Standard Road Plans

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Iowa Department of Transportation

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Highway Division

Standard Road Plans

Prepared by the Methods Section
Office of Design

Iowa Department of Transportation

Highway Division

Standard Road Plans

http://www.iowadot.gov/design/stdrdpln.htm

Prepared by the Methods Section
Office of Design

Questions concerning specific information contained in the Standard Road Plans should be sent to the Methods Section at:
design.standards@dot.iowa.gov

Questions concerning subscriptions to printed versions of the manual and its revisions should be directed to:
Office of Document Services
Telephone 515-239-1940

Preface

The Standard Road Plans contained within this manual have been developed to show standardized design features, construction methods and approved materials to be used in design plans for Interstate, Primary, and Secondary road construction in the State of Iowa.

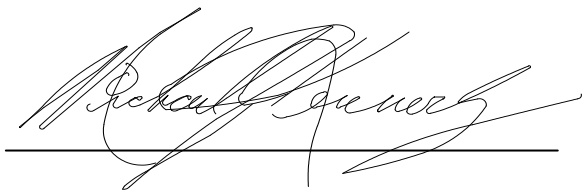
Standard Road Plans address “typical” design situations and are not intended to provide solutions to unique design problems. Where these problems require more individualized solutions, Standard Road Plans may be altered to cover, in part or in whole, these problems. When Standard Road Plans are altered, it is important that they be identified as “Details of ----.“ The DOT title block and all references to “Standard Road Plan” should be removed.

This manual is updated approximately twice per year. It is the responsibility of the holder of this manual to maintain the manual in current condition. The best way to do this is to check the Standard Road Plans website periodically for updates and revisions. The most current version of the manual and its revisions may be downloaded in PDF or DGN (MicroStation) format from:

http://www.iowadot.gov/design/stdrdpln.htm

Specific questions or suggestions with regard to the contents of this manual should be sent to the Methods Section at design.standards@dot.iowa.gov.

Approved



Michael J. Kennerly, P.E.
Design Engineer

Index

Refer to each section's index for a listing of the current Standard Road Plans within that section.

Prefix	Section
BA	Barriers
EC	Erosion Control
EW	Earth Work
MI	Miscellaneous
PM	Pavement Markings
PV	Pavement
RD	Signs
RF	Drainage
RG	Pavement Widening and Resurfacing
RH	Rigid Pavement
RJ	Flexible Pavement
RK	Bridge Approach Pavement
RL	Earthwork
RM	Signals and Lighting
RR	Pavement Rehabilitation
SI	Signs
SW	Sanitary and Storm Sewer
TC	Traffic Control
WM	Water Main

Barriers

BA

SECTION

Barriers

BA

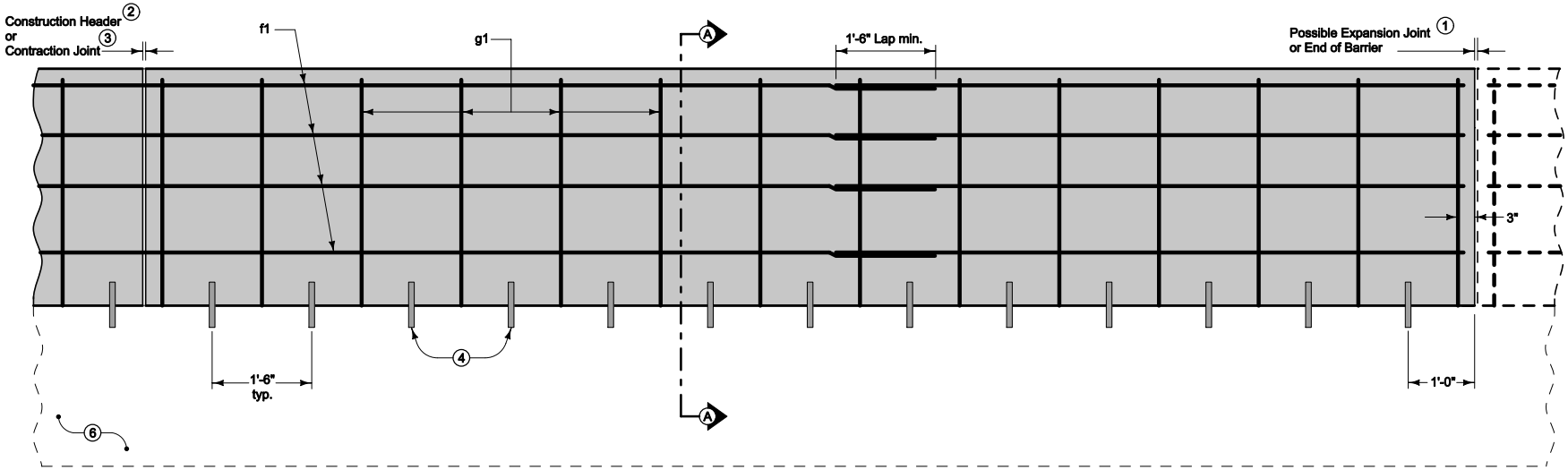
NO.	DATE	TITLE
		Concrete Barriers
BA-100	04-20-10	44" Concrete Median Barrier (Full Section)
BA-101	04-20-10	44" Concrete Median Barrier Width Transition
BA-102	04-19-11	44" Concrete Barrier (Half Section)
BA-103	04-20-10	34" Concrete Barrier (Half Section)
BA-104	04-20-10	34" Concrete Barrier for use with Reinforced Paved Shoulder
BA-105	04-20-10	34" to 44" Concrete Barrier Transition Section
BA-106	04-17-12	Reinforced Paved Shoulder for Concrete Barrier
BA-107	10-18-11	Concrete Barrier End Section
BA-108	04-19-11	Concrete Barrier Tapered End Section
BA-150	04-19-11	Side Obstacle Protection with Concrete Barrier and Guardrail
		Steel Beam Guardrail
BA-200	10-18-11	Steel Beam Guardrail Components
BA-201	10-19-10	Steel Beam Guardrail Barrier Transition Section
BA-202	10-18-11	Steel Beam Guardrail Bolted End Anchor
BA-203	10-18-11	Steel Beam Guardrail W-Beam End Anchor
BA-204	10-18-11	Steel Beam Guardrail Thrie-Beam End Anchor
BA-205	10-18-11	Steel Beam Guardrail End Terminal
BA-206	10-18-11	Steel Beam Guardrail Flared End Terminal For Cable Connection
BA-210	04-20-10	Guardrail Post Adaptor Unit
BA-250	10-18-11	Steel Beam Guardrail Installation at Concrete Barrier or Bridge End Post
BA-251	10-18-11	Steel Beam Guardrail Installation at Side Obstacle (Two-Way Protection)
BA-252	10-18-11	Steel Beam Guardrail Installation at Side Obstacle (One-Way Protection)
BA-253	10-18-11	Steel Beam Guardrail Installation at Railroad Signal
		Cable Guardrail
BA-351	04-20-10	High Tension Cable Guardrail

SECTION

Barriers

BA

NO.	DATE	TITLE
		Temporary Barrier Rails
BA-400	04-20-10	Temporary Barrier Rail (Steel)
BA-401	04-20-10	Temporary Barrier Rail (Precast Concrete)
		Crash Cushions
BA-500	04-20-10	Temporary Crash Cushions Sand Barrel



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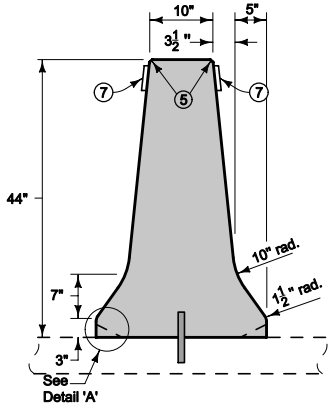
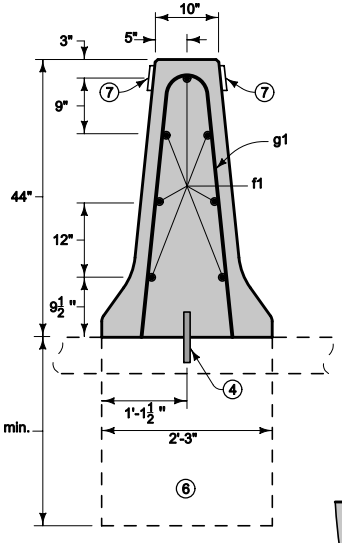


F-SHAPE BARRIER FACE



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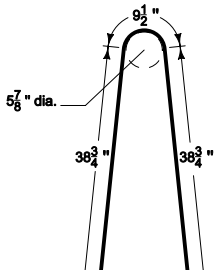


G1
BENT BAR

Use epoxy-coated Grade 60 reinforcing bars. Provide 2 inches minimum cover. Anchor barrier reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" minimum intervals using a method approved by the Engineer.

① Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.

② Saw contraction joints as indicated. Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".

③ For barrier dowelled to pavement, match pavement joints. For free-standing barrier with integral footings, use 20 foot maximum, 15 foot minimum joint spacing.

④ Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.

⑤ Fillet all exposed corners with a ¾ inch dressed and beveled strip.

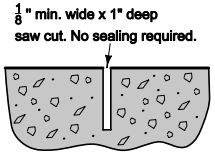
⑥ Construct concrete footing when barrier is not placed on concrete slab. Apply Section 2403.03, but the use of forms is optional. If forms are used, place backfill around the completed footing.

⑦ Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.

Possible Contract Item:
Concrete Barrier, BA-100 or
Concrete Barrier, BA-100 and Footing

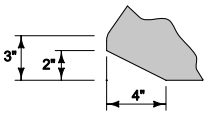
Possible Tabulation:
108-18

REINFORCING BAR LIST Per Section (Approx. 20 feet)					
Mark	Size	Number of Bars	Length	WT. (lbs.)	Max. Spacing
g1	5	14	7'-4"	107	1'-6"
f1	5	7	19'-6"	141	



SAWED CONTRACTION JOINT

Saw cut top and front face



DETAIL 'A'
Special Shaping for Barrier over Intake

CONCRETE QUANTITIES Per Foot
0.15 cy

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

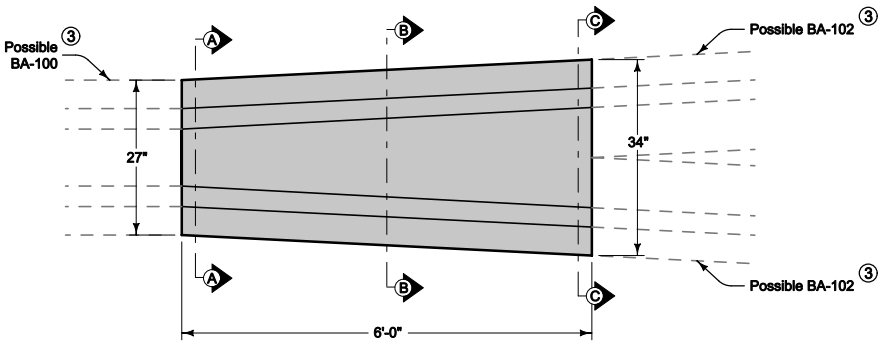
BA-100

SHEET 1 of 1

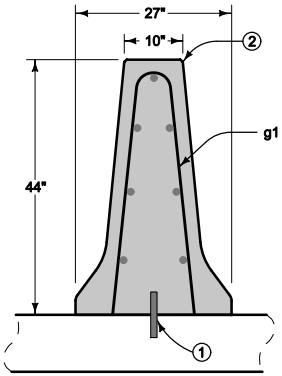
REVISIONS: New. Replaces RE-44A.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

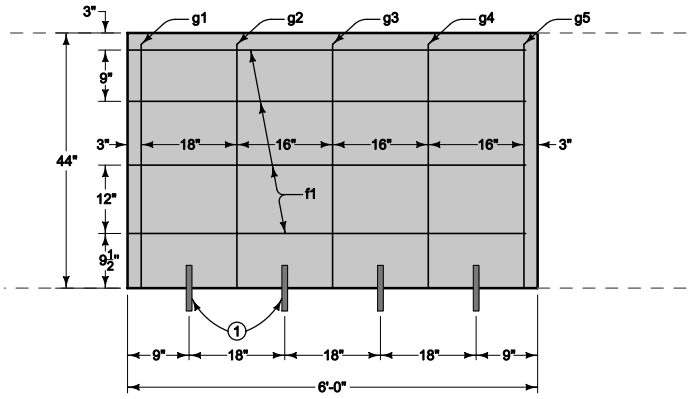
44" CONCRETE MEDIAN BARRIER (FULL SECTION)



PLAN



SECTION A-A



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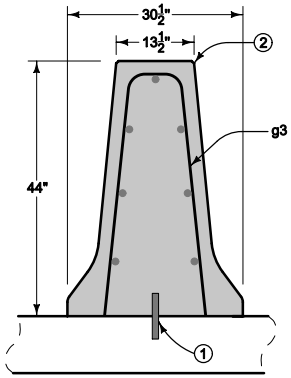
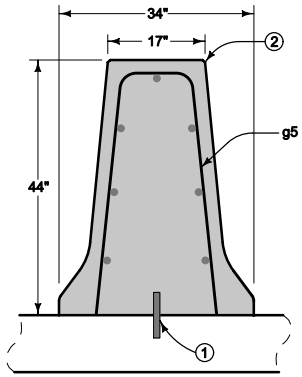
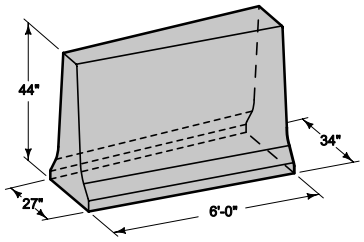


SECTION B-B

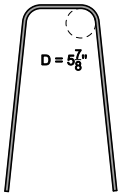


SECTION C-C



ISOMETRIC

BENT BARS



All "g" Bars
D = pin diameter

REINFORCING BAR LIST Per Section (6'-0")				
Mark	Size	Number of Bars	Length	Weight (lbs.)
f1	5	7	69"	42
g1	5	1	87"	8
g2	5	1	89"	8
g3	5	1	91"	8
g4	5	1	92"	8
g5	5	1	94"	8

Use epoxy-coated grade 60 reinforcing bars. Provide 2 inches minimum cover. Anchor barrier reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" minimum intervals using a method approved by the Engineer.

① Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install bars either in supporting surface when placed or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.

② Fillet all exposed corners with a ¾ inch dressed and beveled strip.

③ Provide 18 inch overlap of reinforcing steel between sections.

Possible Contract Item:
Concrete Barrier, BA-101

Possible Tabulation:
108-18

Iowa Department of Transportation

REVISION: New 04-20-10

STANDARD ROAD PLAN

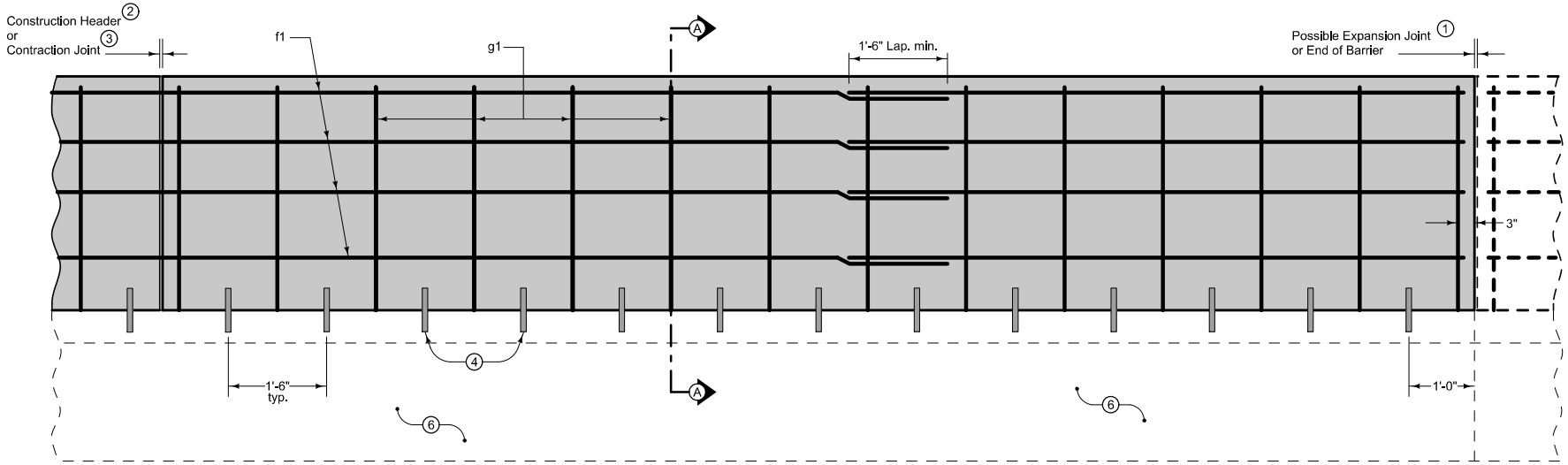
BA-101

SHEET 1 of 1

REVISIONS: New. Replaces RE-44B.

Deanna Maifuld
APPROVED BY DESIGN METHODS ENGINEER

44" CONCRETE MEDIAN BARRIER WIDTH TRANSITION



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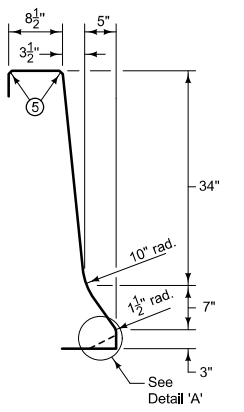
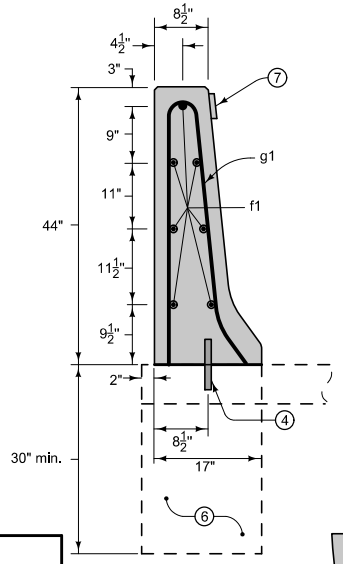
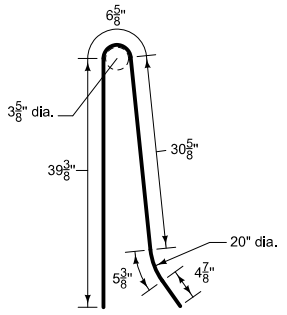


BARRIER FACE



SECTION A-A



g1
BENT BAR

Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

① Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.

② Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".

③ For barrier dowelled to pavement, match pavement joints. For free-standing barrier with integral footings, use 20 foot maximum, 15 foot minimum joint spacing.

④ Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.

⑤ Fillet all exposed corners with a ¾ inch dressed and beveled strip.

⑥ Construct concrete footing when barrier is not placed on concrete slab. Apply Section 2403.03, but the use of forms is optional. If forms are used, place backfill around the completed footing.

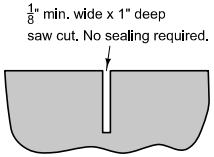
⑦ Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.

Possible Contract Item:
Concrete Barrier, BA-102 or
Concrete Barrier, BA-102 and Footing

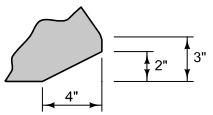
Possible Tabulation:
108-18B

REINFORCING BAR LIST
Per Section (Approx. 20 feet)

Bar	Size	Number of Bars	Length	Weight (lbs.)	Spacing
g1	5	14	7'-3"	106	1'-6"
f1	5	7	19'-6"	141	—



SAWED CONTRACTION JOINT
Saw cut top and front face. Saw cut back if exposed.



DETAIL 'A'
Special Shaping for Barrier over Intake

CONCRETE QUANTITIES
Per foot
0.11 cy

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	04-19-11

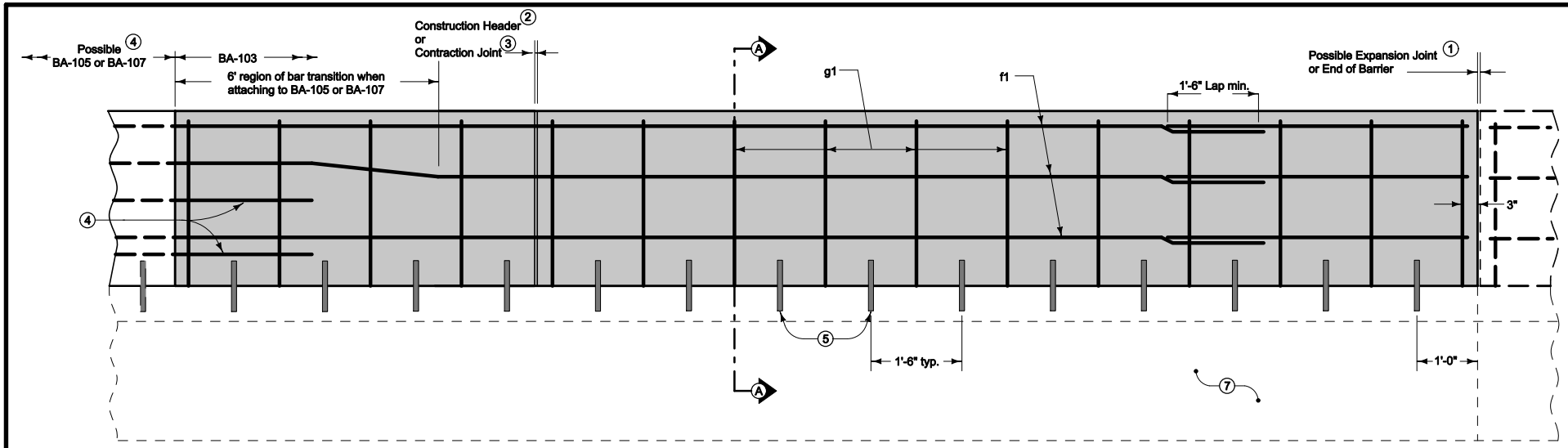
BA-102

SHEET 1 of 1

REVISIONS: Corrected Reinforcing Bar List table values.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

44" CONCRETE BARRIER (HALF SECTION)



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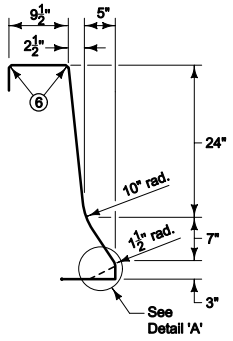
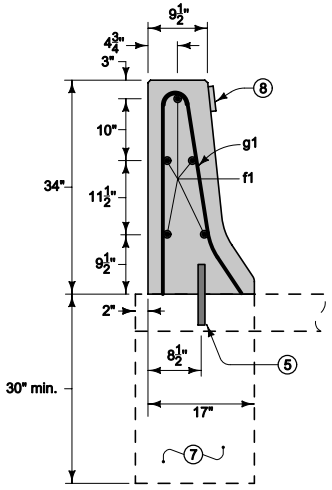
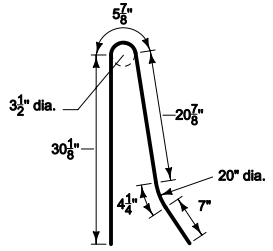


BARRIER FACE



SECTION A-A



g1
BENT BAR

Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

① Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.

② Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".

③ For barrier dowelled to pavement, match pavement joints. For free-standing barrier with integral footings, use 20 foot maximum, 15 foot minimum joint spacing.

④ When connecting to BA-105 or BA-107, include 4 additional #5 bars embedded a minimum of 3 feet into the BA-103 barrier.

⑤ Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.

⑥ Fillet all exposed corners with a ¾ inch dressed and beveled strip.

⑦ Construct concrete footing when barrier is not placed on concrete slab. Apply Section 2403.03, but the use of forms is optional. If forms are used, place backfill around the completed footing.

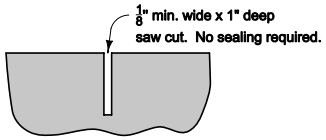
⑧ Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.

Possible Contract Item:
Concrete Barrier, BA-103 or
Concrete Barrier, BA-103 and Footing

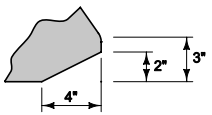
Possible Tabulation:
108-18B

REINFORCING BAR LIST
Per Section (Approx. 20 feet)

Bar	Size	Number of Bars	Length	Weight (lbs.)	Spacing
g1	5	14	5'-8"	83	1'-6"
f1	5	5	19'-6"	98	—



SAWED CONTRACTION JOINT
Saw cut top and front face. Saw cut back if exposed.



DETAIL 'A'
Special Shaping for Barrier over Intake

CONCRETE QUANTITIES
Per foot
0.10 cy

Iowa Department of Transportation

REVISION
New 04-20-10

STANDARD ROAD PLAN

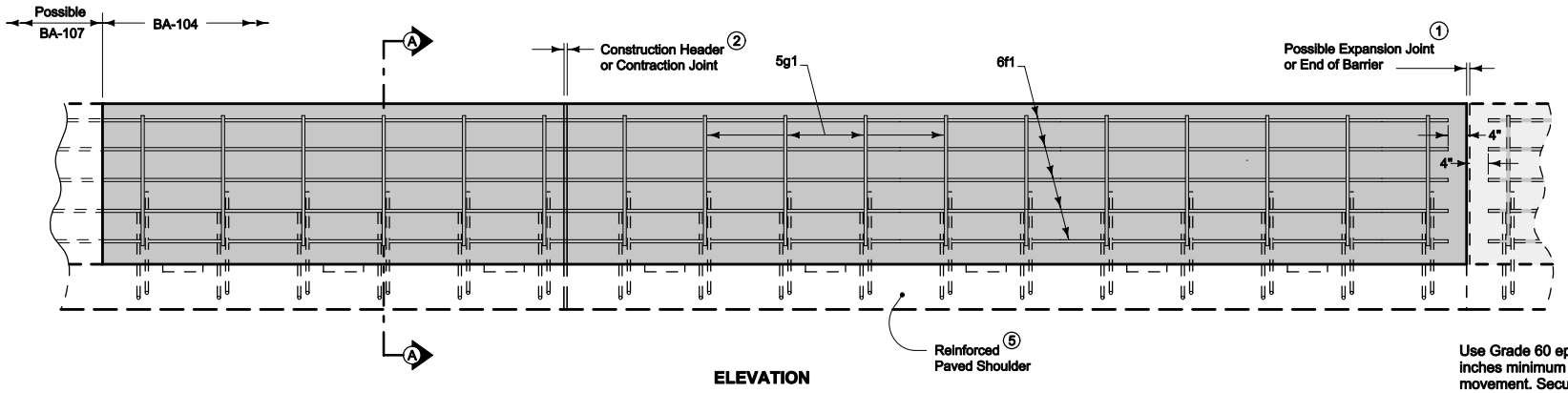
BA-103

SHEET 1 of 1

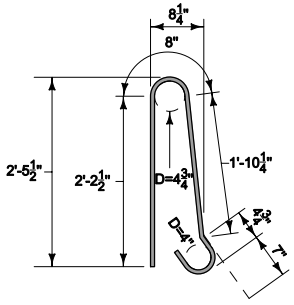
REVISIONS: New. Replaces RE-44E.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

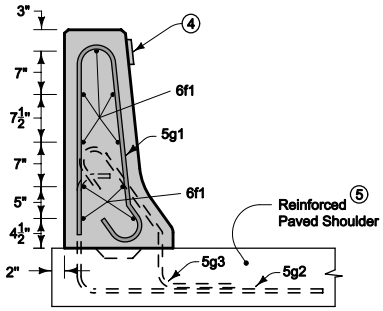
34" CONCRETE BARRIER
(HALF SECTION)



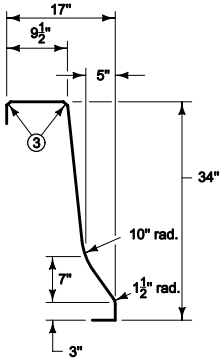
ELEVATION



5g1
BENT BAR



SECTION A-A



BARRIER FACE

Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

① Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.

② Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6". Contraction joint locations shall match pavement joint locations.

③ Fillet all exposed corners with a ¾ inch dressed and beveled strip.

④ Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.

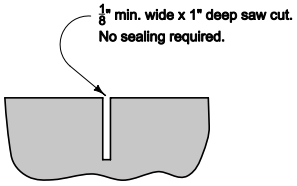
⑤ Refer to BA-106 for details of 5g2 bars, 5g3 bars, and reinforced paved shoulder.

Possible Contract Item:
Concrete Barrier, BA-104

Possible Tabulation:
108-18B

ESTIMATED QUANTITIES FOR BARRIER Per Linear Foot	
Concrete - Cu. Yds.	0.12
Reinforcing Steel - Lbs.	17.5

REINFORCING BAR LIST Per Section (Approximately 20')			
Bar	Number of Bars	Length	Spacing
5g1	15	5'-8½"	1'-4"
6f1	9	19'-4"	—



SAWED CONTRACTION JOINT

Saw cut top and front face. Saw cut back if exposed.

Iowa Department of Transportation

REVISION
New 04-20-10

STANDARD ROAD PLAN

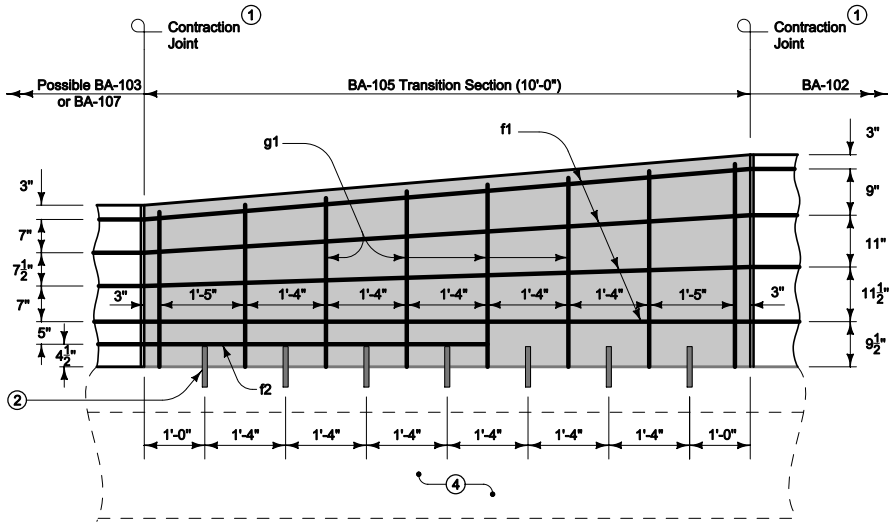
BA-104

SHEET 1 of 1

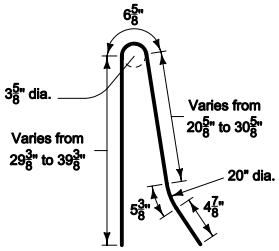
REVISIONS: New. Replaces RE-44F.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

34" CONCRETE BARRIER FOR USE WITH REINFORCED PAVED SHOULDER



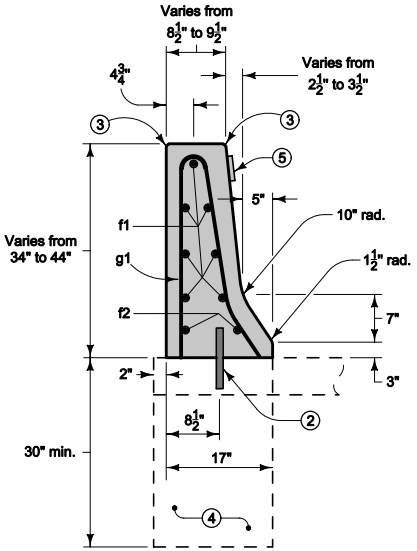
ELEVATION



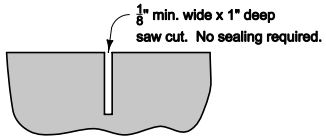
g1
BENT BAR

REINFORCING BAR LIST for one Transition Section				
Bar	Size	Number of Bars	Length	Weight (lbs.)
g1	5	8	*	53.5
f1	5	7	10'-0"	73.5
f2	5	2	5'-8"	11.8

* Varies from 5'-7" to 7'-3"



TYPICAL SECTION



SAWED CONTRACTION JOINT
Saw cut top and front face. Saw cut back if exposed.

CONCRETE QUANTITIES for one Transition Section
1.2 cy

Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

1. Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".
2. Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.
3. Fillet all exposed corners with a ¾ inch dressed and beveled strip.
4. Construct concrete footing when barrier is not placed on concrete slab. Apply Section 2403.03, but the use of forms is optional. If forms are used, place backfill around the completed footing.
5. Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.

Possible Contract Item:
Concrete Barrier, BA-105 or
Concrete Barrier, BA-105 and Footing

Possible Tabulation:
108-18B

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

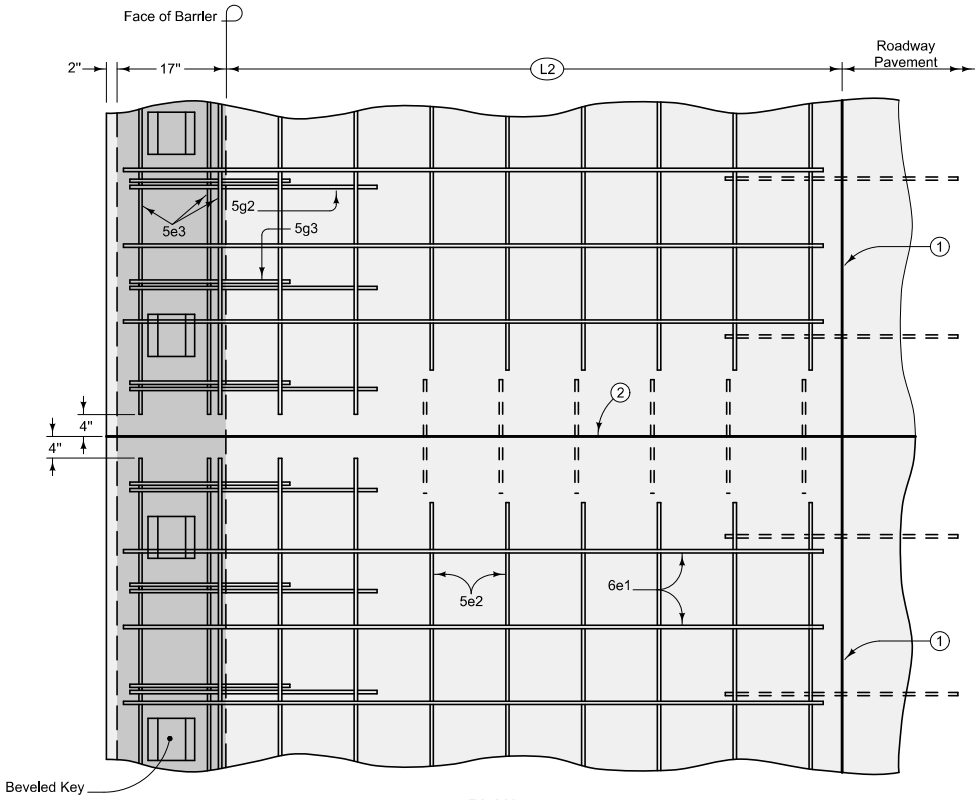
BA-105

SHEET 1 of 1

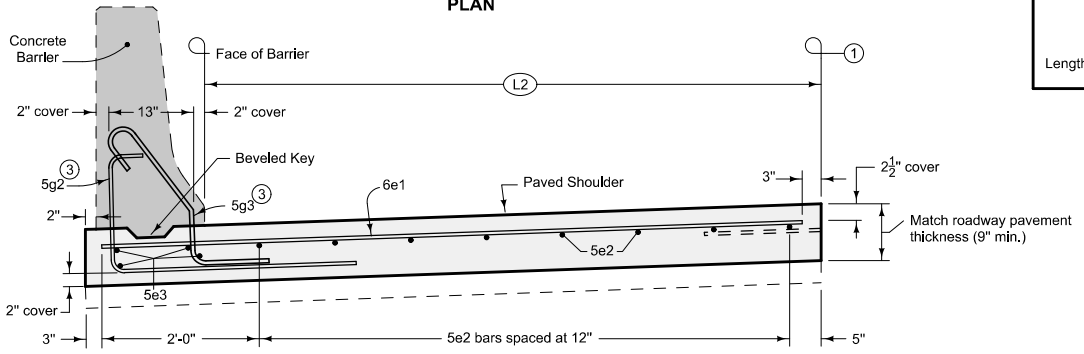
REVISIONS: New. Replaces RE-44G.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

34" TO 44" CONCRETE BARRIER TRANSITION SECTION



PLAN



TYPICAL SECTION

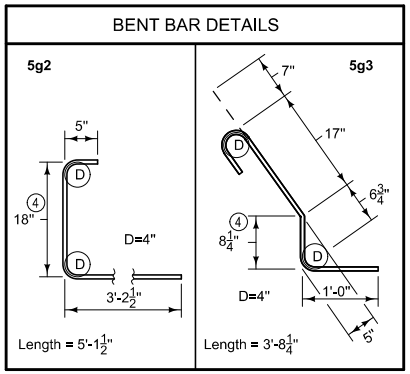
REINFORCING BAR LIST
Per Shoulder Panel (Approximately 20 Linear Feet)

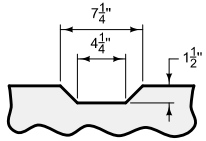
L2	Bar	Number of Bars	Length	Spacing
4'	6e1	18	5'-1"	12"
	5e2	4	18'-0"	12"
6'	6e1	18	7'-1"	12"
	5e2	6	18'-0"	12"
8'	6e1	18	9'-1"	12"
	5e2	8	18'-0"	12"
10'	6e1	18	11'-1"	12"
	5e2	10	18'-0"	12"
12'	6e1	18	13'-1"	12"
	5e2	12	18'-0"	12"
Applies to all Shoulder Widths	5e3	4	18'-8"	See Drawing
	5g2 (3)	varies	varies	(5)
	5g3 (3)	varies	varies	(5)

ESTIMATED SHOULDER QUANTITIES
Per Linear Foot

	L2				
	4'	6'	8'	10'	12'
Concrete Sq. Yds.	0.62	0.84	1.06	1.29	1.51

BENT BAR DETAILS





BEVELED KEY

Use 2 x 8 lumber 8" long to make keys.
Place keys at 2'-8" centers.

1. 'L-2' or 'KT-2' joint. When roadway pavement is existing, use 'BT-3' joint. See PV-101.
2. 'CD' joint. Match roadway joint locations. See PV-101. No 'CD' joint baskets required within 4' of outside edge of shoulder.
3. When shoulder will be located under a concrete barrier end section, replace 5g2 and 5g3 bars with reinforcement as shown on BA-107.
4. Increase these dimensions by one inch for every inch of paved shoulder thickness greater than 9 inches.
5. Match spacing of vertical bars in concrete barrier.

Possible Contract Item:
Reinforced Paved Shoulder

Possible Tabulation:
108-18B

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
3	04-17-12

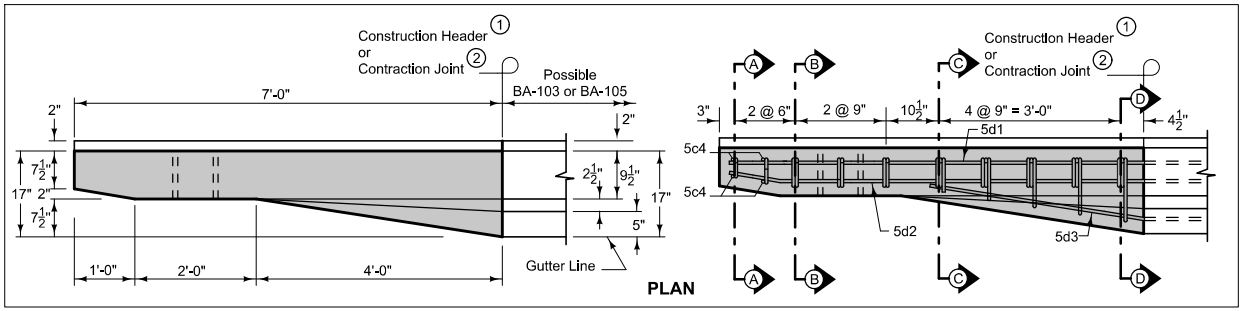
BA-106

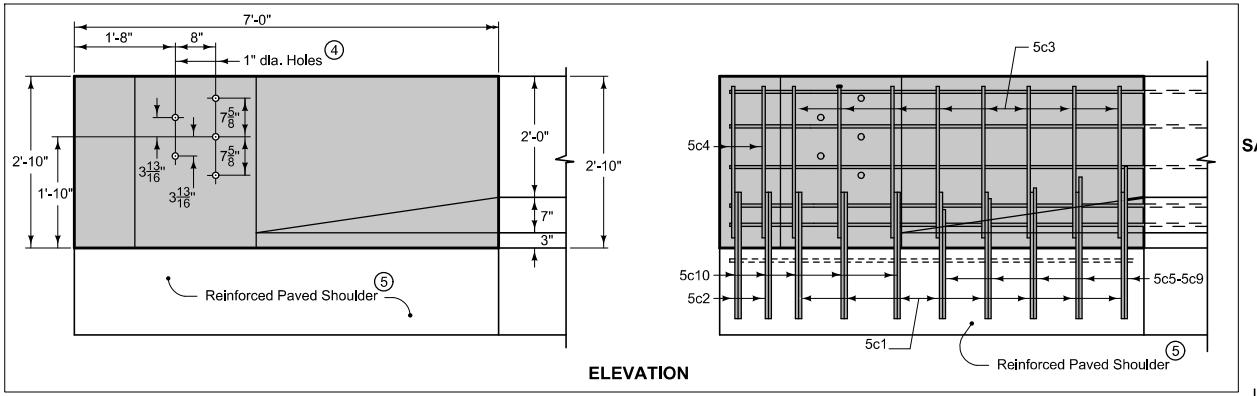
SHEET 1 of 1

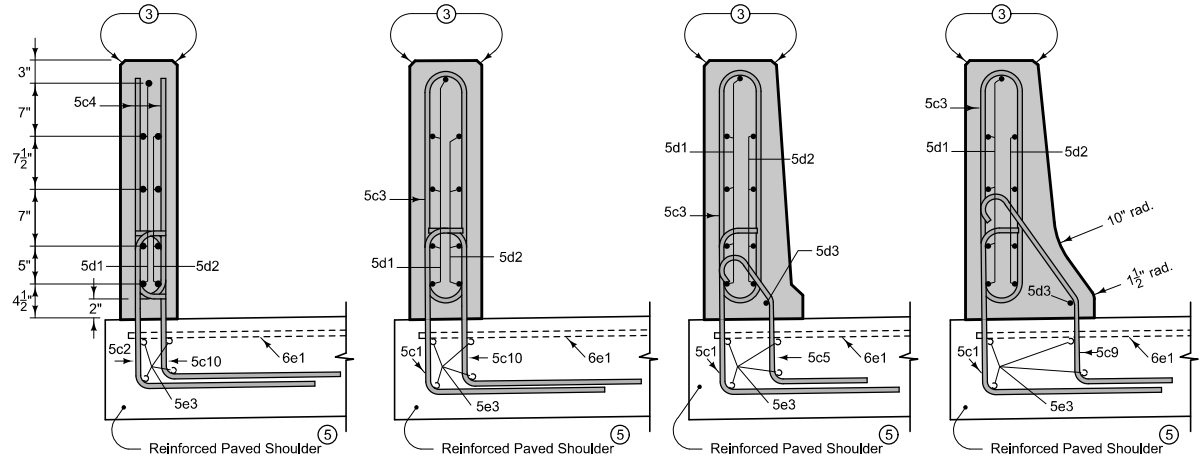
REVISIONS: Made spacing and dimensions of 5g2 and 5g3 bars dependent upon concrete barrier bar spacing and paved shoulder thickness.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

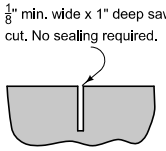
REINFORCED PAVED SHOULDER FOR CONCRETE BARRIER







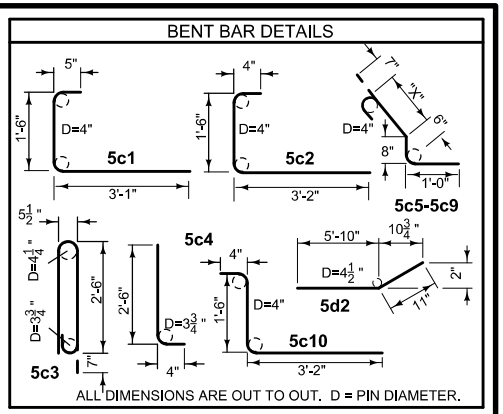
BAR	"X"
5c5	$6\frac{3}{16}$"
5c6	$8\frac{11}{16}$"
5c7	$10\frac{3}{8}$"
5c8	1'-$1\frac{5}{8}$"
5c9	1'-$4\frac{1}{16}$"



SAWED CONTRACTION JOINT

Saw cut top and front face.
Saw cut back if exposed.

CONCRETE QUANTITIES
Per End Section
0.62 cy



REINFORCING BAR LIST

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5c1	VERTICAL	⌐	8	5'-0"	42
5c2	VERTICAL	⌐	2	5'-0"	10
5c3	VERTICAL	∩	8	6'-1"	51
5c4	VERTICAL	⌐	4	2'-10"	12
5c5-5c9	VERTICAL	⌐	5	VARIES	17
5c10	VERTICAL	⌐	5	5'-0"	26
5d1	HORIZONTAL	—	5	6'-8"	35
5d2	HORIZONTAL	—	4	6'-9"	28
5d3	HORIZONTAL	—	1	3'-5"	4
				TOTAL WEIGHT (LBS.)	225

Use Grade 60 epoxy - coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

① Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.

② Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".

③ Fillet all exposed corners with a ¾ inch dressed and beveled strip.

④ Form holes using 1 inch diameter plastic conduit.

⑤ See BA-106 for details of 5e3 bars, 6e1 bars, and reinforced paved shoulder.

Possible Contract Item:
Concrete Barrier Rail, BA-107

Possible Tabulation:
108-18B

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

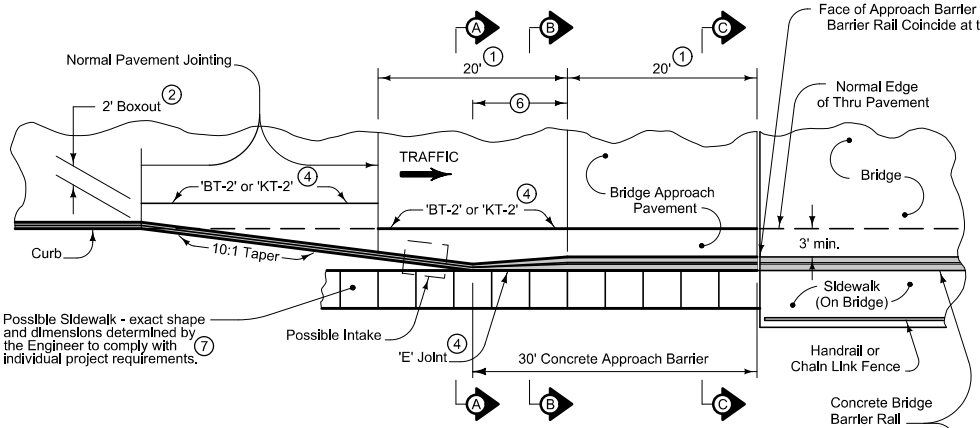
BA-107

SHEET 1 of 1

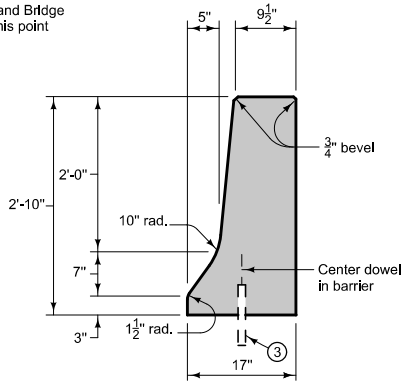
REVISIONS: Labeled 5d2 bars. Modified 'X' bar dimensions and respective bar lengths and bar weights. Updated language in notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

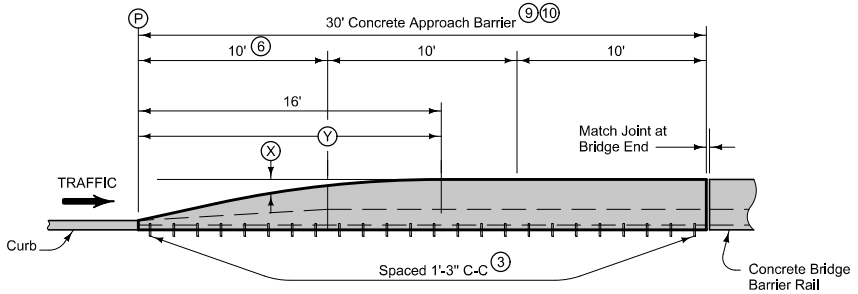
CONCRETE BARRIER END SECTION



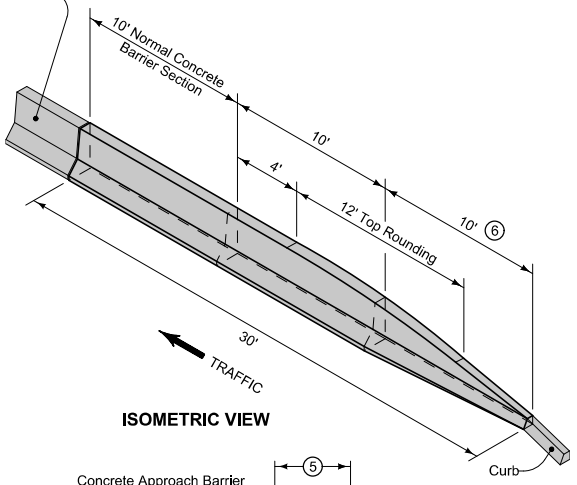
PLAN



FULL BARRIER RAIL SECTION

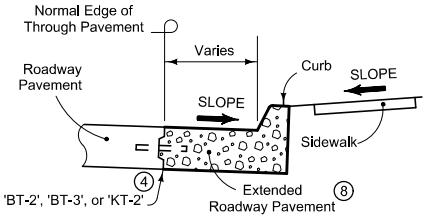


ELEVATION

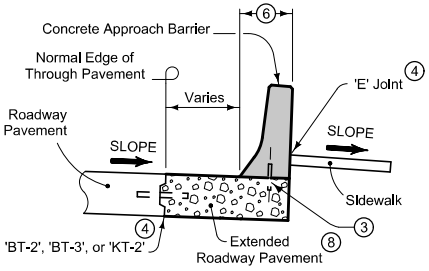


ISOMETRIC VIEW

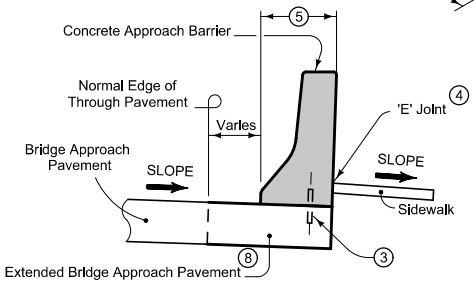
OFFSETS FOR ROUNDED BARRIER TOP																	
Y = Distance from (P)	ft.	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0
X = Offset to Rounded Top	ft.	2.13	1.91	1.70	1.48	1.26	1.06	0.87	0.70	0.54	0.42	0.30	0.20	0.12	0.06	0.02	0.00



SECTION A-A



SECTION B-B



SECTION C-C

Install a 'C' joint in concrete approach barrier to match the location of each joint in both roadway and bridge approach pavement.

(1) Typical joint spacing and location. Specific project requirements shall be as directed by the Engineer.

(2) Match boxout width to existing curb and gutter joint. Use 2 foot wide boxout where curb and gutter are not constructed.

(3) #8 x 8 inch deformed bars or 1 inch diameter smooth.

(4) For joint detail, see PV-101.

(5) Bottom width of barrier is maintained at 17 inches.

(6) Bottom width of barrier transitions from 8 to 17 inches.

(7) Required sidewalk will be measured and paid for separately.

(8) Additional concrete quantity required for extended roadway pavement will be included in roadway paving quantity.

(9) Place no delineator or object marker in front of, or on, the barrier.

(10) Approximately 2.0 cubic yards of concrete are required to construct barrier as shown. Amount may vary depending on individual site requirements.

Possible Contract Item:
Concrete Barrier, Tapered End, BA-108

Possible Tabulation:
108-18B

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

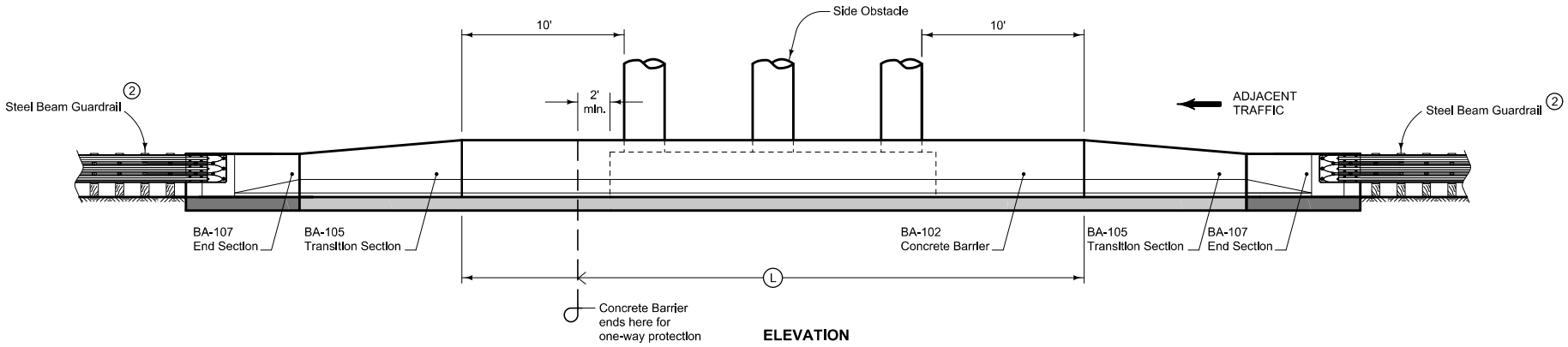
BA-108

SHEET 1 of 1

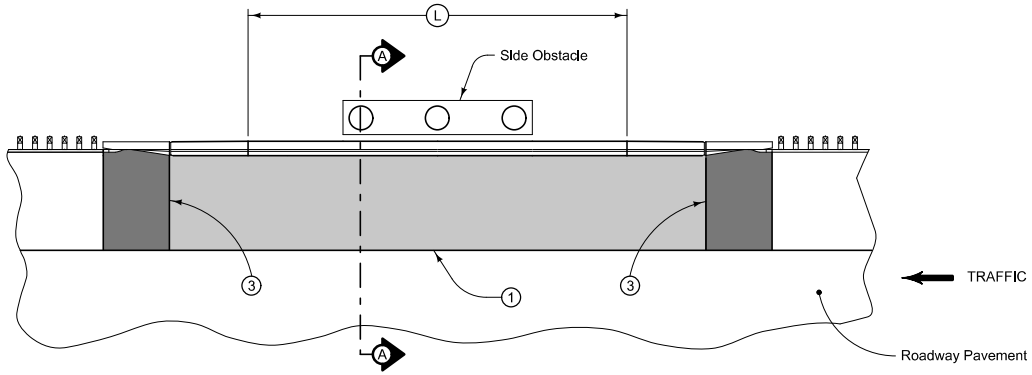
REVISIONS: Changed title to remove reference to speed.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

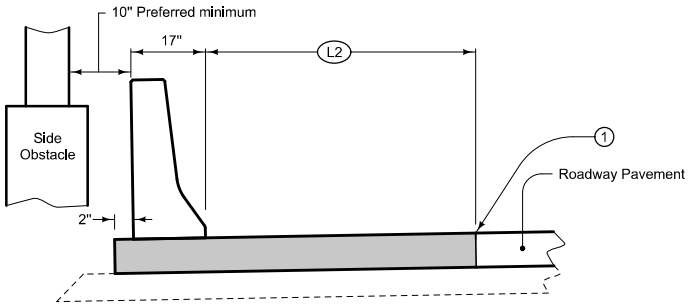
CONCRETE BARRIER TAPERED END SECTION



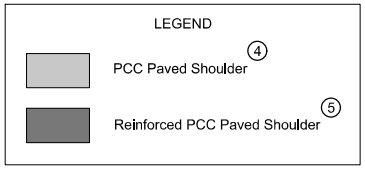
ELEVATION



PLAN



SECTION A-A



1. "L-2" or "KT-2" joint. When roadway pavement is existing, use "BT-3" joint. See PV-101.
2. Refer to BA-250.
3. "C" Joint; match existing roadway joints when possible. See PV-101.
4. Refer to project typicals.
5. Refer to BA-106.

Possible Contract Items:
- Concrete Barrier items
- Steel Beam Guardrail items
- PCC Paved Shoulder
- Reinforced Paved Shoulder

Possible Tabulations:
- 108-18B
- 112-9

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

BA-150

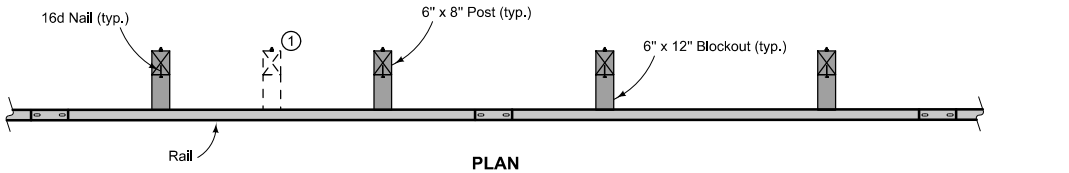
SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

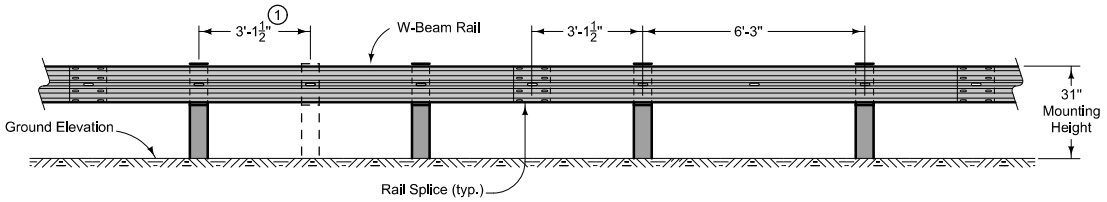
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SIDE OBSTACLE PROTECTION WITH CONCRETE BARRIER AND GUARDRAIL

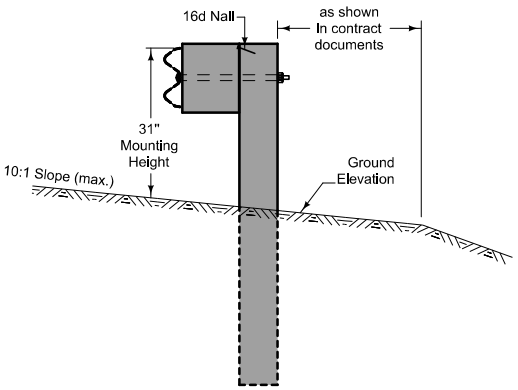
DESIGNER INFO



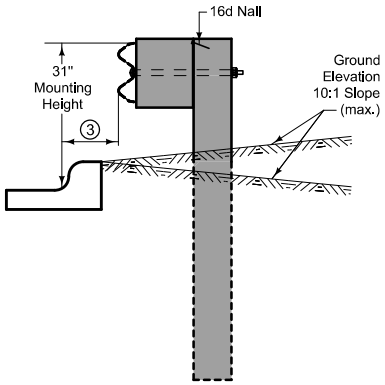
PLAN



ELEVATION



SECTION

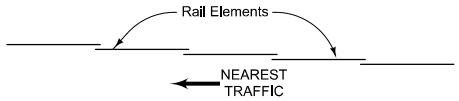


SECTION WITH CURB

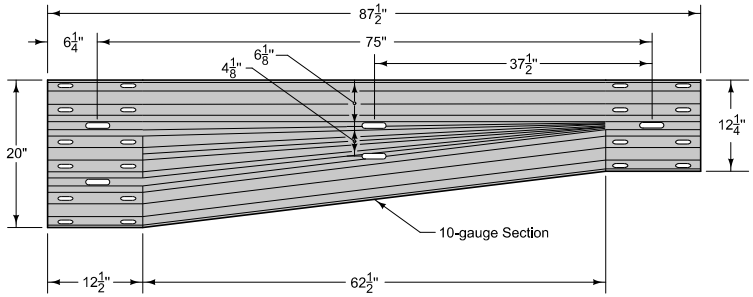
W-BEAM INSTALLATION

At Bridge End Drains, cut Scour Protection (Scourstop and TRM) or remove rock as required to place post(s) such that Bridge End Drains abut post(s).

1. When specified by the contract documents, install posts at 3'-1½" spacing.
2. When posts are placed in solid material such as paved shoulder or rock, drill minimum 15 inch diameter holes for the depth of the material. Backfill holes with special backfill.
3. 6" maximum for 6" Standard or 6" Sloped curbs and for non-standard curbs.

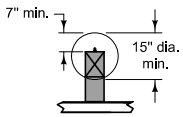


LAPPING PROCEDURE



ASYMMETRICAL TRANSITION SECTION

Possible Contract Item:
Steel Beam Guardrail



INSTALLATION IN PAVED SURFACE OR ROCK (2)

Iowa Department of Transportation

REVISION
2 | 10-18-11

STANDARD ROAD PLAN

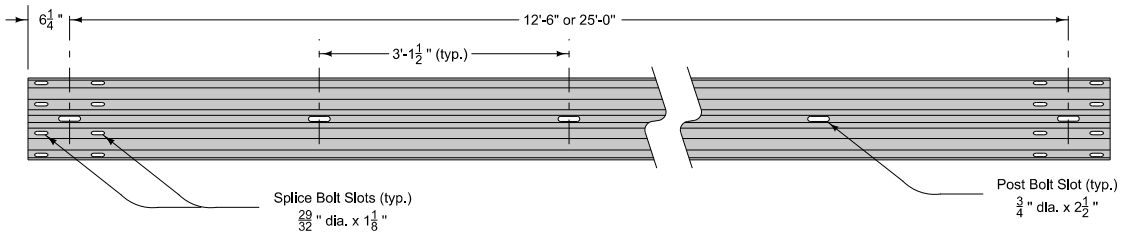
BA-200

SHEET 1 of 2

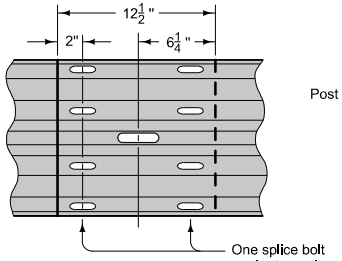
REVISIONS: Added Installation In Paved Surface detail and circle note 2. Clarified height at curb face.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

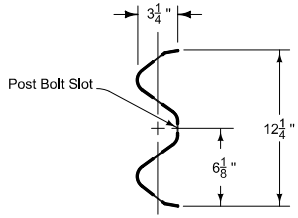
STEEL BEAM GUARDRAIL COMPONENTS



ELEVATION

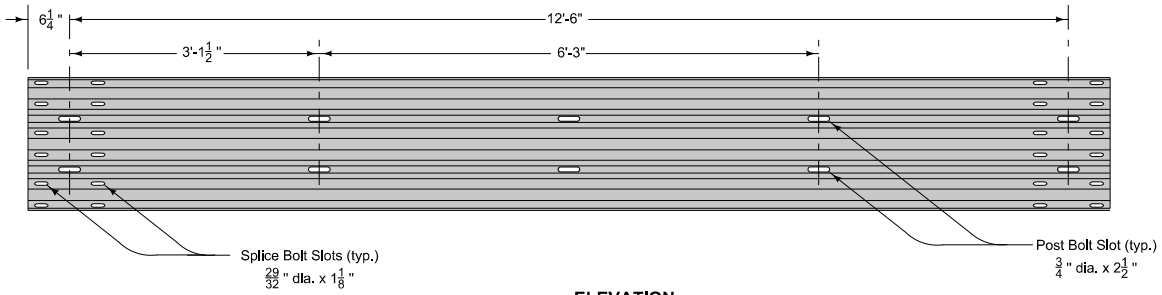


RAIL SPLICE



SECTION

W-BEAM RAIL



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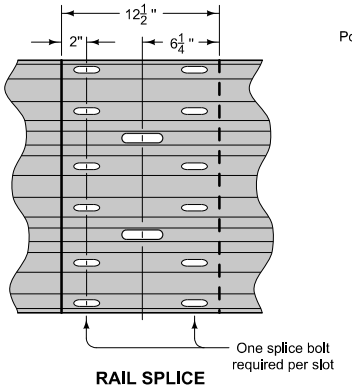
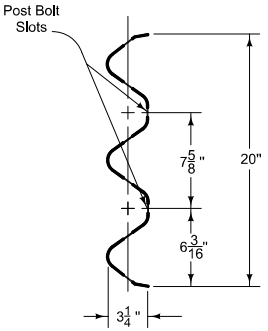
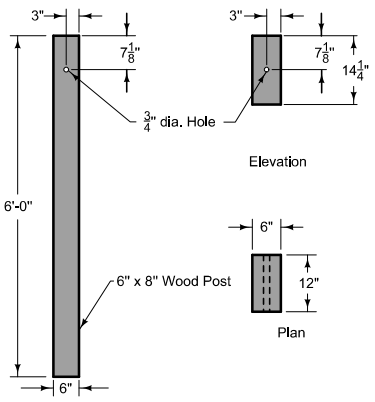


RAIL SPLICE



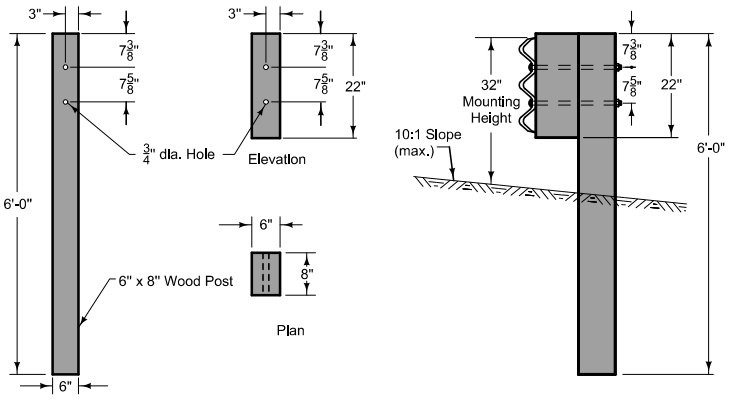
SECTION

THRIE-BEAM RAIL



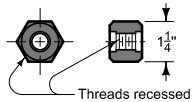
POST BLOCKOUT

W-BEAM

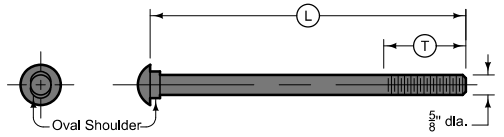


POST BLOCKOUT SECTION

THRIE-BEAM



NUT



BOLT

APPLICATION	T	L
Post Bolt for 8" Blockout	2½"	18"
Post Bolt for 12" Blockout	2½"	22"
Splice Bolt	1 1/16"	1¼"

T = Min. Thread Length L = Bolt Length

HARDWARE

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

BA-200

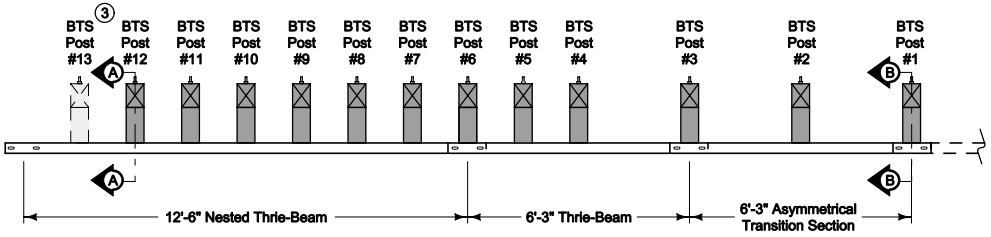
SHEET 2 of 2

REVISIONS: Added Installation In Paved Surface detail and circle note 2. Clarified height at curb face.

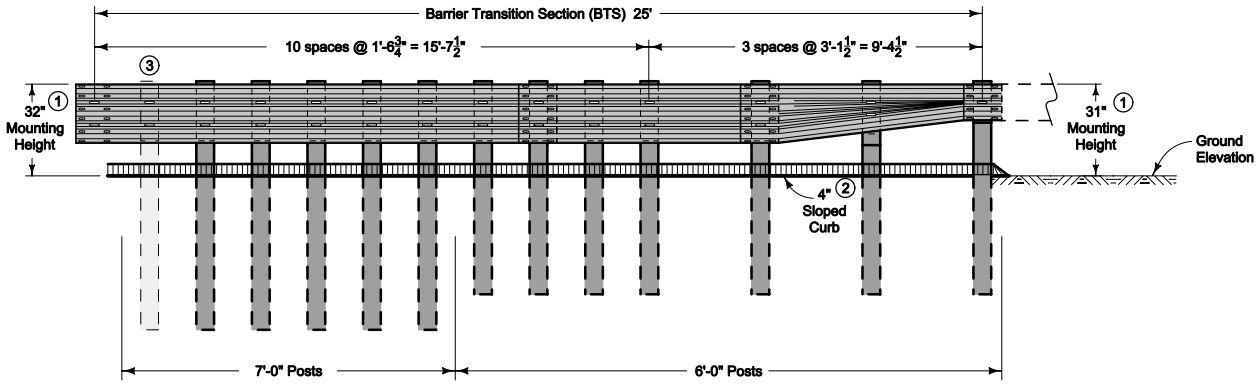
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL COMPONENTS

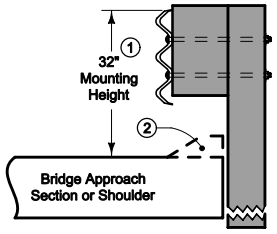
DESIGNER INFO



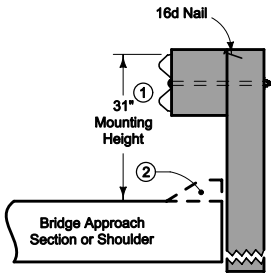
PLAN



ELEVATION



SECTION A-A



SECTION B-B

At Bridge End Drains, cut Scour Protection (Scourstop and TRM) or remove rock as required to place post(s) such that Bridge End Drains abut post(s).

(1) Guardrail mounting height at barrier connection is 32 inches. Transition guardrail mounting height down to 31 inches over the length of the Barrier Transition Section.

(2) Possible curb. See project plans.

(3) Depending on end anchor type, BTS Post #13 may be eliminated or modified. See BA-202.

Possible Contract Item:
Steel Beam Guardrail Barrier Transition Section

Materials included in the Contract Item:
(7) 6" x 8" x 6'-0" posts
(6) 6" x 8" x 7'-0" posts
(12) 6" x 12" x 19" blockouts
(1) 6" x 12" x 14¼" blockout
(1) Asymmetrical Transition Section
(2) 12'-6" Thrie-Beam rail sections*
(1) 6'-3" Thrie-Beam rail section*
Approved bolts, nuts, and washers
Refer to BA-200 for guardrail components

* One 18'-9" Thrie-Beam rail section may be substituted for one of the 12'-6" sections and the 6'-3" section as shown

Iowa Department of Transportation

REVISION
1 10-19-10

STANDARD ROAD PLAN

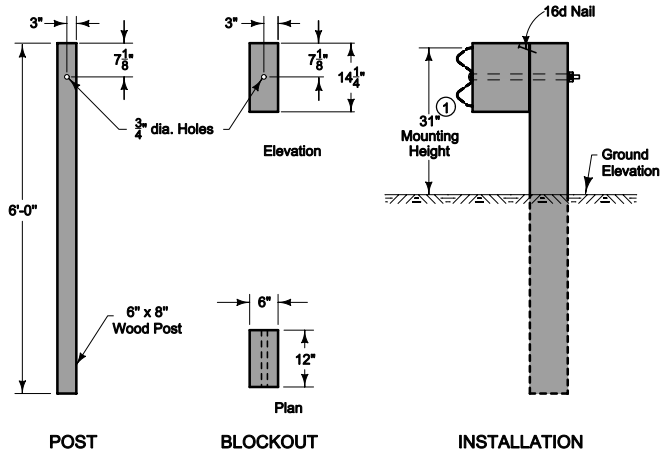
BA-201

SHEET 1 of 2

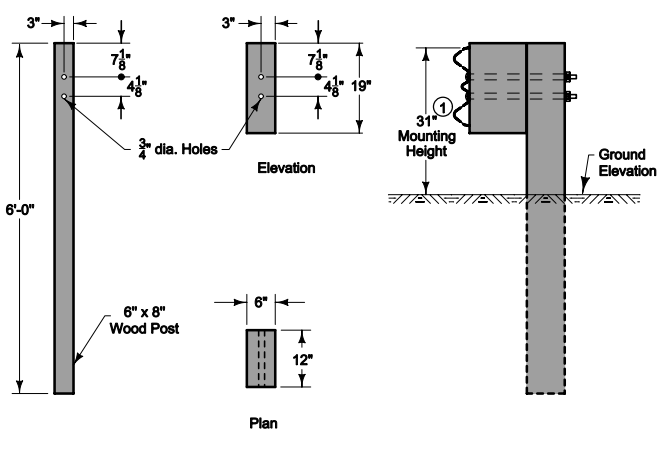
REVISIONS: Removed dimensions from Section A-A and Section B-B on Sheet 1. Clarified nested section options.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

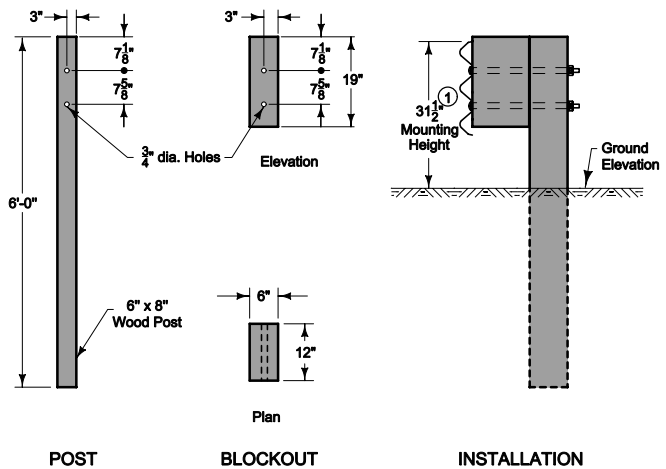
STEEL BEAM GUARDRAIL BARRIER TRANSITION SECTION



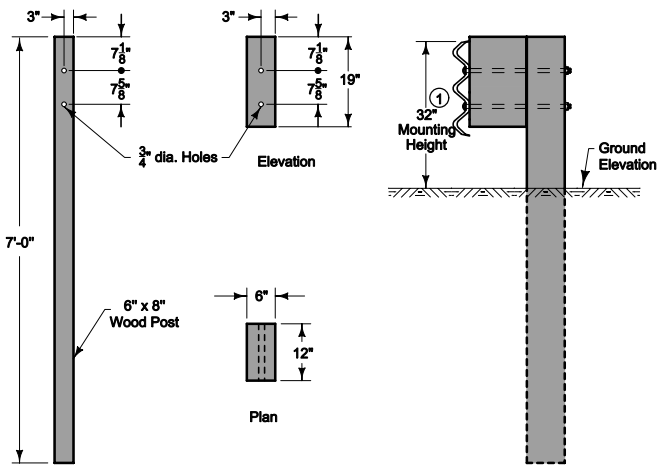
BTS POSTS # 1



BTS POST # 2



BTS POSTS # 3-7



BTS POSTS # 8-13

① Guardrail mounting height at barrier connection is 32 inches. Transition guardrail mounting height down to 31 inches over the length of the Barrier Transition Section.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-19-10

BA-201

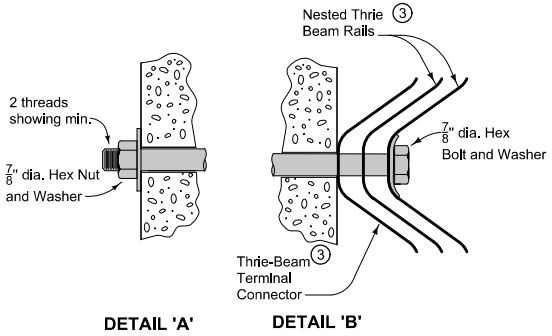
SHEET 2 of 2

REVISIONS: Removed dimensions from Section A-A and Section B-B on Sheet 1. Clarified nested section options.

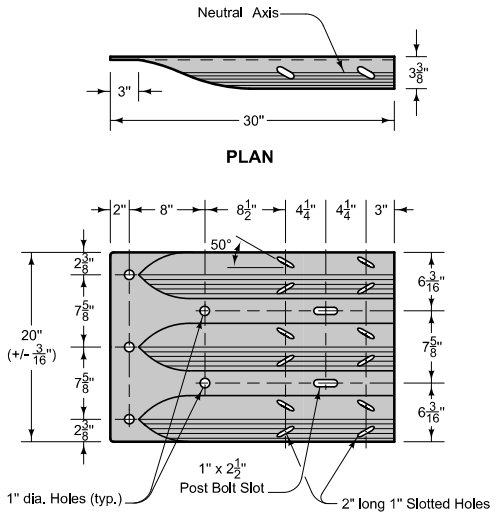
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL BARRIER TRANSITION SECTION

DESIGNER INFO



DETAIL 'A' DETAIL 'B'

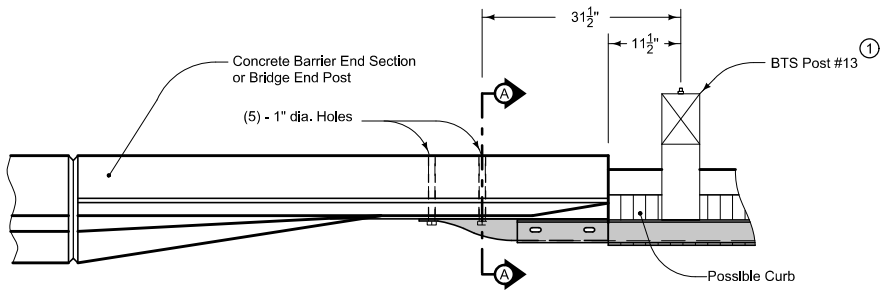


PLAN

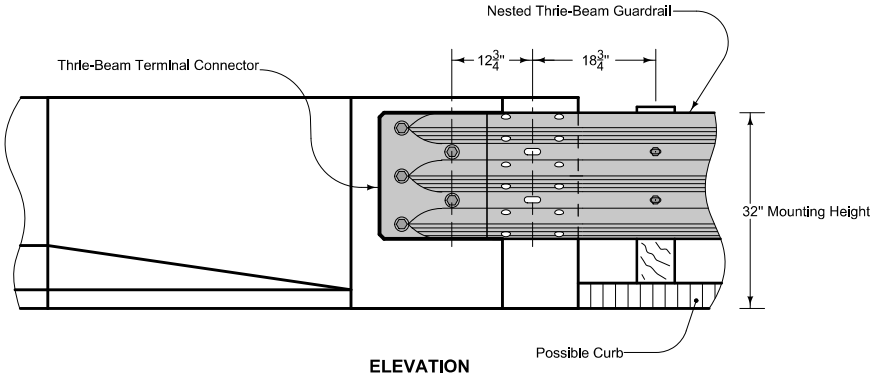
ELEVATION

THRIE - BEAM TERMINAL CONNECTOR

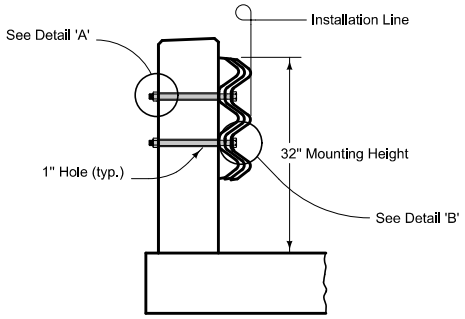
TYPE A



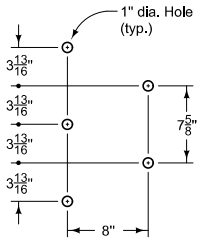
PLAN



ELEVATION



SECTION A-A



5 - BOLT PATTERN
Thrie-Beam Terminal Connector

① See **BA-201**.

③ Lap the Terminal Connector on the outside of the nested thrie beam rails for attachments on the trailing end of a bridge.

Possible Contract Item:
Steel Beam Guardrail End Anchor, Bolted

Materials included in the Contract Item:
Thrie-Beam Terminal Connector
Approved 7/8" x sufficient length Hex Bolts
Approved 7/8" Hex Nuts
Approved 15/16" Washers

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-18-11

BA-202

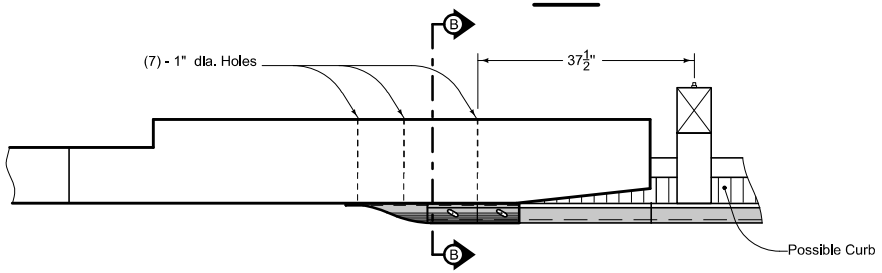
SHEET 1 of 3

REVISIONS: Added note to clarify lapping procedure for terminal section. Added bolt pattern details to sheet 2 and 3. Removed circle note 2.

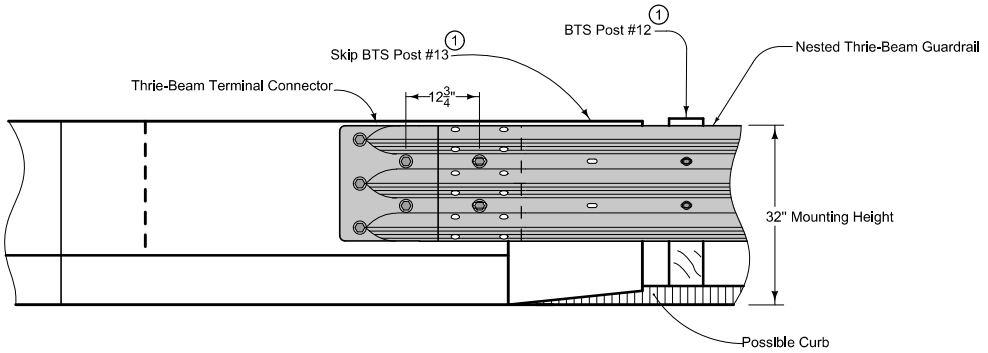
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL
BOLTED END ANCHOR

TYPE B

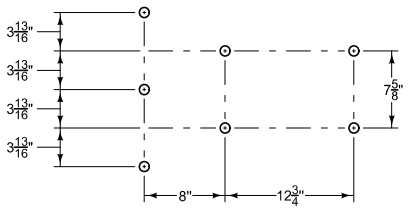


PLAN



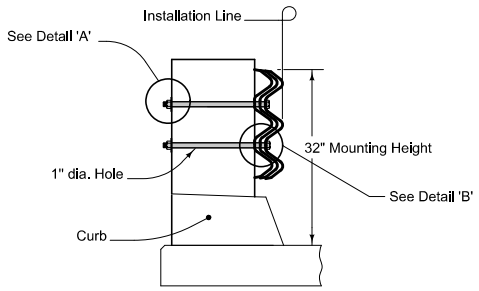
ELEVATION

① See **BA-201**.



7 - BOLT PATTERN

Thrie - Beam Terminal Connector



SECTION B-B

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-18-11

BA-202

SHEET 2 of 3

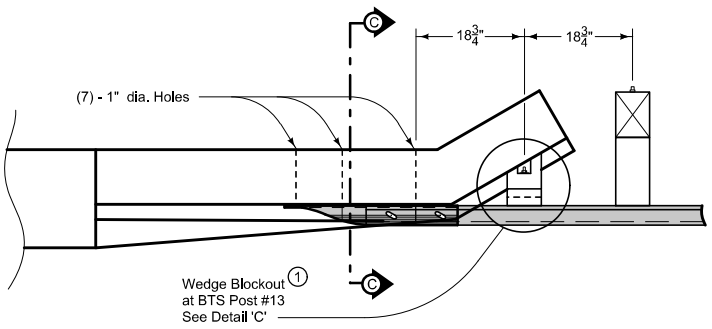
REVISIONS: Added note to clarify lapping procedure for terminal section. Added bolt pattern details to sheet 2 and 3. Removed circle note 2.

Deanna Maifield

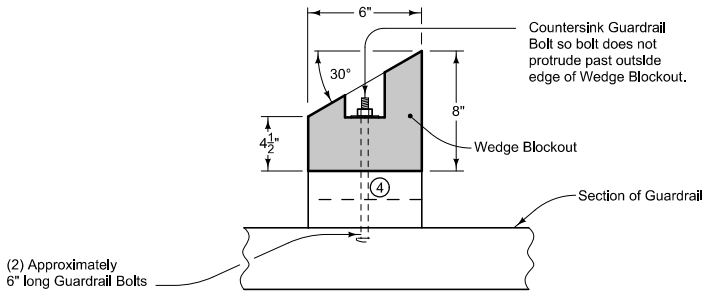
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL
BOLTED END ANCHOR

TYPE C



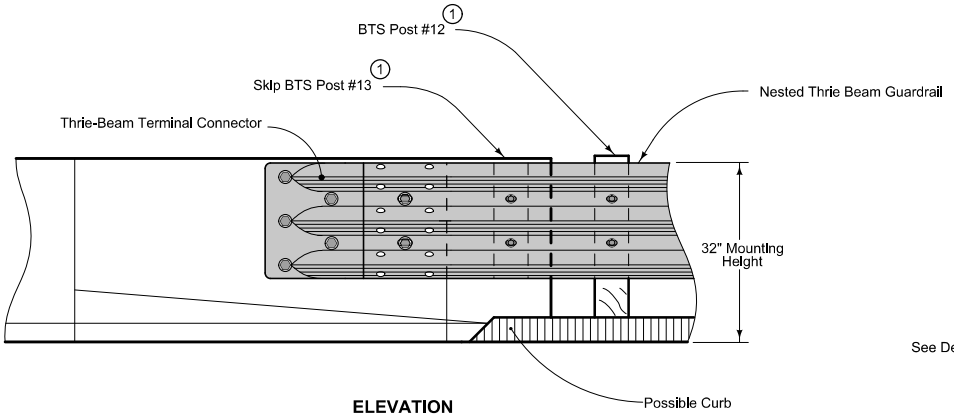
PLAN



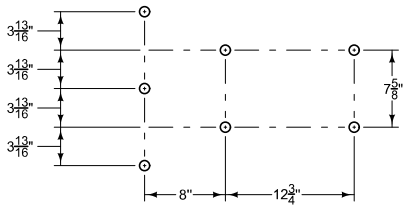
DETAIL 'C'

(1) See **BA-201**.

(4) Use treated spacer boards (1 in. x 6 in. or 2 in. x 6 in.) to produce a tight fit between the wedge blockout and endpost. A nominal 1 inch gap is acceptable. Spacer boards are incidental to bolted end anchor.

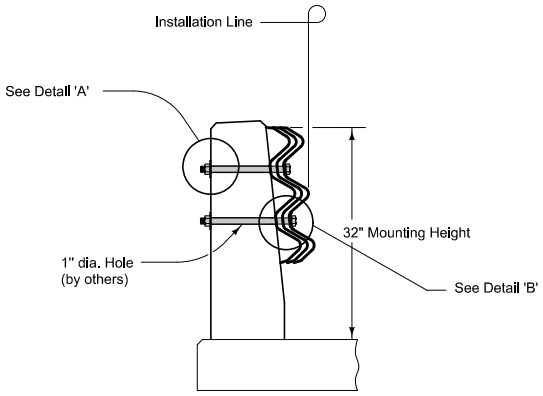


ELEVATION



7 - BOLT PATTERN

Thrie - Beam Terminal Connector



SECTION C-C

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-18-11

BA-202

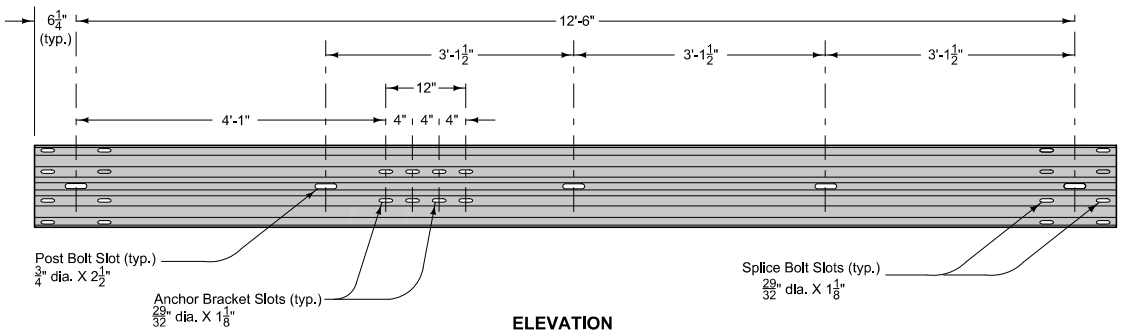
SHEET 3 of 3

REVISIONS: Added note to clarify lapping procedure for terminal section. Added bolt pattern details to sheet 2 and 3. Removed circle note 2.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

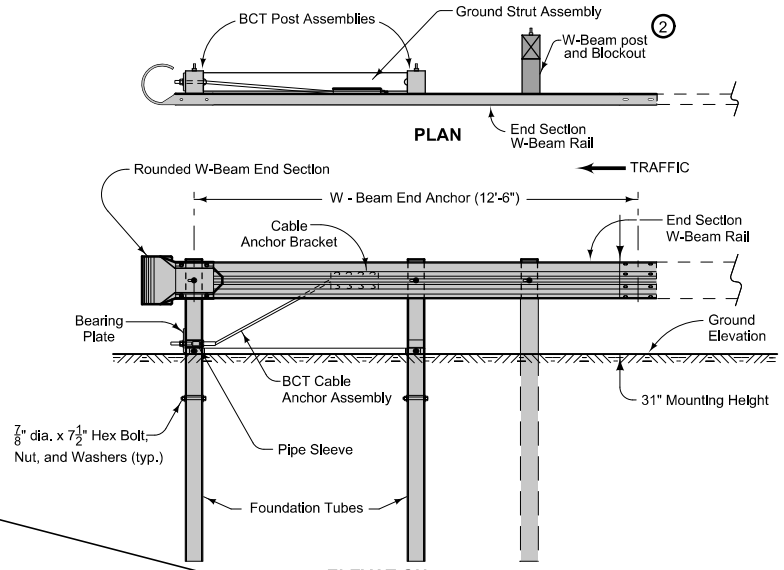
STEEL BEAM GUARDRAIL BOLTED END ANCHOR

DESIGNER INFO



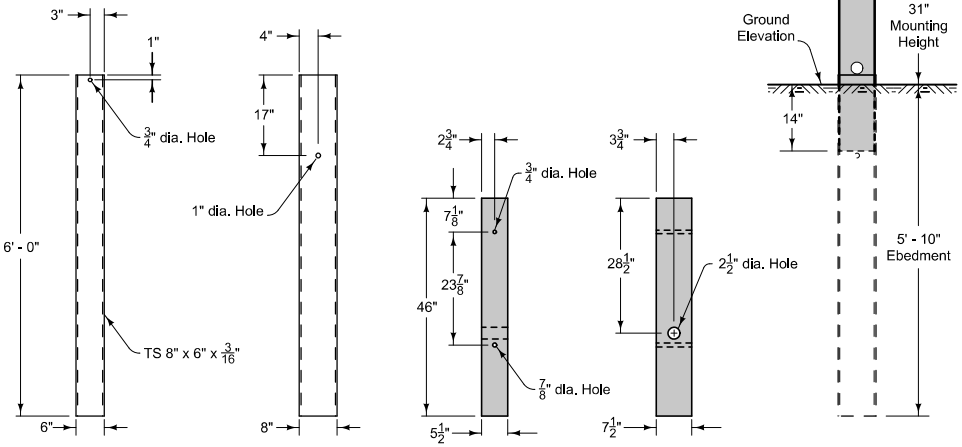
ELEVATION

END SECTION W-BEAM RAIL

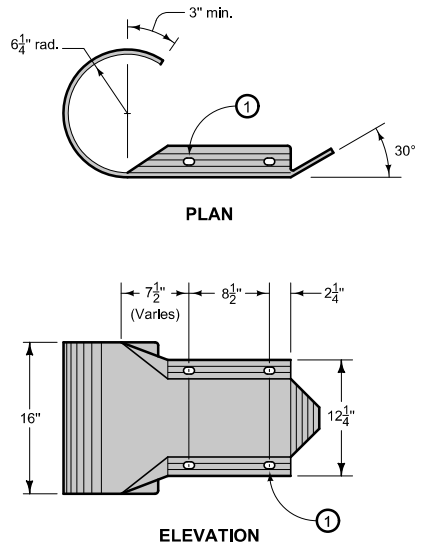


ELEVATION

INSTALLATION



BCT POST ASSEMBLY



ROUNDED W-BEAM END SECTION

1. 29/32" x 1⅛" slots (29/32" x 3" slots acceptable).
2. Refer to BA-200.

Possible Contract Item:
Steel Beam Guardrail End Anchor, W-Beam

Materials included in the Contract Item:
- (1) 12'-6" End Section W-Beam Rail
- (2) Foundation Tube Assemblies
- (2) BCT Wood Posts
- (1) Rounded W-Beam End Section
- (1) Cable Anchor Bracket
- (1) BCT Cable Anchor Assembly
- (1) Ground Strut Assembly
- (1) Pipe Sleeve
- (1) Bearing Plate
- (1) W-Beam Post (wood or steel - match remainder of installation)
- (1) W-Beam Blockout

Approved bolts, nuts, and washers

Iowa Department of Transportation

REVISION: 1 | 10-18-11

STANDARD ROAD PLAN

BA-203

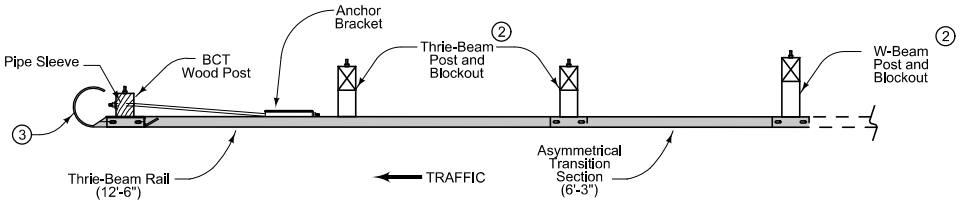
SHEET 1 of 1

REVISIONS: Changed to three post design and added materials included in the Contract Item.

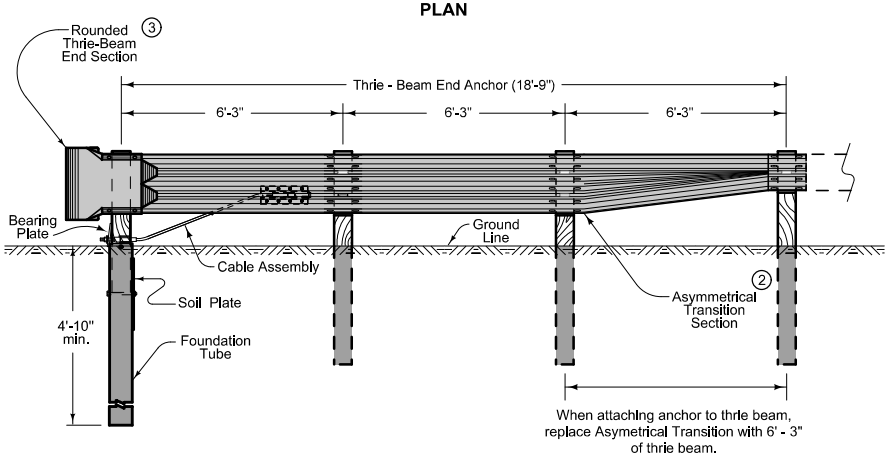
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL W-BEAM END ANCHOR

DESIGNER INFO



PLAN



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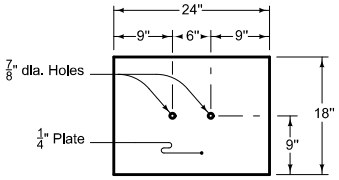
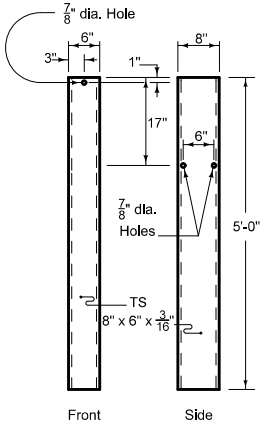
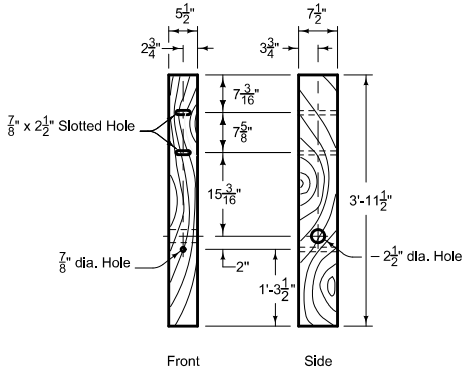


SOIL PLATE

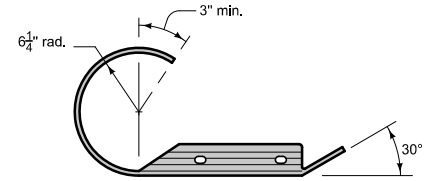
1. Slotted holes $\frac{29}{32}$" x $1\frac{1}{8}$" long.
2. Refer to **BA-200**.
3. Cover entire face of end section with alternating black and yellow striped adhesive sheeting. Stripes shall be approximately 3 inches in width and shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the end anchor. Yellow stripes shall meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.



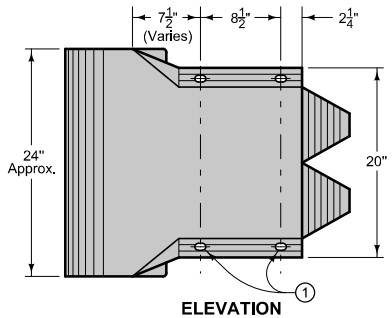
FOUNDATION TUBE



BCT WOOD POST



PLAN



ELEVATION

ROUNDED THRIE-BEAM END SECTION

Possible Contract Item:
Steel Beam Guardrail End Anchor, Thrie-Beam

Materials included in the Contract Item:
- (1) 12'-6" Thrie-Beam rail section
- (1) Asymmetrical Transition Section
- (2) Thrie-Beam posts (wood or steel - match remainder of installation)
- (1) W-Beam post (wood or steel - match remainder of installation)
- (1) W-Beam blockout
- (2) Thrie-Beam blockouts
- (1) BCT Wood Post
- (1) Rounded Thrie-Beam End Section
- (1) Anchor Bracket Assembly
- (1) Cable Assembly
- (1) Foundation Tube Assembly with Soil Plate
- (1) Pipe Sleeve

Approved bolts, nuts, and washers

Iowa Department of Transportation

REVISION
1 | 10-18-11

STANDARD ROAD PLAN

BA-204

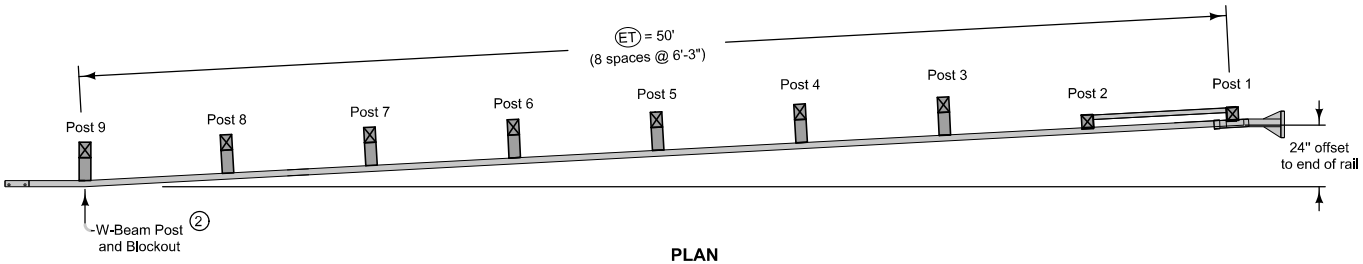
SHEET 1 of 1

REVISIONS: Changed block out size from 19" to 22". Clarified notes. Modified materials included in Contract Items.

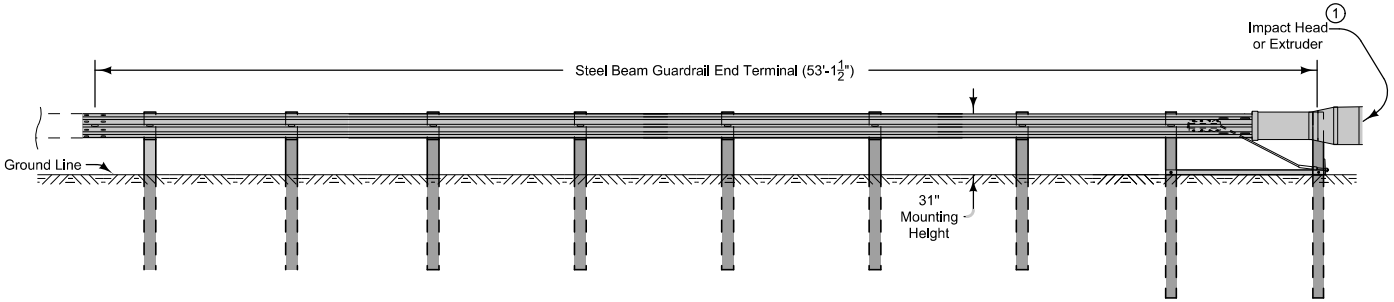
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL THRIE-BEAM END ANCHOR

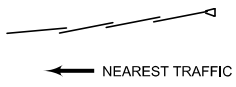
DESIGNER INFO



PLAN



ELEVATION



LAPPING PROCEDURE

Provide the following:

SKT-MGS by Road Systems, Inc.
OR
ET-Plus by Trinity Highway Products, LLC.

Use materials meeting the respective manufacturer's specifications. Install end terminals in accordance with the manufacturer's recommendations.

Note: at the Contractor's option, and at no additional cost to the Contracting Authority, alternate post designs developed by the manufacturer and accepted by the FHWA for use within the end terminal may be substituted for the wood post design shown. When such a substitution is made, provide the Engineer with three copies of the most current installation and maintenance manual for the alternate design.

(1) Cover entire face of impact head or extruder with alternating black and yellow striped adhesive sheeting.

- Stripes are approximately 3 inches wide and slope down at a 45 degree angle toward the side on which traffic is to pass the end terminal.

- Yellow stripes meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.

(2) Refer to BA-200.

Possible Contract Item:
Steel Beam Guardrail End Terminal

Materials included in the Contract Item:
W-Beam Guardrail Sections totaling 53'-1½"
(1) Impact Head or Extruder
(1) Cable Anchor Bracket/Box
(1) BCT Cable Anchor Assembly
(1) BCT Bearing Plate
(1) Ground Strut or Angle Strut
(8) End Terminal Post Assemblies (wood or steel option)
(6) End Terminal Blockouts (as required by manufacturer)
(2) Foundation Tubes (wood post option)
(1) BCT Post Sleeve (wood post option)
(1) W-Beam Post (wood or steel - match remainder of installation.
(1) W-Beam Blockout
Approved Bolts, Nuts, Washers, and Screws

Iowa Department of Transportation

REVISION	
1	10-18-11

STANDARD ROAD PLAN

BA-205

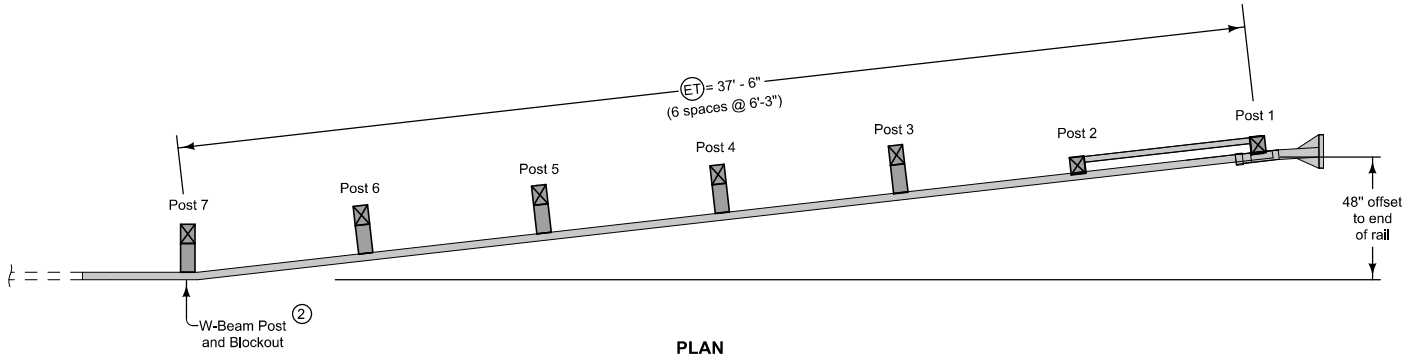
SHEET 1 of 1

REVISIONS: Modified Materials included in the Contract Item. Clarified drawings and notes.

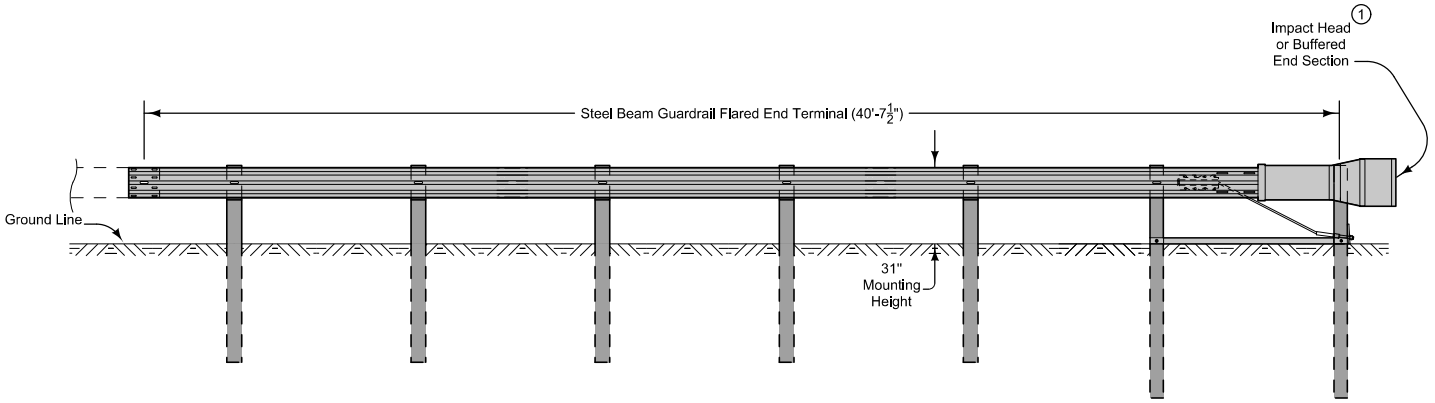
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL END TERMINAL

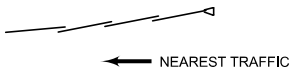
DESIGNER INFO



PLAN



ELEVATION



LAPPING PROCEDURE

Provide the following:

FLEAT-MGS by Road Systems, Inc.
OR
SRT-31 by Trinity Highway Products, LLC.

Use materials meeting the respective manufacturer's specifications. Install end terminals in accordance with the manufacturer's recommendations.

Note: at the Contractor's option, and at no additional cost to the Contracting Authority, alternate post designs developed by the manufacturer and accepted by the FHWA for use within the end terminal may be substituted for the wood post design shown. When such a substitution is made, provide the Engineer with three copies of the most current installation and maintenance manual for the alternate design.

① Cover entire face of impact head or buffered end section with alternating black and yellow striped adhesive sheeting.

-Stripes are approximately 3 inches wide and slope down at a 45 degree angle toward the side on which traffic is to pass the end terminal.

-Yellow stripes meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.

② Refer to BA-200.

Possible Contract Item:
Steel Beam Guardrail Flared End Terminal

Materials included in the Contract Item:

W-Beam Guardrail Sections totaling 40'-7½"
(1) Impact Head or Buffered End Section
(1) Cable Anchor Bracket/Box
(1) BCT Cable Anchor Assembly
(1) BCT Bearing Plate
(1) Ground Strut or Angle Strut
(6) End Terminal Post Assemblies (wood or steel option)
(4) End Terminal Blockouts (as required by manufacturer)
(2) Foundation Tubes (wood post option)
(1) BCT Post Sleeve (wood post option)
(1) W-Beam Post (wood or steel - match remainder of installation.
(1) W-Beam Blockout
Approved Bolts, Nuts, Washers, and Screws

Iowa Department of Transportation

REVISION	
1	10-18-11

STANDARD ROAD PLAN

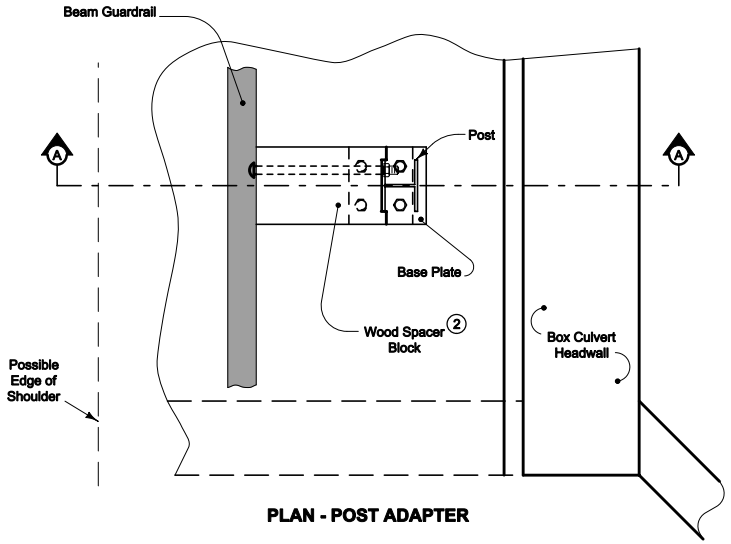
BA-206

SHEET 1 of 1

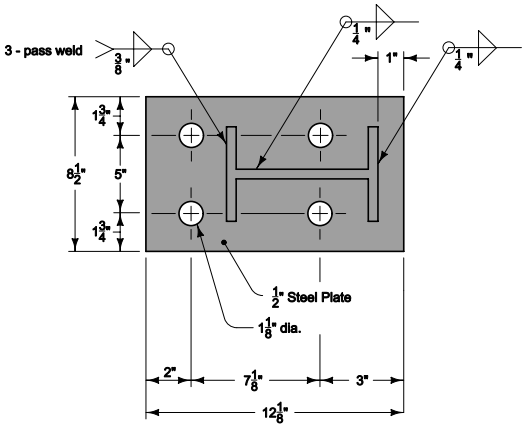
REVISIONS: Reworded Note 1. Clarified drawings. Modified materials in contract items.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

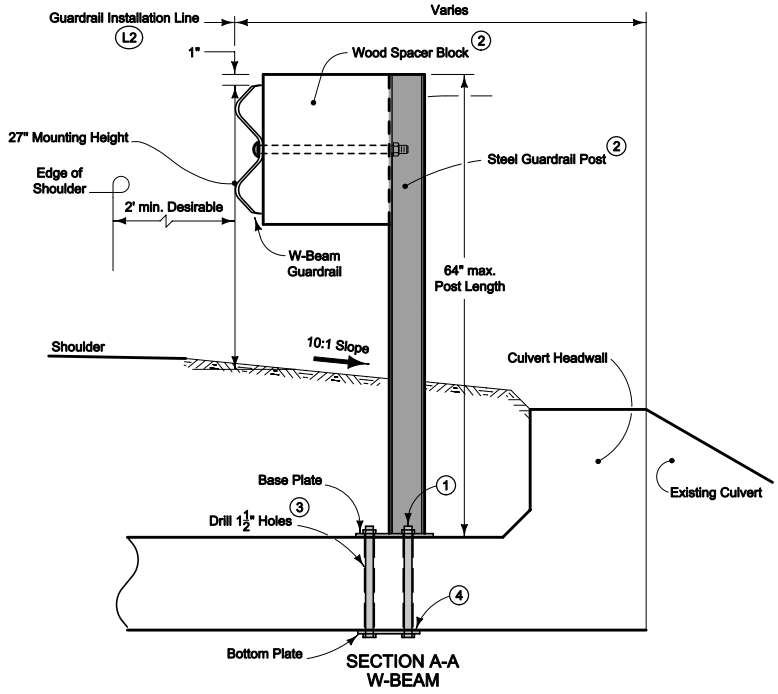
STEEL BEAM GUARDRAIL FLARED END TERMINAL FOR CABLE CONNECTION



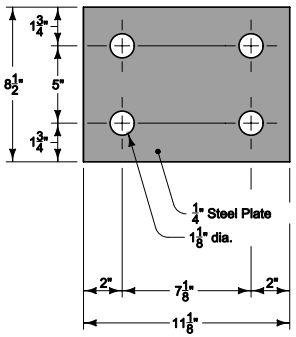
PLAN - POST ADAPTER



BASE PLATE AND POST



SECTION A-A
W-BEAM



BOTTOM PLATE

Provide steel guardrail posts and adapter unit on top of box culverts or similar situations when wood post embedments are not possible.

Contractor may elect to fabricate posts using 6 foot post and adjusting in the field as follows:

A. Saw off top end to proper length and drill new holes.
B. Treat the sawed end and drilled holes with two coats of organic zinc rich paint containing at least 94% zinc dust. Ensure the surfaces to be treated are free of oil residues due to sawing or drilling.

The price bid for "Steal Beam Guardrail, Post Adapter Unit, BA-210" is full compensation for furnishing, assembling, and installing the adapter unit as shown. Quantity shown in the contract documents.

(1) Bolt length equals slab thickness plus 2 inches. Field clip topside washers if necessary to clear weld.

(2) See BA-200 for steel guardrail post and blockout details.

(3) Drill holes using equipment designed to cut through concrete and reinforcing steel.

(4) Grout spalling before placement of bottom plate using a grout consisting of equal parts by weight of Portland cement and concrete sand, mixed with sufficient water to form a paste.

Possible Contract Items:
Steel Beam Guardrail
Steel Beam Guardrail, Post Adapter Unit, BA-210

Incidental to Adapter Unit:
1 - 12" x 8 1/2" x 1/2" ASTM A36 Steel Plate
1 - 11" x 8 1/2" x 1/4" ASTM A36 Steel Plate
4 - 1" ASTM A307 Hex Head bolts with one nut and two washers per bolt

Incidental to Steel Beam Guardrail:
W6 x 9 or W6 x 8.5 Steel Guardrail Post (variable length)
6" x 8" Wood Spacer Block (14" or 21 1/2" length)

Possible Tabulation:
108-8B

Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

BA-210

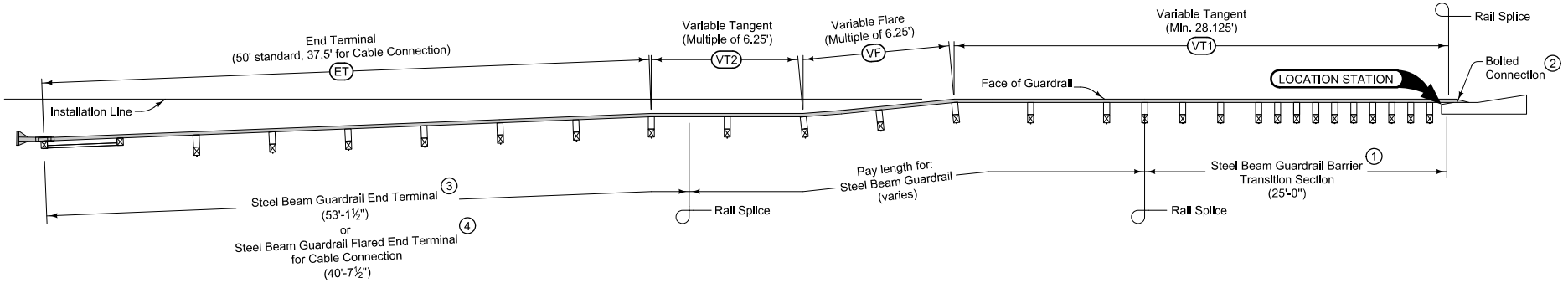
SHEET 1 of 1

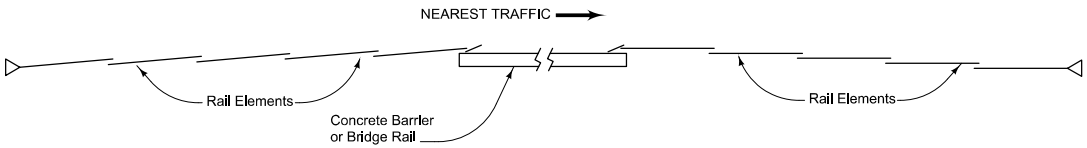
REVISIONS: New. Replaces RE-37.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

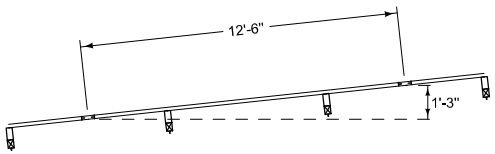
GUARDRAIL POST ADAPTER UNIT

DESIGNER INFO





LAPPING PROCEDURE



VARIABLE FLARE

Install delineators and object markers according to **SI-211**.

For grading requirements, see **EW-301**.

For general guardrail details, see **BA-200**.

1. See **BA-201**.
2. See **BA-202** for connections to concrete barriers and bridge end posts.
3. See **BA-205**.
4. See **BA-206**.

Possible Contract Items:
- Steel Beam Guardrail
- Steel Beam Guardrail Barrier Transition Section
- Steel Beam Guardrail End Anchor, Bolted
- Steel Beam Guardrail End Terminal

Possible Tabulation:
108-8A

Iowa Department of Transportation

REVISION 2 10-18-11

STANDARD ROAD PLAN

BA-250

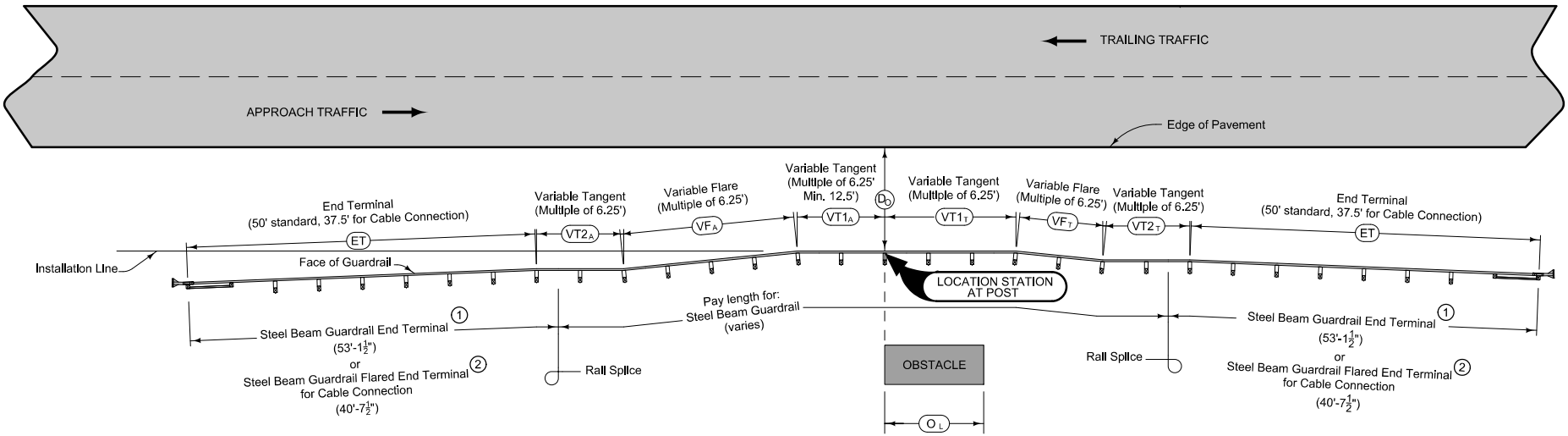
SHEET 1 of 1

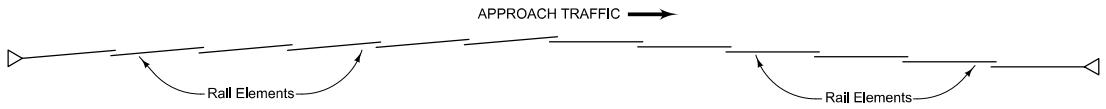
REVISIONS: Updated reference to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

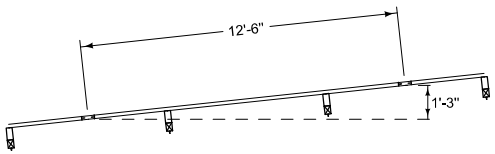
STEEL BEAM GUARDRAIL INSTALLATION AT CONCRETE BARRIER OR BRIDGE END POST

DESIGNER INFO





LAPPING PROCEDURE



VARIABLE FLARE

Install delineators and object markers according to **SI-211**.

For grading requirements, see **EW-301**.

For general guardrail details, see **BA-200**.

1 See **BA-205**.

2 See **BA-206**.

Possible Contract Items:
Steel Beam Guardrail
Steel Beam Guardrail End Terminal

Possible Tabulation:
108-8B

Iowa Department of Transportation

REVISION
2 | 10-18-11

STANDARD ROAD PLAN

BA-251

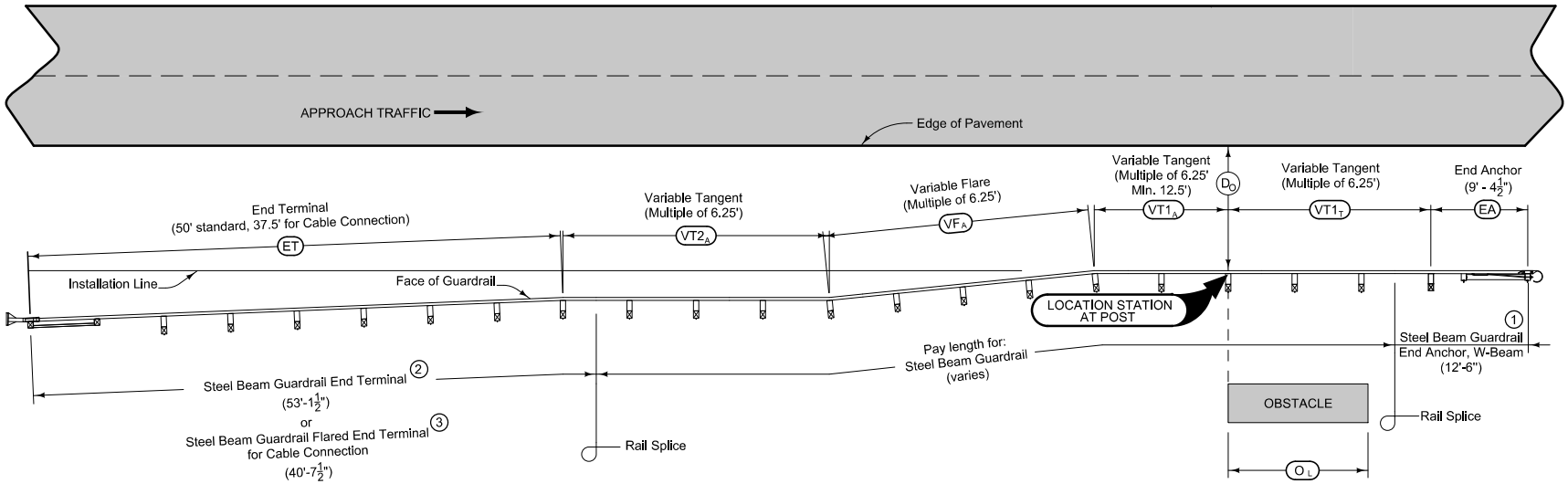
SHEET 1 of 1

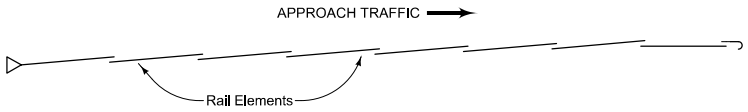
REVISIONS: Update reference to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

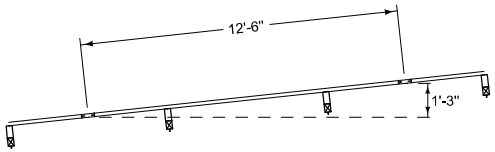
STEEL BEAM GUARDRAIL INSTALLATION AT SIDE OBSTACLE (TWO-WAY PROTECTION)

DESIGNER INFO





LAPPING PROCEDURE



VARIABLE FLARE

Install delineators and object markers according to **SI-211**.

For grading requirements, see **EW-301**.

For general guardrail details, see **BA-200**.

1 See **BA-203**.

2 See **BA-205**.

3 See **BA-206**.

Possible Contract Items:
Steel Beam Guardrail
Steel Beam Guardrail End Anchor, W-Beam
Steel Beam Guardrail End Terminal

Possible Tabulation:
108-8C

Iowa Department of Transportation

REVISION
3 | 10-18-11

STANDARD ROAD PLAN

BA-252

SHEET 1 of 1

REVISIONS: Changed circle note under ET from 1 to 2. Updated standard reference. Modified End Anchor. Modified new Possible Tab.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL INSTALLATION AT SIDE OBSTACLE (ONE-WAY PROTECTION)

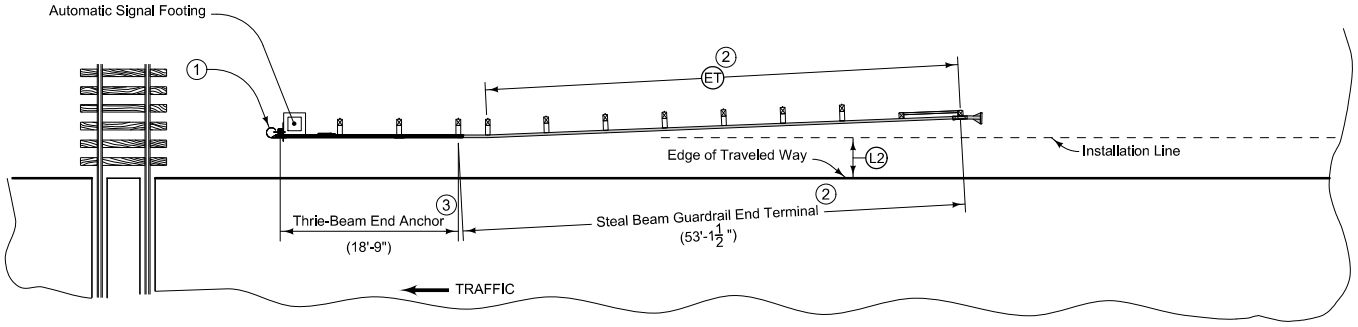
For grading requirements, refer to **EW-301**.

For additional guardrail requirements, refer to **BA-200**.

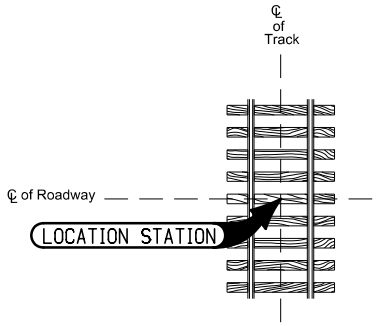
(1) Cover entire face of terminal section with alternating black and yellow striped adhesive sheeting. Stripes shall be approximately 3 inches in width and shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the end anchorage. Yellow stripes shall meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.

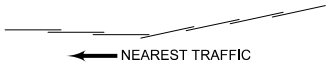
(2) Refer to **BA-205**.

(3) Refer to **BA-204**.



PLAN





LAPPING PROCEDURE

Possible Contract Items:
Steel Beam Guardrail End Anchor, Thrie-Beam
Steel Beam Guardrail End Terminal

Possible Tabulation:
108-8D

Iowa Department of Transportation

REVISION
1 | 10-18-11

STANDARD ROAD PLAN

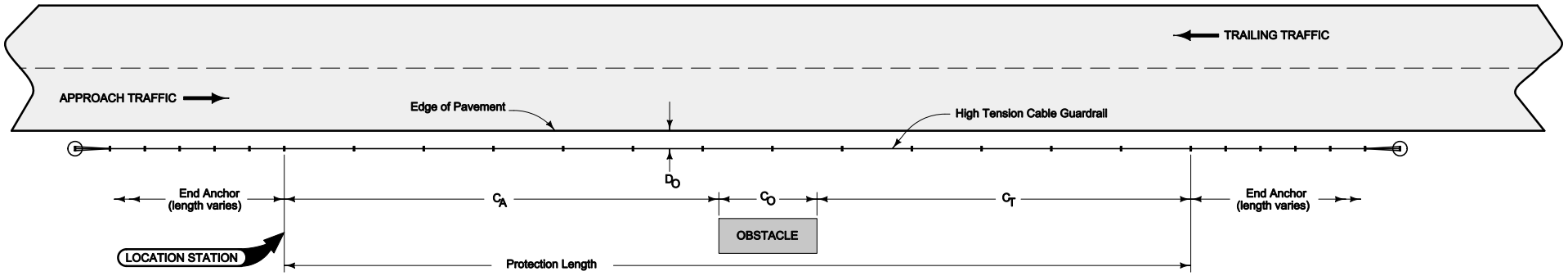
BA-253

SHEET 1 of 1

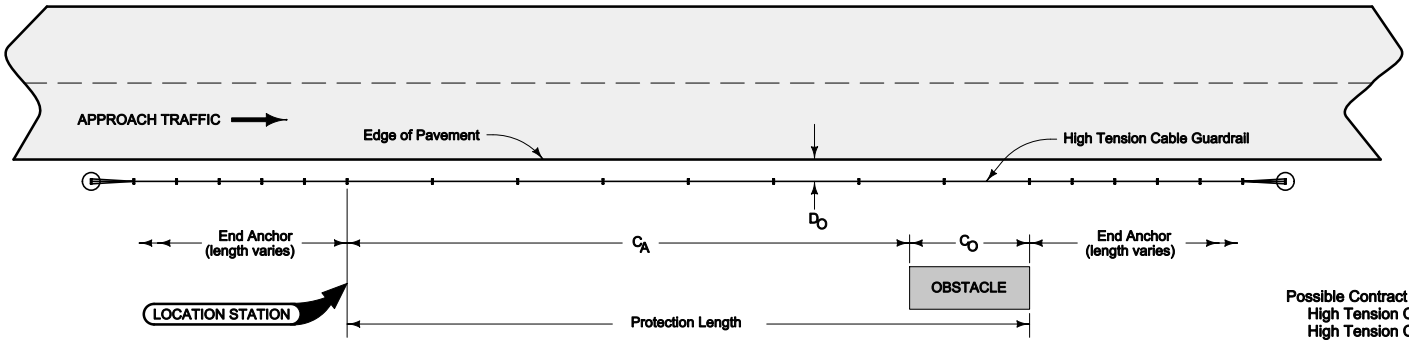
REVISIONS: Updated references to renamed standards. Modified dimensioning on plan view.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL INSTALLATION AT RAILROAD SIGNAL



ROADSIDE OBSTACLE, TWO-WAY PROTECTION



ROADSIDE OBSTACLE, ONE-WAY PROTECTION

Possible Contract Items:
- High Tension Cable Guardrail
- High Tension Cable Guardrail, End Anchor

Possible Tabulation:
- 108-9A

Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

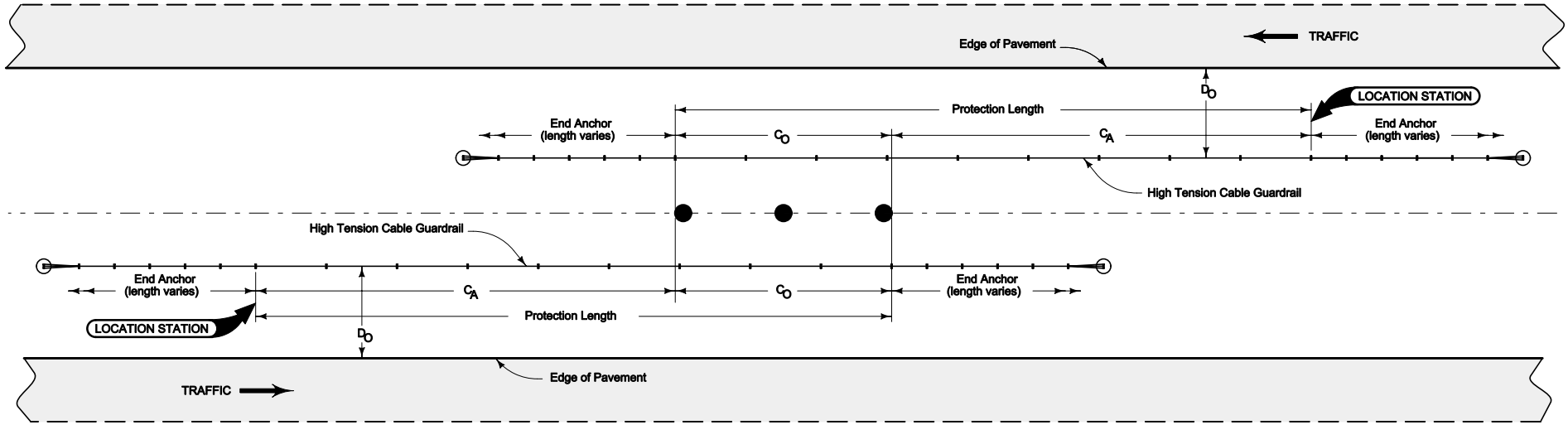
BA-351

SHEET 1 of 2

REVISIONS: New. Replaces RE-88.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

HIGH TENSION CABLE GUARDRAIL



MEDIAN OBSTACLE PROTECTION

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

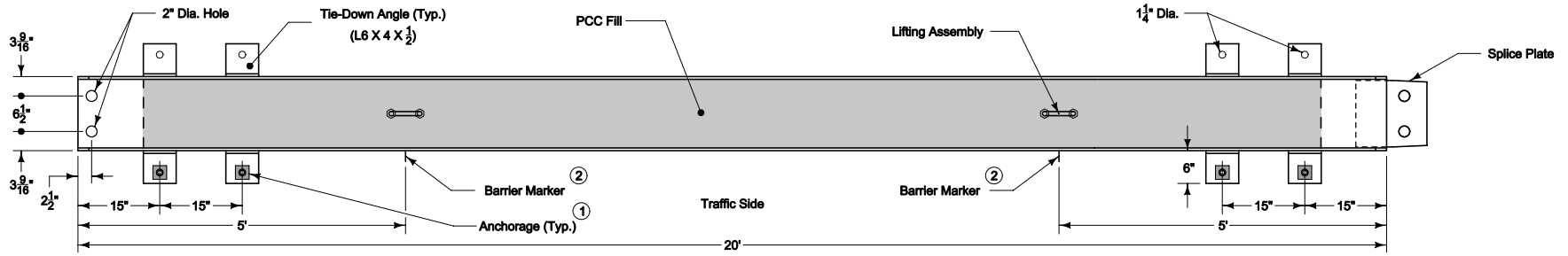
BA-351

SHEET 2 of 2

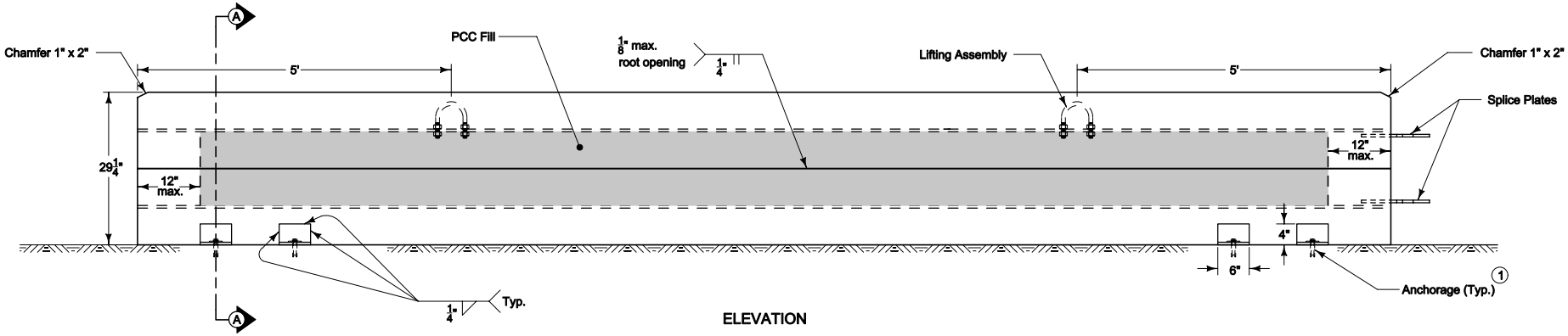
REVISIONS: New. Replaces RE-88.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

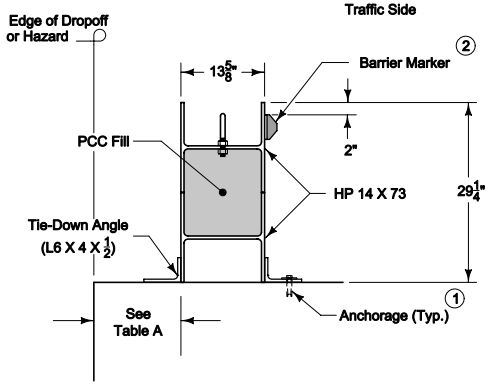
HIGH TENSION CABLE GUARDRAIL



PLAN



ELEVATION



SECTION A-A

Use steel meeting the requirements of ASTM A36.

Use an Iowa DOT Construction Specification mix or a commercial ready-mix with a minimum f_c' = 2500 psi. Deposit by a method approved by the Engineer. Limits of the fill shown are approximate and may be rough or slumped depending on the method of bulkheading.

Provide for an approved monitoring schedule with a person on call and available 24 hours a day, each day of the week, to realign barrier which has been struck. Initiate within one hour of notification of need.

Unless stated otherwise, the barrier rail sections remain the property of the Contractor. Remove from the site upon completion of work.

① Anchorage for use on bridge decks or PCC pavement only. When installed in one-way traffic situations use and install anchorage on traffic side of barrier only. Anchorage consisting of a washer plate as shown, a 3/4" dia. x 1 3/4" long ASTM A307 Grade B heavy hex bolt, and a 3/4" Red Head Multi-Set II drop-in anchor (or approved equivalent). Following removal of anchorage, fill all holes with an approved non-shrink grout. The cost of anchorage, when required, is to be in the price bid for "Temporary Barrier Rail, Steel."

② Furnish and install Barrier Markers. Place Markers as shown on this sheet and attach to the barrier in a manner approved by the manufacturer. Place Markers to face oncoming traffic. Use a color to match the adjacent edge line. Maintain the markers and promptly repair or replace damaged or missing units. Include all costs for furnishing, installing and maintaining markers in the price bid for "Temporary Barrier Rail, Steel."

Possible Contract Item:
Temporary Barrier Rail, Steel

Possible Tabulation:
108-33

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

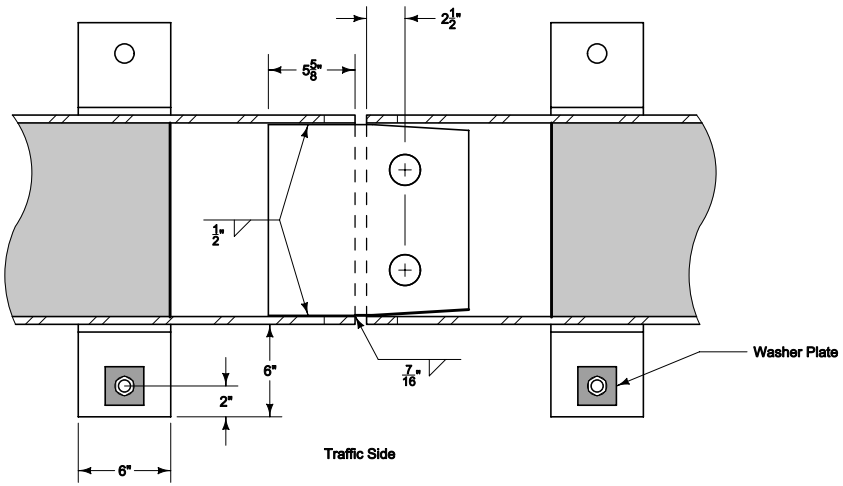
BA-400

SHEET 1 of 2

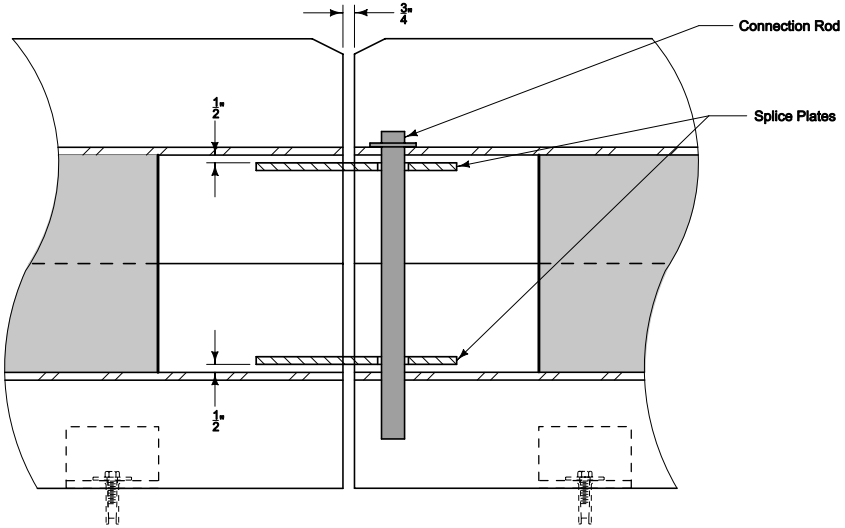
REVISIONS: New. Replaces RE-89.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

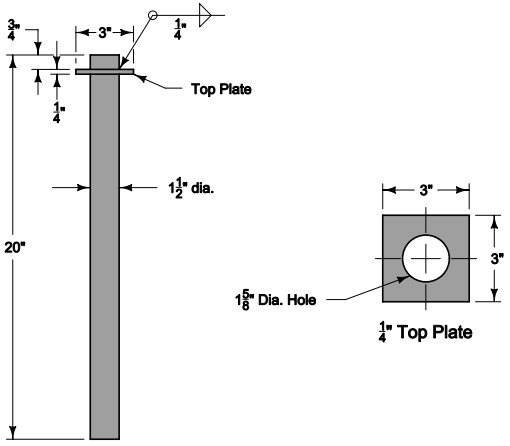
TEMPORARY BARRIER RAIL (STEEL)



BARRIER CONNECTION
TOP SECTION

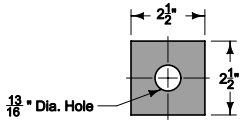


BARRIER CONNECTION
SIDE SECTION

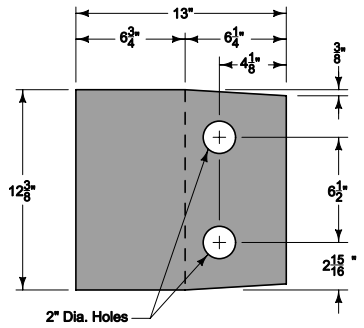


Connection Rod

CONNECTION ROD ASSEMBLY



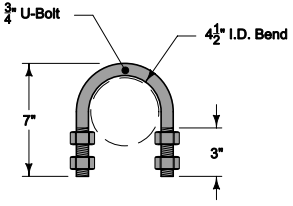
3/16" WASHER PLATE



1/2" SPLICE PLATE

TABLE A
ANCHORAGE REQUIREMENTS

Hazard	Dropoff	Min. offset where TBR is Unanchored	Min. offset where TBR is Anchored
Dropoff from pavement	≤ 24"	10"	6"
	> 24"	18"	6"
Dropoff from bridge	≤ 3"	1"	N/A
	> 3"	18"	6"
Fixed vertical object	N/A	10"	6"



LIFTING ASSEMBLY

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

BA-400

SHEET 2 of 2

REVISIONS: New. Replaces RE-89.

Deanna Maifield
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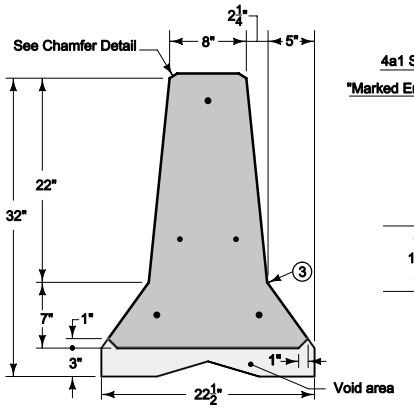
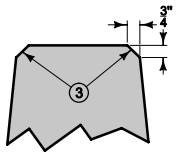
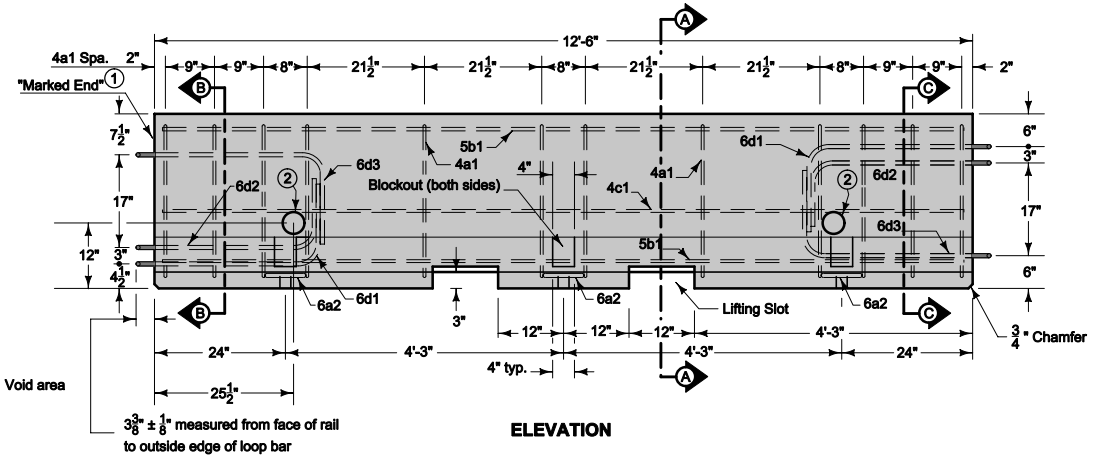
TEMPORARY BARRIER RAIL (STEEL)



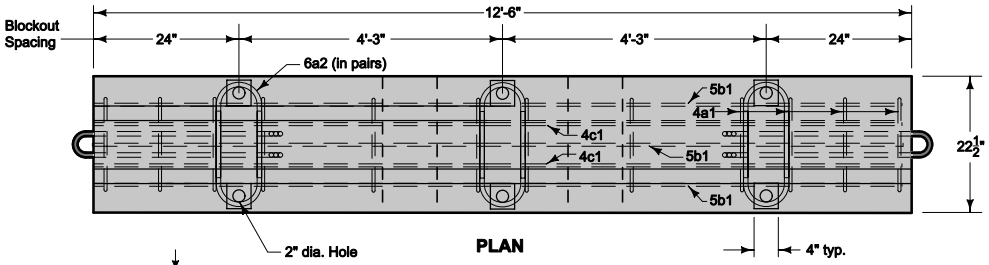
SECTION A-A
Lifting Slot



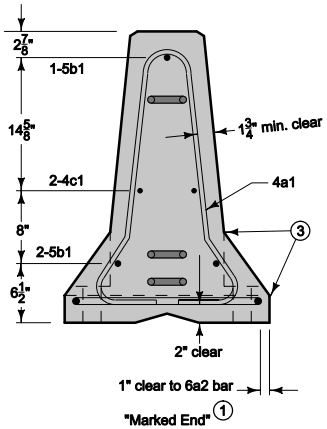
CHAMFER DETAIL



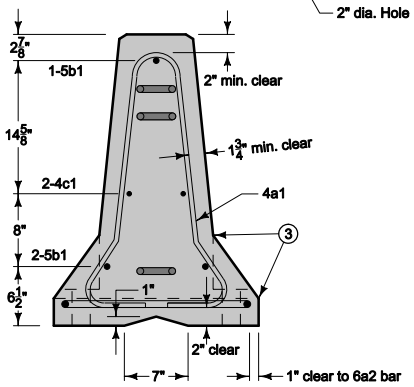
ELEVATION



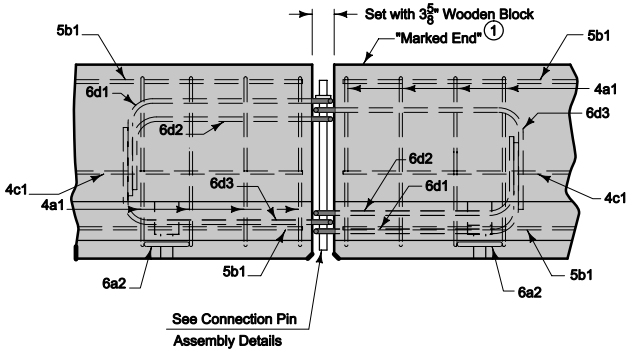
PLAN



SECTION B-B
Stirrup Placement



SECTION C-C
Stirrup Placement



BARRIER CONNECTION
(Elevation)

For loop bars 6d1, 6d2, and 6d3, use ¾" smooth steel bars with a minimum yield strength of 60 ksi, a tensile strength of not less than 1.25 times the yield strength but a minimum of 80 ksi, a minimum 14% elongation in 8 inches, and passing a 180 degree bend test using a 3½" pin bend diameter.

Install loops within ⅛" of the plan dimensions.

Use Grade 60, ASTM A615 for all other reinforcements. Do not lift or move using loop bars 6d1, 6d2 or 6d3.

Provide for an approved monitoring schedule with a person on call and available 24 hours a day, each day of the week, to realign barrier which has been struck. Initiate service within one hour of notification of need.

Unless stated otherwise in the plans, the barrier rail sections shall be the property of the Contractor. Remove from the site upon completion of work.

Following removal of anchorage, fill all holes with an approved non-shrink grout.

Tapered end section is not designed for use within 30 feet of traffic on facilities with speed limits 55 mph or greater, nor within 10 feet of traffic on facilities with speed limits 40 mph to 50 mph.

Estimated quantity of concrete for one taper section is 0.6 cubic yards.

Include the cost of anchorage, when required in the price bid for "Temporary Barrier Rail, Concrete".

(1) Permanently mark one end of each rail section with manufacturing information. The "marked end" is that end of the barrier having one loop bar at the top and two loop bars at the bottom. Include the following information in the marking:

- Manufacturer Identification
- Date Manufactured (Month and Year)
- BA-401 Type A

(2) Lifting hole. 4 inch diameter PVC Pipe.

(3) 1 inch radius allowed.

Possible Contract Item:
Temporary Barrier Rail, Concrete

Possible Tabulation:
108-33

Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

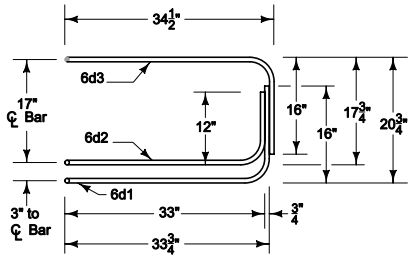
BA-401

SHEET 1 of 4

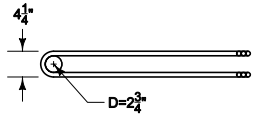
REVISIONS: New. Replaces RE-71.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

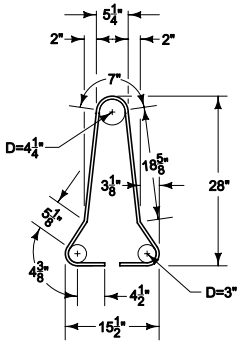
TEMPORARY BARRIER RAIL (PRECAST CONCRETE)



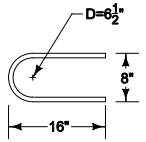
Elevation
(Marked end shown, invert for other end.)



Plan
6d1, 6d2, 6d3

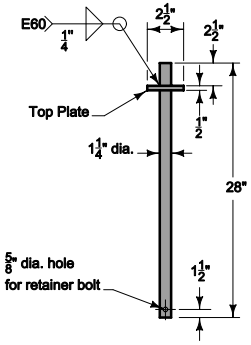


4a1

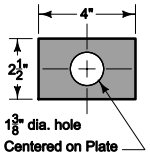


6a2

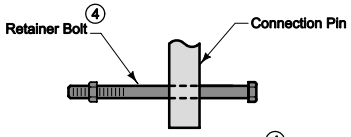
BENT BAR DETAILS
(Dimensions are out to out of bars unless otherwise noted.)



CONNECTION PIN
(A36 Steel - 10.9 lbs. each)

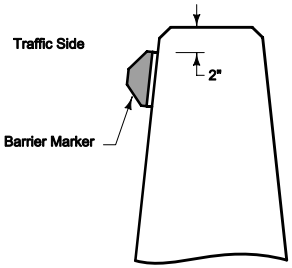


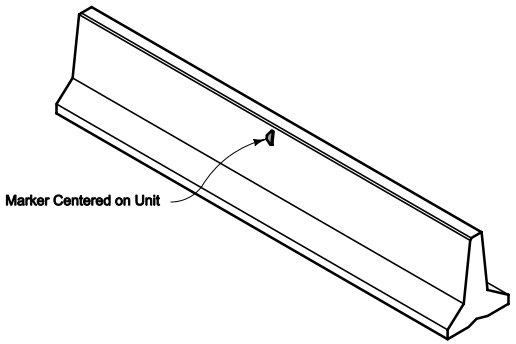
½" Top Plate



RETAINER BOLT & NUT
4
½" dia. bolt & nut
(ASTM A490, Grade 8)

CONNECTION PIN ASSEMBLY





5

BARRIER MARKER PLACEMENT

4 Retainer bolt & nut are required for connections with 2-loop barriers (previous designs) or in conjunction with Strap Anchorage.

5 Furnish and install Barrier Markers. Attach to the barrier in a manner approved by the manufacturer. Markers to face oncoming traffic and match the adjacent edge line in color. Maintain the markers and promptly repair or replace any damaged or missing units. Include costs for furnishing, installing and maintaining markers in the price bid for "Temporary Barrier Rail, Concrete."

Per 12'-6" Barrier Section

REINFORCING A615 Gr. 60					
Bar	Bar Size	Shape	No. of Bars	Length Ft.	Weight Lbs.
4a1	4		12	6'-0"	48.1
6a2	6		6	35"	26.3
5b1	5		3	12'-2"	38.1
4c1	4		2	12'-2"	16.3
LOOP ASSEMBLY					
6d1	6		2	8'-5"	25.3
6d2	6		2	7'-7"	22.8
6d3	6		2	8'-6"	25.5

Iowa Department of Transportation

REVISION: New 04-20-10

STANDARD ROAD PLAN

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SHEET 2 of 4

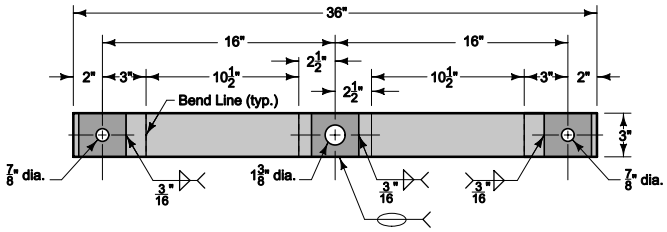
REVISIONS: New. Replaces RE-71.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

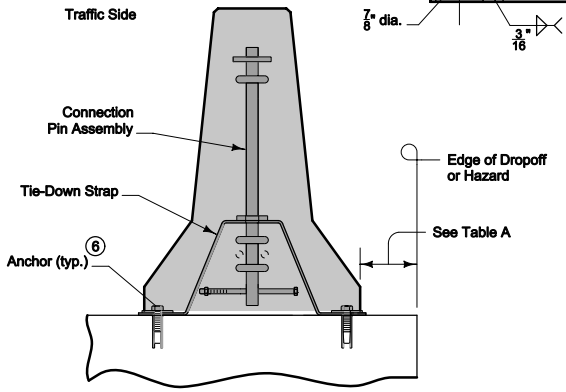
TEMPORARY BARRIER RAIL (PRECAST CONCRETE)

STRAP ANCHORAGE

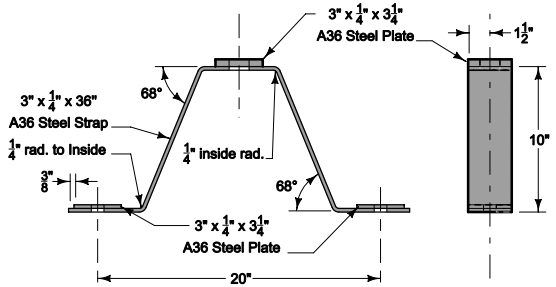
For use on:
Bridge Decks
PCC Pavement



TIE-DOWN STRAP
(before bending)



END VIEW



TIE-DOWN STRAP
(after bending)

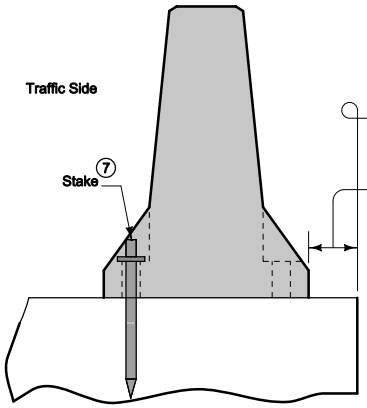
⑥ ¾ inch Red Head Multi-Set II drop-in anchor with ¾" dia. x 1¾" long ASTM A325 structural bolt OR Red Head Large Diameter Tapcon (¾" dia. x 4½" min.) OR Simpson Titen HD Wedge Bolt (¾" dia. x 5" min.).

⑦ 3 stakes required per rail section.

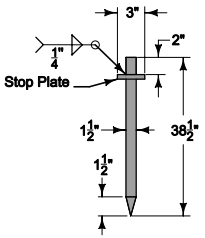
⑧ Pre-drill holes for stakes with 1⅝" core bit.

STAKE ANCHORAGE

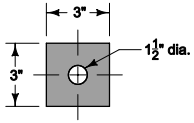
For use on:
HMA Pavement (2" min. thickness)
Composite Pavement ⑧
PCC Pavement ⑧



TYPICAL SECTION



STAKE



½" STOP PLATE

TABLE A
ANCHORAGE REQUIREMENTS

Hazard	Dropoff	Min. offset where TBR is Unanchored	Min. offset where TBR is Anchored
Dropoff from pavement	≤ 24"	24"	6"
	> 24"	45"	6"
Dropoff from bridge	≤ 3"	1"	N/A
	> 3"	45"	6"
Fixed vertical object	N/A	24"	6"

Iowa Department of Transportation

REVISION
New 04-20-10

STANDARD ROAD PLAN

BA-401

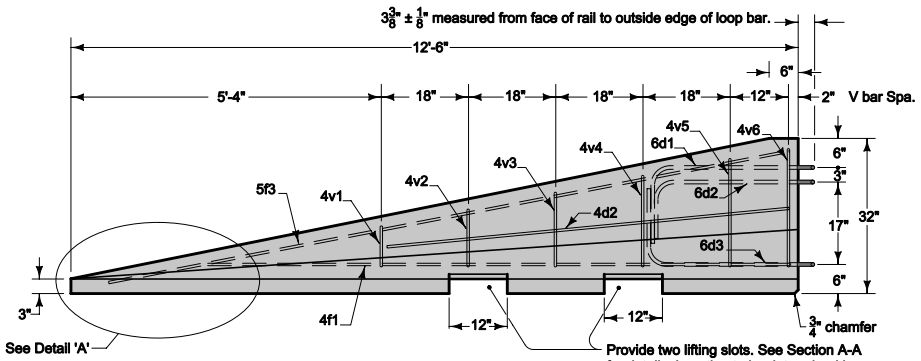
SHEET 3 of 4

REVISIONS: New. Replaces RE-71.

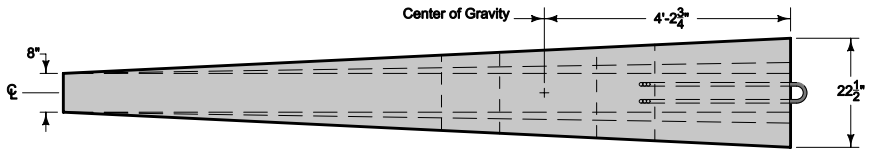
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY BARRIER RAIL (PRECAST CONCRETE)

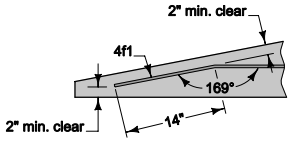
TAPERED END SECTION



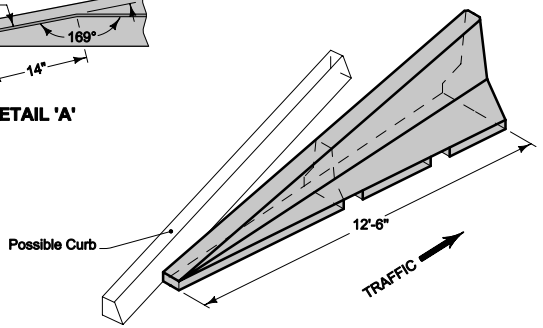
SIDE ELEVATION
(For connection to "marked end" of barrier. Invert loop bars for other end.)



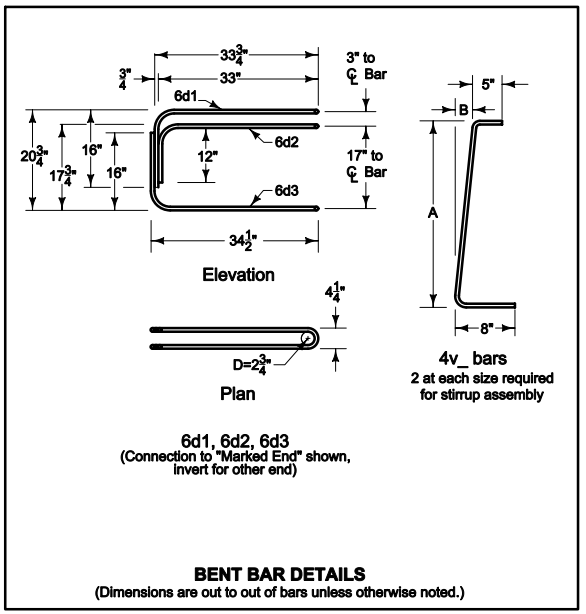
PLAN



DETAIL 'A'

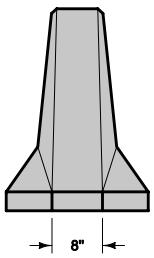


PERSPECTIVE VIEW

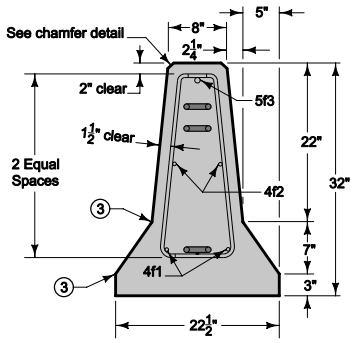


6d1, 6d2, 6d3
(Connection to "Marked End" shown, invert for other end)

BENT BAR DETAILS
(Dimensions are out to out of bars unless otherwise noted.)



FRONT ELEVATION



END SECTION

③ 1 inch radius allowed.

Per 12'-6" Barrier Taper Section

REINFORCING A615 Gr. 60					
Bar	Bar Size	Shape	No. of Bars	Length ft.	Weight lbs.
4v1	4		2	23"	2.6
4v2	4		2	26"	2.9
4v3	4		2	30"	3.3
4v4	4		2	33"	3.7
4v5	4		2	3'-2"	4.2
4v6	4		2	3'-4"	4.5
4f1	4		2	12'-0"	16.0
4f2	4		2	7'-6"	10.0
5f3	5		1	11'-9"	12.3
LOOP ASSEMBLY					
6d1	6		1	8'-5"	12.6
6d2	6		1	7'-7"	11.4
6d3	6		1	8'-6"	12.8

Bar	A	B
4v1	10"	1"
4v2	13"	1¼"
4v3	17"	1⅝"
4v4	20"	1⅞"
4v5	24½"	2⅜"
4v6	27"	2¾"

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

BA-401

SHEET 4 of 4

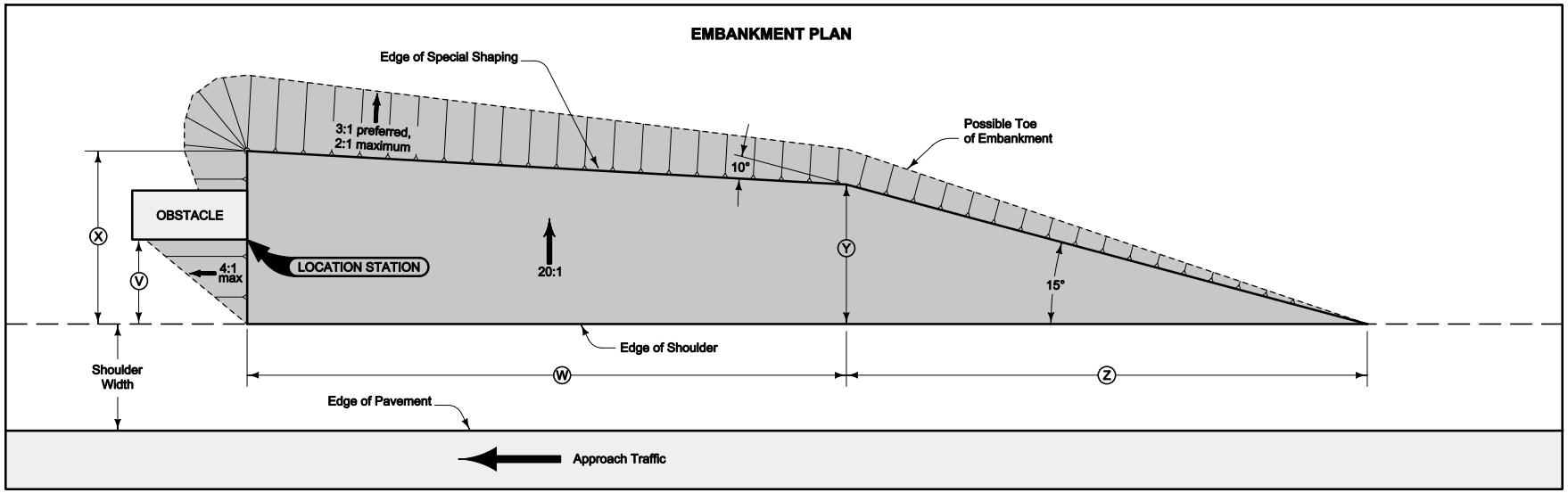
REVISIONS: New. Replaces RE-71.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY BARRIER RAIL (PRECAST CONCRETE)

DESIGNER INFO

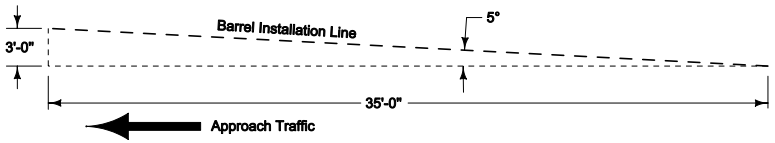
EMBANKMENT PLAN



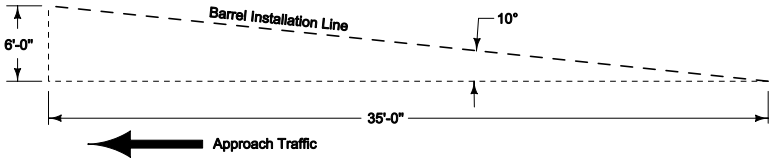
BARREL INSTALLATION LINE LAYOUT

Angle of Barrel Installation Line is measured from a line parallel to roadway centerline.

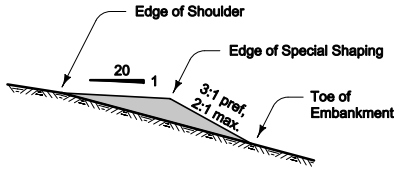
Where distance to obstacle is less than 15 feet from edge of traveled way: ①



Where distance to obstacle is 15 feet or greater from edge of traveled way:



EMBANKMENT TYPICAL SECTION



① For obstacles located within the traveled way where space is limited, Barrel Installation Line may be parallel to roadway centerline. In this case, Ⓨ dimension equals Ⓧ dimension.

Possible Contract Items:
Embankment In Place
Temporary Crash Cushion

Possible Tabulation:
108-30

EMBANKMENT DIMENSIONS

For Obstacle Widths:	Sand Barrel Layouts Required	Ⓦ	Ⓧ	Ⓨ (must not be negative)	Ⓩ
3'-6" or less	1	24'-3"	Ⓥ+5'-3"	Ⓥ+3'-3"	0.268Ⓥ+12'-0"
3'-7" - 10'-7"	2	25'-0"	Ⓥ+12'-3"	Ⓥ+10'-0"	0.268Ⓥ+38'-0"
10'-8" - 17'-9"	3	25'-9"	Ⓥ+19'-3"	Ⓥ+17'-0"	0.268Ⓥ+64'-0"
17'-10" - 32'-3"	4	26'-6"	Ⓥ+26'-3"	Ⓥ+24'-0"	0.268Ⓥ+89'-0"

Iowa Department of Transportation

REVISION: New 04-20-10

STANDARD ROAD PLAN

BA-500

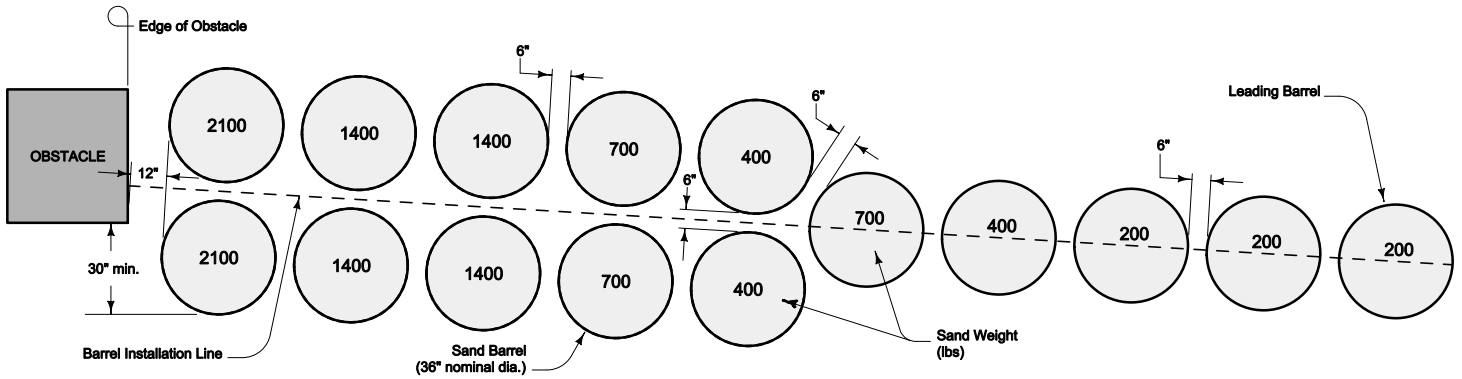
SHEET 1 of 2

REVISIONS: New. Replaces RE-85.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

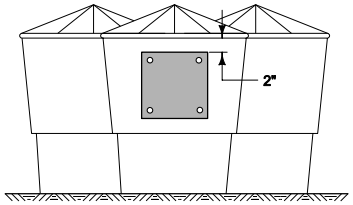
TEMPORARY CRASH CUSHIONS SAND BARREL

SAND BARREL LAYOUT

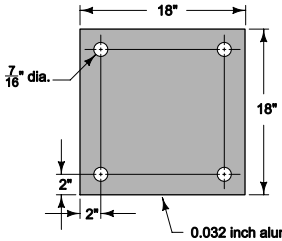


SAND BARREL DELINEATION

Mount marker plate on the leading barrel, centered on the barrel installation line.



MARKER PLATE

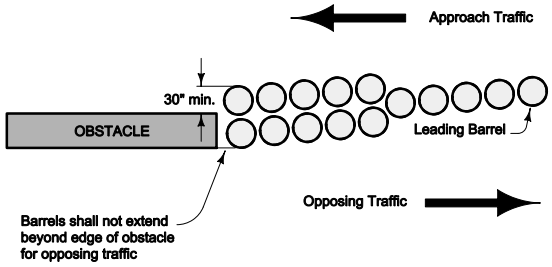


0.032 inch aluminum plate sheeted with yellow Type III or Type IV retroreflective sheeting

Mount plate using four 3/8" bolts, nuts, and washers meeting the requirements of Article 4186.09 for Type A signs.

Self-adhesive sheeting meeting the above requirements may be substituted for the marker plate.

PROTECTING OBSTACLES BETWEEN OPPOSING TRAFFIC

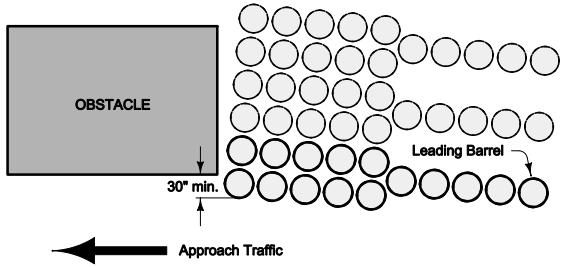


PROTECTING WIDE OBSTACLES

For wide obstacles, repeat sand barrel layout as needed

An installation consisting of multiple sand barrel layouts, similar to the one shown, will be measured as a single crash cushion.

All barrels separated by 6 inches.



Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

BA-500

SHEET 2 of 2

REVISIONS: New. Replaces RE-85.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY CRASH CUSHIONS
SAND BARREL

Erosion Control

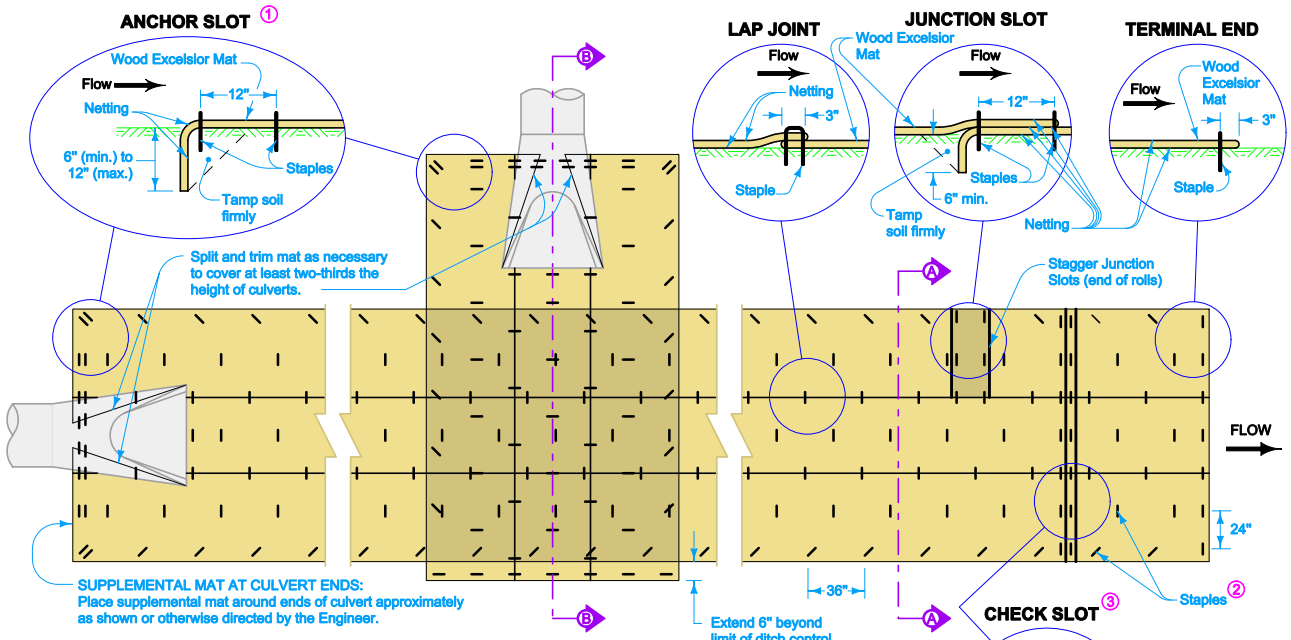
EC

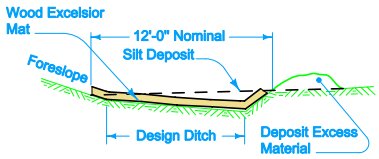
SECTION

Erosion Control

EC

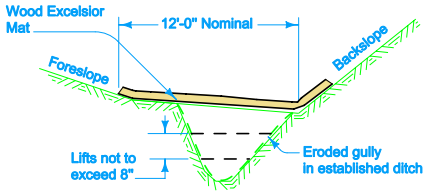
NO.	DATE	TITLE
EC-101	04-20-10	Wood Excelsior Mat for Ditch Protection
EC-102	04-20-10	Sod for Ditch Protection
EC-103	04-20-10	Wood Excelsior Mat for Slope Protection
EC-201	04-20-10	Silt Fence
EC-202	04-17-12	Floating Silt Curtain
EC-501	04-20-10	Trees and Shrubs





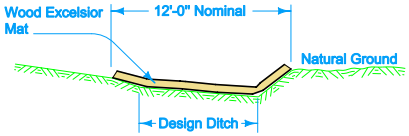
SECTION A-A

Wood excelsior placement for silted area in no ditch section.



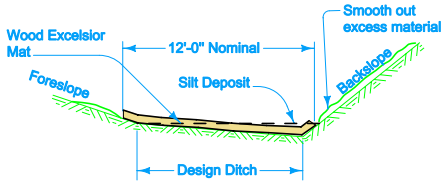
SECTION A-A

Wood excelsior placement for eroded gully.



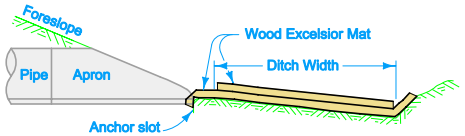
SECTION A-A

Wood excelsior placement where excavation is required for proper installation.

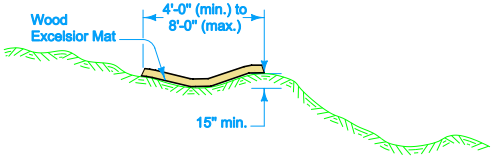


SECTION A-A

Wood excelsior placement for silted ditch in cut.



SECTION B-B



INTERCEPTING DITCH

Provide necessary excavation at locations where silt conditions require shaping of a ditch to provide a proper type of area for installation of wood excelsior mat for special ditch control.

Ensure ground surface adjacent to any channels is shaped to facilitate natural drainage into the protected area.

Use all excavated material to fill low areas, gullies, backslope scours, and otherwise facilitate the free flow of surface water into the channel as directed by the Engineer. Alignment should be smooth and avoid abrupt changes.

① Install anchor slot at the beginning (upstream end) of all wood excelsior mat installations.

② Place staples alternately in rows approximately 24 inches apart. Approximately 30 staples required per square (100 sq. ft.) of wood excelsior mat.

③ Space Check Slots in ditch channel so that one occurs within each 50 feet on slopes of more than 4%.

Iowa Department of Transportation

REVISION: New 04-20-10

STANDARD ROAD PLAN

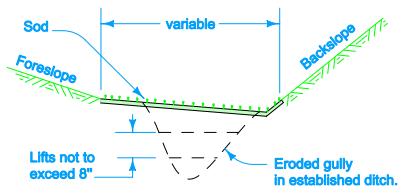
EC-101

SHEET 1 of 1

REVISIONS: New. Replaces RC-5. Removed general notes and wire staple detail.

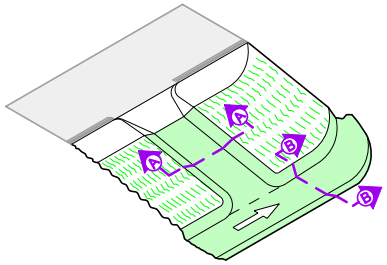
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

WOOD EXCELSIOR MAT FOR DITCH PROTECTION

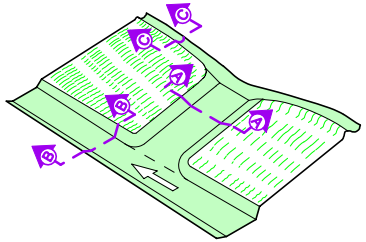


SECTIONS A-A AND B-B

Sod placement for eroded gully.



PERSPECTIVE FORESLOPE FLUME AND ROADWAY DITCH



PERSPECTIVE BACKSLOPE WITH FLUME AND INTERCEPTING DITCH

Through ditches or borrow areas, construct sod channels at the low point. Use all excavated material to fill low areas to facilitate the free flow of surface water into the channel. Alignment should be smooth and avoid abrupt changes.

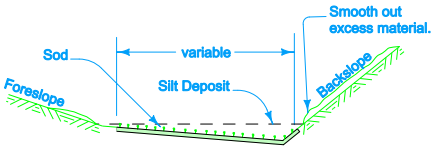
Provide necessary excavation at locations where silt conditions require shaping of a ditch to provide a proper type of area for installation of sod for special ditch control. Dispose excavated material in adjacent area as directed by the Engineer.

At locations where erosion has created gullies in ditches or backslopes, fill and compact gullies in lifts not more than 8-inches thick.

Unless specifically required otherwise by the Engineer, install wire stakes or wood stakes. Stagger wire stakes as shown. Minimum 33 stakes per square. Use wood stakes in sod flumes when designated by the Engineer. When directed by the Engineer, longer stakes may be required for certain soil conditions to properly hold sod in place.

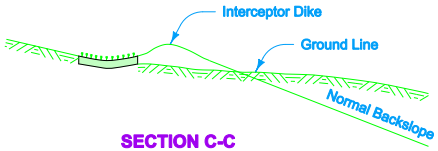
Work for providing proper ditches will not be paid for directly but is incidental to other work on the project.

Shaping and grading work necessary to prepare the ground for sodding adjacent to concrete surfaces will not be paid for separately but is incidental to other work on the project. Such grading and shaping may include the removal and disposal of excess earth, as directed by the Engineer, in order to obtain satisfactory drainage and appearance for the finished work.



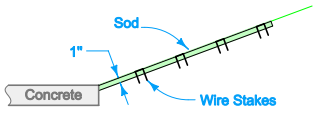
SECTION B-B

Sod placement for silted ditch in cut.



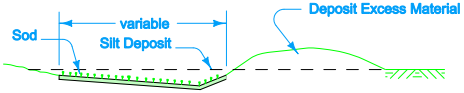
SECTION C-C

Sod placement on Interceptor Ditch



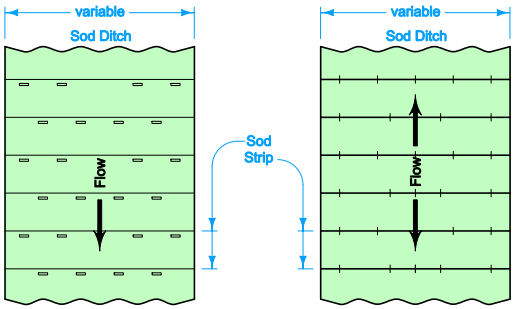
Ground surface shall be graded 1" below the edge of concrete before sod is placed.

CASE 1
NATURAL GROUND SLOPES TOWARD CONCRETE



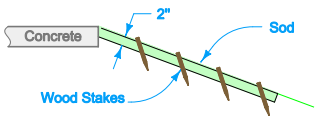
SECTION B-B

Sod placement for silted area in no-ditch section.



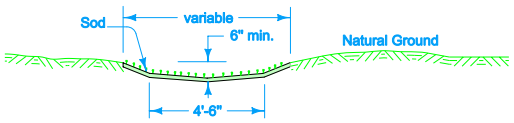
4 Wood Stakes per row, staggered in rows

5 Wire Stakes per row, staggered in rows



Grade ground surface 2" below the edge of concrete before sod is placed.

CASE 2
NATURAL GROUND SLOPES AWAY FROM CONCRETE

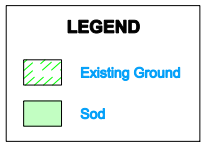


SECTION A-A

Sod placement on slopes where excavation is required for proper installation of sod.

WOOD STAKES **WIRE STAKES**

STAKING FOR SOD CHANNELS



Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

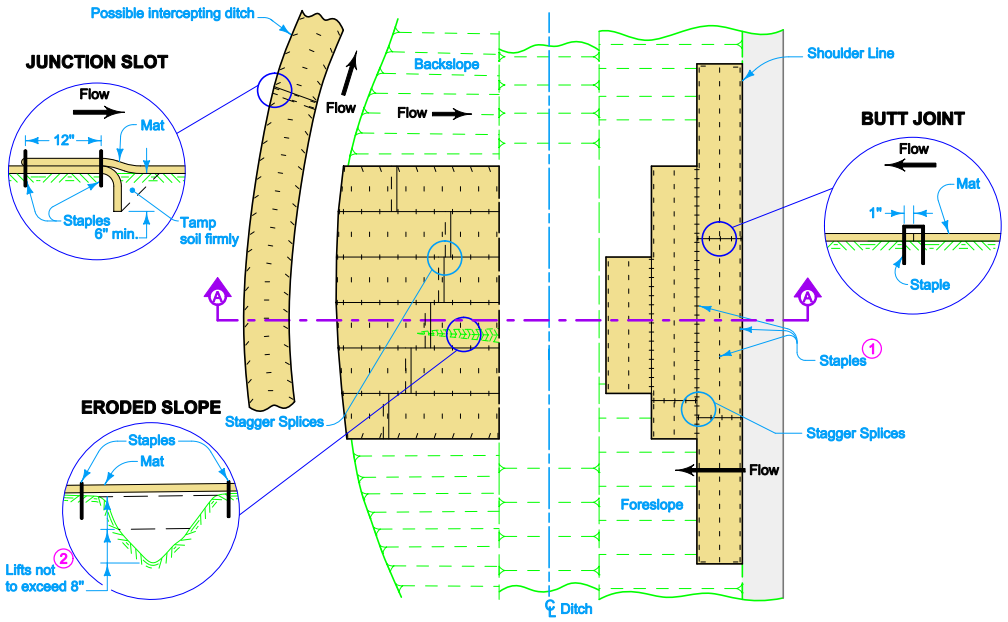
EC-102

SHEET 1 of 1

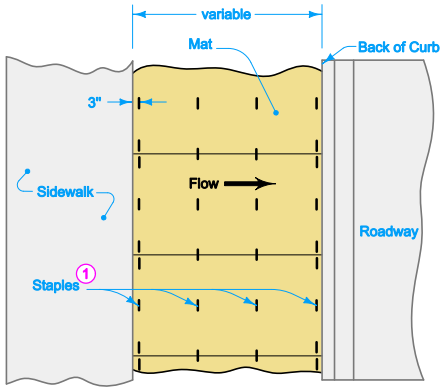
REVISIONS: New. Replaces RC-12. Changed widths to variable instead of fixed. Removed wire and wood stake details.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

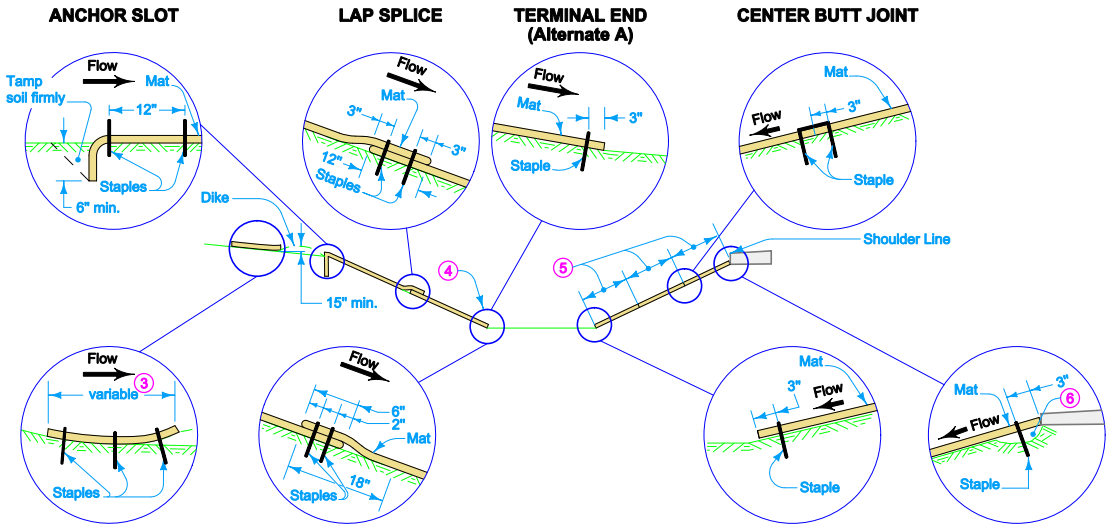
SOD FOR DITCH PROTECTION



PLAN FOR BACKSLOPE AND FORESLOPE PROTECTION



PLAN FOR SIDEWALK ADJACENT TO PAVEMENT



INTERCEPTING DITCH

TERMINAL END
(Alternate B)

SECTION A-A

DOWNSIDE TERMINAL

UPSIDE TERMINAL

The work of providing suitable earth surface for placement of slope protection is incidental to preparation of seedbed. Measurement of "Slope Protection, Wood Excelsior Mat" is the actual ground surface area covered by the mat.

Ensure that ground surfaces adjacent to any channels are shaped to facilitate natural drainage into the protected area.

Excelsior mat for backslope protection is installed with strips placed approximately perpendicular to roadway. Locations for slope protection are shown on detail plans.

Excelsior mat for foreslope protection is installed with strips placed approximately parallel to roadway. The location, width, and number of strips are specified on project plans.

Price bid per square for "Slope Protection, Wood Excelsior Mat", is full compensation for installation of mat according to details shown hereon, in project plans, or as otherwise directed by the Engineer.

(1) Space top row of staples at 18 inch centers, bottom row at 36 inch centers, and all others at 24 inch centers. Approximately 30 staples required per square (100 sq. ft) of wood excelsior mat.

(2) Where erosive gullies have developed in backslope, fill with soil and compact prior to placement of mat.

(3) 4 feet minimum to 8 feet maximum or as specified. Place staples the same as for Special Ditch Control.

(4) Where excelsior mat is to be placed as Special Ditch Control, install slope protection to facilitate placement of the ditch control as indicated (Alternate B). Where there is no Special Ditch Control, install slope protection as shown (Alternate A).

(5) 4 feet unless specified otherwise for foreslope protection.

(6) If erosive rill has developed adjacent to shoulder material, fill with suitable soil and compact prior to placement of mat.

Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

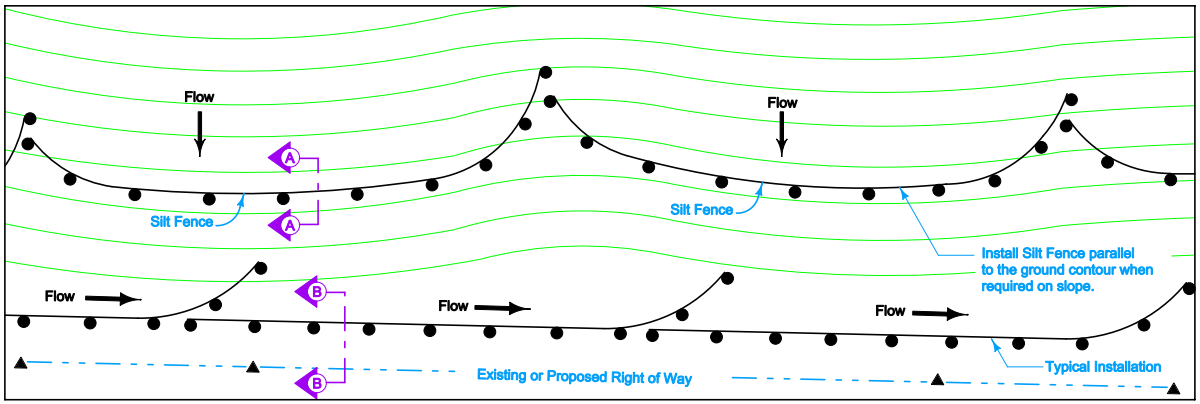
EC-103

SHEET 1 of 1

REVISIONS: New. Replaces RC-14. Removed general notes and wire staple detail.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

WOOD EXCELSIOR MAT FOR SLOPE PROTECTION



PLAN FOR SILT FENCE

Install all silt fence using a silt fence machine. Use manual (trench) installation if phyical conditions prohibit machine installation.

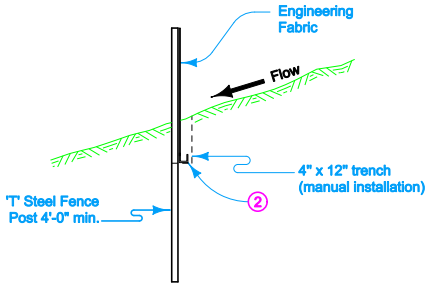
For machine installation, compact by driving over each side of silt fence at least two times with device exerting 60 p.s.i. or greater.

For manual installation, compact with a mechanical or pneumatic tamper.

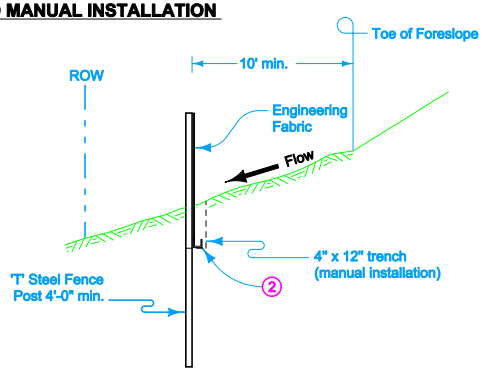
Place silt fence continuously up to a maximum length of 200 feet. For every segment of silt fence that is placed, flare up the slope the last 20 feet of the segment to contain runoff as shown.

1. Secure top of engineering fabric to steel posts using cable ties (50 lb.) or wire. See back view attachment to post.
2. For manual installation only, fold engineering fabric along bottom of trench.
3. Embed all posts 28 inches below the ground line.

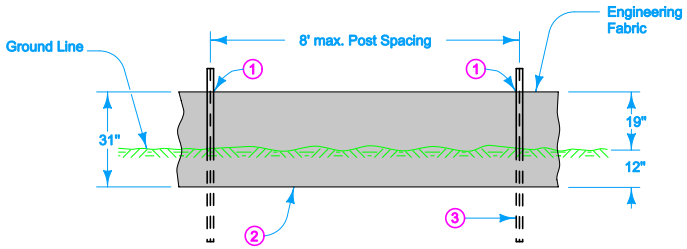
SILT FENCE - MACHINE AND MANUAL INSTALLATION



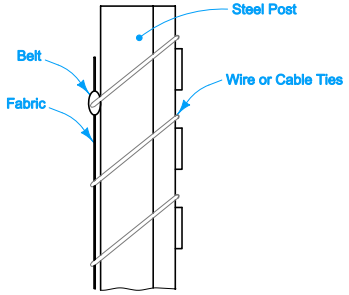
SECTION A-A



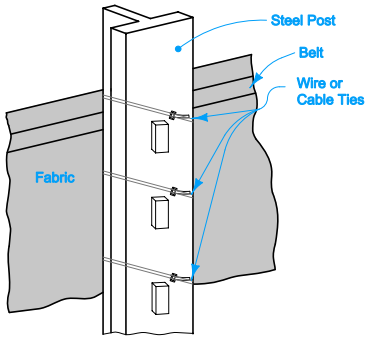
SECTION B-B



FRONT VIEW



PROFILE VIEW ATTACHMENT TO POST



BACK VIEW ATTACHMENT TO POST

Contour Lines

Possible Contract Items:
- Silt Fence
- Silt Fence for Ditch Checks

Possible Tabulations:
- 100-17
- 100-18

Iowa Department of Transportation

REVISION: New 04-20-10

STANDARD ROAD PLAN

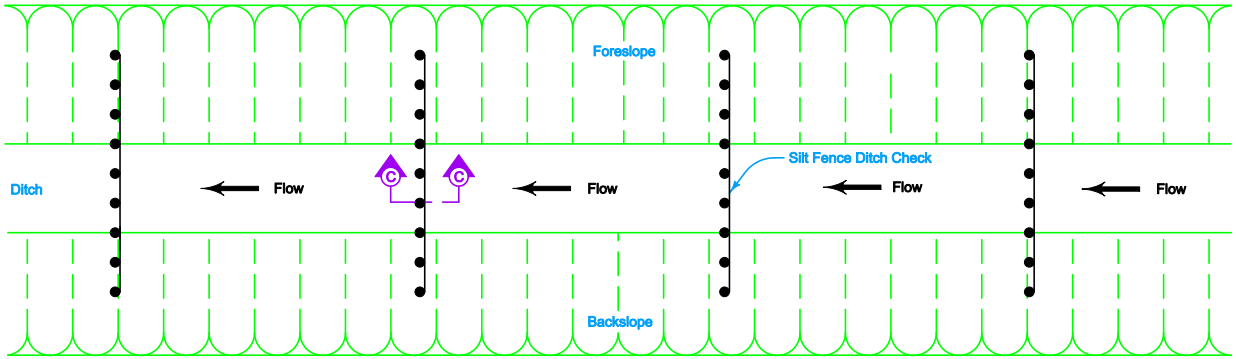
EC-201

SHEET 1 of 3

REVISIONS: New. Replaces RC-17.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SILT FENCE

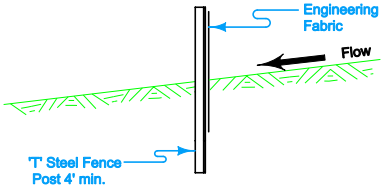


PLAN FOR DITCH CHECK

1. Secure top of engineering fabric to steel posts using cable ties (50 lb.) or wire. See attachment to post.
2. For manual installation only, fold engineering fabric along bottom of trench.
3. Embed all posts 28 inches below the ground line.
4. Locate posts at toe of foreslope and toe of backslope and space remaining posts equally.
5. The minimum end span of ditch check from the toe of slope will be according to the following table:

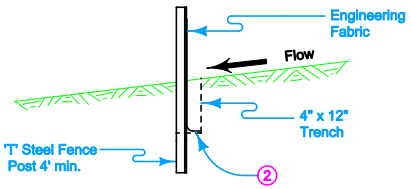
Foreslope or Backslope	Width
6:1	12'
6:1/3.5:1	10'
6:1/3:1	9'
3.5:1	7'
3:1	6'

DITCH CHECK - MACHINE INSTALLATION

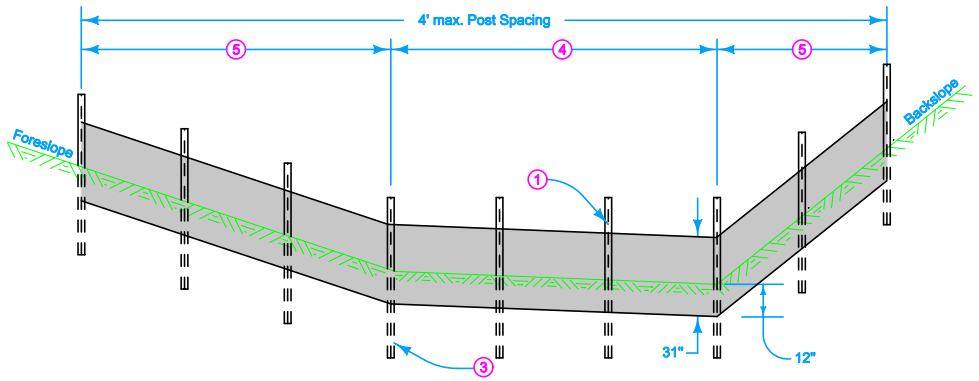


SECTION C-C

DITCH CHECK - MANUAL INSTALLATION



SECTION C-C



FRONT VIEW

Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

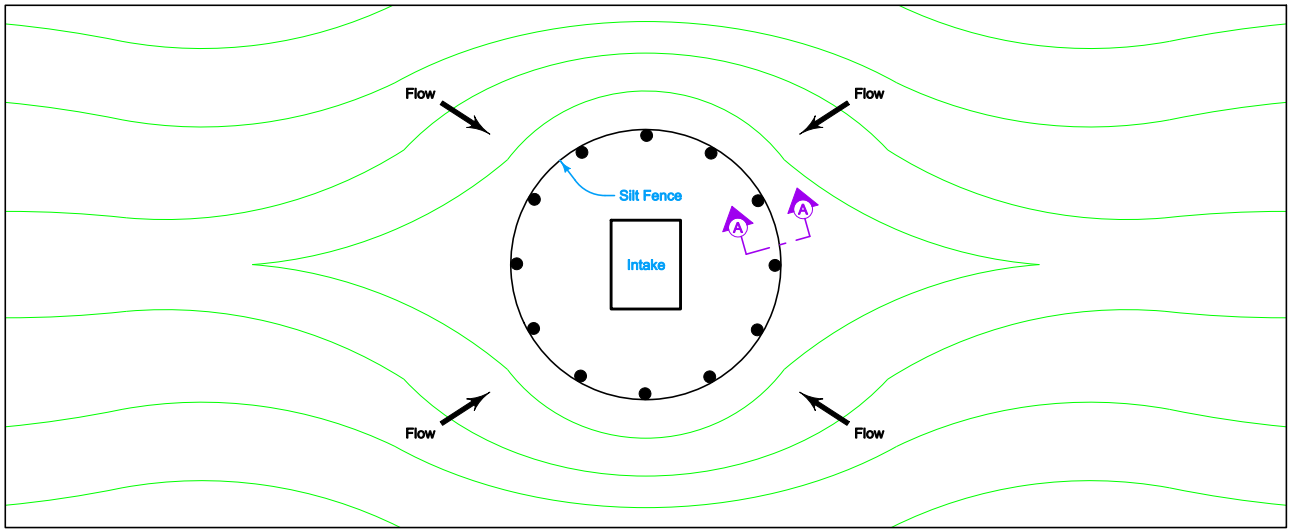
EC-201

SHEET 2 of 3

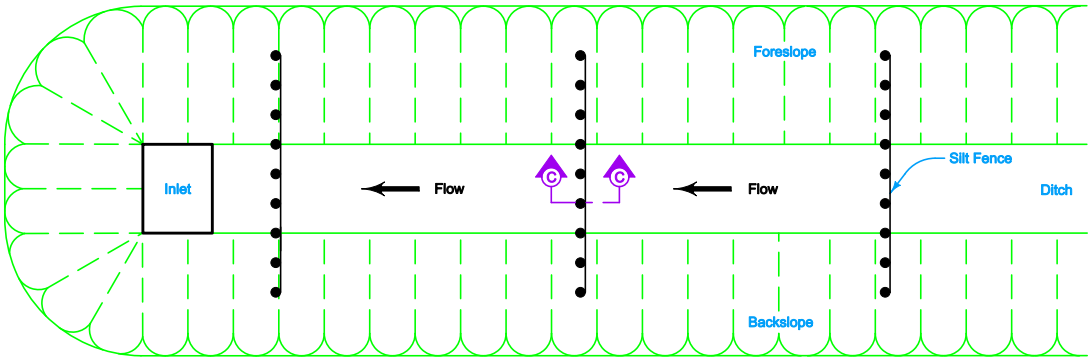
REVISIONS: New. Replaces RC-17.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SILT FENCE



PLAN FOR SILT FENCE AT INTAKE



Contour Lines

PLAN FOR SILT FENCE DITCH CHECK AT INLET

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

EC-201

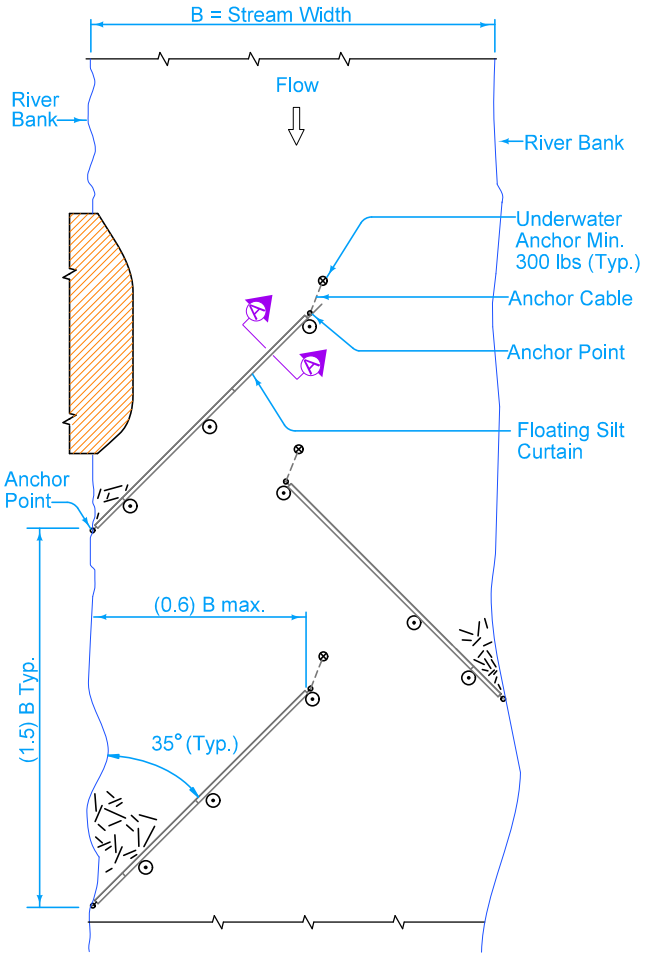
SHEET 3 of 3

REVISIONS: New. Replaces RC-17.

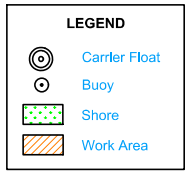
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

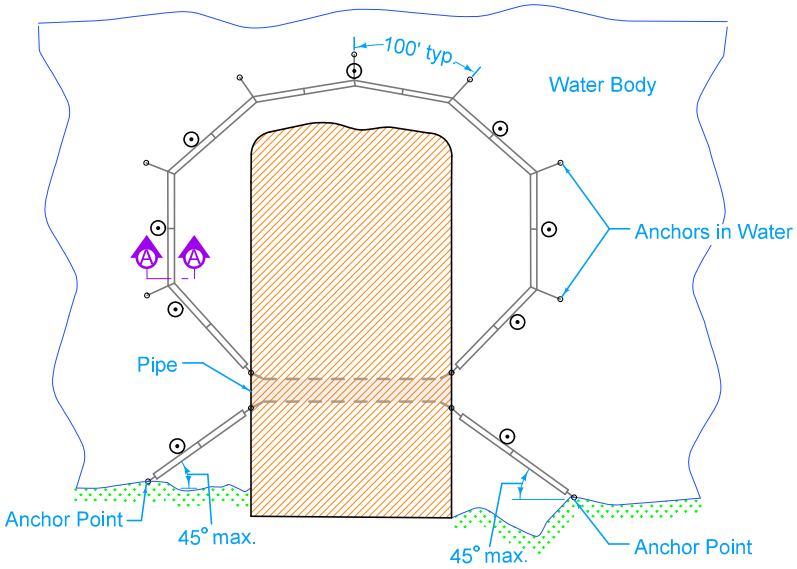
SILT FENCE

DESIGNER INFO

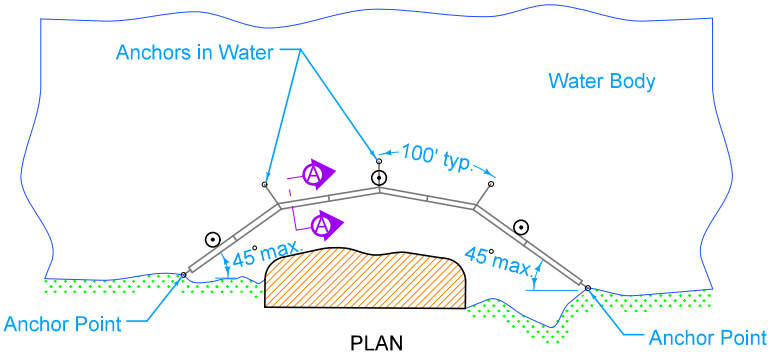


PLAN
Supplemental Installation





PLAN
Locations with pipe
Under stream crossing or causeway



PLAN
Locations without pipe
Under causeway or pad

Keep silt curtain as close to work area as possible.

Anchors and weights are to be as recommended by manufacturer. Construct floating silt curtain of fabric fastened to a flotation carrier and weighted along the bottom edge. Depth of curtain is the dimension of the curtain fabric extending below the flotation, i.e. hanging in the water. Upon completion of the work, remove the curtain in a manner that will prevent re-suspension of sediment into the water.

Install according to Hanging Installation unless otherwise specified.

Possible Tabulation:
100-10

Possible Contract Items:
Clean-out of Floating Silt Curtian (Containment)
Floating Silt Curtian (Containment)
Floating Silt Curtian (Hanging)

Iowa Department of Transportation

REVISION
3 | 04-17-12

STANDARD ROAD PLAN

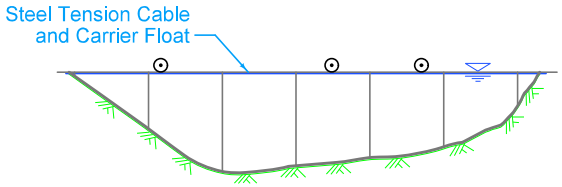
EC-202

SHEET 1 of 2

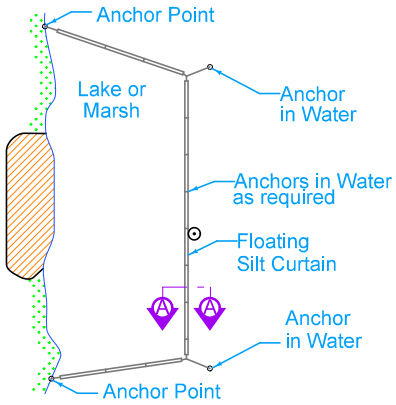
REVISIONS: Added detail for Supplemental Installation.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

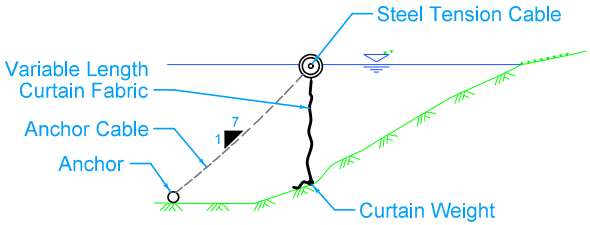
FLOATING SILT CURTAIN



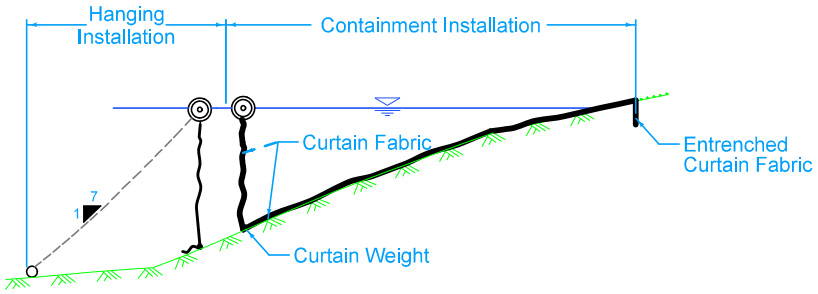
PROFILE



PLAN
Still Water Only



SECTION A-A
Hanging Installation



SECTION A-A ①
Containment Installation

① When Containment Installation is specified, it will be in combination with a Hanging Installation that is paid for separately.

Remove containment by pulling buoy towards land until it reaches trench line. Remove entrenched fabric and pull both ends up and out of the water. Move silt and fabric offsite to ensure total containment.

LEGEND

- Carrier Float
- Buoy
- Water Surface

Iowa Department of Transportation

REVISION
3 | 04/17/12

STANDARD ROAD PLAN

EC-202

SHEET 2 of 2

REVISIONS: Added detail for Supplemental Installation.

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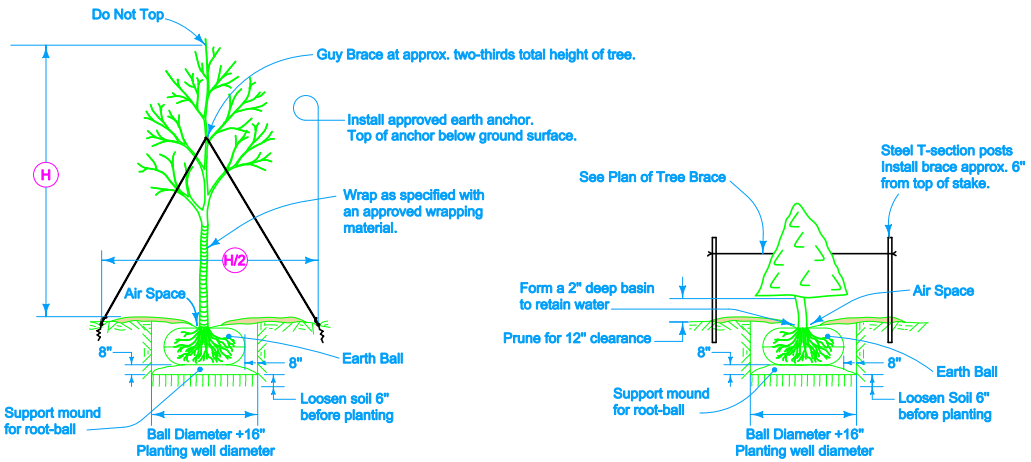
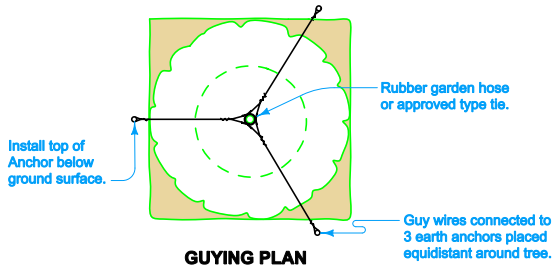
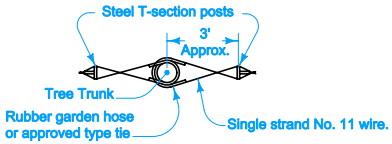
FLOATING SILT CURTAIN



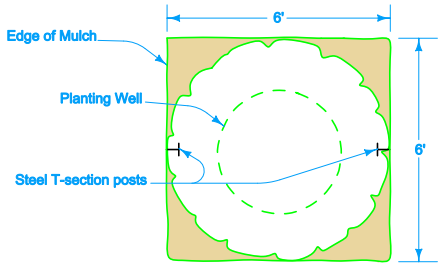
BALLED AND BURLAPPED PLANTING



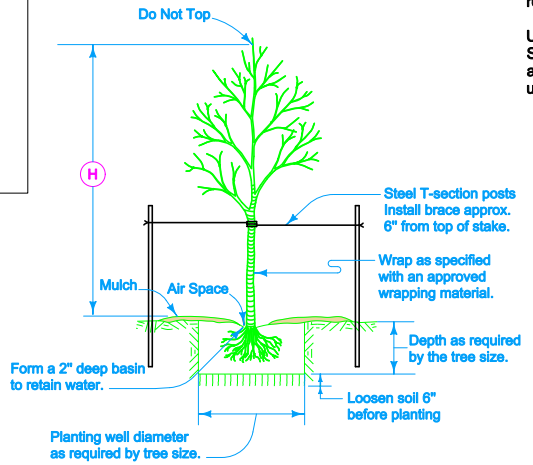
GUYING PLAN



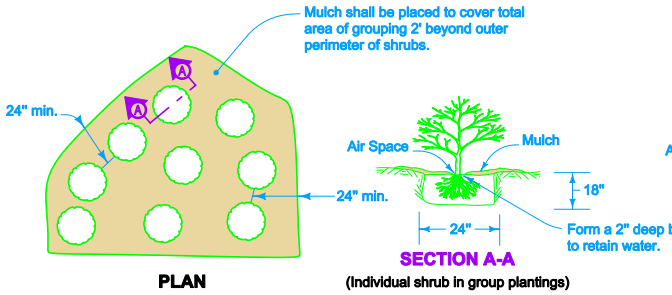
PLAN OF TREE BRACE



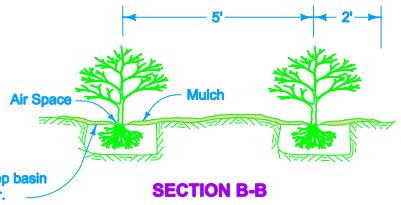
PLAN FOR INSTALLING MULCH



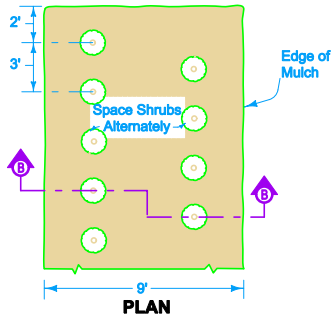
BARE ROOT PLANTING



PLANTING OF IRREGULAR SHRUB GROUPS



LIVING SNOW FENCE



Refer to detail project plans for additional information regarding planting location and layout.

When no specific requirement is indicated, complete planting as directed by the Engineer.

Till entire area to be mulched with a rotary tiller or other method approved by the Engineer.

Rake smooth the entire area to be mulched and ensure it is free of vegetation, debris, clods and rocks. Form a 2 inch deep basin around plants to retain water. Plant plants at the same depth as they were in the nursery.

Follow mulch material and depth as designated on the plans. Pull mulch back ½ inch to 1 inch from the plants to allow air circulation at a uniform depth to reflect the 2 inch basin.

Pruning consists of removing dead, broken, and irregular branches only. Do not prune the tops of plants unless it is to remove dead or broken material.

Use steel posts complying with Article 4154.09 of the Standard Specifications for staking. For trees 5 feet in height and less use posts 5 feet in length. For trees taller than 5 feet use posts 7 feet in length.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

EC-501

SHEET 1 of 1

REVISIONS: New. Replaces RC-6C.

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TREES AND SHRUBS

Earthwork

EW

SECTION

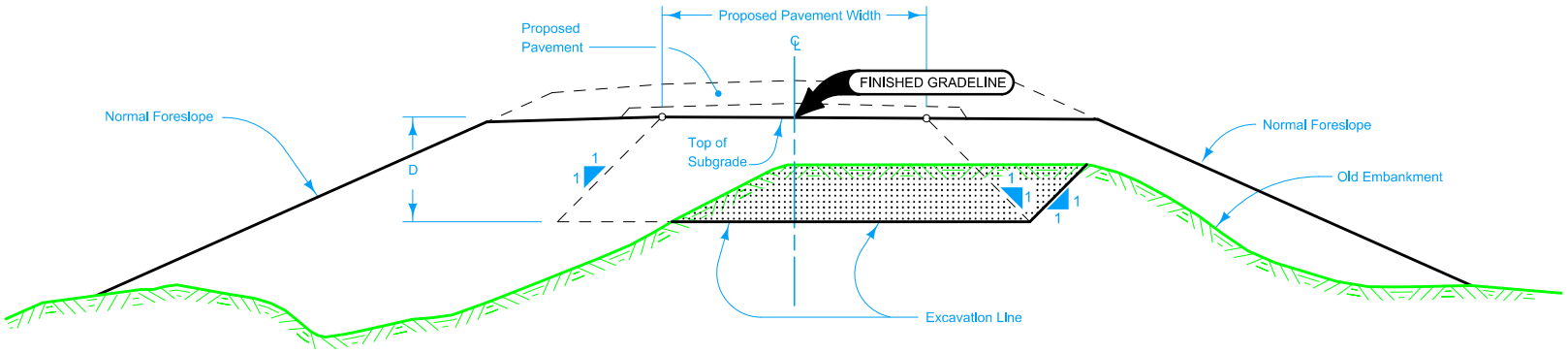
Earthwork

EW

NO.	DATE	TITLE
EW-101	04-19-11	Embankment and Rebuilding Embankments
EW-201	04-17-12	Bridge Berm Grading without Recoverable Slope (Barnroof Section)
EW-202	04-17-12	Bridge Berm Grading without Recoverable Slope (Non-Barnroof Section)
EW-203	04-17-12	Bridge Berm Grading with Recoverable Slope (Non-Barnroof Section)
EW-204	04-17-12	Bridge Berm Grading with Recoverable Slope (Barnroof Section)
EW-301	04-19-11	Guardrail Grading

Refer to contract documents for removal limits and allowable placement areas for excavated material.

When the material is to be deposited in the same area, excavate area shown, then spread and recompact material according to specifications.



TYPICAL CROSS SECTION REBUILDING EMBANKMENT

(Plowing and Shaping)

Possible Tabulation:
107-31

LEGEND

Area of Excavation

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION

New	04-19-11

EW-101

SHEET 1 of 1

REVISIONS: New. Partial replacement of RL-1A. Includes Details of Embankment and Rebuilding Embankments.

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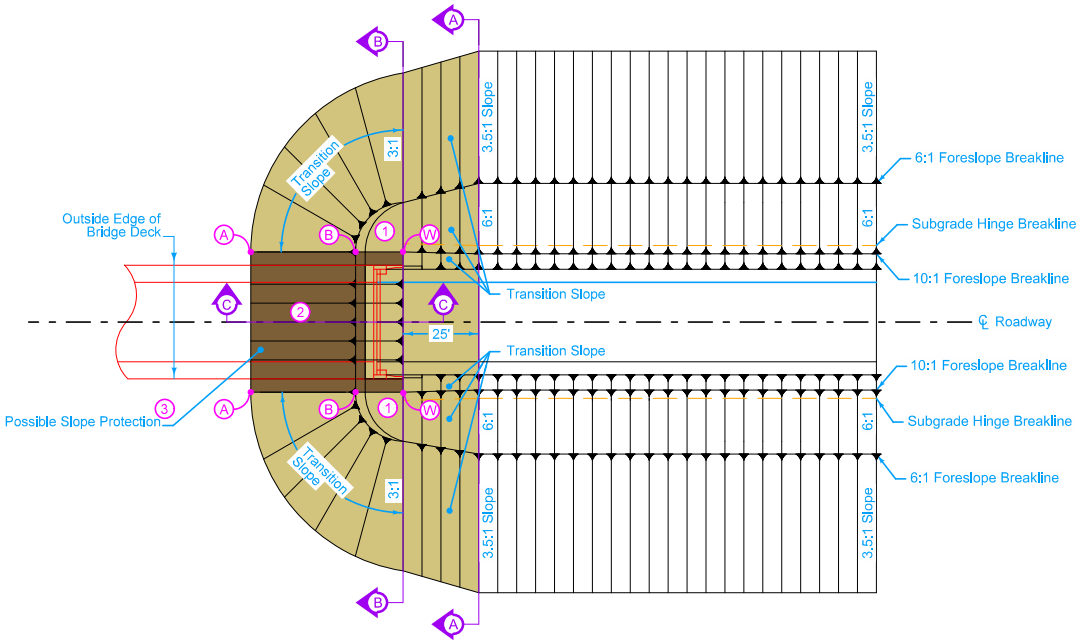
EMBANKMENT AND REBUILDING EMBANKMENTS



PLAN VIEW OF BRIDGE BERM (BARNROOF FORESLOPE)

Grading surface:
Refer to berm slope location table in project plans for locations of A, B, W and possible other points.

1. Variable slope.
2. Bridge Berm slope may vary and is determined by the A and B points. Slope is normally 2.5:1 or flatter.
3. Refer to contract documents for limits of the slope protection.

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

EW-201

SHEET 1 of 3

REVISIONS: Modified the temporary grading surface in Section C-C.

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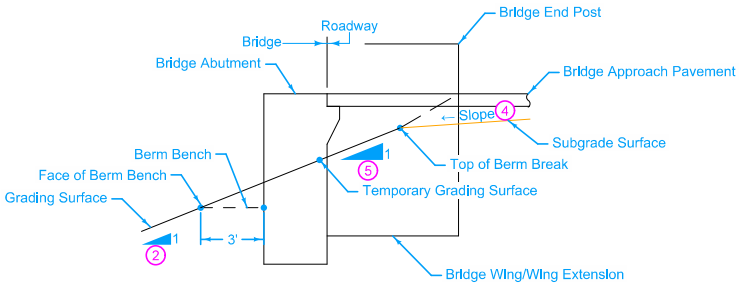
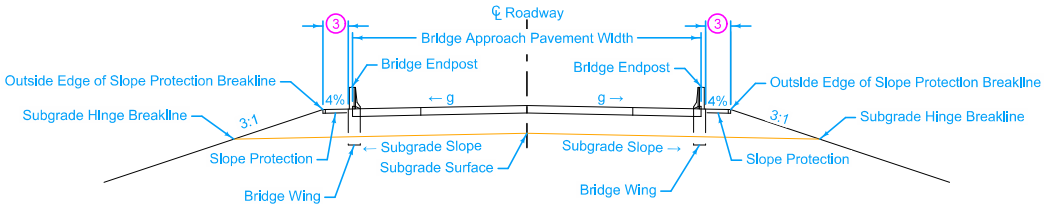
APPROVED BY DESIGN METHODS ENGINEER

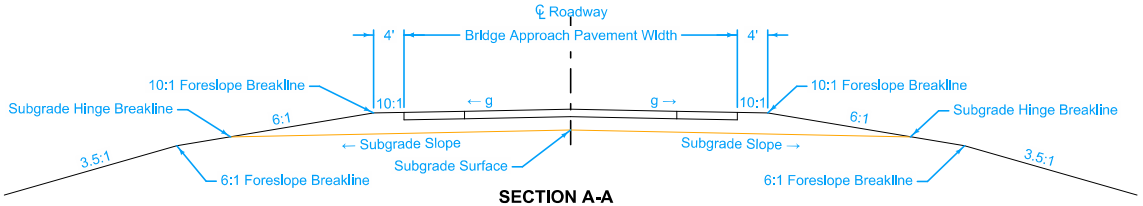
BRIDGE BERM GRADING WITHOUT RECOVERABLE SLOPE (BARNROOF SECTION)



SECTION C-C



SECTION B-B



SECTION A-A

(2) Bridge Berm slope may vary and is determined by the A and B points.

(3) Refer to contract documents for limits of the slope protection.

(4) Refer to RK series for longitudinal subgrade slope.

(5) Temporary grading slope.

g = Pavement cross slope.

Iowa Department of Transportation

REVISION 2 04-17-12

STANDARD ROAD PLAN

EW-201

SHEET 2 of 3

REVISIONS: Modified the temporary grading surface in Section C-C.

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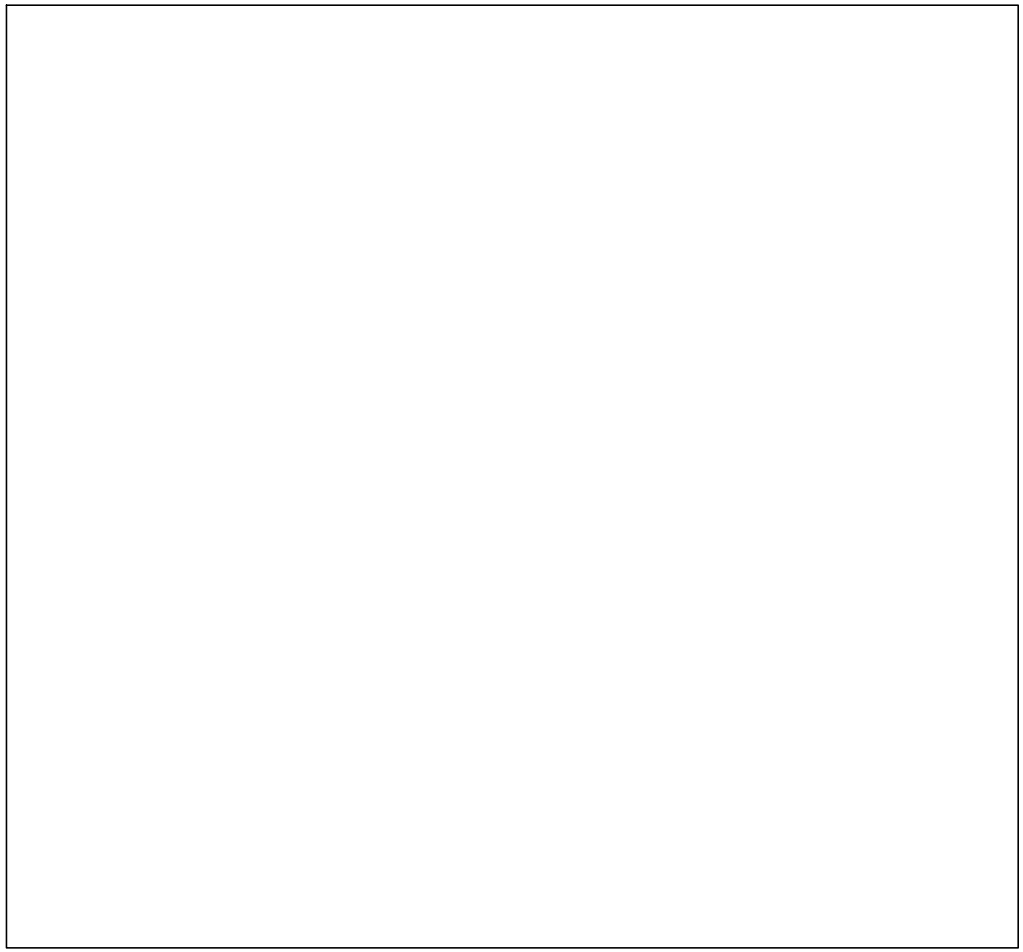
BRIDGE BERM GRADING WITHOUT RECOVERABLE SLOPE (BARNROOF SECTION)

This image can be viewed in 3D on the the ERL or at our website http://www.iowadot.gov/design/stdrdpln.htm



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Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

EW-201

SHEET 3 of 3

REVISIONS: Modified the temporary grading surface in Section C-C.

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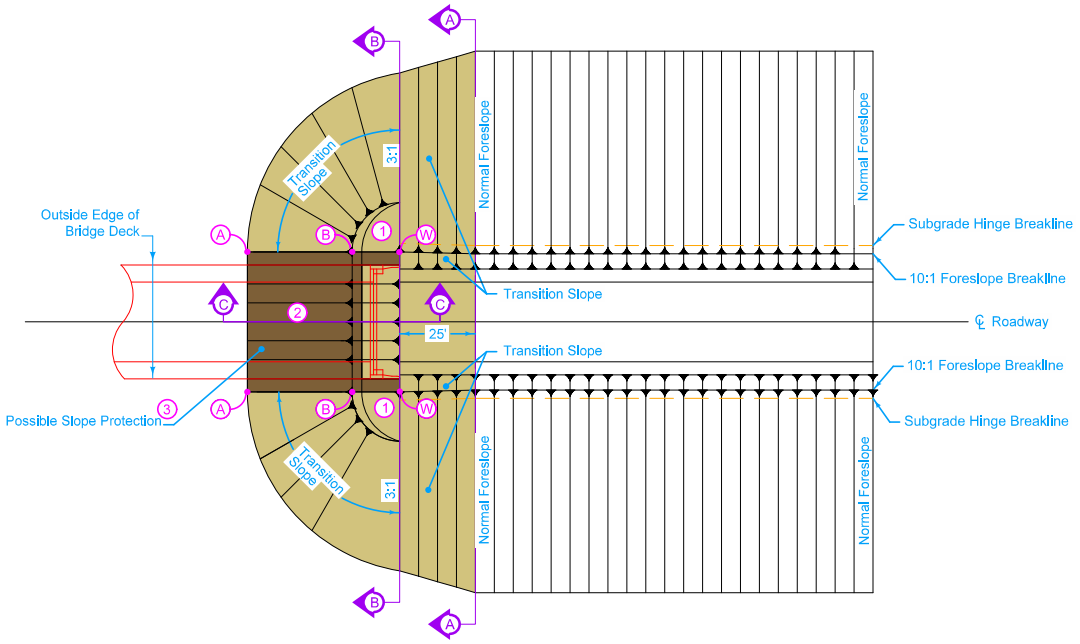
BRIDGE BERM GRADING WITHOUT RECOVERABLE SLOPE (BARNROOF SECTION)



PLAN VIEW OF BRIDGE BERM
(NON-BARNROOF FORESLOPE)

Grading Surface:
Refer to berm slope location table in project plans for locations of A, B, W and possible other points.

1. Variable slope.
2. Bridge Berm slope may vary and is determined by the A and B points. Slope is normally 2.5:1 or flatter.
3. Refer to contract documents for limits of the slope protection.

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

EW-202

SHEET 1 of 3

REVISIONS: Modified the temporary grading surface in Section C-C.

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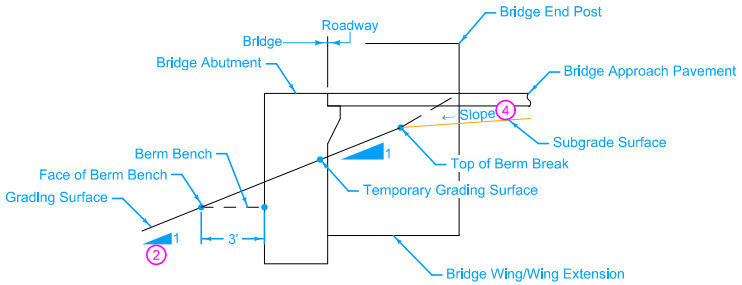
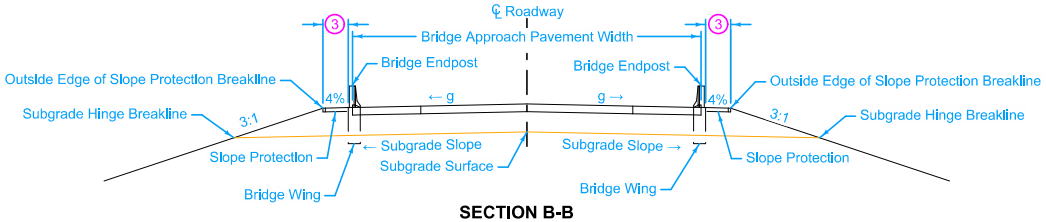
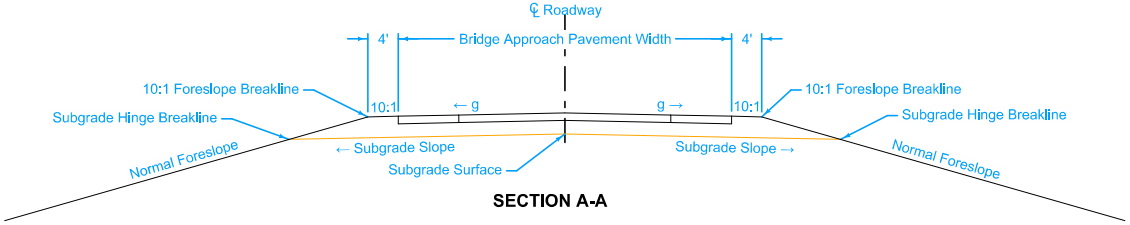
BRIDGE BERM GRADING WITHOUT RECOVERABLE SLOPE (NON-BARNROOF SECTION)



SECTION C-C



SECTION B-B



SECTION A-A

(2) Bridge Berm slope may vary and is determined by the A and B points.

(3) Refer to contract documents for limits of the slope protection.

(4) Refer to RK series for longitudinal subgrade slope.

(5) Temporary grading slope.

g = Pavement cross slope.

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

EW-202

SHEET 2 of 3

REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

BRIDGE BERM GRADING WITHOUT RECOVERABLE SLOPE (NON-BARNROOF SECTION)

This image can be viewed in 3D on the the ERL or at our website http://www.iowadot.gov/design/stdrdpln.htm

This image can be viewed in 3D on the the ERL or at our website http://www.iowadot.gov/design/stdrdpln.htm

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
2 | 04-17-12

EW-202

REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
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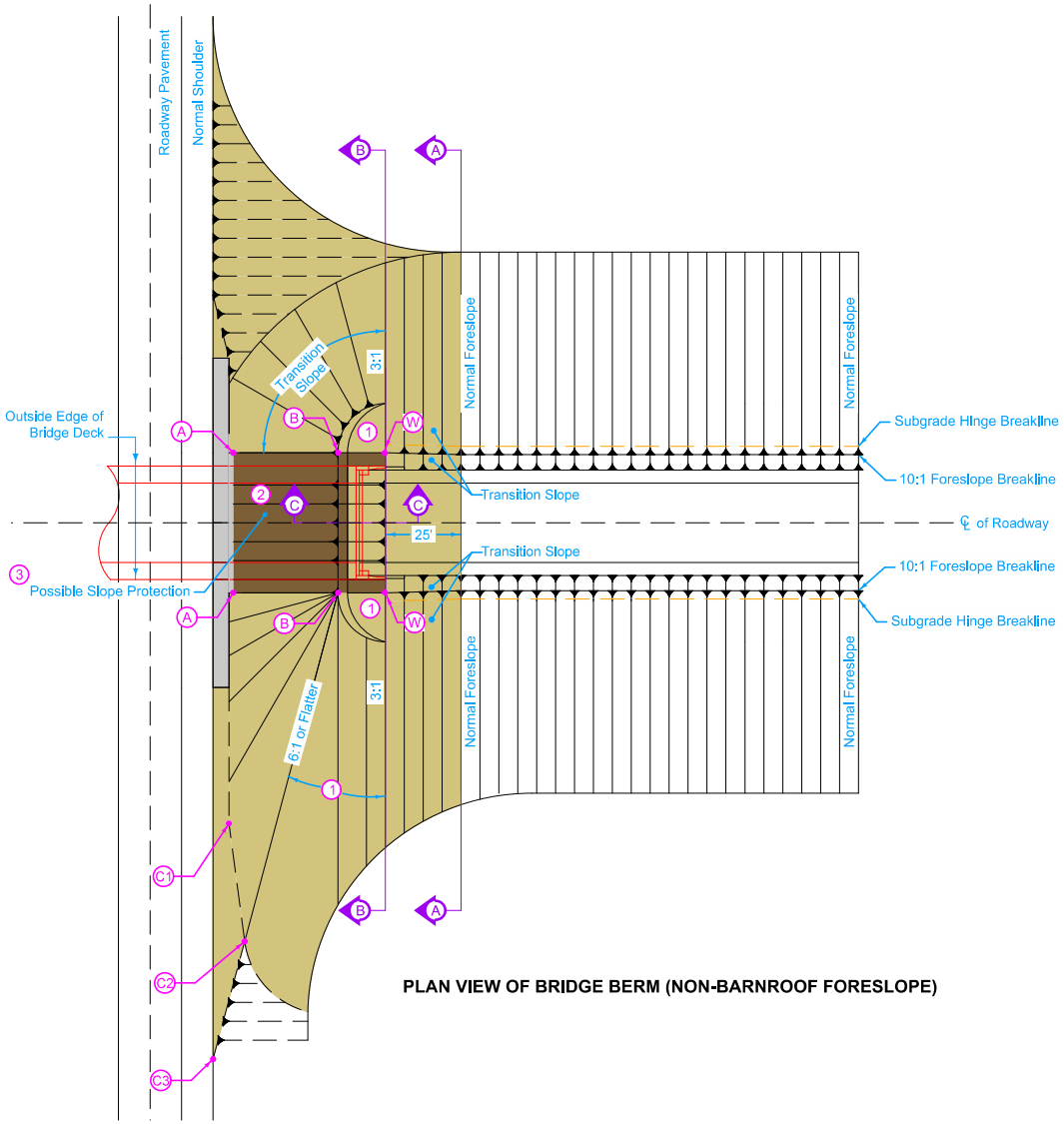
BRIDGE BERM GRADING
WITHOUT RECOVERABLE SLOPE
(NON-BARNROOF SECTION)



PLAN VIEW OF BRIDGE BERM (NON-BARNROOF FORESLOPE)

Grading Surface:
Refer to berm slope location table in project plans for locations of A, B, C, W and possible other points.

The cost of removel, stockpiling and placement of macadam stone shall be considered incidental to "Paved Shoulder, P.C. Concrete".

(1) Special shaping.

(2) Bridge Berm slope may vary and is determined by the A and B points. Slope is normally 2.5:1 or flatter.

(3) Refer to contract documents for limits of the slope protection.

Possible Tabulation: 104-9

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

EW-203

SHEET 1 of 5

REVISIONS: Modified the temporary grading surface in Section C-C.

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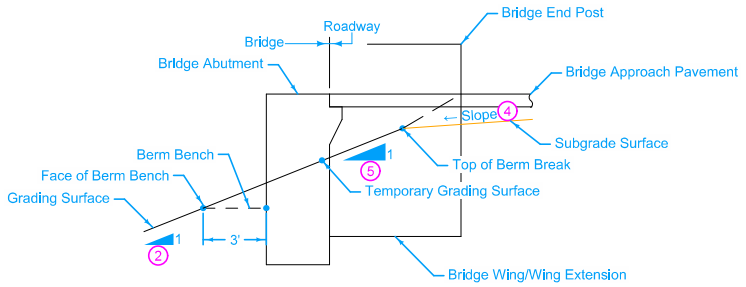
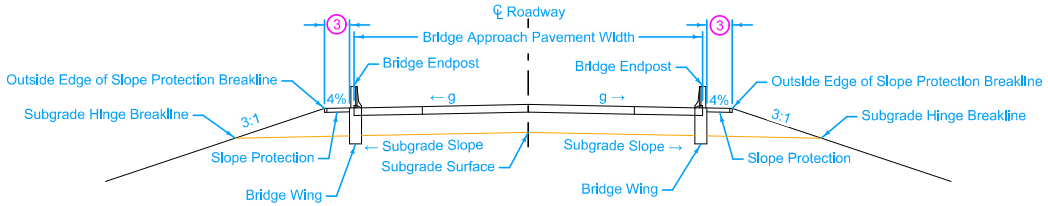
APPROVED BY DESIGN METHODS ENGINEER

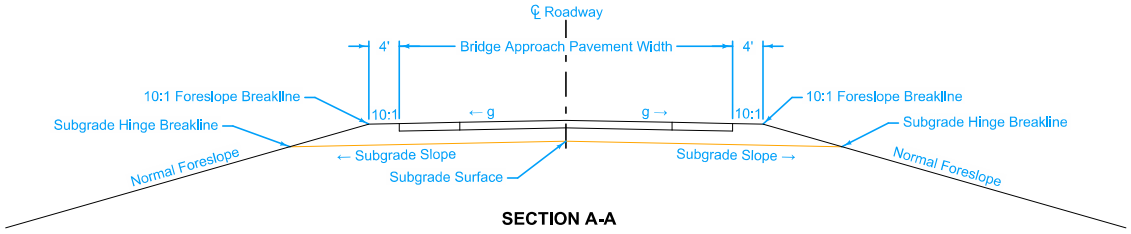
BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (NON-BARNROOF SECTION)



SECTION C-C



SECTION B-B



SECTION A-A

(2) Bridge Berm slope may vary and is determined by the A and B points. Slope is normally 2.5:1 or flatter.

(3) Refer to contract documents for limits of the slope protection.

(4) Refer to RK series for longitudinal subgrade slope.

(5) Temporary grading slope.

g = pavement cross slope.

Iowa Department of Transportation

REVISION 2 04-17-12

STANDARD ROAD PLAN

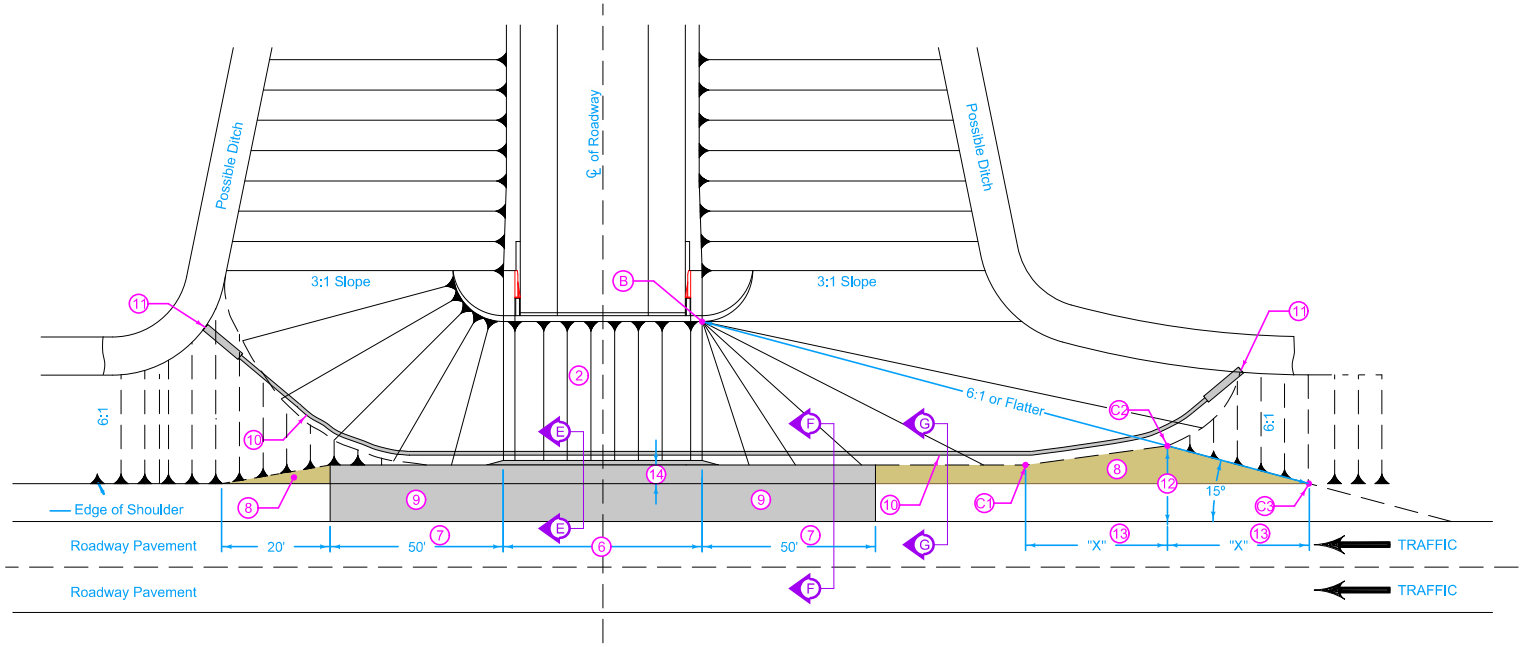
EW-203

SHEET 2 of 5

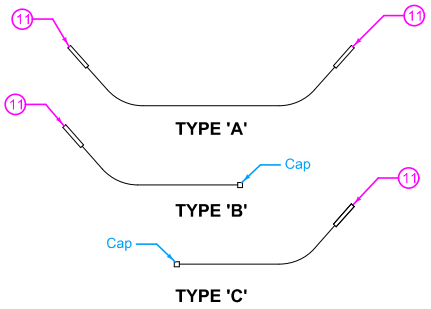
REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (NON-BARNROOF SECTION)



PLAN VIEW OF BRIDGE BERM AREA



TYPE 'A'

TYPE 'B'

TYPE 'C'

SUBDRAIN LAYOUT TYPES

(2) Bridge Berm slope may vary and is determined by the A and B points. Slope is normally 2.5:1 or flatter.

(6) Width of bridge slab + 3' on each side. Build 6" sloped curb to this width. Refer to PV-102 for curb details.

(7) Includes curb runout length. Refer to PV-102 for curb runout details.

(8) Match typical shoulder slope.

(9) See typical cross-sections for details of paved shoulder.

(10) Approximate location of bridge subdrain.

(11) Refer to RF-19E subdrain outlet. When flow of subdrain does not require an outlet at both ends, cap the end without an outlet in a method approved by the Engineer.

(12) 2 times typical shoulder width.

(13) "X" distance based on station difference between points C2 and C3.

(14) 5' offset unless otherwise noted on the Bridge Situation Plan. 4' offset minimum.

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

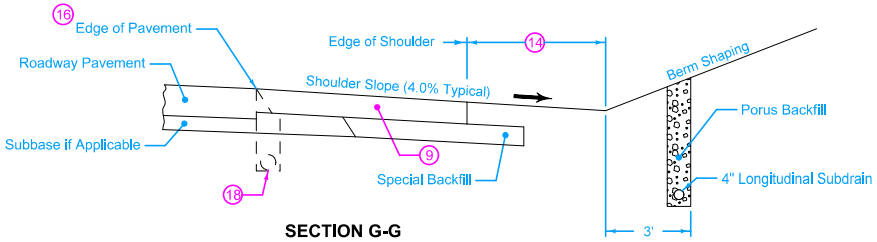
EW-203

SHEET 3 of 5

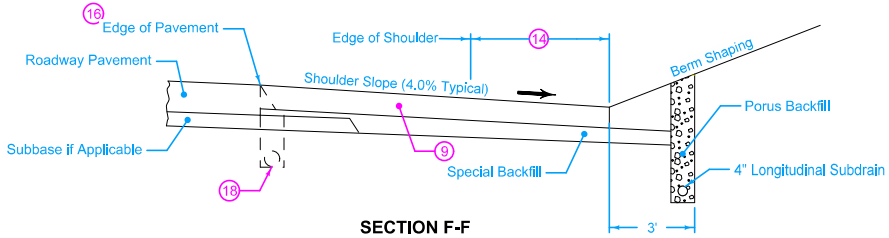
REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

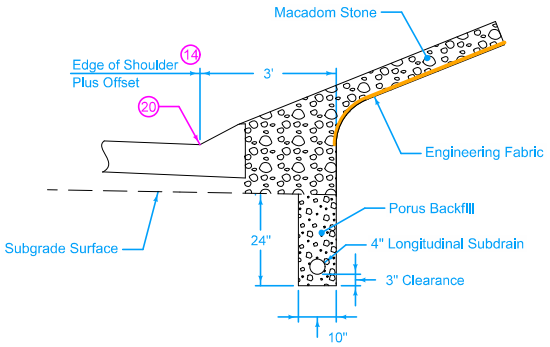
BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (NON-BARNROOF SECTION)



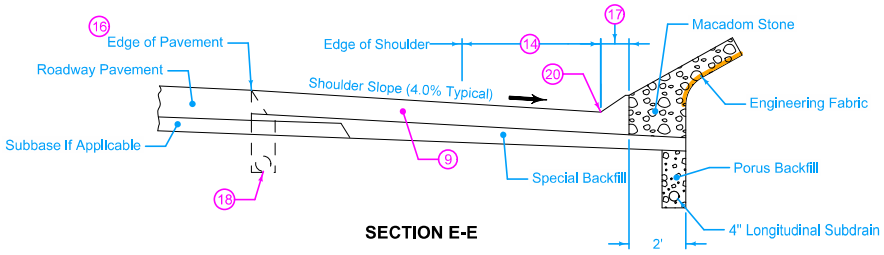
SECTION G-G



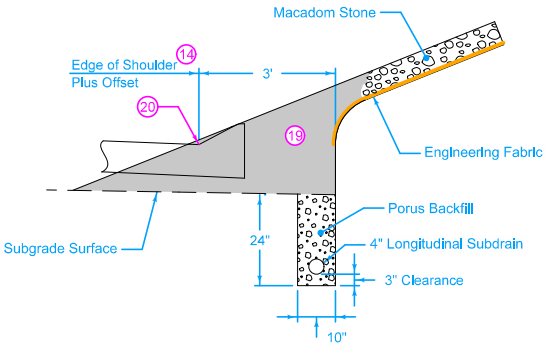
SECTION F-F



PARTIAL SECTION E-E
As constructed by others



SECTION E-E



PARTIAL SECTION E-E
Proposed construction

(9) See typical cross-sections for details of paved shoulder.

(14) 5' offset unless otherwise noted on the Bridge Situation Plan. 4' offset minimum.

(16) If roadway pavement is newly-constructed PCC, use BT-1 or BT-2 joint. If roadway pavement is existing PCC, use BT-3, BT-4, or BT-5 joint. Refer to PV-101 joint details.

(17) 6" sloped curb. Refer to PV-102 curb details.

(18) Roadway subdrain location. Use caution when excavating. Maintain porus material in trench to bottom of roadway pavement.

(19) Remove and stockpile macadam stone. Carefully seperate the macadam stone from the surrounding soil. Preserve the integrity of the engineering fabric.

(20) Toe of the berm. Refer to A points on the berm slope location table.

Iowa Department of Transportation

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STANDARD ROAD PLAN

EW-203

SHEET 4 of 5

REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (NON-BARNROOF SECTION)

This image can be viewed in 3D on the the ERL or at our website http://www.iowadot.gov/design/stdrdpln.htm

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Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-17-12

EW-203

SHEET 5 of 5

REVISIONS: Modified the temporary grading surface in Section C-C.

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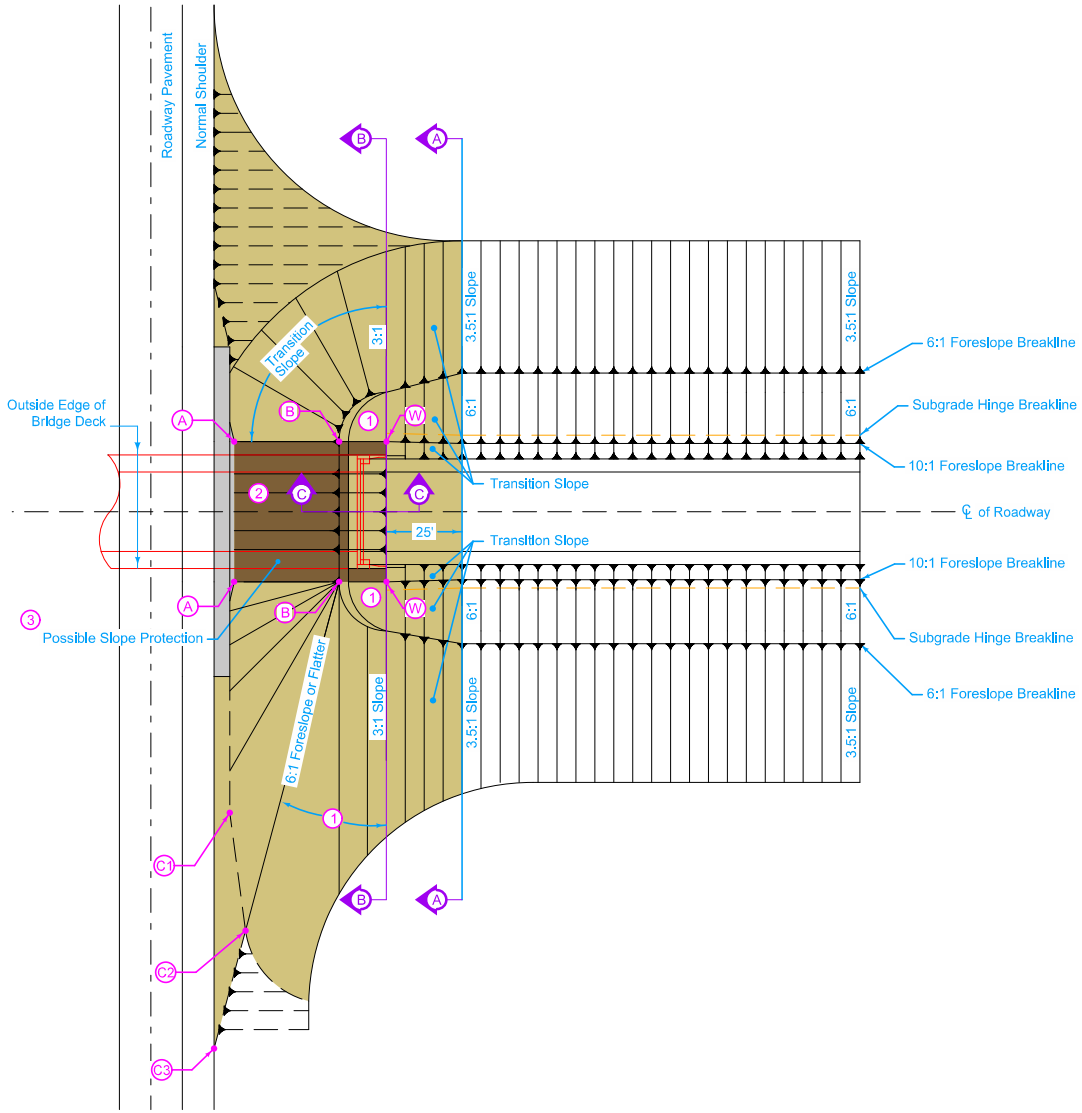
BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (NON-BARNROOF SECTION)



PLAN VIEW OF BRIDGE BERM (BARNROOF FORESLOPE)

Grading Surface:
Refer to berm slope location table in project plans for locations of A, B, C, W and possible other points.

The cost of removel, stockpiling and placement of macadam stone shall be considered incidental to "Paved Shoulder, P.C. Concrete".

(1) Special shaping.

(2) Face of Bridge Berm slope may vary and is determined by the A and B points. Slope is normally 2.5:1 or flatter.

(3) Refer to contract documents for limits of the slope protection.

Possible Tabulation: 104-9

Iowa Department of Transportation

REVISION 2 04-17-12

STANDARD ROAD PLAN

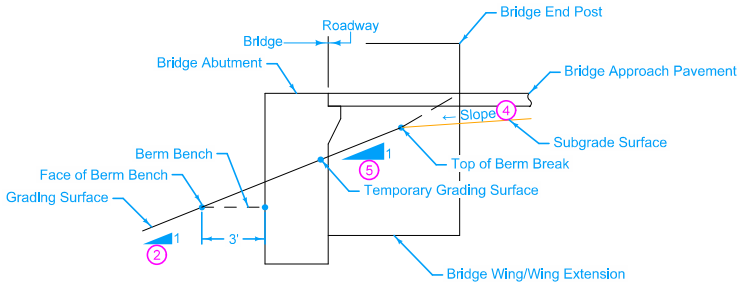
EW-204

SHEET 1 of 5

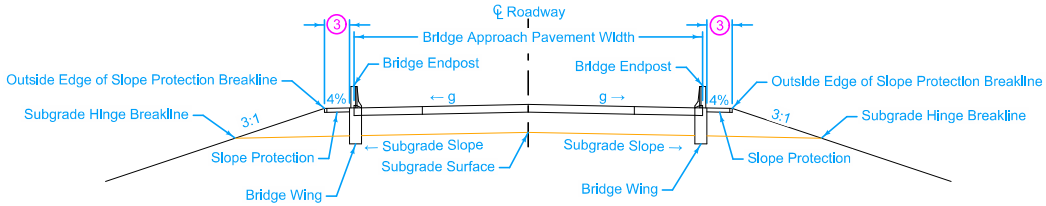
REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

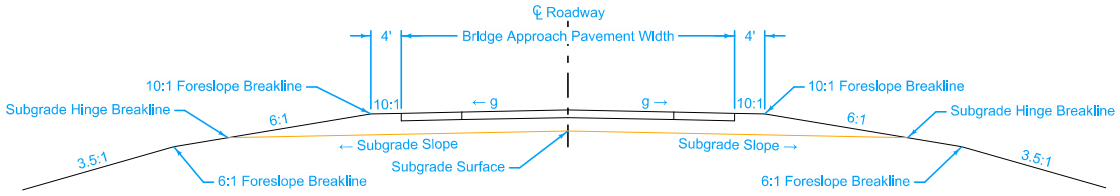
BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (BARNROOF SECTION)



SECTION C-C



SECTION B-B



SECTION A-A

2. Bridge Berm slope may vary and is determined by the A and B points. Slope is normally 2.5:1 or flatter.
3. Refer to contract documents for limits of the slope protection.
4. Refer to RK series for longitudinal subgrade slope.
5. Temporary grading slope.

g = pavement cross slope.

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

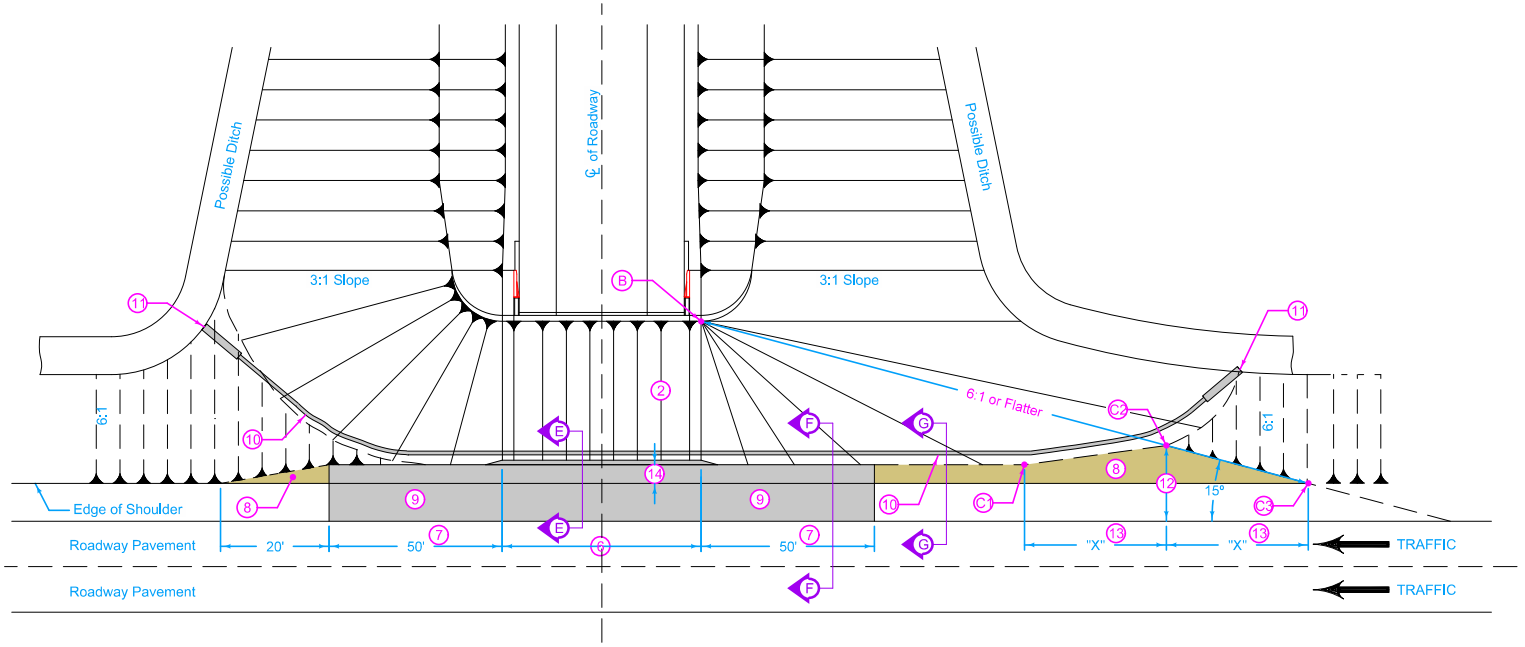
EW-204

SHEET 2 of 5

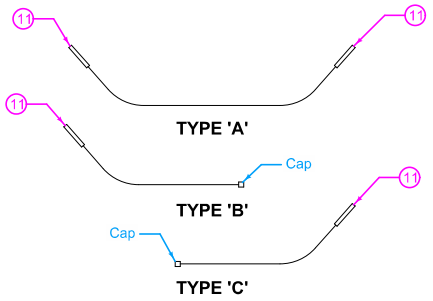
REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (BARNROOF SECTION)



PLAN VIEW OF BRIDGE BERM AREA



TYPE 'A'

TYPE 'B'

TYPE 'C'

SUBDRAIN LAYOUT TYPES

(2) Bridge Beam slope may vary and is determined by the A and B points. Slope is normally 2.5:1 or flatter.

(6) Width of bridge slab + 3' on each side. Build 6" sloped curb to this width. Refer to PV-102 for curb details.

(7) Includes curb runout length. Refer to PV-102 for curb runout details.

(8) Match typical shoulder slope.

(9) See typical cross-sections for details of paved shoulder.

(10) Approximate location of bridge subdrain.

(11) Refer to RF-19E subdrain outlet. When flow of subdrain does not require an outlet at both ends, cap the end without an outlet in a method approved by the Engineer.

(12) 2 times typical shoulder width.

(13) "X" distance based on station difference between points C2 and C3.

(14) 5' offset unless otherwise noted on the Bridge Situation Plan. 4' offset minimum.

Iowa Department of Transportation

REVISION
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STANDARD ROAD PLAN

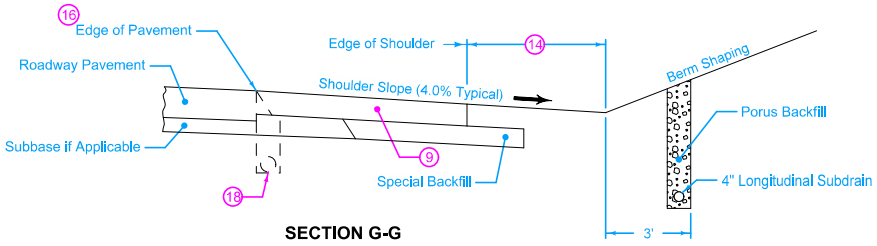
EW-204

SHEET 3 of 5

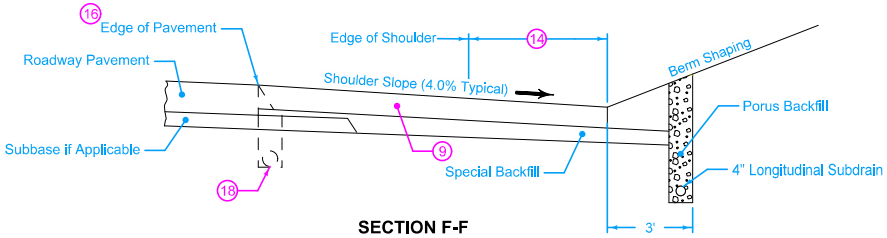
REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

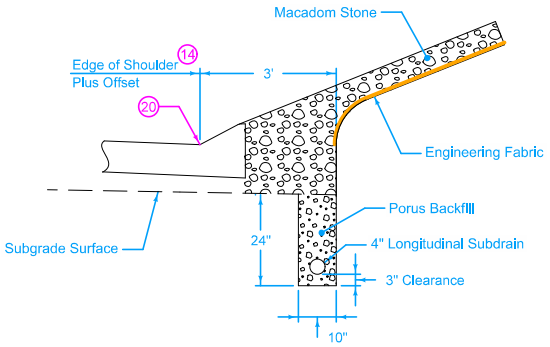
BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (BARNROOF SECTION)



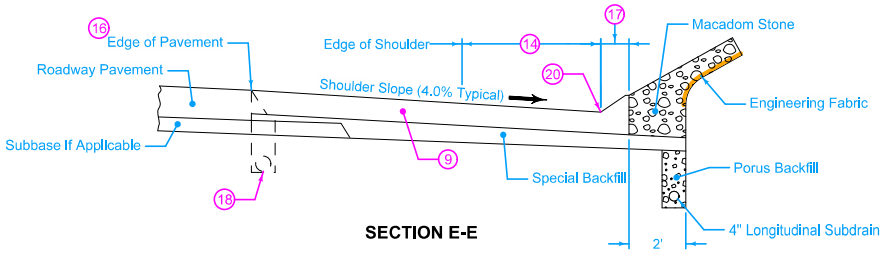
SECTION G-G



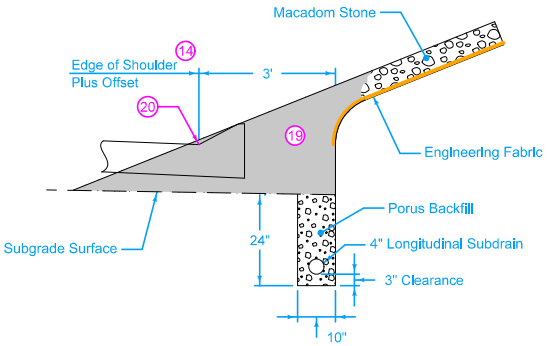
SECTION F-F



PARTIAL SECTION E-E
As constructed by others



SECTION E-E



PARTIAL SECTION E-E
Proposed construction

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(17) 6" sloped curb. Refer to PV-102 curb details.

(18) Roadway subdrain location. Use caution when excavating. Maintain porus material in trench to bottom of roadway pavement.

(19) Remove and stockpile macadam stone. Carefully seperate the macadam stone from the surrounding soil. Preserve the integrity of the engineering fabric.

(20) Toe of the berm. Refer to A Points on the berm slope location table.

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

EW-204

SHEET 4 of 5

REVISIONS: Modified the temporary grading surface in Section C-C.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (BARNROOF SECTION)

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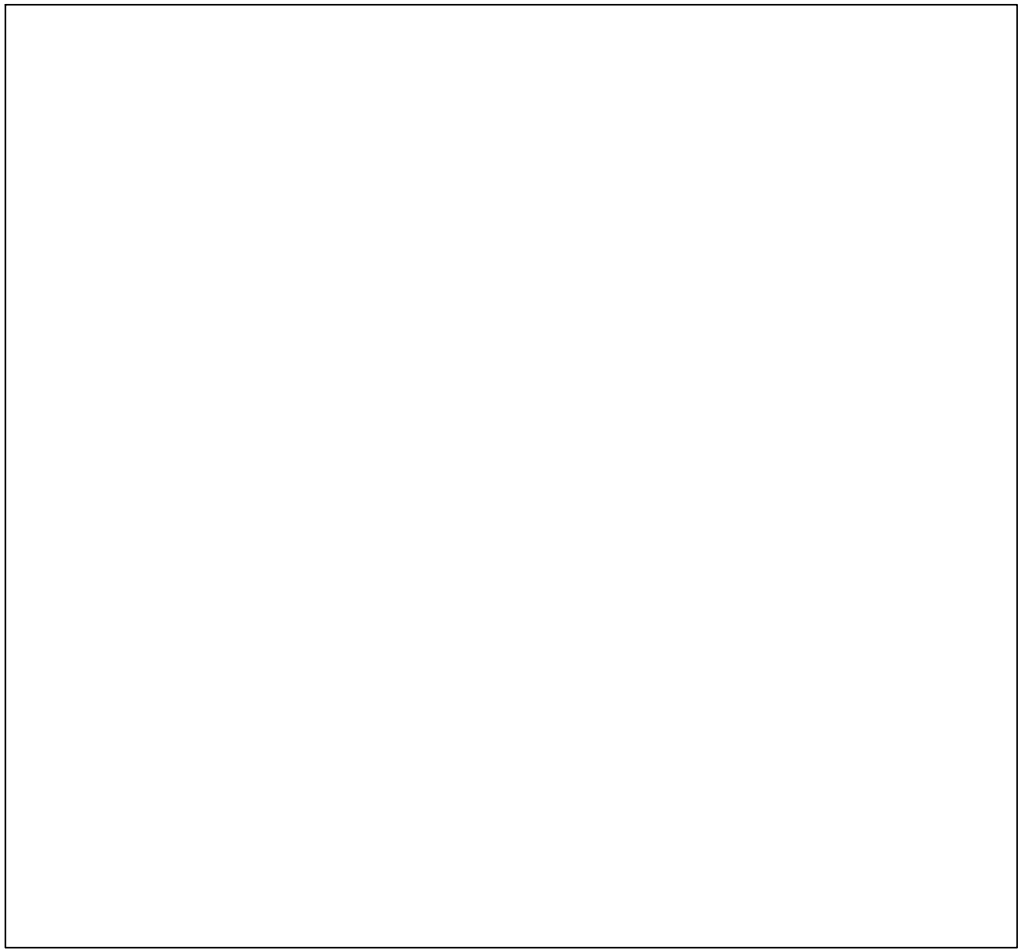

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Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

EW-204

SHEET 5 of 5

REVISIONS: Modified the temporary grading surface in Section C-C.

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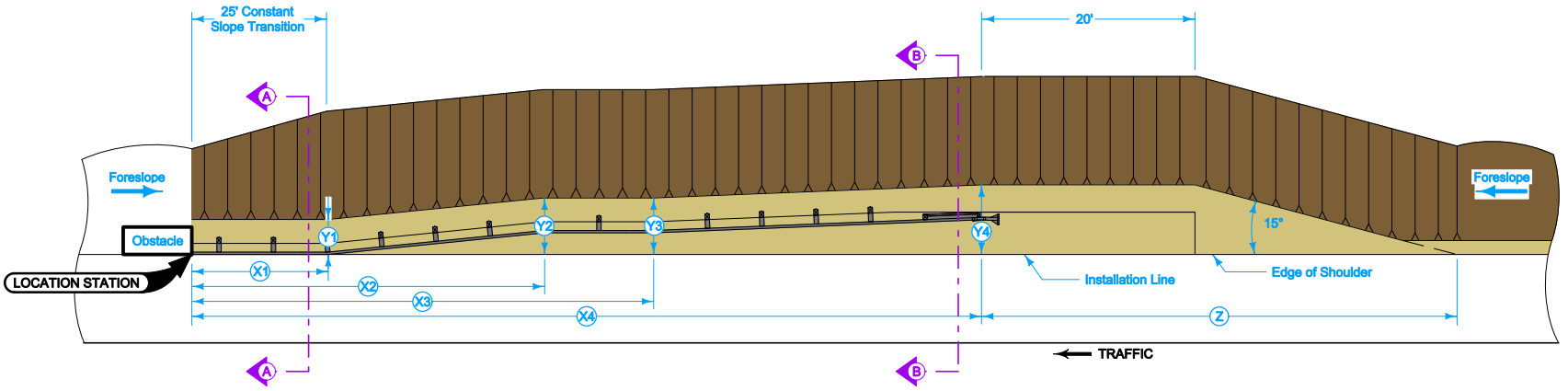
APPROVED BY DESIGN METHODS ENGINEER

BRIDGE BERM GRADING WITH RECOVERABLE SLOPE (BARNROOF SECTION)

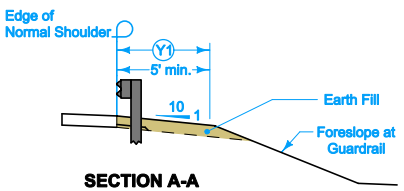


PLAN

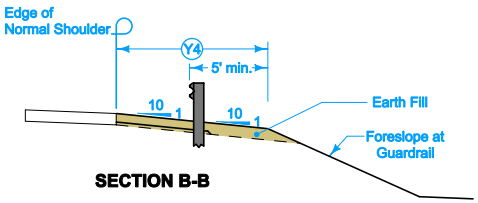
Construct earth fill in conformance with requirements for construction of embankments.

