

This mailing contains revisions to
the English version of the
Road Design Details
effective for the **04-20-21** letting.

The green memos, describing the revisions made,
should be retained in the "Revision Letters" section
in the back of the manuals for future reference.

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Subject: Revision of Road Design Details Manual

Revision Date: 4/20/2021

To: Holders of Road Design Details

From: Design Bureau

INSTRUCTIONS: The attached Road Design Details have received approval and may be referred to in the plans by number. Questions concerning information contained on the Road Design Details should be directed to the Methods Section, Design Bureau, telephone (515) 239-1727 or email daniel.harness@iowadot.us.

****NOTE**** The following revisions are effective with the 4/20/2021 letting. Projects let prior to this date may reference earlier versions of these Road Design Details.

Design
Detail

Description of Revision

TYPICAL COMPONENTS

1LH_
Changed Modified Subbase to 12".

1LP_
Changed Modified Subbase to 12".

1RH_
Changed Modified Subbase to 12".

1RP_
Changed Modified Subbase to 12".

2_C_FullPCC_
Added BT-2 to Longitudinal Joint.

2_P_FullPCC_
Added BT-2 to Longitudinal Joint.

2RH_
Changed Modified Subbase to 12".

2RP_
Changed Modified Subbase to 12".

4_C_FullPCC_
Added BT-2 to Longitudinal Joint.

4_P_FullPCC_
Added BT-2 to Longitudinal Joint.

6D_Closed_P_FullPCC_
Added BT-2 to Longitudinal Joint.

6D_Dprs_P_FullPCC_
Added BT-2 to Longitudinal Joint.

8D_Closed_P_FullPCC_

Added BT-2 to Longitudinal Joint.

8D_Dprs_P_FullPCC_

Added BT-2 to Longitudinal Joint.

500's Index

533-2

Added Point J and Ramp Profile note.

533-4

Added End Taper note.

533-5

Added Point J and Ramp Profile note

Typical Components - Backbones

Name	Date	Title
		Ramps
1LH_	04-20-21	1 Lane HMA Loop
1LP_	04-20-21	1 Lane PCC Loop
1RH_	04-20-21	1 Lane HMA Ramp
1RP_	04-20-21	1 Lane PCC Ramp
2RH_	04-20-21	2 Lane PCC Ramp
2RP_	04-2-21	2 Lane PCC Ramp
		2 Lane
2E_	10-19-10	2 Lane Existing Pavement
2H_	04-21-20	2 Lane HMA
2P_	04-21-20	2 Lane PCC
2E_TWLTL_	10-19-10	2 Lane Existing Pavement with Two Way Left Turn Lane
2H_TWLTL_	04-21-20	2 Lane HMA with Two Way Left Turn Lane
2P_TWLTL_	04-21-20	2 Lane PCC with Two Way Left Turn Lane
		4 Lane
4DH_Dprs_	04-21-20	4 Lane Divided HMA
4DP_	04-21-20	4 Lane Divided PCC
4DP_Raised_Crowned_	04-21-20	4 Lane Divided PCC with Raised Median - Crowned
4DP_Raised_Out_	04-21-20	4 Lane Divided PCC with Raised Median - Sloped Out
4E_	10-19-10	4 Lane Existing Pavement
4UP_	04-21-20	4 Lane Undivided PCC
		6 Lane
6DP_Closed_	10-20-20	6 Lane PCC Closed Median
6DP_Dprs_	10-20-20	6 Lane PCC Depressed Median

SECTION
Typical
Components

Typical Components - Backbones

Name	Date	Title
8DP_Closed_	10-20-20	8 Lane 8 Lane PCC Closed Median
8DP_Dprs_	10-20-20	8 Lane PCC Depressed Median
3R_MillingOverlay_	04-19-11	3R HMA Overlay with Milling
3R_Overlay_	04-19-11	HMA Overlay
3R_WidenOverlay_	04-19-11	HMA Overlay with Base Widening

10-20-20

Typical Components - Shoulders

Name	Date	Title
		Ramps
1L_P_ALT_	04-21-20	Loop Paved Shoulder Alternates
1L_P_HMA_	04-21-20	Loop HMA Shoulder
1R_Curb_	04-21-20	Ramp Curbed Shoulder
1R_G_	10-19-10	Ramp Granular Shoulder
1R_P_ALT_	10-16-18	Ramp Paved Shoulder Alternates
1R_P_HMA_	10-19-10	Ramp HMA Shoulder
		2 Lane
2_C_	04-21-20	Combination Shoulder
2_Curb_	04-21-20	Curbed Shoulder
2_E_	04-21-20	Earth Shoulder
2_G_	04-21-20	Granular Shoulder with Safety Edge
2_G_SR_	04-21-20	Granular Shoulder for Side Roads
2_P_ALT_	04-21-20	Paved Shoulder Alternates
2_P_HMA_	04-21-20	HMA Shoulder
2_P_FullHMA_	04-21-20	Full Depth HMA Shoulder
2_C_FullPCC_	04-20-21	Full Depth PCC Shoulder
2_P_FullPCC_	04-20-21	Full Depth PCC Shoulder
2_P_Guard_	04-21-20	Paved Shoulder at Guardrail

SECTION
Typical
Components

Typical Components - Shoulders

Name	Date	Title
		4 Lane
4_C_	04-21-20	Combination Shoulder
4_P_ALT_	04-21-20	Paved Shoulder Alternates
4_P_FullHMA_	04-21-20	Full Depth HMA Shoulder
4_C_FullPCC_	04-20-21	Full Depth PCC Shoulder
4_P_FullPCC_	04-20-21	Full Depth PCC Shoulder
4_P_Guard_	04-21-20	Paved Shoulder at Guardrail
4_P_HMA_	04-21-20	HMA Shoulder
		6 Lane
6D_Closed_P_FullPCC_	04-20-21	Urban Full Depth PCC Shoulder
6D_Dprs_P_FullPCC_	04-20-21	Rural Full Depth PCC Shoulder
8D_Closed_P_FullPCC_	04-20-21	Urban Full Depth PCC Shoulder
8D_Dprs_P_FullPCC_	04-20-21	Rural Full Depth PCC Shoulder
		3R
3R_Shldr_C_Milling_	04-19-11	Combination Shoulder - Milling
3R_Shldr_C_Overlay_	04-19-11	Combination Shoulder - Overlay
3R_Shldr_G_Milling_	04-19-11	Granular Shoulder - Milling
3R_Shldr_G_Overlay_	04-19-11	Granular Shoulder - Overlay
3R_Shldr_G_Overlay_A_	10-18-11	Granular Shoulder - Overlay using Type 'A'
3R_Shldr_P_Milling_	04-19-11	Paved Shoulder - Milling
3R_Shldr_P_Overlay_	04-19-11	Paved Shoulder - Overlay
3R_Shldr_Paved_	04-19-11	Retrofit Combination Shoulder
		Soils
Soils_1_	04-21-20	Granular Shoulder for Slide Repair
Soils_2_	04-21-20	Combination Shoulder for Slide Repair
Soils_3_	04-19-11	Foreslope Construction for Slide Repair

