

Dowel Basket Standardization

National Concrete Consortium

San Antonio, TX

March 31, 2009

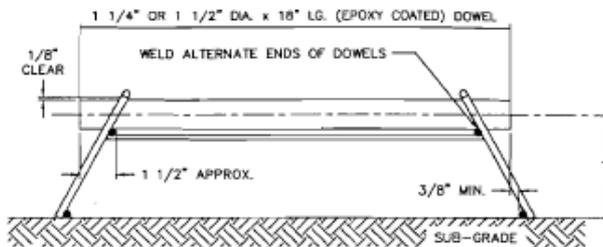
John F. Staton

Michigan DOT

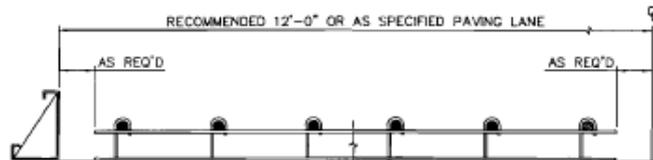
Summary of Dowel Basket Standardization Activities 2000 to Present

- *Spring 2000 - Initial questionnaire sent to 10 member states (Midwest Concrete Consortium)*
- *May 2001 - Universal basket design was developed and distributed to the 10 states*
- *Spring 2004 – MCC State Report , “Dowels and Pavement Reinforcement” ; a follow up to the initial universal basket design*
- *Fall 2008 – NCC votes to revisits universal basket design topic*

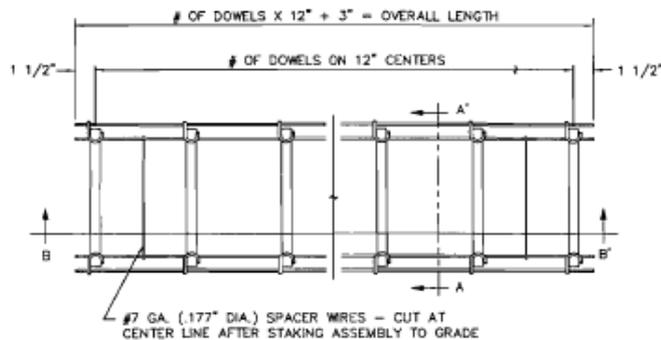
2001 MCC Universal Basket



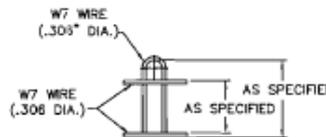
SECTION: A-A'



SECTION: B-B'

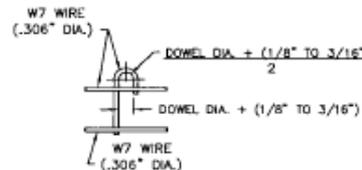


PLAN VIEW



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-815 GR. 40).
- 2) DOWELS ARE TO BE:
 - EPOXY COATED
 - TECTYL 506 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) $\pm 1/4"/8$ UNLESS OTHERWISE SPECIFIED.
 - B) BASKETS SHALL BE MANUFACTURED SO THAT THE DOWELS ARE HORIZONTAL AND PARALLEL FROM EACH OTHER AND PERPENDICULAR TO THE BASKET, $\pm 1/8"/8$.
 - C) ON CENTER SHOULD BE $\pm 1/2"$
 - D) DOWELS SHOULD BE PLACED AT MID DEPTH OF SLAB $\pm 1/2"$ OR AS OTHERWISE SPECIFIED.
- 8) U-LEG OR J-LEG TO BE INSTALLED ON INSIDE OR OUTSIDE OF SUBFRAME.
- 9) DOWELS SHALL BE COATED WITH EPOXY COATING IN ACCORDANCE WITH AASHTO M284 AND THE CUT ENDS ARE NOT REQUIRED TO BE COATED.
- 10) DOWEL DIAMETERS TO BE 1/4" INCREMENTS.