Construct paved shoulder in front of guardrail as shown on Typical 7156.

Guardrail may or may not be attached to face of obstacle.



SECTION A-A



SECTION B-B

Y4 feet	Z feet
5	39
6	43
7	47
8	50
9	54
10	57
11	61
12	65
13	69
14	72
15	76
16	80
17	83
18	87
19	91
20	95

(X) Measured from Location Station.

(Y) Distance from edge of normal shoulder to toe of 10:1 slope

Possible Tabulation:
107-23

LEGEND
- Foreslope at Guardrail
- Slope - 10:1

GUARDRAIL INSTALLATION LINE AT OR WITHIN 10 FEET OF SHOULDER

Iowa Department of Transportation

REVISION: New 04-19-11

STANDARD ROAD PLAN

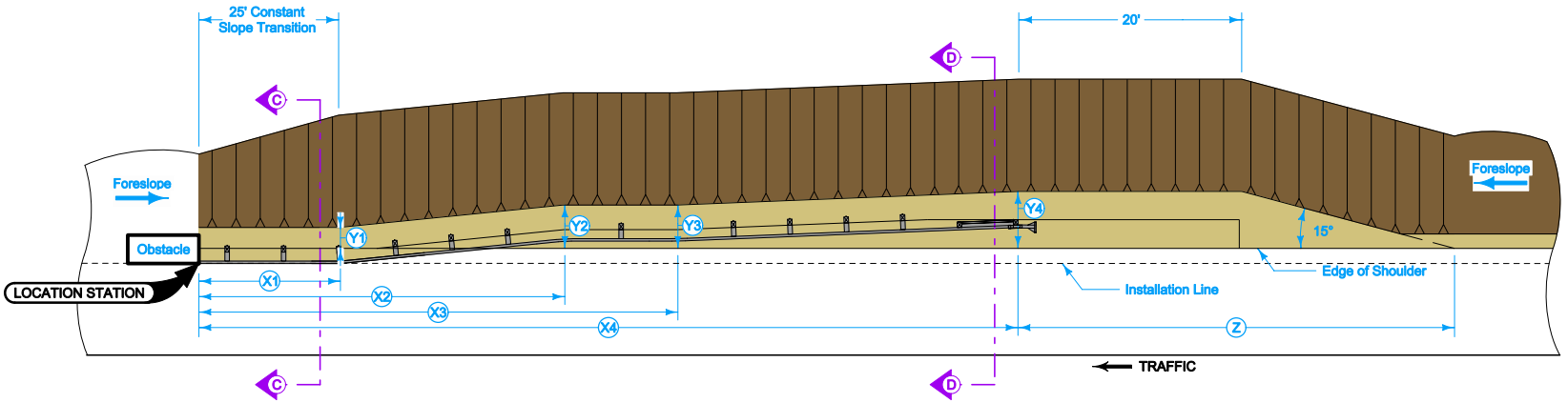
EW-301

SHEET 1 of 5

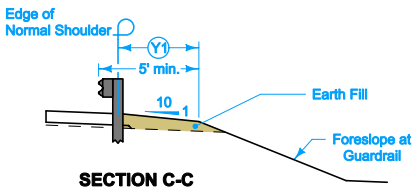
REVISIONS: New. Replaces RL-14A.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

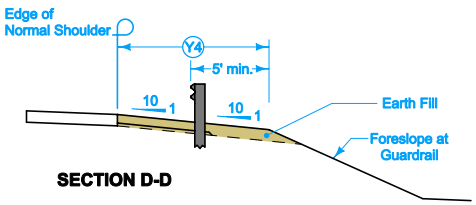
GUARDRAIL GRADING



PLAN



SECTION C-C



SECTION D-D

Y4 feet	Z feet
5	39
6	43
7	47
8	50
9	54
10	57
11	61
12	65
13	69
14	72
15	76
16	80
17	83
18	87
19	91
20	95

(X) Measured from Location Station.

(Y) Distance from edge of normal shoulder to toe of 10:1 slope

LEGEND

Foreslope at Guardrail

Slope - 10:1

GUARDRAIL INSTALLATION LINE WITHIN SHOULDER

Iowa Department of Transportation

REVISION: New 04-19-11

STANDARD ROAD PLAN

EW-301

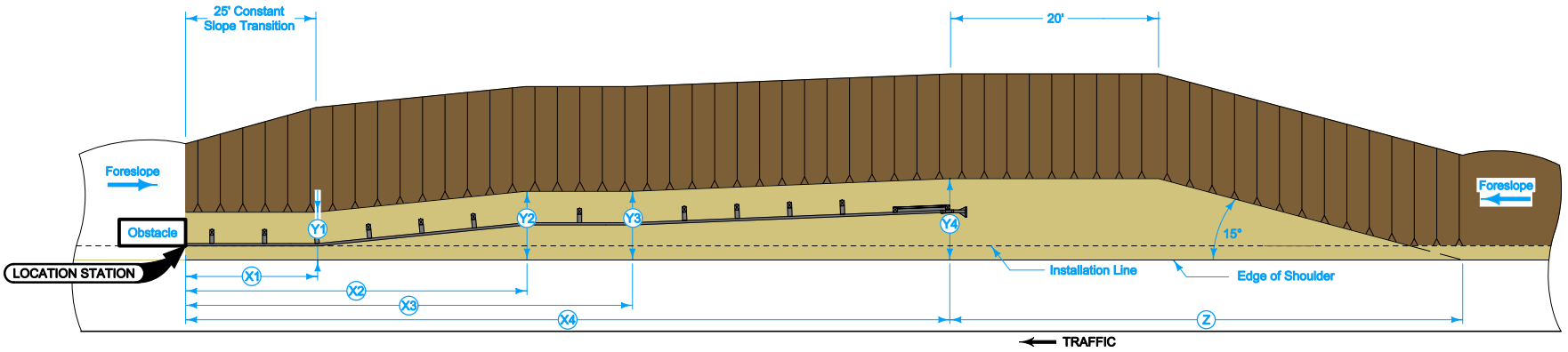
SHEET 2 of 5

REVISIONS: New. Replaces RL-14A.

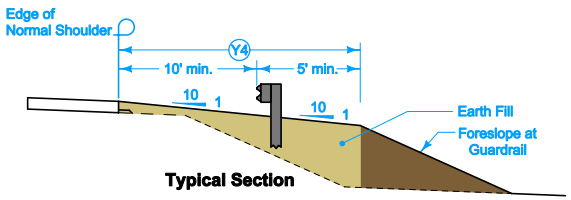
Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

GUARDRAIL GRADING



PLAN



Typical Section

Y4 feet	Z feet
5	39
6	43
7	47
8	50
9	54
10	57
11	61
12	65
13	69
14	72
15	76
16	80
17	83
18	87
19	91
20	95

(X) Measured from Location Station.

(Y) Distance from edge of normal shoulder to toe of 10:1 slope

LEGEND

- Foreslope at Guardrail
- Slope - 10:1

GUARDRAIL INSTALLATION LINE BEYOND 10 FEET FROM SHOULDER

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION: New 04-19-11

EW-301

SHEET 3 of 5

REVISIONS: New. Replaces RL-14A.

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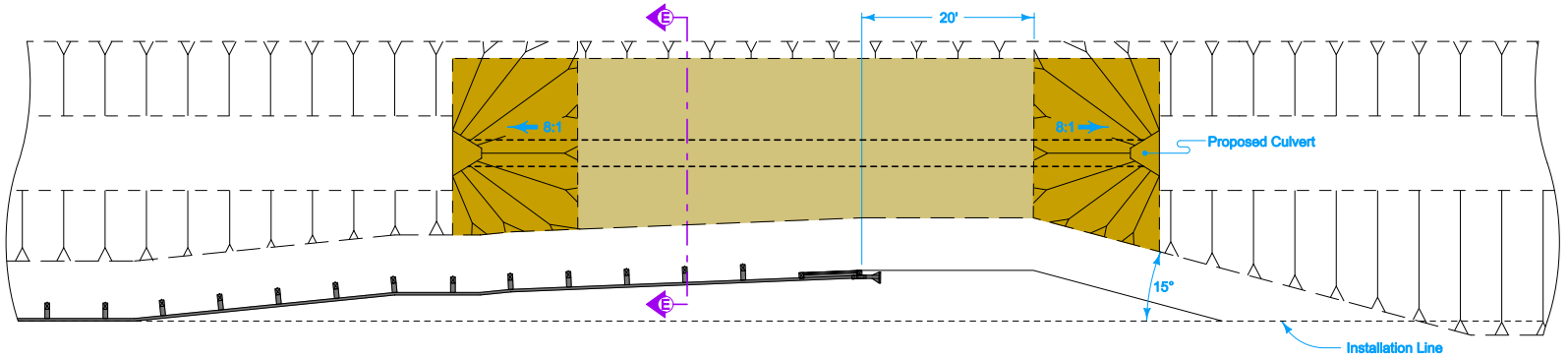
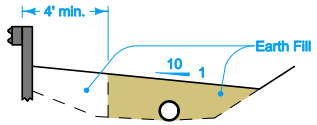
GUARDRAIL GRADING



PLAN

① See sheets 1, 2, or 3 for unshaded areas.



SECTION E-E

LEGEND

Slope - 10:1

Slope - 8:1

FILL OVER PIPE CULVERT ①

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION

New 04-19-11

EW-301

SHEET 4 of 5

REVISIONS: New. Replaces RL-14A.

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GUARDRAIL GRADING

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Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

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SHEET 5 of 5

REVISIONS: New. Replaces RL-14A.

Deanna Maifield
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GUARDRAIL GRADING

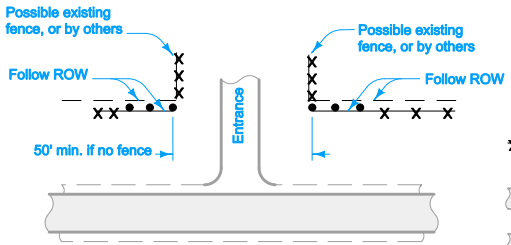
Miscellaneous

SECTION

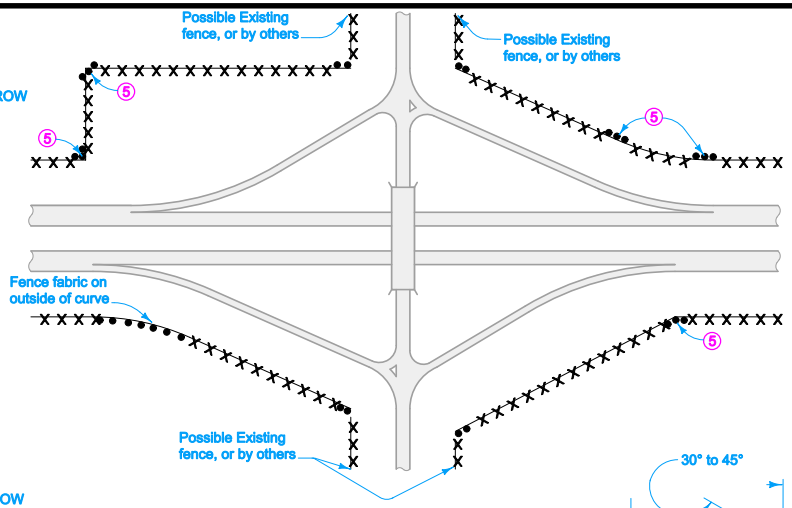
Miscellaneous

MI

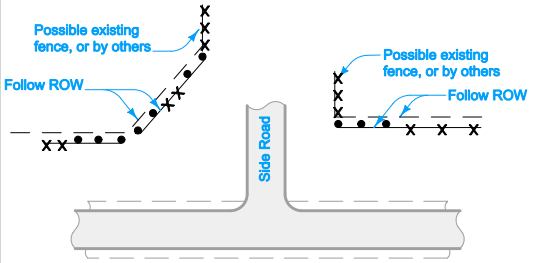
NO.	DATE	TITLE
		Fencing
MI-101	04-20-10	Fencing Layout
MI-102	10-18-11	Chain Link Fence Construction
MI-103	04-20-10	Field Fence Construction
MI-104	10-18-11	Deer Fence Construction
		Sidewalks and Driveways
MI-210	04-17-12	PCC Driveways and Alleys
MI-220	04-17-12	Detectable Warnings and Pedestrian Ramp
MI-221	04-17-12	Combined Retaining Wall - Sidewalk



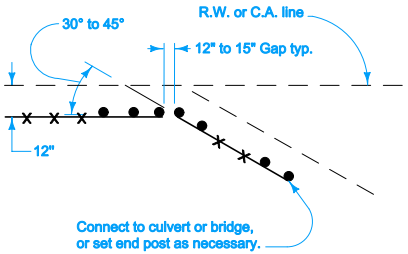
DRIVEWAYS AND ENTRANCES



INTERCHANGES



AT-GRADE INTERSECTIONS



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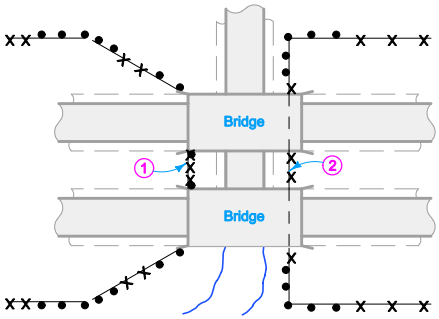
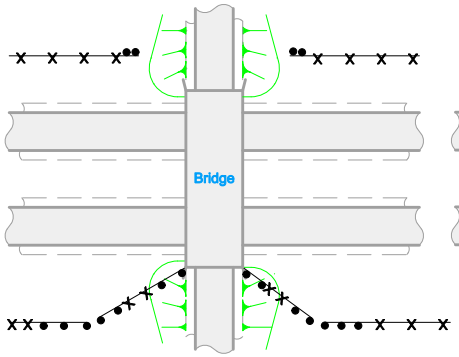
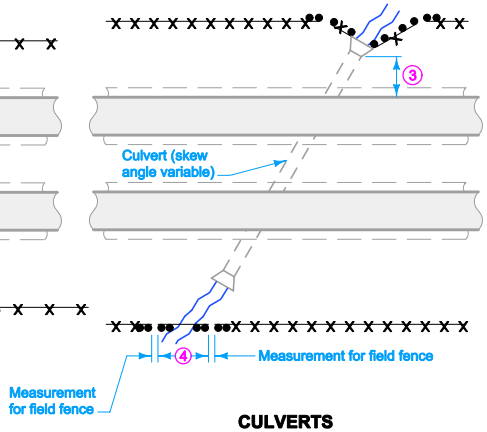


DUAL BRIDGES OVER STREAM AND SIDE ROAD



SIDE ROAD BRIDGE OVER MAINLINE



CULVERTS

Details shown illustrate typical situations and are not intended to cover specific cases. Refer to project plans for particular requirements at various locations.

Do not disturb or destroy any Right-of-Way markers.

Provide 12 inches to 15 inches of clear space between adjoining end post installations.

1. Review the exact location of the posts with the Engineer prior to construction.
2. Contractor has the option to install fence continuously beneath bridges when practical.
3. Contractor has the option to install fence over the top of the culvert if this dimension is a minimum of 50 feet.
4. Floodgate, Floodplain, or Channel Crossing Fence as specified on project plans. Review the exact location of the post with the Engineer prior to construction.
5. Construct corners with posts on the inside, unless wire is cut and wrapped.

Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

MI-101

SHEET 1 of 1

REVISIONS: New. Replaces RC-7.

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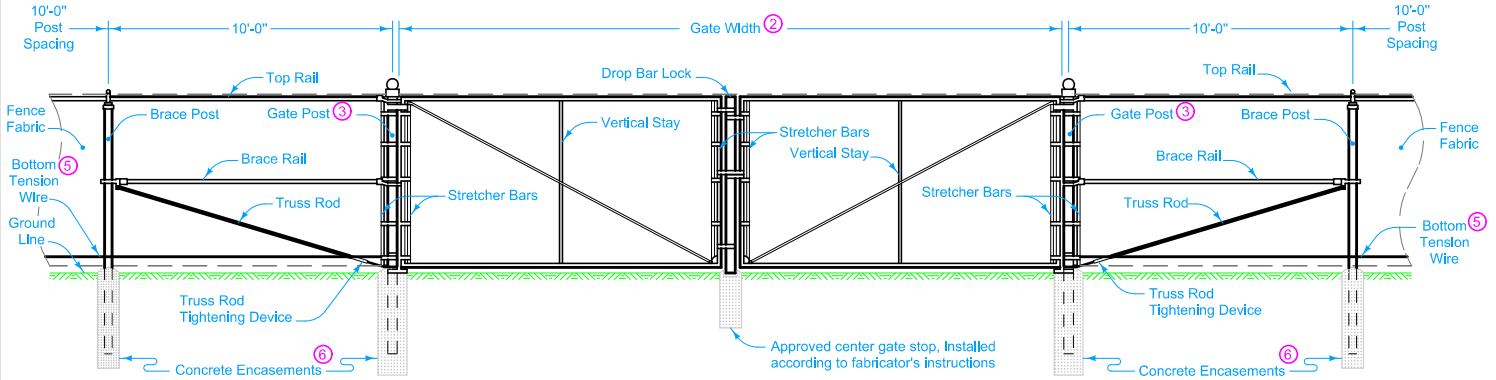
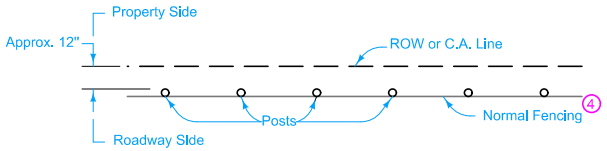
APPROVED BY DESIGN METHODS ENGINEER

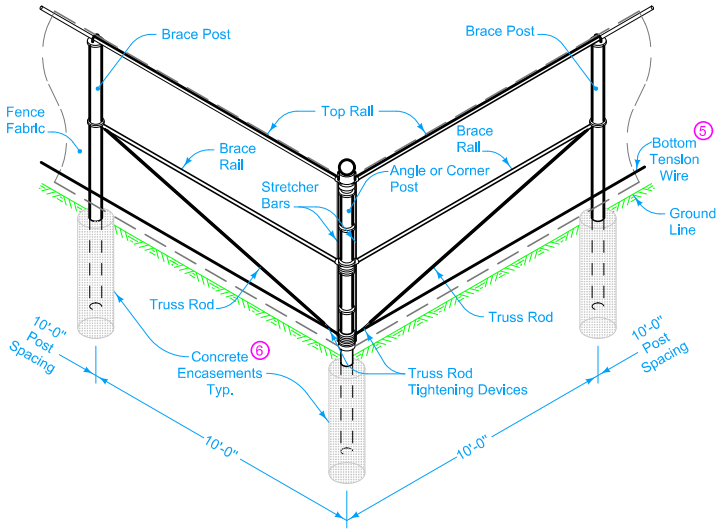
FENCING LAYOUT



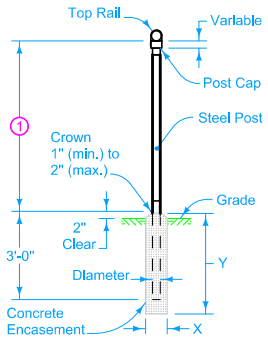
GATE INSTALLATION



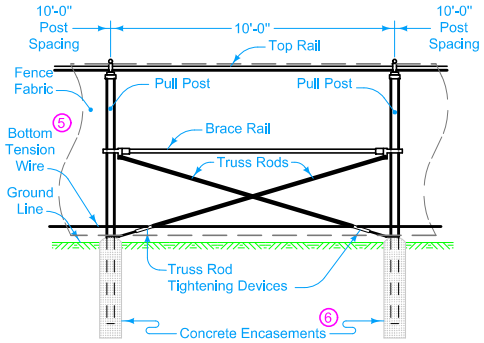
PLAN OF FENCE



ANGLE OR CORNER POST INSTALLATION



POST INSTALLATION



PULL POST INSTALLATION

ITEM	POST SIZE			CONCRETE ENCASEMENT SIZE	
	Nominal Pipe Size, in.	Outside Diameter, in.	Weight, lb./ft.	X	Y
Rail	1¼	1.660	2.27	----	----
Brace Post	1¼	1.660	2.27	0'-9"	3'-6"
Line Post	2	2.375	3.65	0'-9"	3'-6"
Angle, Corner, End, or Pull Post	2½	2.875	5.79	1'-0"	3'-9"
Gate Post for various gate widths:					
6 ft. or less	2½	2.875	5.79	1'-0"	3'-9"
over 6 ft. to 12 ft.	3½	4.000	9.11	1'-0"	4'-0"
over 12 ft. to 18 ft.	6	6.625	18.97	1'-4"	4'-0"
over 18 ft. to 24 ft.	8	8.625	28.55	1'-6"	4'-0"

Attach chain link fabric to braces, top rail, tension wire, and intermediate posts at intervals of 12 inches maximum.

(1) Fabric width will be 6 feet unless otherwise specified.

(2) Unless specified otherwise, install gates 16 feet in width. Double gate (shown) is required only for widths more 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.

(3) End Post used to terminate run of fence if no gate is proposed.

(4) Place fence fabric on roadway side of post. For stream crossings place fabric on the upstream side of the post.

(5) Connect bottom tension wire to end posts, angle posts, and pull posts. Install a turnbuckle or other approved tightening device on each continuous span of tension wire.

(6) Refer to Post Installation detail.

Possible Contract Items:
Chain Link Fence
Chain Link Gate Assembly

Iowa Department of Transportation

REVISION
1 10-18-11

STANDARD ROAD PLAN

MI-102

SHEET 1 of 2

REVISIONS: Modified notes to conform with modified specifications. Added circle notes 4 through 8.

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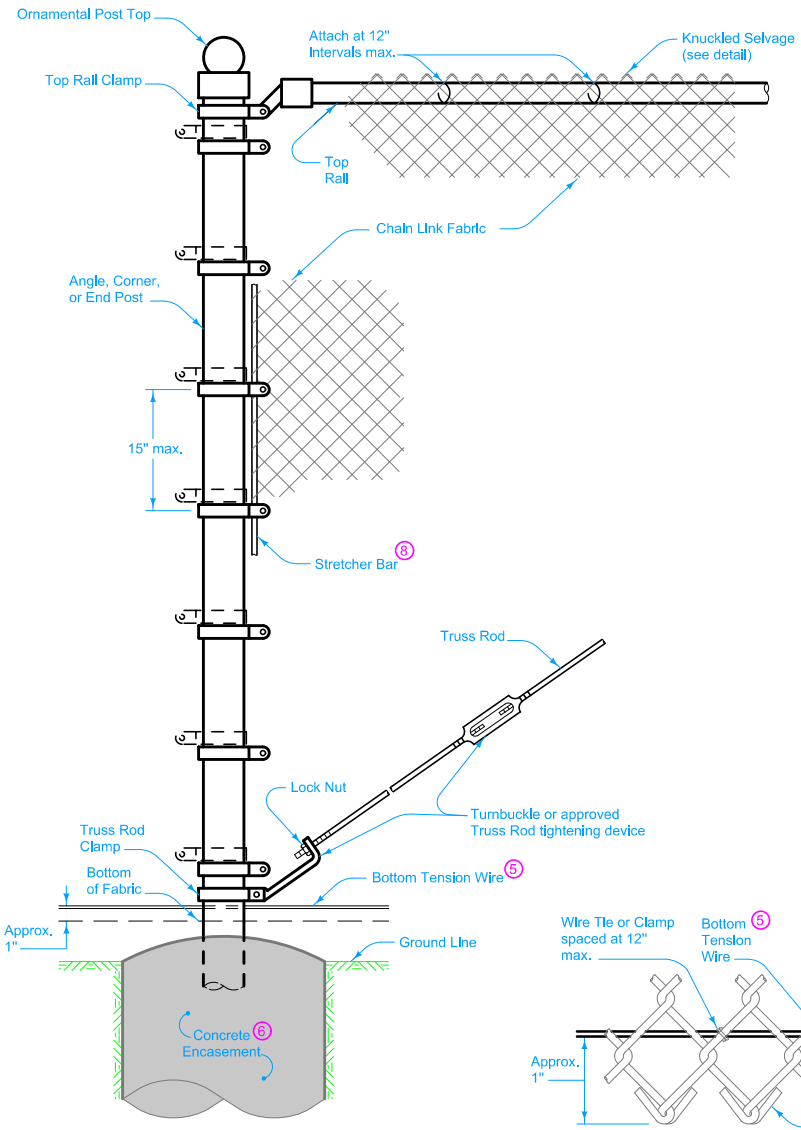
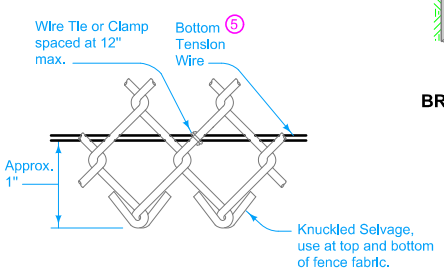
APPROVED BY DESIGN METHODS ENGINEER

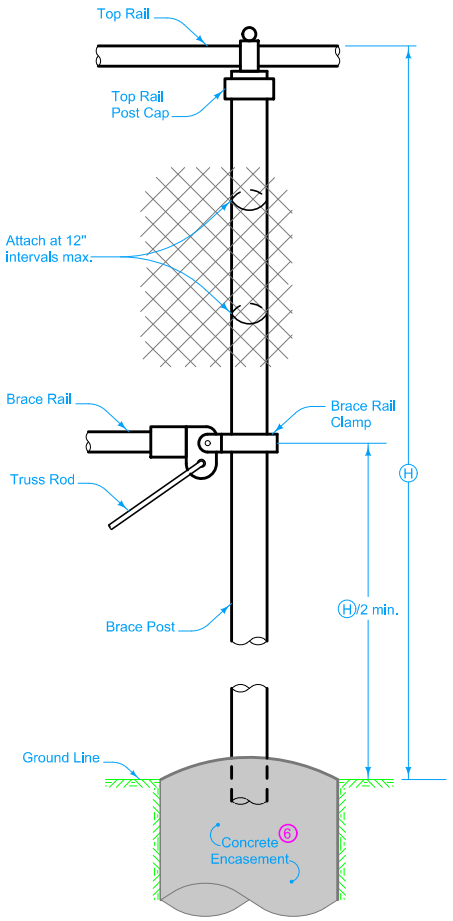
CHAIN LINK FENCE CONSTRUCTION



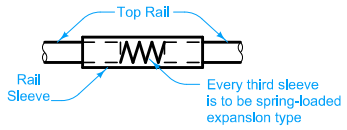
ANGLE, CORNER, OR END POST ASSEMBLY



BOTTOM TENSION WIRE AND KNUCKLED SELVAGE



BRACE POST ASSEMBLY



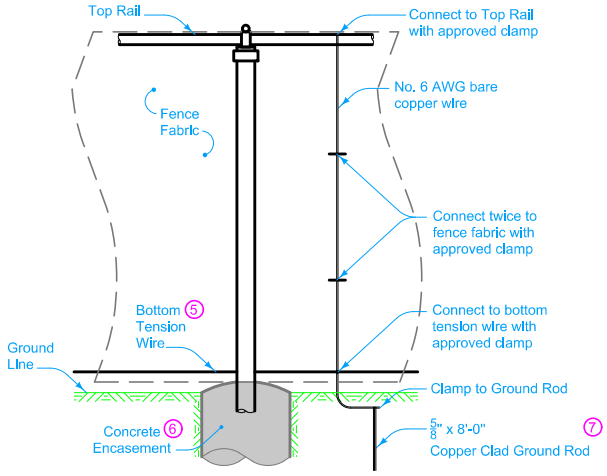
RAIL SLEEVE

(5) Connect bottom tension wire to end posts, angle posts, corner posts, and pull posts. Install a turnbuckle or other approved tightening device on each continuous span of tension wire.

(6) Refer to Post Installation detail.

(7) Drive ground rod vertically until the top is 6 inches below the ground surface.

(8) Secure each end of each run of fabric using a stretcher bar inserted in the final links of the fabric. Use a bar that is as long as the fabric is wide.



GROUND ROD INSTALLATION

Iowa Department of Transportation

REVISION
1 | 10-18-11

STANDARD ROAD PLAN

MI-102

SHEET 2 of 2

REVISIONS: Modified notes to conform with modified specifications. Added circle notes 4 through 8.

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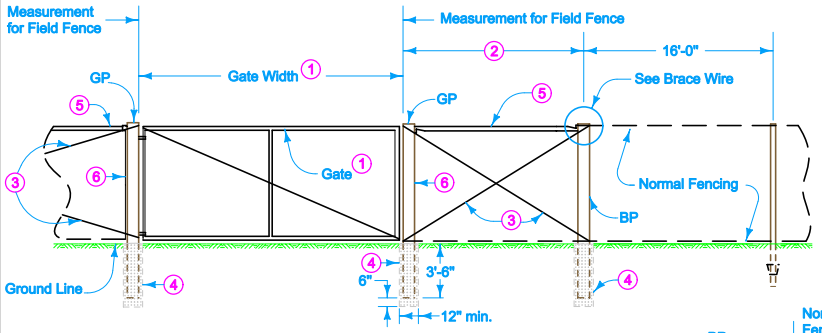
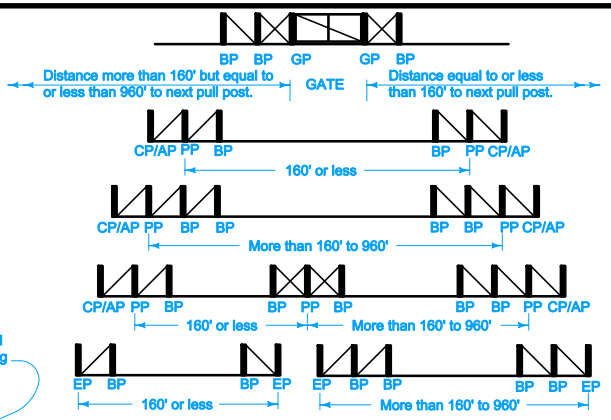
APPROVED BY DESIGN METHODS ENGINEER

CHAIN LINK FENCE CONSTRUCTION

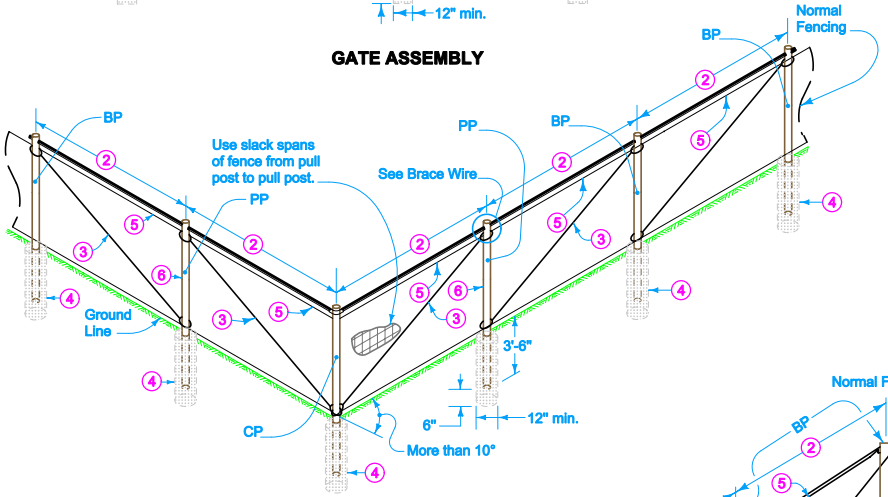


GATE ASSEMBLY

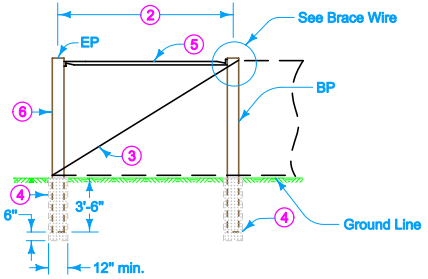


PP = Pull Post CP = Corner Post AP = Angle Post
BP = Brace Post EP = End Post GP = Gate Post

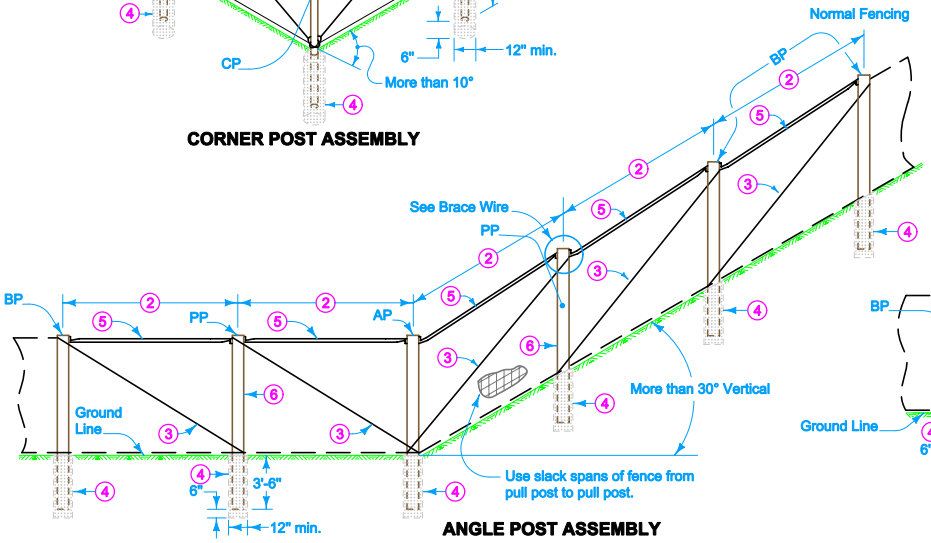
BRACE PANEL LAYOUT



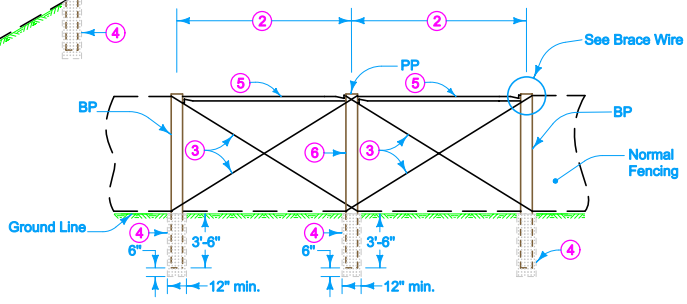
CORNER POST ASSEMBLY



END POST ASSEMBLY



ANGLE POST ASSEMBLY



PULL POST ASSEMBLY 7

FIELD FENCE ASSEMBLY

1. Unless specified otherwise, install a 16 foot gate. Double gate is required only for widths more than 16 feet. Exact details of gate design are subject to the approval of the Engineer. Install as recommended by the manufacturer.
2. Brace Panel.
3. Brace Wire: 4 strands of No. 9 wire.
4. Details indicate placement of granular material for certain posts. The Contractor has the option to drive posts if method demonstrated is satisfactory to the Engineer. Granular material will not be required for driven posts.
5. Metal brace 8 feet long.
6. Wrap wire fabric around post.
7. Pull Post Assembly is requried when the distance between pull posts is greater than 960 feet in straight lines of fence.

Possible Contract Items:
- Field Fence
- Field Fence Brace Panel
- Field Fence Gate
- Flood Plain Fencing
- Type A Channel Crossing Fence
- Type B Channel Crossing Fence

Possible Tabulations:
100-7

Iowa Department of Transportation

REVISION
New 04-20-10

STANDARD ROAD PLAN

MI-103

SHEET 1 of 5

REVISIONS: New. Replaces RC-8A, RC-8B, RC-9A, RC-9B.

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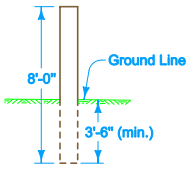
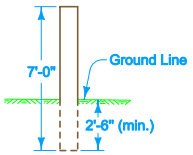
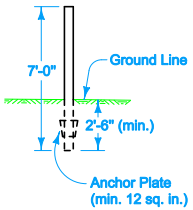
FIELD FENCE CONSTRUCTION



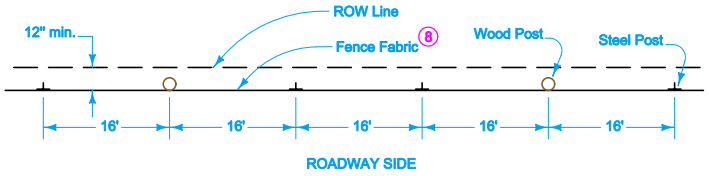
ANGLE, BRACE, CORNER, END OR PULL POST (WOOD)



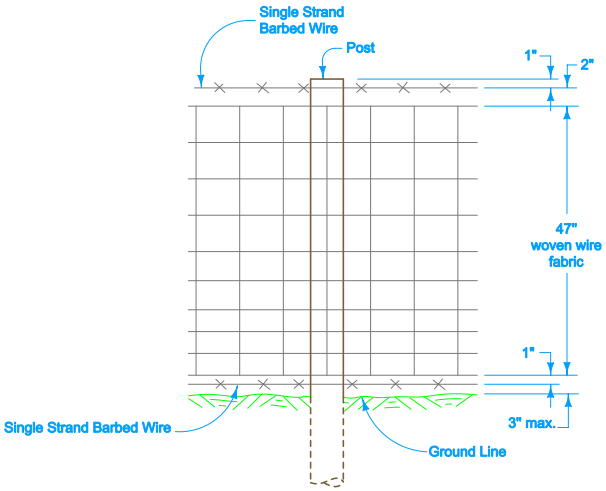
LINE POST (WOOD)



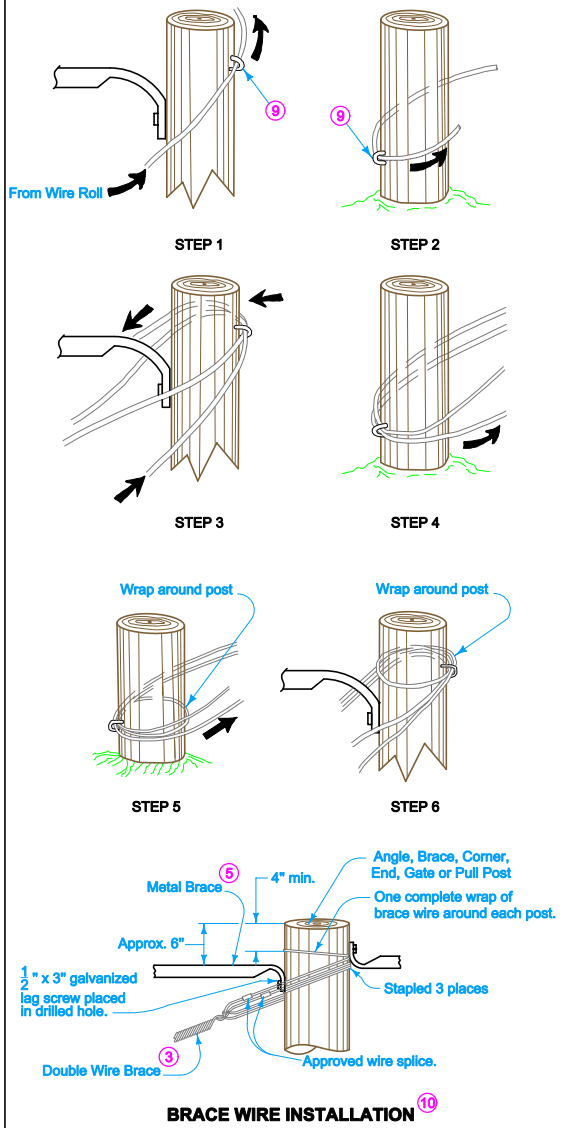
LINE POST (STEEL)



PLAN



ELEVATION



BRACE WIRE INSTALLATION 10

FIELD FENCE ASSEMBLY

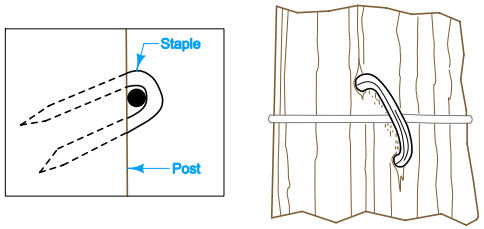
3 Brace Wire: 4 strands of No. 9 wire.

5 Metal brace 8 feet long.

8 Place fence fabric on the roadway side of posts. Place fence fabric on the opposite side of posts for certain curves, stream crossings, or other locations directed by the Engineer or by the contract documents.

9 Set staples cross-wise to the grain. Drive staples tight at pull posts. Drive all other staples firm, but loose enough to allow lateral movement of the wire.

10 Twist the two brace wires together to produce proper tension in the brace assembly.



STAPLES 9

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

MI-103

SHEET 2 of 5

REVISIONS: New. Replaces RC-8A, RC-8B, RC-9A, RC-9B.

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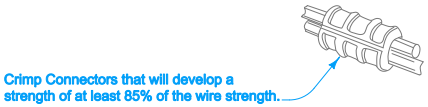
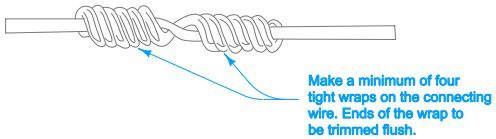
APPROVED BY DESIGN METHODS ENGINEER

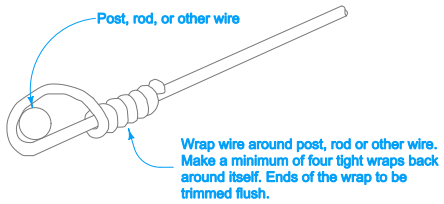
FIELD FENCE CONSTRUCTION



CRIMP CONNECTION

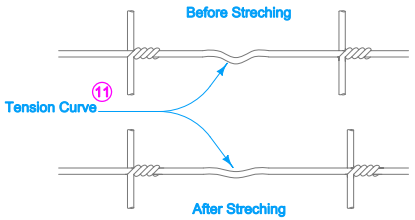


IN-LINE CONNECTION

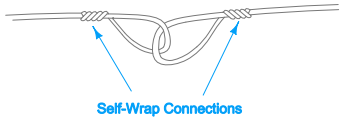


SELF-WRAP CONNECTION

APPROVED WIRE CONNECTIONS

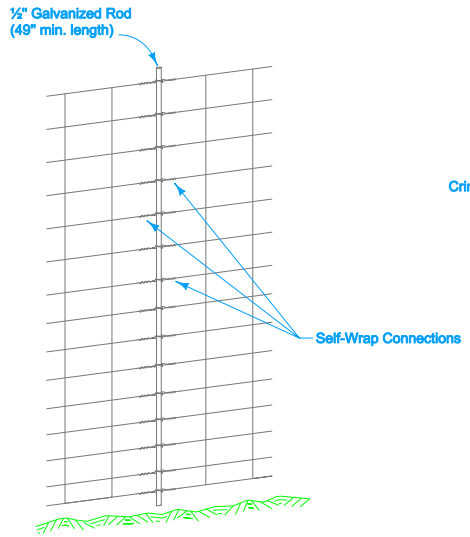


STRETCHING DETAILS

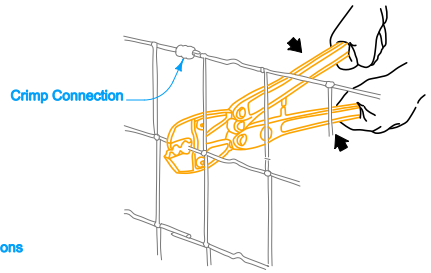


BRACE WIRE SPLICE (12)

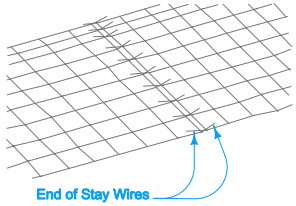
FIELD FENCE ASSEMBLY

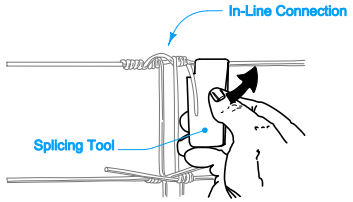


SPLICE WITH ROD



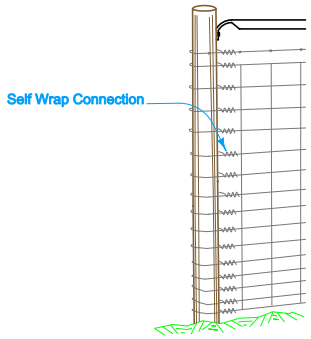
CRIMP SPLICE





OVERLAP SPLICE

FABRIC SPLICES



END POST CONNECTION

(11) Tension curve consists of a "U" shaped crimp in the fence wires and has the same effect as a spring. Stretch to 50% removal of the factory crimp.

(12) Crimp connection and in-line connection are also acceptable brace wire splices.

Iowa Department of Transportation

REVISION: New 04-20-10

STANDARD ROAD PLAN

MI-103

SHEET 3 of 5

REVISIONS: New. Replaces RC-8A, RC-8B, RC-9A, RC-9B.

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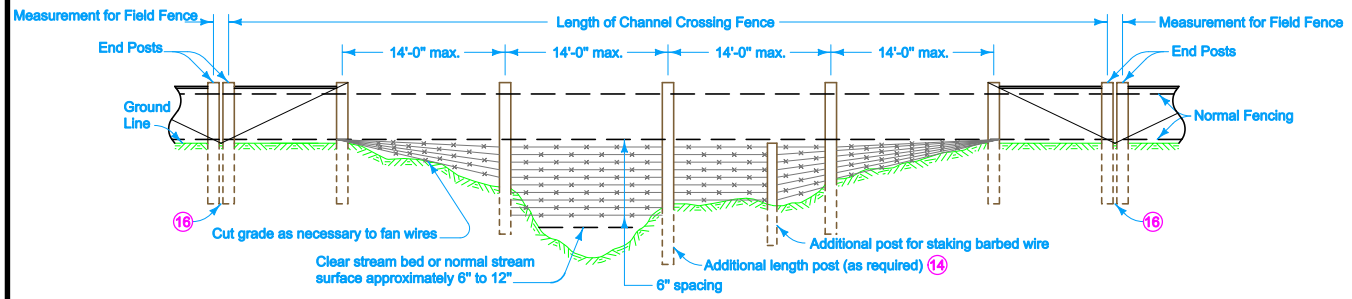
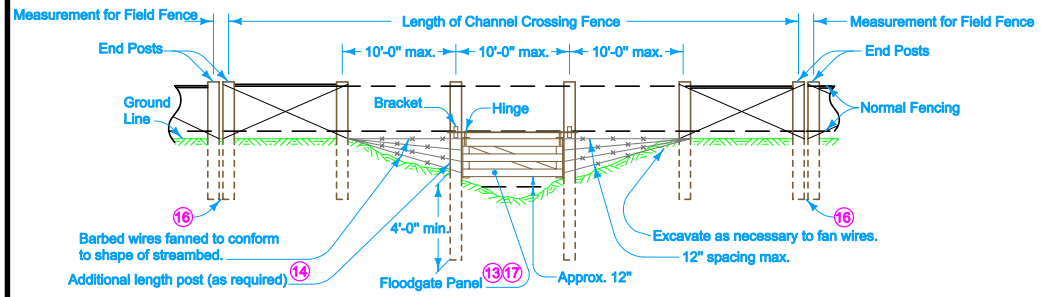
APPROVED BY DESIGN METHODS ENGINEER

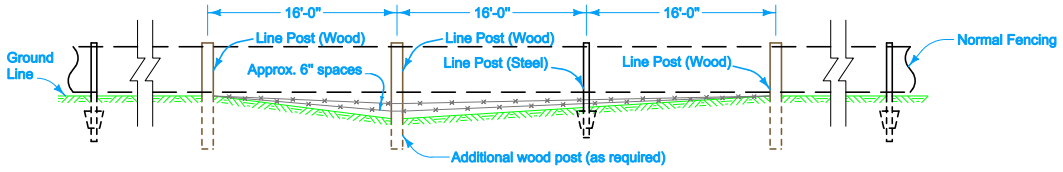
FIELD FENCE CONSTRUCTION



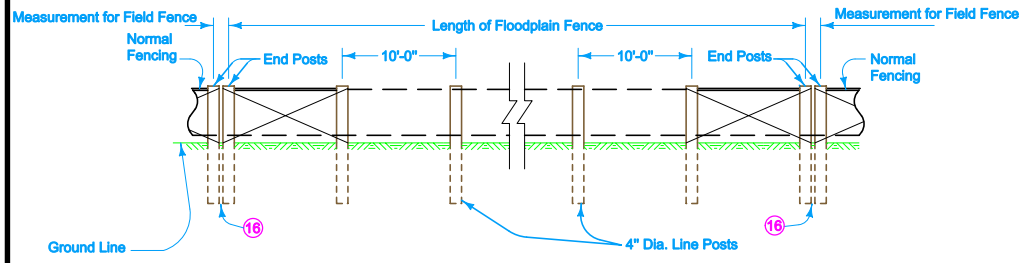
CHANNEL CROSSING FENCE - TYPE "A"



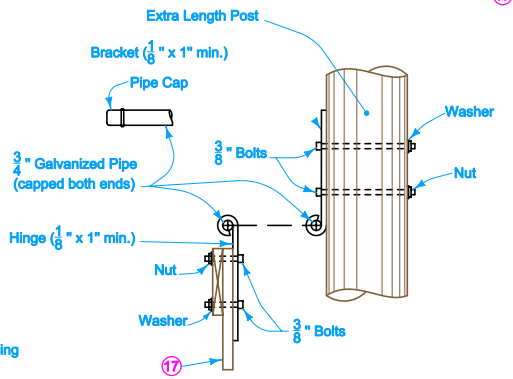
CHANNEL CROSSING FENCE - TYPE "B"



LINE FENCE AT MINOR GROUND DEPRESSIONS 15



FLOOD PLAIN FENCE



FLOODGATE HINGE AND BRACKET

13 Floodgate is part of the Type 'B' Channel Crossing Fence.

14 All extra length posts more than 8 feet long require a minimum embedment of 4 feet. For Flood Plain Fencing, install line posts of treated wood, 4 inches minimum diameter, 8 feet long and spaced at 10 foot centers. Maximum interval of Pull Posts Assembly is 600 feet.

15 For fence at minor ground depressions, additional wood line posts and up to two additional barbed wires will not be paid for directly but will be considered incidental to the price bid for Field Fence.

16 Provide a minimum of 12 to 15 inches of clear space between adjoining end post installations.

17 Floodgate Panel built from Untreated Rough 1 in. x 8 in. (Nominal) Lumber. More than one Floodgate Panel if required by the contract documents.

FIELD FENCE AT WATERWAYS

Iowa Department of Transportation

REVISION
New 04-20-10

STANDARD ROAD PLAN

MI-103

SHEET 4 of 5

REVISIONS: New. Replaces RC-8A, RC-8B, RC-9A, RC-9B.

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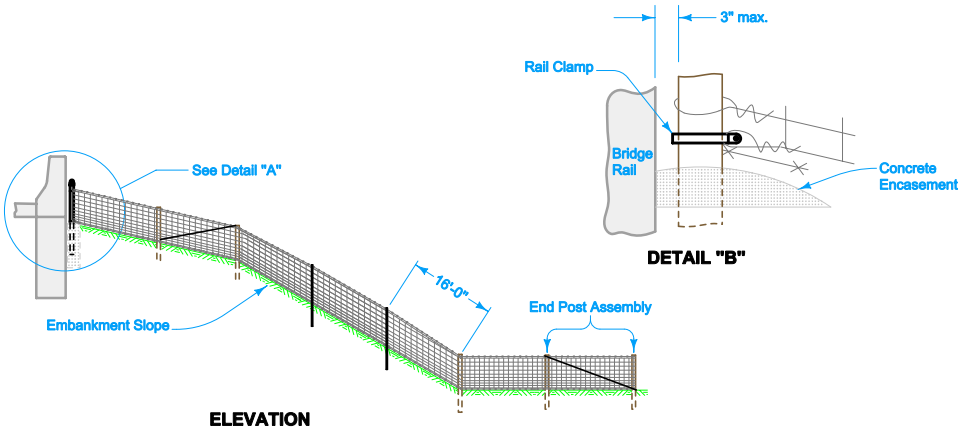
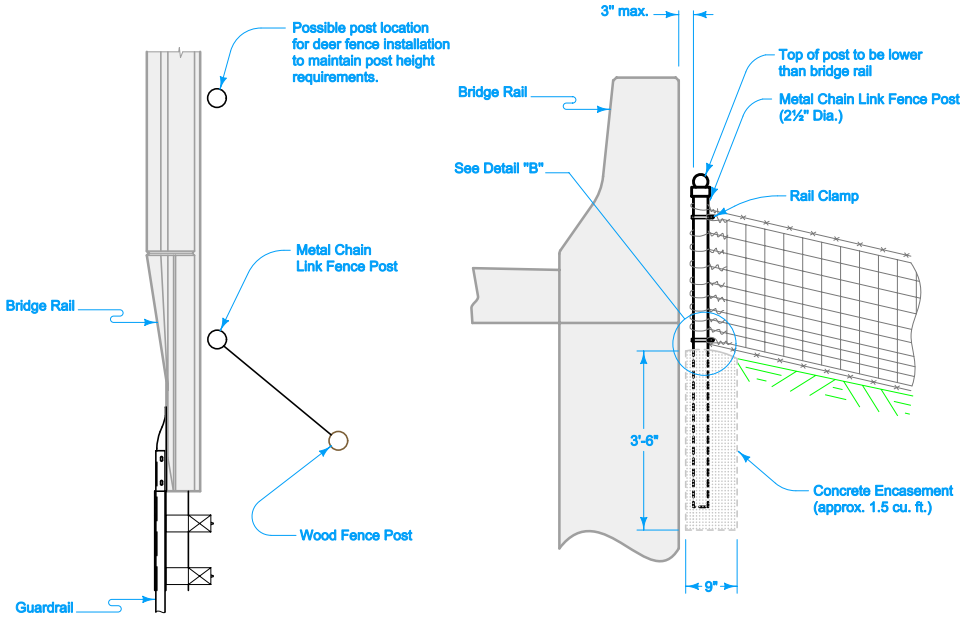
APPROVED BY DESIGN METHODS ENGINEER

FIELD FENCE CONSTRUCTION



DETAIL "B"

ELEVATION



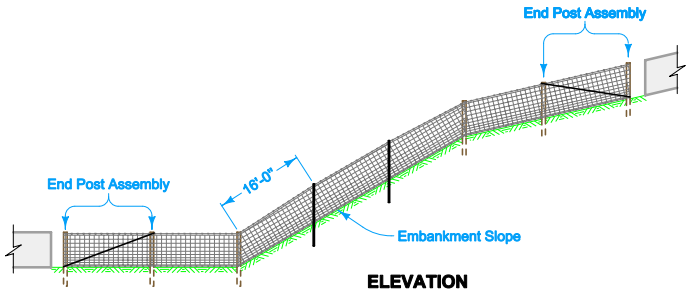
PLAN

DETAIL "A"

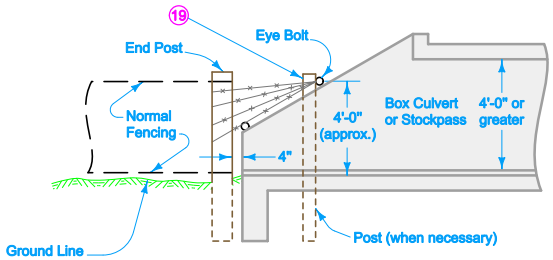
FENCE TERMINATION AT BRIDGES (18)

(18) Fence termination at bridges, culverts, and other structures as detailed hereon will not be paid for separately but will be considered incidental to the bid item "Field Fence" or "Deer Fence."

(19) Place minimum of four (4) barbed wires fan shaped, connected to eye bolt on culvert wall or set 4 inch post when necessary.



ELEVATION



BOX CULVERTS OR STOCK PASSES 4 FEET OR LARGER

FENCE TERMINATION AT STRUCTURES (19)

Iowa Department of Transportation

REVISION: New 04-20-10

STANDARD ROAD PLAN

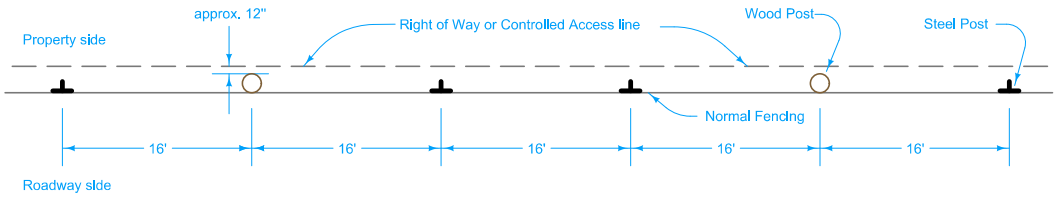
MI-103

SHEET 5 of 5

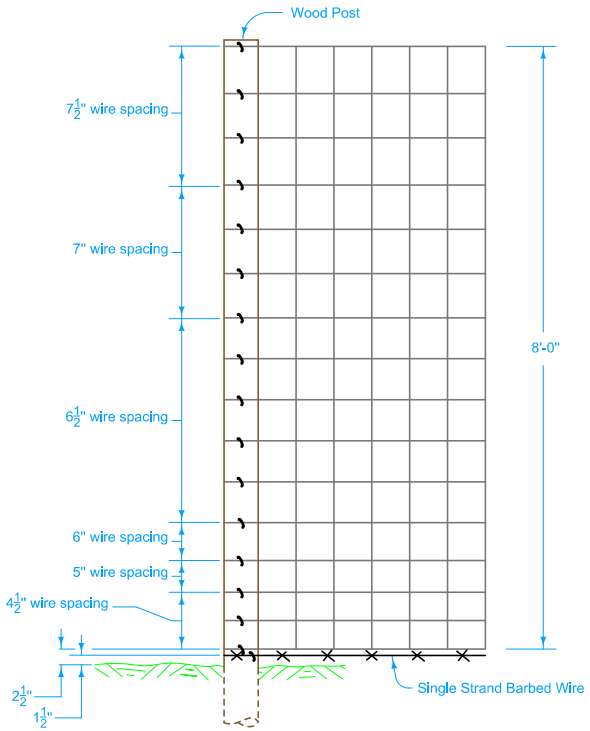
REVISIONS: New. Replaces RC-8A, RC-8B, RC-9A, RC-9B.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

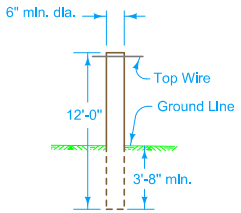
FIELD FENCE CONSTRUCTION



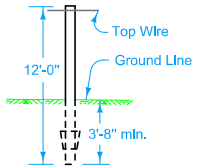
FENCE PLAN



ELEVATION



WOOD POST



STEEL POST

Follow Standard Specification 2519.03A for general fence construction requirements.

Space line brace posts according to MI-103 where fencing is continuous and where end, corner, and line brace posts are not specified.

Double wrap barbed wire and tie off at end posts, corner posts, and line brace posts. Single wrap woven wire and tie off. Restart fence to be continued, in like manner.

Fence wire may be placed on either the road side or the field side of posts, depending on local conditions; I.E., on curves, the wire should be placed on the side which would result in the least amount of tension on the staples. This will also apply where wind, drift, or other conditions would exert unusual pressure against the wire.

Refer to MI-103 for layouts of brace posts.

Refer to MI-103 for details of channel crossing installation and termination of fencing at structures.

Possible Contract Items:
- Deer Fence, 96 in.
- Deer Fence Brace Panels
- Gate, Deer, As Per Plan

Possible Tabulation:
- 100-7

Iowa Department of Transportation

REVISION 2 10-18-11

STANDARD ROAD PLAN

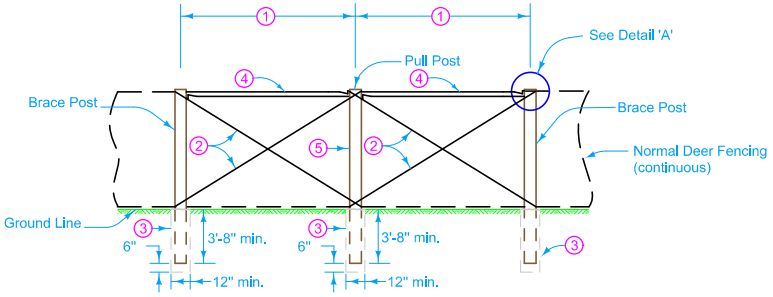
MI-104

SHEET 1 of 3

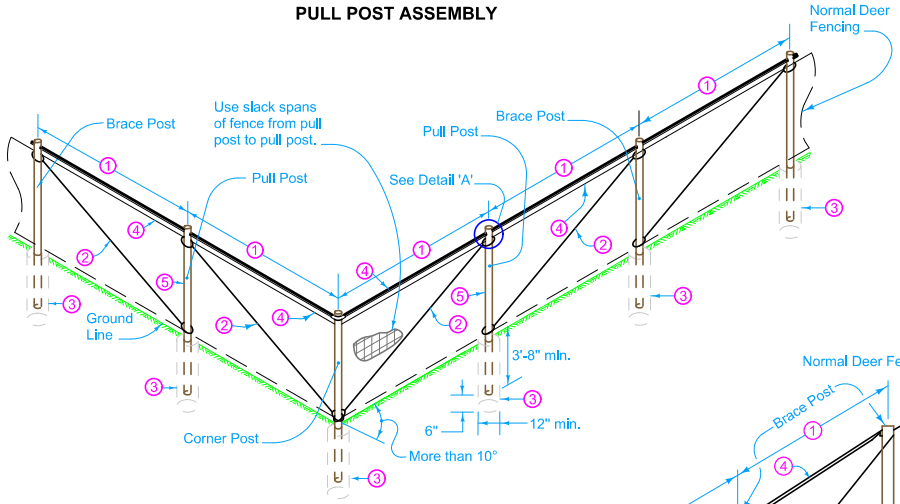
REVISIONS: Removed general notes covered by specs.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

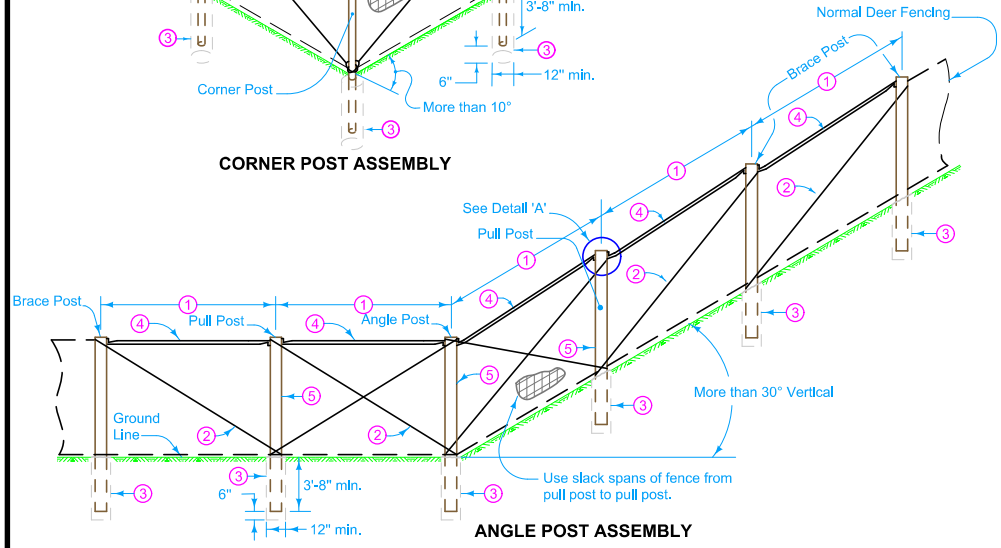
DEER FENCE CONSTRUCTION



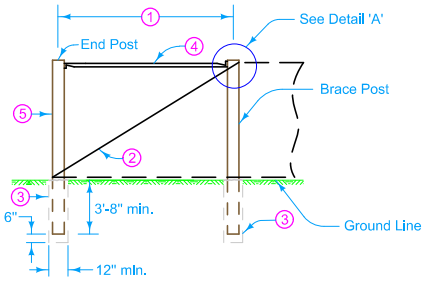
PULL POST ASSEMBLY



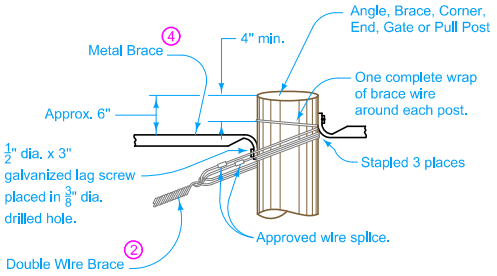
CORNER POST ASSEMBLY



ANGLE POST ASSEMBLY



END POST INSTALLATION



DETAIL 'A'
BRACE WIRE INSTALLATION (6)

(Brace wire wrapped the same at the bottom of post.)

1. Brace Panel.
2. Brace wire: 4 strands of No. 9 wire.
3. Details indicate placement of granular material for certain posts. Posts may be driven if satisfactory method is demonstrated to the Engineer. Granular material will not be required for driven posts.
4. Metal Brace 8 feet long.
5. Wrap wire fabric around post.
6. Twist the two brace wires together to produce proper tension in the brace assembly.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

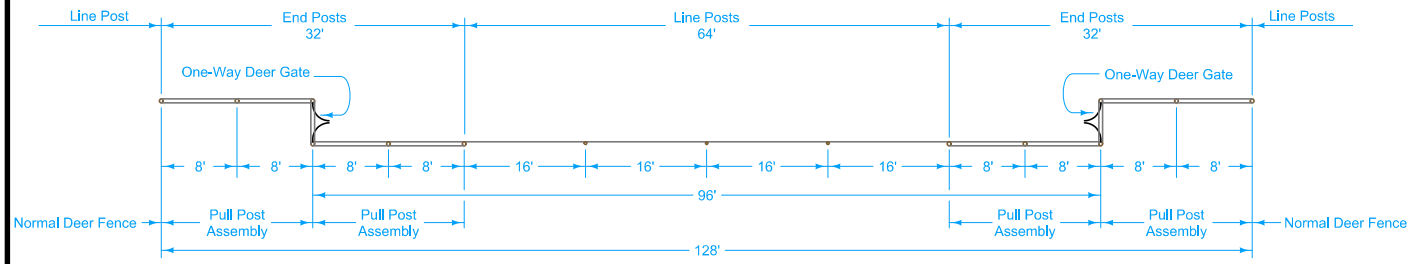
MI-104

SHEET 2 of 3

REVISIONS: Removed general notes covered by specs.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DEER FENCE CONSTRUCTION



GATE PLAN

(7) Spring loaded hinge allows tines to spread apart and return to original position.

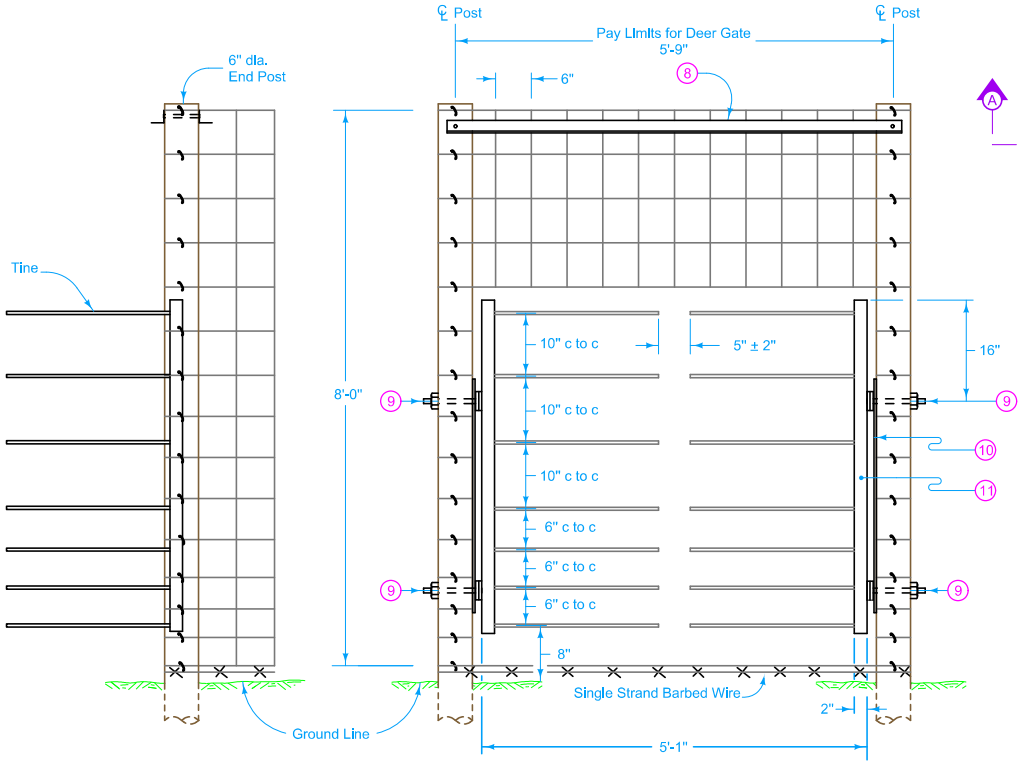
(8) Two 2 in. x 2 in. x $\frac{1}{8}$ in. L top braces held by $\frac{1}{2}$ inch diameter bolts.

(9) Attach nut and washer to each bolt.

(10) Support Plate 3 in. x $\frac{5}{16}$ in. x 37 in.

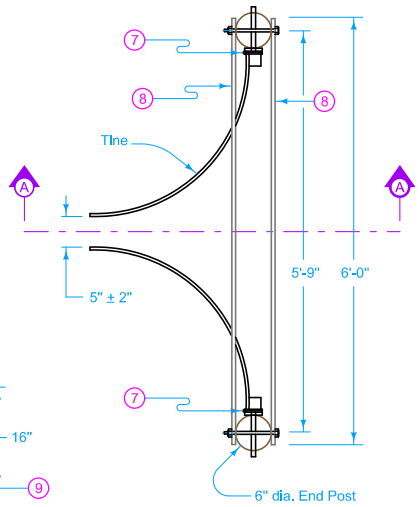
(11) 2 in. x 2 in. x 54 in. structural steel tubing welded to Hinge Plate.

(12) $\frac{3}{4}$ in. diameter x 8 in. bolt welded to Support Plate

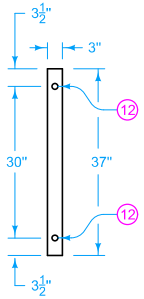


SECTION A-A

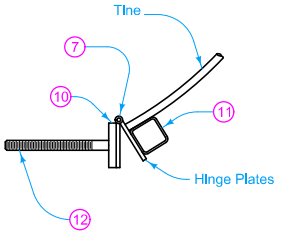
GATE FRONT



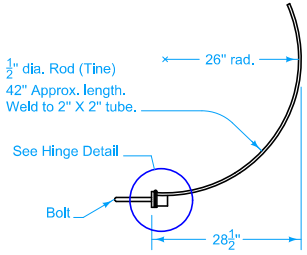
GATE TOP



SUPPORT PLATE



HINGE



TINE

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

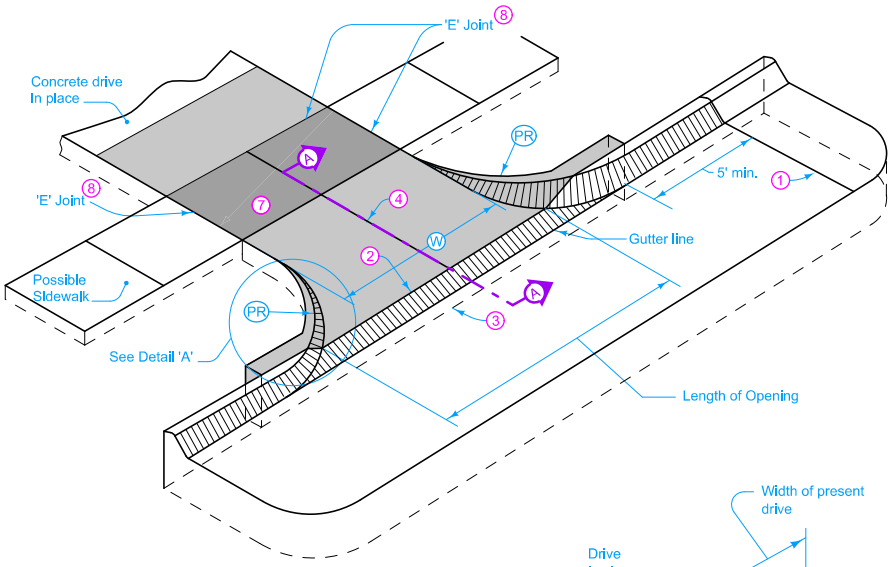
MI-104

SHEET 3 of 3

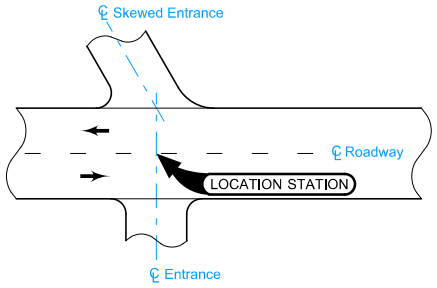
REVISIONS: Removed general notes covered by specs.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

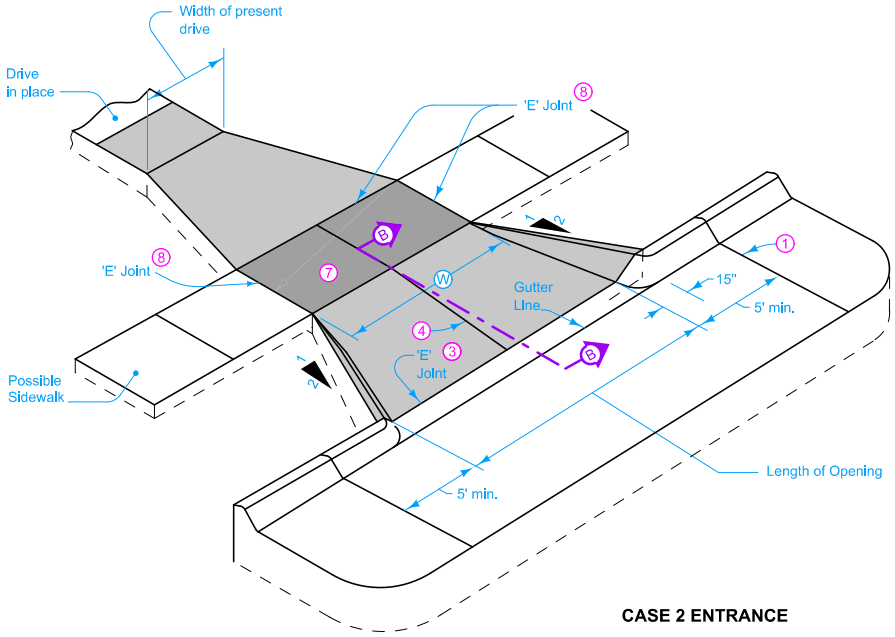
DEER FENCE CONSTRUCTION



CASE 1 ENTRANCE



ENTRANCE LOCATION



CASE 2 ENTRANCE

Special details for entrances other than Cases 1 and 2 are included in the detail plans. The shape and surface of driveways and alleys will vary to fit individual conditions.

Use unreinforced concrete pavement mix with a minimum thickness of 6 inches, unless specified otherwise for driveways and alleys. If an alley drains toward the roadway, use a 2 inch inverted crown; otherwise, use flat surface for driveway pavement.

W is measured at the street side of sidewalk. If sidewalk is not present, W is to be measured at the end of the returns for Case 1 and 10 feet back of curb for Case 2.

(1) Transverse Pavement Joints as per detail Project Plans.

(2) 'K' Pavement Joint (Refer to **PV-101**) from end of radius to end of radius.

(3) Line at the Back of Curb.

(4) 'C' Joint on Centerline.

(7) Refer to contract documents for sidewalk construction if the entrance is designed to accomodate sidewalk. Construct sidewalk using the same thickness as the driveway.

(8) If the sidewalk is in place at the time of construction, place 'E' Joint along the front edge of the sidewalk. If the sidewalk is reconstructed with the driveway entrance, place 'E' Joint along the back edge of the sidewalk and a 'C' Joint sawed or formed along the front edge of the sidewalk. Refer to **PV-101** for joint details.

Possible Contract Items:
Driveway, P.C. Concrete
Driveway, Reinforced P.C. Concrete
Removal of Paved Driveway
Sidewalk, P.C. Concrete

Possible Tabulation:
102-3

Iowa Department of Transportation

REVISION
4 | 04-17-12

STANDARD ROAD PLAN

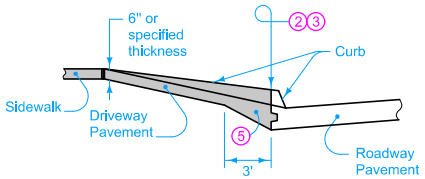
MI-210

SHEET 1 of 2

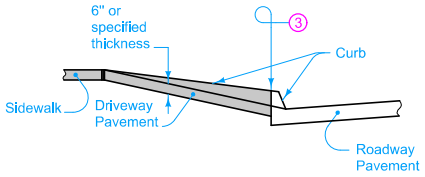
REVISIONS: Removed 6 In. from Sidewalk, P.C. Concrete bid Item and modified circle note 7 to allow thickness to match drive.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

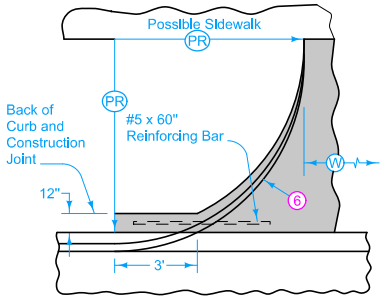
PCC DRIVEWAYS AND ALLEYS



SECTION A-A
(Case 1 Entrance)



SECTION B-B
(Cases 2 Entrance)



DETAIL 'A'
CASE 1 ENTRANCE

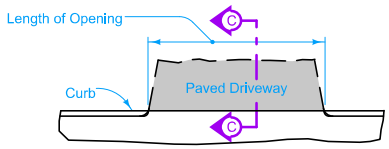
② 'K' Pavement Joint (Refer to PV-101) from end of radius to end of radius.

③ Line at the Back of Curb.

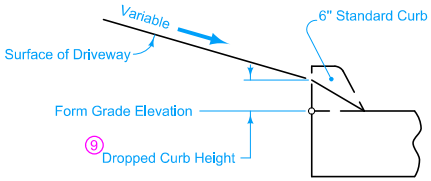
⑤ Taper to Pavement Thickness.

⑥ Lip curb varies from either $4\frac{1}{2}$ inch or 3 inch at back of curb to 0 inch at front of sidewalk.

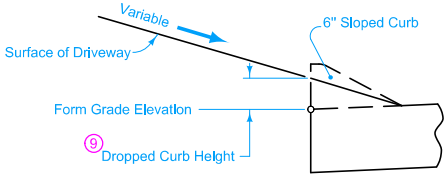
⑨ Refer to Tabulation 102-3.



PLAN



SECTION C-C
(Standard Curb)



SECTION C-C
(Sloped Curb)

DROPPED CURB

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
4	04-17-12

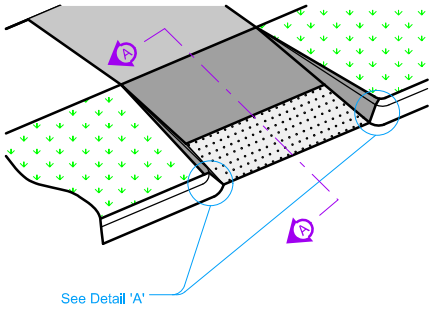
MI-210

SHEET 2 of 2

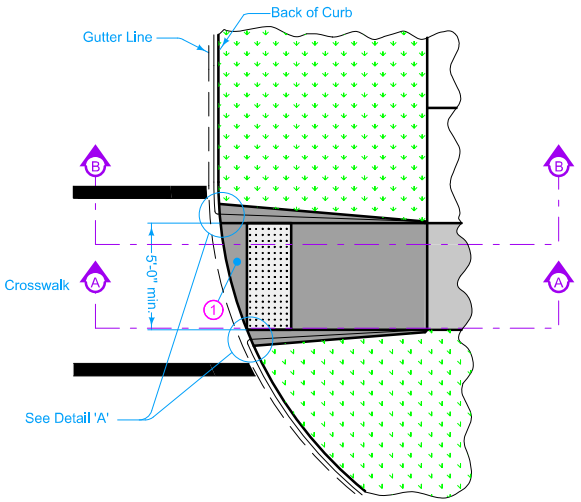
REVISIONS: Removed 6 In. from Sidewalk, P.C. Concrete bid Item and modified circle note 7 to allow thickness to match drive.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PCC DRIVEWAYS AND ALLEYS



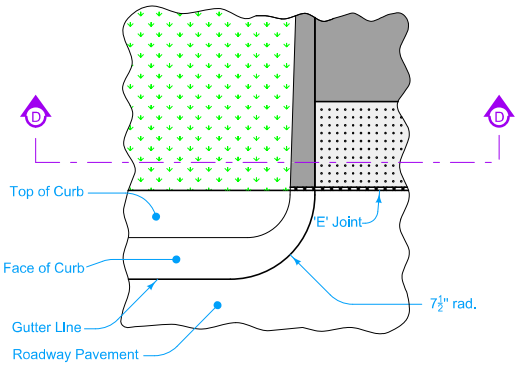
CURB RAMP PERPENDICULAR TO CURB



CURB RAMP NOT PERPENDICULAR TO CURB

1. Unless curb ramp is aligned perpendicular to the street radius, provide an area of special shaping at the bottom of the ramp. This area allows the grade break at the bottom of the ramp to be perpendicular to the ramp and provides a smooth transition to gutterline for wheelchair access.

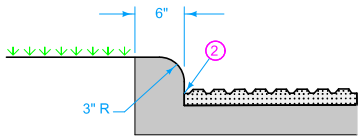
2. Use vertical curb adjacent to ramp unless flares are specified in the project plans. Install Detectable Warnings so that no gap is left between warning panel and base of curb.



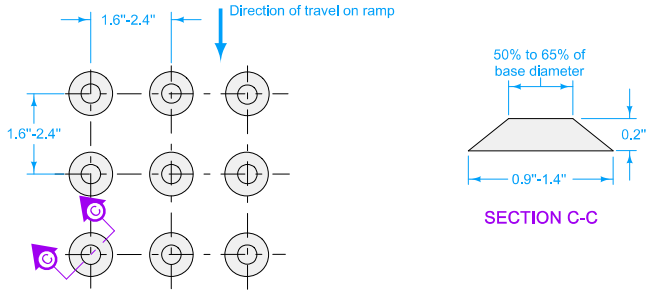
DETAIL 'A'

LEGEND

- Ramp
- Landing
- Detectable Warnings
- Vegetation



SECTION D-D



SQUARE PATTERN
(Parallel alignment)

DOME DETAILS ON DETECTABLE WARNINGS

Possible Contract Items:
- Detectable Warnings
- Sidewalk, P.C. Concrete, 6 in.
- Sidewalk, P.C. Concrete, 4 in.
- Removal of Sidewalk

Possible Tabulation:
- 113-1

Iowa Department of Transportation

REVISION: 4 | 04-17-12

STANDARD ROAD PLAN

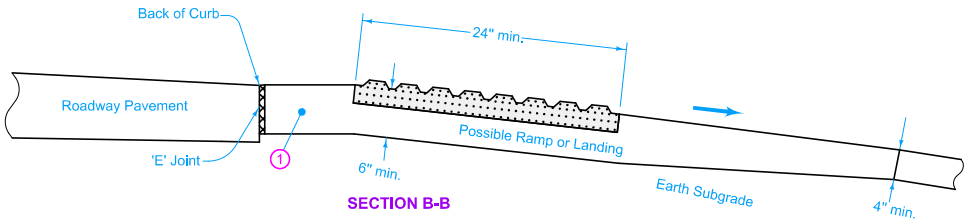
MI-220

SHEET 1 of 3

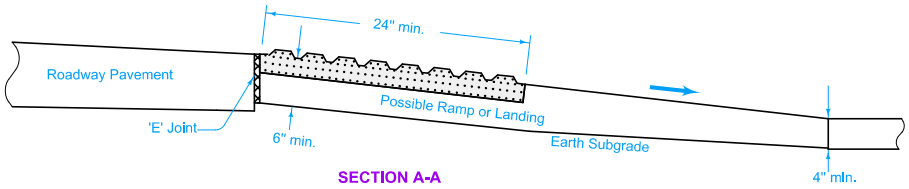
REVISIONS: Modified location of Detail 'B', added Section D-D and changed title.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DETECTABLE WARNINGS AND PEDESTRIAN RAMP



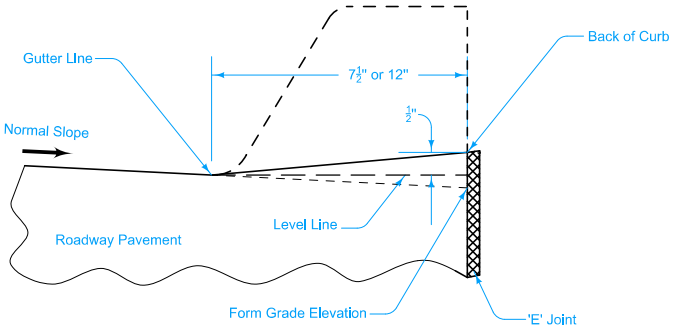
SECTION B-B



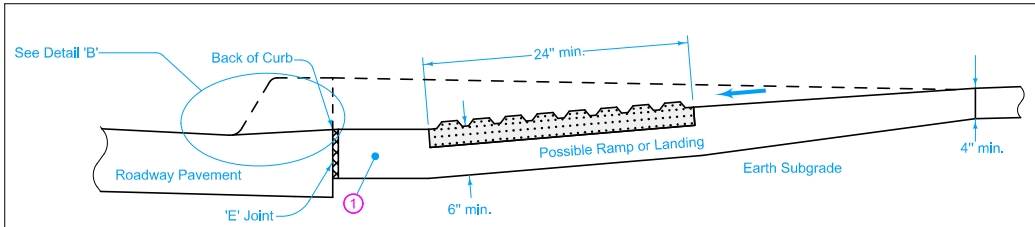
SECTION A-A

TYPICAL INSTALLATION DETECTABLE WARNING
WITH NON CURBED ROADWAY

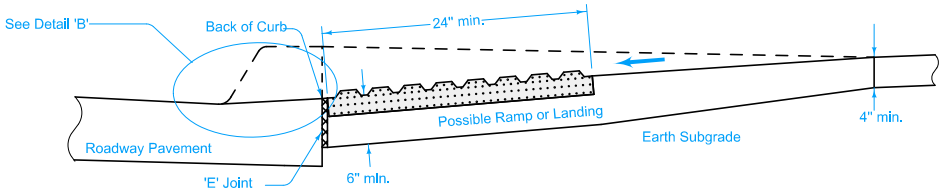
1 Unless curb ramp is aligned perpendicular to the street radius, provide an area of special shaping at the bottom of the ramp. This area allows the grade break at the bottom of the ramp to be perpendicular to the ramp and provides a smooth transition to gutterline for wheelchair access.



DETAIL 'B'



SECTION B-B



SECTION A-A

TYPICAL INSTALLATION DETECTABLE WARNING
WITH CURBED ROADWAY

LEGEND

- Ramp
- Landing
- Detectable Warnings
- Vegetation

Iowa Department of Transportation

REVISION

4	04-17-12

STANDARD ROAD PLAN

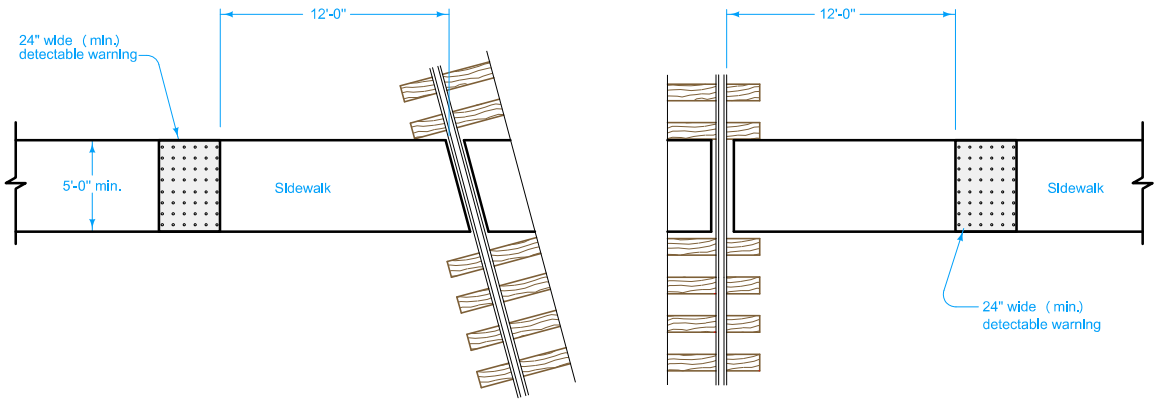
MI-220

SHEET 2 of 3

REVISIONS: Modified location of Detail 'B', added Section D-D and changed title.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DETECTABLE WARNINGS AND PEDESTRIAN RAMP



RAILROAD CROSSING

LEGEND

- Ramp
- Landing
- Detectable Warnings
- Vegetation

Iowa Department of Transportation

REVISION 4 04-17-12

STANDARD ROAD PLAN

MI-220

SHEET 3 of 3

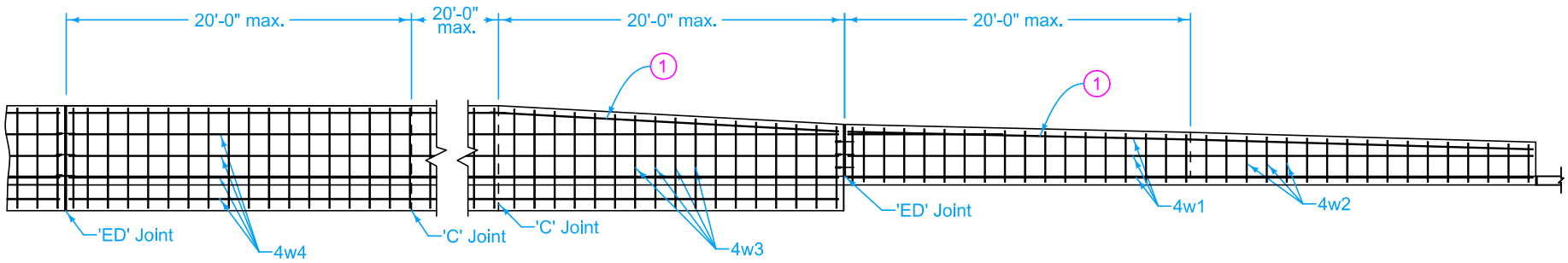
REVISIONS: Modified location of Detail 'B', added Section D-D and changed title.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DETECTABLE WARNINGS AND PEDESTRIAN RAMP

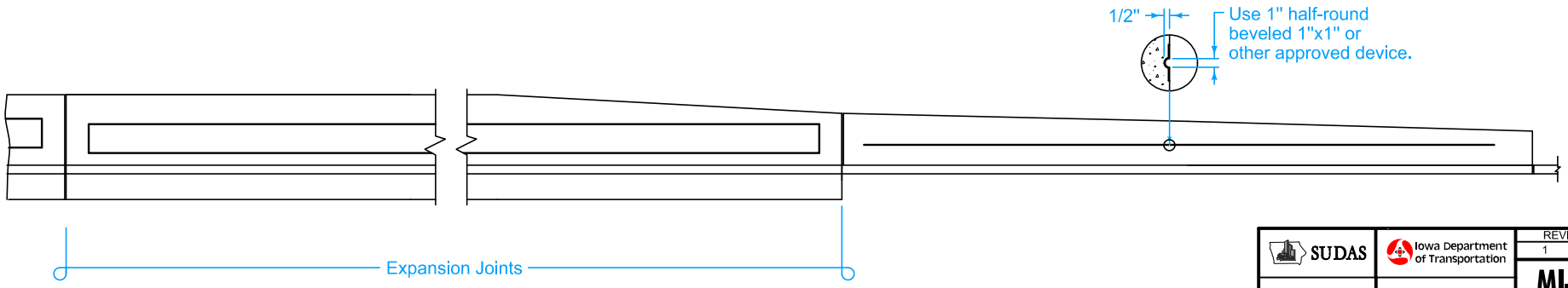
Provide a minimum concrete cover to near reinforcement of 1 1/2 inches. Provide 3 inches minimum cover at the ends of bars.

(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 Department of Transportation

REVISION 1 04-17-12

FIGURE 9072.221 | STANDARD ROAD PLAN

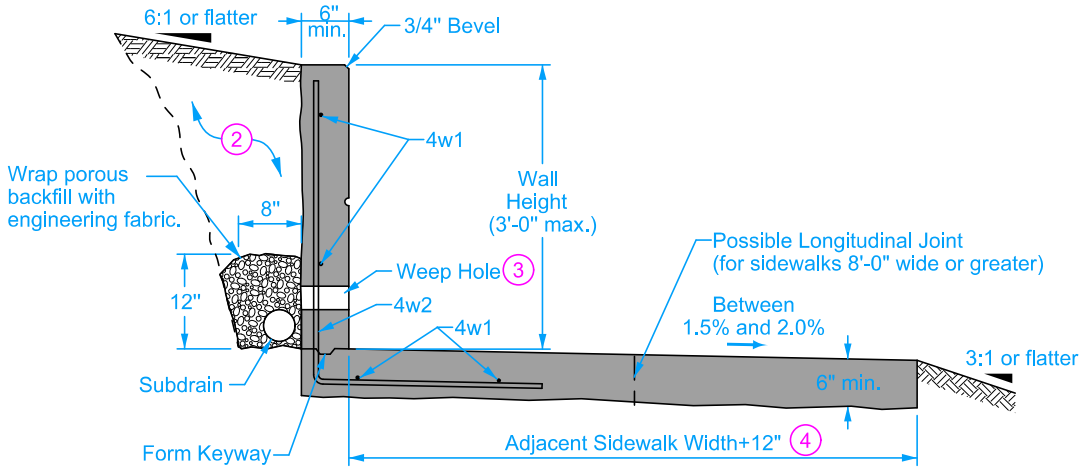
MI-221

SHEET 1 OF 2

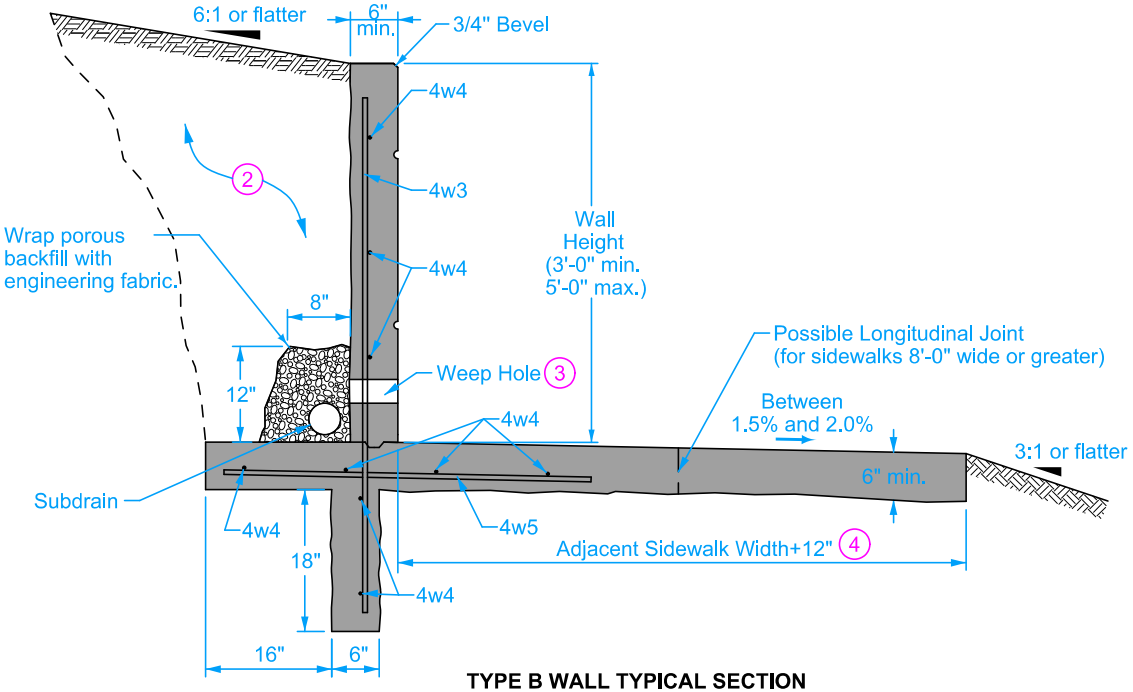
REVISIONS: Changed figure number to 9070.221. Added "or flatter" to clarify slope labels.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

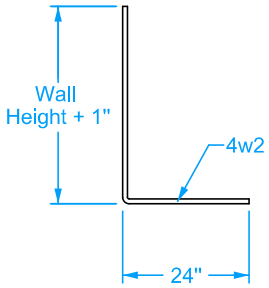
COMBINED RETAINING WALL - SIDEWALK



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 Department of Transportation

REVISION 1 04-17-12

FIGURE 9072.221 | STANDARD ROAD PLAN

MI-221

SHEET 2 OF 2

REVISIONS: Changed figure number to 9070.221. Added "or flatter" to clarify slope labels.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

COMBINED RETAINING WALL - SIDEWALK

FIGURE 9072.221 SHEET 2 OF 2

Pavement Markings

PM

SECTION

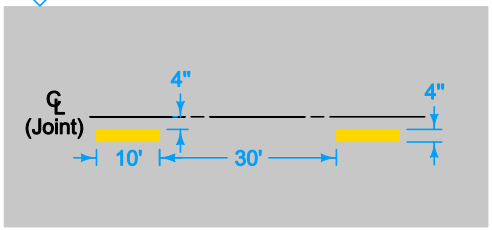
Pavement Markings

PM

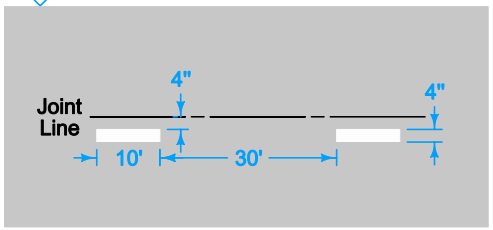
NO.	DATE	TITLE
PM-110	04-19-11	Line Types
PM-111	10-18-11	Symbols and Legends
PM-120	04-19-11	Stop Lines and Islands
PM-210	10-18-11	Separation in Two-Lane Roadway
PM-211	10-18-11	Separation in Four-Lane Roadway
PM-220	04-17-12	Passing Lane
PM-221	04-17-12	Climbing Lane
PM-230	04-17-12	Transition at Abrupt Changes in Pavement Width
PM-240	04-19-11	Railroad Crossing on Two-Lane Roadway
PM-242	04-19-11	Railroad Crossing on Four-Lane Roadway
PM-310	04-19-11	Entrance and Exit Ramps
PM-420	04-19-11	Two-Lane Roadway with no Turn Lanes (One-Way Stop Condition)
PM-520	04-19-11	Two-Lane Roadway with no Turn Lanes (Two-Way Stop Condition)
PM-521	04-19-11	Two-Lane Roadway with Right Turn Lanes
PM-522	04-19-11	Two-Lane Roadway with Left Turn Lanes
PM-550	04-19-11	Two-Lane Roadway with Two-Way Left Turn Lane
PM-560	04-19-11	Divided Multi-Lane Roadway with no Turn Lanes
PM-561	04-19-11	Divided Multi-Lane Roadway with Right Turn Lanes
PM-562	04-19-11	Divided Multi-Lane Roadway with Left Turn Lanes
PM-620	04-19-11	Two-Lane Roadway with no Turn Lanes (Four-Way Stop Condition)
PM-650	04-19-11	Multi-Lane Roadway with Two-Way Left Turn Lane
PM-760	04-19-11	Divided Multi-Lane Roadway Median

DESIGNER INFO

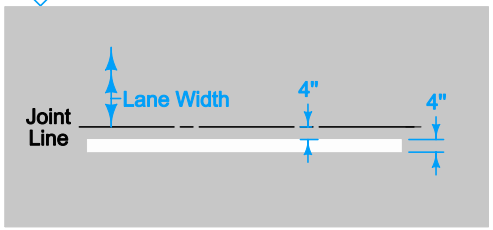
BCY4 BROKEN CENTERLINE (Yellow)



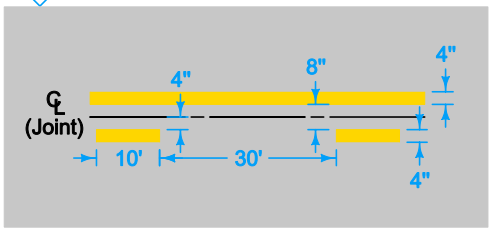
BLW4 BROKEN LANE LINE (White)



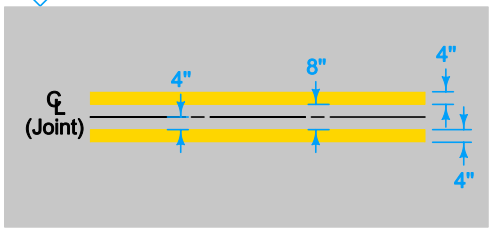
SLW4 SOLID LANE LINE (White)



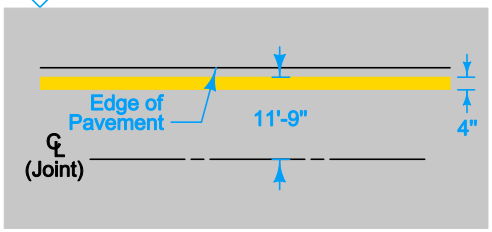
NPY4 NO PASSING ZONE LINE (Yellow)



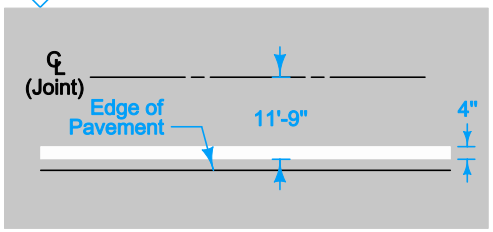
DCY4 DOUBLE CENTERLINE (Yellow)



ELY4 EDGE LINE LEFT (Yellow)



ELW4 EDGE LINE RIGHT (White)



Lane layouts shown are typical.

Centerlines and lane lines may be painted either side of centerline.

Drawings on sheets 1 and 2 are oriented to represent direction of traffic moving from left to right.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

Iowa Department of Transportation

REVISION	
New	04-19-11

STANDARD ROAD PLAN

PM-110

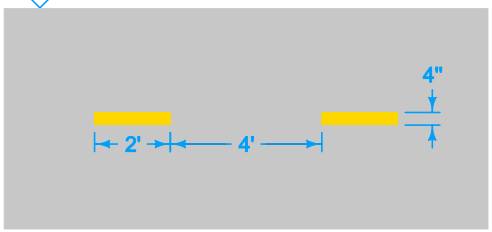
SHEET 1 of 3

REVISIONS: New. Replaces Detail 9001.

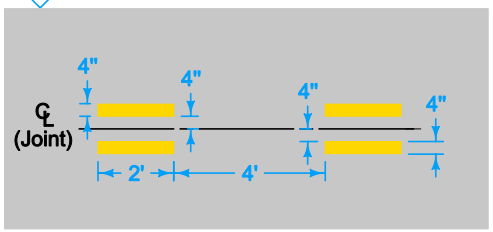
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LINE TYPES

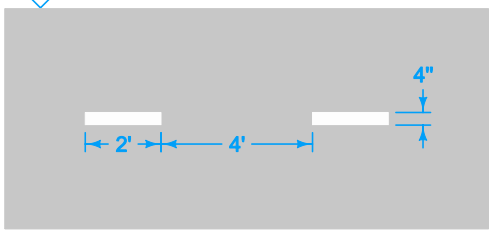
DLY4 DOTTED LINE (Yellow)



DDY4 DOUBLE DOTTED LINE (Yellow)



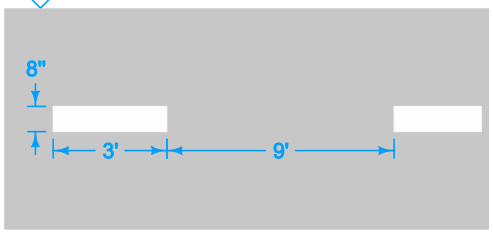
DLW4 DOTTED LINE (White)



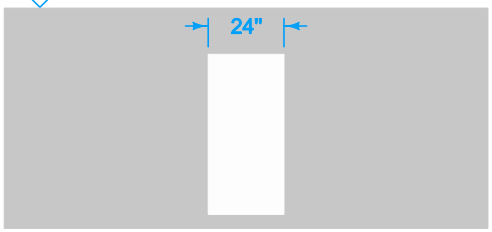
CHY8 CHANNELIZING LINE (Yellow)

CHW8 CHANNELIZING LINE (White)

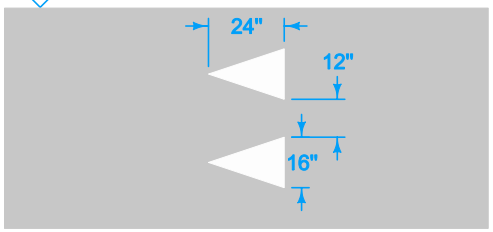
LDW8 LANE DROP (White)



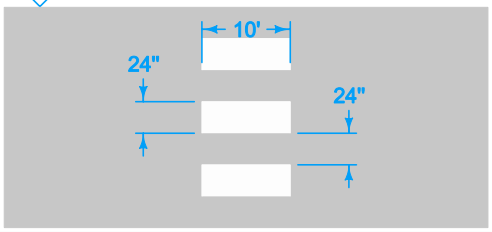
SLW2 STOP LINE (White)



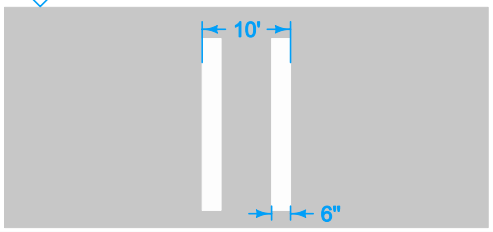
YLW2 YIELD LINE (White)



CBW6 CROSSWALK BAR (White)



CLW6 CROSSWALK LINE (White)



Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-110

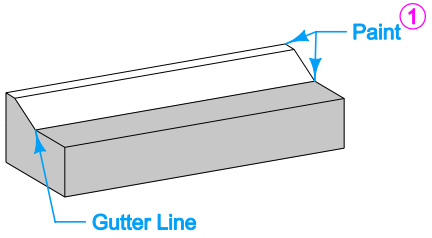
SHEET 2 of 3

REVISIONS: New. Replaces Detail 9001.

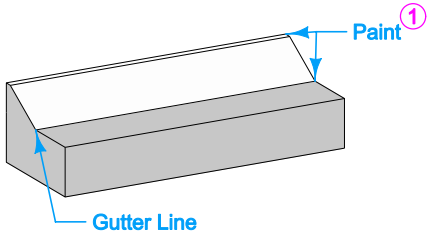
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LINE TYPES

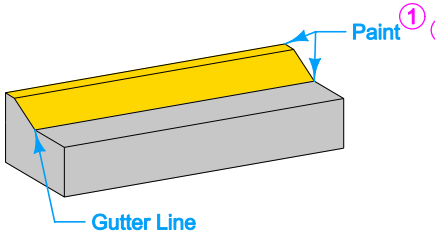
SPW4 SLOPED CURB 4" (White)



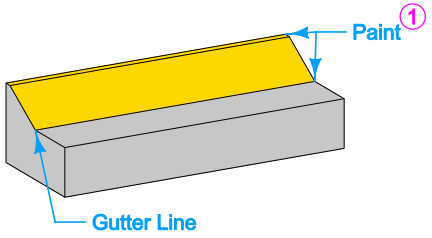
SPW6 SLOPED CURB 6" (White)



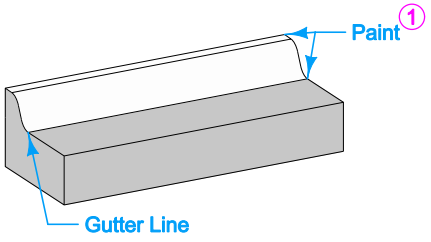
SPY4 SLOPED CURB 4" (Yellow)



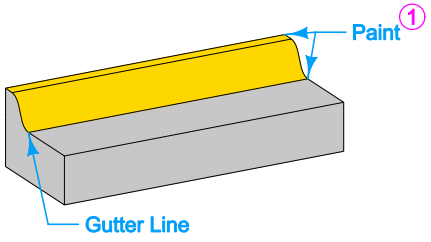
SPY6 SLOPED CURB 6" (Yellow)



STW6 STANDARD CURB 6" (White)



STY6 STANDARD CURB 6" (Yellow)



1 Apply paint from back of curb to gutter line.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-110

SHEET 3 of 3

REVISIONS: New. Replaces Detail 9001.

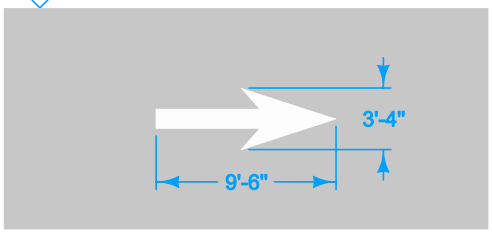
Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

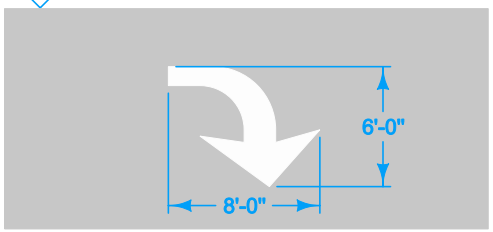
LINE TYPES

DESIGNER INFO

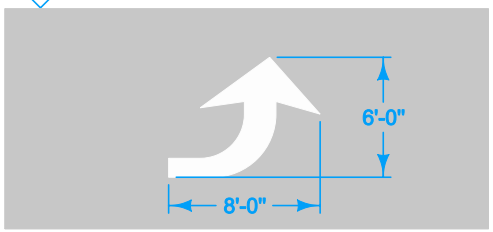
STAW STRAIGHT ARROW (White)



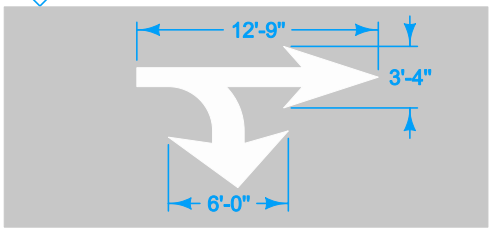
RTAW RIGHT TURN ARROW (White)



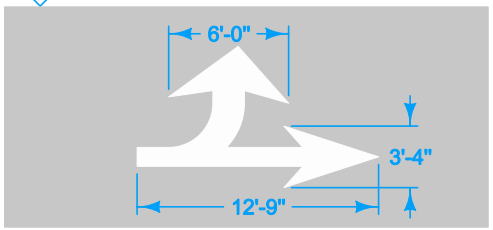
LTAW LEFT TURN ARROW (White)



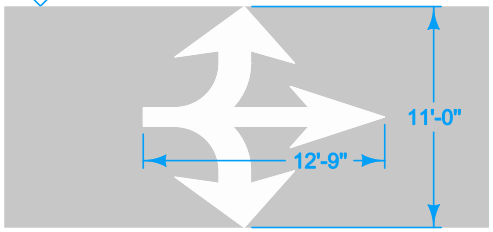
CSRW COMBINED STRAIGHT AND RIGHT TURN ARROW (White)



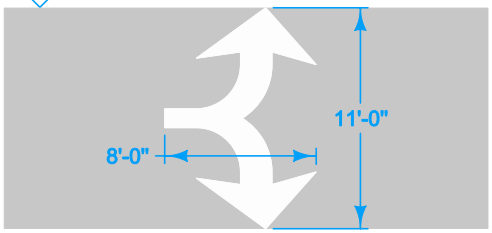
CSLW COMBINED STRAIGHT AND LEFT TURN ARROW (White)



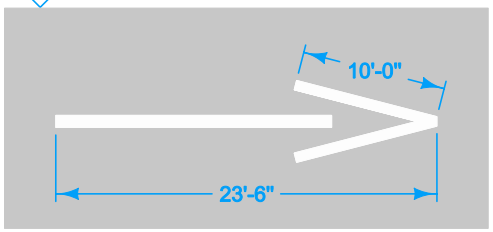
CSTW COMBINED STRAIGHT, RIGHT AND LEFT TURN ARROW (White) (1)



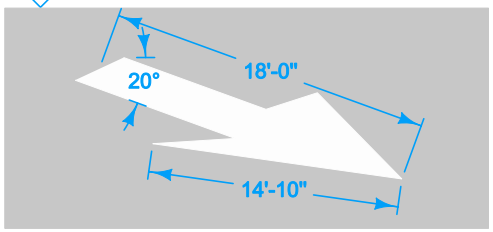
CRLW COMBINED RIGHT AND LEFT TURN ARROW (White) (1)



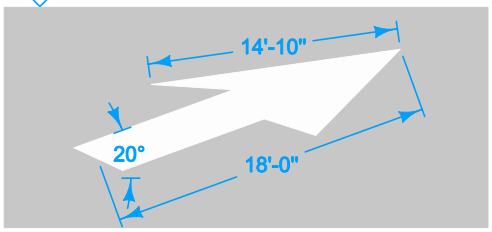
FERW FREEWAY, EXPRESSWAY AND RAMP ARROW (White)



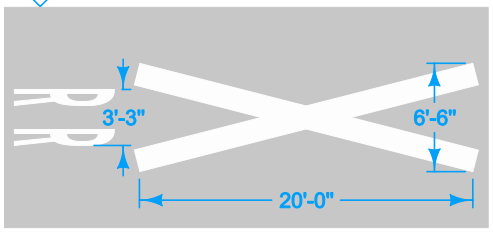
LLRW LEFT LANE REDUCTION ARROW (White)



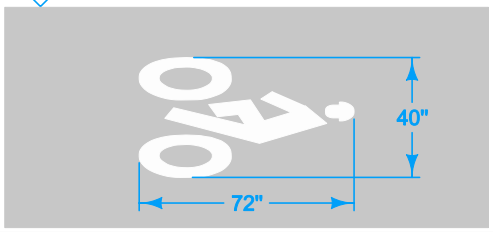
RLRW RIGHT LANE REDUCTION ARROW (White)



RRCW RAILROAD CROSSING SYMBOL (White)



BLSW BIKE LANE SYMBOL (White)



Layouts shown are for typical installations. Drawings are oriented to represent direction of traffic moving from left to right.

Center markings within the lane.

All dimensions shown are nominal. For proper proportion details, see current MUTCD Standard Highway Signs and Markings booklet.

Pavement word, symbol, and arrow markings are to be proportionally scaled to fit within the width of the facility upon which they are applied.

Except for the SCHOOL word marking, all markings are to be no more than one lane in width.

(1) Add template for Right Turn Arrow (RTAW) to Left Turn Arrow (LTAW) or Combined Straight and Left Turn Arrow (CSLW) to create new templates.

Possible Contract Item:
Pavement Marking Symbol and Legend Items

Possible Tabulation:
108-29

Iowa Department of Transportation

REVISION
1 10-18-11

STANDARD ROAD PLAN

PM-111

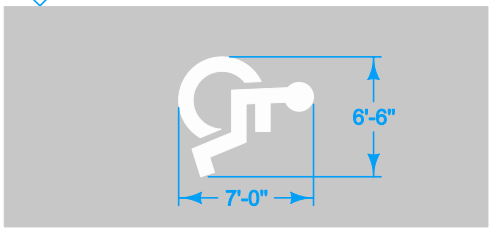
SHEET 1 of 2

REVISIONS: Added EXIT to word markings.

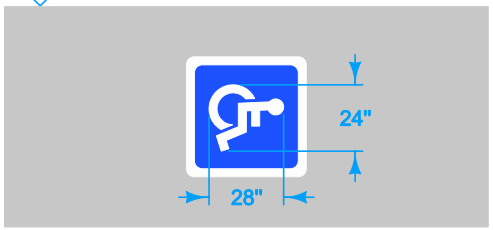
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SYMBOLS AND LEGENDS

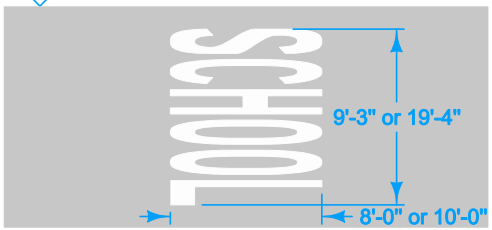
WCSW WHEELCHAIR SYMBOL (White)



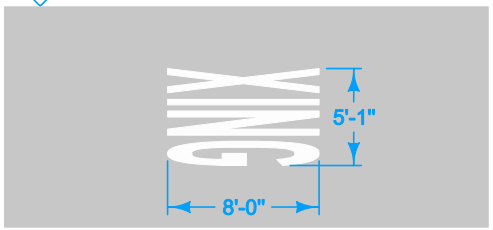
WPSB WHEELCHAIR PARKING SYMBOL (Blue)



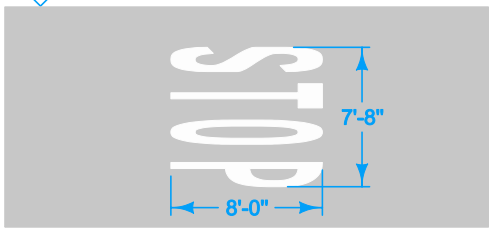
SCLW SCHOOL WORD MARKING (White) ②



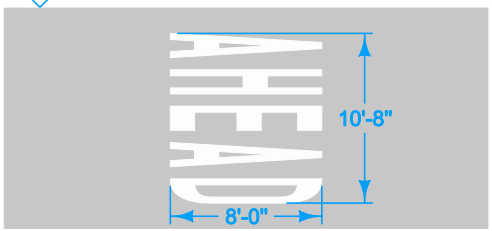
XNGW XING WORD MARKING (White)



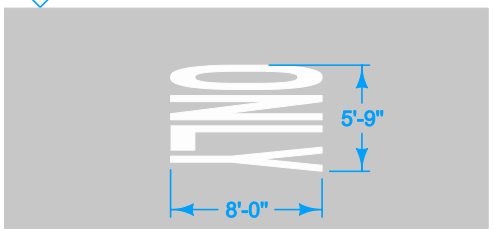
STPW STOP WORD MARKING (White)



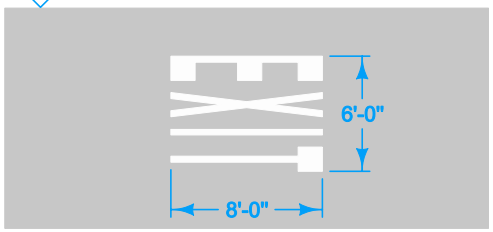
AHDW AHEAD WORD MARKING (White)



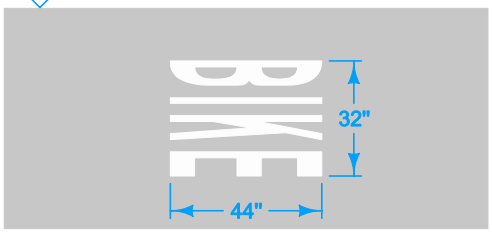
ONLW ONLY WORD MARKING (White)



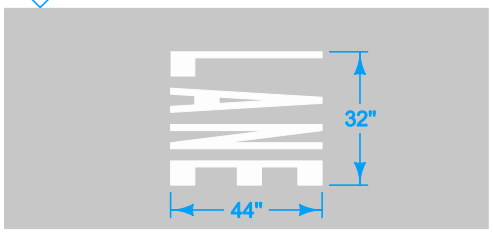
XITW EXIT WORD MARKING (White)



BIKW BIKE WORD MARKING (White)



LANW LANE WORD MARKING (White)



② When placed across one lane, use the smaller dimensions shown. When placed across two lanes, use the larger dimensions shown.

Iowa Department of Transportation

REVISION
1 10-18-11

STANDARD ROAD PLAN

PM-111

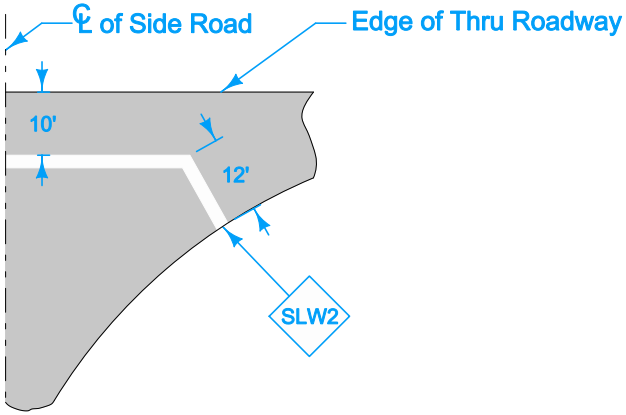
SHEET 2 of 2

REVISIONS: Added EXIT to word markings.

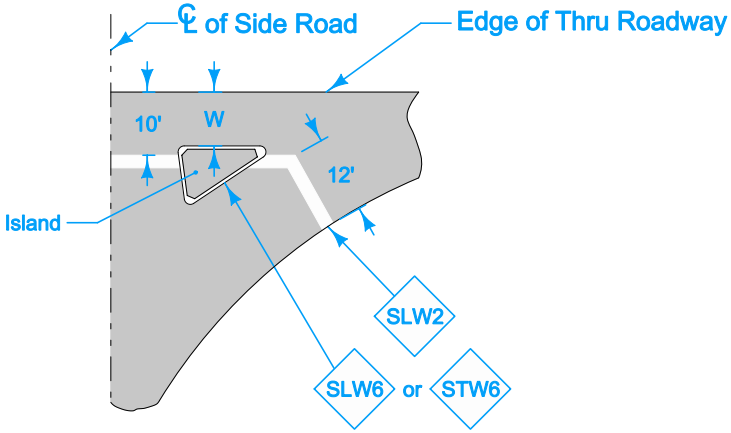
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SYMBOLS AND LEGENDS

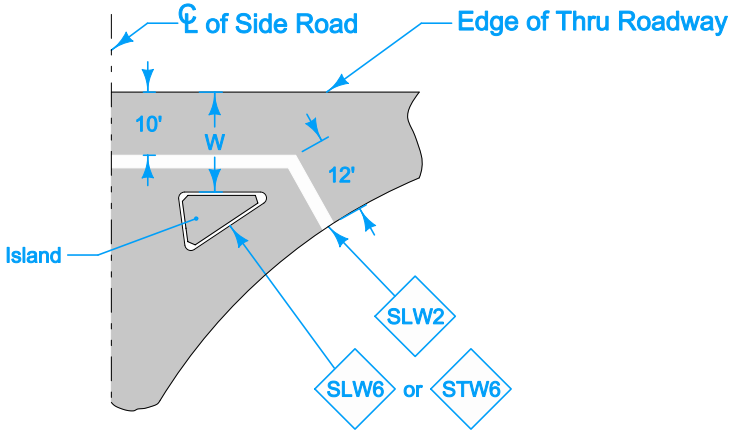
DESIGNER INFO



CASE 'A'
NO ISLAND



CASE 'B'
ISLAND AND W < 12 FT.



CASE 'C'
ISLAND AND W ≥ 12 FT.

LEGEND	
SLW2	Stop Line (White)
SLW6	Sloped Curb 6" (White)
STW6	Standard Curb 6" (White)

Place Stop Line perpendicular to radius and parallel to Thru Roadway.

For line information, see PM-110.

For Island information, see Details 6143 and 6144.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

Iowa Department of Transportation

REVISION
New 04-19-11

STANDARD ROAD PLAN

PM-120

SHEET 1 of 1

REVISIONS: New. Replaces Details 9501 and 9502.

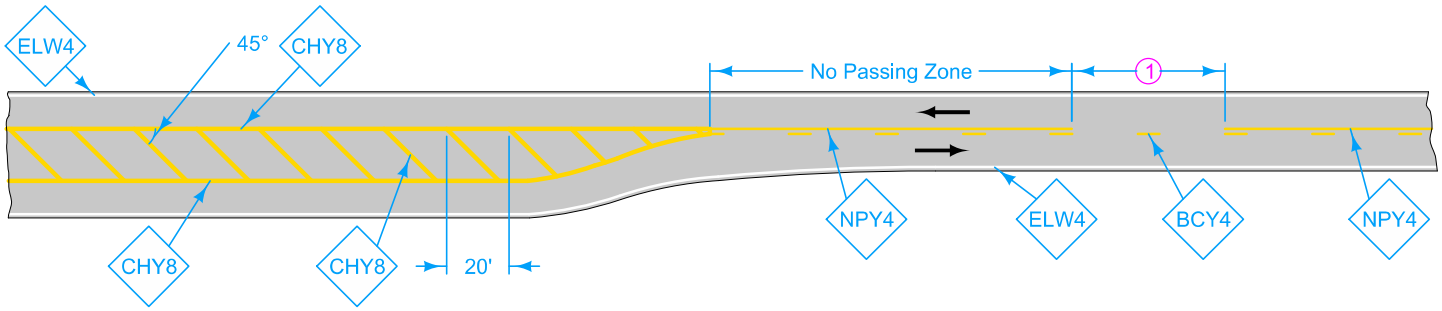
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STOP LINES AND ISLANDS

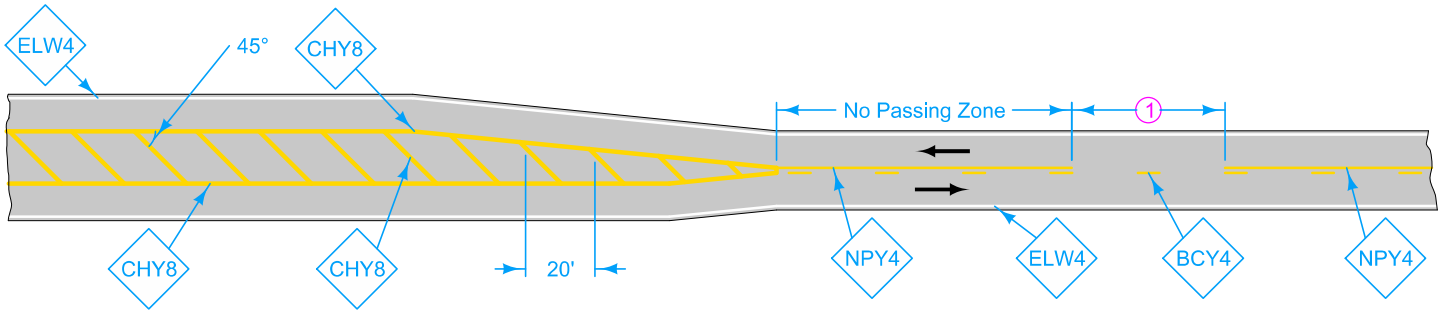
DESIGNER INFO

For line information, see PM-110.

(1) If less than 400 feet, join solid yellow lines.



OFFSET ALL TO ONE SIDE



OFFSET SPLIT BETWEEN SIDES

FLUSH MEDIANS

Speed (mph)	Length of No Passing Zone
20	300'
25	300'
30	360'
35	360'
40	480'
45	480'
50	600'
55	600'

LEGEND

— - -	Centerline Extension	CHY8	Channelizing Line (Yellow)
←	Direction of Traffic	ELW4	Edge Line Right (White)
BCY4	Broken Centerline (Yellow)	NPY4	No Passing Zone Line (Yellow)

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

Iowa Department of Transportation

REVISION

1	10-18-11

STANDARD ROAD PLAN

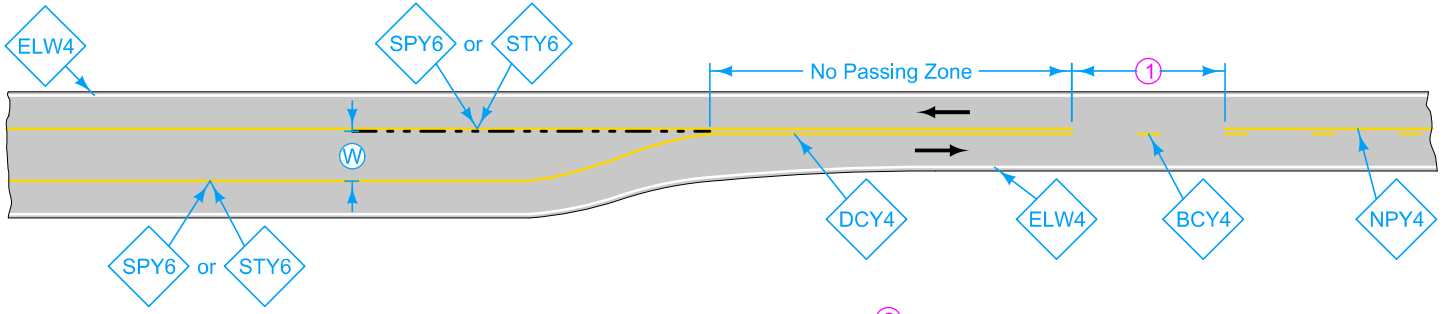
PM-210

SHEET 1 of 2

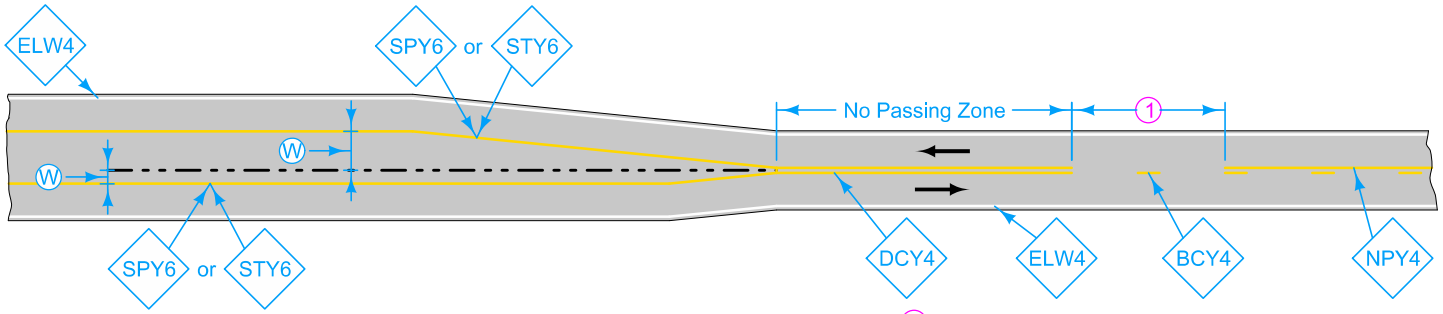
REVISIONS: Added additional 'W' Information and moved to circle note 2. Flush medians: Changed NPZ length table, changed DCY4 to NPY4, and removed 'W'.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SEPARATION IN TWO-LANE ROADWAY



OFFSET (W) ALL TO ONE SIDE (2)



OFFSET (W) SPLIT BETWEEN SIDES (2)

(1) If less than 400 feet, join Yellow Lines.

(2) The offset distance from centerline, W, can be either the entire width of the offset if the offset is all to one side, or it is the larger of the two partial offsets if the entire width of the offset is split between the two directions of traffic. Measure W from the midpoint of the centerline to the outside edge of the painted curb.

RAISED MEDIANS

LEGEND

— - -	Centerline Extension	ELW4	Edge Line Right (White)
←	Direction of Traffic	NPY4	No Passing Zone Line (Yellow)
BCY4	Broken Centerline (Yellow)	SPY6	Sloped Curb 6" (Yellow)
DCY4	Double Centerline (Yellow)	STY6	Standard Curb 6" (Yellow)

Length of No Passing Zone						
Speed (mph)	(W) = offset distance from centerline					
	6'	8'	10'	12'	14'	16'
25	200	200	210	250	300	340
35	250	330	410	490	580	660
45	540	720	900	1080	1260	1440
55	660	880	1100	1320	1540	1760
65	780	1040	1300	1560	1820	2080

Iowa Department of Transportation

REVISION
1 | 10-18-11

STANDARD ROAD PLAN

PM-210

SHEET 2 of 2

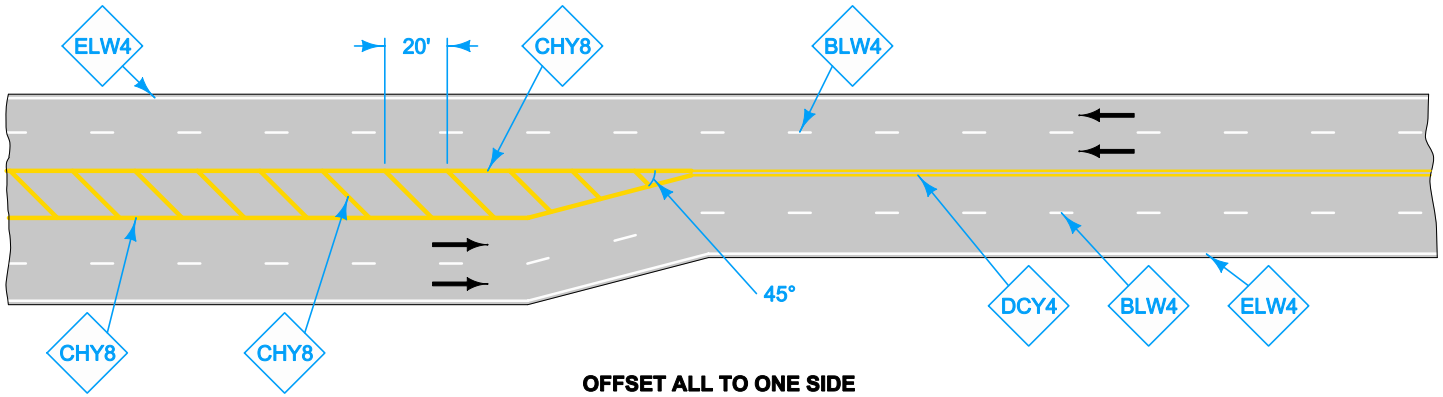
REVISIONS: Added additional 'W' information and moved to circle note 2. Flush medians: Changed NPZ length table, changed DCY4 to NPY4, and removed 'W'.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

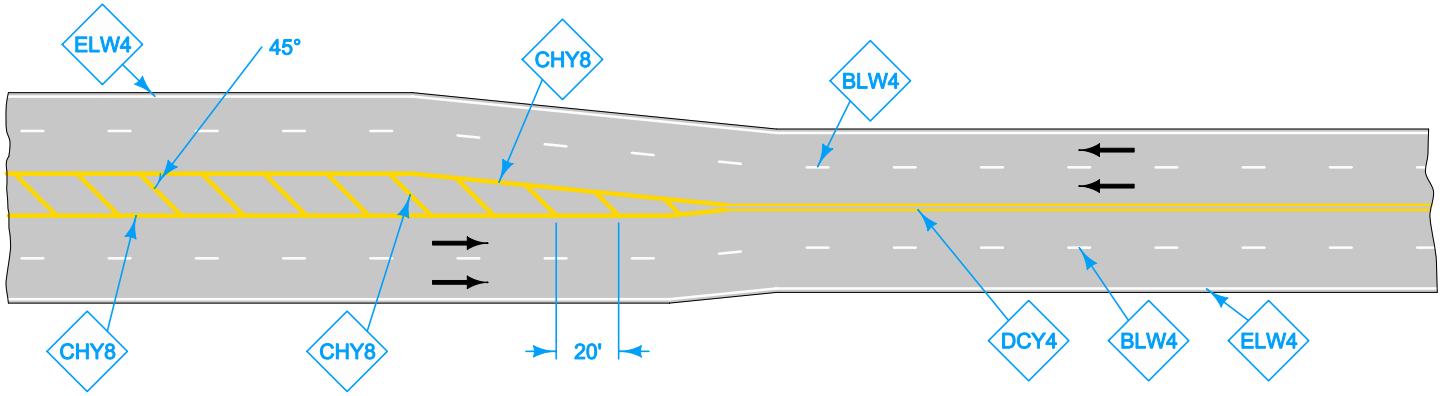
SEPARATION IN TWO-LANE ROADWAY

DESIGNER INFO

For line information, see PM-110.



OFFSET ALL TO ONE SIDE



OFFSET SPLIT BETWEEN SIDES

FLUSH MEDIANS

LEGEND

←	Direction of Traffic	DCY4	Double Centerline (Yellow)
BLW4	Broken Lane Line (White)	ELW4	Edge Line Right (White)
CHY8	Channelizing Line (Yellow)		

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-18-11

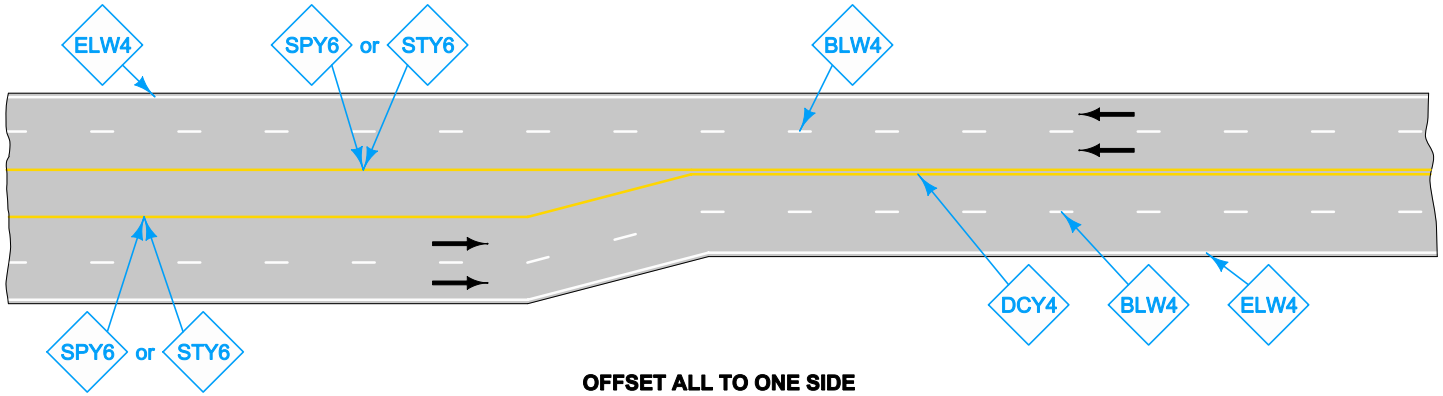
PM-211

SHEET 1 of 2

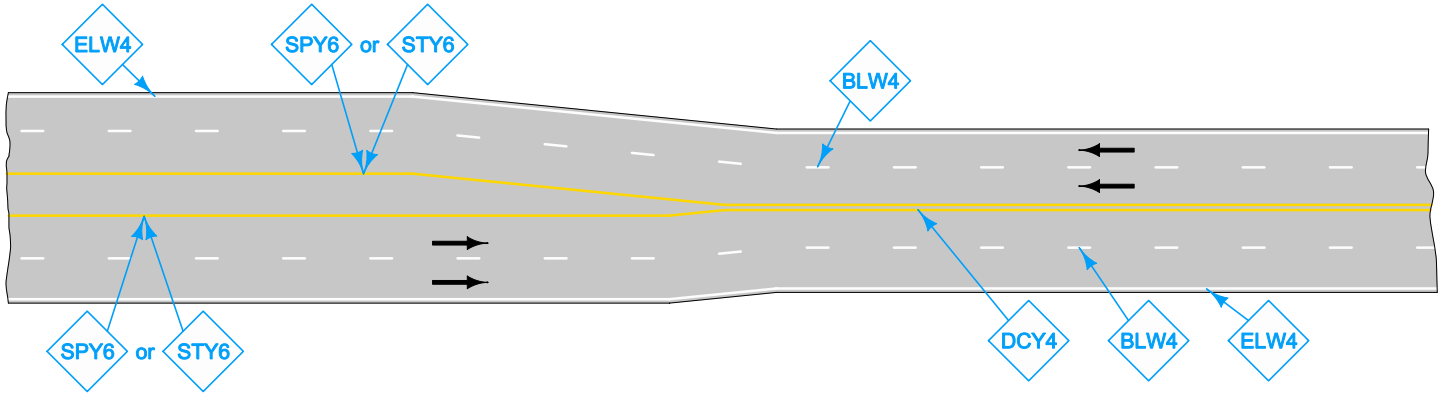
REVISIONS: Removed offset information from general note.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SEPARATION IN FOUR-LANE ROADWAY



OFFSET ALL TO ONE SIDE



OFFSET SPLIT BETWEEN SIDES

RAISED MEDIANS

LEGEND

←	Direction of Traffic	ELW4	Edge Line Right (White)
BLW4	Broken Lane Line (White)	SPY6	Sloped Curb 6" (Yellow)
DCY4	Double Centerline (Yellow)	STY6	Standard Curb 6" (Yellow)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 1 10-18-11

PM-211

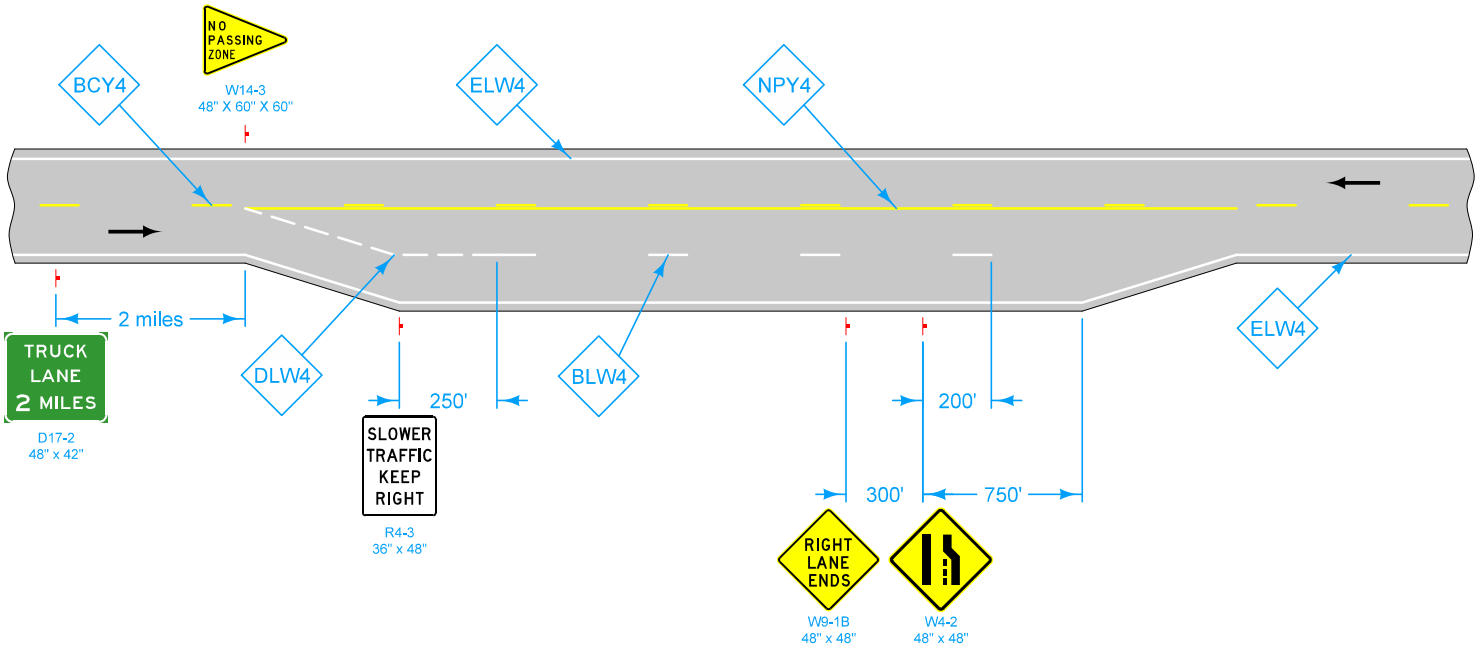
SHEET 2 of 2

REVISIONS: Removed offset information from general note.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SEPARATION IN FOUR-LANE ROADWAY

For line information, see PM-110.



Possible Contract Item:
Pavement Marking Line Items
Type 'A' Signs

Possible Tabulation:
108-22

LEGEND			
←	Direction of Traffic	ELW4	Edge Line Right (White)
BCY4	Broken Centerline (Yellow)	DLW4	Dotted Line (White)
BLW4	Broken Lane Line (White)	NPY4	No Passing Zone Line (Yellow)

Iowa Department of Transportation

REVISION: New 04-17-12

STANDARD ROAD PLAN

PM-220

SHEET 1 of 1

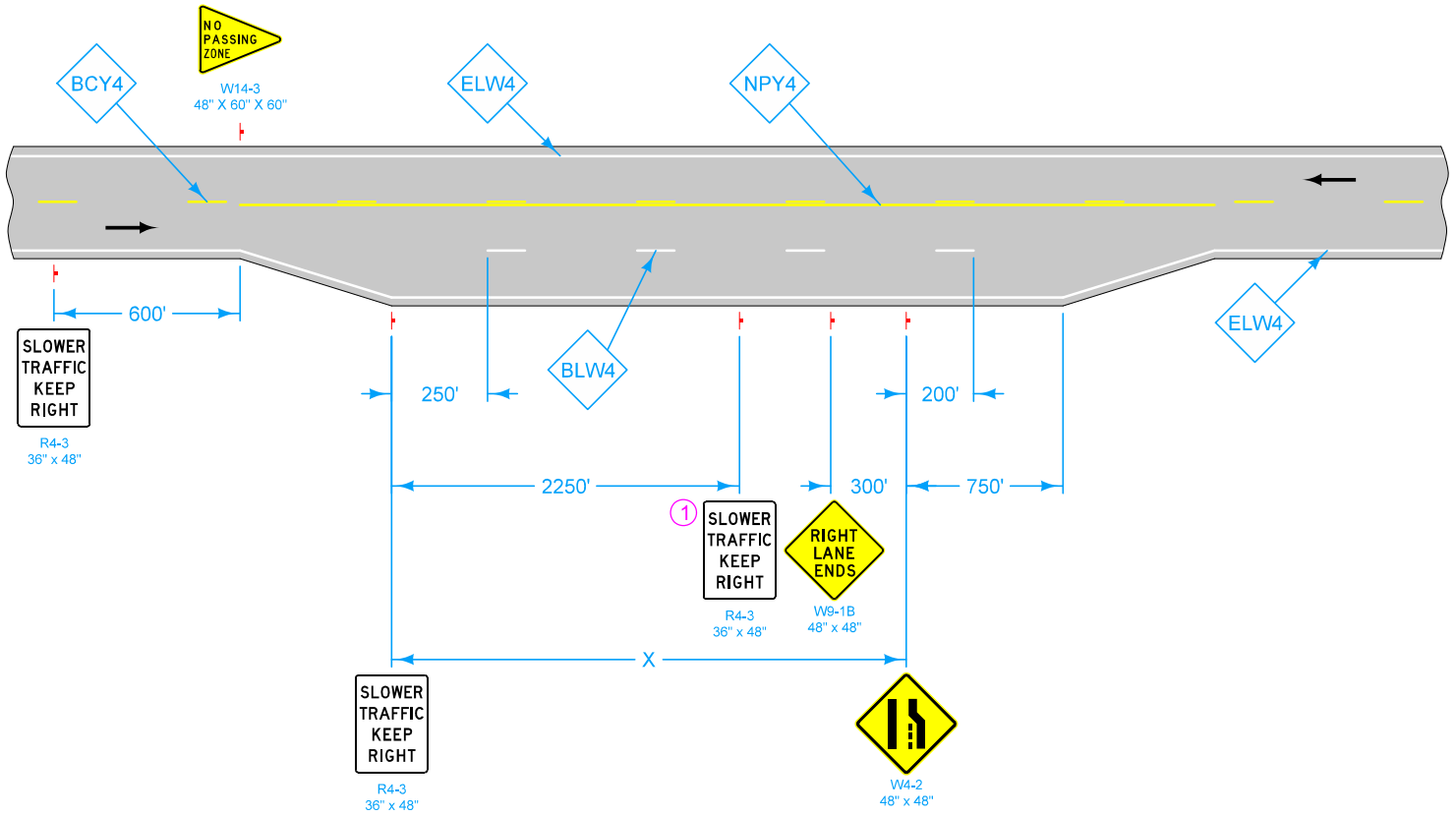
REVISIONS: New. Layout from Traffic Safety Manual.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PASSING LANE

For line information, see PM-110.

(1) If distance X is less than 3000 feet, omit last R4-3 sign. If distance X is greater than 5250 feet, place R4-3 signs at 2250 foot intervals.



LEGEND

←	Direction of Traffic	ELW4	Edge Line Right (White)
BCY4	Broken Centerline (Yellow)	NPY4	No Passing Zone Line (Yellow)
BLW4	Broken Lane Line (White)		

Possible Contract Item:
Pavement Marking Line Items
Type 'A' Signs

Possible Tabulation:
108-22

Iowa Department of Transportation

REVISION: New 04-17-12

STANDARD ROAD PLAN

PM-221

SHEET 1 of 1

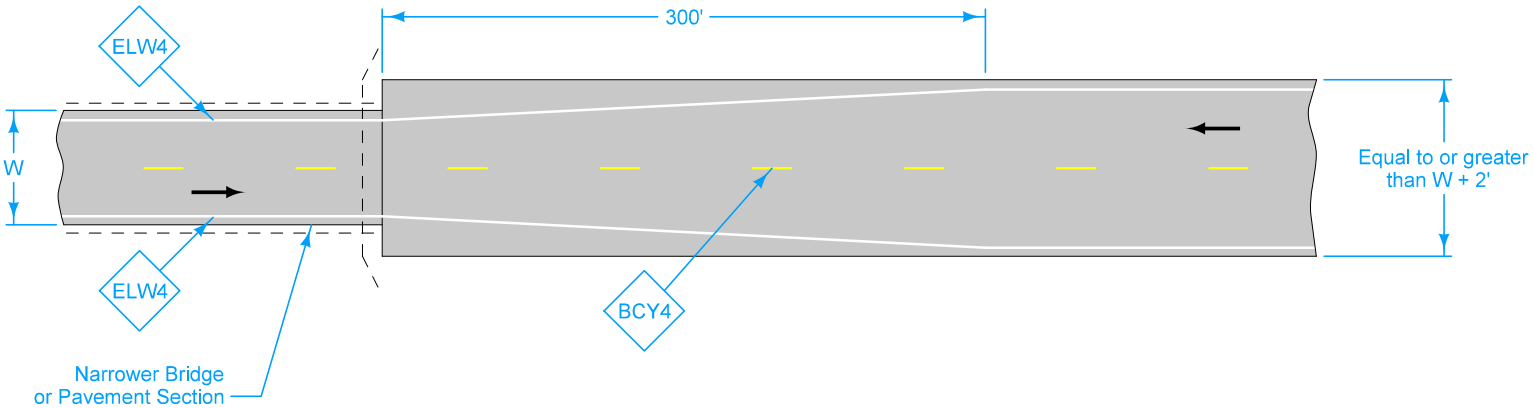
REVISIONS: New. Layout from Traffic Safety Manual.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CLIMBING LANE

For line information, see PM-110.

On the approach to a narrower bridge or pavement section, place edge lines on a diagonal from a point 300 feet from the bridge to the gutter line of the bridge.



Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

LEGEND

←	Direction of Traffic
BCY4	Broken Centerline (Yellow)
ELW4	Edge Line Right (White)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION: New 04-17-12

PM-230

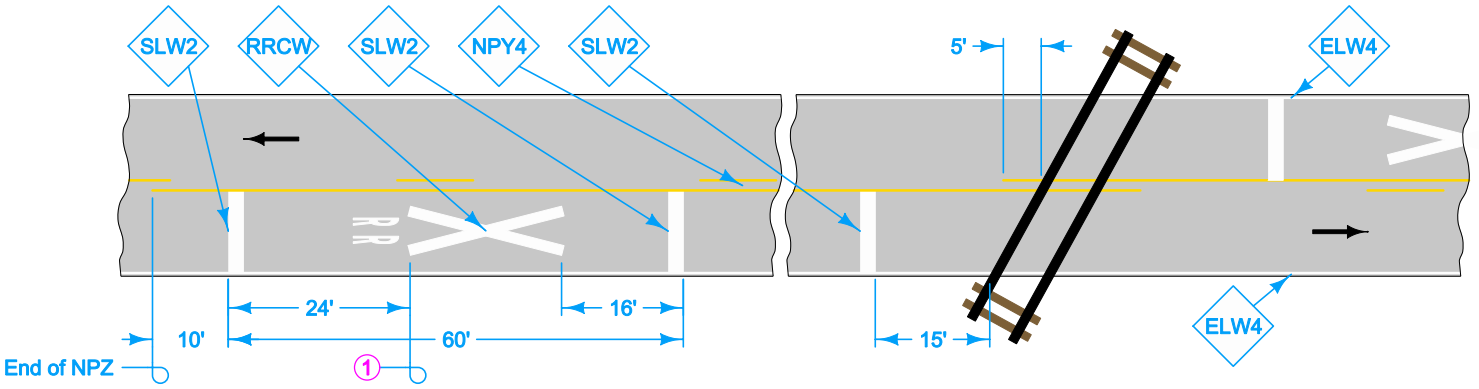
SHEET 1 of 1

REVISIONS: New.

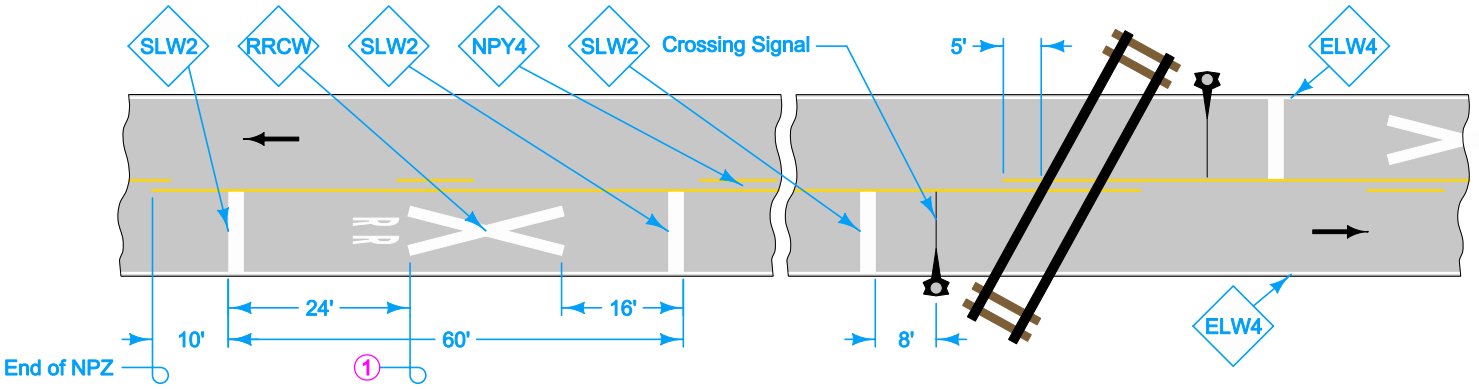
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TRANSITION AT ABRUPT CHANGES IN PAVEMENT WIDTH

DESIGNER INFO



CROSSING WITH CROSSBUCK



CROSSING WITH CROSSING SIGNAL

LEGEND

←	Direction of Traffic	RRCW	Railroad Crossing Symbol (White)
ELW4	Edge Line Right (White)	SLW2	Stop Line (White)
NPY4	No Passing Zone Line (Yellow)		

For line information, see PM-110.

For symbol and legend information, see PM-111.

(1) Location of Grade Crossing Advance Warning sign (W10-1).

Possible Contract Items:
Pavement Marking Line Items
Pavement Marking Symbol and Legend Items

Possible Tabulations:
108-22
108-29

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-240

SHEET 1 of 1

REVISIONS: New. Replaces Details 9105 and 9106.

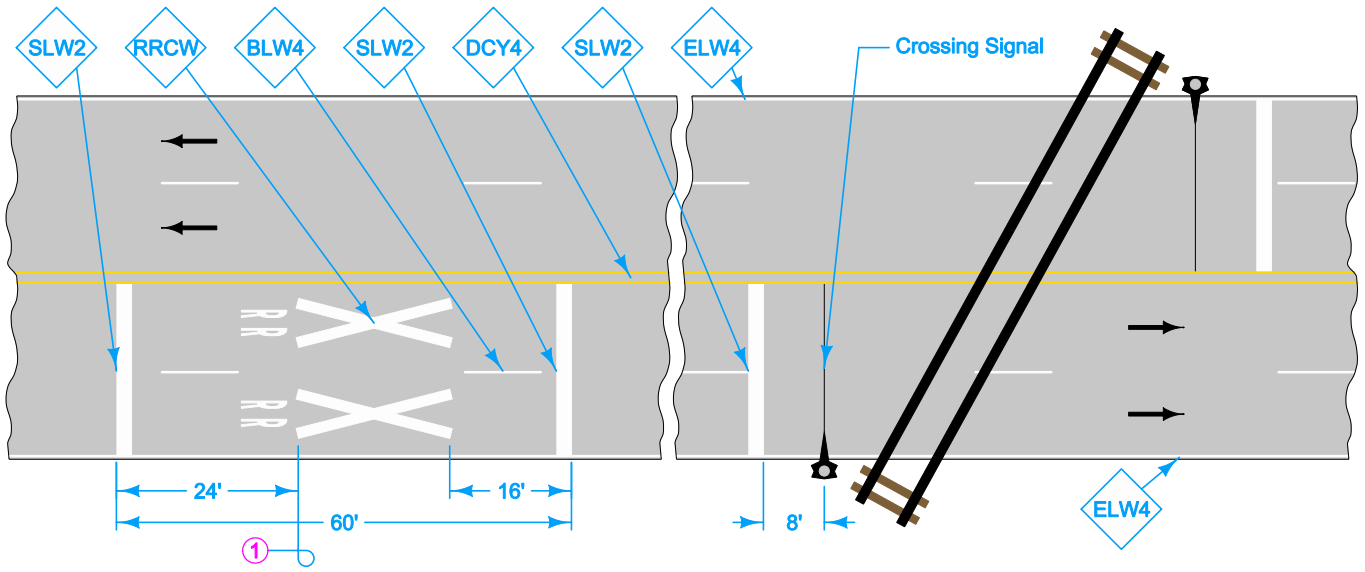
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

RAILROAD CROSSING ON TWO-LANE ROADWAY

DESIGNER INFO

For line information, see PM-110.

For symbol and legend information, see PM-111.



CROSSING WITH CROSSING SIGNAL

1 Location of Grade Crossing Advance Warning sign (W10-1).

Possible Contract Items:
- Pavement Marking Line Items
- Pavement Marking Symbol and Legend Items

Possible Tabulations:
- 108-22
- 108-29

LEGEND

←	Direction of Traffic	ELW4	Edge Line Right (White)
BLW4	Broken Lane Line (White)	RRCW	Railroad Crossing Symbol (White)
DCY4	Double Center Line (Yellow)	SLW2	Stop Line (White)

Iowa Department of Transportation

REVISION: New 04-19-11

STANDARD ROAD PLAN

PM-242

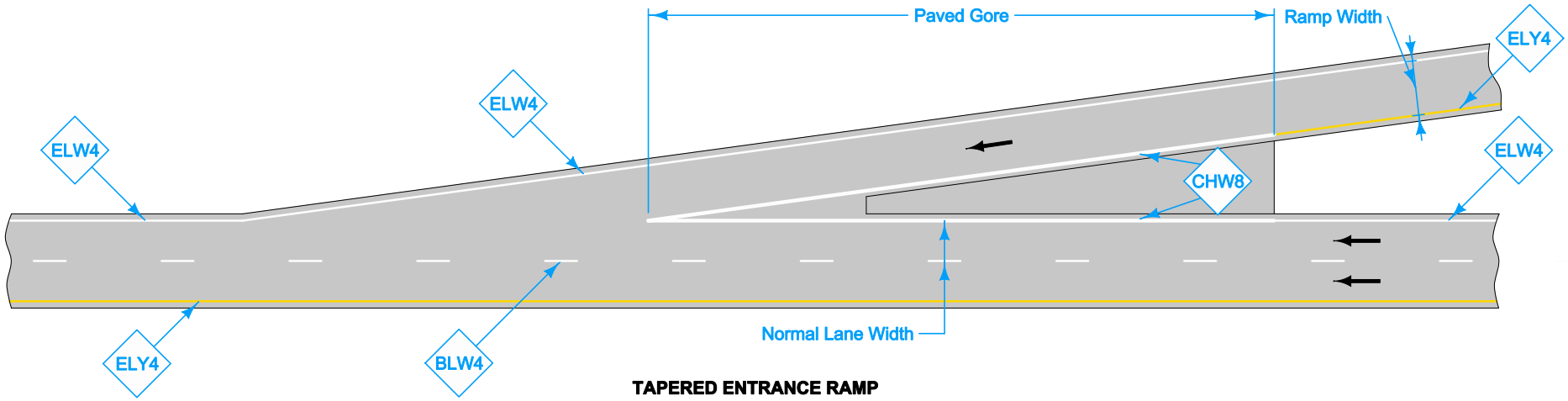
SHEET 1 of 1

REVISIONS: New. Replaces Details 9105 and 9106.

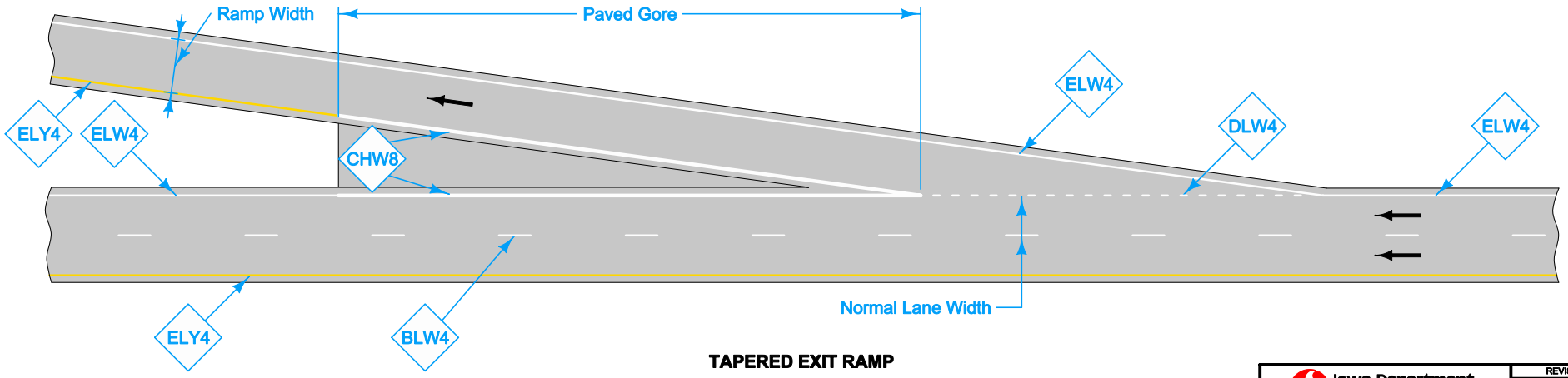
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

RAILROAD CROSSING ON FOUR-LANE ROADWAY

DESIGNER INFO



TAPERED ENTRANCE RAMP



TAPERED EXIT RAMP

LEGEND

←	Direction of Traffic	DLW4	Dotted Line (White)
BLW4	Broken Lane Line (White)	ELW4	Edge Line Right (White)
CHW8	Channelizing Line (White)	ELY4	Edge Line Left (Yellow)

For line information, see PM-110.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

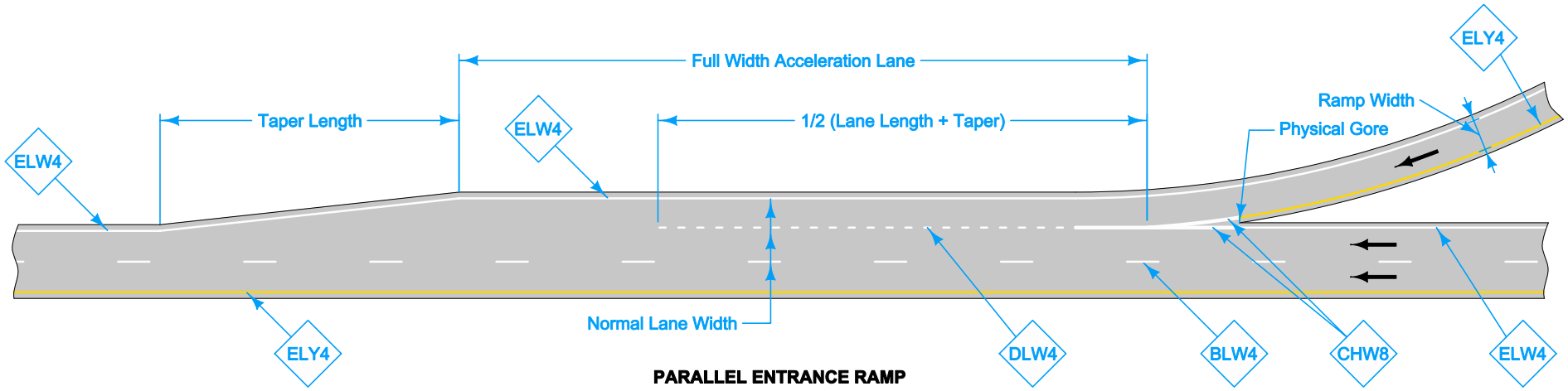
PM-310

SHEET 1 of 2

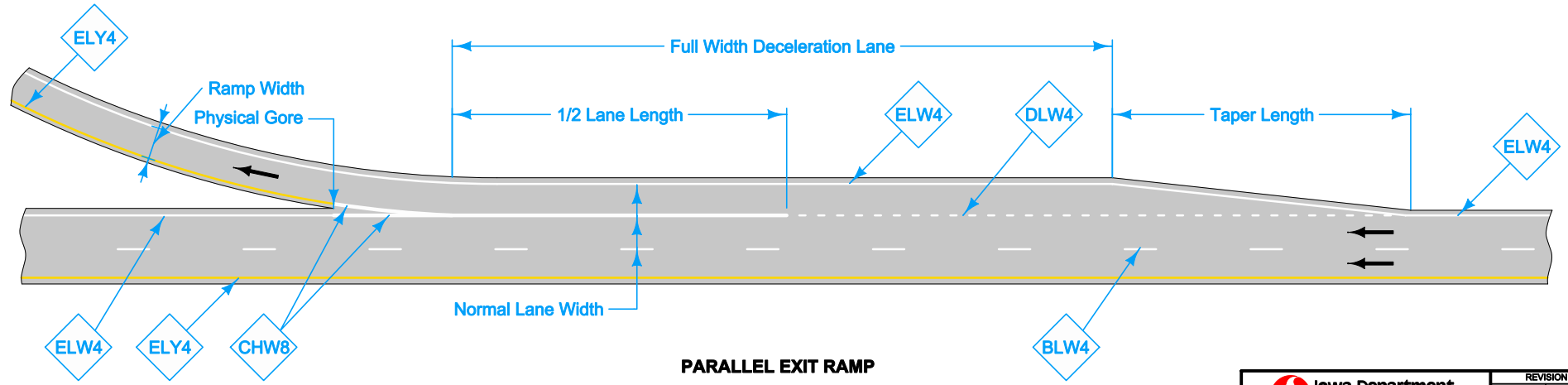
REVISIONS: New. Replaces Details 9301, 9302, 9303, and 9304.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

ENTRANCE AND EXIT RAMPS



PARALLEL ENTRANCE RAMP



PARALLEL EXIT RAMP

LEGEND

←	Direction of Traffic	DLW4	Dotted Line (White)
BLW4	Broken Lane Line (White)	ELW4	Edge Line Right (White)
CHW8	Channelizing Line (White)	ELY4	Edge Line Left (Yellow)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-310

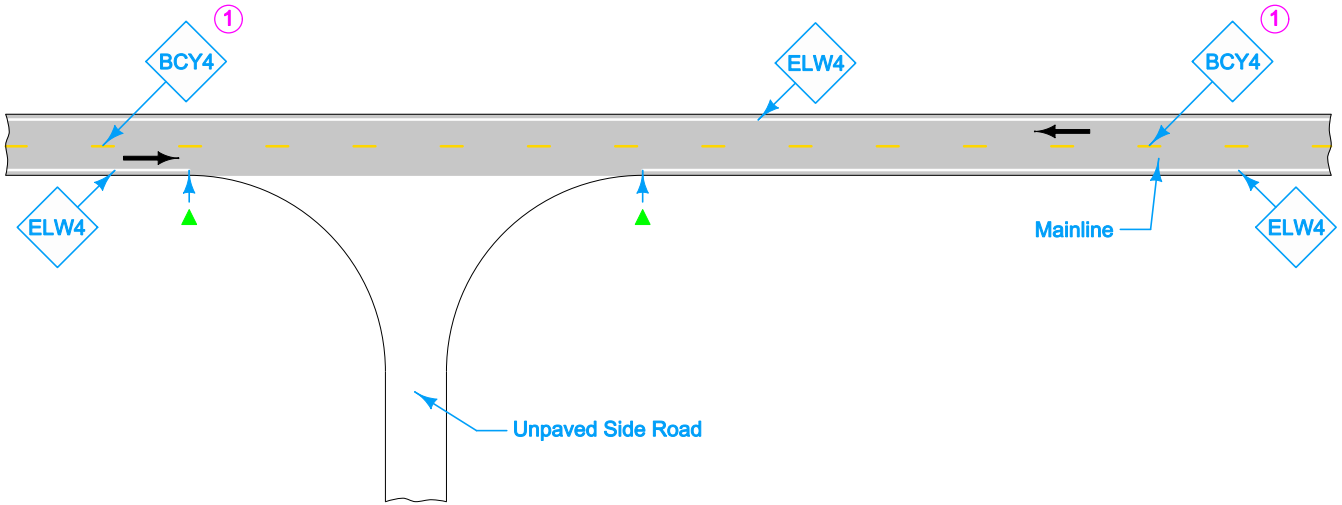
SHEET 2 of 2

REVISIONS: New. Replaces Details 9301, 9302, 9303, and 9304.

Deanna Maifeld
APPROVED BY DESIGN METHODS ENGINEER

ENTRANCE AND EXIT RAMPS

DESIGNER INFO



Roadways may or may not have edge lines. When the free flow roadway has edge lines but the stop controlled roadway does not, end edge lines at the end of returns (marked by ▲s). When the stop controlled roadway has edge lines but the free flow roadway does not, end edge lines at the end of returns (marked by ■s). If both roadways have edge lines, continue edge lines around the returns.

For line information, see PM-110.

(1) Broken Centerline changes to No Passing Zone Line or Double Centerline if required by sight distance.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

LEGEND

←	Direction of Traffic
BCY4	Broken Centerline (Yellow)
ELW4	Edge Line Right (White)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

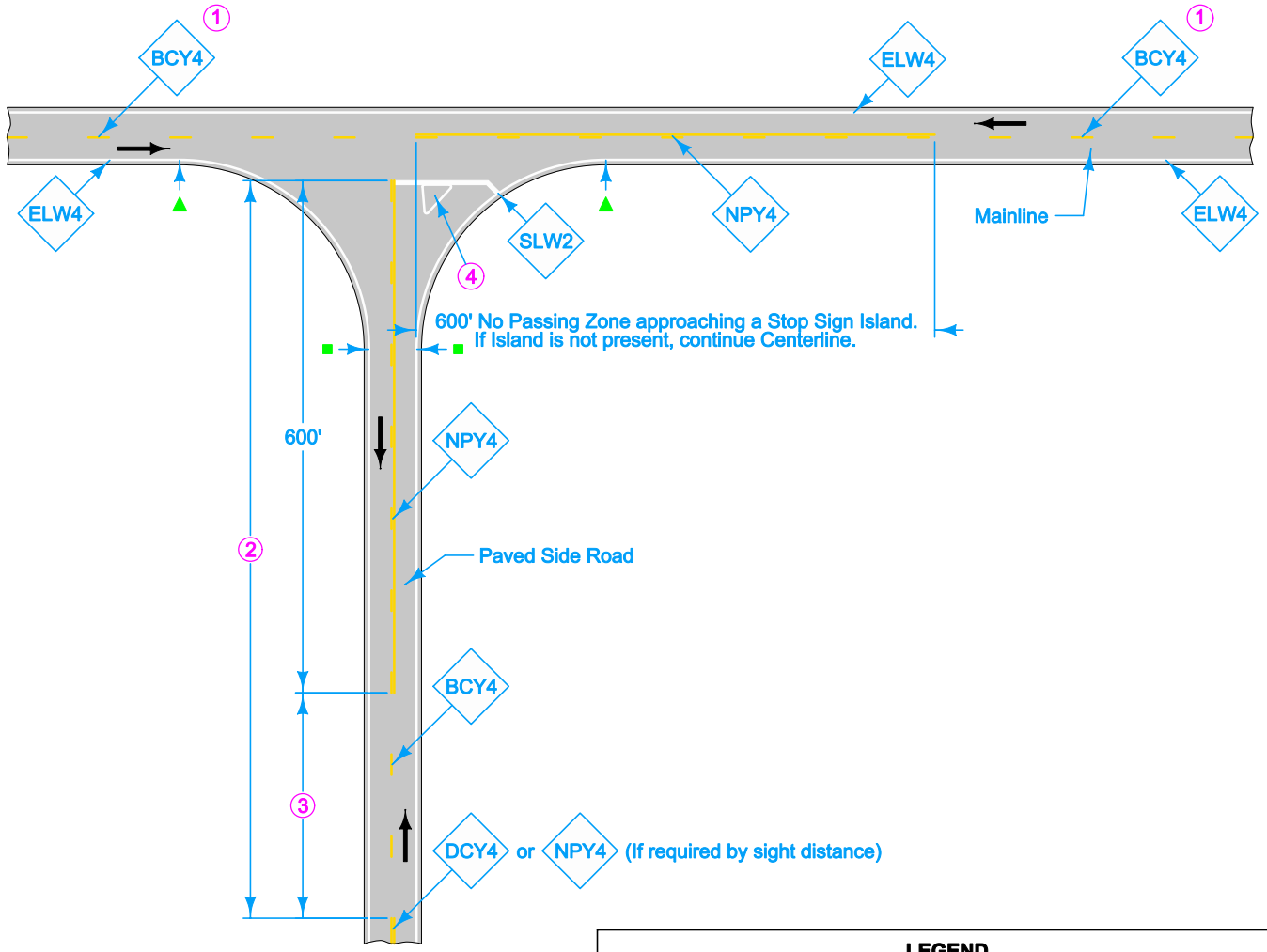
PM-420

SHEET 1 of 2

REVISIONS: New. Partial inclusion of Detail 9101.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH NO TURN LANES (ONE-WAY STOP CONDITION)



1. Broken Centerline changes to No Passing Zone Line or Double Centerline if required by sight distance.
2. If less than 1000 feet, extend Yellow Line to Stop Line.
3. If less than 400 feet, join Yellow Lines.
4. For Island information, see PM-120.

LEGEND

←	Direction of Traffic	ELW4	Edge Line Right (White)
BCY4	Broken Centerline (Yellow)	NPY4	No Passing Zone Line (Yellow)
DCY4	Double Centerline (Yellow)	SLW2	Stop Line (White)

Iowa Department of Transportation

REVISION: New 04-19-11

STANDARD ROAD PLAN

PM-420

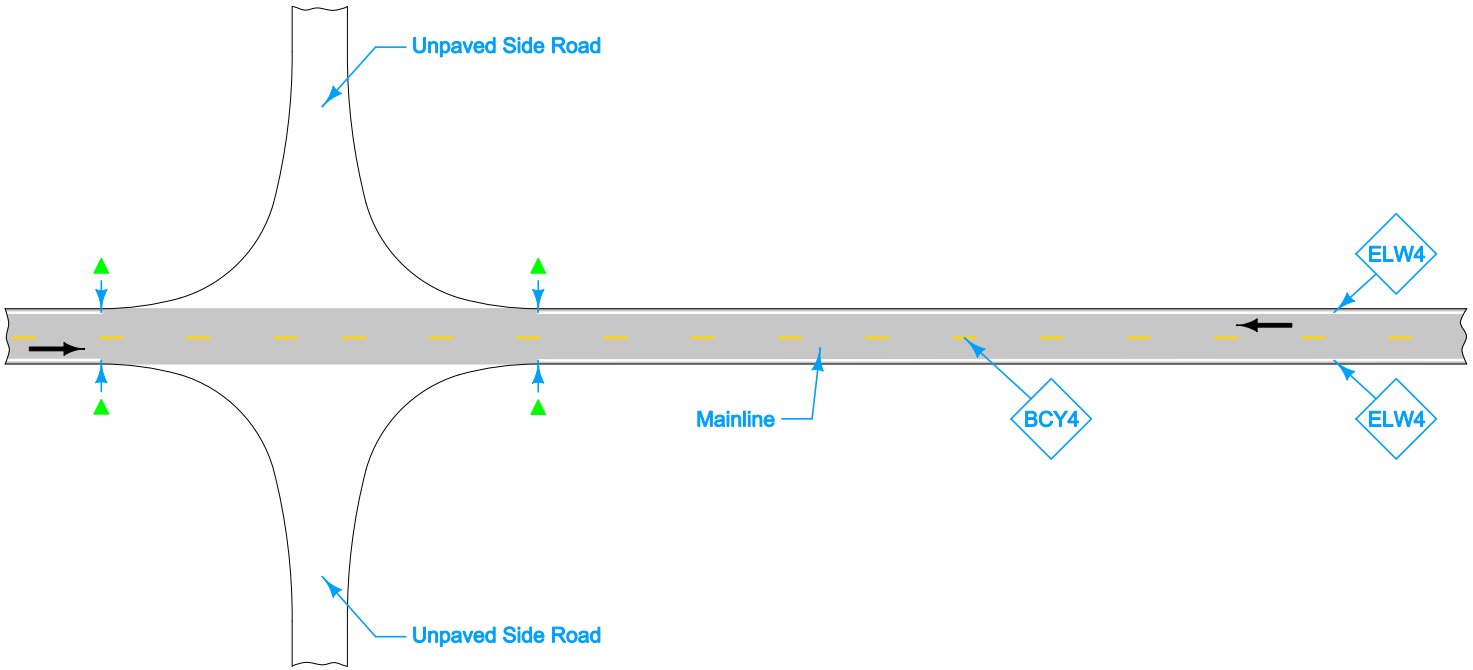
SHEET 2 of 2

REVISIONS: New. Partial inclusion of Detail 9101.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH NO TURN LANES (ONE-WAY STOP CONDITION)

DESIGNER INFO



Roadways may or may not have edge lines. When the free flow roadway has edge lines but the stop controlled roadway does not, end edge lines at the end of returns (marked by ▲s). When the stop controlled roadway has edge lines but the free flow roadway does not, end edge lines at the end of returns (marked by ■s). If both roadways have edge lines, continue edge lines around the returns.

Terminate all mainline centerline markings at the edge of the thru lanes of a paved side road.

For line information, see PM-110.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

LEGEND

←	Direction of Traffic
BCY4	Broken Centerline (Yellow)
ELW4	Edge Line Right (White)

UNPAVED SIDE ROADS

Iowa Department of Transportation

REVISION	
New	04-19-11

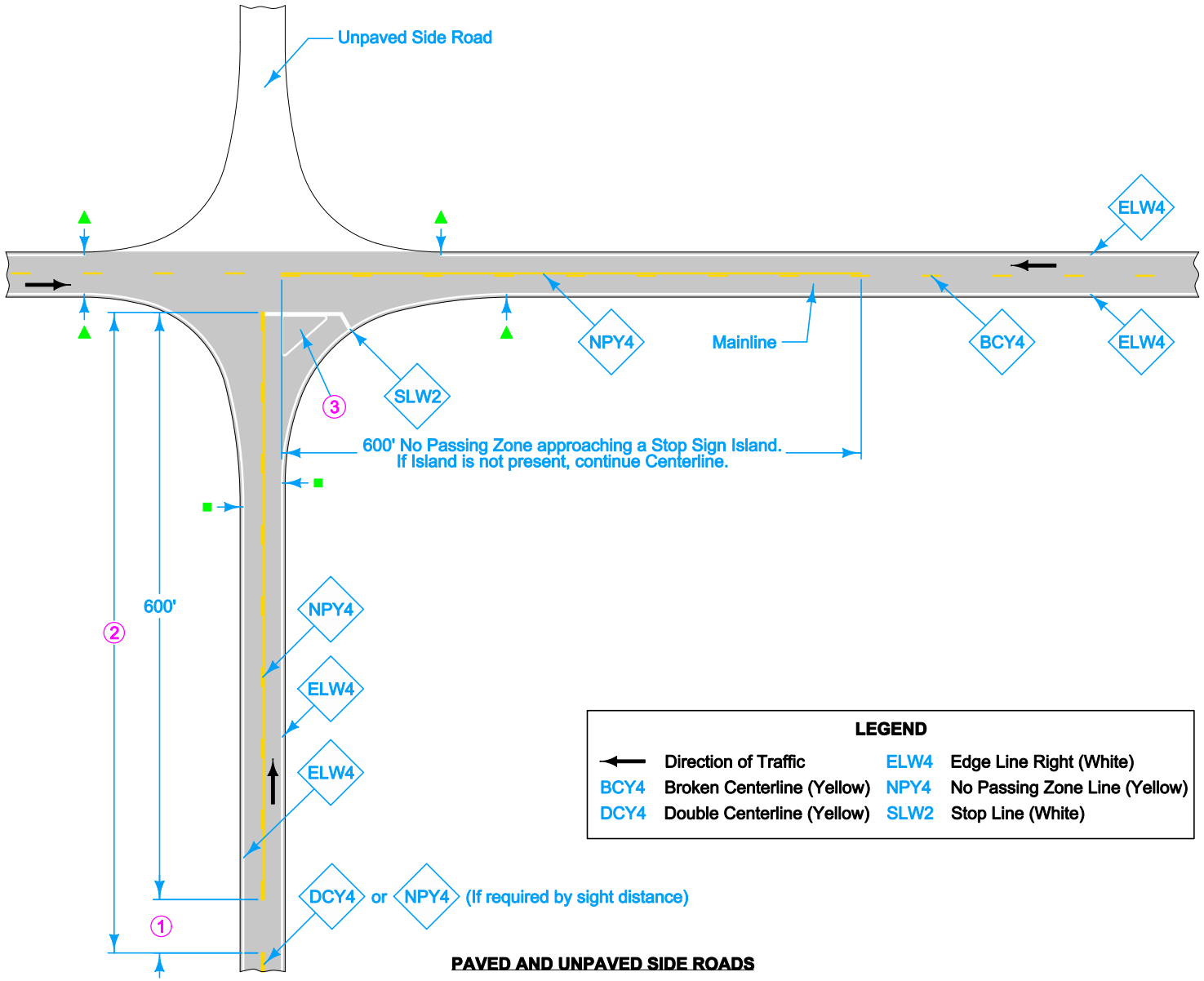
STANDARD ROAD PLAN PM-520

SHEET 1 of 3

REVISIONS: New. Replaces Details 9101, 9102, 9103, and 9104.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH NO TURN LANES (TWO-WAY STOP CONDITION)



1. If less than 400 feet, join Yellow Lines.
2. If less than 1000 feet, extend Yellow Line to Stop Line.
3. For Island information, see PM-120.

LEGEND

←	Direction of Traffic	ELW4	Edge Line Right (White)
BCY4	Broken Centerline (Yellow)	NPY4	No Passing Zone Line (Yellow)
DCY4	Double Centerline (Yellow)	SLW2	Stop Line (White)

PAVED AND UNPAVED SIDE ROADS

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION: New 04-19-11

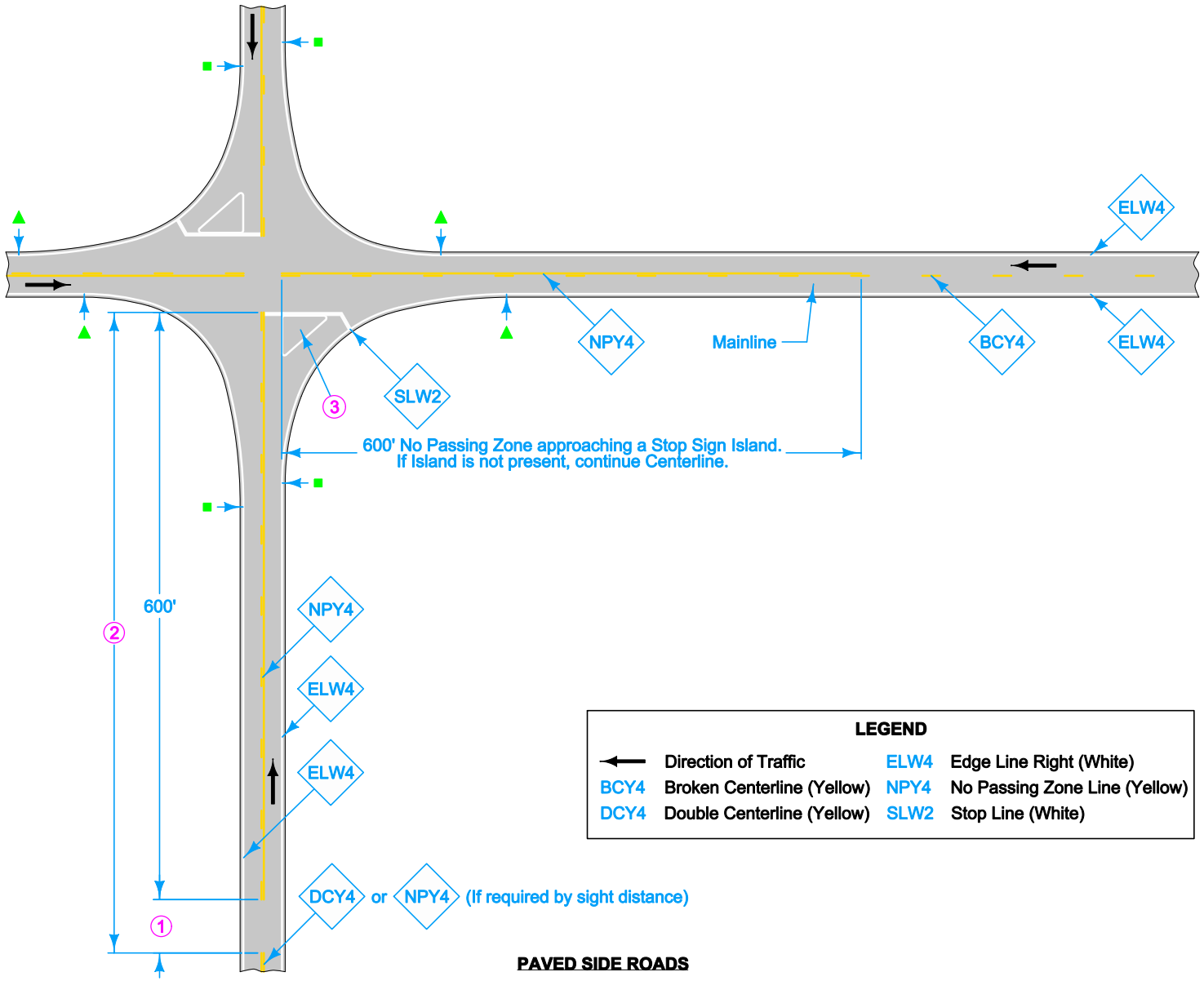
PM-520

SHEET 2 of 3

REVISIONS: New. Replaces Details 9101, 9102, 9103, and 9104.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH NO TURN LANES (TWO-WAY STOP CONDITION)



1. If less than 400 feet, join Yellow Lines.
2. If less than 1000 feet, extend Yellow Line to Stop Line.
3. For Island information, see PM-120.

LEGEND

←	Direction of Traffic	ELW4	Edge Line Right (White)
BCY4	Broken Centerline (Yellow)	NPY4	No Passing Zone Line (Yellow)
DCY4	Double Centerline (Yellow)	SLW2	Stop Line (White)

PAVED SIDE ROADS

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-520

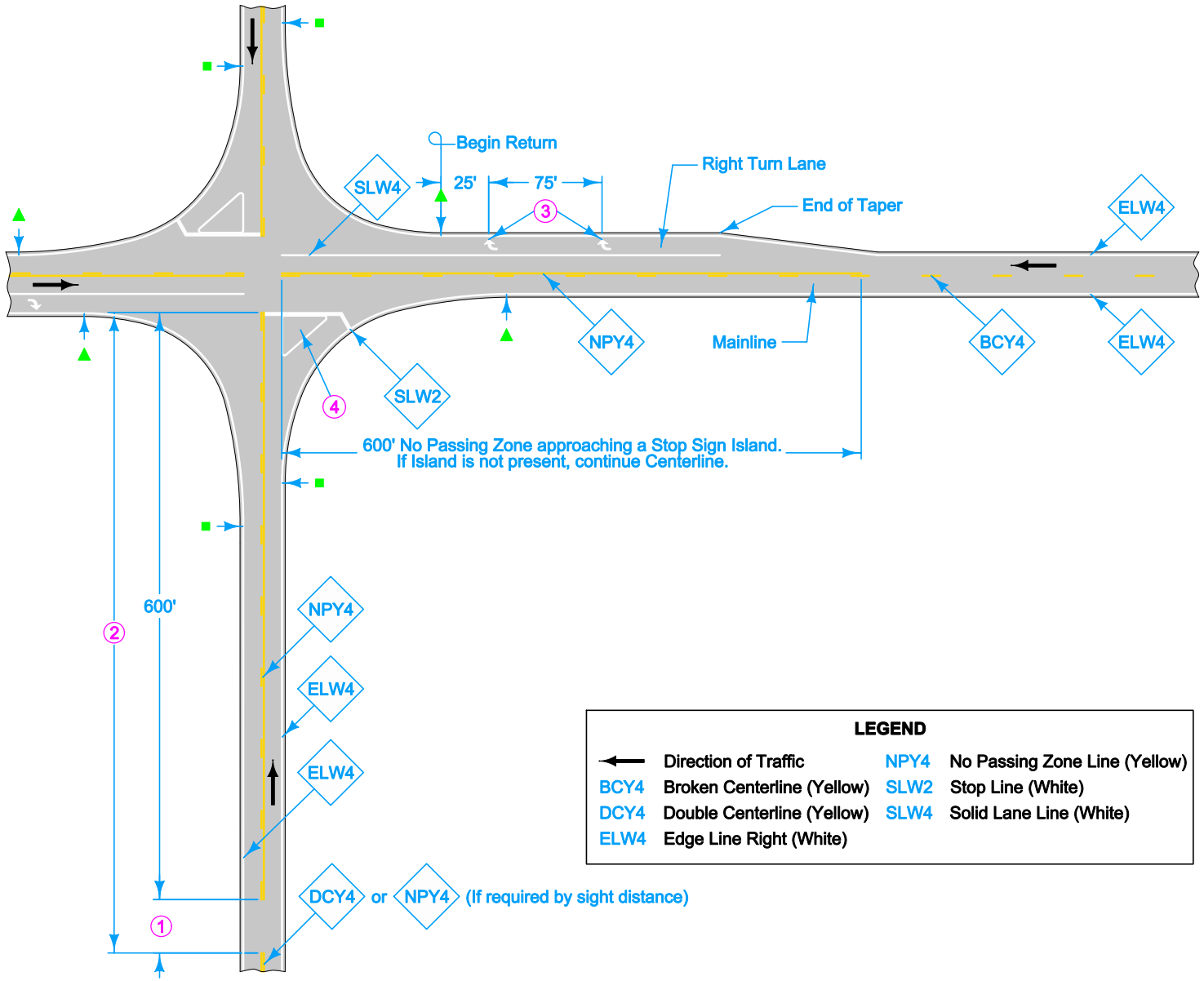
SHEET 3 of 3

REVISIONS: New. Replaces Details 9101, 9102, 9103, and 9104.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH NO TURN LANES (TWO-WAY STOP CONDITION)

DESIGNER INFO



LEGEND

←	Direction of Traffic	NPY4	No Passing Zone Line (Yellow)
BCY4	Broken Centerline (Yellow)	SLW2	Stop Line (White)
DCY4	Double Centerline (Yellow)	SLW4	Solid Lane Line (White)
ELW4	Edge Line Right (White)		

Roadways may or may not have edge lines. When the free flow roadway has edge lines but the stop controlled roadway does not, end edge lines at the end of returns (marked by ▲s). When the stop controlled roadway has edge lines but the free flow roadway does not, end edge lines at the end of returns (marked by ■s). If both roadways have edge lines, continue edge lines around the returns.

Terminate all mainline centerline markings at the edge of the thru lanes of the side road.

Start Solid Lane Line for Right Turn Lane at end of taper.

For line information, see PM-110.

For symbol and legend information, see PM-111.

(1) If less than 400 feet, join Yellow Lines.

(2) If less than 1000 feet, extend Yellow Line to Stop Line.

(3) Symbol and Legend (when listed in 108-29).

(4) For Island information, see PM-120.

Possible Contract Items:
Pavement Marking Line Items
Pavement Marking Symbol and Legend Items

Possible Tabulations:
108-22
108-29

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-521

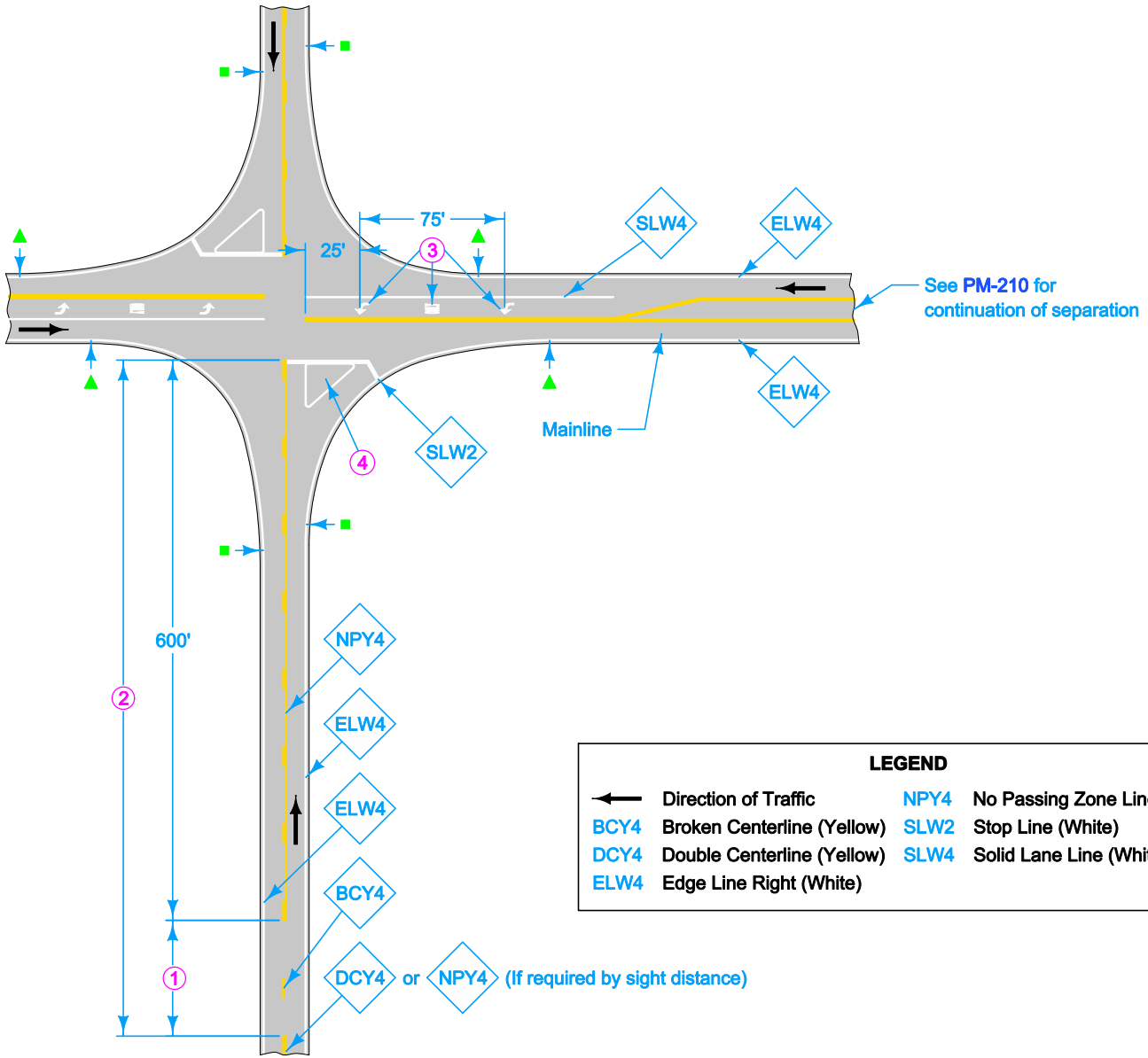
SHEET 1 of 1

REVISIONS: New. Replaces Details 9102, 9103, and 9104.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH RIGHT TURN LANES

DESIGNER INFO



LEGEND

←	Direction of Traffic	NPY4	No Passing Zone Line (Yellow)
BCY4	Broken Centerline (Yellow)	SLW2	Stop Line (White)
DCY4	Double Centerline (Yellow)	SLW4	Solid Lane Line (White)
ELW4	Edge Line Right (White)		

Roadways may or may not have edge lines. When the free flow roadway has edge lines but the stop controlled roadway does not, end edge lines at the end of returns (marked by ▲s). When the stop controlled roadway has edge lines but the free flow roadway does not, end edge lines at the end of returns (marked by ■s). If both roadways have edge lines, continue edge lines around the returns.

Terminate all mainline centerline markings at the edge of the thru lanes of the side road.

The offset distance from centerline W can be the entire width of the offset if the offset is all to one side, or it is the larger of the two partial offsets if the entire offset is split between the two directions of traffic.

For line information, see PM-110.

For symbol and legend information, see PM-111.

(1) If less than 400 feet, join Yellow Lines.

(2) If less than 1000 feet, extend Yellow Line to Stop Line.

(3) Symbol and Legend (when listed in 108-29).

(4) For Island information, see PM-120.

Possible Contract Items:
Pavement Marking Line Items
Pavement Marking Symbol and and Legend Items

Possible Tabulations:
108-22
108-29

Iowa Department of Transportation

REVISION: New 04-19-11

STANDARD ROAD PLAN

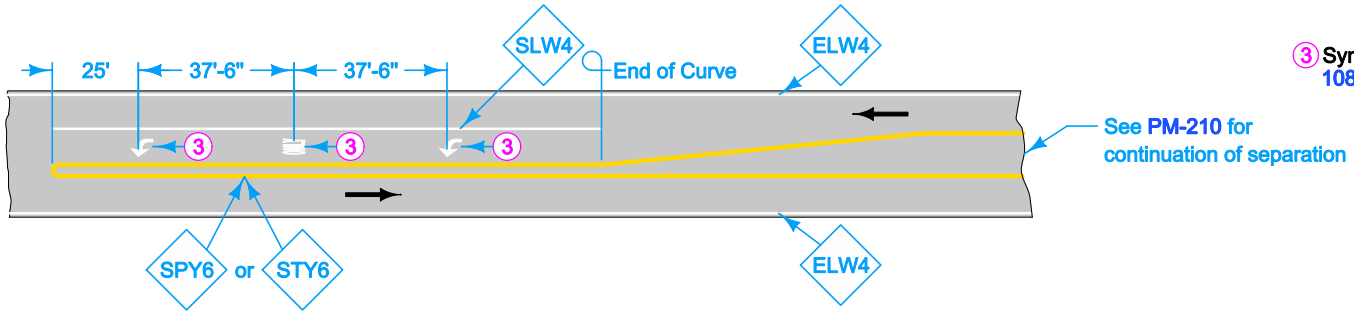
PM-522

SHEET 1 of 2

REVISIONS: New. Replaces Details 9201, 9202, 9401, and 9402.

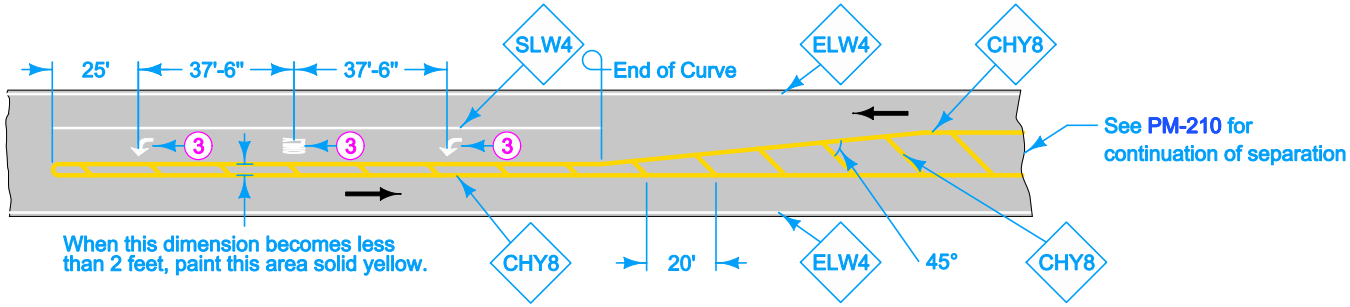
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH LEFT TURN LANES



3 Symbol and Legend (when listed in 108-29).

CURBED CHANNELIZED ISLAND



PAINTED CHANNELIZED ISLAND

LEGEND

←	Direction of Traffic	SLW4	Solid Lane Line (White)
CHY8	Channelizing Line (Yellow)	SPY6	Sloped Curb 6" (Yellow)
ELW4	Edge Line Right (White)	STY6	Standard Curb 6" (Yellow)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-522

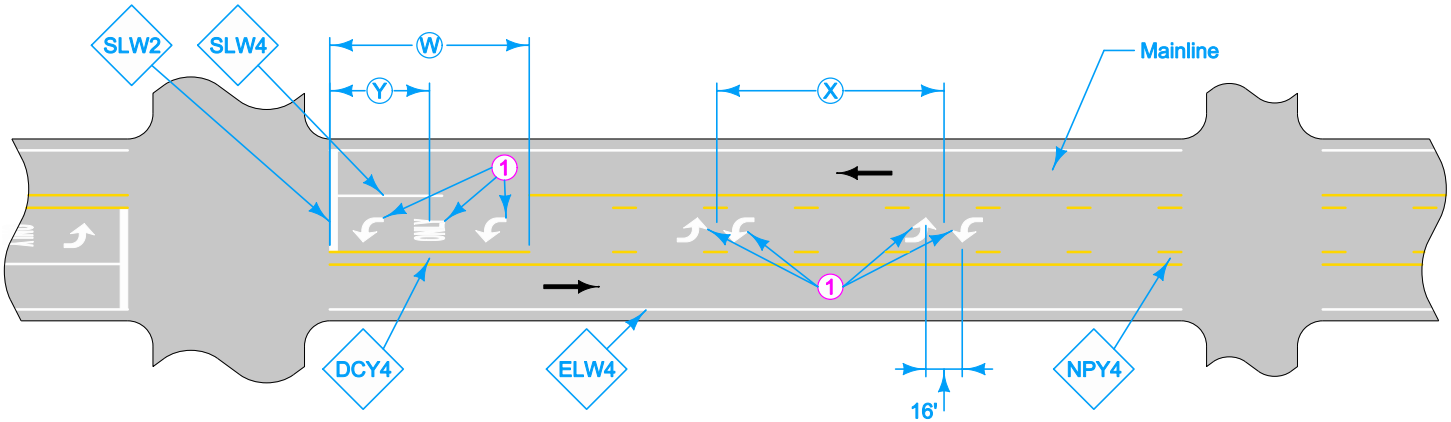
SHEET 2 of 2

REVISIONS: New. Replaces Details 9201, 9202, 9401, and 9402.

Deanna Maifurth
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH LEFT TURN LANES

DESIGNER INFO



Major Cross Street
Mainline Stop or Signalized Condition

Minor Cross Street
No Mainline Stop or Signalized Condition

Terminate all mainline centerline markings at the edge of the property line.

Spacing between center of Symbols and Legends used within Left Turn Only Storage Length is $37\frac{1}{2}$ feet.

For line information, see PM-110.

For symbol and legend information, see PM-111.

(1) Symbol and Legend (when listed in 108-29).

(W) Storage Length to be 150 feet minimum.

(X) Typical spacing (in feet) between sets of arrows should be approximately 10 times the speed limit (MPH) or one set located at mid-block.

(Y) Distance from lane line termination to center of Left Turn Only Symbol and Legend is $\frac{1}{2}$ the Storage Length.

Possible Contract Items:
- Pavement Marking Line Items
- Pavement Marking Symbol and Symbol Items

Possible Tabulations:
- 108-22
- 108-29

LEGEND

←	Direction of Traffic	NPY4	No Passing Zone Line (Yellow)
DCY4	Double CenterLine (Yellow)	SLW2	Stop Line (White)
ELW4	Edge Line Right (White)	SLW4	Solid Lane Line (White)

Iowa Department of Transportation

REVISION	
New	04-19-11

STANDARD ROAD PLAN — **PM-550**

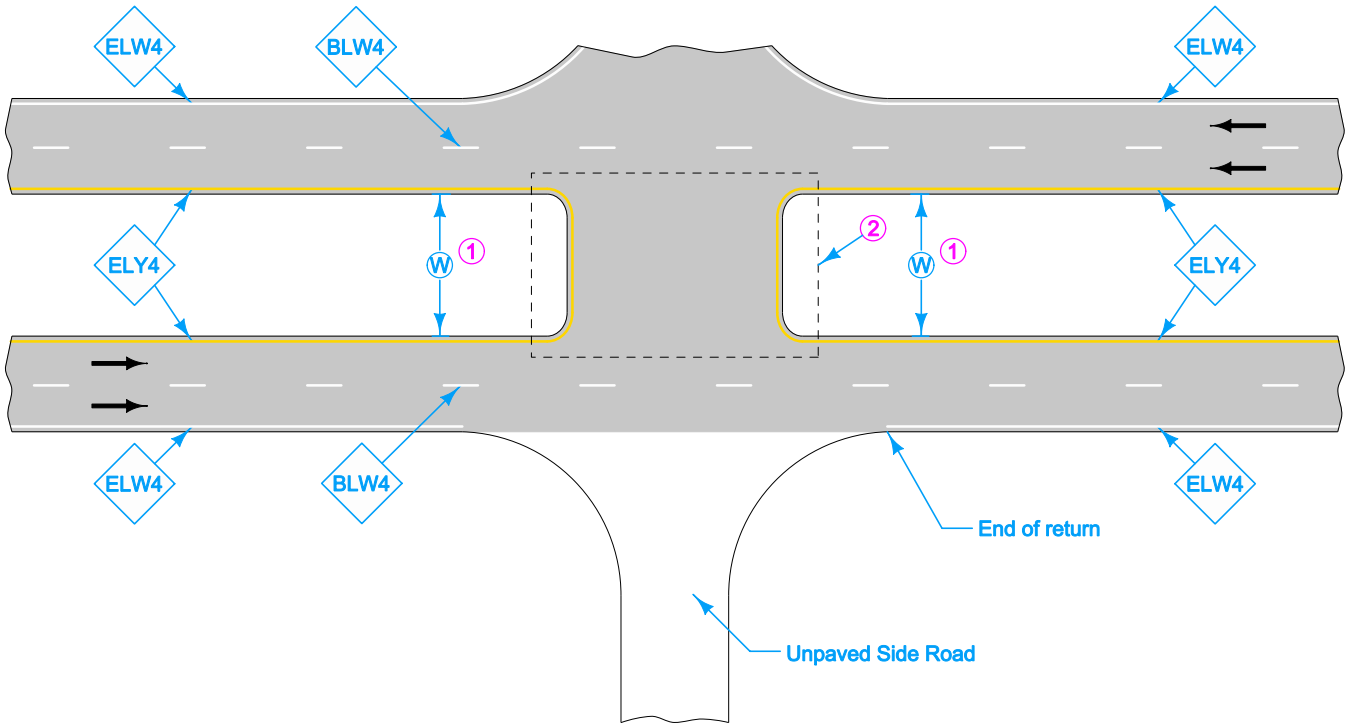
SHEET 1 of 1

REVISIONS: New. Replaces Detail 9403.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH TWO-WAY LEFT TURN LANE

DESIGNER INFO



For line information, see PM-110.

1 W is the width between pavement edges. Measure W from pavement edge to pavement edge. When W values are different, use the smaller of the two.

2 See PM-760 for markings placed in the median.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-29

LEGEND

←	Direction of Traffic
BLW4	Broken Lane Line (White)
ELW4	Edge Line Right (White)
ELY4	Edge Line Left (Yellow)

UNPAVED SIDE ROAD

Iowa Department of Transportation

REVISION
New 04-19-11

STANDARD ROAD PLAN

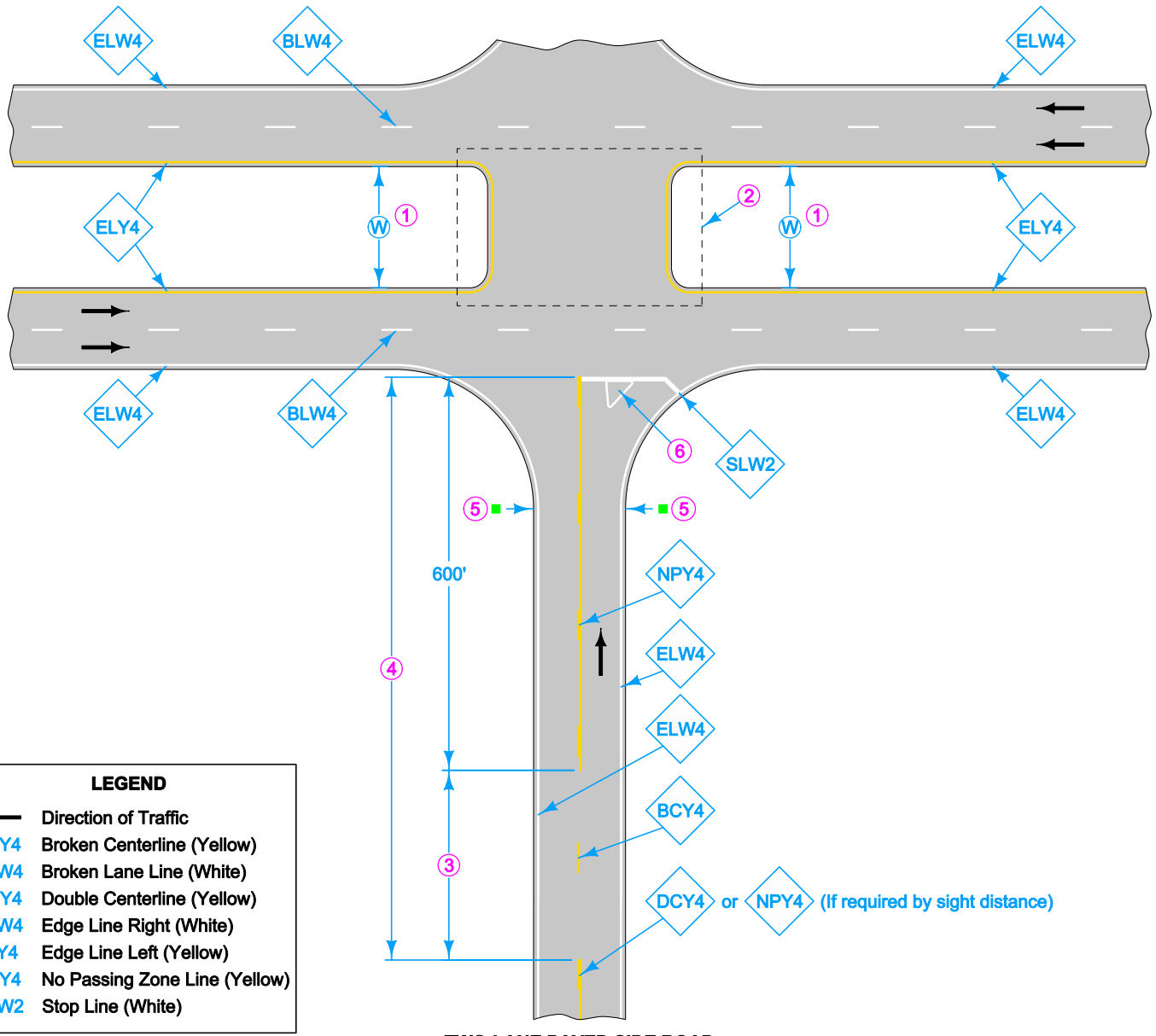
PM-560

SHEET 1 of 2

REVISIONS: New. Replaces Detail 9107.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DIVIDED MULTI-LANE ROADWAY WITH NO TURN LANES



LEGEND

←	Direction of Traffic
BCY4	Broken Centerline (Yellow)
BLW4	Broken Lane Line (White)
DCY4	Double Centerline (Yellow)
ELW4	Edge Line Right (White)
ELY4	Edge Line Left (Yellow)
NPY4	No Passing Zone Line (Yellow)
SLW2	Stop Line (White)

TWO-LANE PAVED SIDE ROAD

(1) W is the width between pavement edges. Measure W from pavement edge to pavement edge. When W values are different, use the smaller of the two.

(2) See PM-760 for markings placed in the median.

(3) If less than 400 feet, join Yellow Lines.

(4) If less than 1000 feet, extend Yellow Line to Stop Line.

(5) When the free flow roadway has edge lines but the stop controlled roadway does not, end edge lines at the end of returns (marked by ■s). If both roadways have edge lines, continue edge lines around the returns.

(6) If Island present, see PM-120.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-560

SHEET 2 of 2

REVISIONS: New. Replaces Detail 9107.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

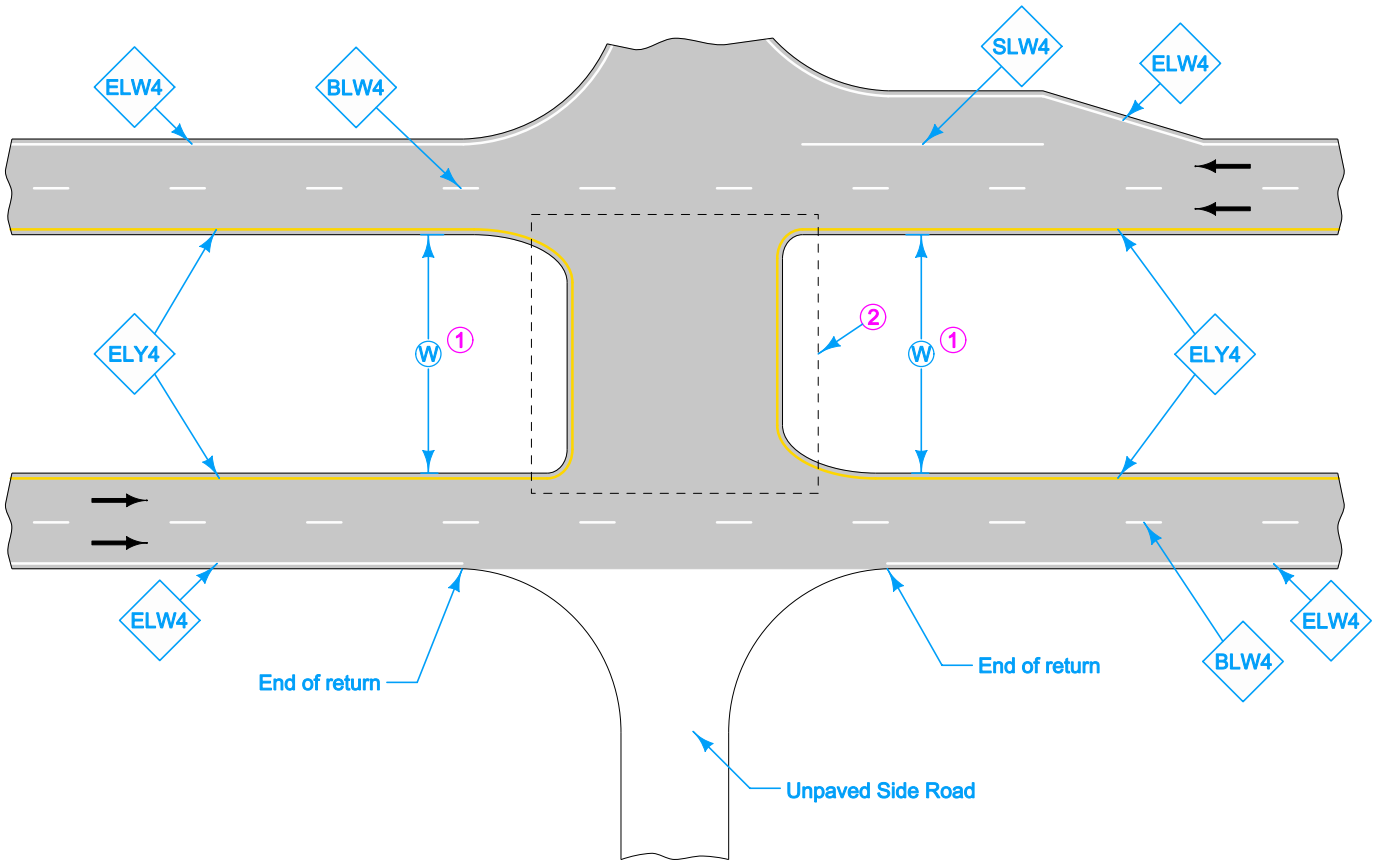
DIVIDED MULTI-LANE ROADWAY WITH NO TURN LANES

DESIGNER INFO

For line information, see PM-110.

(1) W is the width between pavement edges. Measure W from pavement edge to pavement edge. When W values are different, use the smaller of the two.

(2) See PM-760 for markings placed in the median.



LEGEND

←	Direction of Traffic
BLW4	Broken Lane Line (White)
ELW4	Edge Line Right (White)
ELY4	Edge Line Left (Yellow)
SLW4	Solid Lane Line (White)

UNPAVED SIDE ROAD

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-29

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

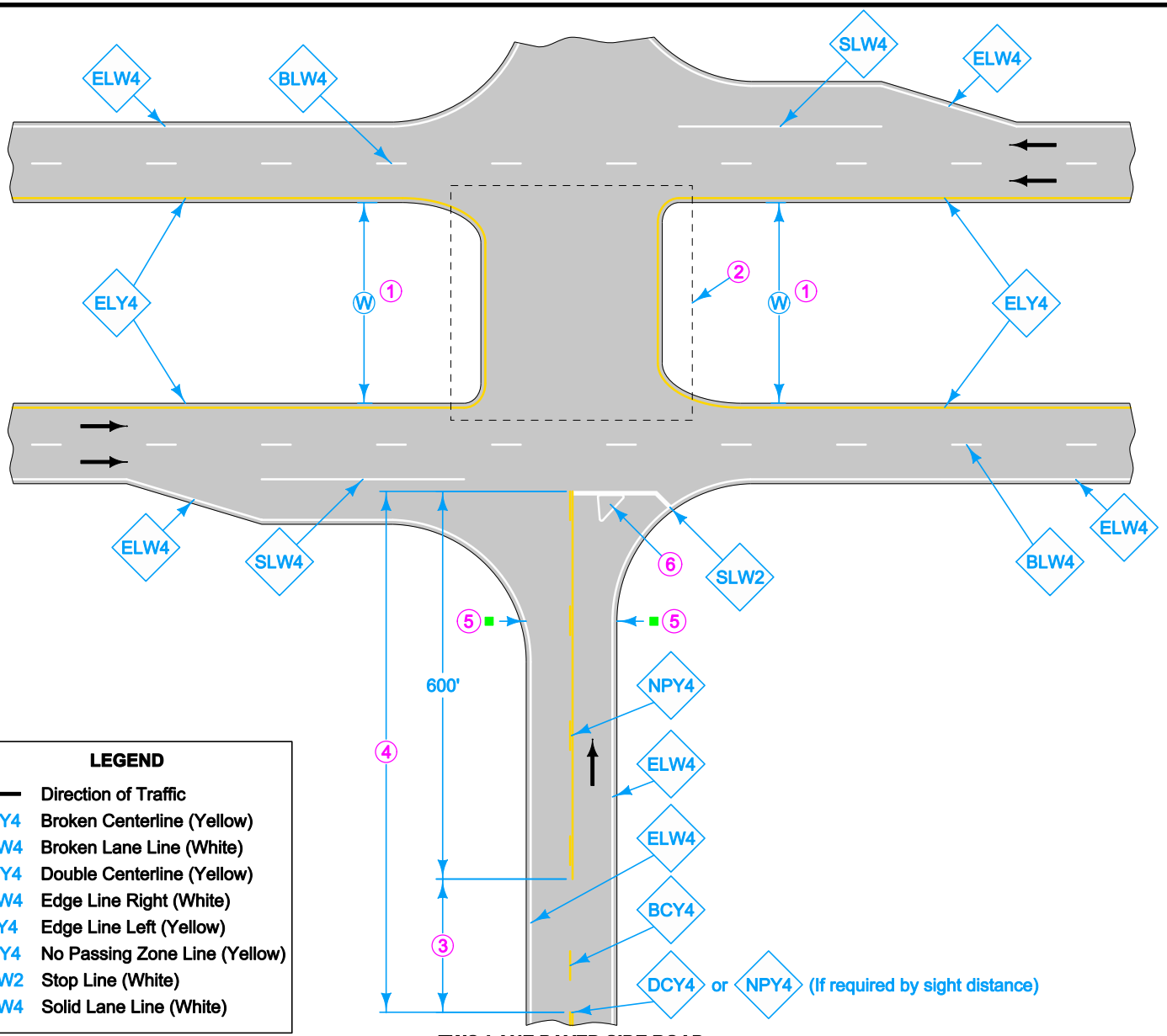
PM-561

SHEET 1 of 2

REVISIONS: New. Replaces Detail 9107.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DIVIDED MULTI-LANE ROADWAY WITH RIGHT TURN LANES



TWO-LANE PAVED SIDE ROAD

LEGEND

←	Direction of Traffic
BCY4	Broken Centerline (Yellow)
BLW4	Broken Lane Line (White)
DCY4	Double Centerline (Yellow)
ELW4	Edge Line Right (White)
ELY4	Edge Line Left (Yellow)
NPY4	No Passing Zone Line (Yellow)
SLW2	Stop Line (White)
SLW4	Solid Lane Line (White)

(1) W is the width between pavement edges. Measure W from pavement edge to pavement edge. When W values are different, use the smaller of the two.

(2) See PM-760 for markings placed in the median.

(3) If less than 400 feet, join Yellow Lines.

(4) If less than 1000 feet, extend Yellow Line to Stop Line.

(5) When the free flow roadway has edge lines but the stop controlled roadway does not, end edge lines at the end of returns (marked by ■s). If both roadways have edge lines, continue edge lines around the returns.

(6) If Island present, see PM-120.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-561

SHEET 2 of 2

REVISIONS: New. Replaces Detail 9107.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

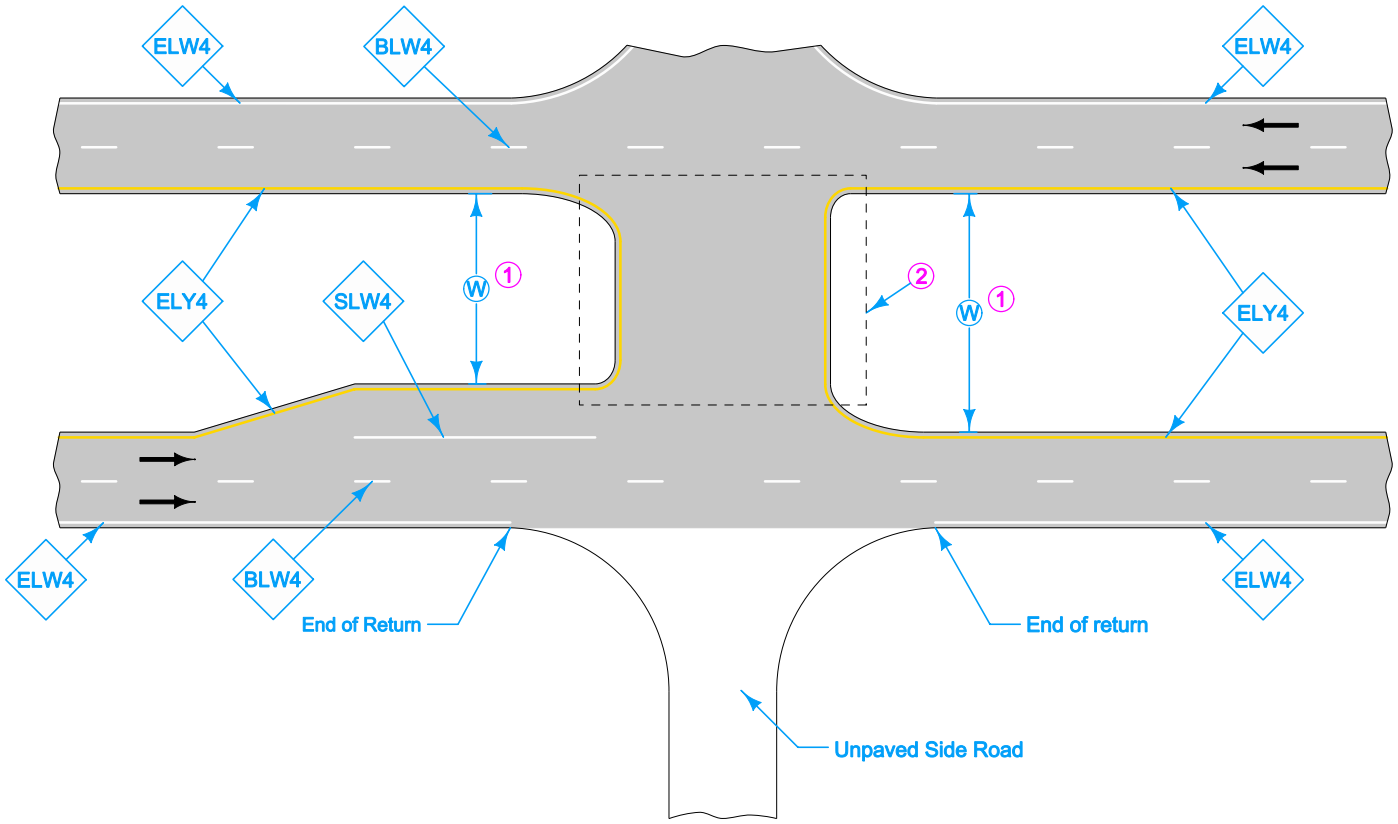
DIVIDED MULTI-LANE ROADWAY WITH RIGHT TURN LANES

DESIGNER INFO

For line information, see PM-110.

(1) W is the width between pavement edges. Measure W from pavement edge to pavement edge. When W values are different, use the smaller of the two.

(2) See PM-760 for markings placed in the median.



LEGEND

←	Direction of Traffic
BLW4	Broken Lane Line (White)
ELW4	Edge Line Right (White)
ELY4	Edge Line Left (Yellow)
SLW4	Solid Lane Line (White)

UNPAVED SIDE ROAD

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-29

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

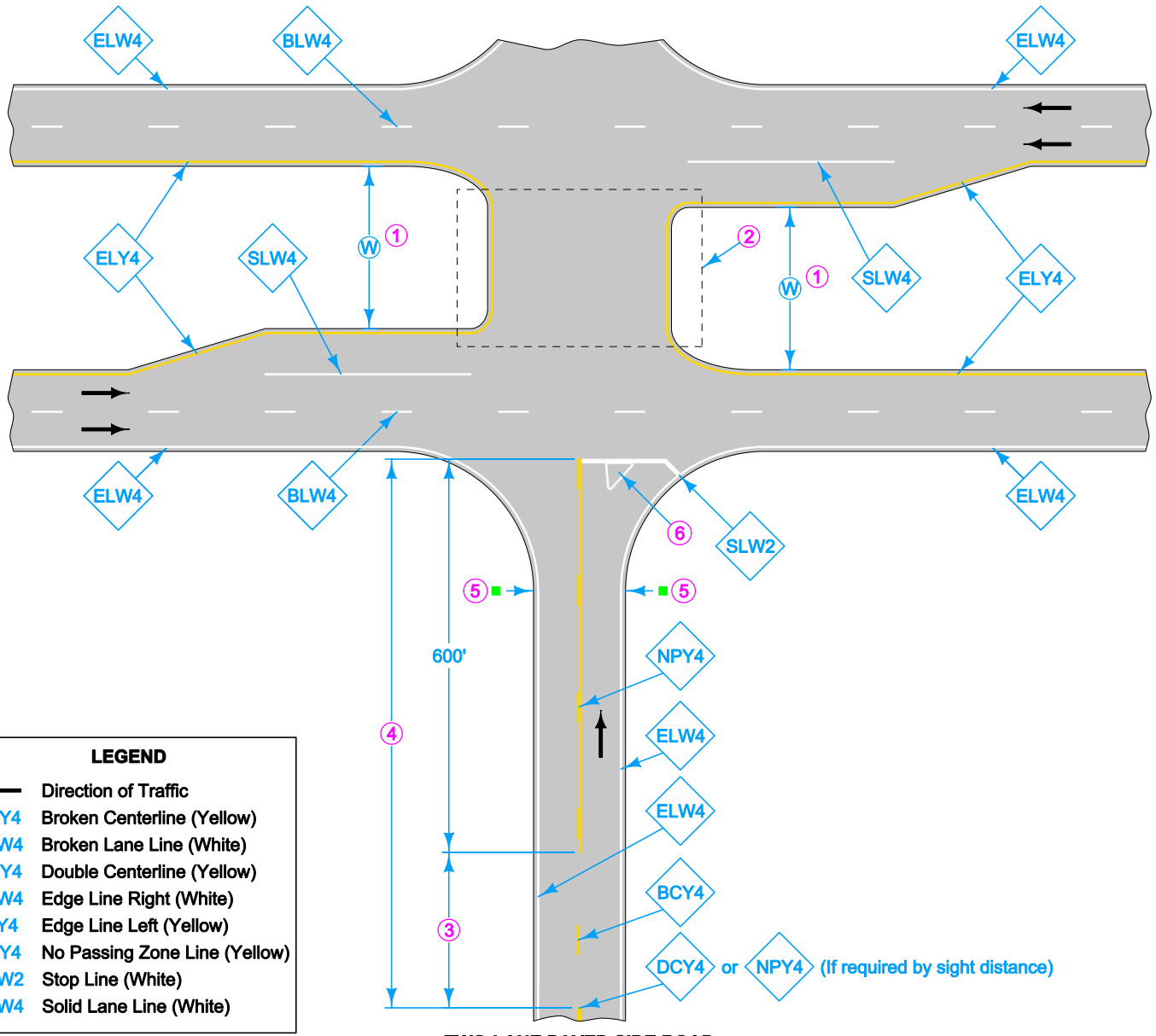
PM-562

SHEET 1 of 2

REVISIONS: New. Replaces Detail 9107.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DIVIDED MULTI-LANE ROADWAY WITH LEFT TURN LANES



TWO-LANE PAVED SIDE ROAD

LEGEND

←	Direction of Traffic
BCY4	Broken Centerline (Yellow)
BLW4	Broken Lane Line (White)
DCY4	Double Centerline (Yellow)
ELW4	Edge Line Right (White)
ELY4	Edge Line Left (Yellow)
NPY4	No Passing Zone Line (Yellow)
SLW2	Stop Line (White)
SLW4	Solid Lane Line (White)

(1) W is the width between pavement edges. Measure W from pavement edge to pavement edge. When W values are different, use the smaller of the two.

(2) See PM-760 for markings placed in the median.

(3) If less than 400 feet, join Yellow Lines.

(4) If less than 1000 feet, extend Yellow Line to Stop Line.

(5) When the free flow roadway has edge lines but the stop controlled roadway does not, end edge lines at the end of returns (marked by ■s). If both roadways have edge lines, continue edge lines around the returns.

(6) If Island present, see PM-120.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-562

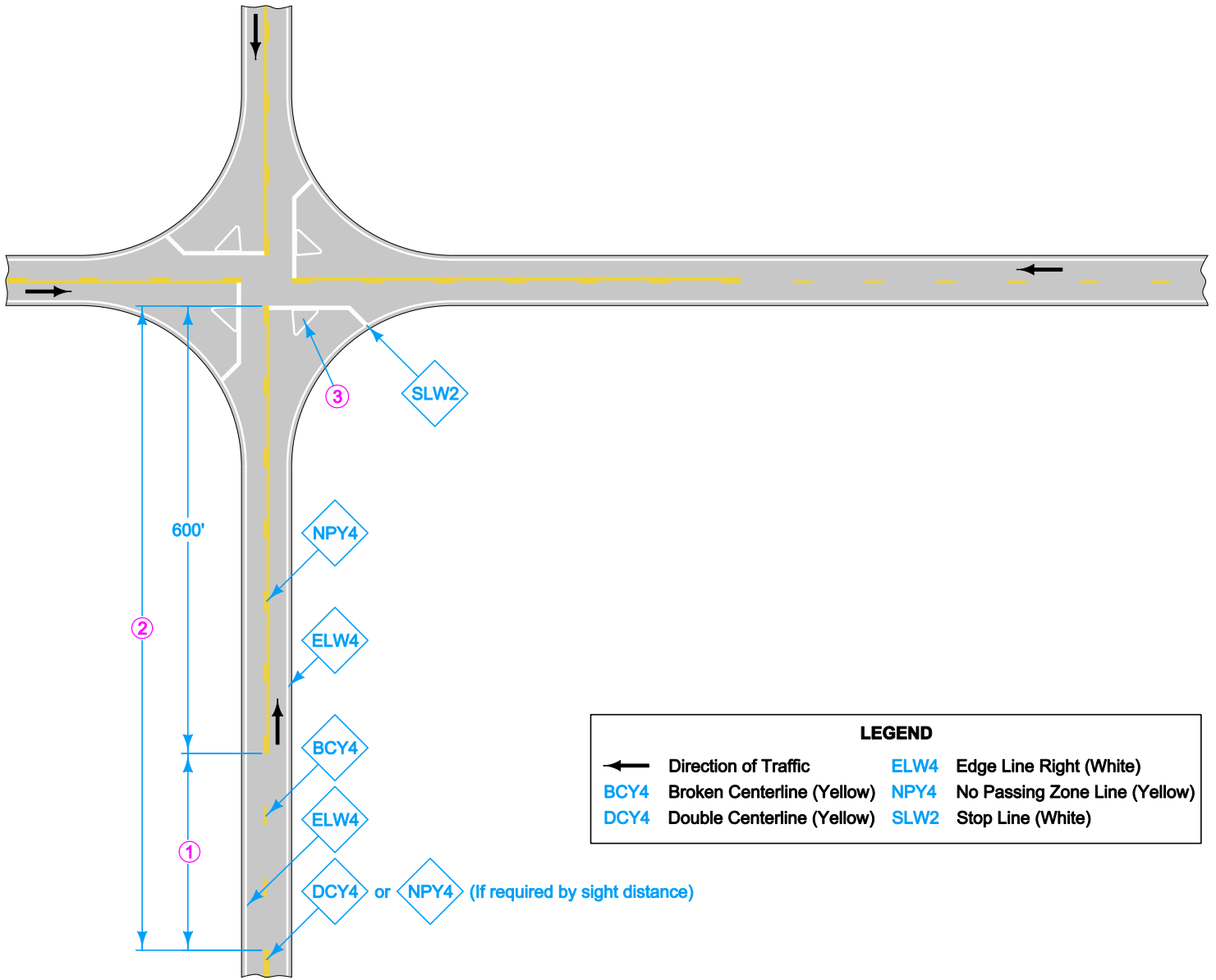
SHEET 2 of 2

REVISIONS: New. Replaces Detail 9107.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DIVIDED MULTI-LANE ROADWAY WITH LEFT TURN LANES

DESIGNER INFO



LEGEND

←	Direction of Traffic	ELW4	Edge Line Right (White)
BCY4	Broken Centerline (Yellow)	NPY4	No Passing Zone Line (Yellow)
DCY4	Double Centerline (Yellow)	SLW2	Stop Line (White)

For line information, see PM-110.

1. If less than 400 feet, join Yellow Lines.
2. If less than 1000 feet, extend Yellow Line to Stop Line.
3. If Island present, see PM-120.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

PM-620

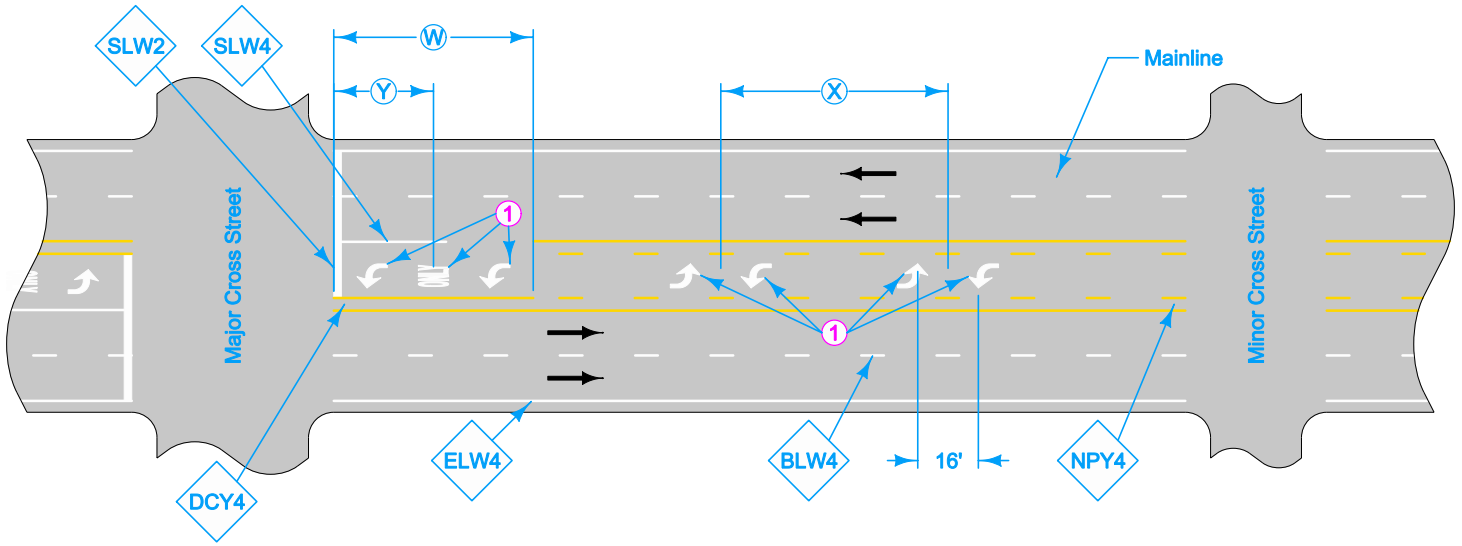
SHEET 1 of 1

REVISIONS: New.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE ROADWAY WITH NO TURN LANES (FOUR-WAY STOP CONDITION)

DESIGNER INFO



Major Cross Street
Mainline Stop or Signalized Condition

Minor Cross Street
No Mainline Stop or Signalized Condition

Terminate all mainline centerline markings at the edge of the property line.

Spacing between center of Symbols and Legends used within Left Turn Only Storage Length is $37\frac{1}{2}$ feet.

For line information, see PM-110.

For symbol and legend information, see PM-111.

(1) Symbol and Legend (when listed in 108-29).

(W) Storage Length to be 150 feet minimum.

(X) Typical spacing (in feet) between sets of arrows should be approximately 10 times the speed limit (MPH) or one set located at mid-block.

(Y) Distance from lane line termination to center of Left Turn Only Symbol and Legend is $\frac{1}{2}$ the Storage Length.

Possible Contract Items:
Pavement Marking Line Items
Pavement Marking Symbol and Legend Items

Possible Tabulations:
108-22
108-29

LEGEND

←	Direction of Traffic	NPY4	No Passing Zone Line (Yellow)
BLW4	Broken Lane Line (White)	SLW2	Stop Line (White)
DCY4	Double Centerline (Yellow)	SLW4	Solid Lane Line (White)
ELW4	Edge Line Right (White)		

Iowa Department of Transportation

REVISION: New 04-19-11

STANDARD ROAD PLAN

PM-650

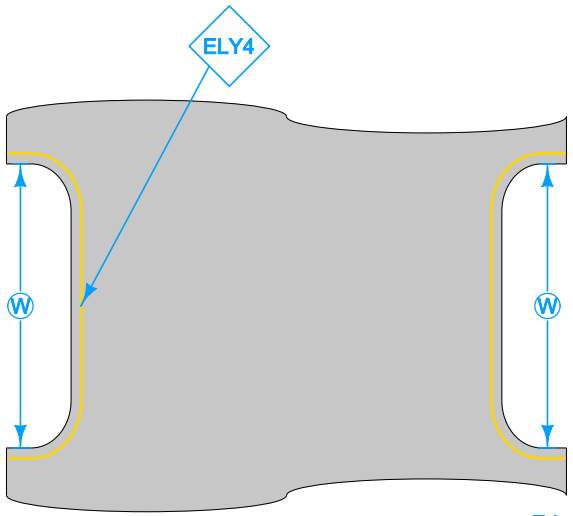
SHEET 1 of 1

REVISIONS: New. Replaces Detail 9403.

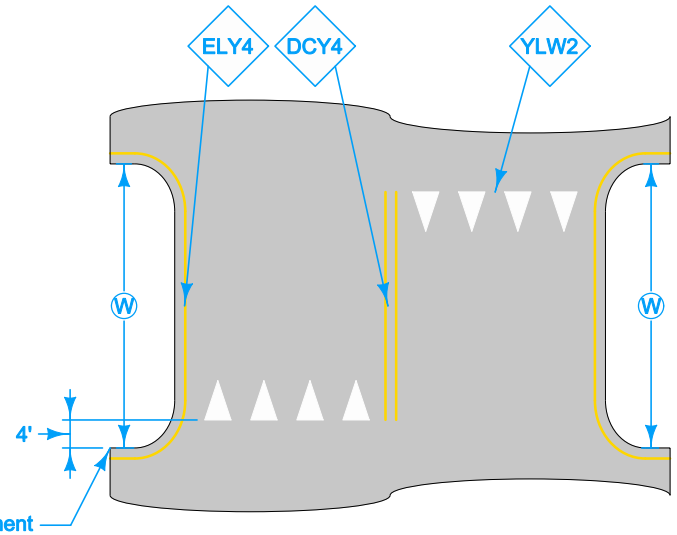
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

MULTI-LANE ROADWAY WITH TWO-WAY LEFT TURN LANE

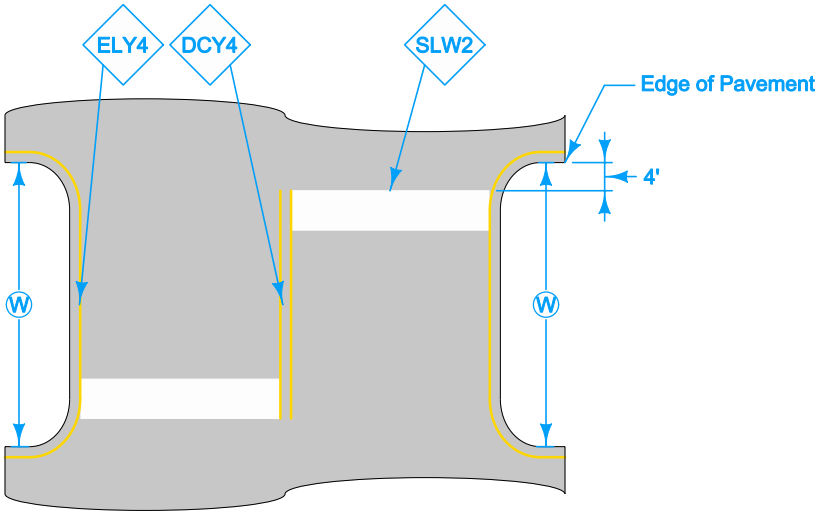
DESIGNER INFO



W < 30 FEET
NO MARKINGS CONDITION



30 FEET ≤ W ≤ 80 FEET
YIELD MARKINGS CONDITION



W > 80 FEET
STOP MARKINGS CONDITION

LEGEND

←	Direction of Traffic
DCY4	Double Centerline (Yellow)
ELY4	Edge Line Left (Yellow)
SLW2	Stop Line (White)
YLW2	Yield Line (White)

W is the width between pavement edges. Measure W from pavement edge to pavement edge. When W values are different, use the smaller of the two.

Omit median edge lines if neither connecting side road has painted edge lines.

For line information, see PM-110.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-29

Iowa Department of Transportation

REVISION	
New	04-19-11

STANDARD ROAD PLAN — **PM-760**

SHEET 1 of 1

REVISIONS: New. Partial inclusion of Detail 9107.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DIVIDED MULTI-LANE ROADWAY MEDIAN

Pavement

PV

SECTION

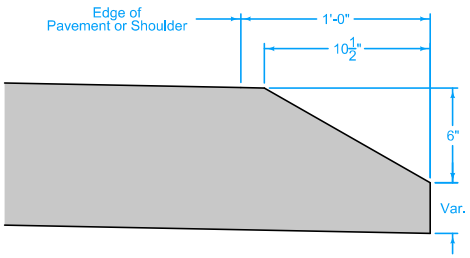
Pavement

PV

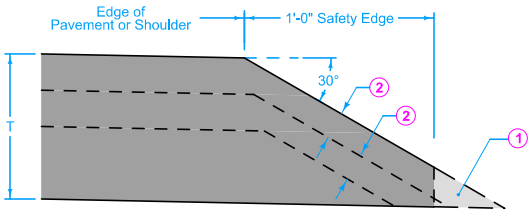
NO.	DATE	TITLE
		General
PV-1	Void	Replaced by PV-101
PV-2	Void	Replaced by PV-102 and PV-104
PV-3	10-18-11	Safety Edge
PV-10	04-19-11	Rumble Strip Panel for Intersection Approach
PV-11	04-20-10	Structural Rumble Strips
PV-12	04-17-12	Milled Shoulder Rumble Strips
PV-13	04-19-11	Milled Centerline Rumble Strips
		PCC
PV-101	04-17-12	Joints
PV-102	04-19-11	PCC Curb Details
PV-103	04-19-11	Manhole Boxouts in PCC Pavement
PV-104	04-19-11	Ramped Median Nose
		HMA
PV-201	04-19-11	Manhole Boxouts in HMA Pavement and HMA Overlays
		Superelevation
PV-301	04-19-11	Superelevation Details Two Lane Roadway
PV-302	04-17-12	Superelevation Details Four Lane Roadway Depressed Median
PV-303	04-19-11	Superelevation Details Ramps
PV-304	04-17-12	Superelevation Details Six Lane Roadway Depressed Median
PV-305	04-17-12	Superelevation Details Six Lane Roadway Closed Median
PV-306	04-19-11	Superelevation Details Eight Lane Roadway Closed Median
		Ramp Tapers
PV-410	10-18-11	Deceleration Taper for 16' Exit Ramp
PV-411	10-18-11	Acceleration Taper for 16' Entrance Ramp
PV-412	10-18-11	Deceleration Taper for 18' Exit Loop
PV-414	10-18-11	Acceleration Taper for 18' Entrance Loop

Pavement

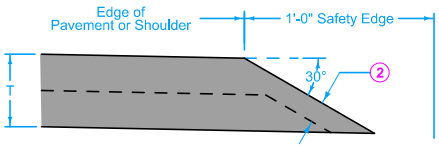
NO.	DATE	TITLE
		Median Crossovers
PV-500	04-19-11	Median Crossover (50' Median)
PV-501	04-19-11	Median Crossover (50' Median) 16' Wide 1 Lane
PV-502	04-19-11	Median Crossover (50' Median) 28' Wide 2 Lane
PV-503	04-19-11	Median Crossover (64' Median)
PV-504	04-19-11	Median Crossover (64' Median) 16' Wide 1 Lane
PV-505	04-19-11	Median Crossover (64' Median) 28' Wide 2 Lane
PV-506	04-19-11	Median Crossover (68.24' Median)
PV-507	04-19-11	Median Crossover (68.24' Median) 16' Wide 1 Lane
PV-508	04-19-11	Median Crossover (68.24' Median) 28' Wide 2 Lane



PCC



T > 8"



T < 8"

HMA

Quantities for Safety Edge are included in the estimated quantity of the pavement or shoulder. For HMA quantities calculated by area, the Safety Edge is measured as one foot of width regardless of thickness.

See paving typicals for placement within roadway.

The number of HMA lifts shown are for illustration purposes only.

(1) Material in excess of 1' width is contractor's option.

(2) Coverage thickness to exceed nominal maximum aggregate size.

Iowa Department of Transportation

REVISION
1 | 10-18-11

STANDARD ROAD PLAN

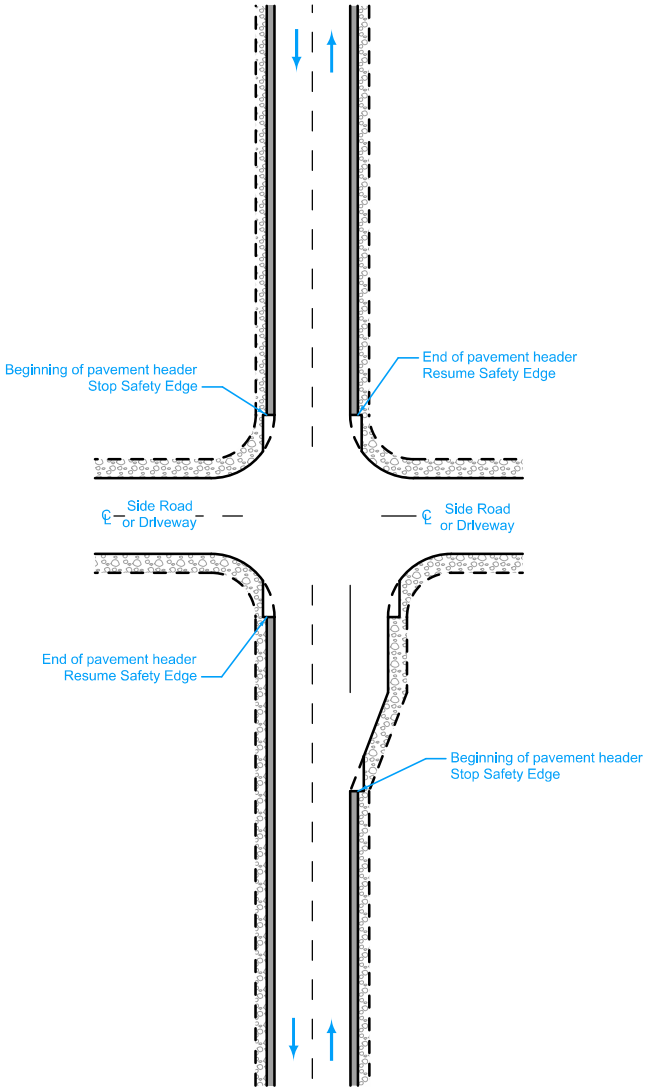
PV-3

SHEET 1 of 2

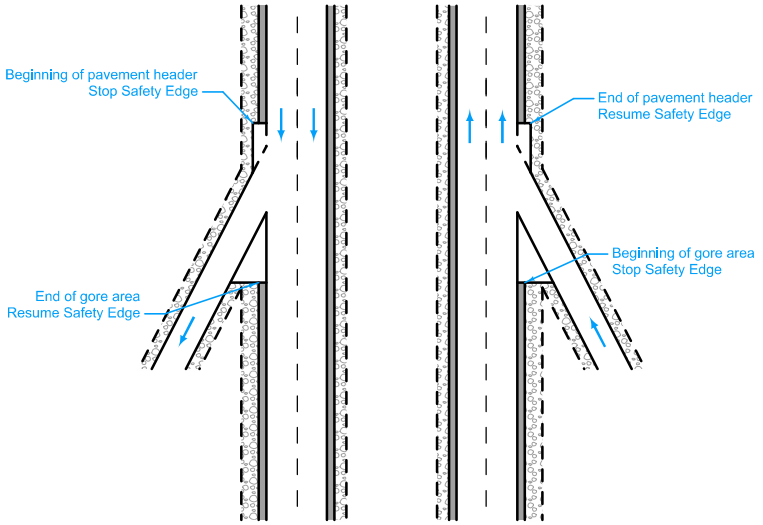
REVISIONS: Modified HMA drawings. Added circle notes 1 and 2.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SAFETY EDGE



AUXILIARY LANES AND INTERSECTIONS



RAMPS AND LOOPS

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-18-11

PV-3

SHEET 2 of 2

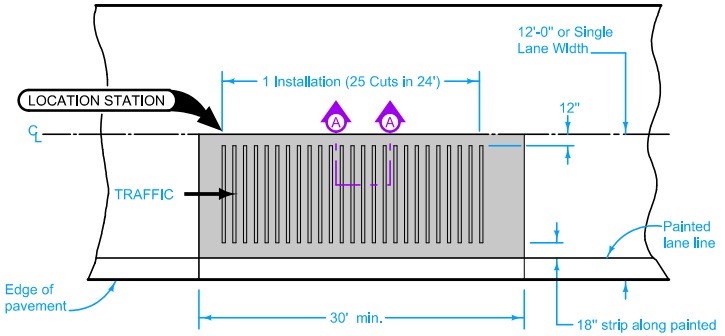
REVISIONS: Modified HMA drawings. Added circle notes 1 and 2.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

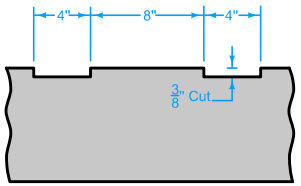
SAFETY EDGE

Construct rumble strip panel prior to opening to traffic.

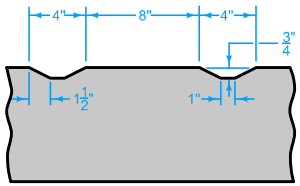
Refer to the contract documents for pavement patching and jointing information.



PLAN



SECTION A-A
(RUMBLE STRIP CUT IN PAVEMENT)



SECTION A-A
(RUMBLE STRIP PLACED IN PLASTIC P.C. CONCRETE)

Possible Contract Items:
- CD Joint Assembly
- CT Joint
- Patches, Full-Depth Finish, by Area
- Patches, Full-Depth Finish, by Count
- Rumble Strip Panel (In Full Depth Patch)
- Rumble Strip Panel (PCC Surface)
- Rumble Strip Panel (HMA Surface)

Possible Tabulations:
- 102-6C
- 112-7

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

PV-10

SHEET 1 of 1

REVISIONS: Updated references to renamed standards and referenced contract documents for joints and patches.

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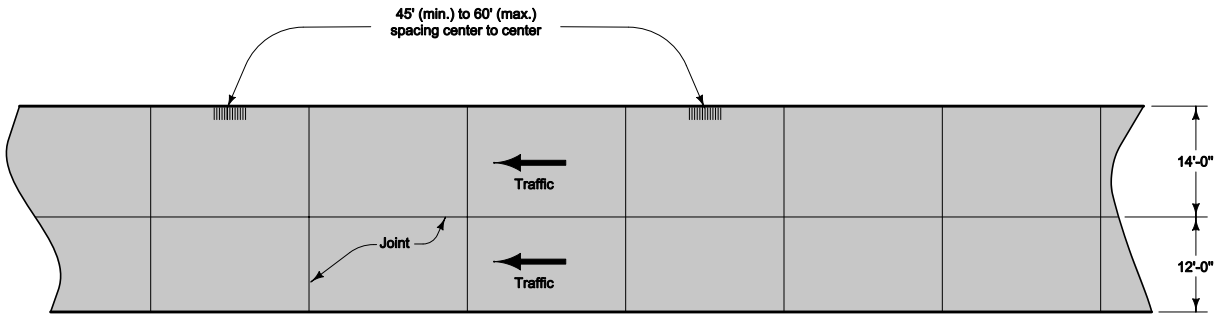
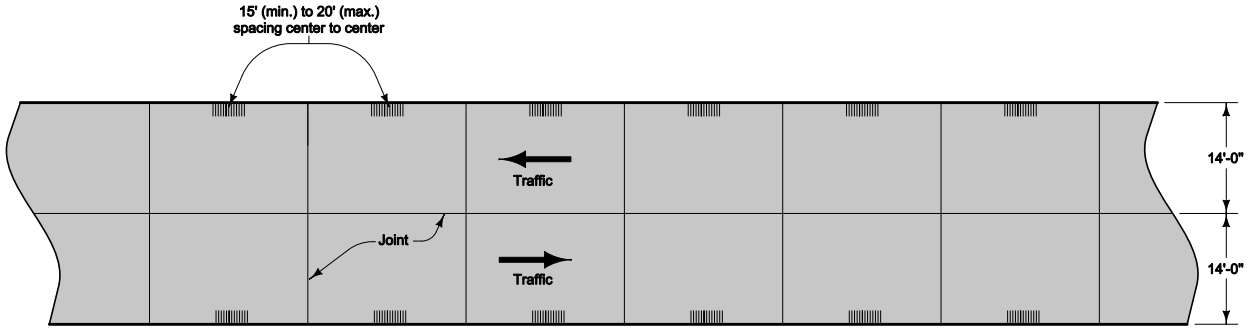
RUMBLE STRIP PANEL FOR INTERSECTION APPROACH



PLAN
(4-Lane Divided Roadway)



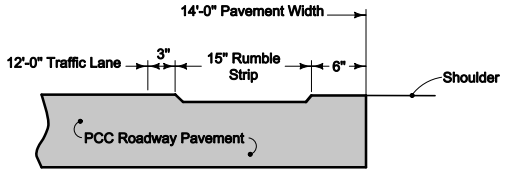
PLAN
(2-Lane Roadway)

Do not place structural rumble strips areas where
- a lane's paved width is less than 14 feet
- milled shoulder rumble strips will be placed

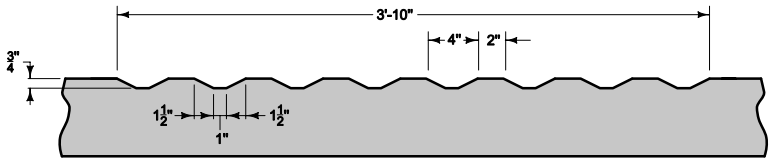
Placement of structural rumble strips will be incidental to "Standard or Slip Form Portland Cement Concrete Pavement".

Possible Contract Item:
Standard or Slip Form Portland Cement Concrete Pavement

STRUCTURAL RUMBLE STRIP



SECTION THROUGH PAVEMENT EDGE



PROFILE

Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

PV-11

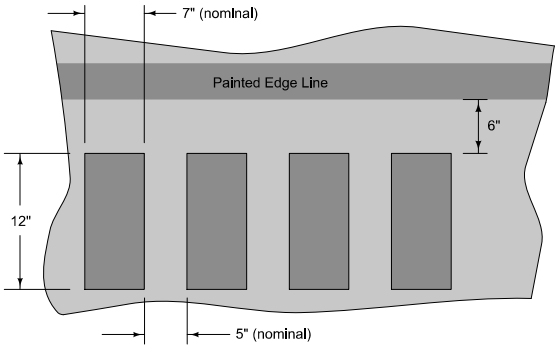
SHEET 1 of 1

REVISIONS: New. Replaces RH-60.

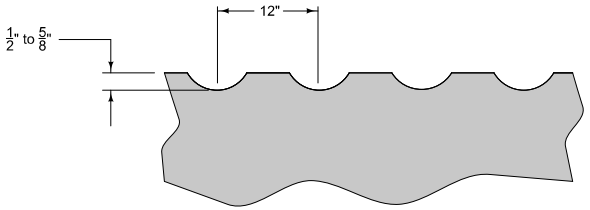
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

STRUCTURAL RUMBLE STRIPS

DESIGNER INFO



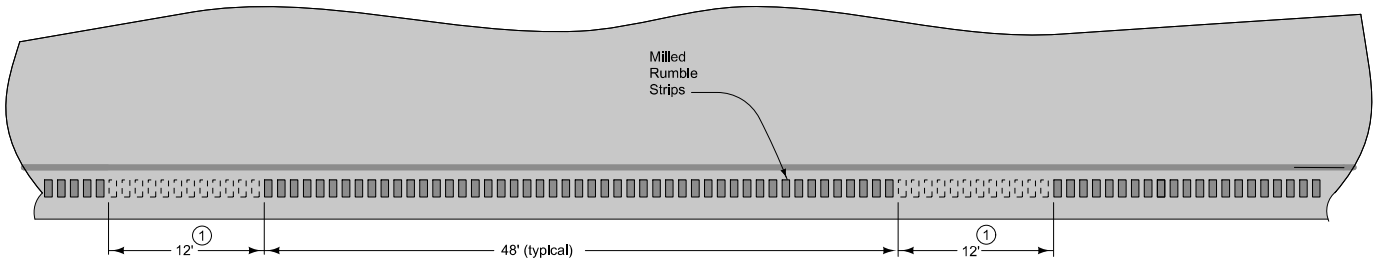
PLAN



SECTION

MILLED RUMBLE STRIP

① Place continuous Milled Rumble Strips (no 12-foot gaps) on all median-side shoulders and on all interstate shoulders.



GAP DETAILS ①

Possible Contract Items:
Asphalt Emulsion for Fog Seal (Shoulder Rumble Strips)
Milled Shoulder Rumble Strips, HMA Surface
Milled Shoulder Rumble Strips, PCC Surface

Possible Tabulation:
112-10

Iowa Department of Transportation

REVISION	
4	04-17-12

STANDARD ROAD PLAN

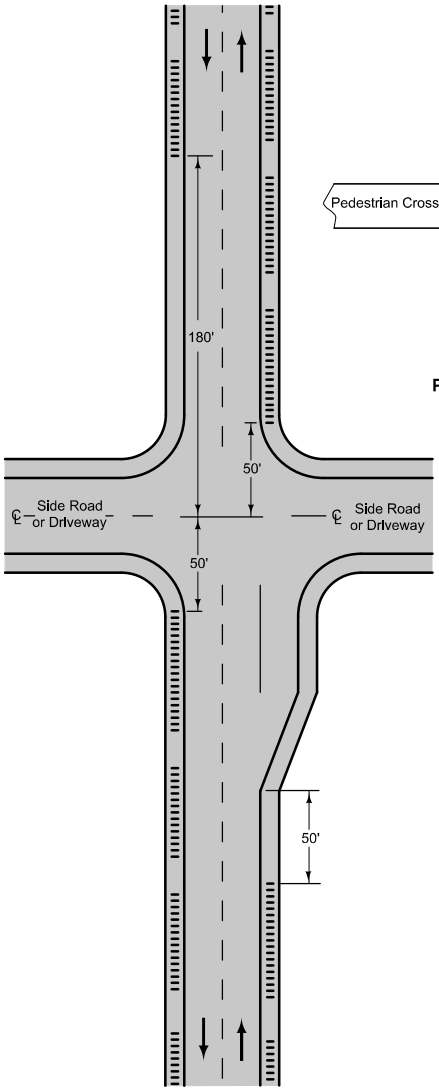
PV-12

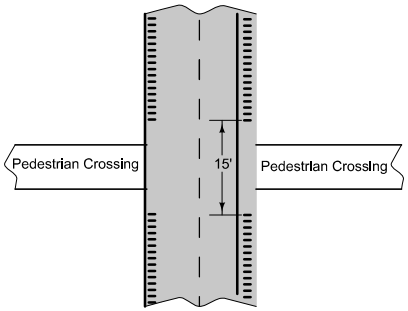
SHEET 1 of 2

REVISIONS: Added drawing to sheet 2 to clarify procedure for gapping rumble strips for a pedestrian crossing.

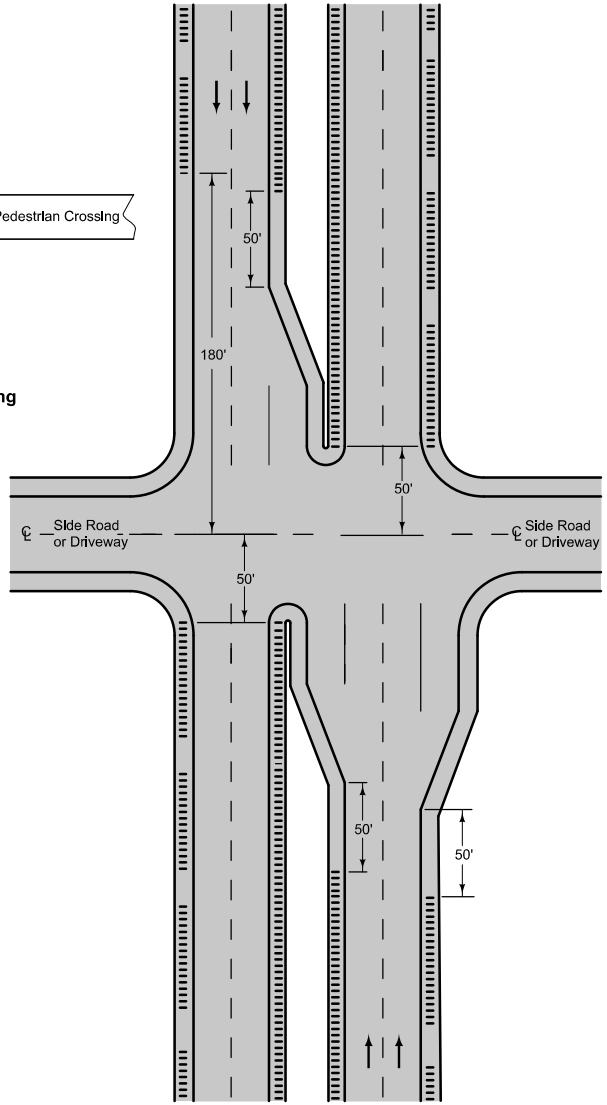
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

MILLED SHOULDER RUMBLE STRIPS





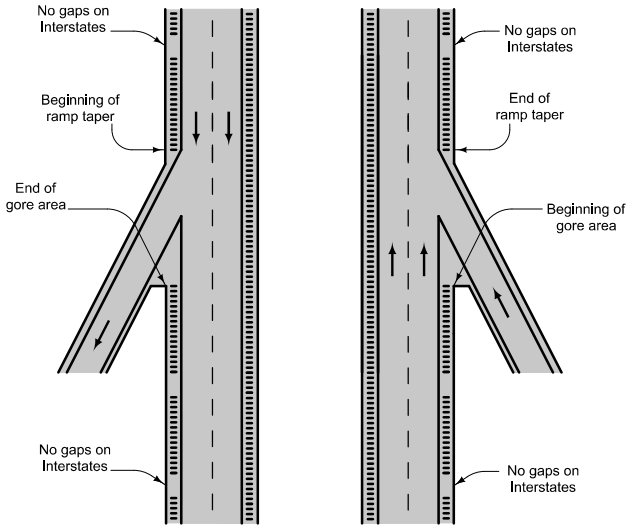
Pedestrian Crossing



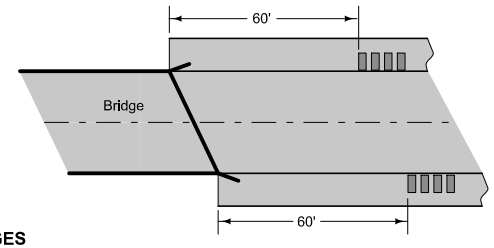
UNDIVIDED HIGHWAYS

DIVIDED HIGHWAYS

INTERSECTION SITUATIONS



RAMP AND LOOP TERMINALS (1)



BRIDGES

(1) Place continuous Milled Rumble Strips (no 12-foot gaps) on all median-side shoulders and on all interstate shoulders.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
4	04-17-12

PV-12

SHEET 2 of 2

REVISIONS: Added drawing to sheet 2 to clarify procedure for gapping rumble strips for a pedestrian crossing.

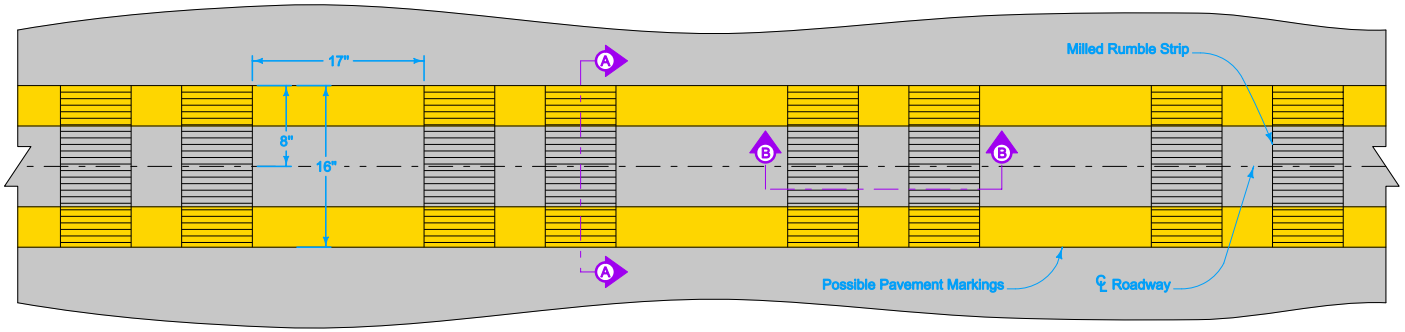
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

MILLED SHOULDER RUMBLE STRIPS

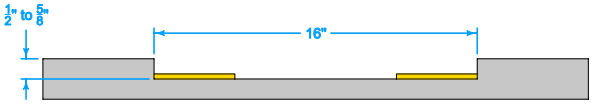
DESIGNER INFO

Centerline rumble strip placement is the same regardless of centerline pavement marking.

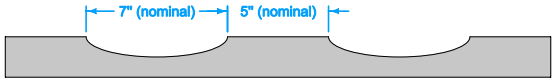
Gap areas where painted median is present.



