SUDAS Revision Submittal Form

Status Date:	As of 10/26/18	**Topic:**	Tubular dowels
Manual:	Specifications	**Manual Location:**	Figure 7010.101

Requested Revision: *See attached.*

Reason for Revision: Add tubular dowels to available methods of joint transfer for doweled contraction joints.

Comments: Requested by the Iowa DOT. The Iowa DOT's Specifications that will be included in their April GS are also attached.

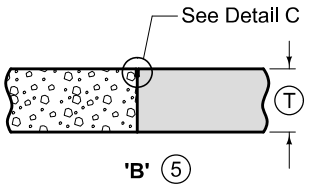
District: ☒ 1 ☒ 2 ☒ 3 ☒ 4 ☒ 5 ☒ 6

Comments: None.

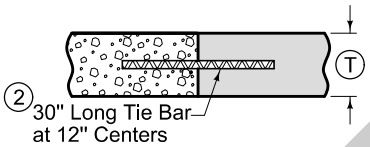
Action: ☐ Deferred ☐ Not Approved ☒ Approved

Final District Action Summary: All 6 districts approved.

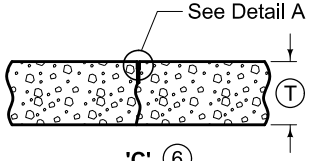
Board of Directors Action:



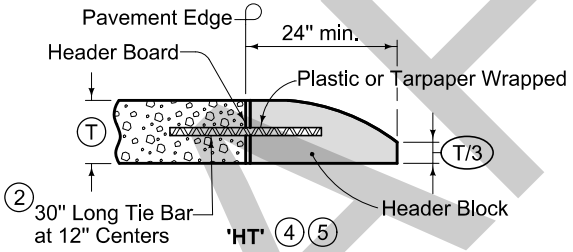
'B' (5)
PLAIN JOINT
(Abutting Pavement Slabs)



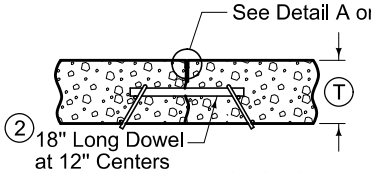
'DW' (3)(4)(7)
DAY'S WORK JOINT(Non-working)



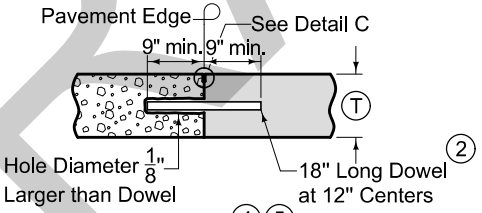
'C' (6)
CONTRACTION JOINT



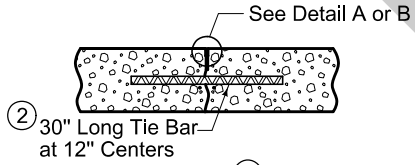
'HT' (4)(5)
HEADER JOINT
(End Rigid Pavement)



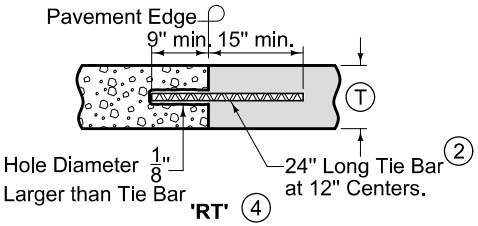
'CD' (1)(4)(6)
DOWELED CONTRACTION JOINT



'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 for Contraction Joints on Sheet 2.

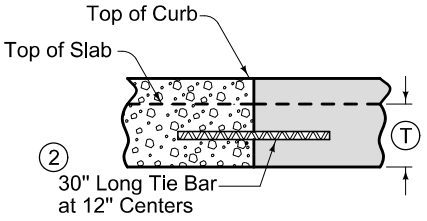
(3) Locate 'Dw' joint at a mid-panel location between future 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.

(4) Place bars within the limits shown under dowel assemblies.

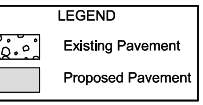
(5) Edge with 1/8 inch tool for length of joint. For HT joint, remove header block and board when second slab is placed.

