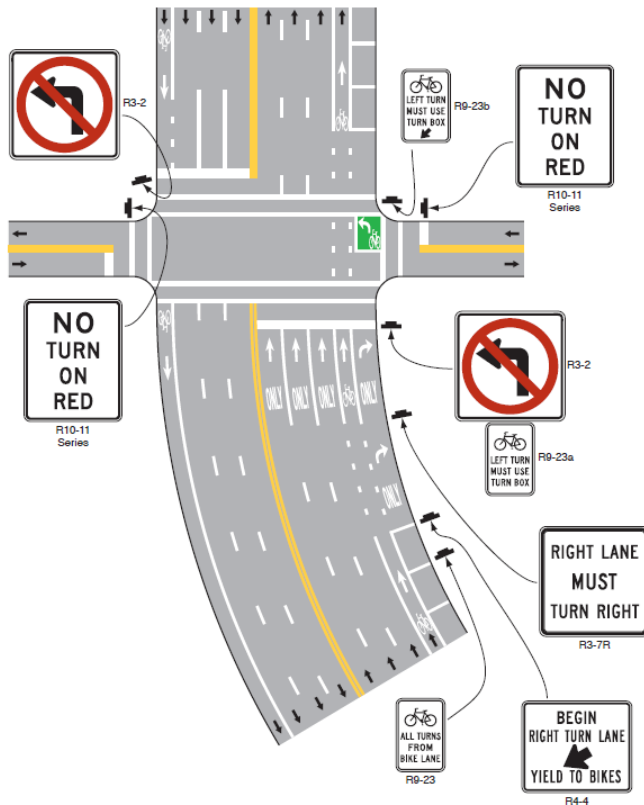


# Design Innovation and the MUTCD Experimentation Process



Bill DeSantis

VHB

Dave Kirschner

Federal Highway Administration

September 13, 2017



# Housekeeping

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## ⇒ **Problems with audio?**

Dial into the phone line instead of using “mic & speakers”

## ⇒ **Webinar issues?**

Re-Load the webpage and log back into the webinar. Or send note of an issue through the Question box.

## ⇒ **Questions?**

Submit your questions at any time in the Questions box.



# Archive and Certificates

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Archive posted at [www.pedbikeinfo.org/webinars](http://www.pedbikeinfo.org/webinars)

- ⇒ Copy of presentations
- ⇒ Recording (within 1-2 days)
- ⇒ Links to resources

Follow-up email will include...

- ⇒ Link to certificate of attendance
- ⇒ Information about webinar archive



# PBIC Webinars and News

- ⇒ Find PBIC webinars and webinar archives  
[pedbikeinfo.org/webinars](http://pedbikeinfo.org/webinars)
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The screenshot shows the Pedestrian and Bicycle Information Center (PBIC) website. The header includes the PBIC logo and navigation links: Data & Resources, Community Support, Planning & Design, Training & Events, and Behavior Change. The main content area is titled "Webinars" and features a sidebar with categories like Livable Communities, PDAF Series, and University Courses. The main text describes the center's offerings and lists upcoming webinars, such as "Getting from Vision Zero Plan to Vision Zero Progress" on 04/18/2017, and recently delivered webinars like "Preparing for Successful Education and Enforcement Efforts" on 03/14/2017.



The screenshot shows the Facebook page for the Pedestrian and Bicycle Information Center. The page header includes the PBIC logo, the name "Pedestrian and Bicycle Information Center", and the website URL [www.pedbikeinfo.org](http://www.pedbikeinfo.org). The page features a "VISION ZERO STRATEGIES SERIES" photo gallery with a "Webinar" and "Twitter #VZChat" caption. The page also displays engagement metrics, including 3,509 likes and 3,446 followers, and contact information such as the phone number 888-823-3977 and the website URL.



# Upcoming Webinar

Visit [www.pedbikeinfo.org](http://www.pedbikeinfo.org) to learn more and register

## Making Signals Work for Bicyclists and Pedestrians

October 18, 1:00 – 2:30 PM Eastern Time



⇒ Topics include:

⇒ Signal Timing

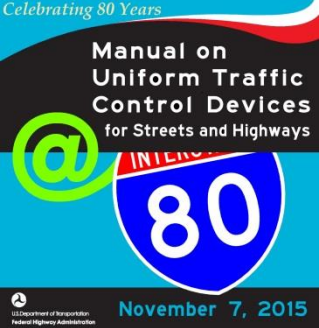
⇒ Cycle Lengths

⇒ Phasing

⇒ Speed Management

⇒ Led by Peter Koonce, PE, Portland, OR

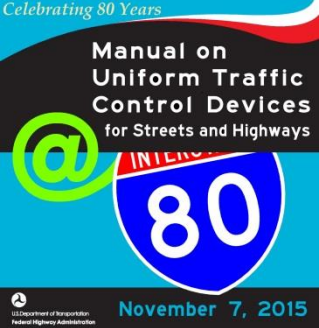




# Agenda

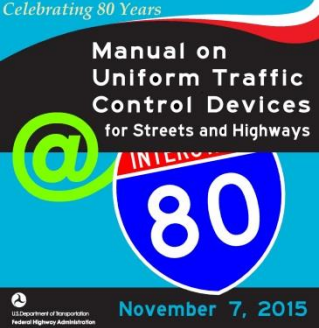
- **The NCUTCD – History & Role**
- **MUTCD Experimentation process**
- **Part 9 TCD's for Bicycle Facilities**
  - **TCD's compliant with 2009 MUTCD**
  - **Interim Approvals**
  - **Frequently requested Official Experiments**





- **National Committee on Uniform Traffic Control Devices (NCUTCD)**
- **Formed in 1931, wrote the MUTCD 1935 - 1971 editions**
- **Since 1971, NC advises FHWA on MUTCD content**
- **Note – final decision on Manual content and schedule for MUTCD update rests with the Federal government, not the NCUTCD**

▪ [www.ncutcd.com](http://www.ncutcd.com)

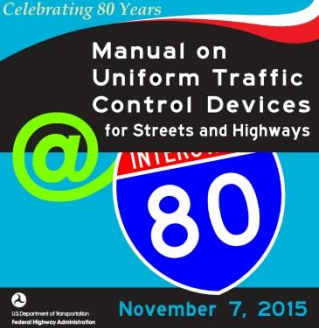


# NCUTCD MISSION

- **Focuses on standards, guidelines and practices for traffic control devices**
- **Recommends proposed revisions to the MUTCD**
- **Provides forum for professionals with diverse backgrounds to exchange information**
- **Volunteer organization membership open to interested professionals**