PLAN



SECTION A-A



SECTION B-B

Possible Contract Items:
Milled Centerline Rumble Strips, HMA Surface
Milled Centerline Rumble Strips, PCC Surface

Possible Tabulation:
112-10

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

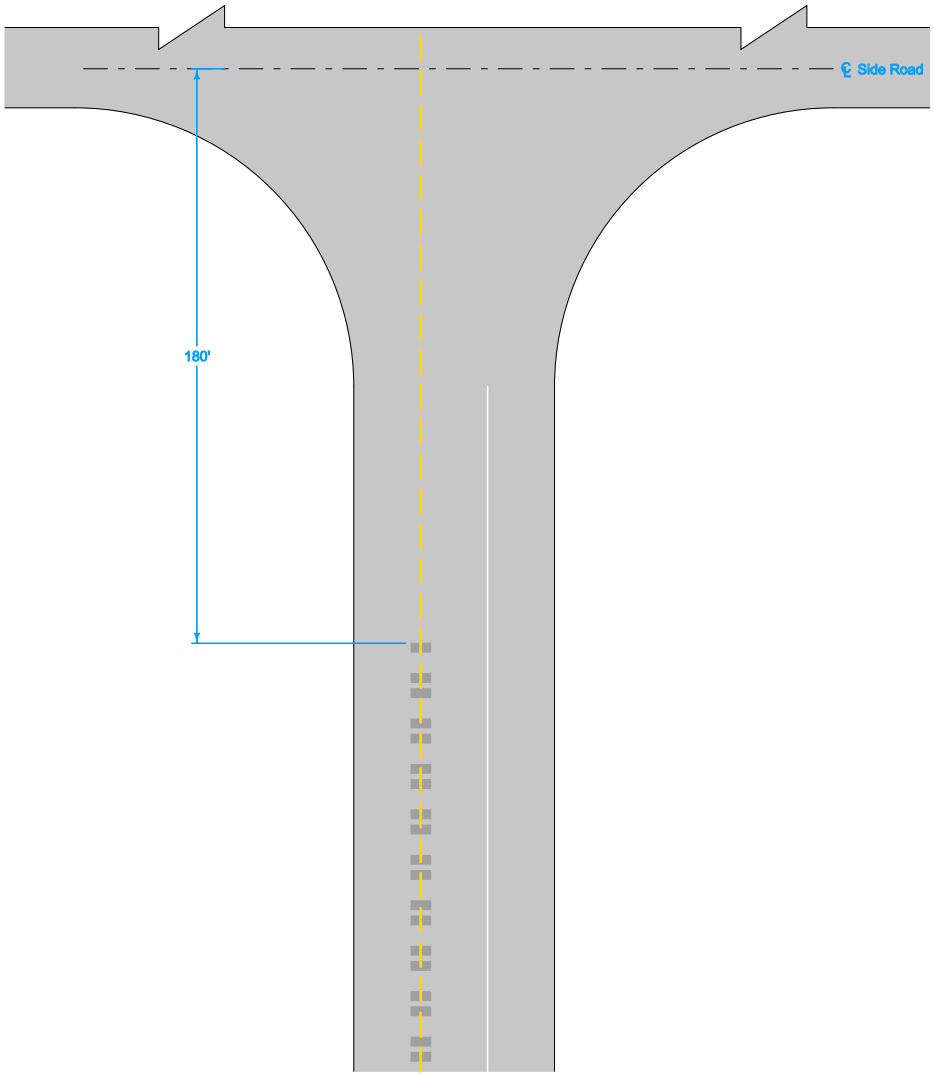
PV-13

SHEET 1 of 2

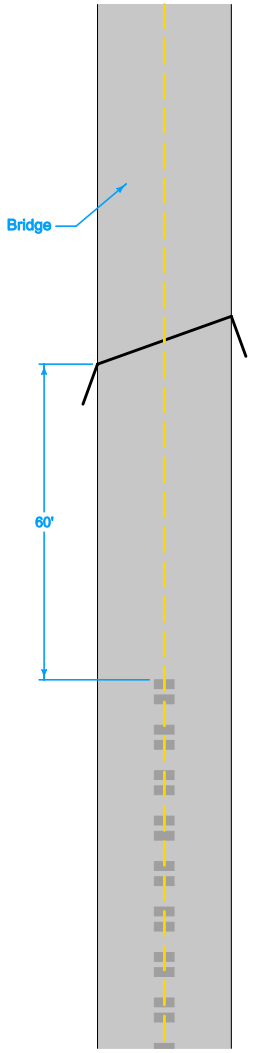
REVISIONS: Removed "Asphalt Emulsion for Fog Seal (Rumble Strips)" from possible bid item list. Removed pavement marking reference to Detail 9001.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

MILLED CENTERLINE RUMBLE STRIPS



INTERSECTION WITH
RIGHT TURN LANE



BRIDGE APPROACH

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	04-19-11

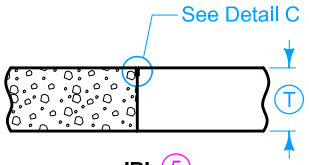
PV-13

SHEET 2 of 2

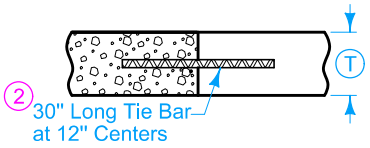
REVISIONS: Removed "Asphalt Emulsion for Fog Seal (Rumble Stripes)" from possible bid item list. Removed pavement marking reference to Detail 9001.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

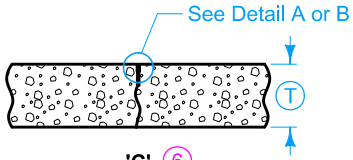
MILLED CENTERLINE RUMBLE STRIPS



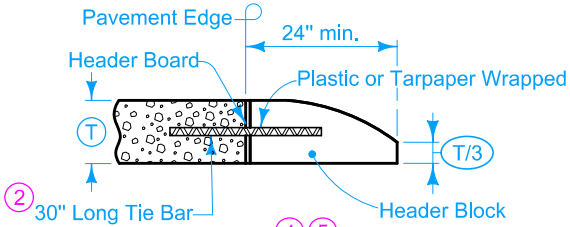
'B' (5)
PLAIN JOINT
(Abutting Pavement Slabs)



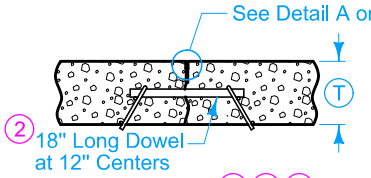
'DW' (3)(4)(7)
DAY'S WORK JOINT(Non-working)



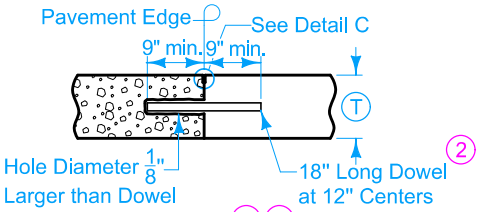
'C' (6)
CONTRACTION JOINT



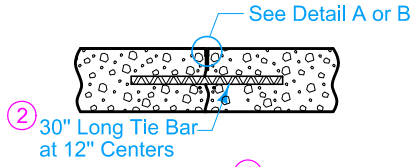
'HT' (4)(5)
HEADER JOINT
(End Rigid Pavement)



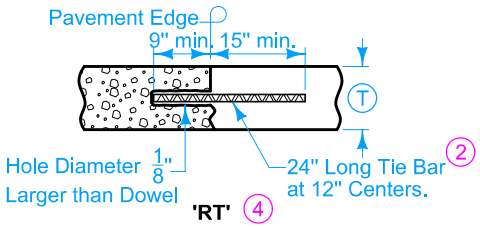
'CD' (1)(4)(6)
DOWELED CONTRACTION JOINT



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



'CT' (4)
TIED CONTRACTION JOINT



'RT' (4)
ABUTTING PAVEMENT JOINT
RIGID TIE

TRANSVERSE CONTRACTION

1. See dowel assemblies for fabrication details.
2. See Bar Size Table.
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 1/4 inch tool for length of joint indicated if formed; edging not required when cut with diamond blade saw. Remove header block and board when second slab is placed.
6. Unless otherwise specified, 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.

FIGURE 7010.101 | SHEET 1 OF 8

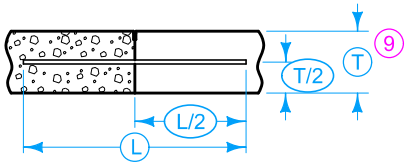
SUDAS | Iowa Department of Transportation | REVISION 1 04-17-12

FIGURE 7010.101 | STANDARD ROAD PLAN | **PV-101** | SHEET 1 of 8

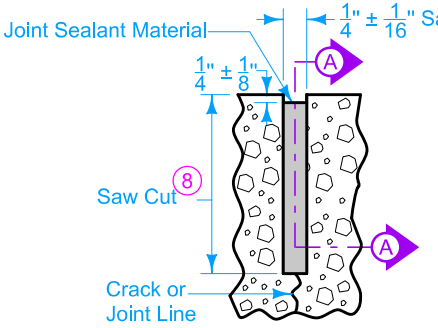
REVISIONS: Added new note 26. Added placement limits drawings on sheet 8.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

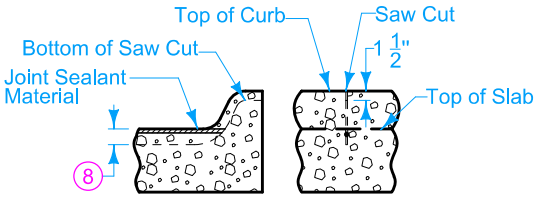
JOINTS



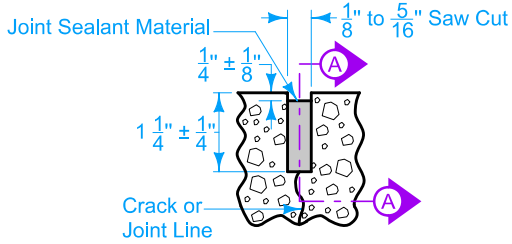
BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



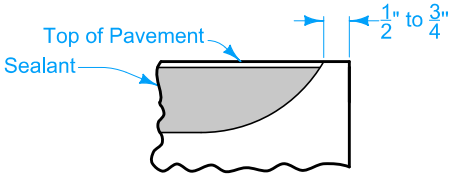
DETAIL A
(Saw cut formed by conventional concrete sawing equipment.)



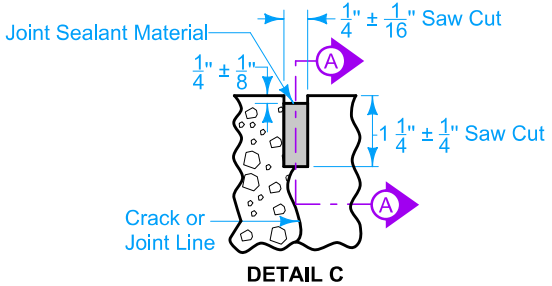
'C' JOINT IN CURB
(Match 'CT', 'CD', or 'C' joint in pavement.)



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		
(T)	Dowel Diameter	Tie Bar Size
< 8"	3/4"	#6
≥ 8" but < 10"	1 1/4"	#10
≥ 10"	1 1/2"	#11

TRANSVERSE CONTRACTION

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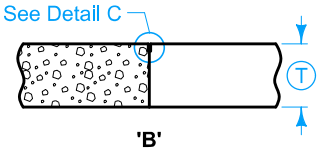
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 2 of 8

REVISIONS: Added new note 26. Added placement limits drawings on sheet 8.

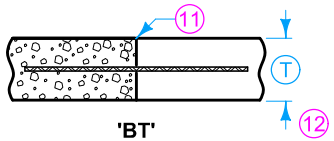
Paul D. Wiegand, SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

JOINTS

FIGURE 7010.101 SHEET 2 OF 8

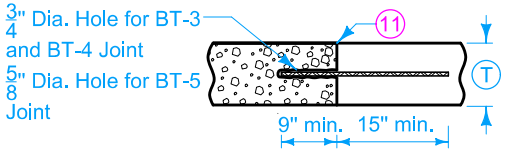


'B'
PLAIN JOINT
(Abutting Pavement Slabs)



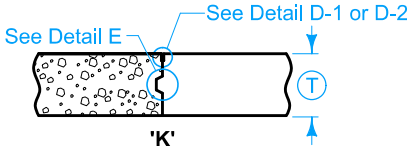
'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE

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

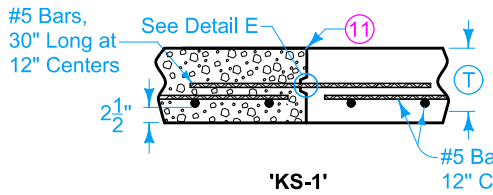


'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE (Drilled)

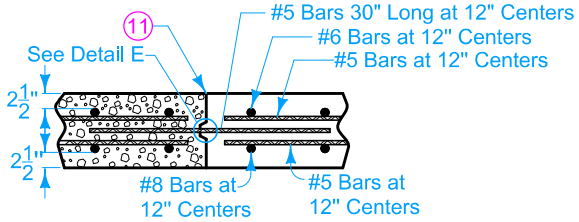
T	Joint	Bars	Bar Length and Spacing
< 8"	'BT-5'	#4	24" Long at 30" Centers
≥ 8"	'BT-3'	#5	24" Long at 30" Centers
	'BT-4'		24" Long at 15" Centers



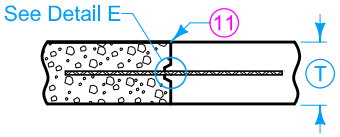
'K'
KEYED JOINT FOR ADJACENT SLABS
(Where T is 8" or more)



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



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



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

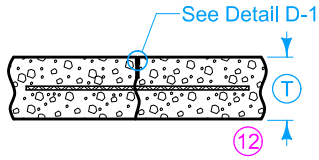
T	Joint	Bars	Bar Length and Spacing
< 8"	'KT-1'	#4	30" Long at 30" Centers
≥ 8"	'KT-2'	#5	30" Long at 30" Centers
	'KT-3'		30" Long at 15" Centers

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:
'BT-1', 'L-1', and 'KT-1'
'KT-2' and 'L-2'
'KT-3' and 'L-3'



'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

FIGURE 7010.101 SHEET 3 OF 8

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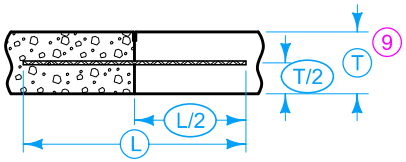
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 3 of 8

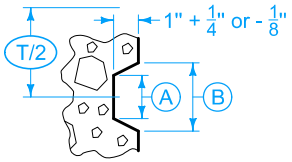
REVISIONS: Added new note 26. Added placement limits drawings on sheet 8.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

JOINTS

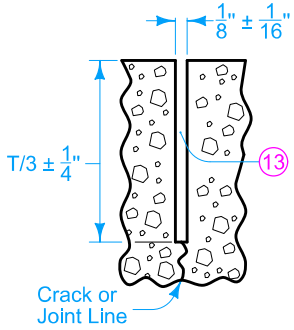


TIE BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)

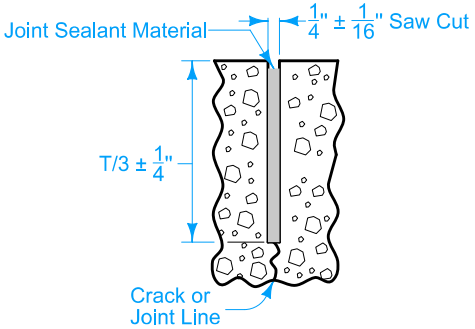


DETAIL E

KEYWAY DIMENSIONS			
Keyway Type	Pavement Thickness (T)	(A)	(B)
Standard	8" or greater	$1\frac{3}{4}$"	$2\frac{3}{4}$"
Narrow	Less than 8"	1"	2"



DETAIL D-1
(Required when the Department of Transportation is the Contracting Authority, or when specified in the contract documents.)



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

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

(13) Sealant or cleaning not required.

LONGITUDINAL CONTRACTION

FIGURE 7010.101 SHEET 4 OF 8

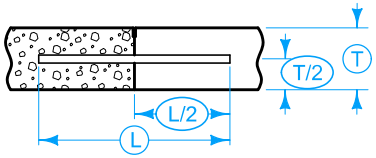
SUDAS | Iowa Department of Transportation | REVISION 1 04-17-12

FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 4 of 8

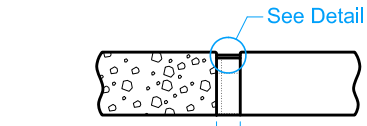
REVISIONS: Added new note 26. Added placement limits drawings on sheet 8.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

JOINTS

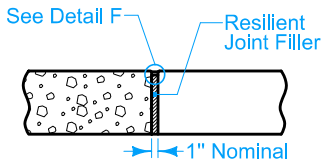


DOWEL PLACEMENT
(Applies to all joints unless otherwise detailed.)

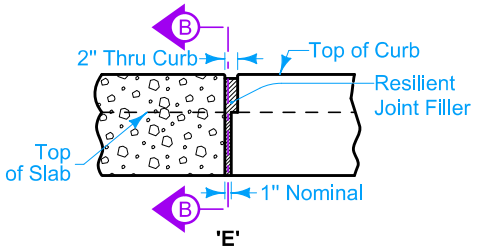


'CF' JOINT

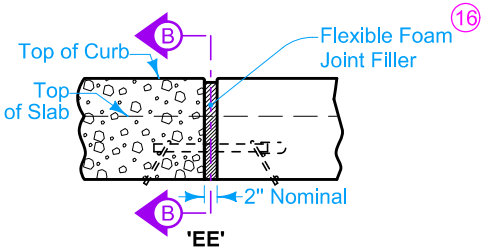
TYPE	WIDTH
CF-1	2"
CF-2	$2\frac{1}{2}$"
CF-3	3"
CF-4	$3\frac{1}{2}$"



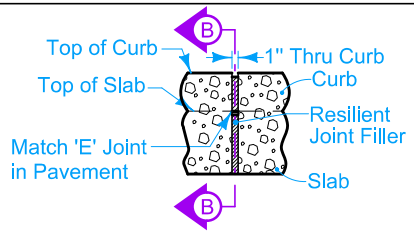
'E'
1" EXPANSION JOINT



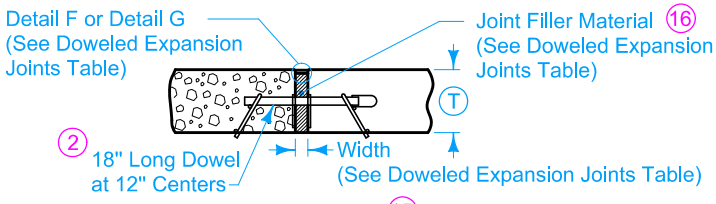
'E'
JOINT IN CURB
(View at Back of Curb)



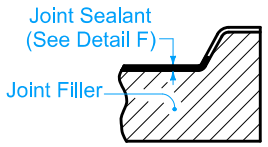
'EE'
JOINT IN CURB
(View at Back of Curb)



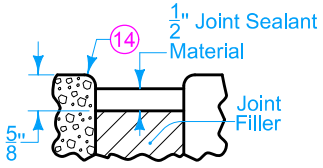
'ES'
JOINT IN CURB
(View at Back of Curb)



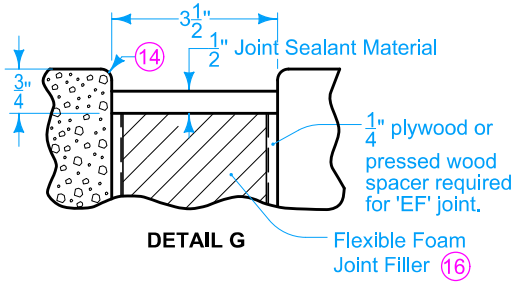
'ED', 'EE', 'EF' 15
DOWELED EXPANSION JOINT



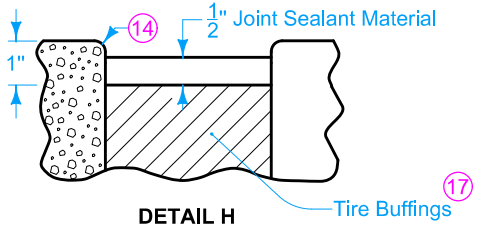
SECTION B-B



DETAIL F



DETAIL G



DETAIL H

EXPANSION

2 See Bar Size Table.

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

15 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.

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

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

DOWELED EXPANSION JOINTS		
TYPE	WIDTH	FILLER MATERIAL 16
ED	1"	Resilient (Detail F)
EE	2"	Flexible Foam (Detail F)
EF	$3\frac{1}{2}$"	Flexible Foam (Detail G)

BAR SIZE TABLE			
T	< 8"	≥ 8" but < 10"	≥ 10"
Dowel Diameter	$\frac{3}{4}$"	$1\frac{1}{4}$"	$1\frac{1}{2}$"

SUDAS | Iowa Department of Transportation

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FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101

SHEET 5 of 8

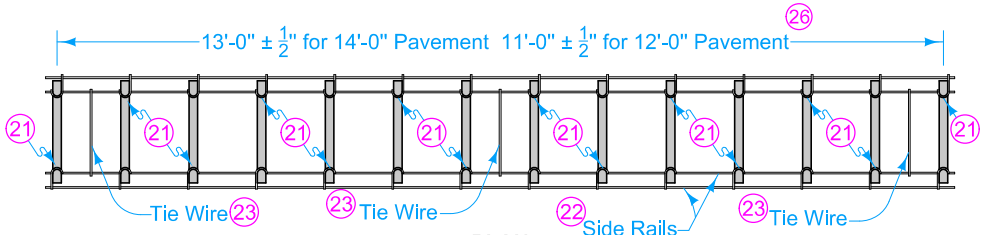
REVISIONS: Added new note 26. Added placement limits drawings on sheet 8.

Paul D. Wigand, SUDAS DIRECTOR
Deanna Maifield, DESIGN METHODS ENGINEER

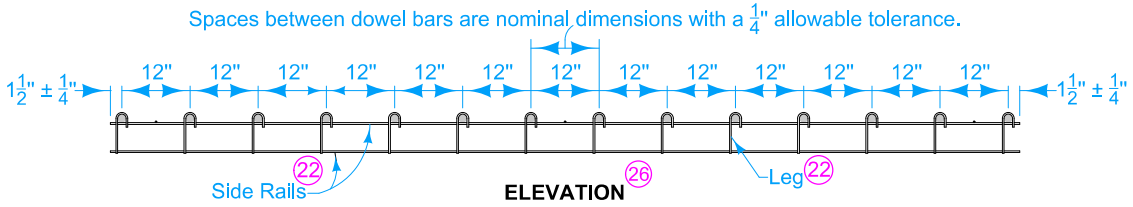
JOINTS

FIGURE 7010.101 SHEET 5 OF 8

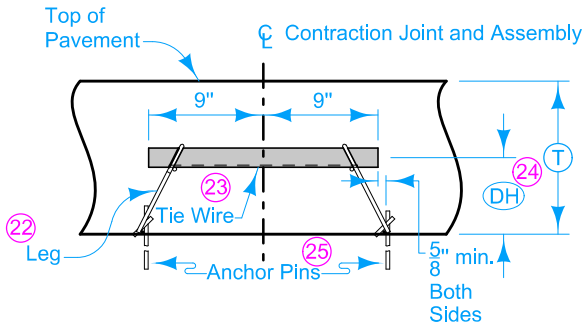
CONTRACTION JOINTS



PLAN



ELEVATION



LONGITUDINAL SECTION

DOWEL ASSEMBLIES (18) (19) (20)

DOWEL HEIGHT AND DIAMETER		
(T)	(DH) (24)	Diameter
7" to 7 1/2"	3 1/2"	3/4"
8" to 9 1/2"	4 1/4"	1 1/4"
10" to 11 1/2"	5 1/4"	1 1/2"
12" to 13"	6 1/4"	1 1/2"

(18) 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.

(19) Wire sizes shown are the minimum required. Use wires with a minimum tensile strength of 50 ksi.

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

(21) Weld alternately throughout.

(22) #1/0 gauge (0.306 inch diameter) wire.

(23) #10 gauge (0.135 inch diameter) wire, welded or friction fit to upper side rail, both sides.

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

(25) 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.

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

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

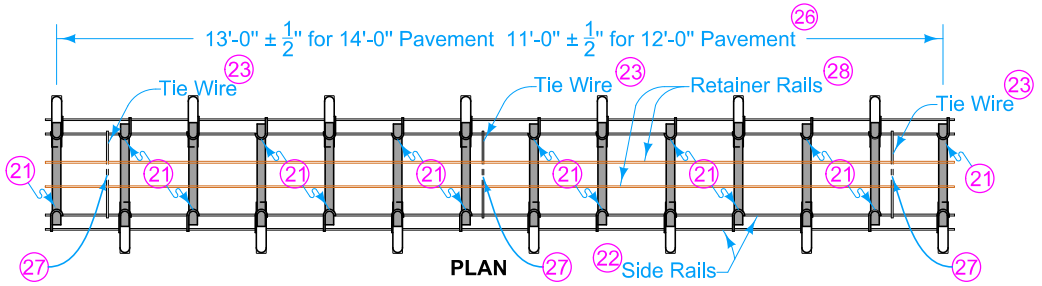
REVISIONS: Added new note 26. Added placement limits drawings on sheet 8.

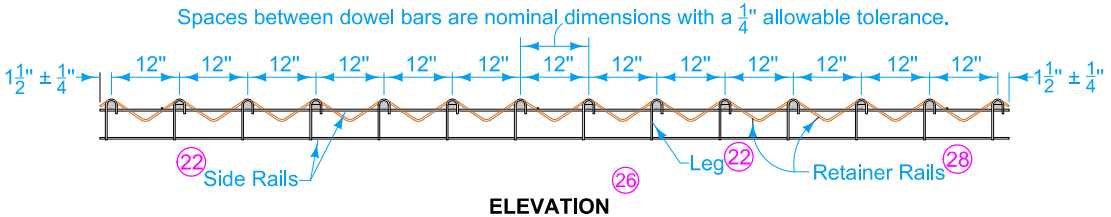
Paul D. Wiegand, SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

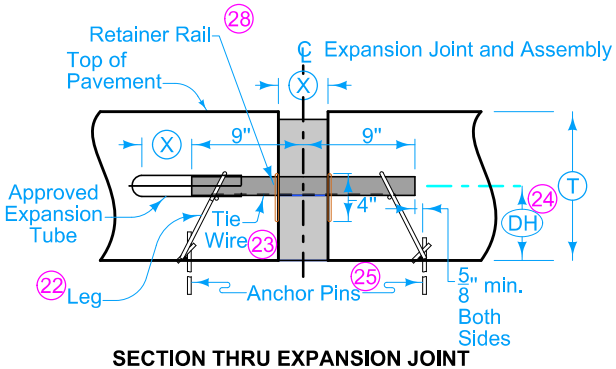
JOINTS

FIGURE 7010.101 SHEET 6 OF 8

EXPANSION JOINTS







SECTION THRU EXPANSION JOINT

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

DOWEL HEIGHT AND DIAMETER		
(T)	(DH) 24	Diameter
7" to 7 1/2"	3 1/2"	3/4"
8" to 9 1/2"	4 1/4"	1 1/4"
10" to 11 1/2"	5 1/4"	1 1/2"
12" to 13"	6 1/4"	1 1/2"

DOWEL ASSEMBLIES 18 19 20

18 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.

19 Wire sizes shown are the minimum required. Use wires with a minimum tensile strength of 50 ksi.

20 Details apply to both transverse contraction and expansion joints.

21 Weld alternately throughout.

22 #1/0 gauge (0.306 inch diameter) wire.

23 #10 gauge (0.135 inch diameter) wire, welded or friction fit to upper side rail, both sides.

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

25 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.

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

27 Clip and remove center portion of tie during field assembly.

28 1/4 inch diameter wire.

FIGURE 7010.101 | SHEET 7 OF 8

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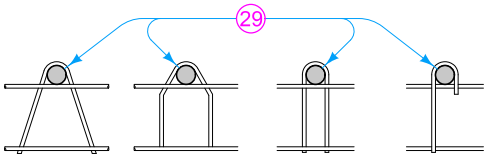
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 7 of 8

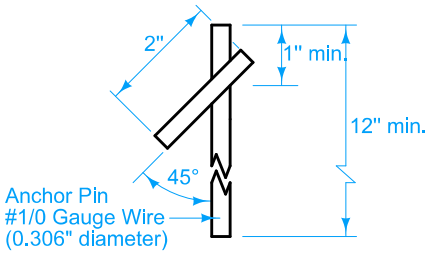
REVISIONS: Added new note 26. Added placement limits drawings on sheet 8.

Paul D. Wigant, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

JOINTS



OPTIONAL LEG SHAPES



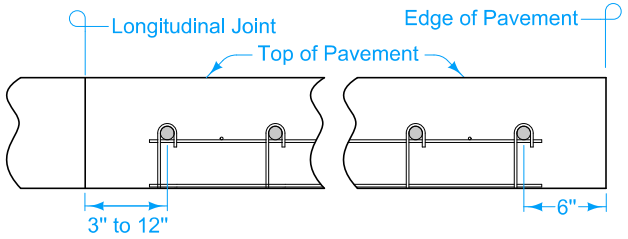
ANCHOR PIN

18 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.

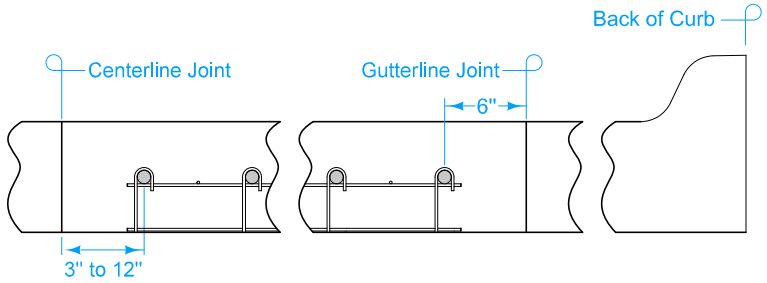
19 Wire sizes shown are the minimum required. Use wires with a minimum tensile strength of 50 ksi.

20 Details apply to both transverse contraction and expansion joints.

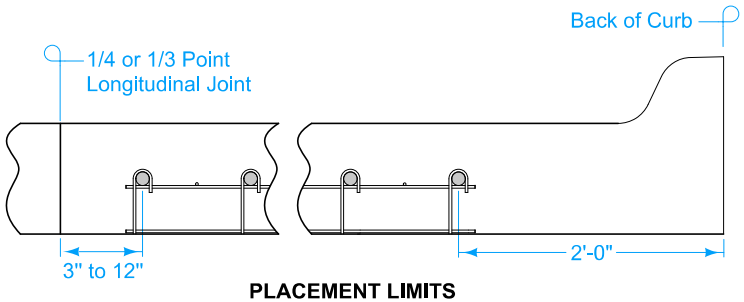
29 Diameter of bend around dowel is dowel diameter + 1/8 to 3/16 inches.



PLACEMENT LIMITS
(Rural Section)



PLACEMENT LIMITS
(Curb and Gutter - Gutterline Jointing)



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

DOWEL ASSEMBLIES 18 19 20

FIGURE 7010.101 SHEET 8 OF 8

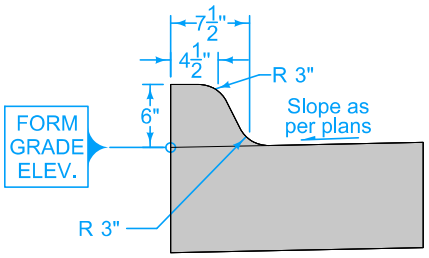
SUDAS	Iowa Department of Transportation	REVISION 1 04-17-12
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101
		SHEET 8 of 8

REVISIONS: Added new note 26. Added placement limits drawings on sheet 8.

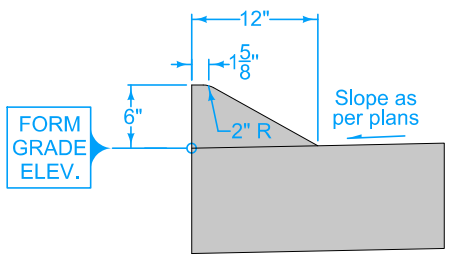
Paul D. Wiegand
SUDAS DIRECTOR

Deanna Maifield
DESIGN METHODS ENGINEER

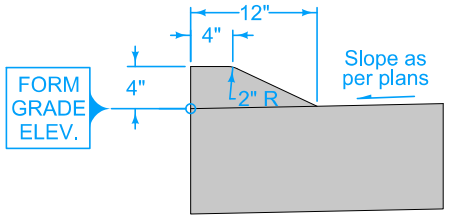
JOINTS



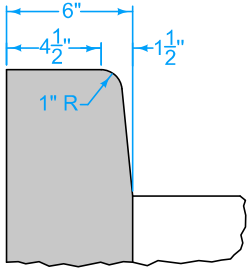
6" STANDARD CURB



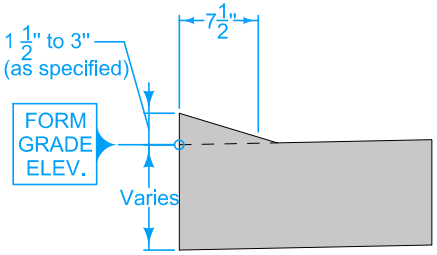
6" SLOPED CURB



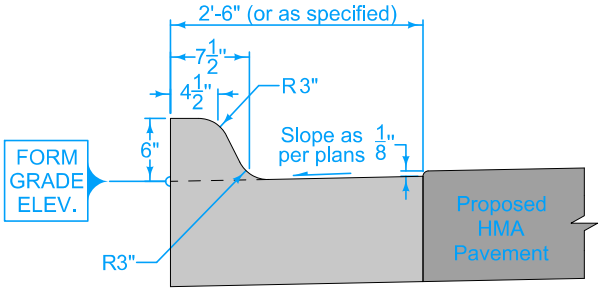
4" SLOPED CURB



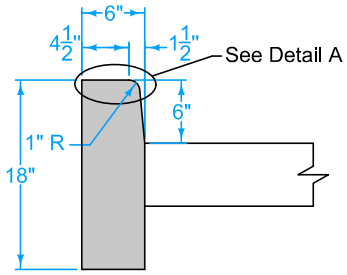
DETAIL A



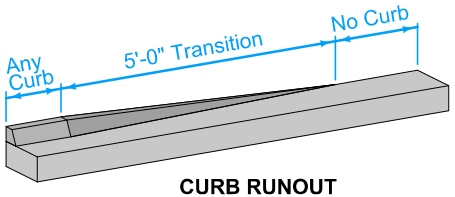
DRIVEWAY DROP CURB



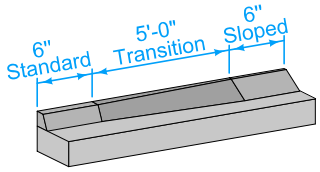
6" STANDARD CURB AND GUTTER



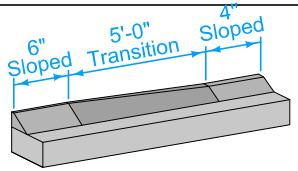
BEAM CURB*
*For short replacement sections, match existing curb profile



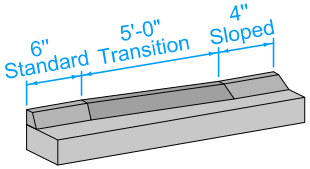
CURB RUNOUT FOR ALL CURBS



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 1 OF 1

SUDAS | Iowa Department of Transportation

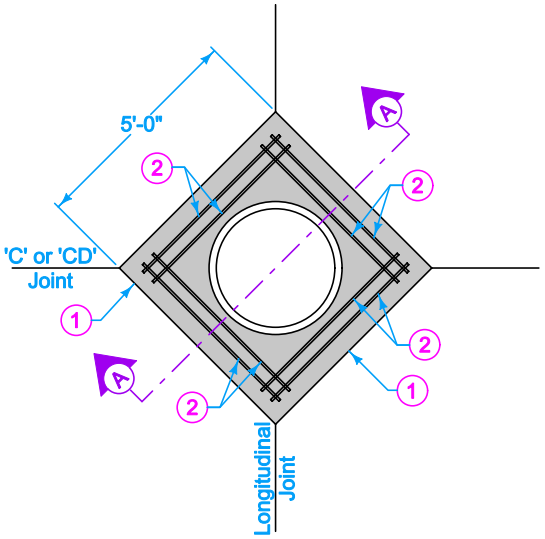
REVISION: New 04-19-11

FIGURE 7010.102 | STANDARD ROAD PLAN | PV-102 | SHEET 1 of 1

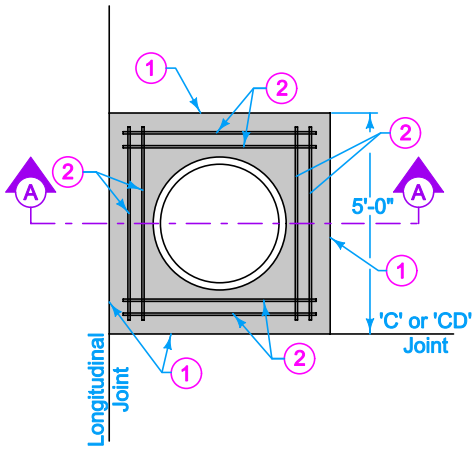
REVISIONS: New. Replaces PV-2. Added Beam Curb and Detail A and combined with SUDAS.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

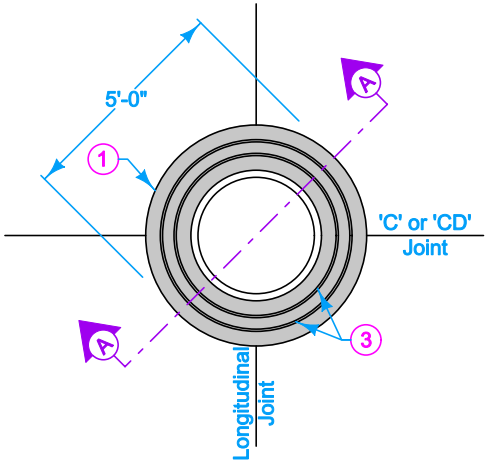
PCC CURB DETAILS



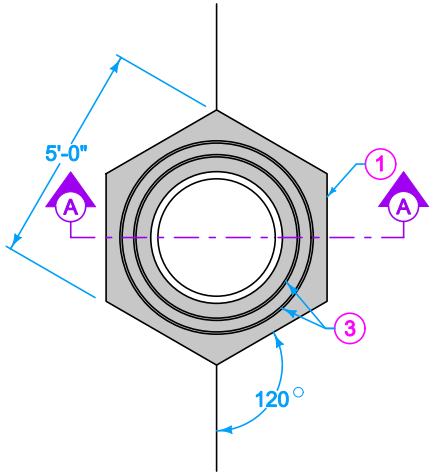
AT JOINT INTERSECTION



OFFSET AT JOINT INTERSECTION



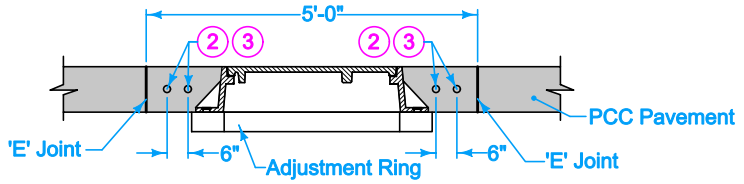
CIRCULAR



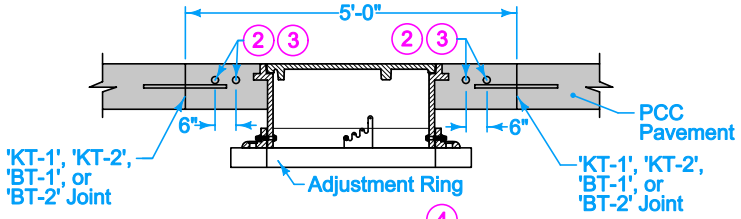
AT A SINGLE JOINT

Construct boxout with Class C concrete or match pavement class. Minimum 2 inches clear on reinforcement. Center casting within boxout area.

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.



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



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

FIGURE 7010.103 | SHEET 1 OF 1

SUDAS | Iowa Department of Transportation

REVISION	
New	04-19-11

FIGURE 7010.103 | STANDARD ROAD PLAN

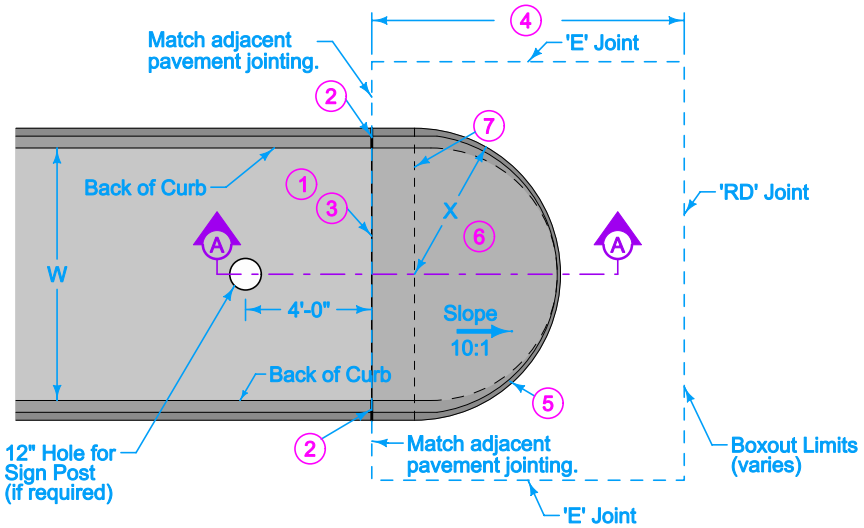
PV-103

SHEET 1 of 1

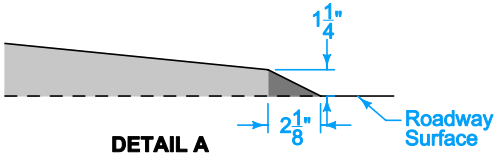
REVISIONS: New. Joint Standard with SUDAS.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

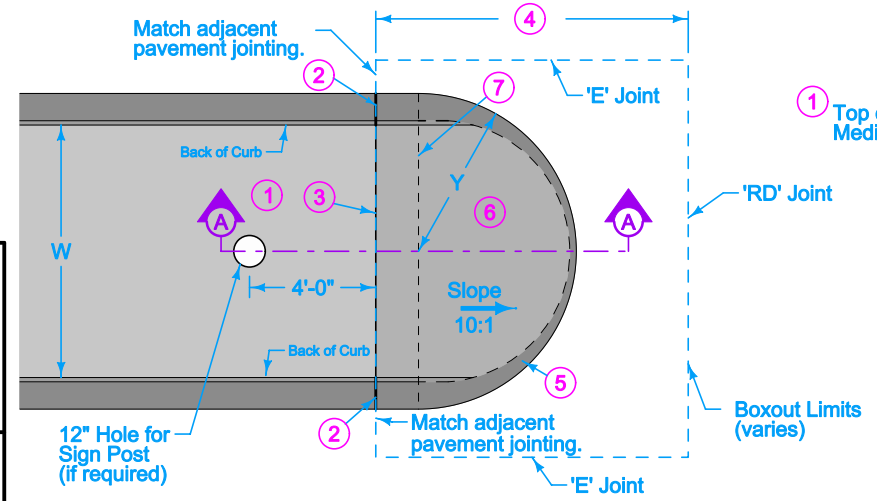
MANHOLE BOXOUTS IN PCC PAVEMENT



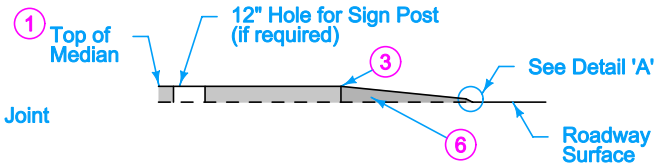
6" STANDARD PLAN



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 | Iowa Department of Transportation

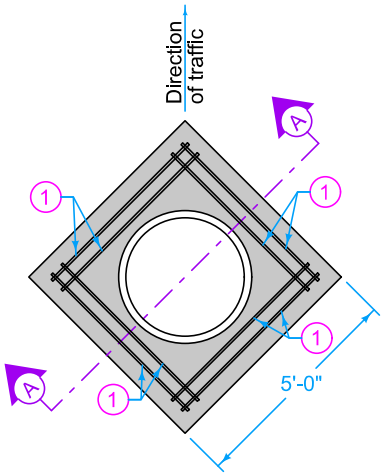
REVISION	
New	04-19-11

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

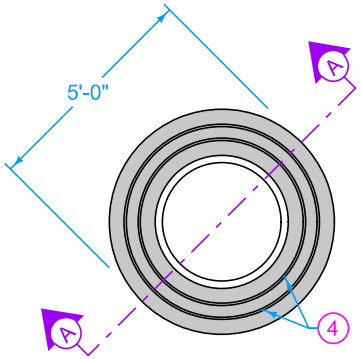
REVISIONS: New. Previously page 2 of PV-2.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

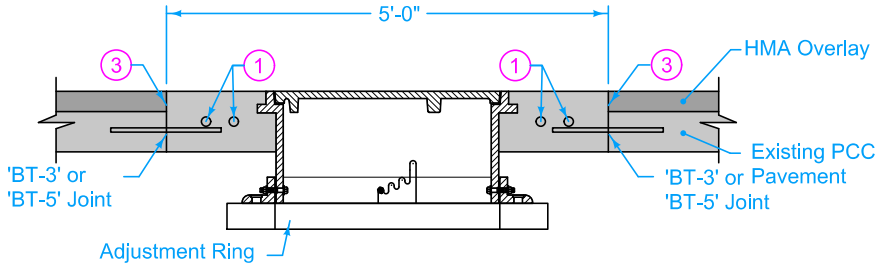
RAMPED MEDIAN NOSE



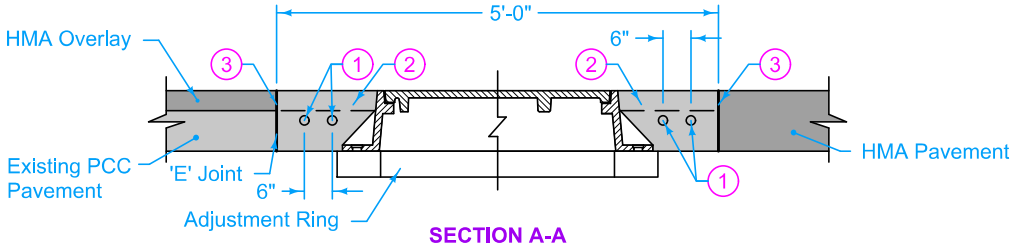
RECTANGULAR



CIRCULAR



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



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

Construct boxout with Class C concrete. Minimum 2 inches clear on reinforcement. Center casting within boxout area.

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 and then final lift or overlay placed.
3. Apply tack coat.
4. #4 hoops (variable length). Place at mid-slab.

FIGURE 7020.201

SHEET 1 OF 1

SUDAS | Iowa Department of Transportation

FIGURE 7020.201 | STANDARD ROAD PLAN

REVISION: New 04-19-11

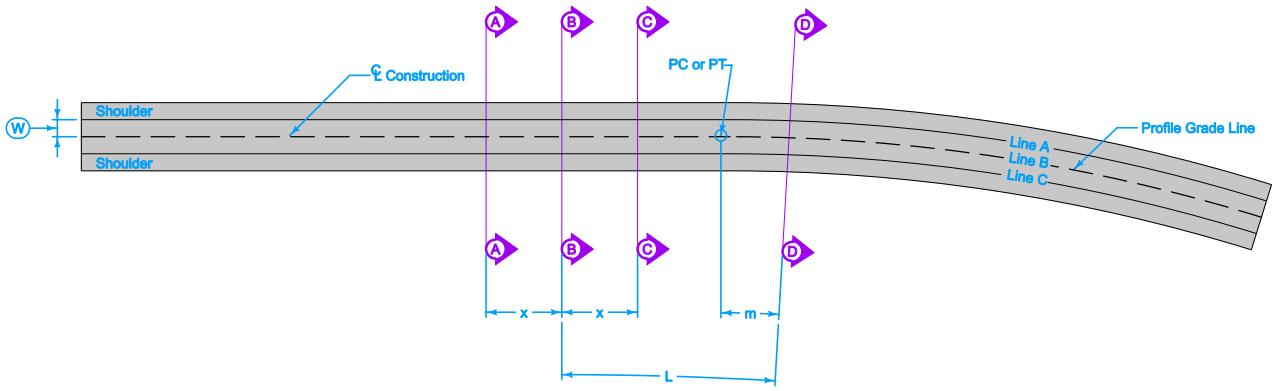
PV-201

SHEET 1 of 1

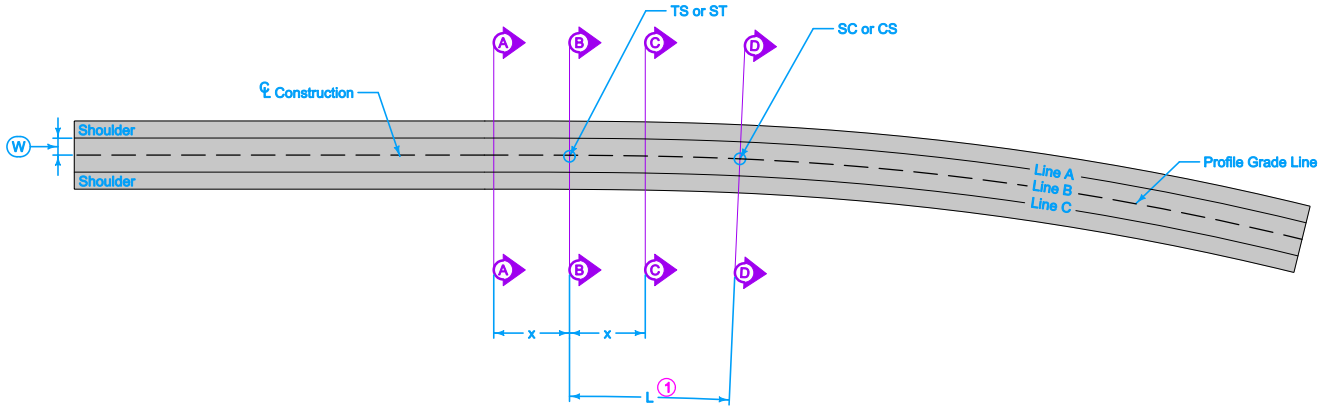
REVISIONS: New. Joint Standard with SUDAS.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

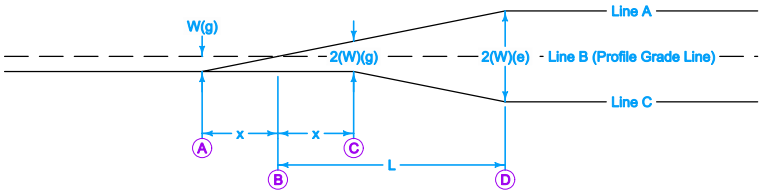
MANHOLE BOXOUTS IN HMA PAVEMENT AND HMA OVERLAYS



TRANSITION DETAILS - TANGENT TO CURVE



TRANSITION DETAILS - SPIRAL CURVE



DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES

Refer to specific curve data contained in project plans for tangent runout length (x), runoff length (L) and full superelevation (e).

When spiral curve transitions are not required:
Place 70% of full superelevation at the PC and PT
Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the centerline of construction.

Superelevations on this standard are shown for curves to the right. Curves to the left are a mirror image of what is shown.

Smooth curves should be established at the time of construction at sections A-D along the profile edges of lines A-C.

Axis of rotation coincides with profile grade location.

m = 30% of Runoff Length (L)

Ⓦ = 12' Regardless of Pavement Width

g = Normal Cross Slope (2%)

L = Distance to Change Cross Slope from 0% to e

e = Supereleavtion Rate

x = Distance to Change Cross Slope from 0% to 2%

s = Normal Shoulder Slope

① Spiral curve length coincides with runoff length (L)

Possible Tabulation:
101-18

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

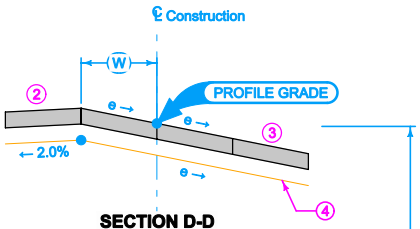
PV-301

SHEET 1 of 2

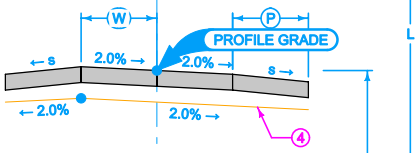
REVISIONS: Revised graphics. Added additional cross sections and notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

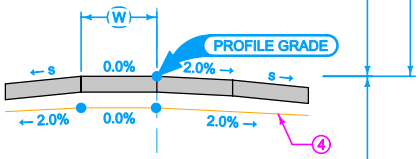
SUPERELEVATION DETAILS
TWO LANE ROADWAY



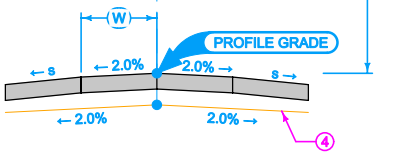
SECTION D-D
(Full Superelevation)



SECTION C-C
(Remove Crown)



SECTION B-B
(Remove Adverse Crown)

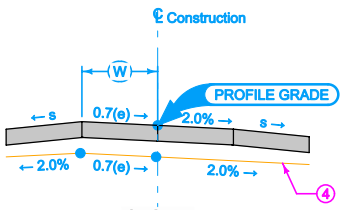


SECTION A-A
(Typical Section)

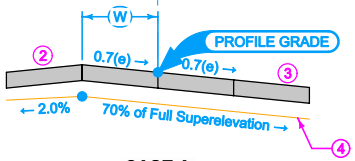
L

X

X

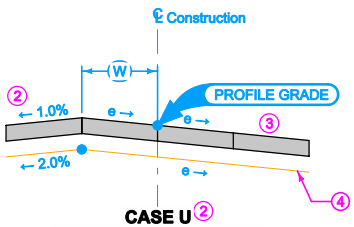


CASE B
e = 2.8%

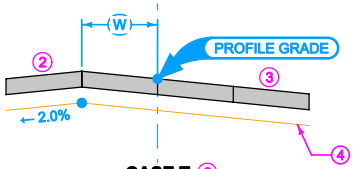


CASE A
e > 2.8%

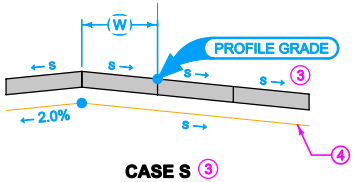
SECTION AT THE PC OR PT



CASE U (2)
(Section where e = 7.0%)



CASE T (2)
(Section where high side shoulder crown break rule occurs)



CASE S (3)
(Section where low side shoulder crown break rule occurs)

SECTION WHERE SHOULDER SLOPE TRANSITION BEGINS

(2) High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

(3) Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

(4) Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

Iowa Department of Transportation

REVISION	
1	04-19-11

STANDARD ROAD PLAN

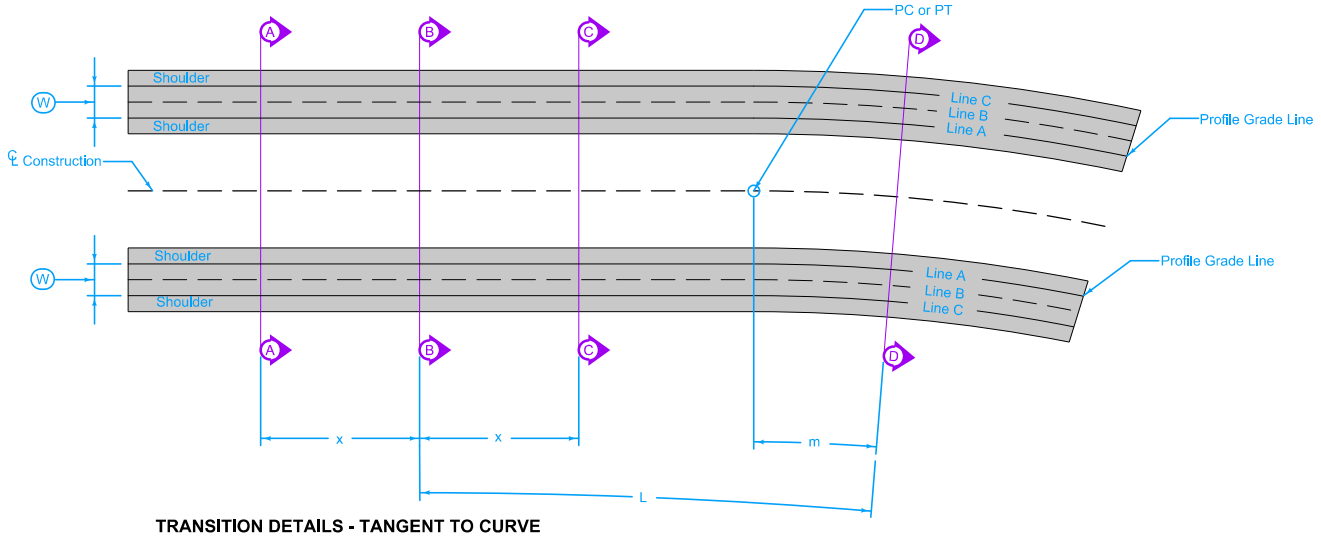
PV-301

SHEET 2 of 2

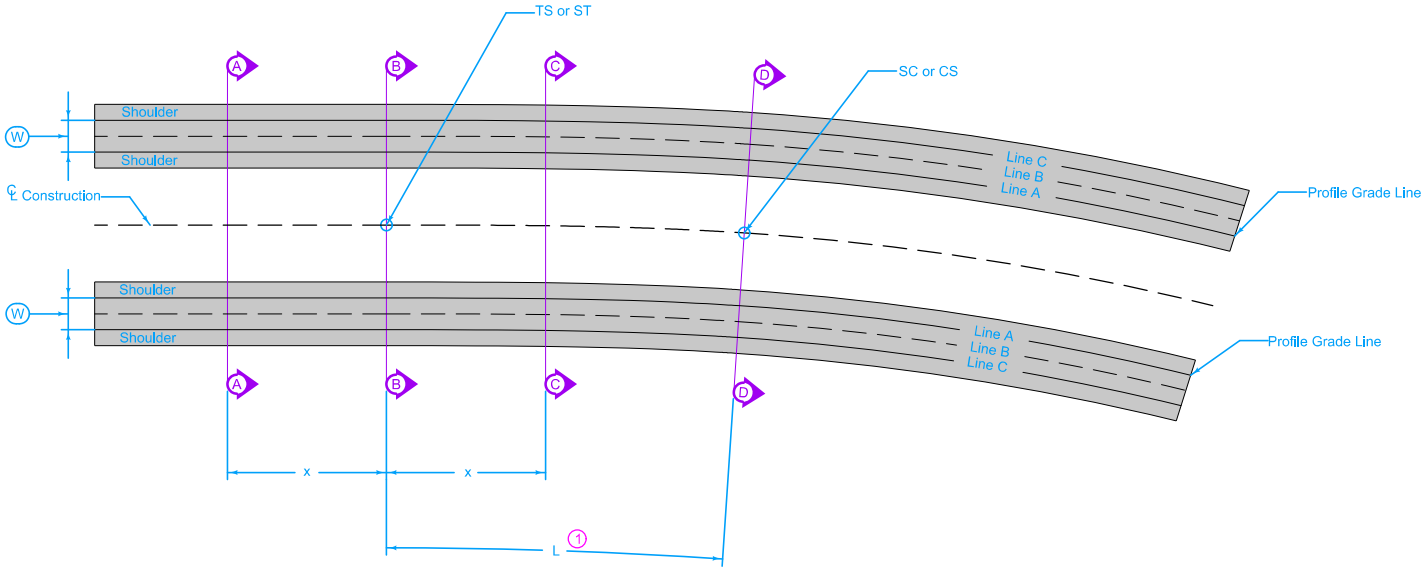
REVISIONS: Revised graphics. Added additional cross sections and notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPERELEVATION DETAILS
TWO LANE ROADWAY



TRANSITION DETAILS - TANGENT TO CURVE



TRANSITION DETAILS - SPIRAL CURVE

Refer to specific curve data contained in project plans for tangent runout length (x), runoff length (L) and full superelevation (e).

When spiral curve transitions are not required:
Place 70% of full superelevation at the PC and PT
Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the centerline of construction.

Superelevations on this standard are shown for curves to the right. Curves to the left are a mirror image of what is shown.

Smooth curves should be established at the time of construction at sections A-D along the profile edges of lines A-C.

Axis of rotation coincides with profile grade location.

m = 30% of Runoff Length (L)

Ⓦ = 24' Regardless of Pavement Width

g = Normal Cross Slope (2%)

L = Distance to Change Cross Slope from 0% to e

e = Supereleavtion Rate

x = Distance to Change Cross Slope from 0% to 2%

s = Normal Shoulder Slope

① Spiral curve length coincides with runoff length (L)

Possible Tabulation:
101-18

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

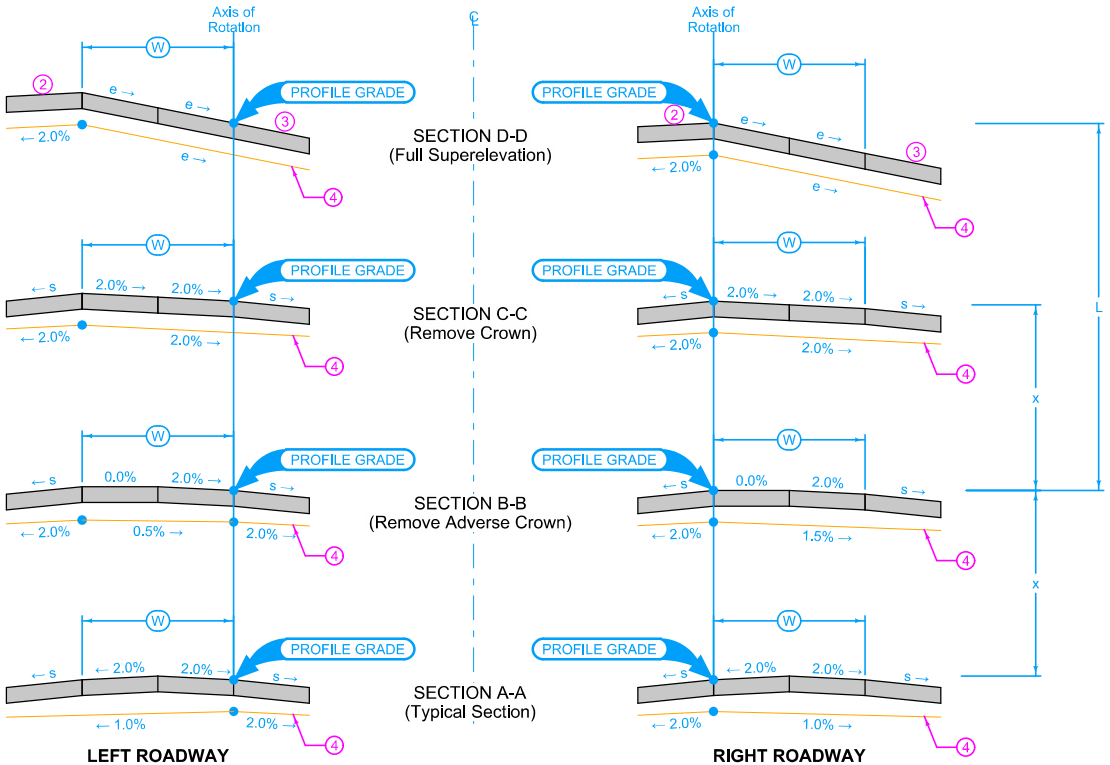
PV-302

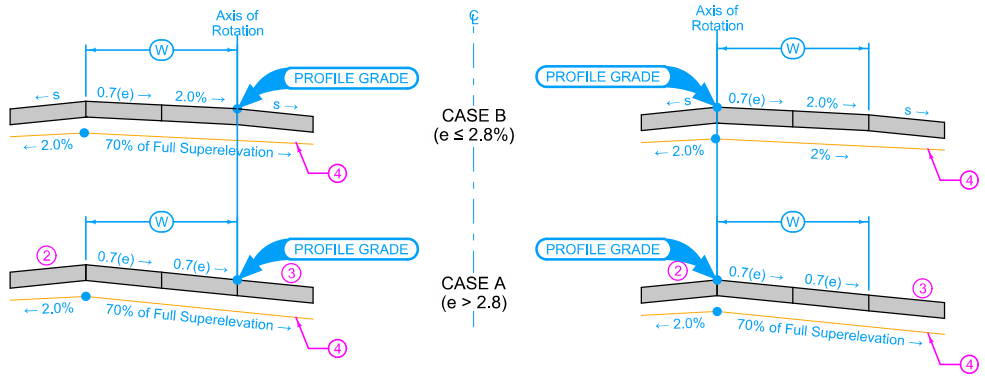
SHEET 1 of 3

REVISIONS: Added Possible Tabulation.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPERELEVATION DETAILS
FOUR LANE ROADWAY
DEPRESSED MEDIAN





(2) High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

(3) Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

(4) Subgrade Surface

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

PV-302

SHEET 2 of 3

REVISIONS: Added Possible Tabulation.

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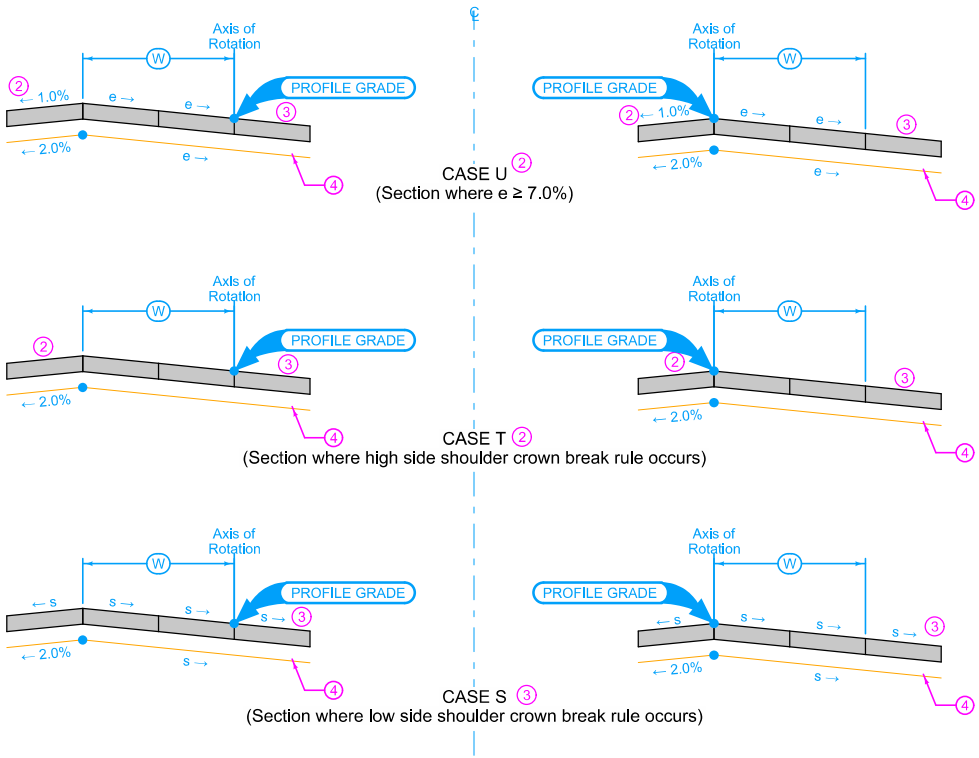
APPROVED BY DESIGN METHODS ENGINEER

SUPERELEVATION DETAILS
FOUR LANE ROADWAY
DEPRESSED MEDIAN

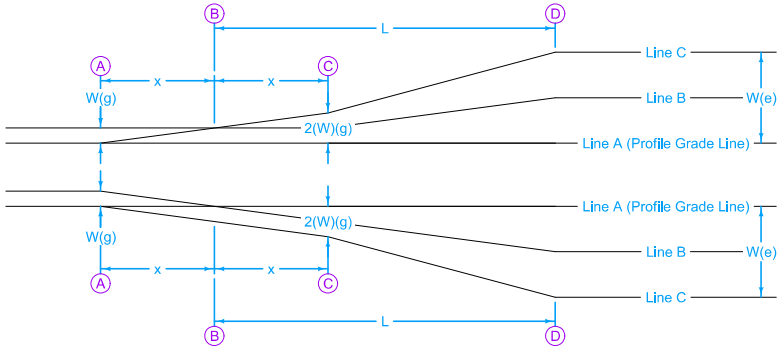


SECTION WHERE SHOULDER SLOPE TRANSITION BEGINS

(2) High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

(3) Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

(4) Subgrade Surface



DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES

Iowa Department of Transportation

REVISION 2 04-17-12

STANDARD ROAD PLAN

PV-302

SHEET 3 of 3

REVISIONS: Added Possible Tabulation.

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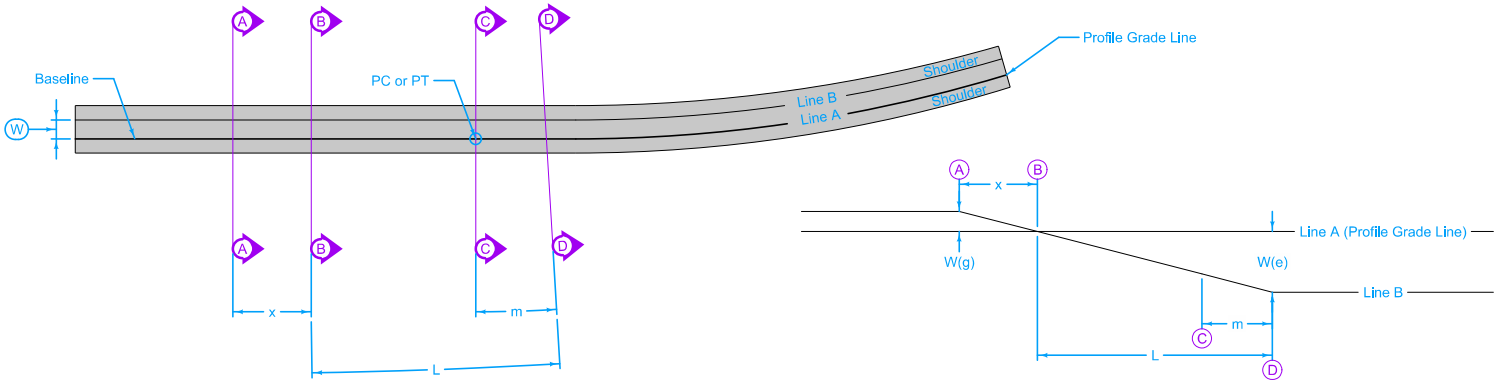
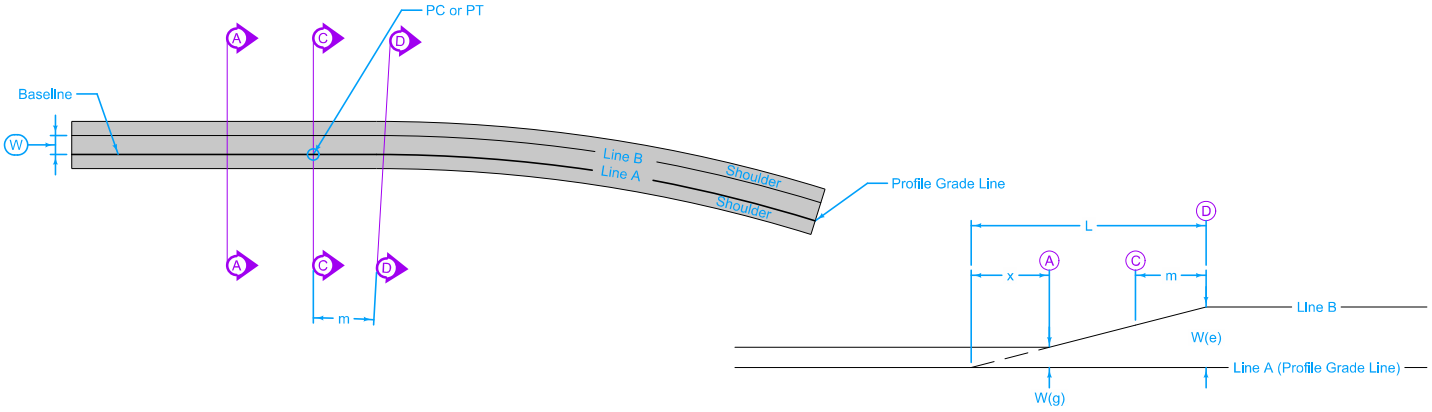
SUPERELEVATION DETAILS FOUR LANE ROADWAY DEPRESSED MEDIAN



DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES

CASE A
TRANSITION DETAILS - TANGENT TO CURVE
WHEN NORMAL CROSS SLOPE IS IN THE OPPOSITE DIRECTION AS SUPERELEVATION



DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES

CASE B
TRANSITION DETAILS - TANGENT TO CURVE
WHEN NORMAL CROSS SLOPE IS IN THE SAME DIRECTION AS SUPERELEVATION

Refer to specific curve data contained in project plans for tangent runout length (x), runoff length (L) and full superelevation (e).

Place 70% of full superelevation at the P.C. and P.T.

Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the baseline.

Smooth curves should be established at the time of construction at sections A-D along the profile edge of lines A and B.

Axis of rotation coincides with profile grade location.

m = 30% of Runoff Length (L)

Ⓦ = Pavement Width

g = Normal Cross Slope (2%)

L = Distance to Change Cross Slope from 0% to e

e = Superelevation Rate

x = Distance to Change Cross Slope from 0% to 2%

s = Normal Shoulder Slope

Possible Tabulation:
101-18

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

PV-303

SHEET 1 of 3

REVISIONS: Revised graphics. Added additional cross sections and notes.

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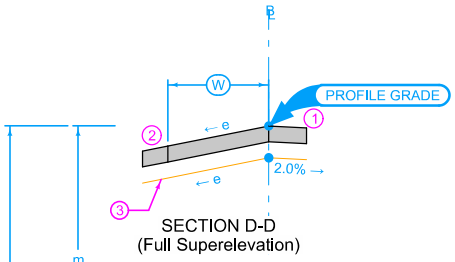
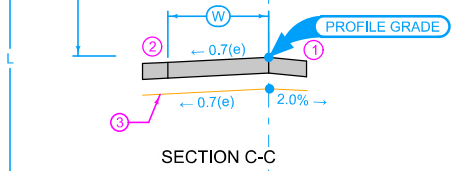
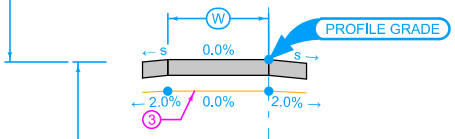
SUPERELEVATION DETAILS
RAMPS



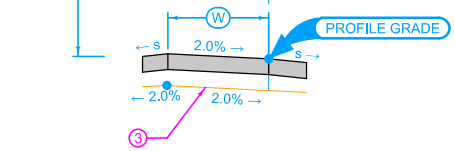
SECTION D-D
(Full Superelevation)



SECTION C-C



SECTION B-B



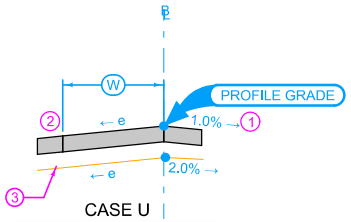
SECTION A-A
(Typical Section)

m

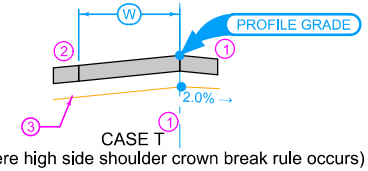
x

L

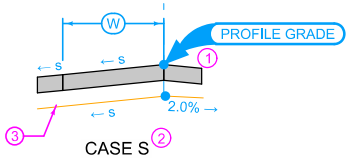
CASE A



CASE U
(Section where e ≥ 7.0%)



CASE T
(Section where high side shoulder crown break rule occurs)



CASE S
(Section where low side shoulder crown break rule occurs)

SECTION WHERE SHOULDER SLOPE TRANSITION BEGINS

1. High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.
2. Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.
3. Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

PV-303

SHEET 2 of 3

REVISIONS: Revised graphics. Added additional cross sections and notes.

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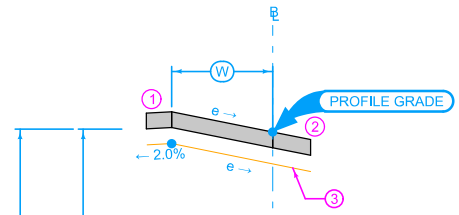
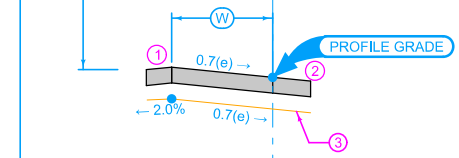
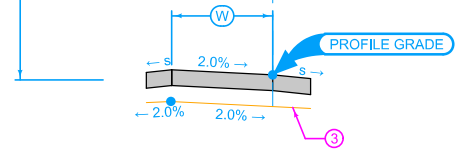
SUPERELEVATION DETAILS RAMPS



SECTION D-D
(Full Superelevation)



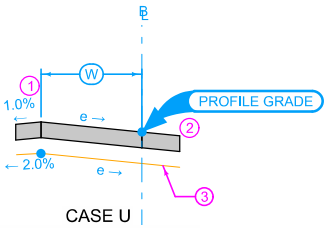
SECTION C-C



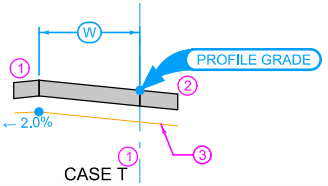
SECTION A-A
(Typical Section)

m

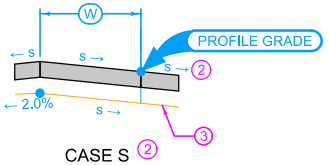
L - x



CASE U
(Section where e ≥ 7.0%)



CASE T
(Section where high side shoulder crown break rule occurs)



CASE S (2)
(Section where low side shoulder crown break rule occurs)

SECTION WHERE SHOULDER SLOPE TRANSITION BEGINS

CASE B

(1) High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

(2) Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

(3) Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

Iowa Department of Transportation

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1 | 04-19-11

STANDARD ROAD PLAN

PV-303

SHEET 3 of 3

REVISIONS: Revised graphics. Added additional cross sections and notes.

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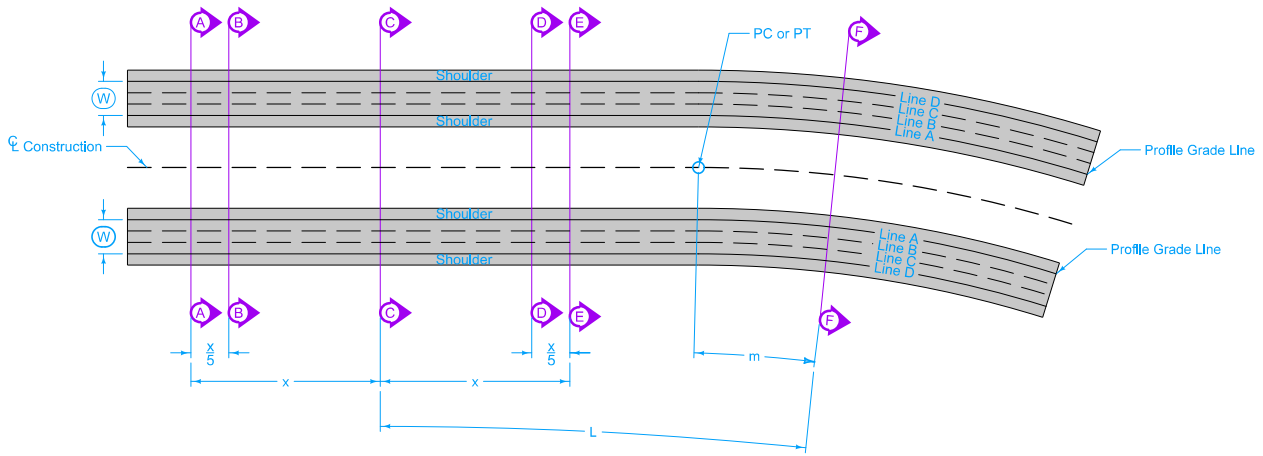
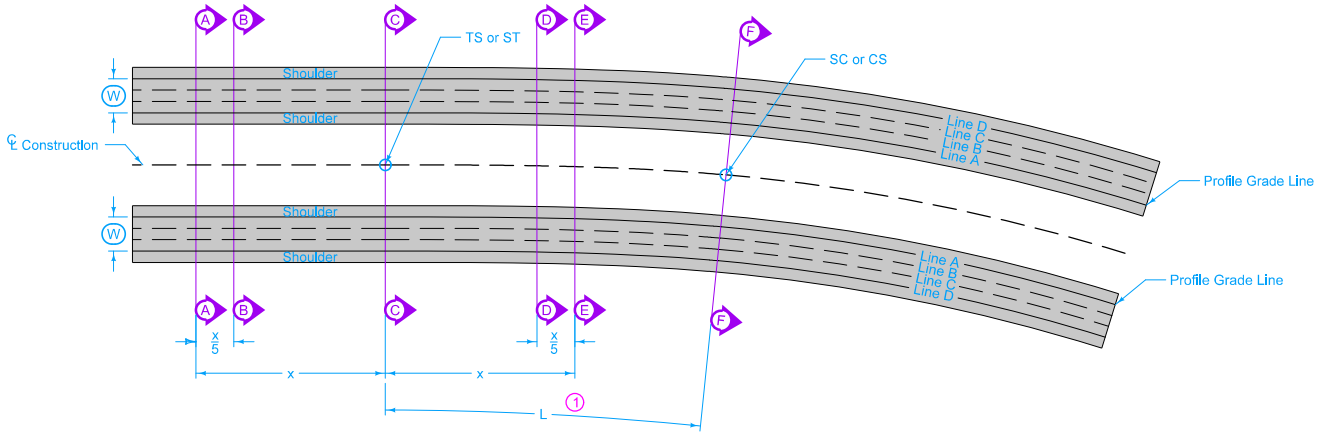
SUPERELEVATION DETAILS RAMPS



TRANSITION DETAILS - TANGENT TO CURVE



TRANSITION DETAILS - SPIRAL CURVE

Refer to specific curve data contained in project plans for tangent runout length (x), runoff length (L) and full superelevation (e).

When spiral curve transitions are not required:
Place 70% of full superelevation at the PC and PT.
Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the centerline of construction.

Superelevations on this standard are shown for curves to the right. Curves to the left are a mirror image of what is shown.

Smooth curves should be established at the time of construction at sections A-F along the profile edges of lines A-D.

Axis of rotation coincides with profile grade location.

m = 30% of Runoff Length (L)

Ⓦ = 36' Regardless of Pavement Width

g = Normal Cross Slope (2.5%)

L = Distance to Change Cross Slope from 0% to e

e = Supereleavtion Rate

x = Distance to Change Cross Slope from 0% to 2.5%

s = Normal Shoulder Slope

① Spiral curve length coincides with runoff length (L)

Possible Tabulation:
101-18

Iowa Department of Transportation

REVISION
1 | 04-17-12

STANDARD ROAD PLAN

PV-304

SHEET 1 of 4

REVISIONS: Updated Diagrammatic Profiles of the Pavement Edge Lines on sheet 4. Added Possible Tabulation. Modified circle note 2.

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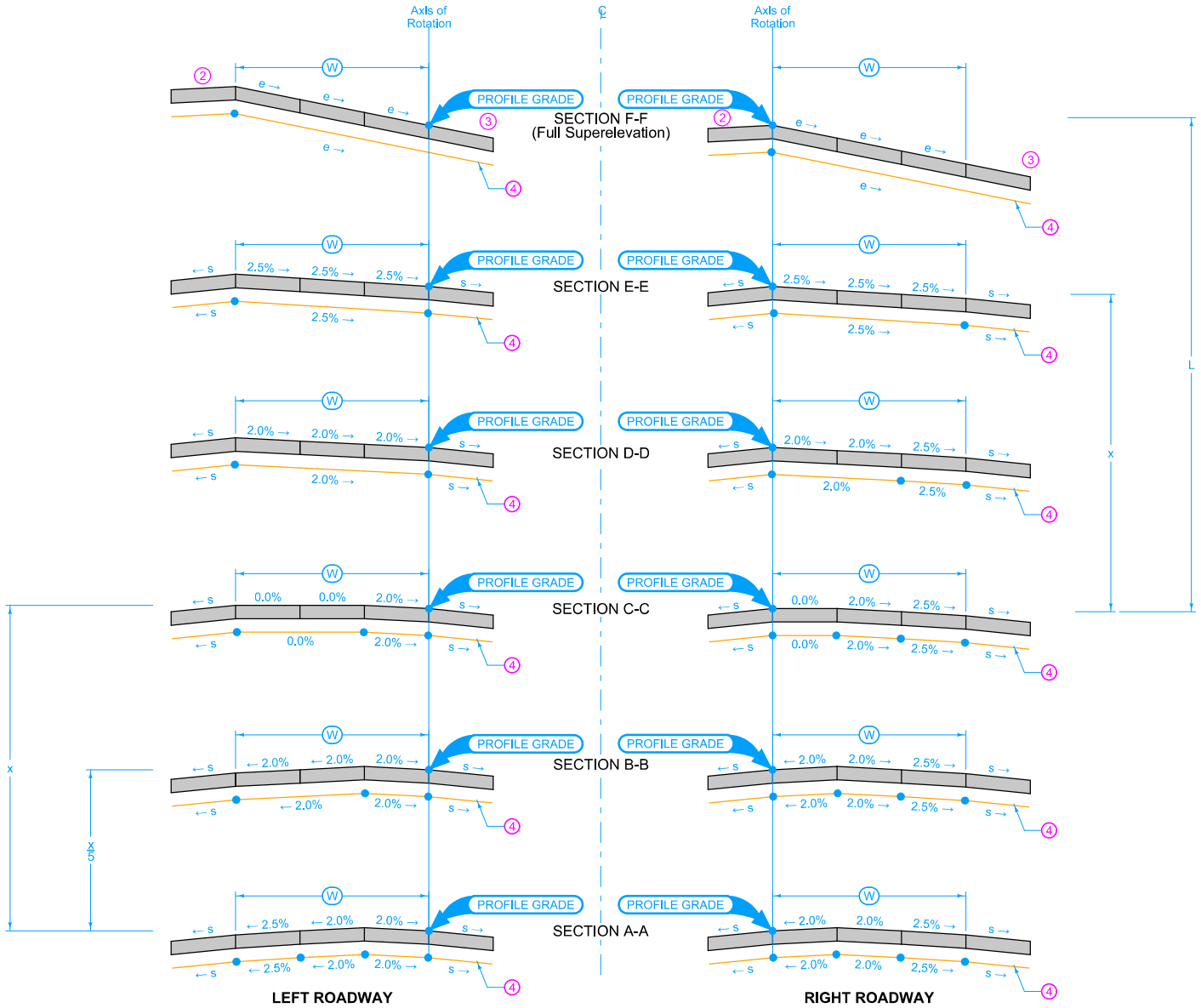
SUPERELEVATION DETAILS
SIX LANE ROADWAY
DEPRESSED MEDIAN



(2) High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

(3) Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

(4) Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

Iowa Department of Transportation

REVISION
1 | 04-17-12

STANDARD ROAD PLAN

PV-304

SHEET 2 of 4

REVISIONS: Updated Diagrammatic Profiles of the Pavement Edge Lines on sheet 4. Added Possible Tabulation. Modified circle note 2.

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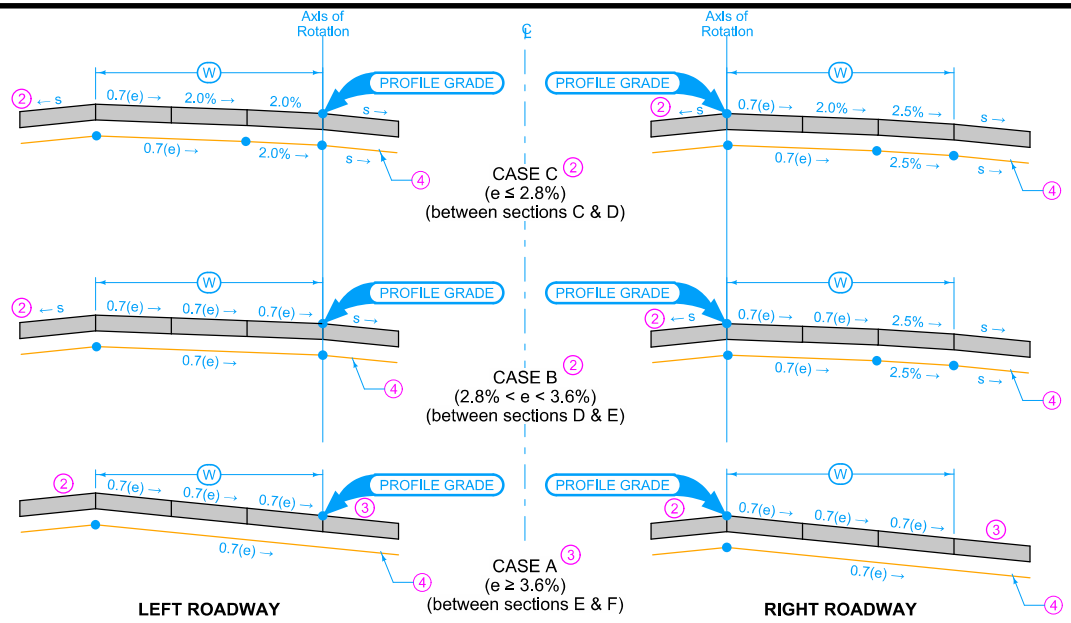
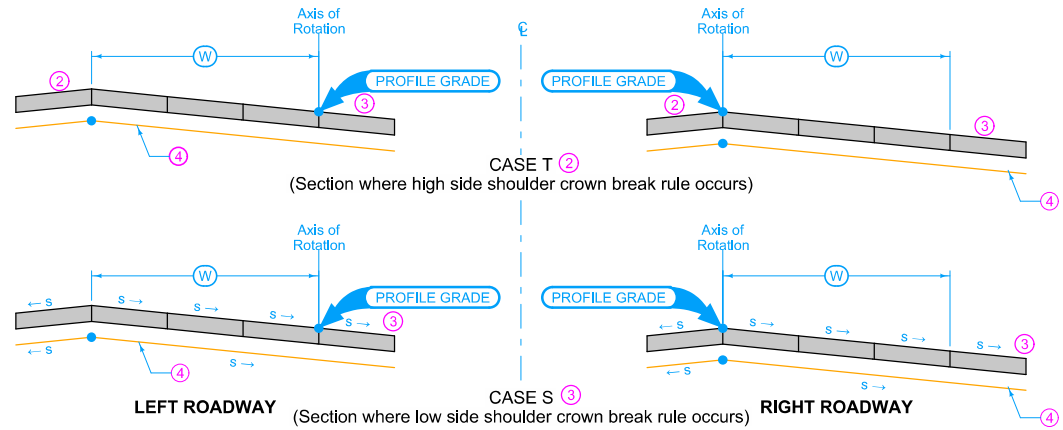
SUPERELEVATION DETAILS
SIX LANE ROADWAY
DEPRESSED MEDIAN



SECTION AT THE PC OR PT



SECTION WHERE SHOULDER SLOPE TRANSITION BEGINS

(2) High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

(3) Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

(4) Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

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SHEET 3 of 4

REVISIONS: Updated Diagrammatic Profiles of the Pavement Edge Lines on sheet 4. Added Possible Tabulation. Modified circle note 2.

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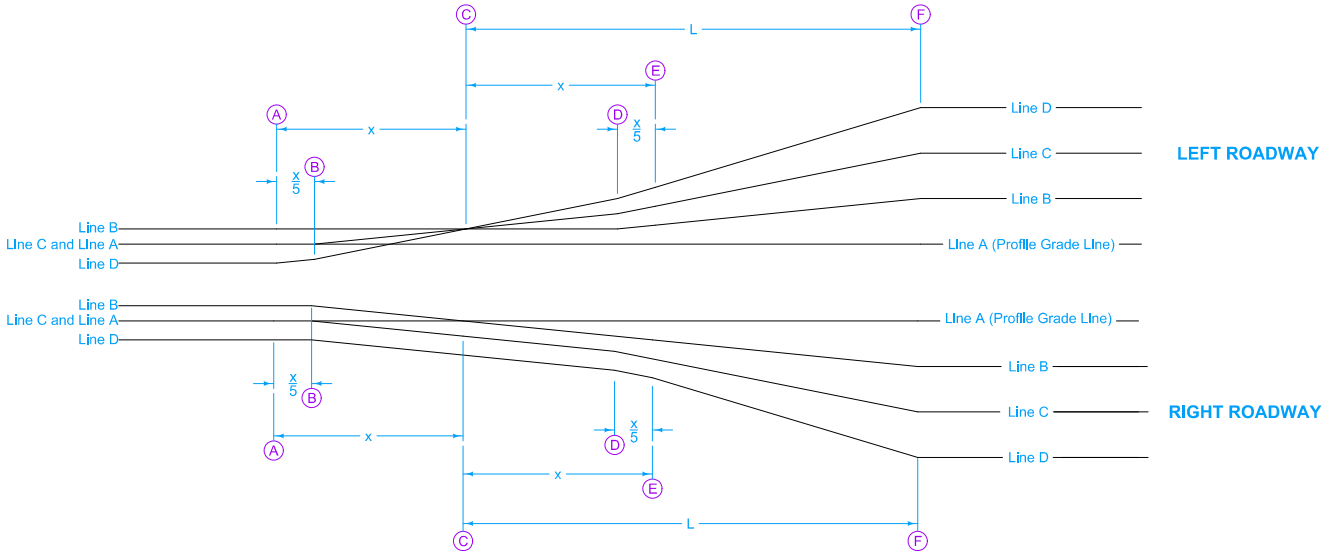
SUPERELEVATION DETAILS
SIX LANE ROADWAY
DEPRESSED MEDIAN

TABLE OF OFFSETS AND DROPS FOR LEFT ROADWAY								
Location of Cross Sections		(A)	(B)	(C)	(D)	(E)	(F)
From Line A To Line B	Offset (Ft.)	12	12	12	12	12	12
	Slope (%)	2.0	2.0	2.0	2.0	2.5	e
	Drop (Ft.)	0.24	0.24	0.24	0.24	0.30	12(e)
From Line B To Line C	Offset (Ft.)	12	12	12	12	12	12
	Slope (%)	-2.0	-2.0	0.0	2.0	2.5	e
	Drop (Ft.)	-0.24	-0.24	0.0	0.24	0.30	12(e)
From Line C To Line D	Offset (Ft.)	12	12	12	12	12	12
	Slope (%)	-2.5	-2.0	0.0	2.0	2.5	e
	Drop (Ft.)	-0.30	-0.24	0.0	0.24	0.30	12(e)
From Line A To Line D	Offset (Ft.)	36	36	36	36	36	36
	Drop (Ft.)	-0.30	-0.24	0.24	0.72	0.90	36(e)



DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES

TABLE OF OFFSETS AND DROPS FOR RIGHT ROADWAY								
Location of Cross Sections		(A)	(B)	(C)	(D)	(E)	(F)
From Line A To Line B	Offset (Ft.)	12	12	12	12	12	12
	Slope (%)	2.0	2.0	0.0	-2.0	-2.5	-e
	Drop (Ft.)	0.24	0.24	0.0	-0.24	-0.30	-12(e)
From Line B To Line C	Offset (Ft.)	12	12	12	12	12	12
	Slope (%)	-2.0	-2.0	-2.0	-2.0	-2.5	-e
	Drop (Ft.)	-0.24	-0.24	-0.24	-0.24	-0.30	-12(e)
From Line C To Line D	Offset (Ft.)	12	12	12	12	12	12
	Slope (%)	-2.5	-2.5	-2.5	-2.5	-2.5	-e
	Drop (Ft.)	-0.30	-0.30	-0.30	-0.30	-0.30	-12(e)
From Line A To Line D	Offset (Ft.)	36	36	36	36	36	36
	Slope (%)						
	Drop (Ft.)	-0.30	-0.30	-0.54	-0.78	-0.90	-36(e)

Iowa Department of Transportation

STANDARD ROAD PLAN

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1	04-17-12

PV-304

SHEET 4 of 4

REVISIONS: Updated Diagrammatic Profiles of the Pavement Edge Lines on sheet 4. Added Possible Tabulation. Modified circle note 2.

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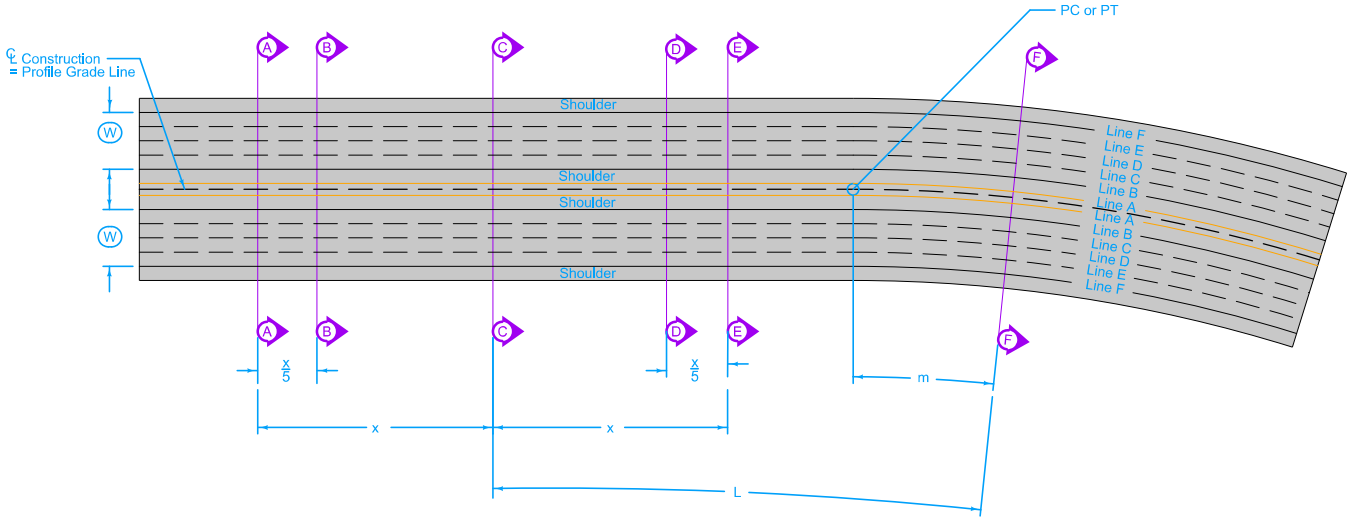
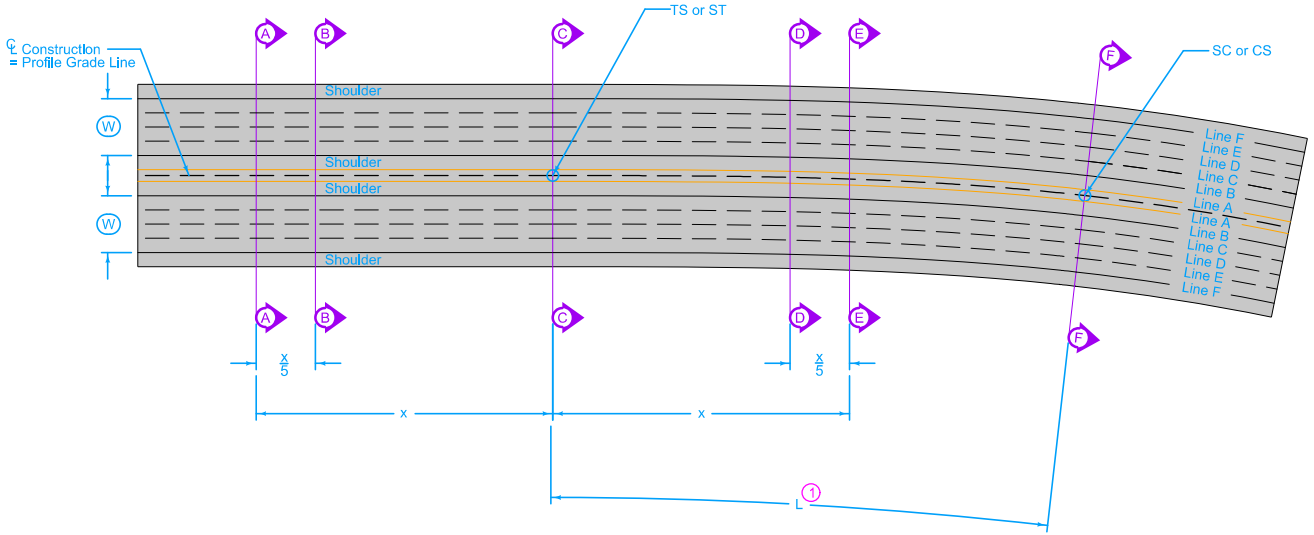
SUPERELEVATION DETAILS
SIX LANE ROADWAY
DEPRESSED MEDIAN



TRANSITION DETAILS - TANGENT TO CURVE



TRANSITION DETAILS - SPIRAL CURVE

Refer to specific curve data contained in project plans for tangent runout length (x), runoff length (L) and full superelevation (e).

When spiral curve transitions are not required:
Place 70% of full superelevation at the P.C. and P.T.
Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the centerline of construction.

Superelevations on this standard are shown for curves to the right. Curves to the left are a mirror image of what is shown.

Smooth curves should be established at the time of construction at sections A-F along the profile edges of lines A-F.

See Detail A for profile grade location.

m = 30% of Runoff Length (L)

Ⓦ = 48'

g = Normal Cross Slope (2.5%)

L = Distance to Change Cross Slope from 0% to e

e = Supereleavtion Rate

x = Distance to Change Cross Slope from 0% to 2.5%

s = Normal Shoulder Slope

① Spiral curve length coincides with runoff length (L)

Possible Tabulation:
101-18

Iowa Department of Transportation

REVISION
New 04-19-11

STANDARD ROAD PLAN

PV-306

SHEET 1 of 4

REVISIONS: New.

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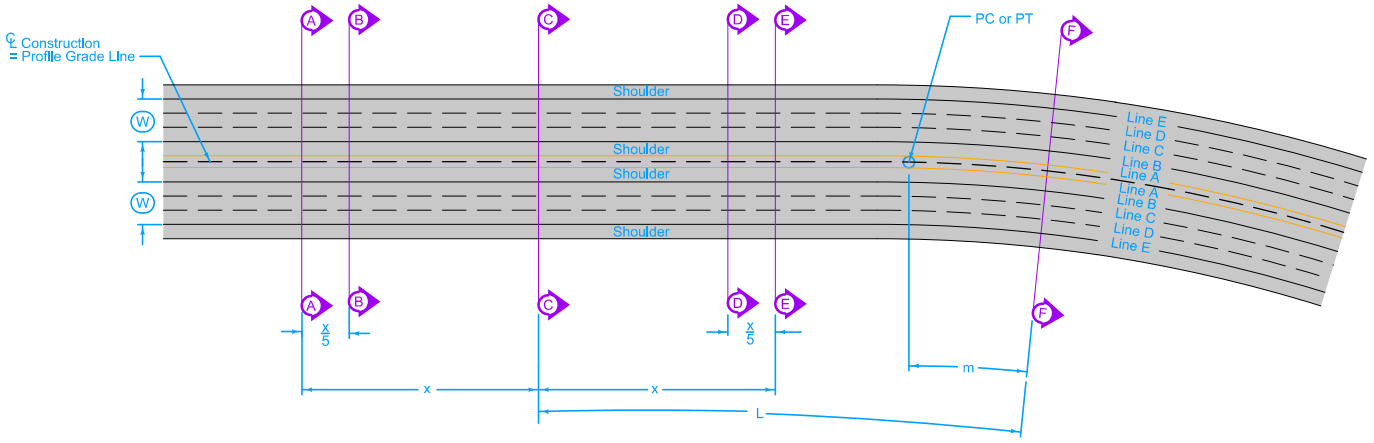
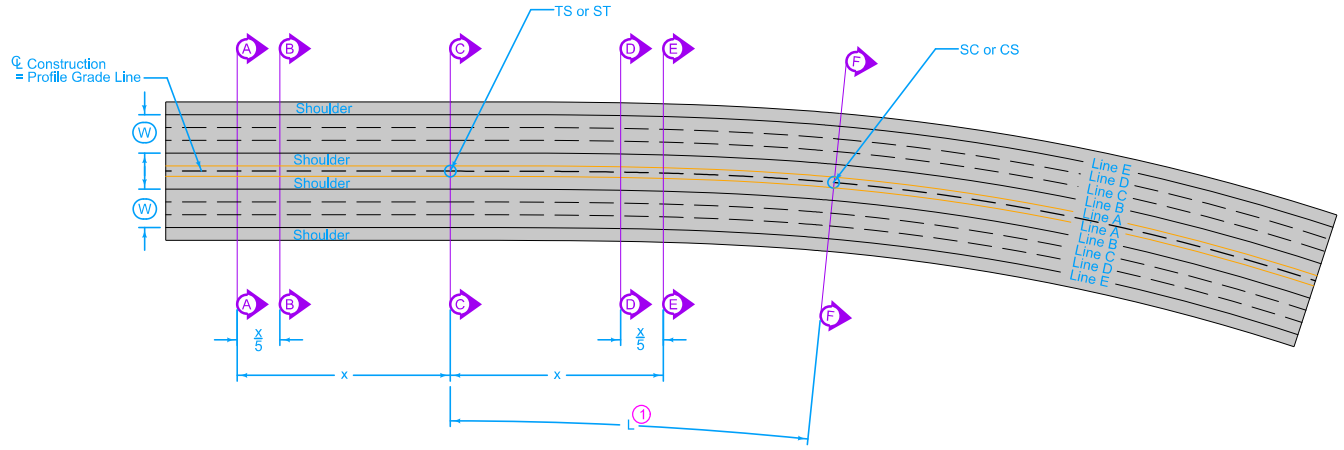
SUPERELEVATION DETAILS
EIGHT LANE ROADWAY
CLOSED MEDIAN



TRANSITION DETAILS - TANGENT TO CURVE



TRANSITION DETAILS - SPIRAL CURVE

Refer to specific curve data contained in project plans for tangent runout length (x), runoff length (L) and full superelevation (e).

When spiral curve transitions are not required:
Place 70% of full superelevation at the P.C. and P.T.
Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the centerline of construction.

Superelevations on this standard are shown for curves to the right. Curves to the left are a mirror image of what is shown.

Smooth curves should be established at the time of construction at sections A-F along the profile edge of lines A-E.

See Detail A for profile grade location.

m = 30% of Runoff Length (L)

Ⓦ = 36'

L = Distance to Change Cross Slope from 0% to e

e = Superelevation Rate

x = Distance to Change Cross Slope from 0% to 2.5%

s = Normal Shoulder Slope

① Spiral curve length coincides with runoff length (L)

Possilbe Tabulation:
101-18

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

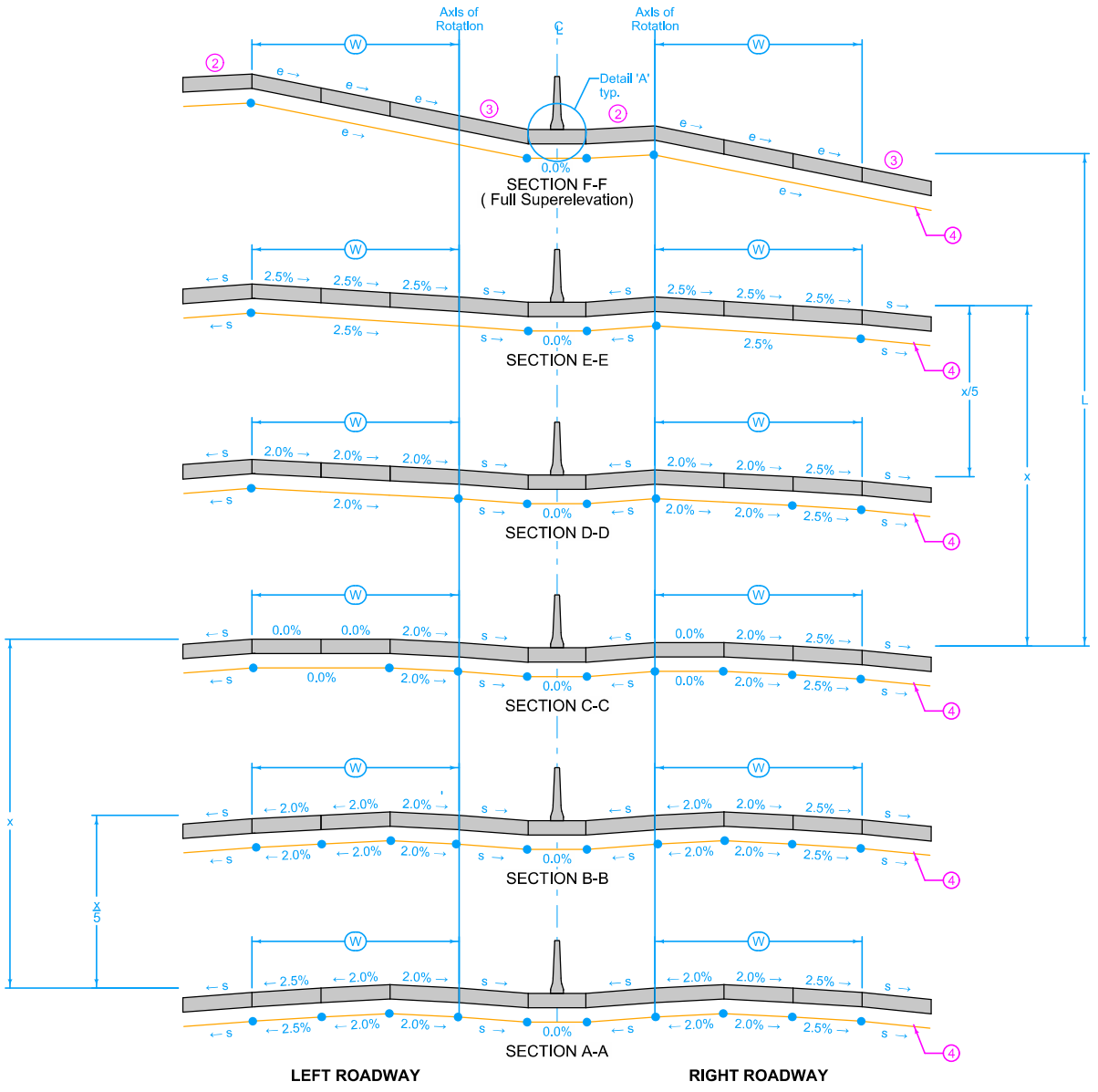
PV-305

SHEET 1 of 4

REVISIONS: Added Possible Tabulation.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

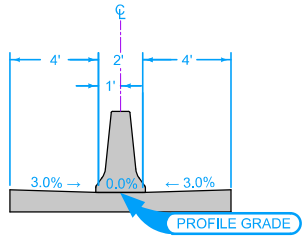
SUPERELEVATION DETAILS
SIX LANE ROADWAY
CLOSED MEDIAN



② High Side Shoulder: Maintain normal shoulder cross slope (s) until the cross slope break with the adjacent pavement reaches 8.0%, then slope the shoulder at the same rate as the adjacent pavement maintaining an 8% cross slope breakover.

③ Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

④ Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.



DETAIL A

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-17-12

PV-305

SHEET 2 of 4

REVISIONS: Added Possible Tabulation.

Deanna Maifield
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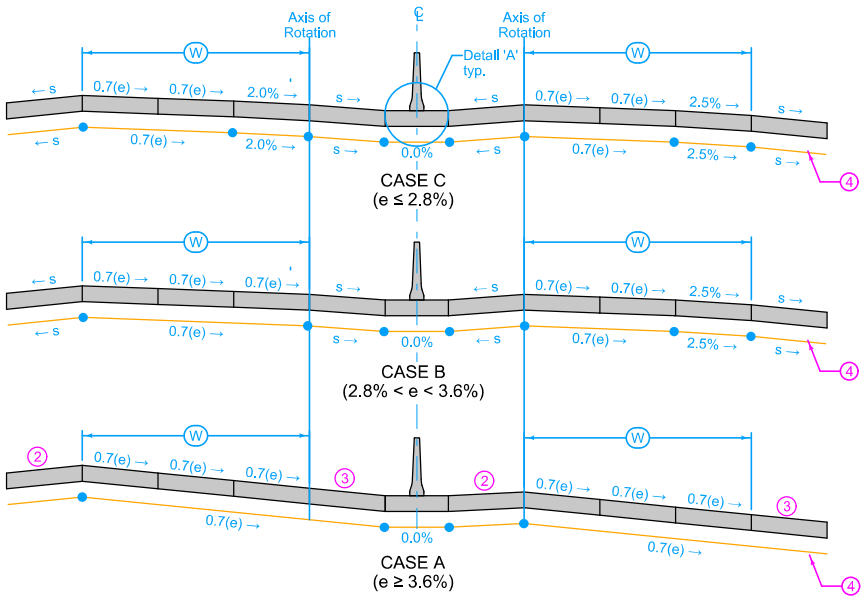
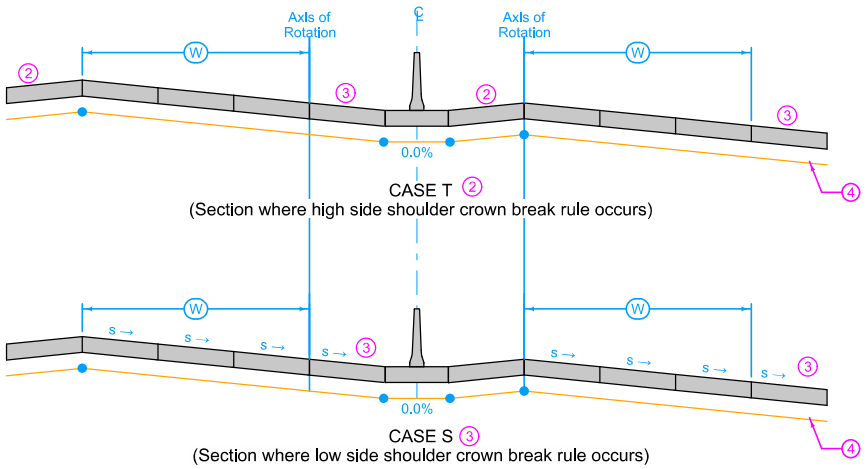
SUPERELEVATION DETAILS
SIX LANE ROADWAY
CLOSED MEDIAN



LEFT ROADWAY **RIGHT ROADWAY**

SECTION AT THE PC OR PT



LEFT ROADWAY **SECTION WHERE SHOULDER SLOPE TRANSITION BEGINS** **RIGHT ROADWAY**

(2) High Side Shoulder: Maintain normal shoulder cross slope (s) until the cross slope break with the adjacent pavement reaches 8.0%, then slope the shoulder at the same rate as the adjacent pavement maintaining an 8% cross slope breakover.

(3) Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

(4) Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

Iowa Department of Transportation

REVISION 2 04-17-12

STANDARD ROAD PLAN

PV-305

SHEET 3 of 4

REVISIONS: Added Possible Tabulation.

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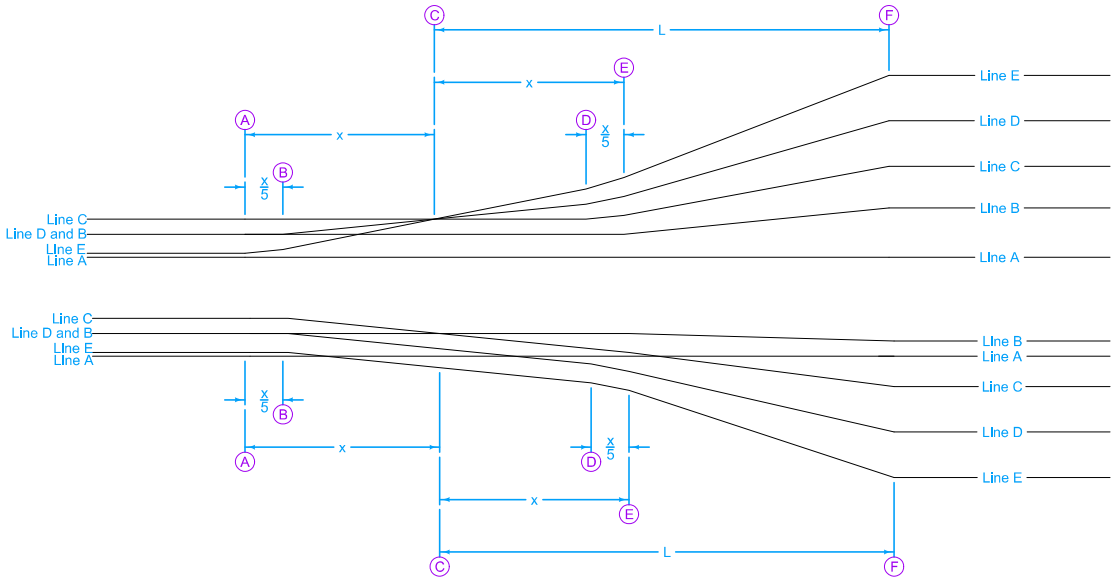
SUPERELEVATION DETAILS
SIX LANE ROADWAY
CLOSED MEDIAN

TABLE OF OFFSETS AND DROPS FOR LEFT ROADWAY								
Location of Cross Sections		(A)	(B)	(C)	(D)	(E)	(F)	
From Line A To Line B	Offset (Ft.)	*	*	*	*	*	*	
	Slope (%)	s	s	s	s	s	(3)	
	Drop (Ft.)							
From Line B To Line C	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	2.0	2.0	2.0	2.0	2.5	e	
	Drop (Ft.)	0.24	0.24	0.24	0.24	0.30	12(e)	
From Line C To Line D	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	-2.0	-2.0	0.0	2.0	2.5	e	
	Drop (Ft.)	-0.24	-0.24	0.0	0.24	0.30	12(e)	
From Line D To Line E	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	-2.5	-2.0	0.0	2.0	2.5	e	
	Drop (Ft.)	-0.30	-0.24	0.0	0.24	0.30	12(e)	

* Refer to plan details for shoulder width



DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES

TABLE OF OFFSETS AND DROPS FOR RIGHT ROADWAY								
Location of Cross Sections		(A)	(B)	(C)	(D)	(E)	(F)	
From Line A To Line B	Offset (Ft.)	*	*	*	*	*	*	
	Slope (%)	s	s	s	s	3.0	(2)	
	Drop (Ft.)							
From Line B To Line C	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	2.0	2.0	0.0	-2.0	-2.5	-e	
	Drop (Ft.)	0.24	0.24	0.0	-0.24	-0.30	-12(e)	
From Line C To Line D	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	-2.0	-2.0	-2.0	-2.0	-2.5	-e	
	Drop (Ft.)	-0.24	-0.24	-0.24	-0.24	-0.30	-12(e)	
From Line D To Line E	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	-2.5	-2.5	-2.5	-2.5	-2.5	-e	
	Drop (Ft.)	-0.30	-0.30	-0.30	-0.30	-0.30	-12(e)	

* Refer to plan details for shoulder width

Iowa Department of Transportation

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STANDARD ROAD PLAN

PV-305

SHEET 4 of 4

REVISIONS: Added Possible Tabulation.

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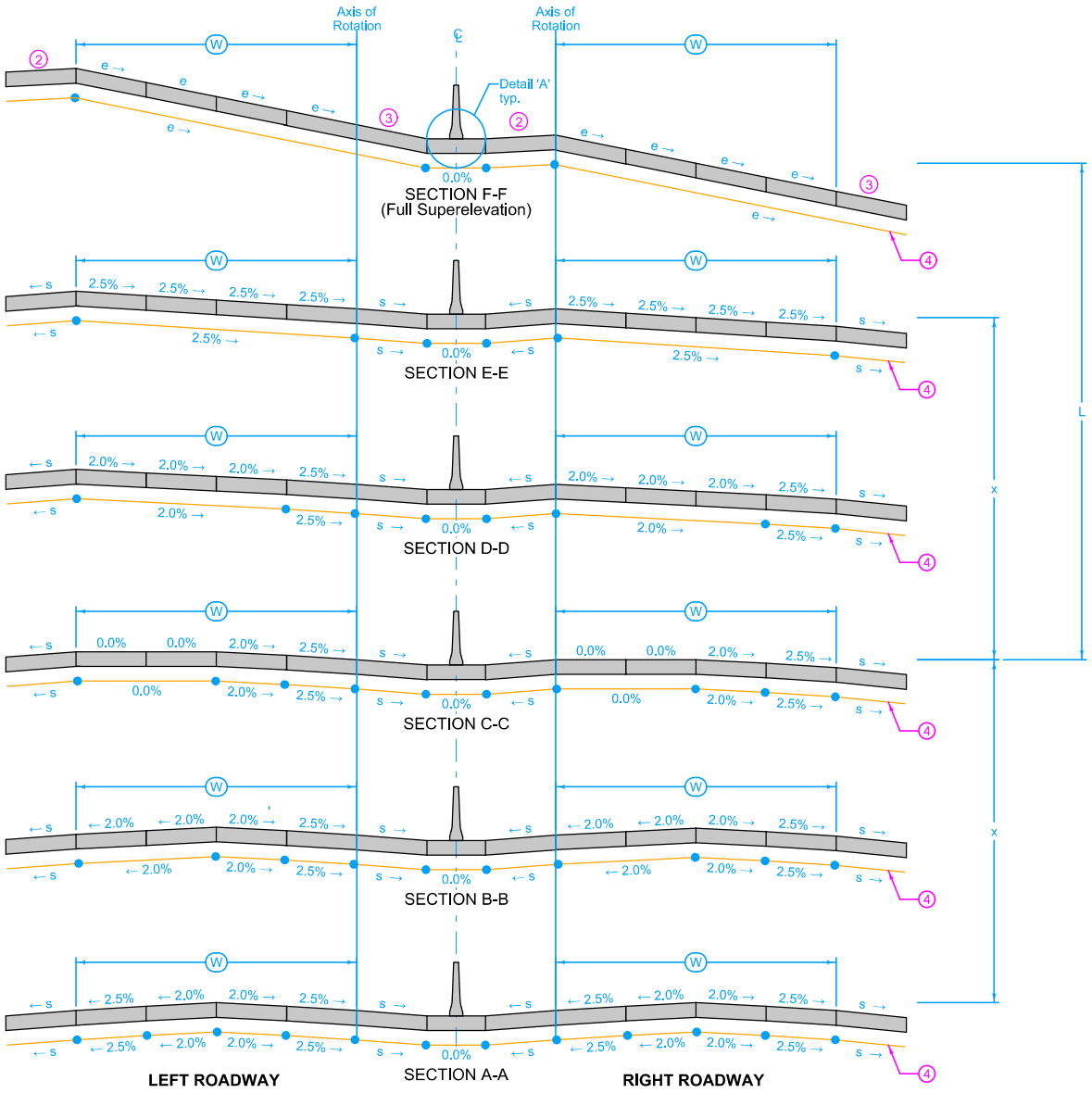
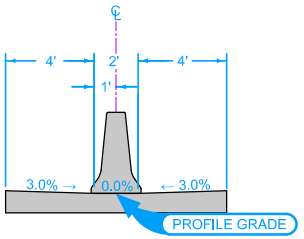
SUPERELEVATION DETAILS
SIX LANE ROADWAY
CLOSED MEDIAN



(2) High Side Shoulder: Maintain normal shoulder cross slope (s) until the cross slope break with the adjacent pavement reaches 8.0%, then slope the shoulder at the same rate as the adjacent pavement maintaining an 8% cross slope breakover.

(3) Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

(4) Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.



DETAIL A

Iowa Department of Transportation

REVISION: New 04-19-11

STANDARD ROAD PLAN

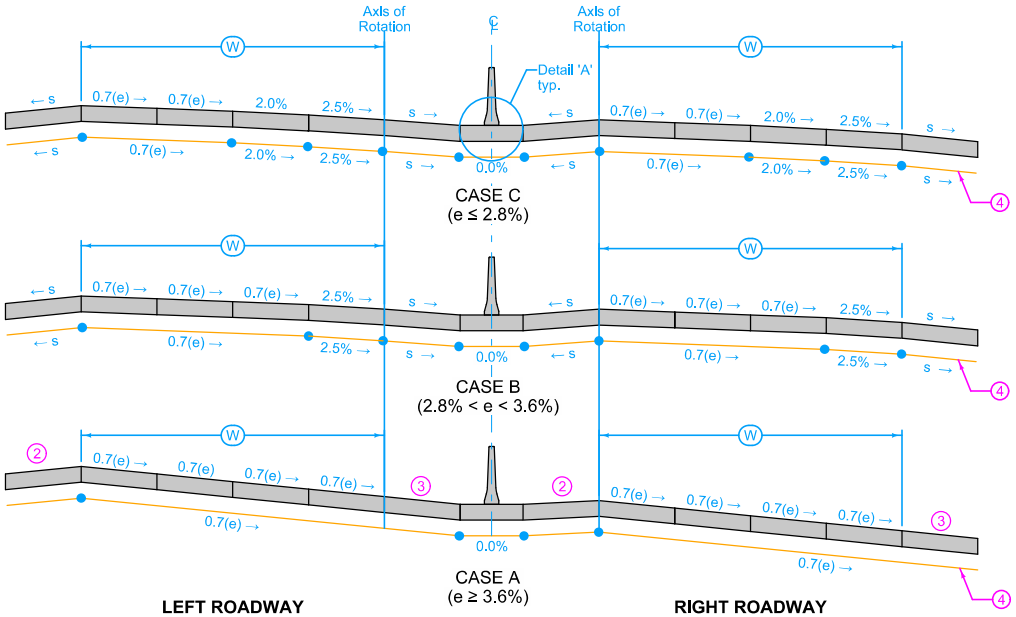
PV-306

SHEET 2 of 4

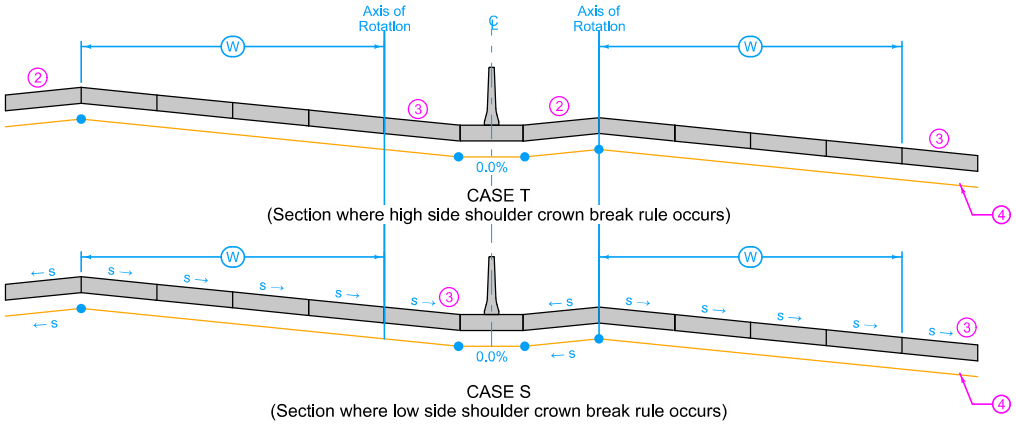
REVISIONS: New.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPERELEVATION DETAILS
EIGHT LANE ROADWAY
CLOSED MEDIAN



SECTION AT THE PC OR PT



SECTION WHERE SHOULDER SLOPE TRANSITION BEGINS

② High Side Shoulder: Maintain normal shoulder cross slope (s) until the cross slope break with the adjacent pavement reaches 8.0%, then slope the shoulder at the same rate as the adjacent pavement maintaining an 8% cross slope breakover.

③ Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

④ Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION: New 04-19-11

PV-306

SHEET 3 of 4

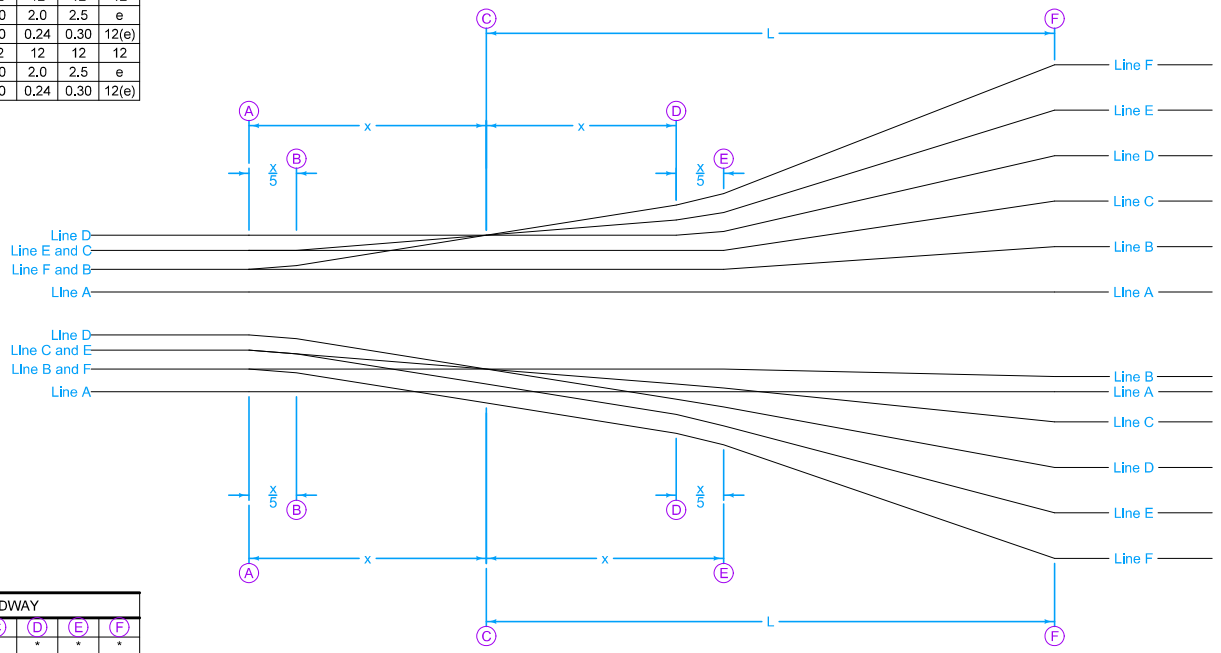
REVISIONS: New.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPERELEVATION DETAILS
EIGHT LANE ROADWAY
CLOSED MEDIAN

TABLE OF OFFSETS AND DROPS FOR LEFT ROADWAY								
Location of Cross Sections		(A)	(B)	(C)	(D)	(E)	(F)	
From Line A To Line B	Offset (Ft.)	*	*	*	*	*	*	
	Slope (%)	s	s	s	s	s	(3)	
	Drop (Ft.)							
From Line B To Line C	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	2.5	2.5	2.5	2.5	2.5	e	
	Drop (Ft.)	0.30	0.30	0.30	0.30	0.30	12(e)	
From Line C To Line D	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	2.0	2.0	2.0	2.0	2.5	e	
	Drop (Ft.)	0.24	0.24	0.24	0.24	0.30	12(e)	
From Line D To Line E	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	-2.0	-2.0	0.0	2.0	2.5	e	
	Drop (Ft.)	-0.24	-0.24	0.0	0.24	0.30	12(e)	
From Line E To Line F	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	-2.5	-2.0	0.0	2.0	2.5	e	
	Drop (Ft.)	-0.30	-0.24	0.0	0.24	0.30	12(e)	

* Refer to plan details for shoulder width



DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES

TABLE OF OFFSETS AND DROPS FOR RIGHT ROADWAY								
Location of Cross Sections		(A)	(B)	(C)	(D)	(E)	(F)	
From Line A To Line B	Offset (Ft.)	*	*	*	*	*	*	
	Slope (%)	s	s	s	s	s	(2)	
	Drop (Ft.)							
From Line B To Line C	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	2.5	2.0	0.0	-2.0	-2.5	-e	
	Drop (Ft.)	0.30	0.24	0.0	-0.24	-0.30	-12(e)	
From Line C To Line D	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	2.0	2.0	0.0	-2.0	-2.5	-e	
	Drop (Ft.)	0.24	0.24	0.0	-0.24	-0.30	-12(e)	
From Line D To Line E	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	-2.0	-2.0	-2.0	-2.0	-2.5	-e	
	Drop (Ft.)	-0.24	-0.24	-0.24	-0.24	-0.30	-12(e)	
From Line E To Line F	Offset (Ft.)	12	12	12	12	12	12	
	Slope (%)	-2.5	-2.5	-2.5	-2.5	-2.5	-e	
	Drop (Ft.)	-0.30	-0.30	-0.30	-0.30	-0.30	-12(e)	

* Refer to plan details for shoulder width

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

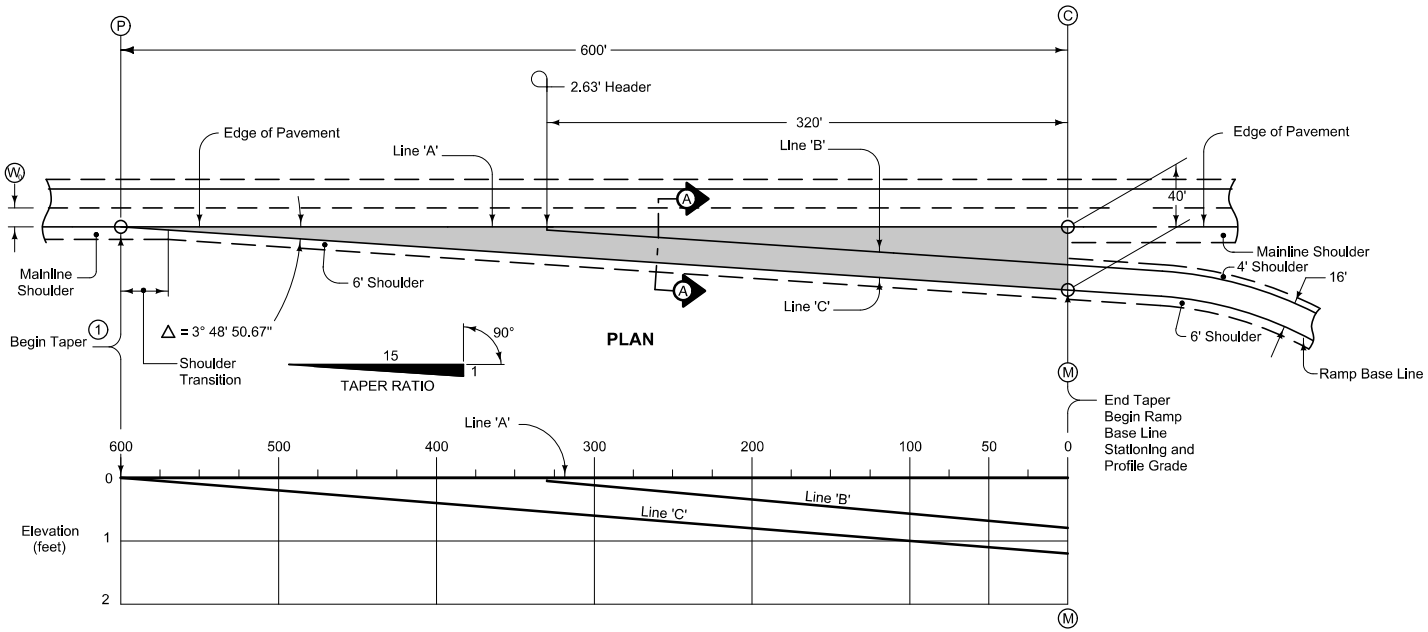
PV-306

SHEET 4 of 4

REVISIONS: New.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPERELEVATION DETAILS
EIGHT LANE ROADWAY
CLOSED MEDIAN



NOTE: The algebraic difference between profile grade for Ramp Base Line at Ⓜ and relative profile grade of Mainline at Ⓒ is 0.2%.

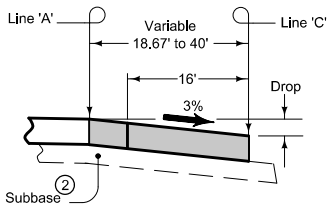
PROFILE

Ⓒ

TABLE OF OFFSETS AND DROPS FOR 16' RAMP TAPER																									
DISTANCE (Ft.)	600	575	550	525	500	475	450	425	400	375	350	320	300	275	250	225	200	175	150	125	100	75	50	25	0
OFFSET (Ft.)	0	1.67	3.33	5.00	6.67	8.33	10.00	11.67	13.33	15.00	16.67	18.67	20.00	21.67	23.33	25.00	26.67	28.33	30.00	31.67	33.33	35.00	36.67	38.33	40.00
DROP (Ft.)	0	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.56	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20

Ⓜ

NOTE: The elevations at edge of taper from BEGIN TAPER to POINT 'M' are established by a constant 3% slope across the appropriate taper widths based on the Taper Ratio of 15:1. Drop = (0.03) x (Offset).



SECTION A-A

TABLE OF SHOULDER TRANSITION LENGTHS			
Ⓦ	Shoulder Width beyond Edge of Mainline Pavement		
	8'	10'	12'
12'	NA	60'	90'
14'	30'	60'	NA

NOTE: W_0 is the width of the outside lane to the Edge of Pavement.

Construct ramp exit pavement the same thickness as mainline pavement.

Ramp exit pavement shown by shaded area is 1334 square yards.

For joint details, see PV-101.

① For header construction details at the beginning of taper, see Typical 7101 or Typical 7102.

② Construct subbase for ramp exit pavement the same thickness as mainline subbase.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

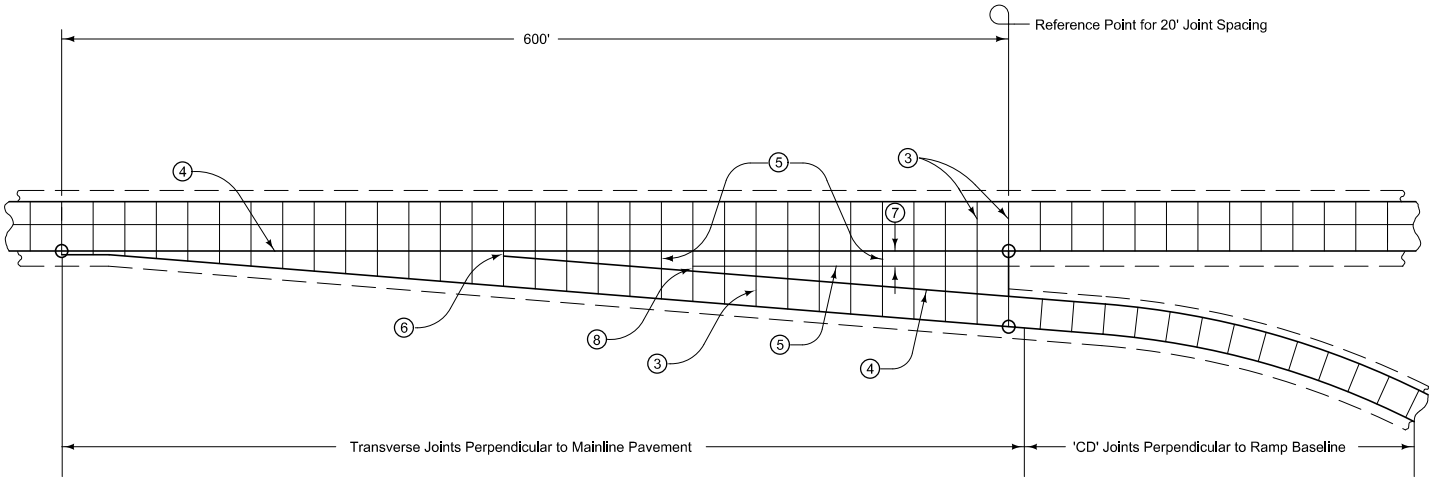
PV-410

SHEET 1 of 2

REVISIONS: Added 'C' Joint and circle notes 7 and 8.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DECELERATION TAPER FOR 16' EXIT RAMP



16' EXIT RAMP

③ 'CD' Joints at 20' spacing.

④ 'BT-2' joint for existing pavement or 'KT-2' for new pavement .

⑤ 'C' Joint.

⑥ 'B' Joint. 2' minimum. 4' maximum.

⑦ 10' minimum or equal to mainline shoulder width.

⑧ 'B' or 'C' Joint. 2' minimum. 4' maximum.

Iowa Department of Transportation

REVISION 2 10-18-11

STANDARD ROAD PLAN

PV-410

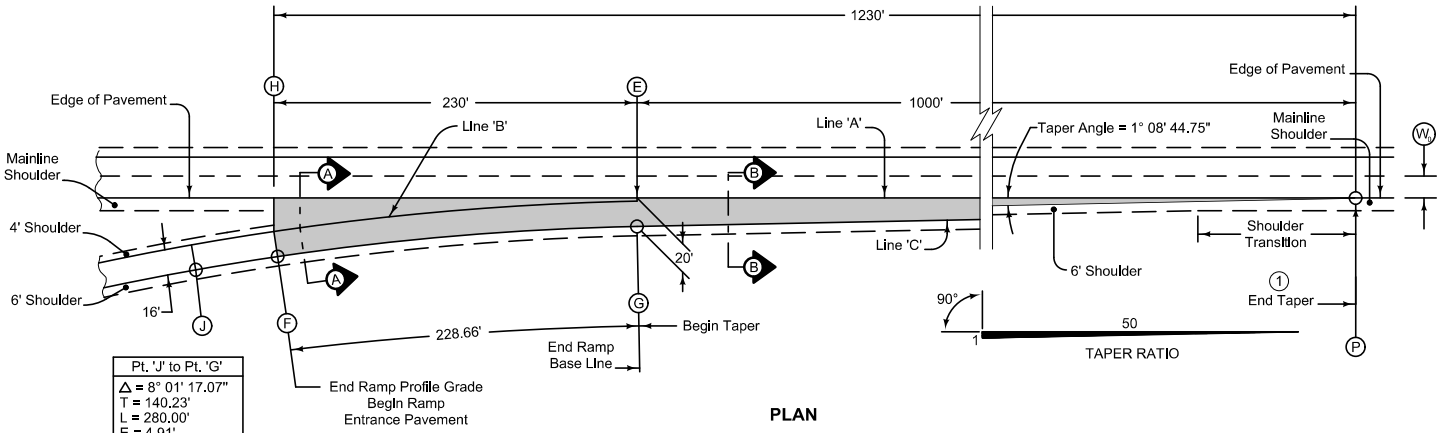
SHEET 2 of 2

REVISIONS: Added 'C' Joint and circle notes 7 and 8.

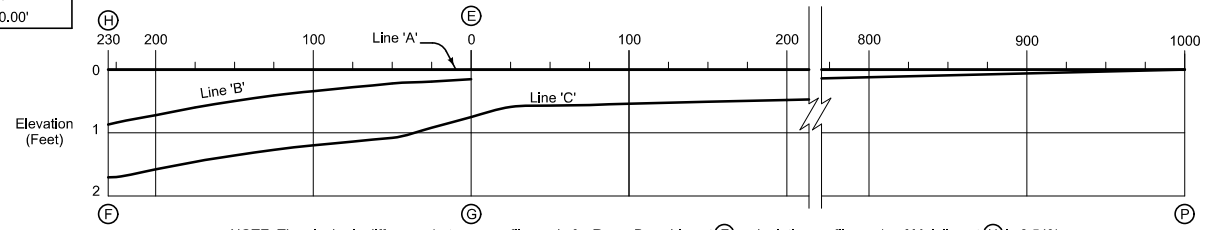
Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

DECELERATION TAPER FOR 16' EXIT RAMP



PLAN

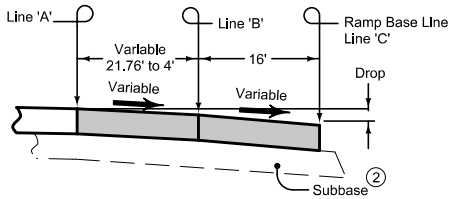


NOTE: The algebraic difference between profile grade for Ramp Base Line at (F) and relative profile grade of Mainline at (H) is 0.54%.

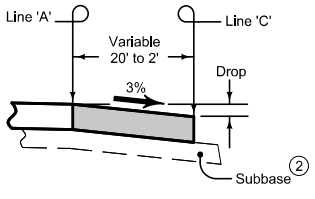
PROFILE

TABLE OF OFFSETS AND DROPS FOR 16' RAMP TAPER

Distance From Point (E) Along Line 'A' (Ft.)		230	225	200	175	150	125	100	75	50	25	0	25	50	75	100	200	300	400	500	600	700	800	900	1000
From Line 'A' To Line 'B'	Offset (Ft.)	21.76	21.10	17.95	15.11	12.59	10.38	8.48	6.90	5.62	4.66	4.0													
	Slope (%)	← Constant 4.0% Slope →										3.78													
	Drop (Ft.)	0.87	0.84	0.72	0.60	0.50	0.42	0.34	0.28	0.22	0.19	0.15													
From Line 'B' To Line 'C'	Offset (Ft.)	← Constant 16.0' Offset →																							
	Slope (%)	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	4.58	3.78													
	Drop (Ft.)	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.73	0.60													
From Line 'A' To Line 'C'	Offset (Ft.)												19.5	19.0	18.5	18.0	16.0	14.0	12.0	10.0	8.0	6.0	4.0	2.0	0.0
	Slope (%)												← Constant 3.0% Slope →												
	Drop (Ft.)	1.73	1.70	1.58	1.46	1.36	1.28	1.20	1.14	1.08	0.92	0.75	0.59	0.57	0.56	0.54	0.48	0.42	0.36	0.30	0.24	0.18	0.12	0.06	0.0
Distance From Point (G) Along Line 'C' (Ft.)		228.66	223.66	198.66	173.70	148.77	123.87	99.00	74.15	49.31	24.49	0.00													



SECTION A-A



SECTION B-B

TABLE OF SHOULDER TRANSITION LENGTHS			
W_o	Shoulder Width beyond Edge of Mainline Pavement		
	8'	10'	12'
12'	NA	200'	300'
14'	100'	200'	NA

NOTE: W_o is the width of the outside lane to the Edge of Pavement.

Construct ramp entrance pavement the same thickness as mainline pavement.

Ramp entrance pavement shown by shaded area is 1793 square yards.

For joint details, see PV-101

(1) For header construction details at the end of taper, see Typical 7101 or Typical 7102.

(2) Construct subbase for ramp entrance pavement the same thickness as mainline subbase.

Iowa Department of Transportation

REVISION 2 10-18-11

STANDARD ROAD PLAN

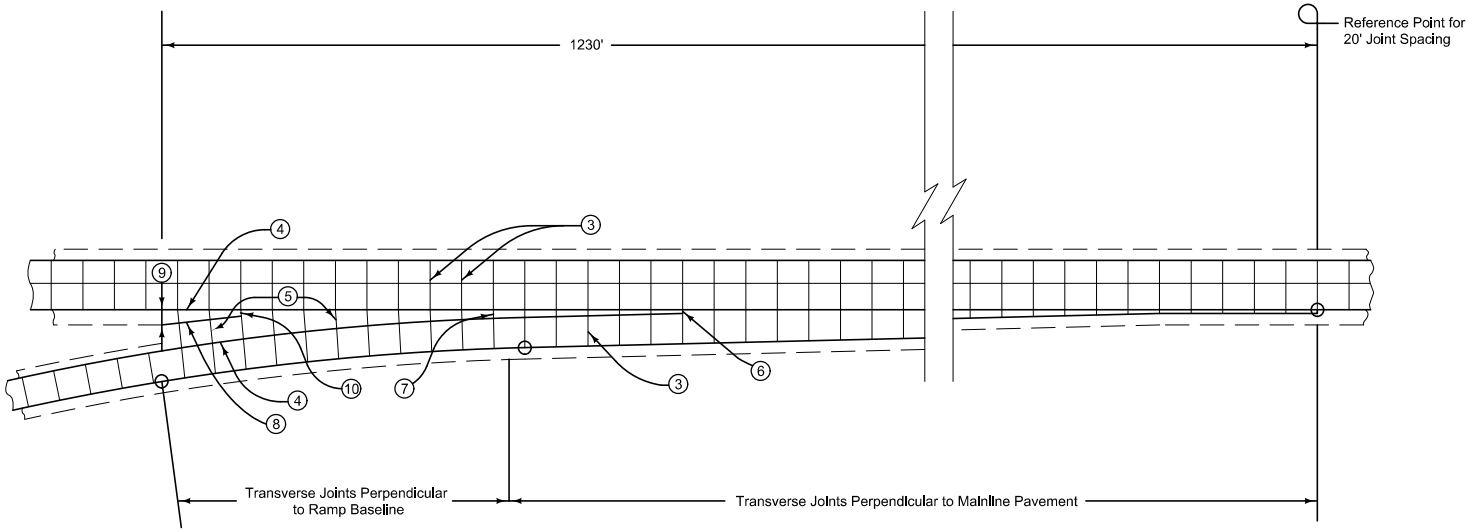
PV-411

SHEET 1 of 2

REVISIONS: Added 'C' Joint and circle notes 8, 9, and 10. Renumbered circle notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

ACCELERATION TAPER FOR 16' ENTRANCE RAMP



16' ENTRANCE RAMP

③ 'CD' Joints at 20' spacing.

④ 'BT-2' or 'KT-2' Joint.

⑤ 'C' Joint.

⑥ 'B' Joint. 2' minimum, 4' maximum.

⑦ Construct transverse joints on the exit ramp taper perpendicular to the tapered edge where the gore area is greater than 4 feet.

⑧ 'C' Joint parallel to ramp baseline.

⑨ 10' minimum, or equal to mainline shoulder width.

⑩ 'B' or 'C' Joint. 2' minimum. 4' maximum.

Iowa Department of Transportation

REVISION 2 10-18-11

STANDARD ROAD PLAN

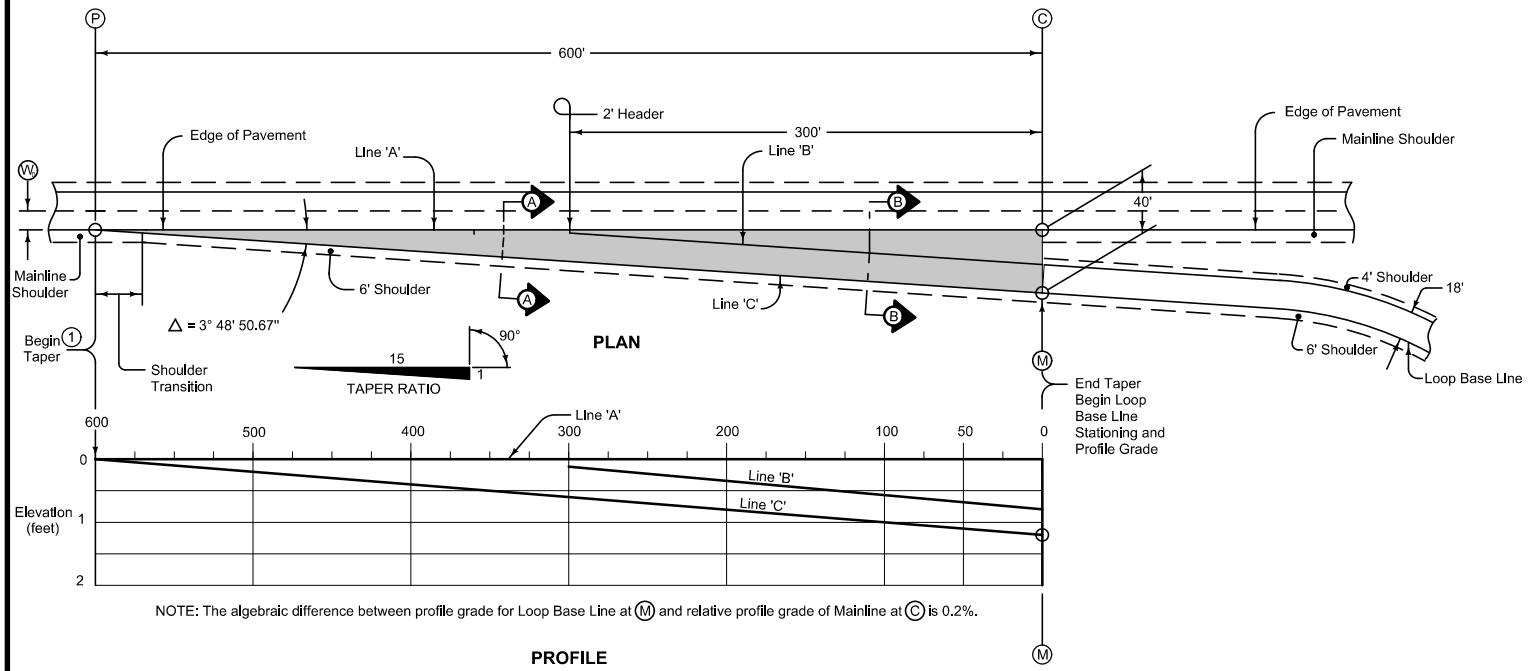
PV-411

SHEET 2 of 2

REVISIONS: Added 'C' Joint and circle notes 8, 9, and 10. Renumbered circle notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

ACCELERATION TAPER FOR 16' ENTRANCE RAMP



NOTE: The algebraic difference between profile grade for Loop Base Line at Ⓜ and relative profile grade of Mainline at Ⓒ is 0.2%.

PROFILE

Construct Loop exit pavement the same thickness as mainline pavement.

Loop exit pavement shown by shaded area is 1334 square yards.

For joint details, see PV-101

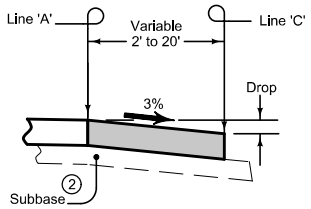
1. For header construction details at the beginning of taper, see Typical 7101 or Typical 7102.
2. Construct subbase for ramp exit pavement the same thickness as mainline subbase.

Ⓒ

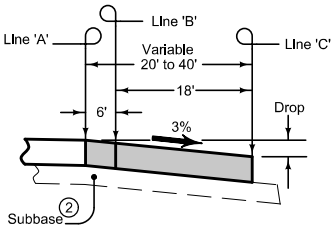
TABLE OF OFFSETS AND DROPS FOR 18' LOOP TAPER																									
DISTANCE (Ft.)	600	575	550	525	500	475	450	425	400	375	350	325	300	275	250	225	200	175	150	125	100	75	50	25	0
OFFSET (Ft.)	0	1.67	3.33	5.00	6.67	8.33	10.00	11.67	13.33	15.00	16.67	18.33	20.00	21.67	23.33	25.00	26.67	28.33	30.00	31.67	33.33	35.00	36.67	38.33	40.00
DROP (Ft.)	0	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20

NOTE: The elevations at edge of taper from BEGIN TAPER to POINT 'M' are established by a constant 3% slope across the appropriate taper widths based on the Taper Ratio of 15:1, Drop = (0.03) x (Offset).

Ⓜ



SECTION A-A



SECTION B-B

TABLE OF SHOULDER TRANSITION LENGTHS			
W	Shoulder Width beyond Edge of Mainline Pavement		
	8'	10'	12'
12'	NA	60'	90'
14'	30'	60'	NA

NOTE: W_0 is the width of the outside lane to the Edge of Pavement.

Iowa Department of Transportation

REVISION 2 10-18-11

STANDARD ROAD PLAN

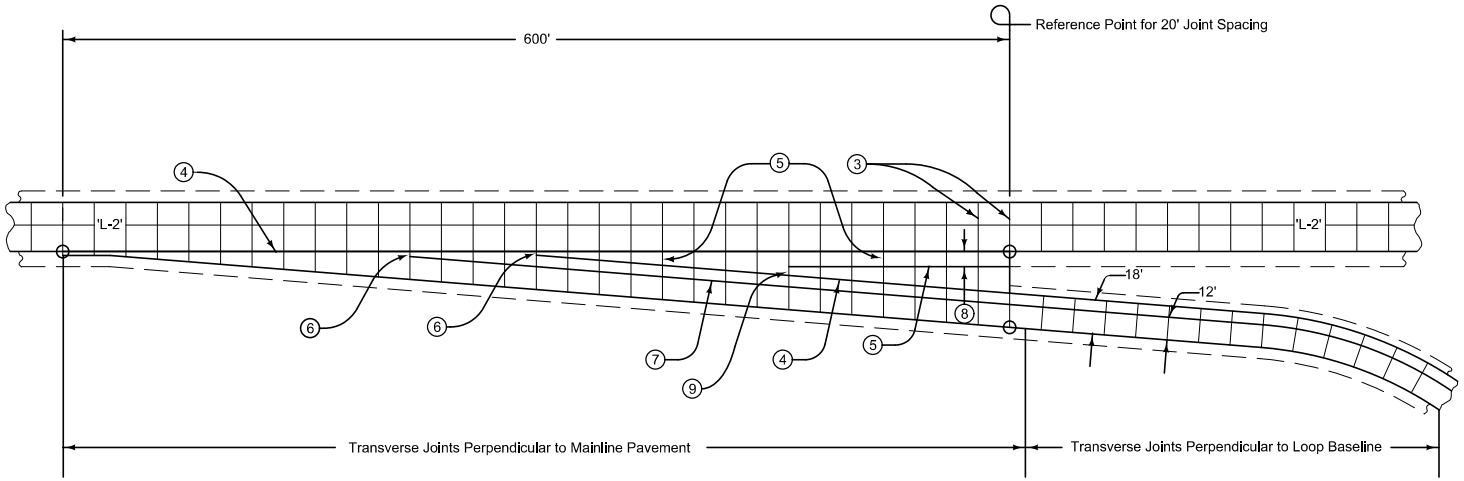
PV-412

SHEET 1 of 2

REVISIONS: Added 'C' Joint and circle note 8 and 9.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DECELERATION TAPER FOR 18' EXIT LOOP



18' EXIT LOOP

③ 'CD' Joints at 20' spacing.

④ 'BT-2' or 'KT-2' Joint.

⑤ 'C' Joint.

⑥ 'B' Joint. 2' minimum, 4' maximum.

⑦ 'L-2' Joint.

⑧ 10' minimum or equal to mainline shoulder width.

⑨ 'B' or 'C' Joint. 2' minimum. 4' maximum.

Iowa Department of Transportation

REVISION 2 10-18-11

STANDARD ROAD PLAN

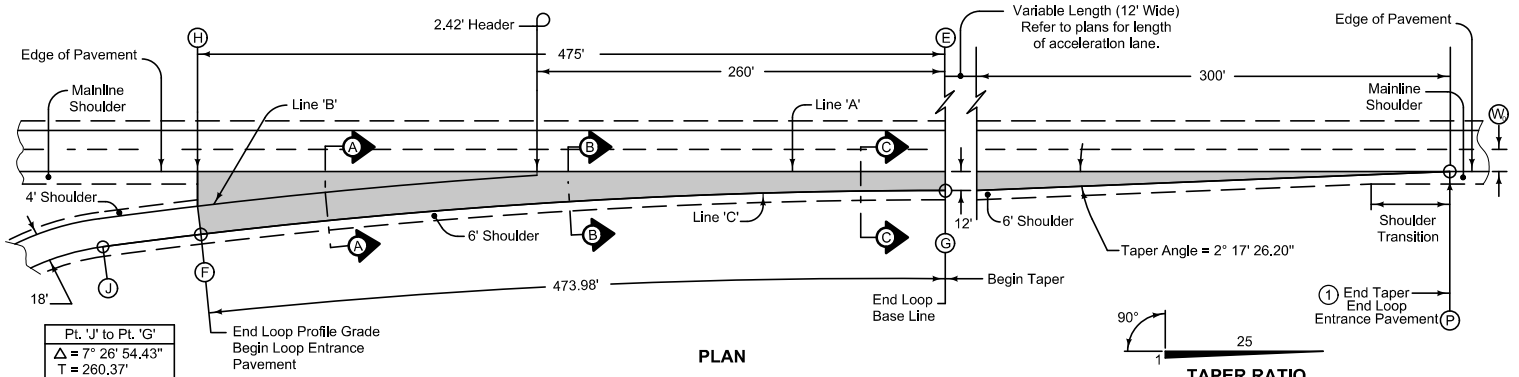
PV-412

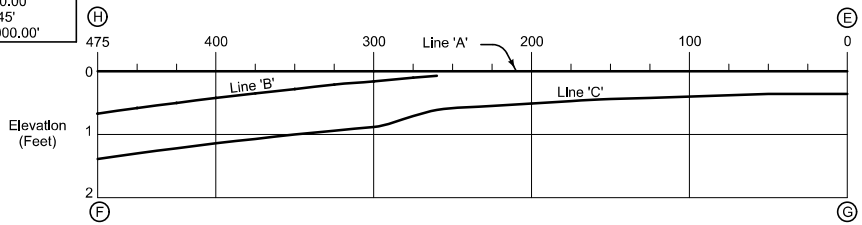
SHEET 2 of 2

REVISIONS: Added 'C' Joint and circle note 8 and 9.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DECELERATION TAPER FOR 18' EXIT LOOP





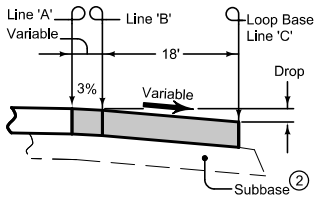
NOTE: The algebraic difference between profile grade for Loop Base Line at (F) and relative profile grade of Mainline at (H) is 0.36%.

PROFILE

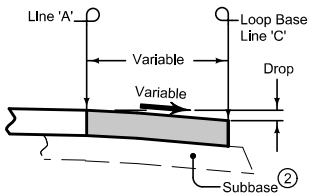
TABLE OF OFFSETS AND DROPS FOR 18' LOOP TAPER

Distance From Point (E) Along Line 'A' (Ft.)		475	450	425	400	375	350	325	300	275	260	225	200	175	150	125	100	75	50	25	0
From Line 'A' To Line 'B'	Offset (Ft.)	22.18	19.28	16.54	13.96	11.54	9.27	7.17	5.22	3.42	2.42										
	Slope (%)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00										
	Drop (Ft.)	0.67	0.58	0.50	0.42	0.35	0.28	0.22	0.16	0.10	0.07										
From Line 'B' To Line 'C'	Offset (Ft.)	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0										
	Slope (%)	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.38	3.00										
	Drop (Ft.)	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.61	0.54										
From Line 'A' To Line 'C'	Offset (Ft.)											18.33	17.00	15.83	14.81	13.95	13.25	12.70	12.31	12.08	12.00
	Slope (%)											3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	Drop (Ft.)	1.39	1.30	1.22	1.14	1.07	1.00	0.94	0.88	0.71	0.61	0.55	0.51	0.47	0.44	0.42	0.40	0.38	0.37	0.36	0.36
Distance From Point (G) Along Line 'C' (Ft.)		473.98	448.93	423.89	398.87	373.86	348.87	323.90	298.93	273.98	260.18	225.12	200.08	175.06	150.03	125.02	100.01	75.00	50.00	25.00	0.00

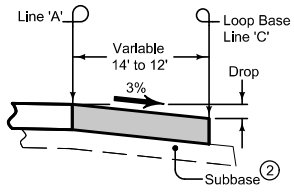
NOTE: From (G) to (P) cross-slope between Line 'A' and Line 'C' is a constant 3%.



SECTION A-A



SECTION B-B



SECTION C-C

TABLE OF SHOULDER TRANSITION LENGTHS			
(W)	Shoulder Width beyond Edge of Mainline Pavement		
	8'	10'	12'
12'	NA	100'	150'
14'	50'	100'	NA

NOTE: W_o is the width of the outside lane to the Edge of Pavement.

Construct loop entrance pavement the same thickness as mainline pavement.

Loop entrance pavement shown by shaded area is 1329 square yards.

For joint details, see PV-101.

(1) For header construction details at the end of taper, see Typical 7101 or Typical 7102.

(2) Construct subbase for loop entrance pavement the same thickness as mainline subbase.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

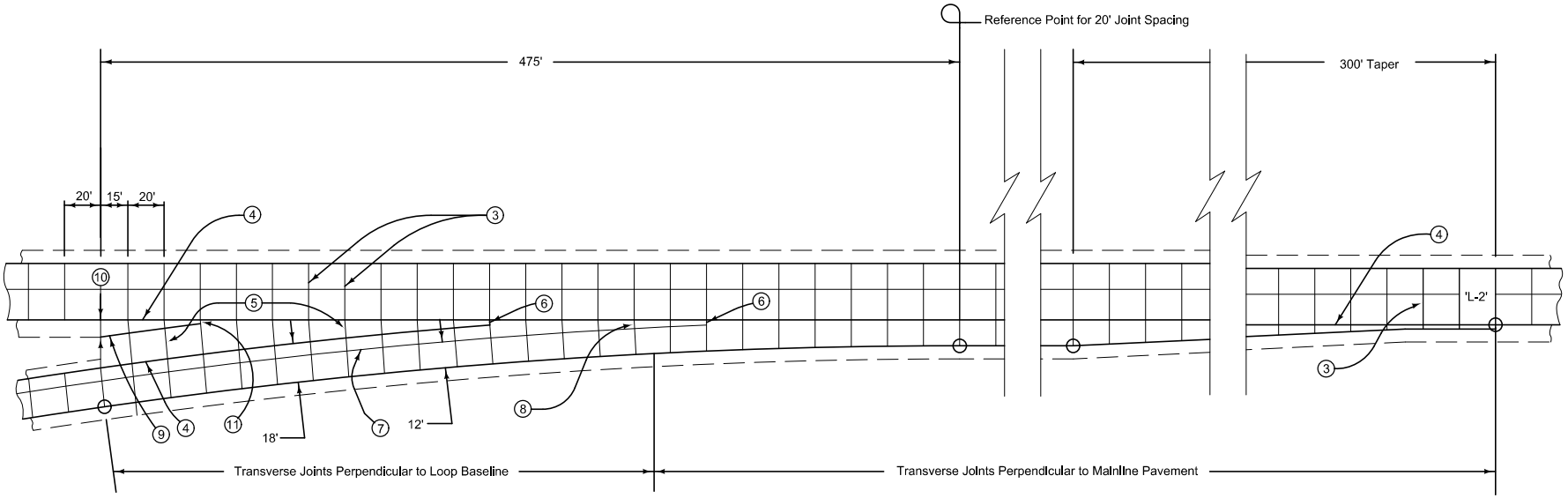
PV-414

SHEET 1 of 2

REVISIONS: Added 'C' Joint and circle notes 9, 10, and 11.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

ACCELERATION TAPER FOR 18' ENTRANCE LOOP



18' ENTRANCE LOOP

③ 'CD' Joints at 20' spacing.

④ 'BT-2' or 'KT-2' Joint.

⑤ 'C' Joint.

⑥ 'B' Joint. 2' minimum, 4' maximum.

⑦ 'L-2' Joint.

⑧ Construct transverse joints on the exit ramp taper perpendicular to the ramp baseline where the gore area is 4 feet or greater.

⑨ 'C' Joint parallel to loop baseline.

⑩ 10' minimum or equal to mainline shoulder width.

⑪ 'B' or 'C' Joint. 2' minimum. 4' maximum.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 10-18-11

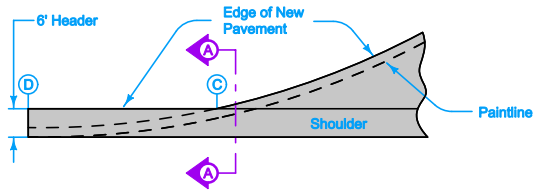
PV-414

SHEET 2 of 2

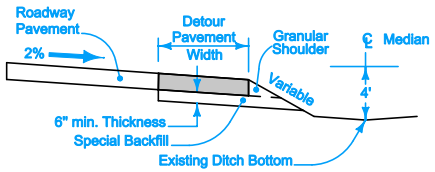
REVISIONS: Added 'C' Joint and circle notes 9, 10, and 11.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

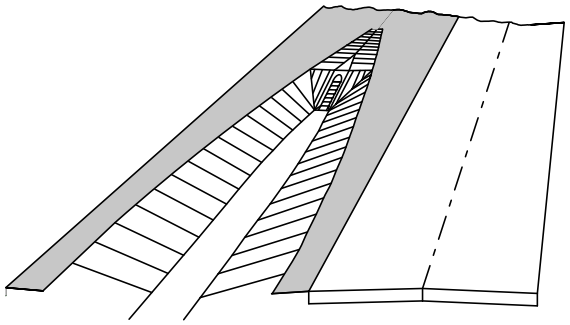
ACCELERATION TAPER FOR 18' ENTRANCE LOOP



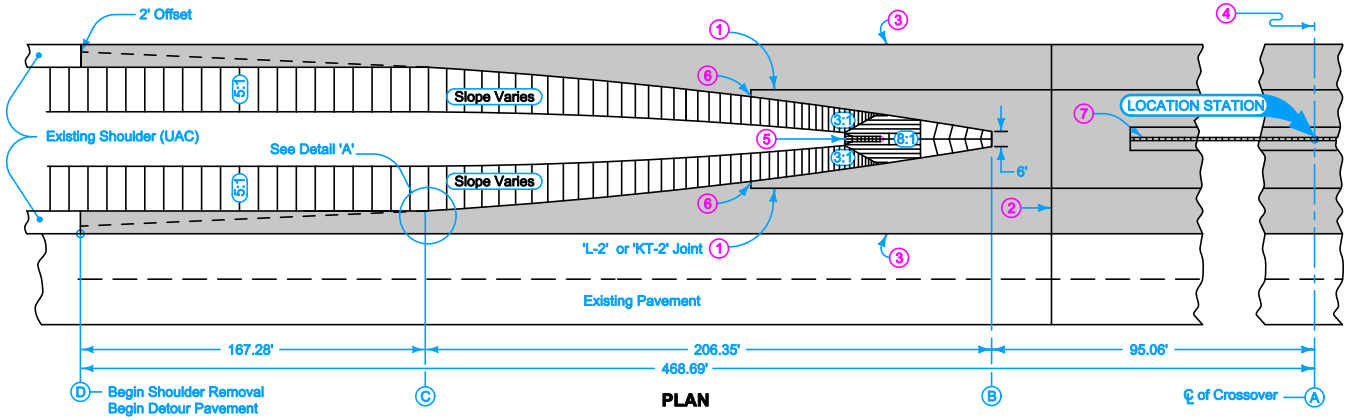
DETAIL 'A'



SECTION A-A



PERSPECTIVE VIEW
DITCH SLOPE AND BEVELED PIPE



PLAN

TABLE OF OFFSETS AND DROPS (PAVED SHOULDERS)

Distance from Location Station (Feet)	468.69	450	425	400	375	350	325	301.41	300	275	250	225	200	175	150	125	100	95.06	75.0	0
Offset from inside edge of Pavement (Feet)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.07	7.36	8.84	10.49	12.33	14.34	16.54	18.92	21.47	22.00	25.00	25.00
Cross-Slope from inside edge of Pavement	4.00%	3.33%	2.44%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Drop from inside edge of Pavement (Feet)	0.24	.20	0.15	0.12	0.12	0.12	0.12	0.12	0.13	.15	0.18	0.21	0.25	0.29	0.33	0.38	0.43	0.44	0.50	0.50
POINT LOCATION	Ⓓ							Ⓒ										Ⓑ		Ⓐ

Detour Pavement options: 9" PCC or 12" HMA

1. 'L-2' or 'KT-2' spaced at one-quarter median width. See PV-101.
2. For PCC pavement, match existing roadway joints. 'CD' joints are required. See PV-101.
3. 'KT-2' joint, bend bars out for new pavement only.
4. Median crossover is symmetrical about centerline.
5. Beveled pipe and guard. See RF-27.
6. 2 foot 'C' Joint.
7. Slotted drain for median crossover. See RF-45.

DESIGN QUANTITY TABLE

Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
2695	1265	215

Detour Pavement

Possible Contract Items:
- Granular Shoulders, Type A
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Removal of Pavement
- Special Backfill

Possible Tabulation:
112-8

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-19-11

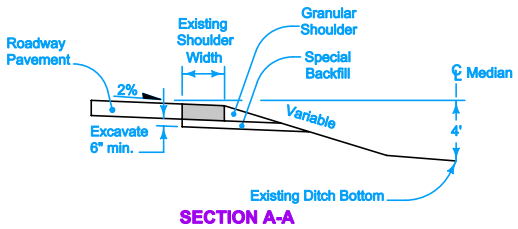
PV-500

SHEET 1 of 1

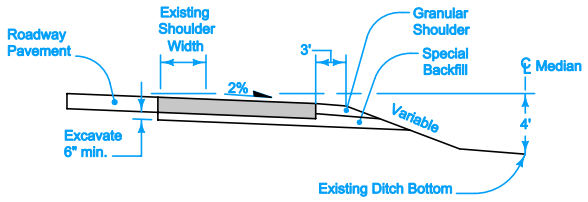
REVISIONS: Modified special backfill quantity. Added granular shoulder quantity.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

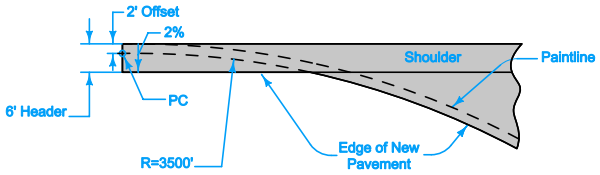
MEDIAN CROSSOVER (50' MEDIAN)



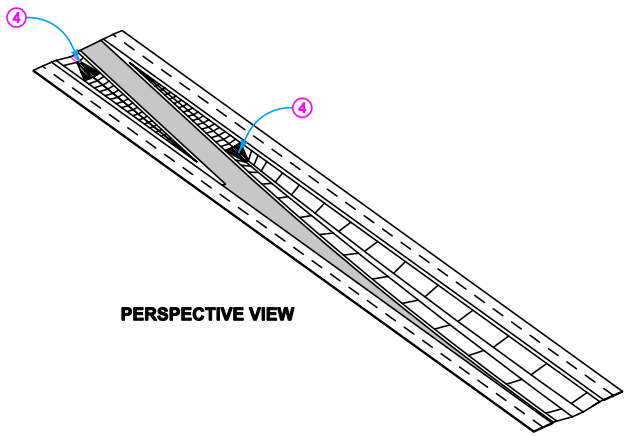
SECTION A-A



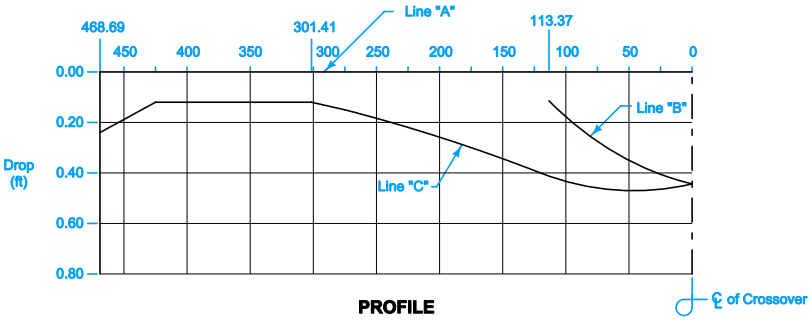
SECTION B-B



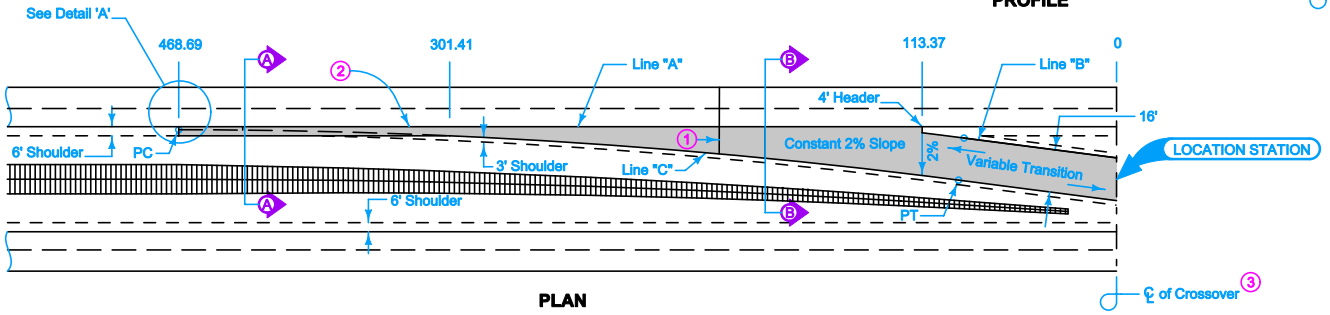
DETAIL 'A'



PERSPECTIVE VIEW



PROFILE



PLAN

TABLE OF OFFSETS AND DROPS

Distance (Feet)	468.69	450	400	350	301.41	300	275	250	225	200	175	150	125	113.37	100	75	50	25	0
Offset A to C (Feet)	6.00	6.00	6.00	6.00	6.00	6.07	7.36	8.84	10.49	12.33	14.34	16.54	18.92	20.08	21.47	24.21	27.13	30.08	33.06
Drop A to C (Feet)	0.24	0.20	0.12	0.12	0.12	0.13	0.15	0.18	0.21	0.25	0.29	0.33	0.38	0.40	0.43	0.46	0.47	0.46	0.44
Drop A to B (Feet)														0.08	0.18	0.27	0.35	0.41	0.44

Detour Pavement options: 9" PCC or 12" HMA

1. Match existing roadway joints. 'CD' joints are required. See PV-101.
2. 'KT-2' joint, bend bars out for new pavement only.
3. Median crossover is symmetrical about centerline.
4. Median pipe for crossover. See Detail 500-19.

DESIGN QUANTITY TABLE		
Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
1140	555	*185

*Quantity based on 8" shoulder depth.

Detour Pavement

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulders, Type A
- Removal of Pavement
- Special Backfill

Possible Tabulation:
112-8

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

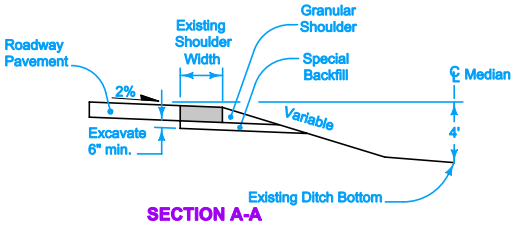
PV-501

SHEET 1 of 1

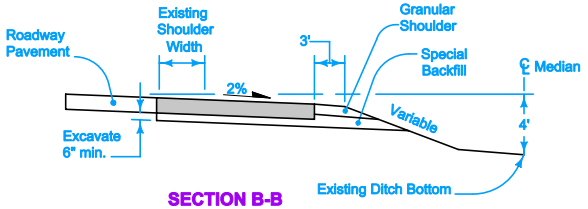
REVISIONS: Modified special backfill and granular shoulder quantities.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

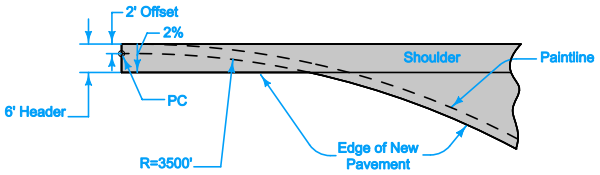
MEDIAN CROSSOVER (50' MEDIAN) 16' WIDE 1 LANE



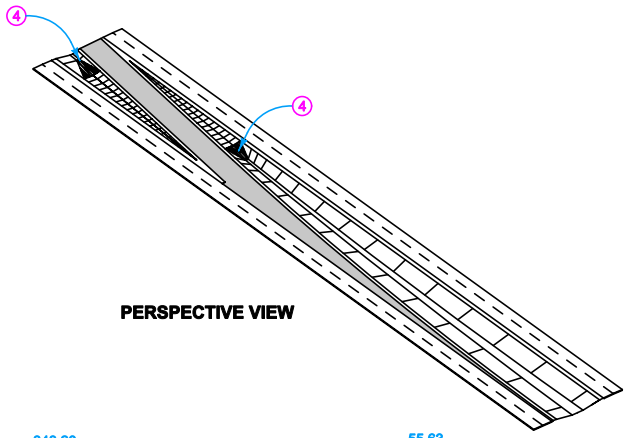
SECTION A-A



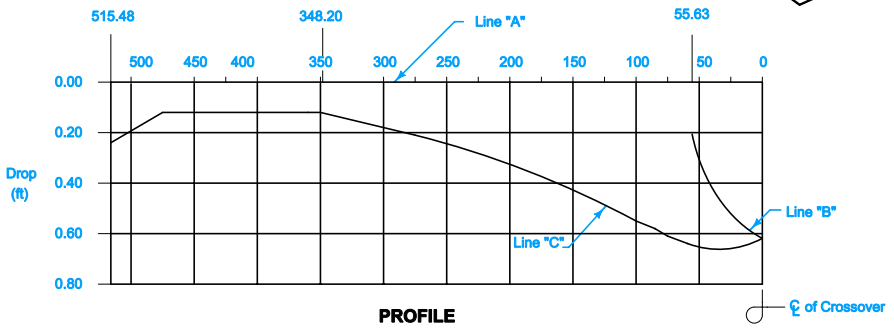
SECTION B-B



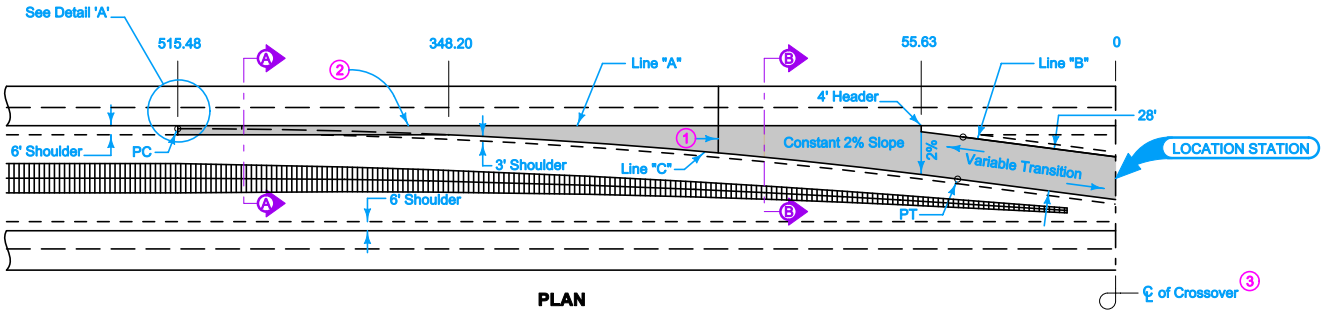
DETAIL 'A'



PERSPECTIVE VIEW



PROFILE



PLAN

TABLE OF OFFSETS AND DROPS																					
Distance (Feet)	515.48	500	450	400	350	348.20	325	300	275	250	225	200	175	150	125	100	75	55.63	50	25	0
Offset A to C (Feet)	6.00	6.00	6.00	6.00	6.00	6.00	7.19	8.64	10.27	12.08	14.07	16.25	18.60	21.13	23.85	26.75	29.81	32.21	32.91	36.01	39.11
Drop A to C (Feet)	0.24	0.21	0.12	0.12	0.12	0.12	0.14	0.17	0.21	0.24	0.28	0.33	0.37	0.42	0.48	0.54	0.60	0.64	0.65	0.66	0.62
Drop A to B (Feet)																		.08	0.31	0.52	0.62

Detour Pavement options: 9" PCC or 12" HMA

1. Match existing roadway joints. 'CD' joints are required. See PV-101.
2. 'KT-2' Joint, bend bars out for new pavement only.
3. Median crossover is symmetrical about centerline.
4. Median pipe for crossover. See Detail 500-19.

DESIGN QUANTITY TABLE		
Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
1685	725	*185

*Quantity based on 8" shoulder depth.

Detour Pavement

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulders, Type A
- Removal of Pavement
- Special Backfill

Possible Tabulation:
112-8

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	04-19-11

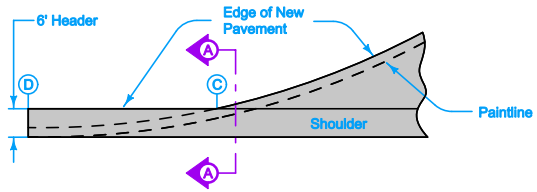
PV-502

SHEET 1 of 1

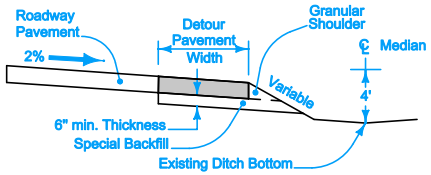
REVISIONS: Modified special backfill and granular shoulder quantities.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

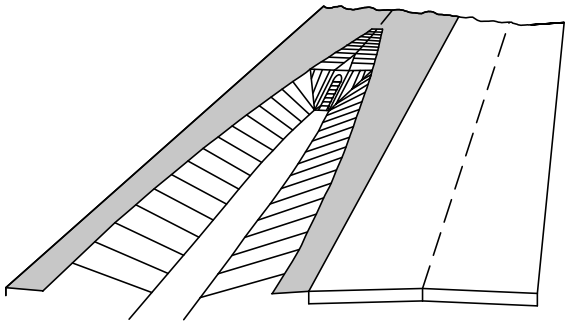
MEDIAN CROSSOVER (50' MEDIAN) 28' WIDE 2 LANE



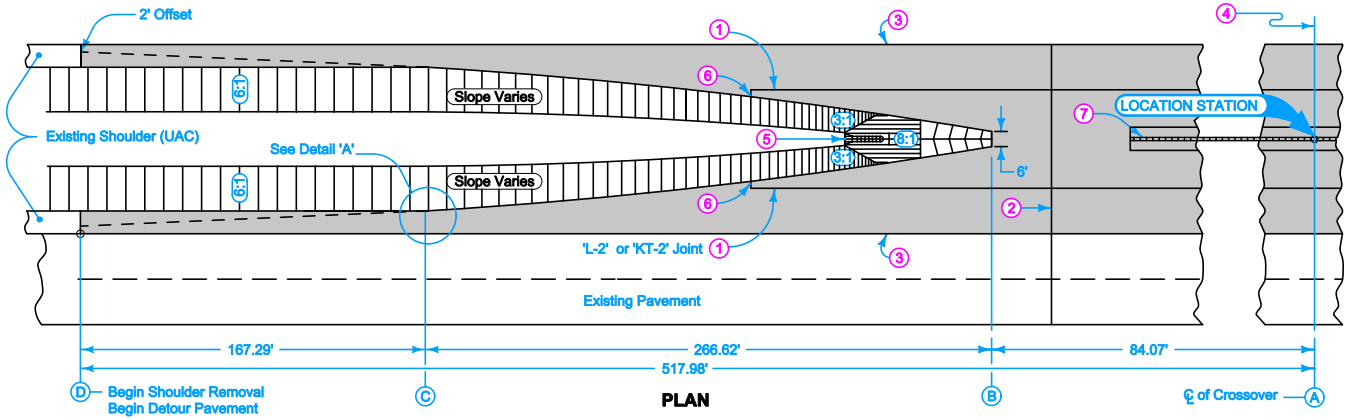
DETAIL 'A'



SECTION A-A



PERSPECTIVE VIEW
DITCH SLOPE AND BEVELED PIPE



PLAN

TABLE OF OFFSETS AND DROPS (PAVED SHOULDERS)

Distance from Location Station (Feet)	517.98	500	475	450	400	350.69	350	325	300	275	250	225	200	175	150	125	100	84.07	75.0	0
Offset from inside edge of Pavement (Feet)	6.00	6.00	6.00	6.00	6.00	6.00	6.03	7.32	8.79	10.44	12.27	14.28	16.47	18.84	21.40	24.13	27.05	30.00	32.00	32.00
Cross-Slope from inside edge of Pavement	4.00%	3.36%	2.47%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Drop from inside edge of Pavement (Feet)	0.24	0.20	0.15	0.12	0.12	0.12	0.12	0.15	0.18	0.21	0.25	0.29	0.33	0.38	0.43	0.48	0.54	0.58	0.64	0.64
POINT LOCATION	D					C												B		A

Detour Pavement options: 9" PCC or 12" HMA

1. 'L-2' or 'KT-2' spaced at one-quarter median width. See PV-101.
2. For PCC pavement, match existing roadway joints. 'CD' joints are required. See PV-101.
3. 'KT-2' joint, bend bars out for new pavement only.
4. Median crossover is symmestrical about centerline.
5. Beveled pipe and guard. See RF-27.
6. 2 foot 'C' joint.
7. Slotted drain for median crossover. See RF-45.

DESIGN QUANTITY TABLE

Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
3515	1700	340

Detour Pavement

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Removal of Pavement
- Special Backfill
- Granular Shoulders, Type A

Possible Tabulation:
112-8

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-19-11

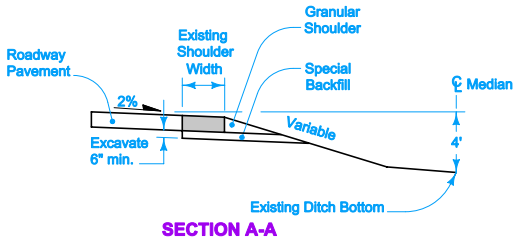
PV-503

SHEET 1 of 1

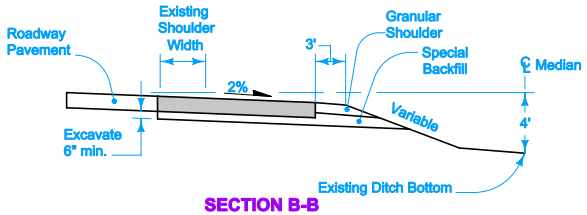
REVISIONS: Modified special backfill quantity. Added granular shoulder quantity.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

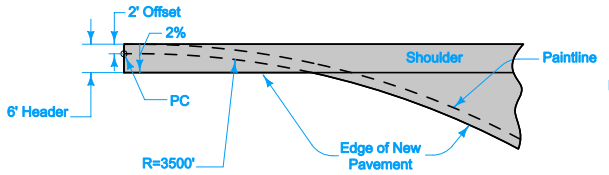
MEDIAN CROSSOVER (64' MEDIAN)



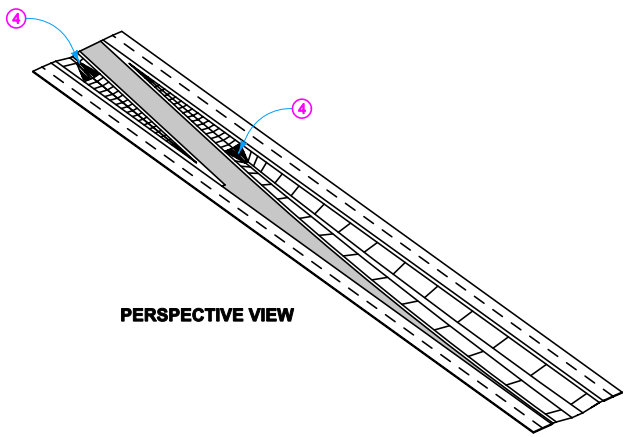
SECTION A-A



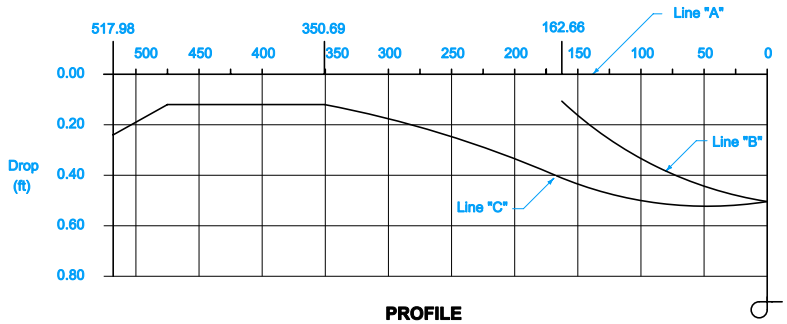
SECTION B-B



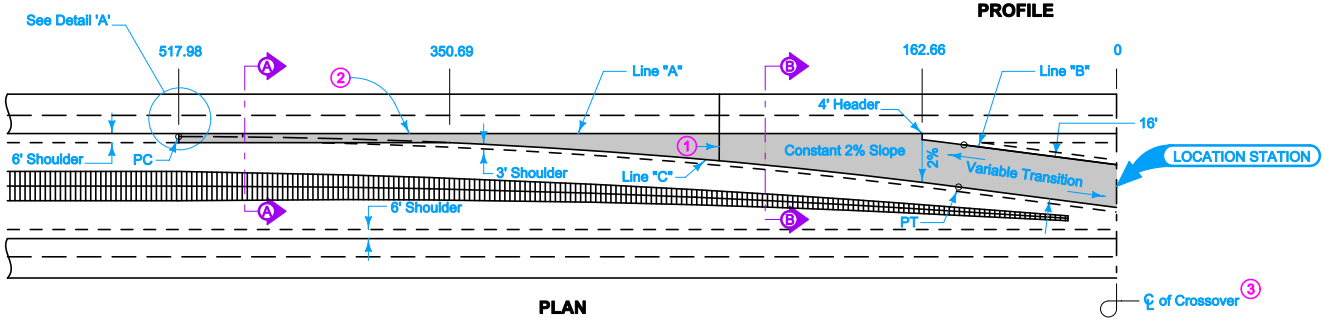
DETAIL 'A'



PERSPECTIVE VIEW



PROFILE



PLAN

TABLE OF OFFSETS AND DROPS																						
Distance (Feet)	517.98	500	450	400	350.69	350	325	300	275	250	225	200	175	162.66	150	125	100	75	50	25	0
Offset A to C (Feet)	6.00	6.00	6.00	6.00	6.00	6.03	7.32	8.79	10.44	12.79	14.28	16.47	18.84	20.08	21.40	24.13	27.05	30.15	33.42	36.75	40.07
Drop A to C (Feet)	0.24	0.20	0.12	0.12	0.12	0.12	0.15	0.18	0.21	0.26	0.29	0.33	0.38	0.40	0.43	0.47	0.50	0.52	0.52	0.52	0.50
Drop A to B (Feet)														0.08	0.17	0.26	0.33	0.40	0.44	0.48	0.50

Detour Pavement options: 9" PCC or 12" HMA

1. Match existing roadway joints. 'CD' joints are required. See PV-101.
2. KT-2 Joint, bend bars out for new pavement only.
3. Median crossover is symmetrical about centerline.
4. Median pipe for crossover. See Detail 500-19.

DESIGN QUANTITY TABLE		
Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
1320	645	*225

*Quantity based on 8" shoulder depth.

Detour Pavement

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulders, Type A
- Removal of Pavement
- Special Backfill

Possible Tabulation:
112-8

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

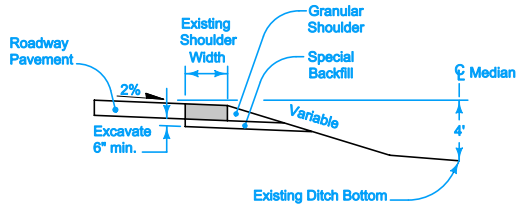
PV-504

SHEET 1 of 1

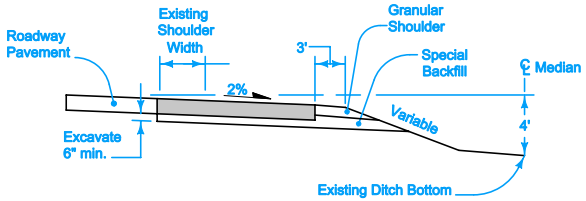
REVISIONS: Modified detour pavement, speicial backfill, and granular shoulder quantities.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

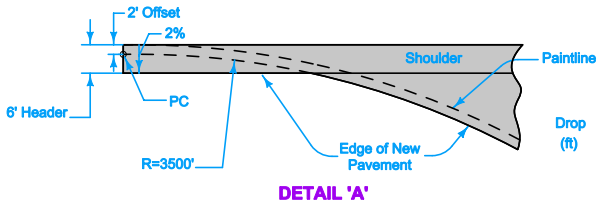
MEDIAN CROSSOVER (64' MEDIAN) 16' WIDE 1 LANE



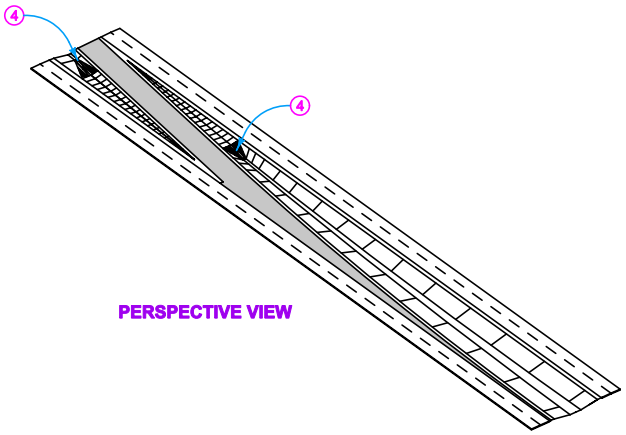
SECTION A-A



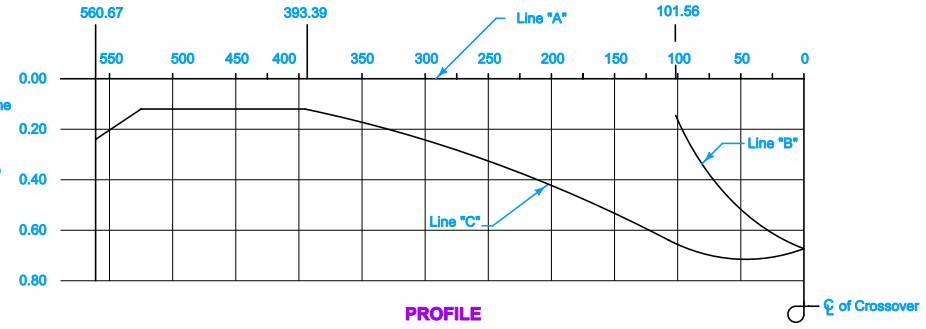
SECTION B-B



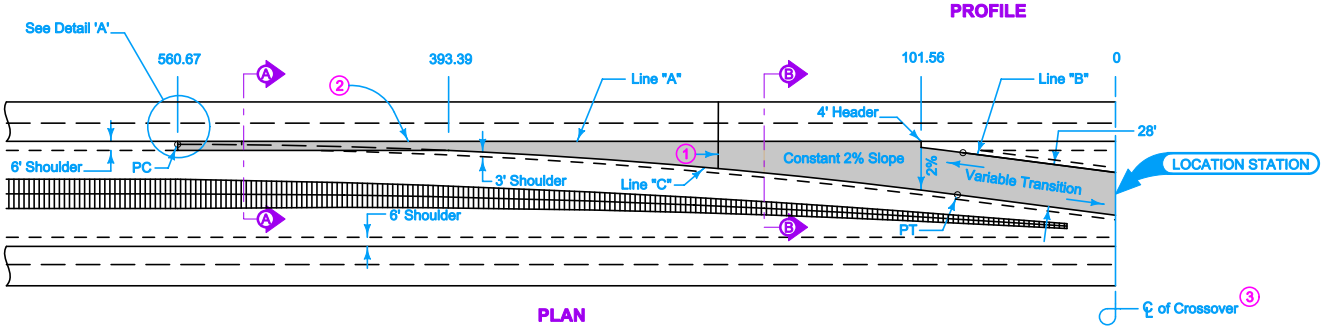
DETAIL 'A'



PERSPECTIVE VIEW



PROFILE



PLAN

Detour Pavement options: 9" PCC or 12" HMA

1. Match existing roadway joints. 'CD' joints are required. See PV-101.
2. KT-2 Joint, bend bars out for new pavement only.
3. Median crossover is symmetrical about centerline.
4. Median pipe for crossover. See Detail 500-19.

DESIGN QUANTITY TABLE		
Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
1970	845	*220

*Quantity based on 8" shoulder depth.

Detour Pavement

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulders, Type A
- Removal of Pavement
- Special Backfill

Possible Tabulation:
112-8

TABLE OF OFFSETS AND DROPS

Distance (Feet)	560.67	550	500	450	400	393.39	375	350	325	300	275	250	225	200	175	150	125	101.56	100	75	50	25	0
Offset A to C (Feet)	6.00	6.00	6.00	6.00	6.00	6.00	6.93	8.35	9.94	11.72	13.68	15.81	18.13	20.63	23.31	26.18	29.22	32.24	32.45	35.84	39.27	42.70	46.13
Drop A to C (Feet)	0.24	0.22	0.12	0.12	0.12	0.12	0.14	0.17	0.20	0.23	0.27	0.32	0.36	0.41	0.47	0.52	0.58	0.64	0.66	0.70	0.71	0.72	0.68
Drop A to B (Feet)																		0.08	0.16	0.38	0.52	0.61	0.68

Iowa Department of Transportation

REVISION: 1 — 04-19-11

STANDARD ROAD PLAN

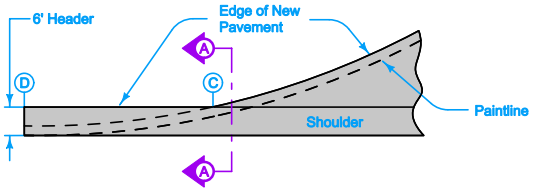
PV-505

SHEET 1 of 1

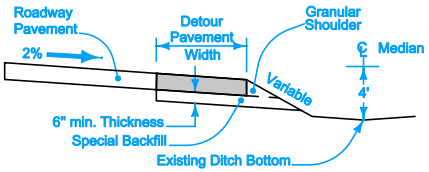
REVISIONS: Modified special backfill and granular shoulder quantities.

Deanna Maifeld
APPROVED BY DESIGN METHODS ENGINEER

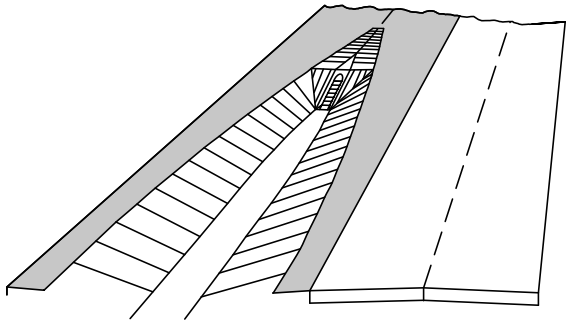
MEDIAN CROSSOVER (64' MEDIAN) 28' WIDE 2 LANE



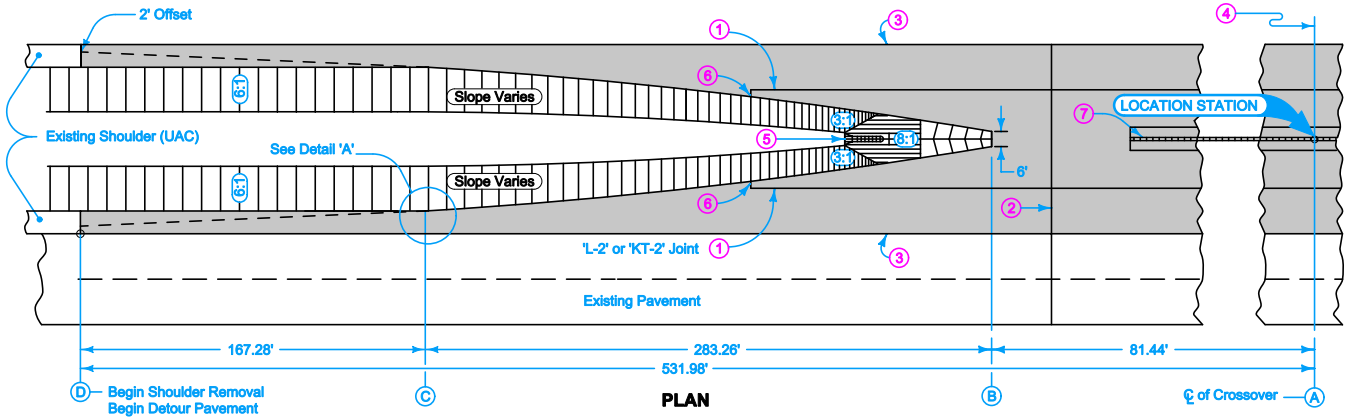
DETAIL 'A'



SECTION A-A



PERSPECTIVE VIEW
DITCH SLOPE AND BEVELED PIPE



PLAN

TABLE OF OFFSETS AND DROPS (PAVED SHOULDERS)																				
Distance from Location Station (Feet)	531.98	500	475	450	400	364.70	350	325	300	275	250	225	200	175	150	125	100	81.44	75.0	0
Offset from inside edge of Pavement (Feet)	6.00	6.00	6.00	6.00	6.00	6.00	7.11	8.55	10.17	11.98	13.96	16.12	18.47	20.99	23.70	26.59	29.66	32.12	34.12	34.12
Cross-Slope from inside edge of Pavement	4.00%	2.86%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Drop from inside edge of Pavement (Feet)	0.24	0.17	0.12	0.12	0.12	0.12	0.13	0.16	0.19	0.23	0.27	0.31	0.36	0.41	0.46	0.51	0.58	0.62	0.68	0.68
POINT LOCATION	(D)					(C)												(B)		(A)

Detour Pavement options: 9" PCC or 12" HMA

1. 'L-2' or 'KT-2' spaced at one-quarter median width. See PV-101.
2. For PCC pavement, match existing roadway joints. 'CD' joints are required. See PV-101.
3. 'KT-2' joint, bend bars out for new pavement only.
4. Median crossover is symmetrical about centerline.
5. Beveled pipe and guard. See RF-27.
6. 2 foot 'C' Joint.
7. Slotted drain for median crossover. See RF-45.

DESIGN QUANTITY TABLE		
Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
3775	1810	350

Detour Pavement

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Removal of Pavement
- Special Backfill
- Granular Shoulders, Type A

Possible Tabulation:
112-8

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-19-11

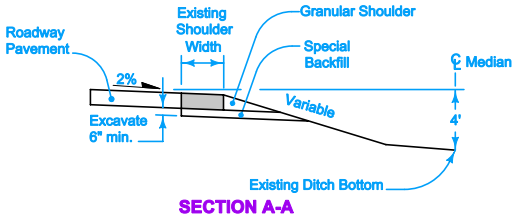
PV-506

SHEET 1 of 1

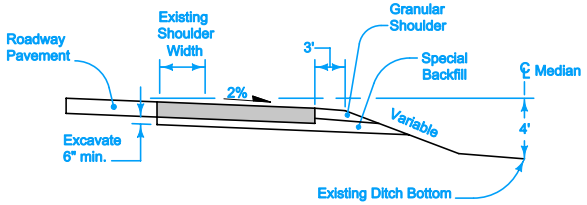
REVISIONS: Modified detour pavement and special backfill quantities. Added granular shoulder quantity.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

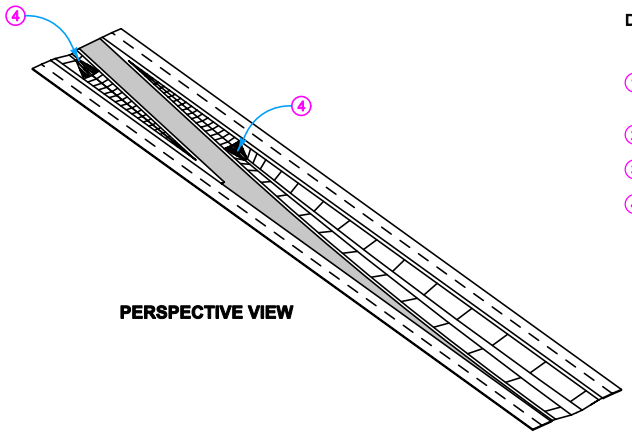
MEDIAN CROSSOVER (68.24' MEDIAN)



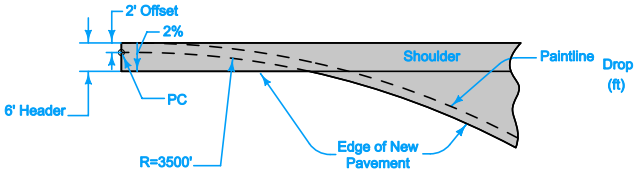
SECTION A-A



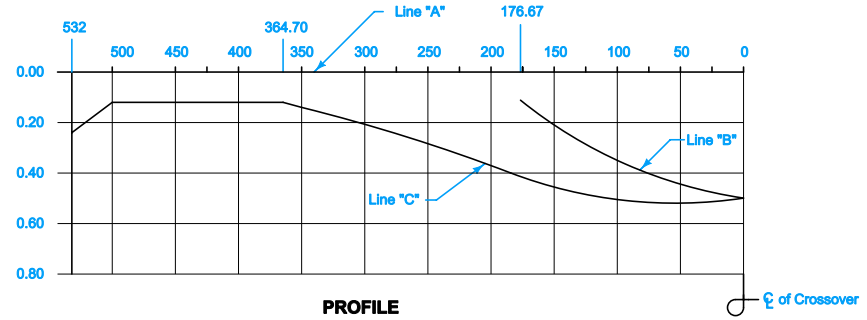
SECTION B-B



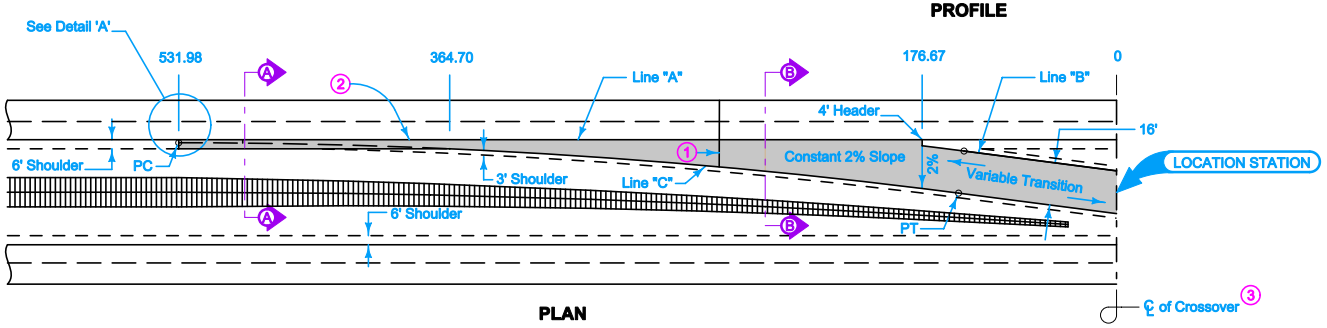
PERSPECTIVE VIEW



DETAIL 'A'



PROFILE



PLAN

TABLE OF OFFSETS AND DROPS																					
Distance (Feet)	531.98	500	450	400	364.70	350	325	300	275	250	225	200	176.67	175	150	125	100	75	50	25	0
Offset A to C (Feet)	6.00	6.00	6.00	6.00	6.00	6.73	8.13	9.70	11.45	13.38	15.49	17.78	20.08	20.25	22.91	25.74	28.76	31.96	35.34	38.77	42.19
Drop A to C (Feet)	0.24	0.17	0.12	0.12	0.12	0.13	0.16	0.19	0.23	0.27	0.31	0.36	0.40	0.42	0.46	0.48	0.50	0.52	0.52	0.51	0.50
Drop A to B (Feet)													0.08	0.12	0.21	0.29	0.35	0.40	0.44	0.48	0.50

Detour Pavement options: 9" PCC or 12" HMA

1. Match existing roadway joints. 'CD' joints are required. See PV-101.
2. 'KT-2' Joint, bend bars out for new pavement only.
3. Median crossover is symmetrical about centerline.
4. Median pipe for crossover. See Detail 500-19.

DESIGN QUANTITY TABLE		
Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
1370	670	*240

*Quantity based on 8" shoulder depth.

Detour Pavement

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulder, Type A
- Removal of Pavement
- Special Backfill

Possible Tabulation:
112-8

Iowa Department of Transportation

REVISION
1 | 04-19-11

STANDARD ROAD PLAN

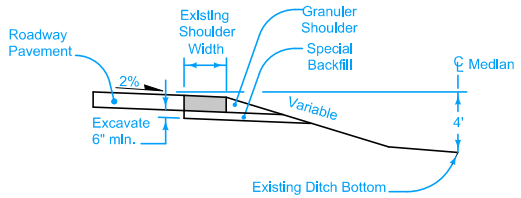
PV-507

SHEET 1 of 1

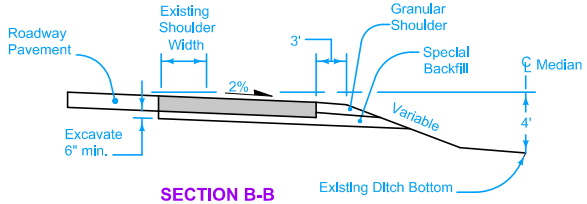
REVISIONS: Modified detour pavement, special backfill and granular shoulder quantities.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

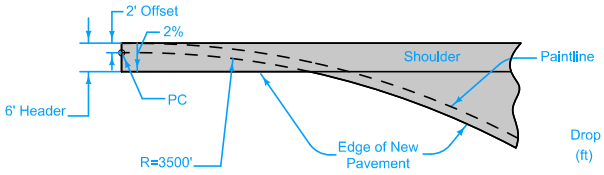
MEDIAN CROSSOVER
(68.24' MEDIAN)
16' WIDE 1 LANE



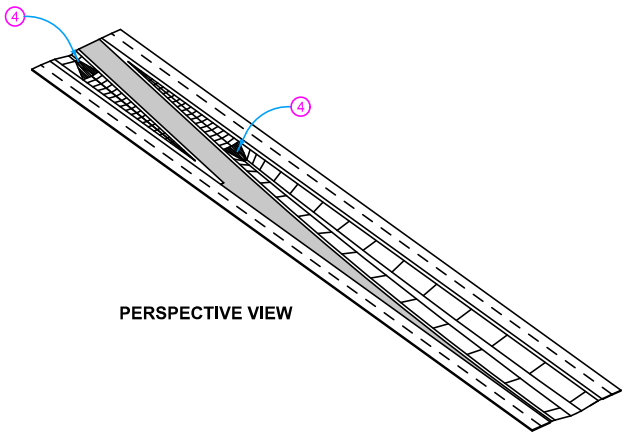
SECTION A-A



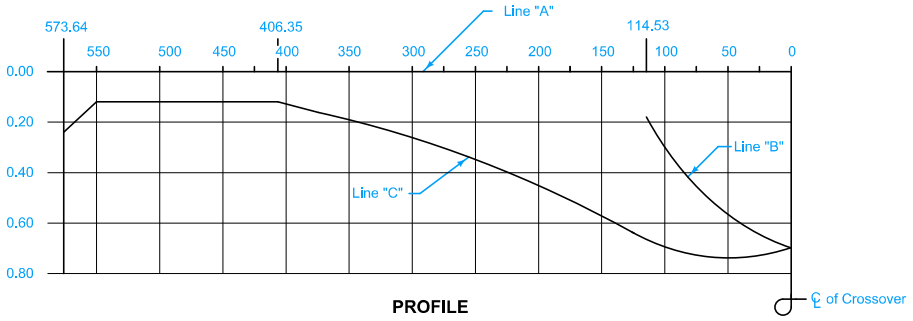
SECTION B-B



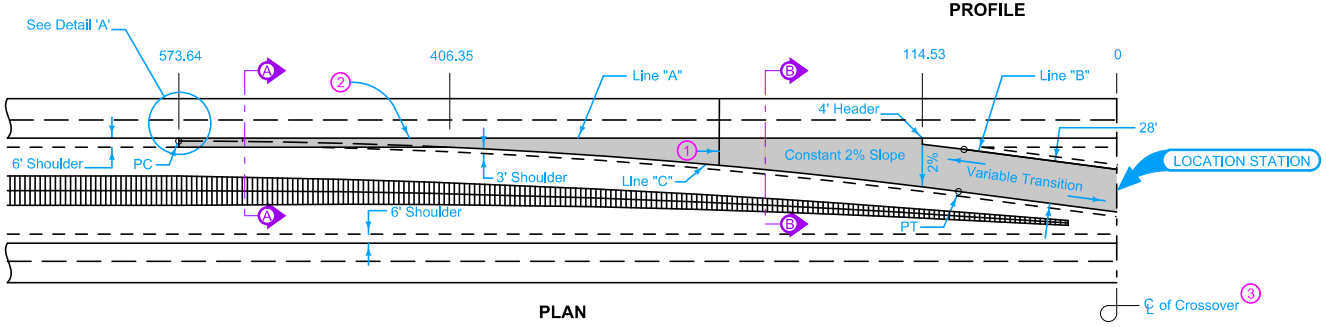
DETAIL 'A'



PERSPECTIVE VIEW



PROFILE



PLAN

Detour Pavement options: 9" PCC or 12" HMA

1. Match existing roadway joints. 'CD' joints are required. See PV-101.
2. 'KT-2' Joint, bend bars out for new pavement only.
3. Median crossover is symmetrical about centerline.
4. Median pipe for crossover. See Detail 500-19.

DESIGN QUANTITY TABLE		
Detour Pavement Sq. Yds.	Special Backfill Tons	Granular Shoulder Tons
2050	880	*230

*Quantity based on 8" shoulder depth.

Detour Pavement

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulder, Type A
- Removal of Pavement
- Special Backfill

Possible Tabulation:
112-8

TABLE OF OFFSETS AND DROPS																								
Distance (Feet)	573.64	550	500	450	406.35	400	375	350	325	300	275	250	225	200	175	150	125	114.53	100	75	50	25	0
Offset A to C (Feet)	6.00	6.00	6.00	6.00	6.00	6.31	7.64	9.15	10.84	12.71	14.76	16.99	19.41	22.00	24.78	27.73	30.87	32.24	34.20	37.69	41.21	44.73	48.26
Drop A to C (Feet)	0.24	0.19	0.12	0.12	0.12	0.13	0.15	0.18	0.22	0.25	0.30	0.34	0.40	0.44	0.50	0.55	0.62	0.64	0.70	0.73	0.74	0.73	0.70
Drop A to B (Feet)																		0.08	0.30	0.45	0.56	0.64	0.70

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	04-19-11

PV-508

SHEET 1 of 1

REVISIONS: Modified special backfill and granular shoulder quantities.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

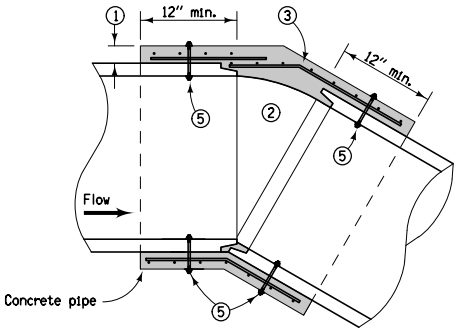
MEDIAN CROSSOVER (68.24' MEDIAN) 28' WIDE 2 LANE

Drainage

RF

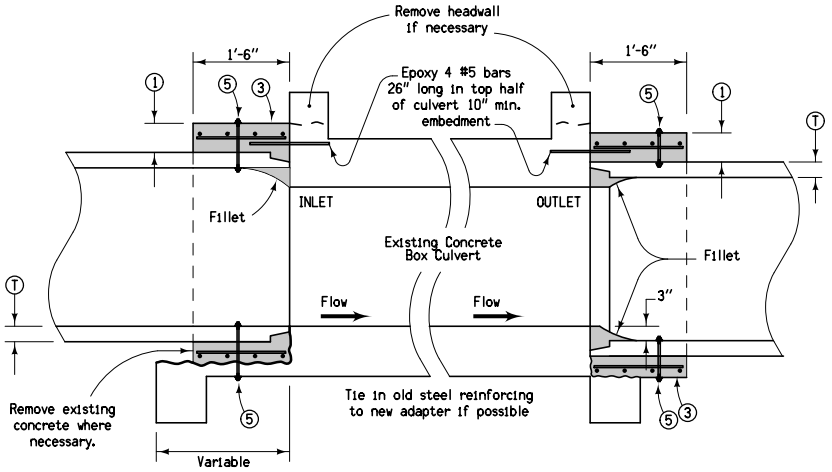
Drainage

NO.	DATE	TITLE
RF-2	10-18-11	Construction of Type "C" Concrete Adaptors for Pipe Culvert Connections
RF-3	10-18-11	Concrete Aprons
RF-5	10-03-00	Metal Pipe Aprons and Beveled Ends
RF-7	10-16-07	Corrugated Metal Type "A" Diaphragm
RF-8	10-28-97	Precast Stock Pass
RF-13	10-18-11	Pipe Bends and Half Pipe
RF-14	10-18-11	Connected Pipe Joints
RF-19A	07-15-97	Subdrains for Fill or Foundation Drainage (Standard)
RF-19B	04-17-12	Subdrains Standard (Farm Tile Replacement)
RF-19C	10-19-10	Subdrains (Longitudinal)
RF-19E	10-20-09	Outlets for Longitudinal, Transverse and Backslope Subdrains
RF-19F	04-25-00	Subdrain Outlets (Standard Subdrain, Pressure Release and Special)
RF-21	10-18-11	Culvert Pipe Tee Sections
RF-26	10-18-11	Pipe Apron Guard
RF-27	10-19-10	Beveled Pipe and Guard
RF-29	04-20-10	Safety Grates for Box Culverts
RF-30A	10-19-10	Culvert (Bedding and Backfill)
RF-30B	10-19-10	Pipe Culvert (Cover and Camber)
RF-30C	04-30-02	Pipe Culvert (Installation Details)
RF-31	03-28-95	Depth of Cover Tables for Concrete Pipe
RF-32	10-19-10	Depth of Cover Tables for Corrugated Pipe
RF-38	04-20-10	Intake for Bridge End Drain
RF-39	04-19-11	Scour Protection for Bridge End Drain
RF-40	10-19-10	Rock Flume for Bridge End Drain
RF-42	04-17-12	Low Clearance Pipe Aprons
RF-43	10-03-00	Metal Arch Aprons (for Corrugated Metal Pipe)
RF-44	10-03-00	Metal Safety Slope Apron 6:1 Slope
RF-45	10-19-10	Slotted Drain for Median Crossovers



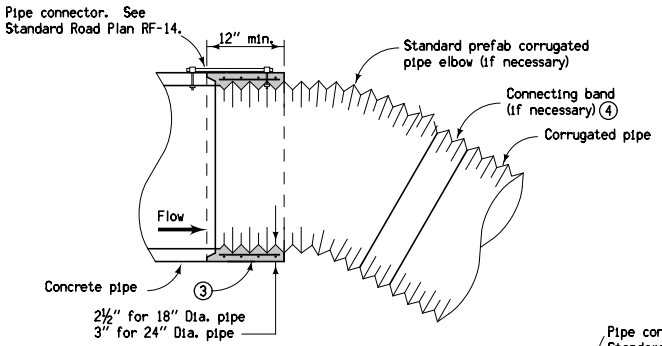
CONCRETE PIPE TO CONCRETE PIPE

TYPE "C-1"



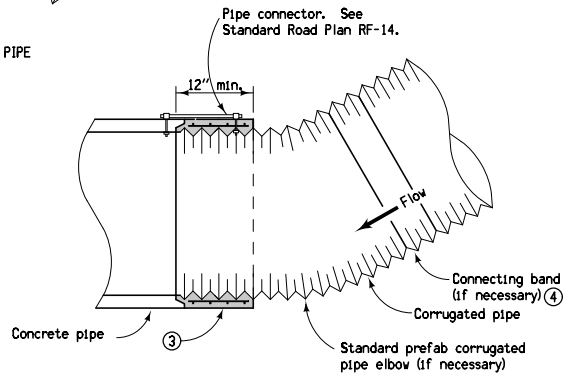
CONCRETE PIPE TO CONCRETE BOX CULVERT

TYPE "C-2"



CONCRETE PIPE TO CORRUGATED PIPE

TYPE "C-3"



CORRUGATED PIPE TO CONCRETE PIPE

TYPE "C-4"

ESTIMATED ENCASEMENT QUANTITIES PER LINEAR FOOT FOR "C-2" ADAPTORS			
Diameter, D inches	Concrete cu. yds.	Wire Mesh lbs.	Concrete for Fillet ("C-2") cu. yds.
15	0.1	2.0	N.A.
18	0.1	2.3	N.A.
21	0.1	2.6	N.A.
24	0.1	2.8	N.A.
30	0.2	3.4	0.1
36	0.2	4.0	0.1
42	0.2	4.5	0.1
48	0.3	5.1	0.1
54	0.3	5.7	0.1
60	0.4	6.2	0.1
66	0.5	6.9	0.1
72	0.6	7.5	0.1
78	0.6	8.1	0.1
84	0.7	8.7	0.1

(2000 D and 3000 D Pipe)

No payment will be made for individual adaptors.

The cost of furnishing all materials and constructing adaptor as indicated will be considered incidental to the pipe culvert.

The cost of removing and disposing, as directed, of any necessary headwall, wingwall or other concrete, shall be bid as "Removal of Existing Structures".

Type "C-1" and "C-2" adaptors shall be formed and constructed on the job site by methods approved by the Engineer.

Type "C-3" and "C-4" adaptors may be shop fabricated by a method approved by the Engineer for attaching a concrete collar (either tongue or groove end) to a standard section of corrugated pipe. Holes may be field drilled in corrugated pipe to match alignment with concrete pipe.

1. Thickness same as pipe thickness (T) but not less than 4 inches.
2. Opening between pipes shall be carefully grouted.
3. Minimum reinforcing shall be steel wire mesh 6" x 6" - W2 No. 8 wire - 30 lbs/100 sq. ft. Lap ends 6 inches.
4. Positive type joint coupling required.
5. 5/8" (min.) bolts in 7/8" (min.) holes. Four bolts around each connection at equal intervals. Existing pipe connector holes may be used if available; place remaining two bolts at approximate equal intervals.
T. Thickness of wall of concrete pipe. See AASHTO M 170.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 10 10-18-11

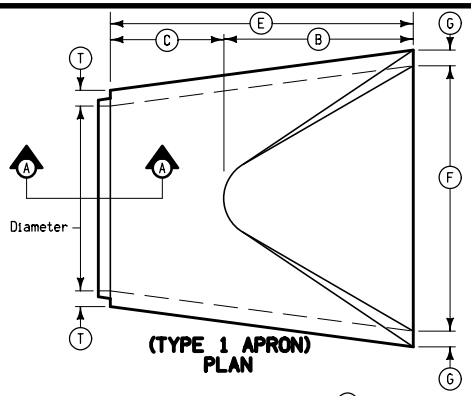
RF-2

SHEET 1 of 1

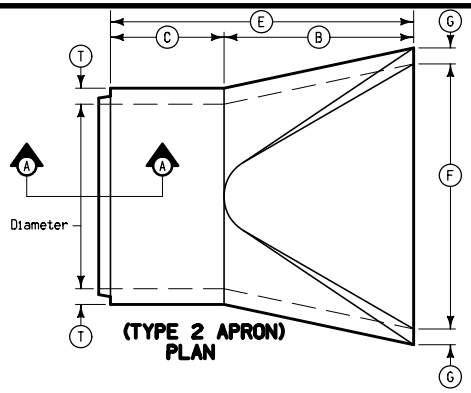
REVISIONS: Modified circle note 5 to allow lift holes to be used for tie rods. Changed RF-1 reference to AASHTO M 170.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CONSTRUCTION OF TYPE 'C' CONCRETE ADAPTERS FOR PIPE CULVERT CONNECTIONS



(TYPE 1 APRON)
PLAN

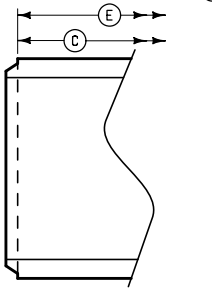


(TYPE 2 APRON)
PLAN

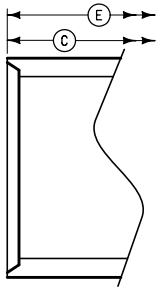
Dimension 'E' shown is minimum and shall be considered the design length. Any difference between the actual length of concrete apron installed and the length indicated hereon shall be appropriately adjusted for in the length of concrete culvert pipe furnished.

When specified in the contract documents, pipe apron guards shall be installed as shown on RF-26. Pipe apron guards will not be measured separately for payment, but shall be included in the contract unit price for "Concrete Aprons."

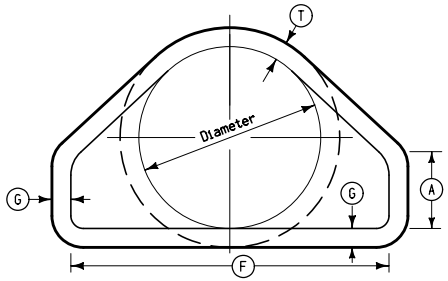
(1) Tongue end used on inlet end section. Groove end used on outlet end section. Comply with AASHTO M 170 for tongue and groove dimensions.



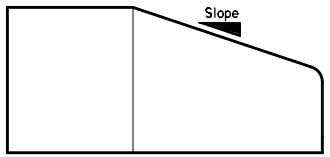
SECTION A-A
TONGUE END DETAIL (1)



SECTION A-A
GROOVE END DETAIL (1)



(TYPE 1 AND TYPE 2 APRONS)
END VIEW



SIDE VIEW

TYPE 1 APRONS								
DIAM.	SLOPE	A	B	MINIMUM C	MINIMUM E	F	G	T
12″	2.4:1	4″	2′-0″	4′-⅞″	6′-⅞″	2′-0″	2″	2″
15″	2.4:1	6″	2′-3″	3′-10″	6′-1″	2′-6″	2¼″	2¼″
18″	2.3:1	9″	2′-3″	3′-10″	6′-1″	3′-0″	2½″	2½″
21″	2.4:1	9″	3′-0 ″	3′-1½″	6′-1½″	3′-5″	3″	3″
24″	2.5:1	9½″	3′-7½″	2′-6″	6′-1½″	4′-0″	3″	3″
27″	2.5:1	10½″	4′-1 ″	2′-0″	6′-1½″	4′-4″	3½″	3½″
30″	2.5:1	12″	4′-6″	1′-7¾″	6′-1¾″	5′-0″	3½″	3½″
36″	2.5:1	15″	5′-3″	2′-9″	8′-0″	6′-0″	4″	4″
42″	2.5:1	21″	5′-3″	2′-9″	8′-0″	6′-6″	4½″	4½″
48″	2.5:1	24″	6′-0″	2′-0″	8′-0″	7′-0″	5″	5″
54″	1.8:1	27″	5′-0″	3′-0″	8′-0″	7′-6″	5½″	5½″
60″	1.6:1	29½″	5′-0″	3′-0″	8′-0″	8′-0″	5½″	6″
66″	1.7:1	30″	6′-0″	2′-3″	8′-3″	8′-0″	5½″	6″
72″	1.6:1	30″	6′-6″	1′-9″	8′-3″	9′-0″	6″	7″
78″	1.8:1	36″	7′-6″	1′-9″	9′-3″	9′-6″	6½″	7½″
84″	1.3:1	29½″	6′-9″	2′-6½″	9′-3½″	10′-0″	6½″	8″

TYPE 2 APRONS								
DIAM.	SLOPE	A	B	MINIMUM C	MINIMUM E	F	G	T
12″	2.4:1	4″	2′-0″	4′-⅞″	6′-⅞″	2′-0″	2″	2″
15″	2.4:1	6″	2′-3″	3′-10″	6′-1″	2′-6″	2¼″	2¼″
18″	2.3:1	9″	2′-3″	3′-10″	6′-1″	3′-0″	2½″	2½″
21″	2.4:1	9″	3′-0″	3′-1½″	6′-1½″	3′-5″	3″	3″
24″	2.5:1	9½″	3′-7½″	2′-6″	6′-1½″	4′-0″	3″	3″
27″	2.5:1	10½″	4′-1 ″	2′-0″	6′-1½″	4′-4″	3½″	3½″
30″	2.5:1	12″	4′-6″	1′-7¾″	6′-1¾″	5′-0″	3½″	3½″
36″	2.5:1	15″	5′-3″	2′-9″	8′-0″	6′-0″	4″	4″
42″	2.5:1	21″	5′-3″	2′-9″	8′-0″	6′-6″	4½″	4½″
48″	2.5:1	24″	6′-0″	2′-0″	8′-0″	7′-0″	5″	5″
54″	1.9:1	24½″	5′-5″	2′-7″	8′-0″	7′-6″	5½″	5½″
60″	1.4:1	24½″	5′-0″	3′-0″	8′-0″	8′-0″	5½″	6″
66″	1.7:1	30″	6′-0″	2′-3″	8′-3″	8′-0″	5½″	6″
72″	1.4:1	24″	6′-6″	1′-9″	8′-3″	9′-0″	6″	7″
78″	1.8:1	36″	7′-6″	1′-9″	9′-3″	9′-6″	6½″	7½″
84″	1.5:1	23½″	7′-6½″	1′-9″	9′-3½″	10′-0″	6½″	8″

Contract Item:

Apron, Concrete

Tabulations:

104-3
104-5C

Iowa Department of Transportation

REVISION
9 10-18-11

STANDARD ROAD PLAN

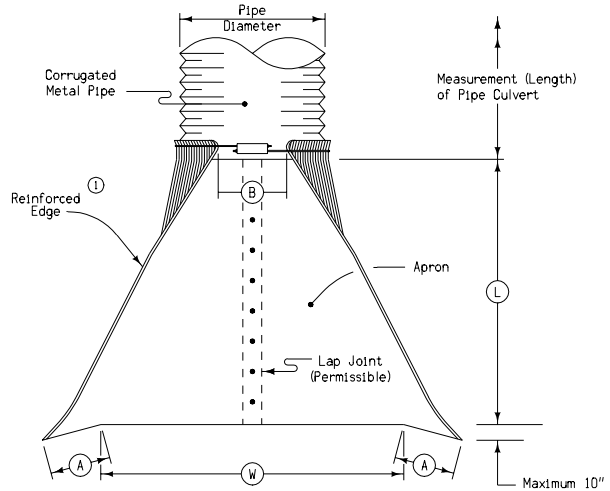
RF-3

SHEET 1 of 1

REVISIONS: Corrected 'A' dimension. Removed references to RF-1. Removed language added to Specifications.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CONCRETE APRONS



PLAN VIEW

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"

GENERAL NOTES:

Metal pipe aprons and hardware shall be constructed of galvanized steel in conformance with the requirements of the current Standard and Supplemental Specifications for Corrugated Culverts and essentially as indicated hereon. Refer to other appropriate Standards Road Plans as well as project plans for additional details of individual culvert installations. Alternate design details may be submitted to the Engineer for approval.

Aprons may be attached to culvert pipe as follows:

A. If normal culvert is of circumferential corrugation type use an approved bolt or clamp to fasten apron directly to culvert.

B. If normal culvert is of helical corrugation type:
   1. Use an approved sizing ring securely fastened to inside diameter of apron to connect to the culvert pipe using special dimple band connector.
   2. "Dimple" bands are not allowed when a positive joint is specified.

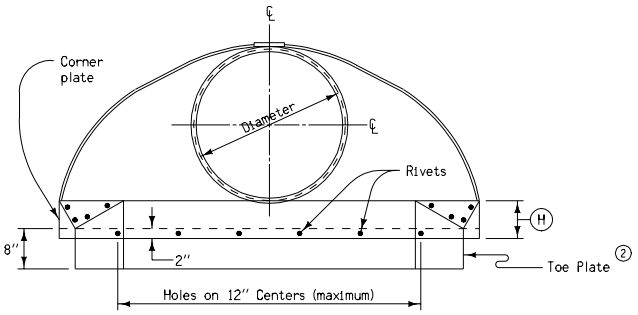
See Materials I.M. 441 for Approved Coupling Devices and specific requirements.

Any damage to spelter Coat resulting from installation of culvert shall be repaired as directed by the Engineer.

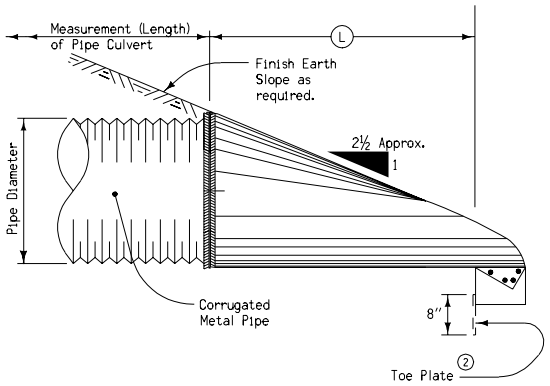
Price bid for "Metal Aprons" shall be considered full compensation for fabrication and installation of the metal apron as detailed hereon.

(1) On sizes 60" and larger, the reinforced edge should be supplemented with a galvanized stiffener angle attached with bolts.

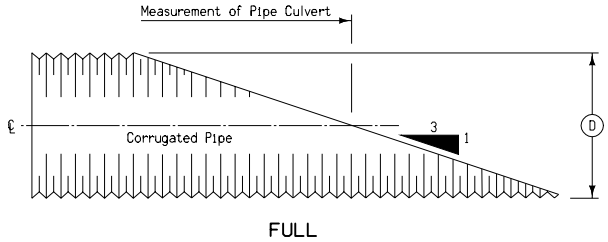
(2) Galvanized Toe Plate (Same gage metal as apron) shall be installed on all aprons 24" diameter and larger.



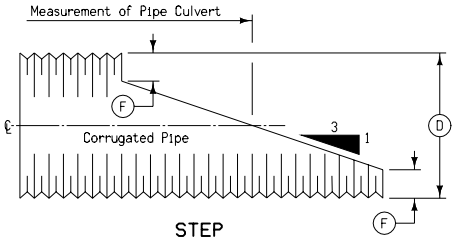
END VIEW



SIDE VIEW



FULL



STEP

BEVEL 3:1	
D	F
54"	3"
60"	6"
66"	9"
72"	12"
78"	15"
84"	18"
90"	21"
96"	24"

NOTE:

When specifically required as part of detail project plans, ends of pipe culvert may be provided with beveled ends as shown.

Either Full Bevel or Step Bevel may be used unless one type is specified. Unless specified otherwise, the slope of the bevel shall be 3:1.

Beveled ends will not be paid for separately but, when required, shall be considered incidental to the price bid for the culvert.

BEVELED ENDS FOR CORRUGATED METAL PIPE

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN | **RF-5**

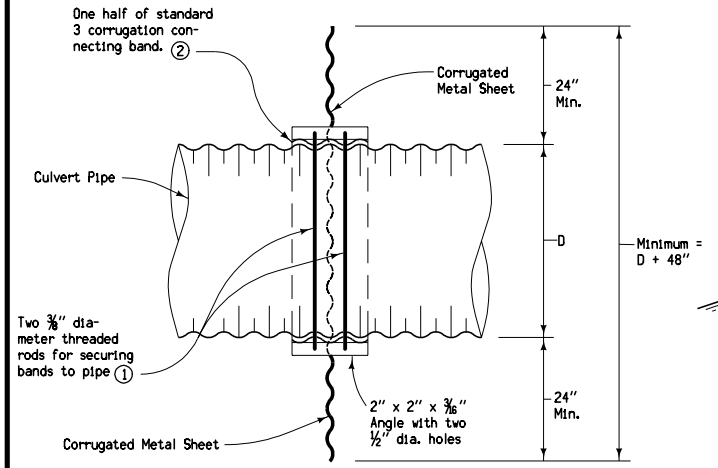
REVISION: Delete M Distance

REVISION NO. 7

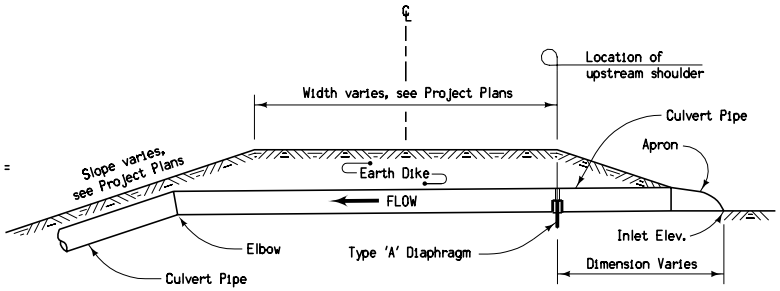
REVISION DATE 10-03-00

APPROVED BY DESIGN METHODS ENGINEER

METAL PIPE APRONS AND BEVELED ENDS

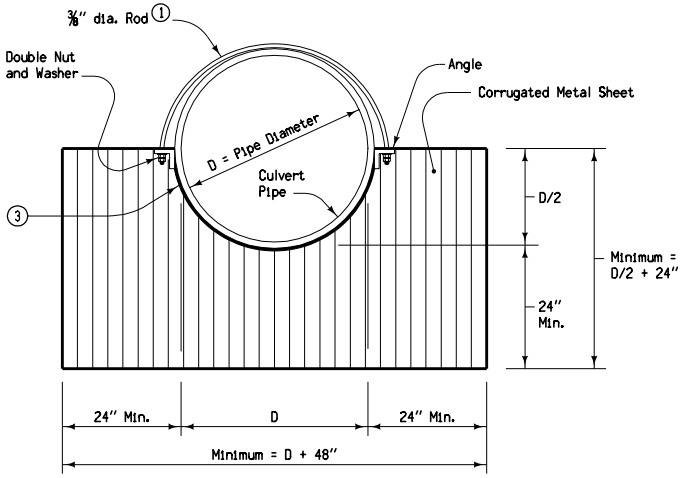


PLAN VIEW

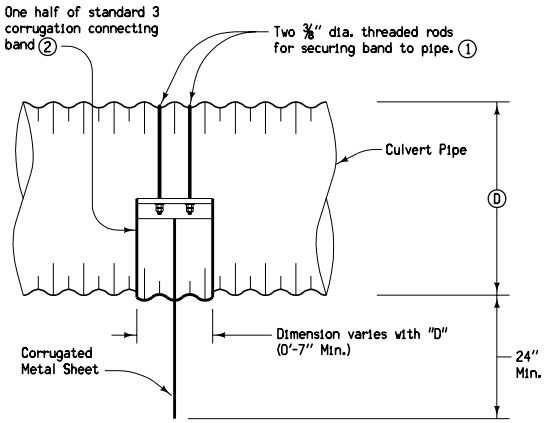


TYPICAL SECTION OF INSTALLATION

Place diaphragm below upstream shoulder of dike unless otherwise specified on Project Plans.



END VIEW



SIDE VIEW

Type 'A' Diaphragm is an anti-seep device for use on letdown structures and shall be installed directly below the upstream shoulder of the dike.

Type 'A' Diaphragm shall consist of a sheet of corrugated metal of the dimensions indicated hereon and of the same thickness as the pipe used for culvert pipe. This sheet may be fabricated from one or more sheets of corrugated metal. If two or more sheets are used, they shall be lapped a minimum of one corrugation and welded or riveted at a minimum of 3 inch centers along the seam. The sheet shall be welded on both sides to a standard half connecting band of dimensions indicated hereon. This assembly shall then be securely attached to the pipe by means of two 3/8-inch diameter rods of appropriate length placed in two adjacent valleys of the corrugated pipe and threaded with double nut and washer.

Details are shown using corrugated metal culvert pipe. Appropriate modifications as indicated, subject to the approval of the Engineer, shall be made as necessary where concrete culvert pipe is used. Plastic diaphragms shall be used when connecting to plastic pipe.

(1) Normal half of connecting band may be used in lieu of rods when approved by the Engineer.

(2) Use flat steel band of equivalent dimensions where Type 'A' Corrugated Metal Diaphragm is to be installed on Concrete Culvert pipe.

(3) Corrugated metal sheet shall be continuously welded to the connecting band. Shape to fit outside pipe diameter.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
6	10-16-07

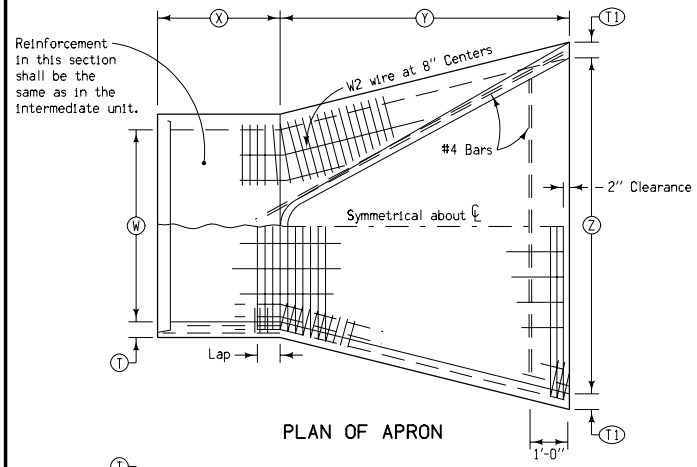
RF-7

SHEET 1 of 1

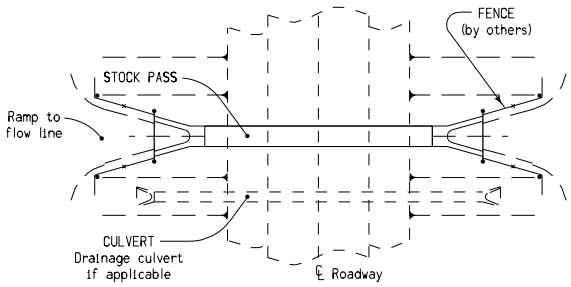
REVISIONS: Added note for use of plastic diaphragm.

Deanna Maifeld
APPROVED BY DESIGN METHODS ENGINEER

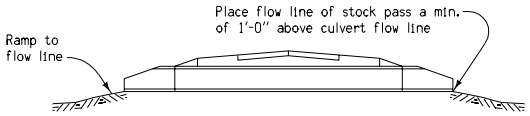
CORRUGATED METAL TYPE 'A' DIAPHRAGM



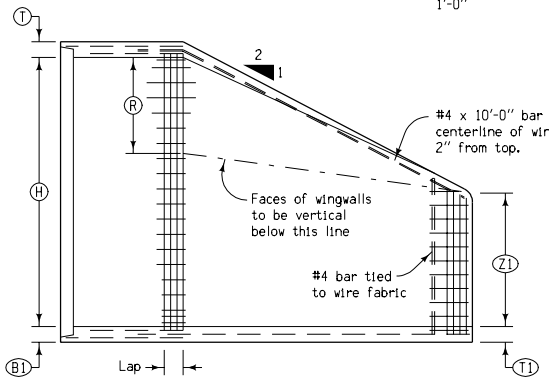
PLAN OF APRON



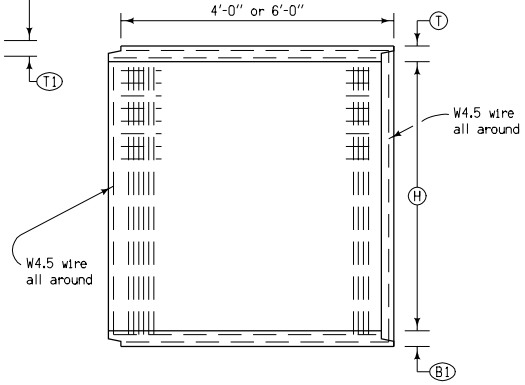
PLAN



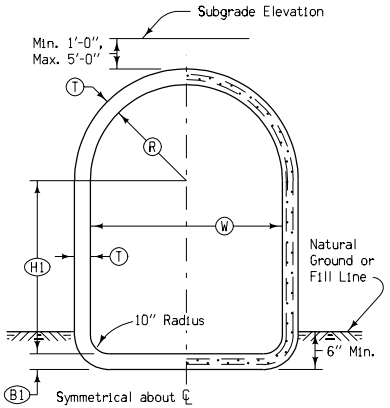
LONGITUDINAL SECTION



APRON LONGITUDINAL SECTION



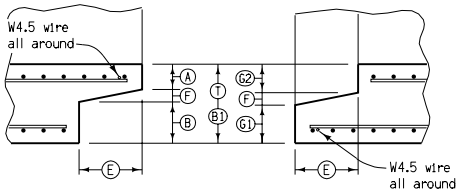
DETAIL OF INTERMEDIATE UNIT



Excavation below ground line shall be made with a template conforming to the shape of the stockpass.

END VIEW

(With Installation Details)



DETAIL OF TONGUE AND GROOVE

GENERAL NOTES:

This plan shows the construction and installation details for precast stock passes. Details indicated are typical. Alternate designs or methods may be submitted to the Engineer for approval.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

The construction and installation of precast stock passes shall conform to the requirements in the section, "Rigid Pipe Culverts," of the specifications insofar as applicable.

Price bid for "Precast Concrete Stockpass Apron", each, and "Precast Concrete Stockpass", of the size specified in feet, shall be considered full compensation for fabrication and installation of stockpass as detailed hereon and as shown on detail project plans.

Reinforcing for intermediate unit shall be W8 wires at 2" centers for interior hoops and W5 wires at 2" centers for exterior hoops, with W2 longitudinal wires at 8" centers interior and exterior.

Reinforcing for wing portion of apron shall be single line W5 transverse wires at 2" centers, with single line W2 longitudinal wires and additional bar reinforcing as noted.

Wire reinforcing shall meet the requirements of AASHTO M 32. Wires shall be properly lapped as indicated, and clearances shall be as noted.

Structure	DIMENSIONS FOR APRON									
	T	T1	B1	H	R	W	X	Y	Z	Z1
4' x 6'	5"	5"	5"	6'	2'	4'	3'-2"	7'	7'	2'-11"
5' x 7'	6"	5"	7½"	7'	2'-6"	5'	1'-9"	7'-5½"	7'	3'-6"

Structure	DIMENSIONS FOR INTERMEDIATE UNIT					
	H	H1	W	R	T	B1
4' x 6'	6'	4'	4'	2'	5"	5"
5' x 7'	7'	4'-6"	5'	2'-6"	6"	7½"

Structure	DIMENSIONS FOR TONGUE AND GROOVE							
	T	A	B	B1	E	F	G1	G2
4' x 6'	5"	1⅝"	2⅝"	5"	4"	¾"	2⅜"	1⅞"
5' x 7'	6"	2⅛"	3"	6"	5"	⅞"	2¾"	2⅜"
		2⅛"	4½"	7½"	5"	⅞"	4¼"	2⅜"

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN — RF-8

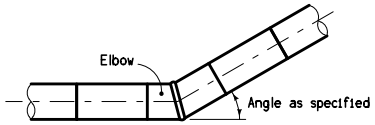
REVISION: Revise dimensioning and wire reinforcing designations.

REVISION NO. 3

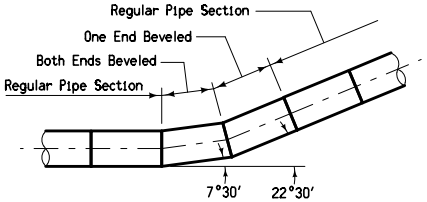
06-23-97
APPROVED BY DESIGN METHODS ENGINEER

REVISION DATE 10-28-97

PRECAST STOCK PASS

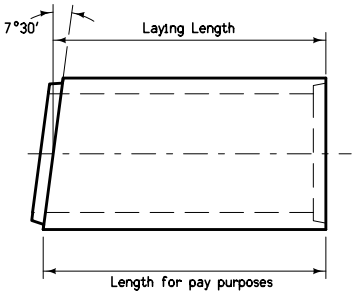


TYPICAL PLAN WITH ELBOW

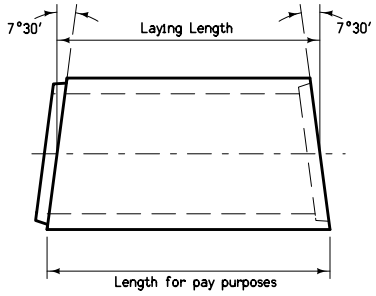


TYPICAL PLAN WITH "D" SECTIONS

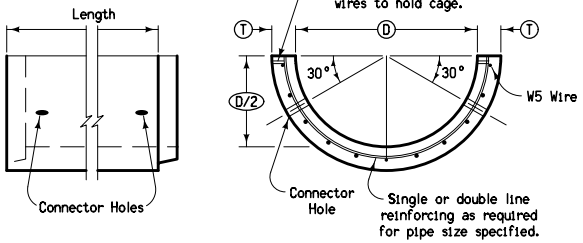
REINFORCING BARS		
Size "D"	Bar Size	Number Required
12" - 21"	3/8"	4
24" - 42"	3/8"	8
48" - 60"	1/2"	8
66" - 84"	5/8"	8



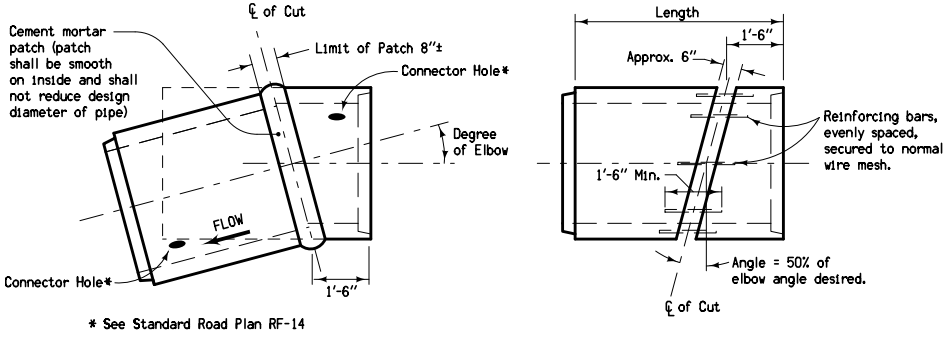
TYPE "D" SECTION (SINGLE BEVEL)



TYPE "D" SECTION (DOUBLE BEVEL)



DETAILS OF HALF PIPE SECTION



* See Standard Road Plan RF-14

TYPICAL CONCRETE PIPE ELBOW

Fabricate concrete pipe elbows and Type "D" pipe sections in conformance with AASHTO M 170 for the size and class of pipe specified.

Meet the requirements of AASHTO M 32 for wire reinforcing.

Refer to plans for degree of elbow required for each individual installation.

Minimum length of elbow to be 5'-6" measured along centerline of pipe. Design length of pipe to be considered 6'-0".

Fabricate elbows by a method approved by the Engineer and resulting in a finished product essentially as indicated hereon. The typical method for fabricating elbows is as follows: Steel rods, as specified, to be attached to the normal wire reinforcing cage as indicated hereon. After pipe is cast, make a cut 50% of the degree of elbow desired as indicated, and cut the reinforcing rods and mesh on centerline of the cut. Rotate the severed section of pipe 180 degrees and reweld the reinforcing to the opposite rods. Patch the remaining opening with cement mortar to effect a satisfactorily completed elbow as shown.

Unless specified otherwise, bevel the Type "D" section on a 7.5 degree miter. The bevel may be provided on either the tongue end or groove end of the pipe. In certain cases, both ends of the pipe section may require the beveled end.

Include Type "D" pipe sections in measurement for pipe culvert. No payment to be made specifically for the Type "D" section bevel. This is considered incidental to the price bid.

Half pipe to conform to the requirements for 2000D for the size specified, unless otherwise noted. Maximum "D" size for Half Pipe is 48 inches. Unless specified otherwise, Half Pipe is to be fabricated with connector holes as indicated.

Minimum length of Half Pipe section is 4'-0". The minimum number of 4'-0" sections are to be used to make up the necessary length of Half Pipe Flume as indicated on detail plans. Normal length is 6'-0".

Price bid for Half Pipe, per foot, is considered full compensation for furnishing and installing Half Pipe in accordance with plan requirements.

For pipe sizes up through 48" in diameter, bends may be accomplished in increments of 7.5 degrees by using standard "D" sections in appropriate combinations.

For pipe sizes from 54" to 72" in diameter, limit the "D" section to a maximum of 5 degree miter on any one end of pipe section.

For pipe sizes through 48" in diameter, bends from 15 to 45 degrees may be accomplished using a single elbow. Bends more than 45 degrees require two elbows unless approved otherwise by the Engineer.

The Contractor may substitute an approved elbow for "D" section bends of 15 degrees or less. Such elbows will not be measured for payment but will be considered incidental to price bid for culvert pipe.

Iowa Department of Transportation

REVISION
6 | 10-18-11

STANDARD ROAD PLAN

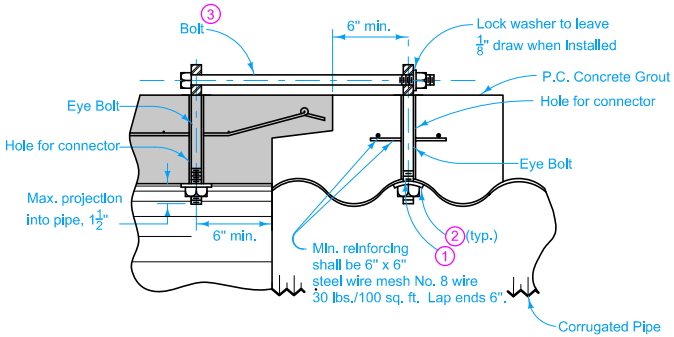
RF-13

SHEET 1 of 1

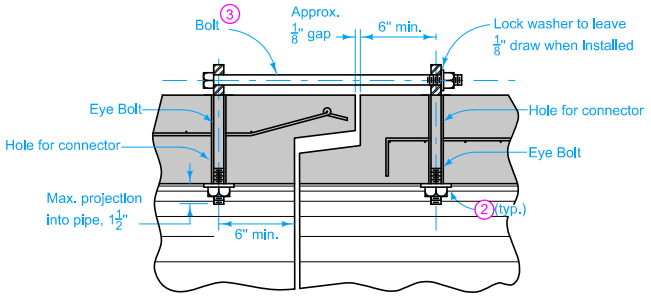
REVISIONS: Removed references to RF-1. Modified language.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

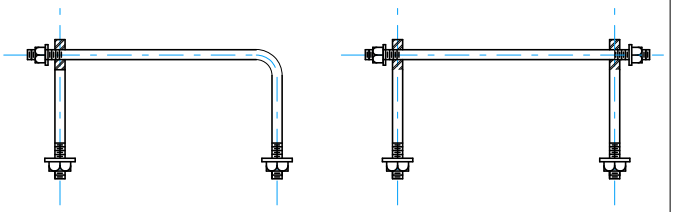
PIPE BENDS AND HALF PIPE



SECTION OF PIPE CONNECTOR
(Concrete Pipe to Corrugated Pipe)

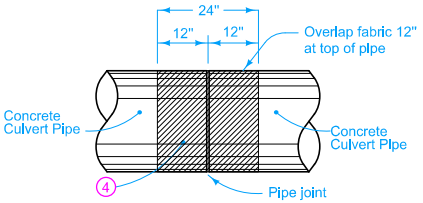


SECTION OF PIPE CONNECTOR
(Concrete Pipe to Concrete Pipe)



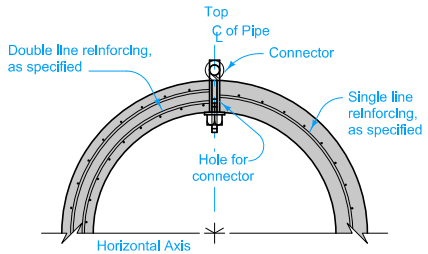
ONE BEND END **THREADED AT BOTH ENDS**

OPTIONAL BOLTS/CONNECTORS

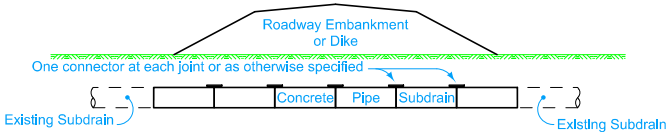


PIPE JOINT WRAPPING

PIPE SIZE (In)	CONNECTOR AND BOLT SIZE (in.)	HOLE FOR CONNECTOR (In.)
12 to 27	5/8	7/8
30 to 60	3/4	1.0
66 to 132	1.0	1 1/4



TYPICAL SECTION
(Non-Sealed Joint)



TYPICAL INSTALLATION

TYPE 1 CONNECTION

Wrap all joints on concrete roadway pipe culverts.

Use Type 3 Connections on all culvert pipes, unless otherwise specified. Refer to Materials I.M. **445.01** for Connector requirements.

Minimum 2 threads showing at all threaded ends.

TYPE 1

One connector at the top of the pipe section.

TYPE 2 (Sealed Joint)

Two connectors near the top of the pipe section. For details of reinforcement, refer to AASHTO M 170 for the class of pipe required. Refer to Materials I.M. 491.09 for seal requirements.

TYPE 3 (Non - Sealed Joint)

Two connectors near the top of the pipe section. For details of reinforcement, refer to AASHTO M 170 for the class of pipe required.

1. If holes are field drilled, place a ribbon of butyl sealant around bolts before placing 3 in. x 3 in. x 1/4 in. plate on bolts through corrugated metal pipe and tightening nuts.
2. 1 3/4 inch round x 9/64 inch thick washer or 3 in. x 3 in. x 1/4 in. square plate (shaped to pipe radius).
3. Connectors with One Bend End and Bell End spacers allowed per Materials I.M. 451. Refer to Optional Bolts detail.
4. Engineering fabric for embankment erosion control.

Possible Tabulation:
104-3

Iowa Department of Transportation

REVISION
15 | 10-18-11

STANDARD ROAD PLAN

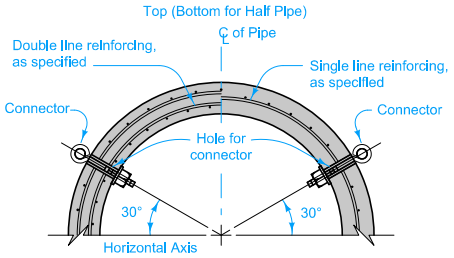
RF-14

SHEET 1 of 2

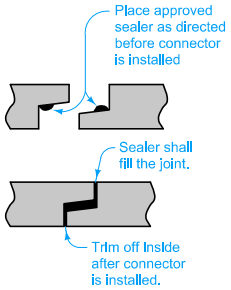
REVISIONS: Added details to allow for alternate tie rods per revised Materials I.M.451, table for connector bar sizes and circle note 3. Changed RF-1 references.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CONNECTED PIPE JOINTS

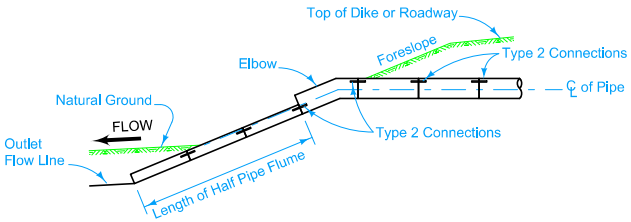


TYPICAL SECTION
TYPE 2 CONNECTION
TYPE 3 CONNECTION

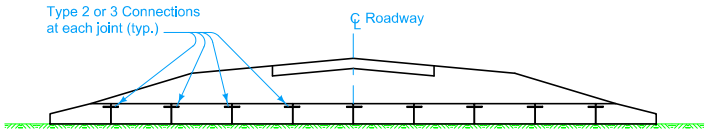


SEALED JOINT
TYPE 2 CONNECTION

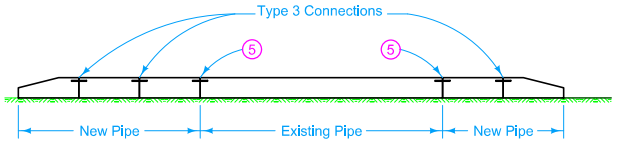
(5) On culvert extensions, connect all new joints including the joint between the old and new culvert pipe. Holes may need to be drilled into existing pipes.



TYPICAL INSTALLATION
TYPE 2 CONNECTION



TYPICAL INSTALLATION
NEW CONSTRUCTION - TYPE 2 or 3 CONNECTION



TYPICAL INSTALLATION
PIPE EXTENSION - TYPE 3 CONNECTION

TYPE 2 AND TYPE 3 CONNECTIONS

Iowa Department of Transportation

REVISION	
15	10-18-11

STANDARD ROAD PLAN

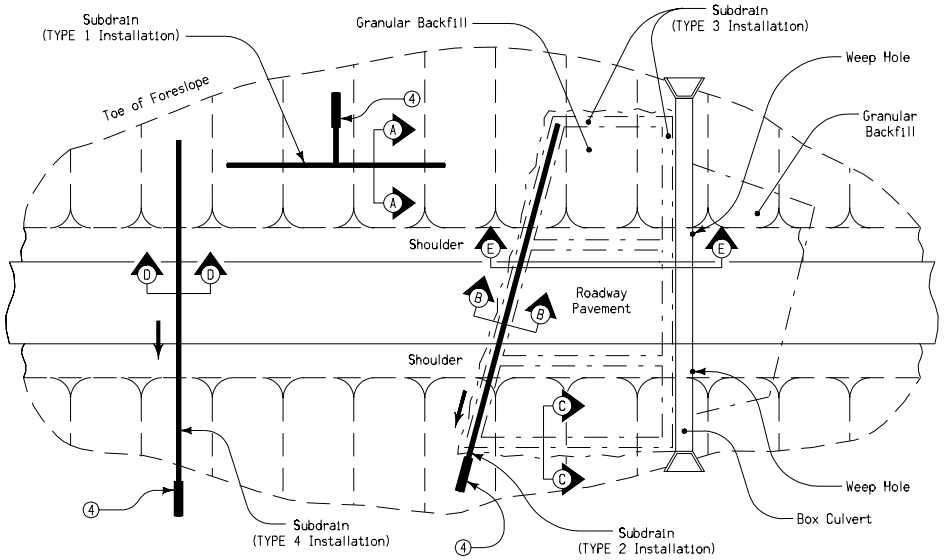
RF-14

SHEET 2 of 2

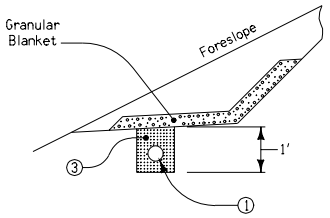
REVISIONS: Added details to allow for alternate tie rods per revised Materials I.M.451, table for connector bar sizes and circle note 3. Changed RF-1 references.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

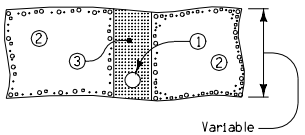
CONNECTED PIPE JOINTS



PLAN VIEW OF TYPICAL STANDARD SUBDRAIN INSTALLATIONS



TYPE 1 INSTALLATION
BENCH DRAIN
SECTION A-A



TYPE 2 INSTALLATION
SUBDRAIN
SECTION B-B

GENERAL NOTES:

The RF–19A shows the methods of installing fill or foundation drains under the roadway fill.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Specific information for individual locations will be found on the detail project plans, soils survey sheets, and tabulations of subdrains.

Material excavated from trenches for subdrain shall be disposed of as directed by the Engineer. No extra compensation will be made for such disposal.

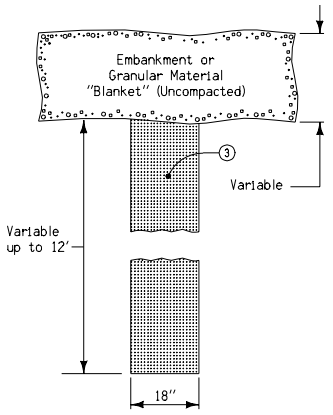
Blind ends of subdrains shall be capped with a metal cap or by other methods approved by the Engineer. All perforated pipe shall be installed with the perforations centered on flowline of the bottom side of the subdrain.

"Granular Material for Blankets" shall be placed as indicated on the plans. Method of measurement and basis of payment shall be as provided in current Standard and Supplemental Specifications.

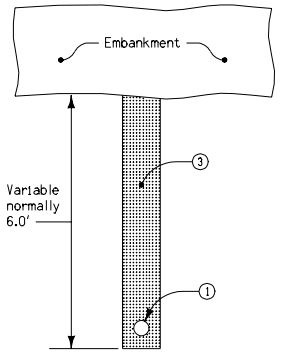
Price bid per linear foot for "Trench Drain" shall be considered full compensation for excavating and backfilling a trench as indicated hereon (Type 3 Installation).

Price bid for "Standard Subdrain" per linear foot, and "Subdrain Outlet CMP" per unit, shall include trenching, all necessary elbows, tees, connections, porous backfill, and any other items not specifically listed, which are necessary, to construct subdrain as described hereon and as shown in detail project plans (Types 2 and 4 installations).

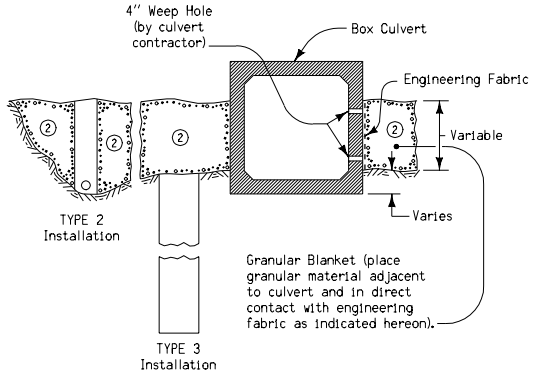
1. 4" Perforated Subdrain (Polyethylene, Corrugated Tubing)
2. Granular Material for Blanket (Uncompacted).
3. Porous Backfill (Uncompacted).
4. For Subdrain outlet construction details, see Standard Road Plans RF–19E and RF–19F.



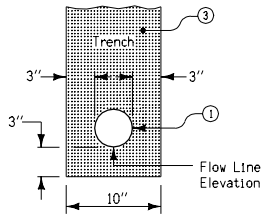
TYPE 3 INSTALLATION
TRENCH DRAIN
SECTION C-C



TYPE 4 INSTALLATION
SUBDRAIN
SECTION D-D



SECTION E-E
SUBSOIL DRAINAGE



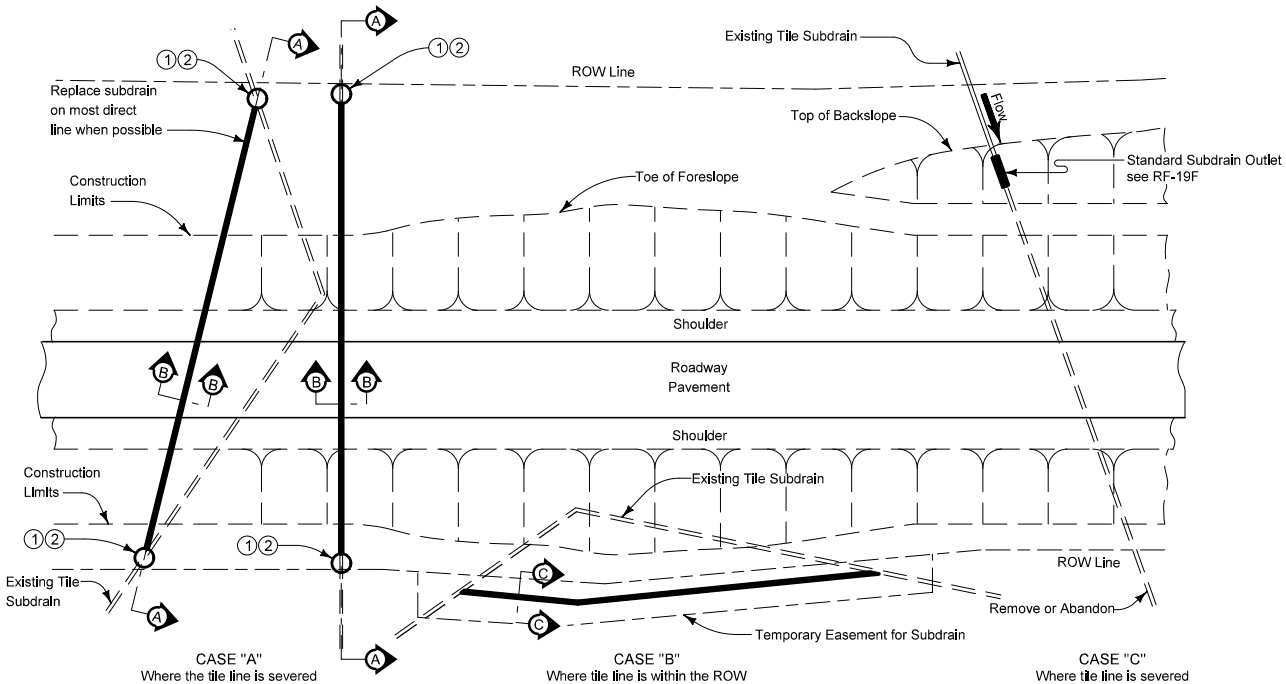
TUBING PLACEMENT DETAIL
ALL TYPES

Iowa Department of Transportation
Project Development Division

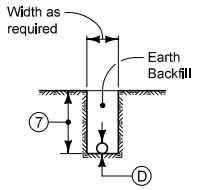
STANDARD ROAD PLAN | RF-19A

REVISION: Correct "Blanket" bid item; add reference to RF-19F in note 4.	REVISION NO. 6
David P. Little 03-14-97 APPROVED BY DESIGN METHODS ENGINEER	REVISION DATE 07-15-97

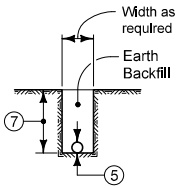
SUBDRAINS
FOR FILL OR FOUNDATION DRAINAGE
(STANDARD)



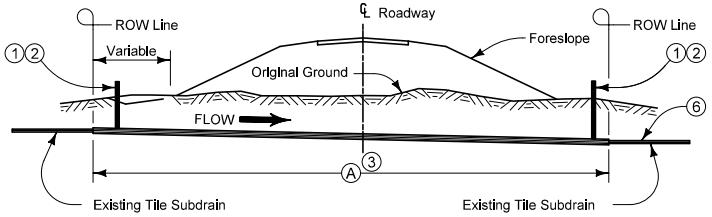
TYPICAL PLAN FOR REPLACING OR RELOCATING EXISTING FIELD TILE



CASE "A"
SECTION B-B



CASE "B"
SECTION C-C



CASE "A"
SECTION A-A

1. 4" Diameter inspection access with cap. Minimum of 3' above ground. Use PVC meeting the requirements of Article 4146.03.
2. Inspection access is required to allow inspection by the upstream and downstream property owners. Perforated pipe may be used to allow ditch drainage into subdrain if approved by adjacent property owners.
3. Dimension (A) indicates the R.O.W. limits in which replacement of tile subdrain in accordance with the replacement schedule is required.
4. Replacement sizes provide equivalent capacity based on a 6" settlement assuming a 0.20% slope with n=0.013 for concrete pipe and n=0.025 for corrugated pipe (Manning's Formula).
5. Replace in kind (size and type) or with 'PE' slotted pipe, a minimum of one size larger than existing line.
6. When multiple drains are connected to one outlet, the outlet is to provide full capacity for all connected drain systems.
7. Depth as required

When the existing tile lines are intercepted by roadway construction, replace them within the ROW limits of the project, or outlet them in a ditch or channel. Where the roadway intersects the tile line in an undesirable alignment, as shown in Case 'A', relocate the tile line to accomplish a more nearly right angle. Where the existing tile line alignment is more parallel to the roadway and within the construction limits, relocate the tile outside the ROW line, as shown in Case 'B'. In cases where new construction requires existing subdrain to outlet into the roadway ditch, as shown in Case 'C', provide the Standard Subdrain Outlet shown in RF-19F.

Replace tile lines within the ROW limits according to the replacement schedule shown below. Install an inspection access at each end of replaced tile line. Replace tile lines outside the ROW limits using the same size of pipe as existing line.

REPLACEMENT SCHEDULE CASE 'A' (Pipe size in inches)		
Existing Tile Size	PROPOSED SUBDRAIN SIZE (D) (4)	
	Concrete Pipe	Coated CMP Pipe
4	-	10
6	-	12
8	12	15
10	15	18
12	15	21
15	18	24
18	21	30
21	24	36
24	30	36
> 24	Existing tile size + 6"	(5)

Install relocated or replacement subdrain so as to cause a minimum of disturbance to existing field tile. Connect to lines of existing tile drains in such a way as to leave the existing tile drains in a functional condition.

Cap blind ends of subdrains with a metal cap or as approved by the Engineer.

When concrete culvert pipe of 2000D (Class III) or stronger is required, furnish and install a RF-14 Type 1 connection at no additional cost to the Contracting Authority.

