PAVEMENT MAINTENANCE ISSUES & POTENTIAL SOLUTIONS

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OR . . .

“FEEBLE HINTS
FOR
FELLOW STRUGGLERS”

TYPES OF COMMON ASPHALT PAVEMENT DISTRESSES

Cracking

Rutting (Deformation)

Stripping / Raveling

Oxidation

Bleeding / Flushing

Potholes

PAVEMENT EVALUATION

- TYPES OF DISTRESS
- SEVERITY
- EXTENT

TYPES OF DISTRESS

- STRUCTURAL
- NON-STRUCTURAL

STRUCTURAL DISTRESSES

- BASE FAILURES
  - POTHOLES
  - FATIGUE (ALLIGATOR) CRACKING
- RUTTING

NON-STRUCTURAL DISTRESSES

- THERMAL CRACKING
  - TRANSVERSE/LONGITUDINAL/BLOCK
- OXIDATION
- RAVELING
- BLEEDING/FLUSHING

SEVERITY AND EXTENT

- SEVERITY – HOW BAD IS THE DISTRESS?
  - CRACK WIDTH
  - RUT DEPTH

- EXTENT – HOW MUCH OF THE DISTRESS IS PRESENT WITHIN THE PAVEMENT SECTION TO BE TREATED?
  - % OF SURFACE AREA
  - SPACING OF CRACKS

TYPES OF DISTRESS, SEVERITY, AND EXTENT WILL DETERMINE THE APPROACH TO BE TAKEN ON A GIVEN PAVEMENT SECTION –

-- PREVENTIVE MAINTENANCE

-- REHABILITATION

-- RECONSTRUCTION

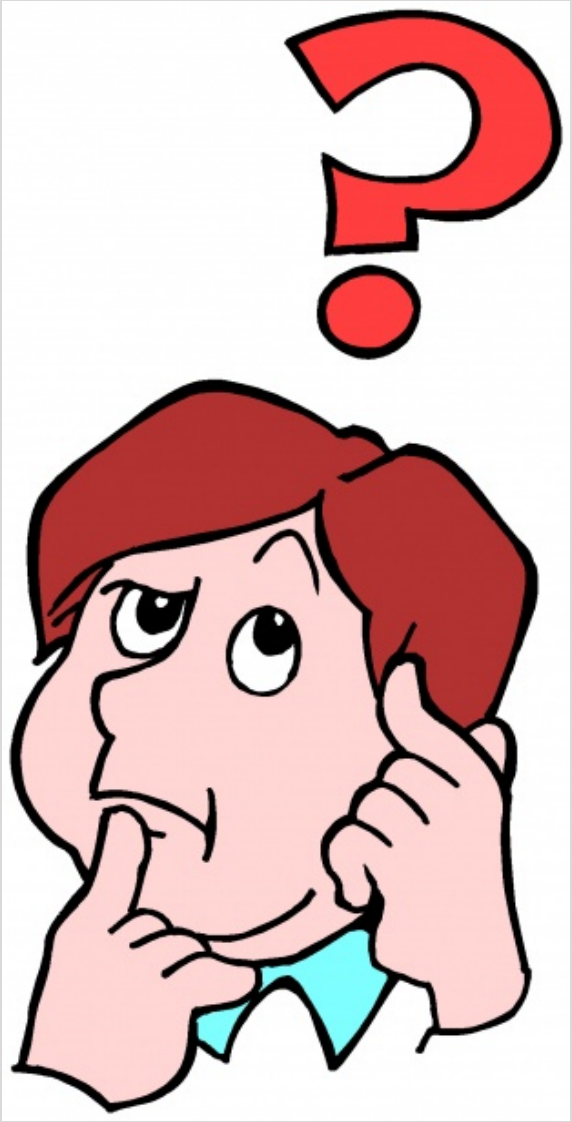
ALL CRACKS ARE NOT CREATED EQUAL!

- THERMAL – Transverse & Block Cracking
- STRUCTURAL – Fatigue (Alligator) Cracking
- OTHER?

QU’EST-CE QUE C’EST??

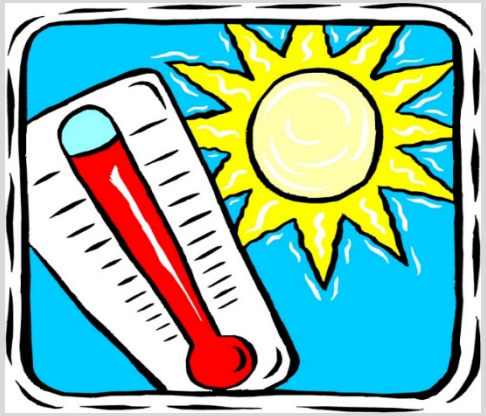
WOW!!

