



Sam  
Adams  
Commissioner

August 31, 2005

Susan D.  
Kell  
Director

Federal Highway Administration  
Office of Transportation Operations  
400 Seventh Street, SW, HOTO  
Washington, DC 20590

Eileen  
Argentina  
System  
Management

RE: Request for Permission to Experiment to Install Shared Lane Markings

Bryant  
Engel  
Business  
Services

Dear Sir or Madam:

Don  
Gardner  
Engineering &  
Development

The City of Portland Office of Transportation respectfully requests permission to experiment with the installation of Shared Lane Markings. The subject pavement marking is a "Bike and Chevron" marking that delineates where both bicyclists and motorists will share a travel lane. The California Traffic Control Devices Committee adopted this symbol on August 12, 2004 for use on California roads.

Sam M.  
Irvine, Jr.  
Maintenance

The following information summarizes the project background and provides the information as requested in the *Manual on Uniform Traffic Control Devices (MUTCD), Section 1A.10, Interpretations, Experimentations, Changes, and Interim Approvals*.

John Gillam &  
Steve Iwata  
Planning

## BACKGROUND

Bicycle travel in Portland has increased rapidly in the past decade. This increase has resulted in Portland's having one of the more respected and user-friendly transportation systems in the country. With its pedestrian orientation, relatively low traffic congestion, and connected street grid, bicycle trips are a pleasant daily option for many people. In addition, as more residents have been cycling for daily transportation, more have been advocating for improved bicycling conditions. This has resulted in more miles of bicycle lanes, bicycle boulevards, and off-street paths; more bicycle parking; and better maintenance of existing facilities, all of which have encouraged more bicycling, which has tripled in Portland's Central City over the past ten years.

These factors have led policy makers at all levels to treat the bicycle as a serious mode of transportation. As early as 1971, Oregon adopted a state law (ORS 366.514) that requires cities and counties to expend a minimum of one percent of transportation revenues on bikeways and walkways, and that bikeways and walkways are included as part of roadway construction and reconstruction.

Many subsequent goals and policies have been adopted toward this end, including the 1991 Oregon State Land Conservation and Development Commission's Transportation Planning Rule (Goal 12), which requires all jurisdictions in the Portland Metro Area to prepare a plan to reduce automobile miles traveled per capita by 20 percent over the next 30 years. The regional government, Metro, has been leading an effort to ensure that future land-use development encourages balanced transportation options, including bicycle transportation.

An Equal  
Opportunity  
Employer

Following this growing policy support, additional funding has been made available for bicycle transportation improvements. This has been true on the local and state level, as well as the federal level, beginning with the 1990 Clean Air Act and the 1991 Inter-Modal Surface Transportation Efficiency Act (ISTEA). The resulting advocacy and increased policy and financial support from all government levels have resulted in significant bicycle transportation improvements. These, in turn, have led to dramatic increases in bicycle ridership in Portland.

As part of these bicycle transportation improvements, the City of Portland is developing guidelines for using shared lane pavement markings for use when bicycle lanes cannot be marked due to one or more of the following conditions:

- A change in automobile operations needed to mark bicycle lanes would result in a level of service that falls short of regional guidelines.
- A change in automobile operations needed to mark bicycle lanes would result in conditions considered unsafe by city traffic engineers.
- Marking bicycle lanes would result in a significant and widespread loss of needed automobile parking.

The City views shared lane pavement markings as a possible solution to bridging the gaps in developed bikeways and improving roadway corridors that are classified City Bikeways that fall under one of the conditions mentioned above.

## REQUESTED DATA

### A. Nature of Problem

The City of Portland has developed bikeways—some of which are marked with bicycle lanes—as a commitment to city residents to provide safe and convenient conditions for bicycling. The decision to mark bicycle lanes on specific streets, as part of Portland's bikeway network, acknowledges that an untreated shared lane riding environment on these specific streets is inappropriate for safe and convenient bicycle travel.

