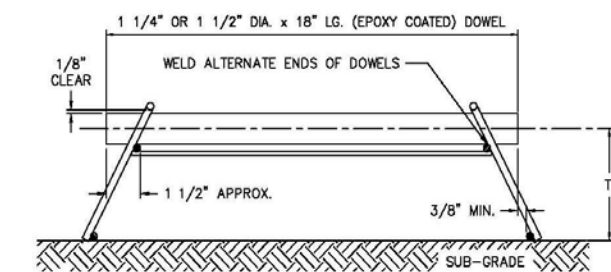


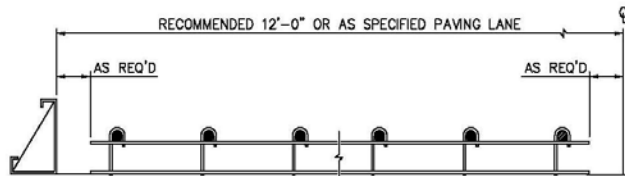
# Dowel Bar Standardization

NC<sup>2</sup> Fall Meeting  
St. Louis, MO

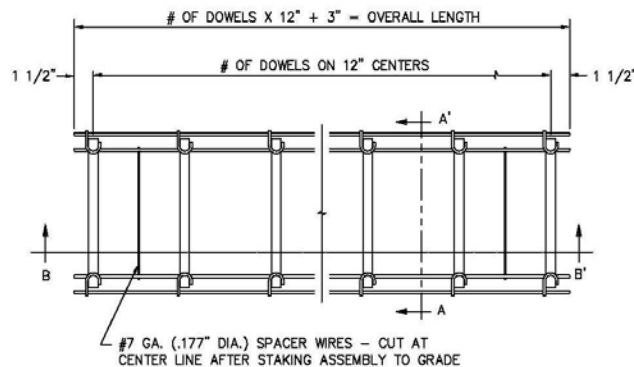
# 2001 Universal Basket



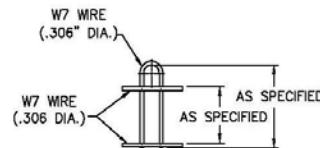
SECTION: A-A'



SECTION: B-B'

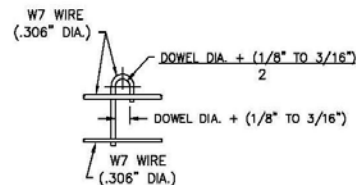


PLAN VIEW



DETAIL: U-LEG

- OR -



ALTERNATE  
DETAIL: J-LEG

## NOTES:

- 1) DOWELS TO BE BILLET STEEL BARS PER AASHTO SPECIFICATION M-31 GR. 40 LATEST REV. (ASTM A-615 GR. 40).
- 2) DOWELS ARE TO BE: ☐ EPOXY COATED  
☐ TECTYL 508 COATED  
 OR FACTORY COATED WITH A VISIBLE COATING OF AN APPROVED COATING COMPOUND, UNIFORMLY APPLIED BY DIPPING AND WITHOUT EXCESSIVE DRIPS OR THICKNESS, BUT IN SUCH A THICKNESS THAT ITS PRESENCE CAN BE READILY IDENTIFIED
- 3) DOWELS ARE TO BE CUT WITH STRAIGHT SURFACE AND DEBURRED.
- 4) WIRE SIZES SHOWN ARE MINIMUM REQ'D.
- 5) ALL WIRE INTERSECTIONS ARE TO BE WELDED
- 6) STAKES TYPICALLY APPLIED AT WORKING ENDS OF DOWELS WITH SUFFICIENT INSTALLATIONS TO PREVENT UNIT FROM OVERTURNING UNDER LOAD.
- 7) TOLERANCES:  
 A)  $\pm 1/4\"/>$

