



INTRODUCTION TO FORTA-FI®

FORTA Corporation



Together, We're Stronger

FORTA®
CONCRETE FIBER



FORTA-FERRO®

The proven leader in concrete fiber reinforcement technology, products and services.

FORTA®
ASPHALT FIBER



FORTA-FI®

Most trusted asphalt fiber reinforcement technology, products and services.

FORTA®
DELIVERY SYSTEMS



Fiber dispersing equipment that delivers performance, accuracy and reliability.

ARISFOR®
COATINGS & SEALERS



High performance coatings and sealers for concrete, stone, brick, and masonry.



Egypt mud bricks
reinforces horsehair
and straw



1484 BC

1277 BC

25 BC - 300 AD

Portland
Cement
discovered

1824

The concept of
composite material

1950's

Shotcrete

1970's

Synthetic Fibers
for Asphalt

2000's

Roman
concrete at the
Pantheon



Asbestos
fibers used in
concrete



Synthetic fibers
enter US market



Mesopotamia
Straw used in
sunbaked bricks



The application of
steel, glass and
synthetic fibers





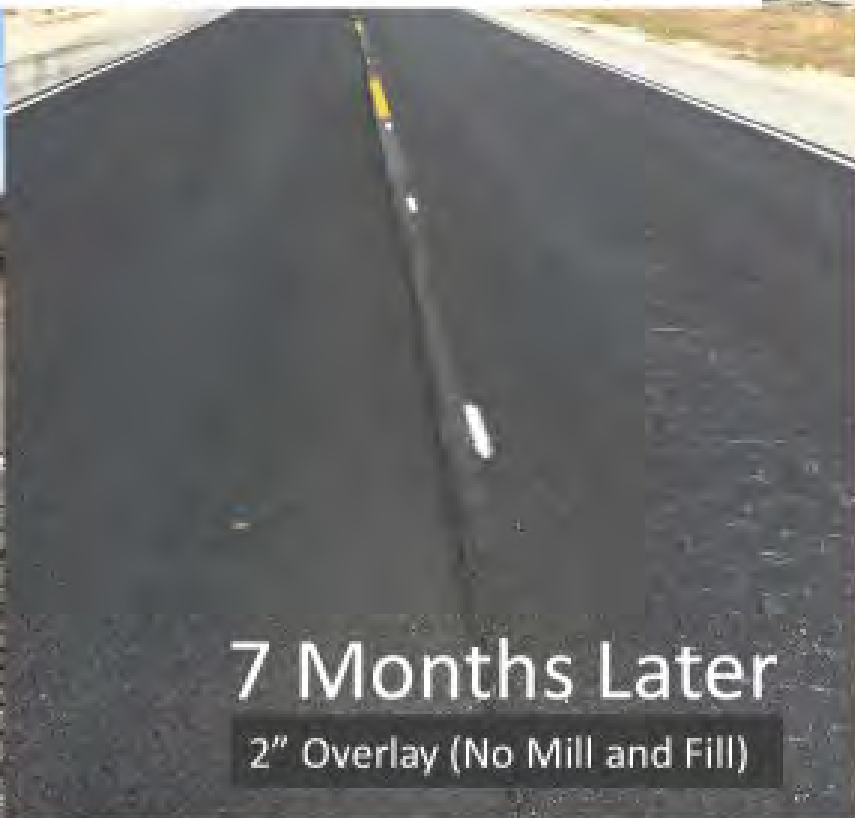




Case Study - Avenue D, Lancaster, CA



Pre-Paving



7 Months Later

2" Overlay (No Mill and Fill)



Case Study - Avenue D, Lancaster, CA

Project Update:

After 2 years, the conventional asphalt is rapidly deteriorating while the fiber reinforced asphalt section is showing only minor distress.



