



Sam
Adams
Commissioner

October 4, 2005

Susan D.
Keil
Interim
Director

Regina S. McElroy, Director
Office of Transportation Operations
HOTO Room 3401
400 7th Street, S.W.
Washington, D.C. 20590

Eileen
Argentina
System
Management

RE: City of Portland Request to Experiment with HAWK/Bike signal

Bryant
Engel
Finance

Dear Ms. McElroy:

Don
Gardner
Engineering &
Development

Enclosed is our request for FHWA to approve experimentation by the City of Portland, Oregon, with a HAWK/Bike signal. The City of Portland understands the responsibilities as a requestor for experimental use of new traffic control devices as outlined in the MUTCD.

Sam M.
Irving, Jr.
Maintenance

We believe that the proposed HAWK/bike signal will improve mobility and safety for pedestrians and cyclists in crossing arterial streets. As we continue to stress multi-modal transportation systems, we need tools like this HAWK/bike signal to address pedestrian and bicycle crossing needs.

Laurel
Wentworth
Planning

We discussed a draft of this proposal with Scott Wainwright last spring, although this submission has substantial changes from that draft. We will be happy to consider any changes recommended by FHWA.

Thank you in advance for your consideration.

Sincerely,

William C. Kloos, PE
Signals & St. Lighting Division Manager
City of Portland - Office of Transportation
503-823-5382

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**Request to the Federal Highway Administration
for Experimentation of Modified HAWK Signals
for Pedestrian and Bicycle Crossings**

By City of Portland, Oregon

Comment [KCK1]:

October 4, 2005

Request for Experimental Use of Modified High-intensity Activated crossWalk (HAWK) Signals for Pedestrian and Bicycle Crossings

Preface

Pedestrian and bicycle safety, mobility and accessibility are increasing issues in urban areas. In Portland, Oregon, between 1985 and 2002, pedestrians accounted for 4,174 (3%) of the 127,249 reported traffic injuries and 217 (29%) of the 748 fatalities. Fourteen percent (14%) of pedestrian injuries occurred at non-signalized intersections and 14% of fatalities occurred at non-signalized.

Improving pedestrian and bicycle safety can help to alleviate a variety of health, economic, and neighborhood livability issues for travelers. If we are successful in improving the real and perceived safety of pedestrians and bicyclists, we also promote pedestrian and bicycle activities.

Statement of the problem

Pedestrians and cyclists have trouble getting adequate gaps between cars to cross at unsignalized intersections on arterial streets with high traffic volume. Few arterial street drivers will stop and yield to crossing pedestrians or cyclists unless forced to stop by traffic signs or traffic signals even though law requires them to. The limited signalized crossings on arterials make pedestrians and cyclist impatient, which results in jaywalking, unpredictable movements, and ultimately more pedestrian and bicycle crashes with motor vehicles. Many bikeways are designated on lower volume neighborhood streets leading to an unsignalized crossing of the major arterials.

Most of these low volume streets do not meet the current traffic signal warrants in the MUTCD. Installing a full signal may create excessive delays and safety issues to the arterial street traffic. Signalizing the low volume neighborhood street may attract addition vehicle trips to that street, leading to neighborhood concerns over traffic volume and speeds.

The City of Portland has 48 legacy half-signal intersections (last one installed in 1985). These half-signals are not compliant with the MUTCD. Concerns with half-signals include violation of main street driver expectations when a side street vehicle pulls out in front of him/her. Also we have anecdotal accounts of numerous main street signal violations when the main street signals turn yellow / red to service the side street pedestrian. We believe part of the issue is the infrequent display changes. Main street motorists, having only seen green indication, no longer pay attention to the signal and don't react to the signal changing state.

One option for a pedestrian only signal is to move the crosswalk to a more mid-block point away from the stop controlled intersection. In Portland, our short block spacing (typically only

200' from property line to property line) make this option more difficult. Also, many pedestrians will not take out of direction travel, even with our short block spacing. Many pedestrians will continue to cross at the intersection. Also motorists do not notice the mid-block signals as intersection signals since they don't have the visual intersection clues.

