OREGON TRAFFIC CONTROL DEVICES COMMITTEE

Meeting Agenda

July 20, 2018

ODOT TLC Bldg., Alsea Conf. Room,
4040 Fairview Industrial Dr., Salem

9:00 – 9:10	Welcome / Building Orientation / Introductions / Approve Previous Minutes	Brian Barnett
9:10 – 9:15	Business from the Audience *Public Comment on Non-Agenda Topics*	Brian Barnett
9:15 – 9:30	PHB Versus Mid-Block Pedestrian Signals *Information*	Eric Niemeyer
9:30 – 9:45	FYA and PPLT with Dual Left Turn Lanes *Information*	Eric Niemeyer
9:45 – 9:50	School Speed Committee Update *Information*	Eric Leaming
9:50 – 10:05	ATV Signing / Misc. Sign Design & Policy *Information*	Marie Kennedy
10:05 – 10:15	BREAK	
10:15 – 11:00	PPRT Research Results *Information / Discussion*	Chris Monsere/David Hurwitz
11:00 – 11:10	New Interim Approval of RRFB Update *Information / Discussion*	Eric Leaming
11:10 – 11:25	HB2409 Allowing Speed Citations Thru Red Light Running Cameras *Information / Discussion/Recommendation for Approval*	Doug Bish
11:25 – 11:40	Roundtable *Local Jurisdiction Issues - Discussion*	All Committee Members
11:40 – 11:45	Not-on-Agenda Items	Brian Barnett
11:45 – 11:50	Agenda Items for Future Meetings	Brian Barnett

2018 OTCDC Meeting Schedule

Date	*Location*
~~January 19~~	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
~~March 16~~ (cancelled)	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
~~May 18~~ (cancelled)	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
July 20	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
September 21	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
November 16	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem

Oregon Traffic Control Devices Committee

January 19, 2018

Meeting Minutes

ODOT TLC Bldg., Alsea Conference Room
4040 Fairview Industrial Drive, Salem

Members Present: Brian Barnett, Chair, City of Springfield; Joseph Marek, Vice-Chair, Clackamas County; Mike Kimlinger, Secretary, Acting ODOT State Traffic-Roadway Engineer; Patrick Huskey, OSP; Darrin Lane, Linn County; Karl MacNair, City of Medford; Julia Uravich, Marion County; *Via Join Me:* Janet Hruby, City of Bend; Pam O'Brien, DKS Associates; Jeff Wise, ODOT Region 5

Others Present: Doug Bish, Frank Belleque, Scott Cramer, Kevin Haas, Marie Kennedy, Julie Kentosh, Eric Leaming, Kathi McConnell, Sarah McCrea, Christina McDaniel-Wilson, ODOT Traffic/Roadway Section; Amanda Salyer, ODOT Region 2; Dave Smith, ODOT Rail Division; Nick Fortey, FHWA; Christopher DeLarto, HDR Inc.' Miguel Guzman, Washington County; Kevin Hottmann, City of Salem; Jabra Khasho, City of Beaverton; Matthew Machado, Lani Radtke, City of Portland; Eric Niemeyer, City of Springfield; *Via Join Me:* Tina Bailey, City of Hillsboro; Scott Beaird, Kittelson & Associates; Peter Koonce, City of Portland

Introduction/Building Orientation/Approval of Minutes

2018 Chair Brian Barnett called the meeting to order at 9:00 a.m. and asked attendees to introduce themselves (see above). New League of Oregon Cities member, Janet Hruby from the City of Bend was welcomed and included her prior work bio in her introduction.

Two corrections were offered and accepted for the first paragraph of page 4 of the draft November 17, 2017 OTCDC meeting minutes. Julia Uravich then moved, Joe Marek seconded, and the committee approved the minutes as corrected.

Business from the Audience/Public Comment

None to report.

AASHTO Supplemental Sign Guidelines

Marie Kennedy updated the committee on ODOT's consideration of adopting the 2001 AASHTO Guidelines for Supplemental Guide Signing (5th edition). This is generally an ODOT concern and applies to Freeway Supplemental signing only. Marie reported the document was brought to ODOT's TOLT committee for discussion. TOLT had no major

concerns. They were interested in grandfathering existing mall guide signs, if needed. It's possible they'd pass as traffic control device signs rather than guide signs. Marie will work with Kevin Haas on how to move forward.

NCUTCD Update

Scott Beaird reported on some highlights of the January 3-5 meeting held in Arlington, Virginia immediately following the Transportation Research Board meeting. He said the major news is there's not much new in regards to replacing the 2009 MUTCD which has had three revisions since issuance. The political climate against new rules is hindering any such action. There is some chance interim approvals may be used in some cases as has been done in the past and some revisions of the current manual may eventually get moving, likely starting with revision to Part 9 on Bicycles. Revisions are easier to get through with less extensive rule-making process involved.

Eric Niemeyer attended the meeting as part of the Signals Technical Committee. He reported the Signals committee was talking about whether we can apply mid-block pedestrian traffic signal warrants in the same realm as the pedestrian hybrid beacon. He'll show the committee what Springfield has done in their jurisdiction at the March meeting. In June, the issue will go to sponsors and next January, they expect to go to FHWA to make a presentation advocating mid-block pedestrian traffic signals be allowed in addition to optional pedestrian hybrid beacons. The signals operate in red flash over the flashing DON'T WALK. The Signals committee is also looking at signal conflicts. The MUTCD doesn't really address what constitutes a conflict in traffic signals and language clarifying which may be worth pursuing.

Mike Kimlinger reported further on what happened at the NCUTCD Meetings, withholding discussion on RRFB activity until later in the agenda. He noted there is a notifications link where interested people can sign up to be notified on MUTCD-related activity by the FHWA.

Peter Koonce noted a memo regarding an NTSB report from July 2017, Reducing Speeding-Related Crashes Involving Passenger Vehicles. The memo gave specific recommendations to FHWA on the subject. DKS's Randy McCourt will be leading an Oregon conversation about the recommendations. Peter intends to be involved in this effort with Randy. The idea is to revise Section 2B.13 of the MUTCD. Instead of having optional studies, the recommendation is to require an expert system like US Limits as a validation tool and to remove the Guidance for speed limits to be set within 5 MPH of the 85th% speed. They're essentially advocating allowing lower speeds to be allowed where it's appropriate. The NCUTCD will try to respond. Automated speed enforcement was also recommended as a possible solution to speed limits not being followed by drivers.

Kevin Haas said NCHRP Project 17-76 is about mid-point and he hopes the NCUTCD and others wait until that project is completed before they move forward with recommendations. They are looking at things in the NTSB report and TTI is doing research on the issues to support the NCHRP project. Mike Kimlinger reported he

stayed an extra day in Arlington for a presentation and discussion on the NCHRP project and speed limits. In discussions, there seemed to be some understanding that, while the urban environment may have differences from others, if the environment doesn't encourage desired speeds, strategies which don't address this may be futile.

Action Item: Joe Marek asked about the previously discussed formation of a subcommittee of the OTCDC and how that might play into the subject. Mike Kimlinger said we've been busy but intend to get it going, including regarding school zones. The Portland pilot project on an alternate speed zoning process should have 18 months of data/experience on their enterprise available maybe later this summer. Joe asked about membership, indicating he would like to be part of it. Kevin Haas, Eric Leaming, Randy McCourt also were suggested and other members, interested parties are welcome to apply.

Further discussion was had on the various driving environments and local perceptions on the differences (urban, suburban, rural) that vary from place to place around the country. Updates on NCHRP Project 1776 and related issues will be on future OTCDC agendas.

Asset Management of Traffic Signals

Scott Cramer gave a brief overview of what ODOT is doing to manage traffic signals. The report he was working from (2017 Traffic Signal Condition Report) has not been finalized and approved for public consumption so it wasn't available as a hand-out. The goal is to identify assets, have a rating for the physical condition of the assets and their location. It needs to be fast and fairly extensive without extensive training required for staff to learn how to add and edit data. Scott ran briefly through the 41 pages of the still-draft document as a preview for the committee. One goal is to find out what it would take to bring all signal assets up to fair or better in work and financing costs. $54 million is a preliminary estimate. There will need to be field work to get up to date data on the current status of what's out there (Google Maps is often too dated to be useful).

ARTS Program Update

Christina McDaniel-Wilson gave an update to ODOT's All Roads Transportation Safety Program. Her handout includes the data and facts presented, with illustrations and tentative schedule for moving forward. Proportional reimbursement to local matching funding will be available to local jurisdictions that apply and qualify under ARTS. Local agencies should go to ODOT's regional representative. Regions will notify them of kick-off meetings in their area.

NHTSA's Requirement for Connected Vehicle Communication

Referring back to his NCUTCD handout, Mike Kimlinger said NHTSSA and NTSB have issued a communication that they are not requiring -- or at least reevaluating requiring – future new vehicles to install equipment to send and receive safety messages. He is concerned it is an effort to reappoint the 5.9 GHz bandwidth to commercial applicants rather than CAV operational communications. Suggestions that untested, non-standardized cellular communications can take the load instead of DSRC's 5.9 GHz technology do not take into account there's at least a decade of research on using the former and little-to none for the latter. Mike encouraged individuals and agencies to comment on this if they have the opportunity.

Termination of Interim Approval of RRFB

Mike Kimlinger returned to his previous handout, referring to the portion on RRFB Interim Approval Termination. He went over the proven utility of the devices and the use Oregon and other states have effectively put them to. Mike noted draft guidance from ODOT on our plans moving forward on the handout, saying he expected final guidance to approve moving forward with plans for RRFBs which are under contract or under construction. Currently existing RRFB's can be used until the end of their useful service life.

In addition, ODOT's bringing back out Standard Beacon Details for application in projects that aren't already covered by the contracted/existing guidance. A comparison tool was shown that may be useful to show the difference between RRFB's and Beacon Systems. Questions about the still-permitted configuration and flashing rates of standard beacons were discussed.

Mike noted there are different government bodies across the nation looking at filing legal challenges.

Mike turned to the legal memo which KBM provided to the NCUTCD Signals Technical Committee and asked Eric Niemeyer to discuss it. Eric noted the patent holder is now trying to expand his patent to make it harder for traffic engineers to get around his patent if they use anything like his patented RRFB. Expanded claims are being resisted and having some minor preliminary success but Eric believes if somebody sells him the equipment, he can use it without legal jeopardy. He theorizes that FHWA's retraction of Interim approval is because they don't want to get involved in lawsuits but this may not apply to everybody else.

Brian Barnett opened a discussion on the subject by stating he wants to have RRFB's or something similar be continuously available to jurisdictions for pedestrian safety reason. Joe Marek asked if this is possible, say, as an Oregon Supplement absent FHWA's Interim Approval. Mike noted any such Supplement would be after six to nine months of procedure to achieve. There is reluctance at ODOT to move a Supplement forward absent FHWA approval. The patent of RRFB's is quite broad, seeks to include all similar flash rates, and will be difficult to get around for local jurisdictions, individual

states. There is concern this could set bad precedent for other traffic control devices of great safety utility.

Some of the other points made in further discussion included:

- Mike will be pursuing legal advice from ODOJ regarding our legal options in moving forward with at least some functional equivalent of RRFB's and what leeway the patent gives us.

- Different flash rates/patterns utilized by other manufacturers, including ELTEC, Carmanah

- Discussion of the reasons for and against incorporating state Supplements to the MUTCD which would cause it to not receive FHWA approval.

- The implications of going down the path of adopting proprietary devices which don't meet standards in the MUTCD and the checkered history of devices being approved by the feds and don't end up being produced for sale for one reason or another.

- Only 2 of twenty-five or so state traffic engineers at the NCUTCD meeting were intending to move forward with use of RRFB's. The others were removing them from planned projects and not considering them for future projects.

- ODOT will go ahead and issue a bulletin with something much like the draft guidance presented earlier.

- Clarification from Nick Fortey that FHWA appreciates the value of the RRFB, but can't approve or fund projects for states which ignore the MUTCD non-approval of patented devices. Accepting a Supplement which includes them is not going to be possible. It's an uncomfortable position but FHWA can't turn a blind eye to this kind of action by a state.

- Patented devices within other devices not visible to the public are generally okay to use. Those outside and viewable are not.

- Suggestion was made for a sunsetting Supplement for maybe five years while the patent fight is resolved one way or the other. Not otherwise addressed.

Decision: Brian Barnett moved, Darrin Lane seconded and the committee approved having the OTCDC make the following statement to ODOT:

> "The Oregon Traffic Control Devices Committee recommends the Oregon Dept. of Transportation find the most expeditious manner for us to use an RRFB (Rectangular Rapid Flashing Beacon) or RRFB-like device with the same equivalent effectiveness and make it available back to the public bodies who are responsible for roadway safety."

Mike said he'd prefer a message separate from the minutes, which Brian amended to add and Darrin seconded. Other preferences were moved, seconded and added to the vote for ODOT to contact FHWA on Oregon's concerns and continue to report back to the committee on any response from FHWA and on progress in future meetings. The committee voted in favor and the motion passed.

Brian expressed appreciation to the committee, FHWA and ODOT for their participation in the discussion.

Roundtable

No items were brought up.

Not-on-Agenda Items

Pam O'Brien announced that Oregon ITE has cancelled this year's joint meeting with the OTCDC meeting in May due to conflicting priorities with a quadrennial conference they are a part of. This will likely end up in the May OTCDC meeting being held at the TLC Building.

Agenda Items for Future Meetings

- RRFB Update – Mike Kimlinger
- PHB's and Signals – Eric Niemeyer
- Possible NCHRP Update/Speed Zoning Working Group – Kevin Haas

Adjournment

Brian Barnett adjourned the meeting at 11:26 a.m.

Next Meeting: March 16, 2018 at 9:00 a.m. at the TLC Building in Salem.


STOP
HERE
ON
RED
STOP
ON RED
Sizzler


CROSSWALK
STOP
ON RED
STOP
WHEN FLASHING
MAY GO WHEN
CROSSING IS
CLEAR


STOP
WHEN FLASHING
MAY GO WHEN
CROSSING IS
CLEAR

Signs Under Study December 2107 for R10-23:

No Significant Difference to NO SIGN

Midblock Hybrid Beacon Pedestrian Crossing

There was no statistical difference between signing alternatives in terms of decision to yield and stop, therefore any of the alternatives would be adequate; however, alternatives 1 and 2 had higher legibility distances.

Table 6: Midblock Hybrid Pedestrian Crossing Sign Alternatives

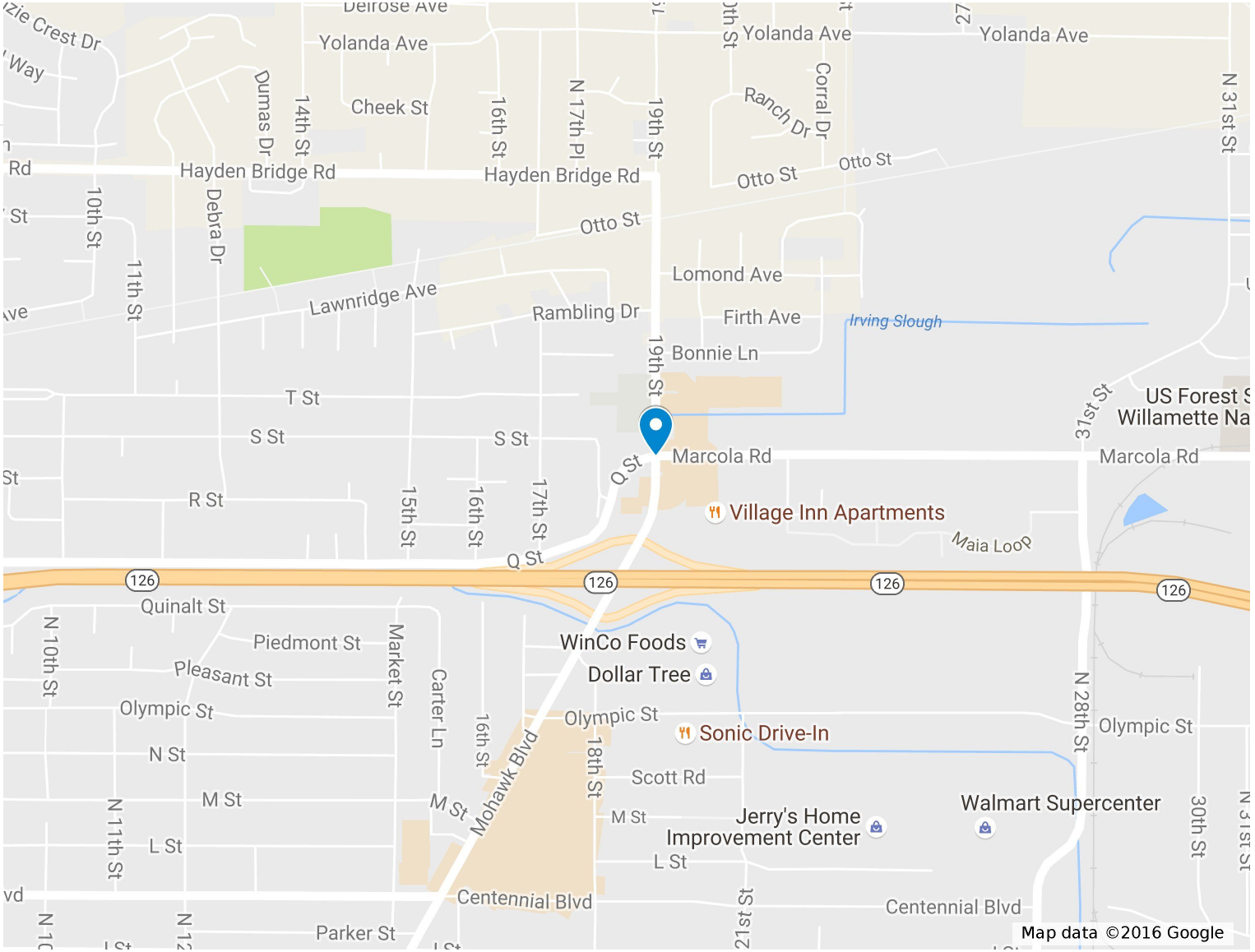
Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
				(no sign)

