

City of Minneapolis
Request to Experiment

July 2010

Introduction / Background

The City of Minneapolis is requesting permission to experiment with several variations of colored pavement, non standard pavement markings, and bicycle signal heads in conjunction with the construction of an ambitious bicycle operations project in 2010.

This project will be funded through the Non-Motorized Transportation Pilot Program with funds administered by Transit for Livable Communities. In order to promote increased bicycle usage in the City, changes will be made to the City's existing signing and pavement markings on 17 roadway segments totaling 33 miles, nearly doubling the City's on-street bike network.

This submittal format is in compliance with Section 1A.10 of the MUTCD. The seven specific items included in this request are:

1. Colored conflict zone
2. Colored crosswalk
3. Intermittent colored background for shared lane marking
4. Continuous colored background for shared lane marking
5. Advisory bike lane
6. Enhanced shared lane marking
7. Bicycle signal indications

In all cases where colored pavement is utilized, the color will be green. The green pavement sections will be produced by using green rock chips in a chip seal process.

The City's purpose in requesting this permission to experiment is to create flexibility for the City to utilize several techniques that are strongly supported by the Minneapolis Bicycle Community and would potentially increase safety and efficiency. The City would favor the ultimate end result of this effort as being the addition of several optional pavement marking techniques, rather than changing the existing standards.

A. A Statement indicating the nature of the problem:

Several locations have been identified by the City that will require motorists, desiring to make a right turn, to cross a through bike lane. It is critical that both bicyclists and motorists recognize that this portion of roadway requires a higher degree of care in order to avoid crashes.

The City is requesting permission to experiment with a technique that will provide additional visibility in these conflict zones – colored green paint. The two proposed treatments utilizing colored paint described in this document are:

- 1.) Colored conflict zone
- 2.) Colored crosswalk at a trail crossing

There are numerous locations throughout the City of Minneapolis where on-street bicycle lanes can not be installed on the designated bicycle routes due space constrictions from other corridor needs. In many of these situations bicycle route signage does not sufficiently address bicyclist needs. Additional guidance for both bicyclists and motorists is required to make the designated corridor suitable for average bicycle riders. In addition, these corridors tend to have a high parking density and high parking turnover. On these routes, cyclists wishing to stay out of the way of drivers often ride too close to parked cars and risk being hit by opening car doors (being “doored”). To avoid this, experienced cyclists ride further to the left and position themselves close to the center of narrow lanes. This is permitted by Minnesota State Statute but it often irritates motorists who are not aware that this is permitted. Minnesota State Statute also requires motorists sharing the same lane to pass with at least 3 feet of clearance between the bicyclist and motorist. To teach cyclists correct positioning on the street and to educate motorists about cyclists’ right to occupy a narrow lane and to pass bicyclists legally, the City of Minneapolis marks bike routes meeting certain criteria with shared lane markings. The City believes that these markings, as described in the MUTCD, lack the visibility and conspicuity that is necessary in all traffic control devices.

The City of Minneapolis is requesting permission to experiment with the following treatments meant to increase the effectiveness of the standard shared lane marking.

- 3.) Intermittent colored background for shared lane marking
- 4.) Continuous colored background for shared lane marking
- 6.) Enhanced shared lane marking

As discussed previously in this section, installation of bicycle facilities in a developed urban area is a significant challenge. The installation of standard traffic control devices occasionally does not result in the optimal solution.

The City of Minneapolis is requesting permission to experiment with a technique that will allow a bike lane on a roadway segment that has traditionally been considered to be too narrow to completely accommodate competing uses. This technique will be referred to in this document as an advisory bike lane. (item 5)

The City of Minneapolis is requesting permission to experiment with bicycle signal indications at the intersection of Broadway Street and 5th Street. The Broadway Street/5th Street intersection is currently a three leg intersection with a concrete diverter disconnecting the south leg of the intersection. To provide a continuous bicycle corridor along 5th Street, the existing concrete diverter will be opened to allow for bicycle passage and crossing of Broadway Street NE.

