

North Carolina Active Transportation Alliance Position Paper: Bicycle Detection at Demand-Actuated Traffic Signals

Subject: Requiring Demand-Actuated Traffic Signals to Detect Bicycles

Summary: Bicyclists are unnecessarily delayed and put at risk by demand-actuated traffic signals that will not turn green for bicyclists. Local routes that are important to bicyclists often cross high-speed, high-volume thoroughfares at intersections where one cannot cross safely without demand-actuated signal protection. While some states and communities routinely design and adjust signal sensors to detect bicycles and motorcycles using ordinary inductive loop technology, many communities in NC do not. This paper presents recommended policy and practical, affordable engineering practices for reliable detection of non-ferromagnetic bicycles based on standards currently established in California.

Discussion: Bicycles with metal rims (aluminum or steel) are easily detected by inductive loop detectors that have been properly designed and adjusted to do so. Appropriate loop sensor designs also detect motorcycles, cars, and trucks over the loop without detecting large vehicles in the adjacent lane. Video detection is another common sensing method that allows detection of bicycles.

Unfortunately, most communities in North Carolina do not have a policy to design or adjust signal detectors to detect bicycles. The resulting performance deficiencies cause bicyclists to be unacceptably delayed or risk injury or death by non-compliance with traffic signals that will not change to provide them an adequate safe gap in traffic, particularly at side streets and left turns. In contrast, traffic control devices that are designed and maintained to work properly foster greater respect for traffic control devices and traffic laws in general, which promotes public safety.

In 2007, California enacted a law to require all new and upgraded traffic signal sensors to detect bicycles and motorcycles. This was implemented in 2009 when Section 4D.105 of the 2010 California Manual on Uniform Traffic Control Devices was revised to define California's performance standard for bicycle detection. As a result, demand-actuated traffic signals in California are now routinely designed and adjusted to detect bicycles. The most common implementation of a sensor meeting the CA standard is a type "D" quadrupole loop, although other loop shapes and video are used as well. Video based detectors in California are adjusted to detect a bicyclist using a headlamp at night.

Existing quadrupole loops can often be adjusted to detect bicycles over a narrow area of peak sensitivity. These areas of peak sensitivity can be marked by a bicycle detection pavement stencil as illustrated in 2009 MUTCD Figure 9C-7.

In contrast to inductive loop technology, magnetometer-based vehicle detectors are not recommended for bicycle detection because they only detect ferromagnetic materials (modern bicycles are made of mostly non-ferromagnetic parts) and they have very narrow areas of detection sensitivity in practice.

For more technical information about bicycle detection, see the accompanying background paper, "Sensors for Bicycle Detection at Traffic Signals."

Recommended Actions:

- NCATA recommends that North Carolina adopt an equivalent standard to California's, that all new and upgraded demand actuated traffic signal sensors detect non-ferromagnetic bicycles over a 6'x6' limit line detection zone centered no more than 6' from the left side of the travel lane.
- NCATA recommends that existing sensors be adjusted to detect bicycles as effectively as possible without unacceptable false detection of adjacent traffic, and that the area of peak sensitivity be marked with MUTCD-compliant bicycle detection stencils when the loop wires have been covered over with pavement.