We need additional options for providing breaks in arterial traffic to provide pedestrian and bike access and safety.

Description of the Proposed Change

The proposed change would allow the use of the High-intensity Activated cross-Walk (HAWK) signal system similar to the design of the installations in Tucson, Arizona. The system has yellow and red indications for the main street. The side street will have a stop sign and pedestrian heads and push buttons for crossing the major street. In Portland we will also install bicycle indications for the minor street. This system allows the pedestrian or cyclist to cross busy arterials at minor streets, while not encouraging more vehicular traffic on minor local streets.

The City of Portland was initially considering pursuing experimental approval of the half-signal concept. The City of Portland has 48 legacy half-signal intersections. However, we think that the HAWK system is a better option since it does not display a green indication to arterial traffic and the vehicle heads are normally dark. The activation of the vehicle heads should provide additional warning to motorists regarding the changing state of the signal.

Proposed Display and Operation Requirements

Below is a picture of a HAWK installation in Tucson.



We propose a similar head configuration. Two-12" red balls mounted horizontally with one-12" yellow ball centered underneath the red balls. We will place both heads overhead on a mast arm. We will not use the signs shown. We will use a standard ped crossing or school crossing warning sign as appropriate for the location. We will also use a bicycle warning sign in this test. Signs will be both overhead and ground mount.

The cross street will have standard pedestrian heads and push buttons. The side street vehicular traffic will have a stop sign. We will install a single bicycle head for side street bicycle traffic. A photo of the proposed bicycle signal head is below. For the bike symbol we used the bike symbol from the Signs section of the MUTCD. We will also include the "bike signal" sign.



(Note: picture turned 90 degrees to save space. Signal head will be vertical.)

The arterial signals rest in a dark condition. We will evaluate two conditions for the side street ped signal rest state. We will have the ped signal first remain in a dark state. After an appropriate period, we will have the ped heads rest in solid don't-walk. The bike signal will also rest in a dark condition. Since our test location is also on a bikeway, we are intending to install ped push buttons next to the curb where they can be reached by cyclist.

Attached is a proposed sequence chart for our test intersection. When the pedestrian and/or bike push button is depressed, the vehicle heads go to either to a flashing yellow interval for a period of 3 seconds or straight to a solid yellow. We will test both methods and observe driver behavior. Following the flashing yellow, the solid yellow is displayed for the normal length of a yellow interval for that particular facility (based on ITE method). Following the solid yellow, an all red interval of 2 seconds will be used. We propose to have one standard sequence where both the ped and bike intervals are both activated even though we didn't have an actuation for both modes. At the completion of the bike sequence (end of interval #6, Bike solid red), both main street heads will flash simultaneously, not in a wig-wag manner. The bike signals also go from solid red to flashing red. After finishing the pedestrian clearance period (intervals 5 through 9), the signal will return to the rest mode with the vehicle and bike signals extinguished.

We considered having unique sequences for just bike-only or ped-only actuations as shown on the second and third sequence charts. If only a pedestrian actuation, the walk comes on and the bike signal remains in a red state. Under this ped only condition at the completion of the walk interval, the ped signal goes to FDW and the vehicle heads go to flashing red. Both main street heads will flash simultaneously, not in a wig-wag manner. At the end of the FDW and a short solid don't walk interval, the signal goes back to the rest condition with the vehicle heads extinguished. If just a bike actuation, the flashing red interval for the main street would be eliminated, keeping solid red until the end of the bike phase. For the bicycle phase, the length of yellow and flashing red allow a bicycle to clear the intersection. When both ped and bike

are activated, the main street stays solid red until the bike phase is cleared. However as noted above, we propose to just use the first sequence under all conditions.

Proposed Work Plan

The City of Portland proposes to install a new HAWK signal in Portland at the intersection of E Burnside and 41st. A draft plan of the proposed installation is attached (Attachment 3). This installation is being funded by an Oregon DOT ped/bike grant. The signal is scheduled to be installed in the summer of 2006. In addition the City of Portland will convert one of its existing 48 half-signals into HAWK signals in late 2006. That conversion will be a HAWK only without the bicycle heads.