C*Crack Test

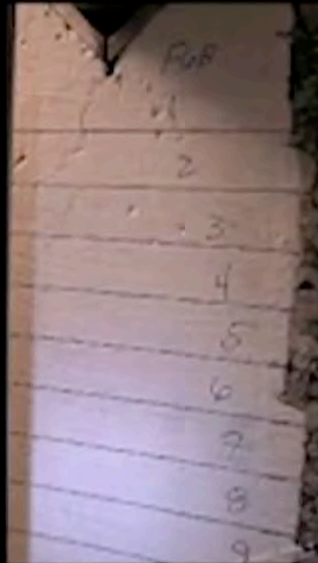
FRA

FORTA-FI

CONTROL

Control

Crack Length Time



Crack Length Time

Loading Rate: 0.9mm/min. Test Temp 21C

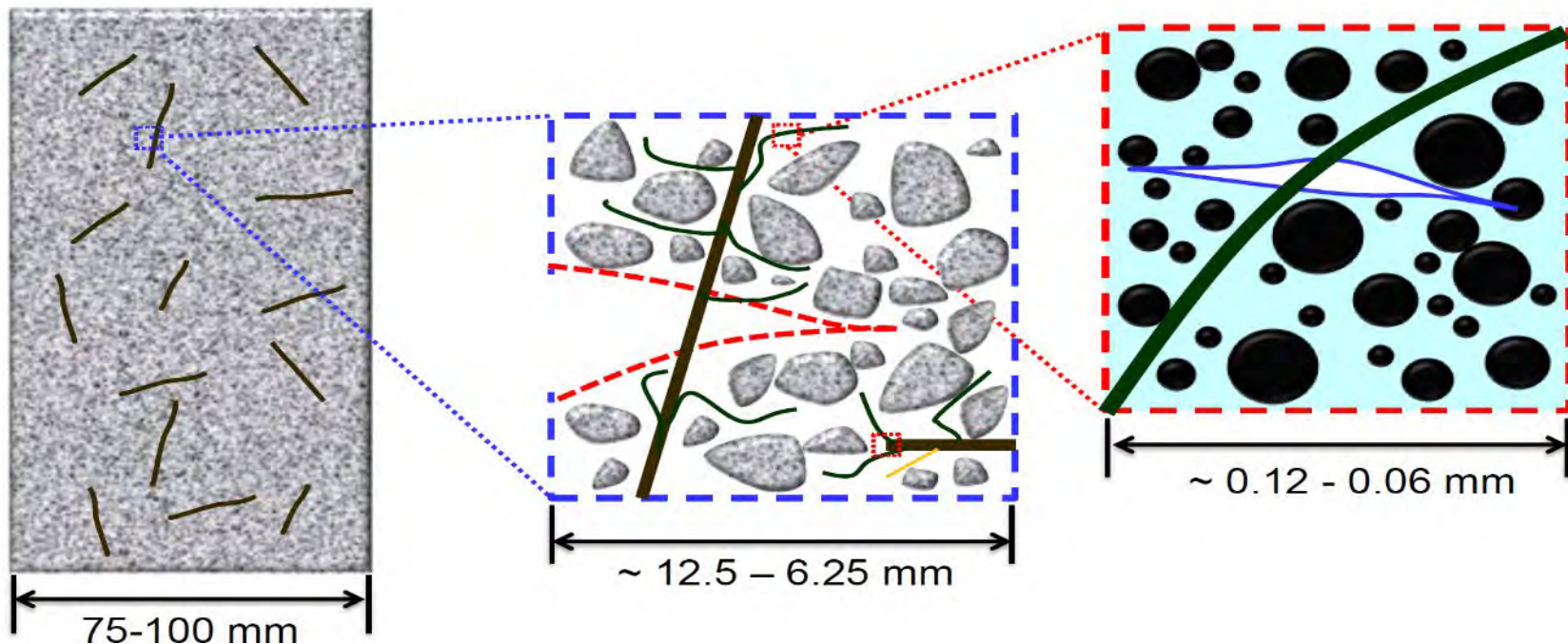


Crack Bridging to Improve Toughness

Mixture

Mortar
Macro-Damage

Mastic/Paste
Micro-Damage





GAINESVILLE AIRPORT

GAINESVILLE, FL - MAY 2015

Table 1. Description of alternate construction method (see Appendix construction layout plan)