However, bicycle lanes are occasionally incomplete on segments of a given corridor, or cannot be marked along a corridor, due to the three above-mentioned reasons. These gaps in a given bikeway corridor leave cyclists in a shared lane environment that is inappropriate given volume and/or speed conditions along that bikeway. Cyclists have reported that bicycle lanes that abruptly end are a significant deficiency in providing for safe and convenient bicycle travel. Office of Transportation staff recognize that the loss or absence of bicycle lanes on a roadway where our guidelines otherwise call for them discourages many residents from bicycling along that corridor. As both San Francisco (CA)<sup>(1)</sup> and Cambridge (MA)<sup>(2)</sup> studies demonstrated, on roadways where bicycle lanes would otherwise be the recommended treatment but cannot be provided, cyclists endanger themselves by riding too closely to parked cars (i.e., within the "door zone"), and overtaking vehicles pass cyclists too closely. The unpleasantness of these experiences for cyclists likely has the effect of discouraging increased bicycle use along corridors where such conditions exist.

It is also the policy of the City of Portland to develop bikeways that are as direct as possible, and to not divert cyclists from a direct route, as might be the case when needed bicycle lanes cannot be marked. For these reasons, the highest priority for applying shared lane pavement markings are on bikeway corridors where marked bicycle lanes end due to operational or geographic barriers to their continuation. The

proposed shared lane pavement markings are intended to improve operating conditions for cyclists on City Bikeways where bicycle lanes are not feasible.

**B. Description of Proposed Experiment**

The City of Portland will install Bike-and-Chevron shared lane markings on several roadway segments with gaps of varying lengths in bicycle lane facilities. The markings will be placed on those block faces where there are no existing bicycle lanes. These markings will be placed in the travel lane in a manner that will communicate to both cyclists and motorists the legitimacy of cyclists sharing the lane, and where cyclists should position themselves in the travel lane relative to parked vehicles.

**C. Illustration of Shared Lane Markings**

Refer to Figure 1 and 2 for a representation of the proposed pavement markings. Figure 1 shows the Bike-and-Chevron markings that are proposed for installation. Figure 2 shows the proposed locations of the markings relative to parked vehicles.

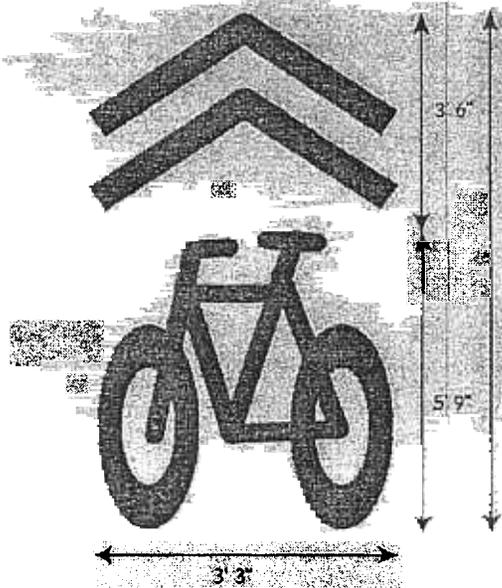


Figure 1: Bike-and-Chevron (Sharrows) (1)

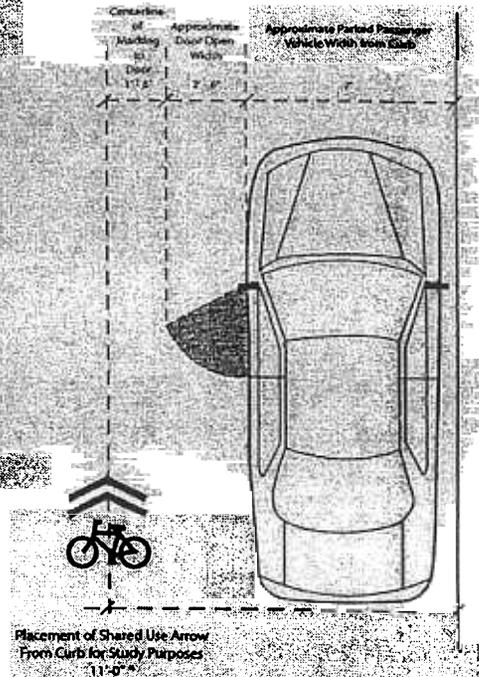


Figure 2: Placement of Sharrows (1)

