



# ASPHALT OVERLAYS ON BRIDGES

March 6, 2018

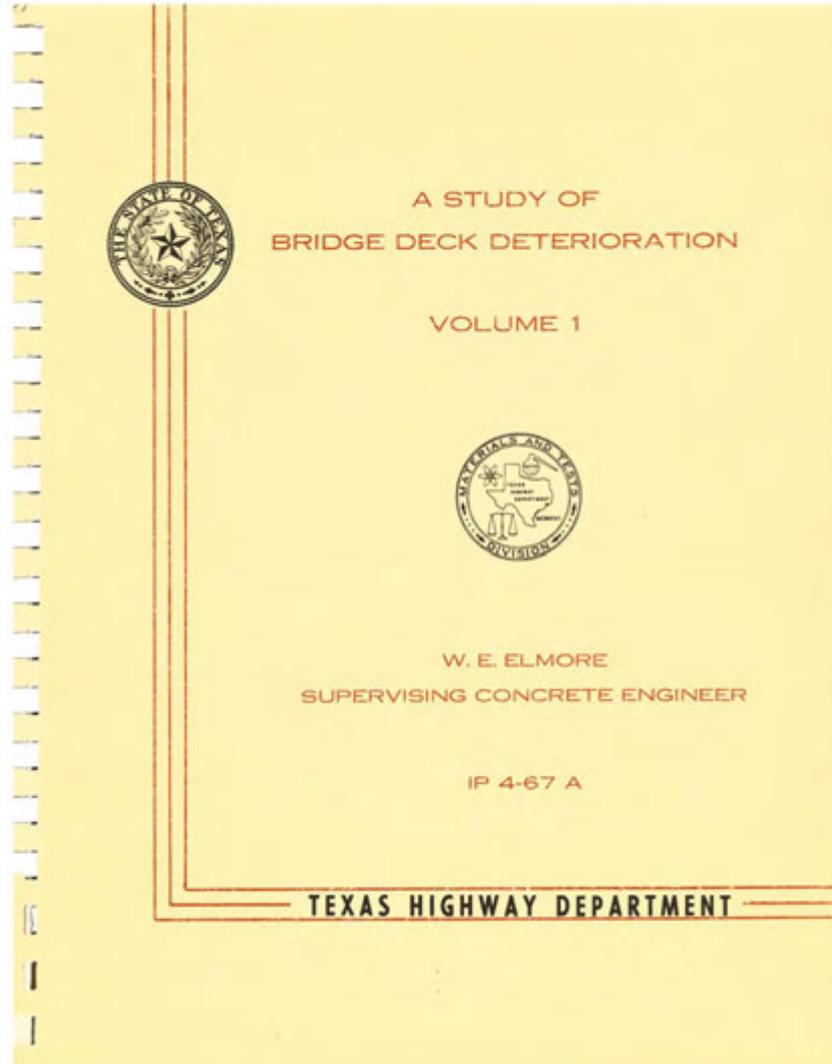


- Practice was to place Seal Coats and ACP overlays on bridges as roadways were getting the same treatment
- If a seal coat was applied, an ACP overlay would often follow
- 1967 Bridge Deck Deterioration Study (in-House)

# 1967 Study of Bridge Deck Deterioration



- Study requested after rapid deterioration of bridge decks noticed in the mid-1960's
- Decks constructed in the 1950's and 1960's performing worse than earlier built decks
- 100 Structures Studied in depth
- Field Inspection as well as lab work conducted
- Findings: A variety of issues can be attributed to the rapid deterioration



# ACP Found to Cause More Extensive Damage



The use of hot mix asphalt concrete (HMAC) and asphalt seal coats on bridge decks as riding surfaces, protective coatings, and maintenance rehabilitation has been common and widespread. In many observations concrete "sealed" by these methods has been found to be more extensively damaged where de-icing salts are used than supposedly unprotected concrete. HMAC contains sufficient voids to allow the passage of de-icing salt solutions and normal solutions of rain water bearing compounds into the interface with the concrete. Here the solutions are trapped and penetrate localized areas of the concrete in concentrated amounts. Similar actions occur at a reduced rate with asphalt seal coats. As the asphalt in the seal coat tends to become more brittle with age, the tendency to crack under cold weather conditions becomes more pronounced until eventually passages are opened to the concrete surface.