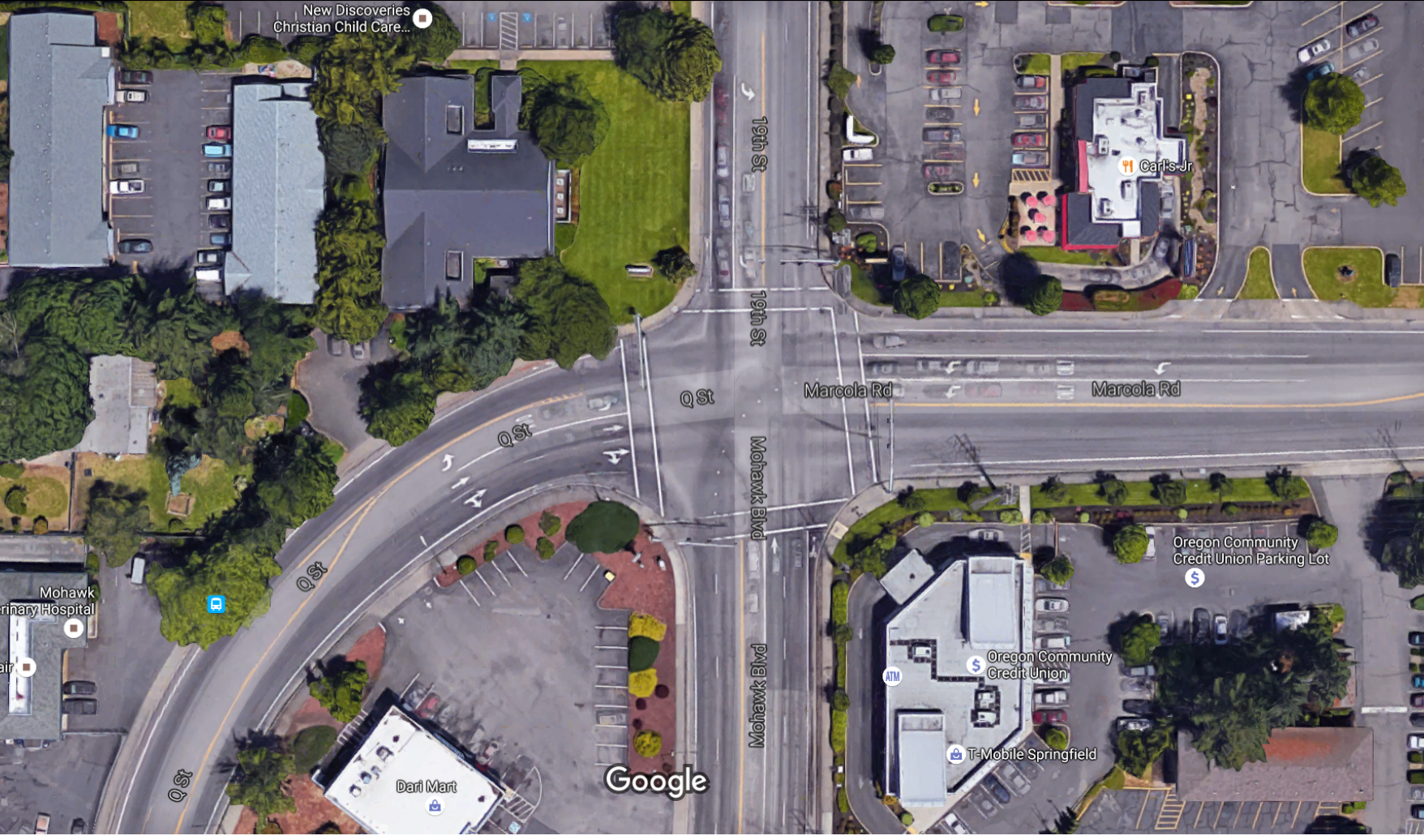
Current IA R10-23a

Springfield Dual Left FYA Location 1

WB Dual Left

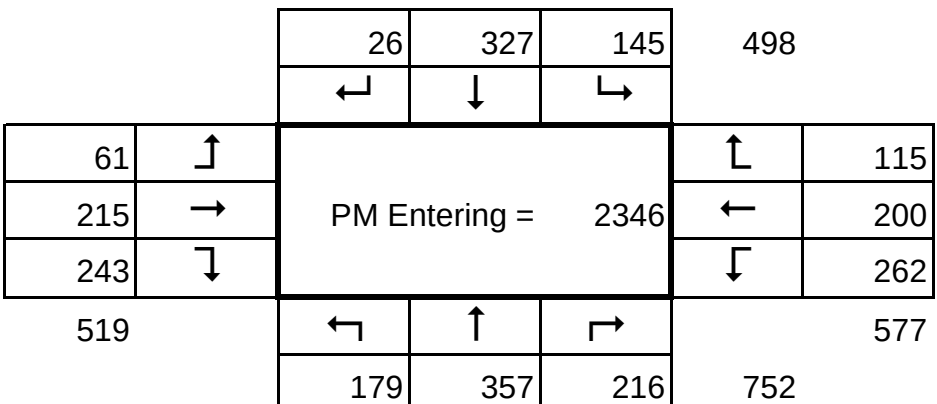
Q St & Mohawk Blvd




New Discoveries Christian Child Care...
19th St
19th St
Carl's Jr
Marcola Rd
Marcola Rd
Q St
Q St
Q St
Q St
Mohawk Blvd
Mohawk Blvd
Oregon Community Credit Union Parking Lot
Oregon Community Credit Union
ATM
T-Mobile Springfield
Mohawk
Dari Mart
Google

Mohawk and Q PM Turning Movements.xlsx

Turning Diagrams



Mohawk and Q - FYA Delay Reduction Data

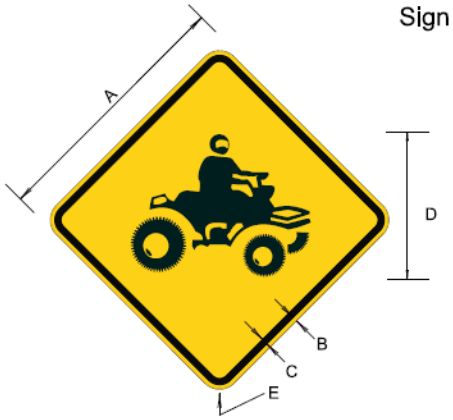
Date	Action	Delay Per Vehicle (seconds) Before	Delay Per Vehicle (seconds) After	Delay Reduction (Seconds)	Entering Volume	Delay Reduction (hours)
10/29/2016	Installed FYA at 3 Approaches	35.4	19	16.4	2346	10.7
6/23/2016	Installed FYA at 4th Approach (dual left)	19	16.8	2.2	2346	1.4

Senate Bill 344 now allows ATVs/OHVs on our highway

- They are only allowed on highways for short segments that connect ATV trails, called “ATV Highway Access Routes”
- The routes on the highways for ATVs must be approved by the OTC
- A committee has been set up to review applications for the access routes and they send their recommendation to OTC
- Law Enforcement can ticket ATV users not on designated ATV Highway Access Routes. Law Enforcement will know where the access routes are by signs
- All signs will be paid for by Oregon Parks and Rec Department

Warning signs for ATVs for Motorists

Sign No.



Sign Background: Yellow, Reflective sheeting

Sign Legend: Black, Non-reflective

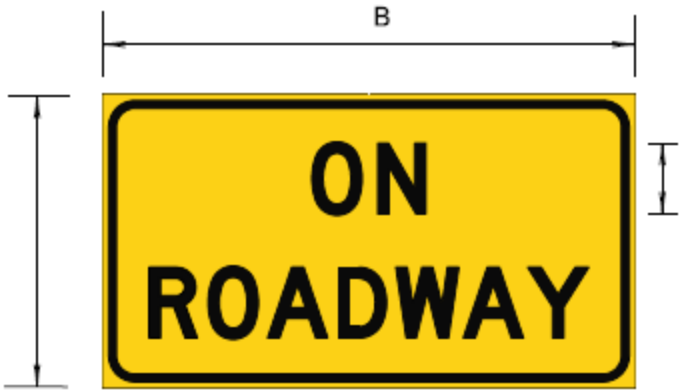
SIGN	DIMENSIONS (INCHES)						
	A	B	C	D	E	F	G
MIN.	30	½	¾		1⅞		
STD.	36	⅝	⅞		2¼		
STD.	48	¾	1¼		3		

