



Bicycle Facility Design



**by
Richard C. Moeur, P.E., L.C.I.**

April 2004 edition





What is a "Bicycle Facility"?

-  **Bicycle Facility:**
Improvements and provisions to accommodate or encourage bicycling
-  Any roadway not specifically prohibited to cycling is a bicycle facility

However...




-  Not all existing roadways necessarily make good bicycle facilities
-  How can we improve conditions for bicyclists?

Good Bicycle Facility Design:




-  Treats bicyclists as operators of vehicles
-  Encourages operation in accordance with traffic flow and traffic law
-  Connects destinations in a continuous network
-  Accommodates cyclists without inconvenience or extra travel distance/time

Good Bicycle Facility Design





DOES NOT:

-  Treat bicyclists like "wheeled pedestrians"
-  Require bicyclists to operate in an unpredictable, unexpected, or unsafe manner
-  Encourage bicyclists to violate traffic laws

Design References

-  AASHTO Guide to Development of Bicycle Facilities
-  Manual on Uniform Traffic Control Devices (MUTCD), Part 9
-  FHWA Documents and reports
(available from bicyclinginfo.org)

Bicycle Operating Characteristics


-  Bicyclists are not pedestrians
-  Bicycles cannot turn instantly – turning radius is based on speed
-  Bicycles cannot stop instantly – stopping distance is based on speed
-  Bicycles are only 2 feet wide – but require 4 to 6 feet of clear width (for "shy distance")

Bicyclist Characteristics



 Skilled Cyclists

 Basic Cyclists

 Child Cyclists

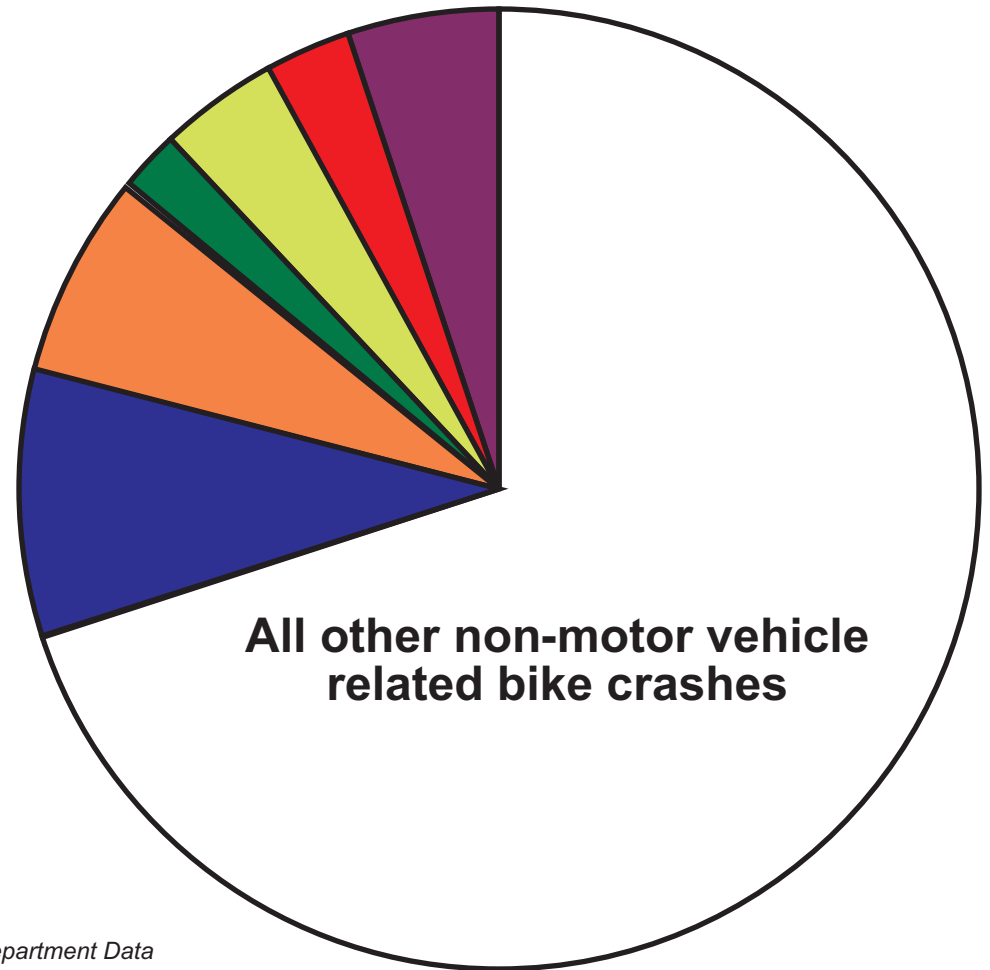
 When accommodating less skilled cyclists, do not make conditions more difficult for skilled cyclists