- Practice was to place Seal Coats and ACP overlays on bridges as roadways were getting the same treatment
- If a seal coat was applied, an ACP overlay would often follow
- **1967 Bridge Deck Deterioration Study (in-House)**
  - ACP on Decks may have resulted in more damage
  - Recommendation to not apply seal coats or ACP on bridge decks
- **1990 Bridge Design Guide Still Recommended**



The Texas Bridge Deck Protection System was developed for the areas that concede the use of deicing salts. This consists of a two-course asphaltic surface treatment or one course of latex asphalt and lightweight aggregate covered with a layer of asphaltic concrete. This is much less expensive than the membrane systems used in other states, but resistivity measurements indicate adequate protection against moisture penetration.

## Which Resulted in 3 Options:

- P1 Texas Bridge Deck Protection System  
2 Course Asphalt Surface Treatment  
Asphaltic Concrete Overlay  
Nominal Total Thickness 2 inches
- P2 Texas Bridge Deck Protection System  
1 Course Latex Asphalt  
Lightweight Surface Treatment  
Latex Asphaltic Concrete Overlay  
Nominal Total Thickness 1½ inches
- P3 Texas Bridge Deck Protection System  
3 Course Asphaltic Surface Treatment  
Nominal Total Thickness 1 inch



- **Asphaltic Protection Systems** The Texas Bridge Deck Protection System, consisting of a two-course surface treatment followed by an asphalt overlay, **is no longer considered to be an adequate protection system. Its use is discouraged**, especially for districts where decks are exposed to coastal seawater or deicing chemicals. Microsurfacing consisting of a thin layer of polymer modified asphalt with an aggregate and mineral filler also is not considered to be a bridge deck protection system. For bridge decks which are already under distress, it may be possible to extend their life by applying the two-course surface treatment with an overlay, but this should be considered temporary until the deck can be repaired or replaced. If the decision is made to apply an asphalt overlay, a two course surface treatment must be applied prior to the overlay.

# Bridge Division's Current Thoughts



- Recognizes that asphalt overlays on bridge decks are common and removing it may not be a good option
  - Will removal cause damage to what lies below?
  - If removed, what to do with the now exposed deck? (grind, ...)
  - Was the overlay addressing a grade issue?
- Still recommends removal of excess to reduce dead load on bridge and to address loss of effective rail height
- If replacing existing overlay, use the best materials available to provide a barrier to water intrusion
  - Impermeable
  - Crack free
- Utilize best performing expansion joint options