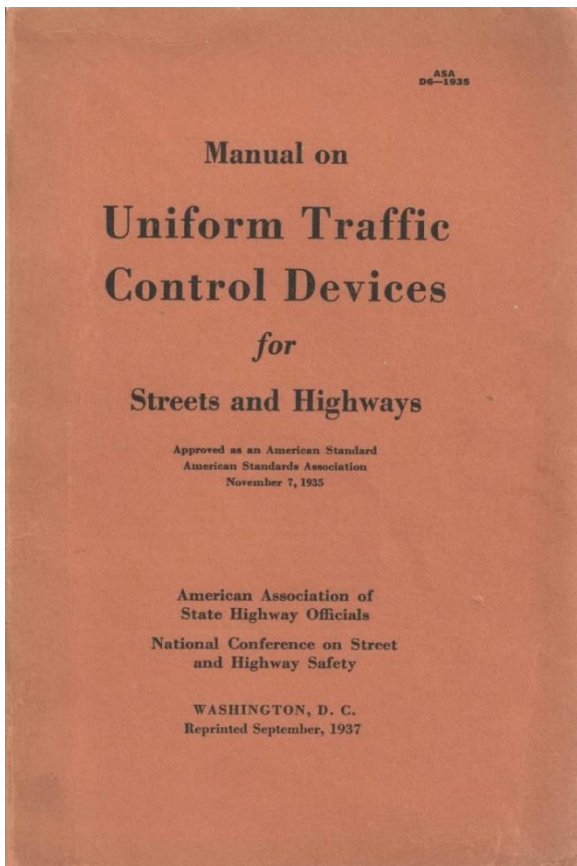






# What is the NCUTCD?

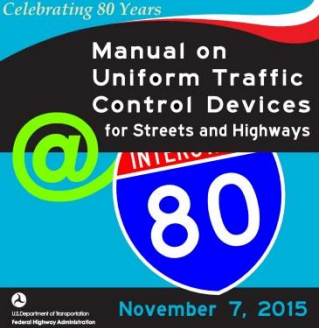
- 2 Parts:
  - Council (37 members representing 21 sponsoring organizations)
  - Technical Committees (TC's)



# NCUTCD Technical Committees



- Regulatory/Warning Signs
- Guide/Motorist Information Signs
- Markings
- Signals
- Temporary Traffic Controls
- RR & Light Rail Grade Crossings
- Bicycles
- Research



# NCUTCD Process

- Consensus-building process
- Utilize research/experimentation to improve existing devices or recommend new ones
- TC's review completed research and/or experimentation results
- Draft proposal by Technical Committee
- Review by sponsoring organizations
- Revisions by technical committee
- Discussed and voted on by Council
- If approved, submitted to FHWA
- Membership open to interested professionals



# Why national standard?

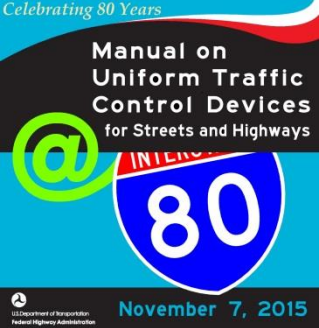


- Uniformity of design and placement of Traffic Control Devices is critical to safe operation for all roadway users.
- Consistency of TCD's with traffic code/rules of the road.
- The US UVC has not been updated since 2001 (ish)

# Official Experiments

It starts with an idea...

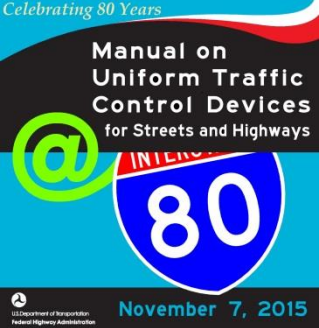




# Official Experiments/Rulings

- **Goal:** to seek effective traffic control devices
- **Purpose:** to allow practitioners to test new or innovative traffic control devices or applications
  - To see if they perform more effectively than the devices in the MUTCD; or
  - Because there is no device in the MUTCD that addresses the situation being studied

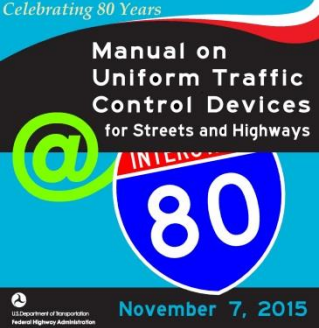




# Official Experiments

- The official experimentation process is described in Section 1A.10 of the 2009 MUTCD, Paragraphs 8 - 11
- A State DOT or a local agency must write a letter to the FHWA requesting to conduct an experiment
- Request must include a research plan describing what data will be collected, how it will be collected, and how it will be analyzed
- Key is for experimental plan to produce data for objective (not subjective) results
- Experiment may begin only after written approval from the FHWA
- Successful experimentation is utilized by NCUTCD & FHWA to recommend updates to the Manual



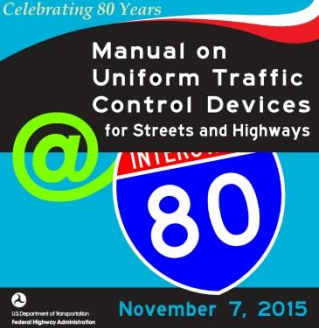


# Official Experiments

- A total of **176** official experiments have been approved since the 2008 NPA for the 2009 MUTCD was published, with the following distribution by parts:
  - Part 1. General – **0**
  - Part 2. Signs – **28**
  - Part 3. Markings – **27**
  - Part 4. Highway Traffic Signals – **29**
  - Part 5. Low-Volume Roads – **0**
  - Part 6. Temporary Traffic Control – **13**
  - Part 7. School Areas – **0**
  - Part 8. Grade Crossings – **4**
  - Part 9. Bicycle Facilities – **75**



