

# Research Summary

## Effectiveness of Bike Boxes in Massachusetts

### Research Need

Bike boxes are a dedicated to bicyclists area to facilitate bicyclists getting ahead of the car queue and waiting during a red signal phase. Despite the plethora of bike box implementations over the past 10 years, the impact of their design on motorist and bicyclist behavior is not well-understood.

### Goals/Objectives

1. Create an inventory of bike boxes in Massachusetts that includes their design characteristics
2. Describe safety outcomes of bike box implementations in Massachusetts based on historical crash data and a conflict analysis of field data
3. Characterize bicyclist and motorist behavior at intersections with bike boxes; the intent is to assess whether bike boxes are utilized as intended by both bicyclists and motorists, and
4. Recommend general guidelines on bike box features that are more effective in improving bicyclist and motorist safety.



### Methodology

1. A comprehensive review of published literature and public agency documentation on bike boxes, their design guidelines, as well as their documented safety outcomes.
2. Creation of an inventory using surveys to obtain the locations of interest and subsequently light detection and ranging (LiDAR) technology and manual observations of online resources to obtain their design characteristics.
3. A crash analysis using information from crash reports at bike box locations across Massachusetts.
4. A field study on bicyclist and motorist behavior at eleven bike box locations in Massachusetts, to analyze motorist compliance and bicycle positioning within the bike box in an effort to assess the effectiveness of bike boxes.

## Key Findings

1. Motorist compliance rate at bike boxes is lower at some intersections and is dependent on the turning movement performed.
2. Bicyclist compliance is high at bike boxes.
3. Implementation of two-stage queue-turn boxes can facilitate left turning movements.
4. Motorist and bicyclist education is critical for the proper use of bike boxes in order to improve safety for all.

## Use of Findings

### DESIGN

- Additional stop lines and “Do not stop” blocks improve motorist compliance and should be considered at all bike box implementations.
- Right-turn On Red signs can improve bike box compliance for right-turning motorists.
- Two-stage queue turn boxes should be considered to accommodate left-turning bicycles in the absence of a bike signal with an advanced green signal phase: (a) for multi-lane approaches and (b) for single lane approaches that present lower rates of proper bike box use by left-turning bicyclists.
- Ensure compliance of future bike box implementations with required bike box features as presented in national guidelines, e.g., the NACTO Urban Bikeway Design Guide.

### EDUCATION

- Bicyclists should be educated on the proper use of bike boxes, especially in terms of positioning themselves ahead of motorized vehicles.
- Motorists should be educated to improve comprehension of bike boxes, their compliance, and consequent safety outcomes from reduced bike box encroachment and increased yielding to bicyclists rates.

## Project Information

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