Concrete Pavements

Streets and local roads

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Palm Beach TPA

April 3, 2018

Outline

Why Concrete?

Top Recommendations

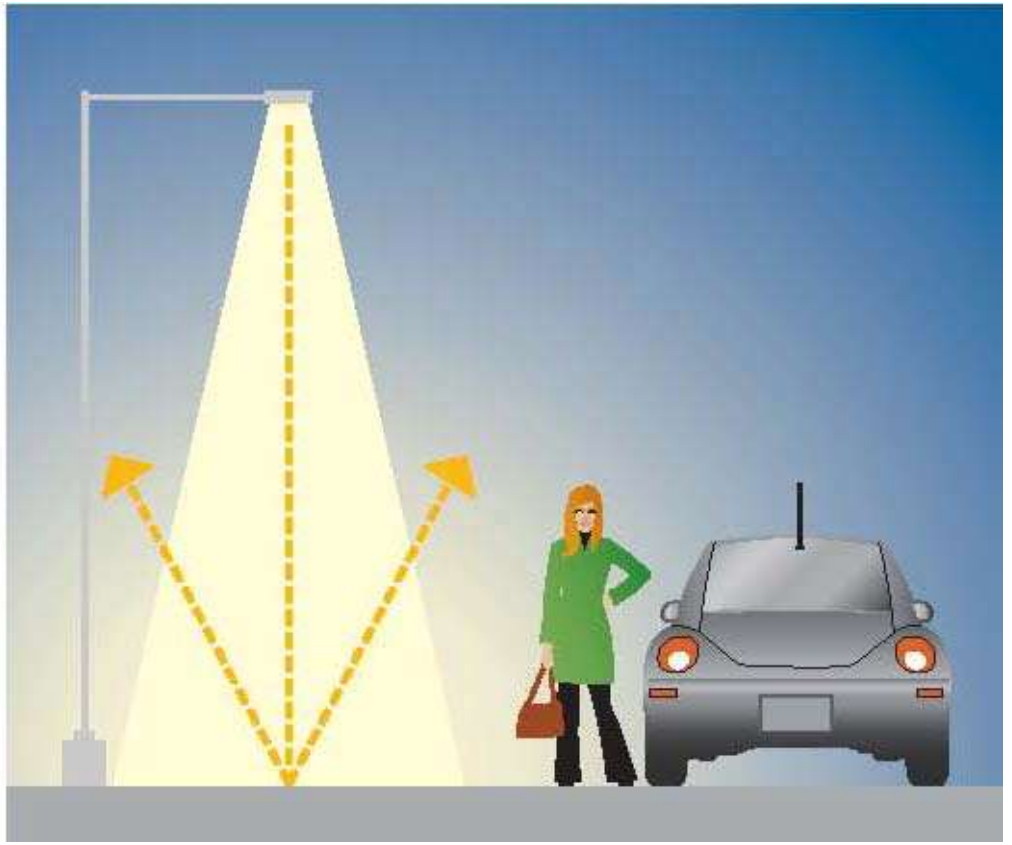
Concrete Paving Applications

Why Concrete?

- Safety
- Reflectivity / Urban Heat Island Effect
- Resiliency
- Lowest Life Cycle Cost
- Long Life / Low Maintenance
- Environmental Friendly Material