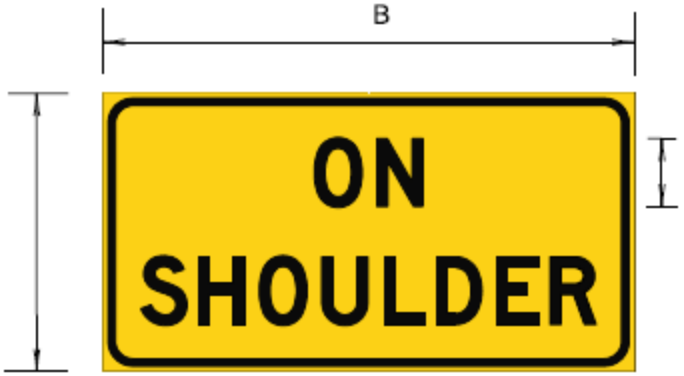
OREGON DEPARTMENT OF TRANSPORTATION

Approved By: - Date: - Publication Date: -

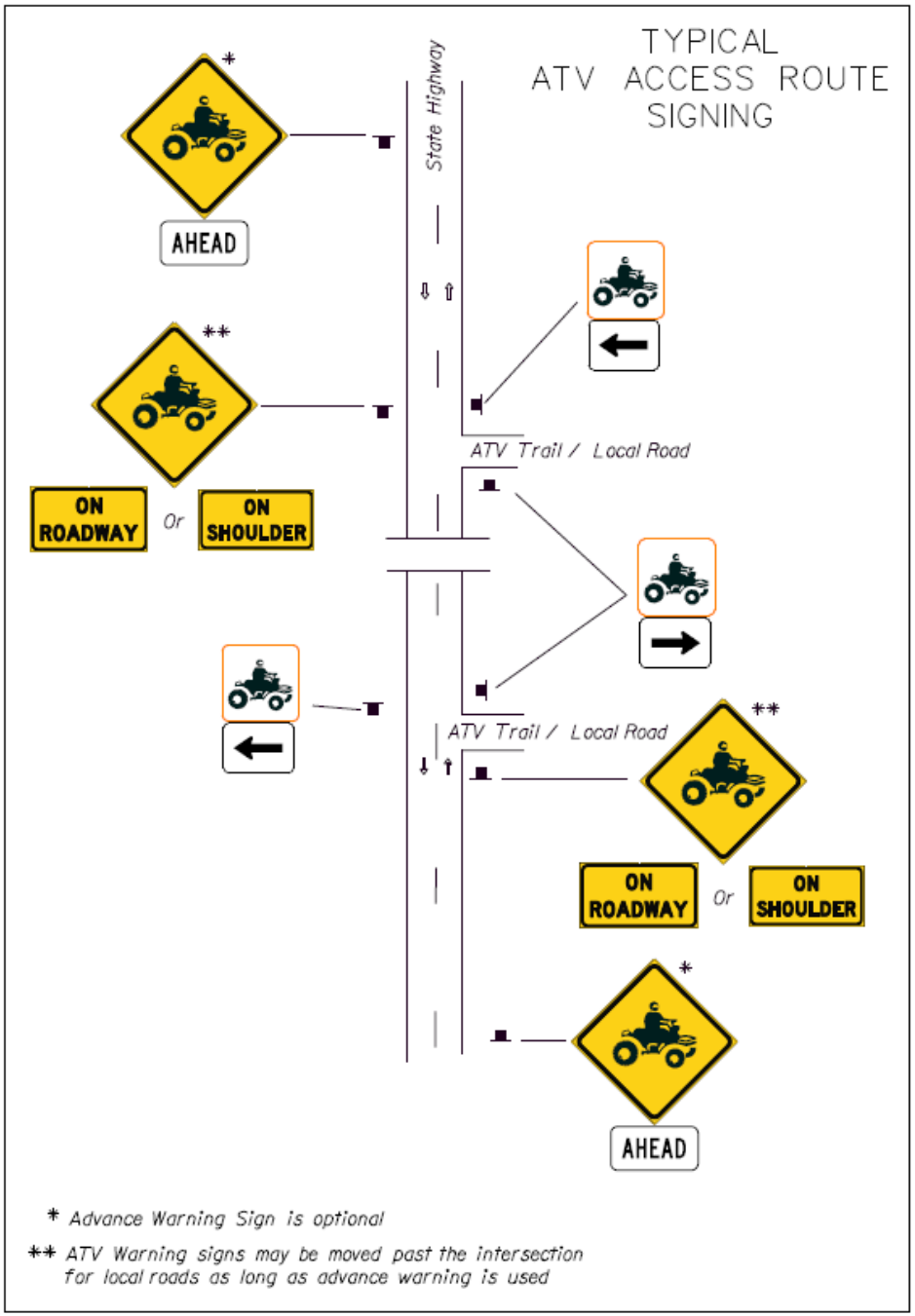
4-75

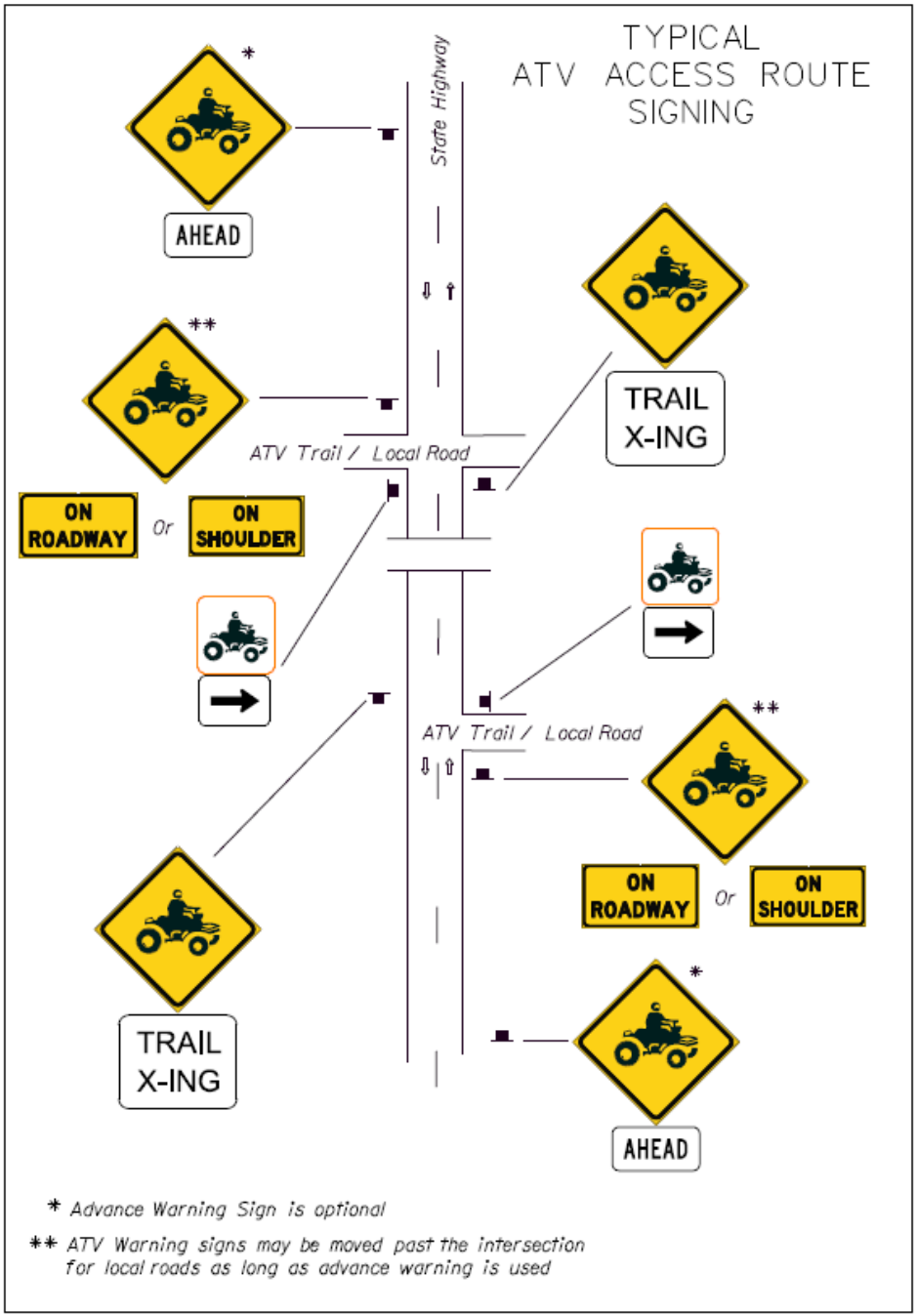
SIGNSTDPG.F12





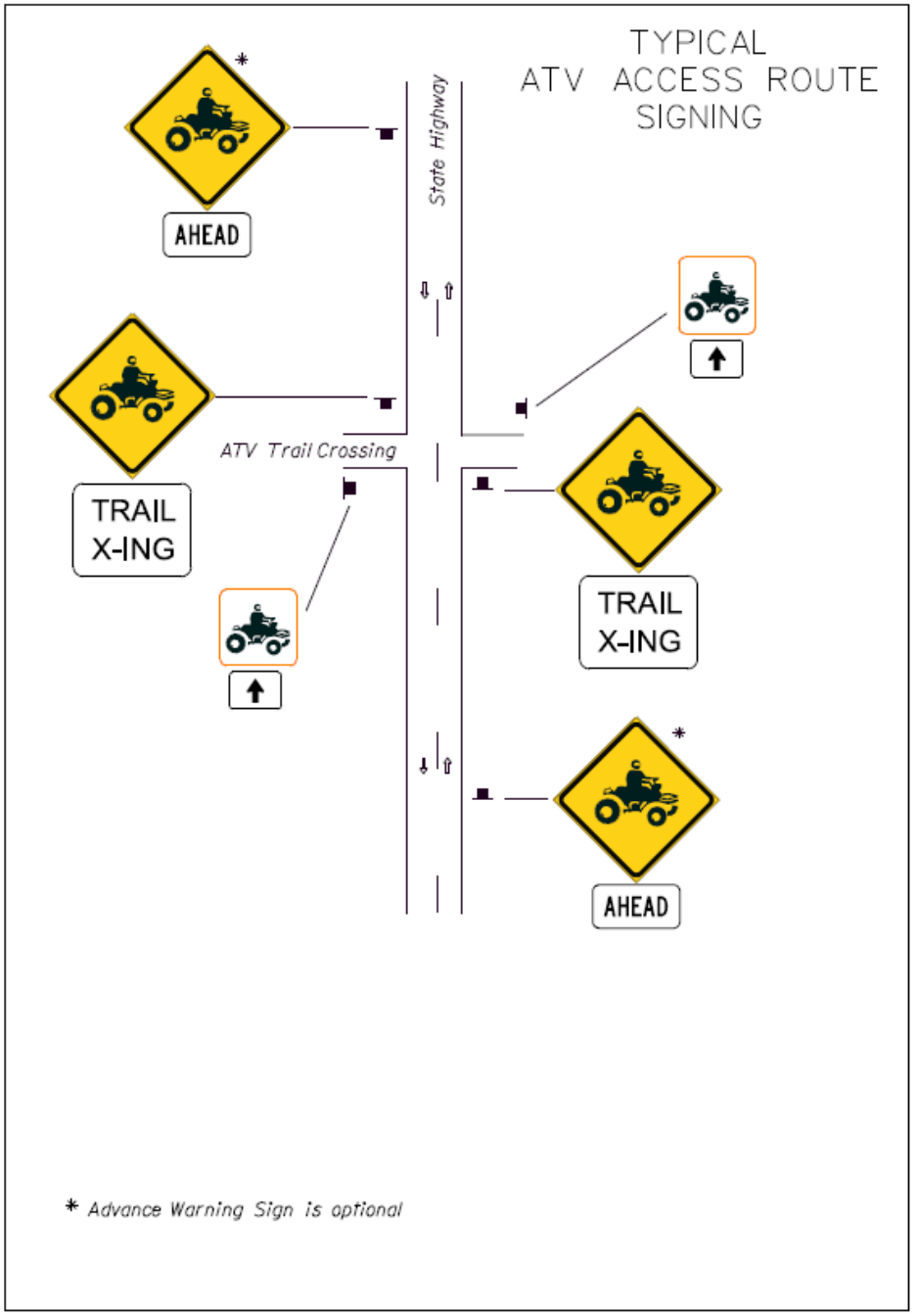
For trails on the same side of the highway.





For trails on different sides of the highway.

Just for crossings



Preferred signing for trails along the highway

This is the sign marker that many agencies use to mark ATV trails including BLM and Parks. ATV users should be use to seeing them and there is little confusion for the car motorist that the sign is not for them. This will be helpful for route confirmation. However it may not be able to be installed when there is not a soft shoulder. Route confirmation should not be place more than every ½ mile.

IMPROVED SAFETY AND EFFICIENCY OF PROTECTED/PERMITTED RIGHT TURNS IN OREGON

OTCDC MEETING

JULY 20, 2018

Research Team:

David Hurwitz, Associate Professor, Co-PI, OSU

Chris Monsere, Professor, Co-PI, PSU

Sirisha Kothuri, Research Associate, PSU

Hisham Jashami, PhD candidate, OSU

Objectives

- Understand and assess driver comprehension and response to the FYA for right turns
- Develop an understanding of the safety and operational implications of using the FYA for permitted right-turns

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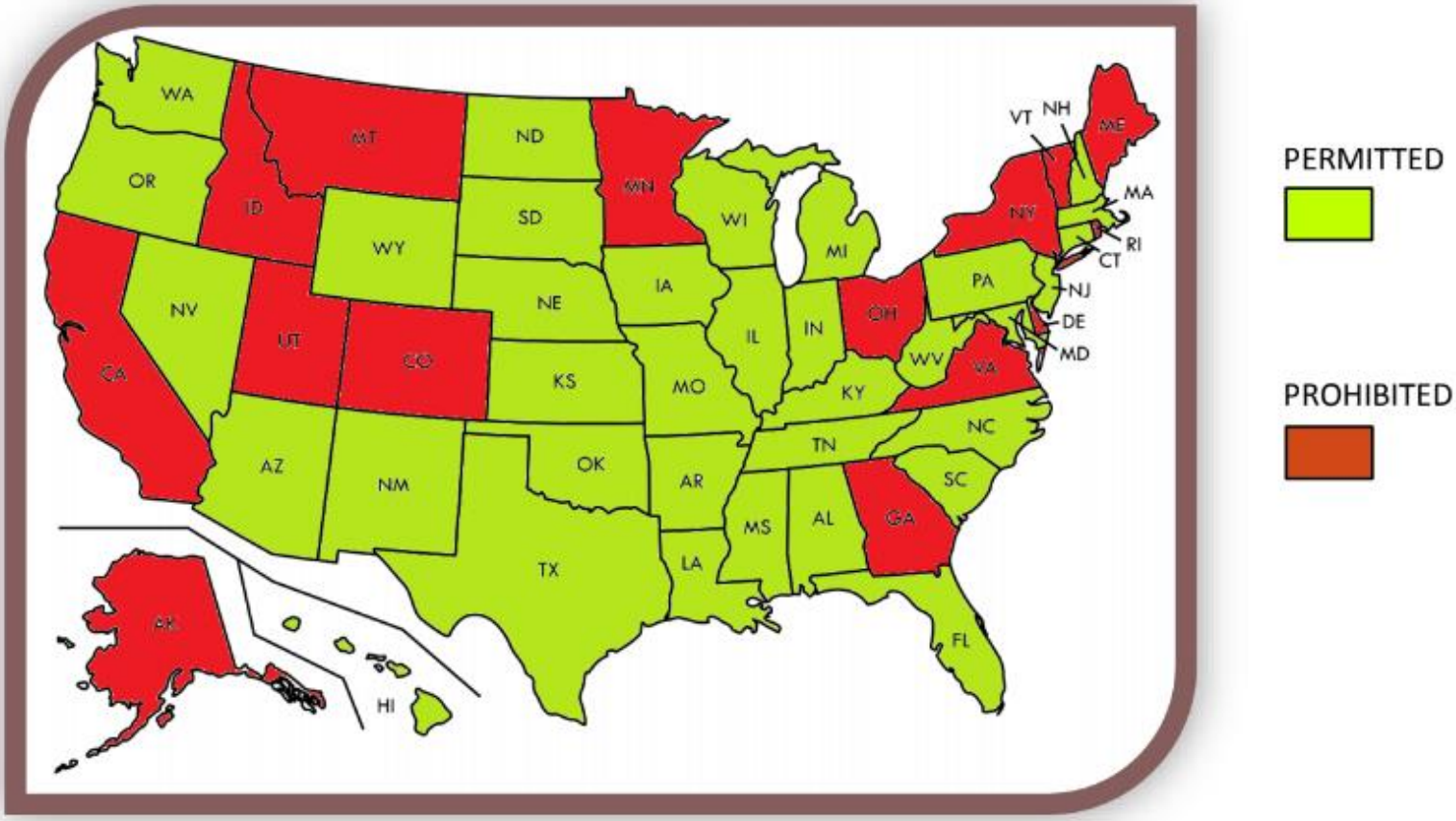
What Does Your State Say?

This table shows comparison of states that permit or prohibit right turns on red arrow. For the majority of the states that allow a left turn on red from a one-way street to another one-way street, the same ruling would apply for a left red arrow[1].



Source: "Right Turns on Red Arrow by State: Does your State Allow it" Sajid Hassan, Traffic Engineer NCDOT. 2016

Research Methods

Oregon Driver Survey

- Determine driver comprehension for PPRT phasing alternatives.
- Identify potential factors for microsimulation and driving simulator study.

Oregon Driving Simulator Study

- Evaluate PPRT phasing alternatives for potential conflicts with active transportation through surrogate safety measures.

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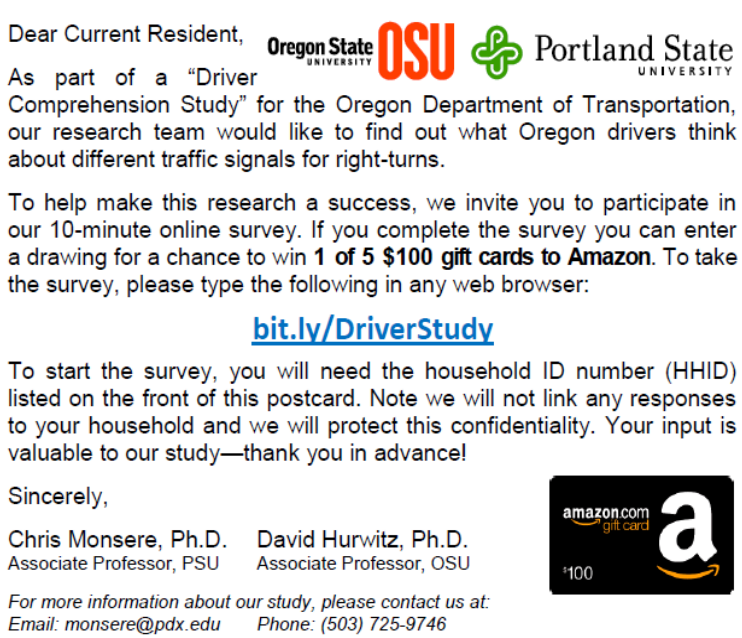
Survey

- Random sample of 10,000 address weighted by county population purchased from infoUSA
- Address cleanse = 9,872
- Pilot survey to OSU/PSU students and TAC
- Postcard distribution, mailed May 16 2016
- 5 $100 Amazon gift cards as incentive



Dear Current Resident,

As part of a "Driver Comprehension Study" for the Oregon Department of Transportation, our research team would like to find out what Oregon drivers think about different traffic signals for right-turns.

To help make this research a success, we invite you to participate in our 10-minute online survey. If you complete the survey you can enter a drawing for a chance to win **1 of 5 $100 gift cards to Amazon**. To take the survey, please type the following in any web browser:

bit.ly/DriverStudy

To start the survey, you will need the household ID number (HHID) listed on the front of this postcard. Note we will not link any responses to your household and we will protect this confidentiality. Your input is valuable to our study—thank you in advance!

Sincerely,

Chris Monsere, Ph.D. Associate Professor, PSU

David Hurwitz, Ph.D. Associate Professor, OSU

For more information about our study, please contact us at:
Email: monsere@pdx.edu Phone: (503) 725-9746

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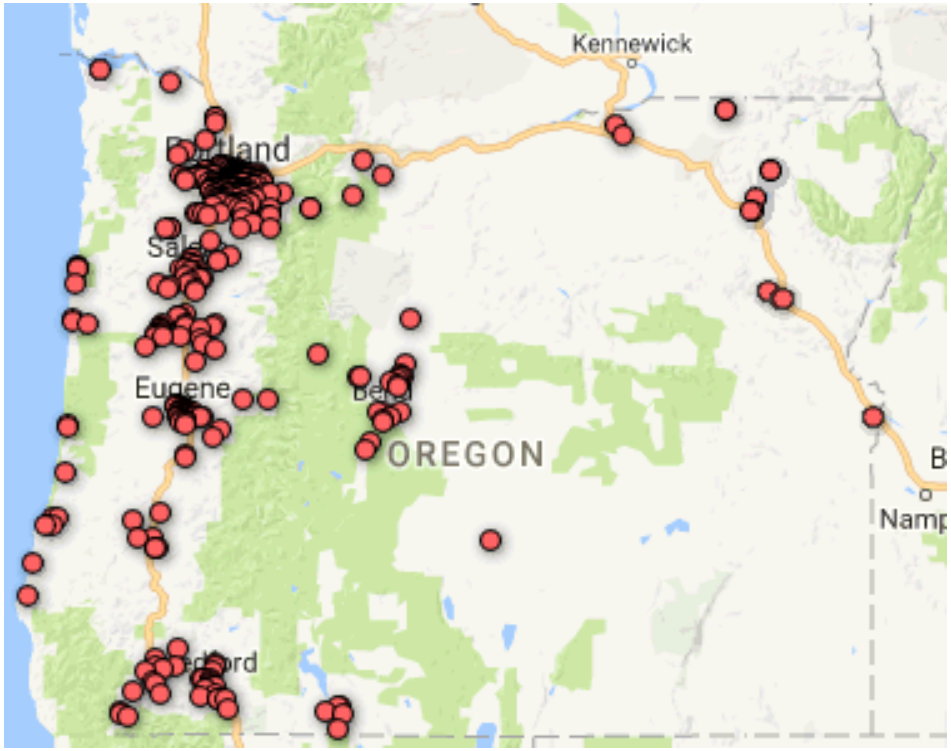
Survey Responses



- 399 responses
- 4% response rate
- Overall, survey demographic
  - Older
  - Whiter
  - More educated
- 98% Oregon licensed drivers
- 50% drive 10+ times a week
- 95% 10+ years driving
- 2.5% color blind

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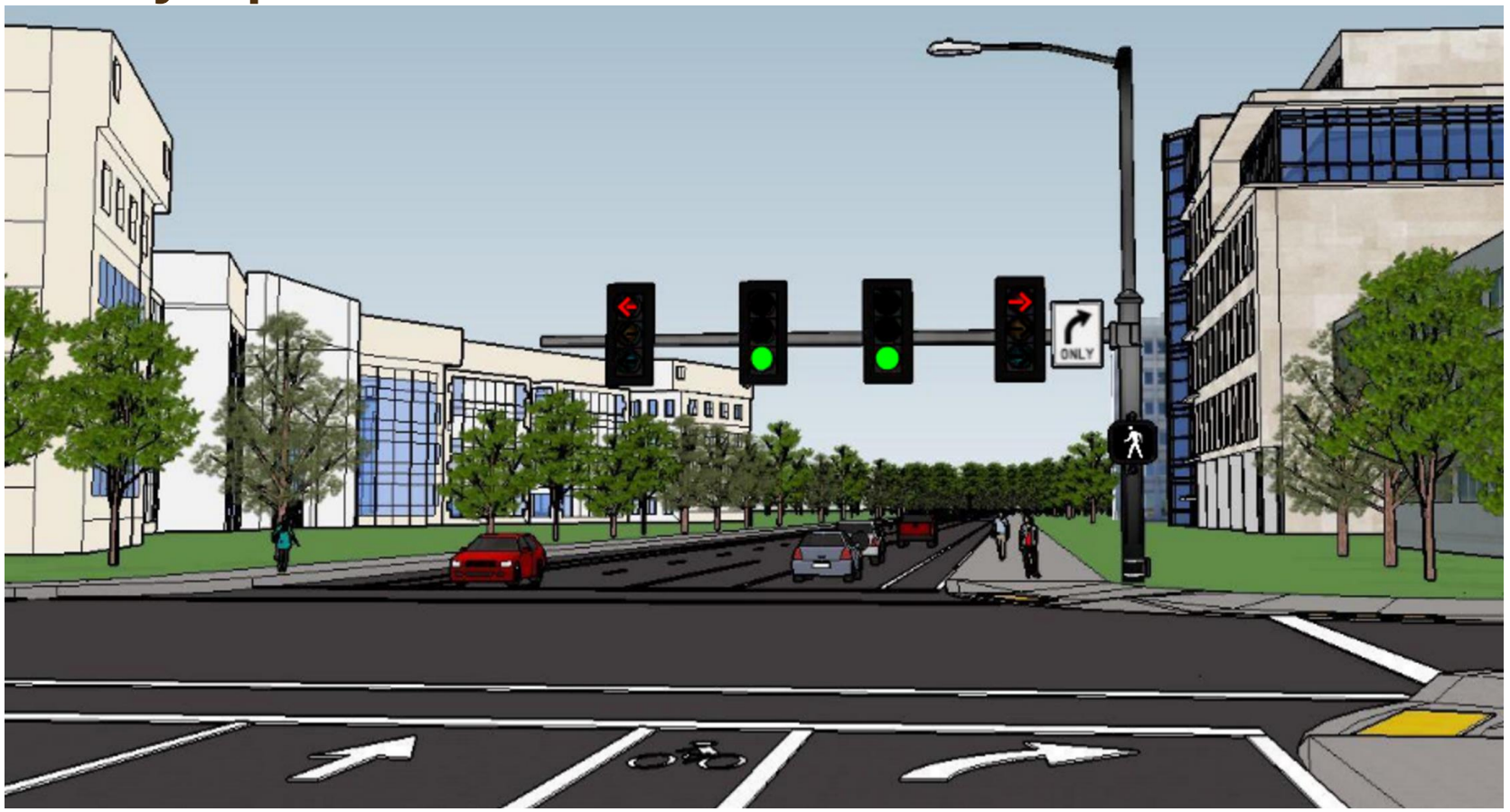
Survey Open Ended



