIPE DIAMETERS	
Wall	Max. Dia.
1	30" (2)
2	24"
3	36" (3)
4	42"

FIGURE 6010.506 | SHEET 1 OF 2

SUDAS | IOWA DOT | REVISION 4 04-21-20

FIGURE 6010.506 | STANDARD ROAD PLAN | SW-506

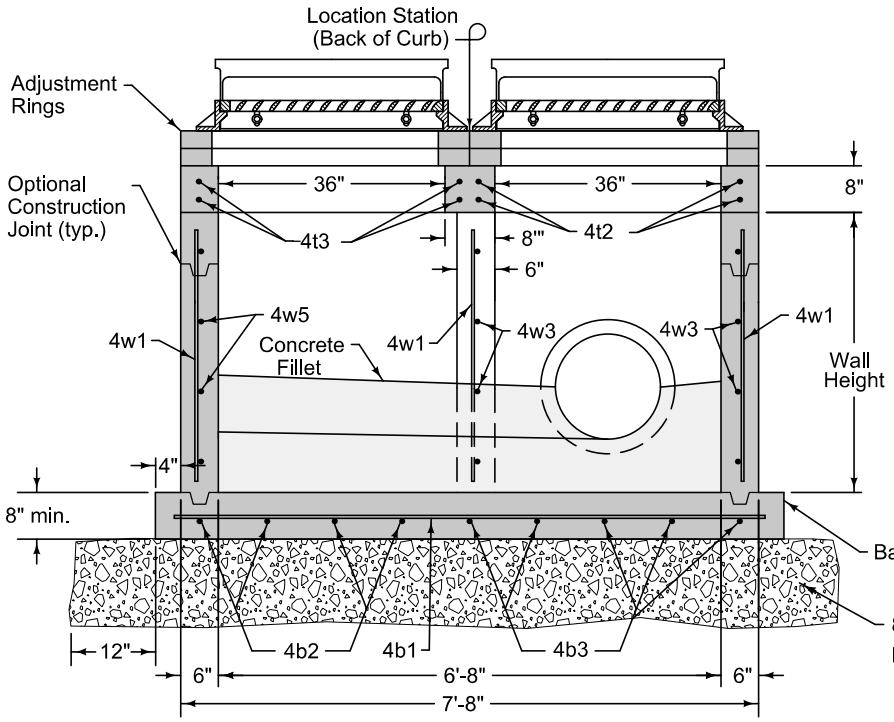
SHEET 1 of 2

REVISIONS: Added Class I Bedding Material.

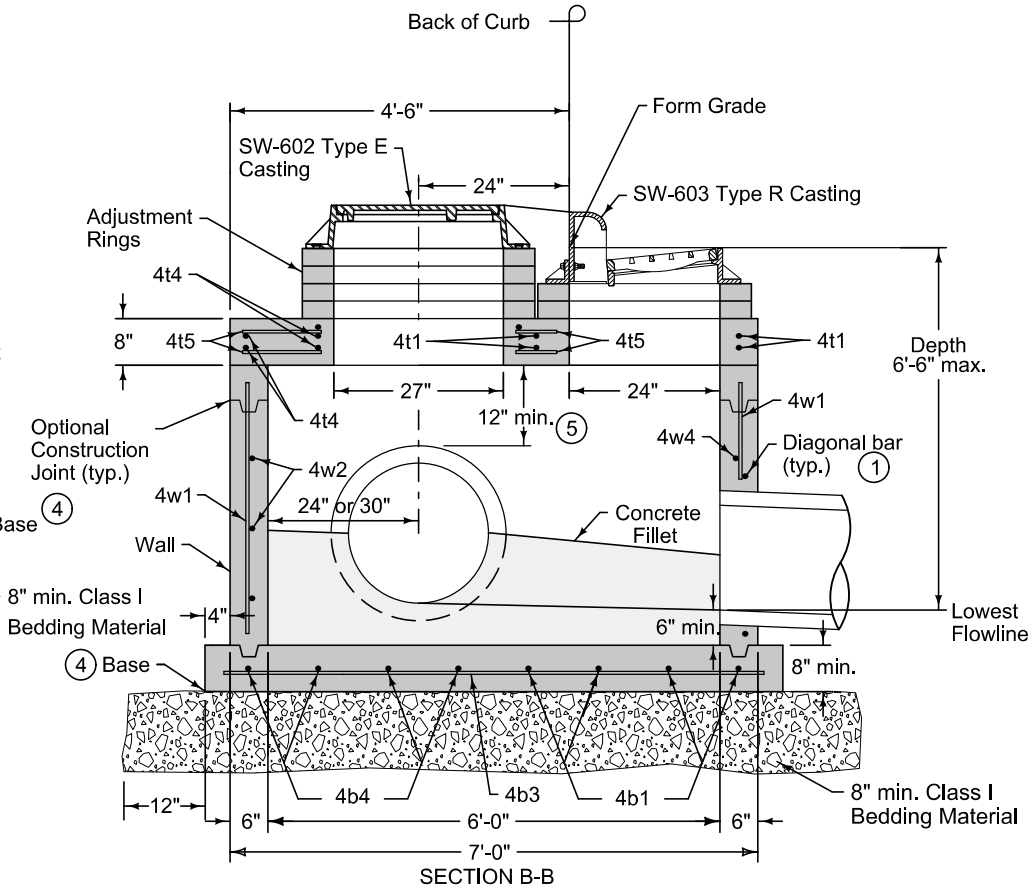
Paul D. Wigard, SUDAS DIRECTOR

DESIGN METHODS ENGINEER

DOUBLE GRATE INTAKE WITH MANHOLE



SECTION A-A



SECTION B-B

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4t1	4	Top	——	4	7'-4"	See Detail
4t2	4	Top	——	4	6'-8"	See Detail
4t3	4	Top	——	4	2'-8"	See Detail
4t4	4	Top	——	8	3'-8"	12"
4t5	4	Top	——	6	4'-2"	12"
4b1	4	Base	——	4	7'-10"	12"
4b2	4	Base	——	4	3'-2"	12"
4b3	4	Base	——	5	7'-2"	12"
4b4	4	Base	——	4	4'-2"	12"
4w1	4	Walls	——	29	Wall Height minus 4"	12"
4w2	4	Wall 2	——	Varies	3'-8"	12"
4w3	4	Walls 1 and 3	——	Varies	6'-8"	12"
4w4	4	Wall 4	——	Varies	7'-4"	12"
4w5	4	Wall 5	——	Varies	2'-8"	12"
4w6	4	Wall 6	——	Varies	3'-10"	12"

(1) Install four #4 diagonal bars at manhole opening and at all pipe openings.

(4) Cast-in-place base shown. If base is precast integral with walls, the footprint of base is not required to extend beyond the outer edge of the walls.

(5) 12 inch minimum wall height above all pipes.

SUDAS | IOWA DOT

REVISION: 4 | 04-21-20

FIGURE 6010.506 | STANDARD ROAD PLAN | SW-506

SHEET 2 of 2

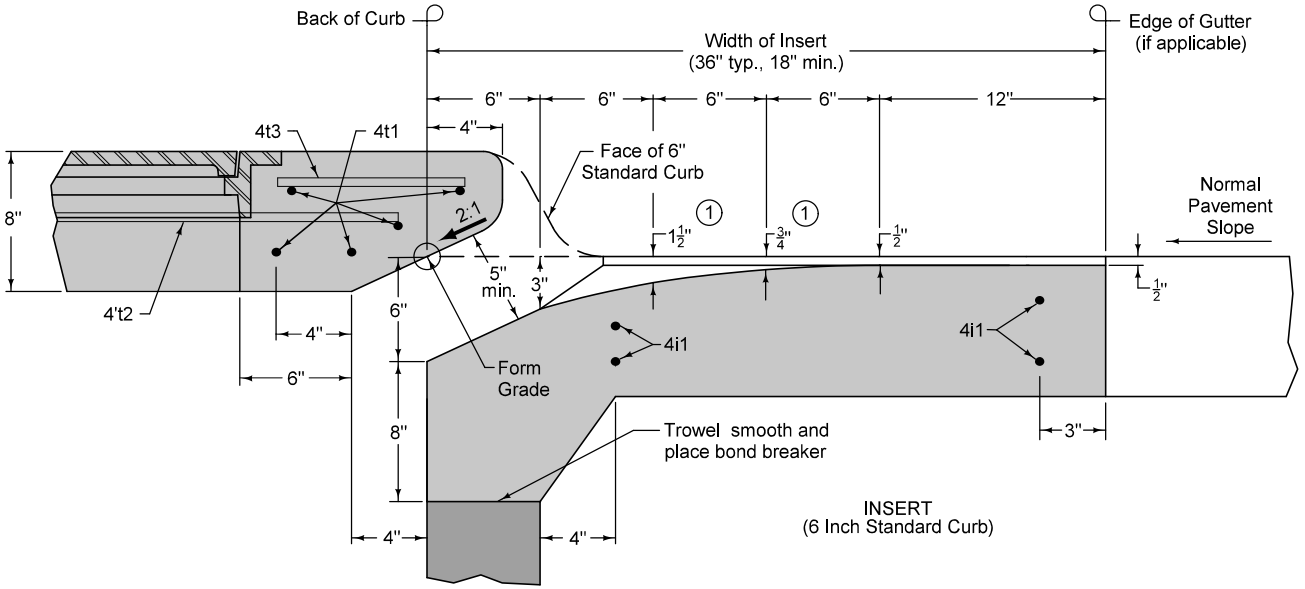
REVISIONS: Added Class I Bedding Material.

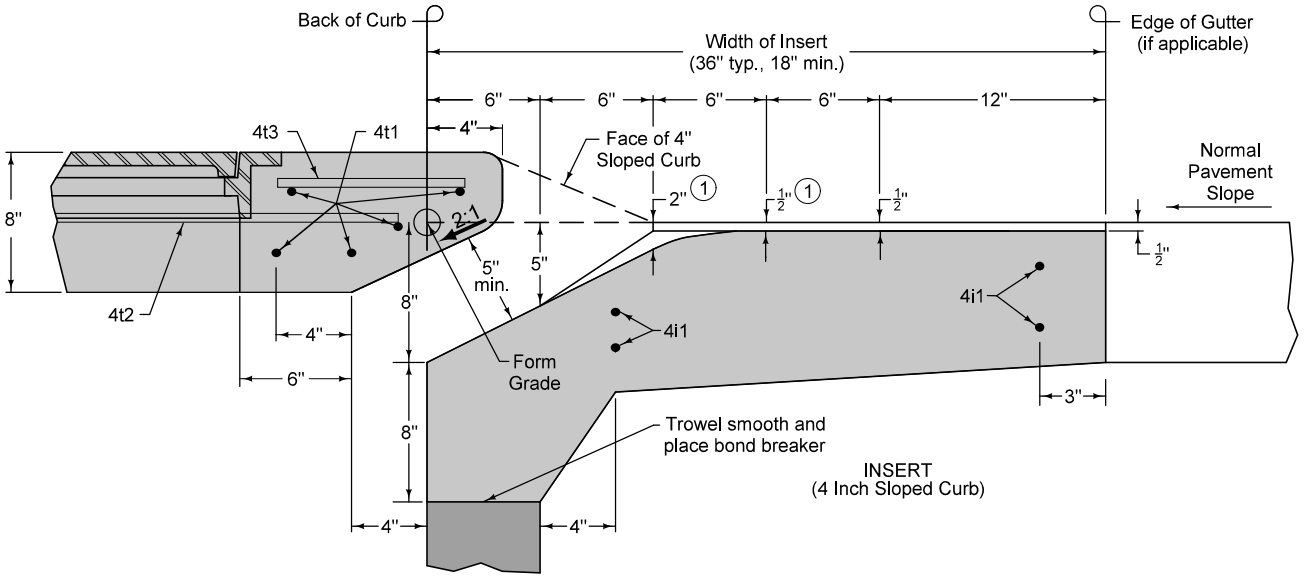
Paul D. Wigand
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

DOUBLE GRATE INTAKE WITH MANHOLE

FIGURE 6010.506 | SHEET 2 OF 2





① Insert shaping may be modified for insert widths less than 36 inches. For an 18 inch insert, reduce dimensions indicated by ½ inch.

FIGURE 6010.507 SHEET 1 OF 2

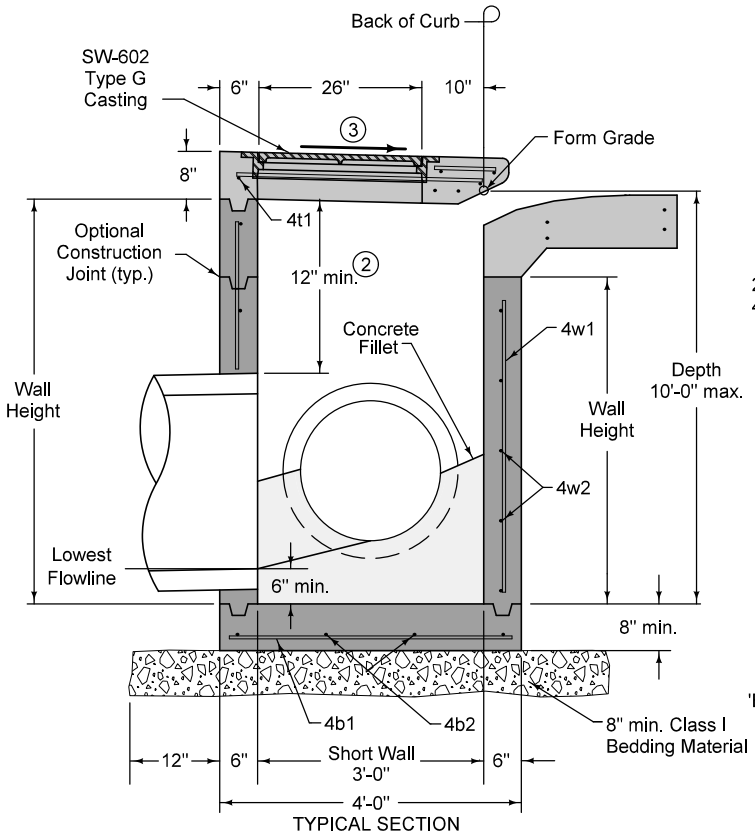
SUDAS	IOWA DOT	REVISION 4 04-21-20
FIGURE 6010.507	STANDARD ROAD PLAN	SW-507
		SHEET 1 of 2

REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

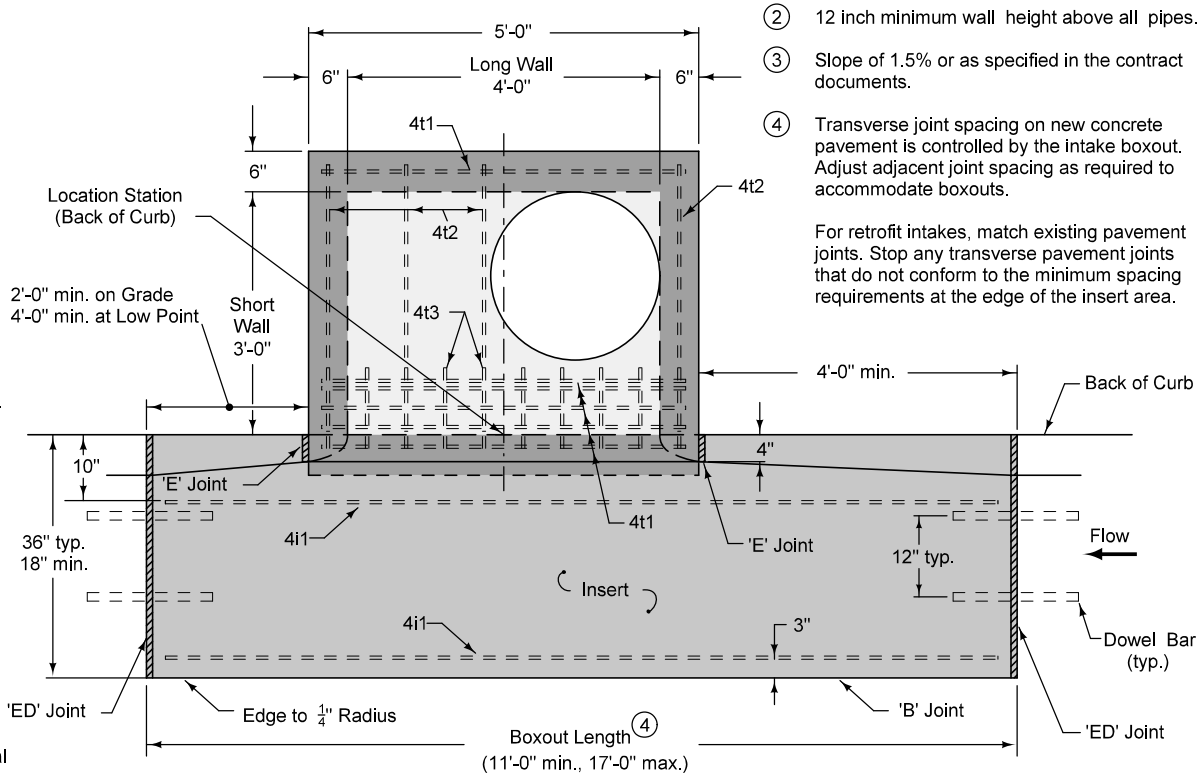
Paul D. Wigand
SUDAS DIRECTOR

DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE, SMALL BOX



TYPICAL SECTION



PLAN

2 12 inch minimum wall height above all pipes.

3 Slope of 1.5% or as specified in the contract documents.

4 Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.

For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	24"	30"
Long Wall	30"	36"

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4t1	4	Top	——	6	4'-8"	See Insert
4t2	4	Top	——	4	3'-6"	12"
4t3	4	Top	——	10	10"	6"
4b1	4	Base	——	6	3'-6"	1 1"
4b2	4	Base	——	5	4'-6"	10"
4i1	4	Insert	——	4	Boxout Length minus 8"	See Plan
4w1	4	Walls	——	14	Wall Height minus 4"	14"
4w2	4	Long Walls	——	Varies	4'-8"	12"
4w3	4	Short Walls	——	Varies	3'-8"	12"

SUDAS | IOWADOT | REVISION 4 04-21-20

FIGURE 6010.507 | STANDARD ROAD PLAN | SW-507 | SHEET 2 of 2

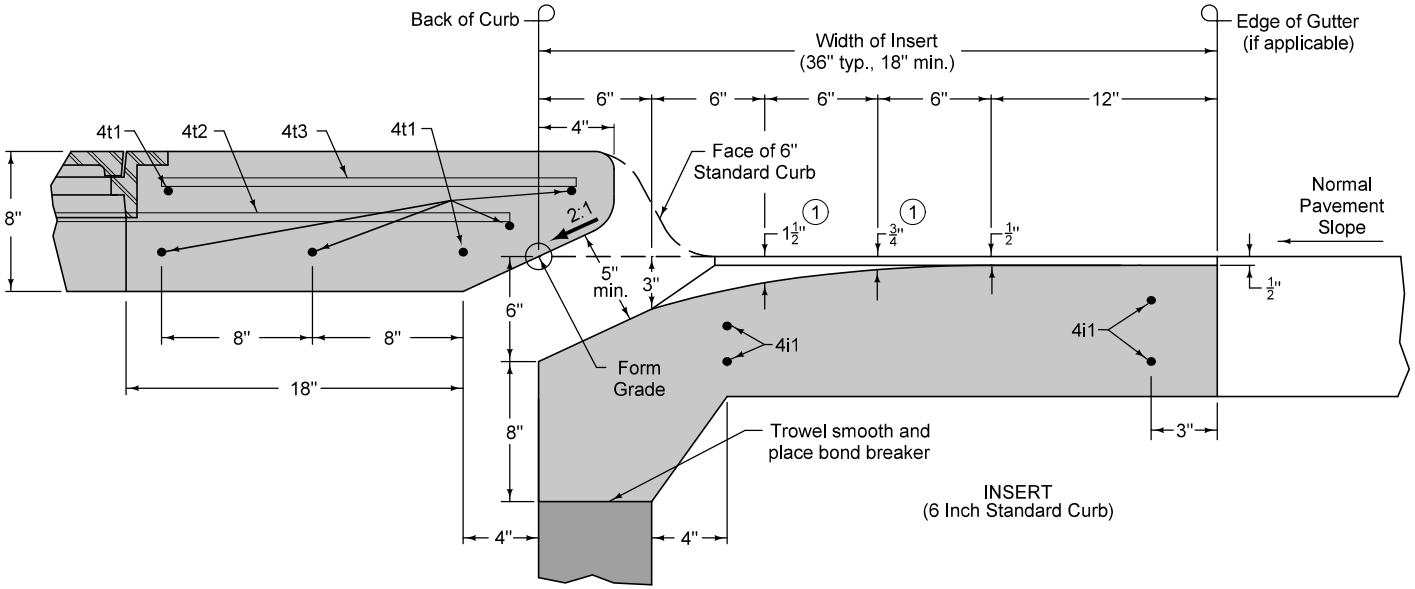
REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

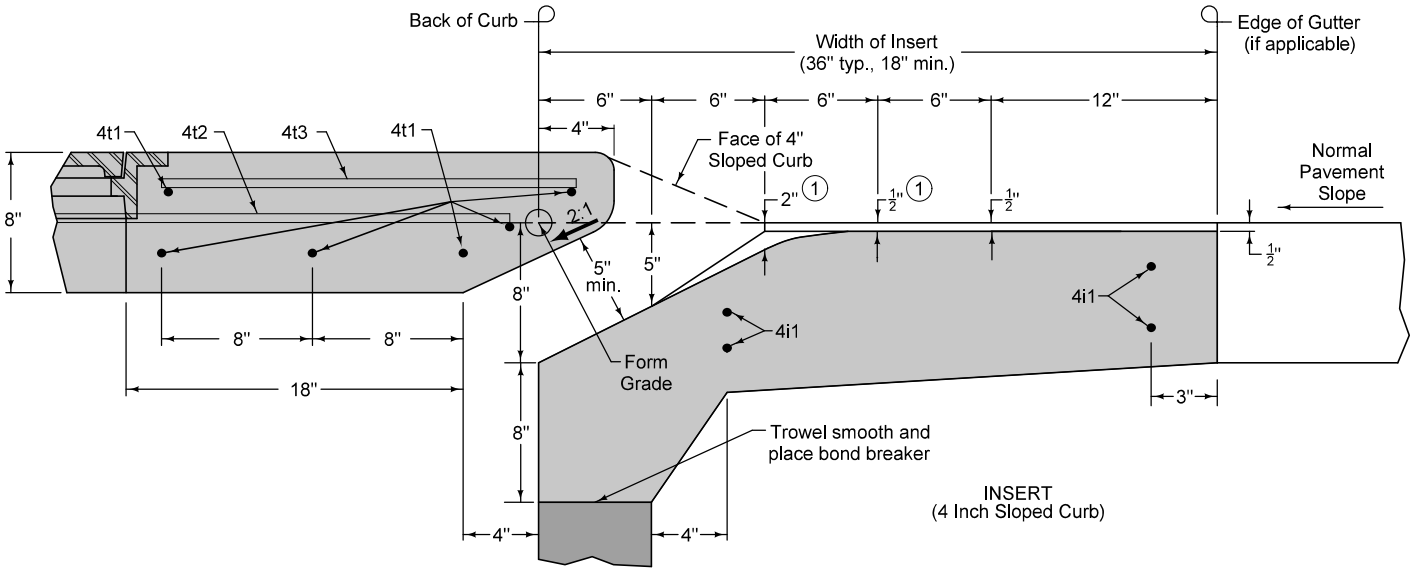
Paul D. Wigand, SUDAS DIRECTOR

DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE, SMALL BOX

FIGURE 6010.507 SHEET 2 OF 2





① Insert shaping may be modified for insert widths less than 36 inches. For an 18 inch insert, reduce dimensions indicated by ½ inch.

FIGURE 6010.508 SHEET 1 OF 2

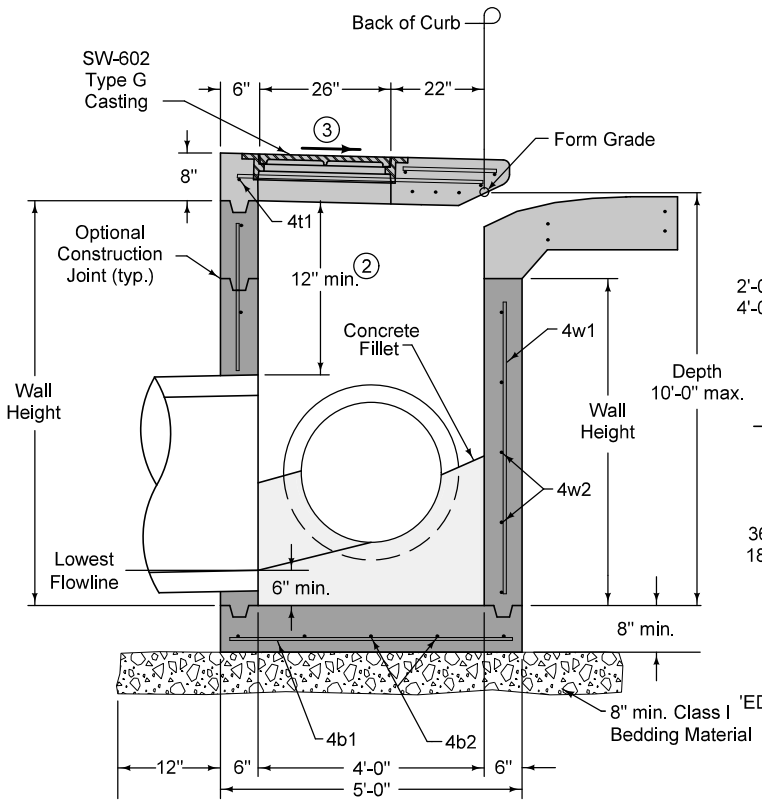
SUDAS	IOWA DOT	REVISION 4	04-21-20
FIGURE 6010.508	STANDARD ROAD PLAN	SW-508	SHEET 1 of 2

REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

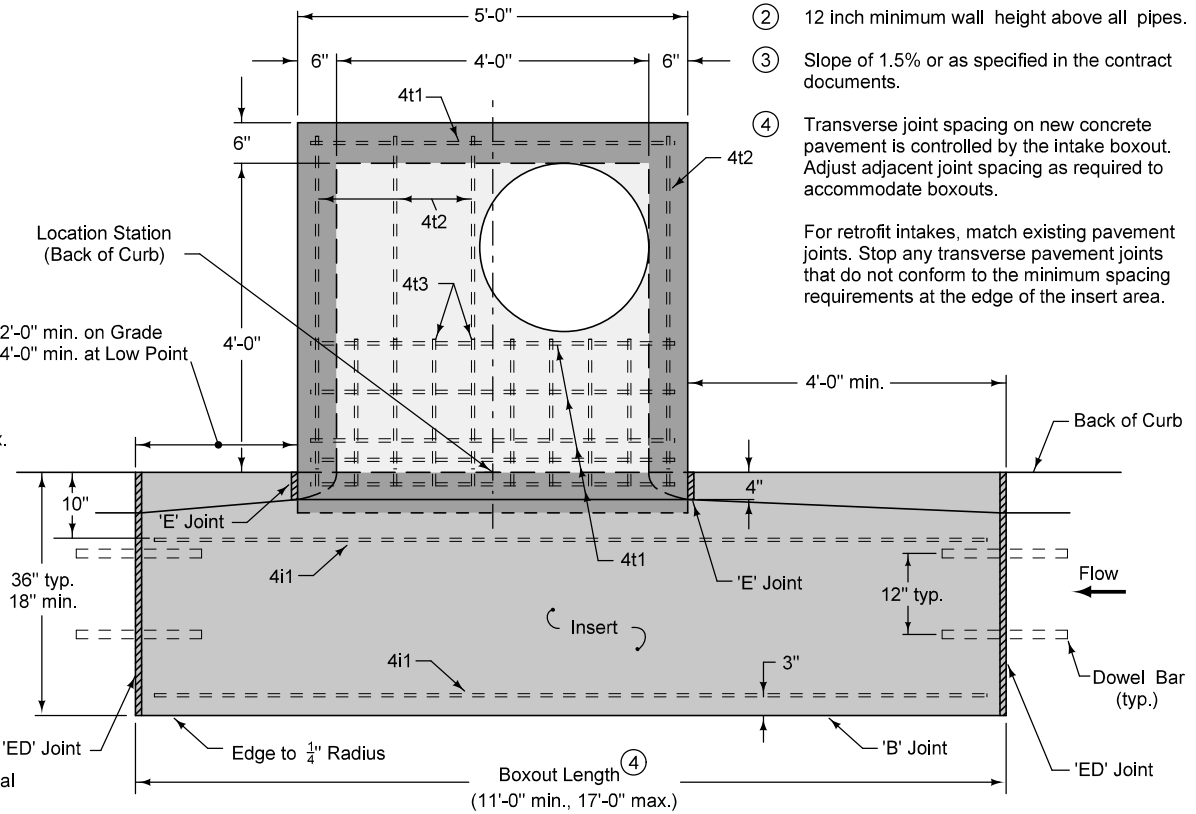
Paul D. Wigand
SUDAS DIRECTOR

DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE, LARGE BOX



TYPICAL SECTION



PLAN

2 12 inch minimum wall height above all pipes.

3 Slope of 1.5% or as specified in the contract documents.

4 Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.

For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.

MAXIMUM PIPE DIAMETERS	
Precast Structure	Cast-in-place Structure
30"	36"

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4t1	4	Top	———	7	4'-8"	See Insert
4t2	4	Top	———	4	4'-6"	12"
4t3	4	Top	———	10	1'-10"	6"
4b1	4	Base	———	6	4'-6"	11"
4b2	4	Base	———	6	4'-6"	11"
4i1	4	Insert	———	4	Boxout Length minus 8"	See Plan
4w1	4	Walls	———	16	Wall Height minus 4"	14"
4w2	4	Walls	———	Varies	4'-8"	12"
4w3	4	Walls	———	Varies	4'-8"	12"

SUDAS | IOWADOT | REVISION 4 04-21-20

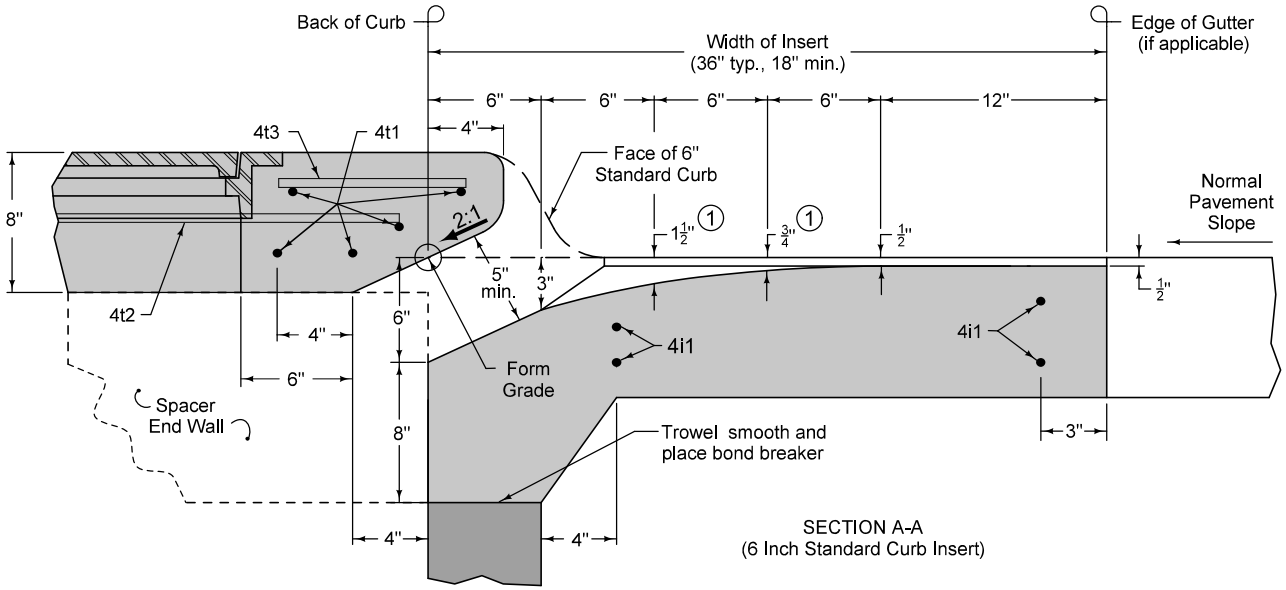
FIGURE 6010.508 | STANDARD ROAD PLAN | SW-508 | SHEET 2 of 2

REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

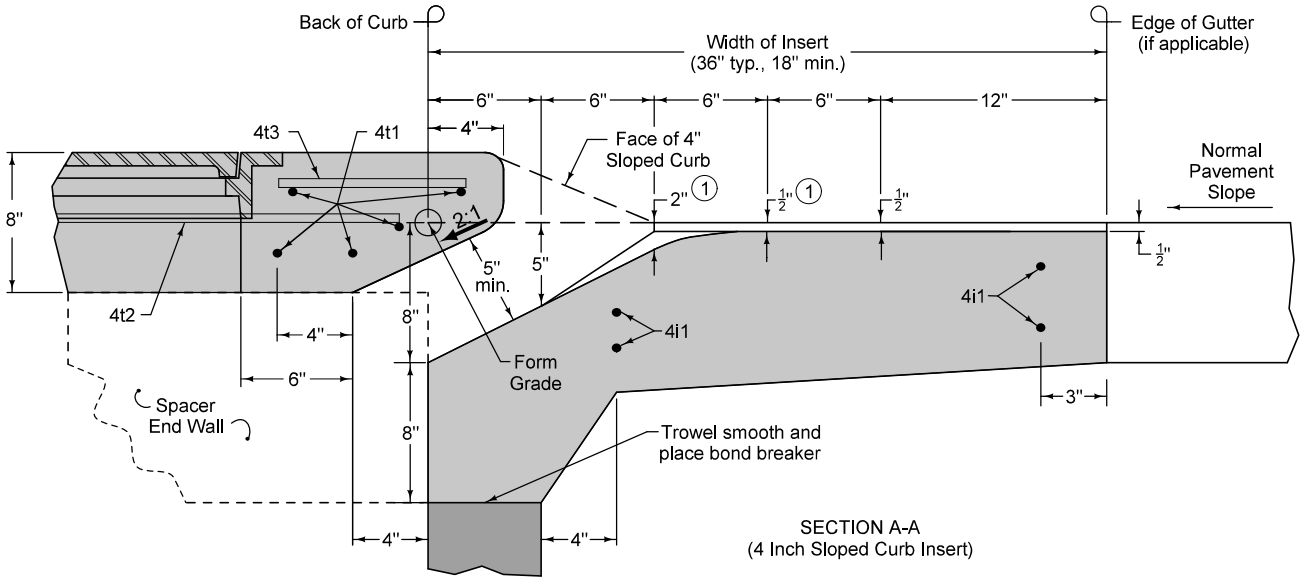
Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE, LARGE BOX

FIGURE 6010.508 | SHEET 2 OF 2



SECTION A-A
(6 Inch Standard Curb Insert)



SECTION A-A
(4 Inch Sloped Curb Insert)

(1) Insert shaping may be modified for insert widths less than 36 inches. For an 18 inch insert, reduce dimensions indicated by $\frac{1}{4}$ inch.

SUDAS	IOWA DOT	REVISION 6	04-21-20
FIGURE 6010.509	STANDARD ROAD PLAN	SW-509	SHEET 1 of 3

REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

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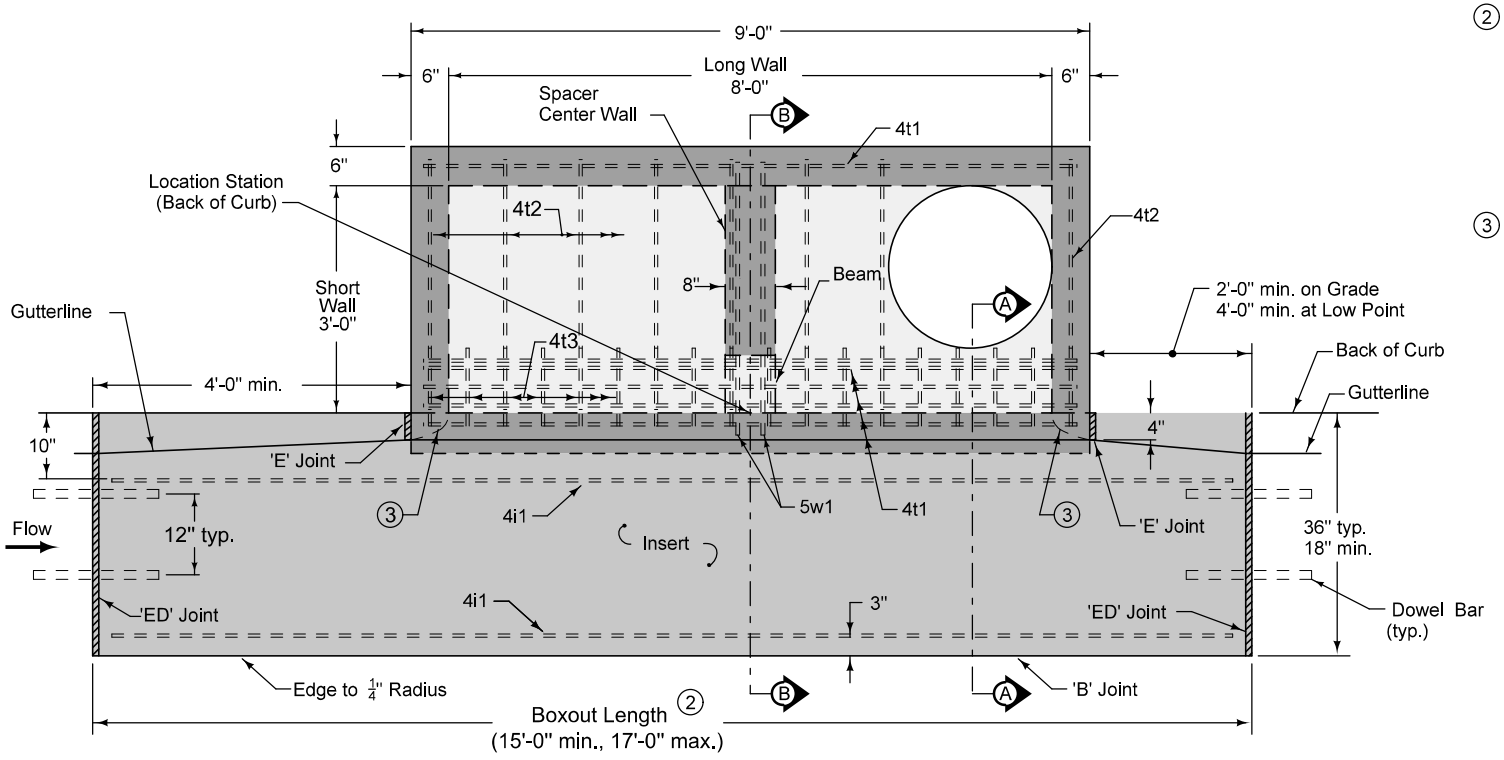
Stuart Nicholson
DESIGN METHODS ENGINEER

DOUBLE OPEN-THROAT CURB INTAKE, SMALL BOX

FIGURE 6010.509 | SHEET 1 OF 3



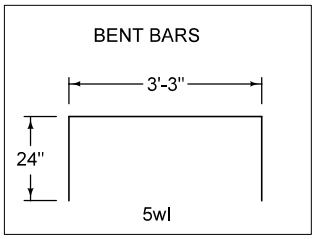
PLAN

2 Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.

For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.

3 Rounded shaping at inlet.

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4b1	4	Base	——	9	3'-6"	12"
4b2	4	Base	——	5	8'-6"	10"
4i1	4	Insert	——	4	Boxout Length minus 8"	See Insert
4t1	4	Top	——	6	8'-6"	See Plan
4t2	4	Top	——	8	3'-6"	12"
4t3	4	Top	——	18	10"	6"
4w1	4	Walls	——	22	Wall Height minus 4"	13"
4w2	4	Long Walls	——	Varies	4'-8"	12"
4w3	4	Short Walls	——	Varies	3'-8"	12"
5w1	5	Beam	⌐¬	2	7'-3"	4"



SUDAS | IOWA DOT

REVISION 6 04-21-20

FIGURE 6010.509 | STANDARD ROAD PLAN | SW-509

SHEET 2 of 3

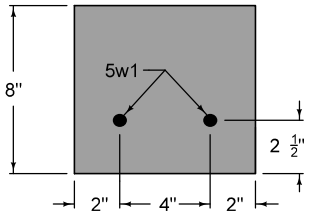
REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

Paul D. Wigand
SUDAS DIRECTOR

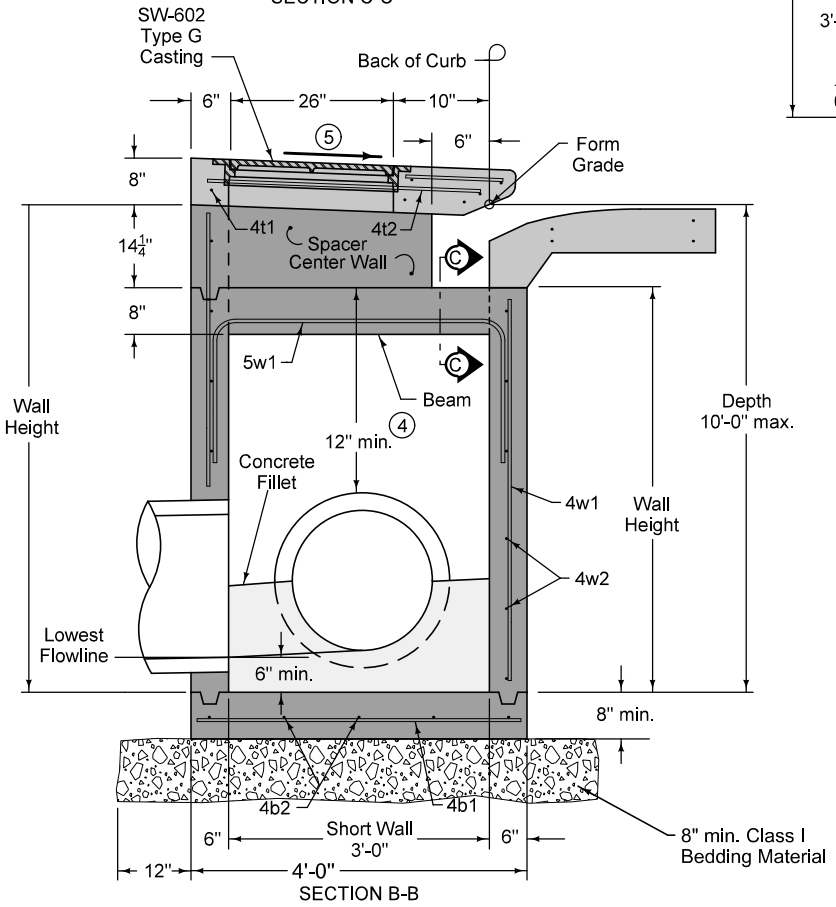
Stuart Nicholson
DESIGN METHODS ENGINEER

DOUBLE OPEN-THROAT CURB INTAKE, SMALL BOX

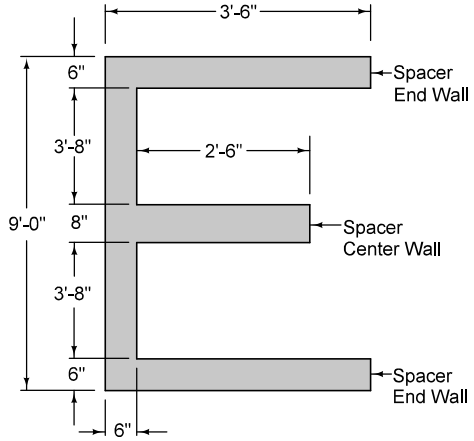
FIGURE 6010.509 SHEET 2 OF 3



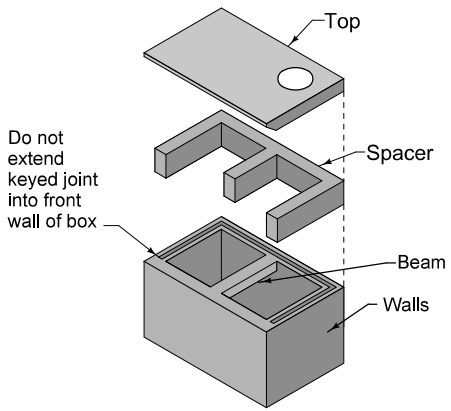
SECTION C-C



SECTION B-B



PLAN
(SPACER)



ISOMETRIC
(Refer to SECTION B-B for
alignment of Top with Spacer)

(4) 12 inch minimum wall height above all pipes.

(5) Slope of 1.5% or as specified in the contract documents.

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	24"	30"
Long Wall	60"	66"

SUDAS | IOWA DOT | REVISION 6 04-21-20

FIGURE 6010.509 | STANDARD ROAD PLAN | SW-509 | SHEET 3 of 3

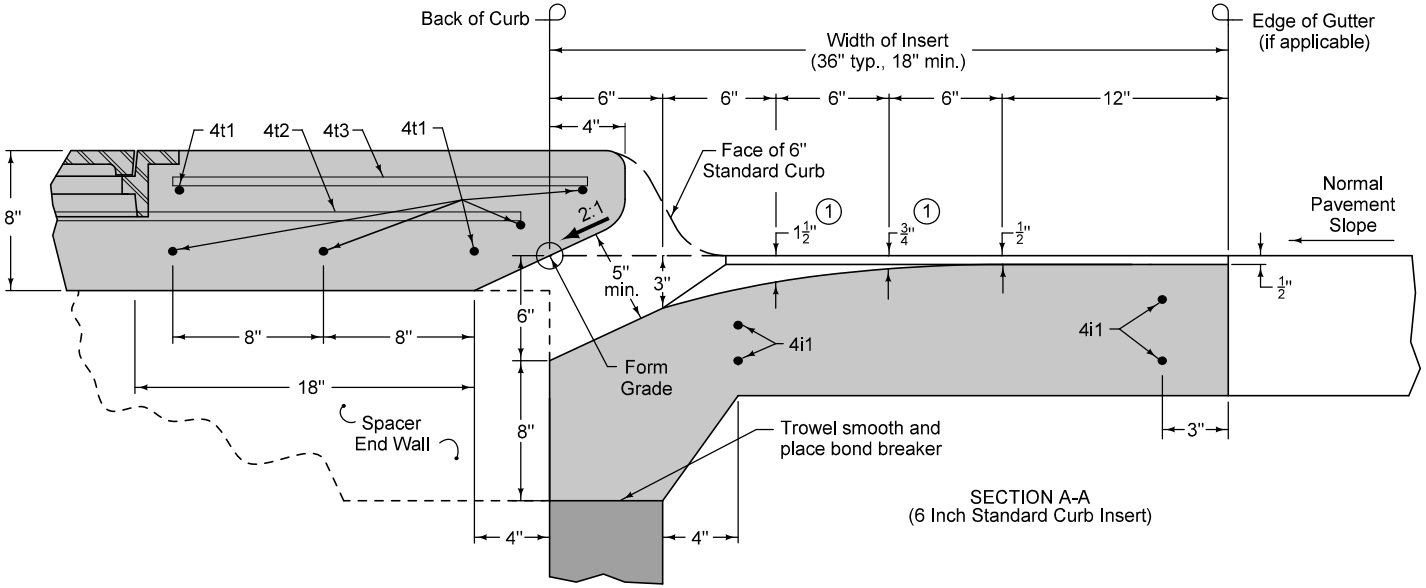
REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

Paul D. Wigand
SUDAS DIRECTOR

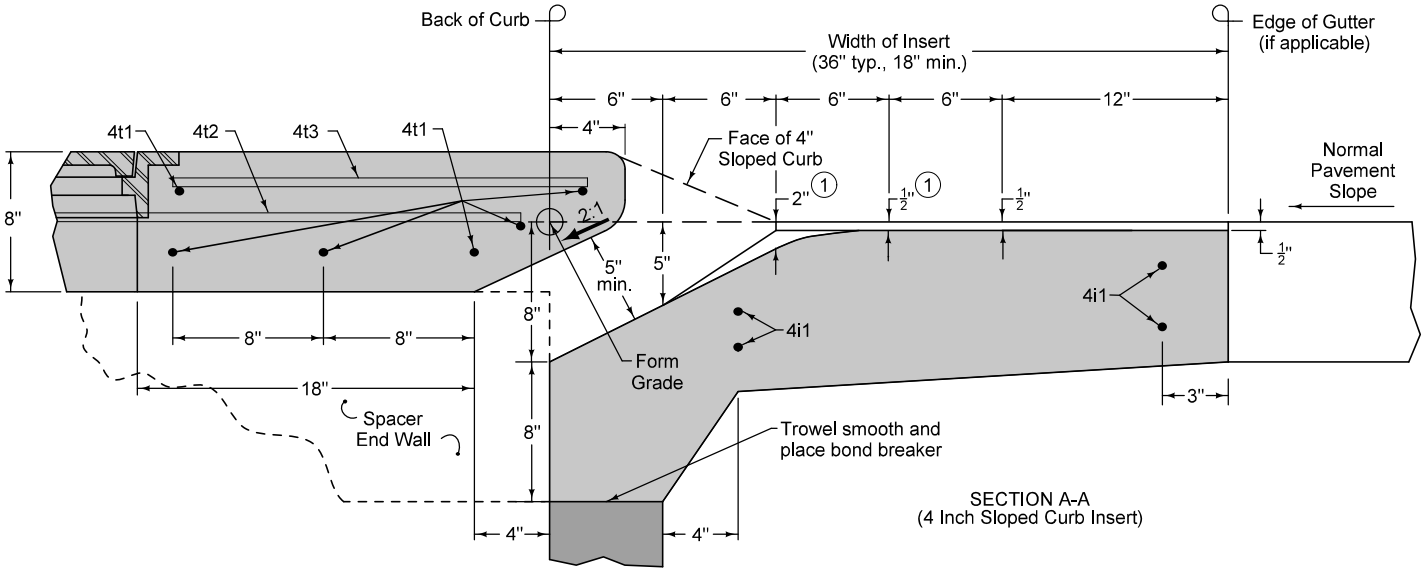
Stuart Nicholson
DESIGN METHODS ENGINEER

DOUBLE OPEN-THROAT CURB INTAKE, SMALL BOX

FIGURE 6010.509 SHEET 3 OF 3



SECTION A-A
(6 Inch Standard Curb Insert)



SECTION A-A
(4 Inch Sloped Curb Insert)

① Insert shaping may be modified for insert widths less than 36 inches. For an 18 inch insert, reduce dimensions indicated by $\frac{1}{4}$ inch.

FIGURE 6010.510 | SHEET 1 OF 3

SUDAS | IOWA DOT

REVISION	
6	04-21-20

FIGURE 6010.510 | STANDARD ROAD PLAN | SW-510 | SHEET 1 of 3

REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

Paul D. Wigand
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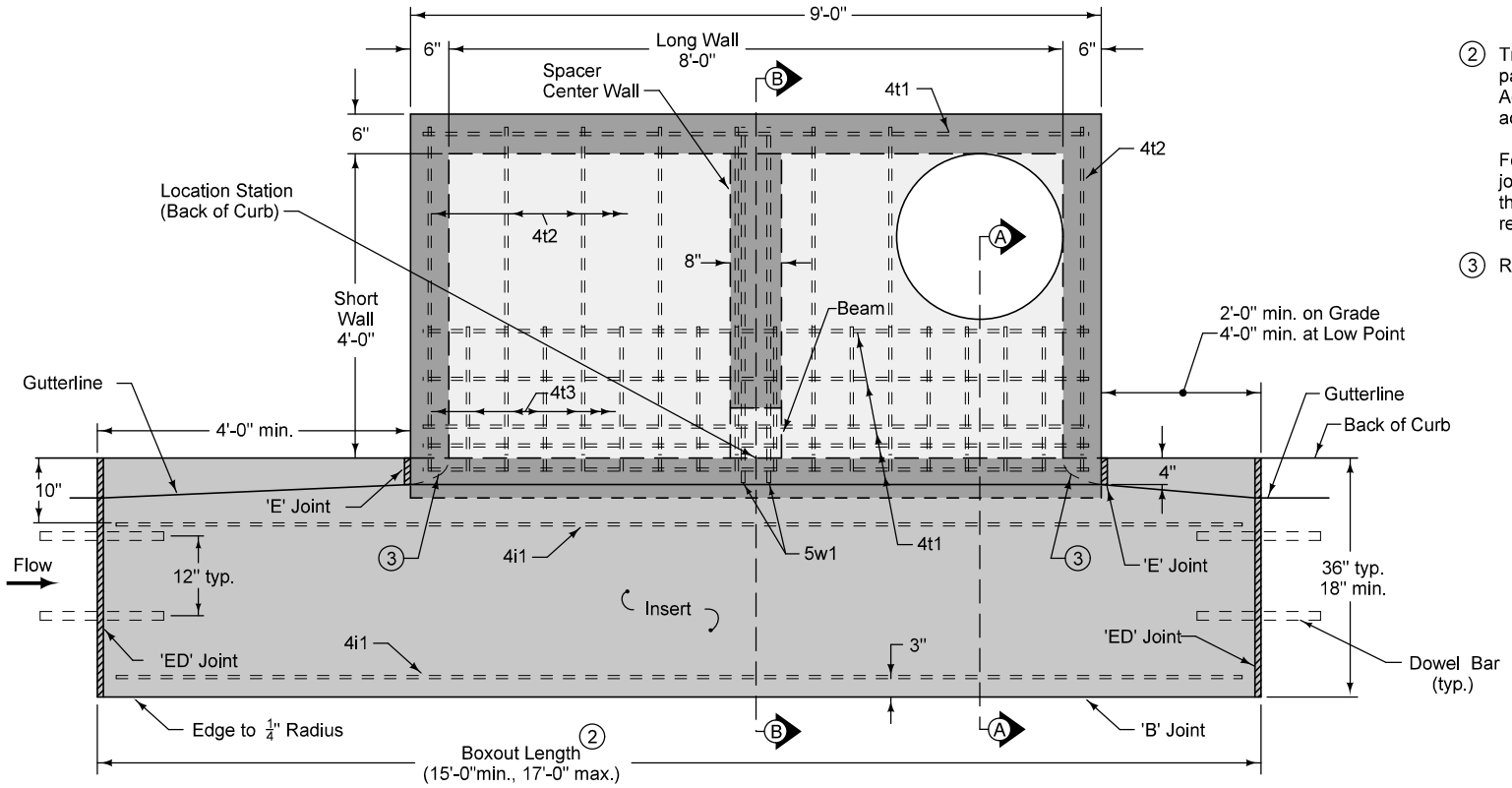
Stuart Nicholson
DESIGN METHODS ENGINEER

DOUBLE OPEN-THROAT CURB INTAKE, LARGE BOX



PLAN

② Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.

For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.

③ Rounded shaping at inlet.

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4b1	4	Base	——	9	4'-6"	12"
4b2	4	Base	——	6	8'-6"	11"
4i1	4	Insert	——	4	Boxout Length minus 8"	See Insert
4t1	4	Top	——	7	8'-6"	See Plan
4t2	4	Top	——	8	4'-4"	12"
4t3	4	Top	——	18	1'-10"	6"
4w1	4	Walls	——	24	Wall Height minus 4"	13"
4w2	4	Long Walls	——	Varies	4'-8"	12"
4w3	4	Short Walls	——	Varies	8'-8"	12"
5w1	5	Beam	⌐¬	2	8'-3"	4"

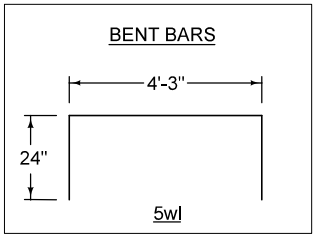


FIGURE 6010.510 SHEET 2 OF 3

SUDAS | IOWA DOT

REVISION 6 04-21-20

SW-510

FIGURE 6010.510 | STANDARD ROAD PLAN

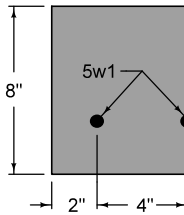
SHEET 2 of 3

REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

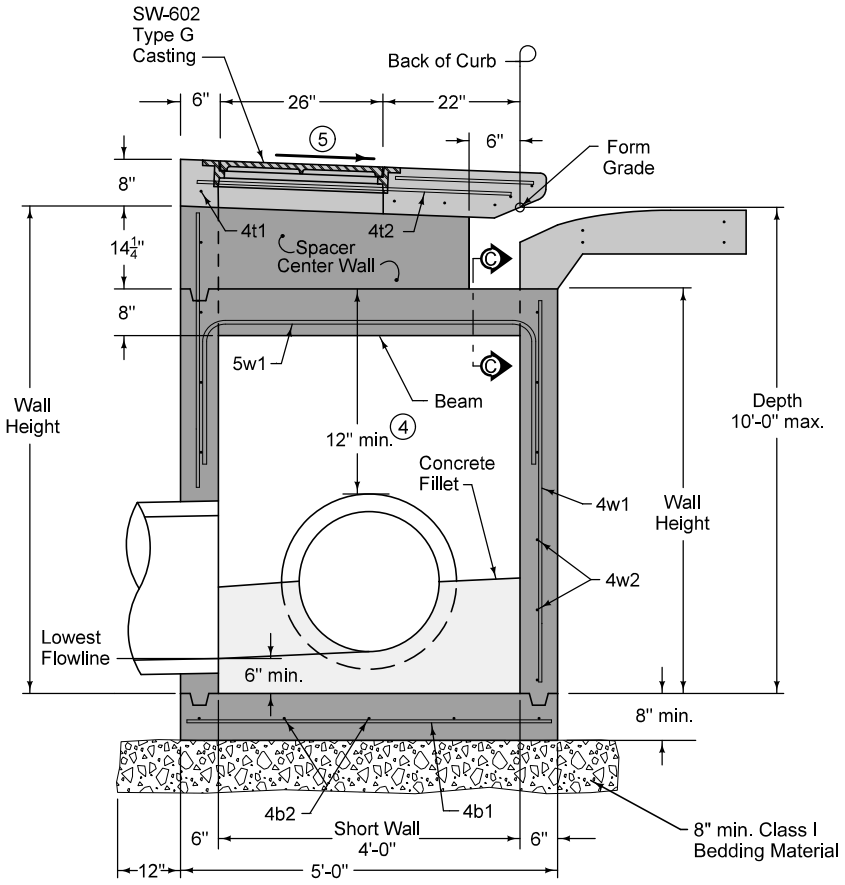
Paul D. Wigand
SUDAS DIRECTOR

DESIGN METHODS ENGINEER

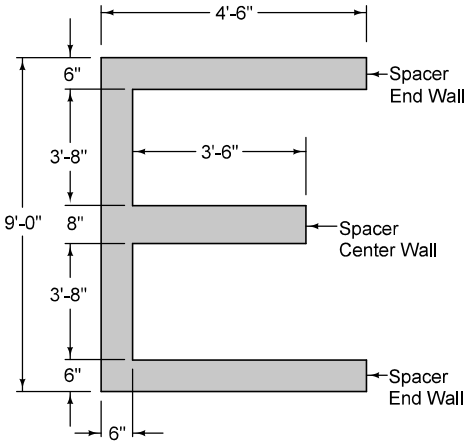
DOUBLE OPEN-THROAT CURB INTAKE, LARGE BOX



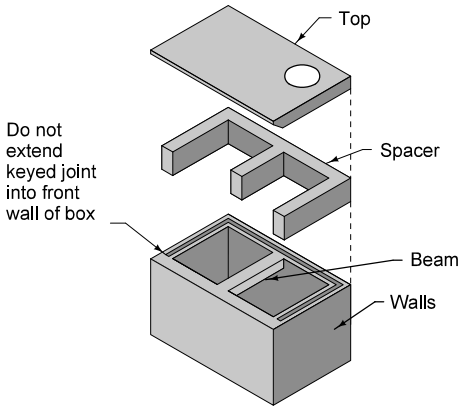
SECTION C-C



SECTION B-B



PLAN
(SPACER)



ISOMETRIC
(Refer to Section B-B
for alignment of Top
with Spacer)

④ 12 inch minimum wall height above all pipes.

⑤ Slope of 1.5% or as specified in the contract documents.

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	30"	36"
Long Wall	60"	66"

SUDAS | IOWADOT | REVISION 6 04-21-20

FIGURE 6010.510 | STANDARD ROAD PLAN | SW-510 | SHEET 3 of 3

REVISIONS: Added Class I Bedding Material and changed maximum box out length to 17'.

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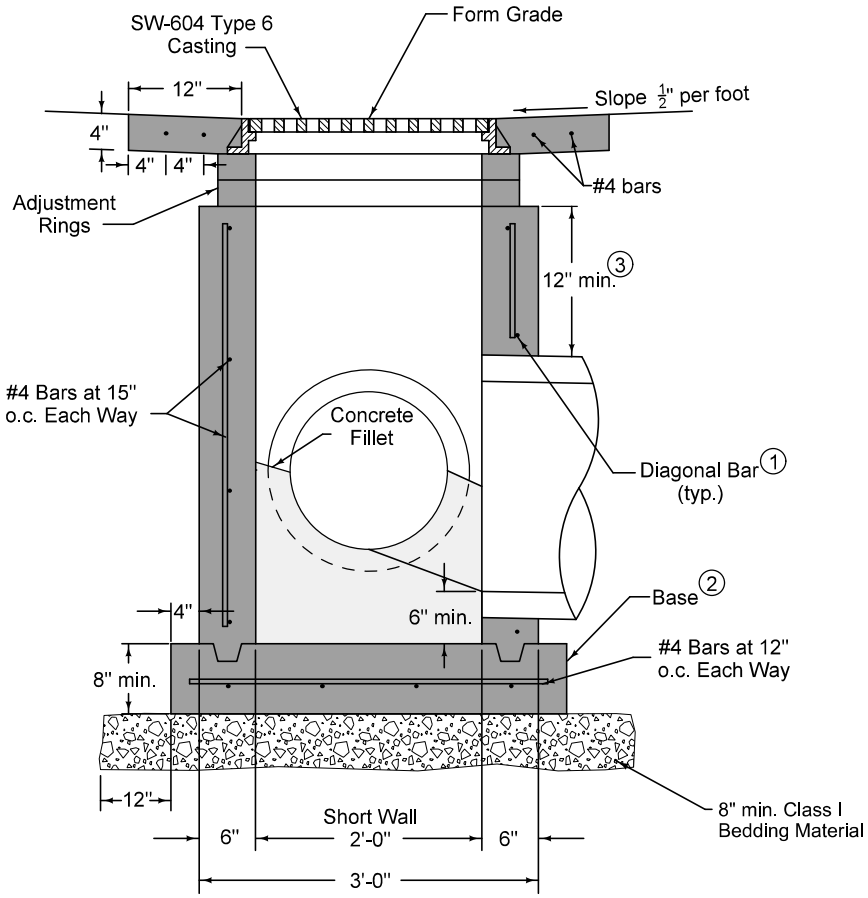
DESIGN METHODS ENGINEER

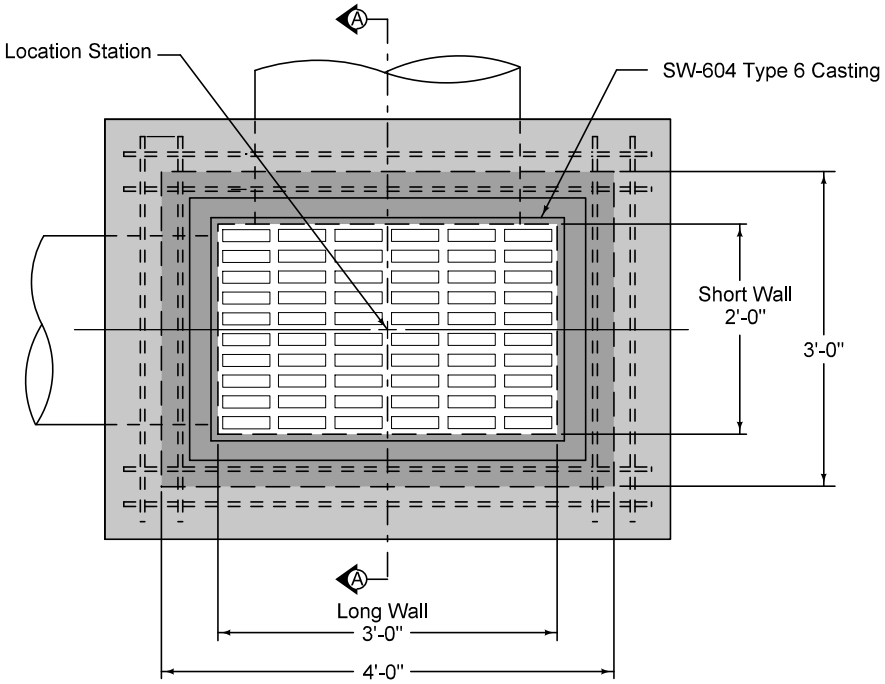
DOUBLE OPEN-THROAT CURB INTAKE, LARGE BOX

FIGURE 6010.510 | SHEET 3 OF 3



SECTION A-A

1. Install four #4 diagonal bars at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.



PLAN

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	15"	18"
Long Wall	24"	30"

FIGURE 6010.511 | SHEET 1 OF 1

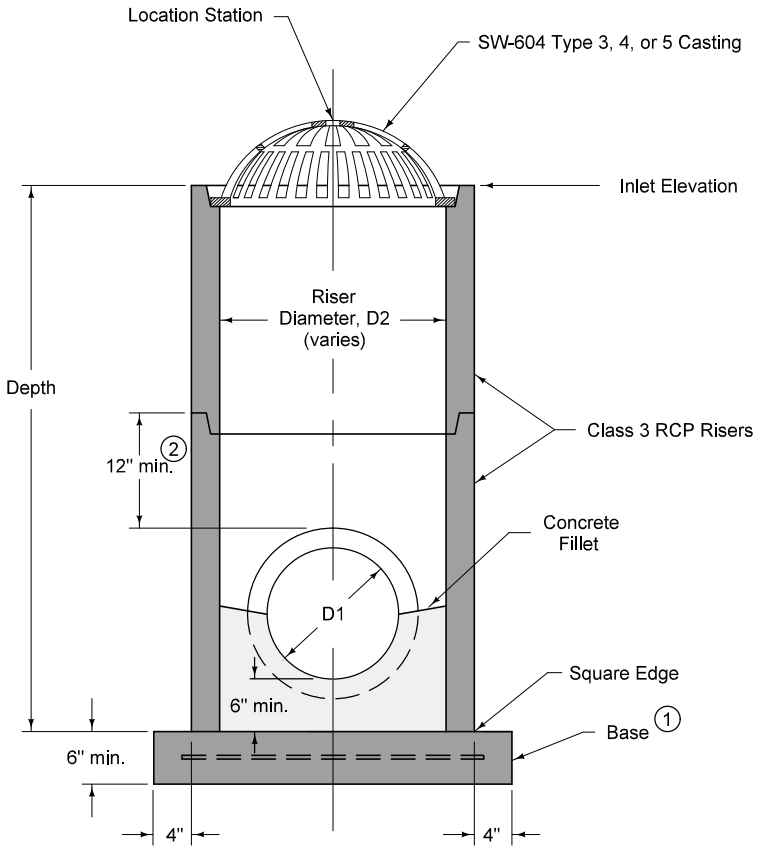
SUDAS | IOWA DOT | REVISION 2 | 04-21-20

FIGURE 6010.511 | STANDARD ROAD PLAN | SW-511 | SHEET 1 of 1

REVISIONS: Added Class I Bedding Material.

Paul D. Wigand, SUDAS DIRECTOR | Stuart Nicholson, DESIGN METHODS ENGINEER

RECTANGULAR AREA INTAKE



TYPICAL SECTION

CASE 1

1. Precast (shown) or cast-in-place base:
   - Precast: 6 inch thick concrete with #6 welded wire mesh on 4 inch centers (WWF 4" x 4"). Center mesh vertically within base.
   - Cast-in-place: 8 inch thick non-reinforced concrete.
2. 12 inch minimum riser height above all pipes.

INTAKE SIZE - CASE 1	
Outlet Pipe Diameter, D1	Minimum Riser Diameter, D2
12"	18"
15"	24"
18"	24"
21"	30"
24"	30"
27"	36"

SUDAS | IOWA DOT

REVISION 4 04-21-20

FIGURE 6010.512 | STANDARD ROAD PLAN | SW-512

SHEET 1 of 2

REVISIONS: Changed 1 to I on Bedding Material

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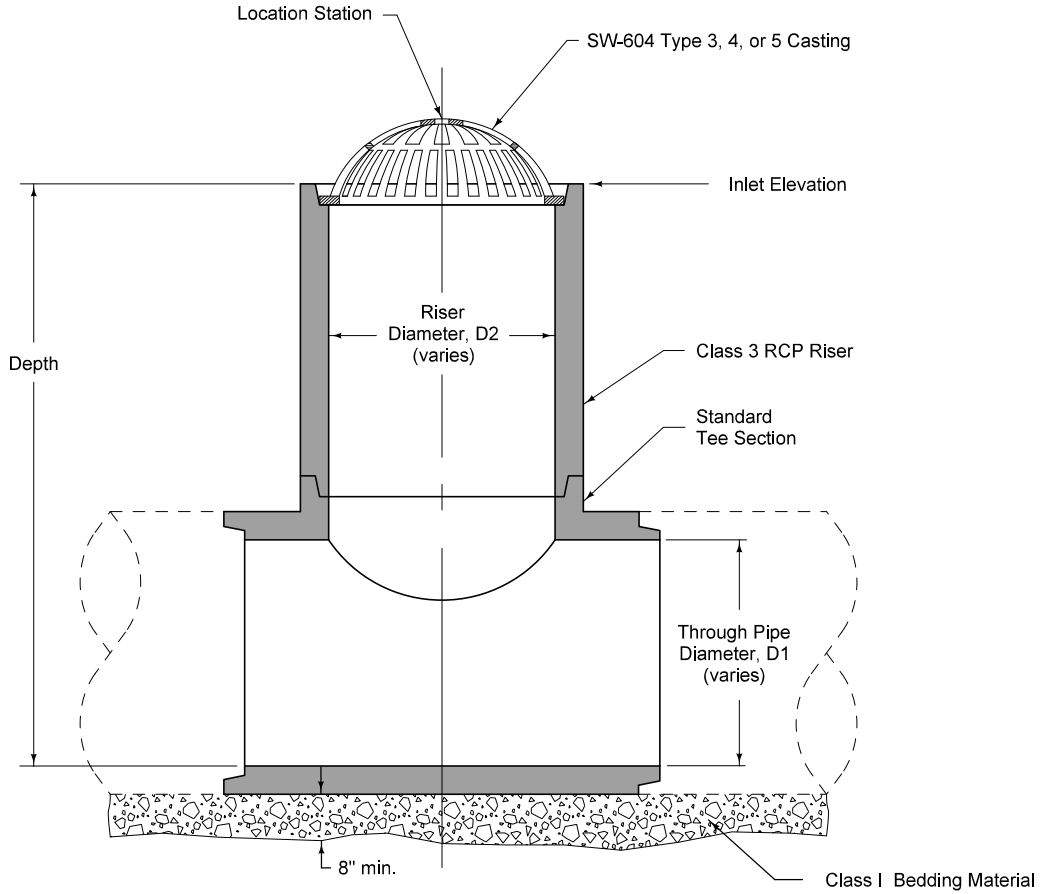
SUDAS DIRECTOR

DESIGN METHODS ENGINEER

CIRCULAR AREA INTAKE

FIGURE 6010.512 | SHEET 1 OF 2

③ Minimum riser diameter is 18 inches.



TYPICAL SECTION

CASE 2

INTAKE SIZE - CASE 2	
Through Pipe Diameter, D1	Maximum ③ Riser Diameter, D2
18"	18"
21"	18"
24"	24"
27"	24"
30"	30"
36" or more	36"

SUDAS | IOWA DOT | REVISION 4 04-21-20

FIGURE 6010.512 | STANDARD ROAD PLAN | SW-512 | SHEET 2 of 2

REVISIONS: Changed 1 to I on Bedding Material.

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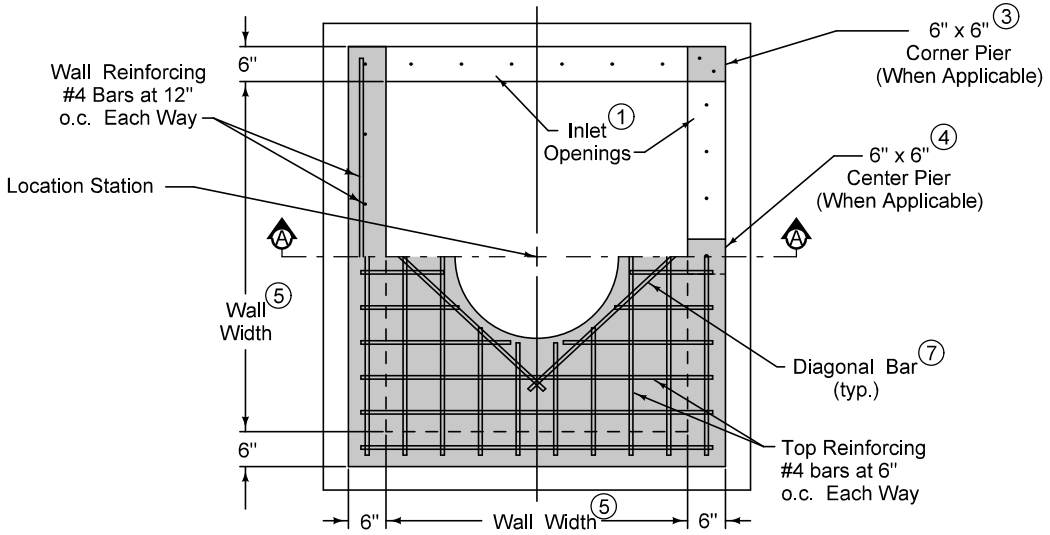
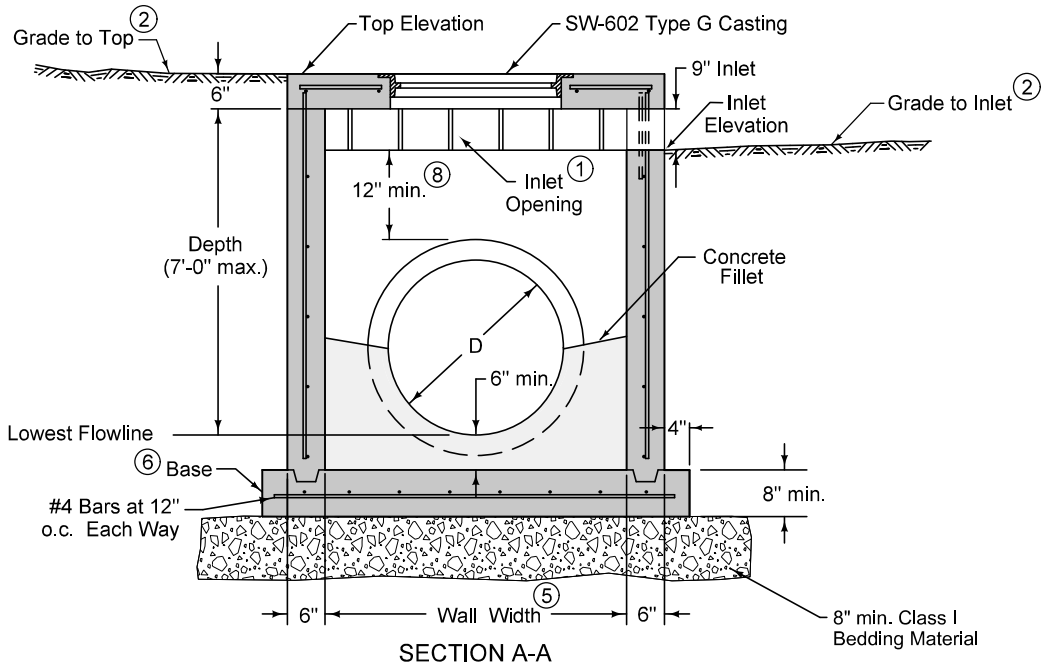
Stuart Nicholson
DESIGN METHODS ENGINEER

CIRCULAR AREA INTAKE

FIGURE 6010.512 SHEET 2 OF 2



PLAN



SECTION A-A

Structure may be built with openings on any or all sides. Provide openings and orientation as specified in the contract documents.

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

① Construct inlet openings with 15 inch #4 epoxy coated bars at 8 inches on center. Embed bars a minimum of 3 inches into walls and top at all openings.

② Grade to inlet elevation on open sides. Grade to top elevation on closed sides.

③ Corner pier required between openings of two adjacent walls. Extend wall reinforcing vertically through pier. Install one additional 15 inch #4 bar in pier.

④ Center pier required at center of any inlet opening with length of 5 feet or greater. Extend wall reinforcing vertically through pier. Install one additional 15 inch #4 bar in pier.

⑤ Wall widths vary with pipe diameter. Provide 6 inches of wall width (minimum) each side of pipe opening. Minimum wall width is 36 inches. Maximum wall width is 72 inches.

⑥ Cast-in-place base shown. If base is precast integral with walls, the footprint of base is not required to extend beyond the outer edge of the walls.

⑦ Install four #4 diagonal bars at all pipe openings.

⑧ 12 inch minimum wall height above all pipes.

SUDAS	IOWADOT	REVISION 3	04-20-21
FIGURE 6010.513	STANDARD ROAD PLAN	SW-513	
		SHEET 1 of 1	

REVISIONS: Modified circle notes 1, 3, 4 and 8.

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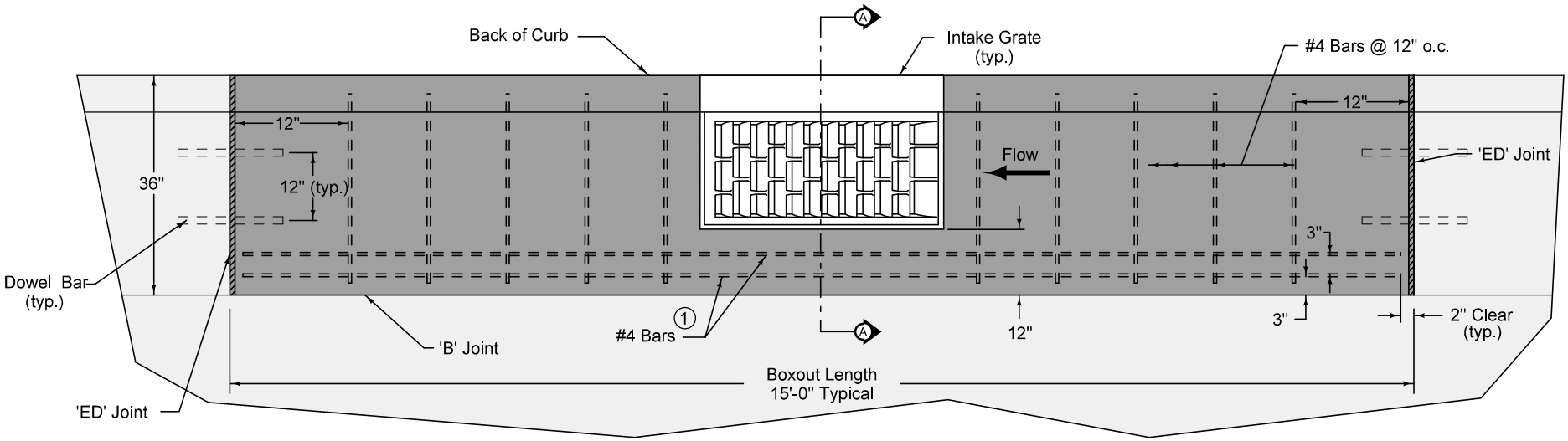
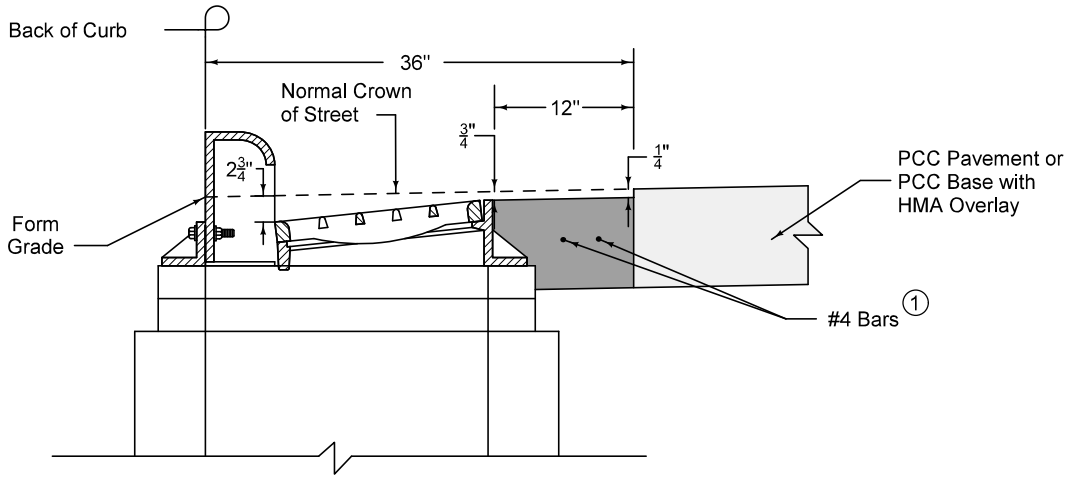
Stuart Nicholson
DESIGN METHODS ENGINEER

OPEN-SIDED AREA INTAKE

FIGURE 6010.513 SHEET 1 OF 1



BOXOUT IN PCC PAVEMENT AND PCC BASE WITH HMA OVERLAY



SECTION A-A

Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.

For retrofit intakes, match existing concrete pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the boxout.

(1) Center bars vertically within slab.

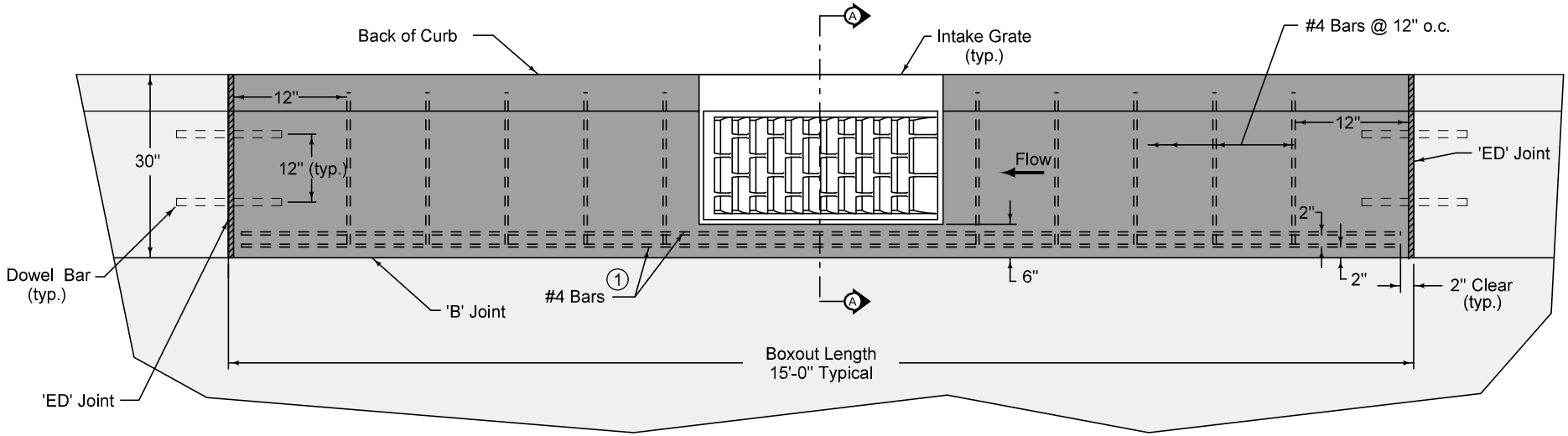
SUDAS	IOWA DOT	REVISION 1 04-17-18
FIGURE 6010.514	STANDARD ROAD PLAN	SW-514
		SHEET 1 of 3

REVISIONS: Added dimension to back of grate. Updated line work and Iowa DOT and SUDAS logo.

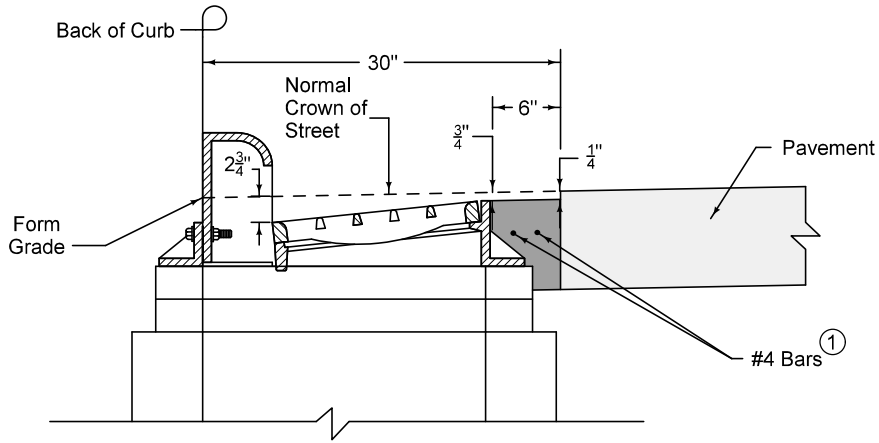
Paul D. Wigand, SUDAS DIRECTOR — Brian Smith, DESIGN METHODS ENGINEER

BOXOUT FOR GRATE INTAKES

FIGURE 6010.514 SHEET 1 OF 3



BOXOUT IN PCC CURB AND GUTTER



SECTION A-A

1 Center bars vertically within slab.

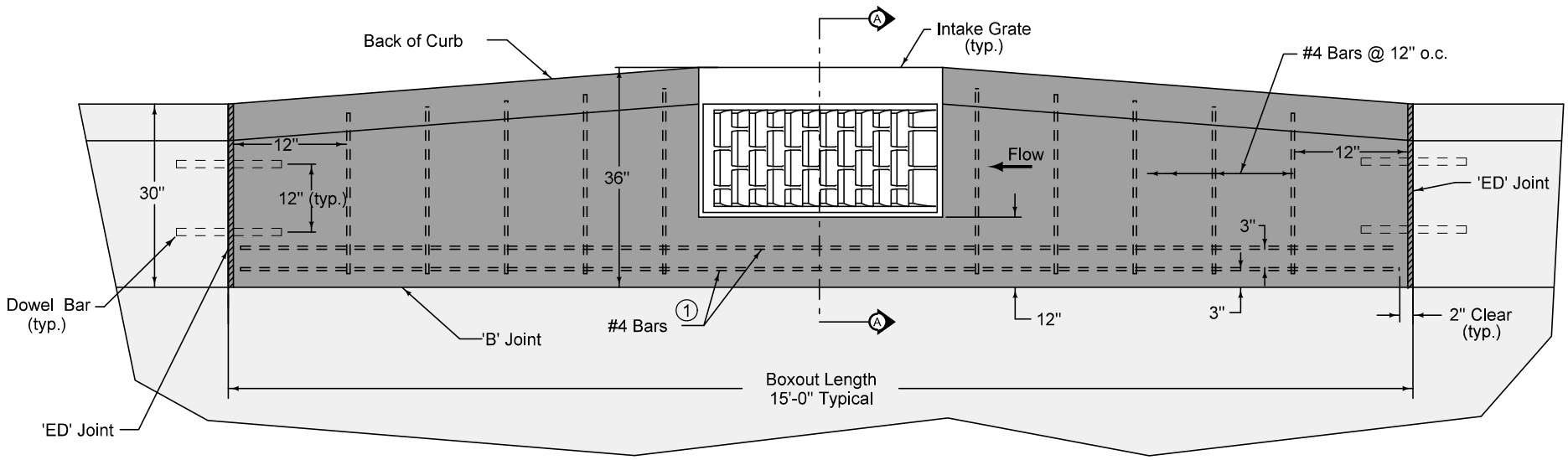
SUDAS	IOWA DOT	REVISION 1 04-17-18
FIGURE 6010.514	STANDARD ROAD PLAN	SW-514
		SHEET 2 of 3

REVISIONS: Added dimension to back of grate. Updated line work and Iowa DOT and SUDAS logo.

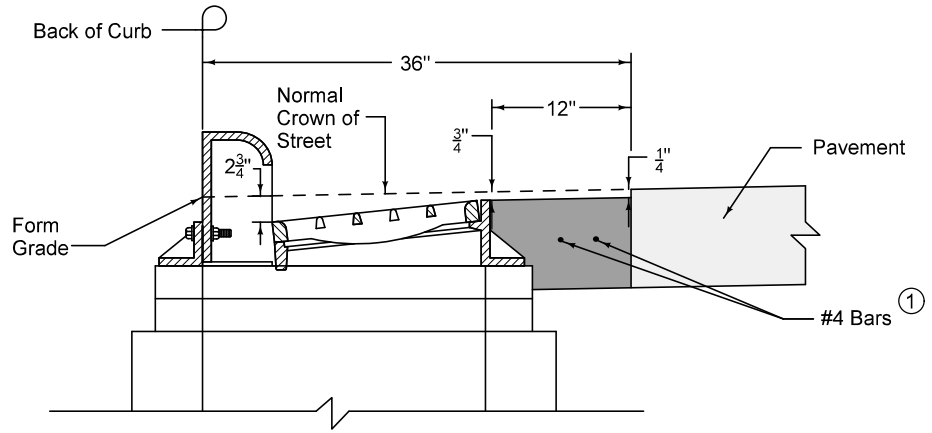
Paul D. Wigand, SUDAS DIRECTOR — Brian Smith, DESIGN METHODS ENGINEER

BOXOUT FOR GRATE INTAKES

FIGURE 6010.514 SHEET 2 OF 3



ALTERNATE BOXOUT IN PCC CURB AND GUTTER



SECTION A-A

Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjacent joint spacing may need to be field adjusted to fit boxouts.

For retrofit intakes, match existing concrete pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the boxout.

(1) Center bars vertically within slab.