Safety

Better visibility reduces accidents

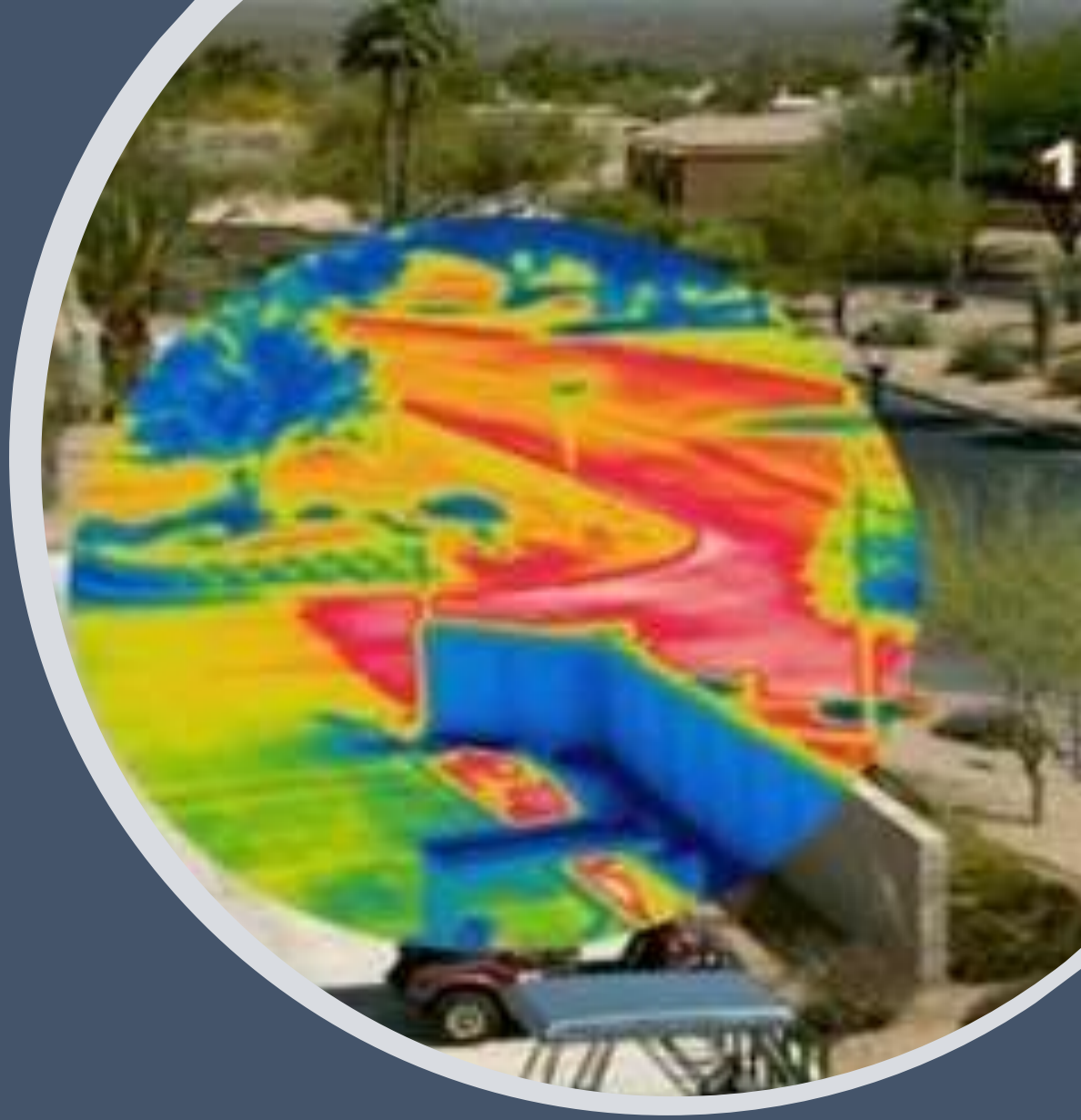


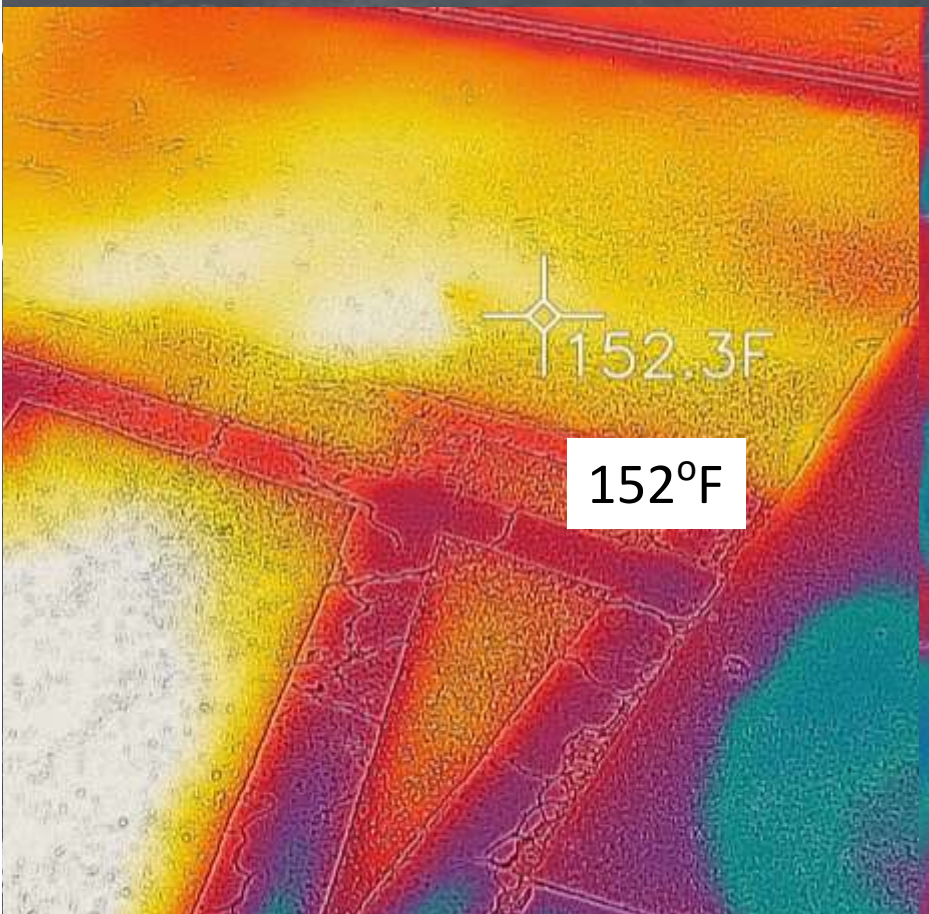
Safety

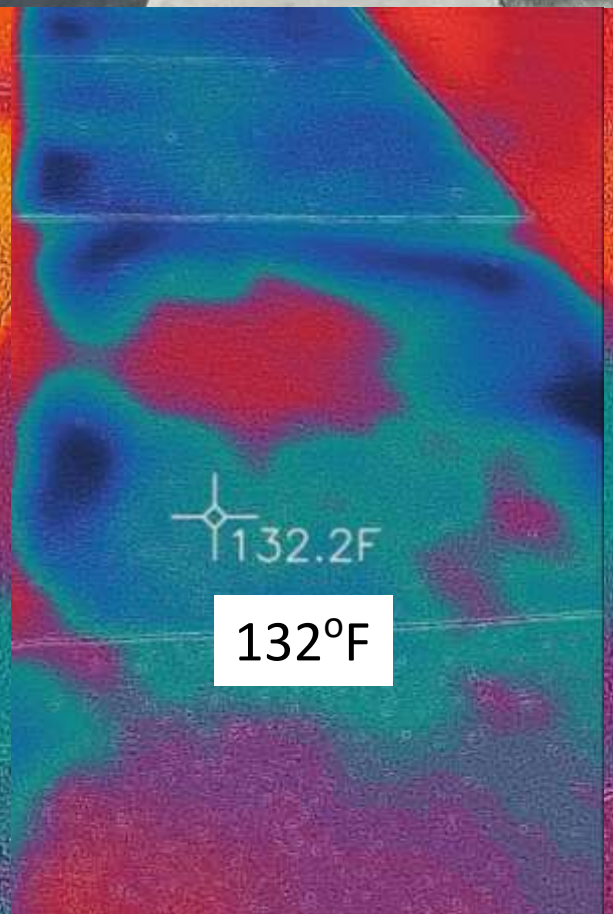
Rutting is an opportunity for hydroplaining.