Broadway Street is a four-lane undivided roadway carrying approximately 16,000 daily vehicles. As part of the intersection evaluation a field study was conducted to collect the existing number of traffic gaps available for safe pedestrian and bicycle crossing. The study found the average delay for pedestrians to be between 3 and 10 minutes and the average delay for bicyclists to be greater than 1 minute. To improve crossing safety and reduce delays for bicyclists and pedestrians, a traffic signal is proposed at this location. Because of the difference in time required to cross the full street width between a bicyclist and a pedestrian, it is undesirable and an inefficient operation to require the bicyclist to cross on the pedestrian interval. In addition, the northbound approach will facilitate only bicycle traffic. It is desired to locate the bicycle curb cut with the alignment of the bicycle facility on 5th Street, and to keep the bicycle and pedestrian movements separate. This technique will be referred to in this document as:

7.) Bicycle signal indication

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:

- 1.) Colored conflict zone
- 2.) Colored crosswalk at a trail crossing

These two strategies would consist of simply coloring the pavement surface between the longitudinal parallel white markings in a bicycle lane and the transverse parallel white markings of an intersection trail crossing. (see figures 1 and 2)

It is anticipated that the colored pavement in these two types of applications will draw the attention of all roadway users and thereby increase the level of care exercised by those users.

Colored Conflict Zone Location	Direction	Turn
15 th Ave SE at Rollins Ave	Northbound	Right
7 th St N at Lyndale Ave E	Westbound	Right
7 th St N at 6 th Ave N	Westbound	Right
Plymouth Ave N at W River Pkwy	Westbound	Right
1 st Ave S at 28 th St	Northbound	Right
Blaisdell Ave at Lake St	Southbound	Right
16 th St E at 3 rd Ave S	Eastbound	Right
16 th St E at 3 rd Ave S	Westbound	Right
16 th St E at 4 th Ave S	Westbound	Right
Colored Crosswalk at a Trail Crossing Location	Intersection Leg	
Hennepin/Lyndale Avenues at Oak Grove St	East	
Hennepin/Lyndale Avenues at Groveland St	East	

- 3.) Intermittent colored background for shared lane marking
 - 4.) Continuous colored background for shared lane marking
- The City has interest in maximizing the visibility, and thus, the effectiveness of shared lane markings in certain circumstances. Roadway operation and safety could likely be improved by calling attention to roadway users of the presence and placement of shared lane markings. These two techniques would consist of colored pavement in a longitudinal alignment upon which standard shared lane markings would be installed. The colored pavement would provide a distinctive background to the markings and make them more conspicuous. (see figures 3 and 4)

The intermittent colored background has been chosen to examine the effectiveness of a colored background which is not continuous, due to the high maintenance cost of colored paint. The distance of the center of the sharrow from the curb will vary in order to examine the effectiveness of distance from the “door zone.” In one direction it will be 12.5’ from the curb, and in the other direction it will be 14’ from the curb.

- 5.) Advisory bike lane
- Traffic control devices are meant to convey information to roadway users that will provide for safe and efficient operation.

The City of Minneapolis requests permission to experiment with a variation of the standard longitudinal markings for a bicycle lane. This strategy is meant to convey a permissive message in a low speed environment and would consist of replacing the inside solid line defining the bicycle lane to a modified dotted line pattern. Detail is shown on figure 5.

The narrow roadway width in this experimental segment will require frequent encroachment by cyclists and motorists into each other's space. Motorists may need to enter the advisory bike lane to pass an oncoming vehicle, and bicyclists may need to leave it to avoid the opened door of a parked vehicle. It is anticipated that the experimental markings will convey this intended message.

While sharrows are an alternative to an advisory bike lane, the visibility and conspicuity of sharrows is a concern. As a result sharrows will be implemented on a roadway in a nearby location with similar conditions to test the effects of the sharrow versus the advisory bike lane on motorist and bicyclist placement.

The advisory bike lane is intended to convey the message that the bike lane is preferred for bicyclist use, which fits under the Minnesota statute definition of bicycle lanes as being "designed for exclusive or preferential use" by bicyclists.

6.) Enhanced shared lane marking

This experimental marking is intended to provide an extra level of visibility over the standard shared lane marking. The specific location for this experiment will be on an uphill grade. It is anticipated that bicyclists will slow down when negotiating the grade and could result in increased impatience or frustration for motorists who may be expected to adopt the bicyclist's pace. The enhanced version of the standard marking may reinforce the message to both bicyclists and motorists that the bicyclist is where he or she belongs. Refer to figure 6.

7.) Bicycle signal indication

To address the issues discussed previously, the experimental bicycle signal indication will provide bicyclists an opportunity to have an exclusive phase for crossing Broadway Street. In addition, the bicycle signal indications will provide the appropriate level and type of indication for northbound bicyclists (otherwise would have green ball or pedestrian indication, which are less appropriate). The proposed signal operation is as follows:

- Semi-actuated control (southbound motor vehicle approach and bicycle phase actuated).