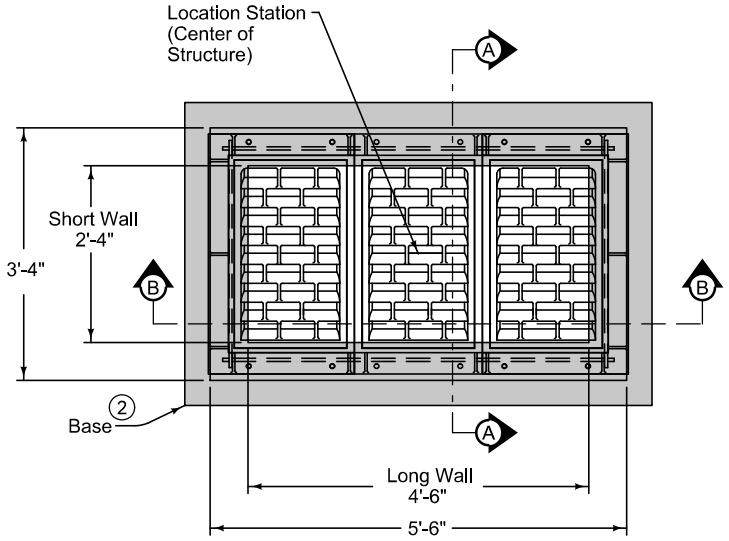
SUDAS	IOWA DOT	REVISION 1 04-17-18
FIGURE 6010.514	STANDARD ROAD PLAN	SW-514
		SHEET 3 of 3

REVISIONS: Added dimension to back of grate. Updated line work and Iowa DOT and SUDAS logo.

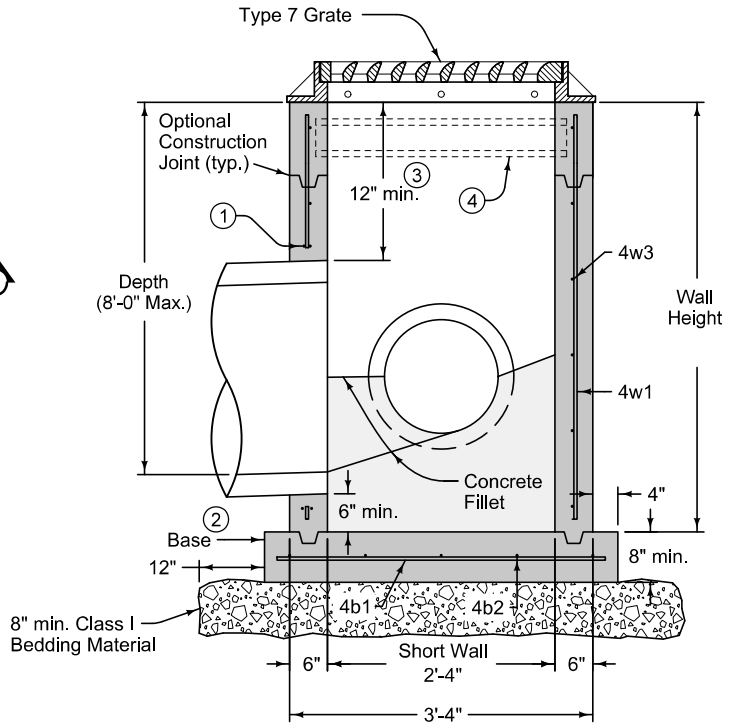
Paul D. Wigand, SUDAS DIRECTOR — Brian Smith, DESIGN METHODS ENGINEER

BOXOUT FOR GRATE INTAKES

FIGURE 6010.514 SHEET 3 OF 3



PLAN



SECTION A-A

1. Provide two #4 hoop bars at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.
4. If required by casting manufacturer, provide support beam under all frame joints. Modify structure walls as required to provide pocket for beam.

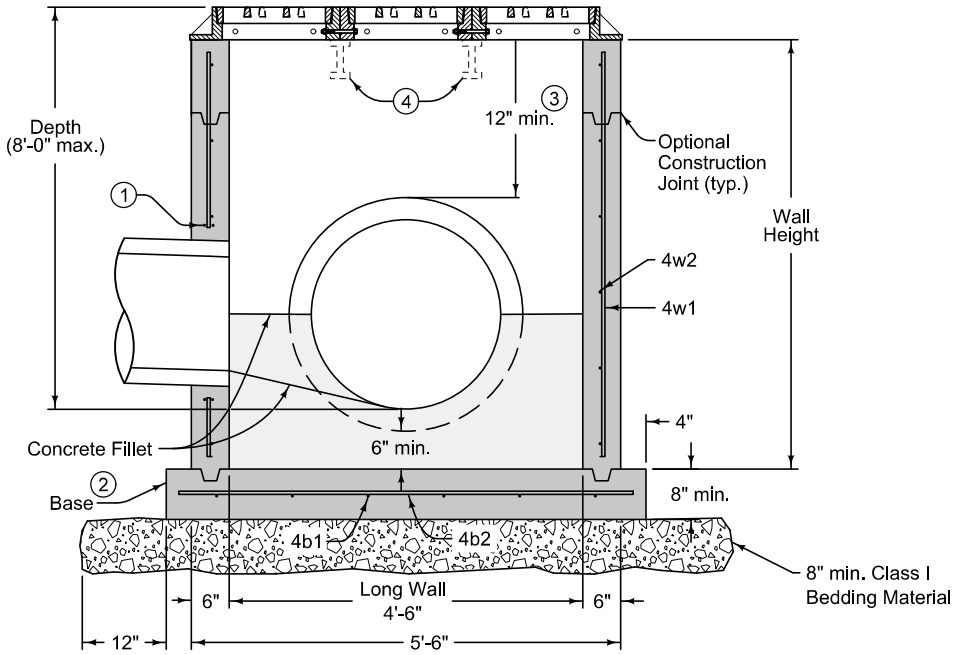
FIGURE 6010.515 | SHEET 1 OF 2

SUDAS	IOWA DOT	REVISION: New 04-21-20
FIGURE 6010.515	STANDARD ROAD PLAN	SW-515
		SHEET 1 of 2

REVISIONS: New.

Paul D. Wigard, SUDAS DIRECTOR — DESIGN METHODS ENGINEER

TRIPLE RECTANGULAR AREA INTAKE



SECTION B-B

1. Provide two #4 hoop bars at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.
4. If required by casting manufacturer, provide support beam under all frame joints. Modify structure walls as required to provide pocket for beam.

MAXIMUM PIPE DIAMETERS		
Pipe Location	Precast Structure	Cast-in-place Structure
Short Wall	18"	21"
Long Wall	36"	42"

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4b1	4	Base	——	6	3'-6"	12"
4b2	4	Base	——	4	5'-8"	12"
4w1	4	Walls	——	20	Wall Height minus 4"	12"
4w2	4	Short Wall	——	Varies	3'-0"	12"
4w3	4	Long Wall	——	Varies	5'-2"	12"

SUDAS | IOWADOT

REVISION: New 04-21-20

FIGURE 6010.515 | STANDARD ROAD PLAN | SW-515

SHEET 2 of 2

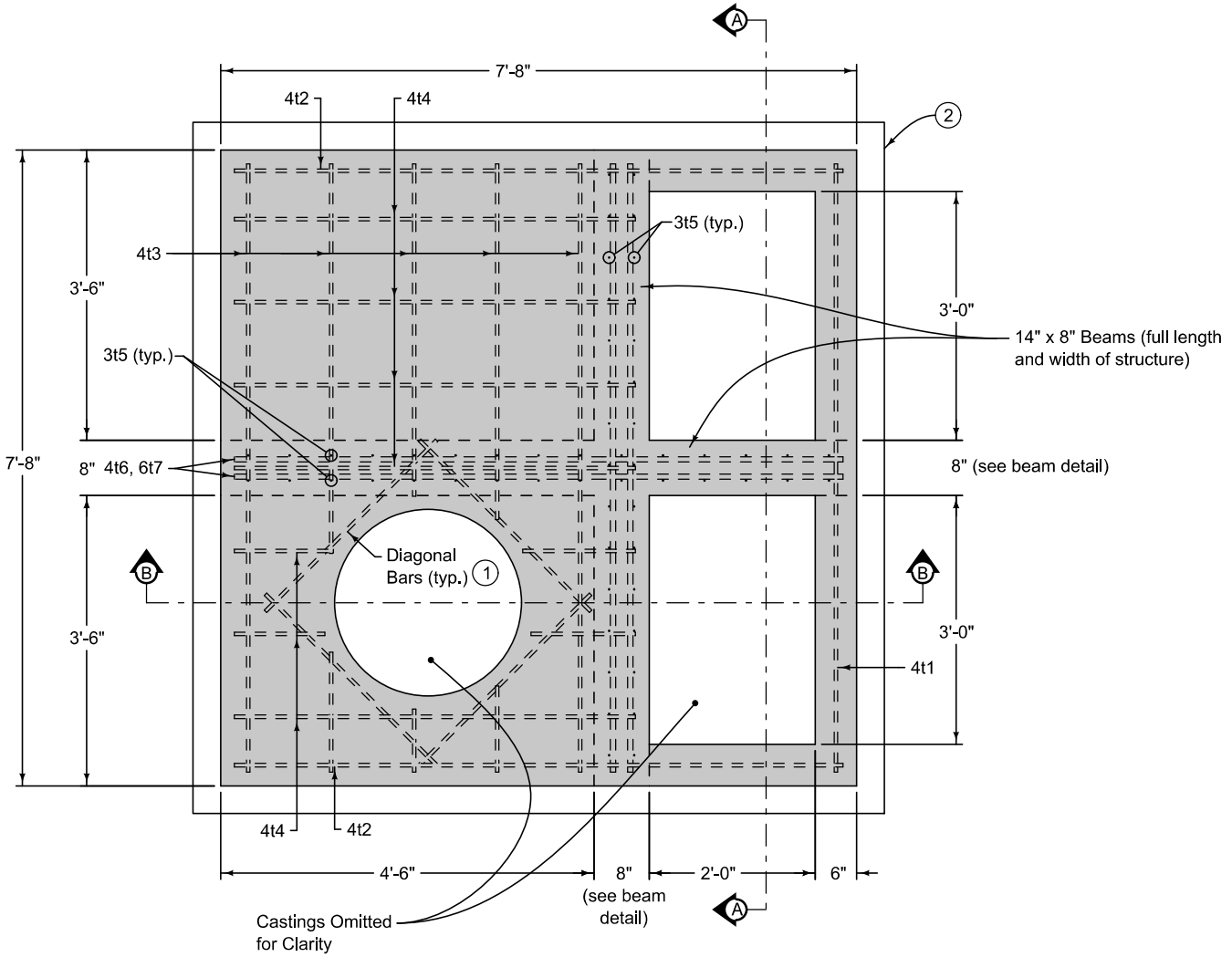
REVISIONS: New.

Paul D. Wigand
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

TRIPLE RECTANGULAR AREA INTAKE

FIGURE 6010.515 | SHEET 2 OF 2



PLAN

Maximum pipe diameters are set based on maximum structure depth of 6 feet-6 inches.

Refer to SW-514 for boxout details.

(1) Install four #4 diagonal bars at manhole opening and at all pipe openings.

(2) Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

MAXIMUM PIPE DIAMETERS	
Wall	Max. Dia.
Front/Back	36"
Sides	42"

FIGURE 6010.516 | SHEET 1 OF 3

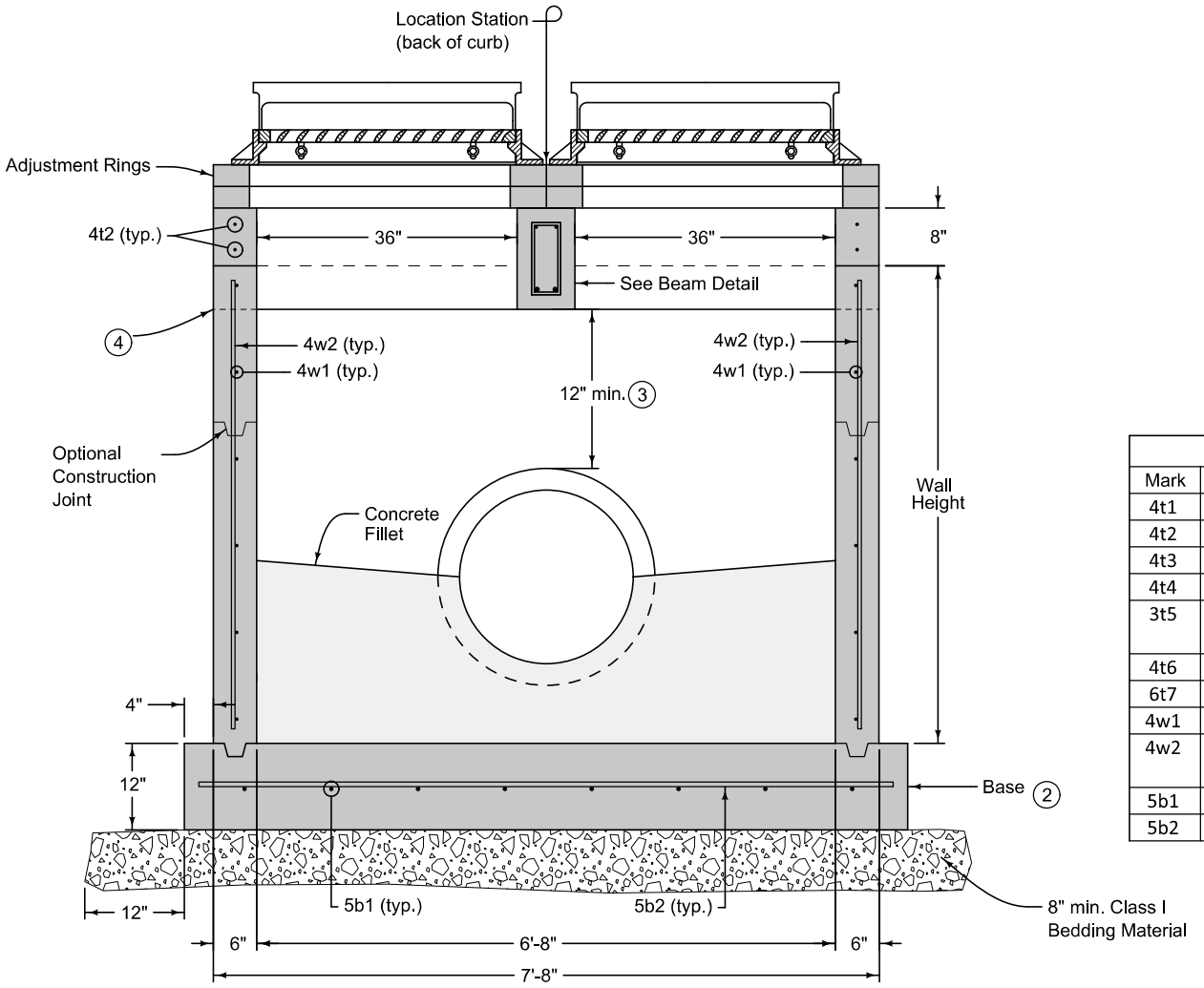
SUDAS | IOWADOT | REVISION: New 4-16-24

FIGURE 6010.516 | STANDARD ROAD PLAN | SW-516 | SHEET 1 of 3

REVISIONS: New.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

LARGE WELL DOUBLE GRATE INTAKE WITH MANHOLE



SECTION A-A

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.
4. Form pockets in the wall to receive integral beams in the top.

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4t1	4	Top	——	2	7'-4''	See Detail
4t2	4	Top	——	4	7'-4''	See Detail
4t3	4	Top	——	10	7'-4"	12''
4t4	4	Top	——	14	4'-2''	12''
3t5	3	Top	▯	30	3'-1"	6"
4t6	4	Top	——	4	7'-4"	See Detail
6t7	6	Top	——	4	7'-4"	See Detail
4w1	4	Walls	——	Varies	7'-4"	12''
4w2	4	Walls	——	32	Wall Height minus 4''	12"
5b1	5	Base	——	9	7'-10''	12''
5b2	5	Base	——	9	7'-10"	12''

SUDAS | IOWA DOT

REVISION: New 4-16-24

FIGURE 6010.516 | STANDARD ROAD PLAN | SW-516

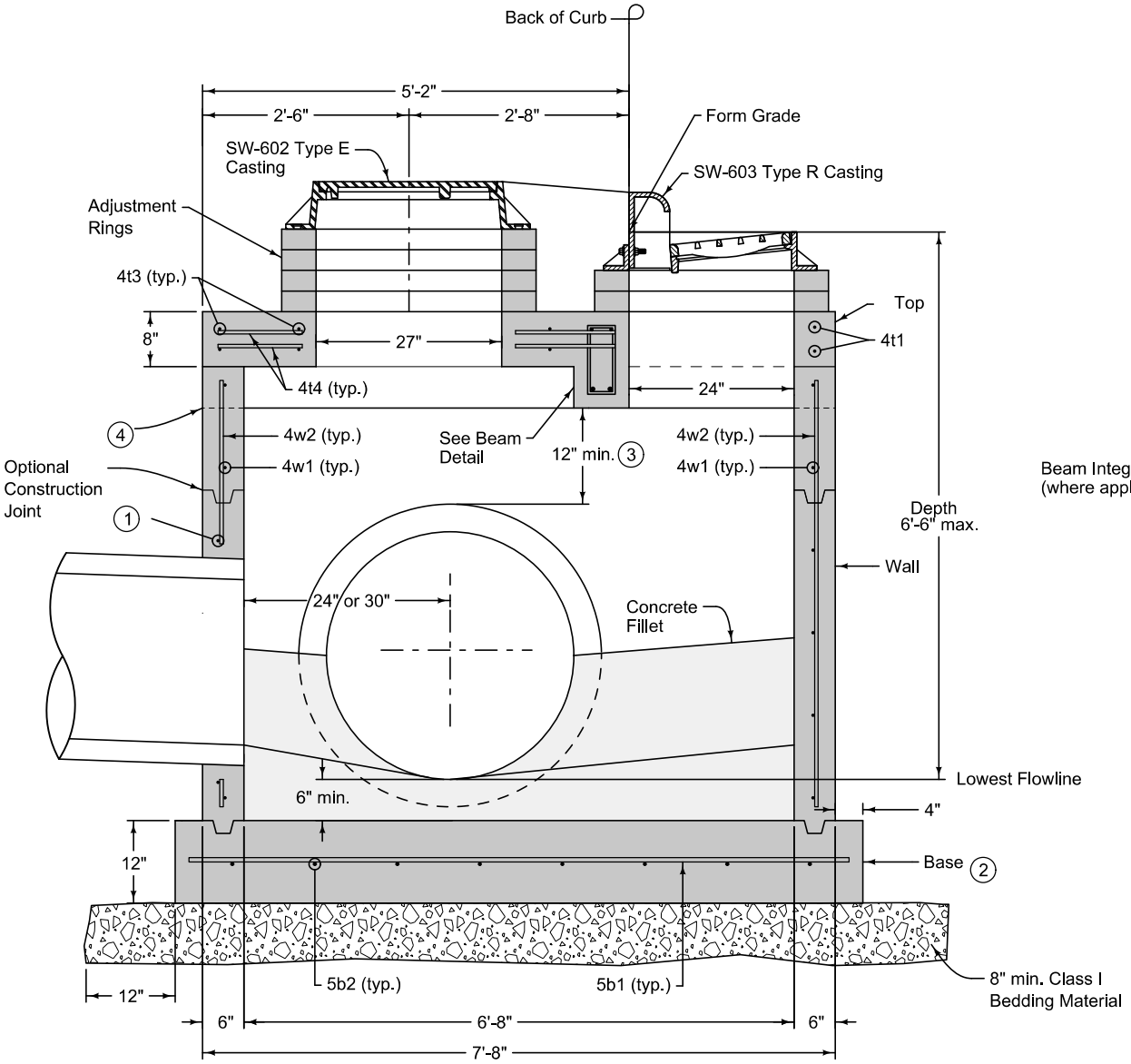
SHEET 2 of 3

REVISIONS: New.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

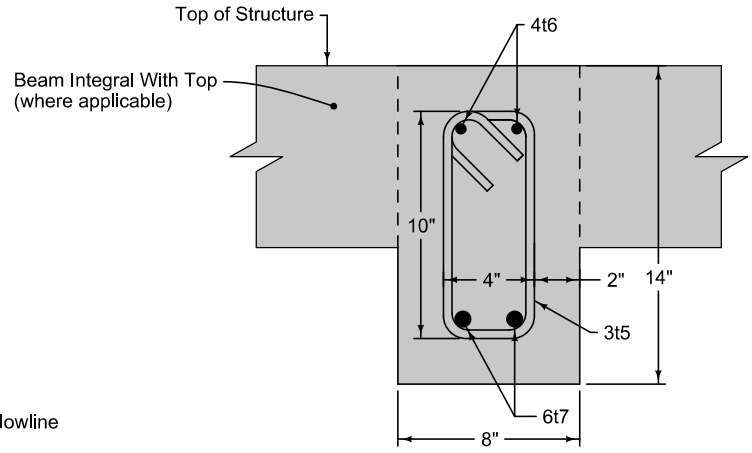
LARGE WELL DOUBLE GRATE INTAKE WITH MANHOLE

FIGURE 6010.516 SHEET 2 OF 3



SECTION B-B

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.
4. Form pockets in the wall to receive integral beams in the top.



BEAM DETAIL

FIGURE 6010.516 | SHEET 3 OF 3

SUDAS | IOWADOT

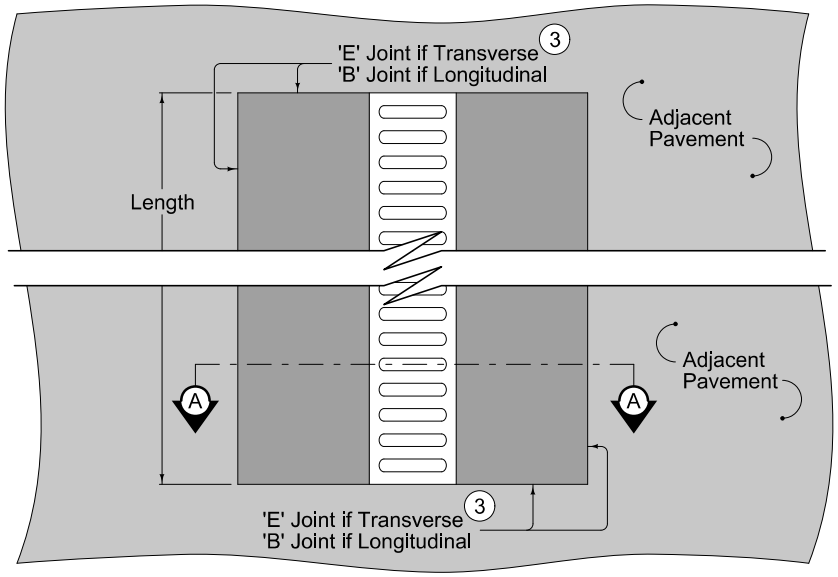
REVISION	
New	4-16-24

FIGURE 6010.516 | STANDARD ROAD PLAN | SW-516 | SHEET 3 of 3

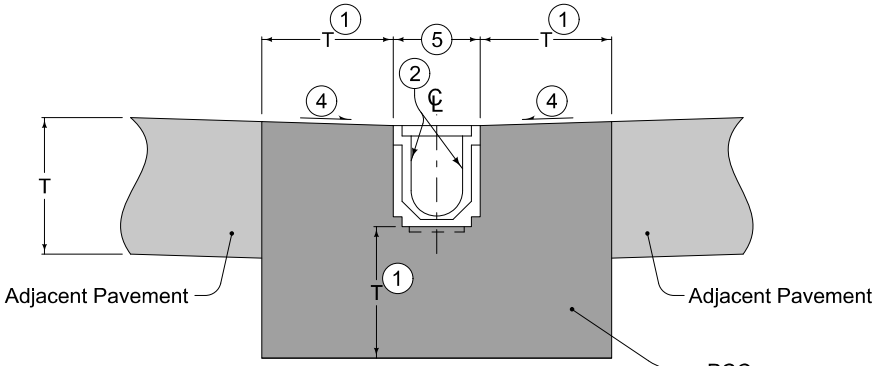
REVISIONS: New.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

LARGE WELL DOUBLE GRATE INTAKE WITH MANHOLE



PLAN



SECTION A-A

1. 6 inches or same as thickness of adjacent pavement, whichever is greater.
2. Linear Trench Drain.
3. For joint details, see PV-101.
4. Slope same as adjacent pavement.
5. Width as determined by manufacturer. Minimum 6 inches.

SUDAS	IOWA DOT	REVISION 2 04-21-20
FIGURE 6010.521	STANDARD ROAD PLAN	SW-521
		SHEET 1 of 2

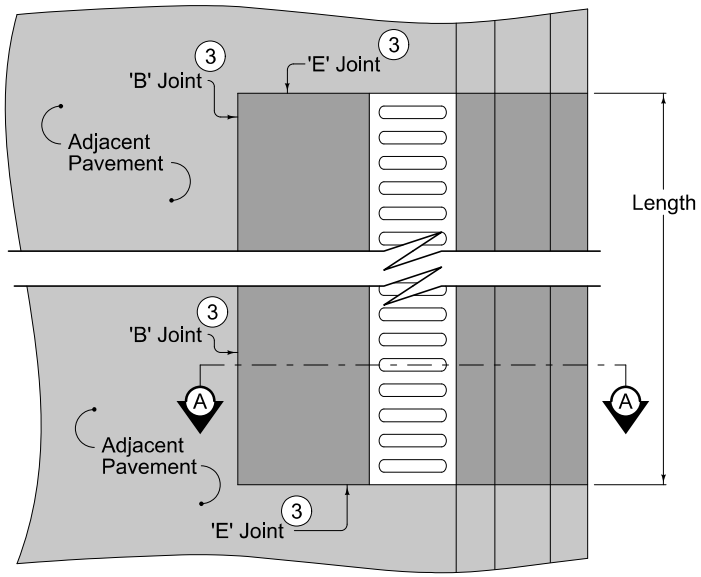
REVISIONS: Converted to joint standard. Modified circle note 1.

Paul D. Wigard
SUDAS DIRECTOR

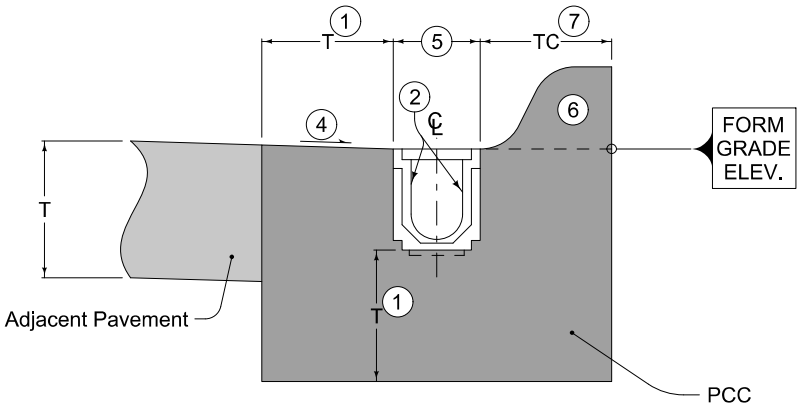
DESIGN METHODS ENGINEER

LINEAR TRENCH DRAIN

FIGURE 6010.521 | SHEET 1 OF 2



PLAN



SECTION A-A

1. 6 inches or same as thickness of adjacent pavement, whichever is greater.
2. Linear Trench Drain.
3. For joint details, see PV-101.
4. Slope same as adjacent pavement.
5. Width as determined by manufacturer. Minimum 6 inches.
6. Standard or sloped curb. For curb details, see PV-102.
7. Minimum thickness same as thickness of adjacent pavement or curb width, whichever is greater.

FIGURE 6010.521 | SHEET 2 OF 2

SUDAS | IOWADOT | REVISION 2 | 04-21-20

FIGURE 6010.521 | STANDARD ROAD PLAN | SW-521 | SHEET 2 of 2

REVISIONS: Converted to joint standard. Modified circle note 1.

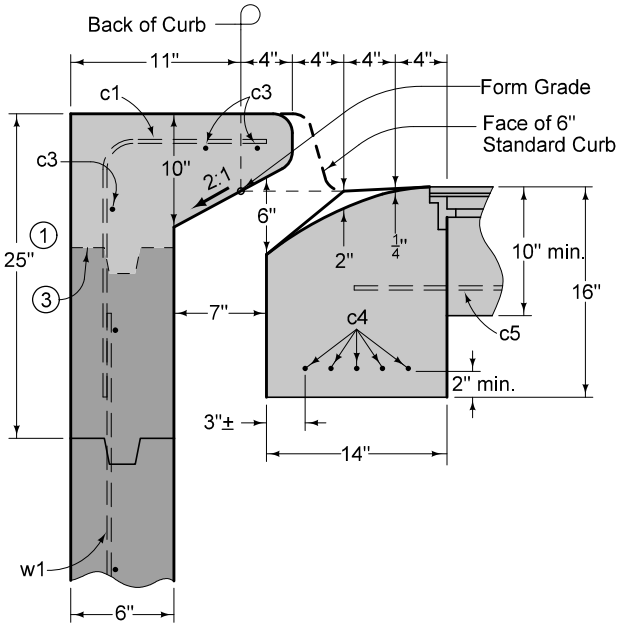
Paul D. Wigand, SUDAS DIRECTOR | Stuart Nicholson, DESIGN METHODS ENGINEER

LINEAR TRENCH DRAIN

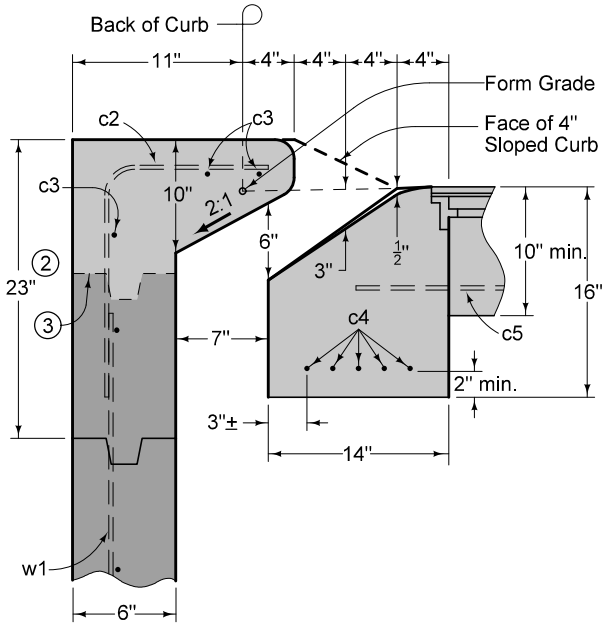
(1) 39 inches when attaching the SW-542 extension unit.

(2) 37 inches when attaching the SW-542 extension unit.

(3) Additional keyed construction joint when attaching the SW-542 extension unit.



INSERT
(6 Inch Standard Curb)



INSERT
(4 Inch Sloped Curb)

FIGURE 6010.541 | SHEET 1 OF 2

SUDAS	IOWA DOT	REVISION 5 04-21-20
FIGURE 6010.541	STANDARD ROAD PLAN	SW-541
		SHEET 1 of 2

REVISIONS: Changed wall walls to 6 inch reinforced. Modified TYPICAL SECTION and c1 and c2 bar lengths. Added note 4. Added Class I bedding material.

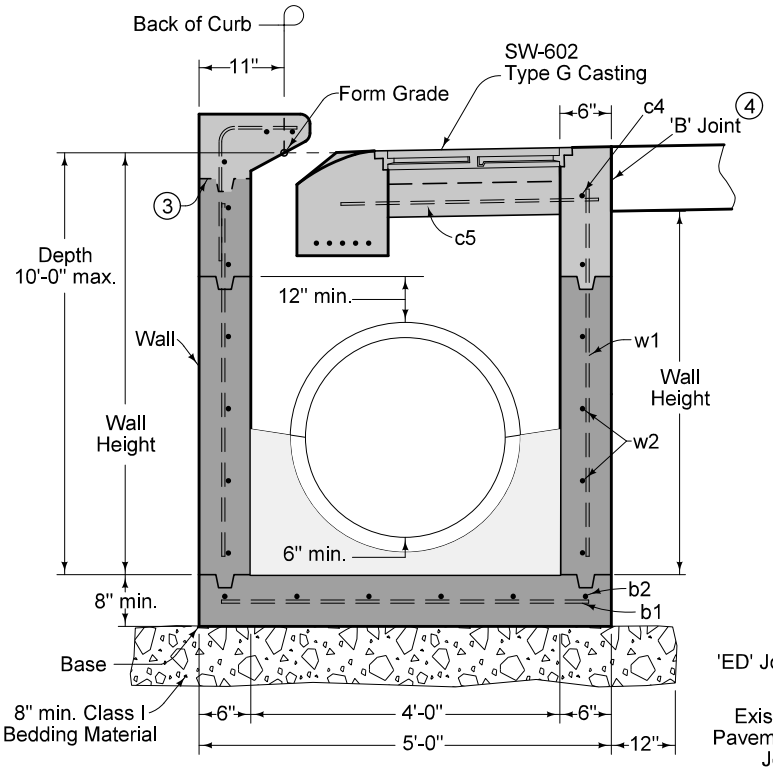
Paul D. Wigand — SUDAS DIRECTOR
Stuart Nicholson — DESIGN METHODS ENGINEER

OPEN-THROAT CURB INTAKE UNDER PAVEMENT

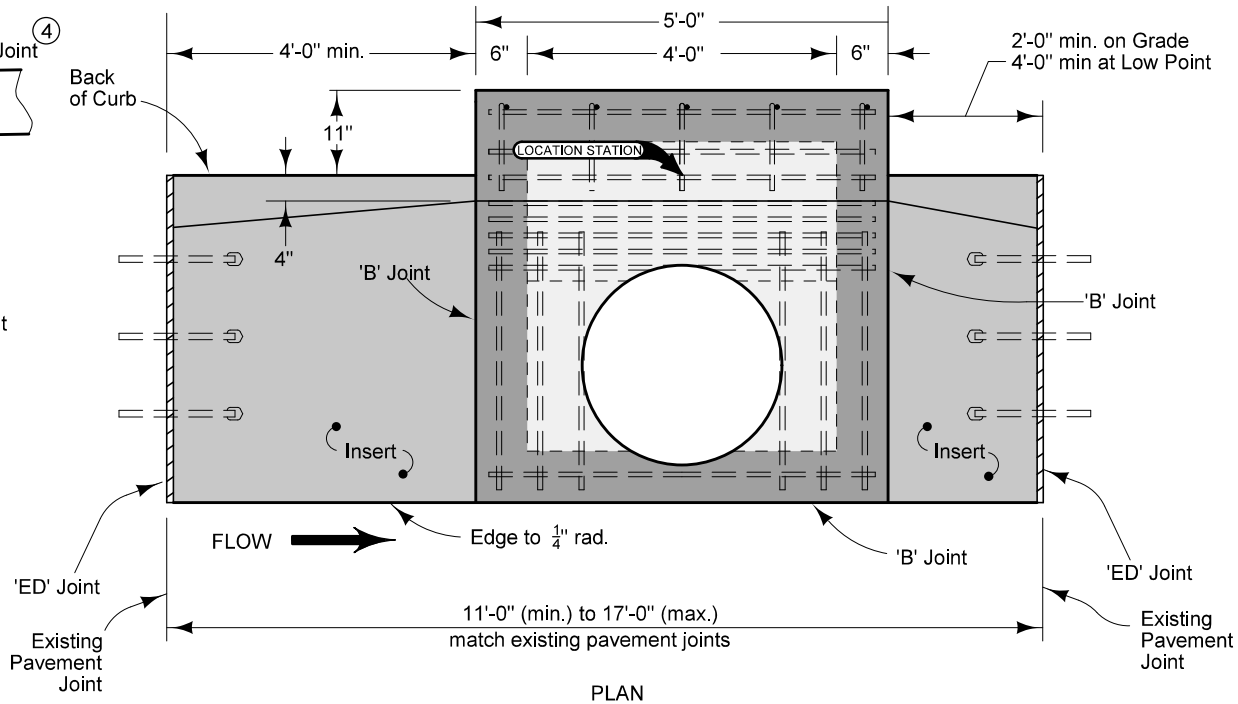
For joint details, refer to PV-101.

③ Additional keyed construction joint when attaching the SW-542 extension unit.

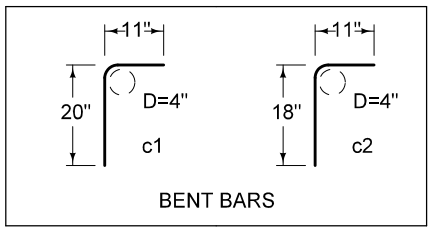
④ Top of well flush with pavement.



TYPICAL SECTION



PLAN



BENT BARS

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
b1	4	Base	——	4'-6"	11"
b2	4	Base	——	4'-6"	11"
w1	4	Wall	——	Wall Height minus 4"	14"
w2	4	Wall	——	4'-8"	12"
c1	4	Top	⌜	2'-7"	14"
c2	4	Top	⌜	2'-5"	14"
c3	4	Top	——	4'-8"	See Detail
c4	4	Top	——	4'-8"	See Detail
c5	4	Top	——	3'-2"	See Detail

MAXIMUM PIPE DIAMETER	
Precast	30"
Cast-in-Place	36"

FIGURE 6010.541 | SHEET 2 OF 2

SUDAS | IOWADOT | REVISION 5 04-21-20

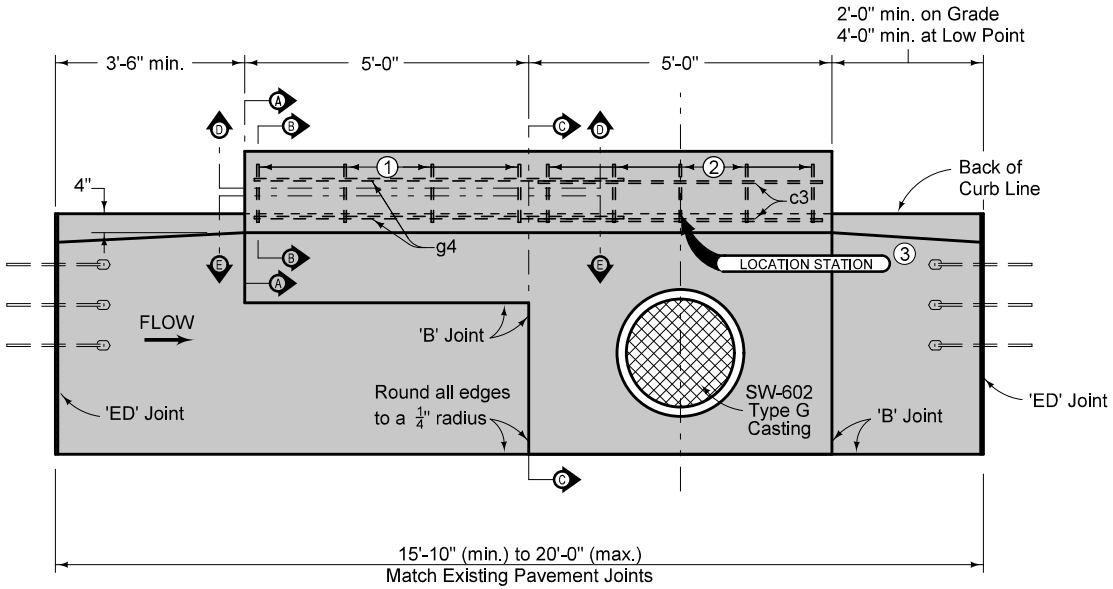
FIGURE 6010.541 | STANDARD ROAD PLAN | SW-541 | SHEET 2 of 2

REVISIONS: Changed wall walls to 6 Inch reinforced. Modified TYPICAL SECTION and c1 and c2 bar lengths. Added note 4. Added Class I bedding material.

Paul D. Wigand
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

OPEN-THROAT CURB INTAKE UNDER PAVEMENT



PLAN
(SW-542 EXTENSION AND SW-541 INTAKE)

Extension unit may be used on either or both sides of SW-541 intakes. Details are similar when extension unit is on the opposite side.

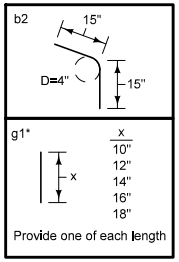
① g3 for 6 inch standard curb; g5 for 4 inch sloped curb.

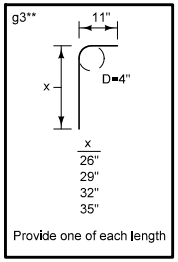
② c1 for 6 inch standard curb; c2 for 4 inch sloped curb. See SW-541 for reinforcing.

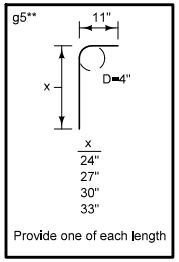
③ The location station is where the centerline of intake meets the back of the curb line.

Placing sequence: 1. Base; 2. Walls and Extension; 3. Top; 4. Insert

REINFORCING BAR LIST							
BAR	SIZE	LOCATION	SHAPE	NO.	LENGTH	WEIGHT	SPACING
b2	4	Intake Wall	⌐	3	2'-6"	5.0	9"
f1	4	Bottom	—	3	4'-9"	9.5	9"
f2	4	Bottom	—	4	1'-7"	4.2	18"
g1	4	Wall	—	5	Varies*	Varies*	12"
g2	4	Wall	—	1	4'-8"	3.1	-
g3	4	Top	⌐	4	Varies**	Varies**	18"
g4	4	Top	—	3	6'-4"	12.7	-
g5	4	Top	⌐	4	Varies**	Varies**	18"







SUDAS IOWA DOT

REVISION	
5	10-20-20

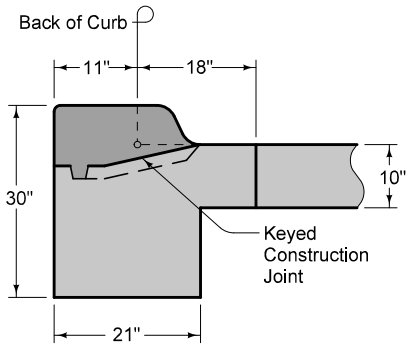
FIGURE 6010.542 | STANDARD ROAD PLAN | SW-542 | SHEET 1 of 4

REVISIONS: Removed Interim from standard.

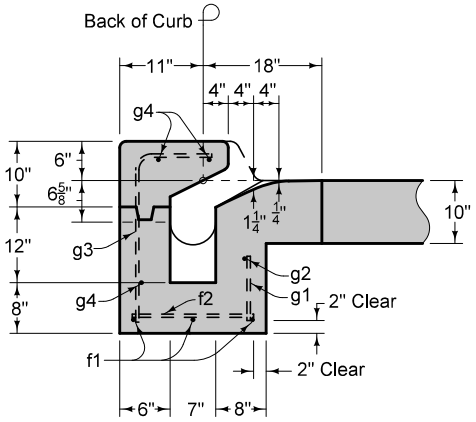
Paul D. Wigard, SUDAS DIRECTOR | Stuart Nicholson, DESIGN METHODS ENGINEER

EXTENSION UNIT FOR OPEN-THROAT CURB INTAKE UNDER PAVEMENT

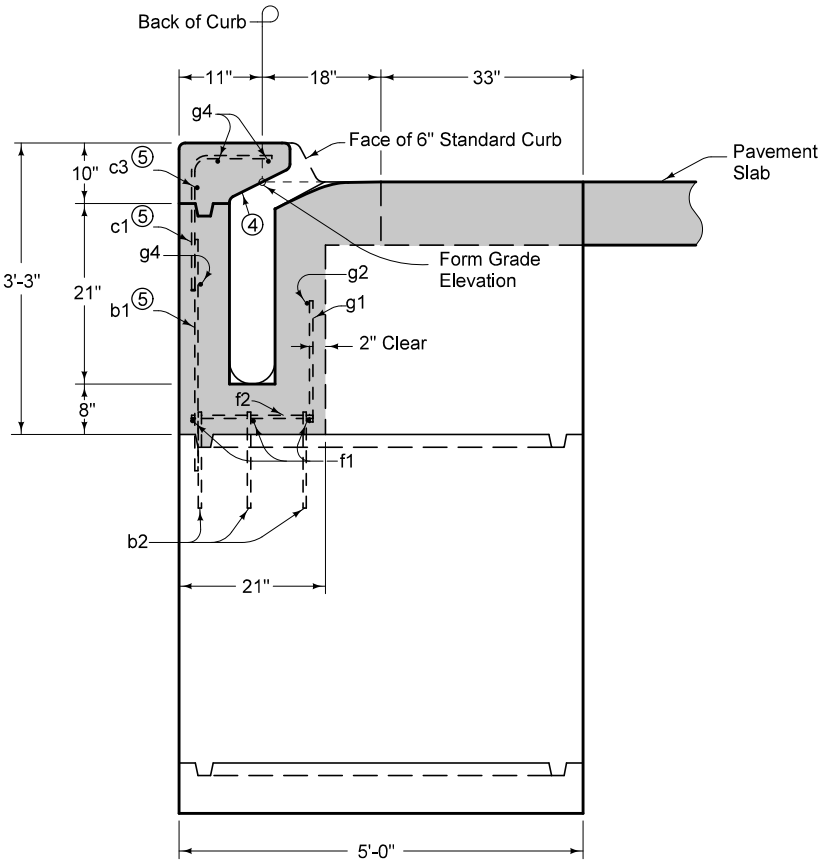
FIGURE 6010.542 | SHEET 1 OF 4



SECTION A-A



SECTION B-B



SECTION C-C

④ 2:1 Slope (Horizontal:Vertical)

⑤ See SW-541 for reinforcing.

6 INCH STANDARD CURB

FIGURE 6010.542 SHEET 2 OF 4

SUDAS IOWADOT

REVISION	
5	10-20-20

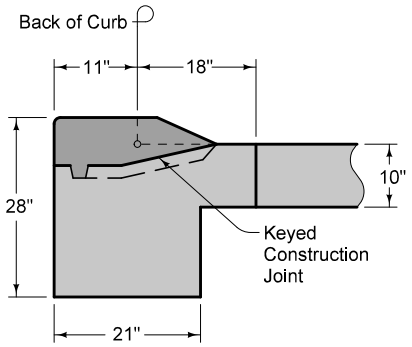
FIGURE 6010.542 | STANDARD ROAD PLAN | SW-542 | SHEET 2 of 4

REVISIONS: Removed Interim from standard.

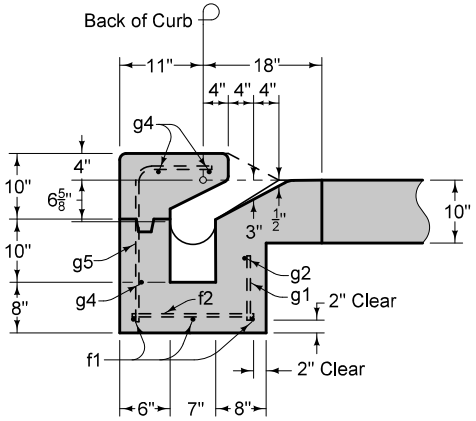
Paul D. Wigand
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

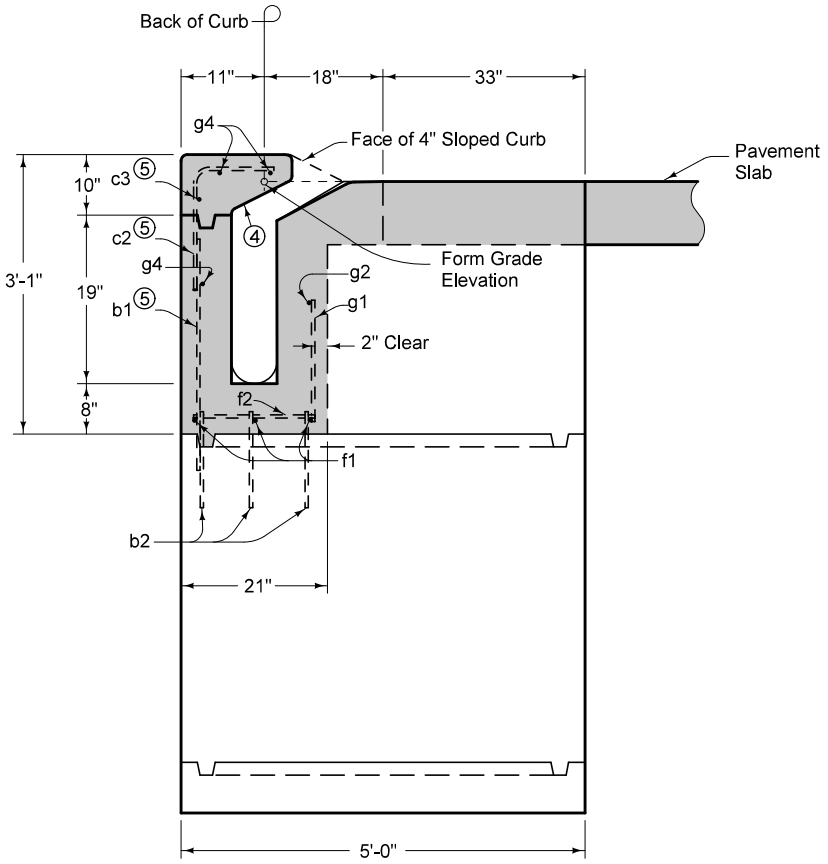
EXTENSION UNIT FOR OPEN-THROAT CURB INTAKE UNDER PAVEMENT



SECTION A-A



SECTION B-B



SECTION C-C

④ 2:1 Slope (Horizontal:Vertical)

⑤ See SW-541 for reinforcing.

4 INCH SLOPED CURB

FIGURE 6010.542 SHEET 3 OF 4

SUDAS IOWA DOT

REVISION	
5	10-20-20

FIGURE 6010.542 | STANDARD ROAD PLAN

SW-542

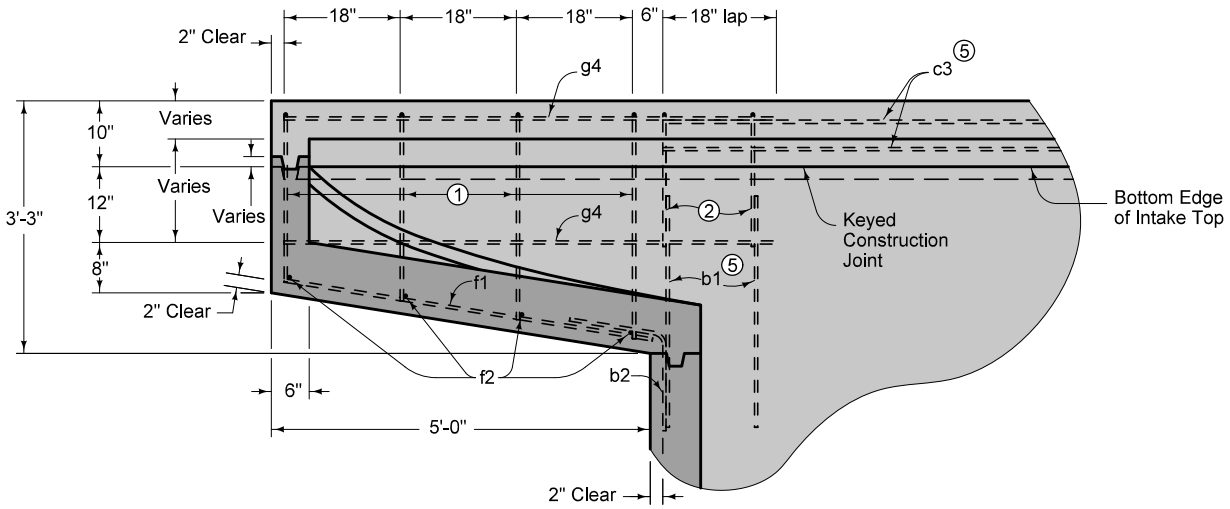
SHEET 3 of 4

REVISIONS: Removed Interim from standard.

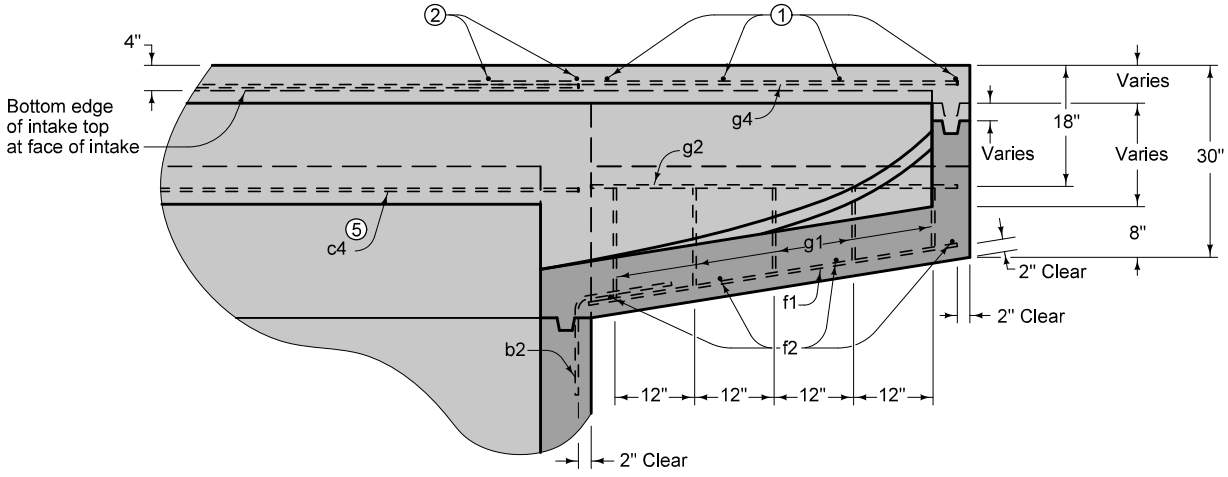
Paul D. Wigand
SUDAS DIRECTOR

DESIGN METHODS ENGINEER

EXTENSION UNIT FOR OPEN-THROAT CURB INTAKE UNDER PAVEMENT



SECTION D-D



SECTION E-E

① g3 for 6 inch standard curb; g5 for 4 inch sloped curb.

② c1 for 6 inch standard curb; c2 for 4 inch sloped curb. See SW-541 for reinforcing.

⑤ See SW-541 for reinforcing.

FIGURE 6010.542 SHEET 4 OF 4

SUDAS IOWADOT

REVISION	
5	10-20-20

FIGURE 6010.542 | STANDARD ROAD PLAN

SW-542

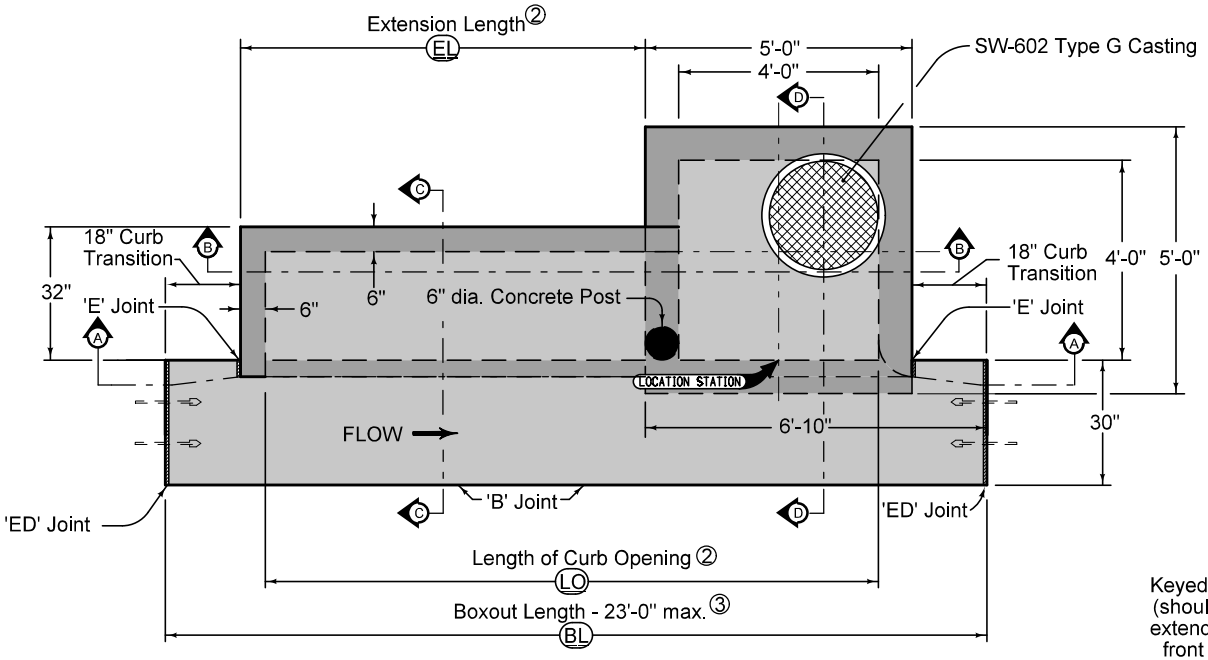
SHEET 4 of 4

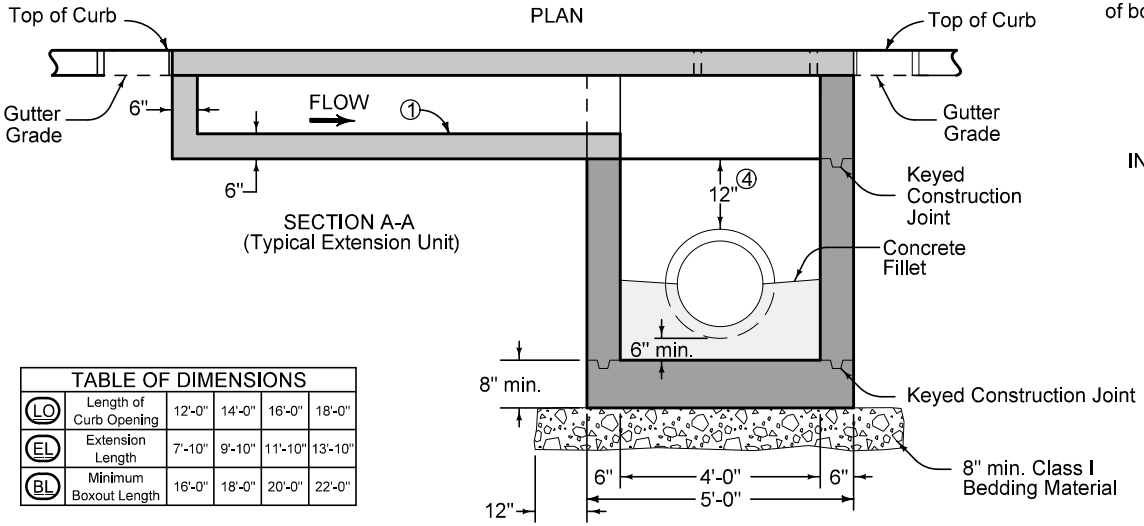
REVISIONS: Removed Interim from standard.

Paul D. Wigant
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

EXTENSION UNIT FOR OPEN-THROAT CURB INTAKE UNDER PAVEMENT

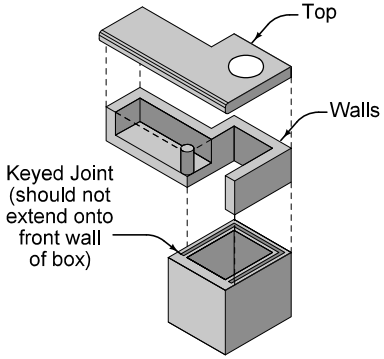




SECTION A-A
(Typical Extension Unit)

SECTION B-B
(Typical Intake Well)

TABLE OF DIMENSIONS					
LO	Length of Curb Opening	12'-0"	14'-0"	16'-0"	18'-0"
EL	Extension Length	7'-10"	9'-10"	11'-10"	13'-10"
BL	Minimum Boxout Length	16'-0"	18'-0"	20'-0"	22'-0"



ISOMETRIC
INTAKE WELL, WALLS AND TOP

Extension unit may be used on either or both sides of intake. Details are similar when extension unit is on the opposite side. For joint details, refer to PV-101.

① Match gutter slope. Drain to well.

② Other lengths of opening may be constructed by varying the length of the extension and the rebar.

③ Includes 2 inches for 'ED' Joints.

④ 12 inch minimum wall height above all pipes.

MAXIMUM PIPE DIAMETERS	
Precast Structure	Cast-in-place Structure
30"	36"

FIGURE 6010.545 SHEET 1 OF 4

SUDAS | IOWA DOT

REVISION 6 04-19-22

FIGURE 6010.545 | STANDARD ROAD PLAN | SW-545

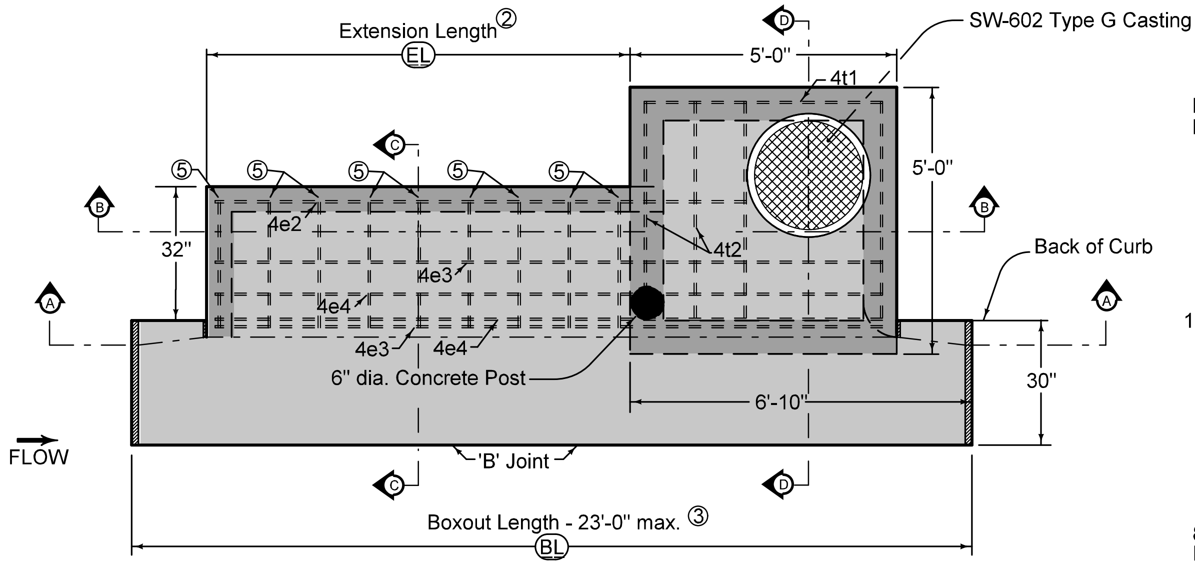
SHEET 1 of 4

REVISIONS: Clarified labeling of rebar.

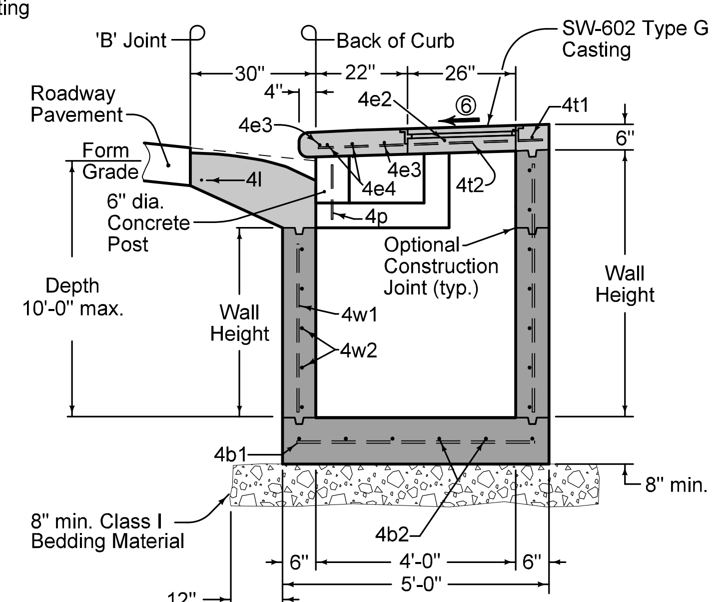
Paul D. Wigard
SUDAS DIRECTOR

DESIGN METHODS ENGINEER

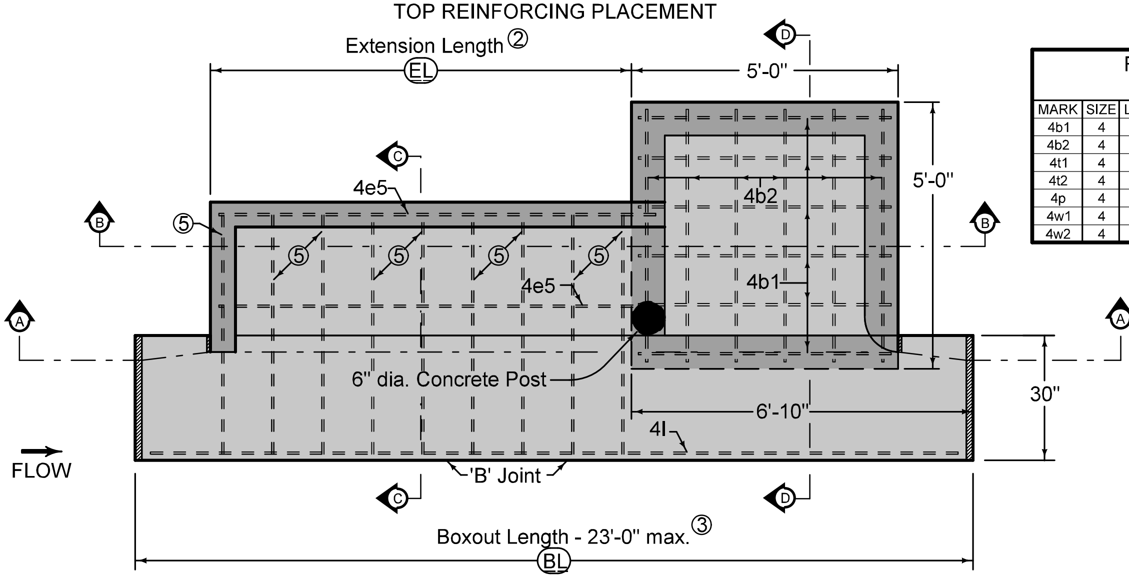
SINGLE OPEN-THROAT CURB INTAKE WITH EXTENDED OPENING



PLAN
TOP REINFORCING PLACEMENT



SECTION D-D



PLAN
BOTTOM REINFORCING PLACEMENT

REINFORCING BAR LIST Intake Well					
MARK	SIZE	LOCATION	NO.	LENGTH	SPACING
4b1	4	Base	6	4'-6"	11"
4b2	4	Base	6	4'-6"	11"
4t1	4	Top	1	4'-8"	12"
4t2	4	Top	4	4'-3"	See Detail
4p	4	Post	1	13"	
4w1	4	Walls	16	Wall Height minus 4"	14"
4w2	4	Walls	Varies	4'-8"	12"

② Other lengths of opening may be constructed by varying the length of the extension and the rebar.

③ Includes 2 inches for 'ED' Joints.

⑤ 4e1 or 4e6. See Sheets 3 and 4.

⑥ Slope of 1.5% or as specified in the contract documents.

SUDAS | IOWADOT | REVISION 6 04-19-22

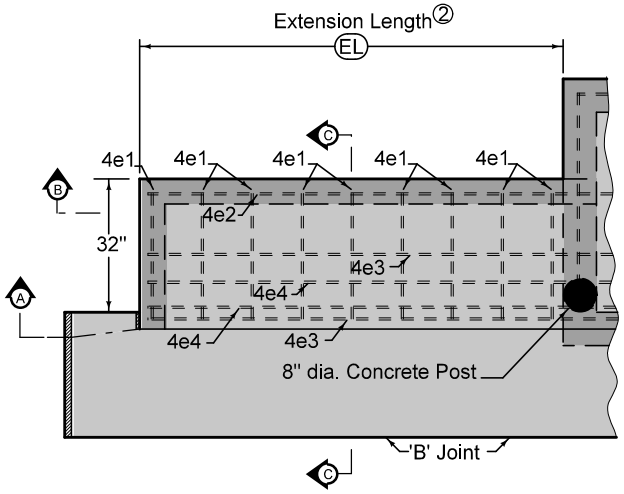
FIGURE 6010.545 | STANDARD ROAD PLAN | SW-545

SHEET 2 of 4

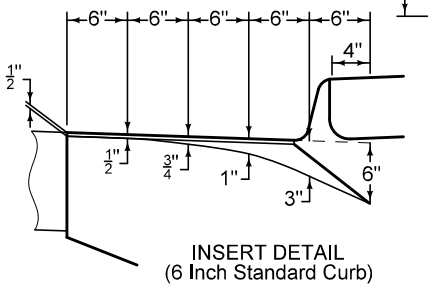
REVISIONS: Clarified labeling of rebar.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

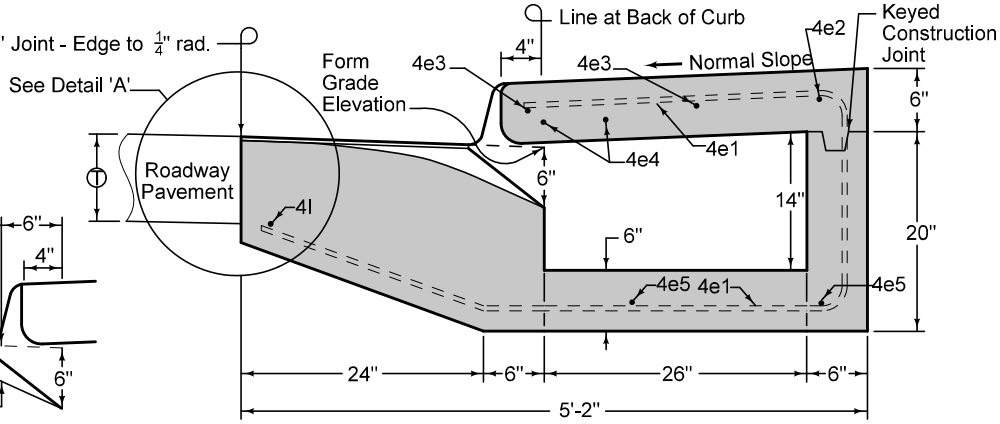
SINGLE OPEN-THROAT CURB INTAKE WITH EXTENDED OPENING



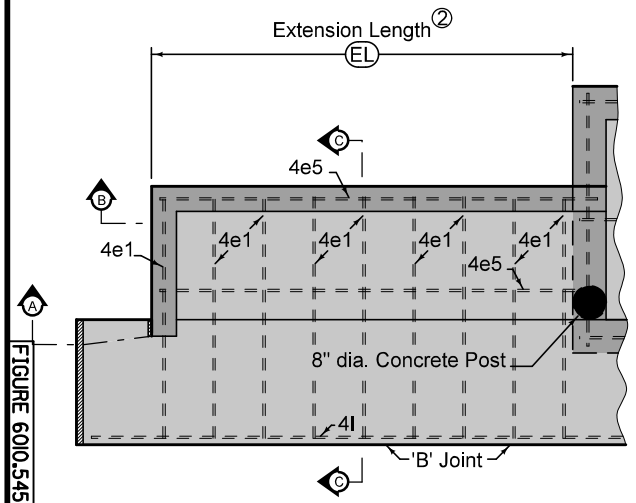
PLAN
TOP OF EXTENSION REINFORCING PLACEMENT



INSERT DETAIL
(6 Inch Standard Curb)



SECTION C-C
(6 Inch Standard Curb)



PLAN
BOTTOM OF EXTENSION REINFORCING PLACEMENT

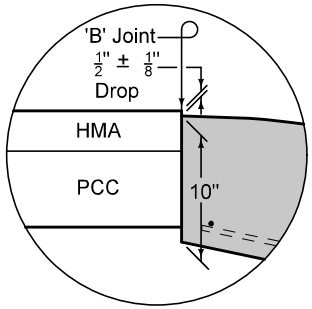
REINFORCING BAR LIST (LO) = 12'-0"						
MARK	SIZE	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4e1	4	Top/Base	9	9'-5½"	56.9	12"
4e2	4	Top	1	10'-0"	6.7	
4e3	4	Top	2	12'-9"	17.0	15½"
4e4	4	Top	2	12'-9"	17.0	6"
4e5	4	Base	2	8'-2"	10.9	22"
4l*	4	Insert	1	15'-10"	10.6	
* With 16'-6" Boxout.				Total	119.1 lbs.	

REINFORCING BAR LIST (LO) = 14'-0"						
MARK	SIZE	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4e1	4	Top/Base	11	9'-5½"	69.5	12"
4e2	4	Top	1	12'-0"	8.0	
4e3	4	Top	2	14'-9"	19.7	15½"
4e4	4	Top	2	14'-9"	19.7	6"
4e5	4	Base	2	10'-2"	13.6	22"
4l*	4	Insert	1	17'-10"	11.9	
* With 18'-6" Boxout.				Total	142.4 lbs.	

REINFORCING BAR LIST (LO) = 16'-0"						
MARK	SIZE	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4e1	4	Top/Base	13	9'-5½"	82.1	12"
4e2	4	Top	1	14'-0"	9.3	
4e3	4	Top	2	16'-9"	22.4	15½"
4e4	4	Top	2	16'-9"	22.4	6"
4e5	4	Base	2	12'-2"	16.2	22"
4l*	4	Insert	1	19'-10"	13.2	
* With 20'-6" Boxout.				Total	165.6 lbs.	

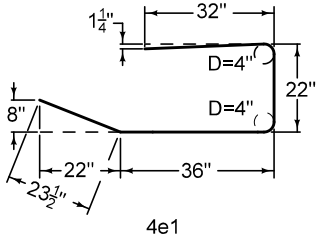
REINFORCING BAR LIST (LO) = 18'-0"						
MARK	SIZE	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4e1	4	Top/Base	15	9'-5½"	94.8	12"
4e2	4	Top	1	16'-0"	10.7	
4e3	4	Top	2	18'-9"	25	15½"
4e4	4	Top	2	18'-9"	25	6"
4e5	4	Base	2	14'-2"	18.9	22"
4l*	4	Insert	1	21'-10"	14.6	
* With 22'-6" Boxout.				Total	189.0 lbs.	

6 INCH STANDARD CURB



DETAIL 'A'
Use when adjacent pavement is HMA or composite.

BENT BAR DETAILS



4e1

NOTE: ALL DIMENSIONS ARE OUT TO OUT
D = PIN DIAMETER

② Other lengths of opening may be constructed by varying the length of the extension and the rebar.

SUDAS | IOWADOT | REVISION 6 04-19-22

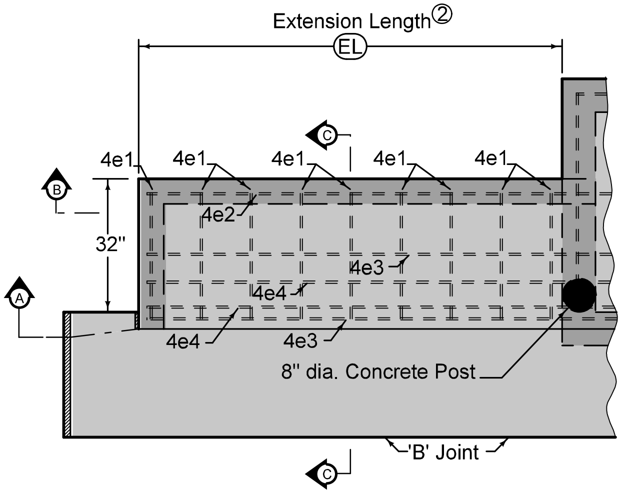
FIGURE 6010.545 | STANDARD ROAD PLAN | SW-545 | SHEET 3 of 4

REVISIONS: Clarified labeling of rebar.

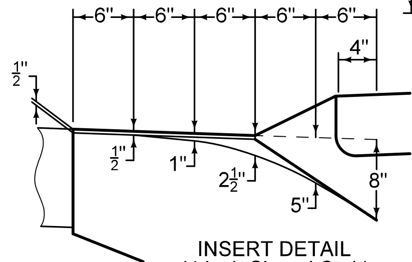
Paul D. Wigard, SUDAS DIRECTOR | DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE WITH EXTENDED OPENING

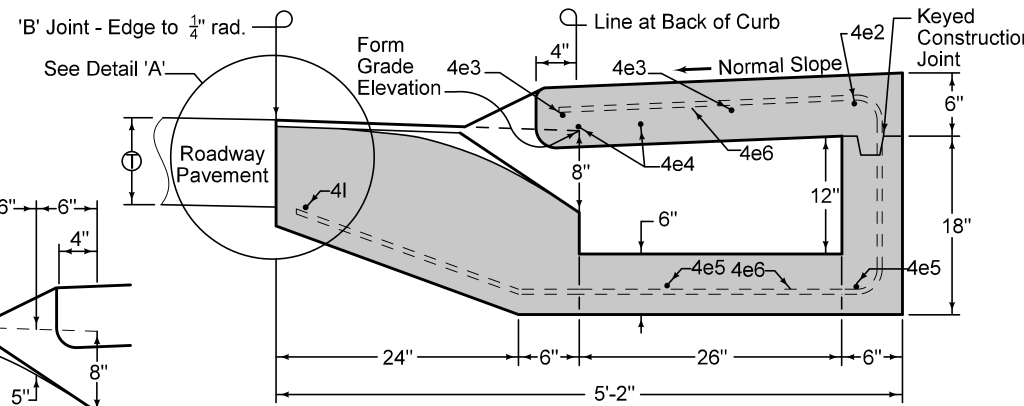
FIGURE 6010.545 | SHEET 3 OF 4



PLAN
TOP OF EXTENSION REINFORCING PLACEMENT



INSERT DETAIL
(4 Inch Sloped Curb)



SECTION C-C
(4 Inch Sloped Curb)

REINFORCING BAR LIST (LO) = 12'-0"

MARK	SIZE	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4e2	4	Top	1	10'-0"	6.7	
4e3	4	Top	2	12'-9"	17.0	15½"
4e4	4	Top	2	12'-9"	17.0	6"
4e5	4	Base	2	8'-2"	10.9	22"
4e6	4	Top/Base	9	9'-3½"	56.9	12"
4l*	4	Insert	1	15'-10"	10.6	
* With 16'-6" Boxout.				Total	119.0 lbs.	

REINFORCING BAR LIST (LO) = 14'-0"

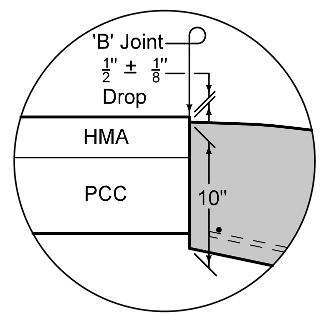
MARK	SIZE	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4e2	4	Top	1	12'-0"	8.0	
4e3	4	Top	2	14'-9"	19.7	15½"
4e4	4	Top	2	14'-9"	19.7	6"
4e5	4	Base	2	10'-2"	13.6	22"
4e6	4	Top/Base	11	9'-3½"	69.5	12"
4l*	4	Insert	1	17'-10"	11.9	
* With 18'-6" Boxout.				Total	142.3 lbs.	

REINFORCING BAR LIST (LO) = 16'-0"

MARK	SIZE	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4e2	4	Top	1	14'-0"	9.3	
4e3	4	Top	2	16'-9"	22.4	15½"
4e4	4	Top	2	16'-9"	22.4	6"
4e5	4	Base	2	12'-2"	16.2	22"
4e6	4	Top/Base	13	9'-3½"	82.1	12"
4l*	4	Insert	1	19'-10"	13.2	
* With 20'-6" Boxout.				Total	165.5 lbs.	

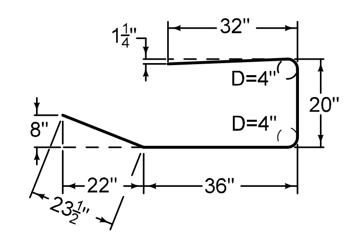
REINFORCING BAR LIST (LO) = 18'-0"

MARK	SIZE	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4e2	4	Top	1	16'-0"	10.7	
4e3	4	Top	2	18'-9"	25	15½"
4e4	4	Top	2	18'-9"	25	6"
4e5	4	Base	2	14'-2"	18.9	22"
4e6	4	Top/Base	15	9'-3½"	94.8	12"
4l*	4	Insert	1	21'-10"	14.6	
* With 22'-6" Boxout.				Total	188.9 lbs.	



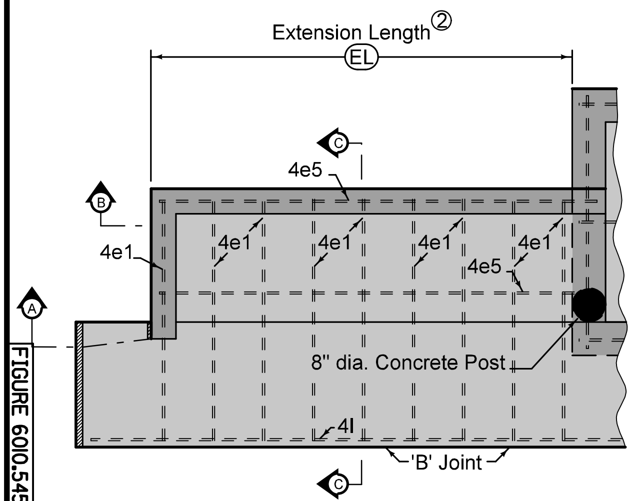
DETAIL 'A'
Use when adjacent pavement is HMA or composite.

BENT BAR DETAILS



4e6

NOTE: ALL DIMENSIONS ARE OUT TO OUT
D = PIN DIAMETER



PLAN
BOTTOM OF EXTENSION REINFORCING PLACEMENT

② Other lengths of opening may be constructed by varying the length of the extension and the rebar.

4 INCH SLOPED CURB

SUDAS | IOWA DOT

REVISION 6 04-19-22

FIGURE 6010.545 | STANDARD ROAD PLAN | SW-545 | SHEET 4 of 4

REVISIONS: Clarified labeling of rebar.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE WITH EXTENDED OPENING

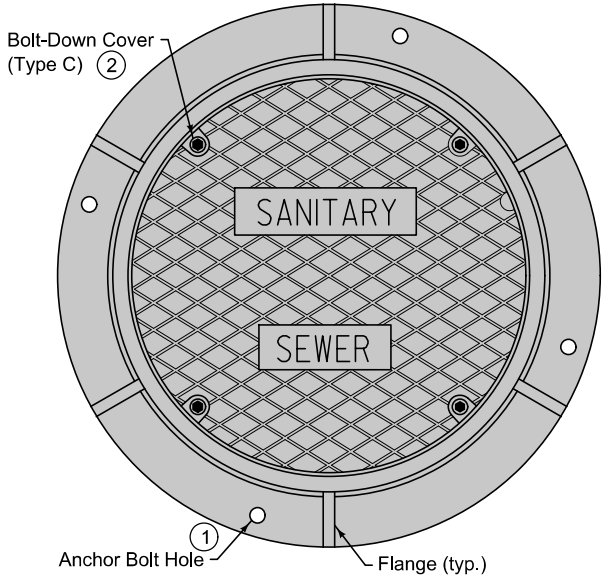
FIGURE 6010.545 SHEET 4 OF 4

TYPE A

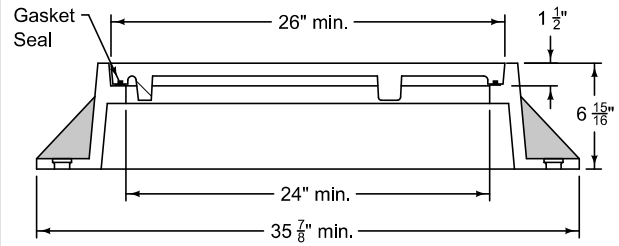
Two-piece fixed casting

TYPE C

Two-piece fixed casting with bolt-down cover (2)



PLAN



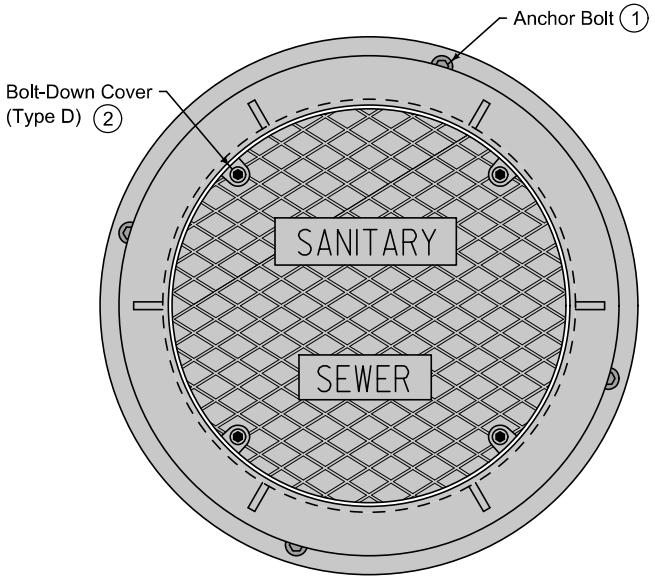
TYPICAL SECTION

TYPE B: HMA

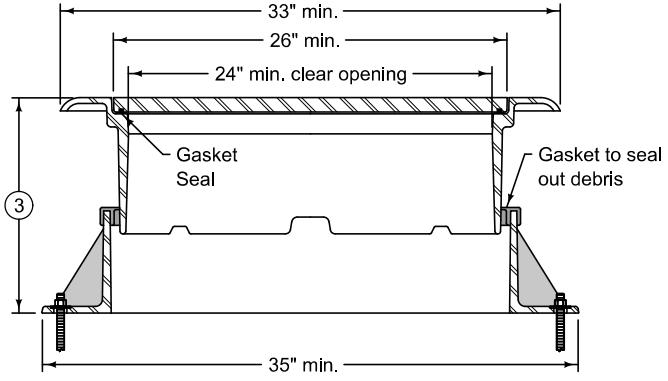
Three-piece floating casting for use in HMA paving

TYPE D: HMA

Three-piece floating casting with bolt-down cover for use in HMA paving (2)



PLAN



TYPICAL SECTION

Frame Notes:
Size, spacing, and number of lugs and flanges may vary.

Cover Notes:
Roughness pattern and text style may vary.
Minimum one concealed pickhole.

(1) Anchor the lower frame of all three-piece castings to the manhole structure. When specified in the contract documents, anchor the frame of two-piece castings to the manhole structure. If casting frame does not include anchor holes or slots, drill four 7/8 inch diameter holes, equally spaced around the frame.

(2) If specified, furnish bolt down frame and cover with four 1/2 inch minimum diameter stainless steel, hex nut, recessed cap screws. Secure cover with screws, washers, and rubber gasket seals.

(3) Casting height varies. Minimum adjustment range of 4 inches.

SUDAS	IOWA DOT	REVISION 4	04-21-20
FIGURE 6010.601	STANDARD ROAD PLAN	SW-601	SHEET 1 of 2

REVISIONS: Add option for 3-piece HMA casting

Paul D. Wigard
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

CASTINGS FOR SANITARY SEWER MANHOLES

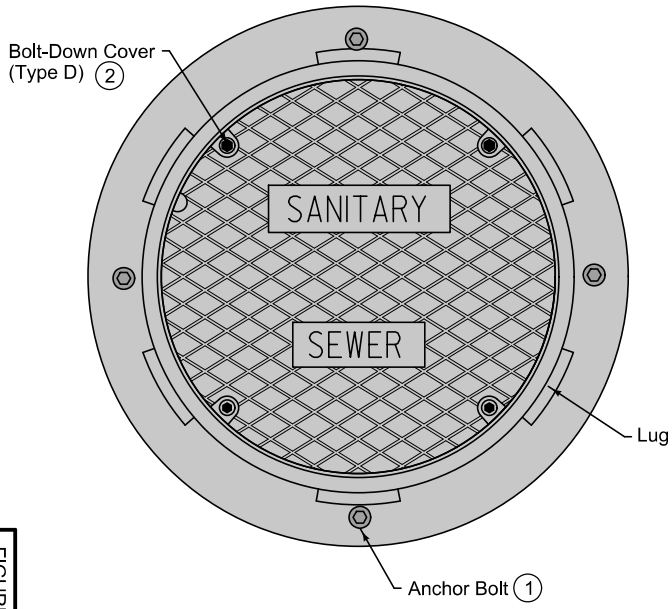
FIGURE 6010.601 | SHEET 1 OF 2

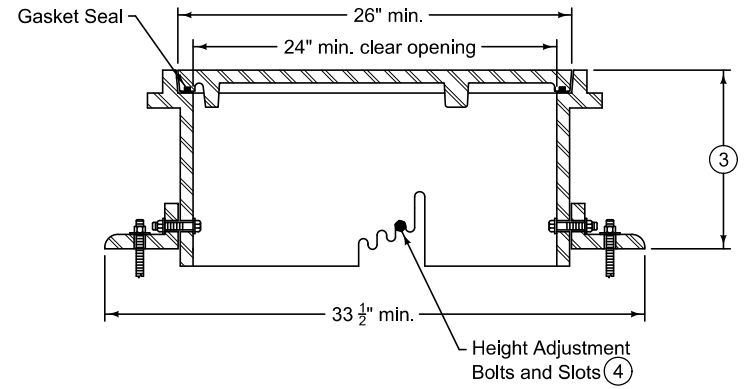
TYPE B: PCC

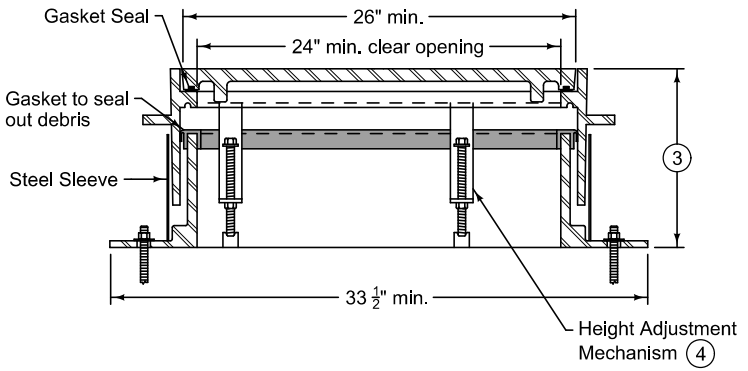
Three-piece floating casting for use in PCC paving and PCC boxouts

TYPE D: PCC

Three-piece floating casting with bolt-down cover for use in PCC paving and PCC boxouts







TYPICAL SECTION 5

Frame Notes:
Size, spacing, and number of lugs and flanges may vary.

