TRENDS AND CHALLENGES IN TRAIL DESIGN

ODOT & FHWA Perspective

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Before Design

- Preliminary Planning
- Determine logical termini
- Secure funding source
- Coordinate with oversight agency

Before Design

- Determine Logical Termini
  - Federal requirement
  - Development of preliminary plan

- Determine Logical Termini
  - Best to develop a master plan

- Determine Logical Termini
  - Best to develop a master plan

Before Design

- Determine Logical Termini
  - Typical termini
    - Connection to an existing trail
    - Gap closure
    - Park facility
    - Designated bike route

- Typical termini
  - Designated bike route

- Typical termini
  - Designated bike route

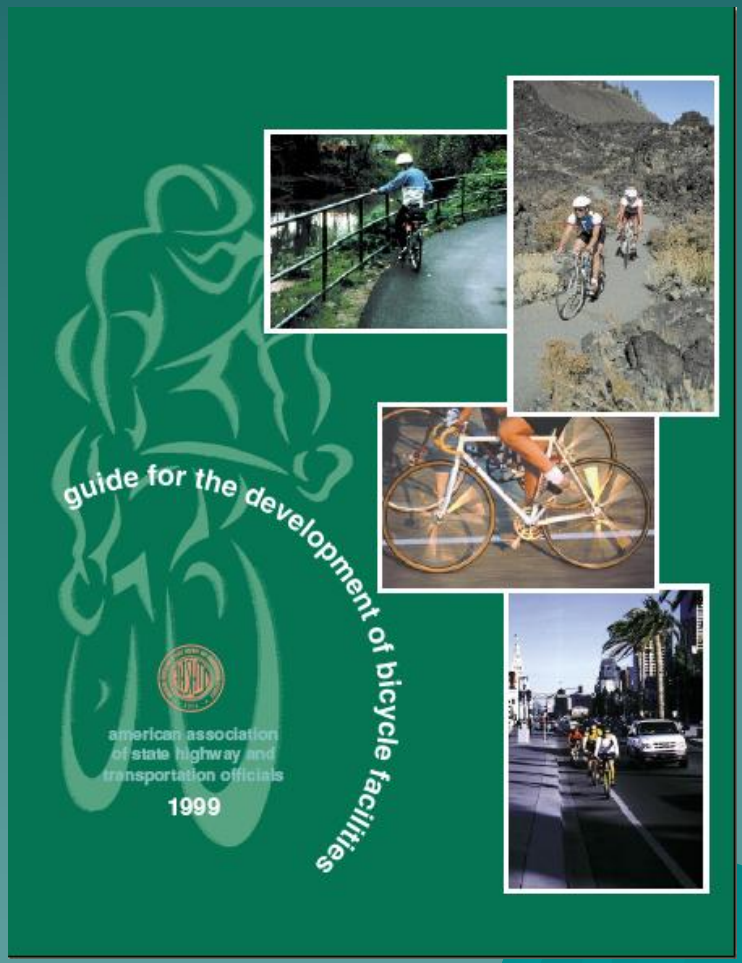
- Typical termini
  - Designated bike route

Design Considerations

- Remember: Rails-to-Trails are not always a fait accompli. Consider the following:
  - Typical section requirements
  - Drainage issues
  - Environmental issues
  - Right of Way
  - Utilities

Design References

- AASHTO "Guidelines for the Development of Bicycle Facilities," (1999 or latest edition)
- New Edition coming in June, 2012



Design References

Many of the provisions being developed by the Regulatory Negotiation Committee on Outdoor Developed Areas, such as surface treatment, minimum path width, changes in the level surface, and passing space, will automatically be met in the construction of a path suitable for bicycle travel.

Once these provisions are adopted, they should be consulted when designing bicycle facilities.

What if an existing path is not accessible? Do as much as possible to remove the barriers. Good signing at the trail access points that identify situations that could be difficult to traverse (such as steep grade and cross slope, narrow width and uneven surface conditions) will help users determine for themselves whether to use the path.

