ACEC/DPW Designer Workshop

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*August 31, 2023*
Content Covered:

- Brief History of Indy Greenways
- Indy Greenways Design Standards
  - Regulatory Standards
  - Indy Greenways Design Standards Reference Table
  - Signs
  - Pavement Design
  - Clear Zone – Roadway + Other Hazards
  - Pedestrian Railings
  - Placement of Trailheads, Access Points, Rest Areas
  - Items Often Overlooked in Design Scope
  - New Items/Guidance
    - Bollards
    - Trail Crossings
When was the first Greenways Plan for the City of Indianapolis created and what is it called?

First one to raise hand and answer correctly wins a prize!
The “Kessler Plan”, 1909
Total Miles Planned: +250

Total Miles Built to Date: 77

Additional 38 miles completed by 2028!!!
Indy Greenways Full Circle Master Plan
2014-2024

Overview:

• Establishes over 250 miles of greenways

• Provides greenway connections to over 70 Indy Park facilities

• Provides regional connection to eleven regional trail systems

• Chapter 4: Design Standards – see QR Code for a link
Indianapolis Trails & Greenways

Regulatory Design Standards

- Including:
  - AASHTO
  - ADA
  - MUTCD
  - NACTO
  - IDM: INDOT Design Manual
  - DPW Design Standards and Memos
  - USACE Louisville SOP's
# Indy Greenway Design Standards

<table>
<thead>
<tr>
<th></th>
<th>AASHTO</th>
<th>ADA</th>
<th>PROPOSED INDY GREENWAYS STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum width- Shared-use Path</td>
<td>8' Minimum</td>
<td>4' Min. (one way)</td>
<td>10' wide- typical trail section</td>
</tr>
<tr>
<td></td>
<td>11-14' Optimum</td>
<td>5' Min. (two way)</td>
<td>8' wide- sidepaths, where context dictates, low user counts</td>
</tr>
<tr>
<td>Maximum Longitudinal Slope</td>
<td>5% (1:20)</td>
<td>5% (1:20)</td>
<td>5% (1:20)</td>
</tr>
<tr>
<td>Maximum Cross Slope</td>
<td>1% (1:100) Recom.</td>
<td>1% (1:100) Recom.</td>
<td>1% (1:100) Recom.</td>
</tr>
<tr>
<td></td>
<td>2% (1:50) Max.</td>
<td>2% (1:50) Max.</td>
<td>2% (1:50) Max.</td>
</tr>
<tr>
<td>Clear Zone</td>
<td>2' Minimum</td>
<td>2' Minimum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3' Optimum</td>
<td>3' Optimum</td>
<td></td>
</tr>
<tr>
<td>Minimum Vertical Clearance</td>
<td>8' Minimum</td>
<td>8' Minimum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10' Optimum</td>
<td>10' Optimum</td>
<td></td>
</tr>
<tr>
<td>Minimum centerline curve radii (18 mph design speed)</td>
<td>60'</td>
<td>95'</td>
<td></td>
</tr>
<tr>
<td>Guardrail height</td>
<td>42”/48”</td>
<td>30” or greater</td>
<td>48” standard height (54” where conditions warrant additional protection)</td>
</tr>
<tr>
<td>Separation from Vehicle Lanes</td>
<td>5’ (or barrier rail)</td>
<td>5’ (or barrier rail)</td>
<td></td>
</tr>
</tbody>
</table>
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Signage Design Standards

To be included in bid plans

SIGN TABLE and
CONSTRUCTION DETAILS:

• Lat/Long of each sign

• Sign Type – per Greenways Design Standard Type (9)

• Construction Details – provided in Greenways Design Standards

• Trailside Map and Trailhead Graphics Files

• Technical Specification
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Signage Design Standards

• Trailhead Signs

• Purpose: Greet users and set the tone for the trail experience, interpret context

• Placement: Each access point and trailhead

• Include trail map, trail etiquette, interpretive info, and emergency response procedures
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Signage Design Standards