**D. Supporting Data on Development**

U.S. cities that have experimented or are experimenting with shared lane markings as a potential solution to gaps in bicycle facilities include Denver (CO), Gainesville (FL), Cambridge (MA), Oakland (CA), and Fort Collins (CO). The City of San Francisco California, Department of Parking and Traffic (SF DPT) recently conducted a study of shared lane markings in their jurisdiction. (4) The study, which was

prepared by Alta Planning + Design, researched the shared lane markings and their application from other U.S. governing agencies. Their study was noteworthy for two elements:

- 1) A human factors' survey identified that of three markings considered it was the bike and chevron shared lane marking that had the most clearly understood "shared lane" message.
- 2) The use of shared lane markings improved the position of both motorists and cyclists on roadways without bicycle lanes, and encouraged correct bicyclist riding behavior.

The completed San Francisco study demonstrated that shared lane pavement markings in San Francisco had a positive impact on motorist and cyclist behavior, position, and safety. The results showed that "the bike-and-chevron marking had a stronger impact on motorist positioning and in reducing wrong-way riding and is preferred by cyclists surveyed."<sup>11</sup> Alta recommended that the bike-and-chevron be used as a standard marking in San Francisco for shared use lanes on appropriate streets. The study resulted in the adoption on August 12, 2004, of the Bike-and-Chevron "sharrow" by the California Traffic Control Device Committee. Adoption by Caltrans for incorporating the shared lane marking into the MUTCD 2003 California Supplement is pending.

**E. Patent/Copyright Protection**

The Bike-and-Chevron shared lane marking is not copyrighted. The use by several cities of this marking indicates that there is not a patent protection for this symbol.

**F. Time Period and Location**

The time period for the experimentation is one year beginning about September 2005 until the rain begins and starting again about June 2006 when the rain ends. Candidate streets were chosen based on the guidelines developed by Portland's Office of Transportation, which evaluates candidate roadway segments based on the following criteria and characteristics:

- Is the segment part of a City Bikeway?
- Is the segment bracketed by bicycle lanes or developed bikeways?
- Is public involvement part of the process?
- Is there or will there be a traffic study conducted to assess feasibility of lane reconfiguration?
- Is there or will there be a parking demand study conducted to assess feasibility of parking removal?
- Is there more than one lane in the direction of travel?
- If there is only one lane in the direction of travel is there: no centerline, a dashed centerline, or a solid centerline?
- Are there developed parallel bikeways? If yes, were they developed specifically as alternatives to proposed roadway?
- What is the length of proposed segment (ft)?
- What is the average daily traffic (vpd)?
- What is the 85th percentile speed (mph)?
- What is the level of current bicycle use?

Portland used the above criteria to select the following candidate street segments:

- NW 19<sup>th</sup> Avenue between NW Hoyt and W Burnside,
- NW 18<sup>th</sup> Avenue between W Burnside and NW Everett,
- NW Alder Street between SW 19<sup>th</sup> Avenue and SW 16<sup>th</sup> Avenue,  
N Interstate Avenue between N Willamette Blvd and N Church Street, and  
N Interstate Avenue between N Holman Street and N Dekum Street.

### G. Research and Evaluation Plan

The City of Portland Office of Transportation will oversee the monitoring and evaluation of the experiment. The following is a summary of the planned monitoring and evaluation process.

