



Evaluation of bike boxes at signalized intersections

Jennifer Dill^{a,*}, Christopher M. Monsere^b, Nathan McNeil^a

^a Nohad A. Toulan School of Urban Studies and Planning, Portland State University, PO Box 751, Portland, OR 97201, United States

^b Department of Civil & Environmental Engineering, Portland State University, PO Box 751, Portland, OR 97201, United States

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ABSTRACT

This paper presents a before–after study of bike boxes at 10 signalized intersections in Portland, Oregon. The bike boxes, also known as advanced stop lines or advanced stop boxes, were installed to increase visibility of cyclists and reduce conflicts between motor vehicles and cyclists, particularly in potential “right-hook” situations. Before and after video were analyzed for seven intersections with green bike boxes, three intersections with uncolored bike boxes, and two control intersections. User perceptions were measured through surveys of cyclists passing through five of the bike box intersections and of motorists working downtown, where the boxes were concentrated. Both the observations and survey of motorists found a high rate of compliance and understanding of the markings. Overall, 73% of the stopping motor vehicles did not encroach at all into the bike box. Both motor vehicle and bicycle encroachment in the pedestrian crosswalk fell significantly at the bike box locations compared to the control intersections. The bike boxes had mixed effects on the motorists’ encroachment in the bicycle lane. The number of observed conflicts at the bike box locations decreased, while the total number of cyclists and motor vehicles turning right increased. Negative-binomial models based upon the data predict fewer conflicts with the boxes, particularly as right-turning motor vehicle volumes increase. Observations of yielding behavior at two bike box and one control intersection found an improvement in motorists yielding to cyclists at the bike box locations. Differences in the traffic volumes and location contexts make firm conclusions about the effects of green coloring of the boxes difficult. Higher shares of surveyed motorists felt that the bike boxes made driving safer rather than more dangerous, even when the sample was narrowed to respondents who were not also cyclists. Over three-quarters of the surveyed cyclists thought that the boxes made the intersection safer.

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1. Introduction

1.1. Background and objectives

Bike boxes, commonly known outside the United States as advanced stop boxes or advanced stop lines (ASLs), have been in use for over 20 years in parts of Northern Europe. The treatment is hypothesized to reduce conflicts between motor vehicles and cyclists and help motorists identify areas of potential conflict. An additional desired secondary outcome would be to encourage more bicycling by enhancing the perception of safety and priority at an intersection. By design, bike boxes place cyclists at the front of the queue at a red signal phase, which should increase their visibility. Some treatments are designed to assist cyclists in turning across oncoming traffic (i.e. turning left in the United States, or right in the United Kingdom); others have been designed to facilitate cyclists

when the bicycle lane crosses from one side of the road to another (Hunter, 2000). Perhaps the most common application of the bike box is to place cyclists in front of right-turning vehicles, proactively preventing collisions at the start of green where the motor vehicle turns right in front of a through cyclist in the adjacent bicycle lane – the “right-hook”.

Bike box treatments can have a number of variations. Bike boxes designed to help cyclists turn across traffic or to navigate a bicycle lane switch from one side of the road to another are more likely to extend across all lanes of traffic. Bike boxes designed to assist cyclists proceeding straight through the intersection are more likely to be limited to a one lane width. Marking the boxes with color (a common strategy) is intended to increase contrast and highlight the presence of bicycles to motorists, thereby reducing potential collisions that occur later in the green phase. A common practice in the Netherlands is to provide a separate cyclist-specific signal, giving cyclists a brief head start; however, this is rare in the United States. Because a bike box places bicycles in front of motor vehicle traffic, they can impede motorists from making right turns at red signals. For this reason, the bike boxes are sometimes paired with “no right-turn on red” signs.

* Corresponding author. Tel.: +1 503 725 5173; fax: +1 503 725 8770.
E-mail address: jdill@pdx.edu (J. Dill).