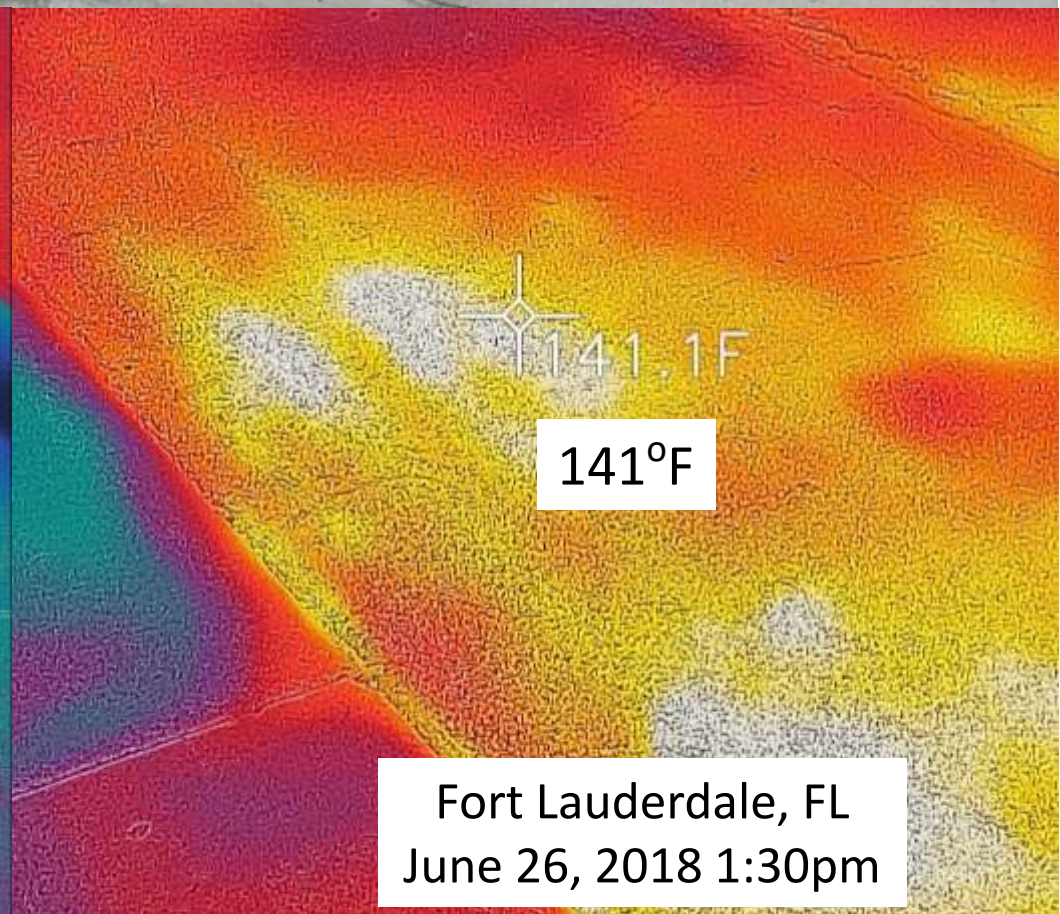
Urban heat Islands

- Reduced urban heat islands
  - 10 to 20 degrees cooler
- Reduced AC needs
  - 1 degree equals 1.5% change in energy consumption
- Improve air quality