(6) Unless specified otherwise, use 'CD' transverse contraction joints in mainline pavement when (T) is greater or equal to 8 inches. Use 'C' joints when (T) is less than 8 inches.

(7) 'RT' joint may be used in lieu of 'DW' joint at the end of the days work. Remove any pavement damaged due to the drilling at no additional cost to the Contracting Authority.



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



SUDAS | IOWA DOT

REVISION	
9	04-16-19

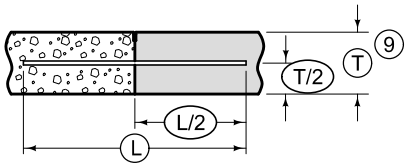
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 1 of 8

REVISIONS: Added tubular dowel option to transverse contraction joints. Modified circle note 2. Added new circle note 14 and renumbered remaining notes.

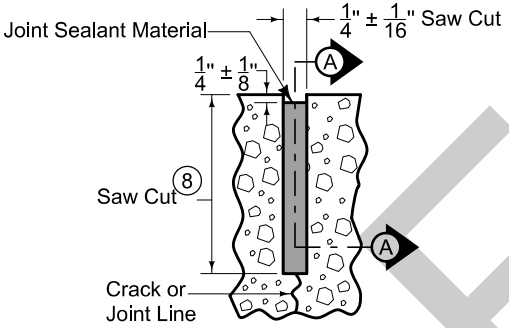
Paul D. Wigant
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS

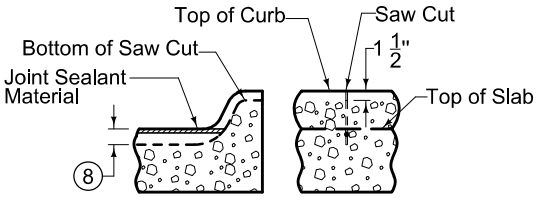
FIGURE 7010.101 | SHEET 1 OF 8



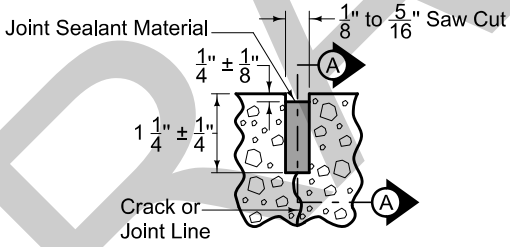
BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



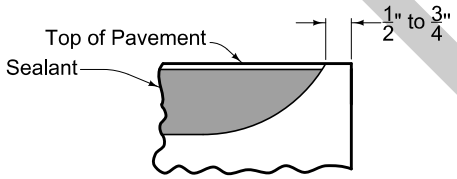
DETAIL A
(Saw cut formed by conventional concrete sawing equipment.)



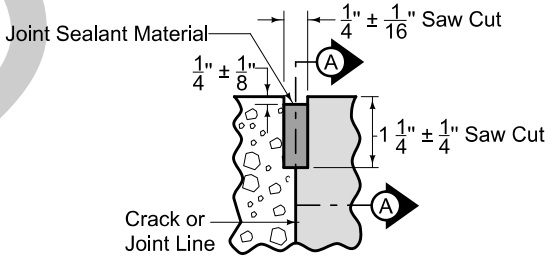
'C' JOINT IN CURB
(Match 'CT', 'CD', or 'C' joint in pavement.)



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



SECTION A-A
(Detail at Edge of Pavement)



DETAIL C

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

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

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

LEGEND
Existing Pavement
Proposed Pavement

SUDAS | IOWADOT | REVISION 9 04-16-19

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

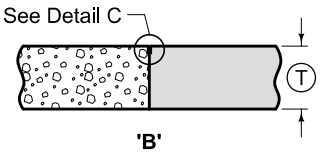
REVISIONS: Added tubular dowel option to transverse contraction joints. Modified circle note 2. Added new circle note 14 and renumbered remaining notes.