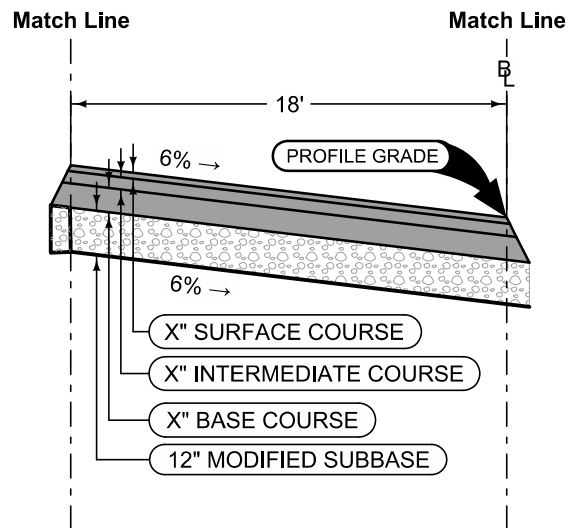
10-20-20

Typical Components - Auxiliary Lanes

Name	Date	Title
2_AuxLane_HMA_	10-18-16	2 Lane HMA Auxiliary Lane
2_AuxLane_PCC_	10-18-16	PCC Auxiliary Lane
4_AuxLane_HMA_	10-18-16	4 Lane HMA Auxiliary Lane
4_AuxLane_PCC_	10-18-16	PCC Auxiliary Lane

Typical Components - Auxiliary Lane Shoulders

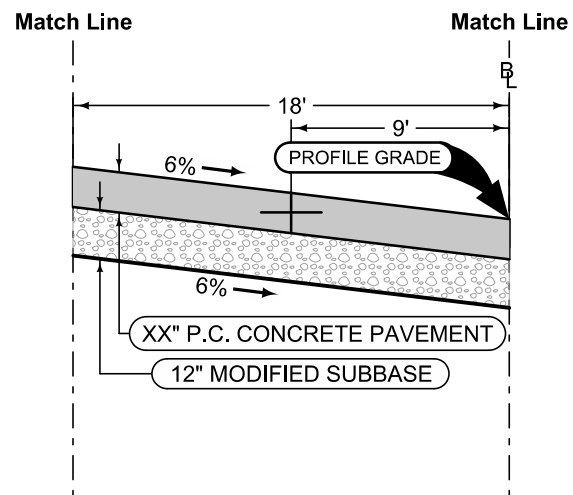
Name	Date	Title
		2 Lane
2_AL_Shldr_ALT_	04-21-20	Paved Shoulder Alternates
2_AL_Shldr_C_	04-21-20	Combination Shoulder
2_AL_Shldr_FullPCC_	04-21-20	Full Depth PCC Shoulder
2_AL_Shldr_G_	04-21-20	Granular Shoulder
2_AL_Shldr_HMA_	04-21-20	HMA Shoulder
		4 Lane
4_AL_Shldr_ALT_	04-21-20	Paved Shoulder Alternates
4_AL_Shldr_C_	04-21-20	Combination Shoulder
4_AL_Shldr_FullPCC_	04-21-20	Full Depth PCC Shoulder
4_AL_Shldr_G_	04-21-20	Granular Shoulder
4_AL_Shldr_HMA_	04-21-20	HMA Shoulder



BACKBONES LOOPS

Section shown in direction of traffic.

1LH_ 04-20-21	
BEGIN STATION	END STATION



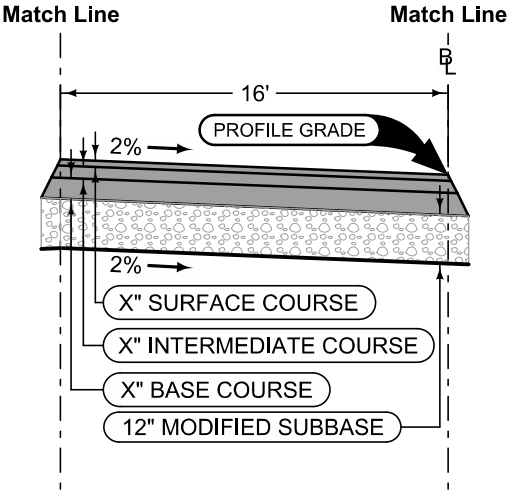
BACKBONES LOOPS

Section shown in the direction of traffic.

Loop Jointing:
 Transverse joints: CD at 15' spacing
 Longitudinal joint: L-2

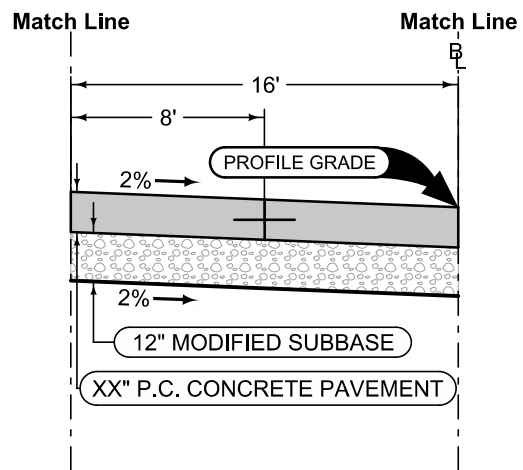
1LP_ 04-20-21	
BEGIN STATION	END STATION

BACKBONES
RAMPS



Section shown in direction of traffic.

1RH_04-20-21	
BEGIN STATION	END STATION



BACKBONES RAMPS

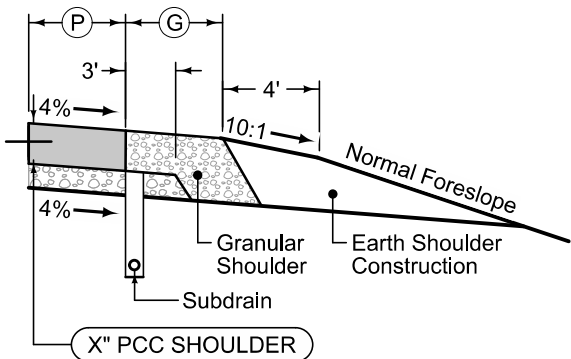
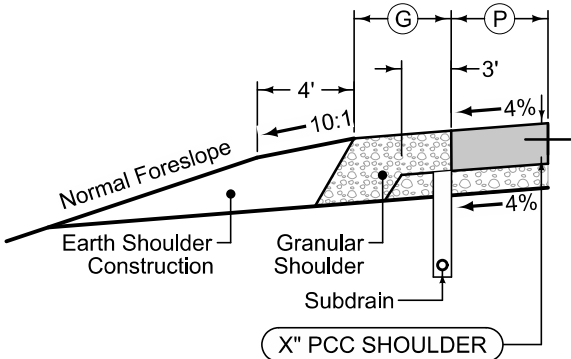
Section shown in the direction of traffic.