152.3F
152°F


132.2F
132°F

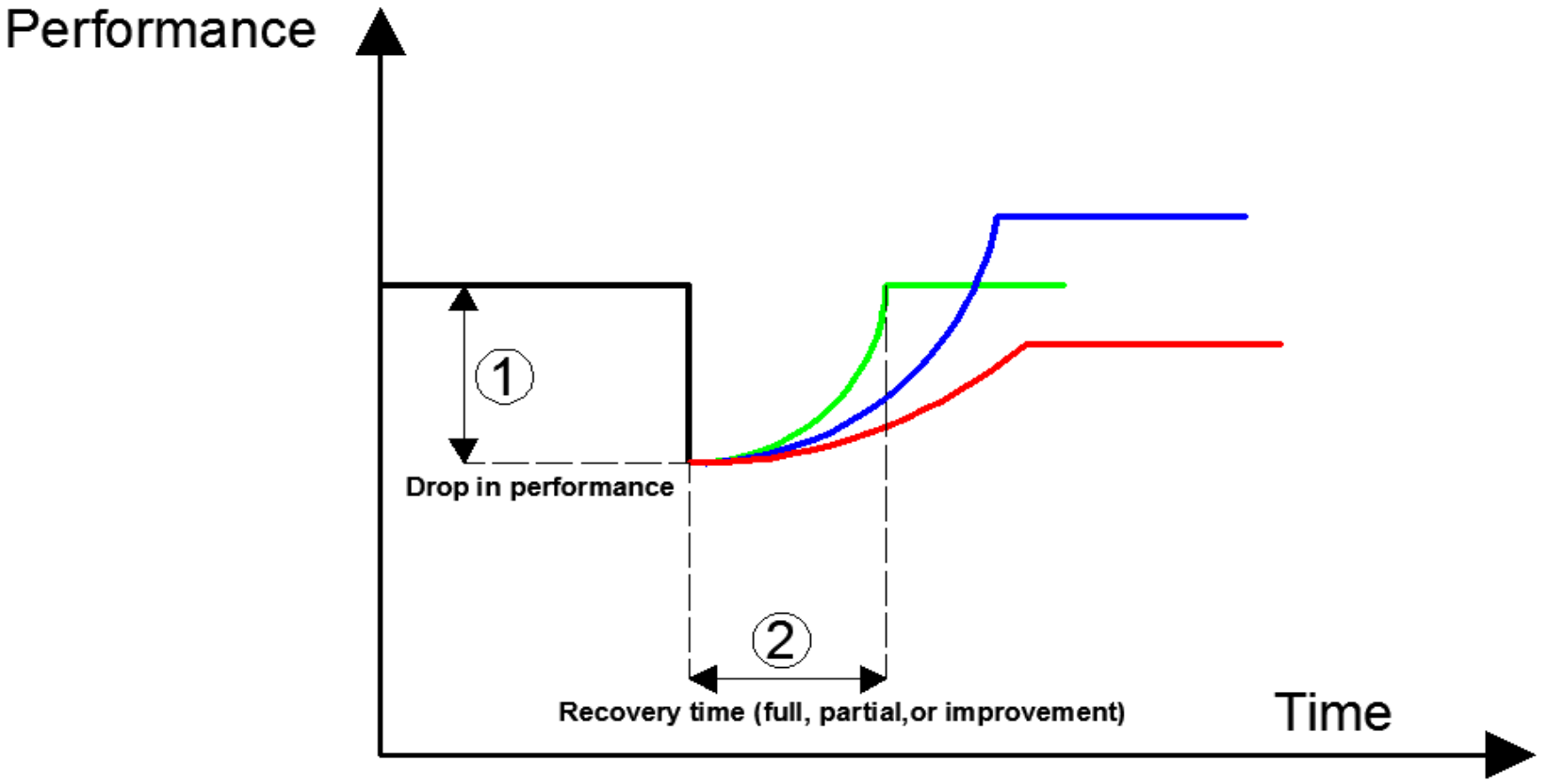

141.1F
141°F
Fort Lauderdale, FL
June 26, 2018 1:30pm

Resiliency

- How are pavement layers impacted?
- Do certain pavement types or base layers perform better when exposed to flood waters?

April 3, 2019

PAVEMENT RESILIENCE



Green is more resilient than Red because it has a faster recovery time

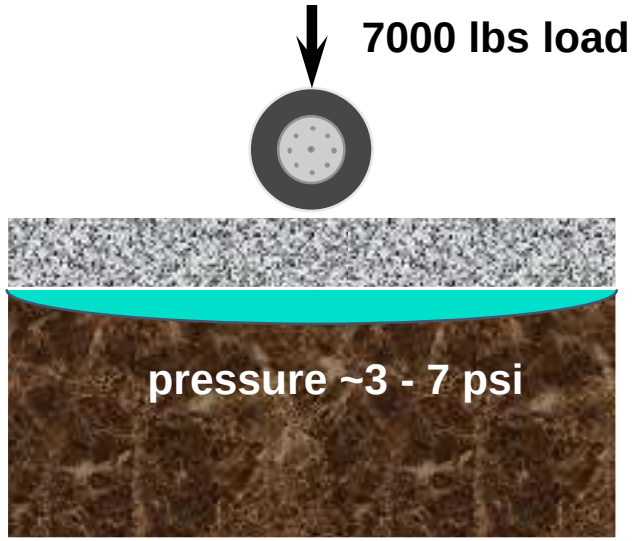
Pavement Resilience with respect to an event (eg. Flooding) is characterized by two parameters:

1. Drop in performance, induced by a the event (eg. reduced ability to carry load).
2. Recovery time to reinstate or improve performance (LCA, LCCA).

CONCRETE AND ASPHALT PAVEMENTS ARE DIFFERENT DUE TO HOW THEY DELIVER LOADS TO THE SUBGRADE

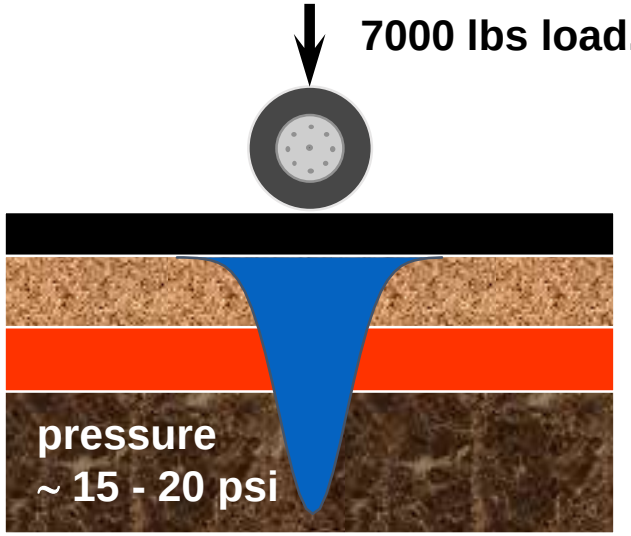
Concrete Pavements are Rigid

- Concrete carries the load and distributes it over a large area
- Minor deflection
- Low subgrade contact pressure
- Subgrade uniformity is more important than strength



Asphalt Pavements are Flexible

- The load is more concentrated and transferred to the underlying layers
- Higher deflection
- Subgrade, base/subbase strength are important
- Usually require more layers and greater thickness in order to protect the subgrade



Concrete's rigidity spreads the load over a large area & keeps pressures on the subgrade low
(therefore the flooded support system does not impact the load carrying capacity to the same degree as asphalt)

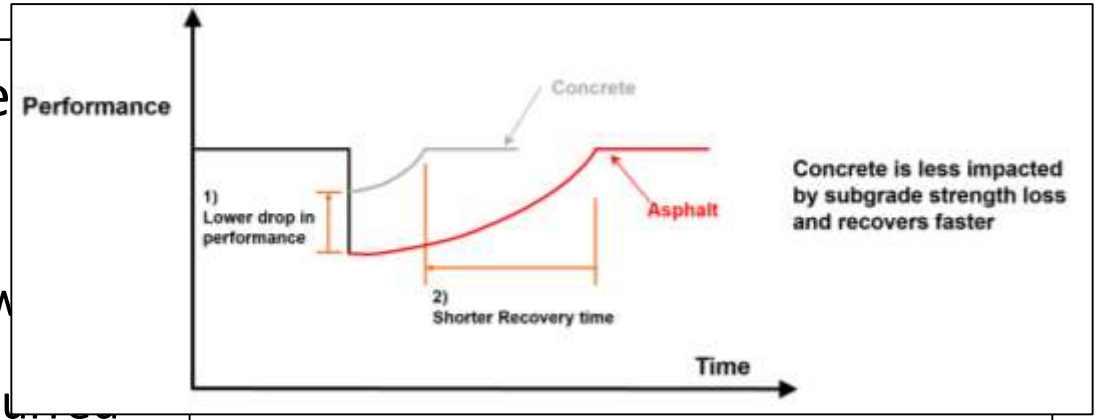
Relief and Rescue Efforts Must take place! Pavements are loaded…Are their lives shortened?