Possible Tabulation:
104-5C

Possible Contract Items:
Standard Subdrain
Subdrain Outlet

Iowa Department of Transportation

REVISION
6 | 04-17-12

STANDARD ROAD PLAN

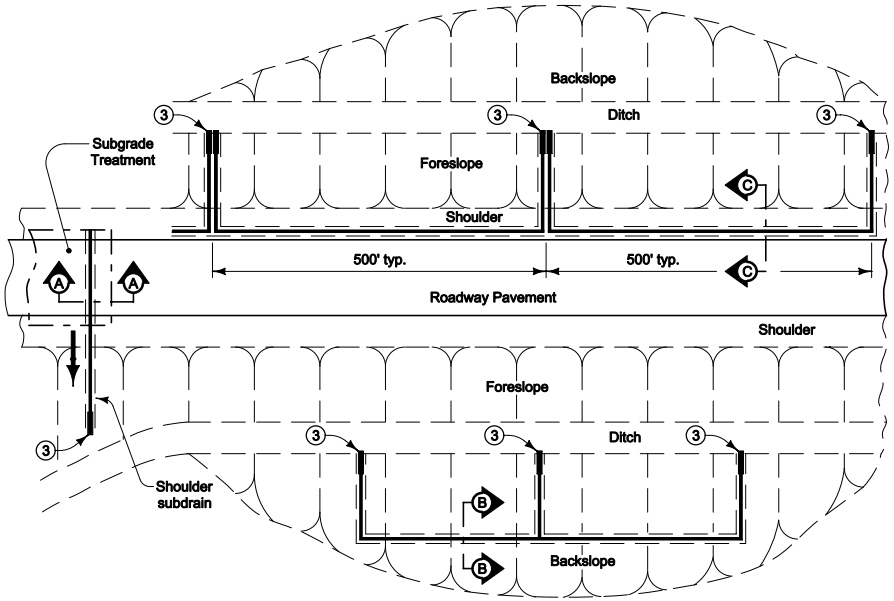
RF-19B

SHEET 1 of 1

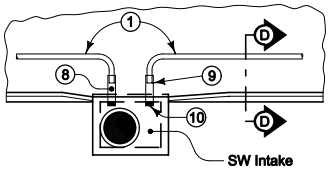
REVISIONS: Updated notes and added Possible tabulation and Possible contract Items.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

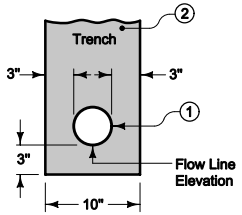
SUBDRAINS STANDARD (FARM TILE REPLACEMENT)



PLAN



INTAKE OUTLET



TUBING PLACEMENT ALL TYPES

When culverts which are less than 1 foot below the trench bottom are encountered within a tabulated subdrain, stop the trench 3 feet from the culvert and resume 3 feet beyond the culvert.

On new construction projects, place the subdrain after the special backfill, if required, and prior to granular or paved shoulder material.

Except for backslope installations, if the Contractor's operations result in a trench, place and compact granular shoulder material in the trench to be level with the adjacent surface prior to opening lanes to traffic.

① 4 inch Perforated Subdrain (Corrugated Polyethylene Tubing).

② Porous Backfill for Subdrain (compacted).

③ Subdrain outlets. See RF-19E.

⑧ 6 inch corrugated metal pipe or 4 inch corrugated double-walled PE or PVC pipe (2 feet long) will be paid for as "Subdrain Outlet (RF-19C)".

⑨ Connect PE or PVC outlet with an appropriate coupler. Connect CMP outlet one of two ways: (1) Inside-fit reducer coupler (1 foot minimum fit inside CMP); or (2) Insert 1 foot of the 4 inch subdrain into 6 inch CMP and full seal entire opening with grout.

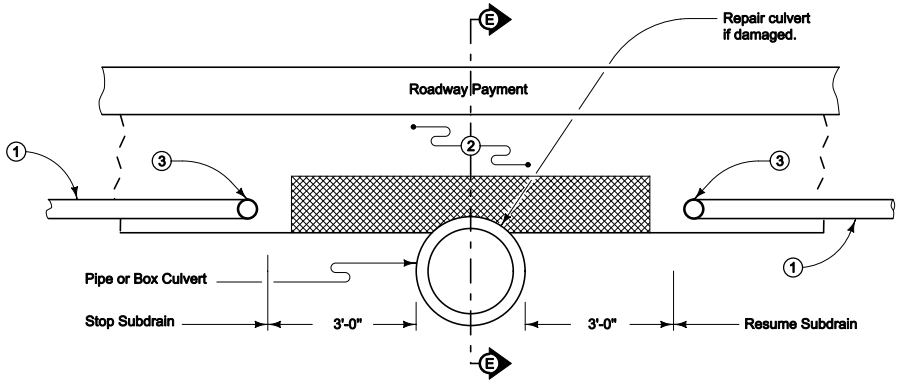
⑩ Removable Grate Rodent Guard. See Materials I.M. 443.01.

⑪ Place porous backfill in direct contact with a minimum of 2 inches of pavement and continuous to shoulder material as per note 6 or 7.

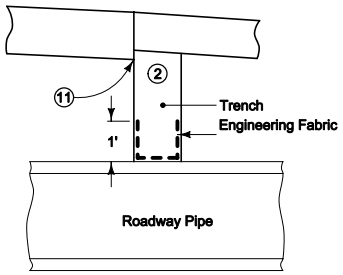
⑫ If the trench is inadvertently carried over the culvert, repair the trench as detailed on this sheet. If obstruction is 1 foot or more below trench bottom, carry subdrain line over in continuous alignment. No payment will be made for trench repair.

Possible Contract Items:
Subdrain, Longitudinal, (Backslope) 4" Dia.
Subdrain, Longitudinal, (Shoulder) 4" Dia.
Subdrain Outlet (RF-19C)
Subdrain Outlet (RF-19E)

Possible Tabulation:
104-9



TRENCH REPAIR AT PIPE CULVERT ⑫



SECTION E-E

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
15	10-19-10

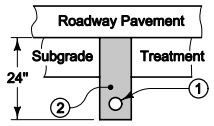
RF-19C

SHEET 1 of 2

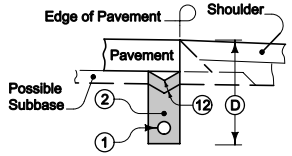
REVISIONS: Changed 'Granular Subbase' to 'Subbase' in Type 12 Installations. Added sheet 2 and Type 13 and 14 installations. Removed Type 10.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

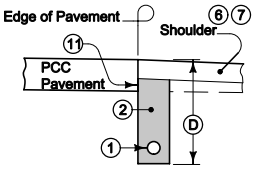
SUBDRAINS (LONGITUDINAL)



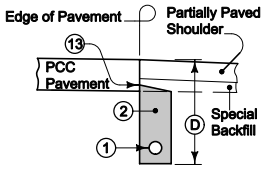
TYPE 5 INSTALLATION
SECTION A-A
Subgrade Treatment Subdrain



TYPE 6 INSTALLATION
SECTION C-C
For Drain Placement Prior to
Subbase or Pavement Placement



TYPE 7A INSTALLATION
SECTION C-C



TYPE 7B INSTALLATION
SECTION C-C

(1) 4 inch Perforated Subdrain (Corrugated Polyethylene Tubing).

(2) Porous Backfill for Subdrain (compacted).

(5) Install subdrain as cut proceeds.

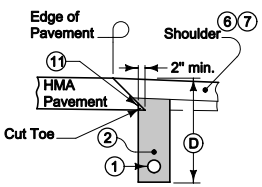
(6) On existing Granular or Earth Shoulders, replace with 4 inch minimum depth granular shoulder material.

(7) On Paved Shoulders, refer to Section 2502 in the current Standard Specifications for finishing shoulder.

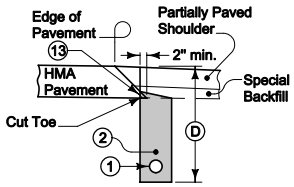
(11) Place porous backfill in direct contact with a minimum of 2 inches of pavement and continuous to shoulder material as per note 6 or 7.

(12) Cut "V" notch just prior to subbase (if proposed) or pavement placement to assure uncontaminated contact.

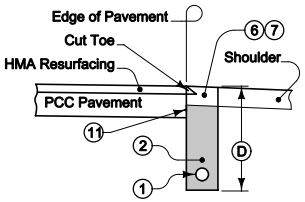
(13) Place top of subdrain trench at the bottom of pavement. Backfill trench so that a wedge of porous backfill has a minimum vertical contact of 2 inches with the pavement.



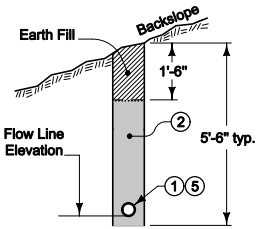
TYPE 8A INSTALLATION
SECTION C-C



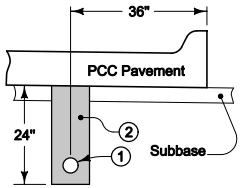
TYPE 8B INSTALLATION
SECTION C-C



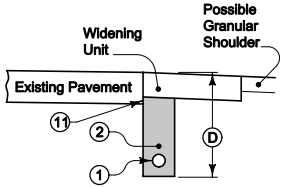
TYPE 9 INSTALLATION
SECTION C-C
Composite Pavement
with Existing Shoulder



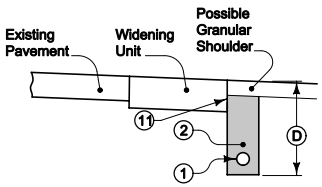
TYPE 11 INSTALLATION
SECTION B-B
Backslope



TYPE 12 INSTALLATION
SECTION D-D



TYPE 13 INSTALLATION
SECTION C-C
For New Widening Unit if
Thinner than Existing Pavement



TYPE 14 INSTALLATION
SECTION C-C
For New Widening Unit if
Thicker than Existing Pavement

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
15	10-19-10

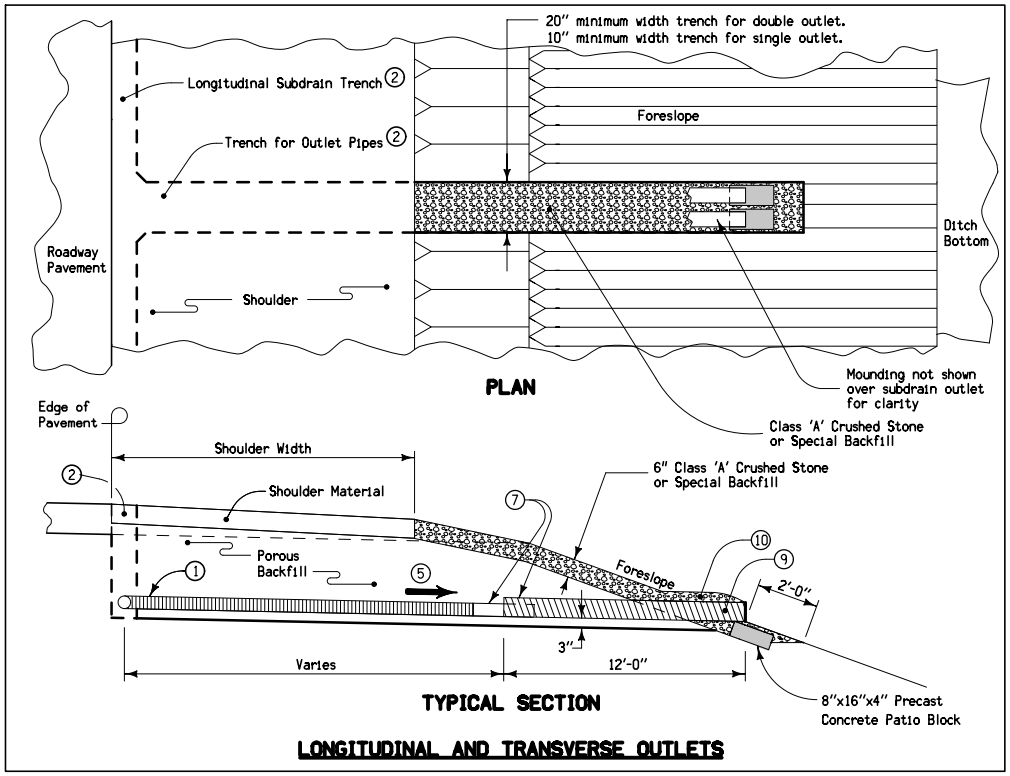
RF-19C

SHEET 2 of 2

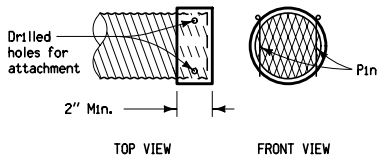
REVISIONS: Changed 'Granular Subbase' to 'Subbase' in Type 12 Installations.
Added sheet 2 and Type 13 and 14 installations. Removed Type 10.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

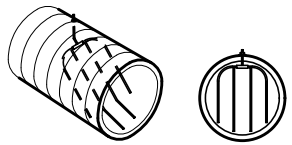
SUBDRAINS
(LONGITUDINAL)



LONGITUDINAL AND TRANSVERSE OUTLETS



REMOVABLE GRATE ⑥



REMOVABLE FORK ⑥

RODENT GUARDS ⑥

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

① 4" perforated subdrain (Polyethylene Corrugated Tubing).

② On projects where existing shoulder material is removed, the shoulder material shall be replaced in accordance with Article 2502.03, C of the Standard Specifications.

③ 'Y' or 'T' connection shall not be allowed. Place subdrain on 1 foot minimum radius.

④ Direction of flow.

⑤ 6" minimum drop in elevation between longitudinal subdrain and outlet. 12" minimum drop for projects using recycled PCC subbase.

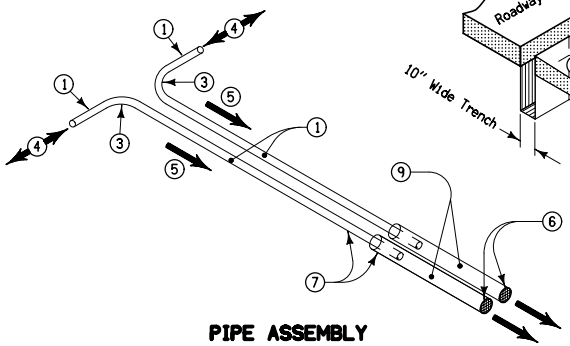
⑥ Removable grate rodent guard shall be used on all projects except those using recycled PCC subbase. For projects using recycled PCC subbase, use the removable fork rodent guard. See Materials I.M. 443.01.

⑦ 6" corrugated metal pipe outlet or 4" corrugated double-walled PE or PVC pipe with an appropriate coupler. If metal pipe is used, the pipes should be coupled in one of the following ways: (1) Use an inside fit reducer coupler (coupler must be inserted a minimum of 12" into CMP); or (2) Insert 12" of the 4" subdrain into the 6" metal outlet pipe, then fully seal the entire opening with grout.

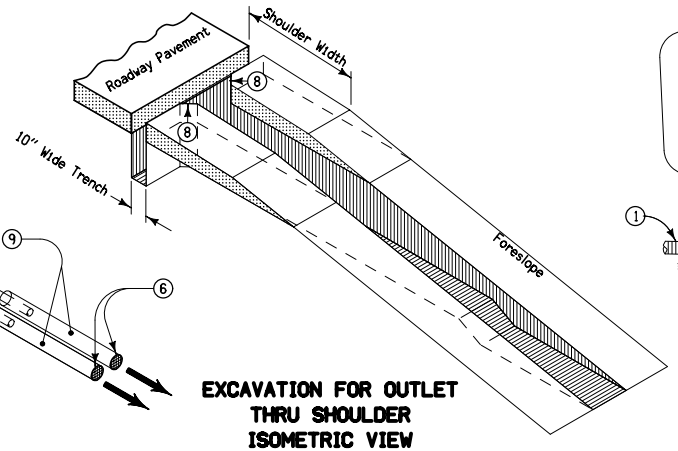
⑧ Trench shall be beveled to provide a minimum of 3" of porous backfill surrounding all portions of subdrain pipe.

⑨ Corrugated metal pipe outlet 2" larger than existing subdrain pipe, or corrugated double-walled PE or PVC pipe of the same diameter as the existing subdrain pipe.

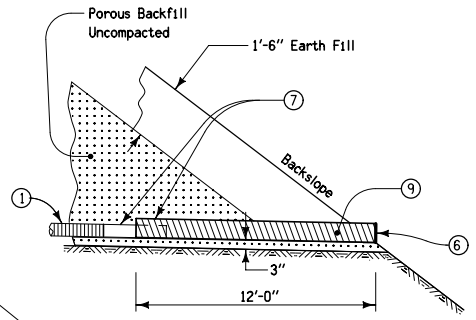
⑩ Class 'A' crushed stone or Special Backfill shall be mounded over outlet and carefully compacted to avoid damaging outlet pipe.



PIPE ASSEMBLY
ISOMETRIC VIEW



EXCAVATION FOR OUTLET
THRU SHOULDER
ISOMETRIC VIEW



BACKSLOPE OUTLET
TYPICAL SECTION

Contract Item:

Subdrain Outlet, RF-19E

Tabulation:

104-5C

Iowa Department of Transportation

REVISION: 14 | 10-20-09

STANDARD ROAD PLAN

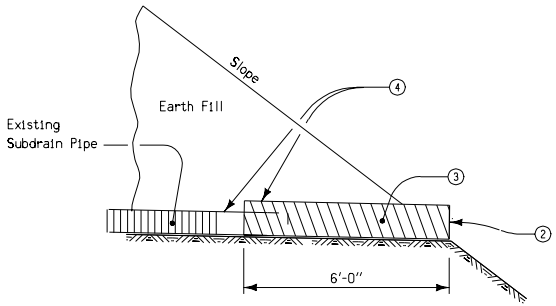
RF-19E

SHEET 1 of 1

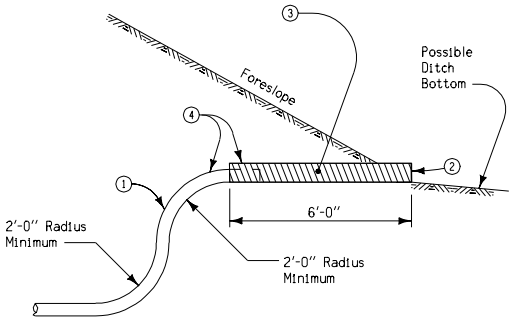
REVISIONS: Changed Standard Specifications reference.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

OUTLETS FOR LONGITUDINAL, TRANSVERSE AND BACKSLOPE SUBDRAINS



STANDARD SUBDRAIN OUTLET
TYPE A
For existing subdrain pipes 12" or less in diameter. ⑤



PRESSURE RELEASE OUTLET
TYPE B

GENERAL NOTES:

This sheet illustrates the construction of the outlet assembly for Standard Subdrain, Pressure Release and Special outlets.

Materials and construction methods used shall be in accordance with current Standard and Supplemental Specifications.

Refer to "Tabulation of Longitudinal Subdrains" for details of individual subdrain installation.

Price bid for "Subdrain Outlet", each of the size specified per unit shall be considered full compensation for all installation work and materials necessary as detailed hereon, and as required by project plans.

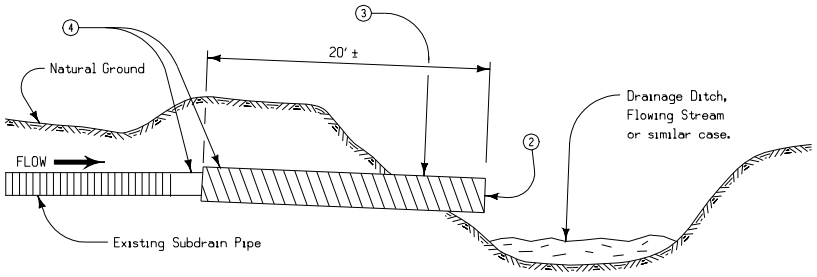
① 4" Perforated Subdrain (Polyethylene Corrugated Tubing).

② Removable Rodent Guard (Appropriately sized to fit pipe).

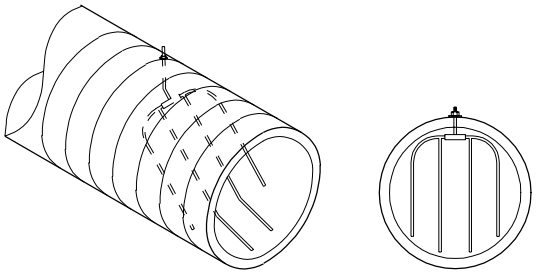
③ If corrugated metal pipe is used an outlet 2" larger than existing subdrain pipe is required. If double-walled PE or PVC pipe is used, an outlet pipe of the same diameter as the existing subdrain pipe may be used.

④ The pipes should be coupled in one of the two following ways: (1) Use an inside fit reducer coupler (coupler must be inserted a minimum of 12" into C.M.P.); or (2) Insert 12" of the existing subdrain pipe into the corrugated metal outlet pipe, then fully seal the entire opening with grout.

⑤ For existing subdrain pipes larger than 12" in diameter, use Special Outlet, Type C.



SPECIAL OUTLET
TYPE C



ISOMETRIC VIEW

FRONT VIEW

REMOVABLE RODENT GUARD
DETAILS

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN | **RF-19F**

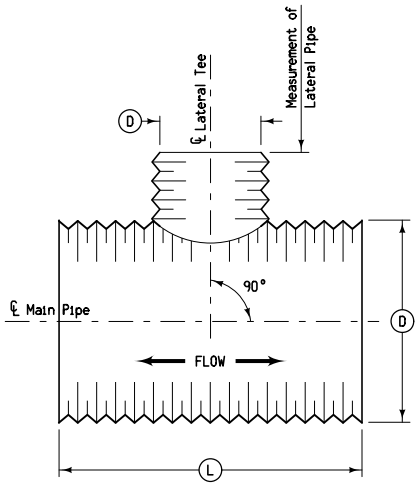
REVISION: Include the uses of PE and PVC pipe for outlets.

REVISION NO. 2

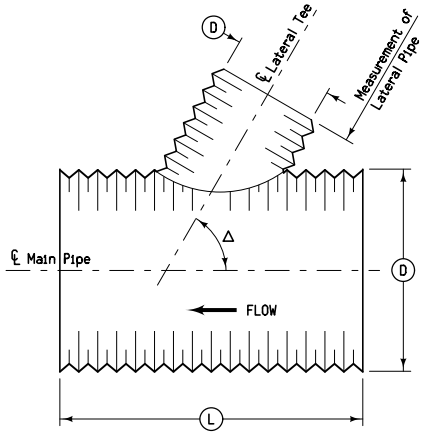
REVISION DATE 04-25-00

01-10-00
APPROVED BY DESIGN METHODS ENGINEER

SUBDRAIN OUTLETS
(STANDARD SUBDRAIN,
PRESSURE RELEASE AND SPECIAL)

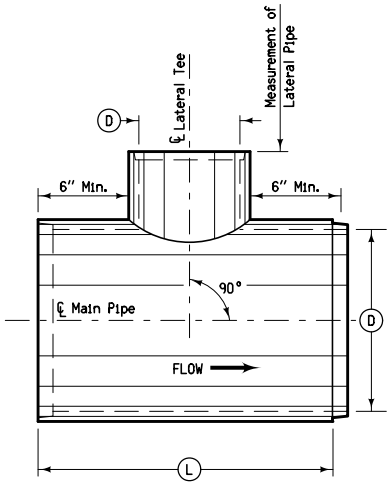


PLAN OF STRAIGHT TEE

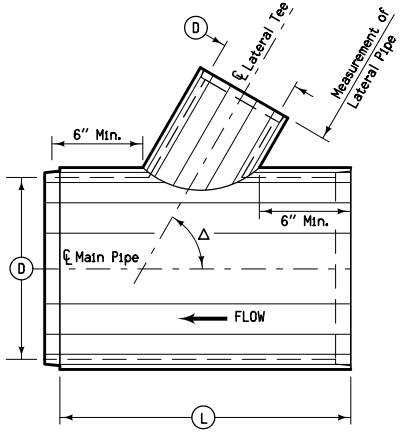


PLAN OF ANGLE TEE

CORRUGATED METAL PIPE

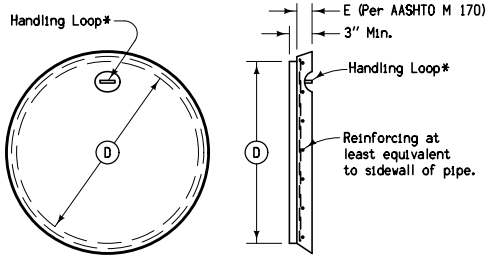


PLAN OF STRAIGHT TEE



PLAN OF ANGLE TEE

CONCRETE PIPE



PLAN SECTION

*The handling loop may be omitted when the cap is placed in a buried installation.

DETAILS OF CONCRETE PIPE CAP

GENERAL NOTES:

Tees may be required in any size from 12 inch diameter to 48 inch diameter (in 6 inch increments) on main pipe culverts equal to or greater in diameter than that of the tee. Angle tees may be required in any delta angle (of 5 degree increment) between 45 and 90 degrees. Unless a delta angle of other than 90 degrees is so specified in the detail project plans, tee sections shall be considered to be 90 degrees (straight tees).

Example: "18–36 inch Tee" means a 18 inch diameter 90 degree lateral tee attached to a 36 inch main pipe culvert.

Example: "24–48 inch 75 degree Tee" means a 24 inch diameter lateral tee attached to a 48 inch main pipe culvert at an angle of 75 degrees.

The fabrication of the tee shall be accomplished in such a manner as to be as free from obstruction on the inside of the pipe as is reasonable and otherwise to be constructed by methods approved by the Engineer.

CORRUGATED METAL PIPE TEE:

Any damage to protective coating resulting from installation of culvert shall be repaired as directed by the Engineer.

CONCRETE PIPE TEE:

Length of main pipe section (L) shall be a minimum of 4 feet and a maximum of 6 feet. Length of main pipe section shall be included in measured length of structure.

CONCRETE PIPE CAP:

The use of an approved pipe cap is required when so indicated on the detail project plans. The dimensions of the pipe cap shall be such as to neatly fit the groove end of the appropriate size of culvert pipe.

The cap may be precast or it may be cast directly into the pipe end with a tight mortar joint between the cap and the pipe. If the cap is positioned at the construction site, an approved bituminous joint material shall be placed between the cap and the pipe.

The Pipe Cap shall not be paid for directly, but when specified, shall be considered to be incidental to other pipe culvert work on the project.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
5	10-18-11

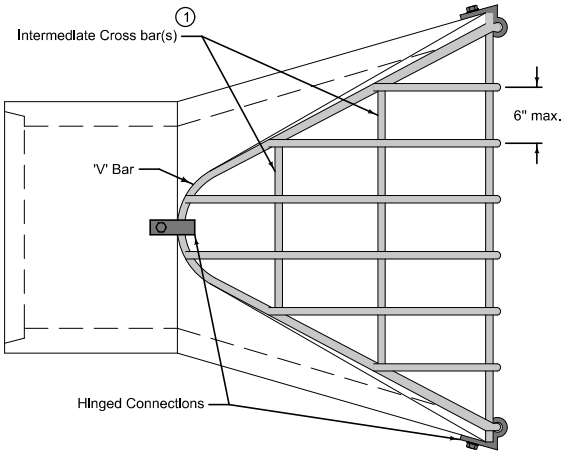
RF-21

SHEET 1 of 1

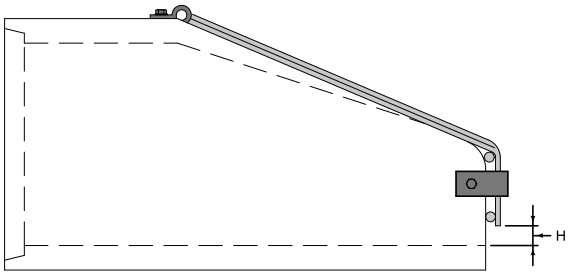
REVISIONS: Changed RF-1 reference to AASHTO M 170.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

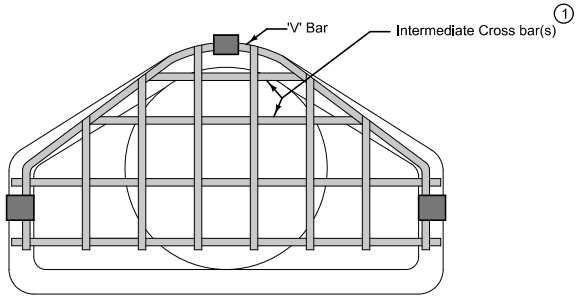
CULVERT PIPE TEE SECTIONS



PLAN



PROFILE



FRONT

Provide guard dimensions to fit with Type of apron provided (RF-3, Type 1 or Type 2 or RF-42). 'V' Bar to completely rest on apron.

Use ASTM A615, Grade 40, or merchant quality, smoothed or deformed steel bars in construction of the guard. Conform to fabrication requirements of Standard Specifications Section **2404**.

Hot-dip galvanize the completed apron guard in accordance with ASTM A123.

(1) All guards to have at least one intermediate cross bar. If pipe size is 60 inches or greater, use two intermediate cross bars equally spaced.

Possible Tabulation:
104-3

ROUND		ARCH	
PIPE SIZE	H	PIPE SIZE	H
12"	$2\frac{1}{2}$"	22" x 14" to 29" x 18"	4"
15"	3"	37" x 23" to 44" x 27"	5"
18" - 24"	4"	52" x 32" to 65" x 40"	6"
27" - 36"	5"	73" x 45" to 88" x 54"	7"
42" - 54"	6"		
60" - 72"	7"		
78" - 90"	8"		

BAR SIZES

	PIPE SIZE	HOLE DIA. REQ'D.	BOLT DIA.	BAR SIZE
ROUND	12" - 18"	$\frac{3}{4}$"	$\frac{5}{8}$"	$\frac{3}{4}$"
	21" - 42"	$\frac{7}{8}$"	$\frac{3}{4}$"	1"
	48" - 90"	$1\frac{1}{8}$"	1"	$1\frac{1}{4}$"
ARCH	up to 22" x 14"	$\frac{3}{4}$"	$\frac{5}{8}$"	$\frac{3}{4}$"
	29" x 18" to 52" x 32"	$\frac{7}{8}$"	$\frac{3}{4}$"	1"
	59" x 36" to 88" x 54"	$1\frac{1}{8}$"	1"	$1\frac{1}{4}$"

BOLT LENGTH = PIPE WALL THICKNESS + $2\frac{1}{2}$"

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
8 | 10-18-11

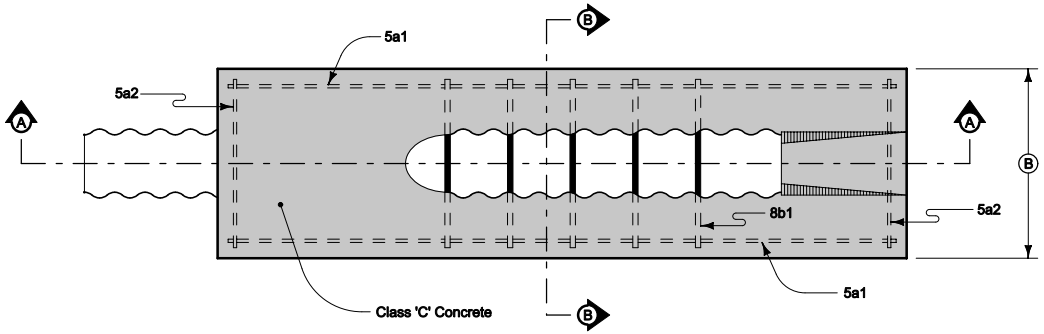
RF-26

SHEET 1 of 1

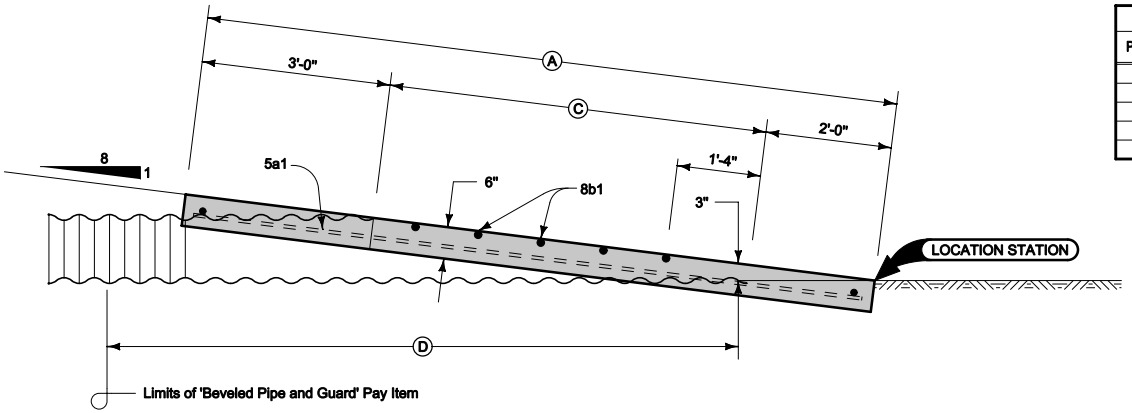
REVISIONS: New design. Added arch pipe sizes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PIPE APRON GUARD

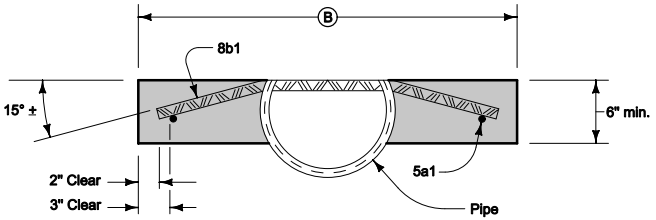


PLAN



SECTION A-A

TABLE OF DIMENSIONS				
PIPE SIZE	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12"	11'-0"	3'-0"	6'-0"	10'-0"
15"	13'-2"	3'-3"	8'-2"	12'-0"
18"	15'-4"	3'-6"	10'-4"	14'-0"
21"	17'-6"	3'-9"	12'-6"	16'-0"
24"	19'-8"	4'-0"	14'-8"	18'-0"



SECTION B-B

REINFORCING BAR LIST									
PIPE SIZE	BAR	LOCATION	SHAPE	COUNT	LENGTH	LIN. FT.	WEIGHT	TOTAL WEIGHT	SPACING
12"	5a1	Base		2	10'-8"	21.4	22.3	65.8	See Detail
	5a2	Base		2	2'-8"	5.4	5.6		See Detail
	8b1	Base		5	2'-10"	14.2	37.9		12"
15"	5a1	Base		2	12'-10"	25.7	26.8	90.7	See Detail
	5a2	Base		2	2'-11"	5.9	6.2		See Detail
	8b1	Base		7	3'-1"	21.6	57.7		12"
18"	5a1	Base		2	15'-0"	30.0	31.3	118.1	See Detail
	5a2	Base		2	3'-2"	6.4	6.7		See Detail
	8b1	Base		9	3'-4"	30.0	80.1		12"
21"	5a1	Base		2	17'-2"	34.4	35.9	148.6	See Detail
	5a2	Base		2	3'-5"	6.9	7.2		See Detail
	8b1	Base		11	3'-7"	39.5	105.5		12"
24"	5a1	Base		2	19'-4"	38.7	40.4	181.3	See Detail
	5a2	Base		2	3'-8"	7.4	7.7		See Detail
	8b1	Base		13	3'-10"	49.9	133.2		12"

Reinforcing steel used in construction of "Beveled Pipe and Guard" is deformed bars meeting the requirements of Article 4151.03. All steel bars to be hot-dip galvanized in accordance with ASTM A123 specifications.

Use Class 'C' Concrete in the construction of Beveled Pipe and Guard.

Cut the pipe to fit the foreslope. Cut slots into the pipe for placement of the No. 8 bars. After the foreslope has been placed, fit the No. 8 bars into the slots cut in the pipe so they will be in proper position when the concrete collar is poured.

Price bid for "Beveled Pipe and Guard," each, is full compensation for furnishing all materials and constructing the Beveled Pipe and Guard.

Special Note:

A silt fence ditch check will be required immediately upstream from the inlet. Refer to EC-201 for construction details.

Possible Contract Item:
Beveled Pipe and Guard

Possible Tabulations:
104-3
112-8

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-19-10

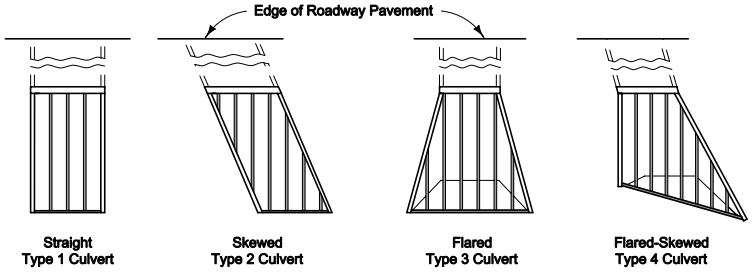
RF-27

SHEET 1 of 1

REVISIONS: Added 21 in. and 24 in. pipe size information. Changed 'D' in table for 18 in. pipe. Corrected weight values in table.

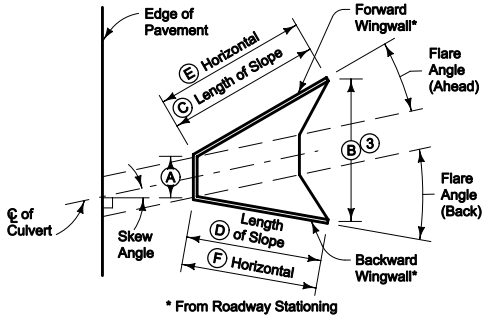
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

BEVELED PIPE AND GUARD

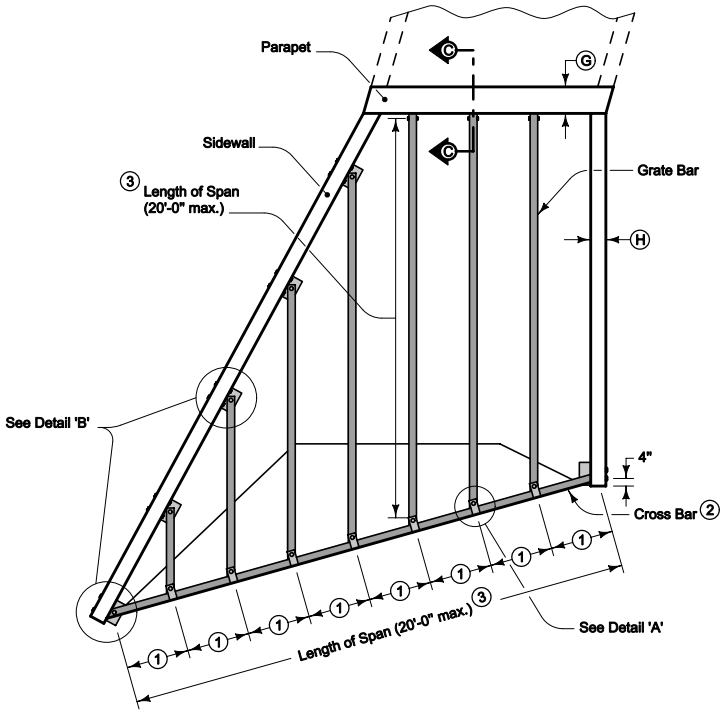


INSTALLATION TYPES

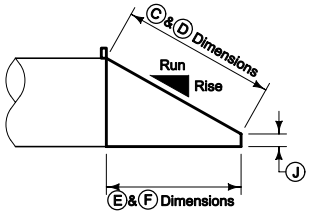
Grate bars to be perpendicular to direction of traffic flow.



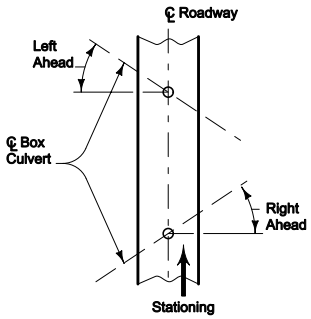
TOP VIEW



INSTALLATION PLAN



SIDE VIEW
DETAILS OF DIMENSIONS



SKEW ANGLE DETERMINATION

GRATE & CROSS BAR SIZE REQUIREMENTS		
Length of Span	Nominal Pipe Size (2)	O.D. Size
less than 12'	3.0"	3.5"
12'-16'	3.5"	4.0"
greater than 16'	4.0"	4.5"

The dimensions shown in the "Tabulation of Safety Grate Treatment" are from the original construction plans. Verify these dimensions at the site before fabrication of the components. Shop drawings are required. The Contractor is responsible for using the correct pipe diameters, correct dimensions and proper fit of the safety grate into the headwall opening.

Install bolts and lock nuts complying with Article 4153.06 at all locations as shown. Use brackets that comply with ASTM A36 and are galvanized per ASTM A123.

Use steel washers meeting the dimensional requirements of Materials I.M. 453.07.

The Contractor may encounter reinforcing steel when drilling holes though the exising structure wall.

Furnish Schedule 40 Pipe meeting the requirements of Article 4153.05.

Galvanize all pipes, fittings and hardware after all cutting, welding, drilling and fabrication.

Gas Metal-Arc and Flux-Cored Arc welding may be used for welding incidental items as indicated on this sheet, provided that the fabricator furnishes certifications for the gas, uses approved filler metal and qualified welders approved by the Iowa DOT.

Price Bid for "Safety Grate, (Type 1,2,3, or 4), Culvert" is considered full compensation for furnishing all materials and work necessary to fabricate and install the grate system as required for each headwall opening.

(1) Equal spaces 24 inches minimum, 30 inches maximum, edge of sidewall to center of bracket or center to center of bracket.

(2) Cross Bar diameter equal to or greater than Grate Bar diameter.

(3) If more than 20 feet, midspan support is required. Refer to sheets 3 and 4.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

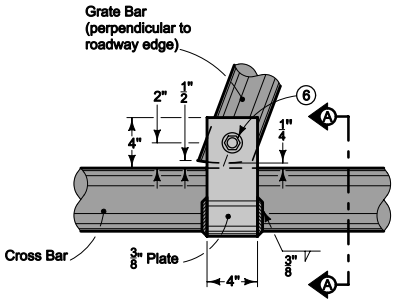
RF-29

SHEET 1 of 4

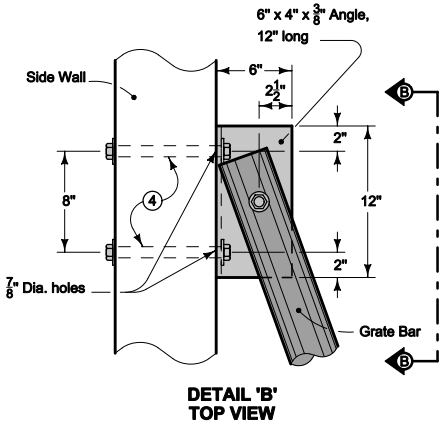
REVISIONS: New. Replaces 540-4A,B,C,D.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SAFETY GRATES FOR BOX CULVERTS



**DETAIL 'A'
TOP VIEW**



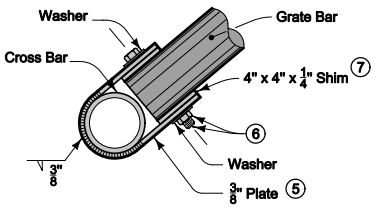
**DETAIL 'B'
TOP VIEW**

4 Holes are to be 7/8 inch diameter made with equipment designed to cut through concrete and reinforcing steel.

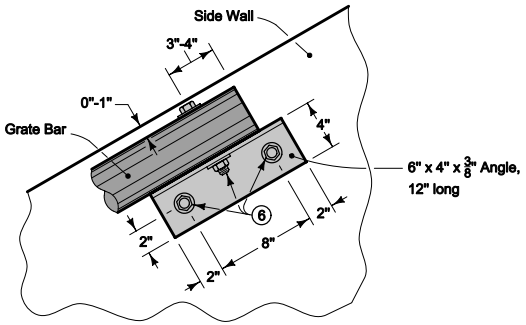
5 Bend plates or strips without cracking material.

6 3/4 inch bolt, lock nut and washers. All holes are to be 7/8 inch diameter.

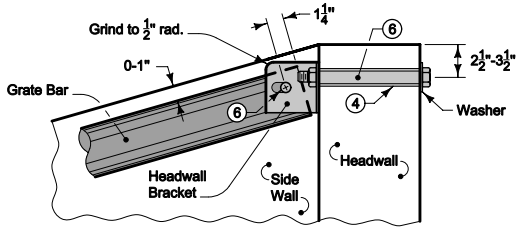
7 Shim thickness equal to difference in diameters of Grate Bar and Cross Bar.



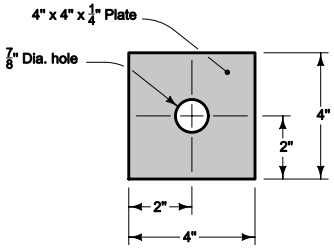
SECTION A-A



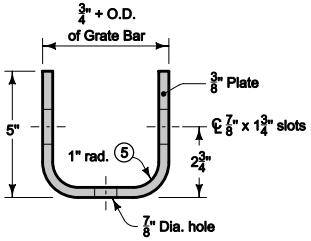
SECTION B-B



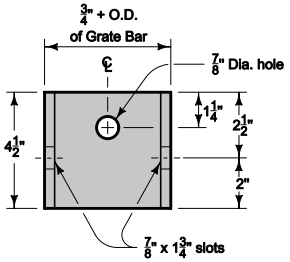
SECTION C-C



SHIM DETAIL



**HEADWALL BRACKET
TOP VIEW**



**HEADWALL BRACKET
FRONT VIEW**

Iowa Department of Transportation

REVISION: New | 04-20-10

STANDARD ROAD PLAN

RF-29

SHEET 2 of 4

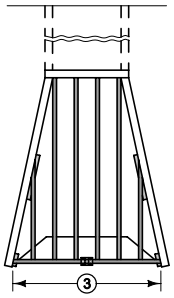
REVISIONS: New. Replaces 540-4A,B,C,D.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

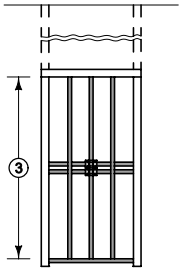
SAFETY GRATES FOR BOX CULVERTS

③ If more than 20 feet, midspan support is required. Refer to sheets 3 and 4.

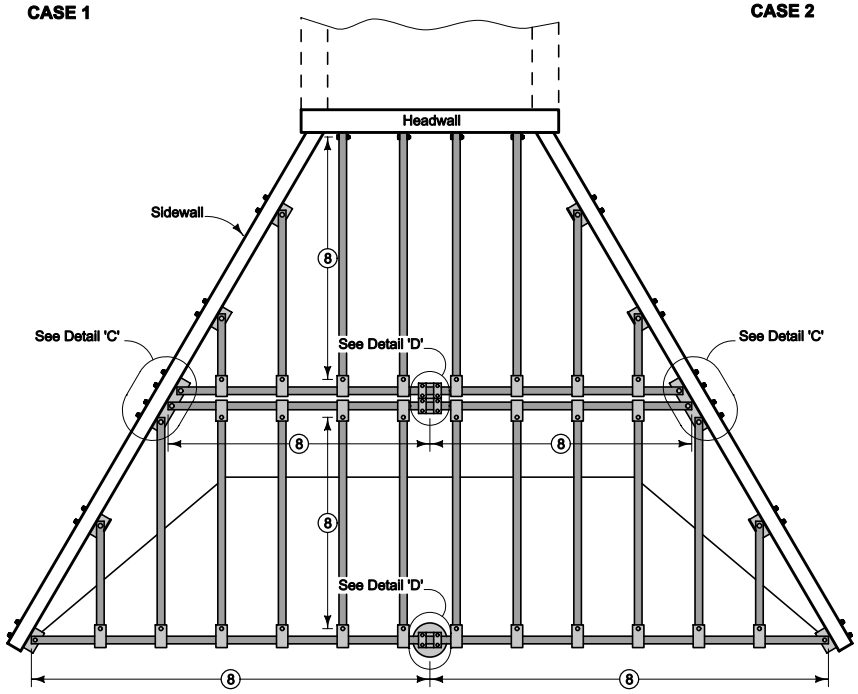
⑧ Length of span (20 feet maximum).



CASE 1



CASE 2



INSTALLATION PLAN WITH MIDSPAN SUPPORT

Iowa Department of Transportation

REVISION
New 04-20-10

STANDARD ROAD PLAN

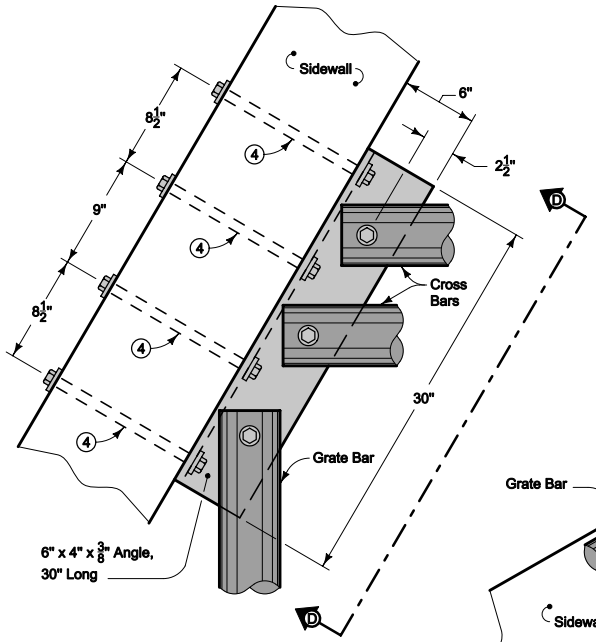
RF-29

SHEET 3 of 4

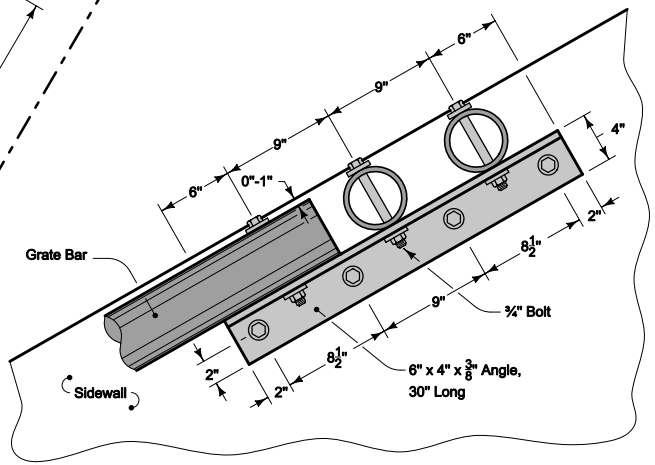
REVISIONS: New. Replaces 540-4A,B,C,D.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

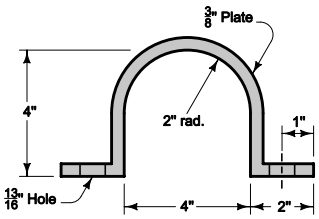
SAFETY GRATES FOR BOX CULVERTS



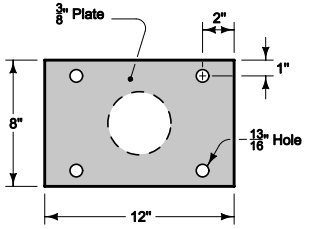
DETAIL 'C'



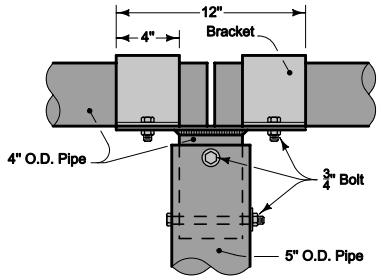
SECTION D-D



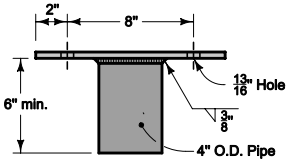
BRACKET END VIEW



TOP VIEW

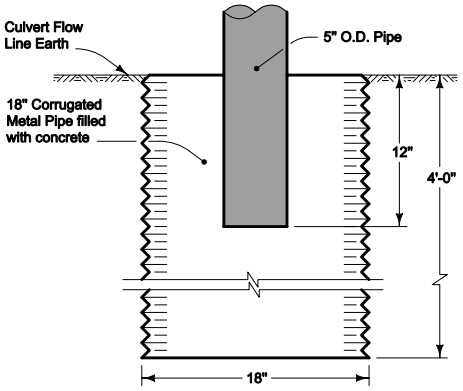


CROSS BAR SUPPORT ASSEMBLY
SIDE VIEW

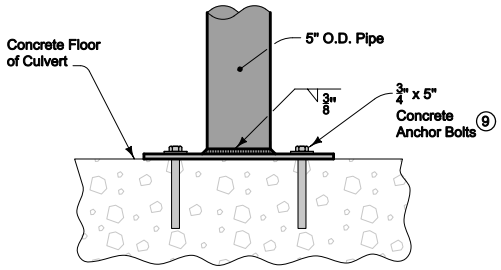


SIDE VIEW
SUPPORT PLATE

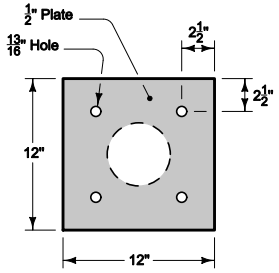
DETAIL 'D'



BOTTOM SUPPORT ON EARTH



BOTTOM SUPPORT ON CULVERT FLOOR



BOTTOM SUPPORT PLATE
TOP VIEW

④ Holes are to be $\frac{7}{8}$ inch diameter made with equipment designed to cut through concrete and reinforcing steel.

⑨ Set approved anchor bolts using epoxy grout as described in the Materials I.M. 453.08 for anchor bolts.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

RF-29

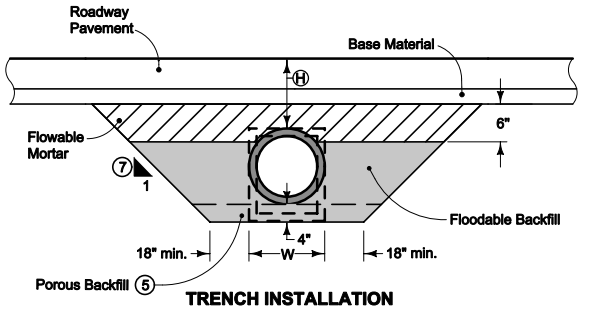
SHEET 4 of 4

REVISIONS: New. Replaces 540-4A,B,C,D.

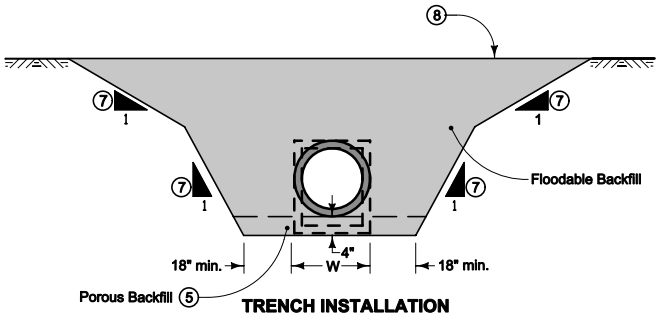
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SAFETY GRATES FOR BOX CULVERTS

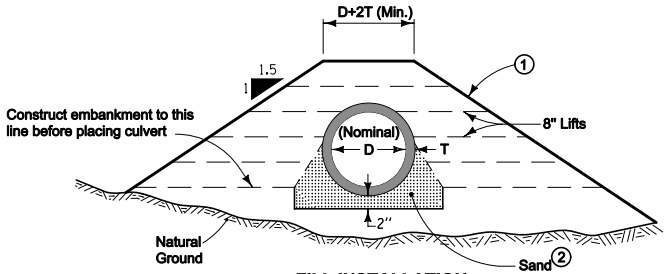
DESIGNER INFO



TRENCH INSTALLATION
H≤4'



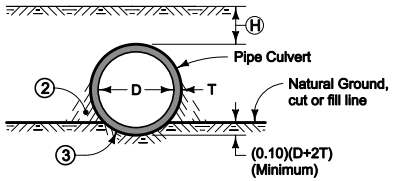
TRENCH INSTALLATION
H>4'



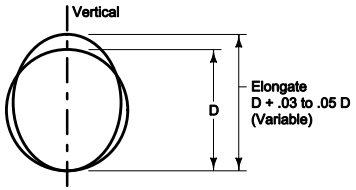
FILL INSTALLATION
(FOR RIGID PIPES ONLY)

CLASS 'B' BEDDING & BACKFILL 4

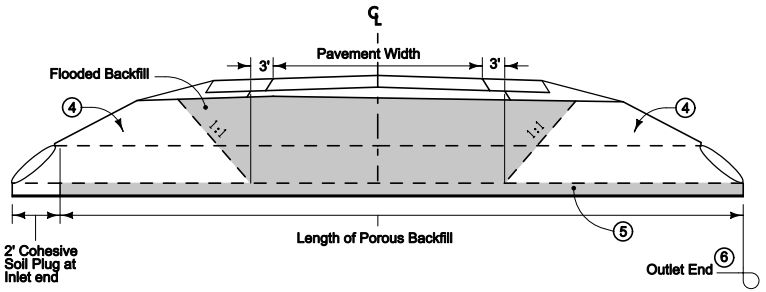
Denotes pay limits for flooded backfill



CLASS 'C' BEDDING & BACKFILL



ELONGATED PIPE



TYPICAL SECTION - SOIL PLUG

Where a corrugated metal pipe culvert requiring elongation is to be installed, such elongation shall be accomplished by means approved by the Engineer. Elongation may be developed either as part of shop fabrication or field installation.

Minimum and maximum allowable cover Ⓗ for pipe culverts shall be as shown on the appropriate Standard Road Plans for the particular kind of culvert, as follows:

RF-31 Depth of Cover Tables for Concrete Pipe
RF-32 Depth of Cover Tables for Corrugated Pipe

1. The backfill adjacent to and above the pipe culvert may be placed in conjunction with normal embankment construction. The embankment within the limits shown shall be thoroughly tamped.
2. Extra care shall be taken to ensure complete and satisfactory tamping of backfill material in the area immediately adjacent to the lower portion of pipe.
3. The excavation below groundline shall be carefully made with a template or shaped by other means and checked with a template conforming to the actual dimension and shape of the pipe.
4. For culverts backfilled by flooding, place a cohesive soil plug at the inlet, outlet, and, when necessary, sides, prior to flooding.
5. 4-inch Porous Backfill bedding. 2-inch Floodable Backfill bedding may be used under unsealed rigid pipe.
6. Extend Porous Backfill through the outlet end soil plug when used for bedding.
7. Quantity calculations are based upon a 1:1 slope and minimum trench dimension. Actual slope of trench may vary based upon contractor's operations.
8. Groundline at time of pipe installation. When existing ground exceeds 5 feet depth over pipe, backfill and compaction by flooding is not required more than 5 feet above the pipe.

Possible Contract Items:
Flowable Mortar
Flooded Backfill
Excavation, Class 20

Possible Tabulation:
104-3
104-4

Iowa Department of Transportation

REVISION
12 | 10-19-10

STANDARD ROAD PLAN

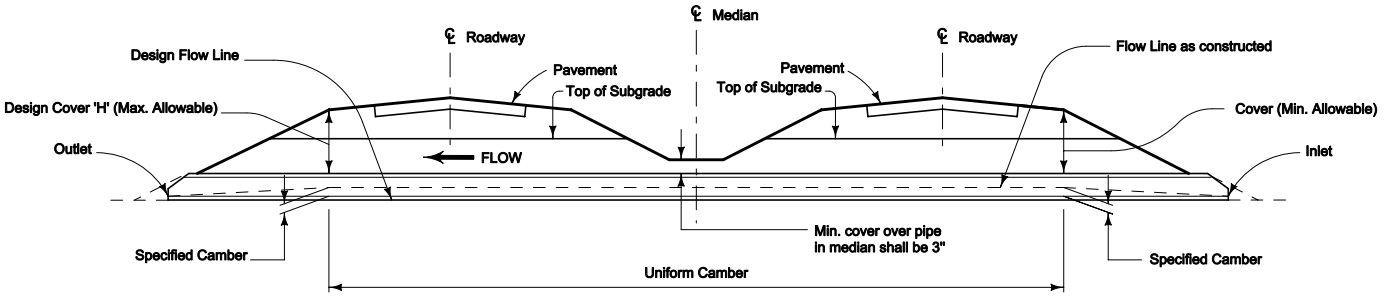
RF-30A

SHEET 1 of 1

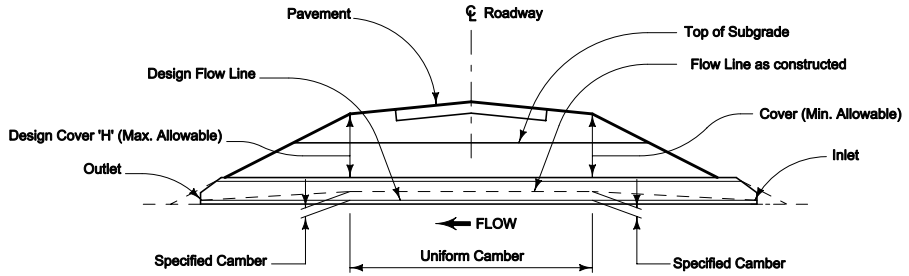
REVISIONS: Added dashed box culvert, modified length of Porous Backfill on typical section - Soil Plug, and modified notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

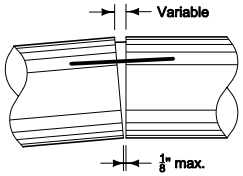
CULVERT (BEDDING AND BACKFILL)



TYPICAL INSTALLATION DUAL ROADWAY



TYPICAL INSTALLATION SINGLE ROADWAY



TYPICAL JOINT IN CAMBERED PIPE ①

Design Cover 'H' (feet)	Normal Camber (feet)
5	0.08
10	0.17
15	0.25
20	0.33
25	0.42
30	0.50
35	0.58

Pipe Size 'D'	Maximum Camber (feet)
24"	1.1
30"	1.2
36"	1.3
42"	1.4
48"	1.5
60"	1.6
84"	1.7

ALLOWABLE CAMBER TABLES

Refer to **RF-14** for pipe joint connection and wrapping.

Refer to **RF-30A** for culvert bedding and backfill.

COVER

Minimum and maximum allowable cover for pipe culverts as shown on the appropriate Standard Road Plans for the particular kind of culvert, as follows:

RF-31 Depth of Cover Tables for Concrete Pipe.
RF-32 Depth of Cover Tables for Corrugated Pipe.

CAMBER

Camber is the dimension line between inlet and outlet elevation. Some settlement of the structure is usually anticipated, resulting in the design flow line between inlet and outlet. Camber is developed uniformly from inlet and outlet to a point beneath the outside shoulder lines of the roadway and is uniform between those points, as indicated. The Normal Camber indicated in the "Allowable Camber Tables" should be used unless specific camber values are indicated elsewhere in the plans.

① Camber for concrete pipe is created by placing pipe sections tight at the bottom of the joint with variable opening at top of joint. Camber for corrugated metal pipe to be done as directed by the Engineer.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
12 | 10-19-10

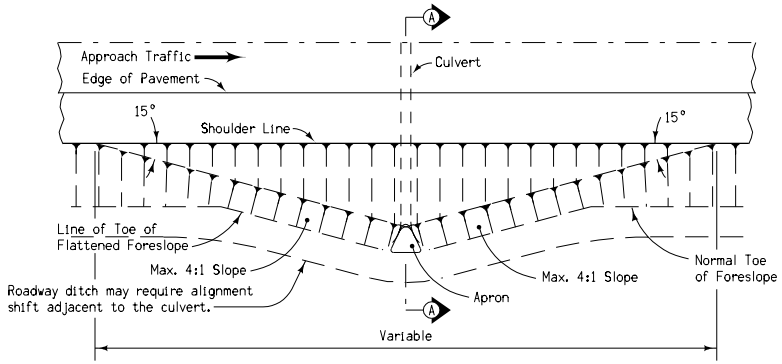
RF-30B

SHEET 1 of 1

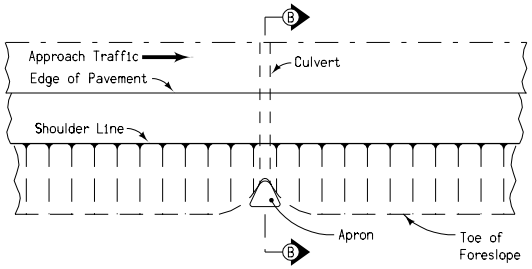
REVISIONS: Changed Standard referenced for Corrugated Pipe.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

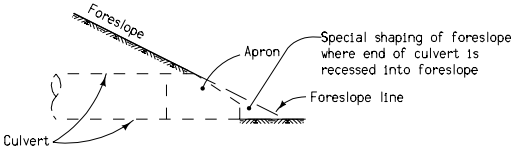
PIPE CULVERT (COVER AND CAMBER)



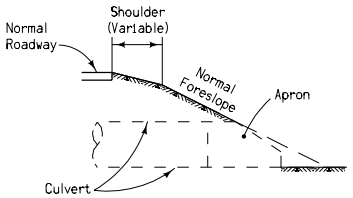
TYPICAL INSTALLATION PLAN
WHERE SPECIAL BERM IS REQUIRED



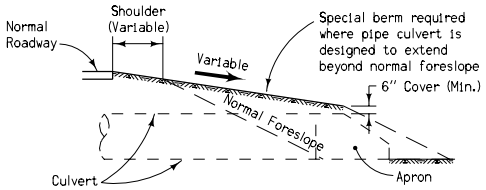
TYPICAL INSTALLATION PLAN
WHERE CULVERT MATCHES NORMAL FORESLOPE



DETAIL OF SHAPING EARTH FORESLOPE
AT CULVERT END



SECTION B-B



SECTION A-A

Iowa Department of Transportation
Highway Division

STANDARD ROAD PLAN | RF-30C

REVISION: New

REVISION NO.
NEW

REVISION DATE
04-30-02

William J. Stein
APPROVED BY DESIGN METHODS ENGINEER

PIPE CULVERT
(INSTALLATION DETAILS)

① CONCRETE CULVERT PIPE CLASS "B" BEDDING				
DIAMETER OF PIPE 'D' Inches	(H) MAXIMUM ALLOWABLE COVER IN FEET			
	1500D	2000D	3000D	3750D
18	11	13	20	25
24	12	14	21	26
36	13	16	23	28
48	14	16	24	29
60	14	17	24	29
72	14	17	24	30
84	15	17	25	30
96	15	18	25	31
108	15	18	26	32

② CONCRETE CULVERT PIPE CLASS "C" BEDDING				
DIAMETER OF PIPE 'D' Inches	(H) MAXIMUM ALLOWABLE COVER IN FEET			
	1500D	2000D	3000D	3750D
18	9	12	18	22
24	10	13	19	23
36	11	14	20	24
48	11	15	21	25
60	12	15	21	26
72	12	16	22	26
84	13	16	22	27
96	13	16	23	27
108	13	17	23	28

SPECIAL NOTE:

Special installations may be designed to exceed indicated maximum allowable cover by specific modification of one or more of the following conditions:

1. Bedding class
2. Pipe strength (including special design pipe)
3. Type of backfill or cover material
4. Compaction requirements for backfill or cover material
5. Controlled trench width

Where site conditions favor such modifications significant economy may result from special design installations and these should be considered. Special designs shall specify particular modification of construction requirements or design criteria as applicable. Necessary modifications of normal requirements will not ordinarily be paid for separately but will be included in the price bid for that culvert pipe.

GENERAL NOTES:

The maximum allowable cover values indicated hereon for the various kind of pipe culvert installations are design values based on current Standard and Supplemental Specifications and normal conditions.

When unclassified pipe is specified, it is the contractor's responsibility to furnish and install a class of pipe meeting the requirements on the chart.

Minimum allowable cover for roadway culverts is 2'–0" and 1'–0" for entrance culverts.

Refer to tabulation of culvert installations and other detail project plans as well as appropriate Standard Road Plans for additional information regarding individual culvert installations.

Where a pipe size not listed in the table is required, the 'H' indicated for the next smaller size shown shall apply.

DESIGN CRITERIA

The height of cover tables have been prepared from data in the "Concrete Pipe Design Manual" published by the American Concrete Pipe Association using the values listed below.

FOR EMBANKMENT CONDITIONS

Fill Material Density = w = 120 lbs. per cu. ft.
Settlement Ratio = rsd = +0.5
* = ku = 0.13
Projection Ratio = P = 0.9 (Class "C" bedding)
= P = 0.7 (Class "B" bedding)
Factor of Safety = F.S. = 1.33 on Ultimate Strength

* Using a ratio of lateral to vertical earth pressure (k) of 0.37 (saturated yellow clay) and a coefficient of internal friction (u) of 0.34.

NOTE:

The data shown hereon has been calculated for concrete pipe placed under embankment conditions. The values shown hereon for H do not apply to design and installation of sanitary sewer except where sanitary sewer would be placed under embankment condition.

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN **RF-31**

REVISION: Place in CADD and update General Notes.

REVISION NO. 1

David P. Little 11-18-94
APPROVED BY DESIGN METHODS ENGINEER

REVISION DATE 03-28-95

DEPTH OF COVER TABLES FOR CONCRETE PIPE

STEEL ROUND PIPE
2 2/3″ x ½″ CORRUGATIONS

DIAMETER OF PIPE 'D' Inches	MINIMUM COVER ABOVE PIPE ① Inches	(H) MAXIMUM ALLOWABLE COVER IN FEET									
		16 GAGE (0.064″)		14 GAGE (0.079″)		12 GAGE (0.109″)		10 GAGE (0.138″)		8 GAGE (0.168″)	
		Round	Elongated	Round	Elongated	Round	Elongated	Round	Elongated	Round	Elongated
12	12	70	-	76	-	-	-	-	-	-	-
15	12	56	-	61	-	-	-	-	-	-	-
18	12	40	-	48	-	64	-	-	-	-	-
24	12	23	-	26	-	33	-	-	-	-	-
30	12	-	-	18	30	22	43	25	51	-	-
36	12	-	-	15	25	17	33	19	38	-	-
42	12	-	-	-	-	14	28	16	31	17	34
48	12	-	-	-	-	13	25	14	27	15	29
54	18	-	-	-	-	12	24	13	25	13	26
60	18	-	-	-	-	-	-	12	23	12	25
66	18	-	-	-	-	-	-	11	22	12	23
72	18	-	-	-	-	-	-	11	17	11	21
78	24	-	-	-	-	-	-	-	-	11	17
84	24	-	-	-	-	-	-	-	-	11	13

STEEL ROUND PIPE
3″ X 1″ and 5″ X 1″ CORRUGATIONS

DIAMETER OF PIPE 'D' Inches	MINIMUM COVER ABOVE PIPE ① Inches	(H) MAXIMUM ALLOWABLE COVER IN FEET									
		16 GAGE (0.064″)		14 GAGE (0.079″)		12 GAGE (0.109″)		10 GAGE (0.138″)		8 GAGE (0.168″)	
		Round	Elongated	Round	Elongated	Round	Elongated	Round	Elongated	Round	Elongated
36	12	27	40	31	50	40	74	-	-	-	-
42	12	21	34	23	42	29	58	-	-	-	-
48	12	17	30	19	37	23	46	-	-	-	-
54	12	15	27	16	32	19	38	-	-	-	-
60	12	13	24	15	29	16	33	-	-	-	-
66	12	13	22	13	27	15	30	-	-	-	-
72	12	12	20	12	25	14	27	-	-	-	-
78	12	12	18	12	23	13	26	-	-	-	-
84	12	-	-	12	21	12	24	13	26	-	-
90	12	-	-	-	-	12	24	12	35	13	26
96	12	-	-	-	-	11	23	12	24	12	25
102	24	-	-	-	-	-	-	12	23	12	24
108	24	-	-	-	-	-	-	-	-	12	23
114	24	-	-	-	-	-	-	-	-	11	23
120	24	-	-	-	-	-	-	-	-	11	20

STRUCTURAL STEEL ROUND PIPE
6″ X 2″ CORRUGATIONS

DIAMETER OF PIPE 'D' Inches	MINIMUM COVER ABOVE PIPE ① Inches	(H) MAXIMUM ALLOWABLE COVER IN FEET													
		12 GAGE (0.109″)		10 GAGE (0.138″)		8 GAGE (0.168″)		7 GAGE (0.187″)		5 GAGE (0.218″)		3 GAGE (0.250″)		1 GAGE (0.281″)	
		Round	Elongated	Round	Elongated	Round	Elongated	Round	Elongated	Round	Elongated	Round	Elongated	Round	Elongated
60	12	35	35	43	52	51	67	-	-	-	-	-	-	-	-
66	12	29	32	35	45	41	61	-	-	-	-	-	-	-	-
72	12	25	29	29	43	34	56	-	-	-	-	-	-	-	-
78	12	22	27	25	40	29	52	31	60	-	-	-	-	-	-
84	12	19	25	22	37	25	48	27	53	-	-	-	-	-	-
90	12	18	23	20	34	22	44	23	47	-	-	-	-	-	-
96	12	16	22	18	32	20	40	21	42	-	-	-	-	-	-
102	24	15	21	17	30	18	36	19	38	-	-	-	-	-	-
108	24	14	19	16	29	17	34	18	36	-	-	-	-	-	-
114	24	14	18	15	27	16	32	17	33	18	36	-	-	-	-
120	24	13	18	14	26	15	30	16	31	17	33	-	-	-	-
126	24	13	-	13	25	14	29	15	30	16	31	-	-	-	-
132	24	12	-	13	24	14	27	14	28	15	30	-	-	-	-
138	24	12	-	13	23	13	26	14	27	14	29	-	-	-	-
144	24	12	-	12	22	13	26	13	26	14	27	-	-	-	-
150	24	12	-	12	21	12	25	13	26	13	27	14	28	-	-
156	24	11	-	12	20	12	24	12	25	13	26	13	27	-	-
162	24	11	-	12	19	12	24	12	24	13	25	13	26	13	27
168	24	11	-	11	19	12	23	12	24	12	25	13	25	13	26
174	24	11	-	11	18	12	23	12	23	12	24	12	25	13	25
180	24	11	-	11	17	11	23	11	23	12	24	12	24	12	25

For all sizes and installations of polyethylene culvert pipe:
minimum cover = 2 feet
maximum cover = 24 feet for 12 to 24 inch pipes
20 feet for 30 to 48 inch pipes

For Steel Round Pipe, the Contractor may choose the type of corrugated pipe and installation to furnish as long as the selection conforms to the limits indicated for the type specified.

Provide Steel Arch Pipe with corrugations as specified in plans.

① **Minimum cover for metal roadway culverts is 24 inches.**
Minimum cover for metal entrance culverts is 12 inches.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
12	10-19-10

RF-32

SHEET 1 of 2

REVISIONS: Clarified general notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DEPTH OF COVER TABLES FOR CORRUGATED PIPE

STEEL ARCH PIPE 2 2/3" X 1/2" CORRUGATIONS								
SPAN	RISE	R_c ②	MINIMUM COVER ABOVE PIPE ①	(H) MAXIMUM ALLOWABLE COVER IN FEET				
				16 GA.	14 GA.	12 GA.	10 GA.	8 GA.
Inches	Inches	Inches	Inches	(0.064")	(0.079")	(0.109")	(0.138")	(0.168")
17	13	3.5	18	6	6	-	-	-
21	15	4.125	18	6	6	-	-	-
24	18	4.875	18	5	5	-	-	-
28	20	5.5	18	5	5	-	-	-
35	24	6.875	18	5	5	-	-	-
42	29	8.25	18	4	4	-	-	-
49	33	9.625	18	-	-	4	4	4
57	38	11.0	18	-	-	4	4	4
64	43	12.375	18	-	-	4	4	4
71	47	13.75	18	-	-	-	4	4
77	52	15.125	18	-	-	-	-	4
83	57	16.5	18	-	-	-	-	4

STEEL ARCH PIPE 3" X 1" and 5" X 1" CORRUGATIONS							
SPAN	RISE	R_c ②	MINIMUM COVER ABOVE PIPE ①	(H) MAX. ALLOWABLE COVER IN FT.			
				16 GA.	14 GA.	12 GA.	10 GA.
Inches	Inches	Inches	Inches	(0.064")	(0.079")	(0.109")	(0.138")
60	46	18.75	18	6	6	-	-
66	51	20.75	18	6	6	-	-
73	55	22.875	18	8	8	-	-
81	59	20.875	18	-	7	7	-
87	63	22.625	18	-	7	7	-
95	67	24.375	18	-	6	6	-
103	71	26.125	24	-	-	6	-
112	75	27.75	24	-	-	5	-
117	79	29.5	24	-	-	5	-
128	83	31.25	24	-	-	-	5

STRUCTURAL STEEL ARCH PIPE 6" X 2" CORRUGATIONS							
SPAN	RISE	R_c ②	MINIMUM COVER ABOVE PIPE ①	(H) MAXIMUM ALLOWABLE COVER IN FEET			
				12 GA.	10 GA.	8 GA.	7 GA.
Inches	Inches	Inches	Inches	(0.109")	(0.138")	(0.168")	(0.187")
73	55	18	18	8	-	-	-
84	61	18	18	7	-	-	-
95	67	18	18	6	-	-	-
106	73	18	24	6	-	-	-
117	79	18	24	5	-	-	-
131	85	18	24	5	-	-	-
142	91	18	24	4	-	-	-
154	100	18	24	4	-	-	-
159	112	31	24	6	-	-	-
170	118	31	24	6	-	-	-
184	124	31	24	-	6	-	-
195	130	31	36	-	5	-	-
206	136	31	36	-	5	-	-
217	142	31	36	-	-	5	-
231	148	31	36	-	-	4	-
239	154	31	36	-	-	4	-
247	158	31	36	-	-	-	4

① Minimum cover for metal roadway culverts is 24 inches.
Minimum cover for metal entrance culverts is 12 inches.

② Corner Radius, Rc, changes from 18 inches to 31 inches for the 6 in. x 2 in. corrugation.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
12	10-19-10

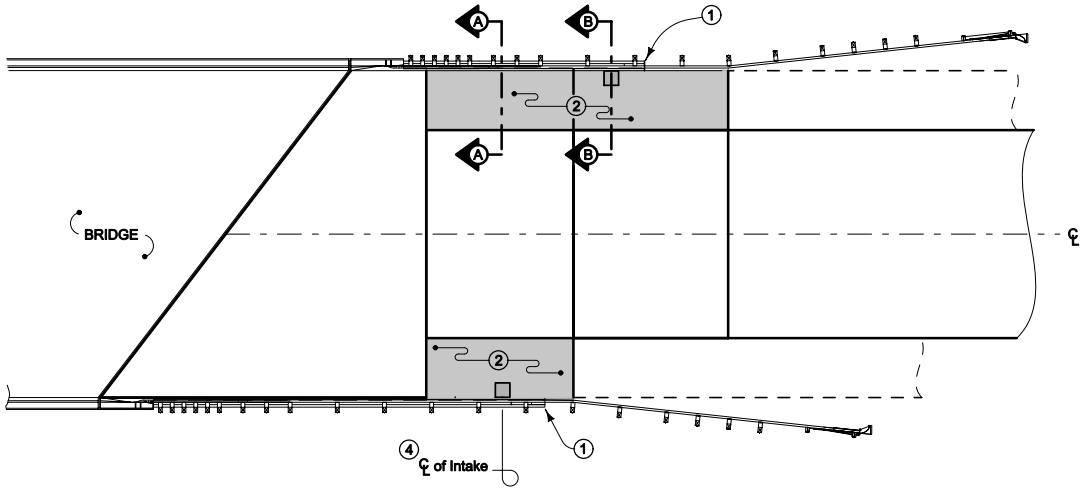
RF-32

SHEET 2 of 2

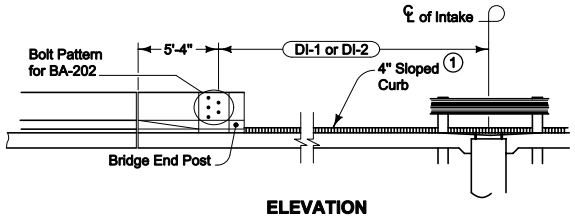
REVISIONS: Clarified general notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

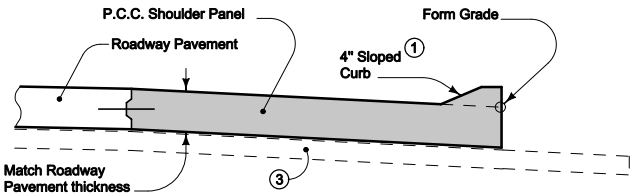
DEPTH OF COVER TABLES FOR CORRUGATED PIPE



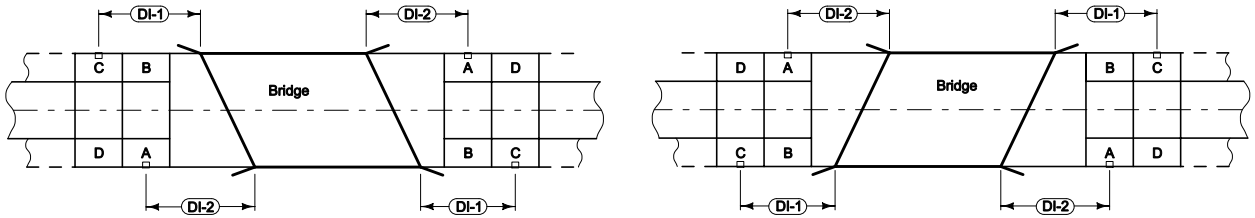
PLAN



ELEVATION



SECTION A-A
(Shoulder Panel)



PANEL LOCATIONS

Price bid for "Bridge End Drain, RF-38" is full compensation for furnishing, installing, and constructing the Bridge End Drain as shown.

(1) Build 4 inch Sloped Curb 5 feet beyond centerline of intake.

(2) Paved shoulder panel will be paid for as, "Paved Shoulders, P.C. Concrete."

(3) Install modified subbase and polymer grid under P.C.C. shoulder panels. See Section A-A (RK-20, RK-25, or RK-26) or Section C-C (RK-23).

(4) Place intake 5 feet or more from the nearest transverse pavement joint and between guardrail posts to allow for storm sewer outlet. Joints are determined by the bridge approach section.

Possible Contract Items:
Bridge End Drain, RF-38
Paved Shoulder, P.C. Concrete

Incidental to Paved Shoulder:
Modified Subbase
Polymer Grid

Possible Tabulation:
104-8

Iowa Department of Transportation

REVISION	
11	04-20-10

STANDARD ROAD PLAN

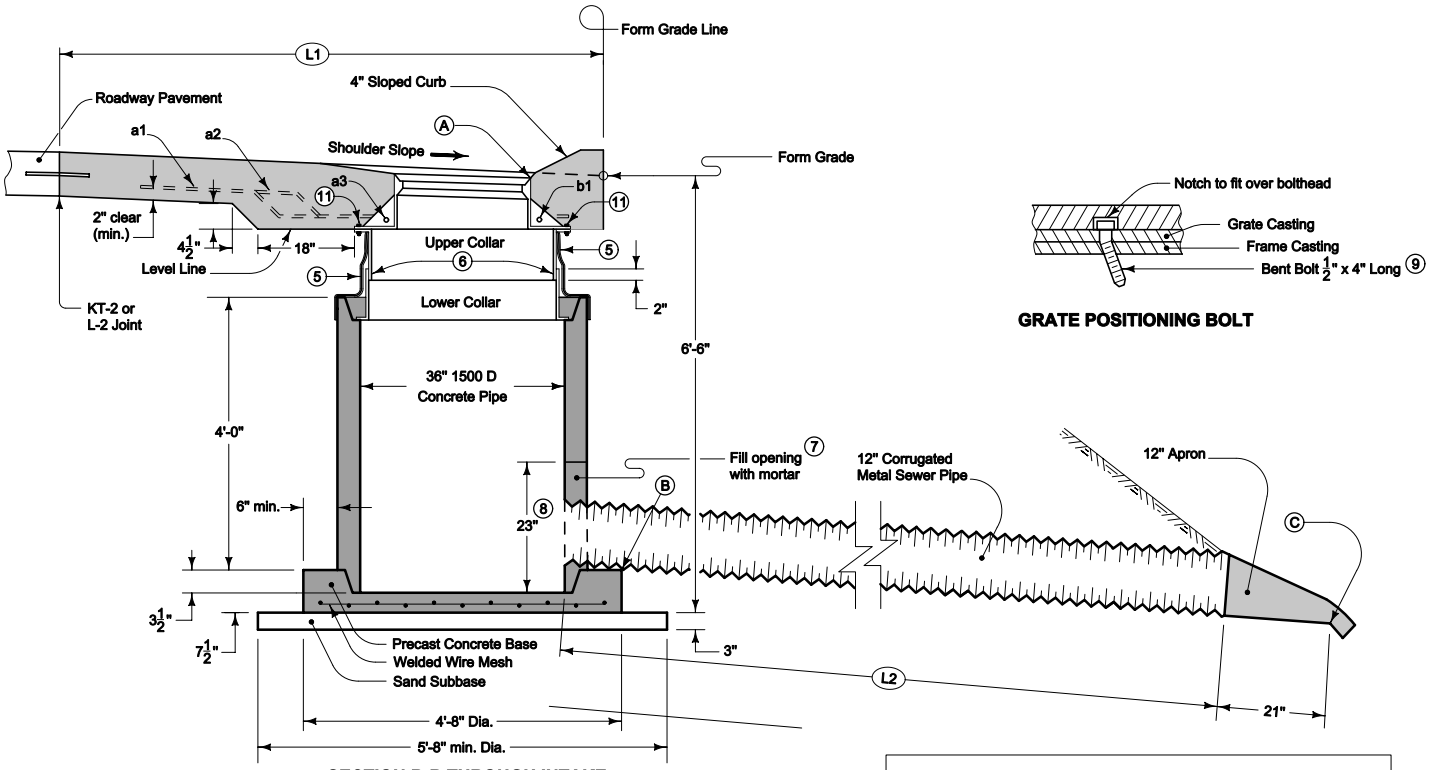
RF-38

SHEET 1 of 5

REVISIONS: Added possible tabulation. Updated materials reference in circle note 7. Changed reference by bolt pattern on sheet 1. Added grate and collar info.

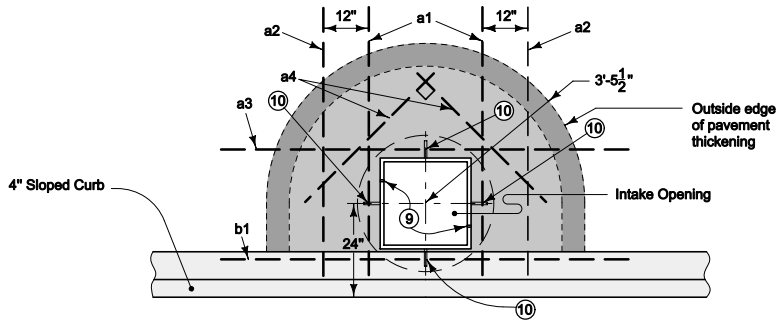
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

INTAKE FOR BRIDGE END DRAIN



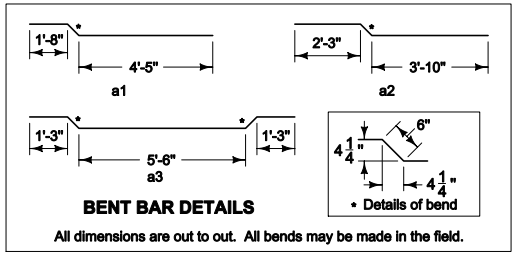
SECTION B-B THROUGH INTAKE

GRATE POSITIONING BOLT



REINFORCING LAYOUT

Note: Place bars a1, a3, & b1 through holes in intake casting.



BENT BAR DETAILS

All dimensions are out to out. All bends may be made in the field.

REINFORCING BAR LIST						
MARK	SIZE	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
a1 ⑩	4	Shoulder		2	6'-7"	9
a2	4	Shoulder		2	6'-7"	9
a3 ⑩	4	Shoulder		1	9'-0"	6
a4	4	Shoulder		2	4'-0"	5
b1 ⑩	4	Curb		1	8'-9"	6
					Total	35 lbs.

Construct precast base using 4 in. x 4 in. No. 6 steel wire mesh reinforcing or equivalent.

Install all joints in corrugated metal pipe made with connecting bands with approved asphaltic sealer to ensure a water-tight joint.

Flow line Ⓐ elevation is 0.10 feet below Form Grade Elevation.

Flow line Ⓑ elevation is 5.75 feet below flow line Ⓐ.

Flow line Ⓒ elevation is 0 - 0.5 feet above ditch grade.

Refer to project plans for actual flow line elevations of Ⓐ, Ⓑ, Ⓒ, and dimensions L1 and L2.

⑤ Before backfilling around the intake assembly, wrap two thicknesses of engineering fabric around the settlement collar. Tape all the way around with 2 inch duct tape immediately below the flange of upper section and 4 inches below the top of well pipe.

⑥ Fasten Slip joint temporarily with four ½ inch cap screws during pavement construction. Remove cap screws after pavement is hardened.

⑦ Refer to Materials I.M. 491.13.

⑧ 23 in. x 15 in. slot for insertion of 12 inch corrugated metal pipe.

⑨ Field place ½ in. x 4 in. long bolt in upstream side and bend underside to prevent removal.

⑩ Place reinforcing through the appropriate holes in the intake casting.

⑪ Fasten frame casting to Upper Collar casting at four locations using ½ in. x 2 in. long hex bolts and ½ inch nuts.

Iowa Department of Transportation

STANDARD ROAD PLAN

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RF-38

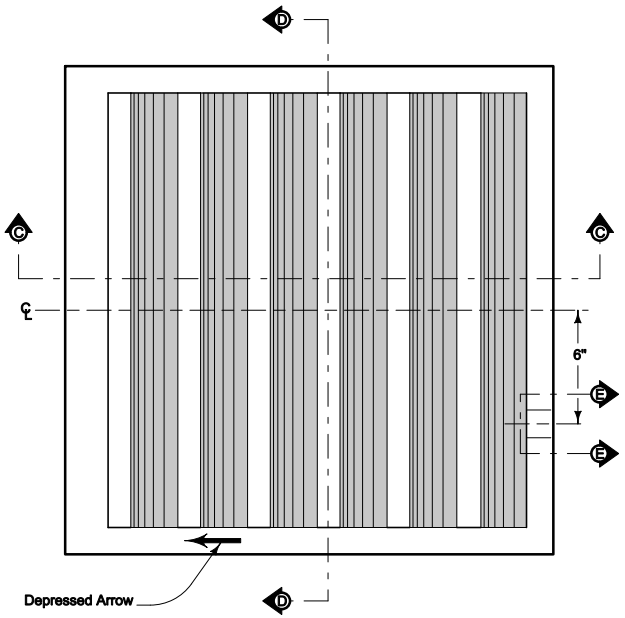
SHEET 2 of 5

REVISIONS: Added possible tabulation. Updated materials reference in circle note 7. Changed reference by bolt pattern on sheet 1. Added grate and collar info.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

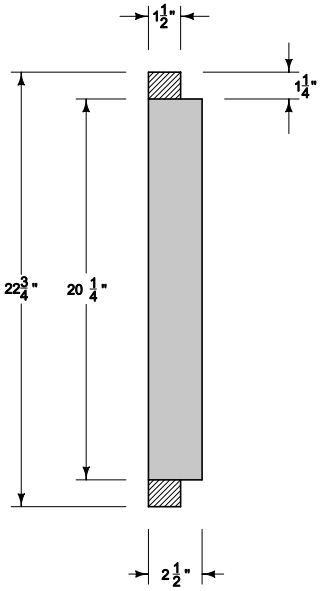
INTAKE FOR BRIDGE END DRAIN

Minimum Weight = 90 lbs.

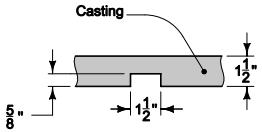


PLAN

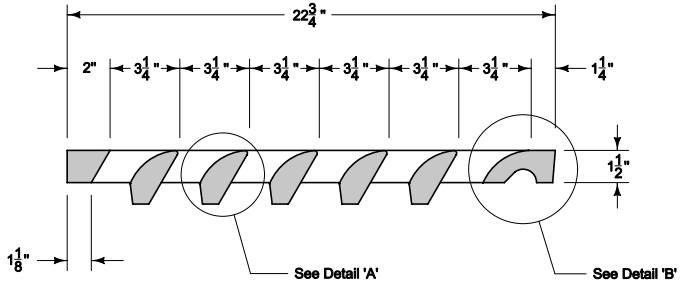
Flow



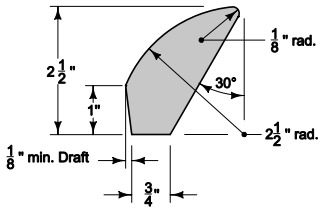
SECTION D-D



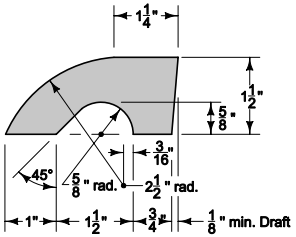
SECTION E-E



SECTION C-C



DETAIL 'A'



DETAIL 'B'

FRAME

Iowa Department of Transportation

STANDARD ROAD PLAN

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11	04-20-10

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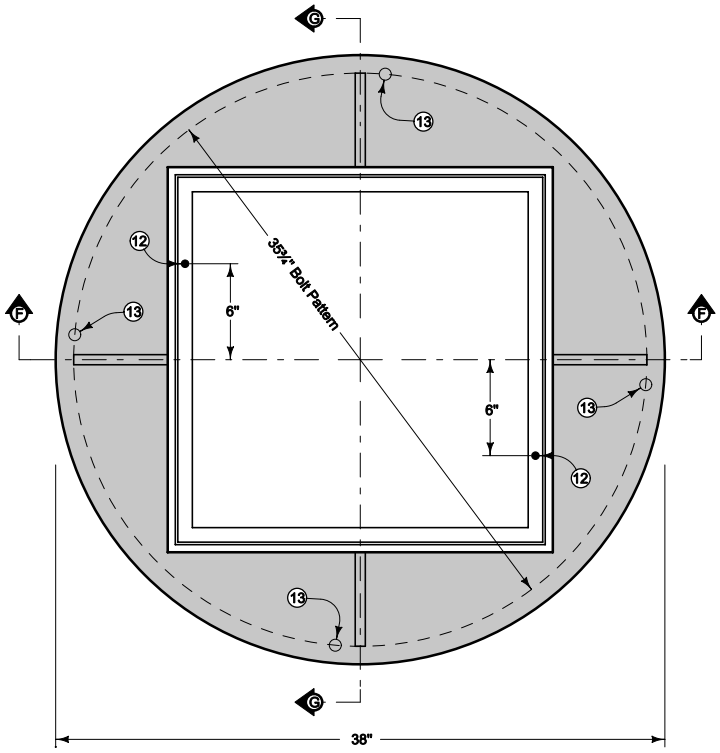
SHEET 3 of 5

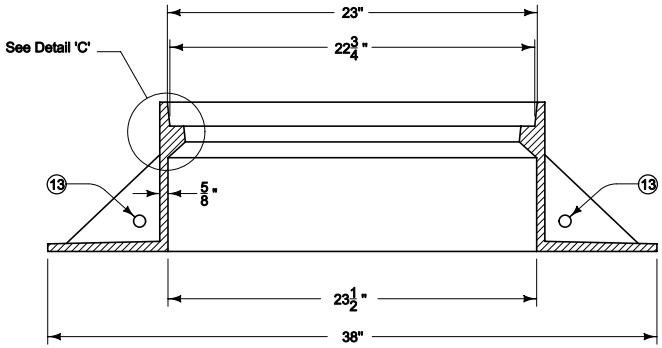
REVISIONS: Added possible tabulation. Updated materials reference in circle note 7. Changed reference by bolt pattern on sheet 1. Added grate and collar info.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

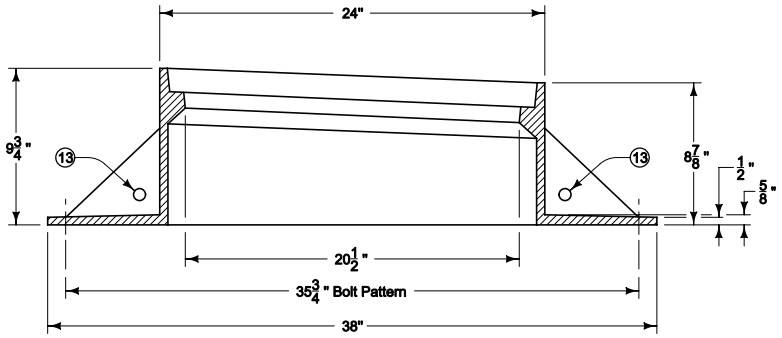
INTAKE FOR BRIDGE END DRAIN



PLAN

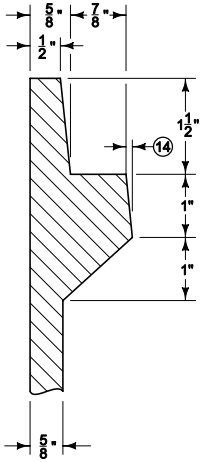


SECTION F-F



SECTION G-G

GRATE



DETAIL 'C'

Minimum Weight = 210 lbs.

⑫ Provide $\frac{9}{16}$ inch diameter holes at locations indicated.

⑬ Drill or Core $\frac{3}{4}$ inch holes.

⑭ DRAFT (Small Casting Taper) will be permitted.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
11	04-20-10

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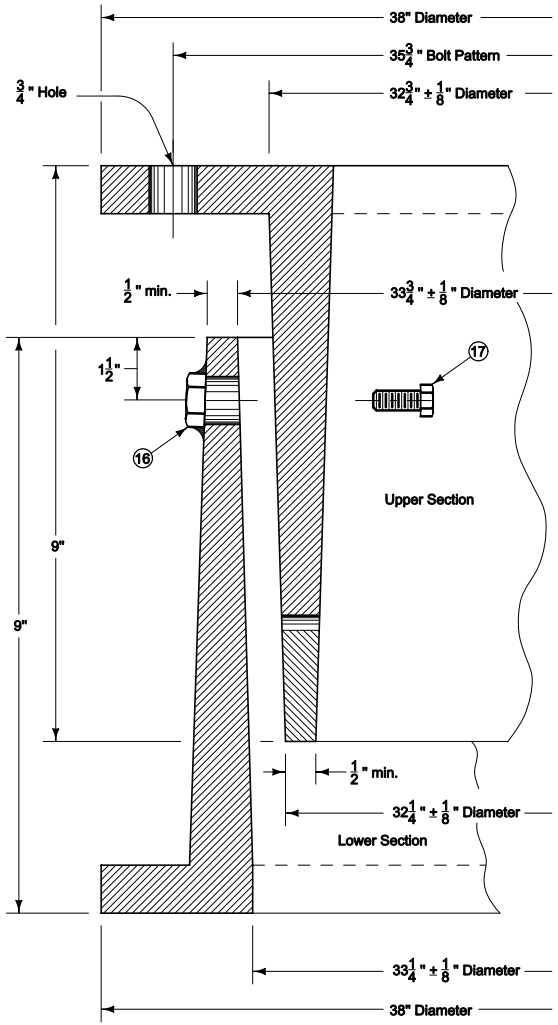
SHEET 4 of 5

REVISIONS: Added possible tabulation. Updated materials reference in circle note 7. Changed reference by bolt pattern on sheet 1. Added grate and collar info.

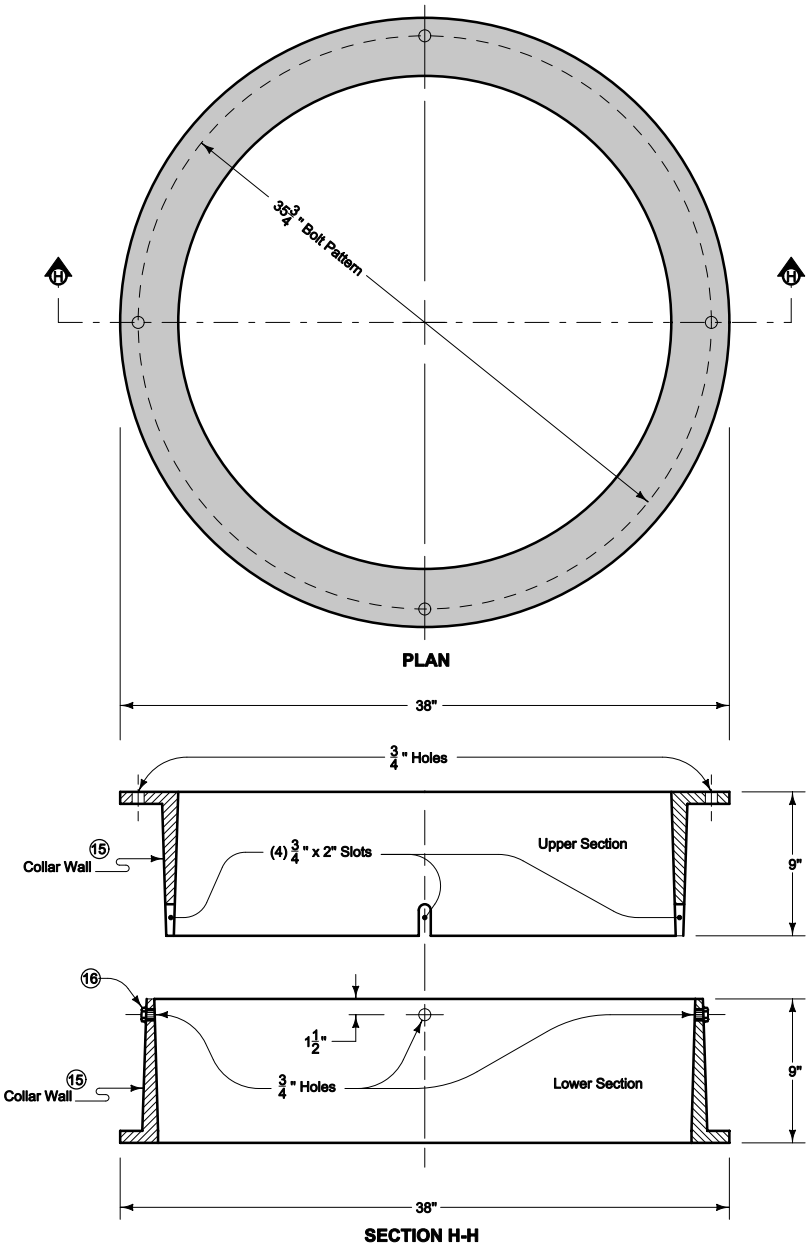
Deanna Maifeld

APPROVED BY DESIGN METHODS ENGINEER

INTAKE FOR BRIDGE END DRAIN



SETTLEMENT COLLAR



SECTION H-H

15 Wall thickness may vary uniformly from base to the top or bottom of the casting.

16 Tack weld (4) 1/2 inch nuts to outside of bottom settlement collar or drill and tap (4) holes for 1/2 inch Cap Screws in bottom settlement collar.

17 Remove the (4) 1/2 inch Cap Screws after surrounding concrete has set.

MINIMUM WEIGHT	
Upper Section	210 lbs.
Lower Section	210 lbs.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
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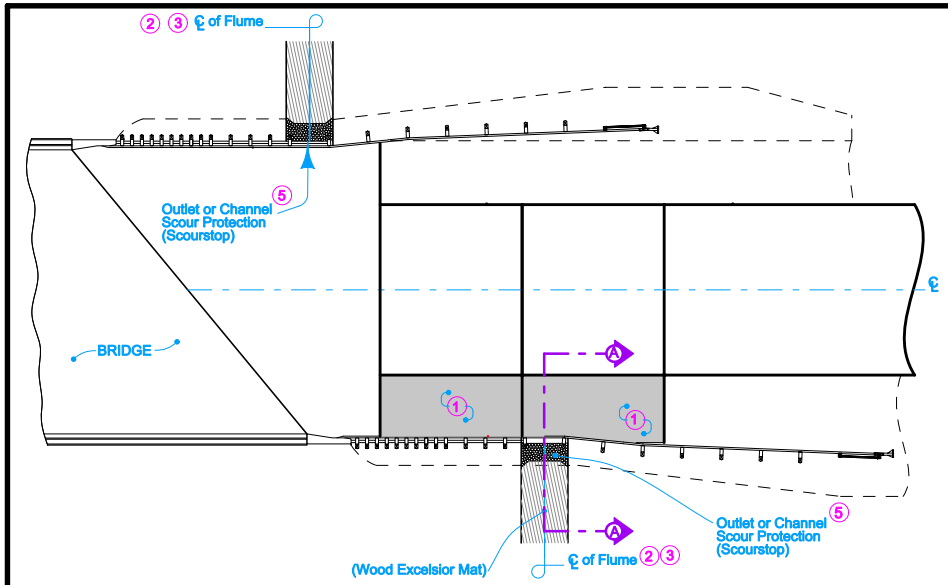
SHEET 5 of 5

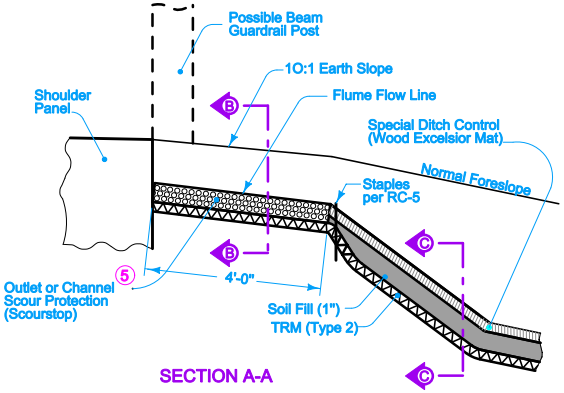
REVISIONS: Added possible tabulation. Updated materials reference in circle note 7. Changed reference by bolt pattern on sheet 1. Added grate and collar info.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

INTAKE FOR BRIDGE END DRAIN



PLAN



SECTION A-A

① Paved shoulder panel will be paid for as, "Paved Shoulder, P.C.C. (Panel Bridge-End Drain)". Continue 4" sloped curb to edge of flume per section B-B.

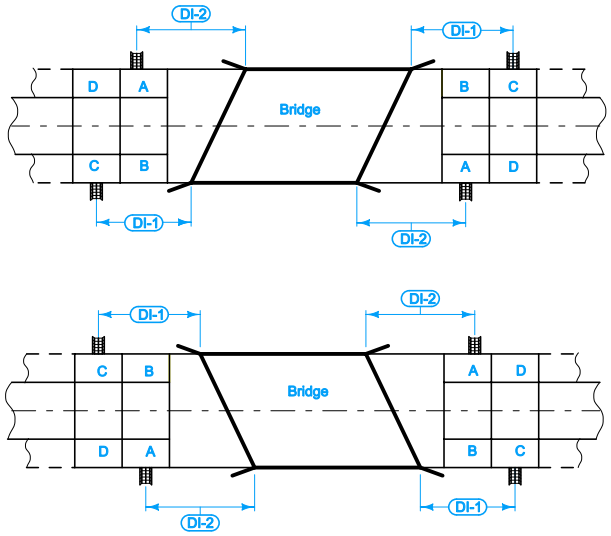
Install modified subbase and polymer grid under PCC shoulder panels as shown in Section A-A on RK-20, RK-25,or RK-26.

② DI-1 and DI-2 distances measured from center of Bolt Pattern. Locate flume 5 feet or more from the nearest transverse pavement joint. Joint locations are determined by the bridge approach section.

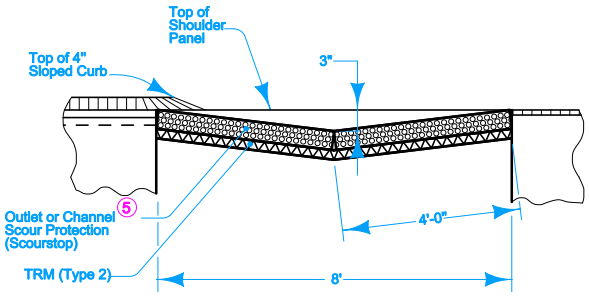
③ Extend the TRM flume to low point of ditch.

④ Transition the flume flow line depth from 3 inches at the downstream edge of Scourstop to 8 inches with an approximate transition rate of 1 inch vertical per 1 foot horizontal.

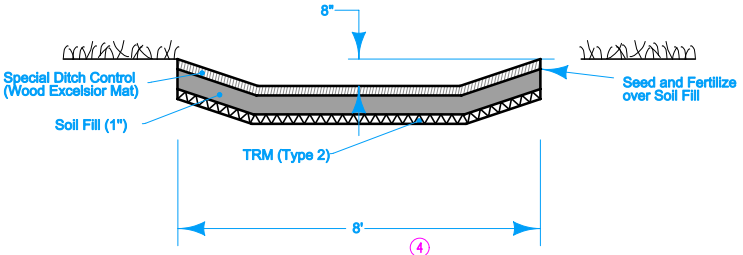
⑤ Scourstop panels must abut the edge of pavement to prevent from being undercut by water. Panels are to be cut to fit around guardrail posts to ensure pavement edge contact. Measurement for Outlet or Channel Scour Protection (Scourstop) will be in square feet. No deduction will be made for area removed for guardrail posts. Payment will be the contract unit price per square foot for Outlet or Channel Scour Protection (Scourstop). Payment is full compensation for furnishing and installing Outlet or Channel Scour Protection (Scourstop).



PCC SHOULDER PANEL LOCATIONS ②



SECTION B-B



SECTION C-C ④

Possible Contract Items:
- Outlet or Channel Scour Protection (Scourstop)
- Paved Shoulder, P.C.C. (Panel Bridge-End Drain)
- Turf Reinforced Mat (TRM)

Incidental to Paved Shoulder:
- Modified Subbase
- Polymer Grid

Incidental to Turf Reinforced Mat (TRM):
- Soil Fill
- Special Ditch Control (Wood Excelsior Mat)
- Seeding and Fertilizing
- Watering for Sod, Special Ditch Control, or Slope Protection

Possible Tabulation:
104-8A

Iowa Department of Transportation

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15 | 04-19-11

STANDARD ROAD PLAN

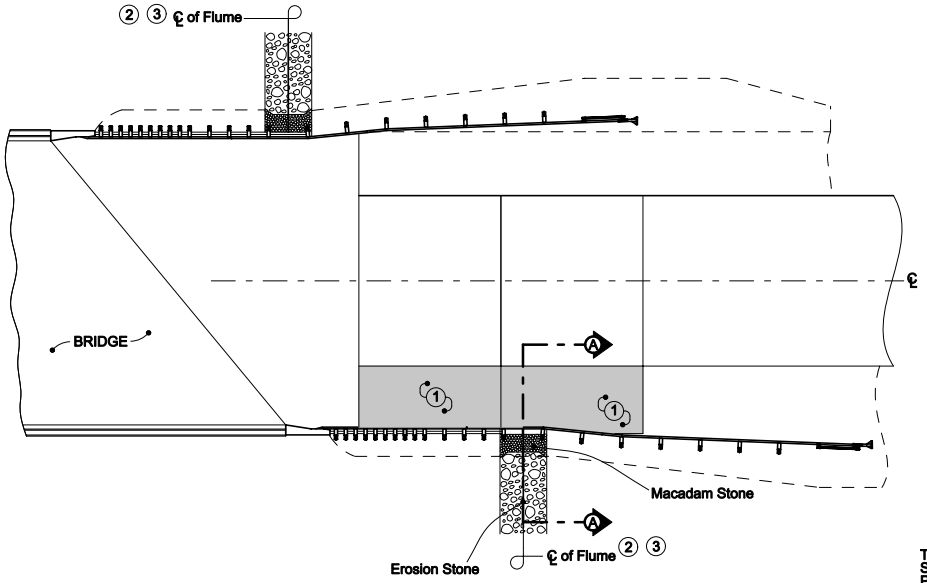
RF-39

SHEET 1 of 1

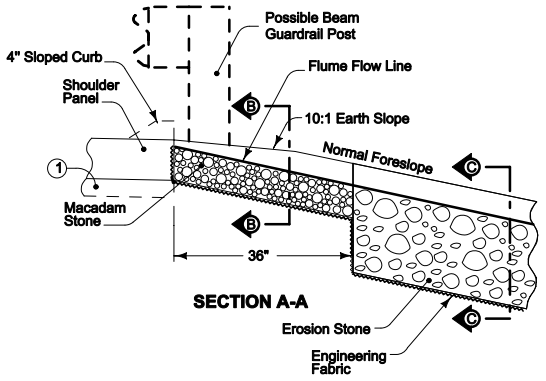
REVISIONS: Added Method of Measurement and Basis of Payment to note 5.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

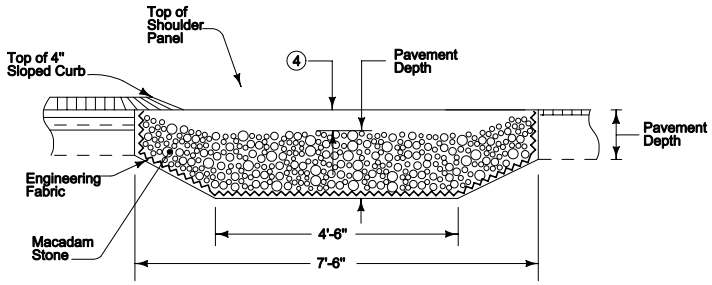
SCOUR PROTECTION FOR BRIDGE END DRAIN



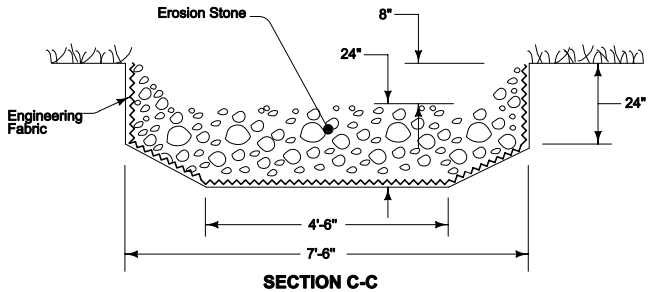
PLAN



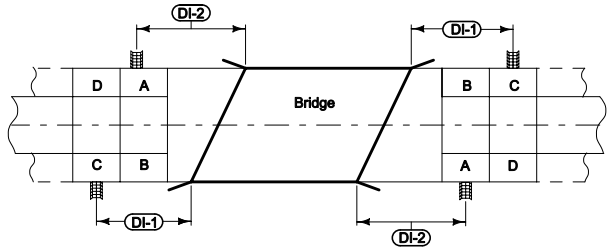
SECTION A-A

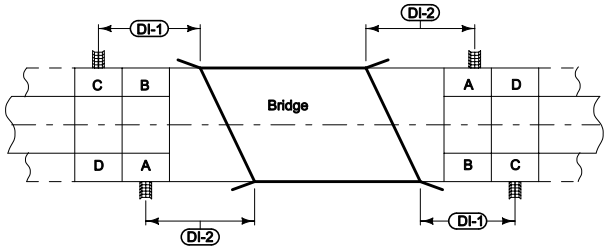


SECTION B-B



SECTION C-C





PCC SHOULDER PANEL LOCATIONS ②

Price bid for "Bridge End Drain, RF-40" is full compensation for furnishing, installing, and constructing the Bridge End Drain as shown.

① Paved shoulder panel will be paid for as, "Paved Shoulder, P.C.C. (Panel Bridge-End Drain)". Continue 4 inch sloped curb to edge of flume per section B-B.

Install modified subbase and polymer grid under PCC shoulder panels as shown in Section A-A on RK-20, RK-25,or RK-26.

② DI-1 and DI-2 distances measured from center of Bolt Pattern. Locate flume 5 feet or more from the nearest transverse pavement joint. Joint locations are determined by the bridge approach section.

③ Extend rock flume to low point of ditch.

④ Transitions from 2 inches at edge of pavement to 8 inches within 3 feet.

Possible Contract Items:
- Paved Shoulder, P.C. Concrete
- Bridge End Drain, RF-40

Incidental to Paved Shoulder:
- Modified Subbase
- Polymer Grid

Incidental to Bridge End Drain:
- Macadam Stone Base Material
- Erosion Stone
- Engineering Fabric
- Excavation, hauling, and disposing of material

Possible Tabulation:
- 104-8A

Iowa Department of Transportation

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8 | 10-19-10

STANDARD ROAD PLAN

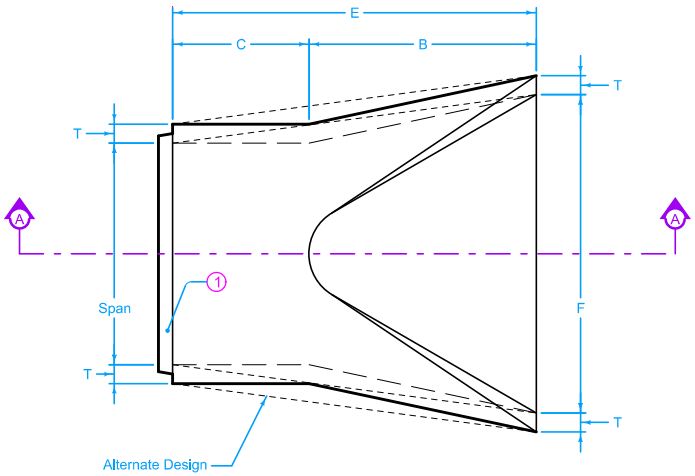
RF-40

SHEET 1 of 1

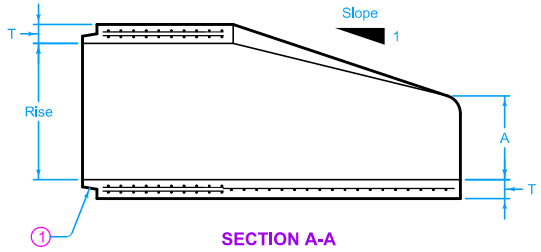
REVISIONS: Corrected labeling errors in prior plan view: Changed Wood Excelsior Mat to Erosion Stone and Scourstop to Macadam Stone in Plan view.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

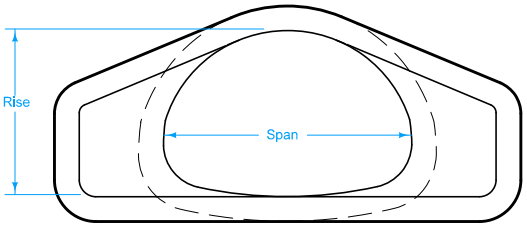
ROCK FLUME FOR BRIDGE END DRAIN



PLAN



SECTION A-A



END

Comply with AASHTO M 206 for Apron Reinforcement.

Dimension "E" shown is minimum and is considered the design length. Appropriately adjust for any difference between the actual length of concrete apron installed and the length indicated hereon for the length of concrete culvert pipe furnished.

(1) Tongue end on inlet end section. Groove end on outlet end section. (Inlet end section shown.)

NOMINAL DIMENSIONS SPAN X RISE Inches	EQUIVALENT DIAMETER Inches	SPAN Inches	RISE Inches	SLOPE	APPROXIMATE DIMENSIONS Inches					
					(T)	(A)	(B)	(C)	(E)	(F)
22 X 14	18	22	13 1/2	3:1	2 1/2	7	27	45	72	36
29 X 18	24	28 1/2	18	3:1	3	8 1/2	39	33	72	48
37 X 23	30	36 1/4	22 1/2	3:1	3 1/2	9 1/2	50	46	96	60
44 X 27	36	43 3/8	26 5/8	3:1	4	11 1/8	60	36	96	72
52 X 32	42	51 1/8	31 5/16	3:1	4 1/2	15 13/16	60	36	96	78
59 X 36	48	58 1/2	36	3:1	5	21	60	36	96	84
65 X 40	54	65	40	3:1	5 1/2	25 1/2	60	36	96	90
73 X 45	60	73	45	3:1	6	31	60	36	96	96
88 X 54	72	88	54	2:1	7	31	60	39	99	120
102 X 62	84	102	62	2:1	8	21 1/2	83	19	102	144

Possible Contract Item:
Low Clearance Concrete Pipe Aprons

Possible Tabulations:
104-3
104-4

Iowa Department of Transportation

REVISION
6 | 04-17-12

STANDARD ROAD PLAN

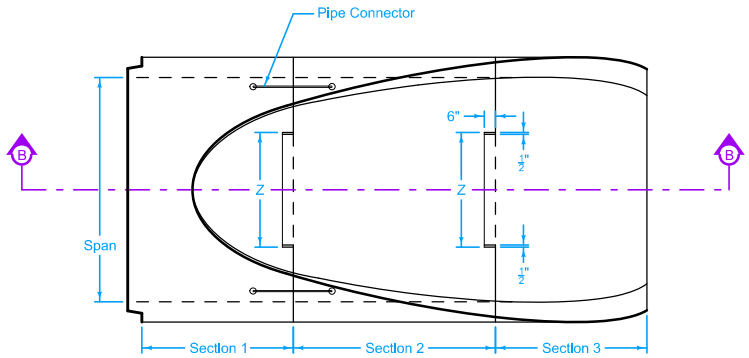
RF-42

SHEET 1 of 3

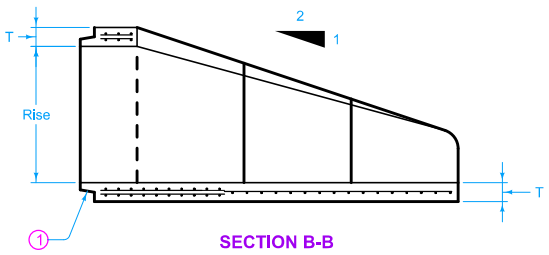
REVISIONS: Added option for elliptical pipe. Changed title. Changed Possible Contract Item to "Low Clearance Concrete Pipe Aprons".

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LOW CLEARANCE CONCRETE PIPE APRONS

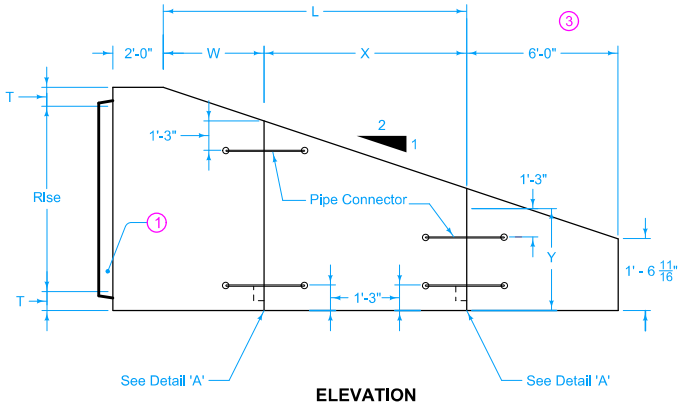


PLAN

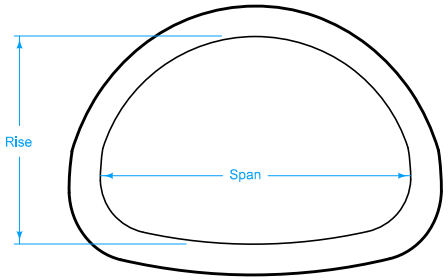


SECTION B-B

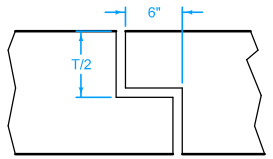
1. Tongue end on inlet end section. Groove end on outlet end section. (Inlet end section shown.)
3. 132" size is a three-piece end section.



ELEVATION



END



DETAIL 'A'

NOMINAL DIMENSIONS SPAN X RISE Inches	EQUIVALENT DIAMETER Inches	SPAN Inches	RISE Inches	APPROXIMATE DIMENSIONS Inches					
				(T)	(L)	(W)	(X)	(Y)	(Z)
115 X 72	90	115	72	8 1/2	102 1/4	72	30 1/4	37 7/8	48
122 X 78	96	122	77 1/2	9	112 1/2	72	40 1/2	39	54
138 X 88	108	138	87 1/8	10	129 1/2	48	81 1/2	42 3/8	66
154 X 97	120	154	96 7/8	11	144	48	96	46 7/8	78
169 X 107	132 (3)	168 3/4	106 1/2	10	144	48	96	54 5/8	90

Iowa Department of Transportation

REVISION 6 04-17-12

STANDARD ROAD PLAN

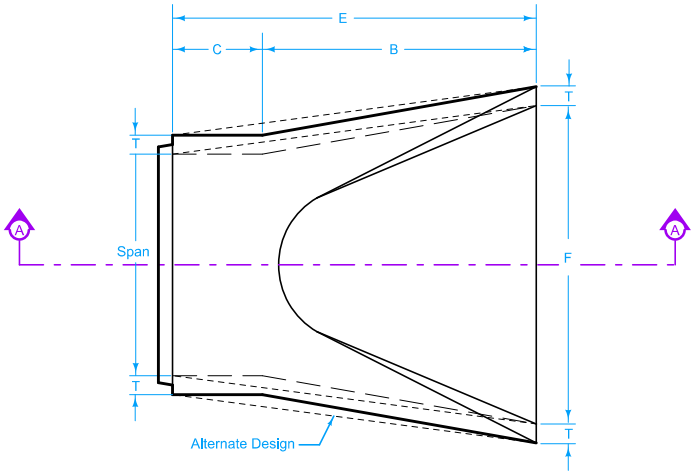
RF-42

SHEET 2 of 3

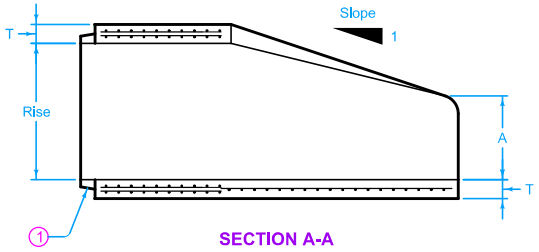
REVISIONS: Added option for elliptical pipe. Changed title. Changed Possible Contract Item to "Low Clearance Concrete Pipe Aprons".

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

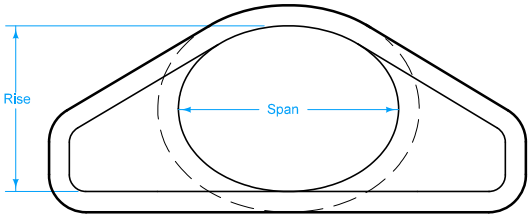
LOW CLEARANCE CONCRETE PIPE APRONS



PLAN



SECTION A-A



END

Comply with AASHTO M 207 for Apron Reinforcement.

Dimension "E" shown is minimum and is considered the design length. Appropriately adjust for any difference between the actual length of concrete apron installed and the length indicated hereon for the length of concrete culvert pipe furnished.

(1) Tongue end on inlet end section. Groove end on outlet end section. (Inlet end section shown.)

EQUIVALENT DIAMETER Inches	SPAN Inches	RISE Inches	SLOPE	APPROXIMATE DIMENSIONS Inches					
				(T)	(A)	(B)	(C)	(E)	(F)
18	23	14	3:1	$2\frac{3}{4}$	$7\frac{1}{2}$	27	45	72	36
24	30	19	3:1	$3\frac{1}{4}$	$8\frac{1}{2}$	39	33	72	48
30	38	24	3:1	$3\frac{3}{4}$	$9\frac{1}{2}$	54	18	72	60
36	45	29	2.5 to 1	$4\frac{1}{2}$	$11\frac{1}{8}$	60	24	84	72
42	53	34	2.5 to 1	5	$15\frac{3}{4}$	60	36	96	78
48	60	38	2.5 to 1	$5\frac{1}{2}$	21	60	36	96	84
54	68	43	2.5 to 1	6	$25\frac{1}{2}$	60	36	96	90
60	76	48	2.5 to 1	$6\frac{1}{2}$	30	60	36	96	96
72	91	58	2.5 to 1	$7\frac{1}{2}$	36	63	33	96	108
90	113	72	1.6 to 1	9	$36\frac{1}{2}$	58	38	96	113

Iowa Department of Transportation

REVISION 6 04-17-12

STANDARD ROAD PLAN

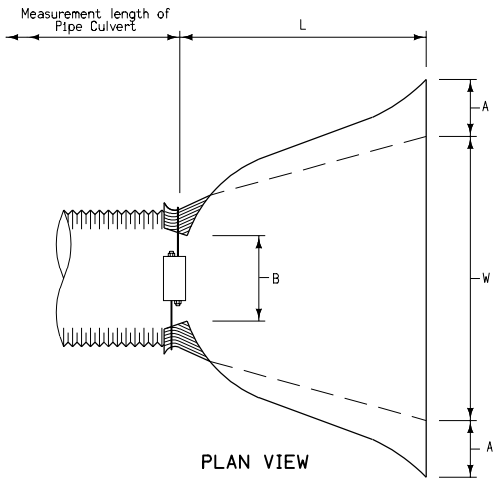
RF-42

SHEET 3 of 3

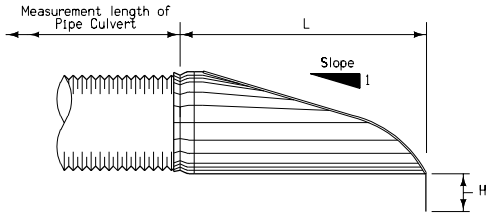
REVISIONS: Added option for elliptical pipe. Changed title. Changed Possible Contract Item to "Low Clearance Concrete Pipe Aprons".

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

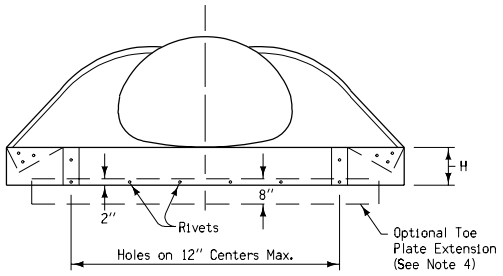
LOW CLEARANCE CONCRETE PIPE APRONS



PLAN VIEW



TYPICAL CROSS SECTION



END VIEW

SPAN/ RISE	GAGE	DIMENSIONS (In Inches)					APPROX. SLOPE
		A (±1")	B (Max.)	H (±1")	L (±1½")	W (±2")	
17"x 13"	16	6½	8½-9	6	20	30	2½
21"x 15"	16	7½	11	6	24	36	2½
24"x 18"	16	8	12	6	28	42	2½
28"x 20"	16	8	16	6	32	48	2½
35"x 24"	14	10	16	7	39	60	2½
42"x 29"	14	12	18	7½-8	46	75	2½
49"x 33"	12	13½	21	9	53	84	2½
57"x 38"	12	18½	26	12	62	90	2½
64"x 43"	12	18	30	12	69	102	2¼-2
71"x 47"	12/10	18½	36	12	77	114	2¼-1½
77"x 52"	12/10	18	36	12	77	126	2-1½
83"x 57"	12/10	18	44	12	77	135±3	2-1½

NOTES:

1. All 3 piece bodies to have 12–gage sides and 10–gage center panels. Multiple panel bodies to have lap seams which are to be tightly joined by galvanized rivets or bolts.
2. For the 77" x 52" and 83" x 57" sizes, reinforced edge to be supplemented by galvanized angles. The angles to be attached by galvanized nuts and bolts.
3. Angle reinforcement will be placed under the center panel seams on the 77" x 52" and 83" x 57" sizes.
4. Galvanized toe plate to be available as an accessory when specified on the order and will be the same gage as the end section.

GENERAL NOTES:

Metal pipe aprons and hardware shall be constructed of galvanized steel in conformance with the requirements of current Standard and Supplemental Specifications and as detailed hereon. Refer to other appropriate Standard Road Plans as well as project plans for additional details of individual culvert installations. Alternate design details may be submitted to the Engineer for approval.

Apron may be attached to culvert pipe as follows:

A. If culvert is of circumferential corrugation type:
   1. Use an approved bolt or clamp to fasten apron directly to culvert.

B. If culvert is of helical corrugation type:
   1. Use an approved sizing ring securely fastened to inside diameter of apron to connect to the culvert pipe using a special dimple band connector.
   2. "Dimple" bands are not allowed when a positive joint is specified.

See Materials I.M. 441 for Approved Coupling Devices and specific requirements.

Any damage to spelter coat resulting from installation of culvert shall be repaired as directed by the Engineer.

Price bid for "Metal Arch Aprons" shall be considered full compensation for fabrication and installation of metal arch aprons as indicated hereon.

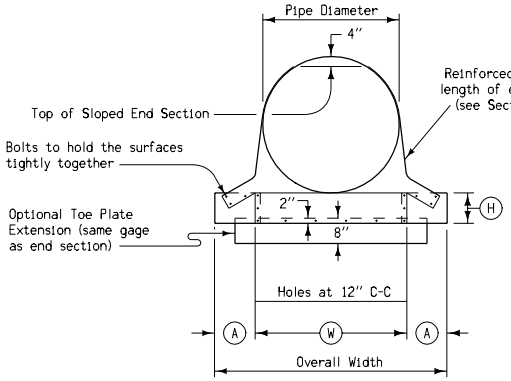
Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN | **RF-43**

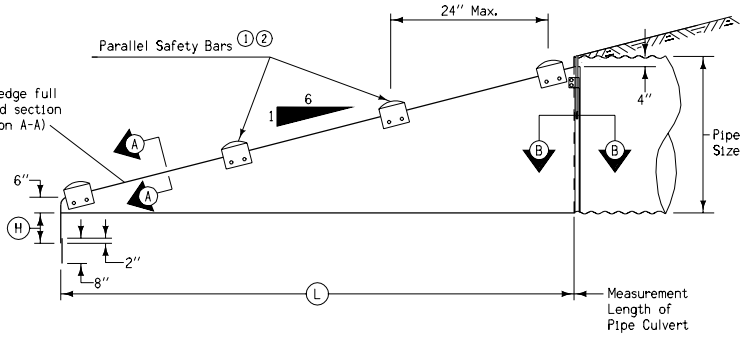
REVISION: Delete M and Q dimensions. | REVISION NO. 2

APPROVED BY DESIGN METHODS ENGINEER | REVISION DATE 10-03-00

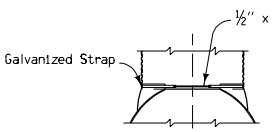
METAL ARCH APRONS
(FOR CORRUGATED METAL PIPE)



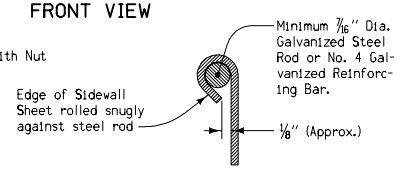
FRONT VIEW



SIDE ELEVATION

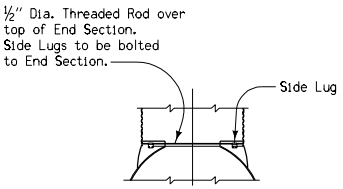


CONNECTOR DETAIL
(15"-24" Dia.)

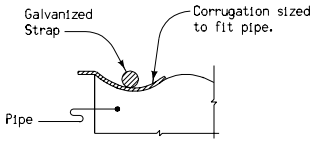


SECTION A-A

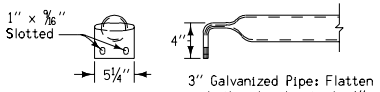
METAL END SECTIONS FOR CIRCULAR PIPES							
Pipe Dia. (In.)	Min. Thick.		Dimensions (Inches)				
	In.	Gage	A	H	W	Overall Width	L
15	.064	16	8	6	21	37	30
18	.064	16	8	6	24	40	48
21	.064	16	8	6	27	43	66
24	.064	16	8	6	30	46	84
30	.109	12	12	9	36	60	120
36	.109	12	12	9	42	66	156
42	.109	12	16	12	48	80	192
48	.109	12	16	12	54	86	228
54	.109	12	16	12	60	92	264
60	.109	12	16	12	66	98	300



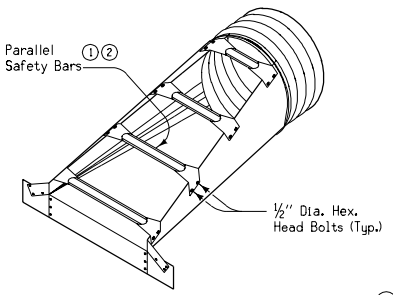
CONNECTOR DETAIL
(30"-60" Dia.)



SECTION B-B



PARALLEL BARS
DETAIL OF SAFETY BARS



PERSPECTIVE VIEW
OF APRON

① Number of bars required will vary depending on the length of the end section.

② Parallel safety bars are required for pipes 30" diameter and larger. For pipes 24" diameter and smaller, parallel safety bars will be required only when specified in project plans.

GENERAL NOTES:

Details on this sheet indicate the typical requirements for Metal Safety Slope Aprons. Refer to appropriate other Standard Road Plans as well as project plans for additional details of individual culverts installations. Alternate design details may be submitted to the Engineer for approval.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Furnishing and installing the metal safety slope aprons shall conform to the requirements of current specifications for " Corrugated Culverts. "

Apron may be attached to culvert pipe as follows:

A. If normal culvert is of circumferential corrugation type:
   1. Use an approved bolt or clamp to fasten apron directly to culvert.

B. If normal culvert is of helical corrugation type:
   1. Use an approved sizing ring securely fastened to inside diameter of apron to connect to the culvert pipe using special dimple band connector.
   2. "Dimple" bands are not allowed when a positive joint is specified.

See Materials I.M. 441 for Approved Coupling Devices and specific requirements.

Any damage to galvanizing coat resulting from installation of culvert shall be repaired as directed by the Engineer.

Price bid for "Safety Slope Aprons" of the size specified shall be considered full compensation for fabrication and installation of metal aprons as indicated hereon.

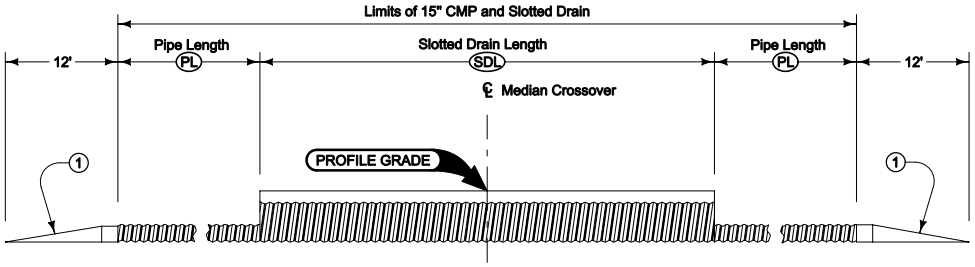
Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN | **RF-44**

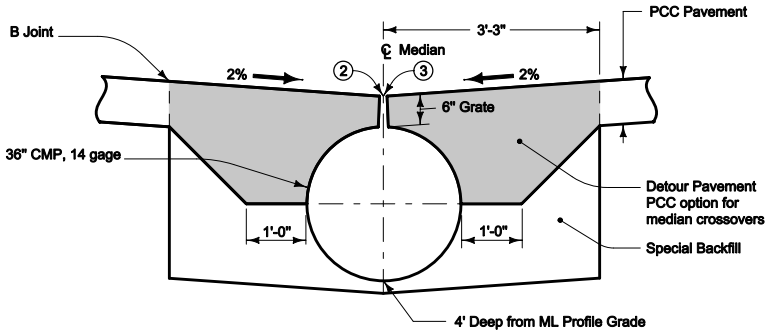
REVISION: Delete M and Q Dimensions — REVISION NO. 3

APPROVED BY DESIGN METHODS ENGINEER — REVISION DATE 10-03-00

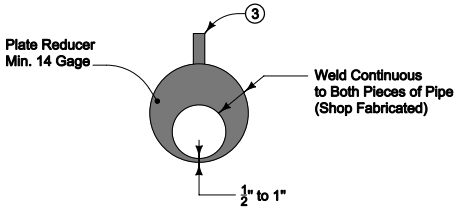
METAL SAFETY SLOPE APRON
6:1 SLOPE



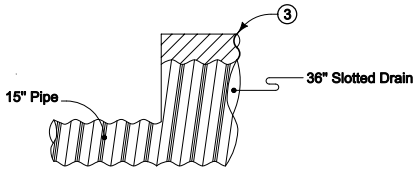
LONGITUDINAL SECTION THROUGH CMP SLOTTED DRAIN ASSEMBLY



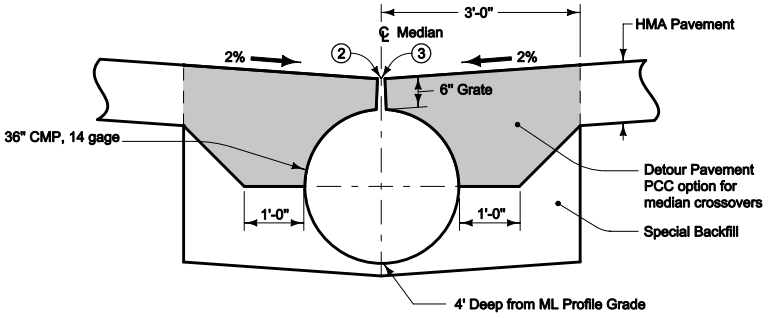
PCC PAVEMENT SITUATION



END VIEW OF PIPE REDUCER



SIDE VIEW OF PIPE REDUCER



HMA PAVEMENT SITUATION

TABLE OF QUANTITIES			
Standard Road Plan	PV-500	PV-503	PV-506
Median Width	50'	64'	68.24'
(SDL) Slotted Drain Length	116'	110'	110'
(PL) Pipe Length	134'	102'	106'
Bid Items			
36" Corrugated Metal Slotted Pipe Drain w/6" Grate	116'	110'	110'
15" dia. Corrugated Metal Entrance Pipe Culvert	268'	204'	212'

① Beveled pipe and guard. See RF-27.

② During construction of crossover pavement, cover slotted drain with duct tape or wood block.

③ Slotted grate 6 inches high x $1\frac{3}{4}$ inches opening width. Use $\frac{3}{16}$ inch material for spacers and bearing bars (sides).

Possible Contract Items:
- Beveled Pipe and Guard
- Culvert, Unclassified Entrance Pipe, 15" Dia.
- Detour Pavement
- Drain, Corrugated Metal Pipe Slotted, 36", w/6" Grate
- Special Backfill

Possible Tabulation:
- 112-8

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-19-10

RF-45

SHEET 1 of 1

REVISIONS: Removed pipe size row from table and added Possible Tabulation.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SLOTTED DRAIN FOR MEDIAN CROSSOVERS

Pavement Widening And Resurfacing

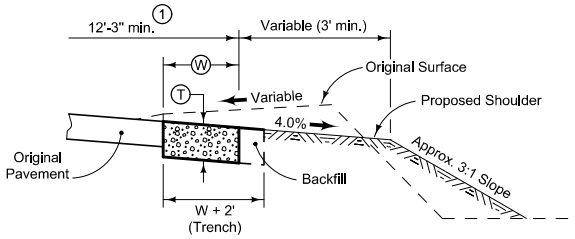
RG

SECTION

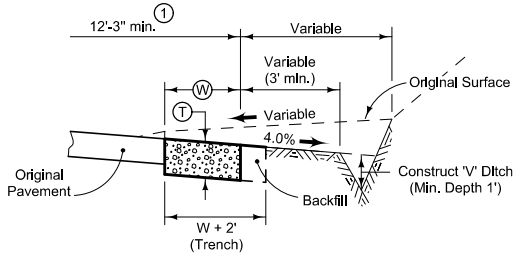
Pavement Widening and Resurfacing

RG

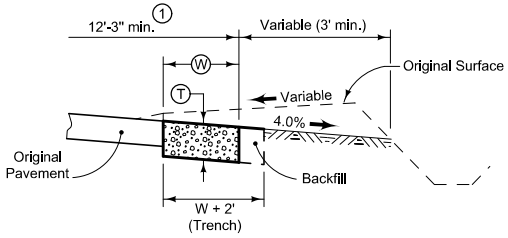
NO.	DATE	TITLE
RG-1	04-19-11	P.C. Concrete Pavement Widening
RG-2	10-19-04	Details for Hot Mix Asphalt Resurfacing (Double Course)
RG-6	10-02-01	Details for Hot Mix Asphalt Resurfacing (Single Course)
RG-8	10-17-06	Hot Mix Asphalt Base Widening



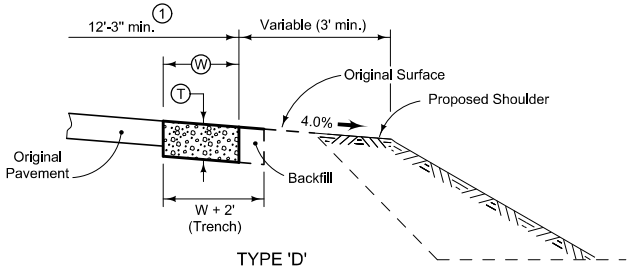
TYPE 'A'



TYPE 'B'

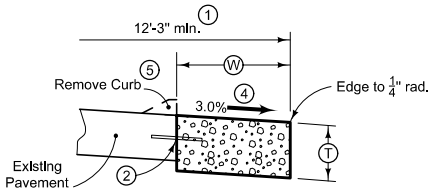


TYPE 'C'



TYPE 'D'

SHOULDERS FOR PAVEMENT WIDENING



PAVEMENT WIDENING

'W' and 'T' are specified by the individual project plans. Dimensions may vary for superelevated curves or at locations specifically designated by the Engineer.

For Joints in the widening unit, refer to the specifications and PV-101.

Install contraction joints adjacent to all existing joints or at the interval specified on the plans. Extend existing expansion joint through the widening unit. This work is incidental to other work on the project.

Dispose of excavation from Type 'A' and 'D' shoulders in the immediate area. Haul excavation from Type 'B' and 'C' shoulders to Type 'A' and 'D' shoulder areas, and dispose of in areas specifically designated by the Engineer. When directed by the Engineer, dispose of surplus excavation on foreslopes of superelevated curves that require extra width of roadbed to accommodate future wedge courses.

Construct special shaping of widening units through bridge approach sections per directions by the Engineer. The joint between the widening unit and the end of a bridge consists of a 3 inch wide joint filled with full depth bituminous resilient filler as specified in Article 4136.03, Paragraph A.

Excavation in excess of that indicated is incidental to other work on the project.

(1) Minimum surface dimension is based on accommodating 3 inches of resurfacing. Where thickness other than 3 inches is provided, modify the surface width appropriately.

(2) 'BT-3' placed at mid-height unless otherwise noted.

(3) Quantities indicated are for design purposes and may be adjusted at time of construction when so directed by the Engineer. Quantities listed are for two sides per station.

(4) For ramps and superelevated curves, match the cross-slope of the widening unit to the existing pavement.

(5) See Section 2514 of the Standard Specifications.

DESIGN QUANTITIES FOR PAVEMENT WIDENING (3)

W feet		T 7"	7.5"	8"	8.5"	9"	9.5"	10"
2	Surface Area, Sq. Yd.	44.44	44.44	44.44	44.44	44.44	44.44	44.44
	Volume, Cu. Yd.	8.64	9.26	9.88	10.49	11.11	11.73	12.35
	Trench Excavation, Cu. Yd.	17.28	18.52	19.75	20.99	22.22	23.46	24.69
3	Surface Area, Sq. Yd.	66.67	66.67	66.67	66.67	66.67	66.67	66.67
	Volume, Cu. Yd.	12.96	13.89	14.81	15.74	16.67	17.59	18.52
	Trench Excavation, Cu. Yd.	21.60	23.15	24.69	26.23	27.78	29.32	30.86
4	Surface Area, Sq. Yd.	88.89	88.89	88.89	88.89	88.89	88.89	88.89
	Volume, Cu. Yd.	17.28	18.52	19.75	20.99	22.22	23.46	24.69
	Trench Excavation, Cu. Yd.	25.93	27.78	29.63	31.48	33.33	35.19	37.04

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 16 04-19-11

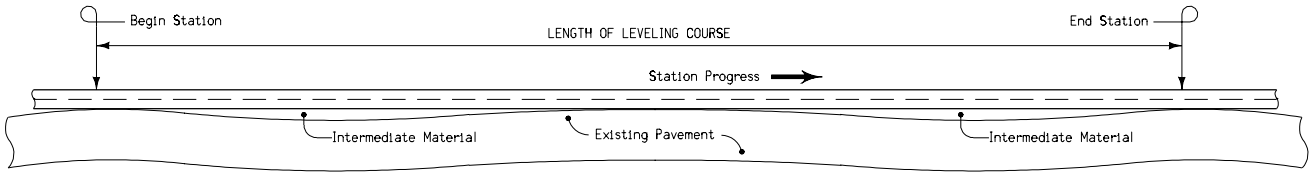
RG-1

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

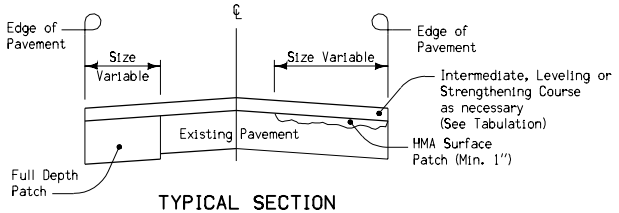
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

P.C. CONCRETE PAVEMENT WIDENING

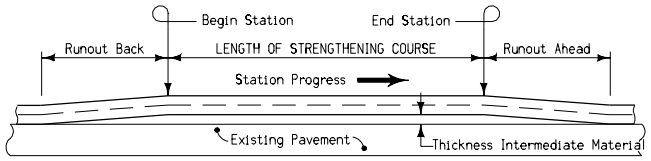


TYPICAL LEVELING COURSE

(See Tabulation for Location)

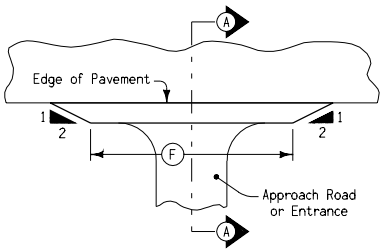


TYPICAL SECTION
FULL DEPTH AND SURFACE PATCHES

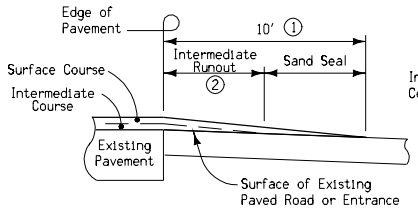


TYPICAL STRENGTHENING COURSE

(See Tabulation for Location)

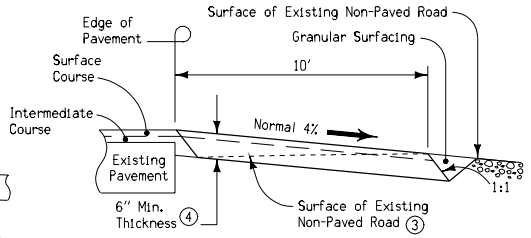


TYPICAL PLAN FOR FILLET
AT ENTRANCE OR
INTERSECTING ROAD



SECTION A-A

(WEDGE SHAPED FILLET)

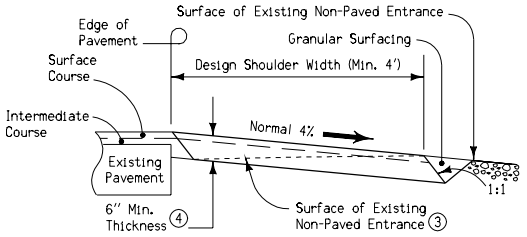


SECTION A-A

(FULL THICKNESS FILLET - NON-PAVED ROAD)

NORMAL FILLET SIZES	
TYPE OF ACCESS	(F) Min. - ft.
Residential Entrance	40
Farm Entrance	60
Commercial Entrance	80
Non-Paved Road	100
Paved Road	Variable*

* See layout drawing for details of construction of special areas.



SECTION A-A

(FULL THICKNESS FILLET - NON-PAVED ENTRANCE)

GENERAL NOTES:

Unless otherwise specifically noted, full runout for Hot Mix Asphalt resurfacing shall be at the rate of 50' of length for each 1" of resurfacing thickness. Place subgrade paper, burlap, or similar material over adjacent surfaces in areas of runout wedges to facilitate removal of wedges where subsequent future resurfacing is anticipated. Temporary runout shall be at the rate of 10' length for each 1" inch of resurfacing thickness.

Design Weight = 145 lbs. per cubic foot

Tack Coat = 0.05 gallons per square yard
For quantitative purposes, it is estimated that 2 applications are necessary.

Wedge shaped fillets of HMA shall be constructed at all paved entrances and paved intersecting roads. Full thickness fillets shall be constructed at all non-paved residential and commercial entrances and non-paved public roads.

Fillet sizes as listed in the table are recommended and shall be used for design and estimating purposes. The Engineer shall establish the length and width of each individual fillet to accommodate conditions at the site.

(1) 10' width based on 3" thickness of resurfacing. Adjust for additional thickness on proportional basis.

(2) The ratio of the Intermediate Course runout length to the total runout length shall be the same as the ratio of the Intermediate Course resurfacing thickness to the total resurfacing thickness.

(3) Special shaping of existing surface prior to placement of fillet may be required by the Engineer and shall be considered incidental to other work on the project.

(4) For existing fillets at non-paved roads and entrances, a wedge shaped fillet matching the thickness of the resurfacing should be constructed.

Iowa Department of Transportation
Highway Division

STANDARD ROAD PLAN — RG-2

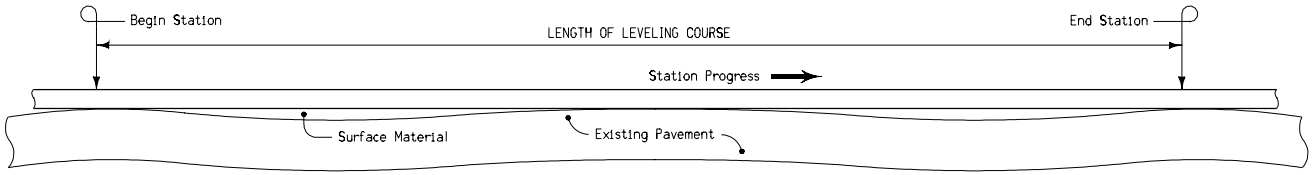
REVISION: Change Asphaltic Concrete to HMA.

REVISION NO. 12

William J. Stein
APPROVED BY DESIGN METHODS ENGINEER

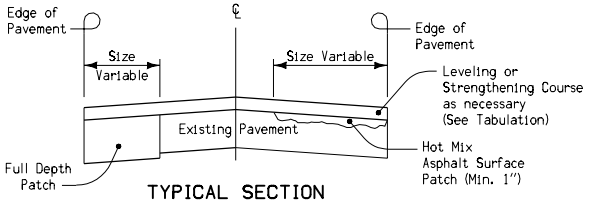
REVISION DATE 10-19-04

DETAILS FOR HOT MIX
ASPHALT RESURFACING
(DOUBLE COURSE)



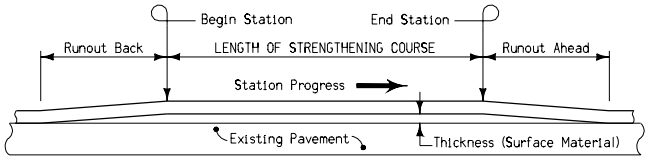
TYPICAL LEVELING COURSE

(See Tabulation for Location)



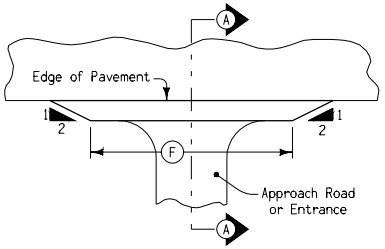
TYPICAL SECTION

FULL DEPTH AND SURFACE PATCHES

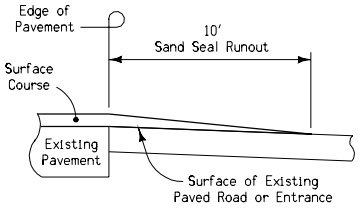


TYPICAL STRENGTHENING COURSE

(See Tabulation for Location)

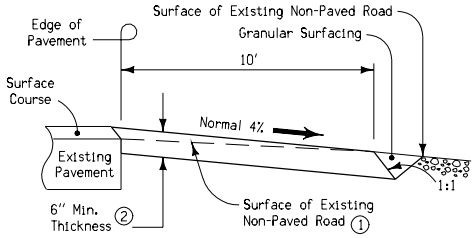


TYPICAL PLAN FOR FILLET AT ENTRANCE OR INTERSECTING ROAD



SECTION A-A

(WEDGE SHAPED FILLET)

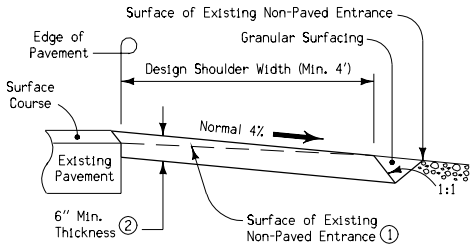


SECTION A-A

(FULL THICKNESS FILLET - NON-PAVED ROAD)

NORMAL FILLET SIZES	
TYPE OF ACCESS	(F) Min. - ft.
Residential Entrance	40
Farm Entrance	60
Commercial Entrance	80
Non-Paved Road	100
Paved Road	Variable*

* See layout drawing for details of construction of special areas.



SECTION A-A

(FULL THICKNESS FILLET - NON-PAVED ENTRANCE)

GENERAL NOTES:

Refer to typical cross sections of the project for detail data as to exact course dimensions and other construction requirements.

Refer to tabular listing for location and other details of runouts.

Unless otherwise specifically noted, full runout for HMA resurfacing shall be at the rate of 50' of length for each 1" of resurfacing thickness. Place subgrade paper, burlap or similar material over adjacent surfaces in areas of runout wedges to facilitate removal of wedges where subsequent future resurfacing is anticipated. Temporary runout shall be at the rate of 10' length for each 1" of resurfacing thickness.

Design Weight = 145 lbs. per cubic foot

Tack Coat = 0.05 gallons per square yard
For quantitative purposes, it is estimated that 2 applications are necessary.

Sand seal shall be constructed in accordance with current Standard Specification for Hot Mix Asphalt Mixtures.

Wedge shaped fillets of HMA shall be constructed at all paved entrances and paved intersecting roads. Full thickness fillets shall be constructed at all non-paved residential and commercial entrances and non-paved public roads.

Fillet sizes as listed in the table are recommended and shall be used for design and estimating purposes. The Engineer shall establish the length and width of each individual fillet to accommodate conditions at the site.

(1) Special shaping of existing surface prior to placement of fillet may be required by the Engineer and shall be considered Incidental to other work on the project.

(2) For existing fillets at non-paved roads and entrances, a wedge shaped fillet matching the thickness of the resurfacing should be constructed.

Iowa Department of Transportation
Highway Division

STANDARD ROAD PLAN — RG-6

REVISION: Change ACC to HMA	REVISION NO. 11
William J. Stein, APPROVED BY DESIGN METHODS ENGINEER	REVISION DATE 10-02-01

DETAILS FOR HOT MIX ASPHALT RESURFACING (SINGLE COURSE)

'W' and 'T' shall be as specified as part of the individual project plans. Dimensions may vary for superelevated curves or at locations specifically designated by the Engineer.

Any asphalt materials excavated shall be handled as detailed elsewhere in the project plans.

Special shaping of widening units through bridge approach sections shall be done at the direction of the Engineer.

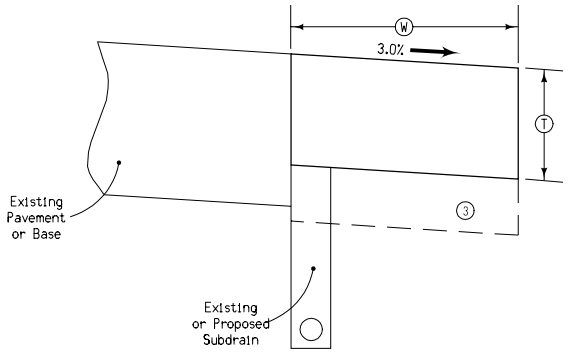
Excavation in excess of that indicated shall be considered incidental to other work on the project.

Special Backfill, as indicated, shall be placed only at locations where specifically required by the Engineer. Any such Special Backfill placed shall be paid for as "Extra Work" as per Article 1109.03 of the Standard Specifications.

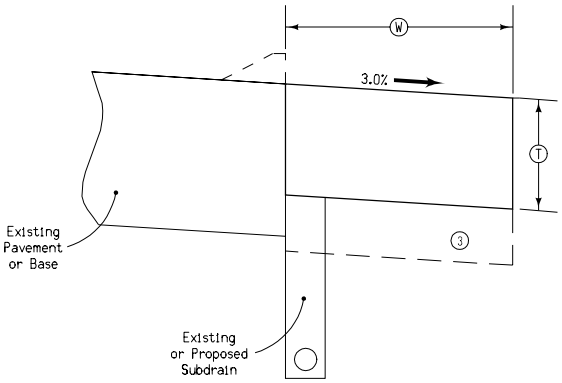
(1) Estimated for two (2) applications of tack coat. Priming of subgrade or finished base is not required.

(2) Quantities indicated are for design purposes and may be adjusted at time of construction when so directed by the Engineer.

(3) 6" Special backfill required when widening unit is part of the proposed traffic lane or when noted in project plans.



Hot Mix Asphalt
Widening on Existing
Pavement Without Curb



Hot Mix Asphalt
Widening on Existing
Pavement With Curb

Design Rates	
Item	Rate
Base Course	145 lbs./cu. ft.
Special Backfill	140 lbs./cu. ft.
Tack Coat	0.05 gal./sq. yd

Design Quantities per side per station (2)

Quantities Per Side	Thickness (Inches)																	Special Backfill Tons	Width Feet
	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0		
HMA Base (Tons)	1.81	2.11	2.42	2.72	3.02	3.32	3.63	3.93	4.23	4.53	4.83	5.14	5.44	5.74	6.04	6.34	6.65	3.50	1
Tack Coat (Gal) (1)	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11		
Class 13 Excavation, Widening (Cu. Yds.)	0.93	1.08	1.23	1.39	1.54	1.70	1.85	2.01	2.16	2.31	2.47	2.62	2.78	2.93	3.09	3.24	3.40		
HMA Base (Tons)	3.63	4.23	4.83	5.44	6.04	6.65	7.25	7.85	8.46	9.06	9.67	10.27	10.88	11.48	12.08	12.69	13.29	7.00	2
Tack Coat (Gal) (1)	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22		
Class 13 Excavation, Widening (Cu. Yds.)	1.85	2.16	2.47	2.78	3.09	3.40	3.70	4.01	4.32	4.63	4.94	5.25	5.56	5.86	6.17	6.48	6.79		
HMA Base (Tons)	5.44	6.34	7.25	8.16	9.06	9.97	10.88	11.78	12.69	13.59	14.50	15.41	16.31	17.22	18.13	19.03	19.94	10.50	3
Tack Coat (Gal) (1)	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33		
Class 13 Excavation, Widening (Cu. Yds.)	2.78	3.24	3.70	4.17	4.63	5.09	5.56	6.02	6.48	6.94	7.41	7.87	8.33	8.80	9.26	9.72	10.19		
HMA Base (Tons)	7.25	8.46	9.67	10.88	12.08	13.29	14.50	15.71	16.92	18.13	19.33	20.54	21.75	22.96	24.17	25.38	26.58	14.00	4
Tack Coat (Gal) (1)	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.44		
Class 13 Excavation, Widening (Cu. Yds.)	3.70	4.32	4.94	5.56	6.17	6.79	7.41	8.02	8.64	9.26	9.88	10.49	11.11	11.73	12.35	12.96	13.58		

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
13 | 10-17-06

RG-8

SHEET 1 of 1

REVISIONS: Deleted details of shoulders and added additional quantities.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

HOT MIX ASPHALT
BASE WIDENING

Rigid Pavement

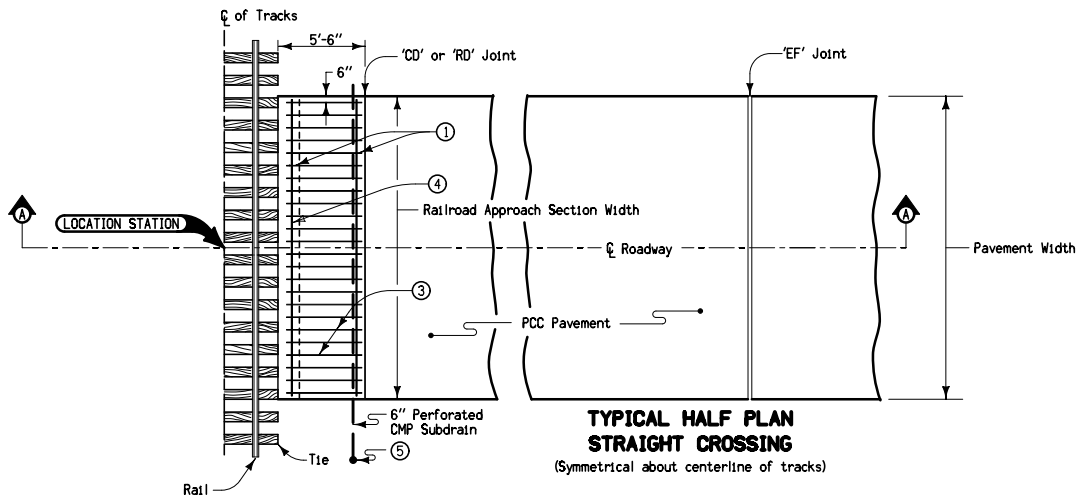
RH

SECTION

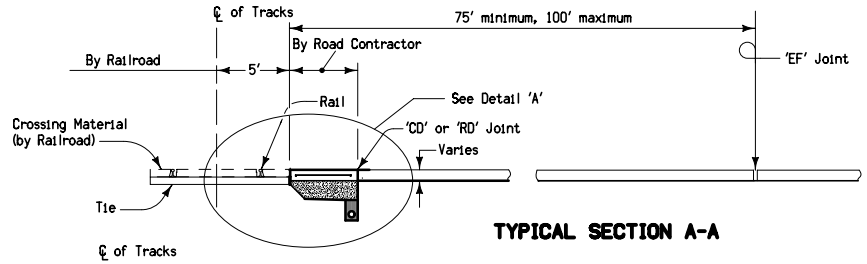
Rigid Pavement

RH

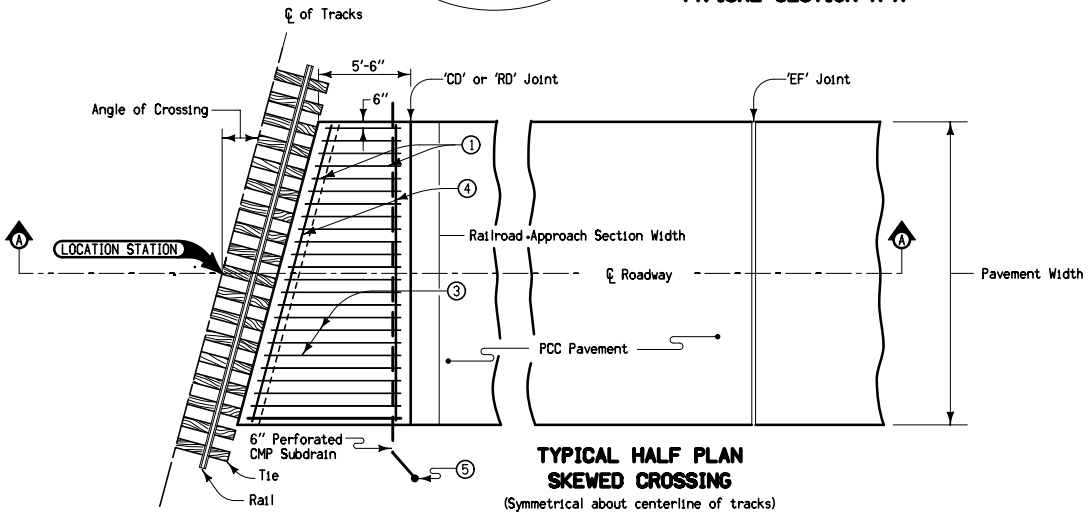
NO.	DATE	TITLE
RH-6	04-19-11	PCC Railroad Approach Section



TYPICAL HALF PLAN
STRAIGHT CROSSING
(Symmetrical about centerline of tracks)



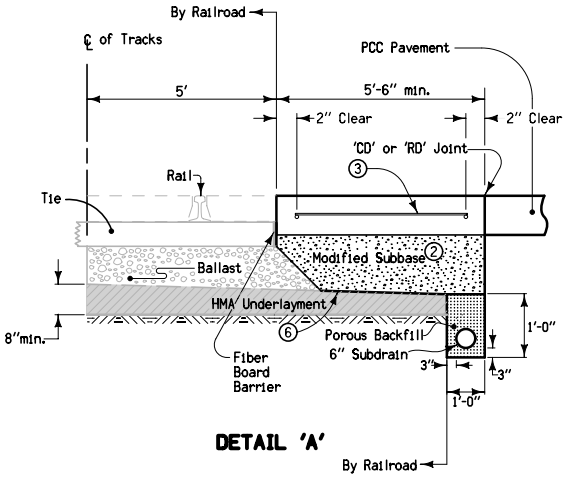
TYPICAL SECTION A-A



TYPICAL HALF PLAN
SKEWED CROSSING
(Symmetrical about centerline of tracks)

For joint details, see PV-101.

1. Reinforcing steel bars shall be wire tied at all intersections with other bars. Reinforcing bars shall be lapped a minimum of 1 foot when necessary and securely wire tied.
2. Ballast meeting Railroad specifications may be substituted for modified subbase.
3. #5 Bars at 12" centers located at half of the pavement thickness.
4. #5 Bars x (Approach Width - 4").
5. Outlet subdrain into ditch or storm sewer. See Standard Road Plans RF-19C and RF-19E. Slope subdrain to drain.
6. Slope per AREMA specifications.



DETAIL 'A'

Possible Contract Item:
Railroad Approach Section, P.C.C.

Possible Tabulation:
112-3

Iowa Department of Transportation

REVISION	
18	04-19-11

STANDARD ROAD PLAN

RH-6

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PCC RAILROAD APPROACH SECTION

Flexible Pavement

RJ

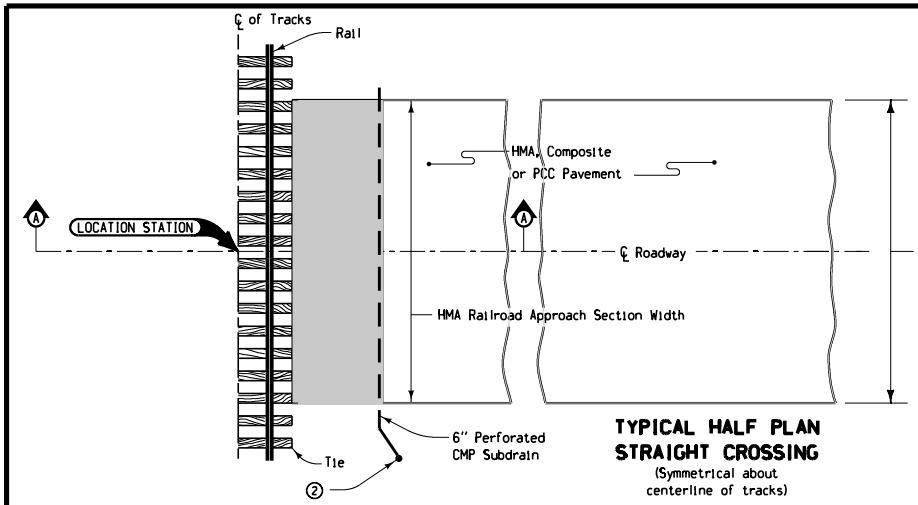
SECTION

Flexible Pavement

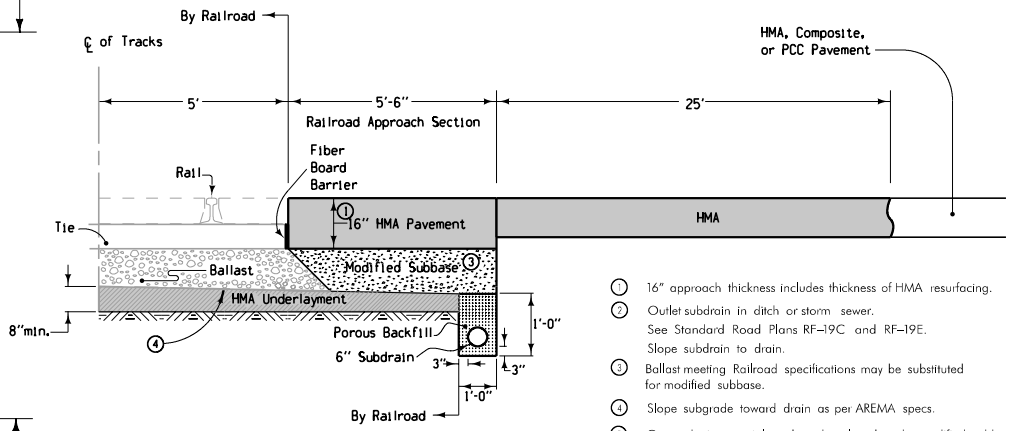
RJ

NO.	DATE	TITLE
RJ-1	10-21-08	HMA Railroad Crossing Approach Section
RJ-26D	Void	Information Added to Paving Typicals
RJ-33	Void	Information Added to Paving Typicals
RJ-34	Void	Information Added to Paving Typicals

GENERAL NOTES:
Contract Item is: "Railroad Approach Section, HMA"

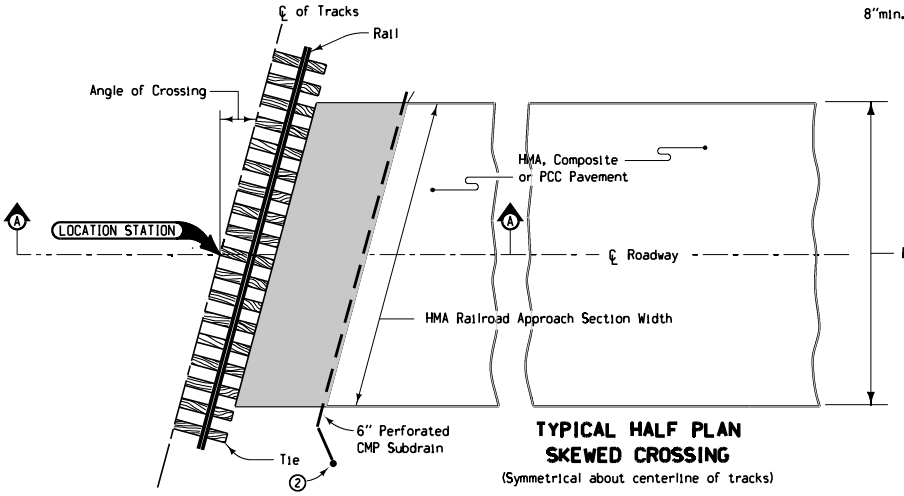


TYPICAL HALF PLAN
STRAIGHT CROSSING
(Symmetrical about centerline of tracks)



TYPICAL SECTION A-A
RAILROAD APPROACH DETAILS

1. 16" approach thickness includes thickness of HMA resurfacing.
2. Outlet subdrain in ditch or storm sewer. See Standard Road Plans RF-19C and RF-19E. Slope subdrain to drain.
3. Ballast meeting Railroad specifications may be substituted for modified subbase.
4. Slope subgrade toward drain as per AREMA specs.
5. Geosynthetic material need not be placed under modified subbase.



TYPICAL HALF PLAN
SKEWED CROSSING
(Symmetrical about centerline of tracks)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
15	10-21-08

RJ-1

SHEET 1 of 1

REVISIONS: Added HMA Underlayment.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

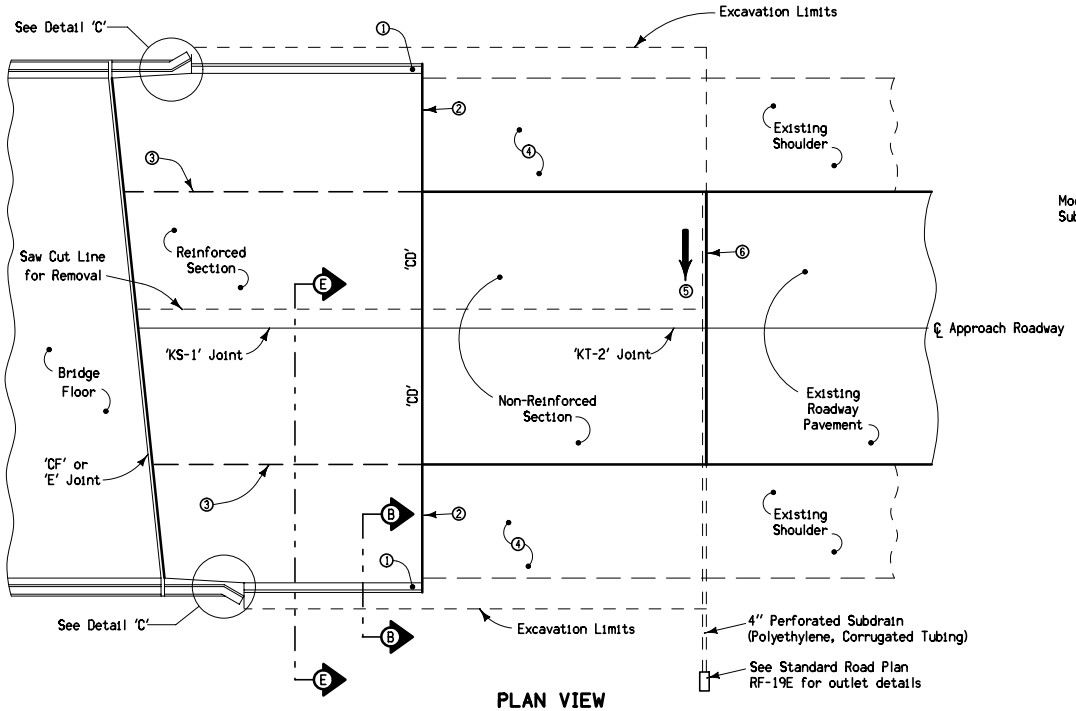
HMA RAILROAD CROSSING APPROACH SECTION

Bridge Approach Pavement

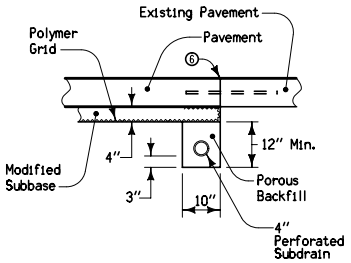
RK

Bridge Approach Pavement

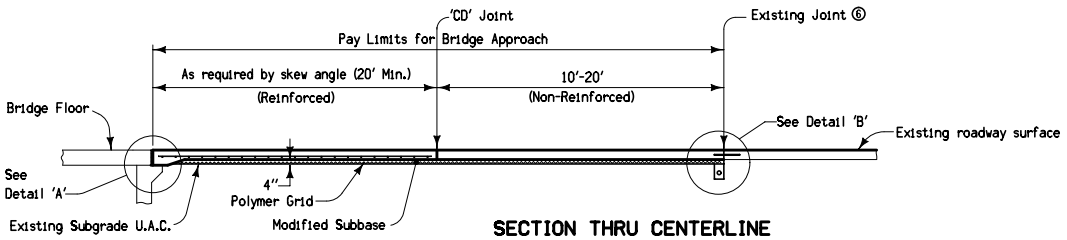
NO.	DATE	TITLE
RK-16	04-19-11	Bridge Approach Details (in Conjunction with Bridge Deck Overlay)
RK-17	04-19-11	PCC Overlay of Reinforced Bridge Approach Section
RK-18	04-19-11	Bridge Approach Details (Secondary Roads)
RK-19A	04-19-11	Bridge Approach Section (General Details)
RK-19B	04-19-11	Bridge Approach Section (Two-Lane) (Abutting PCC Pavement)
RK-19C	04-19-11	Bridge Approach Section (Two Lane for Bridge Reconstruction, P.C.C. Pavement)
RK-19F	04-19-11	Bridge Approach Section (at Existing Bridges, PCC Pavement)
RK-19G	04-19-11	Bridge Approach Section (Two Lane, HMA Pavement)
RK-19H	04-19-11	Bridge Approach Section (Two Lane for Bridge Reconstruction, HMA Pavement)
RK-19J	04-19-11	Bridge Approach Section (at Existing Bridges, HMA Pavement)
RK-20	04-17-12	Double Reinforced 12" Approach
RK-21	04-19-11	Bridge Approach (abutting PCC or Composite Pavement)
RK-22	04-19-11	Bridge Approach (abutting HMA Pavement)
RK-23	04-19-11	Bridge Approach (Multi-Lane, Curbed Roadway)
RK-25	04-17-12	Double Reinforced 10" Approach
RK-26	04-17-12	Double Reinforced 10" Approach with Variable Depth Paving Notch
RK-27	04-17-12	Double Reinforced 12" Approach with Variable Depth Paving Notch
RK-30	04-19-11	Bridge Approach (Abutting Pavement)



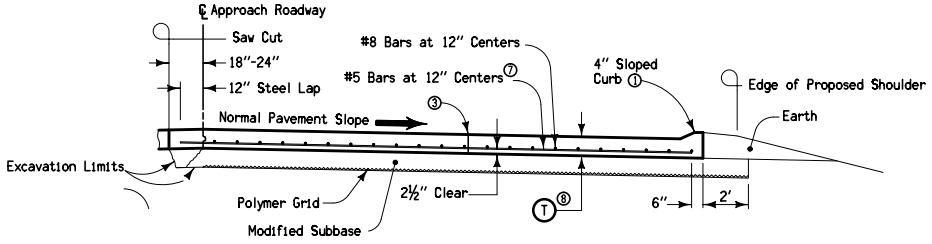
PLAN VIEW



DETAIL 'B'



SECTION THRU CENTERLINE



SECTION E-E

All work is to be performed while carrying traffic in adjacent lanes.

If an existing 'CF' joint is located approximately 60 feet from the new 'B' or 'RT' joint, the joint is to be recut to a width of 4" and new form joint material installed. If no 'CF' exists, a new 'CP' joint shall be constructed approximately 60 feet from the new 'B' or 'RT' joint.

Unless Modified Subbase is measured and paid for elsewhere on the project plans, Modified Subbase under paved shoulder panels adjacent to the bridge approach shall be incidental to "Paved Shoulder, P.C. Concrete".

① Build 4" Sloped Curb to end of Reinfoced Bridge Approach Section. See Curb Location Details (Section B-B).

② Joint will be 'RD' if P.C. Shoulder; 'B' otherwise.

③ Optional 'KS-1' joint.

④ See Typical Paving Cross-Sections.

⑤ Slope Subdrain to Drain.

⑥ Joint will be 'RT' if existing pavement is P.C., otherwise use 'B' joint.

⑦ If bridge is skewed, place additional #5 bar parallel to skewed face.

⑧ T=10".

Possible Contract Items:

Bridge Approach, RK-19
Paved Shoulder, P.C. Concrete

PossibleTabulation: 112-6

For Section B-B, Detail 'A', and Detail 'C', see Standard Road Plan RK-19A.

For Jointing Details, see PV-101.

Iowa Department of Transportation

REVISION
20 | 04-19-11

STANDARD ROAD PLAN

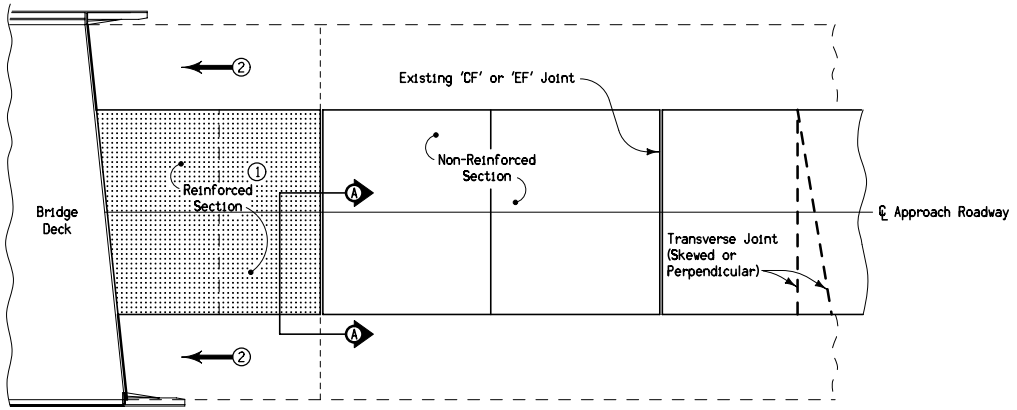
RK-16

SHEET 1 of 1

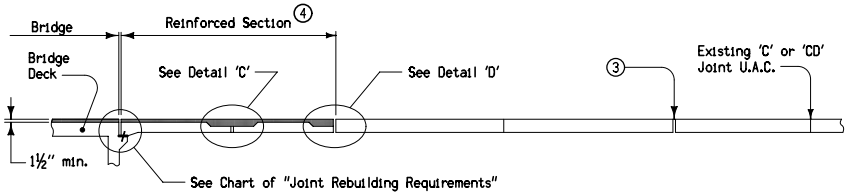
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

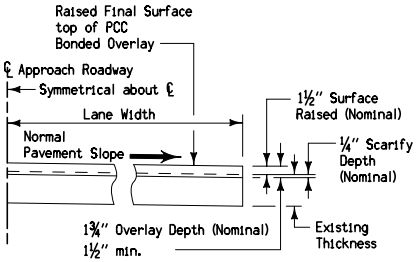
BRIDGE APPROACH DETAILS (IN CONJUNCTION WITH BRIDGE DECK OVERLAY)



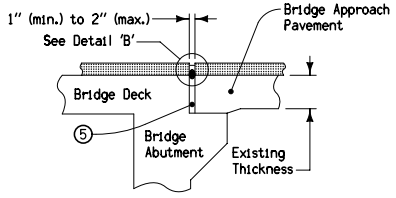
TYPICAL PLAN VIEW



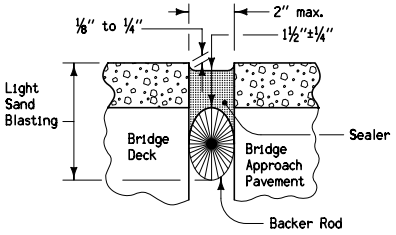
TYPICAL SECTION THRU CENTERLINE



SECTION A-A

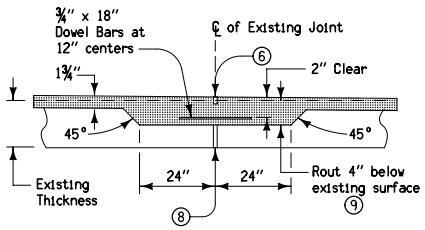


DETAIL 'A'

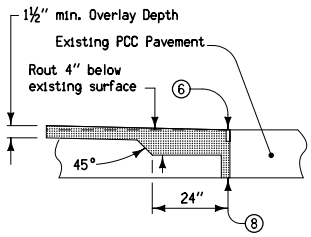


DETAIL 'B'

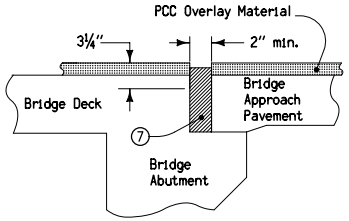
JOINT REBUILDING REQUIREMENTS	
EXISTING JOINT WIDTH	CONSTRUCTION METHOD REQUIRED
0 to 1"	Cut to 1½" width See Detail 'A'
1" to 2"	See Detail 'A'
Greater than 2"	See Detail 'E'



DETAIL 'C'



DETAIL 'D'



DETAIL 'E'
Where Existing Joint is greater than 2"

① Remove HMA Resurfacing if present. The cost of removal is considered incidental to "Bridge Floor Overlay" as detailed hereon.

② Existing shoulder elevation to be raised to match new pavement grade.

③ At first existing 'CF' joint beyond PCC Overlay area, clean joint, trim to $3\frac{3}{4}" \pm \frac{1}{2}"$ and install preformed joint material $4\frac{1}{2}" \pm \frac{1}{8}"$ wide times pavement thickness minus 1 inch deep with lubricant adhesive. See Materials I.M. 436.05 for list of approved materials.

④ Reinforced bridge approach section overlay "Runout" slope not to exceed 1 inch in 50 feet from profile grade.

⑤ Existing joint, remove all expansion material and clean joint area (not to be overlaid and saw cut).

⑥ Saw and seal over existing joint; refer to Detail 'C' on PV-101.

⑦ Tire buffings. Refer to Joint Standards.

⑧ Existing joint, remove all expansion material and fill with overlay material.

⑨ Applicable only if a transverse crack in the reinforced section exists.

This plan shows construction details of a PCC Overlay on a bridge approach section to match the thickness of the bridge deck overlay.

After undersealing (by others), work is to proceed in the following sequence and in accordance with traffic control plans:

1. Rout out existing joints as detailed in the plans.

2. Scarify to the minimum depth of $\frac{1}{4}"$ the existing PCC surface of the reinforced bridge approach section. Scarify deep enough to provide a minimum overlay thickness of 1½ inches.

3. Overlay the scarified approach pavement with PCC in compliance with Section 2413. The existing joint at the bridge end is not to be overlaid and cut out by saw. Use a method approved by the Engineer.

4. Install sealed joint at the bridge end and at the locations of overlaid existing joints as detailed on this sheet.

5. Trim the first existing 'CF' joint beyond the resurfaced area to a uniform $3\frac{3}{4}" \pm \frac{1}{2}"$ width, clean joint and install new preformed joint material with lubricant adhesive.

Routing at joints will be measured and paid for as "Class A Deck Repair" in compliance with section 2413.

Overlaying of the bridge approach pavement with PCC will be paid for at the contract unit price for "Deck Overlay" as specified in Section 2413. Scarification to the depth required is incidental to "Deck Overlay".

Sealed joints installed at locations of existing joints will not be paid for separately, but are incidental to "Deck Overlay".

For raising HMA shoulder to match the PCC overlay of the bridge approach pavement, Class II compaction is required as specified in Section 2303. Asphalt binder and tack coat are incidental.

Construct "Granular Shoulders, Type B" according to Section 2121 when other than paved shoulders exist.

For joint details, refer to PV-101.

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STANDARD ROAD PLAN

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REVISIONS: Updated references to renamed standards. Deleted duplicate note.

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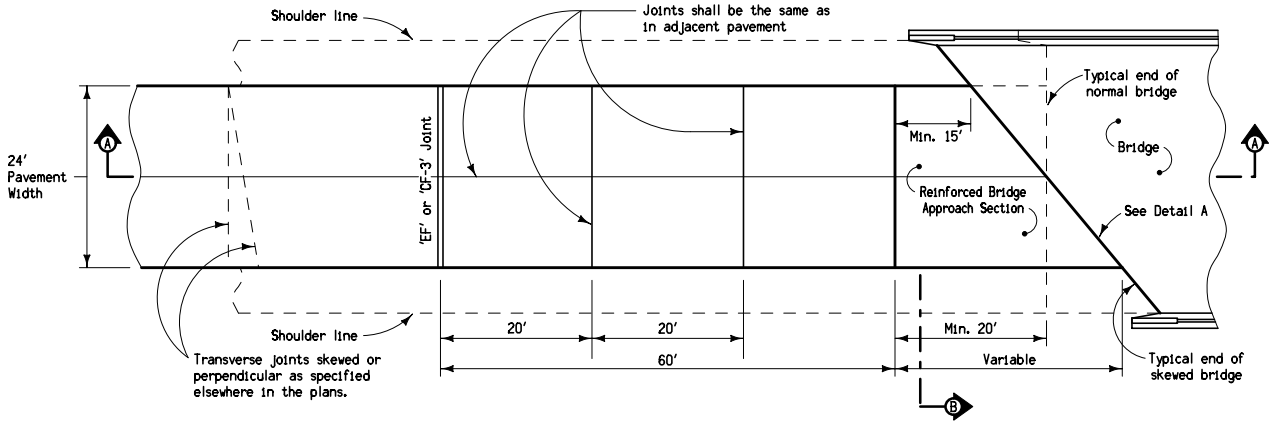
PCC OVERLAY OF REINFORCED BRIDGE APPROACH SECTION

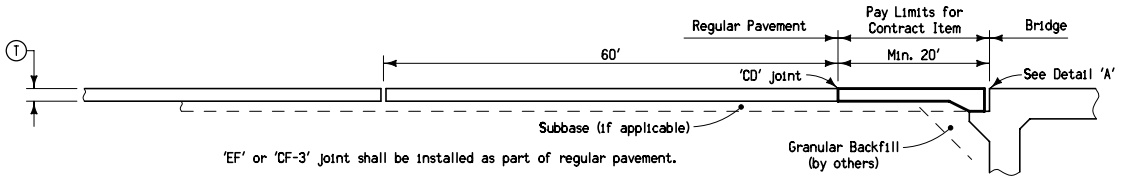


TYPICAL BRIDGE APPROACH PLAN

Concrete used for the bridge approach section shall be the same as that used for remainder of project pavement.

For joint details, see PV-101.

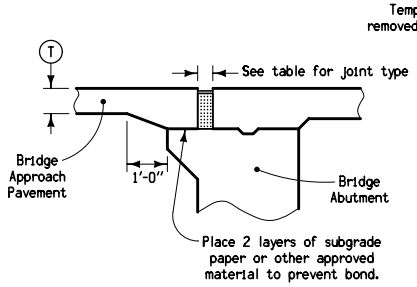
Quantity for 20' long approach section for 24' pavement is 53.33 sq. yds. of "Bridge Approach."



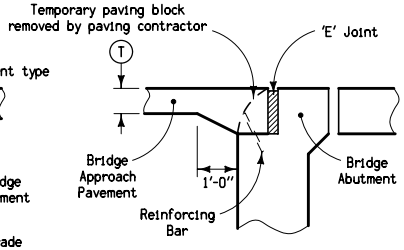
'EF' or 'CF-3' joint shall be installed as part of regular pavement.

SECTION A-A

JOINT TYPE FOR MOVABLE ABUTMENT BRIDGES		
Joint	Concrete Beam Maximum Bridge Length	Steel Girder Maximum Bridge Length
CF-1	370'	250'
CF-2	465'	320'
CF-3	575'	400'



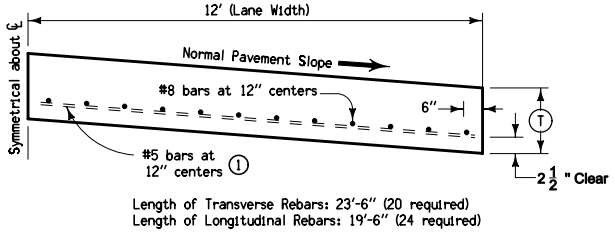
MOVABLE ABUTMENT BRIDGE



FIXED ABUTMENT BRIDGE

DETAIL 'A'

'T' is same thickness as is required for remainder of project pavement.



Length of Transverse Rebars: 23'-6" (20 required)
Length of Longitudinal Rebars: 19'-6" (24 required)

TYPICAL HALF SECTION B

① If bridge is skewed, place additional #5 bar parallel to skewed face.

Possible Contract Items:
Bridge Approach, RK-18
Standard or Slip-Form PCC Pavement

Possible Tabulation:
112-6

Iowa Department of Transportation

STANDARD ROAD PLAN

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REVISIONS: Updated references to renamed standards.

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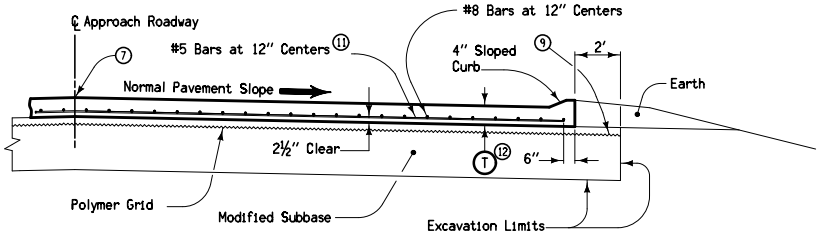
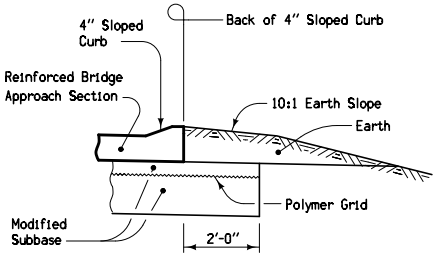
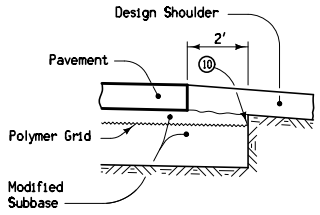
BRIDGE APPROACH DETAILS (SECONDARY ROADS)



SECTION A-A

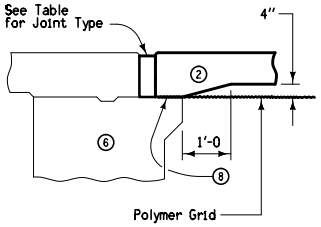


SECTION B-B

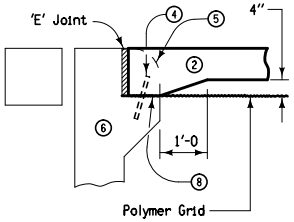


SECTION C-C

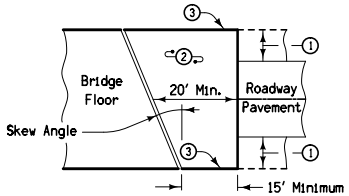
JOINT TYPE FOR MOVABLE ABUTMENT BRIDGES		
Joint	Concrete Beam Maximum Bridge Length	Steel Girder Maximum Bridge Length
CF-1	370'	250'
CF-2	465'	320'
CF-3	575'	400'



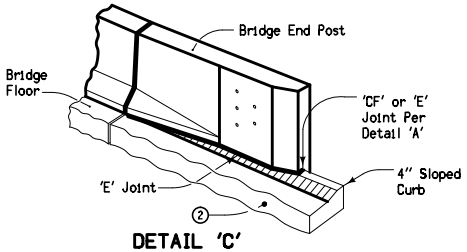
DETAIL 'A'
Movable Abutment Bridge



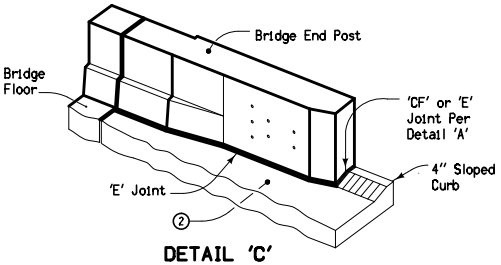
DETAIL 'A'
Fixed Abutment Bridge



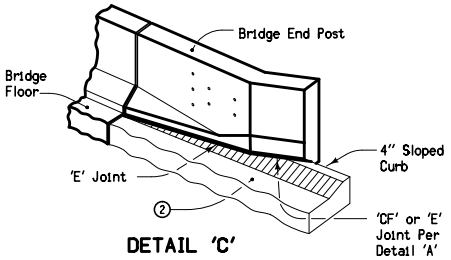
TWO LANE APPROACH PAVEMENT
LAYOUT AT A SKEW



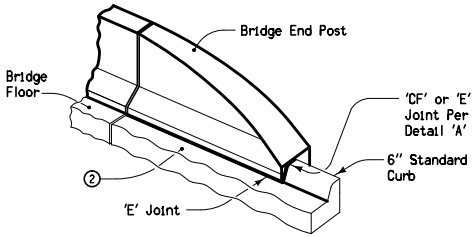
DETAIL 'C'
Five Hole Bridge End Post



DETAIL 'C'
Retrofit Bridge End Post



DETAIL 'C'
Flared Bridge End Post



DETAIL 'C'
Low Speed Bridge End Post

CURB ALIGNMENT and
JOINT PLACEMENT

Sections and details apply to Standard Road Plans RK-16 and RK-19B through RK-19J.

1. Design Shoulder width.
2. Reinforced Bridge Approach Section.
3. Build 4" Sloped Curb.
4. Reinforcing Bar.
5. Temporary paving block removed by paving contractor.
6. Bridge Abutment.
7. Longitudinal Joint: (PV-101)

   Single pour - Saw cut joint per Detail B.
   Two pours - Use 'KS-1' joint.
8. Secure polymer grid on top of paving notch.
9. Extend polymer grid to 2' outside edge of pavement.
10. Trim fabric to edge of excavation.
11. If bridge is skewed, place additional #5 bar parallel to skewed face.
12. T = 10 inches.

Possible Contract Item:
Bridge Approach, RK-19

Possible Tabulation:
112-6

Iowa Department of Transportation

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STANDARD ROAD PLAN

RK-19A

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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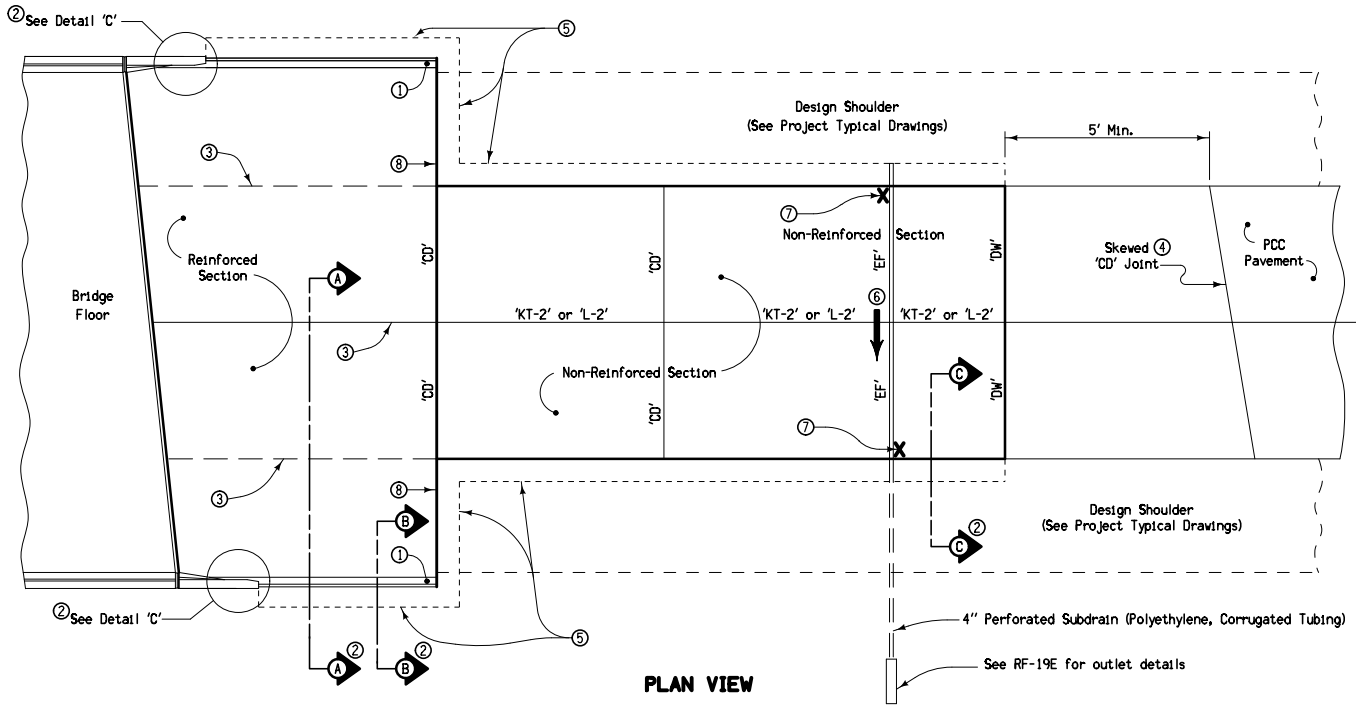
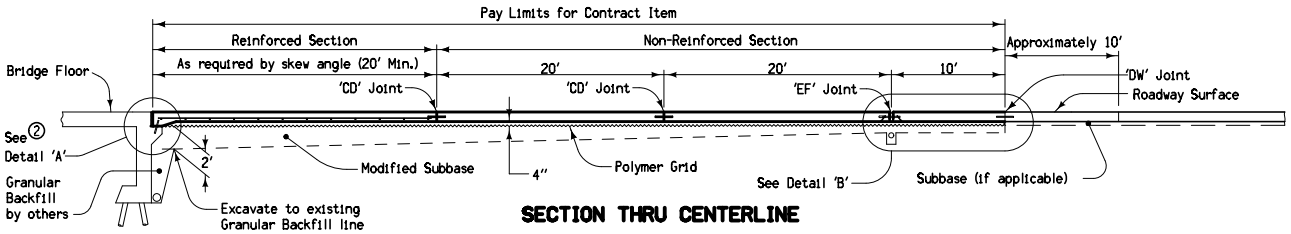
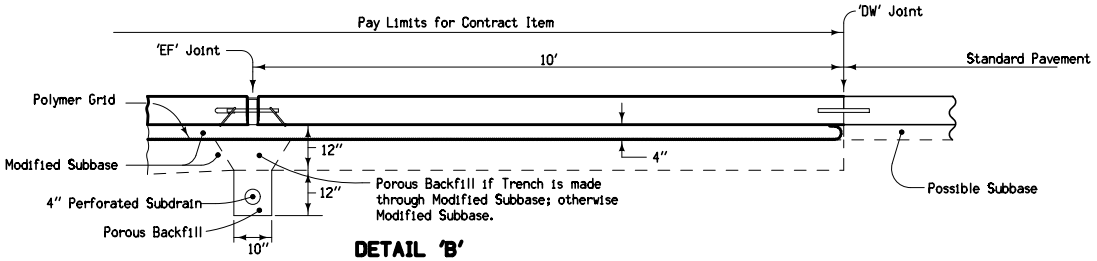
BRIDGE APPROACH SECTION (GENERAL DETAILS)



PLAN VIEW



SECTION THRU CENTERLINE



DETAIL 'B'
Doweled PCC Pavement

For Joint Details, see PV-101.

1. Build 4 inch Sloped Curb to end of Reinforced Bridge Approach Section. See Curb Location Details (Section B-B).
2. See RK-19A.
3. Longitudinal Joint: (PV-101)
   Single Pour - Saw cut joint per Detail "B."
   Two Pours - Use "KS-1" joint.
4. 'CD' Joints required up to 300' each way from end of Reinforced Bridge Approach Section.
5. Excavation limits of Modified Subbase 2' outside of pavement edge, see RK-19A.
6. Slope subdrain to drain.
7. An "X" shall be placed in the plastic concrete near the 'EF' Joint at the outside edge of pavement.
8. Use 'RD' Joint where PCC shoulder, 'B' Joint otherwise.

Possible Contract Item:
Bridge Approach, RK-19

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STANDARD ROAD PLAN

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SHEET 1 of 1

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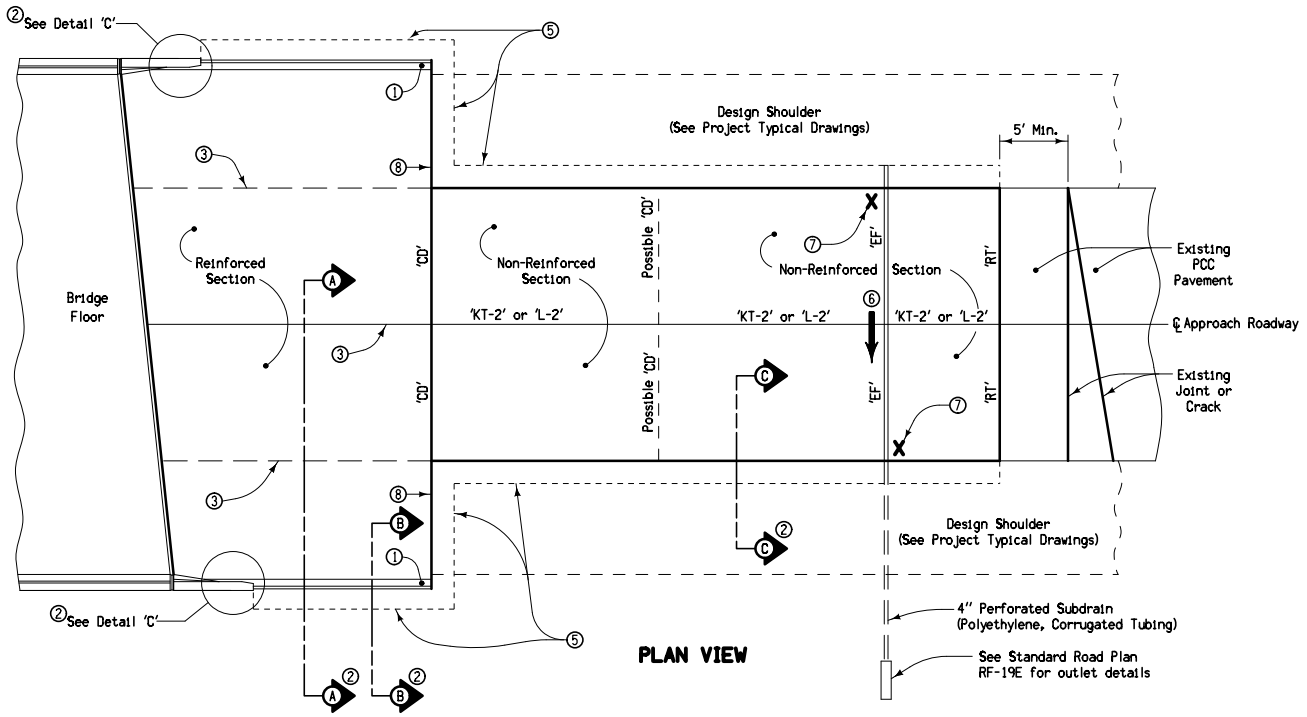
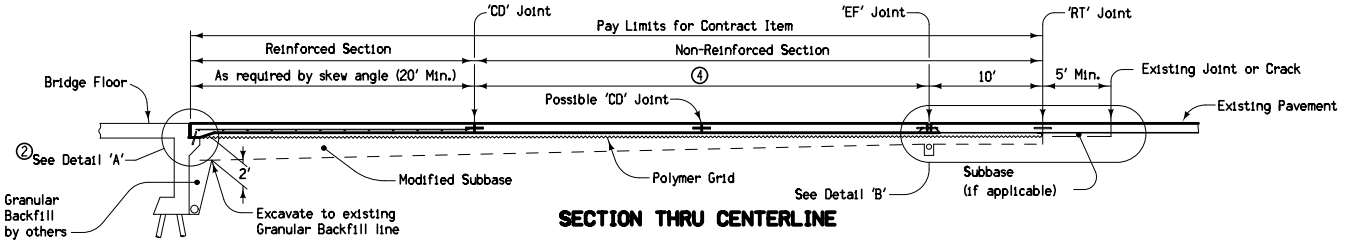
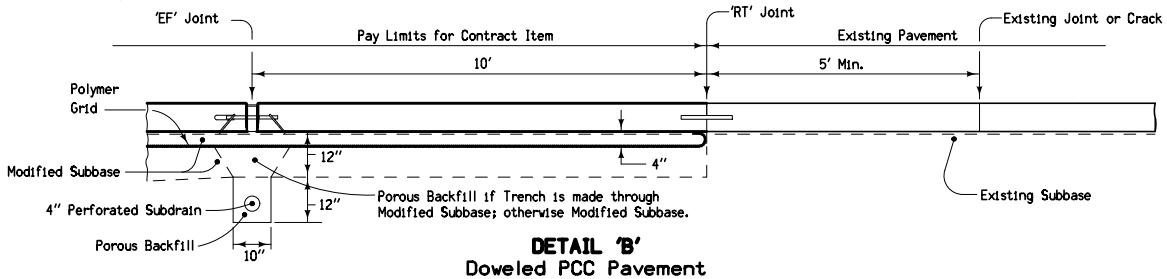
BRIDGE APPROACH SECTION
(TWO-LANE)
(ABUTTING PCC PAVEMENT)



PLAN VIEW



SECTION THRU CENTERLINE



DETAIL 'B'
Doweled PCC Pavement

For Joint Details, see PV-101.

1. Build 4 inch Sloped Curb to end of Reinforced Bridge Approach Section. See Curb Location Details (Section B-B).
2. See Standard Road Plan RK-19A.
3. Longitudinal Joint: (Standard Road Plan PV-101)
   Single Pour - Saw cut joint per detail B.
   Two Pours - Use 'KS-1' joint.
4. Minimum 1 panel, maximum 3 panels; 15' minimum 20' maximum panel length, use 'CD' Joints.
5. Excavation limits of Modified Subbase 2' outside of pavement edge, see Standard Road Plan RK-19A.
6. Slope subdrain to drain.
7. An "X" shall be placed in the plastic concrete near the 'EF' Joint at the outside edge of pavement.
8. Use 'RD' Joint where PCC shoulder, 'B' Joint otherwise.

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RK-19C

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REVISIONS: Updated references to renamed standards.

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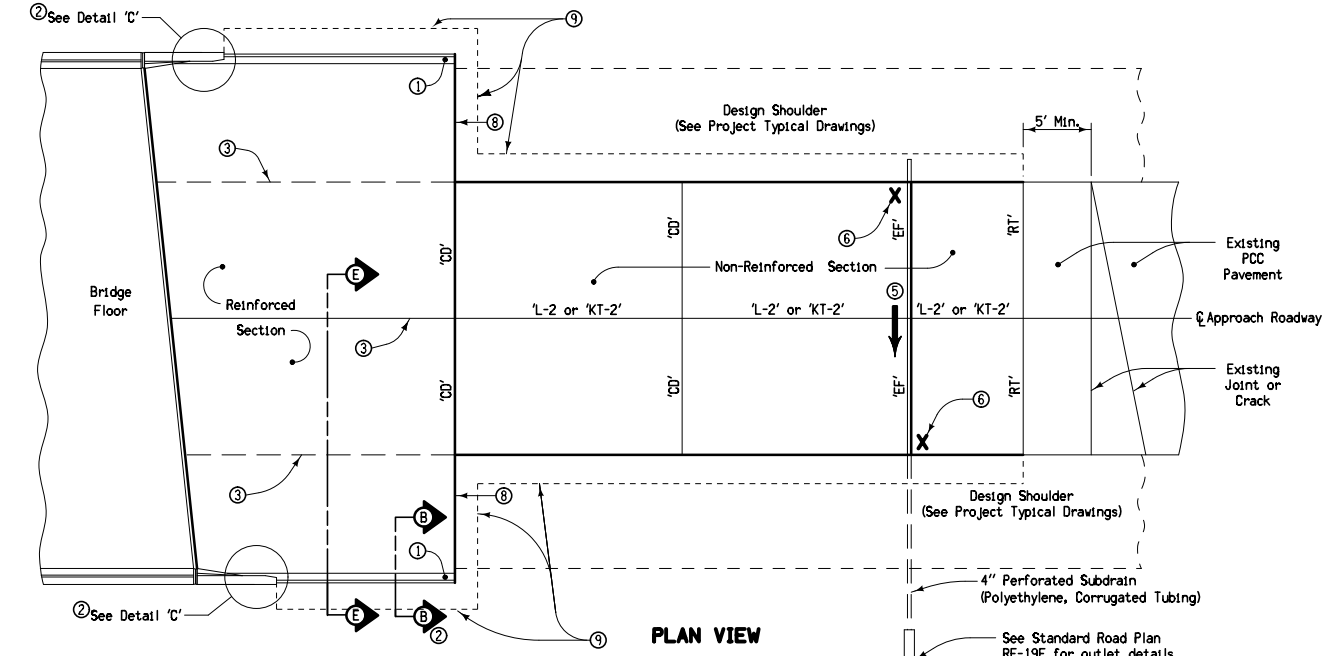
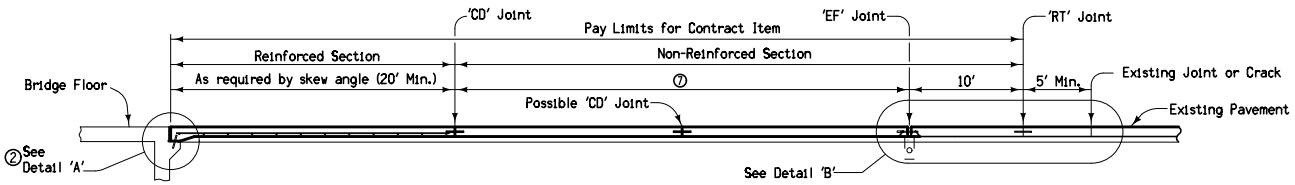
BRIDGE APPROACH SECTION (TWO-LANE FOR BRIDGE RECONSTUCTION, PCC PAVEMENT)

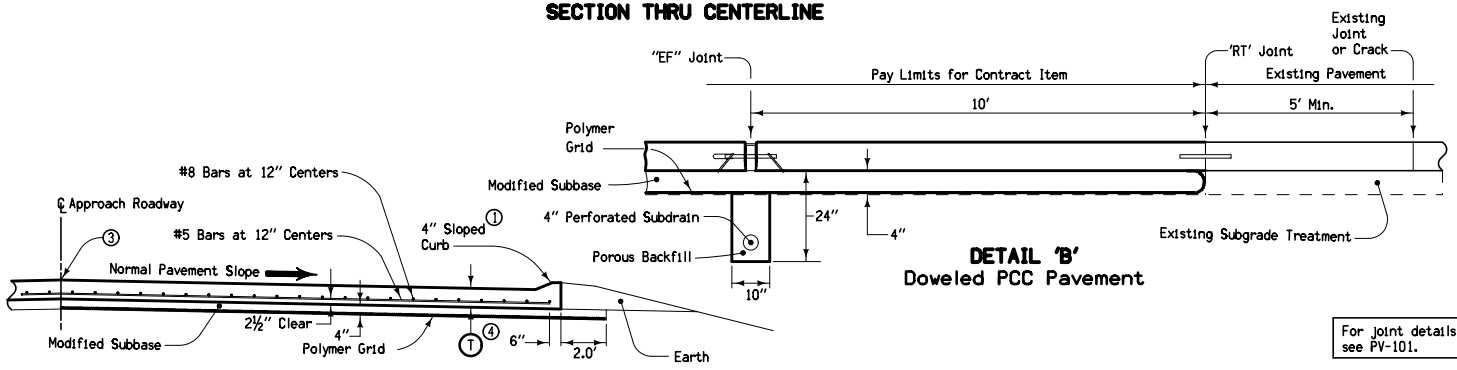


PLAN VIEW



SECTION THRU CENTERLINE

1. Build 4 inch Sloped Curb to end of Reinforced Bridge Approach Section. See Curb Location Details (Section B-B).
2. See Standard Road Plan RK-19A.
3. Longitudinal Joint: (PV-101)
   Single Pour - Saw cut joint per detail B.
   Two Pours - Use 'KS-1' joint.
4. T = 10 inches.
5. Slope subdrain to drain.
6. An "X" shall be placed in the plastic concrete near the 'EF' Joint at the outside edge of pavement.
7. Minimum 1 panel, maximum 3 panels; 15' minimum 20' maximum panel length, use 'CD' Joints.
8. Use 'RD' Joint where PCC shoulder, 'B' Joint otherwise
9. Excavation limits of Modified Subbase 2' outside of pavement edge, see Standard Road Plan RK-19A.



DETAIL 'B'
Doweled PCC Pavement

SECTION E-E

For joint details, see PV-101.

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REVISIONS: Updated references to renamed standards.

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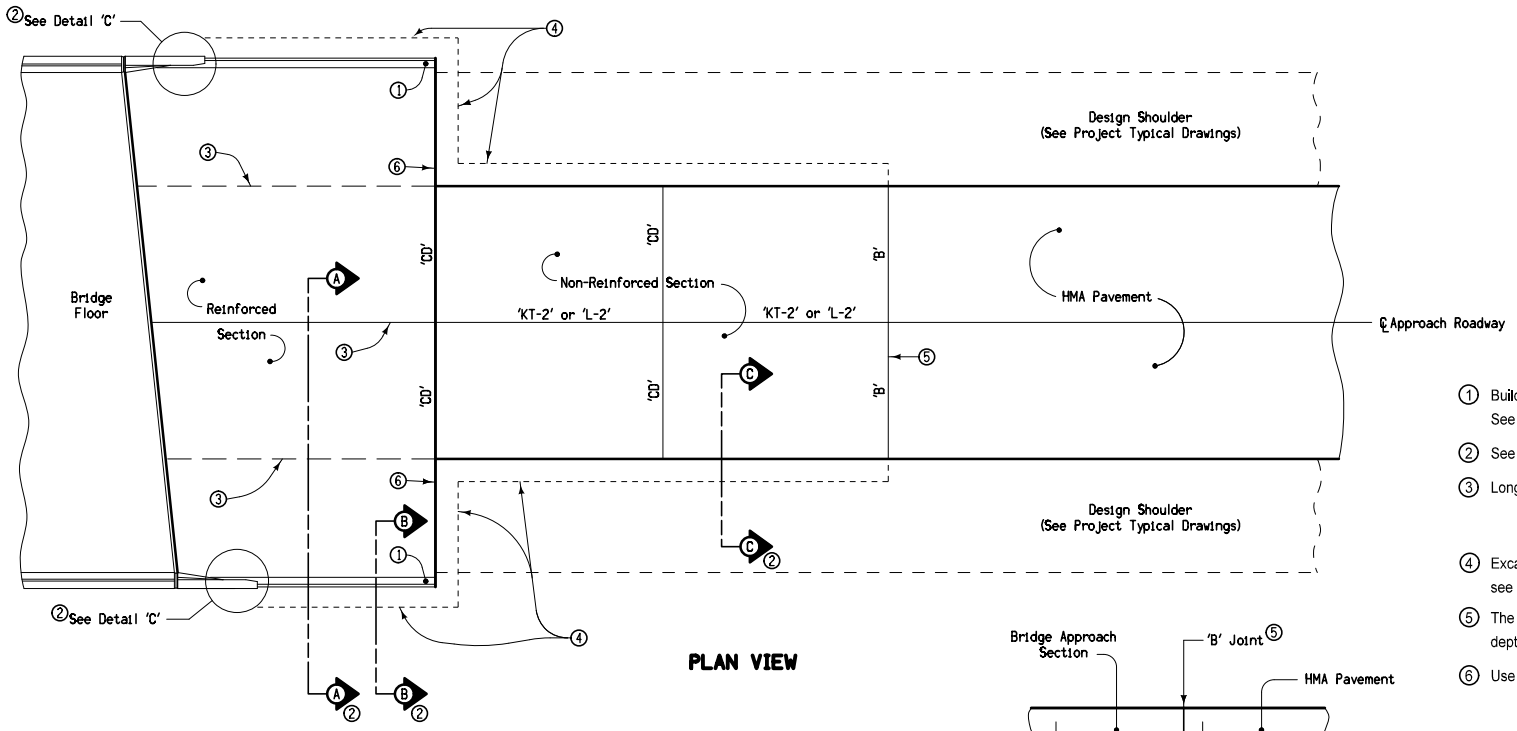
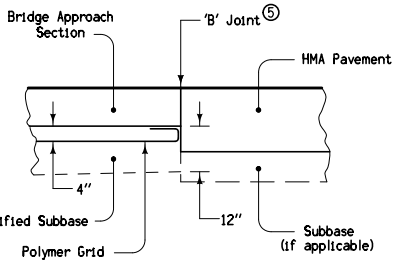
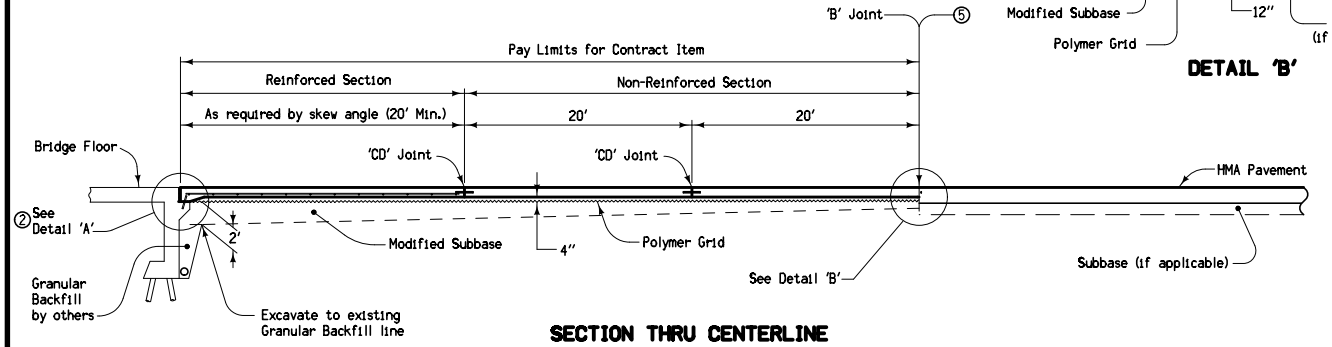
BRIDGE APPROACH SECTION (AT EXISTING BRIDGES, PCC PAVEMENT)



PLAN VIEW



DETAIL 'B'



SECTION THRU CENTERLINE

For Joint Details, see PV-101.

1. Build 4" Sloped Curb to end of Reinforced Bridge Approach Section. See curb location details (Section B-B).
2. See Standard Road Plan RK-19A.
3. Longitudinal Joints: (PV-101)
   Single Pour - Saw cut joint per detail B.
   Two Pours - Use 'KS-1' Joint.
4. Excavation limits of Modified Subbase 2' outside of pavement edge, see Standard Road Plan RK-19A.
5. The contractor may be required to saw cut the HMA pavement full depth to accommodate the 'B' joint.
6. Use 'RD' joint where PCC shoulder, 'B' joint otherwise.

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STANDARD ROAD PLAN

RK-19G

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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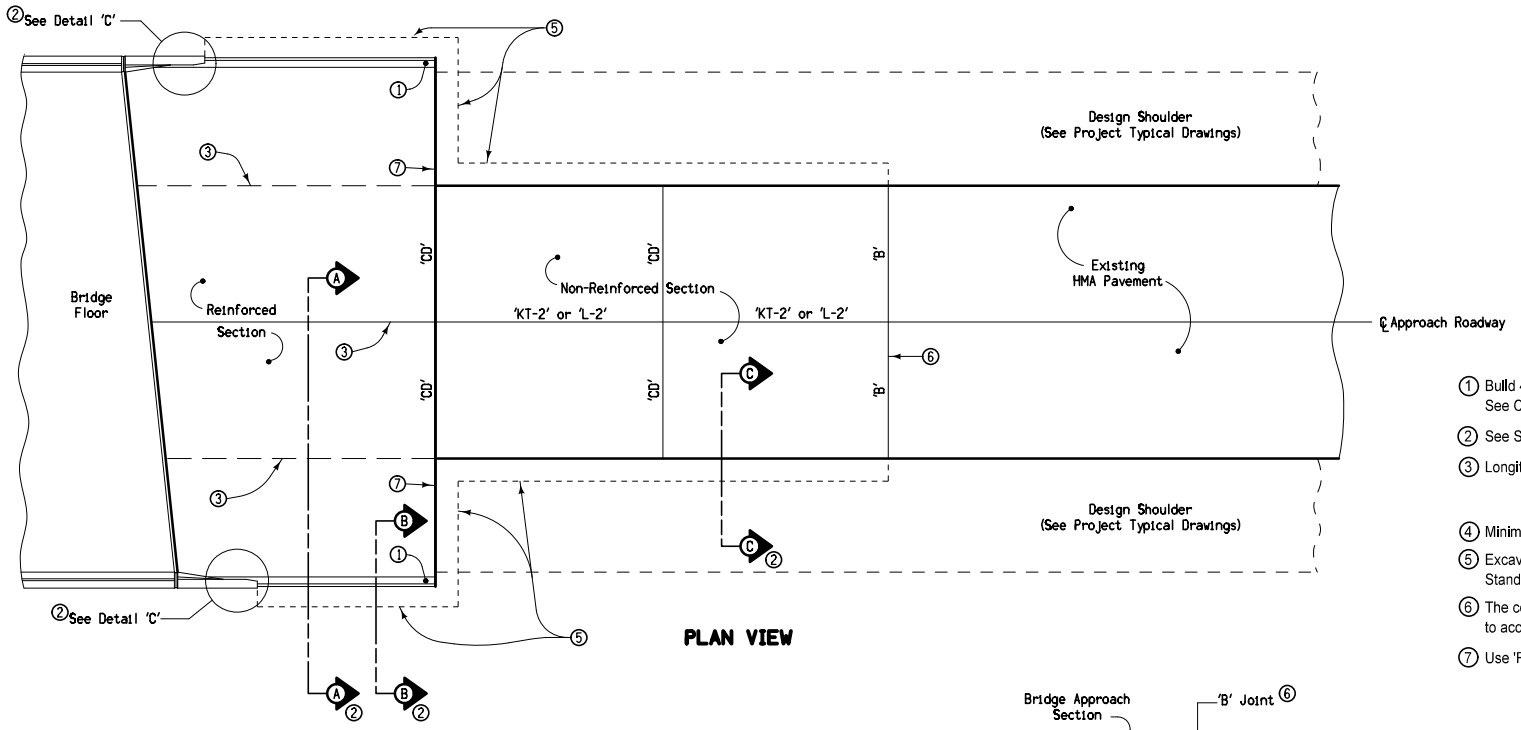
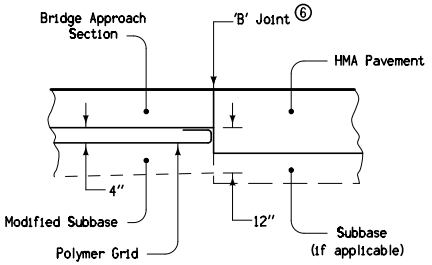
BRIDGE APPROACH SECTION (TWO-LANE, HMA PAVEMENT)

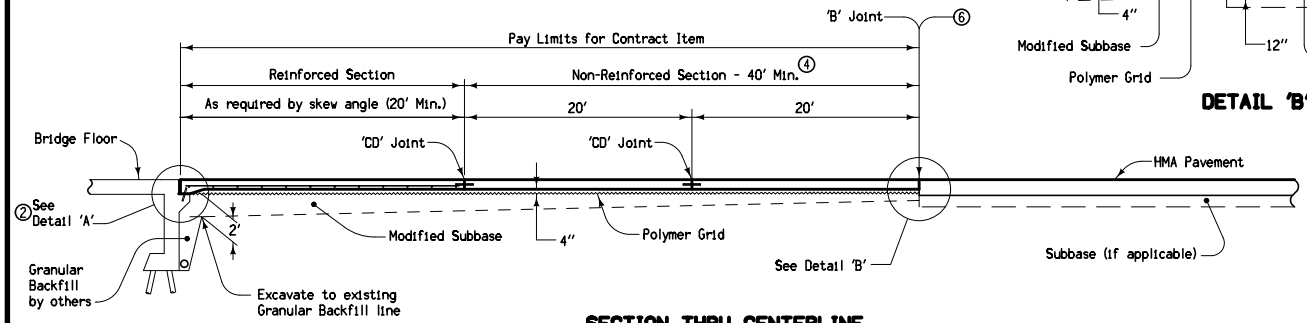


PLAN VIEW

1. Build 4" Sloped Curb to end of Reinforced Bridge Approach Section. See Curb Location Details (Section B-B).
2. See Standard Road Plan RK-19A.
3. Longitudinal Joint: (PV-101)
   Single Pour - Saw cut joint per Detail B.
   Two Pours - Use 'KS-1' Joint.
4. Minimum 2 panels, maximum 3 panels; 20' panel length, use 'CD' Joints.
5. Excavation limits of Modified Subbase 2' outside of pavement edge, see Standard Road Plan RK-19A.
6. The contractor may be required to saw cut the HMA pavement full depth to accommodate the 'B' joints.
7. Use 'RD' joint where PCC shoulder, 'B' joint otherwise.



DETAIL 'B'



SECTION THRU CENTERLINE

For joint details, see PV-101.

Iowa Department of Transportation

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STANDARD ROAD PLAN

RK-19H

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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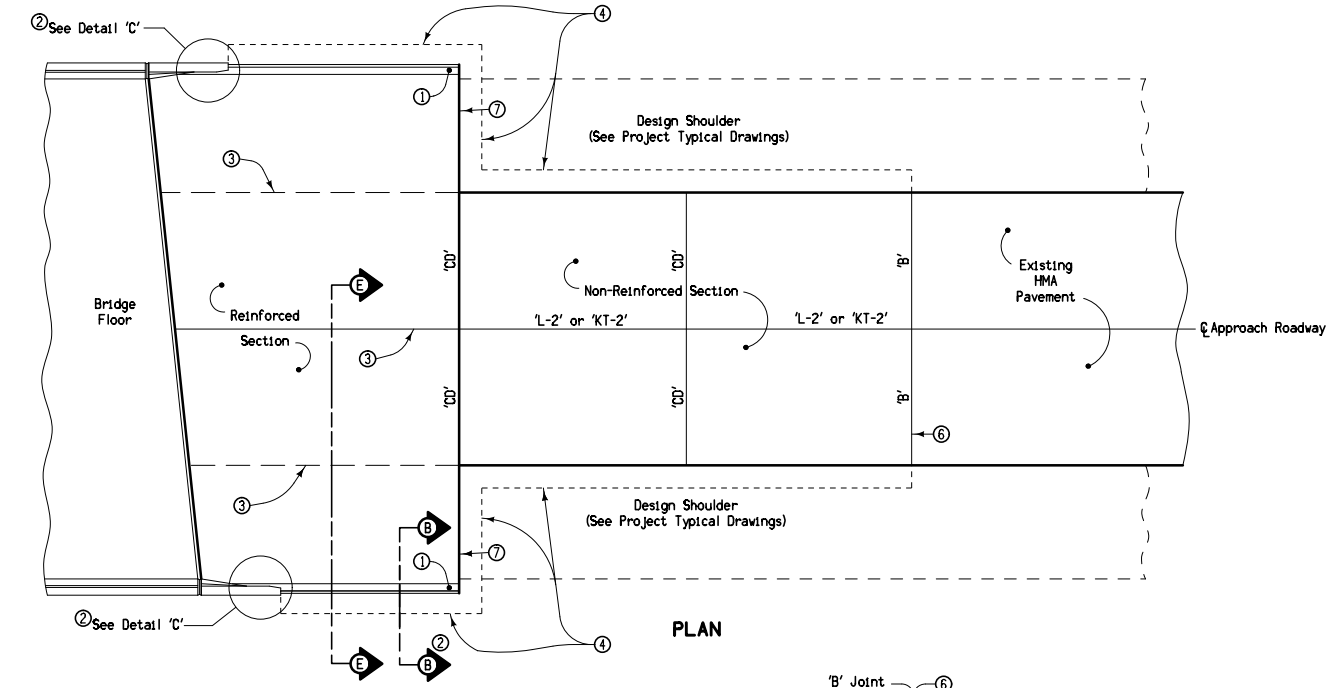
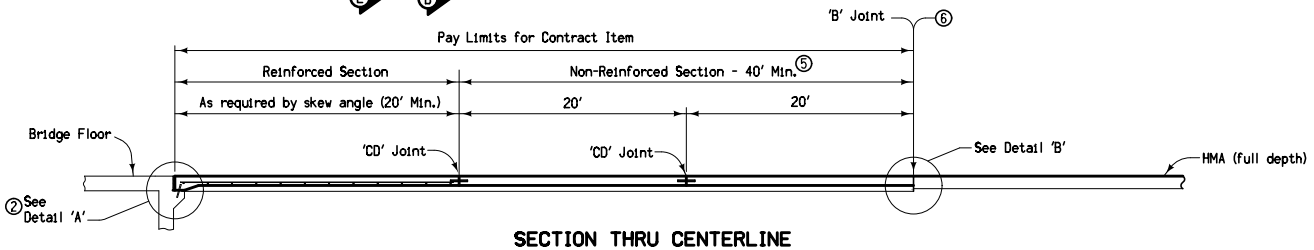
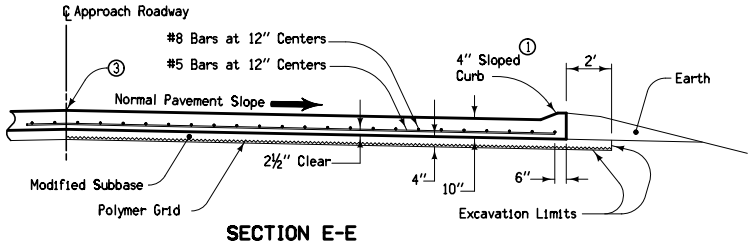
BRIDGE APPROACH SECTION (TWO-LANE FOR BRIDGE RECONSTRUCTION, HMA PAVEMENT)

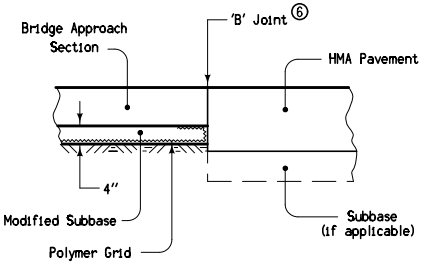




SECTION THRU CENTERLINE



SECTION E-E



DETAIL 'B'

For joint details see PV-101.

1. Build 4" Sloped Curb to end of Reinforced Bridge Approach Sections. See Curb Location Details (Section B-B).
2. See RK-19A.
3. Longitudinal Joints: (PV-101)
   Single Pour - Saw cut joint per detail B.
   Two Pours - Use 'KS-1' Joint.
4. Excavation limits of Modified Subbase 2' outside of pavement edge; see RK-19A.
5. Minimum 2 panels, maximum 3 panels; 20' panel length, use 'CD' Joints.
6. The contractor may be required to saw cut the HMA pavement full depth to accommodate the 'B' joint.
7. Use 'RD' joint where PCC shoulder, 'B' joint otherwise.

Possible Contract Item:
Bridge Approach, RK-19

Iowa Department of Transportation

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STANDARD ROAD PLAN

RK-19J

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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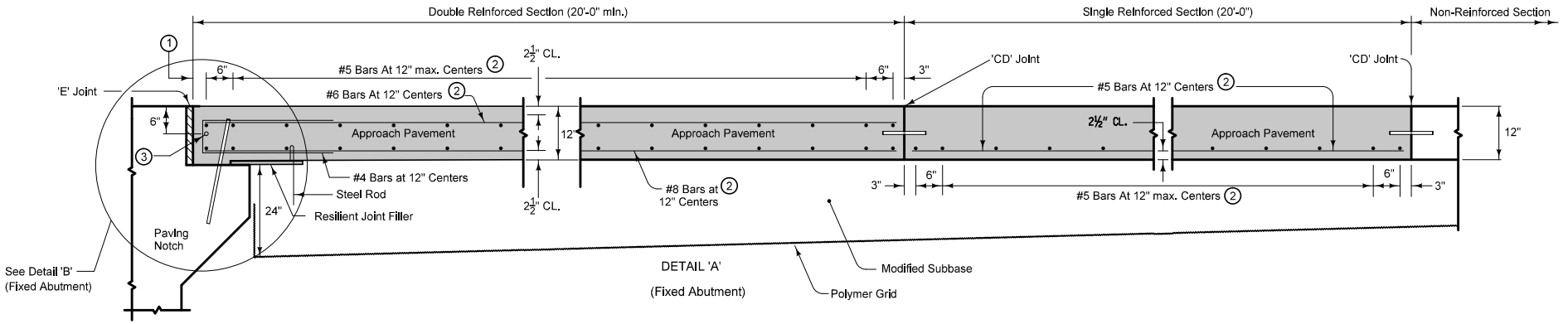
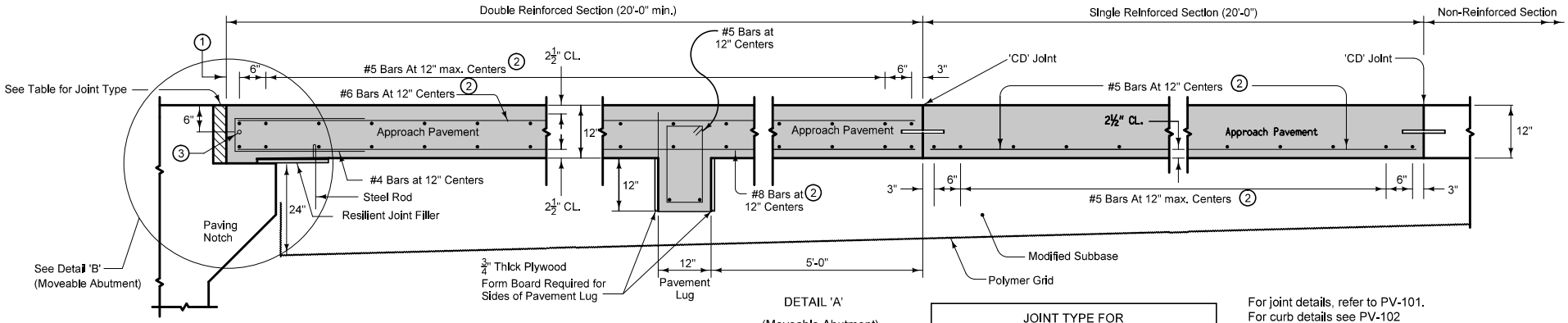
BRIDGE APPROACH SECTION (AT EXISTING BRIDGES, HMA PAVEMENT)





JOINT TYPE FOR MOVEABLE ABUTMENT BRIDGES		
Joint	Maximum Bridge Length	
	Concrete Beam or Slab	Steel Girder
CF-1	370'	250'
CF-2	465'	320'
CF-3	575'	400'

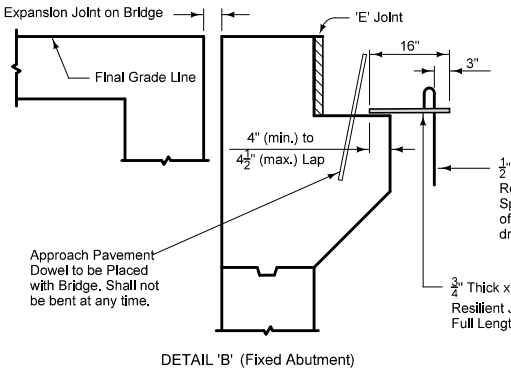
For joint details, refer to PV-101.
For curb details see PV-102

All transverse bars are #5.

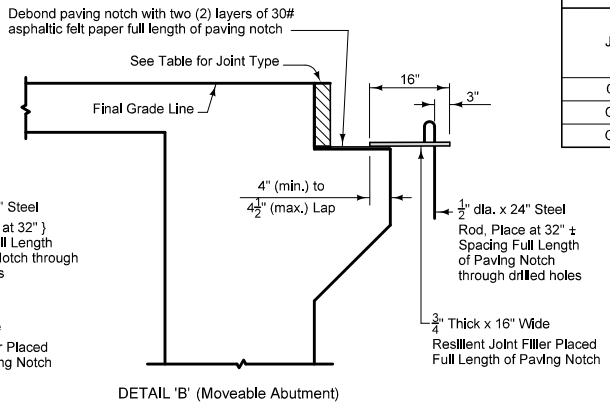
Possible Contract Item:

Bridge Approach, RK-20

Possible Tabulation: 112-6



DETAIL 'B' (Fixed Abutment)



DETAIL 'B' (Moveable Abutment)

(1) 2" min. to 2 1/2" max. clear to bent bar.

(2) Minimum lap length: #5 Bars - 18"
#6 Bars - 27"
#8 Bars - 48"

(3) If bridge is skewed, place additional #5 bar parallel to skewed face.

Iowa Department of Transportation

STANDARD ROAD PLAN

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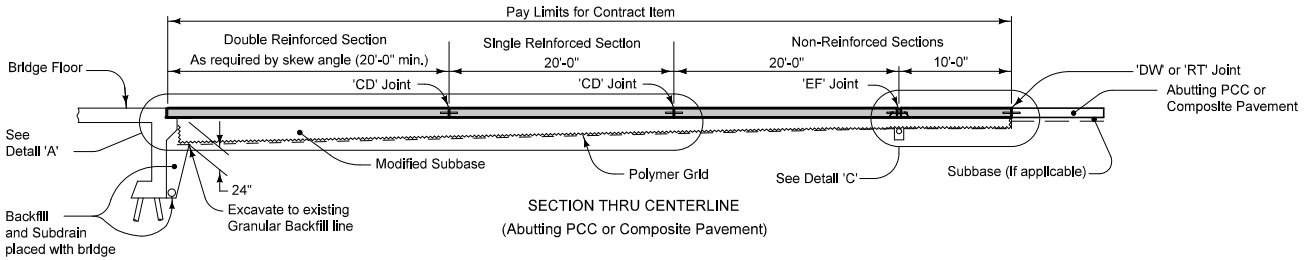
SHEET 1 of 3

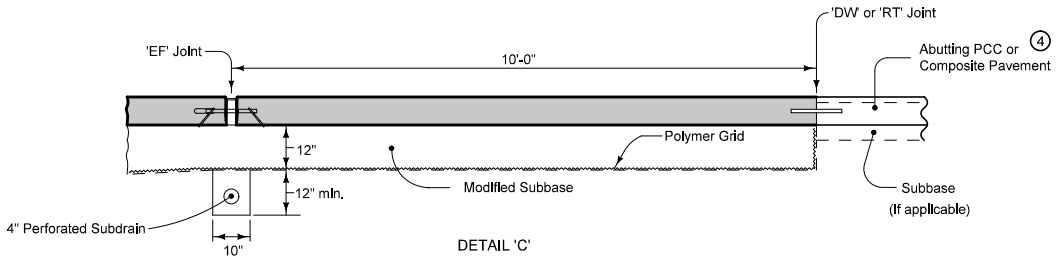
REVISIONS: Removed note In Detail 'C' that allowed the Contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

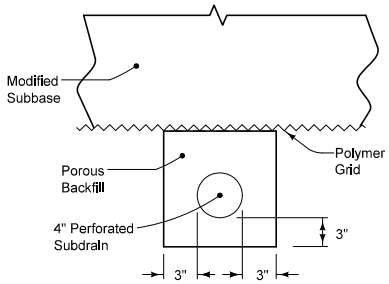
DOUBLE REINFORCED 12" APPROACH



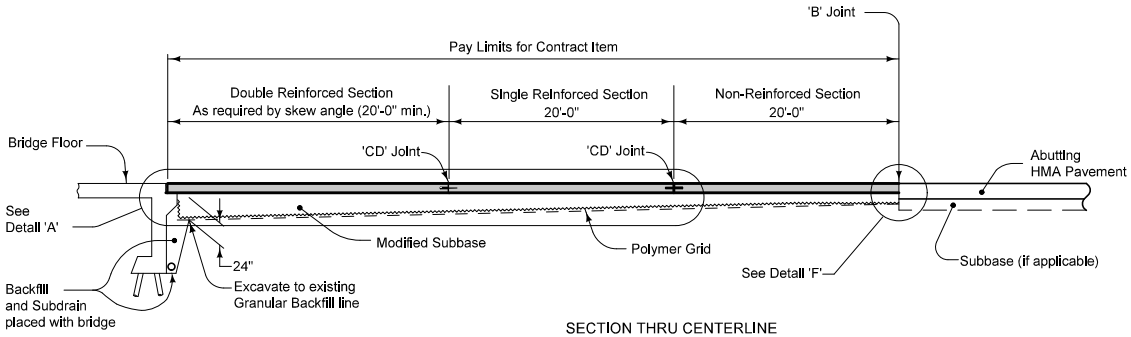
SECTION THRU CENTERLINE
(Abutting PCC or Composite Pavement)



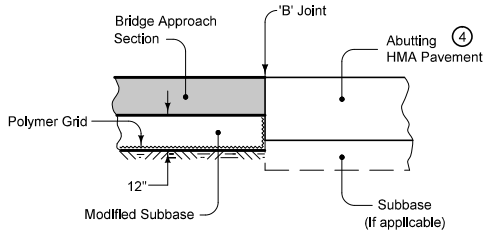
DETAIL 'C'
(Doweled PCC Pavement)



4" SUBDRAIN LOCATION



SECTION THRU CENTERLINE
(Abutting HMA Pavement)



DETAIL 'F'

④ If abutting pavement (PCC or HMA) is not in place, refer to RK-30.

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STANDARD ROAD PLAN

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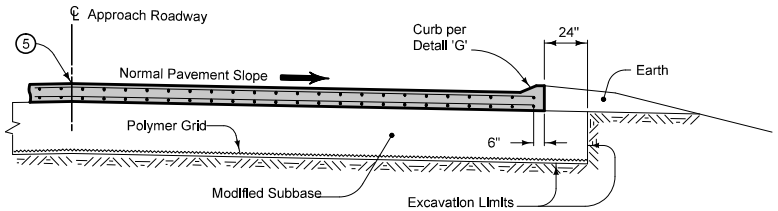
SHEET 2 of 3

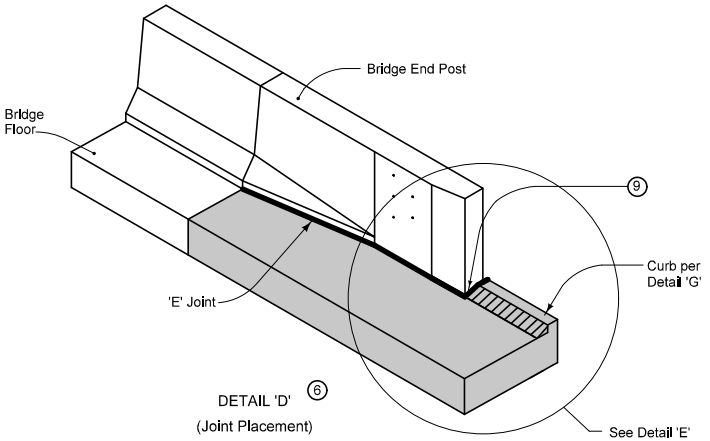
REVISIONS: Removed note In Detail 'C' that allowed the Contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

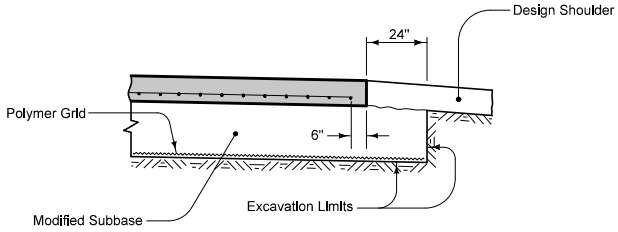
DOUBLE REINFORCED 12" APPROACH



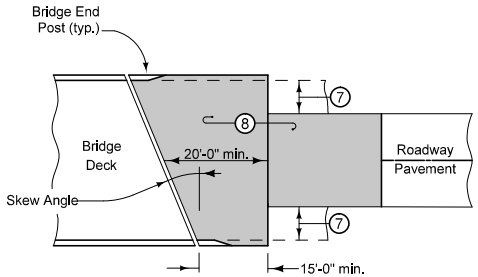
SECTION A-A (6)



DETAIL 'D' (6)
(Joint Placement)



SECTION B-B (6)



APPROACH PAVEMENT
LAYOUT AT A SKEW

(5) Longitudinal Joint: (PV-101)
Single pour - Saw cut joint per Detail B.
Two pours - Use 'KS-2' Joint

(6) Refer to RK-21, RK-22, or RK-23.

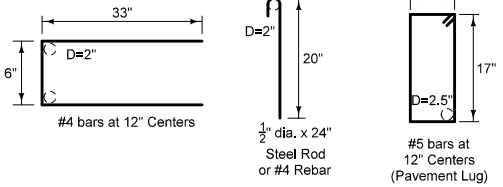
(7) Design shoulder width.

(8) Reinforced bridge approach section.

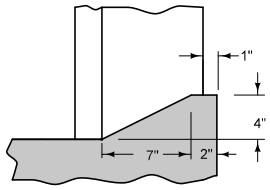
(9) Expansion joint at end of bridge end post: Place joint filler the full depth of the bridge approach pavement. In areas with curb, place full depth of pavement plus curb and shape material to fit the shape of the curb per Section B-B of PV-101. Seal joint per Detail F of PV-101.

- Fixed Abutment Bridges:Type 'E' Joint

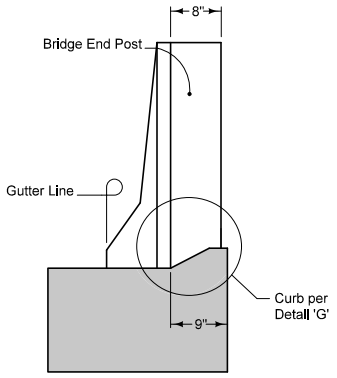
- Moveable Abutment Bridges: Flexible Foam Expansion Joint Filler in accordance with Specification Section 4136. Minimum filler width is the abutment 'CF' joint width. Joint length as required to completely fill from back side of curb to front face of bridge wing.



BENT BAR SHAPES



DETAIL 'G'



DETAIL 'E'
(Back of Curb Placement)

Iowa Department of Transportation

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STANDARD ROAD PLAN

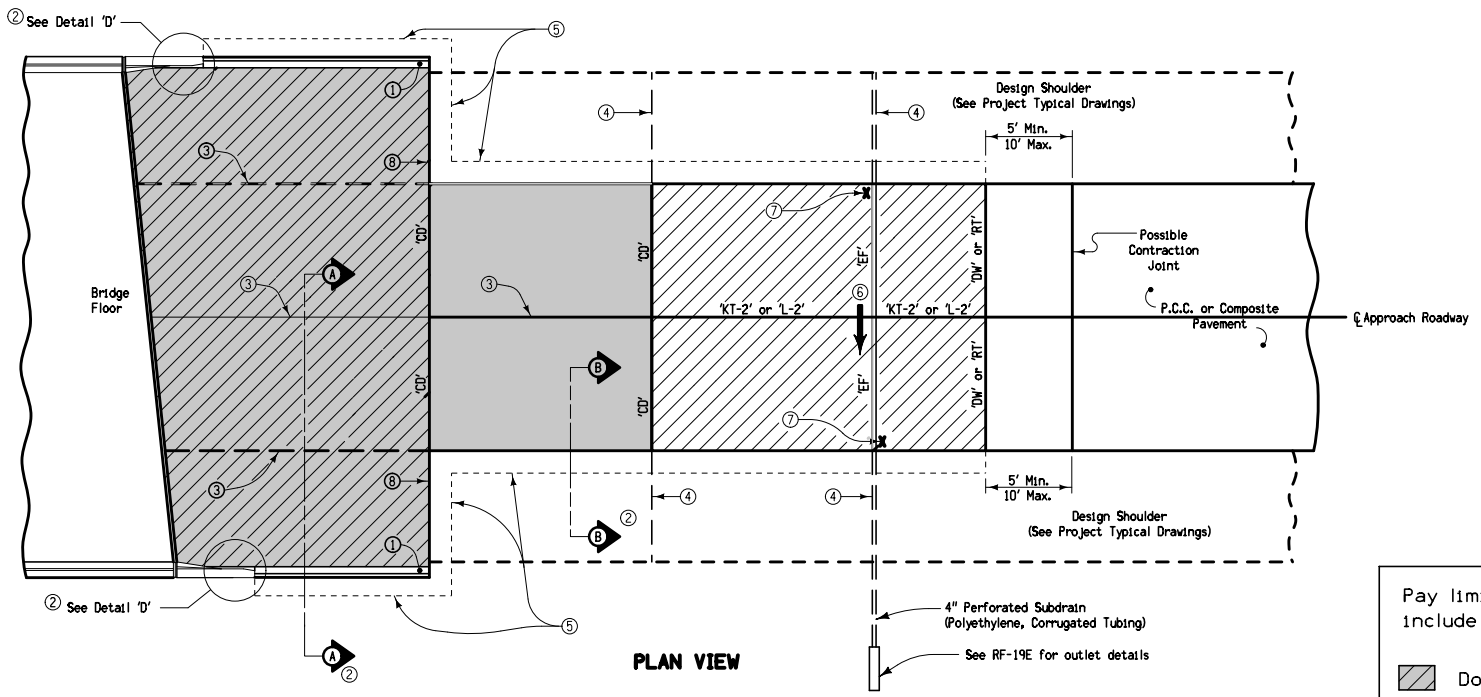
RK-20

SHEET 3 of 3

REVISIONS: Removed note In Detail 'C' that allowed the Contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DOUBLE REINFORCED 12" APPROACH



PLAN VIEW

Pay limits for contract item include the following areas:

- Double Reinforced Section
- Single Reinforced Section
- Non-Reinforced Section

1. Build 4 inch Sloped Curb to end of Double Reinforced Section.
2. See Standard Road Plan RK-20, RK-25, or RK-26.
3. Longitudinal Joint: (See PV-101)
   Single Pour - Saw cut joint per detail B
   Two Pours - Use 'KS-2' Joint (Double Reinforced Section).
   Use 'KS-1' Joint (Single Reinforced Section).
4. Extend 'CD' and 'EF' Joints where PCC Shoulder.
5. Polymer Grid and excavation limits of Modified Subbase 2' outside of pavement edge. See Standard Road Plan RK-20, RK-25, or RK-26.
6. Slope Subdrain to Drain.
7. An "X" shall be placed in the plastic concrete near the 'EF' Joint at the outside edge of pavement.
8. Use 'RD' Joint where PCC shoulder, 'B' Joint otherwise.

For joint details, see PV-101.

Iowa Department of Transportation

STANDARD ROAD PLAN

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SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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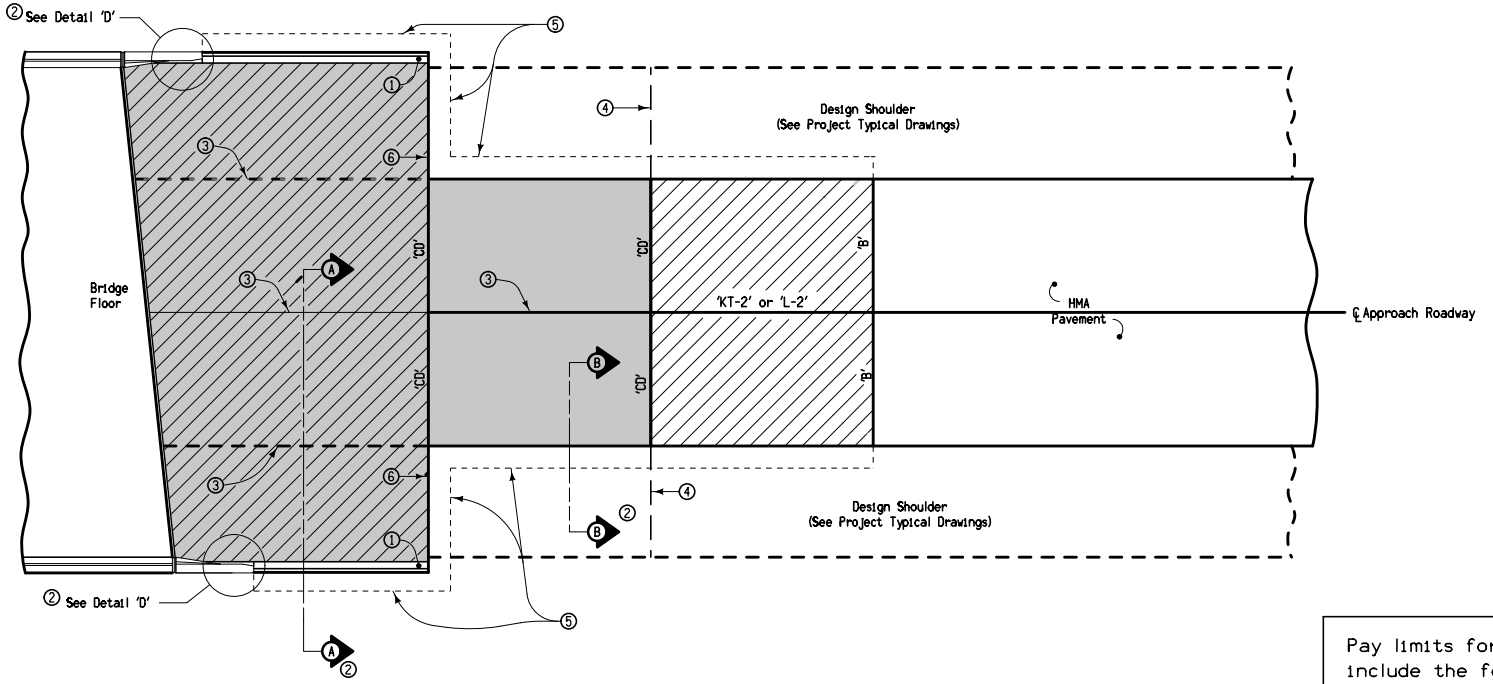
BRIDGE APPROACH (ABUTTING PCC OR COMPOSITE PAVEMENT)



PLAN VIEW

Pay limits for contract item include the following areas:

- Double Reinforced Section
- Single Reinforced Section
- Non-Reinforced Section

① Build 4" Sloped Curb to end of Double Reinforced Section.

② See RK-20, RK-25, or RK-26.

③ Longitudinal Joint: (See PV-101)
Single Pour - Saw cut joint per detail B
Two Pours - Use 'KS-2' Joint (Double Reinforced Section).
Use 'KS-1' Joint (Single Reinforced Section).

④ Extend 'CD' Joints where PCC Shoulder.

⑤ Polymer Grid and excavation limits of Modified Subbase 2' outside of pavement edge. See RK-20, RK-25, or RK-26.

⑥ Use 'RD' joint where PCC shoulder, 'B' joint otherwise.

For joint details, see PV-101.

Iowa Department of Transportation

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SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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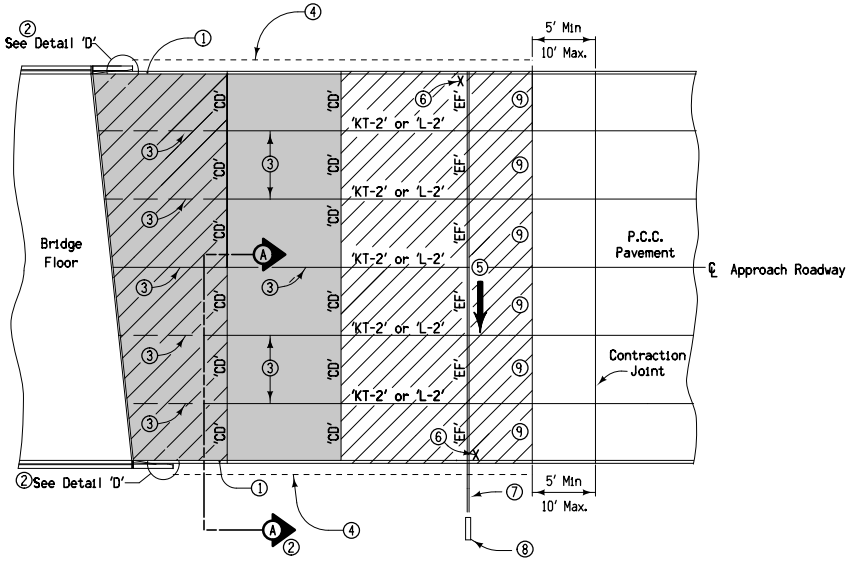
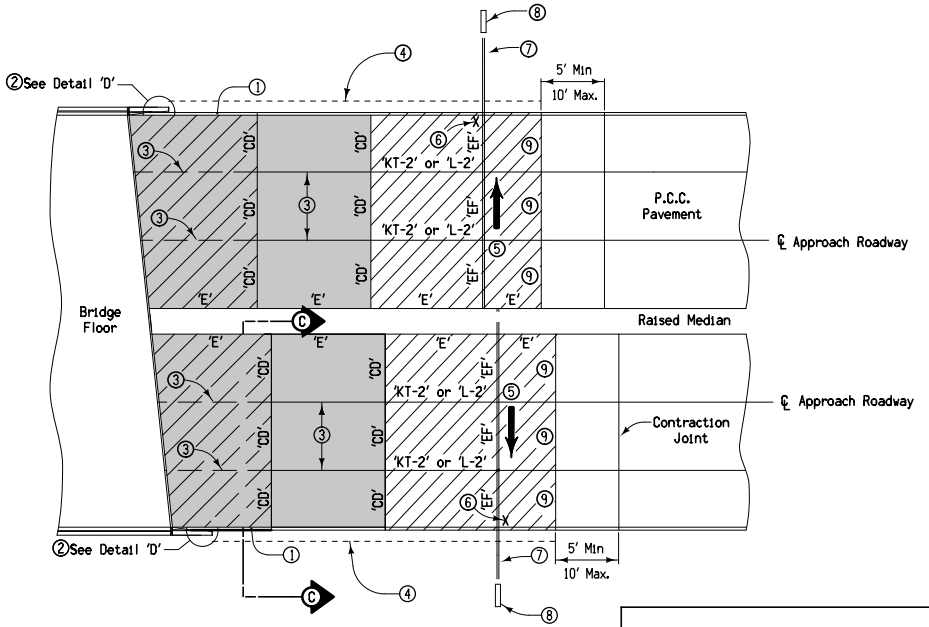
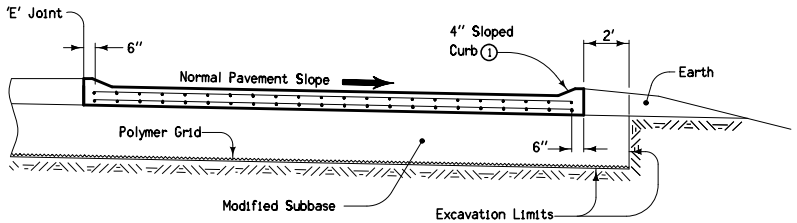
BRIDGE APPROACH (ABUTTING HMA PAVEMENT)



PLAN VIEW



PLAN VIEW



SECTION C-C

1. Build 4 inch Sloped Curb, unless noted otherwise in the plans.
2. See RK-20, RK-25, or RK-26.
3. Longitudinal joint: (PV-101)
   Single Pour - Saw cut joint per detail B.
   Two Pours - Use 'KS-2' Joint (Double Reinforced Section).
   Use 'KS-1' Joint (Single Reinforced Section).
4. Polymer grid and excavation limits of Modified Subbase 2' outside of pavement edge. See RK-20, RK-25, or RK-26.
5. Slope subdrain to drain.
6. An "X" shall be placed in the plastic concrete near the 'EF' joint at the outside edge of pavement.
7. 4 inch perforated subdrain (polyethylene, corrugated tubing).
8. See RF-19C or RF-19E for outlet details.
9. 'DW' or 'RT' Joint.

For joint details, see PV-101.

Pay limits for contract item include the following areas:

- Double Reinforced Section
- Single Reinforced Section
- Non-Reinforced Section

Iowa Department of Transportation

STANDARD ROAD PLAN

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SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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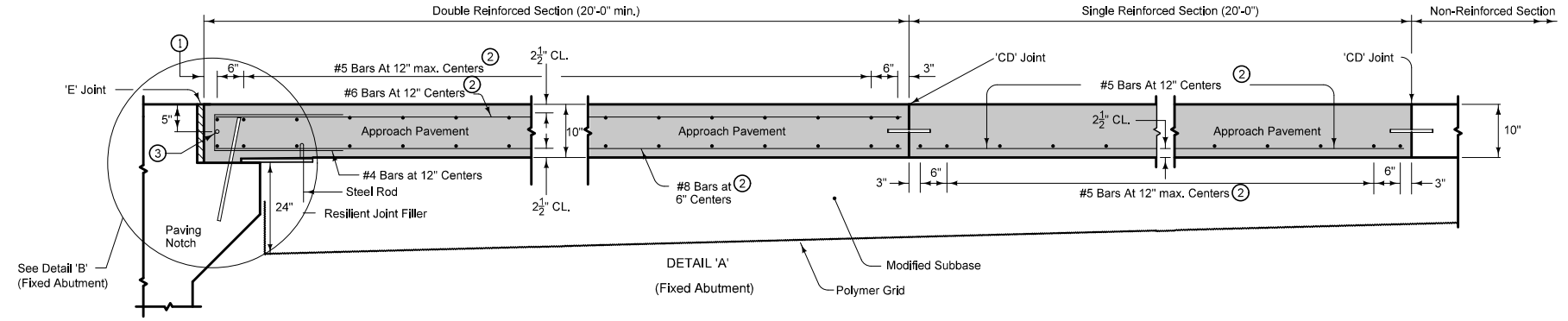
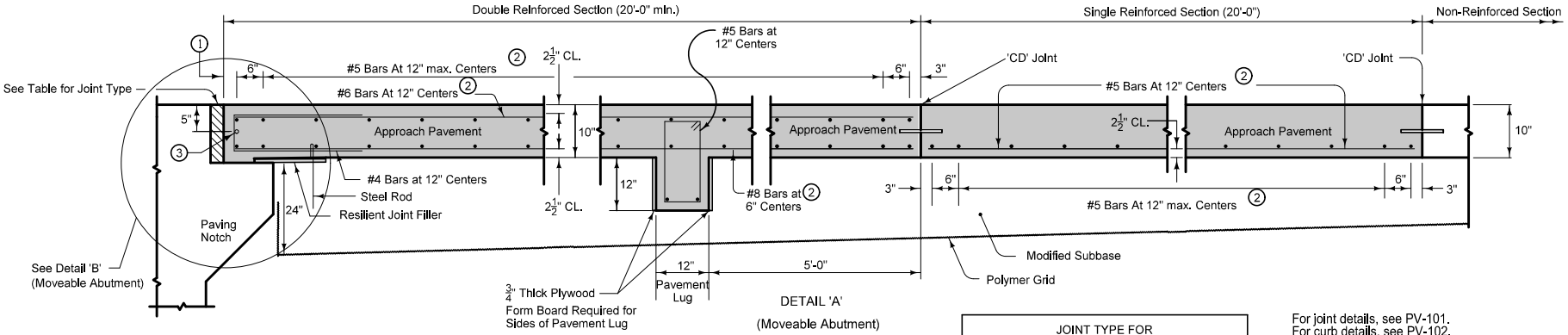
BRIDGE APPROACH (MULTI-LANE, CURBED ROADWAY)



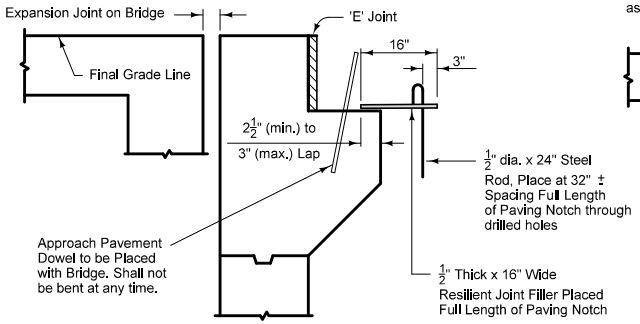
DETAIL 'A'

(Fixed Abutment)

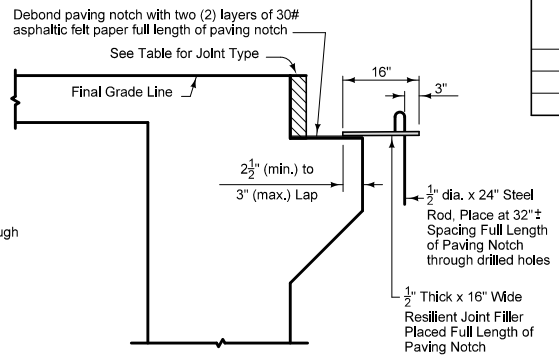


DETAIL 'A'

(Moveable Abutment)



DETAIL 'B' (Fixed Abutment)



DETAIL 'B' (Moveable Abutment)

JOINT TYPE FOR MOVEABLE ABUTMENT BRIDGES		
Joint	Maximum Bridge Length	
	Concrete Beam or Slab	Steel Girder
CF-1	370'	250'
CF-2	465'	320'
CF-3	575'	400'

1. 2" min. to 2 1/2" max. clear to bent bar.
2. Minimum lap length: #5 Bars - 18"
   #6 Bars - 27"
   #8 Bars - 48"
3. If bridge is skewed, place additional #5 bar parallel to skewed face.

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

All transverse bars are #5.

