PLANNING FOR TRAIL FACILITIES

Design Standards for Shared Use Paths

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PLANNING PROCESS
GOVERNING REGULATIONS
- Federally Funded
  - INDOT Design Manual – Chapter 51, Section 7.0
  - Indiana Manual for Uniform Traffic Control Devices (MUTCD) 2011
  - Americans With Disabilities Act and Architectural Barriers Act, Accessibility Guidelines – 2010 Standards (Signed March 2012 by DOJ)
  - Outdoor Accessibility Guidelines

- Locally Funded
  - Indiana Manual for Uniform Traffic Control Devices (MUTCD) 2011
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  - NACTO – Urban Design Guide

- Future Standards
  - AASHTO - Guide for the Development of Bicycle Facilities Update
  - US Access Board - Shared Use Path Guidelines
DEFINITIONS

SIDEWALK

TRAIL

BIKE LANE

SHARED USE PATH
**DESIGN SPEED**
- Average Speed of a Bicycle = 11 mph
- Average Speed of Recumbent Bicycle = 14 mph
- Minimum Design Speed = 15 mph (Urban Areas and Flat Areas)
- Desired Design Speed = 20 mph (Hilly Areas and Rural Areas)

**A. DESIRED MINIMUM RADIUS OF HORIZONTAL CURVE**
1. 15 MPH = 60 FEET (SIGN CURVE)
2. 20 MPH = 100 FEET
PATH WIDTH

- Average Width of a Bicycle = 2.0 Feet
- Average Bicycle Operating Space = 3 Feet
- 97.5 Percentile (large) Man Shoulder Width = 1’ 8”

A. Recommended = 10 Feet

B. Desired = 12 Feet or 14 Feet
   (Urban areas, wide maintenance vehicles)

A. Minimum = 8 feet
**VERTICAL CLEARANCE**

- Design Vertical Height = 8 Feet Minimum

**Other Considerations**
- A. Maintenance Vehicles and Emergency Vehicles – 10 Feet Required
- B. Tree Clearing – Recommend 12 Feet
TRAILHEAD ACCESSIBILITY

- Required to Have Access Routes Complying with American with Disabilities Act Between Parking, Path, and Trailhead Amenities
  A. Longitudinal Slope = Less than 5 %
  B. Cross Slope = Less than 2%

- Parking
  A. At Least 1 Van Accessible Space For Every 6 Car Accessible Spaces
  B. 1 Car Accessible Space Per 25 Spaces (Up to 100, See ADAAG for Over 100)
  C. Access Aisle = 5 Feet Wide
  D. Van Access Space = 11 Feet Wide
  E. Car Access Space = 8 Feet Wide
- PAVEMENT DESIGN / SECTION
  - INDOT Standard Pavement Section for HMA and PCCP
  - Pavement Section Can Be Modified, But Will Require Pavement Design, a Geotechnical Report, and Approval
- **RECOVERY AREA**

  - Minimum Graded Shoulder = 2 Feet Wide Graded @ 6:1
  
  - Desirable Clearance Between Lateral Obstructions = 3 Feet
    (Trees, Poles, Wall, Fences)

  - Desirable Clearance Between Edge of Path and a Grade Break Greater than 3:1 = 5 Feet
    
    **A)** Consider a Physical Barrier for the Following Conditions:
    1. Slope Greater Than 3:1 and Drop-off Greater Than 6 Feet
    2. Slope Greater Than 2:1 and Drop-off Greater Than 4 Feet
    3. Slope Greater Than 1:1 and Drop-off Greater Than 2 Feet
SAFETY RAIL / BICYCLE GUARDRAIL HEIGHT

- Minimum Height = 42 Inches

- Center of Gravity for a 95th Percentile Adult Male on a Bicycle = 45.9 Inches
  A. Consider Increasing Height Rail on Steep Declines With a Sharp Turn at the Bottom to 48 or 54 Inches
**SEPARATION BETWEEN PATH AND ROAD**

- **Minimum Separation Using AASHTO = 5 Feet**
  (Edge of Path to Edge of Road Pavement)