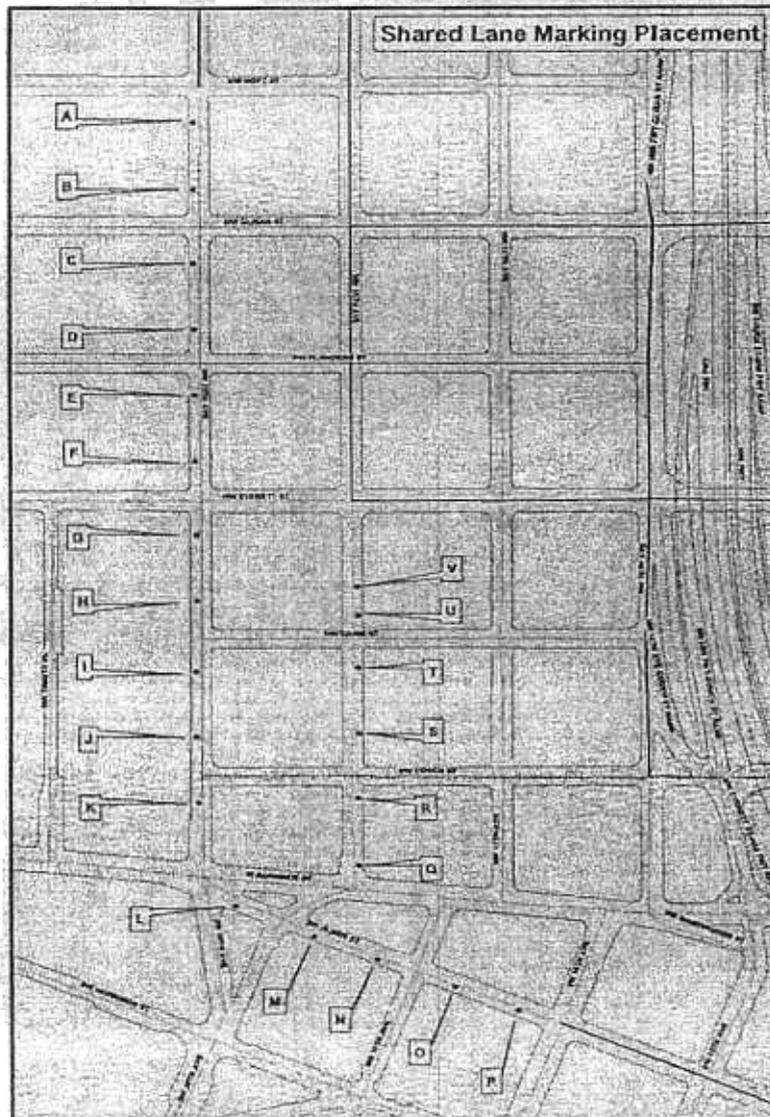


Figure 3: Shared Lane Marking Placement

The City of Portland proposes to install the Bike-in-Chevron shared lane markings in candidate locations as mention in Section F. Two markings per block face will be installed. Figure 3 shows the locations and frequency at three candidate road segments.

The City of Portland proposes to collect video data using a camera mounted on a mast arm directly over the shared lane marking to minimize distortion. At least 40 hours per location will be recorded, split evenly between before and after periods. Cyclist position on the roadway will be determined by taking measurements from the video recordings relative to pavement markings placed at one-foot intervals between 8'-16' from the curb. The markings, which will be either painted or taped, will be as small as can be readily discerned to the video cameras

The study methodology will focus in the primary area of observed measurable behavior. The following observations and measurements will be conducted for both before and after the installation of shared lane pavement markings:

1. Distance between cyclist and parked vehicles
2. Distance between cyclist and curb (if location has no on-street parking)
3. Motor vehicle distance from curb
4. Motor vehicle distance from parked vehicle
5. Distance between motor vehicle and cyclist
6. Number and frequency of conflicts and collisions (motorists passing cyclists too close or tailgating cyclist before passing them)
7. Cyclist's direction (with or against traffic)

8. Change in number of cyclists riding on the sidewalk
9. Change in motorist lane or crossing over into an opposing lane (change in merging/weaving behavior by road users)
10. Distance between overtaking vehicles and curb face
11. Changes in "head-checking" (scanning/looking) behavior
12. If applicable, proportion of cyclists giving a hand signal when leaving the bicycle lane and entering the shared lane

Additionally, the following data will also be collected and reported for the same observations periods

13. Motor vehicle speeds
14. Directional and total motor vehicle volume
15. Directional and total bicycle volume

Before and after measurements and observations will be taken at locations where shared lane pavement markings will be placed 11' and 12' feet from the curb face. A statistical analysis will be conducted using the collected data if a statistically significant sample size is obtained from the video sample. Data will be recorded and coded according to all relevant behaviors as outlined above. A regression analysis will be conducted to determine the significance of changes in behavior and other patterns. Conclusions will be drawn on which changes are significant and which are within the normal margin of error.