Possible Contract Item:

Bridge Approach, RK-25

Possible Tabulation:

112-6

Iowa Department of Transportation

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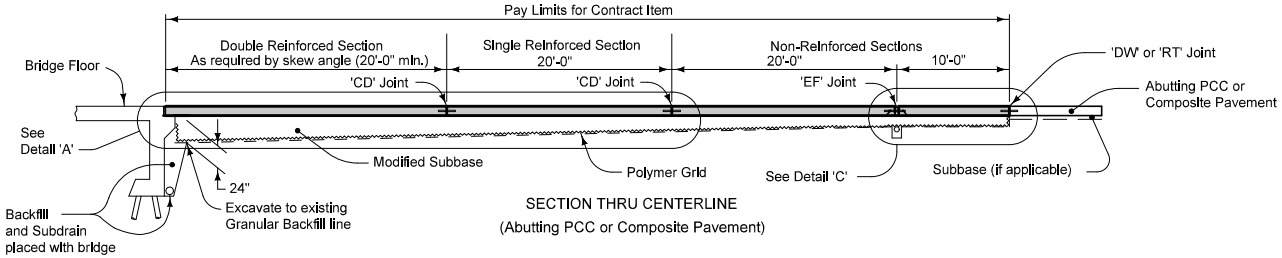
SHEET 1 of 3

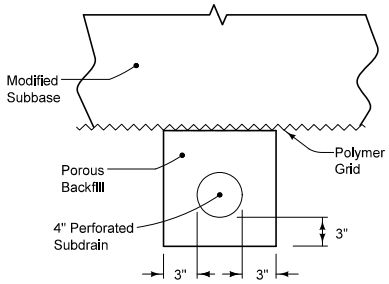
REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

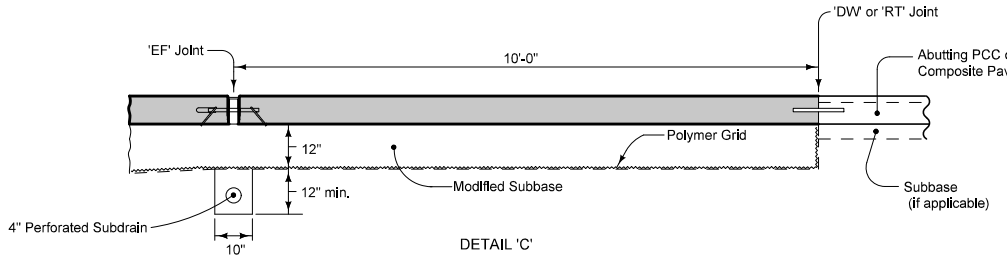
DOUBLE REINFORCED 10" APPROACH



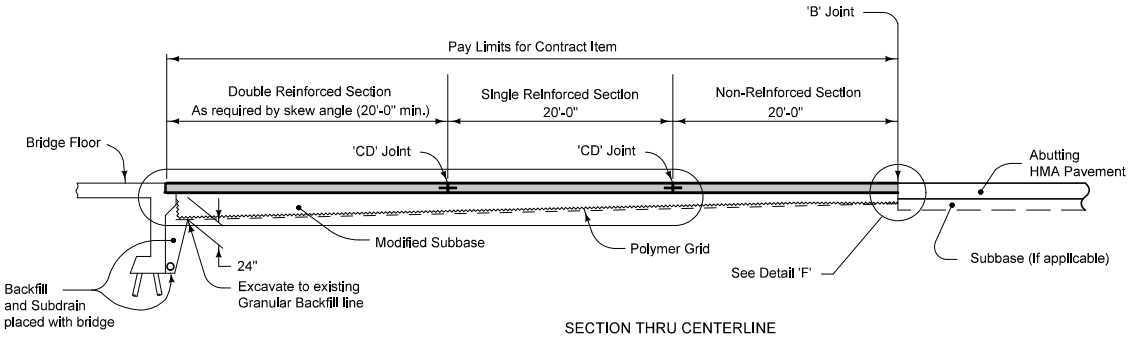
SECTION THRU CENTERLINE
(Abutting PCC or Composite Pavement)



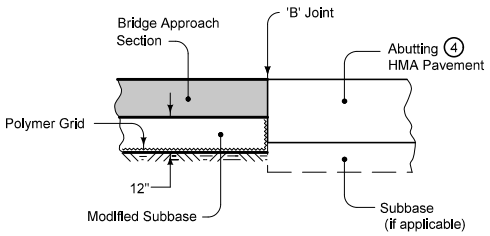
4" SUBDRAIN LOCATION



DETAIL 'C'
(Doweled PCC Pavement)



SECTION THRU CENTERLINE
(Abutting HMA Pavement)



DETAIL 'F'

4 If abutting pavement (PCC or HMA) is not in place, see RK-30.

Iowa Department of Transportation

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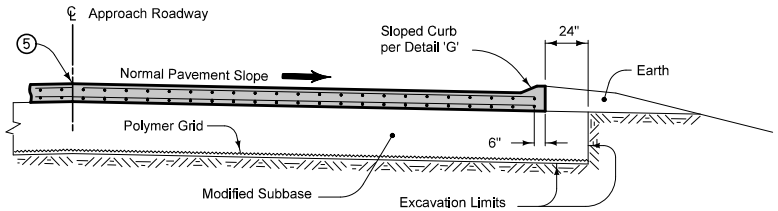
SHEET 2 of 3

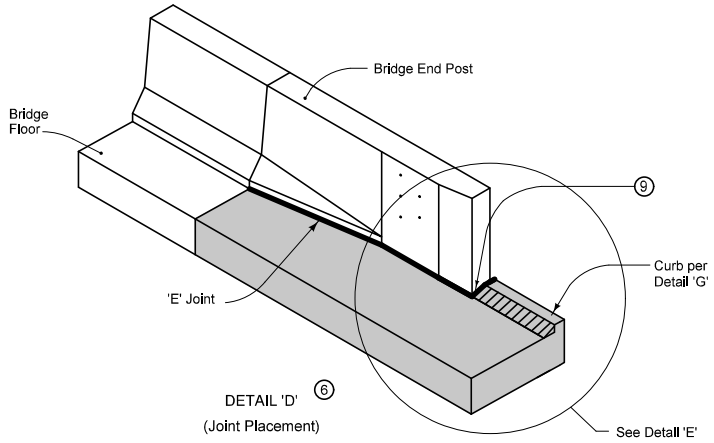
REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DOUBLE REINFORCED 10" APPROACH

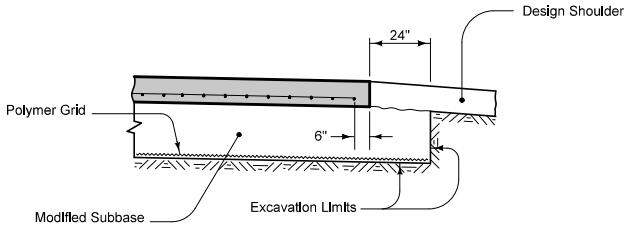


SECTION A-A ⑥

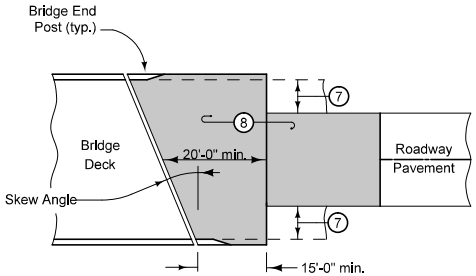


DETAIL 'D' ⑥

(Joint Placement)



SECTION B-B ⑥



APPROACH PAVEMENT

LAYOUT AT A SKEW

⑤ Longitudinal Joint: (PV-101)
Single pour — Saw cut joint per Detail B.
Two pours — Use 'KS-2' Joint

⑥ See RK-21, RK-22, or RK-23.

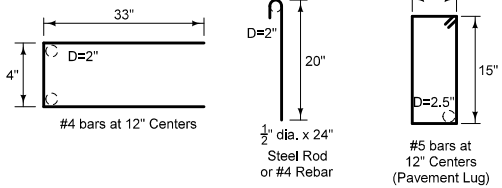
⑦ Design shoulder width.

⑧ Reinforced bridge approach section.

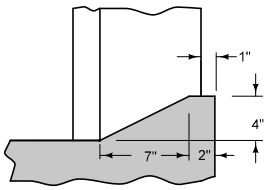
⑨ Expansion joint at end of bridge end post: Place joint filler the full depth of the bridge approach pavement. In areas with curb, place full depth of pavement plus curb and shape material to fit the shape of the curb per Section B-B of PV-101. Seal joint per Detail F of PV-101.

- Fixed Abutment Bridges:Type 'E' Joint

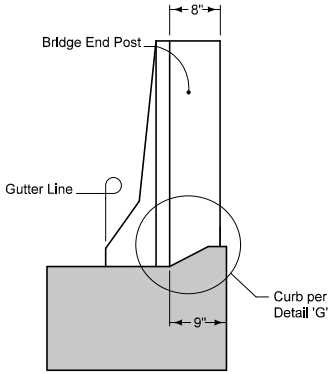
- Moveable Abutment Bridges: Flexible Foam Expansion Joint Filler in accordance with Specification Section 4136. Minimum filler width is the abutment 'CF' joint width. Joint length as required to completely fill from back side of curb to front face of bridge wing.



BENT BAR SHAPES



DETAIL 'G'



DETAIL 'E'

(Back of Curb Placement)

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STANDARD ROAD PLAN

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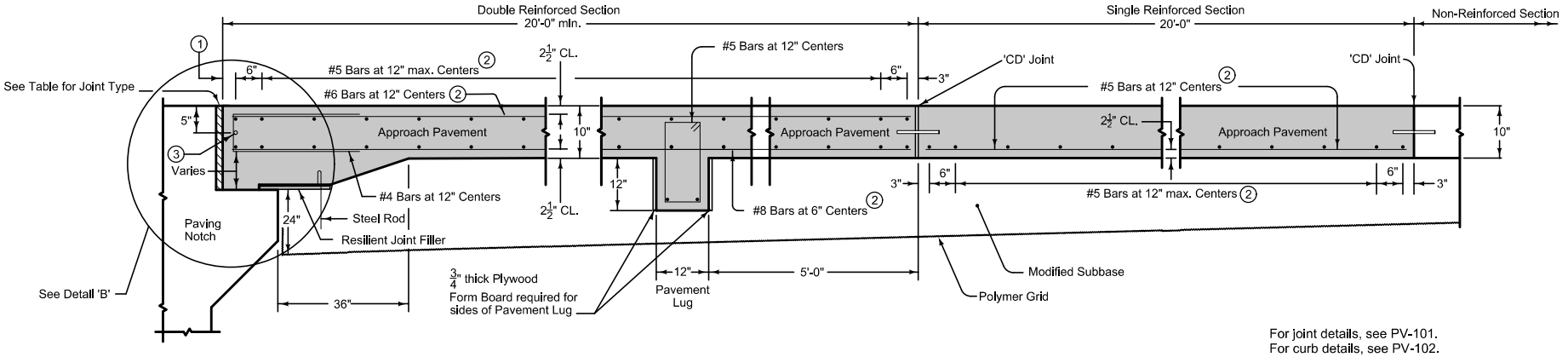
SHEET 3 of 3

REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

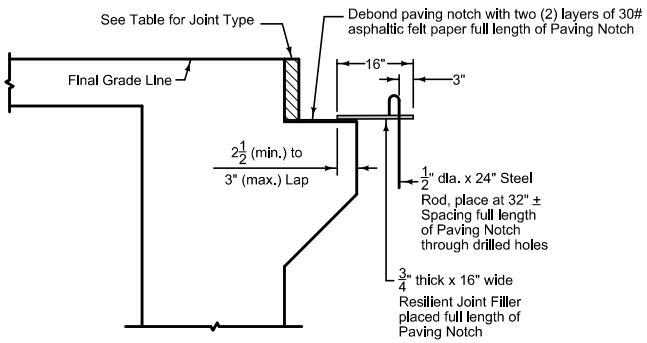
Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

DOUBLE REINFORCED 10" APPROACH



DETAIL 'A'



DETAIL 'B'

JOINT TYPE FOR MOVEABLE ABUTMENT BRIDGES		
Joint	Maximum Bridge Length	
	Concrete Beam or Slab	Steel Girder
CF-1	370'	250'
CF-2	465'	320'
CF-3	575'	400'

MOVEABLE ABUTMENT

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

All Transverse Bars are #5.

See RK-21 or RK-22 for shoulders.

① 2" to 2½" clear to bent bar.

② Minimum lap length: #5 bars - 18 inches
#6 bars - 27 inches
#8 bars - 48 inches

③ If bridge is skewed, place additional #5 bar parallel to skewed face.

Possible Contract Item:
Bridge Approach, RK-26

Possible Tabulation:
112-6

Iowa Department of Transportation

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STANDARD ROAD PLAN

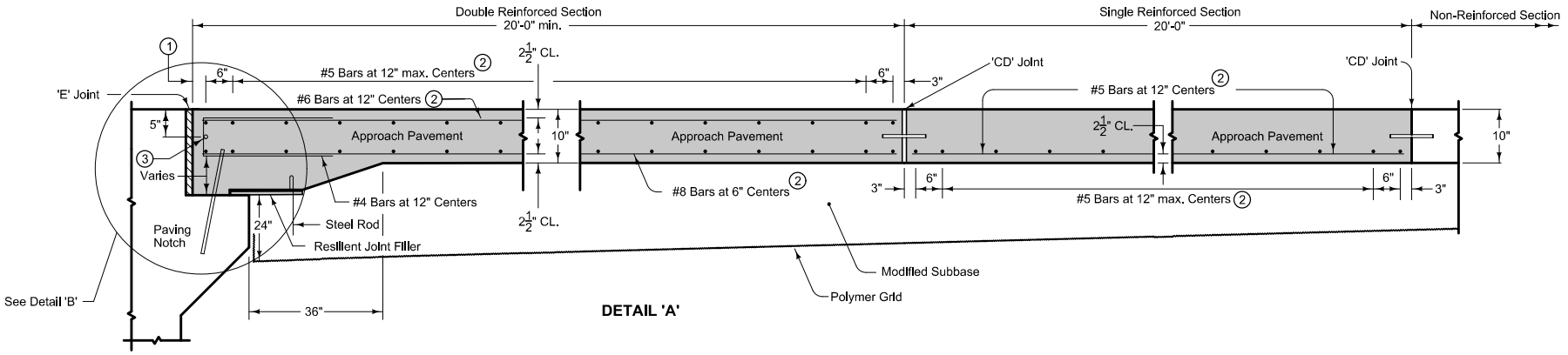
RK-26

SHEET 1 of 4

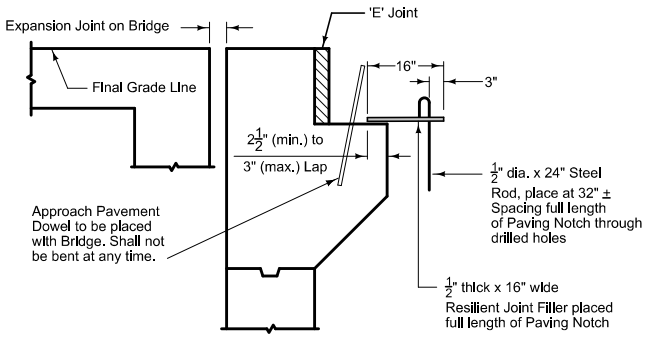
REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DOUBLE REINFORCED 10" APPROACH WITH VARIABLE DEPTH PAVING NOTCH



DETAIL 'A'



DETAIL 'B'

1. 2" to 2½" clear to bent bar.
2. Minimum lap length: #5 bars - 18 inches
   #6 bars - 27 inches
   #8 bars - 48 inches
3. If bridge is skewed, place additional #5 bar parallel to skewed face.

FIXED ABUTMENT

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STANDARD ROAD PLAN

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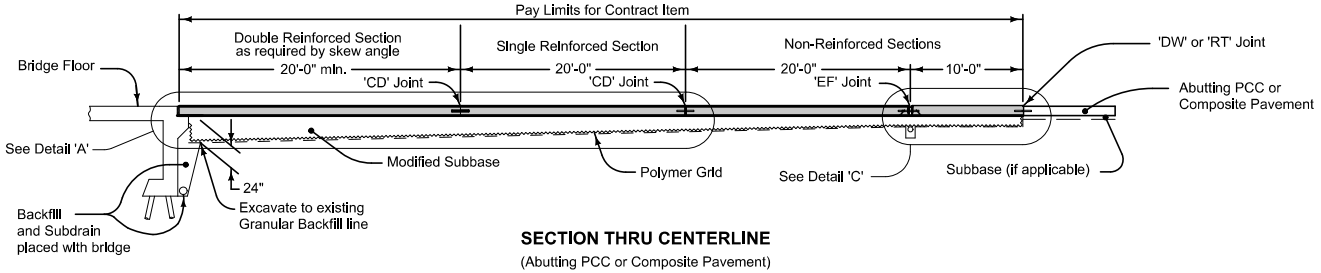
SHEET 2 of 4

REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

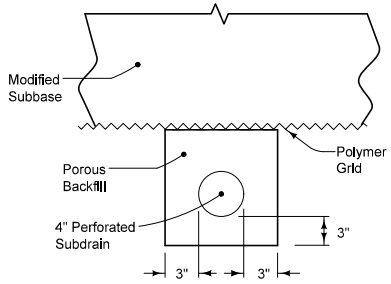
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DOUBLE REINFORCED 10" APPROACH WITH VARIABLE DEPTH PAVING NOTCH

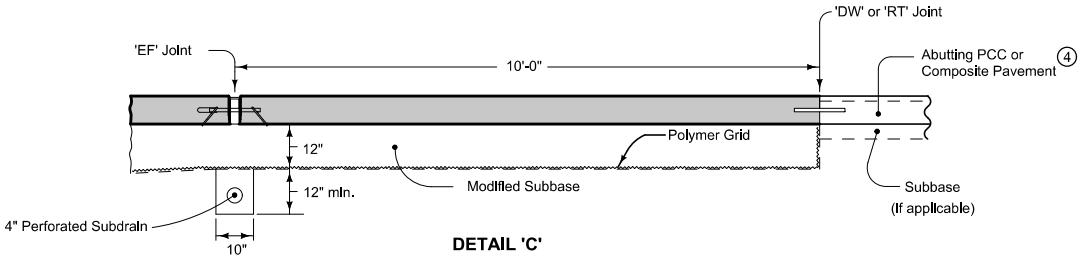


SECTION THRU CENTERLINE

(Abutting PCC or Composite Pavement)

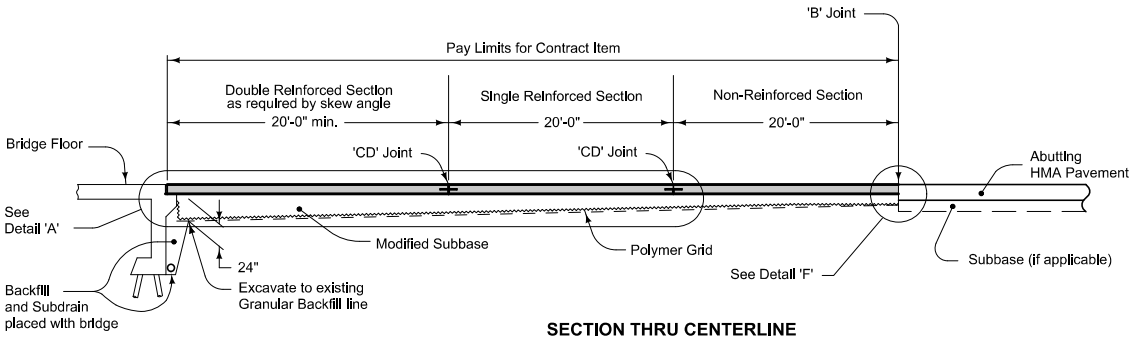


4" SUBDRAIN LOCATION



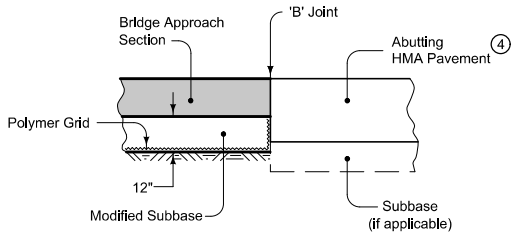
DETAIL 'C'

(Doweled PCC Pavement)



SECTION THRU CENTERLINE

(Abutting HMA Pavement)



DETAIL 'F'

④ If abutting pavement (PCC or HMA) is not in place, see RK-30.

Iowa Department of Transportation

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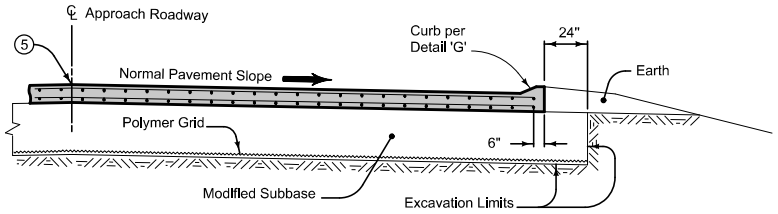
SHEET 3 of 4

REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

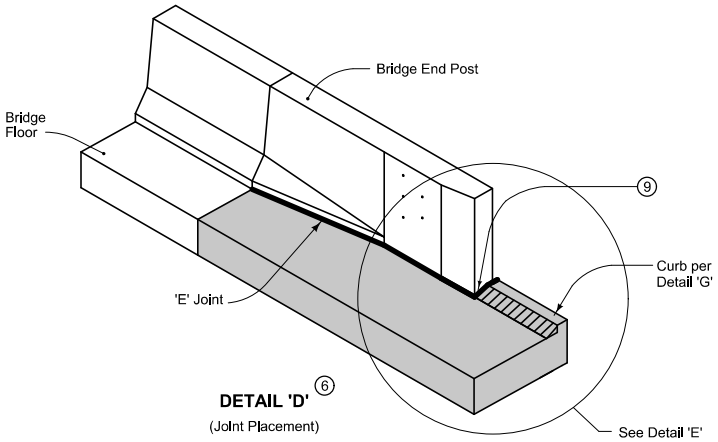
Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

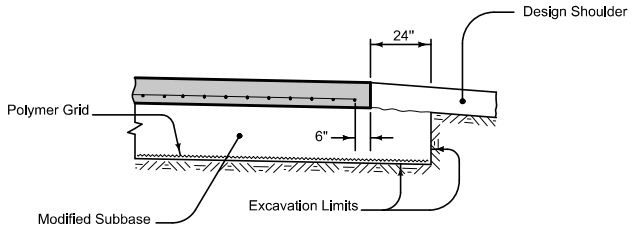
DOUBLE REINFORCED 10" APPROACH WITH VARIABLE DEPTH PAVING NOTCH



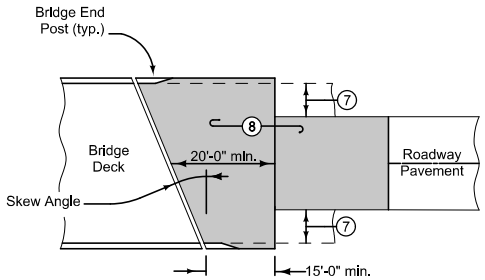
SECTION A-A (6)



DETAIL 'D' (6)
(Joint Placement)



SECTION B-B (6)



APPROACH PAVEMENT LAYOUT AT A SKEW

(5) Longitudinal Joint: (PV-101)
Single pour - Saw cut joint per Detail B
Two pours - use 'KS-2' Joint

(6) See RK-21, RK-22, or RK-23.

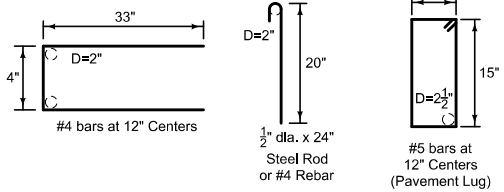
(7) Design shoulder width.

(8) Reinforced bridge approach section.

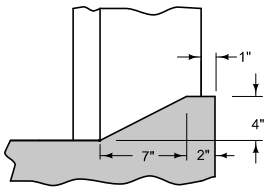
(9) Expansion joint at end of bridge end post: Place joint filler the full depth of the bridge approach pavement. In areas with curb, place full depth of pavement plus curb and shape material to fit the shape of the curb per Section B-B of PV-101. Seal joint per Detail F of PV-101.

- Fixed Abutment Bridges:Type 'E' Joint

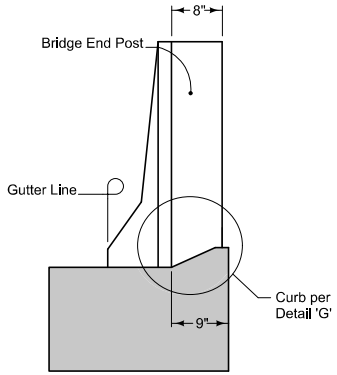
- Moveable Abutment Bridges: Flexible Foam Expansion Joint Filler in accordance with Specification Section 4136. Minimum filler width is the abutment 'CF' joint width. Joint length as required to completely fill from back side of curb to front face of bridge wing.



BENT BAR SHAPES



DETAIL 'G'



DETAIL 'E'
(Back of Curb Placement)

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STANDARD ROAD PLAN

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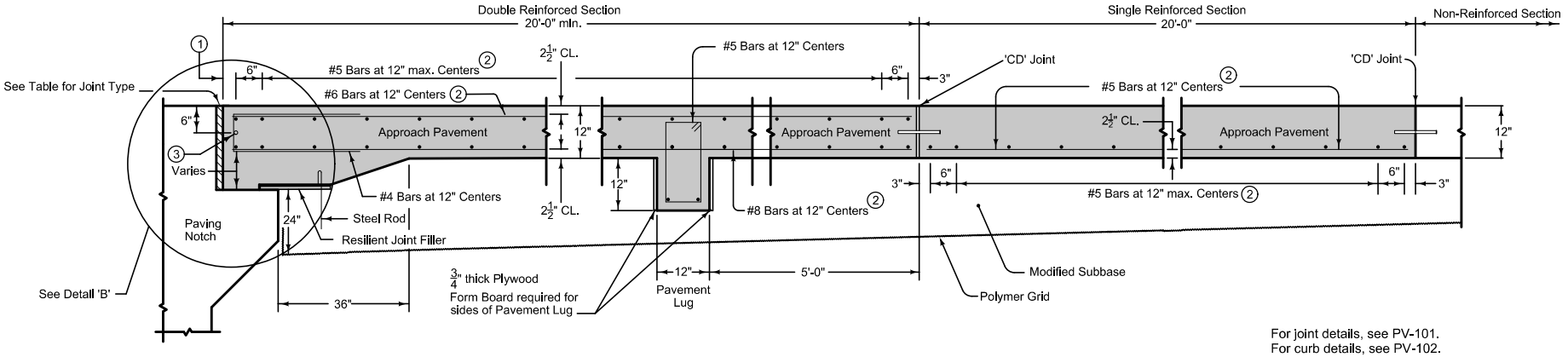
SHEET 4 of 4

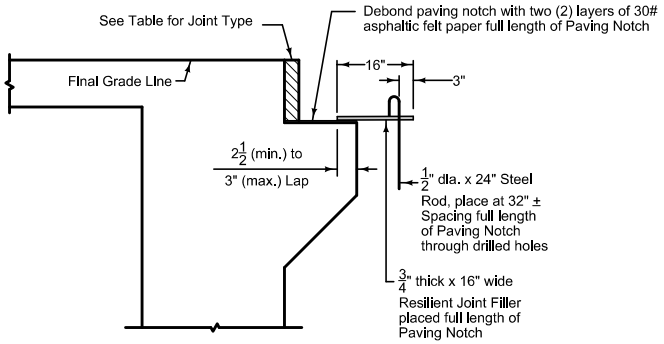
REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DOUBLE REINFORCED 10" APPROACH WITH VARIABLE DEPTH PAVING NOTCH



DETAIL 'A'



DETAIL 'B'

JOINT TYPE FOR MOVEABLE ABUTMENT BRIDGES		
Joint	Maximum Bridge Length	
	Concrete Beam or Slab	Steel Girder
CF-1	370'	250'
CF-2	465'	320'
CF-3	575'	400'

MOVEABLE ABUTMENT

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

All Transverse Bars are #5.

See RK-21 or RK-22 for shoulders.

① 2" to 2½" clear to bent bar.

② Minimum lap length: #5 bars - 18 inches
#6 bars - 27 inches
#8 bars - 48 inches

③ If bridge is skewed, place additional #5 bar parallel to skewed face.

Possible Contract Item:
Bridge Approach, RK-27

Possible Tabulation:
112-6

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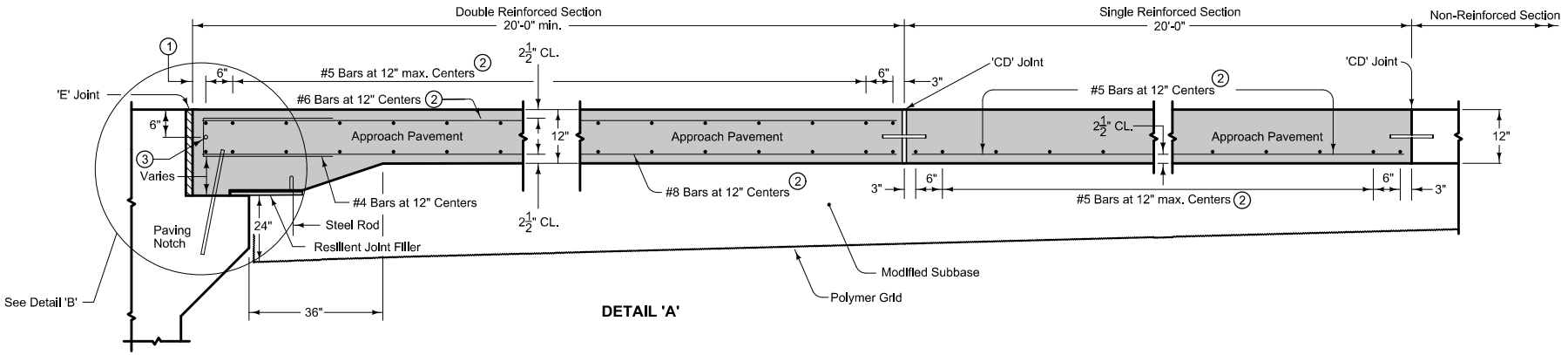
SHEET 1 of 4

REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DOUBLE REINFORCED 12" APPROACH WITH VARIABLE DEPTH PAVING NOTCH



DETAIL 'A'

① 2" to 2½" clear to bent bar.

② Minimum lap length: #5 bars - 18 inches
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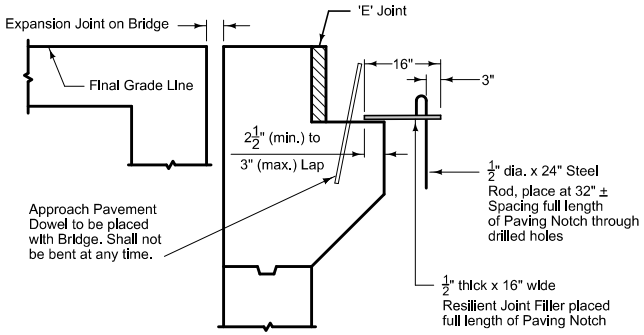
③ If bridge is skewed, place additional #5 bar parallel to skewed face.



DETAIL 'B'

FIXED ABUTMENT

Iowa Department of Transportation

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STANDARD ROAD PLAN

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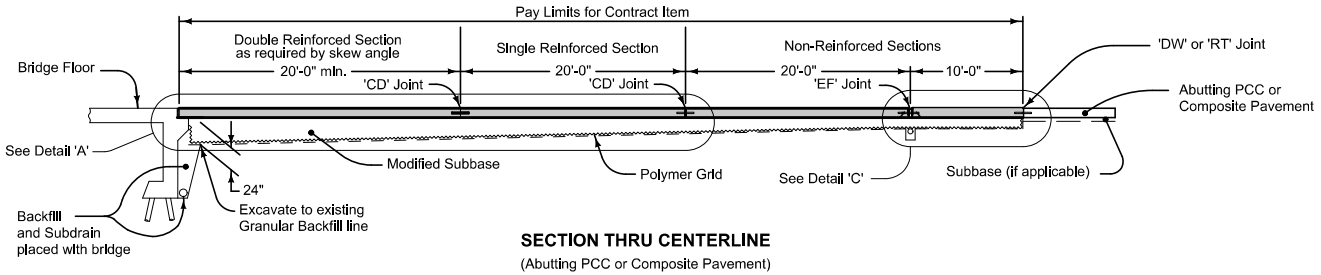
SHEET 2 of 4

REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

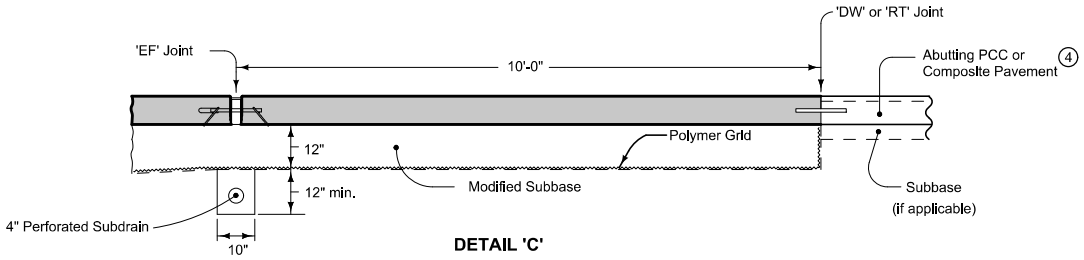
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DOUBLE REINFORCED 12" APPROACH WITH VARIABLE DEPTH PAVING NOTCH



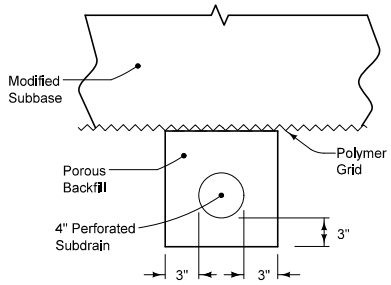
SECTION THRU CENTERLINE

(Abutting PCC or Composite Pavement)

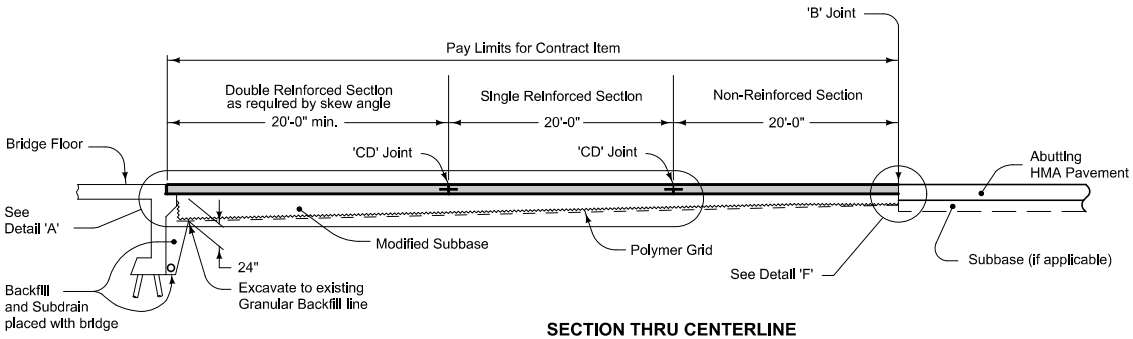


DETAIL 'C'

(Doweled PCC Pavement)

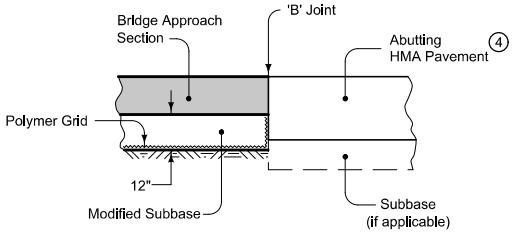


4" SUBDRAIN LOCATION



SECTION THRU CENTERLINE

(Abutting HMA Pavement)



DETAIL 'F'

④ If abutting pavement (PCC or HMA) is not in place, see RK-30.

Iowa Department of Transportation

STANDARD ROAD PLAN

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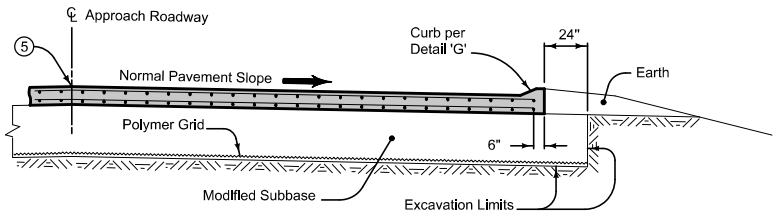
SHEET 3 of 4

REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

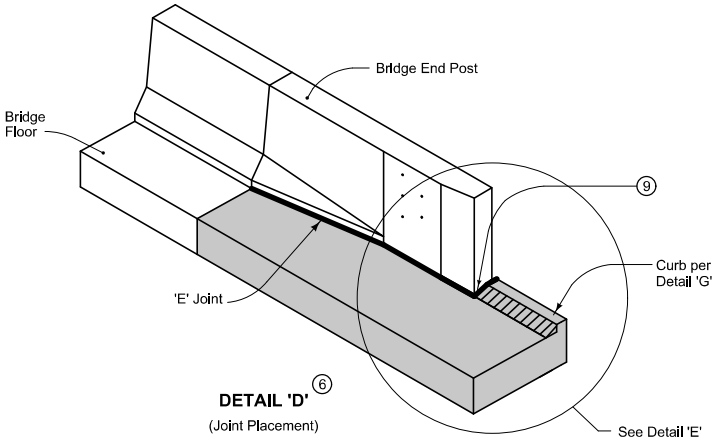
Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

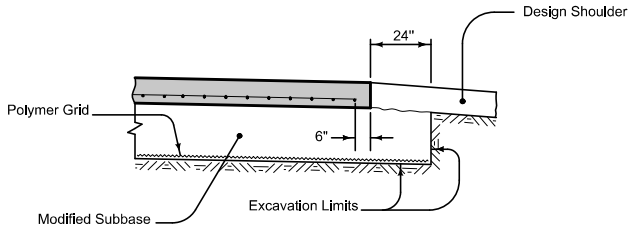
DOUBLE REINFORCED 12" APPROACH WITH VARIABLE DEPTH PAVING NOTCH



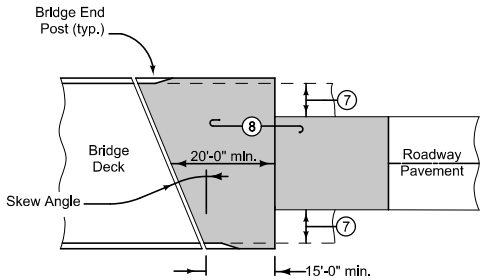
SECTION A-A (6)



DETAIL 'D' (6)
(Joint Placement)



SECTION B-B (6)



APPROACH PAVEMENT LAYOUT AT A SKEW

(5) Longitudinal Joint: (PV-101)
Single pour - Saw cut joint per Detail B
Two pours - use 'KS-2' Joint

(6) See RK-21, RK-22, or RK-23.

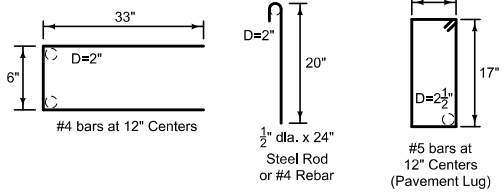
(7) Design shoulder width.

(8) Reinforced bridge approach section.

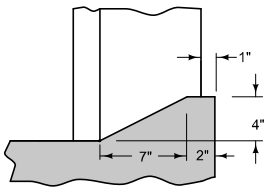
(9) Expansion joint at end of bridge end post: Place joint filler the full depth of the bridge approach pavement. In areas with curb, place full depth of pavement plus curb and shape material to fit the shape of the curb per Section B-B of PV-101. Seal joint per Detail F of PV-101.

- Fixed Abutment Bridges:Type 'E' Joint

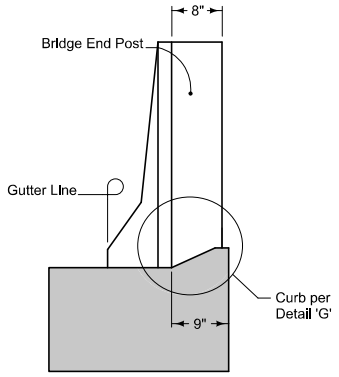
- Moveable Abutment Bridges: Flexible Foam Expansion Joint Filler in accordance with Specification Section 4136. Minimum filler width is the abutment 'CF' joint width. Joint length as required to completely fill from back side of curb to front face of bridge wing.



BENT BAR SHAPES



DETAIL 'G'



DETAIL 'E'
(Back of Curb Placement)

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STANDARD ROAD PLAN

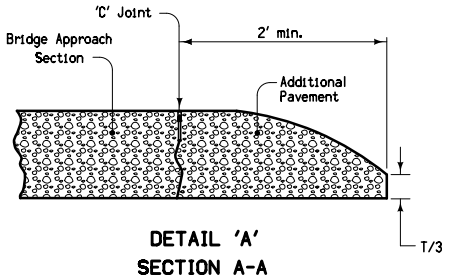
RK-27

SHEET 4 of 4

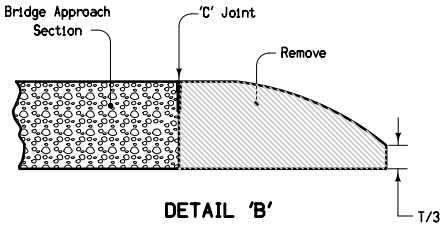
REVISIONS: Removed note In Detail 'C' that allowed the contractor to trench through Modified Subbase.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

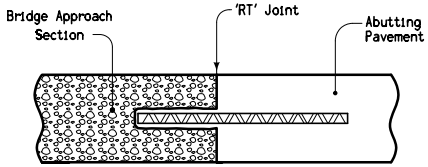
DOUBLE REINFORCED 12" APPROACH WITH VARIABLE DEPTH PAVING NOTCH



DETAIL 'A'
SECTION A-A

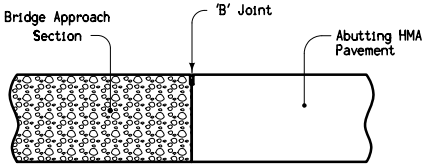


DETAIL 'B'
SECTION A-A



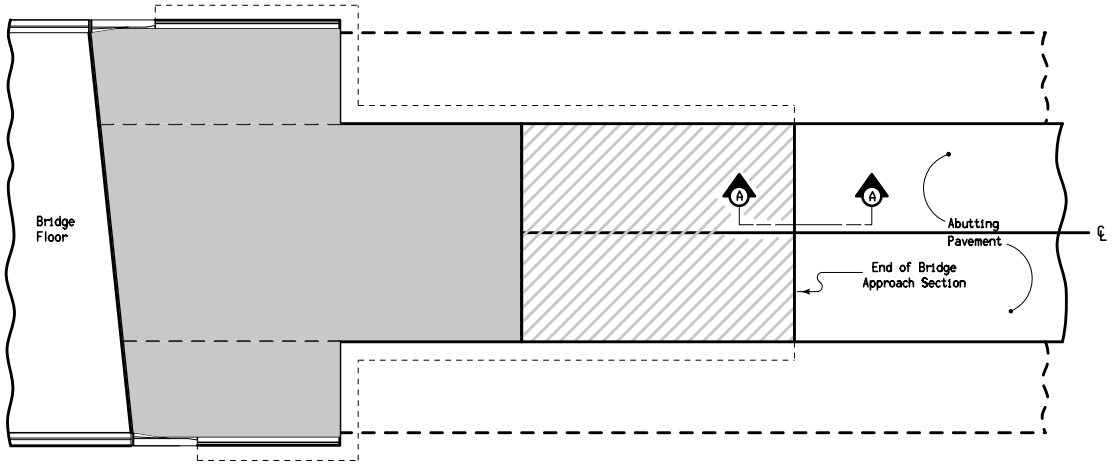
(For Abutting PCC Pavement)

DETAIL 'C'
SECTION A-A



(For Abutting HMA Pavement)

DETAIL 'C'
SECTION A-A



PLAN VIEW

If abutting pavement (PCC or HMA) is not in place when bridge approach pavement is constructed, the following procedure should apply:

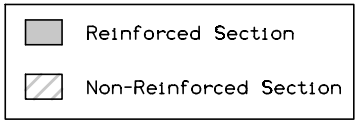
Detail A: Paving contractor (of bridge approach pavement) to pave additional pavement (as shown) and construct 'C' Joint at end of bridge approach section. Leave in this state.

Detail B: Paving contractor (of abutting pavement) to saw cut full depth at 'C' Joint and remove additional pavement, then

Detail C: Pave abutting pavement and construct 'RT' joint or 'B' Joint, accordingly.

This work will be considered incidental to one of the following:

Bridge Approach, RK-20 (Detail 'A')
Standard or Slip Form PCC Pavement (Detail 'B' and 'C')
Hot Mix Asphalt Mixture (Detail 'B' and 'C')



For joint details, see PV-101.

Iowa Department of Transportation

REVISION
3 | 04-19-11

STANDARD ROAD PLAN

RK-30

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

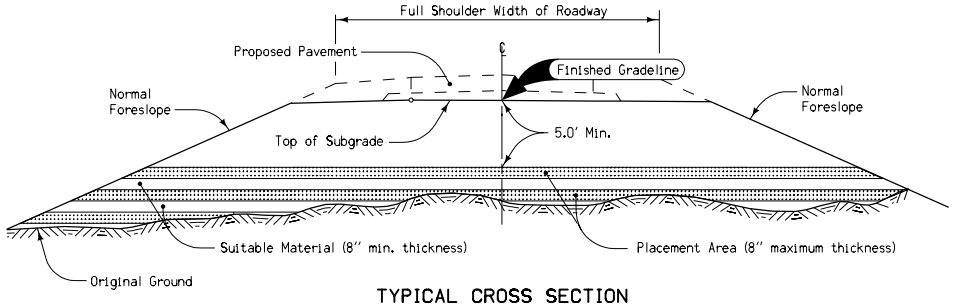
BRIDGE APPROACH (ABUTTING PAVEMENT)

Earthwork

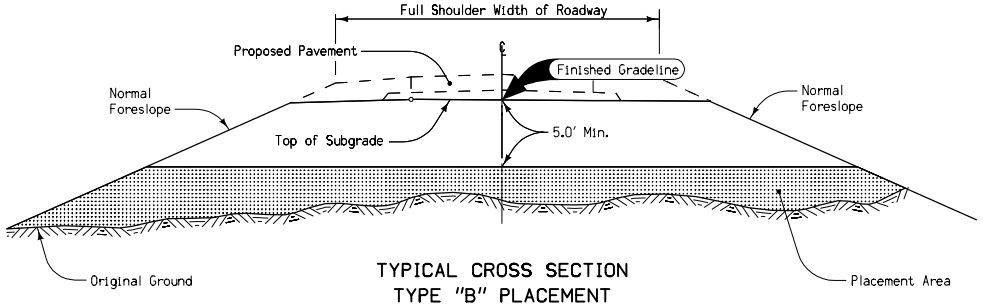
RL

Earthwork

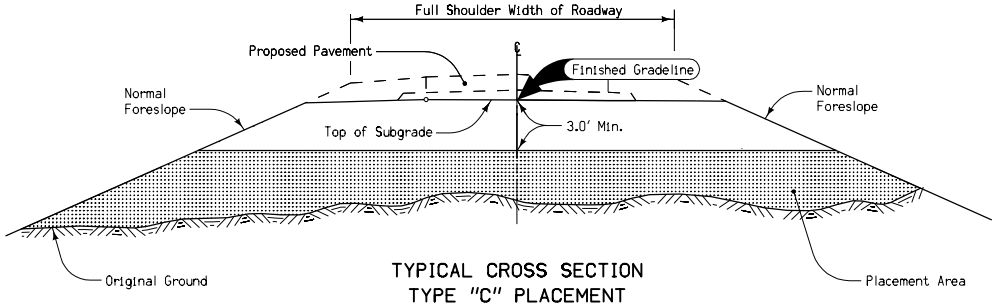
NO.	DATE	TITLE
RL-1A	Void	Replaced by EW-101
RL-1B	10-17-06	Details of Embankment (Allowable Placement of Unsuitable Material)
RL-2A	10-18-05	Details of Embankment Subgrade Treatment, Moisture Density Control & Special Compaction
RL-3	10-31-95	Details for Standard Wing Dikes
RL-4	09-21-99	Ditch Blocks and Dikes
RL-6	10-17-06	Settlement Plate
RL-7	10-16-07	Safety Ramp
RL-8	10-20-09	Rural Entrance
RL-9	04-20-10	Temporary Erosion Control Measures
RL-12	04-20-10	Special Shaping for High Tension Cable Guardrail at Median Obstacles
RL-13	04-15-03	Details for Special Grading at Side Piers
RL-14A	Void	Replaced by EW-301
RL-15	Void	Replaced by EW-203 and EW-204
RL-16	04-19-11	Temporary Stream Crossing, Causeway, or Equipment Pad
RL-17	Void	Replaced by EW-201 and EW-202



TYPICAL CROSS SECTION
TYPE "A" PLACEMENT



TYPICAL CROSS SECTION
TYPE "B" PLACEMENT



TYPICAL CROSS SECTION
TYPE "C" PLACEMENT

GENERAL NOTES:

This plan illustrates the normal construction procedure for the placement of unsuitable materials.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Materials listed as "unsuitable" in the project plans shall normally be placed as detailed for the particular type of soil described in "Roadway and Borrow Excavation" of the Specifications. Project plan details or specific directions of the Engineer may require placement of topsoil or other unsuitable soil by methods other than those shown. Refer also to plan cross sections and soil survey sheets for additional information.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
7	10-17-06

RL-1B

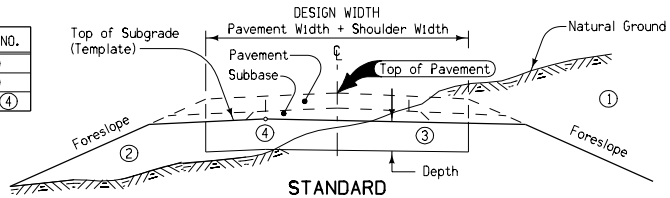
SHEET 1 of 1

REVISIONS: Do not allow placement of Type "C" under shoulders due to shoulder stability problems.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

DETAILS OF EMBANKMENT
(ALLOWABLE PLACEMENT
OF UNSUITABLE MATERIAL)

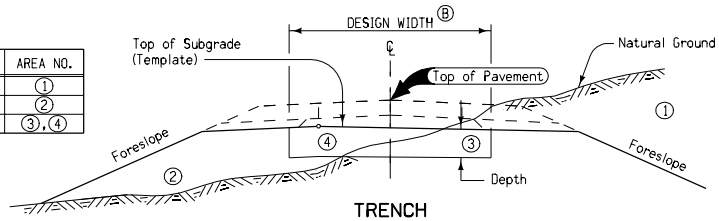
TYPE OF WORK	AREA NO.
Excavation	①
Embankment	②
Subgrade Treatment	③, ④



AREA NO.	TYPE OF ADJUSTMENTS TO TEMPLATE QUANTITY
①	None
②	None
③	+ Cut
④	- Fill

STANDARD
SUBGRADE TREATMENT

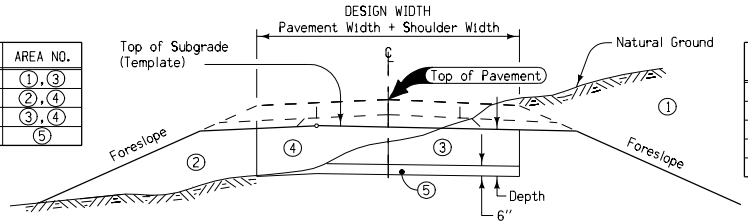
TYPE OF WORK	AREA NO.
Excavation	①
Embankment	②
Subgrade Treatment	③, ④



AREA NO.	TYPE OF ADJUSTMENTS TO TEMPLATE QUANTITY
①	None
②	None
③	+ Cut
④	- Fill

TRENCH
SUBGRADE TREATMENT

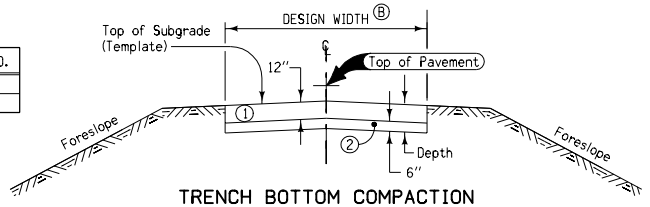
TYPE OF WORK	AREA NO.
Excavation	①, ③
Embankment	②, ④
M & D Embankment	③, ④
Scarify with M & D Embank.	⑤



AREA NO.	TYPE OF ADJUSTMENTS TO TEMPLATE QUANTITY
①	None
②	None
③	+ Cut + Fill
④	None
⑤	None

MOISTURE CONTROL OR
MOISTURE AND DENSITY CONTROL

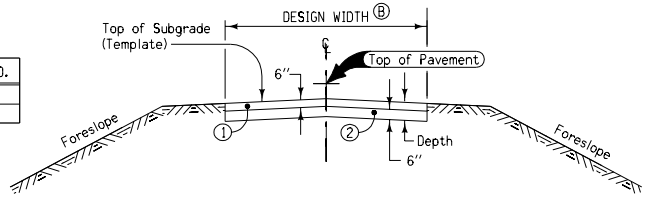
TYPE OF WORK	AREA NO.
Excavation	①
Scarify	②



AREA NO.	TYPE OF ADJUSTMENTS TO TEMPLATE QUANTITY
①	+ Cut + Fill
②	None

TRENCH BOTTOM COMPACTION
(Existing Roadways)

TYPE OF WORK	AREA NO.
Excavation	①
Scarify	②



AREA NO.	TYPE OF ADJUSTMENTS TO TEMPLATE QUANTITY
①	None
②	None

Ⓑ Design width equals pavement width plus 3.0 feet on each side.

SPECIAL COMPACTION
(Existing Roadway)

The pay quantity for Subgrade Treatment shall be in either tons or cubic yards. The volume shall be based on specified depth, the treatment type, and shall include the quantity allowed for shrinkage.

The pay quantity for "Compaction with Moisture and Density Control" or "Compaction with Moisture Control" shall be the absolute volume for the specified depth and subgrade width.

Contract Items:

Compaction with Moisture and Density Control
Compaction with Moisture Control
Compacting Trench Bottom
Special Compaction of Subgrade

Tabulations:

103-1
103-3
103-6

Iowa Department of Transportation
Highway Division

STANDARD ROAD PLAN | **RL-2A**

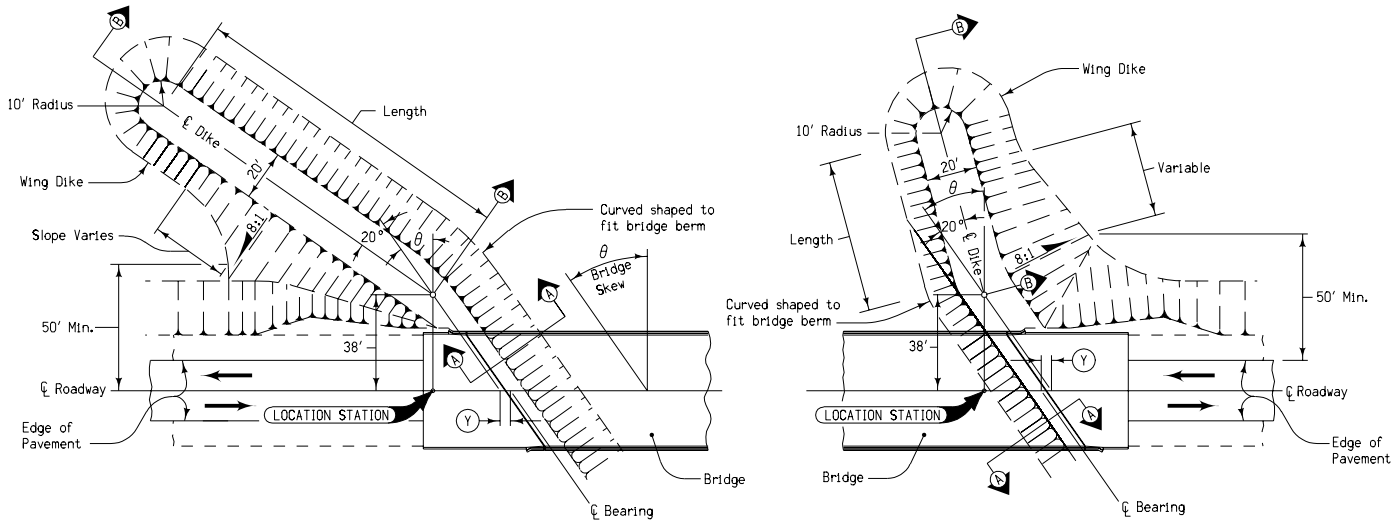
REVISION: Add note B to drawings 2 and 4.

REVISION NO. 10

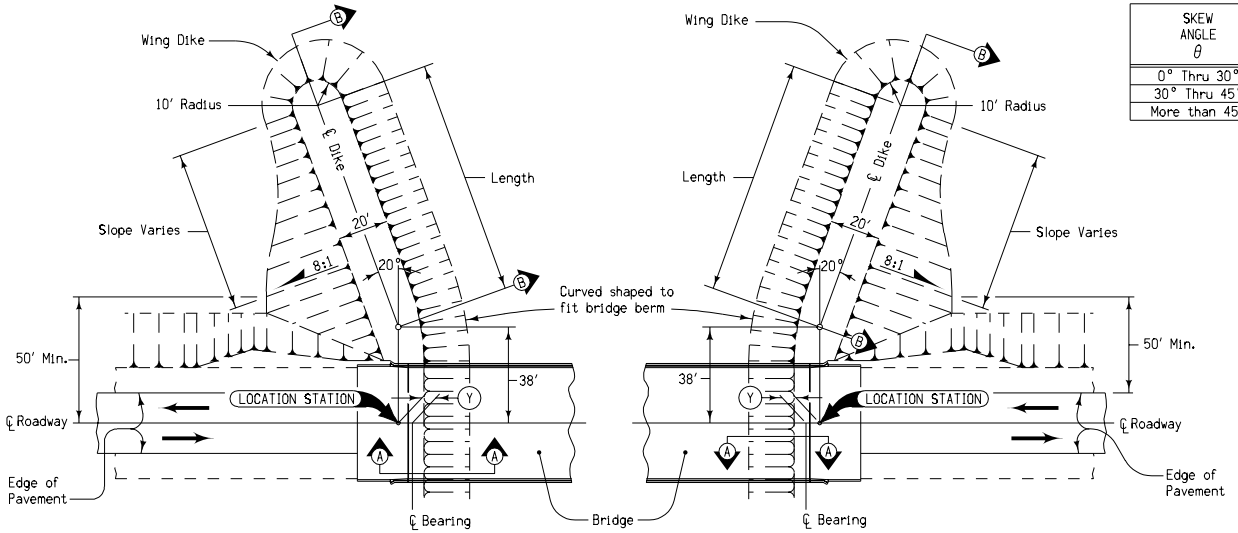
William J. Stein
APPROVED BY DESIGN METHODS ENGINEER

REVISION DATE 10-18-05

DETAILS OF EMBANKMENT
SUBGRADE TREATMENT, MOISTURE
DENSITY CONTROL & SPECIAL COMPACTION

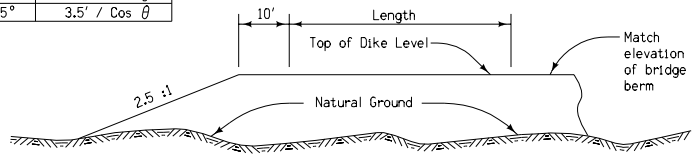


TYPICAL PLAN VIEW OF DIKE CONSTRUCTION AT SKEWED BRIDGE

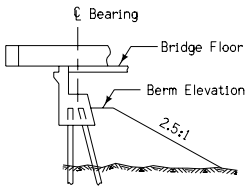


TYPICAL PLAN VIEW OF DIKE CONSTRUCTION AT NON-SKEWED BRIDGE

SKEW ANGLE θ	DIMENSION (Y)
0° Thru 30°	5.5' / Cos θ
30° Thru 45°	4.5' / Cos θ
More than 45°	3.5' / Cos θ



SECTION B-B



SECTION A-A

General Notes:

This plan illustrates the normal construction procedure for wing dikes at bridges. The details for construction shall be as indicated hereon except when otherwise shown on the Project Plan.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

At locations where a portion of the wing dike would be within 50 feet of the edge of the traffic lane for the approach traffic, that portion of the dike shall be constructed with a slope of 8:1 parallel to traffic. The stream side slope of the wing dike shall be 2.5:1 as shown.

The wing dikes will be built with an additional skew angle of 20 degrees to the skew angle of the bridge. For details see the typical drawings on this sheet. The method of location will be similar when the direction of flow or skew is opposite that indicated.

Top of dike elevation will be the same as the bridge berm elevation unless otherwise noted.

Necessary materials for construction of the dikes are included on the tabulation of "Estimate of Quantities" for excavation.

Price bid for "Excavation of the class specified" shall be full compensation for construction of dikes as indicated hereon.

For guidelines to determine wing dike lengths or when to use wing dikes, see the Office of Bridges and Structures' document "Guidelines for Preliminary Design of Bridges and Culverts" or Iowa D.O.T.'s "Instructional Memorandums to County Engineers," I.M. 3.131.

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN — RL-3

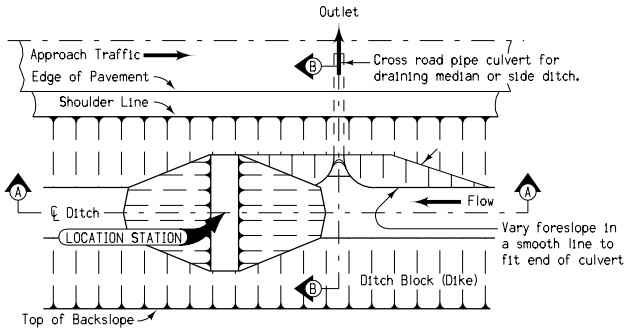
REVISION: Revise general notes.

REVISION NO. 7

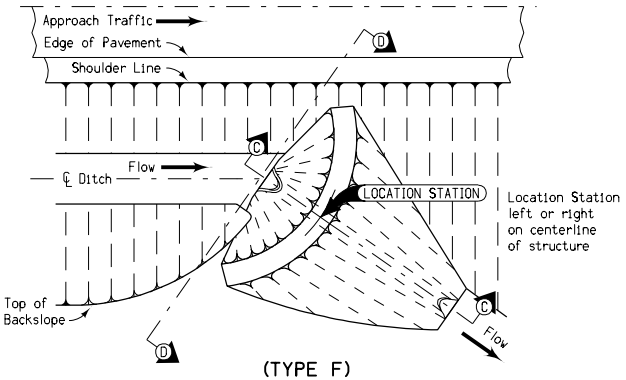
David P. Little 07-31-95
APPROVED BY DESIGN METHODS ENGINEER

REVISION DATE 10-31-95

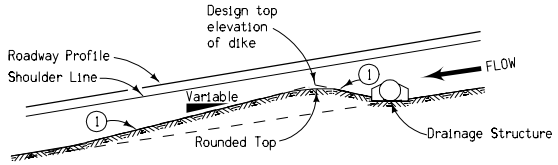
DETAILS FOR STANDARD WING DIKES



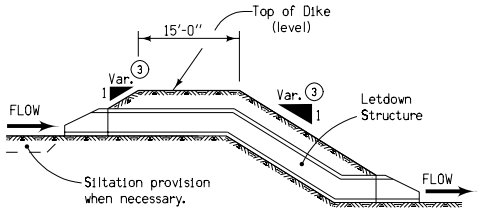
(TYPE M AND G)
TYPICAL PLAN FOR DITCH BLOCK (DIKE)



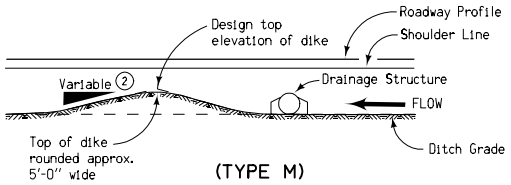
(TYPE F)
TYPICAL PLAN FOR DIKE AT LETDOWN STRUCTURES



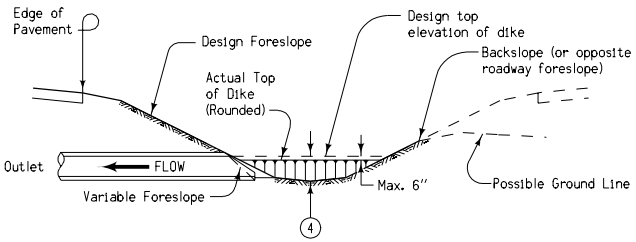
(TYPE G)
TYPICAL SECTION A-A



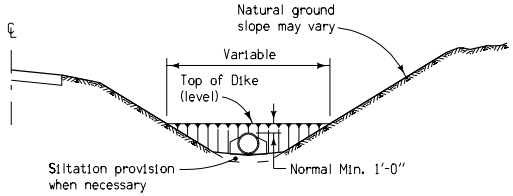
(TYPE F)
TYPICAL SECTION C-C



(TYPE M)
TYPICAL SECTION A-A



(TYPE M AND G)
TYPICAL SECTION B-B



(TYPE F)
TYPICAL SECTION D-D

GENERAL NOTES:

Dikes of the types indicated hereon shall be constructed essentially as shown. Some variation will be allowed to adapt to local conditions when necessary.

Type F dike for letdown structures may vary in length and plan in different locations. Ends of dikes shall ordinarily tie into natural ground at the elevation of top of dike.

Refer to detail road plans and tabulation of drainage structures for exact information on location, top elevation, shape, or any variation from this plan for dikes.

Construction of dikes shall be coordinated with project provisions for erosion control as directed by the Engineer.

Necessary material for construction of dikes is included in "Estimate of Quantities" for excavation.

Price bid for "Excavation of the class specified" shall be full compensation for construction of dikes as indicated hereon in accordance with current Standard and Supplemental Specifications.

DESCRIPTION OF DIKES

Type M – Normal ditch block for medians or roadway side ditches.

Type G – Ditch block using established ditch grades. For median or side ditches.

Type F – Dike for letdowns or other structures away from roadway area. Refer to project plans for details.

(1) Design Ditch Grade to accomplish purpose of Ditch Block. Maximum slope approximately 10:1 relative to roadway grade.

(2) Dike slope shall not be greater than 10:1.

(3) Any portion of dike constructed within 50' of edge of roadway with approaching traffic shall be 8:1 slope relative to approach roadway. Any portion of dike beyond 50' from edge of raodway may vary from 8:1 to a maximum of 2.5:1 at 100' from roadway.

(4) Shall be 18" unless specified otherwise

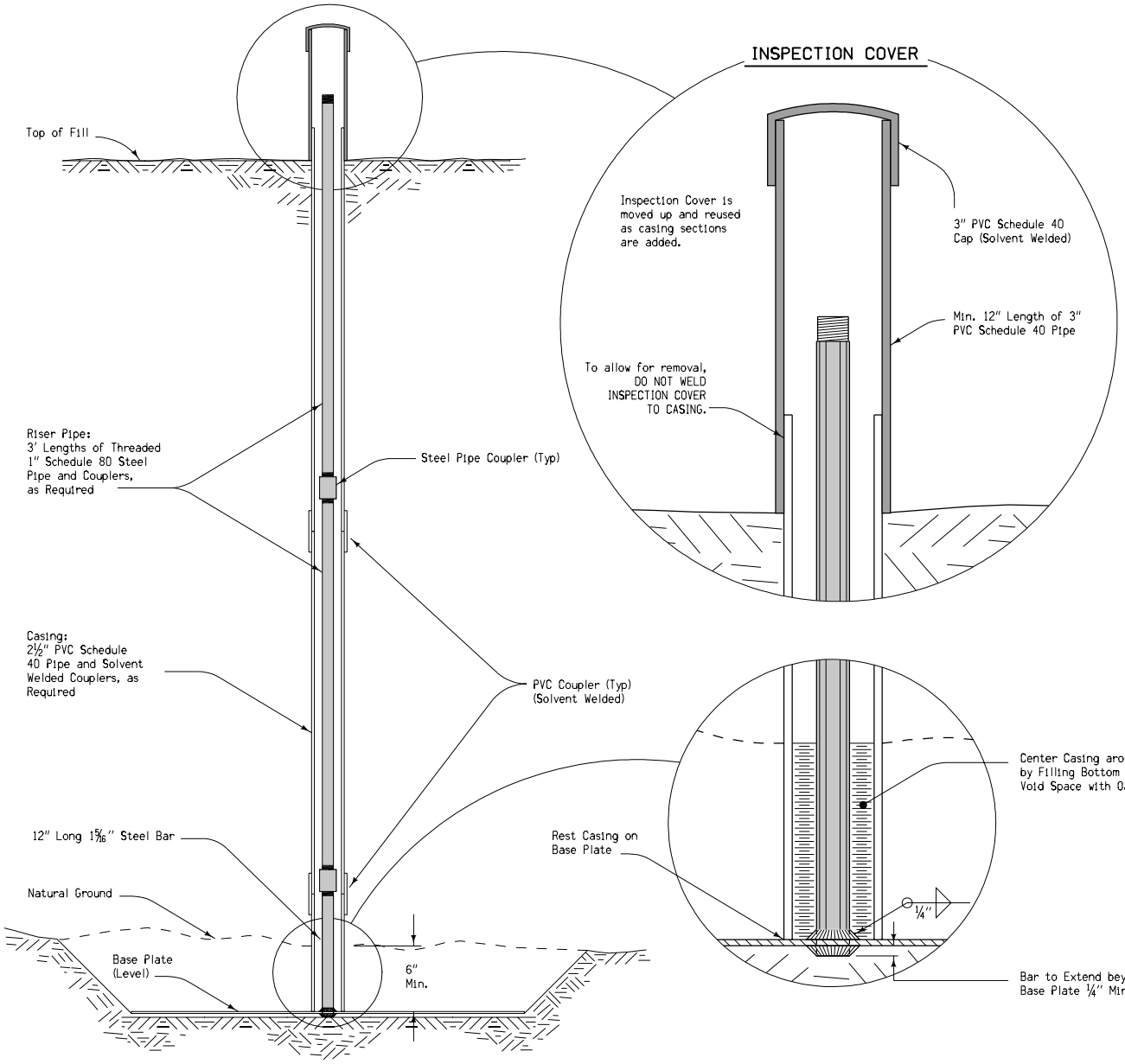
Iowa Department of Transportation
Project Development Division

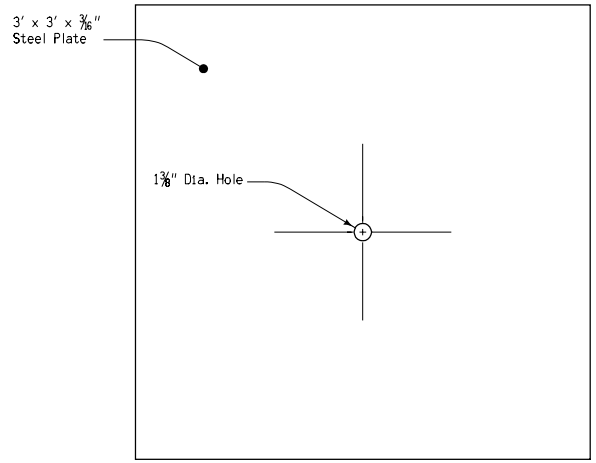
STANDARD ROAD PLAN | **RL-4**

REVISION: Redrawn in CADD. | REVISION NO. 5

05-24-99
APPROVED BY DESIGN METHODS ENGINEER | REVISION DATE 09-21-99

DITCH BLOCKS
AND DIKES





BASE PLATE

Tabulation:
103-5

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
6	10-17-06

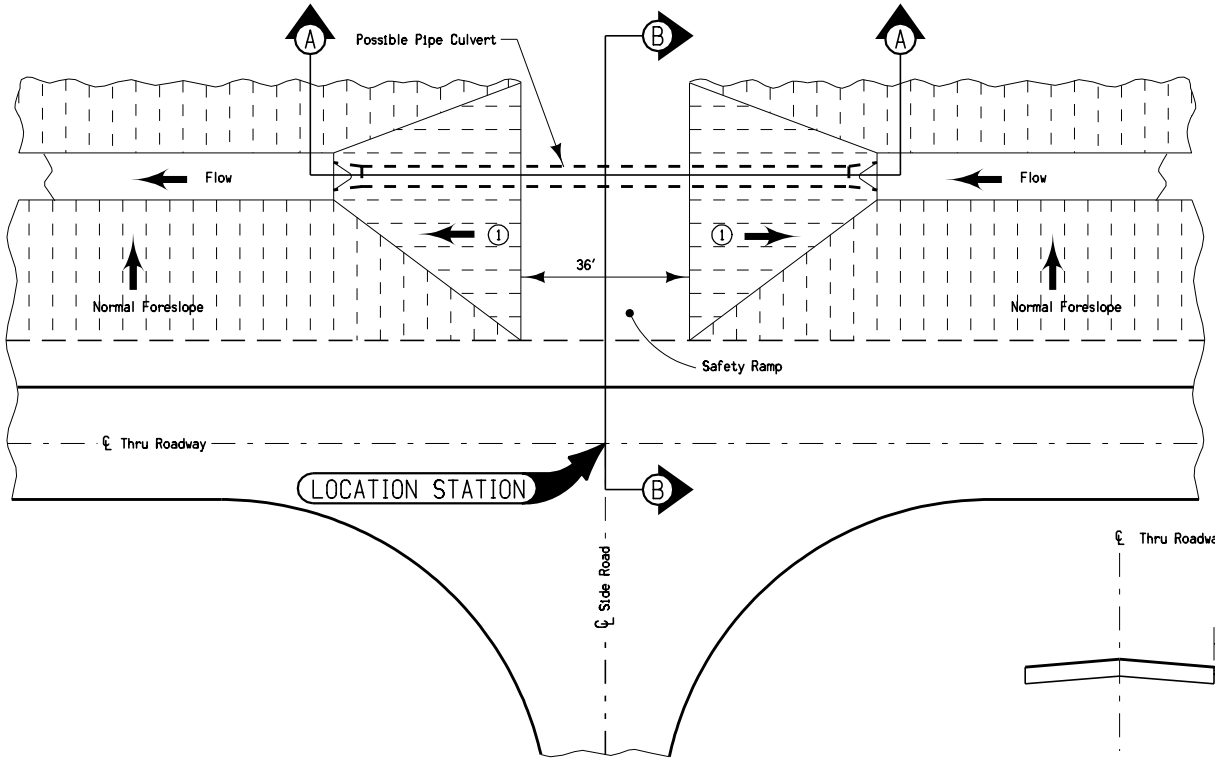
RL-6

SHEET 1 of 1

REVISIONS: Updated design. Remove all information concerning Embankment Control Stakes.

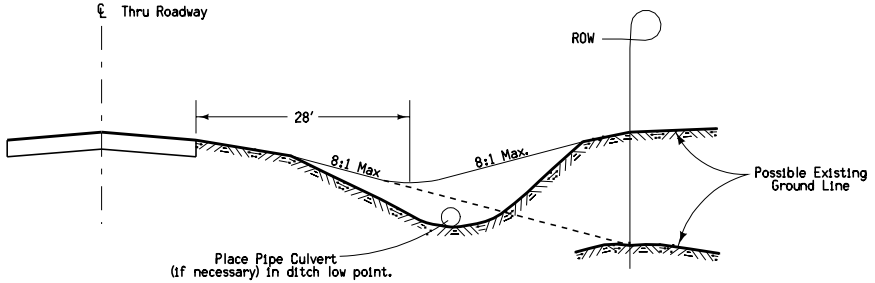
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SETTLEMENT PLATE

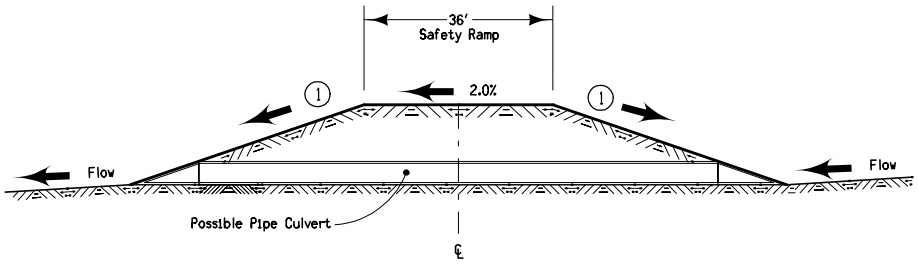


PLAN

1 Slope 10:1 or flatter without pipe, 8:1 or flatter with pipe. Construct slopes relative to the roadway grade.



SECTION B-B



SECTION A-A

Contract Items:

Culvert, Unclassified Entrance Pipe Excavation, Class 10

Iowa Department of Transportation

REVISION 11 10-16-07

STANDARD ROAD PLAN

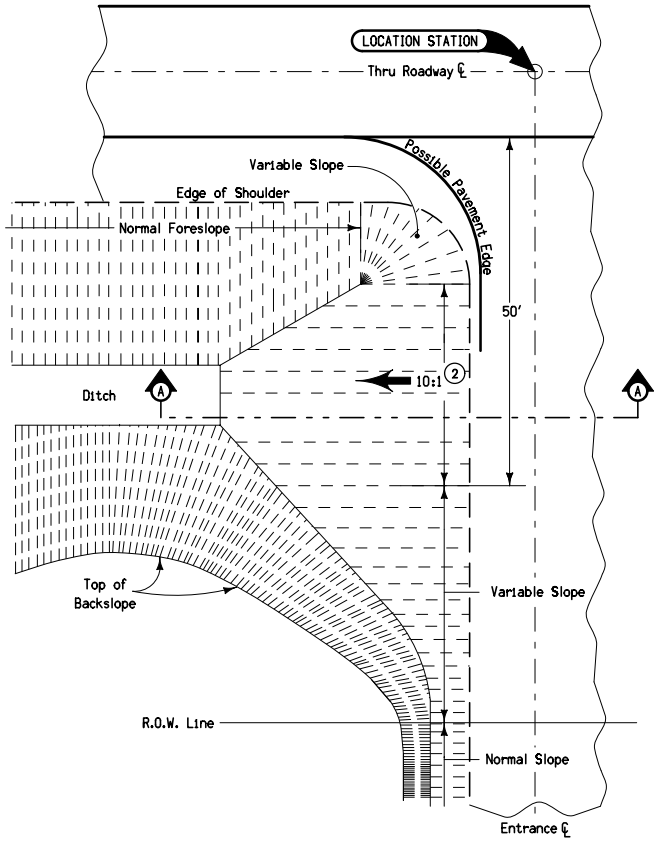
RL-7

SHEET 1 of 1

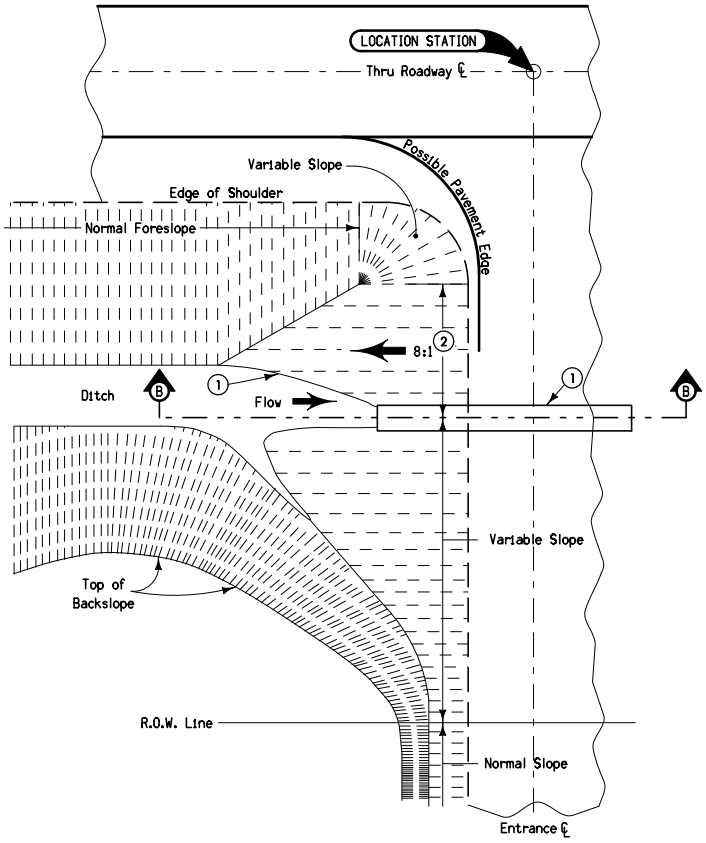
REVISIONS: Modified standard to show only safety ramp. Revised safety ramp width and added a dimension to section B-B.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SAFETY RAMP



TYPE B OR C ENTRANCE WITHOUT PIPE



TYPE B OR C ENTRANCE WITH PIPE

Surface and slopes of entrances shall be smoothly shaped and rounded where practical to provide minimal hazard to an out of control vehicle from through roadway.

Earthwork and material used for construction of entrances are included in estimate of quantities.

(1) Normal locations for entrance pipe culverts shall coincide with the line of the toe of backslopes as shown. Some special shaping of ditch may be required to fit culvert. Refer to tabulation of entrance pipe culverts and cross sections for details of installation.

(2) Construct slope relative to thru roadway grade.

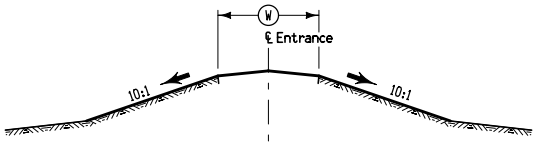
ENTRANCE RADIUS CHART		
TYPE OF ENTRANCE	Shoulder Radius (SR)	Pavement Radius (PR)
TYPE 'B' Light Commercial	35'	45'
TYPE 'C' Field, Farm or Residential	15'	20'

Possible Contract Items:

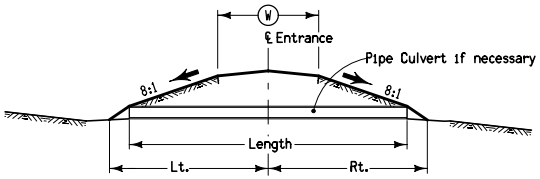
Culvert, Unclassified Entrance Pipe
Excavation, Class 10

Possible Tabulation:

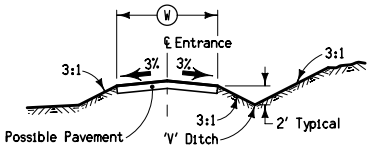
102-3



SECTION A-A



SECTION B-B



ENTRANCE TYPICAL SECTION

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 5 10-20-09

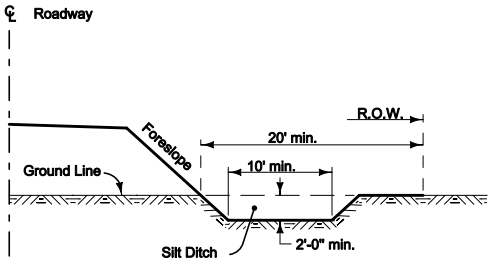
RL-8

SHEET 1 of 1

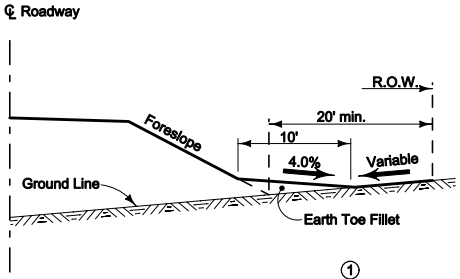
REVISIONS: Modified Section B-B.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

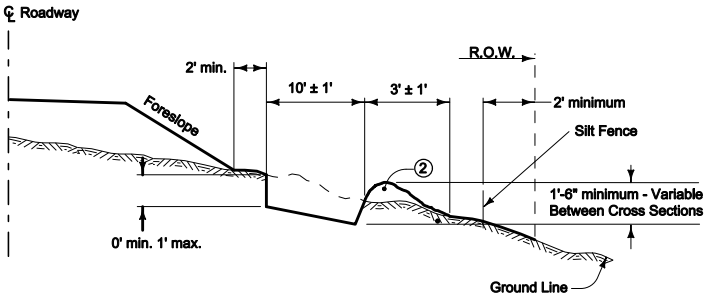
RURAL ENTRANCE



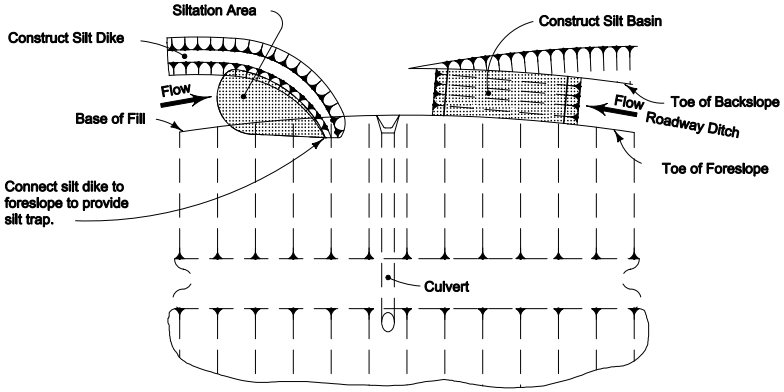
SILT DITCH



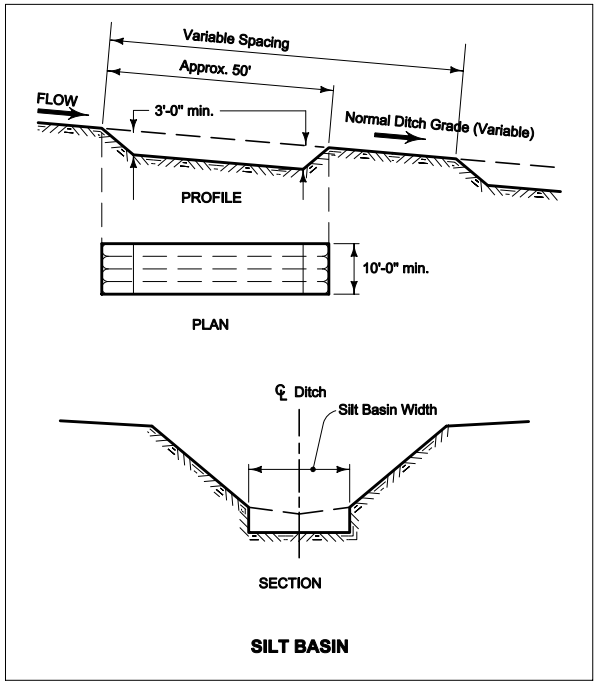
TOE FILLET ①



SILT DIKE



TYPICAL PLAN WITH
PERMANENT CULVERT INSTALLATION



SILT BASIN

All installation locations are to be approved by he engineer.

① Construct an earth fillet at the toe of the roadway foreslope for areas where a roadway ditch, silt ditch, or silt dike are not provided. This Toe Fillet is incidental to "Roadway and Borrow Excavation".

② Windrow of excavated and compacted silt material or deposited and compacted earth.

Possible Contract Items:

Silt Ditch
Silt Dike
Silt Basin

Possible Tabulations:

100-13
100-14
100-15

Iowa Department of Transportation

REVISION
8 | 04-20-10

STANDARD ROAD PLAN

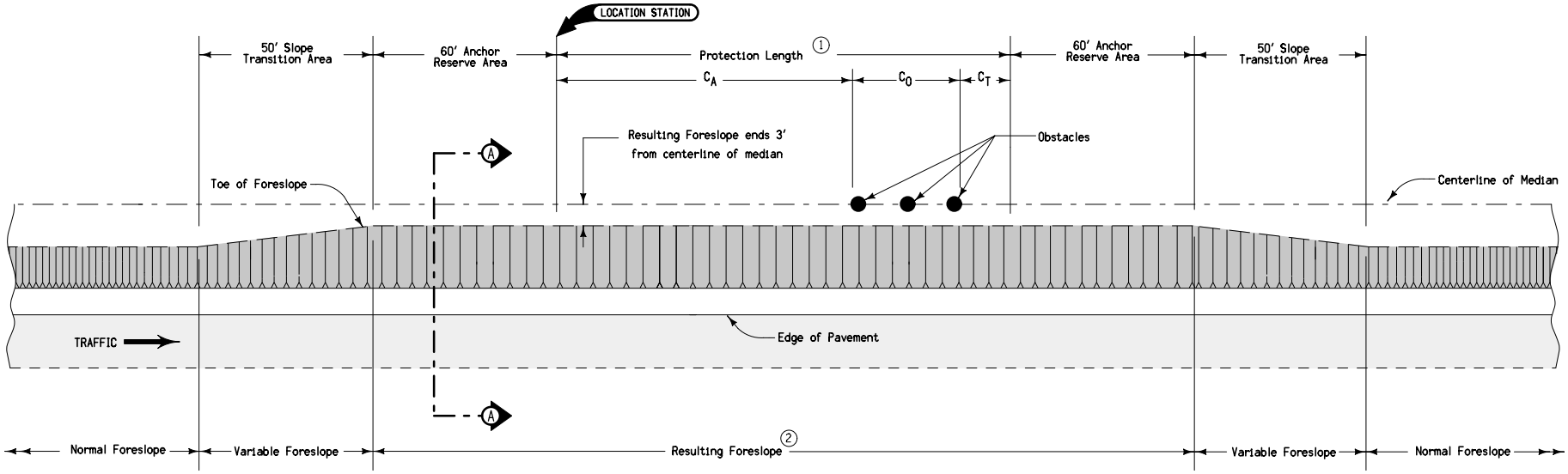
RL-9

SHEET 1 of 1

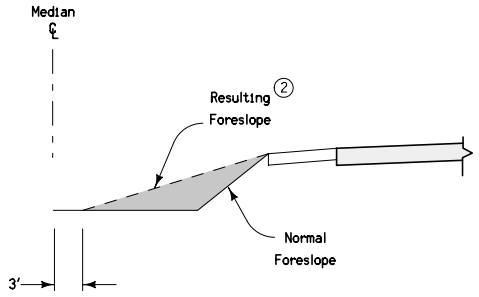
REVISIONS: Change reference from Tab 100-19 to 100-13, 100-14 and 100-15.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY EROSION CONTROL MEASURES



PLAN



SECTION A-A

Possible Contract Items:

Topsoil
Embankment in Place
Excavation, Class 10

Possible Tabulations:

107-24
108-9A

Positive drainage shall be provided through the median obstacle area.

① Refer to Tabulation 108-9A and BA-351.

② Resulting Foreslope shall be no steeper than 6:1.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
8	04-20-10

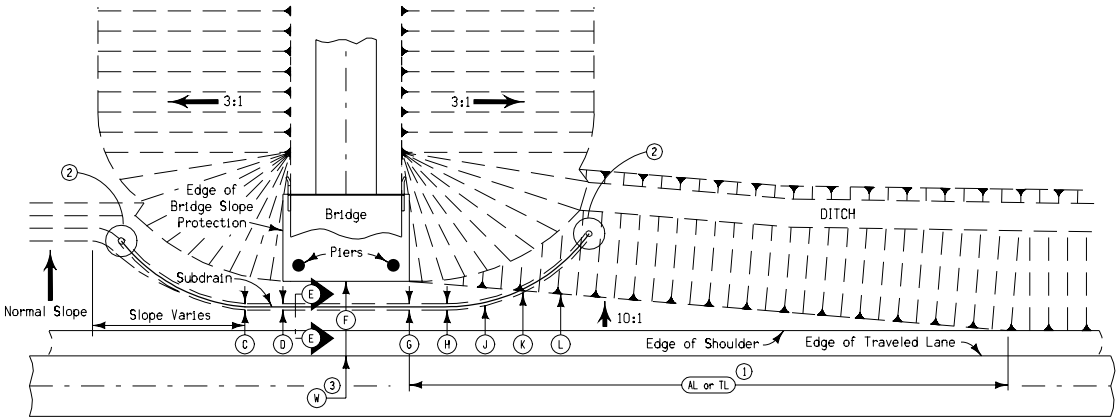
RL-12

SHEET 1 of 1

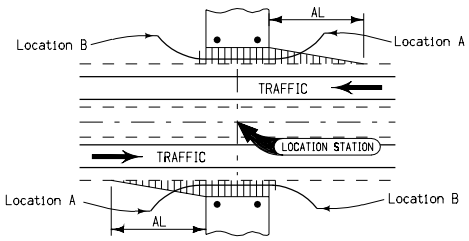
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

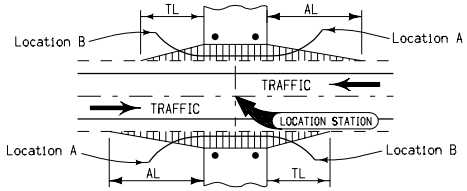
SPECIAL SHAPING FOR HIGH TENSION CABLE GUARDRAIL AT MEDIAN OBSTACLES



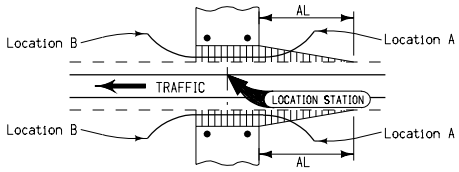
SITUATION PLAN



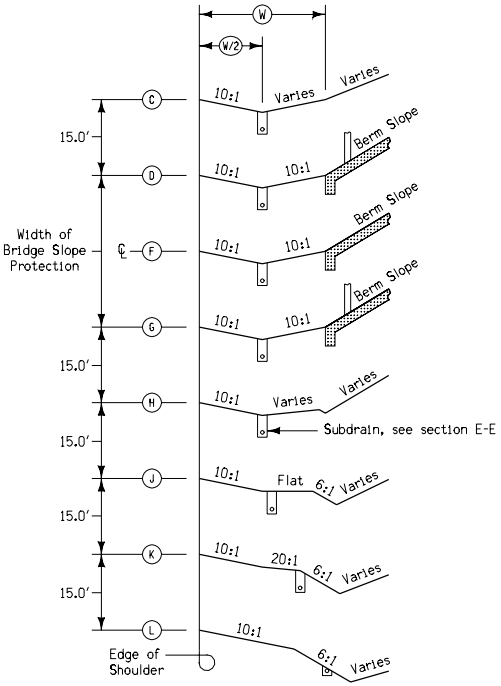
TYPE 6
(Interstate, Freeway and Expressway)



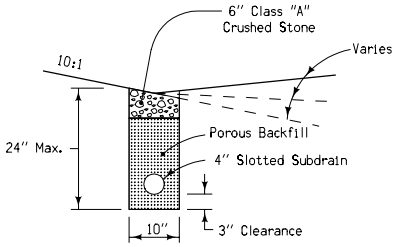
TYPE 7
(Two-Way)



TYPE 8
(Ramp)



TYPICAL SECTIONS



SECTION E-E

GENERAL NOTES:

These details illustrate the grading and subdrain requirements for side piers at locations indicated on the "Tabulation of Grading and Subdrain(s) at Side Piers." All grading shall be as specified for "Embankments" in the current Standard and Supplemental Specifications.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Earthwork for construction of the grading at side piers has been included in the tabulation of earthwork quantities. Drainage structure requirements in conjunction wth the grading at side piers has also been tabulated elsewhere in the plans.

When Longitudinal Subdrains are proposed or present at this site, the 6" subdrain at the base of Bridge Berm is not required.

Subdrain installation shall be in conformance with "Placing Longitudinal Subdrains" of the current Standard and Supplemental Specifications.

When a subdrain installation does not have a subdrain outlet on the end, that end shall be capped with methods approved by the Engineer. Outlet Location A and B are indicated on Tabulation of subdrain and grading at side piers.

Price bid for contract items shall be considered full compensation for furnishing all necessary materials and installing subdrain as indicated hereon.

Contract items are:
Longitudinal Subdrain (Shoulder), 4–inch
Subdrain Outlet (RF–19E)

(1) (AL) or (TL) is the length measured from the edge of the bridge slope protection to a point on the shoulder edge.

(2) See typical section on Standard Road Plan RF–19E.

(3) W= Clear Zone at (F)

Iowa Department of Transportation
Highway Division

STANDARD ROAD PLAN **RL-13**

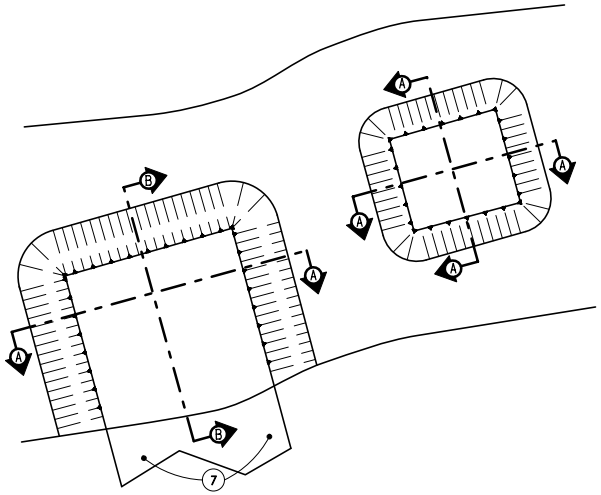
REVISION: Change contract item. REVISION NO. 7

William J. Stein
APPROVED BY DESIGN METHODS ENGINEER

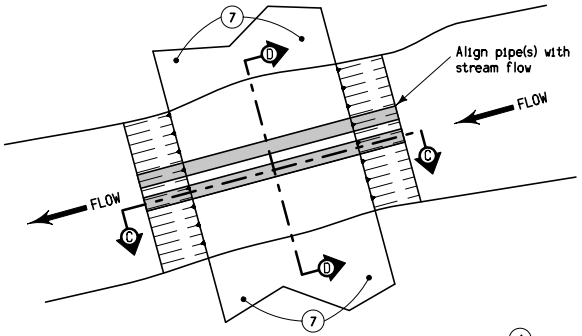
REVISION DATE 04-15-03

DETAILS FOR SPECIAL GRADING
AT SIDE PIERS

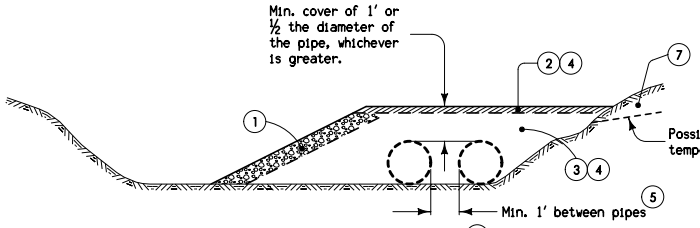
DESIGNER INFO



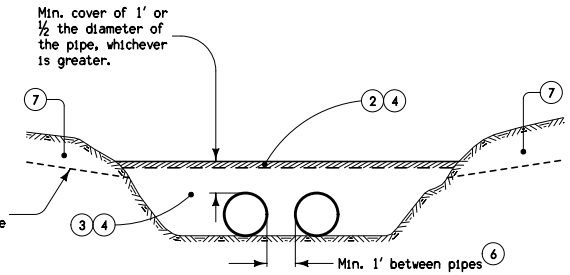
TYPICAL PLAN (CAUSEWAY OR EQUIPMENT PAD) (5)



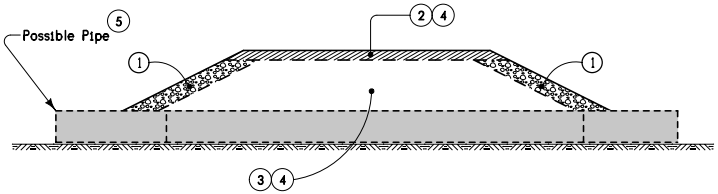
TYPICAL PLAN (STREAM CROSSING) (6)



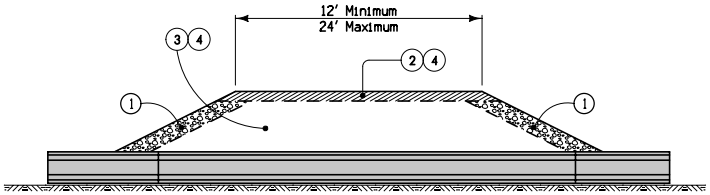
SECTION B-B (CAUSEWAY) (5)



SECTION D-D (STREAM CROSSING) (6)



SECTION A-A (5)



SECTION C-C (6)

1. Minimum 1 foot of Class D revetment, Class E revetment, or broken concrete meeting the requirements of Section 4130.
2. Possible choke layer for construction traffic. Material shall be any combination of erosion stone, granular backfill, special backfill (except with reclaimed HMA), granular surfacing material, or granular soils of AASHTO classification A-1 or A-2 with less than 5% fines passing the #200 sieve.
3. Material shall be clean with less than 5% fines passing the #200 sieve. Acceptable materials include revetment and granular materials.
4. When dredging is allowed by a permit, the dredged material must have 10% or less passing the #200 sieve. Prior to beginning construction according to RL-16, install erosion control measures in accordance with EC-202. These measures shall remain in place and be maintained by the Contractor until temporary RL-16 materials have been completely removed.
5. Pipe required if structure spans greater than half the distance between banks. Size and number of pipe(s) shall be determined by the Contractor.
6. Pipe required. Size and number of pipe(s) shall be determined by the Contractor.
7. Material cut from the bank for access to construct and use a temporary stream structure shall be moved to an upland location.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
6	04-19-11

RL-16

SHEET 1 of 1

REVISIONS: Modified Circle Note 4.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY STREAM CROSSING, CAUSEWAY, OR EQUIPMENT PAD

Signals and Lighting

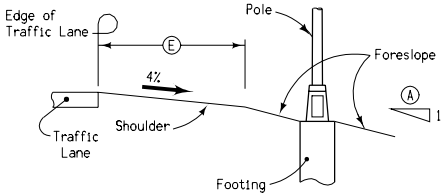
RM

SECTION

Signals and Lighting

RM

NO.	DATE	TITLE
RM-31	09-21-99	Location Details for Poles on Transformer Bases (Roadway Lighting)
RM-32	04-27-99	Location Details for Poles on Slip Bases (Roadway Lighting)
RM-33	10-03-00	Electrical Installation Details (Roadway Ducts)
RM-34A	10-19-04	Electrical Installation Details via Handhole (Slip-Base)
RM-34B	09-21-99	Electrical Installation Details (Transformer Base)
RM-35	04-19-11	Control Station Details (Pole-Mounted)
RM-36	04-19-11	Control Station Details (Pad-Mounted)
RM-37	10-21-08	Junction Box (Cast Iron)
RM-38	04-27-99	Junction Box (Fiber Reinforced Concrete)
RM-39	10-18-11	Light Pole Footings
RM-40	09-21-99	Cable Splices and Connectors
RM-41	04-25-00	Underdeck Lighting (High Pressure Sodium Luminaire)
RM-42	10-18-11	Precast Handhole
RM-43	10-18-05	Transformer Base (Cast Aluminum)
RM-44	10-20-09	Lighting Tower
RM-46	10-16-07	Slip Base for Light Poles
RM-47	10-18-11	Footing for Slip-Base Light Poles
RM-48	10-17-06	Temporary Floodlighting



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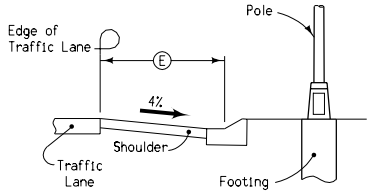

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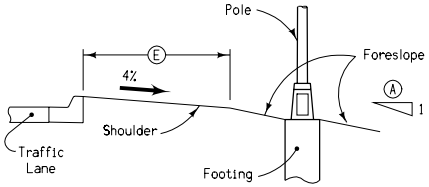

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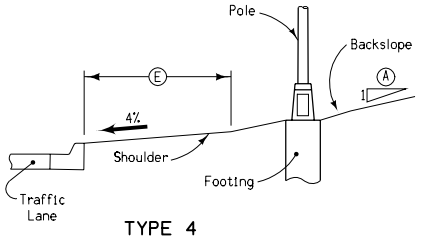

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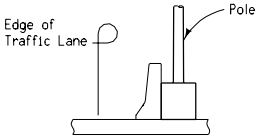

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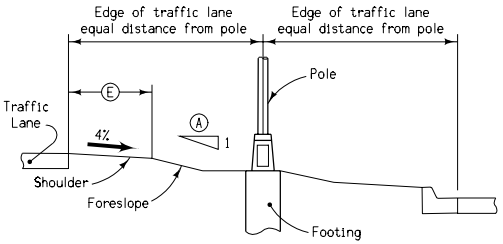

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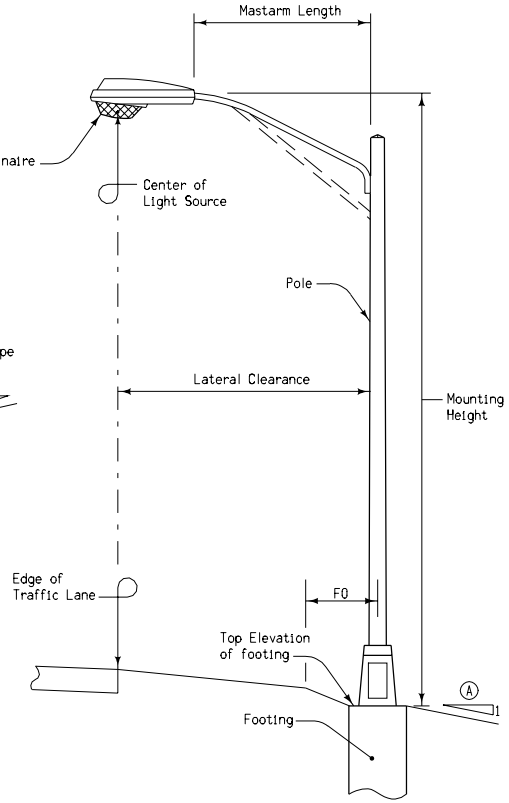
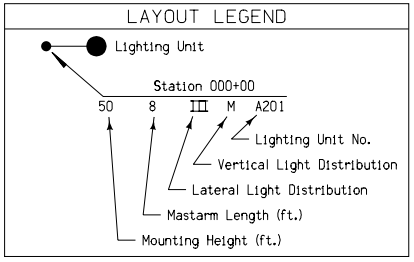
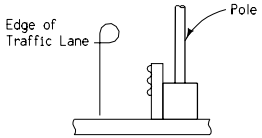


TYPICAL POLE INSTALLATION





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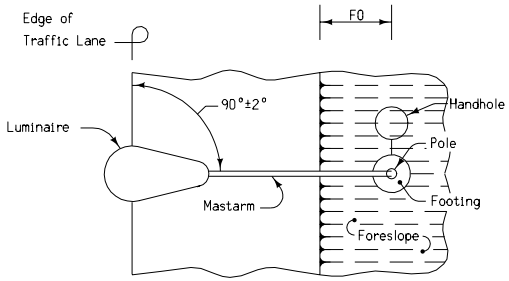


ORIENTATION OF MASTARM

GENERAL NOTES:

The details indicated hereon are for the installation of light poles on transformer bases for roadway illumination.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Refer to appropriate Standard Road Plans and project plans for additional details.

DEFINITIONS:

Mounting Height (MH) is the dimension measured vertically from the center of end of mastarm to the top of footing as shown. Allowable tolerance in MH for final installation is from +3 inches to –3 inches.

Overhang (OH) is the horizontal dimension from the edge of the traffic lane to the Luminaire center. Unless specifically designated otherwise, design OH shall be zero, with an allowable tolerance of ±6 inches.

Lateral clearance will be controlled by luminaire dimensions, and by specified overhang and mastarm dimensions. Unless otherwise directed by the Engineer, clearance of adjacent poles having identical mastarm lengths shall not vary by more than ±3 inches.

Orientation: If not otherwise specified, angular orientation of mast–arms shall be 90° ±2° to the respective centerlines or baselines, or to the respective edges of the pavement along acceleration and deceleration tapers.

Twin–Mastarm Angles: Included angle shall provide required orientation within the nearest 5 degree increment. Anticipated angle will be shown on the detail plans.

Footing offset (FO) is the vertical offset from the edge of the shoulder to the centerline of footing. If the foreslope is steeper than 6:1, FO should be between 2 and 3 feet. If the foreslope is 6:1 or flatter, the FO will vary based on specified mast arm length.

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN RM-31

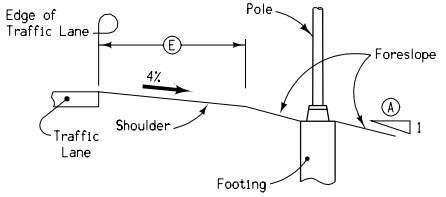
REVISION: Revise notes.

REVISION NO. 1

APPROVED BY DESIGN METHODS ENGINEER 05-24-99

REVISION DATE 09-21-99

LOCATION DETAILS FOR POLES ON TRANSFORMER BASES (ROADWAY LIGHTING)



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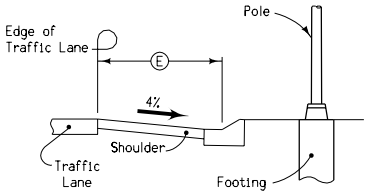

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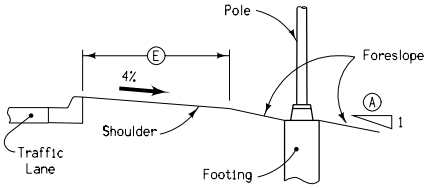

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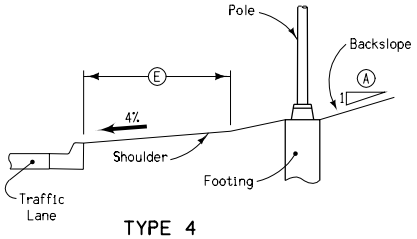

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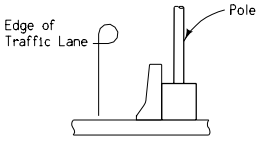

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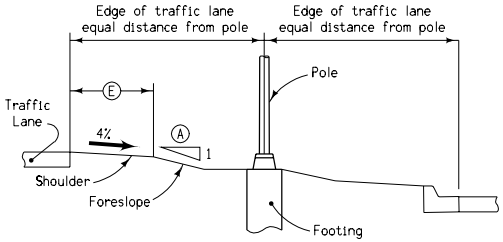

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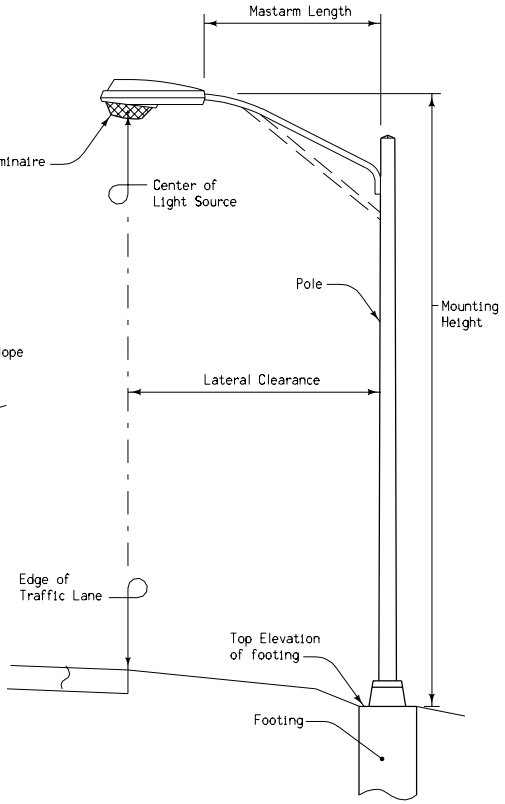
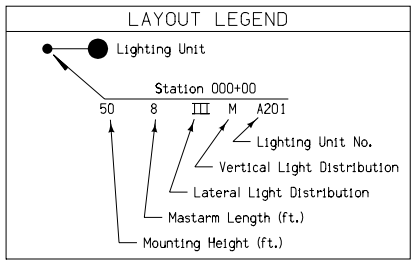
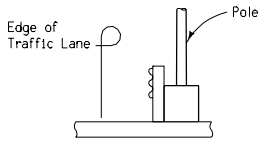
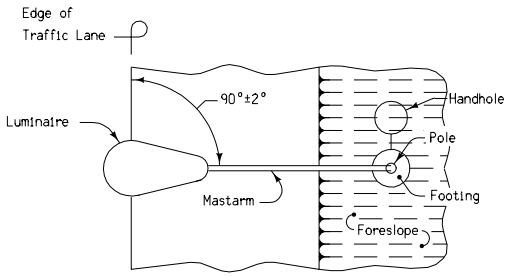


TYPICAL POLE INSTALLATION





TYPE 7



ORIENTATION OF MASTARM

GENERAL NOTES:

The details indicated hereon are for the installation of light poles on slip bases for roadway illumination.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Refer to appropriate Standard Road Plans and project plans for additional details.

DEFINITIONS:

Mounting Height (MH) is the dimension measured vertically from the center of end of mast arm to the top of footing as shown. Allowable tolerance in MH for final installation is from +3 inches to –3 inches.

Overhang (OH) is the horizontal dimension from the edge of the traffic lane to the Luminaire center. Unless specifically designated otherwise, design OH shall be zero, with an allowable tolerance of ± 6 inches.

Lateral clearance will be controlled by luminaire dimensions, and by specified overhang and mastarm dimensions. Unless otherwise directed by the Engineer, clearance of adjacent poles having identical mastarm lengths shall not vary by more than ± 3 inches.

Orientation: If not otherwise specified, angular orientation of mast-arms shall be $90° \pm 2°$ to the respective centerlines or baselines, or to the respective edges of the pavement along acceleration and deceleration tapers.

Twin–Mastarm Angles: Included angle shall provide required orientation within the nearest 5 degree increment. Anticipated angle will be shown on the detail plans.

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN | **RM-32**

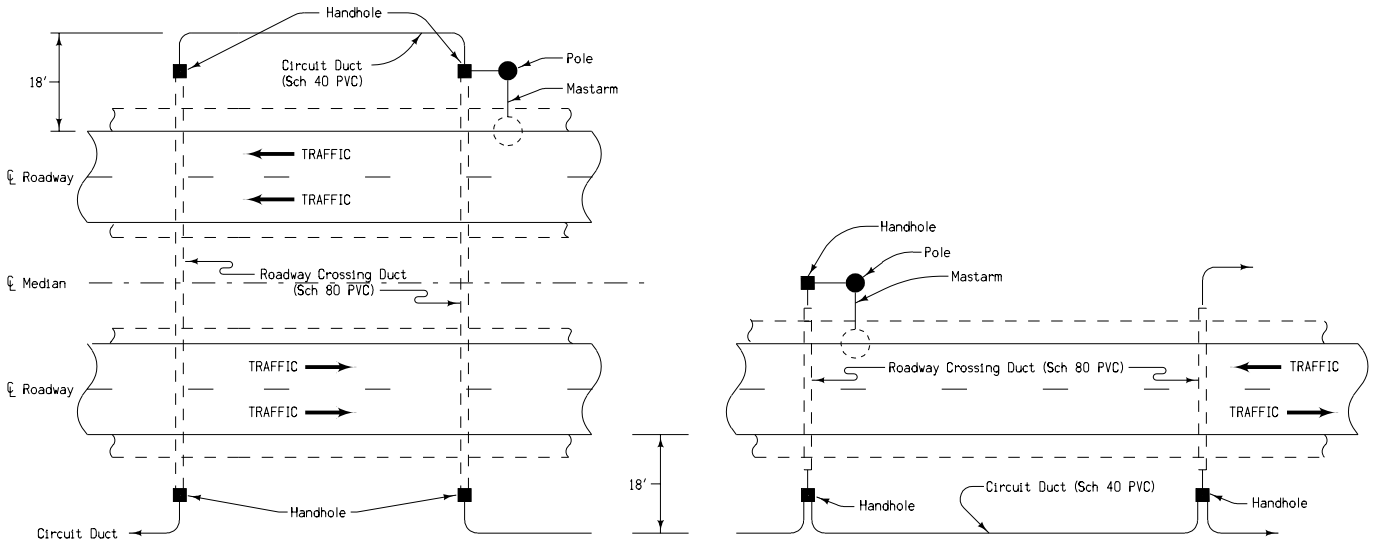
REVISION: New.

APPROVED BY DESIGN METHODS ENGINEER

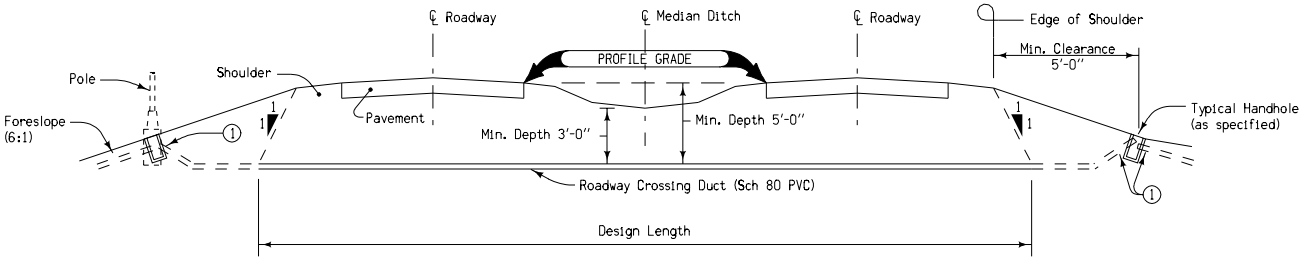
REVISION NO.: New

REVISION DATE: 04-27-99

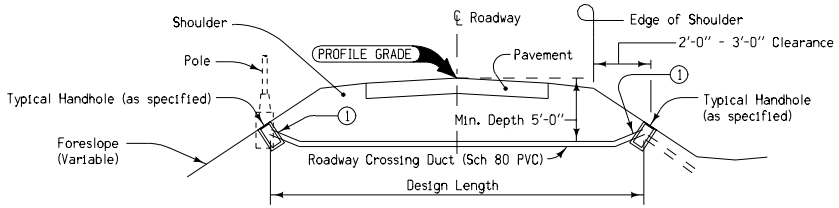
LOCATION DETAILS FOR POLES ON SLIP BASES (ROADWAY LIGHTING)



TYPICAL PLANS
CIRCUIT AND ROADWAY CROSSING DUCTS



TYPICAL SECTION
WHERE FORESLOPES ARE 6:1 OR FLATTER



TYPICAL SECTION
WHERE FORESLOPES ARE STEEPER THAN 6:1

GENERAL NOTES:

The details indicated hereon are for installation of electrical roadway ducts. Alternate designs may be submitted to the Engineer for approval.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

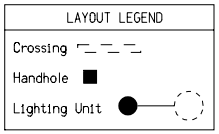
Refer to appropriate Standard Road Plans and project plans for additional details.

The type, size and location of electrical roadway ducts will be shown on the project plans. Roadway crossings shall be installed as shown hereon unless otherwise specified or directed by the Engineer.

Ducts for roadway crossings shall be Sch 80 PVC. Crossings which are to be placed without disturbing the existing roadway surface shall be installed by jacking or boring methods approved by the Engineer. No access to duct or jacking of duct from median will be allowed without the specific approval of the Engineer.

After cable is installed, all duct terminal ends in handholes, transformer bases, light pole shafts, or similar locations as directed by the Engineer shall be sealed against entry of moisture. Sealants shall be either approved sealing bushings or a non-hardening sealing compound.

(1) Connect to pole footing, handhole, or circuit duct as shown on project plans.

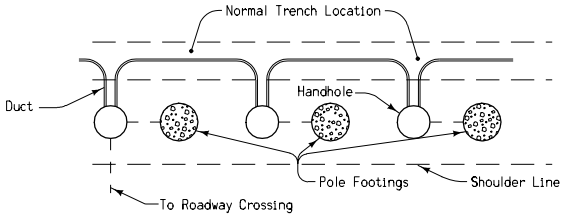


Iowa Department of Transportation
Project Development Division

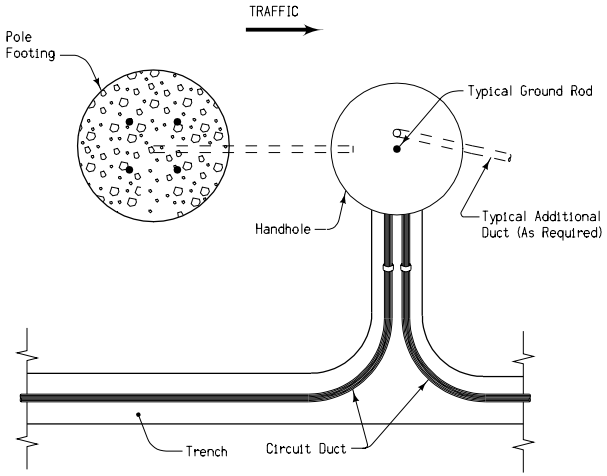
STANDARD ROAD PLAN RM-33

REVISION: Show Profile Grade at Inside edge of pavement for four lanes.	REVISION NO. 2
APPROVED BY DESIGN METHODS ENGINEER	REVISION DATE 10-03-00

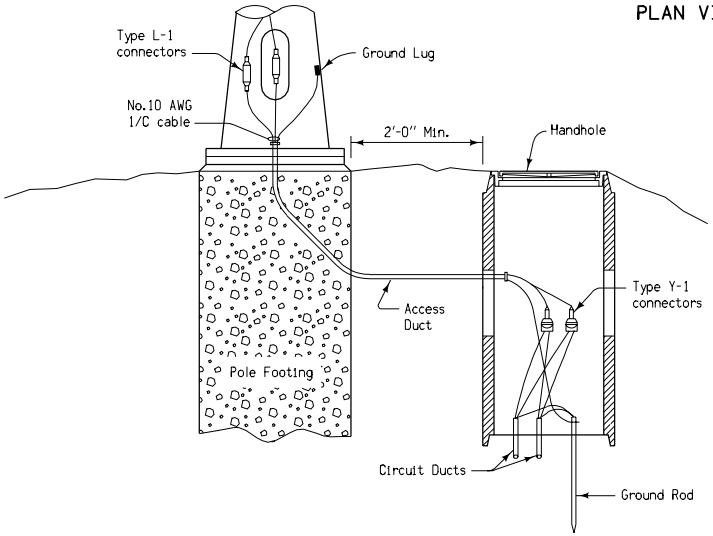
ELECTRICAL INSTALLATION DETAILS (ROADWAY DUCTS)



TYPICAL LAYOUTS ①
CONNECTIONS TO POLE FOOTINGS



PLAN VIEW



DETAILS OF UNDERGROUND DISTRIBUTION

GENERAL NOTES:

Lighting circuits shall consist of single conductor phase lines with bare ground wires installed in continuous underground ducts.

Standard trench location for lighting distribution circuits shall be 3'-0" outside the line of the pole footings, except for roadway crossings, access to connection points, or other cases detailed on the project plans or approved by the Engineer.

The Engineer may allow variation from minimum depths for roadway crossings, access to connection points, soil conditions, or other special cases. Where rock is encountered, a minimum trench depth of 2 feet will be required.

Ducts installed under pavement slabs, drives, and other similar locations detailed in the project plans shall be designated as "crossings" and distinguished from other underground circuit ductwork. Refer to Standard Road Plan RM-33 for additional details.

All load taps in phase lines shall be with Y-1 connectors and all circuit branch taps shall be made with Y-3 connectors unless otherwise specified or detailed. When the method of in-line splicing is not specified on the project plans, the Engineer may approve the use of connector assemblies or field molded splices.

Provide 600 volt fuses as specified, 5 amperes for each Type L-1 connector, and 20 amperes for each Type Y-1 connector.

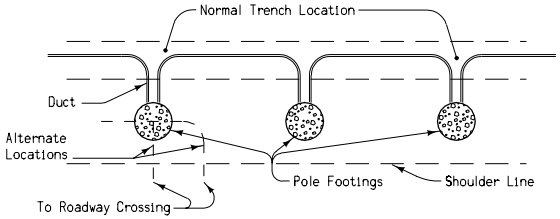
① Each connection to pole footing shall require a separate access duct.

Iowa Department of Transportation
Highway Division

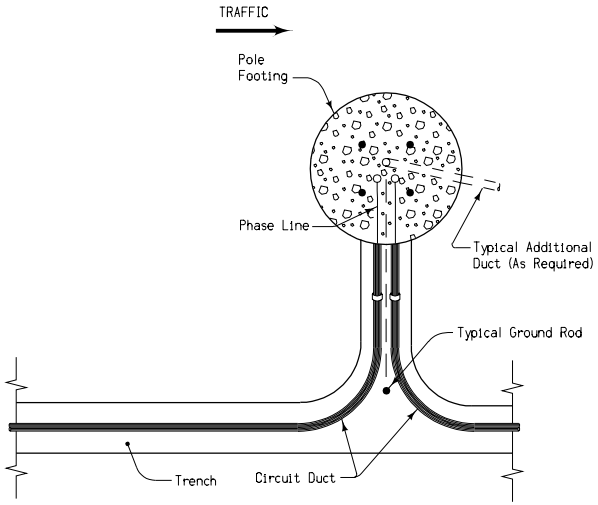
STANDARD ROAD PLAN RM-34A

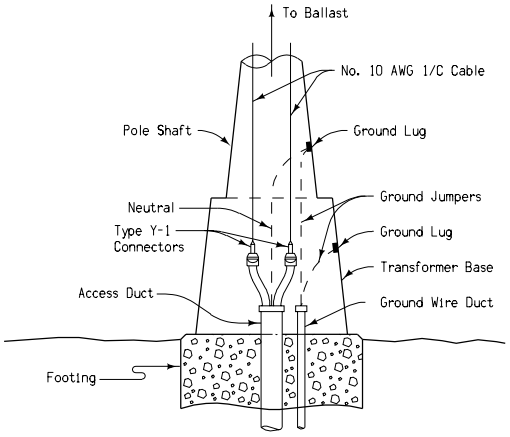
REVISION: Remove General Notes already in the Specifications Book. Correct Title.	REVISION NO. 2
William J. Stein APPROVED BY DESIGN METHODS ENGINEER	REVISION DATE 10-19-04

ELECTRICAL INSTALLATION DETAILS
VIA HANDHOLE
(SLIP-BASE)



TYPICAL LAYOUTS ①
CONNECTIONS TO POLE FOOTINGS





WIRING DIAGRAM
(BALLAST TAP CONNECTION)

GENERAL NOTES:

The details indicated hereon are for installation of cable in underground ducts. Alternate designs may be submitted to the Engineer for approval.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Refer to appropriate Standard Road Plans and project plans for additional details.

Lighting circuits shall consist of single conductor phase lines with bare ground wires installed in continuous underground ducts.

Standard trench location for lighting distribution circuits shall be 3 feet outside the line of the pole footings, except for roadway crossings, access to connection points, or other cases detailed on the project plans or approved by the Engineer.

The Engineer may allow variation from minimum depths for roadway crossings, access to connection points, soil conditions, or other special cases. Where rock is encountered, a minimum trench depth of 2 feet will be required.

Ducts installed under pavement slabs, drives, and other similar locations detailed in the project plans shall be designated as "crossings" and distinguished from other underground circuit ductwork. Refer to Standard Road Plan RM–33 for additional details.

All load taps in phase lines shall be with Y–1 connectors and all circuit branch taps shall be made with Y–3 connectors unless otherwise specified or detailed. When the method of in–line splicing is not specified on the project plans, the Engineer may approve the use of connector assemblies or field molded splices.

Provide 600 volt fuses as specified, 5 amperes for each Type Y–1 connector.

All unused connector openings shall be sealed against entry of moisture as directed by the Engineer.

① Each connection to pole footing shall require a separate access duct.

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN **RM–34B**

REVISION: Add note; change title block.

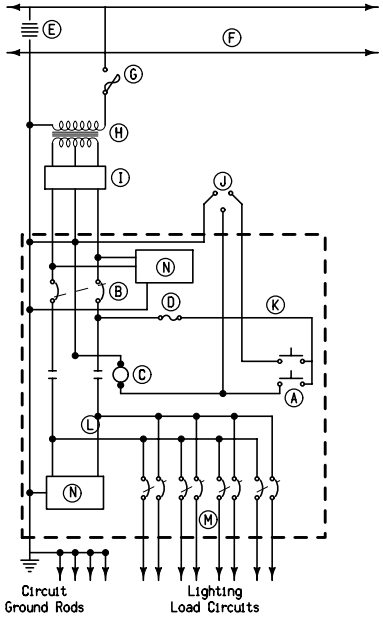
REVISION NO. 1

APPROVED BY DESIGN METHODS ENGINEER 05-24-99

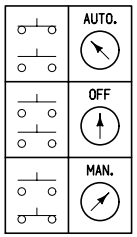
REVISION DATE 09-21-99

ELECTRICAL INSTALLATION DETAILS
(TRANSFORMER BASE)

A. Test Switch
B. Line Breaker
C. Contactor
D. Control Fuse
E. Lightning Arrestor
F. Primary Line
G. Primary Fused Cutout
H. Distribution Transformer
I. Meter
J. Photoelectric Control
K. Control Circuits
L. Line Circuits
M. Branch Circuit Breakers
N. Surge Suppressors

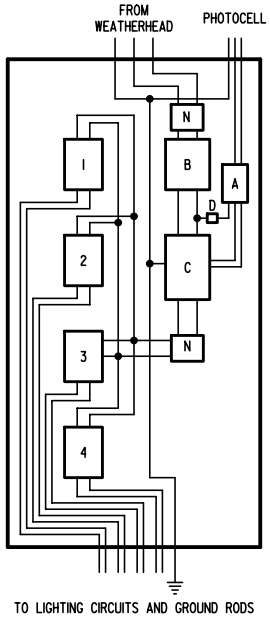


SCHEMATIC DIAGRAM

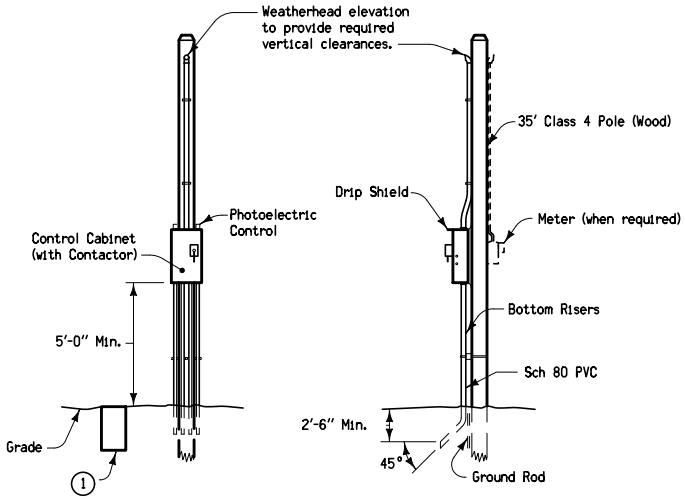


SWITCH OPERATION

A. Test Switch
B. Line Breaker (2P.)
C. Contactor (2P.)
D. Control Fuse
1 thru 4. Branch Circuit Breakers (2P.)
N Surge Suppressors



CONTROL PANEL WIRING DIAGRAM



TYPICAL INSTALLATION

LAYOUT LEGEND	
Control Station (Pole-Mounted)	

The details indicated hereon are for the installation of pole–mounted control stations. Alternate designs may be submitted to the Engineer for approval.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Aerial service drop and required meters will be furnished by the Utility Company in accordance with their service agreement. The Contractor shall furnish and install meter sockets and meter loops unless an agreement for unmetered service has been secured at the time of construction.

All components within the control cabinet shall be so arranged to provide access for maintenance and space for four (4) branch circuit breakers without disturbing other components or wiring.

All load circuits within the control cabinet shall be connected phase–to–phase, with neutral connections to grounds only.

All internal wiring for line and control circuits shall meet requirements for single conductor cable, except that thermoplastic cable may be used with the approval of the Engineer.

Line circuit conductor sizes shall comply with NEC requirements based on the total load current ratings of the branch circuit breakers supplied by the respective circuit segments, with a minimum size of No. 8, AWG. Minimum size for control circuit conductors shall be No. 12, AWG.

Minimum interrupting ratings for branch circuit breakers shall be identical to line circuit breakers. Provide one branch breaker for each active circuit and specified spare.

Load current ratings for branch circuit breakers will be 30 amperes, and main circuit breakers will be 100 amperes unless shown otherwise on the project plans.

Interrupting ratings for the contactor shall not be less than the load current rating for the line circuit breaker.

The minimum working voltage rating of the control fuse shall be 240 volts. The fuse shall be cartridge type with dimensions 13/32 inch by 1 1/2 inches. Current ratings shall be as recommended by the manufacturer.

The test switch shall have a double–break contact block.

The control cabinet shall be electrically bonded to the ground rod(s) with a copper wire or jumper equivalent to No. 6, AWG or larger.

All risers shall be rigid conduit of the type shown on the plans. All top risers shall have a Nominal Outside Diameter of 2 inches or larger. One 2–inch Nominal Outside Diameter bottom riser shall be provided for each active circuit and specified spare unless otherwise shown on the project plans.

All internal line slide and control circuit wiring shall be considered incidental to the contract price for the control cabinet, and will not be measured for payment.

(1) Handhole where shown on plans, or when the control cabinet is at a low point in the conduit system, and could possibly be flooded with water entering at other points in the conduit system.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-19-11

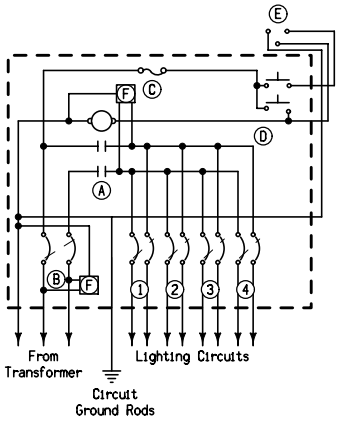
RM-35

SHEET 1 of 1

REVISIONS: Removed general note conflicting with specifications.

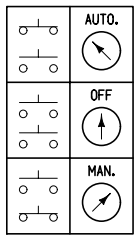
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CONTROL STATION DETAILS (POLE-MOUNTED)

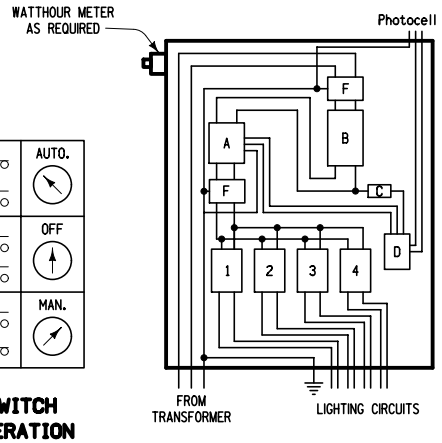


SCHEMATIC DIAGRAM

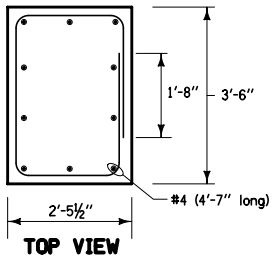
A. Contactor (2P.)
B. Line Breaker (2P.)
C. Control Fuse
D. Test Switch
E. Photocell
F. Surge Supressor
1 thru 4. Branch Circuit Breakers (2P.)



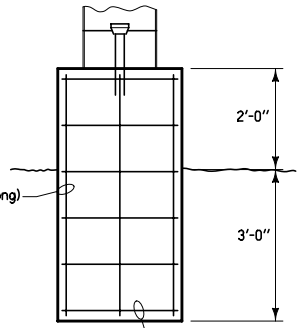
SWITCH OPERATION



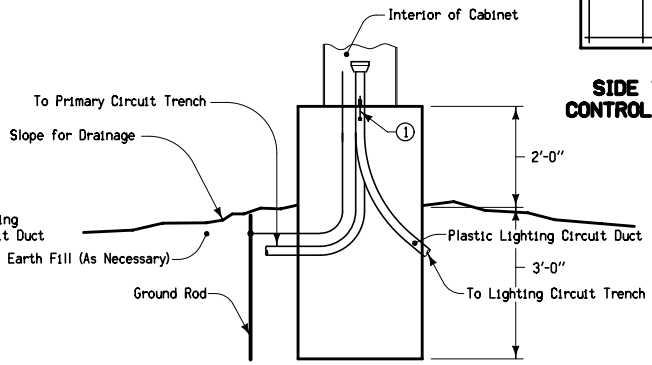
CONTROL PANEL WIRING DIAGRAM



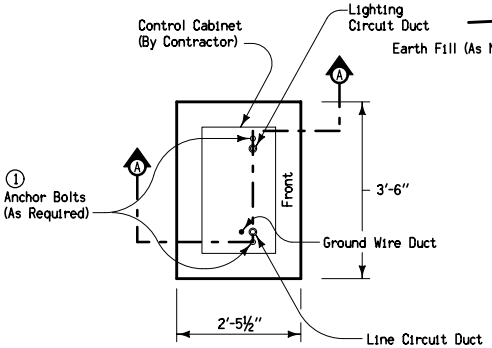
TOP VIEW



SIDE VIEW CONTROLLER PAD



PLAN VIEW



SECTION A-A

INSTALLATION DETAILS

ESTIMATED QUANTITIES (One Pad)	
Reinforcing Steel	79.5 lbs.
Structural Concrete	1.6 yd^3

LAYOUT LEGEND	
Control Station (Pad-Mounted)	⊠

Estimated quantities for plastic conduit include all circuit ducts shown. The ground wire duct shall be considered incidental to the length of plastic conduit. The No. 12, AWG grounding jumper for the photoelectric control shall be considered incidental to the length of ground wire. All line and control circuit wire and cable, except the cable to the remote photoelectric control socket, shall be considered incidental to the control cabinet. The estimated quantities for wire and cable includeconnections to the loadside terminals of the branch circuit breakers.

The details indicated hereon are for the installation of pad–mounted control stations. Alternate design may be submitted to the Engineer for approval.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Primary service cable, pad–mounted transformer, and required meters will be furnished by the Utility Company in accordance with their service agreement. The Contractor shall furnish and install meter sockets and meter loops unless an agreement for un–metered service has been secured at the time of construction.

All requirements for a pad mounted control cabinet with contactor shall apply. Minimum interior dimensions shall be 2'–6''(H) x 3'–0'' (W) x 2'–0'' (D). All seams shall be continuously welded.

All load circuits within the control cabinet shall be connected phase–to–phase, with neutral connections to grounds only.

All internal wiring for line and control circuits shall meet requirements for single conductor cable, except that thermoplastic cable may be used with the approval of the Engineer.

Line circuit conductor sizes shall comply with NEC requirements based on the total load current ratings of the branch circuit breakers supplied by the respective circuit segments, with a minimum size of No. 8, AWG. Minimum size for control circuit conductors shall be No. 12, AWG.

Minimum interrupting ratings for branch circuit breakers shall be identical to line circuit breakers. Provide one branch breaker for each active circuit and specified spare.

Load current ratings for branch circuit breakers will be 30 amperes, and main circuit breakers will be 100 amperes unless shown otherwise on the project plans.

Interrupting ratings for the contactor shall not be less than the load current rating for the line circuit breaker.

The minimum working voltage rating of the control fuse shall be 240 volts. The fuse shall be cartridge type with dimensions 13⁄32 inch by 1–1⁄2 inch. Current ratings shall be as recommended by the manufacturer.

The test switch shall have a double–break contact block.

The control cabinet shall be electrically bonded to the ground rod(s) with a copper wire or jumper equivalent to No. 6, AWG or larger.

The photoelectric control shall be remotely mounted as indicated on the detail plans. The photoelectric control socket shall be connected to the nearest accessible grounding con–nection, or where indicated on the detail plans, by means of a No. 12, AWG bare cop–per wire.

All duct connections into the control cabinet shall be weatherproof threaded hubs or compression glands.

The top surface of the concrete pad shall slope one–quarter inch per foot in the direction of the natural ground. The placement of all concrete pads shall be at the direction of the Engineer.

① 1⁄2" x 4" long Bolts (2 required)

Iowa Department of Transportation

REVISION	
3	04-19-11

STANDARD ROAD PLAN

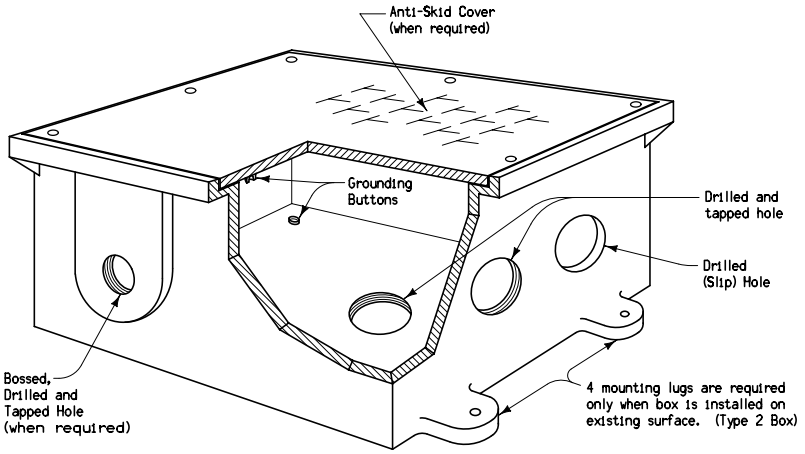
RM-36

SHEET 1 of 1

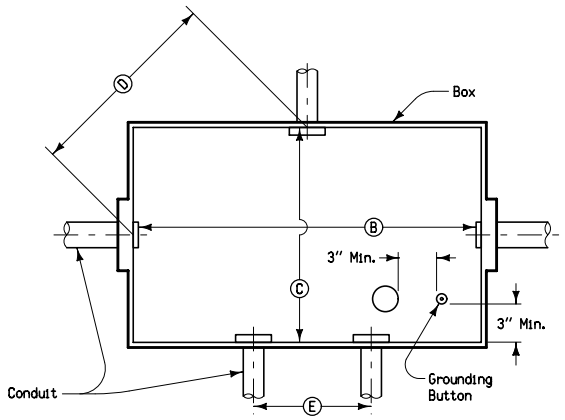
REVISIONS: Removed general note conflicting with specifications.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CONTROL STATION DETAILS (PAD-MOUNTED)



JUNCTION BOX



JUNCTION BOX REQUIREMENTS

For straight pulls	Min. 'B' = 8 diameters of larger conduit
For opposite wall	Min. 'C' = 6 diameters of larger conduit
For right angle turns	Min. 'D' = 8 diameters of larger conduit

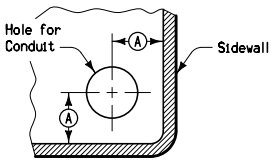
The details indicated hereon are for typical junction boxes used in electrical circuitry for highway lighting. Alternate design may be submitted to the Engineer for approval.

Covers of junction boxes installed in locations subject to pedestrian traffic shall have an approved anti-skid pattern. Approved galvanized steel covers may be substituted for cast iron.

Grounding buttons shall be fitted with 3/8" x 3/4" brass screws unless otherwise specified.

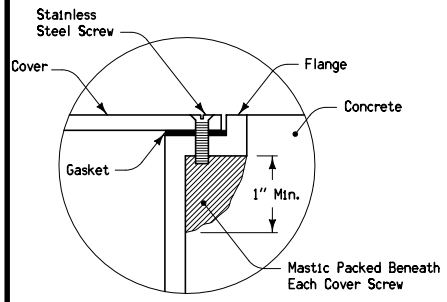
Type, size and location of holes will be shown on the plans.

Slip holes shall be used only for junction box drains unless otherwise specified on plans.

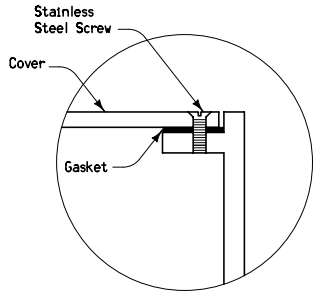


CONDUIT LOCATION FOR LOCK NUT AND BUSHING CLEARANCE - 'A'										
Conduit Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3	3 1/2"	4"
Minimum Clearance	1"	1"	1 1/8"	1 3/8"	1 1/2"	1 3/4"	2 1/8"	2 1/2"	2 7/8"	3 1/8"

MINIMUM SPACING BETWEEN CONDUIT CENTERS - 'E'										
Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"
1/2"	1 1/4"	1 3/8"	1 5/8"	1 7/8"	2"	2 3/8"	2 5/8"	3"	3 1/4"	3 5/8"
3/4"		1 1/2"	1 3/4"	2"	2 1/8"	2 1/2"	2 3/4"	3 1/8"	3 3/8"	3 3/4"
1"			2"	2 1/4"	2 3/8"	2 3/4"	3"	3 3/8"	3 5/8"	4"
1 1/4"				2 1/2"	2 5/8"	3"	3 1/4"	3 5/8"	3 7/8"	4 1/4"
1 1/2"					2 3/4"	3 1/8"	3 3/8"	3 3/4"	4"	4 3/8"
2"						3 1/2"	3 3/4"	4 1/4"	4 3/8"	4 3/4"
2 1/2"							4"	4 3/8"	4 5/8"	5"
3"								4 3/4"	5"	5 3/8"
3 1/2"									5 1/4"	5 5/8"
4"										6"



TYPE 1



TYPE 2

CORNER DETAILS OF JUNCTION BOX

Contract Items:

Handholes and Junction Boxes

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
1 10-21-08

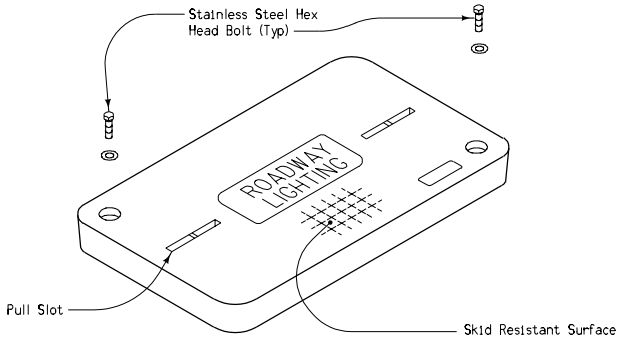
RM-37

SHEET 1 of 1

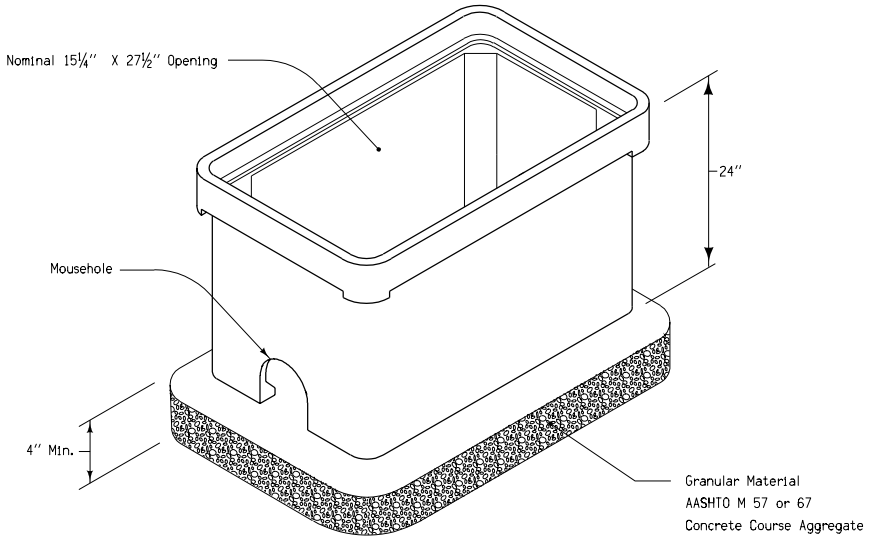
REVISIONS: Removed requirements for 5 threads in holes.
Revised notes to remove specification language.

Deanna Maifuss
APPROVED BY DESIGN METHODS ENGINEER

JUNCTION BOX (CAST IRON)



COVER



BOX

JUNCTION BOX DETAILS

GENERAL NOTES:

The details indicated hereon are for typical junction boxes used in electrical circuitry for highway lighting. Alternate designs may be submitted to the Engineer for approval.

Materials and methods of construction shall be in accordance with current Standard and Supplemental Specifications.

Refer to appropriate Standard Road Plans and project plans for additional details.

Junction box shall be installed per manufacturer's recommendations.

Covers of junction boxes installed in locations subject to pedestrian traffic shall have an approved anti-skid pattern.

Iowa Department of Transportation
Project Development Division

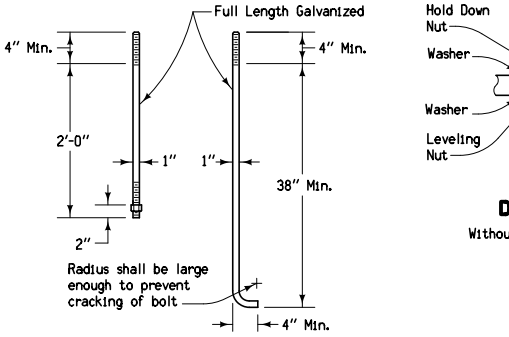
STANDARD ROAD PLAN | **RM-38**

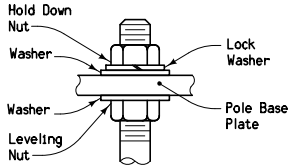
REVISION: New.

APPROVED BY DESIGN METHODS ENGINEER 12-28-98

REVISION NO.
New
REVISION DATE
04-27-99

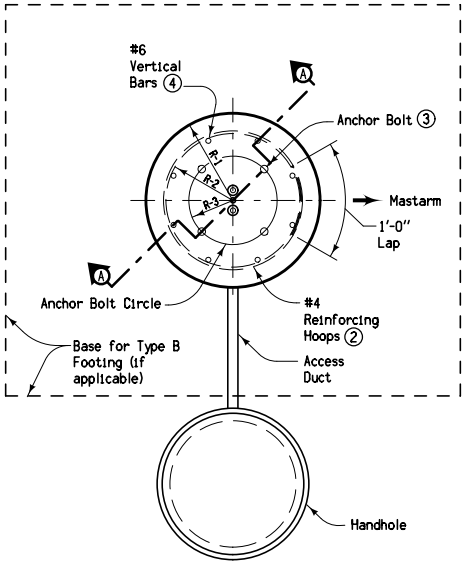
JUNCTION BOX
(FIBER REINFORCED CONCRETE)



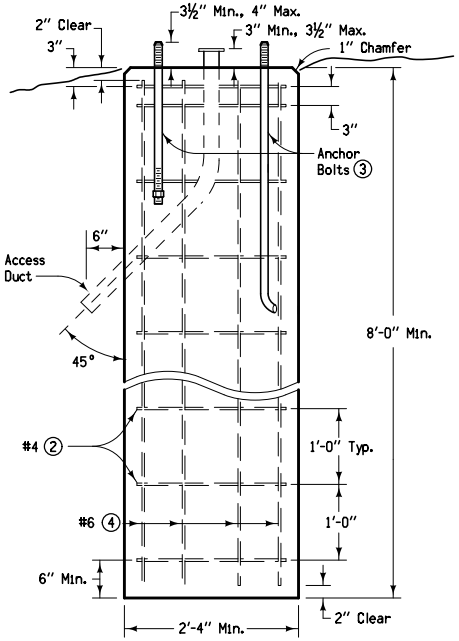


DETAIL 'A'
Without Transformer Base (5)

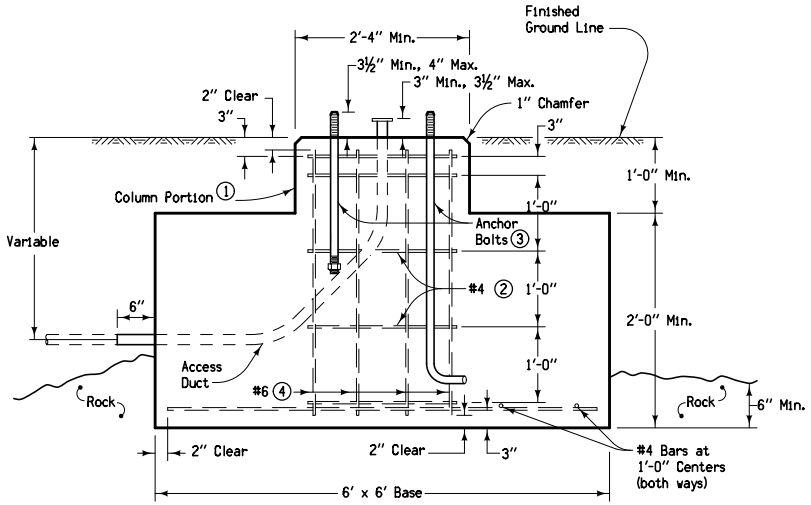
ANCHOR BOLT DETAILS



FOOTING PLAN



SECTION A-A
TYPE A FOOTING



SECTION A-A
TYPE B FOOTING

The details indicated hereon are for the construction of a concrete footing for light poles with a mounting height of 49 feet or less. Where poles with greater mounting heights are specified, footings of different designs may be required.

The Type A Footing is the normally required footing construction. Where rock, shale, sandstone, broken or shattered rock, or other similar material is encountered, the Engineer may approve the use of the Type B Footing. Dispose of all excavations in the area adjacent to the footing and shape to the natural contour unless otherwise directed by the Engineer.

Diameter of footing is determined by the Anchor Bolt Circle required for the diameter of the pole being installed. Where dimensional requirements indicated cannot be met with normal footings, enlarge the footing as necessary to accomodate the required diameter at Contractor's expense.

R-1 Radius of the outside of the footing is 1' -1½" minimum unless anchor bolt circle requires a larger radius.

R-2 Radius of the reinforcing hoop is a maximum of 2" less than R-1 and a minimum of 1" greater than R-3.

R-3 Radius of the anchor bolt circle.

Cap open ends of conduit during construction to prevent infiltration of foreign material. After the cable is installed, seal the upper end of the ducts against entry of moisture by a method approved by the Engineer. For access ducts use a 2" nominal outside diameter, with a minimum of two access ducts per footing, unless otherwise specified. Use a 1" nominal outside diameter for the ground wire duct.

No welding of the anchor bolts is permitted. Obtain a template from the light pole manufacturer for placement of anchor bolts.

(1) Footing base may be thickened and column portion omitted at the Contractor's option.

(2) Horizontal reinforcing hoops are #4 bars lapped a minimum of 1'-0" as indicated. Hoops may be welded to vertical bars.

(3) Either type of bolt shown may be used at the option of the Contractor.

(4) This bar is to be a #7 when the mounting height is greater than 44 feet.

(5) When transformer base is required, refer to Standard Road Plan RM-43.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
4	10-18-11

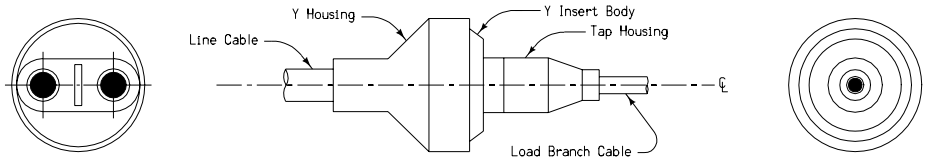
RM-39

SHEET 1 of 1

REVISIONS: Modified and clarified general notes. Removed information covered by Specifications.

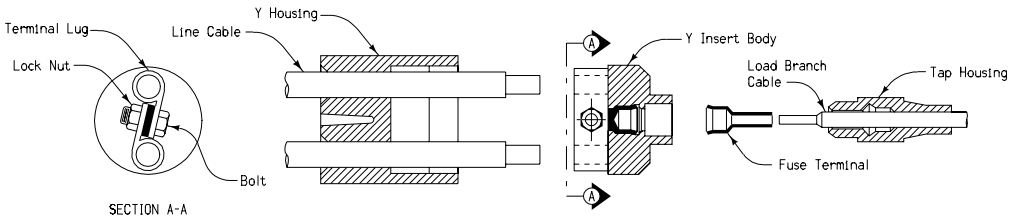
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LIGHT POLE FOOTINGS



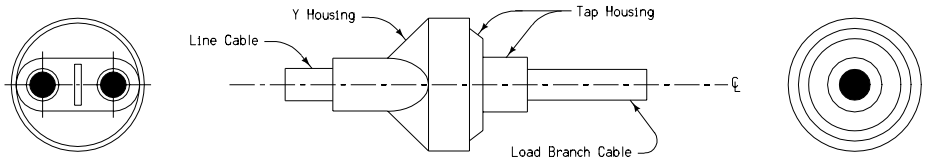
TYPE Y-1 OR Y-2 CONNECTOR ①

ASSEMBLED CONNECTOR



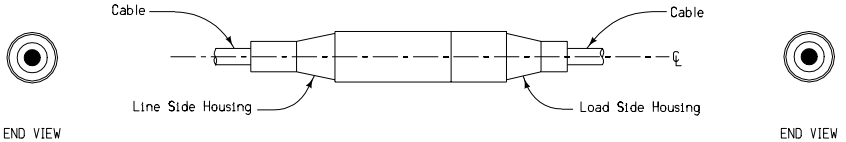
DETAILS OF TYPE Y-1 CONNECTOR

DISASSEMBLED CONNECTOR



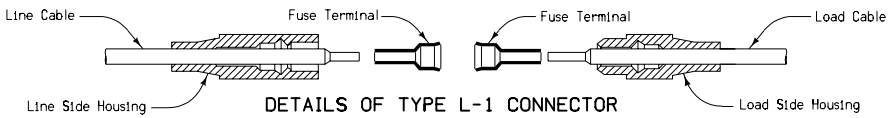
TYPE Y-3 CONNECTOR ①

ASSEMBLED CONNECTOR



TYPE L-1 OR L-2 CONNECTOR ②

ASSEMBLED CONNECTOR



DETAILS OF TYPE L-1 CONNECTOR

DISASSEMBLED CONNECTOR

GENERAL NOTES:

The details indicated hereon are typical for cable splices and connectors. Alternate designs may be submitted to the Engineer for approval.

Materials and methods of construction shall be in accordance with Standard and Supplemental Specifications.

Refer to appropriate Standard Road Plans and project plans for additional details.

All connector assemblies shall be of waterproof construction, designed for both direct burial in the earth and exposure to sunlight, and shall be capable of repeated disconnections without damage to the watertight seals and terminals or reducing the conductivity below specifications. It shall be the responsibility of the Contractor to furnish connectors recommended for the required cable sizes.

Types L–1 and L–2 connectors shall be of the friction type, and shall disconnect without stressing the cable or its attachment beyond recommended limits when axial tension is applied to the cable or housing.

The top housings of Y–1 and Y–2 connectors shall be friction connected to Y insert bodies, and shall meet the disconnecting requirements of L–1 and L–2 connectors.

Lineside terminals of type Y–1 and Y–2 connectors, and all terminals for type Y–3 connectors shall be of the semi–permanent type, and shall be designed not to disconnect under tension.

Where the cable size exceeds the capacity of the L–2 and Y–3 connectors the contrractor shall use set screw type splice and tap units with waterproof heat–shrink covering.

- Method of measurement and basis of Payment shall be in accordance with Section 2523 of the Standard and Supplemental Specifications.

① Y–1 connectors are fused. Y–2 and Y–3 connectors are unfused.

② L–1 connectors are fused. L–2 connectors are unfused.

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN | **RM-40**

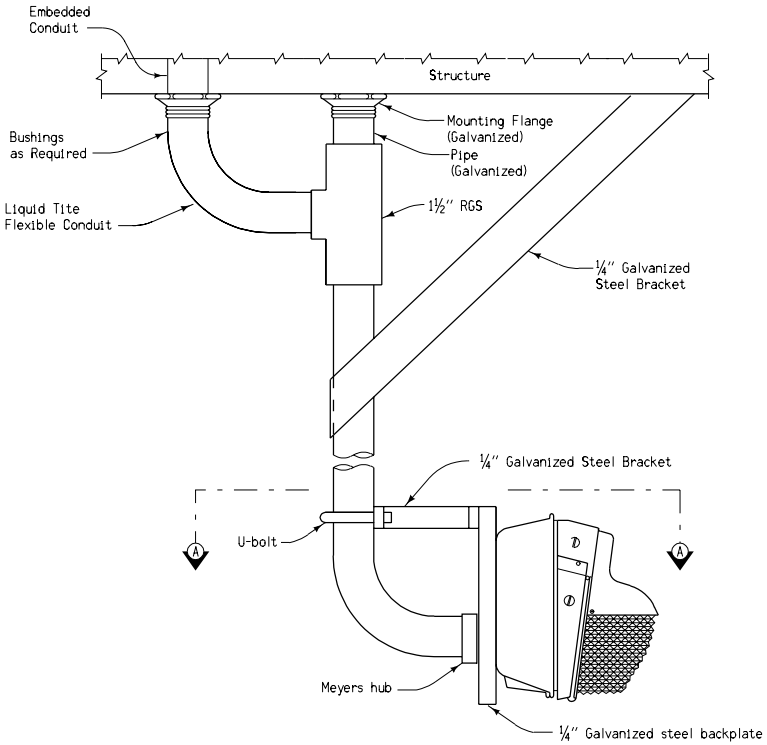
REVISION: Add note.

REVISION NO. 1

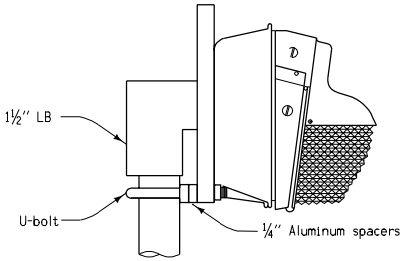
REVISION DATE 09-21-99

05-24-99
APPROVED BY DESIGN METHODS ENGINEER

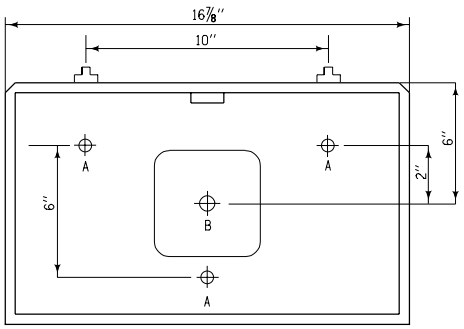
CABLE SPLICES
AND CONNECTORS



CASE A
TOP MOUNTED

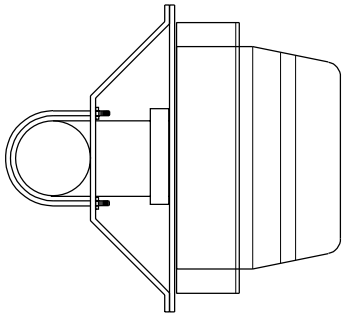


CASE B
STANCHION MOUNTED

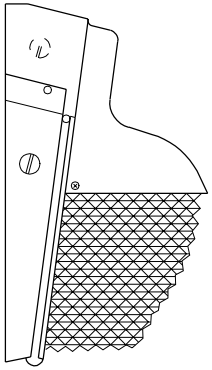


HOLE	DESCRIPTION
A	7/16" (Min.) Mounting Hole
B	Entry for 1½" conduit

SIMPLIFIED BACK VIEW



SECTION A-A



CASE C
WALL MOUNTED

GENERAL NOTES:

Materials and methods of construction shall be in accordance with with current Standard and Supplemental Specifications.

Details shown hereon are typical. Alternate designs may be submitted to the Engineer for approval. Minimum requirements and equivalent materials must be used. Refer to appropriate Standard Road Plans and project plans for any additional requirements for particular installations shown on plans.

Each luminaire shall provide a ballast housing to be attached to, or integral with, the luminaire housing.

Method of Measurement and basis of Payment shall be in accordance with Section 2523 of the Standard and Supplemental Specifications.

LAYOUT LEGEND	
High pressure sodium (Low Mounting Height)	■

Iowa Department of Transportation
Project Development Division

STANDARD ROAD PLAN RM-41

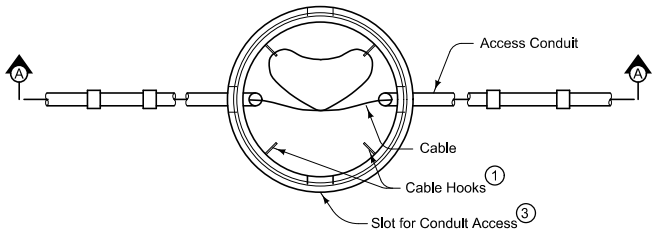
REVISION: Change Title to conform to the specifications.

REVISION NO. 2

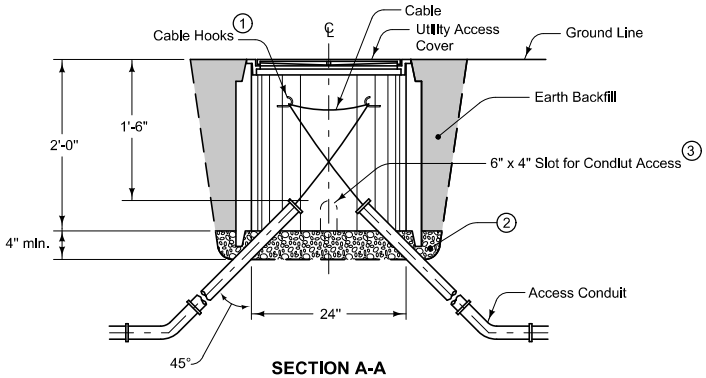
APPROVED BY DESIGN METHODS ENGINEER 01-10-00

REVISION DATE 04-25-00

UNDERDECK LIGHTING (HIGH PRESSURE SODIUM LUMINAIRE)

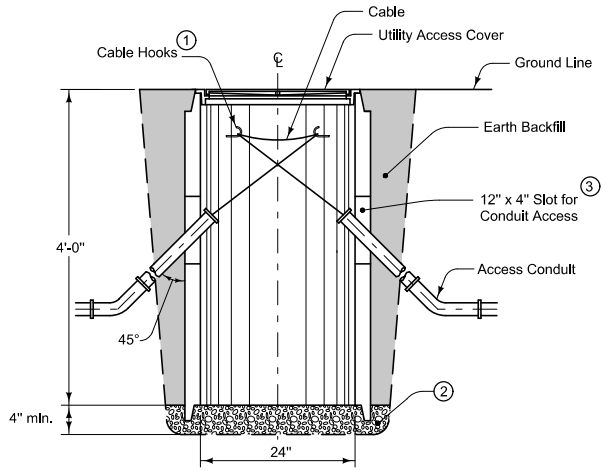


PLAN



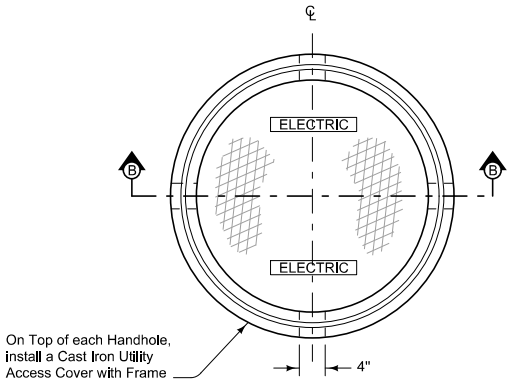
SECTION A-A

Type 1

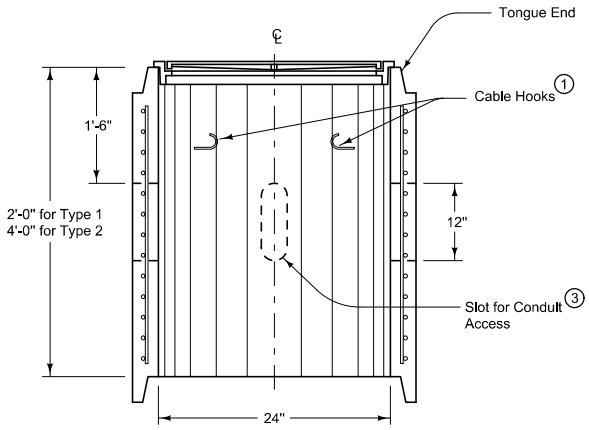


SECTION A-A

Type 2



PLAN



SECTION B-B

Install pipe complying with the requirements of Class 1500 D concrete pipe. Place with Tongue End at top of handhole.

Use cable hooks and handling loops galvanized according to ASTM A153 or ASTM B695.

Use the same material for access conduit as required for the circuit ducts unless otherwise specified.

Minimum Weight (Frame + Cover) = 145 lbs.

(1) $\frac{3}{8}$" diameter Steel Rod or approved equivalent. Cable hooks may be precast with handhole or Installed as approved by the Engineer.

(2) Granular Material meeting requirements of Gradation Number 3 or 5 as shown in the Aggregate Gradation Table from the current General Supplemental Specifications.

(3) Slots for conduit access may be cast at 90 degree spacing, as shown, or cast only as necessary for conduit installation as project plans require. Grout slots with mortar after necessary conduits are installed. See Sections A-A for slot dimensions.

Possible Contract Item:
Handholes and Junction Boxes

Iowa Department of Transportation

REVISION
7 | 10-18-11

STANDARD ROAD PLAN

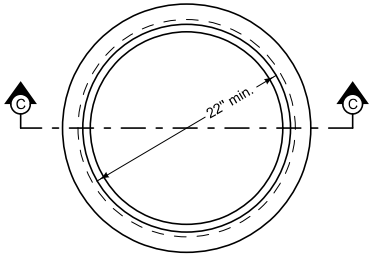
RM-42

SHEET 1 of 2

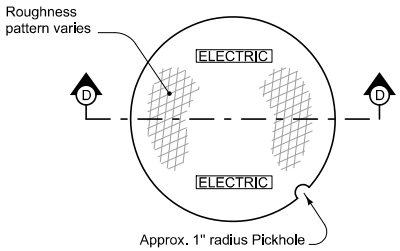
REVISIONS: Added allowance for slots with Type '1' handhole. Removed reference to RF-1.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

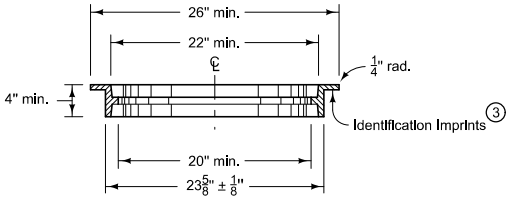
PRECAST HANDHOLE



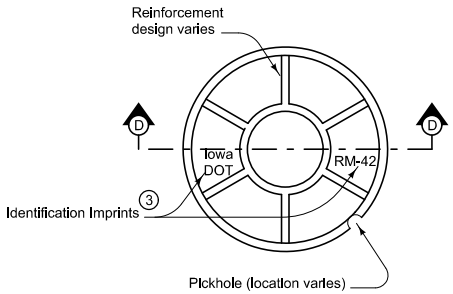
FRAME PLAN



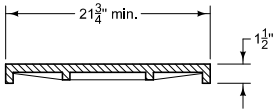
COVER TOP PLAN



SECTION C-C



COVER BOTTOM PLAN



SECTION D-D

③ Place an identification imprint "Iowa DOT RM-42" on each frame and cover according to Materials I.M. 453.04. Covers previously imprinted with "Iowa DOT RA-69" and meeting the dimension and I.M. requirements of this standard are also acceptable.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
7	10-18-11

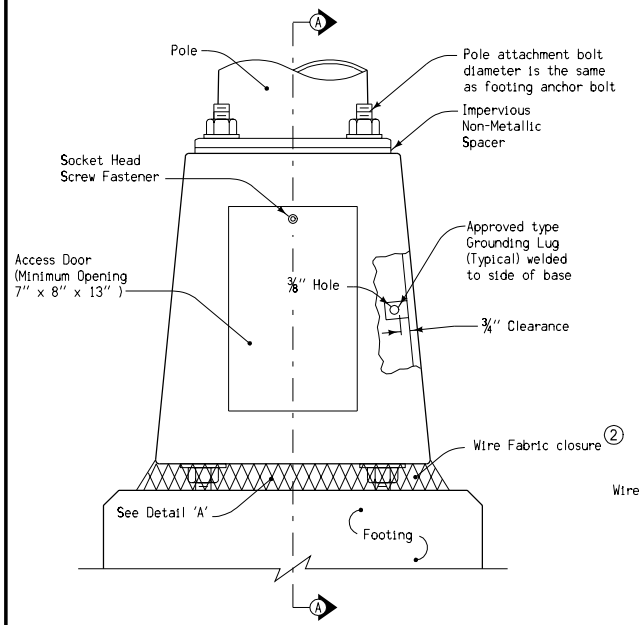
RM-42

SHEET 2 of 2

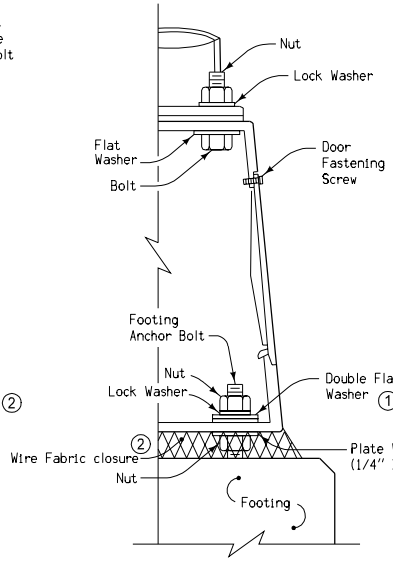
REVISIONS: Added allowance for slots with Type '1' handhole. Removed reference to RF-1.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

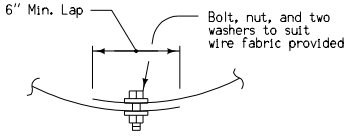
PRECAST HANDHOLE



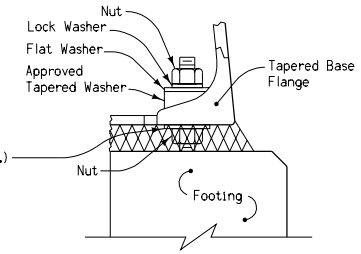
ELEVATION



SECTION A-A



WIRE FABRIC CLOSURE DETAIL (2)



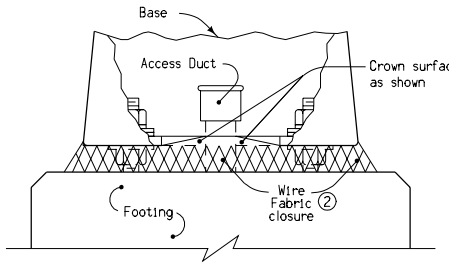
ALTERNATE SECTION A-A

All hardware shall be stainless steel.

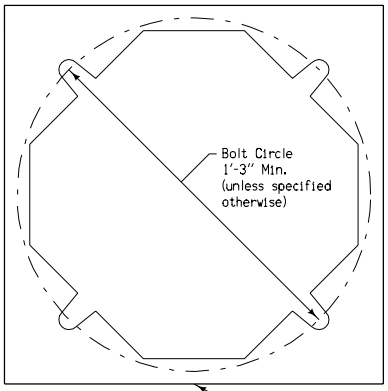
When the design of the base flanges requires the use of tapered, mating washers, such washers shall be of the design and material recommended by the manufacturer of the base.

(1) Use double thickness flat washers only when tapered washer is not required.

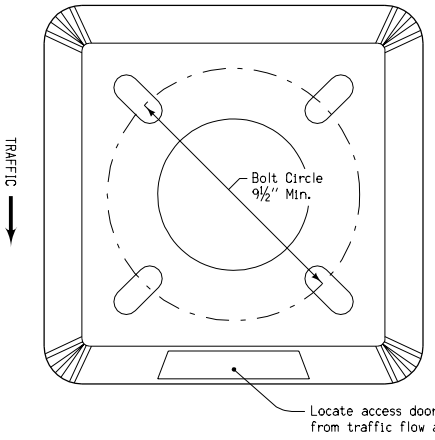
(2) Wire fabric material to comply with Materials I.M. 443.01: Rodent Guard, Expanded Metal. Wire fabric shall be placed around anchor bolt circle between concrete footing and base.



DETAIL 'A'



BOTTOM VIEW



TOP VIEW

Iowa Department of Transportation
Highway Division

STANDARD ROAD PLAN RM-43

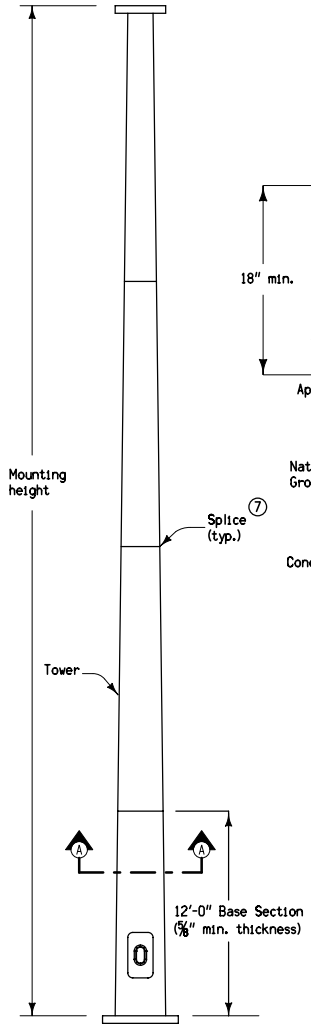
REVISION: Replace grout with wire fabric closure.

REVISION NO. 2

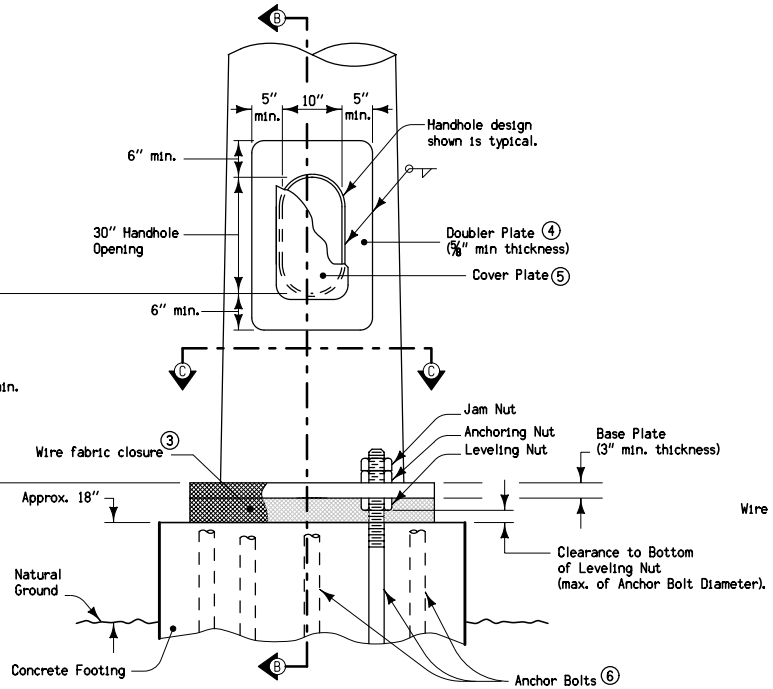
William J. Stein
APPROVED BY DESIGN METHODS ENGINEER

REVISION DATE 10-18-05

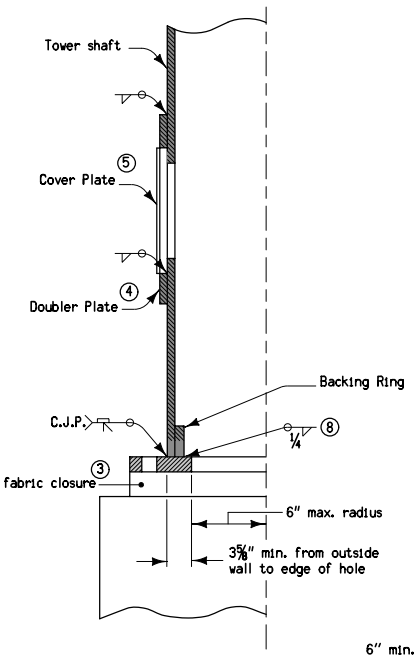
TRANSFORMER BASE (CAST ALUMINUM)



ELEVATION



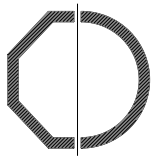
ELEVATION



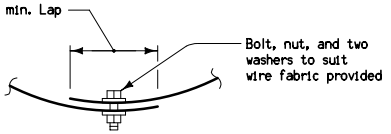
SECTION B-B

(Anchor Bolts not shown for clarity)

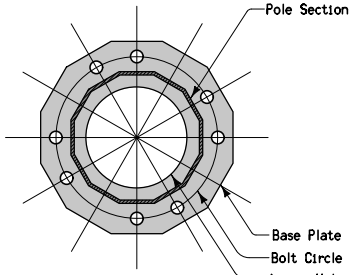
1. Place a minimum of eight anchor bolts for all poles. Place bolts as shown in Section C-C.
2. Tower may be fabricated with circular or polygonal cross-section.
3. Wire fabric material to comply with Materials I.M. 443.01: Rodent Guard, Expanded Metal. Place wire fabric around base plate and extended to the concrete footing. Fit fabric tight to the edge of the base plate and to the top surface of footing to prevent rodent entry.
4. Provide vent holes in doubler plate as needed for galvanizing. After galvanizing, fill holes with caulk approved for joint sealer.
5. Provide two handles on cover plate. Project cover plate beyond the hole at least 1 inch in all directions.
6. Use Anchor Bolt material meeting the requirements of Materials I.M. 453.08.
7. Joint sealer shall be a light gray non-sag urethane caulking sealer marketed for outdoor use as approved by the Engineer.
8. Backing ring shall be continuous or made continuous by a complete joint penetration weld.



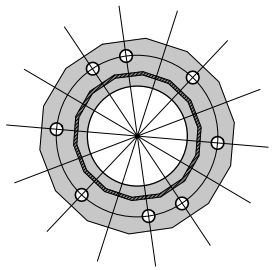
SECTION A-A ②



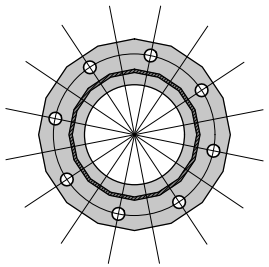
WIRE FABRIC CLOSURE ③



EIGHT ANCHOR BOLT PATTERN FOR DODECAGON (12) TOWER SECTION



EIGHT ANCHOR BOLT PATTERN FOR TETRADECAGON (14) TOWER SECTION



EIGHT ANCHOR BOLT PATTERN FOR HEXADECAGON (16) TOWER SECTION

SECTION C-C ①

Possible Contract Item:

Lighting Tower

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
5	10-20-09

RM-44

SHEET 1 of 1

REVISIONS: New release of previously voided standard.

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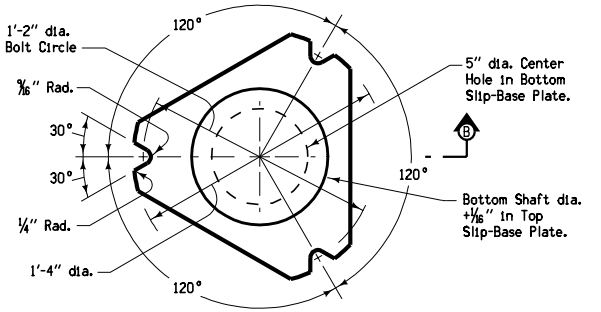
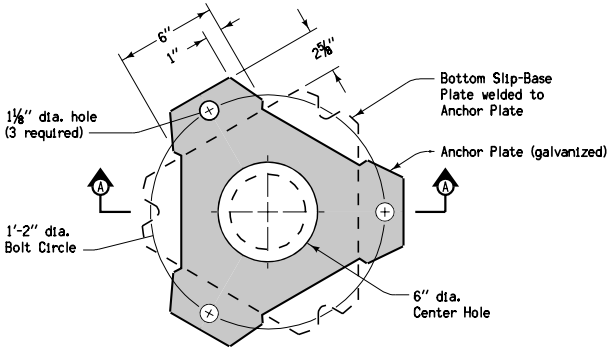
APPROVED BY DESIGN METHODS ENGINEER

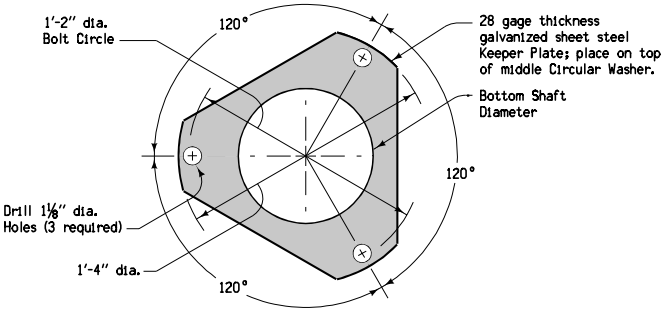
LIGHTING TOWER



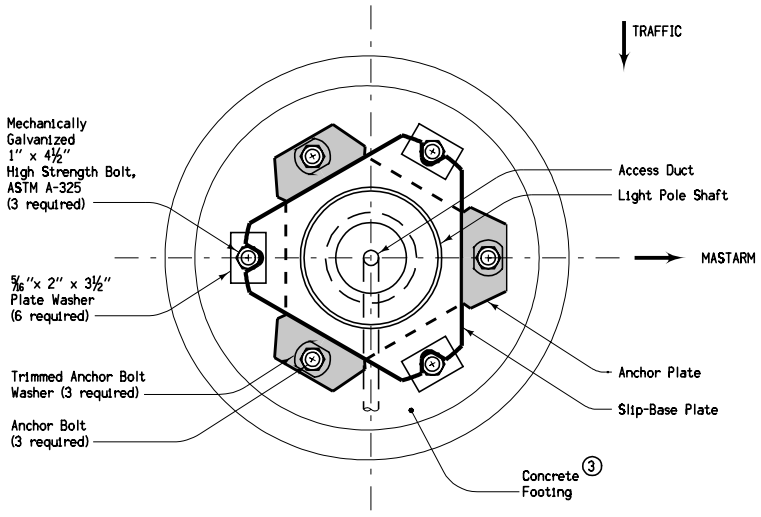
SLIP-BASE PLATE



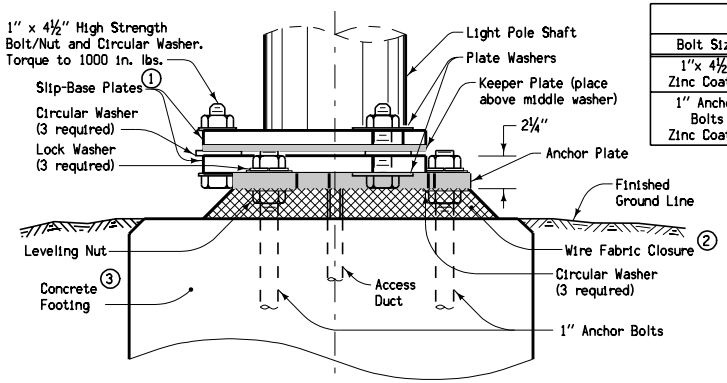
ANCHOR PLATE



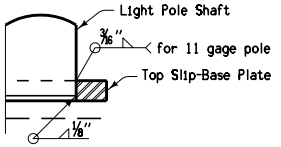
KEEPER PLATE



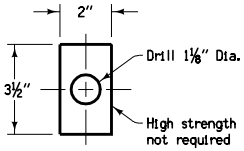
PLAN



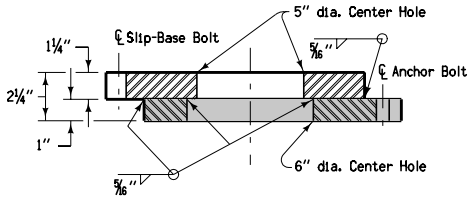
ELEVATION



TYPICAL HALF SECTION 'B'



5/16" THICK PLATE WASHER



SECTION A-A ANCHOR PLATE

1. The top Slip-Base Plate shall be positioned to clear all Anchor Bolts.
2. Wire fabric material shall comply with Materials I.M. 443.01. Wire fabric shall be placed around anchor bolt circle between concrete footing and base plate. The fabric shall fit tight to the bottom surface of the base plate and the top surface of the footing to prevent rodent entry.
3. Refer to RM-47 for footing details.

HARDWARE CLASSIFICATION

Bolt Size	Bolt Grade	Nuts	Washers	Galvanizing
1"x 4 1/2" Zinc Coated	ASTM A-325 Zinc Coated	ASTM A-563-DH Zinc Coated	ASTM F-436 Zinc Coated	ASTM B-695 Class C-Type 1
1" Anchor Bolts Zinc Coated	ASTM F-1554 Grade 105 Zinc Coated	ASTM A-563-DH Zinc Coated	ASTM F-436 Zinc Coated	ASTM A-153 Class C

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
6	10-16-07

RM-46

SHEET 1 of 1

REVISIONS: Added note 2 and 3.

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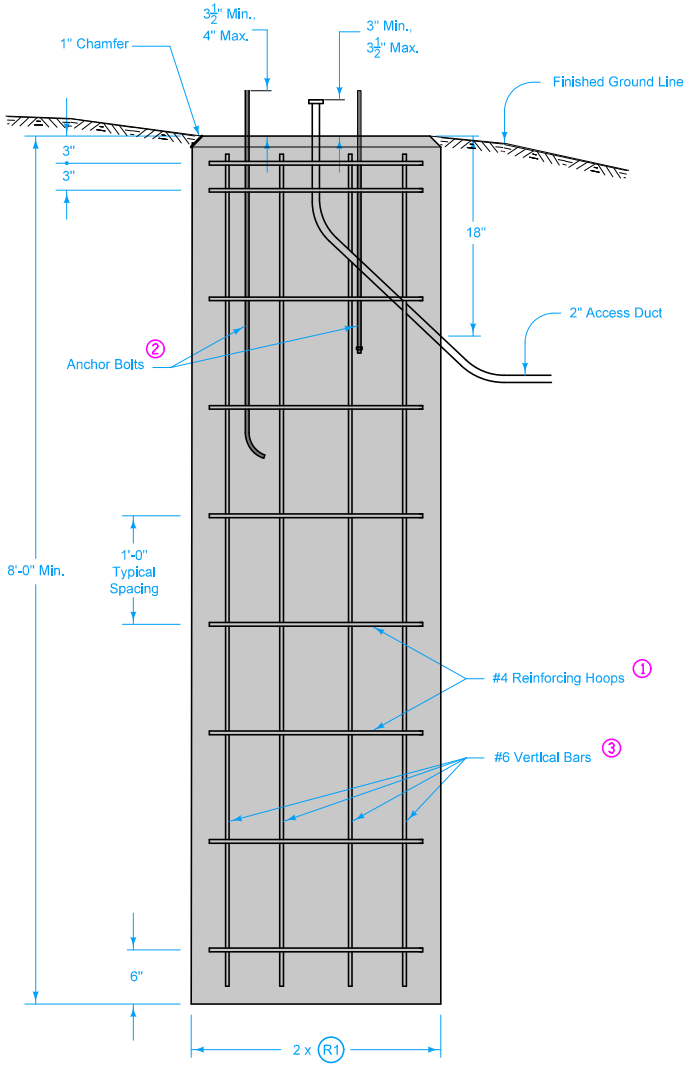
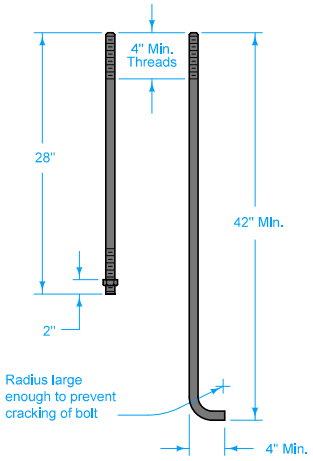
APPROVED BY DESIGN METHODS ENGINEER

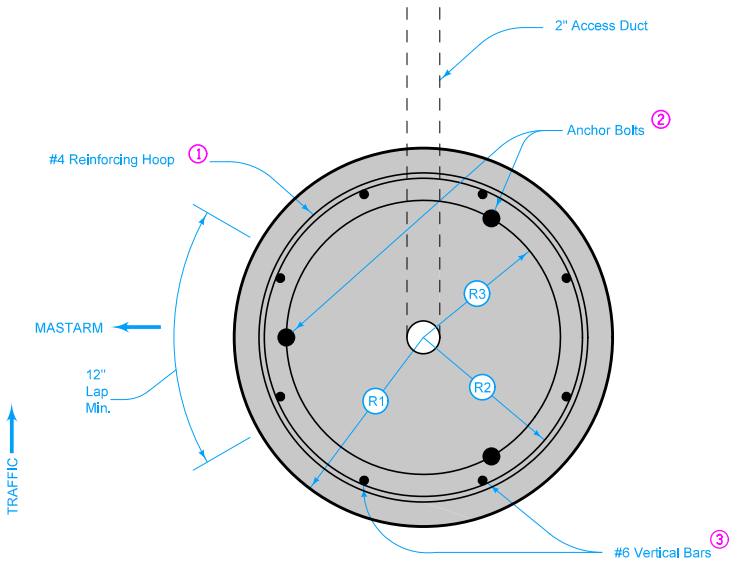
SLIP BASE FOR LIGHT POLES



TYPICAL SECTION



1" ANCHOR BOLTS ②



PLAN

Diameter of footing is determined by the Anchor Bolt Circle required for the pole being installed.

Provide minimum 2" clear for all reinforcement.

(R1) = Radius of footing, minimum of 2" greater than R2, 13.5" minimum.

(R2) = Radius of the reinforcing hoop, minimum of 1" greater than R3.

(R3) = Radius of the anchor bolt circle.

When precast footings are used, backfill with Class B concrete. When caving soil or ground water are present, remove to provide an acceptable condition prior to placing Class B concrete.

① #4 bars lapped a minimum of 12". Hoops may be welded to vertical bars.

② Three anchor bolts required per footing. Either anchor bolt type may be used.

③ Use #7 bars when mounting height is greater than 44 feet.

Iowa Department of Transportation

REVISION 7 10-18-11

STANDARD ROAD PLAN

RM-47

SHEET 1 of 1

REVISIONS: Corrected title spelling.

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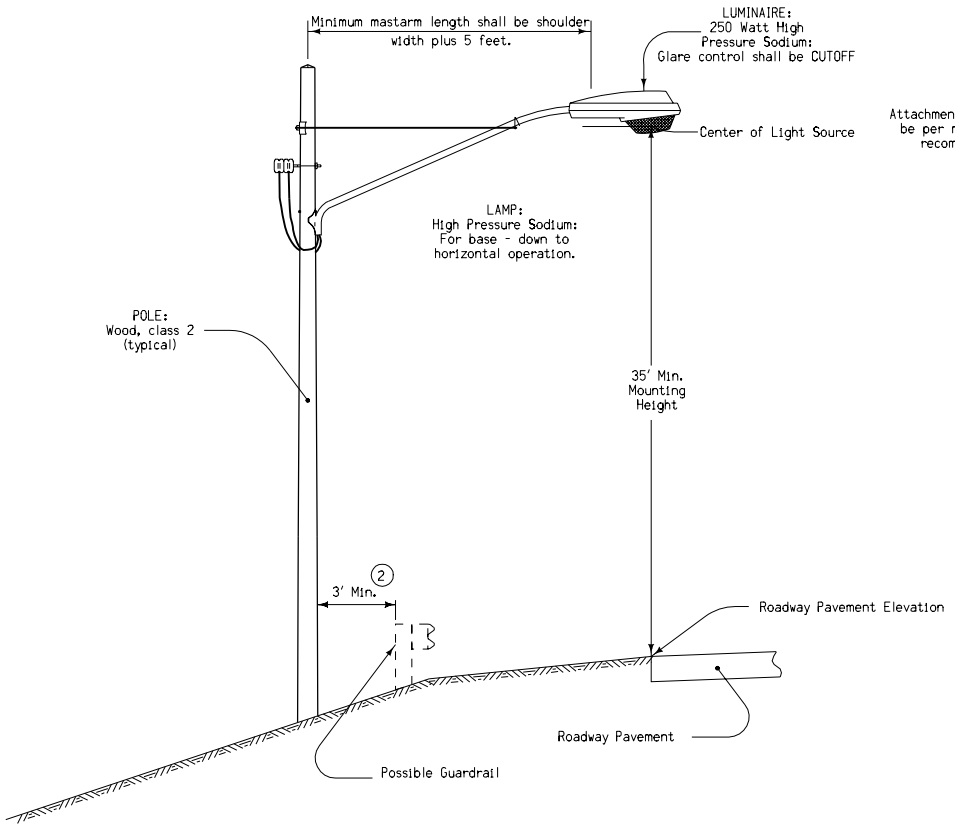
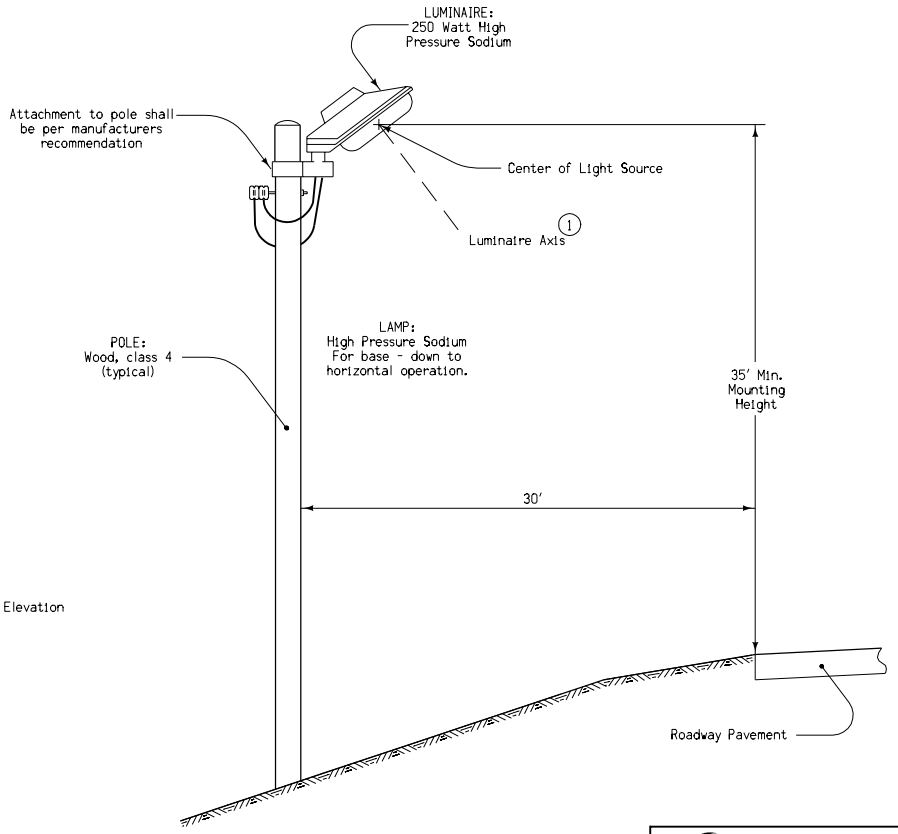
APPROVED BY DESIGN METHODS ENGINEER

FOOTING FOR SLIP-BASE LIGHT POLES

CONVENTIONAL



OFFSET



1 Luminaire axis shall be directed to within the limits of the near traffic lane unless specified otherwise.

2 When protecting pole with guardrail.

Contract item:
Temporary Floodlighting Luminaire

Tabulation:
108-27

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-17-06

RM-48

SHEET 1 of 1

REVISIONS: Show guardrail as optional.

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TEMPORARY FLOODLIGHTING

Pavement Rehabilitation

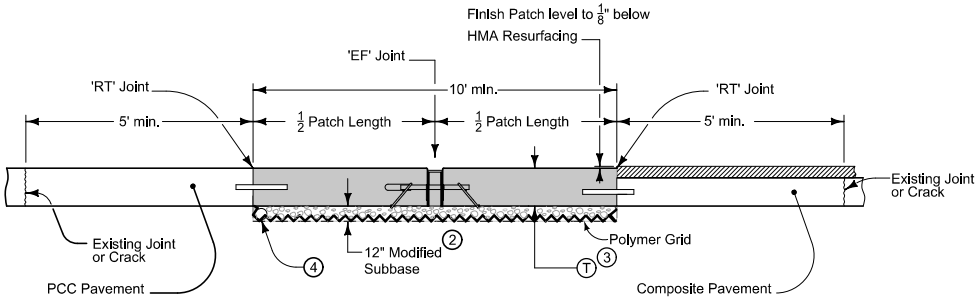
RR

SECTION

Pavement Rehabilitation

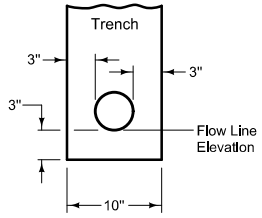
RR

NO.	DATE	TITLE
RR-1	04-17-12	Full Depth Patch with 'EF' joint in PCC
RR-2	04-19-11	Full Depth PCC Patch without Dowels
RR-4	04-19-11	Full Depth PCC Patch with Dowels
RR-18	04-19-11	Full Depth Patch Continuous Reinforced P.C. Concrete Pavement
RR-21	10-17-06	PCC Crack and Joint Cleaning and Sealing
RR-23	04-19-11	Double Reinforced Pavement Over Box Culverts
RR-24	04-19-11	Reinforced Concrete Panel at Box Culverts
RR-25	10-18-05	HMA Wedge for Superelevation
RR-26	04-19-11	Subbase Patches

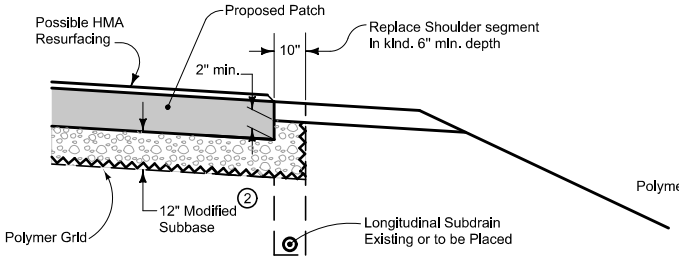


SECTION A-A

DOWELED PCC PAVEMENT

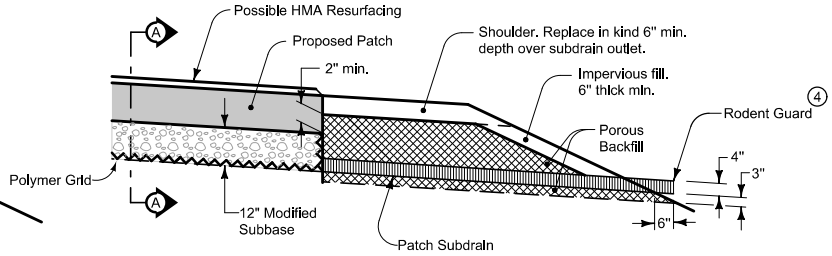


DRAIN PLACEMENT (4)



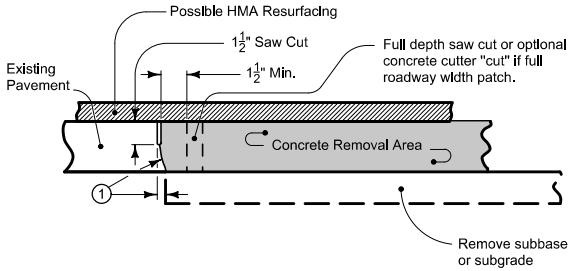
MODIFIED SUBBASE AND SUBDRAIN

IF LONGITUDINAL SUBDRAIN IS PRESENT OR IS TO BE PLACED

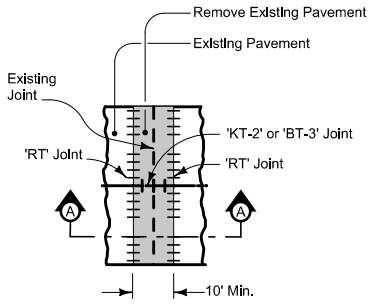


MODIFIED SUBBASE AND SUBDRAIN (4)

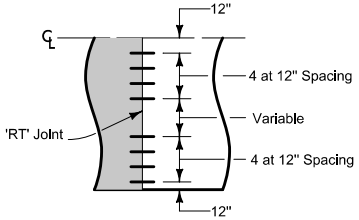
WITHOUT LONGITUDINAL SUBDRAIN



PAVEMENT REMOVAL DETAILS



FULL ROADWAY WIDTH PATCH



TYPICAL HALF PLAN

Place Full Depth Patch with 'EF' Joint after the final lift of asphalt has been placed. Porous Backfill and Subdrain may be placed prior to construction of resurfacing of shoulders.

Place Full Depth Patch according to Full Depth Patch specifications and Standard Road Plan **RR-4**, except as noted on this sheet.

Place Full Depth Patch and 'EF' Joint full width of the roadway. If roadway has PCC shoulders, extend 'CF' joint across shoulder. Cost of placing 'CF' joint is incidental to 'EF' joint.

See **PV-101** for joint and bar placement details.

(1) Break out concrete within 1 1/2 " of saw cut with hand tools to ensure near vertical face with minimal undercut or protrusion. No need to remove protrusions smaller than 2 inches if uniformly tapered from bottom of saw cut to bottom of pavement. A step or ledge on this face is not allowed.

(2) 12 inches Modified Subbase is required under Full Depth Patch with 'EF' Joint. Extend Modified Subbase over longitudinal subdrain, if present.

(3) Unless otherwise noted in the plans, depth of patch, T, is 12 inches regardless of existing pavement thickness.

(4) If longitudinal subdrain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, then place Patch Subdrain at low end(s) of patch. Use removable grate rodent guard except for projects using recycled PCC subbase where a removable fork rodent guard is required. Refer to **RF-19E** for rodent guard details. Refer to Drain Placement detail.

Possible Contract Items:
- Joint Assembly, EF
- Patches, Full-Depth Repair
- Patches by Count (Repair)
- Patches, Full-Depth Finish, by Area
- Patches, Full-Depth Finish, by Count
- Patch Subdrain
- Subbase Patch with EF Joint

Possible Tabulation:
- 102-6C

Iowa Department of Transportation

REVISION: 5 | 04-17-12

STANDARD ROAD PLAN

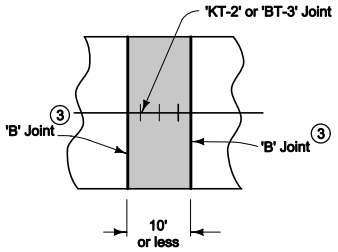
RR-1

SHEET 1 of 1

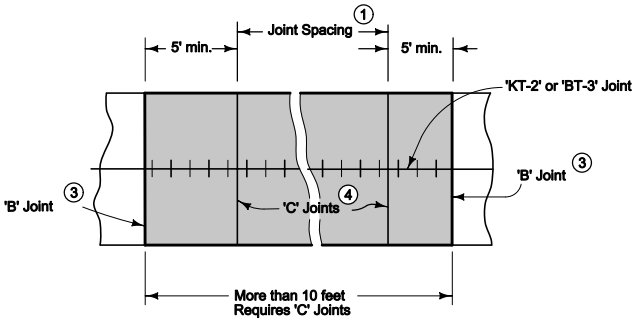
REVISIONS: Increased minimum patch length from 6' to 10' and added Polymer Grid under Subbase Patch.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

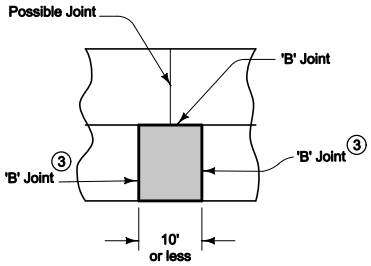
FULL DEPTH PATCH WITH 'EF' JOINT IN PCC



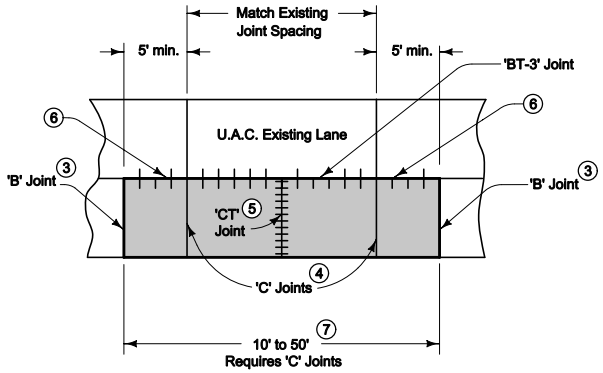
FULL ROADWAY WIDTH PATCH



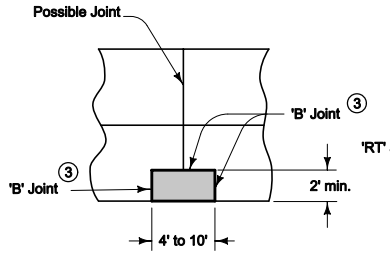
FULL ROADWAY WIDTH PATCH



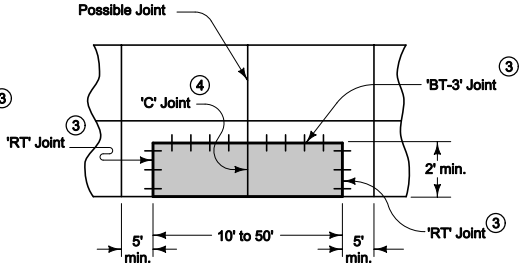
ONE LANE WIDTH PATCH



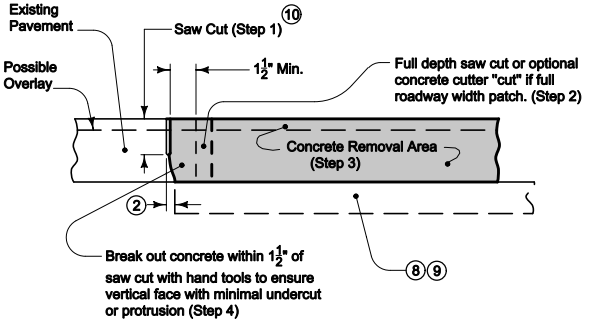
ONE LANE WIDTH PATCH



PARTIAL LANE WIDTH PATCH



PARTIAL LANE WIDTH PATCH



PAVEMENT REMOVAL

See PV-101 for joint and bar placement details.

Construct rectangular patches even when existing pavement joints are skewed.

① Joint spacing 10 feet minimum, 20 feet maximum, 15 feet optimum.

② The face of the patch should be near vertical. Protrusions less than 2 inches need not be removed if uniformly tapered from bottom of saw cut to bottom of patch. A step or ledge on this face is not allowed.

③ If resurfacing is part of the contract, joint shall not be sawed after patching nor be sealed. If patch is not to be surfaced, then saw and seal according to PV-101.

④ If resurfacing is part of the contract, 'C' joints shall be sawed but not sealed. If the patch is not to be resurfaced, then saw and seal according to PV-101.

⑤ Establish a new joint at approximate mid patch. This joint does not need to align with any existing joint or crack in adjacent pavement.

⑥ 'B' joint if end of patch does not match an existing joint or crack in the adjacent lane.

⑦ If one lane patch exceeds 50 feet, both lanes should be considered for patching.

⑧ Possible Subbase Patch, see RR-26.

⑨ If longitudinal subdrain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, then place drain per RR-26.

⑩ Saw cut through overlay so that cut is $1\frac{1}{2}$ inches into original pavement.

Possible Contract Items:
- CT Joint
- Patches, Full-Depth Repair
- Patches by Count (Repair)
- Patches, Full-Depth Finish, by Count
- Patches, Full-Depth Finish, by Area

Possible Tabulation:
- 102-6C

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
7	04-19-11

RR-2

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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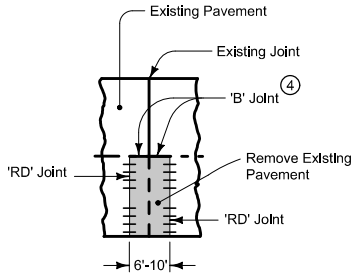
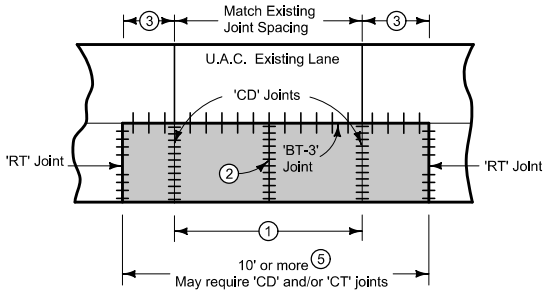
APPROVED BY DESIGN METHODS ENGINEER

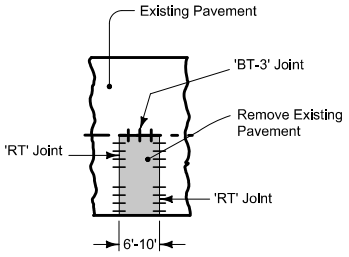
FULL DEPTH PCC PATCH WITHOUT DOWELS



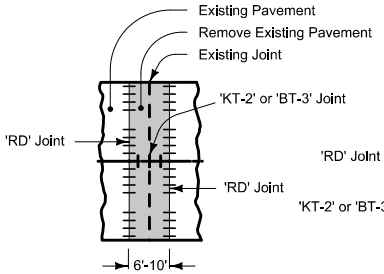
ONE LANE WIDTH PATCH



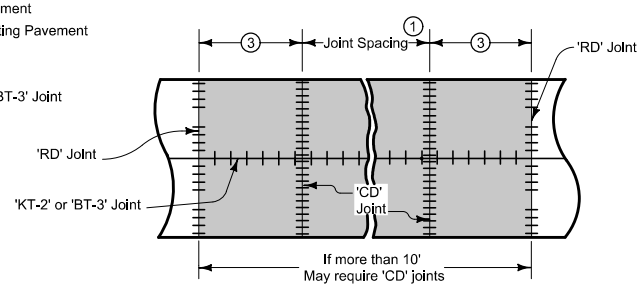
ONE LANE WIDTH PATCH



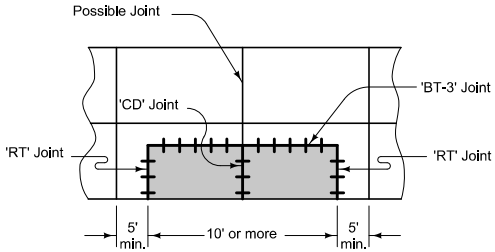
ONE LANE PATCH (NO OPPOSING JOINT)



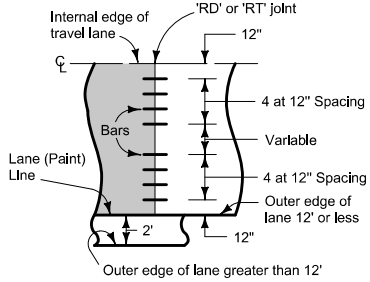
FULL ROADWAY WIDTH PATCH



FULL ROADWAY WIDTH PATCH



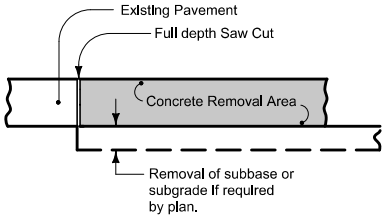
PARTIAL LANE WIDTH PATCH



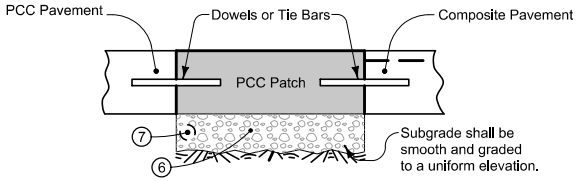
DETAIL FOR 'RT' OR 'RD' JOINT BAR SPACING

TYPICAL HALF PLAN

For interior lanes, place first bar 12" from edge of lane (slab).



PAVEMENT REMOVAL DETAILS



LONGITUDINAL SECTION THRU PATCH

BAR SIZE TABLE			
Existing PCC Pavement Thickness	Less than 8"	8" to 10"	More than 10"
DOWEL SIZE	$\frac{3}{4}$"	$1\frac{1}{4}$"	$1\frac{1}{2}$"
TIE BAR SIZE	#6	#10	#11

See **PV-101** for joint and bar placement details.

Construct rectangular patches even when existing pavement joints are skewed.

1. Joint spacing 10 feet minimum, 20 feet maximum, 15 feet optimum.
2. If there is no existing joint or crack in the adjacent pavement, place a 'CT' joint. If there is an existing joint or crack in the adjacent pavement, place a 'CD' joint at the same transverse location. Saw and do not seal 'CT' joints.
3. New 'CD' joint must be a minimum 5 feet from the patch end.
4. Do not saw or seal the joint. Place $\frac{1}{2}$ inch preformed joint material between patch and concrete in adjacent lane.
5. If one lane patch exceeds 50 feet, both lanes should be considered for patching.
6. Possible Subbase Patch, see RR-26.
7. If longitudinal subdrain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, then place drain per RR-26.

Possible Contract Items:
- CD Joint Assembly
- CT Joint
- Patches by Count (Repair)
- Patches, Full-Depth Finish, by Area
- Patches, Full-Depth Finish, by Count
- Patches, Full-Depth Repair

Possible Tabulation:
- 102-6C

Iowa Department of Transportation

REVISION: 6 | 04-19-11

STANDARD ROAD PLAN

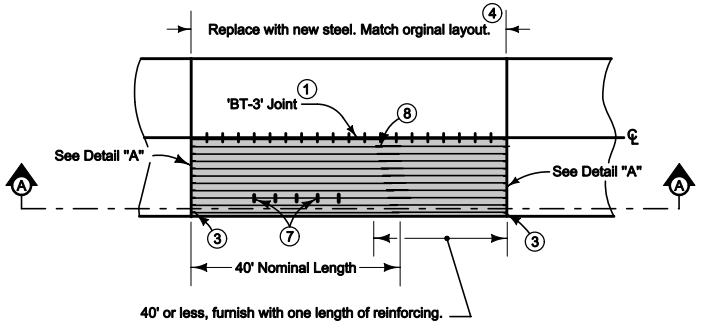
RR-4

SHEET 1 of 1

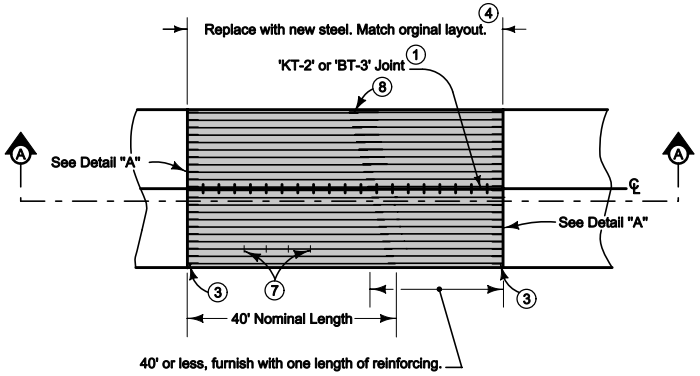
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

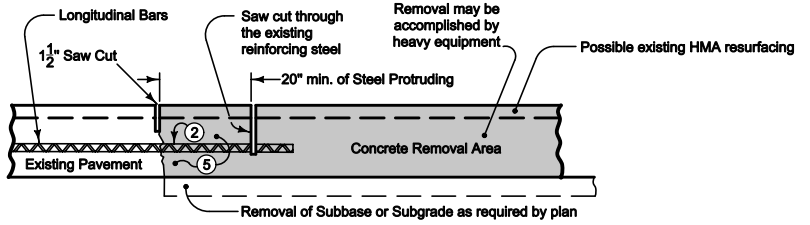
FULL DEPTH PCC PATCH WITH DOWELS



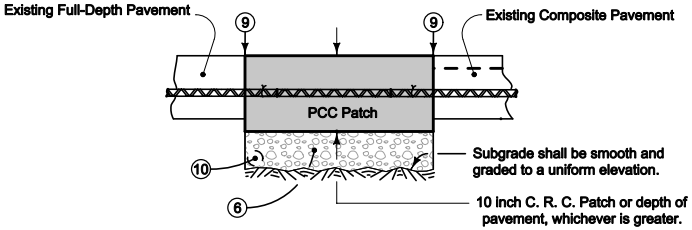
ONE LANE WIDTH PATCH



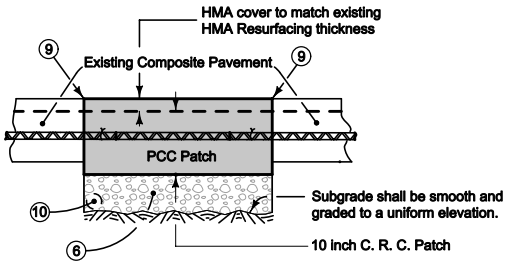
FULL ROADWAY WIDTH PATCH



DETAIL "A"
PAVEMENT REMOVAL DETAILS LONGITUDINAL SECTION



SECTION A-A
PCC ONLY PATCH OPTION



SECTION A-A
COMPOSITE PATCH OPTION

1. If patch is over 10 feet in length, replace tie bars. See PV-101 for joint details.
2. Reasonable care shall be taken to preserve the 20 inch length of longitudinal steel when removing concrete.
3. 18 inch minimum lap between existing and new reinforcing bars 2 wire ties per lap.
4. Minimum length of patch is 8 feet.
5. Pavement area shall be broken and removed to ensure vertical face with minimal undercut or protrusion.
6. Possible Subdrain Patch, see RR-26.
7. Longitudinal bars shall be placed at approximately midpoint of the slab and supported at approximately 4 foot intervals.
8. Lap bars 25 diameters of steel or 24 inch minimum for mesh; patches 8 feet to 40 feet no immediate lap joint; over 40 feet length lap joint as required to not exceed 40 feet spacing.
9. Do not saw or seal the joint after patch is placed.
10. If longitudinal subdrain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, then place drain per RR-26.

Possible Contract Items:
- Patches by Count (Repair)
- Patches, Full-Depth Finish, by Area
- Patches, Full-Depth Finish, by Count
- Patches, Full-Depth Repair

Possible Tabulation:
- 102-6C

Iowa Department of Transportation

REVISION
4 | 04-19-11

STANDARD ROAD PLAN

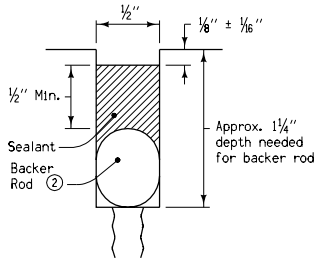
RR-18

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

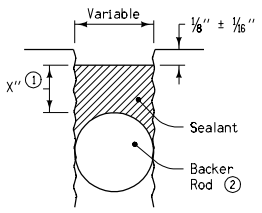
FULL DEPTH PATCH CONTINUOUS REINFORCED P.C. CONCRETE PAVEMENT



Note: Center ½" saw cut over the crack

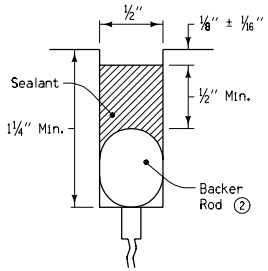
CLASS I CRACK

RANDOM CRACK LESS THAN ½" IN WIDTH



CLASS II CRACK

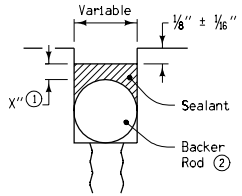
RANDOM CRACK ½"-1½"



Note: Center ½" saw cut over existing joint

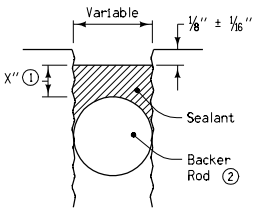
CLASS III JOINT

EXISTING JOINT LESS THAN ½" WIDE



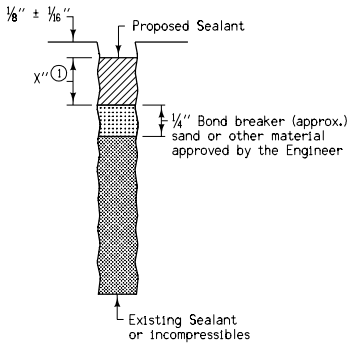
CLASS IV JOINT

EXISTING WIDTH ½"-1½"

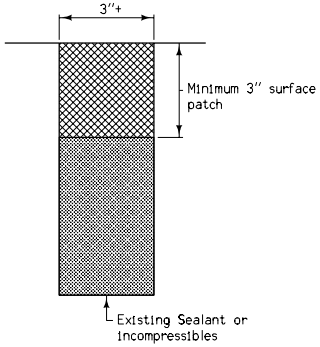


CLASS V CRACK OR JOINT

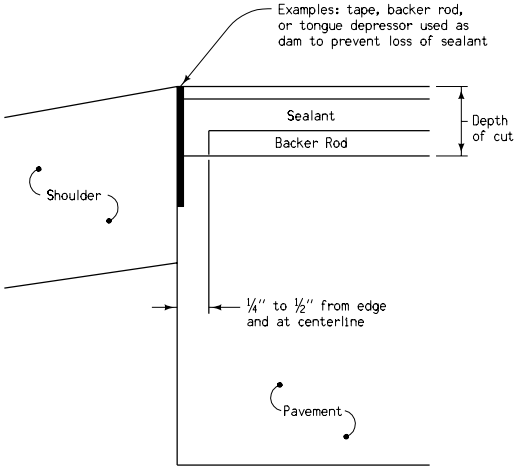
EXISTING WIDTH 1½"-3"



ALTERNATE BOND BREAKER FOR
CLASS II CRACK
CLASS IV JOINT
CLASS V CRACK OR JOINT



GREATER THAN 3" OPENING



BACKER ROD PLACEMENT DETAIL

(1) X" = ½" Minimum when width is 1" or less
2:1 (Width:Depth) when width is greater than 1"

(2) Minimum diameter shall be one nominal size larger than the existing crack or joint

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-17-06

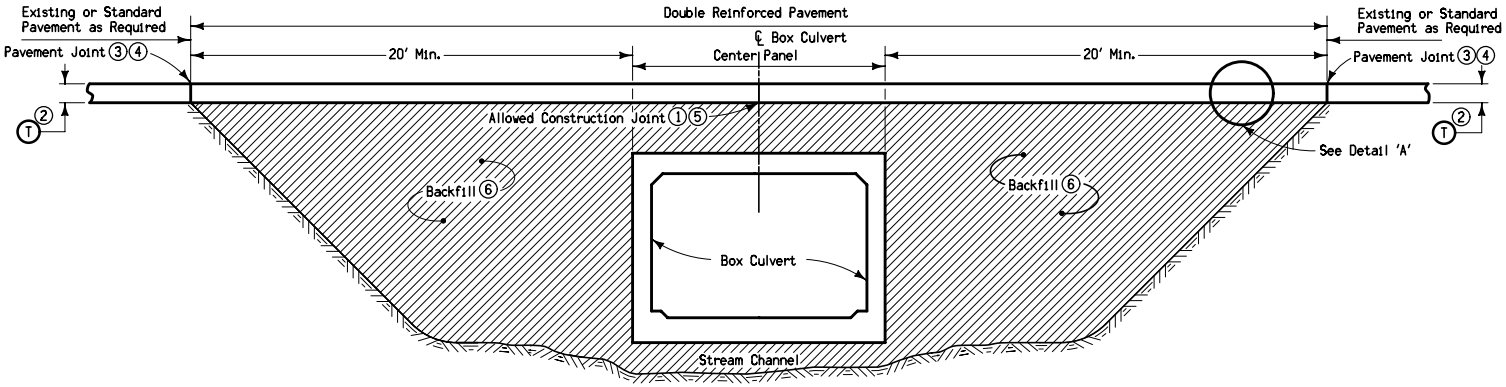
RR-21

SHEET 1 of 1

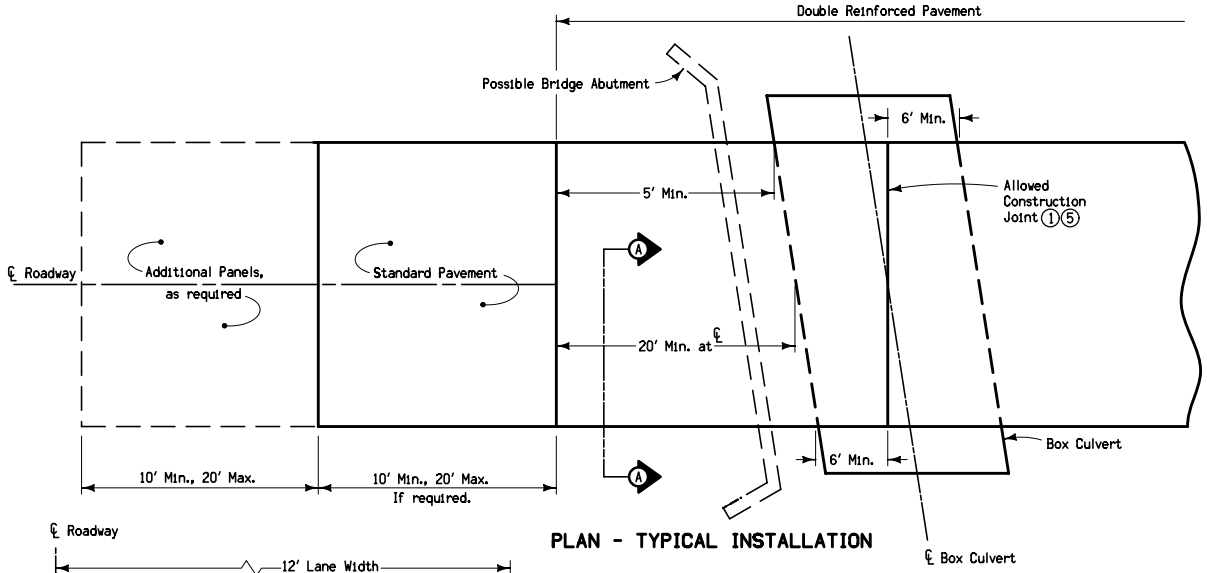
REVISIONS: Deleted "by others" from 3" patch note.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

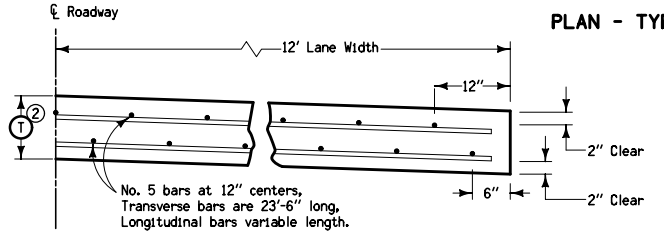
PCC CRACK AND JOINT CLEANING AND SEALING



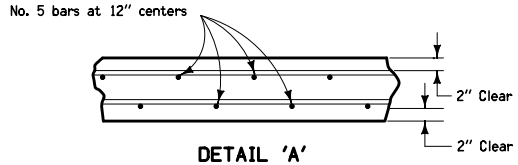
SECTION - TYPICAL INSTALLATION AT ℄



PLAN - TYPICAL INSTALLATION



SECTION A-A
Half Section



DETAIL 'A'
PARTIAL LONGITUDINAL SECTION

Price bid for standard pavement of the specified thickness shall be considered full compensation for constructing the pavement as detailed hereon and elsewhere in the plans, including all necessary reinforcement and expansion joints as required on this sheet.

See PV-101 for joint details.

(1) Construction Joints will be allowed if:
A. Joint is located at center of culvert.
B. Joint is a minimum of 6 feet from edge of culvert.
C. Two joints may be used if condition B is met and center panel is a minimum of 15 feet in length.

(2) Refer to typical sections elsewhere in plans for pavement thickness, T. Minimum T=8 inches.

(3) Existing Pavement Joints:
A. When joints are 'C'; use 'B' joint.
B. When joints are 'CD'; use 'RD' joint.
C. If existing pavement is HMA or Composite (HMA over PCC); use 'B' joint.

(4) New Pavement Joints:
A. When joints are 'C'; use 'B' joint.
B. When joints are 'CD'; use 'CD' joint.

(5) Lap all bars 15 inches.

(6) Limits of excavation and type of backfill shall be as shown elsewhere on the plan.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
3	04-19-11

RR-23

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

Deanna Maifield
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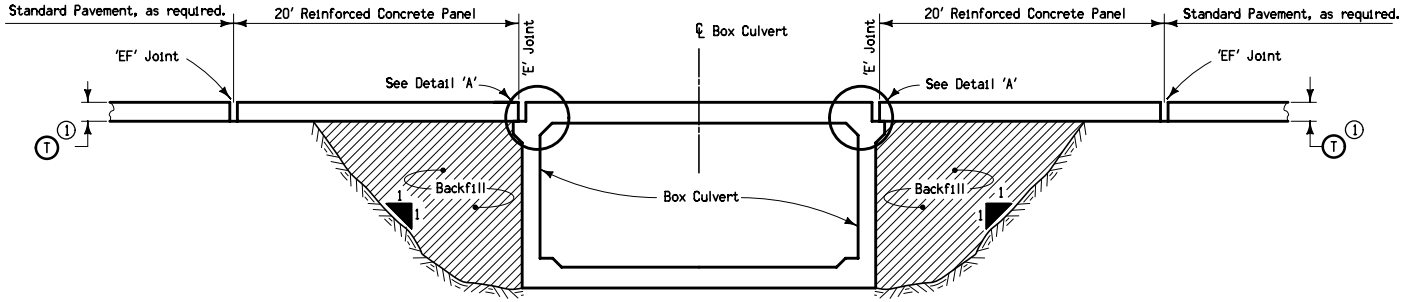
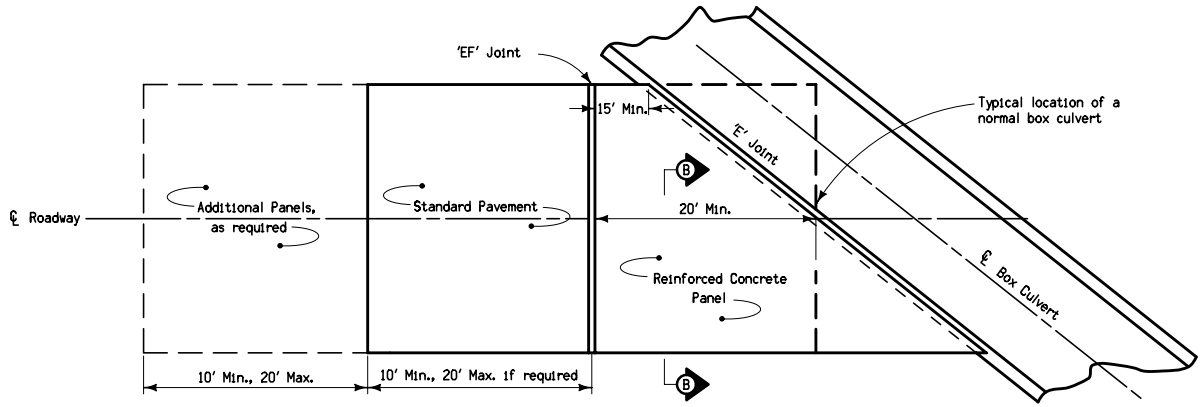
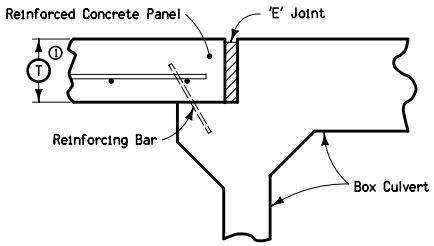
DOUBLE REINFORCED PAVEMENT OVER BOX CULVERTS



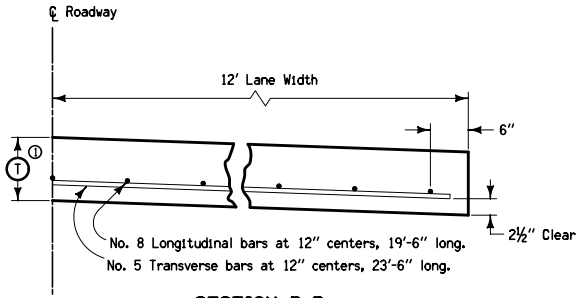
SECTION - TYPICAL INSTALLATION



PLAN - TYPICAL INSTALLATION



DETAIL 'A'



SECTION B-B
Half Section

Price bid for standard pavement of the specified thickness shall be considered full compensation for constructing the pavement as detailed, including all necessary reinforcement and expansion joints as required on this sheet.

Quantity for 20 feet long by 24 feet wide Reinforced Concrete Panel is 53.3 square yards.

See PV-101 for joint details.

(1) Refer to plans for pavement thickness (T).

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
3	04-19-11

RR-24

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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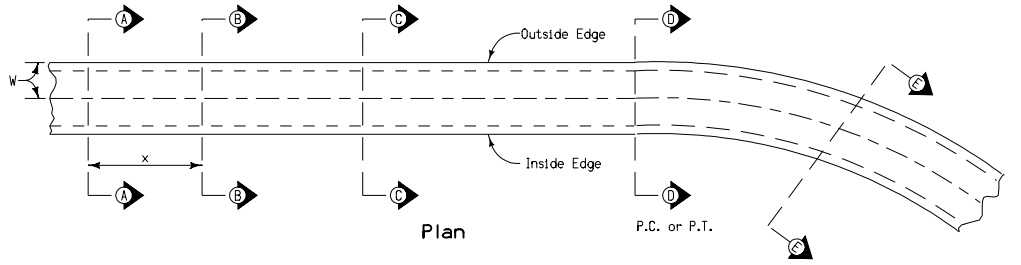
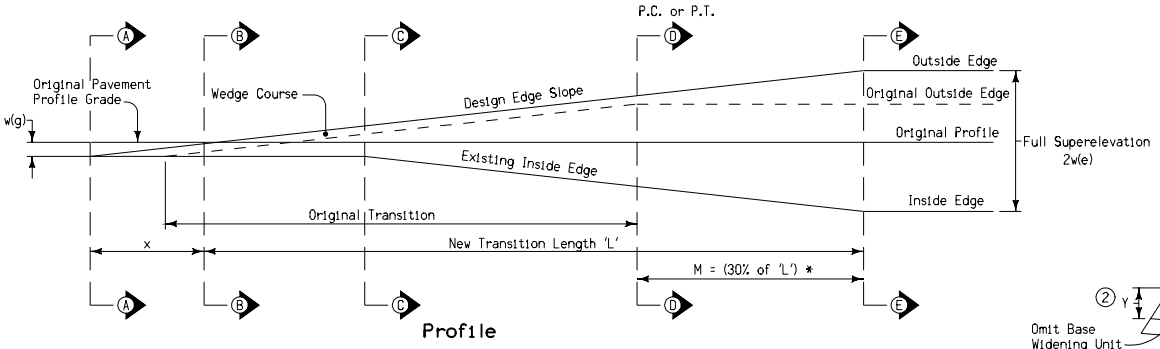
REINFORCED CONCRETE PANEL AT BOX CULVERTS





Transition lengths for a given design speed should never be less than the minimums indicated in the table, regardless of pavement width. The "x" dimensions given in the tables are based on normal crown cross slope of 2%.

Tabulation: 101-8

* If the existing cross slope at the PC/PT exceeds 70% of the proposed "e", the value of "M" shall be determined by the following formula:

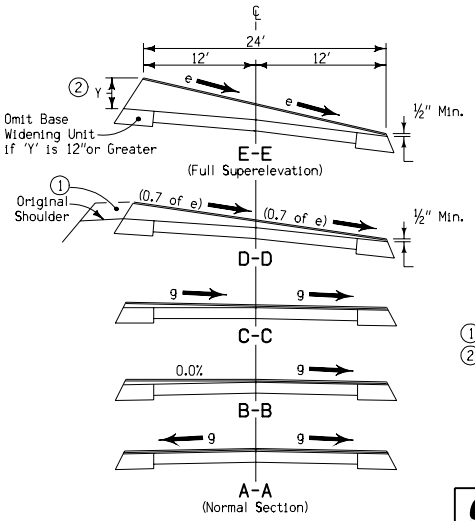
$$M = L - \left[\frac{(L)\ (E)}{(e)}\right]$$

E = Existing Cross Slope at PC/PT (%)
e = Full superelevation (%)
L = Transition length

DESIGN SPEED (mph)

Degree of Curve	Radius (ft)	40			45			50			55			60			65			70		
		e	L	x	e	L	x	e	L	x	e	L	x	e	L	x	e	L	x	e	L	x
0°15′	22918	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
0°30′	11459	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	53	53	RC	56	56	RC	60	60
0°45′	7639	NC	0	0	NC	0	0	RC	48	48	RC	51	51	2.2	59	53	2.5	69	56	2.7	82	60
1°00′	5730	NC	0	0	RC	44	44	2.1	50	48	2.5	63	51	2.9	76	53	3.2	89	56	3.6	107	60
1°30′	3820	2.1	43	41	2.5	56	44	3.0	72	48	3.5	90	51	4.1	108	53	4.6	127	56	5.1	153	60
2°00′	2865	2.7	55	41	3.2	72	44	3.8	92	48	4.5	114	51	5.1	137	53	5.8	161	56	6.5	194	60
2°30′	2292	3.2	67	41	3.9	87	44	4.6	110	48	5.3	135	51	6.1	162	53	6.8	189	56	7.5	225	60
3°00′	1910	3.8	78	41	4.5	100	44	5.2	126	48	6.0	154	51	6.8	182	53	7.5	210	56	8.0	239	60
3°30′	1637	4.3	88	41	5.0	112	44	5.8	140	48	6.6	169	51	7.4	197	53	7.9	221	56	Dmax. = 3°00′		
3°45′	1528	4.5	93	41	5.3	117	44	6.1	146	48	6.9	176	51	7.6	203	53	8.0	223	56			
4°00′	1432	4.7	97	41	5.5	122	44	6.3	152	48	7.1	182	51	7.8	207	53	Dmax. = 3°45′					
4°30′	1273	5.1	105	41	5.9	132	44	6.8	162	48	7.5	192	51	8.0	213	53						
4°45′	1206	5.3	109	41	6.1	136	44	7.0	167	48	7.7	196	51	8.0	213	53						
5°00′	1146	5.4	113	41	6.3	140	44	7.1	171	48	7.8	199	51	Dmax. = 4°45′								
5°30′	1042	5.8	119	41	6.6	148	44	7.4	179	48	8.0	203	51									
5°45′	996	5.9	122	41	6.8	151	44	7.6	182	48	8.0	204	51									
6°00′	955	6.1	125	41	6.9	154	44	7.7	184	48	Dmax. = 5°45′											
6°30′	881	6.3	131	41	7.2	160	44	7.9	188	48												
7°00′	819	6.6	136	41	7.4	165	44	8.0	191	48												
7°30′	764	6.8	141	41	7.6	169	44	8.0	192	48												
8°00′	716	7.0	145	41	7.8	173	44	Dmax. = 7°30′														
8°30′	674	7.2	149	41	7.9	175	44															
9°00′	637	7.4	153	41	8.0	177	44															
9°30′	603	7.5	156	41	8.0	178	44															
10°00′	573	7.7	158	41	Dmax. = 9°30′																	
11°00′	521	7.9	162	41																		
12°00′	477	8.0	165	41																		
12°15′	468	8.0	165	41																		
Dmax. = 12°15′																						

NC = Normal Crown
RC = Remove Crown
'L' and 'x' are given in feet



Typical Sections Through Transition Area

g = Normal cross-slope
e = Full superelevation (%)

① See other drawings for shoulder details
② 'Y' = Total Thickness of Wedge and Surface Mat.

Iowa Department of Transportation
Highway Division

STANDARD ROAD PLAN RR-25

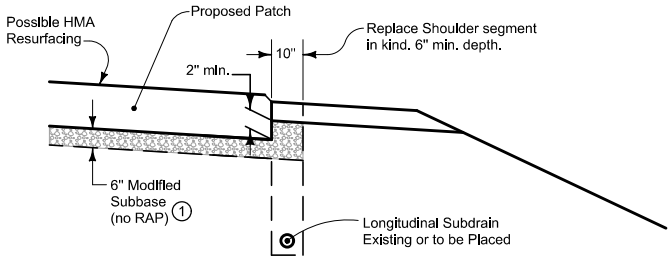
REVISION: NEW. Replaces Road Design Detail Sheet 530-6.

REVISION NO.: NEW

William J. Stein
APPROVED BY DESIGN METHODS ENGINEER

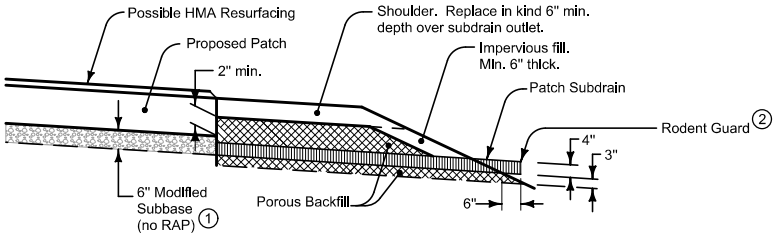
REVISION DATE: 10-18-05

HMA WEDGE FOR SUPERELEVATION



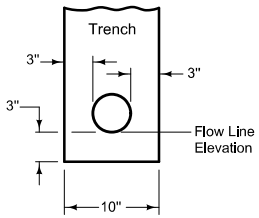
MODIFIED SUBBASE AND SUBDRAIN

IF LONGITUDINAL SUBDRAIN IS PRESENT OR IS TO BE PLACED



MODIFIED SUBBASE AND SUBDRAIN 2

WITHOUT LONGITUDINAL SUBDRAIN



DRAIN PLACEMENT 2

1. 6 inches Modified Subbase (no RAP) if required by plan. When placed, extend Modified Subbase (no RAP) over longitudinal subdrain, if present.

2. If longitudinal subdrain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, then place Patch Subdrain at low end(s) of patch. Use removable grate rodent guard except for projects using recycled PCC subbase where a removable fork rodent guard is required. Refer to RF-19E for rodent guard details. Refer to Drain Placement detail.

Possible Contract Items:
Subbase (Patches)
Patch Subdrain

Possible Tabulation:
102-6C

Iowa Department of Transportation

REVISION	
1	04-19-11

STANDARD ROAD PLAN

RR-26

SHEET 1 of 1

REVISIONS: Changed Possible Contract Item.

Deanna Maifield
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SUBBASE PATCHES

Signs

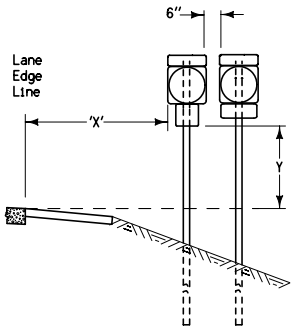
SI

SECTION

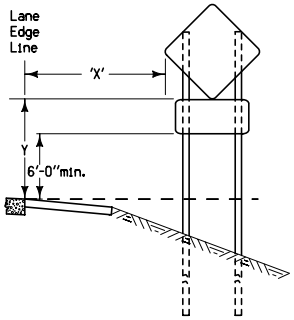
Signs

SI

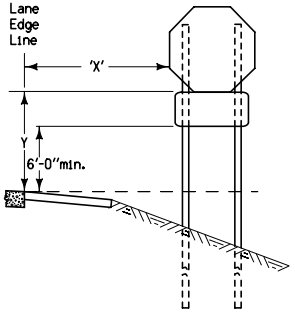
NO.	DATE	TITLE
SI-101	04-21-09	Locations - Type 'A' Signs
SI-102	10-20-09	Locations - Type 'B' Signs
SI-111	10-20-09	Support Structures - Wood Posts
SI-113	10-18-11	Support Structures - Steel Breakaway Posts
SI-114	10-18-11	Support Structures - Steel Breakaway Posts Rectangular Tube
SI-119	10-20-09	Support Structures - Mounting Brackets
SI-121	04-20-10	Fabrication - Sign Legend Components
SI-123	10-20-09	Fabrication - Type 'B' Signs
SI-131	10-18-11	Installation - Type 'A' Signs
SI-132	04-20-10	Installation - Type 'B' Signs
SI-171	10-20-09	Reference Posts
SI-172	10-18-11	Delineators
SI-173	04-20-10	Object Markers
SI-175	10-19-10	Chevrons
SI-181	10-18-11	Permanent Road Closure - Rural
SI-182	10-18-11	Permanent Road Closure - Urban
SI-211	10-19-10	Object Marker and Delineator Placement with Guardrail
SI-241	10-18-11	Sign Placement Approaching a Railroad Crossing
SI-881	04-19-11	Special Signs for Workzones
SI-882	04-20-10	Special Signs for Restricted Width Traffic Control Zones



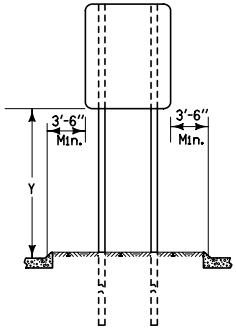
FRONT VIEW
ROUTE DIRECTION MARKER
Type 1 Installation



FRONT VIEW
WARNING SIGN
WITH ADVISORY PLATE
* Without Advisory Plate
Type 1 Installation



FRONT VIEW
REGULATORY SIGN
WITH ADVISORY PLATE
* Without Advisory Plate
Type 1 Installation



FRONT VIEW
SIGN LOCATION
Type 3 Installation

Type 3 installation is intended to show the requirements for a Type 'A' sign when installed in an island or median (where traffic passes on both sides of the sign) as well as for locations where the Type 'A' sign is installed adjacent to a curbed roadway (sign may be located on either side of a roadway as specified in project plans).

See "Summary of Materials for Type 'A' Signs" and the Sign Type and Location Plan Sheets for data regarding specific sign assemblies.

Final location of signs shall be at the discretion of the Engineer.

Use the Type 1 installation in any case except where:

(A) Otherwise specified in the plans.

(B) Otherwise directed by the Engineer.

(C) A Type 3 installation is required due to location in an island or gore area.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
NEW	04-21-09

SI-101

SHEET 1 of 1

REVISIONS: New.

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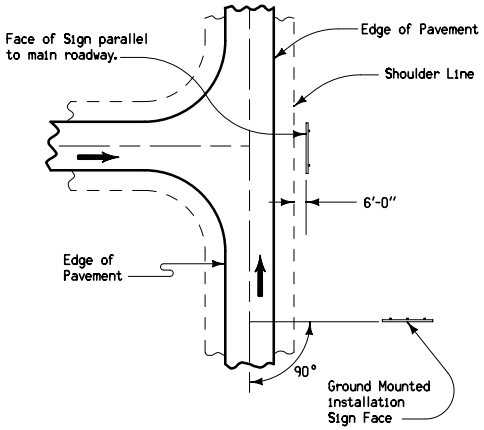
LOCATIONS -
TYPE 'A' SIGNS

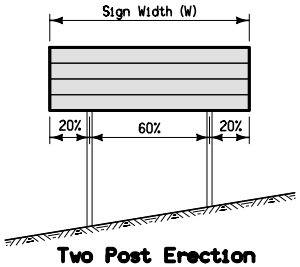
This sheet shows the general requirements of sign locations for various types of conditions. It shall be the contractor's responsibility to become familiar with the actual conditions at the requirements for each sign installations.

Modification of plan requirements will be permitted only as physical conditions require and shall be subject to the following limitations:

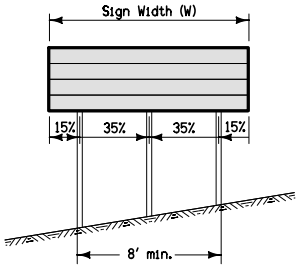
- Breakway sign posts shall have a minimum length of 7'-4" plus height of sign.
- A minimum spacing distance of 800 feet between signs shall be maintained.
- All sign panels shall be set level.
- Sign location shall not be modified without approval of the Engineer.



SIGN ORIENTATION PLAN



Two Post Erection



Three Post Erection

POST POSITION DETAIL

Iowa Department of Transportation

REVISION: 1 — 10-20-09

STANDARD ROAD PLAN

SI-102

SHEET 1 of 2

REVISIONS: Modified general notes. Added clarafication to drawings.

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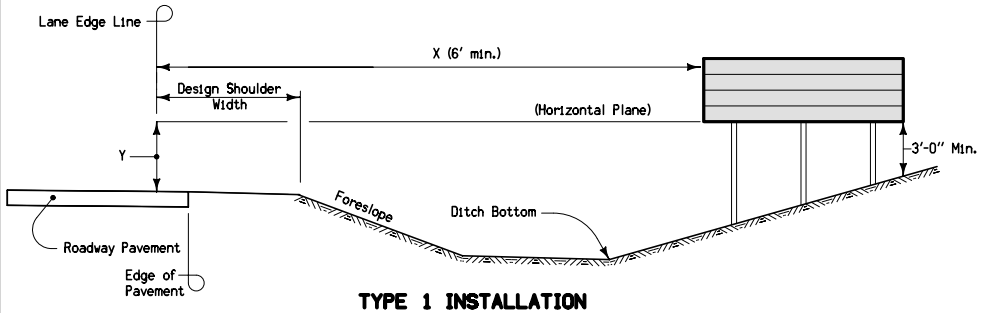
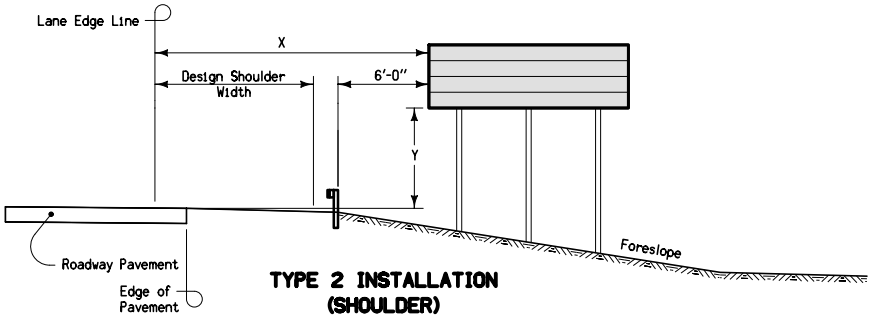
APPROVED BY DESIGN METHODS ENGINEER

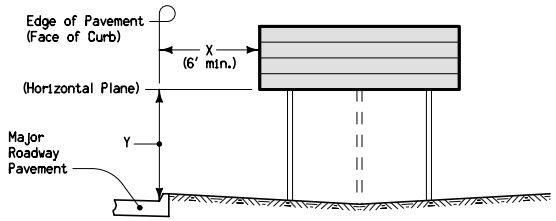
LOCATIONS - TYPE 'B' SIGNS



TYPE 1 INSTALLATION
(OFFSET)

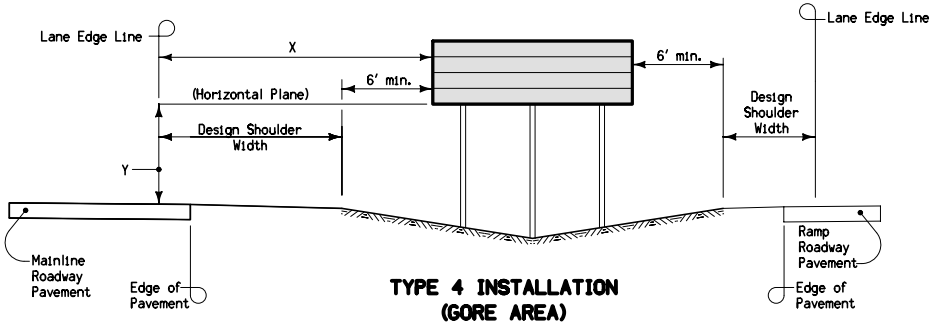


TYPE 2 INSTALLATION
(SHOULDER)



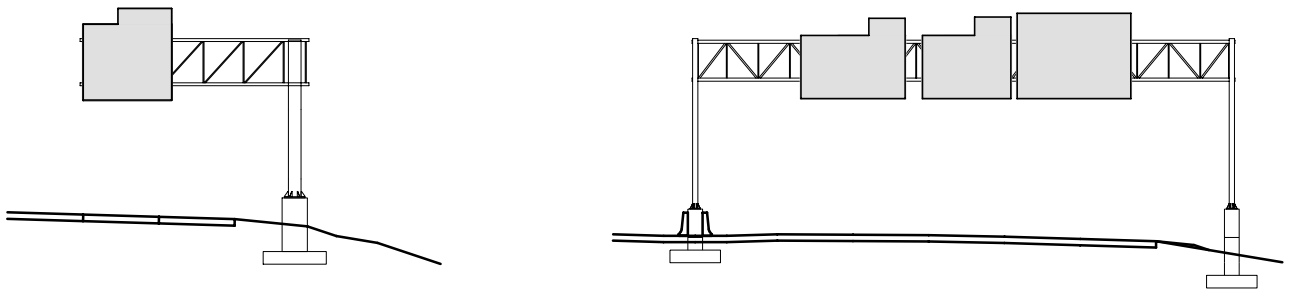
TYPE 3 INSTALLATION
(CURBED SECTION)

Details indicated are for an installation adjacent to a curbed roadway. The sign may be located on either side of the roadway, or in a gore area where curbed roadways pass on both sides, such as an urban freeway exit ramp. Width between curbs shall not be less than 12 feet plus sign width.



TYPE 4 INSTALLATION
(GORE AREA)

Details indicated are for an installation in a gore area where traffic on non-curbed roadways passes on both sides of the sign such as the exit ramp for a rural type interchange.



TYPE 5 INSTALLATION
(OVERHEAD SUPPORT STRUCTURES)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-20-09

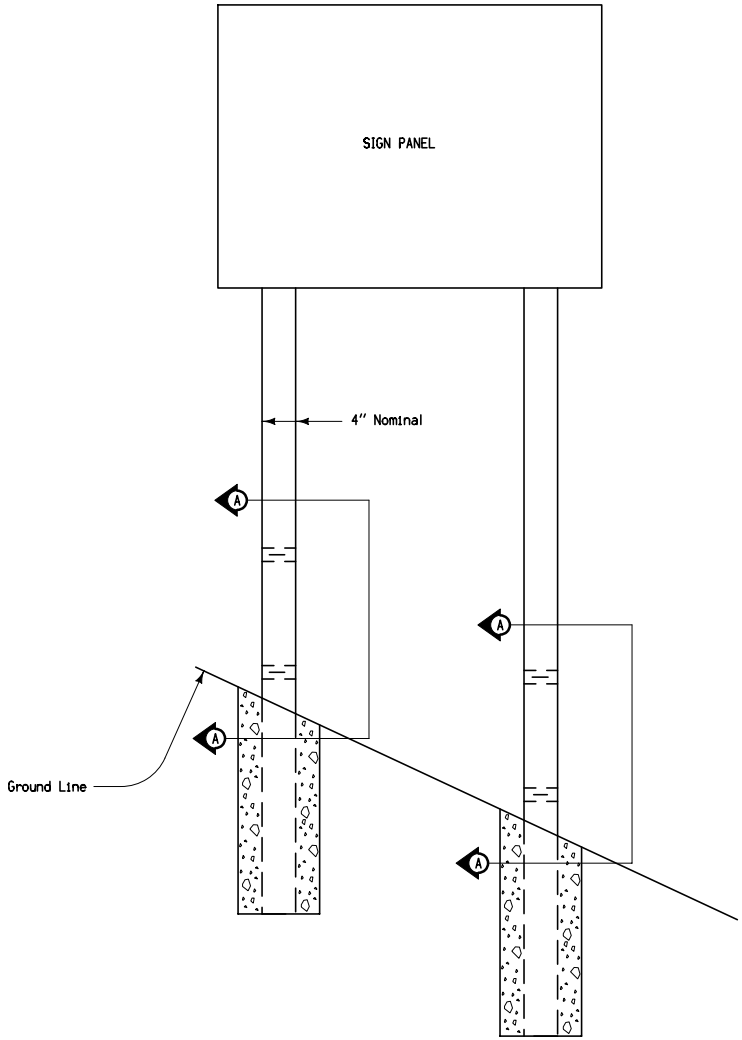
SI-102

SHEET 2 of 2

REVISIONS: Modified general notes. Added clarafication to drawings.

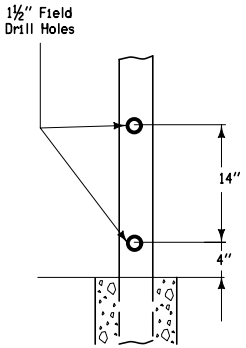
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LOCATIONS -
TYPE 'B' SIGNS



FRONT VIEW

Top View



Section A-A

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-20-09

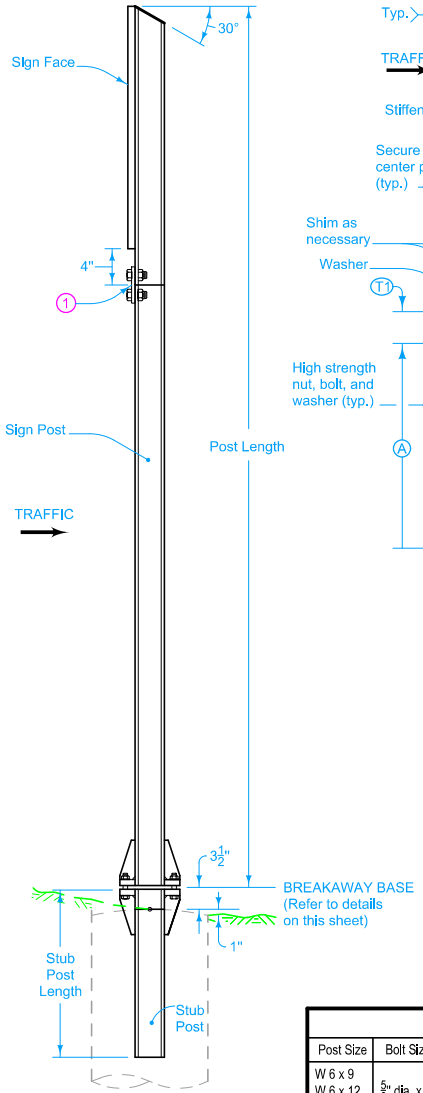
SI-111

SHEET 1 of 1

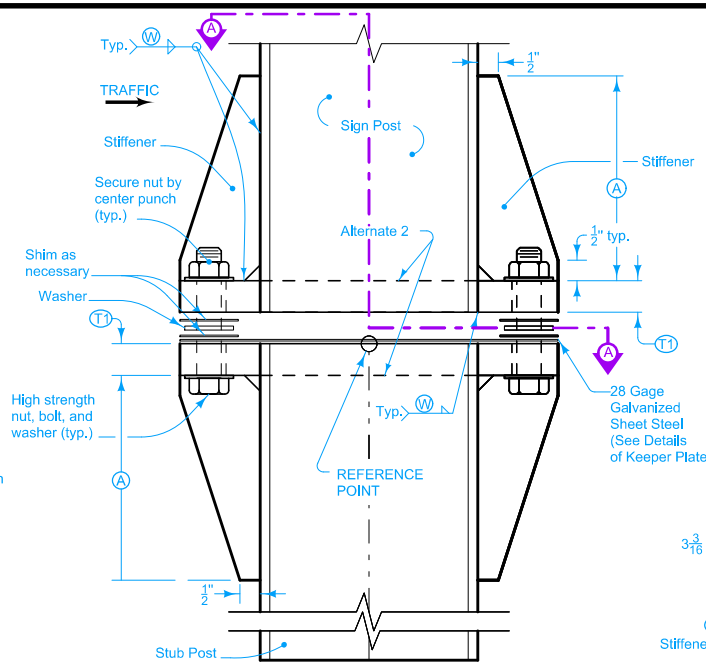
REVISIONS: Clarified location of Section A-A and field drilled holes.

Deanna Maifuldt
APPROVED BY DESIGN METHODS ENGINEER

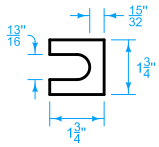
SUPPORT STRUCTURES - WOOD POSTS



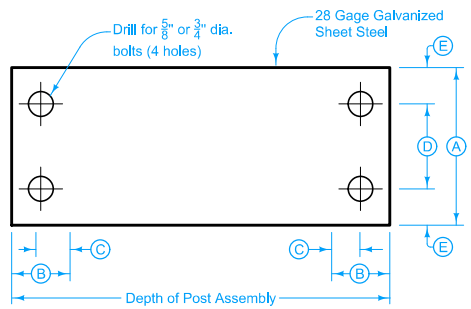
SIGN INSTALLATION
Side View



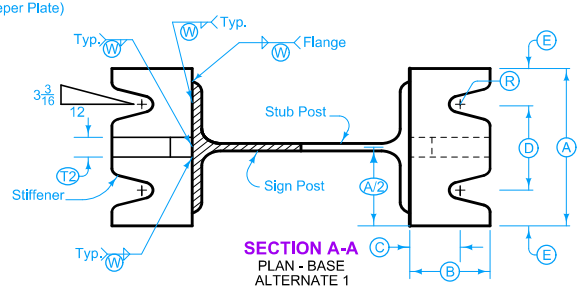
BREAKAWAY BASE
Side View



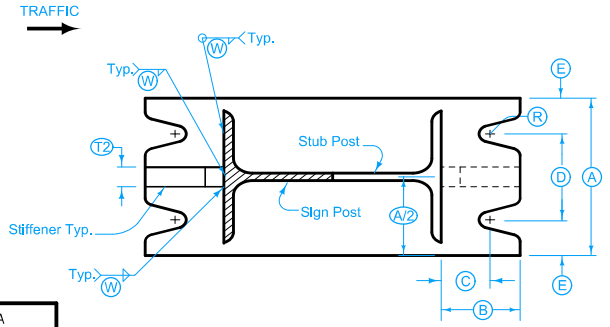
SHIM



KEEPER PLATE



SECTION A-A
PLAN - BASE
ALTERNATE 1



SECTION A-A
PLAN - BASE
ALTERNATE 2

BREAKAWAY BASE DATA										
Post Size	Bolt Size & Torque	A	B	C	D	E	T1	T2	W	R
W 6 x 9 W 6 x 12 W 6 x 15 W 8 x 18	⅝" dia. x 2¾" Torque = 37.50 ft. lbs.	5"	2"	1¼"	2¾"	1⅛"	¾"	½"	¼"	11/32"
W 8 x 21 W 10 x 22 W 10 x 26 W 12 x 26	¾" dia. x 3½" Torque = 62.50 ft. lbs.	6"	2¼"	1⅜"	3½"	1¼"	1"	¾"	5/16"	13/32"

POST DATA	
Post Size	Stub Length
W 6 x 9 W 6 x 12 W 6 x 15 W 8 x 18	2'-6"
W 8 x 21 W 10 x 22 W 10 x 26 W 12 x 26	3'-0"

Place signpost by installing shims. Furnish two shims each of 0.012" and 0.032" thickness (total of 4 per post). Shims to be brass stock or strip conforming to ASTM B 36.

Grind smooth all welds and galvanizing between Base Plates.

(W) Welds to be continuous fillet welds and of a depth equal to the thickness of the flange for the post unless otherwise specified.

Construct the footing as shown for normal footing in earth. Where solid rock is encountered, the alternate design for footing in solid rock may be used with the approval of the Engineer.

Dispose of all excavation for the footing in the area adjacent to the footing and shape to normal ground contour, unless directed otherwise by the Engineer.

Hold the stub post in proper position by an approved device to ensure that it remains in proper position upon completion of concrete placement.

Base Plate(s):
The following alternates are considered equivalent:

Alternate 1 - Weld base plates (2 each), to sides of signpost and stub post flanges.

Alternate 2 - Weld base plate (1 each) to end of sign post and stub post by continuous fillet weld. Properly match and align the bolt holes and notches in the stub post plate and the sign post plate as indicated herein.

The contract price for size of footing required to be full compensation of footing as detailed hereon, including all necessary excavation regardless of character.

(1) Not for single post installations.

Possible Contract Item:
Steel Breakaway Sign Post

Iowa Department of Transportation

REVISION
4 | 10-18-11

STANDARD ROAD PLAN

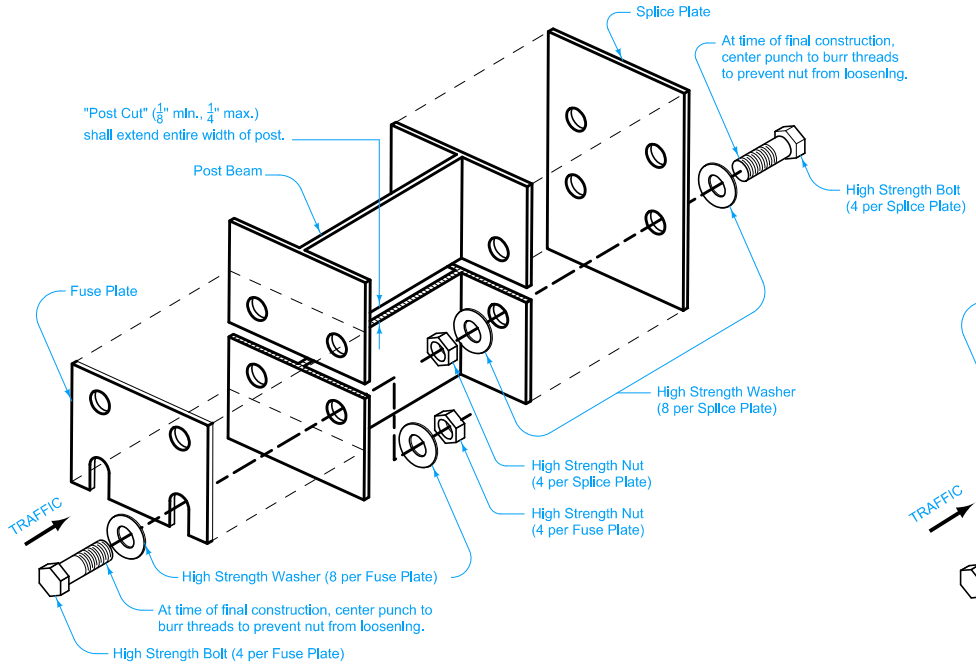
SI-113

SHEET 1 of 3

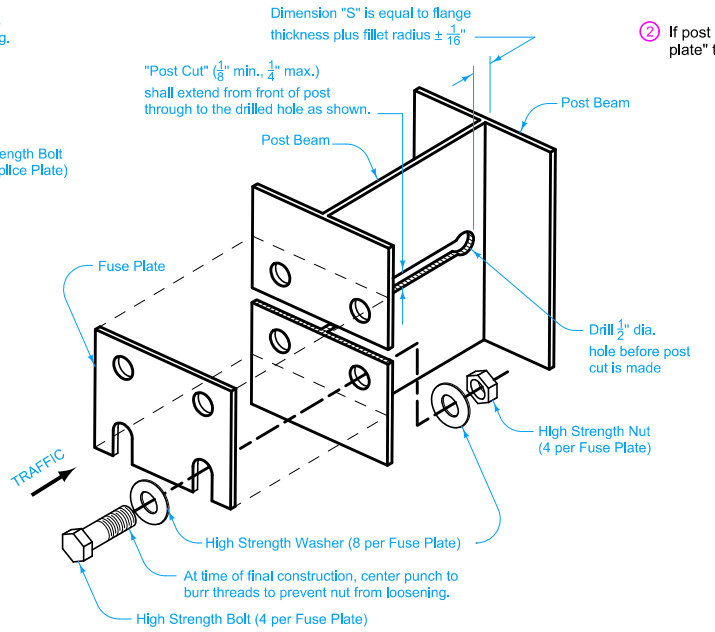
REVISIONS: Added alternate base plates.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPPORT STRUCTURES - STEEL BREAKAWAY POSTS



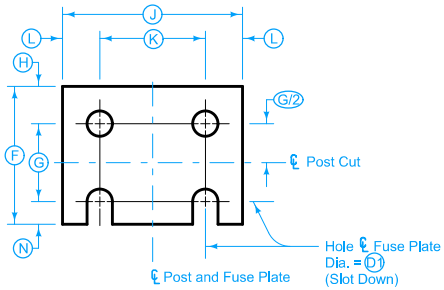
Hinge Alternate 1
(With Splice Plate)



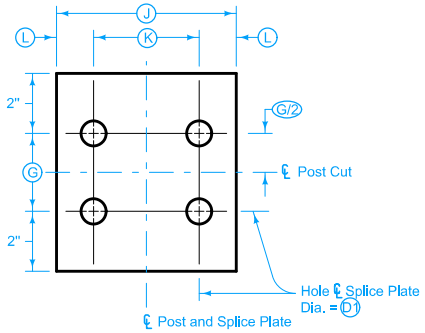
Hinge Alternate 2 (2)
(One-Piece Post)

(2) If post is to be transported after cut is made, bolt a "splice plate" to front of post to prevent damage to the post.

FUSE PLATE ASSEMBLY



FUSE PLATE
(Thickness T3)



SPLICE PLATE
(Thickness T4)

Bolt Size	Torque
1/2"	100 Ft. Lbs.
5/8"	180 Ft. Lbs.
3/4"	320 Ft. Lbs.
7/8"	470 Ft. Lbs.

FUSE AND SPLICE PLATE DATA

Post Size	Bolt Dia.	F	G	H	J	K	L	N	D1	T3	T4
W6x9	1/2"	3 5/8"	2"	1 1/8"	4"	2 1/4"	7/8"	1/2"	9/16"	1/4"	1/4"
W6x12	5/8"	3 3/4"	2"	1 1/8"	4"	2 1/4"	7/8"	5/8"	11/16"	3/8"	1/4"
W6x15	3/4"	4 1/2"	2 1/2"	1 1/4"	6"	3 1/2"	1 1/4"	3/4"	13/16"	1/2"	1/4"
W8x18	3/4"	4 1/2"	2 1/2"	1 1/4"	5 1/4"	2 3/4"	1 1/4"	3/4"	13/16"	1/2"	3/8"
W8x21	7/8"	4 7/8"	2 1/2"	1 1/2"	5 1/4"	2 3/4"	1 1/4"	7/8"	15/16"	5/8"	3/8"
W10x22	7/8"	5 3/8"	3"	1 1/2"	5 3/4"	2 3/4"	1 1/2"	7/8"	15/16"	5/8"	3/8"
W10x26	7/8"	5 3/8"	3"	1 1/2"	5 3/4"	2 3/4"	1 1/2"	7/8"	15/16"	5/8"	3/8"
W12x26	7/8"	5 3/8"	3"	1 1/2"	6 1/2"	3 1/2"	1 1/2"	7/8"	15/16"	5/8"	3/8"

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
4	10-18-11

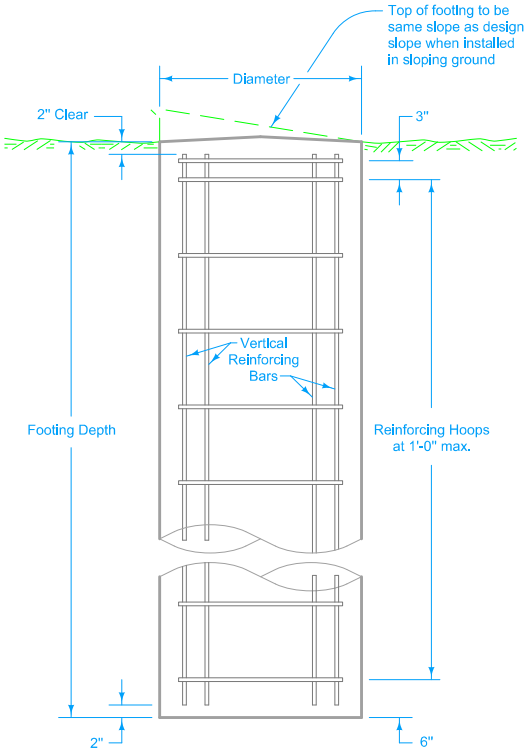
SI-113

SHEET 2 of 3

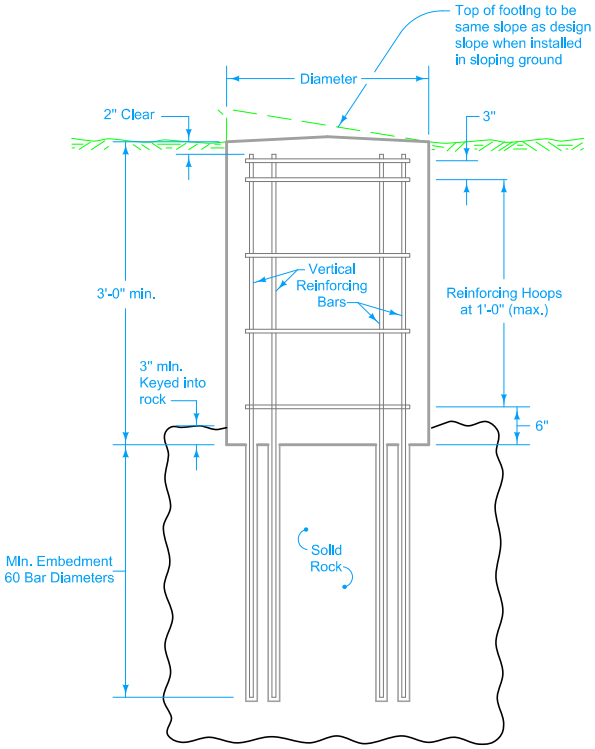
REVISIONS: Added alternate base plates.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

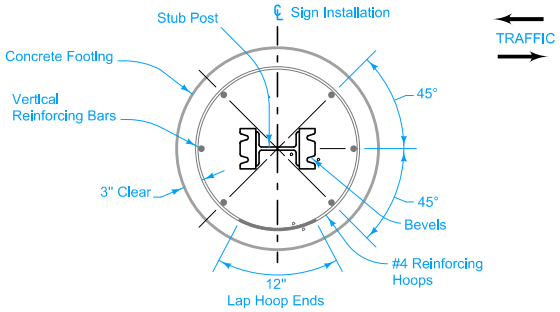
SUPPORT STRUCTURES - STEEL BREAKAWAY POSTS



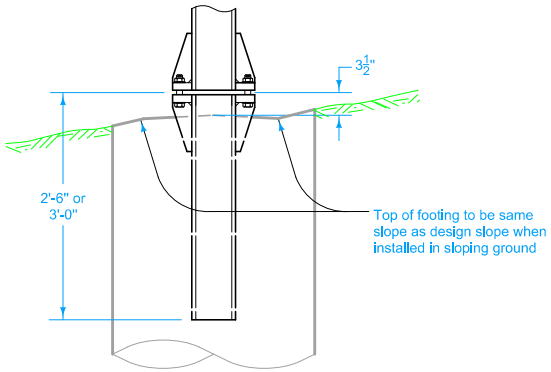
INSTALLATION
NORMAL FOOTING IN EARTH



ALTERNATE DESIGN (4)
FOOTING IN SOLID ROCK



PLAN
(Reinforcing Placement and Sign Orientation)



BREAKAWAY POST INSTALLATION

(3) Lengths are for normal footings. Required length may vary where alternate rock design is used.