Section	Rehabilitation Strategy	Approximate Station No.	L/R Side
E1	No alternative methods were used	104+00-108+00	L+R
B1-A	Grid Bit without Leveling Course	108+00-111+00	R4 (Lane 4)
B1-B	Grid Bit with Leveling Course	111+00-114+00	R4 (Lane 4)
B1-C	Luckenhaus with Leveling Course	114+00-117+00	R4 (Lane 4)
B1-D	Cidex with Leveling Course	117+00-120+00	R4 (Lane 4)
E2	Joint Stabilizer Material	121+00-123+00	L+R
C	Echelon Paving	123+00-131+00	L+R
B2	Aramid Fiber (Forta)	121+00-108+00	L
D-L	Pavement rejuvenator material	141+50-144+50	R
D-R	Aramid Fiber (Forta)	141+50-144+50	R

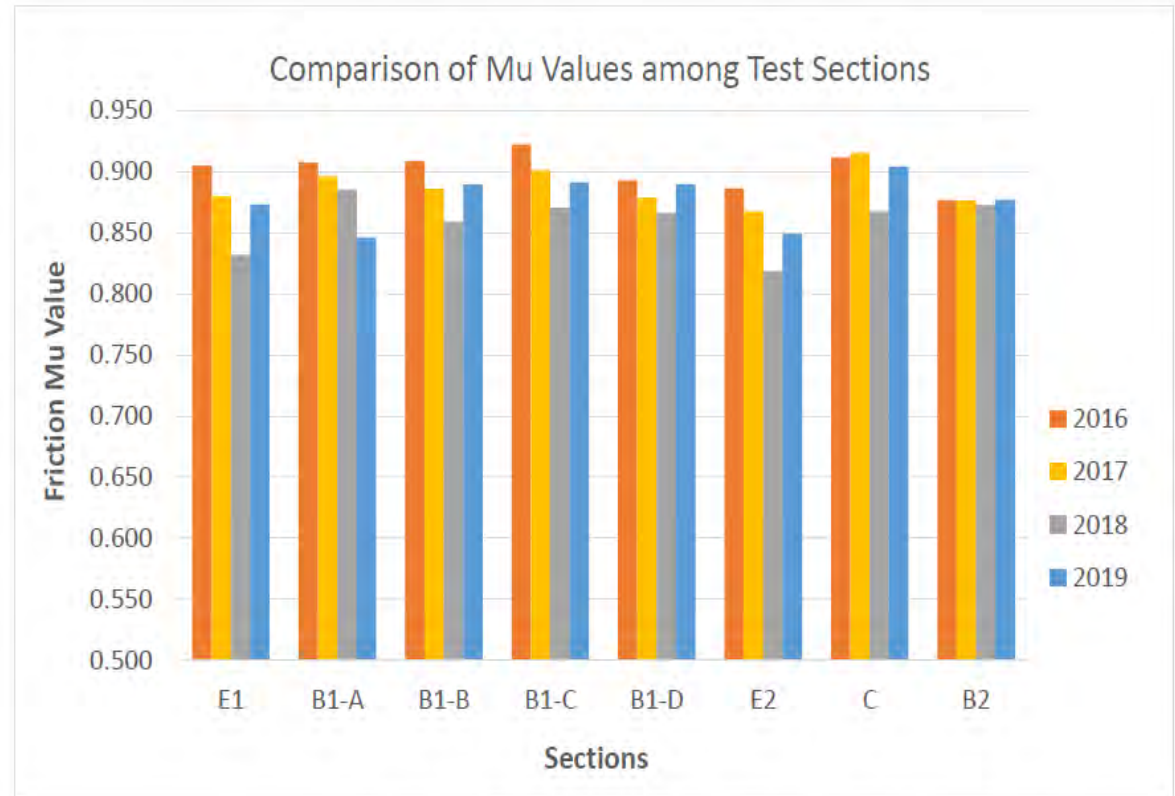


Figure 4. Comparison of Mu values among sections



FORTA®
ASPHALT FIBER
STRONGER LASTING™

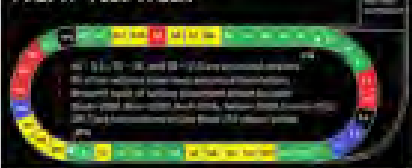
FORTA-FI®
From the Plant to the Project



**"HOW CAN YOU TELL
IF THERE IS
FIBER IN THE MIX?"**

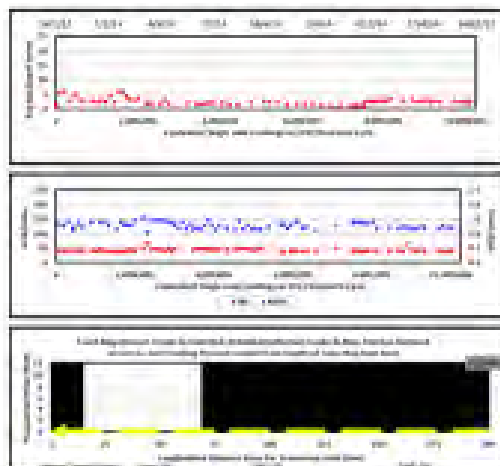
MoDOT are looking for more cost effective pavement materials without compromising the quality of the pavement. In the National Center for Asphalt Technology (NCAT) conducted a field study on accelerated performance testing (APT) and FORTA-FI was placed in section 1B. In July of 2002, all NCAT test track sections are subjected to identical test procedures (described below) at 1000 ft/hr for performance purposes. The NCAT test track used section 1B two-year cycle when a trafficking was applied by using a fleet of heavily loaded tractor trailers (up to 40,000 lbs) for the equivalent of 10 million 18,000-pound single-axle loads (SALs). NCAT applied a design traffic of 100,000 SALs per day in order to achieve a 100-year traffic simulation. During the trafficking phase, performance of test test sections were studied and FORTA-FI has gained with flying colors. FORTA-FI's testing results showed an average rut depth of 2.5mm, the roughness index started at 50 in/mile with a final result of 40 in/mile. The MFD started at 18mm and by the end of the 2-year period, was 22mm. The Alabama test is planning on testing FORTA-FI's top section in place for another 10 million SALs to further study its benefits in utilizing carbon fibers in the asphalt mix.

NCAT Test Track



Section	1	2
Section 1B (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1C (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1D (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1E (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1F (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1G (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1H (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1I (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1J (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1K (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1L (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1M (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1N (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1O (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1P (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1Q (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1R (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1S (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1T (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1U (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1V (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1W (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1X (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1Y (1000 ft/hr)	1000 ft/hr	1000 ft/hr
Section 1Z (1000 ft/hr)	1000 ft/hr	1000 ft/hr

Preliminary Field Performance Data





Field Performance - Cracking





Asphalt is made up of:

Rock,
Sand, &
Aggregates



Asphalt Cement
(the binder)