CAN YOU GUESS THE CAUSE ?



DESSICATION ("DRYING") CRACKING

Definition – Cracking that occurs through a combination of extended dry weather and subgrade soils that shrink when dry (clays & silty clays).



DESSICATION CRACKING

- Usually occurs in the late summer or fall, when drier conditions prevail.
- Most often occurs where trees [especially hardwoods] are adjacent to and overhang the roadway.
- Can lead to longitudinal faulting [“drop-offs”] in the travel lane.

DESSICATION CRACKING SOMETIMES RESULTS IN PAVEMENT FAULTING

LEVELING CAN CORRECT FAULTING, BUT . . .
CRACK REFLECTION USUALLY OCCURS

ON THE 3,000-LINEAR FOOT SECTION OF ROADWAY SHOWN IN PREVIOUS SLIDES

- SOIL BORINGS INDICATED PRESENCE OF CLAY SUBGRADE SOILS WITH PLASTICITY INDEX OF 21

- DESIGN PAVEMENT TYPICAL SECTION WAS 12” THICK SUBGRADE LAYER [6% LIME TREATMENT FOLLOWED BY 6% CEMENT TREATMENT] AND 8.5” THICK CEMENT STABILIZED BASE COURSE [6% CEMENT]

- COUPLED WITH PROXIMITY TO TREES ALONG ROADSIDE =
  A RECIPE FOR DESSICATION CRACKING

IN THESE SITUATIONS . . .

- THE POTENTIAL FOR DESSICATION CRACKING MUST BE CONSIDERED AND ADDRESSED DURING DESIGN

HOW TO ADDRESS?

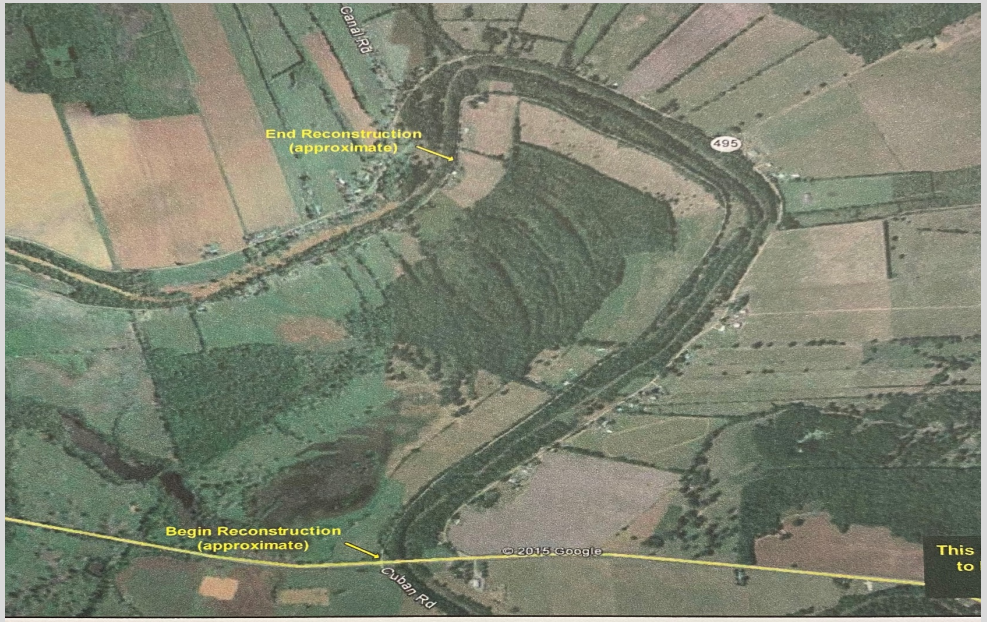
- REMOVAL OF TREES
  - PROBLEM – Overhanging trees may be located outside public R/W
- INSTALLATION OF ROOT BARRIER SYSTEM
  - PROBLEM – Severing roots may kill trees
- ADDITION OF GEOGRID OR OTHER REINFORCEMENT TO RESIST TENSILE STRESSES THAT OCCUR DURING CRACK DEVELOPMENT
  - PROBLEM – These materials are expensive

ANOTHER OPTION TO CONSIDER . . .

