



## ***TWO LIFT PCC PAVEMENTS TO MEET PUBLIC NEEDS***

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## ***RESEARCH GOALS***

- IDENTIFICATION OF:
  - Construction - strengths and limitations
  - Development constraints – cost, mix design, constr.
  - Research needs – material/ equipment knowledge
  - Goals – improved surface durability, reduced noise, and improved safety





## ***RESEARCH OBJECTIVES***

- US and European Synthesis of Practice
  - Location, design, construction details, condition
  - Need for quality and durability
  - Identification of design/construction research gaps



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## ***EUROPEAN EXPERIENCE***

- Countries employing two lift paving
  - France, Germany and Austria
- Lessons learned
  - 2-5.5 inch high quality surface courses
  - 8.5-9.5 inch low cost base courses
  - Use of local aggregates in base and imported in the surface
  - Problem with stress intensity noted
  - Two lift paving equipment built



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## ***US EXPERIENCE IN TWO LIFT PAVEMENT CONSTRUCTION***

- 1906 – Granitoid concrete patent
- 1950-1990 – Interstate mesh pavement
- 1970-2000 – Design changes and cost drive many away from two lift.

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## ***US CONSTRUCTION EXPERIENCE***

- US Experience, 11 projects (1970-1994)
  - Iowa, North Dakota, Florida, Kansas, Michigan
  - Wet on wet construction
  - Use of recycled materials in base layer
  - Capping of base layer
  - Use of econocrete in base layer
  - Use of durable aggregates in surface or employment of exposed aggregate surfaces for noise/durability
  - All in service yet today.

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## ***US PROJECT CHARACTERISTICS***

- Facility – street, road, interstate
- Lower lift – gravel or poor limestone
- Width – 24 to 36 feet
- Load transfer – some
- Panel size – 15 or 20 feet
- ADT > 4,800
- Paving method – slipform and/or forms
- Time between lifts – 30-60 minutes minimum

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## ***CONSTRUCTION INDUSTRY CONCERNS***

- Extra equipment – plants, placers, pavers
- Definition of low quality layer – strength, durability, cost, etc.?
- Construction - site management, trucks
- Thermo coefficient differences between lift materials

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## ***BENEFITS IDENTIFIED***

- Construction material conservation/recycling
- Materials cost savings?
- Improved surfaces
- Recyclable surface layers

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## ***RESEARCH NEEDS IDENTIFIED BASE LIFT***

- Material specifications
  - Lower (base) lift – durability, strength, gradations, recycled material limits, admixture requirements, design depths
- Base Lift Construction guidelines
  - Placement methods and equipment
  - Compaction methods and equipment

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## **RESEARCH NEEDS IDENTIFIED SURFACE LIFT**

- Material specifications
    - Surface lift – strength, durability, friction, noise and splash characteristics, admixture requirements
    - Design depths and cap or no cap
- Surface Lift Construction guidelines
- Time between lift placement (min and max)
  - Need for jointing details and placement
  - Bonding need, amount and method of inducing
  - Concrete placement methods and equipment

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## **DEMONSTRATION PROJECTS**

- Think life cycle in this process
    - How will you rehabilitate this surface in the future?
    - Balance cost of imported surface materials against the savings in local cost for the base layer
- Involve the construction industry in the decisions
- Aggregate /material suppliers- material availability, compatibility and goal characteristics
  - Contractors/equipment suppliers – set the goal and let them give you ideas on the methods
  - Learn from partnering

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## ***TWO LIFT OPPORTUNITIES IN IOWA***

- Pav't type    PCI<50
  - ACC            252
  - PCC            866
  - Composite    845
  - Total           1963 miles
- \* Realistic goal – 5% or 500 miles