Cover Notes:
Roughness pattern and text style may vary.
Minimum one concealed pickhole.

1. Anchor the lower frame of all three-piece castings to the manhole structure. When specified in the contract documents, anchor the frame of two-piece castings to the manhole structure. If casting frame does not include anchor holes or slots, drill four 7/8 inch diameter holes, equally spaced around the frame.
2. If specified, furnish bolt down frame and cover with four 1/2 inch minimum diameter stainless steel, hex nut, recessed cap screws. Secure cover with screws, washers, and rubber gasket seals.
3. Casting height varies. Minimum adjustment range of 4 inches.
4. Set casting at proper grade using the adjustment slots or adjustment mechanism. Remove bolts or mechanism upon completion of paving.
5. Height adjustment method may vary; two options are shown.

SUDAS	IOWADOT	REVISION 4	04-21-20
FIGURE 6010.601	STANDARD ROAD PLAN	SW-601	SHEET 2 of 2

REVISIONS: Add option for 3-piece HMA casting

Paul D. Wigand
SUDAS DIRECTOR

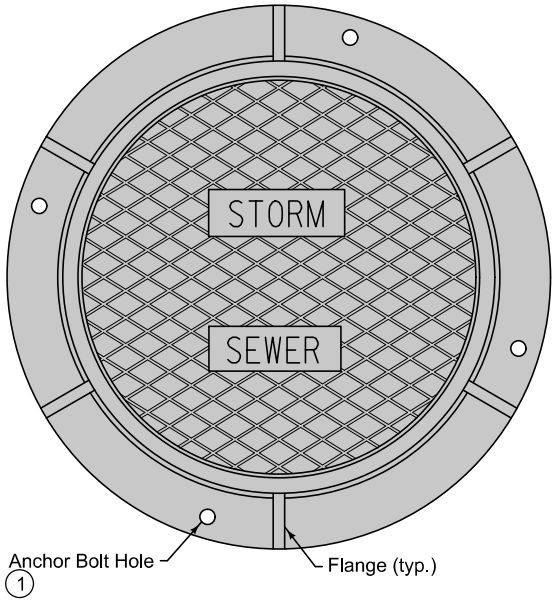
Stuart Nicholson
DESIGN METHODS ENGINEER

CASTINGS FOR SANITARY SEWER MANHOLES

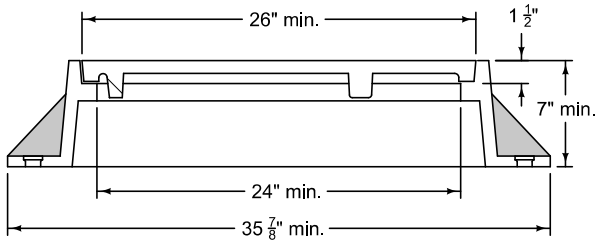
FIGURE 6010.601 | SHEET 2 OF 2

TYPE E

Two-piece fixed casting



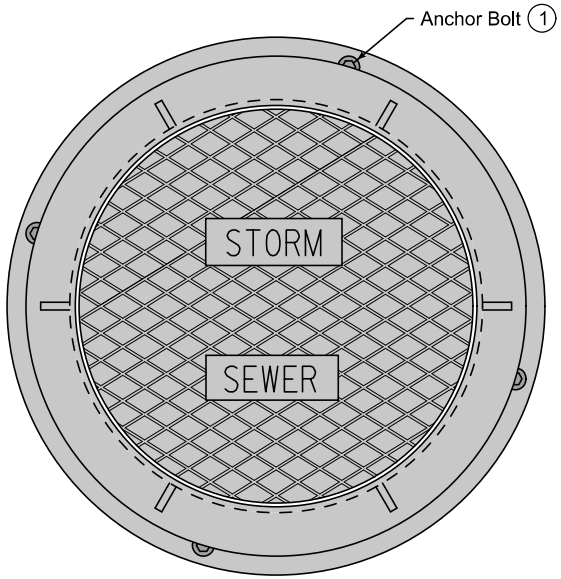
PLAN



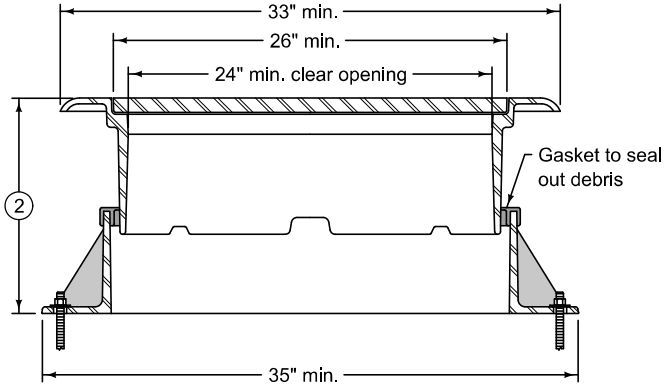
TYPICAL SECTION

TYPE F: HMA

Three-piece floating casting for use in HMA paving



PLAN



TYPICAL SECTION

Frame Notes:
Size, spacing, and number of lugs and flanges may vary.

Cover Notes:
Roughness pattern and text style may vary.
Minimum one pickhole.

(1) Anchor the lower frame of all three-piece castings to the manhole structure. When specified in the contract documents, anchor the frame of two-piece castings to the manhole structure. If casting frame does not include anchor holes or slots, drill four 7/8 inch diameter holes, equally spaced around the frame.

(2) Casting height varies. Minimum adjustment range of 4 inches.

FIGURE 6010.602 | SHEET 1 OF 3

SUDAS | IOWADOT | REVISION 4 | 04-21-20

FIGURE 6010.602 | STANDARD ROAD PLAN | SW-602 | SHEET 1 of 3

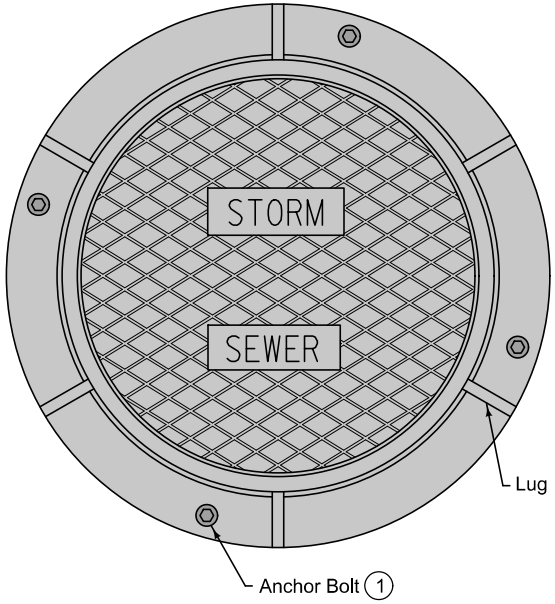
REVISIONS: Add option for 3-piece HMA casting

Paul D. Wigand, SUDAS DIRECTOR
Stuart Nicholson, DESIGN METHODS ENGINEER

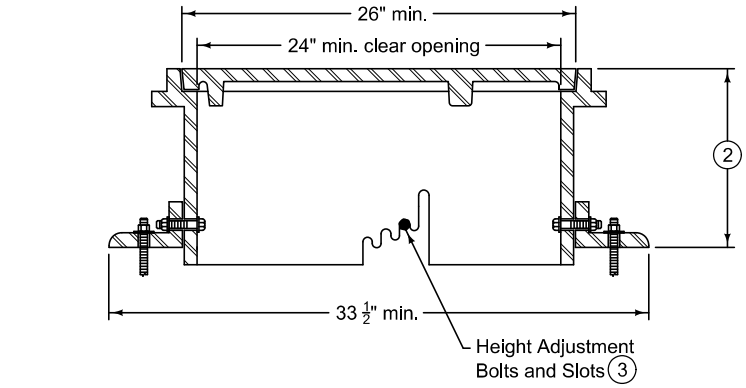
CASTINGS FOR STORM SEWER MANHOLES

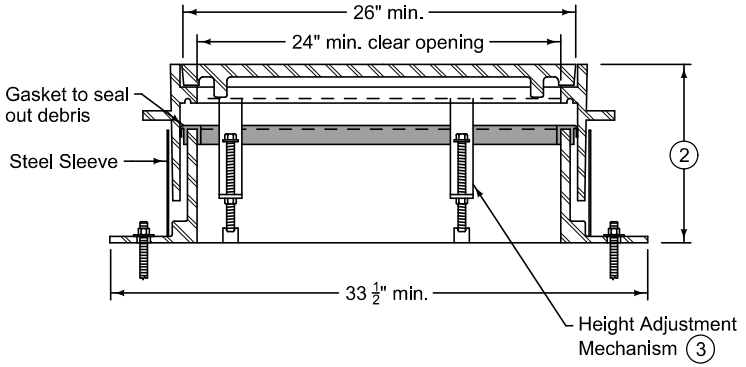
TYPE F: PCC

Three-piece floating casting for use in PCC paving and PCC boxouts



PLAN





TYPICAL SECTION (4)

Frame Notes:
Size, spacing, and number of lugs and flanges may vary.

Cover Notes:
Roughness pattern and text style may vary.
Minimum one pickhole.

(1) Anchor the lower frame of all three-piece castings to the manhole structure. When specified in the contract documents, anchor the frame of two-piece castings to the manhole structure. If casting frame does not include anchor holes or slots, drill four 7/8 inch diameter holes, equally spaced around the frame.

(2) Casting height varies. Minimum adjustment range of 4 inches.

(3) Set casting at proper grade using the adjustment slots or adjustment mechanism. Remove bolts or mechanism upon completion of paving.

(4) Height adjustment method may vary; two options are shown.

FIGURE 6010.602 | SHEET 2 OF 3

SUDAS	IOWA DOT	REVISION 4	04-21-20
FIGURE 6010.602	STANDARD ROAD PLAN	SW-602	SHEET 2 of 3

REVISIONS: Add option for 3-piece HMA casting

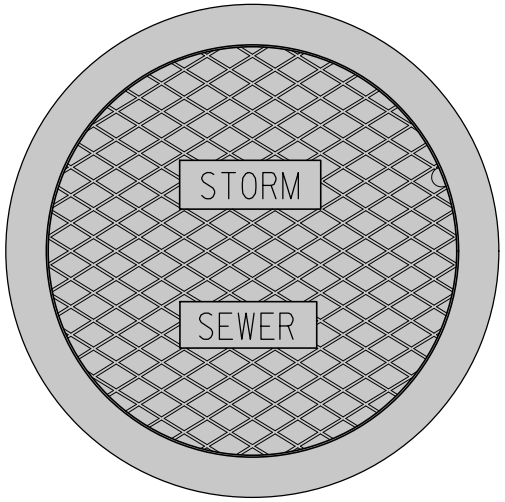
Paul D. Wigand
SUDAS DIRECTOR

Stuart Nicholson
DESIGN METHODS ENGINEER

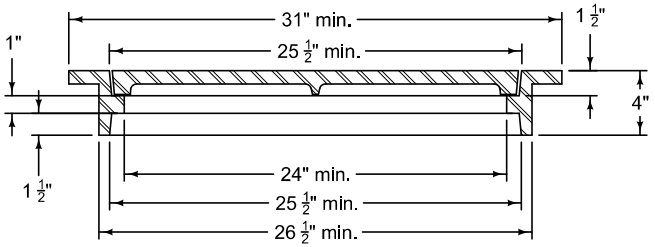
CASTINGS FOR STORM SEWER MANHOLES

TYPE G

Two piece fixed casting



PLAN



TYPICAL SECTION

Cover Notes:
Roughness pattern and text style may vary.
Minimum one pickhole.

SUDAS	IOWA DOT	REVISION 4 04-21-20
FIGURE 6010.602	STANDARD ROAD PLAN	SW-602
		SHEET 3 of 3

REVISIONS: Add option for 3-piece HMA casting

Paul D. Wigand — SUDAS DIRECTOR

Stuart Nicholson — DESIGN METHODS ENGINEER

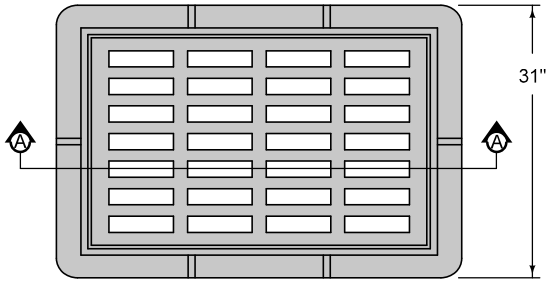
CASTINGS FOR STORM SEWER MANHOLES

FIGURE 6010.602 | SHEET 3 OF 3

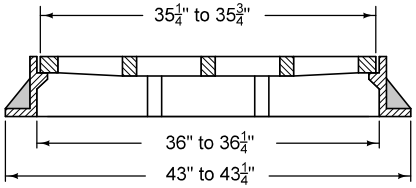
TYPE Q (1)

Driveway Grate

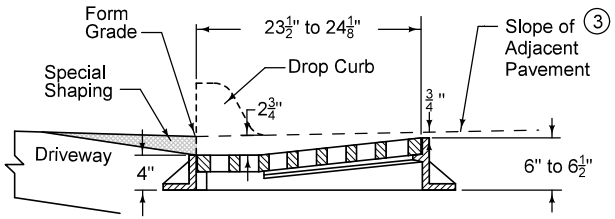
(Minimum open area 370 in^2)



PLAN



SECTION A-A

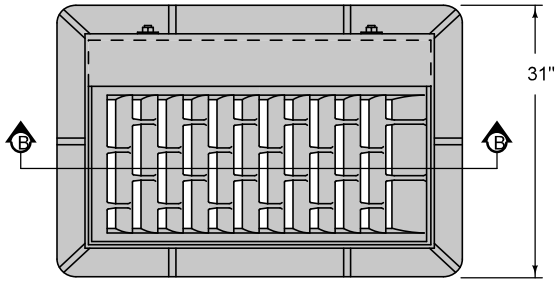


TYPICAL SECTION

TYPE R (2)

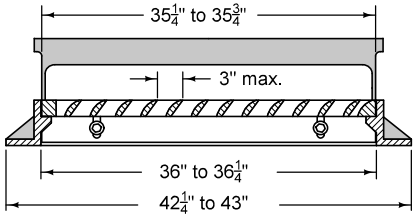
Curb Inlet Grade

(Minimum open area 180 in^2)

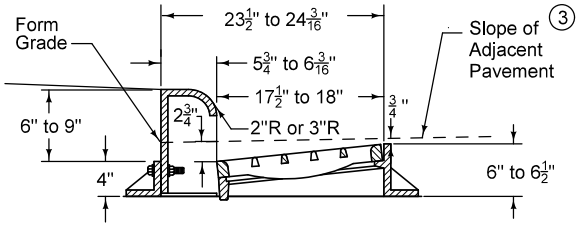


PLAN

Flow



SECTION B-B



TYPICAL SECTION

1. For use at curb drops for driveways. Use only when specified in the contract documents.
2. Provide bicycle-safe vane-style grate. At low points, grates with vanes facing both directions of flow are allowed.
3. For details of boxout pavement, refer to SW-514.

SUDAS	IOWA DOT	REVISION 6 10-16-18
FIGURE 6010.603	STANDARD ROAD PLAN	SW-603
		SHEET 1 of 2

REVISIONS: Corrected typo on page two that said SHEET 1 of 2.

Paul D. Wigant — SUDAS DIRECTOR

Brian Smith — DESIGN METHODS ENGINEER

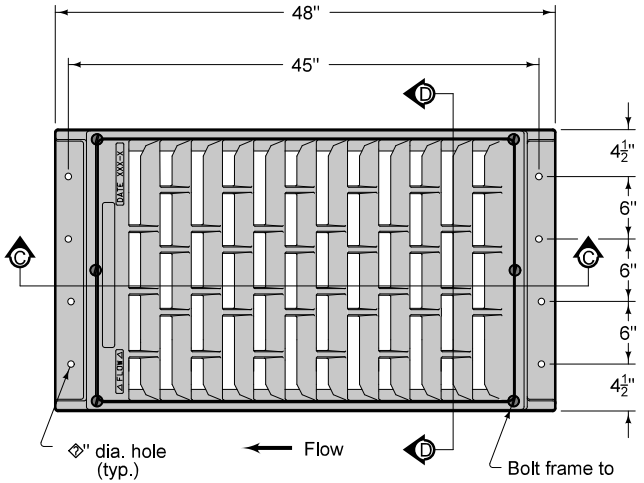
CASTINGS FOR GRATE INTAKES

FIGURE 6010.603 SHEET 1 OF 2

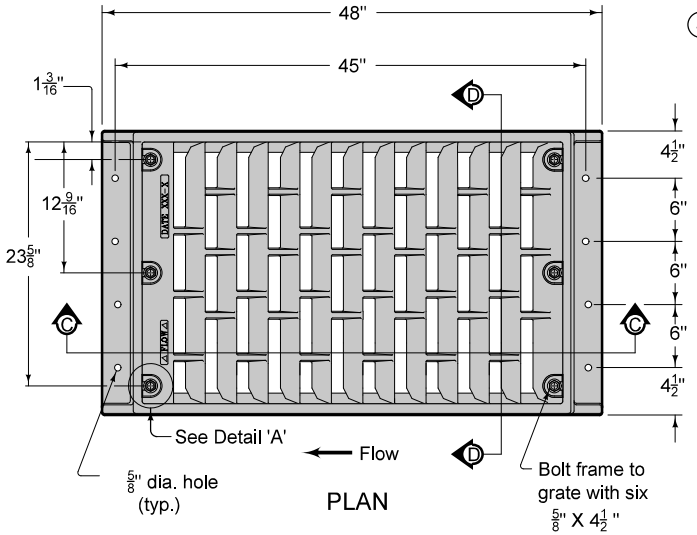
TYPE S ②④

Barrier Intake Grate

(Minimum open area 300 in^2)



PLAN

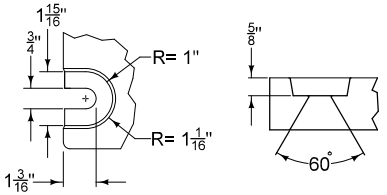


PLAN

② Provide bicycle-safe vane-style grate. At low points, grates with vanes facing both directions of flow are allowed. The Contractor has the choice of which Type S Grate to use.

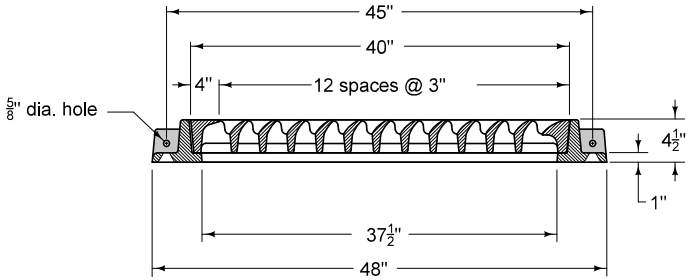
④ Use ductile iron frame castings meeting the requirements of ASTM A 536.

Frame minimum weight = 220 lbs.
Grate minimum weight = 340 lbs.

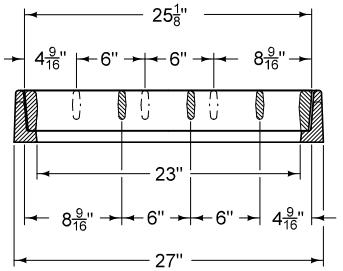


DETAIL'A'

Bolt Slot Detail



SECTION C-C



SECTION D-D

SUDAS	IOWADOT	REVISION 6 10-16-18
FIGURE 6010.603	STANDARD ROAD PLAN	SW-603 SHEET 2 of 2

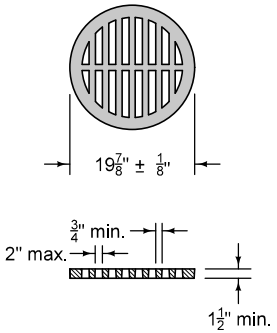
REVISIONS: Corrected typo on page two that said SHEET 1 of 2.

Paul D. Wigand, SUDAS DIRECTOR — Brian Smith, DESIGN METHODS ENGINEER

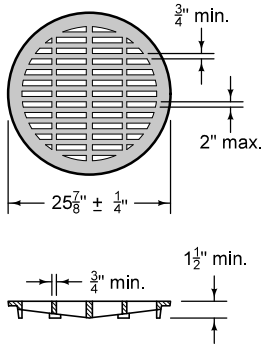
CASTINGS FOR GRATE INTAKES

FIGURE 6010.603 SHEET 2 OF 2

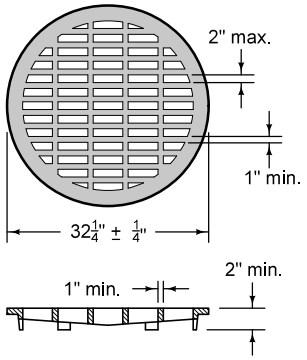
TYPE 4



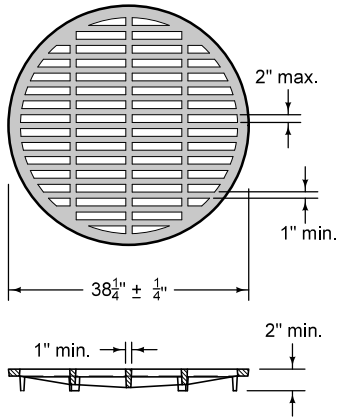
TYPE 4A
For Placement on 18" RCP



TYPE 4B
For Placement on 24" RCP

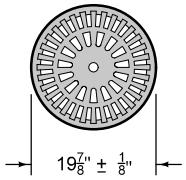


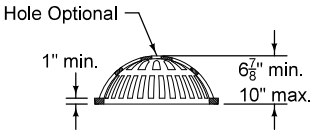
TYPE 4C
For Placement on 30" RCP



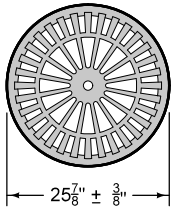
TYPE 4D
For Placement on 36" RCP

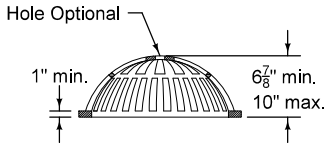
TYPE 3
(Light Duty)





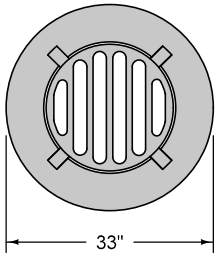
TYPE 3A
For Placement on 18" RCP





TYPE 3B
For Placement on 24" RCP

TYPE 5
(Light Duty)
For Placement on 24" to 30" RCP



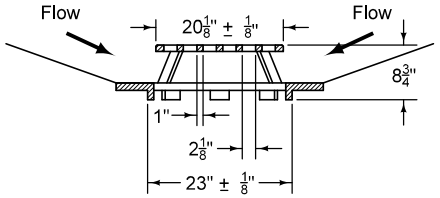


FIGURE 6010.604 SHEET 1 OF 2

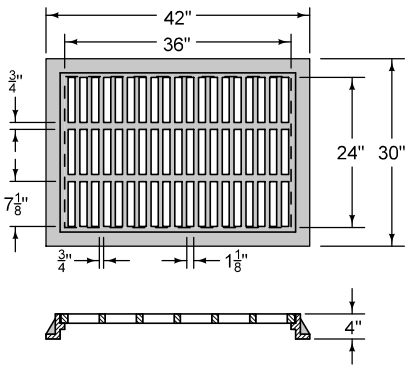
SUDAS	IOWA DOT	REVISION 3 04-21-20
FIGURE 6010.604	STANDARD ROAD PLAN	SW-604
		SHEET 1 of 2

REVISIONS: Added Type 7 casting. Modified circle notes.

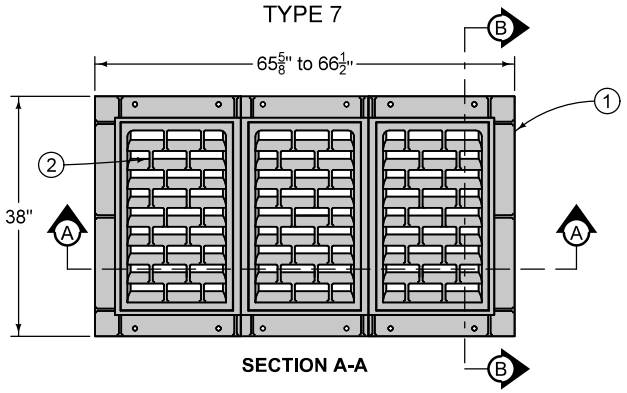
Paul D. Wigard, SUDAS DIRECTOR — DESIGN METHODS ENGINEER

CASTINGS FOR AREA INTAKES

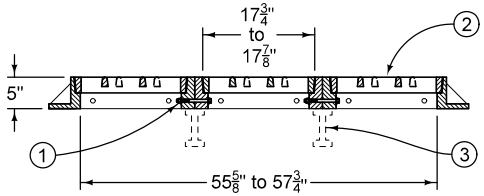
TYPE 6



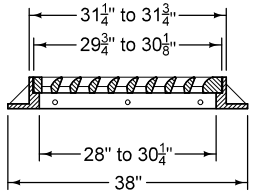
TYPE 7



SECTION A-A



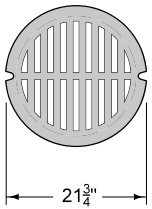
SECTION A-A

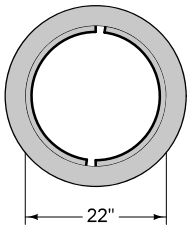


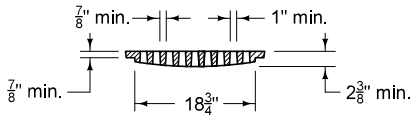
SECTION B-B

TYPE 9

(Light Duty)

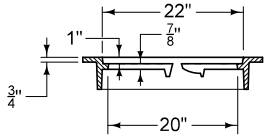






GRATE (4)

Minimum Weight = 85 lbs.



FRAME

Minimum Weight = 75 lbs.

(1) Frame provided in three segments (two ends and one center). Bolt segments together as specified by the casting manufacturer.

(2) Provide bicycle safe, vane style grates with a minimum open area of 4 square feet. At low points, grates with vanes facing both directions will be allowed.

(3) If required by casting manufacturer, provide support beam under all frame joints. Modify structure walls as required to provide pocket for beam.

(4) Cast grate without locking lugs so it may be used in an inverted position.

SUDAS	IOWADOT	REVISION 3 04-21-20
FIGURE 6010.604	STANDARD ROAD PLAN	SW-604
		SHEET 2 of 2

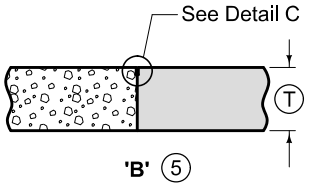
REVISIONS: Added Type 7 casting. Modified circle notes.

Paul D. Wigand
SUDAS DIRECTOR

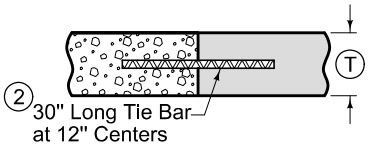
Stuart Nicholson
DESIGN METHODS ENGINEER

CASTINGS FOR AREA INTAKES

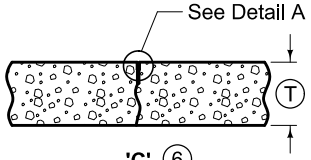
FIGURE 6010.604 SHEET 2 OF 2



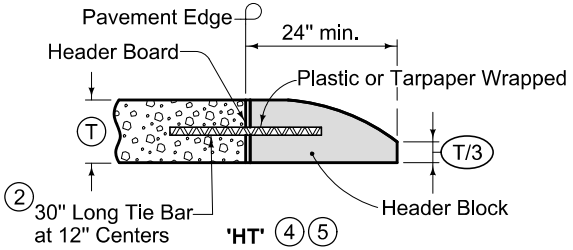
'B' (5)
PLAIN JOINT
(Abutting Pavement Slabs)



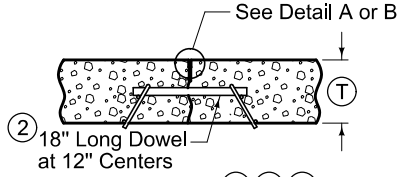
'DW' (3)(4)(7)
DAY'S WORK JOINT(Non-working)



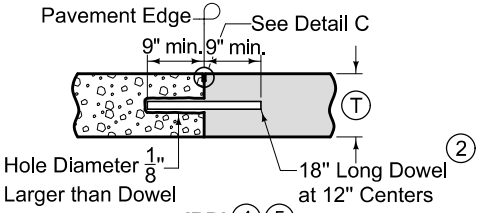
'C' (6)
CONTRACTION JOINT



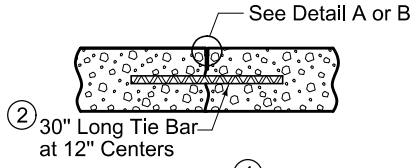
'HT' (4)(5)
HEADER JOINT
(End Rigid Pavement)



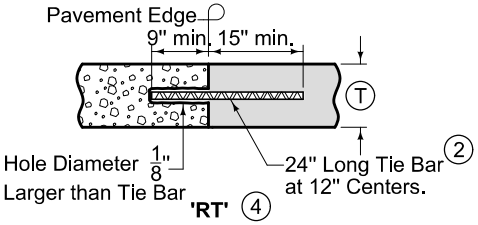
'CD' (1)(4)(6)
DOWELED CONTRACTION JOINT



'RD' (4)(5)
ABUTTING PAVEMENT JOINT

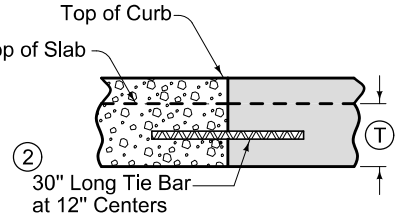


'CT' (4)
TIED CONTRACTION JOINT

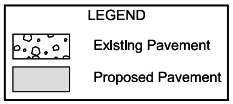


'RT' (4)
ABUTTING PAVEMENT JOINT
RIGID TIE

1. See dowel assemblies for fabrication details.
2. See Bar Size Table for Contraction Joints on Sheet 2.
3. Locate 'DW' joint at a mid-panel location between future 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.
4. Place bars within the limits shown under dowel assemblies.
5. Edge with 1/8 inch tool for length of joint. For HT joint, remove header block and board when second slab is placed.
6. Unless specified otherwise, use 'CD' transverse contraction joints in mainline pavement when (T) is greater or equal to 8 inches. Use 'C' joints when (T) is less than 8 inches.
7. 'RT' joint may be used in lieu of 'DW' joint at the end of the days work. Remove any pavement damaged due to the drilling at no additional cost to the Contracting Authority.



'DW - CG' (3)(4)
DAY'S WORK JOINT
CURB AND GUTTER UNIT



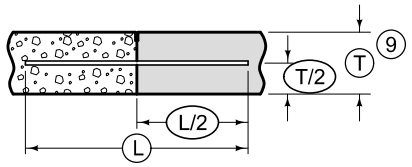
TRANSVERSE CONTRACTION JOINTS

FIGURE 7010.101 SHEET 1 OF 8

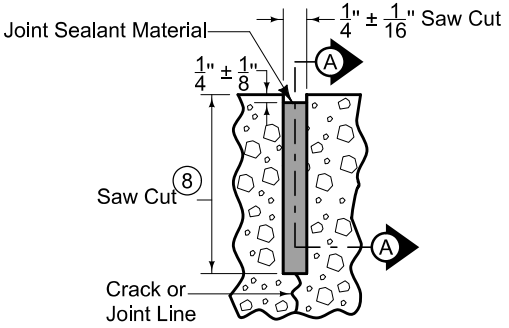
SUDAS | INTERIM | REVISION 13 01-01-26
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 1 of 8

REVISIONS: Updated SUDAS and IDOT Logo.

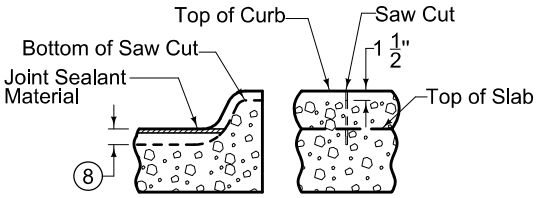
SUDAS DIRECTOR | DESIGN METHODS ENGINEER



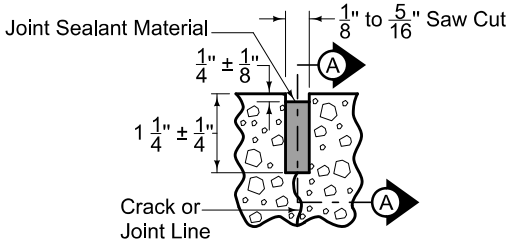
BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



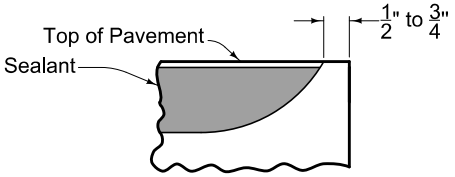
DETAIL A
(Saw cut formed by conventional concrete sawing equipment.)



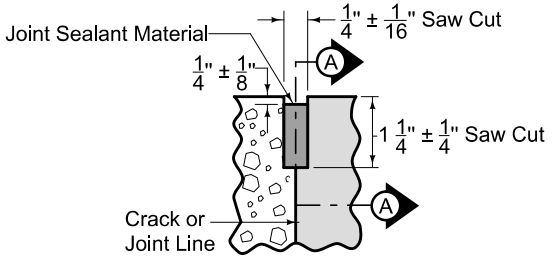
'C' JOINT IN CURB
(Match 'CT', 'CD', or 'C' joint in pavement.)



DETAIL B
(Saw cut formed by approved early concrete sawing equipment.)



SECTION A-A
(Detail at Edge of Pavement)

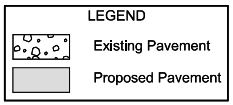


DETAIL C

(8) Saw 'CD' joint to a depth of T/3 ± 1/4"; saw 'C' joint to a depth of T/4 ± 1/4".

(9) When tying into old pavement, (T) represents the depth of sound PCC.

BAR SIZE TABLE FOR CONTRACTION JOINTS				
(T)	Solid Dowel Diameter	Tubular Dowel Diameter	Elliptical	Tie Bar Size
< 8"	3/4"	7/8"	N/A	#6
≥ 8" but < 10"	1 1/4"	1 3/8"	Small	#10
≥ 10"	1 1/2"	1 5/8"	Medium	#11
Tubular and Elliptical Dowel Bars will not be allowed for RD joints.				



SUDAS | INTERIM | REVISION 13 01-01-26
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 2 of 8

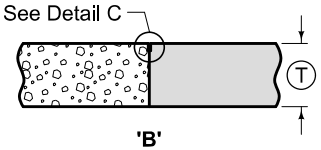
REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

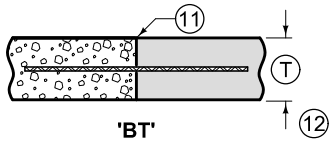
JOINTS

TRANSVERSE CONTRACTION

FIGURE 7010.101 | SHEET 2 OF 8

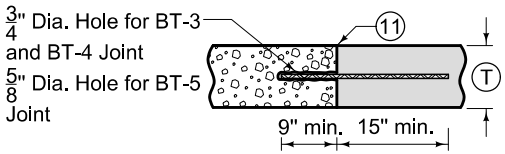


'B'
PLAIN JOINT
(Abutting Pavement Slabs)



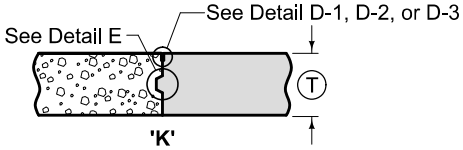
'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE

(T)	Joint	Bars	Bar Length and Spacing
< 8"	'BT-1'	#4	36" Long at 30" Centers
		#5	30" Long at 30" Centers
≥ 8"	'BT-2'	#5	36" Long at 30" Centers
	'BT-6'	#5	36" Long at 15" Centers

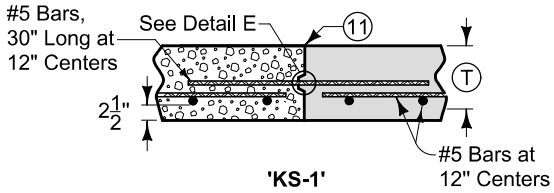


'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE (Drilled)

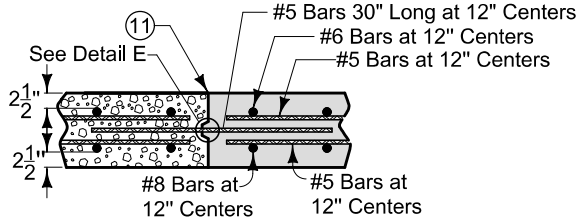
(T)	Joint	Bars	Bar Length and Spacing
< 8"	'BT-5'	#4	24" Long at 30" Centers
≥ 8"	'BT-3'	#5	24" Long at 30" Centers
	'BT-4'		24" Long at 15" Centers



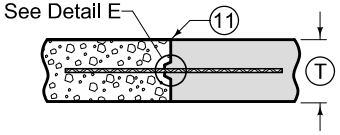
'K'
KEYED JOINT FOR ADJACENT SLABS
(Where T is 8" or more)



'KS-1'
[Single Reinforced Pavement (Bridge Approach)]



'KS-2'
[Double Reinforced Pavement (Bridge Approach)]



'KT' (10)(12)
ABUTTING PAVEMENT JOINT - KEYWAY TIE

(T)	Joint	Bars	Bar Length and Spacing
< 8"	'KT-1'	#4	30" Long at 30" Centers
≥ 8"	'KT-2'	#5	30" Long at 30" Centers
	'KT-3'		30" Long at 15" Centers

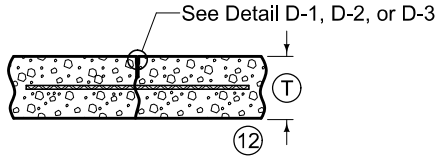
LONGITUDINAL CONTRACTION

(10) Bar supports may be necessary for fixed form paving to ensure the bar remains in a horizontal position in the plastic concrete.

(11) Sawing or sealing of joint not required.

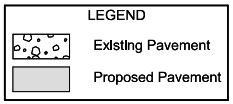
(12) The following joints are interchangeable, subject to the pouring sequence:
'L-1', 'BT-1', and 'KT-1'
'L-2', 'BT-2', and 'KT-2'
'L-3', 'BT-6', and 'KT-3'

KT joints should not be used when DOT is contracting authority.



'L'
CONTRACTION JOINT

(T)	Joint	Bars	Bar Length and Spacing
< 8"	'L-1'	#4	36" Long at 30" Centers
≥ 8"	'L-2'	#5	36" Long at 30" Centers
	'L-3'		36" Long at 15" Centers



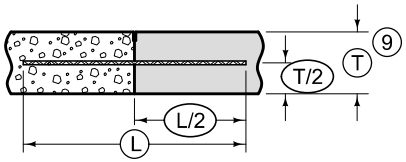
SUDAS | INTERIM | REVISION 13 01-01-26
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 3 of 8

REVISIONS: Updated SUDAS and IDOT Logo.

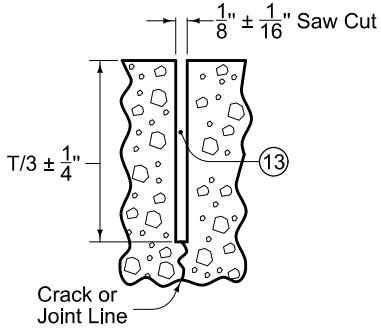
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS

FIGURE 7010.101 SHEET 3 OF 8



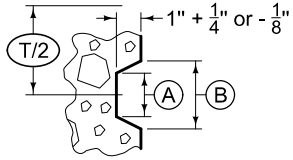
TIE BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



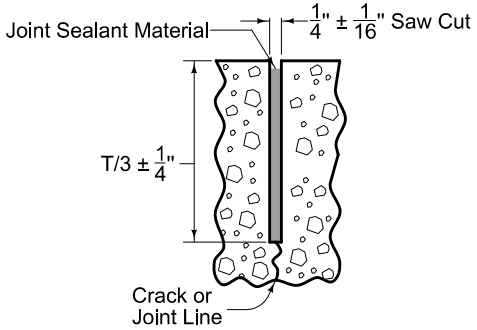
DETAIL D-1
(Required when specified in the contract documents.)

⑨ When tying into old pavement, Ⓣ represents the depth of sound PCC.

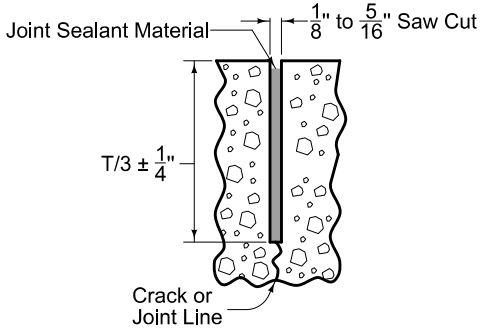
⑬ Sealant or cleaning not required.



DETAIL E



DETAIL D-2
(Required when the Department of Transportation is not the Contracting Authority, or when specified in the contract documents)



DETAIL D-3
(Required when the Department of Transportation is the Contracting Authority, or when specified in the contract documents)

KEYWAY DIMENSIONS			
Keyway Type	Pavement Thickness Ⓣ	Ⓐ	Ⓑ
Standard	8" or greater	1 3/4"	2 3/4"
Narrow	Less than 8"	1"	2"

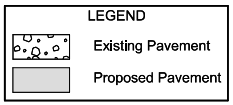


FIGURE 7010.101 | SHEET 4 OF 8

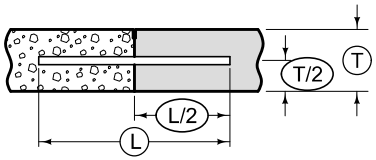
LONGITUDINAL CONTRACTION

SUDAS | FIGURE 7010.101 | INTERIM | STANDARD ROAD PLAN | REVISION 13 01-01-26 | PV-101 | SHEET 4 of 8

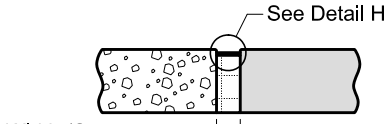
REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS

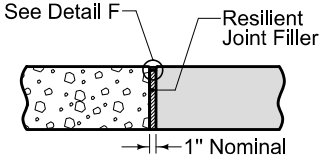


DOWEL PLACEMENT
(Applies to all joints unless otherwise detailed.)

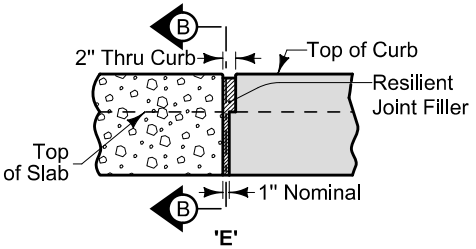


'CF' JOINT

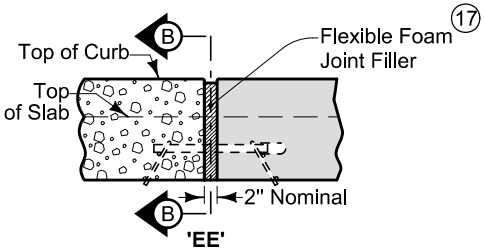
TYPE	WIDTH
CF-1	2"
CF-2	$2\frac{1}{2}$"
CF-3	3"
CF-4	$3\frac{1}{2}$"



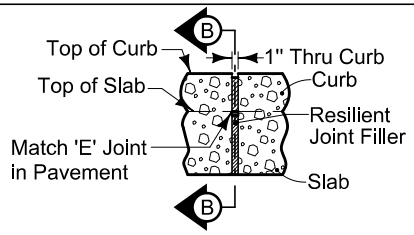
'E'
1" EXPANSION JOINT



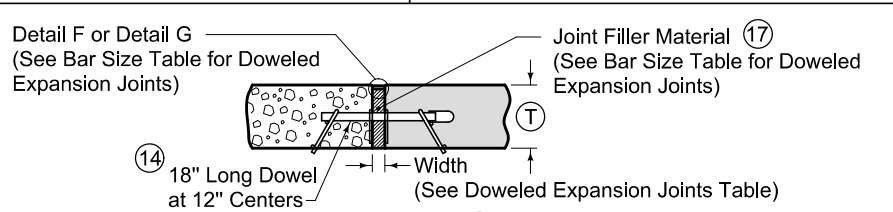
'E'
JOINT IN CURB
(View at Back of Curb)



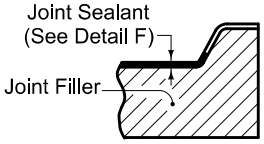
'EE'
JOINT IN CURB
(View at Back of Curb)



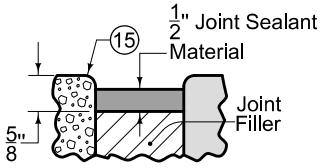
'ES'
JOINT IN CURB
(View at Back of Curb)



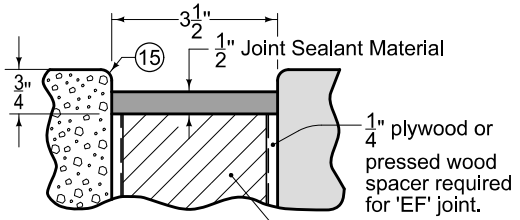
'ED', 'EE', 'EF' 16
DOWELED EXPANSION JOINT



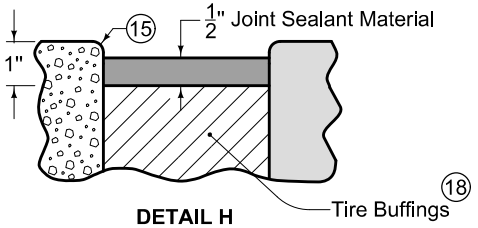
SECTION B-B



DETAIL F



DETAIL G



DETAIL H

EXPANSION

14 See Bar Size Table for Doweled Expansion Joints.

15 Edge with 1/4 inch tool for length of joint indicated if formed; edging not required when cut with diamond blade saw.

16 See Dowel Assemblies for fabrication details and placement limits. Coat the free end of dowel bar to prevent bond with pavement. At intake locations, dowel bars may be cast-in-place.

17 Predrill or preform holes in joint material for appropriate dowel size.

18 Compact tire buffings by spading with a square-nose shovel.

DOWELED EXPANSION JOINTS		
TYPE	WIDTH	FILLER MATERIAL 17
ED	1"	Resilient (Detail F)
EE	2"	Flexible Foam (Detail F)
EF	$3\frac{1}{2}$"	Flexible Foam (Detail G)

BAR SIZE TABLE FOR DOWELED EXPANSION JOINTS			
T	< 8"	≥ 8" but < 10"	≥ 10"
Dowel Diameter	$\frac{3}{4}$"	$1\frac{1}{4}$"	$1\frac{1}{2}$"
Tubular, GFRP, and Elliptical Dowel Bars will not be allowed for expansion joints.			

LEGEND
Existing Pavement
Proposed Pavement

SUDAS
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FIGURE 7010.101
STANDARD ROAD PLAN
PV-101
SHEET 5 of 8

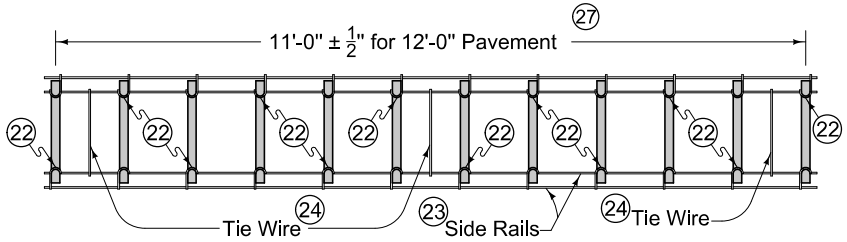
REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR
DESIGN METHODS ENGINEER

JOINTS

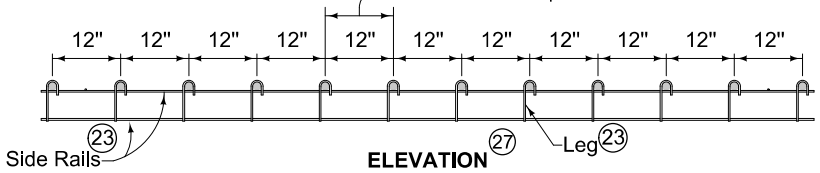
FIGURE 7010.101
SHEET 5 OF 8

CONTRACTION JOINTS

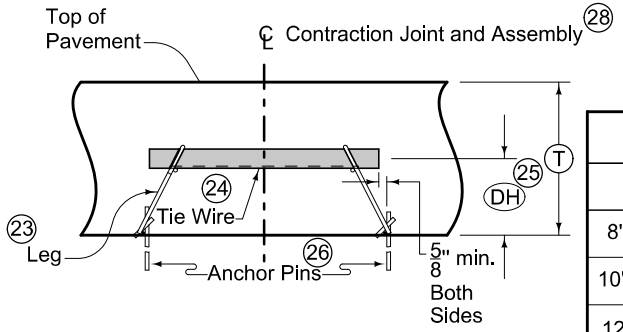


PLAN

Spaces between dowel bars are nominal dimensions with a $\frac{1}{4}$" allowable tolerance.



ELEVATION



LONGITUDINAL SECTION

DOWEL ASSEMBLIES (19) (20) (21)

DOWEL HEIGHT AND DIAMETER FOR DOWELED CONTRACTION JOINTS				
(T)	(DH) (25)	Diameter (Solid)	Diameter (Tubular)	Elliptical
8" to 9 1/2"	4 1/4"	1 1/4"	1 3/8"	Small
10" to 11 1/2"	5 1/4"	1 1/2"	1 5/8"	Medium
12" to 13"	6 1/4"	1 1/2"	1 5/8"	Medium
Tubular, Elliptical Dowel Bars will not be allowed for RD joints.				

(19) Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

(20) Use wires with a minimum tensile strength of 50 ksi.

(21) Details apply to both transverse contraction and expansion joints.

(22) Weld alternately throughout.

(23) 0.306 inch diameter wire. Wire sizes shown are the minimum required.

(24) Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

(25) Measured from the centerline of dowel bar to bottom of lower side rail + 1/4 inch.

(26) Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

(27) If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

(28) Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

FIGURE 7010.101 | SHEET 6 OF 8

SUDAS | INTERIM | REVISION 13 01-01-26

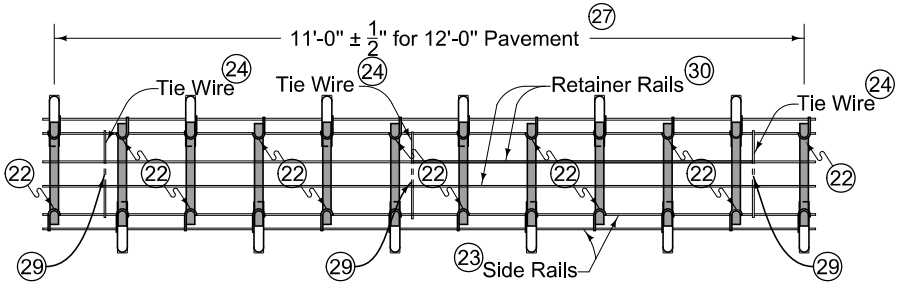
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 6 of 8

REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

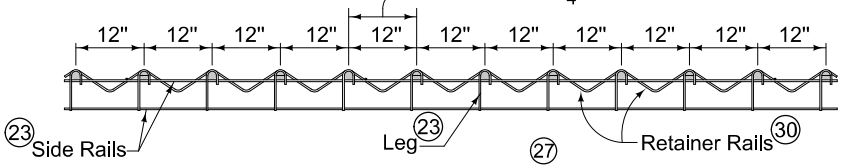
JOINTS

EXPANSION JOINTS

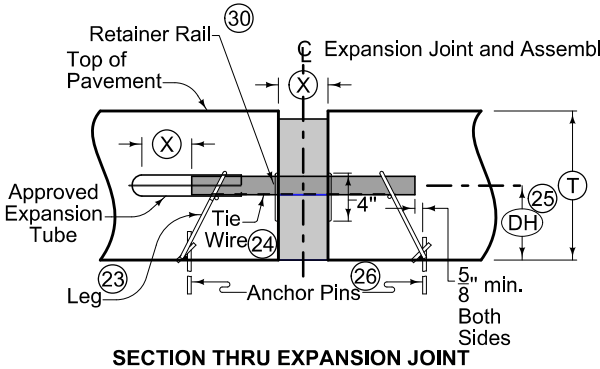


PLAN

Spaces between dowel bars are nominal dimensions with a $\frac{1}{4}$" allowable tolerance.



ELEVATION



SECTION THRU EXPANSION JOINT

JOINT OPENING AND EXPANSION TUBE EXTENSION		
Joint Type	(X)	Minimum Tube Length
"ED"	1"	6"
"EE"	2"	7"
"EF"	$3\frac{1}{2}$"	9"

DOWEL HEIGHT AND DIAMETER FOR DOWELED EXPANSION JOINTS		
(T)	(DH) (25)	Diameter
8" to $9\frac{1}{2}$"	$4\frac{1}{4}$"	$1\frac{1}{4}$"
10" to $11\frac{1}{2}$"	$5\frac{1}{4}$"	$1\frac{1}{2}$"
12" to 13"	$6\frac{1}{4}$"	$1\frac{1}{2}$"
Tubular, GFRP, and Elliptical Dowel Bars will not be allowed for expansion joints.		

DOWEL ASSEMBLIES (19) (20) (21)

(19) Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

(20) Use wires with a minimum tensile strength of 50 ksi.

(21) Details apply to both transverse contraction and expansion joints.

(22) Weld alternately throughout.

(23) 0.306 inch diameter wire. Wire sizes shown are the minimum required.

(24) Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

(25) Measured from the centerline of dowel bar to bottom of lower side rail + 1/4 inch.

(26) Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

(27) If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

(28) Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

(29) Clip and remove center portion of tie during field assembly.

(30) 1/4 inch diameter wire.

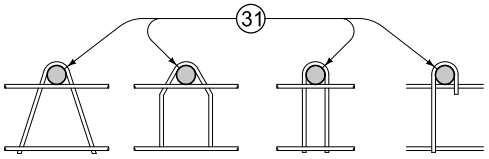
SUDAS	INTERIM	REVISION 13 01-01-26
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101
		SHEET 7 of 8

REVISIONS: Updated SUDAS and IDOT Logo.

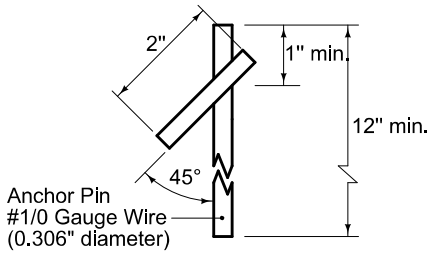
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS

FIGURE 7010.101 SHEET 7 OF 8



OPTIONAL LEG SHAPES



ANCHOR PIN

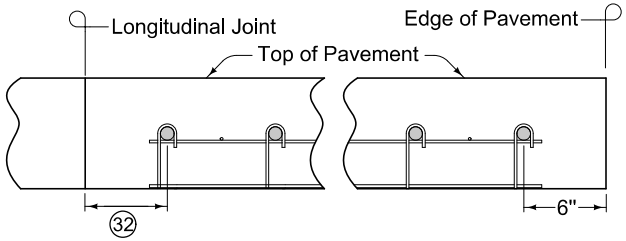
19 Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

20 Use wires with a minimum tensile strength of 50 ksi.

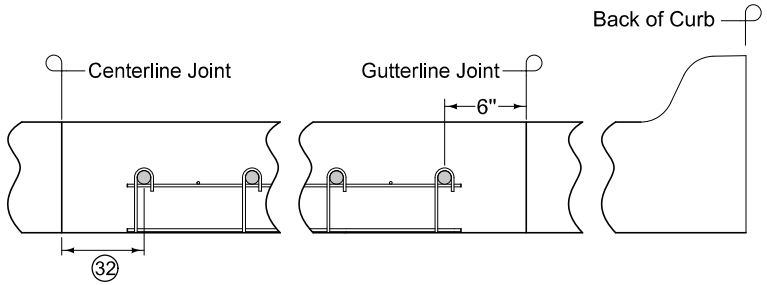
21 Details apply to both transverse contraction and expansion joints.

31 Diameter of bend around dowel is dowel diameter + 1/8 to 3/16 inches.

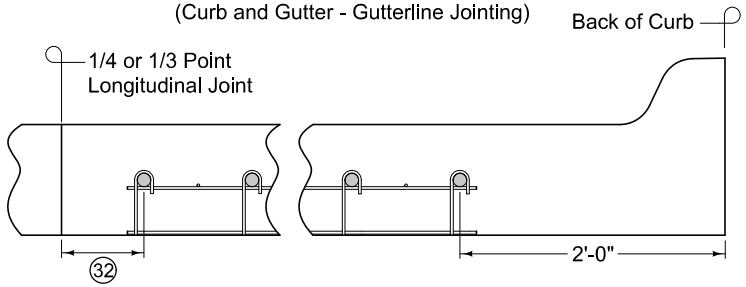
32 For uniform lane widths: 3 to 6 inches. For taper and variable width pavements: 3 to 12 inches.



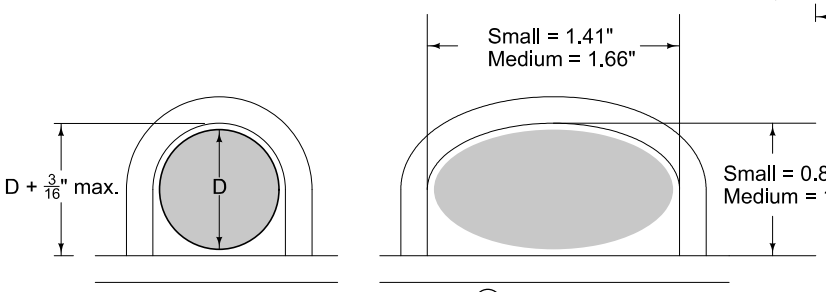
PLACEMENT LIMITS
(Rural Section)



PLACEMENT LIMITS
(Curb and Gutter - Gutterline Jointing)



PLACEMENT LIMITS
(Curb and Gutter - 1/4 or 1/3 Point Jointing)



BEND AROUND DOWEL 31

DOWEL ASSEMBLIES 19 20 21

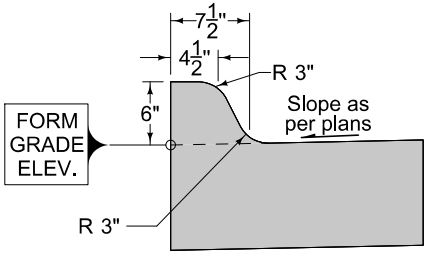
FIGURE 7010.101 SHEET 8 OF 8

SUDAS	INTERIM	REVISION 13 01-01-26
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101 SHEET 8 of 8

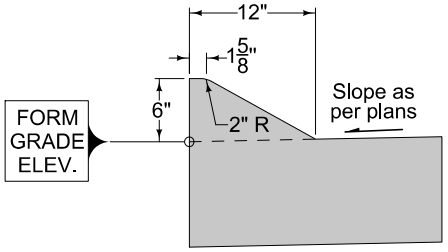
REVISIONS: Updated SUDAS and IDOT Logo.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

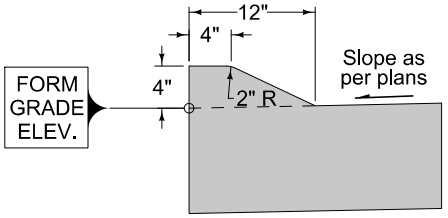
JOINTS



6" STANDARD CURB



6" SLOPED CURB



4" SLOPED CURB

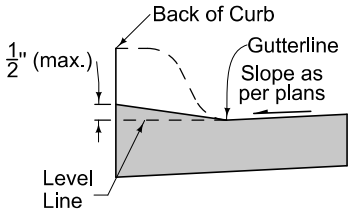
For joint details, see PV-101.

① 6 inch Standard Curb, 6 inch Sloped Curb, or 4 inch Sloped Curb as specified.

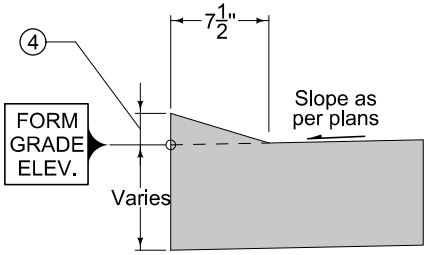
② ⅛ inch if Proposed Pavement is HMA. No elevation difference if Proposed Pavement is PCC.

③ 'BT' , 'KT', or 'L' joint if Proposed Pavement is PCC. 'B' joint if Proposed Pavement is HMA.

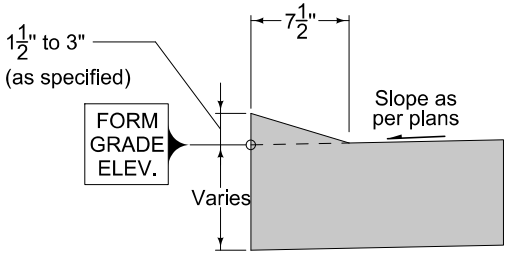
④ 0 to 2 inches for residential entrances. 1½ to 3 inches for industrial or commercial entrances.



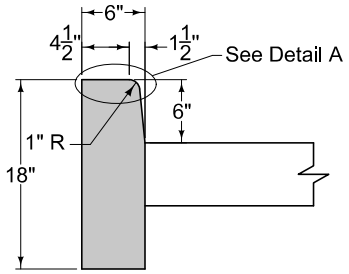
DROP CURB AT SIDEWALK



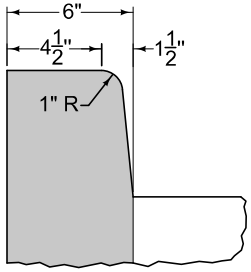
DRIVEWAY DROP CURB (IowaDepartment of Transportation is not the Contracting Authority)



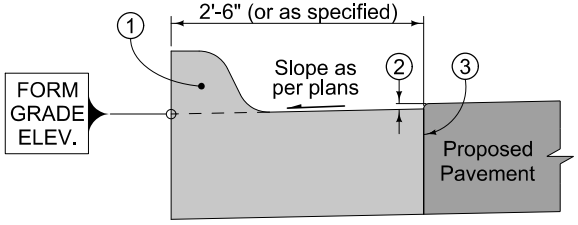
DRIVEWAY DROP CURB (Iowa Department of Transportation is the Contracting Authority)



BEAM CURB*
*For short replacement sections, match existing curb profile



DETAIL A



CURB AND GUTTER UNIT

FIGURE 7010.102

SHEET 1 OF 2

SUDAS | IOWA DOT

REVISION 5 04-21-20

PV-102

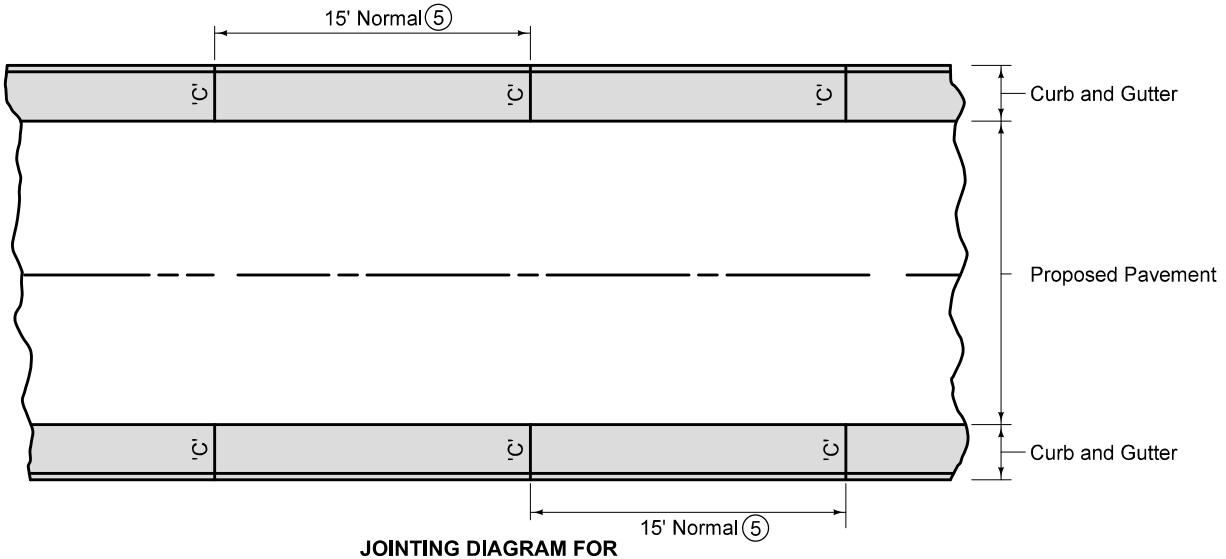
FIGURE 7010.102 | STANDARD ROAD PLAN | SHEET 1 of 2

REVISIONS: Split DRIVEWAY DROP CURB detail into two details. Added new circle note 4 on Sheet 1. Renumbered circle note on Sheet 5.

Paul D. Wigant
SUDAS DIRECTOR

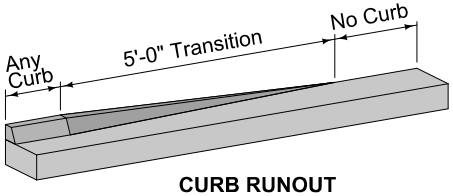
Stuart Nicholson
DESIGN METHODS ENGINEER

PCC CURB DETAILS

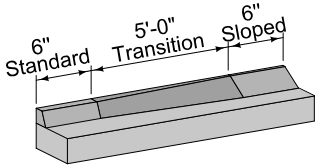


JOINTING DIAGRAM FOR CURB AND GUTTER UNIT

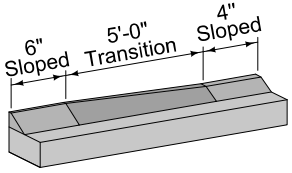
(5) If proposed pavement is PCC, match joint spacing for proposed pavement. Place 'E' joints in curb and gutter section where expansion joints are to be placed in proposed pavement.



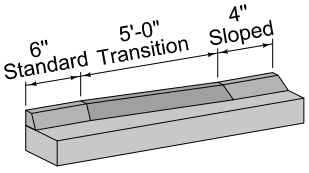
CURB RUNOUT FOR ALL CURBS



CURB TRANSITION FROM 6" STANDARD TO 6" SLOPED



CURB TRANSITION FROM 6" SLOPED TO 4" SLOPED



CURB TRANSITION FROM 6" STANDARD TO 4" SLOPED

FIGURE 7010.102 | SHEET 2 OF 2

SUDAS | IOWA DOT

REVISION	
5	04-21-20

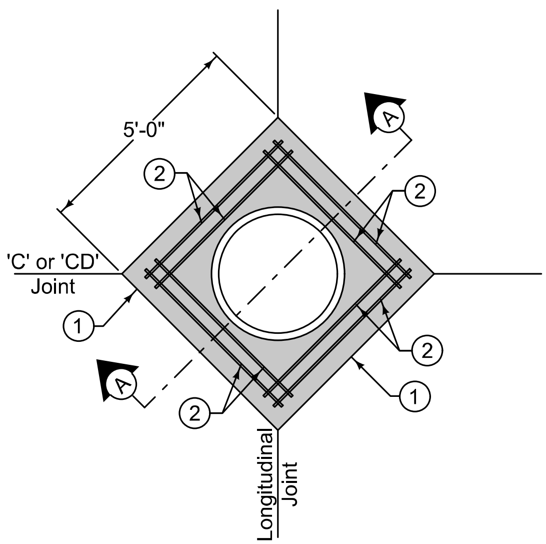
FIGURE 7010.102 | STANDARD ROAD PLAN | PV-102 | SHEET 2 of 2

REVISIONS: Split DRIVEWAY DROP CURB detail into two details. Added new circle note 4 on Sheet 1. Renumbered circle note on Sheet 5.

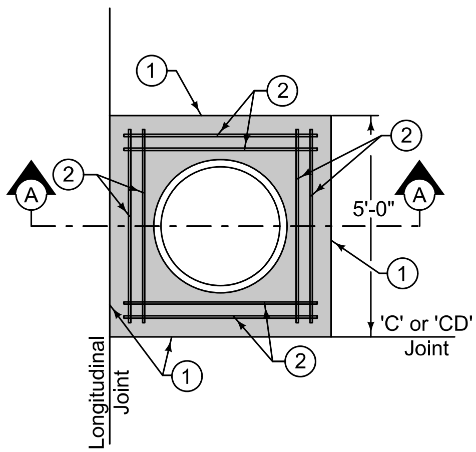
Paul D. Wigand — SUDAS DIRECTOR

Stuart Nicholson — DESIGN METHODS ENGINEER

PCC CURB DETAILS



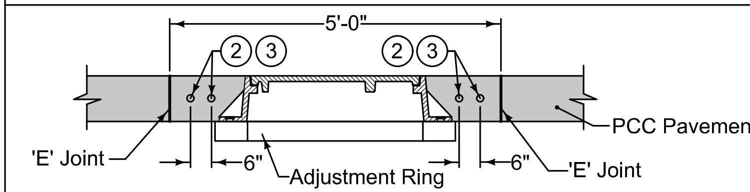
AT JOINT INTERSECTION



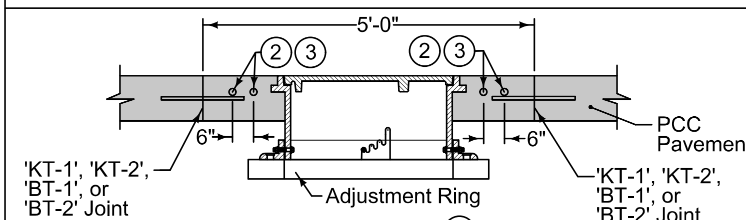
OFFSET AT JOINT INTERSECTION

Construct boxout with Class C concrete or match pavement class. Minimum 2 inches clear on reinforcement. Minimum 12 inches of concrete between outside of casting and nearest joint. Center casting within boxout area if possible.

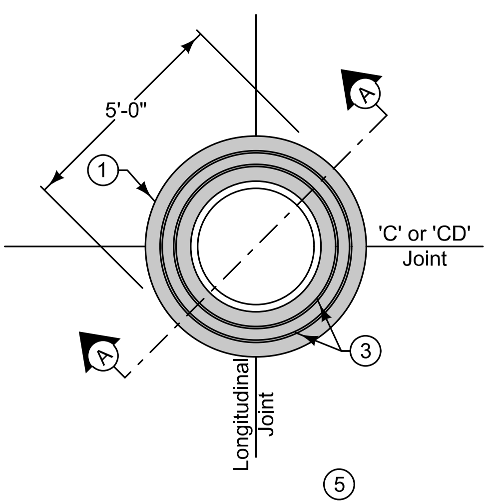
1. 'KT-1', 'KT-2', 'BT-1', or 'BT-2' joint if three-piece floating casting (SW 601 Type B and D or SW-602 Type F) is used. 'E' joint if two-piece fixed casting (SW 601 Type A and C or SW-602 Type E) is used.
2. 4 foot 8 inch (typ.) #4 bar. Place at mid-slab.
3. #4 hoops (variable length). Place at mid-slab.
4. No boxout is required for three-piece floating castings (SW 601 Type B and D or SW-602 Type F). If a boxout is used with a three-piece casting, construct as detailed in Section A-A for three-piece floating casting.
5. If a circular boxout is cut and extracted after PCC construction, a 'B' joint may be substituted for the 'E' joint if approved by the Engineer.



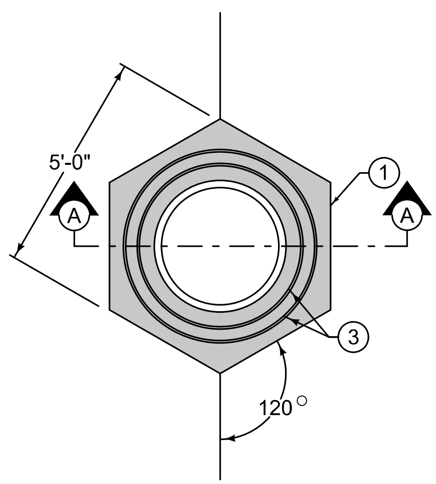
SECTION A-A
(For two-piece fixed casting)



SECTION A-A 4
(For three-piece floating casting)



CIRCULAR



AT A SINGLE JOINT

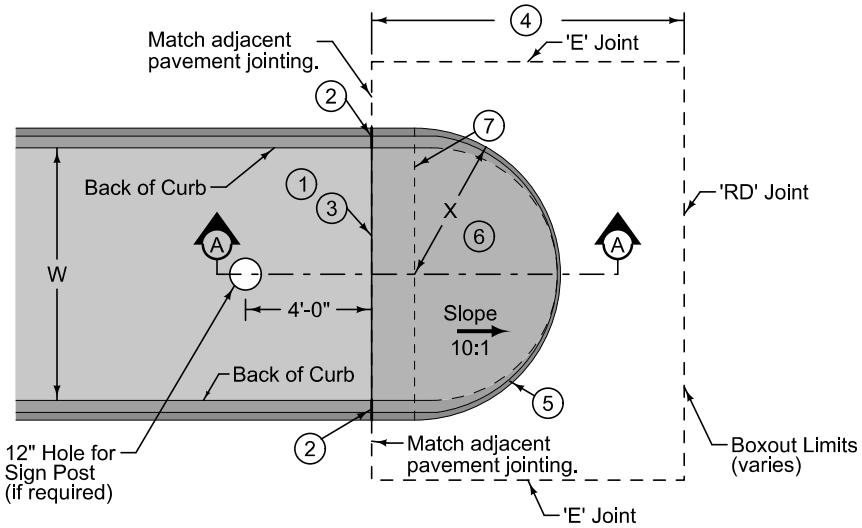
SUDAS	IOWADOT	REVISION 2 04-19-22
FIGURE 7010.103	STANDARD ROAD PLAN	PV-103 SHEET 1 of 1

REVISIONS: Added note 5.

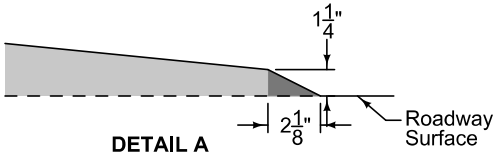
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

MANHOLE BOXOUTS IN PCC PAVEMENT

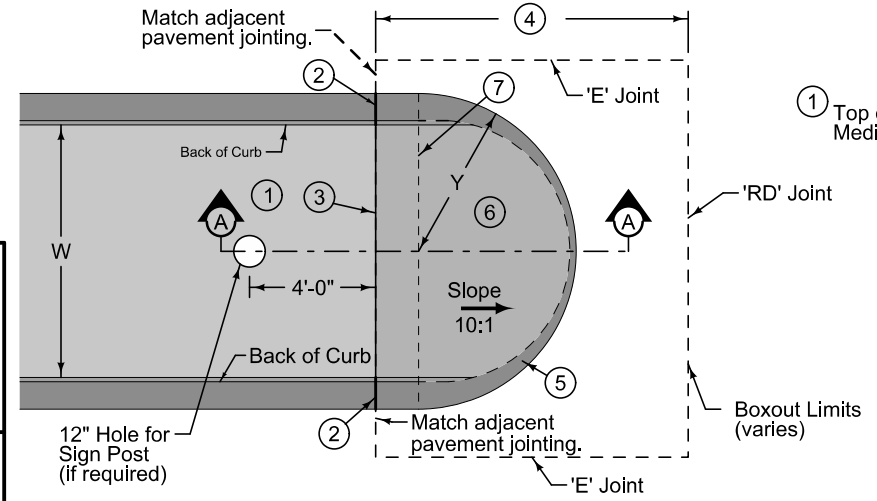
FIGURE 7010.103 SHEET 1 OF 1



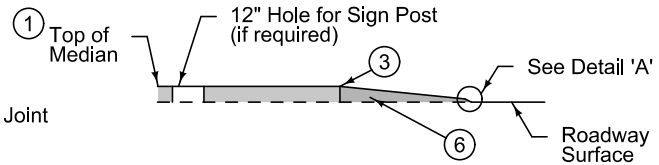
6" STANDARD
PLAN



DETAIL A



6" SLOPED
PLAN



SECTION A-A

1. For details of paved median, see contract documents.
2. 'EE' Joint. Expansion joints located at the end of normal curb.
3. 'E'Joint. If median is paved, place expansion joints at the end of normal curb.
4. If boxout length is less than or equal to 12 feet, provide 'C' Joint. If boxout length is greater than 12 feet, provide 'RD' joint.
5. Special shaping of curb.
6. Quantities for ramped median nose area is included in roadway pavement quantities.
7. When X or Y is 4 feet or greater the expansion joints will be at the begining of the rounded median.

W = Width from back of curb to back of curb

X = W/2 + 7.5"

Y = W/2 + 12"

RAMPED MEDIAN NOSE
(Median Width 8'-0" or Less)

FIGURE 7010.104 | SHEET 1 OF 1

SUDAS | IOWADOT | REVISION 1 04-21-20

FIGURE 7010.104 | STANDARD ROAD PLAN | PV-104 | SHEET 1 of 1

REVISIONS: New logo.

Paul D. Wigand, SUDAS DIRECTOR | Stuart Nicholson, DESIGN METHODS ENGINEER

RAMPED MEDIAN NOSE

For joint details, see PV-101.
For curb details, see PV-102.

(1) If more than 20 feet, add extra joint at midpoint.

(2) 'BT' Joint.

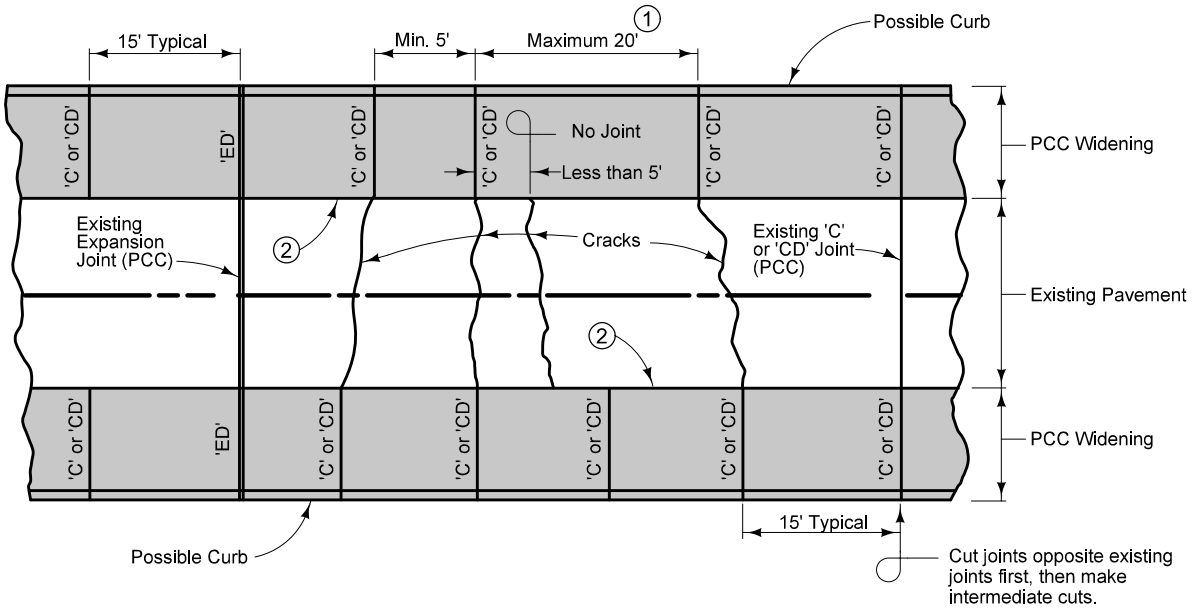


FIGURE 7010.121 | SHEET 1 OF 1

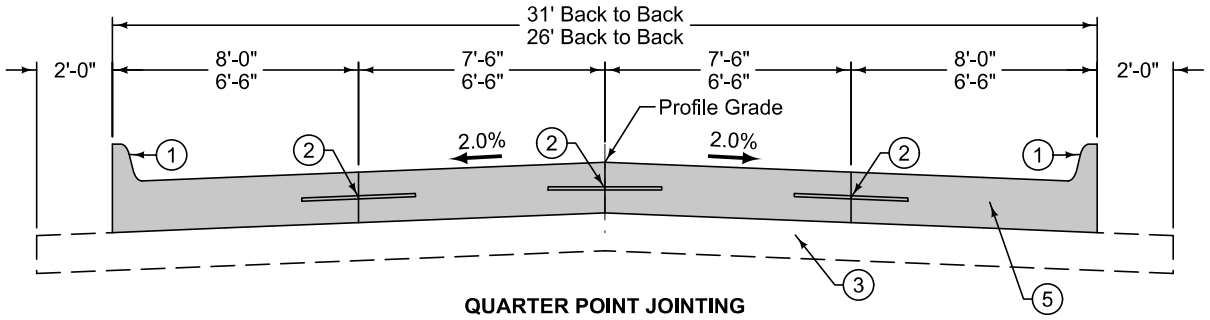
SUDAS | IOWA DOT | REVISION 1 04-21-15

FIGURE 7010.121 | STANDARD ROAD PLAN | PV-121 | SHEET 1 of 1

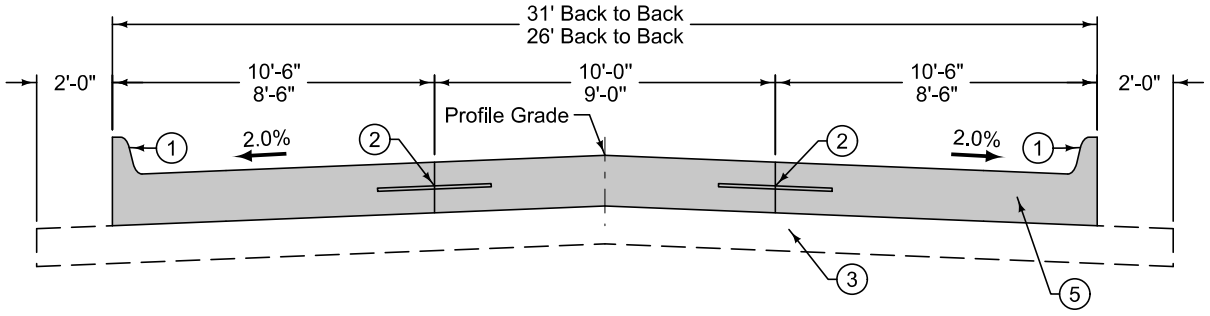
REVISIONS: Added circle note 2 and replaced the DOT logo in the title block with the new version.

Paul D. Wigand, SUDAS DIRECTOR | Brian Smith, DESIGN METHODS ENGINEER

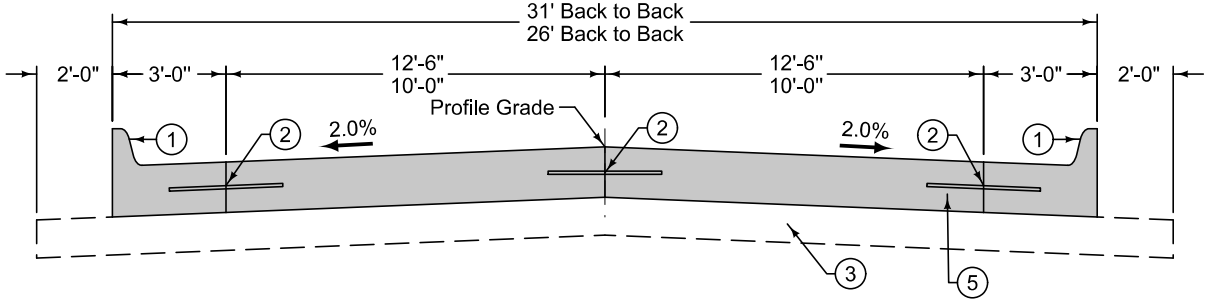
JOINTING PCC PAVEMENT WIDENING



QUARTER POINT JOINTING



THIRD POINT JOINTING



GUTTERLINE JOINTING

(1) 6 inch standard curb.

(2) BT, KT, or L joint depending on pavement thickness and construction staging.

(3) Subbase or subgrade as specified.

(4) Unless otherwise specified in the contract documents.

(5) No dowels within 24" of the back of curb. With gutterline joint, place first dowel 6 inches from the joint. See Figure 7010.101, Sheet 8.

TRANSVERSE JOINT REQUIREMENTS (4)		
Pavement Thickness	Transverse Joint Type	Transverse Joint Spacing
6"	C	12'
7"	C	15'
8"	CD (5)	15'
9"	CD (5)	15'
≥10"	CD (5)	17'

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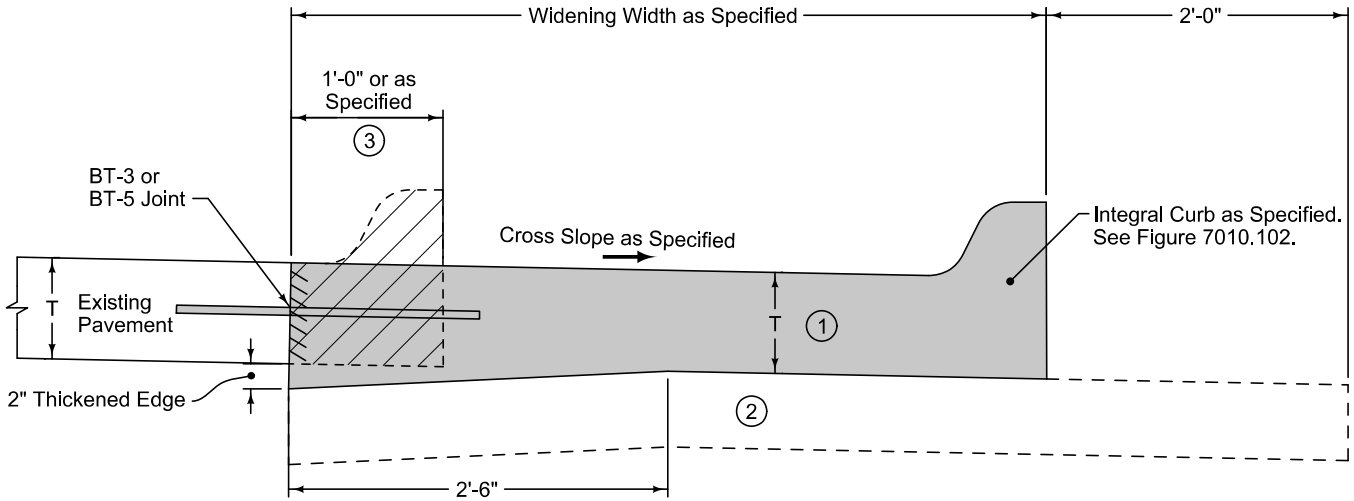
7010.901

SHEET 1 of 1

SUDAS Standard Specifications

PCC PAVEMENT JOINTING

FIGURE 7010.901 | SHEET 1 OF 1



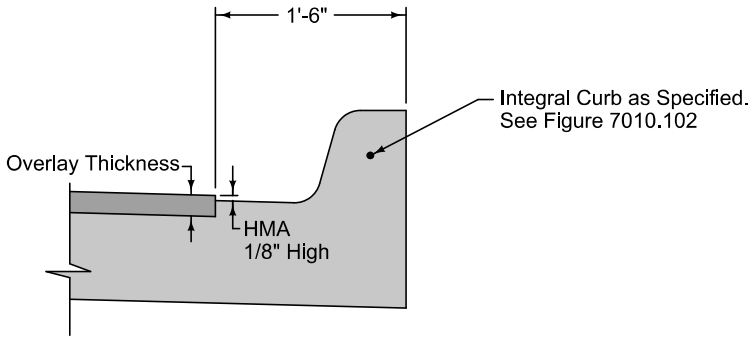
TYPICAL SECTION

See Figure 7010.121 for typical joint layout.

(1) Match existing pavement thickness or as specified in the contract documents.

(2) Subgrade or subbase material as specified.

(3) Remove existing curb using full depth saw cut.