Where are the real dangers to cyclists?

-  Motor vehicle/bicycle crashes typically have high severity
...but comprise less than 1/3 of all bike crashes
-  Facilities that are perceived to be safer can actually increase overall crash risks for cyclists




Bicycle Crash Types

- All non-MV related bike crashes - 69%
- Bicyclist failed to yield - 9%
- Motorist failed to yield - 7%
- Bicyclist turn/merge into motorist - 2%
- Motorist turn/merge into bicyclist - 4%
- Motorist overtaking bicyclist - 3%
- Other circumstances - 6%



Source: Federal Highway Administration
• *Bicycle Crash Types: A 1990s Informational Guide*
• *Injuries to Bicyclists & Pedestrians - An Analysis Based on Emergency Department Data*

Facility Selection

-  Two basic types:
On-roadway & off-roadway
-  On-roadway:
 - Wide curb lanes
 - Shoulders
 - Bike lanes
-  Off-roadway:
 - Pathways

On-Roadway Facilities




 Wide Curb Lanes

 Shoulders






 Bike Lanes

 Sidewalks should never be considered to be an acceptable alternative to on-roadway accommodations






Wide Curb Lanes

-  Typically 14-16 ft wide from lane line to face of curb
-  Serve cyclists and motorists safely and conveniently
-  Less skilled cyclists may be reluctant to use the lane, and may instead use the sidewalk





Shoulders

-  4 ft minimum clear width recommended for bicycle use
-  Create a place for cyclists to operate adjacent to traffic
-  Not typically used in urban areas
-  Can accumulate debris, parked vehicles, etc.
-  Can create conflicts between cyclists and turning vehicles





Bike Lanes

-  4 ft minimum clear width
-  Create defined road space for cyclists
-  Typically used in urban / suburban areas
-  Can accumulate debris, gravel, etc.
-  Should not be placed in "door zone" of parked cars





Pathways

-  Serve pedestrians and other users
-  Preferred by recreational cyclists
-  May be scenic and esthetically pleasing
-  Can form valuable links in a transportation network when placed on independent alignments




Problems with Pathways

-  Conflicts between different user types
-  Users may be less attentive
-  Crossings of roadways may cause problems
-  Pathways parallel and adjacent to roadways create severe intersection and driveway conflicts

