

Request to Experiment Washington Avenue Transit Mall

The City of Minneapolis is requesting permission to experiment with red, yellow, and green bicycle symbol signal indications and two-stage left-turn bike boxes at four intersections along the Washington Avenue Transit Mall on the University of Minnesota campus (see **Figure 1**). The signals are proposed to be used on the northbound and southbound approaches at Church Street and Union Street, and the westbound approach at Walnut Street. The two-stage left-turn bike boxes are proposed for installation at the four signalized intersections along the pedestrian/bicycle/transit mall, where bicycle left-turn movements across the bus/light rail guideway are allowed. The City is seeking FHWA approval through MnDOT as authorized in the Manual on Uniform Traffic Control Devices.



Figure 1. Proposed Experiment Locations

The segment of Washington Avenue between Church Street and Walnut Street has been permanently closed to regular vehicular traffic as part of the Central Corridor Light Rail Transit Project, a project that is being constructed by the Metropolitan Council. When construction is complete, the roadway will be open only to transit vehicles (buses and light rail trains), emergency vehicles, pedestrians, and bicycles. Due to the unique mix of traffic and atypical operations, the specialized traffic signals and two-stage left-turn bike boxes are proposed to clarify operations for users of the corridor, reduce delay by allowing for a designated bicycle phase, and provide for safe movements across the bus/light rail guideway. The City’s proposal is aimed at maximizing compliance, and thereby safety, at intersections along the corridor, and is supported by the Central Corridor Light Rail Transit Project.

This submittal format is in compliance with Section 1A.10.2 of the MMUTCD.

Proposal

To provide for safe and efficient operation of bicycles through the Washington Avenue Transit Mall, the Central Corridor Light Rail Transit Project and the City are proposing to install bicycle signal indications and two-stage left-turn bike boxes.

A. A statement indicating the nature of the problem

As part of the Central Corridor Light Rail Transit project, Washington Avenue between Church Street and Walnut Street on the University of Minnesota campus is being converted to a transit, bicycle, and pedestrian mall. The segment will be closed to general vehicular traffic. Buses and trains will operate on the center-running guideway, between the eastbound and westbound lanes, which are designated for use only by bicycles and emergency vehicles. There was a large volume of bicycles on Washington Avenue prior to the construction of the light rail transit guideway, and this is expected to continue with the introduction of light rail transit service.

At the Washington Avenue/Walnut Street intersection, the eastern terminus of the pedestrian/bicycle/transit mall, westbound buses will move from the roadway onto the guideway through the intersection (see **Figure 2** for geometry). Due to the potential conflicts between westbound buses and light rail transit vehicles, all westbound traffic will be operate on an exclusive phase. However, bicycle movements from the bicycle lane east of Walnut Street to the bicycle/emergency vehicle lane west of Walnut Street do not conflict with buses, light rail transit vehicles, or other vehicular traffic. To eliminate unnecessary delay and increase bicyclists' compliance with the signal indications, separate indications for westbound bicyclists are proposed which will be operated concurrently with the eastbound vehicle, bus, and light rail transit phases. This maintains a safe operation for all users, which allowing bicyclists to take advantage of additional green time at the intersection.

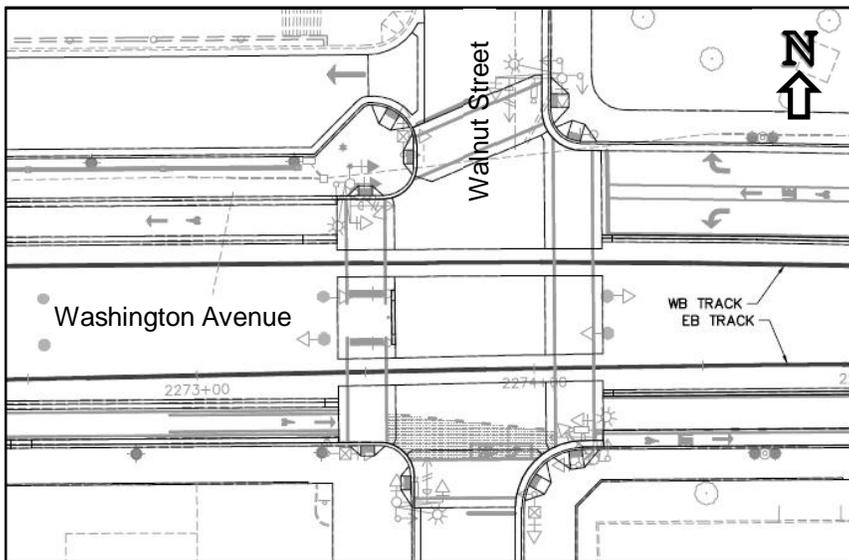


Figure 2. Washington Avenue and Walnut Street Design

At the Washington Avenue/Church Street and Washington Avenue/Union Street intersections, there are no vehicle approaches and the the only north/south movements are by bicyclists and pedestrians. Traffic signals are provided to safely control the crossings of bicyclists and pedestrians across the guideway. For these intersections, the Church Street and Union Street approaches are proposed to be equipped with bicycle symbol signal indications to supplement the pedestrian indications and most accurately reflect their purpose.