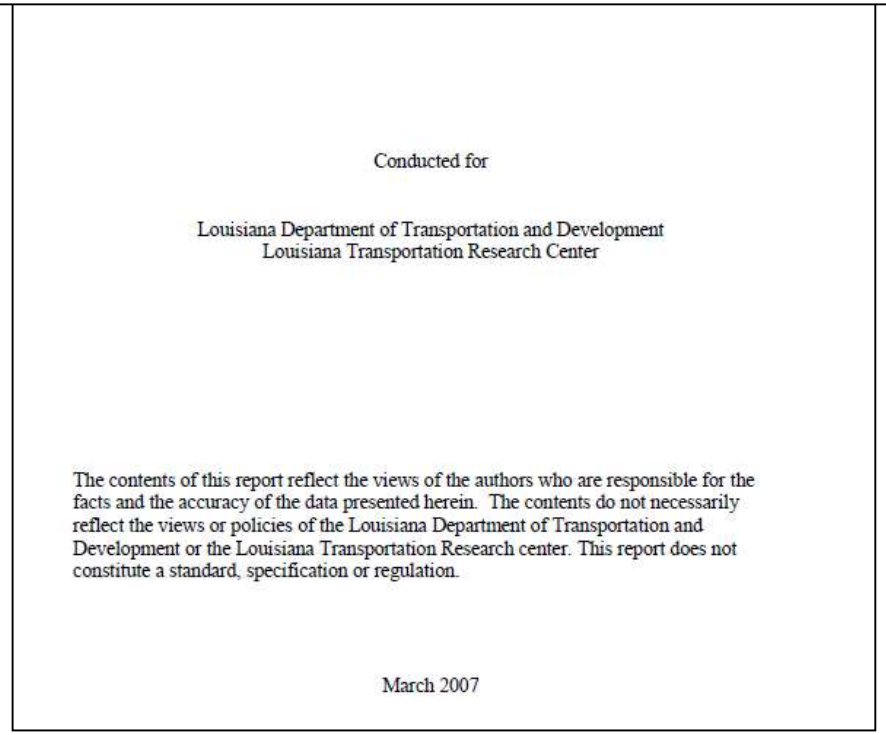
CAROLINAS CONCRETE PAVING ASSOCIATION

RESEARCH LOOKING AT PAVEMENTS THAT WERE SUBMERGED BY HURRICANE KATRINA

Key Findings

- Pavements that were submerged were found to be weaker than non-submerged pavements
- Asphalt pavements
  - Overall strength loss was equivalent to two inches of new asphalt
  - Duration of submergence was not a factor – damage occurred regardless of the length of time the pavement was submerged
  - Estimated cost of rehabilitating the 200 miles of submerged state (asphalt) roads would be **$50 million**
- Concrete Pavements
  - **Little relative loss of strength** due to flooded versus non-flooded conditions
  - Mr (subgrade strength) for concrete pavements is similar for submerged and non-submerged pavements
  - No information given on repairs or repair costs





Conducted for

Louisiana Department of Transportation and Development
Louisiana Transportation Research Center

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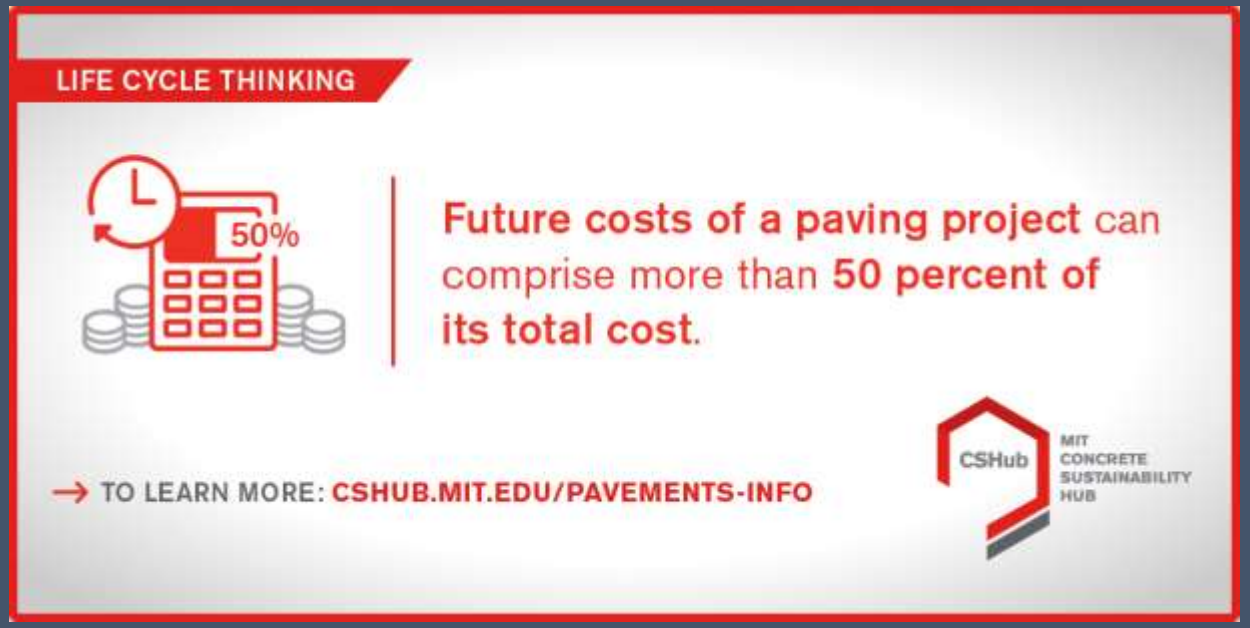
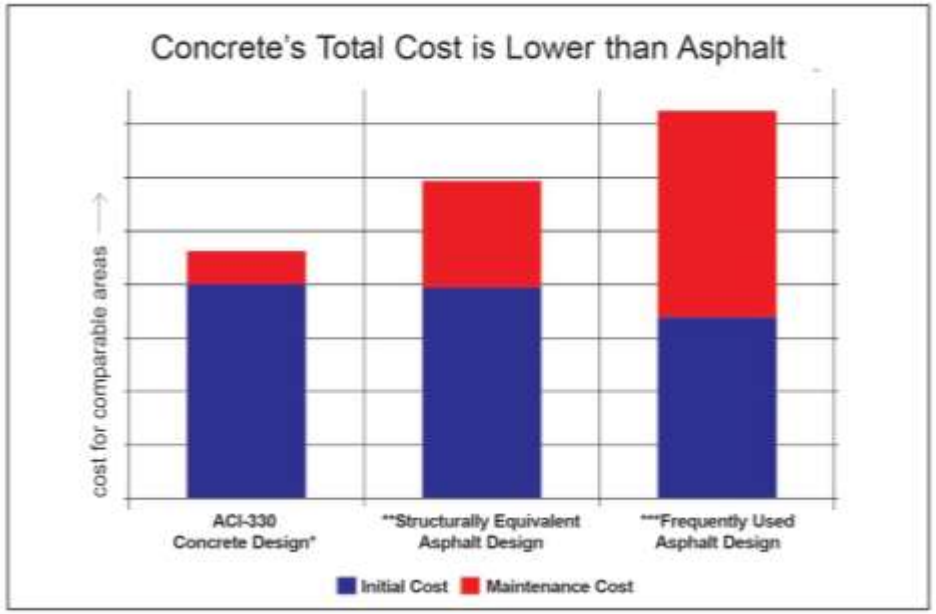
March 2007