Prior to activating the new HAWK signals, we will conduct a public information campaign, including contacting neighborhood associations and bike/ped advocacy groups.

Length of Experimentation

The experiment is proposed to last until the City of Portland has access to three-years of crash data after implementation, which could be up to 4.5 years after the implementation date.

Evaluation Plan

The City of Portland will collect and evaluate before and after crash data at the experimental installation and at the one converted half-signal. As noted above, we will have at least three years before data and three years of after data. In addition, the City will review the crash data at the existing 48 half-signals in Portland. The data will be analyzed for any trends or concerns related to red light running and rear end crashes on the main street. We will also look for errors made by side street motorists.

After the installation, we will collect 24 hours of time-lapse video to check for erratic activities during times of higher activity. Actions / conditions to be looked for include:

- Side street traffic turning over the cross walk does not always yield to the pedestrians.
- Main street traffic stopping at dark main street heads (driver assume power failure and 4-stop in place)
- Main street red light running

We are also committed to evaluate the following options:

- Whether to use a flashing yellow interval on the main street versus just a solid yellow.
- Whether to rest the ped head in DW or dark.

From the videotaping noted above, we will try to ascertain issues with red light running on the main street and pedestrian confusion on the side street.

We will install loops for traffic count information and will track how often the signal cycles. We will install stop bar loops to track main street red light running.

Other research efforts have also conducted studies of these HAWK signals. The current TTI

NCHRP/TCRP project has prepared a draft report showing favorable operation at HAWK signals. An intersection Safety Audit has been done and also has favorable results. We will look for other relevant studies.

We will also work with Tucson on their experimental request.

Site Restoration

The City of Portland agrees to restore the experiment site to a state complying with the provisions of the MUTCD:

- Within 3 months following the end of the time period of the experiment, or
- At any time that the participating agency determines that significant hazards are directly or indirectly attributable to the experimentation, or
- If requested to do so by the Office of Traffic Operations.

If, as a result of experimentation, a request is made that the Manual be changed to include the HAWK design, then the experimental device may remain in place until an official rulemaking action has occurred.

Reporting

The City of Portland will provide semi-annual progress reports until the experiment is completed. A copy of the final results will be sent to FHWA, HHS-10, within 3 months following completion of experimentation. All reports will be submitted to:

Director

Office of Transportation Operations
HOTO Room 3401
400 7th Street, S.W.
Washington, D.C. 20590

Project Administration

The City of Portland is responsible for all project administration. The City's project manager will be:

William C. Kloos, PE
Signals & St. Lighting Division Manager
Portland Office of Transportation
1120 SW 5th Avenue, Room 800
Portland, OR 97204
503-823-5382
Bill.Kloos@pdxtrans.org

Attachments:

- HAWK-bike signal sequence chart
- Preliminary signal plan for experimental study site

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Attachment #1

Recommended HAWK - Bike signal sequence chart

City of Portland Experimental Request

Revised 10/4/05

Recommended Full Time Operation

				
Interval	Veh	Bike	Ped	Length (sec)
1	dark	dark	dark	rest
2	FY	R	DW	3
3	Y	R	DW	4
4	R	R	DW	2
4	R	G	W	8
5	R	Y	FDW	6
6	R	R	FDW	2
7	FR	FR	FDW	6
8	FR	FR	DW	3
9	FR	FR	DW	1
10	dark	dark	dark	rest

Notes:

1. As part of the experiment, the intersection operation will be tested with and without Interval #2.
2. The rest condition for the pedestrian head will be tested both as dark and as solid don't walk.

Attachment #2a

Alternate HAWK - Bike signal sequence charts

City of Portland Experimental Request

Revised 10/4/05

These alternate sequences were considered, but not recommended for this experiment.