- Interconnected and coordinated operation with Broadway Street/University Avenue and Broadway Street/Washington Avenue (next adjacent signal systems)
- Exclusive bicycle phase, activated by a push button. Bicycle push buttons will be conveniently located adjacent to bike lane. Total clearance time will be increased from the typical five seconds to seven seconds.
- Southbound bicyclists will operate on both the exclusive bicycle phase and concurrent with southbound motor vehicle phase. The bicycle signal head will be mounted next to the pedestrian head.
- Pedestrian crossing intervals with countdown timers will be provided for crossing the east, west and north legs of the intersection.

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

See figures 1 through 7.

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:**

The City of Minneapolis is aware of several ongoing studies across the U.S. involving colored paint.

The concept of utilizing an attention getting technique to increase compliance is intuitive; the question that remains is - does it really work?

The City is interested in evaluating these attention getting ideas by experimenting with them, and then be able to add those results to the body of knowledge being created across the nation.

The advisory bike lane component of this request to experiment does not fit the attention getting approach. The intended result will be to convey additional pertinent information to roadway users by using a standard device (dotted line) in a non standard application (to define a bike lane).

The test location is low volume and low speed, but lacks the width required for the standard bicycle lane markings.

Bicycle signal indications are prevalent on streets in the UK, the Netherlands, Germany and Denmark. They have also been utilized in the

United States in Tucson, AZ, New York City, NY, Denver, CO, Washington DC and Portland, OR.

E. A legally binding statement certifying that 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 colored pavement or bicycle signal indications to supplement standard traffic control devices is not protected by a patent or copyright.

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

Construction of the proposed test techniques is scheduled for the summer of 2010. Evaluation will continue through 2012.

Appendix A contains specific location and design details of each of the proposed test areas.

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:

Of the seven experimental items discussed in this document, only items 2 (colored crosswalk) and 4 (continuous colored background for shared lane markings) would lend themselves to a true before and after analysis. The crosswalks intended to receive colored pavement exist without colored pavement. The roadway segment targeted to receive continuous green longitudinal markings to supplement the shared lane markings, currently has those markings in place.

The evaluation process for the remaining items will necessarily be focused on their performance after implementation.

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

- Direction of cyclists' travel (with or against traffic)
- Before and after bicycle volumes
- Before and after crash rates
- Bicyclists surveys to determine recognition, comprehension, and effectiveness
- Driver surveys to determine recognition, comprehension, and effectiveness

- Driver and bicyclist surveys to identify any parking/bicycle conflicts
- Driver and bicyclist surveys to gauge value
- Effectiveness of signal timing relative to safety and operation efficiency
- Motorist and bicycle behavior (compliance with device)

If resources permit the following variables may be considered in this study.

- Distance between cyclists and parked vehicles.
- Number and frequency of conflicts between cyclists and motorists in the same lane.

In addition to videotaped data, surveys will be given to cyclists, residents, and motorists traveling along the streets of the experiment. The survey will be conducted along the corridor by stopping bicyclists and motorists. Willing participants will fill out a short survey about the proposed treatment. Residents will be mailed their surveys. This survey will include questions regarding the visibility of the pavement marking, the person's interpretation of the pavement marking's meaning, and what, if any, changes were made to one's driving or riding behavior after the pavement marking was applied to the street.

- 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 this experiment. This agreement must also provide that the agency sponsoring the experimentation at any time 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.**

Minneapolis Public Works agrees to the above conditions.

- I. **An agreement to provide semiannual 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 Operation has the right to terminate approval of the experimentation if reports are not provided in accordance with this schedule.**

Minneapolis Public Works agrees to the above conditions.

City of Minneapolis
2010 Bicycle Operations Project – Request to Experiment
Appendix A - Index

<u>Item No.</u>	<u>Description</u>	<u>Detail Drawing</u>
1	Colored conflict zone	1
2	Colored crosswalk	2
3	Intermittent colored background for shared lane marking	3
4	Continuous colored background for shared lane marking	4
5	Advisory bike lane	5
6	Enhanced shared lane marking	6
7	Bicycle signal indication	7