*Imagine that you are approaching the intersection in **the lane farthest to the right and planning to TURN RIGHT**. What action would you take based on the current signal display?*
Please type your response in the box below and be as descriptive as possible

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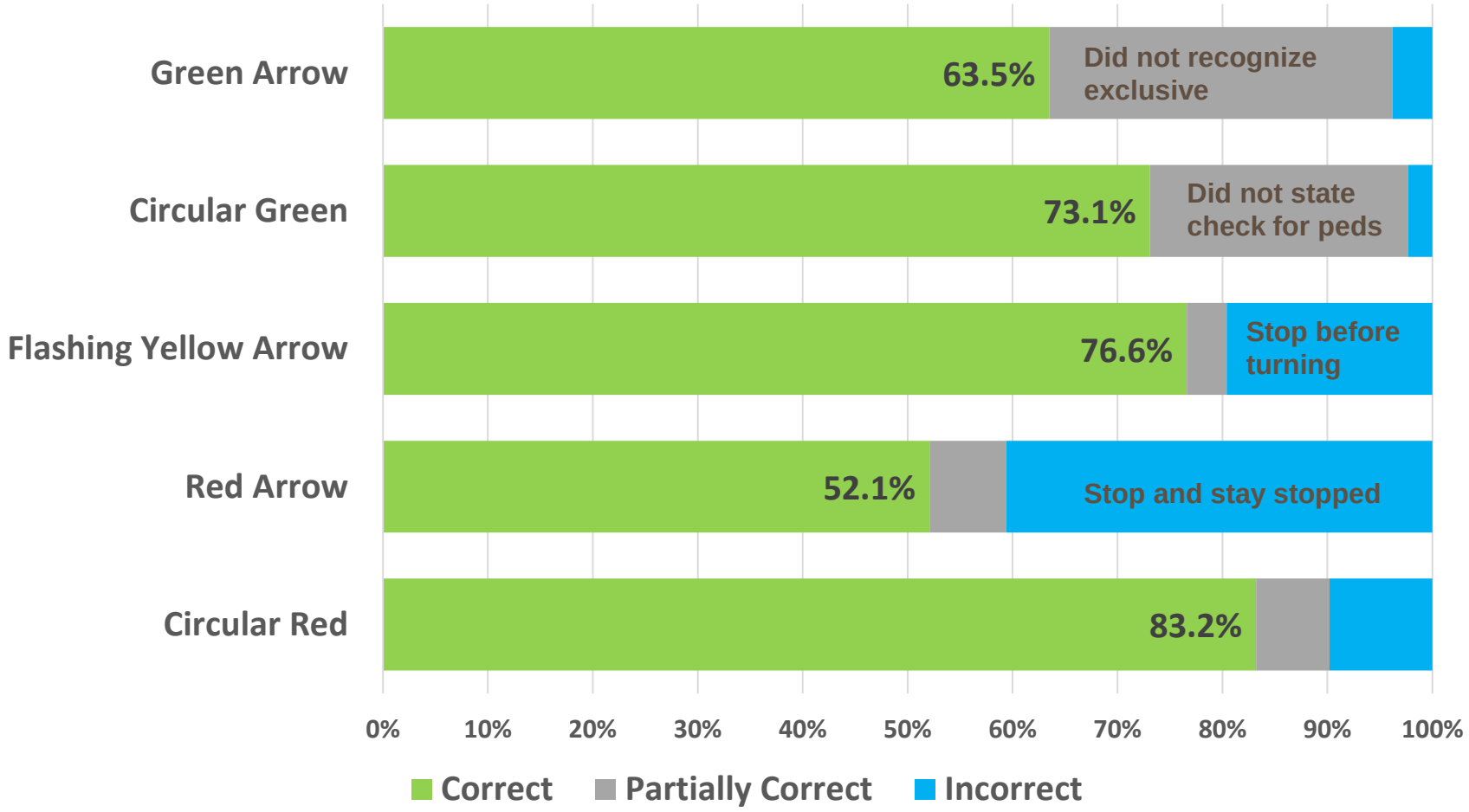
Error Coding of Open Ended Survey Responses

if respondents indicated that they would…	Correct	Partially Incorrect	Incorrect
Steady Circular Green	Turn right with caution after yielding to pedestrians in the crosswalk	Turn right without stopping but failed to state that they would yield to pedestrians if present in the crosswalk	Stop before turning
Steady Green Arrow	Turn right without stopping recognizing that the steady green arrow indication means a protected movement (or) Indicated that they would watch for pedestrians who may cross against the pedestrian Don't Walk signal	Check for pedestrians and turn right (or) slow down and check for pedestrians and other cross traffic but did not recognize the protected movement in either case	Stop before turning
Steady Circular Red and Steady Red Arrow	Come to a complete stop and complete the turn when they found a safe gap or remained stopped if they failed to find a gap	Stop or turn right, without providing additional details	Stop and remained stopped until the green indication
Flashing Yellow Arrow	Turn right with caution after yielding to pedestrians in crosswalk	Turn right without stopping or failed to state that they would yield to pedestrians if present in the crosswalk	Stop before turning

Overall, n=399



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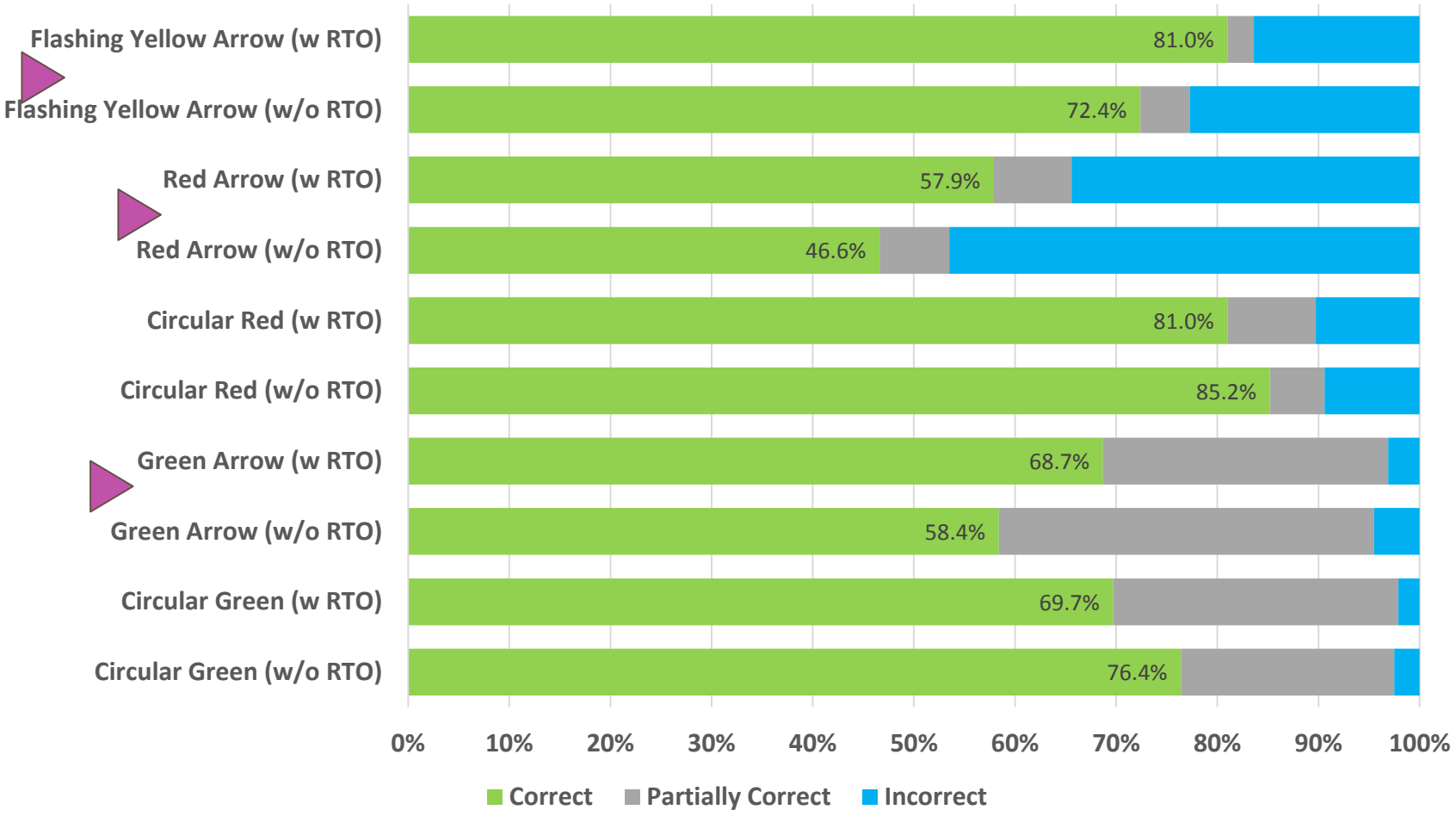
With and Without Right Turn Only Sign



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Statistically significant differences, p <0.05)

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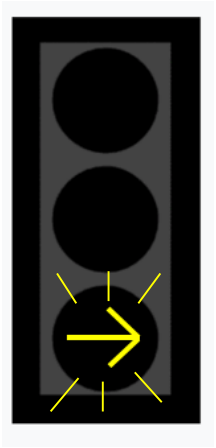
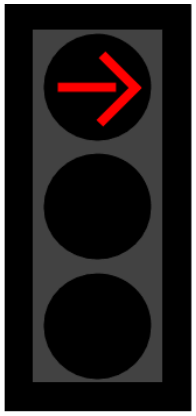
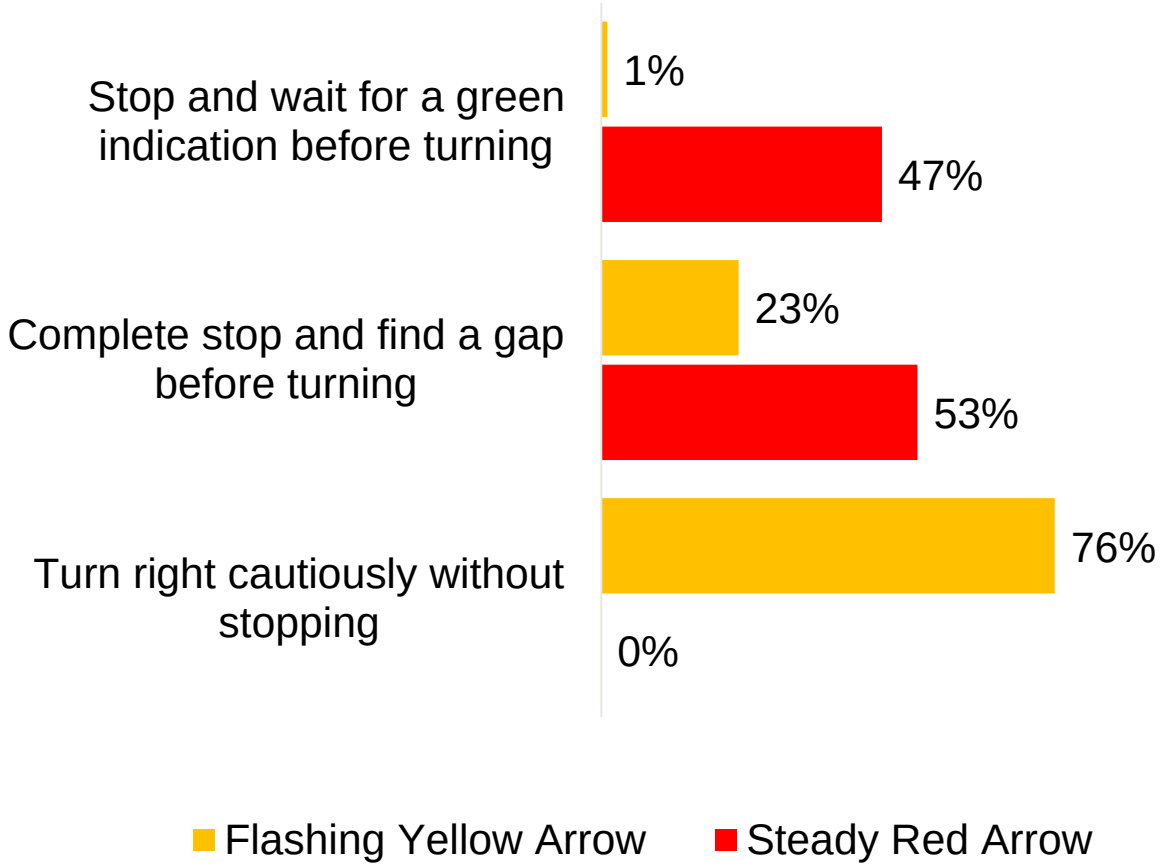
Steady Red and Flashing Yellow Arrow Multiple Choice







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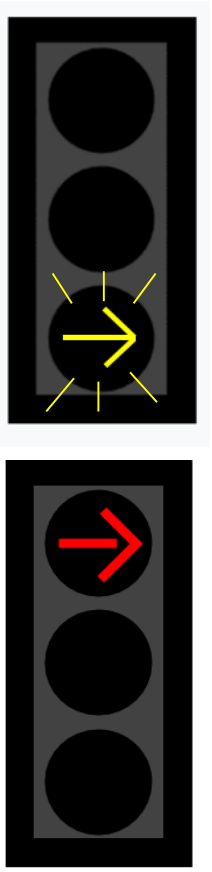
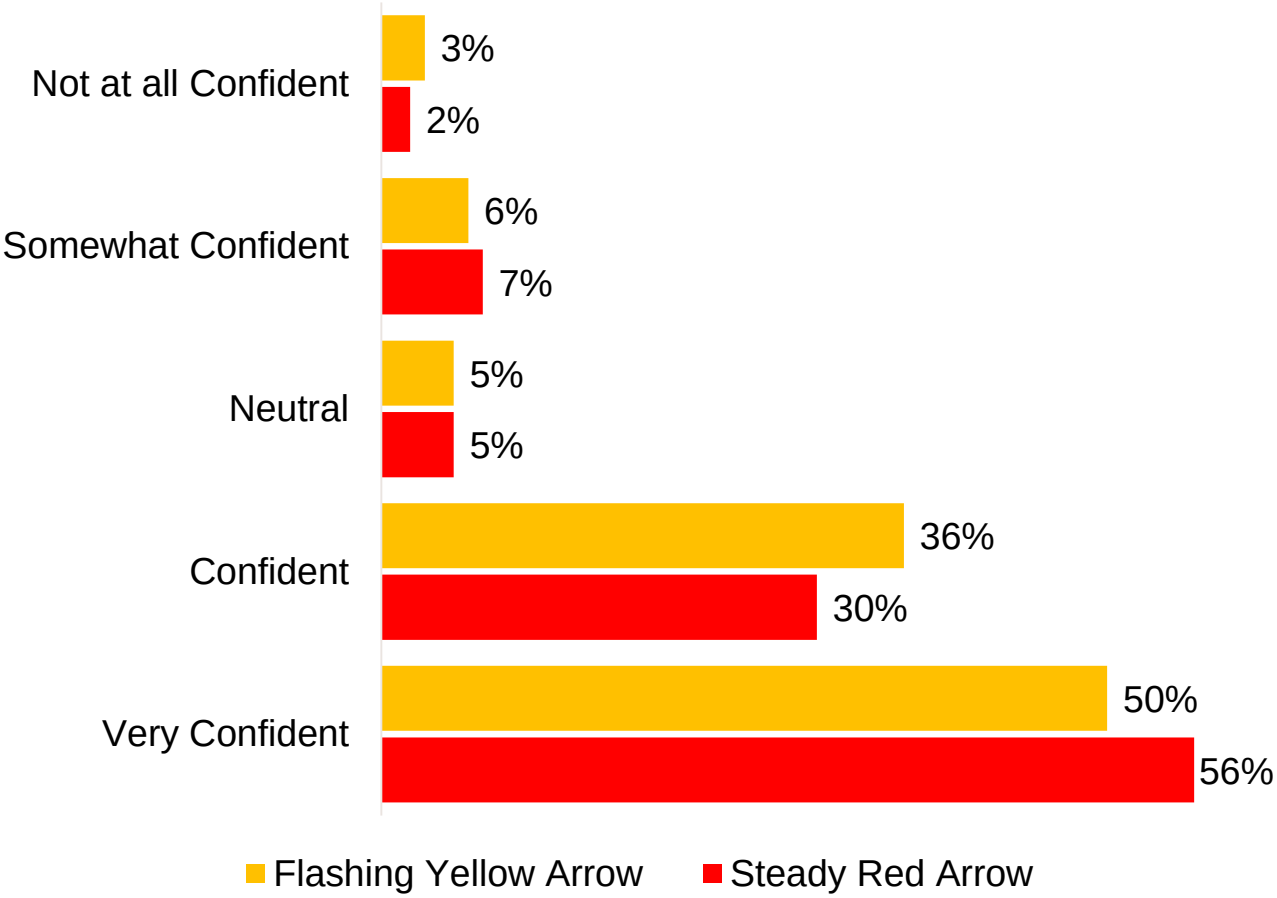
Steady Red and Flashing Yellow Arrow Multiple Choice