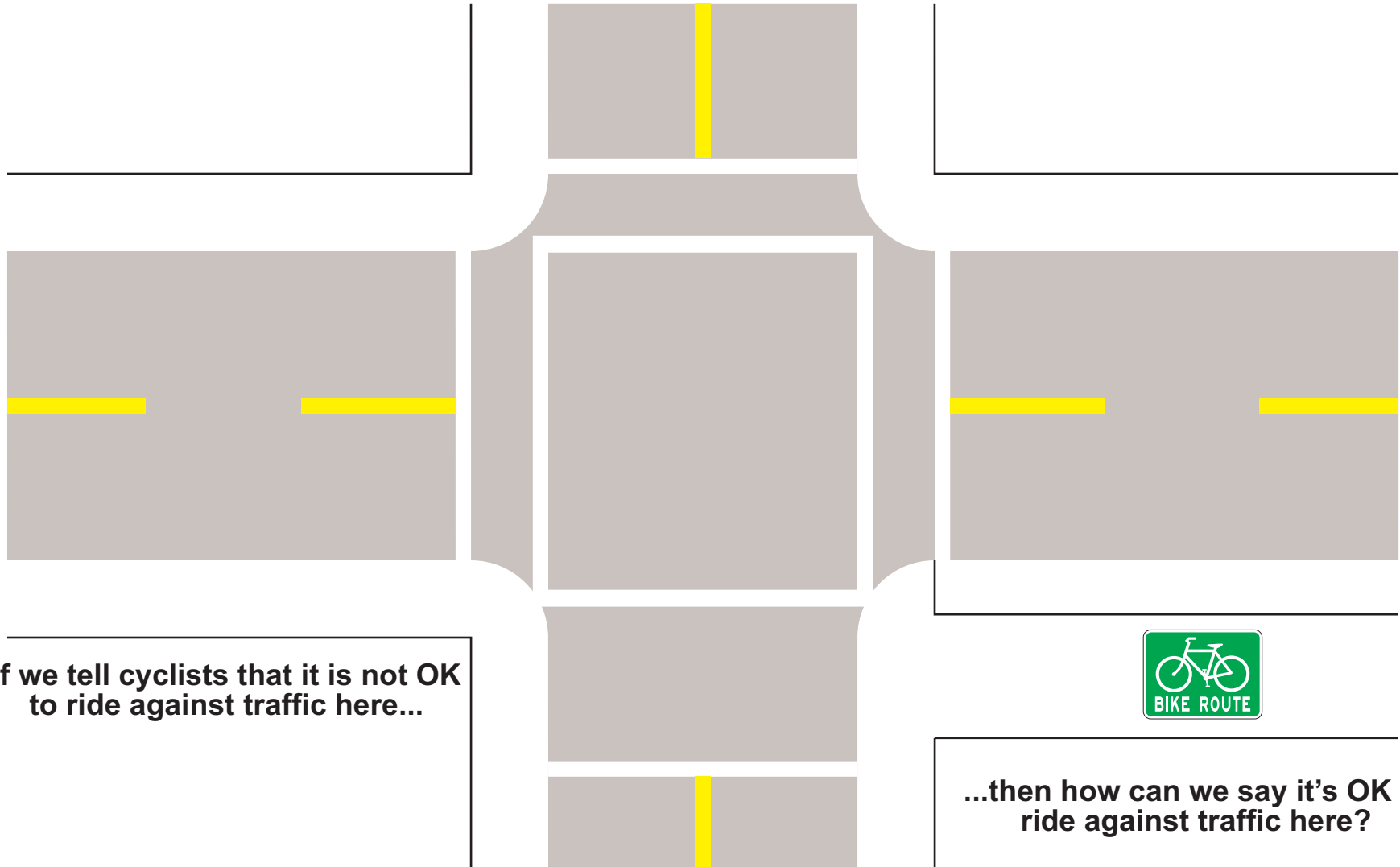
Are Pathways Safer?

-  70% of bicycle/motor vehicle crashes occur at intersections and driveways
-  Very few bicycle crashes involve overtaking vehicles
-  Unless grade-separated, pathways still have intersection conflicts - often severe
-  Children are still at greater relative risk at intersections & driveways

Other Pathway Design Issues

-  Offset between the path and adjacent roadway does not ensure safety
-  Requiring cyclists to yield at intersections and driveways or operate at pedestrian speeds may not be feasible or reasonable
-  Two-way path on one side of street encourages wrong-way operation