Impact of Hurricane Katrina on Roadways in the New Orleans Area, Technical Assistance Report No. 07-2TA
Kevin Gaspard, Mark Martinez, Zhongjie Zhang, and Zhong Wu; LTRC Pavement Research Group, March 2007

Life Cycle Cost Analysis

- Competitive first costs
- Lowest costs in 5 to 10 years





Concrete parking delivers value: Factoring initial placement, maintenance and repair costs, compared to asphalt, concrete costs less over its useful life.

*ACI-330 is the American Concrete Institute's authoritative document on concrete parking area design.
** A structurally equivalent asphalt design is engineered to have the same load carrying capacity as the ACI-330 Concrete Design.
***While the frequently used asphalt design may be the the cheapest to buy, because it is often under-designed in load carrying capacity, it is the most expensive to own.

Lowest total cost of ownership!

83 year old concrete road

- US 17/92 in Winter Park
- Built 1936
- slab thickness 7” (Reinforced)

Minimal Maintenance

- No resurfacing
- No deformities

Environmentally Friendly Material

- Local materials
- Recycled materials
- No hazardous materials
- Stormwater management (pervious concrete)

Outline

Why Concrete?

Top Recommendations

Concrete Paving Applications

Top Recommendations

- acceleration
- deceleration
- turning

Intersections

Roundabouts

Bus stops

Roadways with heavy trucks

Intersections

- Sample & Powerline

Roundabouts

Dean Still Road & 33, Polk county

Bus stops

Bus stops use a disproportionately high portion of roadway maintenance budgets.

Outline

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Top Recommendations

Concrete Paving Applications

Concrete Paving Applications

Pervious Concrete

- Roller Compacted Concrete (RCC)
- Concrete Overlays
- Full Depth Reclamation (FDR)

Pervious Concrete

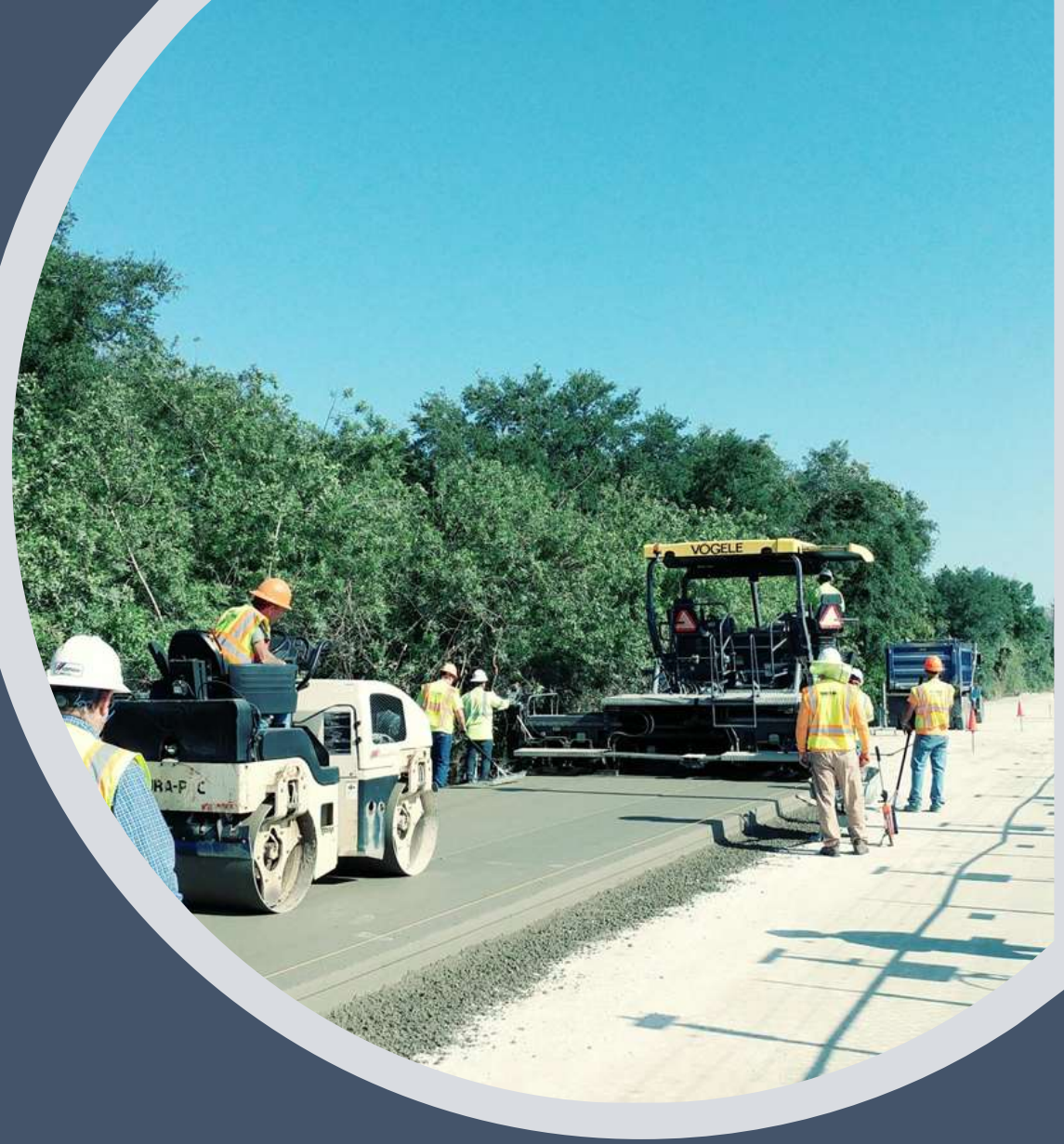
- Stormwater management
  - Quality control
  - Quantity control
- Recharge aquafer