City of Minneapolis Request to Experiment Location Map

1 - COLORED CONFLICT ZONE

2 - COLORED CROSSWALK

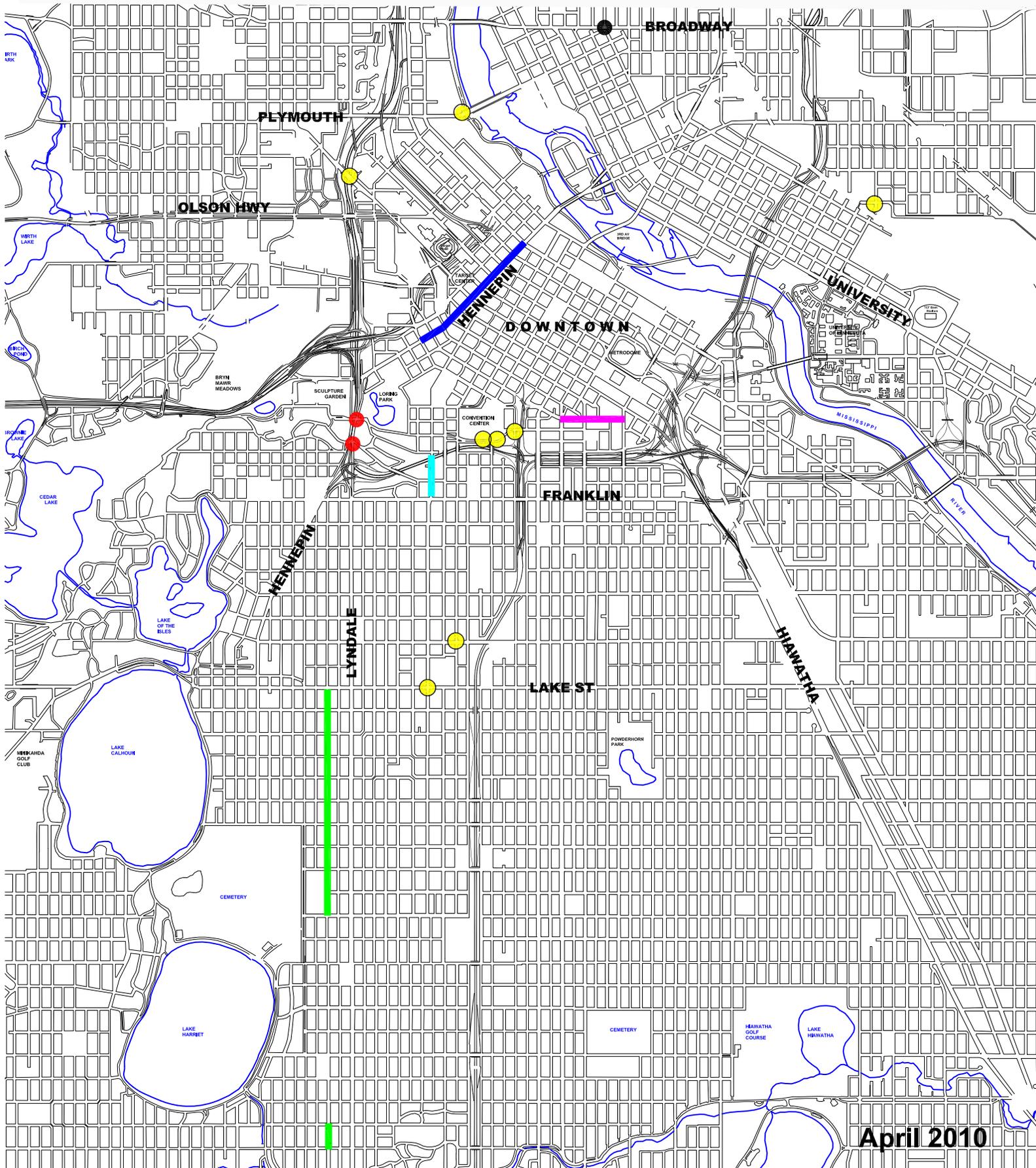
3 - INTERMITTENT COLORED BACKGROUND

4 - CONTINUOUS COLORED BACKGROUND