At the signalized intersections along the pedestrian/bicycle/transit mall, it is necessary to provide for left-turn bicycle movements across the guideway in order for bicyclists to access destinations and other bicycle facilities. To minimize delay for all users, the traffic signal phasing allows eastbound and westbound bicycle, buses, and light rail transit vehicles to operate through the intersection on the same phase. However, this does result in conflicts between left-turning bicycles and through buses and trains, which are to the left of the bicycle lane. An additional complexity is that buses and trains may approach from the rear of a left-turning bicyclist (i.e., the bicyclist would not be able to see the conflicting vehicle). To provide for safe and efficient operations of bicyclists through this segment and continue to provide for the left-turn movement by bicyclists, two-stage left-turn bike boxes have been proposed that would allow a left-turning bicyclist to wait until it is safe to cross the guideway (i.e., with the north/south signal phase). These bike boxes would be installed at the six locations where bicycles can turn left from the pedestrian/bicycle/transit mall across the guideway:

- Westbound left-turn movement at Washington Avenue/ Church Street
- Eastbound and westbound left-turn movements at Washington Avenue/ Union Street
- Eastbound and westbound left-turn movement at Washington Avenue/ Harvard Street
- Eastbound left-turn movement at Washington Avenue/ Walnut Street

An example of one of these locations is shown in **Figure 3**.

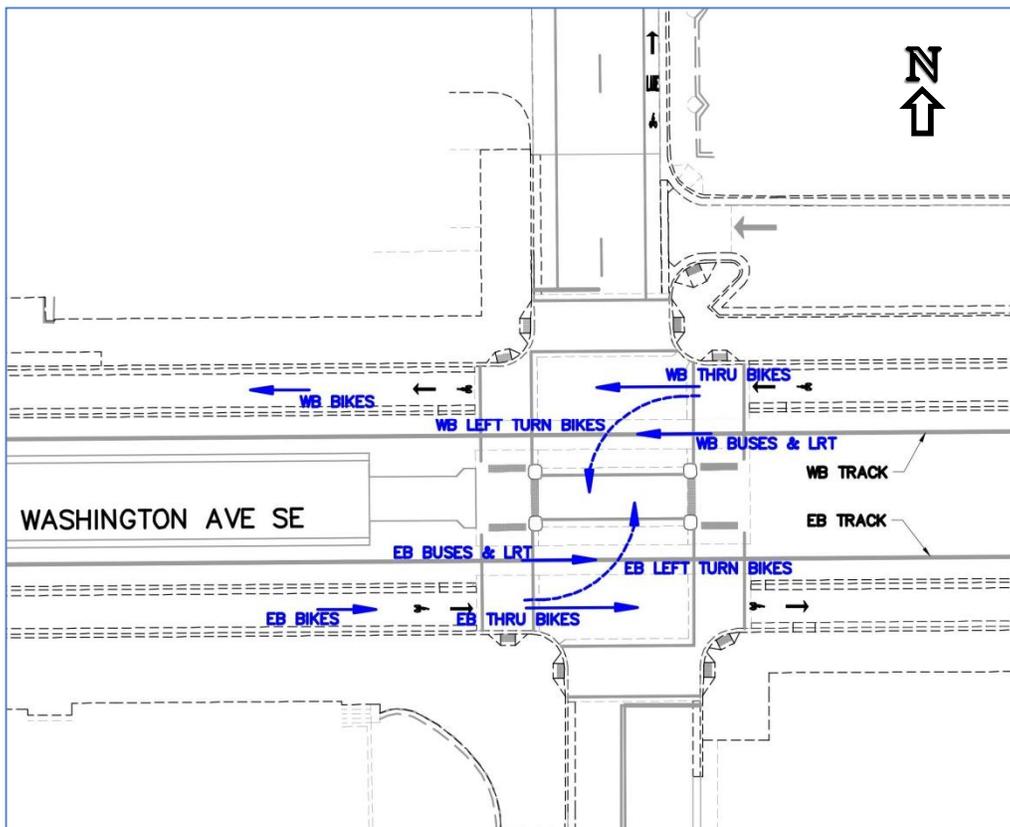


Figure 3. Washington Avenue Transit Mall Intersection Design

B. A description of the proposed change to the traffic control device or application of the traffic control device, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standards.

This experiment would evaluate the use of bike-specific signal heads and two-stage left-turn bike boxes.