Paul D. Wigant
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

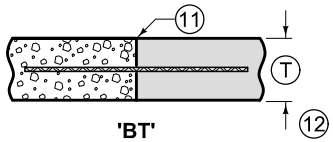
JOINTS

TRANSVERSE CONTRACTION

FIGURE 7010.101 | SHEET 2 OF 8

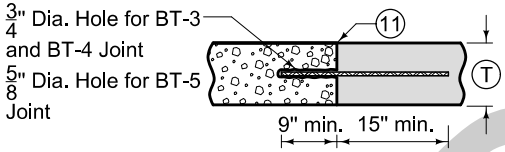


'B'
PLAIN JOINT
(Abutting Pavement Slabs)



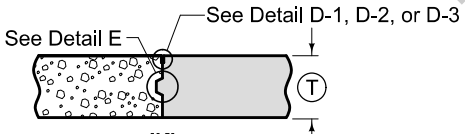
'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE

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

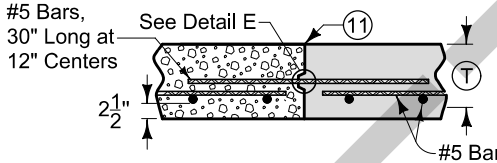


'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE (Drilled)

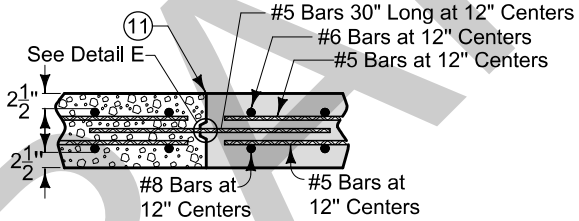
T	Joint	Bars	Bar Length and Spacing
< 8"	'BT-5'	#4	24" Long at 30" Centers
≥ 8"	'BT-3'	#5	24" Long at 30" Centers
	'BT-4'		24" Long at 15" Centers



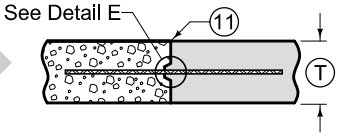
'K'
KEYED JOINT FOR ADJACENT SLABS
(Where T is 8" or more)



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



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



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

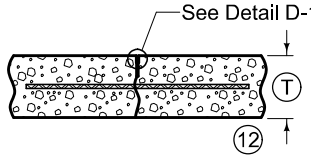
T	Joint	Bars	Bar Length and Spacing
< 8"	'KT-1'	#4	30" Long at 30" Centers
≥ 8"	'KT-2'	#5	30" Long at 30" Centers
	'KT-3'		30" Long at 15" Centers

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

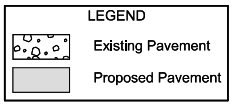


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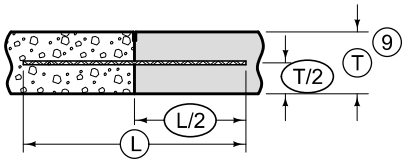
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 3 of 8

REVISIONS: Added tubular dowel option to transverse contraction joints. Modified circle note 2. Added new circle note 14 and renumbered remaining notes.

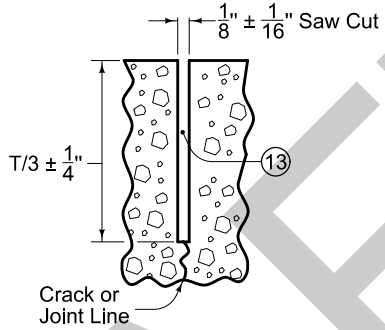
Paul D. Wigant
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS

FIGURE 7010.101 SHEET 3 OF 8



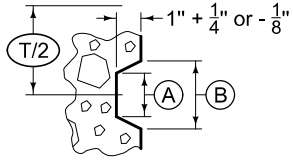
TIE BAR PLACEMENT
(Applies to all joints unless otherwise detailed.)



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

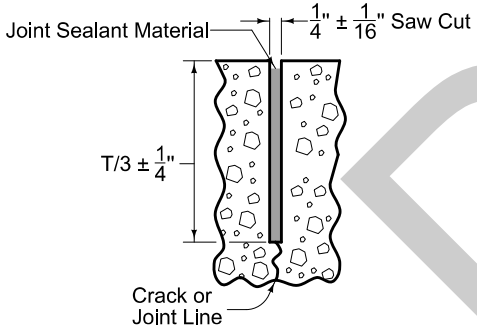
⑨ When tying into old pavement, Ⓣ represents the depth of sound PCC.