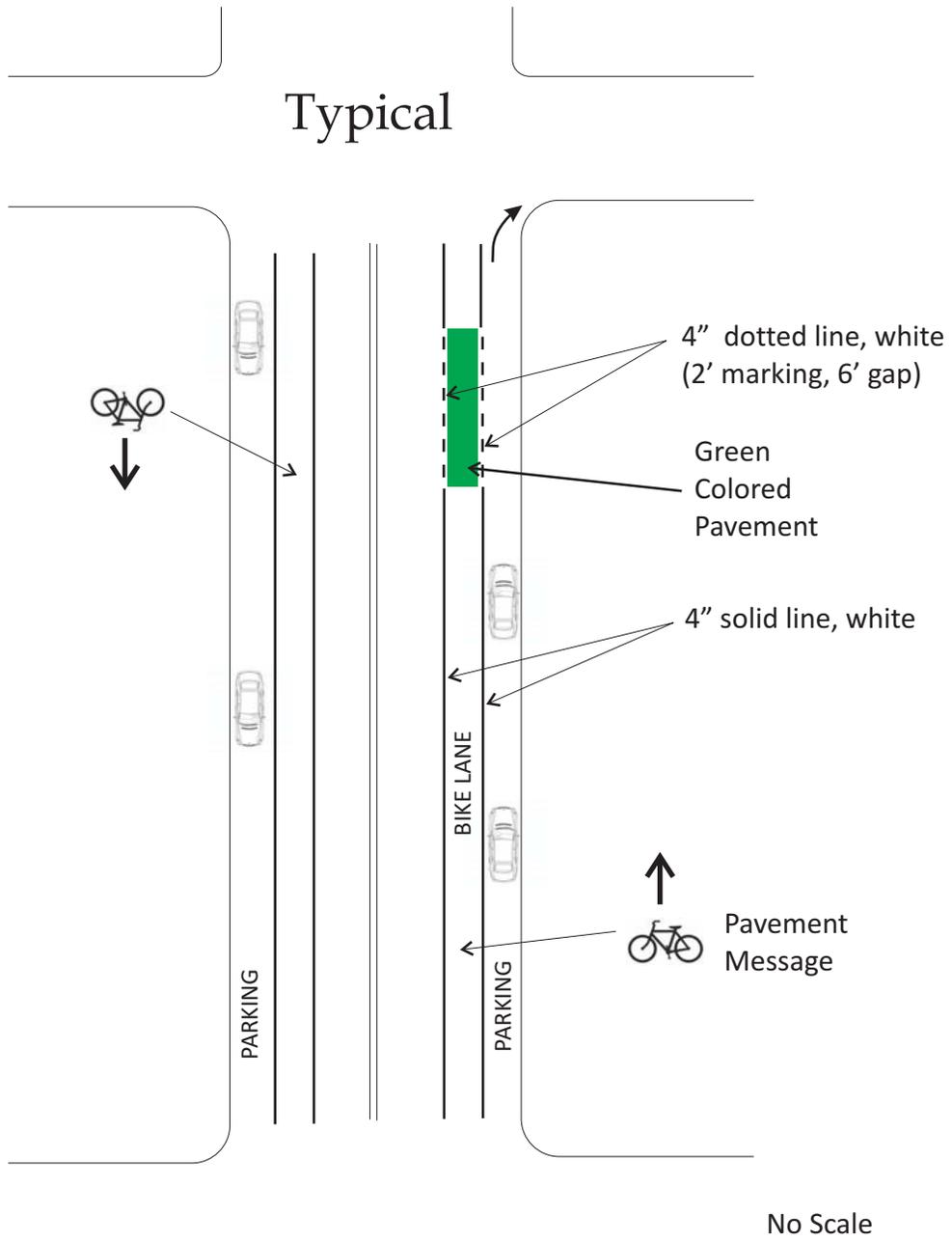
5 - ADVISORY BIKE LANE

6 - ENHANCED SHARED LANE MARKING

7 - BICYCLE SIGNAL INDICATIONS



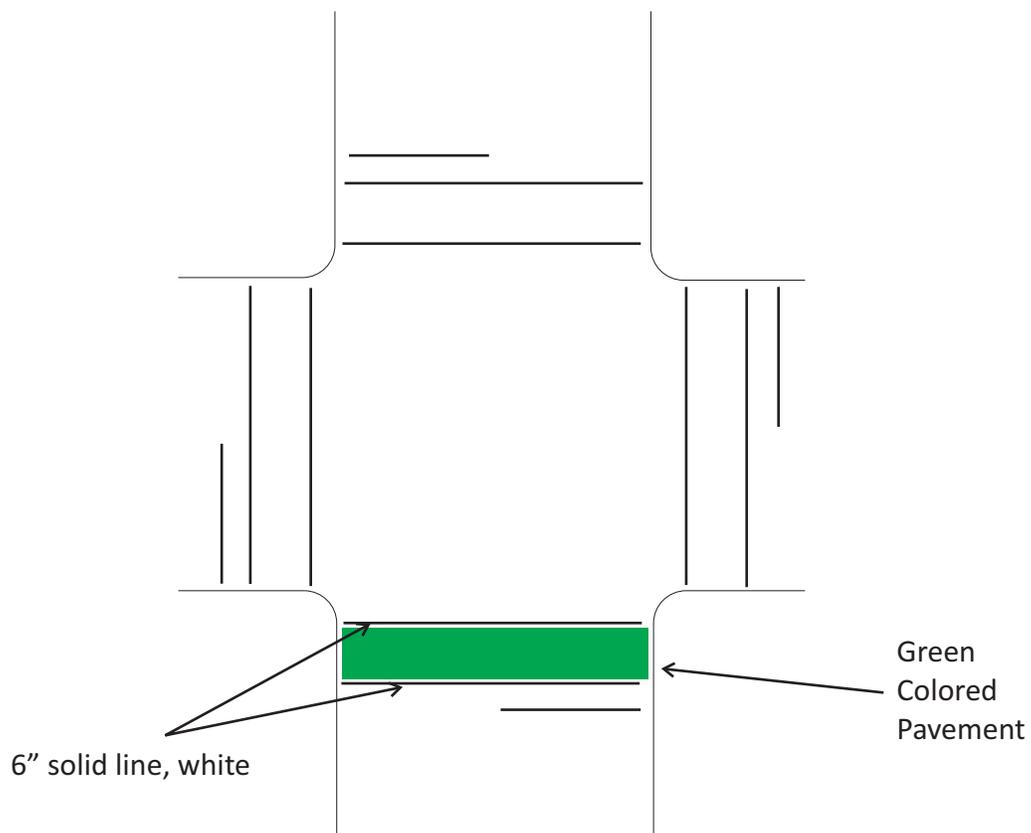
Item 1 Colored Conflict Zone



City of Minneapolis