CURB FOR WIDENING WITH HMA OVERLAY

FIGURE 7010.902 | SHEET 1 OF 1

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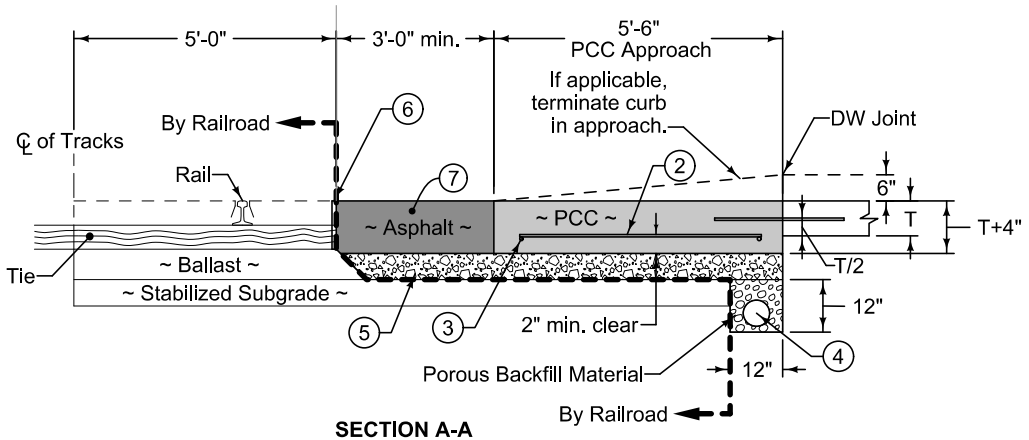
7010.902

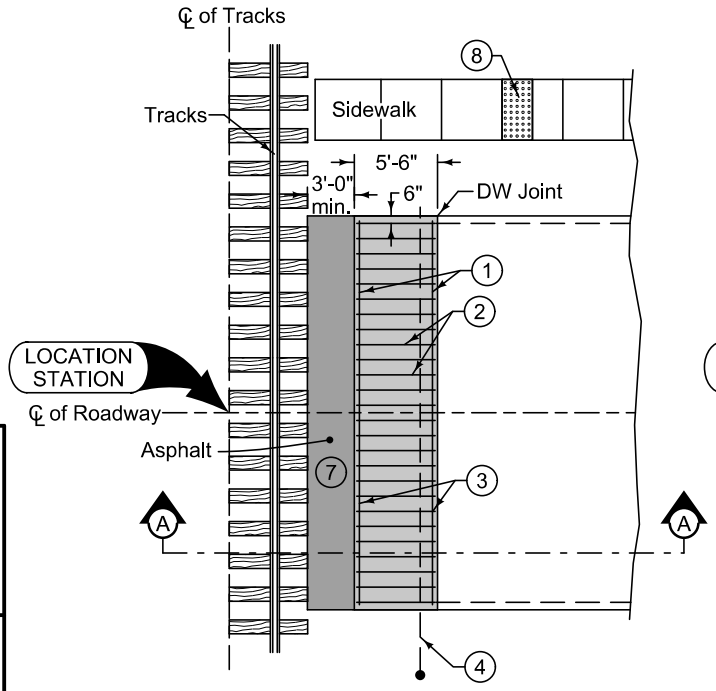
SHEET 1 of 1

SUDAS Standard Specifications

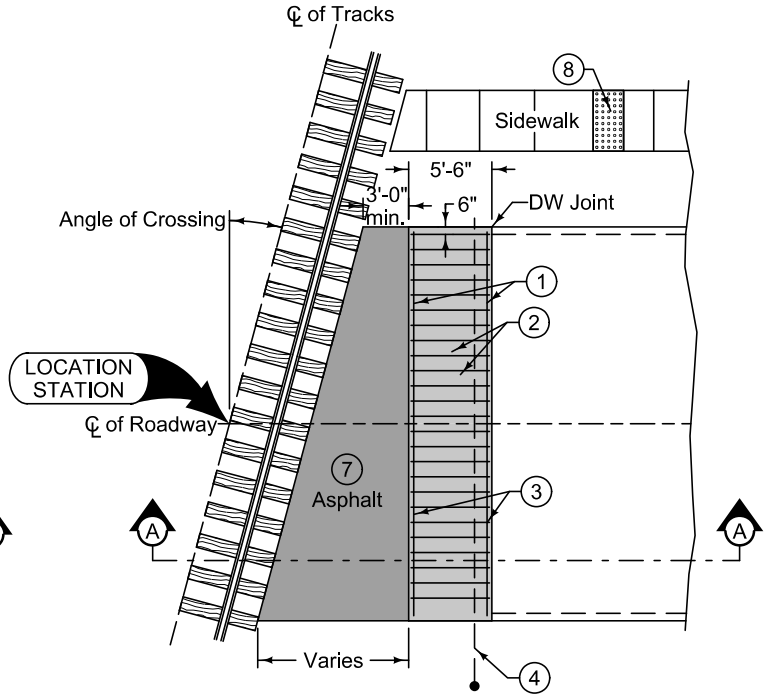
PCC PAVEMENT WIDENING



SECTION A-A



PLAN VIEW - STRAIGHT CROSSING



PLAN VIEW - SKEWED CROSSING

1. Tie reinforcing bars with wire at all intersections with other bars. Lap reinforcing bars a minimum of 12 inches when necessary and tie securely.
2. 5 foot 2 inch (typ.) #5 bar or pavement length minus 4 inches, at 12 inches on center.
3. #5 bars X (approach width minus 4 inches).
4. Install 6 inch perforated CMP subdrain, if specified. Include rodent guard per Iowa DOT Materials I.M. 443.01.
5. Granular subbase, modified subbase, or ballast meeting railroad specifications.
6. For new crossings, construct pavement 1/2 inch to 1 inch below top of rail. For existing crossings, construct pavement level to 1/2 inch below top of rail.
7. Full depth asphalt patch per Section 7040.
8. Refer to Figure 7030.205 for detectable warning location.

FIGURE 7010.903

SHEET 1 OF 1

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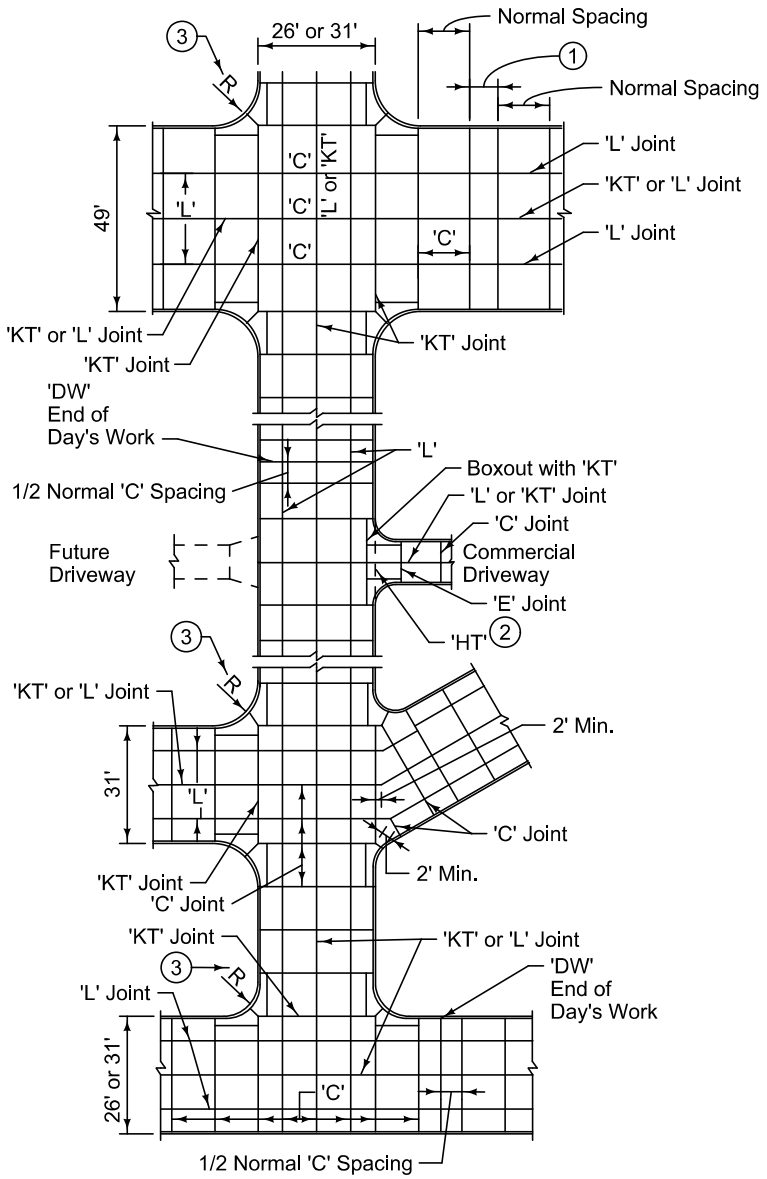
SUDAS Standard Specifications

PCC RAILROAD CROSSING APPROACH



PLAN VIEW

Refer to Figure 7010.901 for maximum transverse joint spacing.

Where new and existing pavements meet, and no existing dowels, tie bars, or keyed joints are present, provide a 'BT', 'RT', or 'RD' joint.

(1) Shorten jointing pattern on either side of openings to allow joints to intersect round castings and fall at the edges of intake boxouts.

(2) Where pavement abuts an unimproved street, terminate with a type 'HT' joint.

(3) When radius exceed 20 feet, add one additional 'C' joint at radius intersections.

FIGURE 7010.904 | SHEET 1 OF 1

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7010.904

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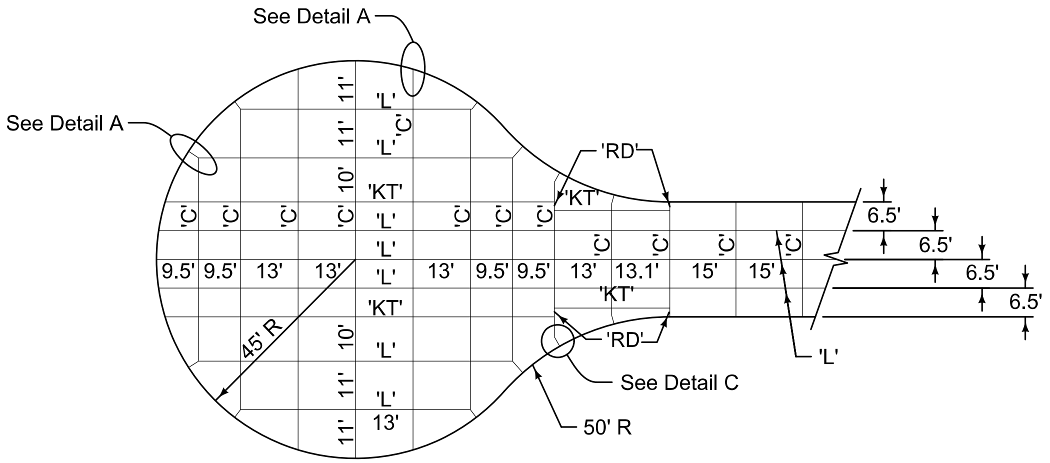
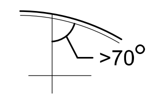
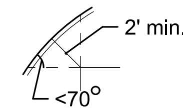
SUDAS Standard Specifications

TYPICAL JOINTING LAYOUT

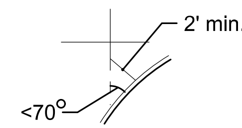




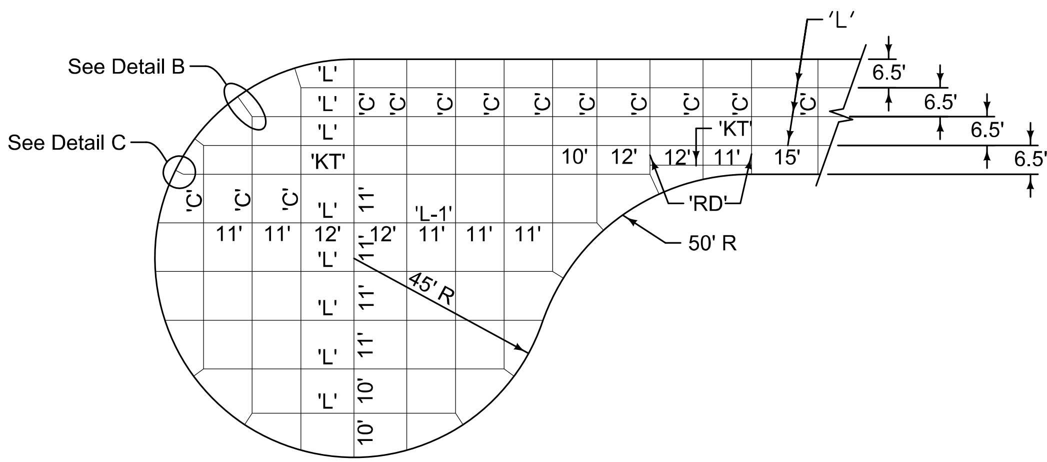
DETAIL A



DETAIL B



DETAIL C



QUARTER POINT JOINTING

FIGURE 7010.905 SHEET 1 OF 3

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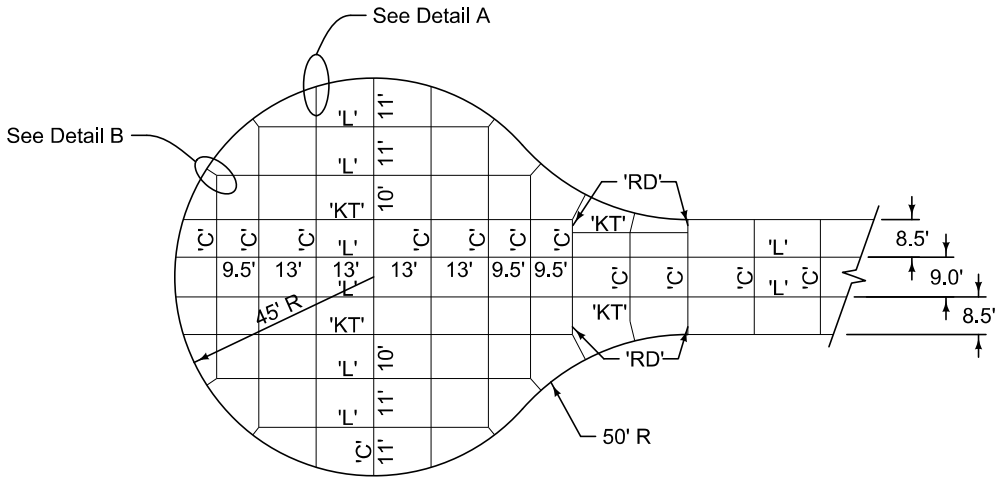
1 2023 Edition

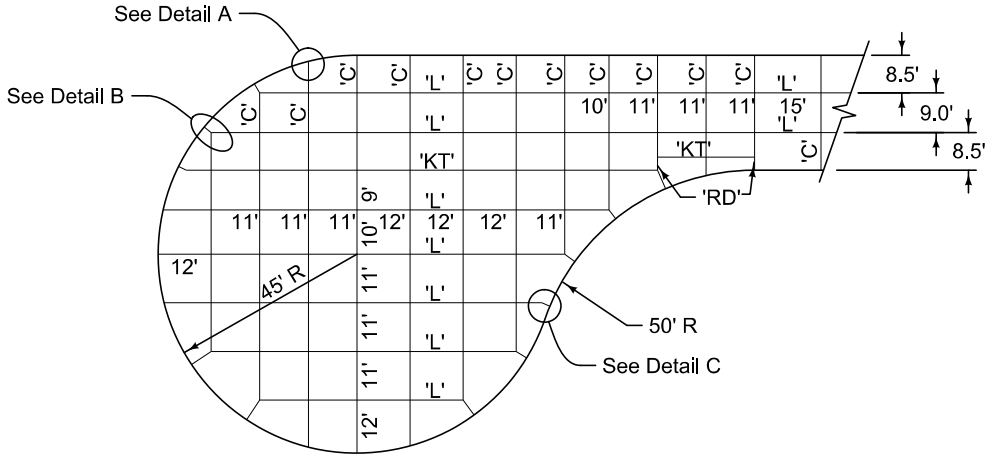
7010.905

SHEET 1 of 3

SUDAS Standard Specifications

PCC CUL-DE-SAC JOINT LOCATIONS





THIRD POINT JOINTING

FIGURE 7010.905 | SHEET 2 OF 3

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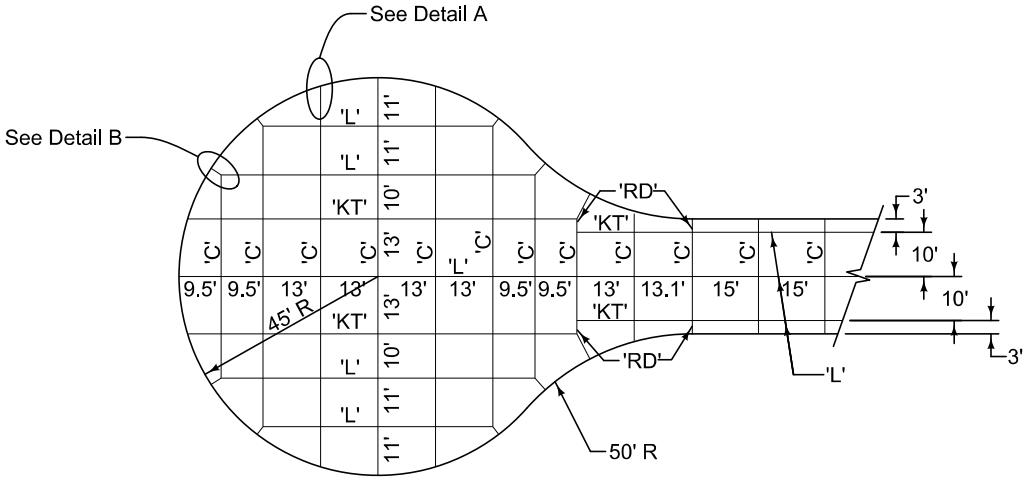
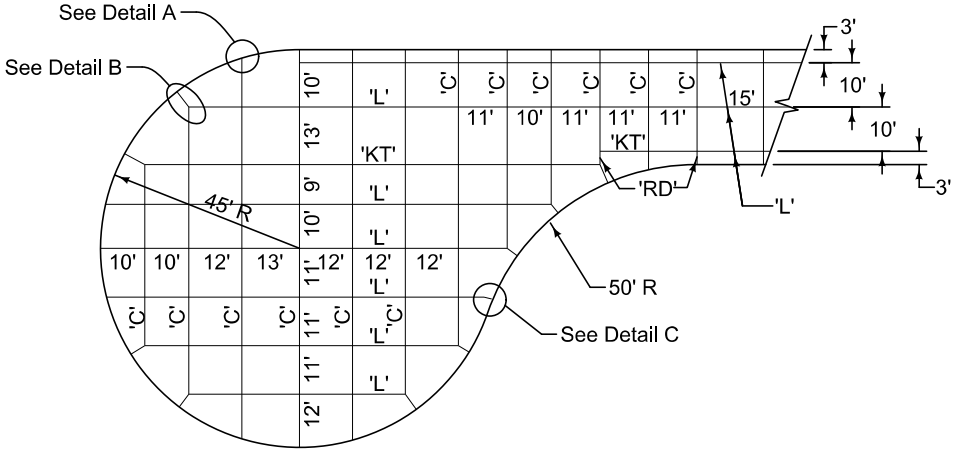
SHEET 2 of 3

SUDAS Standard Specifications

PCC CUL-DE-SAC JOINT LOCATIONS





GUTTERLINE JOINTING

FIGURE 7010.905 SHEET 3 OF 3

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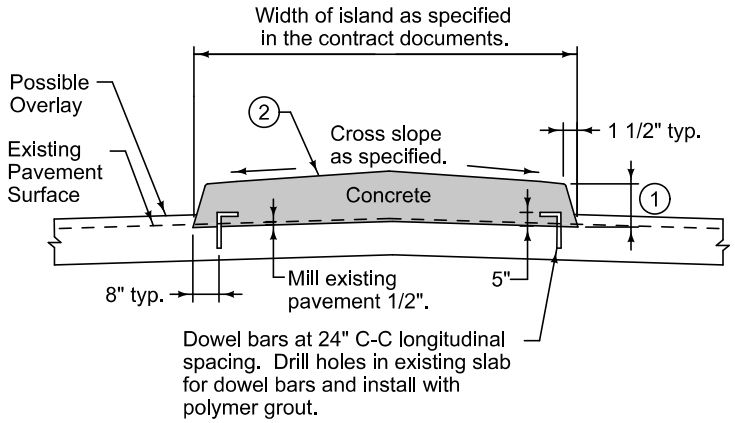
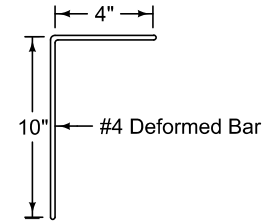
SUDAS Standard Specifications

PCC CUL-DE-SAC JOINT LOCATIONS



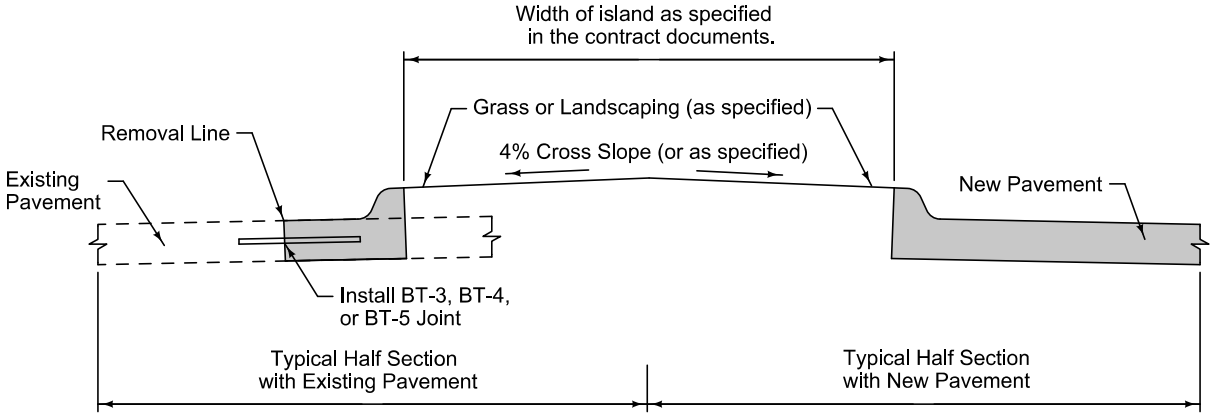
DOWELED MEDIAN



DOWEL BAR DETAIL

(1) Median height as specified in the contract documents.

(2) Construct 'C' joints at a maximum spacing of 15'. Match the joint pattern of the existing pavement. Install expansion joints as directed by the Engineer. Construct expansion joints with 1 inch expansion material. Seal all joints.



LANDSCAPE MEDIAN

FIGURE 7010.906

SHEET 1 OF 1

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7010.906

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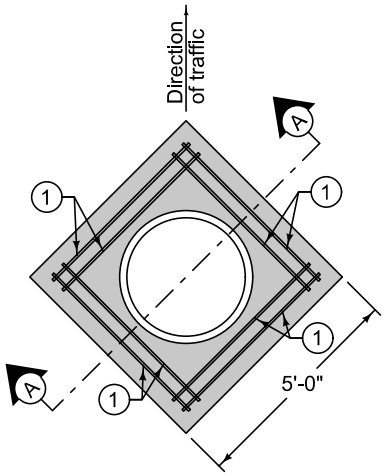
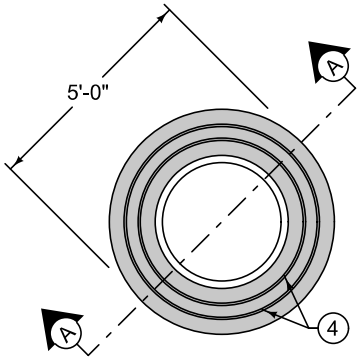
SUDAS Standard Specifications

MEDIANS



RECTANGULAR



CIRCULAR

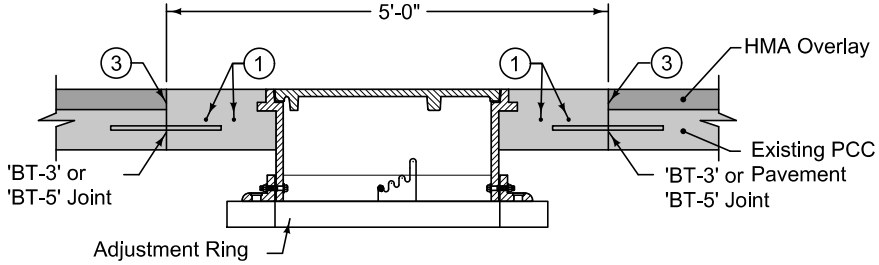
Construct boxout with Class C concrete or match pavement class. Minimum 2 inches clear on reinforcement. Minimum 12 inches of concrete between outside of casting and nearest joint. Center casting within boxout area if possible.

(1) 4 foot 8 inch (typ.) #4 bar. Place at mid-slab.

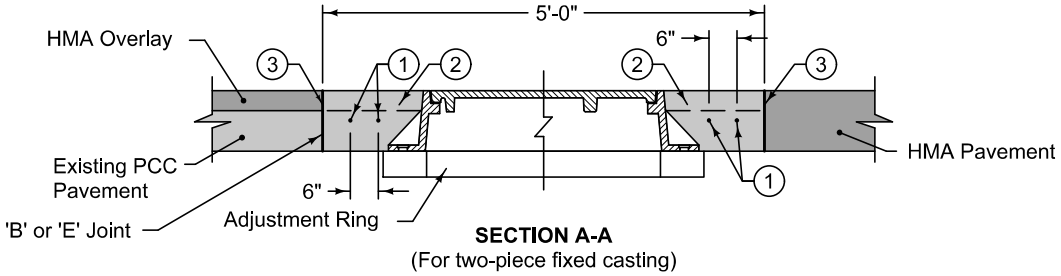
(2) If boxout is constructed prior to placement of HMA overlay or final lift of HMA pavement, boxout may be constructed low, with a 'B' joint in place of the 'E' joint, and then final lift or overlay placed.

(3) Apply tack coat.

(4) #4 hoops (variable length). Place at mid-slab.



SECTION A-A
(For three-piece floating casting)



SECTION A-A
(For two-piece fixed casting)

FIGURE 7020.201

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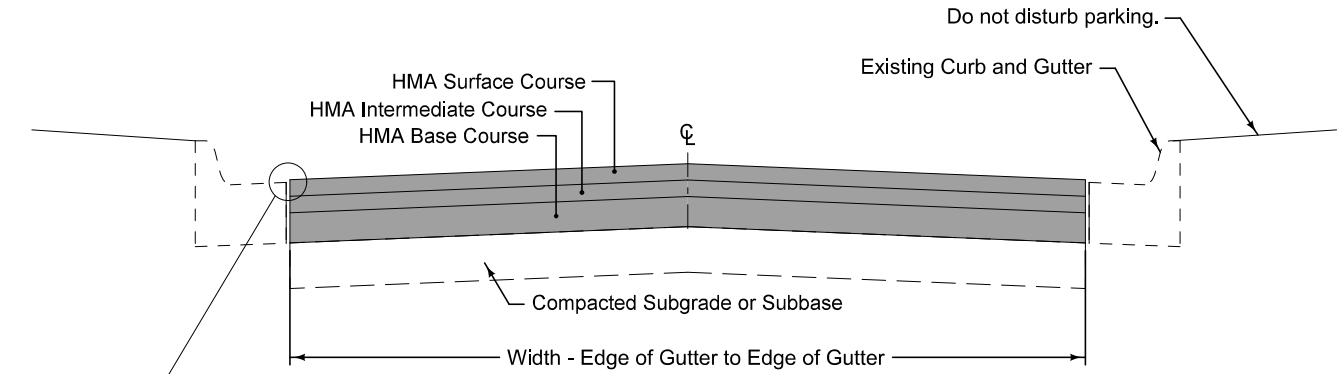
FIGURE 7020.201 | STANDARD ROAD PLAN | PV-201 | SHEET 1 of 1

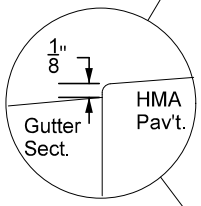
REVISIONS: Added note 12 inch minimum around casting.

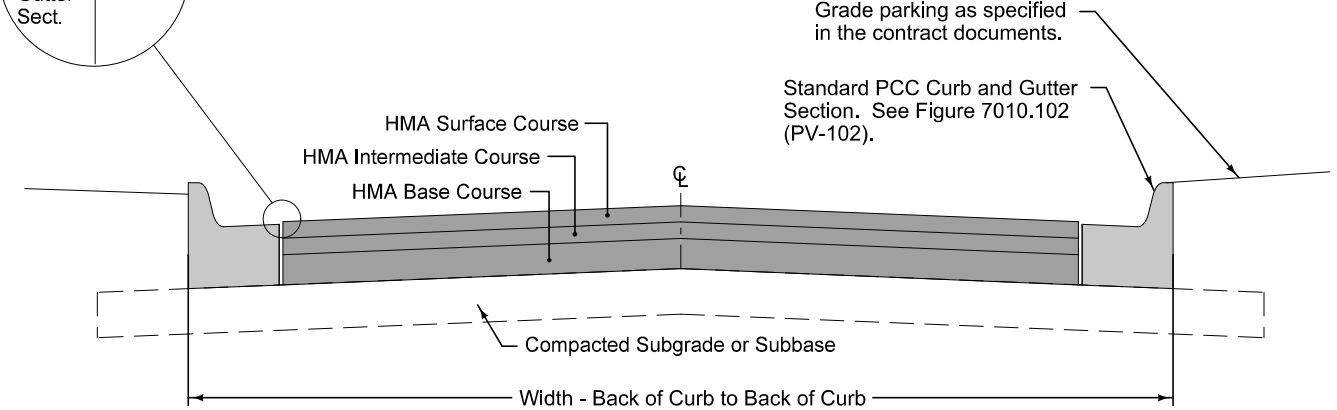
Paul D. Wigand, SUDAS DIRECTOR — Stuart Nicholson, DESIGN METHODS ENGINEER

MANHOLE BOXOUTS IN HMA PAVEMENT AND HMA OVERLAYS



HMA PAVEMENT SECTION
(With Existing Curb and Gutter)





HMA PAVEMENT SECTION
(With New Curb and Gutter)

FIGURE 7020.901

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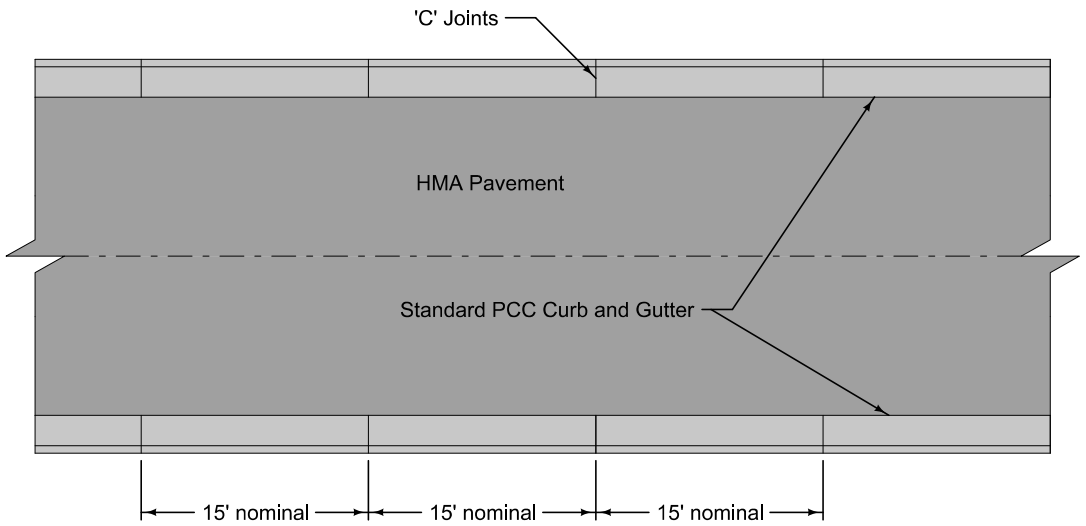
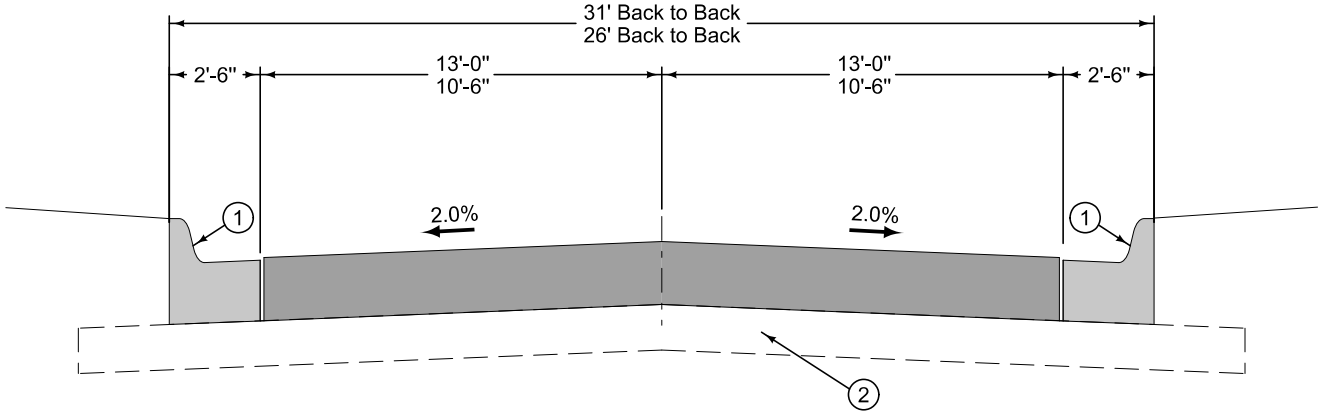
HMA PAVEMENT



1. 6 inch standard curb and gutter.
2. Subbase or subgrade as specified.



TYPICAL CROSS-SECTION

FIGURE 7020.901 | SHEET 2 OF 2

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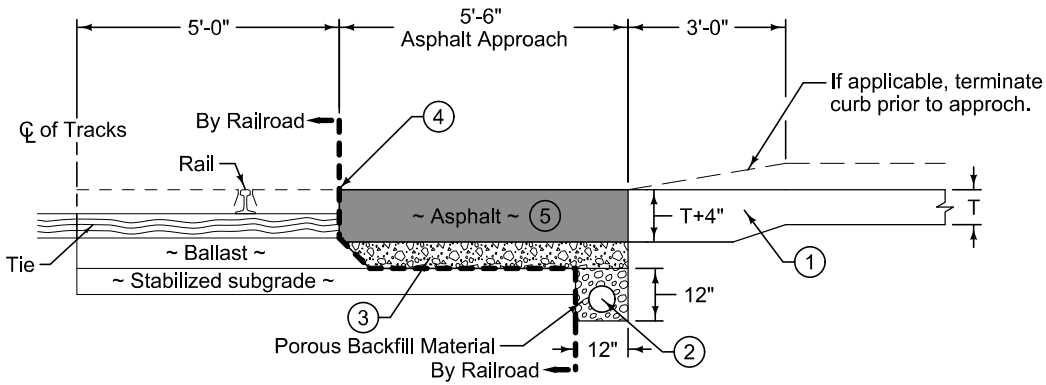
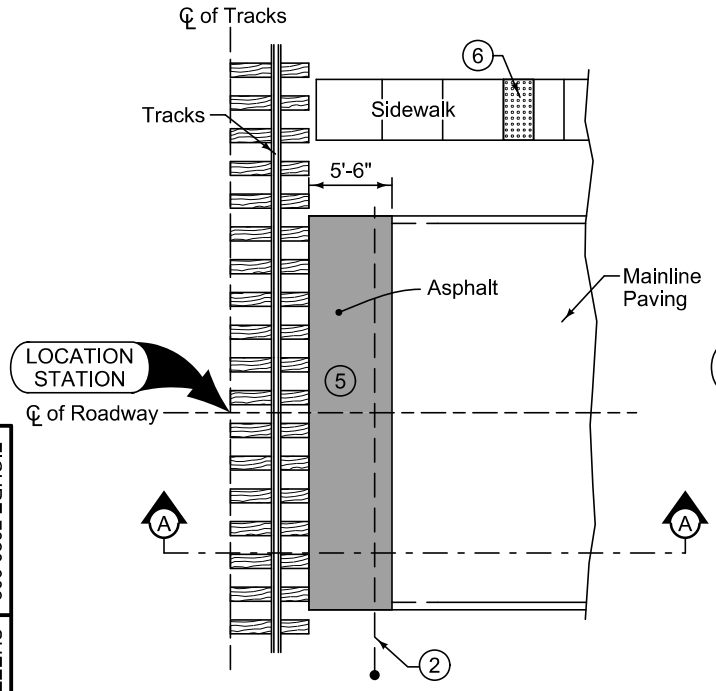
SUDAS Standard Specifications

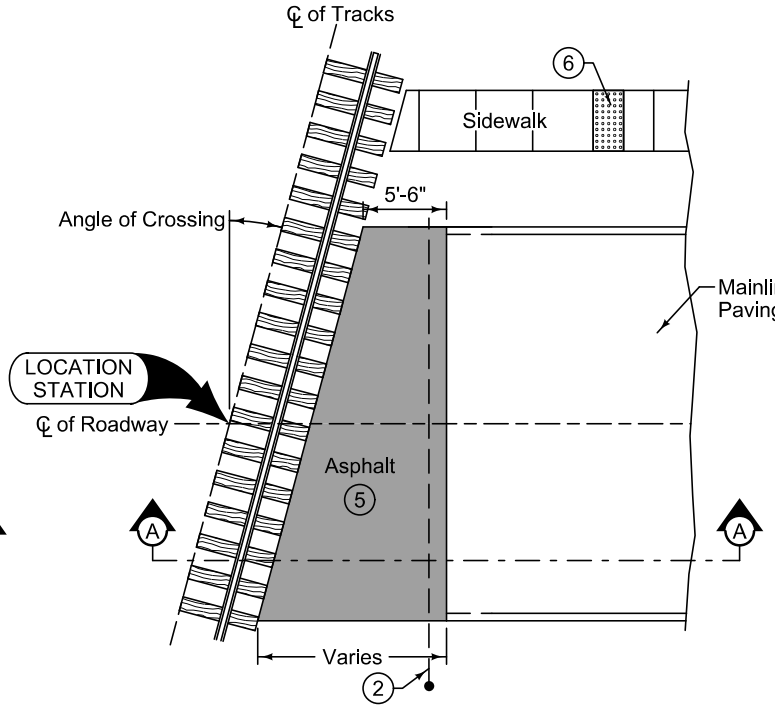
HMA PAVEMENT



SECTION A-A



PLAN VIEW - STRAIGHT CROSSING



PLAN VIEW - SKEWED CROSSING

1. Asphalt mainline paving.
2. Install 6 inch perforated CMP subdrain, if specified. Include rodent guard per Iowa DOT Materials I.M. 443.01.
3. Granular subbase, modified subbase, or ballast meeting railroad specifications.
4. For new crossings, construct pavement 1/2 inch to 1 inch below top of rail. For existing crossings, construct pavement level to 1/2 inch below top of rail.
5. Construct asphalt approach according to the requirements for full depth asphalt patching or the requirements for asphalt paving if constructed in conjunction with mainline asphalt.
6. Refer to Figure 7030.205 for detectable warning location.

FIGURE 7020.902

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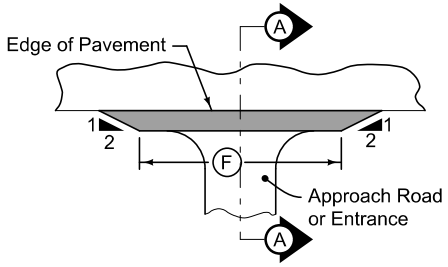
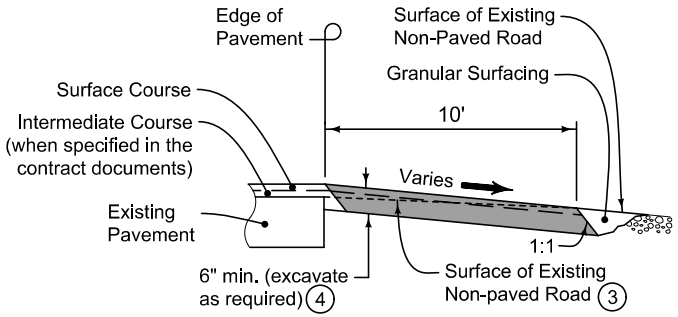
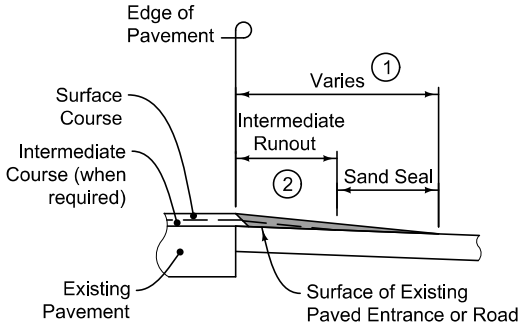
ASPHALT RAILROAD CROSSING APPROACH



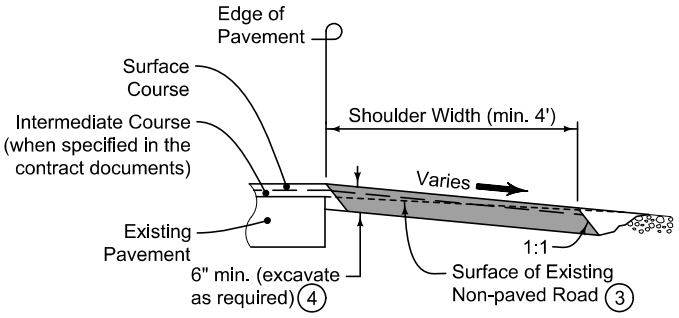
TYPICAL PLAN FOR FILLET AT ENTRANCE OR INTERSECTING ROAD



SECTION A-A
(Full Thickness Fillet - Non-paved Road)



SECTION A-A
(Wedge Shaped Fillet - Paved Entrance or Road)



SECTION A-A
(Full Thickness Fillet - Non-paved Entrance)

MINIMUM FILLET WIDTH		
TYPE OF ACCESS	PRIMARY ROADS (F) ft.	SECONDARY AND LOCAL ROADS (F) ft.
Residential Entrance	40	12
Farm Entrance	60	18
Commercial Entrance	80	24
Non-paved Road	100	30
Paved Road	Variable (5)	Variable (5)

For temporary runouts and wedges, place subgrade paper, burlap, or similar material over adjacent surfaces to facilitate removal. Construct temporary runout at a length of 10 feet for each 1 inch of resurfacing thickness.

Construct wedge shaped asphalt fillets at all paved entrances and paved roads. Construct full thickness fillets at all non-paved entrances and non-paved roads.

1. Width of fillet is 4 feet for each inch of overlay thickness.
2. The runout length of the intermediate course is equal to the total runout length, multiplied by the intermediate course thickness, divided by the total resurfacing thickness.
3. Excavate and shape road or entrance as required to accommodate proposed fillet.
4. For existing fillets at non-paved roads and entrances, construct a wedge shaped fillet matching the thickness of the resurfacing.
5. Match width and shape of existing pavement.

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DETAILS FOR ASPHALT PAVING

FIGURE 7020.903

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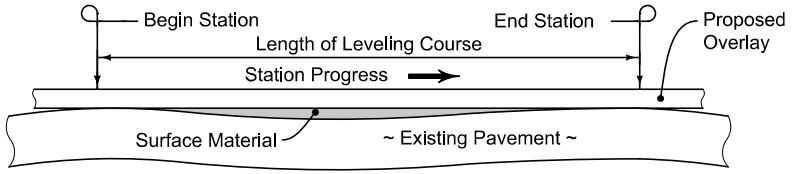
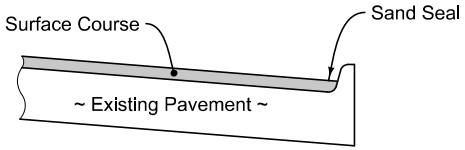
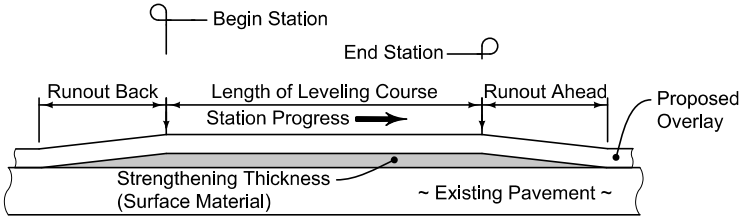


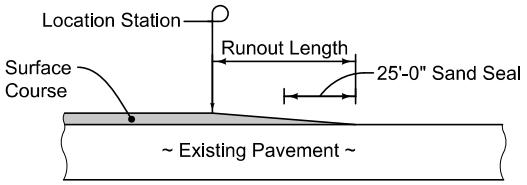
TYPICAL LEVELING COURSE



GUTTERLINE EDGE - MATCH

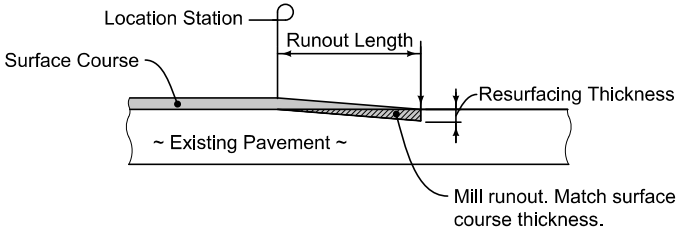


TYPICAL STRENGTHENING COURSE

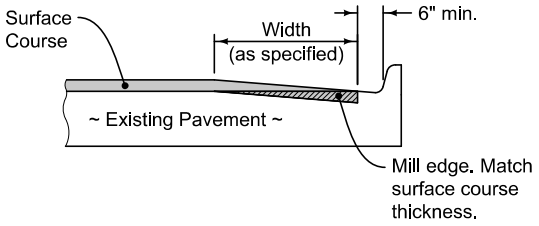


WEDGE SHAPED RUNOUT
(When Milling is not Specified)

RUNOUT LENGTH	
POSTED SPEED LIMIT (mph)	RUNOUT RATIO (ft. per inch)
45 or More	50
20 to 45	25



MILLED SURFACE NOTCH FOR RUNOUT



GUTTERLINE EDGE - NOTCH

SINGLE COURSE RESURFACING

FIGURE 7021.101

SHEET 1 OF 2

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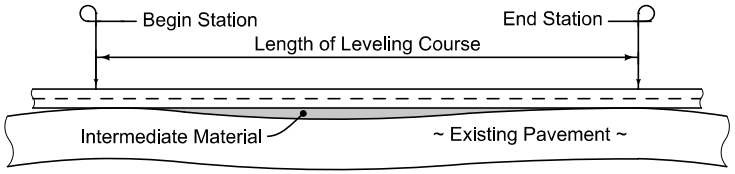
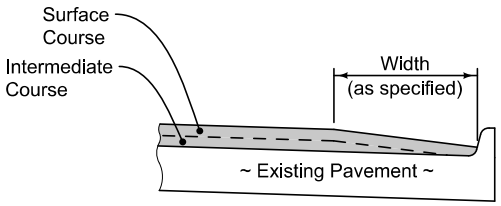
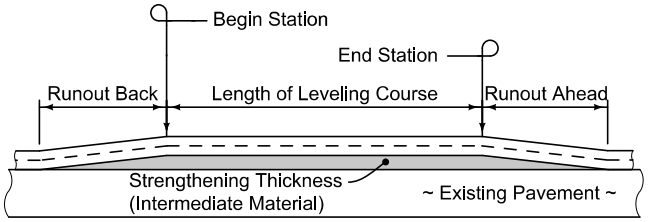
DETAILS FOR ASPHALT RESURFACING



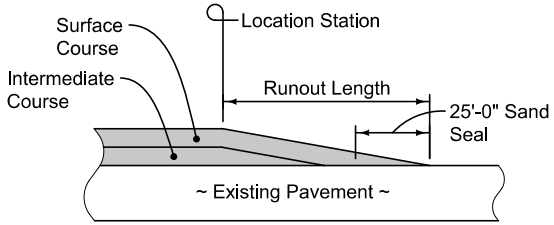
TYPICAL LEVELING COURSE



GUTTERLINE EDGE - MATCH

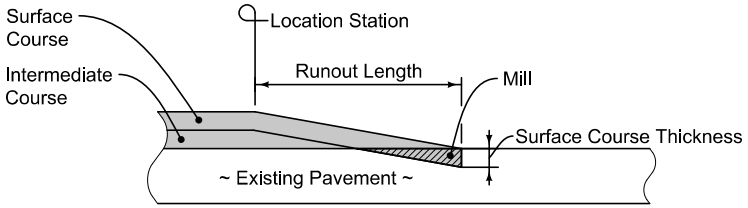


TYPICAL STRENGTHENING COURSE

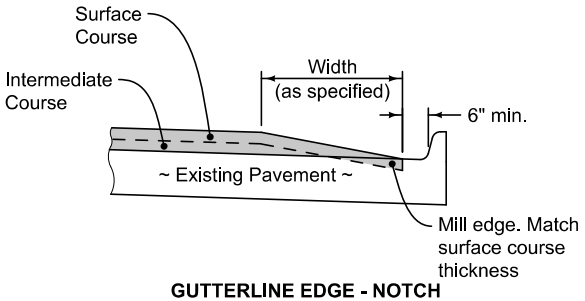


WEDGE SHAPED RUNOUT
(When Milling is not Specified)

RUNOUT LENGTH	
POSTED SPEED LIMIT (mph)	RUNOUT RATIO (ft. per inch)
45 or More	50
20 to 45	25



MILLED SURFACE NOTCH RUNOUT



GUTTERLINE EDGE - NOTCH

DOUBLE COURSE RESURFACING

FIGURE 7021.101 SHEET 2 OF 2

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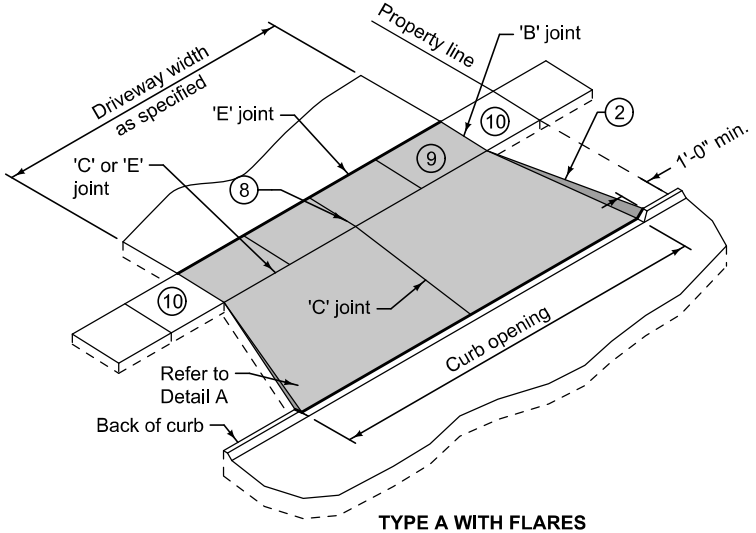
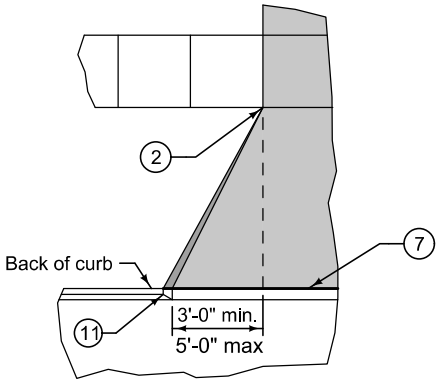
SUDAS Standard Specifications

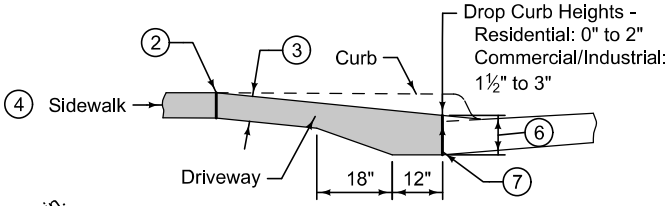
DETAILS FOR ASPHALT RESURFACING



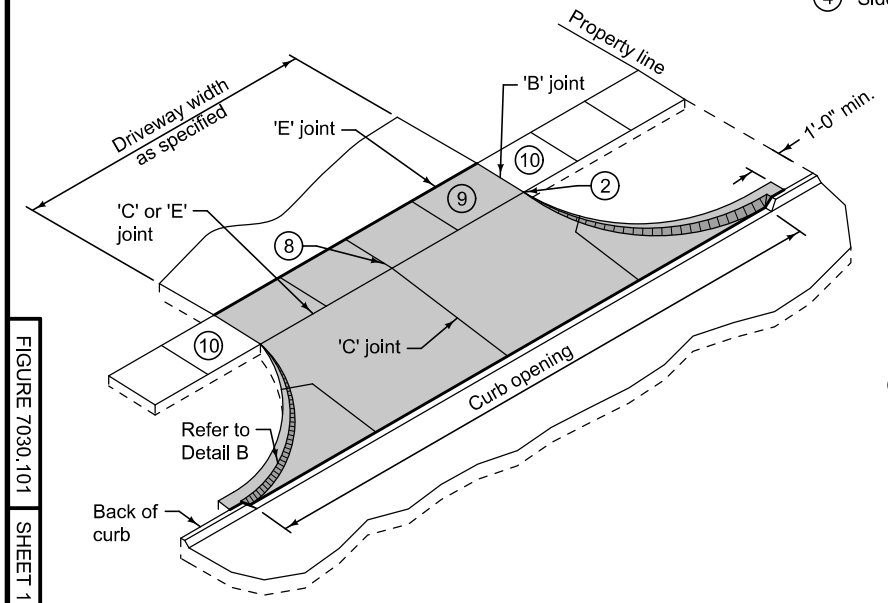
TYPE A WITH FLARES



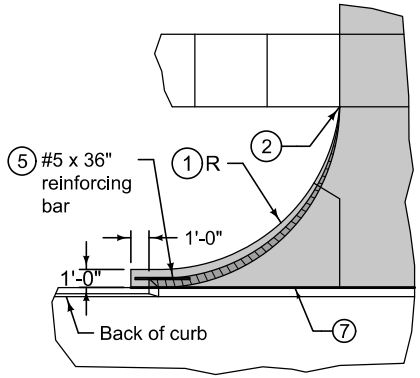
DETAIL A
(Residential/Agricultural Only)



TYPICAL SECTION



TYPE A WITH RADII



DETAIL B

1. Driveway radius (R).
   Residential: 10 foot minimum,15 foot maximum.
   Commercial and industrial: As specified in the contract documents.
2. Transition the curb height to 0 inches at end of taper/radius or at the front edge of sidewalk. Do not extend raised curb across sidewalk.
3. Pavement thickness.
   Residential: 6 inches minimum.
   Commercial and industrial: 7 inches minimum.
4. Sidewalk thickness through driveway to match thickness of driveway.
5. Center reinforcing bar vertically in the pavement.
6. Match thickness of adjacent roadway, 8 inches minimum.
7. Provide 'E' joint at back of curb unless 'B' joint is specified.
8. For alleys, invert the pavement crown 2% toward center of alley.
9. Target cross slope of 1.5% with a maximum cross slope of 2.0%. If specified in the contract documents, construct the sidewalk through the driveway 5 feet wide to serve as a passing space.
10. If cross slope of adjacent sidewalk panel exceeds 2.0%, remove and replace to transition from existing sidewalk to sidewalk through driveway. If elevation change requires a curb ramp, comply with Figure 7030.205; verify need for detectable warning panel with Engineer.
11. Transition street curb at minimum 1:1 slope to meet driveway curb.

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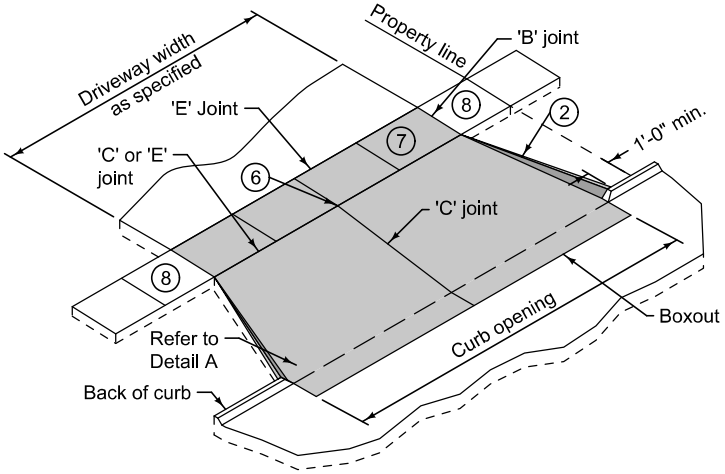
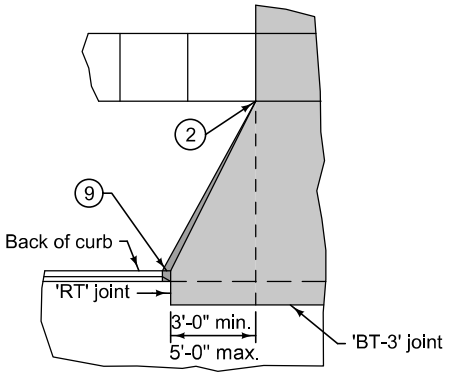
CONCRETE DRIVEWAY, TYPE A

FIGURE 7030.101 | SHEET 1 OF 1

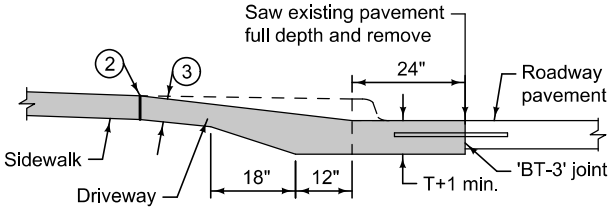


TYPE B WITH FLARES

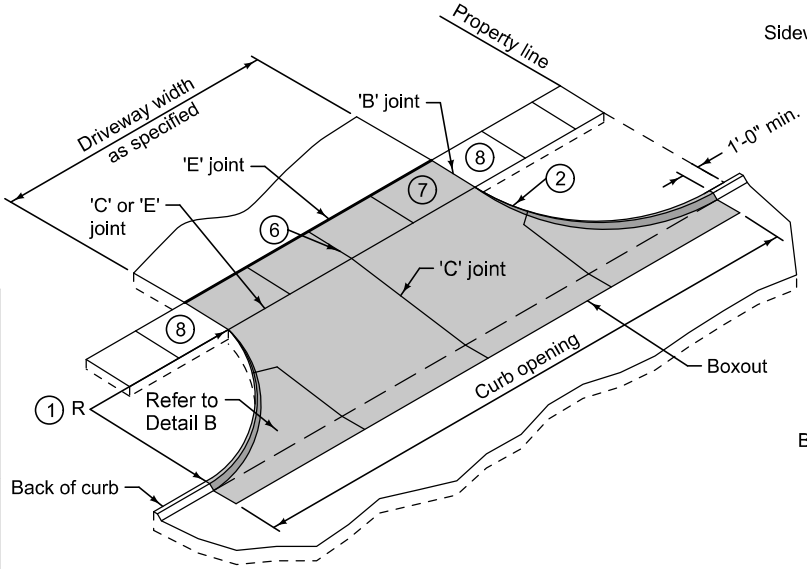


DETAIL A

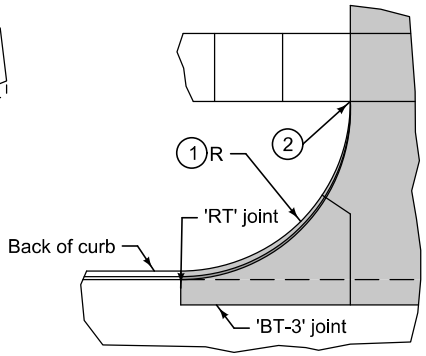
(Residential/Agricultural Only)



SECTION A-A



TYPE B WITH RADII



DETAIL B

1. Driveway radius (R).
   Residential: 10 foot minimum, 15 foot maximum.
   Commercial and industrial: As specified in the contract documents.
2. Transition the curb height to 0 inches at end of taper/radius or at the front edge of sidewalk. Do not extend raised curb cross sidewalk.
3. Pavement thickness.
   Residential: 6 inches minimum.
   Commercial and industrial: 7 inches minimum.
4. Sidewalk thickness through driveway to match thickness of driveway.
5. If longitudinal joint is located 48 inches or less from the back of curb, extend boxout to joint line. Full depth saw cut is still required.
6. For alleys, invert the pavement crown 2% toward the center of the alley.
7. Target cross slope of 1.5% with a maximum cross slope of 2.0%. If specified in the contract documents, construct the sidewalk through the driveway 5 feet wide to serve as a passing space.
8. If cross slope of adjacent sidewalk panel exceeds 2.0%, remove and replace to transition from existing sidewalk to sidewalk through driveway. If the elevation change requires a curb ramp, comply with Figure 7030.205; verify need for detectable warning panel with Engineer.
9. Transition street curb at minimum 1:1 slope to meet driveway curb.

FIGURE 7030.102

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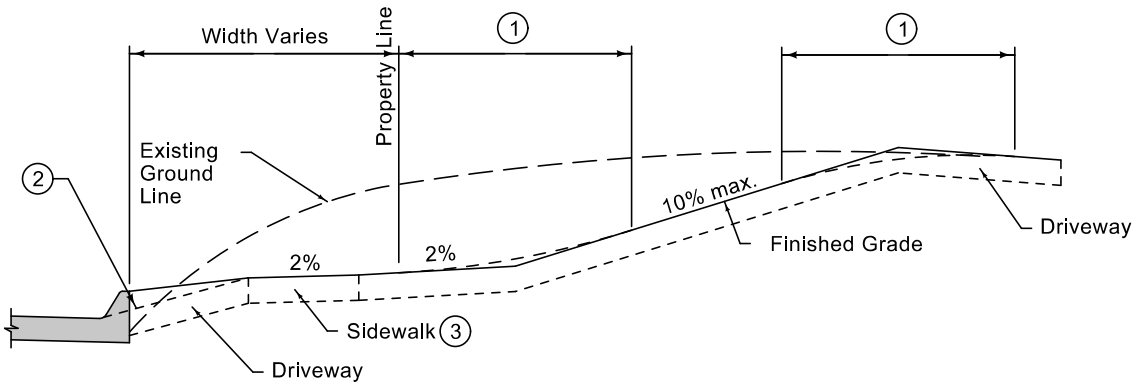
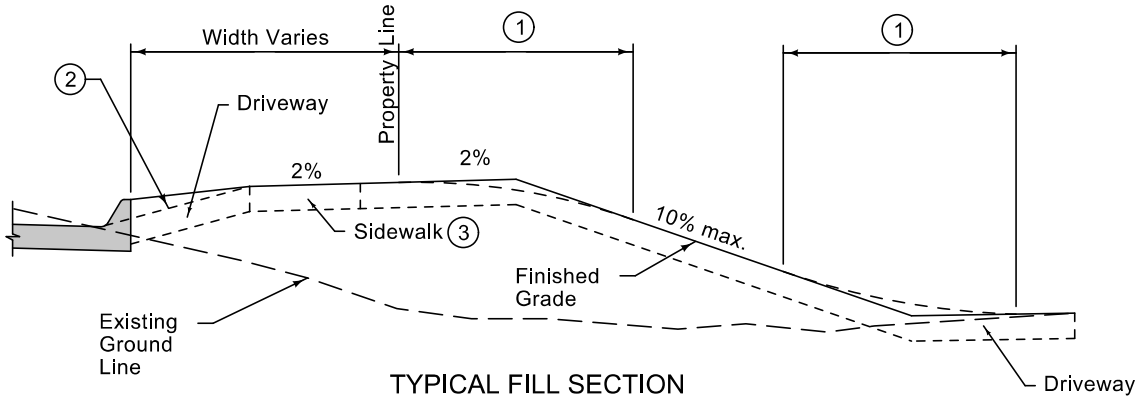
SUDAS Standard Specifications

CONCRETE DRIVEWAY, TYPE B



TYPICAL CUT SECTION



TYPICAL FILL SECTION

1. 10 foot vertical curve required for 5% or greater change in grade.
2. Slope varies. See contract documents.
3. Target cross slope of 1.5% with a maximum cross slope of 2.0%.

FIGURE 7030.103

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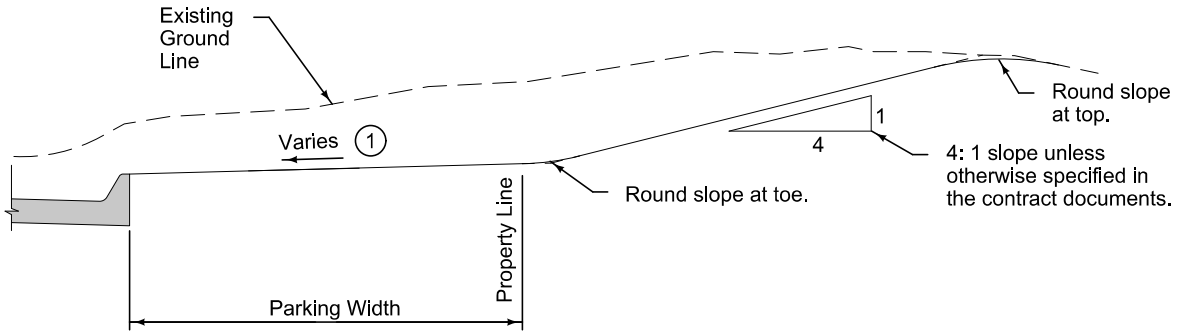
SUDAS Standard Specifications

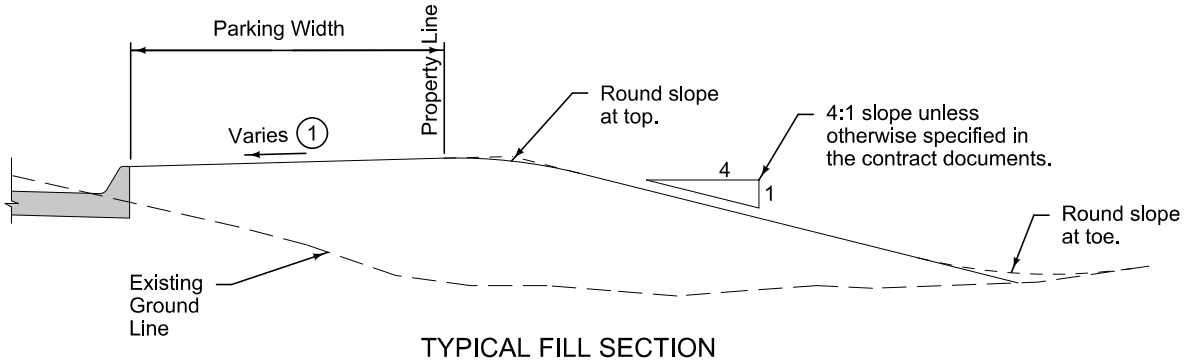
DRIVEWAY GRADING

(1) Parking Slope:
If parking width is less than 10 feet wide, slope at 1/4 inch per foot.

If parking width is 10 feet wide and greater, slope at 1/2 inch per foot.



TYPICAL CUT SECTION



TYPICAL FILL SECTION

FIGURE 7030.104 | SHEET 1 OF 1

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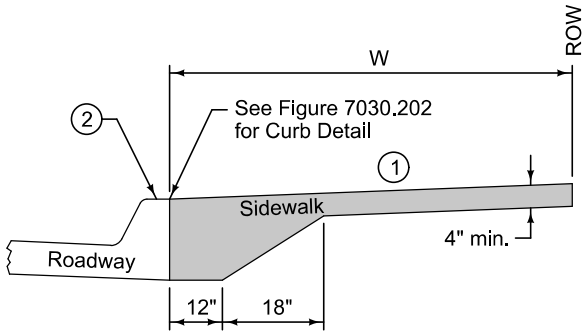
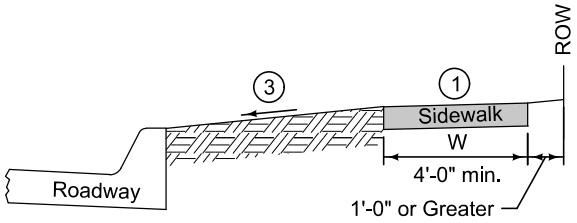
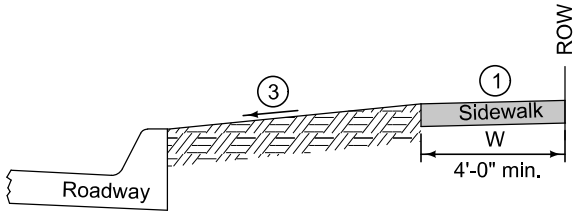
RIGHT-OF-WAY GRADING



CLASS A SIDEWALK
(Sidewalk extends from back of curb to ROW)



CLASS B SIDEWALK



CLASS C SIDEWALK

(1) Target cross slope of 1.5% with a maximum cross slope of 2.0% (including sidewalk through driveway).

(2) Ensure top of curb slopes to street for drainage.

(3) Parking Slopes:
If parking width is less than 10 feet wide, slope at ¼ inch per foot.

If parking width is 10 feet wide and greater, slope at ½ inch per foot.

Special grade may be specified in the contract documents.

W = Sidewalk width as specified in the contract documents.

FIGURE 7030.201 | SHEET 1 OF 1

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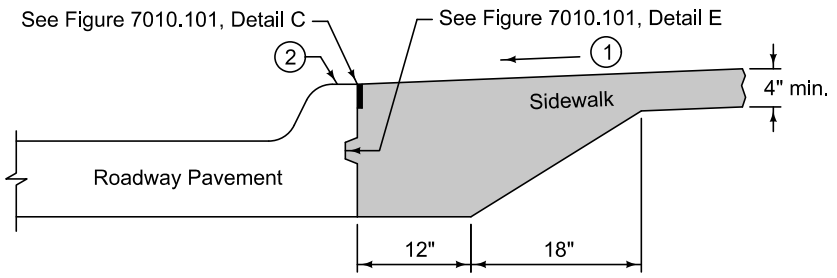
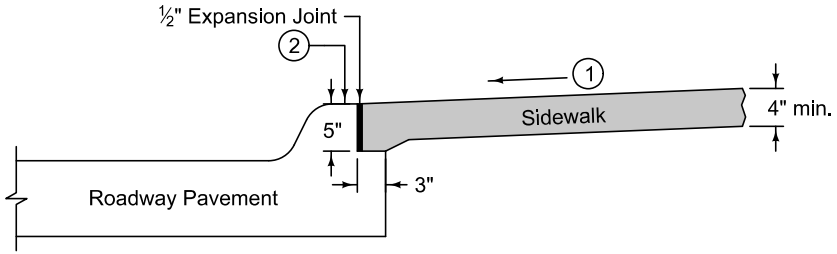
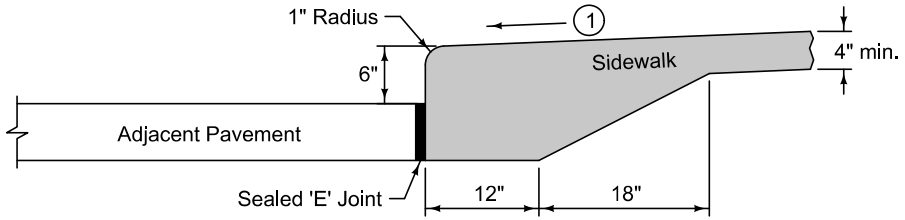
CLASSES OF SIDEWALKS



DETAIL 1



DETAIL 2



DETAIL 3

For new sidewalk with new curb and gutter, comply with Detail 1 or Detail 2. Comply with Detail 3 for new sidewalk adjacent to existing pavement or when specified in the contract documents.

(1) Target cross slope of 1.5% with a maximum cross slope of 2.0%.

(2) Ensure top of curb slopes to street for drainage.

FIGURE 7030.202

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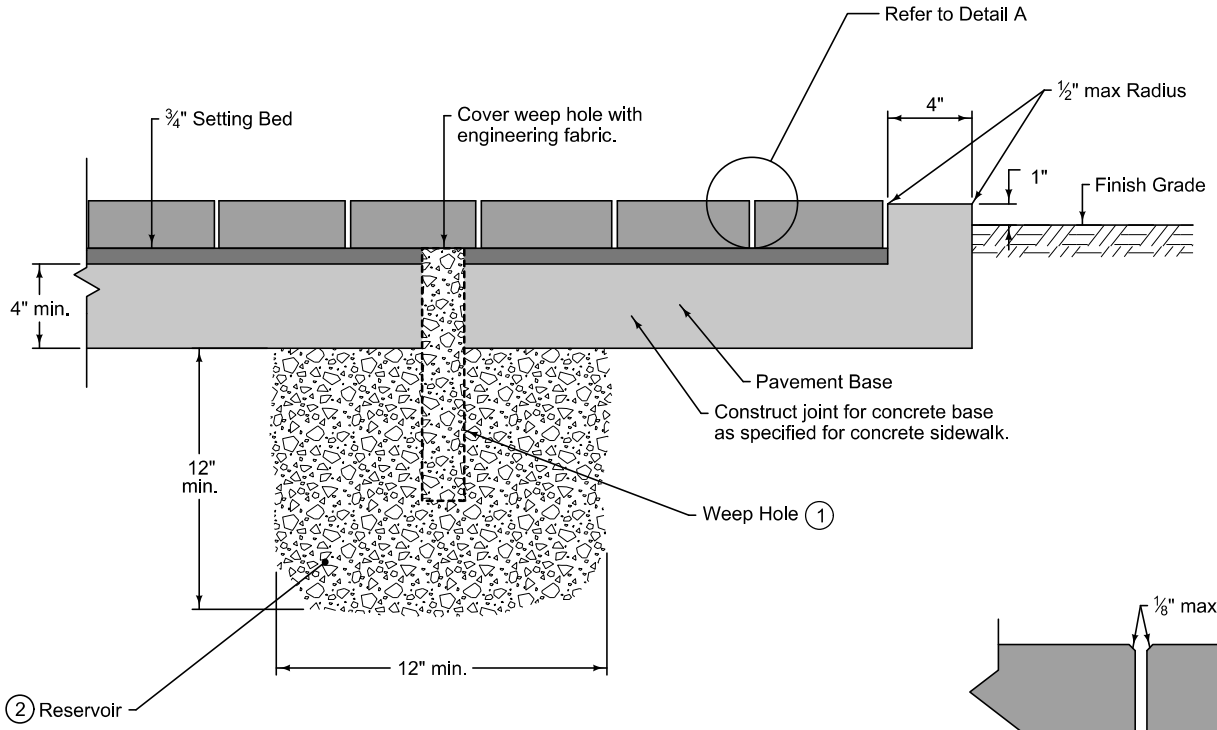
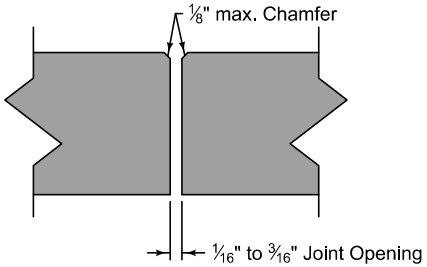
CURB DETAILS FOR CLASS A SIDEWALK

Install brick/paver sidewalk with pattern specified in the contract documents.

1. Install 2 inch diameter, 12 inch long, PVC pipe even with the top of the asphalt setting bed at locations specified. Fill pipe with 3/4 inch clean rock.
2. Fill reservoir with 3/4 inch clean rock. Extend reservoir to subdrain if present.



BRICK/PAVER SIDEWALK WITH PAVEMENT BASE



Detail A

FIGURE 7030.203 | SHEET 1 OF 1

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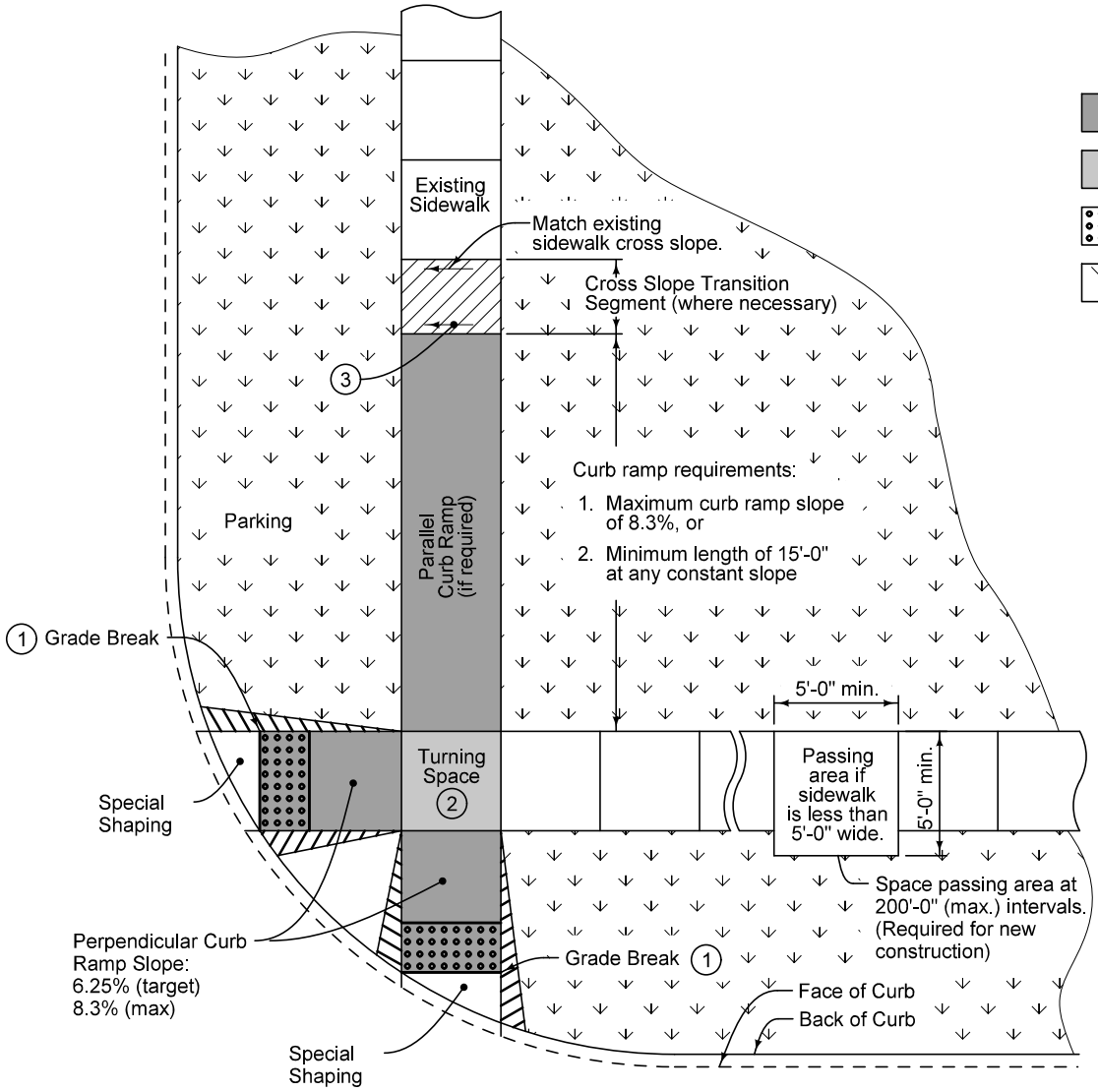
BRICK/PAVER SIDEWALK



Key

- Curb Ramp
- Turning Space
- Detectable Warning
- Grass

1. Match pedestrian street crossing slope, or flatter.
2. Minimum 4 feet by 4 feet. Target cross slope of 1.5% with a maximum cross slope of 2.0%.
3. Target cross slope of 1.5% with a maximum cross slope of 2.0%.

FIGURE 7030.204 | SHEET 1 OF 1

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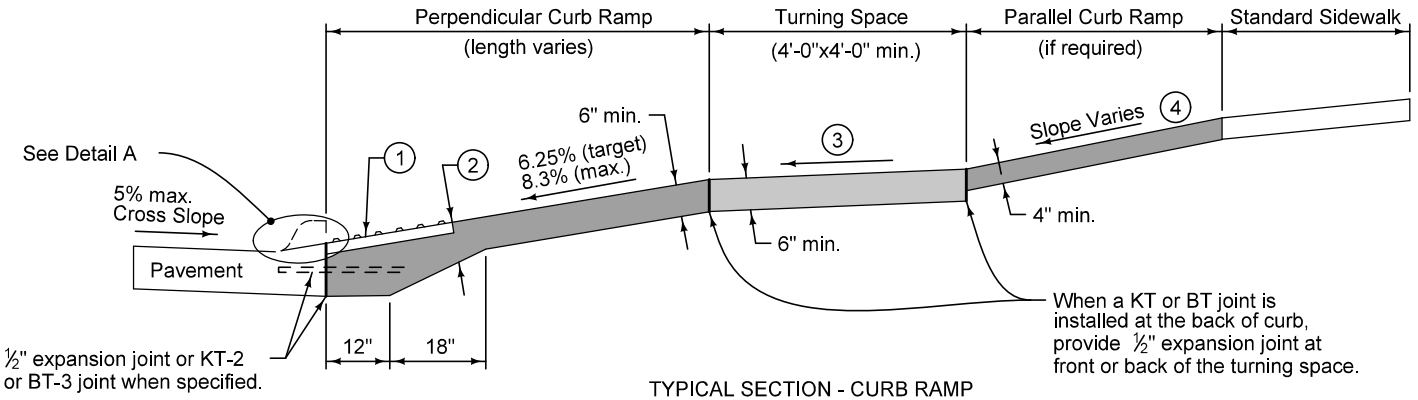
SUDAS Standard Specifications

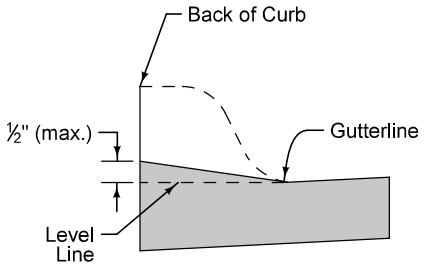
GENERAL FEATURES OF AN ACCESSIBLE SIDEWALK



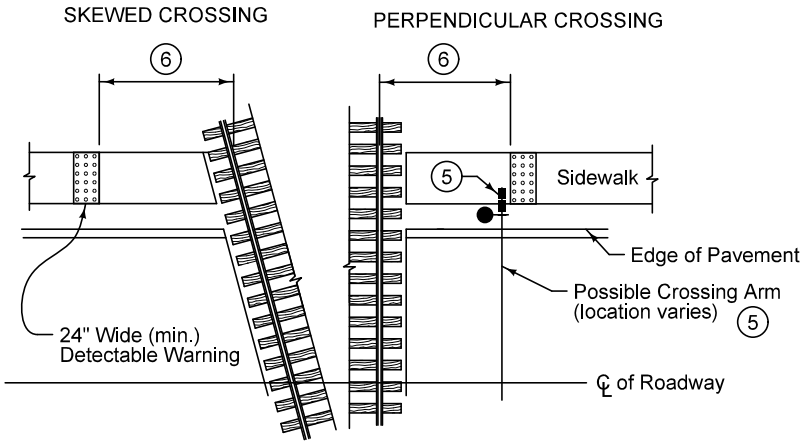
TYPICAL SECTION - CURB RAMP

Key

- Curb Ramp
- Turning Space
- Detectable warning



DETAIL A



DETECTABLE WARNING LOCATION AT RAILROAD CROSSING

1. Provide a minimum 2 foot width of detectable warning surfaces in the direction of pedestrian travel across the full width of the curb ramp or turning space, exclusive of curbs or flares.
2. Provide a minimum of 6 inches of concrete below the detectable warning panel.
3. Minimum 4 feet by 4 feet. Target cross slope of 1.5% with a maximum cross slope of 2.0%.
4. If normal sidewalk elevation cannot be achieved with the perpendicular ramp between the street and landing due to limited ramp length, provide a parallel ramp to make up the elevation difference between the landing and the standard sidewalk.

   The length of the parallel ramp is not required to exceed 15 feet, regardless of the resulting slope. Do not exceed 8.3% slope for parallel ramps shorter than 15 feet.
5. If crossing gate conflicts with location of detectable warning or if pedestrian crossing gate is provided, place detectable warning panel in advance of the crossing gate.
6. Locate front edge of detectable warning panel 12 to 15 feet from centerline of nearest rail. Orient truncated domes parallel to the direction of pedestrian travel.

FIGURE 7030.205 | SHEET 1 OF 1

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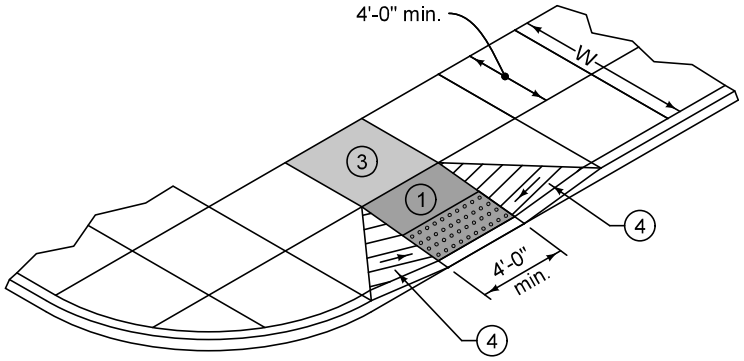
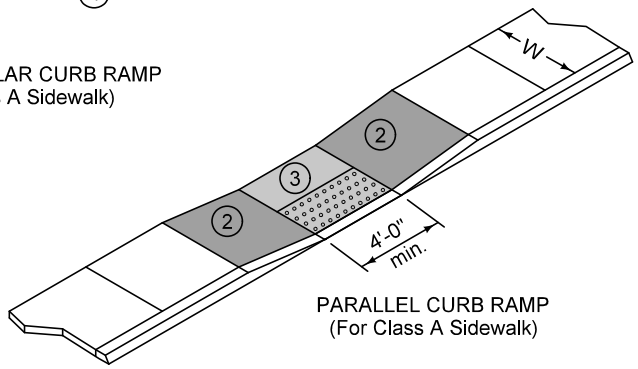
SUDAS Standard Specifications

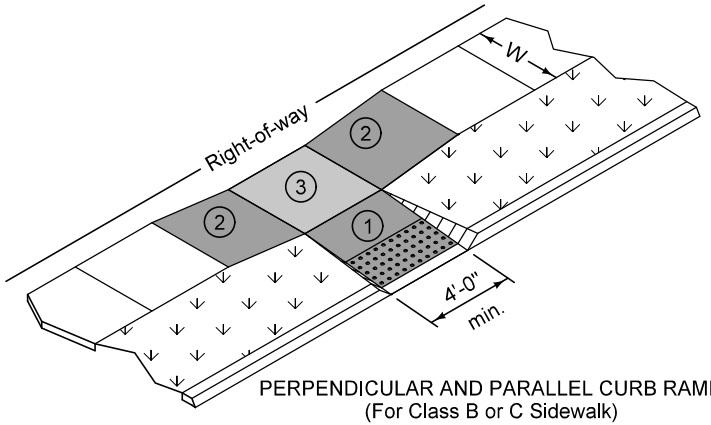
GENERAL SIDEWALK AND CURB RAMP DETAILS



PERPENDICULAR CURB RAMP
(For Class A Sidewalk)



PARALLEL CURB RAMP
(For Class A Sidewalk)



PERPENDICULAR AND PARALLEL CURB RAMP
(For Class B or C Sidewalk)

Key

- Curb Ramp
- Turning Space
- Detectable Warning

1. Perpendicular Curb Ramp: Target running slope of 6.25% with maximum running slope of 8.3%. Match pedestrian street crossing cross slope at back of curb. At mid-block crossings, cross slope may exceed 2.0% to match roadway grade.
2. Parallel Curb Ramp: Target cross slope of 1.5% with a maximum cross slope of 2.0%. The length of the parallel ramp is not required to exceed 15 feet, regardless of resulting slope. Do not exceed 8.3% slope for parallel ramps shorter than 15 feet.
3. Turning Space: Target slope of 1.5%, with a maximum slope perpendicular to the travel directions of 2.0%. At mid-block crossings, cross slope of landing may exceed 2.0% to match roadway grade. Minimum 4 feet by 4 feet.
4. Flare (10:1 max.) required if ramp is contiguous with sidewalk.

FIGURE 7030.206 | SHEET 1 OF 1

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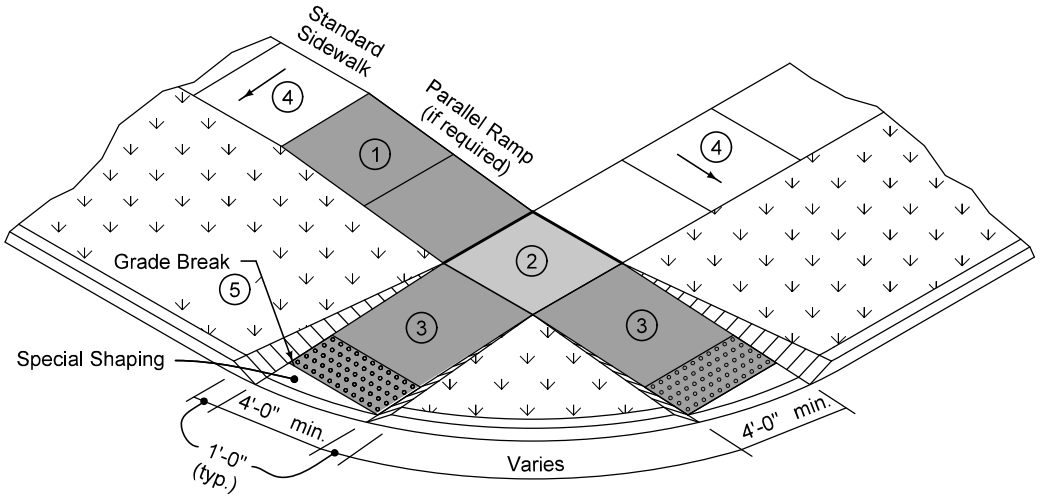
CURB RAMPS OUTSIDE OF INTERSECTION RADIUS



1. Parallel Curb Ramp: If normal sidewalk elevation cannot be achieved with the perpendicular ramp between the street and landing due to limited ramp length, provide a parallel ramp to make up the elevation difference between the landing and the standard sidewalk.

   The length of the parallel ramp is not required to exceed 15 feet, regardless of the resulting slope. Do not exceed 8.3% slope for parallel ramps shorter than 15 feet.

2. Turning Space: Target slope of 1.5% with maximum slope perpendicular to the travel directions of 2.0%. Minimum 4 feet by 4 feet.

3. Perpendicular Curb Ramp: Target running slope of 6.25% with maximum running slope of 8.3%.

4. Target cross slope of 1.5% with a maximum cross slope of 2.0%.

5. Match pedestrian street crossing cross slope or flatter.

Key

- Curb Ramp
- Turning Space
- Detectable warning
- Grass

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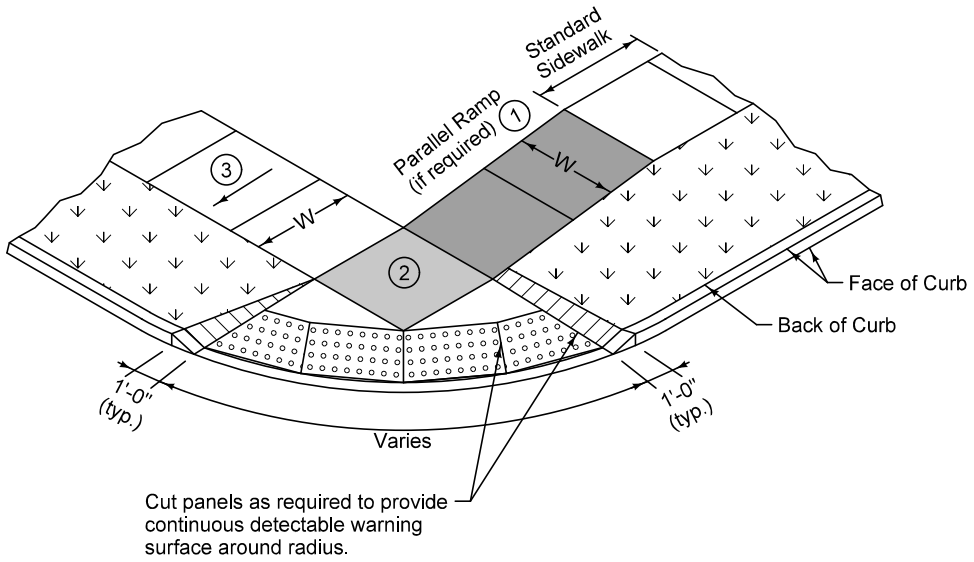
SUDAS Standard Specifications

CURB RAMP FOR
CLASS B OR C SIDEWALK

FIGURE 7030.207

SHEET 1 OF 1



1. Parallel Curb Ramp: If normal sidewalk elevation cannot be achieved with the perpendicular ramp between the street and landing due to limited ramp length, provide a parallel ramp to make up the elevation difference between the landing and the standard sidewalk.