PROJECT	MIDWEST CONCRETE CONSORTIUM	
LOCATION	STATE	
ACCOUNT		
SCALE	NOT TO SCALE	DRAWING NO.
DRAWN		
DATE		SHEET 1 OF 1

NC<sup>2</sup> Fall Meeting  
St. Louis, MO

# Continuation of discussion from NC<sup>2</sup> Spring meeting

NC<sup>2</sup> Fall Meeting  
St. Louis, MO

# Results of Dowel Bar Questionnaire

## ***Dowel Basket Standardization Questionnaire Results***

***National Concrete Consortium***

***San Antonio, TX  
March 2009***

NC<sup>2</sup> Fall Meeting  
St. Louis, MO

# Results of Dowel Bar Questionnaire

	7). DO YOU SPECIFY WHERE THE DOWEL IS TO BE WELDED TO THE BASKET? CONTRACTION AND EXPANSION.	8). WHAT IS YOUR SPECIFICATION FOR # OF FILLER SPACER WIRES ON EXPANSION BASKETS?	9). WHAT DOWEL SIZES DO YOU USE? WHAT DETERMINES THE SIZE? WHAT GRADE OF STEEL?
CALIFORNIA	Weld may be at the top or bottom of the dowel bar.	Five spacer wires welded to top support wire.	1 1/2" dowel for PCC less than 0.70 ft thick. 1 1/2" dowel for PCC 0.70ft. or greater.
GEORGIA			
* IOWA	Weld on the top of the dowel bar.	4-5 filler spacer wires, #5 gauge or #7 gauge.	7.5" and less 3/4" dowel. 8" to 9.5" = 1 1/4" dowel bar. 10" to 13" = 1 1/2" dowel bar. 40/60 grade (ASTM)
* ILLINOIS	Weld on the top or bottom of dowel bar. One weld per bar.	Not applicable.	less than 7" thick = 1" dia. 7 to 7.99" = 1 1/4" dia. 8" or greater = 1 1/2". AASHTO M 227 Gr. 70-80.
* INDIANA	Weld location is not specified.	Not applicable.	Less than 9" = 1" dia. 9" thru 12" = 1 1/4" dia. Greater than 12" = 1 1/2". Grade 40 or 60.
KANSAS	No.	22 tie wires.	1/8 inch of concrete. Grade 40 or 60.
LOUISIANA	Weld on top and bottom of dowel bar.	Not specified.	1 1/4" & 1 1/2" dowels are used based on thickness. Grade 60 Steel is required.
* MICHIGAN	Weld may be at the top or bottom of the dowel bar.	22 filler spacer wires. 0.177" diameter minimum.	less than 8" = 1" diameter dowel. 8" to 11" thick pavt. = 1 1/4". Greater than 11" = 1 1/2". Grade 40 steel.
* MINNESOTA			
* MISSOURI	Weld location not specified.	Not specified.	1 1/4" for pavt. 10" thick or less. 1 1/2" for pavt. more than 10". Dowels must meet AASHTO M31.
NEW YORK			
N. CAROLINA	Weld on bottom of dowel bar.	2 wires minimum.	Dowel sizes not given. Grade 60 dowels.
N. DAKOTA	Weld location not specified.	Not specified.	1 1/2" when pavt is 10" thick or less. 1 1/2" diameter when greater than 10". Grade not specified.
* OHIO	Weld on bottom of dowel bar.	Spacer wires every 12".	less than 8.5" = 1" dia. 8.5" to 10" = 1.25" dia. Greater than 10" = 1.5" dia. Grade not specified.
OKLAHOMA			
PENNSYLVANIA			
S. DAKOTA			
TEXAS	Weld location not specified.	Not applicable.	8" thick = 1" dia. Increase dia. By 1/8" per 1" of thickness. Grade 60 steel bars required.
* WISCONSIN	Weld location not specified.	Not specified.	7-7.5" = 1" dia. 8 - 9.5" = 1.25" dia. 10" and above = 1.5" dia. Grade 40 or 60 dowels.

\* States involved in initial dowel basket standardization effort.

# Dowel Bar Diameters

	6.0"	6.5"	7.0"	7.5"	8.0"	8.5"	9.0"	9.5"	10.0"	10.5"	11.0"	11.5"	12.0"	12.5"
Recommended	1.000	1.000	1.000	1.000	1.250	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500
California	1.250	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Iowa	0.750	0.750	0.750	0.750	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500	1.500
Illinois	1.000	1.000	1.250	1.250	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
Indiana	1.000	1.000	1.000	1.000	1.000	1.000	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.500
Michigan	1.000	1.000	1.000	1.000	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.500	1.500	1.500
Minnesota	1.000	1.000	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500
Missouri	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500
North Dakota	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500
Ohio	1.000	1.000	1.000	1.000	1.000	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500
Texas					1.000		1.125		1.250		1.375		1.500	
Wisconsin			1.000	1.000	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500	1.500

Based on NC^2 March 2009 dowel bar questionnaire, question number 9 responses.

**NC^2 Fall Meeting**  
**St. Louis, MO**

# Dowel Bar Standardization Recommendations

Recommendation Following is our recommendation for standardizing dowel bar baskets for concrete paving in the United States. A regional approach may also be utilized to adopt some of the following recommendations.