- CONSTRUCTION OF ALTERNATE BASE COURSE IN AFFECTED AREAS
  - Construct ***thicker*** cement-**treated** base [150 psi compressive strength] rather than ***thinner*** cement-**stabilized** base [300 psi compressive strength]
    - Lowers required percentage of Portland cement [5-6% versus 9-10+%]
  - **Crushed Stone Base** underlain with geotextile fabric
    - Obviously more expensive than cement-treated or stabilized bases, but it eliminates the introduction of a drying agent.
  - **Cement-treated base with reduced cement content along with addition of liquid polymer to help attain design compressive strength**

COCO BED ROAD NEAR CLOUTIERVILLE

COCO BED ROAD -- PROJECT SITE



Project Location Map

d Reconstruction, Cloutierville, Natchitoches Parish, Louisiana

ATE	FILE NUMBER	CLIENT
7/8/2015	06-15-093	Natchitoches Parish Highway Depar

EXISTING AGGREGATE & DIRT ROADBED

- SOIL BORINGS INDICATED PRESENCE OF IN-SITU SOILS IN THE TOP 12” THAT EXCEEDED UPPER LIMIT OF SILT CONTENT FOR CEMENT STABILIZATION [68% – 83%].

- UNDERLYING SUBGRADE SOILS RANGED FROM SILT [0 P.I.] TO CLAYEY SILT [P.I. OF 2 - 6] TO LEAN CLAY [P.I. OF 9 – 19] TO FAT CLAY [27 P.I.].

- COUPLED WITH EXTENT OF OVERHANGING HARDWOOD TREES, A HIGH POTENTIAL FOR DESSICATION CRACKING.

COCO BED ROAD -- DESIGN APPROACH

- IMPORTED 8” OF SELECT FILL
  - REPLACED EXCESSIVELY SILTY IN-SITU ROADBED SOILS
  - RAISED ROADWAY ELEVATION FOR IMPROVED DRAINAGE
  - WOULD HAVE REQUIRED 7% CEMENT TO ATTAIN COMPRESSIVE STRENGTH OF 150 PSI [WHICH WOULD HAVE REQUIRED 12” THICK BASE]

- LABORATORY TESTING TO DETERMINE IF DESIGN COMPRESSIVE STRENGTH COULD BE ATTAINED WITH A LOWER CEMENT CONTENT, ALONG WITH INCLUSION OF A LIQUID POLYMER.

SURE ENOUGH . . .

- LABORATORY TESTING INDICATED THAT 300 PSI COMPRESSIVE STRENGTH COULD BE ATTAINED BY UTILIZING 3% PORTLAND CEMENT WITH A PROPRIETARY LIQUID POLYMER [“BASE SEAL”] ADDED TO MIXING WATER AT RATE OF 0.6 OUNCES PER GALLON.

- ALLOWED FOR 8” THICK BASE COURSE INSTEAD OF 12” THICK

ADDITIONAL BENEFITS OF POLYMER

- "BASE SEAL" DELIVERED IN 55-GALLON DRUMS WAS POURED INTO WATER TANK FOR INTRODUCTION INTO MIXER DRUM DURING STABILIZATION OPERATION – *NO ADDITIONAL EQUIPMENT NEEDED*.

- INCREASES LONGEVITY -- *"SEALS HYGROSCOPIC MOISTURE WITHIN THE SOIL MASS, WHICH ULTIMATELY INCREASES THE DURABILITY OF THE PAVEMENT."* [from independent lab report]

AND THE BE$$T PART . . .

- INCREASED BID UNIT PRICE BY LESS THAN $1.00 PER SQ. YD.
  - $9.00 PER SQUARE YARD BID PRICE FOR 8” THICK BASE

RESULT -- NO CRACKS!

. . . EVEN 3 YEARS LATER

POLYMER UTILIZED ON COCO BED ROAD

- PROPRIETARY PRODUCT KNOWN AS "BASE SEAL"
- MANUFACTURED BY BASE SEAL INTERNATIONAL, INC., HOUSTON, TX

- DESCRIBED AS *"A BLEND OF BUFFERED, INORGANIC CHEMICALS, FORMULATED TO PRODUCE COHESIVE GELS IN THE SOIL MASS."*

- A REPUTABLE PRODUCT -- DOCUMENTED PREVIOUS RESEARCH BY A LOCAL GEOTECHNICAL TESTING LABORATORY

BEWARE OF CHEAP IMITATIONS!!

- “GORILLA SNOT”
- OTHER “FLY-BY-NIGHT” & “JOHNNY-COME-LATELY” PRODUCTS

DO YOUR HOMEWORK . . .

- WORK WITH AN EXPERIENCED TESTING LABORATORY TO DEVELOP A MIX DESIGN THAT WILL PRODUCE THE DESIRED DESIGN COMPRESSIVE STRENGTH.
- CAREFULLY NOTE THE STATED [OR UNSTATED] PRODUCT LIMITATIONS.
- RESEARCH ONGOING PERFORMANCE OF PREVIOUS PROJECTS.

FOR ADDITIONAL INFORMATION ON DESSICATION CRACKING & POTENTIAL TREATMENTS . . .

- LTRC RESEARCH PROJECT
- OTHER STATES' RESEARCH PROJECTS


That's all Folks!