SPRAY APPLIED WATERPROOFING MEMBRANES

New and Rehab Bridge Decks using Spray Applied Waterproofing Membranes

www.stirlinglloyd.com
Why waterproof?

Protection of Steel From Corrosion

Protection of Salt and Chloride Attack

Protection of Carbonation and Freeze Thaw Issues

to fulfil the bridge design life and reduce maintenance of the bridge structure
It is clear that the primary function of a waterproofing membrane is to ensure the concrete and steel elements of a bridge structure to enable it to fulfil its design life of over 100 years.
The effects of water in asphalt act like a sponge holding the water thru freeze thaw and create bond failure of asphalt to membrane.
Some waterproofing membranes bonds to asphalt deteriorate rapidly when subject water under pressure.
Bituminous Membranes have limited life expectancy and other downfalls

- Cannot be used for multiple paving cycles
- Cannot be applied in cold temperatures
- Blistering and moisture problems
- Puncturing, from aggregate in asphalt and deck
- Joint Failures in between each seam
- Poor Adhesion To Deck
- Poor Adhesion to Asphalt Overlay
- Sensitivity to Weather Conditions
- Slowness of Application.
- Lack of Bond can cause asphalt shoving

SOURCE: 18TH WORLD ROAD CONGRESS
Brussels, 1987
Bridge Deck Waterproofing

Spray Applied Membranes offer seamless applications Compared to traditional sheet membranes.

www.stirlinglloyd.com
Spray Applied Membranes offer long term waterproofing protection with asphalt overlay

- Will last and perform the design life of structure – “100 years”
- Allows repaving over the Eliminator for Multiple Life-Cycles
- Can reduce long-term bridge deck maintenance cost by 50%
- High bond to substrate and asphalt surfacing
- Applied all year round at cold temperatures
- Intimate adhesion to curb verticals and drains
- Excellent durability: Will not soften under hot paving/compaction
- Applicable to the roughest and most irregular substrate conditions
Spray Membranes sequence for Highway Application

Pavement Asphalt
- Tack Coat:
  - 2nd Coat of membrane optional
    - Some membranes broadcast aggregate
- Membrane Coat
- Primer
- Bridge Deck or Substrate
Surface Preparation: Concrete Specification

- Surface to be abrasively cleaned in accordance with ASTM D4259
- Prior to application of the system all voids must be filled with suitable repair material
- Any weak bonded residues must be cleaned to satisfy adhesion requirements. Adhesion Testing offers a good indicator of substrate strength.
- Responsibilities of each party regarding the removal of old asphalt and membrane and surface preparation must be clearly spelled out.
Rehab Bridge Deck: Considerations for Waterproofing

- Surface Preparation
- Application Speed with Quality Control
- Weather
- Box Beam Applications
- Phased Construction
- Night work with day traffic
- Tack Coat and Paving
- Pre Construction Meeting
- Long Term Thinking
SURFACE PREPARATION
Sharps Aggregates Should Be Ground Down To Reduce Mechanical Damage: Otherwise, This Substrate is Suitable
Some Milled Surfaces Leave Asphalt Remains...
Weak-bonded Materials Must Be Removed: Many Fast Mechanical Tools Can Be Used
Bridge Deck Waterproofing

Thorough, High Quality Preparation Ensures Long Life
Ride-On Vacuum Shot Blast Equipment removes laitance.
Bridge Deck Waterproofing

Larger Units Are Available For Even Faster Surface Prep
10,000 – 15,000sf/ hour

www.stirlinglloyd.com
Cleaning Of Verticals Is Very Important And Can Be Sandblasted or Grinded clean:
Bridge Deck Waterproofing

Surface Prep Is Confirmed By Adhesion Testing
eliminator® Bridge Deck Waterproofing

ASTM D4541 Standard Tensile Adhesion Test, ASTM D4541: 2” Diameter Dollies Provide More Accurate Results

RESULTS FOR CONCRETE:
> 100psi with failure in concrete

RESULTS FOR STEEL:
> 290psi
Failure of the concrete above 100 psi indicates good bond. This makes a good litmus test when bond is in question.
Primers must be used to promote bond adhesion to both concrete or steel substrates after mechanical cleaning.
The Spray Membranes terminates up vertical curbs at critical waterproofing areas.
eliminator® Bridge Deck Waterproofing

They can be installed very quickly with little overcoating time.

www.stirlinglloyd.com
Multiple Sprayers increase production for larger projects.
Bridge Deck Waterproofing

Installation of Spray Applied on New Tappan Zee Bridge
Bridge Deck Waterproofing

Installation of Spray Applied on New Tappan Zee Bridge
Bridge Deck Waterproofing

Installation of Spray Applied on New Tappan Zee Bridge
Bridge Deck Waterproofing

Installation of Spray Applied on New Tappan Zee Bridge

www.stirlinglloyd.com
Bridge Deck Waterproofing

Installation of Spray Applied on New Tappan Zee Bridge
The Spray Applied Membranes can accommodate very rough substrate conditions and milled surfaces.
Bridge Deck Waterproofing

Box Beam Construction
Poor grouted joints are more than commonly found.
It is important these joints are grouted properly.
Bridge Deck Waterproofing

Added reinforcement over these joints are recommended
The reinforcement is added into the spray membranes over vulnerable joints.
The grouted joints on this box beam bridge has been reinforced before the application of the spray membrane.
Bridge Deck Waterproofing

The spray membrane offers a seamless solution
Bridge Deck Waterproofing

...for long term protection
eliminator® Bridge Deck Waterproofing

Spray membranes terminates easily at expansion joints
Bridge Deck Waterproofing

Phased Construction
Phased Construction remains jointless for spray membranes.
Temporary trafficking Eliminator
Bridge Deck Waterproofing

Spray Applied Membranes can be temporarily trafficked before paving with an aggregate broadcast into the membrane.
This allows night construction and reduces cold joints with paving.
Polymer Modified Tack Coat
Spray Applied Membranes require a tack coat to promote bond of the paving overlay.
Bridge Deck Waterproofing

Pavement can commence as soon as tack coat cools, typically One Hour
Bridge Deck Waterproofing

Multiple Life Cycles: Replacing Asphalt/ Retaining Spray Membranes

www.stirlinglloyd.com
Bridge Deck Waterproofing

Multiple Life Cycles: Replacing Asphalt/Retaining Eliminator
Conclusion - Spray Applied Membranes

- Will last and perform the design life of structure – “100 years”
- Allows repaving over the Eliminator for Multiple Life-Cycles
- Can reduce long-term bridge deck maintenance cost by 50%
- High bond to substrate and asphalt surfacing
- Applied all year round at cold temperatures
- Intimate adhesion to curb verticals and drains
- Excellent durability: Will not soften under hot paving/ compaction
- Applicable to the roughest and most irregular substrate conditions
PDH Questions

• Minimum average results for ASTM D4541 Standard Tensile Adhesion Test?
  • 150 PSI Concrete/250 PSI Steel
  • 100 PSI Concrete/290 PSI Steel
  • 50 PSI Concrete/290 PSI Steel

• Spray applied membranes allow you to retain the membrane while repaving allowing multiple life cycles of the membrane?
  • True
  • False

• Spray applied membranes can prevent premature failures within the deck by preventing attacks from salts, water, and chlorides.
  • True
  • False