# What got covered up?



2002 LMC Overlay



2018 Same Deck with ACP installed in 2014

# What got covered up (cont)?



# What ACP System to Use?



- National Perspective

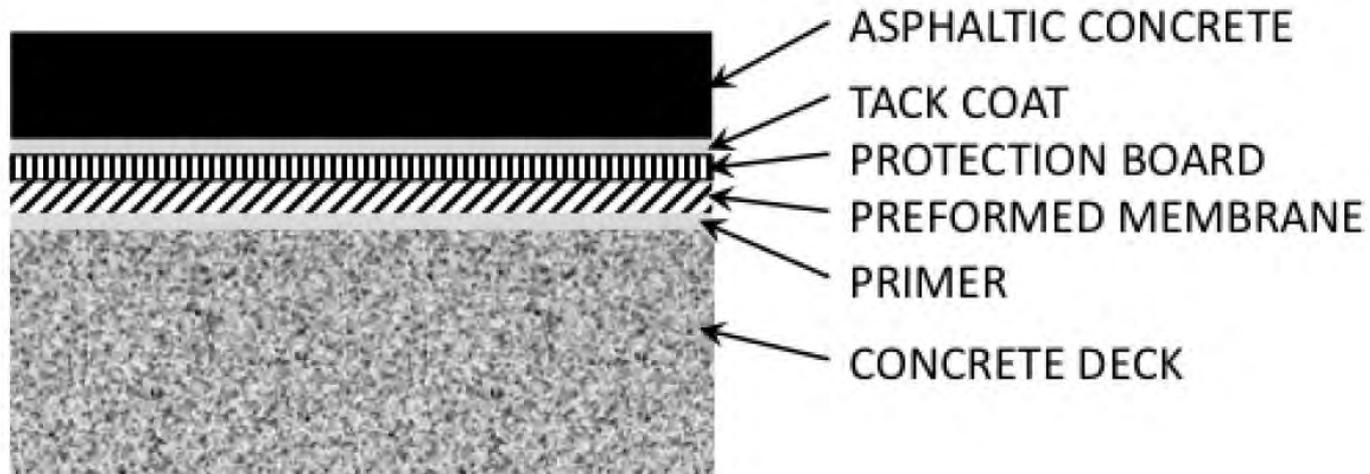


FIGURE 3 Schematic of possible components of preformed systems.

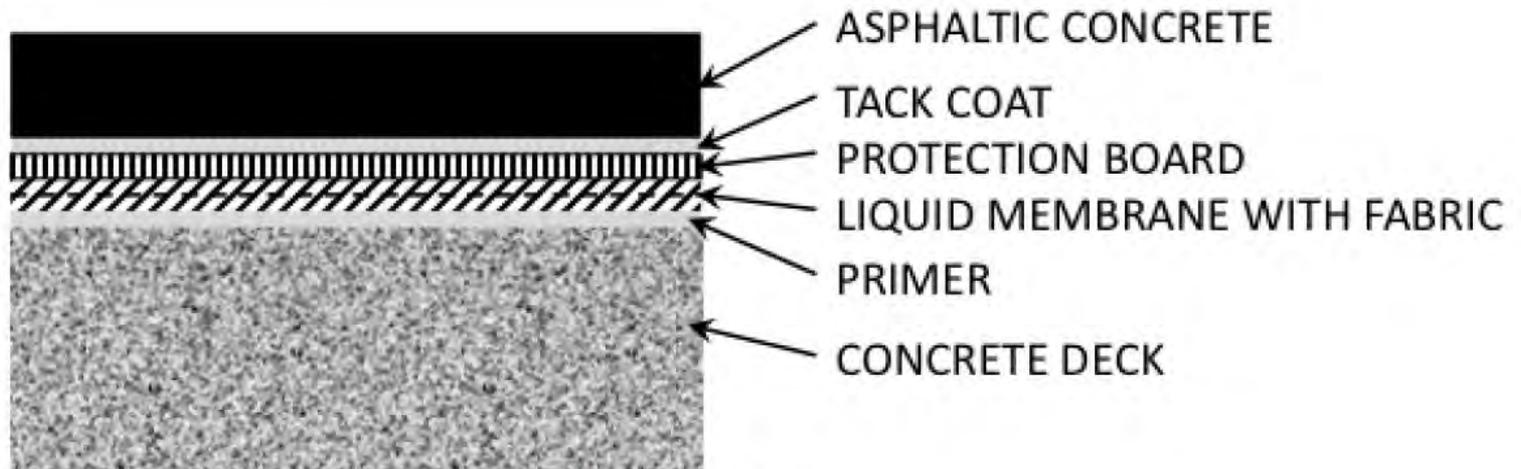


FIGURE 4 Schematic of possible components of liquid systems.