The bicycle signal head would differ from standard indications in the use of a bicycle symbol in lieu of a solid green, yellow, or red ball. The device would operate the same as standard traffic signals heads, but assigns right-of-way at the intersection only for bicyclists. At the Washington Avenue/Walnut Street intersection, the modified device allows for phasing for the bicycles that is different than the vehicle phasing. At the Washington Avenue/Church Street and Washington Avenue/Union Street intersections, the bicycle symbols on the signal indications reinforces when it is safe for bicyclists to proceed across the guideway, as a supplement to the pedestrian indications at the signal (i.e., there are no vehicle indications for these approaches).

C. Any illustration that would be helpful to understand the traffic control device or use of the traffic control device.

The proposed bicycle signal indication would be similar to the one shown in **Figure 4**. The two-stage left-turn bike box would be as shown in **Figure 5**, with green pavement markings highlighting the box and a bicycle symbol and left-turn arrow within the box. In addition, static regulatory signing will be used that prohibit the left turn, direct bikes to use the bike box, and also show the maneuvers to use the bike box. The proposed signing is shown in **Figure 6**.



Figure 4. Proposed Bicycle Indication.

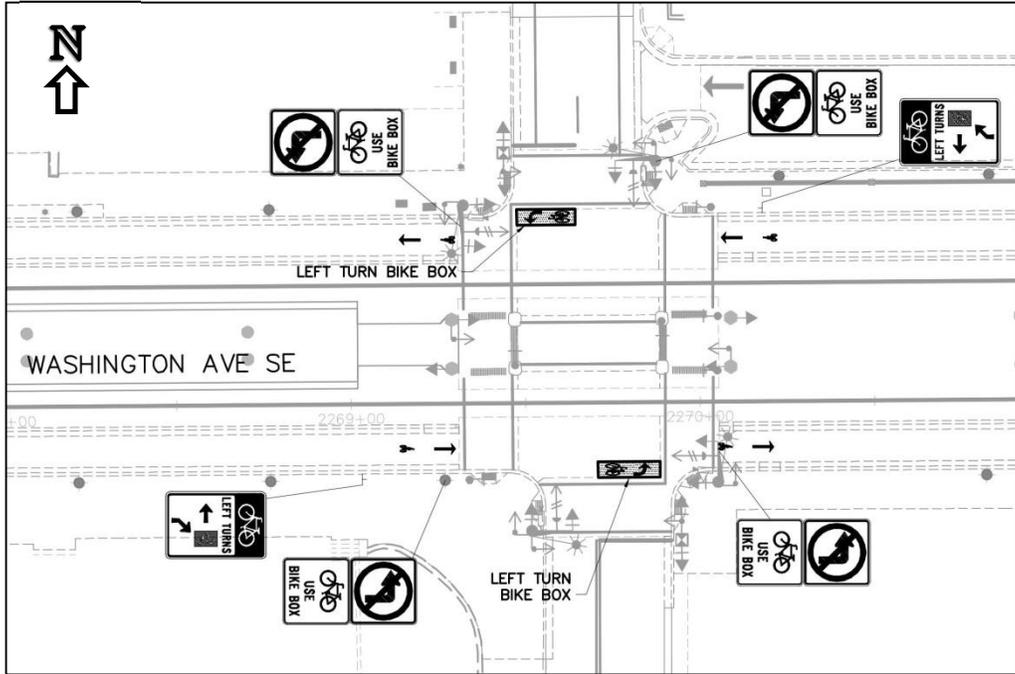


Figure 5.