Design References

- FHWA Publication No. FHWA-EP-01-027, "Best Practices Design Guide Part 2, Designing Sidewalks and Trails for Access," (2001)

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- AASHTO "Guidelines for the Development of Bicycle Facilities," (1999 or latest edition)
- OMUTCD "Ohio Manual of Uniform Traffic Control Devices (2012, Chapter 9)
- Additional References
  - ODOT Division of Planning Bike & Pedestrian Program web site
    - www.dot.state.oh.us/Divisions/Planning/SPR/bicycle/Pages/default.aspx
  - ODOT Local Technical Assistance Program website
    - www.dot.state.oh.us/Divisions/Quality/LTAP/Pages/default.aspx
  - Local MPO (Metropolitan Planning Organization): NOACA, AMATS, SCATS, EDATA, etc.

Types of Bicycle Facilities

- Bike Lane

  Designated area within the roadway established with pavement markings and signs along corridors where bicycles share the street with vehicles in adjacent lane.

Bike Lane Typical Section

- Lane Width: 5’
- Curb or Graded Shoulder With No Drop Off
- Carry Lanes Across All Bridges
- Lane Markings and Signage
- Special Design Features

Types of Bicycle Facilities

- Shared Use Path (aka Bike Path)

  An off road facility shared by recreational users (i.e. pedestrians, joggers, bicyclists, skaters, & other non motorized vehicles) separated from roadway traffic.

Types of Bicycle Facilities

- Share the Road

  A roadway facility shared by motorized traffic and bicyclists in the same lanes. It is recommended signage and pavement markings be used to remind all users to share the road

Share the Road Typical Section

- Lane Width: Widest Possible
- Curb or Graded Shoulder
- Lane Markings (Sharrows) and Signage
- Special Design Features (Grates)

Bike Path Typical Section

- Width
  - Path Width = 10’
  - Graded Shoulder = 2’
  - Bridge or Tunnel Width = 14’
- Cross Slope
  - Path Slope = 2% pref., 3% max
    - No crown is preferred
  - Graded Shoulder = 12:1 pref., 6:1 max

Bike Path Typical Section

- Horizontal Clearance
  - Obstructions: 3’ desired, 2’ min.
  - Separation from Roadway: 5’ or Barrier
  - Steep Embankment (> 3:1): 5’
- Vertical Clearance
  - 10’ desired, 8’ min.

Bike Path Typical Section

- Pavement Composition
  - Design for expected emergency, law enforcement, & maintenance vehicles
  - ODOT commercial drive design is recommended

Bike Path Typical Section

Horizontal Alignment

- The criteria established in the ASHTO and FHWA publications establish the threshold for safety in design. Also remember that an aesthetically pleasing and enjoyable facility is most desirable.

Horizontal Alignment

Vertical Alignment

- Maximum length of steep profile grades
  - AASHTO page 70

Grade

Grades on shared use paths should be kept to a minimum, especially on long inclines. Grades greater than 5 percent are undesirable because the ascents are difficult for many bicyclists to climb and the descents cause some bicyclists to exceed the speeds at which they are competent or comfortable. On some shared use paths, where terrain dictates, designers may need to exceed the 5 percent grade recommended for bicycles for some short sections. As a general guide, the following grade restrictions and grade lengths are suggested:*

5-6%	for up to 240 m (800 ft)
7%	for up to 120 m (400 ft)
8%	for up to 90 m (300 ft)
9%	for up to 60 m (200 ft)
10%	for up to 30 m (100 ft)
11+%	for up to 15 m (50 ft)

Vertical Alignment

- Maximum length of steep profile grades
  - FHWA page 16-5

CHAPTER 14 SHARED USE PATH DESIGN

If steeper segments are incorporated into the shared-use path, the total running grade that exceeds 8.33 percent should be less than 30 percent of the total trail length. In addition, it is essential that the lengths of the steep sections are minimized and are free of other access barriers. Negotiating a steep grade requires considerable effort. Users should not be required to exert additional energy to simultaneously deal with other factors, such as steep cross slopes and change in vertical levels. When designing maximum grade segments, the following recommendations should be used:

- 8.3 percent for a maximum of 61.0 m (200 ft);
- 10 percent for a maximum of 9.14 m (30 ft); and
- 12.5 percent for a maximum of 3.05 m (10 ft).