   The length of the parallel ramp is not required to exceed 15 feet, regardless of the resulting slope. Do not exceed 8.3% slope for parallel ramps shorter than 15 feet.

2. Turning Space: Target slope of 1.5% with maximum slope perpendicular to the direction of travel of 2.0%. Minimum 4 feet by 4 feet.

3. Target cross slope of 1.5% with a maximum cross slope of 2.0%.

Key

- Curb Ramp
- Turning Space
- Detectable warning
- Grass

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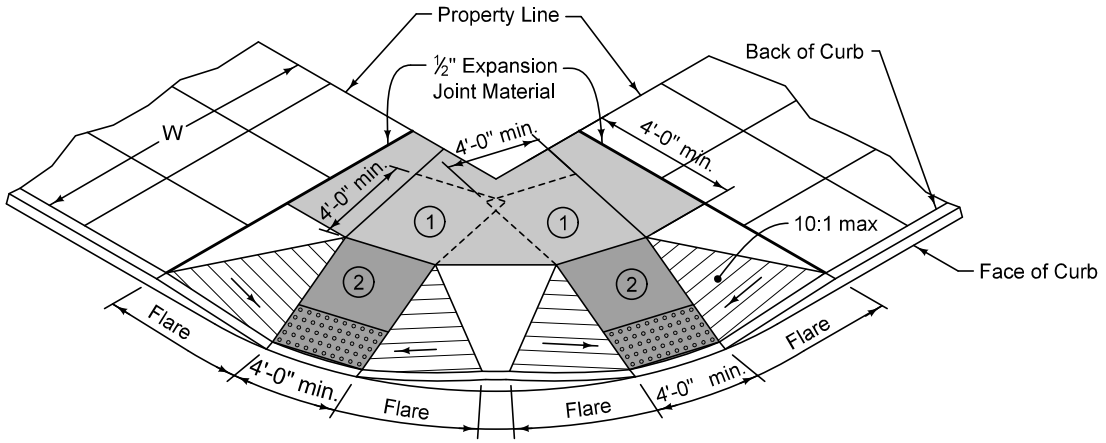
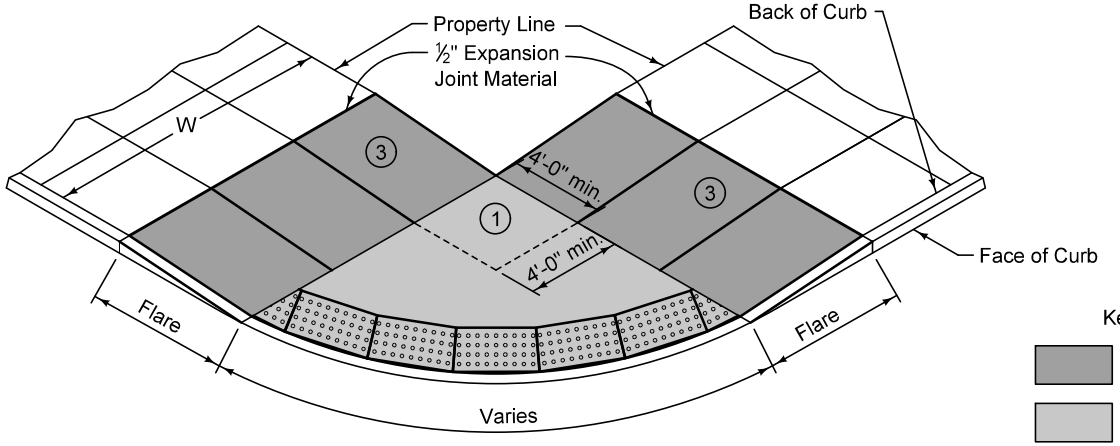
SUDAS Standard Specifications

ALTERNATIVE CURB RAMP FOR CLASS B OR C SIDEWALK

FIGURE 7030.208 | SHEET 1 OF 1



CLASS A SIDEWALK CURB RAMP



CLASS A SIDEWALK CURB RAMP ALTERNATIVE

Key

- Curb Ramp
- Turning Space
- Detectable Warning

1. Turning Space: Target slope of 1.5% with maximum slope perpendicular to the travel direction of 2.0%. Minimum 4 feet by 4 feet (turning spaces may overlap).
2. Perpendicular Curb Ramp: Target running slope of 6.25% with maximum running slope of 8.3%.
3. Parallel Curb Ramp: Target running slope of 6.25% with maximum running slope of 8.3%. The length of the parallel ramp is not required to exceed 15 feet, regardless of the resulting slope. Do not exceed 8.3% for parallel ramps shorter than 15 feet.

FIGURE 7030.209 | SHEET 1 OF 1

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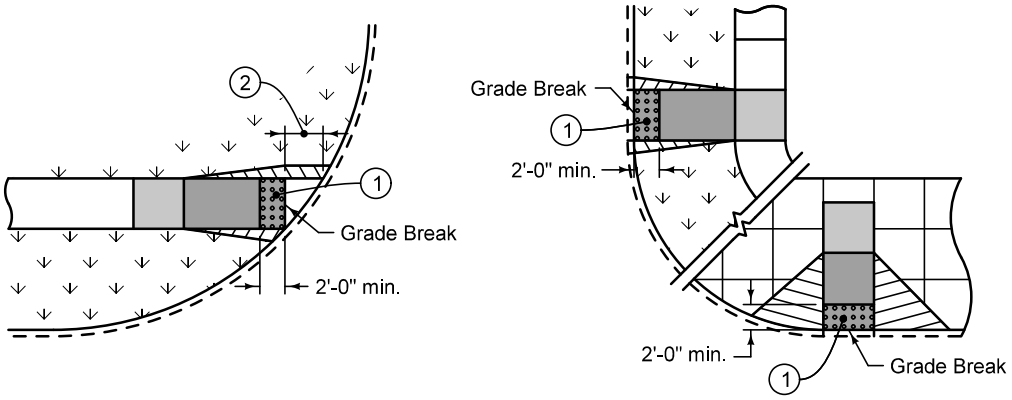
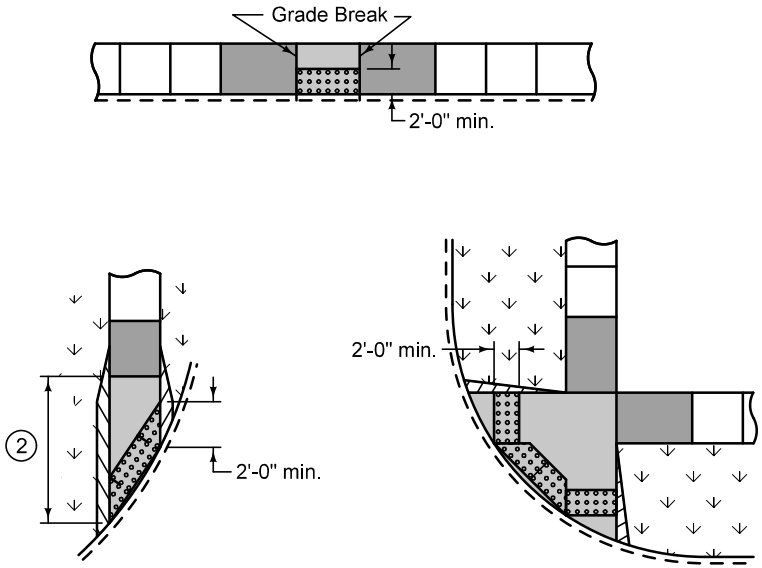
CURB RAMPS FOR CLASS A SIDEWALK



PERPENDICULAR RAMPS



PARALLEL RAMPS

Provide a minimum 2 foot width of detectable warning surfaces in the direction of pedestrian travel across the full width of the curb ramp or turning space, exclusive of curbs or flares.

(1) When detectable warning is located on curb ramp surface, orient domes in the direction of pedestrian travel.

(2) When the distance between the grade break and the back of curb is less than 5 feet, place detectable warning surface at the bottom of the curb ramp.

Where one corner of the curb ramp is more than 5 feet from the back of curb, construct curb ramp as a parallel curb ramp. Move grade break back as required to place detectable warning on turning space at the back of curb.

Key

- Curb Ramp
- Turning Space
- Detectable Warning

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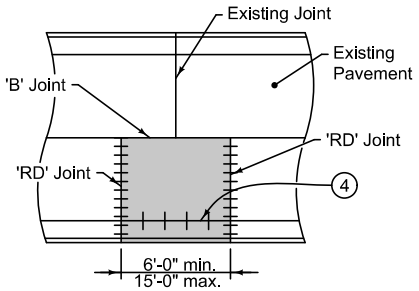
DETECTABLE WARNING PLACEMENT

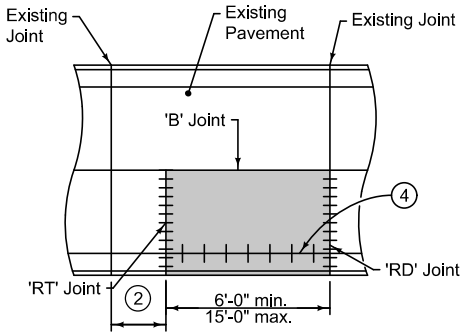
FIGURE 7030.210

SHEET 1 OF 1

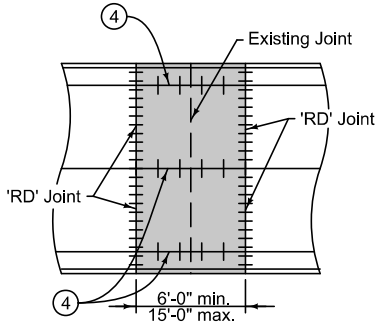
GUTTERLINE JOINTING



ONE PANEL WIDTH PATCH WITH OPPOSING JOINT

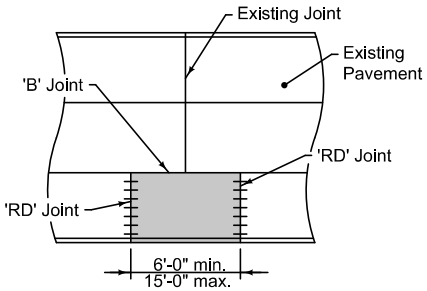


ONE PANEL WIDTH PATCH NO OPPOSING JOINT

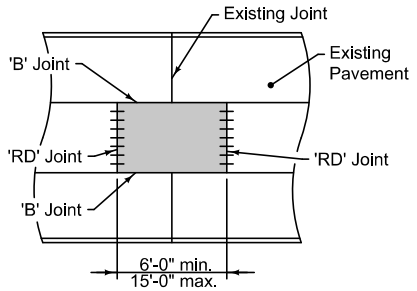


FULL ROADWAY WIDTH PATCH

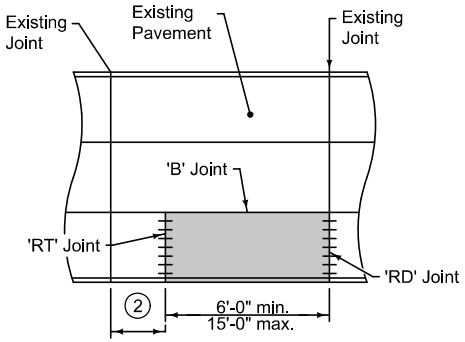
THIRD POINT JOINTING (1)



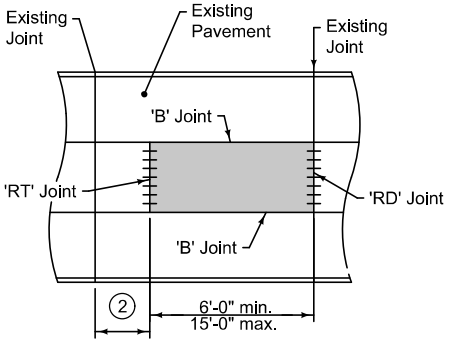
OUTSIDE PANEL PATCH WITH OPPOSING JOINT



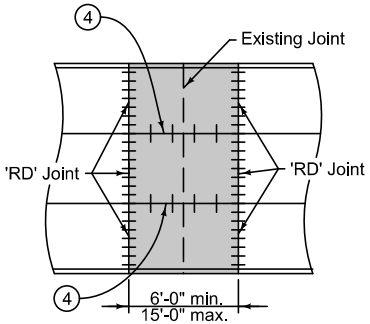
CENTER PANEL PATCH WITH OPPOSING JOINTS



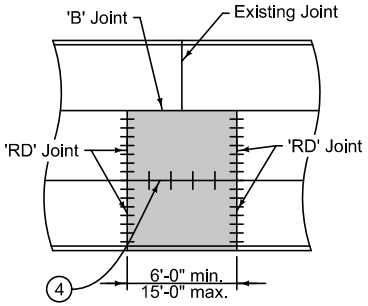
OUTSIDE PANEL PATCH NO OPPOSING JOINT



CENTER PANEL PATCH NO OPPOSING JOINT



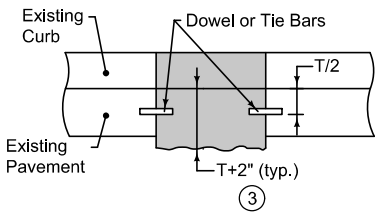
FULL ROADWAY WIDTH PATCH



ADJACENT PANELS PATCH

1. Patches on roadways with quarter point jointing will be similar to third point jointing details.
2. Minimum distance between existing joint and patch is 6 feet. If distance is less than 6 feet, extend patch to existing joint.
3. If subgrade or subbase material is required below patch, bring material to a level 2 inches below bottom of existing pavement.
4. BT, KT, or L joint depending on pavement thickness and pouring sequence.

LONGITUDINAL SECTION THRU PCC PATCH



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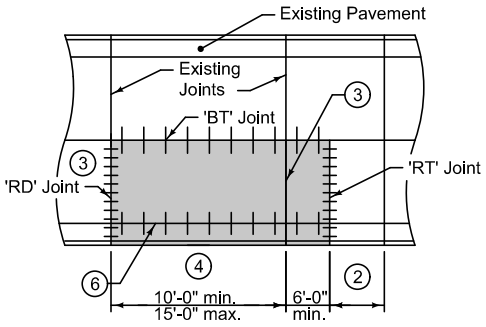
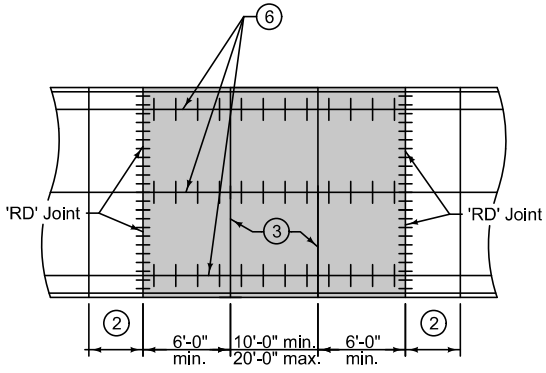
FULL DEPTH PCC PATCHES
LESS THAN OR EQUAL TO 15' LONG

FIGURE 7040.101 | SHEET 1 OF 1

GUTTERLINE JOINTING

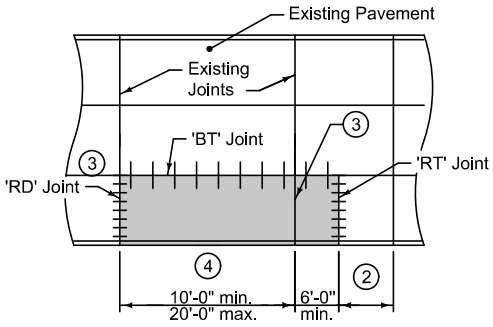


ONE PANEL WIDTH PATCH

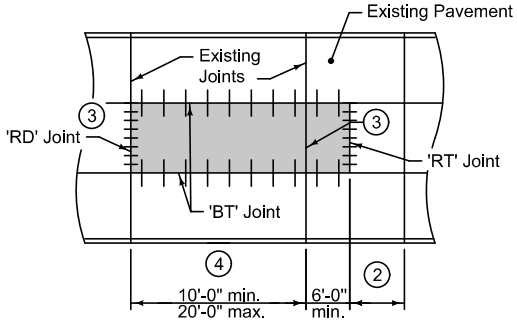


FULL ROADWAY WIDTH PATCH

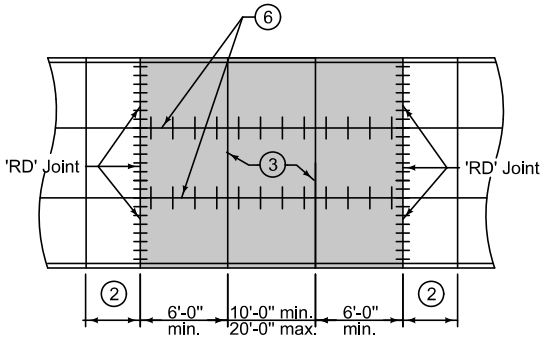
THIRD POINT JOINTING (1)



OUTSIDE PANEL PATCH



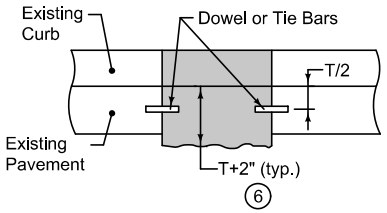
CENTER PANEL PATCH



FULL ROADWAY WIDTH PATCH

1. Patches on roadways with quarter point jointing will be similar to third point jointing details.
2. Minimum distance between existing joint and patch is 6 feet. If distance is less than 6 feet, extend patch to existing joint.
3. Match existing joint type and locations. If specified, replace existing 'C' joints with 'CD' joints.
4. If existing joint spacing is greater than 20 feet, add a 'CT' joint at mid-panel.
5. If subgrade or subbase material is required below patch, bring material to a level 2 inches below bottom of existing pavement.
6. BT, KT, or L joint depending on pavement thickness and pouring sequence

LONGITUDINAL SECTION THRU PCC PATCH



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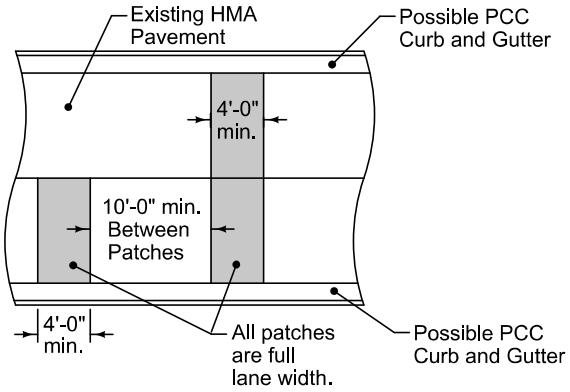
FULL DEPTH PATCHES GREATER THAN 15' LONG

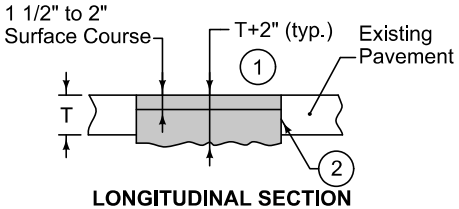
FIGURE 7040.102 | SHEET 1 OF 1

(1) If subgrade or subbase material is required below patch, bring material to a level 2 inches below bottom of existing pavement.

(2) When removing pavement, saw to full depth or 10 inches, whichever is less.



HMA PATCHES



LONGITUDINAL SECTION THRU HMA PATCH

FIGURE 7040.103

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7040.103

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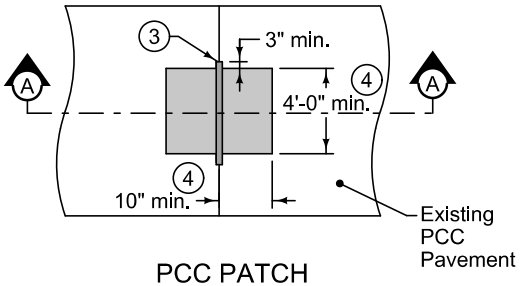
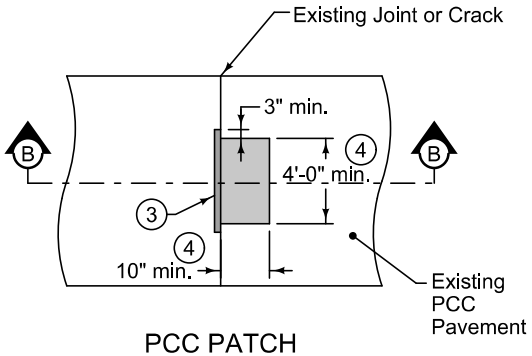
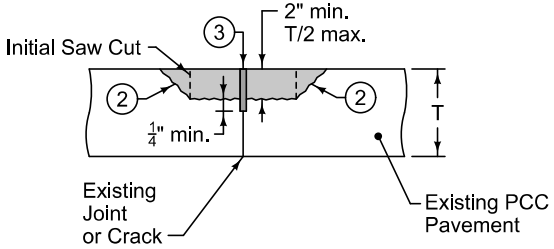
FULL DEPTH HMA PATCHES



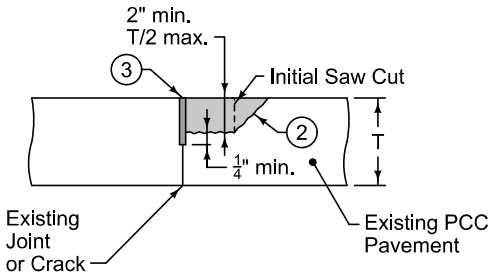
PCC PATCH
ACROSS JOINT



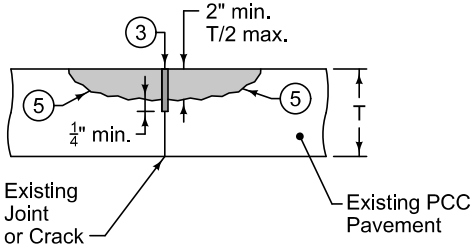
PCC PATCH
ABUTTING JOINT



SECTION A-A
(Option 1: Sawed Edges)

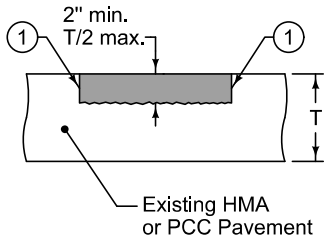


SECTION B-B



SECTION A-A
(Option 2: Milled Edges)

1. Vertical saw cut (typical). Apply tack coat to sides and bottom.
2. Taper the sides of the removal area 30 to 60 degrees from vertical. Apply cement grout to sides and bottom.
3. Saw and seal existing joint.
4. Extend patch limits at least 3 inches beyond distressed area.
5. When milled removal is allowed, sawed vertical edges are not required. Apply cement grout to milled area.



HMA PATCH

FIGURE 7040.104 | SHEET 1 OF 1

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1	10-17-17

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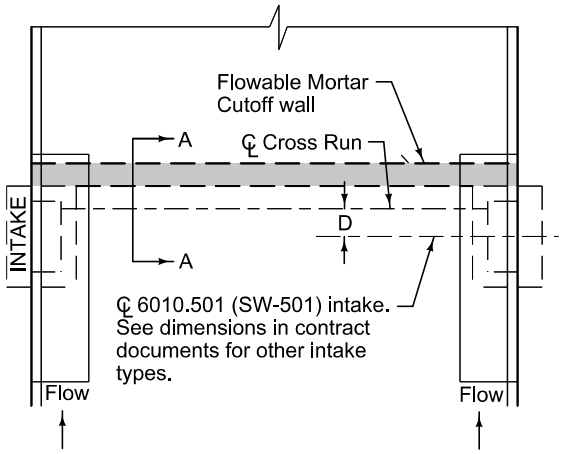
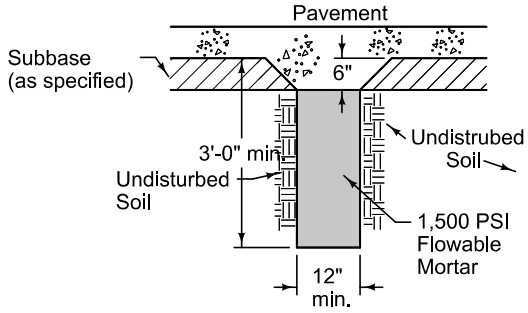
SUDAS Standard Specifications

PARTIAL DEPTH PATCHES

Length of cutoff wall to be back of curb to back of curb.

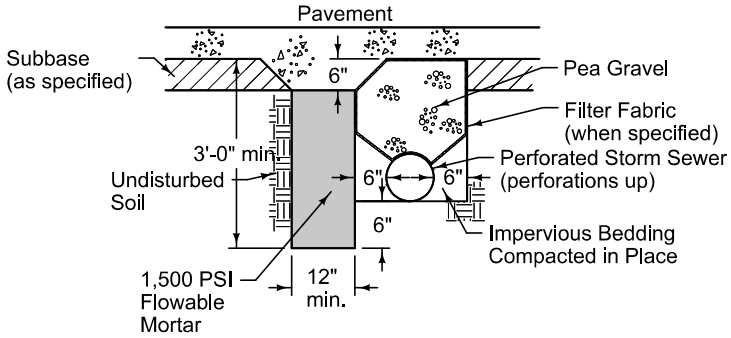


PLAN VIEW
(Flowable mortar cutoff wall and cross run location.)

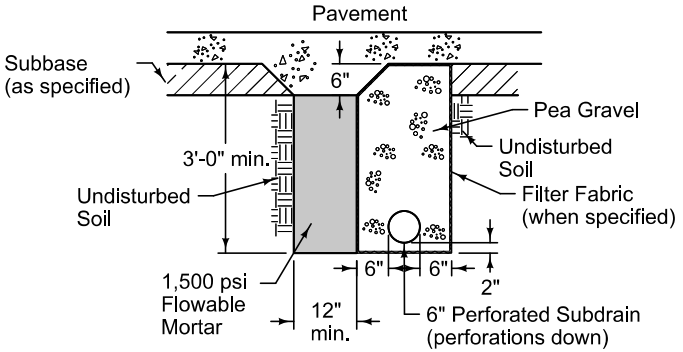


FLOWABLE MORTAR CUTOFF WALL
(Without Sewer)

DISTANCE FROM ℄ INTAKE TO ℄ CROSSRUN	
Size	D
15" RCP	0.7'
15" CMP	0.8'
18" RCP	0.5'
18" CMP	0.7'



SECTION A-A
(Flowable mortar cutoff wall and storm sewer)



FLOWABLE MORTAR CUTOFF WALL
(With Subdrain)

FIGURE 7040.105 | SHEET 1 OF 1

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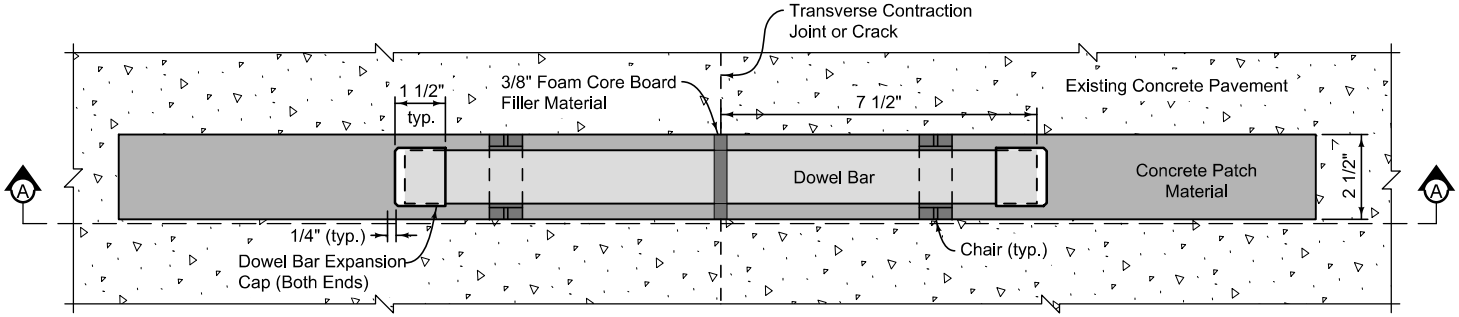
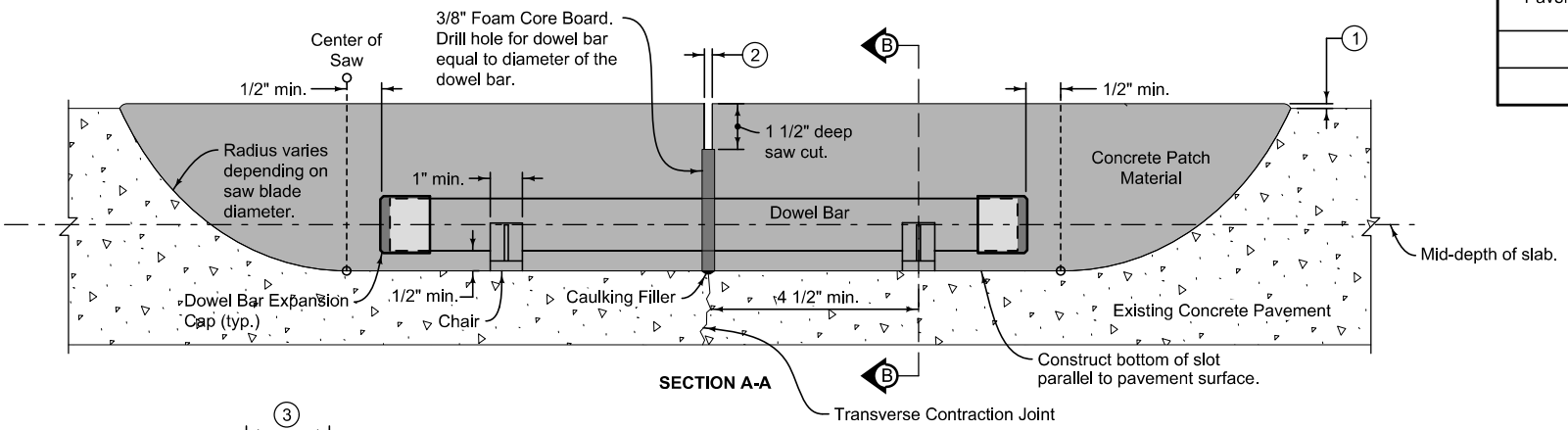
SUDAS Standard Specifications

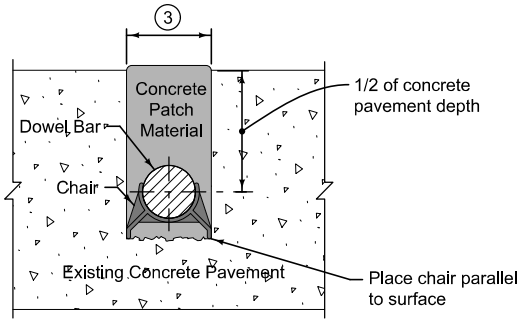
FLOWABLE MORTAR CUTOFF WALL



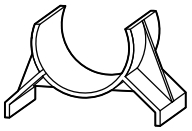
PLAN VIEW



SECTION A-A



SECTION B-B



CHAIR DETAIL

1. Extend concrete patch material 1/8" above existing concrete surface for projects to be diamond ground; construct flush if diamond grinding is not required.
2. Sawcut joint width 3/16" min to 5/16" max. Saw after concrete patch material has set.
3. Cut slot width equal to chair width (min) to chair width + 1/8" (max).

DOWEL BAR DIAMETER	
Pavement Thickness (inches)	Diameter (inches)
8 to 9½	1¼
>10	1½

FIGURE 7040.106 | SHEET 1 OF 1

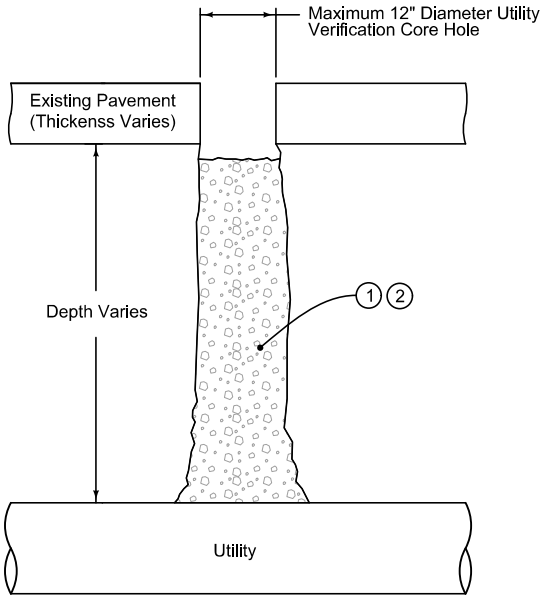
SUDAS | INTERIM | REVISION NEW 01-01-26

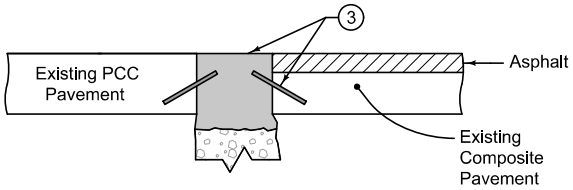
FIGURE 7040.106 | STANDARD ROAD PLAN | PR-106 | SHEET 1 of 1

REVISIONS:

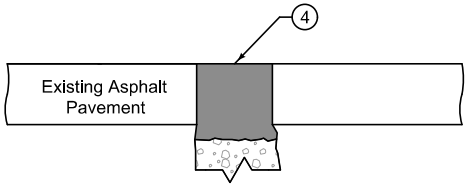
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

DOWEL BAR RETROFIT

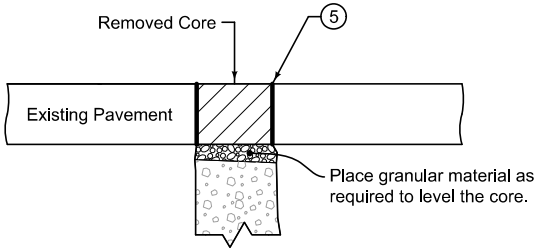




PCC CORE HOLE REPAIR



ASPHALT CORE HOLE REPAIR



CORE REPLACEMENT
(Reinstatement of Removed Core)

For pedestrian ramps damaged by subsurface utility exploration (SUE) core holes, replace the entire ramp according to Section 7030. For pavements damaged by SUE core holes, provide patches according to Figures 7040.101 or 7040.103. If allowed by the Engineer, repair core holes as shown.

1. Fill vacuum excavated SUE hole with CLSM to an elevation within 2 inches of the bottom of the pavement.
2. When allowed by the Engineer, fill utility verification hole with Class I bedding stone, pea gravel, or suitable native materials. Place backfill materials in 4 inch maximum lifts and compact each lift.
3. For PCC core hole repairs, drill four, 5 inch long, 5/8 inch diameter holes into the sides of the core hole at a 30 to 45 degree angle. Grout four 8 inch long #4 reinforcing bars into holes. Fill core holes with low slump concrete, tamp to remove air voids, screed level with existing pavement and texture to match existing pavement.
4. For asphalt core hole repairs, place asphalt mixture in 2 inch lifts and compact. If allowed by the Engineer, replace core with low slump concrete as noted above or pre-mixed high performance cold mix generally meeting the asphalt mixture specified. Match elevation of existing pavement.
5. When allowed by the Engineer, the removed core may be replaced back in the core hole. If the removed core is intact, stable, and free of fractures, replace core back in hole and fill annular space with approved bonding material.

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New | 2021 Edition

7040.107

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SUDAS Standard Specifications

UTILITY CORE HOLE REPAIR

FIGURE 7040.107 | SHEET 1 OF 1

Refer to the contract documents for dimensions, grades, and additional requirements for permeable interlocking pavers and associated improvements.

(1) Permeable interlocking pavers as specified in the contract documents.

(2) 2 inch minimum permeable pavement bedding aggregate to accomodate imperfections in the permeable pavement filter aggregate layer.

(3) Permeable pavement storage aggregate thickness as specified in the contract documents.

(4) When underdrain collectors and/or laterals are specified, install to the line and grade specified in the contract documents. Place permeable pavement filter aggregate to springline of pipe.

(5) Place 4 inches of filter aggregate under curb and gutter section. Extend to 12 inches beyond the back of curb. Extend engineering fabric under aggregate.

(6) Install paver edge restraint system along unrestrained edges.

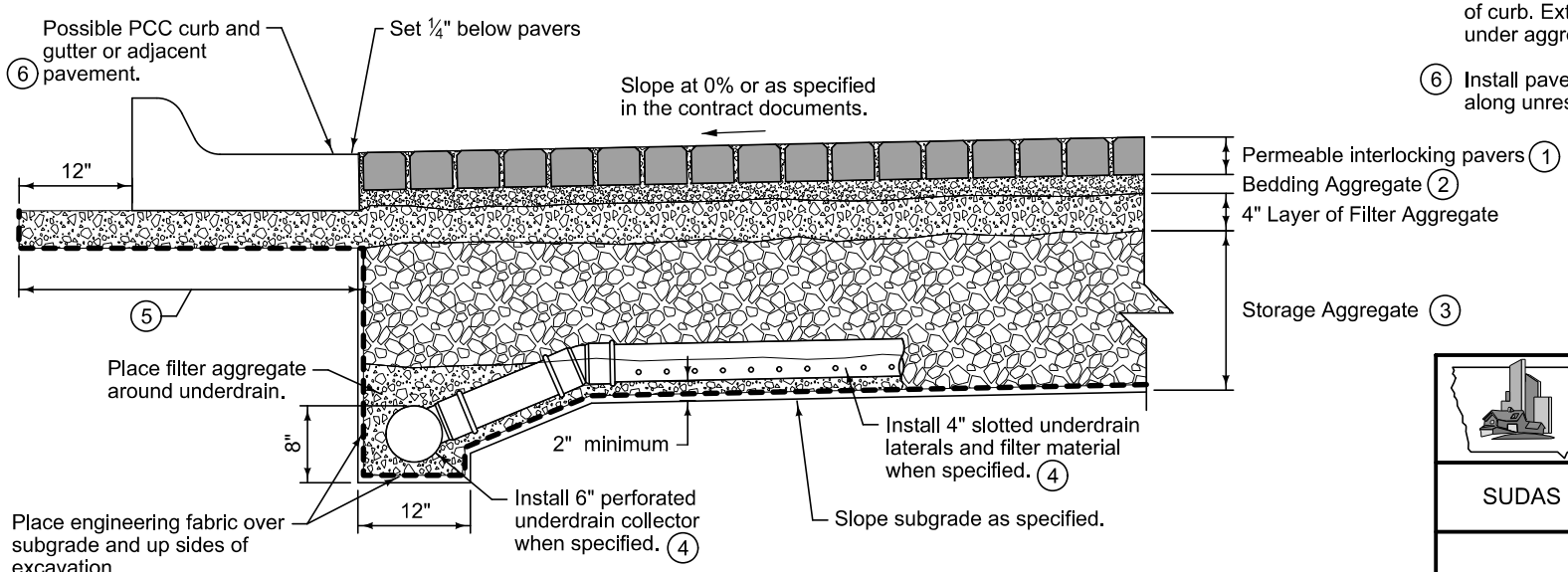

FIGURE 7080.101

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SUDAS

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New	10-20-15

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SHEET 1 of 1

SUDAS Standard Specifications

PERMEABLE INTERLOCKING PAVERS

Refer to the contract documents for dimensions, grades, and additional requirements for permeable interlocking pavers and associated improvements.

1. Permeable interlocking pavers as specified in the contract documents.
2. 2 inch minimum permeable pavement bedding aggregate to accomodate imperfections in the permeable pavement filter aggregate layer.
3. Permeable pavement storage aggregate thickness as specified in the contract documents.
4. Set PCC edge restraint 1/4 inch below pavers.

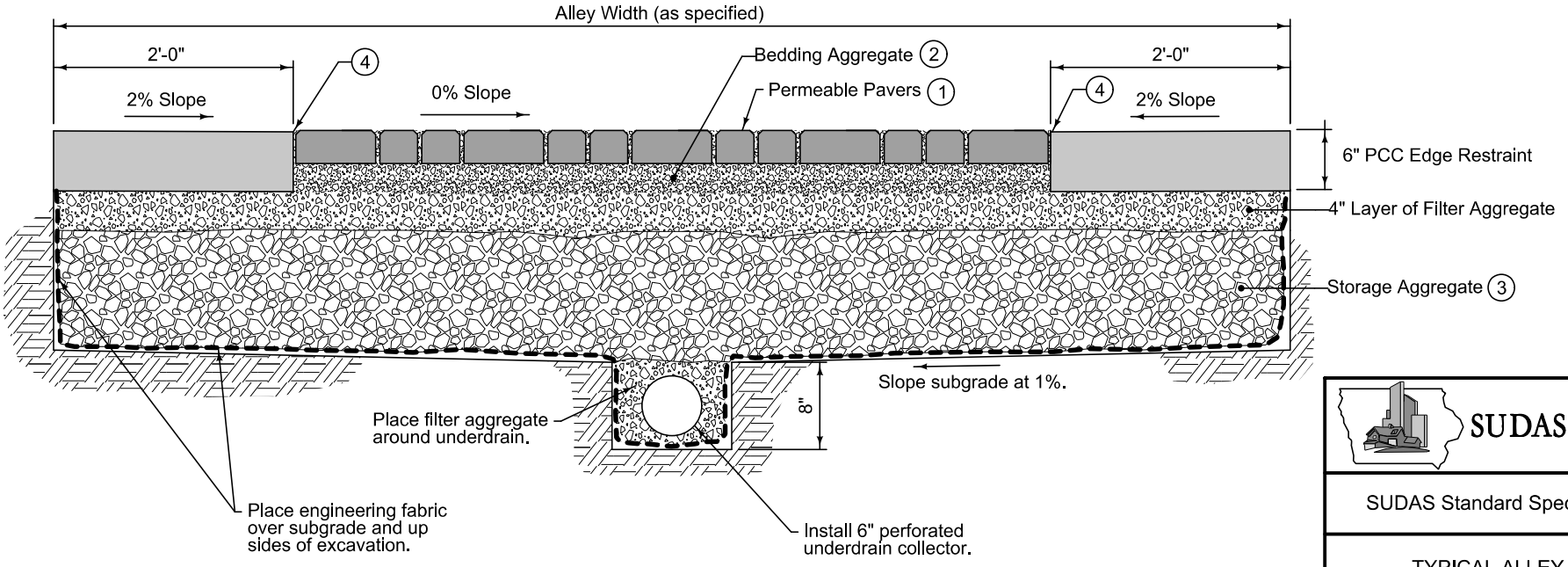


FIGURE 7080.102

SHEET 1 OF 1

SUDAS

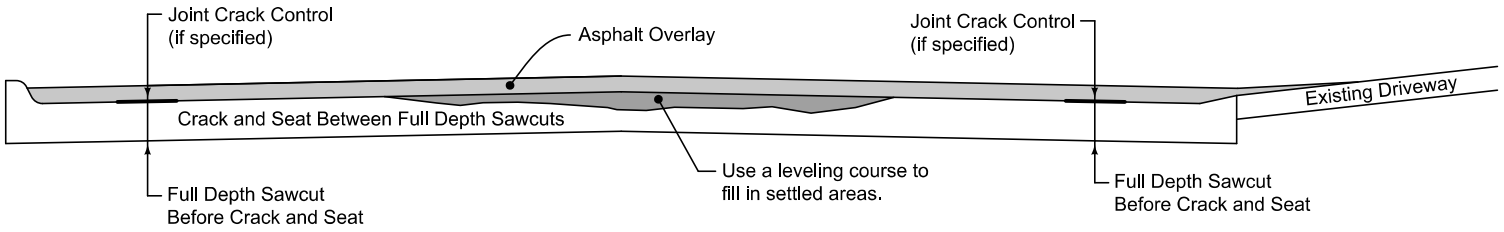
REVISION: New 10-20-15

7080.102

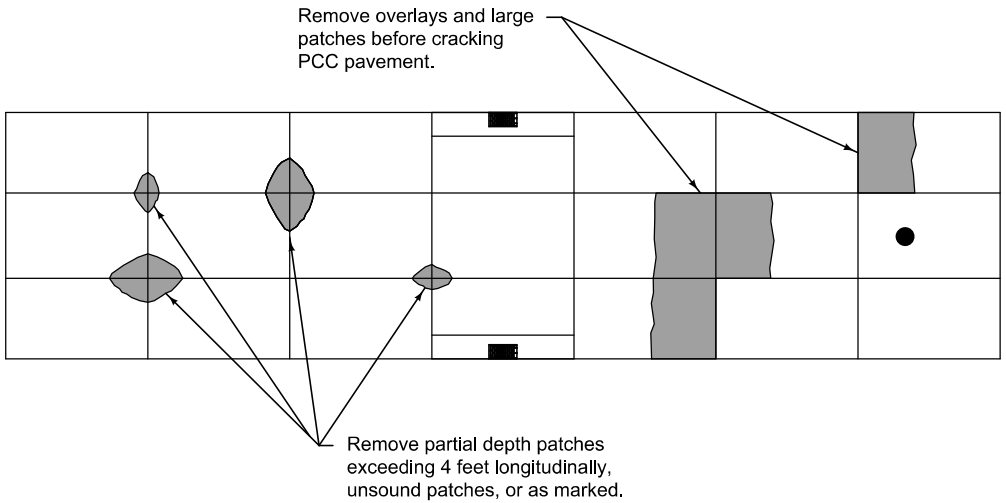
SHEET 1 of 1

SUDAS Standard Specifications

TYPICAL ALLEY WITH PERMEABLE PAVERS



OVERLAY DETAIL



REMOVAL OF EXISTING ASPHALT

FIGURE 7092.101

SHEET 1 OF 1

SUDAS

REVISION
New | 2022 Edition

7092.101

SHEET 1 of 1

SUDAS Standard Specifications

OVERLAY WITH CRACK AND SEAT

(1) Shape top 11 inches with forms.

(2) Bolt spacing and conduit locations as specified by the manufacturer.

(3) Provide apron on three sides of cabinet if cabinet has front and back doors.

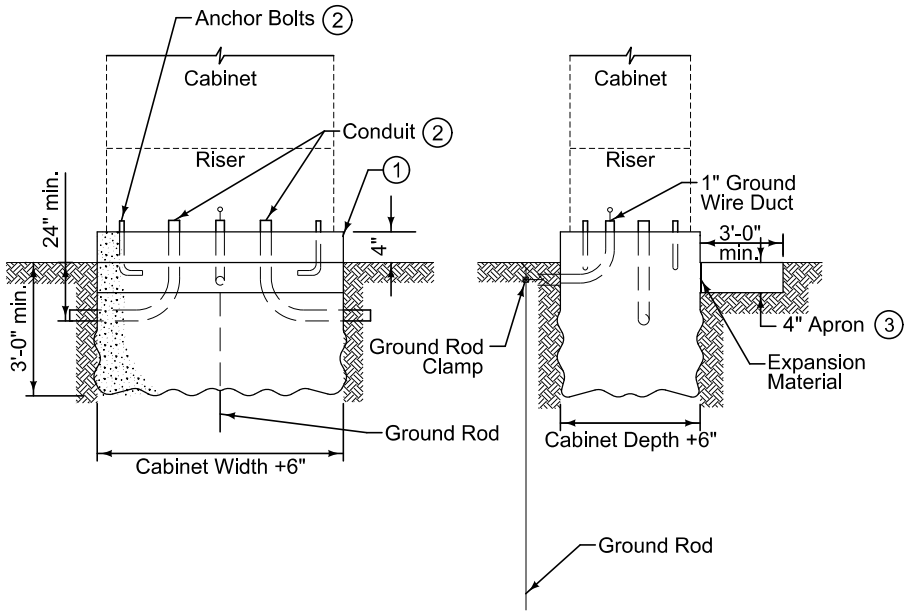


FIGURE 8010.101 | SHEET 1 OF 1

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REVISION
1 | 2022 Edition

8010.101

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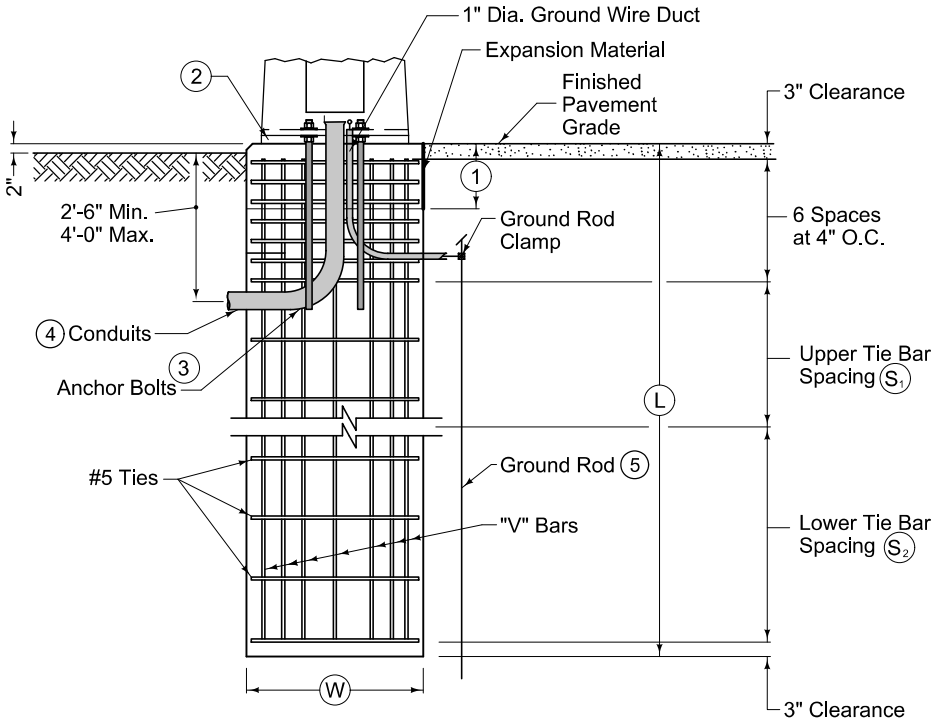
SUDAS Standard Specifications

CABINET FOOTING DETAILS

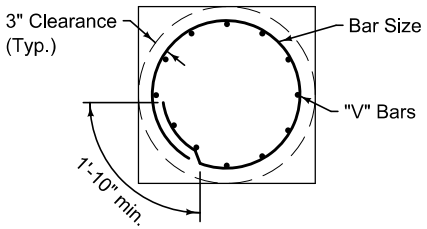


MAST ARM POLE FOUNDATION IN SOIL
TYPE A FOUNDATION

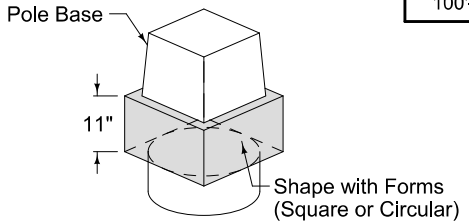
The Type A Foundation is the normally required foundation construction. Where rock is encountered, the Engineer may approve the use of the Type B or C Foundation. Prior to installing a foundation in rock, obtain a subsurface investigation certified by a geotechnical engineer licensed in the State of Iowa.

1. Shape top 11 inches with forms. See Detail 'A'.
2. Install rodent guard or non-shrink grout with weep hole.
3. Furnish nut, nut and plate, or nut and anchor bolt assembly ring plate on embedded end.
4. Provide conduits as per plans.
5. Install ground rod adjacent to foundation or in adjacent handhole.

Max. Mast Arm Length	Foundation		"V" Bars			Tie Bars				
	W	L	Count	Size	Length	Count	Upper Spacing		Lower Spacing	
							# Spaces	S_1	# Spaces	S_2
35'-0"	3'-0"	12'-0"	12	#8	11'-6"	17	9	12"	N/A	N/A
45'-0"	3'-0"	14'-0"	12	#8	13'-6"	19	11	12"	N/A	N/A
55'-0"	3'-0"	16'-0"	12	#8	15'-6"	25	12	8"	5	12"
60'-0"	3'-0"	18'-0"	13	#8	17'-6"	28	15	8"	5	12"
70'-0"	3'-6"	18'-0"	12	#10	17'-6"	28	15	8"	5	12"
80'-0"	3'-6"	21'-0"	14	#10	20'-6"	40	28	6"	4	12"
90'-0"	4'-0"	22'-0"	16	#10	21'-6"	42	24	6"	10	8"
100'-0"	4'-0"	24'-0"	18	#10	23'-6"	47	32	6"	7	8"



PLAN VIEW



DETAIL 'A'

FIGURE 8010.102 | SHEET 1 OF 4

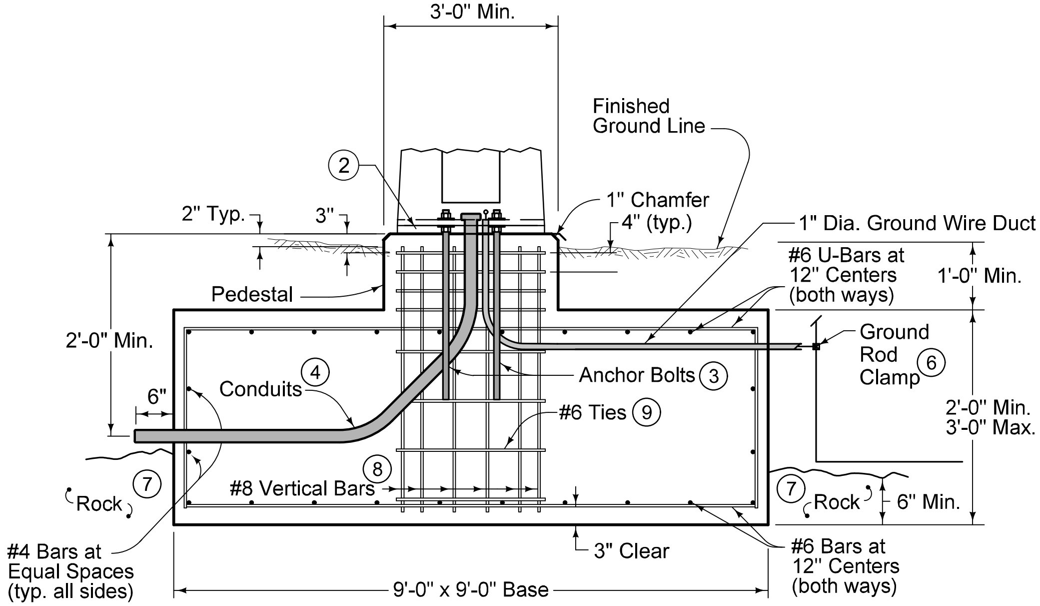
SUDAS | IOWA DOT | REVISION 5 04-19-22

FIGURE 8010.102 | STANDARD ROAD PLAN | TS-102 | SHEET 1 of 4

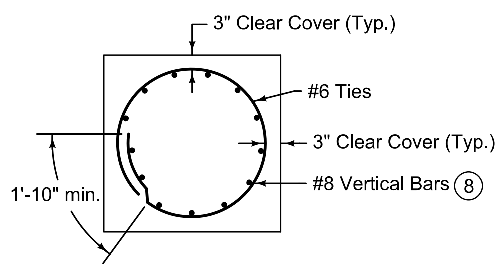
REVISIONS: Removed hooks from foundation reinforcing. Updated notes for conduit installation. Clarified placement of ground rod.

Paul D. Wigand, SUDAS DIRECTOR | DESIGN METHODS ENGINEER

TRAFFIC SIGNAL POLE FOUNDATION



MAST ARM POLE FOUNDATION IN ROCK
TYPE B FOUNDATION



PLAN VIEW

Type B Foundation is applicable for traffic signal poles with mast arm lengths up to 60 feet.

If the excavation for a Type B Foundation is left open for more than 1 calendar day, install temporary barrier rail if any part of the excavation is located within the clear zone. Temporary barrier rail layout requires the Engineer's approval.

Competent rock has an average unconfined compressive strength (q_u) of at least 2.0 ksi and rock quality designation of at least 90%. Conditions not meeting minimum requirements will require either:
- A site specific design, or
- Using the parameters for Mast Arm Pole Foundation in Soil.

(2) Install rodent guard or non-shrink grout with weep hole.

(3) Furnish nut, nut and plate, or nut and anchor bolt assembly ring plate on embedded end.

(4) Provide conduits as per plans.

(6) When in contact with rock, place ground rods as specified in National Electrical Code, current edition, adjacent to foundation or in adjacent handhole.

(7) Cast foundation concrete against competent rock. If foundation is formed, place backfill with concrete cast against rock.

(8) Place 13 equally spaced #8 vertical bars.

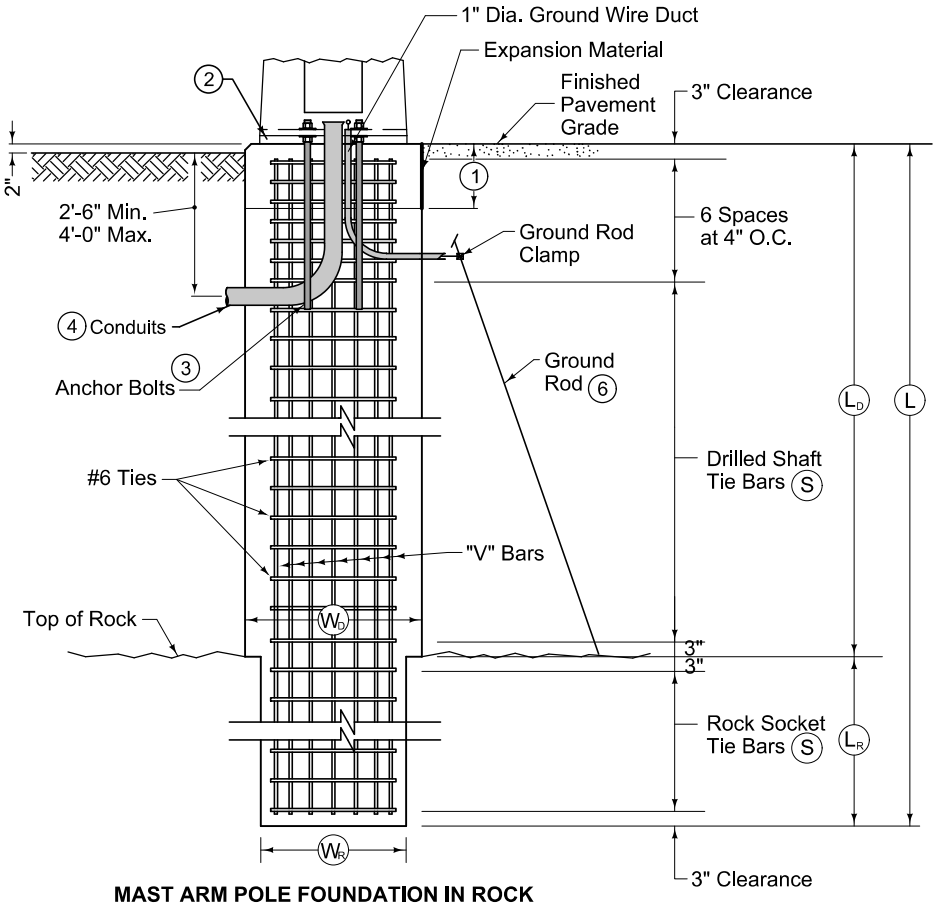
(9) #6 bars spaced at 8 inch maximum. Ties may be welded to vertical bars.

SUDAS	IOWADOT	REVISION 5 04-19-22
FIGURE 8010.102	STANDARD ROAD PLAN	TS-102 SHEET 2 of 4

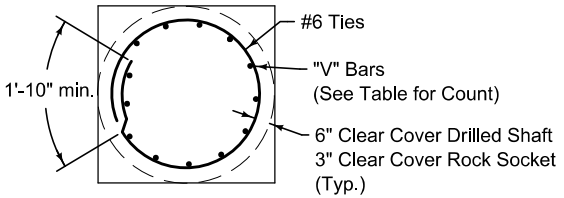
REVISIONS: Removed hooks from foundation reinforcing. Updated notes for conduit installation. Clarified placement of ground rod.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

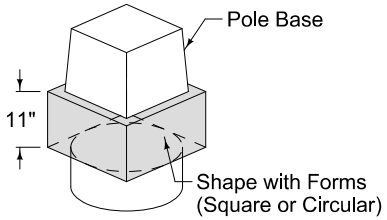
TRAFFIC SIGNAL POLE FOUNDATION



MAST ARM POLE FOUNDATION IN ROCK
TYPE C FOUNDATION



PLAN VIEW



DETAIL 'A'

1. Shape top 11 inches with forms. See Detail 'A'.
2. Install rodent guard or non-shrink grout with weep hole.
3. Furnish nut, nut and plate, or nut and anchor bolt assembly ring plate on embedded end.
4. Provide conduits as per plans.
6. When in contact with rock, place ground rods as specified in National Electrical Code, current edition, adjacent to foundation or in adjacent handhole.

Max. Mast Arm Length	Foundation					"V" Bars			Tie Bars
	W_D Min.	W_R Min.	L*** Max.	L_D	L_R**** Broken Rock*	L_R**** Competent Rock**	Count	Size	Length	S Spacing
35'-0"	3'-0"	2'-6"	12'-0"	VARIES $L_D = (L - L_R)$	4'-6"	3'-0"	13	#8	L - 6"	6"
45'-0"	3'-0"	2'-6"	14'-0"		4'-6"	3'-0"	13	#8	L - 6"	6"
55'-0"	3'-0"	2'-6"	16'-0"		4'-6"	3'-0"	13	#8	L - 6"	6"
60'-0"	3'-0"	2'-6"	18'-0"		4'-6"	3'-0"	13	#8	L - 6"	6"
70'-0"	3'-6"	3'-0"	18'-0"		5'-6"	3'-6"	14	#9	L - 6"	5½"
80'-0"	3'-6"	3'-0"	21'-0"		5'-6"	3'-6"	14	#9	L - 6"	5½"
90'-0"	4'-0"	3'-6"	22'-0"		6'-0"	4'-0"	15	#10	L - 6"	5½"
100'-0"	4'-0"	3'-6"	24'-0"		6'-0"	4'-0"	15	#10	L - 6"	5½"

*Broken rock has an average unconfined compressive strength (q_u) of at least 1.0 ksi and rock quality designation of at least 20%.
**Competent rock has an average unconfined compressive strength (q_u) of at least 2.0 ksi and rock quality designation of at least 90%.
***Total foundation length L must be sufficient to provide a 3 inch clearance between the bottom of the traffic signal pole anchor bolts and the bottom of the rock socket.
****The Rock Socket Length L_R can be decreased if the total length of the shaft is L long as shown in the table.
Conditions not meeting minimum requirements will require site specific designs or shall use theType A Foundation Soil parameters.

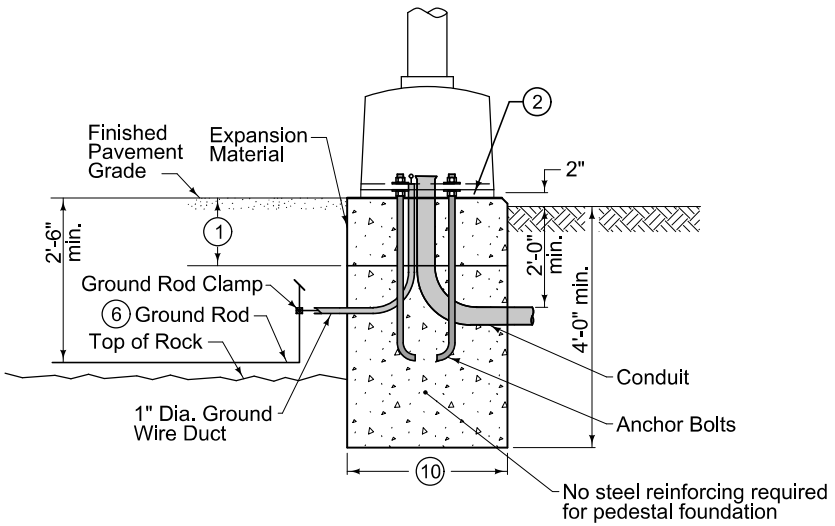
SUDAS | IOWA DOT | REVISION 5 04-19-22
FIGURE 8010.102 | STANDARD ROAD PLAN | TS-102 | SHEET 3 of 4

REVISIONS: Removed hooks from foundation reinforcing. Updated notes for conduit installation. Clarified placement of ground rod.

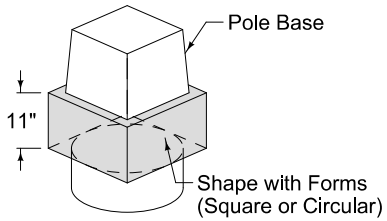
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

TRAFFIC SIGNAL POLE FOUNDATION

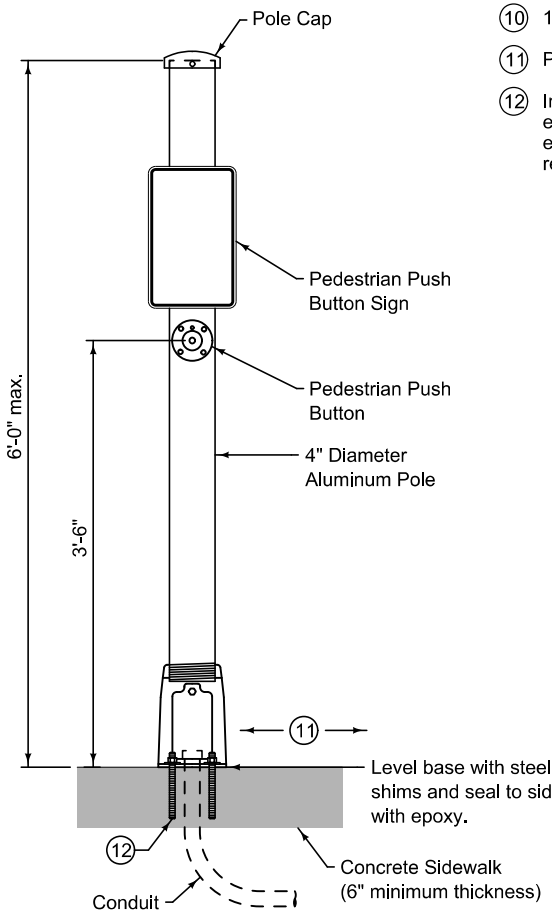
FIGURE 8010.102 SHEET 3 OF 4



PEDESTAL POLE FOUNDATION IN SOIL OR ROCK



DETAIL 'A'



ALTERNATE PUSH BUTTON POLE SIDEWALK MOUNTING

(1) Shape top 11 inches with forms. See Detail 'A'.

(2) Install rodent guard or non-shrink grout with weep hole.

(6) When in contact with rock, place ground rods as specified in National Electrical Code, current edition, adjacent to foundation or in adjacent handhole.

(10) 12 to 24 inch diameter as shown in contract documents.

(11) Provide 4 foot accessible path adjacent to push button pole.

(12) Install four anchor bolts, washers, and nuts in new or existing concrete sidewalk by drilling and anchoring with epoxy adhesive. Provide bolts according to manufacturer's recommendations.

SUDAS | IOWADOT | REVISION 5 04-19-22

FIGURE 8010.102 | STANDARD ROAD PLAN | TS-102 | SHEET 4 of 4

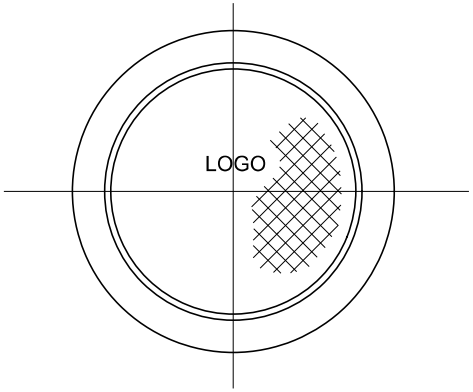
REVISIONS: Removed hooks from foundation reinforcing. Updated notes for conduit installation. Clarified placement of ground rod.

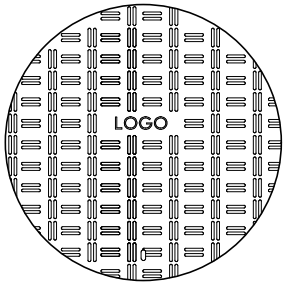
Paul D. Wigand, SUDAS DIRECTOR | Steven Nichols, DESIGN METHODS ENGINEER

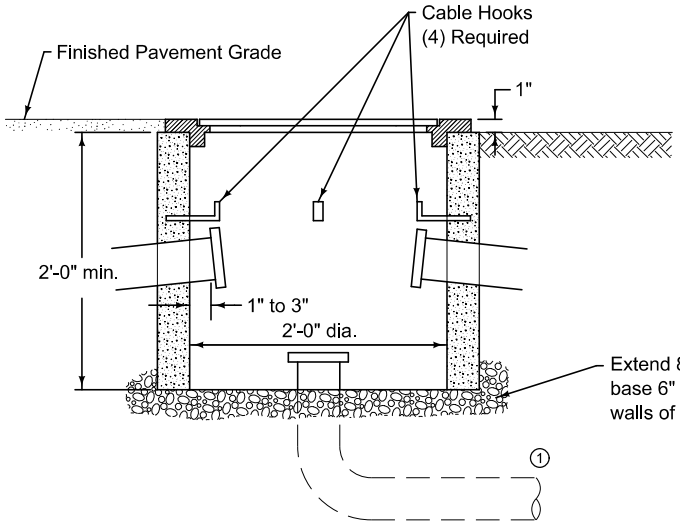
TRAFFIC SIGNAL POLE FOUNDATION

FIGURE 8010.102 | SHEET 4 OF 4

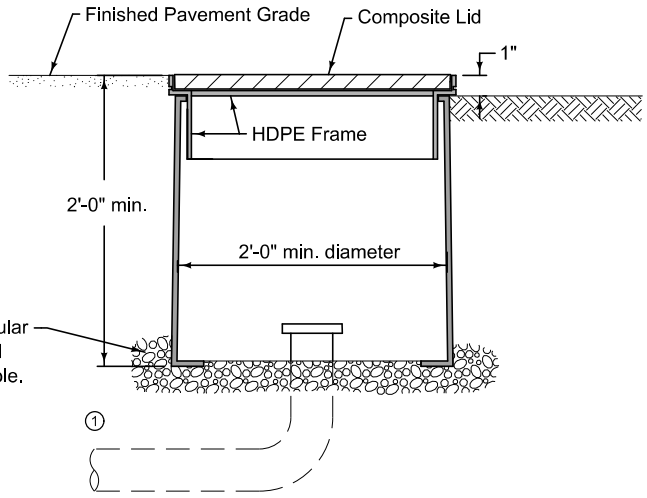
① Potential conduit entry through bottom of handhole.







PRECAST CONCRETE HANDHOLE (TYPE I)



HDPE HANDHOLE (TYPE V)

FIGURE 8010.103 | SHEET 1 OF 2

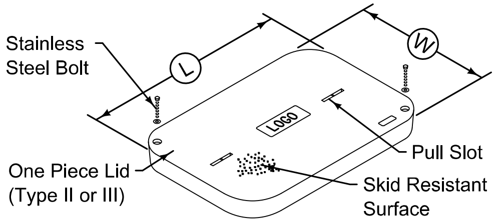
SUDAS	IOWA DOT	REVISION 2	04-19-22
FIGURE 8010.103	STANDARD ROAD PLAN	LI-103	SHEET 1 of 2

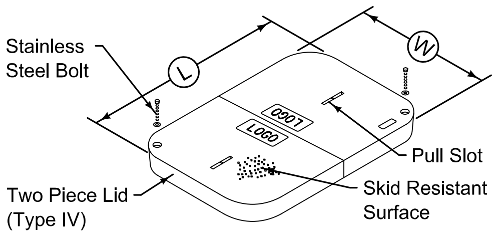
REVISIONS: Added option for conduit to enter through the bottom of handhole.

Paul D. Wigand
SUDAS DIRECTOR

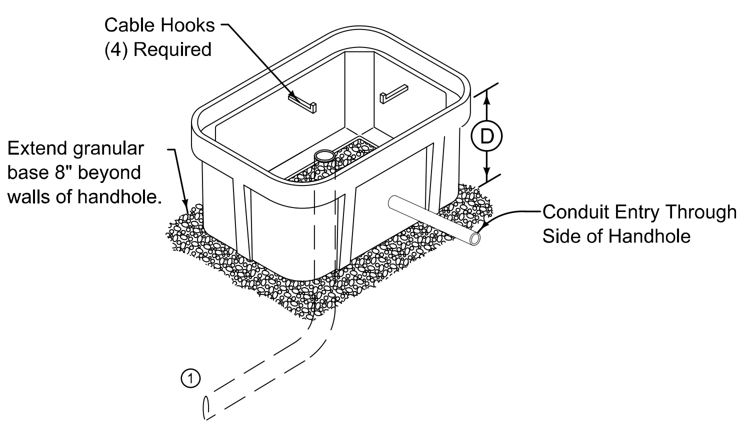
DESIGN METHODS ENGINEER

CONDUIT AND PRECAST HANDHOLES





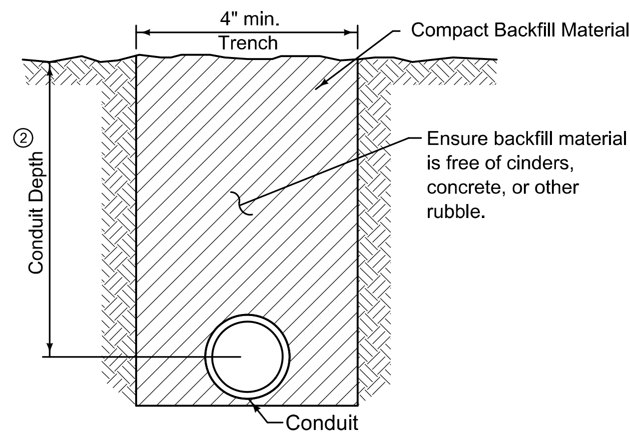
HANDHOLE DIMENSIONS TABLE (NOMINAL)			
TYPE	(L)	(W)	(D)
II	30"	17"	24"
III	36"	24"	30"
IV	48"	30"	36"



PRECAST CONCRETE COMPOSITE HANDHOLE

(1) Potential conduit entry through bottom of handhole.

(2) For conduit behind curb, place 24 to 48 inches below top of curb. For conduit under roadway, place 30 to 60 inches below the gutterline.



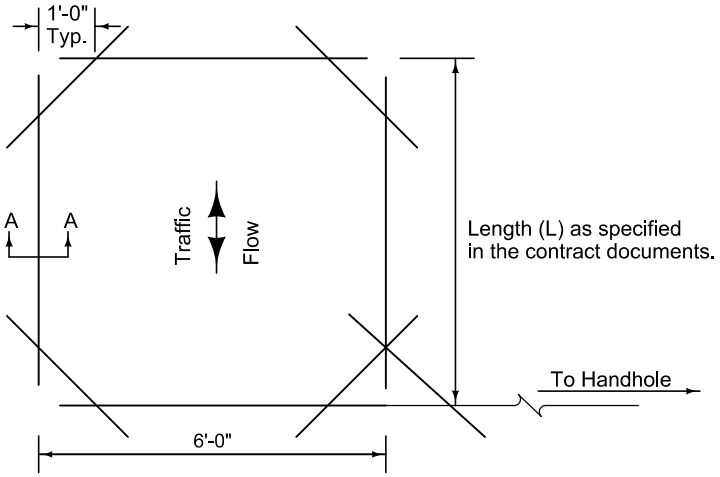
CONDUIT IN TRENCH

SUDAS	IOWADOT	REVISION 2 04-19-22
FIGURE 8010.103	STANDARD ROAD PLAN	LI-103 SHEET 2 of 2

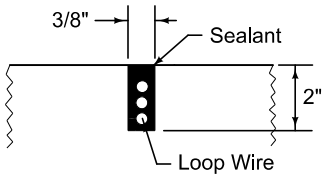
REVISIONS: Added option for conduit to enter through the bottom of handhole.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

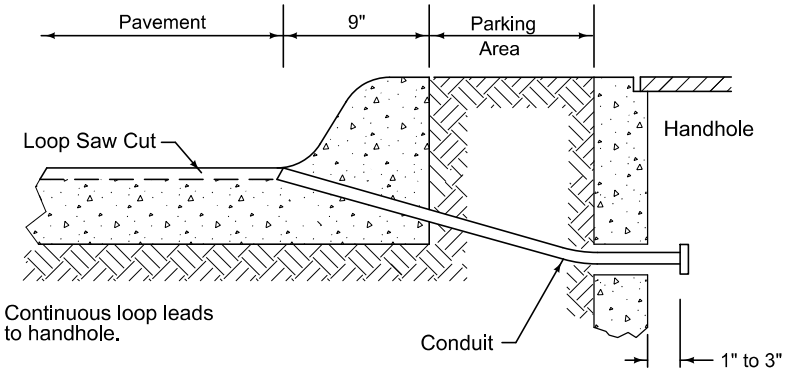
CONDUIT AND PRECAST HANDHOLES



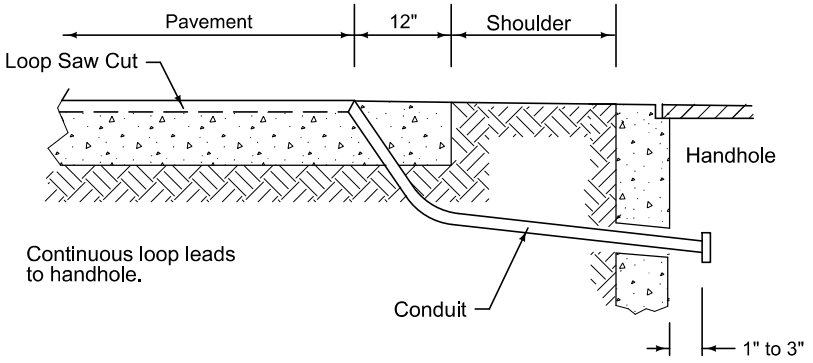
RECTANGULAR DETECTOR LOOP



SECTION A-A



CURB



NO CURB

DETECTOR CONDUIT ENTRY

FIGURE 8010.104

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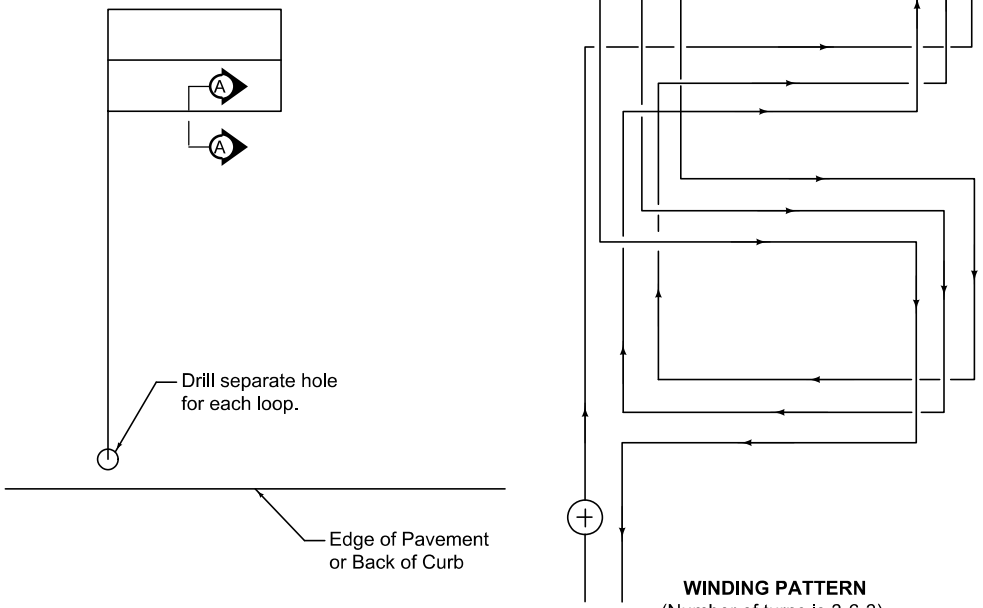
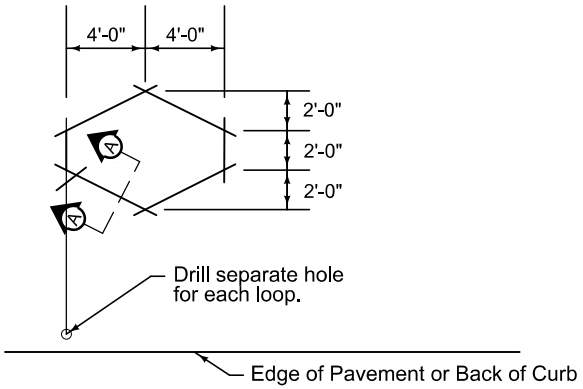
INDUCTIVE LOOP VEHICLE DETECTORS

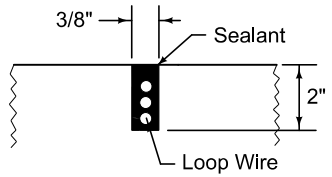


WINDING PATTERN
(Number of turns is 3-6-3)

BICYCLE QUADRUPOLE LOOP DETECTOR



MODIFIED DIAMOND DETECTOR LOOP



SECTION A-A

FIGURE 8010.104 SHEET 2 OF 2

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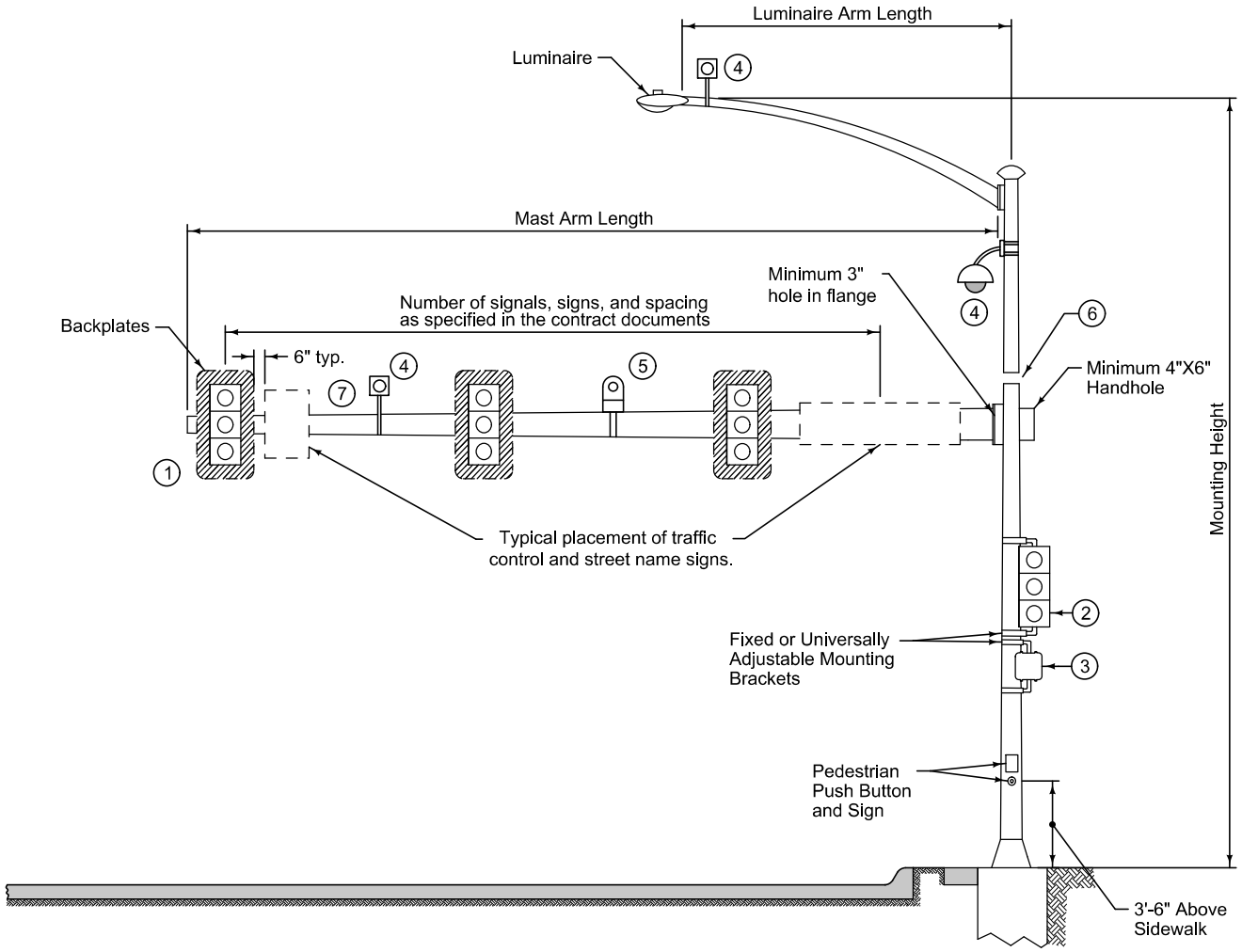
SUDAS Standard Specifications

INDUCTIVE LOOP VEHICLE DETECTORS



STEEL MAST ARM POLE

1. Ensure the top of the signal housing is no more than 25.6 feet above the pavement. Ensure the bottom of the signal housing and related attachments are at least 15 feet above the pavement.
2. Ensure the bottom of the signal housing (including brackets) that is not located over a roadway is a minimum of 10 feet and a maximum of 19 feet above the sidewalk or, if there is no sidewalk, above the pavement grade at the center of the roadway.
3. Mount pedestrian signal heads with the bottom of the signal housing (including brackets) no less than 7 feet or more than 10 feet above the sidewalk level. Position and adjust heads to provide maximum visibility at the beginning of the controlled crosswalk.
4. Possible video camera location.
5. Possible EVP detector.
6. Pole cap if no luminaire extension.
7. Install wind vibration dampening device on mast arms greater than 60 feet in length. Locaton and mounting method as specified by manufacturer.

FIGURE 8010.105 | SHEET 1 OF 1

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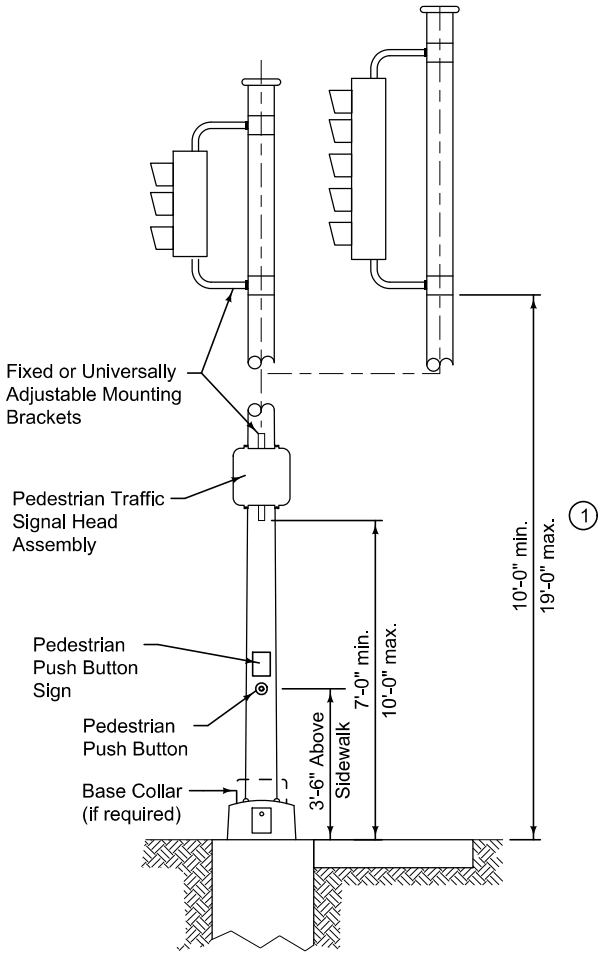
MAST ARM POLE DETAILS

(1) For signal head visibility and possible pedestrian head installation.



PEDESTAL POLE

FIGURE 8010.106 | SHEET 1 OF 1

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8010.106

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SUDAS Standard Specifications

PEDESTAL POLE DETAILS

(1) Possible video camera location.

(2) Possible EVP detector location.