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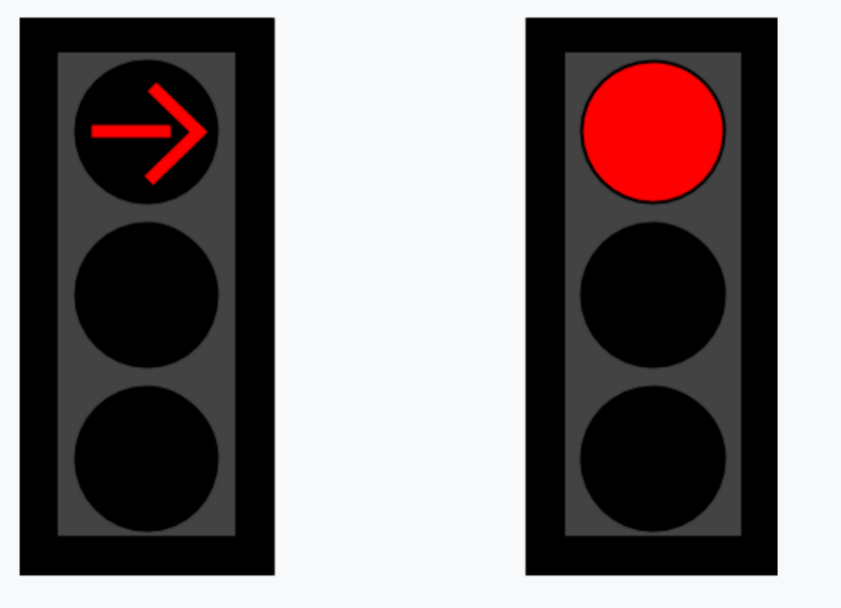
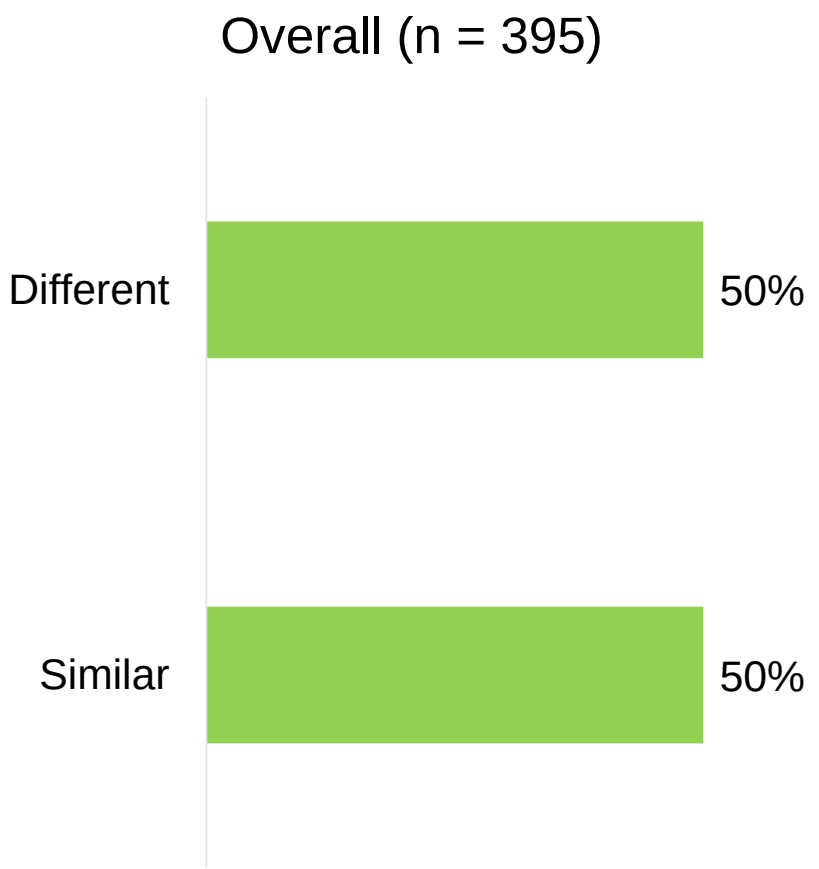
Red Ball and Red Arrow Comparison





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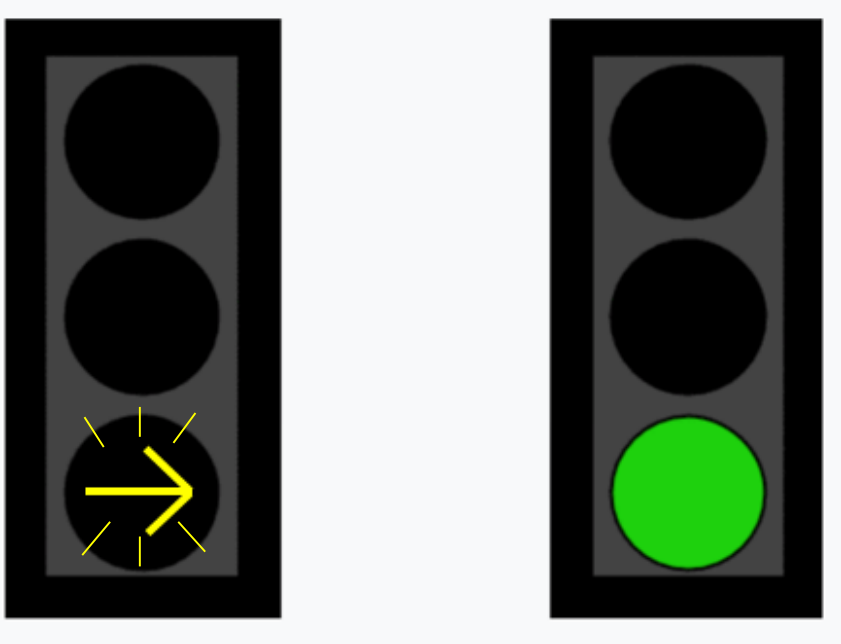
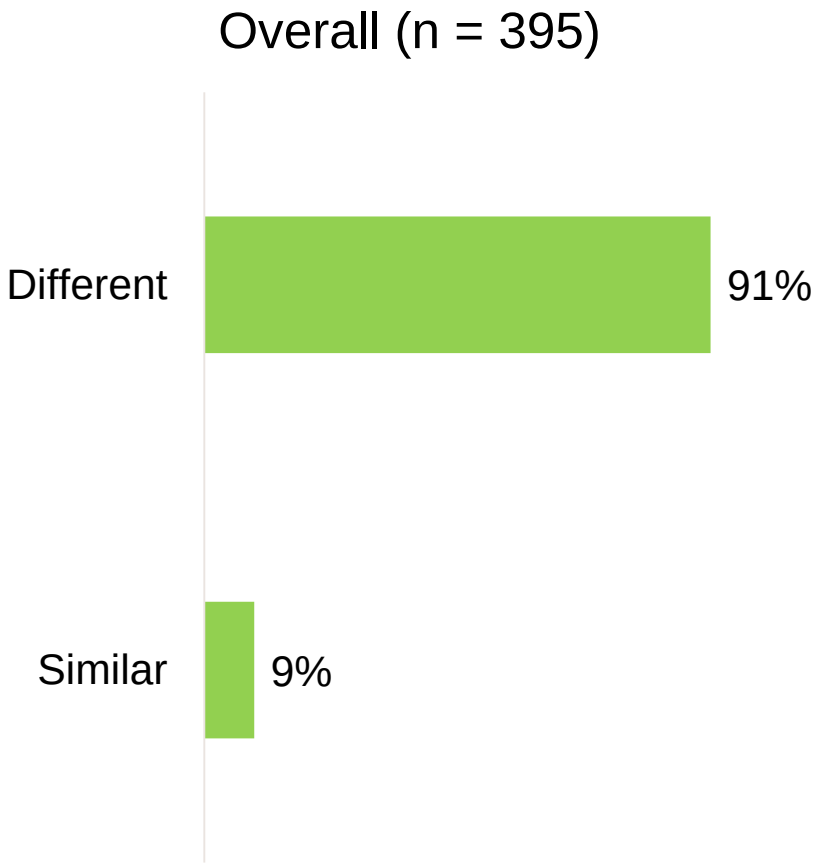
Green Ball and Flashing Yellow Arrow Comparison





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Primary Findings

- Good geographic coverage and number of responses
- Older drivers over-sampled
- Expected driver behavior with Steady Red Arrow not well understood
- FYA and CG
  - Both have good comprehension
  - FYA more incorrect, but fail safe (STOP)
  - CG more partially correct (fail to mention pedestrian)
  - CG and FYA strongly recognized “as different”

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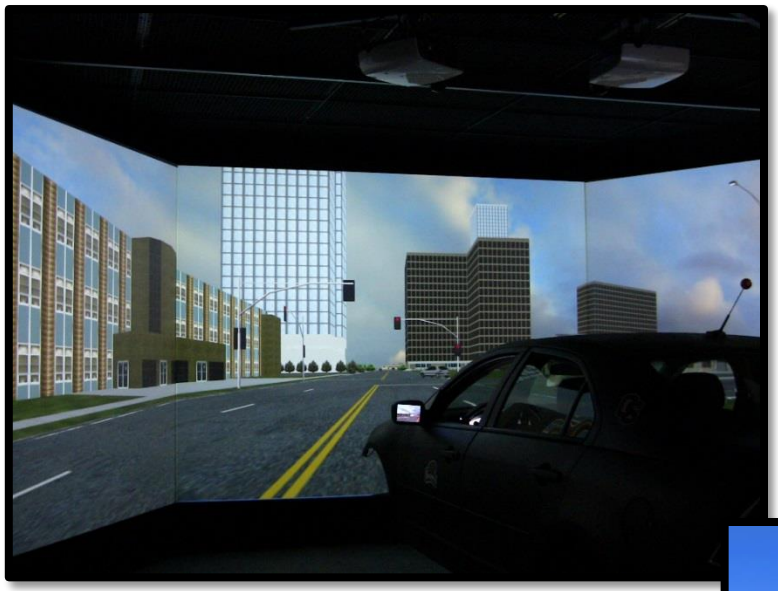
OSU Driving Simulator



View from outside the car

View from inside car
w/ ped crossing

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Independent Variables & Levels

VARIABLE	ACRONYM	CATEGORY	LEVEL	LEVEL DESCRIPTION	
Signal Head	SHA	Nominal (categorical)	1	CR: Circular Red	
			2	CG: Circular Green	
	SHB		1	SRA: Solid Red Arrow	
			2	SGA: Solid Green Arrow	
			3	FYA: Flashing Yellow Arrow	W: Walk interval
					C: Clearance walk interval
Geometry	G	Discrete	1	TB1: Right-turn bay length 1: 50 ft	
			2	TB2: Right-turn bay length 2: 100 ft	
Pedestrians	P	Discrete	1	No pedestrians crossing	
			2	Pedestrians crossing	

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Experimental Scenarios

T #	RT #	SIGNAL HEAD	BAY LENGTH (ft)	PEDESTRIAN
Grid 1				
6	1	FYAC	50	None
22	2	SGA	100	Pedestrian crossing
9	3	SRA	100	None
14	4	CG	50	Pedestrian crossing
Grid 2				
23	1	FYAW	100	Pedestrian crossing
8	2	CG	100	None
2	3	CG	50	None
18	4	FYAC	50	Pedestrian crossing
Grid 3				
19	1	CR	100	Pedestrian crossing
5	2	FYAW	50	None
7	3	CR	100	None
4	4	SGA	50	None
Grid 4				
20	1	CG	100	Pedestrian crossing
12	2	FYAC	100	None
10	3	SGA	100	None
21	4	SRA	100	Pedestrian crossing
Grid 5				
16	1	SGA	50	Pedestrian crossing
1	2	CR	50	None
11	3	FYAW	100	None
17	4	FYA	50	Pedestrian crossing
Grid 6				
3	1	SRA	50	None
13	2	CR	50	Pedestrian crossing
15	3	SRA	50	Pedestrian crossing
24	4	FYAC	100	Pedestrian crossing

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Intersection Layout

With 50 ft exclusive right turning bay

With 100 ft exclusive right turning bay

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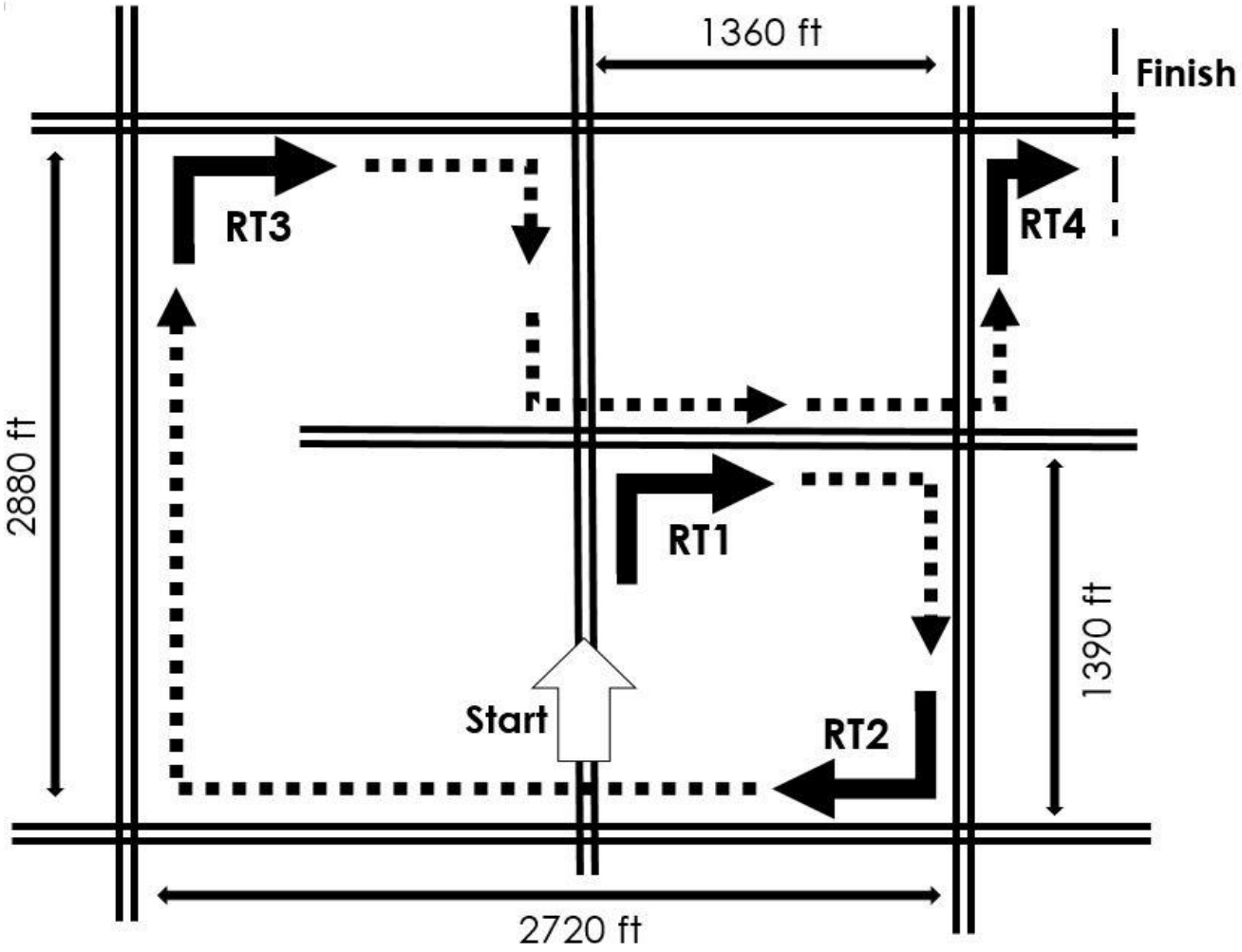
Example Experimental Trial w/ 4 Scenarios