• Mile Marker Signs

• Purpose: Orient users to location and aid emergency response

• Placement: Every ¼ mile

• Emergency Disk on each mile marker post

• Exact location of mile markers critical to safety
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Signage Design Standards
Emergency Location System

- Emergency Disk to be placed on every sign except regulatory signs
- Used as an emergency location system
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Signage Design Standards

• Regulatory Signs

  • Purpose: Direct users to potential hazards and give cues to expected trail behavior

  • Must follow MUTCD standards

  • Placement: As dictated by MUTCD

  • Emergency Disks are not placed on regulatory signs
QUIZ TIME !!

Which signs should NOT include an Emergency Location System sign?

First one to raise hand and answer correctly wins a prize!
Pavement Design

Current Pavement design *differs* from Greenways Design Standard, INDOT E 604-NVUF-01 Standard Drawing, and Indy DPW Transportation Standard 101.05

**165 lb/sys Type B, Surface HMA**

275 lbs/syd

Type B, Intermediate 6" Compacted Aggregate Base

**4-6" concrete**

4-6" compacted aggregate base

2" compacted limestone fines

**4" compacted aggregate base**

**asphalt greenway paving**

**concrete greenway paving**

**crusher fines greenway paving**
Pavement Design

Indy DPW Transportation Standard 101.05 - TYPICAL TRAIL CROSS SECTION

275 lb/yd² HMA
Intermediate
Type B

ASPHALT TRAIL:
165#/SYS HMA, SURFACE, TYPE A: 9.0MM
330#/SYS HMA, INTERMEDIATE, TYPE A: 19.0MM
SUBGRADE TREATMENT, TYPE III

NOTE:
1. CROSS SLOPE SHALL BE 2% MAXIMUM FOR CROWNS, TRANSITIONS, AND SUPERELEVATIONS.
Pavement Design
INDOT E 604-NVUF-01 Standard Drawing

NOTE:
1. Construct safety edge as required for Surface and Intermediate layers at edge of pavement.

165 lb/yd² HMA Surface Type B
265 lb/yd² HMA Intermediate Type B

INDIANA DEPARTMENT OF TRANSPORTATION
NON-MOTORIZED VEHICLE USE FACILITY
HMA PAVEMENT SECTION
SEPTEMBER 2017
STANDARD DRAWING NO. E 604-NVUF-01
Pavement Design

DPW Alternate for Consideration

- Allows for single lift
- Cost savings

- 330 lb/syd HMA Surface Type B
- 6” Compacted Aggregate
Clear Zone – Roadway + Other Hazards

- Standard Greenway Cross-Section

- 10 Typ., 8' Min. clearance
- 5.1 Max.
- 6.1 Max.
- 3.1 Max.
- 2% Max. cross slope
- 10' Typ. shared use path; 14' Max., 8' Min.
- 8' (Min.) Maintained Zone
- 2 Clear shoulder
- 30' min. Greenway width
- Buffer area, width varies

- 15' Tree planting setback
- Signage beyond 2' Clear shoulder, typ.
Clear Zone – Roadway + Other Hazards

- Roadway Separation with Curb

**Figure 51-7E**

<table>
<thead>
<tr>
<th>Roadway Speed Limit (mph)</th>
<th>Separation, ( b ) * (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \leq 30 )</td>
<td>5, minimum</td>
</tr>
<tr>
<td></td>
<td>3, minimum if parking permitted</td>
</tr>
<tr>
<td>35 or 40</td>
<td>5, minimum</td>
</tr>
<tr>
<td>( \geq 45 )</td>
<td>10, minimum</td>
</tr>
</tbody>
</table>

* or roadway clear-zone width, whichever is greater

**Figure 51-7F**
Clear Zone – Roadway + Other Hazards

- IDM Chapter 51 - Roadway Separation with No Curb

**Figure 51-7C**

<table>
<thead>
<tr>
<th>Roadway Speed Limit (mph)</th>
<th>Separation, ( b ) (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \leq 45 )</td>
<td>20, desirable</td>
</tr>
<tr>
<td></td>
<td>10, minimum</td>
</tr>
<tr>
<td>( \geq 50 )</td>
<td>24 to 35</td>
</tr>
</tbody>
</table>