2010 Bicycle Operations Project - Request to Experiment

Item 2
Colored Crosswalk

Typical

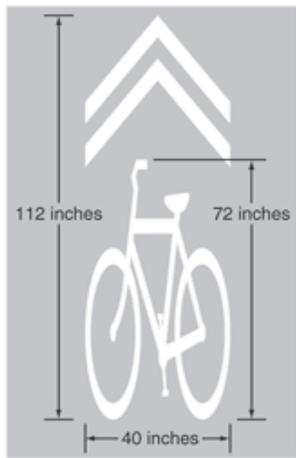


No Scale

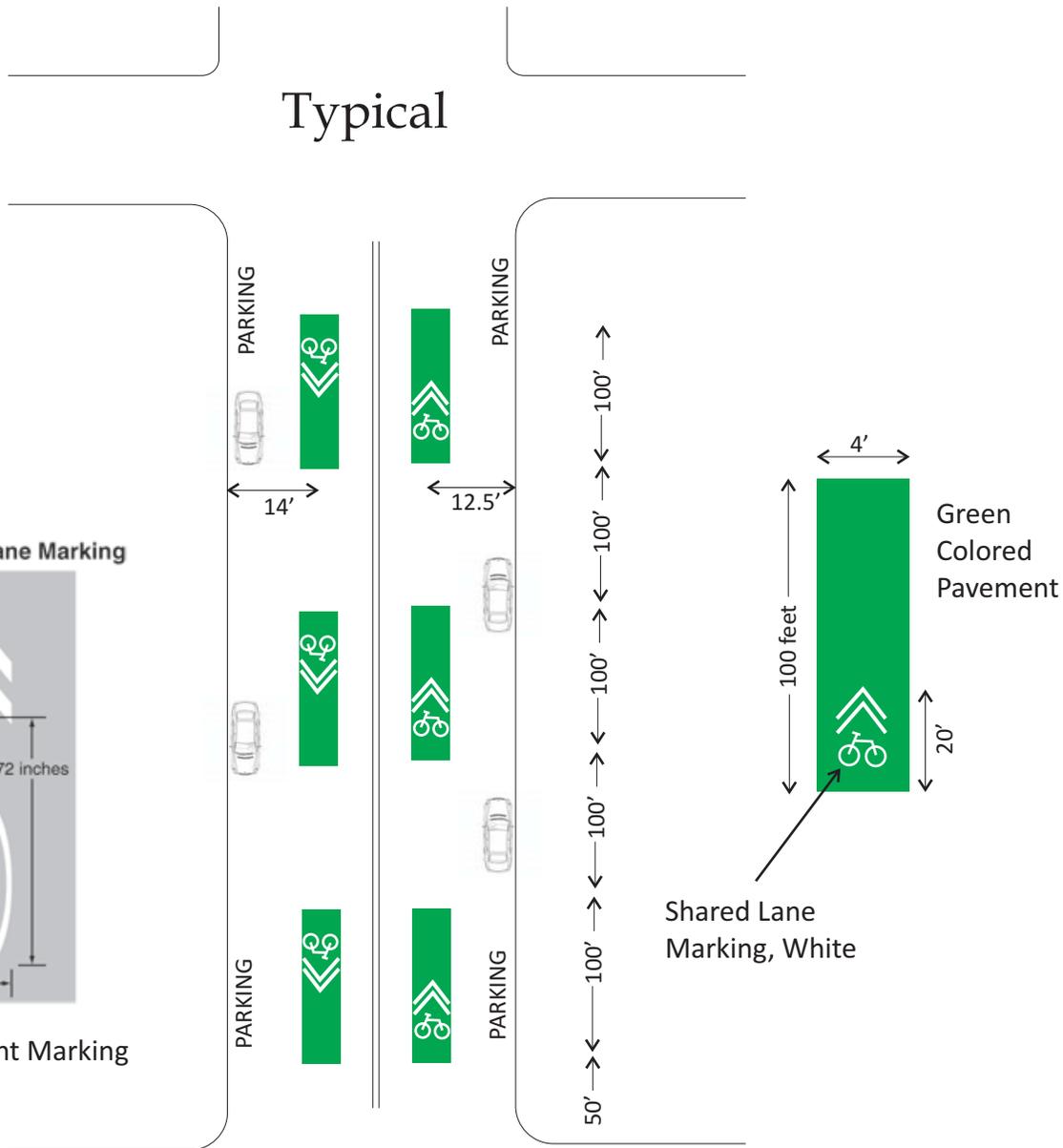
Item 3 Intermittent Colored Background For Shared Lane Markings