NORTHERN
ARIZONA
UNIVERSITY



PennState



North Carolina
Agricultural and Technical
State University



RUTGERS
UNIVERSITY

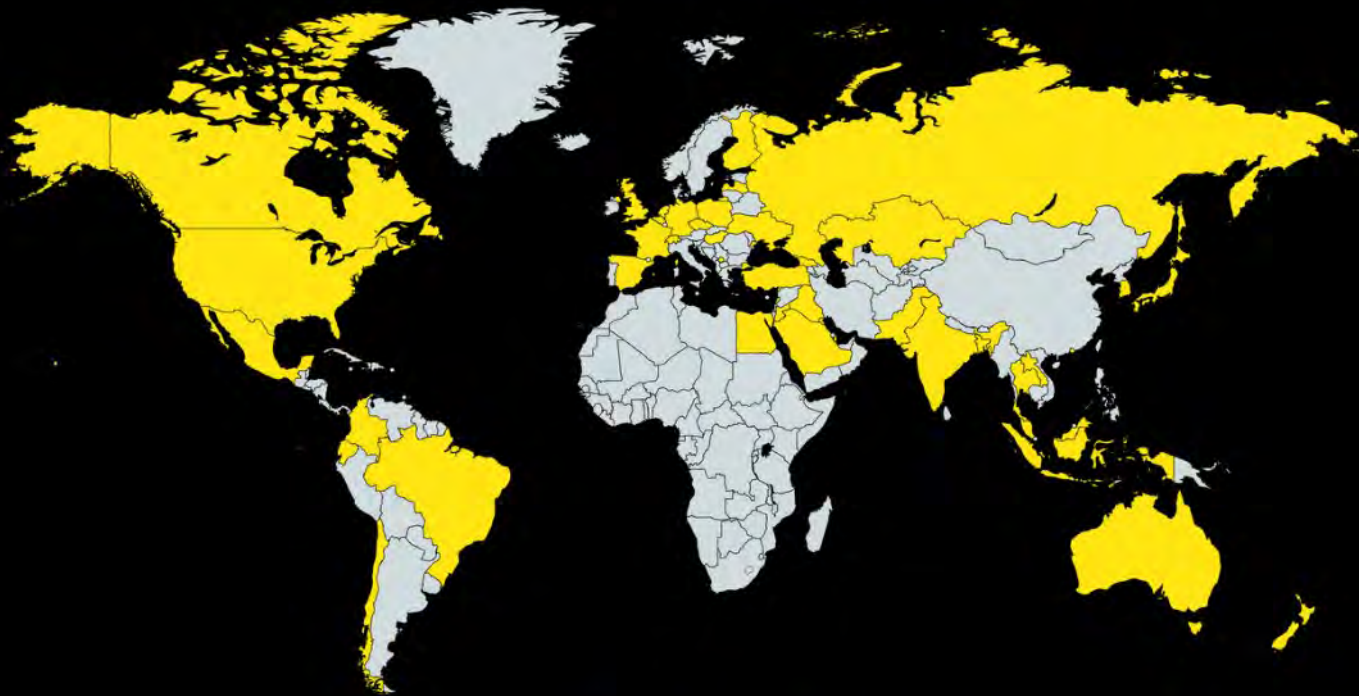


U.S. Department of Transportation
**Federal Highway
Administration**





Where in the world is FORTA-FI®?



www.forta-fi.com

INNOVATION BELL CURVE OF FIBER IN ASPHALT

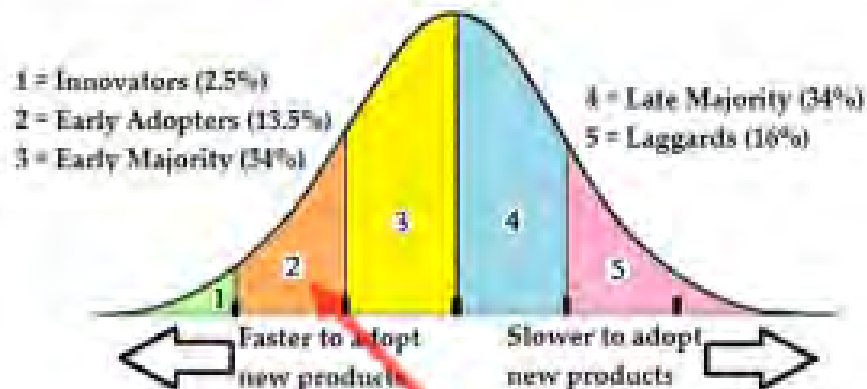
ASPHALT -VS- CONCRETE

CONCRETE FIBER

Concrete already went through all 5 stages starting in 1978 when FORTA opened its doors. Today most concrete has fibers in it... *Asphalt Fiber is going through these same stages now...*

ASPHALT FIBER

- 1) Innovators – Boeing, Jackson Hole Airport
- 2) *Early Adopters – Destin, FL, Gainesville Airport, NASA
- 3) Early Majority – Takes concept & weighs options
- 4) Late Majority – High skepticism, aversion to change
- 5) Laggards – Last to adopt, tend to be advanced in age



*** ASPHALT FIBERS TODAY = Stage 2**



FORTA®
ASPHALT FIBER



Pave-Aid Fiber

100% RAP Process

Pave-Aid is the Only Fiber
for 100% RAP



Mill Process

Existing road is milled up resulting in
RAP = “Recycled Asphalt
Pavement” and is crushed
to desired size.