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Experiment – Data Acquisition

Participants:

- 52 Participated
- 5 Simulator Sickness
- 1 calibration issue
- 46 Usable
- 1104 total-right turn scenarios

Data:

- Visual attention
- Observed driver behavior
- Position and speed of vehicles, and pedestrians
- Pre-post survey

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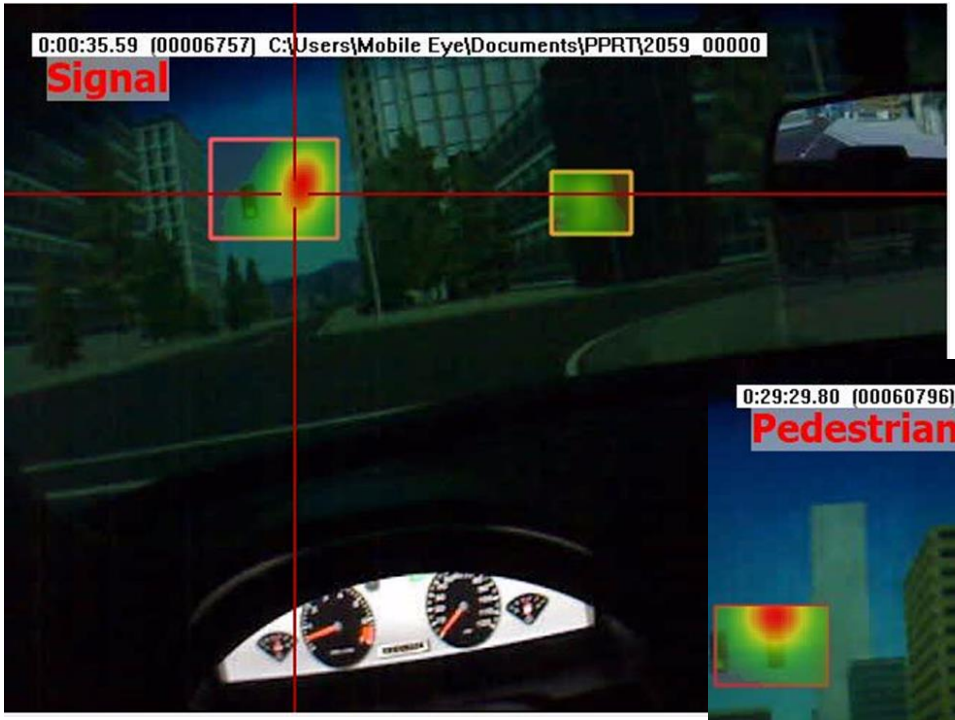
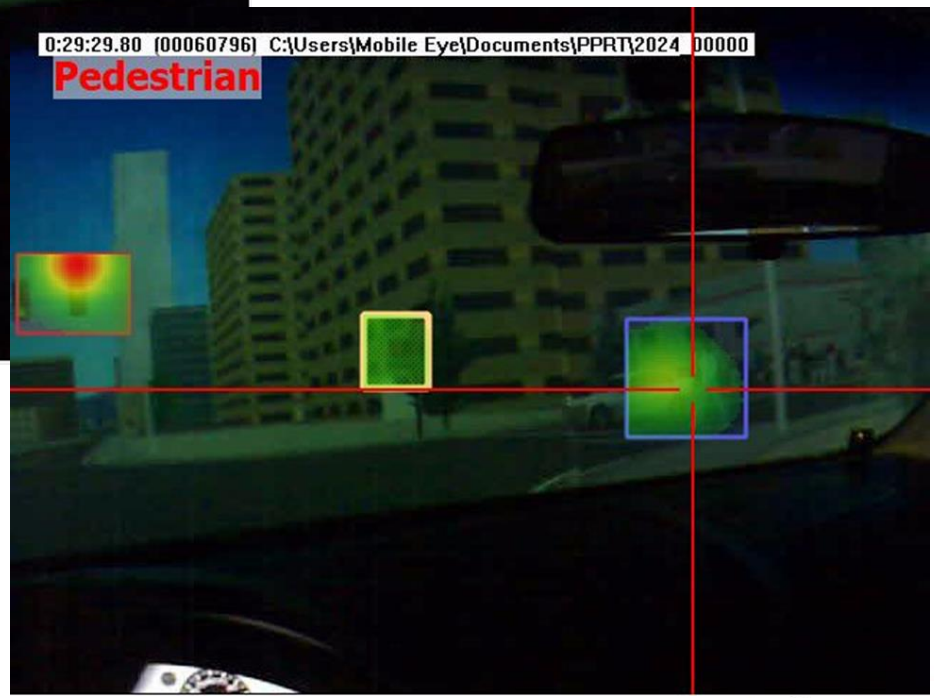
Visual Attention – Areas of Interest (AOIs)





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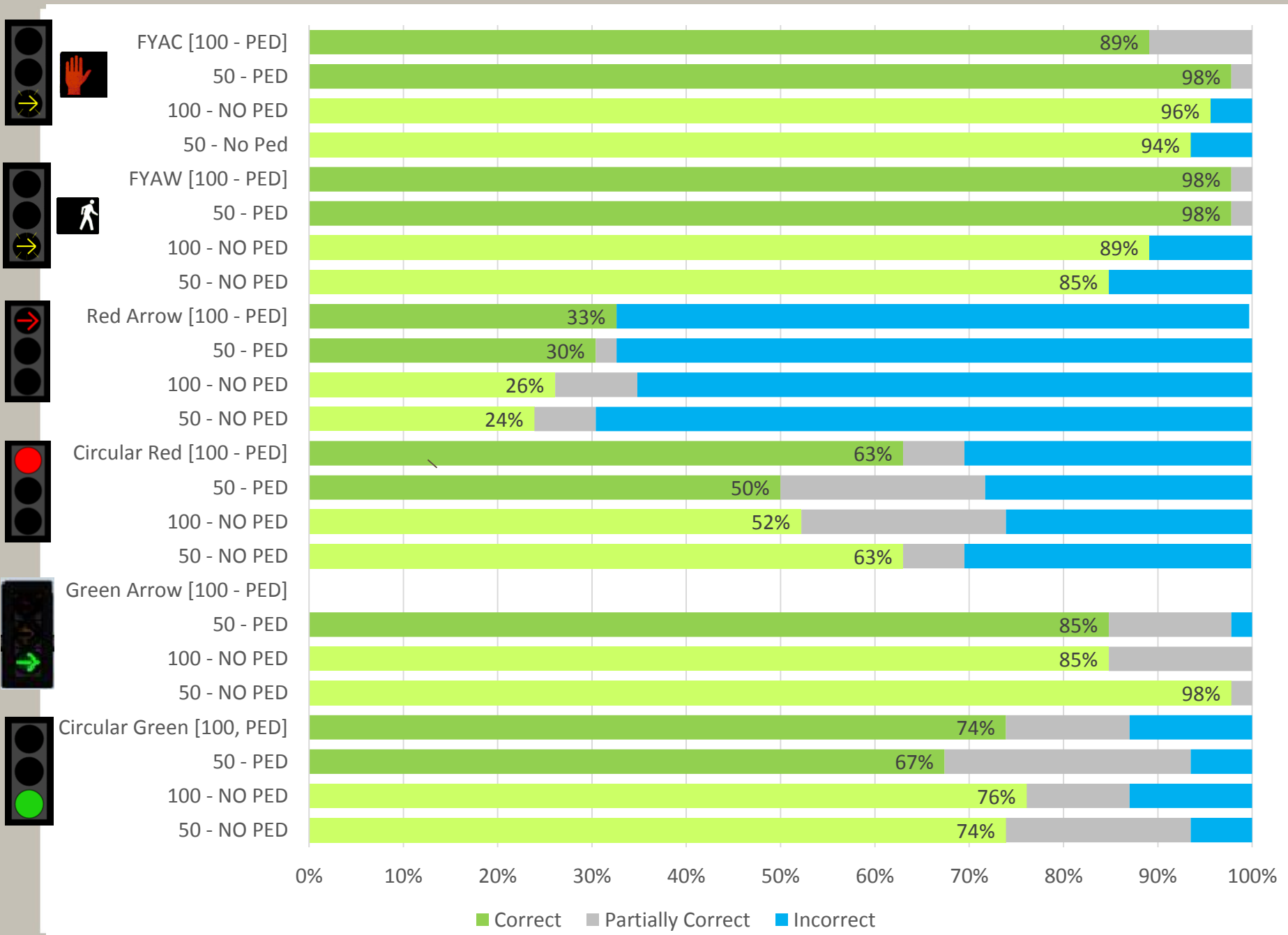
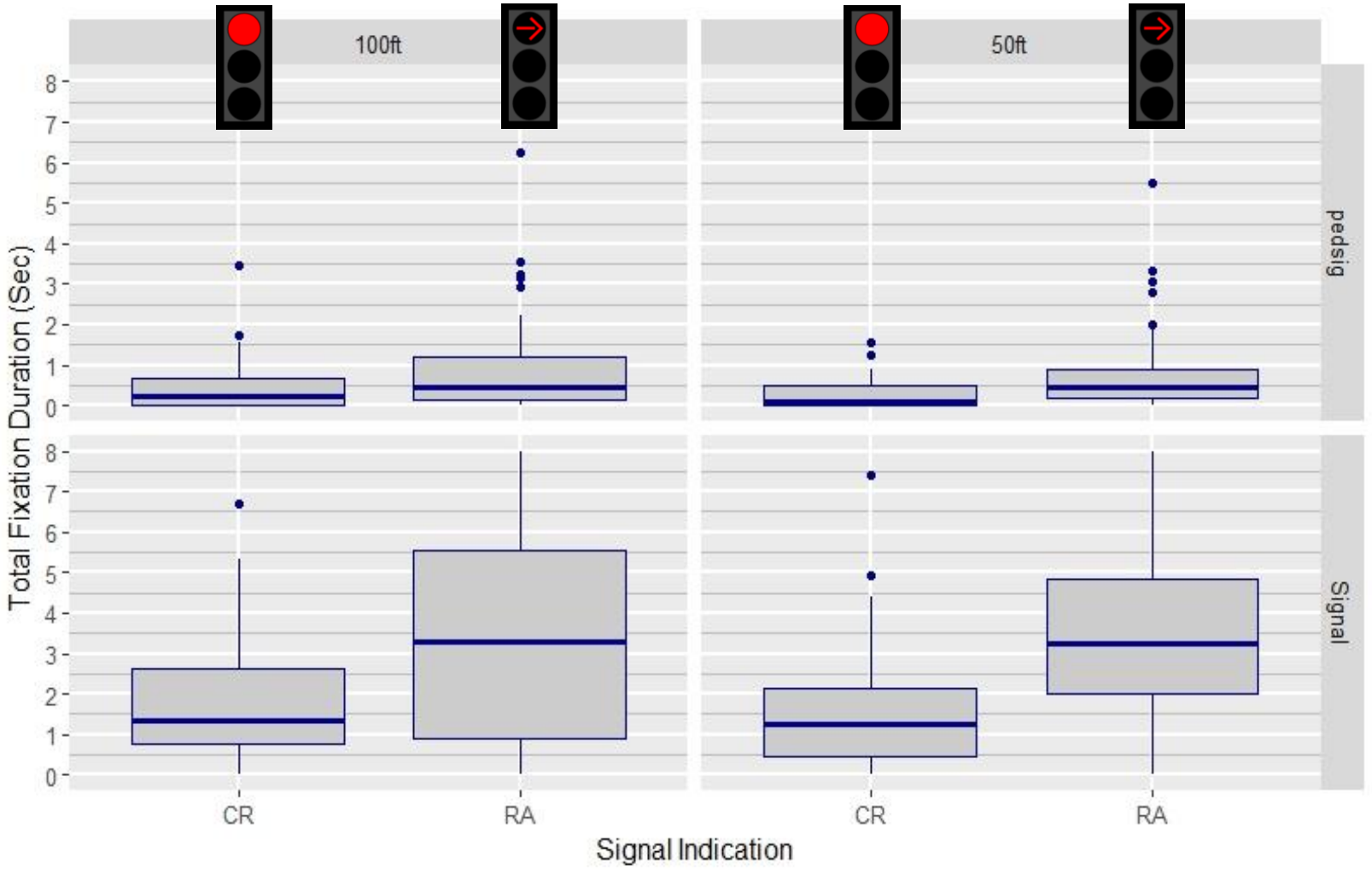
Error Coding of Observed Behavior

if respondents indicated that they would…	Correct	Partially Incorrect	Incorrect
Steady Circular Green	Turn right with caution after yielding to pedestrians (if present) in the crosswalk	Turn without checking for pedestrians even though the walk indication was displayed (or) not checking before turning but stopping once they saw a pedestrian	Stop before turning (vehicle speed < 1 mph) to check for pedestrians (or) A crash with a pedestrian
Steady Green Arrow	Turn right without stopping, recognizing that the SGA indicates a protected right-turn movement	Check for pedestrians and turn right (or) Slow down and check for pedestrians and other cross traffic but did not recognize the protected movement in either case	Stop before turning (some noted remain stopped until the signal display became green)
Steady Circular Red & Steady Red Arrow	Come to a complete stop (vehicle speed < 1 mph) and complete the turn when they find a safe gap	Turn right without coming to a complete stop (Vehicle speed > 1 mph)	Stop and remain stopped until the green indication
Flashing Yellow Arrow	Turn right with caution after yielding to pedestrians (if present) in crosswalk	Turn right without caution (vehicle speed >15 mph) (or) Not yielding when necessary	Stop before turning (vehicle speed < 1 mph) to check for pedestrians, (or) Remain stopped until the green indication


FYAC [100 - PED]
89%
50 - PED
98%
100 - NO PED
96%
50 - No Ped
94%
FYAW [100 - PED]
98%
50 - PED
98%
100 - NO PED
89%
50 - NO PED
85%
Red Arrow [100 - PED]
33%
50 - PED
30%
100 - NO PED
26%
50 - NO PED
24%
Circular Red [100 - PED]
63%
50 - PED
50%
100 - NO PED
52%
50 - NO PED
63%
Green Arrow [100 - PED]
50 - PED
85%
100 - NO PED
85%
50 - NO PED
98%
Circular Green [100, PED]
74%
50 - PED
67%
100 - NO PED
76%
50 - NO PED
74%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Correct
Partially Correct
Incorrect

Visual Attention – Total Fixation Duration (TFD)



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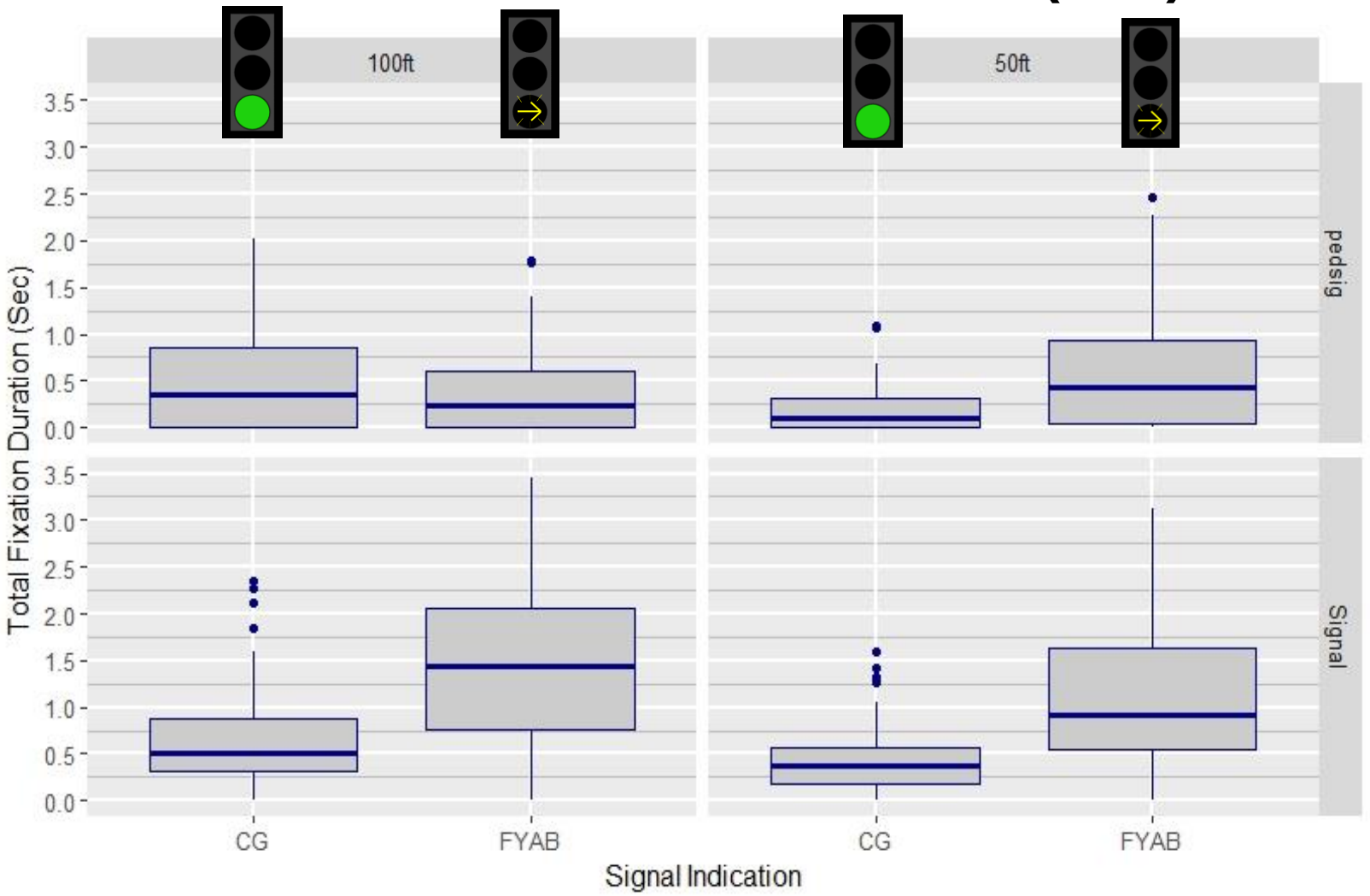
Visual Attention – Total Fixation Duration (TFD)



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Comparison: Indications that require driver yielding

- **Steady Circular Green**
  - Results between survey and driving simulator are consistent.
  - Survey (73%) and simulator (67 – 74%) simulator correct response.
  - Partially correct responses resulted from respondents failing to state in the survey (25% of the sample) or to demonstrate in the simulator (by near misses with pedestrians; 10%-19% of right turns) that they would yield to pedestrians

- **Flashing Yellow Arrow**
  - Results between survey and driving simulator are consistent.
  - Survey (77%) and simulator (84-95%) simulator correct response
  - Incorrect responses (stop) were fail-safe.
  - Evidence of better driver yielding to pedestrians.