Typical

Figure 9C-9. Shared Lane Marking



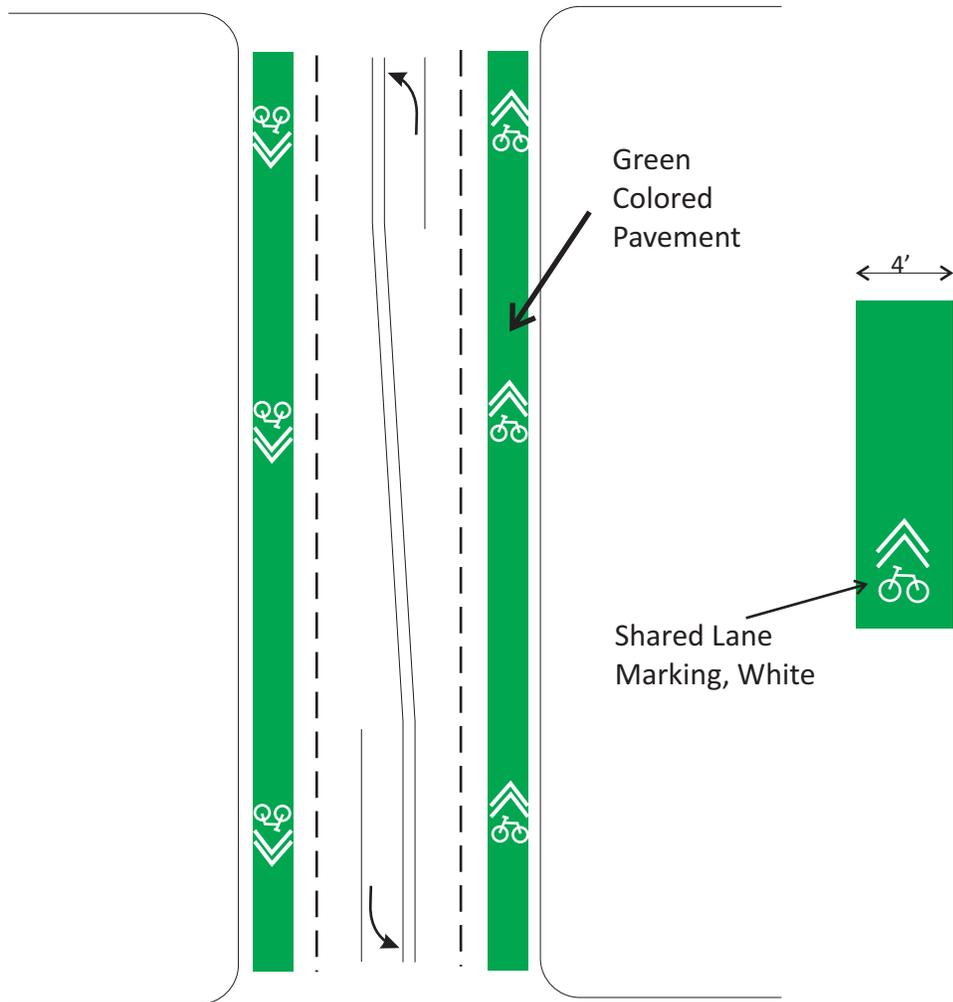
Dimensions of Pavement Marking



No Scale

Item 4 Continuous Colored Background For Shared Lane Markings