- 0.306" basket/frame wire diameter
- Optional legs shapes as shown in IA Standard Road Plan RH-55
- 8 – 12 mil epoxy coating thickness on dowel bar
- Dowel bar steel – AASHTO M 227 Grade 70-80 (ASTM A 615 Grade 40 or 60)
- 15" long dowel bar
- 10'-0" basket length (11 bars spaced at 12" on center)
- Dowel bar size –

Pavement Thickness	6" – 7.5"	>7.5" – 10"	> 10" - 12"	>12"
Dowel Bar Diameter	1"	1¼"	1½"	1½"
Height to center of dowel	3¼"	4½"	5"	6½"

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# Questions/Comments/ Discussion

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# Revised Recommendations

After the group discussion on Tuesday October 6th, I would like to revise our recommendation to move forward.

- 0.306" basket/frame wire diameter – spacer wire diameter (0.177")
- Number of spacer wires required – 4 minimum
- U-leg and V-leg – basket stability
- 8 – 12 mil epoxy coating thickness on dowel bar
- Dowel bar steel – AASHTO M 227 Grade 70-80 (ASTM A 615 Grade 40 or 60)

# Wires and Basket Style

Wire Gauge Comparison (#5)					Cut Shipping (Spacer) Wires (#11)			Basket Leg Style (#4)				
	Top	Bottom	Side	Shipping	Yes	No	Contractor's Option	U-leg	V-leg	J-leg	Choked V-leg	Not Specified
Recommended	0.306	0.306	0.306	0.177				X	X			
California	W10	W10	NG	NG	x			x	x			
Iowa	0.306	0.306	0.306	0.135			x (must cut every 4th)	x	x	x	x	
Illinois	0.306	0.306	0.306	0.177	x							x
Indiana	W7.5	W7.5	W7.5	NG	x							x
Louisiana	0.306	0.306	0.306	NG	x				x			
Michigan	0.306	0.306	0.306	NS	x			x		x		
Minnesota	0.306	0.306	0.243	0.177			x	x	x	x		
Missouri	#0(.306)	#0(.306)	#0(.306)	NG		x		x		x		
New York	0.306	0.306	0.243	NG					x			
North Carolina	0.276	0.276	0.276	0.192	x				x			
North Dakota	NS	NS	NS	NS		x						x
Ohio	0.306	0.306	0.306	0.177	x			x		x		
Texas	NG	NG	NG	NG		x						x
Wisconsin	NG	NG	NG	NG		x			x			
NG = Not Given		NS = Not Specified										

# Dowel Bar Material

Dowel Bar Material Comparison (#9)

	AASHTO M227 GR 70-80	ASTM A615 Grade 40	ASTM A615 Grade 60	AASHTO M31	Not Specified
<b>Recommended</b>	<b>X</b>	<b>X</b>	<b>X</b>		
California					
Iowa		X	X		
Illinois	X				
Indiana		X	X		
Louisiana			X		
Michigan		X			
Minnesota		X	X		
Missouri				X	
North Carolina			X		
North Dakota					X
Ohio					X
Texas			X		
Wisconsin		X	X		

ASTM A615 Grade 40 is recertifiable as AASHTO M227, 99% of time, ASTM A615 Grade 60 is also becoming re-certifiable as AASHTO M227 Grade 70-80 (Eder NC^2 March 2009)

# Epoxy Coating Thickness



Based on NC'2 March 2009 Glenn Eder presentation

# Dowel bar size and dowel basket height to center of dowel

Pavement Thickness	6" – 7.5"	>7.5" – 10"	> 10" – 12"	>12"
Dowel Bar Diameter	1"	1 ¼"	1 ½"	1 ½"
Height to center of dowel	3 ¼"	4 ½"	5"	6 ½"

# Cost savings

- Although difficult to quantify, savings would be there
- Fabrication will be simplified knowing the frames could be supplied to many different DOTs
- Reduced lead time needed to supply baskets to projects
- Although DOTs don't see it directly, when projects get delayed baskets that are being stored outside in manufacturer's yards could be shipped to other projects reducing the time they sit in the yard which may be degrading the epoxy coating
- Standardizing the epoxy coating thickness will show cost savings as risk of sending the wrong dowels to the wrong projects should decrease and costs at the plants where epoxy coating is placed can be streamlined if they do not have to modify options to adjust for varying coating thicknesses

# Future discussion points

- **Dowel bar length**
  - Individual DOT decision
- **Dowel basket length**
  - Individual DOT decision
- **Dowel basket anchoring methods and materials**
  - We should recommend the industry work with the manufacturer's to develop and propose the best systems for DOT's to ensure baskets are sufficiently anchored into the underlying material
- **Lubrication material used as bond breaker on dowels**
  - Several states are allowing the baskets to be pre-coated prior to shipment with Tectyl 506 which eliminates a construction operation
  - Consideration of the value of the Tectyl material protecting the epoxy coating from nicks caused by handling and placement and ultraviolet exposure to the elements (UV rays) during outdoor storage
  - We should recommend the industry show us the benefits of pre-coating the dowel bars with a Tectyl type material