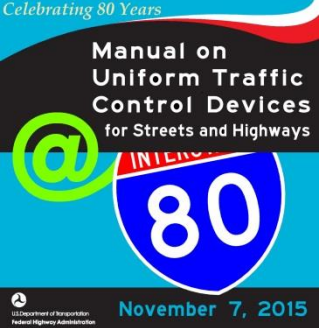




# Official Experiments – Why Important

- A jurisdiction that installs a device or application that is not in the MUTCD, that violates MUTCD requirements, or that has not received Interim Approval status, without first obtaining FHWA experimentation approval, faces these risks:
  - Potential legal liability if a crash occurs (why wouldn't an agency actively monitor an experimental treatment?)
  - Potential loss of Federal-Aid funding

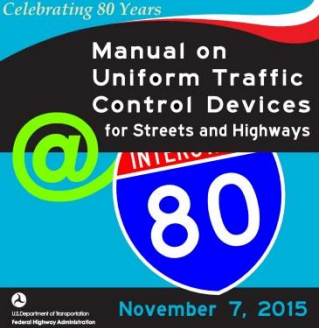




## Official Experiments – Why Important

- Data from experiments is critical to objective, scientific evaluation of new devices
- Experimental results are also critical in the FHWA's consideration of a new device for possible Interim Approval or adoption into the MUTCD

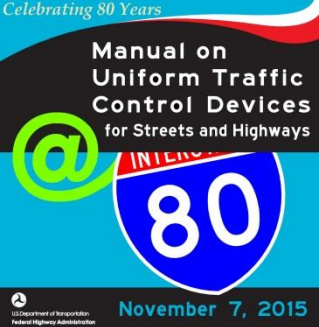




# Experiment Research-Why Important

- The FHWA Status webpage provides information for submission of a request including:
  - Background on the proposed treatment and intended purpose
  - Suggested roadway characteristics
  - Minimum design elements including those required, those recommended and those that are optional
  - List of current similar experiments and contact information of local agency

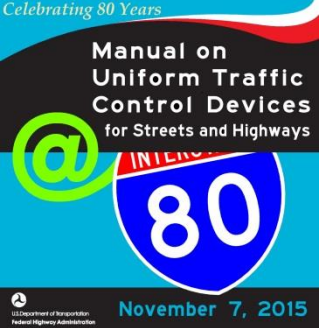




# Bicycle Devices in the 2009 MUTCD

- Part 9 – Bicycle Traffic Control Devices
  - Bicyclists on the Roadway
    - Paragraph 3 in Section 9A.02:
      - The absence of a marked bicycle lane or any of the other traffic control devices discussed in this Chapter on a particular roadway shall not be construed to mean that bicyclists are not permitted to travel on that roadway.

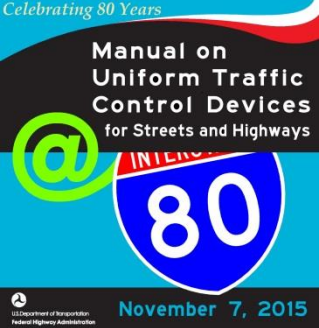




# Bicycle Devices in the 2009 MUTCD

- Part 9 – Bicycle Traffic Control Devices
  - Based on principles found throughout MUTCD
    - Fulfill a need
    - Command attention
    - Convey a clear, simple meaning
    - Command respect from road users
    - Give adequate time for proper response





# Bicycle TCDs Compliant with the 2009 MUTCD

- Many traffic control devices targeted towards bicyclists are compliant with the 2009 MUTCD without additional approval
  - Bike Lane Extensions
  - Buffered Bike Lanes
  - Counter-Flow Bike Lanes
  - Separated Bike Lanes





# Bicycle TCDs Compliant with the 2009 MUTCD

## ■ Bike Lane Extensions

- Bike lanes are preferential lanes (like HOT, HOV, transit) dedicated for the exclusive use of bicyclists
- Provisions of preferential lane markings found in Chapter 3D
- Lane extension markings addressed in Section 3B.08
  - Used where design or visibility constraints make it desirable to provide guidance through intersections
  - Chevrons, used alone, are not compliant with the MUTCD
  - Bike lane symbols and directional arrows may be used in lane extensions



# Bicycle TCDs Compliant with the 2009 MUTCD



- Non-compliant lane extension
- Principles correct
- Chevrons used alone are not in the MUTCD and are non-compliant





November 7, 2015

# Bicycle TCDs Compliant with the 2009 MUTCD



- Compliant bike lane extension using bicycle symbols and arrows
- Green colored pavement is allowed in bike lane extensions under Interim Approval 14

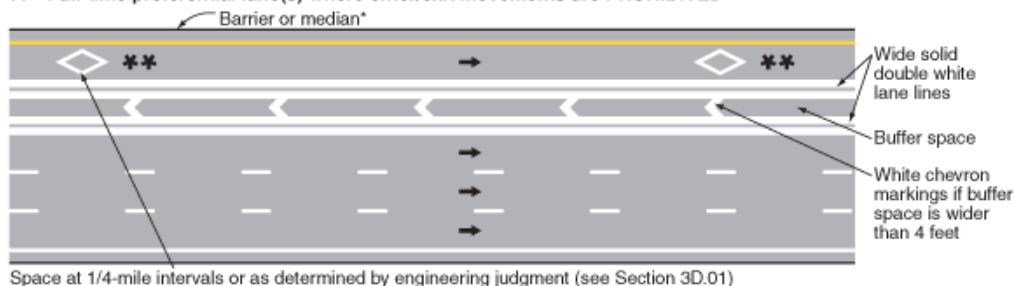


# Bicycle TCDs Compliant with the 2009 MUTCD

## ■ Buffered Bike Lanes

- Remember, bike lanes are preferential lanes
- Chapter 3D provides buffer marking options

A – Full-time preferential lane(s) where enter/exit movements are PROHIBITED



B – Preferential lane(s) where enter/exit movements are DISCOURAGED



Legend

→ Direction of travel

\* If no barrier or median is present and the left-hand side of the lane is the center line of a two-way roadway, use a double yellow center line

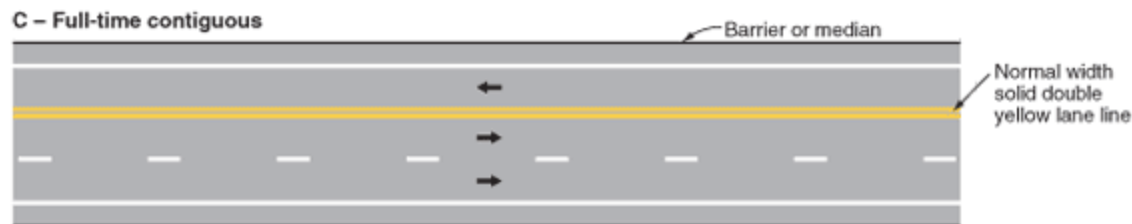
\*\* Example of HOV only lane symbol markings