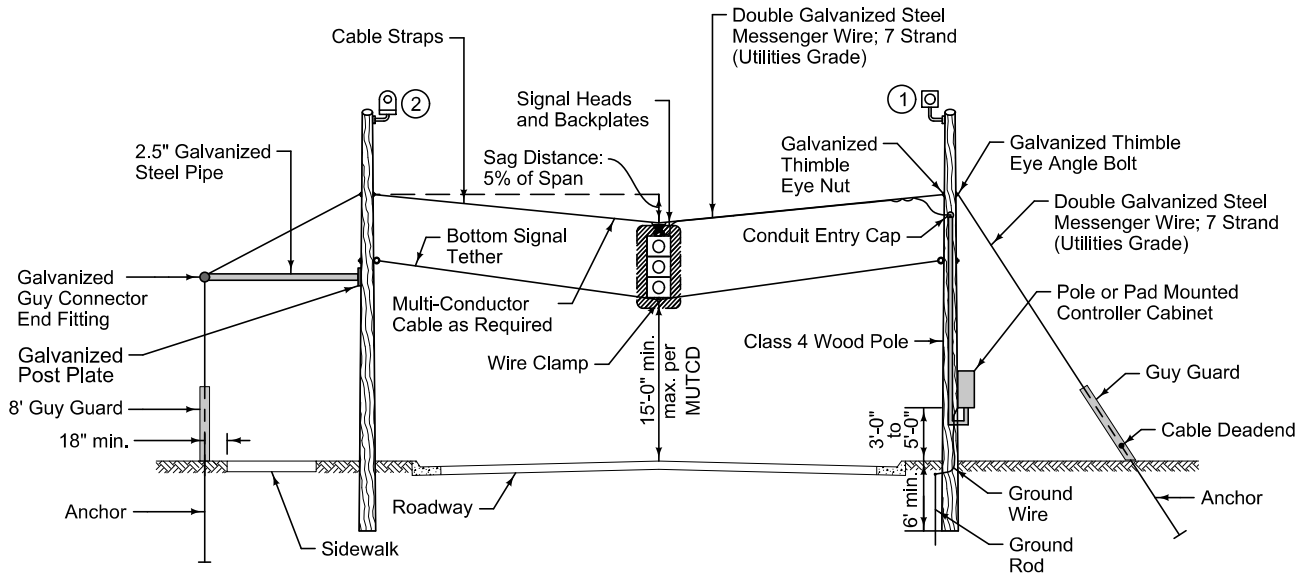

FIGURE 8010.107 | SHEET 1 OF 1

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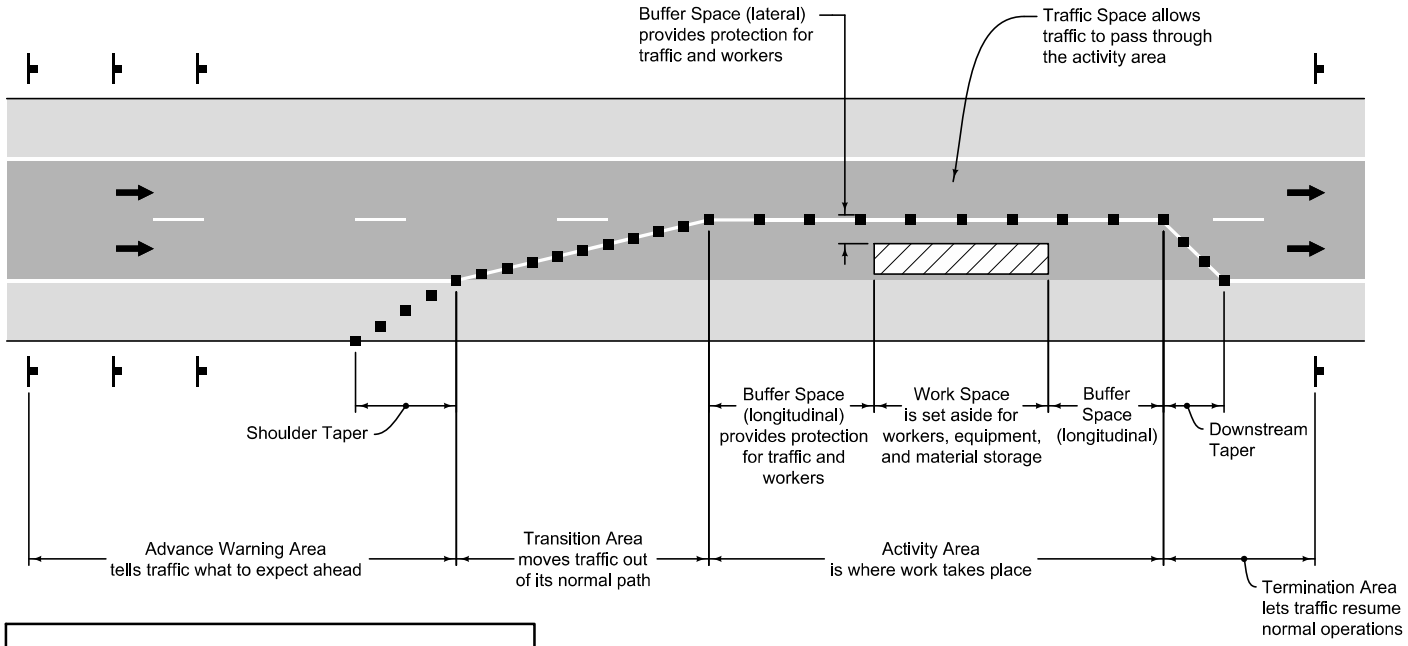
SUDAS Standard Specifications

WOOD POST SPAN ASSEMBLY



It may be necessary to combine two or more examples to adequately address the traffic control needed.

Utilize vehicle warning lights (amber, high-intensity rotating, flashing, oscillating, or strobe light) on all shadow and work vehicles.

Vehicle hazard lights may be used to supplement warning lights. Do not use hazard lights alone.

Flags may be used to call attention to the advanced warning signs.

If a closure extends overnight, utilize channelizing devices with retroreflective sheeting.

Speed limit refers to the legally established and signed speed limit.

If an arrow board is used on 2-lane roads, operate only in the caution mode.

Adjust the position of warning signs and channelizing devices for available sight distance.

Do not install temporary traffic control devices until work is ready to begin, and remove or cover all signs and devices promptly when they are not needed.

The END WORK (G20-2) signs shown on all figures are optional.

Key*

- Arrow Board
- Arrow Board Support or Trailer
- Channelizing Device
- Direction of Traffic
- Drum
- Flagger
- Pedestrian Channelizing Device
- Safety Fence
- Shadow Vehicle
- Sign (shown facing left)
- Type III Barricade
- Work Space
- Work Vehicle
- Vehicle Warning Light (amber, high-intensity rotating, flashing, oscillating, or strobe light)

*Applies to all Section 8030 figures

Distance Between Signs	
Speed Limit (mph)	A
20-25	100
30-40	250
45-50	350
55	500

Channelizing Device Spacing			
Speed Limit (mph)	Taper (ft)	Buffer (ft)	Work Space (ft)
20	20	40	40
25	25	50	50
30	30	60	60
35	35	70	70
40	40	80	80
45	45	90	90
50	50	100	100
55	55	110	110

Merging Taper Lengths for Lane Closure*		
Speed Limit (mph)	Taper Length (L) (ft)	Number of Devices
20	80	5
25	125	6
30	180	7
35	245	8
40	320	9
45	540	13
50	600	13
55	660	13

*Values shown are for a 12 foot shift. Table does not apply to one-lane, two-way (flagger) tapers

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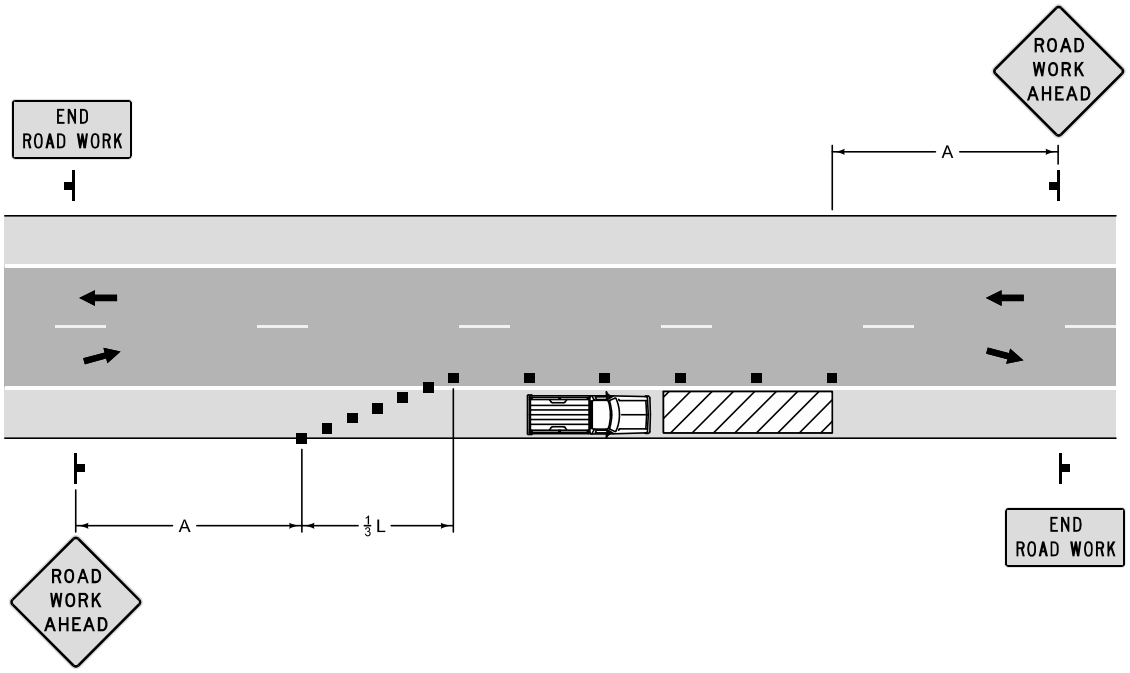
TEMPORARY TRAFFIC CONTROL GENERAL INFORMATION

FIGURE 8030.101

SHEET 1 OF 1



Use only on minor, low speed (≤ 40 mph) streets. Provide a lane closure for higher speed traffic conditions.

Maintain a minimum lane width of 10 feet as measured to the near face of channelizing devices. For short-term use on low speed, low volume roads without wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.

Where the opposite shoulder is suitable for carrying vehicular traffic, lanes may be shifted by using closely spaced channelizing devices provided the resulting lane widths are at least 10 feet wide.

Additional advanced warning may be appropriate, such as a ROAD NARROWS sign.

For short-term work, the taper and channelizing devices may be omitted if a shadow vehicle with activated vehicle warning lights is used.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.102

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New 10-17-17

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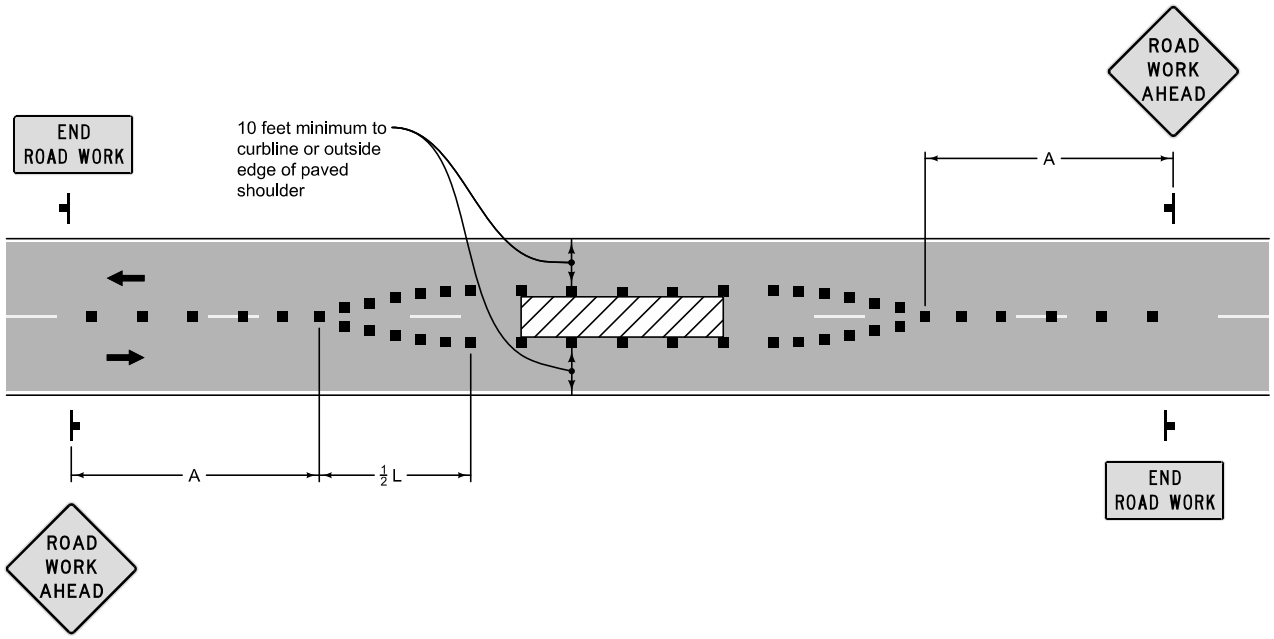
SUDAS Standard Specifications

WORK OFF OF PAVEMENT
WITH MINOR ENCROACHMENT
ONTO TRAVELED WAY



Maintain a minimum lane width on either side of the center work space of 10 feet as measured from the near edge of channelizing devices to the edge of pavement, paved shoulder, or face of curb.

A lane width of 9 feet may be used for short-term stationary work on low speed (≤ 40 mph), low volume roads when motor vehicle traffic does not include longer and wider heavy commercial vehicles.

A work vehicle displaying vehicle warning lights may be used instead of the channelizing devices forming the tapers.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.103

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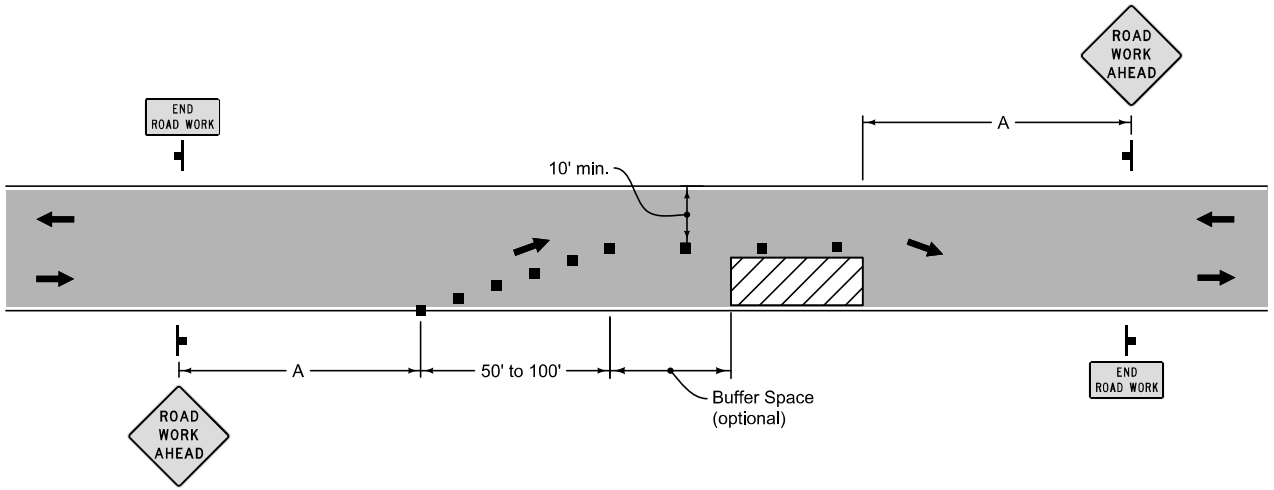
SUDAS Standard Specifications

WORK IN CENTER OF LOW VOLUME STREET



Alternate 1

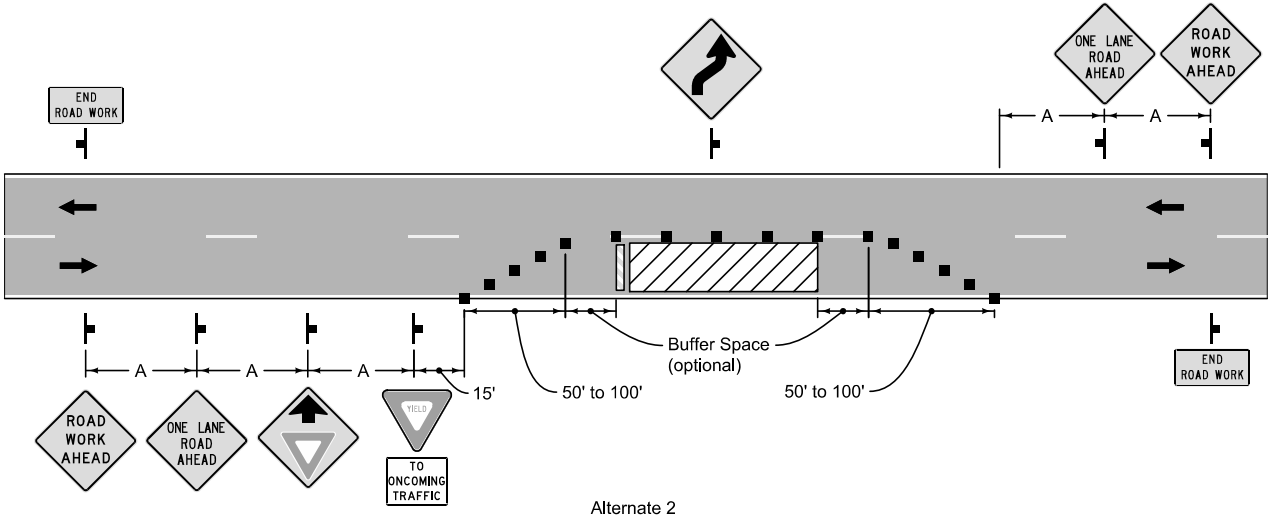
Refer to Figure 8030.101 for symbol key and sign spacing.

Alternate 1

Use of Alternate 1 is restricted to low-speed roadways with good sight distance (paved or unpaved) during daylight hours.

Traffic may be self-regulating when the work space is short and drivers can see the roadway beyond.

Use one or two flaggers when motor vehicle traffic cannot effectively self-regulate.



Alternate 2

Alternate 2

Use of Alternate 2 is restricted to roadways where average daily traffic is fewer than 400 vehicles and good sight distance exists.

Do not use within 2,500 feet of a similar work site.

May be used for overnight closures. During non-working hours remove materials, equipment, or stockpiled waste and fill or cover excavations.

FIGURE 8030.104

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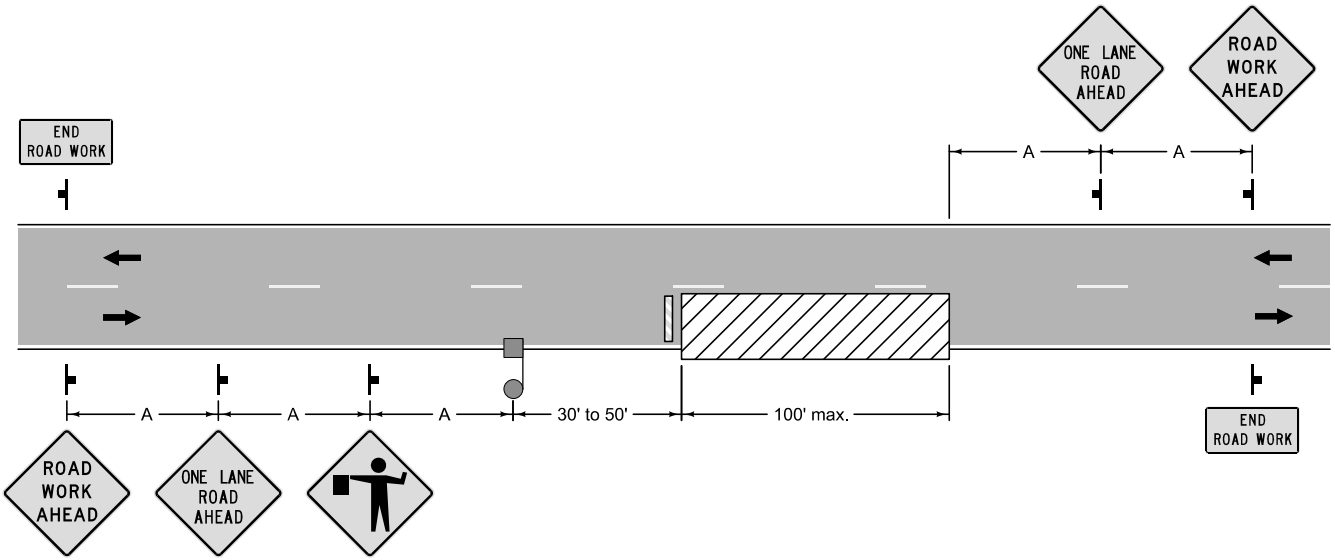
SUDAS Standard Specifications

LANE CLOSURE ON LOW VOLUME STREET (SELF-REGULATING)



Use is restricted to roadways where average daily traffic is fewer than 2,000 vehicles per day and good sight distance exists. Use during daylight hours only.

Do not park vehicles or equipment on opposite side of work area.

A work vehicle displaying vehicle warning lights may be substituted for the Type III barricade.

Refer to Figure 8030.101 for symbol key and sign spacing.

Flagger Notes:

Allow traffic in the open lane to flow freely.

Stop the first vehilcle in the closed lane from the flagger position shown, then move toward the centerline to stop other vehicles.

A second flagger may be required when the flagger's view of approaching traffic in the open lane is less than ¼ mile or the work site is in an area of restricted sight distance (such as a No Passing Zone); and excessive traffic delays and conflicts are encountered.

If second flagger is required, refer to Figure 8030.106.

FIGURE 8030.105

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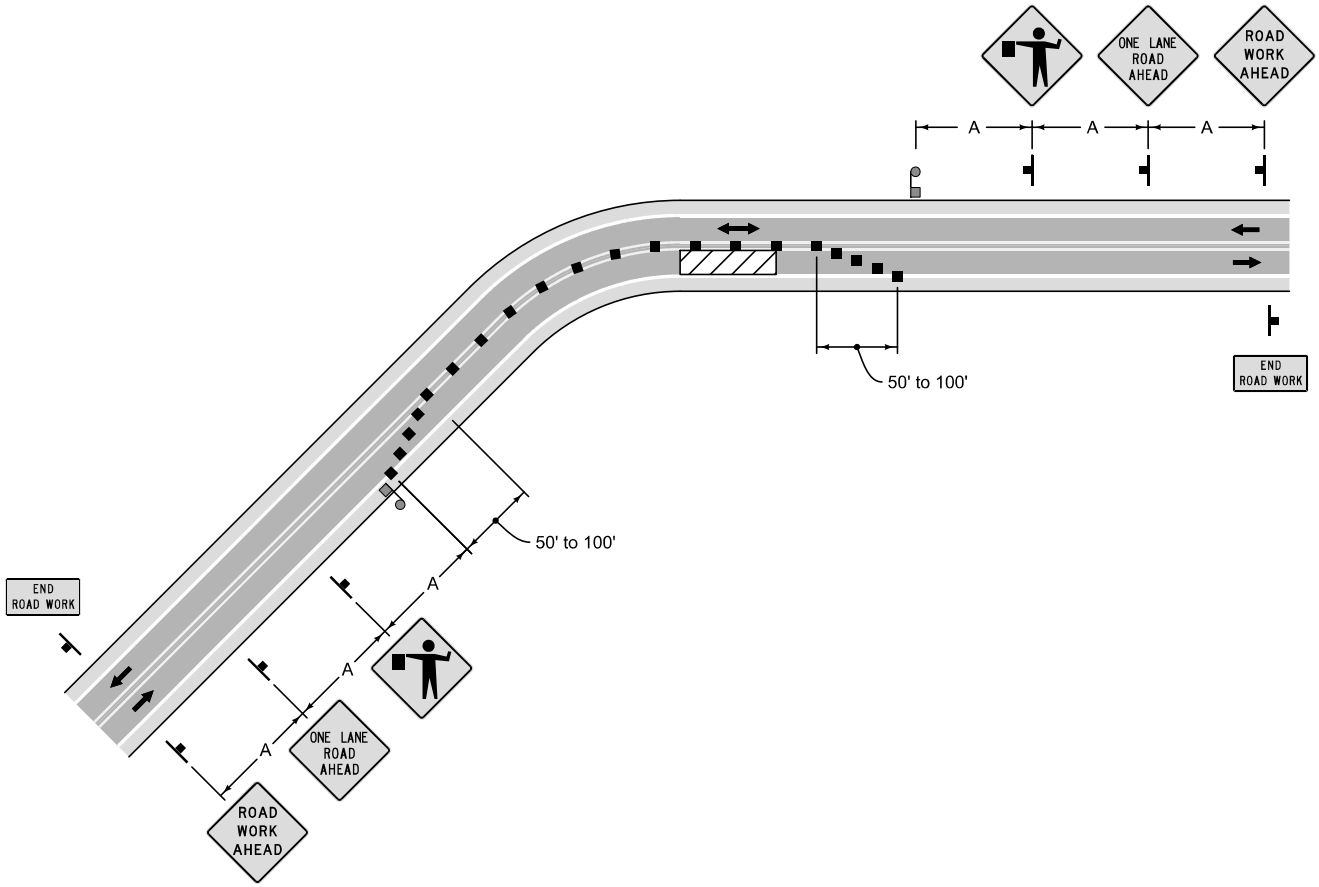
SUDAS Standard Specifications

LANE CLOSURE FOR SHORT-TERM OR MOVING OPERATIONS USING A SINGLE FLAGGER



An optional BE PREPARED TO STOP sign may be added between the Flagger sign and the ONE LANE ROAD AHEAD sign.

Extend the buffer space as required so the two-way traffic taper is placed before a horizontal curve (or crest vertical curve) to provide adequate sight distance for the flagger and a queue of stopped vehicles.

Refer to Figure 8030.101 for symbol key and sign spacing.

Flagger Notes:

Stop the first vehicle in the closed lane from the flagger position shown, then move toward the centerline to stop other vehicles.

Provide lighting to mark flagger stations at night.

A single flagger may be used for low volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions. Refer to Figure 8030.105.

Refer to Figure 8030.107 for work in vicinity of a street-rail crossing.

FIGURE 8030.106

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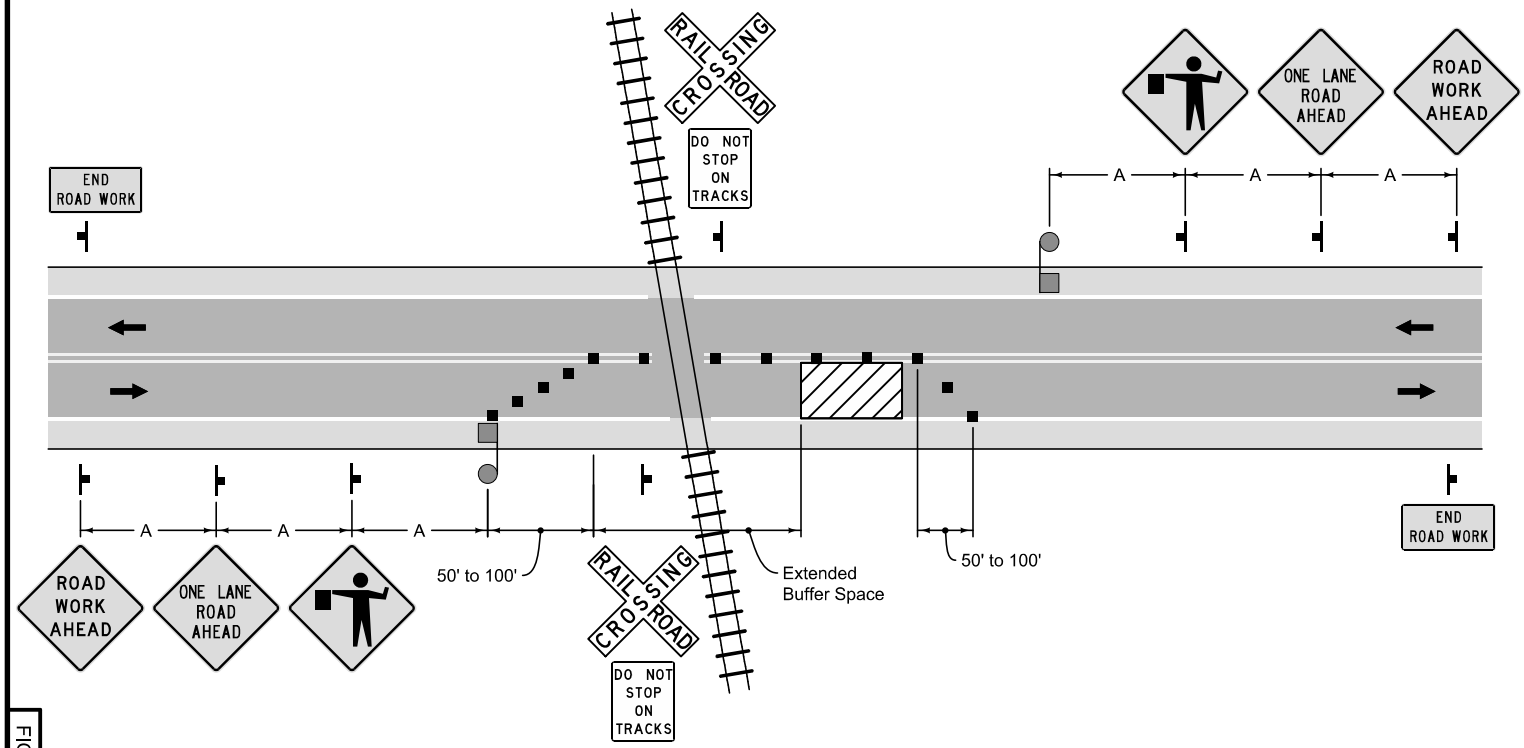
SUDAS Standard Specifications

LANE CLOSURE ON TWO-LANE ROAD USING TWO FLAGGERS



Coordinate with railroad company early, before work starts.

When roadway work activities come within or near railroad grade crossing, take extra care to eliminate the possibility of lane restrictions, flagging, or other operations where vehicles might be stopped within the grade crossing, which is defined as 15 feet from the closest rail.

Extend the buffer space of the activity area upstream of the grade crossing (as depicted in the figure) so a vehicle backup by the flagging operation will not extend across the grade crossing.

Refer to Figure 8030.101 for symbol key and sign spacing.

Flagger Notes:

The railroad company may require railroad-supplied flaggers.

FIGURE 8030.107

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SUDAS Standard Specifications

WORK IN VICINITY OF ROADWAY-RAIL GRADE CROSSING

May be used for short-term daylight operations in urban areas on 3-lane street. Nighttime operations require additional traffic control and retroreflective sheeting.

Cones may be used as channelizing devices during daylight hours.

Flaggers and additional traffic control devices may be required for higher traffic volumes or commercial areas.

Refer to Figure 8030.101 for symbol key and sign spacing.

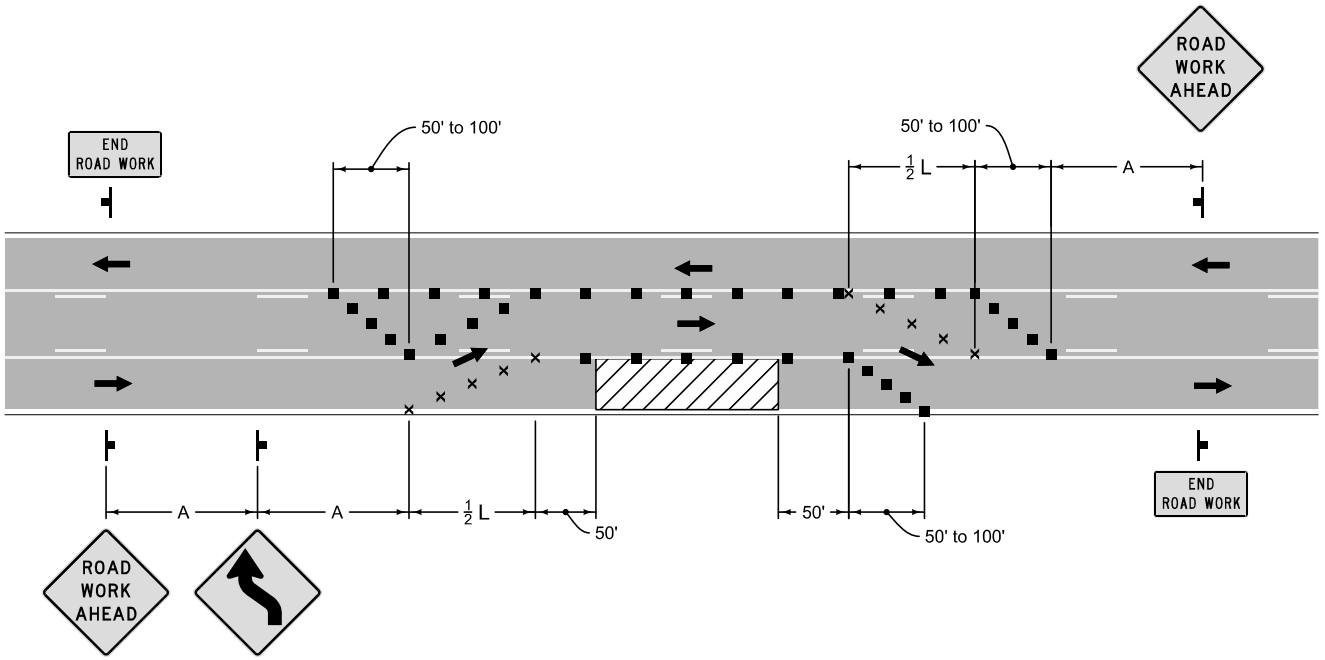

FIGURE 8030.108

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SUDAS Standard Specifications

TRAFFIC CONTROL FOR OUTSIDE LANE CLOSURE OF STREET WITH CONTINUOUS LEFT TURN LANE

May be used for short-term daylight operations in urban areas on 3-lane or 5-lane streets. Nighttime operations require additional traffic control and retroreflective sheeting.

Cones may be used as channelizing devices during daylight hours.

Flaggers and additional traffic control devices may be required for higher traffic volumes or commercial areas.

Refer to Figure 8030.101 for symbol key and sign spacing.

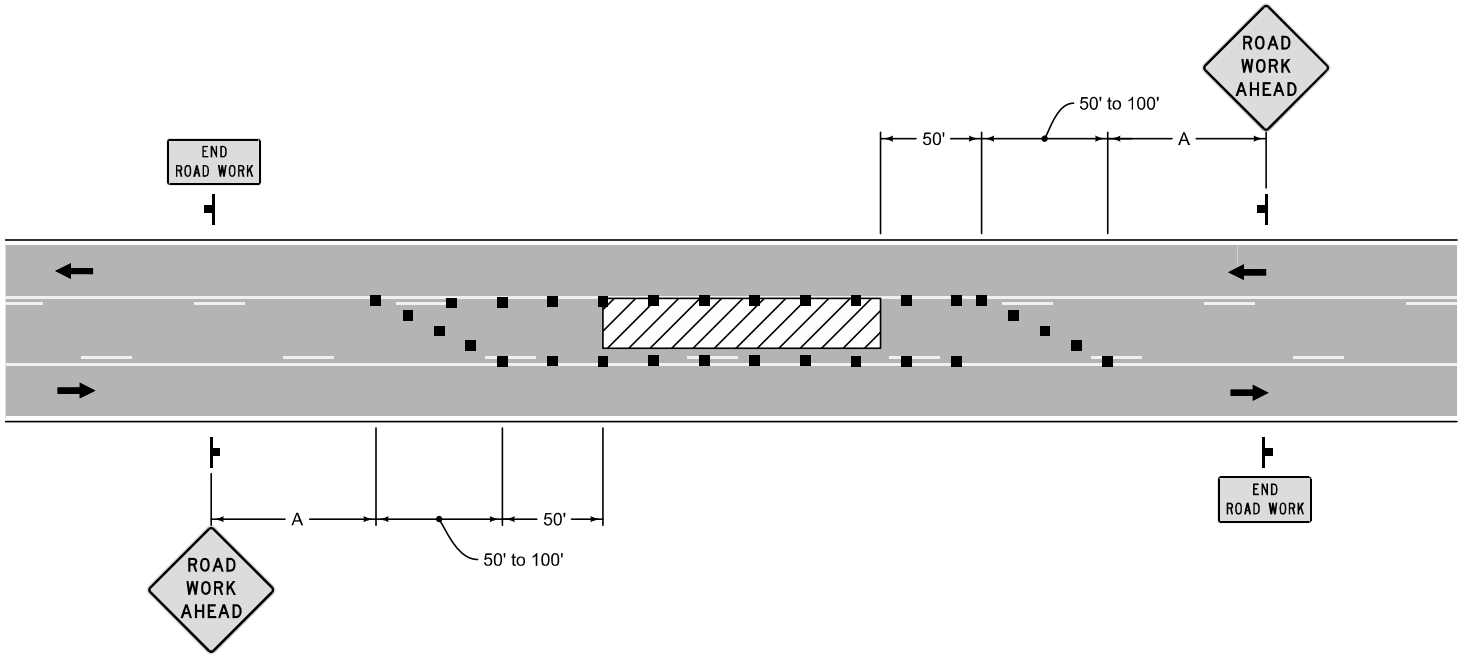

FIGURE 8030.109

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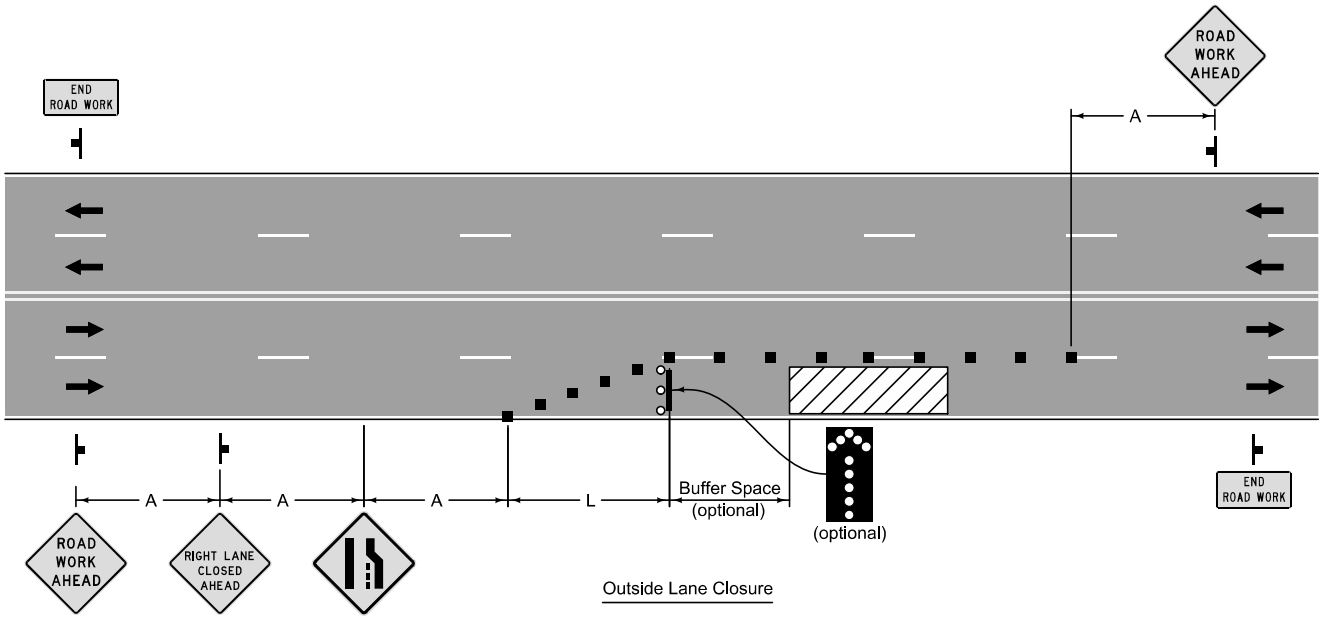
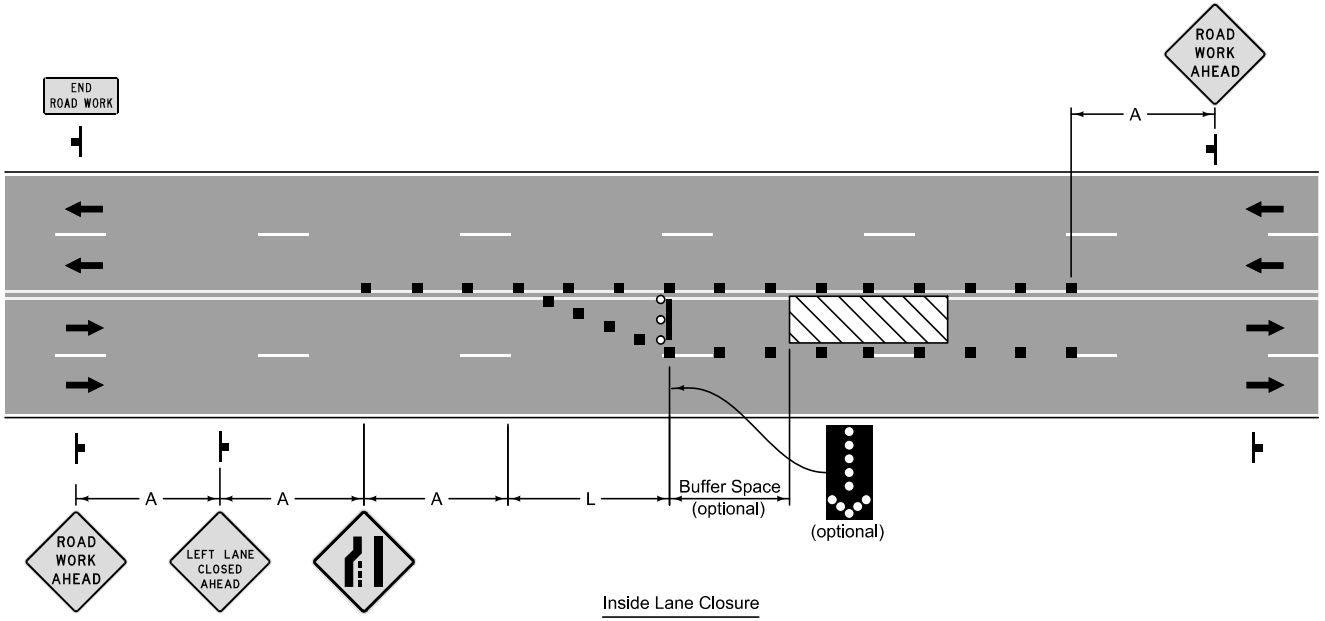
TRAFFIC CONTROL FOR CLOSURE OF CONTINUOUS LEFT TURN LANE



Outside Lane Closure



Inside Lane Closure

For low speed, low volume, urban streets the LEFT/RIGHT LANE CLOSED AHEAD sign may be omitted.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.110

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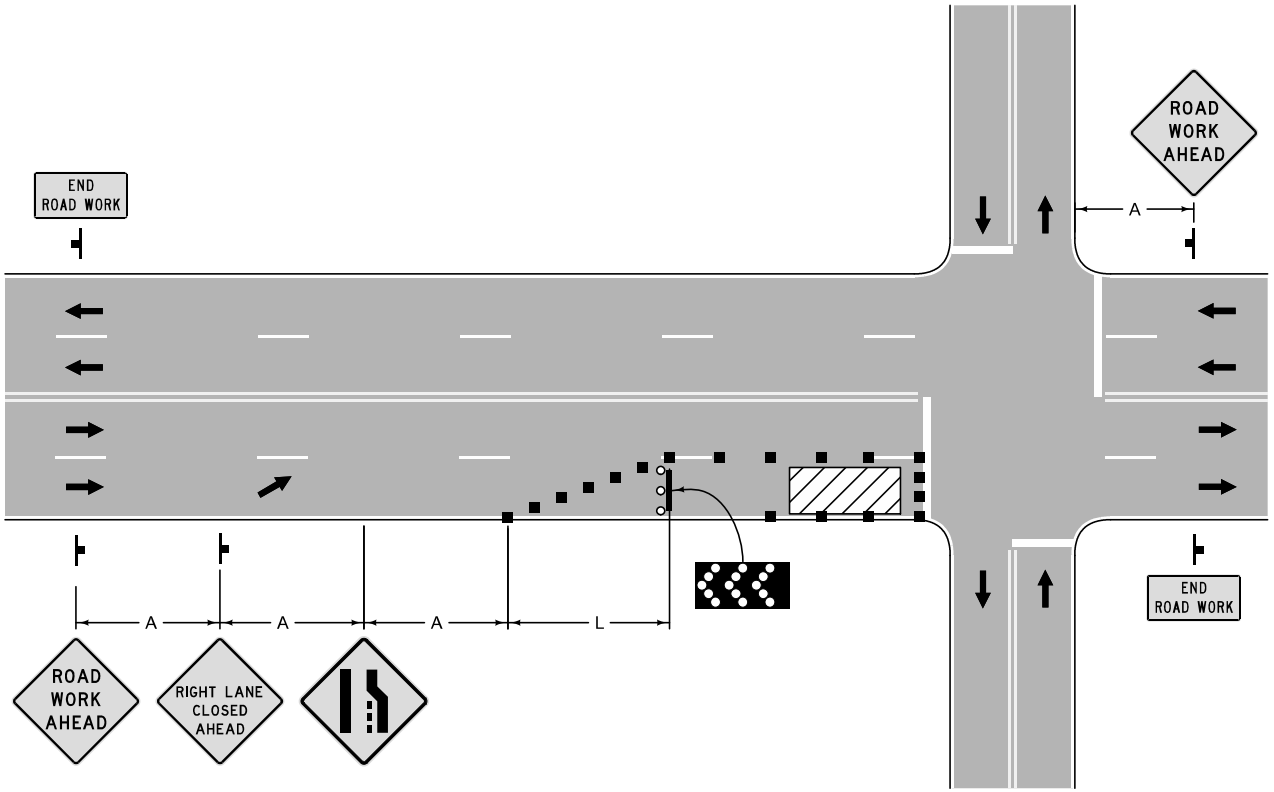
SUDAS Standard Specifications

LANE CLOSURE ON MULTI-LANE STREET



Place arrow board within the closed lane behind the channelizing devices and as close to the beginning of the taper as practical, while keeping it on the paved surface.

If the work area extends across the crosswalk, the crosswalk should be closed using appropriate information and devices.

For traffic signal maintenance, consider using law enforcement and/or a shadow vehicle.

For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through motor vehicle traffic.

Right lane closure shown; for left lane closure, modify sign messages and arrow board.

Refer to Figure 8030.101 for symbol key and sign spacing.

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LANE CLOSURE AT
AN INTERSECTION

FIGURE 8030.111

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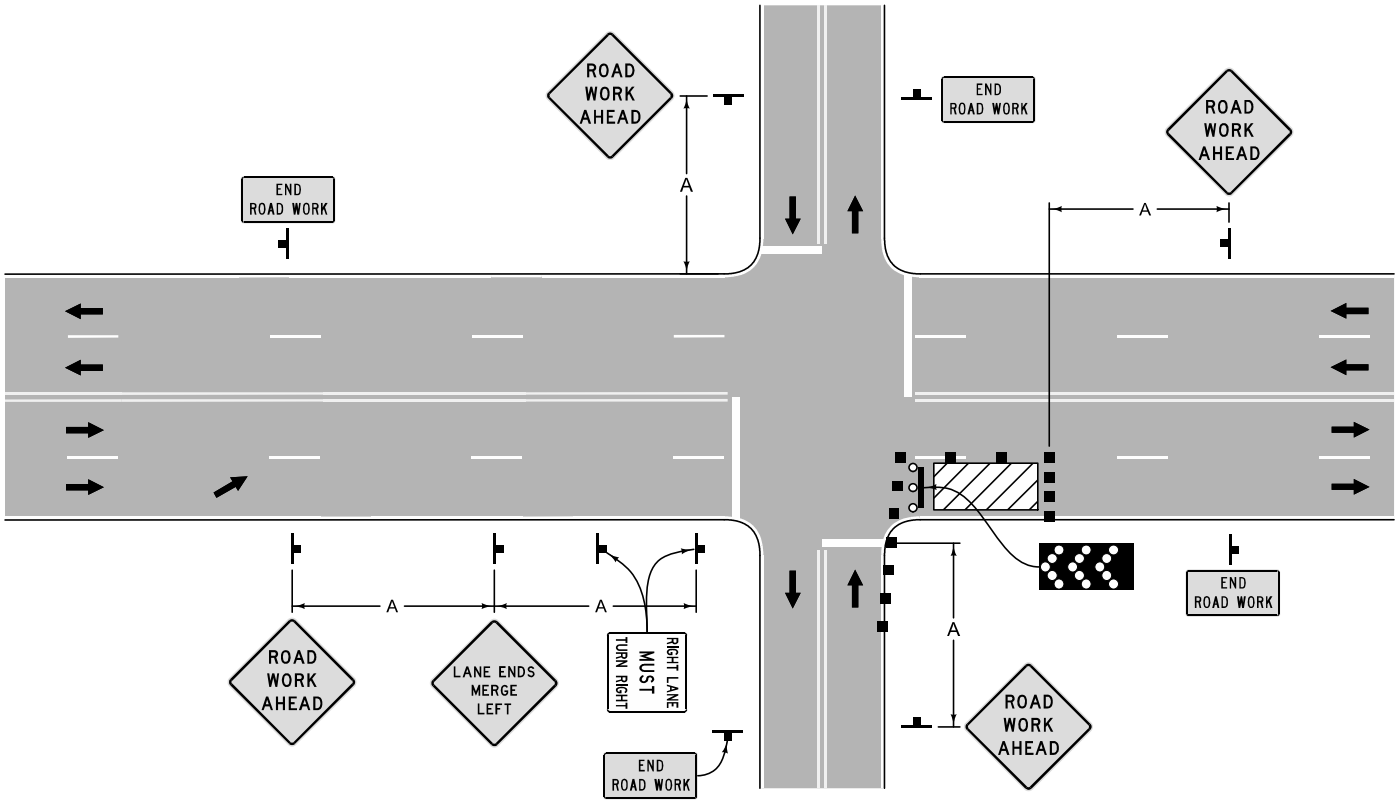

If the work area extends across the crosswalk, the crosswalk should be closed using appropriate information and devices.

For traffic signal maintenance, consider using law enforcement and/or a shadow vehicle.

Right lane closure shown; for left lane closure, modify sign messages and arrow board.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.112

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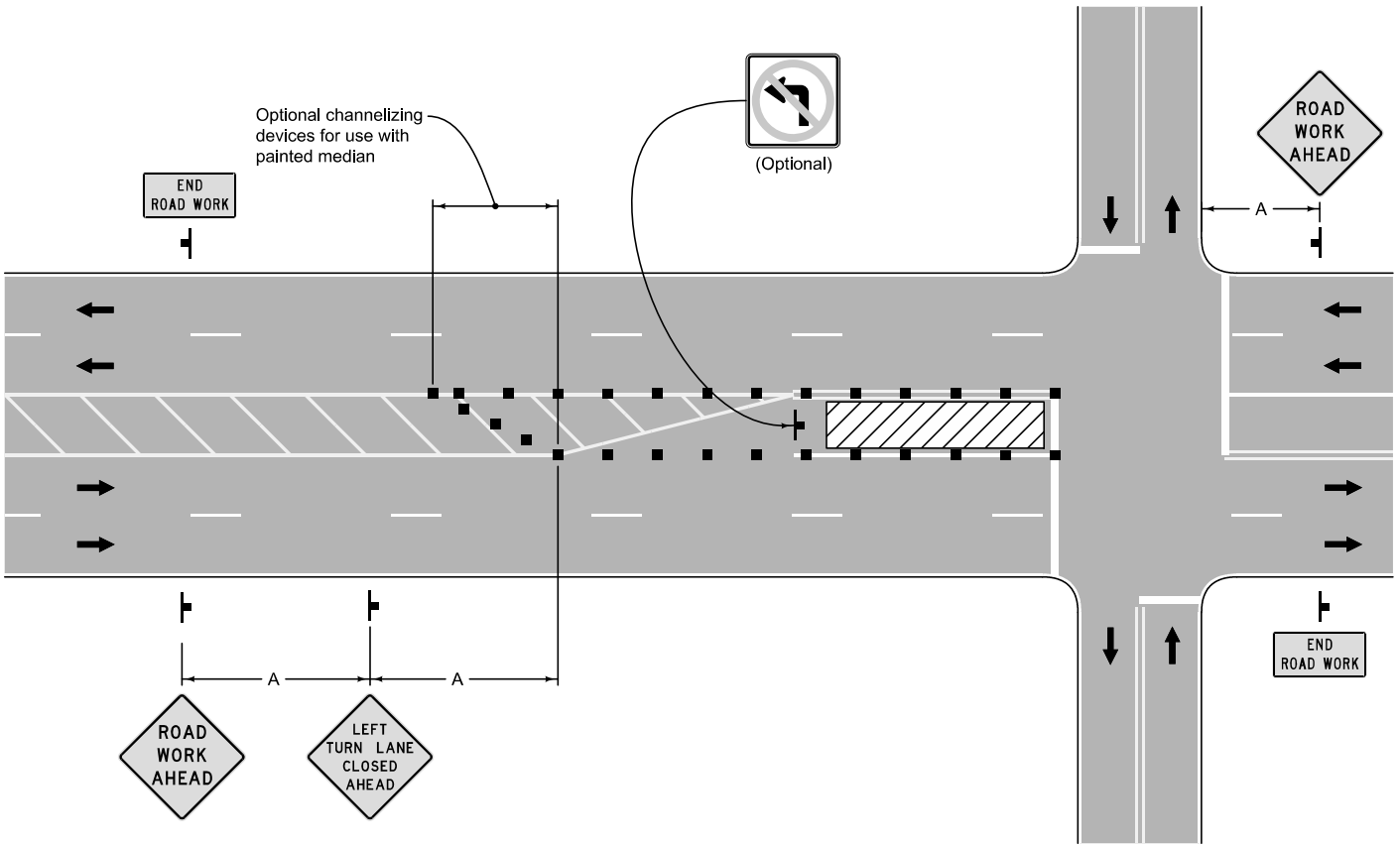
LANE CLOSURE ON THE FAR SIDE OF AN INTERSECTION



Left lane closure shown; for right lane closure, modify sign messages and channelizing devices.

For intersection approaches reduced to a single lane, left turn movements may be prohibited to maintain capacity for through motor vehicle traffic.

Prohibit left turn movements if sight distance from the through lane is restricted for left turning vehicles.

If work area extends across the crosswalk, the crosswalk should be closed using appropriate information and devices.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.113

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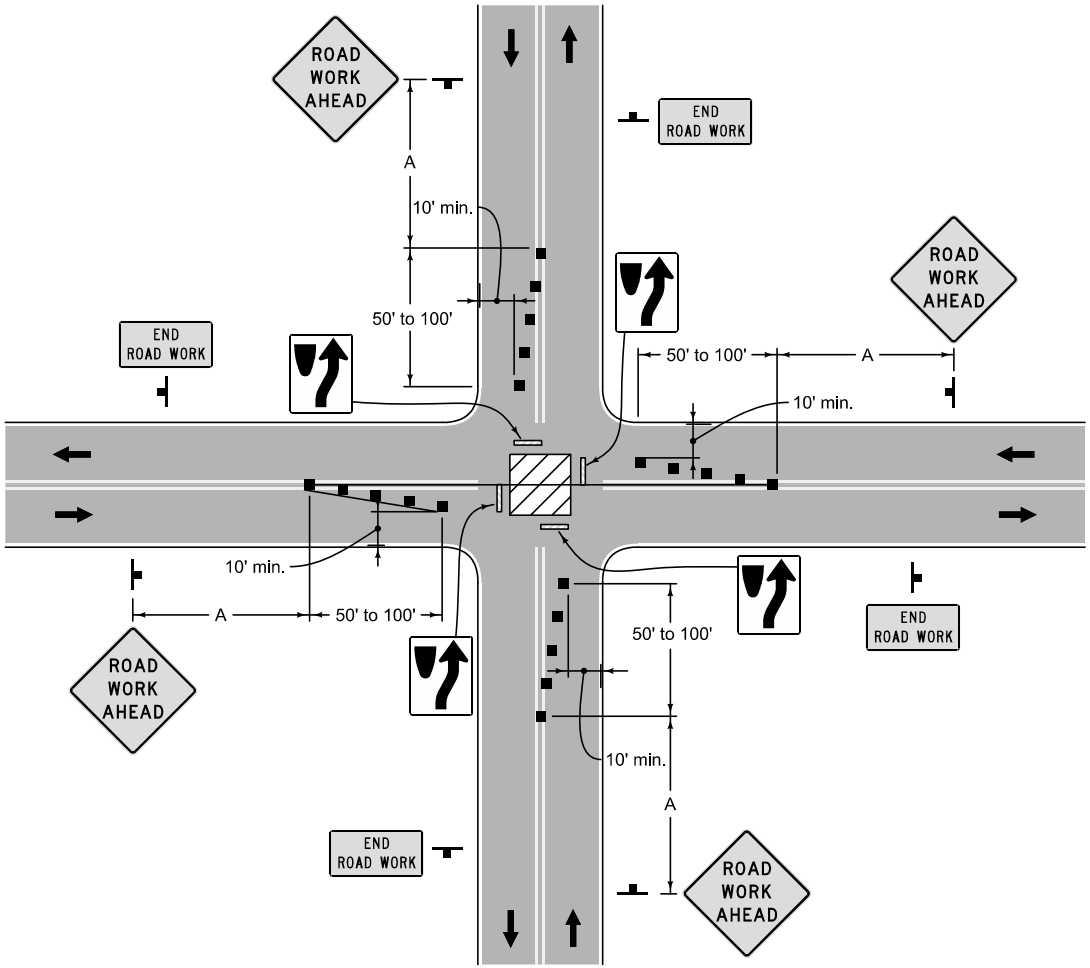
SUDAS Standard Specifications

CLOSURE OF TURN LANE



Maintain a minimum lane width of 10 feet as measured to the near face of channelizing devices. For short-term use on low speed, low volume roads without wider heavy-commercial vehicles, a minimum lane width of 9 feet may be used.

Left turns may be prohibited as required by geometric and traffic conditions.

For short-duration work, the channelizing devices may be eliminated if a vehicle displaying vehicle warning lights is positioned in the work space. Arrow signs (W1-6) may be used to replace the KEEP RIGHT signs.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.114 | SHEET 1 OF 1

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SUDAS Standard Specifications

CLOSURE IN CENTER OF INTERSECTION

Use for pavement marking and surface maintenance operations in daylight hours only.

Place vehicle-mounted signs at an elevation so they are not obscured by equipment or materials and are fully visible to approaching traffic.

Cover or turn sign legends from view when work is not in progress.

Refer to Figure 8030.101 for symbol key and sign spacing.

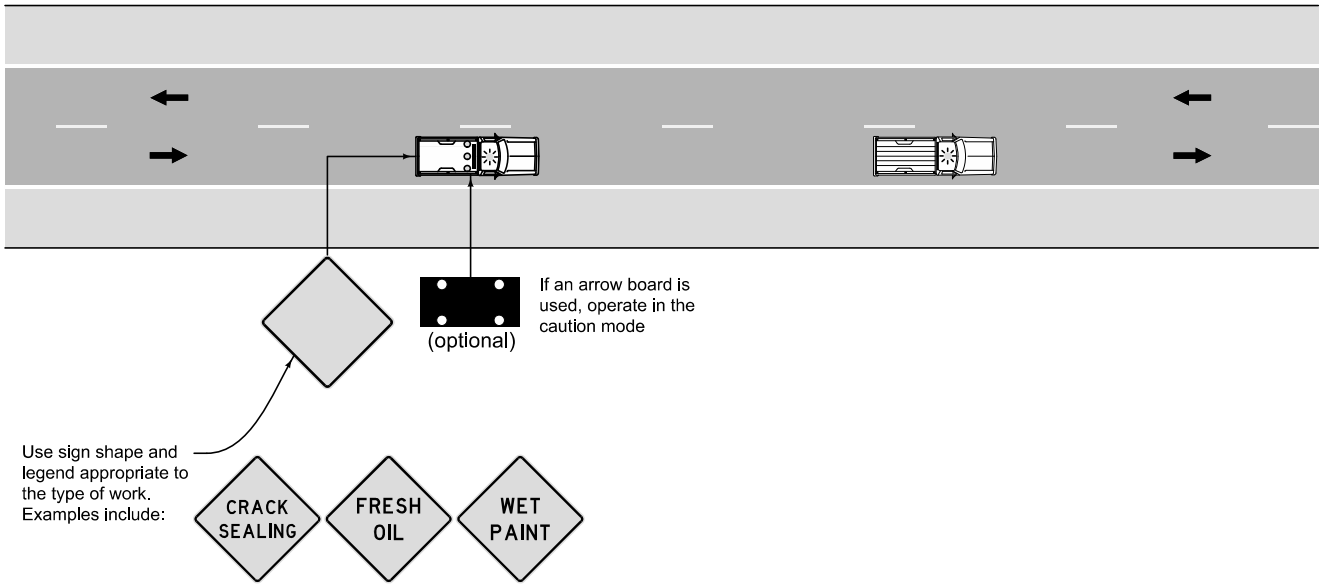

FIGURE 8030.115

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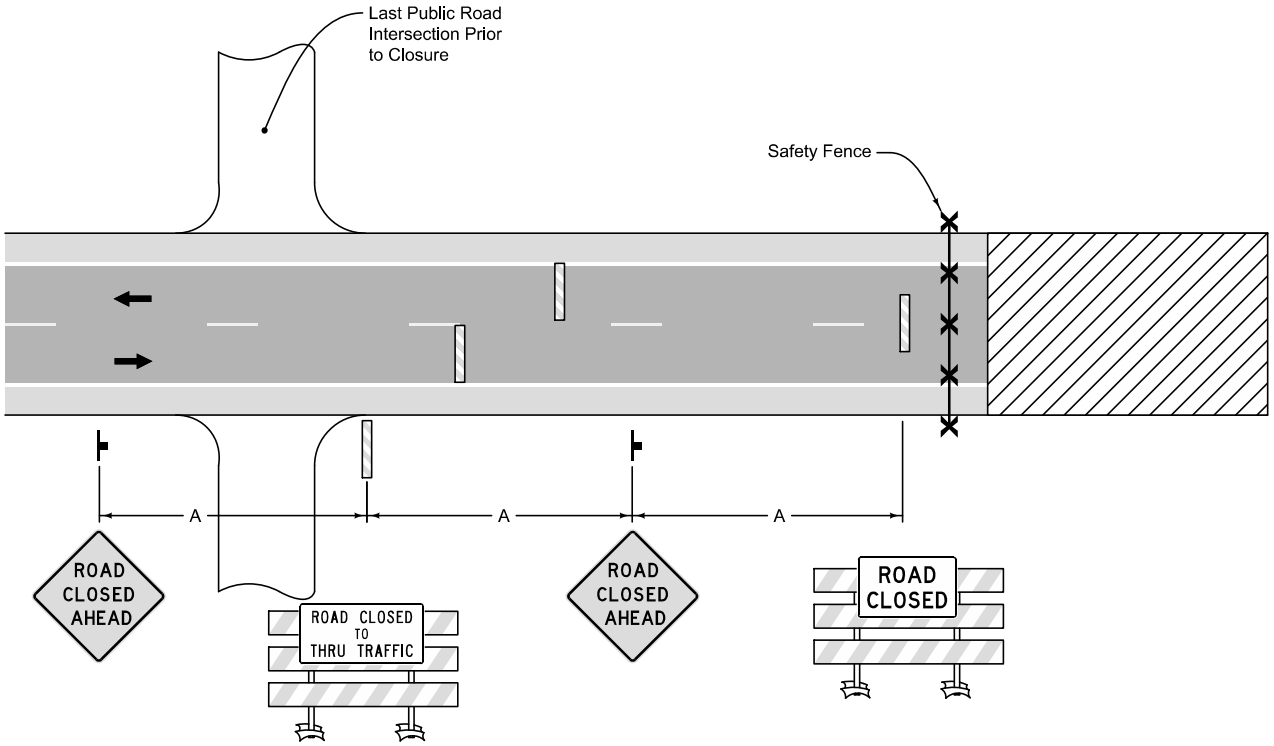
MOVING OPERATIONS ON TWO LANE ROADS



When distance "A" is less than 500 feet, place the barricade with the ROAD CLOSED TO THRU TRAFFIC sign in the middle of the traffic lane approaching the work area. The barricade may be omitted if the distance to the work area is less than 250 feet.

Maintain safety fence closures to prevent unauthorized vehicles from passing through.

Place staggered Type III barricades in the roadway after the last public road intersection prior to the closure.

If local traffic is allowed to pass a Type III barricade, retroreflective sheeting is required on both sides of the barricade.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.116

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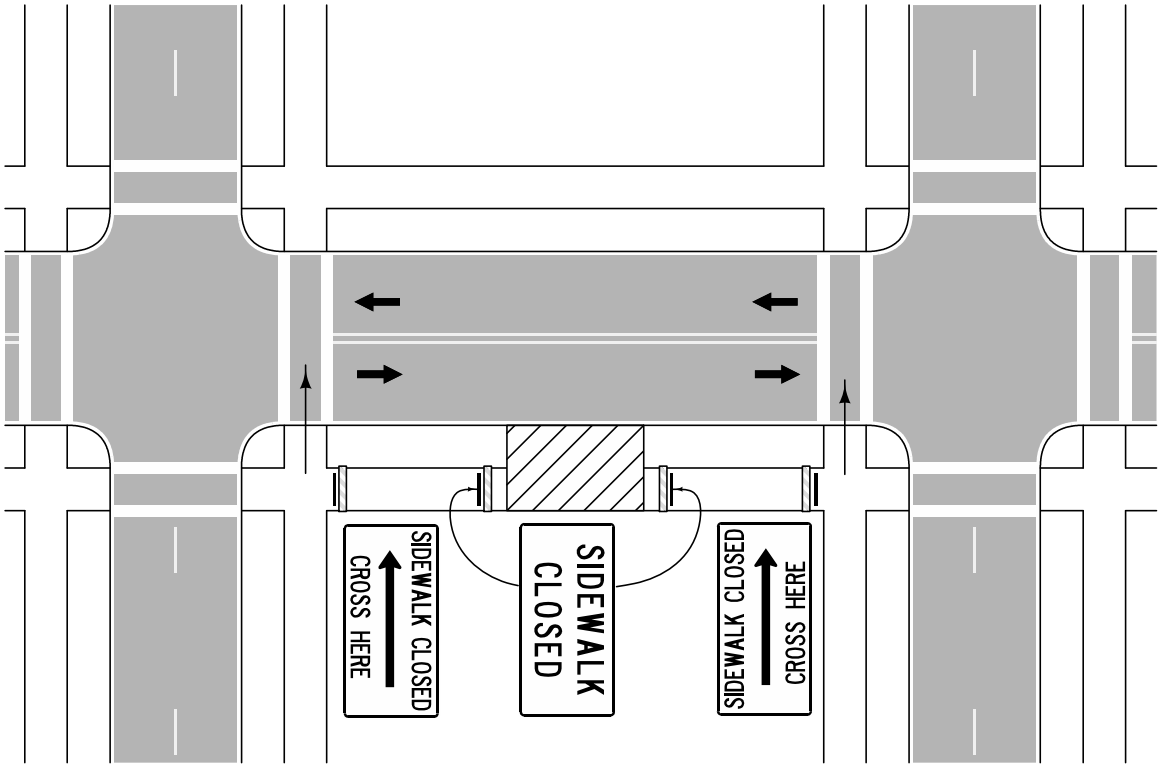
SUDAS Standard Specifications

STREET OR ROAD CLOSURE



Use when crosswalks, sidewalks, or other pedestrian facilities are closed or relocated. Ensure temporary facilities are detectable and include accessibility features consistent with the features present in the existing pedestrian facility.

Signs such as KEEP RIGHT (LEFT) may be placed to guide or direct pedestrians.

Provide continuous barriers or fencing complying with the requirements of PROWAG to secure work areas from pedestrians.

When required in the contract documents, provide auxiliary lighting or audible information devices to assist pedestrians with visual disabilities.

Only the temporary traffic control devices related to pedestrians are shown. Other devices related to control of vehicular traffic may be necessary.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.117 | SHEET 1 OF 1

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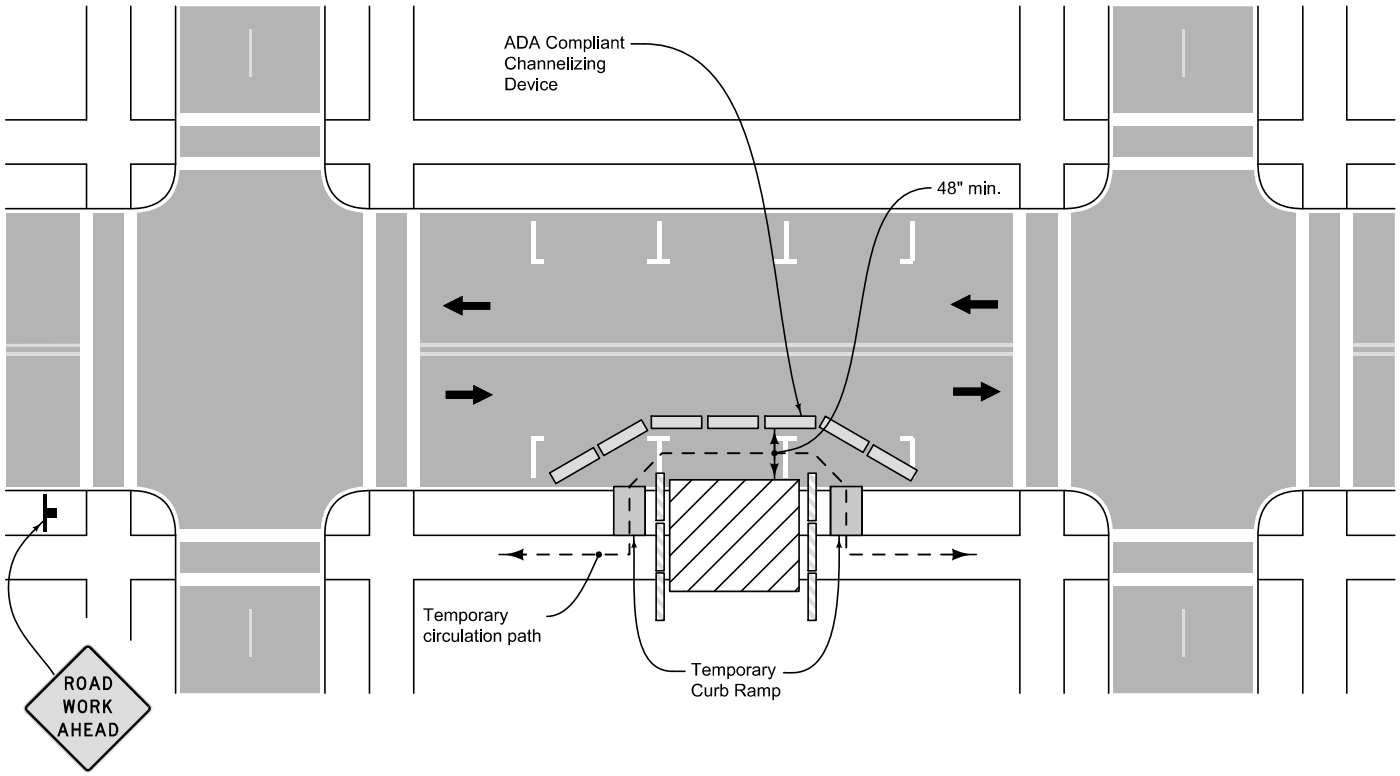
SUDAS Standard Specifications

SIDEWALK DETOUR



Use when crosswalks, sidewalks, or other pedestrian facilities are closed or relocated. Ensure temporary facilities are detectable and include accessibility features consistent with the features present in the existing pedestrian facility.

Provide continuous barriers or fencing complying with the requirements of PROWAG to secure work areas from pedestrians.

Where pedestrians are diverted onto high-speed roadways, provide a temporary traffic barrier and, if specified in the contract documents, a crash cushion, to separate the temporary sidewalk from vehicular traffic.

When required in the contract documents, provide auxiliary lighting or audible information devices to assist pedestrians with visual disabilities.

Only the temporary traffic control devices related to pedestrians are shown. Other devices related to control of vehicular traffic may be necessary.

Refer to Figure 8030.101 for symbol key and sign spacing.

FIGURE 8030.118

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SUDAS Standard Specifications

SIDEWALK DIVERSION

Use when work activities close crosswalk or reduce width to less than 4 feet. Ensure temporary facilities are detectable and include accessibility features consistent with the features present in the existing pedestrian facility.

When required in the contract documents, provide auxiliary lighting or audible information devices to assist pedestrians with visual disabilities.

Refer to Figure 8030.101 for symbol key and sign spacing.

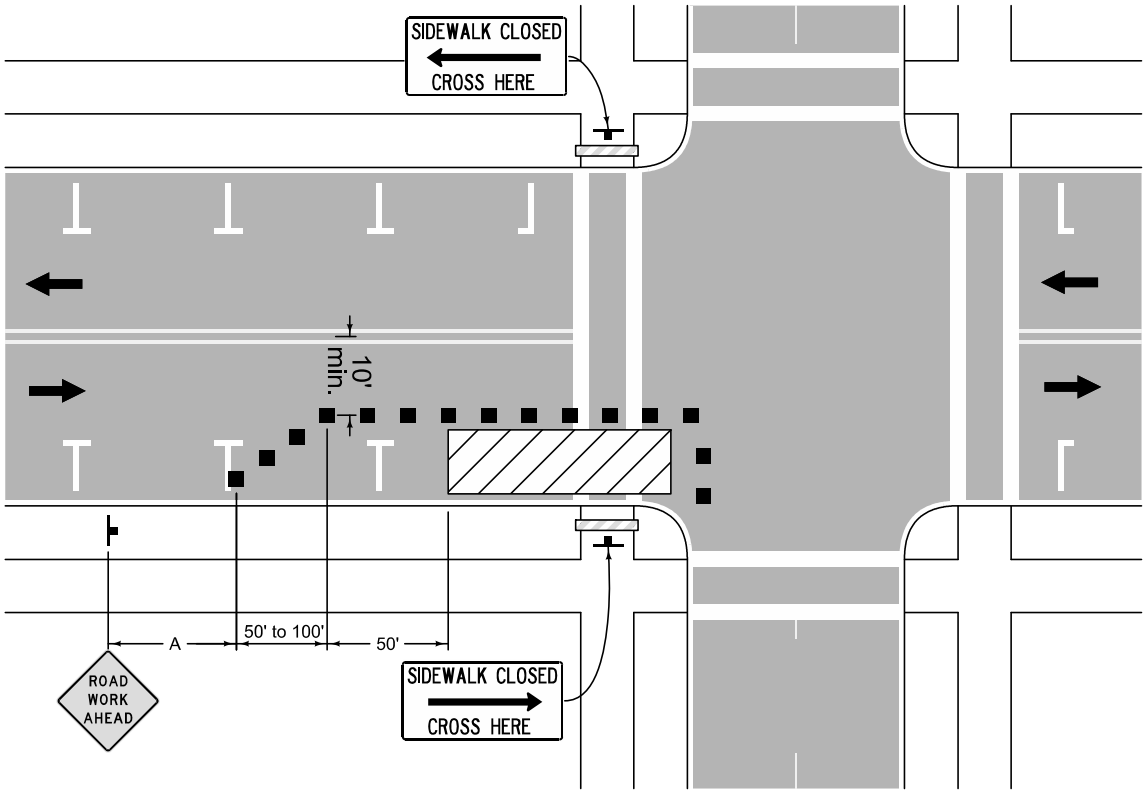

FIGURE 8030.119 SHEET 1 OF 1

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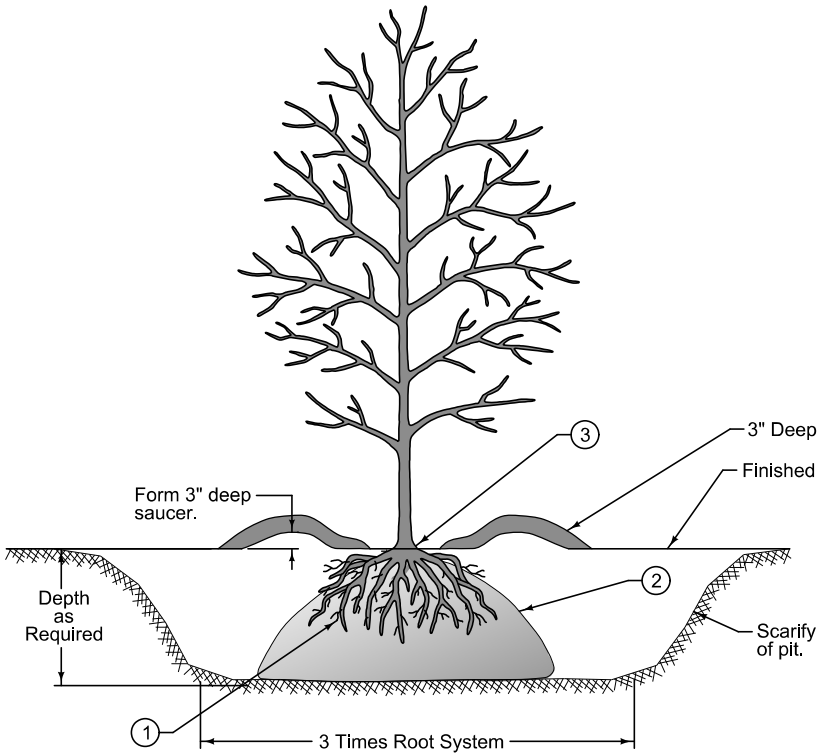
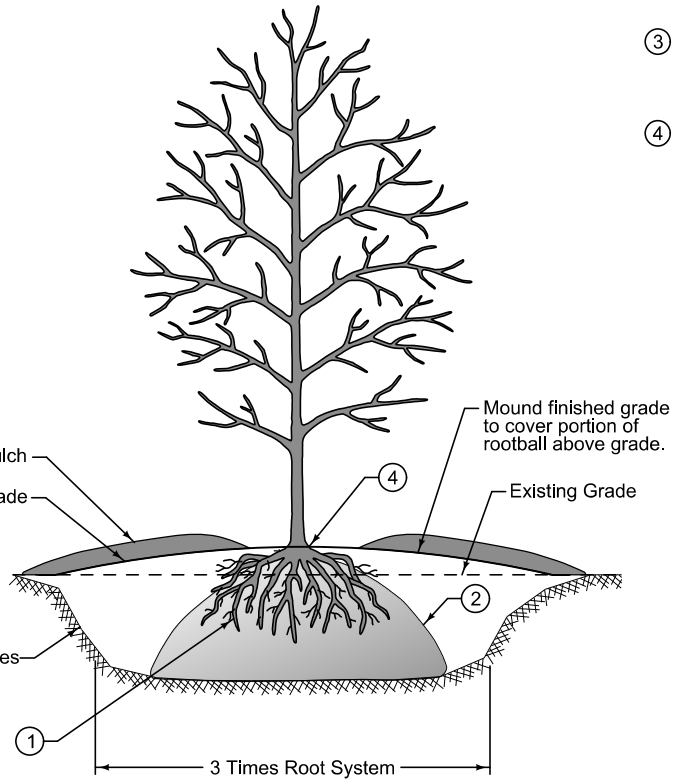
SUDAS Standard Specifications

CLOSURE OF MARKED OR UNMARKED CROSSWALK

1. Spread root system in natural position with soil excavated from pit.
2. Build a firm cone-shaped mound of soil in the middle of the planting pit.
3. Install with root flare at or slightly above grade. Do not place mulch within 6 inches of trunk.
4. Install root flare 2 to 3 inches above grade. Do not place mulch within 6 inches of trunk.



PLANTING PIT
(Bare Root Plants)



PLANTING PIT
(Bare Root Plants on Poorly Drained Soils)

FIGURE 9030.101

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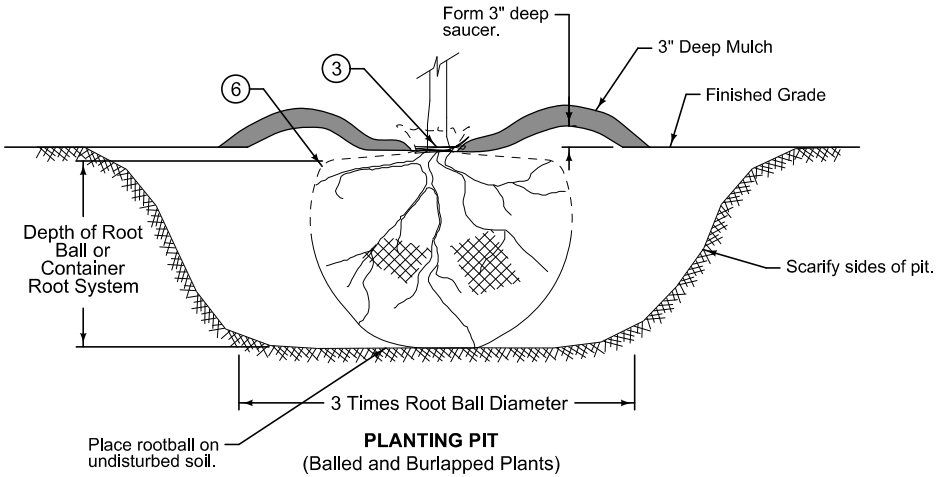
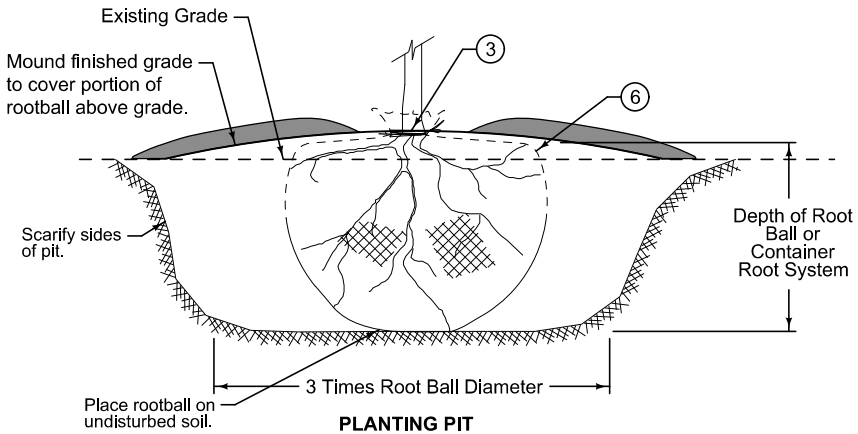
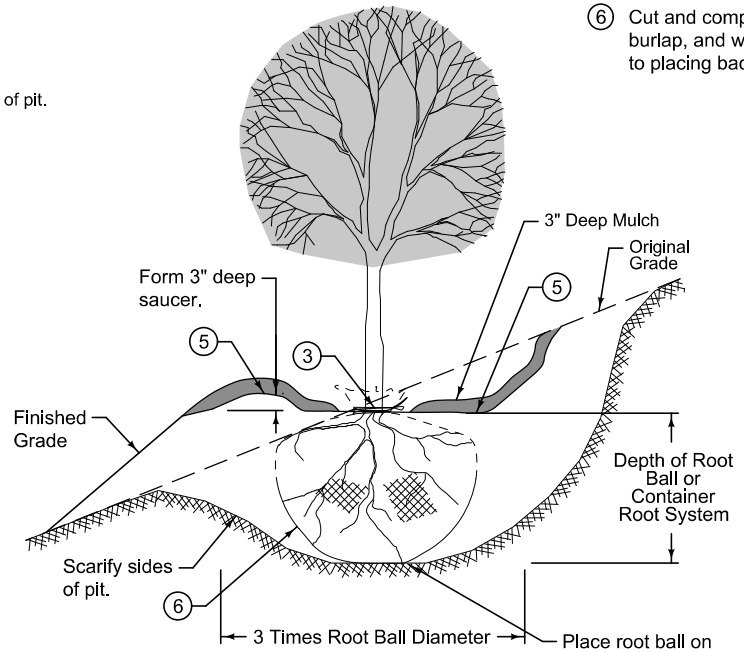
PLANTING PIT



PLANTING PIT
(Balled and Burlapped Plants)



PLANTING PIT
(Balled and Burlapped Plants on Poorly Drained Soils)



PLANTING PIT
(On Slopes)

3. Install with root flare at or slightly above grade. Do not place mulch within 6 inches of trunk.
4. Install root flare 2 to 3 inches above grade. Do not place mulch within 6 inches of trunk.
5. Begin transition at edge of root ball.
6. Cut and completely remove top 1/2 of twine, burlap, and wire baskets from root ball prior to placing backfill material.

FIGURE 9030.101 | SHEET 2 OF 2

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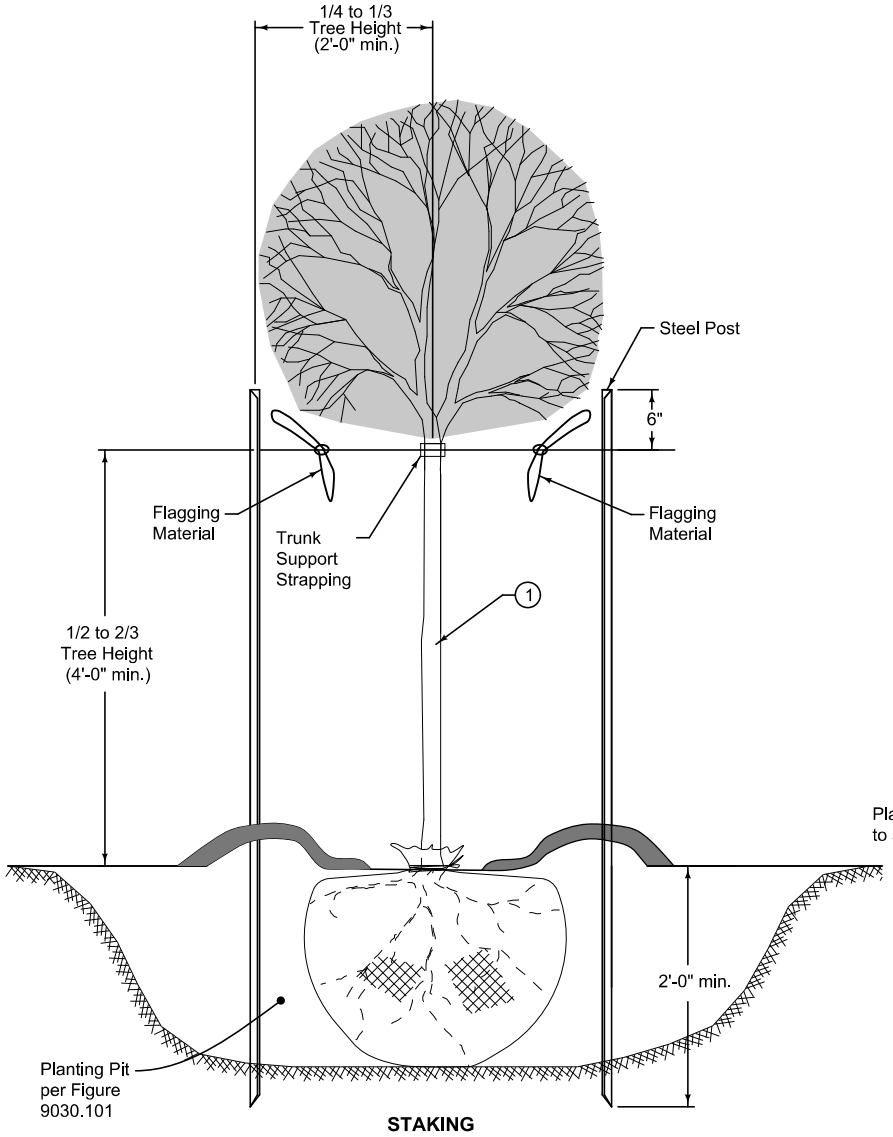
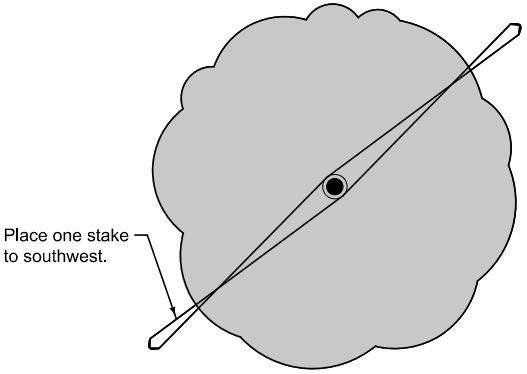
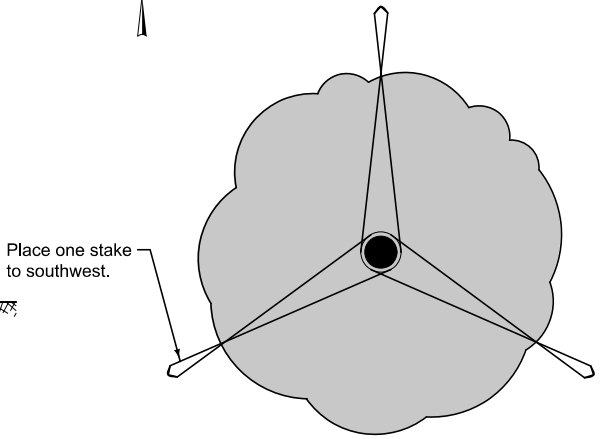
PLANTING PIT



STAKING



STAKING PLAN
(Trees 2 1/2 inch diameter or smaller)



STAKING PLAN
(Trees larger than 2 1/2 inch diameter)

1. Protect trunk from ground line to first branch when specified in the contract documents.

FIGURE 9030.102

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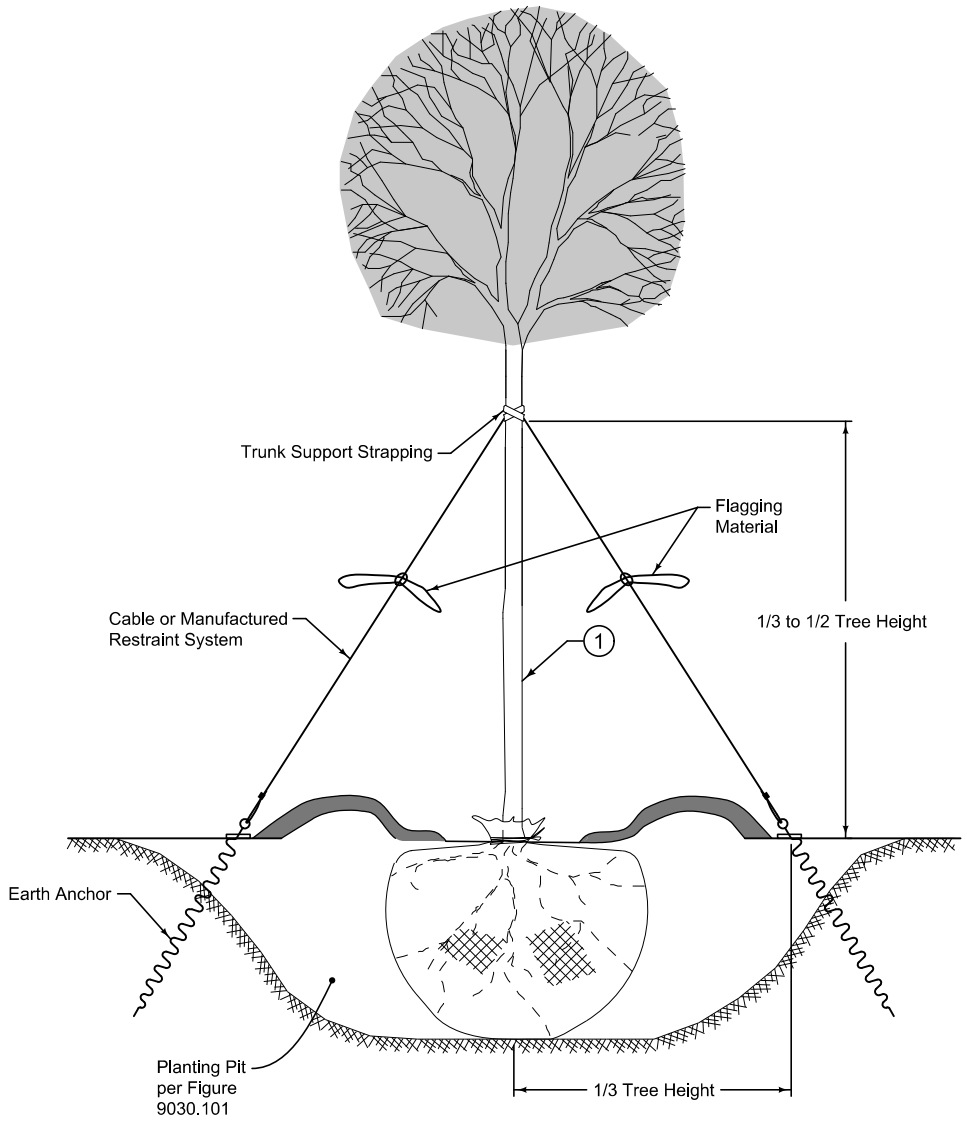
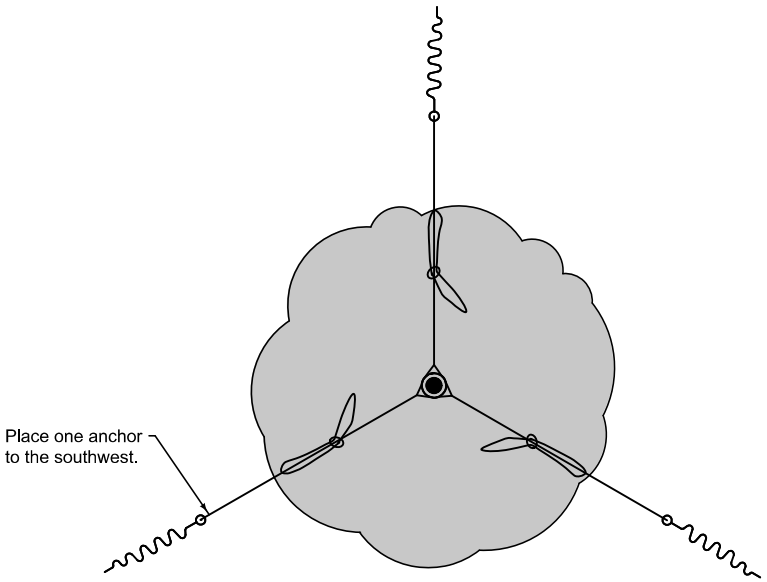
TREE STAKING, GUYING, AND WRAPPING



GUYING

1 Protect trunk from ground line to first branch when specified in the contract documents.



GUYING PLAN

FIGURE 9030.102 | SHEET 2 OF 2

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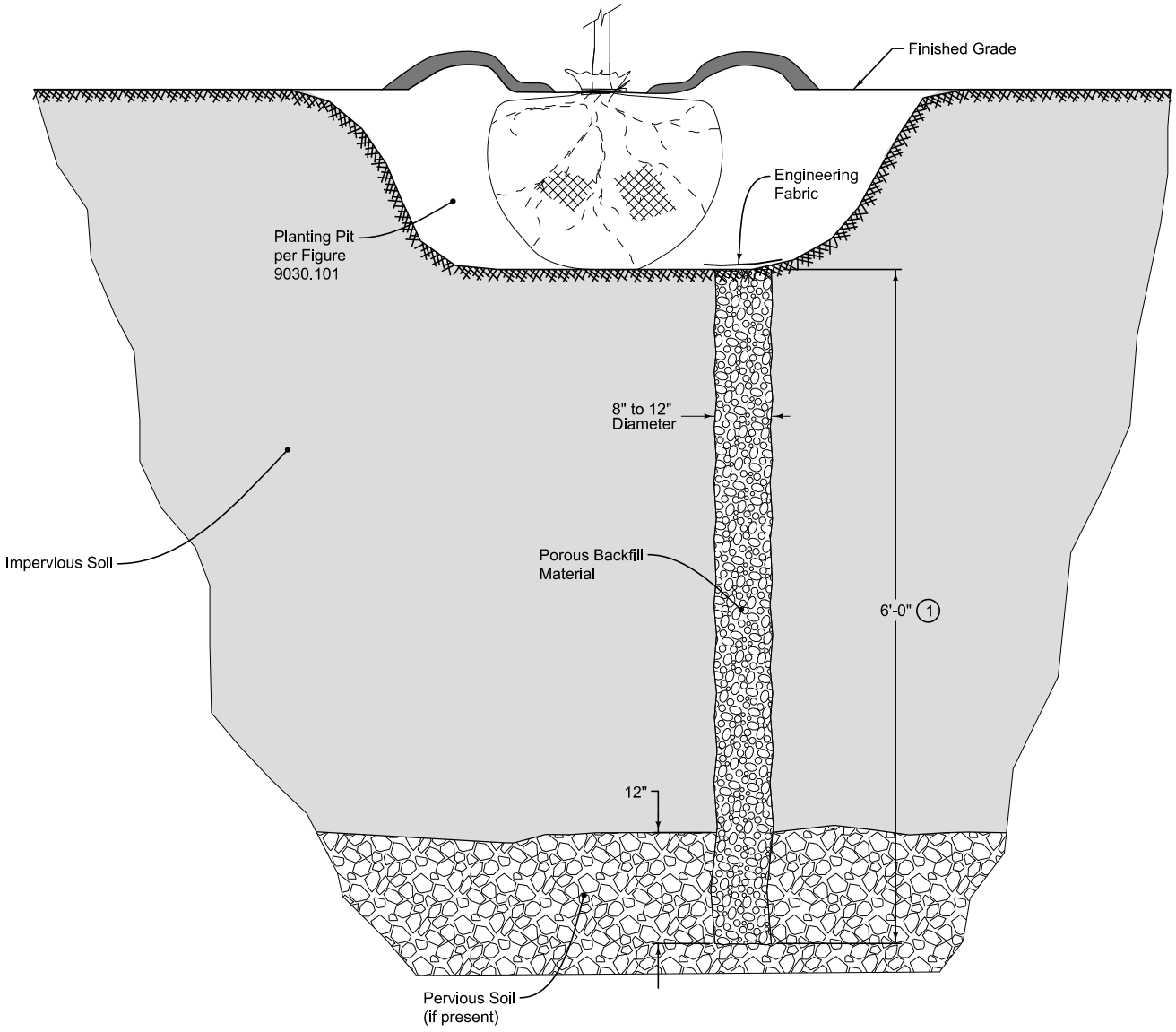
SUDAS Standard Specifications

TREE STAKING, GUYING, AND WRAPPING



(1) If pervious soil is encountered at a depth less than 6 feet, the drainage well may be terminated when the well extends a minimum of 12 inches into the pervious soil layer.