* or roadway clear-zone width, whichever is greater

**Figure 51-7D**
Railings

DESIGN STANDARDS
Pedestrian railings shall be designed to meet both recreational and transportation standards including AASHTO and ADA. Specific criteria include:

- **Materials:** Pressure-treated or decay-resistant lumber, stainless steel cable systems for cable railings.
- **Height:** 47.5” Min, up to 54” where conditions warrant extra protection.
- Railing should not encroach into required 2’-0” clear zones adjacent to greenways.
- Utilize cable railing in areas where wood railings would interrupt desirable views such as along stream corridors.

![Railings Diagram](image-url)
Trailheads, Access Points, Rest Areas

What's the difference?

Trailhead

Access Point

Rest Node
**Trailhead**

- Major points of entry into the greenway system – provide parking, trail info., and other amenities
- Located on City property – preferably within a park
- Appropriate furnishings – benches, bike racks, waste receptacles, trailhead sign, landscaping
- Minimum of 10 parking locations
Access Points

- Located at least every two miles and provide parking for minimum of 4 vehicles

- Smaller, intermediate trailhead facilities – think local neighborhood connections

- Appropriate furnishings – benches, bike racks, waste receptacles, trailhead sign
Rest Nodes

- Located at least every 1/2 mile
- Furnishings based on space available – bench, bike rack, waste receptacle
- Where feasible, combined rest area with overlook, historic sites, scenic views
Greenways Project Scoping

Items Often Overlooked in Project Scope of Work

- **Traffic Analysis**
  - Volume, turning movements and vehicle type at peak hours, capacity analysis
  - Trail Crossing Analysis & recommendation
    - MUTCD, IDM – Ch. 51, NACTO, AASHTO
  - Sight Line Analysis

- **Sign Details & Graphic Files (.eps or .ai) for Production**
  - Including EDP Lat/long

- **Forestry Assessment & Mitigation Plan**
  - Be mindful of CRITICAL ROOT ZONE
  - Data needed in survey:
    - Tree size, condition, species

- **Stormwater Design**
  - Updated NPDES requirements
  - Levee Coordination

- **Landscape Design**
What sign should be included at every access point, node, or trailhead?

First one to raise hand and answer correctly wins a prize!
New Items/Guidance

- **Bollards**
  - Required per DPW Direction

- **Trail Crossings**
  - Treatments
  - Pavement Markings
  - Signal Warrant Analysis
  - Raised Crossing

- **Refuge Islands**

- **HAWK Signals**
  - Signs
  - Pavement Markings
New Items/Guidance

Bollards

- To be used at all midblock access points and where directed by City Project Manager
- Bollards to be used:
  - Collapsible, retro-reflective markings, top padlock
  - 4.5" Removable with retro-reflective markings, bottom lock – minimum 42" in height
- Placement:
  - 30' from edge of adjacent travel lane or curb in center of trail
- Pavement Markings:
New Items/Guidance

Trail Crossings

- Traffic Analysis Recommendations
  - IDM Chap. 51 Figure 51-7 O

- Additional analysis and review by DPW Traffic Safety based on TA Recommendations

- Treatments can include, but not limited to:
  - Raised Crossing
  - Signal – RRFB, HAWK, Full Signal
  - Speed Limit Reduction
  - Median Refuge Island
  - Lane Removal/Reduction
  - Grade Separation