Legal Issues of Parallel Pathways

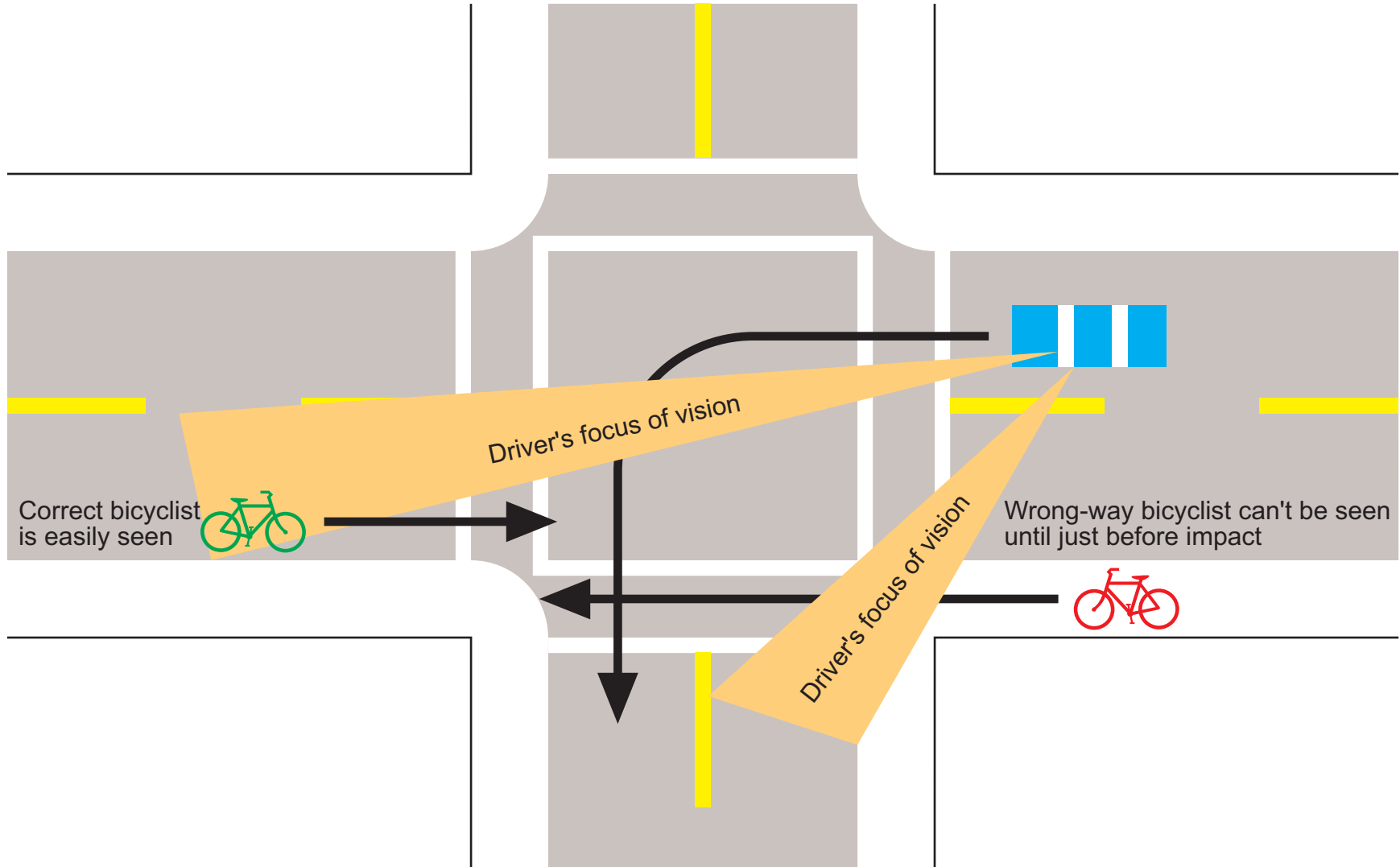


If we tell cyclists that it is not OK to ride against traffic here...