- May 15th Workshop Ft. Lauderdale

Palm Beach State College
Loxahatchee Groves Campus

RCC roller compacted concrete

- Speed of Construction
- Economic solution
- Open to traffic in 24 hours



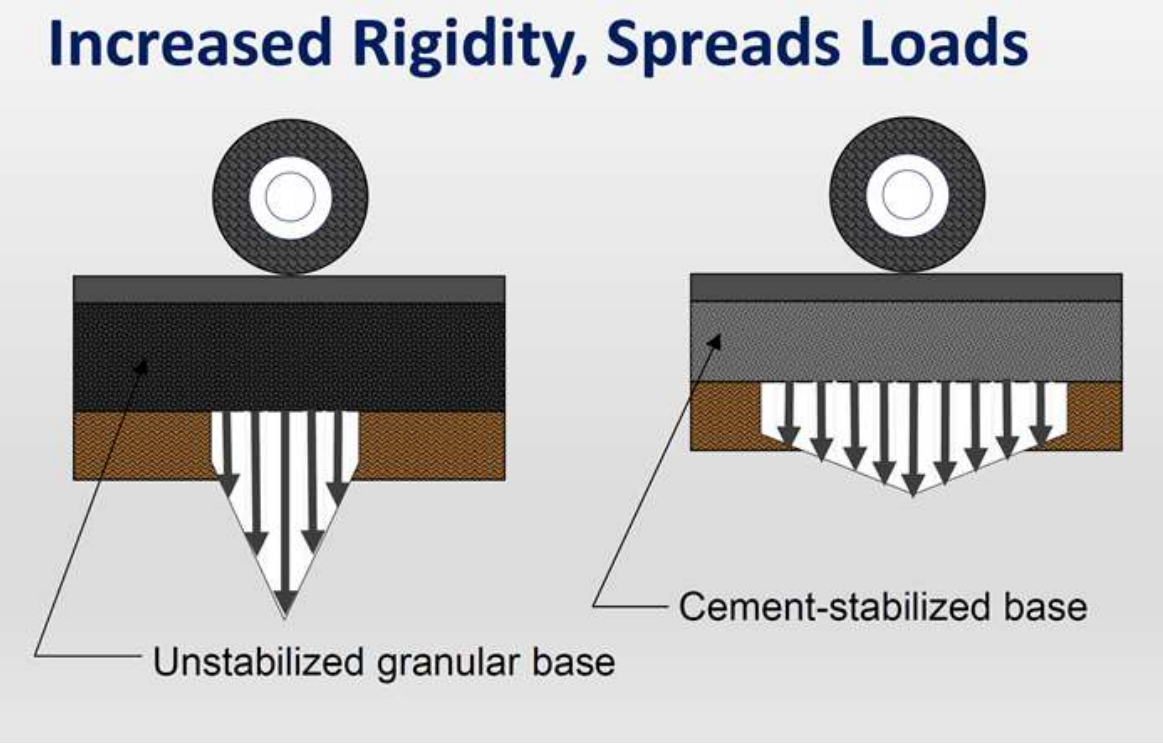
Concrete Overlays

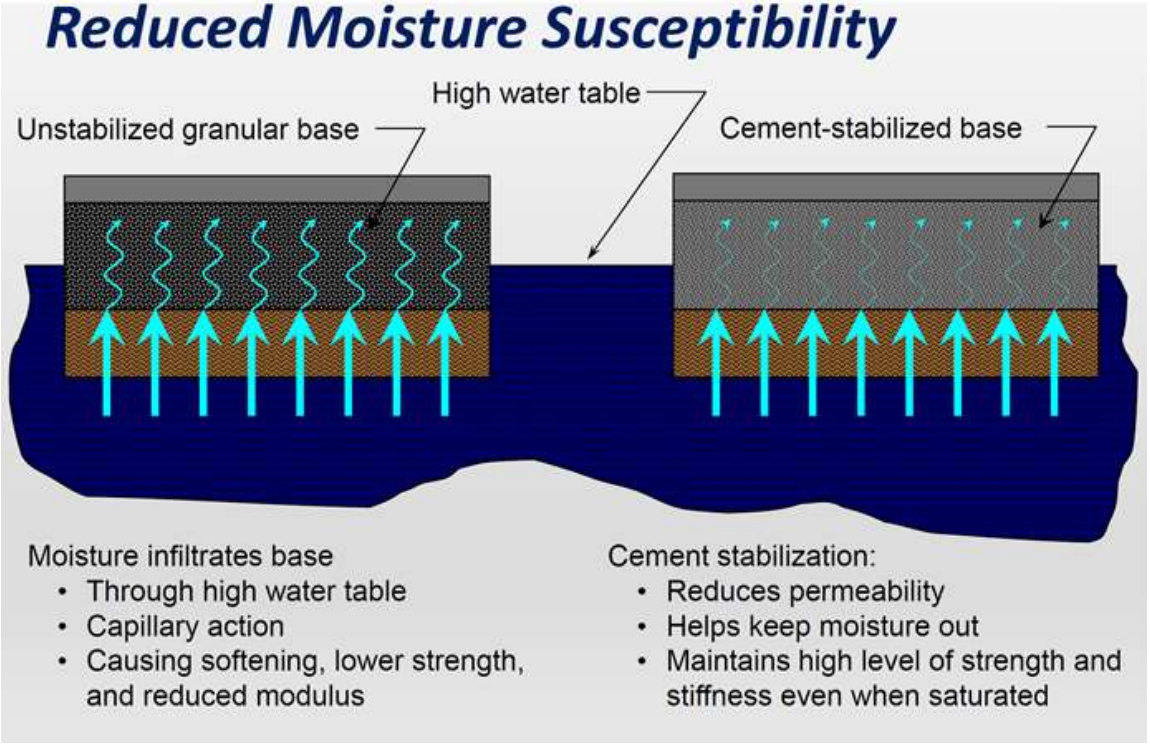
- Concrete overlay (3” - 7”) on existing asphalt surface
- Existing asphalt serves as compacted base for concrete pavement
- Cost effective