Ramp Jointing:
 Transverse joints: CD at 15' spacing.
 Longitudinal joints: L-2

1RP_ 04-20-21	
BEGIN STATION	END STATION

SHOULDERS

2 LANE

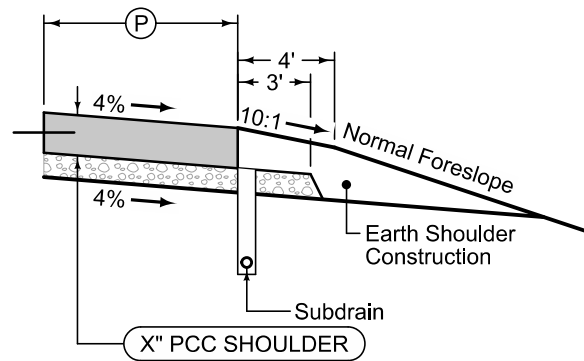
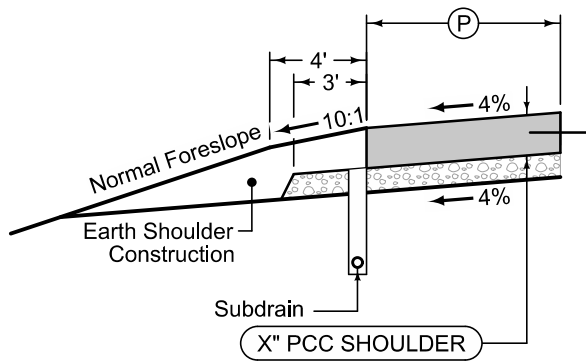


Full Depth PCC Combination Shoulder

Shoulder Jointing:
 Longitudinal joint: BT-2, L-2 or KT-2
 Transverse joints: C at 17' spacing

2_C_FullPCC_04-20-21			
STATION TO STATION		(P) Feet	(G) Feet

SHOULDERS 2 LANE



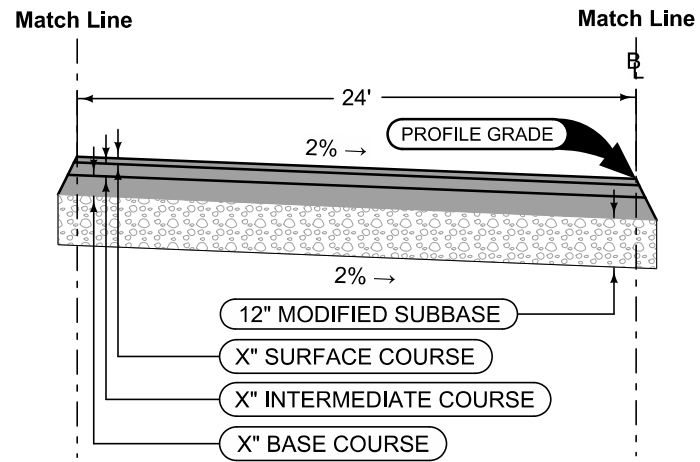
Full Depth PCC Shoulder

Shoulder Jointing:
 Longitudinal joint: BT-2, L-2 or KT-2
 Transverse joints: C at 17' spacing

2_P_FullPCC_ 04-20-21		
STATION TO STATION		(P) Feet

BACKBONES

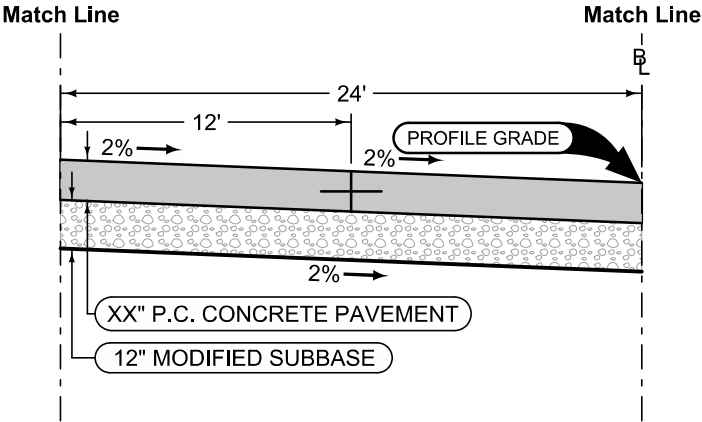
RAMPS



Section shown in the direction of traffic.

2RH_ 04-20-21	
BEGIN STATION	END STATION

BACKBONES
RAMPS

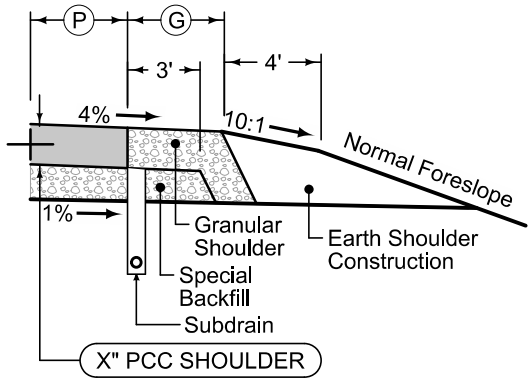
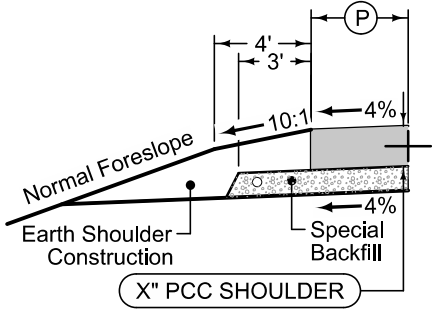


Section shown in the direction of traffic.