⑬ Sealant or cleaning not required.

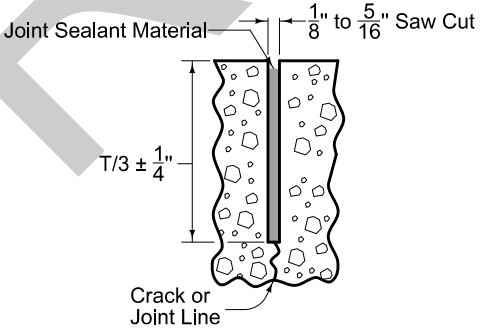


DETAIL E

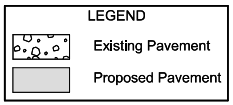
KEYWAY DIMENSIONS			
Keyway Type	Pavement Thickness Ⓣ	Ⓐ	Ⓑ
Standard	8" or greater	1 3/4"	2 3/4"
Narrow	Less than 8"	1"	2"



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



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



SUDAS | IOWADOT | REVISION 9 04-16-19

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

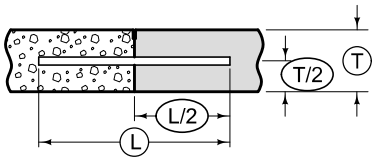
REVISIONS: Added tubular dowel option to transverse contraction joints. Modified circle note 2. Added new circle note 14 and renumbered remaining notes.

Paul D. Wigand
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

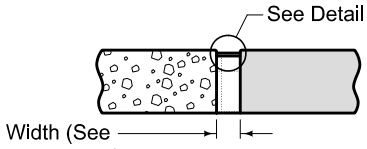
JOINTS

LONGITUDINAL CONTRACTION

FIGURE 7010.101 | SHEET 4 OF 8

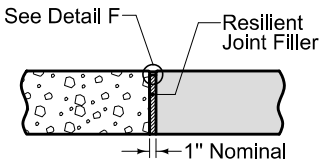


DOWEL PLACEMENT
(Applies to all joints unless otherwise detailed.)

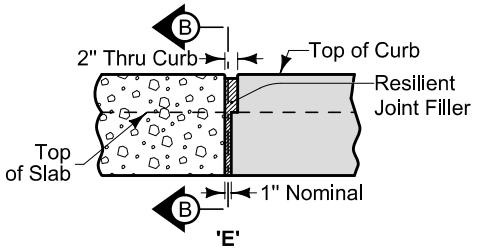


'CF' JOINT

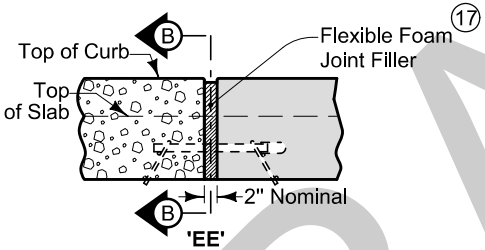
TYPE	WIDTH
CF-1	2"
CF-2	$2\frac{1}{2}$"
CF-3	3"
CF-4	$3\frac{1}{2}$"



'E'
1" EXPANSION JOINT

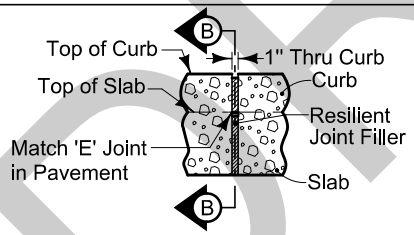


'E'
JOINT IN CURB
(View at Back of Curb)