- **Minimum Separation Using INDOT Chapter 51**
  
  **A. Non-Curb Section**
  1. Speed Limit Less Than or Equal 45 MPH = 20 Feet Desirable
  2. Speed Limit Less Than or Equal 45 MPH = 10 Feet Minimum
  3. Speed Limit Greater Than or Equal 50 MPH = 24 to 35 Feet
  4. If Roadway Clear Zone is Greater, Must Use This Distance

  **B. Curb Section (From Back of Curb to Edge of Path)**
  1. Speed Limit Less Than or Equal 30 MPH = 3 Feet with Parking
  2. Speed Limit Less Than or Equal 30 MPH = 5 Feet Minimum
  3. Speed Limit 35 or 40 MPH = 5 Feet Minimum
  4. Speed Limit Greater Than 45 MPH = 10 Feet Minimum
  5. If Roadway Clear Zone is Greater, Must Use This Distance
SHARED USE PATH GRADING

- Cross Slope = 2%
- Shoulder Cross Slope = 4%

Profile Grade
- A. Less Than 5% is Desirable
- B. May Exceed 5% Where Terrain Requires For Short Distances (Recreation Trails)
  1. Between 5% and 7% for 800 Feet Max.
  2. Between 7% and 8% for 400 Feet Max.
  3. Between 8% and 9% for 300 Feet Max.
  4. Greater Than or Equal to 9% for 200 Feet Max.
- C. Consider Goal or Use of Trail
  1. Recreational?
  2. Safe Connection to Community?
     a) Maximum ADA Slope = 8.33%
PROFILE GRADE SLOPE MITIGATION

Consider the Following:

A. On Longer Grades Widen Pavement Width by 4-6 Feet to allow slower speed bicyclists to dismount and walk;
B. Eliminate hazards to the path user near the end of a steep downgrade or ramp;
C. Warn the path user by means of signage ahead of a steep downgrade hazard;
D. Provide signage stating the recommended descent speed;
E. Exceed the minimum stopping sight distance; or
F. Provide a series of short switchbacks near the top of a descent to contain the speed of a descending bicyclist, or consider a portion of 10 to 20 ft length with a 1 to 2% grade at the point of direction change on the switchbacks to provide a resting area for the path user.
G. Provide small resting areas to break up a longer Grade
ROADWAY CONFLICTS / INTERSECTIONS

Consider the Following:

A. Path Should Intersect Road at a 90-Deg Angle When Possible
   (Maximum 45 Degree Skew is Acceptable)

B. Increase Path Width at Intersection to Reduce User Conflicts

C. Provide Roadway Signage to Alert Motorists of Crossing

D. Provide Visible Crosswalk to Increase Awareness

E. Detectable Warnings Should Be Provided at All Crossings

F. Provide Signage to Indicate Whether Path User or Motorist has the Right-of-Way

G. Use Engineering Judgment and Warrants in MUTCD to Decide if Signalization is Required
ROADWAY CONFLICTS / REFUGE ISLAND

Consider if One or More of the Following Apply:

A. A high roadway traffic volume or speed creates unacceptable conditions for the path user;

B. The roadway is wider than 75 ft, or a pedestrian walking at 2.5 ft/s cannot completely cross the street during the green traffic-signal phase;

C. A mid-block shared-use-path crossing or a path-roadway intersection is located where there are limited gaps in traffic (complete gap study);

D. The crossing will be used by a number of people who cross relatively slowly, such as the elderly schoolchildren, persons with disabilities, etc.
ROADWAY CONFLICTS / RESTRICTION OF MOTOR VEHICLE

- Consider the Following:
  
  A. A Lockable, Removable, or Collapsible Bollard  
     (Can Create an Obstacle for Path Users)
  
  B. Split Trail Into 5 Feet Sections Separated By Landscaping
### STRUCTURES

#### Bridge

A. A Structure Crossing a Stream with a Drainage Area of At Least 1 mi square

B. Requires an IDNR Construction in a Floodway Permit

C. Requires Hydraulic Modeling and Shall Not Create Backwater During a 100 Year Event

D. Should Match the Approaching Path Width Plus a 2-Ft Clear Width on Each Side of the Path

E. The Minimum Path Width is 8 Feet Plus 2-Ft Clear on Each Side
QUESTIONS?