(4) Set vertical bars in solid rock as follows:
1. Drill holes twice bar diameter and fill with water.
2. When hole is fully saturated; blow water out and fill two-thirds depth with sand cement mortar.
3. Insert bar and consolidate mortar.
4. Fill hole to top with mortar.

FOOTING REINFORCING DATA

Post Size	Stub Length	Footing		Vertical Rein. Bar	
		Diameter	Depth	Size	Length (3)
W6x9	2'-6"	2'-0"	6'-0"	No. 6	5'-8"
W6x12	2'-6"	2'-0"	6'-0"	No. 6	5'-8"
W6x15	2'-6"	2'-0"	6'-6"	No. 6	6'-2"
W8x18	2'-6"	2'-0"	7'-0"	No. 6	6'-8"
W8x21	3'-0"	2'-8"	7'-6"	No. 8	7'-2"
W10x22	3'-0"	2'-8"	8'-0"	No. 8	7'-8"
W10x26	3'-0"	2'-8"	8'-6"	No. 8	8'-2"
W12x26	3'-0"	2'-8"	9'-0"	No. 8	8'-8"

Iowa Department of Transportation

REVISION
4 | 10-18-11

STANDARD ROAD PLAN

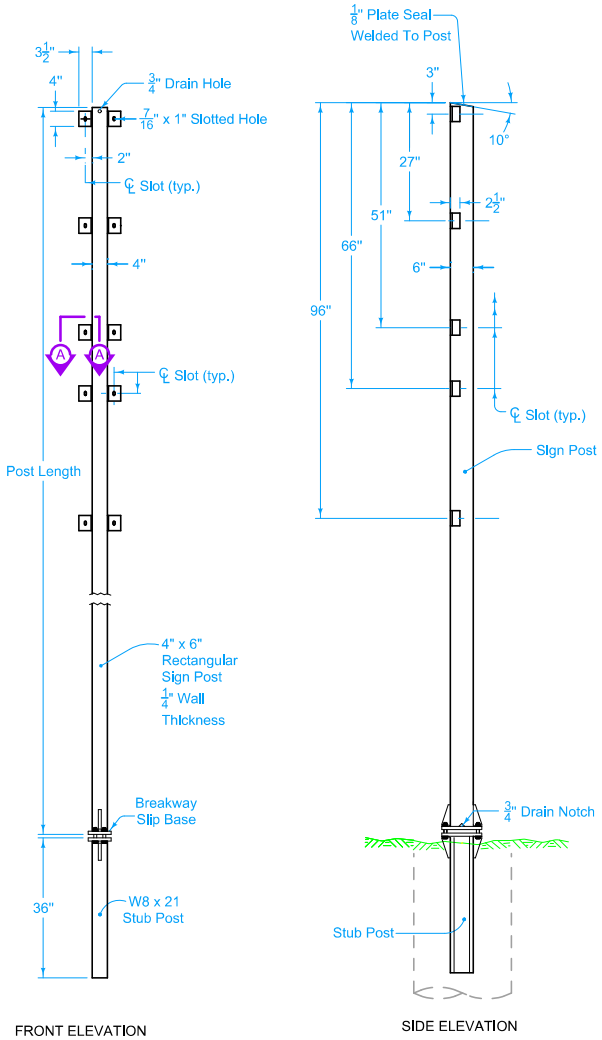
SI-113

SHEET 3 of 3

REVISIONS: Added alternate base plates.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

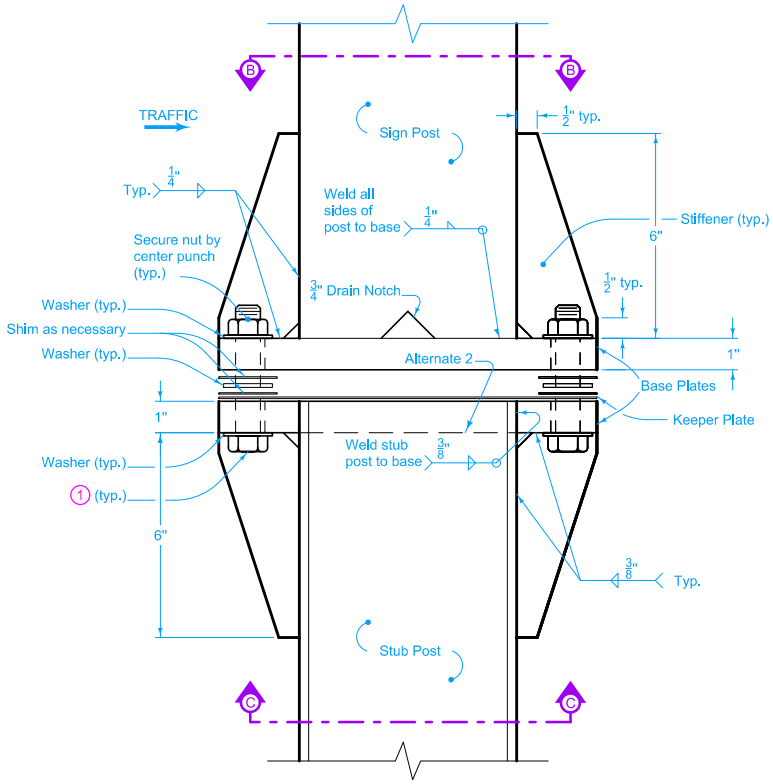
SUPPORT STRUCTURES - STEEL BREAKAWAY POSTS



FRONT ELEVATION

SIDE ELEVATION

4" x 6" RECTANGULAR TUBE POST FOR INTERSTATE SPEED SIGNS



BREAKAWAY BASE
Side View

Furnish post, stub, and fasteners as per Specification 4186.10.B.

Plumb signpost by installing shims. Furnish two shims each of 0.012" and 0.032" thickness (total of 4 per post). Shims to be brass stock or strip conforming to ASTM B 36.

Construct the footing as shown for normal footing in earth. Where solid rock is encountered, the alternate design for footing in solid rock may be used with the approval of the Engineer.

Dispose of all excavation for the footing in the area adjacent to the footing and shape to normal ground contour, unless directed otherwise by the Engineer.

Hold the stub post in proper position by an approved device to ensure that it remains in proper position upon completion of concrete placement.

Stub Post Base Plate(s);
The following alternates are considered equivalent:

ALTERNATE 1 - Weld base plates (2 each) to sides of stub post flanges.

ALTERNATE 2 - Weld base plate (1 each) to end of stub post by continuous fillet weld. During assembly, properly match and align the bolt holes and notches in the stub post plate and the sign post plate as indicated hereon.

The contract price for size of footing required is full compensation of footing as detailed hereon, including all necessary excavation regardless of character.

Grind smooth all welds and galvanizing between Base Plates.

(1) ¾" dia. x 3½"
Torque = 62.50 ft. lbs.

Possible Contract Items:
Concrete Footing for Steel Breakaway Post
Steel Breakaway Sign Post, Rectanguler Tube

Iowa Department of Transportation

REVISION
1 | 10-18-11

STANDARD ROAD PLAN

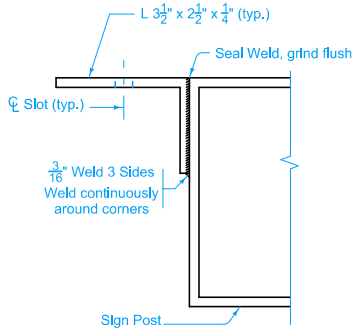
SI-114

SHEET 1 of 3

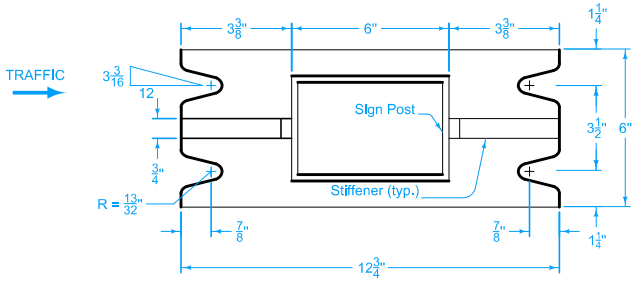
REVISIONS: Modified Breakaway Brace weld size. Added size of welds on Section C-C, added Alternate 2 and clarified dimensioning on Section B-B.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

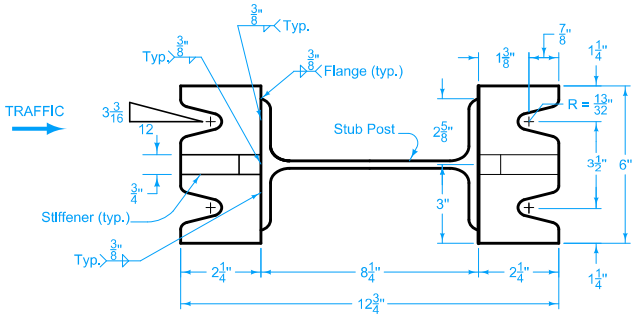
SUPPORT STRUCTURES - STEEL BREAKAWAY POSTS RECTANGULAR TUBE



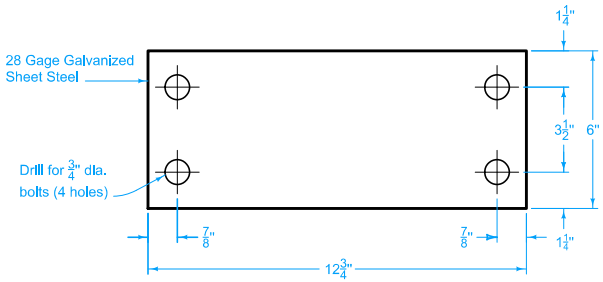
SECTION A-A



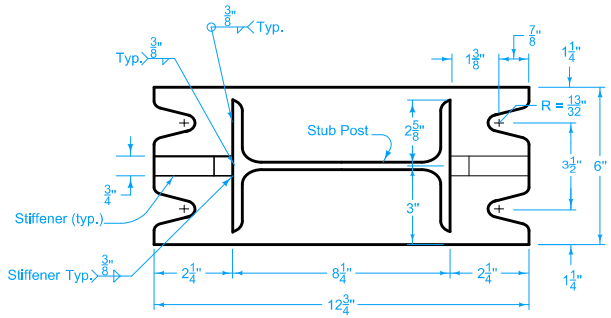
SECTION B-B
PLAN - BASE



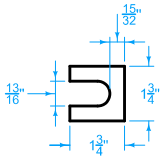
SECTION C-C
PLAN - BASE
ALTERNATE 1



KEEPER PLATE



SECTION C-C
PLAN - BASE
ALTERNATE 2



SHIM

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-18-11

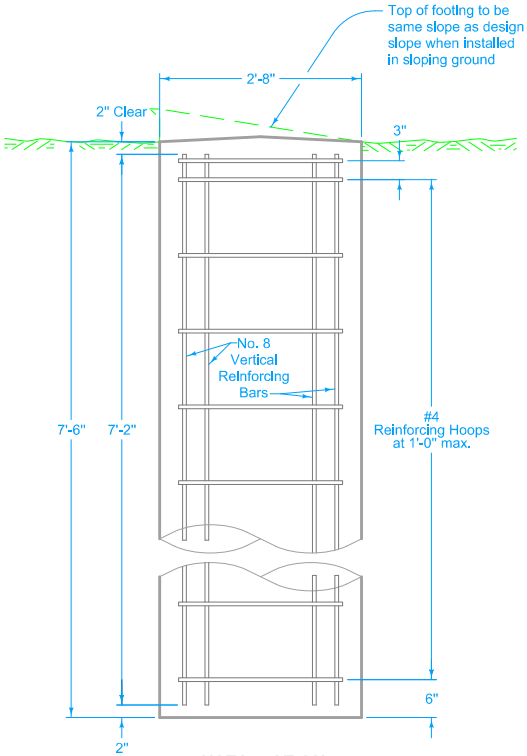
SI-114

SHEET 2 of 3

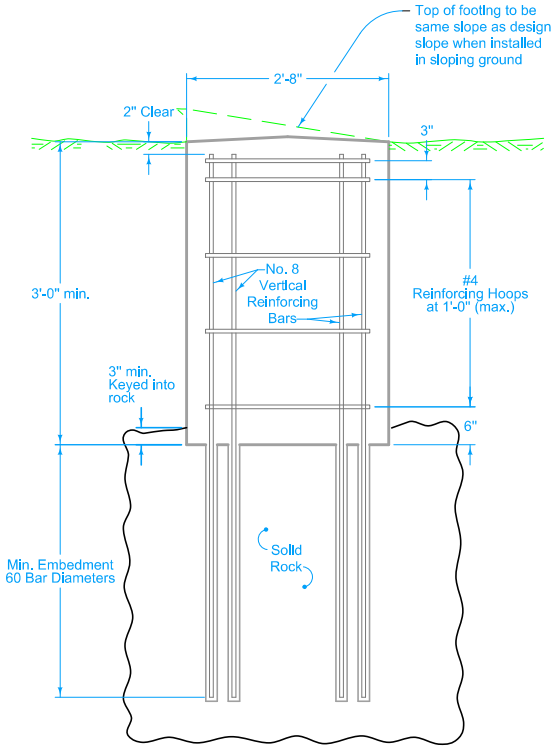
REVISIONS: Modified Breakaway Brace weld size. Added size of welds on Section C-C, added Alternate 2 and clarified dimensioning on Section B-B.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPPORT STRUCTURES - STEEL BREAKAWAY POSTS RECTANGULAR TUBE

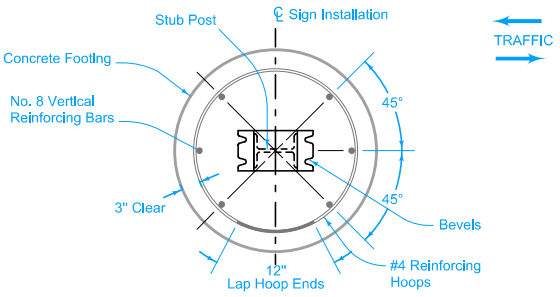


INSTALLATION
NORMAL FOOTING IN EARTH

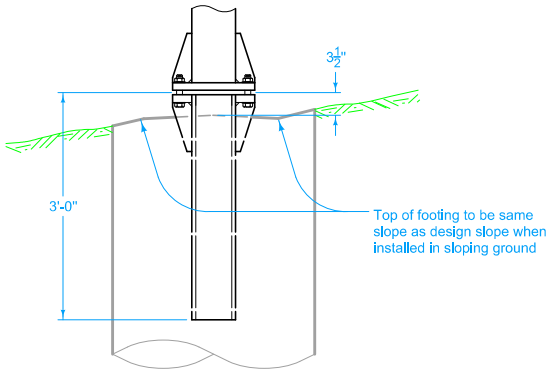


ALTERNATE DESIGN (2)
FOOTING IN SOLID ROCK

(2) Set vertical bars in solid rock as follows:
1. Drill holes twice bar diameter and fill with water.
2. When hole is fully saturated; blow water out and fill two-thirds depth with sand cement mortar.
3. Insert bar and consolidate mortar.
4. Fill hole to top with mortar.



PLAN
(Reinforcing Placement and Sign Orientation)



BREAKAWAY POST INSTALLATION

Iowa Department of Transportation

REVISION
1 | 10-18-11

STANDARD ROAD PLAN

SI-114

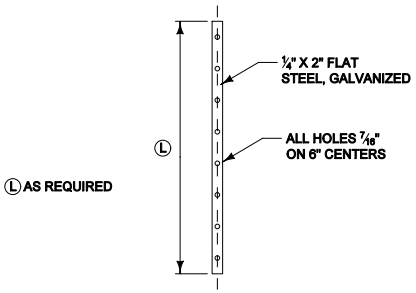
SHEET 3 of 3

REVISIONS: Modified Breakaway Brace weld size. Added size of welds on Section C-C, added Alternate 2 and clarified dimensioning on Section B-B.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

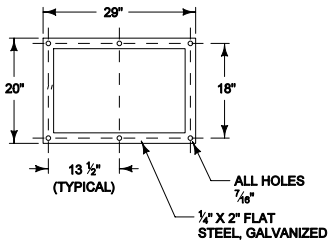
SUPPORT STRUCTURES - STEEL BREAKAWAY POSTS RECTANGULAR TUBE

The necessary mounting bolts, washers, nuts, and set screws shall be included in the bid price for the brackets.



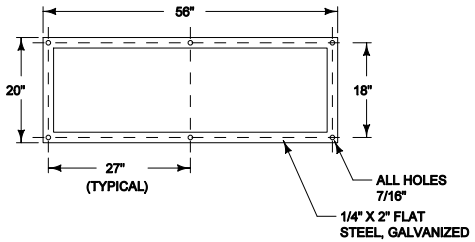
AUXILIARY SIGN MOUNTING BAR

Type 1



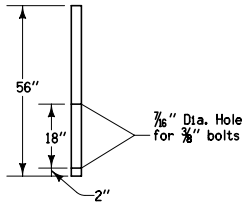
ONE POST SIGN MOUNTING BRACKET

Type 2



TWO POST SIGN MOUNTING BRACKET

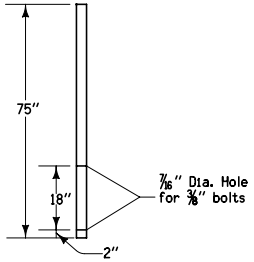
Type 3



PIPE DETAIL

(Bracket 'F')

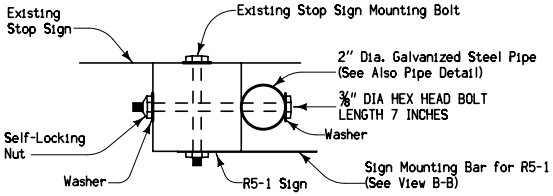
Type 4A



PIPE DETAIL

(Bracket "F_1")

Type 4B



SECTION A-A

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-20-09

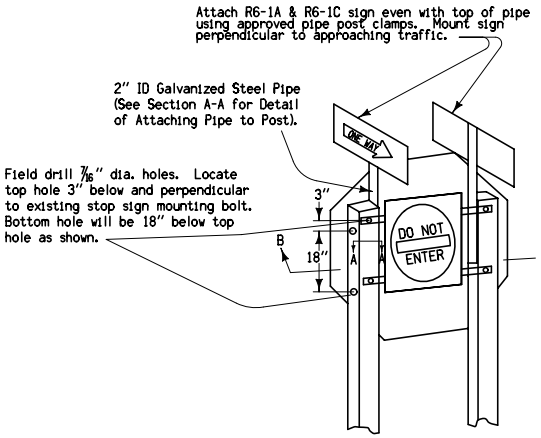
SI-119

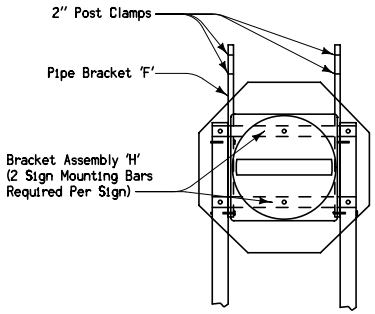
SHEET 1 of 2

REVISIONS: Corrected spelling and dimension errors.

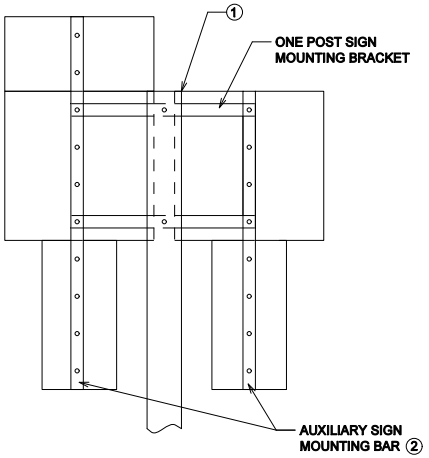
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPPORT STRUCTURES - MOUNTING BRACKETS

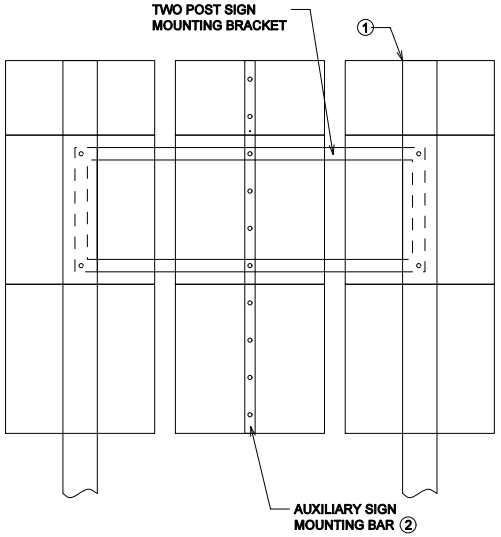




VIEW B-B



TYPICAL MOUNTING BRACKET ARRANGEMENT FOR SINGLE WOOD POST INSTALLATION



TYPICAL MOUNTING BRACKET ARRANGEMENT FOR DUAL WOOD POST INSTALLATION

(1) Top of wood post to be flush with top of sign panel.

(2) Auxiliary Sign Mounting Bracket shall extend full length of proposed mounted sign assembly.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-20-09

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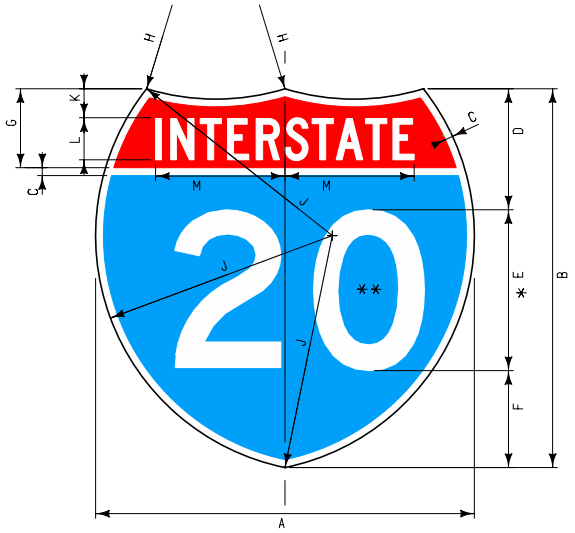
SHEET 2 of 2

REVISIONS: Corrected spelling and dimension errors.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SUPPORT STRUCTURES - MOUNTING BRACKETS

All dimensions are in inches unless otherwise designated.



* Series 2000 Standard Alphabets.

** Optically space numerals about vertical center line.

Sign	Width A	Height B	Border Thick. C	Numeral Top Offset D	Numeral Height & Font E	Numeral Bottom Offset F	Upper Section Height G	Top Radius H	Side Radius J	Text Top Offset K	Text Height & Font L	Text Length Lt & Rt M
1,2 Digit Shields	48	48	1	15.375	20 D	12.625	10	30	30	4	5 C	15.375
	36	36	0.75	11.5	15 D	9.5	7.5	22.5	22.5	2.75	4 C	12.3
	30	30	0.625	9.5	12.5 D	8	6.25	18.75	18.75	2.375	3.25 C	9.99375
	24	24	0.5	7.625	10 D	6.375	5	15	15	2	2.5 C	7.6875
	18	18	0.375	5.75	7.5 D	4.75	3.75	11.25	11.25	1.375	2 C	6.15
	12	12	0.25	3.75	5 D	3.25	2.5	7.5	7.5	1	1.25 C	3.84375
3 Digit Shields	48	60	1	15.375	20 C	12.625	10	48	34	4	5 E	21.9
	36	45	0.75	11.5	15 C	9.5	7.5	36	25.5	2.75	4 E	17.52
	30	37.5	0.625	9.5	12.5 C	8	6.25	30	21.25	2.375	3.25 E	14.235
	24	30	0.5	7.625	10 C	6.375	5	24	17	2	2.5 E	10.95
	18	22.5	0.375	5.75	7.5 C	4.75	3.75	18	12.75	1.375	2 E	8.76
	12	15	0.25	3.875	5 C	3.125	2.5	12	8.5	1	1.25 E	5.475

COLORS:
Text: White
Border: White
Background (Interstate): Red
Background (Route No.): Blue

INTERSTATE ROUTE MARKERS

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-20-10

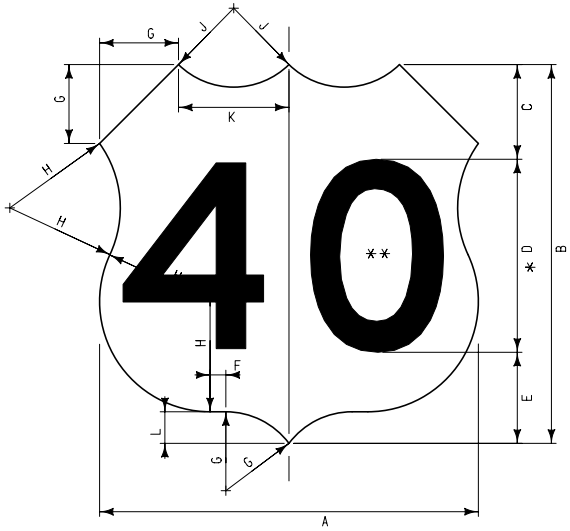
SI-121

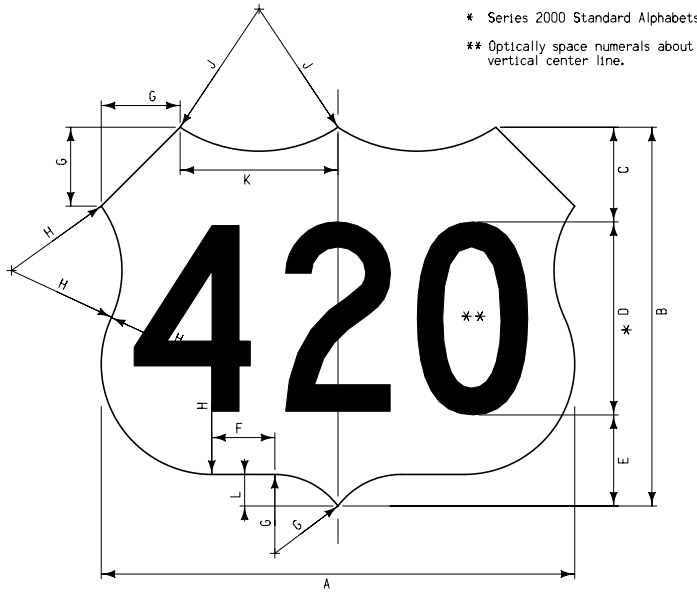
SHEET 1 of 4

REVISIONS: Corrected background plaque dimensions on county route marker.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

FABRICATION - SIGN LEGEND COMPONENTS





* Series 2000 Standard Alphabets.

** Optically space numerals about vertical center line.

Sign	Width A	Height B	Numeral Top Offset C	Numeral Height & Font D	Numeral Bottom Offset E	Bottom Tangent Length F	Upper Section Height G	Corner & Top Radius H	Side Radius J	Top Radius K	Bottom Tangent Offset L
1,2 Digit Shields	48	48	11	24 D	13	2	10	14	10	14	4
	36	36	8.25	18 D	9.75	1.5	7.5	10.5	7.5	10.5	3
	30	30	6.875	15 D	8.125	1.25	6.25	8.75	6.25	8.75	2.5
	24	24	5.5	12 D	6.5	1	5	7	5	7	2
	18	18	4.125	9 D	4.875	0.75	3.75	5.25	3.75	5.25	1.5
	12	12	2.75	6 D	3.25	0.5	2.5	3.5	2.5	3.5	1
3 Digit Shields	60	48	11	24 D	13	8	10	14	18	20	4
	45	36	8.25	18 D	9.75	6	7.5	10.5	13.5	15	3
	37.5	30	6.875	15 D	8.125	5	6.25	8.75	11.25	12.5	2.5
	30	24	5.5	12 D	6.5	4	5	7	9	10	2
	22.5	18	4.125	9 D	4.875	3	3.75	5.25	6.75	7.5	1.5
	15	12	2.75	6 D	3.25	2	2.5	3.5	4.5	5	1

COLORS:
Text: Black
Shield: White

US ROUTE MARKERS

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-20-10

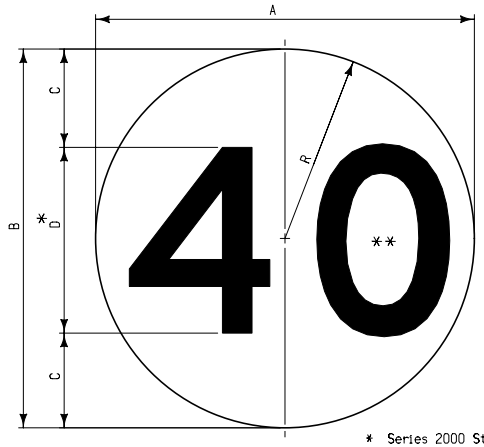
SI-121

SHEET 2 of 4

REVISIONS: Corrected background plaque dimensions on county route marker.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

FABRICATION -
SIGN LEGEND COMPONENTS



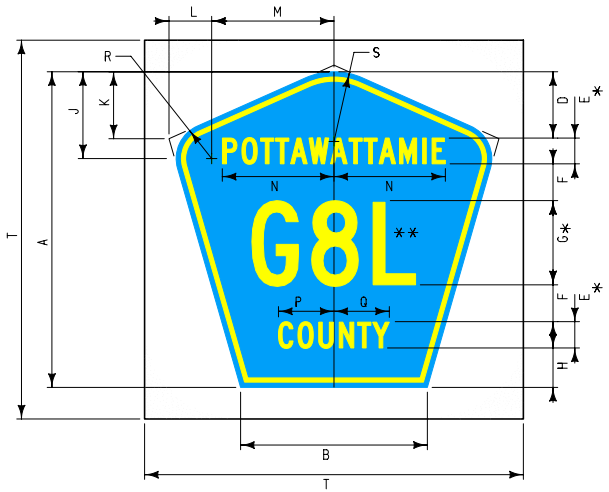
* Series 2000 Standard Alphabets.

** Optically space numerals about vertical center line.

STATE ROUTE MARKER

Sign	Width A	Height B	Numeral Offset C	Numeral Height & Font D	Radius R
1,2 Digit Shields	48	48	12	24 D	24
	36	36	9	18 D	18
	30	30	7.5	15 D	15
	24	24	6	12 D	12
	18	18	4.5	9 D	9
	12	12	3	6 D	6
3 Digit Shields	48	48	14	20 C	24
	36	36	10.5	15 C	18
	30	30	9	12 C	15
	24	24	7	10 C	12
	18	18	5.25	7.5 C	9
	12	12	3.5	5 C	6

COLORS:
Text: Black
Shield: White



* Series 2000 Standard Alphabets.

** Optically space numerals about vertical center line.

COUNTY ROUTE MARKER

Sign	Height A	Bottom Width B	Border Thick. C	County Top Offset D	County Text Hgt & Font E	Numeral Offset F	Numeral Height & Font G	County Bottom Offset H	Radius Vertical Offset J	Corner Vertical Offset K	Corner Lateral Offset L	Radius Lateral Offset M	County Name Lt & Rt N	County Text Lt & Rt P & Q	Side Radius R	Top Radius S	Backgrd Plaque T
All Routes	30	17.75	0.5	6.25	2.5 C	3.5	8 C	3.75	8.25	6.5	3.875	11.625	VAR	5.275	3.375	6.625	36
	24	14.1875	0.375	5	2 C	2.5	7 C	3	6.625	5.125	3.125	9.3125	VAR	4.22	2.6875	5.3125	30
	18	10.625	0.25	4	1.5 C	2	5 C	2	5	3.375	2.375	7	VAR	3.165	2	5	24
	15	8.875	0.25	3.125	1.25 C	1.75	4 C	1.875	4.125	3.25	1.9375	5.8125	VAR	2.6375	1.6875	3.3125	18
	12	5.9375	0.1875	2.0625	0.8125 C	1	3 C	1.3125	2.75	2.1875	1.3125	3.875	VAR	1.7144	1.125	2.2188	12

COLORS:
Text: Yellow
Border: Yellow
Shield: Blue
Background: White

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-20-10

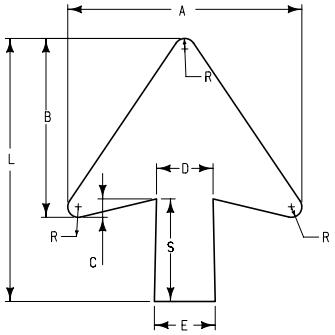
SI-121

SHEET 3 of 4

REVISIONS: Corrected background plaque dimensions on county route marker.

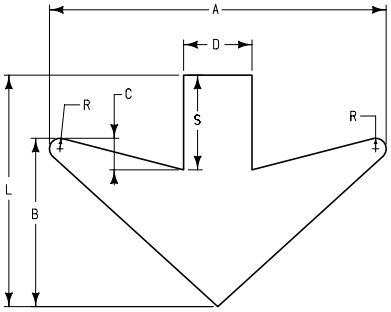
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

FABRICATION -
SIGN LEGEND COMPONENTS



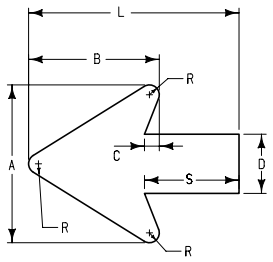
TYPE K

ID	Length L	Head Code	Head Width A	Head Length B	Draft C	Radius R	Tip	Shaft Width at Head D	Shaft Width at Tail E	Shaft Length S
K - 17	17	I-A	15.125	11.5625	1.3125	0.8125	Round	3.75	4.03	6.75
K - 20	20	I-B	18.25	14	1.5	0.75	Round	4.5	4.81	7.5
K - 25	25	I-C	22.25	17	1.75	1	Round	5.375	5.78	9.75
K - 30	30	I-B	18.25	14	1.5	0.75	Round	4.5	5.23	17.5



TYPE M

ID	Length L	Head Code	Head Width A	Head Length B	Draft C	Radius R	Tip	Shaft Width at Head D	Shaft Length S
M - 16	16	II-A	24	12	2.25	0.75	Point	4.875	6.25
M - 22	22	II-B	32	16	3	1	Point	6.5	9

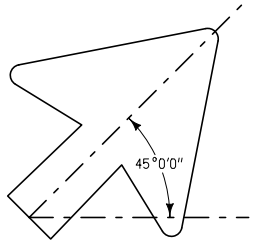


TYPE D

ID	Length L	Head Code	Head Width A	Head Length B	Draft C	Radius R	Tip	Shaft Width at Head D	Shaft Length S
D - 4 x 6	6	III-A	4	3.3125	0.375	0.25	Round	1.5	3.0625
D - 4 x 10	10	III-A	4	3.3125	0.375	0.25	Round	1.5	7.0625
D - 5 x 7	7	III-B	5	4.140625	0.46875	0.3125	Round	1.875	3.328125
D - 5 x 11	11	III-B	5	4.140625	0.46875	0.3125	Round	1.875	7.328125
D - 6 x 8	8	III-C	6	4.96875	0.5625	0.375	Round	2.25	3.59375
D - 6 x 12	12	III-C	6	4.96875	0.5625	0.375	Round	2.25	7.59375
D - 8 x 10	10	III-D	8	6.625	0.75	0.5	Round	3	4.125
D - 8 x 14	14	III-D	8	6.625	0.75	0.5	Round	3	8.125
D - 10 x 12	12	III-E	10	8.28125	0.9375	0.625	Round	3.75	4.65625
D - 10 x 16	16	III-E	10	8.28125	0.9375	0.625	Round	3.75	8.65625

ARROW DESIGNATION:

Each arrow used on a guide sign is identified by a three part code as follows:
Part 1 is the arrow ID number
Part 2 is the angle in degrees between the center line of the arrow and the horizontal



K-25, 45

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-20-10

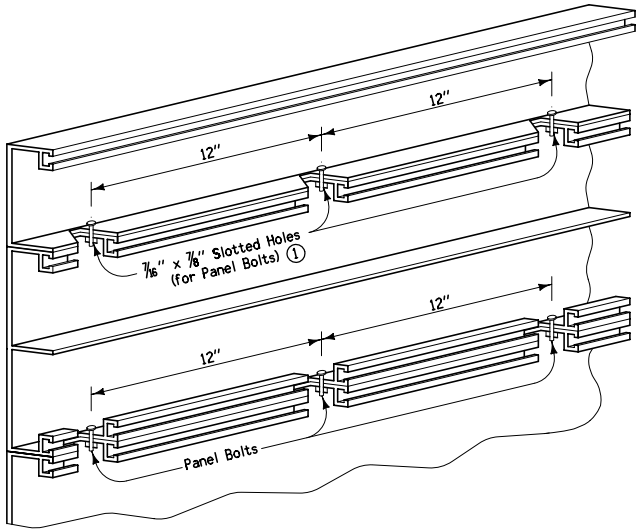
SI-121

SHEET 4 of 4

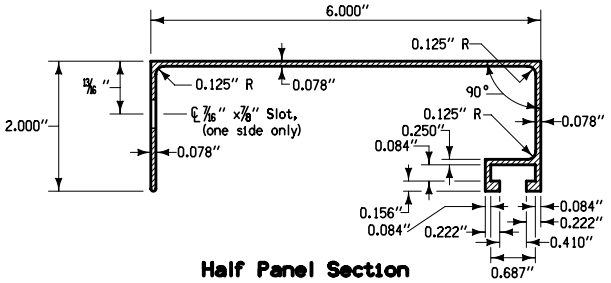
REVISIONS: Corrected background plaque dimensions on county route marker.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

FABRICATION - SIGN LEGEND COMPONENTS



ASSEMBLY DETAIL



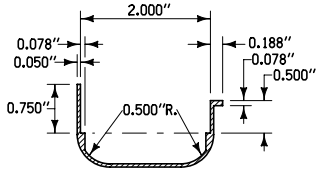
Half Panel Section

Panel bolt slotted holes spaced at 12 inch centers shall be located along the full length of each panel, such that the outermost slots are of equal distances (not to exceed 6 inches) from the ends of the panel.

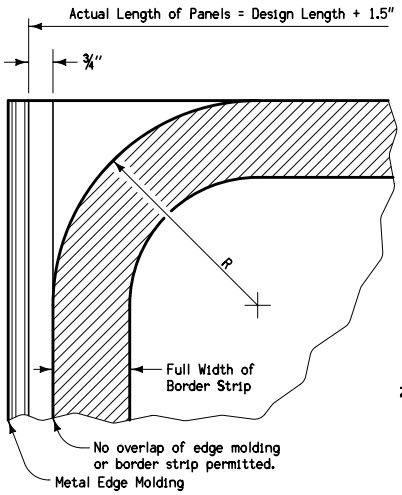
Signs shall be made up of full panels unless a half panel is required, in which case it shall be placed at the top edge of the sign.

Refer to detail project plans and summary sheet for exact data for individual sign fabrication requirements.

① 2 Washers per panel bolt, one each side of sign.

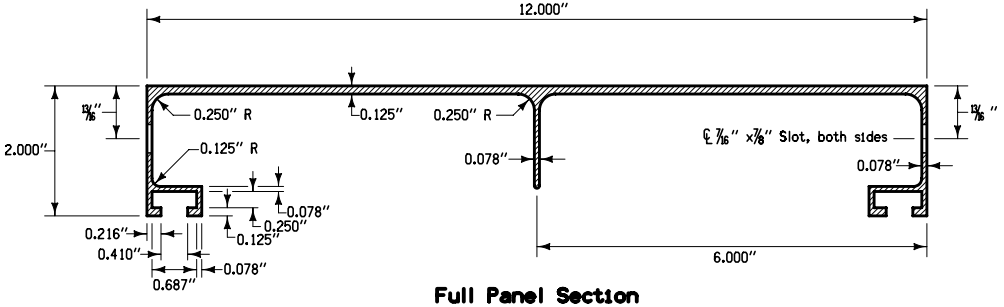


EDGE MOLDING



EDGE MOLDING BORDER STRIP DETAIL

Edge molding shall be installed full length of each vertical side of each sign. Attach in accordance with current specifications.



Full Panel Section

STANDARD STRUCTURAL SIGN PANELS

Iowa Department of Transportation

STANDARD ROAD PLAN

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1	10-20-09

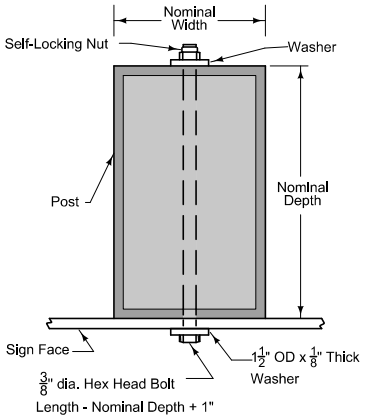
SI-123

SHEET 1 of 1

REVISIONS: Modified general notes.

Deanna Maifeld
APPROVED BY DESIGN METHODS ENGINEER

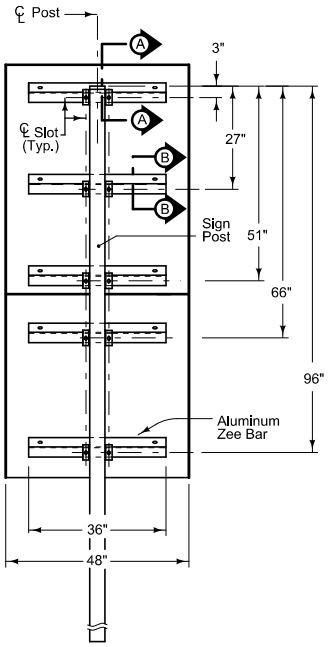
FABRICATION - TYPE 'B' SIGNS



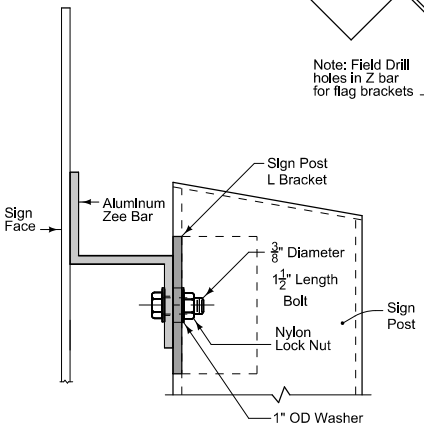
PLAN

NOTE: Treated Wood or Perforated Square Tube Post

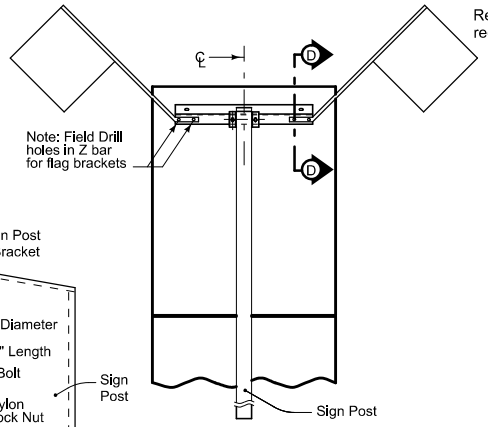
WOOD OR PERFORATED SQUARE TUBE POST INSTALLATION



BACK ELEVATION
4" x 6" RECTANGULAR TUBE POST ATTACHMENT DETAILS

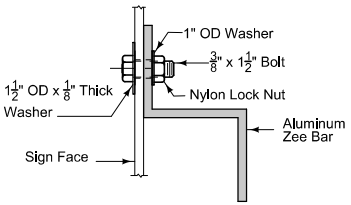


SECTION A-A

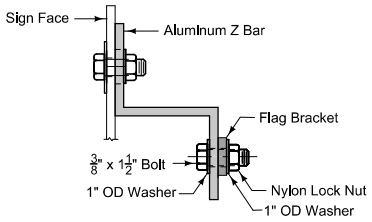


BACK ELEVATION ATTACHMENT DETAILS FOR FLAGS

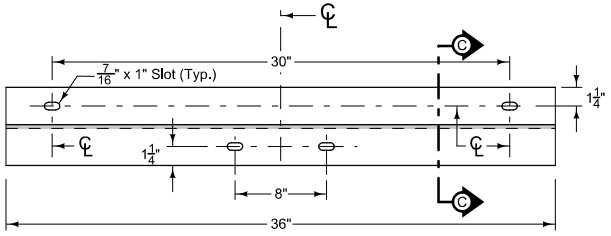
Refer to SI-114 for details of steel breakaway sign post rectangular tube.



SECTION B-B

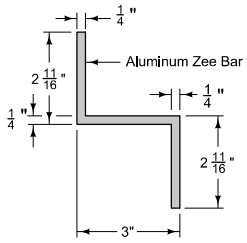


SECTION D-D



ALUMINUM ZEE BAR

RECTANGULAR TUBE POST INSTALLATION



SECTION C-C

Possible Contract Items:
Steel Breakaway Sign Post
Wood Sign Post

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
3	10-18-11

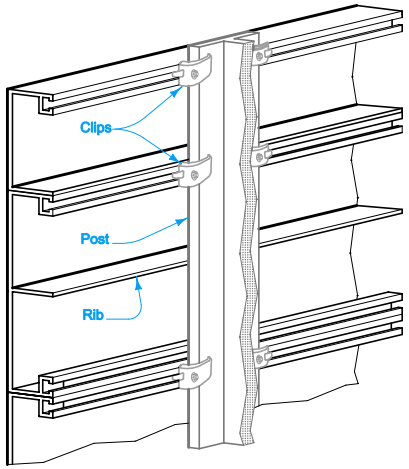
SI-131

SHEET 1 of 1

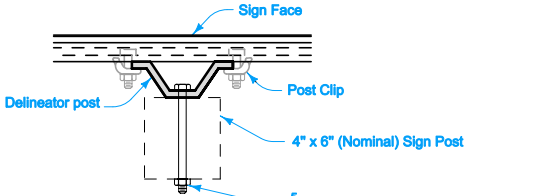
REVISIONS: Added Perforated Square Tube Post to Wood Post Installation detail.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

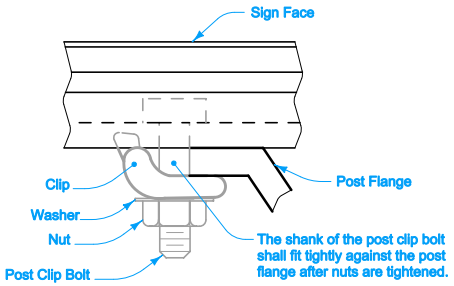
INSTALLATION - TYPE 'A' SIGNS



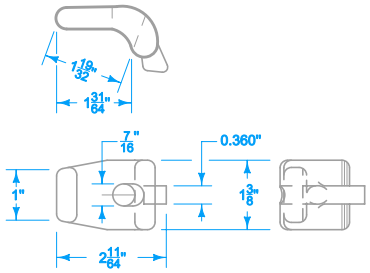
TYPE 1 ATTACHMENT
Type 1 Attachment shall be used for all signs placed on metal breakaway posts.



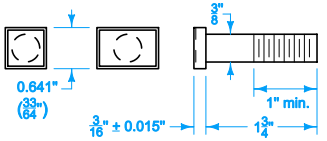
PLAN



CLIP INSTALLATION



POST CLIP



CLIP BOLT
(Square or Rectangualr Head Optional)

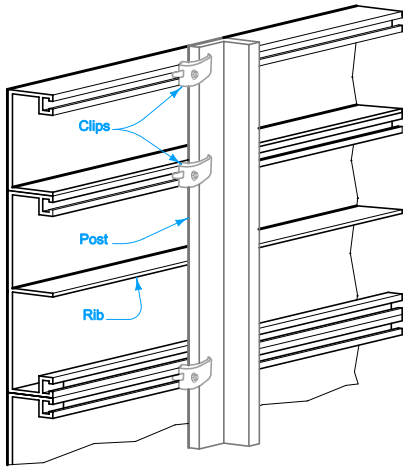
Position the EXIT NUMBER PANEL above the guide sign aligned with the edge of the guide sign indicating direction of exit.

If the bolt holes in the top panel and the bottom panel of the two signs line up, panel bolts are to be used.

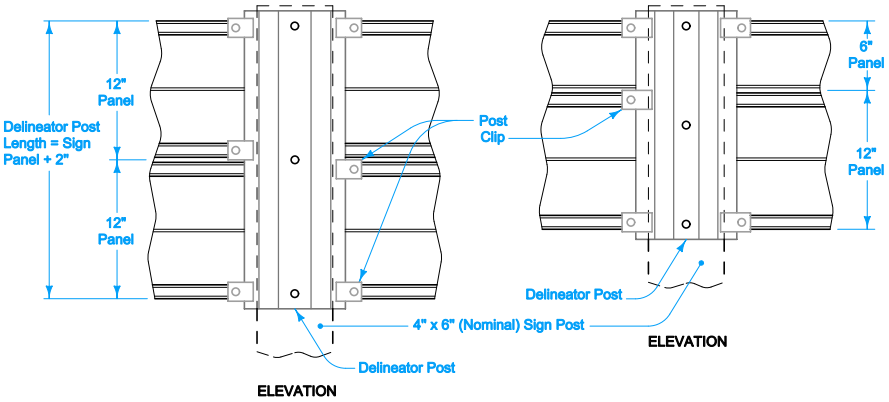
If the angle fasteners can not be horizontally placed as shown, they can be moved so as to securely hold the top sign.

A post clip is required on each angle at top of panel and each extrusion joint.

The aluminum angles are considered part of the mounting hardware and will be furnished by the Contractor as an incidental item and no separate payment will be made.



TYPE 4 ATTACHMENT
Type 4 Attachment shall be used for all signs mounted on overhead sign support structures.



TYPE 3 ATTACHMENT
Type 3 Attachment shall be used for all signs with wood posts.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
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SHEET 1 of 2

REVISIONS: Removed general note already covered in spec.

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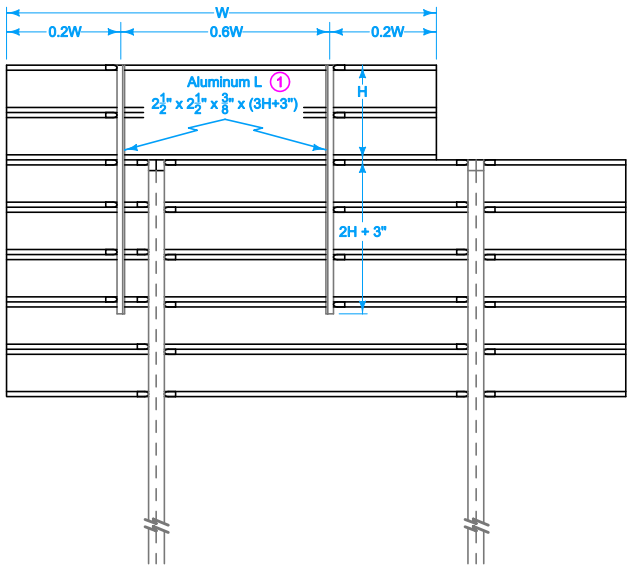
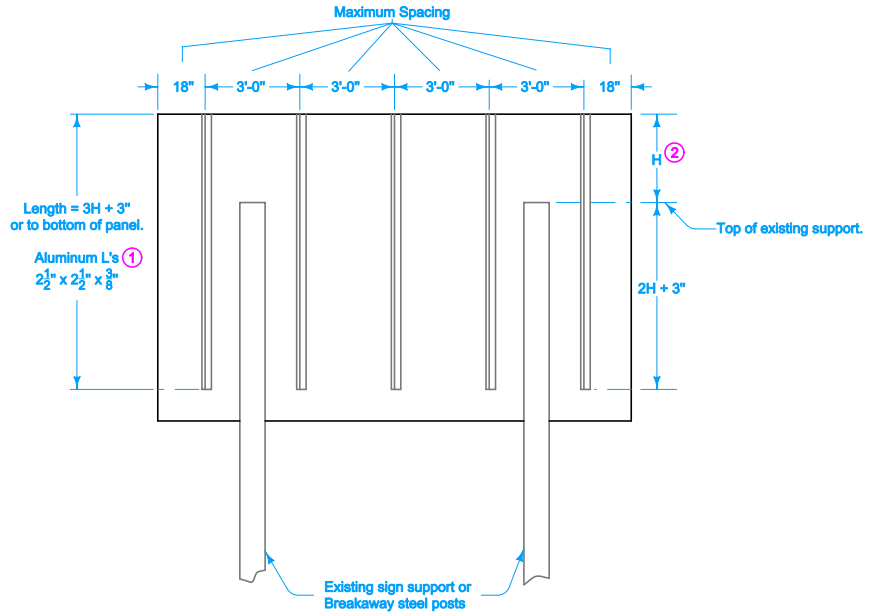
INSTALLATION - TYPE 'B' SIGNS

① The aluminum L shall never extend below the bottom of the major sign.

② Sign height added above existing supports.





GUIDE SIGNS

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-20-10

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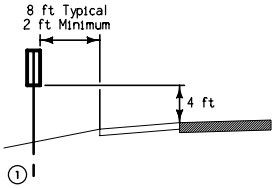
SHEET 2 of 2

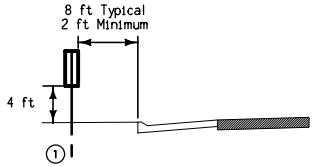
REVISIONS: Removed general note already covered in spec.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

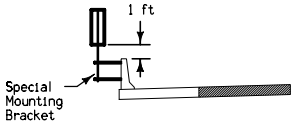
INSTALLATION - TYPE 'B' SIGNS



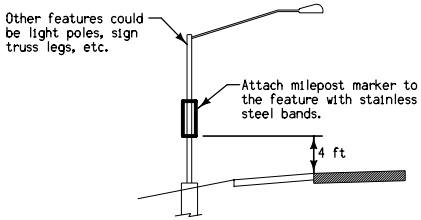
TYPE 1
SHOULDER INSTALLATION



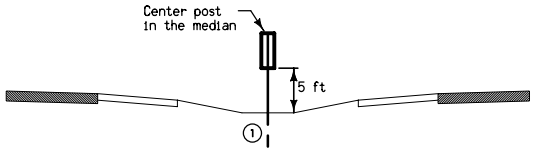
TYPE 2
CURB INSTALLATION



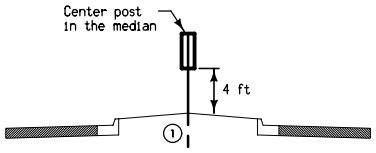
TYPE 3
BRIDGE BARRIER RAIL INSTALLATION



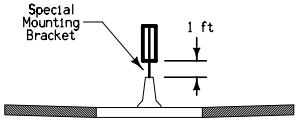
TYPE 4
ATTACHMENT TO OTHER FEATURE



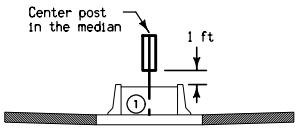
TYPE 5
DEPRESSED MEDIAN INSTALLATION



TYPE 6
RAISED MEDIAN INSTALLATION



TYPE 7
FULL MEDIAN BARRIER RAIL INSTALLATION

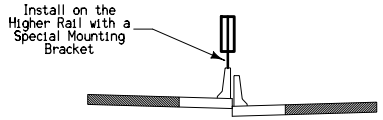


TYPE 8
SPLIT MEDIAN BARRIER RAIL INSTALLATION

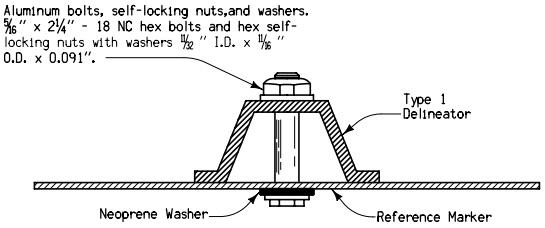
The Contractor shall furnish Type 1 delineator posts for each location unless specified otherwise in the plans.

All dimensions are in inches unless otherwise designated.

(1) Post length shall be sufficient to provide a minimum of 30 inches of embedment when installed at the specified mounting height.



TYPE 9
SPLIT MEDIAN BARRIER RAIL INSTALLATION
WITH GRADE DIFFERENTIAL



MILEPOST MARKER ASSEMBLY
TOP VIEW

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-20-09

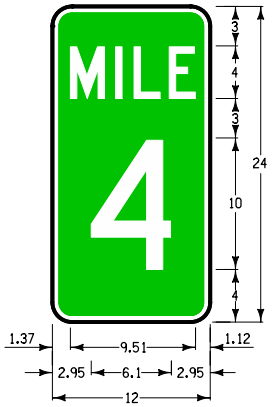
SI-171

SHEET 1 of 4

REVISIONS: Deleted information already in the specification book and added general note.

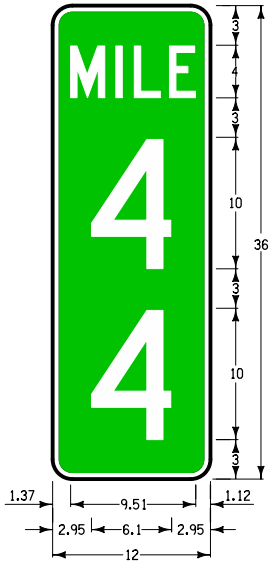
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

REFERENCE POSTS



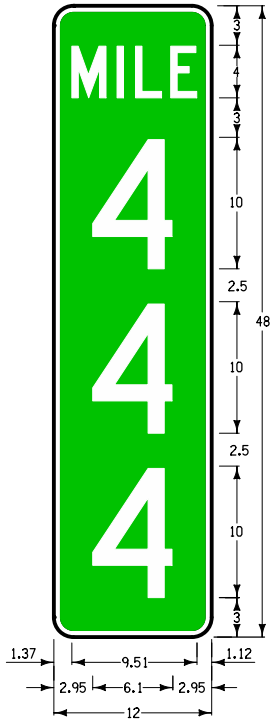
1.50" Radius, 0.50" Border, White on Green;
[MILE] C; [4] C;

D10-1A



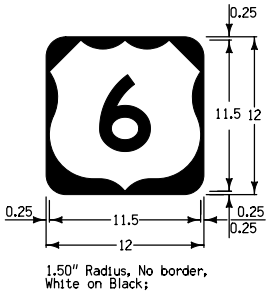
1.50" Radius, 0.50" Border, White on Green;
[MILE] C; [4] C; [4] C;

D10-2A



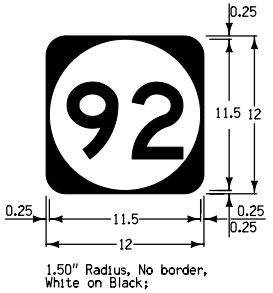
1.50" Radius, 0.50" Border, White on Green;
[MILE] C; [4] C; [4] C; [4] C;

D10-3A



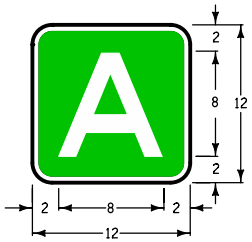
1.50" Radius, No border,
White on Black;

D10-5A



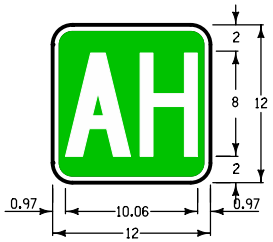
1.50" Radius, No border,
White on Black;

D10-6A



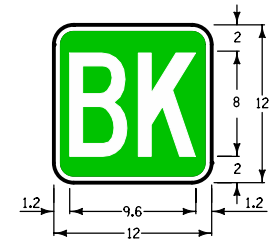
1.50" Radius, 0.50" Border, White on Green;
[A] E;

D10-7A



1.50" Radius, 0.50" Border, White on Green;
[AH] C 50± spacing;

D10-8A



1.50" Radius, 0.50" Border, White on Green;
[BK] C 50± spacing;

D10-9A

Iowa Department of Transportation

REVISION	
1	10-20-09

STANDARD ROAD PLAN

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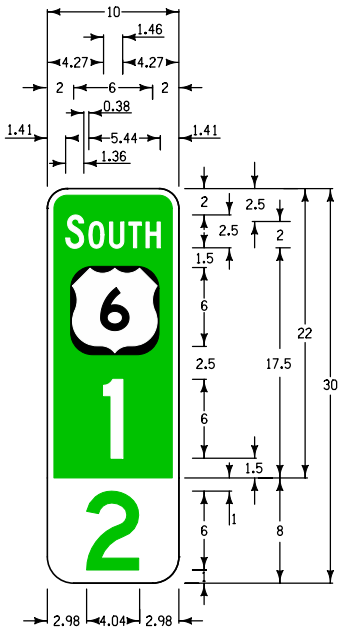
SHEET 2 of 4

REVISIONS: Deleted information already in the specification book and added general note.

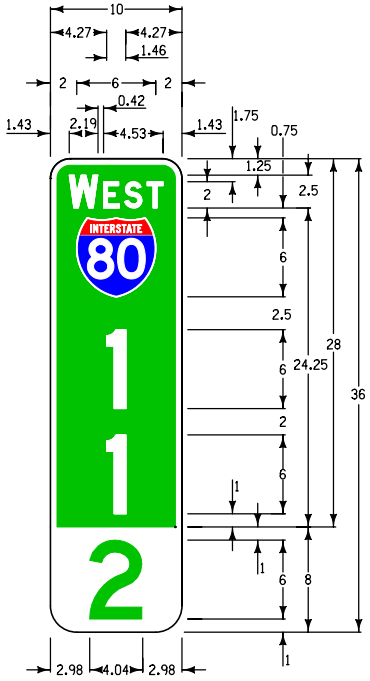
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

REFERENCE POSTS



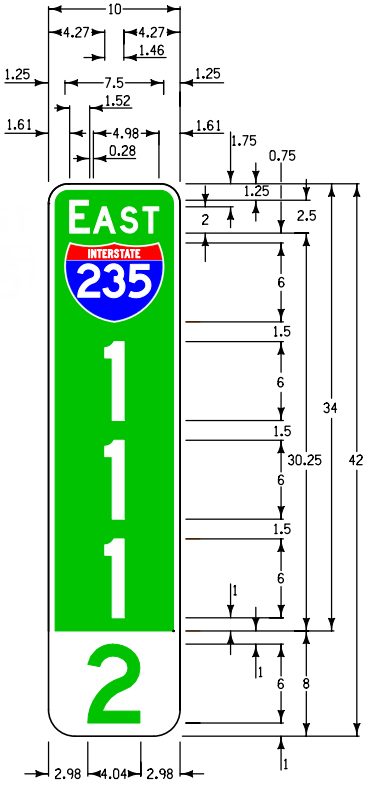
1.50" Radius, 0.50" Border, White on Green;
[SOUTH] C; [1] D;
1.50" Radius, 0.00" Border, White on White;
[2] Green D;

D10-1D



1.50" Radius, 0.50" Border, White on Green;
[WEST] D; [1] D; [1] D;
1.50" Radius, 0.00" Border, White on White;
[2] Green D;

D10-2D



1.50" Radius, 0.50" Border, White on Green;
[EAST] D; [1] D; [1] D; [1] D;
1.50" Radius, 0.00" Border, White on White;
[2] Green D;

D10-3D

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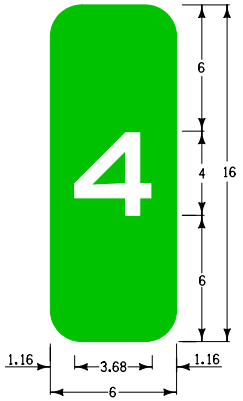
REVISIONS: Deleted information already in the specification book and added general note.

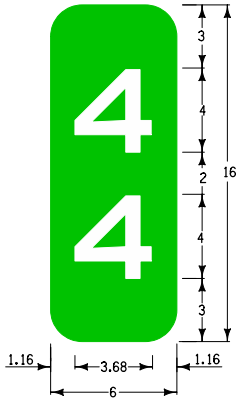
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

REFERENCE POSTS



1.50" Radius, No border, White on Green;
[4] E;

D10-1



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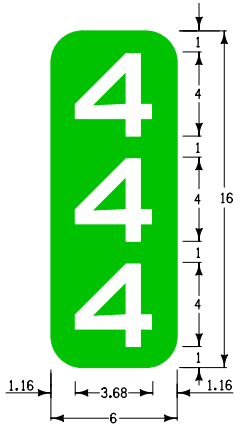
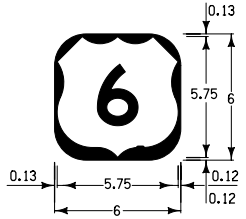
[4] E; [4] E;

D10-2



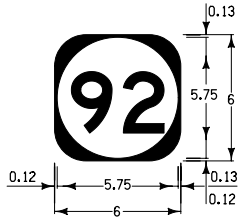
1.50" Radius, No border, White on Green;
[4] E; [4] E; [4] E;

D10-3



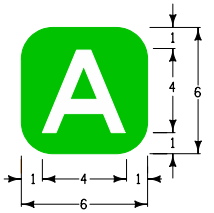
1.50" Radius, No border, White on Black;

D10-5



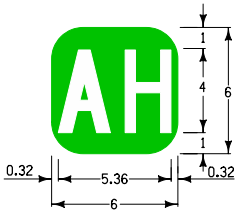
1.50" Radius, No border, White on Black;

D10-6



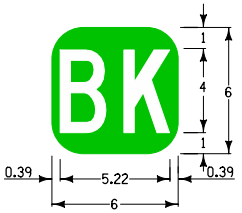
1.50" Radius, No border, White on Green;
[A] E;

D10-7



1.50" Radius, No border, White on Green;
[AH] C;

D10-8



1.50" Radius, No border, White on Green;
[BK] C;

D10-9

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REVISIONS: Deleted information already in the specification book and added general note.

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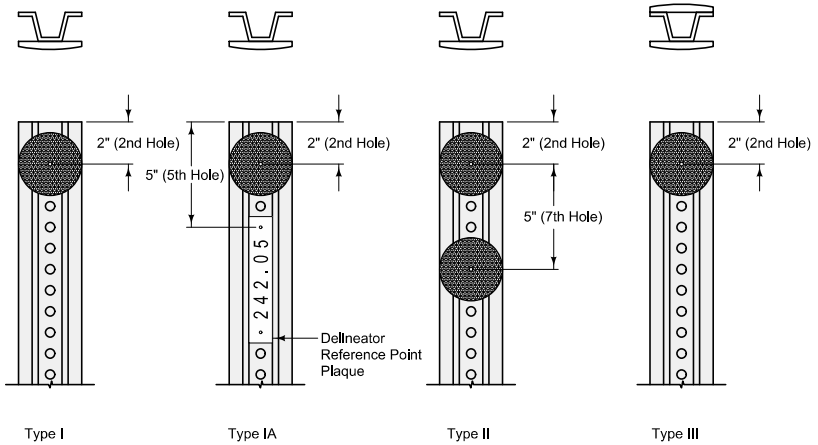
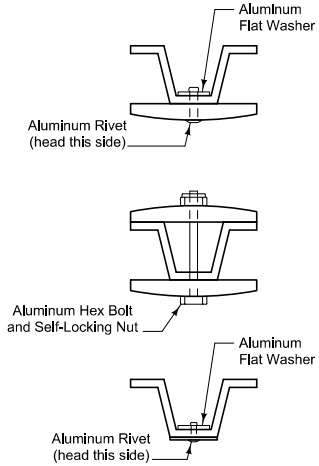
APPROVED BY DESIGN METHODS ENGINEER

REFERENCE POSTS



RIGID DELINEATOR MOUNTINGS



ATTACHMENTS

Place delineators at a constant distance from the edge of pavement and/or the edge of shoulder.

The delineator height is measured from the edge of pavement or the face of curb.

When placed behind curb, the delineator offset is measured from the face of curb. Allowable offsets are 2 feet minimum and 8 feet maximum. If the curb is part of a shoulder, maintain at least a minimum 8 foot offset from the edge of pavement.

When placed on the foreslope, the delineator offset is measured from the edge of shoulder. Allowable offsets are 2 feet minimum and 8 feet maximum. However, for shoulders less than 6 feet in width, maintain a minimum 8 feet to the edge of pavement.

Refer to the project plans for specific offset dimensions.

Furnish white, yellow, and/or red reflectors as specified in the project plans.

Furnish Type I delineator posts. Post lengths are to be sufficient to ensure the proper installation height and provide a minimum of 2'-6" embedment. See Table I for post lengths for various slope and offset conditions.

Install delineators truly vertical.

Delineators placed along freeways and expressways are to be spaced every 0.05 mile along the thru roadway. Placements are based on the reference post marker. A Delineator Reference Point Plaque is required on each delineator for both directions of travel.

Fabricate plaques from 0.063 inch thick sheet aluminum of the appropriate dimensions. Use non-reflectorized sheeting. White for the background, and black for the numerals.

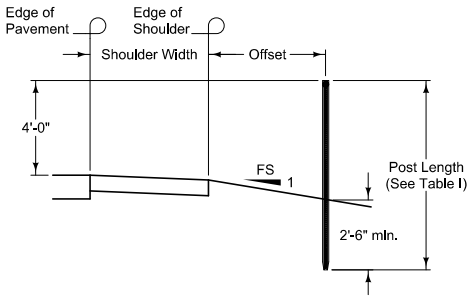
Attach single reflectors to the post with an aluminum, brazier head, blind rivet of $\frac{3}{16}$ inch diameter and a grip range of 0.376 to 0.625 inches, and an aluminum flat washer of 0.193 in. ID x 0.750 in. OD x 0.091 in. thickness.

Attach back to back reflectors to the post with an aluminum $\frac{3}{16}$ in. dia x $2\frac{1}{2}$ in. length hex head bolt with a matching self-locking nut.

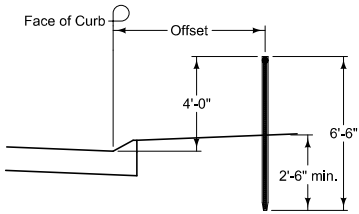
Attach plaques to the post with an aluminum, brazier head, blind rivet of $\frac{1}{8}$ inch diameter and a grip range of 0.126 to 0.250 inches, and an aluminum flat washer of 0.129" ID x 0.750" OD x 0.091" thickness.

All materials shall comply with Standard Specification 4186.

Post Lengths for Shoulder Installation					
Offset	Foreslope Rate (FS:1)				
ft	10:1	6:1	4:1	3:1	2:1
2	8	8	8	8	8
4	8	8	8	10	10
6	8	8	10	10	10
8	8	10	10	10	12

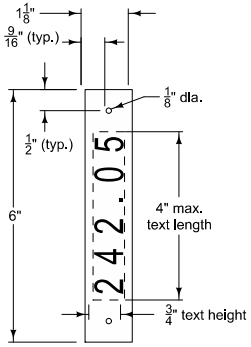


Shoulder Installation



Curb Installation

DELINEATOR POST LOCATIONS



DELINEATOR REFERENCE POINT PLAQUE

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REVISIONS: Changed Face of Curb reference.

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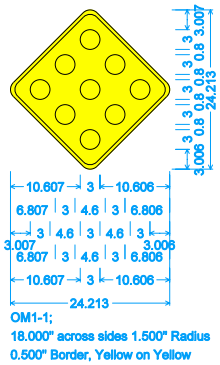
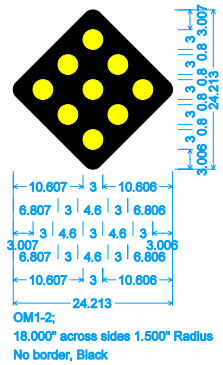
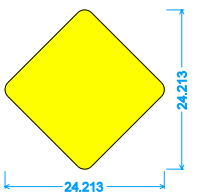
DELINEATORS



OM1-1;
18.000" across sides 1.500" Radius
0.500" Border, Yellow on Yellow

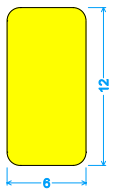


OM1-2;
18.000" across sides 1.500" Radius
No border, Black



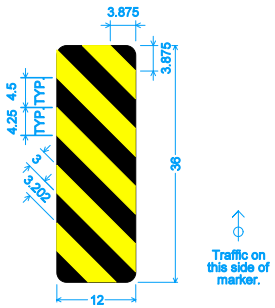
OM1-3;
18.000" across sides 1.500" Radius
No border, Yellow

TYPE 1 OBJECT MARKERS

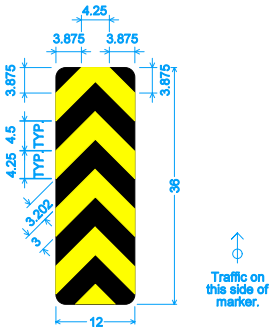


OM2-2;
1.000" Radius, No border, Yellow

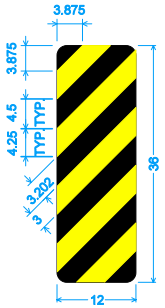
TYPE 2 OBJECT MARKER



OM3-L;
1.500" Radius, No border,
Black, Yellow Diagonal

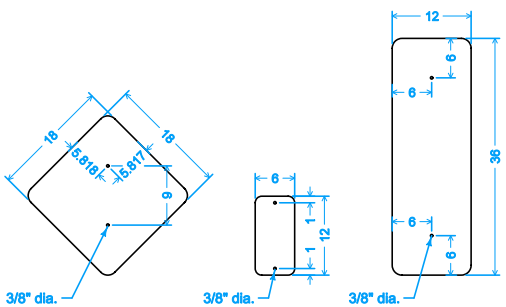


OM3-C;
1.500" Radius, No border,
Black, Yellow Diagonal

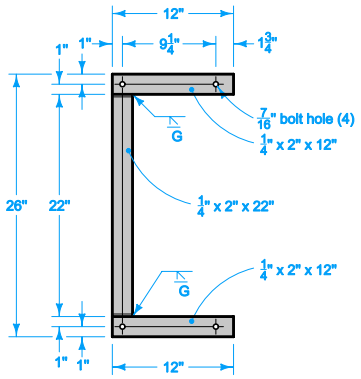


OM3-R;
1.500" Radius, No border,
Black, Yellow Diagonal

TYPE 3 OBJECT MARKERS



SIGN BLANKS
0.063 inch aluminum



OFFSET BRACKET
Galvanize in accordance with AASHTO M 111.

Fabricate object markers from materials complying with Section 4186 of the Standard Specifications.

Buttons on Type 1 Object Markers may consist of yellow reflectors or yellow reflective sheeting. Do not mix types on any single object marker. When reflectors are used, attach to sign blank with an aluminum, brazier head, blind rivet of $\frac{3}{16}$ inch diameter and a grip range of $\frac{1}{8}$ to $\frac{3}{8}$ inches.

Install object markers truly vertical.

Ensure top of post does not extend above top of object marker.

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New	04-20-10

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REVISIONS: New.

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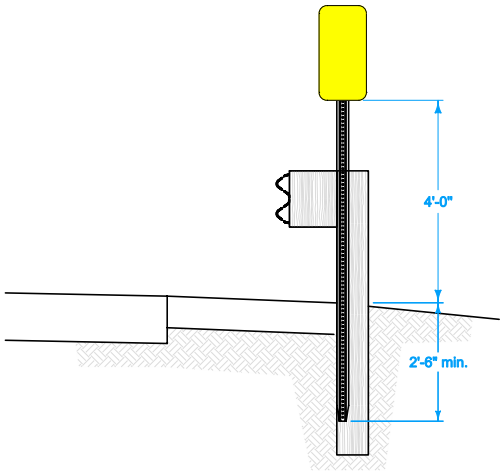
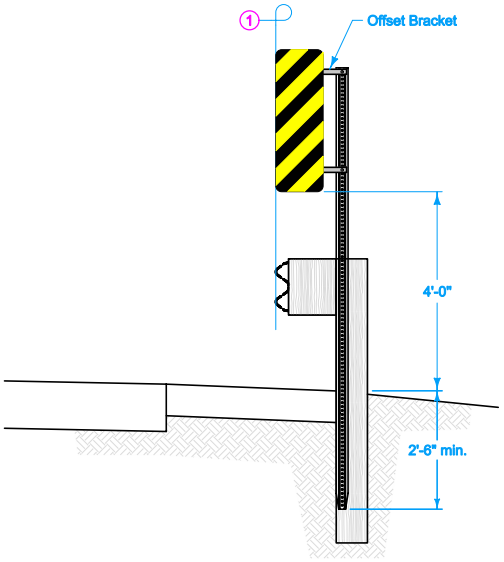
OBJECT MARKERS



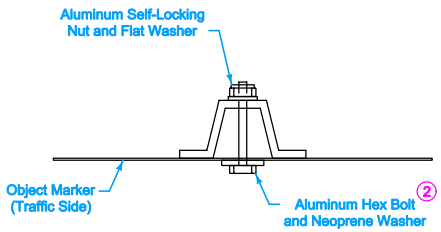
TYPE 2



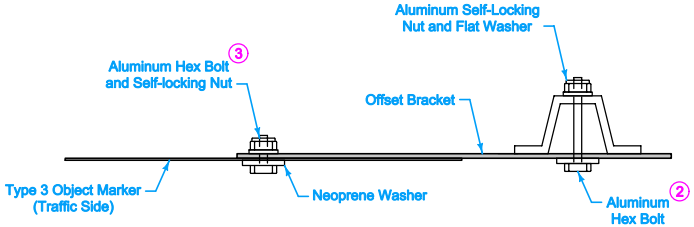
TYPE 3

INSTALLATION AT GUARDRAIL LOCATIONS

1. Install Type 3 Object Markers so the inside edge of the marker is in line with the inner edge of the obstruction.
2. Attach object marker or offset bracket to the delineator post at two locations. Use the following per bolt hole location:
   - one aluminum $\frac{5}{16}$ in. dia x $2\frac{1}{4}$ in. length hex head bolt with matching self-locking nut,
   - one aluminum flat washer of 0.344 in. ID x 0.688 in. OD x 0.091 thickness behind the nut, and
   - for object marker attachment only, one neoprene washer of 1 in. OD x $\frac{1}{8}$ in. thickness behind the bolt head.
3. When Type 3 Object Marker is installed on an offset bracket, attach marker to bracket at two locations. Use the following per bolt hole location:
   - one aluminum $\frac{5}{16}$ in. dia x $1\frac{1}{2}$ in. length hex head bolt with matching self-locking nut,
   - one aluminum flat washer of 0.344 in. ID x 0.688 in. OD x 0.091 thickness behind the nut, and
   - one neoprene washer of 1 in. OD x $\frac{1}{8}$ in. thickness behind the bolt head.



STANDARD ATTACHMENT



OFFSET BRACKET ATTACHMENT

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New	04-20-10

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REVISIONS: New.

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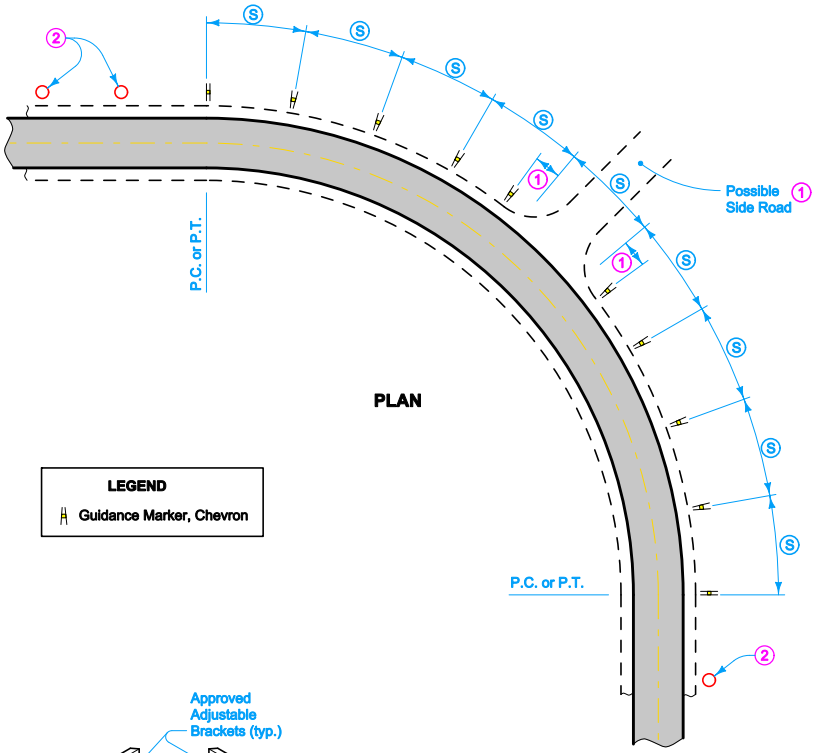
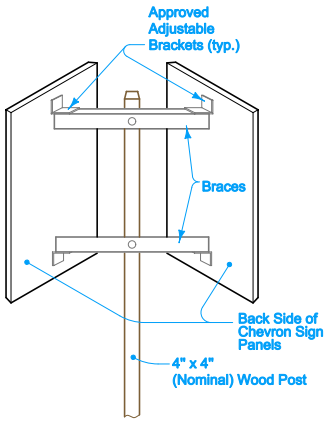
OBJECT MARKERS



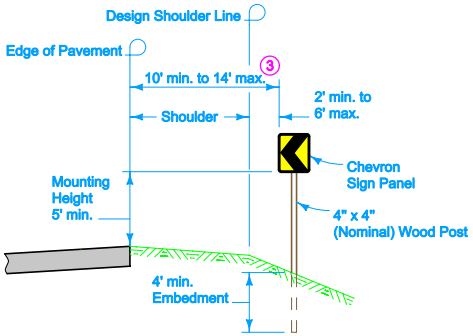
PLAN

LEGEND

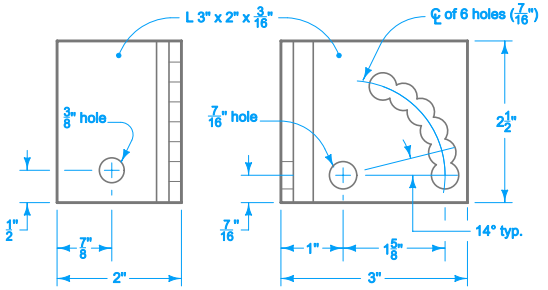
Guidance Marker, Chevron



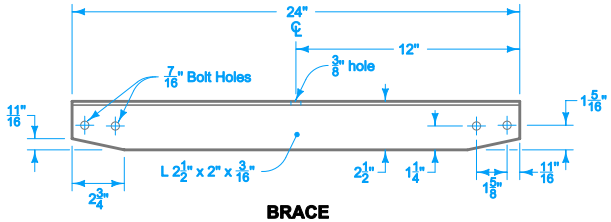
BACK VIEW OF GUIDANCE MARKER, CHEVRON



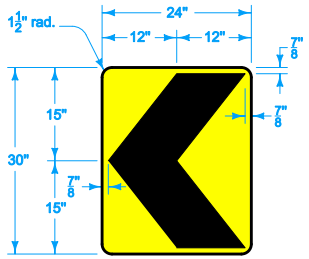
TYPICAL SECTION



BRACKET
Right side. Left side is mirror image.



BRACE



CHEVRON SIGN PANEL (W1-8)

Colors: Chevron - Black (non-reflective)
Background - Yellow (reflective)

To be effective, Chevron Sign Panels should be visible for at least 500 feet. Attach Chevron Sign Panels to the adjustable brackets at an angle so headlight beams are not reflected back into the driver's eye.

Furnish adjustable brackets in all aluminum or all galvanized steel products. Include locking devices on all bolts.

Each correctly installed "Guidance Marker, Chevron W1-8 (Special)" will be counted and paid for at the contract unit price. Payment is full compensation for furnishing and installing one wood post, two chevron W1-8 sign panels, approved mounting brackets, braces, and all work necessary to install as shown.

(1) Adjust chevron locations as necessary to meet (S) as near as possible.

(2) Possible delineators.

(3) Align horizontal placement of Chevrons with roadway delineators if applicable.

Possible Contract Item:
Guidance Marker, Chevron W1-8 (Special)

Possible Tabulation:
108-34

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REVISIONS: Updated formatting. Added circle notes 2 and 3. Clarified measurement and payment.

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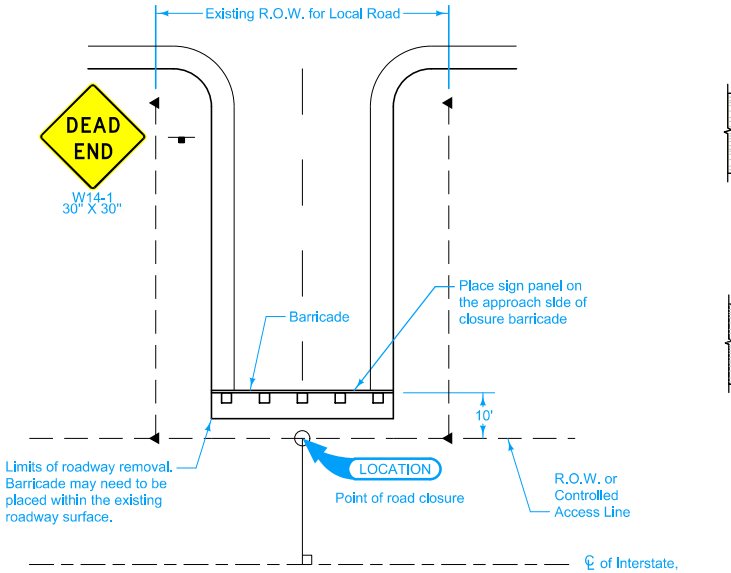
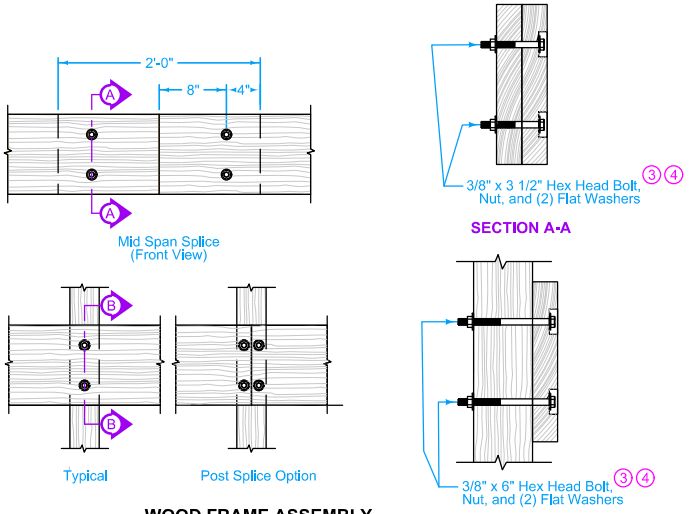
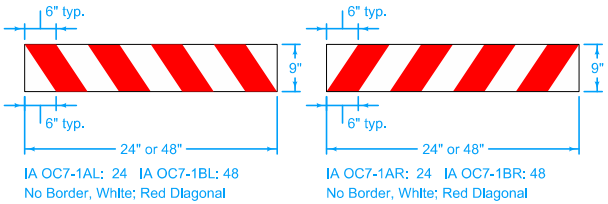
CHEVRONS



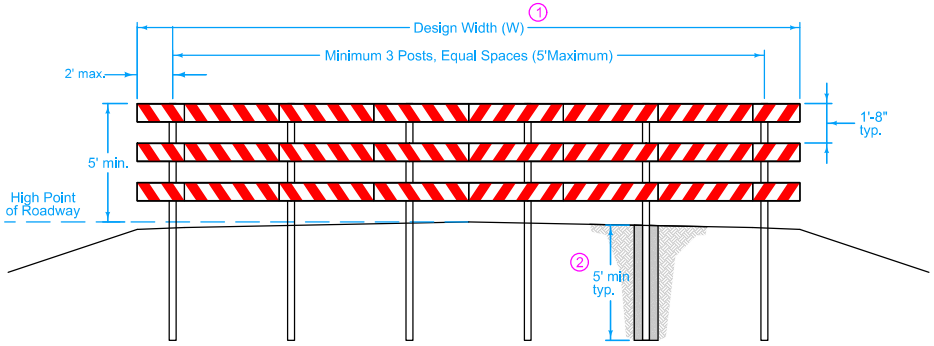
PLAN - INSTALLATION



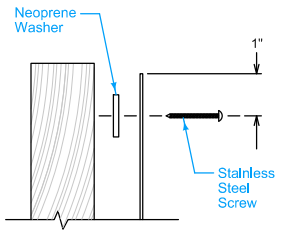
WOOD FRAME ASSEMBLY



SIGN PANEL FABRICATION (5)



APPROACH VIEW (6)



SIGN PANEL INSTALLATION (5)

Price bid for "Permanent Road Closure, Rural, SI-181" includes furnishing and installing the barricade, signs, posts, and hardware.

The length will be measured in linear feet based upon the width of standard sign panels installed.

The Contractor will be paid the contract unit price per linear foot.

Minimum Barricade length = design width (W).

(1) Design width (W) equals width of existing roadway and shoulders.

(2) Install posts as per Standard Specification **2524.03.B.1**.

(3) Assemble the wood frame with standard strength, hot dip galvanized bolts, nuts and washers as per the following specifications:

Bolts - ASTM A307
Nuts - ASTM A563
Washers - ASTM F884
Galvanization - ASTM F2329.

(4) Recess all bolt heads in a $1\frac{1}{4}$ inch diameter x $\frac{1}{2}$ inch deep hole to allow sign panels to lay flush on the planks.

(5) Use 0.063 inch aluminum blank for sign panel. Sign panel to meet the requirements of Standard Specification **2524**. Attach sign panels to the planks along the top and bottom at 2 foot centers using #10 x 1 $\frac{1}{4}$ inch self-drilling, phillips, pan head, 18-8 stainless steel screws. Use a 1 in. OD x $\frac{1}{8}$ in. thick neoprene washer between the sign panel and the treated wood plank to prevent corrosion.

(6) Use pressure treated 4 in. x 4 in. x 12 ft. nominal boards for posts, and pressure treated 2 in. x 10 in. x variable length nominal boards for planks. Use planks of sufficient length to span at least 2 posts.

Possible Contract Item:
Permanent Road Closure, Rural, SI-181

Possible Tabulation:
102-4

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STANDARD ROAD PLAN

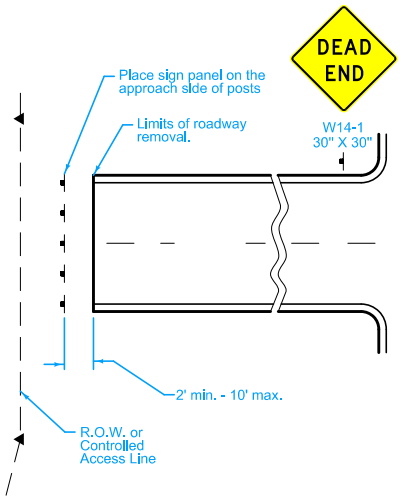
SI-181

SHEET 1 of 1

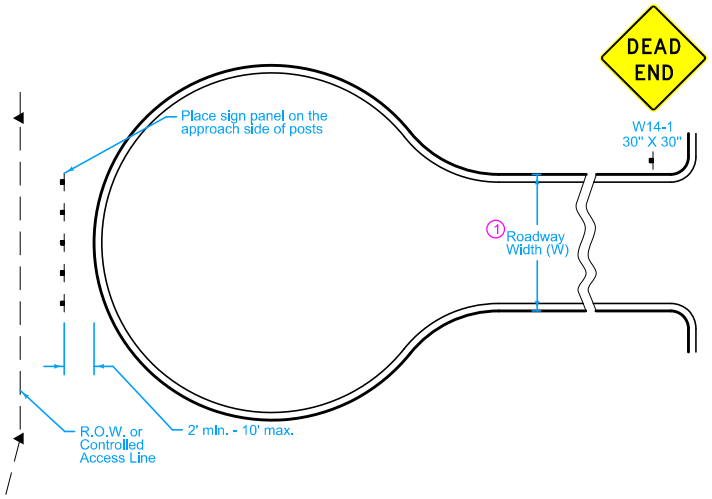
REVISIONS: Added 'W' to match tab. Added general note and modified circle note 1 to clarify 'W'.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PERMANENT ROAD CLOSURE - RURAL



DEAD END WITHOUT CUL-DE-SAC

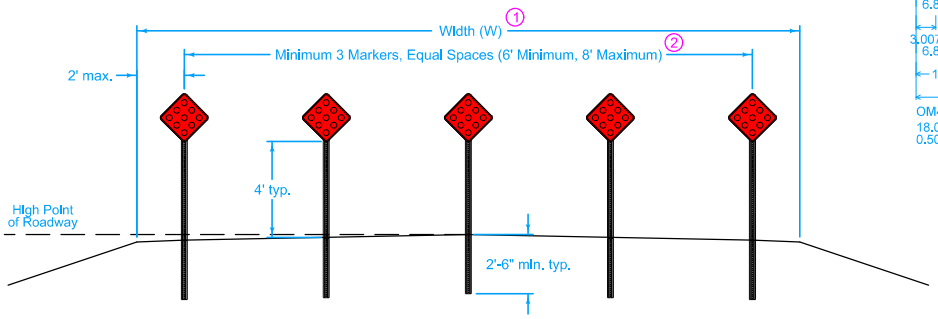


DEAD END WITH CUL-DE-SAC

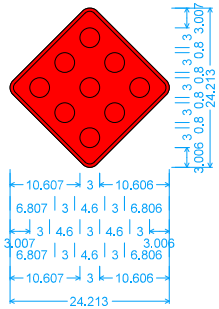
Price bid for "Permanent Road Closure, Urban, SI-182" includes furnishing and installing the closure, signs, posts, and hardware.

Closures will be counted and the contractor will be paid the contract unit price for each closure.

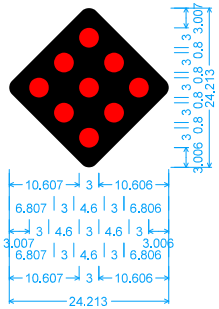
1. Width includes the width of the existing roadway and shoulders.
2. Type I delineator posts.
3. The three types of markers are equivalent. The same type should be used for each closure. Use 0.063 inch aluminum blank with Type III or IV retro reflective sheeting for sign panel. Use reflectors for buttons.



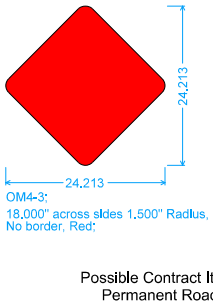
APPROACH VIEW



OM4-1:
18.000" across sides 1.500" Radius,
0.500" Border, Red on Red;



OM4-2:
18.000" across sides 1.500" Radius,
No border, Black;



OM4-3:
18,000" across sides 1.500" Radius,
No border, Red;

END OF ROADWAY MARKER FABRICATION 3

Possible Contract Item:
Permanent Road Closure, Urban, SI-182

Possible Tabulation:
102-4

Iowa Department of Transportation

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STANDARD ROAD PLAN

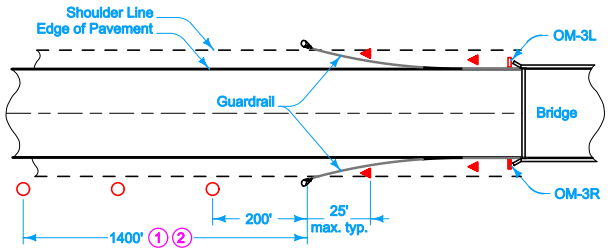
SI-182

SHEET 1 of 1

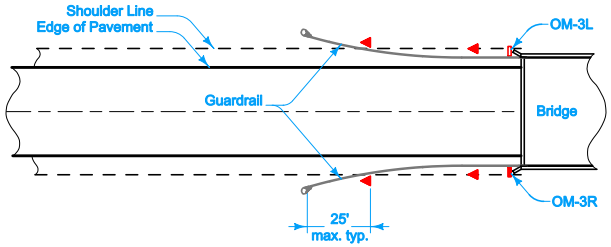
REVISIONS: Added to general notes that the three object marker types are equivalent. Added 'W' to match tab. Modified circle note 1.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

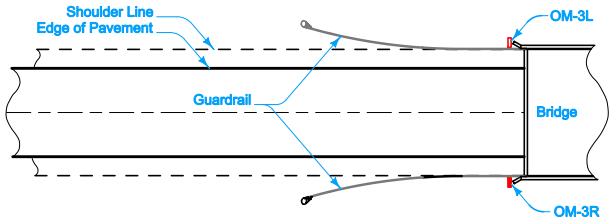
PERMANENT ROAD CLOSURE - URBAN



TYPE 1
BRIDGE OR CONCRETE BARRIER RAIL
(LESS THAN FULL SHOULDER WIDTH AND BRIDGE/ROADWAY WIDTH LESS THAN 30 FT.)



TYPE 2
BRIDGE OR CONCRETE BARRIER RAIL
(LESS THAN FULL SHOULDER WIDTH AND BRIDGE/ROADWAY WIDTH 30 FT. OR GREATER)



TYPE 3
BRIDGE OR CONCRETE BARRIER RAIL
(FULL SHOULDER WIDTH)

INSTALLATION AT BRIDGES

See SI-172 for details of Delineators and SI-173 for details of Object Markers.

TYPE 1:
Beginning 25 ft. from the approach end of guardrail, install Type 2 Object Markers at 25 ft. intervals behind the guardrail. Install Type 3 Object Marker at the bridge ends. On paved roadways only, install 7 Single White Delineators at 200 ft. spacing beginning 200 ft. in front of the approach end of the guardrail. For ramp terminals see note 2.

TYPE 2:
Beginning 25 ft. from the approach end of guardrail, install Type 2 Object Markers at 25 ft. intervals behind the guardrail. Install Type 3 Object Marker at the bridge ends.

TYPE 3:
Install Type 3 Object Markers at the bridge ends.

(1) Not required on projects where delineators are proposed or installed throughout the length of the project.

(2) At ramp terminals only, install Single White Delineators as follows: Place first delineator at location where near ramp terminal radius meets the edge of the through pavement. Place additional delineator(s) spaced equally (spacing not to exceed 200') between first delineator and guardrail.

LEGEND

- Type 3 Object Marker, Left (OM-3L)
- Type 3 Object Marker, Right (OM-3R)
- Type 2 Object Marker
- Rigid Delineator, Type 1 White

Iowa Department of Transportation

STANDARD ROAD PLAN

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SHEET 1 of 3

REVISIONS: Added notes for clarification.

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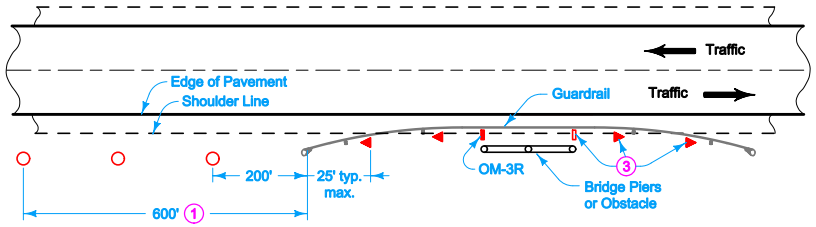
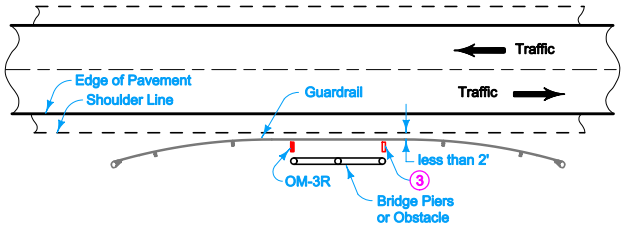
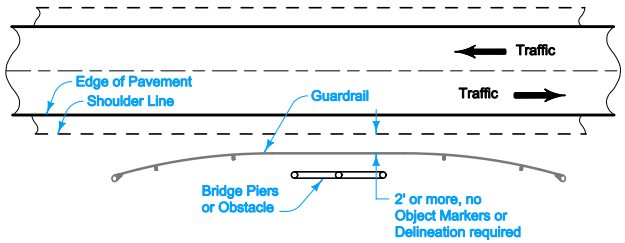
OBJECT MARKER AND DELINEATOR PLACEMENT WITH GUARDRAIL



TYPE 4
MARKING SIDE OBSTACLES
(STEEL BEAM GUARDRAIL ON THE SHOULDER)



TYPE 5
MARKING SIDE OBSTACLES
(STEEL BEAM GUARDRAIL LESS THAN 2 FT. FROM THE SHOULDER LINE)



TYPE 6
MARKING SIDE OBSTACLES
(STEEL BEAM GUARDRAIL 2 FT. OR MORE FROM THE SHOULDER LINE)

INSTALLATION AT SIDE OBSTACLES

TYPE 4:
Beginning 25 ft. from the approach end of guardrail, install Type 2 Object Markers at 25 ft. intervals behind the guardrail. Beginning 200 ft. in front of approach end of the guardrail, install 3 Single White Delineators at 200 ft. spacing. Additional markers as shown.

1. Not required on projects where delineators are proposed or installed throughout the length of the project.

3. Type 2 and Type 3 Object Marker at trailing end of obstacle not required when one-way traffic exists.

LEGEND

- Type 3 Object Marker, Left (OM-3L)
- Type 3 Object Marker, Right (OM-3R)
- Type 2 Object Marker
- Rigid Delineator, Type 1 White

Iowa Department of Transportation

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STANDARD ROAD PLAN

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SHEET 2 of 3

REVISIONS: Added notes for clarification.

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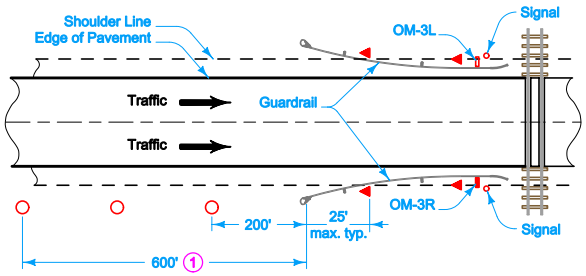
OBJECT MARKER AND DELINEATOR PLACEMENT WITH GUARDRAIL

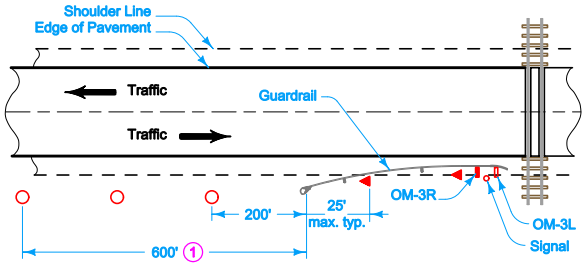
TYPE 7:
Beginning 25 ft. from the approach end of guardrail, install Type 2 Object Markers at 25 ft. intervals behind the guardrail. Beginning 200 ft. in front of approach end of the outside guardrail, install 3 Single White Delineators at 200 ft. spacing.

TYPE 8:
Beginning 25 ft. from the approach end of guardrail, install Type 2 Object Markers at 25 ft. intervals behind the guardrail. Beginning 200 ft. in front of approach end of the right guardrail, install 3 Single White Delineators at 200 ft. spacing.

(1) Not required on projects where delineators are proposed or installed throughout the length of the project.



TYPE 7
MARKING RAILROAD CROSSING SIGNALS
(ONE-WAY TRAFFIC)



TYPE 8
MARKING RAILROAD CROSSING SIGNALS
(TWO-WAY TRAFFIC)

LEGEND

- Type 3 Object Marker, Left (OM-3L)
- Type 3 Object Marker, Right (OM-3R)
- Type 2 Object Marker
- Rigid Delineator, Type 1 White

INSTALLATION AT RAILROADS

Iowa Department of Transportation

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STANDARD ROAD PLAN

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SHEET 3 of 3

REVISIONS: Added notes for clarification.

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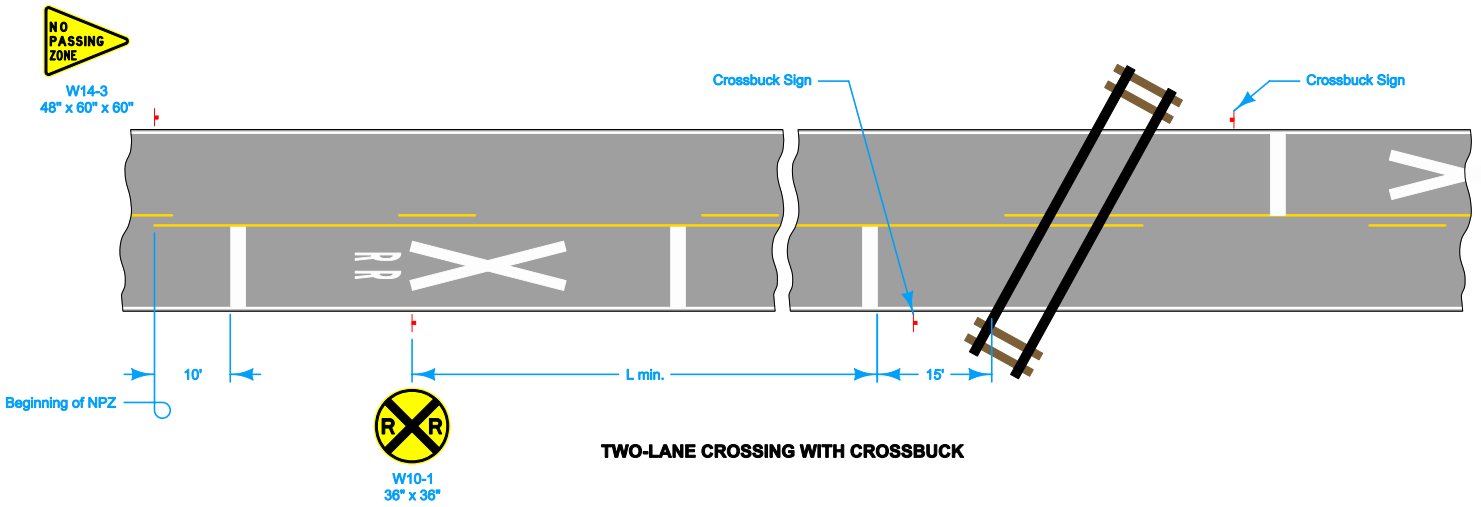
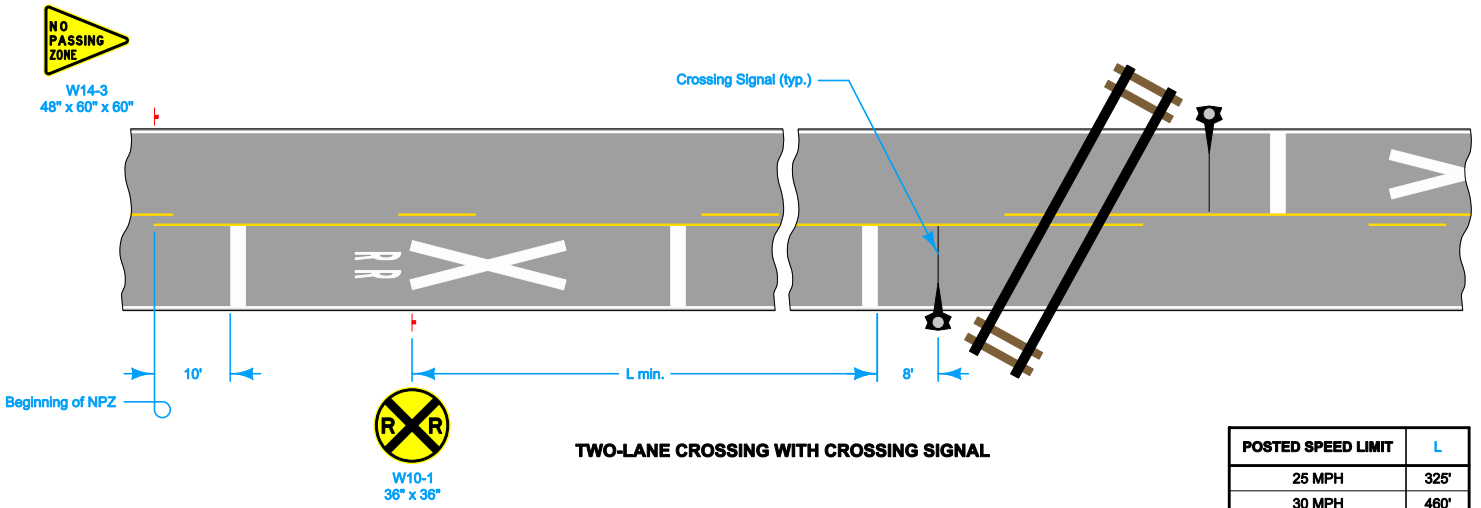
OBJECT MARKER AND DELINEATOR PLACEMENT WITH GUARDRAIL

For pavement marking information, see PM-240 and PM-242.



TWO-LANE CROSSING WITH CROSSBUCK



TWO-LANE CROSSING WITH CROSSING SIGNAL

POSTED SPEED LIMIT	L
25 MPH	325'
30 MPH	460'
35 MPH	565'
40 MPH	670'
45 MPH	775'
50 MPH	885'
55 MPH	990'
60 MPH	1100'
65 MPH	1200'

LEGEND

Traffic Sign

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	10-18-11

SI-241

SHEET 1 of 2

REVISIONS: New. Replaces Details 9105 and 9106.

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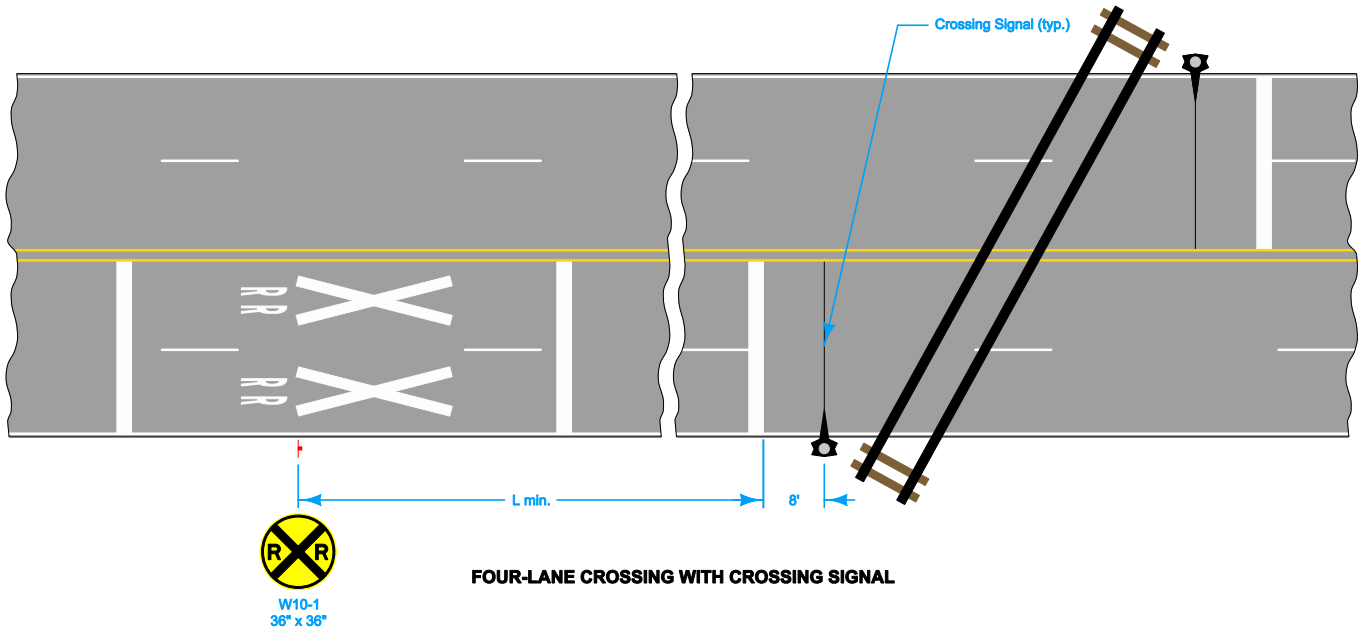
SIGN PLACEMENT APPROACHING A RAILROAD CROSSING



FOUR-LANE CROSSING WITH CROSSING SIGNAL

LEGEND

Traffic Sign

POSTED SPEED LIMIT	L
25 MPH	325'
30 MPH	460'
35 MPH	565'
40 MPH	670'
45 MPH	775'
50 MPH	885'
55 MPH	990'
60 MPH	1100'
65 MPH	1200'

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	10-18-11

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SHEET 2 of 2

REVISIONS: New. Replaces Details 9105 and 9106.

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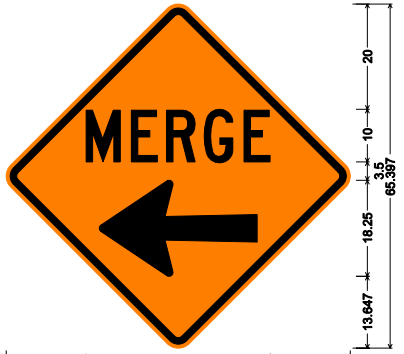
SIGN PLACEMENT APPROACHING A RAILROAD CROSSING

W4-2M

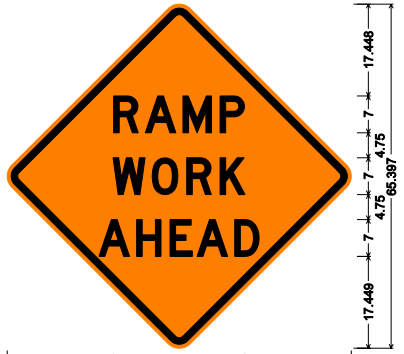


W4-2M;
48.000" across sides 3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[MERGE] C; Arrow K-30, 180°;

W8-11A

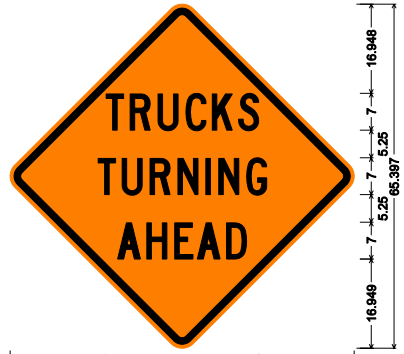
W8-11A;
48.000" across sides 3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[END] C; [UNEVEN] C; [LANES] C;

W20-1A



W20-1A;
48.000" across sides 3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[RAMP] D; [WORK] D; [AHEAD] D;

W21-3A



W21-3A;
48.000" across sides 3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[TRUCKS] C; [TURNING] C; [AHEAD] C;

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STANDARD ROAD PLAN

SI-881

SHEET 1 of 3

REVISIONS: Added signs G20-24, G40-1, G40-2, G40-3, G40-4, W8-1A, changed title, modified sign radius, border and indents.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

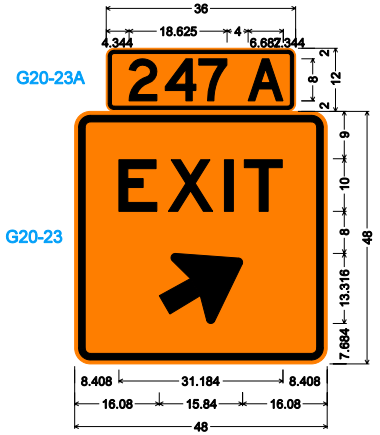
SPECIAL SIGNS FOR WORKZONES

G20-22

G20-22;
3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[EXIT] E; [500 FT] E;

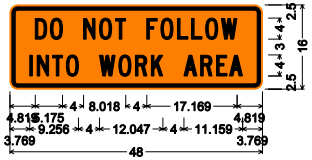
G20-23A

G20-23



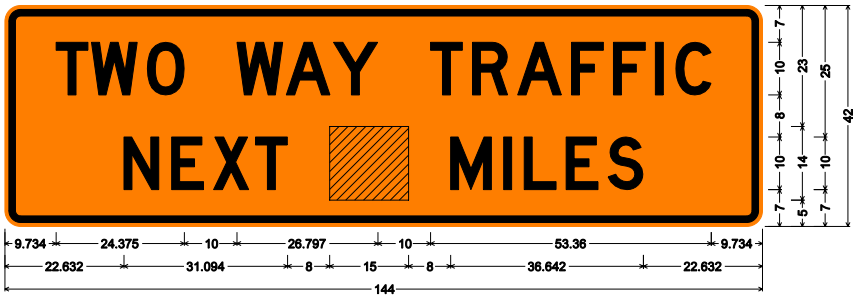
G20-23A;
1.500" Radius, 0.625" Border, 0.375" Indent, Black on Orange;
[247] D; [A] D;
G20-23;
3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[EXIT] E; Arrow K-17, 30°;

G20-24



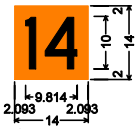
G20-24;
1.500" Radius, 0.625" Border, 0.375" Indent, Black on Orange;
[DO NOT FOLLOW] C;
[INTO WORK AREA] C;

G20-21



G20-21; 3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[TWO WAY TRAFFIC] D; [NEXT] D; Rectangle Orange; [MILES] D;

G20-21A



G20-21A;
No border, White on Orange;
[14] Black C;

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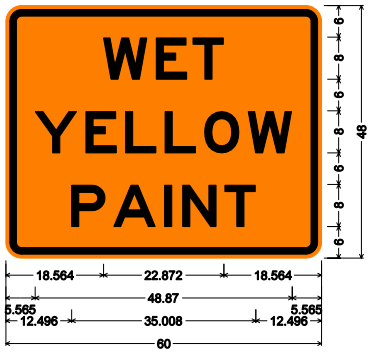
SHEET 2 of 3

REVISIONS: Added signs G20-24, G40-1, G40-2, G40-3, G40-4, W8-1A, changed title, modified sign radius, border and indents.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

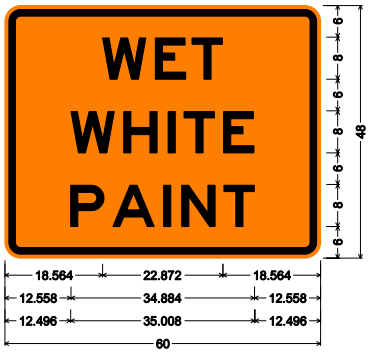
SPECIAL SIGNS FOR WORKZONES

G40-1



G40-1;
3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[WET] E; [YELLOW] E; [PAINT] E;

G40-2

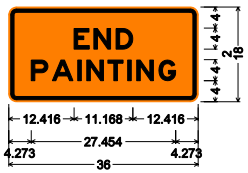


G40-2;
3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange;
[WET] E; [WHITE] E; [PAINT] E;

G40-3

G40-3;
1.875" Radius, 0.750" Border, 0.500" Indent, Black on Orange;
[WET PAINT] E;

G40-4



G40-4;
1.500" Radius, 0.625" Border, 0.375" Indent, Black on Orange;
[END] E; [PAINTING] E;

Iowa Department of Transportation

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STANDARD ROAD PLAN

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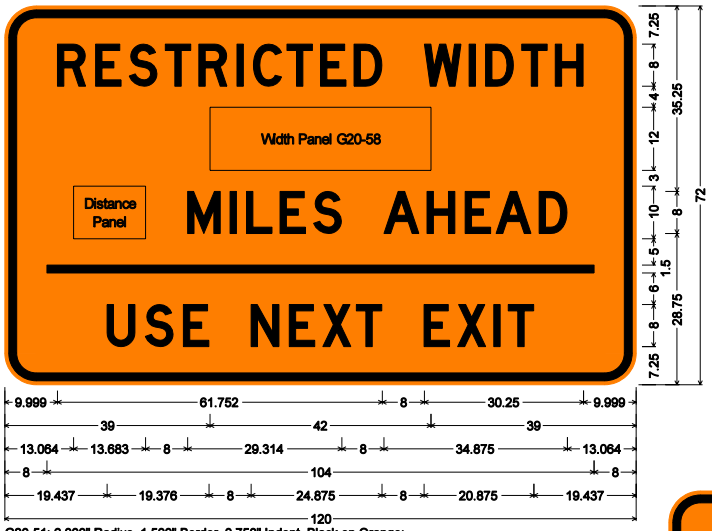
SHEET 3 of 3

REVISIONS: Added signs G20-24, G40-1, G40-2, G40-3, G40-4, W8-1A, changed title, modified sign radius, border and indents.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

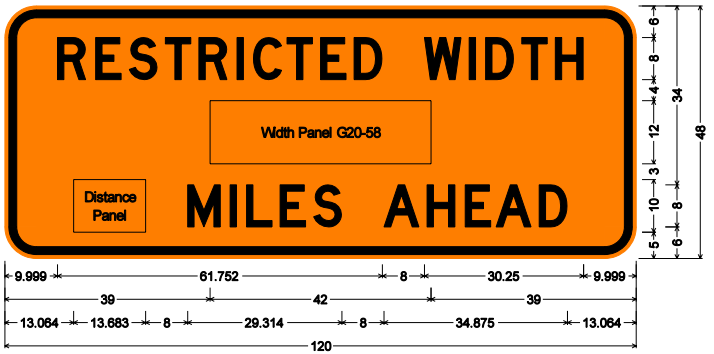
SPECIAL SIGNS FOR WORKZONES

G20-51



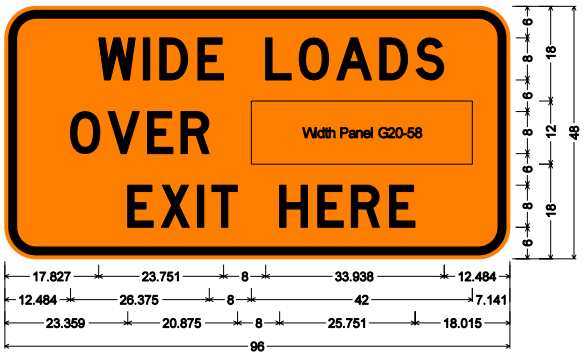
G20-51; 6.000" Radius, 1.500" Border, 0.750" Indent, Black on Orange;
[RESTRICTED WIDTH] D; Rectangle Orange;
Rectangle Orange;
[MILES AHEAD] D; [USE NEXT EXIT] D;

G20-52



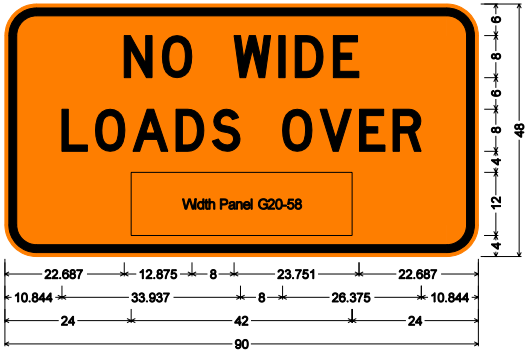
G20-52; 6.000" Radius, 1.500" Border, 0.750" Indent, Black on Orange;
[RESTRICTED WIDTH] D; Rectangle Orange;
Rectangle Orange;
[MILES AHEAD] D;

G20-53



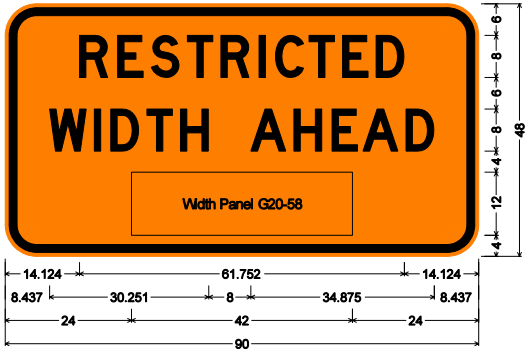
G20-53; 6.000" Radius, 1.500" Border, 0.750" Indent, Black on Orange;
[WIDE LOADS] D; [OVER] D; Rectangle Orange;
[EXIT HERE] D;

G20-54



G20-54; 6.000" Radius, 1.500" Border, 0.750" Indent, Black on Orange;
[NO WIDE] D; [LOADS OVER] D; Rectangle Orange;

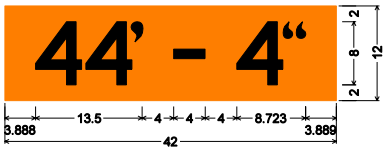
G20-55



G20-55; 6.000" Radius, 1.500" Border, 0.750" Indent, Black on Orange;
[RESTRICTED] D; [WIDTH AHEAD] D; Rectangle Orange;

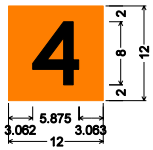
① See TC-81 for requirement of restricted width dimension.

G20-58 ①



G20-58; No border, White on Orange;
[44'] Black D; [-] Black D; [4"] Black D;

G20-59



G20-59;
No border, White on Orange;
[4] Black D;

Iowa Department of Transportation

REVISION	
New	04-20-10

STANDARD ROAD PLAN

SI-882

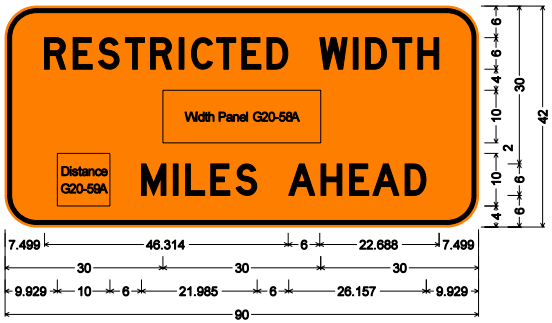
SHEET 1 of 2

REVISIONS: New. Replaces RD-63 and RD-64.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

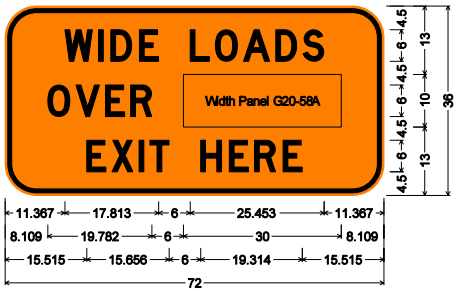
SPECIAL SIGNS FOR RESTRICTED WIDTH TRAFFIC CONTROL ZONES

G20-52A



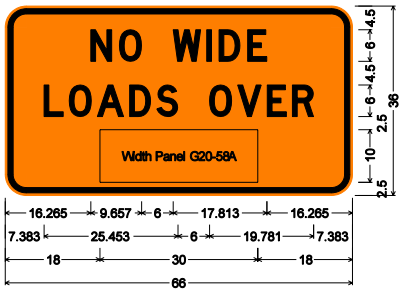
G20-52A; 6.000" Radius, 0.750" Border, 0.500" Indent, Black on Orange;
[RESTRICTED WIDTH] D; Rectangle Orange;
Rectangle Orange;
[MILES AHEAD] D;

G20-53A



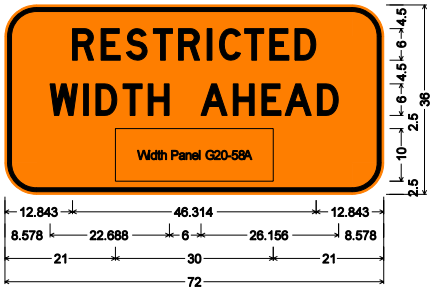
G20-53A;
6.000" Radius, 0.750" Border, 0.500" Indent, Black on Orange;
[WIDE LOADS] D; [OVER] D; Rectangle Orange;
[EXIT HERE] D;

G20-54A



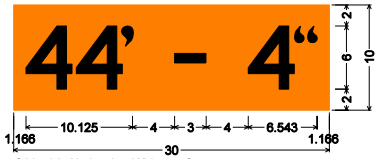
G20-54A;
4.000" Radius, 1.000" Border, 0.500" Indent, Black on Orange;
[NO WIDE] D; [LOADS OVER] D; Rectangle Orange;

G20-55A



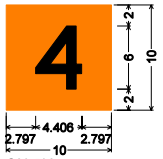
G20-55A;
6.000" Radius, 0.750" Border, 0.500" Indent, Black on Orange;
[RESTRICTED] D; [WIDTH AHEAD] D; Rectangle Orange;

G20-58A (1)



G20-58A; No border, White on Orange;
[44'] Black D; [-] Black D; [4"] Black D;

G20-59A



G20-59A;
No border, White on Orange;
[4] Black D;

(1) See TC-81 for requirement of restricted width dimension.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

SI-882

SHEET 2 of 2

REVISIONS: New. Replaces RD-63 and RD-64.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SPECIAL SIGNS FOR RESTRICTED WIDTH TRAFFIC CONTROL ZONES

Sanitary and Storm Sewers

SW

SECTION

Storm and Sanitary Sewers

SW

NO.	DATE	TITLE
		Trench and Backfill
SW-101	04-21-09	Trench Bedding and Backfill Zones
SW-102	04-21-09	Rigid Gravity Pipe Trench Bedding
SW-103	04-21-09	Flexible Gravity Pipe Trench Bedding
SW-104	04-21-09	Pressure Pipe Trench Bedding
SW-105	10-20-09	Miscellaneous Pipe Bedding
		General Sewer
SW-201	04-21-09	Sanitary Sewer Service Stub
SW-202	04-21-09	Sewage Air Release Valve Pit
SW-203	10-20-09	Sanitary Sewer Cleanout
SW-211	04-21-09	Special Pipe Connections for Storm Sewer
		Sanitary Sewer Manholes
SW-301	04-21-09	Circular Sanitary Sewer Manhole
SW-302	04-21-09	Rectangular Sanitary Sewer Manhole
SW-303	04-21-09	Sanitary Sewer Manhole over Existing Sewer
SW-304	04-17-12	Rectangular Base/Circular Top Sanitary Sewer Manhole
SW-305	04-21-09	Tee-Section Sanitary Sewer Manhole
SW-306	04-21-09	Chimney Seals for Sanitary Sewer Manholes
SW-307	04-21-09	Drop Connection for Sanitary Sewer
SW-350	10-20-09	Travel Trailer Dump Station
		Storm Sewer Manholes
SW-401	04-21-09	Circular Storm Sewer Manhole
SW-402	04-21-09	Rectangular Storm Sewer Manhole
SW-403	04-21-09	Deep Well Rectangular Storm Sewer Manhole
SW-404	04-17-12	Rectangular Base/Circular Top Storm Sewer Manhole
SW-405	04-21-09	Tee-Section Storm Sewer Manhole

SECTION

Storm and Sanitary Sewers

SW

NO.	DATE	TITLE
		Storm Sewer Intakes
SW-501	04-21-09	Single Grate Intake
SW-502	04-21-09	Circular Single Grate Intake
SW-503	04-21-09	Single Grate Intake with Manhole
SW-504	04-21-09	Single Grate Intake with Flush-Top Manhole
SW-505	04-21-09	Double Grate Intake
SW-506	04-21-09	Double Grate Intake with Manhole
SW-507	10-20-09	Single Open-Throat Intake, Small Box
SW-508	10-20-09	Single Open-Throat Intake, Large Box
SW-509	10-18-11	Double Open-Throat Curb Intake, Small Box
SW-510	10-18-11	Double Open-Throat Curb Intake, Large Box
SW-511	04-21-09	Rectangular Area Intake
SW-512	10-20-09	Circular Area Intake
SW-513	04-21-09	Open-Sided Area Intake
SW-514	04-21-09	Boxouts for Grate Intakes
SW-541	04-19-11	Open-Throat Curb Intake under Pavement
SW-542	10-20-09	Extension Unit for Open-Throat Curb Intake under Pavement
SW-545	10-18-11	Single Open-Throat Curb Intake with Extended Opening
SW-546	04-19-11	Single Open-Throat Barrier Intake
SW-547	04-19-11	Triple-Grate Barrier Intake
SW-548	04-19-11	Single-Grate Barrier Intake, Circular
SW-549	04-19-11	Single-Grate Barrier Intake, Rectangular
SW-550	04-20-10	Alternate Construction Method (SW-508 and SW-510 Intake)
SW-562	10-20-09	Vertical Throat Area Intake

SECTION

Storm and Sanitary Sewers

SW

NO.	DATE	TITLE
		Castings
SW-601	10-20-09	Castings for Sanitary Sewer Manholes
SW-602	10-20-09	Castings for Storm Sewer Manholes
SW-603	04-17-12	Castings for Grate Intakes
SW-604	10-20-09	Castings for Area Intakes

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.

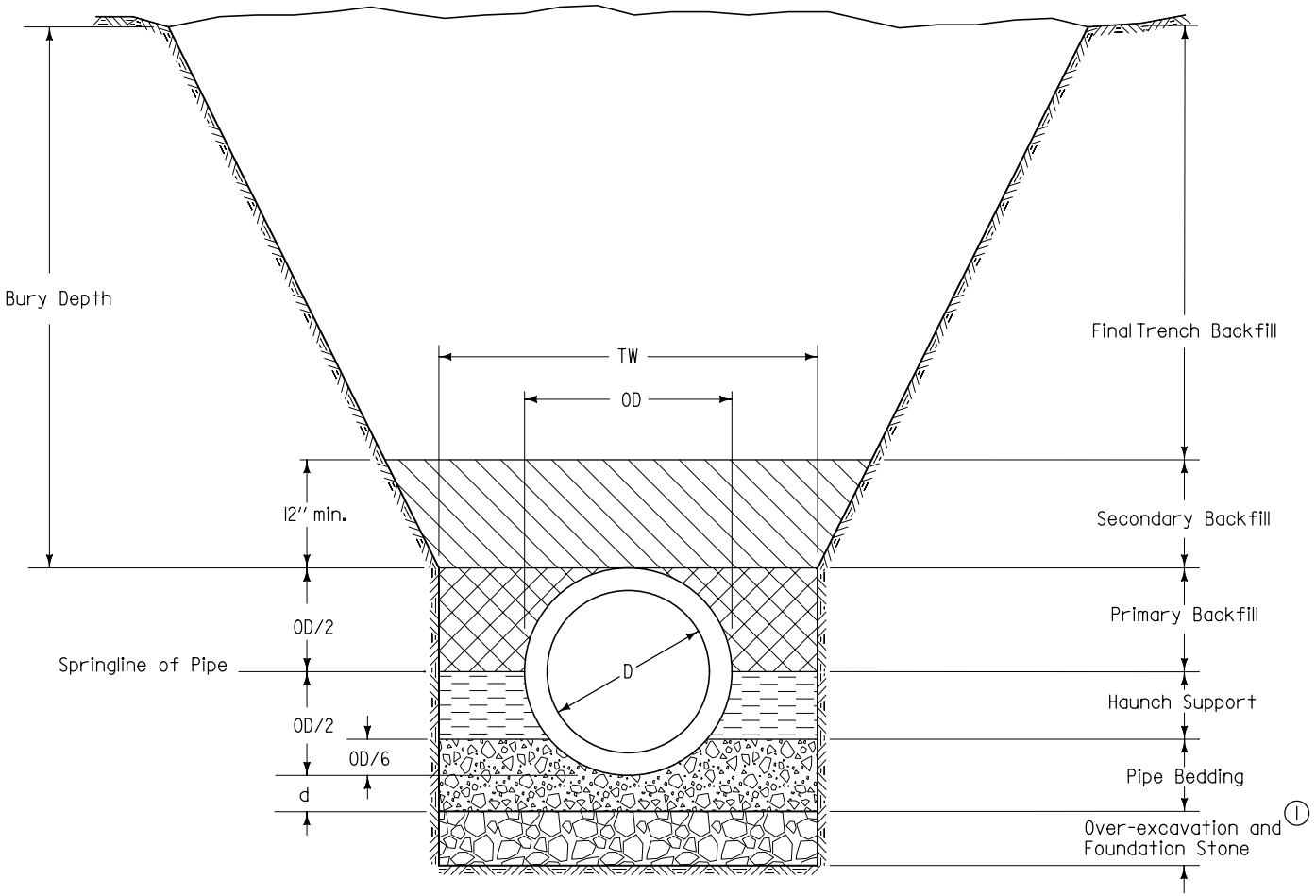
Key

OD = Outside diameter of pipe

D = Inside diameter of pipe

TW = Trench width at top of pipe

d = Depth of bedding material below pipe



SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 3010.101	STANDARD ROAD PLAN	SW-101 SHEET 1 of 1

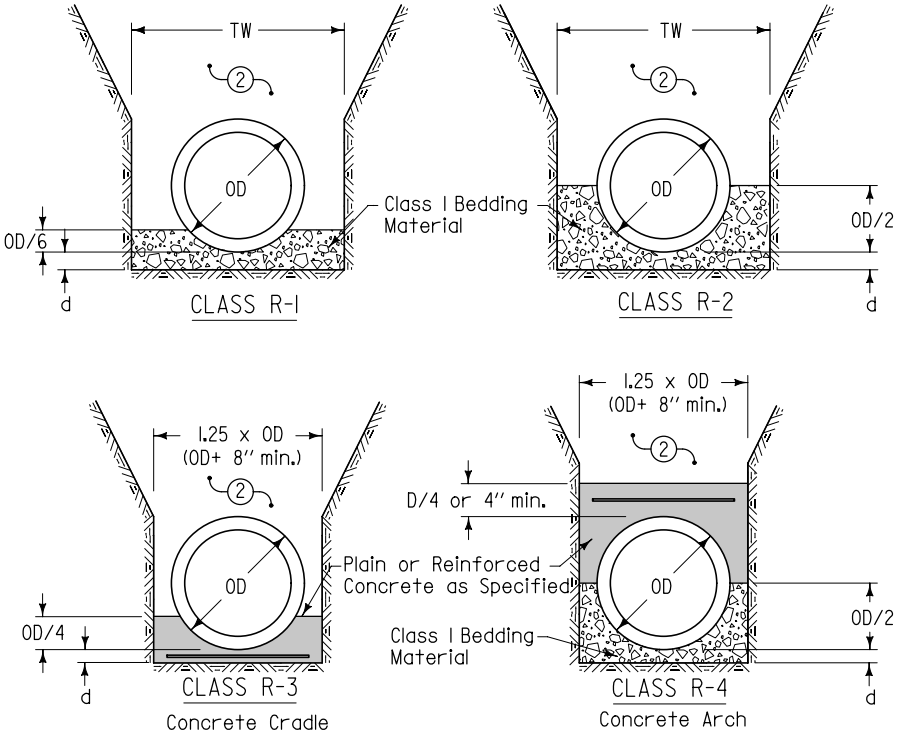
REVISIONS: New. Replaces SUDAS Figure 3010.1.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

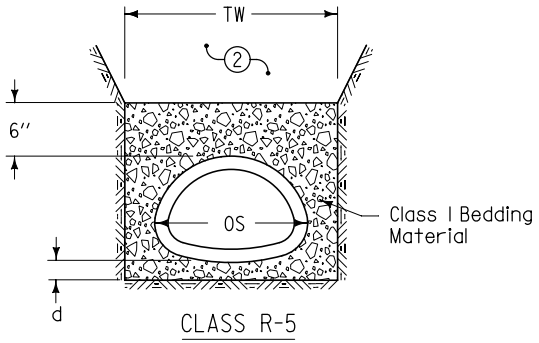
TRENCH BEDDING AND BACKFILL ZONES

FIGURE 3010.101 | SHEET 1 OF 1

RCP AND VCP PIPE BEDDING ①



REINFORCED CONCRETE ARCH PIPE BEDDING



Refer to sheet 2 for bury depth restrictions.

① Use Bedding Class R-I 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)

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 3010.102	STANDARD ROAD PLAN	SW-102 SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Figures 3010.3, 3010.7, and 3010.8.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

RIGID GRAVITY PIPE TRENCH BEDDING

FIGURE 3010.102 SHEET 1 OF 2

ALLOWABLE BURY DEPTH

CLASS III RCP

Pipe Diameter (inches)	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 (inches)	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 (inches)	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 Diameter (inches)	Class R-1 Bedding	Class R-2 Bedding	Class R-3 & R-4 Bedding		
			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					

REINFORCED CONCRETE ARCH PIPE

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

FIGURE 3010.102 SHEET 2 OF 2

SUDAS | Iowa Department of Transportation

REVISION: NEW 04-21-09

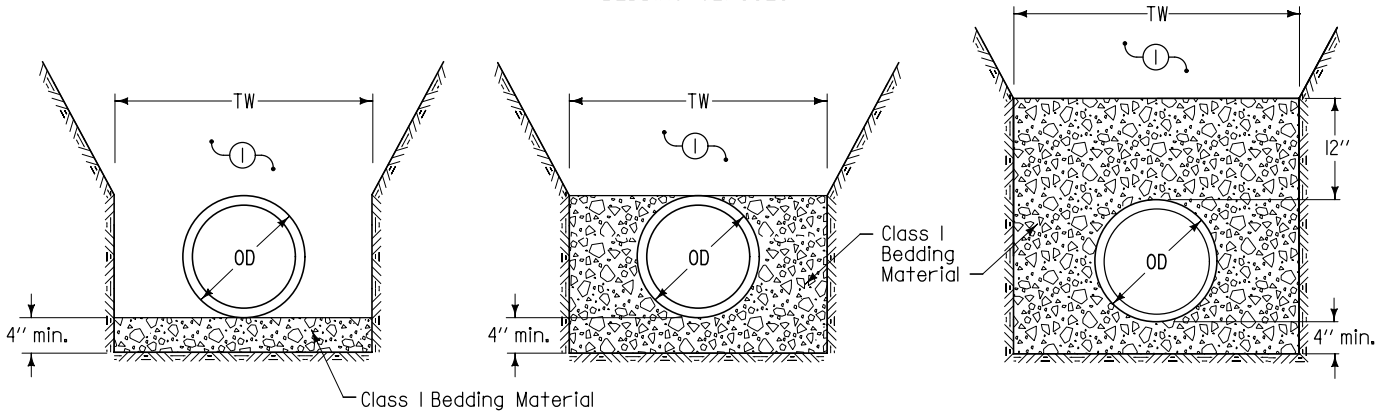
FIGURE 3010.102 | STANDARD ROAD PLAN | SW-102 | SHEET 2 of 2

REVISIONS: New. Replaces SUDAS Figures 3010.3, 3010.7, and 3010.8.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

RIGID GRAVITY PIPE TRENCH BEDDING

BEDDING CLASSES



① Place remainder of bedding and backfill materials as specified in the contract documents.

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
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

PVC PIPE

(Bedding Class F-2 or F-3)

Pipe Diameter (inches)	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

(Bedding Class F-1, F-2, or F-3)

Pipe Diameter (inches)	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

(Bedding Class F-2 or F-3)

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

SUDAS | Iowa Department of Transportation

REVISION: NEW 04-21-09

FIGURE 3010.103 | STANDARD ROAD PLAN | SW-103 | SHEET 1 of 1

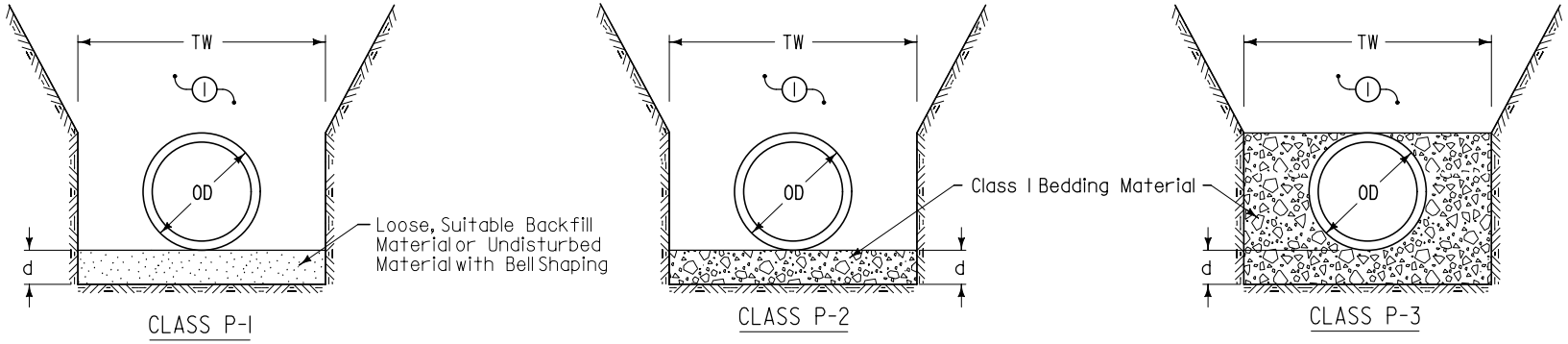
REVISIONS: New.

SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

FLEXIBLE GRAVITY PIPE TRENCH BEDDING

FIGURE 3010.103 SHEET 1 OF 1

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 & C905, 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 | Iowa Department of Transportation | REVISION NEW 04-21-09

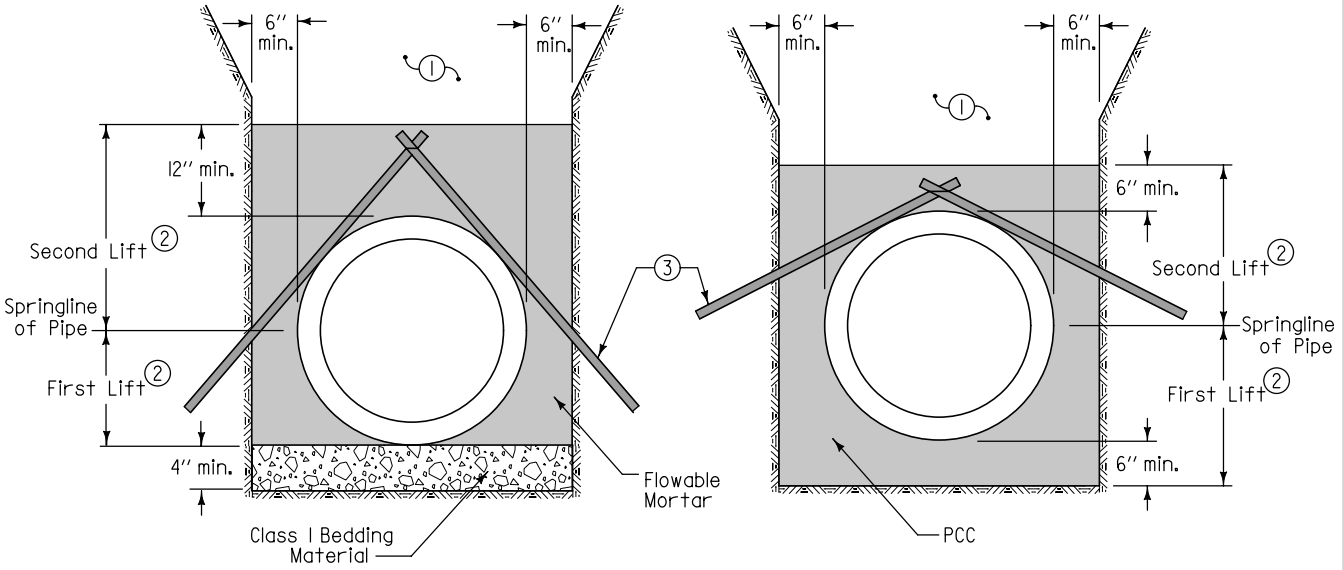
FIGURE 3010.104 | STANDARD ROAD PLAN | SW-104 | SHEET 1 of 1

REVISIONS: New.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

PRESSURE PIPE TRENCH BEDDING

FIGURE 3010.104 SHEET 1 OF 1



FLOWABLE MORTAR ENCASEMENT

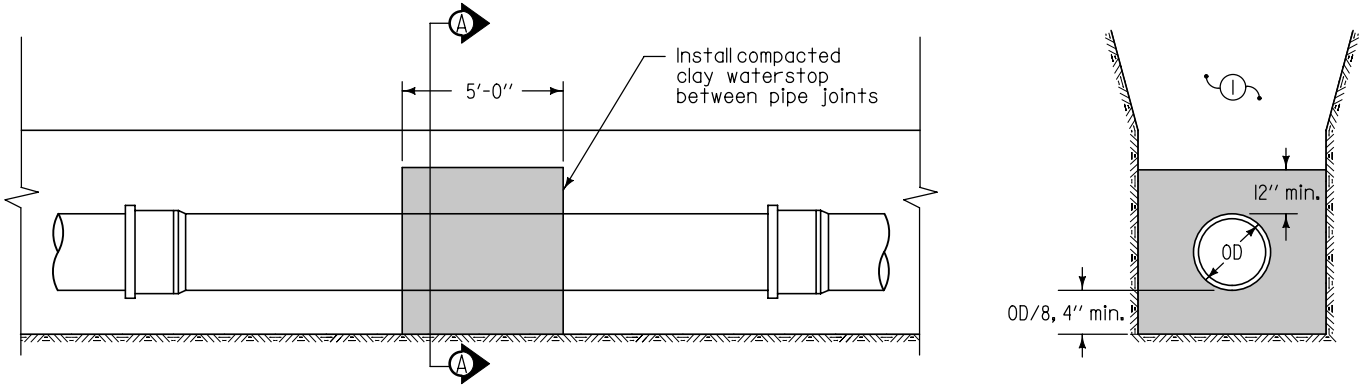
PCC ENCASEMENT

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

SUDAS	Iowa Department of Transportation	REVISION 1 10-20-09
FIGURE 3010.105	STANDARD ROAD PLAN	SW-105 SHEET 1 of 1

REVISIONS: Added waterstop information from SUDAS figure.

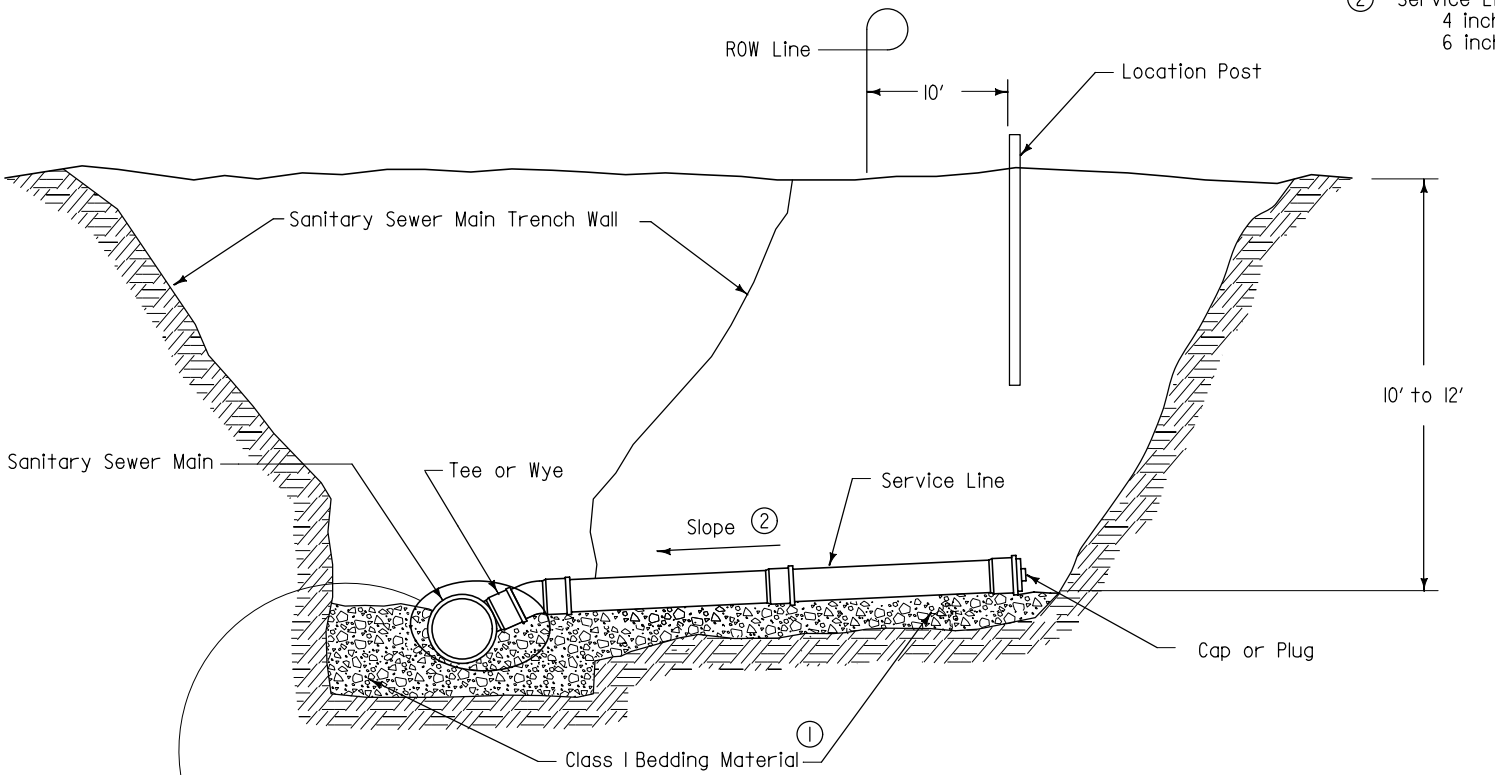
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

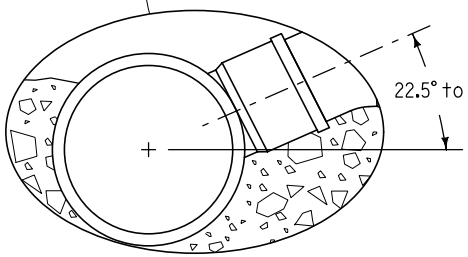
MISCELLANEOUS PIPE BEDDING

FIGURE 3010.105 SHEET 1 OF 1

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

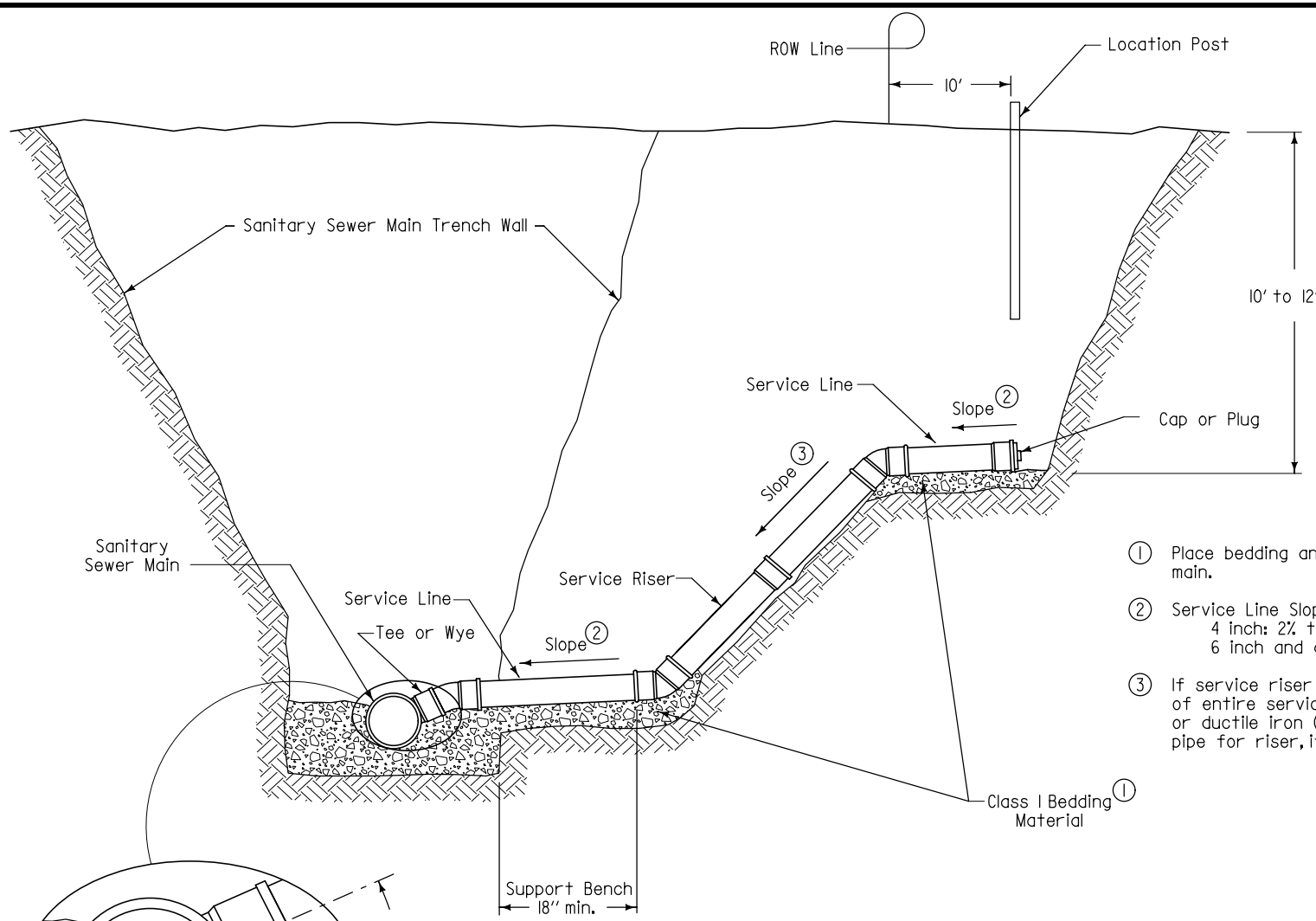
SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 4010.201	STANDARD ROAD PLAN	SW-201 SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Figures 4010.1A and 4010.1B.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SANITARY SEWER SERVICE STUB

FIGURE 4010.201 SHEET 1 OF 2



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.

SANITARY SEWER SERVICE STUB WITH RISER

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 4010.201	STANDARD ROAD PLAN	SW-201 SHEET 2 of 2

REVISIONS: New. Replaces SUDAS Figures 4010.1A and 4010.1B.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

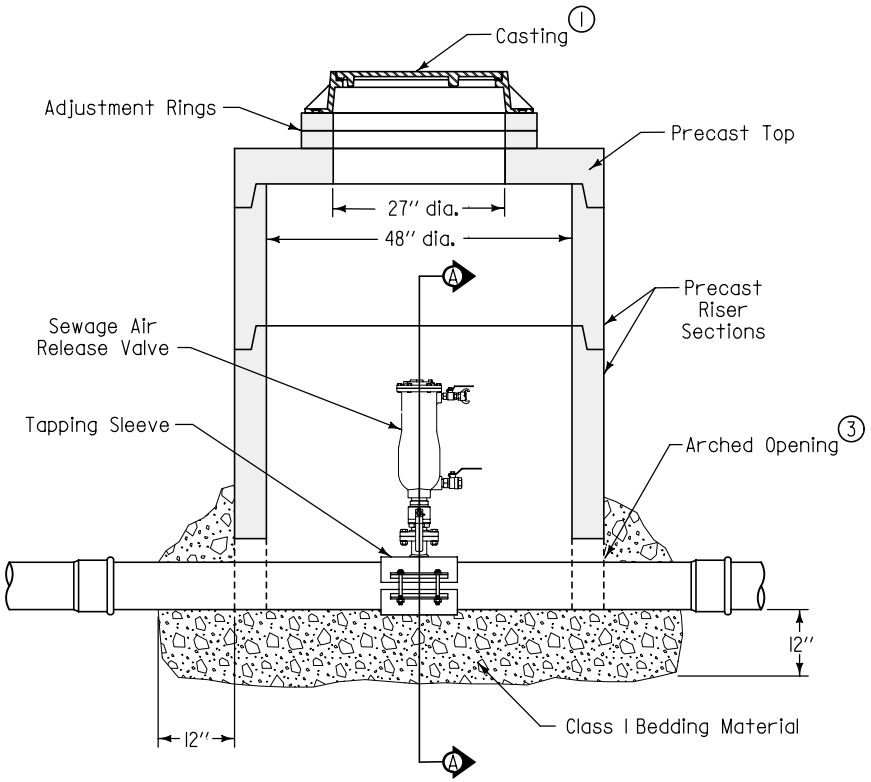
SANITARY SEWER SERVICE STUB

FIGURE 4010.201 SHEET 2 OF 2

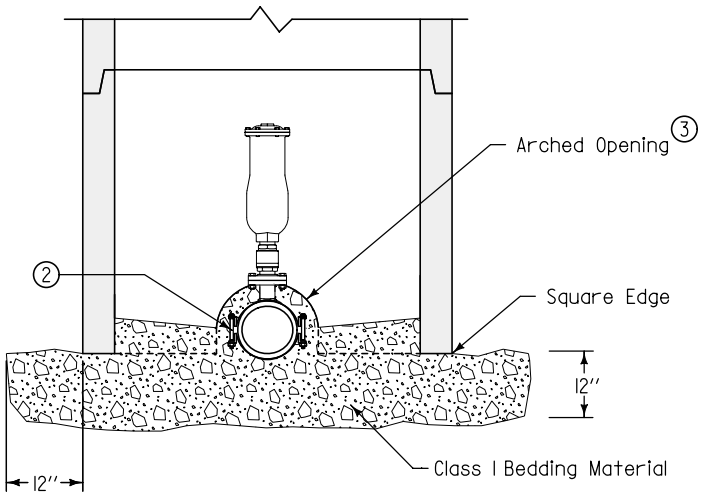
① SW-601 Type A or SW-602 Type G casting.

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	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 4010.202	STANDARD ROAD PLAN	SW-202 SHEET 1 of 1

REVISIONS: New. Replaces SUDAS Figure 4010.3

SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

SEWAGE AIR RELEASE VALVE PIT

FIGURE 4010.202 SHEET 1 OF 1

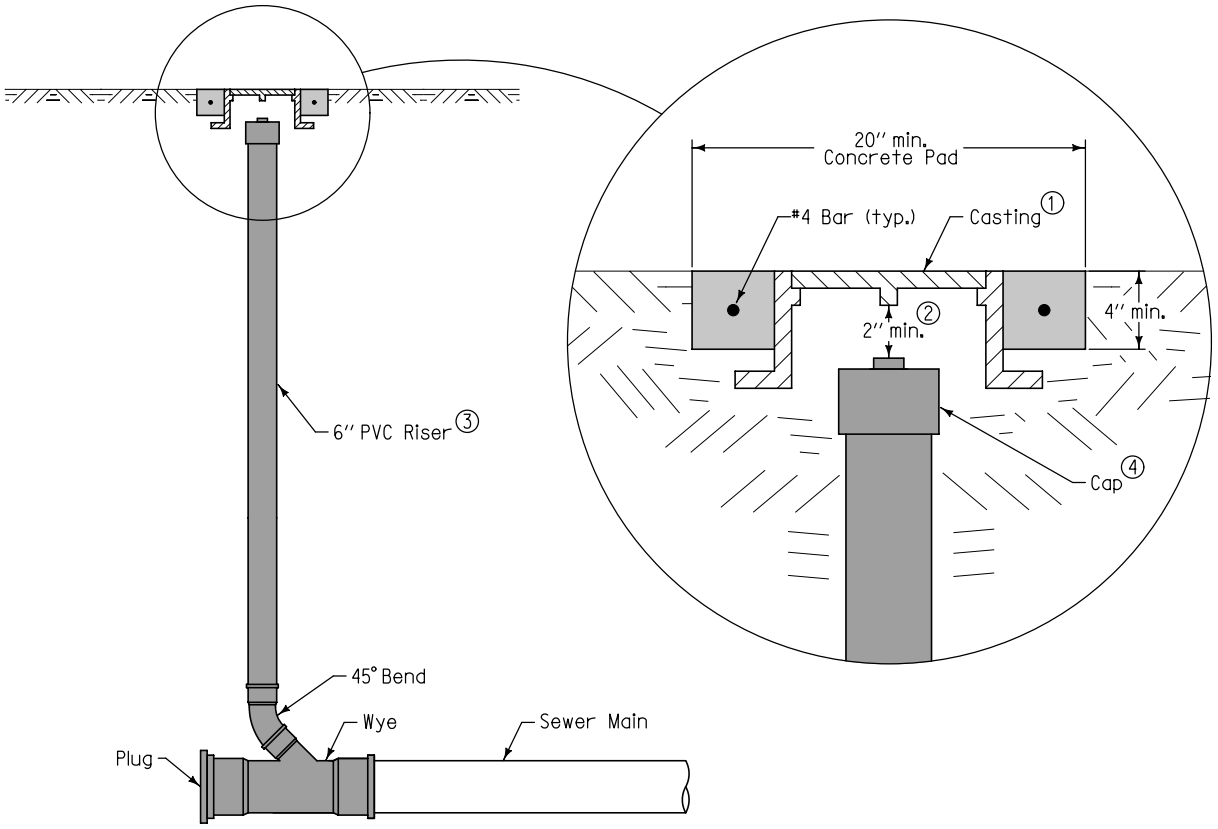
DESIGNER INFO

① Standard duty casting complying with AASHTO M 306. Mark lid with "Sanitary" or "Sanitary C.O."

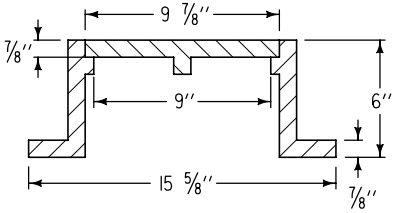
② Do not allow casting to bear on top of riser pipe.

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 Department of Transportation	REVISION: NEW 10-20-09
FIGURE 4010.203	STANDARD ROAD PLAN	SW-203
		SHEET 1 of 1

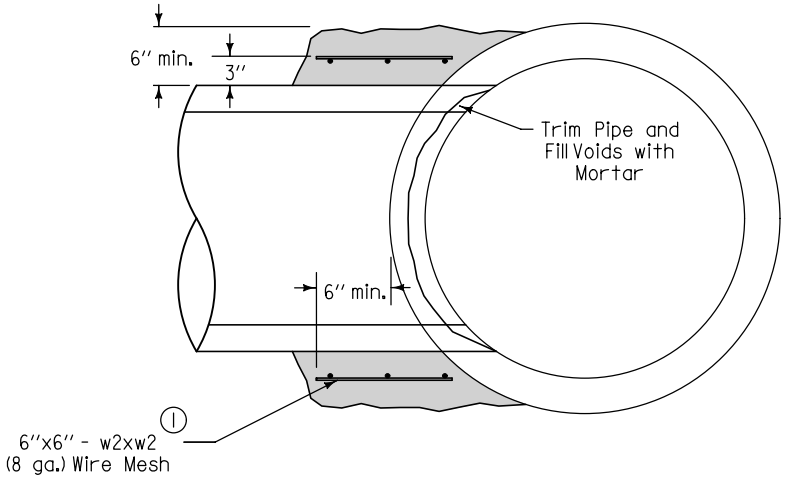
REVISIONS: New.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

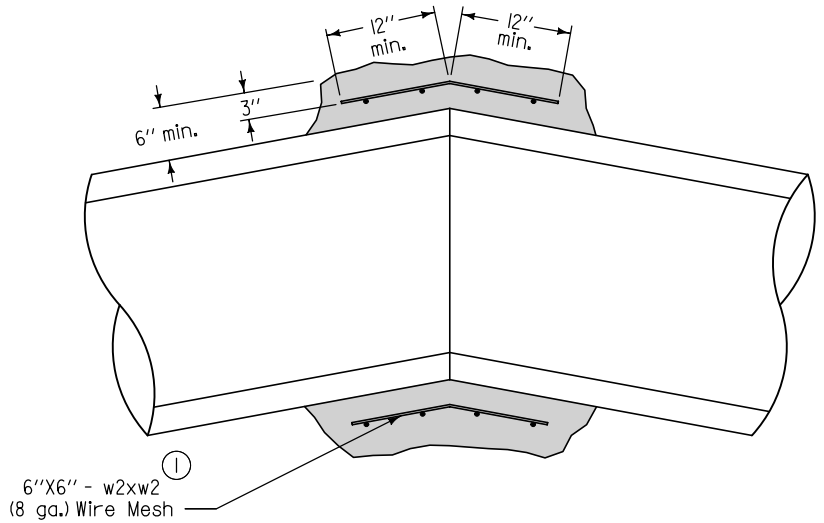
SANITARY SEWER CLEANOUT

FIGURE 4010.203 SHEET 1 OF 1

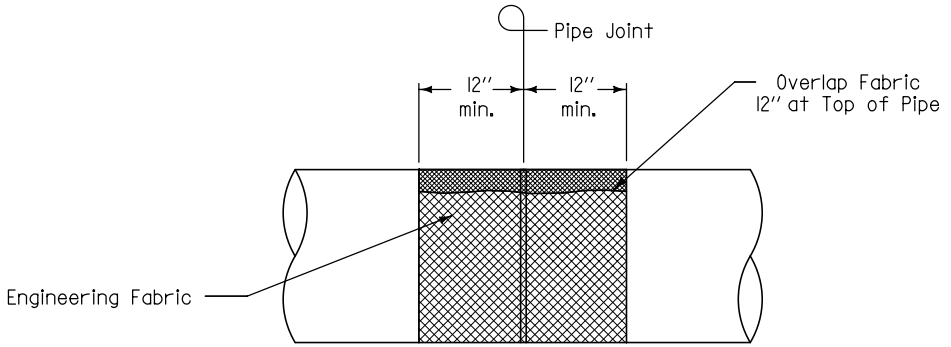
① Lap ends of wire mesh a minimum of 6 inches.



TYPE PC-1 CONCRETE COLLAR CONNECTION



TYPE PC-2 CONCRETE COLLAR CONNECTION



PIPE JOINT WRAPPING

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 4020.211	STANDARD ROAD PLAN	SW-211 SHEET 1 of 1

REVISIONS: New. Replaces SUDAS Figure 4020.1A.

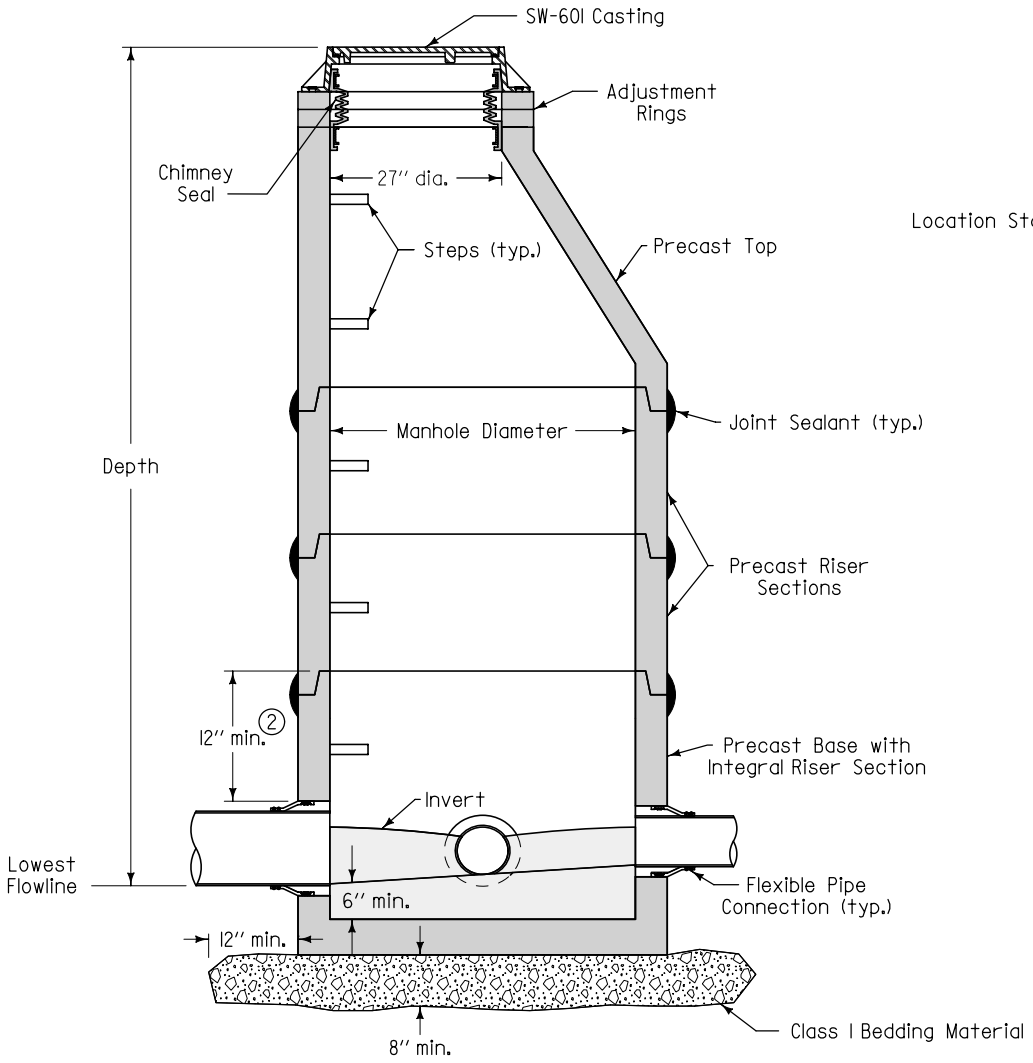
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SPECIAL PIPE CONNECTIONS FOR STORM SEWER

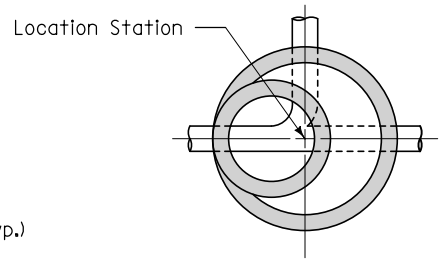
FIGURE 4020.211 SHEET 1 OF 1

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.



TYPICAL SECTION



PLAN

Manhole Diameter (inches)	Maximum Pipe Diameter ① (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 Department of Transportation | REVISION NEW 04-21-09

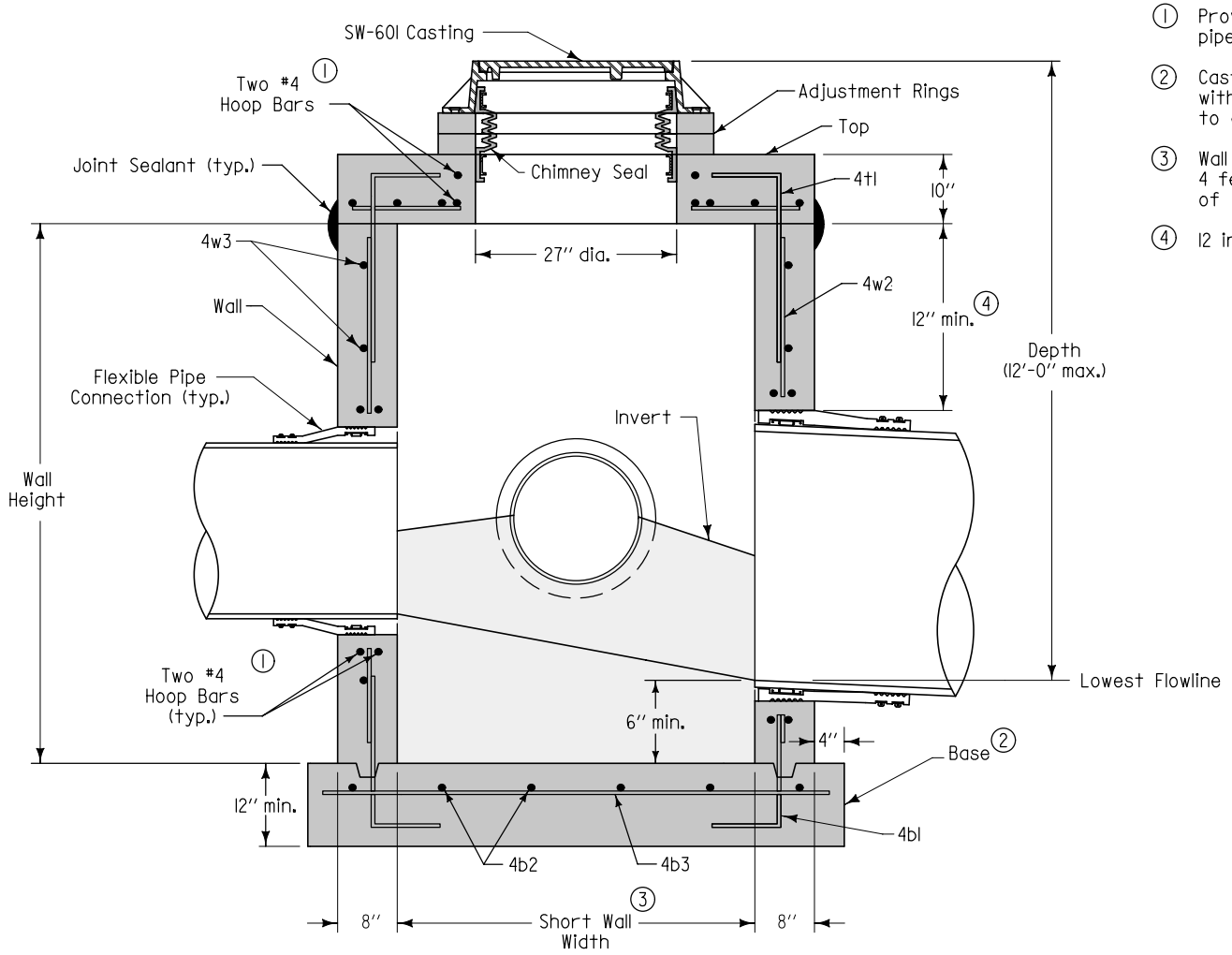
FIGURE 6010.301 | STANDARD ROAD PLAN | SW-301 | SHEET 1 of 1

REVISIONS: New. Replaces SUDAS Type "A" Manhole. Will replace RA-51

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

CIRCULAR SANITARY SEWER MANHOLE

FIGURE 6010.301 SHEET 1 OF 1



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 pipe openings.

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.302	STANDARD ROAD PLAN	SW-302 SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Type "E" Manhole.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

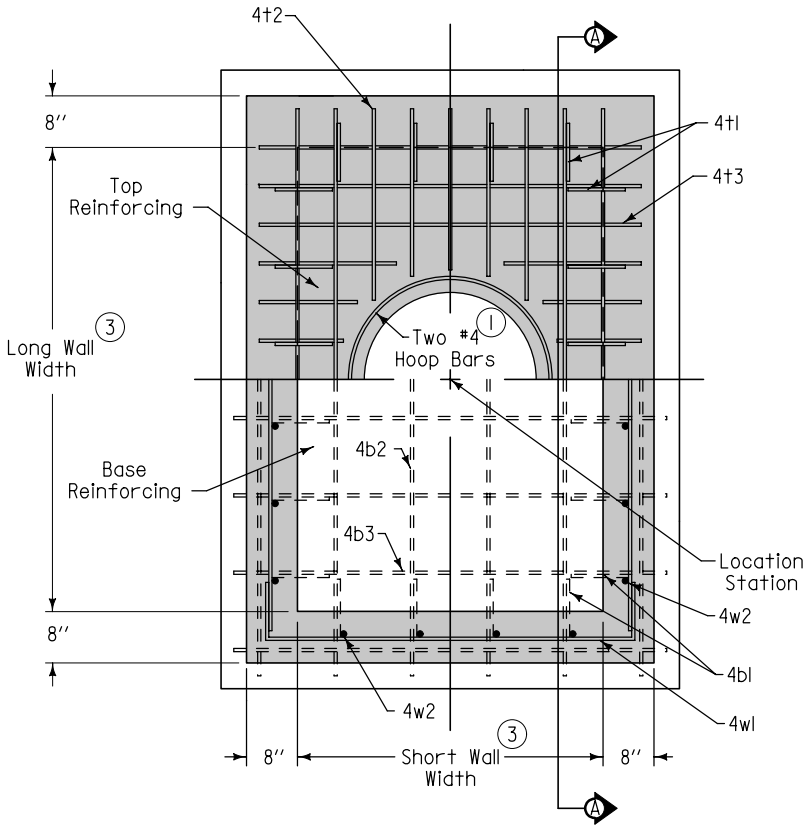
RECTANGULAR SANITARY SEWER MANHOLE

FIGURE 6010.302 SHEET 1 OF 2

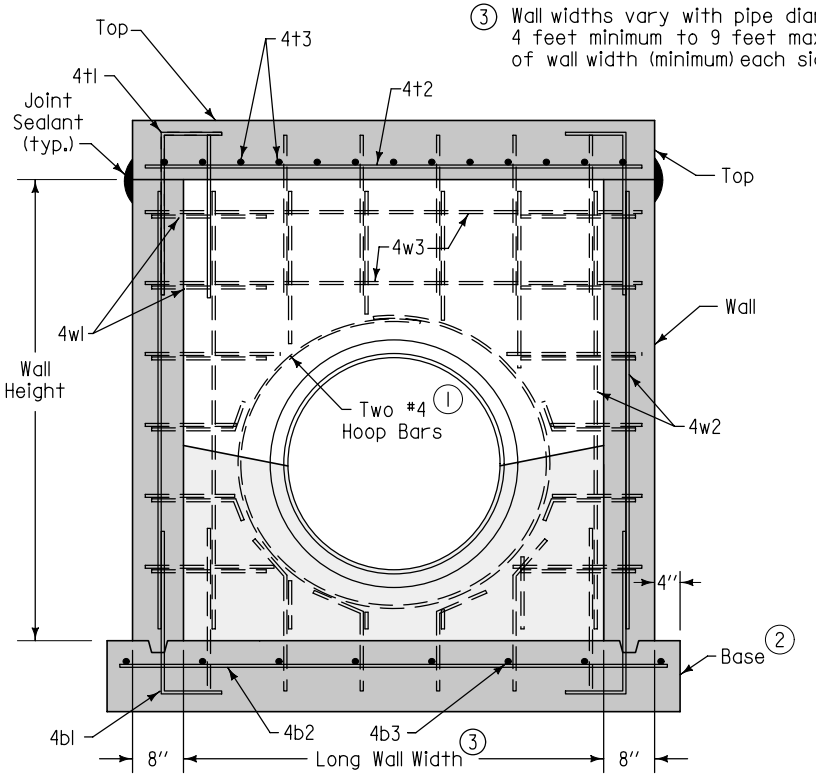
(1) Provide two #4 hoop bars at top opening and at all pipe openings.

(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.



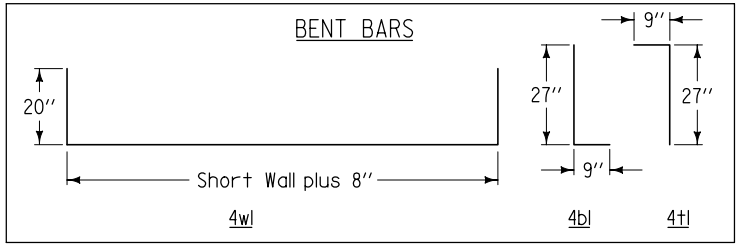
PLAN



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''

BENT BARS



SUDAS | Iowa Department of Transportation | REVISION NEW 04-21-09

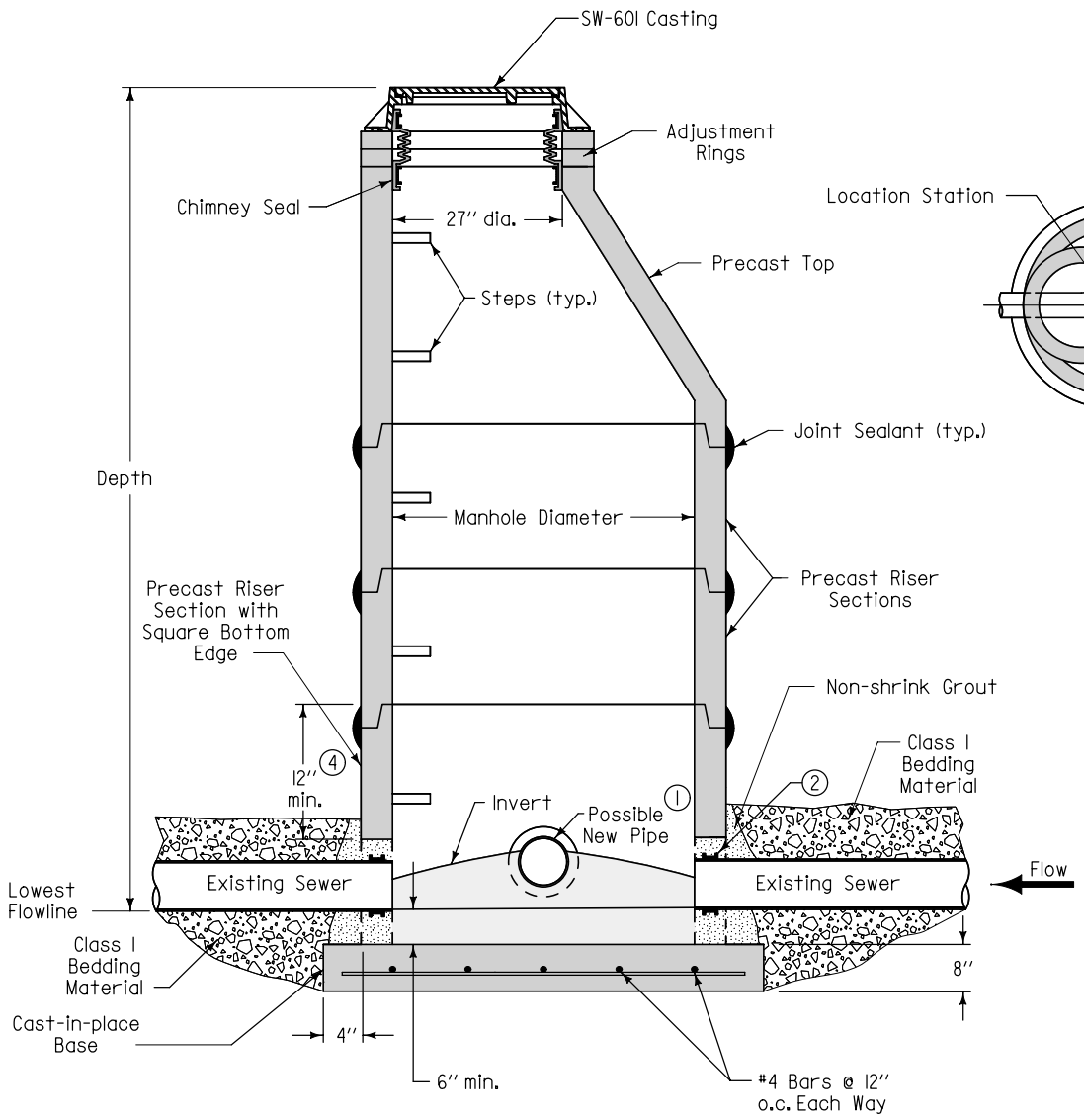
FIGURE 6010.302 | STANDARD ROAD PLAN | SW-302 | SHEET 2 of 2

REVISIONS: New. Replaces SUDAS Type "E" Manhole.

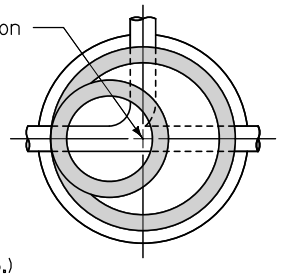
SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

RECTANGULAR SANITARY SEWER MANHOLE

FIGURE 6010.302 SHEET 2 OF 2



TYPICAL SECTION



PLAN

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.

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 Department of Transportation

REVISION: NEW 04-21-09

FIGURE 6010.303 | STANDARD ROAD PLAN

SW-303

SHEET 1 of 1

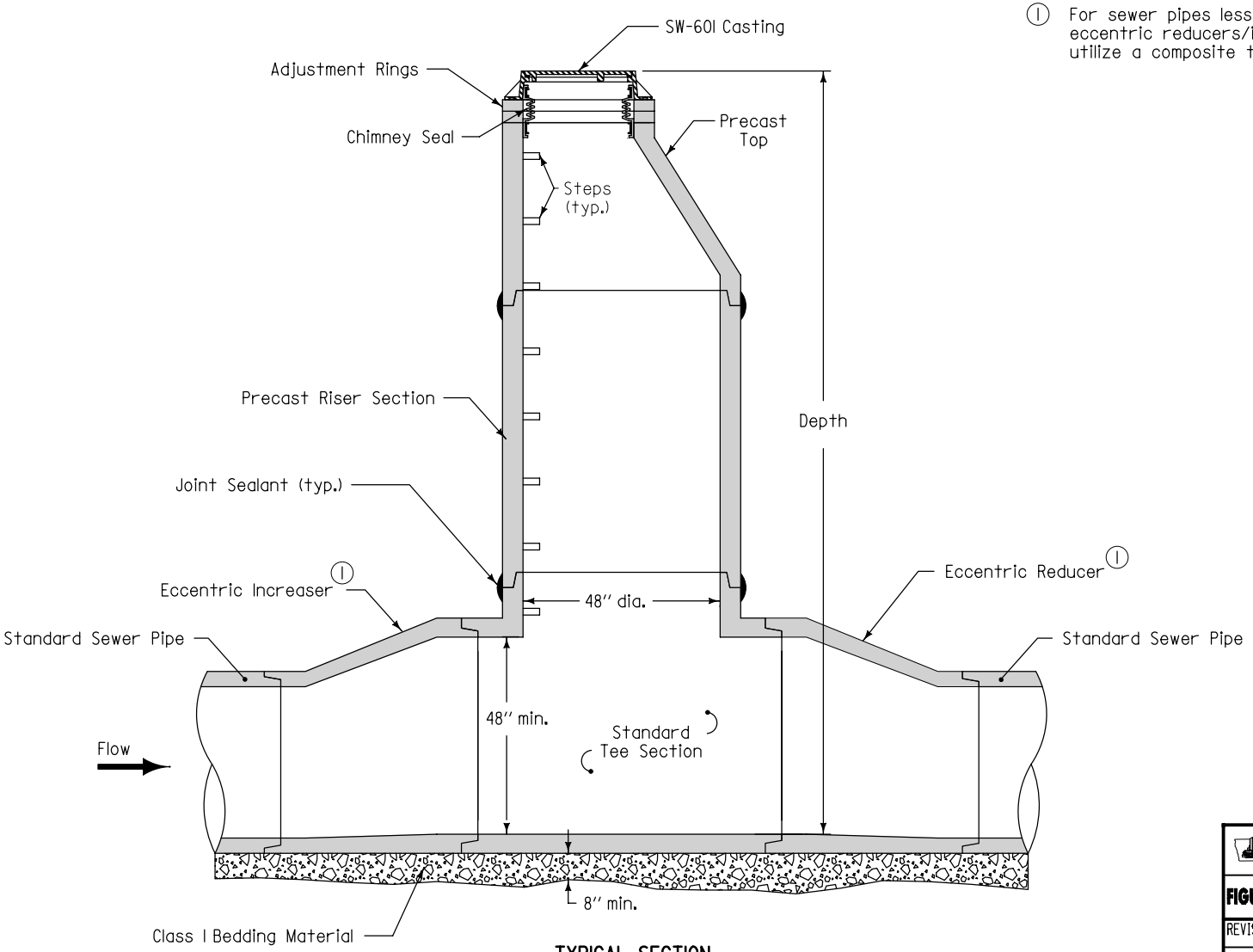
REVISIONS: New. Replaces SUDAS Type "I" Manhole.

SUDAS DIRECTOR

Deanna Maifield
DESIGN METHODS ENGINEER

SANITARY SEWER MANHOLE OVER EXISTING SEWER

FIGURE 6010.303 SHEET 1 OF 1



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

TYPICAL SECTION

STANDARD TEE (1)

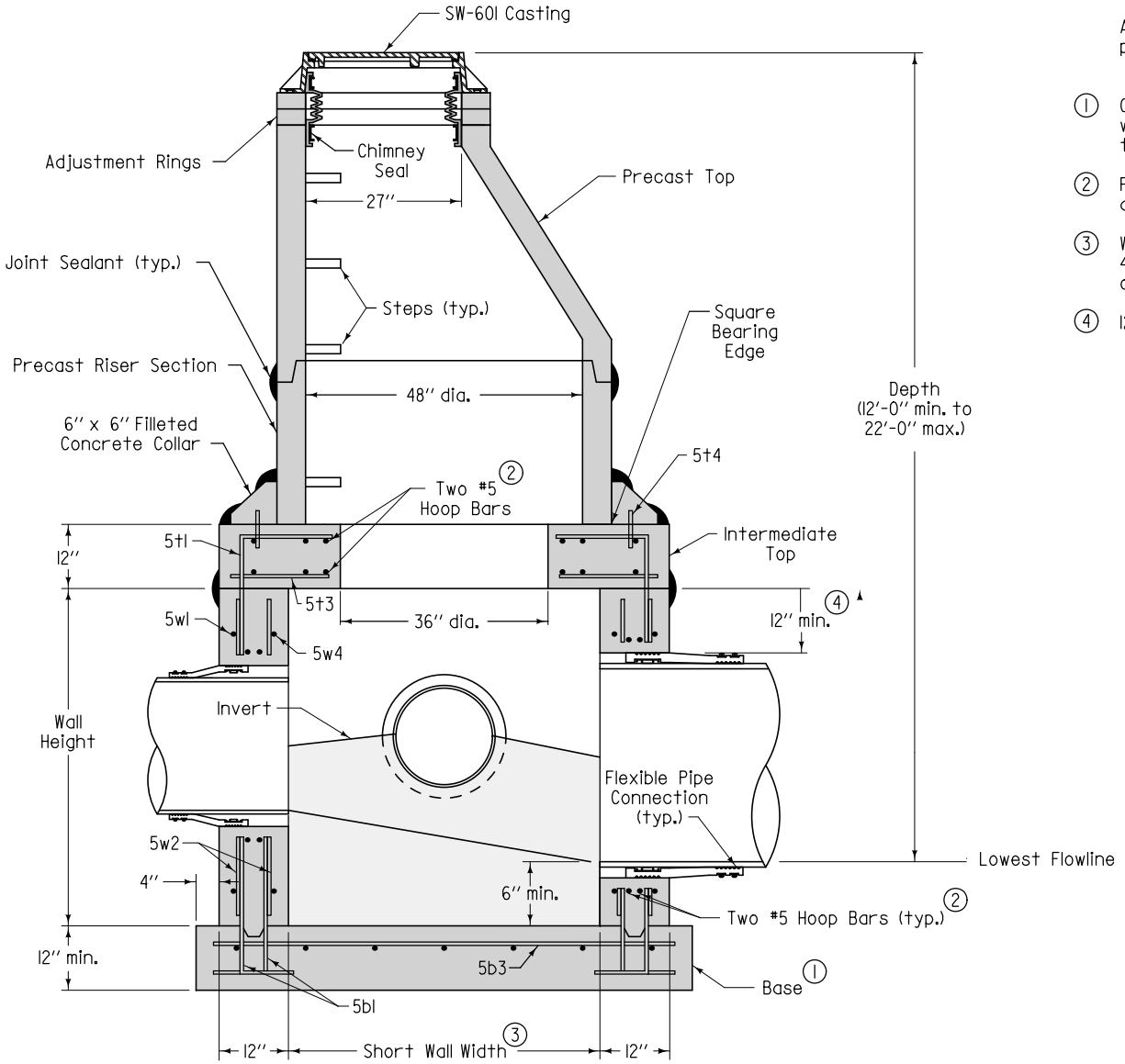
FIGURE 6010.305 SHEET 1 OF 2

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.305	STANDARD ROAD PLAN	SW-305 SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Type "J" Manhole.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

TEE-SECTION SANITARY 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) 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.

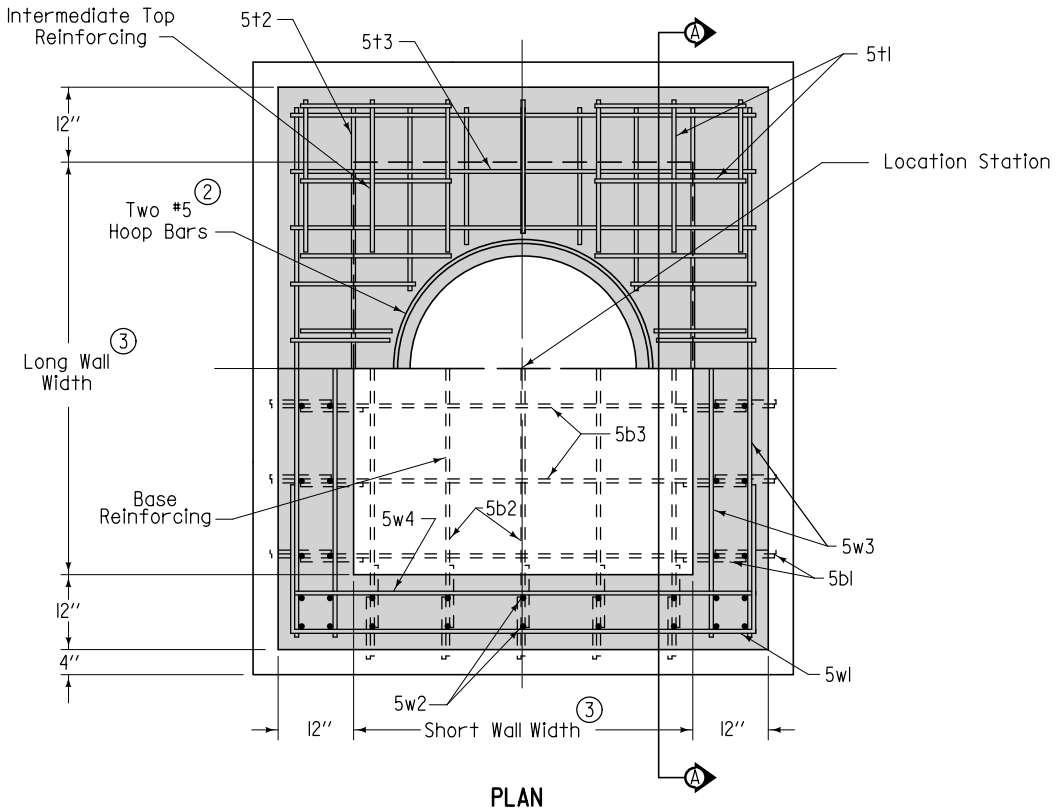
SUDAS	Iowa Department of Transportation	REVISION 1 04-17-12
FIGURE 6010.304	STANDARD ROAD PLAN	SW-304 SHEET 1 of 2

REVISIONS: Modified note 3 on sheet 2.

Paul D. Wiegand — SUDAS DIRECTOR
Deanna Maifield — DESIGN METHODS ENGINEER

RECTANGULAR BASE/ CIRCULAR TOP SANITARY SEWER MANHOLE

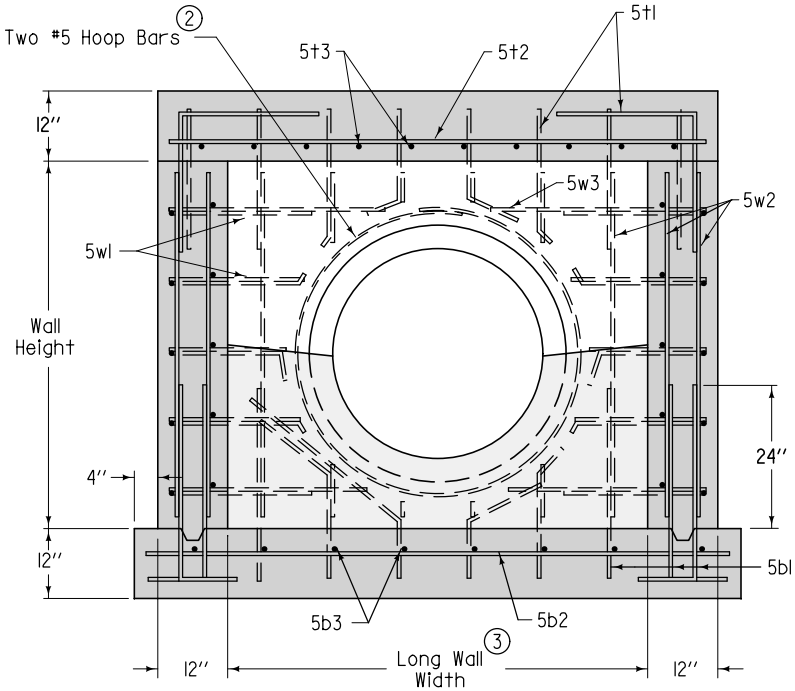
FIGURE 6010.304 SHEET 1 OF 2



PLAN

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

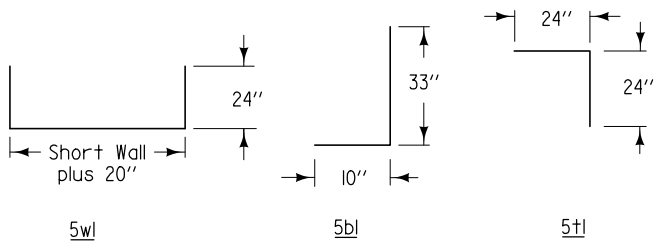
③ Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall opening (minimum) each side of pipe opening.



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	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 | Iowa Department of Transportation | REVISION 1 04-17-12

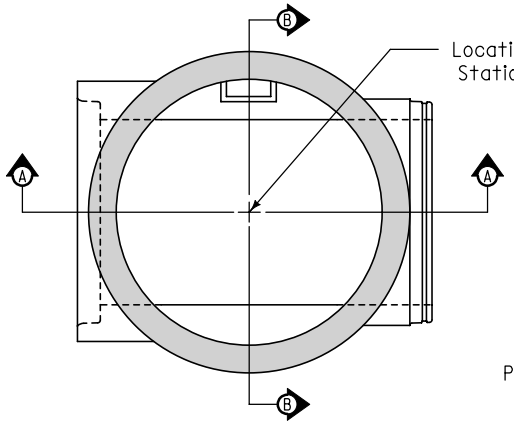
FIGURE 6010.304 | STANDARD ROAD PLAN | SW-304 | SHEET 2 of 2

REVISIONS: Modified note 3 on sheet 2.

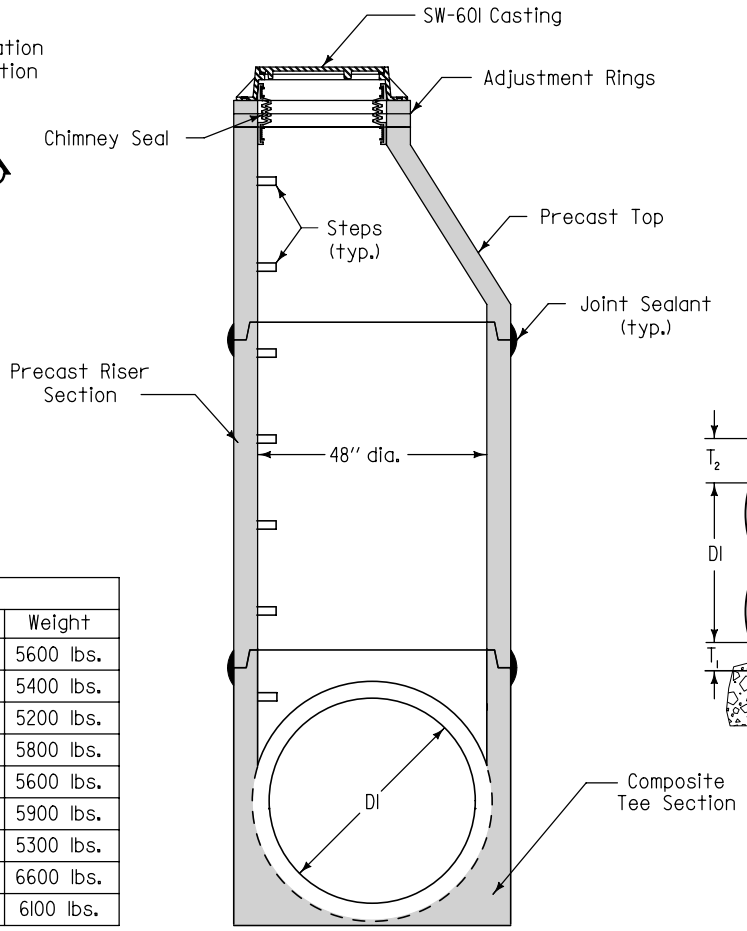
Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

RECTANGULAR BASE/ CIRCULAR TOP SANITARY SEWER MANHOLE

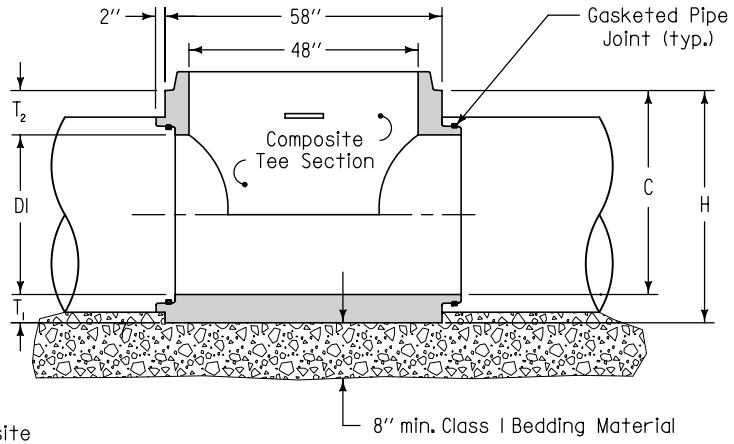
FIGURE 6010.304 SHEET 2 OF 2



PLAN



SECTION A-A



SECTION B-B

COMPOSITE TEE DIMENSIONS						
Size	DI	H	T_1	T_2	C	Weight
48" on 12"	12"	50"	8 1/2"	29 1/2"	41 1/2"	5600 lbs.
48" on 15"	15"	50"	7"	28"	43"	5400 lbs.
48" on 18"	18"	50"	5 1/2"	26 1/2"	44 1/2"	5200 lbs.
48" on 21"	21"	48"	9 1/2"	17 1/2"	38 1/2"	5800 lbs.
48" on 24"	24"	48"	8"	16"	40"	5600 lbs.
48" on 27"	27"	48"	9 1/2"	11 1/2"	38 1/2"	5900 lbs.
48" on 30"	30"	48"	8"	10"	40"	5300 lbs.
48" on 33"	33"	54"	9 1/2"	11 1/2"	44 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 | Iowa Department of Transportation

REVISION: NEW 04-21-09

FIGURE 6010.305 | STANDARD ROAD PLAN | SW-305 | SHEET 2 of 2

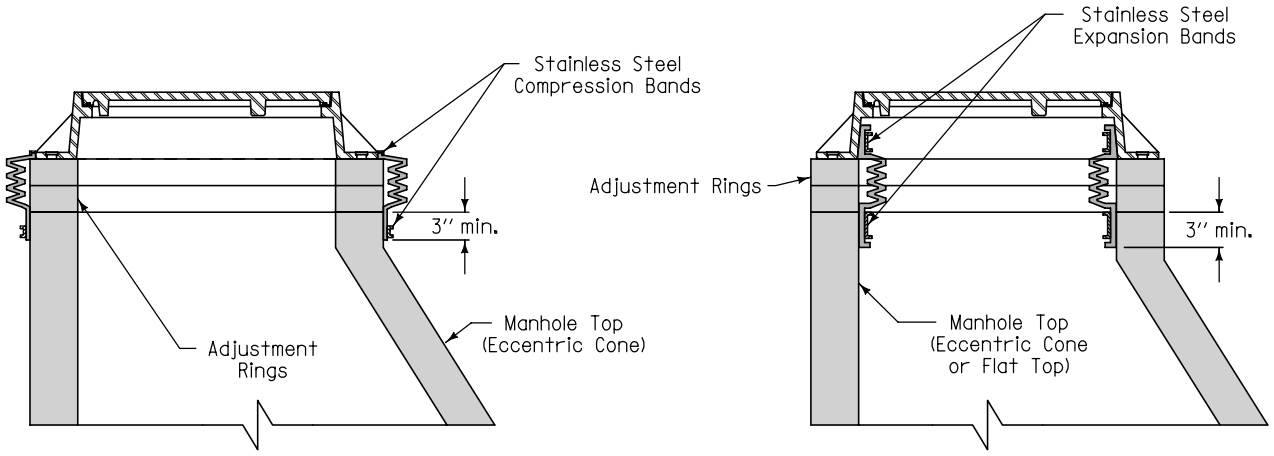
REVISIONS: New. Replaces SUDAS Type "J" Manhole.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

TEE-SECTION
SANITARY SEWER MANHOLE

FIGURE 6010.305 SHEET 2 OF 2

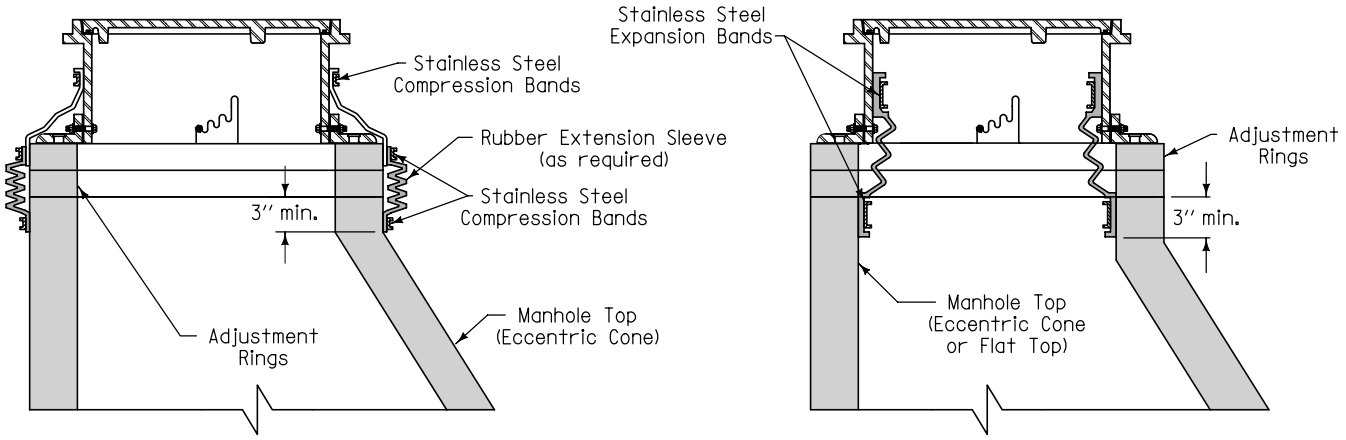
CHIMNEY SEALS FOR 2-PIECE CASTINGS



EXTERNAL SEAL

INTERNAL SEAL

CHIMNEY SEALS FOR 3-PIECE CASTINGS



EXTERNAL SEAL

INTERNAL SEAL

FIGURE 6010.306 SHEET 1 OF 1

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.306	STANDARD ROAD PLAN	SW-306 SHEET 1 of 1

REVISIONS: New.

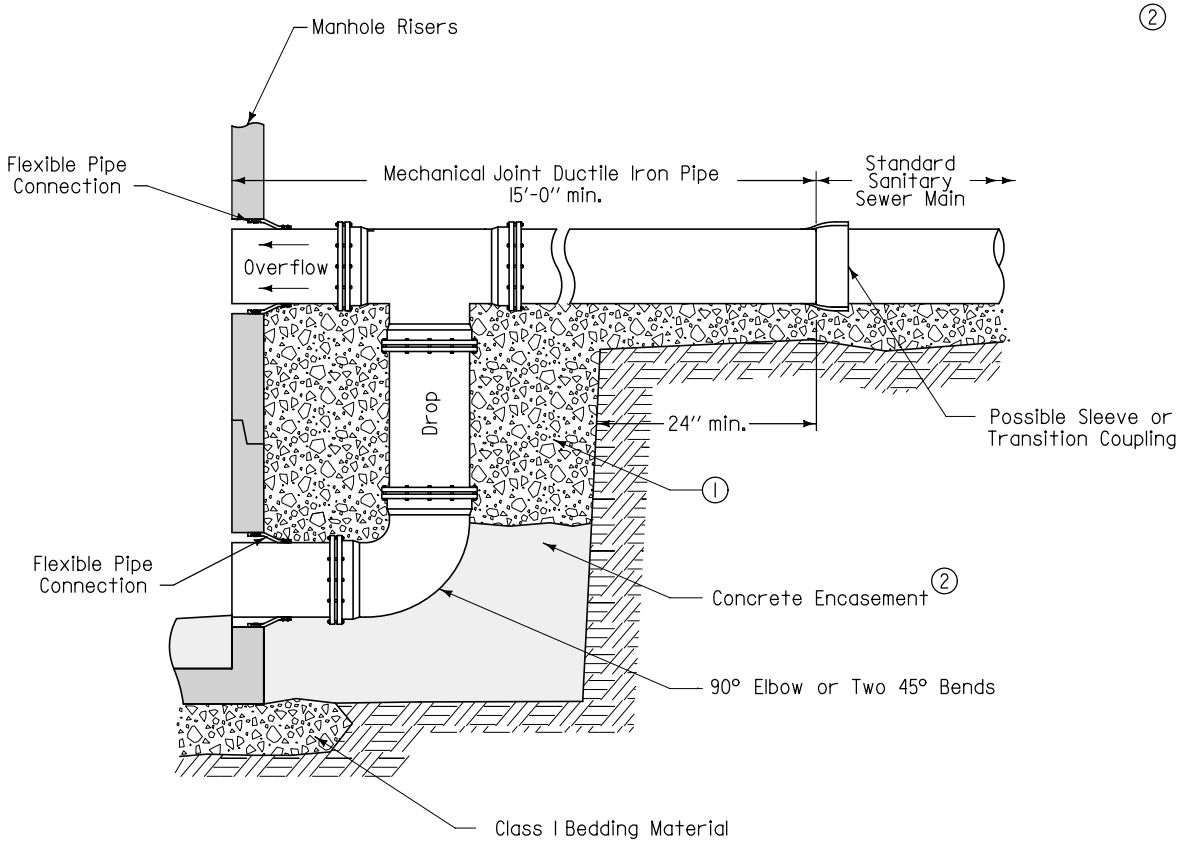
SUDAS DIRECTOR — Deanna Maifield DESIGN METHODS ENGINEER

CHIMNEY SEALS FOR SANITARY SEWER MANHOLES

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.



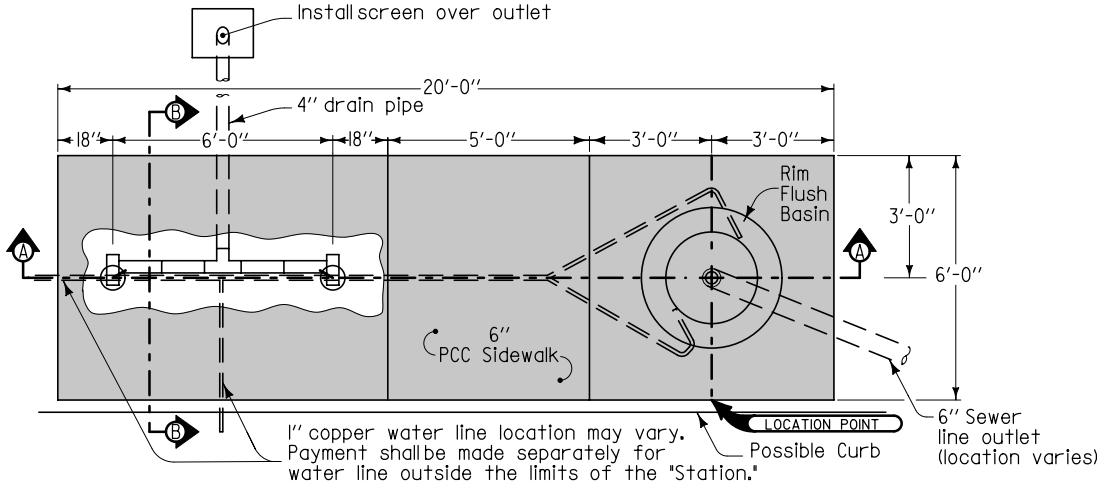
SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.307	STANDARD ROAD PLAN	SW-307 SHEET 1 of 1

REVISIONS: New. Replaces SUDAS Figure 6020.6A and 6020.6B. Will replace RA-52.

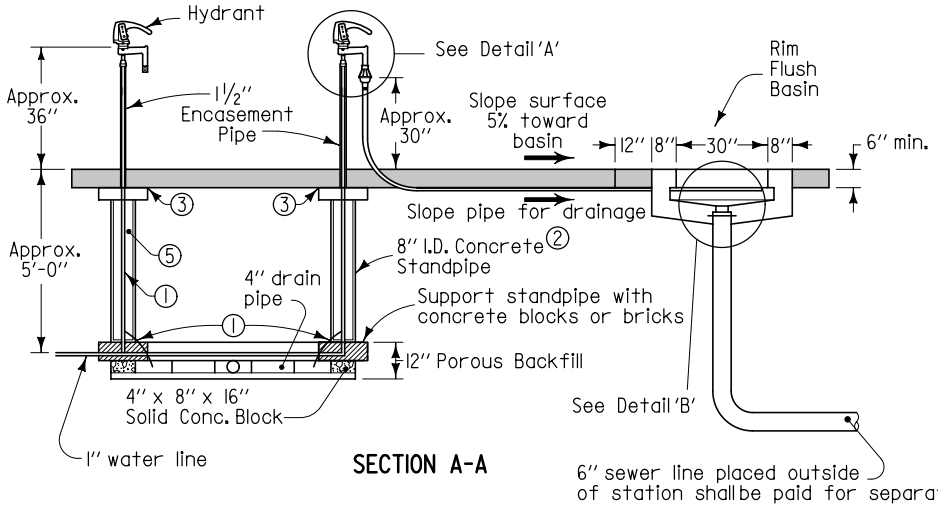
SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

DROP CONNECTION FOR SANITARY SEWER MANHOLE

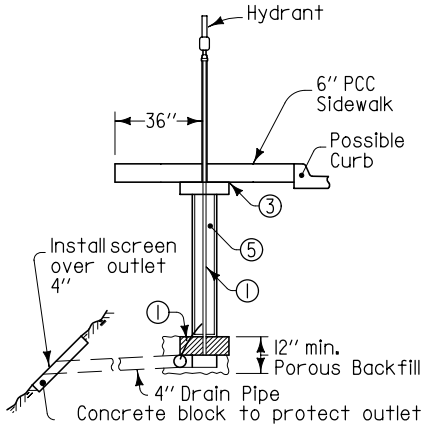
FIGURE 6010.307 SHEET 1 OF 1



PLAN



SECTION A-A



SECTION B-B

Hydrants shall be combination freezeless and standard operating units or freezeless and self-closing (as designated on the plans), of a design and construction approved by the Engineer and equipped with approved model accessory attachment as indicated. Riser pipe for hydrants shall be one inch I.D. galvanized water pipe.

After the water line (to the last hydrant on the line) has been placed and inspected, the line shall be tested and proven free of leaks under 100 lbs. per square inch air pressure with soap and water or other proven means. The line shall be required to maintain such pressure 24 hours. Upon successful completion of inspection and testing, excavated material shall be returned to the trench and tamped. Water lines for rim flush basin shall be either type "K" copper or galvanized pipe.

Advisory signs and a single 4 inch x 4 inch post will be furnished by the Iowa Department of Transportation. Mount signs back-to-back on post. Exact location is to be determined by the Engineer at the time of installation by the Contractor.

Details shown for hatch cover are typical. It shall be self-closing, cast bronze type of a design and construction approved by the Engineer. Handle shall be shaped to ensure self-closing feature.

① Copper tube connection. Place hydrant drain a minimum of 2 inches above porous backfill to ensure proper operation.

② Position 8-inch I.D. Standpipe so that no damage will result to the normal operation of water lines and drain tile located in the immediate vicinity.

③ Block standpipe to prevent concrete from entering pipe during construction of slab.

④ Inside of standpipe shall be void of material.

⑤ 4-inch cast iron threaded base with bronze cover and handle and provisions for locking model 41 from VAREC, Inc. Cypress, CA.

Iowa Department of Transportation

REVISION: NEW 10-20-09

STANDARD ROAD PLAN

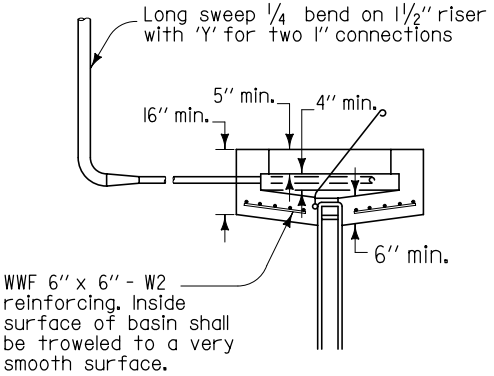
SW-350

SHEET 1 of 2

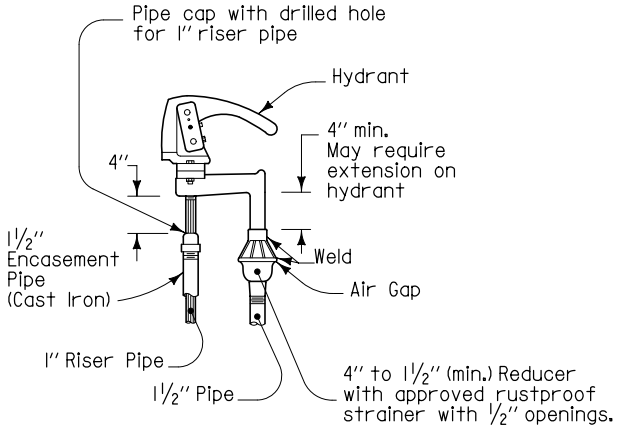
REVISIONS: New. Replaces RA-59.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

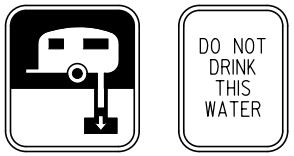
TRAVEL TRAILER DUMP STATION



TYPICAL SECTION

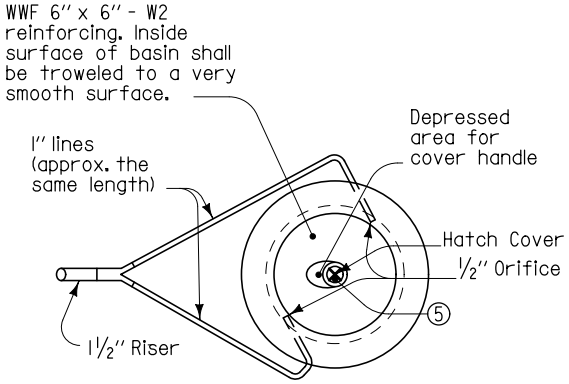


DETAIL 'A'



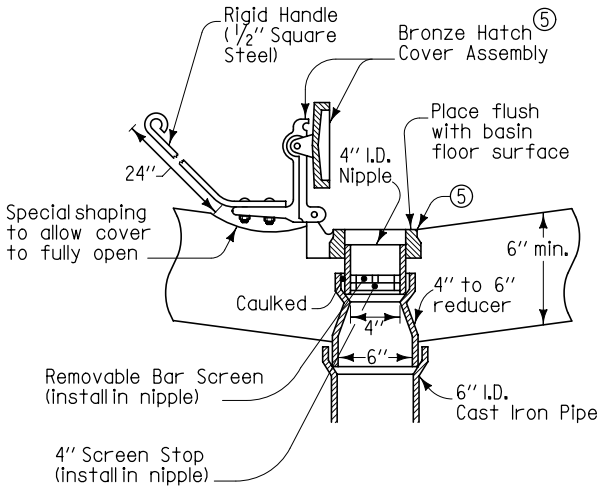
(Facing Traffic) (Facing Facility)

ADVISORY SIGNS



PLAN

RIM FLUSH BASIN



DETAIL 'B'

⑤ 4-inch cast iron threaded base with bronze cover and handle and provisions for locking model 41 from VAREC, Inc. Cypress, CA.

Iowa Department of Transportation

REVISION: NEW 10-20-09

STANDARD ROAD PLAN

SW-350

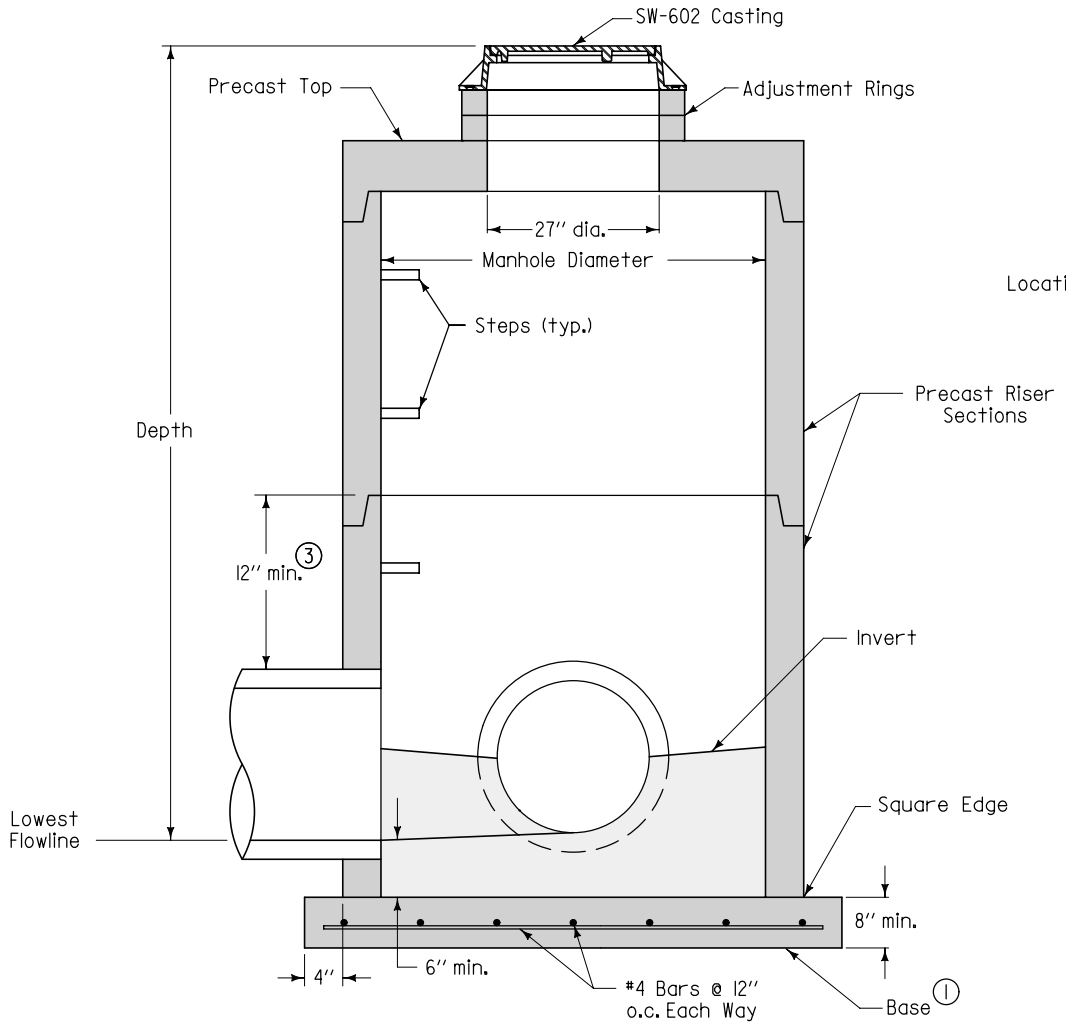
SHEET 2 of 2

REVISIONS: New. Replaces RA-59.

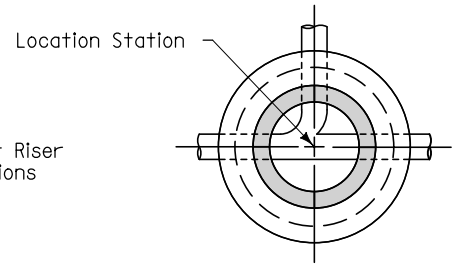
Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

TRAVEL TRAILER DUMP STATION



TYPICAL SECTION



PLAN

(1) Cast-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.

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

(3) 12 inch minimum riser height above all pipe openings.

Manhole Diameter (inches)	Maximum Pipe Diameter (2) (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 Department of Transportation

REVISION: NEW 04-21-09

FIGURE 6010.401 | STANDARD ROAD PLAN

SW-401

SHEET 1 of 1

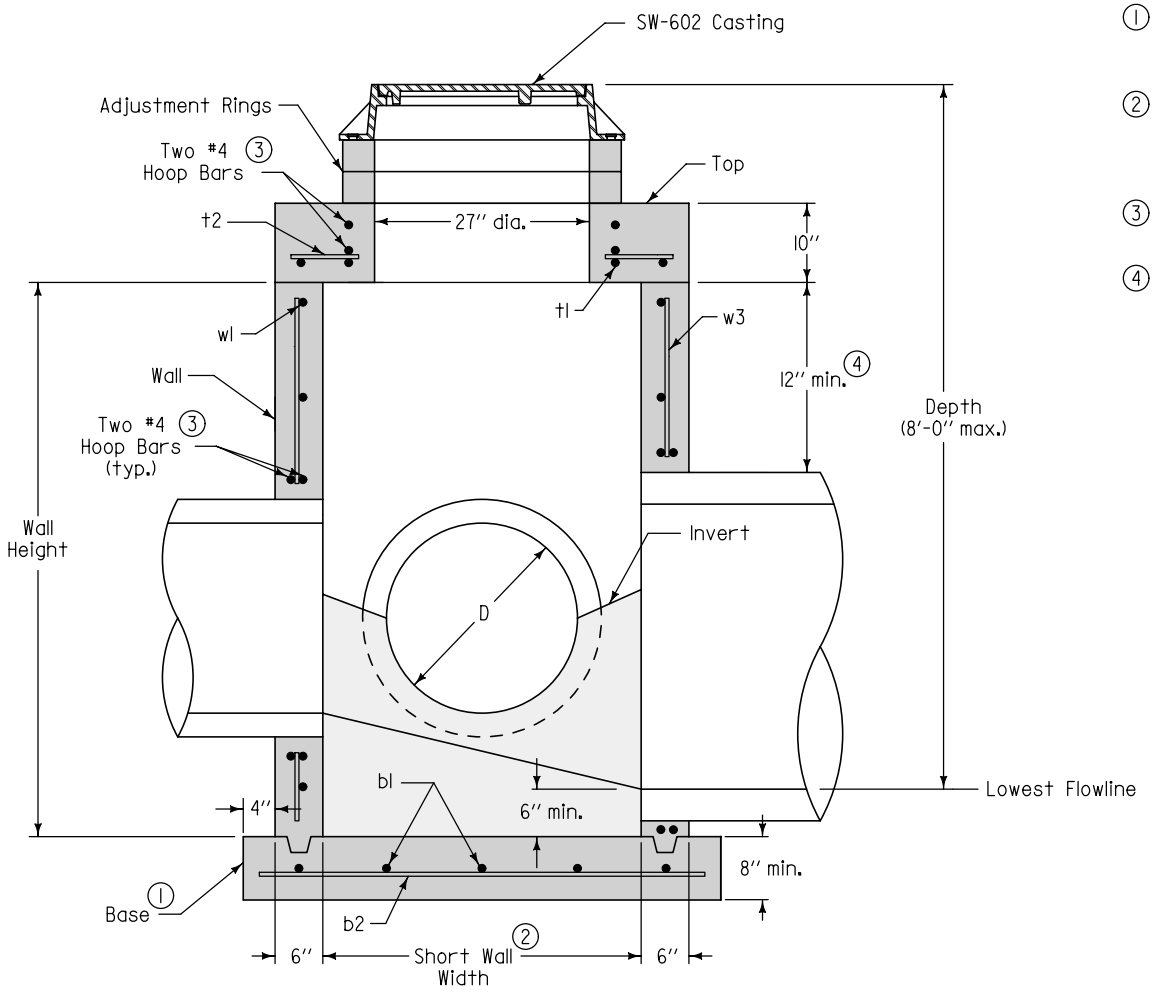
REVISIONS: New. Replaces SUDAS Type "M-A" Manhole. Will replace RA-50.

SUDAS DIRECTOR

DESIGN METHODS ENGINEER

CIRCULAR STORM SEWER MANHOLE

FIGURE 6010.401 SHEET 1 OF 1



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 Department of Transportation

REVISION: NEW 04-21-09

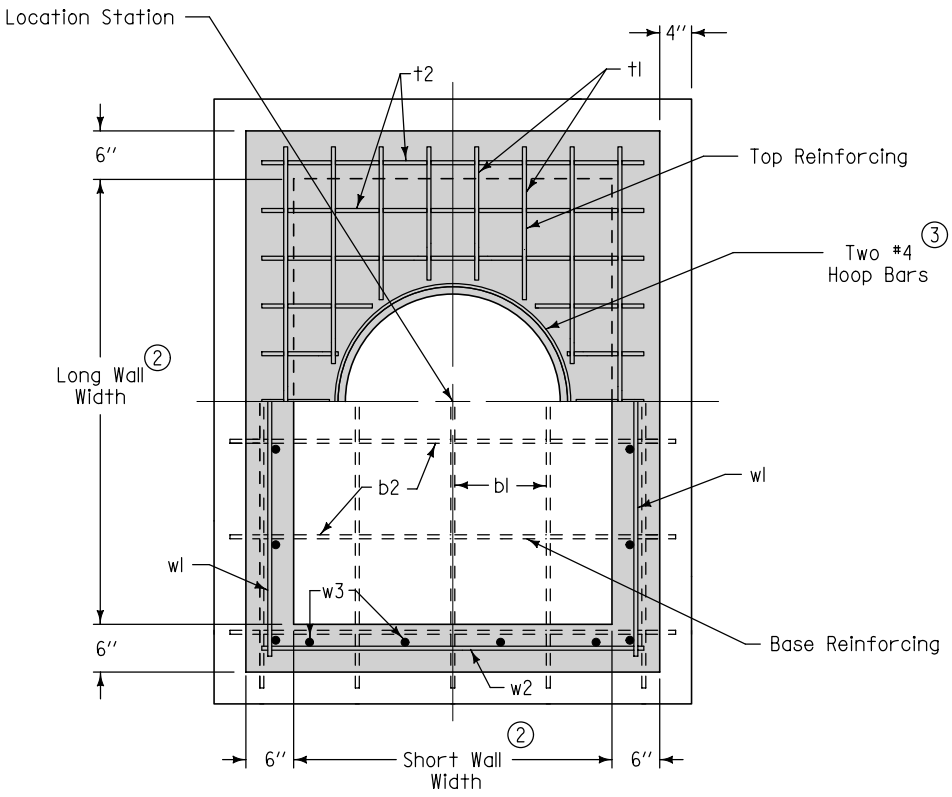
FIGURE 6010.402 | STANDARD ROAD PLAN | SW-402 | SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Type "M-B" Manhole. Will replace RA-49.

SUDAS DIRECTOR | 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 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''

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

SUDAS | Iowa Department of Transportation

REVISION NEW 04-21-09

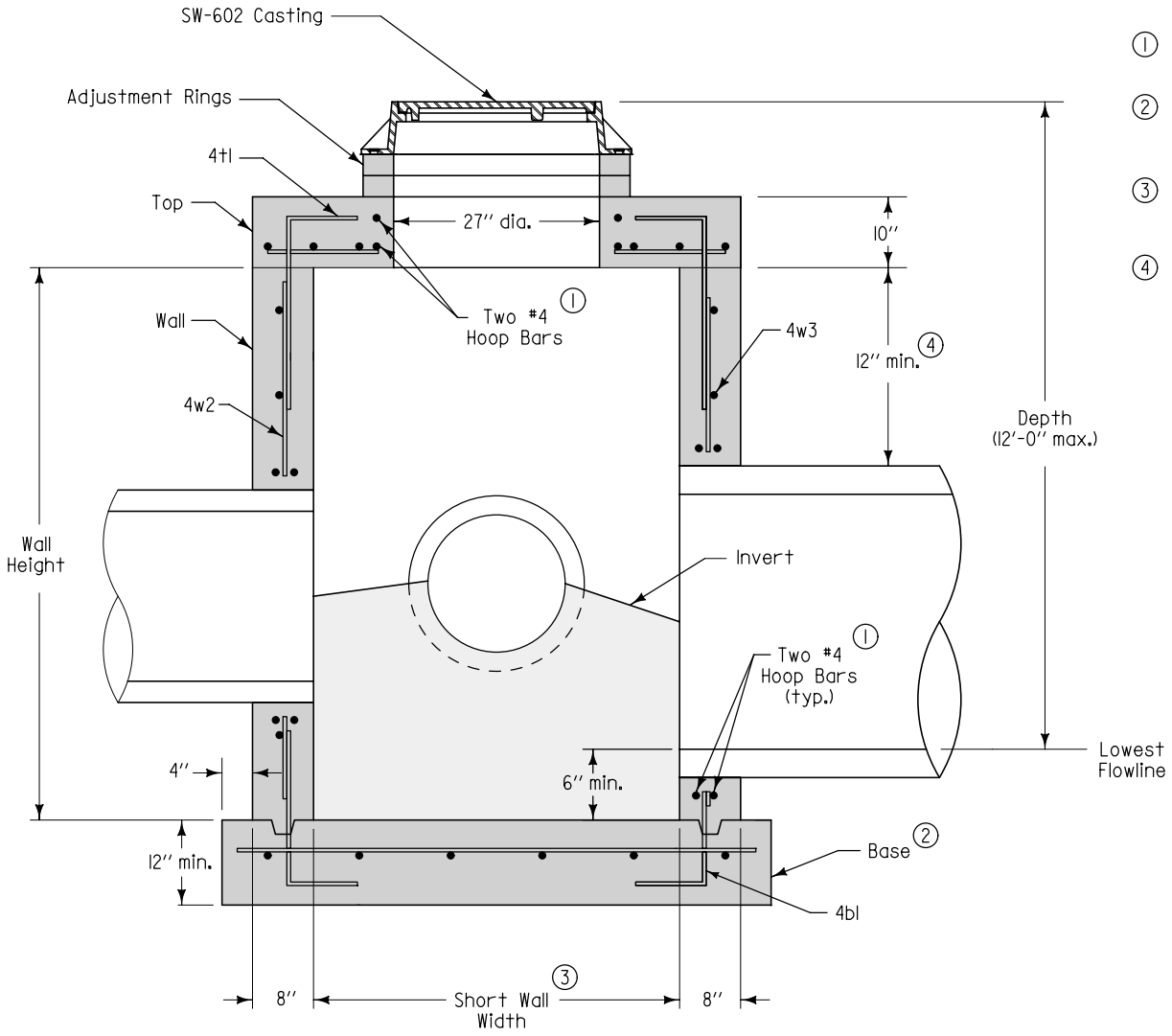
FIGURE 6010.402 | STANDARD ROAD PLAN | SW-402 | SHEET 2 of 2

REVISIONS: New. Replaces SUDAS Type "M-B" Manhole. Will replace RA-49.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

RECTANGULAR STORM SEWER MANHOLE

FIGURE 6010.402 SHEET 2 OF 2



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.

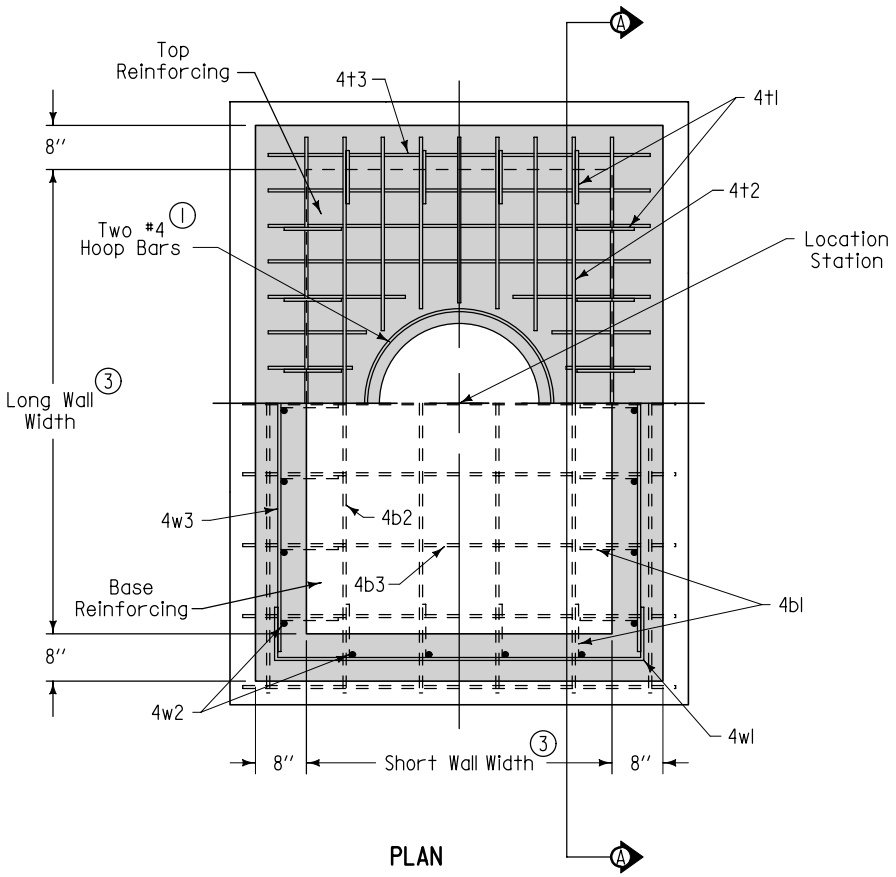
SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.403	STANDARD ROAD PLAN	SW-403 SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Type "M-C" Manhole.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

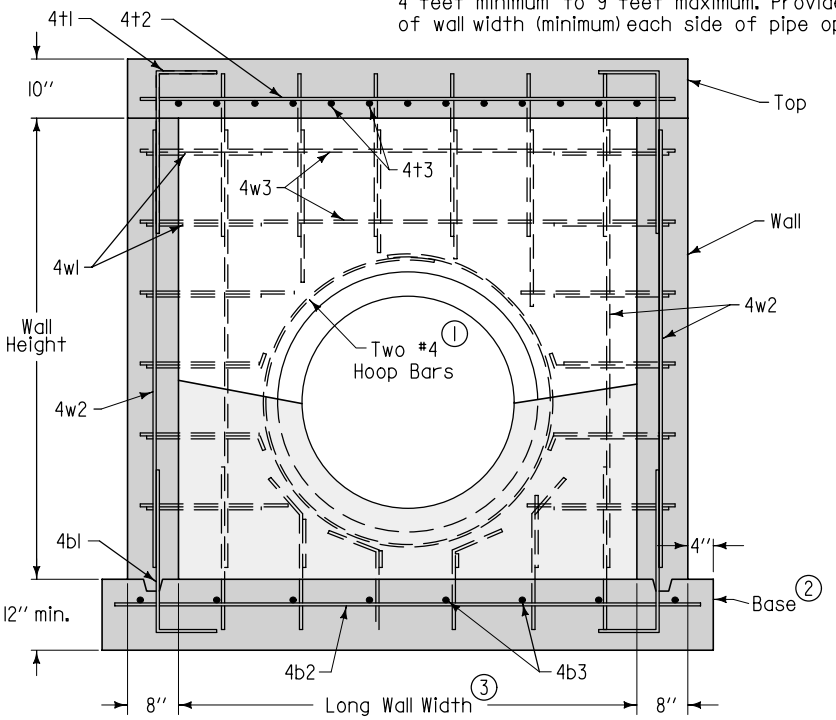
DEEP WELL RECTANGULAR STORM SEWER MANHOLE

FIGURE 6010.403 SHEET 1 OF 2



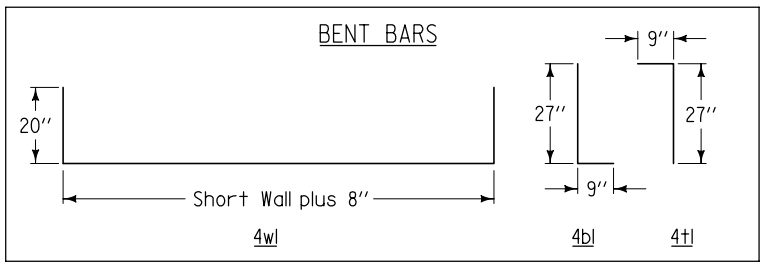
PLAN

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.



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	⌊	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 Department of Transportation | REVISION NEW 04-21-09

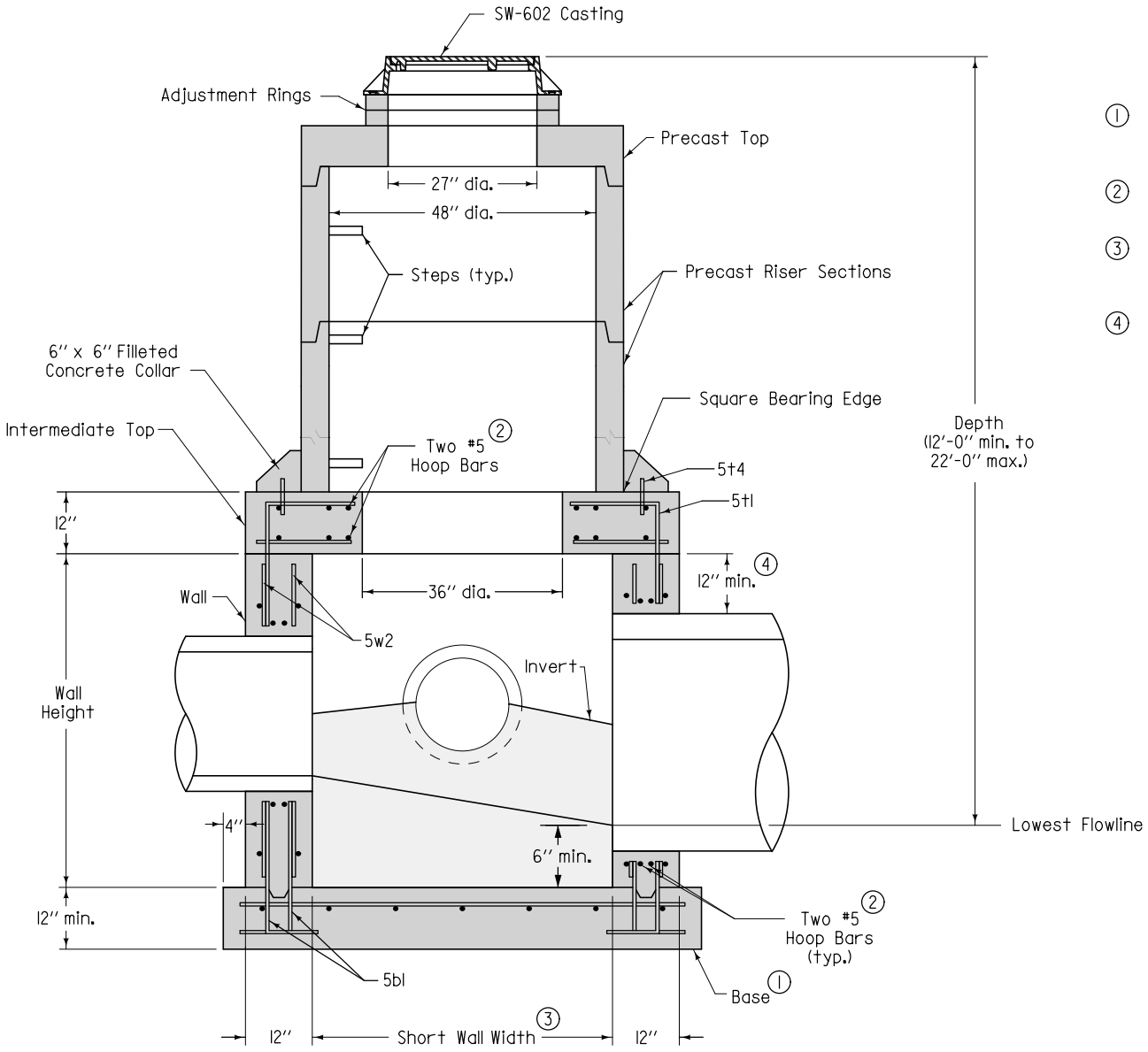
FIGURE 6010.403 | STANDARD ROAD PLAN | SW-403 | SHEET 2 of 2

REVISIONS: New. Replaces SUDAS Type "M-C" Manhole.

SUDAS DIRECTOR | 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.

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	Iowa Department of Transportation	REVISION 1 04-17-12
FIGURE 6010.404	STANDARD ROAD PLAN	SW-404
		SHEET 1 of 2

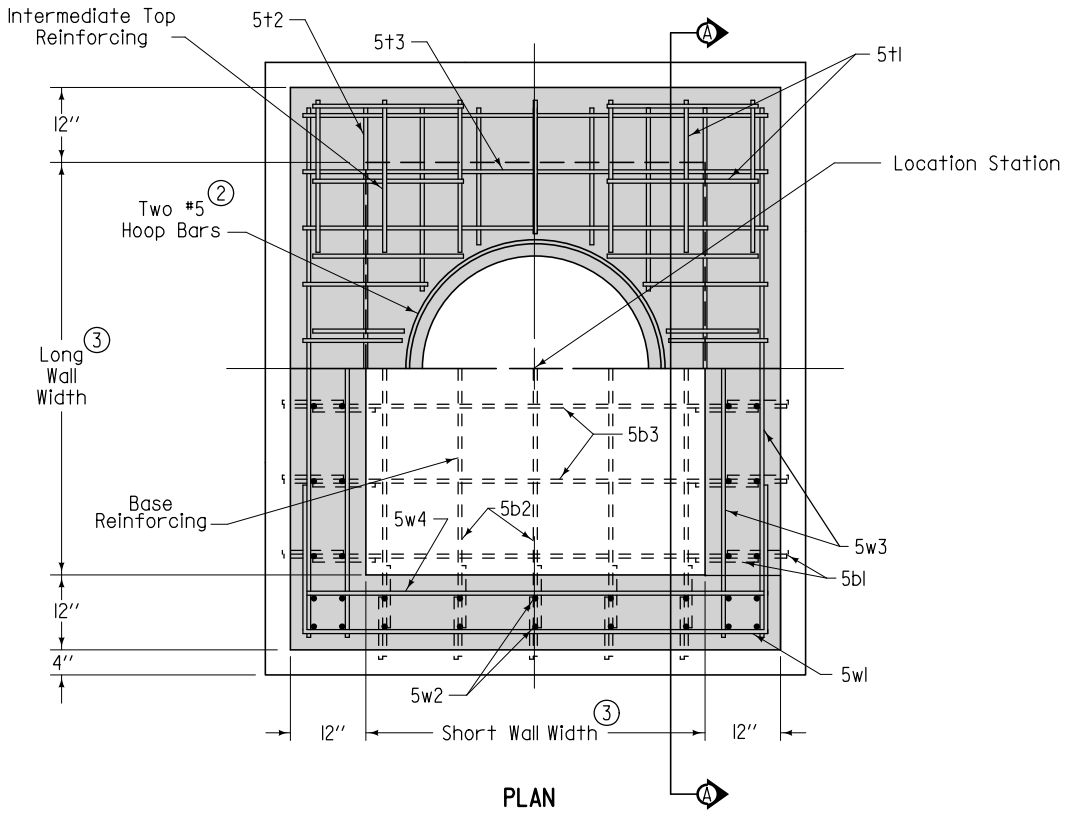
REVISIONS: Modified note 3 on sheet 2.

Paul D. Wiegand
SUDAS DIRECTOR

Deanna Maifield
DESIGN METHODS ENGINEER

RECTANGULAR BASE/ CIRCULAR TOP STORM SEWER MANHOLE

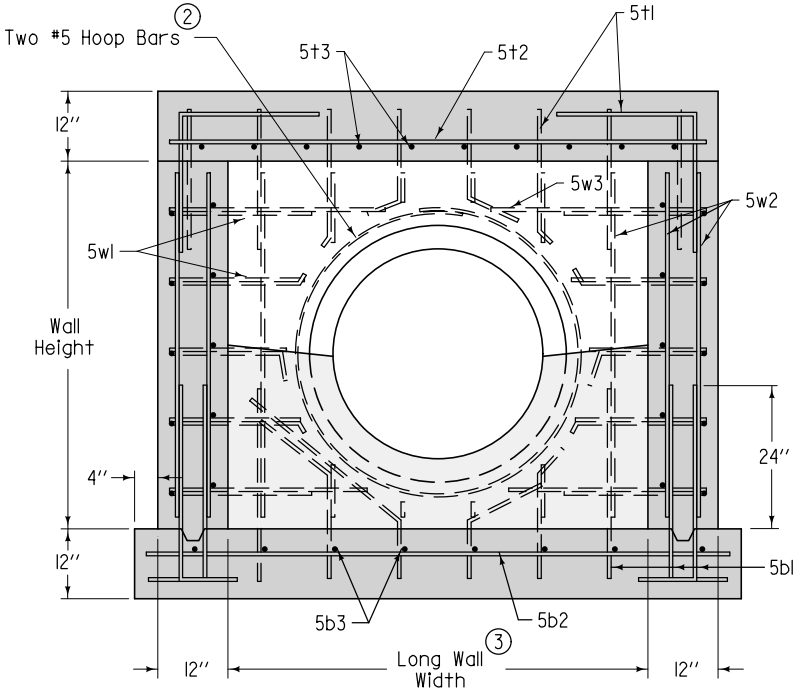
FIGURE 6010.404 SHEET 1 OF 2



PLAN

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

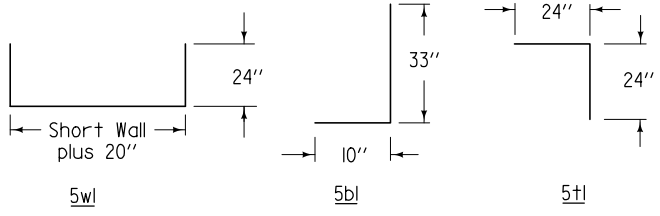
③ Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.



SECTION A-A

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
5t1	5	Top	⌊	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	⌊	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 | Iowa Department of Transportation | REVISION 1 04-17-12

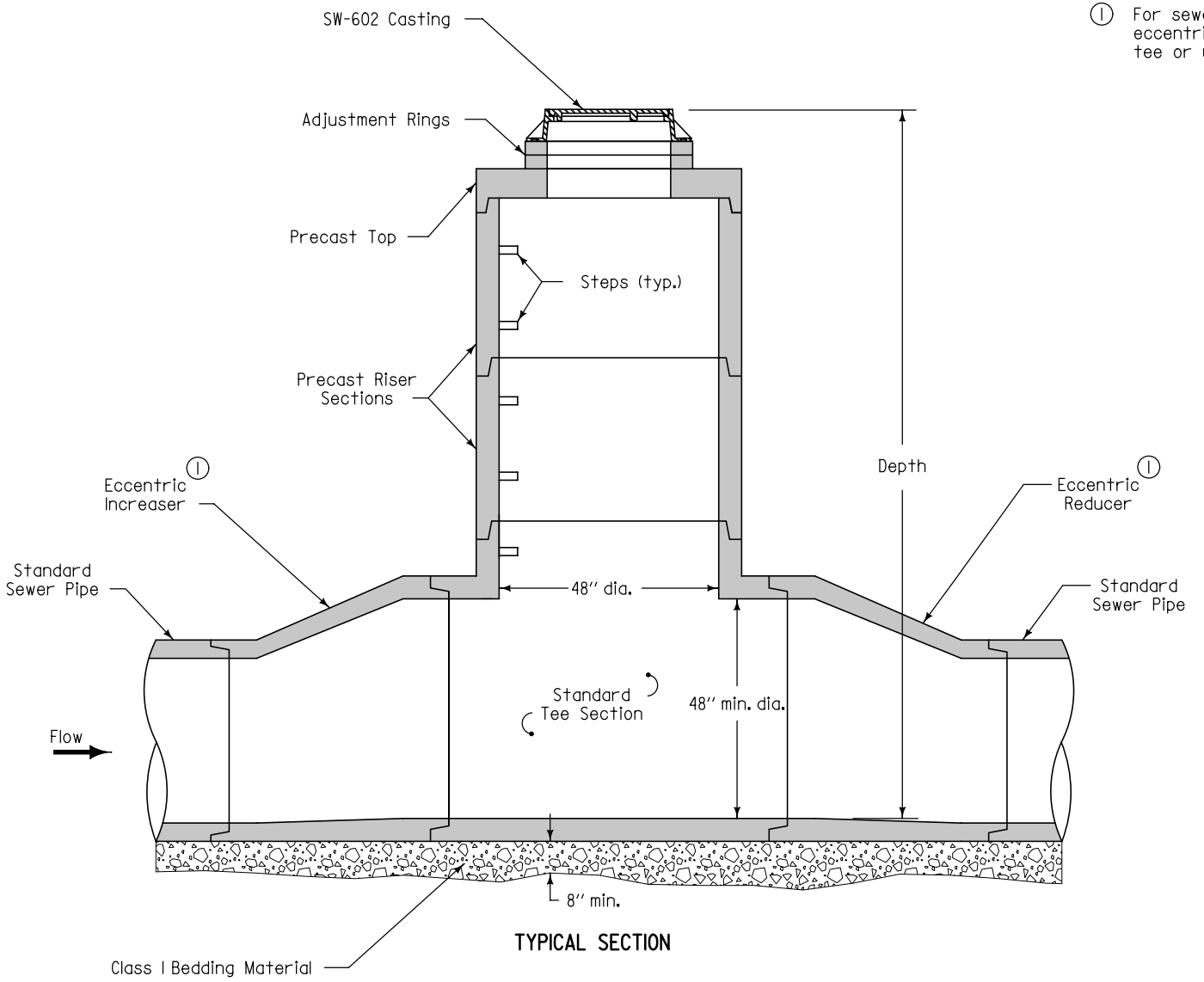
FIGURE 6010.404 | STANDARD ROAD PLAN | SW-404 | SHEET 2 of 2

REVISIONS: Modified note 3 on sheet 2.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

RECTANGULAR BASE/ CIRCULAR TOP STORM SEWER MANHOLE

FIGURE 6010.404 SHEET 2 OF 2



TYPICAL SECTION

STANDARD TEE (1)

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

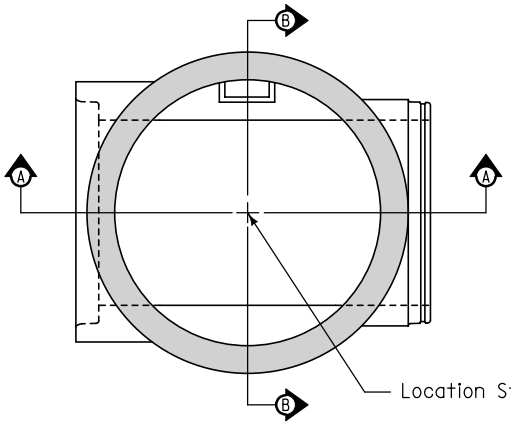
SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.405	STANDARD ROAD PLAN	SW-405 SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Type "M-E" Manhole.

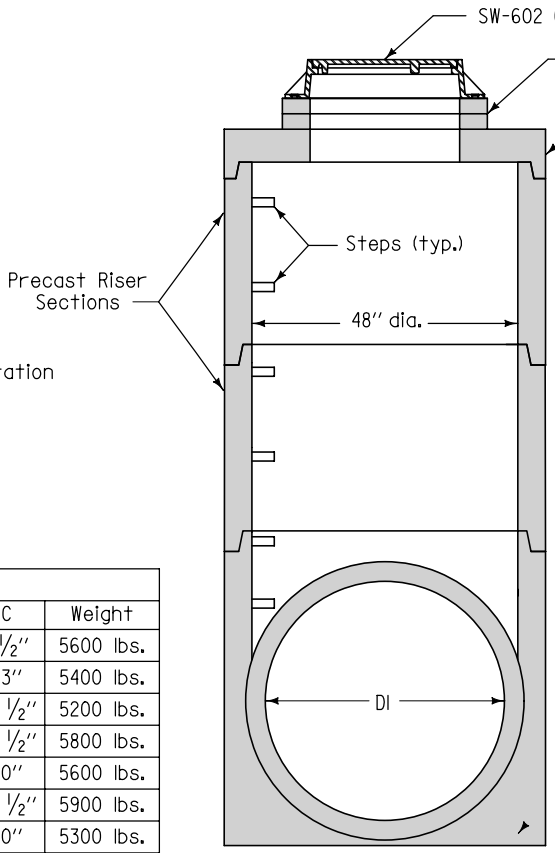
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

TEE-SECTION
STORM SEWER MANHOLE

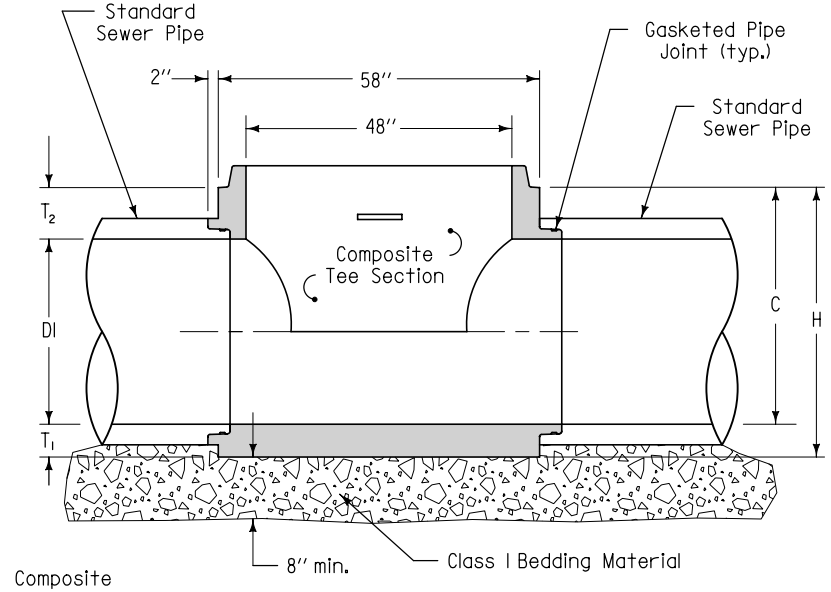
FIGURE 6010.405 SHEET 1 OF 2



PLAN



SECTION B-B



SECTION A-A

COMPOSITE TEE DIMENSIONS						
Size	DI	H	T_1	T_2	C	Weight
48" on 12"	12"	50"	8 1/2"	29 1/2"	41 1/2"	5600 lbs.
48" on 15"	15"	50"	7"	28"	43"	5400 lbs.
48" on 18"	18"	50"	5 1/2"	26 1/2"	44 1/2"	5200 lbs.
48" on 21"	21"	48"	9 1/2"	17 1/2"	38 1/2"	5800 lbs.
48" on 24"	24"	48"	8"	16"	40"	5600 lbs.
48" on 27"	27"	48"	9 1/2"	11 1/2"	38 1/2"	5900 lbs.
48" on 30"	30"	48"	8"	10"	40"	5300 lbs.
48" on 33"	33"	54"	9 1/2"	11 1/2"	44 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 | Iowa Department of Transportation

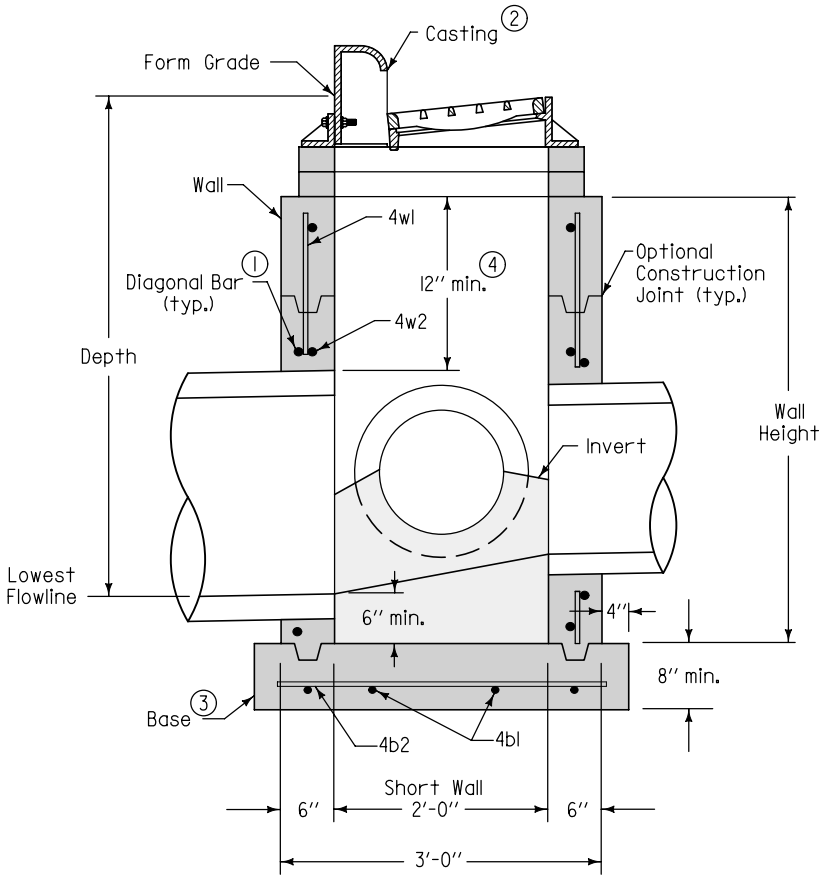
REVISION: NEW 04-21-09

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

REVISIONS: New. Replaces SUDAS Type "M-E" Manhole.

SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

TEE-SECTION
STORM SEWER MANHOLE



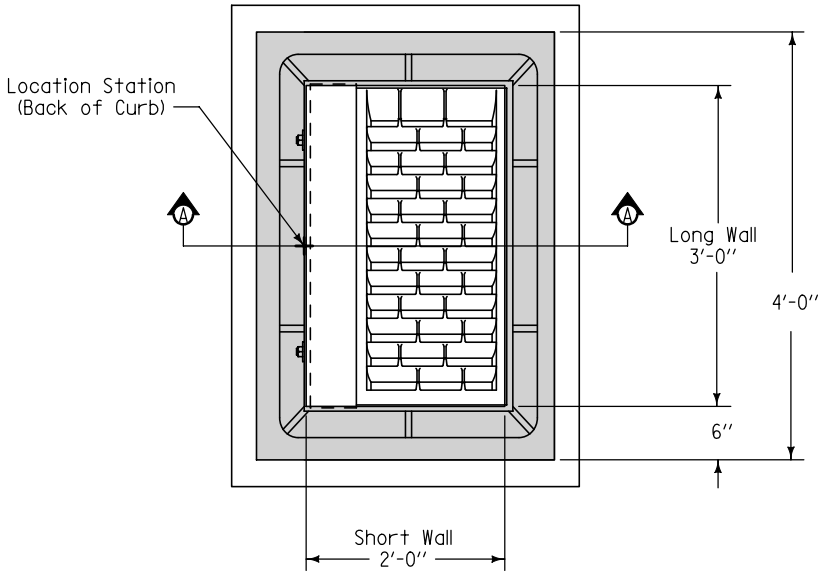
SECTION A-A

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.



PLAN

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 Department of Transportation

REVISION: NEW 04-21-09

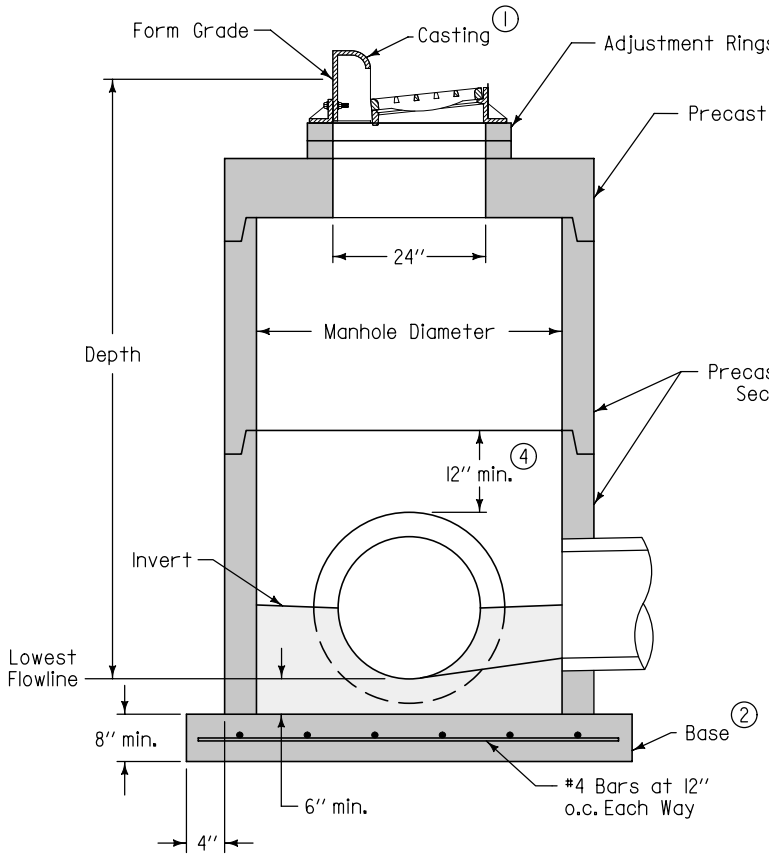
FIGURE 6010.501 | STANDARD ROAD PLAN | SW-501 | SHEET 1 of 1

REVISIONS: New. Replaces SUDAS Type "M-A" Intake.

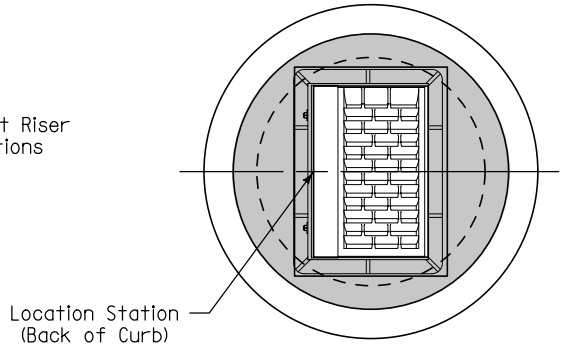
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE

FIGURE 6010.501 | SHEET 1 OF 1



TYPICAL SECTION



PLAN

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 Department of Transportation | REVISION NEW 04-21-09

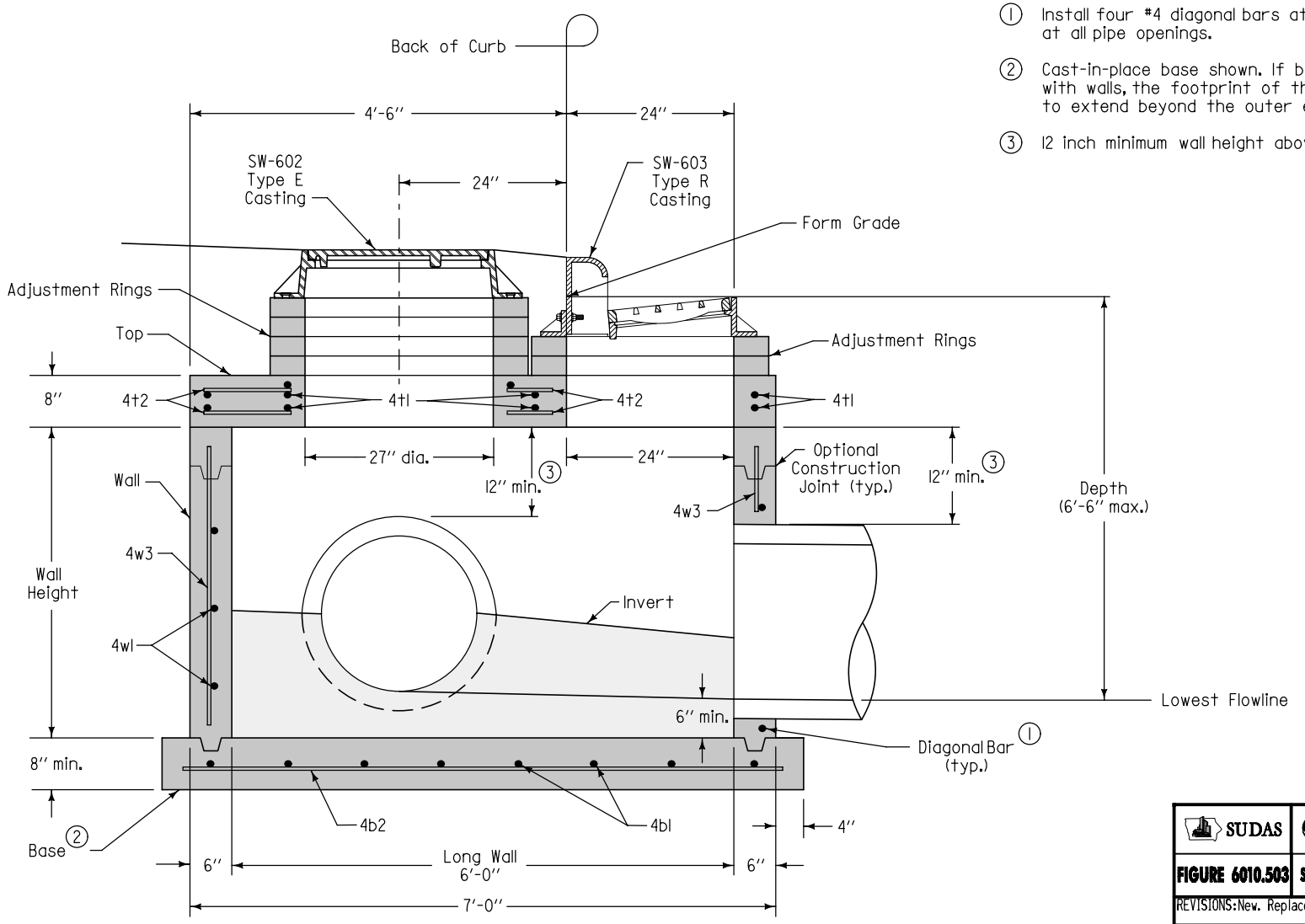
FIGURE 6010.502 | STANDARD ROAD PLAN | SW-502 | SHEET 1 of 1

REVISIONS: New. Replaces SUDAS Type "M-B" Intake.

SUDAS DIRECTOR | Deanna Maifield DESIGN METHODS ENGINEER

CIRCULAR SINGLE GRATE INTAKE

FIGURE 6010.502 SHEET 1 OF 1



TYPICAL SECTION

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.

