Bike Paths and Low Volume Mixes

Ohio Asphalt Paving Conference
Wednesday, February 7, 2018

Presented by
James A. Marszal, PE
Pavements, Materials & Field Applications Engineer
Flexible Pavements of Ohio
Bike Paths

aka...Shared Use Paths (Rail Trails, Greenway Trails, Waterfront Paths, Side Paths)
  Multi-Use Paths
  All Purpose Paths
  Bikeways

**Shared Use Paths** are multi-use paths designed primarily for use by bicyclists and pedestrians, including those with disabilities, for transportation and recreation purposes. Shared use paths are physically separated from motor vehicle traffic by an open space or barrier.
Topics Presented:

- Bike Path Design
  - Design resources

- Bike Path Construction
  - Issue(s) affecting pavement performance
  - Recommended solutions

- Low Volume Asphalt Concrete for Bike Paths
## 702 Shared Use Paths

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>702.1</td>
<td>General</td>
<td>7-2</td>
</tr>
<tr>
<td>702.1.1</td>
<td>Accessibility Requirements for Shared Use Paths</td>
<td>7-2</td>
</tr>
<tr>
<td>702.2</td>
<td>Elements of Design</td>
<td>7-2</td>
</tr>
<tr>
<td>702.2.1</td>
<td>Width and Clearance</td>
<td>7-2</td>
</tr>
<tr>
<td>702.2.2</td>
<td>Shared Use Paths Adjacent to Roadways (Sidepaths)</td>
<td>7-3</td>
</tr>
<tr>
<td>702.2.3</td>
<td>Design Speed</td>
<td>7-5</td>
</tr>
<tr>
<td>702.2.4</td>
<td>Horizontal Alignment</td>
<td>7-5</td>
</tr>
<tr>
<td>702.2.5</td>
<td>Cross Slope</td>
<td>7-5</td>
</tr>
<tr>
<td>702.2.6</td>
<td>Grade</td>
<td>7-6</td>
</tr>
<tr>
<td>702.2.7</td>
<td>Stopping Sight Distance</td>
<td>7-6</td>
</tr>
<tr>
<td>702.2.8</td>
<td>Surface Structure</td>
<td>7-6</td>
</tr>
<tr>
<td>702.2.9</td>
<td>Bridges and Underpasses</td>
<td>7-6</td>
</tr>
<tr>
<td>702.3</td>
<td>Shared Use Path Intersection Design</td>
<td>7-7</td>
</tr>
<tr>
<td>702.3.1</td>
<td>Design of Mid-Block Crossings</td>
<td>7-7</td>
</tr>
<tr>
<td>702.3.2</td>
<td>Sidepath Intersection Design</td>
<td>7-7</td>
</tr>
</tbody>
</table>
Typical Cross Section of Two-Way Shared Use Path on Independent Right-of-Way

Post-Mounted Sign or Other Traffic Control Device

Edge of Shared-Use Path

Notes:
* Maximum Slope (Typ.)
* More if necessary to meet anticipated volumes and mix of users, per the FHWA Shared Use Path Level of Service Calculator

January 2014

- Original Version 1999
- Current Version 2012
- 200 pages + figures & tables
- February 2013 Errata
- February 2017 Errata
This document describes how to use a new method to analyze the quality of service provided by shared-use paths of various widths that accommodate various travel mode splits.

- Considers widths from 8-20 ft.

- July 2006
NACTO
-National Association of City Transportation Officials

FHWA
Federal Highway Administration
SEPARATED BIKE LANE PLANNING AND DESIGN GUIDE
Ohio Bike & Pedestrian Program Design

Designing pedestrian and bicycle facilities requires an understanding of the surrounding context and the needs of the community. A functional approach to understanding the surrounding context and the needs of the community is to consider the surrounding context and the needs of the community. A functional approach to understanding the surrounding context and the needs of the community is to consider the surrounding context and the needs of the community.