#### H. Application Restoration

The Portland Office of Transportation agrees to restore the site within three months following the end of the time period of the experiment and to terminate the experiment as required in Section 1A.10 if an unsafe condition arises. If the experiment appears to be successful, however, the City of Portland Office of Transportation will request that the MUTCD be changed to include the Bike-in-Chevron shared lane marking in the next edition and that the shared lane marking remain in place.

#### I. Semiannual Progress Reports

The Portland Department of Transportation agrees to provide progress reports every three months of the experimentation of the Shared Lane Marking application and to provide a final report within three months after the end of the experimentation period.

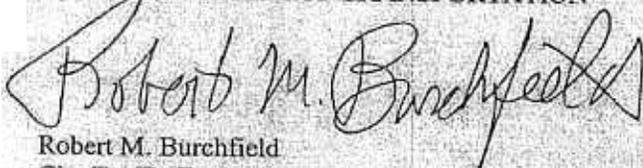
#### Reference

- (1) Alta Planning + Design (February 2004) *San Francisco's Shared Lane Pavement Markings: Improving Bicycle Safety, Final Report*. Prepared for the San Francisco Department of Parking and Traffic.
- (2) Ron Van Houten and Cara Seiderman (January 2005) *How Pavement Markings Influence Bicycle and Motor Vehicle Positioning; A Case Study in Cambridge, MA*. Preprint Version for Transportation Research Board Annual Meeting, Washington, D.C., January 2006.

The goal for the project is to provide an option to bridge the gaps in developed bikeway and roadway corridors that are classified City Bikeways. It is the desire of the City of Portland to use the Shared Lane Pavement markings on roadways after all other possibilities that would allow for marked bicycle lanes have been comprehensively explored. The shared lane pavement markings are an effort to provide safe and convenient conditions for bicycling on roads segments where conditions do not allow for marked bicycle lanes.

Respectfully,

PORTLAND OFFICE OF TRANSPORTATION



Robert M. Burchfield  
City Traffic Engineer

RB:cjh

enc: Letter of Support – Sam Adams  
Letter of Support – Earl Blumenauer

cc: Sam Adams, City of Portland-Commissioner  
Earl Blumenauer, Representative  
Roland Chlapowski, City of Portland-Policy Analyst



CITY OF  
**PORTLAND, OREGON**

OFFICE OF PUBLIC UTILITIES

Sam Adams, Commissioner  
1221 S.W. Fourth Avenue, Rm. 220  
Portland, Oregon 97204-1994  
(503) 823-3008  
FAX (503) 823-3017  
Email: [samadams@ci.portland.or.us](mailto:samadams@ci.portland.or.us)  
[www.portlandonline.com/adams](http://www.portlandonline.com/adams)

Commissioner Sam Adams  
Portland City Council  
Portland Department of Transportation  
Office of Public Utilities

August 25, 2005

Federal Highway Administration  
Office of Transportation Operations  
400 Seventh Street, SW, HOTO  
Washington, DC 20590

August 25, 2005

To: Federal Highway Administration  
From: Commissioner Sam Adams, City of Portland

RE: City of Portland's Request to Experiment with "Sharrows"

Attached please find the City of Portland's request to experiment with shared lane pavement markings, or "sharrows." I hope you view the potential for these markings as we do here: enthusiastically. They hold the potential to better manage conditions on city streets and encourage bicyclists and motorists to share our streets in a manner that will be more comfortable and safer for everyone.

We have long been seeking a tool that would allow us to address what happens when one of our bicycle lanes ends because of constraints that we have: neither the space nor finances to address with conventional roadway markings. Tested initially in this country in San Francisco, sharrows seem to make the roadways safer for cycling by getting cyclists out of the "door zone" of parked cars, and encouraging passing motorists to give bicyclists a wider berth when passing. Given our commitment to promote bicycling, we are encouraged by San Francisco's experience and believe sharrows will be a significant addition to Portland's efforts to further increase bicycling in our city.