Although the recommended maximum grades are similar to those recommended in the 1999 AASHTO Guide for the Development of Bicycle Facilities, the maximum distances are significantly shorter.

Near the top and bottom of the maximum grade segments, the grade should gradually transition to less than 5 percent. In addition, rest intervals should be provided within 7.6 m (25 ft) of the top and bottom of a maximum grade segment. Rest intervals may be located on the shared-use path but should ideally be located adjacent to the path for the safety of all users (see Section 14.5.2). Well-designed rest intervals should have the following characteristics:

- Grades that do not exceed 5 percent;
- Cross slopes on paved surfaces that do not exceed 2 percent and cross slopes on non-paved surfaces that do not exceed 5 percent;

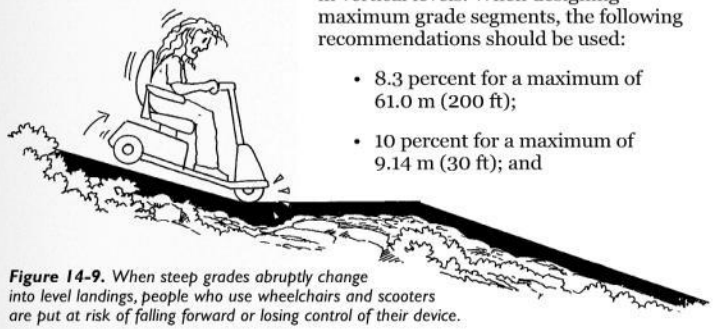

Figure 14-9. *When steep grades abruptly change into level landings, people who use wheelchairs and scooters are put at risk of falling forward or losing control of their device.*

Vertical Alignment

- Maximum length of steep profile grades

5% < Grade ≤ 6%	up to 800ft
6% < Grade ≤ 7%	up to 400ft
7% < Grade ≤ 8%	up to 300ft
8% < Grade ≤ 8.33%	up to 200ft *
8.33% < Grade ≤ 10%	up to 30ft *
10% < Grade ≤ 12.5%	up to 10ft *

Vertical Alignment

- Maximum length of steep profile grades
  - Exception: when the path is adjacent to a roadway, it can follow the roadway profile.

Vertical Alignment

Vertical Alignment

Vertical Alignment

ADA Compliance

- ADA (Americans with Disabilities Act)
- Curb Ramps
  - Provide truncated domes

ADA Compliance

- ADA (Americans with Disabilities Act)
- Curb Ramps
  - Provide truncated domes
- Accessibility
  - The trail (shared use path) is considered a “facility.”
  - Access to the “facility” is subject to the ADAAG (Americans with Disabilities Act Accessibility Guidelines)

ADA Compliance

ADA Compliance

Vehicular Crossings

- Pave drives for at least 10’ on each side of the path

Vehicular Crossings

- Slow down users with geometrics & provide Safe Stopping Distance at intersection