FIGURE 9030.103

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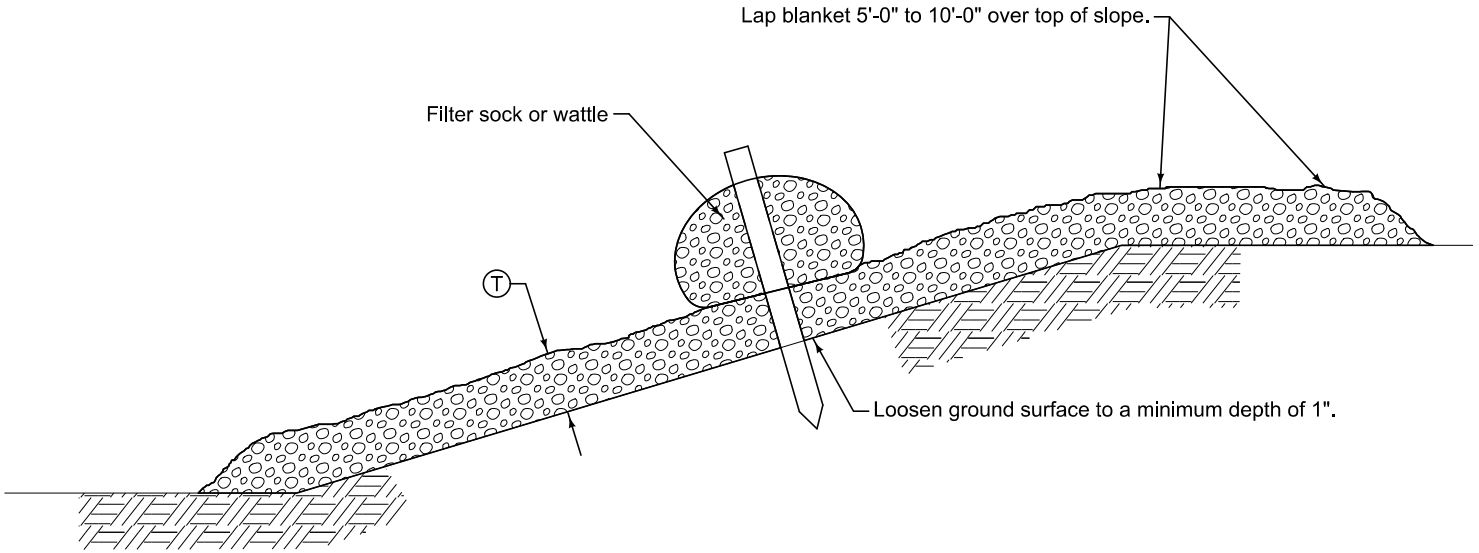
TREE DRAINAGE WELL

Compost blanket may be vegetated or unvegetated as specified in the contract documents.



COMPOST BLANKET DETAIL

MINIMUM COMPOST BLANKET THICKNESS

SLOPE	BLANKET THICKNESS Ⓣ
3:1	3"
≤ 4:1	2"

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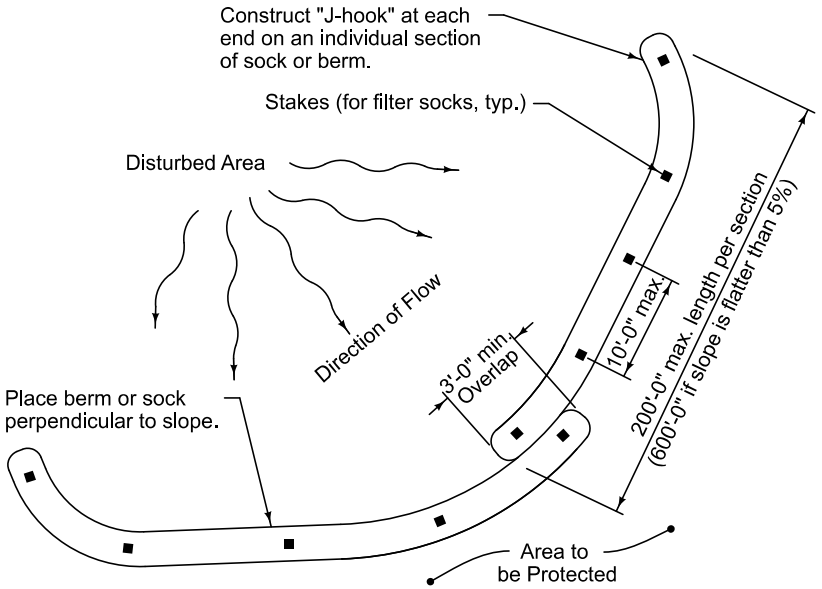
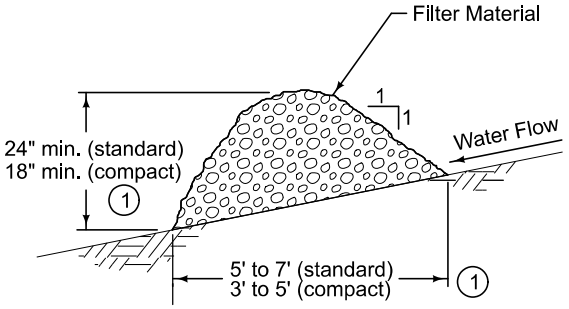
COMPOST BLANKET

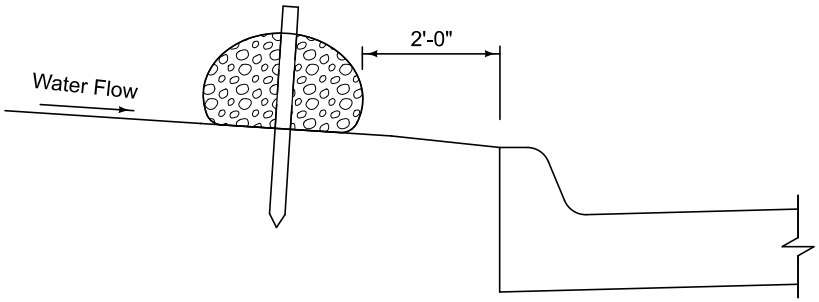
FIGURE 9040.101 | SHEET 1 OF 1



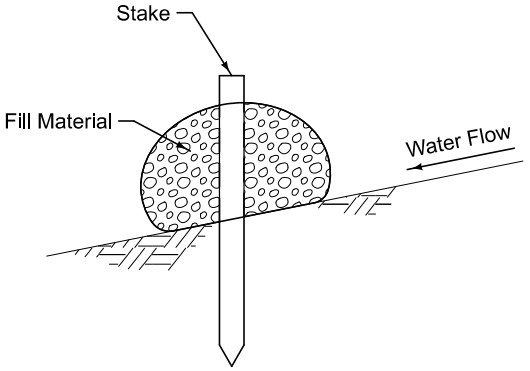
PLAN VIEW OF SLOPE
(for sediment and slope control)



FILTER BERM



SECTION VIEW AT STREET
(for perimeter control along street)



FILTER SOCK

Berm shown is typical for slopes flatter than 3:1. For steeper slopes, increase berm size as directed by the Engineer.

Place berm in uncompacted windrow perpendicular to the slope at locations specified in the contract documents.

Filter sock diameter as specified in the contract documents.

(1) Filter berm size (standard or compact) as specified in the contract documents.

TYPICAL PLACEMENT OF BERM OR SOCK

FIGURE 9040.102

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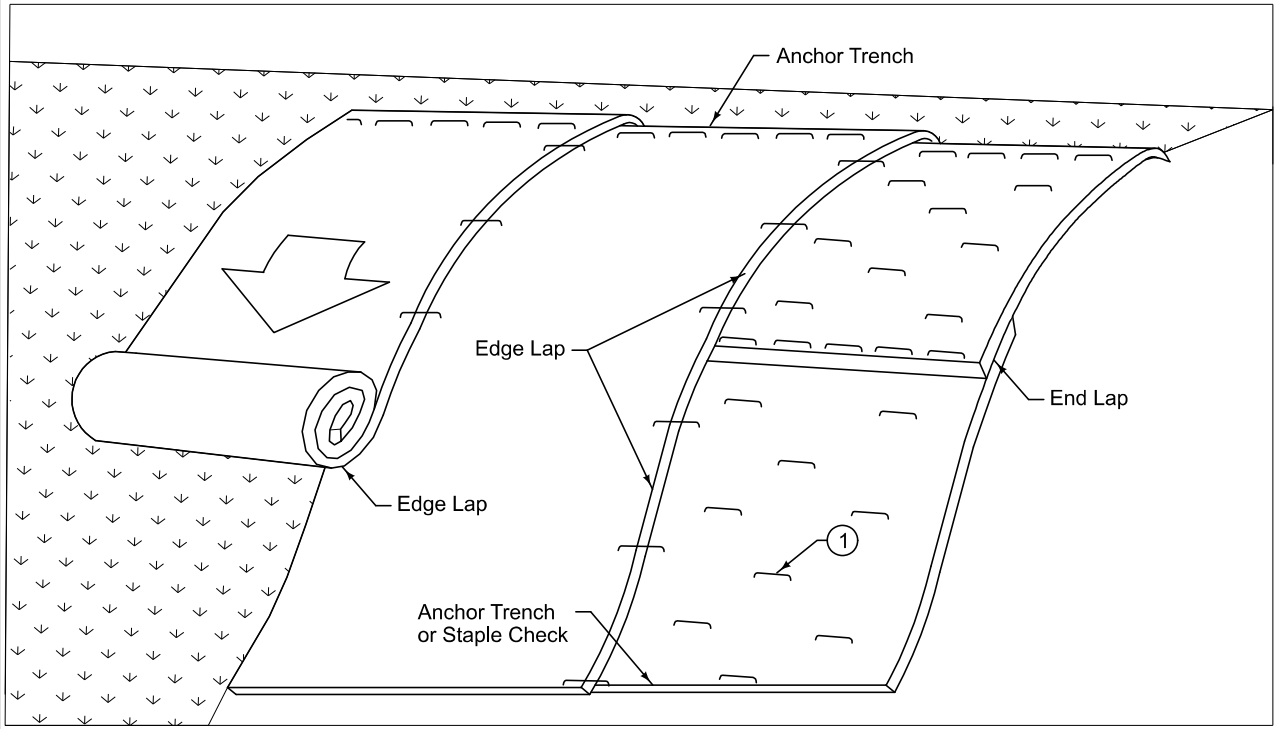
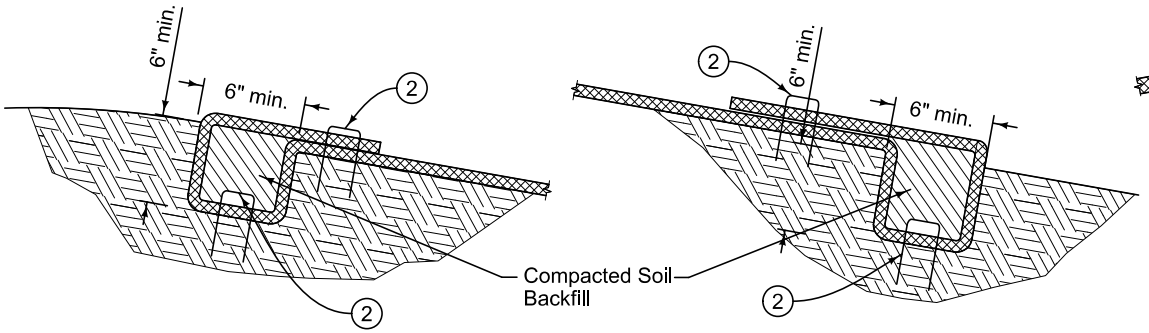
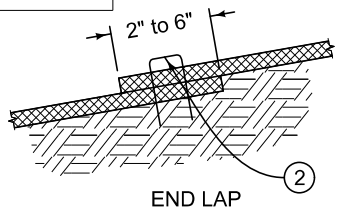
FILTER BERM AND FILTER SOCK



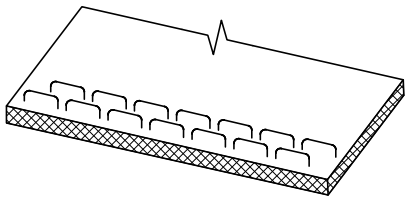
1. Secure blanket to ground according to manufacturer's recommended anchoring pattern and anchor density (minimum 1.3 anchors per square yard).
2. Install staples at 1 foot on center.



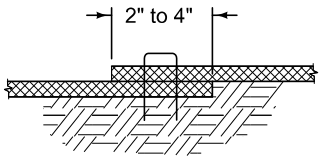
UPSLOPE AND TERMINAL END ANCHOR TRENCH



END LAP



STAPLE CHECK
(Two rows of staples at 4" on center and staggered 4" apart)



EDGE LAP
(4'-0" min. anchor spacing)

FIGURE 9040.103

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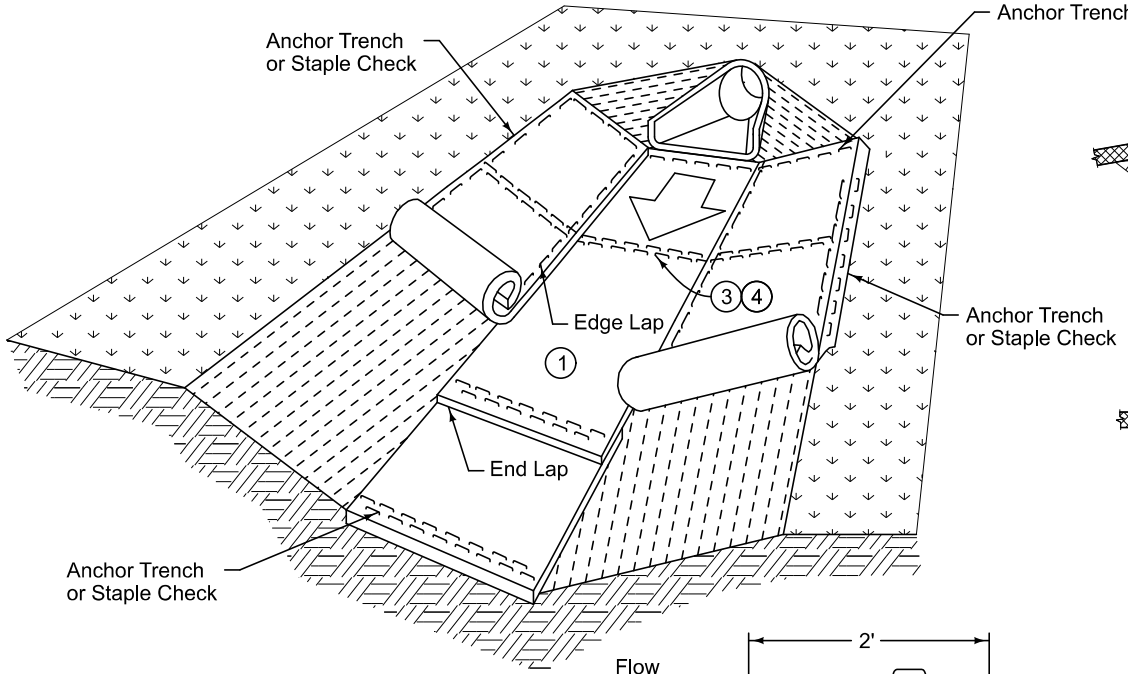
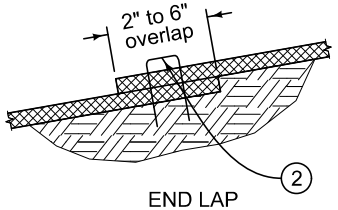
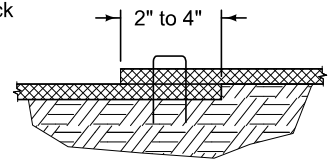
ROLLED EROSION CONTROL PRODUCT (RECP) INSTALLATION ON SLOPES

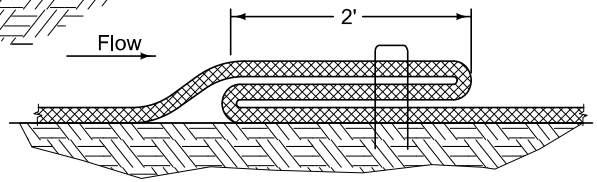




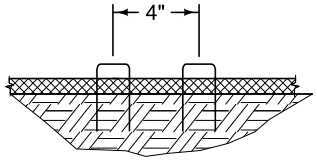
END LAP



EDGE LAP
(4'-0" min. anchor spacing)

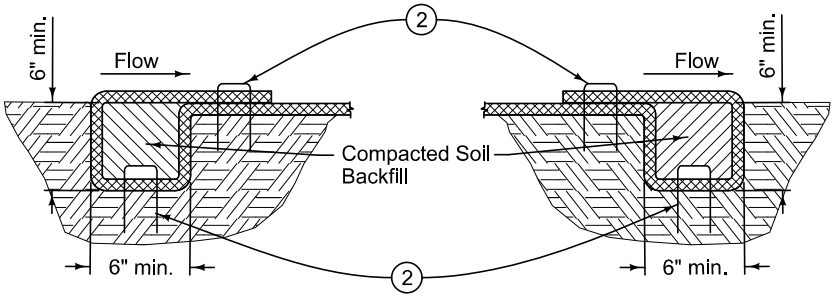


BLANKET CHECK
(Install a single row of staples at a 12" spacing)

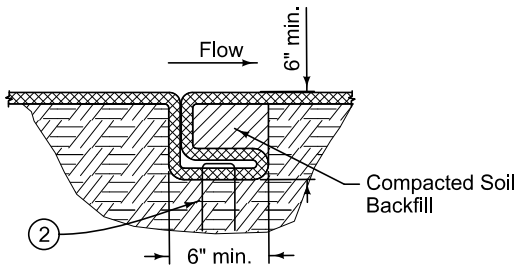


STAPLE CHECK
(Two rows of staples at 4" on
center and staggered 4" apart)

1. Secure blanket to ground according to manufacturer's recommended anchoring pattern and anchor density (minimum 1.7 anchors per square yard).
2. Install staples at 1 foot on center.
3. Install staple checks at 100 foot intervals for channel slopes less than 2.5%.
4. Install blanket checks for the following slopes:
   2.5% - 3% 100 ft. intervals
   3% - 5% 50 ft. intervals
   5% - 7% 25 ft. intervals



UPSTREAM AND DOWNSTREAM ANCHOR TRENCH



INTERMEDIATE ANCHOR TRENCH

FIGURE 9040.104 | SHEET 1 OF 1

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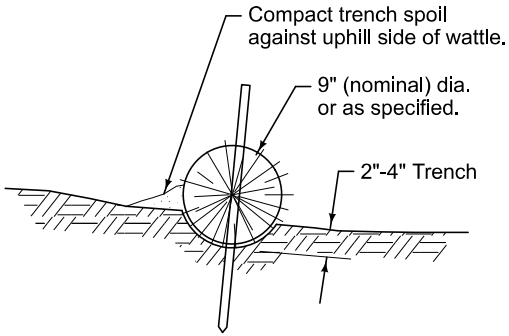
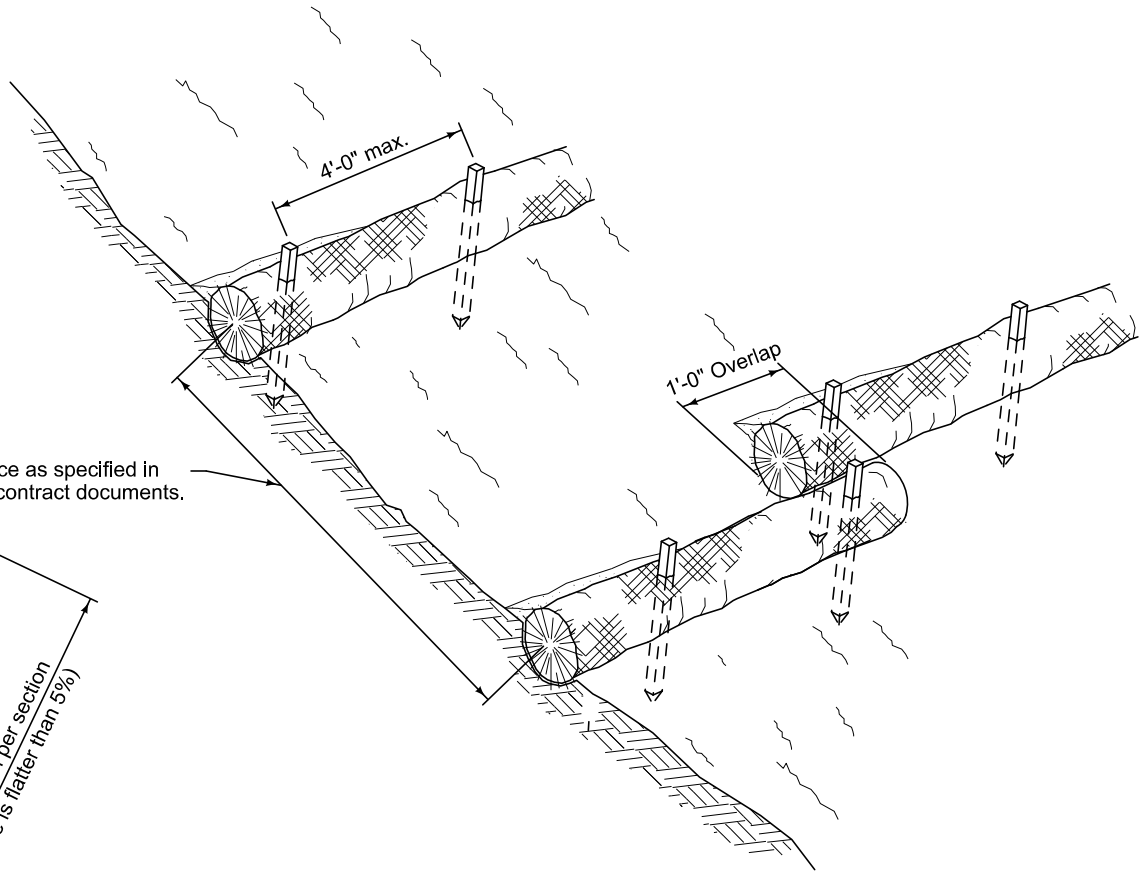
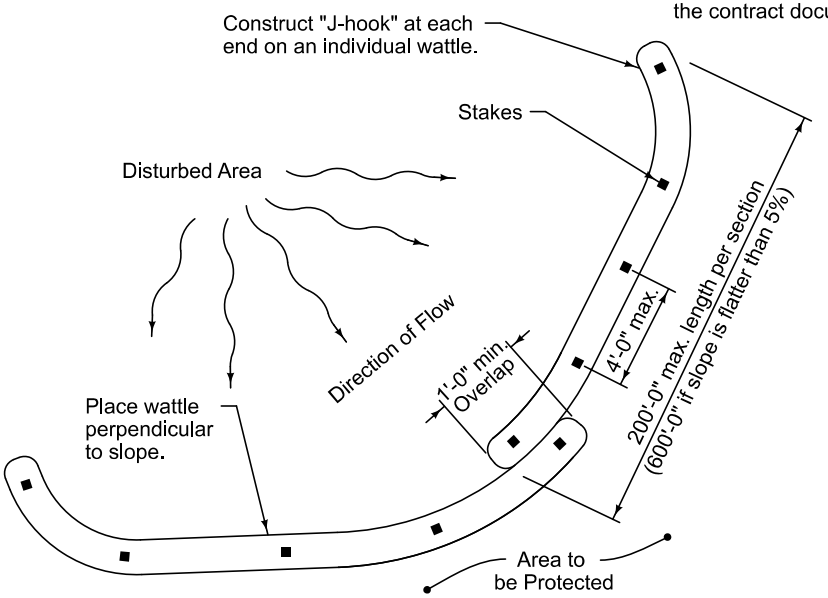
SUDAS Standard Specifications

ROLLED EROSION CONTROL PRODUCT (RECP) INSTALLATION IN CHANNELS







PLAN VIEW OF SLOPE
(for sediment and slope control)

FIGURE 9040.105

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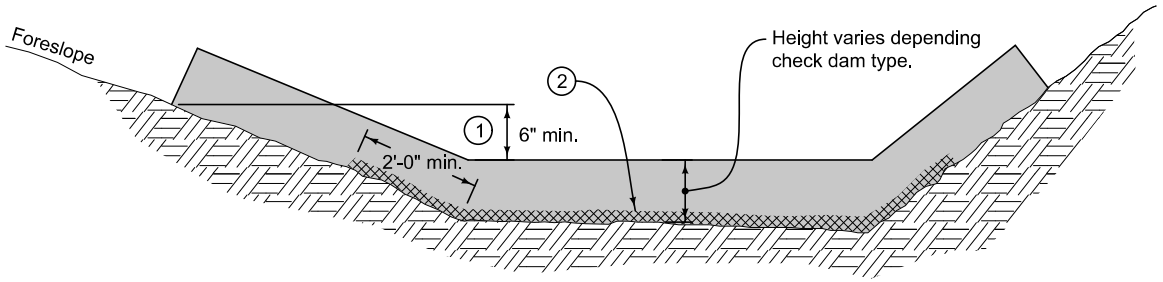
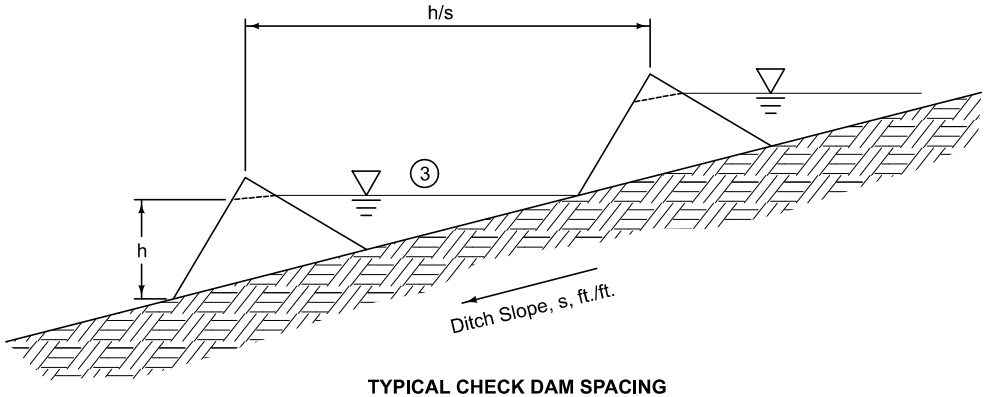
WATTLE



TYPICAL CHECK DAM SECTION
(Applies to silt fence, fiber log, and manufactured check dam devices)



TYPICAL CHECK DAM SPACING

1. Extend check dam up sides of slope so the bottom of the check dam is at least 6 inches higher than the check dam crest.
2. When specified, install an 8 foot wide strip of RECP under the check dam. Extend RECP up the slopes a minimum of 2 feet from the toe of the channel.
3. Space check dams so crest of downstream check dam is level with the base of the upstream check dam.

FIGURE 9040.106 | SHEET 1 OF 2

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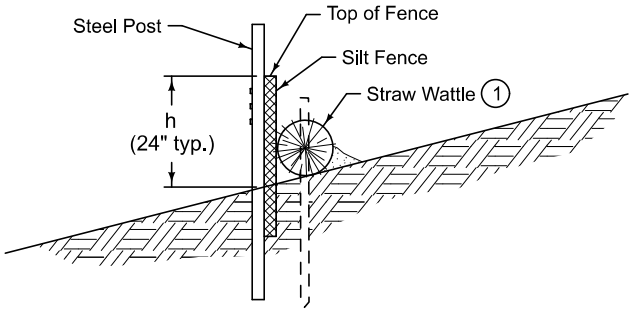
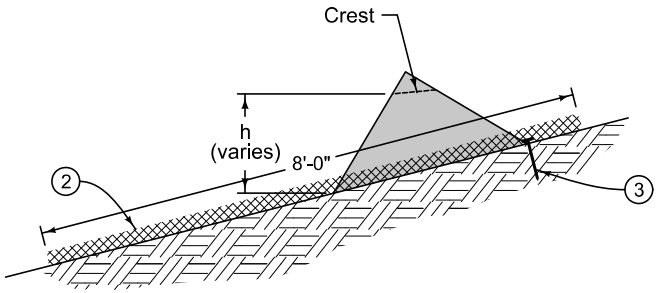
SUDAS Standard Specifications

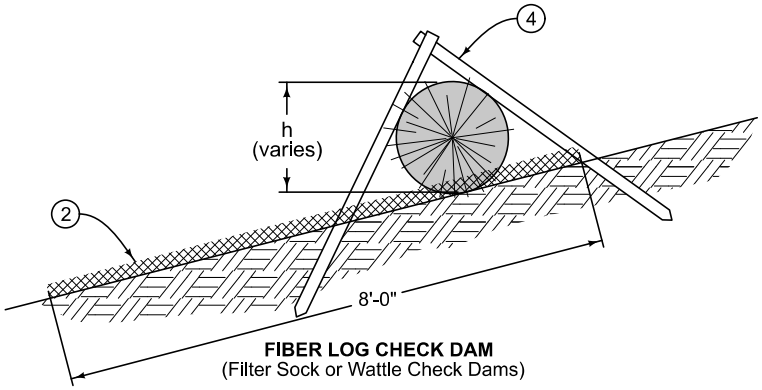
CHECK DAMS



SILT FENCE CHECK DAM
(See Figure 9040.119 for installation of Silt Fence Check Dams)



MANUFACTURED CHECK DAM
(Synthetic Permeable and Triangular Foam Check Dams)



FIBER LOG CHECK DAM
(Filter Sock or Wattle Check Dams)

1. When specified, place a straw wattle against the upstream face of silt fence check dams. Secure wattle in place with wood stakes.
2. When specified, install an 8 foot wide strip of RECP under the check dam. Extend RECP up the slopes a minimum of 2 feet from the toe of the channel.
3. Anchor manufactured check dam according to the manufacturer's recommendations.
4. Install two stakes at a 45 degree angle to the surface. Space stakes at 1 foot intervals.

FIGURE 9040.106 | SHEET 2 OF 2

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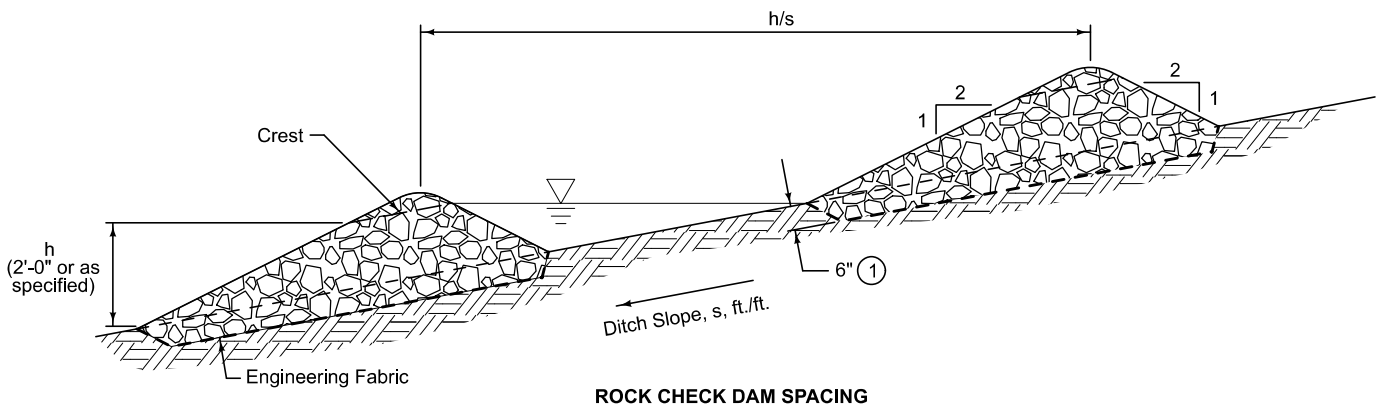
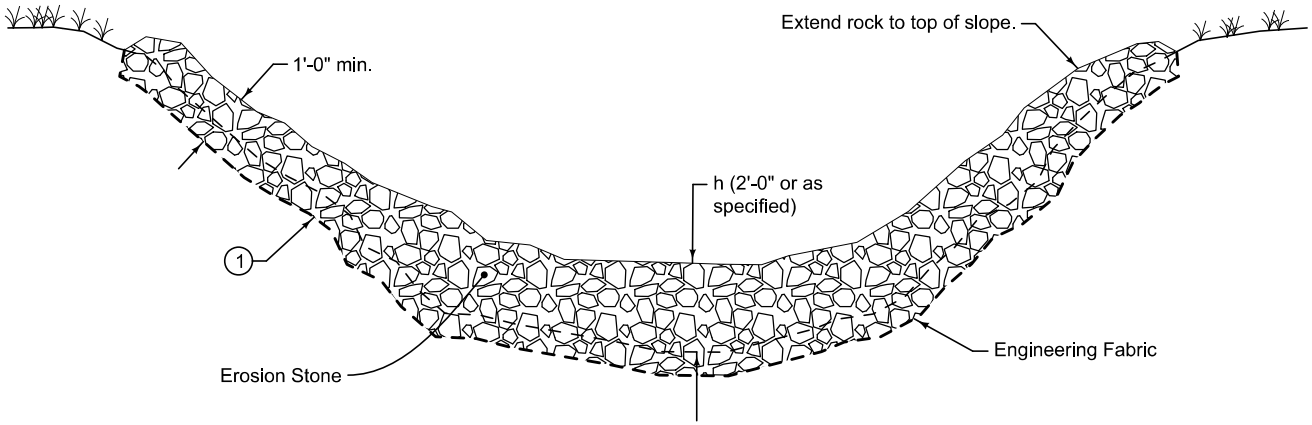
SUDAS Standard Specifications

CHECK DAMS



ROCK CHECK DAM SPACING

(1) Key rock check dam into bottom and sides of the channel a minimum of 6 inches.



ROCK CHECK DAM SECTION

FIGURE 9040.107

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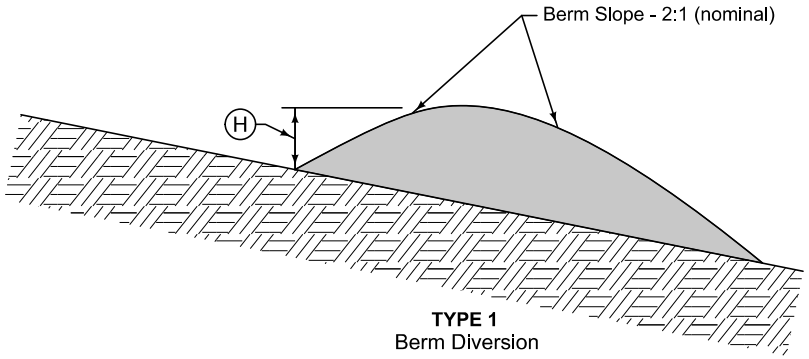
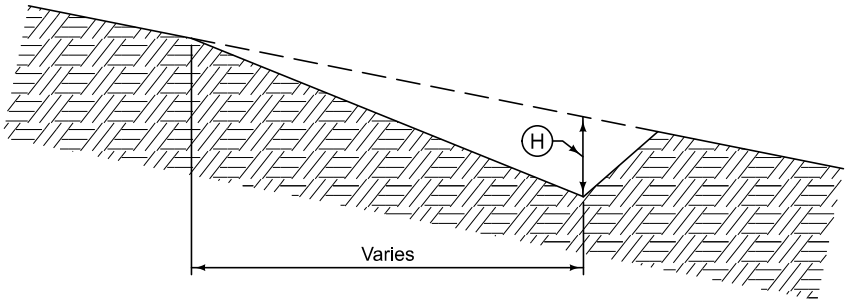
SUDAS Standard Specifications

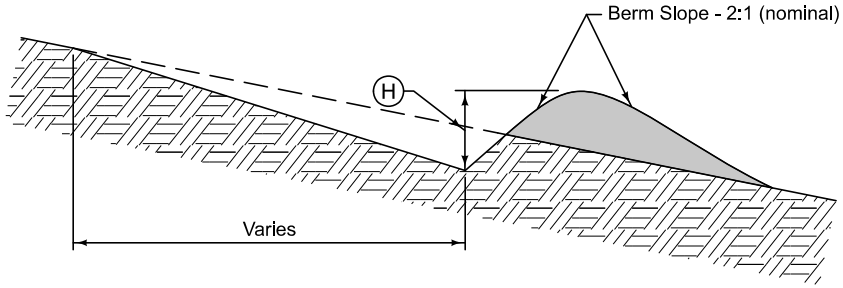
ROCK CHECK DAM



TYPE 1
Berm Diversion



TYPE 2
'V' Ditch Diversion



TYPE 3
Ditch/Berm Diversion

Diversion Types 1, 2, and 3 may be used interchangably unless otherwise specified in the contract documents.

Alternate configurations may be used upon approval from the Engineer.

(H) Total height of diversion (swale and berm): 18 inch minimum or as specified.

FIGURE 9040.108

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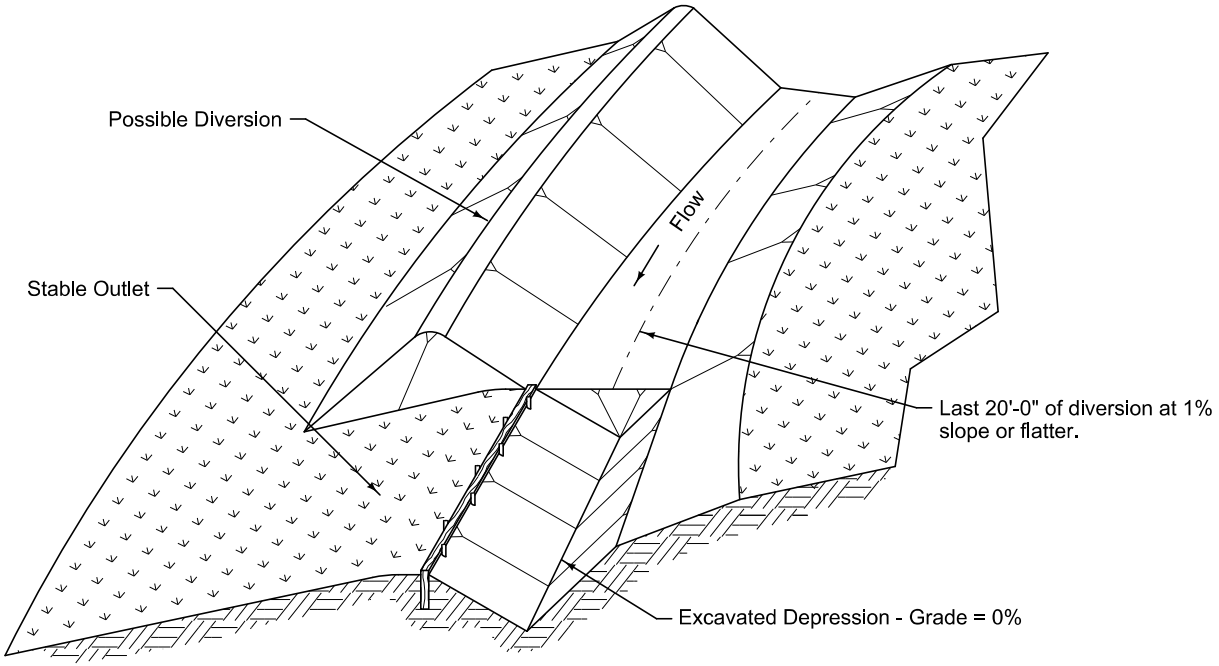
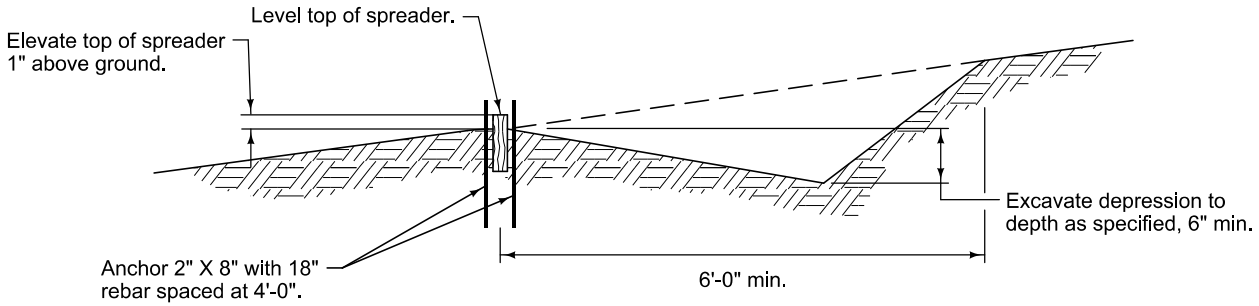
TEMPORARY EARTH DIVERSION BERMS



PERSPECTIVE VIEW



CROSS-SECTION

FIGURE 9040.109

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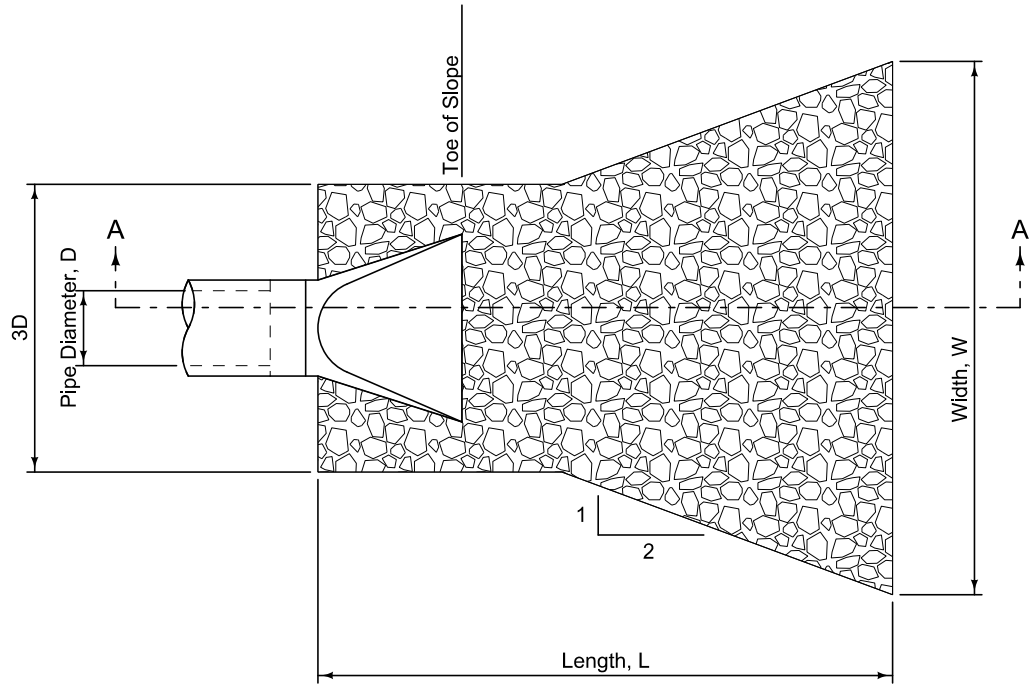
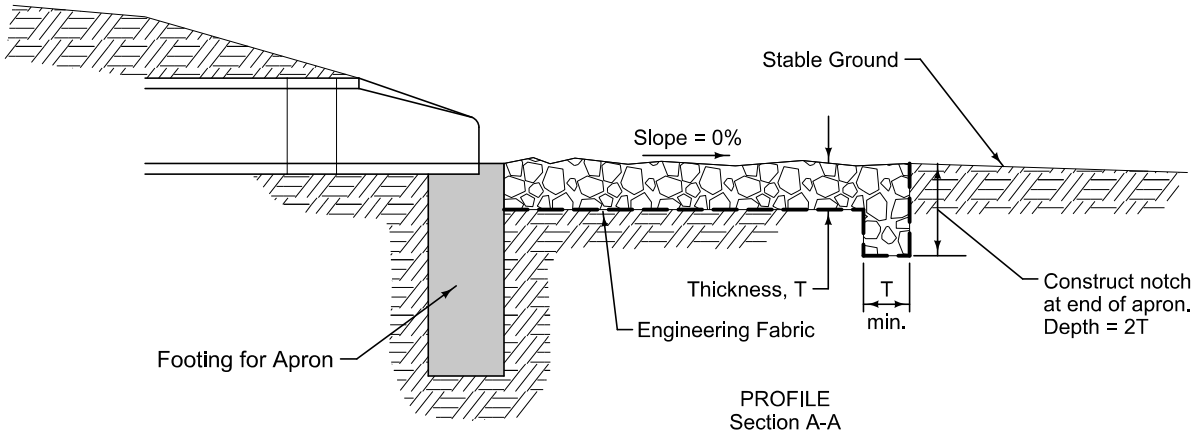
SUDAS Standard Specifications

LEVEL SPREADER



PLAN



PROFILE
Section A-A

FIGURE 9040.110 | SHEET 1 OF 1

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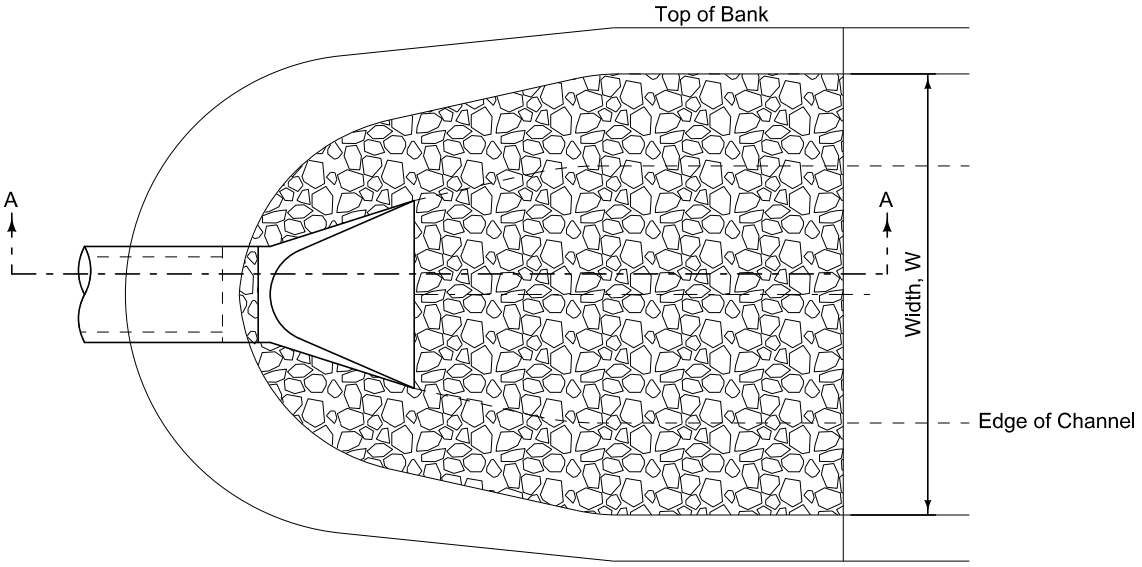
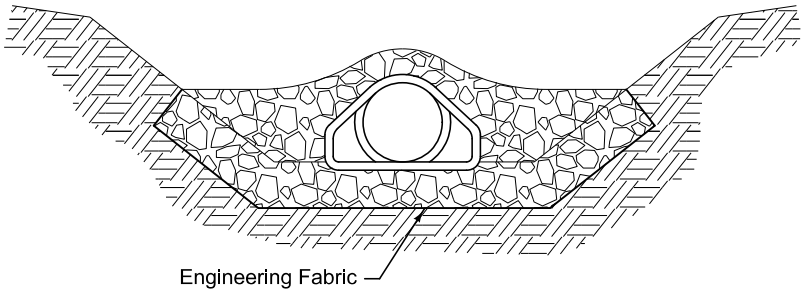
SUDAS Standard Specifications

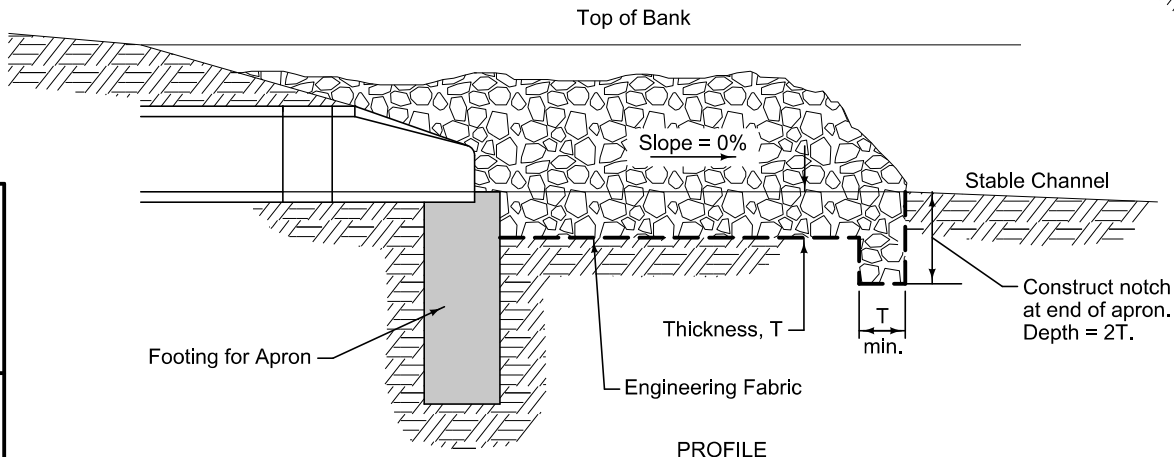
RIP RAP FOR PIPE OUTLET
ONTO FLAT GROUND



PLAN



CROSS-SECTION



PROFILE
Section A-A

FIGURE 9040.111 | SHEET 1 OF 1

SUDAS

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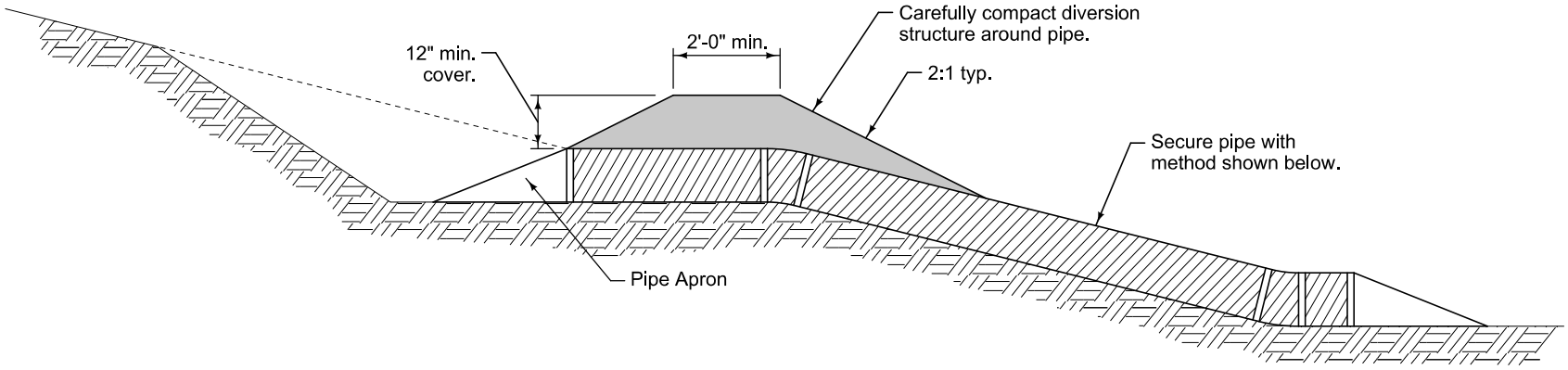
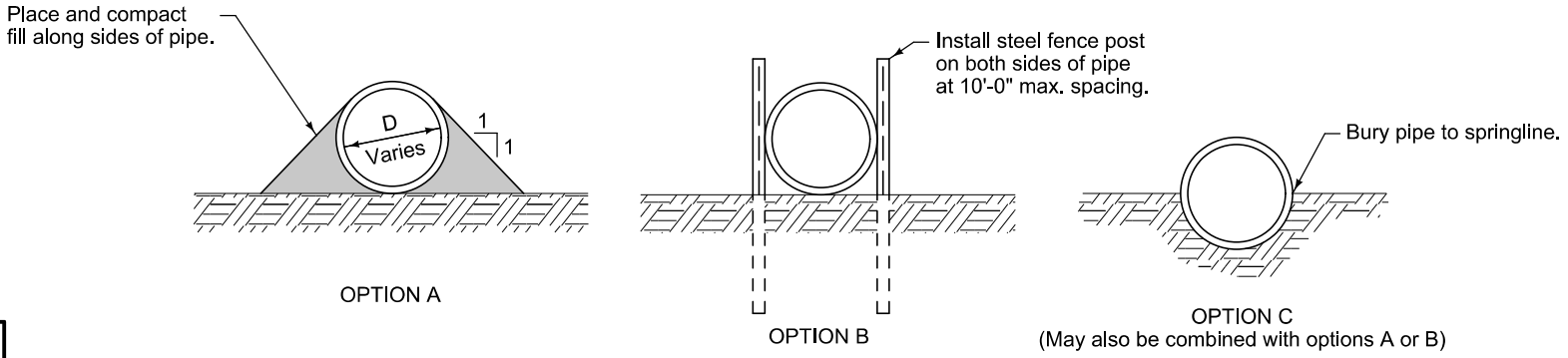
SUDAS Standard Specifications

RIP RAP APRON FOR PIPE
OUTLET INTO CHANNEL





OPTION A

OPTION B

OPTION C
(May also be combined with options A or B)

SLOPE DRAIN ANCHORING OPTIONS
(Options A, B, and C are interchangable unless otherwise specified in the contract documents)

FIGURE 9040.112

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SUDAS Standard Specifications

TEMPORARY PIPE SLOPE DRAIN

1. Barrel length and diameter as specified in the contract documents.
2. Riser pipe and base/dewatering device: See Figure 9040.115.
3. Anti-vortex device: See Figure 9040.116.

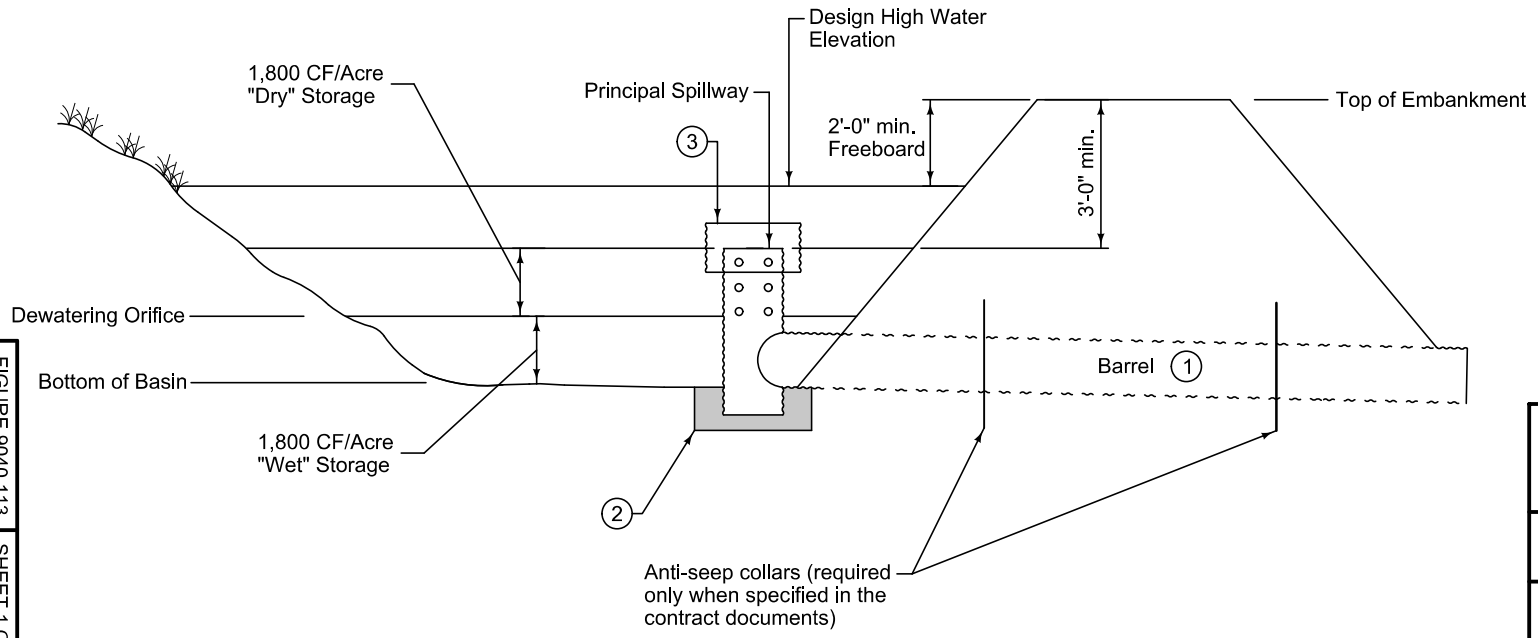

FIGURE 9040.113

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9040.113

SHEET 1 of 1

SUDAS Standard Specifications

SEDIMENT BASIN WITHOUT EMERGENCY SPILLWAY

(1) Barrel length and diameter as specified in the contract documents.

(2) Riser pipe and base/dewatering device: See Figure 9040.115.

(3) Anti-vortex device: See Figure 9040.116.

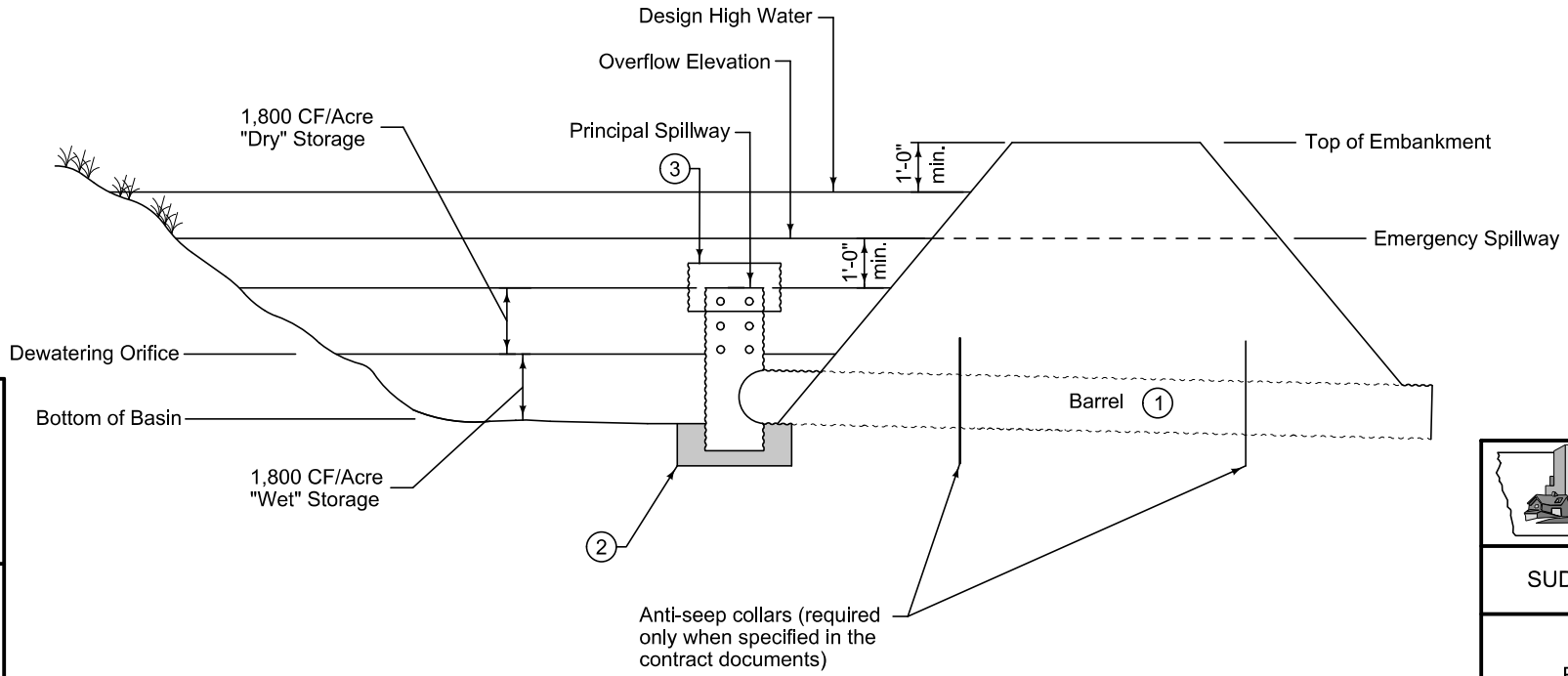

FIGURE 9040.114

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9040.114

SHEET 1 of 1

SUDAS Standard Specifications

SEDIMENT BASIN WITH EMERGENCY SPILLWAY

Elevations and dimensions not given are as specified in the contract documents.

(1) Drill four, 5/8 inch diameter holes, 3 inches from bottom of riser pipe and insert two, #4 bars in an "X" configuration.
Length of bars = D+16 inches

(2) Provide perforation configuration as specified in the contract documents.

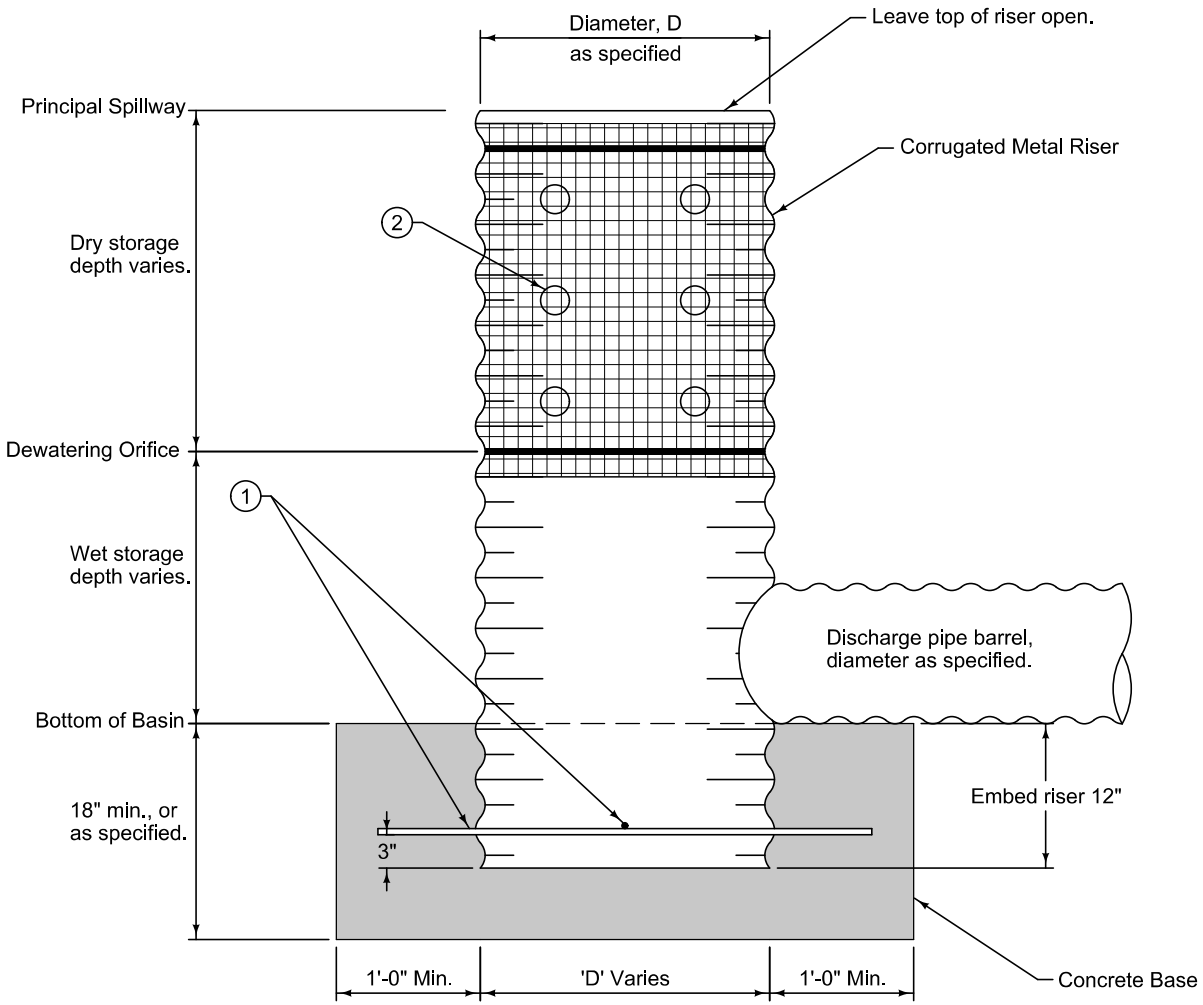

FIGURE 9040.115

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9040.115

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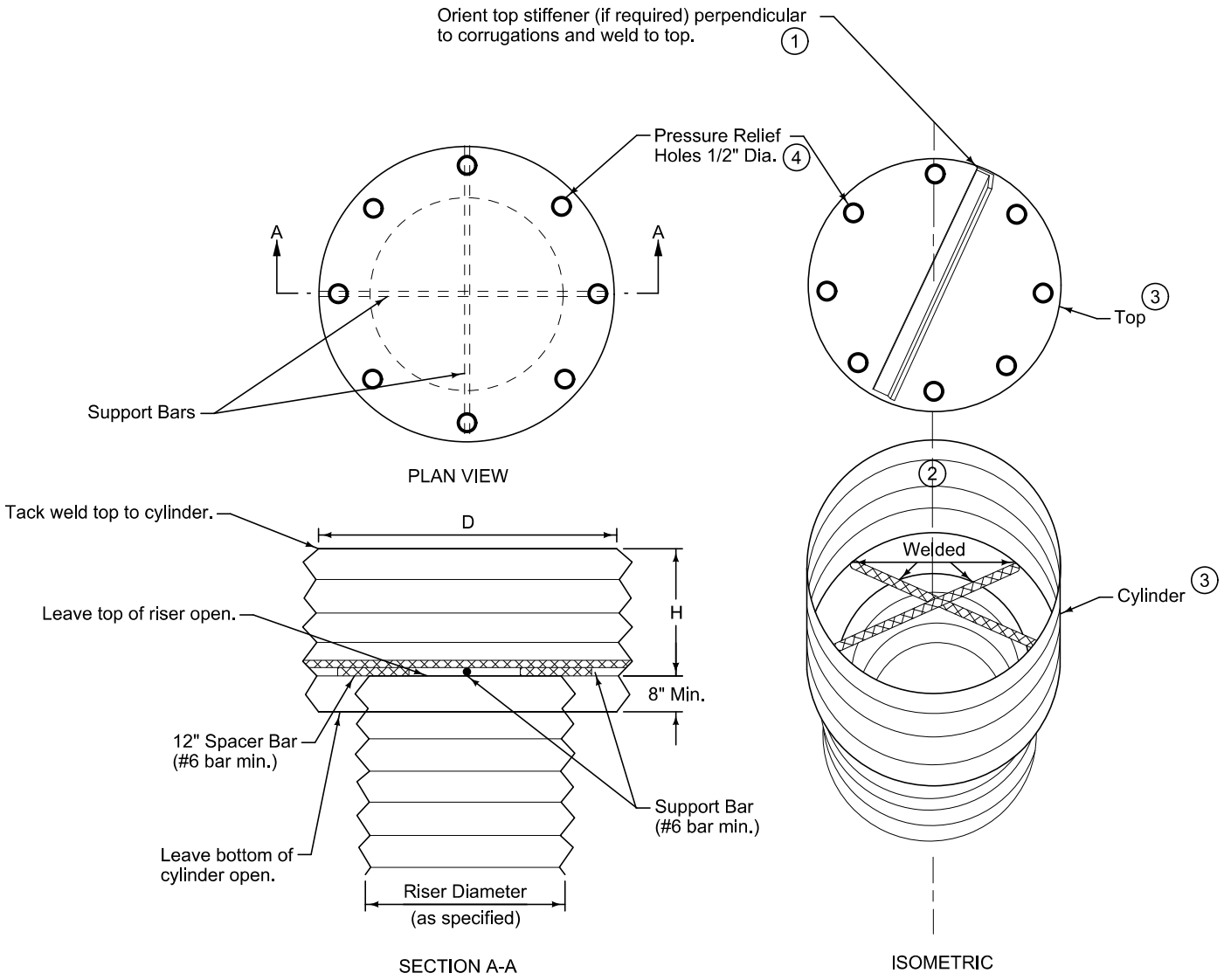
SUDAS Standard Specifications

SEDIMENT BASIN
DEWATERING DEVICE
(PERFORATED RISER)



Alternate anti-vortex device configurations may be utilized upon approval of the Engineer.

1. See sheet 2 for dimensions of cylinder support bars, top plate, and top stiffener.
2. Firmly attach the anti-vortex cylinder to the top of the riser by welding or other means.
3. Corrugated metal or 1/8 inch steel plate cylinder and top.
4. Pressure relief holes may be omitted if ends of corrugations are left fully open when the top is attached.

FIGURE 9040.116

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SUDAS Standard Specifications

ANTI-VORTEX DEVICE

RISER	CYLINDER				MINIMUM TOP	
Diameter (in.)	Diameter (in.)	Thickness (gage)	Height (H) (in.)	Minimum Size Support Bar	Thickness	Stiffener
12	18	16	6	#6 rebar or 1 1/2" X 3/16" angle	16 ga F & C	----
15	21	16	7	#6 rebar or 1 1/2" X 3/16" angle	16 ga F & C	----
18	27	16	8	#6 rebar or 1 1/2" X 3/16" angle	16 ga F & C	----
21	30	16	11	#6 rebar or 1 1/2" X 3/16" angle	16 ga (C), 14 ga (F)	----
24	36	16	13	#6 rebar or 1 1/2" X 3/16" angle	16 ga (C), 14 ga (F)	----
27	42	16	15	#6 rebar or 1 1/2" X 3/16" angle	16 ga (C), 14 ga (F)	----
36	54	16	17	#8 rebar	14 ga (C), 12 ga (F)	----
42	60	16	19	#8 rebar	14 ga (C), 12 ga (F)	----
48	72	16	21	1 1/4" pipe or 1 1/4" X 1 1/4" X 1/4" angle	14 ga (C), 10 ga (F)	----
54	78	16	25	1 1/4" pipe or 1 1/4" X 1 1/4" X 1/4" angle	14 ga (C), 10 ga (F)	----
60	90	14	29	1 1/2" pipe or 1 1/2" X 1 1/2" X 1/4" angle	12 ga (C), 8 ga (F)	----
66	96	14	33	2" pipe or 2" X 2" X 1/4" angle	12 ga (C), 8 ga (F)	2" X 2" X 1/4" angle
72	102	14	36	2" pipe or 2" X 2" X 1/4" angle	12 ga (C), 8 ga (F)	2 1/2" X 2 1/2" X 1/4" angle
78	114	14	39	2 1/2" pipe or 2" X 2" X 1/4" angle	12 ga (C), 8 ga (F)	2 1/2" X 2 1/2" X 1/4" angle
84	120	12	42	2 1/2" pipe or 2" X 2" X 1/4" angle	12 ga (C), 8 ga (F)	2 1/2" X 2 1/2" X 5/16" angle

Notes:

1. The criterion for sizing the cylinder is that the area between the inside of the cylinder and the outside of the riser is equal to or greater than the area inside the riser. Therefore, the above table is invalid for use with concrete pipe risers.

2. C - Corrugated F - Flat.

FIGURE 9040.116 | SHEET 2 OF 2

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SUDAS Standard Specifications

ANTI-VORTEX DEVICE

Sediment baffles improve sediment capture by increasing the length that flow must travel through a sediment basin or sediment trap.

1. Construct sediment baffle by installing rows of silt fence across the bottom of the sediment basin or sediment trap leaving an opening equal to 25% of the bottom width on alternating sides.

2. Install the number of baffles specified in the contract documents. Space baffles evenly between the inlet and outlet of the basin or trap.

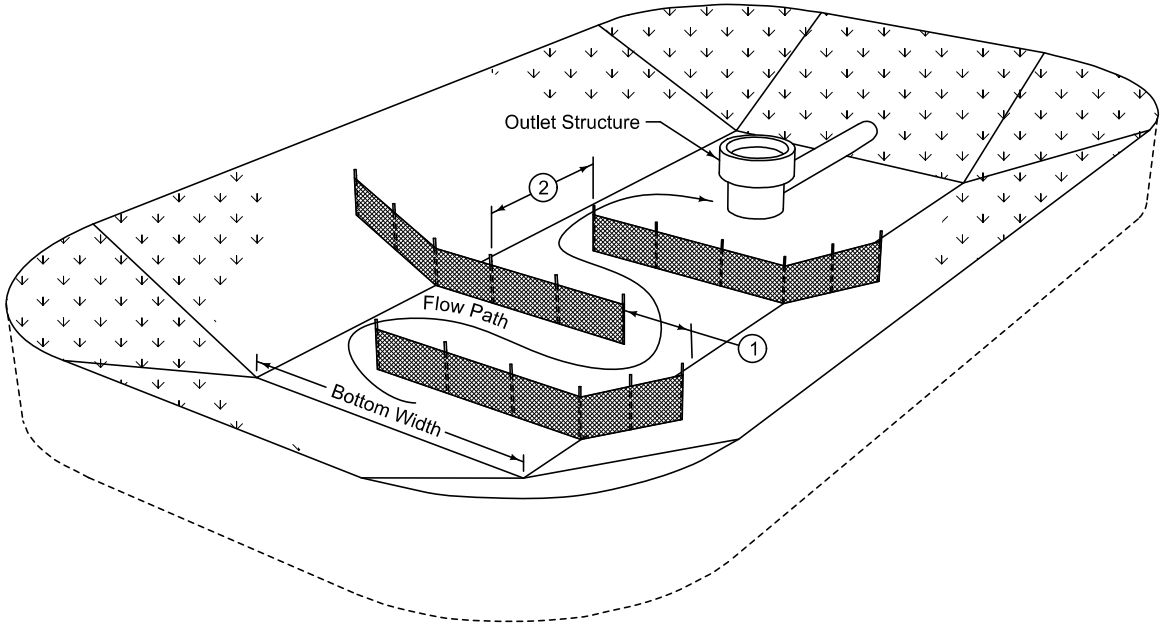

FIGURE 9040.117

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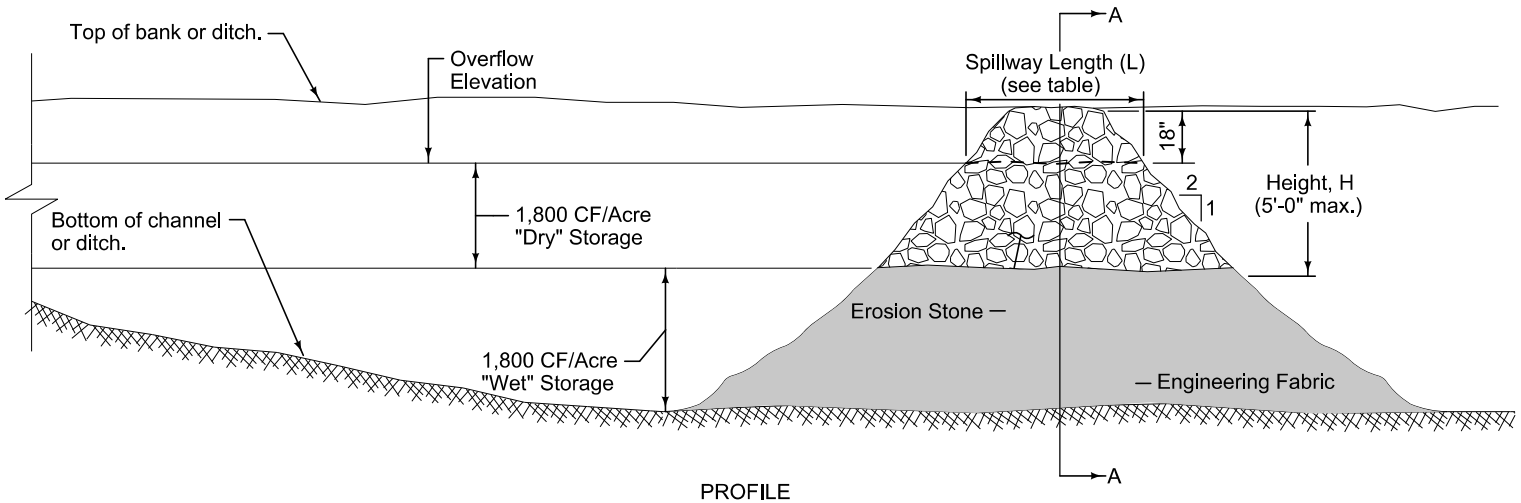
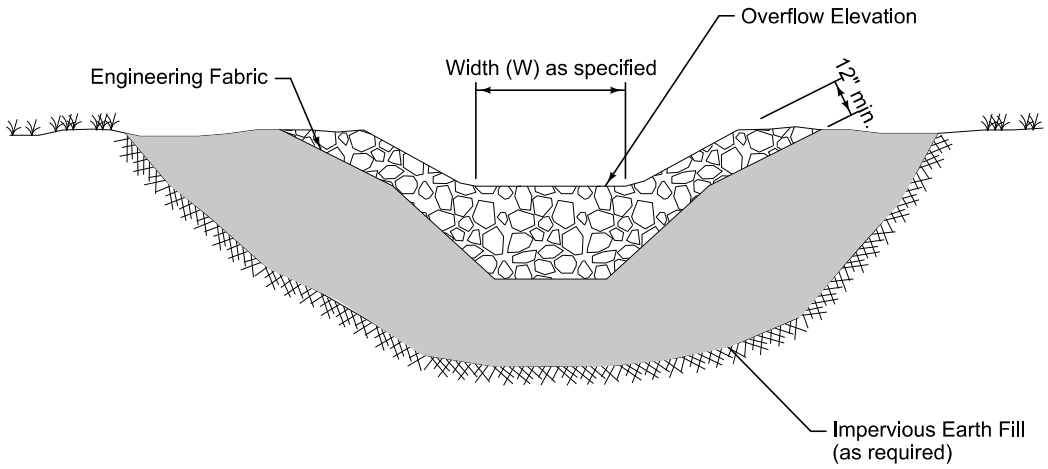
SUDAS Standard Specifications

SEDIMENT BAFFLE

Remove accumulated sediment when level reaches one-half the height of the wet storage.



PROFILE



SECTION A-A

Spillway Length

H (ft.)	L (ft.)
1.5	2.0
2.0	2.0
2.5	2.5
3.0	2.5
3.5	3.0
4.0	3.0
4.5	4.0
5.0	4.5

FIGURE 9040.118

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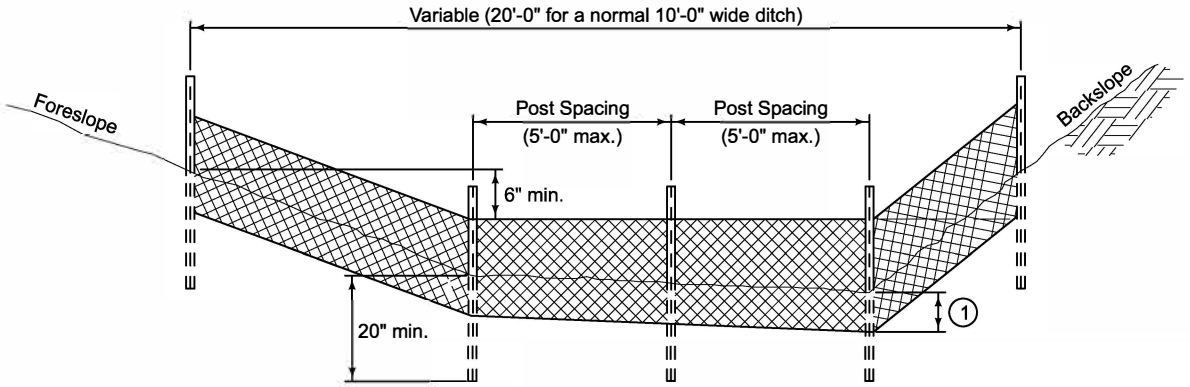
SUDAS Standard Specifications

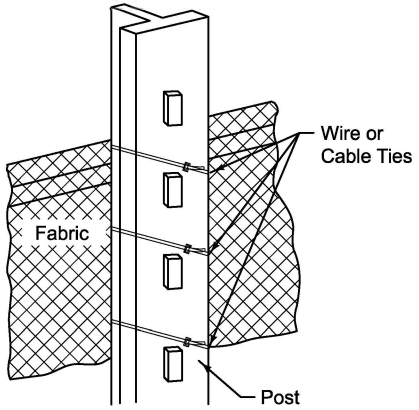
SEDIMENT TRAP



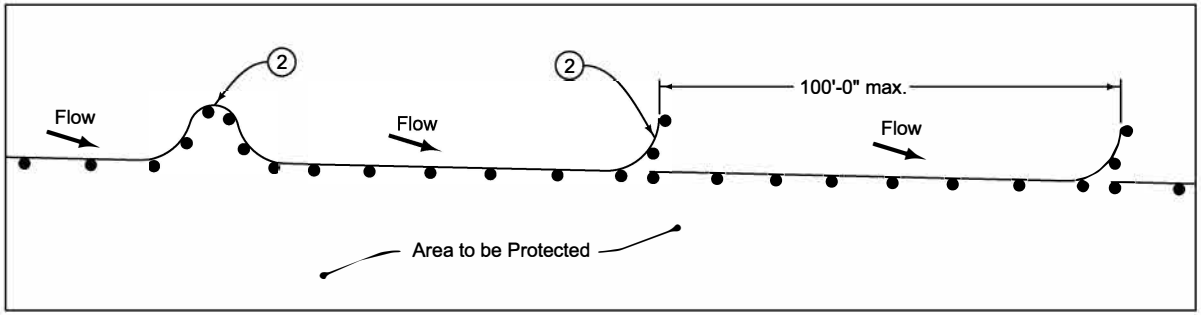
TYPICAL SILT FENCE DITCH CHECK

1. Insert 12 inches of fabric a minimum of 6 inches deep (fabric may be folded below the ground line).

2. Install silt fence for perimiter control with a maximum run length of 100 feet. At the downstream end of each run, turn the silt fence up the slope for 20 feet as shown to construct a 'J-Hook' to contain runoff. At the contractor's option, the silt fence may terminate and restart at the J-hook or may be installed continuously through the J-hook.



