

#39 – Bicycle Signal Heads

DAVIS, CALIFORNIA

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Background

The city of Davis, CA, has been a mecca for cycling since the mid 1960's. Bicycling accounts for about 17 percent of the mode share in Davis, whereas nationally, two to three percent is considered high. Whenever possible, grade separations have been built to minimize conflicts between cyclists and motorists. These include undercrossings and overcrossings of mostly collector and arterial streets. Where grade separations have not been possible, specially designed traffic control devices have been added at selected intersections.

To help manage the large number of bicyclists utilizing the city's transportation network, there has been a continually increasing need to explore new engineering techniques that would benefit cyclists and enhance safety for all road users. The use of bicycle signal heads was chosen as one such approach. The goal was to enhance safety for cyclists while maintaining adequate levels of service for motor vehicles at each of the intersections where these signals have been installed.

However, bicycle signal heads never had been approved for use by the California Department of Transportation (Caltrans), so the city was required to go through an approval process that included an experimental, conditional-use phase of the bicycle signal heads. Final approval would ultimately be subject to review and acceptance by the California Traffic Control Devices Committee (CTCDC) under the purview of Caltrans.

Although the use of bicycle signals had not previously been formally used in California, they have been widely used for many years in countries such as China, England, and the Netherlands. A former Public Works Director for the city of Davis had at one point visited the Netherlands, and brought the concept of the bike signal heads back with him.

Potential intersections that were evaluated for retrofitting with bicycle signal heads were selected based on three primary criteria:

1. Volumes of bicyclists at peak hour(s)
2. Bicycle and motor vehicle crash data
3. Proximity to schools (primary, secondary, and university levels)

Other locations considered for placement were those where separated bike paths connected with intersections in such a way that conventional traffic light configurations could not be seen by cyclists. These were typically locations where there was a three-way intersection for motorist's (i.e. "T" intersections) that became four-way intersections for bicyclists.

Countermeasures

Bicycle signal heads actually are similar to conventional traffic signals. However, rather than red, yellow and green "balls," the new signal heads use red, yellow, and green bike icons. Initially, the city had to have these custom-made by blacking out conventional colored lens covers to hide everything but the bike shape. The newer signals now use red, yellow, and green LED's in the shape of a bike that are much brighter, yet more energy-efficient. These lights are also actuated in the same way as traditional traffic lights: through the use of bicycle sensitive loop detectors and, where appropriate, bike push buttons. As technology has advanced, newer intersections utilizing conventional or bicycle signal heads now use camera detection.

Although several locations throughout the city met the criteria listed previously, the location that would ultimately prove the viability of bicycle signal heads was the intersection of Sycamore Lane and Russell Boulevard. This location is a "T" intersection for motor vehicles, yet it is a "five-way" intersection for bicyclists due to the presence of bike lanes and bike paths that converge at this location. It is also a primary access point to the University of California for many of the students in the northwest quadrant of the city. Manual traffic counts at this location indicated that approximately 1,100 cyclists and 2,300 motor vehicles passed through this intersection during peak hours. Additionally, this would be the first location where both motorists and cyclists could see the conventional traffic lights and the bicycle signal heads.

Previously, all bicyclists, pedestrians, and motor vehicles would proceed through this intersection concurrently, with many bicyclists and pedestrians choosing the routes they perceived to be the most direct, not necessarily the safest. Bicycle signal heads were chosen for this location to help make the respective movements more predictable, and



thereby safer. To this end, movements were split, with bicyclists and pedestrians moving through the intersection first and motor vehicles proceeding only after all the bicyclists and pedestrians had cleared the intersection. Additionally, a changeable message sign was added for the motorists, indicating "NO RIGHT TURN ON RED" to prevent through cyclists from being hit by right-turning motorists.



Evaluation and Results

In order to objectively assess just how effective the bicycle signal heads were in reducing conflicts, surveys were conducted with both motorists and cyclists before and after the addition of bicycle signal heads. Additionally, video footage was taken of bicycle, pedestrian, and motor vehicle movements before and after intersection modification (both horizontally and vertically). Bicycle and motor vehicle crash reports were also evaluated before and after the installation of the bicycle signal heads.

Both motorists and bicyclists found the new signal heads to be effective in reducing conflicts between the various modes passing through the intersection. Evaluation of crash data seemed to reflect this as well. For the two-year period before the installation of bicycle signal heads at the intersection of Sycamore and Russell, there were about 16 bicycle and motor vehicle collisions. For the two-year period following the installation, there were only two collisions, neither of which involved bicycles.

Conclusions and Recommendations

This study demonstrated that:

- Bicycle signals enhance safety by separating large volumes of bicycle and auto traffic.
- There is minimal additional delay to motor vehicles
- Bike signals are easy to comprehend by cyclists and motorists
- Bicycle traffic signals should be considered on a case-by-case basis taking into account intersection geometry and bicycle and motor vehicle volumes

As a result of what the city of Davis was able to demonstrate regarding the effectiveness of bicycle signal heads, CTCDC voted to approve use of this traffic control device in 1998. Subsequently, the California legislature amended the California Vehicle Code to allow its use statewide, and it was signed into law by the governor in 1999.

Costs and Funding

Cost will depend on the complexity and size of the intersection, but in general, costs are comparable to the installation of conventional traffic signals (e.g. controller boxes, detection devices, mast arms, etc.)

Contact

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The modification (bicycle signal heads) that is the subject of this case study is not currently compliant with the Manual on Uniform Traffic Control Devices, but it may be considered for inclusion once research is completed. Accordingly, it is imperative that any jurisdiction wishing to utilize the bicycle signal heads (or any other non-approved traffic control device) should seek experimental approval from the Federal Highway Administration. For information on how to do so, please visit this Web site: <http://mutcd.fhwa.dot.gov/kno-amend.htm>.