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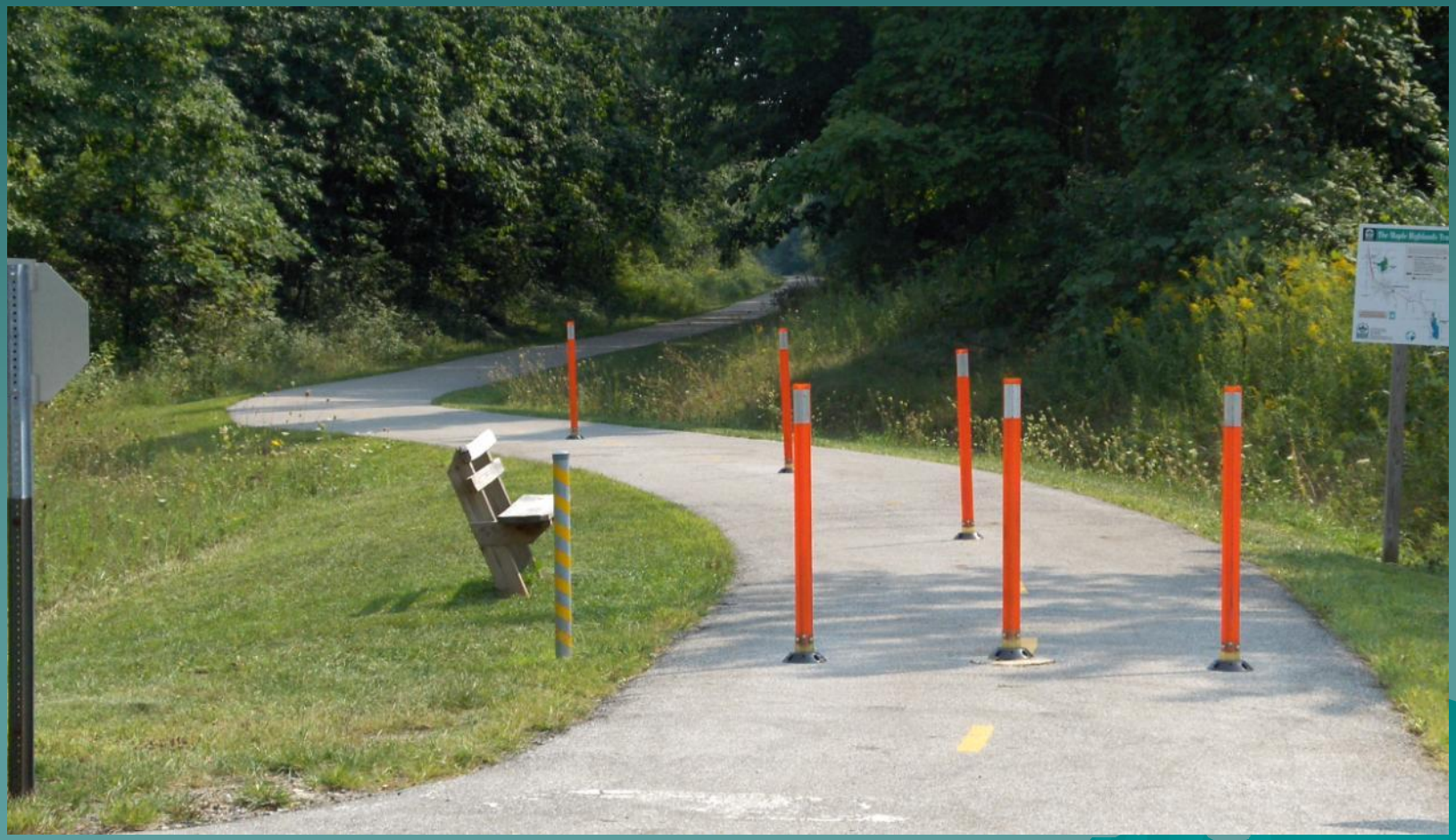
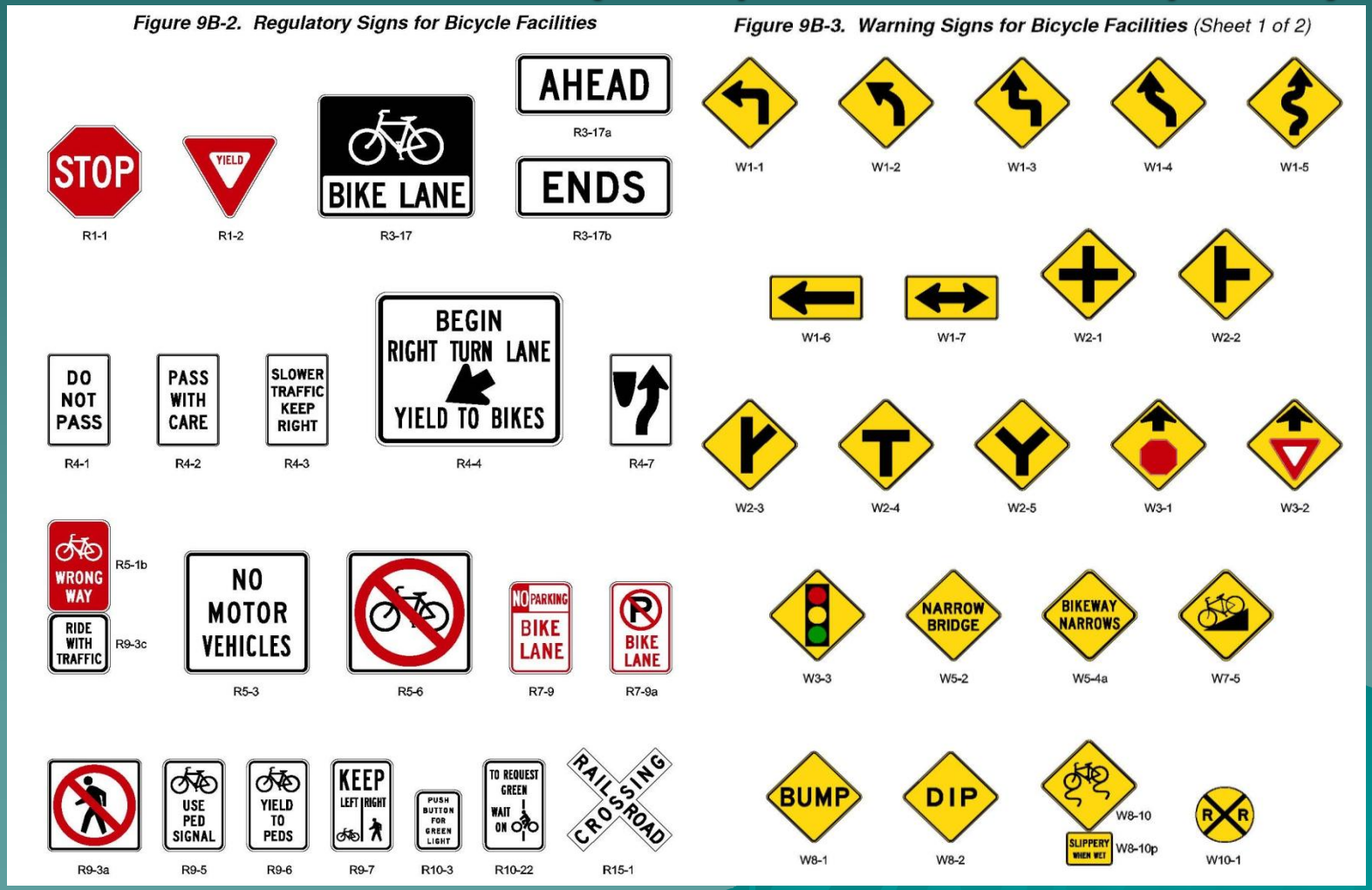