ATTACHMENT TO POST



TYPICAL SILT FENCE INSTALLATION FOR PERIMITER CONTROL

FIGURE 9040.119

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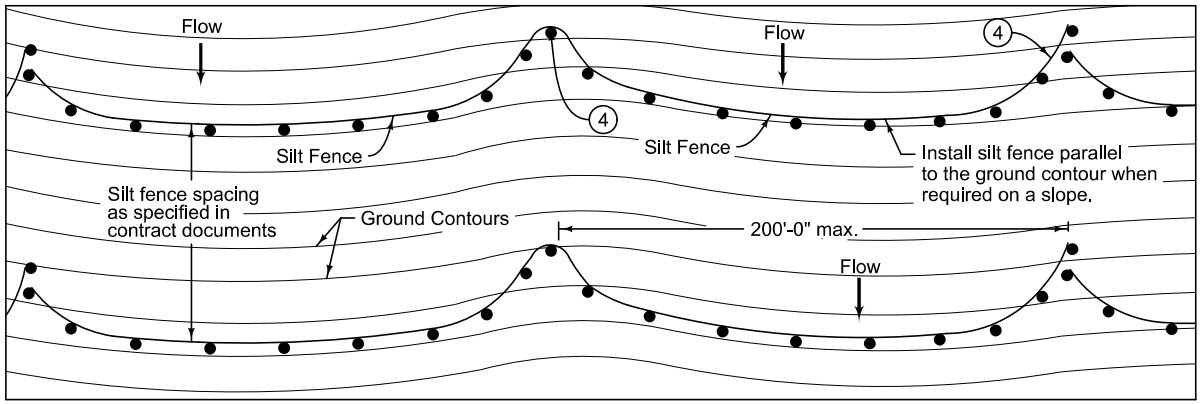
SUDAS Standard Specifications

SILT FENCE

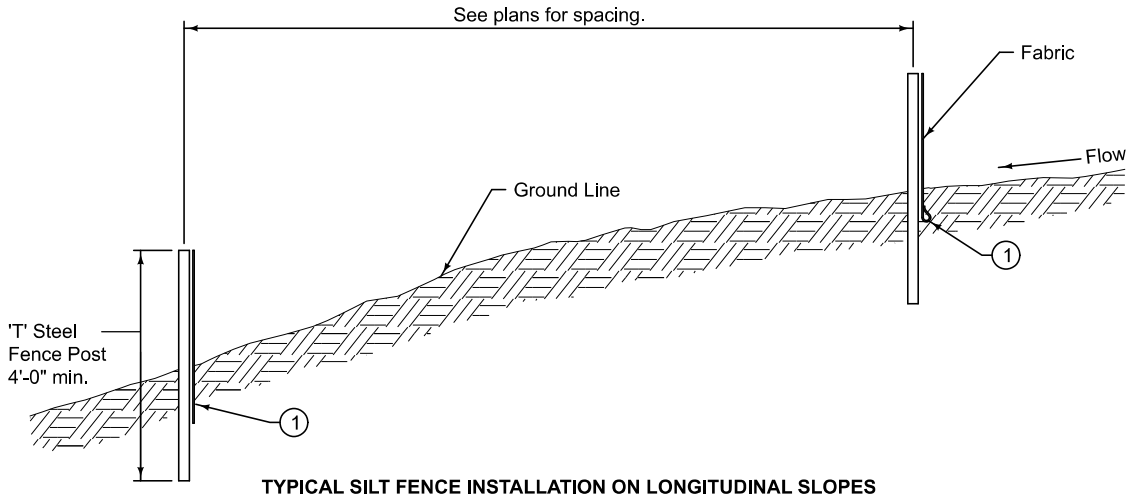


TYPICAL SILT FENCE INSTALLATION ON LONGITUDINAL SLOPES
(Plan View)

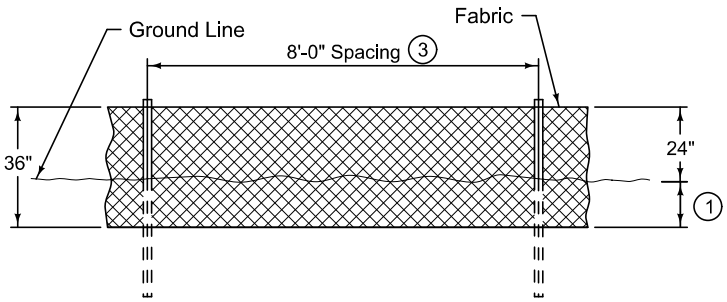
(1) Insert 12 inches of fabric a minimum of 6 inches deep (fabric may be folded below the ground line).

(3) Reduce post spacing to 5 feet at water concentration areas, or as required to adequately support fence.

(4) Place silt fence continuously along a constant elevation for a maximum run of 200 feet. At the end of each run, construct a 'J-Hook' to contain runoff by turning the silt fence up the slope for a length of 20 feet as shown. At the contractor's option, the silt fence may terminate and restart at the J-hook or may be installed continuously through the J-hook.



TYPICAL SILT FENCE INSTALLATION ON LONGITUDINAL SLOPES
(Profile View)



DETAILS OF SILT FENCE ON LONGITUDINAL SLOPES

FIGURE 9040.119 | SHEET 2 OF 2

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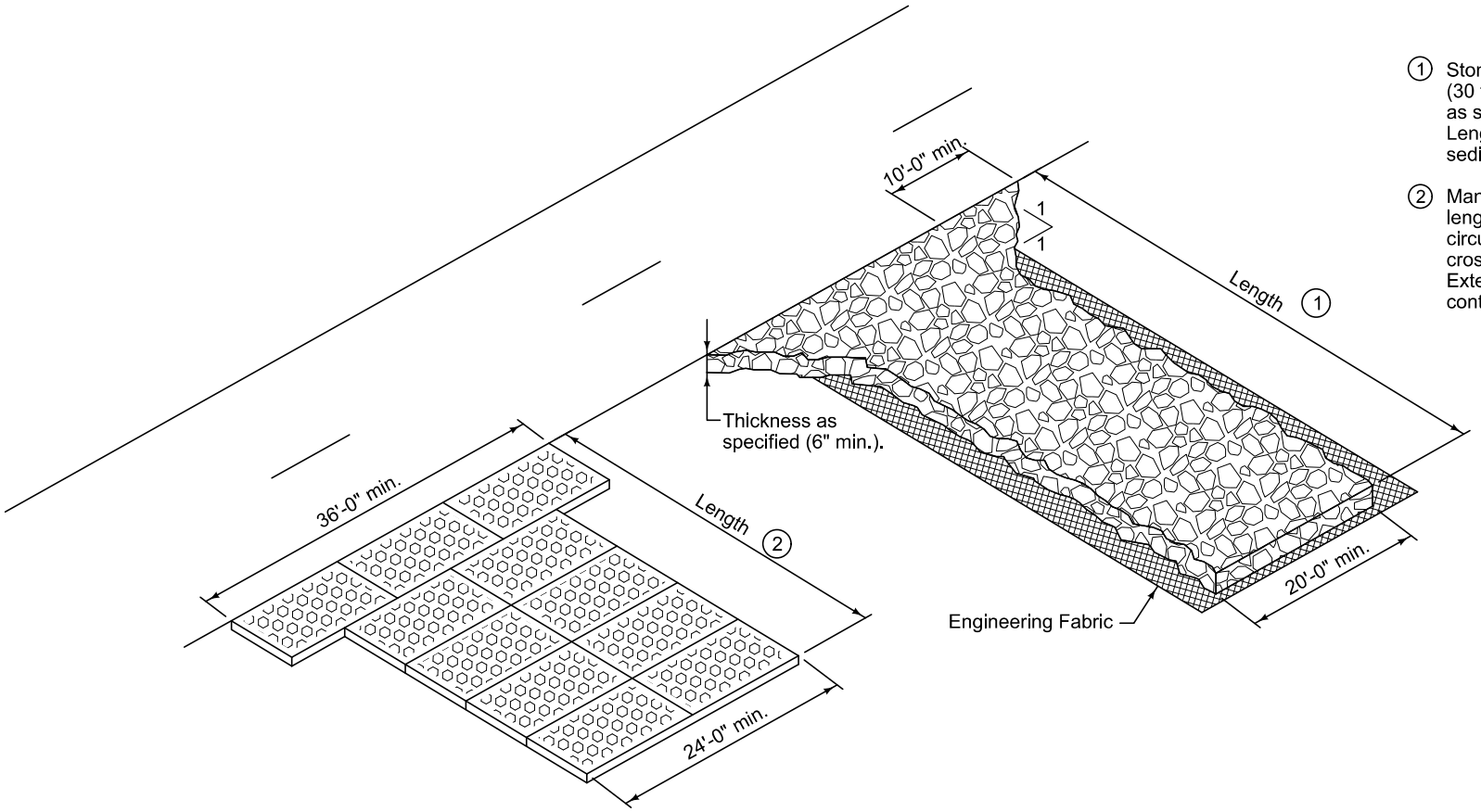
SILT FENCE



(1) Stone Exit: 50 foot minimum length (30 foot for single family residential), or as specified in the contract documents. Length of exit may be increased if sediment track-out occurs.

(2) Manufactured Track-Out Pad: Minimum length of 35 feet or 3 times the circumference of the largest tire that will cross its path (whichever is larger). Extend length if adequate track out control is not acheived.

FIGURE 9040.120 | SHEET 1 OF 1

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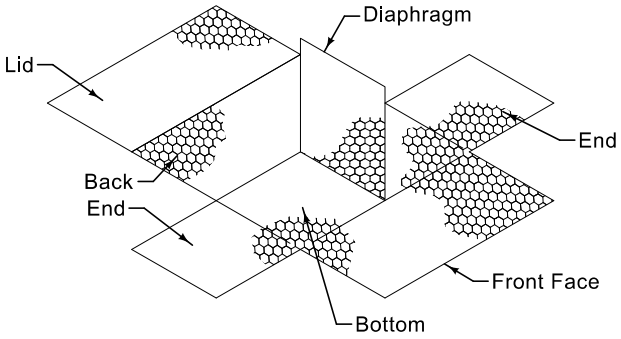
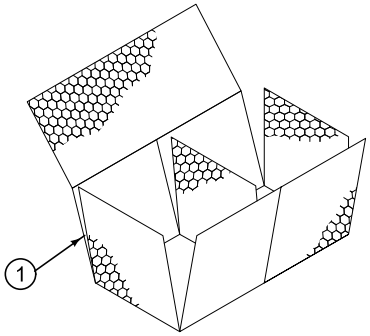
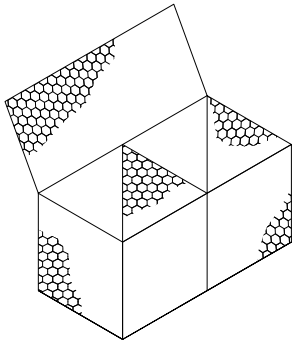
SUDAS Standard Specifications

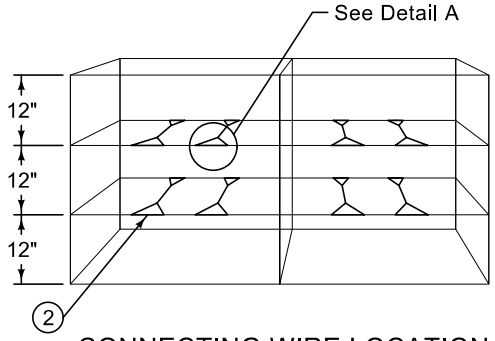
STABILIZED CONSTRUCTION EXIT



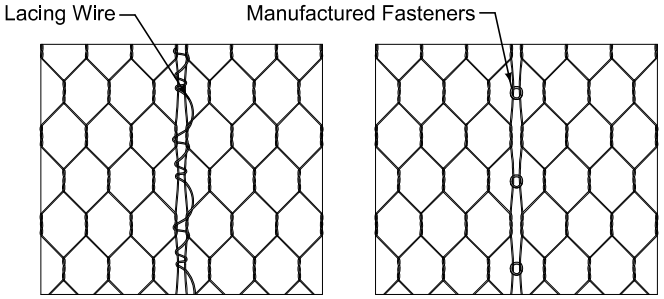




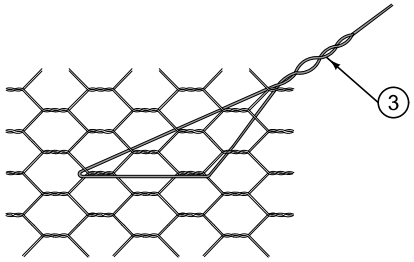
GABION ASSEMBLY



CONNECTING WIRE LOCATION



EDGE CONNECTIONS



DETAIL A

1. Connect edges of basket with lacing wire or fasteners.
2. Install connecting wires on exposed gabion faces.
3. Twist wire a minimum of four turns.

FIGURE 9050.101

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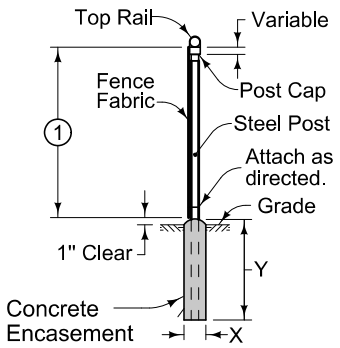
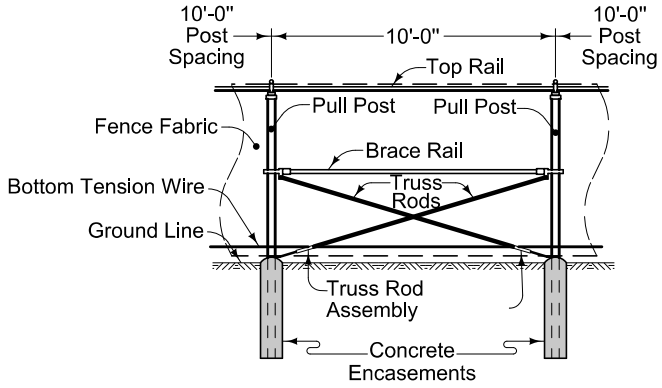
SUDAS Standard Specifications

GABION ASSEMBLY



POST INSTALLATION



PULL POST INSTALLATION

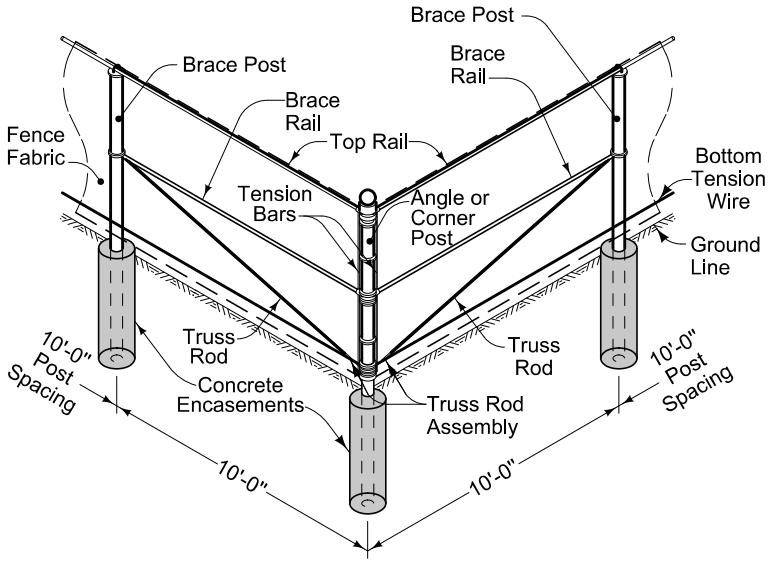
Place fence fabric on roadway side of post. For certain curves, stream crossings, or other locations, the Contractor has the option to place fabric on the side of the post away from the roadway.

Residential chain link fence does not include braces, truss rod assembly, tension wire, tension bar, tension band, or grounds

(1) Fabric width as specified in the contract documents.

(2) For fence heights greater than 8 feet, the depth of the fence post footing is 3 feet plus 3 inches for each 1 foot in height over 8 feet.

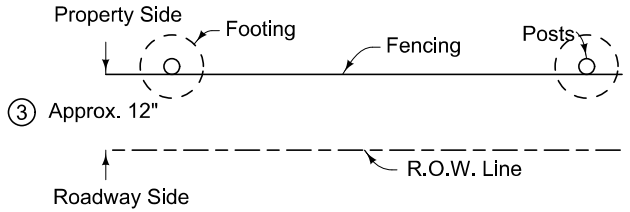
(3) Install the fence on the roadway side of the right-of-way when specified in the contract documents.



ANGLE OR CORNER POST INSTALLATION

FENCE POST FOOTING DEPTH AND DIAMETER

USE IN FENCE	FENCE HEIGHT					
	4'-0" and less		Over 4'-0" to 8'-0"		Over 8'-0"	
	X	Y	X	Y	X	Y
Line and Brace Posts	0'-8"	3'-0"	0'-10"	3'-0"	1'-0"	(2)
Terminal Post*	0'-10"	3'-0"	1'-0"	3'-0"	1'-4"	(2)
*Includes corner, angle, end, and pull posts.						



PLAN OF FENCE

SUDAS

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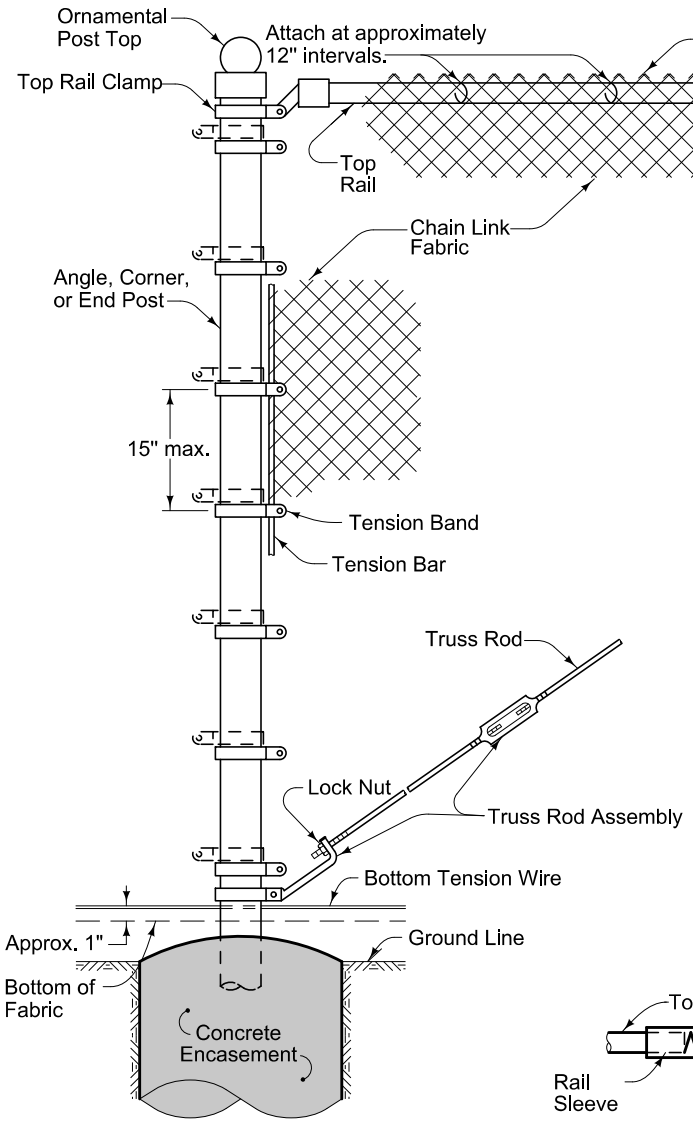
SHEET 1 of 2

SUDAS Standard Specifications

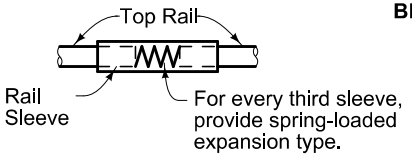
CHAIN LINK FENCE

FIGURE 9060.101

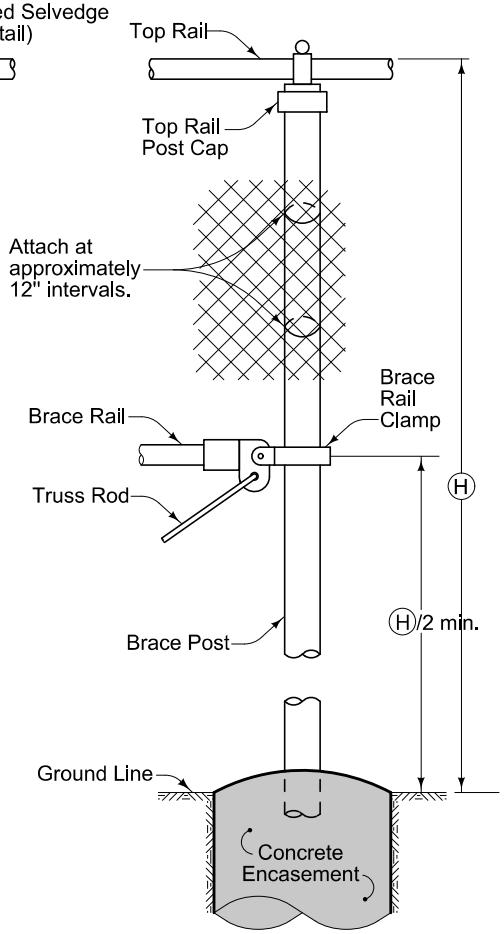
SHEET 1 OF 2



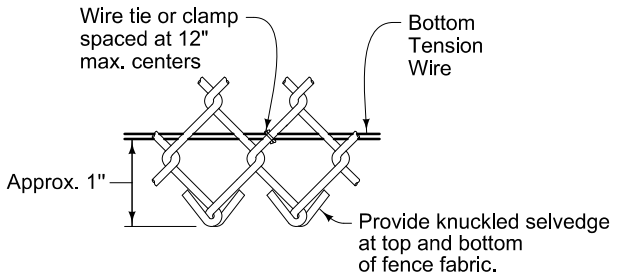
ANGLE, CORNER, OR END POST ASSEMBLY



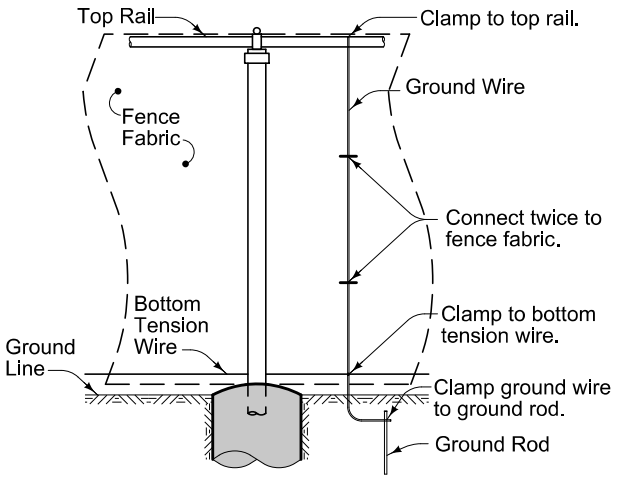
RAIL SLEEVE



BRACE POST ASSEMBLY



BOTTOM TENSION WIRE AND KNUCKLED SELVEDGE



GROUND ROD INSTALLATION

FIGURE 9060.101

SHEET 2 OF 2

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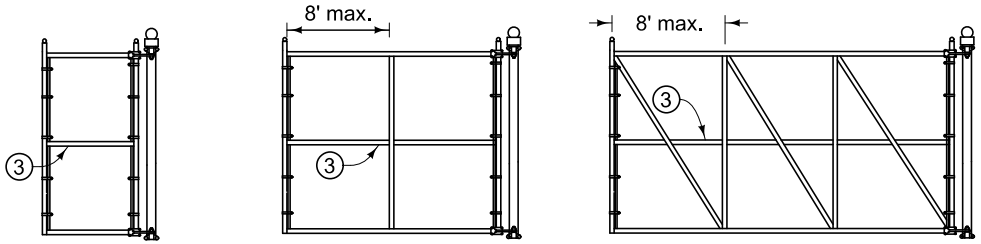
SUDAS Standard Specifications

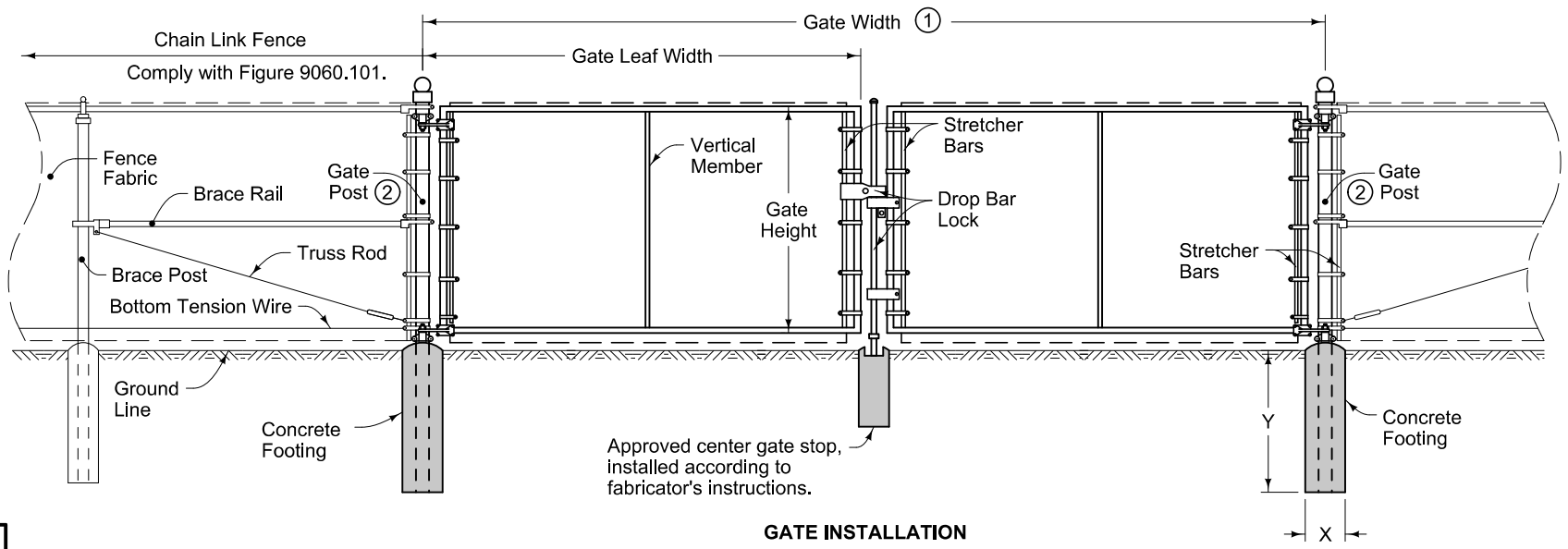
CHAIN LINK FENCE



8' AND LESS | OVER 8' UP TO 16' | OVER 16' UP TO 18'

FRAME PATTERNS FOR VARIOUS GATE OPENINGS

1. Double swing gate is required only for widths greater than 16 feet. Exact details of gate design are subject to approval of the Engineer. Furnish gate with approved stop, latch, and means for locking. Install as recommended by the manufacturer.
2. End post used to terminate run of fence if no gate is proposed.
3. Horizontal members are required only if the fabric height is 8 feet or greater.



GATE INSTALLATION

GATE POST FOOTING DEPTH AND DIAMETER

GATE HEIGHT	GATE LEAF WIDTH	X	Y
6'-0" or less	4'-0" or less	0'-10"	3'-0"
6'-0" or less	over 4'-0" to 10'-0"	0'-12"	3'-0"
6'-0" or less	over 10'-0" to 18'-0"	1'-2"	3'-0"
over 6'-0"	6'-0" or less	0'-10"	3'-0"
over 6'-0"	over 6'-0" to 12'-0"	1'-0"	3'-0"
over 6'-0"	over 12'-0" to 18'-0"	1'-4"	3'-6"
over 6'-0"	over 18'-0" to 24'-0"	1'-6"	4'-0"

FIGURE 9060.102 | SHEET 1 OF 1

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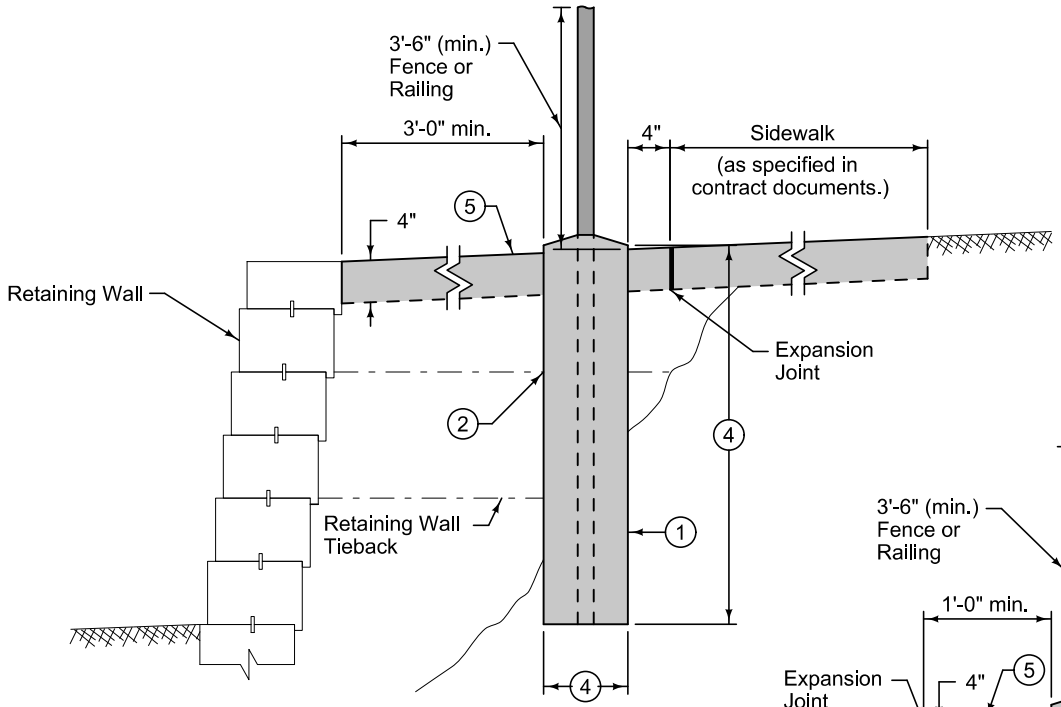
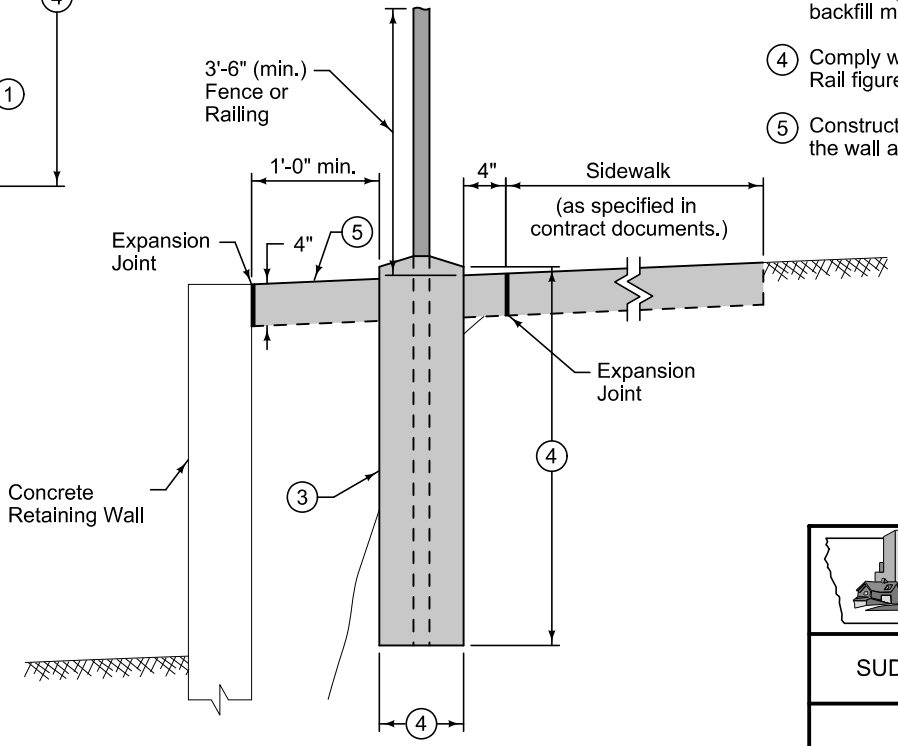
SUDAS Standard Specifications

CHAIN LINK GATE



RETAINING WALL



CONCRETE RETAINING WALL

1. For modular block retaining walls, install column tube or PVC pipe as backfill material is placed. When fence is installed after backfill material is placed, utilize hand excavation of post hole footings to avoid damaging engineering fabric tiebacks.

   For landscape timber walls, locate fence posts to avoid timber tiebacks.

2. Cut or displace engineering fabric tiebacks (if present) around column tube or PVC pipe.

3. Column tubes or PVC pipes may installed behind PCC retaining walls during placement of backfill material or post holes may be excavated upon completion of backfill material placement.

4. Comply with Chain Link Fence or Safety Rail figures for post footing dimensions.

5. Construct a PCC cap between the back of the wall and the fence or rail.

FIGURE 9060.103 | SHEET 1 OF 1

SUDAS

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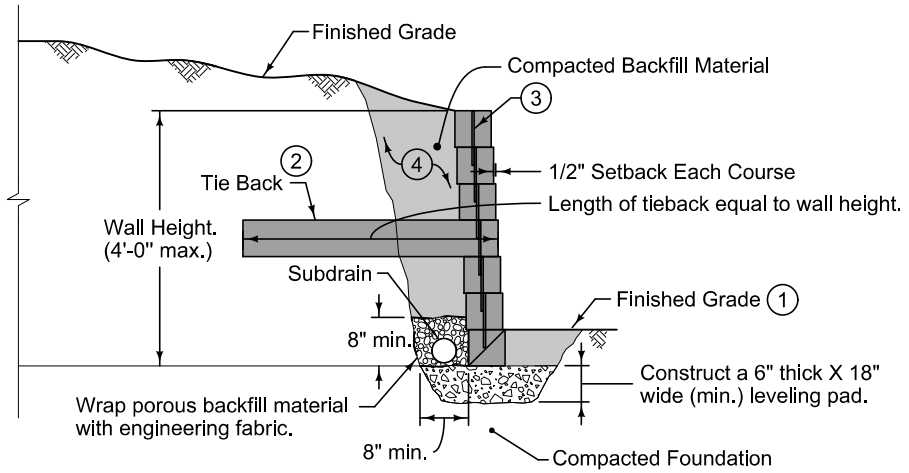
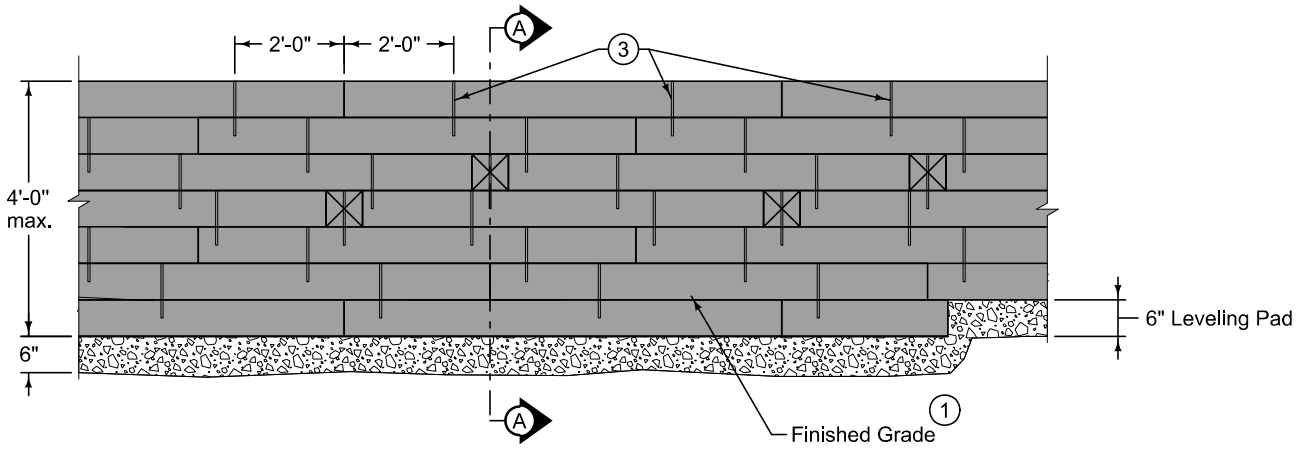
SHEET 1 of 1

SUDAS Standard Specifications

POST INSTALLATION
ADJACENT TO RETAINING WALLS



SECTION A-A



ELEVATION

1. Construct entire first course of timbers beneath finished grade.
2. No tie backs in upper two courses or lower three courses of timbers. Stagger tie back location.
3. Secure each course with spikes.
4. Excavate and place backfill material. Use suitable soil or granular material.

FIGURE 9070.101 | SHEET 1 OF 1

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New	10-18-11

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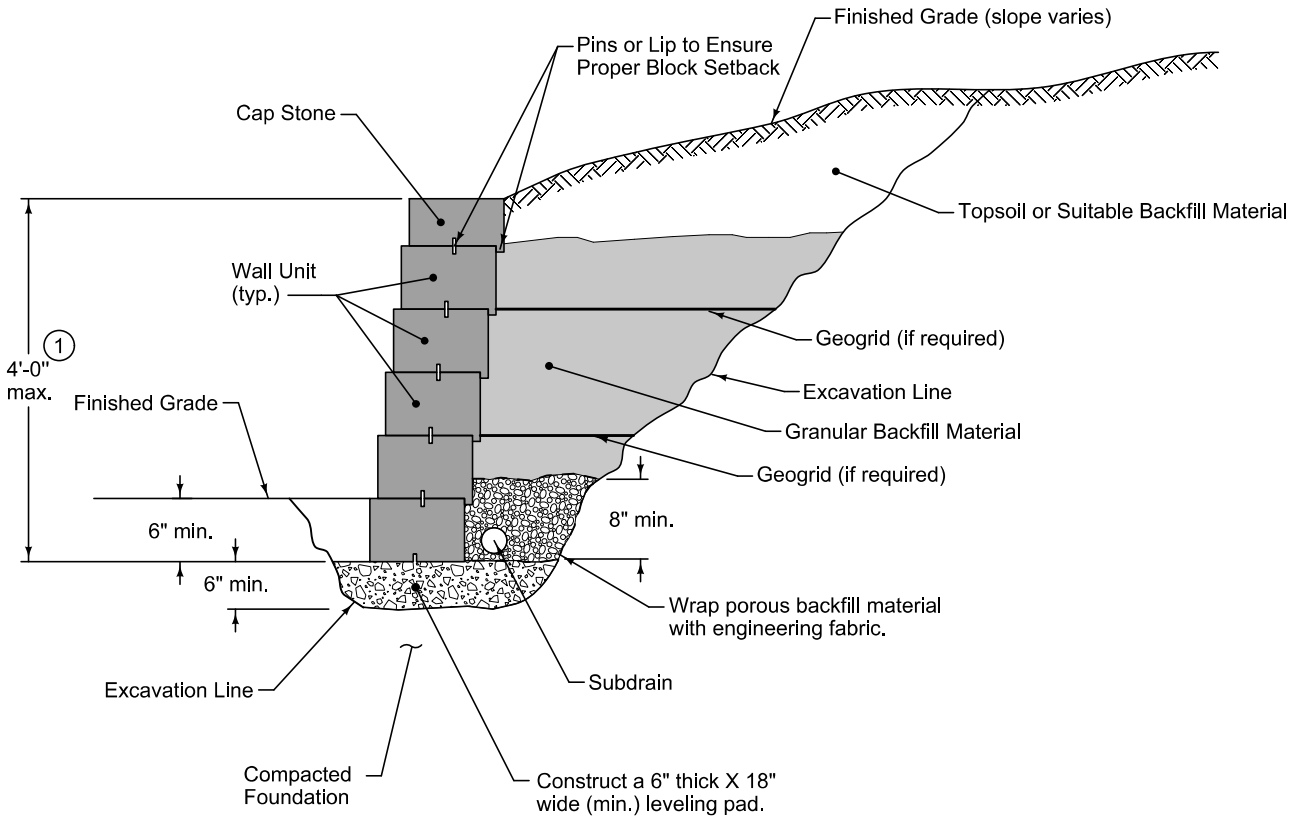
SHEET 1 of 1

SUDAS Standard Specifications

LANDSCAPE TIMBER RETAINING WALL

Exact dimensions, wall batter, backfill limits, reinforcement, and leveling pad materials and dimensions will be specified by the wall manufacturer.

(1) For walls higher than 4 feet, use segmental block retaining wall.



TYPICAL SECTION

FIGURE 9070.102

SHEET 1 OF 1

SUDAS

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New 10-18-11

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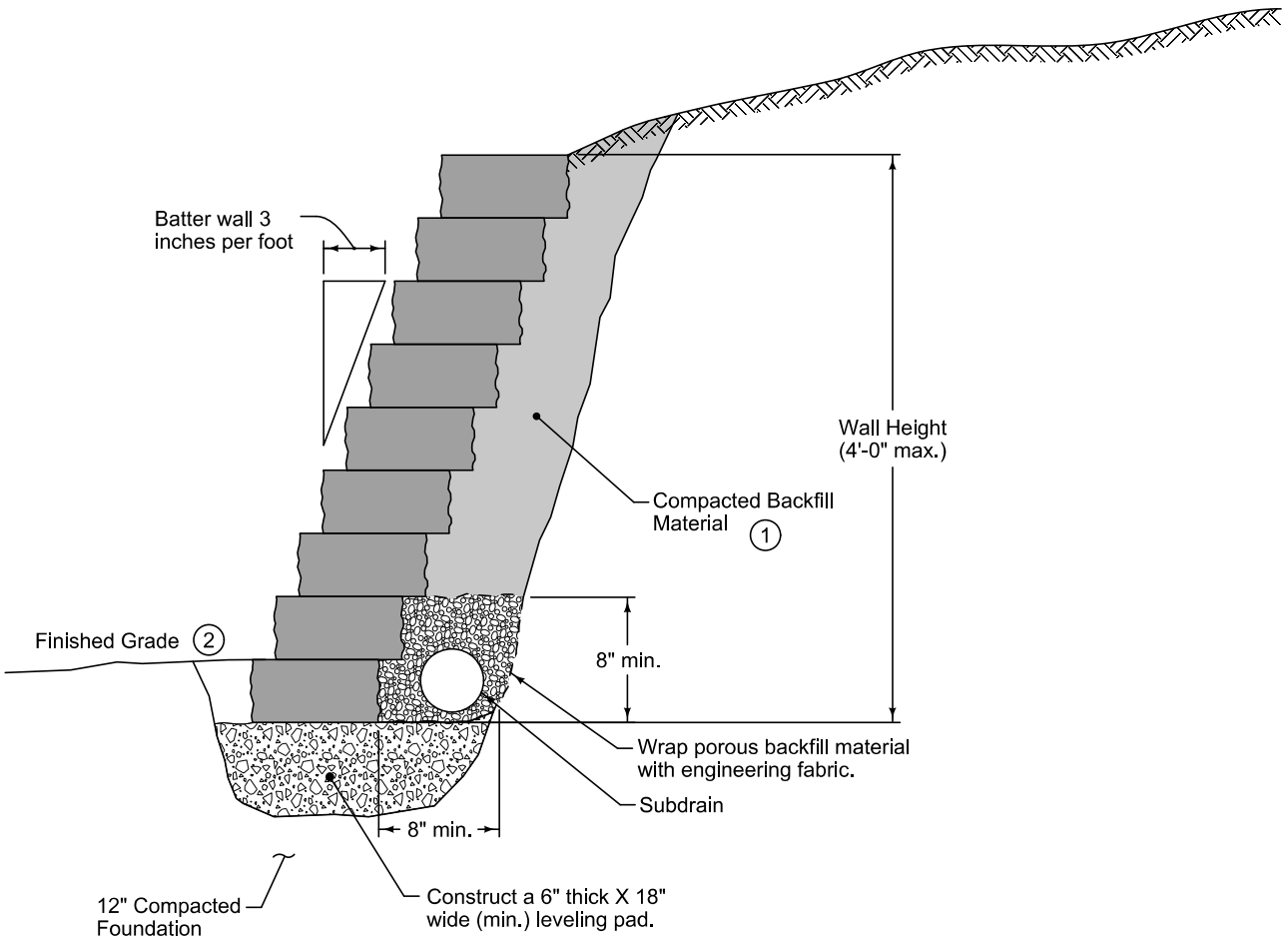
SHEET 1 of 1

SUDAS Standard Specifications

MODULAR BLOCK RETAINING WALL

(1) Compact backfill material as wall construction progresses.

(2) Construct entire first course of limestone below finished grade.



TYPICAL SECTION

FIGURE 9070.103

SHEET 1 OF 1

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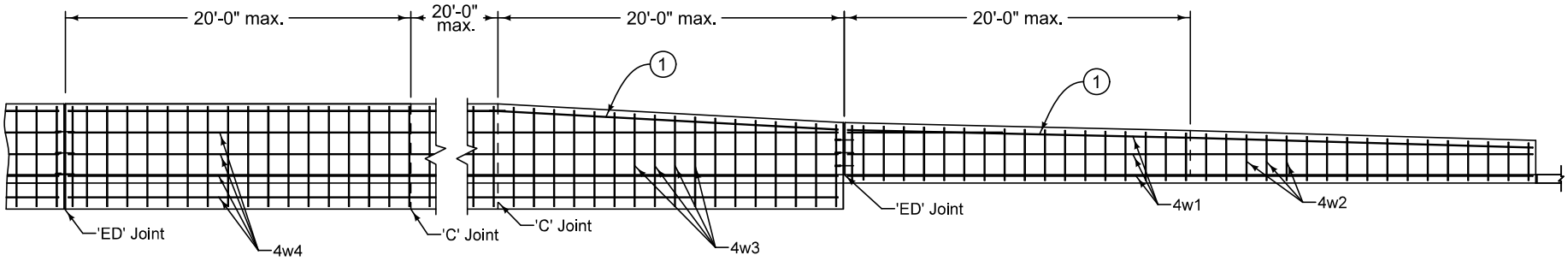
SHEET 1 of 1

SUDAS Standard Specifications

LIMESTONE RETAINING WALL

Provide a minimum concrete cover to near reinforcement of 1 1/2 inches. Provide 3 inches minimum cover at the ends of bars.

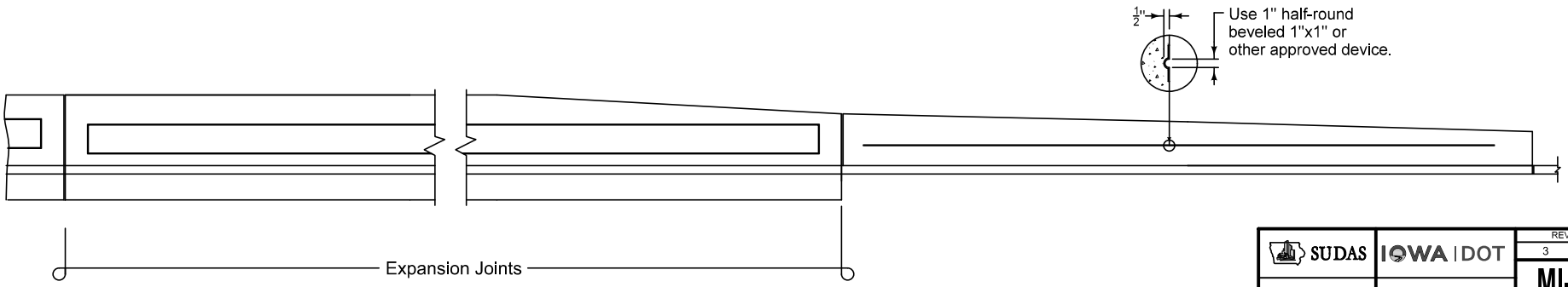
(1) Top bar parallel to top of wall. Lap 6 inch minimum as necessary. Tie securely.



TYPE B WALL

TYPE A WALL

TYPICAL LONGITUDINAL SECTION OF RETAINING WALL



TYPICAL RUSTICATION DETAIL

FIGURE 9072.221 | SHEET 1 OF 2

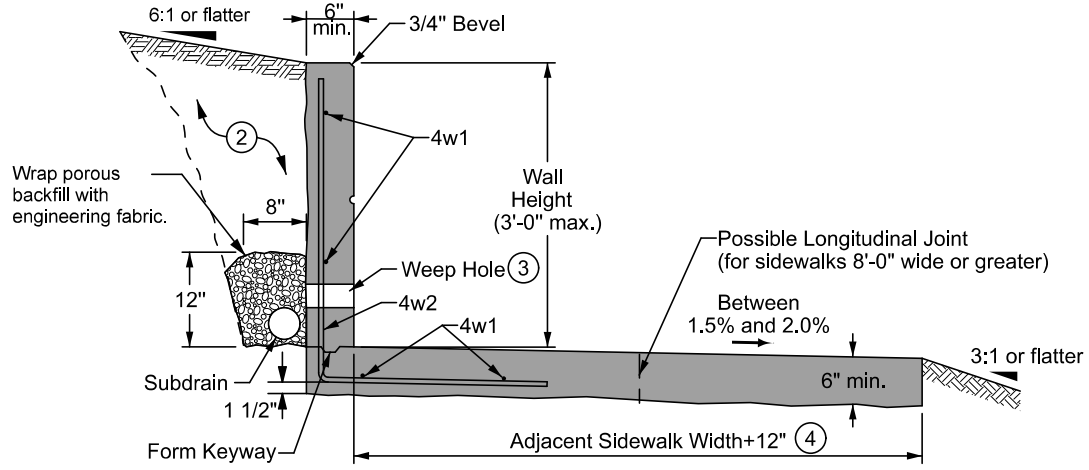
SUDAS	IOWA | DOT	REVISION 3 04-15-25
FIGURE 9072.221	STANDARD ROAD PLAN	MI-221
		SHEET 1 of 2

REVISIONS: Added 1.5 inch clearance dimension on type "A" wall, "L" bar.

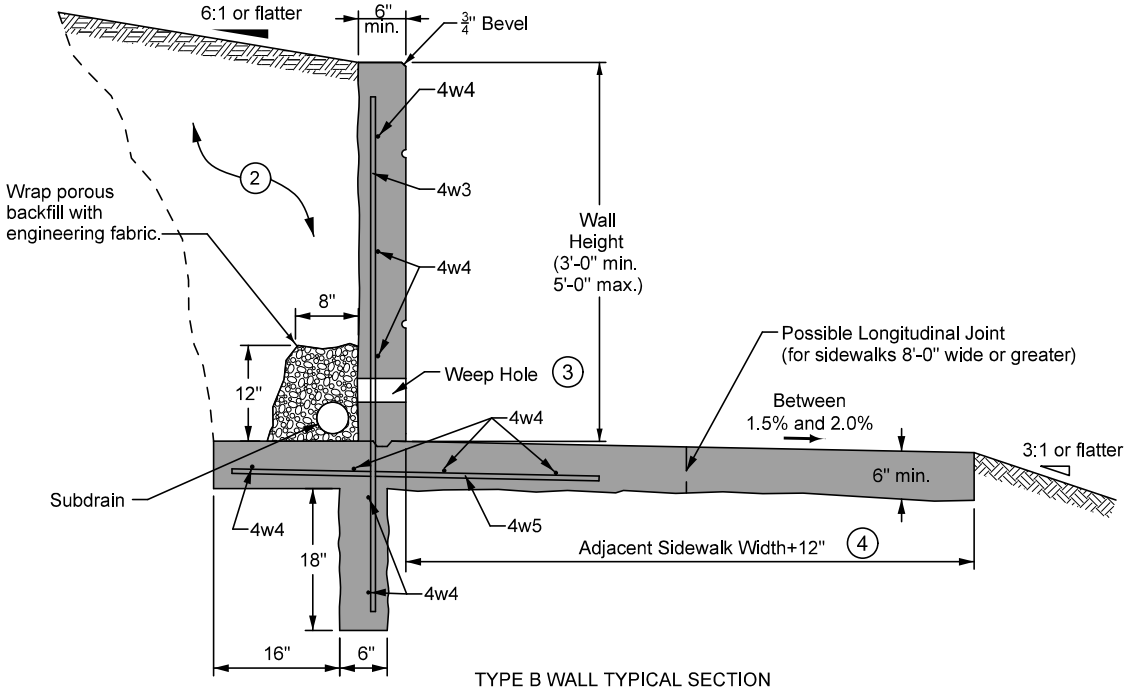
SUDAS DIRECTOR

DESIGN METHODS ENGINEER

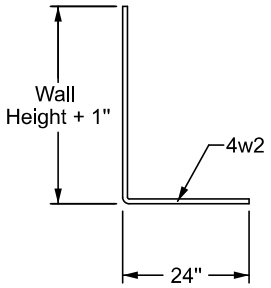
COMBINED RETAINING WALL - SIDEWALK



TYPE A WALL TYPICAL SECTION



TYPE B WALL TYPICAL SECTION



BENT BARS

Provide a minimum concrete cover to near reinforcement of 1 1/2 inches. Provide 3 inches minimum cover at the ends of bars.

(2) Excavate and place backfill material as necessary.

(3) Provide 3 inch diameter weep holes at 8 foot intervals. Install rodent guards in weep holes. Align bottom of weep hole with top of subdrain.

(4) Additional 12 inch width is adjacent to wall.

REINFORCING BAR LIST					
Wall Type	Mark	Size	Shape	Length	Spacing
Type A	4w1	4	———	Variable	15"
	4w2	4	L	Variable	14"
Type B	4w3	4	—	Wall Height + 18"	14"
	4w4	4	—	Variable	15"
	4w5	4	—	3'-10"	14"

SUDAS | IOWA DOT

REVISION 3 04-15-25

FIGURE 9072.221 | STANDARD ROAD PLAN

MI-221

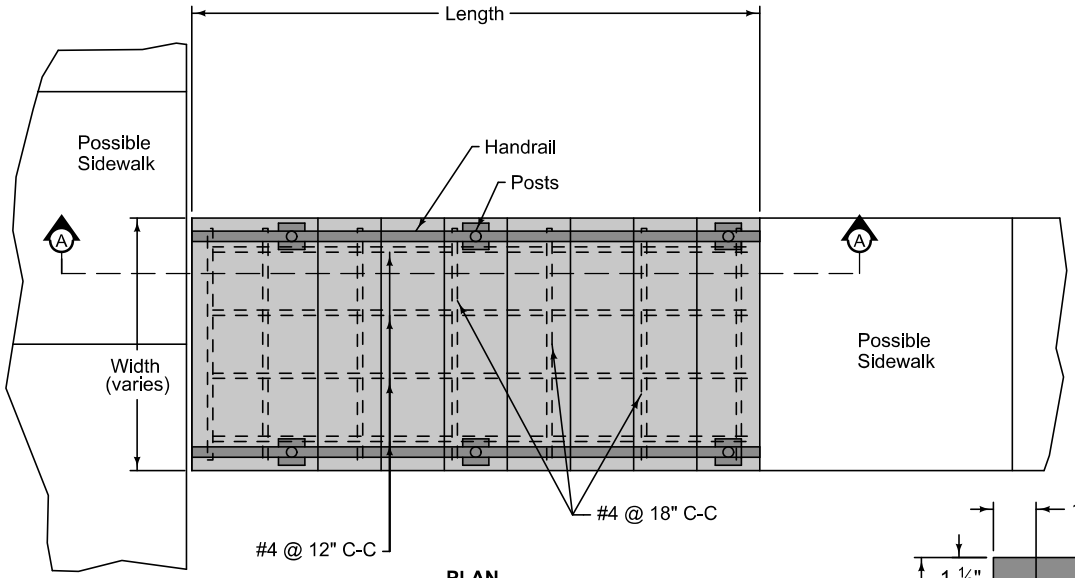
SHEET 1 of 2

REVISIONS: Added 1.5 inch clearance dimension on type "A" wall, "L" bar.

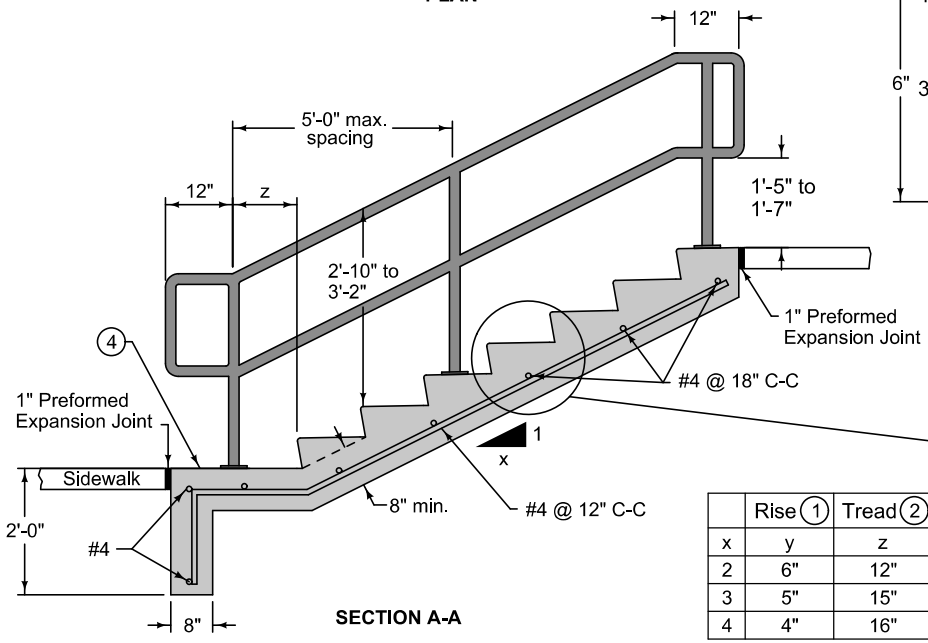
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

COMBINED RETAINING WALL - SIDEWALK

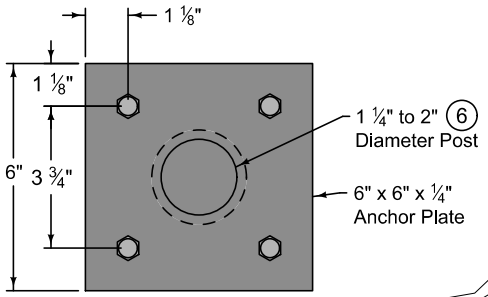
FIGURE 9072.221 | SHEET 2 OF 2



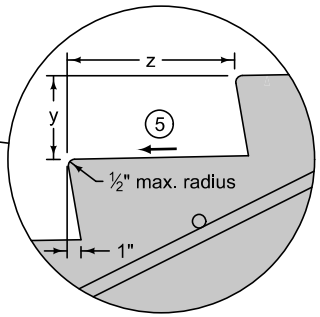
PLAN



SECTION A-A



ANCHOR PLATE DETAIL



	Rise (1)	Tread (2)
x	y	z
2	6"	12"
3	5"	15"
4	4"	16"

Provide a minimum of 2 inches of cover for all reinforcing.

Ensure all risers are an equal height and all treads are an equal depth within a flight of stairs.

(1) Minimum riser height is 4 inches. Maximum riser height is 7 inches.

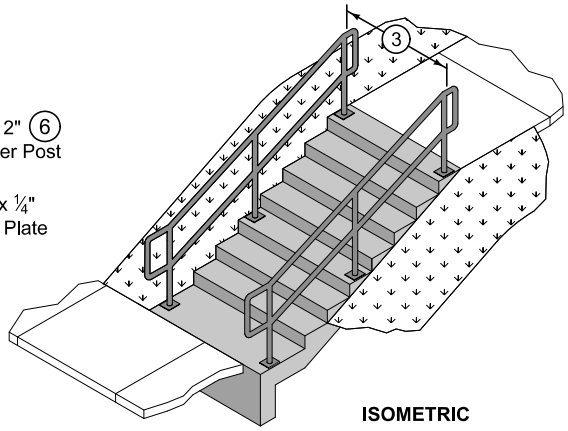
(2) Minimum tread depth is 11 inches.

(3) Match existing sidewalk width.

(4) Construct cross slope of landing to match adjacent sidewalk.

(5) Slope tread 1% minimum to 2% maximum in any direction.

(6) Weld post to anchor plate with 1/4 inch weld. Grind weld to provide smooth surface, free of burrs.



ISOMETRIC

FIGURE 9080.101

SHEET 1 OF 1

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2	10-16-18

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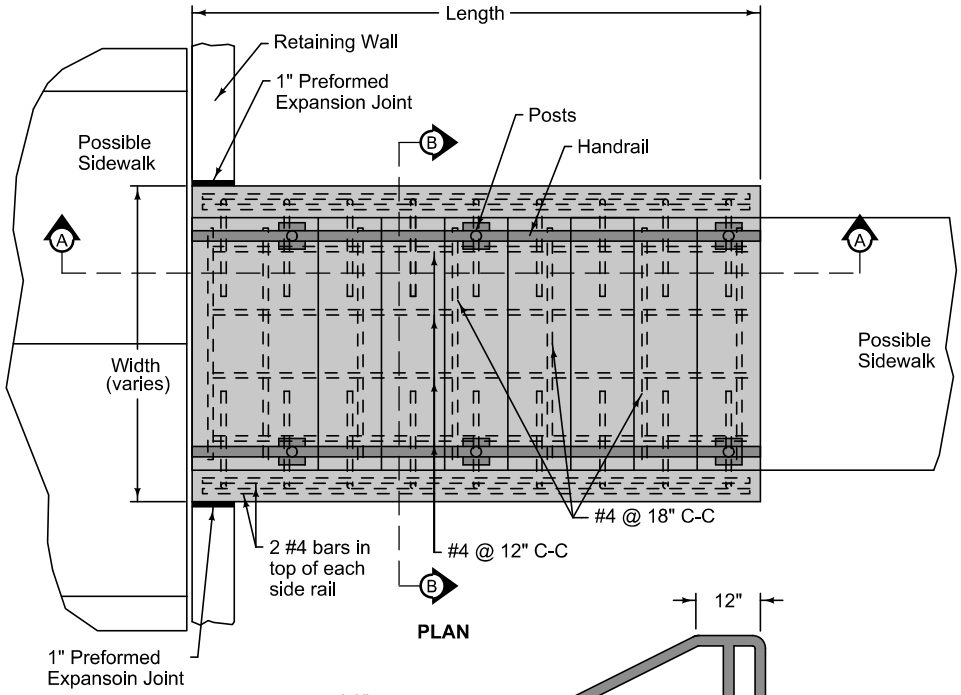
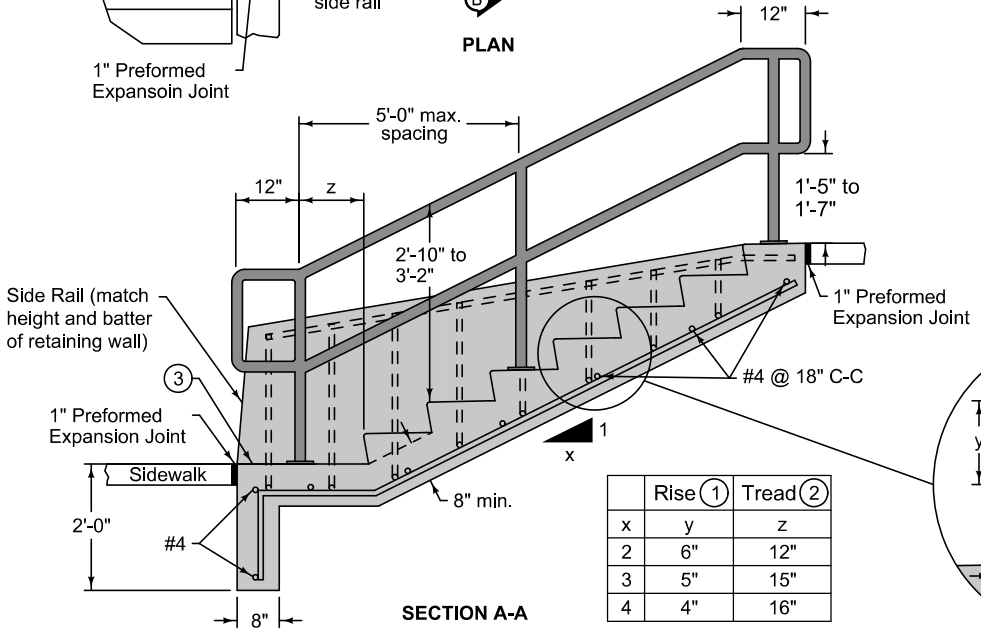
SHEET 1 of 1

SUDAS Standard Specifications

TYPE A CONCRETE STEPS WITH HANDRAIL

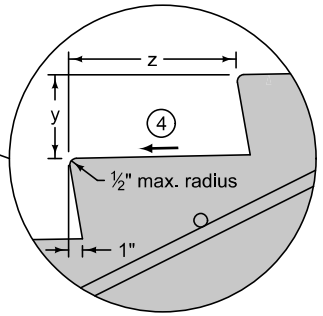


PLAN



SECTION A-A

	Rise (1)	Tread (2)
x	y	z
2	6"	12"
3	5"	15"
4	4"	16"



Provide a minimum of 2 inches of cover for all reinforcing.

Ensure all risers are an equal height and all treads are an equal depth within a flight of stairs.

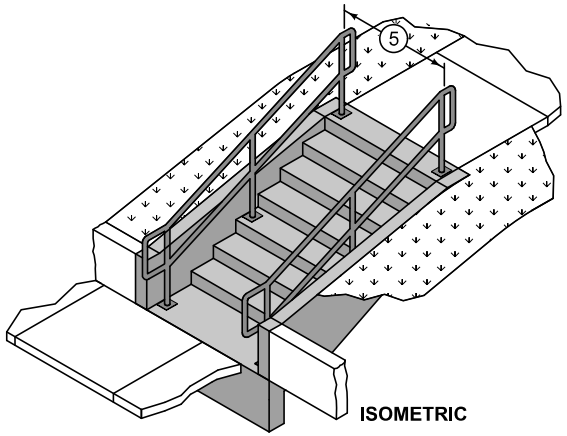
(1) Minimum riser height is 4 inches. Maximum riser height is 7 inches.

(2) Minimum tread depth is 11 inches.

(3) Construct cross slope of landing to match adjacent sidewalk.

(4) Slope tread 1% minimum to 2% maximum in any direction.

(5) Match existing sidewalk width.



ISOMETRIC

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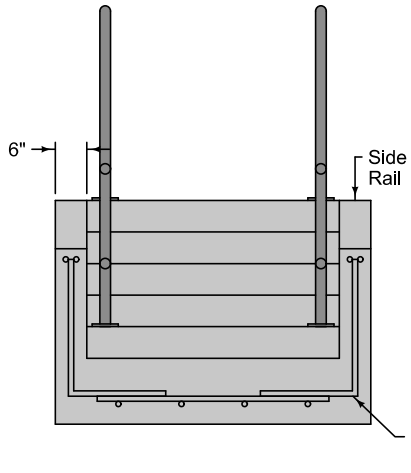
SHEET 1 of 2

SUDAS Standard Specifications

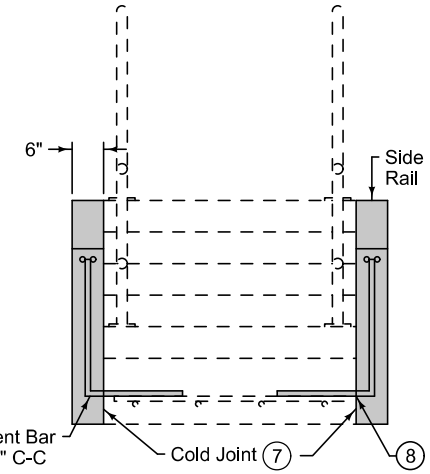
TYPE B CONCRETE STEPS WITH HANDRAIL

FIGURE 9080.102

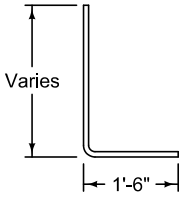
SHEET 1 OF 2



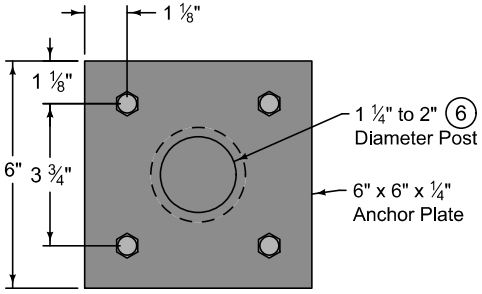
SECTION B-B
(Side Rails and Stairs Formed and Constructed Monolithically)



ALTERNATE SECTION B-B
(Side Rails and Stairs Formed and Constructed Separately)



BENT BAR



ANCHOR PLATE DETAIL

Provide a minimum of 2 inches of cover for all reinforcing.

Ensure all risers are an equal height and all treads are an equal depth within a flight of stairs.

(6) Weld post to anchor plate with 1/4 inch weld. Grind weld to provide smooth surface, free of burrs.

(7) Upon approval of Engineer, side rails may be formed and constructed separately from the stairs. Seal the cold joint between the side rail and stairs according to Section 7010.

(8) If side rails and stairs are constructed separately, dowel bar substitutes may be used for the bent bars connections between the side rails and the stairs.

FIGURE 9080.102 | SHEET 2 OF 2

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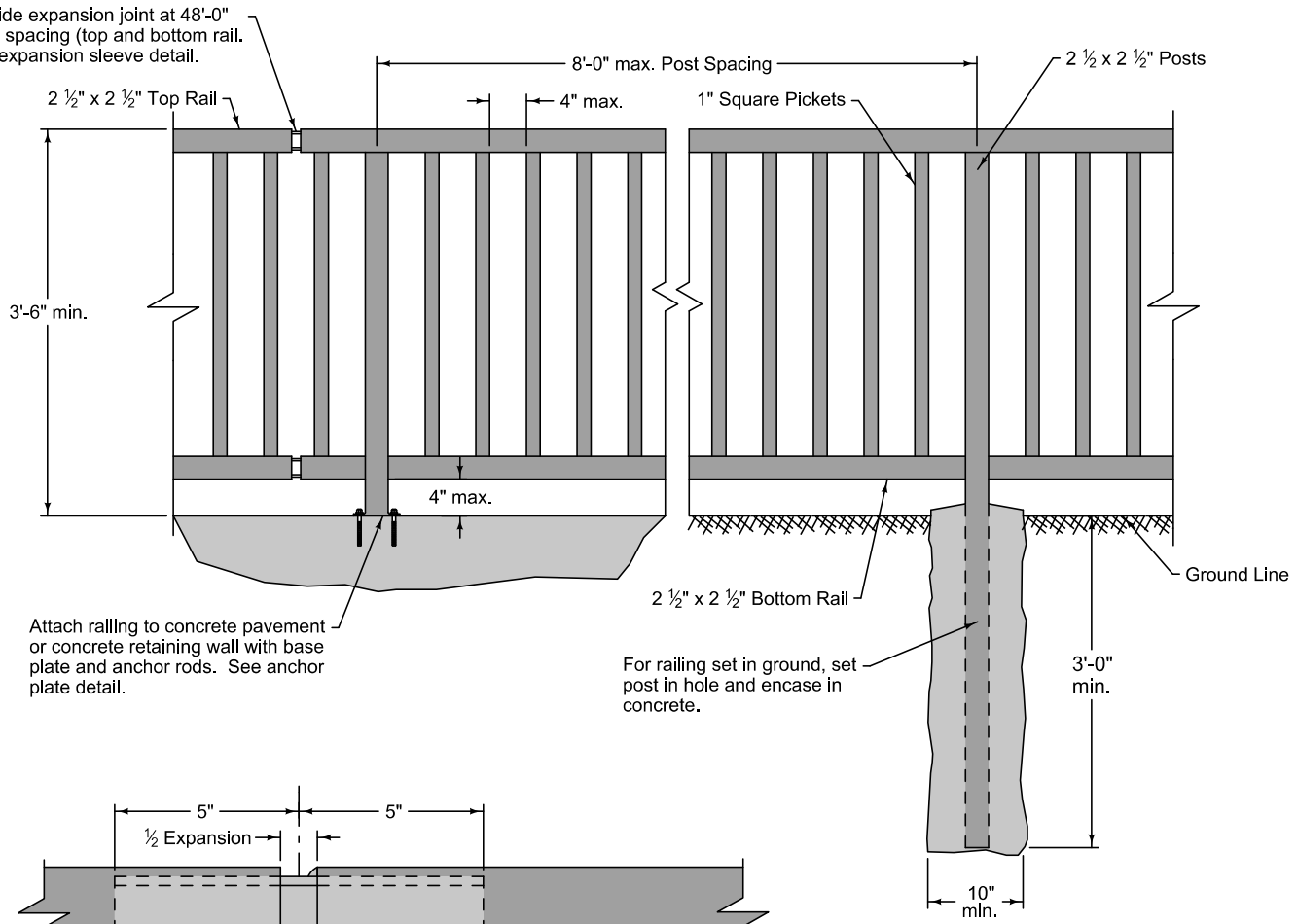
SHEET 2 of 2

SUDAS Standard Specifications

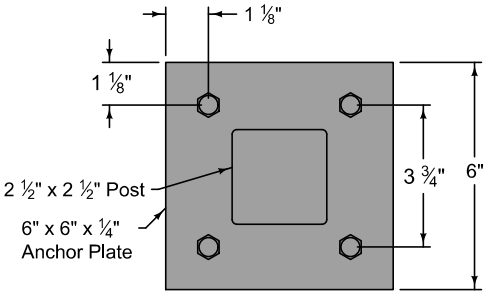
TYPE B CONCRETE STEPS WITH HANDRAIL



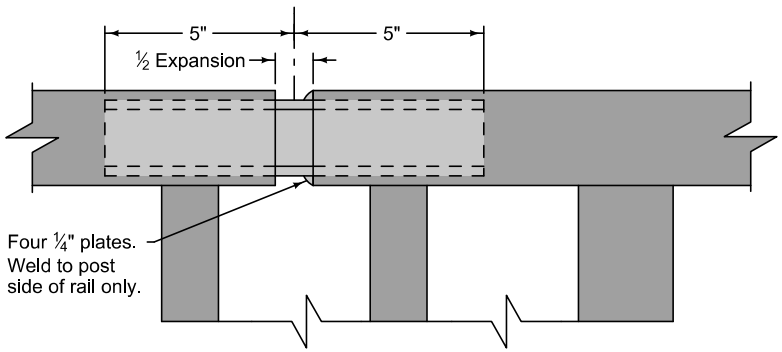
Weld all components with 1/4 inch fillet welds. Grind welds and connections as requried to provide a smooth surface, free of burrs.

Field paint safety rail after installation as specified in the contract documents.

(1) Detail shown is for top rail. Expansion joint for bottom rail is similar.



ANCHOR PLATE DETAIL



EXPANSION SLEEVE DETAIL (1)

FIGURE 9080.103

SHEET 1 OF 1

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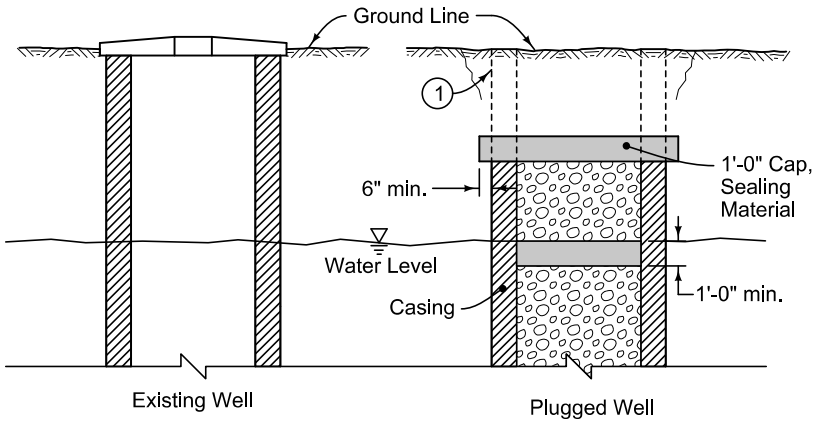
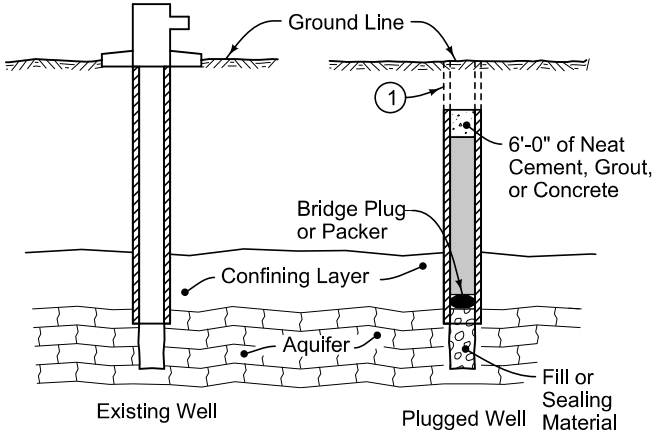
SUDAS Standard Specifications

SAFETY RAIL

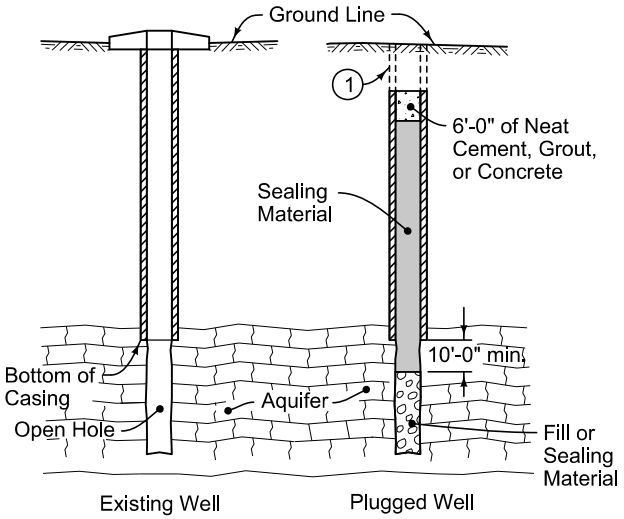


CLASS 1 WELL

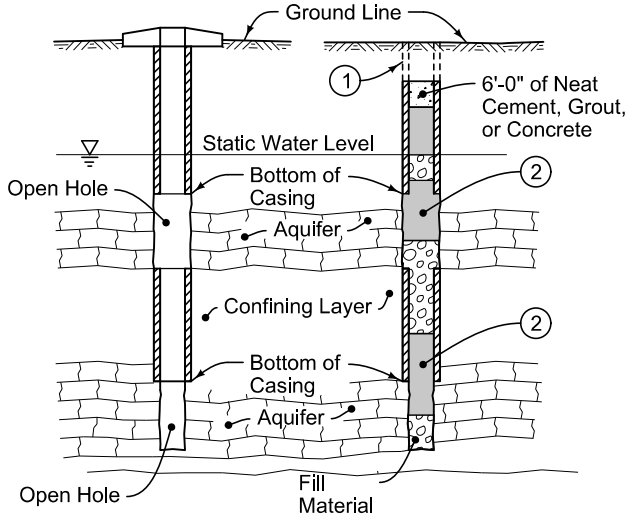


CLASS 2 BEDROCK WELL IN SINGLE CONFINED AQUIFER
(Artesian Well)

1. Remove the top 4 feet of the existing casing pipe.
2. Place sealing material to a minimum thickness of 20 feet (10 feet minimum above and below bottom of casing or top of the aquifer).



CLASS 2 BEDROCK WELL IN SINGLE UNCONFINED AQUIFER



CLASS 2 BEDROCK WELL IN MULTIPLE AQUIFERS

Sealing Material

Fill or Sealing Material

Neat Cement, Grout, or Concrete

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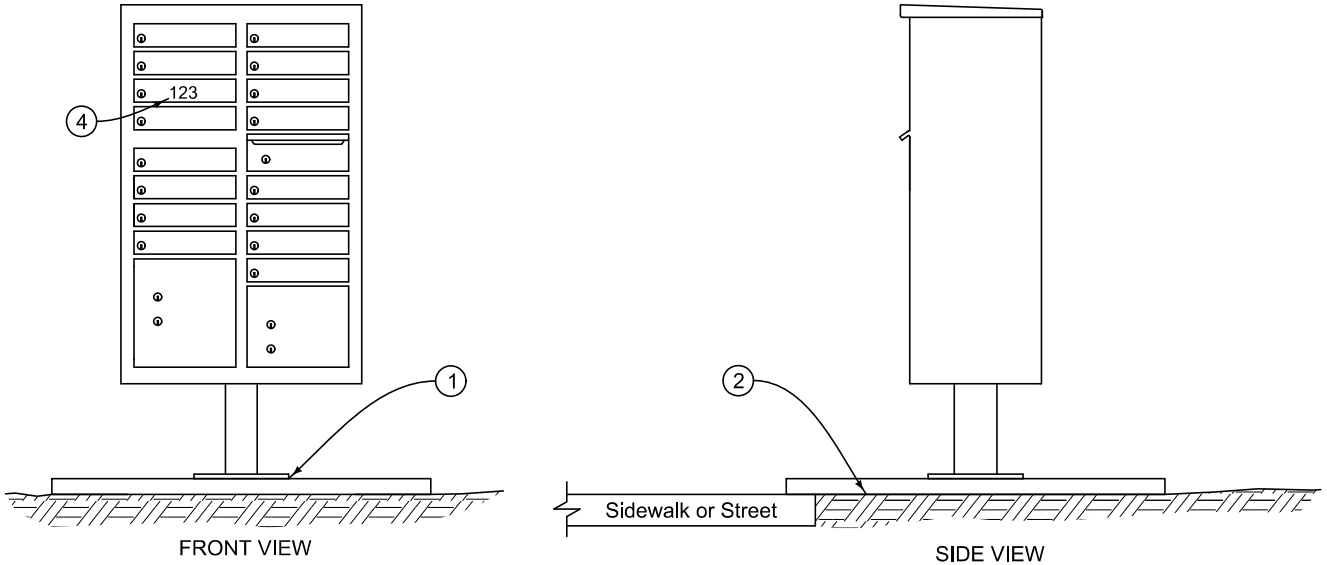
DETAILS FOR PLUGGING WATER WELLS

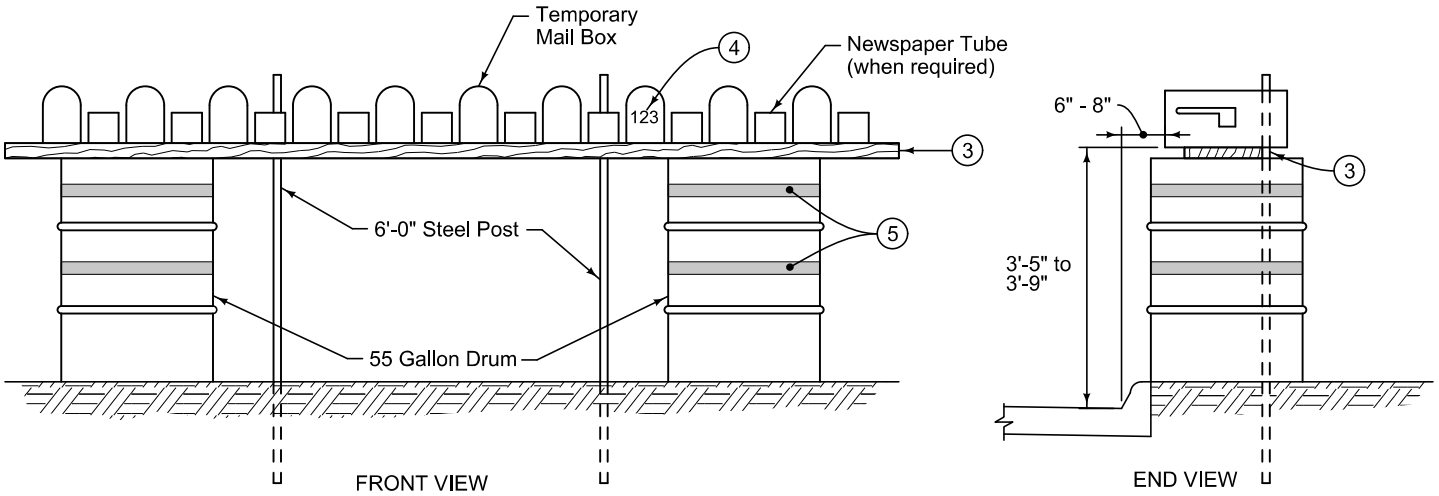
FIGURE 10010.101

SHEET 1 OF 1



TEMPORARY CLUSTER BOX UNIT

1. Attach cluster box unit to a stable skid or anchor plate.
2. Set cluster box on firm and level ground adjacent to sidewalk or street paving. Provide anchorage as needed to prevent overturning.
3. Provide a 2 inch x 12 inch plank with length as required. Firmly attach mailboxes and newspaper tubes to plank. Secure plank to steel posts for lateral support.
4. Label each mailbox with property address.
5. Attach two bands of 2 inch wide reflectorized tape to each barrel.



TEMPORARY GROUP MAILBOX

FIGURE 11030.101

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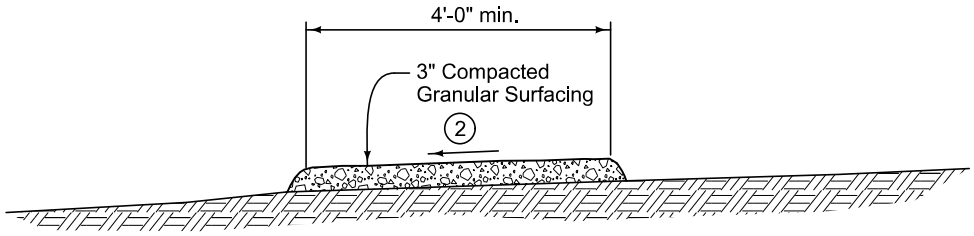
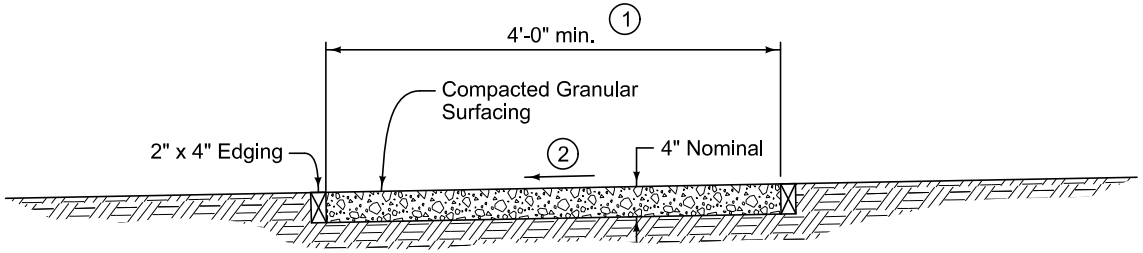
TEMPORARY MAILBOXES

(1) If sidewalk width is less than 5 feet, provide 5 foot long by 5 foot wide passing spaces at 200 foot intervals.

(2) Target cross slope of 1.5% with a maximum cross slope of 2%.



TEMPORARY RESIDENTIAL ACCESS



TEMPORARY GRANULAR SIDEWALK

FIGURE 11040.101 | SHEET 1 OF 1

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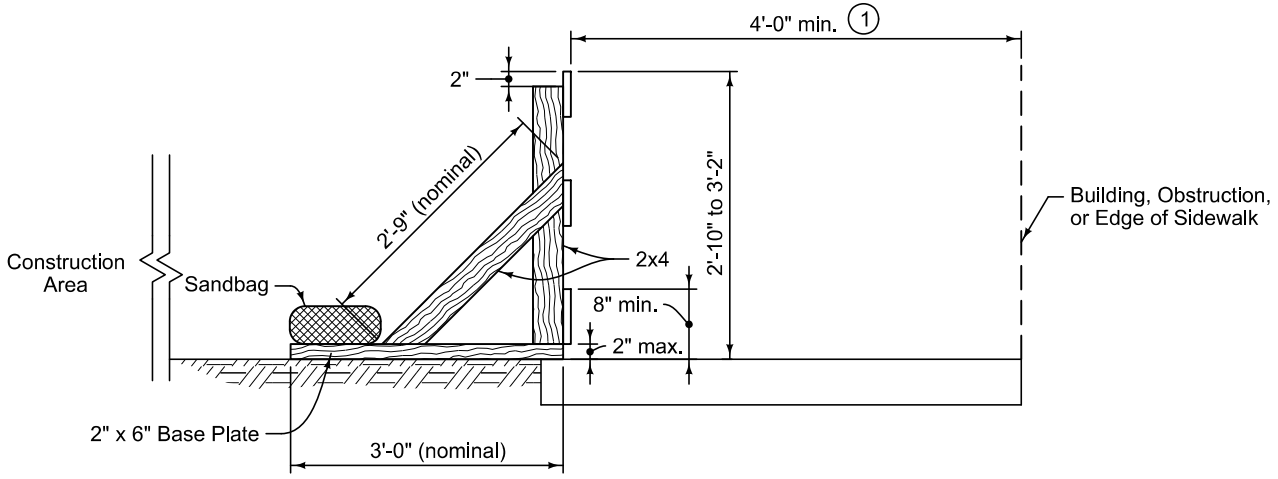
TEMPORARY GRANULAR SIDEWALK
AND
TEMPORARY RESIDENTIAL ACCESS



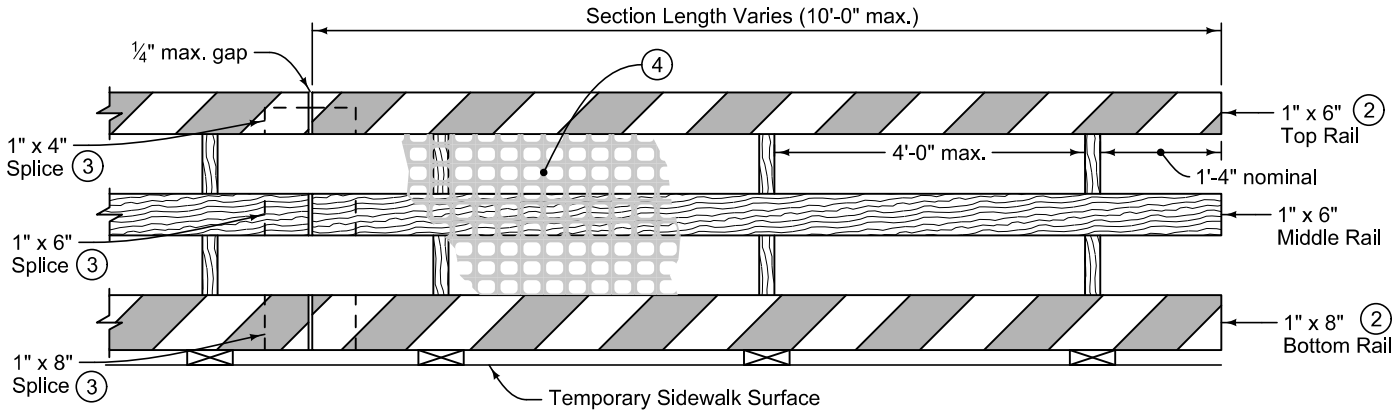
END VIEW

(1) If sidewalk width is less than 5 feet, provide 5 foot long by 5 foot wide passing spaces at 200 foot intervals.

(2) Provide non-reflective orange and white sheeting on top and bottom rails.

(3) Attach 12 inch long splice boards on the back side of rails at joints between sections.

(4) When specified in the contract documents, install orange construction safety fence between the top of the bottom rail and the bottom of the top rail.



FRONT VIEW

FIGURE 11040.102 SHEET 1 OF 1

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TEMPORARY PEDESTRIAN CHANNELIZING DEVICE