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.503	STANDARD ROAD PLAN	SW-503 SHEET 1 of 2

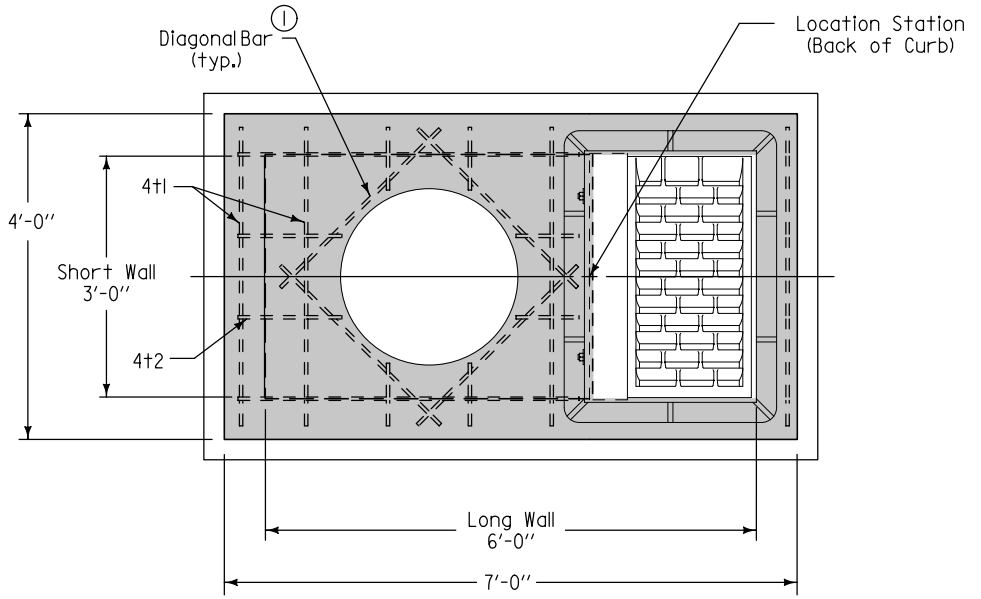
REVISIONS: New. Replaces SUDAS Type "M-C" Intake.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE WITH MANHOLE

FIGURE 6010.503 SHEET 1 OF 2

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 | Iowa Department of Transportation

REVISION: NEW 04-21-09

FIGURE 6010.503 | STANDARD ROAD PLAN | SW-503

SHEET 2 of 2

REVISIONS: New. Replaces SUDAS Type "M-C" Intake.

SUDAS DIRECTOR

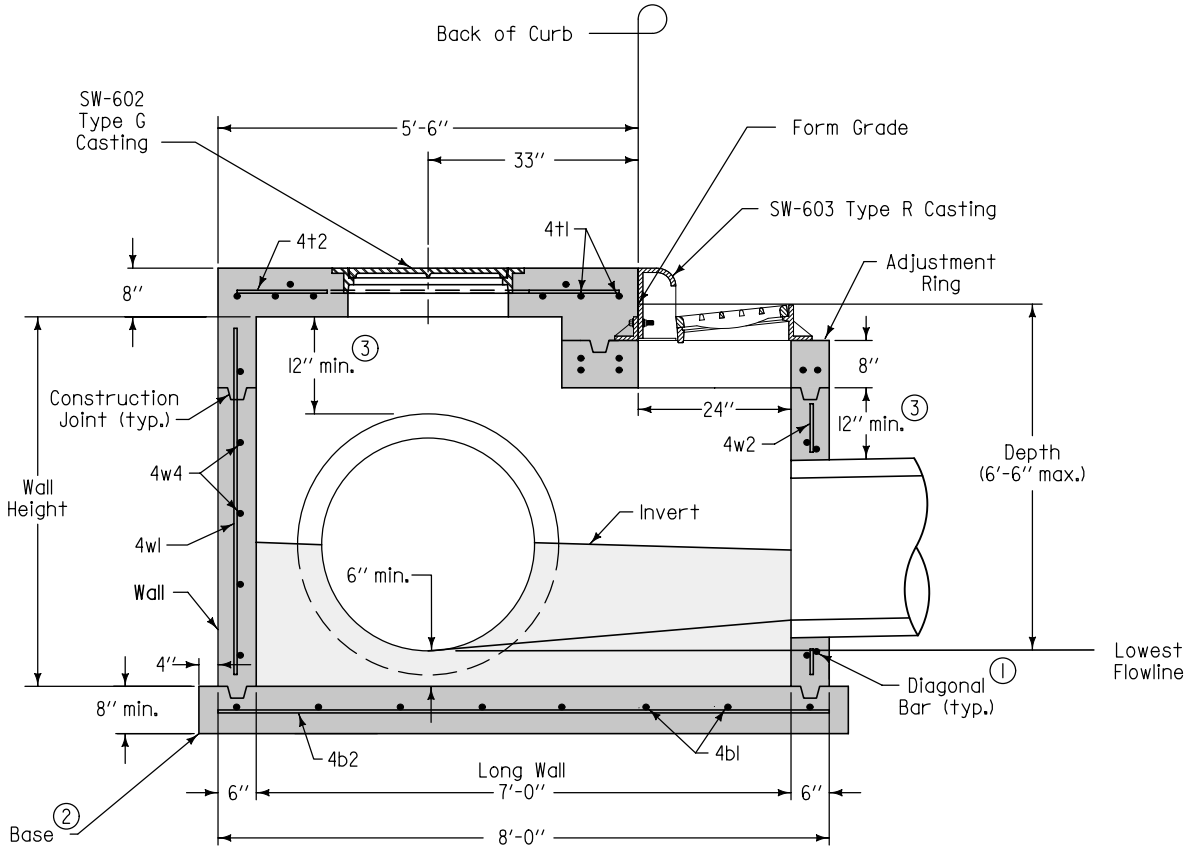
Deanna Maifield
DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE WITH MANHOLE

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

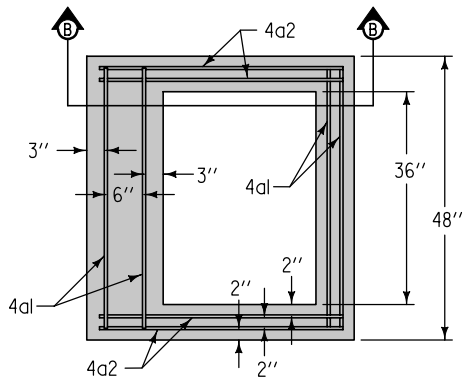
② Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

③ 12 inch minimum wall height above all pipes.

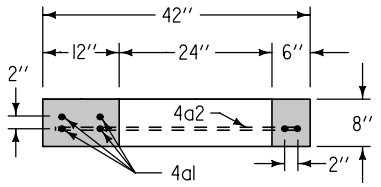


SECTION A-A

ADJUSTMENT RING



PLAN



SECTION B-B

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.504	STANDARD ROAD PLAN	SW-504 SHEET 1 of 2

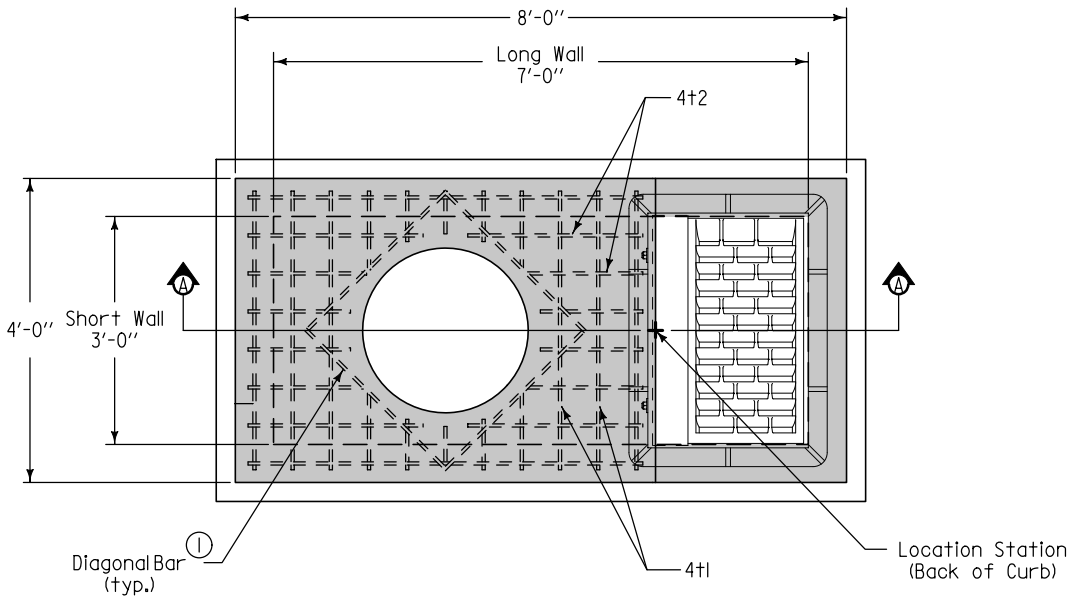
REVISIONS: New. Replaces SUDAS Special Type "M-C" Intake.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SINGLE GRATE INTAKE WITH FLUSH-TOP MANHOLE

FIGURE 6010.504 SHEET 1 OF 2

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	——	11	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	——	11	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 | Iowa Department of Transportation

REVISION
NEW 04-21-09

FIGURE 6010.504 | STANDARD ROAD PLAN | SW-504

SHEET 2 of 2

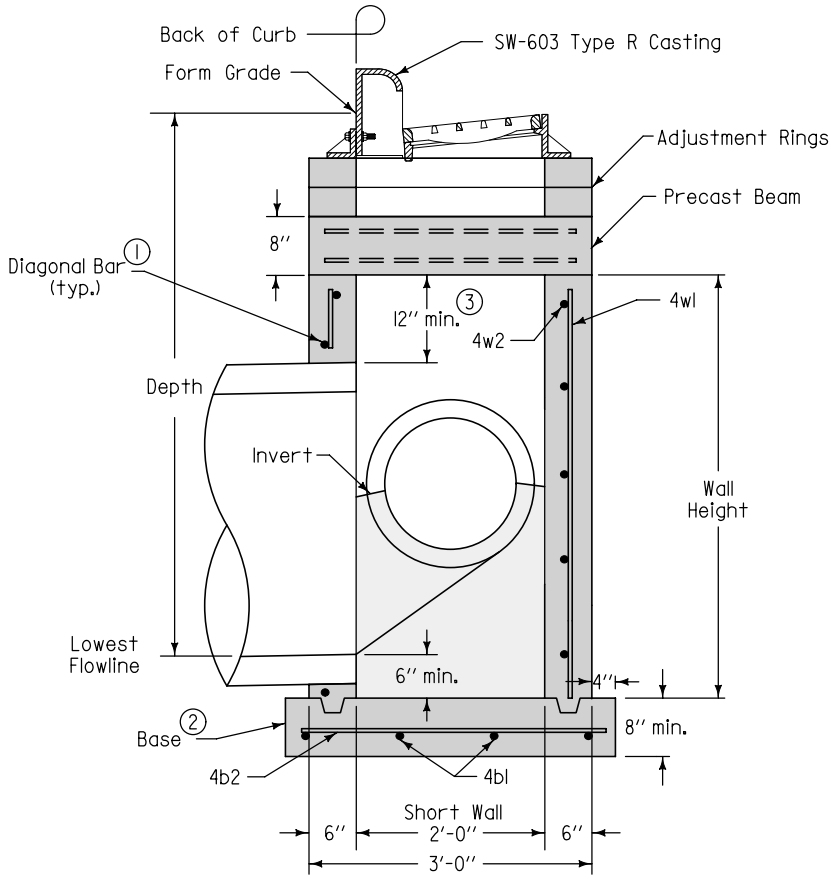
REVISIONS: New. Replaces SUDAS Special Type "M-C" Intake.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

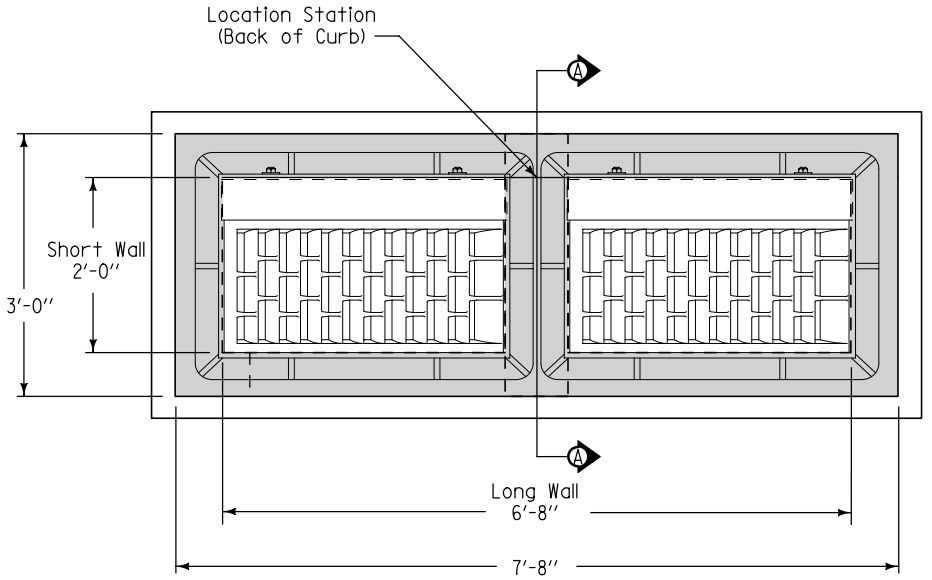
SINGLE GRATE INTAKE WITH FLUSH-TOP MANHOLE

FIGURE 6010.504 SHEET 2 OF 2

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	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.505	STANDARD ROAD PLAN	SW-505 SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Figure 6030.5.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

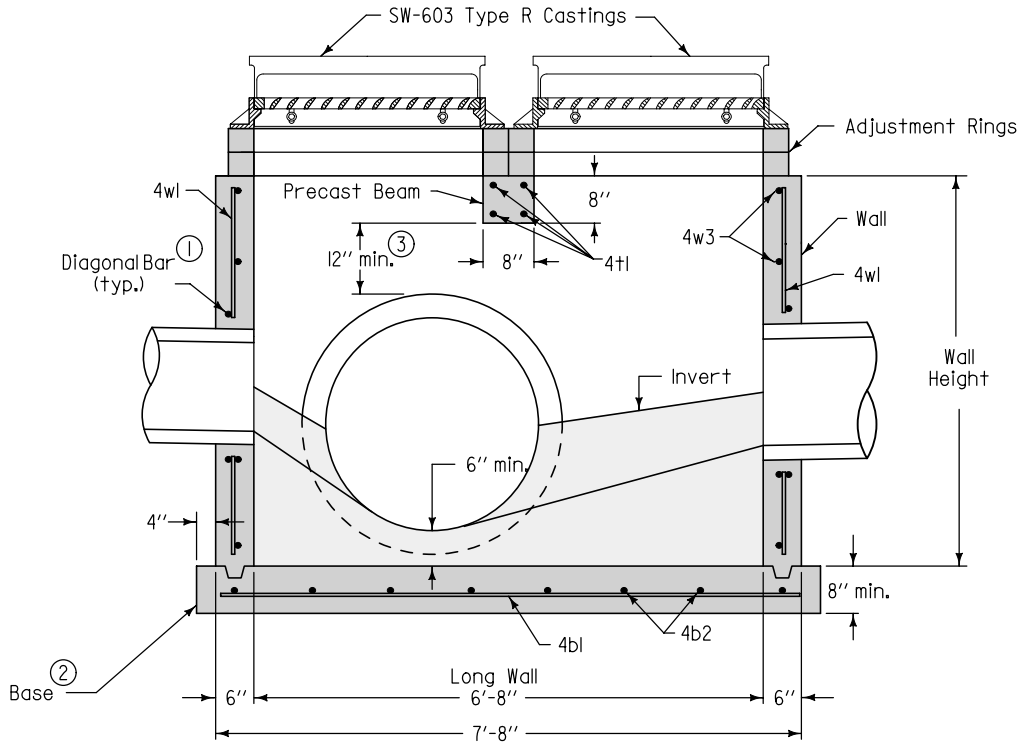
DOUBLE GRATE INTAKE

FIGURE 6010.505 SHEET 1 OF 2

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 | Iowa Department of Transportation

REVISION: NEW 04-21-09

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

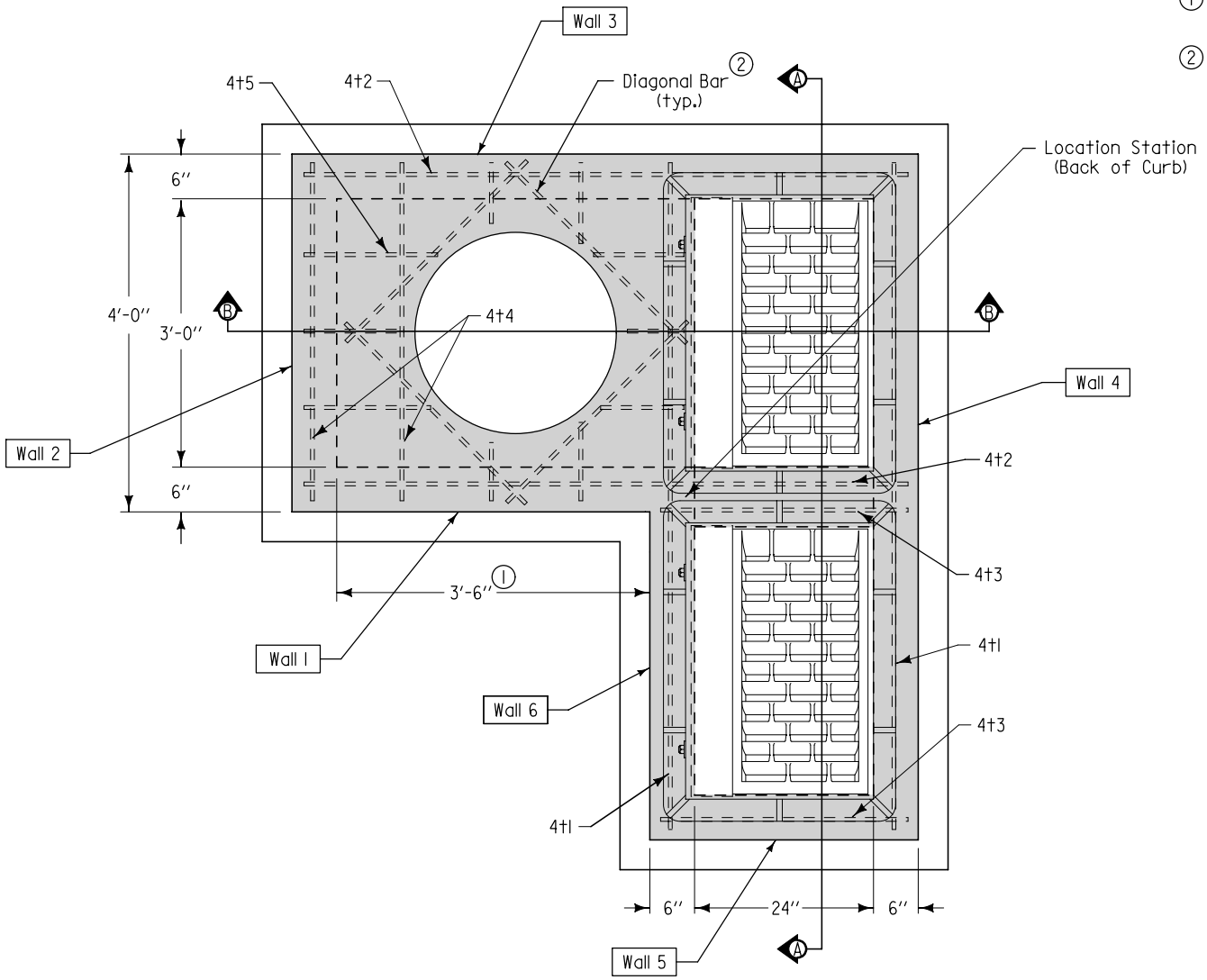
REVISIONS: New. Replaces SUDAS Figure 6030.5.

SUDAS DIRECTOR

Deanna Maifield
DESIGN METHODS ENGINEER

DOUBLE GRATE INTAKE

FIGURE 6010.505 SHEET 2 OF 2



PLAN

(1) 36 inch pipe may be used when wall dimension is increased to 4 feet.

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

MAXIMUM PIPE DIAMETERS	
Wall	Max. Dia.
1	30'' (1)
2	24''
3	36''
4	48''

SUDAS | Iowa Department of Transportation

REVISION: NEW 04-21-09

FIGURE 6010.506 | STANDARD ROAD PLAN | SW-506

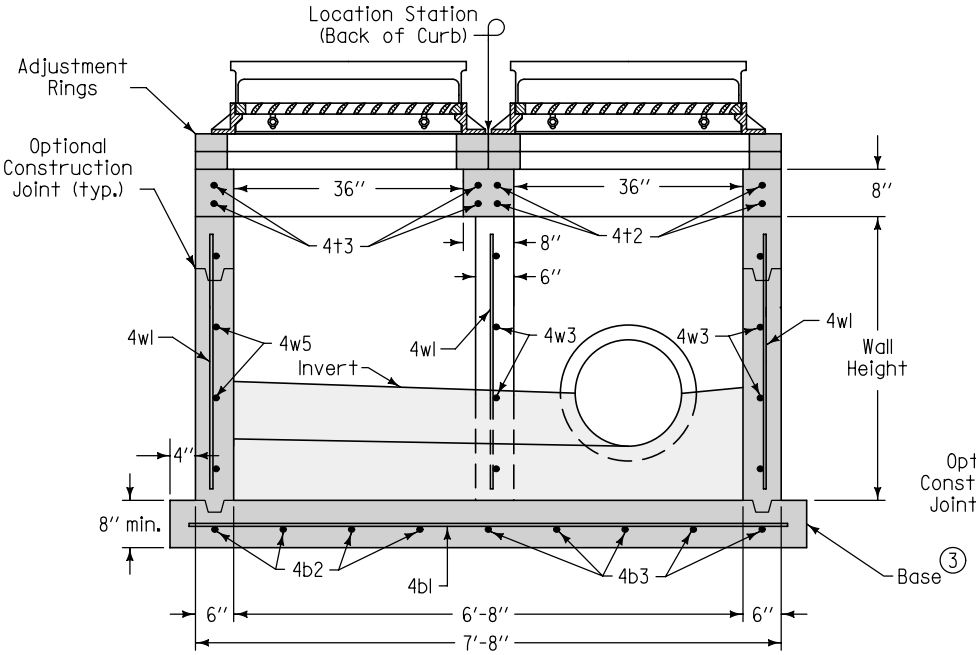
SHEET 1 of 2

REVISIONS: New. Replaces SUDAS Type "M-E" Intake.

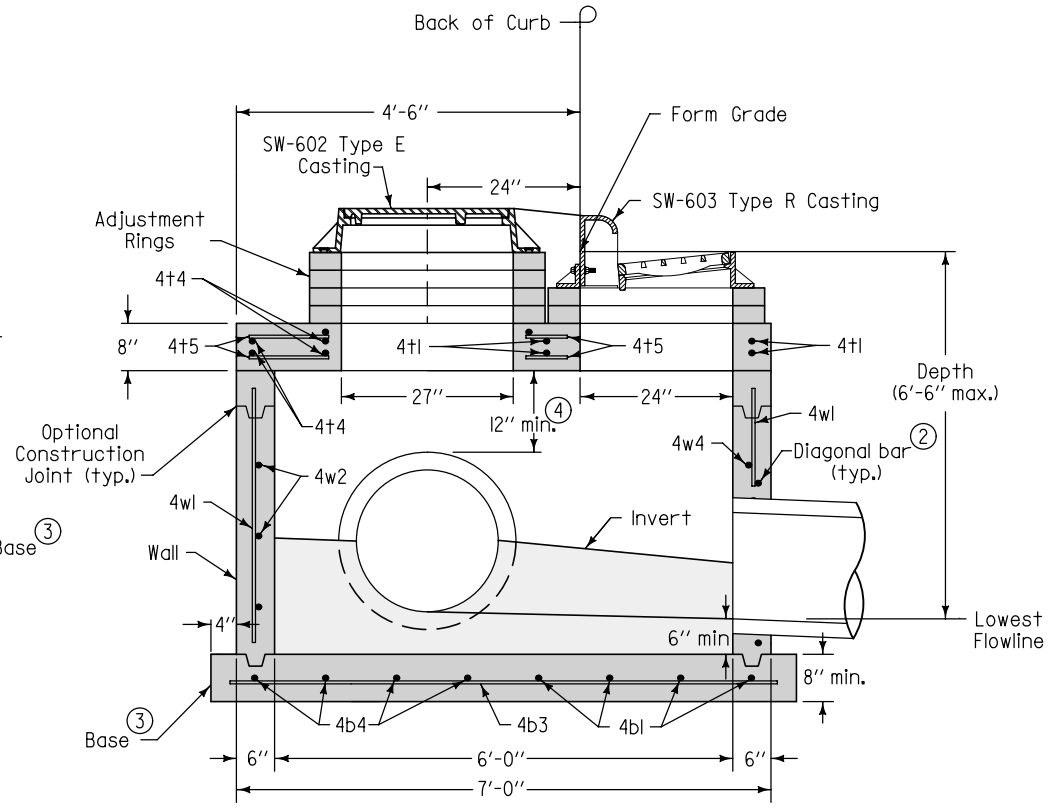
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

DOUBLE GRATE INTAKE WITH MANHOLE

FIGURE 6010.506 SHEET 1 OF 2



SECTION A-A



SECTION B-B

REINFORCING BAR LIST						
Mark	Size	Location	Shape	Count	Length	Spacing
4tl	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''
4bl	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''
4wl	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''

② Install four #4 diagonal bars at manhole opening and at all pipe openings.

③ 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.

④ 12 inch minimum wall height above all pipes.

SUDAS | Iowa Department of Transportation

REVISION
NEW 04-21-09

FIGURE 6010.506 | STANDARD ROAD PLAN | SW-506

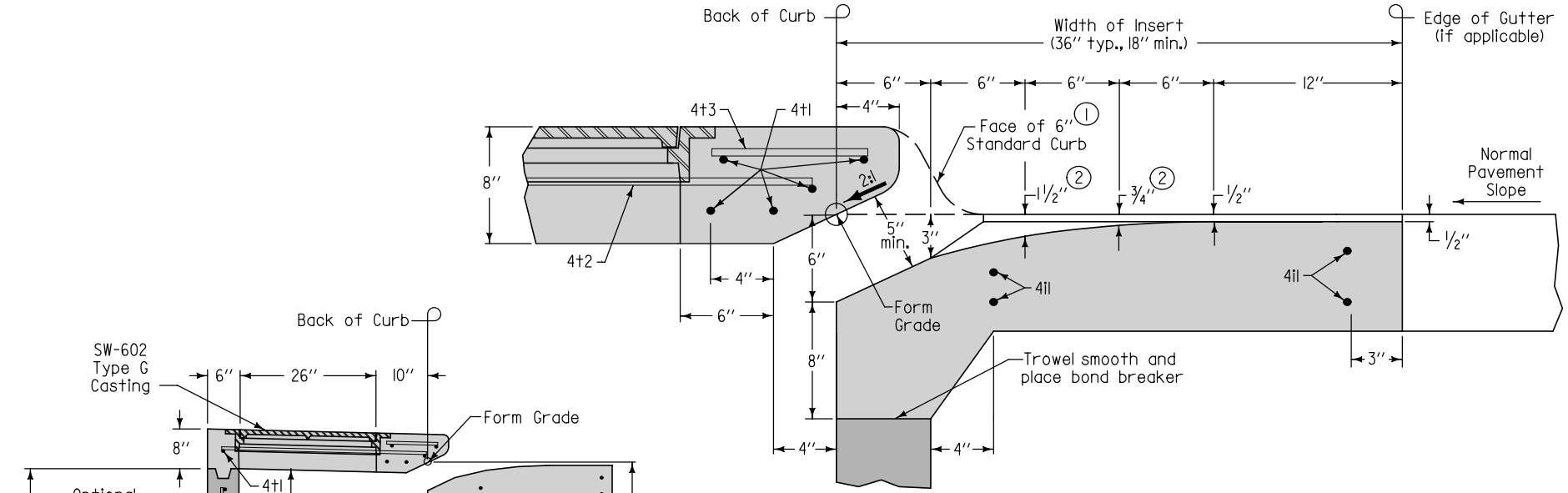
SHEET 2 of 2

REVISIONS: New. Replaces SUDAS Type "M-E" Intake.

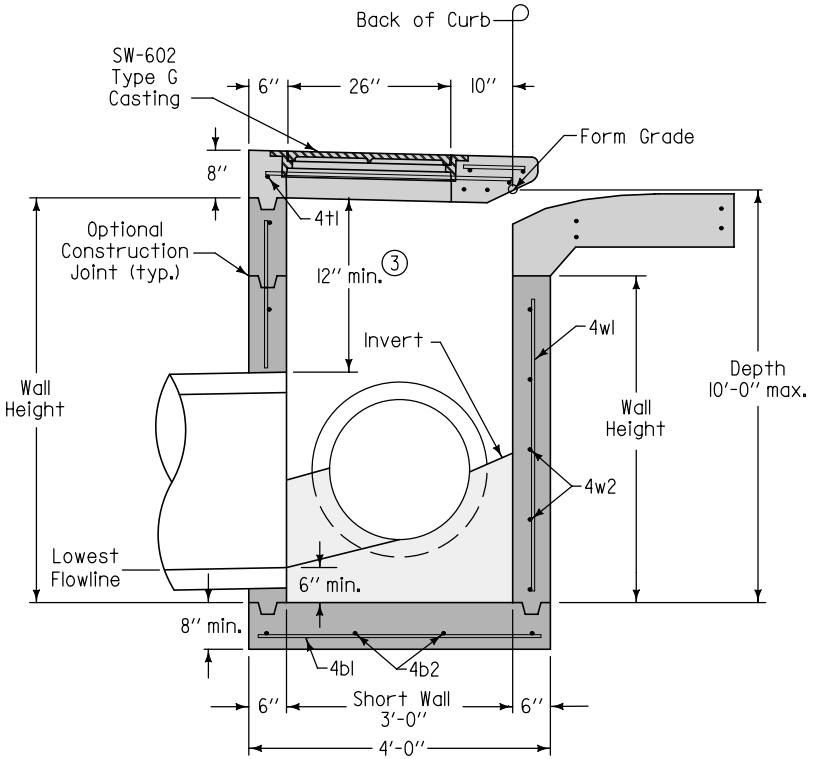
SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

DOUBLE GRATE INTAKE WITH MANHOLE

FIGURE 6010.506 SHEET 2 OF 2



INSERT



TYPICAL SECTION

1. Modify dimensions as required to accommodate other curb heights when specified.
2. Insert shaping may be modified for insert widths less than 36 inches. For an 18-inch insert, reduce dimensions indicated by ½ inch.
3. 12-inch minimum wall height above all pipes.

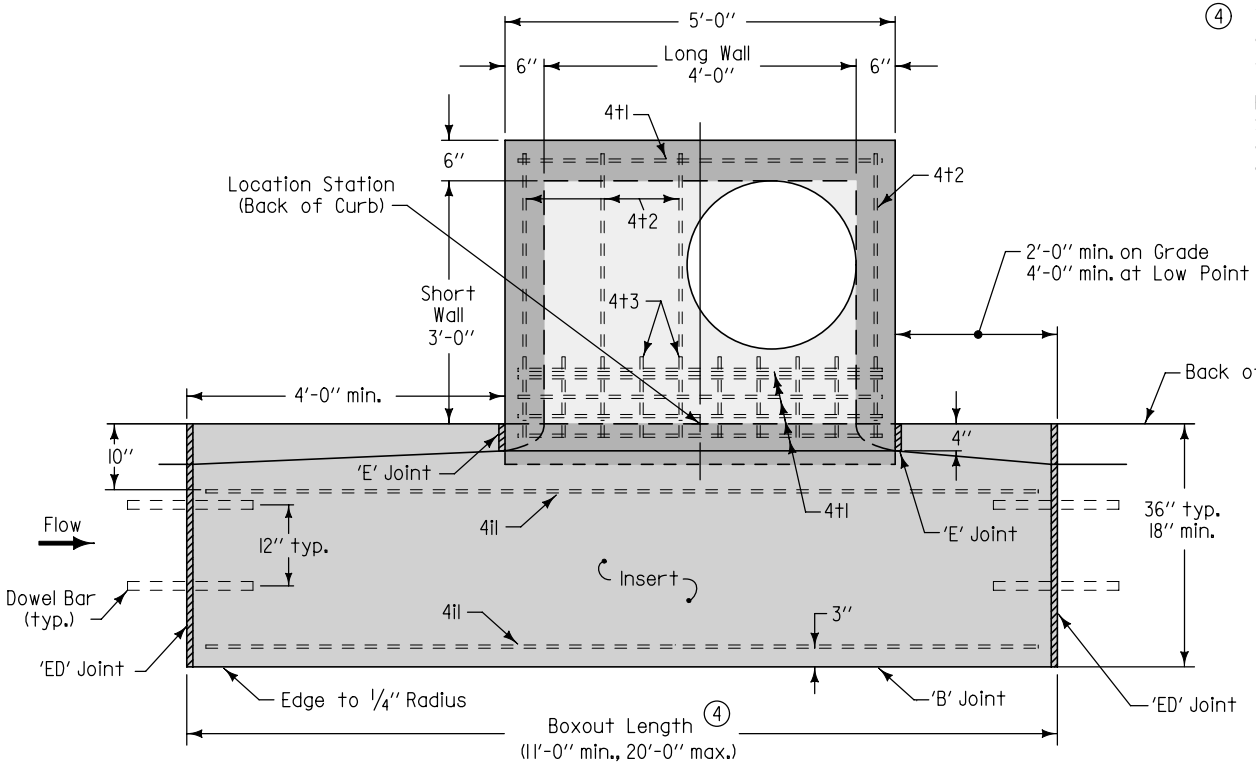
SUDAS	Iowa Department of Transportation	REVISION 1 10-20-09
FIGURE 6010.507	STANDARD ROAD PLAN	SW-507
		SHEET 1 of 2

REVISIONS: Adjusted depth line and shading. Removed minimum depth. Renamed standard.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE, SMALL BOX

FIGURE 6010.507 SHEET 1OF 2



PLAN

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"	11"
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 | Iowa Department of Transportation

REVISION 1 10-20-09

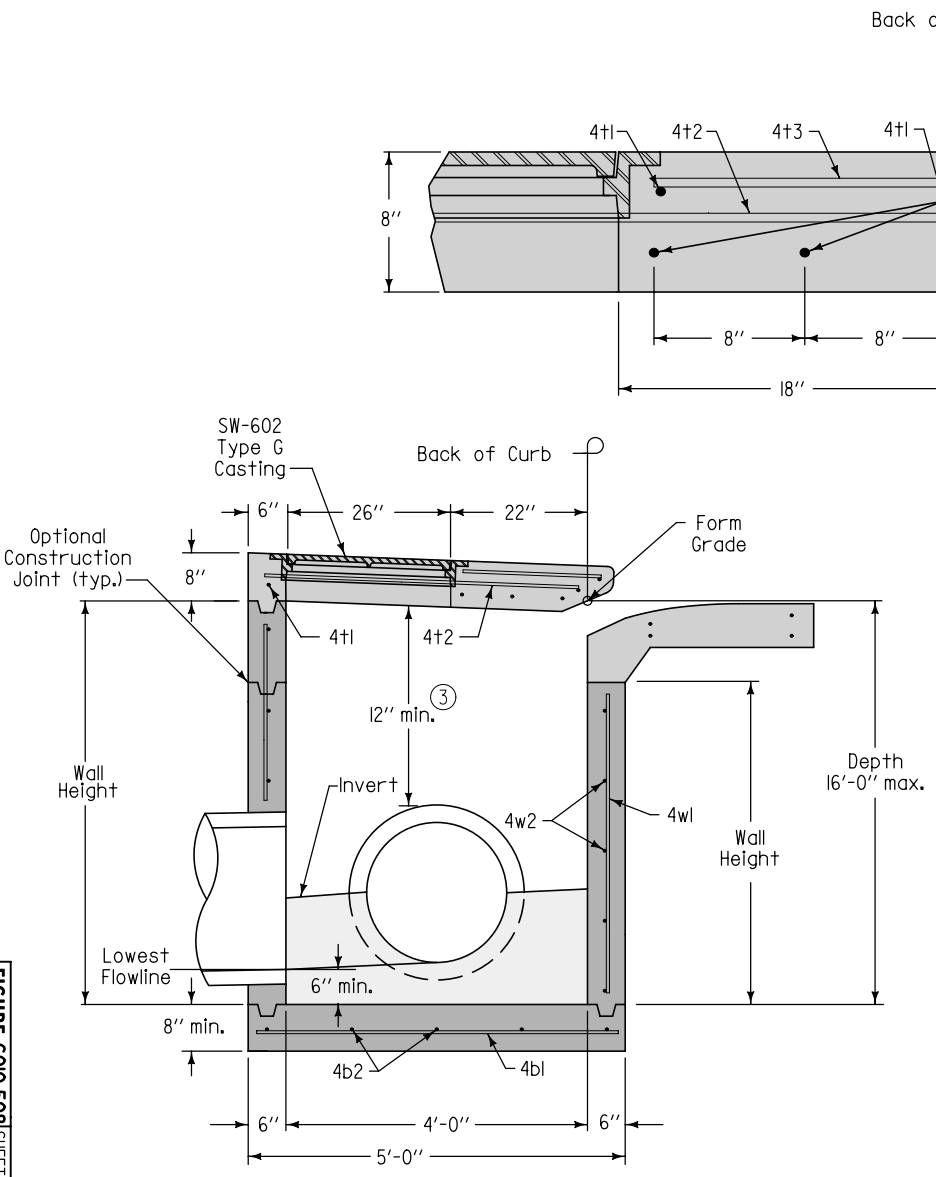
FIGURE 6010.507 | STANDARD ROAD PLAN | SW-507

SHEET 2 of 2

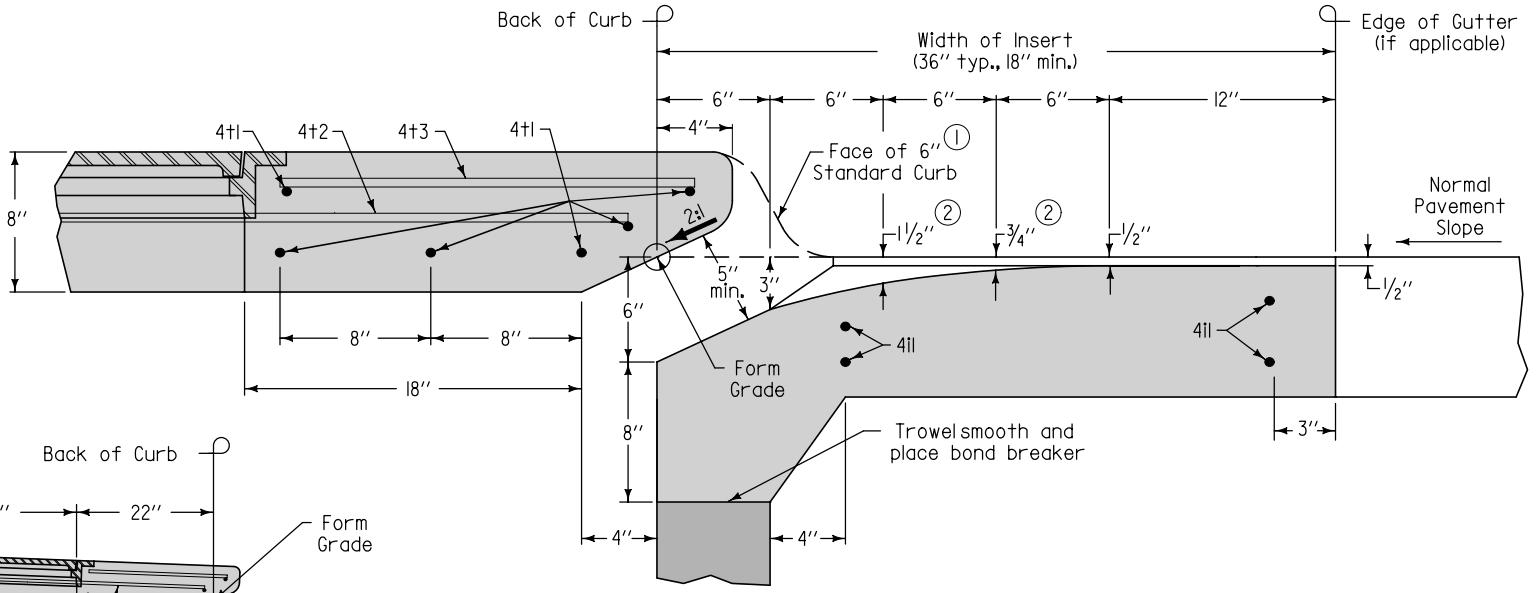
REVISIONS: Adjusted depth line and shading. Removed minimum depth. Renamed standard.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE, SMALL BOX



TYPICAL SECTION



INSERT

1. Modify dimensions as required to accommodate other curb heights when specified.
2. Insert shaping may be modified for insert widths less than 36 inches. For an 18-inch insert, reduce dimensions indicated by ½ inch.
3. 12-inch minimum wall height above all pipes.

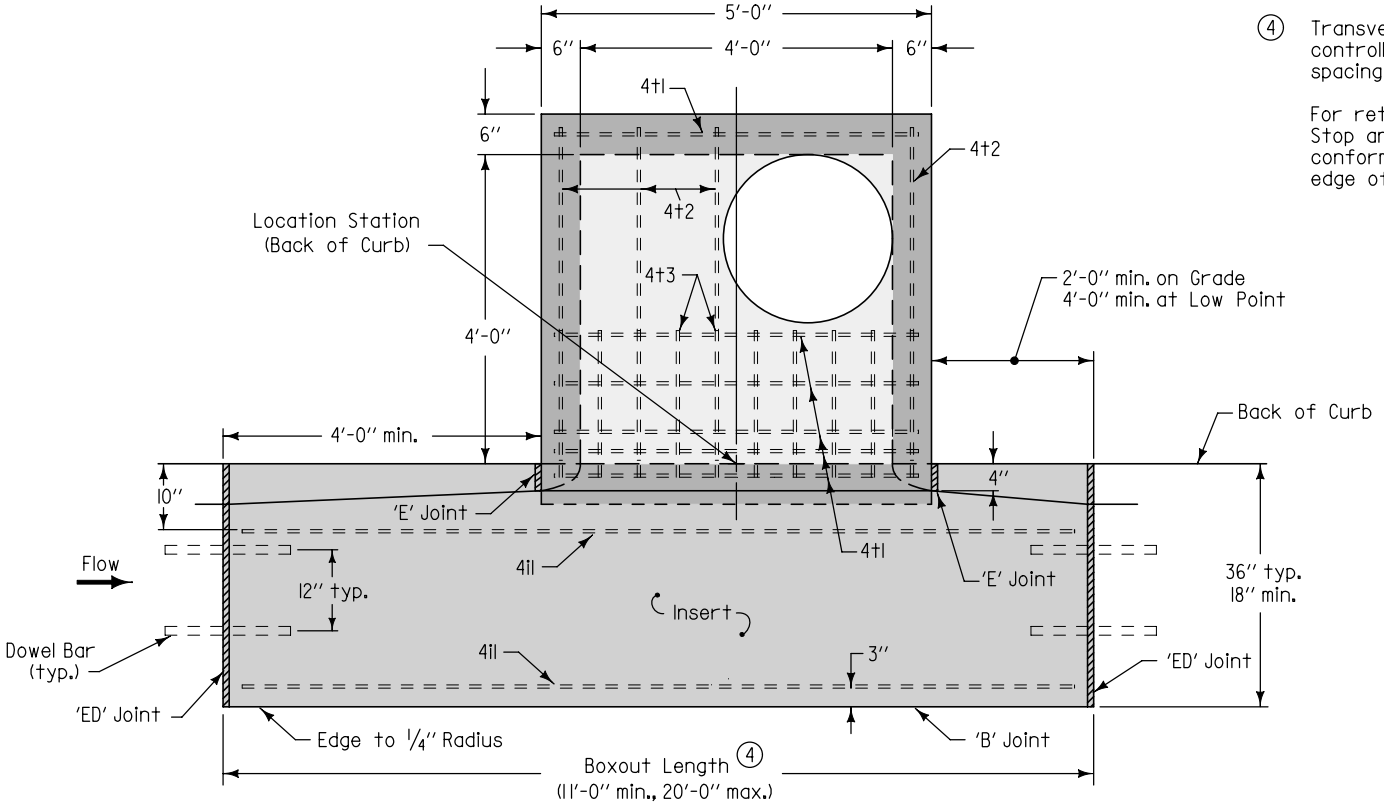
SUDAS	Iowa Department of Transportation	REVISION 1 10-20-09
FIGURE 6010.508	STANDARD ROAD PLAN	SW-508
		SHEET 1 of 2

REVISIONS: Adjusted depth line and shading. Removed minimum dimension. Renamed standard.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE, LARGE BOX

FIGURE 6010.508 SHEET 1 OF 2



PLAN

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 | Iowa Department of Transportation

REVISION 1 10-20-09

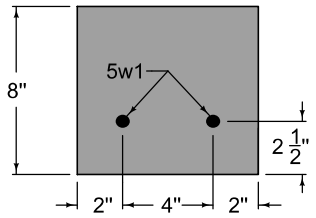
FIGURE 6010.508 | STANDARD ROAD PLAN | SW-508 | SHEET 2 of 2

REVISIONS: Adjusted depth line and shading. Removed minimum dimension. Renamed standard.

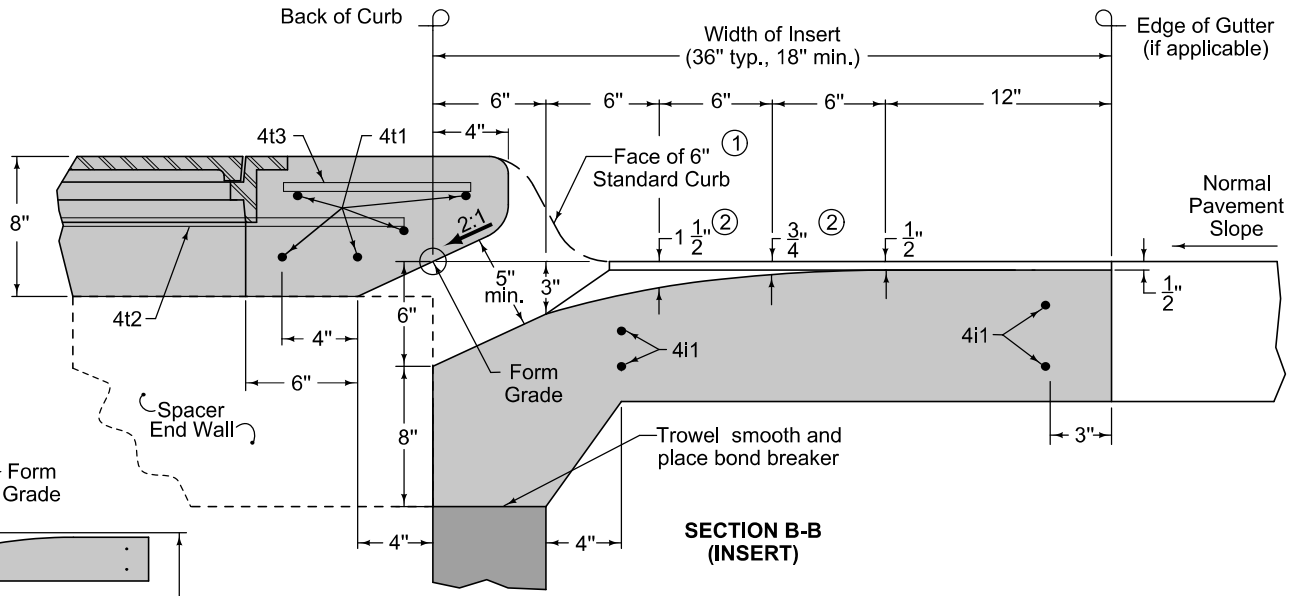
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE, LARGE BOX

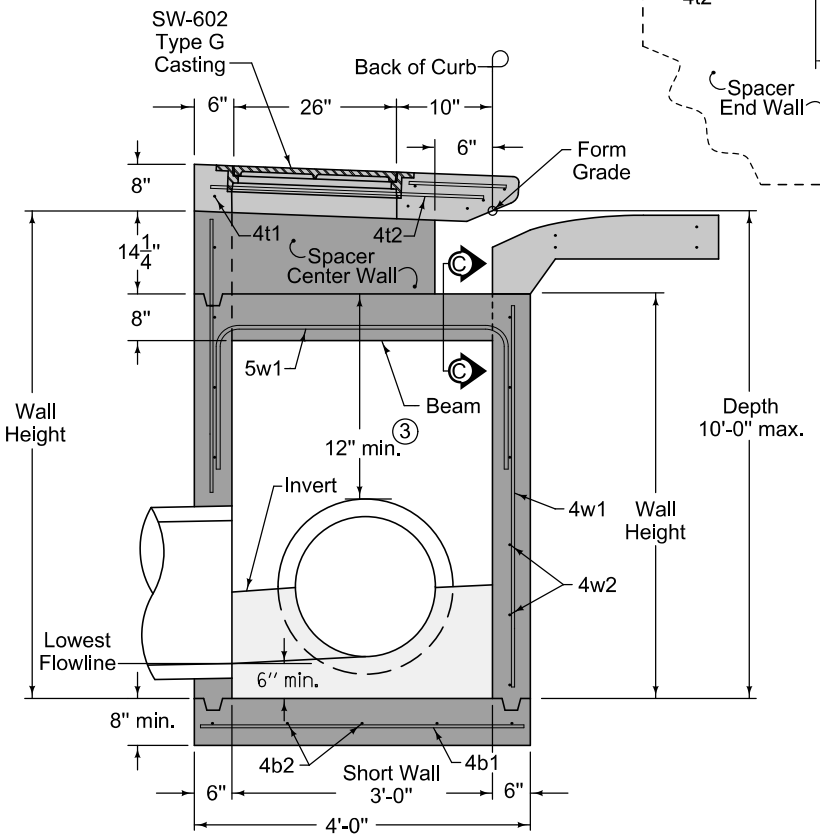
FIGURE 6010.508 | SHEET 2 OF 2



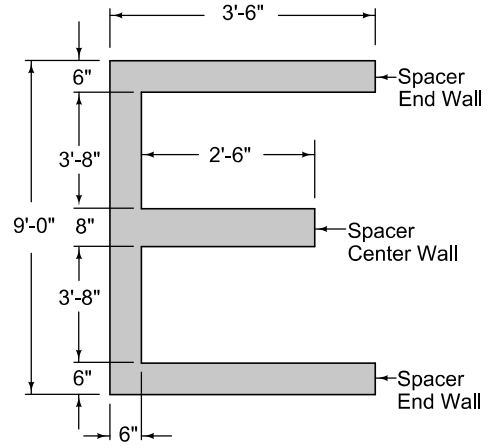
SECTION C-C



SECTION B-B
(INSERT)



SECTION A-A



PLAN
(SPACER)

1. Modify dimensions as required to accommodate other curb heights when specified.
2. 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.
3. 12 inch minimum wall height above all pipes.

SUDAS | Iowa Department of Transportation | REVISION 3 10-18-11

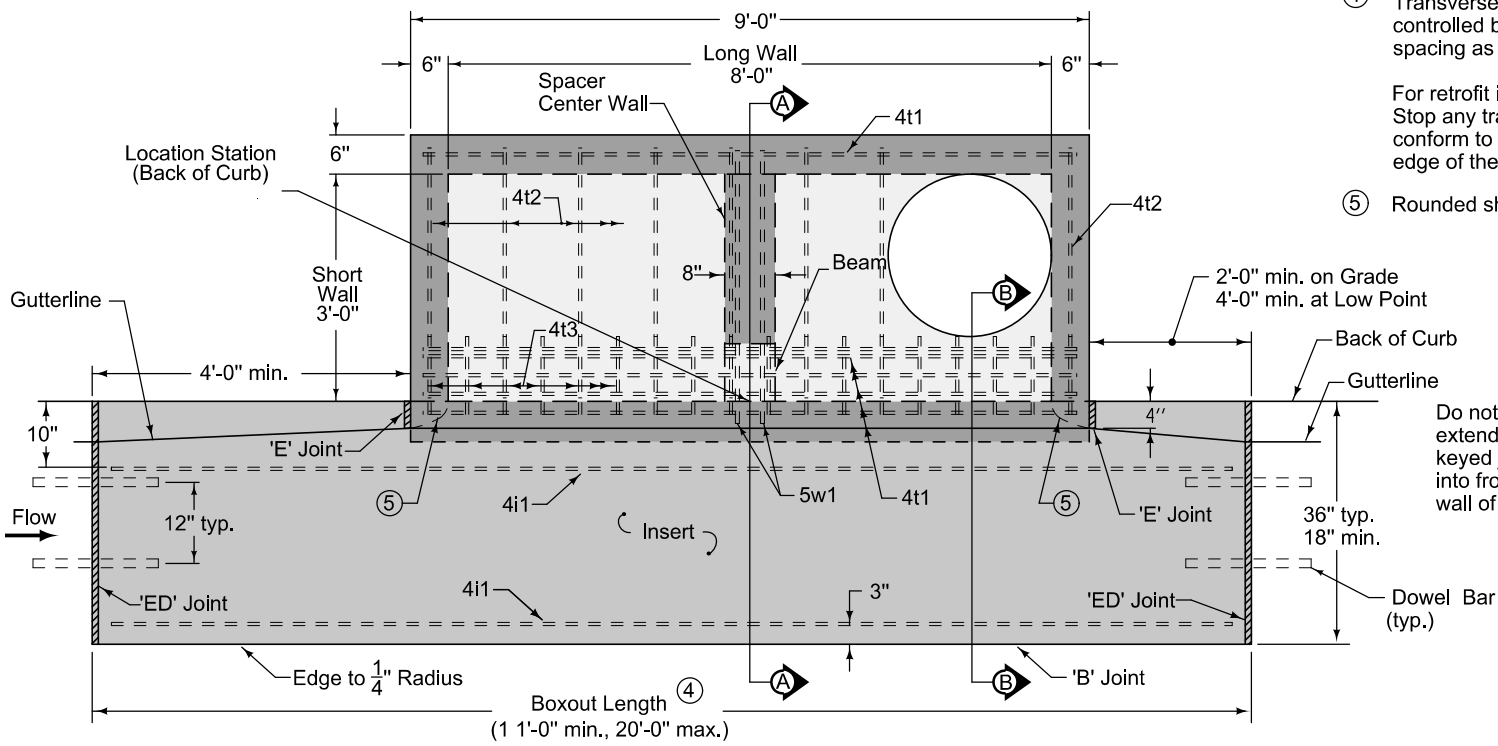
FIGURE 6010.509 | STANDARD ROAD PLAN | SW-509 | SHEET 1 of 2

REVISIONS: Added circle note 5 and note for transitioning curbs. Clarified spacer dimensions and configuration.

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

DOUBLE OPEN-THROAT CURB
INTAKE, SMALL BOX

FIGURE 6010.509 | SHEET 1 OF 2

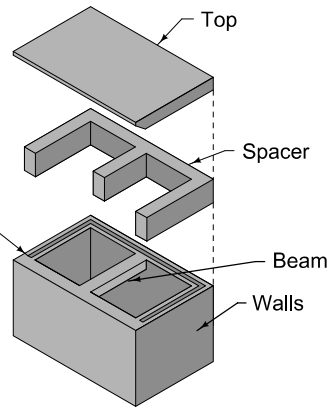


PLAN

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

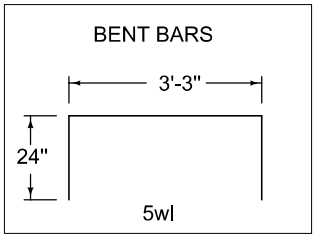
For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.

5 Rounded shaping at inlet.



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

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"



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

SUDAS | Iowa Department of Transportation | REVISION 3 10-18-11

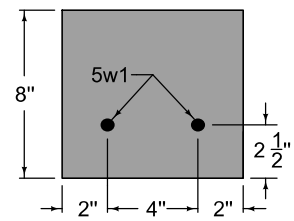
FIGURE 6010.509 | STANDARD ROAD PLAN | SW-509 | SHEET 2 of 2

REVISIONS: Added circle note 5 and note for transitioning curbs. Clarified spacer dimensions and configuration.

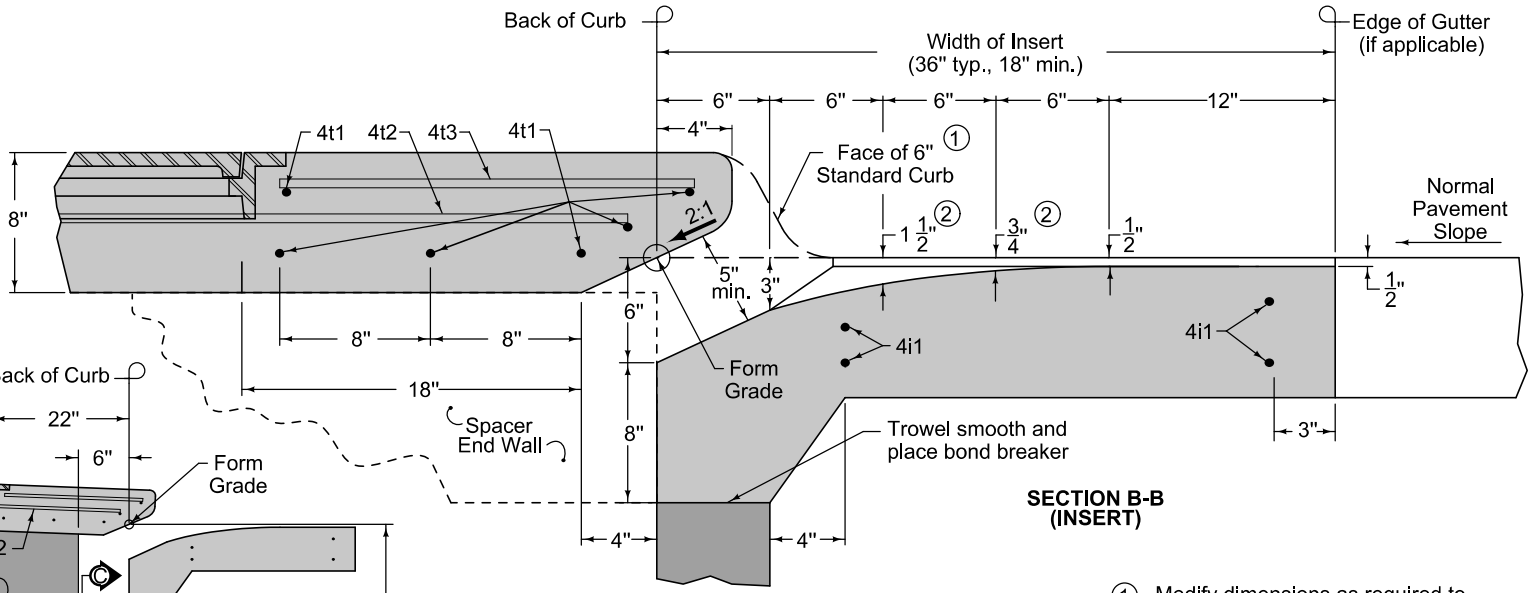
Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

DOUBLE OPEN-THROAT CURB INTAKE, SMALL BOX

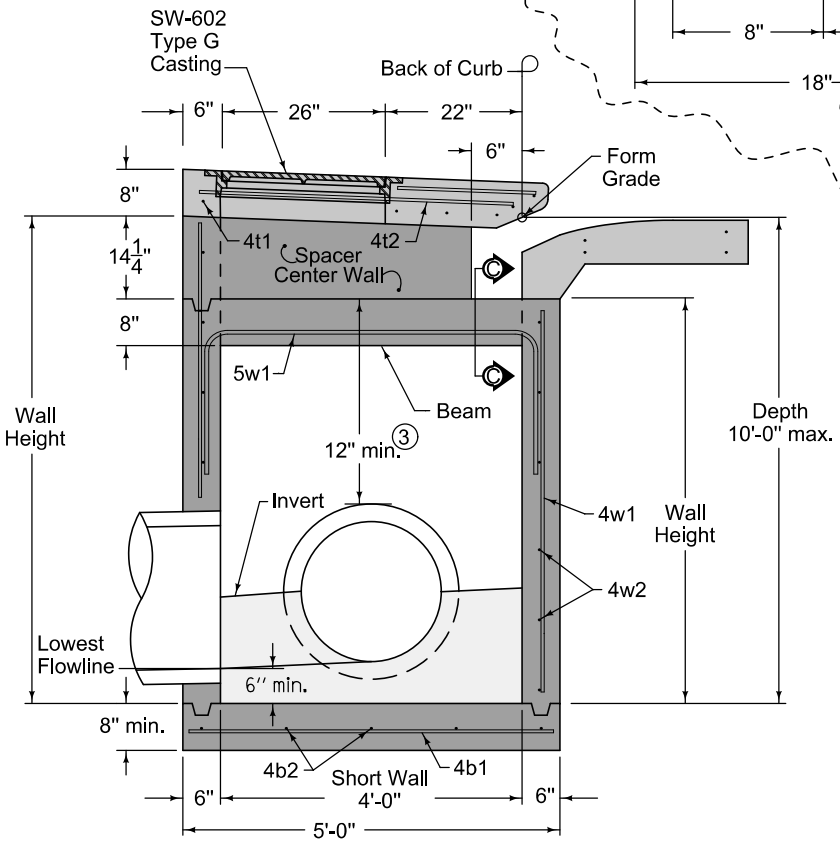
FIGURE 6010.509 SHEET 2 OF 2



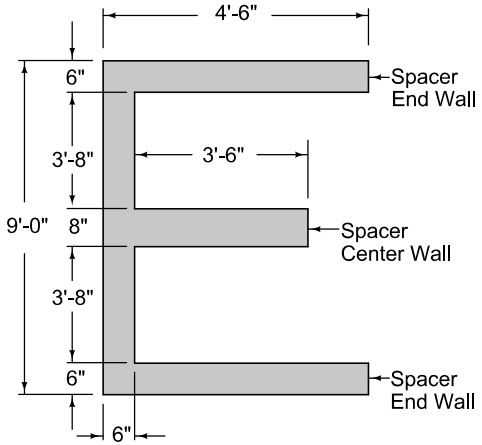
SECTION C-C



SECTION B-B
(INSERT)



SECTION A-A



PLAN
(SPACER)

1. Modify dimensions as required to accommodate other curb heights when specified.
2. 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.
3. 12 inch minimum wall height above all pipes.

SUDAS	Iowa Department of Transportation	REVISION 3 10-18-11
FIGURE 6010.510	STANDARD ROAD PLAN	SW-510
		SHEET 1 of 2

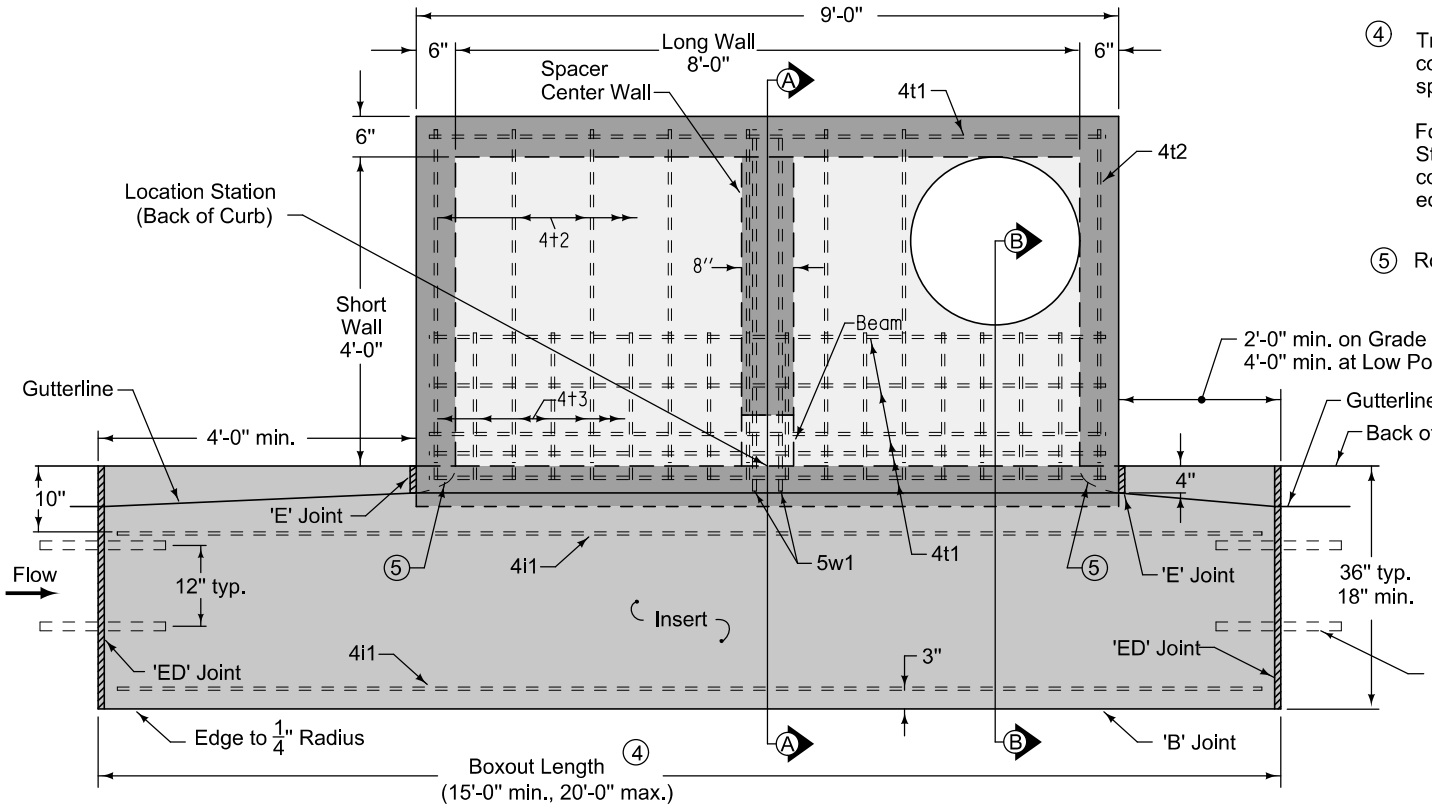
REVISIONS: Added circle note 5 and note for transitioning curbs. Clarified spacer dimensions and configuration.

Paul D. Wiegand
SUDAS DIRECTOR

Deanna Maifield
DESIGN METHODS ENGINEER

DOUBLE OPEN-THROAT CURB INTAKE, LARGE BOX

FIGURE 6010.510 SHEET 1OF 2

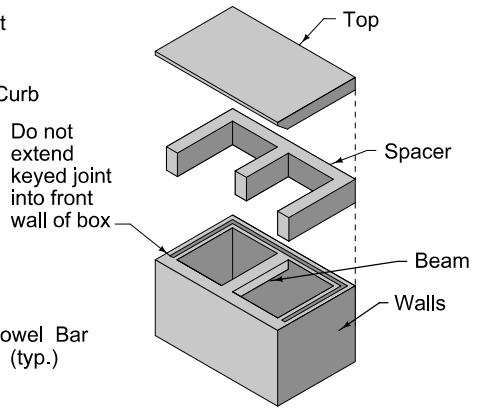


PLAN

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.

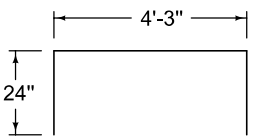
5 Rounded shaping at inlet.



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

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"

BENT BARS



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

SUDAS | Iowa Department of Transportation

REVISION 3 10-18-11

FIGURE 6010.510 | STANDARD ROAD PLAN | SW-510

SHEET 2 of 2

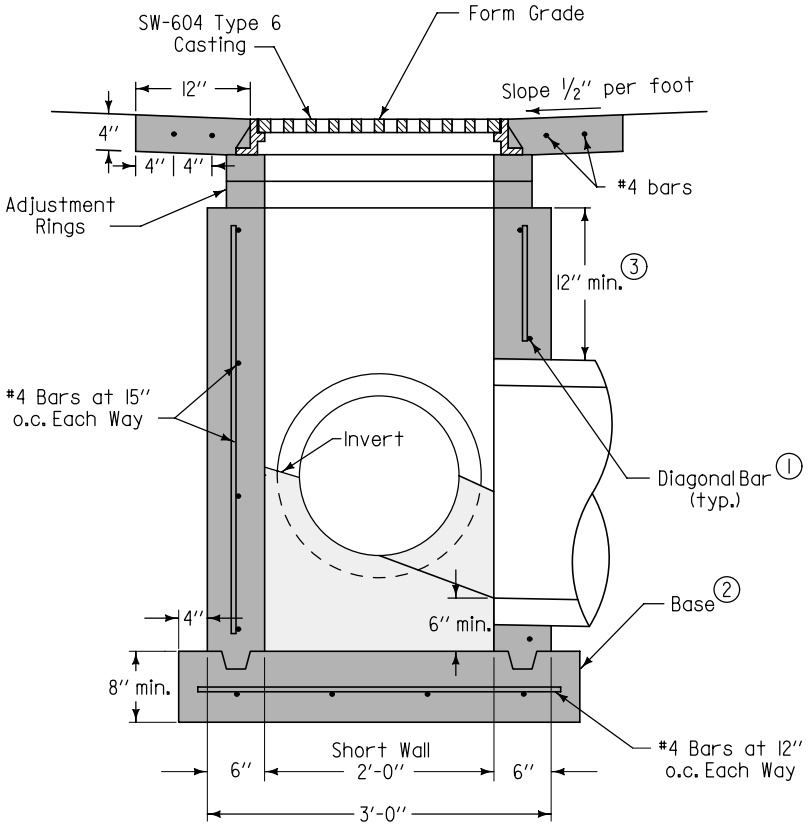
REVISIONS: Added circle note 5 and note for transitioning curbs. Clarified spacer dimensions and configuration.

Paul D. Wigand
SUDAS DIRECTOR

Deanna Maifield
DESIGN METHODS ENGINEER

DOUBLE OPEN-THROAT CURB INTAKE, LARGE BOX

FIGURE 6010.510 | SHEET 2 OF 2

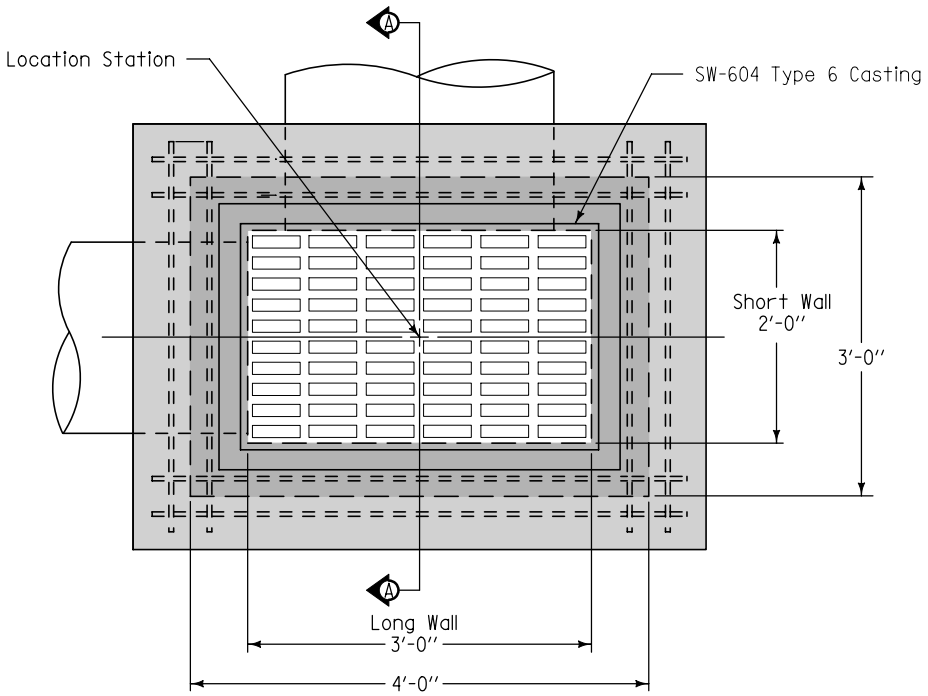


SECTION A-A

(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''

SUDAS | Iowa Department of Transportation

REVISION: NEW 04-21-09

FIGURE 6010.511 | STANDARD ROAD PLAN

SW-511

SHEET 1 of 1

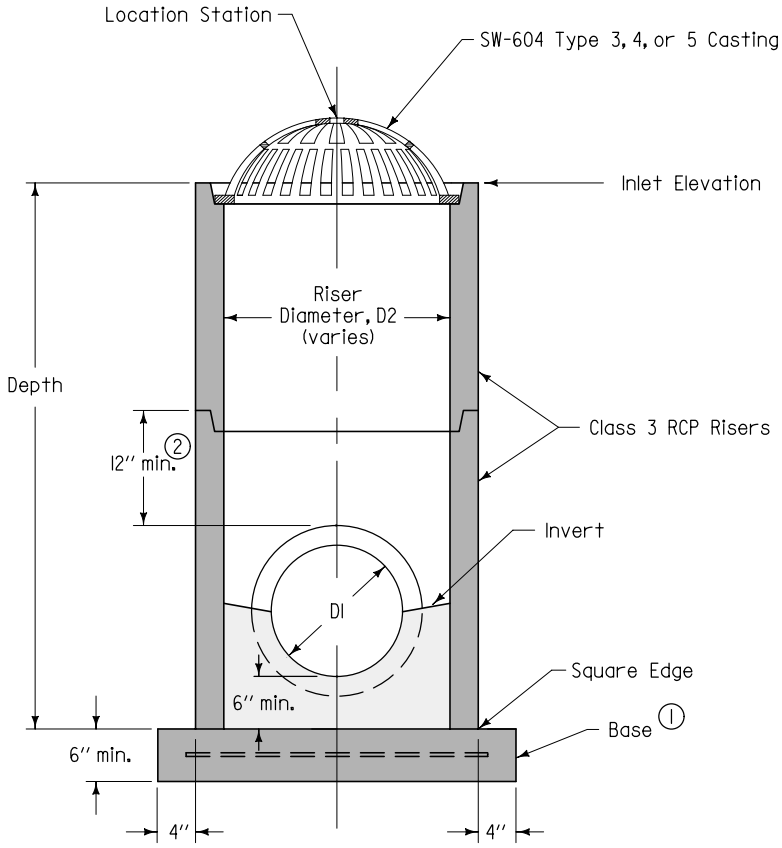
REVISIONS: New. Replaces SUDAS Area Type "M-H" Intake.

SUDAS DIRECTOR

Deanna Maifield
DESIGN METHODS ENGINEER

RECTANGULAR AREA INTAKE

FIGURE 6010.511 | SHEET 1 OF 1



TYPICAL SECTION

CASE I

(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 I	
Outlet Pipe Diameter, DI	Minimum Riser Diameter, D2
12"	18"
15"	24"
18"	24"
21"	30"
24"	30"
27"	36"

SUDAS | Iowa Department of Transportation

REVISION: 1 | 10-20-09

FIGURE 6010.512 | STANDARD ROAD PLAN | SW-512 | SHEET 1 of 2

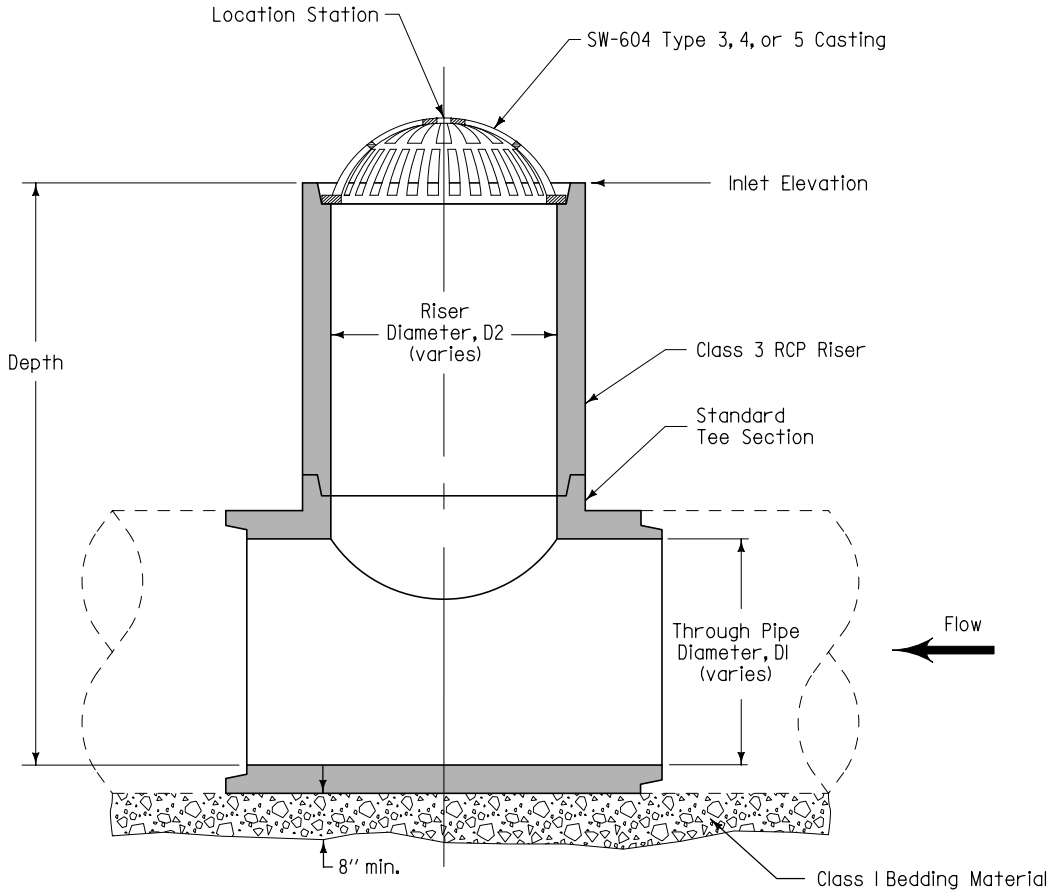
REVISIONS: Changed circle notes 1 & 2 and shading. Added sheet 2.

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

CIRCULAR AREA INTAKE

FIGURE 6010.512 | SHEET 1OF 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"

FIGURE 6010.512 SHEET 2 OF 2

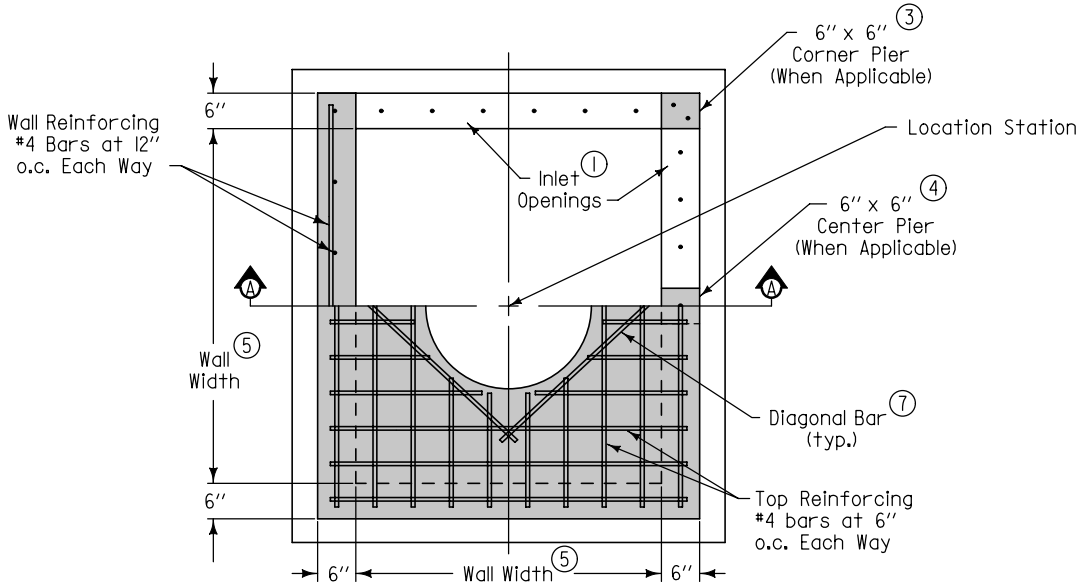
SUDAS | Iowa Department of Transportation | REVISION 1 10-20-09

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

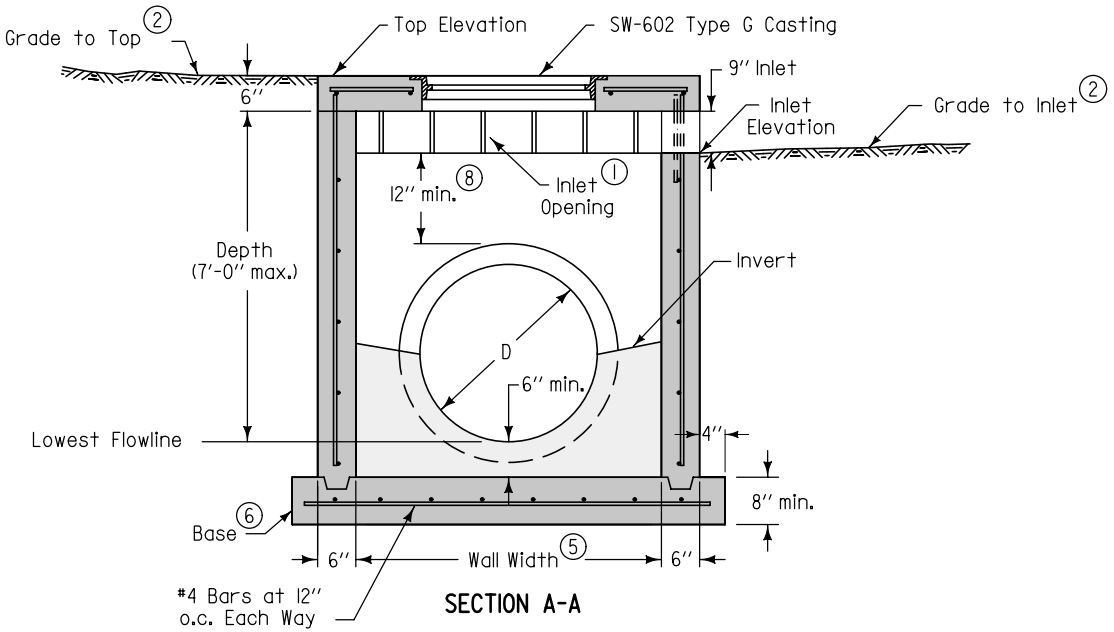
REVISIONS: Changed circle notes 1 & 2 and shading. Added sheet 2.

SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

CIRCULAR AREA INTAKE



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" minimum wall height above all pipes.

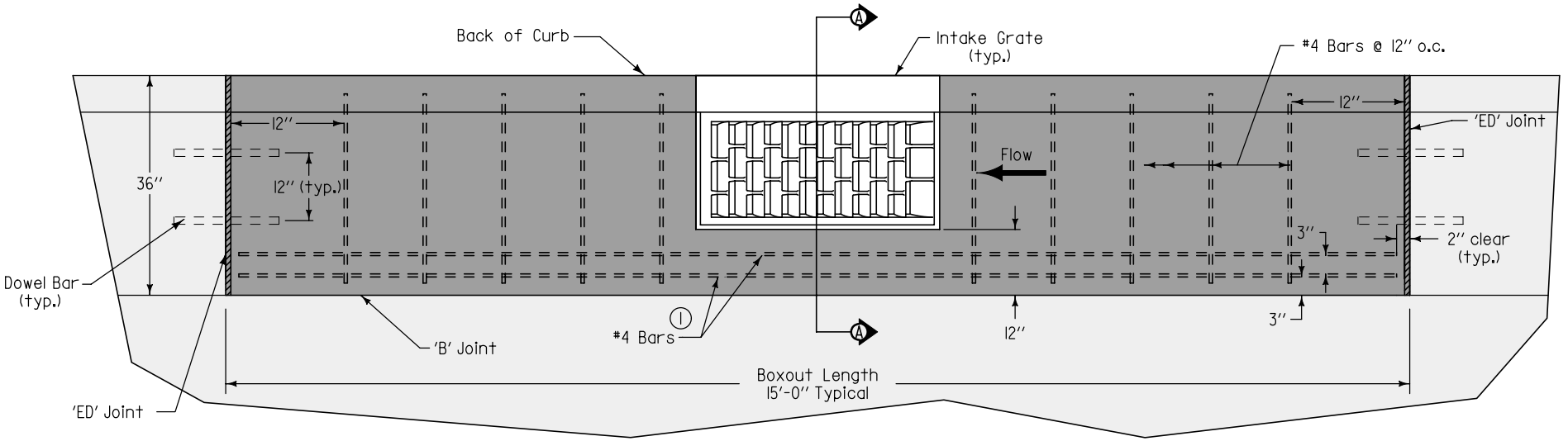
SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.513	STANDARD ROAD PLAN	SW-513 SHEET 1 of 1

REVISIONS: New. Replaces SUDAS Area Type "M-6" Intake.

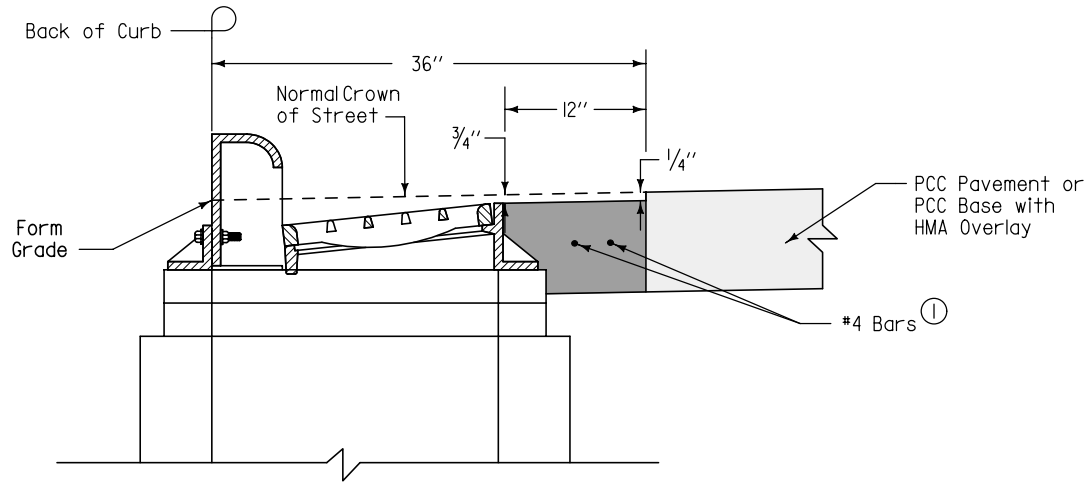
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

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.

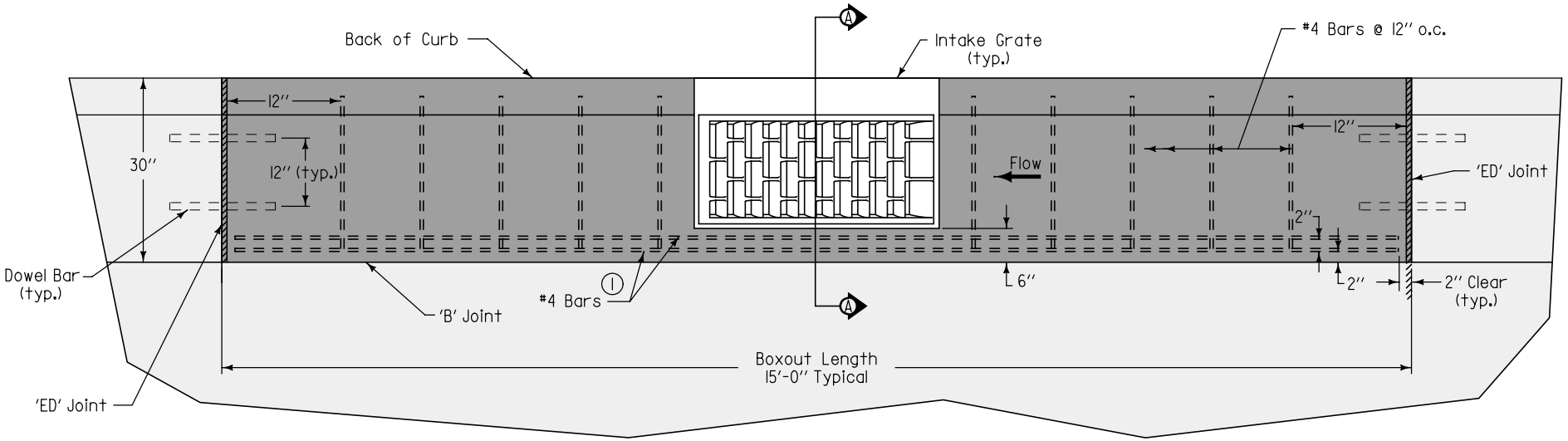
SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.514	STANDARD ROAD PLAN	SW-514
		SHEET 1 of 3

REVISIONS: New. Replaces SUDAS Figure 6030.16.

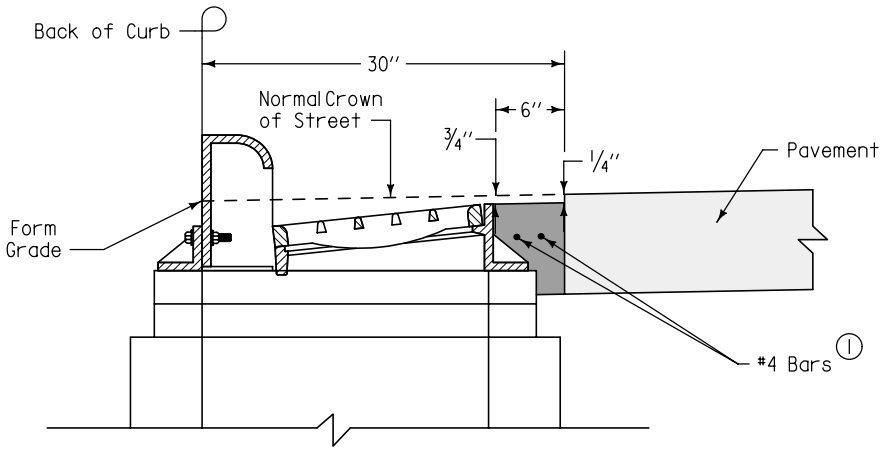
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

BOXOUTS 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.

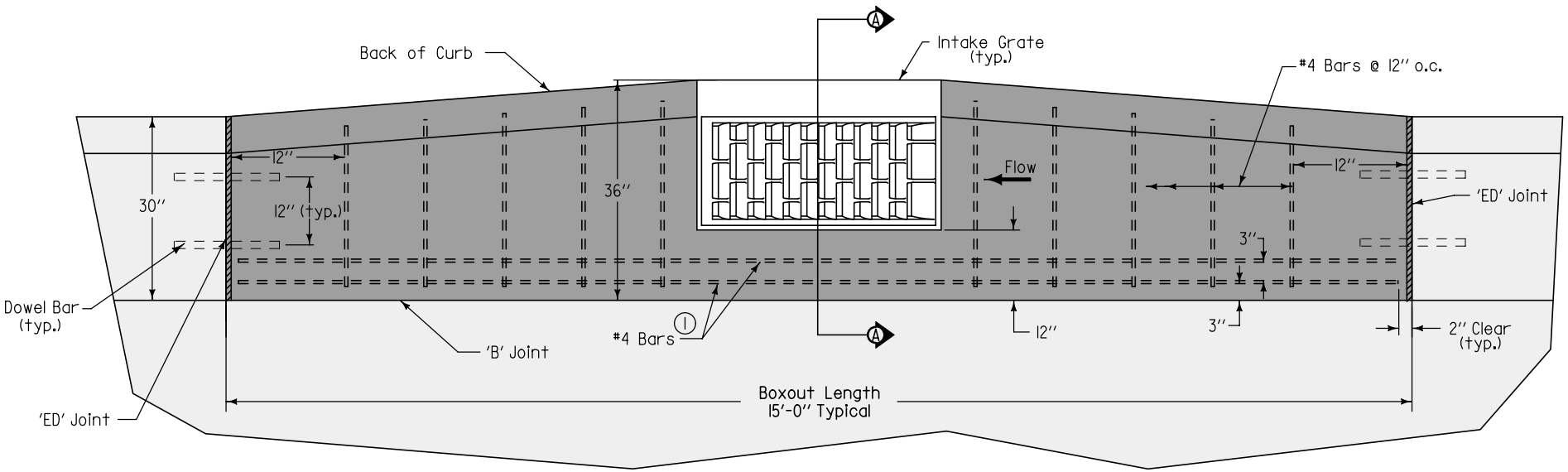
SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.514	STANDARD ROAD PLAN	SW-514
		SHEET 2 of 3

REVISIONS: New. Replaces SUDAS Figure 6030.16.

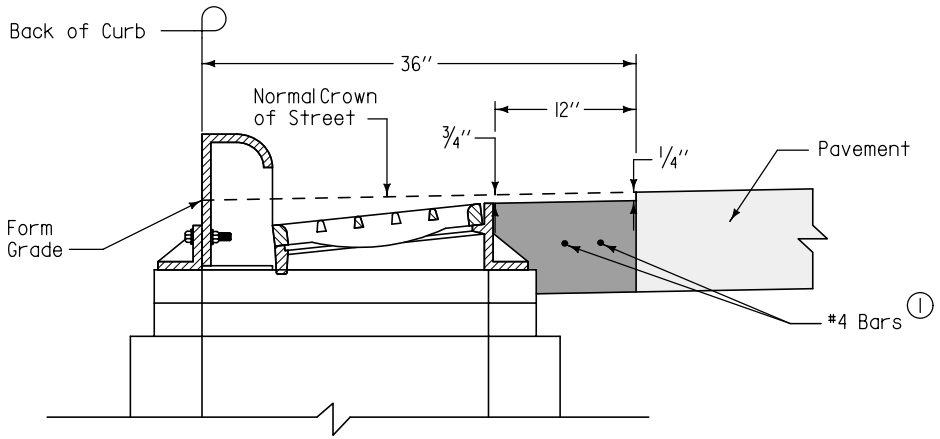
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

BOXOUTS 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 Department of Transportation	REVISION NEW 04-21-09
FIGURE 6010.514	STANDARD ROAD PLAN	SW-514
		SHEET 3 of 3

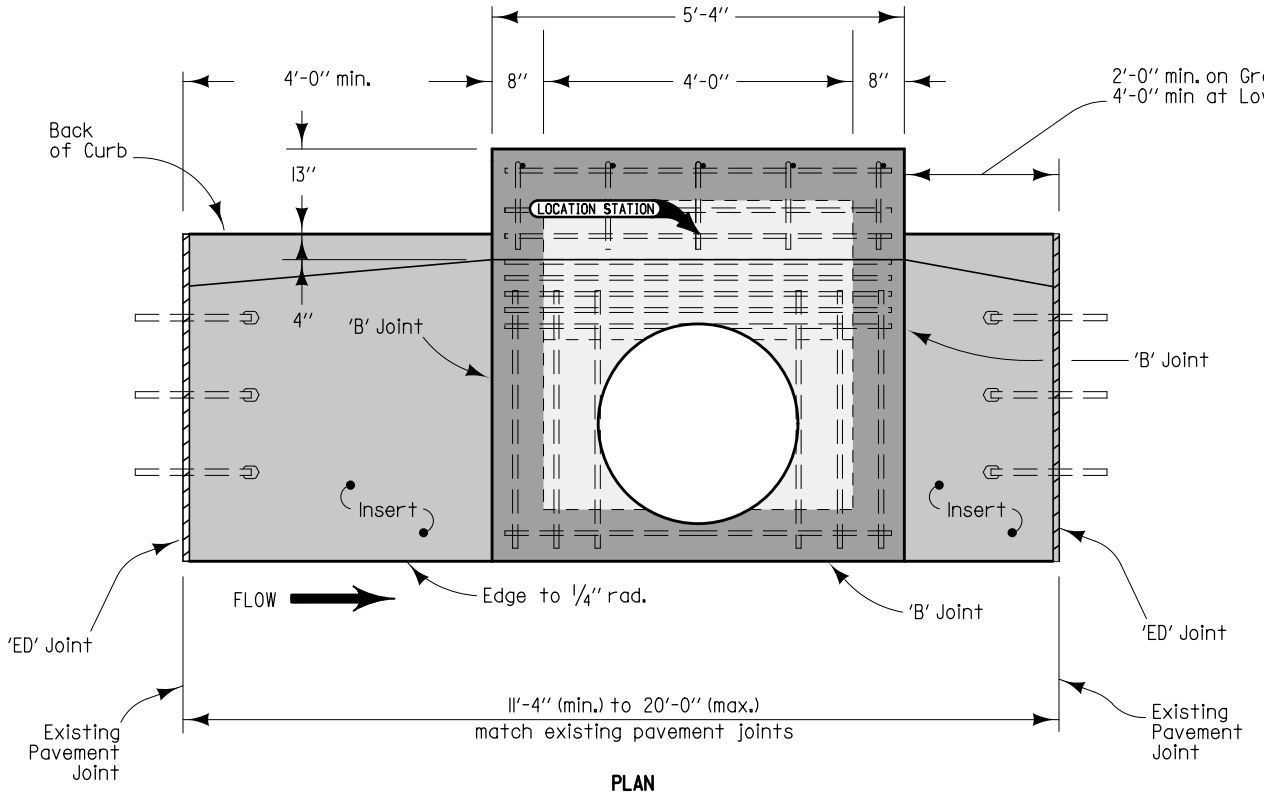
REVISIONS: New. Replaces SUDAS Figure 6030.16.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

BOXOUTS FOR GRATE INTAKES

FIGURE 6010.514 SHEET 3 OF 3

For joint details, refer to PV-101.



PLAN

Iowa Department of Transportation

REVISION	
2	04-19-11

STANDARD ROAD PLAN

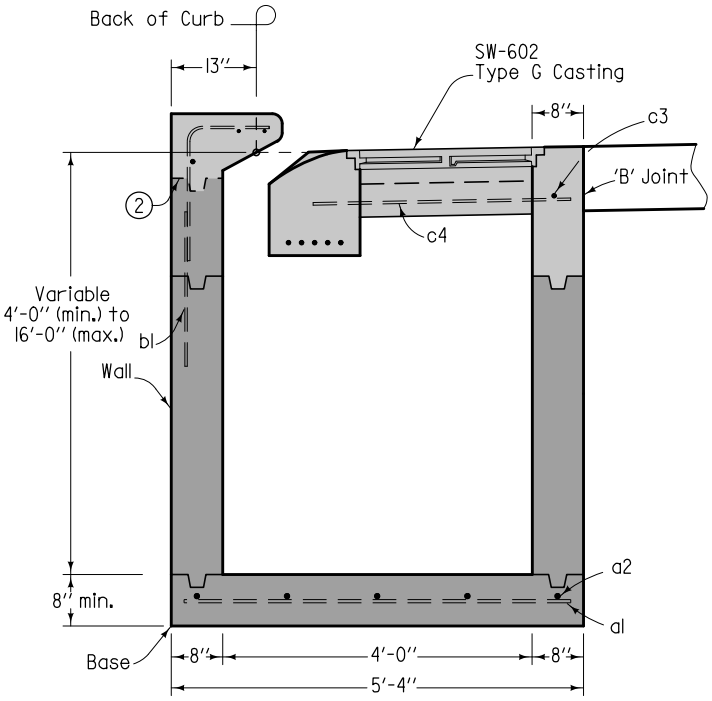
SW-541

SHEET 1 of 2

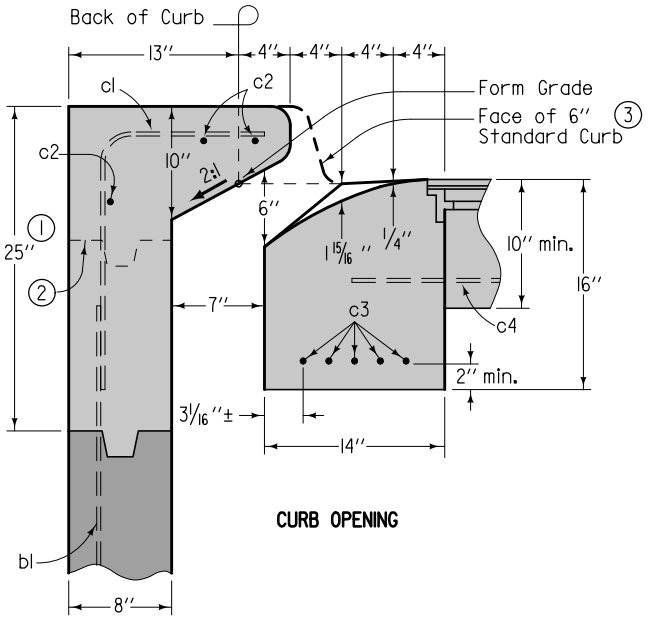
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

OPEN-THROAT CURB INTAKE UNDER PAVEMENT

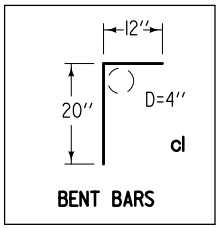


TYPICAL SECTION



CURB OPENING

1. 39 inches when attaching the SW-542 extension unit.
2. Additional keyed construction joint when attaching the SW-542 extension unit.
3. Modify dimensions as required to accommodate other curb heights when specified.



BENT BARS

REINFORCING BAR LIST					
Mark	Size	Location	Shape	Length	Spacing
a1	4	Base	——	5'-0''	14''
a2	4	Base	——	5'-0''	14''
b1	4	Wall	——	3'-0''	14''
c1	4	Top	⌐	2'-8''	14''
c2	4	Top	——	5'-0''	See Detail
c3	4	Top	——	5'-0''	See Detail
c4	4	Top	——	3'-4''	See Detail

Iowa Department of Transportation

REVISION: 2 | 04-19-11

STANDARD ROAD PLAN

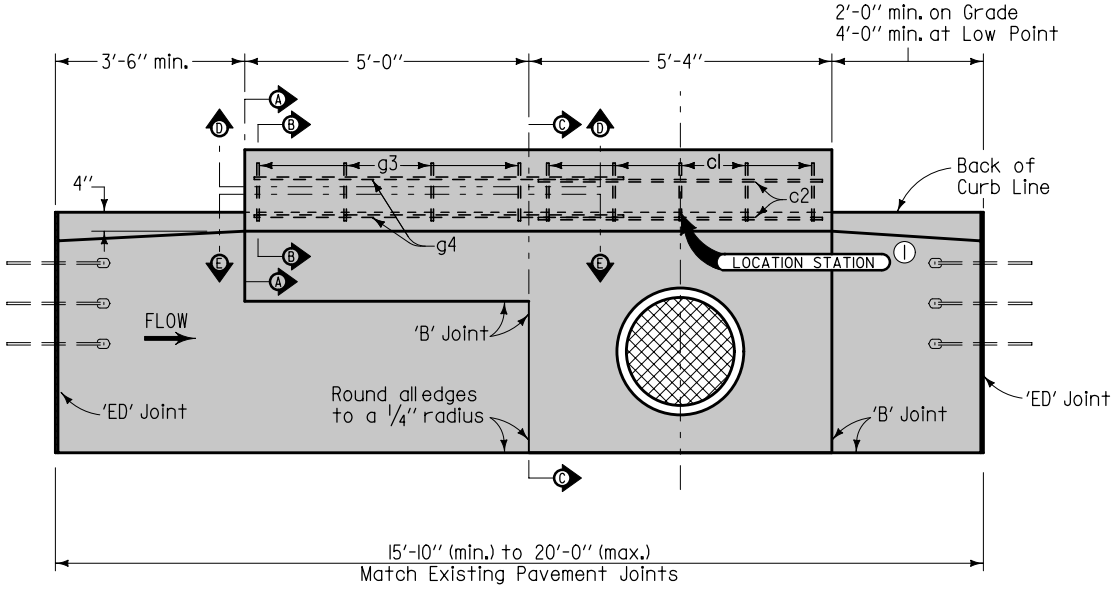
SW-541

SHEET 2 of 2

REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY 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 intakes. Details are similar when extension unit is on the opposite side.

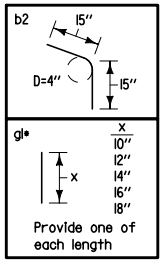
Dimensions shown are for the construction of a 6 inch standard curb as a part of pavement. Modifications may be made to conform to other curb shapes.

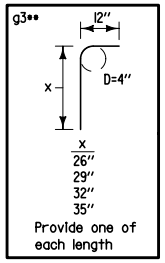
① The location station is where the centerline of intake meets the back of the curb line.

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•	3.9	12″
g2	4	Wall	—	1	4′-8″	3.1	-
g3	4	Top	⌐	4	Varies••	6.8	18″
g4	4	Top	—	3	6′-4″	12.7	-
					Total	45 lbs.	





Possible Contract Item:

Intake Extension Unit, SW-542

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
NEW	10-20-09

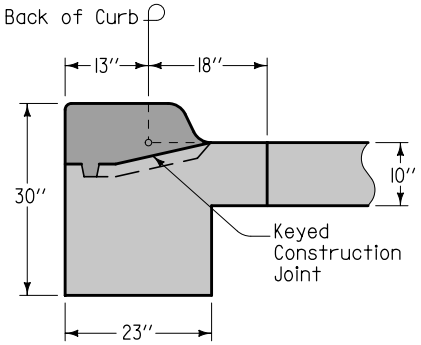
SW-542

SHEET 1 of 3

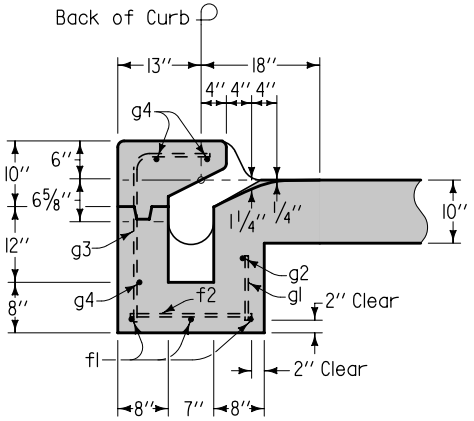
REVISIONS: New. Replaces RA-42.

Deanna Maifeld
APPROVED BY DESIGN METHODS ENGINEER

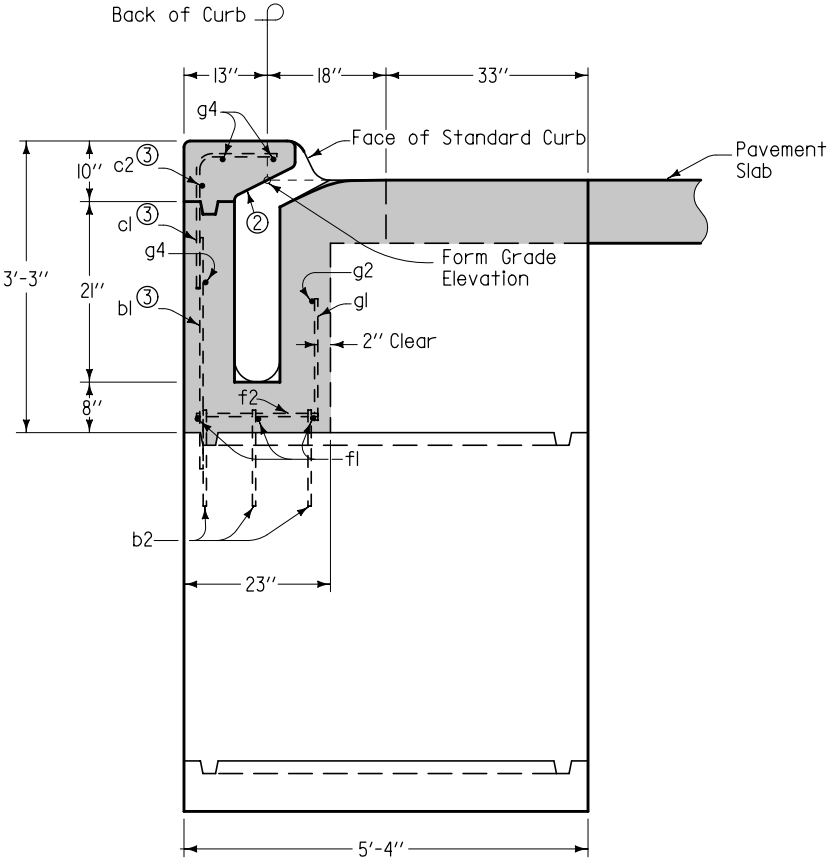
EXTENSION UNIT FOR OPEN-THROAT CURB INTAKE UNDER PAVEMENT



SECTION A-A



SECTION B-B



SECTION C-C

② 2:1 Slope (Horizontal:Vertical)

③ See SW-541 for reinforcing.

Iowa Department of Transportation

REVISION: NEW 10-20-09

STANDARD ROAD PLAN

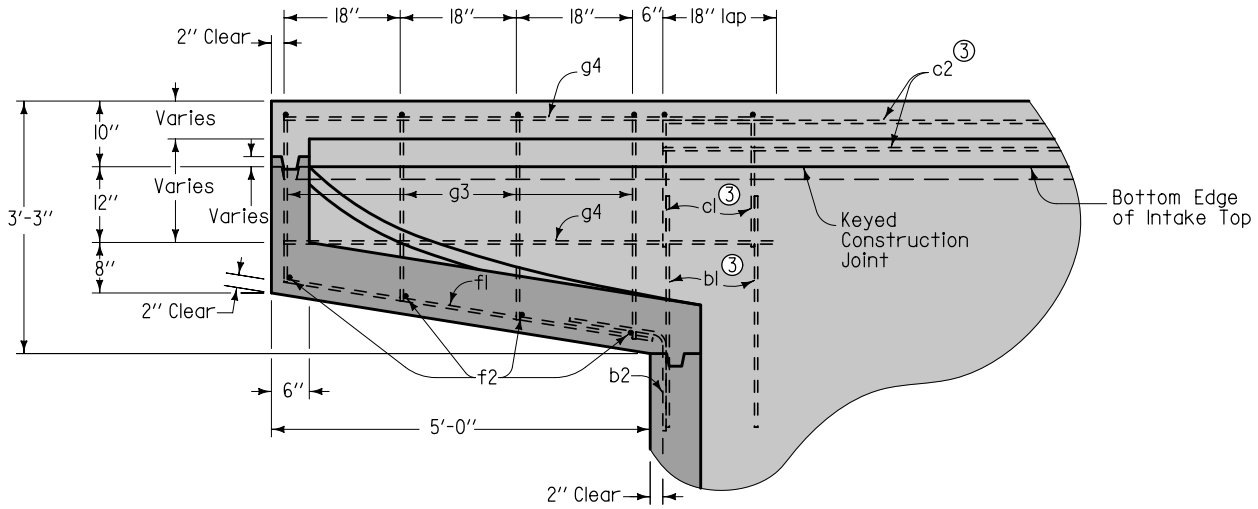
SW-542

SHEET 2 of 3

REVISIONS: New. Replaces RA-42.

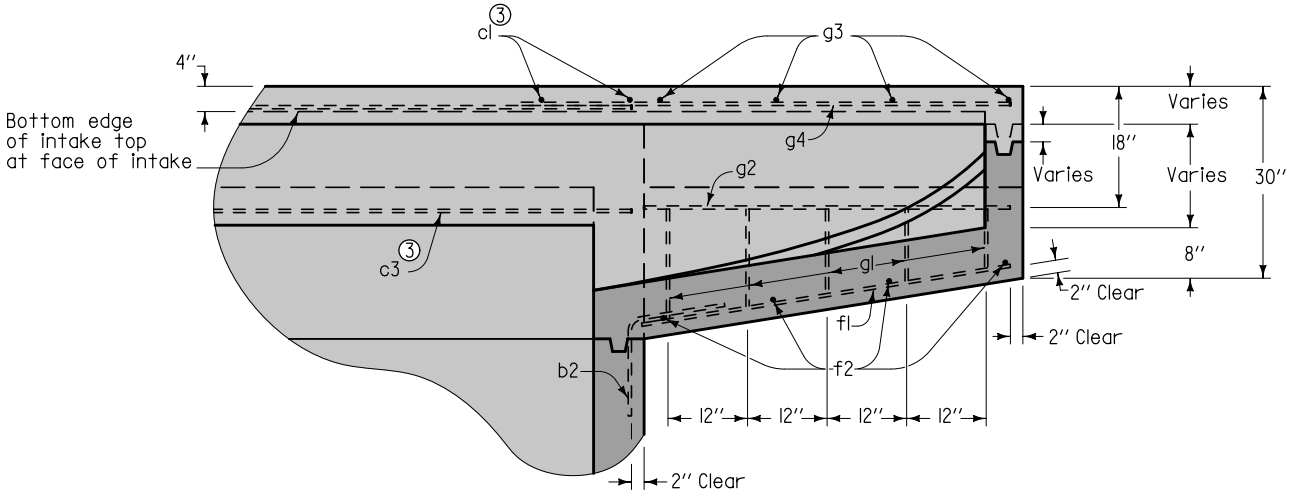
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

EXTENSION UNIT FOR OPEN-THROAT CURB INTAKE UNDER PAVEMENT



SECTION D-D

③ See SW-541 for reinforcing.



SECTION E-E

Iowa Department of Transportation

REVISION: NEW 10-20-09

STANDARD ROAD PLAN

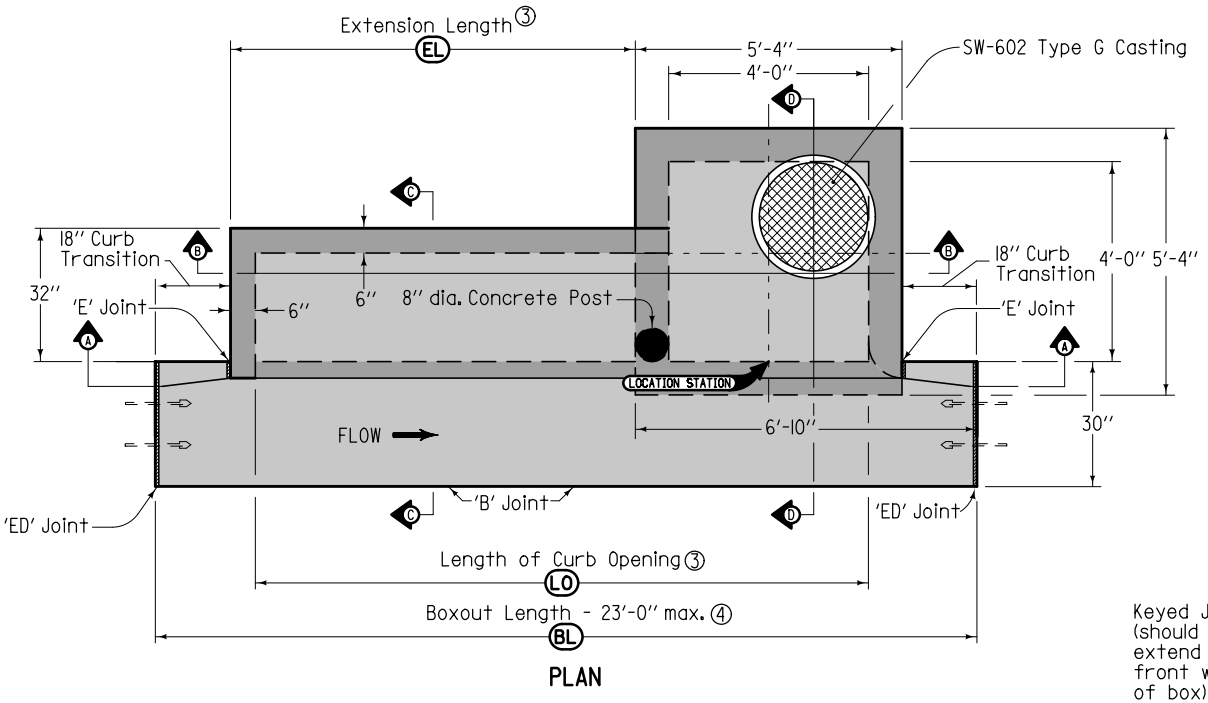
SW-542

SHEET 3 of 3

REVISIONS: New. Replaces RA-42.

Deanna Maifeld
APPROVED BY DESIGN METHODS ENGINEER

EXTENSION UNIT FOR OPEN-THROAT CURB INTAKE UNDER PAVEMENT



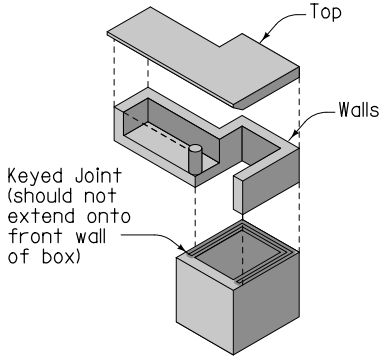
PLAN

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.

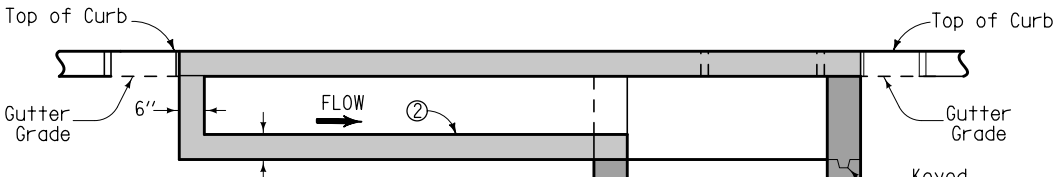
② Match gutter slope. Drain to well.

③ Other lengths of opening may be constructed by varying the length of the extension and the rebar.

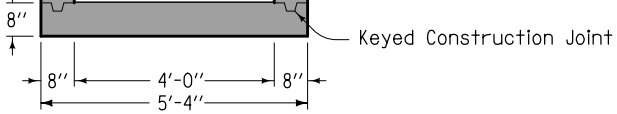
④ Includes 2 inches for 'ED' Joints.



ISOMETRIC
INTAKE WELL, WALLS AND TOP



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'-2"	18'-2"	20'-2"	22'-2"

Possible Contract Item:

Intake, SW-545

Iowa Department of Transportation

REVISION	
3	10-18-11

STANDARD ROAD PLAN

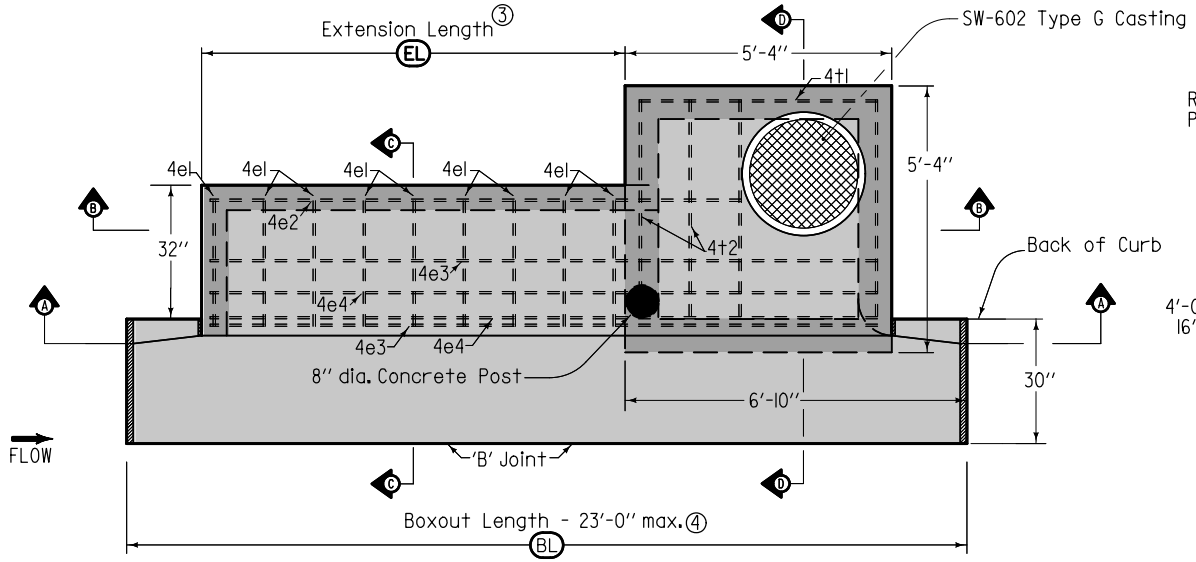
SW-545

SHEET 1 of 3

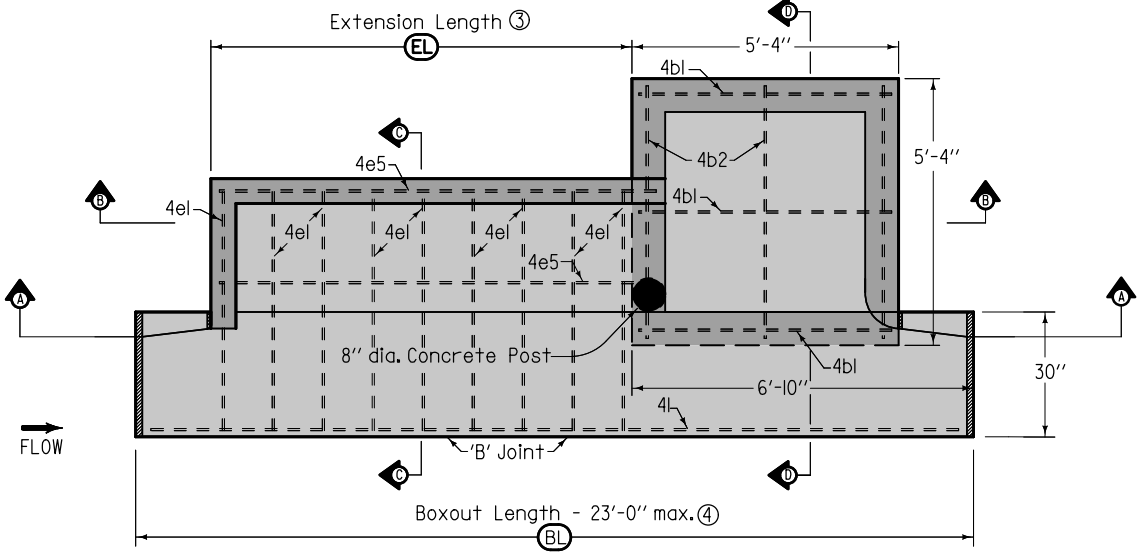
REVISIONS: Added "Type G" (casting) on sheets 1 and 2.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

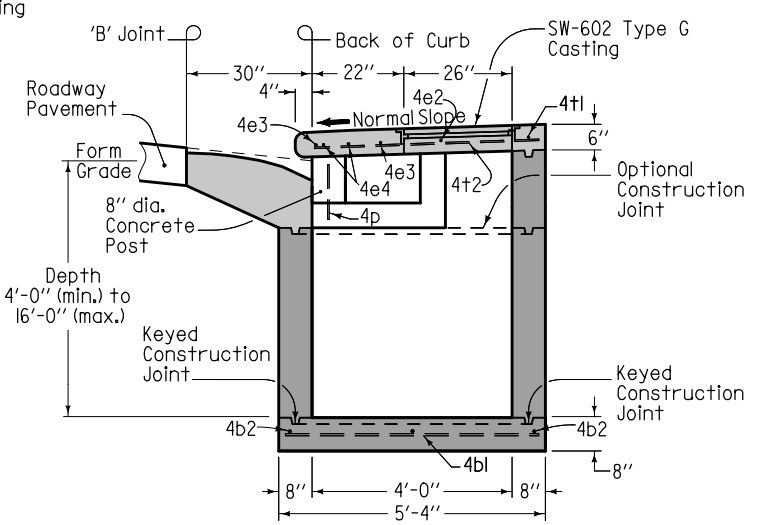
SINGLE OPEN-THROAT CURB INTAKE WITH EXTENDED OPENING



PLAN
TOP REINFORCING PLACEMENT



PLAN
BOTTOM REINFORCING PLACEMENT



SECTION D-D

REINFORCING BAR LIST Intake Well					
MARK	LOCATION	NO.	LENGTH	WEIGHT	SPACING
4b1	Base	3	5'-0"	10.0	2'-4"
4b2	Base	3	5'-0"	10.0	2'-4"
4t1	Top	1	5'-0"	3.3	12"
4t2	Top	4	4'-6"	12.0	See Detail
4p	Post	1	13"	0.7	
			Total	36 lbs.	

③ Other lengths of opening may be constructed by varyingthe length of the extension and the rebars.

④ Includes 2 inches for 'ED' Joints.

Iowa Department of Transportation

REVISION
3 | 10-18-11

STANDARD ROAD PLAN

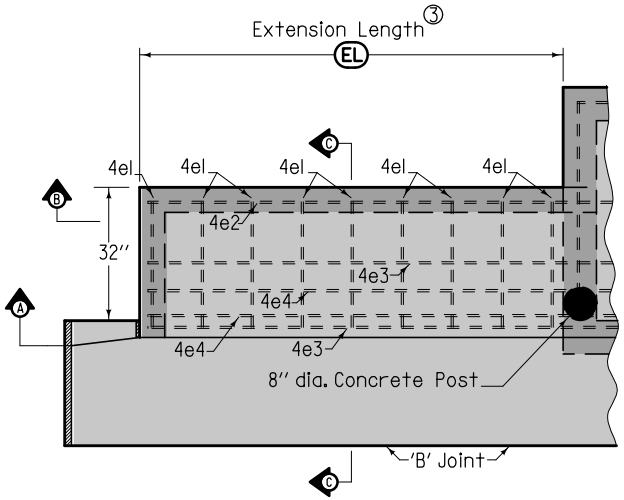
SW-545

SHEET 2 of 3

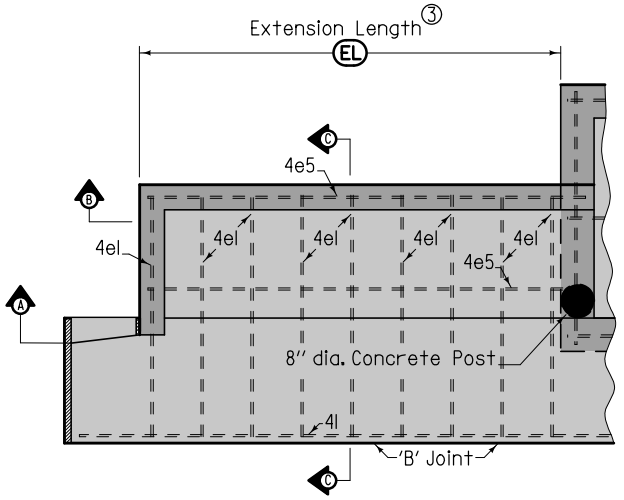
REVISIONS: Added "Type G" (casting) on sheets 1 and 2.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

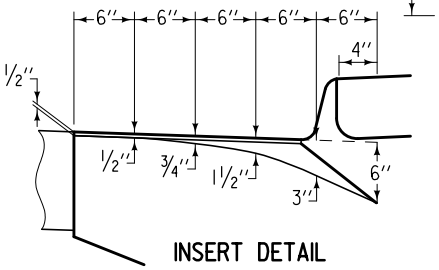
SINGLE OPEN-THROAT CURB INTAKE WITH EXTENDED OPENING



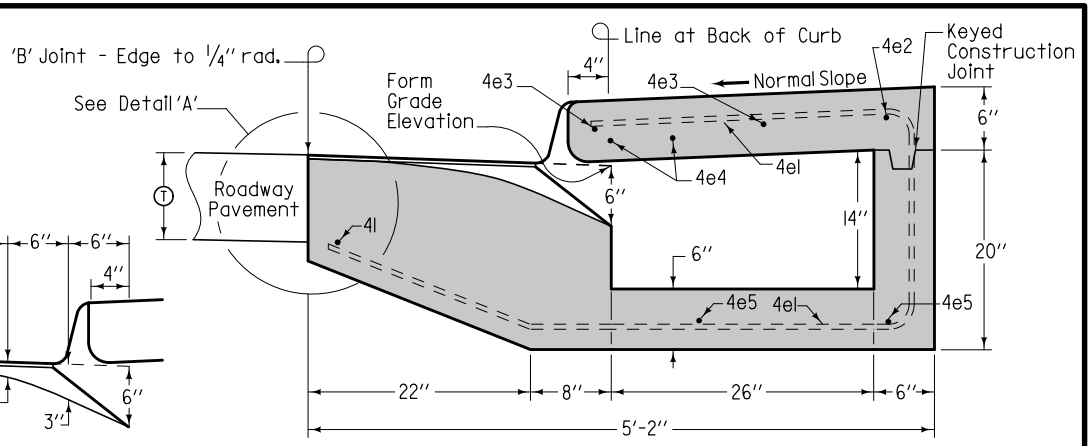
PLAN
TOP OF EXTENSION REINFORCING PLACEMENT



PLAN
BOTTOM OF EXTENSION REINFORCING PLACEMENT



INSERT DETAIL



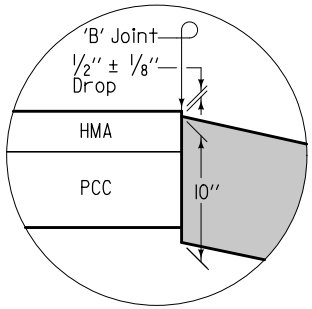
SECTION C-C

REINFORCING BAR LIST (LO) = 12'-0''						
MARK	SIZE	LOCATION	NO.	LENGTH	MASS	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	MASS	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.	

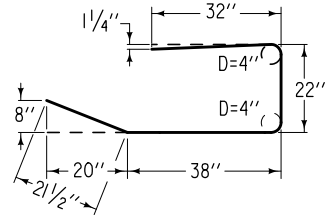
REINFORCING BAR LIST (LO) = 16'-0''						
MARK	SIZE	LOCATION	NO.	LENGTH	MASS	SPACING
4e1	4	Top/Base	13	9'-5½''	82.1	12''
4e2	4	Top	1	14'-0''	9.3	
4e3	4	Top	2	16'-9''	22.4	15½''
4e4	4	Top	2	16'-9''	22.4	6''
4e5	4	Base	2	12'-2''	16.2	22''
4l *	4	Insert	1	19'-10''	13.2	
* With 20'-6'' Boxout.				Total	165.6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

REINFORCING BAR LIST (LO) = 18'-0''						
MARK	SIZE	LOCATION	NO.	LENGTH	MASS	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.	



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

BENT BAR DETAILS



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

③ Other lengths of opening may be constructed by varying the length of the extension and the rebars.

Iowa Department of Transportation

REVISION
3 | 10-18-11

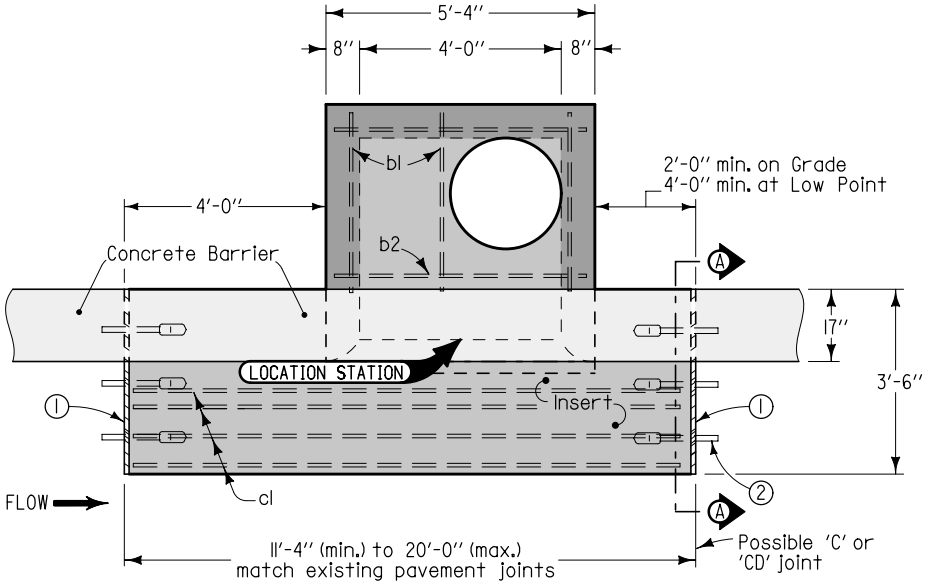
STANDARD ROAD PLAN

SW-545
SHEET 3 of 3

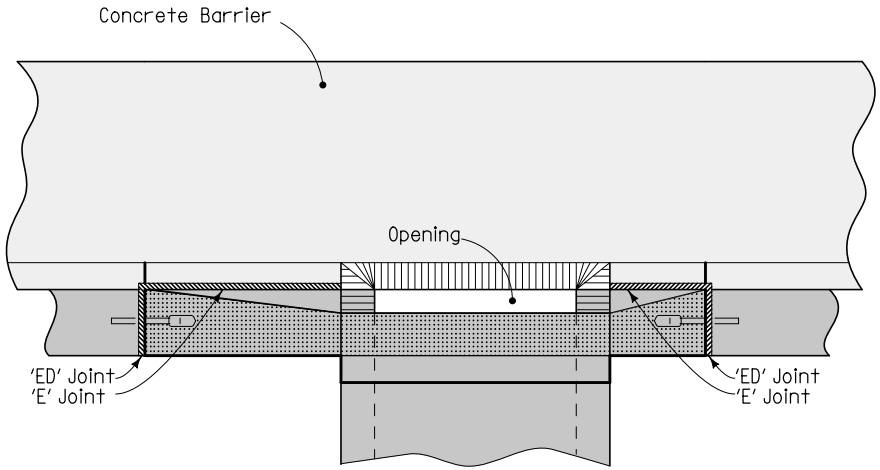
REVISIONS: Added "Type G" (casting) on sheets 1 and 2.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SINGLE OPEN-THROAT CURB INTAKE WITH EXTENDED OPENING



PLAN



ELEVATION

① 'ED' joint. Refer to PV-101 for details.

② (6) 1¼-inch smooth dowelbars in insert and 6 dowelbars in concrete barrier per installation.

Possible Contract Item:

Intake, SW-546

Iowa Department of Transportation

REVISION 2 04-19-11

STANDARD ROAD PLAN

SW-546

SHEET 1 of 2

REVISIONS: Updated references to renamed standards.

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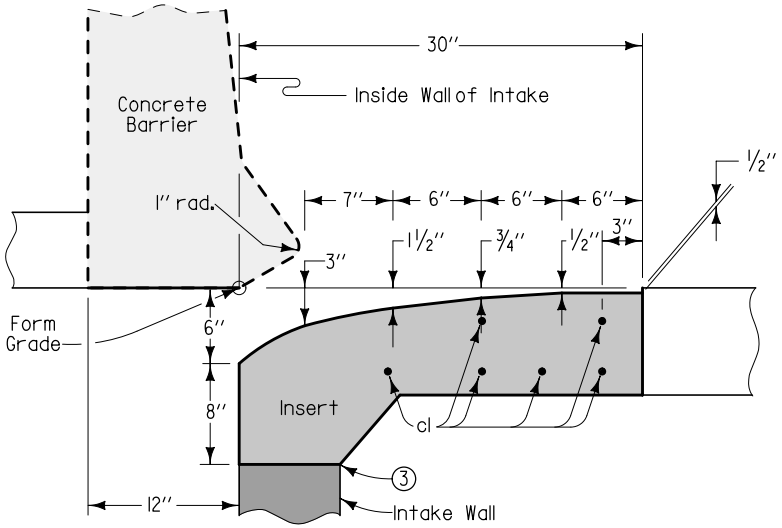
SINGLE OPEN-THROAT BARRIER INTAKE



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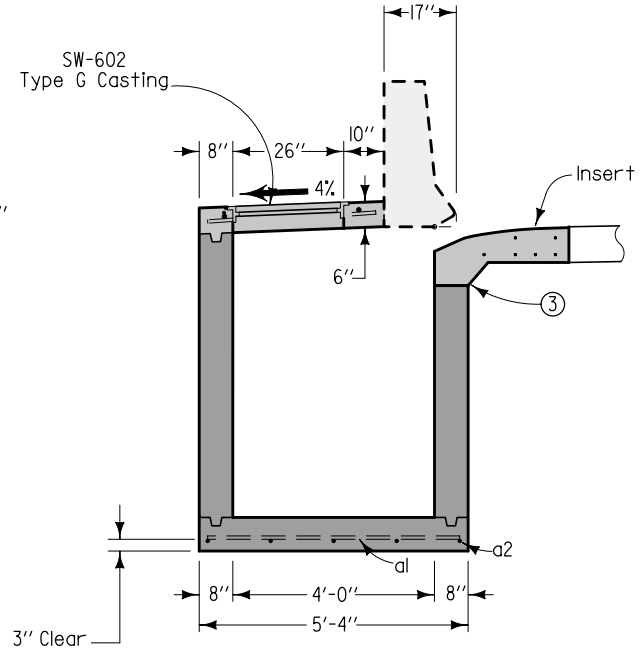
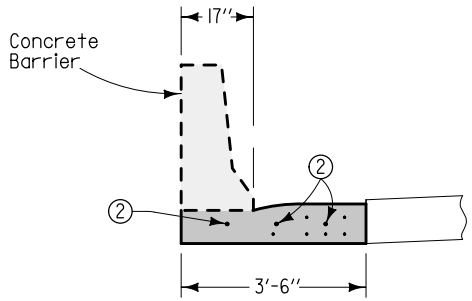


TYPICAL SECTION

② (6) 1¼-inch smooth dowel bars in insert and 6 dowel bars in concrete barrier per installation.

③ Trowel smooth and place subgrade paper to prevent bond.



SECTION A-A

REINFORCING BAR LIST					
MARK	LOCATION	NO.	LENGTH	WEIGHT	SPACING
a1	Base	5	5'-0''	16.7	15''
a2	Base	5	5'-0''	16.7	15''
b1	Top	3	3'-4''	6.7	See Detail
b2	Top	2	5'-0''	6.7	See Detail
c1	Insert	6	11'-1''	44.4	See Detail
c1	Insert	6	13'-1''	52.4	See Detail
			Total	91 lbs. or 99 lbs.	

Iowa Department of Transportation

STANDARD ROAD PLAN

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2	04-19-11

SW-546

SHEET 2 of 2

REVISIONS: Updated references to renamed standards.

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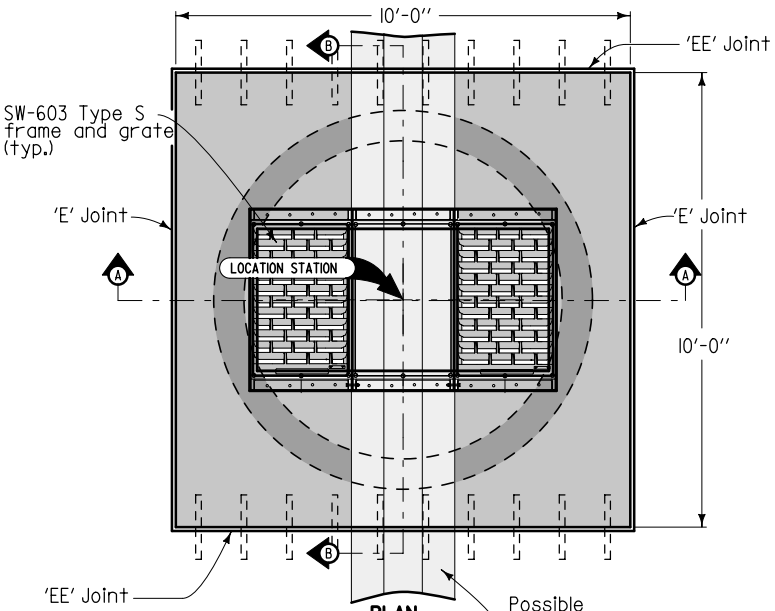
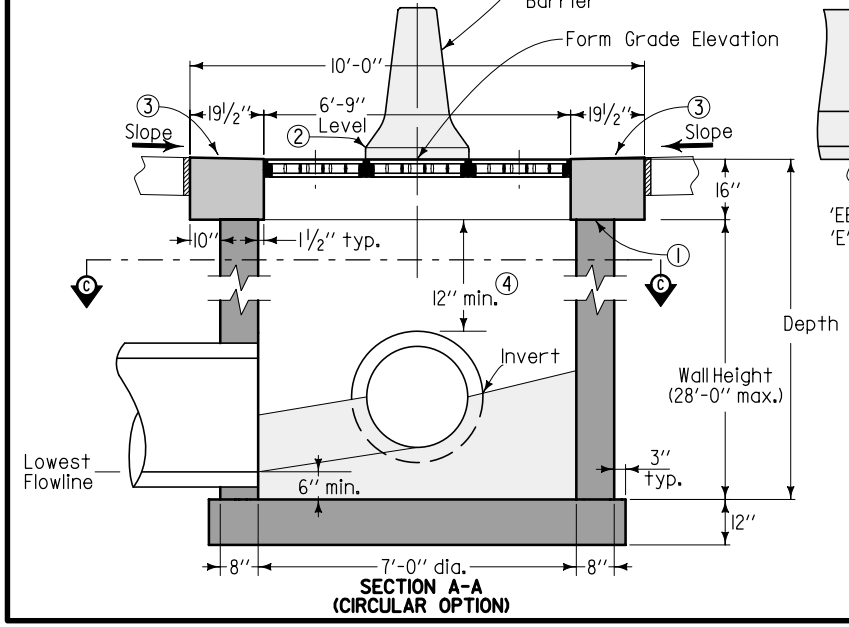
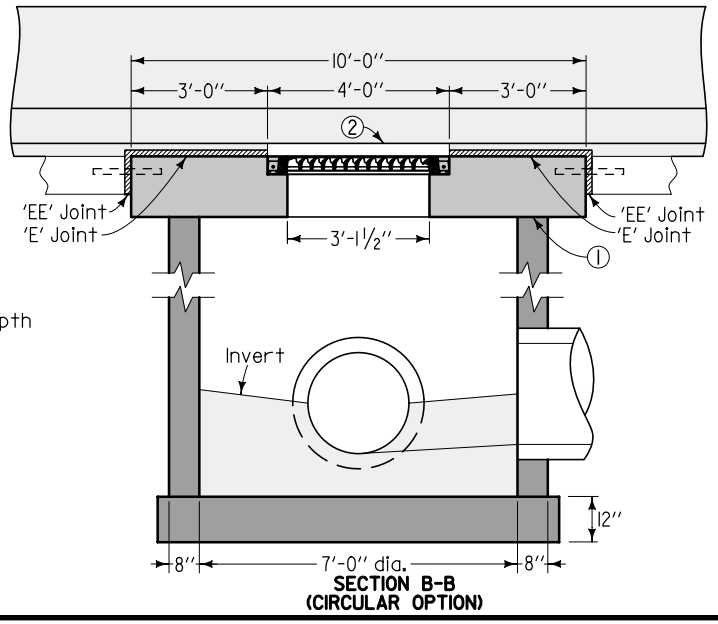
SINGLE OPEN-THROAT BARRIER INTAKE







Unless otherwise specified, the contractor may construct either a circular structure or a rectangular structure.

All plate and edge armor steel to be ASTM A 36, galvanized after fabrication.

Remove center grate before constructing concrete barrier.

Cast frames into intake top so tops of grates are ¼″ below Form Grade Elevation. Bolt intake frames together on both sides with four ½″ x 4″ bolts.

For joint details, refer to PV-101.

① Trowel smooth and place two layers of 30-pound roofing felt to prevent bond.

② Leave 3-inch opening through barrier over the intake.

③ Vary slope of top to match elevation of adjacent pavement.

④ 12-inch minimum wall height above all pipes.

Possible Contract Item:

Barrier Intake, SW-547

Possible Tabulation:

104-5B

Iowa Department of Transportation

REVISION 2 04-19-11

STANDARD ROAD PLAN

SW-547

SHEET 1 of 7

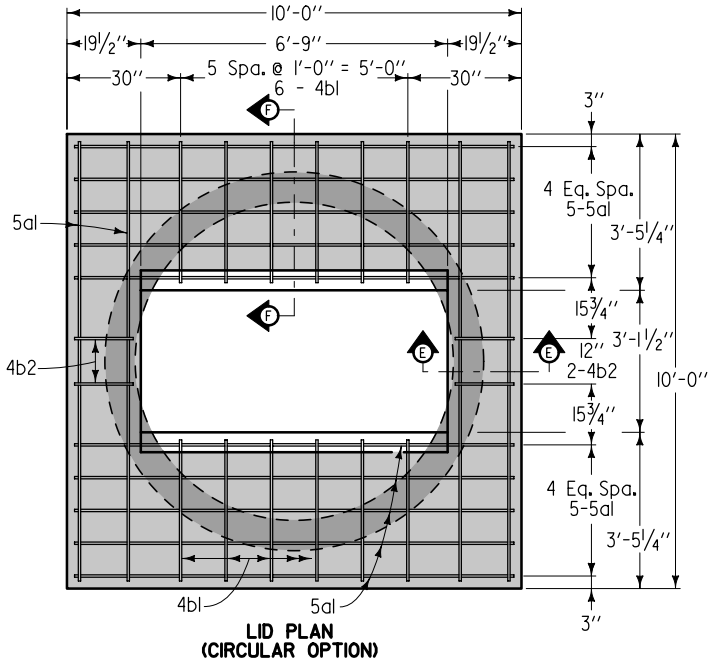
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

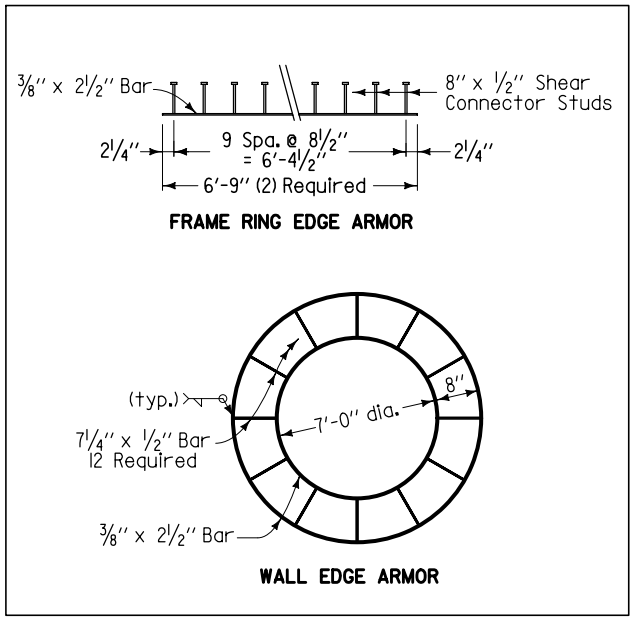
TRIPLE-GRATE BARRIER INTAKE

LID REINFORCING BAR LIST - EPOXY-COATED (CIRCULAR OPTION)

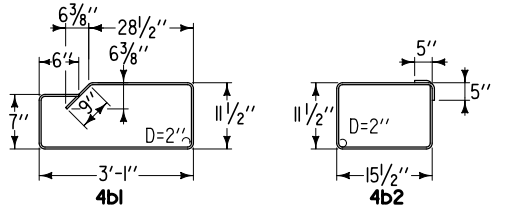
BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5a1	Lid, Longit. & Transverse	—	28	9'-8	282
4b1	Lid Hoop		12	8'-3	66
4b2	Lid Hoop		4	5'-4	14
	EPOXY COATED REINFORCING STEEL - TOTAL				362



LID PLAN (CIRCULAR OPTION)



LID BENT BAR DETAILS (CIRCULAR OPTION)



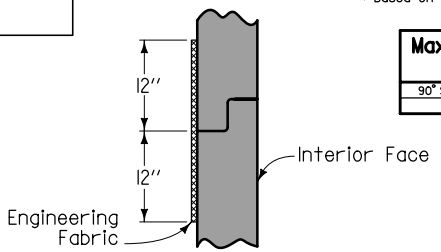
NOTE: ALL DIMENSIONS SHOWN OUT TO OUT. D = PIN DIAMETER

LID QUANTITY SUMMARY (CIRCULAR OPTION)

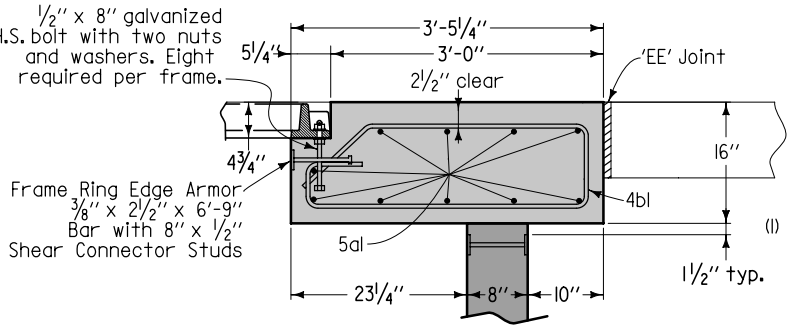
Concrete	3.8 CY •
Epoxy Coated Reinforcing Steel	362 LB

• Based on Minimum thickness = 16"

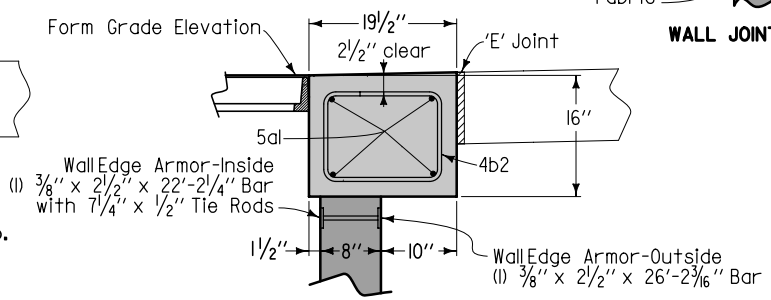
Maximum Pipe Diameter for Pipes at:	
90° Separation	180° Separation
36	48



WALL JOINT DETAIL



SECTION F-F



SECTION E-E

LID (CIRCULAR OPTION)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-19-11

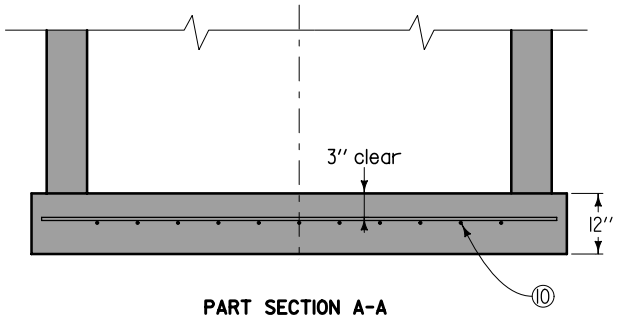
SW-547

SHEET 2 of 7

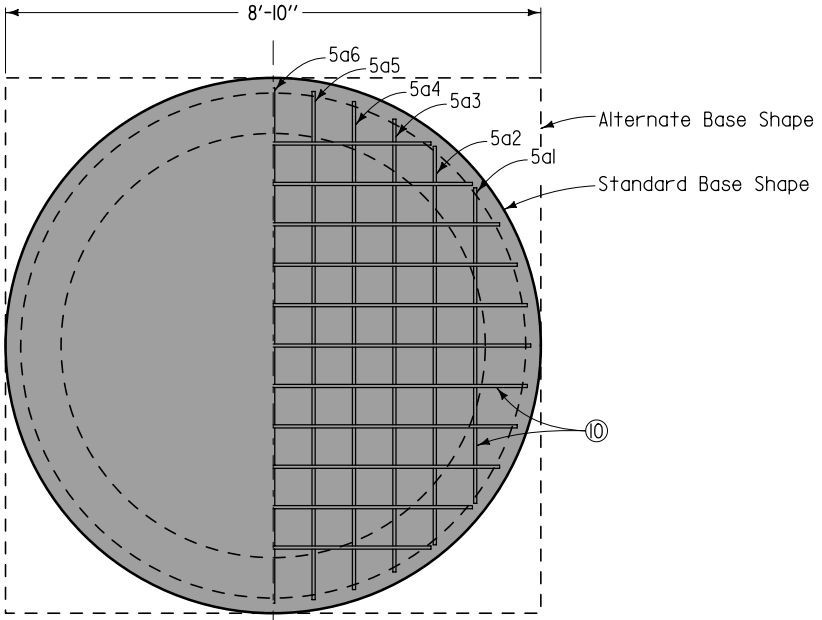
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TRIPLE-GRATE BARRIER INTAKE



PART SECTION A-A



BASE PLAN
(CIRCULAR OPTION)

BASE REINFORCING BAR LIST - EPOXY-COATED
(CIRCULAR OPTION)

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5a1	Base, Longit. & Transverse	——	4	5'-3"	22
5a2	Base, Longit. & Transverse	——	4	6'-7"	27
5a3	Base, Longit. & Transverse	——	4	7'-6"	31
5a4	Base, Longit. & Transverse	——	4	8'-0"	33
5a5	Base, Longit. & Transverse	——	4	8'-4"	35
5a6	Base, Longit. & Transverse	——	2	8'-6"	18
	EPOXY COATED REINFORCING STEEL - TOTAL				166

BASE QUANTITY SUMMARY
(CIRCULAR OPTION)

Concrete	2.3 CY •
Epoxy Coated Reinforcing Steel	166 LB •

• Based on Standard Base Shape

⑩ #5 at 8-inch centers each direction or equivalent welded wire fabric.

BASE (CIRCULAR OPTION)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
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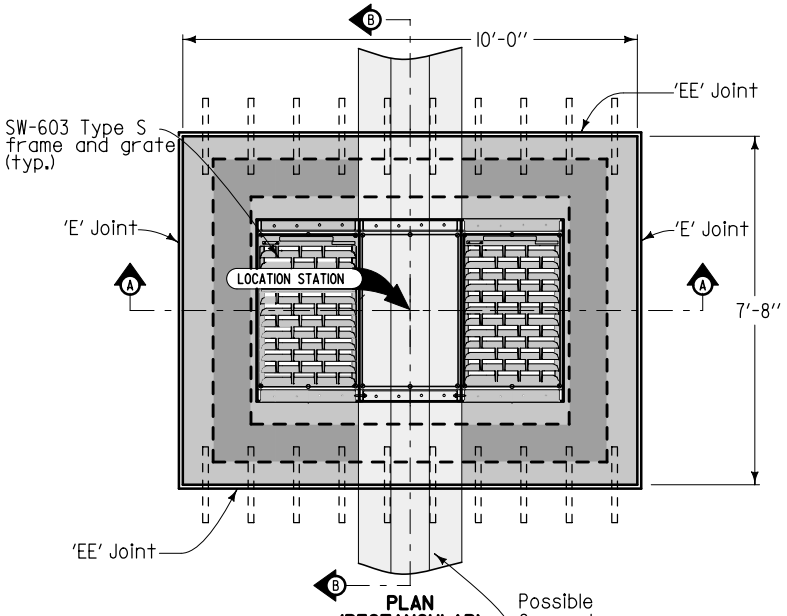
SHEET 3 of 7

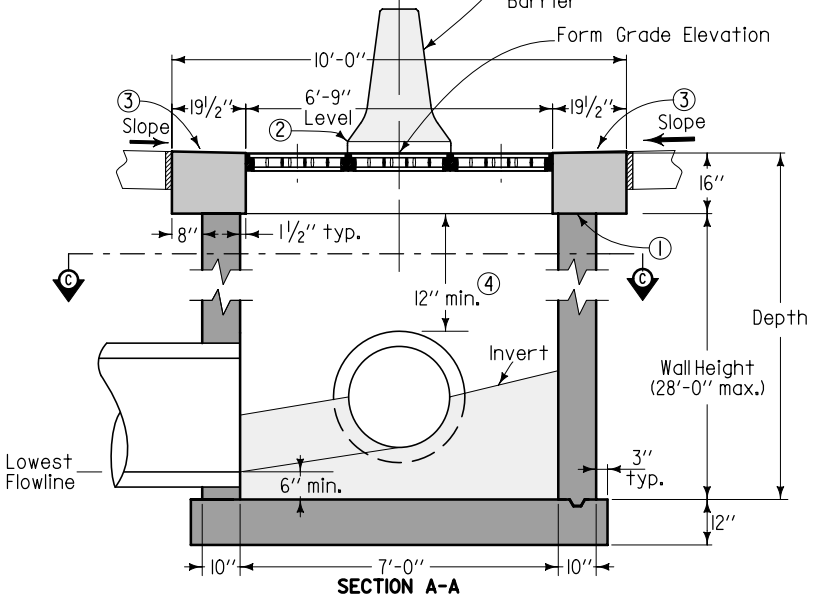
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

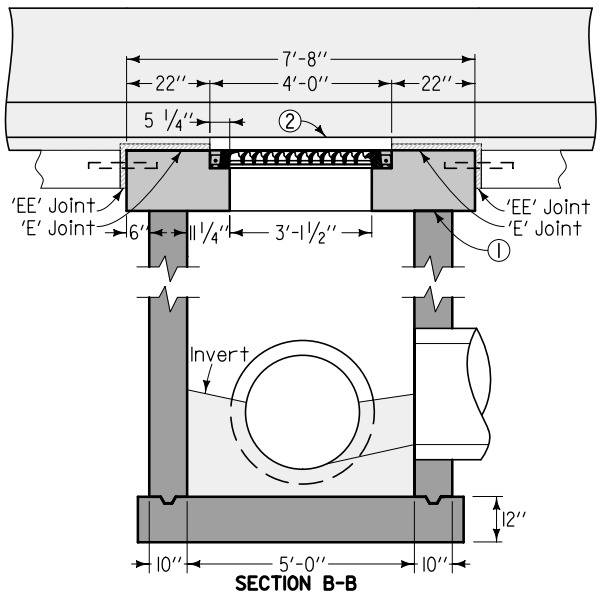
TRIPLE-GRATE BARRIER INTAKE



PLAN (RECTANGULAR)



SECTION A-A (RECTANGULAR OPTION)



SECTION B-B (RECTANGULAR OPTION)

① Trowel smooth and place two layers of 30-pound roofing felt to prevent bond.

② Leave 3-inch opening through barrier over the intake.

③ Vary slope of top to match elevation of adjacent pavement.

④ 12-inch minimum wall height above all pipes.

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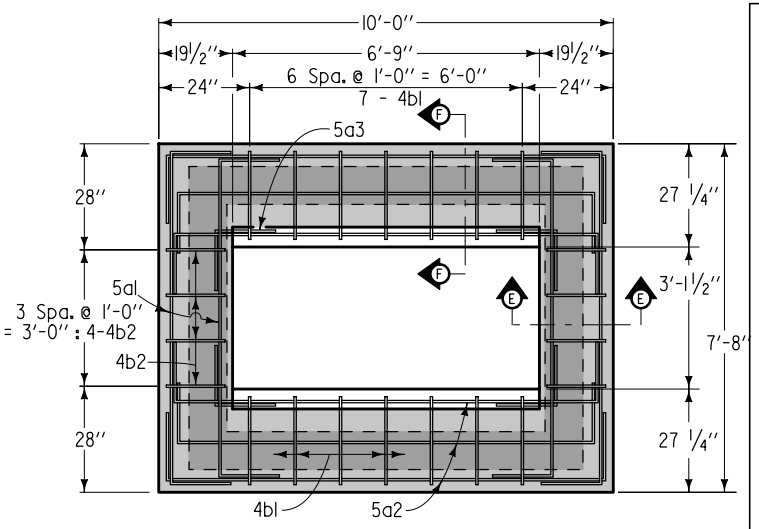
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

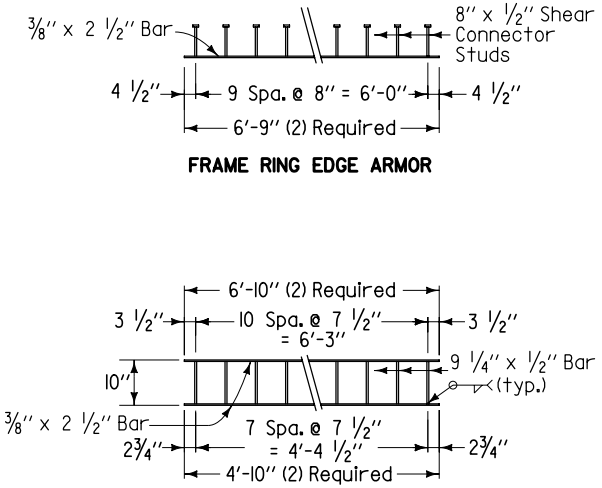
TRIPLE-GRATE BARRIER INTAKE

LID REINFORCING BAR LIST - EPOXY-COATED
(RECTANGULAR OPTION)

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5a1	Lid, Longitudinal		8	10'-2	85
5a2	Lid, Transverse		10	12'-6	130
5a3	Lid, Interior, Corners		4	3'-0	13
4b1	Lid Hoop		14	5'-11	55
4b2	Lid Hoop		8	5'-4	29
	EPOXY COATED REINFORCING STEEL - TOTAL				312



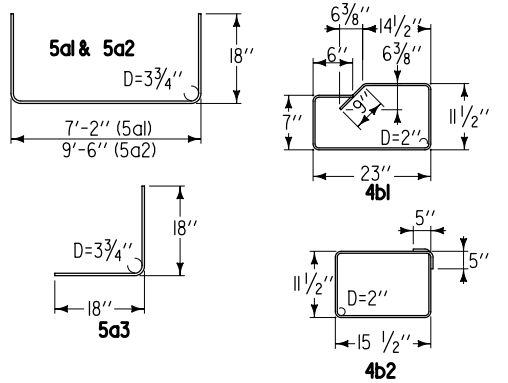
LID PLAN
(RECTANGULAR OPTION)



FRAME RING EDGE ARMOR

WALL EDGE ARMOR

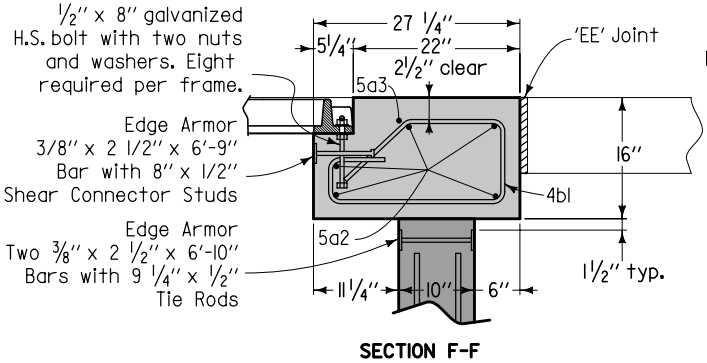
LID BENT BAR DETAILS (RECTANGULAR OPTION)



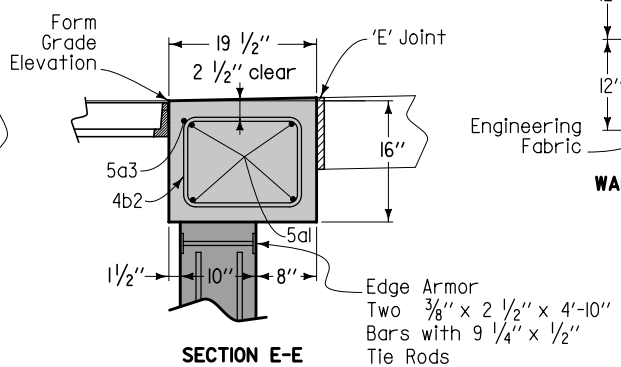
NOTE: ALL DIMENSIONS SHOWN OUT TO OUT. D = PIN DIAMETER

LID QUANTITY SUMMARY
(RECTANGULAR OPTION)

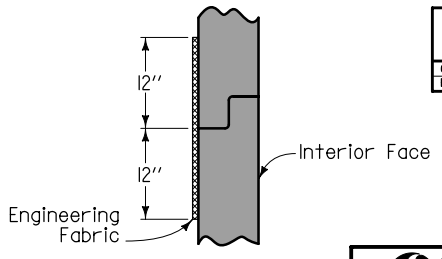
Concrete	2.7 CY
Epoxy Coated Reinforcing Steel	312 LB



SECTION F-F



SECTION E-E



WALL JOINT DETAIL

LID (RECTANGULAR OPTION)

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REVISIONS: Updated references to renamed standards.

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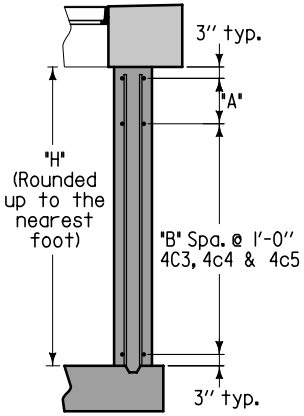
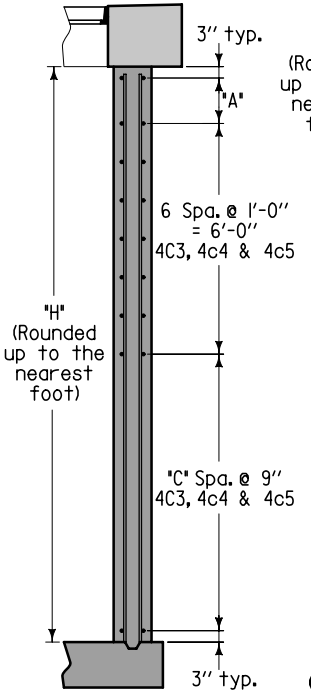
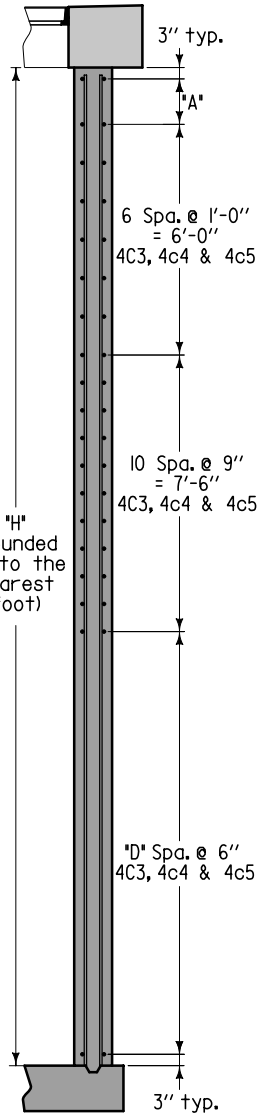
TRIPLE-GRATE BARRIER INTAKE



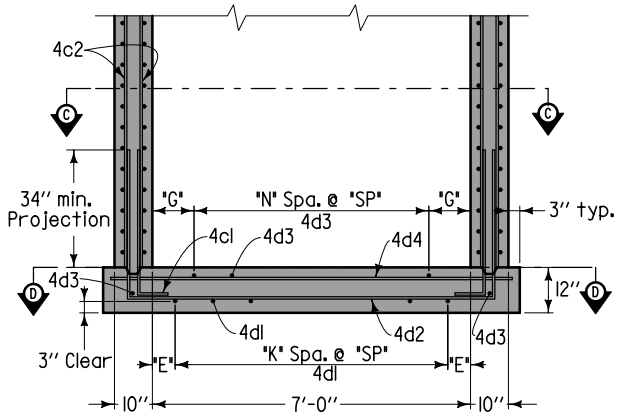
PART SECTION A-A
(Where H = 3' to 7')



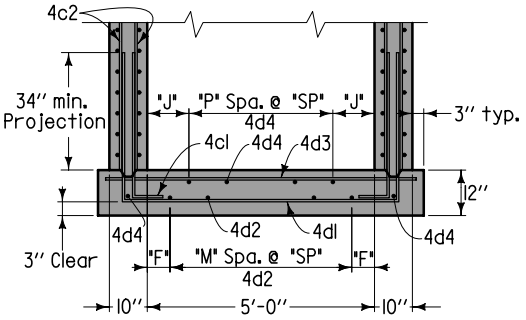
PART SECTION A-A
(Where H = 8' to 15')



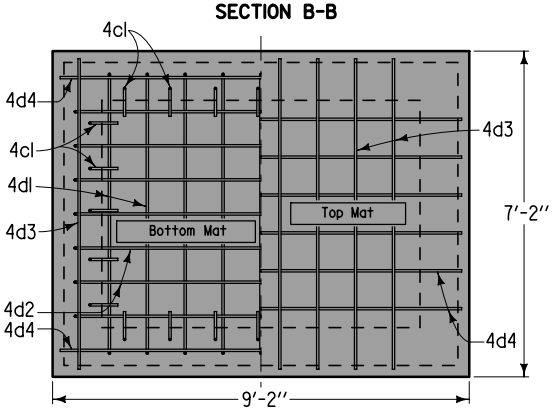
PART SECTION A-A
(Where H = 16' to 28')



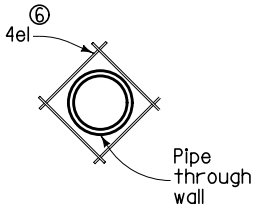
SECTION A-A



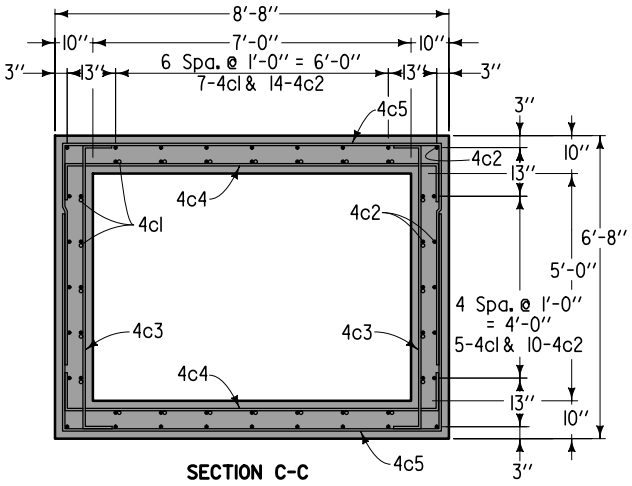
SECTION B-B



SECTION D-D
BASE REINFORCING



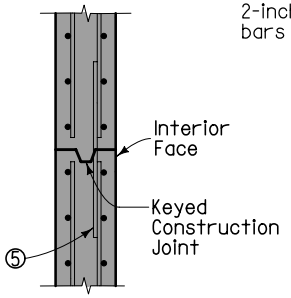
PIPE REINFORCING



SECTION C-C

⑤ Install one set of 4r1 x 3'-0" dowel bars @ 12-inch spacing at any wall joints. Twenty-eight 4r1 bars required per joint, total weight = 56 lbs.

⑥ 4e1 bar length to be pipe diameter plus 12 inches. Place 4e1 bar inside of vertical reinforcing. Shift main reinforcing bars as required for pipe entrance. Field cut bars to maintain 3-inch clearance from bottom and 2-inch clearance from face of walls. Eight 4e1 bars required per pipe entrance.



C.I.P. Wall
CONSTRUCTION JOINT

WALLS (RECTANGULAR OPTION)

Iowa Department of Transportation

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REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TRIPLE-GRATE BARRIER INTAKE

VARIABLE DIMENSIONS AND QUANTITIES FOR RECTANGULAR OPTION

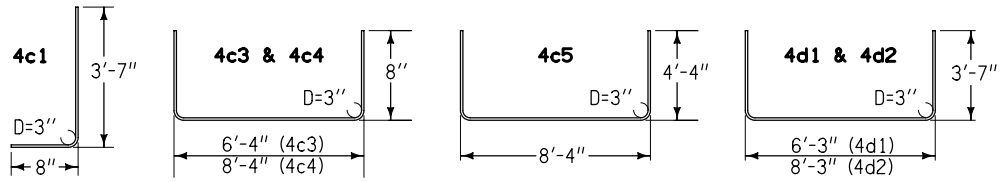
Dimensions						Bar List																												Quantities				
	⑦					4c1		4c2		4c3 ⑧					4c4 ⑧					4c5 ⑧					4d1					4d2					4d3					4d4					Concrete - Cu. Yds.				Steel
"H" (Ft.)	"A" (In.)	"E" (In.)	"F" (In.)	"G" (In.)	"J" (In.)	No.	L	No.	L	No. of Spaces "B"	No. of Spaces "C"	No. of Spaces "D"	NO.	L	No. of Spaces "B"	No. of Spaces "C"	No. of Spaces "D"	No.	L	No. of Spaces "B"	No. of Spaces "C"	No. of Spaces "D"	NO.	L	SP	"K"	No.	L	SP	"M"	No.	L	SP	"N"	No.	L	SP	"P"	No.	L	Base	Lid	Walls	Total	⑨ Total lbs.
3	6	2"	0"	7"	5"	24	4'-3"	--	--	2	--	--	8	7'-8"	2	--	--	8	9'-8"	2	--	--	8	17'-0"	10"	8	9	13'-5"	10"	6	7	15'-5"	10"	7	10	6'-10"	10"	5	8	8'-10"	2.4	2.7	2.5	7.7	810
4	6	2"	0"	7"	5"	24	4'-3"	52	3'-10"	3	--	--	10	7'-8"	3	--	--	10	9'-8"	3	--	--	10	17'-0"	10"	8	9	13'-5"	10"	6	7	15'-5"	10"	7	10	6'-10"	10"	5	8	8'-10"	2.4	2.7	3.4	8.5	989
5	6	2"	0"	7"	5"	24	4'-3"	52	4'-10"	4	--	--	12	7'-8"	4	--	--	12	9'-8"	4	--	--	12	17'-0"	10"	8	9	13'-5"	10"	6	7	15'-5"	10"	7	10	6'-10"	10"	5	8	8'-10"	2.4	2.7	4.2	9.4	1,068
6	6	2"	0"	7"	5"	24	4'-3"	52	5'-10"	5	--	--	14	7'-8"	5	--	--	14	9'-8"	5	--	--	14	17'-0"	10"	8	9	13'-5"	10"	6	7	15'-5"	10"	7	10	6'-10"	10"	5	8	8'-10"	2.4	2.7	5.1	10.2	1,150
7	6	2"	2"	6"	6"	24	4'-3"	52	6'-10"	6	--	--	16	7'-8"	6	--	--	16	9'-8"	6	--	--	16	17'-0"	8"	10	11	13'-5"	8"	7	8	15'-5"	8"	9	12	6'-10"	8"	6	9	8'-10"	2.4	2.7	5.9	11.0	1,273
8	9	2"	2"	6"	6"	24	4'-3"	52	7'-10"	6	1	--	18	7'-8"	6	1	--	18	9'-8"	6	1	--	18	17'-0"	8"	10	11	13'-5"	8"	7	8	15'-5"	8"	9	12	6'-10"	8"	6	9	8'-10"	2.4	2.7	6.8	11.9	1,353
9	12	2"	2"	6"	6"	24	4'-3"	52	8'-10"	6	2	--	20	7'-8"	6	2	--	20	9'-8"	6	2	--	20	17'-0"	8"	10	11	13'-5"	8"	7	8	15'-5"	8"	9	12	6'-10"	8"	6	9	8'-10"	2.4	2.7	7.6	12.7	1,434
10	6	2"	2"	6"	6"	24	4'-3"	52	9'-10"	6	4	--	24	7'-8"	6	4	--	24	9'-8"	6	4	--	24	17'-0"	8"	10	11	13'-5"	8"	7	8	15'-5"	8"	9	12	6'-10"	8"	6	9	8'-10"	2.4	2.7	8.4	13.6	1,562
11	9	2"	2"	6"	6"	24	4'-3"	52	10'-10"	6	5	--	26	7'-8"	6	5	--	26	9'-8"	6	5	--	26	17'-0"	8"	10	11	13'-5"	8"	7	8	15'-5"	8"	9	12	6'-10"	8"	6	9	8'-10"	2.4	2.7	9.3	14.4	1,641
12	12	2"	2"	6"	6"	24	4'-3"	52	11'-10"	6	6	--	28	7'-8"	6	6	--	28	9'-8"	6	6	--	28	17'-0"	8"	10	11	13'-5"	8"	7	8	15'-5"	8"	9	12	6'-10"	8"	6	9	8'-10"	2.4	2.7	10.1	15.3	1,722
13	6	2"	2"	6"	6"	24	4'-3"	52	12'-10"	6	8	--	32	7'-8"	6	8	--	32	9'-8"	6	8	--	32	17'-0"	8"	10	11	13'-5"	8"	7	8	15'-5"	8"	9	12	6'-10"	8"	6	9	8'-10"	2.4	2.7	11.0	16.1	1,849
14	9	0"	0"	3"	3"	24	4'-3"	52	13'-10"	6	9	--	34	7'-8"	6	9	--	34	9'-8"	6	9	--	34	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	11.8	17.0	2,050
15	12	0"	0"	3"	3"	24	4'-3"	52	14'-10"	6	10	--	36	7'-8"	6	10	--	36	9'-8"	6	10	--	36	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	12.7	17.8	2,129
16	12	0"	0"	3"	3"	24	4'-3"	52	15'-10"	6	10	2	40	7'-8"	6	10	2	40	9'-8"	6	10	2	40	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	13.5	18.6	2,256
17	12	0"	0"	3"	3"	24	4'-3"	52	16'-10"	6	10	4	44	7'-8"	6	10	4	44	9'-8"	6	10	4	44	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	14.4	19.5	2,383
18	12	0"	0"	3"	3"	24	4'-3"	52	17'-10"	6	10	6	48	7'-8"	6	10	6	48	9'-8"	6	10	6	48	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	15.2	20.3	2,509
19	12	0"	0"	3"	3"	24	4'-3"	52	18'-10"	6	10	8	52	7'-8"	6	10	8	52	9'-8"	6	10	8	52	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	16.0	21.2	2,636
20	12	0"	0"	3"	3"	24	4'-3"	52	19'-10"	6	10	10	56	7'-8"	6	10	10	56	9'-8"	6	10	10	56	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	16.9	22.0	2,763
21	12	0"	0"	3"	3"	24	4'-3"	52	20'-10"	6	10	12	60	7'-8"	6	10	12	60	9'-8"	6	10	12	60	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	17.7	22.9	2,888
22	12	0"	0"	3"	3"	24	4'-3"	52	21'-10"	6	10	14	64	7'-8"	6	10	14	64	9'-8"	6	10	14	64	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	18.6	23.7	3,015
23	12	0"	0"	3"	3"	24	4'-3"	52	22'-10"	6	10	16	68	7'-8"	6	10	16	68	9'-8"	6	10	16	68	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	19.4	24.6	3,141
24	12	0"	0"	3"	3"	24	4'-3"	52	23'-10"	6	10	18	72	7'-8"	6	10	18	72	9'-8"	6	10	18	72	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	20.3	25.4	3,269
25	12	0"	0"	3"	3"	24	4'-3"	52	24'-10"	6	10	20	76	7'-8"	6	10	20	76	9'-8"	6	10	20	76	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	21.1	26.3	3,395
26	12	0"	0"	3"	3"	24	4'-3"	52	25'-10"	6	10	22	80	7'-8"	6	10	22	80	9'-8"	6	10	22	80	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	22.0	27.1	3,521
27	12	0"	0"	3"	3"	24	4'-3"	52	26'-10"	6	10	24	84	7'-8"	6	10	24	84	9'-8"	6	10	24	84	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	22.8	27.9	3,647
28	12	0"	0"	3"	3"	24	4'-3"	52	27'-10"	6	10	26	88	7'-8"	6	10	26	88	9'-8"	6	10	26	88	17'-0"	6"	14	15	13'-5"	6"	10	11	15'-5"	6"	13	16	6'-10"	6"	12	15	8'-10"	2.4	2.7	23.7	28.8	3,774

⑦ A = First bar spacing at top of wall. Minimum spacing is 3 inches. Maximum spacing is 12 inches. Adjust as necessary.

⑧ See Section A-A on sheet 2 for spacing.

⑨ Quantity includes 312 lbs. for lid.

BENT BAR DETAILS (RECTANGULAR OPTION)



NOTE: ALL DIMENSIONS SHOWN OUT TO OUT. D = PIN DIAMETER

REINFORCEMENT (RECTANGULAR OPTION)

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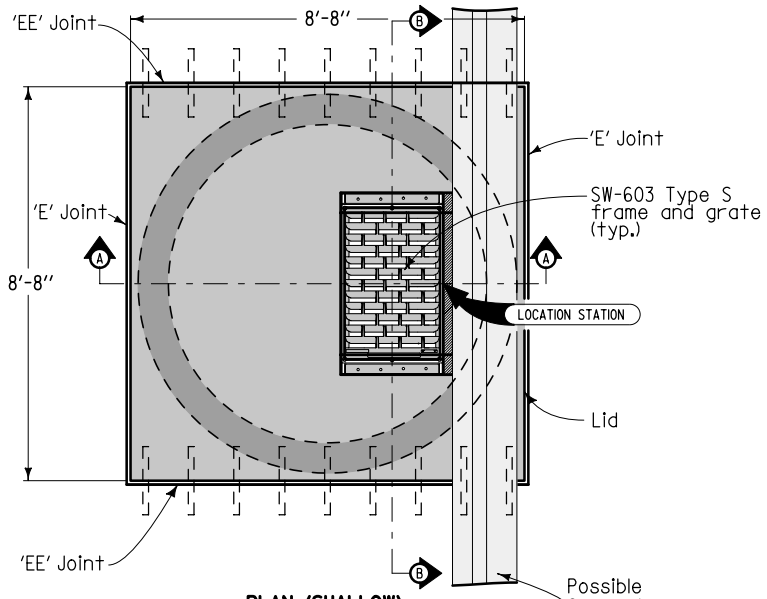
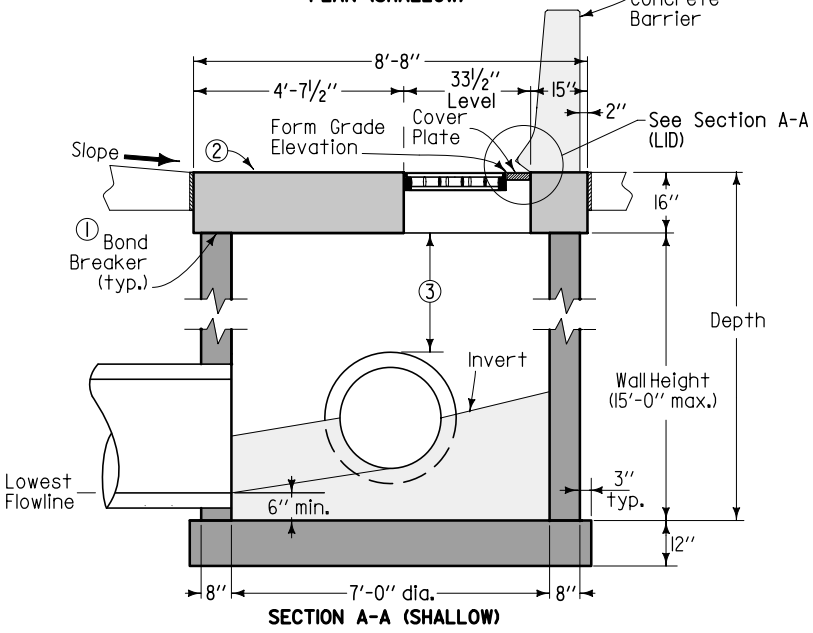
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

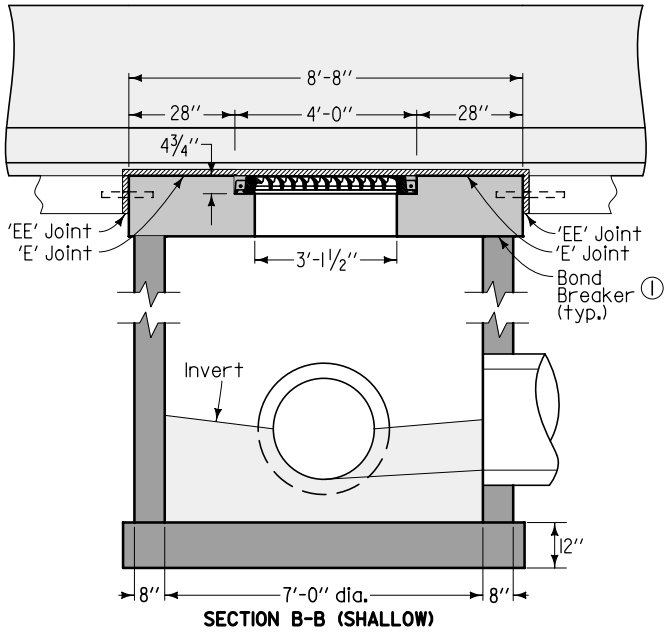
TRIPLE-GRATE BARRIER INTAKE



PLAN (SHALLOW)



SECTION A-A (SHALLOW)



SECTION B-B (SHALLOW)

All plate and edge armor steel to be ASTM A 36, galvanized after fabrication.

Remove cover plate before constructing concrete barrier.

Cast frames into intake top so tops of grates are ¼" below Form Grade Elevation. Bolt intake frames together on both sides with four ½" x 4" bolts.

For joint details, refer to PV-101.

① Trowel smooth and place two layers of 30-pound roofing felt to prevent bond.

② Vary slope of top to match elevation of adjacent pavement.

③ 12-inch minimum above all pipes.

Shallow circular intake
H = 3'-0" to 15'-0"
7' barrel diameter

Deep circular option:
H = 15'-0" to 28'-0"
4' and 7' barrel diameters

Possible Contract Item:
Barrier Intake, SW-548

Possible Tabulation:
104-5B

Iowa Department of Transportation

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STANDARD ROAD PLAN

SW-548

SHEET 1 of 6

REVISIONS: Updated references to renumbered standards.

Deanna Maifield
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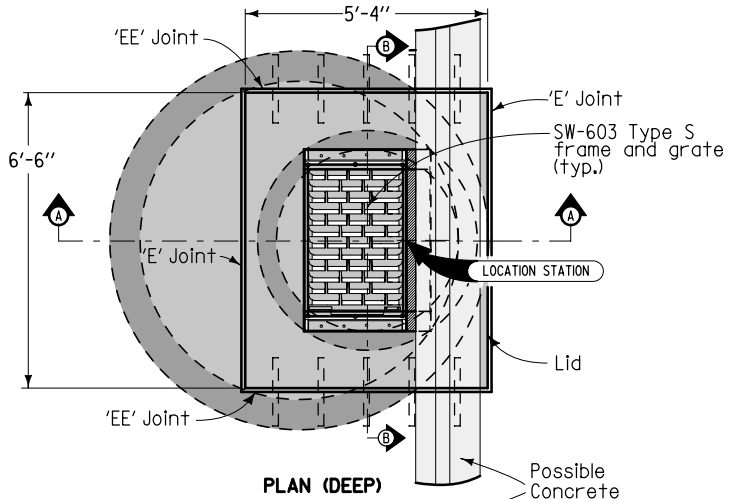
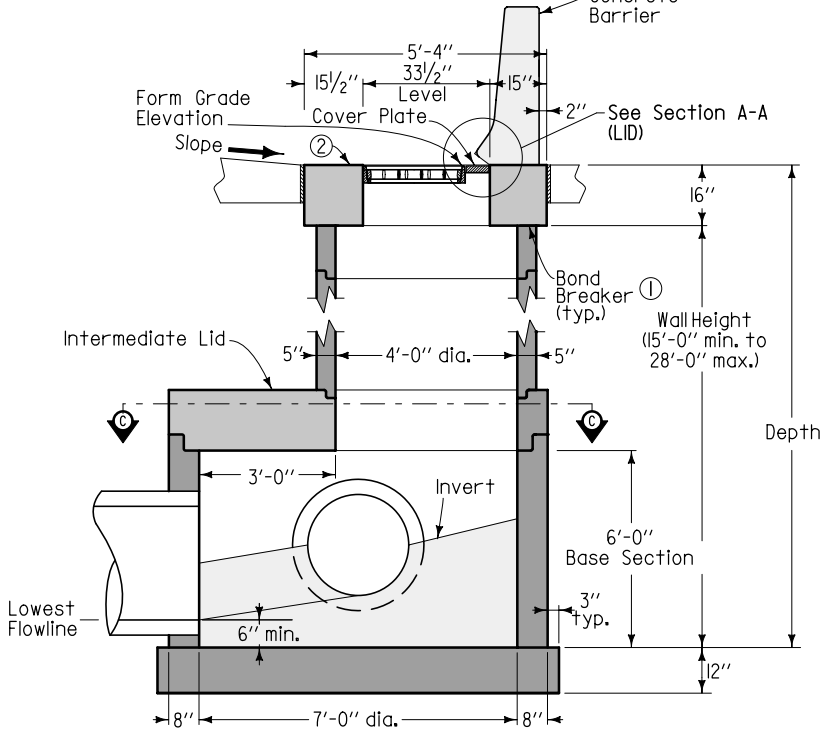
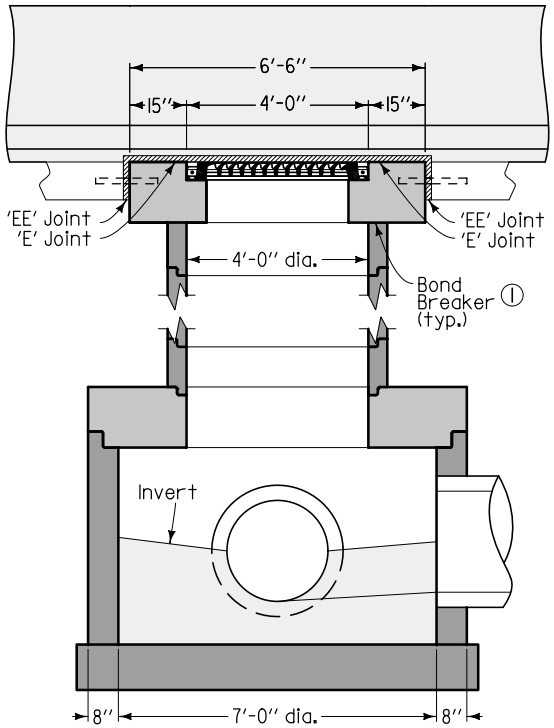
SINGLE-GRATE BARRIER INTAKE, CIRCULAR



PLAN (DEEP)



SECTION A-A (DEEP)



SECTION B-B (DEEP)

① Trowel smooth and place two layers of 30-pound roofing felt to prevent bond.

② Vary slope of top to match elevation of adjacent pavement.

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REVISIONS: Updated references to renamed standards.

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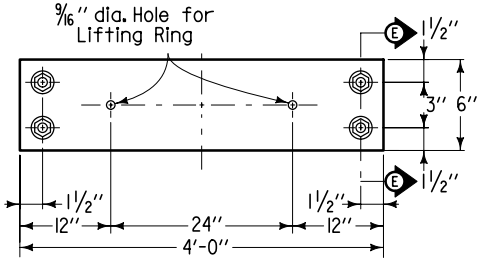
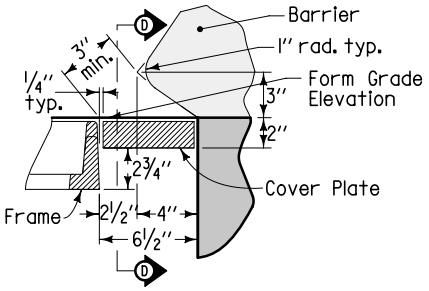
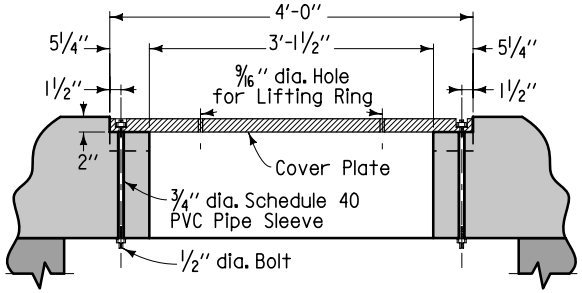
SINGLE-GRATE BARRIER INTAKE, CIRCULAR



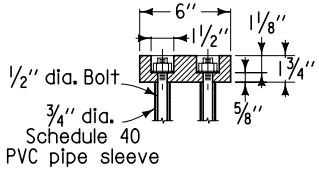
PLAN



SECTION A-A
(LID)

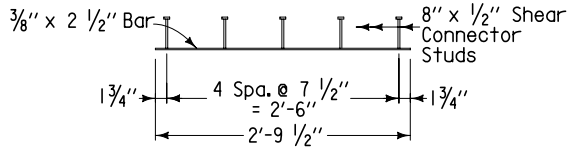


SECTION D-D

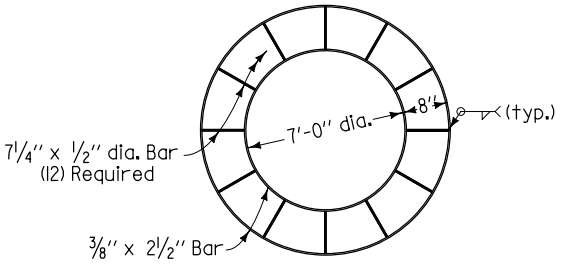


SECTION E-E

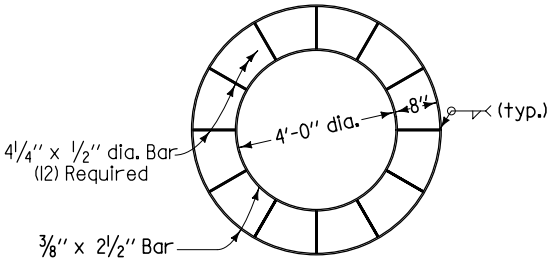
COVER PLATE



FRAME RING
(2 required)



WALL (SHALLOW)



WALL (DEEP)

EDGE ARMOR

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SHEET 3 of 6

REVISIONS: Updated references to renamed standards.

Deanna Maifield
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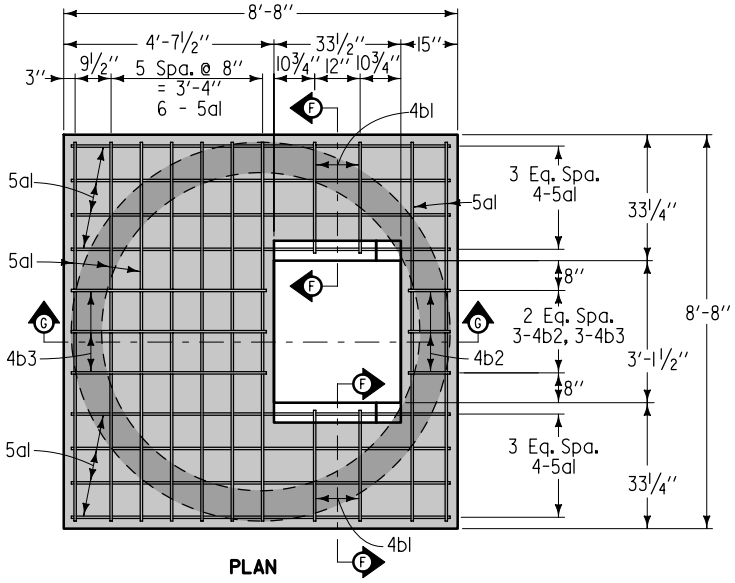
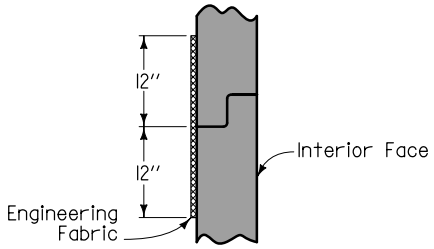
SINGLE-GRATE BARRIER INTAKE, CIRCULAR



PLAN



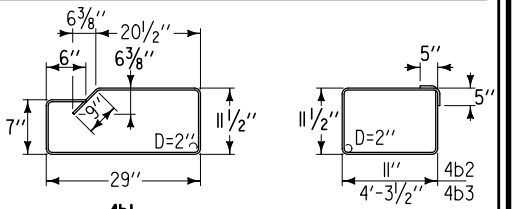
WALL JOINT DETAIL

LID REINFORCING BAR LIST

EPOXY-COATED

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5a1	Lid, Longitudinal & Transverse	——	34	8'-4"	296
4b1	Lid Hoop		4	6'-11"	18
4b2	Lid Hoop		3	4'-7"	9
4b3	Lid Hoop		3	11'-4"	23
	EPOXY COATED REINFORCING STEEL - TOTAL				346

LID BENT BAR DETAILS



NOTE: ALL DIMENSIONS SHOWN OUT TO OUT. D = PIN DIAMETER

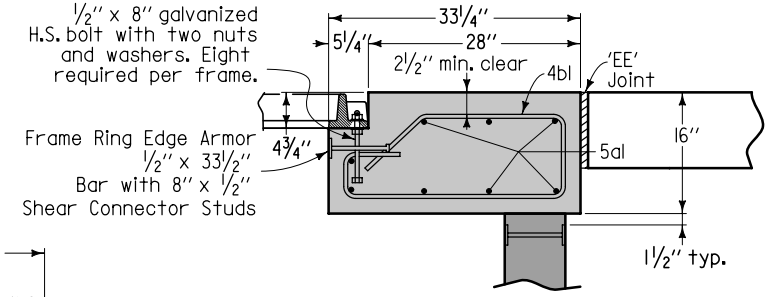
LID QUANTITY SUMMARY (SHALLOW)

Concrete	3.2	CY •
Epoxy Coated Reinforcing Steel	346	LB

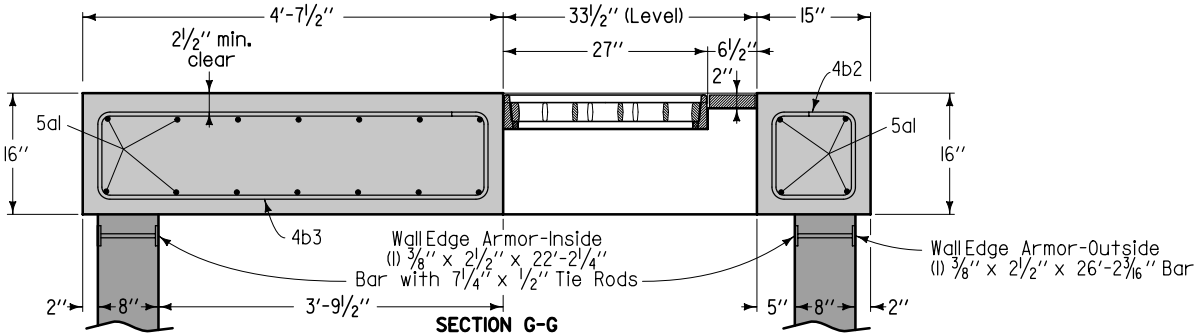
• Based on Minimum thickness = 16"

Maximum Pipe Diameter for Pipes at:

90° Separation	180° Separation
36	48



SECTION F-F



SECTION G-G

LID (SHALLOW)

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SHEET 4 of 6

REVISIONS: Updated references to renamed standards.

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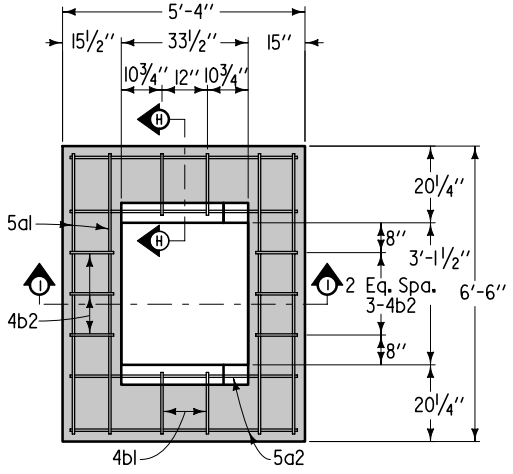
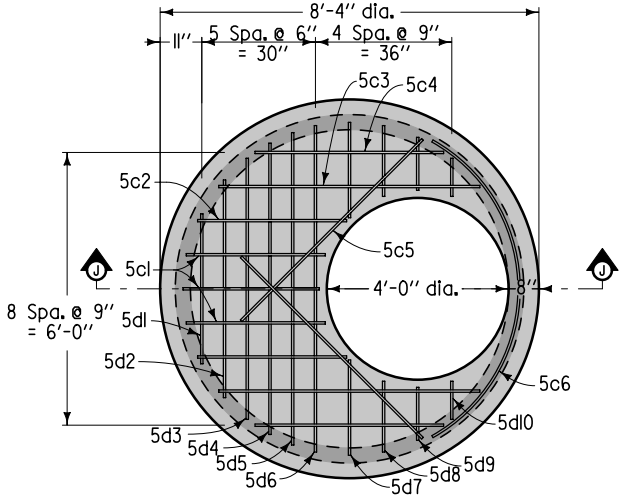
SINGLE-GRATE BARRIER INTAKE, CIRCULAR

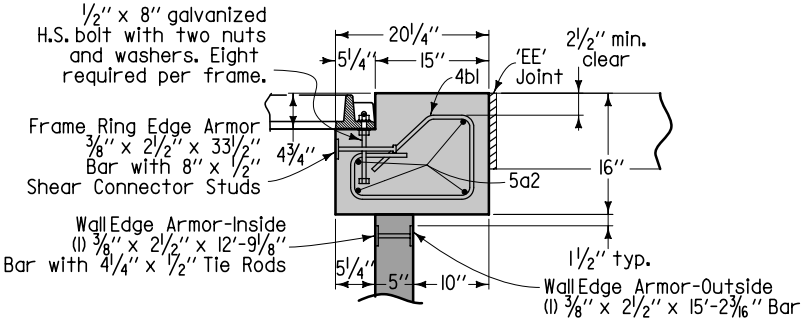


PLAN

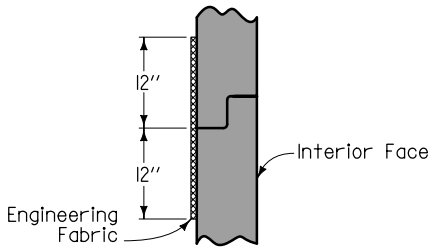


SECTION C-C
INTERMEDIATE LID

LID REINFORCING BAR LIST					
EPOXY-COATED					
BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5a1	Lid, Longitudinal	——	8	6'-2"	51
5a2	Lid, Transverse	——	8	5'-0"	42
4b1	Lid Hoop		4	4'-9"	13
4b2	Lid Hoop		6	4'-7"	18
5c1	Intermediate Lid	——	3	3'-0"	9
5c2	Intermediate Lid	——	2	3'-3"	7
5c3	Intermediate Lid	——	2	5'-9"	12
5c4	Intermediate Lid	——	2	4'-2"	9
5c5	Intermediate Lid	——	2	5'-8"	12
5c6	Intermediate Lid	⌒	1	8'-2"	9
5d1	Intermediate Lid	——	1	3'-5"	4
5d2	Intermediate Lid	——	1	4'-10"	5
5d3	Intermediate Lid	——	1	5'-9"	6
5d4	Intermediate Lid	——	1	6'-5"	7
5d5	Intermediate Lid	——	1	6'-10"	7
5d6	Intermediate Lid	——	1	7'-2"	7
5d7	Intermediate Lid	——	2	2'-1"	4
5d8	Intermediate Lid	——	2	1'-6"	3
5d9	Intermediate Lid	——	2	1'-2"	2
5d10	Intermediate Lid	——	2	0'-11"	2
				EPOXY COATED REINFORCING STEEL - TOTAL	229

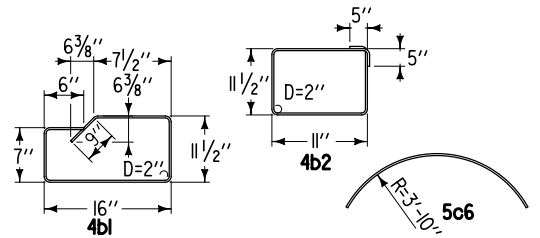


SECTION H-H



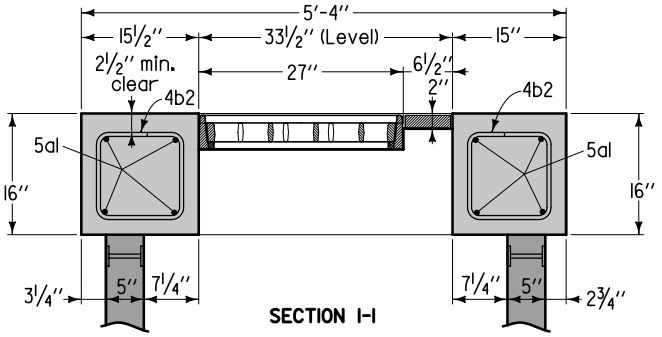
WALL JOINT DETAIL

LID BENT BAR DETAILS

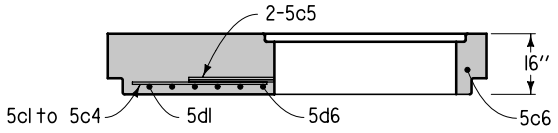


NOTE: ALL DIMENSIONS SHOWN OUT TO OUT. D=PIN DIAMETER

LID QUANTITY SUMMARY (DEEP)	
Concrete - Lid	1.2 CY
Concrete - Intermediate Lid	2.1 CY
Epoxy Coated Reinforcing Steel	229 LB



SECTION I-I



SECTION J-J

LID (DEEP)

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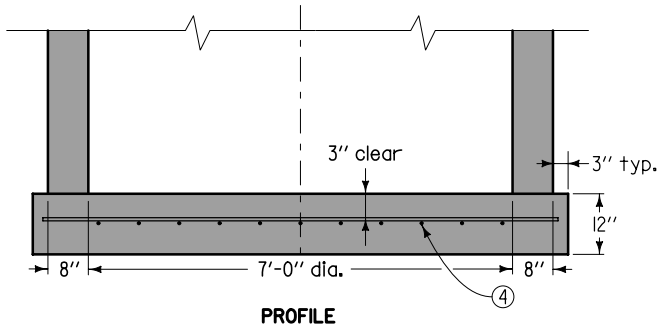
SHEET 5 of 6

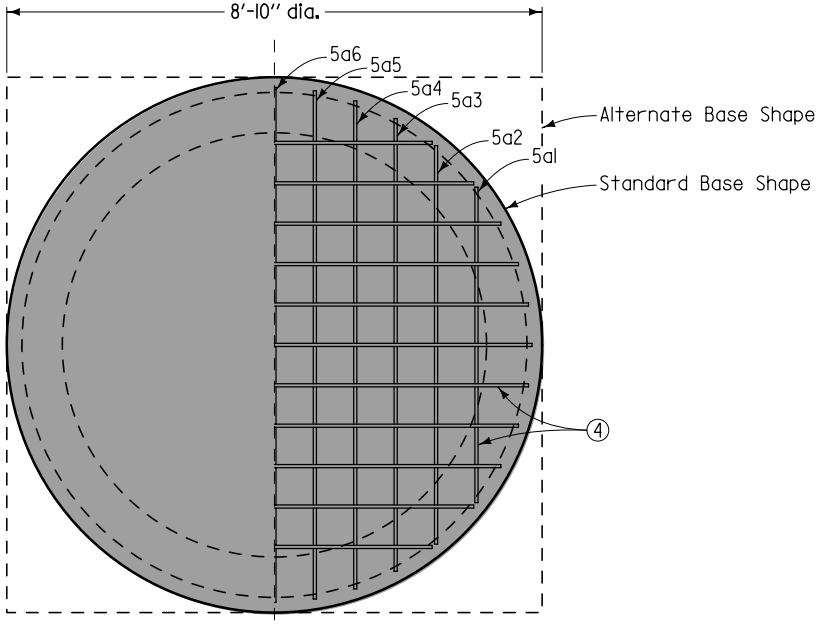
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SINGLE-GRATE BARRIER INTAKE, CIRCULAR



PROFILE



PLAN

BASE

BASE REINFORCING BAR LIST

EPOXY-COATED

BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5a1	Base, Longit. & Transverse	——	4	5'-3"	22
5a2	Base, Longit. & Transverse	——	4	6'-7"	27
5a3	Base, Longit. & Transverse	——	4	7'-6"	31
5a4	Base, Longit. & Transverse	——	4	8'-0"	33
5a5	Base, Longit. & Transverse	——	4	8'-4"	35
5a6	Base, Longit. & Transverse	——	2	8'-6"	18
	EPOXY COATED REINFORCING STEEL - TOTAL				166

BASE QUANTITY SUMMARY

Concrete	2.3 CY •
Epoxy Coated Reinforcing Steel	166 LB •

• Based on Standard Base Shape

④ #5 at 8-inch centers each direction or equivalent welded wire fabric.

⑤ 4el bar length to be pipe diameter plus 12 inches. Place 4el abr inside of vertical reinforcing. Shift main reinforcing bars as required for pipe entrance. Filed cut bars to maintin 3-inch clearance from bottom. Maintain 2-inch clearance from face of walls. Four 4el bars required per pipe entrance.

Iowa Department of Transportation

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SHEET 6 of 6

REVISIONS: Updated references to renamed standards.

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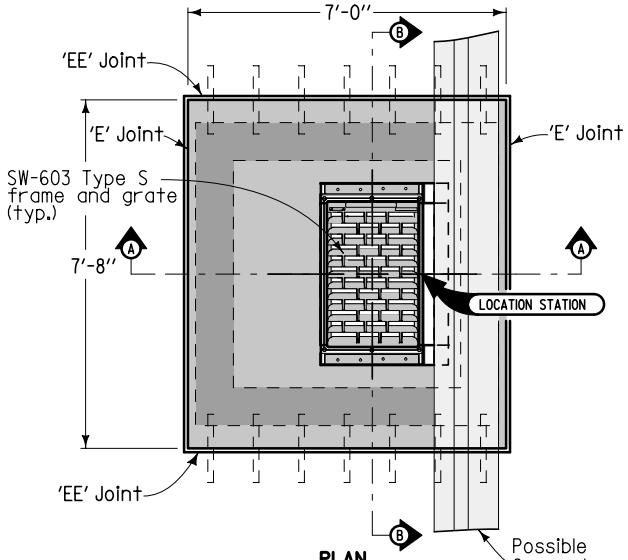
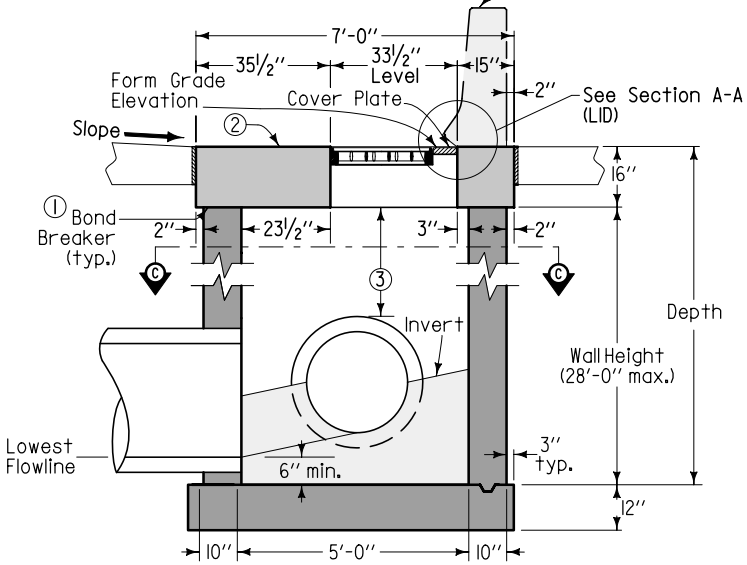
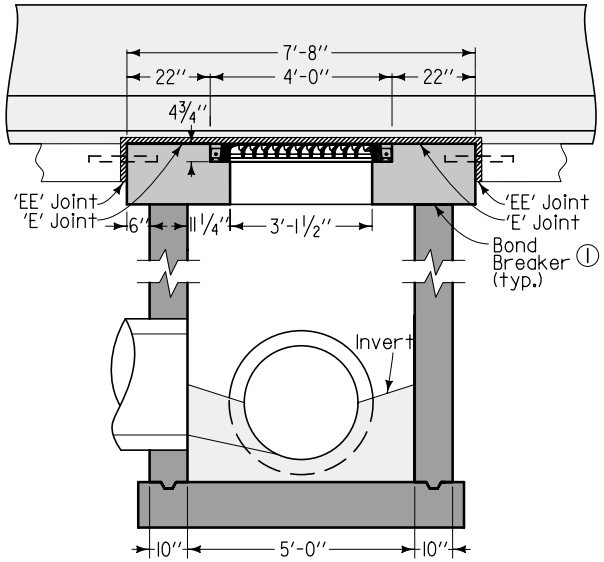
SINGLE-GRATE BARRIER INTAKE, CIRCULAR





SECTION A-A



SECTION B-B

All plate and edge armor steel to be ASTM A 36, galvanized after fabrication.

Remove cover plate before constructing concrete barrier.

Cast frames into intake top so tops of grates are ¼″ below Form Grade Elevation. Bolt intake frames together on both sides with four ½″ x 4″ bolts.

For joint details, refer to PV-101.

① Trowel smooth and place two layers of 30-pound roofing felt to prevent bond.

② Vary slope of top to match elevation of adjacent pavement.

③ 12-inch minimum wall height above all pipes.

Possible Contract Item:

Barrier Intake, SW-549

Possible Tabulation:

104-5B

Iowa Department of Transportation

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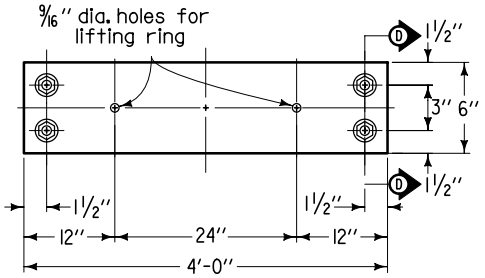
SHEET 1 of 5

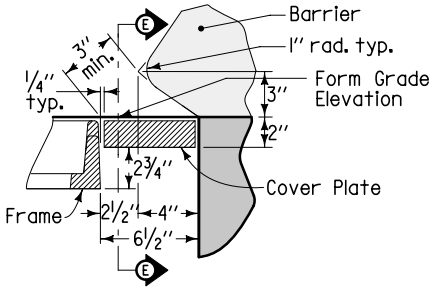
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

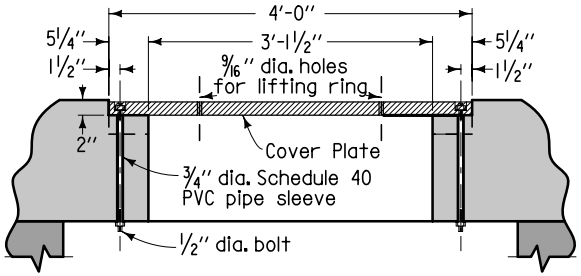
SINGLE-GRATE BARRIER INTAKE, RECTANGULAR



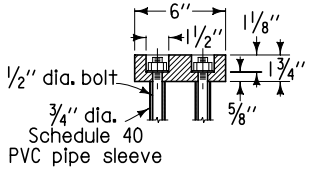
PLAN



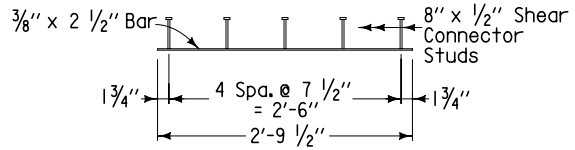
SECTION A-A
(LID)



SECTION E-E



SECTION D-D



FRAME RING
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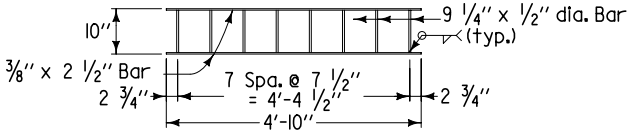

WALL
(4 required)

EDGE ARMOR

COVER PLATE

Iowa Department of Transportation

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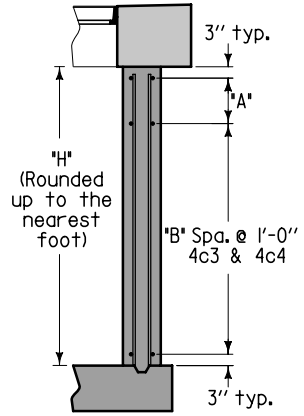
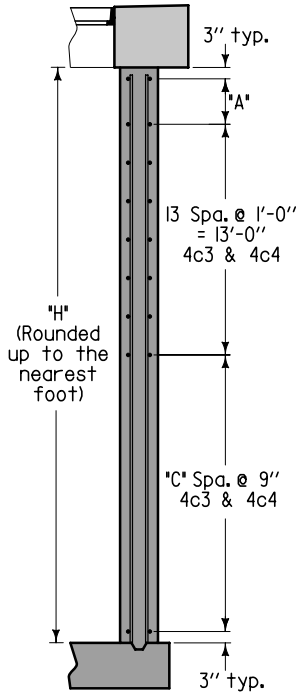
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

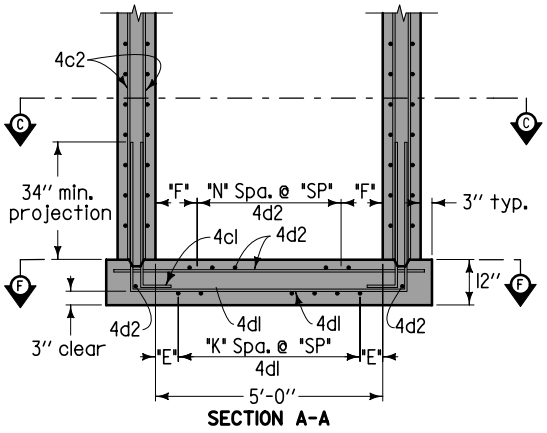
SINGLE-GRATE BARRIER INTAKE, RECTANGULAR



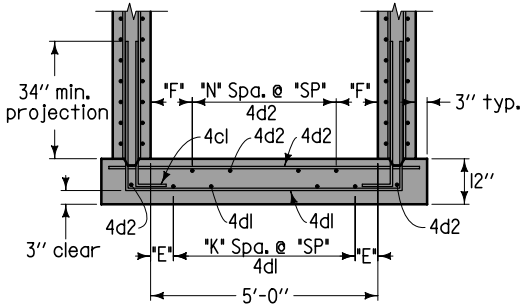
PART SECTION A-A
(Where H = 3' to 14')



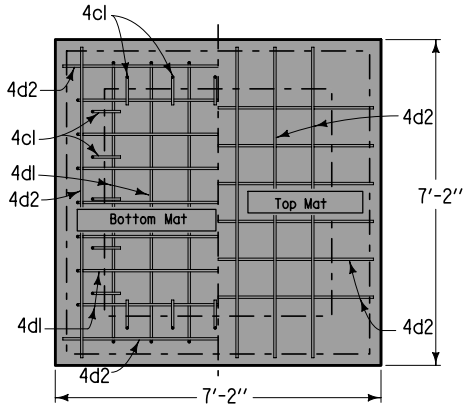
PART SECTION A-A
(Where H = 15' to 28')



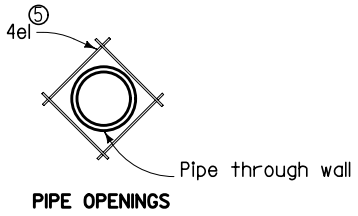
SECTION A-A



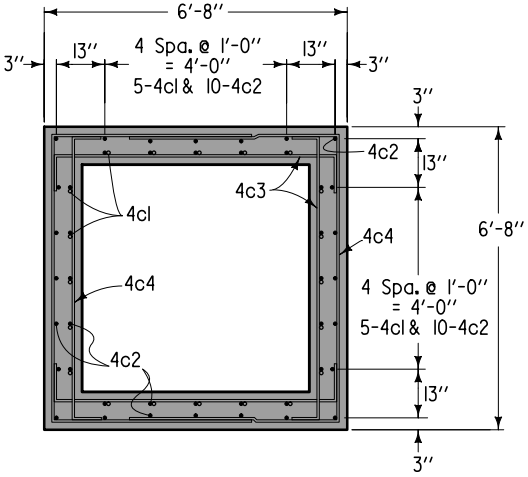
SECTION B-B



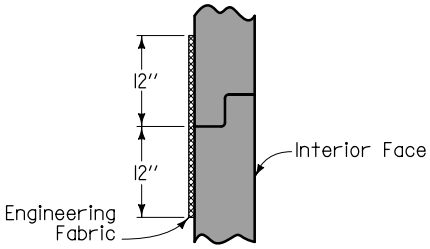
SECTION F-F
BASE REINFORCING



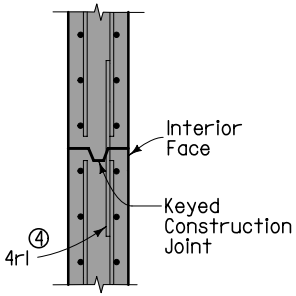
PIPE OPENINGS



SECTION C-C



WALL JOINT DETAIL



C.I.P. WALL
CONSTRUCTION JOINT

④ Install 4rl x 3'-0" dowel bars at 12-inch spacing at all wall joints. Twenty-four 4rl bars required per joint, total weight = 48 lbs.

⑤ 4el bar length to be pipe diameter plus 12 inches. Place 4el bar inside of vertical reinforcing. Shift main reinforcing bars as required for pipe entrance. Field cut bars to maintain 3-inch clearance from bottom and 2-inch clearance from face of walls. Four 4el bars required per pipe entrance.

Iowa Department of Transportation

REVISION
3 | 04-19-11

STANDARD ROAD PLAN

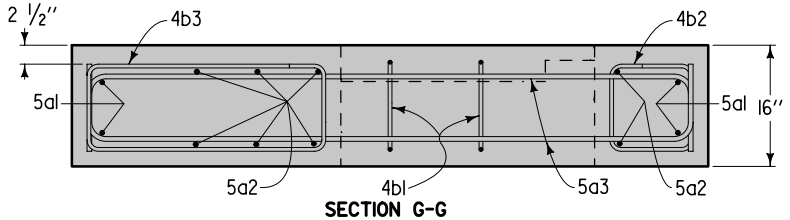
SW-549

SHEET 3 of 5

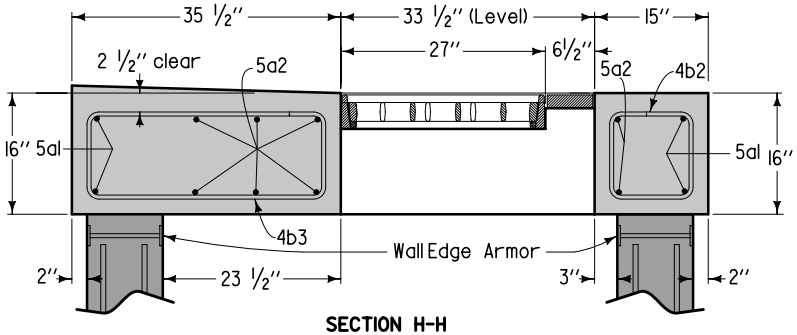
REVISIONS: Updated references to renamed standards.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

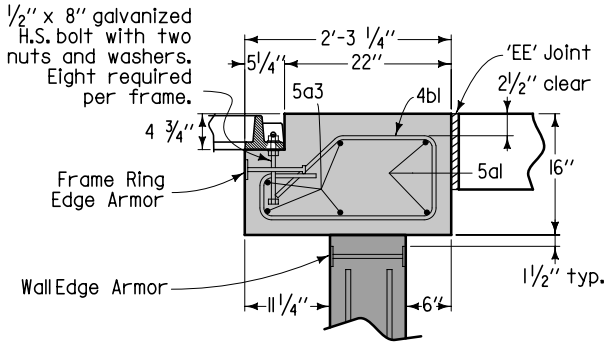
SINGLE-GRATE BARRIER INTAKE, RECTANGULAR



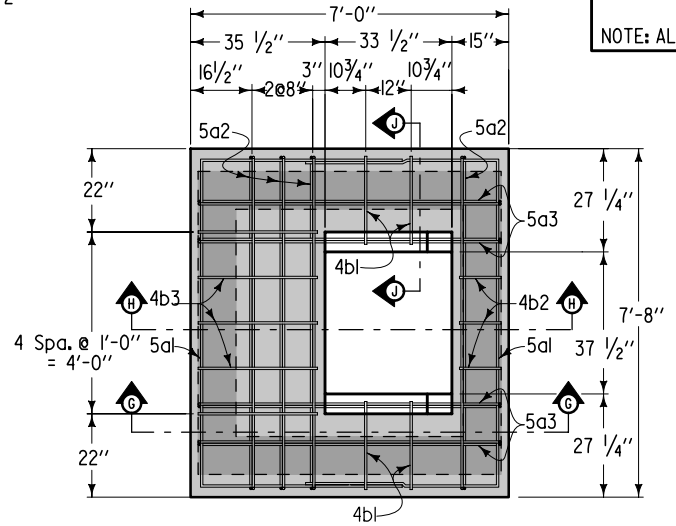
SECTION G-G



SECTION H-H



SECTION J-J

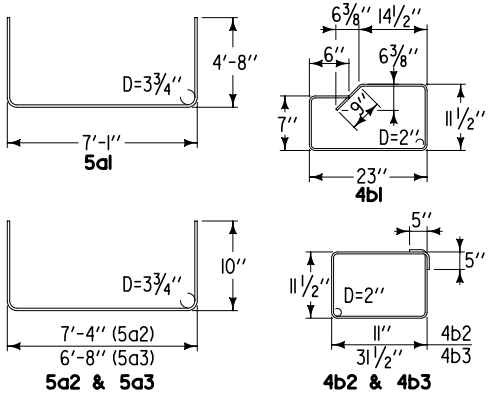


LID PLAN

LID

LID REINFORCING BAR LIST					
EPOXY-COATED					
BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT (lb.)
5a1	Lid, Exterior, Edge		4	16'-5	68
5a2	Lid, Interior, Longitudinal		8	9'-0	75
5a3	Lid, Interior, Transverse		8	8'-4	70
4b1	Lid Hoop		4	5'-11	16
4b2	Lid Hoop		3	4'-7	9
4b3	Lid Hoop		5	8'-0	27
	EPOXY COATED REINFORCING STEEL - TOTAL				265

LID BENT BAR DETAILS



NOTE: ALL DIMENSIONS SHOWN OUT TO OUT. D = PIN DIAMETER

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
3	04-19-11

SW-549

SHEET 4 of 5

REVISIONS: Updated references to renamed standards.

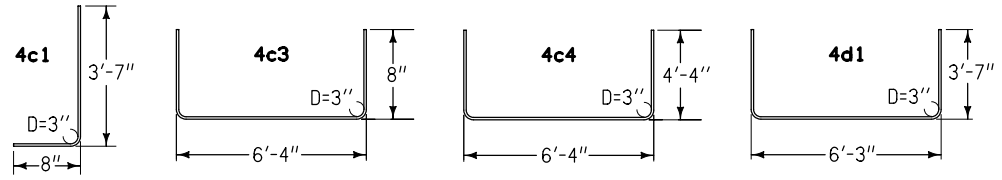
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SINGLE-GRATE BARRIER INTAKE, RECTANGULAR

VARIABLE DIMENSIONS AND QUANTITIES

Dimensions				Bar List																		Quantities				
⑥	⑦			4c1		4c2		4c3 ⑧				4c4 ⑧				4d1				4d2				Concrete - Cu. Yds.				Steel
								No. of Spaces				No. of Spaces															
"H" (Ft.)	"A" (In.)	"E" (In.)	"F" (In.)	NO.	L	NO.	L	"B"	"C"	NO.	L	"B"	"C"	NO.	L	SP	"K"	NO.	L	SP	"N"	NO.	L	BASE	LID	WALLS	TOTAL	TOTAL LBS.
3	6	3"	7½"	20	4'-3"	--	--	2	--	16	7'-8"	2	--	8	15'-0"	9"	6	14	13'-5"	9"	5	16	6'-10"	1.9	2.2	2.2	6.3	682
4	6	3"	7½"	20	4'-3"	44	3'-10"	3	--	20	7'-8"	3	--	10	15'-0"	9"	6	14	13'-5"	9"	5	16	6'-10"	1.9	2.2	2.9	7.0	835
5	6	3"	7½"	20	4'-3"	44	4'-10"	4	--	24	7'-8"	4	--	12	15'-0"	9"	6	14	13'-5"	9"	5	16	6'-10"	1.9	2.2	3.6	7.7	905
6	6	3"	7½"	20	4'-3"	44	5'-10"	5	--	28	7'-8"	5	--	14	15'-0"	9"	6	14	13'-5"	9"	5	16	6'-10"	1.9	2.2	4.3	8.4	974
7	6	3"	7½"	20	4'-3"	44	6'-10"	6	--	32	7'-8"	6	--	16	15'-0"	9"	6	14	13'-5"	9"	5	16	6'-10"	1.9	2.2	5.0	9.1	1,045
8	6	3"	7½"	20	4'-3"	44	7'-10"	7	--	36	7'-8"	7	--	18	15'-0"	9"	6	14	13'-5"	9"	5	16	6'-10"	1.9	2.2	5.8	9.9	1,114
9	6	3"	7½"	20	4'-3"	44	8'-10"	8	--	40	7'-8"	8	--	20	15'-0"	9"	6	14	13'-5"	9"	5	16	6'-10"	1.9	2.2	6.5	10.6	1,185
10	6	3"	7½"	20	4'-3"	44	9'-10"	9	--	44	7'-8"	9	--	22	15'-0"	9"	6	14	13'-5"	9"	5	16	6'-10"	1.9	2.2	7.2	11.3	1,254
11	6	2"	6"	20	4'-3"	44	10'-10"	10	--	48	7'-8"	10	--	24	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	7.9	12.0	1,351
12	6	2"	6"	20	4'-3"	44	11'-10"	11	--	52	7'-8"	11	--	26	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	8.6	12.7	1,422
13	6	2"	6"	20	4'-3"	44	12'-10"	12	--	56	7'-8"	12	--	28	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	9.4	13.5	1,492
14	6	2"	6"	20	4'-3"	44	13'-10"	13	--	60	7'-8"	13	--	30	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	10.1	14.2	1,562
15	9	2"	6"	20	4'-3"	44	14'-10"	13	1	64	7'-8"	13	1	32	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	10.8	14.9	1,632
16	12	2"	6"	20	4'-3"	44	15'-10"	13	2	68	7'-8"	13	2	34	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	11.5	15.6	1,701
17	6	2"	6"	20	4'-3"	44	16'-10"	13	4	76	7'-8"	13	4	38	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	12.2	16.3	1,812
18	9	2"	6"	20	4'-3"	44	17'-10"	13	5	80	7'-8"	13	5	40	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	13.0	17.1	1,882
19	12	2"	6"	20	4'-3"	44	18'-10"	13	6	84	7'-8"	13	6	42	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	13.7	17.8	1,952
20	6	2"	6"	20	4'-3"	44	19'-10"	13	8	92	7'-8"	13	8	46	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	14.4	18.5	2,062
21	9	2"	6"	20	4'-3"	44	20'-10"	13	9	96	7'-8"	13	9	48	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	15.1	19.2	2,132
22	12	2"	6"	20	4'-3"	44	21'-10"	13	10	100	7'-8"	13	10	50	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	15.8	19.9	2,202
23	6	2"	6"	20	4'-3"	44	22'-10"	13	12	108	7'-8"	13	12	54	15'-0"	8"	7	16	13'-5"	8"	6	18	6'-10"	1.9	2.2	16.6	20.7	2,312
24	9	2"	5½"	20	4'-3"	44	23'-10"	13	13	112	7'-8"	13	13	56	15'-0"	7"	8	18	13'-5"	7"	7	20	6'-10"	1.9	2.2	17.3	21.4	2,410
25	12	2"	5½"	20	4'-3"	44	24'-10"	13	14	116	7'-8"	13	14	58	15'-0"	7"	8	18	13'-5"	7"	7	20	6'-10"	1.9	2.2	18.0	22.1	2,479
26	6	2"	5½"	20	4'-3"	44	25'-10"	13	16	124	7'-8"	13	16	62	15'-0"	7"	8	18	13'-5"	7"	7	20	6'-10"	1.9	2.2	18.7	22.8	2,589
27	9	2"	5½"	20	4'-3"	44	26'-10"	13	17	128	7'-8"	13	17	64	15'-0"	7"	8	18	13'-5"	7"	7	20	6'-10"	1.9	2.2	19.4	23.5	2,660
28	12	2"	5½"	20	4'-3"	44	27'-10"	13	18	132	7'-8"	13	18	66	15'-0"	7"	8	18	13'-5"	7"	7	20	6'-10"	1.9	2.2	20.2	24.3	2,729

BENT BAR DETAILS



NOTE: ALL DIMENSIONS SHOWN OUT TO OUT. D = PIN DIAMETER

⑥ A = First bar spacing at top of wall. Minimum spacing is 3 inches. Maximum spacing is 12 inches. Adjust as necessary.

⑦ See Section A-A on sheet 2 for spacing.

⑧ Quantity includes 265 lbs. for lid.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 3 04-19-11

SW-549

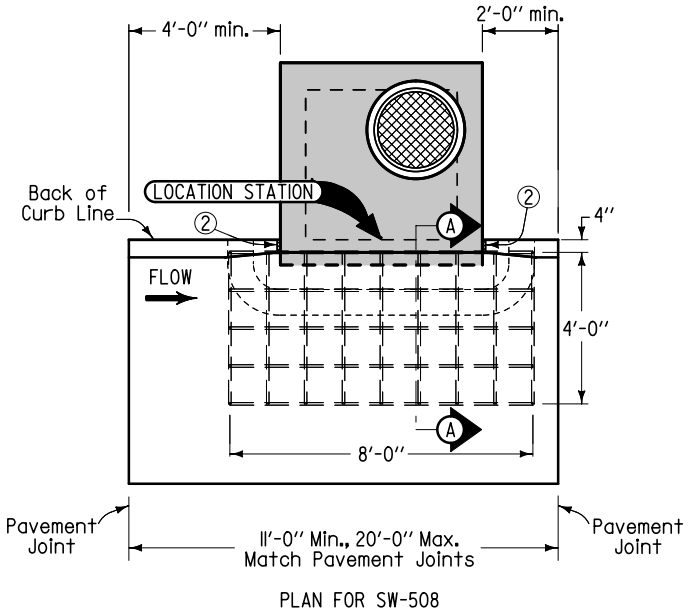
SHEET 5 of 5

REVISIONS: Updated references to renamed standards.

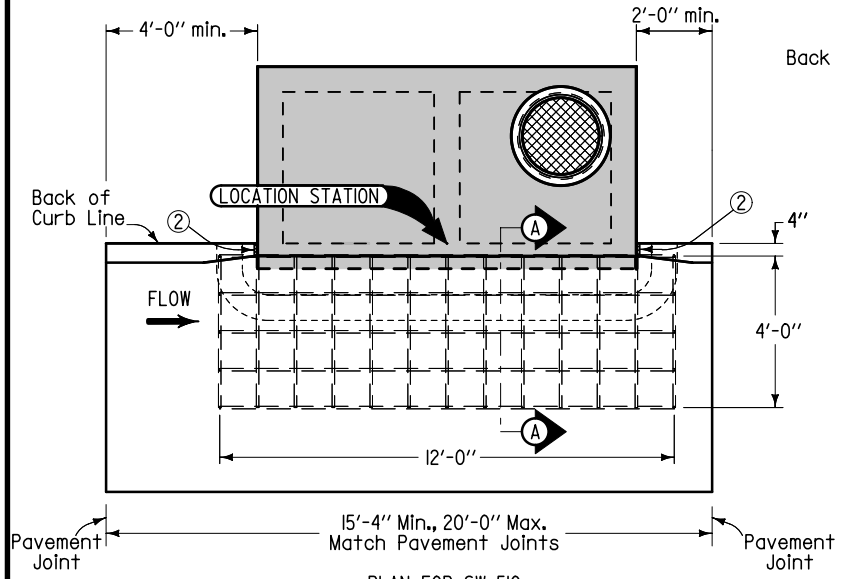
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SINGLE-GRATE BARRIER INTAKE, RECTANGULAR

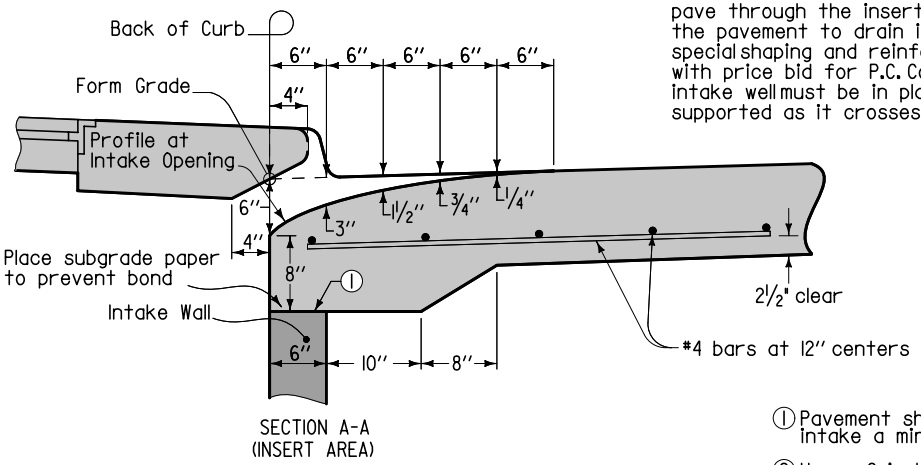
REINFORCEMENT



PLAN FOR SW-508



PLAN FOR SW-510



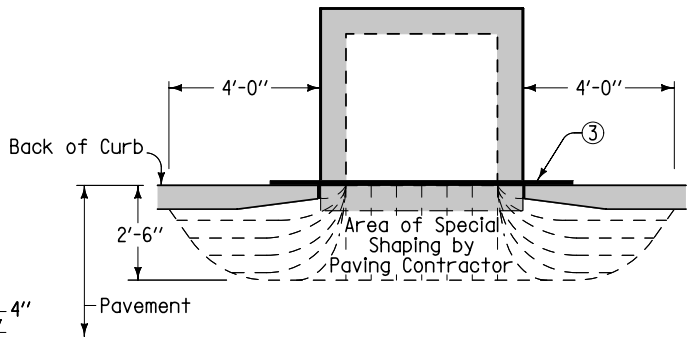
SECTION A-A
(INSERT AREA)

This alternate method eliminates the need for boxouts at intakes. It requires the Contractor to pave through the insert area and special shape the pavement to drain into the intake. Include special shaping and reinforcement of insert area with price bid for P.C. Concrete Pavement. The intake well must be in place and the paver supported as it crosses over the intake well.

① Pavement shall rest on front wall of intake a minimum of 4 inches.

② Use a 2 inch thick resilient joint filler between the curb and intake top.

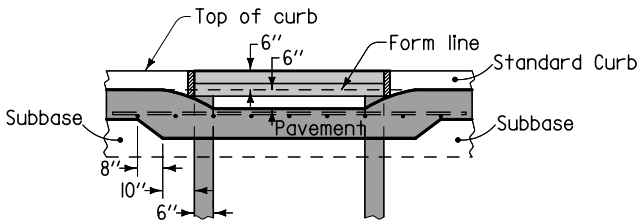
③ Form used as a guide for shaping.



PLAN FOR SPECIAL SHAPING of INTAKE THROAT

REINFORCING BAR LIST

Type	Size	No. of Bars	Length	WT. (lbs.)
SW-508	4	14	76′	51
SW-510	4	18	112′	75



ELEVATION FOR SPECIAL SHAPING of INTAKE THROAT

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-20-10

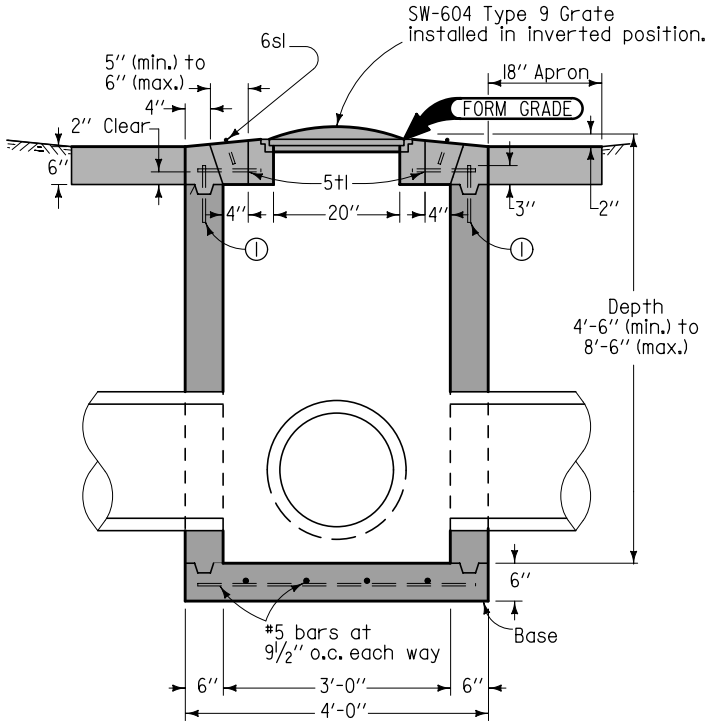
SW-550

SHEET 1 of 1

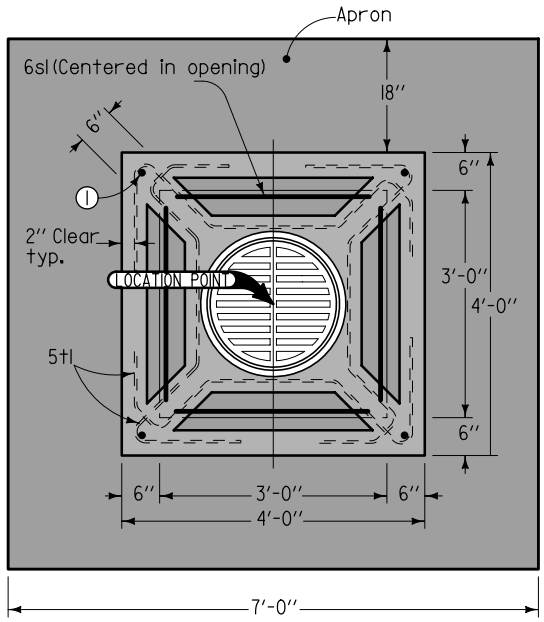
REVISIONS: New. Replaces RA-71. Changed intake wall thickness dimensions.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

ALTERNATE CONSTRUCTION METHOD (SW-508 AND SW-510 INTAKE)

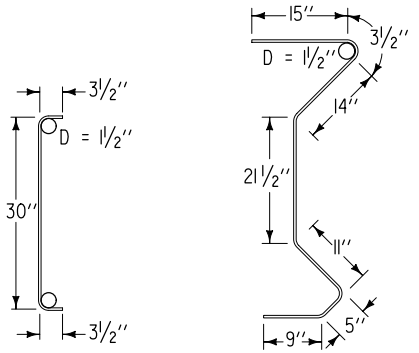


TYPICAL SECTION



PLAN

BENT BAR DETAILS



6sl
(4 bars required)

5tl
(4 bars required)

NOTE: ALL DIMENSIONS SHOWN OUT TO OUT.
D = PIN DIAMETER

Top unit of intake may be poured in field or precast. Alignment hole shall be 1 inch in diameter and 3 inches deep (placed 3 inches from each side at corners of unit) if precast.

(1) #6 X 9 inch alignment pins (4 bars required). Alignment pins required only when top is precast

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
NEW	10-20-09

SW-562

SHEET 1 of 1

REVISIONS: New. Replaces RA-62.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

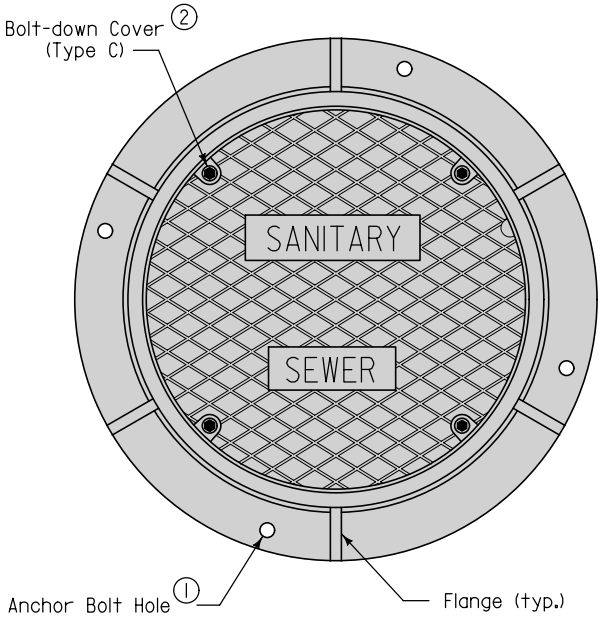
VERTICAL THROAT AREA INTAKE

TYPE A

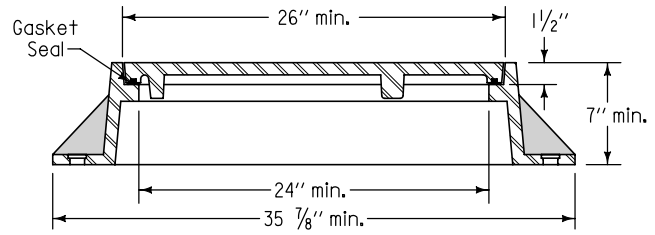
Two-piece fixed casting

TYPE C

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



PLAN



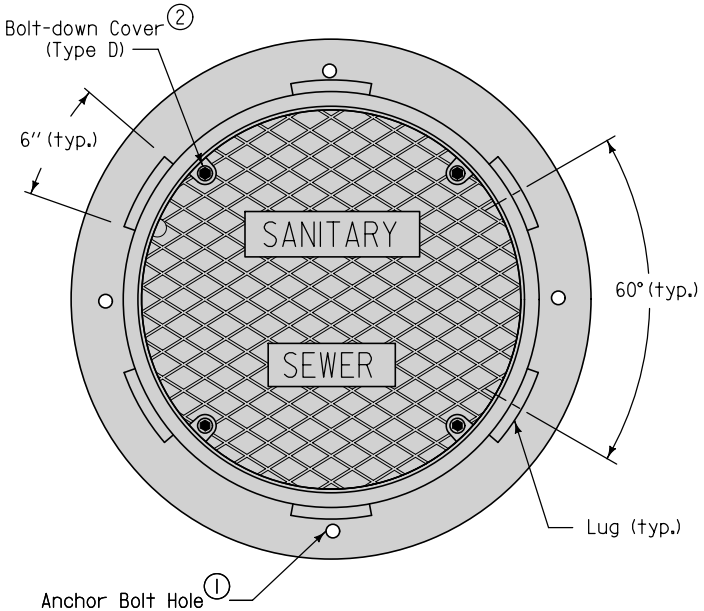
TYPICAL SECTION

TYPE B

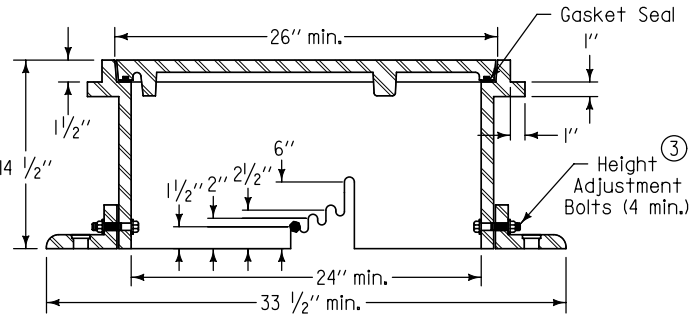
Three-piece floating casting

TYPE D

Three-piece floating casting with bolt-down cover (2)



PLAN



TYPICAL SECTION

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

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

(1) When the contract documents require the frame to be attached to the structure, drill four 7/8" diameter holes or slots, equally spaced around frame.

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

(3) Remove bolts upon completion of paving.

SUDAS	Iowa Department of Transportation	REVISION 1 10-20-09
FIGURE 6010.601	STANDARD ROAD PLAN	SW-601
		SHEET 1 of 1

REVISIONS: Changed note 1 and added shading.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

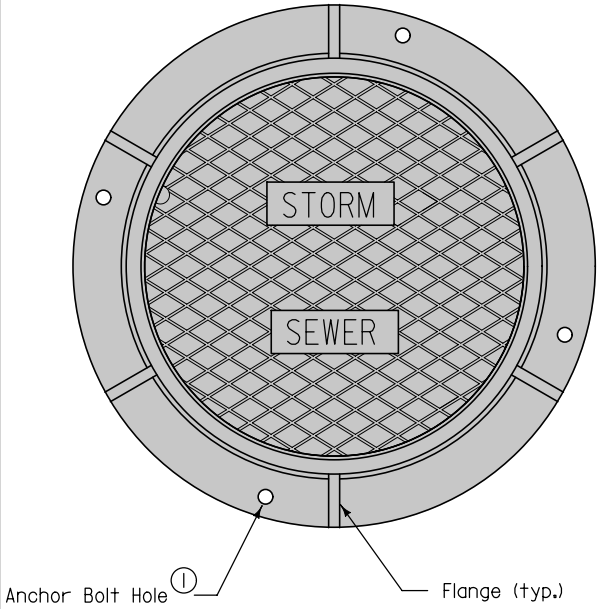
CASTINGS FOR SANITARY SEWER MANHOLES

FIGURE 6010.601 | SHEET 1 OF 1

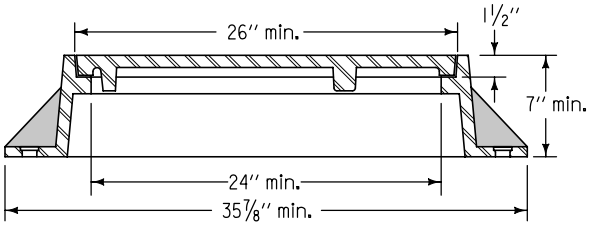
DESIGNER INFO

TYPE E

Two-piece fixed casting



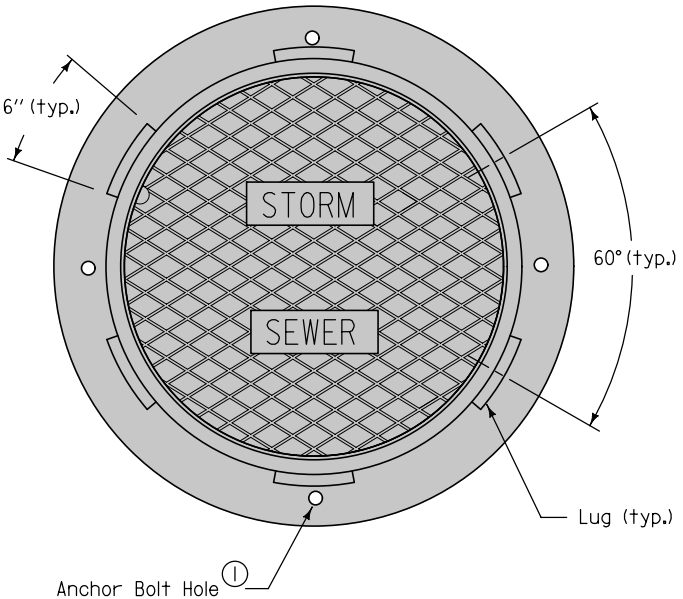
PLAN



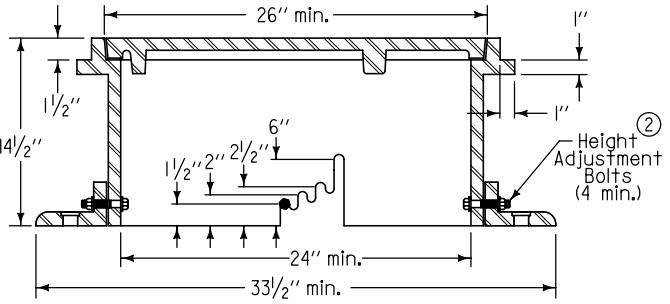
TYPICAL SECTION

TYPE F

Three-piece floating casting



PLAN



TYPICAL SECTION

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

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

① When the contract documents require the frame to be attached to the structure, drill four ⅞" diameter holes or slots, equally spaced around frame.

② Remove bolts upon completion of paving.

SUDAS	Iowa Department of Transportation	REVISION 1 10-20-09
FIGURE 6010.602	STANDARD ROAD PLAN	SW-602
		SHEET 1 of 2

REVISIONS: Changed note 1 and added shading.

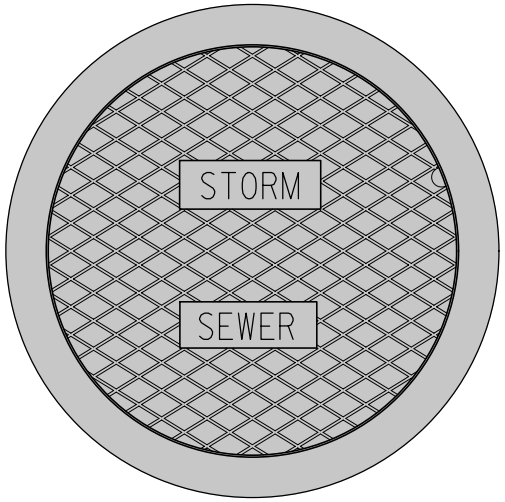
SUDAS DIRECTOR — DESIGN METHODS ENGINEER Deanna Maifield

CASTINGS FOR STORM SEWER MANHOLES

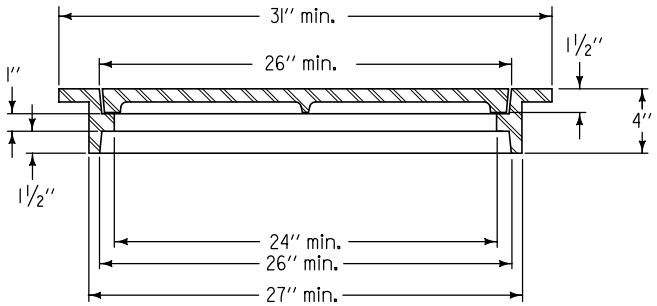
FIGURE 6010.602 SHEET 1 OF 2

TYPE G

Two-piece fixed casting



PLAN



TYPICAL SECTION

FIGURE 6010.602 SHEET 2 OF 2

SUDAS | Iowa Department of Transportation

REVISION 1 10-20-09

FIGURE 6010.602 STANDARD ROAD PLAN

SW-602

SHEET 2 of 2

REVISIONS: Changed note 1 and added shading.

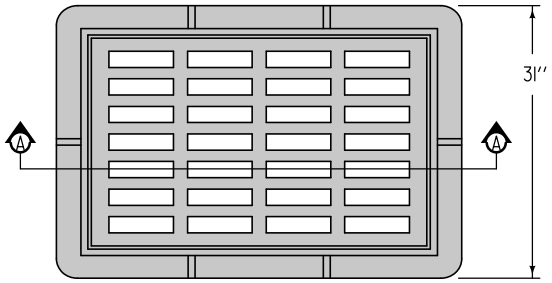
SUDAS DIRECTOR

Deanna Maifield
DESIGN METHODS ENGINEER

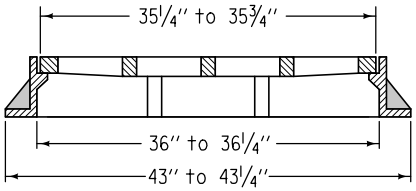
CASTINGS FOR
STORM SEWER MANHOLES

TYPE Q ①

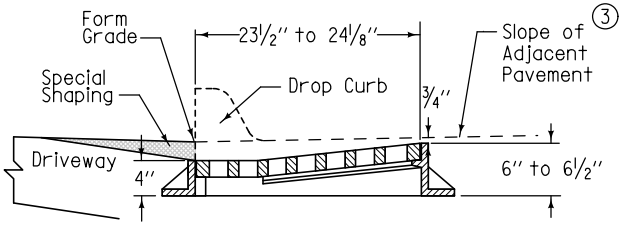
Driveway Grate
(Minimum open area 370 in^2)



PLAN



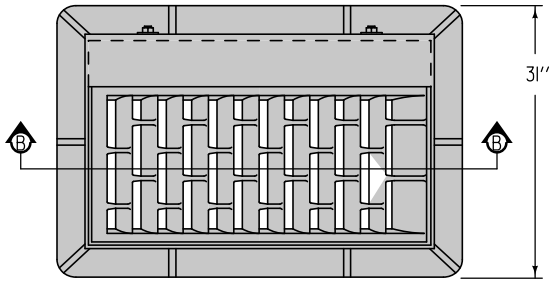
SECTION A-A



TYPICAL SECTION

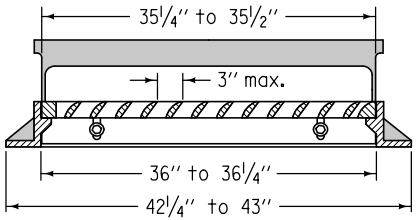
TYPE R ②

Curb Inlet Grate
(Minimum open area 180 in^2)

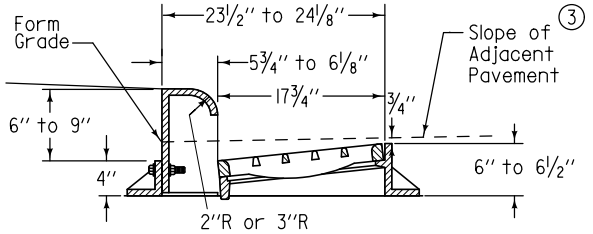


PLAN

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 Department of Transportation	REVISION 2 04-17-12
FIGURE 6010.603	STANDARD ROAD PLAN	SW-603
		SHEET 1 of 2

REVISIONS: Modified dimensions on Type 'Q' and Type 'R' grates.

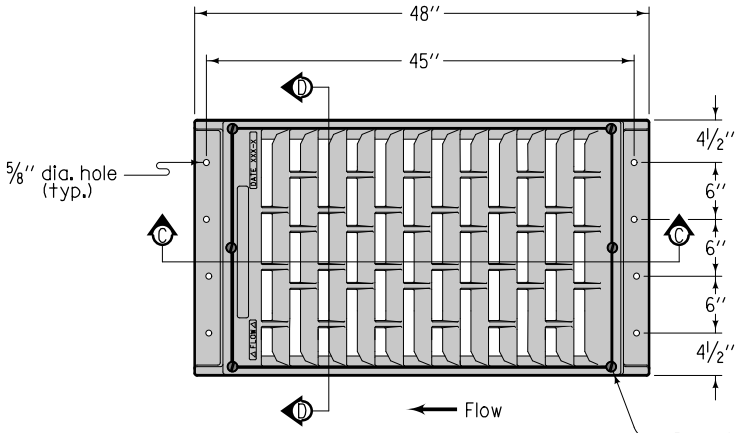
Paul D. Wiegand — SUDAS DIRECTOR
Deanna Maifield — DESIGN METHODS ENGINEER

CASTINGS FOR GRATE INTAKES

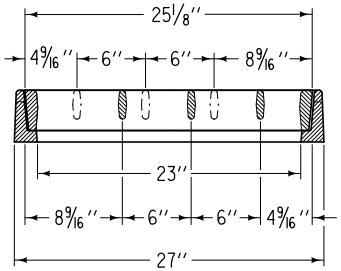
FIGURE 6010.603 SHEET 1OF 2

TYPE S ②④

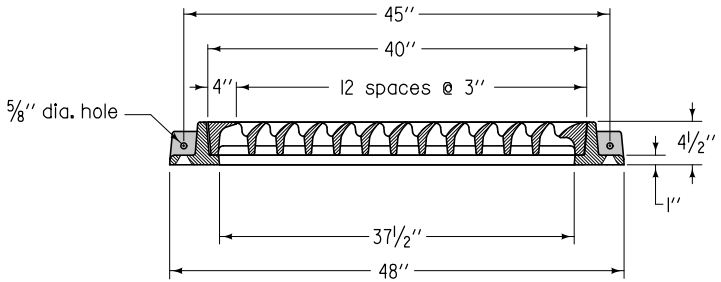
Barrier Intake Grate
(Minimum open area 300 in^2)



PLAN



SECTION D-D



SECTION C-C

② Provide bicycle-safe vane-style grate. At low points, grates with vanes facing both directions of flow are allowed.

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

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

SUDAS | Iowa Department of Transportation | REVISION 2 04-17-12

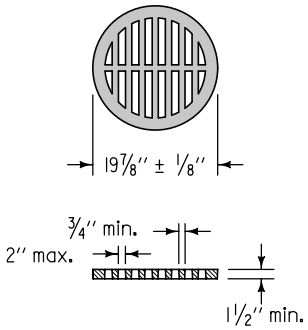
FIGURE 6010.603 | STANDARD ROAD PLAN | SW-603 | SHEET 2 of 2

REVISIONS: Modified dimensions on Type 'Q' and Type 'R' grates.

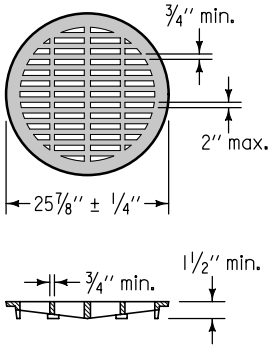
Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

CASTINGS FOR GRATE INTAKES

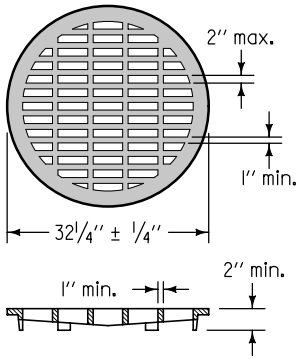
TYPE 4



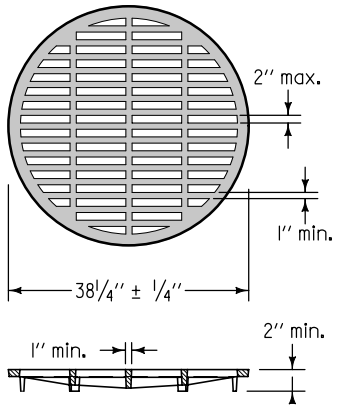
TYPE 4A
For Placement on 18" RCP



TYPE 4B
For Placement on 24" RCP

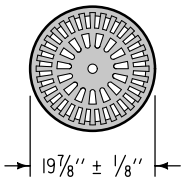


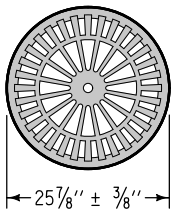
TYPE 4C
For Placement on 30" RCP

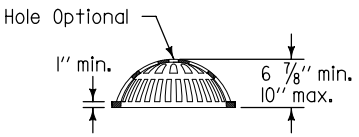


TYPE 4D
For Placement on 36" RCP

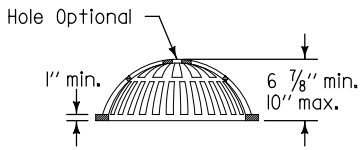
TYPE 3
(Light Duty)





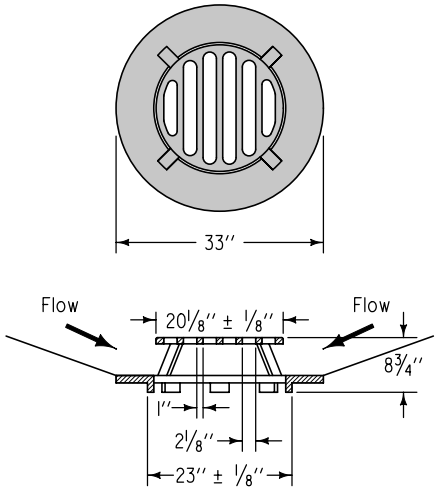


TYPE 3A
For Placement on 18" RCP



TYPE 3B
For Placement on 24" RCP

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



SUDAS	Iowa Department of Transportation	REVISION 1 10-20-09
FIGURE 6010.604	STANDARD ROAD PLAN	SW-604 SHEET 1 of 2

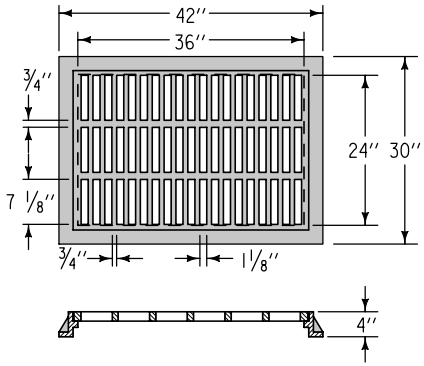
REVISIONS: Added Type 9 Grate to sheet 2. Added shading.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER

CASTINGS FOR AREA INTAKES

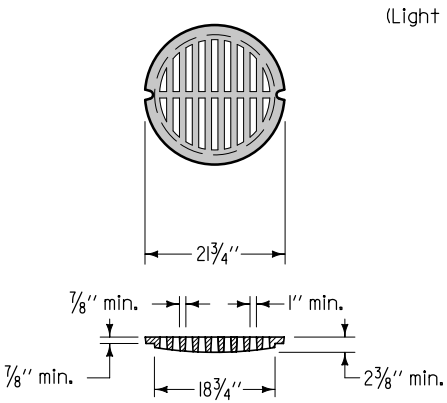
FIGURE 6010.604 SHEET 1OF 2

TYPE 6



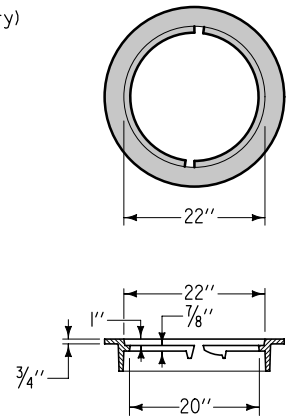
TYPE 9

(Light Duty)



GRATE ①

Minimum Weight = 85 lbs.



FRAME

Minimum Weight = 75 lbs.

① Cast grate without locking lugs so it may be used in an inverted position.

FIGURE 6010.604 SHEET 2 OF 2

SUDAS	Iowa Department of Transportation	REVISION 1 10-20-09
FIGURE 6010.604	STANDARD ROAD PLAN	SW-604 SHEET 2 of 2

REVISIONS: Added Type 9 Grate to sheet 2. Added shading.

SUDAS DIRECTOR — DESIGN METHODS ENGINEER Deanna Maifield

CASTINGS FOR AREA INTAKES

Traffic Control

TC

SECTION

Traffic Control

TC

NO.	DATE	TITLE
		Two-Lane and Multi-Lane Roadways
TC-1	10-18-11	Work Not Affecting Traffic (Two-Lane or Multi-Lane)
TC-30	04-17-12	Closure of Continuous Two-Way Left Turn Lane
TC-61	04-17-12	Two-Lane, Two-Way Operation
TC-62	04-17-12	Permanent Two-Lane to Four-Lane Divided Transition
TC-63	04-17-12	Lane Closure at Auxilliary Lane.
TC-64	04-17-12	Lane Closure at Two-Lane to Four-Lane Transition with Flagger
		Two-Lane Roadways
TC-202	04-17-12	Shoulder Closure (One Lane)
TC-203	04-17-12	Aerial Seeding Operations
TC-211	04-17-12	Lane Closure on Low Volume Roadway
TC-212	04-17-12	Spot Location Lane Closure with Flaggers
TC-213	04-17-12	Lane Closure with Flaggers
TC-214	04-17-12	Lane Closure with Flaggers for use with Pilot Car
TC-215	04-17-12	Lane Closure with Signals (Up to Three Days)
TC-216	04-17-12	Lane Closure with Signals
TC-217	10-19-10	Lane Closure with Signals and TBR
TC-218	04-17-12	Lane Closure with Pilot Car and Flagger Operated Signals
TC-228	04-17-12	Lane Closure Utilizing Continuous Two-Way Left Turn Lane
TC-231	10-16-07	Slow Moving Vehicle Operating in the Traffic Lane
TC-232	04-17-12	Shoulder Rumble Strip Operations
TC-233	10-18-11	Pavement Marking Operations Two-Lane
TC-251	04-17-12	Temporary Road Closure
TC-252	04-17-12	Routes Closed to Traffic
TC-253	04-17-12	Paved On-Site Detour
TC-271	04-19-11	Signalized Equipment Crossing
TC-272	04-17-12	Unsignalized Equipment Crossing

Traffic Control

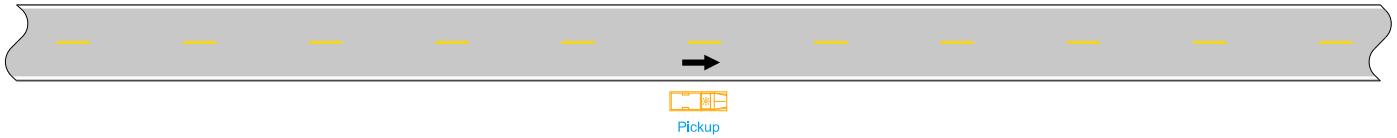
NO.	DATE	TITLE
TC-273	04-20-10	Construction Site Entrance
TC-282	04-19-11	Uneven Lanes
TC-283	10-18-11	Surveying Operations
		Multi-Lane Roadways
TC-402	04-17-12	Shoulder Closure (Multi-Lane)
TC-403	04-17-12	Aerial Seeding Operations
TC-416	04-17-12	Partial Lane Closure on Ramps
TC-417	04-17-12	Ramp Closure
TC-418	04-17-12	Lane Closure on Divided Highway
TC-419	04-17-12	Lane Closure on Undivided Highway
TC-420	04-17-12	Lane Closure at Ramps
TC-421	04-17-12	Lane Closure with TBR
TC-422	04-17-12	Closure of Two Adjacent Lanes on Divided Highway
TC-423	04-17-12	Closure of Two Adjacent Lanes on Undivided Highway
TC-429	04-17-12	Closure of Continuous Two-Way Left Turn Lane and Adjacent Lane
TC-431	04-17-12	Slow Moving Vehicle Operating in the Traffic Lane
TC-432	04-17-12	Shoulder Rumble Strip Operations
TC-433	10-18-11	Pavement Marking Operations
TC-451	04-17-12	Temporary Road Closure on Divided Highway
TC-454	04-17-12	Temporary Detour Using Ramps on Divided Highway
TC-482	04-19-11	Uneven Lanes
TC-601	10-18-11	Pedestrian Detour
TC-602	10-18-11	Sidewalk Diversion

Do not allow work to interfere with the flow of traffic.

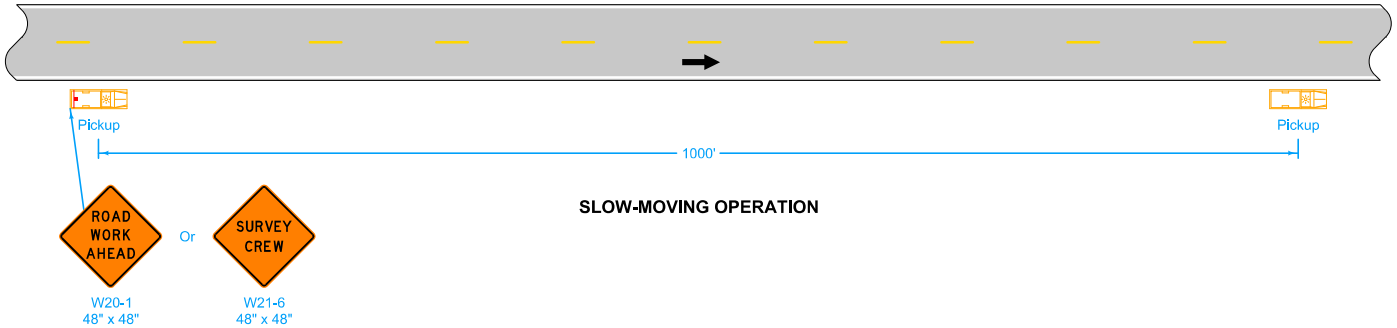
When parked, locate vehicles as far from the open traffic lane as possible. Entrances and driveways should be used whenever appropriate.

Equip all vehicles with an amber Vehicle Warning Light.

(1) For work lasting longer than one hour, refer to TC-202 or TC-402.