# Bicycle TCDs Compliant with the 2009 MUTCD

## ■ Counter-Flow Bike Lanes

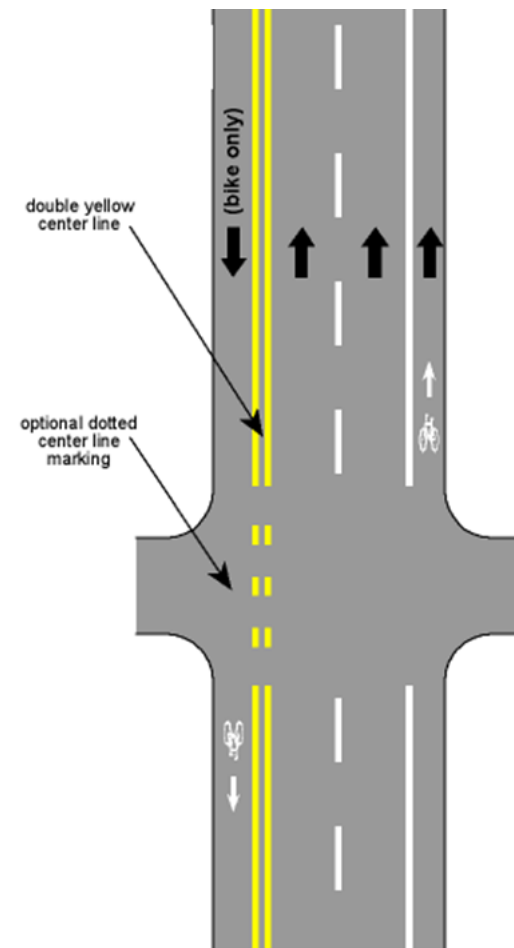
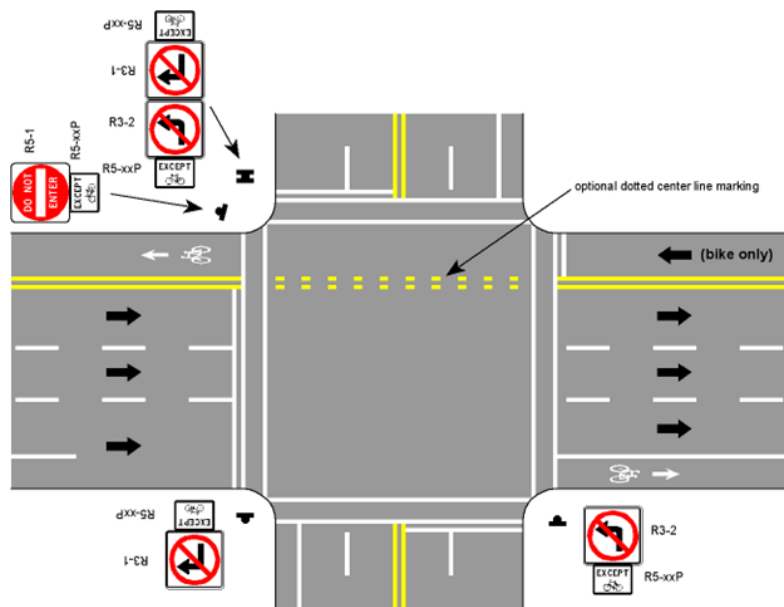
- Bike lanes are (still!) preferential lanes
- Chapter 3D provides marking style for counter-flow preferential lane
- Symbol or word markings must be provided
  - Markings are always required to establish bike lanes



# Bicycle Devices in the 2009 MUTCD

## ■ Counter-Flow Bike Lanes

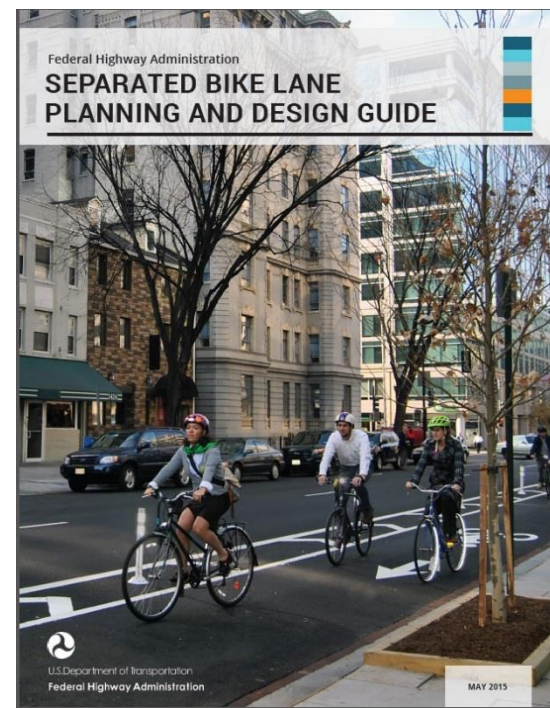
- Additional guidance needed
- NCUTCD has submitted Change Request

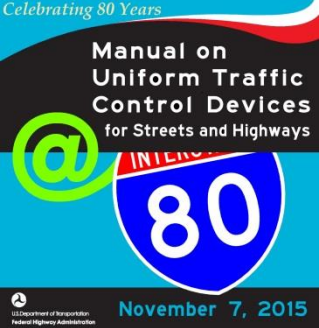


# Bicycle Devices in the 2009 MUTCD

## ■ Separated Bike Lanes

- Like other bike lanes but physically separated
  - Chapter 3H addresses channelizing devices
  - Intersection treatments vary – Compliant, Experimental, IA
- Not addressed directly in 2009 MUTCD
- Refer to FHWA's *Separated Bike Lane Planning and Design Guide*





# Bicycle Devices Under Interim Approval

- Five Interim Approvals (IAs) addressing bicyclists issued since the 2009 MUTCD
  - IA-14 – Green Colored Pavement
  - IA-15 – Modified US Bike Route Sign
  - IA-16 – Bicycle Signal Faces
  - IA-18 – Intersection Bicycle Boxes
  - IA-20 – Two-Stage Bicycle Turn Boxes
- Optional use, jurisdictions are not required to use these devices