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Comparison: Indications that require driver stop

- **Steady Circular Red**
  - Results between survey and driving simulator are not as comparable.
  - Correct survey responses (83%) were higher compared to the simulator experiment (50-63%) primarily dues to high “stop and stay stop” behaviors (could be carryover effect from RA.
  - Incorrect responses generally were a result of fail-safe actions.
- **Steady Red Arrow**
  - Results between survey and driving simulator are consistent.
  - Evidence of significant misunderstanding of the steady red arrow indication from both survey and simulator experiment as correct responses were 52% (survey) and 23-33% (simulator).
  - Only 50% of the survey respondents stated that both displays have the same meaning.

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Comparison of Results: Indications that communicate the movement is exclusive

- **Steady Green Arrow**
  - In survey, partially correct responses were coded if drivers indicated that they would check for pedestrians or other users before turning right (32%) but only 13% of drivers in the simulator experiment.
  - This is a fail-safe response.

Limitations of Research

Survey

- Distribution of respondents in survey was biased toward white, men, and older population.
- Larger proportion of respondents were from southern Oregon (closer to CA), which has different laws for steady red arrow indication.

Simulator

- Potential for fatigue effects.
- Limited number and levels of variables were evaluated.

Recommendations for Practice

- Add language in the applicable ODOT documents, policies and manuals to require the use of the FYA in for protected permissive right turn operations and allow use of FYA for permissive right turn operations

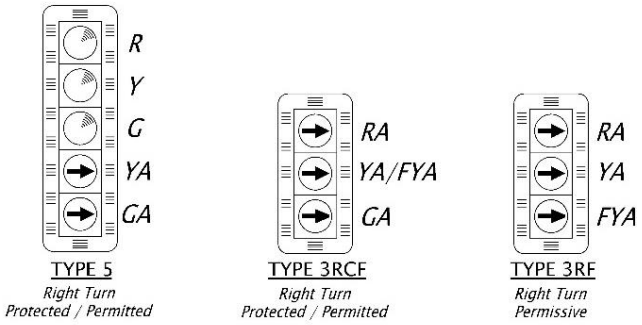
    - Due to better yielding and driver behavior, Oregon transportation agencies could potentially improve pedestrian safety at signalized intersections with high volumes of permissive right turns from exclusive right-turn lanes by using the FYA display in lieu of a STEADY CIRCULAR GREEN display. This type of operation is currently in use at NW 3rd St and NW Van Buren Ave in Corvallis, OR with two one-way streets.

PPRT w/FYA Display Options

- Displaying the FYA only during the clearance interval and DO NOT WALK (steady red arrow display during the walk interval; currently implemented at NW 3rd St and NW Van Buren Ave in Corvallis, OR)
- Displaying the FYA only during the DO NOT WALK (steady red arrow display through the walk and clearance interval; currently implemented at NW Evergreen Pkwy and NW Cornell Rd in Washington County, OR).
- Displaying the STEADY GREEN ARROW only during the DO NOT WALK (steady red arrow display through the walk and clearance interval; provided by protected only right turn phasing that excludes the pedestrian walk and clearance interval).
- Displaying the FYA during the pedestrian walk, clearance interval, and DO NOT WALK

Recommendations for Practice

- Add two new signal head types in the applicable ODOT documents, policies and manuals: Replace the TYPE5 signal head with a TYPE3RCF signal head for PPRT operations and add a TYPE 3RF signal head for permissive right turn operations



Color Indications. All Indications Are 12" Diameter.	
R	Red Circular Ball
Y	Yellow Circular Ball
G	Green Circular Ball
RA	Red Arrow
YA	Yellow Arrow
GA	Green Arrow
FYA	Flashing Yellow Arrow

- Recommend the use of R10-17a sign at locations using the STEADY RED ARROW (where RTOR is desired for efficiency)

R10-17a

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Acknowledgements

Oregon Department of Transportation (ODOT) and the Federal Highway Administration (FHWA) for funding this research.

The Technical Advisory Committee has provided valuable input throughout the project (Craig Black-ODOT, Scott Cramer-ODOT, Julie Kentosh-ODOT, Katie Johnson-ODOT, and Bikram Raghubansh-Clackamas County) and Mark Joerger, ODOT Research Coordinator.

Students at Oregon State University helped reduce data and code the simulator environment (Kayla Fleskes, MS, Ellie Simpson, MS, Hameed Aswad Mohammed, PhD, Hagai Tapiro, Post-Doctoral researcher, and Logan Scott-Deeter, undergraduate).

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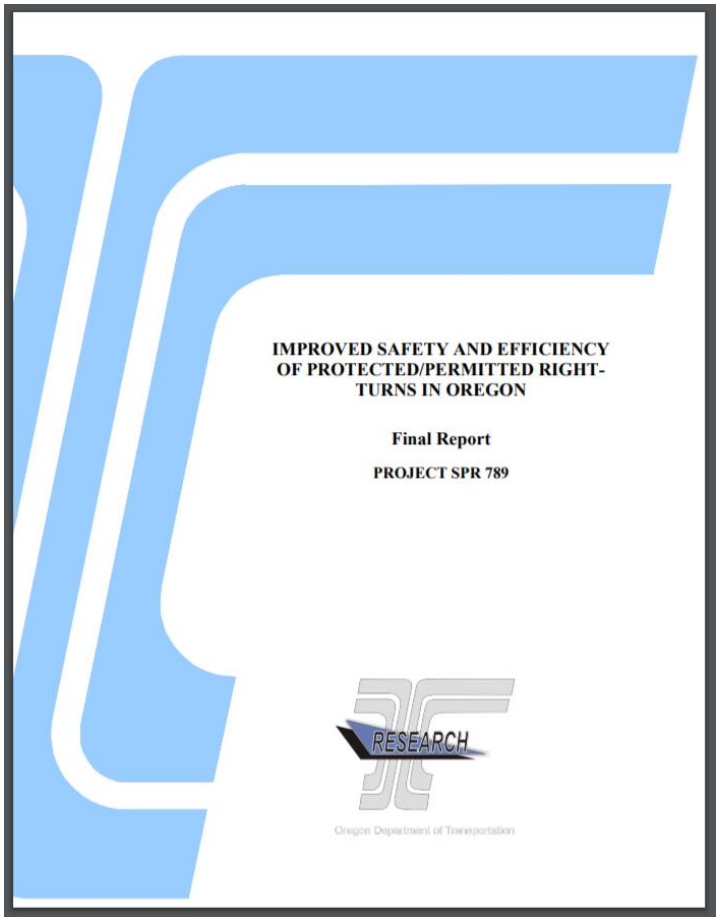
SPR 789 Final Report



Download the full report here

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Presentations and Papers:

- David Hurwitz, *ITE Western District Annual Meeting*, Keystone, CO, June 24-27, 2018.
- Chris Monsere and Sirisha Kothuri*, ITE Quad Conference*, Portland, OR, May 7-9, 2018.
- Sirisha Kothuri*, TRB Traffic Signal Systems Mid-Year Meeting*, Flagstaff, AZ, July 22-24, 2018.
- TRB and ASCE Journal of Transportation articles in development

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Oregon Department of Transportation
and
Oregon Traffic Control Devices Committee

Red Light Running (RLR) Camera Guidelines For State Highways

2018

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OREGON DEPARTMENT of TRANSPORTATION
TRANSPORTATION OPERATIONS DIVISION
TECHNICAL SERVICES
TRAFFIC MANAGEMENT SECTION
http://www.odot.state.or.us/traffic

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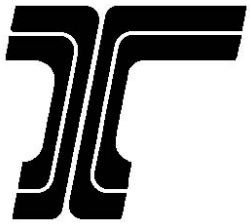

Approved by the State Traffic-Roadway Engineer, in consultation with the Oregon Traffic Control Devices Committee for use on State Highways and adopted by the Oregon Traffic Control Devices Committee as a guide to assist Oregon cities in the deployment of Red Light Running (RLR) Cameras.

Mike Kimlinger

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State Traffic-Roadway Engineer

July, 2018

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Major Revisions included in this version:

1. Added Section on using Red Light cameras for Automated Speed Enforcement.

Major Revisions included in previous versions:

1. Revised Legislative Report requirement from "Regular Session" to "Odd-numbered year" to reflect legislative change in 2013.
2. New bullets in the Crash History requirements for the Safety and Operations Report
3. New Section- Future Changes to the Intersection
4. Various Changes in the section Procedure for State Highways to clarify the procedure
5. New section - Removal Procedure for Red Light Running Cameras
6. New Section – Conditions of Approval
7. New Appendix with web link to the Red Light Running Toolbox
8. Removed the requirement that the Oregon Department of Transportation provide an executive summary of evaluations of the systems to the Oregon Legislature.
9. Added a requirement that each city that operates cameras present an evaluation of the use and administration of the cameras to the Oregon Legislature.

Deleted: Revised Legislative Report requirement from "Regular Session" to "Odd-numbered year" to reflect legislative change in 2013.¶

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Red Light Running (RLR) Camera Guidelines

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Oregon Department of Transportation

Red Light Running (RLR) Camera Guidelines

Introduction

This document has been prepared by the Oregon Department of Transportation (ODOT) and the Oregon Traffic Control Devices Committee (OTCDC) to assist local jurisdictions in the deployment of Red Light Running (RLR) Cameras on State Highways. Local jurisdictions should follow this guidance for installation of RLR cameras off state highways or develop their own guidance for application.

Supporting Legislation

In response to what appeared to be a growing disrespect for traffic laws in general and disobeying red traffic signal indications in particular, the Oregon Legislature enacted a law in 1999 to help Oregon communities effectively enforce and reduce red light running. The law was revised and expanded several times since. These guidelines are based on Oregon Revised Statutes (ORS) 810.434 through 810.436. The Oregon legislature last revised ORS 810.434 and 810.436 in 2013.

RLR Camera System Justification

In 2016811 people were killed and in 2015 an estimated 137,000 were injured in crashes that involved red light running in the US. About half of the deaths in red light running crashes are pedestrians and occupants in other vehicles who are hit by the red light runners. Studies have reported that red light cameras reduce angle and turning crashes, but can increase rear-end crashes. Because the types of crashes prevented by red light cameras tend to be more severe than rear-end crashes, research has shown there is also a reduction in the severity of crashes.

The Highway Safety Manual (published by AASHTO) quantifies the expected crash reductions of different measures. These measures are only included if there is known statistical stability and reliability. The Highway Safety Manual[1] lists the expected crash effects for installation of red-light cameras as a 26 percent crash reduction in right-angle and left-turn crashes and an 18 percent increase in rear-end crashes.

[1]Council, F.; Persaud, B.; Eccles, K.; Lyon, C.; and Griffith, M. 2005. Safety evaluation of red-light cameras: executive summary. Report no. FHWA HRT-05-049. Washington, DC: Federal Highway Administration.

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RLR Cameras are not a panacea for intersection safety problems and should be installed only after other means have failed to solve the problems (see appendix A - RLR Toolbox). RLR Cameras have the potential to reduce the number and severity of crashes, but because of the concern for increasing rear-end crashes, RLR Cameras should be installed only where a crash problem within the last 5 years can be documented. When used, they should be a part of a process that considers education, enforcement and engineering, which are essential to any traffic safety program. Enhanced traffic safety is the principal aim of RLR Camera enforcement programs.

The following are means of improving intersection safety prior to RLR Cameras the jurisdiction should consider:

(1) Proper sight distance;
(2) Speed zones are consistent with engineering practice;
(3) The number, size and location of vehicle heads are consistent with the MUTCD and ODOT's "Traffic Signal Policy and Guidelines";
(4) Proper yellow change and red clearance intervals are consistent with ODOT's "Traffic Signal Policy and Guidelines" or other jurisdiction's adopted policy;
(5) Corridor progression timing does not contribute to red light running;
(6) Enforcement "tattle-tale" lights; and
(7) The traffic signal timing is consistent with traffic volume, speed and specific intersection design elements.

RLR Camera System Implementation

RLR Cameras monitor both the flow of traffic at the stop location and the condition (or color) of the traffic signal indication on the approach. Special detectors, commonly loops cut into the pavement, check for the passage of vehicles into the intersection and if the traffic signal phase condition is red, cause pole mounted cameras to record pictures of the vehicle position, license plate and driver. Upon verification by a police officer, the vehicle owner is issued a citation through the mail. RLR Camera systems should differentiate between vehicles running a red light and those vehicles stopping slightly beyond the stop bar or those vehicles, after stopping, making a legal turn against a red indication.

Typically RLR Camera Systems are installed under contract, by a commercial firm that specializes in such systems. These contracts cover the furnishing, installation and operation of the RLR Cameras. The firm may also prepare the evidence for verification by local law enforcement and mail the citation. As compensation, the firm usually collects a predetermined fee for this service when the citation fine is received.

Costs that the local jurisdiction must cover include internal expenses for engineering plan review, site evaluation and field engineering during the installation phase of the RLR Camera System. Local jurisdictions also can purchase, install and operate RLR Camera Systems or can enter into agreements with other jurisdictions to provide all or a portion of this service.

If the candidate location is at a state highway intersection or on a state highway approach, application to and approval of the Oregon Department of Transportation is required.

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Automated Speed Enforcement

Oregon law allows Red Light Running Cameras to also detect and issue speeding violations for motorists violating speeds by 11 mph or greater. Cities may not issue a speeding violation concurrently with a red light running violation, unless the motorist was exceeding the posted speed by more than 20 mph.

The placement of the RLR devices is primarily for the purpose of reducing red light running crashes and may only be placed at signalized intersections. The placement of RLR cameras should be limited to locations that demonstrate a history of red light running crashes and not specifically to curtail speed related crashes. The primary consideration will be to reduce severe red light running crashes. Reducing speed related crashes will be a secondary consideration.

When there is also a history of speed related crashes, the Safety and Operations report should take into account any pertinent considerations found in the Fixed Photo Radar (FPR) Camera Guidelines.

Placement of combined speed and red light cameras are proven to have a favorable effect on traffic safety, in particular reducing severe crashes[2]. However less severe rear-end crashes are likely to increase, so it is necessary to demonstrate that there has been a history of severe crashes that can be mitigated by the measure.

Public Information Campaign and Sign Requirements

Oregon Law requires that cities provide a public information campaign to inform local drivers about the use of RLR Cameras before citations are actually issued. Educating the public is a critical step in reducing red light running. In order to effectively change poor driving habits, drivers must be made aware that RLR Cameras are in use. It is recommended that cities hold well-publicized kickoff events and issue periodic press releases about the effectiveness of RLR Camera enforcement within their jurisdictions.

Oregon law also requires that signs be posted, so far as practicable, on all major routes entering the jurisdiction indicating that compliance with traffic control devices is enforced through cameras. The law further requires that signs indicating that a camera may be in operation be posted near each intersection where a camera is installed.

Signs should be of appropriate size so as to be easily readable at the posted speed. Signs should be placed in such a manner that the motorist can easily see them, without undue visual clutter or obstruction.