Ramp Jointing:
Transverse joints: CD at 17' spacing.
Longitudinal joint: L-2

2RP_ 04-20-21	
BEGIN STATION	END STATION

SHOULDERS
4 LANE



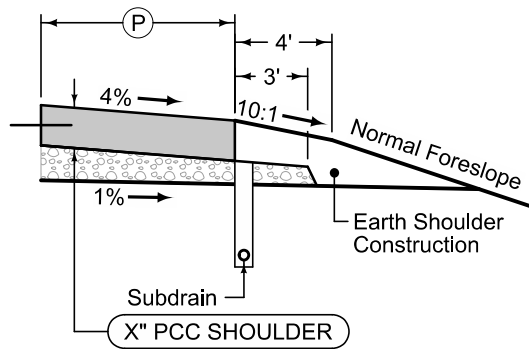
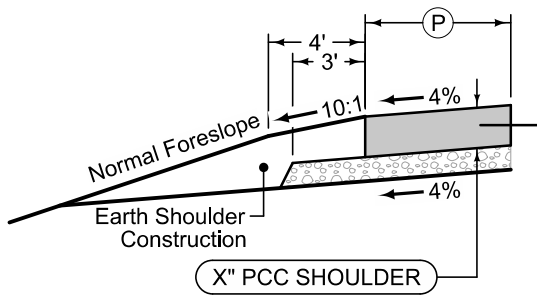
Full Depth PCC Combination Shoulder

Shoulder Jointing:
Longitudinal joint: BT-2, L-2 or KT-2
Transverse joints: C at 17' spacing

4_C_FullPCC_04-20-21				
Direction of Travel	BEGIN STATION	END STATION	(P) Feet	(G) Feet

SHOULDERS

4 LANE



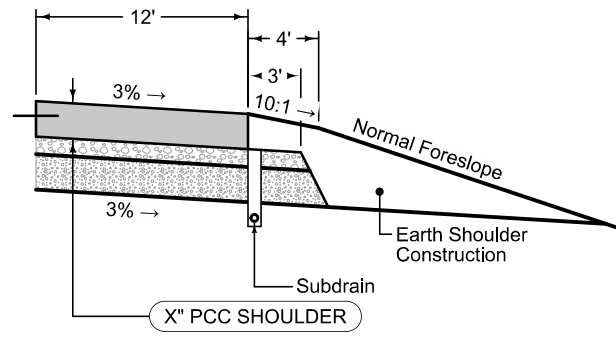
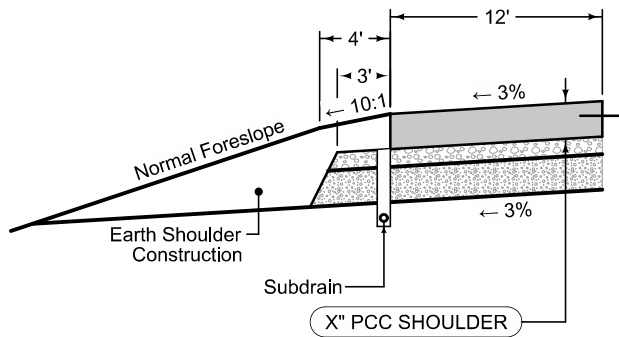
Full Depth PCC Shoulder

Shoulder Jointing:
 Longitudinal joint: BT-2, L-2 or KT-2
 Transverse joints: C at 17' spacing

4_P_FullPCC_ 04-20-21			
Direction of Travel	BEGIN STATION	END STATION	(P) Feet

SHOULDERS

6 LANE



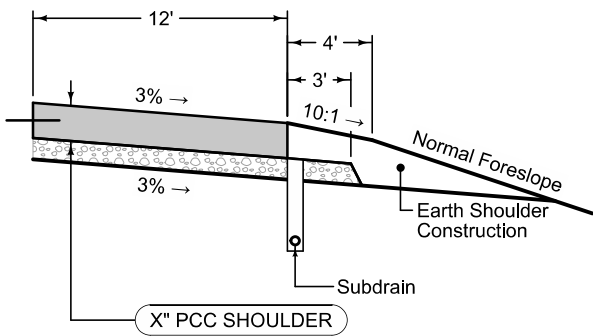
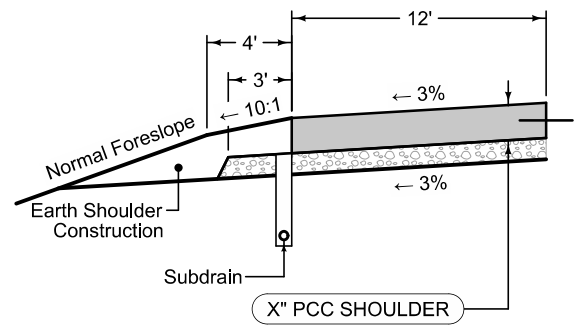
Full Depth PCC Shoulder

Shoulder Jointing:
 Longitudinal joint: BT-2, L-2 or KT-2
 Transverse joints: C at 17' spacing

6D_Closed_P_FullPCC_ 04-20-21	
BEGIN STATION	END STATION

SHOULDERS

6 LANE



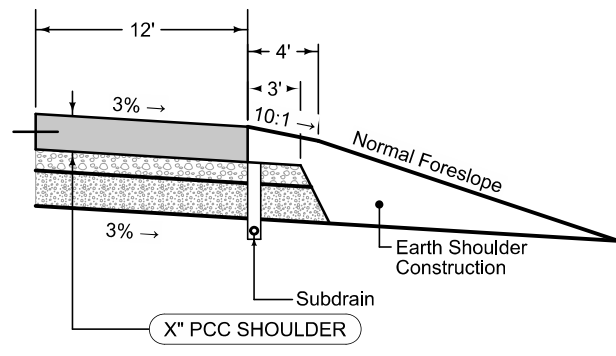
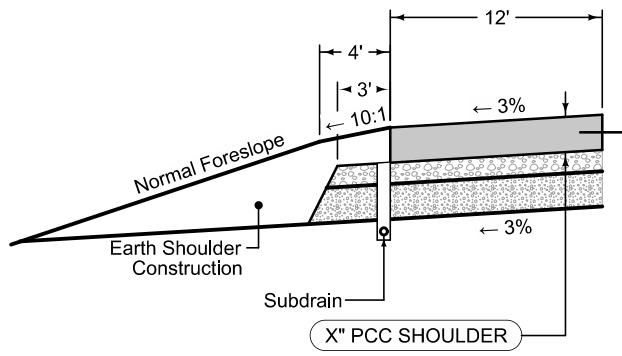
Full Depth PCC Shoulder

Shoulder Jointing:
 Longitudinal joint: BT-2, L-2 or KT-2
 Transverse joints: C at 17' spacing

6D_Dprs_P_FullPCC_04-20-21		
Direction of Travel	BEGIN STATION	END STATION

SHOULDERS

8 LANE



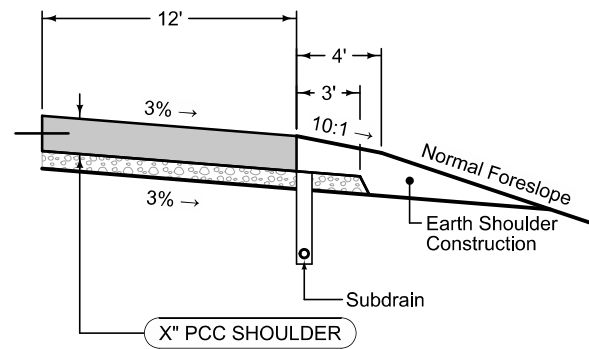
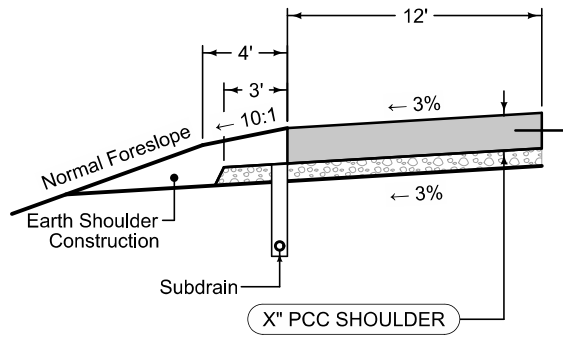
Full Depth PCC Shoulder

