Dowel Basket Ripple: The Invisible Mistake That Ruins Smoothness

By Michael Gerardi

Concrete pavement smoothness isn't just about what's visible on the surface. Sometimes the problem starts a few inches below—long before the first aircraft ever rolls down the runway.

One of the most overlooked causes of surface roughness in newly constructed concrete pavements is **dowel basket ripple**. When dowel baskets shift or "float" during concrete placement, the result is a repeating surface ripple pattern that can be nearly impossible to correct after the fact. It's a silent disruptor—easy to miss during construction, but obvious when you're looking at the profile trace later.

What Causes Dowel Basket Ripple?

Dowel baskets are intended to align and anchor the dowel bars that transfer loads across transverse joints. But if they're not properly secured, they can move as concrete is placed and consolidated. This movement—just a little bit—creates **regular undulations** in the slab surface.

It's like paving over a washboard—you might cover it up, but the surface still reflects every peak and valley. That's essentially what's happening. As the concrete is placed and leveled, the raised sections of the dowel baskets translate into minor but repeating surface deviations.

The **Federal Highway Administration (FHWA)** has noted that "improper anchoring of dowel baskets can cause vertical or horizontal displacement," which leads to visible surface roughness once the concrete hardens (FHWA, 2016).

How It Affects Runway Smoothness

On airfield pavements, these ripples can be particularly problematic. Because aircraft speeds vary significantly during takeoff and landing, even **subtle vertical deviations** in the surface can produce noticeable changes in ride quality—or worse, accelerate wear on landing gear components.

The **Innovative Pavement Research Foundation (IPRF)** underscores that dowel basket ripple is one of the key contributors to initial roughness and can show up clearly in profilograph traces. Once those bumps are in place, they're difficult and expensive to grind out—especially on long runway segments where the pattern repeats over hundreds of feet.

Prevention Is the Only Real Cure

The **American Concrete Pavement Association (ACPA)** provides straightforward advice: secure the baskets properly. That means anchoring them firmly into the base using reliable techniques and verifying alignment before paving begins. Avoid over-vibration or excessive concrete discharge directly over the baskets, both of which can cause them to shift.

Once the concrete is placed, it's too late. If the baskets have moved, the ripple is already there. And while you may pass strength or thickness specs, you'll fail where it matters most: **ride quality**.

Why It Matters for Your Next Project

Initial smoothness sets the tone for the life of the pavement. Whether you're building a runway or a taxiway, avoiding dowel basket ripple can save time, cost, and lots of corrective action. It's a detail many overlook—but the profilograph never does.

At APR, we've reviewed pavement profiles from projects all over the world—and patterns of roughness always tell a story. Whether the issue stems from design decisions, construction techniques, or something as subtle as joint layout, we specialize in identifying how and where ride quality is being compromised. If smoothness is a priority on your next project, we're always happy to provide insight based on what the data is showing—before it turns into a costly problem.

References:

- Federal Highway Administration (FHWA). (2016). *Dowel Basket Anchoring Methods Technical Brief*. https://www.fhwa.dot.gov/pavement/concrete/pubs/hif16021.pdf

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