Operation with only a pedestrian call



Interval	Veh	Bike	Ped	Length (sec)
1	dark	dark	dark	rest
2	FY	R	DW	3
3	Y	R	DW	4
4	R	FR	DW	2
5	R	FR	W	8
6	FR	FR	FDW	14
7	FR	FR	DW	3
8	FR	FR	DW	1
9	dark	dark	dark	rest

Attachment #2

Alternate HAWK - Bike signal sequence charts

City of Portland Experimental Request

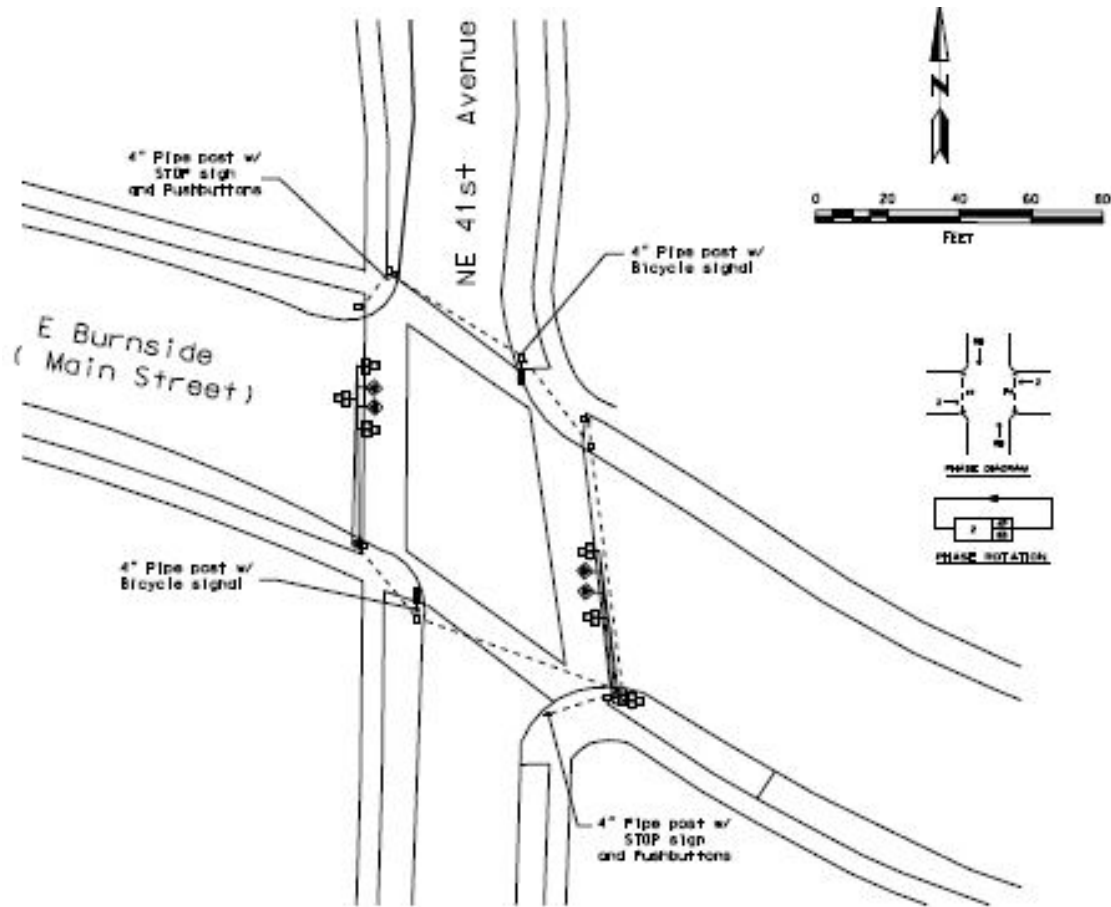
Revised 10/4/05

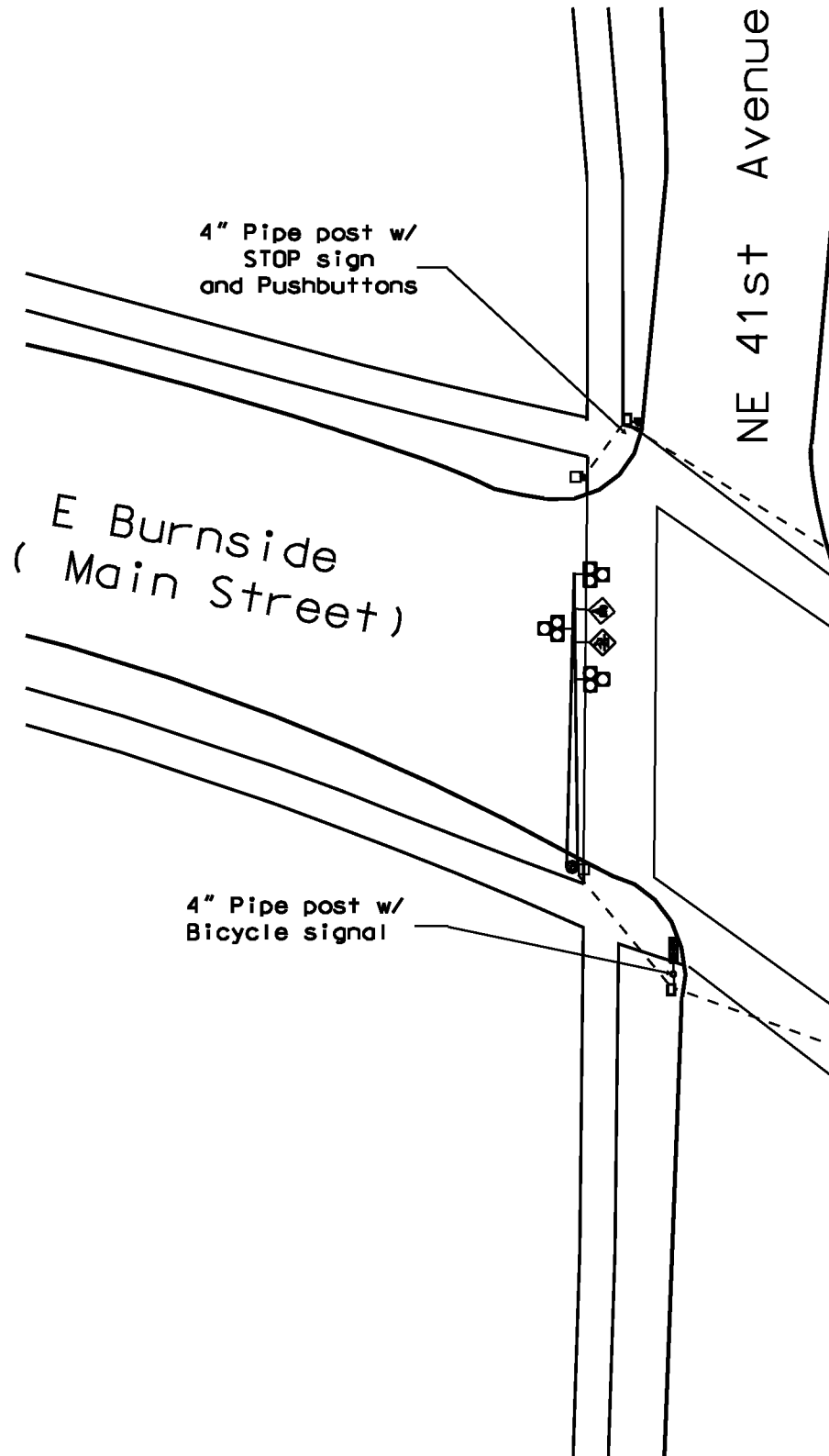
Operation **with only a bike** call



Interval	Veh	Bike	Ped	Length (s)
1	dark	dark	dark	rest
2	FY	R	DW	3
3	Y	R	DW	4
4	R	R	DW	2
5	R	G	DW	10
6	R	Y	DW	6
7	R	R	DW	2
8	dark	dark	dark	rest

Attachment 3
Draft Signalization Plan for Proposed Experimental Site
New Installation – E Burnside and 41st





			DESIGNED BY	DATE APPROVED	APPROVALS 1
			CAD BY	DIV. ENGINEER	
			CHECKED BY	PROJECT NO.	
				SECTION	
NO.	DATE	DESCRIPTION	APPD.		CITY ENGINEER
REVISION					REG. PROF. E