Shoulder Jointing:
 Longitudinal joint: BT-2, L-2 or KT-2
 Transverse joints: C at 17' spacing

8D_Closed_P_FullPCC_ 04-20-21	
BEGIN STATION	END STATION

SHOULDERS

8 LANE



Full Depth PCC Shoulder

Shoulder Jointing:
 Longitudinal joint: BT-2, L-2 or KT-2
 Transverse joints: C at 17' spacing

8D_Dprs_P_FullPCC_04-20-21		
Direction of Travel	BEGIN STATION	END STATION

ROADWAY PAVEMENT

SECTION

531

NO.	DATE	TITLE
531-2	04-21-20	Median Crossover at Interchange (50' Median)
531-3	04-21-20	Median Crossover at Interchange (64' Median)

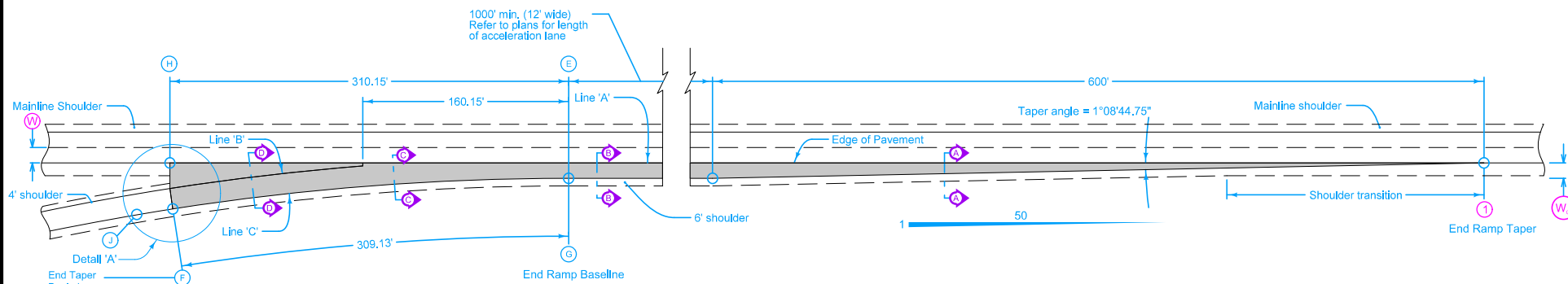
ROADWAY PAVEMENT

SECTION

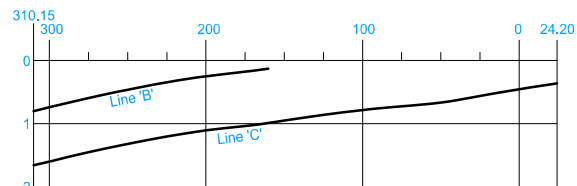
533

NO.	DATE	TITLE
533-1	04-21-20	Parallel Deceleration Taper for 16' Ramp (60MPH Design Speed)
533-2	04-20-21	Parallel Acceleration Taper for 16' Ramp (60MPH Design Speed)
533-3	04-21-20	Parallel Deceleration Taper for 18' Exit Loop (60MPH Design Speed)
533-4	04-20-21	Parallel Deceleration Taper for 24' Exit Loop (60MPH Design Speed)
533-5	04-20-21	Parallel Acceleration Taper for 24' Ramp (60MPH Design Speed)

04-20-21

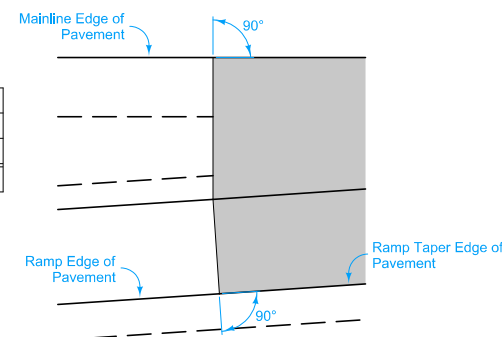


Pt. 'G' to Pt. 'J'
 $\Delta = 8^{\circ} 51' 20.88''$
 $T = 164.23'$
 $L = 327.73'$
 $E = 6.73'$
 $R = 2000.00'$



NOTE: The algebraic difference between ramp profile grade at point (F) and relative profile grade of mainline at point (H) is 0.62%

Shoulder Width beyond Edge of Mainline Pavement	TABLE OF SHOULDER TRANSITION LENGTHS WITH 6' SHOULDER ON RAMP		
	8'	10'	12'
12'	NA	100'	150'



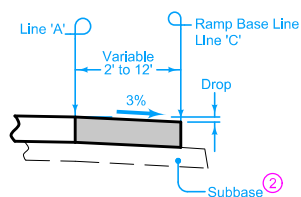
DETAIL A

Construct ramp exit pavement the same thickness as mainline pavement.

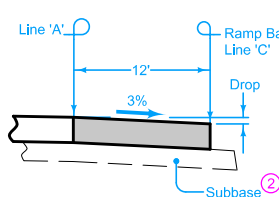
For joint detail, see PV-101.

- ① For header construction detail at the end of taper, see Typical 7101 or Typical 7102.
- ② Construct subbase for ramp exit pavement the same thickness as mainline subbase.