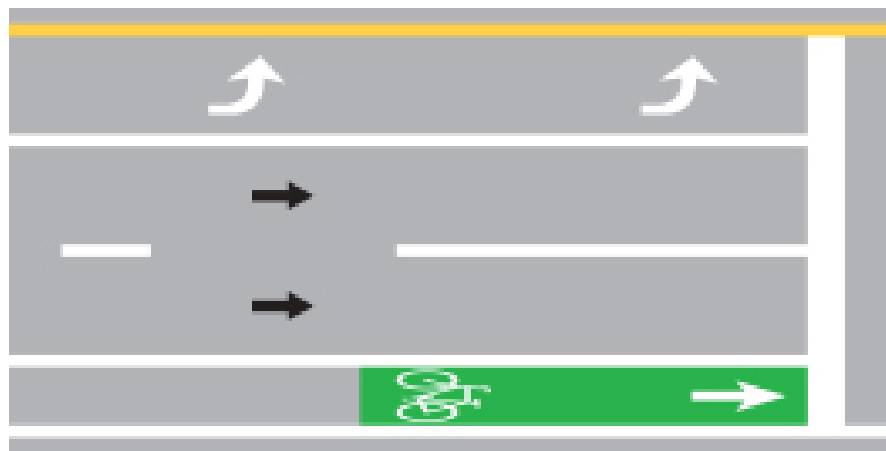




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# Bicycle Devices Under Interim Approval

- Interim Approval 14 – Green-Colored Pavement
  - Allows for the use of green-colored pavement in marked bicycle lanes and in extensions of bicycle lanes
  - Testing showed positive operational effects



# Bicycle Devices Under Interim Approval

- Interim Approval 14 – Green Colored Pavement
  - Flexibility for installation locations and pattern
    - Conflict areas only
    - Entire facilities





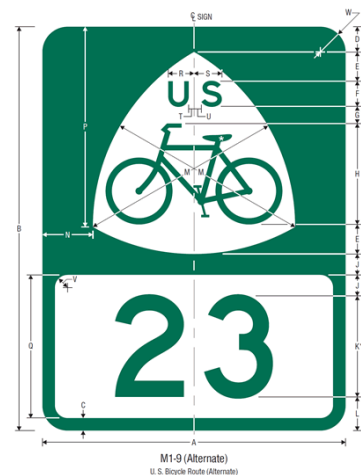
# Bicycle Devices Under Interim Approval

- Interim Approval 15 – Modified US Bike Route Sign
  - Developed by the NCUTCD
  - Updated design reinforces that this bike route is part of a national-level route system
  - Tested and approved by FHWA; likely to be included in next edition

Existing  
M1-9



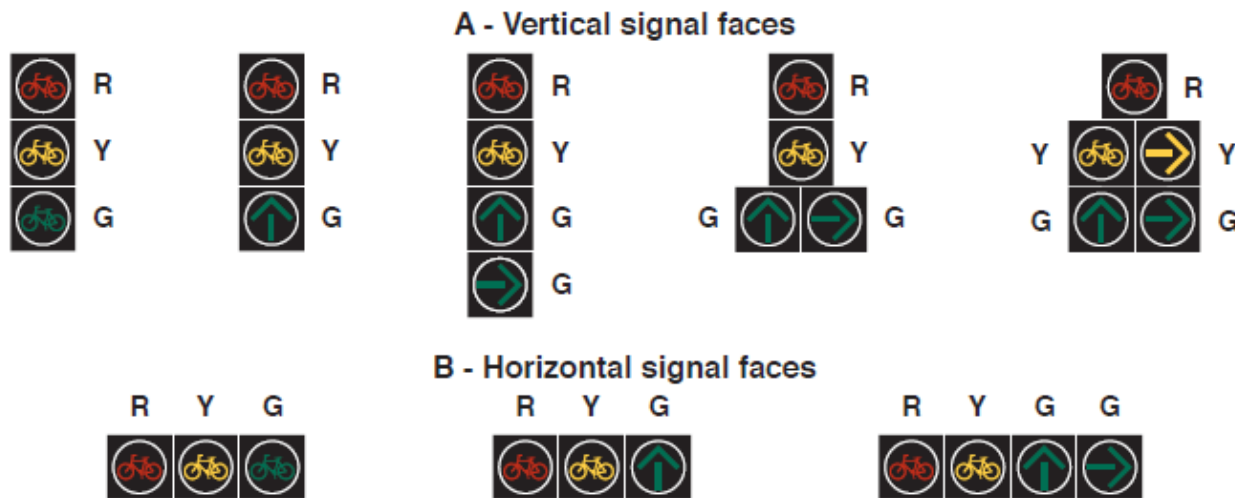
Alternative  
M1-9

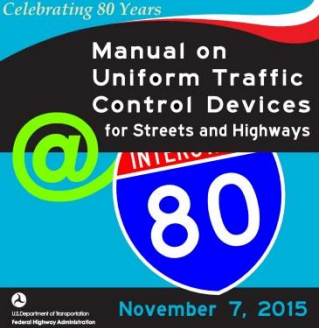


# Bicycle Devices Under Interim Approval

## ■ Interim Approval 16 – Bicycle Signal Faces

- Part 9 allows for the use of standard circular traffic signals to control bicycle facilities
- IA-16 allows for the use of signal faces including bicycle symbols