The City of Portland strongly supports the testing and pilot use of these markings and I encourage the Federal Highways Administration to approve this request expeditiously.

Sincerely,

Commissioner Sam

**EARL BLUMENAUER**  
THIRD DISTRICT, OREGON

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INFRASTRUCTURE**

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**Congress of the United States**  
**House of Representatives**  
**Washington, DC 20515-3703**

WASHINGTON OFFICE:  
2446 RAYBURN BUILDING  
WASHINGTON, DC 20515  
(202) 225-4811  
FAX: (202) 225-8941

DISTRICT OFFICE:  
729 N.E. OREGON STREET  
SUITE 115  
PORTLAND, OR 97232  
(503) 231-2300  
blumenauer.house.gov

August 26, 2005

Federal Highway Administration  
Office of Transportation Operations  
400 Seventh Street, SW, HOTO  
Washington, DC 20590

To Whom It May Concern:

I am writing in support of the City of Portland's application to experiment with a new type of bicycle marking: the shared lane pavement marking.

For the past decade, Portland has had a strong commitment to creating safe and convenient conditions for bicycling in the city. The results of the city's efforts have been significant in terms of increasing ridership and making the bicycle a legitimate choice when residents are considering their transportation choices.

In developing their extensive network of bikeways, Portland has discovered areas where bicycle lanes are needed but cannot be provided because of specific traffic operations or geographic constraints. These gaps in bicycle service diminish the utility of what are otherwise excellent bicycle facilities, acting as significant deterrents to those who wish to cycle. Portland has long sought a means to address these gaps in a manner that provides excellent service to bicyclists while maintaining adequate service for other roadway users. With Portland believes that shared lane pavement markings can accomplish this.

Shared lane markings, long used throughout European cities and in some U.S. cities, have most recently been tested in San Francisco. Found to improve operating conditions for cyclists in that city, San Francisco is now using shared lane markings on greater number of roadways. Portland wishes to expand upon San Francisco's success, provide further testing, and do it in a manner that leads to formal adoption in the MUTCD.

Given the potential of this new tool and Portland's ability to identify potential locations and conduct a formal test, I lend support to their application and encourage the FHWA to expedite their request to experiment, giving them all needed support.

Thank you for your consideration

Sincerely,

A handwritten signature in black ink that reads "Earl Blumenauer". The signature is written in a cursive, flowing style.

Earl Blumenauer  
Member of Congress



# Oregon

Theodore R. Kulongoski, Governor

**Department of Transportation**  
Traffic Engineering and Operations  
355 Capitol St. NE, 5<sup>th</sup> Floor  
Salem, Oregon 97301-3871  
Phone (503) 986-3568  
FAX (503) 986-4063

September 7, 2005

Federal Highway Administration  
Office of Transportation Operations  
400 7th Street SW, HOTO  
Washington D.C. 20590

File Code:

**RE: Support for City of Portland's Request to Experiment with Shared Lane Pavement Markings**

I am writing to express the Oregon Department of Transportation's support for the City of Portland's application to experiment with shared lane pavement markings for roadways that otherwise might be striped with bicycle lanes. ODOT staff has been briefed on their successful use in San Francisco, as well as on Portland's plan for where and how to apply them. I have reviewed Portland's draft warrants and evaluation criteria for the use of the "sharrows" and believe they are a good start for providing a rational and professional approach for determining where to use these markings. We concur with Portland's planned experiment and think this marking may have great potential to improve operating conditions on low volume and low speed shared lane environments. We will be interested in viewing results of Portland's experimental application because ODOT has roadways running through both urban and rural communities that could benefit from such a treatment if it proves successful.

I encourage you to approve Portland's application. Following preliminary results and further in-house discussion we may request to join in with their experiment in the future.

Thank you

Sincerely,

Edward L. Fischer, P.E., PTOE  
State Traffic Engineer

cc: Roland Chlapowski  
Roger Geller  
Matt Garrett  
Charlie Sciscione  
Dennis Mitchell  
Stacy Codington