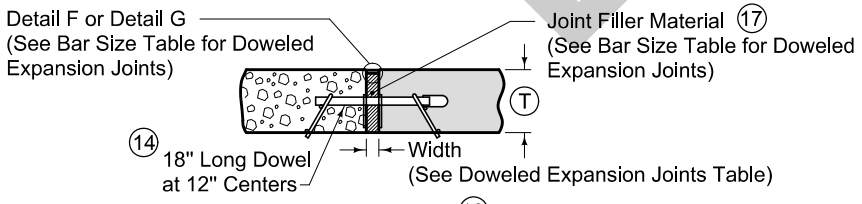


17

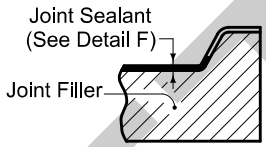
'EE'
JOINT IN CURB
(View at Back of Curb)



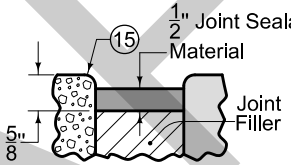
'ES'
JOINT IN CURB
(View at Back of Curb)



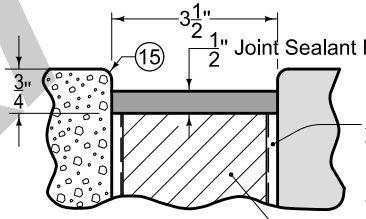
'ED', 'EE', 'EF' 16
DOWELED EXPANSION JOINT



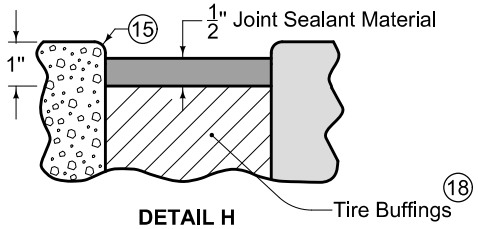
SECTION B-B



DETAIL F



DETAIL G



DETAIL H

EXPANSION JOINTS

14 See Bar Size Table for Doweled Expansion Joints.

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

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

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

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

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

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

LEGEND
Existing Pavement
Proposed Pavement

SUDAS | IOWADOT | REVISION 9 04-16-19
FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101 | SHEET 5 of 8

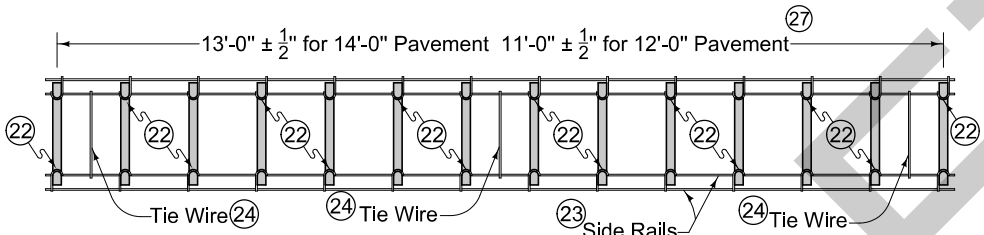
REVISIONS: Added tubular dowel option to transverse contraction joints. Modified circle note 2. Added new circle note 14 and renumbered remaining notes.

Paul D. Wigand
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS

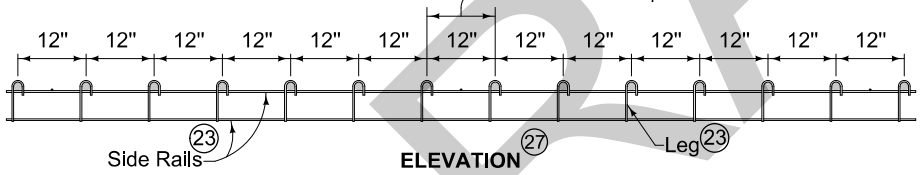
FIGURE 7010.101 | SHEET 5 OF 8

CONTRACTION JOINTS

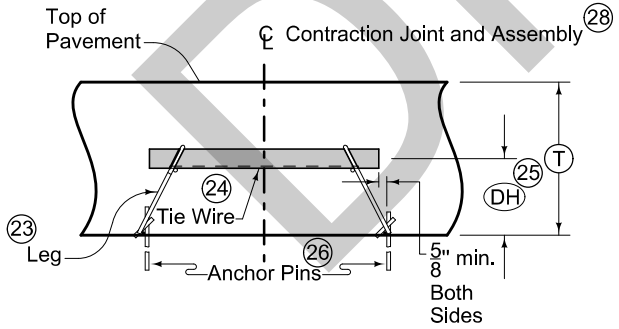


PLAN

Spaces between dowel bars are nominal dimensions with a 1/4" allowable tolerance.