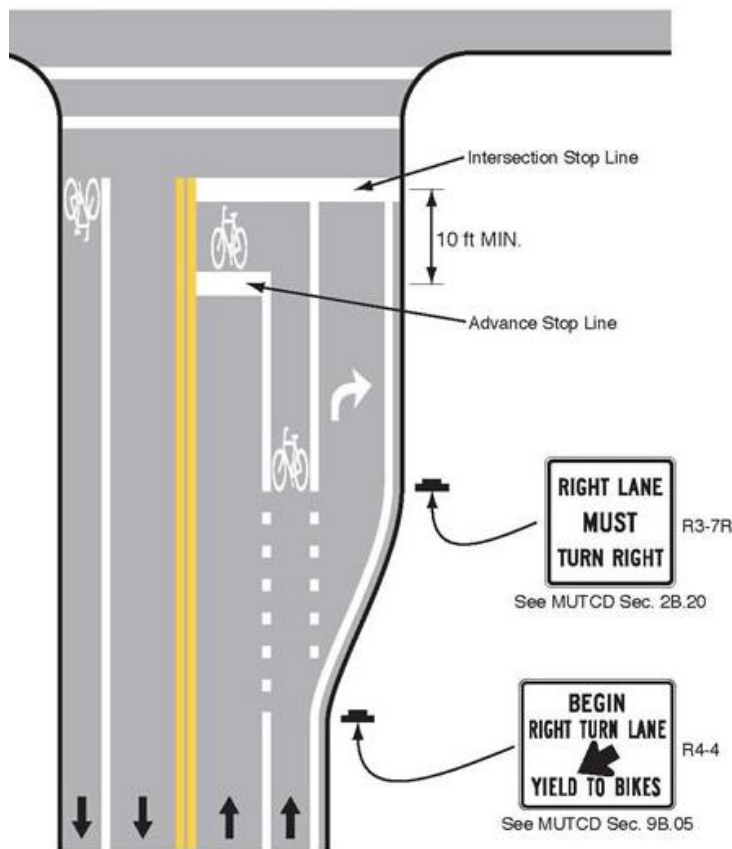
# Bicycle Devices Under Interim Approval

- Interim Approval 16 – Bicycle Signal Faces
  - IA-16 restricts the operation of bicycle signal faces where there are potentially conflicting motor vehicle movements
  - Permissive motor vehicle movements across bicycle signal face-controlled movements are non-compliant with IA-16
    - Experimentation is being conducted with this operation



# Bicycle Devices Under Interim Approval

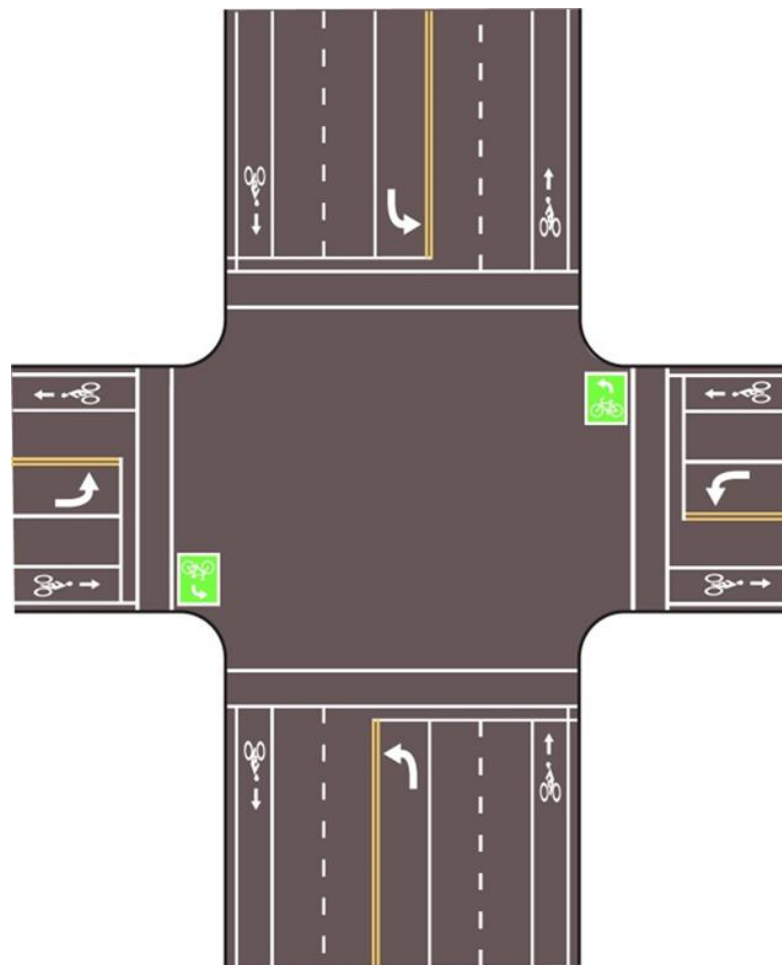
- Interim Approval 18 – Intersection Bicycle Boxes
  - IA-18 allows for the use of the Intersection Bicycle Box marking
    - Facilitates bicyclists positioning themselves at intersections for improved visibility
  - Research and Experimentation
    - Reduced conflicts between bicyclists and turning drivers
    - Reduced avoidance maneuvers between bicyclists and drivers
    - Reduced encroachments by motor vehicles into crosswalks