# What ACP System to Use?

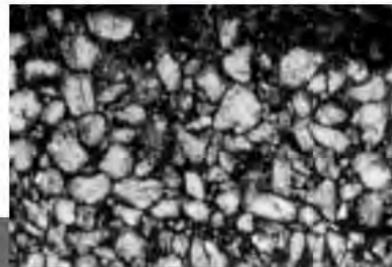


- National Perspective
- **Hotmix 101**



## Mix Types

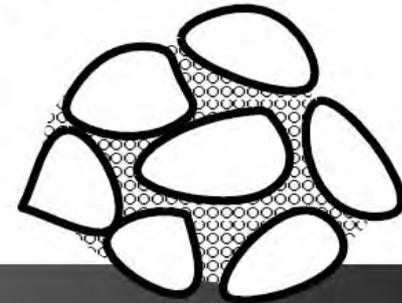
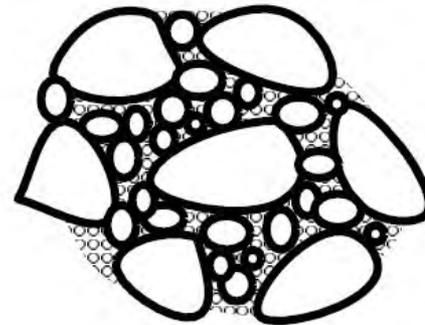
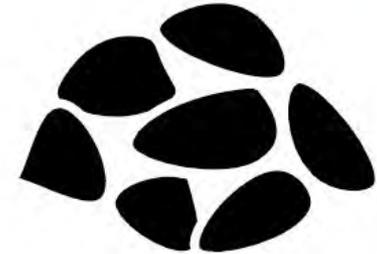
- Dense-Graded
- Stone Matrix Asphalt (SMA)
- Permeable Friction Course (PFC)





## Types Of Gradations

- \* Open graded
  - Few points of contact
  - Stone on Stone contact
  - High permeability
- \* Well graded
  - Good interlock
  - Low permeability
- \* Gap graded
  - Lacks intermediate sizes
  - Good interlock
  - Permeability varies



# What ACP System to Use?



- National Perspective
- Hotmix 101
- Ask the experts (Common TxDOT Processes)
  - CST/M&P
  - Local TxDOT Personnel to Determine what is Available

# What a Bridge Guy has Learned about ACP

- Specify Spray Paver Tack/Membrane or Trackless Tack
- Least Permeable Mixtures (least to greatest)
  - Item 346 SMA (Not Recommended based on compaction effort required)
  - Item 347 TOM-F/C
  - Item 344 SP-D/C
  - Item 341 Type D
  - Item 341 Type C
- Crack Resistant Mixtures (greatest to least)
  - Item 347 TOM-F
  - Item 347 TOM-C
  - Item 344 SP-D
  - Item 344 SP-C
  - Item 341 Type D
  - Item 341 Type C
- Compaction is Critical



- Many Options
  - Do Nothing (let it crack and see what happens)
  - Saw ACP at joints (both fixed and expansion)
  - Saw ACP at joints and Seal (both fixed and expansion)
  - Install Fabric Underseal prior to ACP and then Saw and Seal
  - Header Type Expansion Joints (Item 454)
    - Two Payment Options – by LF for CF
    - Both options require expected overlay thickness shown in the plans – history has shown we typically underestimate the thickness
  - Asphalt Plug Expansion Joints (Special Specification 4001)

# Do Nothing Option (after 15 years)



- 15 Year Old ACP
- No initial joint treatment
- Post treat with Class 3 Seal



# Saw-cut and Seal/with or without fabric underseal





- Asphalt on Bridge Decks may not be the worst thing
- If replacing an existing ACP overlay, mill off as much as possible without damaging expansion joints.
- If done, do it right. Include a good membrane/tack coat.
- Consider the details (joints, etc)



- Thanks for your attention.
- Time for comment/questions?

Kevin Pruski, PE  
BRG Construction and Maintenance  
512-416-2306



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