ELEVATION



LONGITUDINAL SECTION

DOWEL ASSEMBLIES (19) (20) (21)

DOWEL HEIGHT AND DIAMETER FOR DOWELED CONTRACTION JOINTS			
(T)	(DH) (25)	Diameter (Solid)	Diameter (Tubular)
7" to 7 1/2"	3 1/2"	3/4"	7/8"
8" to 9 1/2"	4 1/4"	1 1/4"	1 3/8"
10" to 11 1/2"	5 1/4"	1 1/2"	1 5/8"
12" to 13"	6 1/4"	1 1/2"	1 5/8"
Tubular Dowel Bars will not be allowed for RD joints.			

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

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

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

(22) Weld alternately throughout.

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

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

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

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

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

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

SUDAS	IOWADOT	REVISION 9	04-16-19
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101	SHEET 6 of 8

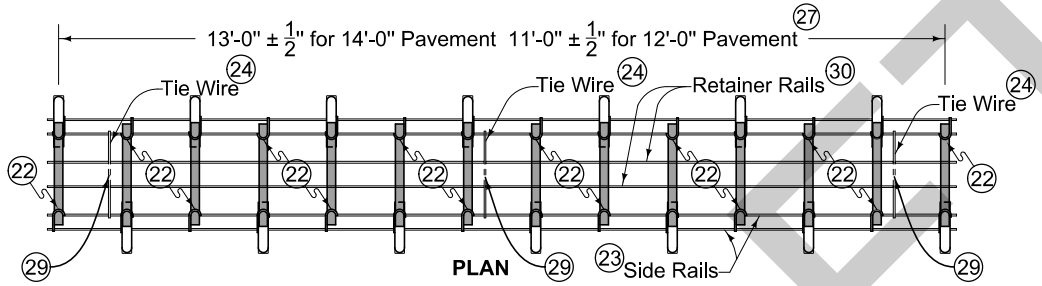
REVISIONS: Added tubular dowel option to transverse contraction joints. Modified circle note 2. Added new circle note 14 and renumbered remaining notes.

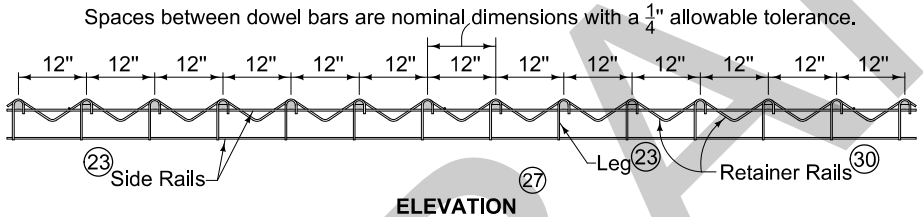
Paul D. Wigand
SUDAS DIRECTOR — DESIGN METHODS ENGINEER

JOINTS

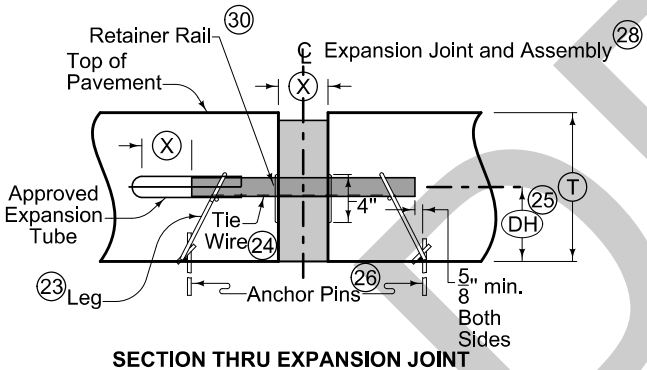
FIGURE 7010.101 | SHEET 6 OF 8

EXPANSION JOINTS





ELEVATION



SECTION THRU EXPANSION JOINT

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

DOWEL HEIGHT AND DIAMETER FOR DOWELED EXPANSION JOINTS		
(T)	(DH) 25	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"
Tubular Dowel Bars will not be allowed for expansion joints.		