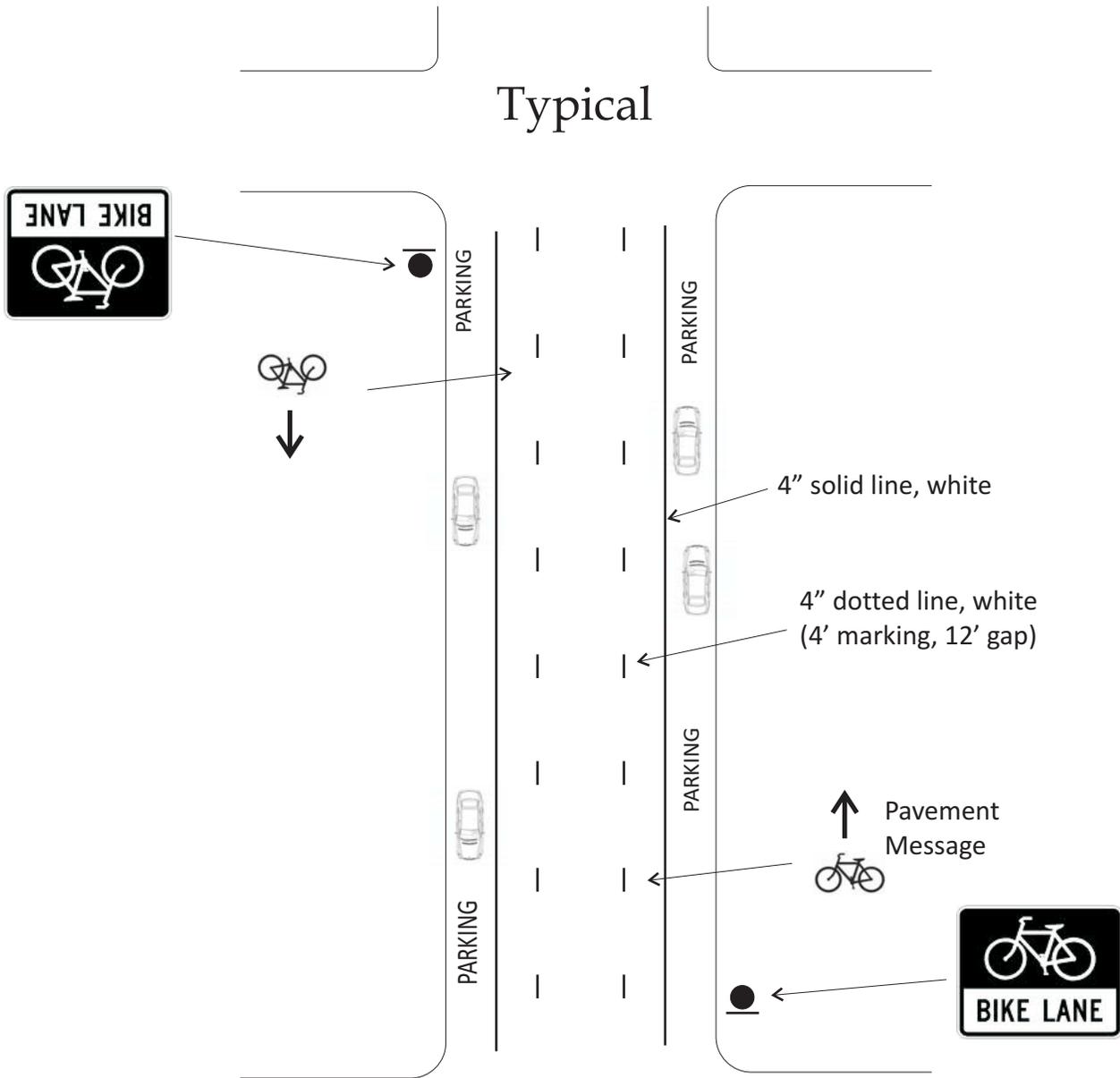
Typical



No Scale

Item 5 Advisory Bike Lane

Typical



No Scale

City of Minneapolis
2010 Bicycle Operations Project - Request to Experiment

Item 6
Enhanced Shared Lane Marking