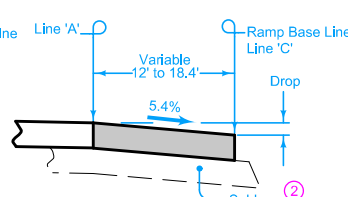
TABLE OF OFFSETS AND DROPS FOR 16' RAMP TAPER																
DISTANCE FROM POINT (E) ALONG LINE 'A' (FL)	310.15	300	275	250	225	204	200	175	160.15	150	125	100	75	50	25	0
From Line 'A' To Line 'B'	OFFSET (FL)	20.00	18.45	14.84	11.56	8.60	6.30	5.95	3.61	2.37						
	SLOPE (%)	Constant 4.0% Slope								4.11	4.92	5.40				
	DROP (FL)	0.80	0.74	0.59	0.46	0.34	0.25	0.24	0.18	0.13						
From Line 'B' To Line 'C'	OFFSET (FL)	Constant 16' Offset														
	SLOPE (%)	Constant 5.4% Slope														
	DROP (FL)	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86							
From Line 'A' To Line 'C'	OFFSET (FL)									17.63	15.91	14.50	13.41	12.63	12.16	12.00
	SLOPE (%)									5.40	5.40	5.40	5.40	4.59	3.78	3.00
	DROP (FL)	1.66	1.60	1.45	1.32	1.20	1.11	1.10	1.04	0.99	0.95	0.86	0.78	0.72	0.68	0.45
DISTANCE FROM POINT (G) ALONG LINE 'C' (FL)	309.13	298.73	273.67	248.66	223.68	202.73	198.74	173.83	159.04	150.14	125.08	100.04	75.02	50.01	25.00	0.00



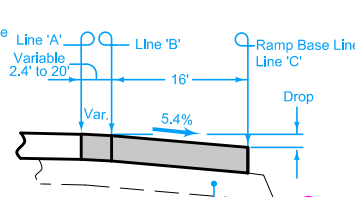
SECTION A-A



SECTION B-B

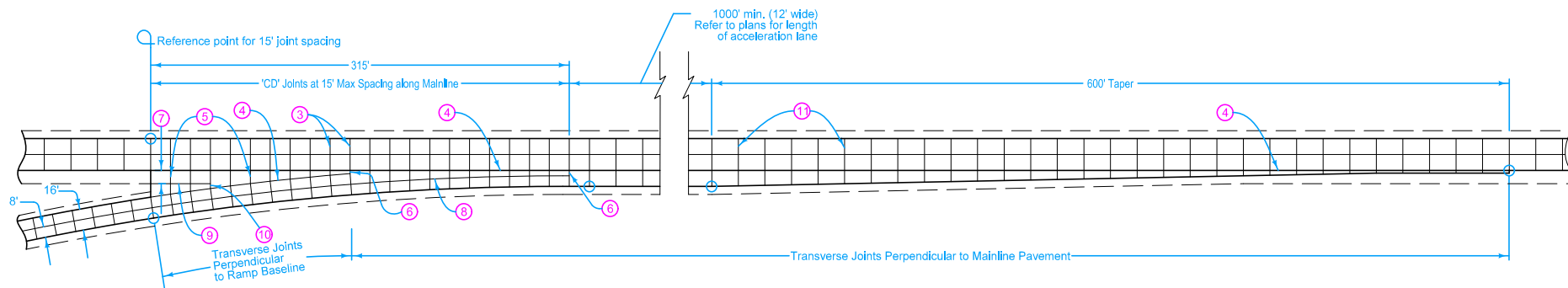


SECTION C-C




SECTION D-D

	REVISION
	3 04-20-21
	ROAD DESIGN DETAIL
	533-02
SHEET 1 of 2	
REVISIONS: Added Point J and Ramp Profile note.	
PARALLEL ACCELERATION TAPER FOR 16' RAMP (60 MPH DESIGN SPEED)	



- ③ 'CD' Joints at 15' spacing.
- ④ 'BT-2' or 'KT-2' Joint.
- ⑤ 'C' Joint.
- ⑥ 'B' Joint. 2' minimum, 4' maximum.
- ⑦ 10' minimum or equal to mainline shoulder width.
- ⑧ 'L-2' Joint.
- ⑨ 'C' Joint parallel to mainline pavement.
- ⑩ 'B' or 'C' Joint. 2' minimum, 4' maximum.
- ⑪ 'CD' Joints at 17' spacing.

 IOWA DOT	REVISION	
	3	04-20-21
	533-02	
	SHEET 2 of 2	
ROAD DESIGN DETAIL		
REVISIONS: Added Point J and Ramp Profile note.		

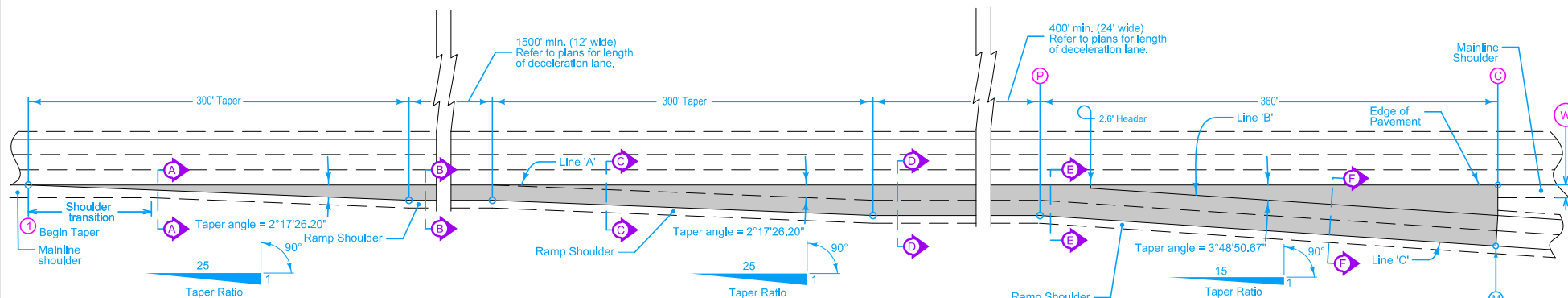
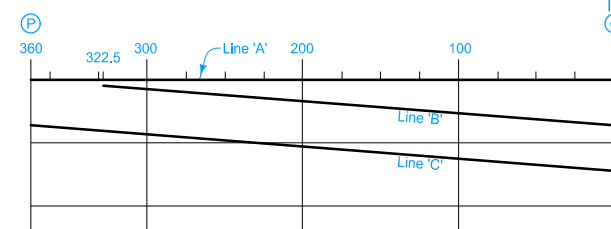
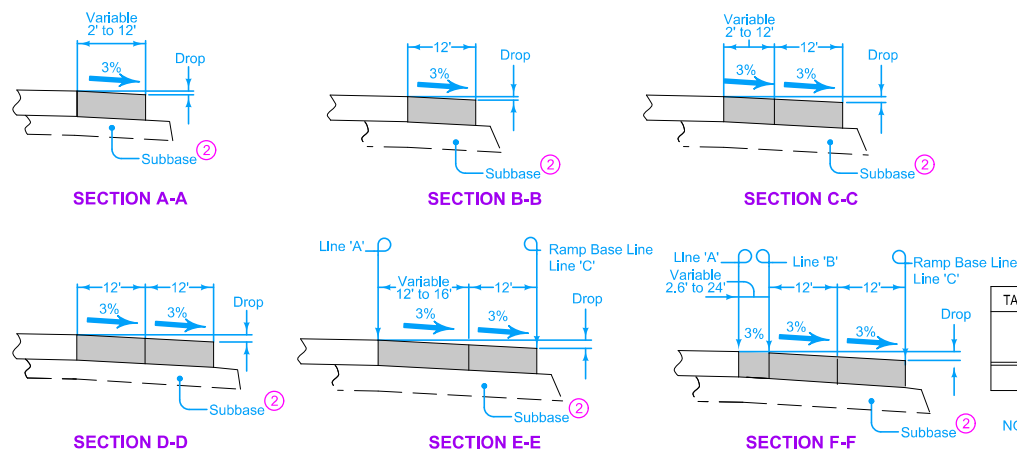