Bicycle & Pedestrian Information

Bicycles & Trails

Announcements

Bicycle and Pedestrian Resources for Engineers

Resources

Bicycle & Pedestrian Program

The Bicycle & Pedestrian Program (BPP) is available to
communicate opportunities and

Bicycle & Pedestrian Info

Regional

Announcement

The Bike & Pedestrian Program

Contact Us

Contact Us
Bike Path Construction: Common Issues Affecting Bike Path Performance

- Soft Subgrade
- Poor Drainage
- Thin or Weak Pavement Structure

Observable Distress:
- Edge Cracking
- Irregular Settlement => Raveling/cracking/disintegration due to standing water or perpetually wet pavement or subgrade conditions
- Age related oxidation and fatigue cracking
Design/Construction Recommendations to improve performance:

- Consider conducting a sub-surface investigation

- Item 204 – Subgrade Compaction & Proof Rolling

- Item 304 – Aggregate Base; 6” preferred, 4” acceptable

- Extend aggregate base 6-12” beyond edges of bike path asphalt

- Inspect subgrade preparation and aggregate placement to ensure a uniform depth of aggregate base is placed full width. Avoid thin edges that will result in reduced support and potential edge failure

- Consider specifying granular material(s), geotextile fabrics and geogrids for undercuts in soft, weak or wet areas
Design/Construction Recommendations (continued):

- Install path above curb/roadway to help with drainage and reduce runoff across the path

Paving Operation:

- Consider smaller trucks or lighter loads for asphalt concrete delivery
- Consider load limits for distributor if tack coat is specified
- Consider including a plan note advising the contractor that he may encounter soft(er) subgrade conditions when constructing the bike path. State that the contractor shall be responsible for providing an appropriate paver, trucks and rollers suitable for those conditions
When circumstances require paving over soft subgrades, consider placement of one lift of asphalt concrete surface course instead of separate intermediate and surface course lifts.

Bike path pavement looks better if concrete curb ramps can be installed first so that paving can be pulled away from ramps. This approach also prevents concrete ramps from cracking.

Generally Not Recommended:

Item 206 – Subgrade Stabilization

- Rarely used
- Costly
- Impractical for most bike path projects
Typical Bike Path Cross Section:

1. ITEM 448 - 1 1/4” ASPHALT CONCRETE, SURFACE COURSE, TYPE 1, PG54-22, MEDIUM TRAFFIC
2. ITEM 448 - 1 3/4” ASPHALT CONCRETE, INTERMEDIATE COURSE, TYPE 2, PG64-22, MEDIUM TRAFFIC
3. ITEM 304 - 6” AGGREGATE BASE
4. ITEM 204 - SUBGRADE COMPACTION
5. ITEM 659 - SEEDING & MULCHING AS PER PLAN
6. ITEM 653 - 3” MIN. PULVERIZED TOPSOIL, FURNISHED AND PLACED, AS PER PLAN OR APPROVED EQUAL

MULTI-USE PATH — TYPICAL CROWNED SECTION

NOT TO SCALE
Low Volume Asphalt Concrete for Bike Paths

What Attributes do we want for Low Volume Asphalt Concrete?

- Resilient (self-healing, less brittle, improved crack resistance, slower oxidation)
- Places consistently with uniform texture and is segregation resistant
- Low permeability is desired
- Aesthetically positive to the owner/agency and user
How do we achieve those attributes?

- Softer binders
- Higher binder content
- Finer aggregate gradation
- Polymer binders
  - Resistant to cracking (fatigue and thermal)
  - Resistant to moisture damage (stripping, raveling)
  - Durability = reduced maintenance effort/costs
  - Extends service life of pavement (2-5 yrs/5-10 yrs)
Misc. Pavement Design Issues:

- Item 408 Prime Coat
- Item 407 Tack Coat (0.40 gal/sq yd or fog spray)
- Assuming 3 inch Bike Path Pavement
  - 1 ¾ “ Intermediate / 1 ¼ ” Surface
  - 2 ” Intermediate / 1 ” Surface
  - 3 ” Surface
Item 424 – Fine Graded Polymer Asphalt Concrete, Type A

- Recipe mix (for light or medium traffic applications)
- Blend of sands w/ 8.5% polymer modified asphalt binder (PG 76-22M)
- Silicon dioxide requirement on the fine agg. ensures good skid resistance
- Highest polymer dosage used in today’s market enhances mix toughness, stability, and longevity
- 5/8 ” < thickness < 1”
Item 424 – Fine Graded Polymer Asphalt Concrete, Type B