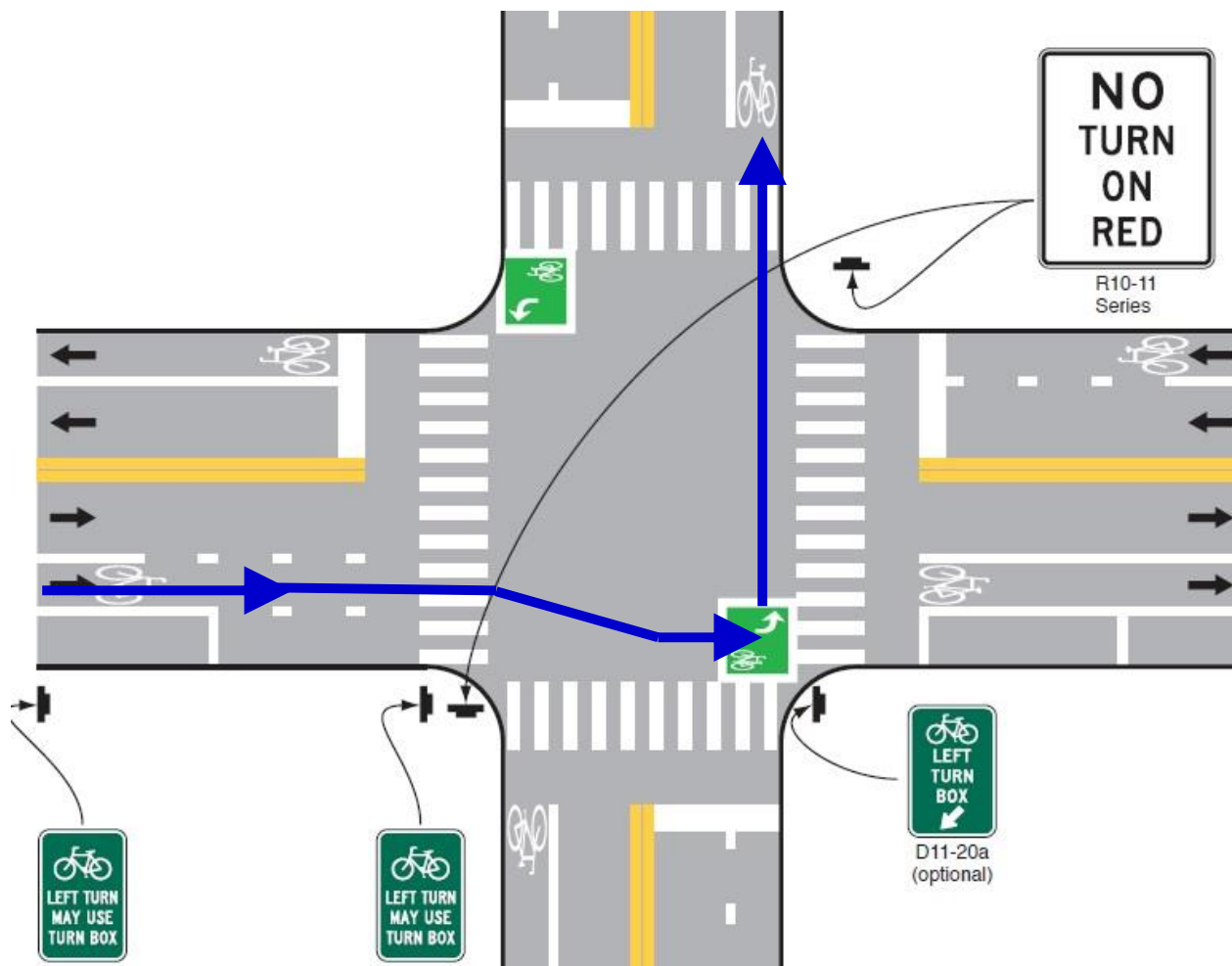


# Bicycle Devices Under Interim Approval

- Interim Approval 20 – Two-Stage Bicycle Turn Boxes
  - Area set aside from vehicle paths for bicyclists to queue for a turn
  - Allows bicyclists to make a turn without merging across traffic

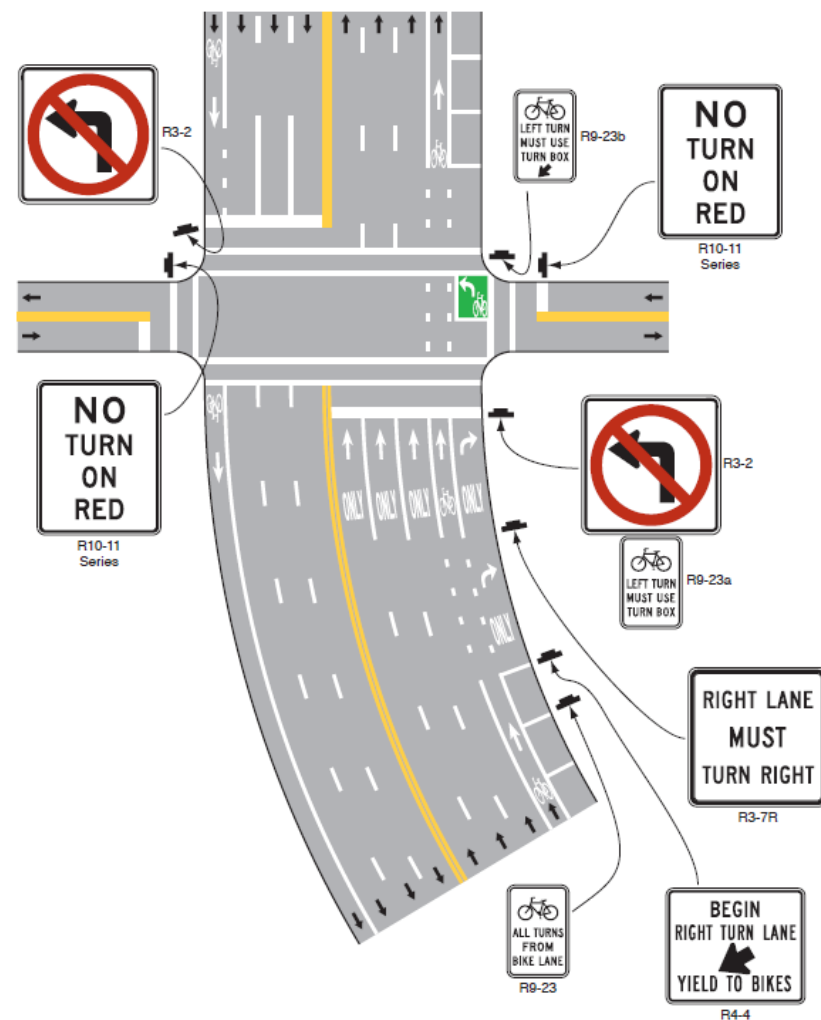


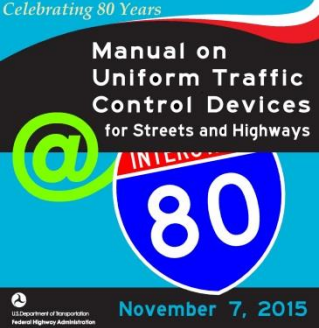
# Bicycle Devices Under Interim Approval



# Bicycle Devices Under Interim Approval

- Interim Approval 20 – Two-Stage Bicycle Turn Boxes
  - Example applications
    - Multiple-lane merges
    - High-speed roadways
    - In-street rail tracks
    - Physically separated bicycle lanes



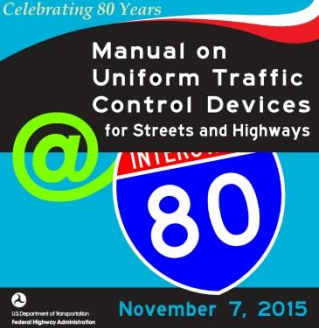


# Bicycle TCDs Under Experimentation

- Many different new and modified devices under FHWA Experimentation – these are two examples
  - Two-Stage Turn Boxes
  - Green-Backed Shared-Lane Markings
  - Advisory Bike Lanes
- Reminder – Section 1A.10 has guidance on experimentation