TABLE OF OFFSETS AND DROPS FOR 24' RAMP TAPER																			
DISTANCE FROM POINT (P) ALONG LINE 'A' (FL)		360	350	325	322.5	300	275	250	225	200	175	150	125	100	75	50	25	0	
From Line 'A' To Line 'B'	OFFSET (FL)				2.5	4.00	5.67	7.33	9.00	10.67	12.33	14.00	15.67	17.33	19.00	20.67	22.33	24.00	
	SLOPE (%)				← Constant 3.0% Slope →														
	DROP (FL)				0.08	0.12	0.17	0.22	0.27	0.32	0.37	0.42	0.47	0.52	0.57	0.62	0.67	0.72	
From Line 'B' To Line 'C'	OFFSET (FL)				← Constant 24' Offset →														
	SLOPE (%)				← Constant 3.0% Slope →														
	DROP (FL)				0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	
From Line 'A' To Line 'C'	OFFSET (FL)	24.00	24.72	26.39															
	SLOPE (%)	3.00	3.00	3.00															
	DROP (FL)	0.72	0.74	0.79	0.80	0.84	0.89	0.94	0.99	1.04	1.09	1.14	1.19	1.24	1.29	1.34	1.39	1.44	



Note: The algebraic difference between the profile grade for ramp base line at (M) and relative profile grade of mainline at (C) is 0.20%.

PROFILE



Construct ramp exit pavement the same thickness as mainline pavement.

For joint detail, see PV-101.

① For header construction detail at the end of taper See Typical 7101 or Typical 7102.

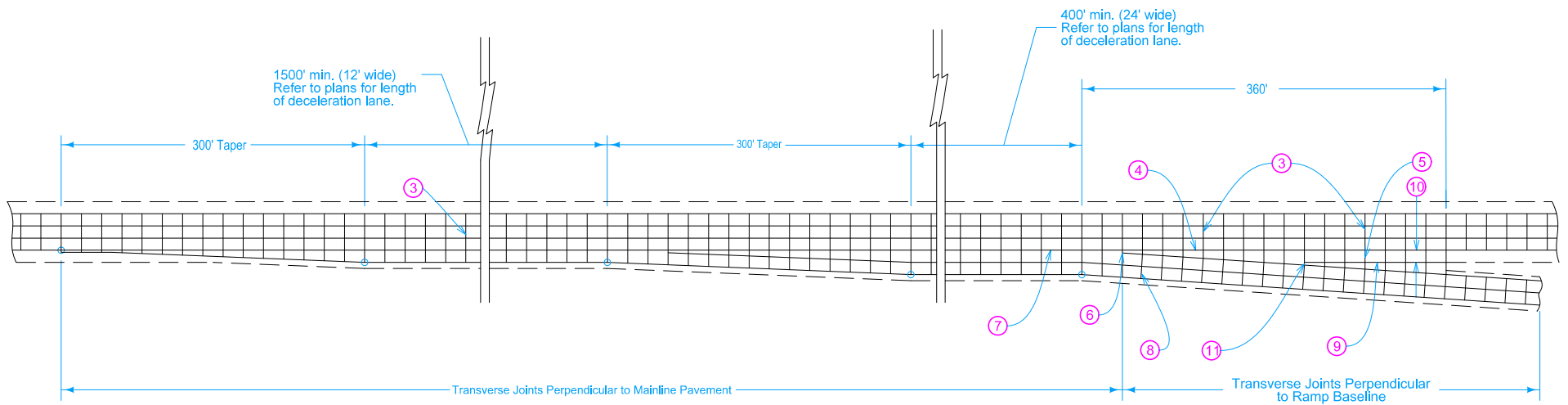
② Construct subbase for ramp exit pavement the same thickness as mainline subbase.

TABLE OF SHOULDER TRANSITION LENGTHS WITH 6' SHOULDER ON RAMP

(W _o)	Shoulder Width beyond Edge of Mainline Pavement		
	8'	10'	12'
12'	NA	100'	150'


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

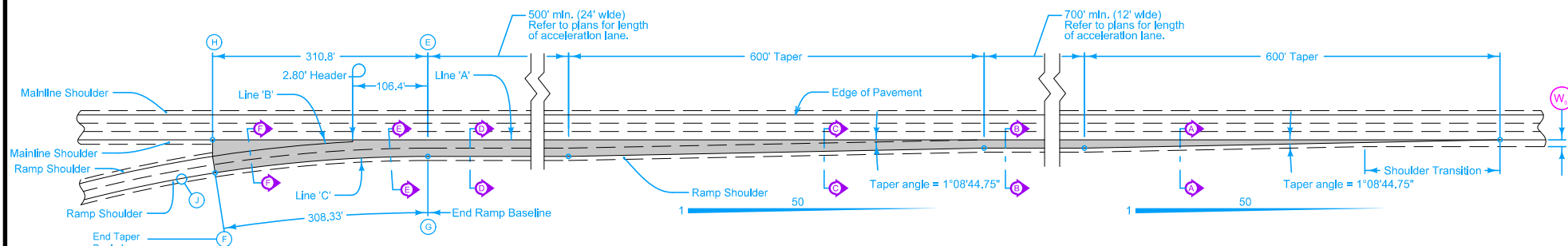
	REVISION	
	3	04-20-21
	533-04	
ROAD DESIGN DETAIL		SHEET 1 of 2
REVISIONS: Added End Taper note.		
PARALLEL DECELERATION TAPER FOR 24' RAMP (60 MPH DESIGN SPEED)		



24' EXIT RAMP WITH PARALLEL DECELERATION LANE

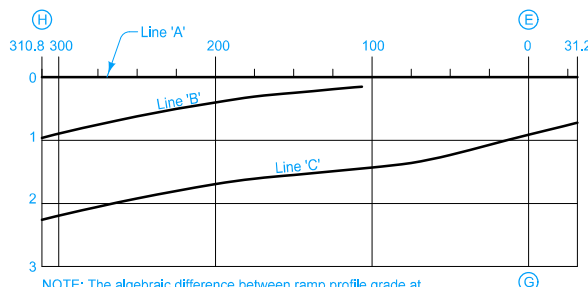
- ③ 'CD' Joints at 17' spacing.
- ④ 'BT-2' or 'KT-2' Joint.
- ⑤ 'C' Joint.
- ⑥ 'B' Joint, 2' minimum, 4' maximum.
- ⑦ 'L-2' Joint.
- ⑧ Construct transverse joints on the exit ramp taper perpendicular to the ramp baseline where the gore area is 4 feet or greater.
- ⑨ 'C' Joint parallel to mainline pavement.
- ⑩ 10' minimum or equal to mainline shoulder width.
- ⑪ 'B' or 'C' Joint, 2' minimum, 4' maximum.