[2]De Pauw September 2014."To brake or to accelerate? Safety Effects of combined speed and red light cameras". Journal of Safety Research Volume 50, Transportation Research Institute, Hasselt University, Belgium.

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If the RLR camera will be used for citing speed violations, consideration should be given to placing speed signs prior to the intersection approach or as near as possible to remind motorists of the posted speed.

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Operational Considerations

- RLR Cameras shall not affect the display or the operation of the traffic signal.
- Power for RLR Camera equipment may be provided from the traffic signal cabinet and should be on its own clearly identified circuit breaker.
- Contact closures, as may be required for red and yellow indications on RLR Camera approaches, should be electrically isolated from traffic signal equipment.
- Detection loops for RLR camera equipment should not be wired through the traffic signal cabinet, associated electrical conduit, or junction boxes and shall not interfere with the operation of detector loops used for traffic signal operation. At state highway intersections, segregated wiring is required.
- Traffic signal timing changes shall not be made to increase the possibility of vehicles running red lights. If a review of traffic signal timing prior to RLR Camera installation identifies inappropriate yellow change and red clearance interval values that require adjustment, these adjustments shall be made prior to operation of the RLR Camera system.
- Traffic signal timing changes may be made in response to substantial changes in approach speed, significant changes to traffic patterns, routine timing reviews, design changes, etc.
- Plans showing the location of all proposed and existing equipment shall be prepared.
- Signs at each City Limit, informing the public that compliance with traffic control devices is enforced through the use of cameras, shall be provided if not already in place. A RLR Camera sign on each covered approach shall be installed and should be shown on or as an attachment to the signal plans. Refer to the *Manual on Uniform Traffic Control Devices* and the Oregon Adopted Supplements for guidance on signs that should be posted.

Site Considerations

RLR Cameras may not be appropriate at locations where:

- Recent geometric or traffic signal design changes have been made. Supporting crash records may not be applicable in the new configuration.
- Traffic signals have been installed within the previous year. Crash history may be too short to support RLR Camera use.
- Geometric or traffic signal design changes are scheduled and an engineering evaluation indicates such changes may substantially alter the need for RLR Camera enforcement.
- Road or utility work is anticipated during the first year of RLR operation.
- Traffic pattern changes resulting from development, construction detours or similar events are anticipated during the first year of RLR operation.
- An electrical interconnect with “railroad active warning devices” is provided on the approach.
- Design, operation or maintenance is inconsistent with state or local standards and practices.

Safety and Operations Report

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A Safety and Operations Report is required for all RLR Camera Systems to be installed at intersections on state highways and is strongly recommended for all other locations since it can provide the basis for the process and outcome evaluation required in ORS 810.434(3)(b). It may be desirable to secure the services of a Professional Engineer to conduct the necessary study.

In addition to a general project narrative, the Safety and Operations Report should address to the extent practical the following:

Crash History - An engineering study of the crash experience at the intersection should be conducted.

- Target crashes for reduction at a RLR installation are angle crashes where the driver of one of the vehicles disregarded the traffic control device. Oregon crash records include codes for driver error and crash cause that describe these crashes (code for Participant Error code 020: "DISREGARDED TRAFFIC SIGNAL" and Crash Cause code 04: "DISREGARDED R-A-G TRAFFIC SIGNAL").
- Target crashes coded to driver inattention may also be included in the study.
- The study should identify the relative crash problem of the intersection and each approach or movement of the intersection based on nearby intersections of similar volume, geometry, and traffic control.
- The study shall identify the approaches and movements to the intersections the applicant is requesting to be monitored by a RLR camera.
- Approaches should be those that have target crashes identified.
- Right turn approaches may have a high rate of violation but typically result in low severity or low crash occurrence and should not be included unless there is associated evidence of a significant crash history of high severity.

Safety Concerns – Documentation detailing other safety concerns may be included in the report. Concerns may be supported by any of the following (or other relevant data):

- Traffic citation data
- Complaints
- Enforcement observations
- Speeds, traffic volumes and grades
- Traffic signal spacing
- Proximity to freeway or expressway ramp terminals

Design, Operations, and Maintenance Issues – Copies of signal plans showing the location of all proposed and existing equipment should be included. A description of how the RLR Camera System will be operated and maintained should be provided. Any design, operations, or maintenance issues that could affect the potential effectiveness of a RLR Camera System should be identified.

Public Information Campaign – The public information requirements as outlined in ORS 810.434 (3)(a) should be addressed.

Budget – A budget for system implementation and operation should be developed.

PE Certification – The jurisdiction proposing to install a RLR Camera System should secure the services of a Professional Engineer (PE) to attest that the traffic signal is operated and maintained in accordance with the MUTCD and appropriate state and local guidelines. This certification should be made available to the enforcing jurisdiction.

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Future Changes to the Intersection

While every effort should be made to determine appropriate modifications and changes to the signal system prior to the installation of RLR cameras, land use and traffic patterns may change over time. Such changes may require a road authority to make changes to the signal system that may impact the operations of the RLR Cameras equipment. At no time shall the presence of RLR cameras obstruct an agency from making necessary changes to improve the safety of the driving public or the operation of the traffic signal.

When problems affecting the safety of the public arise (whether part of the signal system or are attributed to the operation of the RLR cameras) and traffic solutions to improve geometry, remove or add lanes or change the operational characteristics of the signal system are identified, the RLR camera operations and the associated costs of changing the RLR cameras shall not be taken into account as the reason for not making such changes. Any changes to the RLR cameras and associated costs shall be the responsibility of the commercial firm under contract for operation of the RLR cameras and the jurisdiction overseeing the operation of the RLR camera system, depending on their agreements.

Biennial Report Requirement

Oregon Law requires that once each biennium all cities using RLR Camera Systems must conduct a process and outcome evaluation that includes:

- The effect of the use of cameras on traffic safety
- The degree of public acceptance of the use of cameras
- The process of administration of the use of cameras

Regardless of the jurisdiction in the position of road authority, the jurisdiction overseeing the operation of a RLR Camera System shall prepare the Biennial Report and submit the report by March 1st of the year of each regular session to the Legislative Assembly. The Biennial Report should include the following information:

- Name, address, and phone number of person who will be the main RLR contact for this jurisdiction.
- Date of implementation.
- Number of intersections at which RLR Cameras are installed.
- RLR contractor name.
- Crash data specific to RLR locations for the 3-year period prior to RLR Camera installation and post RLR camera installation data to identify average crash rate and annual change.
- Public information surveys (if available) regarding jurisdiction's use of RLR Cameras.
- Copies of media releases sent as a part of the public RLR awareness program.
- Description of areas of concern or difficulty in administering the RLR Camera enforcement program.
- Available information on the local courts ability to handle the increase in citations.
- “Success stories" to share with the legislature about local RLR program such as major reductions in serious injuries and fatalities in the local jurisdiction due to RLR Camera systems.

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Each city that operates a camera system is responsible for presenting a report to the Legislative Assembly by March 1st of the odd-numbered year.

Approval Procedure for State Highways

State Traffic-Roadway Engineer approval is required for RLR Camera installation and operation at all State-owned intersections regardless of operation or maintenance responsibilities. The following procedure should be followed:

- The Applicant:
  - Submits letter to ODOT Region requesting authorization to install and operate a RLR Camera at a specific State-owned intersection and specific movements monitored.
  - The letter shall identify a responsible party to whom an ODOT permit will be issued and the point of contact responsible for the construction, operation, and public information requirements.
  - The letter shall be accompanied by:
    1. The Safety and Operations Report.
    2. A statement of consistency with the Operational Considerations.
    3. A statement of agreement with the Conditions of Approval

- Region Traffic:
  - Reviews RLR design and supporting documents and works with applicant to ensure the RLR Camera Enforcement Installation Checklist (see page 11) is complete.
  - If supportive of the proposal, prepares all documents for the State Traffic-Roadway Engineer with a recommendation to approve.
  - Receives State Traffic-Roadway Engineer response of approval or denial of the RLR camera and any conditions.
  - Leads development of an Intergovernmental Agreement (IGA), laying out terms of agreement as to the responsibilities and obligations of each jurisdiction for the RLR camera.

- The District Office:
  - Establishes an account number through ODOT Financial Services identifying responsible party and budget in an Order to Render Service.
  - Establishes the amount of deposit to be paid by the applicant. If cost are more than the deposit the applicant will charged for the additional cost, if less then reimbursed.
  - Issues Miscellaneous Permit to applicant stating conditions of approval. Conditions include the need for State Traffic-Roadway Engineer approval.

- The Applicant:
  - Signs the permit, acknowledging the conditions of approval.
  - Agrees to pay for all actual costs incurred by ODOT relating to the installation, inspection, or repair, and any incidental costs.
  - Pays a monetary deposit as determined by the District office. Below are examples of typical costs and services:
    1. Plan review by the Traffic-Roadway Section estimated between $200 and $1000 per RLR Camera installation.

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2. Traffic signal cabinet and intersection modifications required to protect ODOT equipment and provide proper communication to RLR equipment estimated at $1000 per intersection.
3. Sign installation estimated at $200 per sign, $600 for sign and post.
4. Relocation or repair of existing traffic control devices resulting from the installation of RLR equipment (costs are based on time and materials plus any damages).
5. Inspection of installation estimated between $200 and $1000.

- The District Office:
  - Upon receipt of signed permit and deposit, forwards plans and supporting documents to the Region Traffic Manager.
  - Notify the Electrical Crew responsible for the traffic signal and arranges for inspections of permit work.

State Traffic-Roadway Engineer approval will be based on review of supporting documents and completion of final, ODOT approved plans and may stipulate further conditions of approval. The State Traffic-Roadway Engineer will specify which movements are approved to receive RLR Cameras.

Removal Procedure for State Highways

When considering removal of a RLR camera, a study should be performed to determine if the RLR Camera should be removed or remain. A RLR camera may be ordered removed by the State Traffic-Roadway Engineer for an intersection or a particular approach to an intersection or a particular movement at an intersection.

If for instance the study shows there is little or no reduction in the number, severity or targeted crashes (i.e., angle crashes) or if similar results can be obtained from engineering countermeasures such as improving sight distance, conspicuity of the signal heads, signal timing or installation of “tattle tale” lights the Region Traffic Engineer may recommend removal to the State Traffic-Roadway Engineer.

Intersections where engineering or geometric improvements are proposed may require study of the new intersection geometry and may result in a request to remove RLR camera equipment. The study may include a determination of changes in conflicts, phasing changes to traffic signals, addition of turn lanes or diversions of traffic patterns that change the operations of the traffic signal.

The following procedure should be followed when considering removal of RLR cameras:

- ODOT Region Traffic shall conduct a study.
  - The study shall determine the safety effectiveness of the RLR camera at reducing crashes, severity of crashes and/or types of crashes (especially as they relate to angle crashes vs. rear-end crashes).
  - The study shall recommend continued operation of the camera, removal of the camera and/or modifications to the operation of the camera or intersection.
  - Other safety concerns such as changes in violations and compliance rates may be considered but are not the primary measure of safety.
  - The study shall also consider the extent to which other countermeasures had been implemented prior to implementation of the RLR cameras or proposed changes to the

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intersection.
  - Other considerations may include traffic volumes and delay, unusual or unique geometry, signal timing, operation and cycle lengths, driver behavior, and other engineering countermeasures to improve safety.
  - The study shall include any proposed changes to the intersection such as engineering or geometric improvements that reduce or eliminate conflicts or change the operations of the traffic signal.

- If the recommendation is to remove the RLR Camera, ODOT should work together with the Jurisdiction responsible for the RLR cameras to come to agreement for how to proceed with the recommendations of the study.

- Additional input may include the public and/or enforcement to determine support or opposition to the removal.

- Whether or not an agreement can be reached, ODOT Region Traffic will submit a recommendation to the State Traffic-Roadway Engineer along with the study.

- The Jurisdiction responsible for the RLR camera may submit a recommendation with supporting documentation to the State Traffic-Roadway Engineer.

- The State Traffic-Roadway Engineer decisions will be based on review of the study, the recommendations submitted and any other input received.

- The State Traffic-Roadway Engineer may hold a meeting of interested parties to go over the issues.

The State Traffic-Roadway Engineer may approve removal of the RLR Camera, may approve the RLR camera remaining, and/or require engineering countermeasures or other changes to the intersection or roadway or cameras. The State Traffic-Roadway Engineer's decision is final and will be based primarily on safety.

Upon request of the jurisdiction responsible for the RLR Camera the State Traffic-Roadway Engineer may approve removal of the RLR Camera without study of the intersection. Typically this occurs under special conditions such as the vendor of the equipment goes out of business, a political entity passes an ordinance to remove the RLR Camera or other circumstances as determined by the State Traffic-Roadway Engineer.

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RLR Camera Enforcement Installation Checklist
Non-State Highway

Location Information

File Code: _____
Acct. No.: _____

Street Name: _____

Intersecting Street: _____

RLR Camera Approaches: _____

☐ Traffic safety need based on crash history and safety concerns has been documented.

☐ A public information contact has been identified.

Contact Name: _____Email: _____
Address:_____Telephone:_____

☐ Location approaches and movements have been clearly identified.

☐ Traffic signal indications on the approach are clearly visible from an adequate distance based on field observation. Current MUTCD signal visibility standards are met.

☐ Yellow change and red clearance intervals are displayed for at least the recommended time.

☐ No significant improvement (project) is scheduled or planned that would substantially alter the need for a RLR Camera.

☐ Signs indicating that compliance with traffic control devices is enforced through cameras are posted (or will be provided by this project) on all major routes entering the jurisdiction.

☐ Signs indicating that a camera may be in operation will be posted on all approaches where a camera is to be installed**.**

☐ No known reason why a RLR Camera should not be installed.

Checklist completed by: _____ Date: _____

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Oregon Department of Transportation

RLR Camera Enforcement Installation Checklist
State Highway

Location Information File Code: _____

TSSU Location ID: _____ Region: _____ District: _____ Acct. No.: _____

Street Name: _____

Intersecting Street: _____

RLR Camera Approaches: _____

Applicant (City/County): _____

☐ Local jurisdiction has documented traffic safety need based on crash history, and safety concerns.

☐ A local jurisdiction point-of-contact has been identified.

Contact Name: _____Email: _____
Address:_____Telephone:_____

☐ Location and approaches have been clearly identified.

☐ Traffic signal indications on the approach are clearly visible from an adequate distance based on field observation. Current MUTCD signal visibility standards are met.

☐ Yellow change and red clearance intervals are displayed for at least the recommended time.

☐ Existing traffic signal coordination with adjacent traffic signals is in place and properly timed.

☐ No significant improvement (project) is scheduled or planned that would substantially alter the need for a RLR Camera.

☐ Signs indicating that compliance with traffic control devices is enforced through cameras are posted (or will be provided by this project) on all major routes entering the jurisdiction.

☐ Signs indicating that a camera may be in operation will be posted on all approaches where a camera is to be installed.

☐ No known reason why a RLR Camera should not be installed.

Checklist completed by: _____ Date: _____

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Oregon Department of Transportation

Conditions of Approval

The applicant agrees:

1. The cost of any required changes to the RLR camera equipment as a result of changes or modifications to the intersection, regardless of who implements the changes, shall be the responsibility of the applicant and/or any commercial firm under contract for operation of the RLR cameras.

2. When problems affecting the safety of the public arise whether part of the signal system or the RLR cameras, ODOT has the discretion to modify geometry, remove or add traffic lanes or change the operating characteristics of the intersections to protect the safety of the public, up to and including the ordering of the removal of the RLR camera systems or the removal of cameras for particular movements.

3. When ODOT desires to modify an intersection with a RLR camera to improve operations or safety it may do so without consideration to the cost of changes to the RLR camera system or impact to revenue generation on RLR camera system or agreements between the applicant and any commercial firm operating the camera system. ODOT shall not be subject to any costs for changes, modifications, or removals of the RLR camera system.

4. Applicant shall make available to ODOT all reasonable requests for records concerning the operations of the RLR cameras and the intersection, including but not limited to, number of violations by particular cameras or movements, total violations, distribution of violations, percentages of violations within specific time periods, crash records and/or operating parameters of the RLR camera.

5. Applicant shall ensure that signs at each City Limit, informing the public that compliance with traffic control devices is enforced through the use of cameras, are provided if not already in place. A RLR Camera sign on each covered approach shall be provided and shown on or as an attachment to the signal plans.

6. Applicant shall ensure a method for ODOT staff to turn off the camera system to perform routine maintenance of the signal system, including cabinet or controller replacement or timing changes.

7. Failure to comply with any of the conditions of approval listed herein or stipulated by the State Traffic-Roadway Engineer shall be sufficient reason for the State Traffic-Roadway Engineer to order removal of the RLR camera system.

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Appendix A – Red Light Running Toolbox

See the following websites:

Red Light Running Tool Box- https://safety.fhwa.dot.gov/intersection/conventional/signalized/rlr/rlr_toolbox/

Speed Efnrocement Camera Systems (automated speed enforcement)- https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa09028/resources/Speed%20Camera%20Guidelines.pdf

Deleted: http://safety.fhwa.dot.gov/intersection/resources/fhwasa09027/resources/Making%20Intersections%20Safer%20-%20A%20Toolbox%20of%20Engineering%20Count.pdf

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