Proposed Two-Stage Left-Turn Bike Box

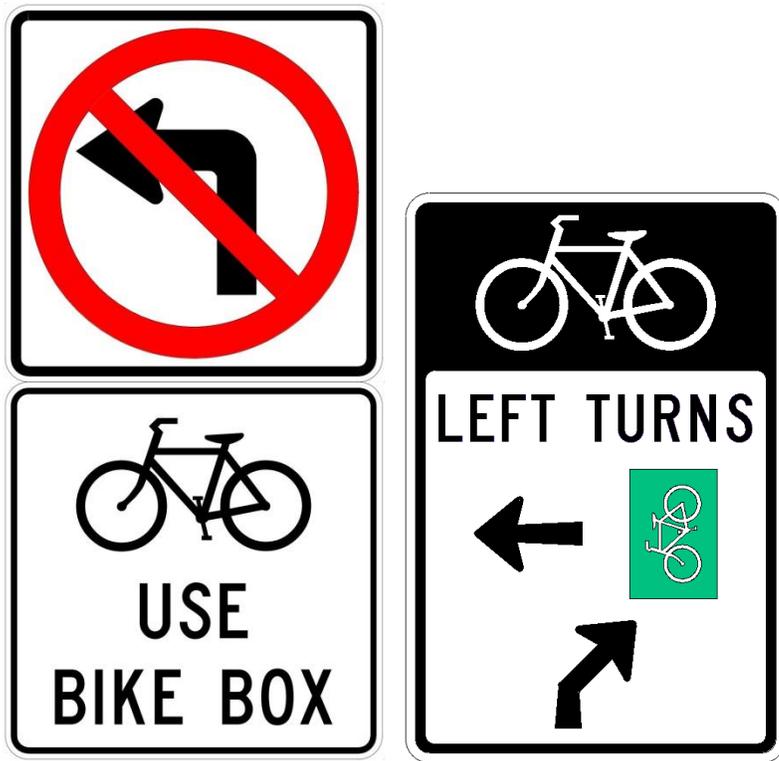


Figure 6. Proposed Signing for Two-Stage Left-Turn Bike Box

D. Any supporting data explaining how the traffic control device was developed, if it has been tried, in what ways it was found to be adequate or inadequate, and how this choice of device or application was derived.

In recent years, the City of Minneapolis has dramatically increased its bicycle infrastructure. All users of the City's transportation system have been exposed to the increased number of bicycle facilities and the associated use of the bike symbol.

The Central Corridor Light Rail Transit Project and the City believe that the intended meaning of the widely recognized bicycle symbol in conjunction with a traffic signal indication would be obvious. The Central Corridor Light Rail Transit Project and the City believe that the likelihood of a general misunderstanding of the bike symbol is very small. Additionally, the City has previously requested and been granted approval to experiment with bicycle symbol signal indications at the University Avenue/15th Avenue SE and Broadway Street/5th Street NE intersections, which are currently operational and located within 0.5 miles and 2.5 miles from the proposed location, respectively.

The Central Corridor Light Rail Transit Project and the City believe that the intended meaning of the green bike box, in conjunction with the signing, would indicate to bicyclists how to safely make the left-turn maneuver across the transit guideway. Since the only motorized vehicles on the pedestrian/bicycle/transit mall are transit and emergency vehicles with trained drivers, the Central Corridor Light Rail Transit Project and the City believe that the likelihood of a misunderstanding of the boxes and signing by drivers is minimal. In addition, the City has recently installed a similar two-stage right-turn bike box at Portland Avenue/10th Street S.

E. A legally binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright.

To the best of the City of Minneapolis' knowledge, the concept of using bicycle signal indications and two-stage turn bike boxes to supplement standard traffic control devices are not protected by patents or copyrights.

F. The time period and location(s) of the experiment.

Construction of the Central Corridor Light Rail Transit project is expected to be completed by the end of 2013, with the proposed bicycle signal indications and bike boxes proposed for installation prior to November 1, 2013. Testing of the light rail transit system will be conducted throughout the fall and winter of 2013, and revenue service of the light rail transit line is expected in spring 2014. The evaluation of the proposed signals, signing, and markings would continue at least until the end of 2014 to allow for several months of observation before and after light rail trains begin revenue operations.

G. A detailed research or evaluation plan that must provide for close monitoring of the experimentation, especially in the early stages of its field implementation. The evaluation plan should include before and after studies as well as quantitative data describing the performance of the experimental device.

Bicyclist and motorist behavior and interaction will be observed by staff at the subject intersections after the application of the test devices. Variables to be studied and recorded in the field will be:

- Bicycle volumes, especially for the following movements:
 - Westbound left-turn movement at Washington Avenue/ Church Street
 - Eastbound and westbound left-turn movements at Washington Avenue/ Union Street
 - Eastbound and westbound left-turn movements at Washington Avenue/ Harvard Street
 - Westbound through and eastbound left-turn movements at Washington Avenue/ Walnut Street
- Crash rates at the signalized intersections
- Bicyclists surveys to determine recognition, comprehension, and effectiveness of the devices
- Driver surveys of transit operators to determine recognition, comprehension, and effectiveness of the devices
- Bicyclist behavior (compliance with devices)

H. An agreement to restore the site of the experiment to a condition that complies with the provisions of this Manual within 3 months following the end of the time period of the experiment. This agreement must also provide that the agency sponsoring the experimentation will terminate the experimentation at any time that it determines significant safety concerns are directly or indirectly attributable to the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation at any time if there is an indication of safety concerns. If, as a result of the experimentation, a request is made that this Manual be changed to include the device or application being experimented with, the device or application will be permitted to remain in place until an official rulemaking action has occurred.

The City of Minneapolis and the Central Corridor Light Rail Transit Project agree to the above conditions.

I. An agreement to provide semi-annual progress reports for the duration of the experimentation, and an agreement to provide a copy of the final results of the experimentation to the FHWA's Office of Transportation Operations within 3 months following completion of the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation if reports are not provided in accordance with this schedule.

The City of Minneapolis and the Central Corridor Light Rail Transit Project agree to the above conditions.