 IOWA DOT	REVISION	
	3	04-20-21
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	SHEET 2 of 2	
REVISIONS: Added End Taper note.		
PARALLEL DECELERATION TAPER FOR 24' RAMP (60 MPH DESIGN SPEED)		



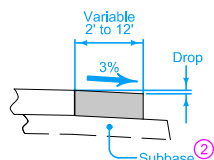
PL. 'G' to PL. 'J'

$\Delta = 09^{\circ}31'13.98''$
 $T = 169.55'$
 $L = 332.33'$
 $E = 6.92'$
 $R = 2000.00'$

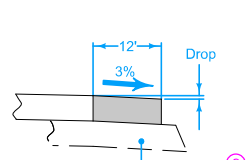


NOTE: The algebraic difference between ramp profile grade at point (F) and relative profile grade of mainline at point (H) is 0.61%

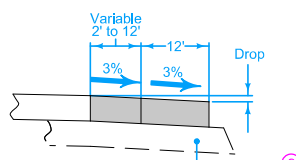
TABLE OF OFFSETS AND DROPS FOR 16' RAMP TAPER																				
DISTANCE FROM POINT (H) ALONG LINE 'A' (FL)		310.8	300	275	250	225	200	175	150	125	106.4	100	75	65	50	25	0	25	31.2	
From Line 'A' To Line 'B'	OFFSET (FL)	24.00	22.36	18.77	15.50	12.55	9.91	7.58	5.57	3.86	2.80									
	SLOPE (%)	← Constant 4.0% Slope →										4.51	5.02	5.40						
	DROP (FL)	0.96	0.89	0.75	0.62	0.50	0.40	0.30	0.25	0.19	0.15									
From Line 'B' To Line 'C'	OFFSET (FL)	← Constant 24' Offset →																		
	SLOPE (%)	← Constant 5.4% Slope →																		
	DROP (FL)	← Constant 1.30' Drop →																		
From Line 'A' To Line 'C'	OFFSET (FL)											26.50	25.41	25.06	24.63	24.16	24.00	24.00	24.00	
	SLOPE (%)											5.40	5.40	5.40	5.04	4.41	3.78	3.15	3.00	
	DROP (FL)	2.26	2.19	2.05	1.92	1.80	1.69	1.60	1.55	1.49	1.45	1.43	1.37	1.35	1.24	1.07	0.91	0.76	0.72	
DISTANCE FROM POINT (F) ALONG LINE 'C' (FL)		308.30	297.54	272.58	247.67	202.79	197.95	173.14	148.36	123.60	105.21	100.04	75.02	65.01	50.01	25.00	0.00			



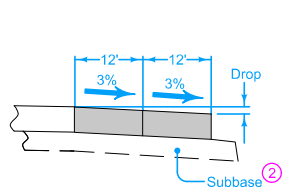
SECTION A-A



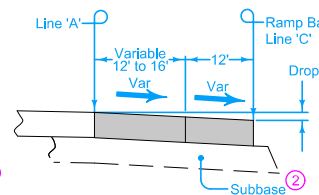
SECTION B-B



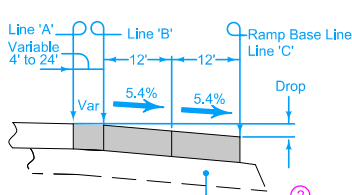
SECTION C-C



SECTION D-D



SECTION E-E



SECTION F-F

Construct ramp entrance pavement the same thickness as mainline pavement.

For joint detail, see PV-101.

① For header construction detail at the end of taper See Typical 7101 or Typical 7102.

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

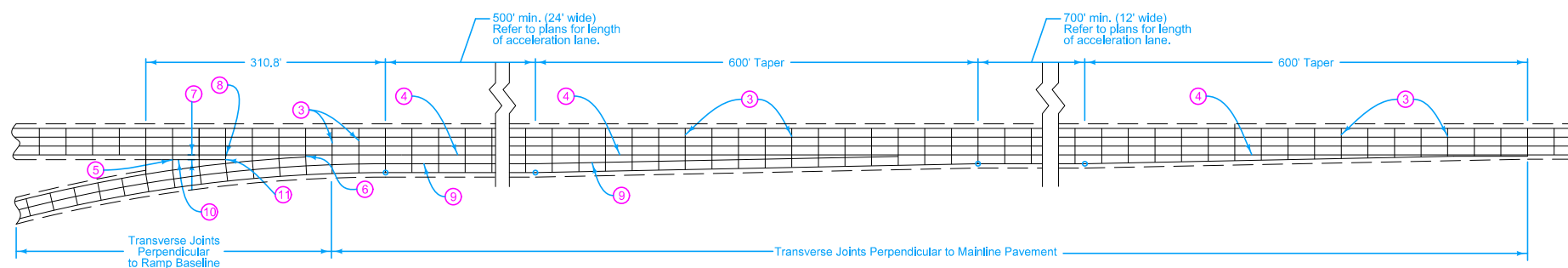
TABLE OF SHOULDER TRANSITION LENGTHS WITH 6' SHOULDER ON RAMP			
(W)	Shoulder Width beyond Edge of Mainline Pavement		
	8'	10'	12'
12'	NA	200'	300'

NOTE: W₁ is the width of the outside lane to the Edge of Pavement.


IOWA DOT	REVISION	
	3	04-20-21
ROAD DESIGN DETAIL		
533-05		
SHEET 1 of 2		

REVISIONS: Added Point J and Ramp Profile note.

**PARALLEL ACCELERATION TAPER
FOR 24' RAMP
(60 MPH DESIGN SPEED)**



- ③ 'CD' Joints at 17' spacing.
- ④ 'BT-2' or 'KT-2' Joint.
- ⑤ 'C' Joint.
- ⑥ 'B' Joint, 2' minimum, 4' maximum.
- ⑦ 10' minimum or equal to mainline shoulder width.
- ⑧ Construct transverse joints through the gore perpendicular to mainline pavement.
- ⑨ 'L-2' Joint.
- ⑩ 'C' Joint parallel to mainline pavement.
- ⑪ 'B' or 'C' Joint, 2' minimum, 4' maximum.

	REVISION	
	3	04-20-21
	533-05	
ROAD DESIGN DETAIL		
REVISIONS: Added Point J and Ramp Profile note.		
PARALLEL ACCELERATION TAPER FOR 24' RAMP (60 MPH DESIGN SPEED)		