<table>
<thead>
<tr>
<th>Speed Limit</th>
<th>Roadway Type</th>
<th>ADT</th>
<th>Proposed Treatments Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 30 mph</td>
<td>2 Lanes</td>
<td>&lt;12,000</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥12,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td>3 Lanes</td>
<td>&lt;12,000</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥12,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td>≥ 4 Lanes with Raised Median</td>
<td>12,000 ≤ ADT &lt; 15,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥15,000</td>
<td>(2 + (3 or 4)) or 5</td>
</tr>
<tr>
<td></td>
<td>≥ 4 Lanes without Raised Median</td>
<td>&lt; 9,000</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9,000 ≤ ADT &lt; 12,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥12,000</td>
<td>(2 + (3 or 4)) or 5</td>
</tr>
<tr>
<td>35 mph or</td>
<td>2 Lanes</td>
<td>&lt;12,000</td>
<td>2</td>
</tr>
<tr>
<td>40 mph</td>
<td></td>
<td>≥12,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td>3 Lanes</td>
<td>&lt;9,000</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9,000 ≤ ADT &lt; 15,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥15,000</td>
<td>(2 + (3 or 4)) or 5</td>
</tr>
<tr>
<td></td>
<td>≥ 4 Lanes with Raised Median</td>
<td>&lt;9,000</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9,000 ≤ ADT &lt; 15,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥15,000</td>
<td>(2 + (3 or 4)) or 5</td>
</tr>
<tr>
<td></td>
<td>≥ 4 Lanes without Raised Median</td>
<td>&lt;12,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥12,000</td>
<td>(2 + (3 or 4)) or 5</td>
</tr>
<tr>
<td>≥ 45 mph</td>
<td>2 Lanes</td>
<td>&lt;12,000</td>
<td>2 + (3 or 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥12,000</td>
<td>(2 + (3 or 4)) or 5</td>
</tr>
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<td></td>
<td>3 Lanes</td>
<td>&lt;12,000</td>
<td>2 + (3 or 4)</td>
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<tr>
<td></td>
<td></td>
<td>≥12,000</td>
<td>(2 + (3 or 4)) or 5</td>
</tr>
<tr>
<td></td>
<td>≥ 4 Lanes with Raised Median</td>
<td>&lt;15,000</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥15,000</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>≥ 4 Lanes without Raised Median</td>
<td>&lt;12,000</td>
<td>(2 + (3 or 4)) or 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥12,000</td>
<td>5</td>
</tr>
</tbody>
</table>

RECOMMENDED TREATMENT OF SHARED USE PATH AND ROADWAY INTERSECTION

Figure 51-7 O (Pg. 1 of 2)
New Items/Guidance

Trail Crossings – Pavement Markings

• All Trail Crossings must be MUTCD Compliant and should include:
  • 'TRAIL XING' (no bike symbol) - All Lanes
  • 'XX MPH' where applicable
  • Continental Crosswalk – **wider than ramp** where applicable – up to 20' in length to increase visibility
• Other pavement markings based on crossing treatment (HAWK, Raised Crossing, etc.)
New Items/Guidance

Trail Crossings – Median Refuge Islands

• Width of 10' or greater to accommodate cyclists with trailers

• Pavement Markings on the approach shall follow Section 31.02 of the MUTCD

• The approach edge shall be outlined in retroreflective white or yellow material – Section 3B.23 of the MUTCD
  • Reflective markers on the approach and top of nose curb preferred.
B&O TRAIL
FALL CREEK GREENWAY
POGUE’S RUN GREENWAY
NICKEL PLATE TRAIL
PLEASANT RUN GREENWAY
EAGLE CREEK GREENWAY
GRASSY CREEK (E/W)
INTERURBAN TRAIL

77    Miles of Existing
38    Miles of New Trails
 8    Miles of Reconstruction

2014 Plan 50% Complete!!!

2022-2028 - $105,000,000 in Funding for Construction
Secured!!
*Does not include Indianapolis Cultural Trail Expansions
Gretchen Zortman
Program Manager, Indianapolis DPW Trails & Greenways

Bill Kincius
Senior Project Manager, Indianapolis DPW Trails & Greenways

Heather Kilgour
Project Team Leader, United Consulting Engineers, Inc.

Questions?