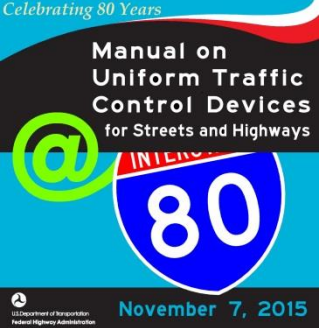


# Bicycle TCDs Under Experimentation

## ■ Bicycle Signals allowing Conflicting Movements

- IA-16 does not allow bicycle signal faces to be used where there are conflicting motor vehicle movements
- FHWA has received many requests to relax this provision but no data or observations have been submitted
  - FHWA is aware that jurisdictions are operating bicycle signals in this manner but none that have collected operational or conflict data





# Bicycle TCDs Under Experimentation

- Bicycle Signals allowing Conflicting Movements
  - Several experiments with this operation
    - Some show bicyclists a green bicycle indication, some show a flashing yellow bicycle indication
    - Critical observations – conflicts and interactions between motorists and bicyclists while conflicts are permitted
    - Do motorists and bicyclists understand the conflicts, rights, and responsibilities at these locations?
    - Flashing yellow arrows shown to turning motorists to indicate additional degree of conflict





# Bicycle TCDs Under Experimentation

## ■ Green-Backed Shared Lane Markings

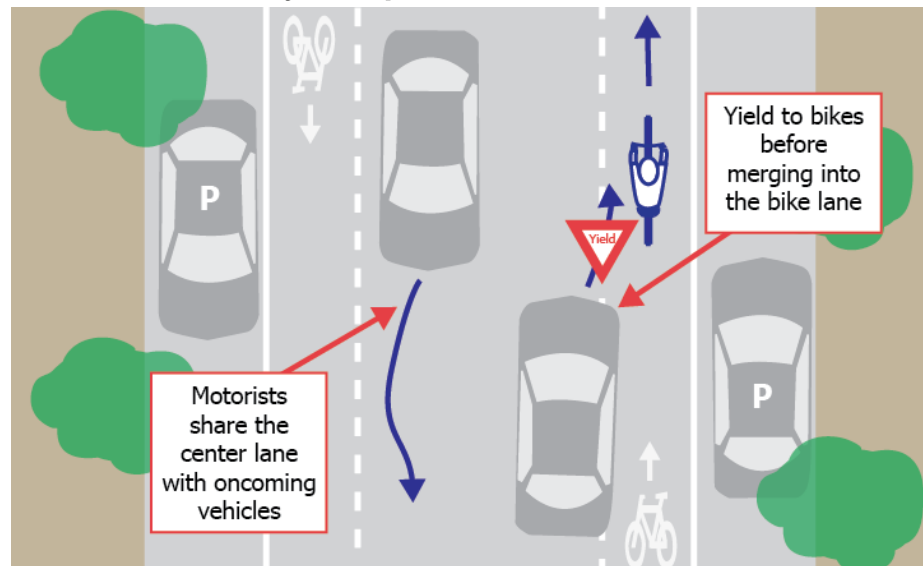
- IA-14 reserves green colored pavement for bike lanes and bike lane extensions
- FHWA has previously allowed experimentation with continuous green colored pavement behind shared-lane markings
- FHWA interested to learn effects of green colored pavement behind shared-lane markings
  - Is operation improved?
  - Motorist passing distance
  - Bicyclist positioning
  - Motorist lane change behavior
  - Effect on perception of green coloring



# Bicycle TCDs Under Experimentation

## ■ Advisory Bike Lanes

- Used when roadway too narrow for standard bike lanes
- Intended operation – motor vehicles in center lane, using dashed bike lanes only to pass



Graphic: City of Minneapolis, MN



November 7, 2015

# Bicycle TCDs Under Experimentation

## ■ Advisory Bike Lanes

- Widespread in other countries
- Mixed results in experimentation so far, additional experimentation underway
  - Understanding of concept not demonstrated – drivers keeping passenger-side wheels within advisory bike lane in experimental locations
  - Understanding of basic concept critical to success



Graphic: Experimental installation, Alexandria, VA





November 7, 2015

# Traffic Control Devices

## Additional Resources

### Allowable through the 2009 MUTCD

- Continuation of Bicycle Lanes up to Intersections
- Extensions of Bicycle Lanes through Intersections
- Counter-flow Bicycle Lanes
- Buffer-Separated Bicycle Lanes
- Bicycle Lanes on the Left-Hand Side of One-Way Streets
- Two-stage turn box Jughandle movement at a T-intersection
- Shared-Lane Markings
- Shared-lane markings in exclusive turn lanes
- Rotated bicycle symbols in bicycle lanes or separated bikeways at intersections and driveways oriented towards turning or entering motorists

### Disallowed

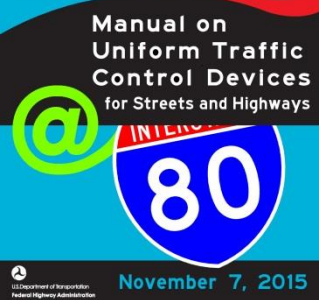
- Combined bicycle lane/turn lane where the lane attempts to establish a bike lane
- Green channelizing devices, delineators, posts, or retroreflective elements thereof
- Yield bar pavement markings without a standard, regulatory yield sign
- Alterations of the shared lane marking symbol, including its chevrons

### Other treatments that are not traffic control devices, so no MUTCD restriction on their use

- Separated bikeways
- Convex mirrors at conflict points to improve visibility
- Bicycle networks
- Median or refuge island for bikeway crossings

## [Additional Information](#)





- FHWA sponsored source for reports, data, case studies:
  - [www.pedbikeinfo.com](http://www.pedbikeinfo.com)
- Information on MUTCD status of new bike designs:
  - [www.fhwa.dot.gov/environment/bicycle\\_pedestrian/guidance/design\\_guidance/mutcd\\_bike.cfm](http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/mutcd_bike.cfm)
- Information on MUTCD, links to state supplements and Interim Approvals:
  - [www.fhwa.mutcd.org](http://www.fhwa.mutcd.org)
- Information on the NCUTCD
  - [www.ncutcd.org](http://www.ncutcd.org)



# Discussion

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⇒ Send us your questions



⇒ Follow up with us:

⇒ Bill DeSantis [wdesantis@vhb.com](mailto:wdesantis@vhb.com)

⇒ Dave Kirschner [david.kirschner@dot.gov](mailto:david.kirschner@dot.gov)

⇒ General Inquiries [pbic@pedbikeinfo.org](mailto:pbic@pedbikeinfo.org)

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