- Durable (30 years 2018 FDOT)

FDR Full Depth Reclamation (recycled road)

- Recycle existing asphalt
- Strengthened stabilized base
- New top layer

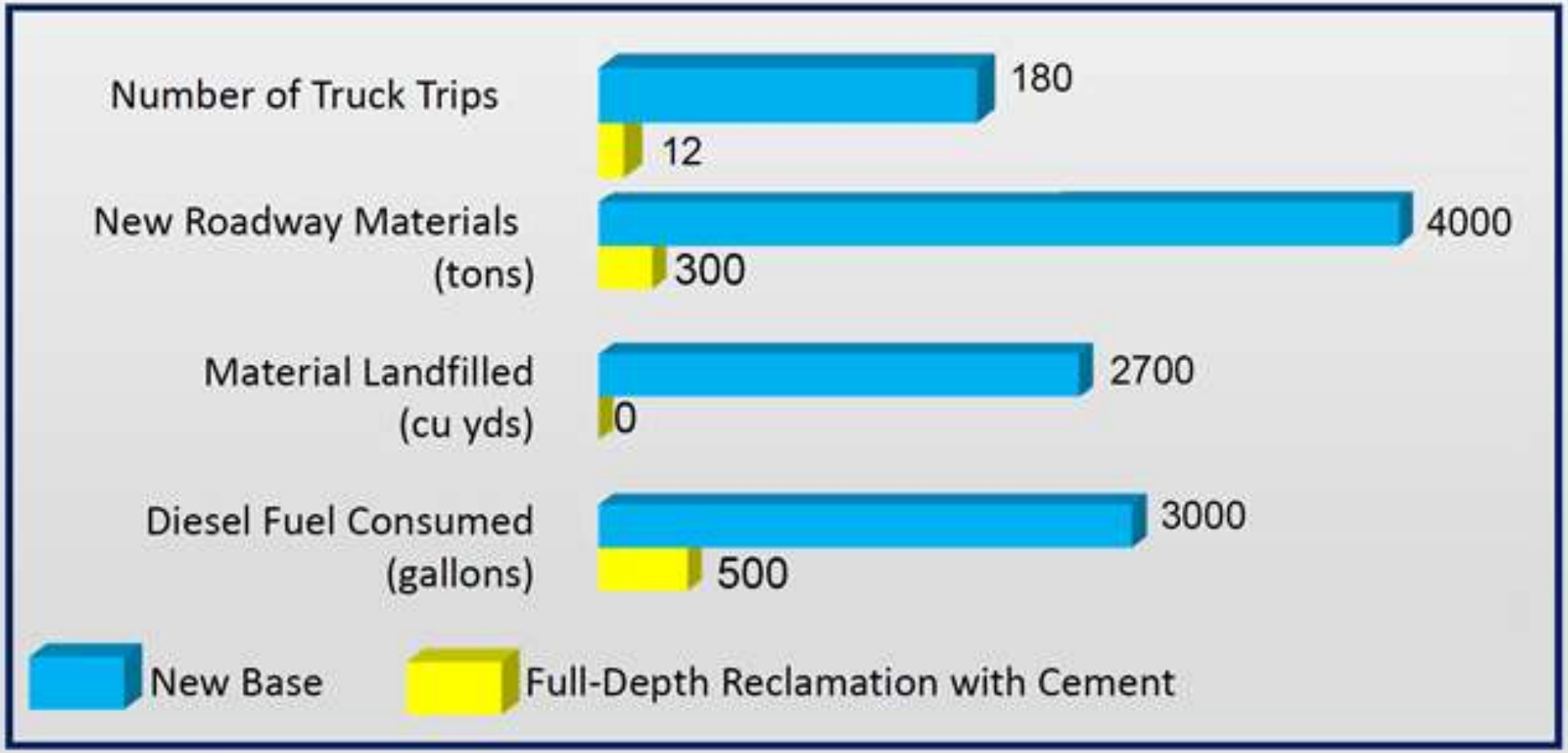
More resilient roadway





Sustainable Element of FDR Process

Energy and Materials Use*



*Based on 1 mile 24-ft wide 2-lane road, 6-inch base

Industry Support

Analysis of options

Specifications

Questions?

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Thank you!