Vehicular Crossings

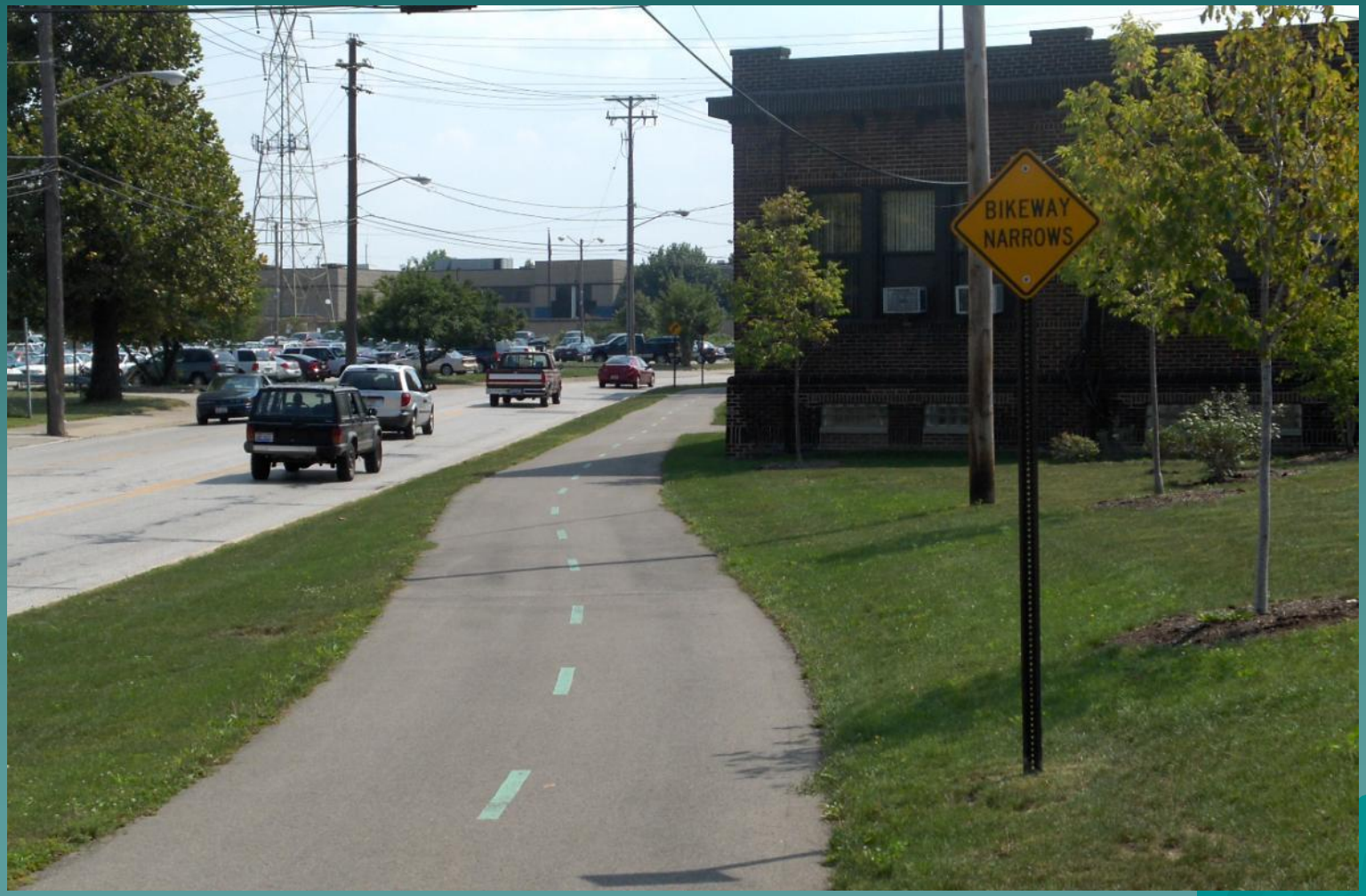
- Signing and striping per AASHTO manual and the OMUTCD (Chapter 9 for bicycles)



