Lessons Learned on Concrete Pavement Patching

Virginia Concrete Conference
March 9, 2012

Mohamed Elfino, PE, PhD
Assistant Division Administrator
Materials Division
1. In order to patch it right we need to know how it was built?

2. Learn from each other the best approach to complete quality concrete patching projects on time and within budget
What to be covered

- Basics of concrete pavement
- Components of concrete pavements
- Overview of concrete pavement new construction
Concrete Pavement in Virginia Since 1913 (Farmville, VA)
Natural Crack Development

- Temperature Gradients
- Moisture Gradients
- Thermal Cycles
- Loading

Crack Spacing is Variable, Depends on the Slab Thickness and Type
Concrete Pavement Jointing

A joint is a man-made Crack
Basic Components of a Concrete Pavement

- Longitudinal joint
- Transverse joint
- Surface Texture
- Surface smoothness or rideability
- Thickness Design
- Concrete materials
- Dowel bars
- Tie bars
- Subgrade
- Subbase or base
Concrete Pavement Steel

- Dowel bars
- Tie bars
- Reinforcing mesh
- Continuous reinforcement (rebar)
Wire Mesh Terminology

What 6X12-W5.5XW4 means?

6 inches is the spacing between the Longitudinal wires
12 inches is the spacing between the Transverse wires
W5.5 means smooth wire with area of 0.055 in²/ft
W4 means smooth wire with area of 0.04 in²/ft
D 4 means deformed wire with area of 0.04 in²/ft
What can be used as Substitute?

For 60 ft X 12 ft patch

We can use:

6x12 - W6xW4

4x4 - W4xW4
Concrete Pavement Design Features

- Materials
- Thickness
- Joints
- Steel
UNIFORMITY:
and not necessarily strong

The Key To
GOOD PAVEMENT PERFORMANCE
Subbase

May be constructed as

Plain Aggregate Base:
Principal criteria is to limit fines passing #200 sieve for good Drainage

Stabilized Base:
- Cement-Treated Aggregate (CTA)
- Soil Cement

Permeable (OGDL)
- Stabilized (With Asphalt or Cement)
Load Transfer
The ability of one slab to share its load with the neighboring slab

Aggregate Interlock (no Dowel)
- Low Traffic Volumes

Dowels & Aggregate Interlock
- High Traffic Volumes
Load-Related: Faulting

Wedge of "injected fines"

Saturated support layer

Approach slab

Fault

Joint (or crack)

Leave slab

Movement of fines

Travel
Load-Related: Faulting
Transverse Contraction Joints

Doweled

Undoweled

D/2
Longitudinal Contraction Joint Using Tiebar

\[ \text{Reservoir } \frac{1}{4} - \frac{1}{2} \text{ in. (typ.)} \]
Isolation/Expansion Joints

Doweled Expansion Joint

Isolation Joint

Manhole, Inlet Building, etc
Transverse Contraction Joints
Joint Sealant Reservoirs

Three Basic Sealants

- Filler (in single saw cut)
- Hot-pour Sealant (in reservoir cut)
- Silicone Sealant (in reservoir cut)
- Compression Seal (in reservoir cut)
Continuously Reinforced Concrete Pavement

Plan

Profile

3 – 6 ft.
High Steel as a Result of Feed Tube System
High Steel Measurement
Testing Steel Mat Rigidity on Chairs
Potential cold joint due to uneven Concrete spreading
Evidence of Lack of Consolidation at the Header
Construction Joint with 50% more steel (Steel on chairs)
Construction Joint Close up
Leave Out Joint
Steel overlap @ 30 x Bar diameter
Check steel Depth T/2 +/- 0.5 inch
Anchor Lugs Before Pouring concrete
Anchor Lugs After pouring
Trenches spaced at 15 ft
Anchor Lugs Steel Tied to the CRCP Steel
Digging out Concrete Slab on Top of an Anchor Lug
Anchor Lug
Notice the discontinuation of the steel
Corrected Anchor Lug
Notice the added Steel bars
Anchor Slab Type II
Wide Flange Beam Embedded in a Sleeper Slab
Wide Flange Beam Before a Bridge
I-64 Battlefield Blvd. CRCP Project
Madison Heights By-Pass 2004
CRCP 12 inches (Truck lane 14 ft wide)
106 Years of Excellence
1906-2012
THANK YOU
Questions?