Conveyor Process

RAP is loaded onto a Pugmill Conveyor for processing.





Fiber and Emulsion

Fiber is added to the mixing chamber along with Emulsion to break down old glue.





Add Fiber





Delivery and Paving

Recycled Material is delivered to the jobsite for paving and rolling.





Paving Continued





Paving Continued





Paving Continued





FORTA
ASPHALT FIBER
STRONGER LASTING™

PAVE-AID™ - THE ONLY FIBER FOR 100% RAP

LEADING INNOVATION IN RECYCLED ASPHALT PRODUCT REINFORCEMENT

WOULD YOU LIKE TO...

UTILIZE MORE OF
YOUR RAP?

SAVE TAXPAYERS
MONEY?

OFFER A BETTER
PAVEMENT?

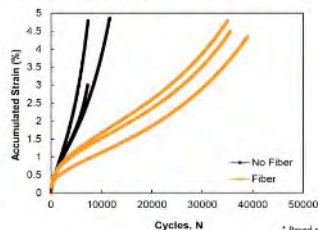
MAKE YOUR COLD MIX & 100% RAP PAVEMENT ROADS LAST LONGER WITH...

Pave-Aid™



PROVEN PERFORMANCE

Findings detailed in the graph below suggest that the use of fibers can significantly improve the rutting resistance of asphalt mixtures containing 100% RAP.*



* Based on the ASU Evaluation of the Mechanical Properties of FORTA fiber blends in asphalt mixtures with 100% RAP

LONGER LASTING PAVEMENTS

Cold mix & 100% RAP roads reinforced with Pave-Aid are showing significantly reduced rutting.

REDUCED MAINTENANCE

By reducing rutting you save time and money typically spent on repairs and out of service time.

REDUCED COSTS

Save money by reducing maintenance and extending life. Pave-Aid puts money back in your pocket without sacrificing performance.

FORTA
ASPHALT FIBER
STRONGER LASTING™

LEADING INNOVATION IN RAP REINFORCEMENT

WE KNOW YOU CARE ABOUT QUALITY.
WE KNOW YOU CARE ABOUT COSTS.
WE KNOW YOU WANT THE BEST.

HAVE ALL THREE WITH...

Pave-Aid™

“The use of fibers in RAP mixtures can be positively detected and can significantly improve the rutting resistance of asphalt mixtures containing 100% RAP.”
- ASU Study

Pave-Aid
Easy to use polyamide blend
increases rutting resistance

Reinforcement Throughout
Distributes evenly & forms a
superior bond with the 100%
RAP mix

Fine Individual Filaments
Filaments do not protrude or
impact surface finish

UNMATCHED TECHNICAL SUPPORT

We want to see your project succeed, which is why we offer assistance throughout every step of the process - selling, designing, addition, and placement.

We pride ourselves on maintaining an up-to-date literature database featuring design guidelines and technical documents readily available.

FORTA IS BUILT ON RELATIONSHIPS, EACH WITH THE SAME GOAL: CREATING BETTER PAVEMENT

Phone 724-458-5221 Toll Free 800-245-0306 WWW.FORTA-FL.COM

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Testimonials

DESTIN CITY USING NEW PAVING TECHNOLOGY ON ROADS

“We will be able to resurface city roads faster than previously anticipated because this new type of paving adds longevity to our roads and provides considerable cost-savings,” said City Manager Carisse LeJenue. ***“I am proud of our staff for identifying this opportunity to save money and provide a high-quality product for our citizens.”***



Thank you.

FORTA[®]
ASPHALT FIBER
STRONGER LASTING™

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www.forta-fi.com