



Date: October 2012

# Dowel Basket Assemblies Tie Wire: Material & Research Field Performance Investigation

Nebraska Department of Roads

**Research Project Title:**  
Dowel Basket Assembly Tie Wire:  
Materials & Research Field Performance  
Investigation

**Locations:**

2007- Hooper East & West  
2012- Waverly to Greenwood  
2012- 56th Street to Waverly Interchange

**Project Number:** NA

**Starting Date:** 2007

**Completion Date:** 2012

**Principle Investigators:**

-Wally Heyen, PCC Engineer  
-Lieska Halsey, NDOR Research

**NDOR Districts:**

-District 1  
-District 2

**Participating Contractors:**

-Werner Construction CO.  
-Constructors, Inc.  
-Hawkins Construction CO.



**Introduction:**

Nebraska Department of Roads - Materials and Research (M&R) Division determined in July 2012 that cutting the tie wires on the dowel bar basket assembly is allowing the dowel bars to shift as concrete is placed. As a result of field observation and field performance, M&R has concluded leaving dowel basket assembly tie wires uncut.

This brief summary presents the field observation and field performance findings. M&R has concluded the likelihood of a joint becoming locked due to the movement of the dowel bar assembly is greater than becoming locked as a result of the un-cut tie wires in the dowel basket assembly.

**Field Observation:**

M&R noticed the dowel bar movement within the basket assembly during the pavement operation as shown in Figures 1 to 5. Two projects were observed, Waverly to Greenwood and 56<sup>th</sup> Street to Waverly Interchange and is documented as follows:



The red arrow shown is the dowel bar translation movement during concrete placement. Figure 1.

Figure 1. Dowel Movement During Placement



The measured translation movement from the original dowel bar assembly was 1 1/2 inches as shown in Figure 3 and 4.

Figure 2. Dowel misalignment



Figure 3.



Figure 4.



Figure 5 shows the possible result of the dowel bar translation movement as the paver passes. This figure shows the dowel bar vertically aligned from the surface of the pavement.

Figure 5.

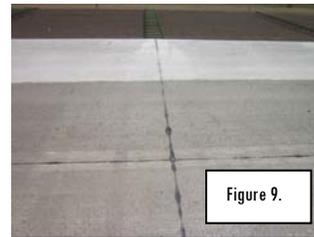
The research team experimented with 4 uncut dowel basket assemblies on the I-80 Waverly to Greenwood project. Figure 6 shows dowel bar assembly with uncut tie wires.



Figure 6. Uncut Tie Wires Dowel Bar Assembly

Dowel basket assembly steps during paving concrete operations were:

1. Shipping wires were not cut (Figure 6).
2. Measure the translational movement of the dowel bars and spray paint on the dowel bar basket assembly to visualize the movement during concrete placement (Figure 7 and 8).
3. Identified location of uncut wire assembly for future for field monitoring (Figure 9).



In summary, these projects identified/showed potential problems due to the translational movement of the dowel bar in the dowel bar basket assembly. This impact the effectiveness of individual dowel bars in performing the intended function (i.e., provide load transfer).<sup>1</sup> Therefore, the experimental section has shown the dowel bar basket assembly is resistant to movement when tie wires of the assembly is uncut prior to concrete placement. Leaving tie wires intact will strengthen the dowel basket, making more resistant to movement and deflection while paving.<sup>2</sup>

**Field Performance:**

In 2007, the Department of Roads experimented with a section of pavement in District 2 on the Hooper East & West project. For the last 5 years the M&R Portland Cement Concrete Pavement Research and Development Section has been monitoring a section built with uncut dowel bar basket assemblies, as shown in Figure 10.

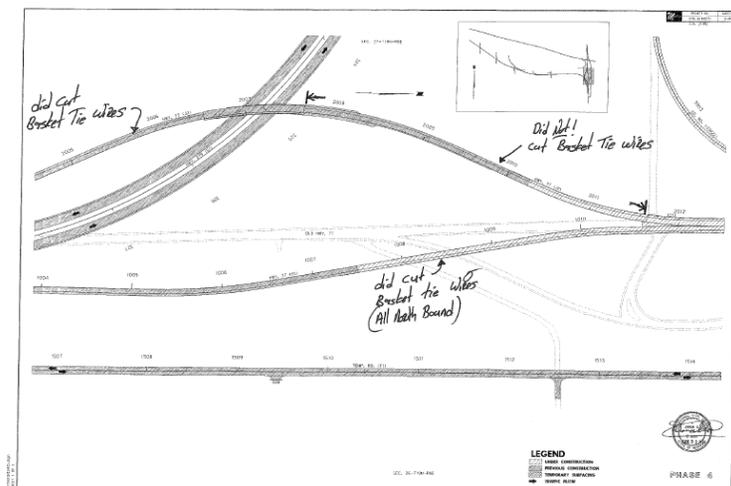


Figure 10. Hooper Experimental Section Built in 2007

After 5 years of monitoring on the Hooper East & West project, the field performance of the uncut dowel bar assembly has shown no signs of distress at the transverse joints, as shown in Figure 11. Therefore, the field performance has shown the impact of not cutting the wires is negligible. In fact, this result in smoother pavement, as well as dowel that are better aligned, which strengthen dowel baskets.<sup>3</sup>



Figure 11. Transverse Joint- 2012 Field performance

### Summary:

The transverse joint performance with uncut dowel bar assemblies and the observations of the translation movement as the paver passes has led the M&R to recommend leaving dowel bar basket assemblies tie wires uncut.

### References

1. CPTP, 2007. *Best Practices for Dowel Placement Tolerances*. Publication FHWA-HIF-07-021. Concrete Pavement Technology Program. Springfield, VA.
2. ACPA, 1991. *Design and Construction of Joints for Concrete Highways*. Publication TB010.01P. Concrete Pavement Technology. American Concrete Pavement Association. Skokie, IL.
3. ACPA, 2005. *Dowel Basket Tie Wires: Leaving Them Intact Does Not Affect Pavement Performance*. Publication RT6.01. American Concrete Pavement Association. Skokie, IL.