Long-Term Performance of Asphalt Underlayment Trackbeds for Special Trackwork Applications

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Strengthens Trackbed Support

Waterproofs Underlying Roadbed

Confines Ballast and Track

0.5 ton/track-foot
Dense-Graded Highway Base Mix
1 – 1 ½ in. Maximum Size Aggregate
Asphalt Binder +0.5% above Optimum
Low to Medium Modulus Mix, 1 - 3% Air Voids
Trackbed Materials Classifications
• Roadbed/Subgrade Moisture Contents
  – At or Near Optimum
  – Thus, HMA Mat not Trapping Moisture
  – For Design - Use Unsoaked Condition

• HMA Cores
  – No Significant Weathering or Deterioration
  – No Loss of Fatigue Life
Empty Coal Train at Conway

P-Cell 209 on 5 in. HMA Layer

Pressure (psi)

4 6-Axle Locos

Time (s)

Initial 5 Cars
Reduction of Dynamic Stresses

Time (s)

Stress (psi)

- 8 in. HMA surface
- Subgrade surface
Locomotive

(P) 593 PSI  (A) 46.66 in²  (F) 27675 lb
Positioning of Lead Wheel with Respect to Sensor

Average Pressure (psi):

Lead Wheel Position

Snapshot of the Lead Wheel Directly above the Sensor

Lead Wheel Over Sensor

F = 20985 lbf, P = 437 psi
Rear Tires of Tractor of a 151,000 lb Loaded Coal Truck on Concrete Crossing of Kentucky Coal Terminal, Mile Post 6.6. May 25, 2004

9842 lb

135 psi

72.93 in^2

Force vs. Frames

Pressure vs. Frames
Unloading hot mix asphalt for transloading to hi-rail dump

Unloading hot mix asphalt at north end to be distributed by loader

Unloading hot mix asphalt inside tunnel

Spreading cold mix on floor
Looking north at south portal to tunnel #3 at PN 2.5. Pumping station at left. All 4 tunnels have sump pump systems. All 4 have asphalt.

South portal to tunnel #1 from 22nd Street station, PN 1.9. Asphalt placed in tunnels and approaches during 1999. No surfacing required. Wood ties used in tunnels.
Excavating trackbed and checking grade

KY 303 Condition prior to rebuild

Removing old crossing 08:30

Began excavating

Excavating trackbed and checking grade
Compacting ballast

Positioning new panel

Spreading cribbing rock 11:30

Tamping ballast
3 weeks later

Compacting hand-spread approaches

Regulating ballast 12:40

Finished compacting asphalt approaches 16:50

3 weeks later
Waller Avenue

T&S 2002
S 2003
T&S 2006

#1
#2
Profile of Rosemont Garden Westbound Crossing
Top-of-Rail Settlements

US 60 Stanley
Top-of-Rail Settlements

KY Coal Terminal
## Top-of-Rail Settlements

### Isom

<table>
<thead>
<tr>
<th>Station</th>
<th>Settlement (in.)</th>
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<td>12/19/06</td>
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### Graphs

- **Elevation (ft.)** vs. **Station**
- **Settlement (in.)** vs. **Months**

The graphs illustrate the changes in elevation and settlement over time. The data points show the progression of settlement over various months, with the settlement in inches and the station locations marked accordingly.
Top-of-Rail Settlements

Flag Spring

- Average approach settlement (both rails): 0.805 in, 1.451 in, 1.727 in
- Average crossing settlement (both rails): 0.812 in, 1.245 in, 1.669 in

Note: Bold lines indicate crossing area.