- Volumetric mix design (typ. for medium or heavy traffic)
- ½-inch max. sized coarse agg. and sand particles w/ min. polymer binder content of 6.4% (PG 76-22M)
- Silicon dioxide requirement on the fine agg. ensures good skid resistance
- One of the highest polymer dosages used in today’s market enhances mix toughness, stability, and longevity
- 10% RAP permitted
- ¾” < thickness < 1 ¼”
Gea-306, ODOT D-12
2009 Project
2012 Picture
Smoothseal - Ohio DOT’s Fine-Graded Polymer Asphalt Concrete

Types of Smoothseal
Technical Resources: Smoothseal
Thinlay Asphalt Concrete

- Volumetric Mix Design
- One Specification with 4 mixes designed for various traffic levels
- ¼” (6.3 mm) max. nominal aggregate size
- Minimum Total Binder 6.6% For LT and ULT Mixes; 6.4% for MED Mix
- PG 58-28 for LT Mix; PG 52-28 for ULT Mix; PG 64-22 for MED Mix
- ¾” < thickness < 1”
Ohio Thinlay Asphalt Concrete

<table>
<thead>
<tr>
<th>Traffic Condition:</th>
<th>HT</th>
<th>MED</th>
<th>LT</th>
<th>ULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADT:</td>
<td>---</td>
<td>---</td>
<td>&lt;2500</td>
<td>&lt;500</td>
</tr>
<tr>
<td>ADTT:</td>
<td>&gt;1500</td>
<td>250-1499</td>
<td>&lt;250</td>
<td>&lt;25</td>
</tr>
<tr>
<td>Course Thickness:</td>
<td>¾ to 1-inch</td>
<td>¾ to 1-inch</td>
<td>¾ to 1-inch</td>
<td>¾ to 1-inch</td>
</tr>
<tr>
<td>Composition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Traffic:</strong></td>
<td>HT</td>
<td>MED</td>
<td>LT</td>
<td>ULT</td>
</tr>
<tr>
<td>Gradation:</td>
<td>6.3 mm (1/4-inch) Maximum Nominal Aggregate Size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine agg. (passing no. 8) proportions:</td>
<td>Blend 65/35h (95% mech. crush/nat. sd.)</td>
<td>Blend 50/50 (95% mech. crush/nat. sd.)</td>
<td>&gt;50% nat. sd.</td>
<td>&gt;50% nat. sd.</td>
</tr>
<tr>
<td>Coarse agg. angularity:</td>
<td>90% mech. Crushed</td>
<td>90% mech. Crushed</td>
<td>per 703.05</td>
<td>per 703.05</td>
</tr>
<tr>
<td>RAP (max %):</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>RAP Preparation:</td>
<td>ODOT Method 2 (extended) RAP, Table 401.04-2, 100% pass 9/16-inch sieve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virgin Binder (min.):</td>
<td>5.2</td>
<td>5.2</td>
<td>5.2</td>
<td>5.2</td>
</tr>
<tr>
<td>Total Binder (min):</td>
<td>6.4</td>
<td>6.4</td>
<td>6.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Virgin Binder (type):</td>
<td>70-22M</td>
<td>64-22</td>
<td>58-28</td>
<td>52-28</td>
</tr>
</tbody>
</table>
Wayne-539, ODOT D-3
Shelly & Sands, Inc.
PG 52-28
8/18/17
Lak-20, ODOT D-12
Karvo Paving
PG 70-22M
8/28/17
Technical Resources: Thinlay Asphalt Concrete

Technical Bulletin: Thinlay For Use As Pavement Preservation

SURFACE TREATMENTS — 1997

GENERAL
The following is intended as a general preservation treatment procedure for maintenance asphaltic surface treatments that are similar in terms of being able to be placed in the same way and with the same dilution or blend as a binder. It is intended to be used in a Thinlay Asphalt Concrete, which is a method of applying asphaltic concrete to a pavement.