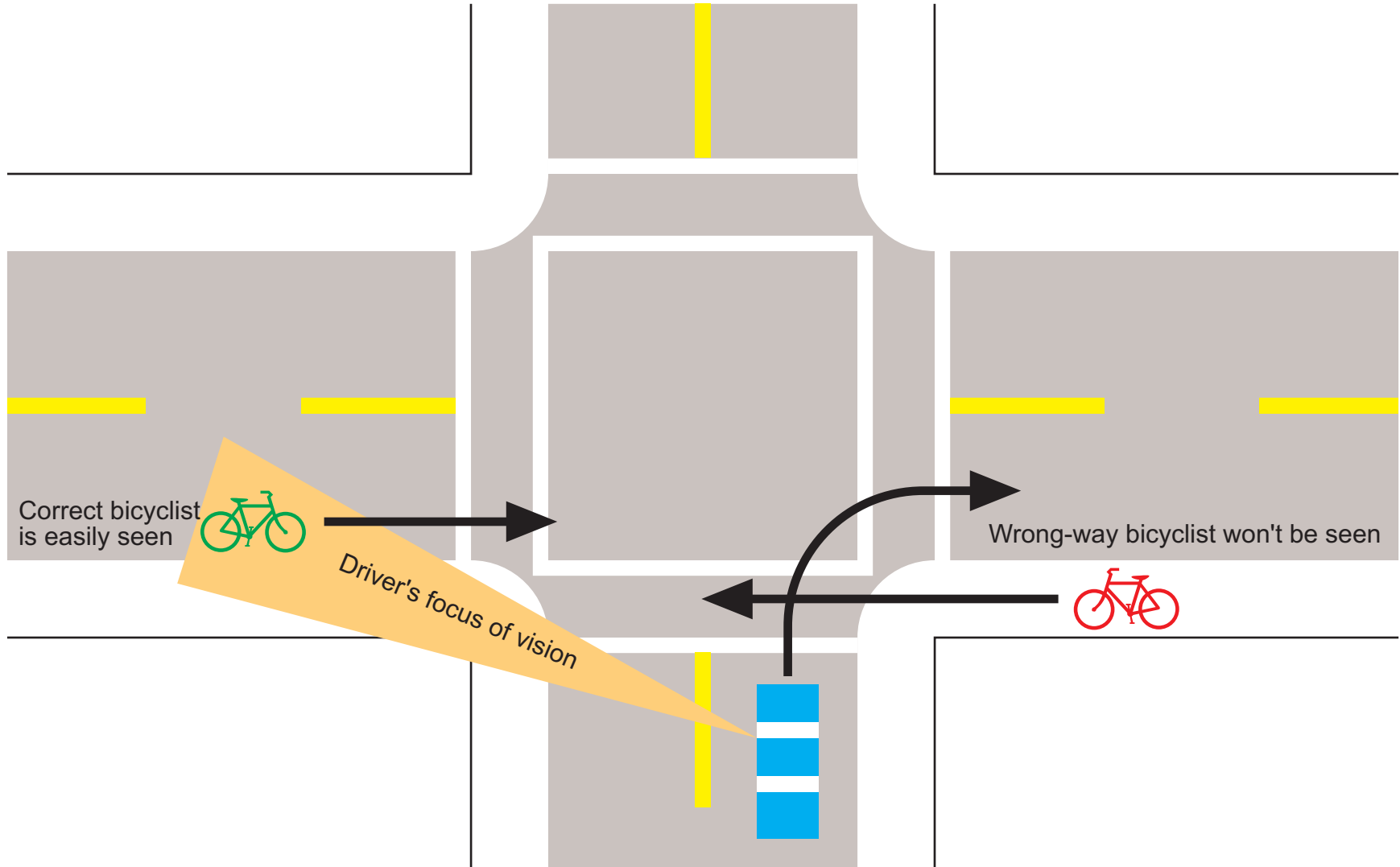


...then how can we say it's OK to ride against traffic here?