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

Winter 2009 - Questionnaire was sent to the 19 NCC state reps to query interest in a universal basket design

- *Twelve of the 19 (63%) NCC states responded to the questionnaire*
- *Three of the 12 NCC responding states incorporate a version of the 2001 universal basket design*
- *Information from the questionnaire was used to determine:*
 - *Differences between state standard designs*
 - *Similarities between state standard designs*
 - *"Low hanging fruit"*

Q1: Were you involved with MCC in 2001? Do you use the 2001 proposed universal basket design?

- *Nine of the original 10 MCC states still in the NCC*
- *In 2000, 7 of 10 MCC states participated in the initial task group standardization questionnaire*
- *Today:*
 - *Two MCC /NCC states currently use a version of the universal basket design*
 - *One state does not use the drawing but allows the use of it per a general note on their detail sheet*

Q3: Do you have a required dowel bar basket configuration?

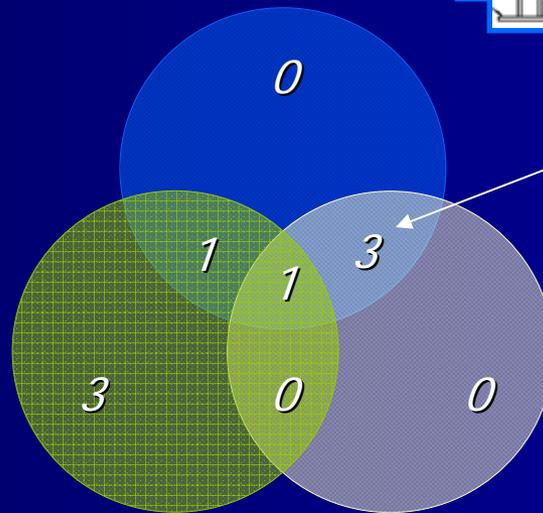
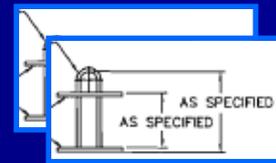
- *Yes -8*
- *No - 4*

Q4: What basket leg style do you use?



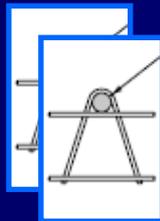
No specified leg style

U-Leg only

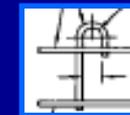


Wire chair also - 1

V-Leg only



J-Leg only



Number of States Responding - 12

Q5: Do you specify minimum wire size?

- *Yes - 9*
- *No - 3*

Is minimum wire size important?

Q7: Do you specify where the dowel bar is to be welded to the wire frame on your contraction baskets?

- *Seven states specify weld location*
 - *Four states allow the weld to be either top or bottom*
 - *One state specifies top only*
 - *Two state specify bottom only*
- *Five states do not specify weld location*

Is dowel bar weld location important?

Q9: What size dowels are used in your state? What determines dowel size?

- *Eleven of 12 responding states - 18" long dowels*
- *Eleven of 12 responding states - Diameter of dowels are determined by pavement thickness*
 - *Five states use 1", 1 ¼", and 1 ½" diameter*
 - *Four states use 1 ¼" and 1 ½" diameter only*
 - *One state uses ¾", 1 ¼", and 1 ½" diameter*
 - *One state uses 1" diameter dowels for 8" thick pavement. Diameters increase by 1/8" for every 1" of pavement thickness, thereafter*
- *One responding state – Not detailed on standards*

Are there benefits to simplification?

Q9 (cont.): What grade of steel do you specify for your dowel bars?