FLEXIBLE PAVEMENTS OF OHIO
An Association for the development, improvement and advancement of quality asphalt pavement design, construction, maintenance and repair.
6205 Eastway Drive, Suite 600
Columbus, OH 43214
614-416-1811
info@flextarmac.org
www.flextarmac.org

In Thinlay Asphalt Concrete, the binder is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete. This binder is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete. Thinlay Asphalt Concrete is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete. Thinlay Asphalt Concrete is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete. Thinlay Asphalt Concrete is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete.

DESCRIPTION OF CANDIDATE PROJECTS

The specifications for Thinlay Asphalt Concrete are based on the following:

- \textbf{Purpose:} To provide a binder that can be used as a surface treatment.
- \textbf{Application:} As an overlay to an existing asphalt surface.
- \textbf{Advantages:} Lower cost, reduced labor, and improved ride quality.

The binder is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete. Thinlay Asphalt Concrete is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete. Thinlay Asphalt Concrete is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete. Thinlay Asphalt Concrete is delivered specifically for the Thinlay product and is delivered in a Thinlay Asphalt Concrete.
SS 823 – Light Traffic Asphalt Mixture Composition Requirements

- Item 823 – Asphalt Concrete Surface Course, Type 1, (448)
- Item 823 – Asphalt Concrete Intermediate Course, Type 1, (448)
- Item 823 – Asphalt Concrete Intermediate Course, Type 2, (448)

Designer Note: This item is for use in locations with little or no truck traffic (<50 trucks per day). Locations where this item may be used include state park roads, parking lots, driveways, and bike paths. This item is not for use on any state highway.

- PG 64-22 binder

- 35 blow design = higher binder content; + 0.2-0.3% typ. => 6.0-6.4%

- Gradation; surface ½ “ max, but, slightly finer than 441 Type 1

- 1”< thickness < 1 ½”; typical thickness = 1 ¼”
Item 441 – Asphalt Concrete Surface Course, Type 1, (448)

- Volumetric Mix Design
- Designed for Medium Traffic, i.e. 50 blow mix
- ½ “ max. aggregate
- Asphalt Binder: PG 64-22 at 5.8-10.0%; Typ. 5.8-6.1%
- 1” < thickness < 1 ½ ”; typical thickness = 1 ¼ “
- Or...one 3” lift when paving over soft subgrades

Item 441 – Asphalt Concrete Intermediate Course, Type 2, (448)
  - Typ. placed at 1 ¾ ” (min); but can be placed at 2”+
Technical Resources: ODOT Items 823-Type 1 and 441-Type 1
Special Pavement Option:

Porous Asphalt Pavement
Conclusion:

1) Bike Path Design
   ▪ See ODOT Internet Planning Site for additional information and links

2) Construction
   ▪ Extend 304 aggregate 6-12” beyond limits of bike path pavement and inspect for uniform depth
   ▪ Adjust equipment, methods and materials when paving over soft subgrades
Conclusion:

3) **Low Volume Asphalt Concrete**

- **Intermediate Course**
  - Item 823 – Asphalt Concrete Intermediate Course, Type 2, (448)
  - Item 441 – Asphalt Concrete Intermediate Course, Type 2, (448)

- **Surface Course**
  - Item 424 – Fine Graded Polymer Asphalt Concrete, Type A
  - Item 424 – Fine Graded Polymer Asphalt Concrete, Type B
  - Item 690 – Thinlay Asphalt Concrete, Type (ULT, LT, MED), (448)
  - Item 823 – Asphalt Concrete Surface Course, Type 1, (448)
  - Item 441 – Asphalt Concrete Surface Course, Type 1, (448)

- Item Special – Porous Asphalt Pavement
I would like to thank
Bradley Foster, PE, PS
Assistant County Engineer
Franklin County, Ohio
for the Franklin County Bike Path Background
Information and Pictures
Questions?

Thank you!

James A. Marszal, P.E.
Pavements, Materials and Field Applications Engineer
Flexible Pavements of Ohio
james.marszal@flexiblepavements.org
info@flexiblepavements.org
www.flexiblepavements.org
p 888.4HOTMIX