VEHICLE STOPPED ON SHOULDER FOR LESS THAN ONE HOUR (1)



SLOW-MOVING OPERATION

LEGEND

- Traffic Sign
- Direction of Traffic

Possible Contract Item:
Traffic Control

Iowa Department of Transportation

REVISION	
1	10-18-11

STANDARD ROAD PLAN

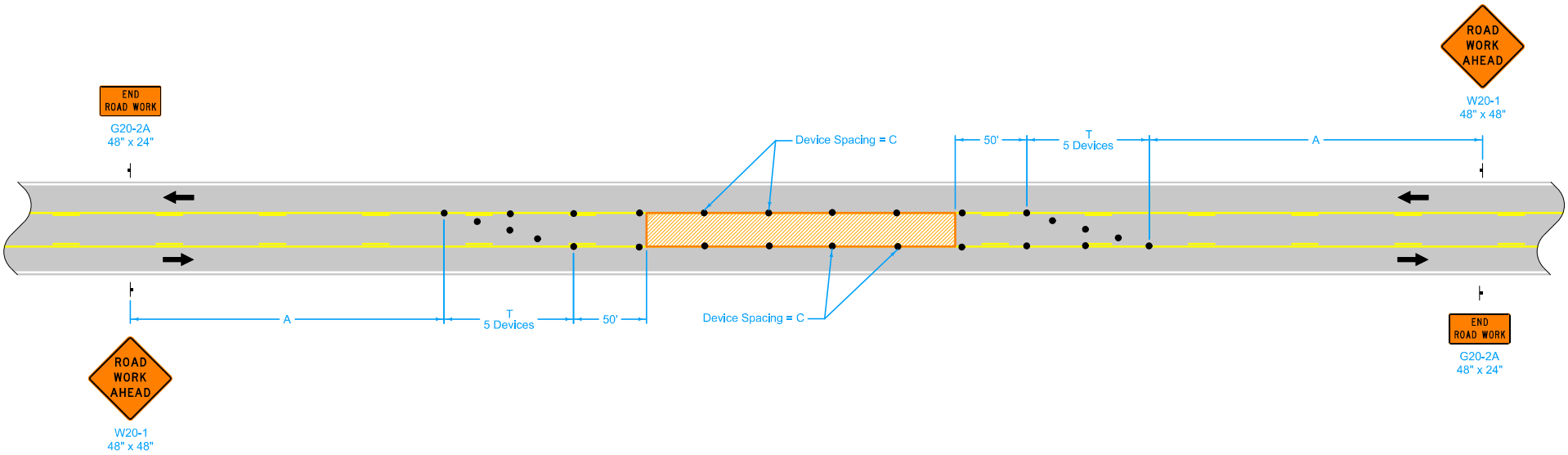
TC-1

SHEET 1 of 1

REVISIONS: Changed size of W21-6 sign. Updated language of general notes. Made Into a color standard.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

WORK NOT AFFECTING TRAFFIC (TWO-LANE OR MULTI-LANE)



Possible Contract Item:
Traffic Control

LEGEND

- 42" Channelizer
- Traffic Sign
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A	C	T
25 or less	100'	40'	50'
30 - 35	250'	40'	50'
40 - 50	700'	80'	100'
55 or greater	1000'	100'	100'

Iowa Department of Transportation

REVISION
4 | 04-17-12

STANDARD ROAD PLAN

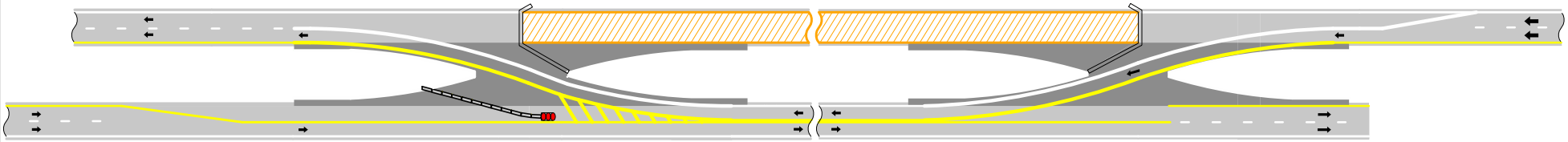
TC-30

SHEET 1 of 1

REVISIONS: Removed "or vertical panel" from 42" Channelizer in Legend. Moved circle note 1 information to specifications.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CLOSURE OF CONTINUOUS TWO-WAY LEFT-TURN LANE



Place Two-Way Traffic symbol and DO NOT PASS signs alternately on both sides of the roadway at a maximum of one-half mile intervals for both directions of travel. Always have signs in sight of motorists.

When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

Possible Contract Items:

- Painted Symbols and Legends
- Pavement Marking Items
- Pavement Marking Removed
- Safety Closures
- Temporary Barrier Rail
- Temporary Crash Cushions
- Temporary Floodlighting
- Temporary Lane Separator System
- Traffic Control

Possible Tabulations:

108-13A, 108-22, 108-27, 108-29, 108-30, 108-33, 108-35

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION

6	04-17-12

TC-61

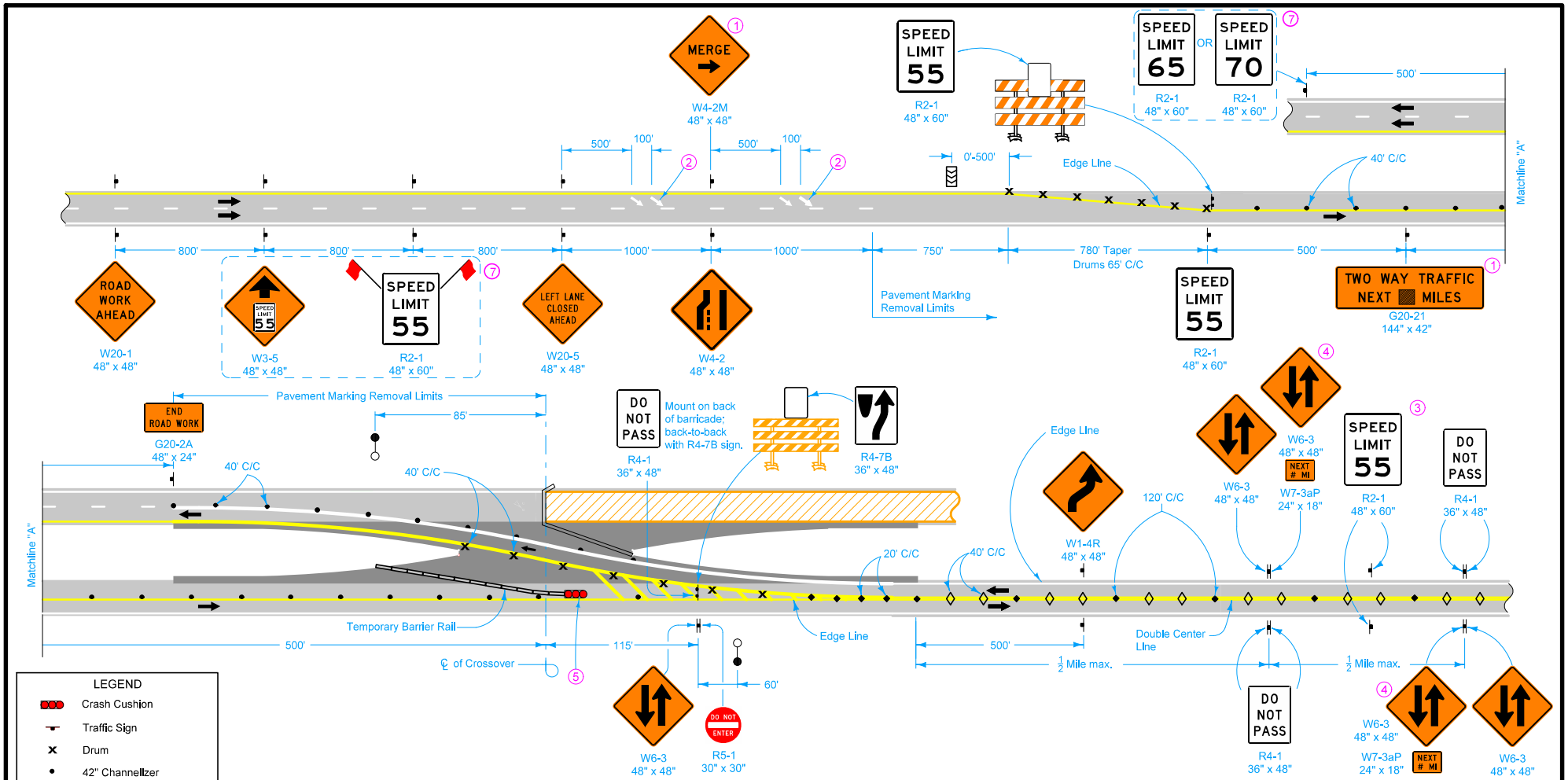
SHEET 1 of 5

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend and added Sheet 1.

Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE, TWO-WAY OPERATION



1. Refer to SI-881 for sign details.
2. Refer to PM-111 for arrow details.
3. Space Speed Limit signs at one-mile intervals.
4. Install an additional supplemental plaque with the message NEXT X MILES on the Two-Way Traffic symbol sign assembly on the right side of the roadway to inform motorists of the remaining length of two-lane traffic. Round X to the nearest whole-mile increment.
5. Temporary Crash Cushion. Refer to BA-500 for approved sand barrel layouts.
7. For roadways with a posted speed limit of 60 mph or greater before road work:

   Place SPEED LIMIT AHEAD sign and SPEED LIMIT 55 sign prior to the lane closure as shown. Place SPEED LIMIT 65 or 70 beyond the work area as shown.

   Remove or cover all existing signs that conflict with 55 mph speed limit while 55 mph speed limit is in effect.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
6 | 04-17-12

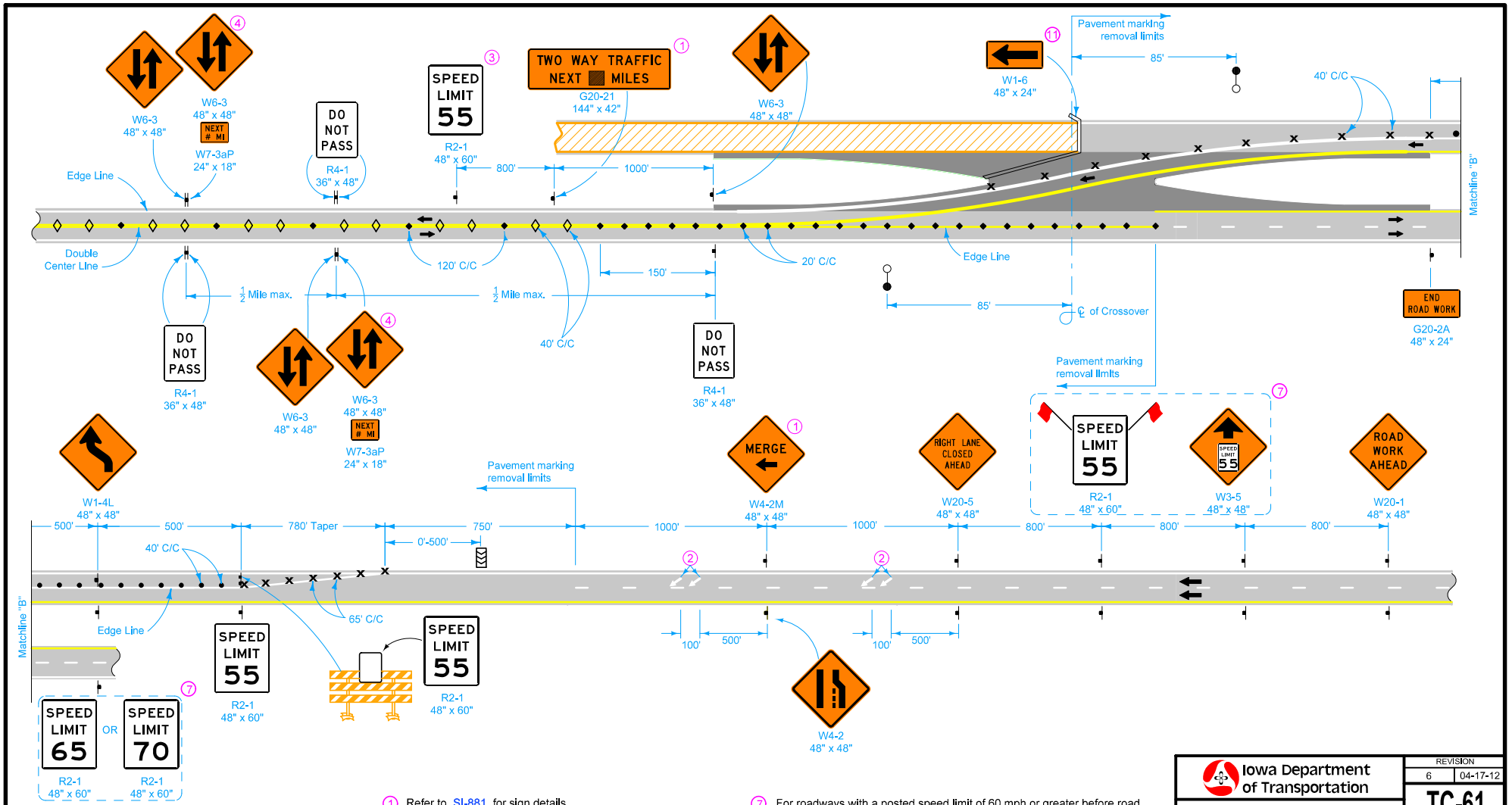
TC-61

SHEET 2 of 5

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend and added Sheet 1.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE, TWO-WAY OPERATION



LEGEND

- Traffic Sign
- Drum
- 42" Channelizer
- Channelizer Marker
- Tubular Marker
- Type III Barricade
- Sequencing Arrow
- Safety Closure (Refer to TC-252)
- Temporary Floodlighting
- Work Area
- Direction of Traffic
- Detour Pavement

1. Refer to SI-881 for sign details.
2. Refer to PM-111 for arrow details.
3. Space Speed Limit signs at one-mile intervals.
4. Install an additional supplemental plaque with the message NEXT X MILES on the Two-Way Traffic symbol sign assembly on the right side of the roadway to inform motorists of the remaining length of two-lane traffic. Round X to the nearest whole-mile increment.

7. For roadways with a posted speed limit of 60 mph or greater before road work:

   Place SPEED LIMIT AHEAD sign and SPEED LIMIT 55 sign prior to the lane closure as shown. Place SPEED LIMIT 65 or 70 beyond the work area as shown.

   Remove or cover all existing signs that conflict with 55 mph speed limit while 55 mph speed limit is in effect.

11. Add below R11-2 already included in Safety Closure.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
6	04-17-12

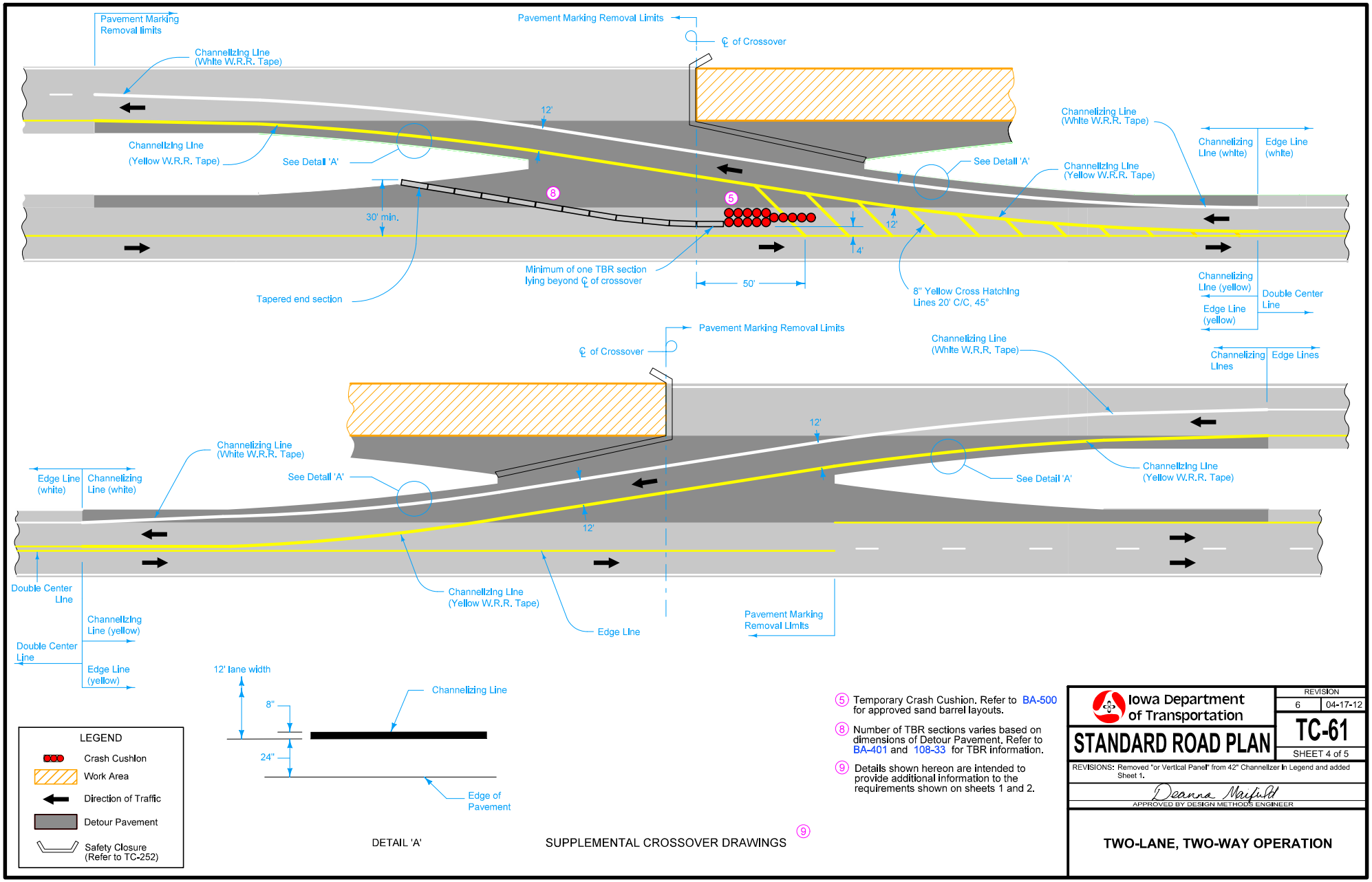
TC-61

SHEET 3 of 5

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend and added Sheet 1.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE, TWO-WAY OPERATION



DETAIL 'A'

SUPPLEMENTAL CROSSOVER DRAWINGS (9)

(5) Temporary Crash Cushion. Refer to BA-500 for approved sand barrel layouts.

(8) Number of TBR sections varies based on dimensions of Detour Pavement. Refer to BA-401 and 108-33 for TBR information.

(9) Details shown hereon are intended to provide additional information to the requirements shown on sheets 1 and 2.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
6	04-17-12

TC-61

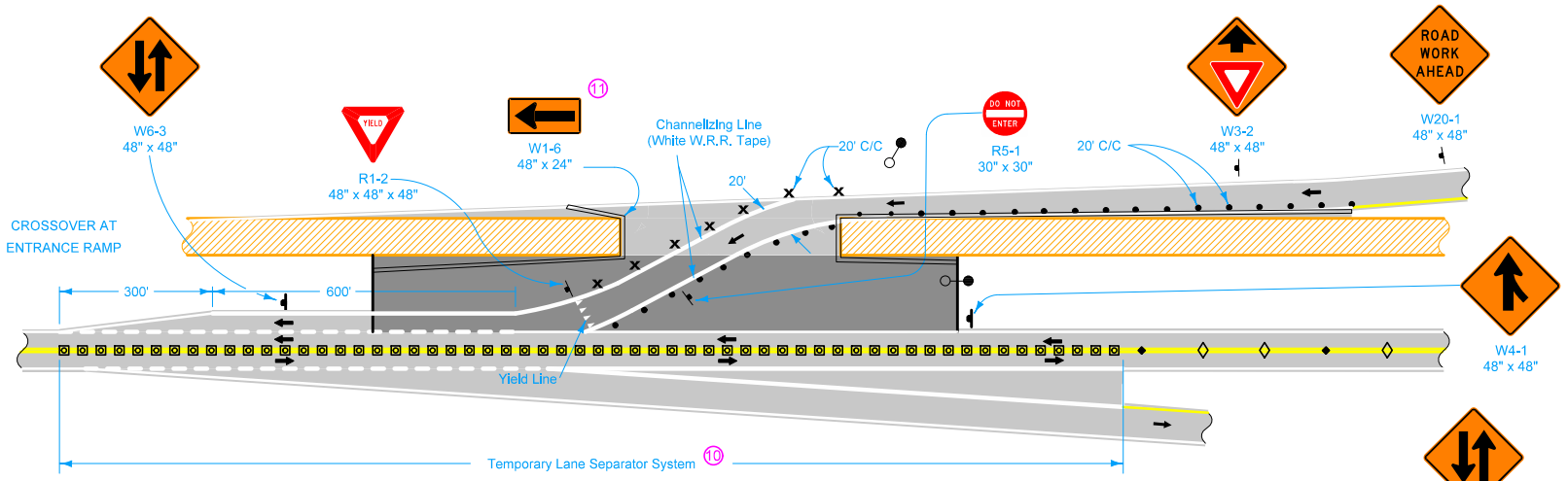
SHEET 4 of 5

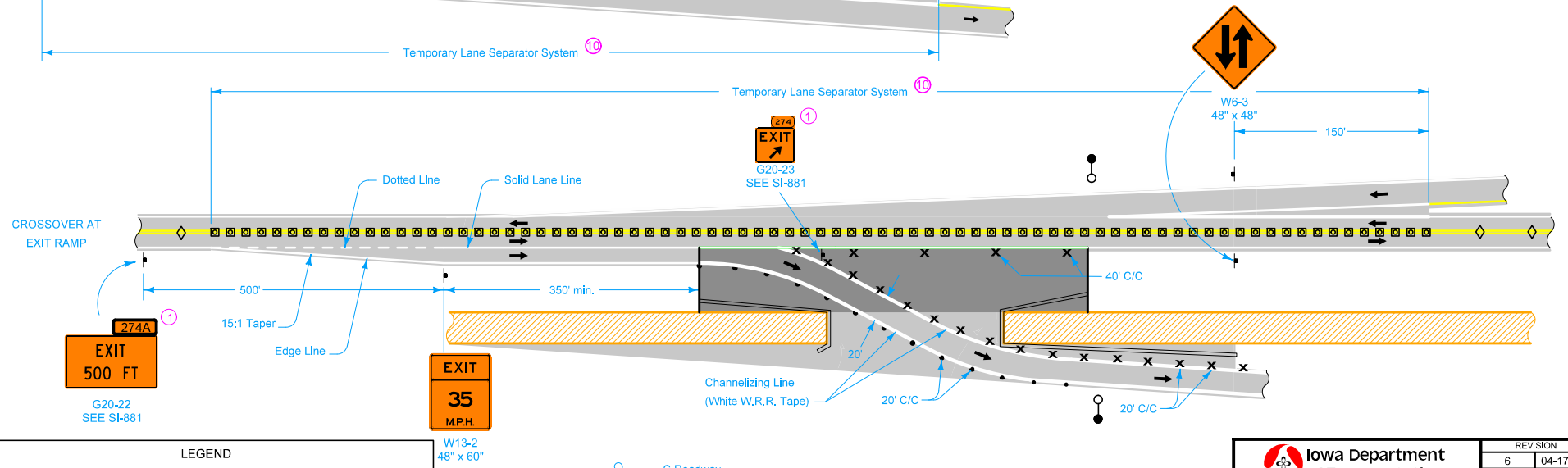
REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend and added Sheet 1.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE, TWO-WAY OPERATION

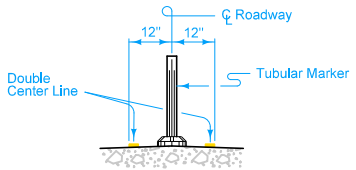
RAMP LOCATIONS





LEGEND

- Traffic Sign
- Drum
- 42" Channelizer
- Channellzer Marker
- Tubular Marker
- Type III Barricade
- Temporary Lane Separator
- Type 'A' Warning Light
- Temporary Floodlighting
- Work Area
- Detour Pavement
- Direction of Traffic
- Safety Closure (Refer to TC-252)



PLACEMENT OF
DOUBLE YELLOW CENTERLINE

(1) Refer to SI-881 for sign details.

(10) Place TLSS from start of ramp gore or start of full width decel lane to end of temporary ramp crossover pavement or end of ramp gore.

(11) Add below R11-2 already included in Safety Closure.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
6 | 04-17-12

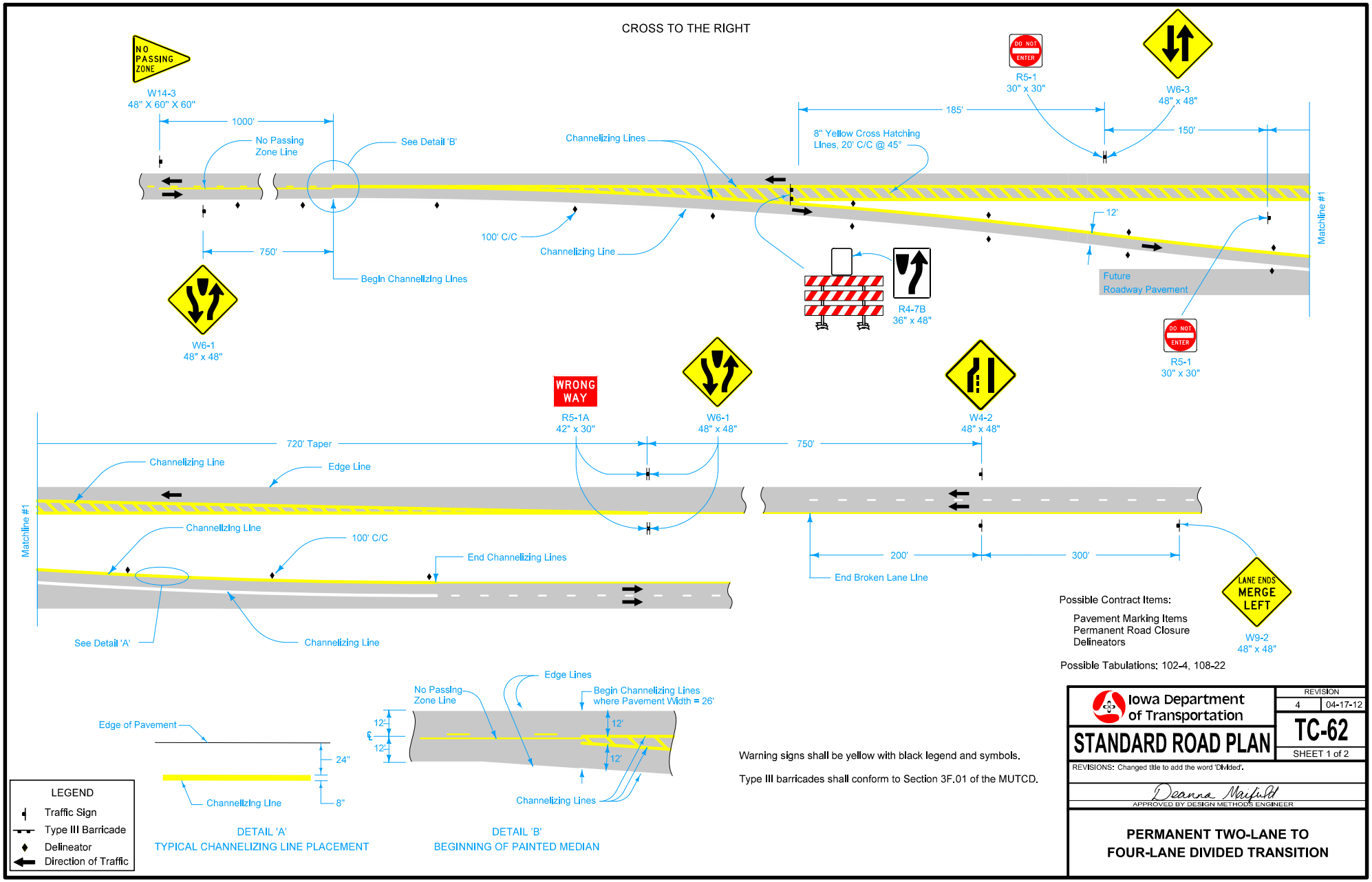
TC-61

SHEET 5 of 5

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend and added Sheet 1.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TWO-LANE, TWO-WAY OPERATION



DETAIL 'A'
TYPICAL CHANNELIZING LINE PLACEMENT

DETAIL 'B'
BEGINNING OF PAINTED MEDIAN

Possible Contract Items:

Pavement Marking Items
Permanent Road Closure
Delineators

Possible Tabulations: 102-4, 108-22

Warning signs shall be yellow with black legend and symbols.

Type III barricades shall conform to Section 3F.01 of the MUTCD.

Iowa Department of Transportation

REVISION
4 | 04-17-12

STANDARD ROAD PLAN

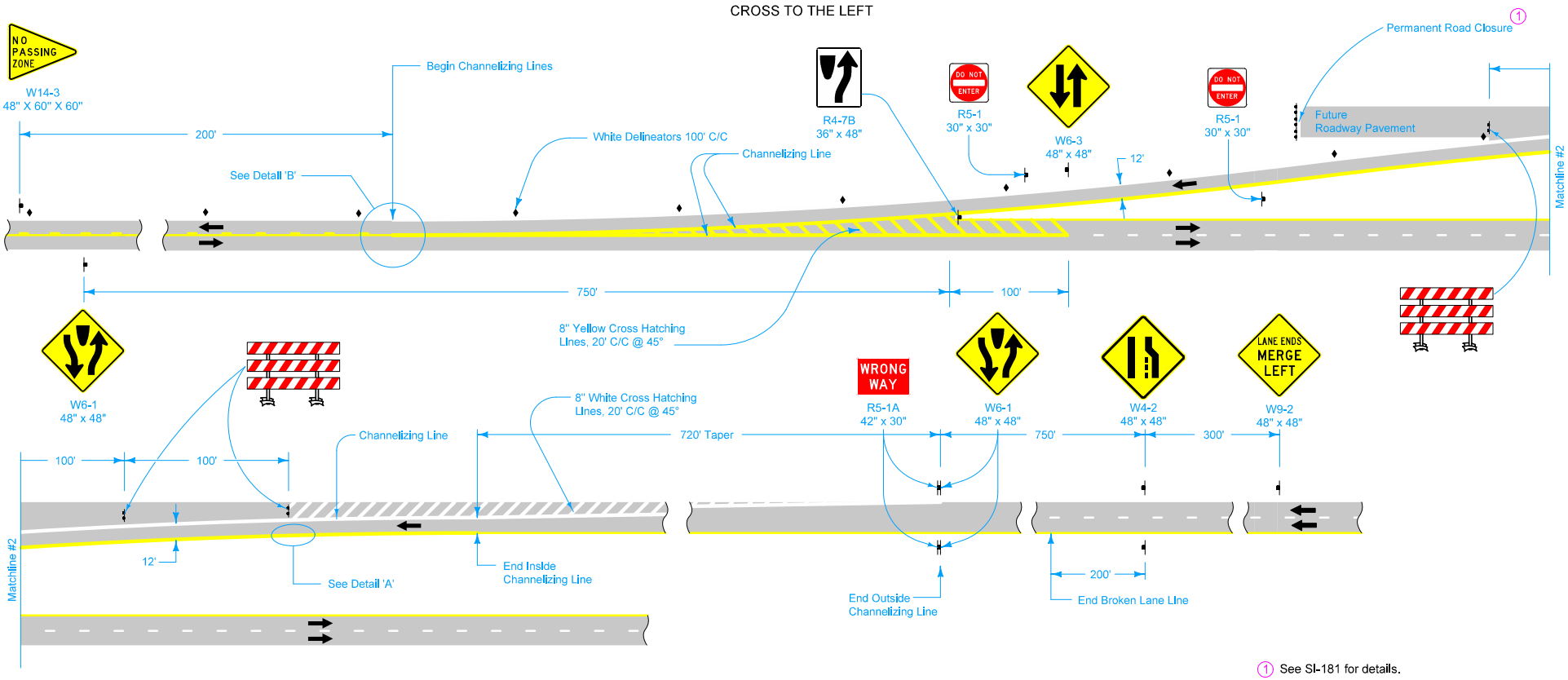
TC-62

SHEET 1 of 2

REVISIONS: Changed title to add the word 'Divided'.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PERMANENT TWO-LANE TO FOUR-LANE DIVIDED TRANSITION



LEGEND

- Traffic Sign
- Type III Barricade
- Delineator
- Direction of Traffic

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION

4	04-17-12

TC-62

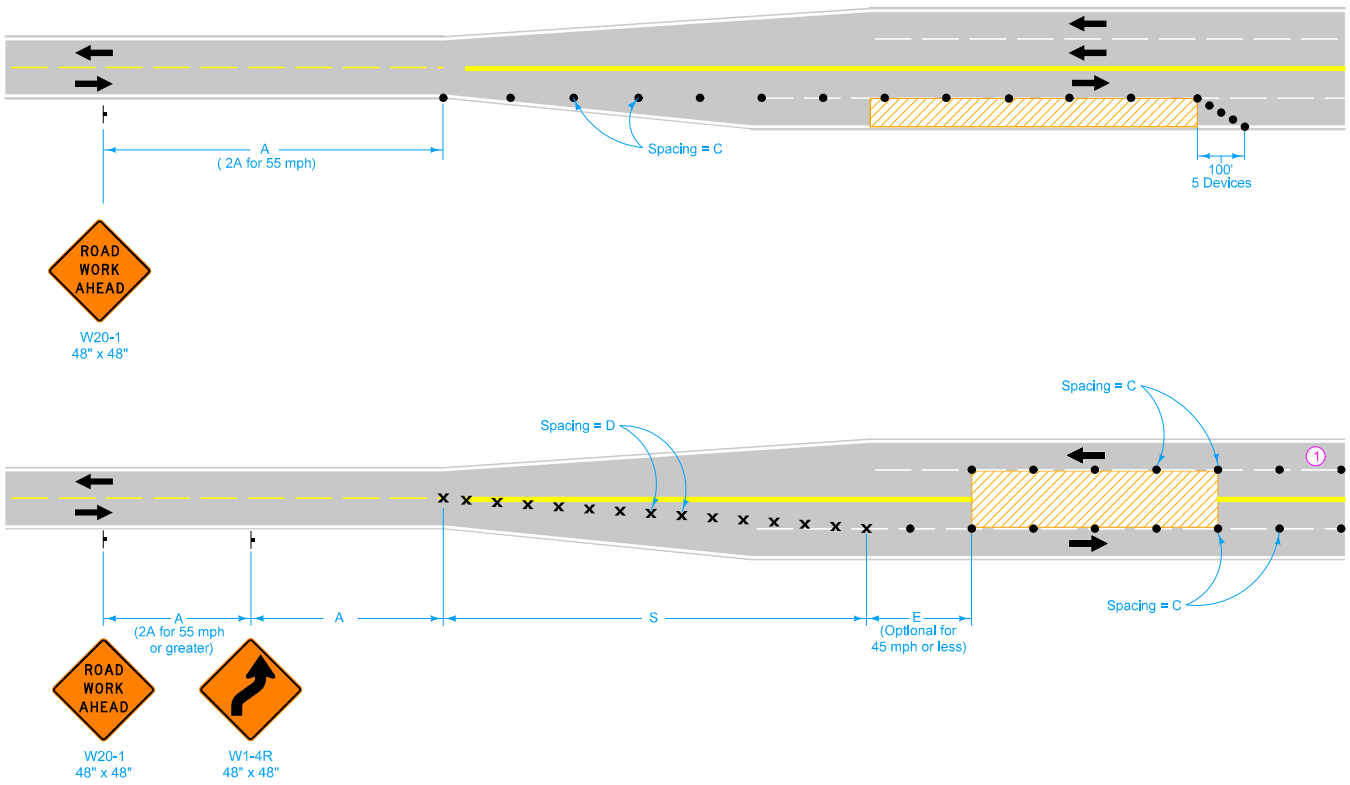
SHEET 2 of 2

REVISIONS: Changed title to add the word 'Divided'.

Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

PERMANENT TWO-LANE TO FOUR-LANE DIVIDED TRANSITION



Possible Contract Item:
Traffic Control

LEGEND

- Traffic Sign
- 42" Channelizer
- Drum
- Work Area
- Direction of Traffic

SPEED LIMIT	A	C	D	E	S
25 or less	100'	40'	25'	0' - 200'	100'
30 - 35	250'	40'	30'	0' - 200'	120'
40 - 45	350'	80'	40'	0' - 400'	280'
50 - 55	500'	100'	50'	200' - 400'	350'

(1) Refer to TC-419 for lane closure details.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
New 04-17-12

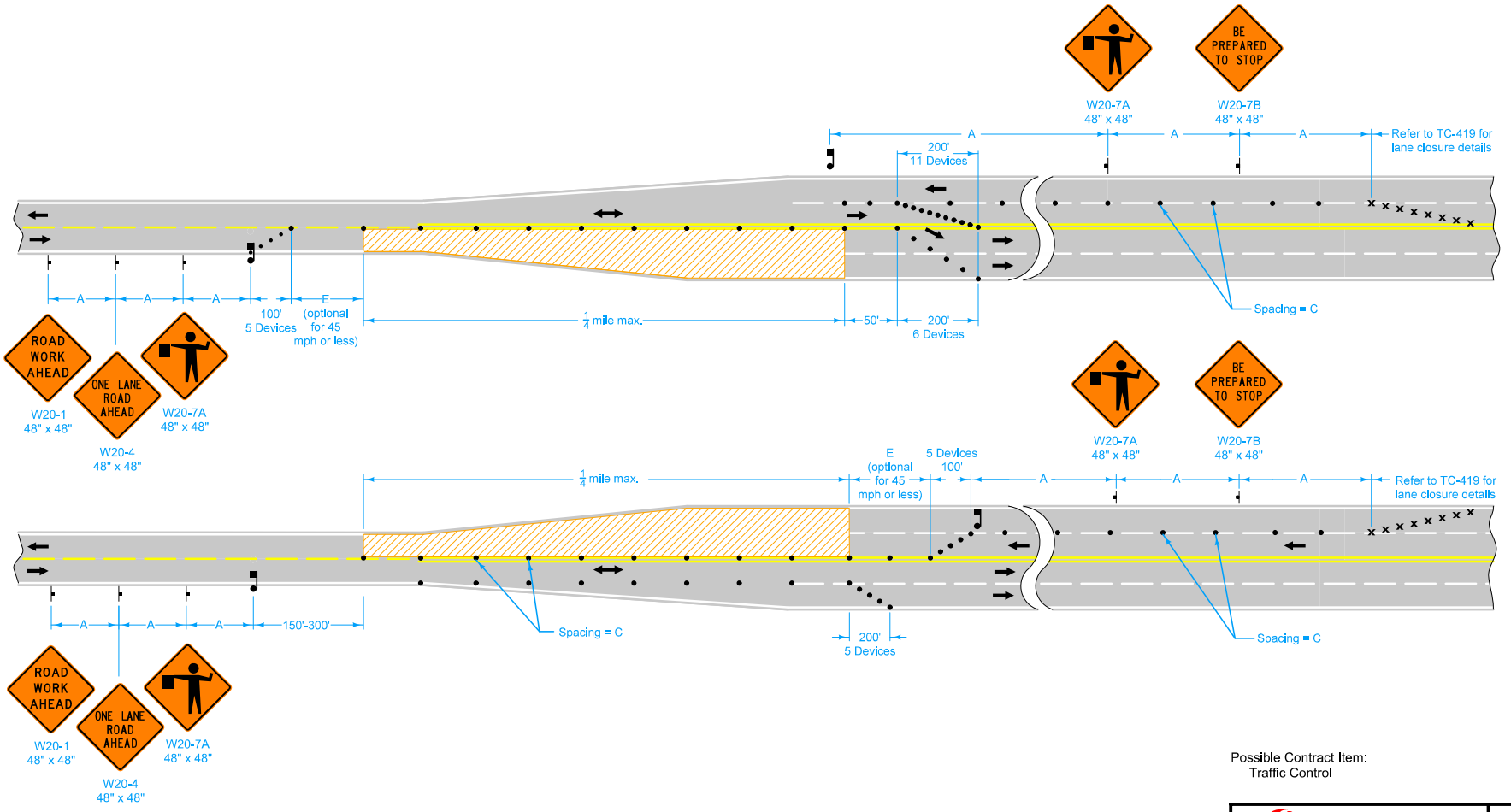
TC-63

SHEET 1 of 1

REVISIONS: New.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE AT
AUXILLIARY LANE



Possible Contract Item:
Traffic Control

LEGEND

- Traffic Sign
- 42' Channelizer
- Drum
- Work Area
- Direction of Traffic

SPEED LIMIT	A	C	E
25 or less	100'	40'	0' - 200'
30 - 35	250'	40'	0' - 200'
40 - 45	350'	80'	0' - 200'
50 - 55	500'	100'	200' - 300'

Iowa Department of Transportation

REVISION
New 04-17-12

STANDARD ROAD PLAN

TC-64

SHEET 1 of 1

REVISIONS: New

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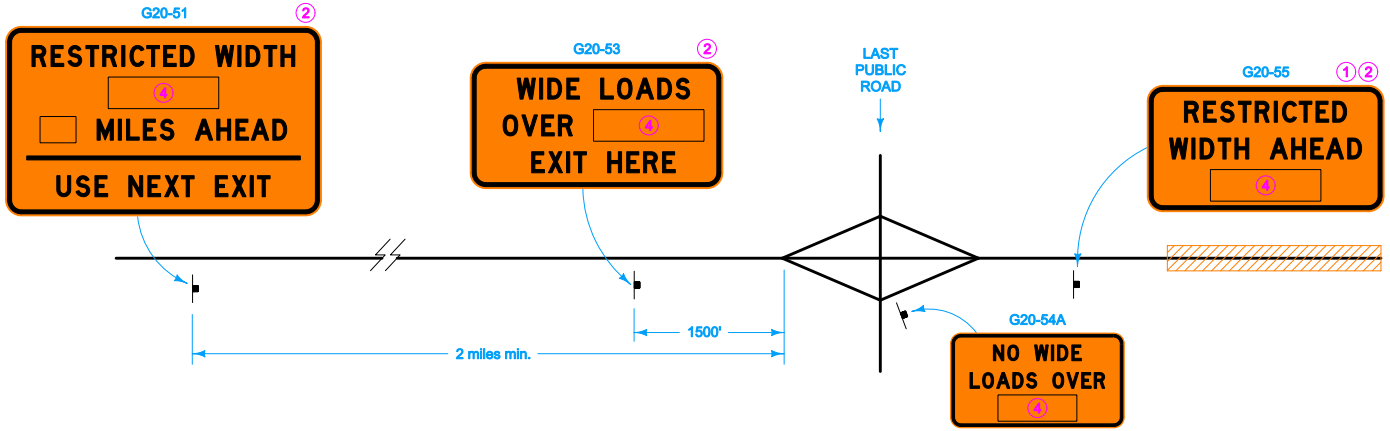
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE AT TWO-LANE TO FOUR-LANE TRANSITION WITH FLAGGER



WHERE AN INTERCHANGE IS LOCATED AT THE LAST PUBLIC ROAD PRIOR TO AREA OF RESTRICTED WIDTH

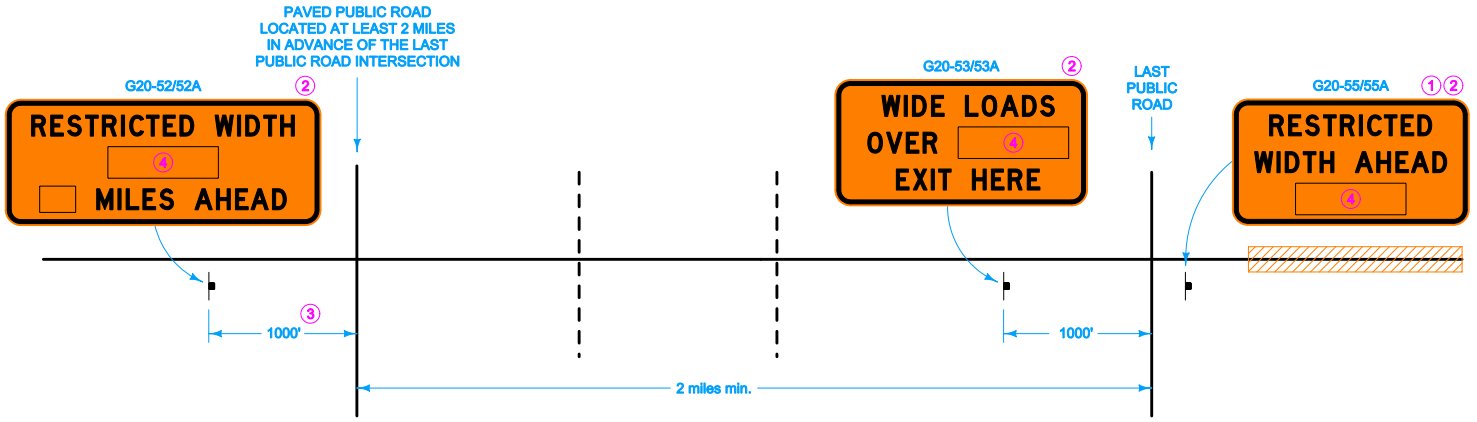
Coordinate signing in conjunction with other traffic control in the area.

Exact sign locations will be as approved by the Engineer.

For multi-lane divided roadways, use larger sign sizes. For two-lane highways, use small sign sizes.

See SI-882 for sign details.

1. Place after ROAD WORK AHEAD sign.
2. For divided highways, two signs shall be installed at each location: One each on right and left shoulders.
3. When this paved road intersection has an interchange, the distance shall be measured from the beginning of the exit ramp taper.
4. Dimension on G20-58/58A panel equals 1 foot less than narrowest measurement.



WHERE AN AT-GRADE INTERSECTION IS LOCATED AT THE LAST PUBLIC ROAD PRIOR TO AREA OF RESTRICTED WIDTH

LEGEND

- Area of Restricted Width
- Traffic Sign

Possible Contract Item:
Traffic Control

Iowa Department of Transportation

REVISION
1 | 04-20-10

STANDARD ROAD PLAN

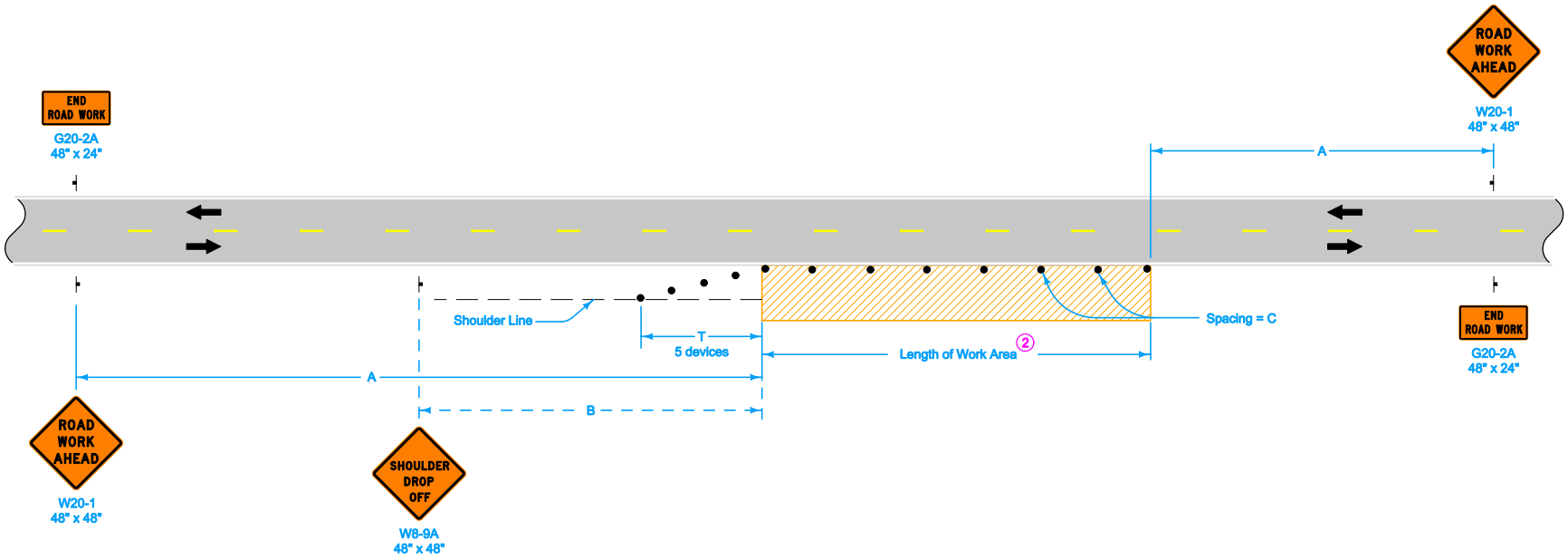
TC-81

SHEET 1 of 1

REVISIONS: Updated references to renamed standards. Updated signs. Added circle note 4.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

RESTRICTED WIDTH SIGNING (LESS THAN 14.5 FEET)



LEGEND

- Traffic Sign
- 42" Channelizer
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A	B	C (2)	T
35 or less	500'	250'	40'	100'
40 - 45	700'	350'	80' (1)	200'
50 or greater	1000'	500'	100' (1)	200'

When a pavement edge drop-off exists, install a SHOULDER DROP-OFF sign.

Pavement edge drop-offs greater than a nominal 10 inches will not be allowed during non-working hours.

Shoulder edge drop-offs shall be mitigated according to Article 1107.08.K2 of the Standard Specifications.

(1) When the length of a pavement edge drop-off is 1000 feet or less, the temporary fillet requirement of Article 1107.08 of the Standard Specifications does not apply.

Space devices at 40 feet.

(2) For work areas less than 200 feet long, use channelizers spaced at 20 foot centers or use a vehicle with an amber revolving light or amber strobe light.

Possible Contract Item:
Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 4 04-17-12

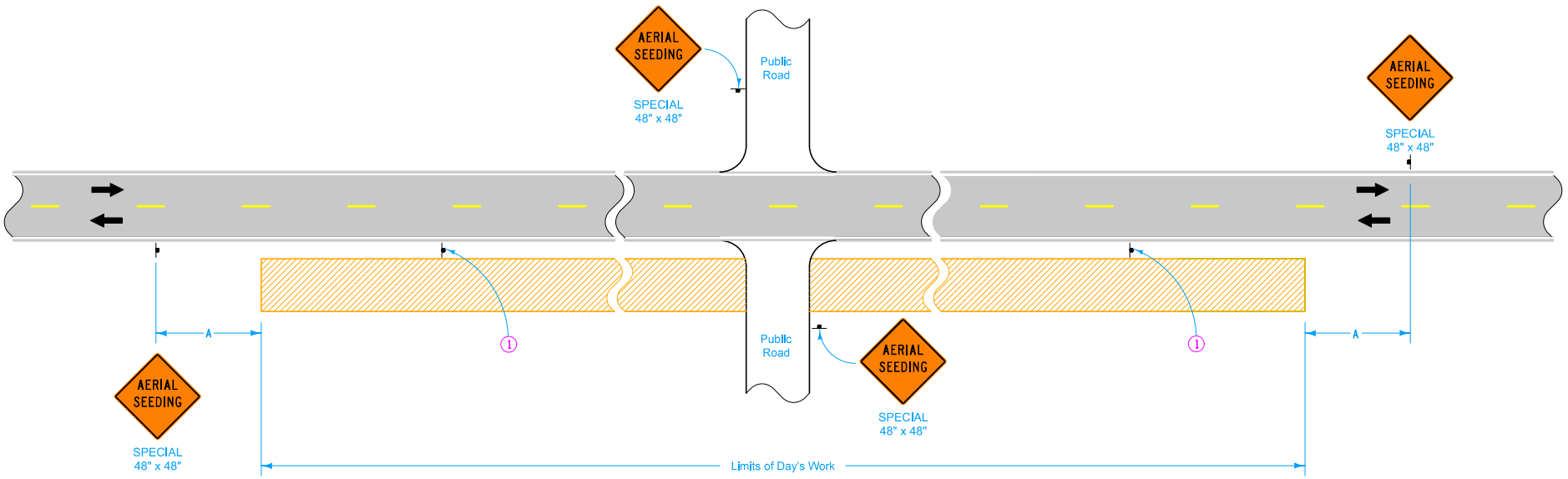
TC-202

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SHOULDER CLOSURE (ONE LANE)



Possible Contract Item:

Traffic Control

LEGEND

- Traffic Sign
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A
35 or less	250'
40 - 45	350'
50 or greater	500'

(1) AERIAL SEEDING signs shall be placed along the mainline at a maximum spacing of 3 miles.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-17-12

TC-203

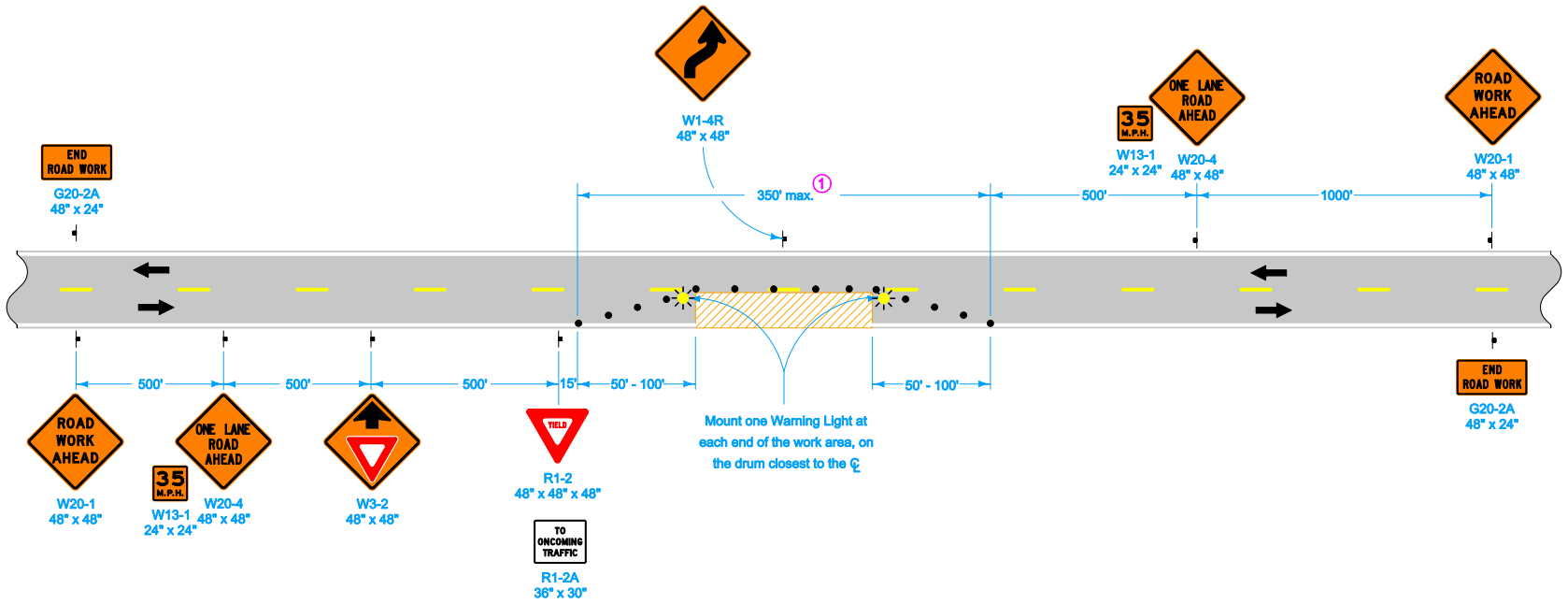
SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

AERIAL SEEDING OPERATIONS



LEGEND

- Type 'A' Warning Light
- Traffic Sign
- Work Area
- Direction of Traffic
- 42" Channelizer

Do not use this layout when ADT exceeds 2000 vehicles.

Locate this layout at least 2,500 feet from any other work site layout.

Full-depth openings during non-working hours will not be allowed. Temporary plating, planking or filling may be necessary. Vehicles, unattended equipment, materials or stock-piled waste are not permitted between the shoulder lines during non-working hours.

For bridge deck overlay projects: The night before overlay operations begin, a bridge deck finishing machine and necessary materials may be placed on the roadway.

(1) Do not use this layout if a No Passing Zone for the closed lane is located within this area.

Possible Contract Item:

Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-17-12

TC-211

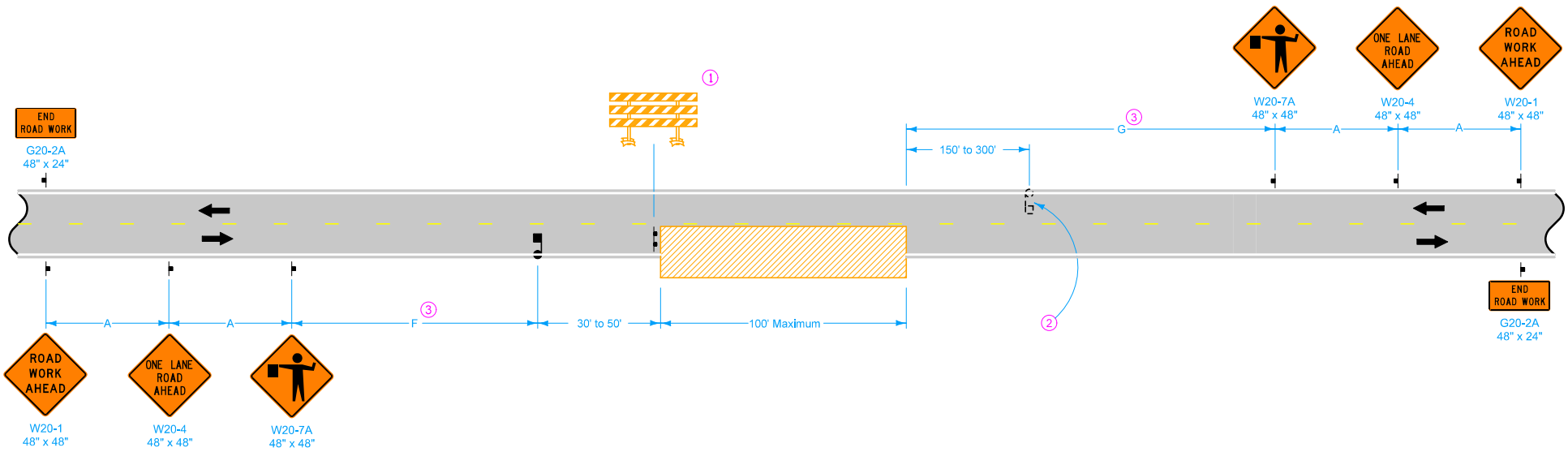
SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend. Removed Drum information already in the specifications.

Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE ON LOW VOLUME ROADWAY



LEGEND

- Traffic Sign
- Flagger
- Work Area
- Type III Barricade
- Direction of Traffic

SPEED LIMIT (mph)	A	F and G Range (3)	F + G Max.
35 or less	250'	250'-3250'	3500'
40 - 45	350'	350'-3350'	3700'
50 or greater	500'	500'-3500'	4000'

(1) A vehicle with an amber revolving or an amber strobe light may be substituted for the Type III barricade.

(2) A second flagger shall be required:

If the flagger's view of approaching traffic in the open lane is less than 1/4 mile or the work site is in an area of restricted sight distance (such as a "No Passing" zone); or

If excessive traffic delays are encountered.

(3) F and G distances are to remain as near minimum values as work permits. However, to be able to move the work area without moving the advance signing, F and G distances may be varied within the limits of the table. Maximum movement can be be achieved by setting one F or G value at the minimum and the other value at its maximum.

Possible Contract Items:

Traffic Control
Flaggers

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-17-12

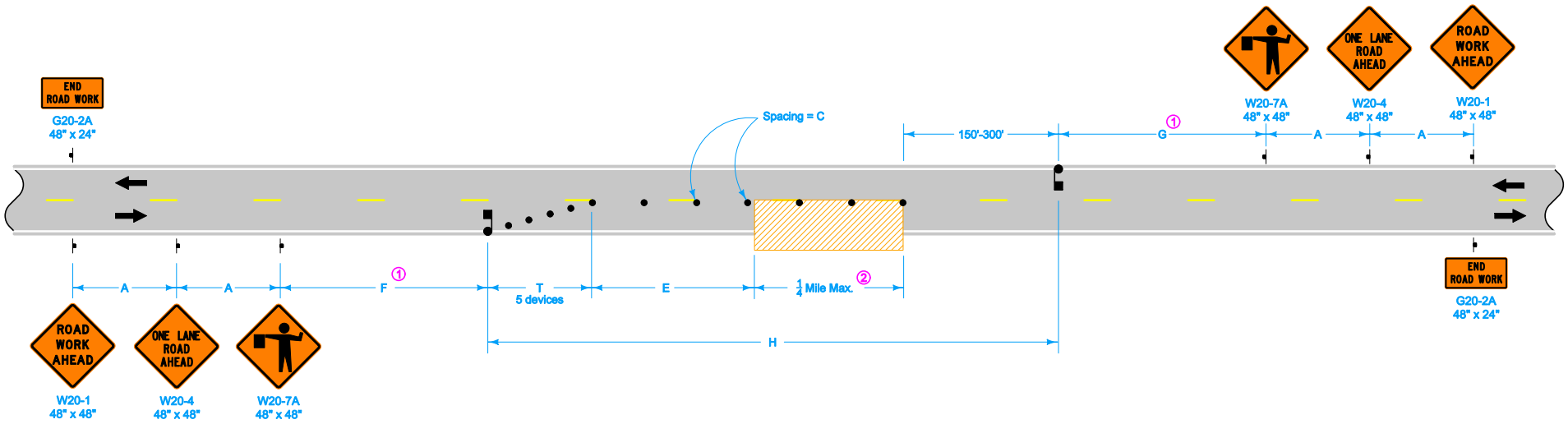
TC-212

SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SPOT LOCATION LANE CLOSURE WITH FLAGGERS



LEGEND

- Traffic Sign
- Flagger
- 42" Channelizer
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A	C	E	F and G Range ①	F + G Max.	H Max.	T
35 or less	250'	40'	0'-200'	500'-3000'	3500'	2000'	50'
40 - 45	350'	80'	0'-200'	700'-3000'	3700'	2000'	100'
50 or greater	500'	100'	200'-300'	1000'-3000'	4000'	2000'	100'

① Keep F and G distances as near to minimum values as work permits. However, to allow advancement of the work area without moving signs, F and G distances may be varied within the limits of the table. Maximum movement can be achieved by setting one F or G value at the minimum and the other value at its maximum.

② If length of work area exceeds 1/4 mile, use TC-214.

Possible Contract Items:
Flaggers
Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 3 04-17-12

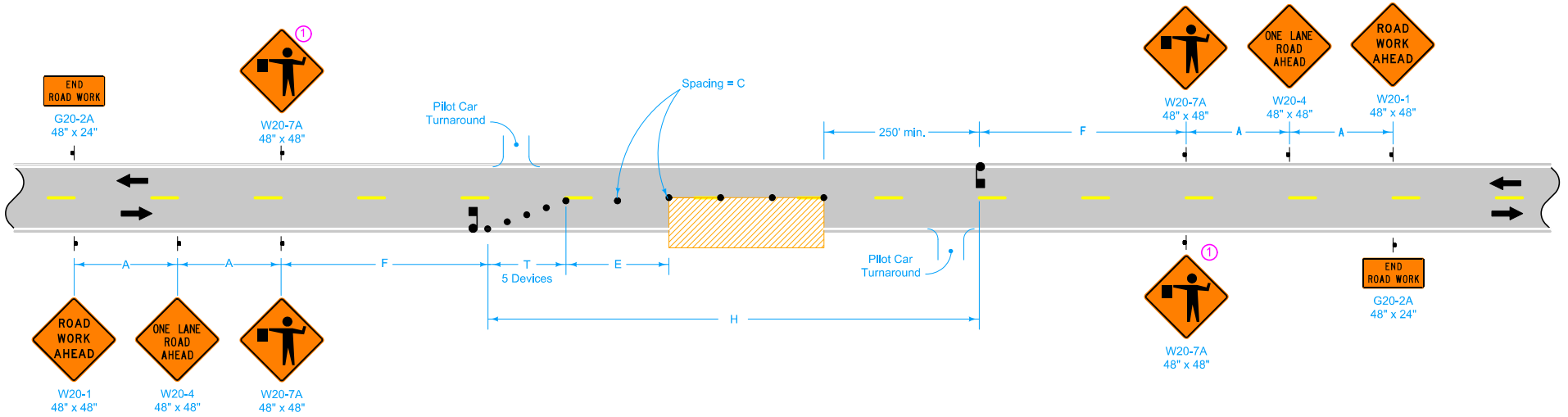
TC-213

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE WITH FLAGGERS



LEGEND

- Traffic Sign
- Flagger
- 42" Channelizer
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	ADT	A	C	E	F	H (2) max.	T
35 or less	up to 2,500	250'	40'	0'-200'	500'	2.5 mi.	50'
	2,500 - 5,000	250'	40'	0'-200'	500'	2.0 mi.	50'
	more than 5,000	500'	40'	0'-200'	1000'	1.5 mi.	50'
40 - 45	up to 2,500	350'	80'	0'-200'	700'	2.5 mi.	100'
	2,500 - 5,000	350'	80'	0'-200'	700'	2.0 mi.	100'
	more than 5,000	700'	80'	0'-200'	1400'	1.5 mi.	100'
50 or greater	up to 2,500	500'	100'	200'-300'	1000'	2.5 mi.	100'
	2,500 - 5,000	500'	100'	200'-300'	1000'	2.0 mi.	100'
	more than 5,000	1000'	100'	200'-300'	2000'	1.5 mi.	100'

(1) Sign optional for ADT less than 5,000.

(2) In rural areas during non-peak hours, the lane closure may be extended up to 1.0 mile beyond the maximum shown in the table. Once the traffic control devices have been placed to extend the lane closure, progress downstream until the H distance is once again within the limit shown in the table.

Possible Contract Items:
Flagger
Pilot Car
Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
4	04-17-12

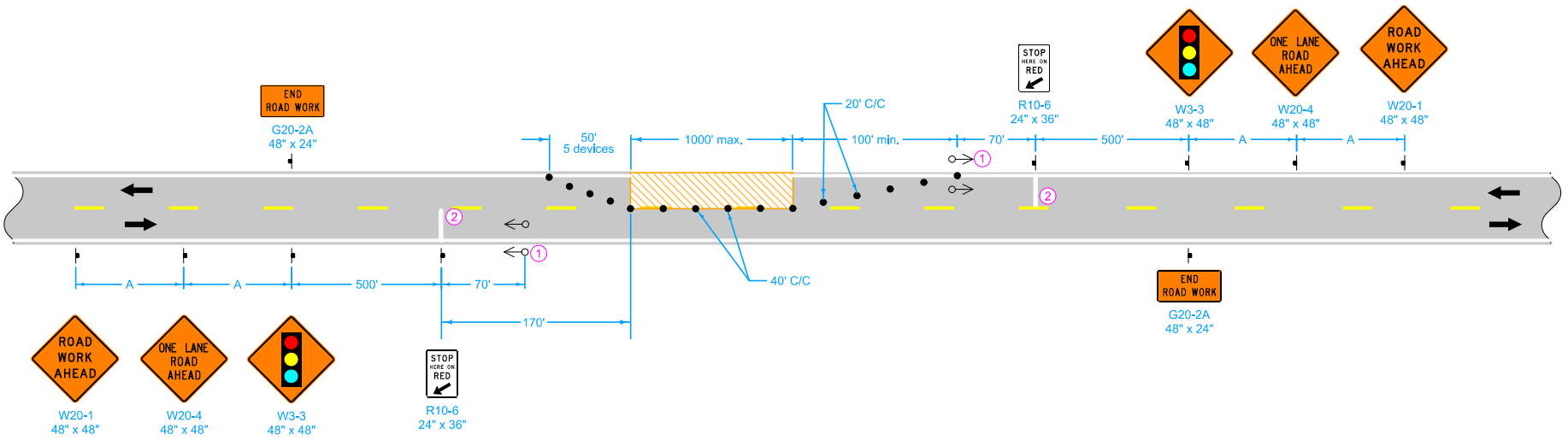
TC-214

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE WITH FLAGGERS FOR USE WITH PILOT CAR



SPEED LIMIT (mph)	A
35 or less	250'
40-45	350'
50 or greater	500'

LEGEND

- Traffic Signal
- Traffic Sign
- 42" Channelizer
- Work Area
- Direction of Traffic

TIMING FOR ACTUATED SIGNALS
Recommended Settings (secs)

Initial = 12.0
Extension = 2.5
Max. Green = 45.0
Yellow = 4.0
All Red = (see table)

Distance between stop lines	All Red* (secs)	Distance between stop lines	All Red* (secs)
450'	9 - 15	950'	19 - 33
550'	11 - 19	1050'	21 - 36
650'	13 - 22	1150'	23 - 39
750'	15 - 26	1250'	25 - 43
850'	17 - 29	1350'	27 - 46

* All Red values based on operating speeds between 20 mph and 35 mph

This layout is for conditions lasting up to three calendar days. For situations lasting longer than three days refer to TC-216.

Temporary Traffic Signals will meet the requirements of 2528.07 except for the following:

(1) In lieu of a trailor or span-wire mounted system, signal heads may be located on the shoulders, one on each side of the roadway. Mount shoulder signal heads a minimum of 8 feet from the bottom of the signal head to the top of the ground surface.

(2) 24-inch stop lines required during nighttime operation.

Possible Contract Item:
Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
1 | 04-17-12

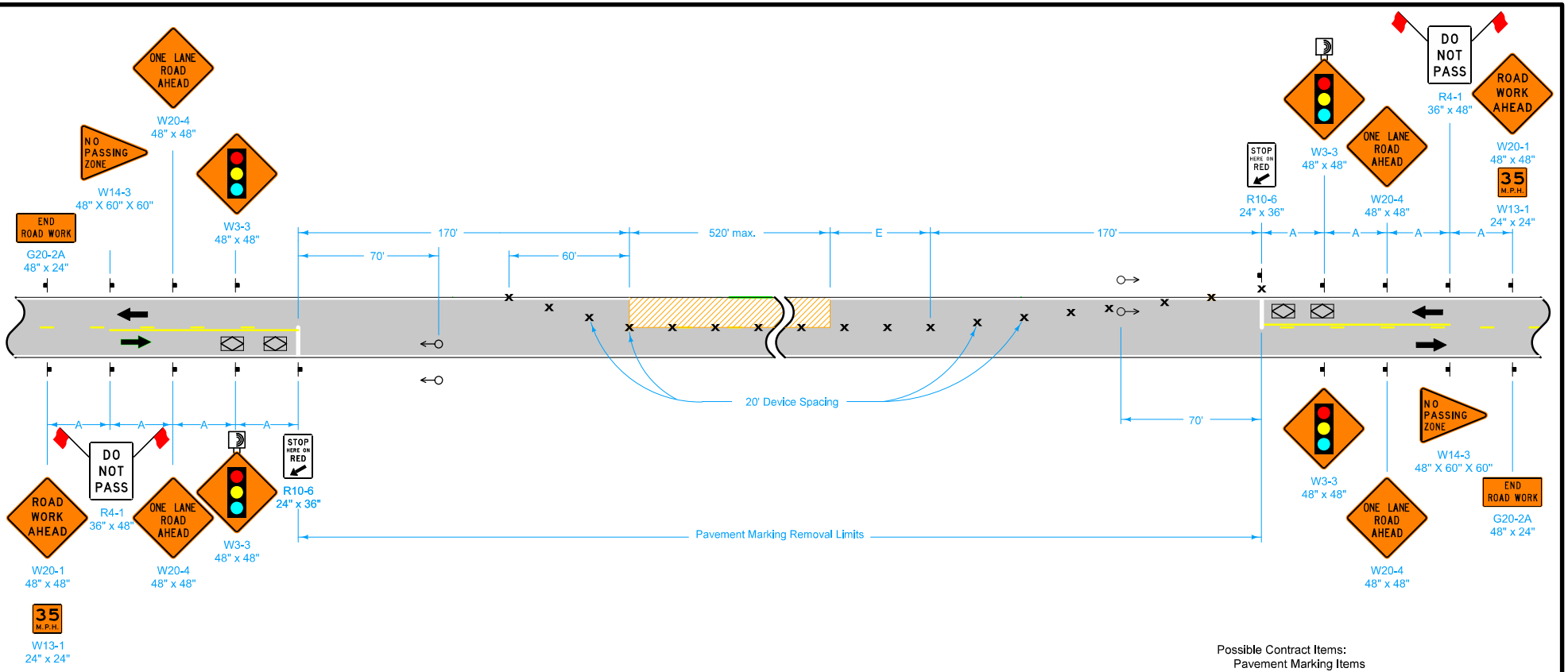
TC-215

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE WITH SIGNALS (UP TO THREE DAYS)



LEGEND

- Vehicle Detection Area
- Traffic Sign
- Drum
- Type 'B' High-Intensity Flashing Warning Light
- Work Area
- Temporary Traffic Signal
- Direction of Traffic

TIMING FOR ACTUATED SIGNALS

Recommended Settings, secs.

Initial = 12.0
Extension = 2.5
Maximum Green = 45.0
Yellow = 5.0
All Red = (see table)

Distance Between Stop Lines	All Red (secs.)*
1050'	20.4-35.7
950'	18.5-32.3
850'	17-30
750'	15-27
650'	14-23
550'	12-20

* Range of values are based on operating speeds between 20 and 35 mph

SPEED LIMIT (mph)	A	E
35 or less	250'	0'-50'
40 - 45	350'	0'-100'
50 or greater	500'	100'

No drop-offs greater than pavement depth will be allowed during non-working hours.

No vehicles, unattended equipment, materials or stock-piled waste are permitted between the shoulder lines during non-working hours.

Possible Contract Items:
- Pavement Marking Items
- Pavement Markings Removed
- Temporary Traffic Signals
- Traffic Control

Possible Tabulations:
- 108-22
- 108-28

Iowa Department of Transportation

REVISION 5 04-17-12

STANDARD ROAD PLAN

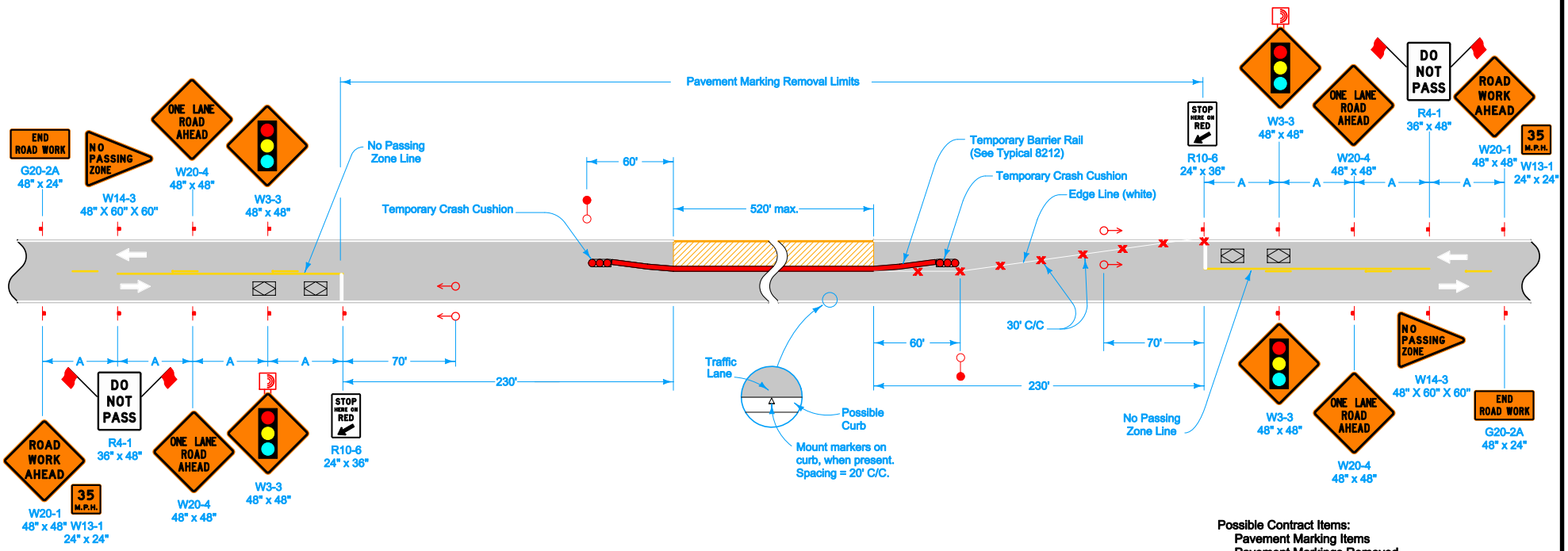
TC-216

SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE WITH SIGNALS



LEGEND

- Concrete Barrier Marker
- Vehicle Detection Area
- Temporary Crash Cushion
- Direction of Traffic
- Traffic Sign
- Drum
- Temporary Floodlighting
- Type 'B' High-Intensity Flashing Warning Light
- Work Area
- Temporary Traffic Signal

TIMING FOR ACTUATED SIGNALS Recommended Settings, secs.	Distance Between Stop Lines	All Red (secs.)*
Initial = 12.0	1050'	20.4-35.7
Extension = 2.5	950'	18.5-32.3
Maximum Green = 45.0	850'	17-30
Yellow = 5.0	750'	15-27
All Red = (see table)	650'	14-23
	550'	12-20

* Range of values are based on operating speeds between 20 and 35 mph

SPEED LIMIT (mph)	A
35 or less	250'
40 - 45	350'
50 or greater	500'

Possible Contract Items:
- Pavement Marking Items
- Pavement Markings Removed
- Temporary Barrier Rail
- Temporary Crash Cushions
- Temporary Floodlighting
- Temporary Traffic Signals
- Traffic Control

Possible Tabulations:
- 108-22
- 108-27
- 108-28
- 108-30
- 108-33

Iowa Department of Transportation

REVISION 4 10-19-10

STANDARD ROAD PLAN

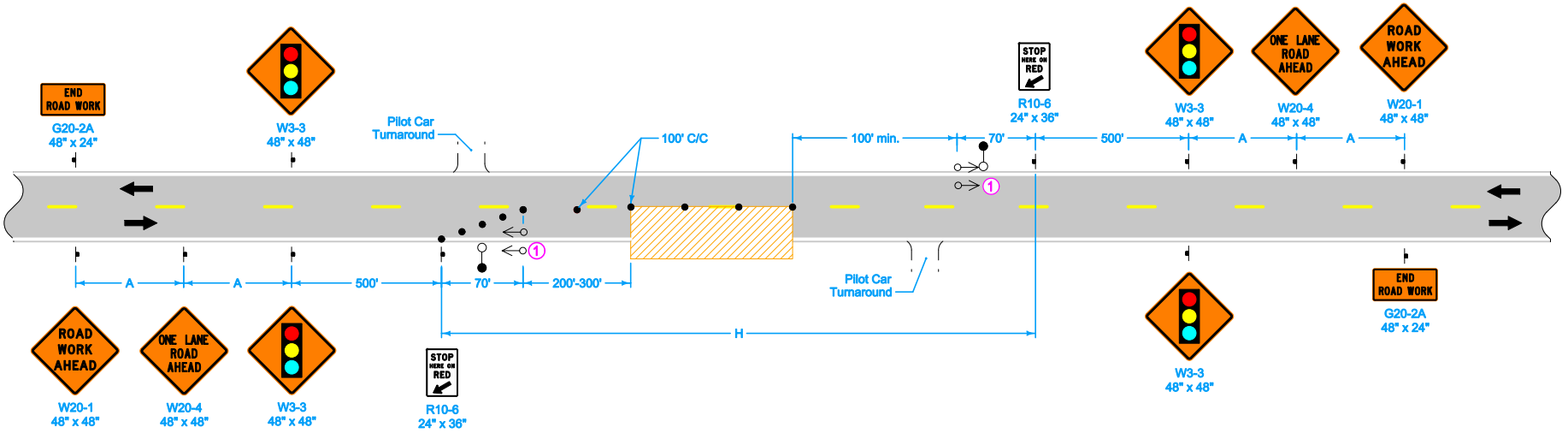
TC-217

SHEET 1 of 1

REVISIONS: Fixed spelling errors and added color.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE WITH SIGNALS AND TBR



LEGEND

- Temporary Floodlighting
- Traffic Signal
- Traffic Sign
- 42" Channelizer
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	ADT	A	H
50 or greater	up to 2,500	500'	2.5 mi.
	2,500 - 5,000	500'	2.0 mi.
	more than 5,000	1000'	1.5 mi.

No detection area required.

Timing for Push-button Actuated Signals
Initial Green = 15 sec.
Green Ext. = 2.5 sec.
Yellow = 4.0 sec.

Install push-button actuated traffic signals.
Program signals to rest in RED.
GREEN and GREEN EXTENSION only are initiated by flagger.

(1) In lieu of a trailer or span-wire mounted system, signal heads may be located on the shoulders, one on each side of the roadway. Mount shoulder signal heads a minimum of 8 feet from the bottom of the signal head to the top of the ground surface.

Possible Contract Items:
Flagger
Pilot Car
Traffic Control

Iowa Department of Transportation

REVISION
1 04-17-12

STANDARD ROAD PLAN

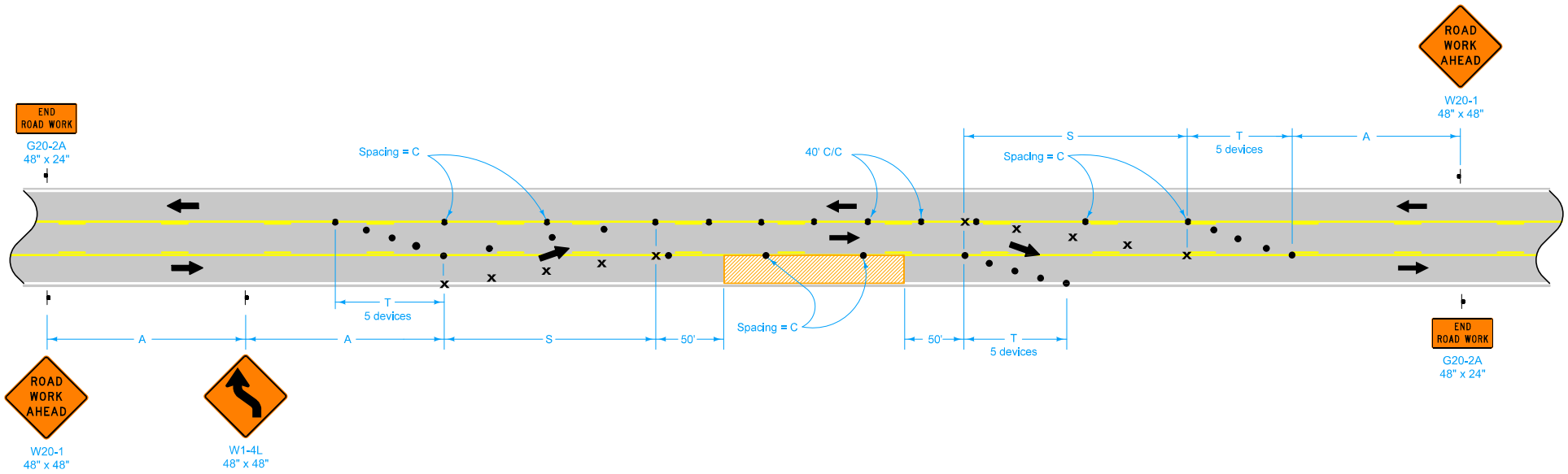
TC-218

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE WITH PILOT CAR AND FLAGGER OPERATED SIGNALS



LEGEND

- 42" Channelizer
- Drum (1)
- Traffic Sign
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A	C	D	S	T
25 or less	100'	40'	25'	100'	50'
30 - 35	250'	40'	30'	120'	50'
40 - 45	350'	80'	40'	280'	100'
50 or greater	500'	100'	50'	350'	100'

(1) Spacing = D for all drums.

Possible Contract Item:

Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION

3	04-17-12

TC-228

SHEET 1 of 1

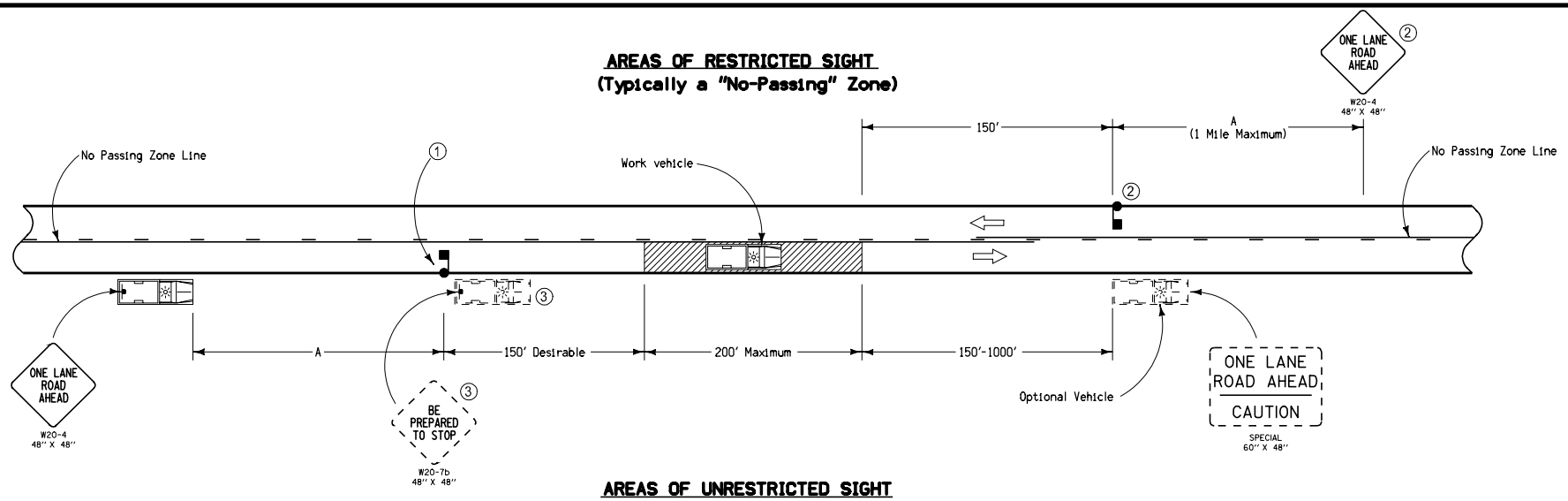
REVISIONS: Remove "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield

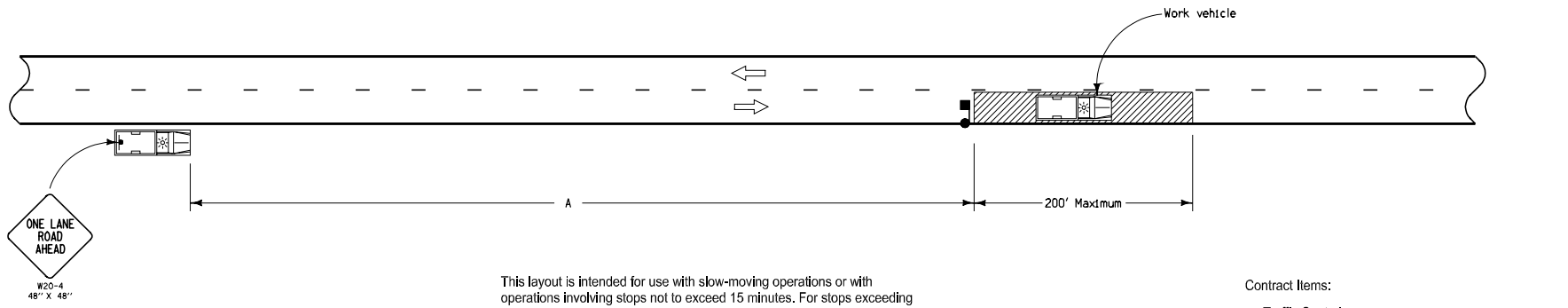
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE UTILIZING CONTINUOUS TWO-WAY LEFT-TURN LANE

AREAS OF RESTRICTED SIGHT
(Typically a "No-Passing" Zone)



AREAS OF UNRESTRICTED SIGHT



This layout is intended for use with slow-moving operations or with operations involving stops not to exceed 15 minutes. For stops exceeding 15 minutes or in heavy traffic situations, use TC-213.

All vehicles shall be equipped with an amber revolving light or an amber strobe light.

① When a stop is made for less than 5 minutes in an area of restricted sight distance, traffic in the closed lane shall be held by a flagger and allowed to pass when conditions are safe.

② When a stop is made or work proceeds in an area where sight distance is restricted from either direction and is anticipated to be more than 5 minutes, a second flagger and ONE LANE ROAD AHEAD sign shall be required.

③ This vehicle and sign may be used in lieu of a flagger for Road Rater tests.

Contract Items:

Traffic Control
Flaggers

LEGEND

- Traffic Sign
- Work Area
- Flagger
- Direction of Traffic

Speed Limit (mph)	A min.
25 or less	200'
30-35	300'
40-45	500'
50 or greater	1000'

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
1	10-16-07

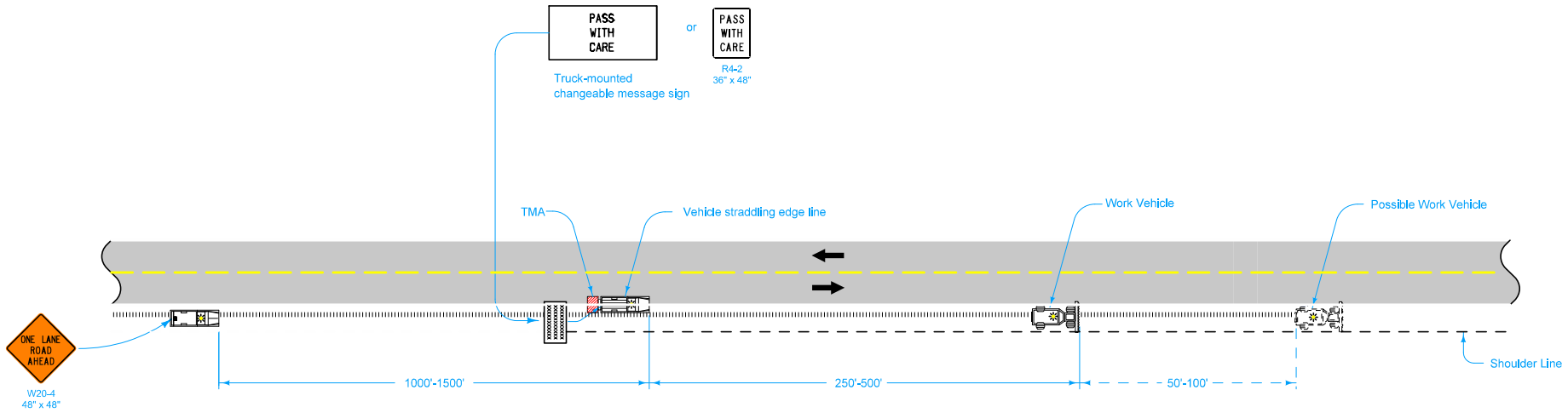
TC-231

SHEET 1 of 1

REVISIONS: Modified speed limit table values.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SLOW MOVING VEHICLE OPERATING IN THE TRAFFIC LANE



LEGEND

- Traffic Sign
- Truck Mounted Attenuator (TMA)
- Direction of Traffic

All vehicles shall be equipped with an amber revolving light or an amber strobe light.

When fog sealing the milled rumble strips, place a 48" X 48" FRESH OIL sign (W21-2) at the beginning of the work area. Place additional FRESH OIL signs after each intersection and periodically through the work area so that signs are no more than 2 miles apart.

Operators should adjust their spacing, as necessary, to keep adjacent vehicles within view.

Possible Contract Item:

Traffic Control

Iowa Department of Transportation

REVISION

1	04-17-12

STANDARD ROAD PLAN

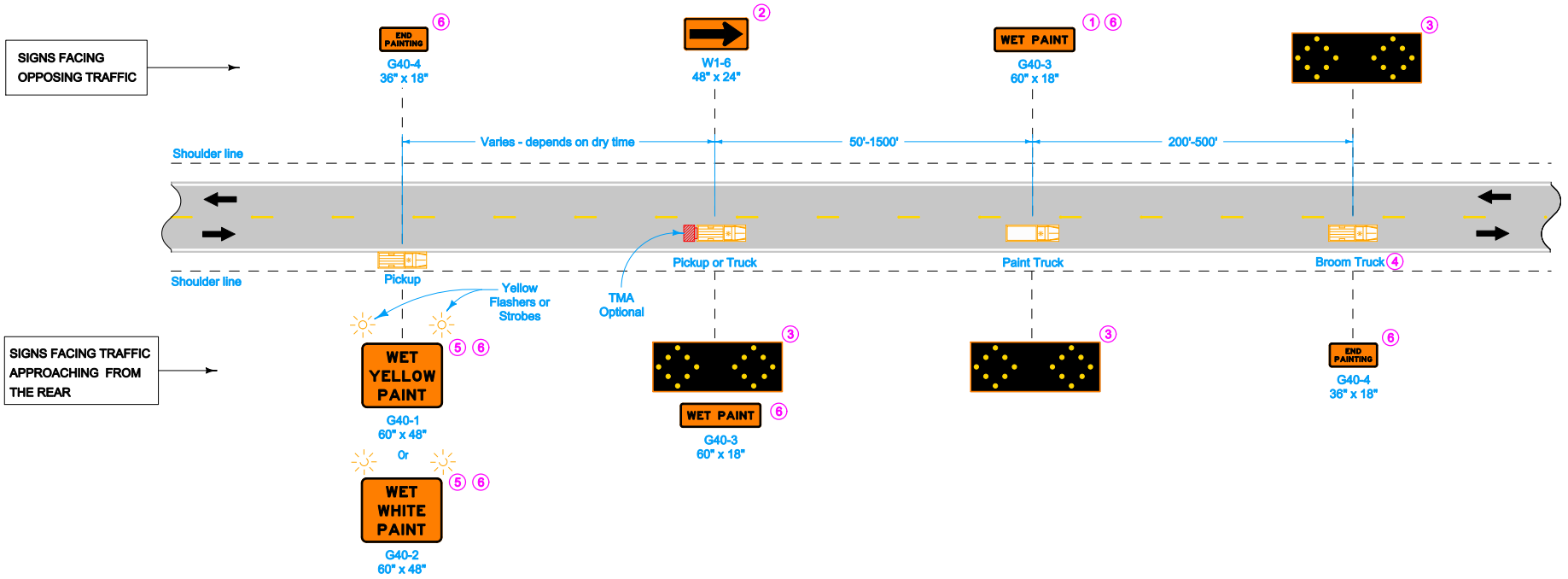
TC-232

SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SHOULDER RUMBLE STRIP OPERATIONS



VEHICLES NOT STRADDLING CENTERLINE

This layout may be used when painting edgeline or centerline markings.

Equip all vehicles with an amber Vehicle Warning Light.

(1) Use this sign when painting centerline markings.

(2) Optional Fluorescent Yellow Green (FYG) sign background may be used.

(3) This arrow display may be operated in a four-corner caution mode.

(4) Move this vehicle to the shoulder to accommodate passing traffic.

(5) A vehicle mounted Changeable Message Sign (CMS) may be used in lieu of this sign.

(6) Refer to SI-881 for sign details.

Possible Contract Item:
Traffic Control

LEGEND

Direction of Traffic

Truck-Mounted Attenuator (TMA)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

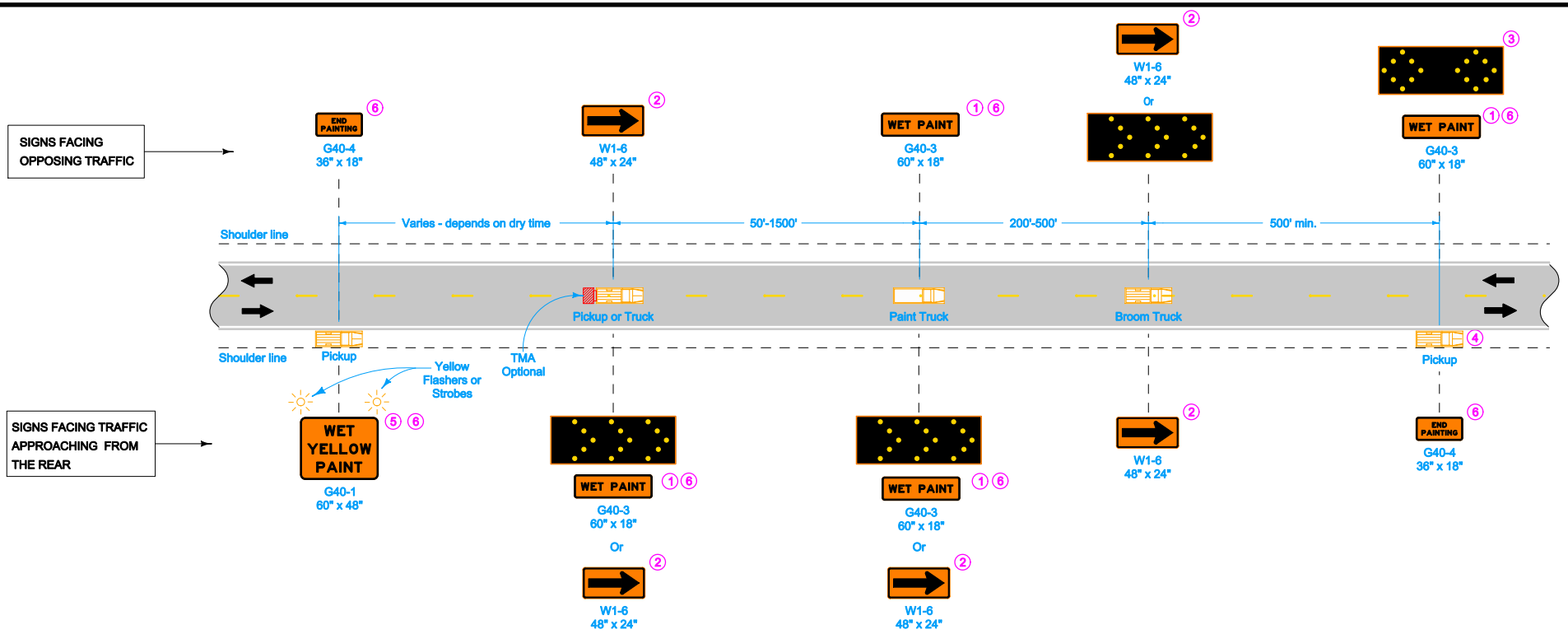
TC-233

SHEET 1 of 2

REVISIONS: Adjusted amber light wording in general notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PAVEMENT MARKING OPERATIONS TWO-LANE



VEHICLES STRADDLING CENTERLINE

LEGEND

- Direction of Traffic
- Truck-Mounted Attenuator (TMA)

(1) Use this sign when painting centerline markings.

(2) Optional Fluorescent Yellow Green (FYG) sign background may be used.

(3) This arrow display may be operated in a four-corner caution mode.

(4) This vehicle should move to the shoulder to accommodate passing traffic.

(5) A vehicle mounted Changeable Message Sign (CMS) may be used in lieu of this sign.

(6) Refer to SI-881 for sign details.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

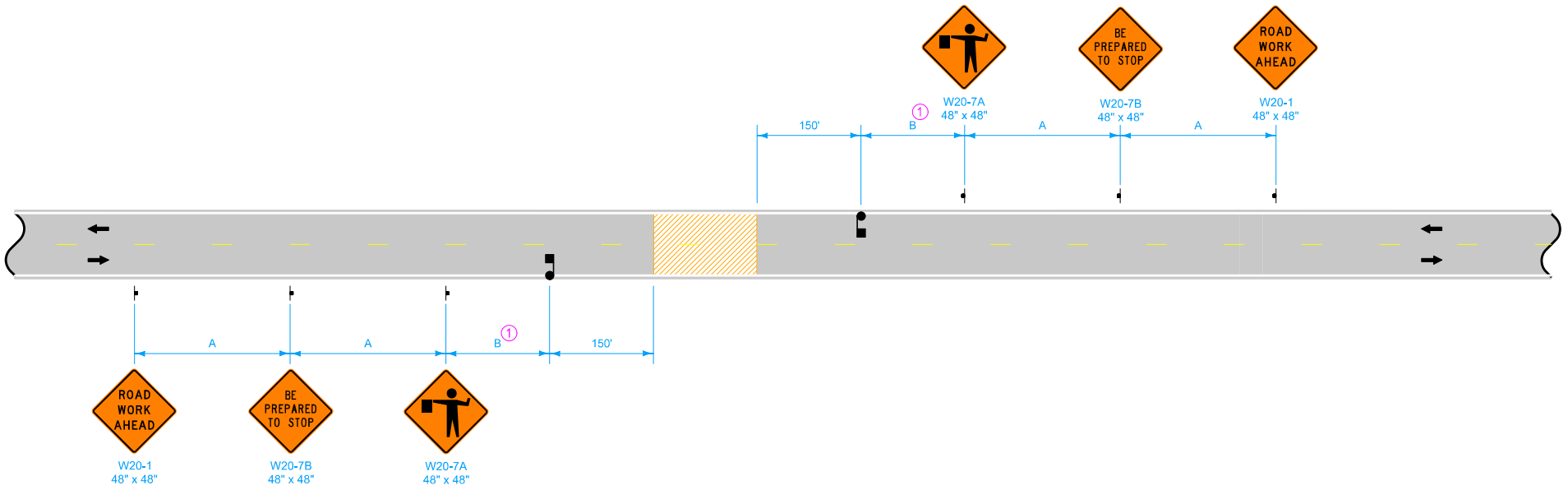
TC-233

SHEET 2 of 2

REVISIONS: Adjusted amber light wording in general notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PAVEMENT MARKING OPERATIONS TWO-LANE



Possible Contract Item:

Traffic Control
Flaggers

LEGEND

- Traffic Sign
- Work Area
- Flagger
- Direction of Traffic

SPEED LIMIT (mph)	A	B (1) (minimum)
35 or less	250'	250'
40 - 45	350'	350'
50 or greater	500'	500'

This layout is intended for a preplanned closure of 20 minutes or less.

(1) The Engineer will determine the storage length, B, necessary to accommodate stopped traffic during the closure.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-17-12

TC-251

SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY ROAD CLOSURE

SIGN PLACEMENT ON
TYPE III BARRICADES

Typical Sign Placement

Sign Placement with
Supplemental Sign

Iowa Department of Transportation

REVISION
3 | 04-17-12

STANDARD ROAD PLAN

TC-252

SHEET 1 of 3

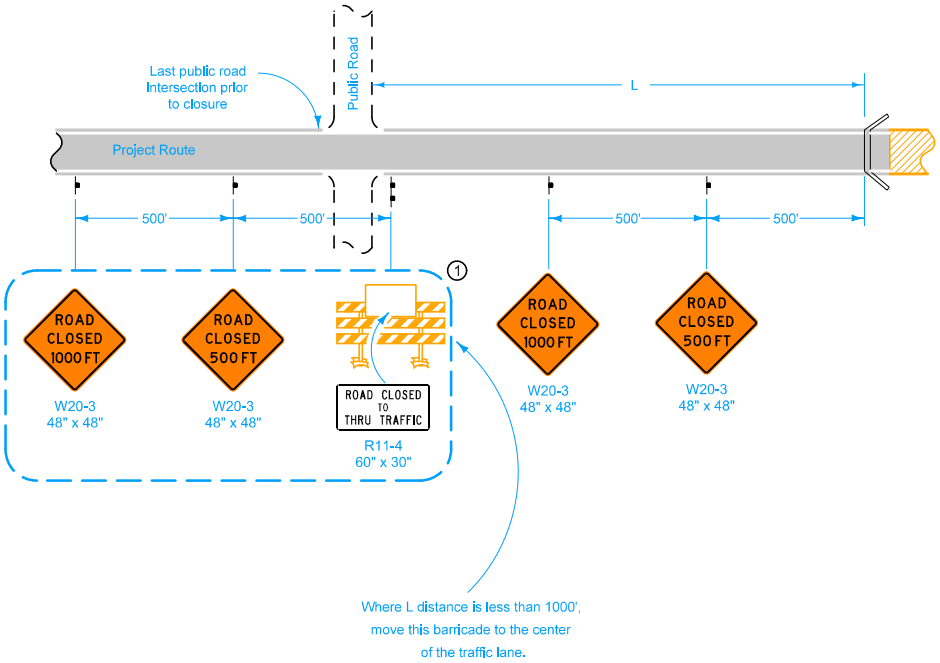
REVISIONS: Added Road Closure symbol for Safety Closures and graphics to show location of signs on Type III barricade. Changed title.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

ROUTES CLOSED TO TRAFFIC

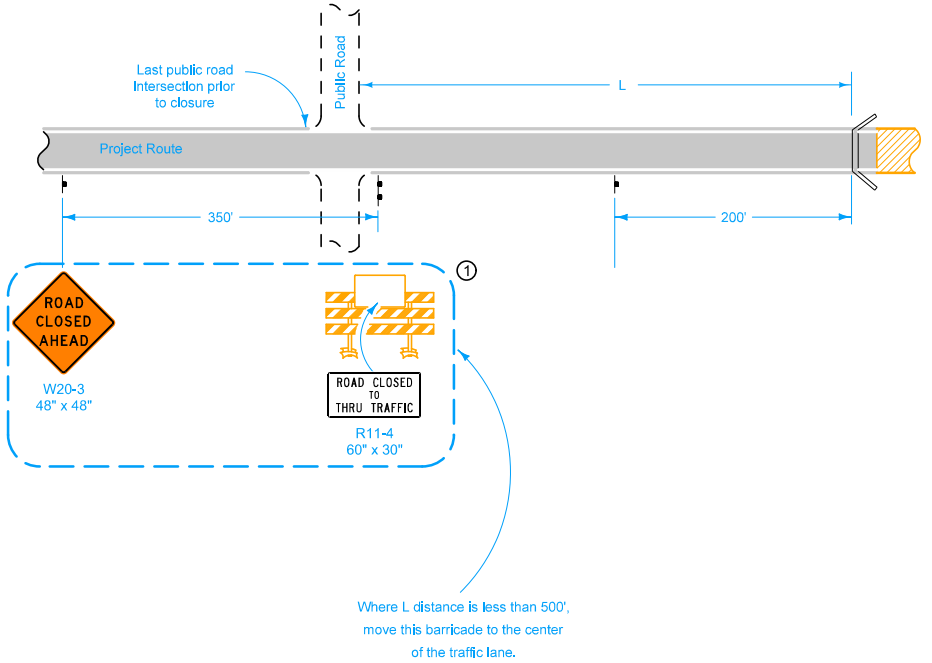
SITUATION 1 (RURAL)

Project Route Closure



SITUATION 1 (URBAN)

Project Route Closure



LEGEND

- Traffic Sign
- Type III Barricade
- Work Area
- Road Closure

① In situation 1, if the intersection is the point of detour these signs and barricade will become the responsibility of the contracting authority and may be modified by the contracting authority to fit detour signing.

Possible Contract Items:

Traffic Control
Safety Closures

Possible Tabulation:

108-13A

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 3 04-17-12

TC-252

SHEET 2 of 3

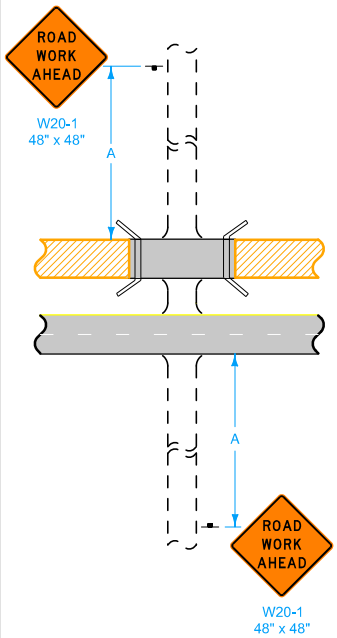
REVISIONS: Added Road Closure symbol for Safety Closures and graphics to show location of signs on Type III barricade. Changed title.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

ROUTES CLOSED TO TRAFFIC

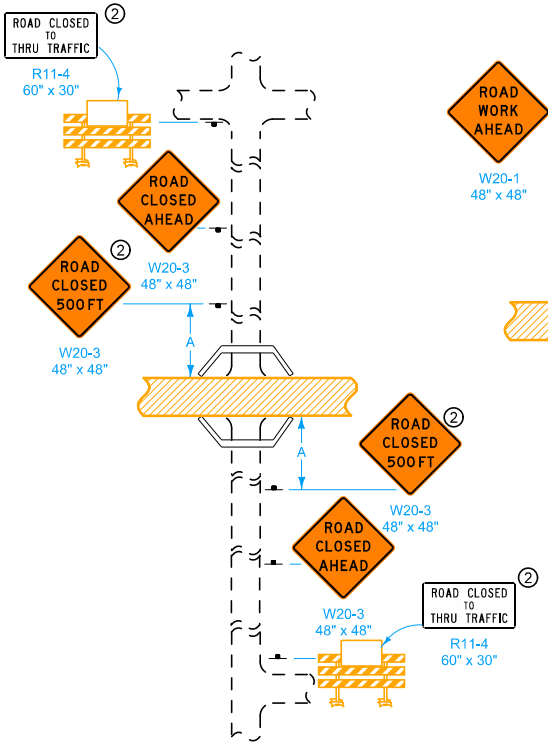
SITUATION 2

Public cross-traffic maintained.
No access to project.



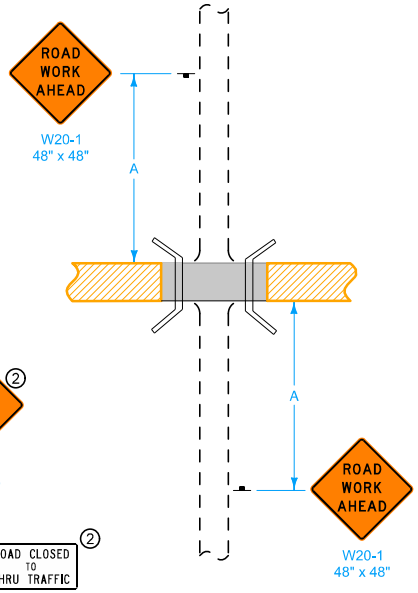
SITUATION 3

No access to project
(Applicable to T-intersections)



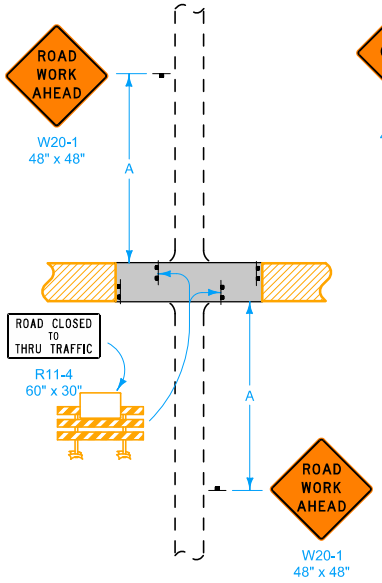
SITUATION 4

Public cross-traffic maintained.
No access to project.



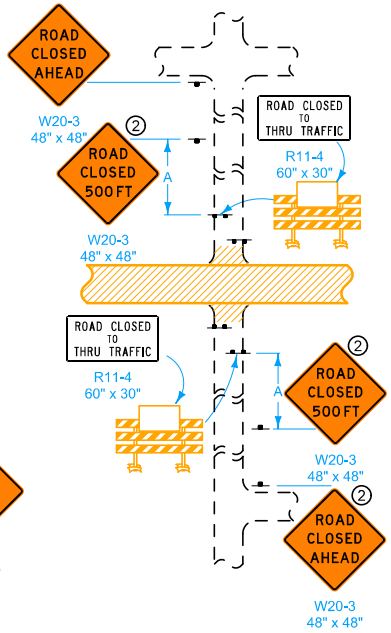
SITUATION 5

Public cross-traffic maintained.
Contractor and resident access.



SITUATION 6

No public access. Contractor and resident access only. (Applicable to T-intersections)



LEGEND

- Traffic Sign
- Type III Barricade
- Work Area
- Road Closure

Location	A
Urban	200'
Rural	500'

During suspension of work, (such as over winter):

- Use Situation 2 on two-lane to four-lane projects.
- Situation 5 is preferred where cross-traffic is maintained.

② In urban locations, remove the ROAD CLOSED 500 FT sign and replace it with the ROAD CLOSED AHEAD sign.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
3 | 04-17-12

TC-252

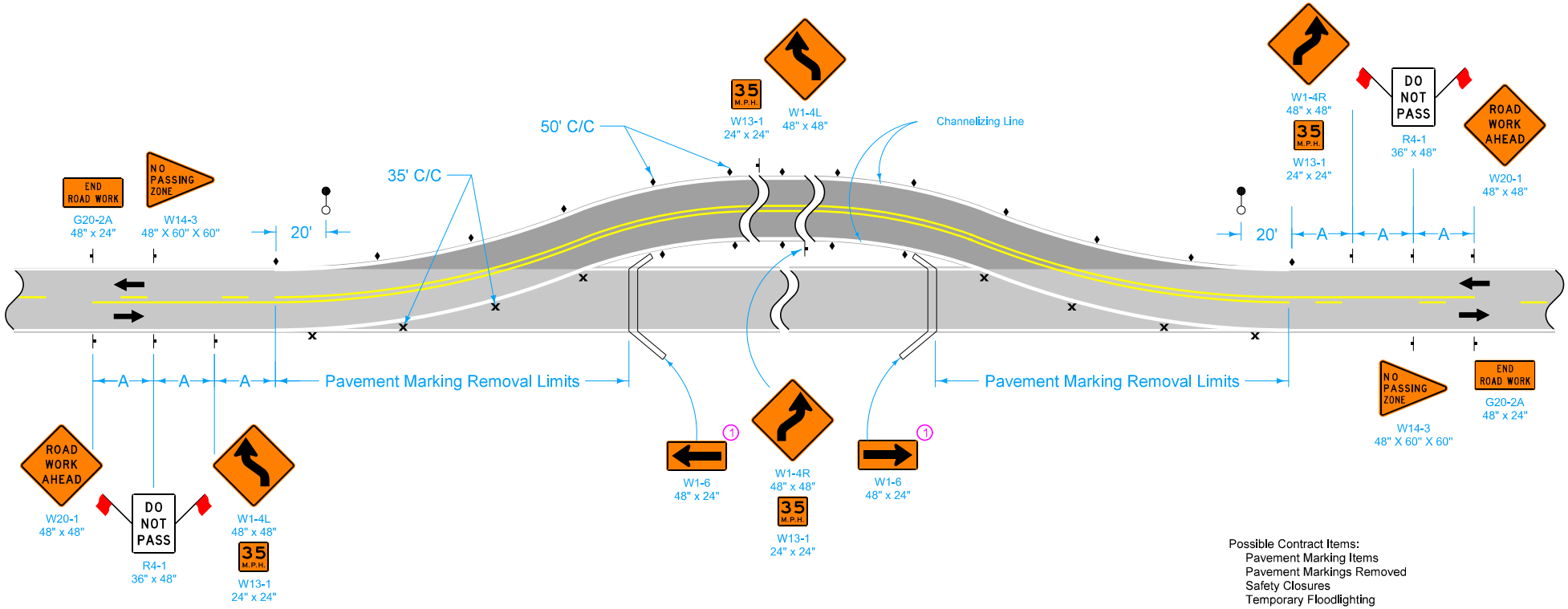
SHEET 3 of 3

REVISIONS: Added Road Closure symbol for Safety Closures and graphics to show location of signs on Type III barricade. Changed title.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

ROUTES CLOSED TO TRAFFIC

TWO-LANE DETOUR



Possible Contract Items:
- Pavement Marking Items
- Pavement Markings Removed
- Safety Closures
- Temporary Floodlighting
- Temporary Delineators
- Traffic Control

Possible Tabulations:
- 108-13A
- 108-18
- 108-22
- 108-27

LEGEND

- Direction of Traffic
- Drum
- Single White Delineators (mount back to back)
- Road Closure
- Temporary Floodlighting
- Traffic Sign

SPEED LIMIT (mph)	A
35 or less	250'
40 - 45	350'
50 or greater	500'

The Engineer may change the advisory speed. If reduced below 35 mph, the Reverse Curve signs (W1-4L and W1-4R) change to Reverse Turn signs (W1-3La and W1-3Ra).

(1) Add below ROAD CLOSED (R11-2) sign already included in Safety Closure.

Iowa Department of Transportation

REVISION 6 04-17-12

STANDARD ROAD PLAN

TC-253

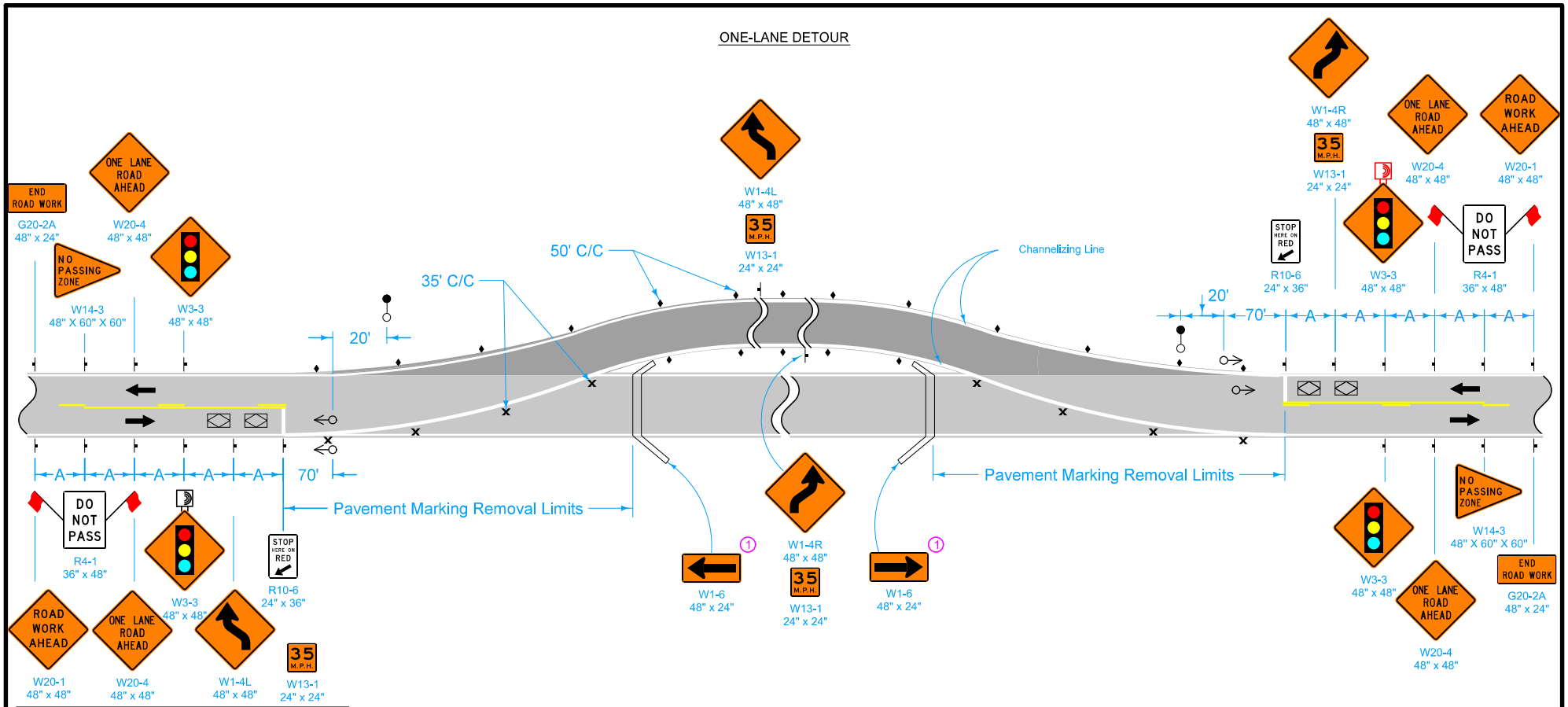
SHEET 1 of 2

REVISIONS: Added Road Closure symbol for Safety Closures.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PAVED ON-SITE DETOUR

ONE-LANE DETOUR



LEGEND

- Direction of Traffic
- Drum
- Single White Delineators (mount back to back)
- Road Closure
- Temporary Floodlighting
- Temporary Traffic Signal
- Traffic Sign
- Type 'B' High-Intensity Flashing Warning Light
- Vehicle Detection Area

(1) Add below ROAD CLOSED (R11-2) sign already included in Safety Closure.

TIMING FOR ACTUATED SIGNALS	Distance Between Stop Lines	All Red (secs.)*	Distance Between Stop Lines	All Red (secs.)*
Recommended Settings, secs.	400'	10	900'	21
Initial = 12.0	500'	12	1000'	23
Extension = 2.5	600'	14	1100'	25
Maximum Green = 45.0	700'	16	1200'	28
Yellow = 3.0	800'	19	1300'	30
All Red = (see table)				

* Range of values are based on an operating speed of 30 mph

SPEED LIMIT (mph)	A
35 or less	250'
40 - 45	350'
50 or greater	500'

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 6 04-17-12

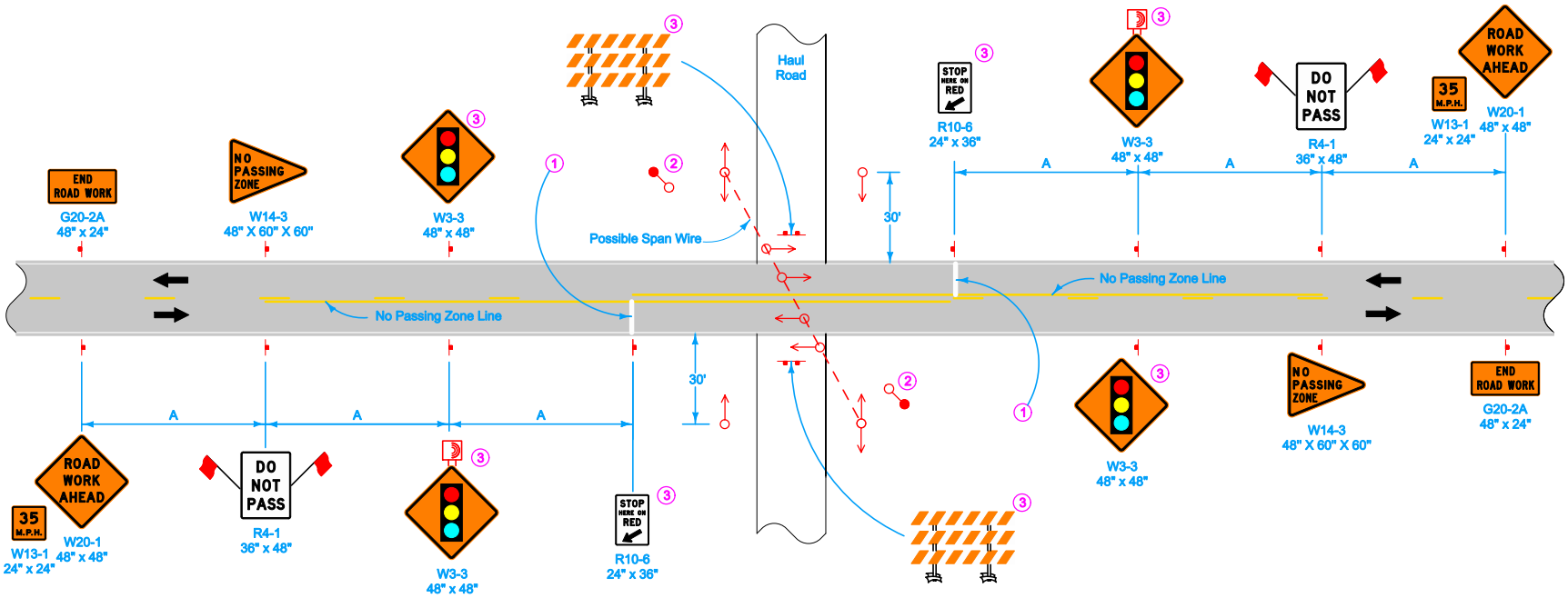
TC-253

SHEET 2 of 2

REVISIONS: Added Road Closure Symbol for Safety Closures.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PAVED ON-SITE DETOUR



LEGEND

- Traffic Sign
- Type III Barricade
- Temporary Floodlighting
- Type 'B' Warning Light
- Traffic Signal
- Direction of Traffic

SPEED LIMIT (mph)	A
35 or less	250'
40 - 45	350'
50 or greater	500'

No detection area required.

Set signal timing as follows: For traffic from all directions, set the yellow indication at approximately 5 seconds and the all-red clearance interval at approximately 2 seconds. Set the minimum green interval on the main road at 20 seconds. Set the green interval for haul road traffic at 12 seconds but may be extended up to a maximum of 30 seconds.

(1) Locate the stop bars 70 feet in advance of each lane's nearest signal head.

(2) Required only if haul road is used during nighttime hours.

(3) When the equipment crossing is not in use, place Type III Barricades as shown, and cover SIGNAL AHEAD and STOP HERE ON RED signs.

Possible Contract Items:
- Pavement Marking Items
- Pavement Markings Removed
- Traffic Control
- Temporary Floodlighting
- Temporary Traffic Signals

Possible Tabulations:
- 108-22
- 108-27
- 108-28

Iowa Department of Transportation

REVISION 4 04-19-11

STANDARD ROAD PLAN

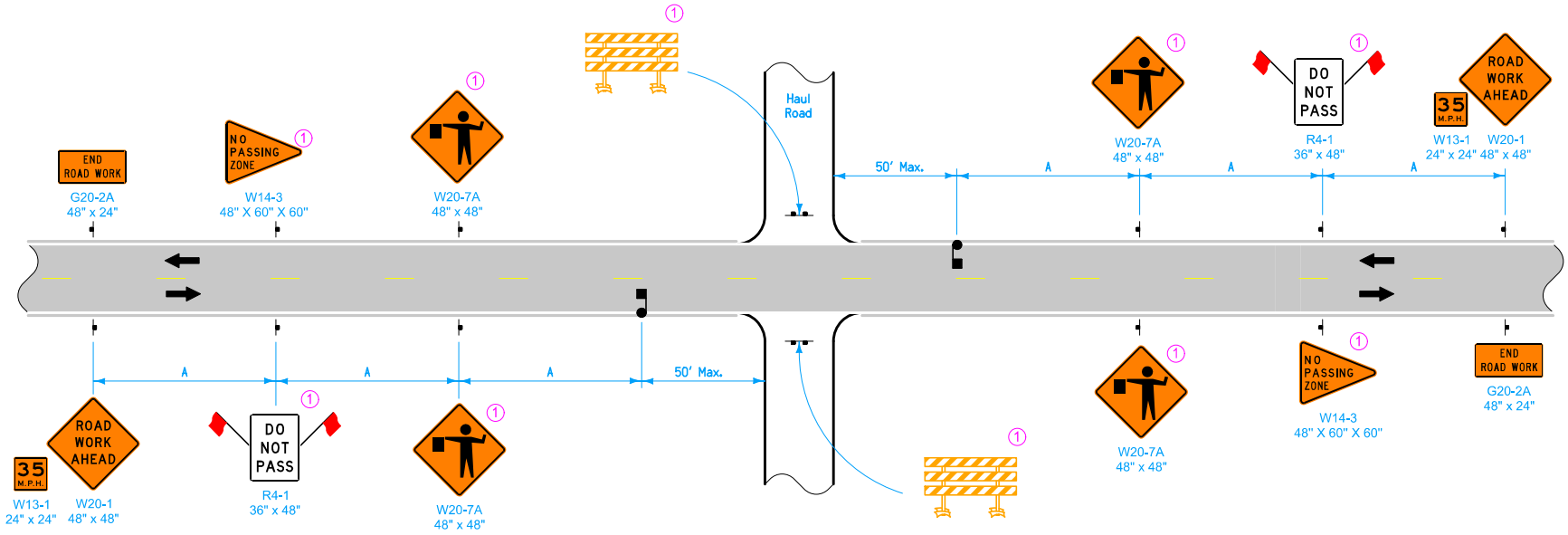
TC-271

SHEET 1 of 1

REVISIONS: Added general note.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SIGNALIZED EQUIPMENT CROSSING



Possible Contract Items:

Traffic Control
Flaggers

① During nighttime hours or when the haul road is not in use, Type III Barricades shall be placed as shown and DO NOT PASS, NO PASSING ZONE and Flagger Symbol signs shall be covered or removed.

LEGEND

- Traffic Sign
- Type III Barricade
- Flagger
- Direction of Traffic

SPEED LIMIT (mph)	A
35 or less	250'
40 - 45	350'
50 or greater	500'

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

TC-272

SHEET 1 of 1

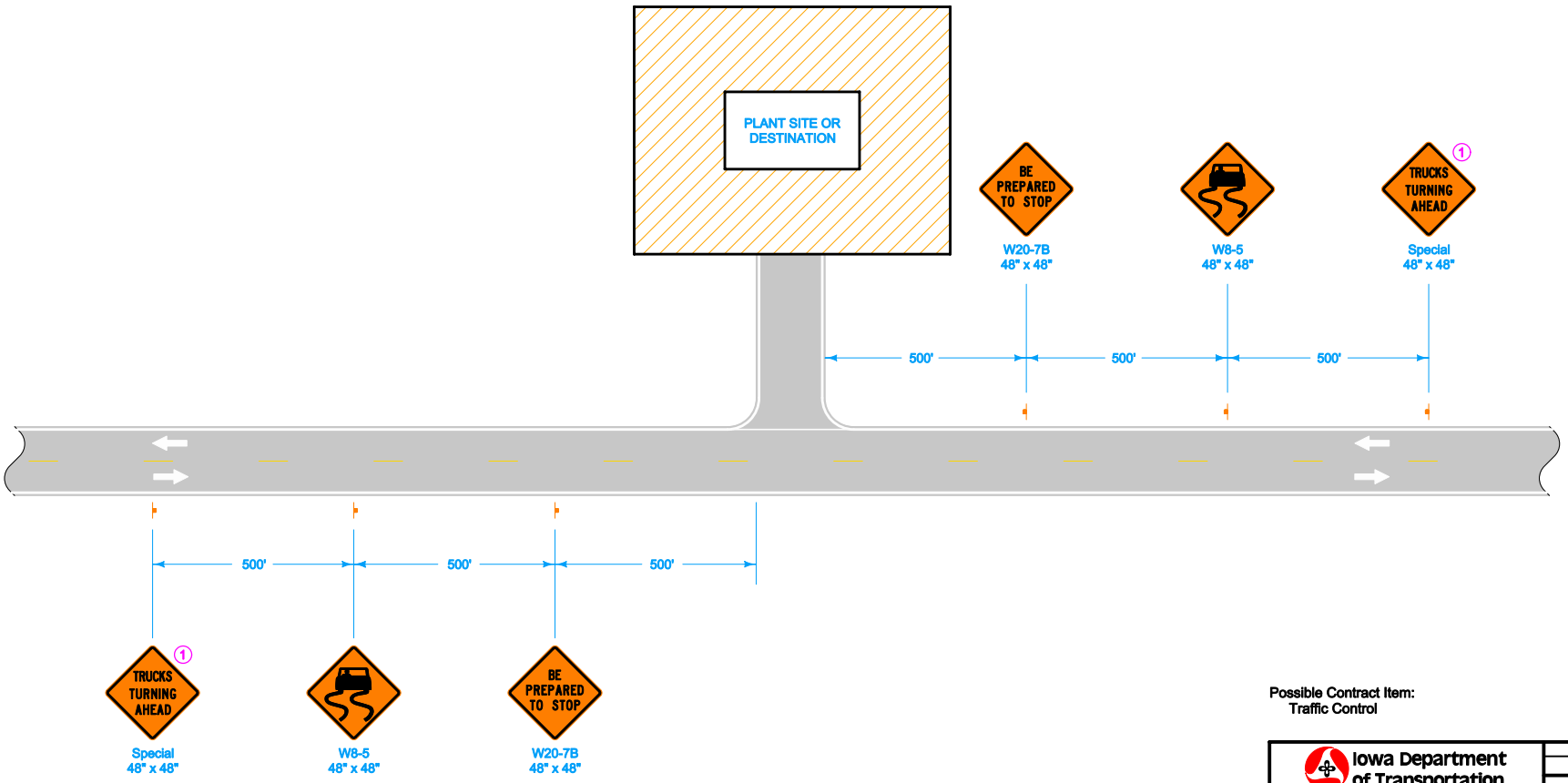
REVISIONS: No significant changes. Changed to color.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

UNSIGNALIZED EQUIPMENT CROSSING

Construction traffic shall yield the right-of-way to mainline traffic.

(1) Refer to SI-881 for details.



LEGEND

Traffic Sign

Direction of Traffic

Possible Contract Item:
Traffic Control

Iowa Department of Transportation

REVISION
1 | 04-20-10

STANDARD ROAD PLAN

TC-273

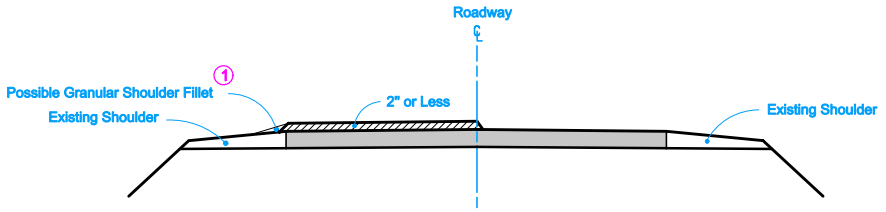
SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

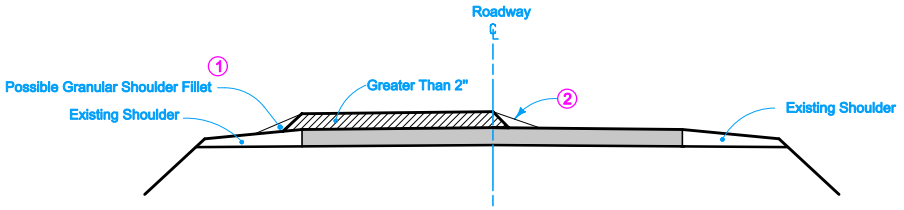
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

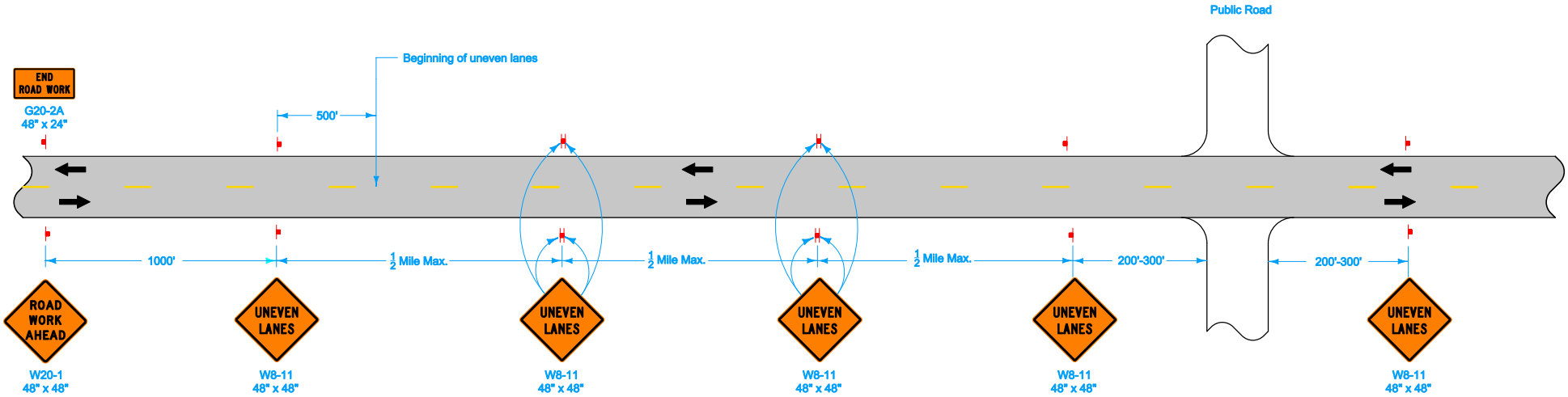
CONSTRUCTION SITE ENTRANCE

DESIGN LIFT THICKNESSES 2" OR LESS



DESIGN LIFT THICKNESSES GREATER THAN 2" (WITH ℄ FILLET)





LEGEND

- Direction of Traffic
- Traffic Sign

① Shoulder Fillet: Refer to Standard Specification 1107 and Safety Edge specifications.

② Centerline fillet may be notched wedge, Safety Edge, or a temporary 3:1 HMA fillet.

Possible Contract Items:
Pavement Marking Items
Traffic Control

Possible Tabulation:
108-22

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
3	04-19-11

TC-282

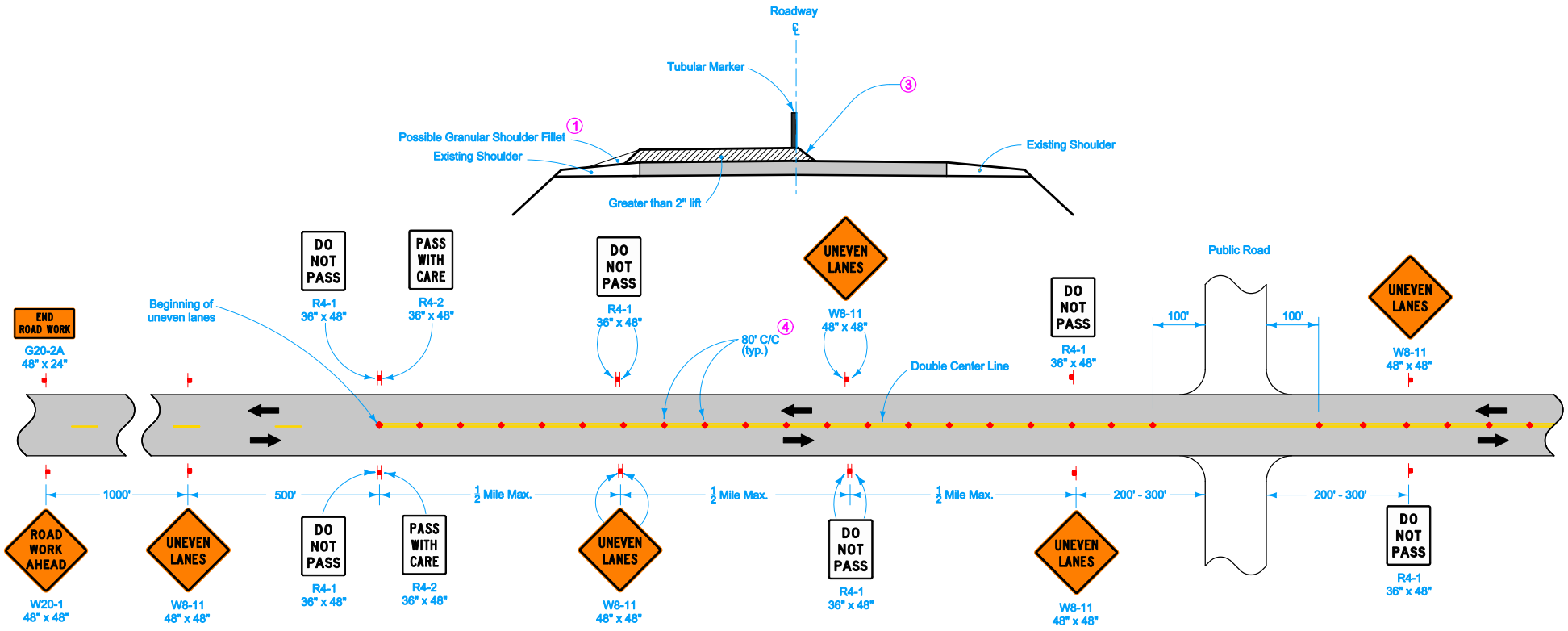
SHEET 1 of 3

REVISIONS: Added Detail 9018 to new page 3.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

UNEVEN LANES

DESIGN LIFT THICKNESSES GREATER THAN 2" (WITHOUT ℄ FILLET)



LEGEND

- Direction of Traffic
- Traffic Sign
- Tubular Marker

"No-Passing" zones shall not exceed 2.5 miles for ADT less than 2500 vpd or 2.0 miles for ADT from 2500 to 5000 vpd.

① Shoulder Fillet: Refer to Standard Specification 1107 and Safety Edge specifications.

③ Typical 1:1 taper.

④ Spacing = 40 feet where horizontal curve radius is less than 1000 feet.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
3	04-19-11

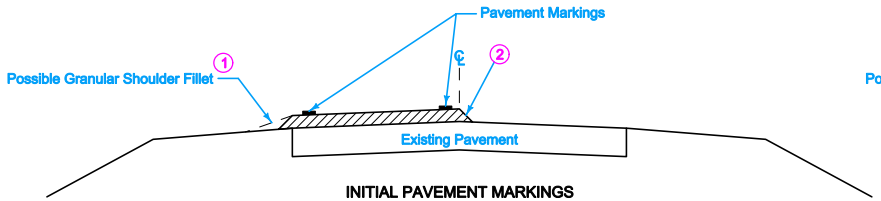
TC-282

SHEET 2 of 3

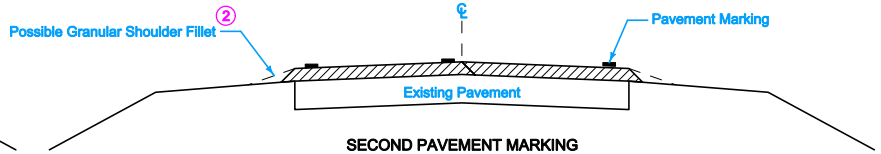
REVISIONS: Added Detail 9018 to new page 3.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

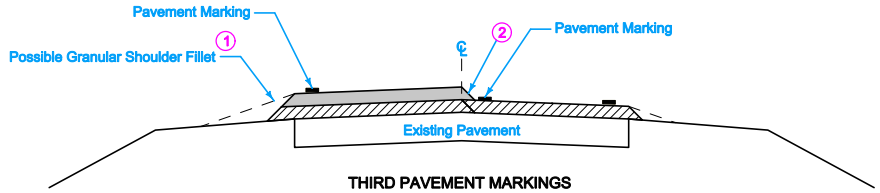
UNEVEN LANES



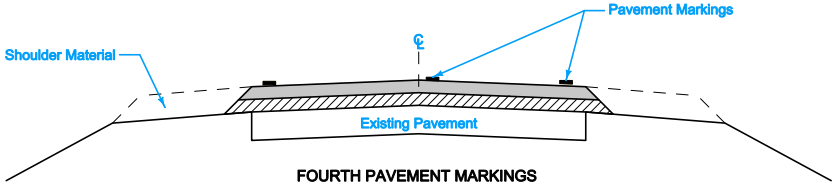
INITIAL PAVEMENT MARKINGS



SECOND PAVEMENT MARKING



THIRD PAVEMENT MARKINGS



FOURTH PAVEMENT MARKINGS

PAVEMENT MARKING SEQUENCE

① Shoulder Fillet: Refer to Standard Specification 1107 and Safety Edge specifications.

② Centerline fillet may be notched wedge, Safety Edge, or a temporary 3:1 HMA fillet.

LEGEND

- Surface Course
- Intermediate Course

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
3	04-19-11

TC-282

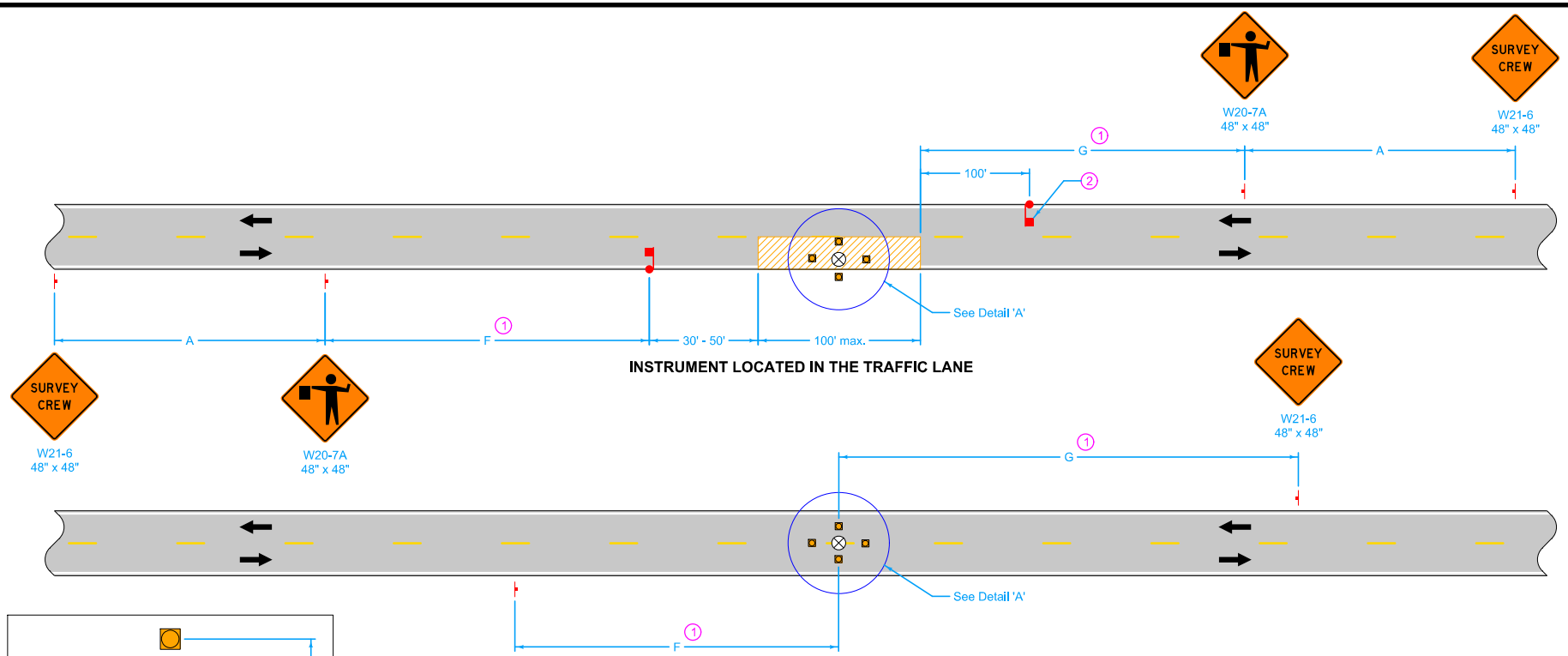
SHEET 3 of 3

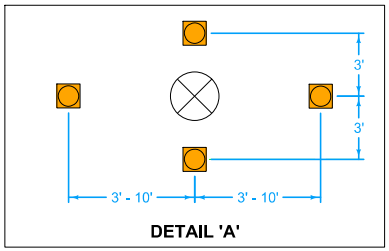
REVISIONS: Added Detail 9018 to new page 3.

Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

UNEVEN LANES





LEGEND

- Traffic Sign
- Instrument Person
- Cone
- Work Area
- Flagger
- Direction of Traffic

SPEED LIMIT (mph)	A	WITH LANE CLOSURE F and G (1)	WITHOUT LANE CLOSURE F and G (1)	F + G MAXIMUM
35 or less	250'	250' - 3250'	500' - 3000'	3500'
40 - 45	350'	350' - 3350'	700' - 3000'	3700'
50 or greater	500'	500' - 3500'	1000' - 3000'	4000'

When another person is required outside of the signing setup (e.g. for a survey target), a separate signing setup may be necessary unless the traffic lane can be vacated to accommodate traffic.

(1) Keep F and G distances as near to minimum values as work permits. However, to be able to move the work area without moving the advance signing, F and G values may be varied within the limits of the table. Maximum movement can be achieved by setting one F or G value at the minimum and the other value at its maximum.

(2) Use a second flagger if:

- The flagger's view of approaching traffic in the open lane is less than a quarter mile or the work site is in an area of restricted sight distance (such as a "No-Passing" zone); or
- Excessive traffic delays are encountered.

Possible Contract Items:
Flaggers
Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 10-18-11

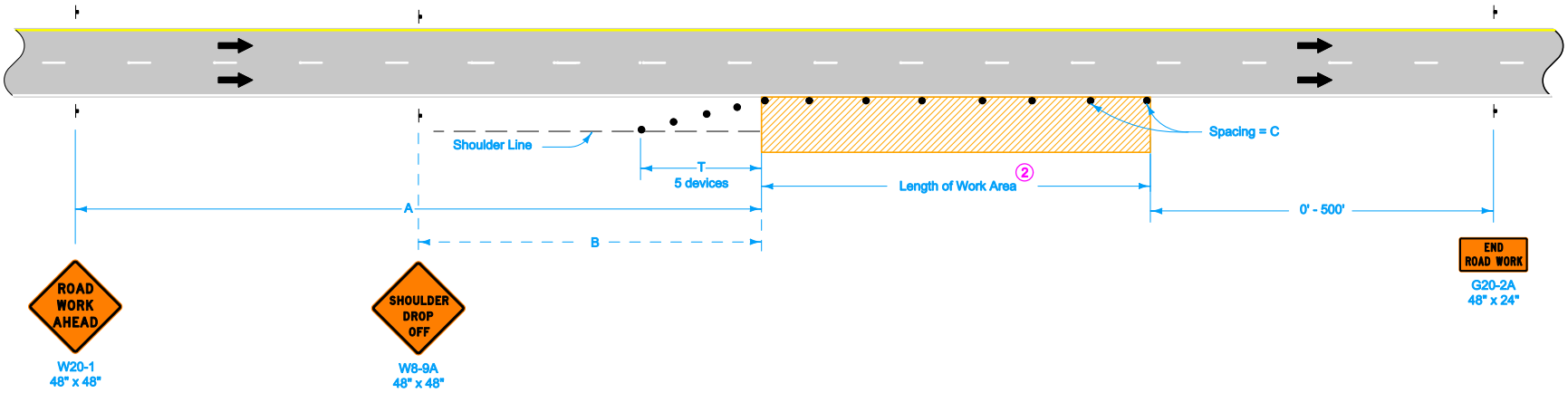
TC-283

SHEET 1 of 1

REVISIONS: Made into color standard. Changed size of signs to 48" X 48".

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SURVEYING OPERATIONS



LEGEND

- Traffic Sign
- 42" Channelizer
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A	B	C (2)	T
40 or less	500'	250'	40'	100'
45 - 50	700'	350'	80' (1)	200'
55 - 60	1500'	500'	100' (1)	200'
65 - 70	1500'	500'	100' (1)	230'

When a pavement edge drop-off exists, install a SHOULDER DROP-OFF sign.

Pavement edge drop-offs greater than a nominal 10 inches will not be allowed during non-working hours.

Shoulder edge drop-offs shall be mitigated according to Article 1107.08.K2 of the Standard Specifications.

(1) When the length of a pavement edge drop-off is 1000 feet or less, the temporary fillet requirement of Article 1107.08 of the Standard Specifications does not apply.

Space devices at 40 feet.

(2) For work areas less than 200 feet long, use channelizers spaced at 20 foot centers or use a vehicle with an amber revolving light or amber strobe light.

Possible Contract Item:
Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 4 04-17-12

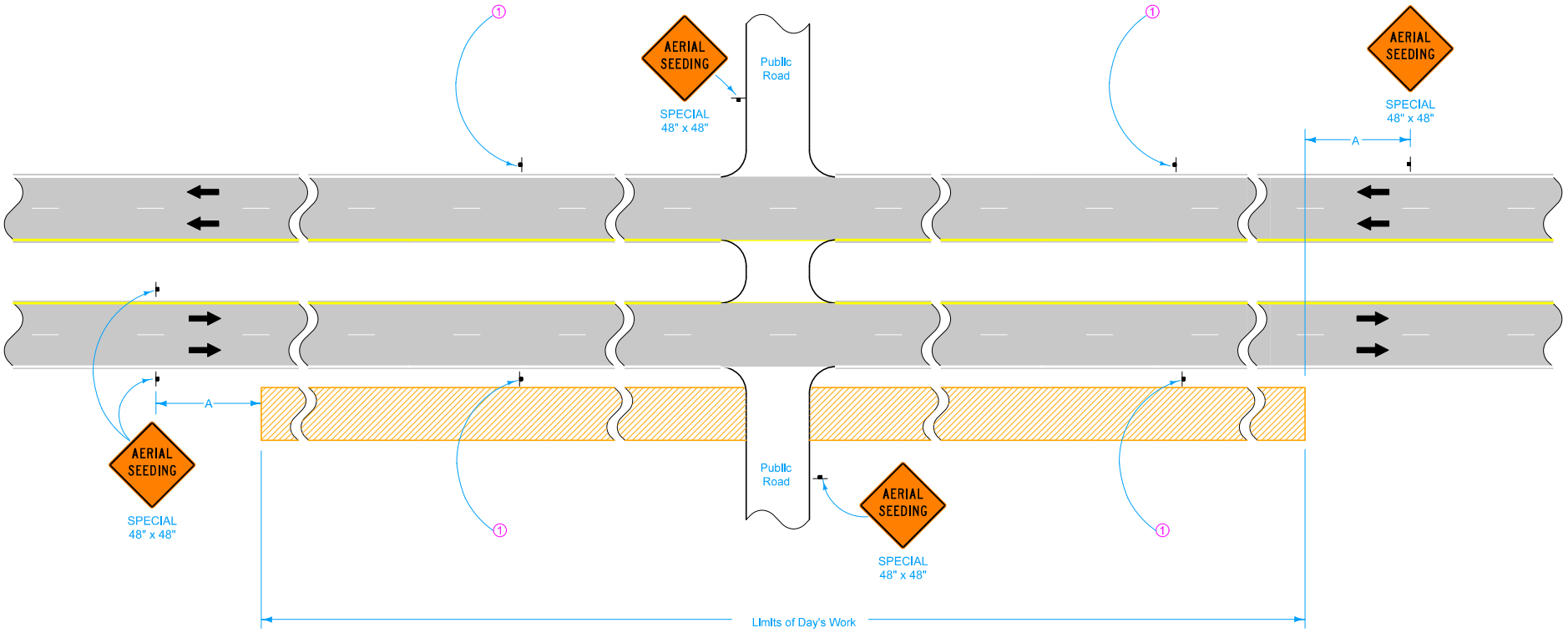
TC-402

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SHOULDER CLOSURE (MULTI-LANE)



Possible Contract Item:

Traffic Control

① AERIAL SEEDING signs shall be placed along the mainline at a maximum spacing of 3 miles.

LEGEND

- Traffic Sign
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A
35 or less	250'
40 - 45	500'
50 or greater	500'

Iowa Department of Transportation

REVISION 2 04-17-12

STANDARD ROAD PLAN

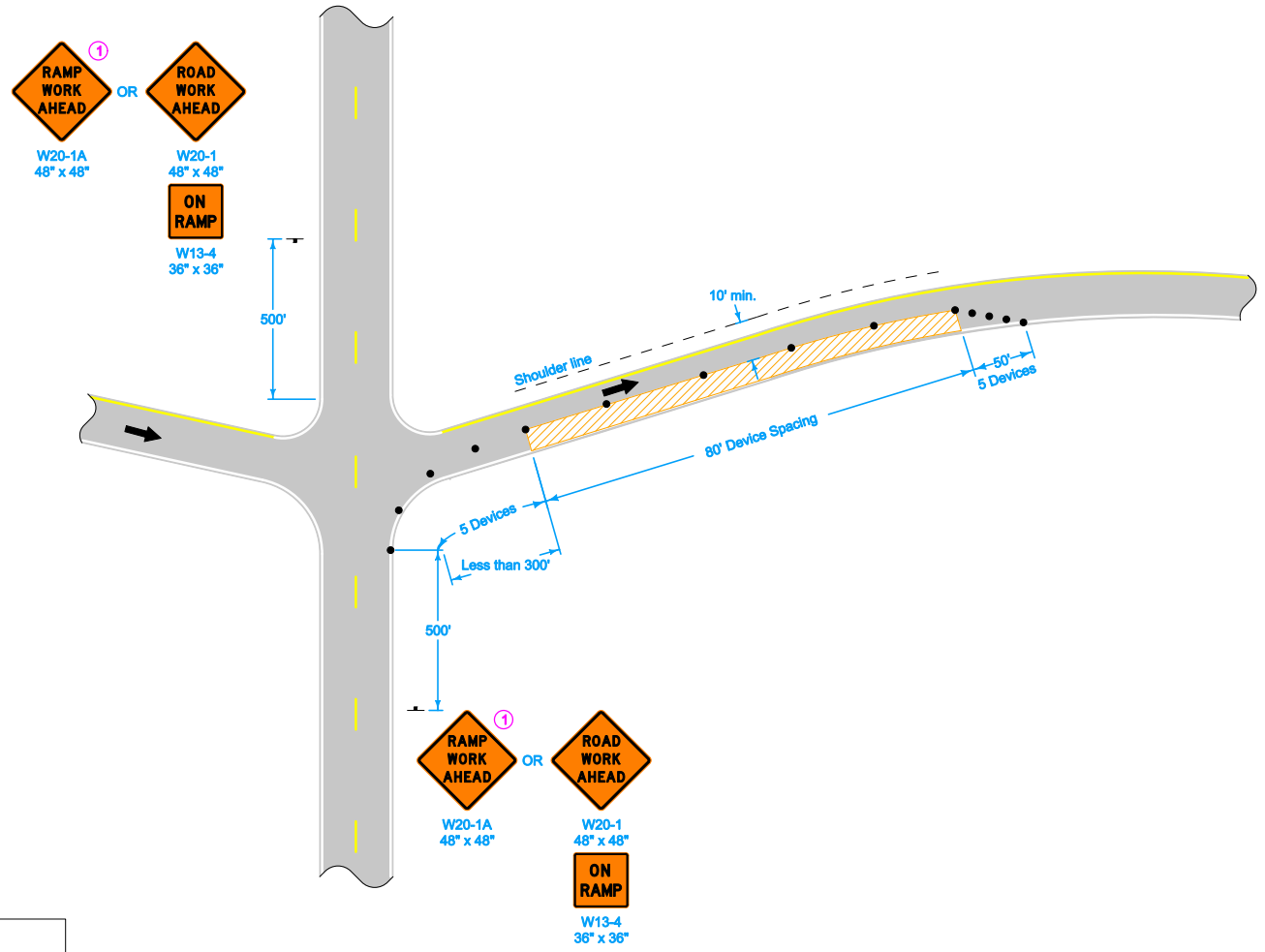
TC-403

SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

AERIAL SEEDING OPERATIONS



① Refer to SI-881 for sign details.

LEGEND

- Traffic Sign
- 42" Channelizer
- Direction of Traffic
- Work Area

Possible Contract Item:
Traffic Control

Iowa Department of Transportation

REVISION 2 04-17-12

STANDARD ROAD PLAN

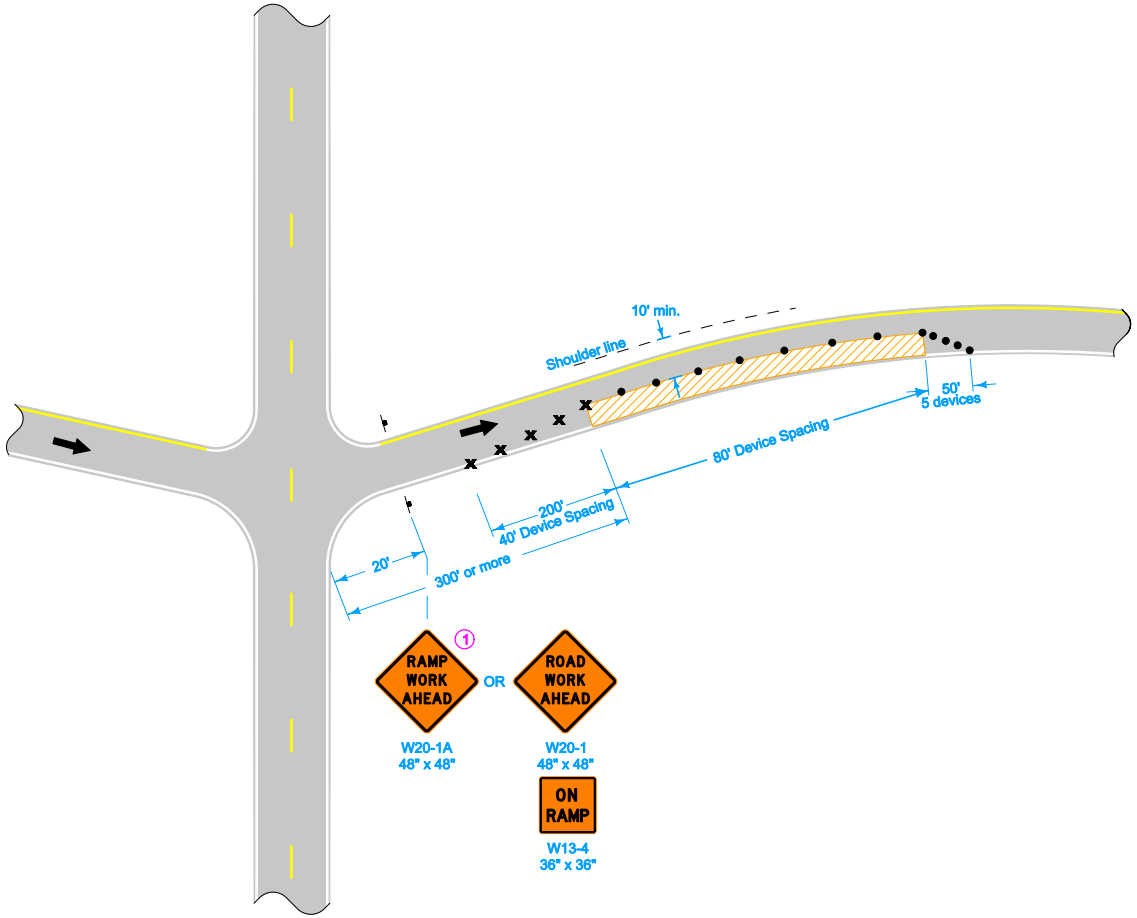
TC-416

SHEET 1 of 4

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PARTIAL LANE CLOSURE ON RAMPS



(1) Refer to SI-881 for sign details.

LEGEND

- Drum
- Traffic Sign
- 42" Channelizer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-17-12

TC-416

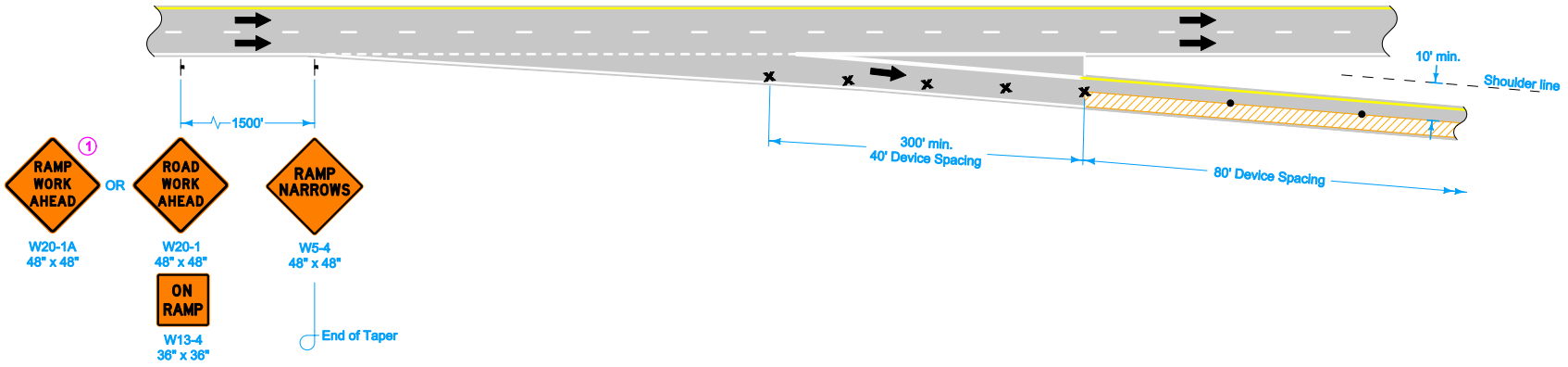
SHEET 2 of 4

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PARTIAL LANE CLOSURE ON RAMPS

① Refer to SI-881 for sign details.



LEGEND

- Drum
- Traffic Sign
- 42" Channelizer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-17-12

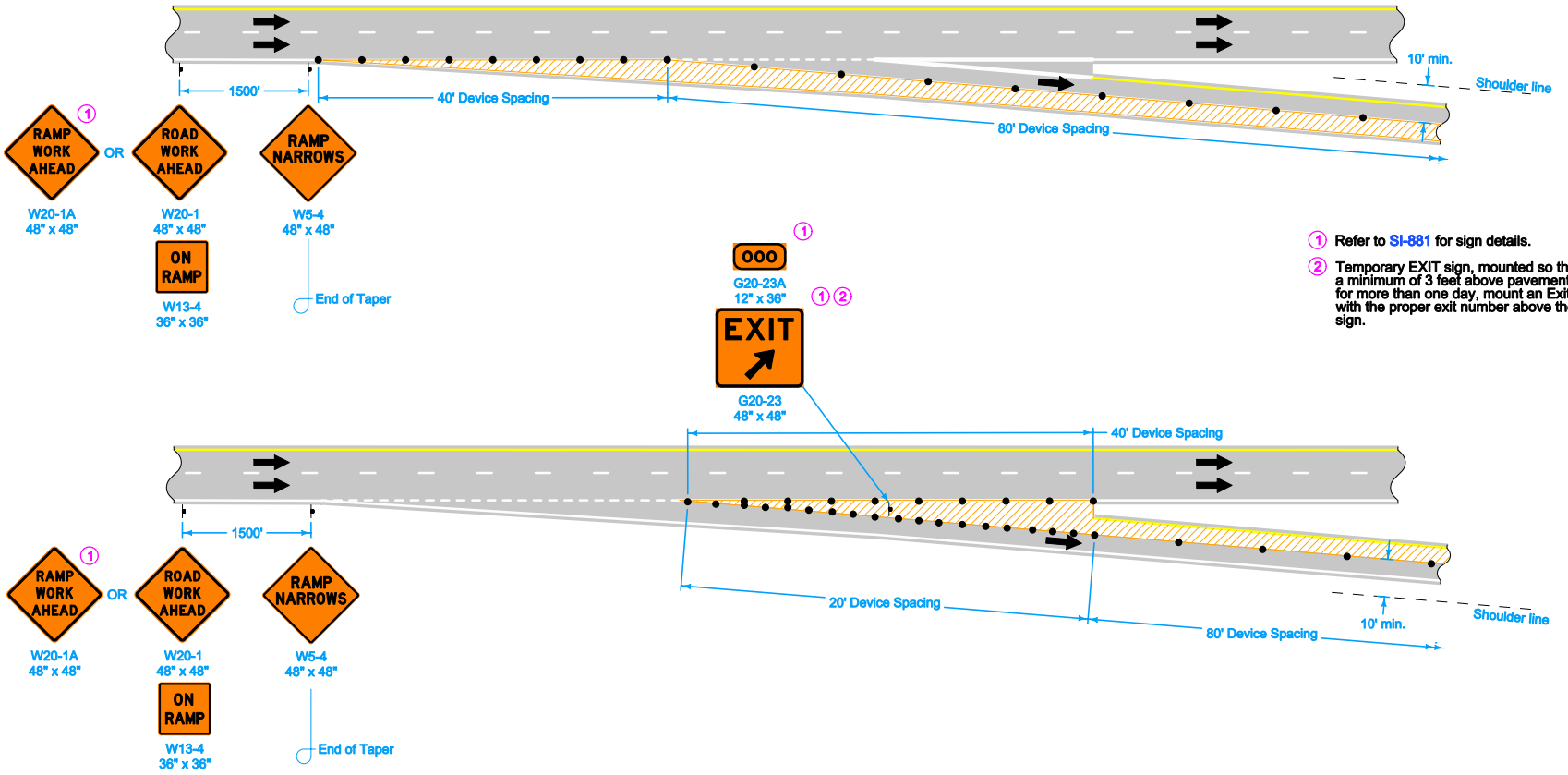
TC-416

SHEET 3 of 4

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PARTIAL LANE CLOSURE ON RAMPS



① Refer to SI-881 for sign details.

② Temporary EXIT sign, mounted so that bottom of sign is a minimum of 3 feet above pavement surface. If in place for more than one day, mount an Exit Number Panel with the proper exit number above the temporary EXIT sign.

LEGEND

- Traffic Sign
- 42" Channelizer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	04-17-12

TC-416

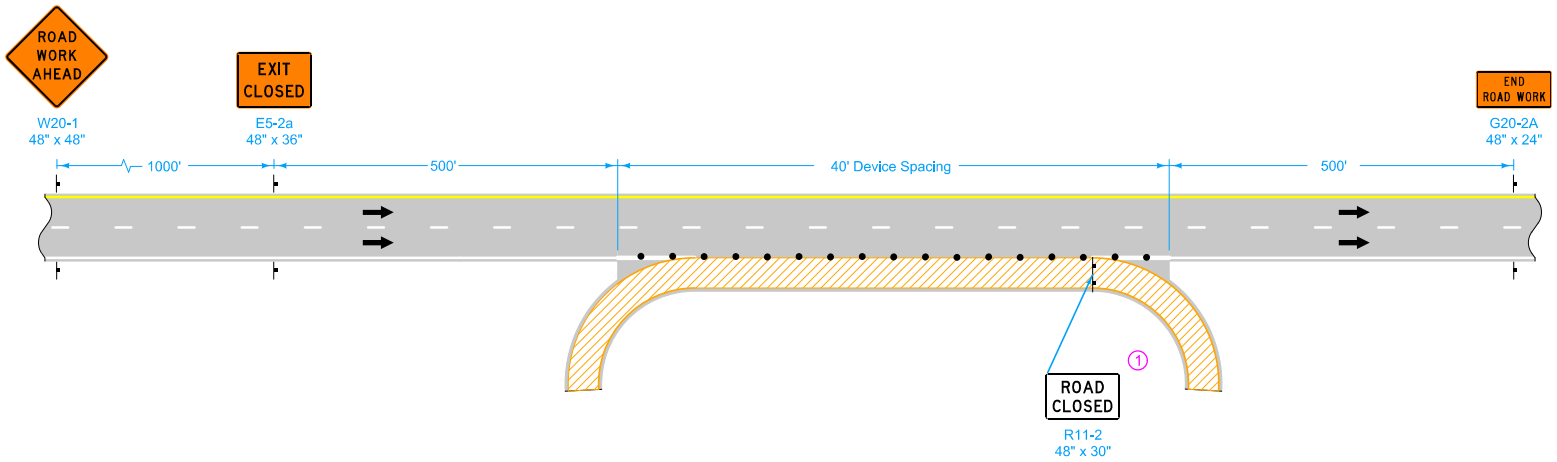
SHEET 4 of 4

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PARTIAL LANE CLOSURE ON RAMPS

① A vehicle with an amber Vehicle Warning Light may be substituted for the Type III barricade.



EXIT RAMP CLOSURE

Possible Contract Items:
Safety Closure
Traffic Control

Possible Tabulation:
108-13A

LEGEND

- Type III Barricade
- Traffic Sign
- 42" Channelizer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
2 | 04-17-12

TC-417

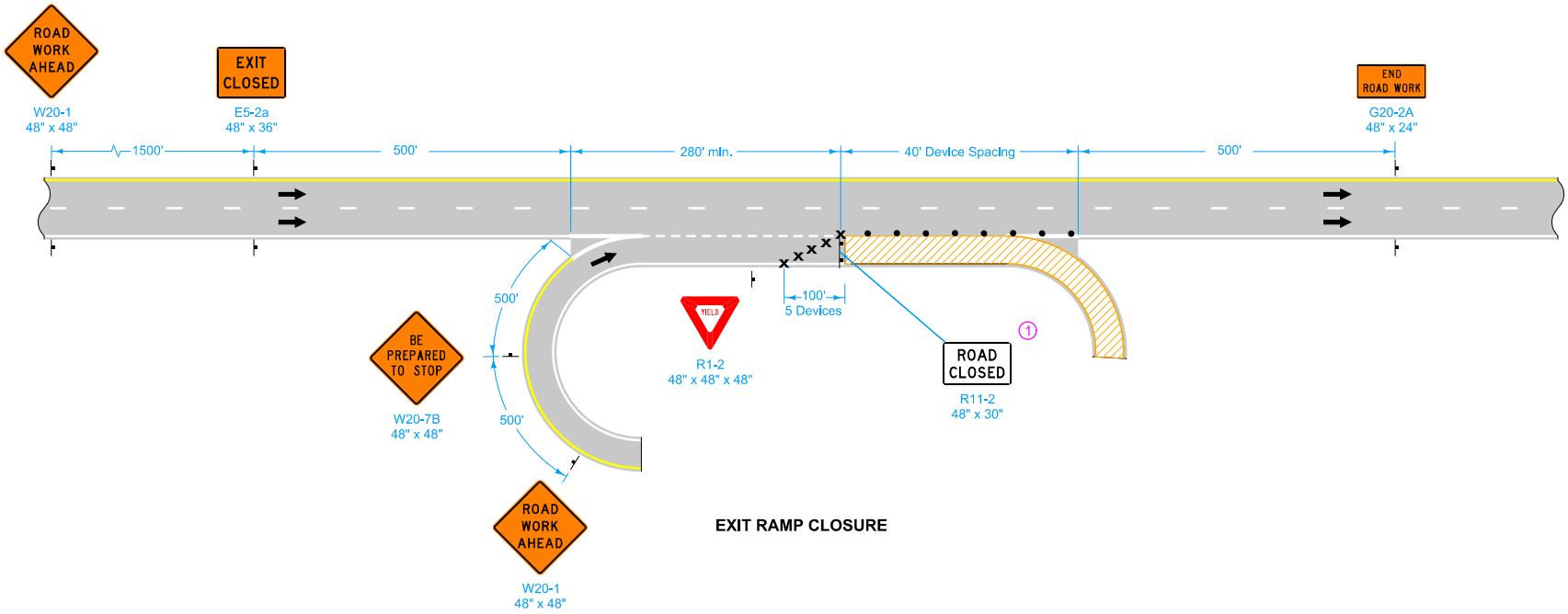
SHEET 1 of 3

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

RAMP CLOSURE

① A vehicle with an amber Vehicle Warning Light may be substituted for the Type III barricade.



EXIT RAMP CLOSURE

LEGEND

- Type III Barricade
- Traffic Sign
- Drum
- 42" Channelizer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

REVISION
2 | 04-17-12

STANDARD ROAD PLAN

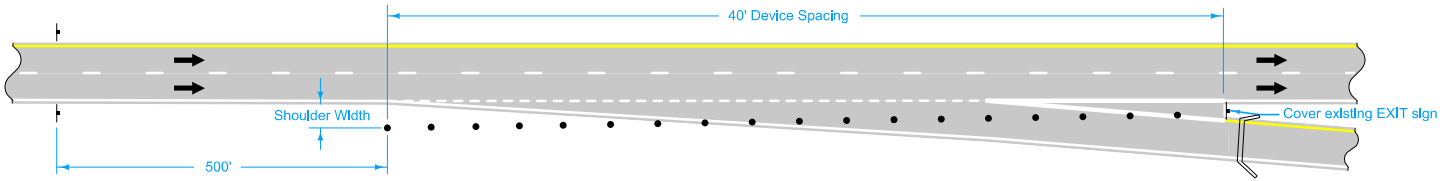
TC-417

SHEET 2 of 3

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

RAMP CLOSURE



EXIT CLOSED

E5-2a
48" x 36"

EXIT RAMP CLOSURE

LEGEND

- Road Closure
- Traffic Sign
- 42" Channelizer
- Direction of Traffic

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 04-17-12

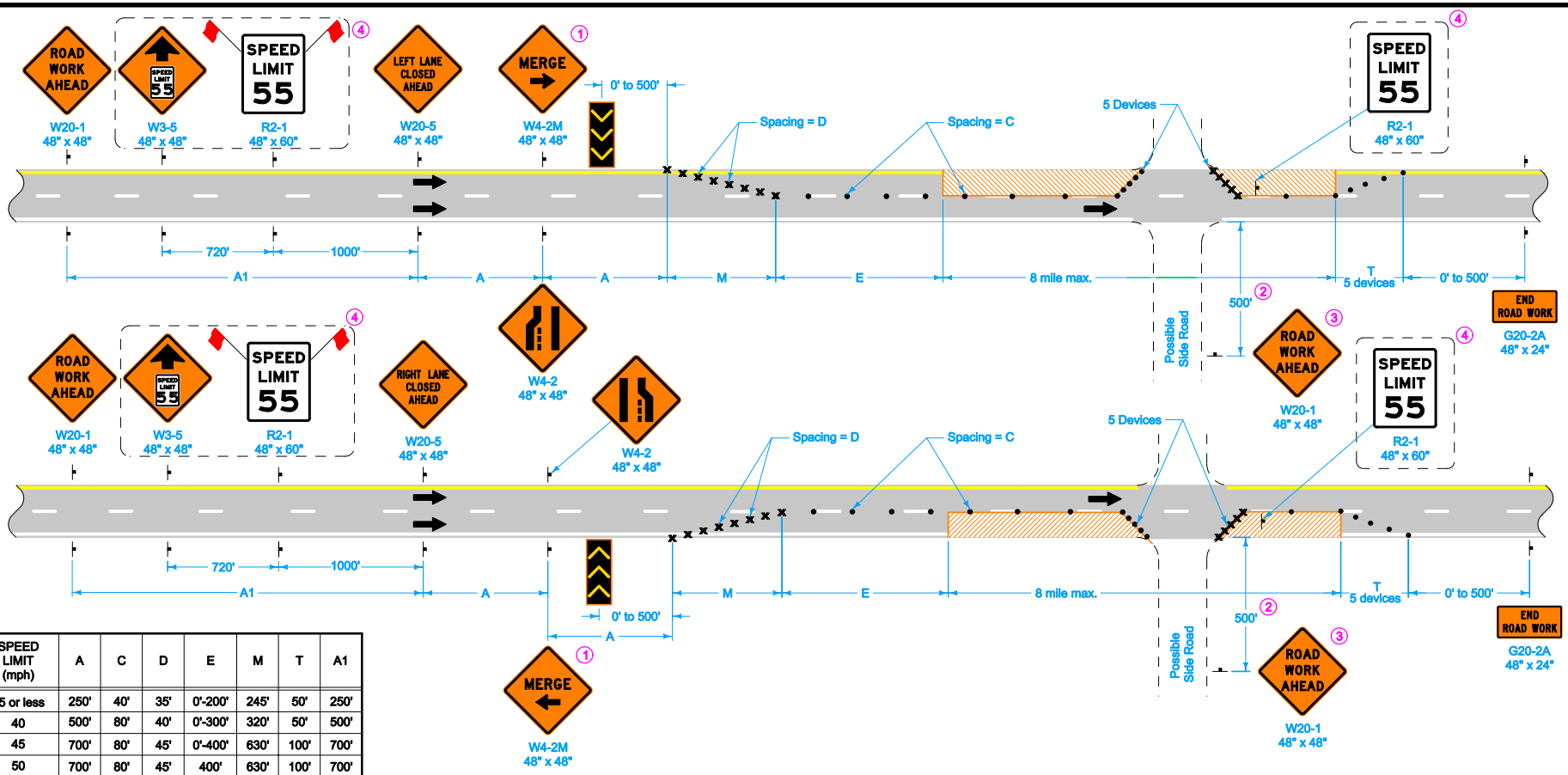
TC-417

SHEET 3 of 3

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

RAMP CLOSURE



SPEED LIMIT (mph)	A	C	D	E	M	T	A1
35 or less	250'	40'	35'	0'-200'	245'	50'	250'
40	500'	80'	40'	0'-300'	320'	50'	500'
45	700'	80'	45'	0'-400'	630'	100'	700'
50	700'	80'	45'	400'	630'	100'	700'
55 - 60	1000'	100'	55'	600'	770'	100'	2000'
65 - 70	1000'	100'	65'	700'	910'	100'	2000'

LEGEND

- Direction Of Traffic
- Traffic Sign
- Drum
- 42" Channelizer
- Arrow Display
- Work Area

When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

Where there is a lane line drop-off or rise, do not allow traffic to cross over the drop-off or rise; except for ramp locations where a BUMP (W8-1) sign is placed.

Drop-offs greater than a nominal 4 inches are not allowed during non-working hours.

1. Refer to SI-881 for sign details.
2. Where side road speed limit is 40 mph or less, a distance of 200 feet is allowed.
3. Place a ROAD WORK AHEAD sign on the opposite side of the intersection in a similar location.
4. For roadways with a posted speed limit of 60 mph or greater before road work:

   Place SPEED LIMIT 55 signs prior to the lane closure as shown.

   When the length of closure is greater than 1 mile, install SPEED LIMIT 55 signs in the closed lane at 1-mile intervals.

   Remove or cover all existing signs that conflict with 55 mph speed limit while 55 mph speed limit is in effect.

Possible Contract Item:
Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 6 04-17-12

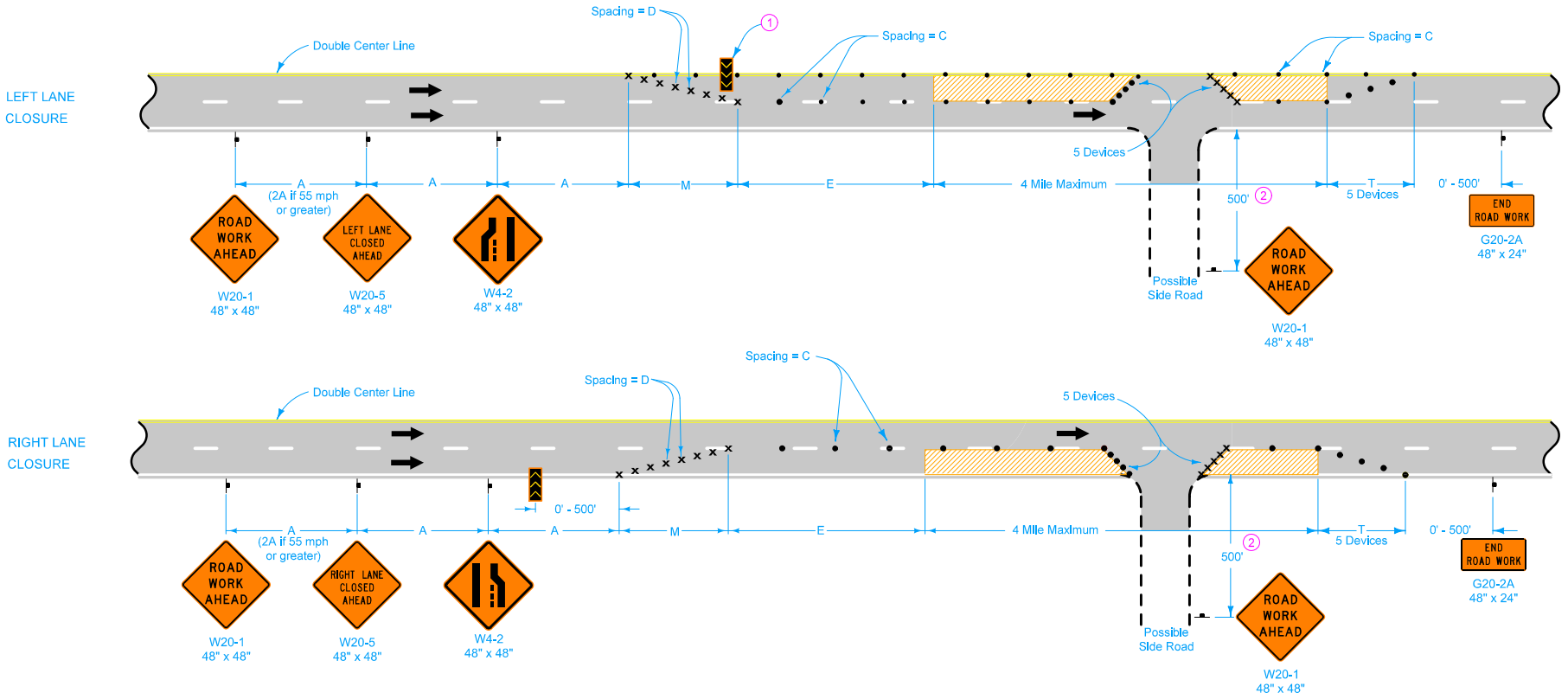
TC-418

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from Channelizer in Legend. Modified circle notes. Added Reduced Speed Ahead signs.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE ON DIVIDED HIGHWAY



LEGEND

- Traffic Sign
- Drum
- 42" Channelizer
- Arrow Panel
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A	C	D	E	M	T
35 or less	250'	40'	35'	0'-200'	245'	50'
40	500'	80'	40'	0'-300'	320'	50'
45	700'	80'	45'	0'-400'	630'	100'
50	700'	80'	45'	400'	630'	100'
55 - 60	1000'	100'	55'	600'	770'	100'

Where there is a lane line drop-off or rise, do not allow traffic to cross over the drop-off or rise; except for ramp locations where a BUMP (W8-1) sign is placed.

Drop-offs greater than a nominal 4 inches are not allowed during non-working hours.

(1) Place arrow panel within the closed lane behind the drums and as close to the beginning of the taper as practical.

(2) Where side road speed limit is 40 mph or less, a distance of 200 feet is allowed.

Possible Contract Item:

Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 4 04-17-12

TC-419

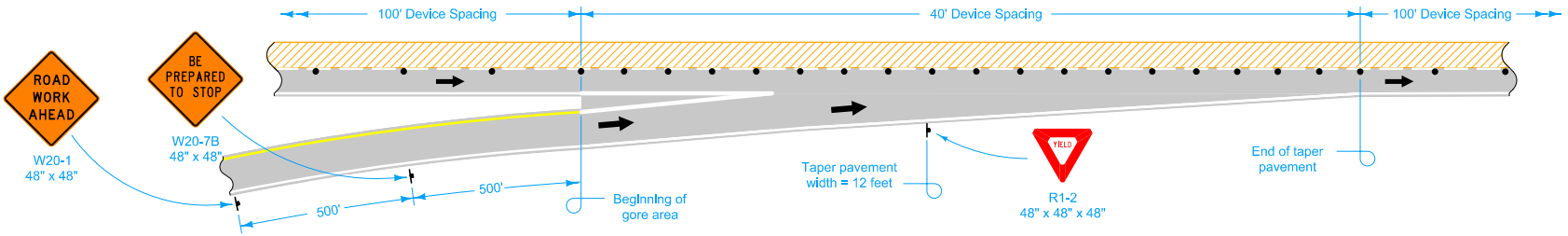
SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend. Incorporated circle note 1 in to Section 2528 of the Specifications.

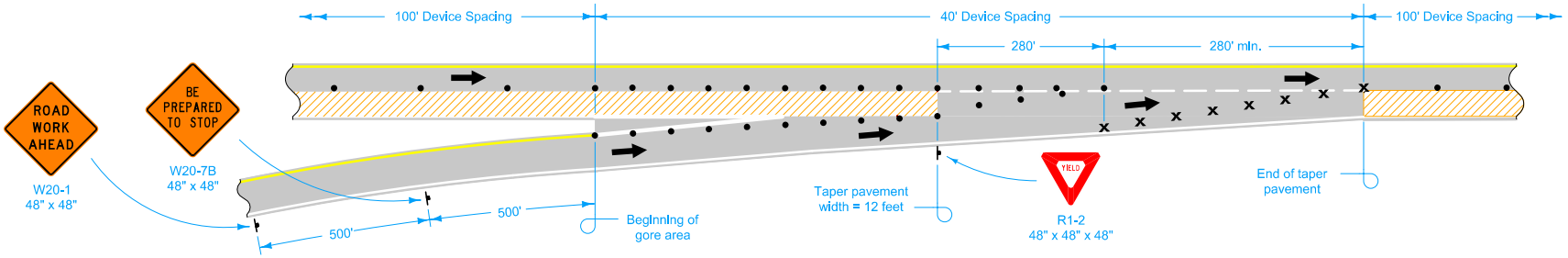
Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

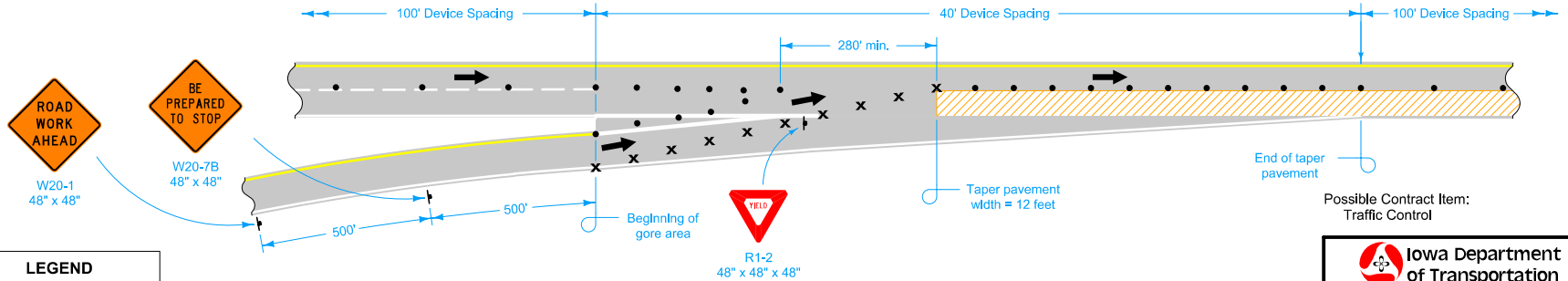
LANE CLOSURE ON UNDIVIDED HIGHWAY



LEFT LANE CLOSURE THROUGH ENTRANCE RAMP



RIGHT LANE CLOSURE THROUGH ENTRANCE RAMP



STAGING THROUGH ENTRANCE RAMP

Possible Contract Item:
Traffic Control

LEGEND

- Drum
- Traffic Sign
- 42" Channellzer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 5 04-17-12

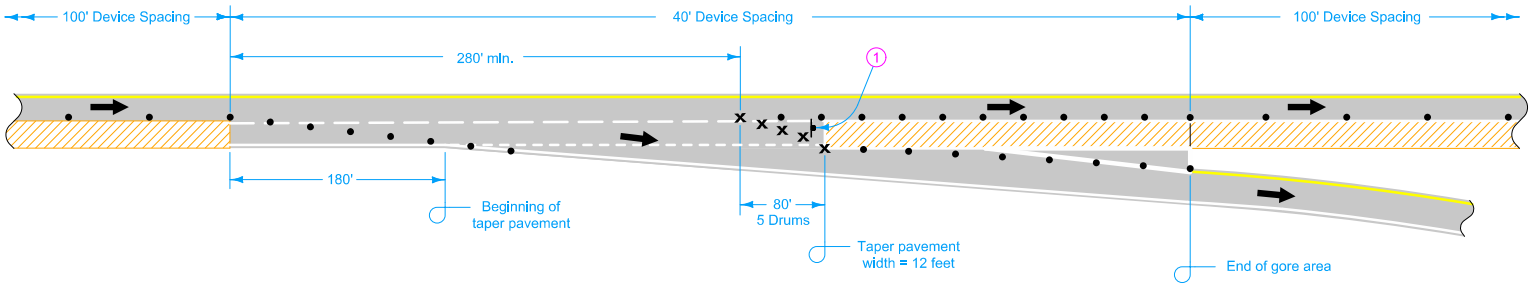
TC-420

SHEET 1 of 5

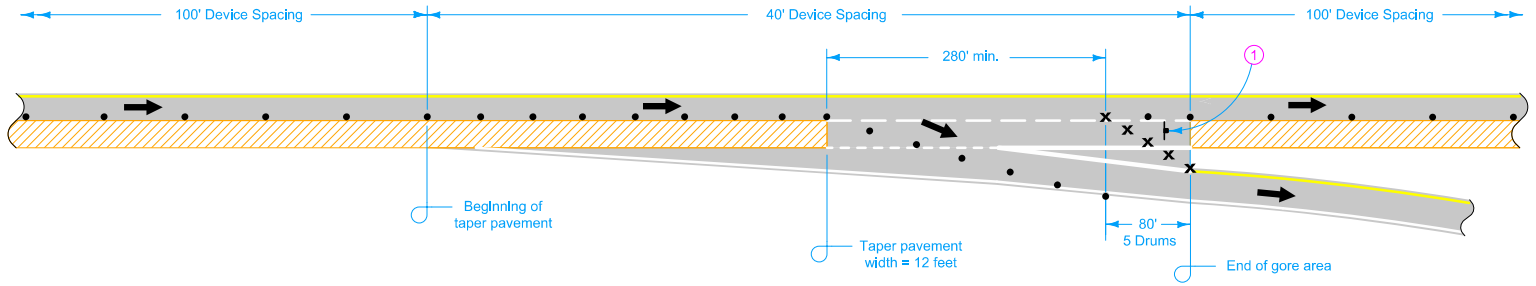
REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE AT RAMPS



RIGHT LANE CLOSURE THROUGH EXIT RAMP



STAGING THROUGH EXIT RAMP

LEGEND

- Drum
- Traffic Sign
- 42" Channellzer
- Direction of Traffic
- Work Area

(1) Temporary EXIT sign, mounted so that bottom of sign is a minimum of 3 feet above pavement surface. If in place for more than one day, mount an Exit Number Panel with the proper exit number above the temporary EXIT sign. See SI-881 for details.

Iowa Department of Transportation

REVISION 5 04-17-12

STANDARD ROAD PLAN

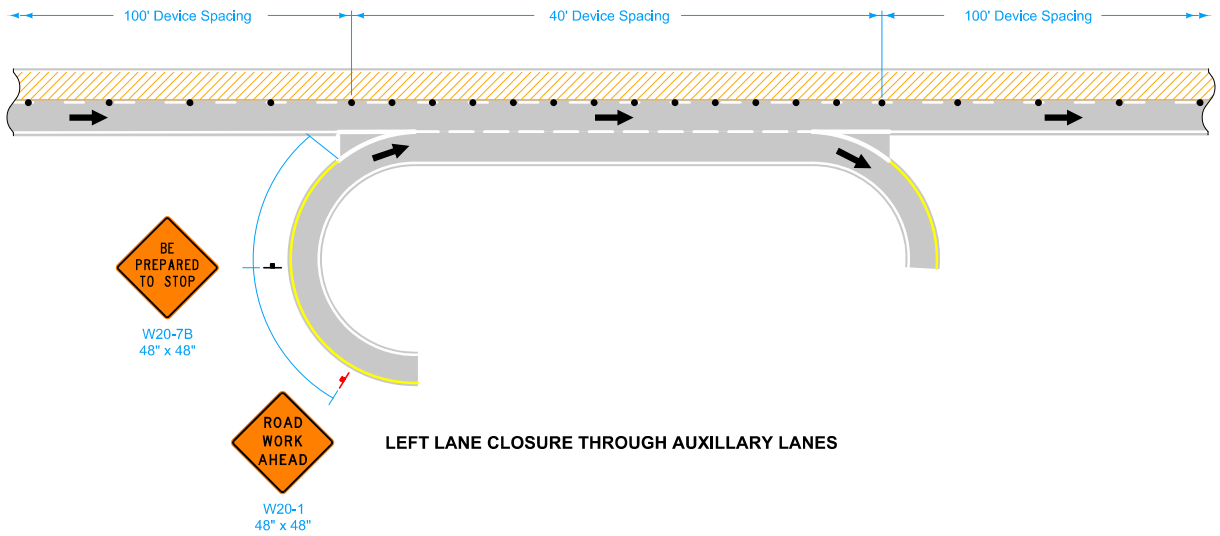
TC-420

SHEET 2 of 5

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE AT RAMPS



LEFT LANE CLOSURE THROUGH AUXILLARY LANES

LEGEND

- Drum
- Traffic Sign
- 42" Channellzer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
5 | 04-17-12

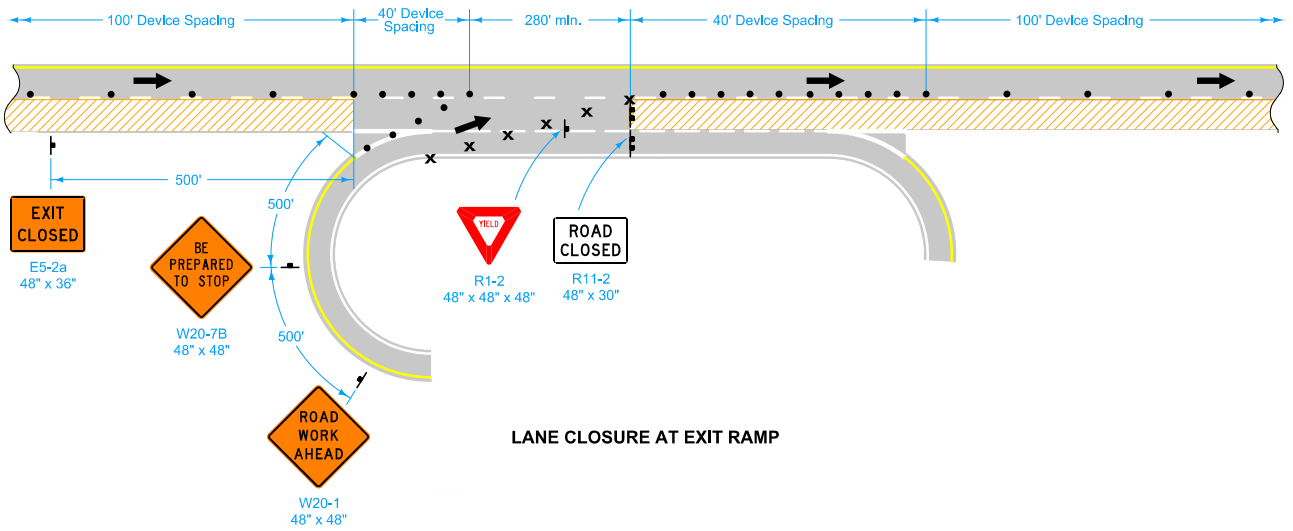
TC-420

SHEET 3 of 5

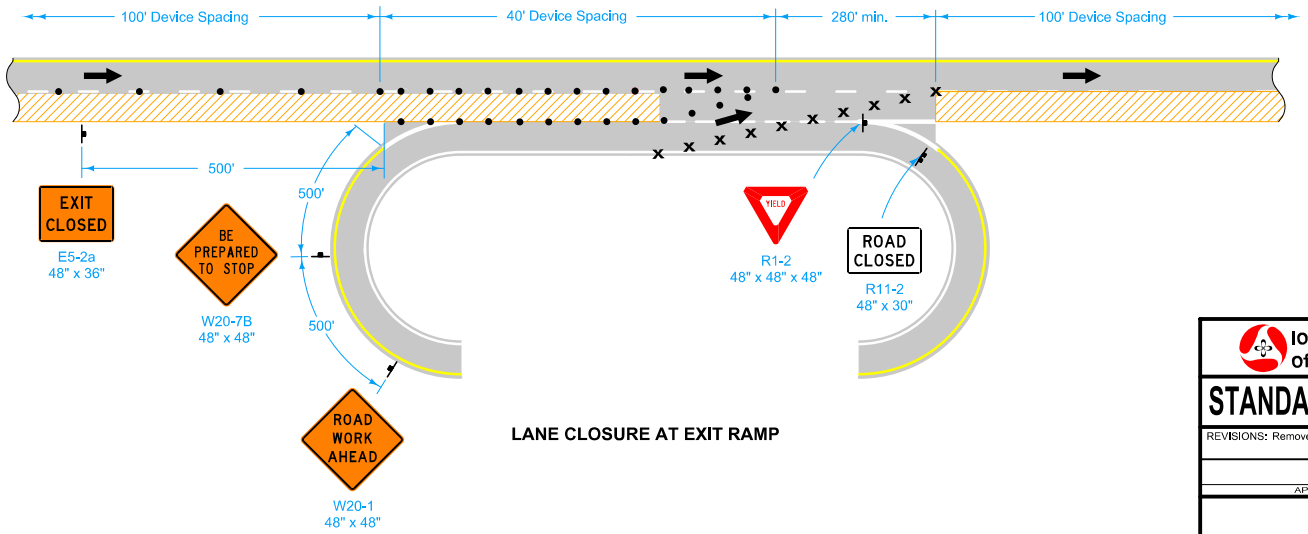
REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE AT RAMPS



LANE CLOSURE AT EXIT RAMP



LANE CLOSURE AT EXIT RAMP

LEGEND

- Drum
- Traffic Sign
- 42" Channellzer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 5 04-17-12

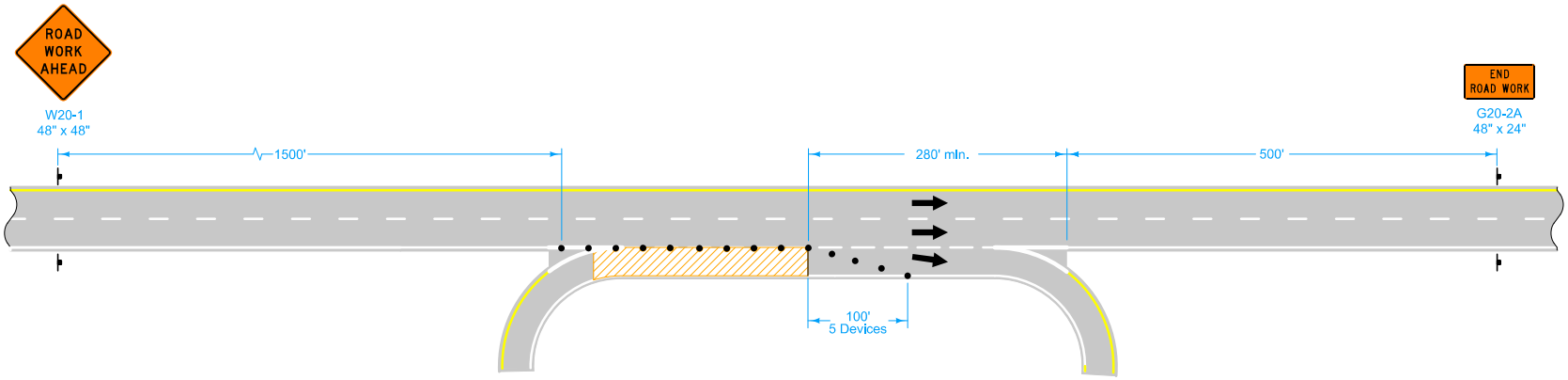
TC-420

SHEET 4 of 5

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE AT RAMPS



LANE CLOSURE AT EXIT RAMP

LEGEND

- × Drum
- Traffic Sign
- • 42" Channellzer
- Direction of Traffic
- Work Area

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
5	04-17-12

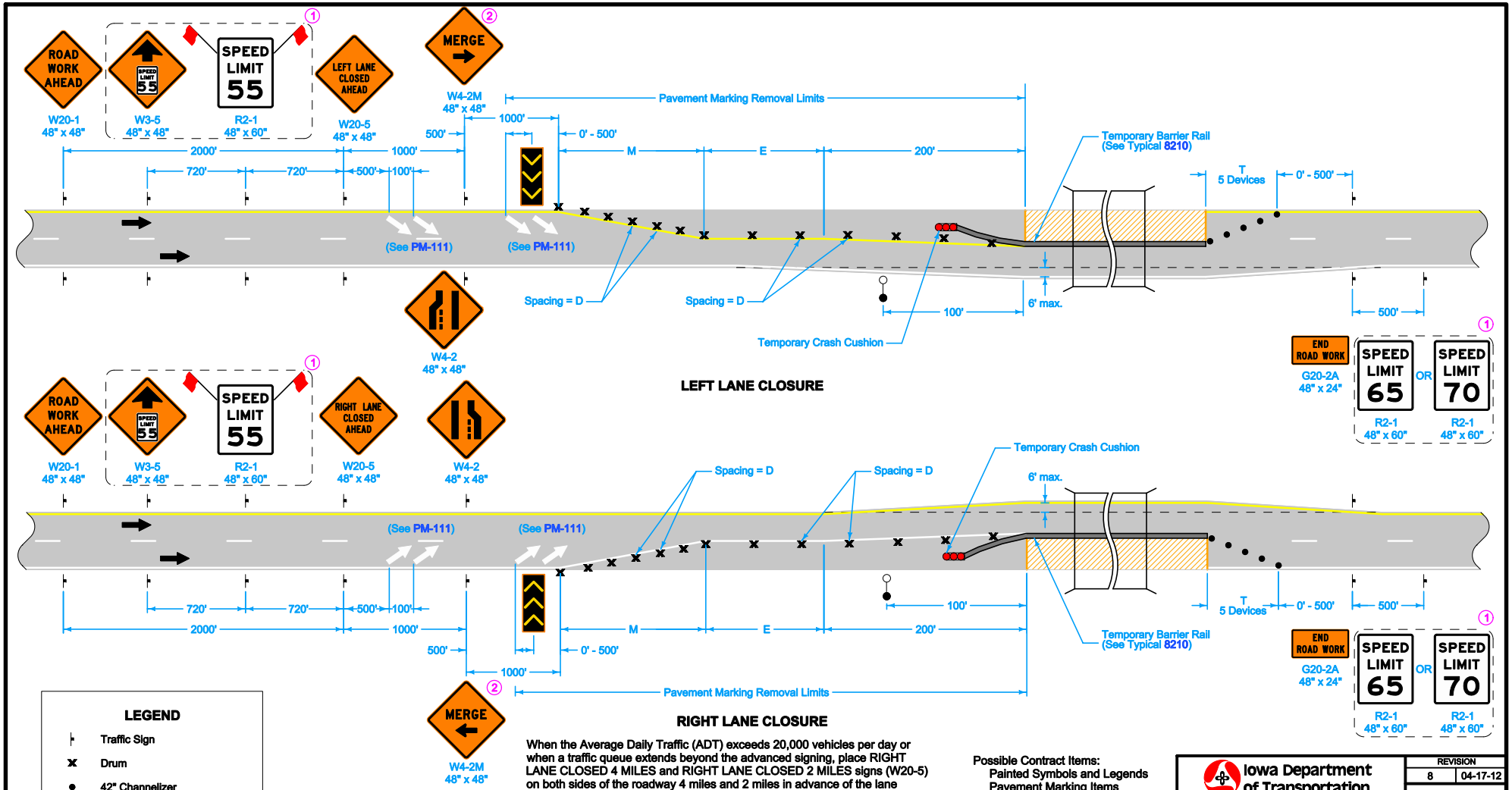
TC-420

SHEET 5 of 5

REVISIONS: Removed "or Vertical Panel" from 42" Channellzer In Legend.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE AT RAMPS



SPEED LIMIT (mph)	D	E	M	T
45 - 50	45'	300'	630'	100'
55 - 60	55'	400'	770'	100'
65 - 70	65'	500'	910'	100'

When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT LANE CLOSED 4 MILES and RIGHT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively.

(1) For roadways with a posted speed limit of 60 mph or greater before road work:

Place SPEED LIMIT AHEAD sign and SPEED LIMIT 55 sign prior to the lane closure as shown. Place SPEED LIMIT 65 or 70 beyond the work area as shown.

Remove or cover all existing signs that conflict with 55 mph speed limit while 55 mph speed limit is in effect.

(2) Refer to SI-881 for sign details.

Possible Contract Items:
- Painted Symbols and Legends
- Pavement Marking Items
- Pavement Markings Removed
- Symbols and Legends Removed
- Temporary Barrier Rail
- Temporary Crash Cushions
- Temporary Floodlighting

Possible Tabulations:
- 108-22
- 108-27
- 108-29
- 108-30
- 108-33

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 8 04-17-12

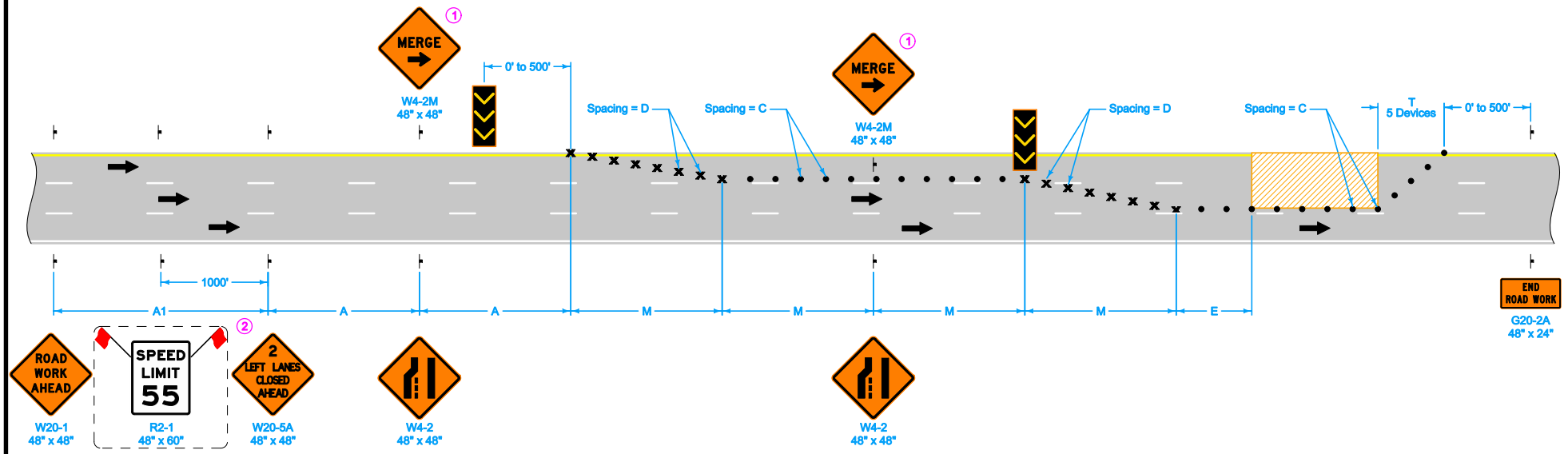
TC-421

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend. Added W20-5 signs.

Deanna Maifurth
APPROVED BY DESIGN METHODS ENGINEER

LANE CLOSURE WITH TBR



When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

Where there is a lane line drop-off or rise, do not allow traffic to cross over the drop-off or rise; except for ramp locations where a BUMP (W8-1) sign is placed.

Drop-offs greater than a nominal 4 inches are not allowed during non-working hours.

Possible Contract Item:
Traffic Control

LEGEND

- Direction Of Traffic
- Traffic Sign
- Drum
- 42" Channelizer
- Arrow Display
- Work Area

SPEED LIMIT (mph)	A	C	D	E	M	T	A1
35 or less	250'	40'	35'	0'-200'	245'	50'	250'
40	500'	80'	40'	0'-300'	320'	50'	500'
45	700'	80'	45'	0'-400'	630'	100'	700'
50	700'	80'	45'	400'	630'	100'	700'
55 - 60	1000'	100'	55'	600'	770'	100'	2000'
65 - 70	1000'	100'	65'	700'	910'	100'	2000'

① Refer to SI-881 for sign details.

② For roadways with a posted speed limit of 60 mph or greater before road work:

Place SPEED LIMIT 55 signs prior to the lane closure as shown.

When the length of closure is greater than 1 mile, install SPEED LIMIT 55 signs in the closed lane at 1-mile intervals.

Remove or cover all existing signs that conflict with 55 mph speed limit while 55 mph speed limit is in effect.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
6	04-17-12

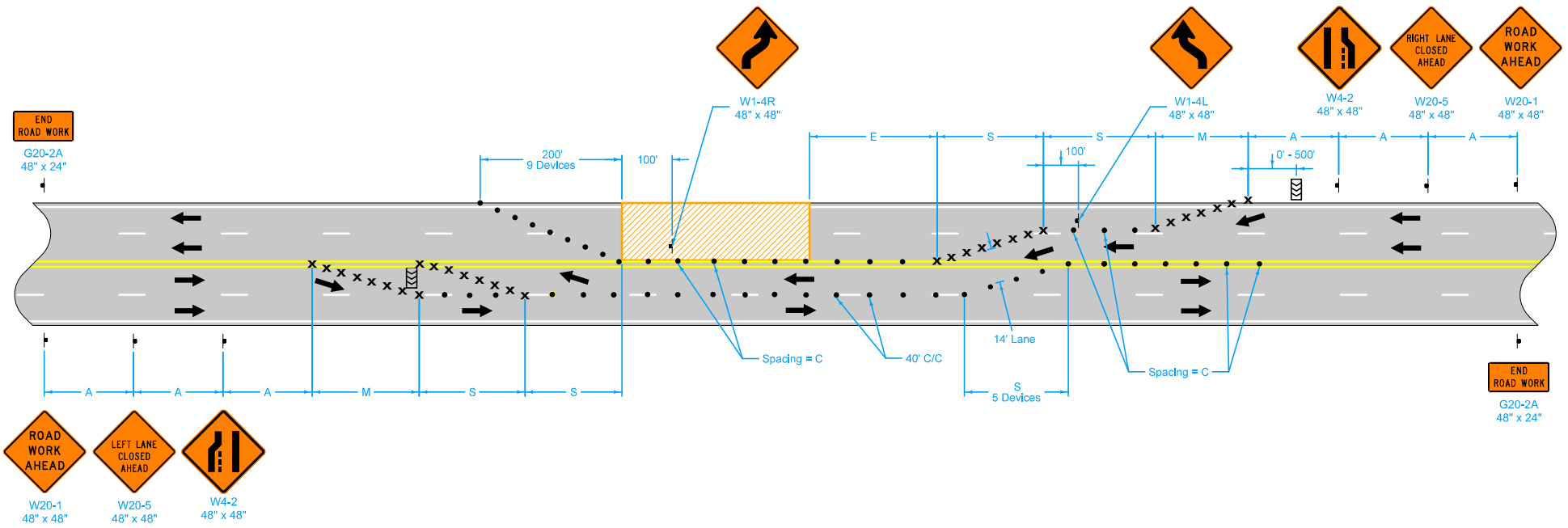
TC-422

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer from Legend. Modified circle notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CLOSURE OF TWO ADJACENT LANES ON DIVIDED HIGHWAY



Possible Contract Item:
Traffic Control

LEGEND

- Traffic Sign
- Drum (1)
- 42" Channelizer
- Arrow Panel
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A	C	D	E	M	S
35 or less	250'	40'	35'	0'-200'	245'	140'
40	500'	80'	40'	0'-300'	320'	160'
45	700'	80'	45'	0'-400'	630'	315'
50	700'	80'	45'	400'	630'	315'
55 - 60	1000'	100'	55'	600'	770'	385'

When this layout is used during nighttime hours and the width of the traffic lanes is 11 feet or less, use tubular markers to separate two-way two-lane traffic.

(1) Spacing = D for all drums.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION
4 | 04-17-12

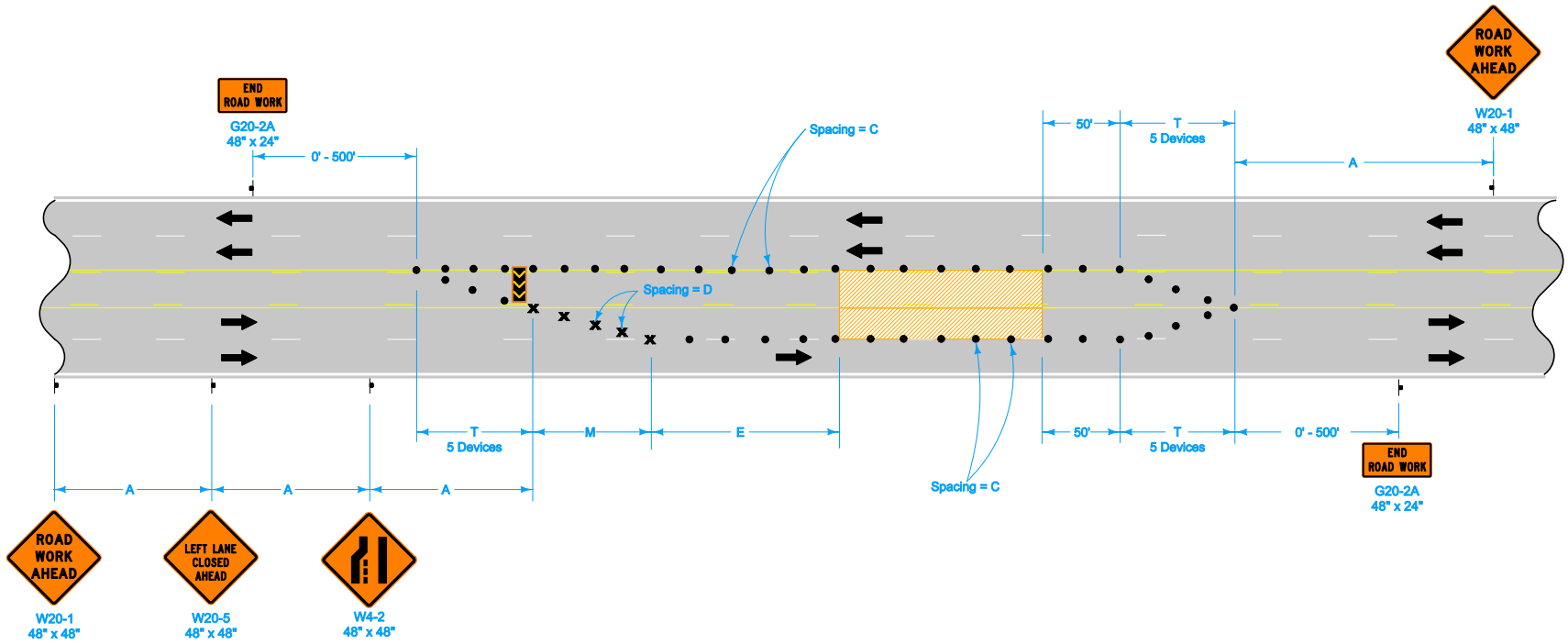
TC-423

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from legend. Moved circle note 1 into specs. Changed "head-to-head" wording to "two-way two-lane" in general note.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

CLOSURE OF TWO ADJACENT LANES ON UNDIVIDED HIGHWAY



LEGEND

- 42" Channelizer
- Drum
- Traffic Sign
- Work Area
- Direction of Traffic
- Arrow Panel

SPEED LIMIT (mph)	A	C	D	E	M	T
35 or less	250'	40'	35'	0'-200'	245'	50'
40	500'	80'	40'	0'-300'	320'	50'
45	700'	80'	45'	0'-400'	630'	100'
50	700'	80'	45'	400'	630'	100'
55 - 60	1000'	100'	55'	600'	770'	100'

Possible Contract Item:

Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 4 04-17-12

TC-429

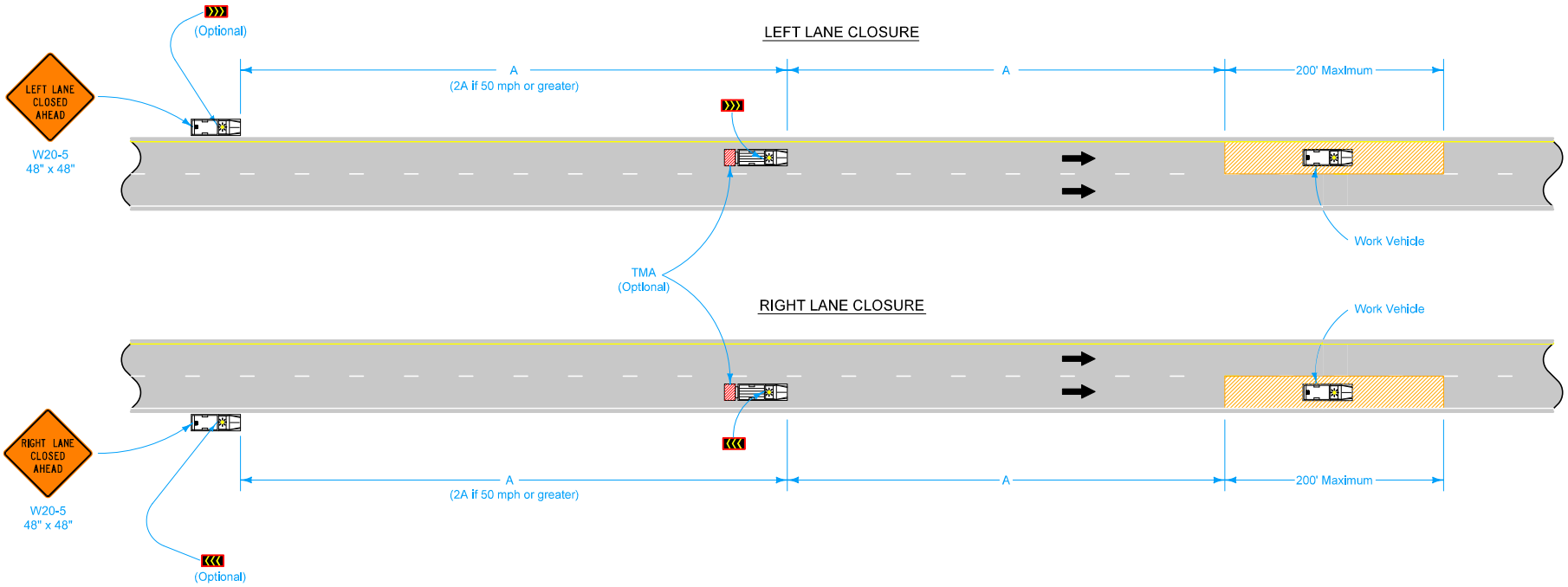
SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend. Removed circle note 1.

Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

CLOSURE OF CONTINUOUS TWO-WAY LEFT-TURN LANE AND ADJACENT LANE



LEGEND

- Traffic Sign
- Work Area
- Arrow Panel
- Direction of Traffic
- Truck-Mounted Attenuator (TMA)

SPEED LIMIT (mph)	A
35 or less	300'
40 - 45	500'
50 - 55	500'
60 or greater	1000'

All vehicles shall be equipped with an amber revolving light or an amber strobe light.

This layout is intended for use with slow-moving operations involving stops not to exceed 30 minutes. For stops exceeding 30 minutes, use TC-418 or TC-419.

Possibe Contract Item:

Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 3 04-17-12

TC-431

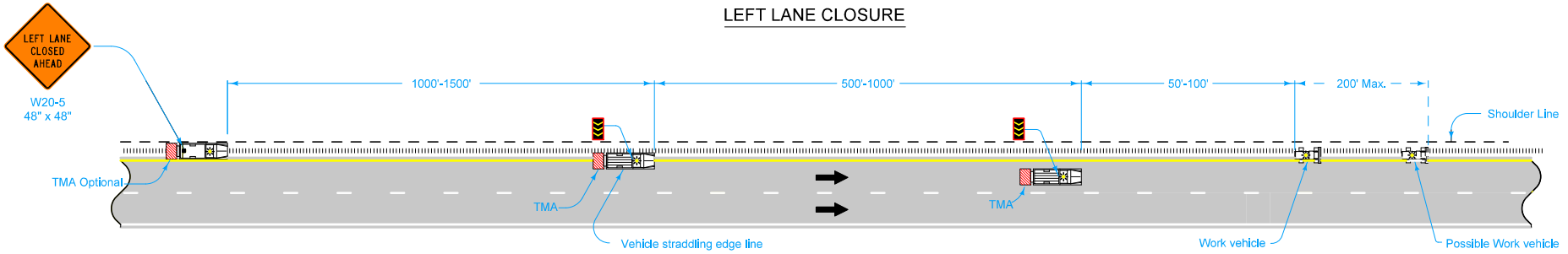
SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

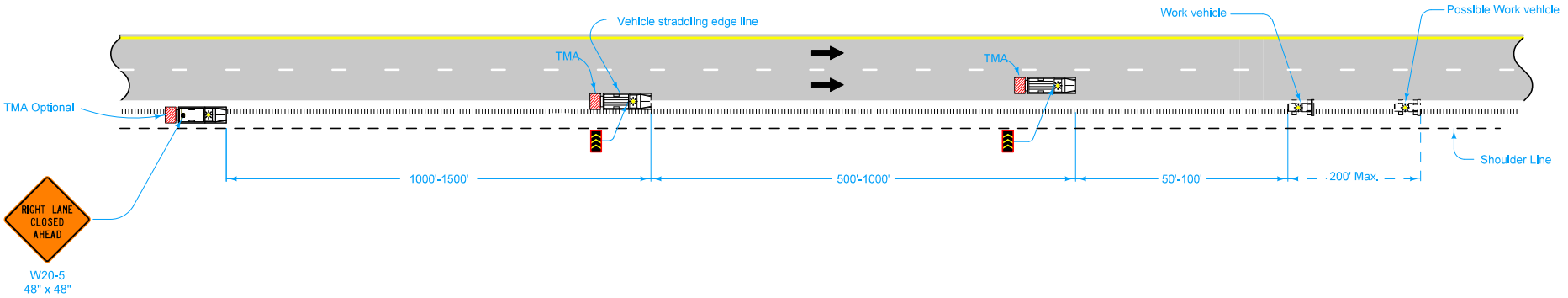
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

SLOW MOVING VEHICLE OPERATING IN THE TRAFFIC LANE

LEFT LANE CLOSURE



RIGHT LANE CLOSURE



LEGEND

- Traffic Sign
- Arrow Panel
- Truck Mounted Attenuator (TMA)
- Direction of Traffic

All vehicles shall be equipped with an amber revolving light or an amber strobe light.

When fog sealing the milled rumble strips, place a 48" X 48" FRESH OIL sign (W21-2) at the beginning of the work area. Place additional FRESH OIL signs after each intersection and periodically through the work area so that signs are no more than 2 miles apart.

Operators should adjust their spacing, as necessary, to keep adjacent vehicles within view.

Possible Contract Item:

Traffic Control

Iowa Department of Transportation

REVISION

1	04-17-12

STANDARD ROAD PLAN

TC-432

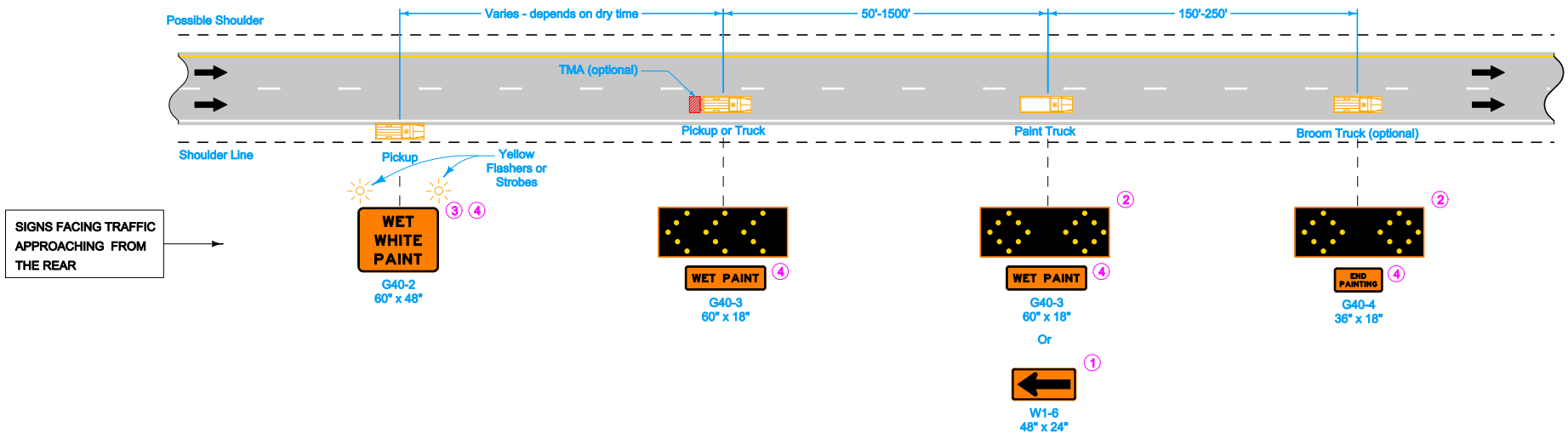
SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

SHOULDER RUMBLE STRIP OPERATIONS



OUTSIDE EDGELINE OR LANELINE - DIVIDED OR UNDIVIDED

Possible Contract Item:
Traffic Control

Equip all vehicles with an amber Vehicle Warning Light.

(1) Optional Fluorescent Yellow Green (FYG) sign background may be used.

(2) This arrow display may be operated in a four-corner caution mode.

(3) A vehicle mounted Changeable Message Sign (CMS) may be used in lieu of this sign.

(4) Refer to SI-881 for sign details.

LEGEND

- Direction of Traffic
- Truck-Mounted Attenuator (TMA)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

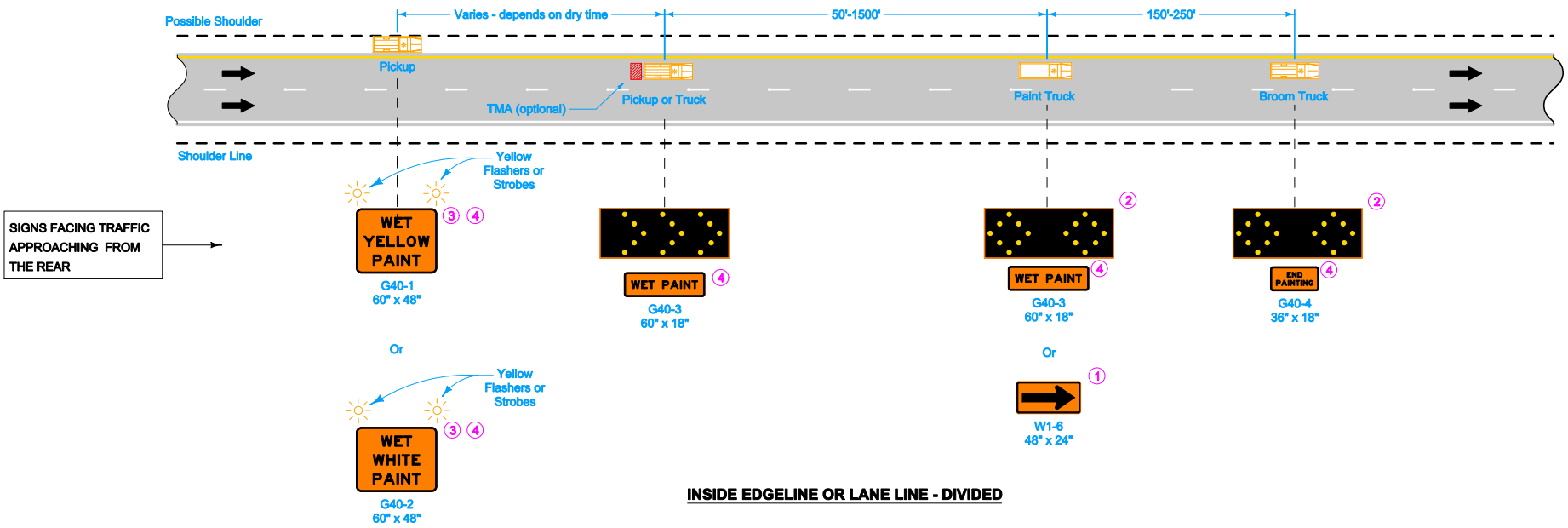
TC-433

SHEET 1 of 3

REVISIONS: Adjusted amber light wording in general notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PAVEMENT MARKING OPERATIONS



INSIDE EDGELINE OR LANE LINE - DIVIDED

LEGEND

- Direction of Traffic
- Truck-Mounted Attenuator (TMA)

(1) Optional Fluorescent Yellow Green (FYG) sign background may be used.

(2) This arrow display may be operated in a four-corner caution mode.

(3) A vehicle mounted Changeable Message Sign (CMS) may be used in lieu of this sign.

(4) Refer to SI-881 for sign details.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 2 10-18-11

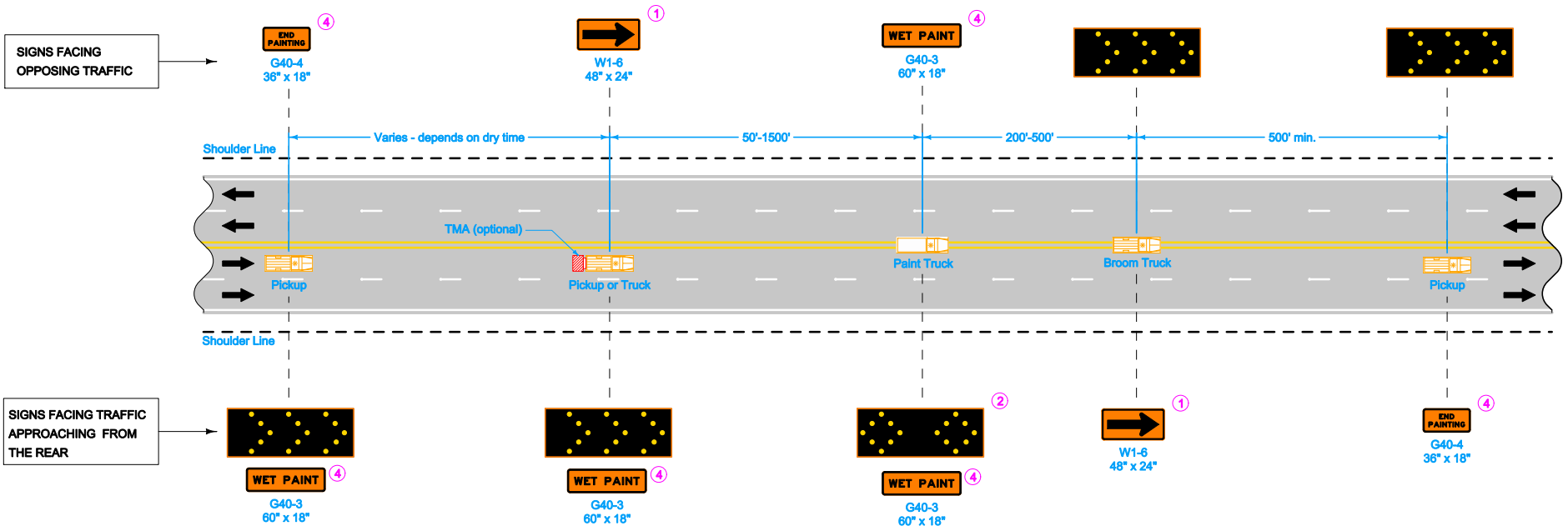
TC-433

SHEET 2 of 3

REVISIONS: Adjusted amber light wording in general notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PAVEMENT MARKING OPERATIONS



CENTERLINE - UNDIVIDED ONLY

LEGEND

- Direction of Traffic
- Truck-Mounted Attenuator (TMA)

(1) Optional Fluorescent Yellow Green (FYG) sign background may be used.

(2) This arrow display may be operated in a four-corner caution mode.

(4) Refer to SI-881 for sign details.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
2	10-18-11

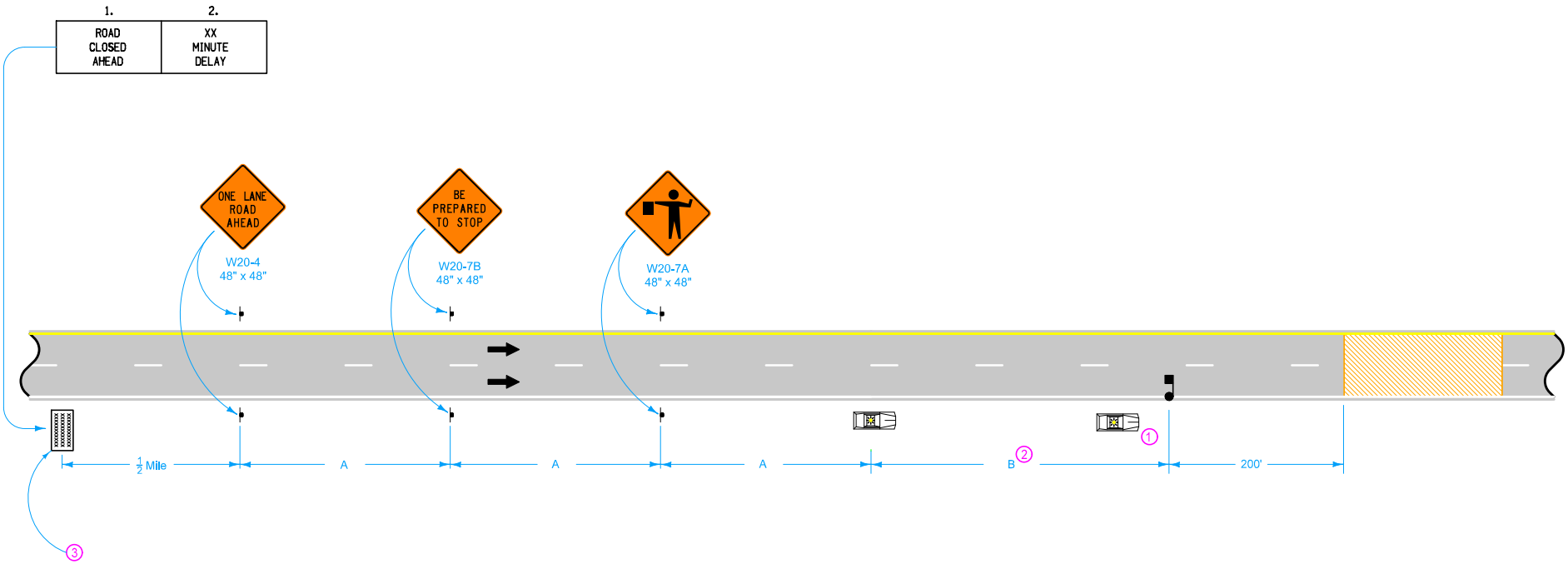
TC-433

SHEET 3 of 3

REVISIONS: Adjusted amber light wording in general notes.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PAVEMENT MARKING OPERATIONS



LEGEND

- Traffic Sign
- Law Enforcement Vehicle
- Flagger
- Changeable Message Sign
- Work Area
- Direction of Traffic

SPEED LIMIT (mph)	A	B
35 or less	250'	250'
40 - 45	350'	350'
50 or greater	1000'	2500'

① A vehicle with an amber revolving light or amber strobe light may substitute leading law enforcement vehicle.

② This distance may be increased to provide adequate storage for stopped vehicles.

③ Optional for speed limits less than 55 mph.

Possible Contract Items:

Traffic Control
Flaggers
Changeable Message Signs

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 3 04-17-12

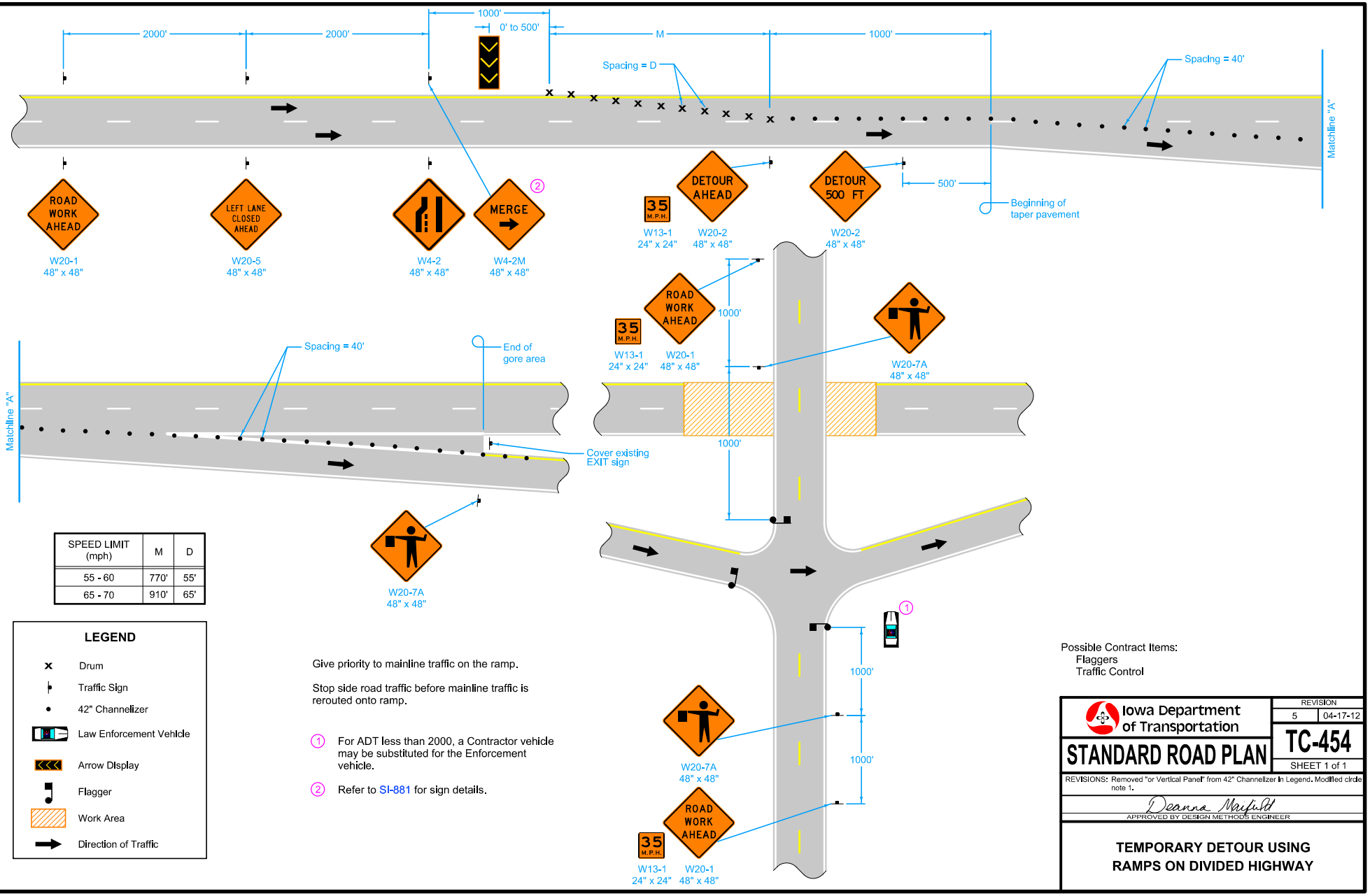
TC-451

SHEET 1 of 1

REVISIONS: No significant changes. Changed to color.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY ROAD CLOSURE ON DIVIDED HIGHWAY



SPEED LIMIT (mph)	M	D
55 - 60	770'	55'
65 - 70	910'	65'

LEGEND

- Drum
- Traffic Sign
- 42" Channelizer
- Law Enforcement Vehicle
- Arrow Display
- Flagger
- Work Area
- Direction of Traffic

Give priority to mainline traffic on the ramp.

Stop side road traffic before mainline traffic is rerouted onto ramp.

(1) For ADT less than 2000, a Contractor vehicle may be substituted for the Enforcement vehicle.

(2) Refer to SI-881 for sign details.

Possible Contract Items:
Flaggers
Traffic Control

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 5 04-17-12

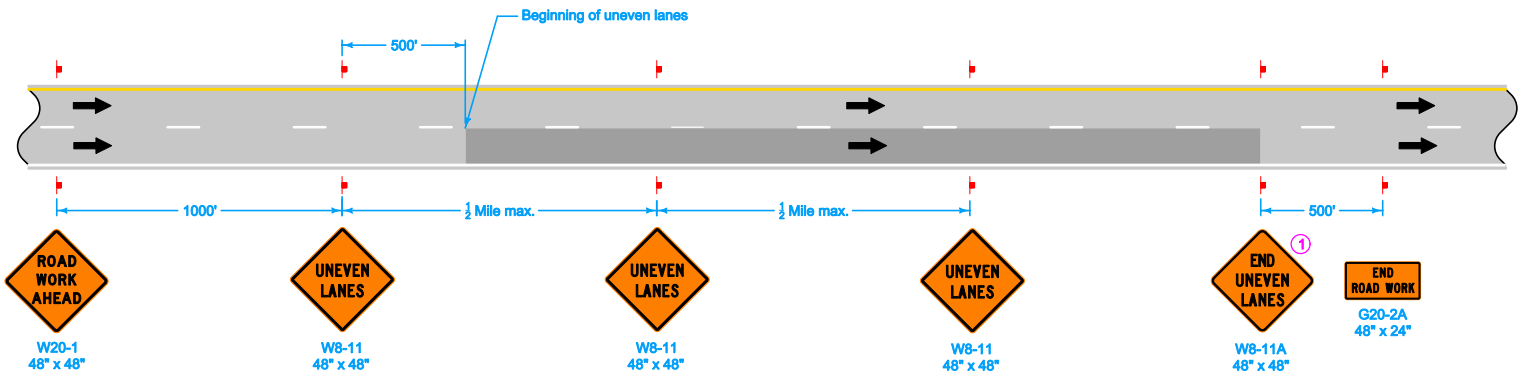
TC-454

SHEET 1 of 1

REVISIONS: Removed "or Vertical Panel" from 42" Channelizer in Legend. Modified circle note 1.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY DETOUR USING RAMPS ON DIVIDED HIGHWAY



1 Refer to SI-881 for sign details.

Possible Contract Items:
Pavement Marking Items
Traffic Control

Possible Tabulation:
108-22

LEGEND

Direction of Traffic

Traffic Sign

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
New	04-19-11

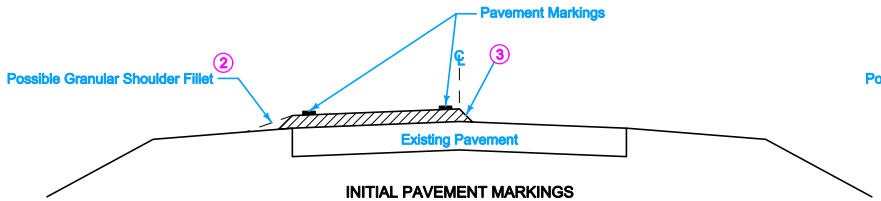
TC-482

SHEET 1 of 2

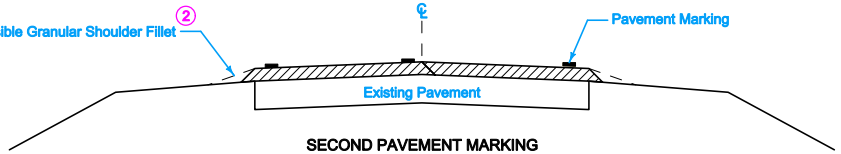
REVISIONS: New. Partial inclusion of Detail 9018.

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

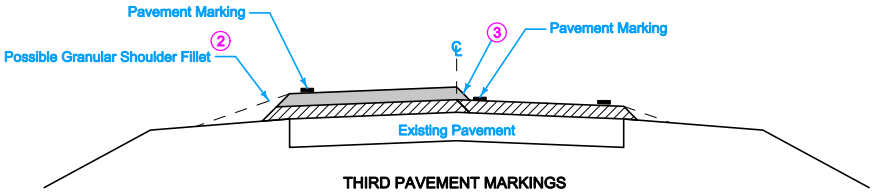
UNEVEN LANES



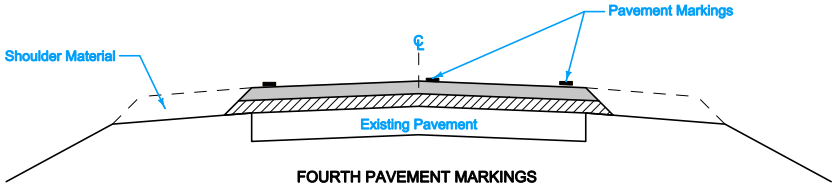
INITIAL PAVEMENT MARKINGS



SECOND PAVEMENT MARKING



THIRD PAVEMENT MARKINGS



FOURTH PAVEMENT MARKINGS

PAVEMENT MARKING SEQUENCE

(2) Shoulder Fillet: Refer to Standard Specification 1107 and Safety Edge specifications.

(3) Centerline fillet may be notched wedge, Safety Edge, or a temporary 3:1 HMA fillet.

LEGEND

- Surface Course
- Intermediate Course

Iowa Department of Transportation

REVISION	
New	04-19-11

STANDARD ROAD PLAN

TC-482

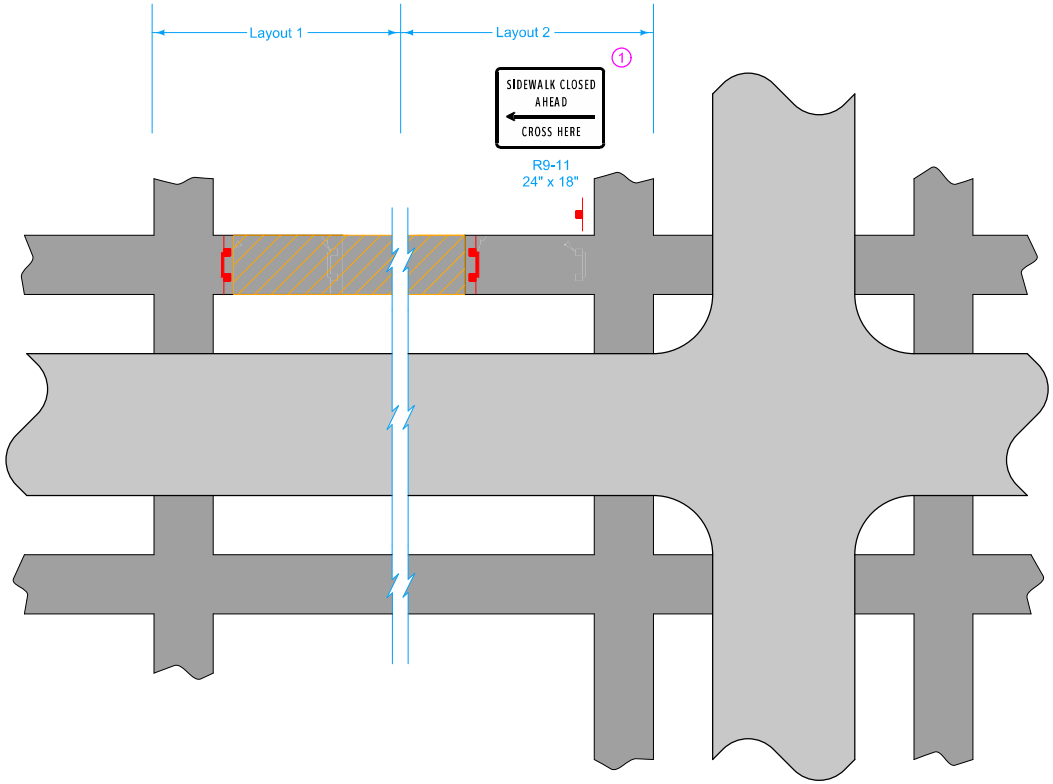
SHEET 2 of 2

REVISIONS: New. Partial inclusion of Detail 9018.

Deanna Maifield

APPROVED BY DESIGN METHODS ENGINEER

UNEVEN LANES



1 Omit "SIDEWALK CLOSED AHEAD CROSS HERE" (R9-11) sign when closure is at sidewalk intersection as shown in layout 1.

Possible Contract Item:
Traffic Control

Possible Tabulation:
113-2

MID-BLOCK CLOSURE

LEGEND

- Roadway
- Sidewalk
- Sign
- Pedestrian Path Closure
- Work Area

Iowa Department of Transportation

REVISION
NEW 10-18-11

STANDARD ROAD PLAN

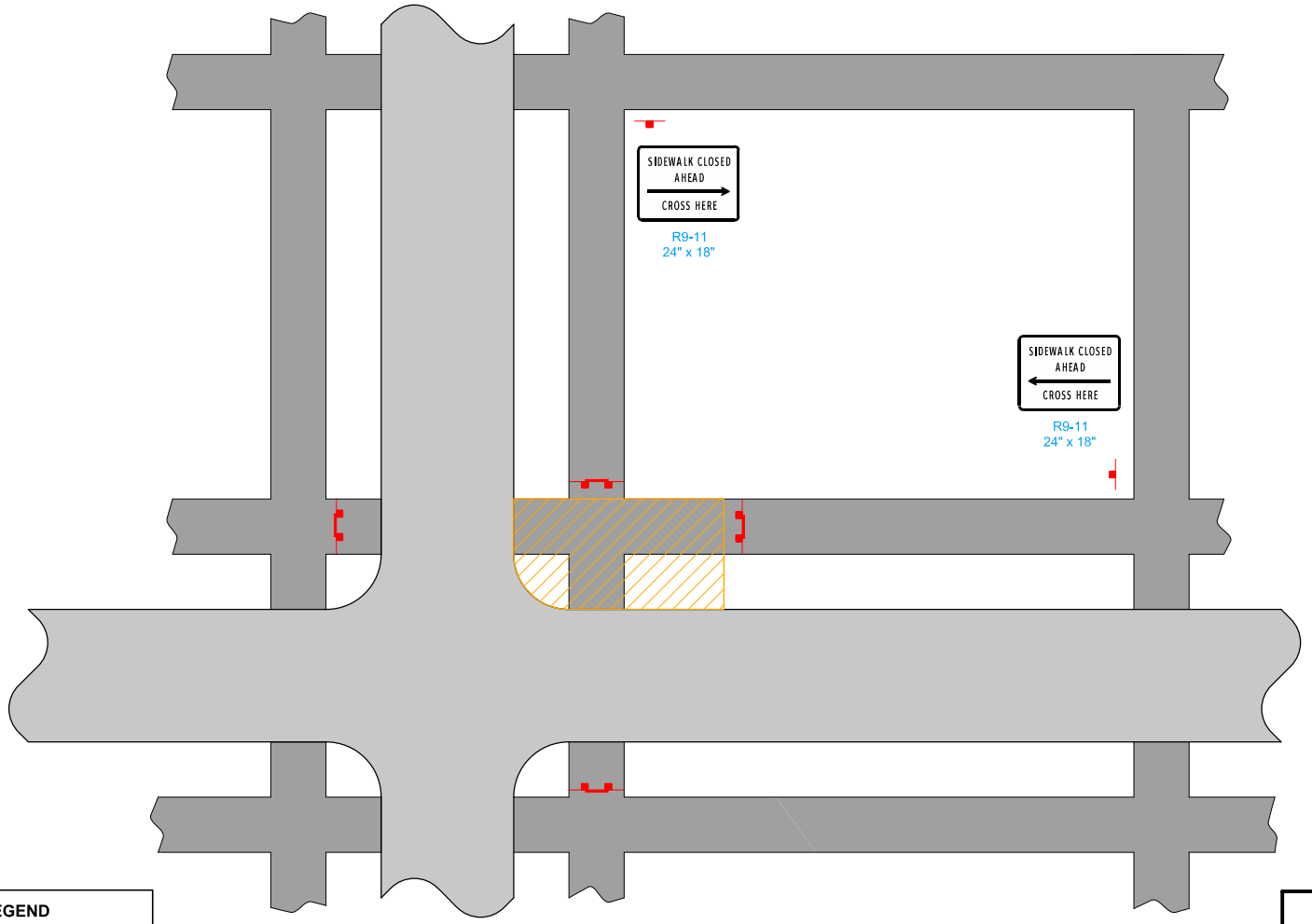
TC-601

SHEET 1 of 2

REVISIONS: New

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

PEDESTRIAN DETOUR



LEGEND

- Roadway
- Sidewalk
- Sign
- Pedestrian Path Closure
- Work Area

CLOSURE AT INTERSECTION

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION: NEW 10-18-11

TC-601

SHEET 2 of 2

REVISIONS: New

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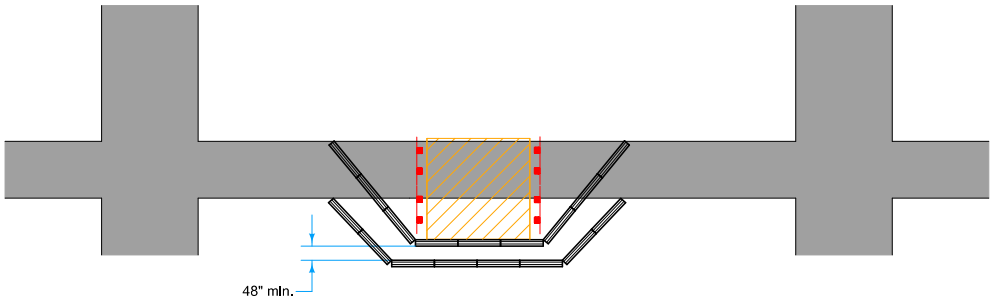
PEDESTRIAN DETOUR

Acceptable materials and construction method for Pedestrian Channelizer will be defined in the contract documents. When Temporary Barrier Rail is specified as the Pedestrian Channelizer, Section 2528 of the Standard Specifications applies. For other types of Pedestrian Channelizers, the length of Pedestrian Channelizer installed will be measured in feet. Payment will be at the contract price per linear foot.



Possible Contract Items:

- Pedestrian Channelizer
- Temporary Barrier Rail
- Maintenance of Pedestrian Traffic

Possible Tabulation:

- 113-3

LEGEND

- Sidewalk
- Direction of Traffic
- Work Area
- Type III Barricade
- Pedestrian Channelizer

Iowa Department of Transportation

REVISION: NEW 10-18-11

STANDARD ROAD PLAN

TC-602

SHEET 1 of 1

REVISIONS: New

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SIDEWALK DIVERSION

Water Main

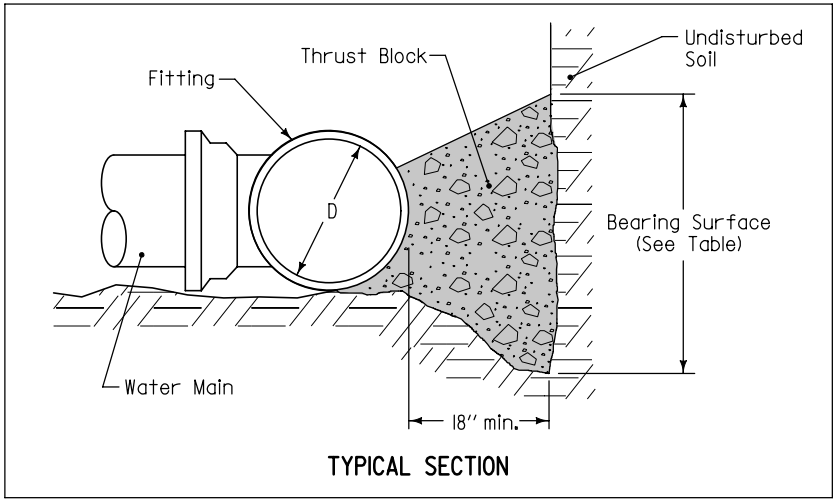
WM

SECTION

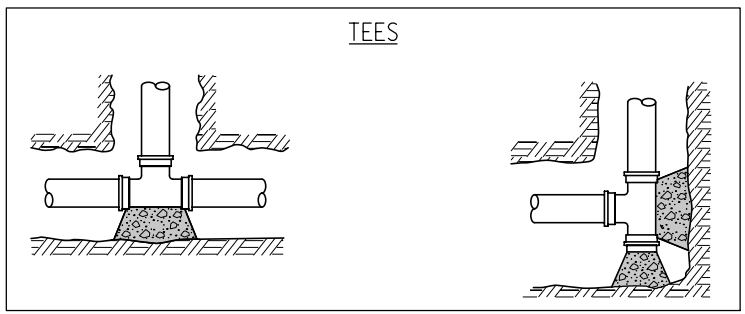
Water Main

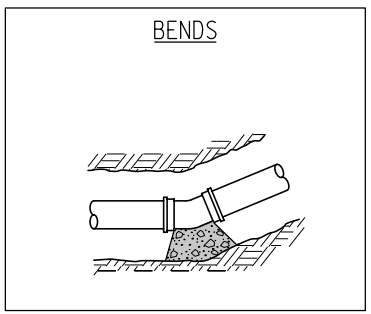
WM

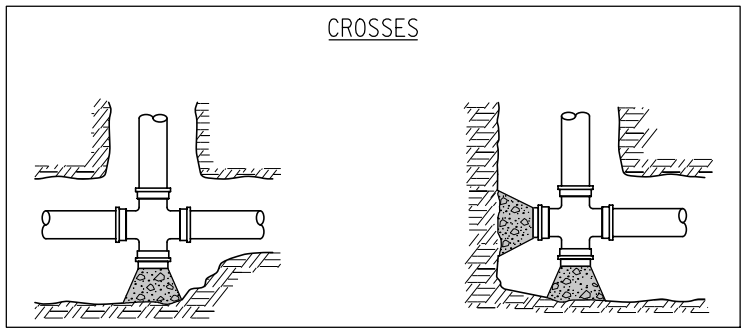
NO.	DATE	TITLE
WM-101	04-21-09	Thrust Blocks
WM-102	04-21-09	Tracer System
WM-201	04-19-11	Fire Hydrant Assembly

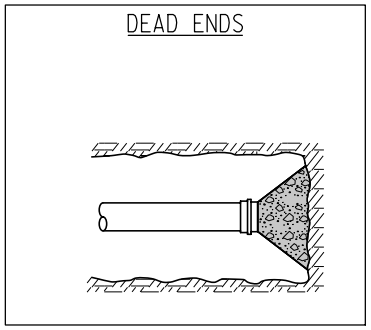


TYPICAL SECTION









TYPICAL PLAN

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

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

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

Diameter of Pipe, D (Inches)	MINIMUM BEARING SURFACE (sf)				
	Bends				Tees and Dead Ends
	11¼°	22½°	45°	90°	
4	1	1	2	4	3
6	1	2	4	8	6
8	2	4	7	14	10
10	3	6	11	21	15
12	4	8	16	29	21
14	5	11	21	39	28
16	7	14	27	50	36
18	9	17	34	63	45
20	11	21	42	78	55
24	15	31	60	111	78
30	24	47	92	171	120
36	34	67	132	244	173

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

SUDAS | Iowa Department of Transportation

REVISION: NEW 04-21-09

FIGURE 5010.101 | STANDARD ROAD PLAN

WM-101

SHEET 1 of 2

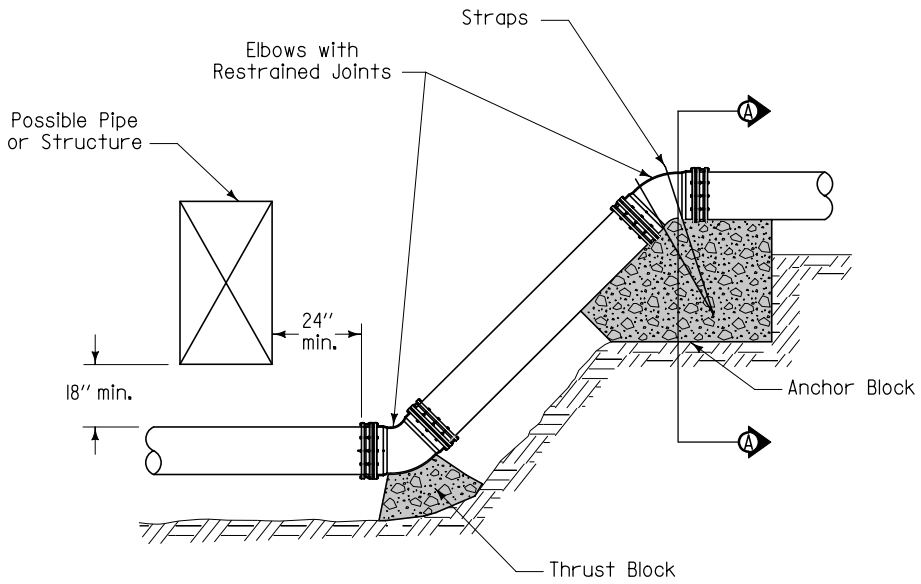
REVISIONS: New. Replaces SUDAS Figure 5010.1

SUDAS DIRECTOR | DESIGN METHODS ENGINEER

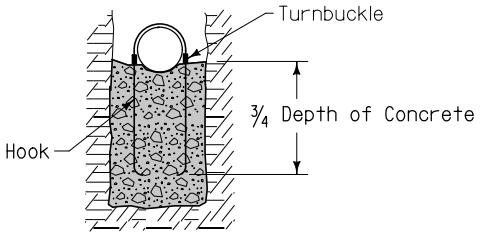
THRUST BLOCKS

FIGURE 5010.101 | SHEET 1 OF 2

CHANGES IN PIPE DEPTH



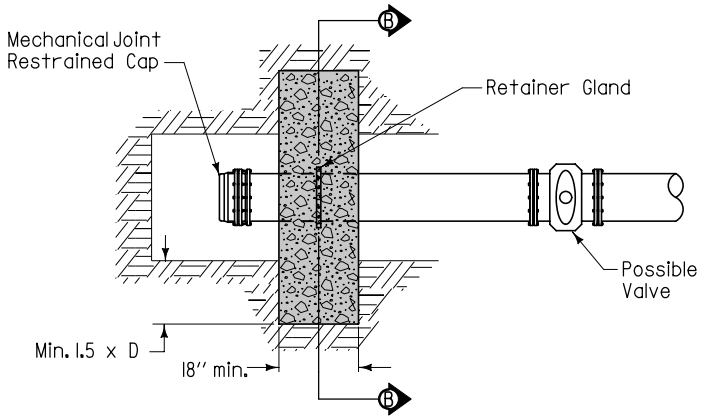
ELEVATION



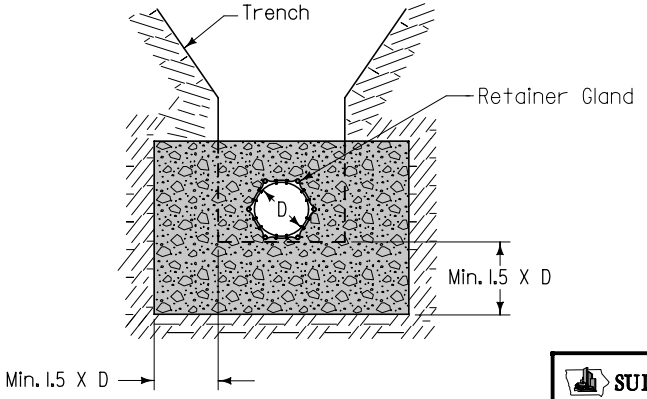
SECTION A-A

DEAD ENDS (ALTERNATE METHOD)

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



PLAN



SECTION B-B

SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 5010.101	STANDARD ROAD PLAN	WM-101 SHEET 2 of 2

REVISIONS: New. Replaces SUDAS Figure 5010.1.

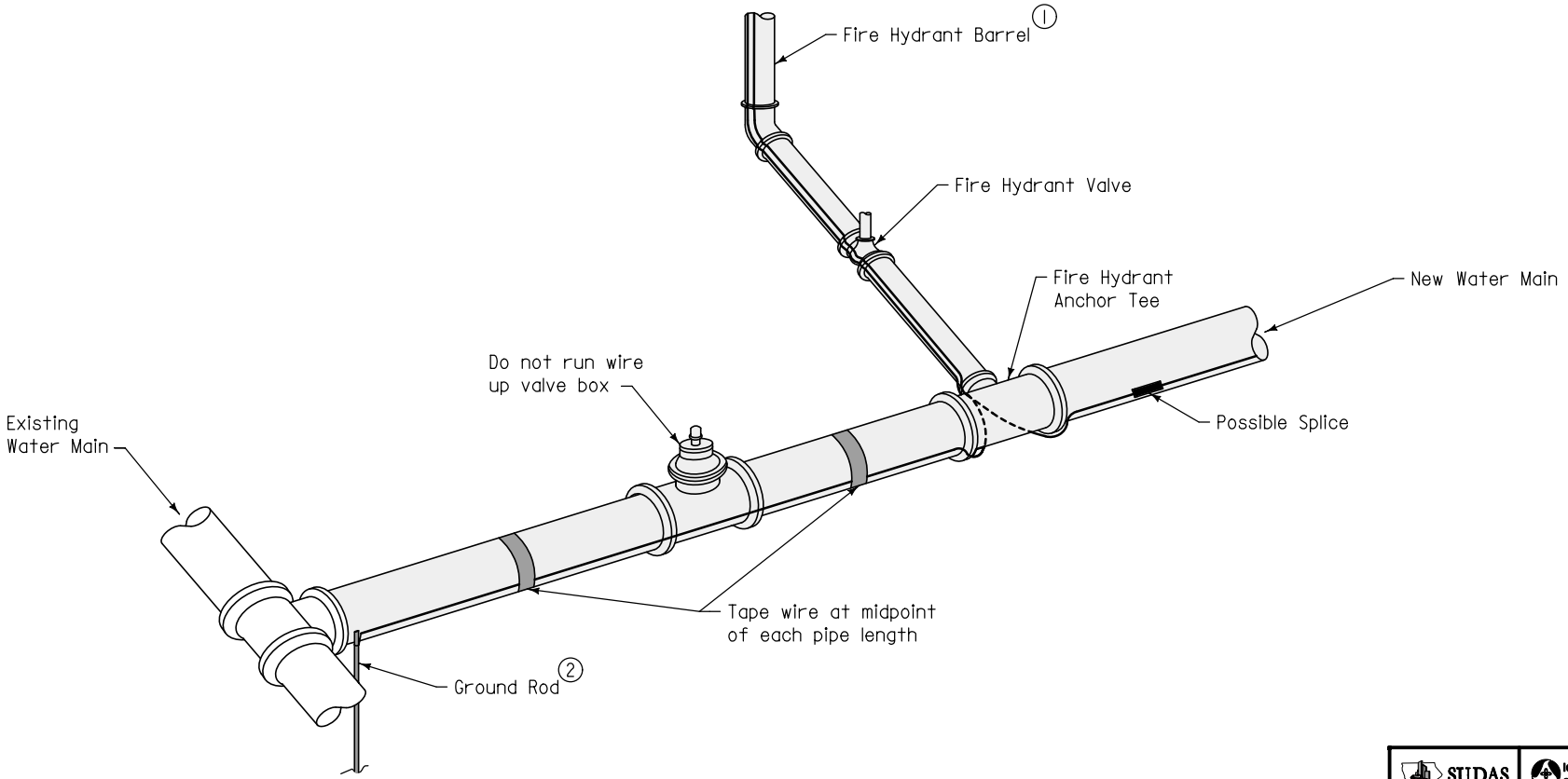
SUDAS DIRECTOR — Deanna Maifield, DESIGN METHODS ENGINEER

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

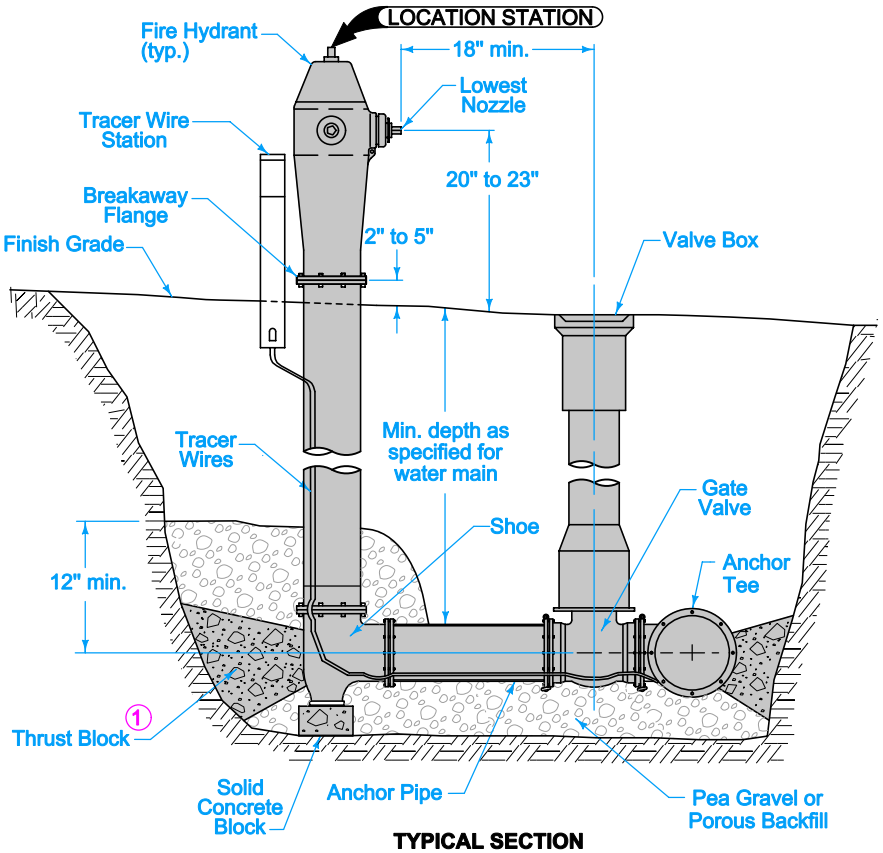
SUDAS	Iowa Department of Transportation	REVISION NEW 04-21-09
FIGURE 5010.102	STANDARD ROAD PLAN	WM-102 SHEET 1 of 1

REVISIONS: New. Replaces SUDAS Figure 5010.3

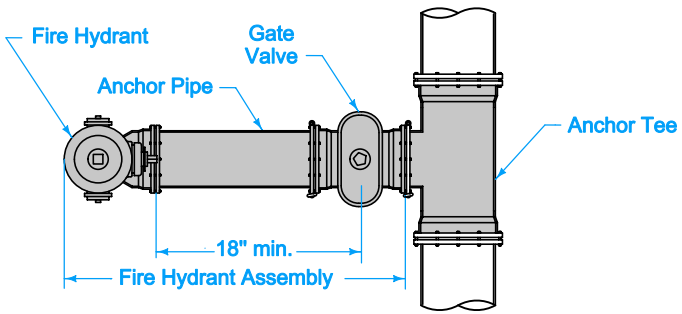
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

TRACER SYSTEM

FIGURE 5010.102 SHEET 1 OF 1

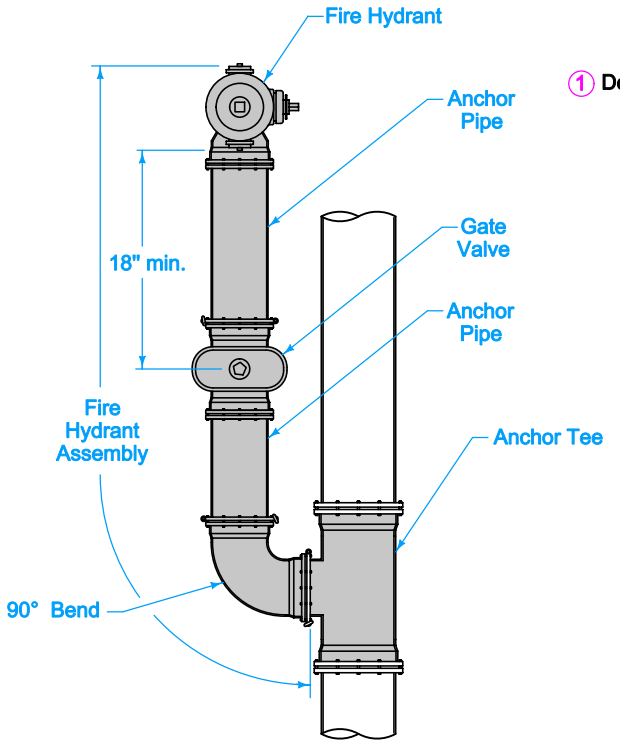


TYPICAL SECTION



TYPICAL PLAN

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



ALTERNATE PLAN

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

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FIGURE 5020.201 | STANDARD ROAD PLAN | WM-201 | SHEET 1 of 1

REVISIONS: Deleted Note 1 and references, renumbered Note 2, and deleted "typ" after "Tracer Wire Station".

Paul D. Wiegand, SUDAS DIRECTOR | Deanna Maifield, DESIGN METHODS ENGINEER

FIRE HYDRANT ASSEMBLY

FIGURE 5020.201 | SHEET 1OF 1