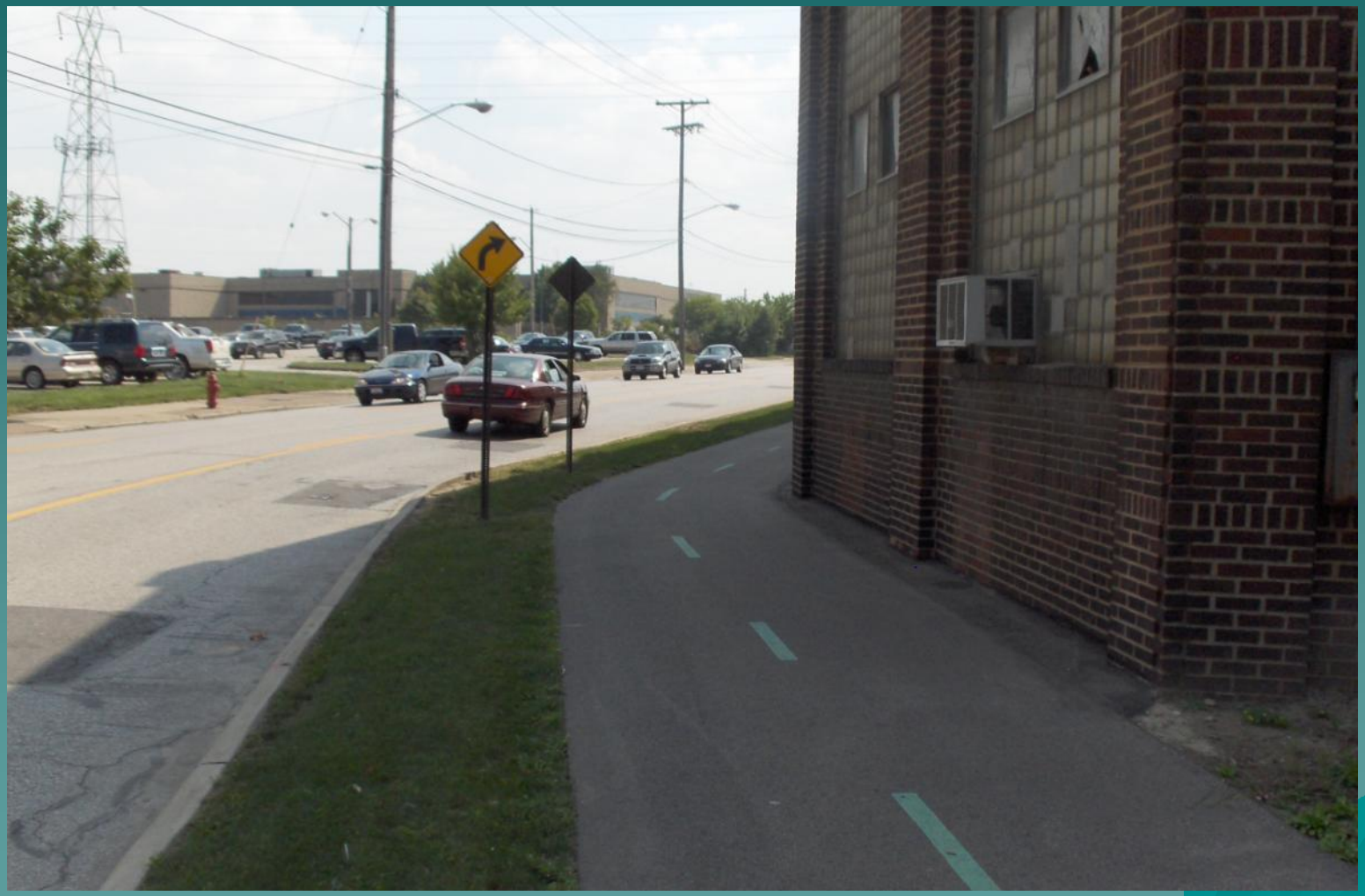
Design Exceptions

- The design exception documents the sound engineering decisions which have been made to optimize a situation and account for the safety of the users
- Prepare in accordance with ODOT Location & Design Manual, Vol. 1, section 105
- Submit with letter of concurrence from the Local Public Agency (owner & maintaining agency)
- Design standards that are “advisable” or “recommended” generally do not require a design exception

Design Exceptions



Design Exceptions



Other Design Considerations

- Account for post construction clean up in the bid, especially on urban trails
- Design bridges for emergency and maintenance vehicle loading
- Construction
  - Construction equipment loading
    - Soils investigation
  - Staging areas
- Utilities within Railroad Corridors
  - Petroleum pipelines
  - Fiber optic lines

Design Summary

- Design
  - Employ Common Sense
  - Always keep the safety of the user as your foremost priority
  - Design as if your family will be using the facility

QUESTIONS?

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