DOWEL ASSEMBLIES 19 20 21

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

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

21 Details apply to both transverse contraction and expansion joints.

22 Weld alternately throughout.

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

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

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

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

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

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

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

30 1/4 inch diameter wire.

FIGURE 7010.101 | SHEET 7 OF 8

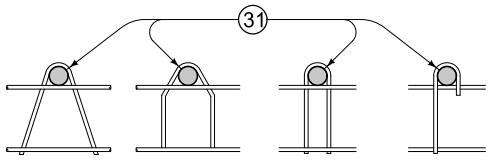
SUDAS | IOWADOT | REVISION 9 04-16-19

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

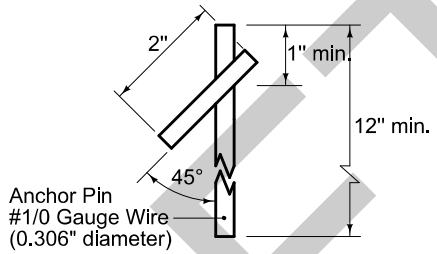
REVISIONS: Added tubular dowel option to transverse contraction joints. Modified circle note 2. Added new circle note 14 and renumbered remaining notes.

Paul D. Wigand
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS



OPTIONAL LEG SHAPES



ANCHOR PIN

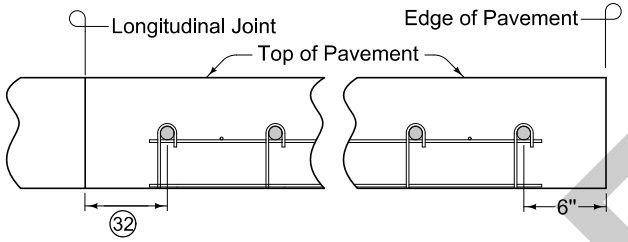
19 Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

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

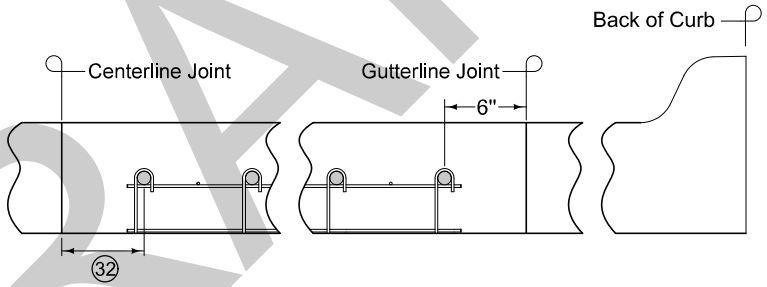
21 Details apply to both transverse contraction and expansion joints.

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

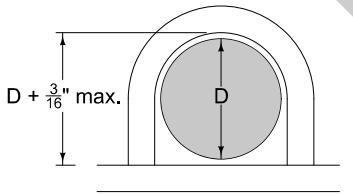
32 For uniform lane widths: 3" - 6". For taper and variable width pavements: 3" - 12".



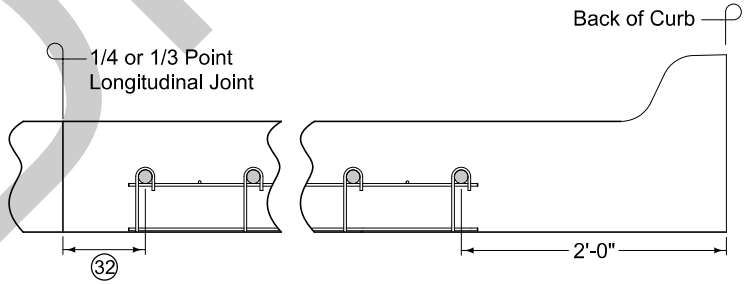
PLACEMENT LIMITS
(Rural Section)



PLACEMENT LIMITS
(Curb and Gutter - Gutterline Jointing)



BEND AROUND DOWEL 31



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

DOWEL ASSEMBLIES 19 20 21

FIGURE 7010.101 | SHEET 8 OF 8

SUDAS | IOWADOT

REVISION: 9 | 04-16-19

FIGURE 7010.101 | STANDARD ROAD PLAN | PV-101

SHEET 8 of 8

REVISIONS: Added tubular dowel option to transverse contraction joints. Modified circle note 2. Added new circle note 14 and renumbered remaining notes.