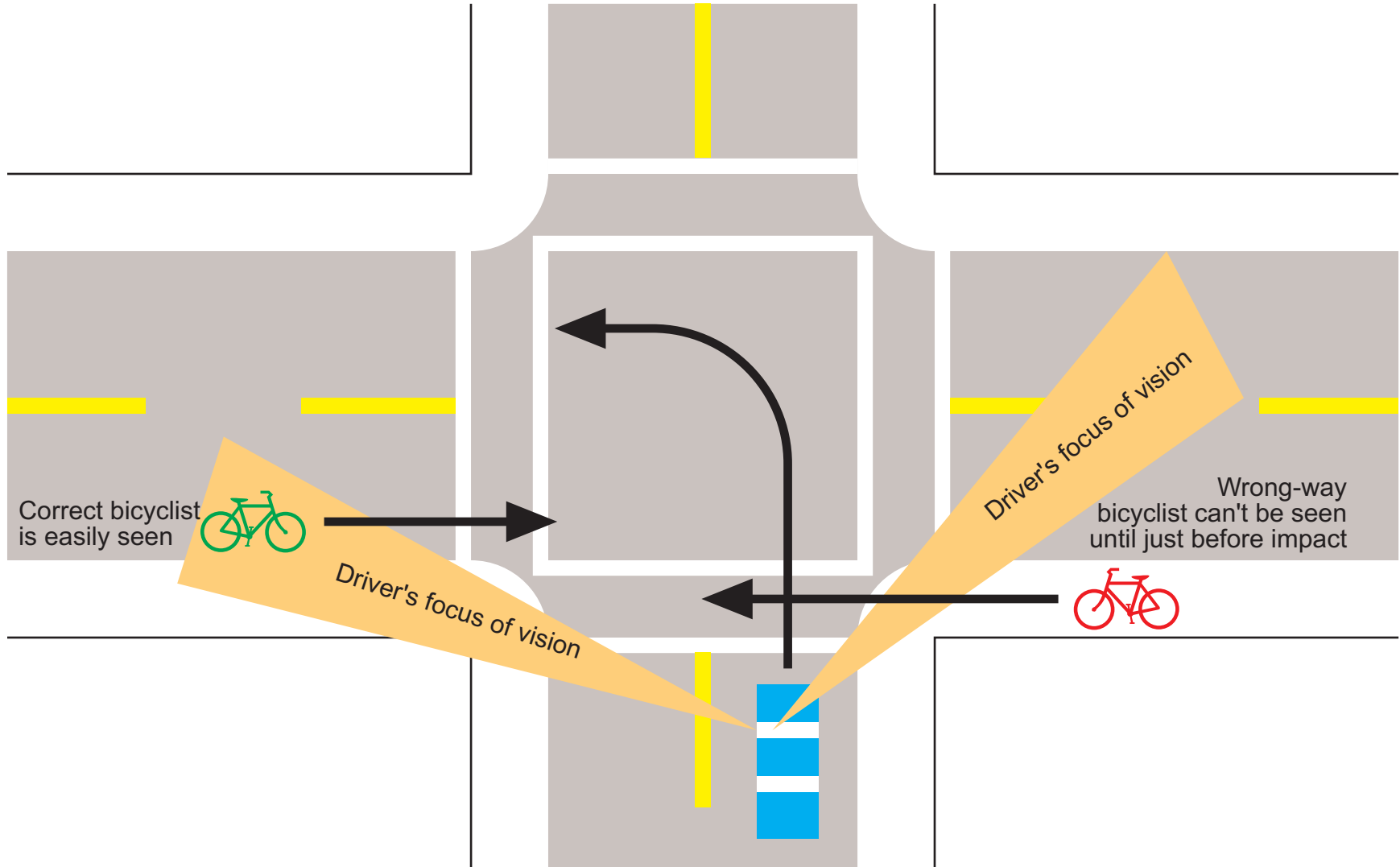
Wrong-Way Cycling Hazard – Left Turn from Parallel Road






Wrong-Way Cycling Hazard – Right Turn from Cross Road



Wrong-Way Cycling Hazard – Left Turn from Cross Road



So, Finally...

-  There are many ways to accommodate bicyclists
-  It's extremely important to accommodate cyclists in reasonable, convenient, and safe ways
-  Select the correct type of facility, then design it properly