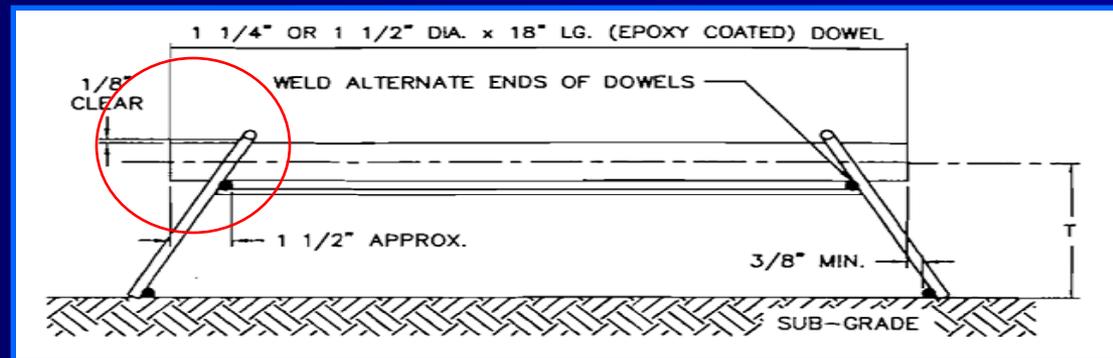
- *Four states require Grade 40 or 60 steel*
- *One state requires Grade 40 steel only*
- *Three states require Grade 60 steel only*
- *One state requires Grade 70 or 80 steel*
- *Three states do not specify Grade of steel*

Are there benefits to simplification?

1) DOWELS TO BE BILLET STEEL BARS PER AASHTO SPECIFICATION M-31 GR. 40 LATEST REV. (ASTM A-615 GR. 40).

Q10: Do you require a minimum distance from the end of the dowel bar to the top longitudinal spacer wire?

- *One state specified 3/4 inch (Type A basket)*
- *One state specifies 1 – 1 1/2 inches*
- *Two states require 1 1/2 inches*
- *Two states require 1 1/2 inches minimum*
- *Six states do not specify a distance*

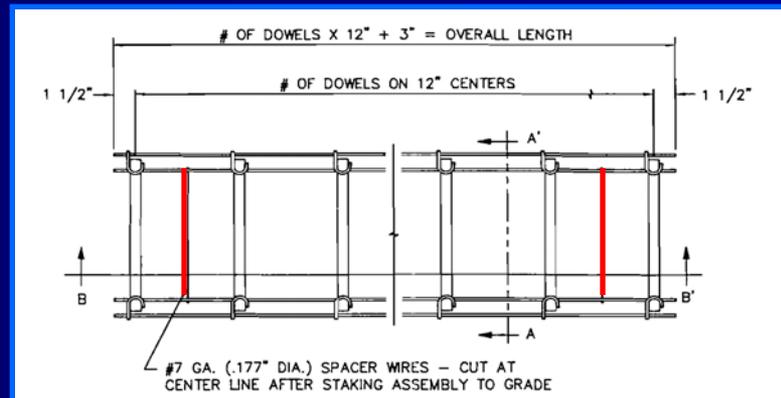


What are the Issues?

Q11: Do you require shipping wires to be cut after the basket has been staked onto the grade?

- *Seven of 12 states require the shipping wires to be cut after staking*
- *Four of 12 states do not require the wires to be cut after staking*
- *One state allows contractor option. Cannot leave more than 3 uncut after staking*

How many states require shipping wires to not be cut?



Is maximum shipping wire size important?

Q12: Do you locate dowels at any location other than one-half the depth of the slab?

- *Eleven of 12 states place dowels at one-half depth*
- *One state places dowels at $D/2$ minus $1/4$ inch using $1/2$ inch pavement thickness increments*

7) TOLERANCES:

- A) $\pm 1/4"$ /if UNLESS OTHERWISE SPECIFIED.
- B) BASKETS SHALL BE MANUFACTURED SO THAT THE DOWELS ARE HORIZONTAL AND PARALLEL FROM EACH OTHER AND PERPENDICULAR TO THE BASKET.
 $\pm 1/8"$ /if
- C) ON CENTER SHOULD BE $\pm 1/2"$
- D) DOWELS SHOULD BE PLACED AT MID DEPTH OF SLAB $\pm 1/2"$ OR AS OTHERWISE SPECIFIED

Q13: Do you epoxy coat dowel bars? What are your requirements for epoxy coating?

- *Ten of 12 states require dowels to be epoxy coated*
 - *AASHTO M284 is most commonly specified*
 - *Minimum epoxy thickness varies*
- *One southern state does not require coating*
- *One southern coastal state requires polypropylene or polyethylene coating*

9) DOWELS SHALL BE COATED WITH EPOXY COATING IN ACCORDANCE WITH AASHTO M284 AND THE CUT ENDS ARE NOT REQUIRED TO BE COATED

Q14: What type of lubricant do you use to coat your dowel bars?

- *Eleven of 12 states use some type of de-bonding agent*
 - *Oil or graphite grease were the most common*
 - *Tectyl 506*
 - *Assembly dipped in bituminous or paraffin*

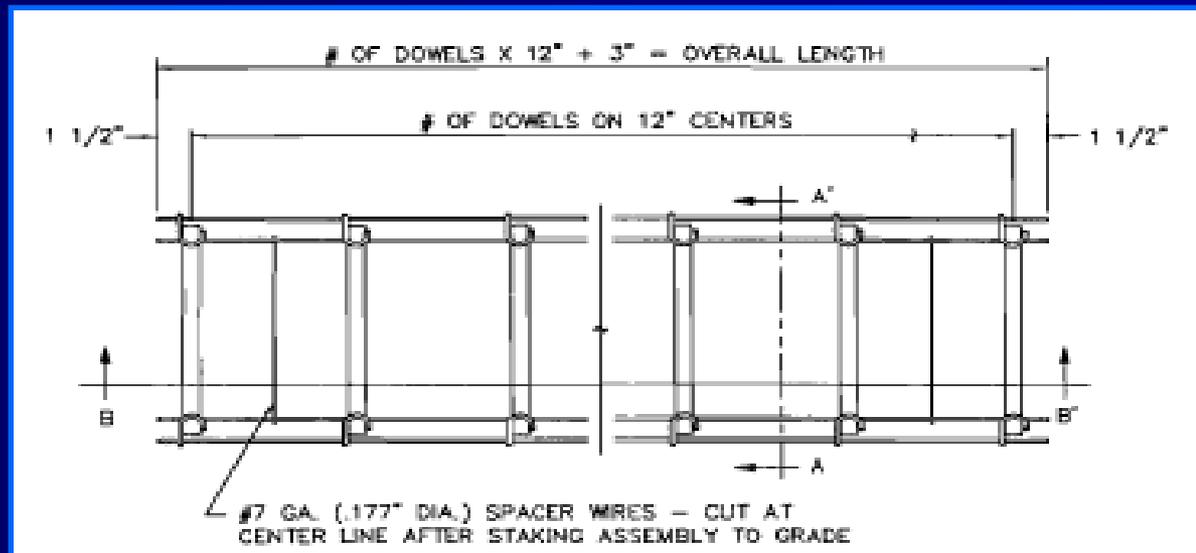
Question: What is an acceptable pull out resistance for a dowel bar?

2) DOWELS ARE TO BE: EPOXY COATED
 TECTYL 506 COATED

Q15: What is your lateral spacing requirement between dowel bars?

- *All 12 states require dowels to be spaced 12 inches on center*

What about variable spacing with fewer bars?



Q2: Are you in favor of establishing a universal dowel bar basket design?

- *Yes -8*
 - *(1 comment – if compatible with our practice)*
- *No – 2*
 - *In-house standard plan – 1*
 - *No in-house standard plan - 1*
- *Possibly – 1*
- *No response to question - 1*

Q16: Do you have any unique requirements that would make standardization not possible?

- *None of the 12 states reported any unique requirements that would be a barrier to standardization.*

Q17: Do you have trouble getting baskets to meet your specifications?

- *Ten of 12 states report that getting baskets is not a problem*
- *One state was not sure*
- *One state responded - occasionally*

States report no problem...what about dowel basket manufacturers, suppliers, contractors?

Thank you

Questions ?