Paul D. Wigand
SUDAS DIRECTOR | DESIGN METHODS ENGINEER

JOINTS

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Kevin Merryman	**Office:** Construction & Materials	**Item 7**
Submittal Date: April 2018	**Proposed Effective Date:** April 2019	
Article No.: 4151.02, B **Title:** Pavement Reinforcement	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 7/12/2018	**Effective Date:** 4/16/2019

Specification Committee Approved Text:

4151.02, B, 1.

Replace the Article:

Use either of the following

a. Solid dowels.

Use plain round bars meeting requirements of:

- ASTM A 663, Grade 60 or higher,
- ASTM A 675, Grade 60 or higher, or
- ASTM A 615, Grade 40 or higher.

b. Tubular dowels.

1) Provide welded carbon and alloy steel tubular dowel bar meeting requirements of ASTM A 513, with a minimum wall thickness of 0.120 inches.

2) Galvanize exterior and interior of tubular dowel bars according to ASTM A 653 Coating Designation G90.

3) Cap ends of tubular dowel to prevent intrusion of concrete or other materials. Caps shall be manufacturer supplied and designed for this purpose.

4151.02, B, 3

Add as the second sentence:

Use tubular dowels in load transfer assemblies only.

Comments: The ASTM designation for galvanizing was revised to be more concise.

Specification Section Recommended Text:

4151.02, B, 1.

Replace the Article:

Use either of the following

a. Solid dowels.

Use plain round bars meeting requirements of:

- ASTM A 663, Grade 60 or higher,
- ASTM A 675, Grade 60 or higher, or
- ASTM A 615, Grade 40 or higher.

b. Tubular dowels.

- Provide welded carbon and alloy steel tubular dowel bar meeting requirements of ASTM A 513, with a minimum wall thickness of 0.120 inches.

- Galvanize exterior and interior of tubular dowel bars meeting ASTM A 653 G90 coverage zinc galvanized coating
- Cap ends of tubular dowel to prevent intrusion of concrete or other materials

4151.02, B, 3

Add as the second sentence:
Use tubular dowels in load transfer assemblies only.

Comments:

Member's Requested Change: **(Do not use 'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.)**

4151.02 PAVEMENT REINFORCEMENT.

B. Pavement Dowel Bars.

1. Use either of the following
a. Solid dowels
Use plain round bars meeting requirements of:
- ASTM A 663, Grade 60 or higher,
- ASTM A 675, Grade 60 or higher, or
- ASTM A 615, Grade 40 or higher.

b. Tubular dowels
- Provide welded carbon and alloy steel tubular dowel bar meeting the requirements of ASTM A 513, with a minimum wall thickness of 0.120 inches.
- Galvanize the exterior and interior of the tubular dowel bars meeting ASTM A 653 G90 coverage zinc galvanized coating
- Cap the ends of the tubular dowel to prevent intrusion of concrete or other materials

3. Furnish dowels, with the exceptions of end of run and header joints, in approved assemblies as shown in the contract documents. Use tubular dowels in load transfer assemblies only. Ensure all dowels, including end of run and header dowels, have an epoxy coating. Ensure the coating is applied by the electrostatic spray method complying with the requirements of AASHTO M 254, Type B, with a minimum coating thickness of 6 mils after cure. Epoxy powders approved for use are listed in Materials I.M. 451.03B, Appendix B. Perform welding and tack welding on reinforcement according to Article 4151.06..

Reason for Revision: To allow approval of tubular dowel basket

New Bid Item Required (X one)	**Yes**	**No** X
Bid Item Modification Required (X one)	**Yes**	**No** X
Bid Item Obsoletion Required (X one)	**Yes**	**No** X

Comments:

County or City Comments:

Industry Comments: