

Alternate Interchange Signing Study For Indiana Highways

JTRP-4545

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Outline

- Introduction
- Study Process
- Gather Interchange Signings Information
- Survey Design
- Survey Data Collection and Analysis
- Findings and recommendations
- Project Impact

Introduction

- Current highway interchange signing is designed based on established standards,
- Some drivers have expressed that signing is confusing, not intuitive, or perhaps not explanatory enough.
- The main objective of this research is to understand signing issues from the perspective of driver and provide recommendations for potential interchange signing design improvement in Indiana.



Study Process

Task 1

- Investigate all interchange signings on Indiana interstate highways;
- Categorize sign messages with respect to the interchange types.

Task 2

- Identify the interchanges with unclear or inadequate signing from the perspective of drivers using surveys.

Task 3

- Determine the causes that drivers consider “not clear” for all identified specific interchange signings.

Task 4

- Propose recommendations to improve interchange signing design.

Gather Interchange Signings Information

- More than 300 interchanges were found in Indiana.
- Two types of interchange signs related to the highway were considered:
 - *signs on the highway and indicate exit, e.g. SB_exit, EB_exit, NB_exit, WB_exit.*
 - *signs guide the drivers to enter the highway, e.g. SS_entry, ES_entry, NS_entry, WS_entry.*
- The locations of all signs related to each interchange from Google Street view map were found.

Driver Survey Design

- Key survey questions:
 - *Demographic information of the survey participant.*
 - *Where do you see the problematic signing? (Use the Google Maps to find out the location of the reported problematic signing.)*
 - *How often do you drive through this road?*
 - *What information are you looking for from the signing?*
 - *What is the problem of the signing? Is it information-related, time-related and/or location related problems?*

Survey Data Collection

- A survey was distributed through e-mail, social media, online newspapers, and a survey company.
- E-mail distribution proved to be the most effective way in receiving responses, with a response rate of around 2%.
- Then social media, online newspapers, and a survey company (least effective).

TELL US WHICH INDIANA INTERSTATE HIGHWAY INTERCHANGE SIGNINGS YOU DO NOT LIKE

CLICK HERE TO TAKE A SHORT SURVEY FROM IUPUI
https://iu.co1.qualtrics.com/jfe/form/SV_9ox8Fw0sk14HJP

THE FIRST 400 SURVEYS TO PASS A QUALITY CHECK WILL RECEIVE A FREE \$10 AMAZON GIFT CARD
FOR ADDITIONAL QUESTIONS, PLEASE CONTACT JTRPSIGN@IUPUI.EDU

TAKE THE SURVEY

Tell us which Indiana Interstate Highway interchange signage you do not like.

Tell Us
Which Indiana Highway Interchange Signs Confuse You

Background
Drivers tell us that Indiana highway signage is confusing. IUPUI is working with the Department of Transportation to improve the signage.

What you can do
Tell us about the Indiana highway signage that you think could be improved. If you are 18 years or older, click the following link or scan the barcode to take the survey. (Do not use Internet Explorer.)
https://iu.co1.qualtrics.com/jfe/form/SV_9ox8Fw0sk14HJP

Compensation
The first 400 participants whose their surveys pass our quality check will receive a \$10 Amazon.com gift card through e-mail.

This advertisement is approved by IRB at Indiana University-Purdue University Indianapolis. For additional questions, please contact jtrpsign@iupui.edu

Survey Data Collection

Types of survey responses	Total
Robot response	250
Participants opened the survey but didn't start to do it	160
Participants started the survey but didn't finish it	432
Participants finished the survey but didn't give complete information	182
Participants completed survey (paid)	128
Total	919

- Pay \$20 for each Completed survey
- 84 completed survey responses were considered providing valid information.
- The valid responses covered all major Indiana cities and provided useful and actionable information for INDOT.

Confusing Sign Example (I-65 NB Exit 114):

- Problem:
 - *This is an area with a high amount of weaving after I-65 NB and I-70 WB come together from the North Split and a lane drops at Meridian Street shortly thereafter. There is a lot going on in a short distance. The signing is up for MLK and West Street but the first sign (1/2 mile) is likely missed due to the action occurring here.*



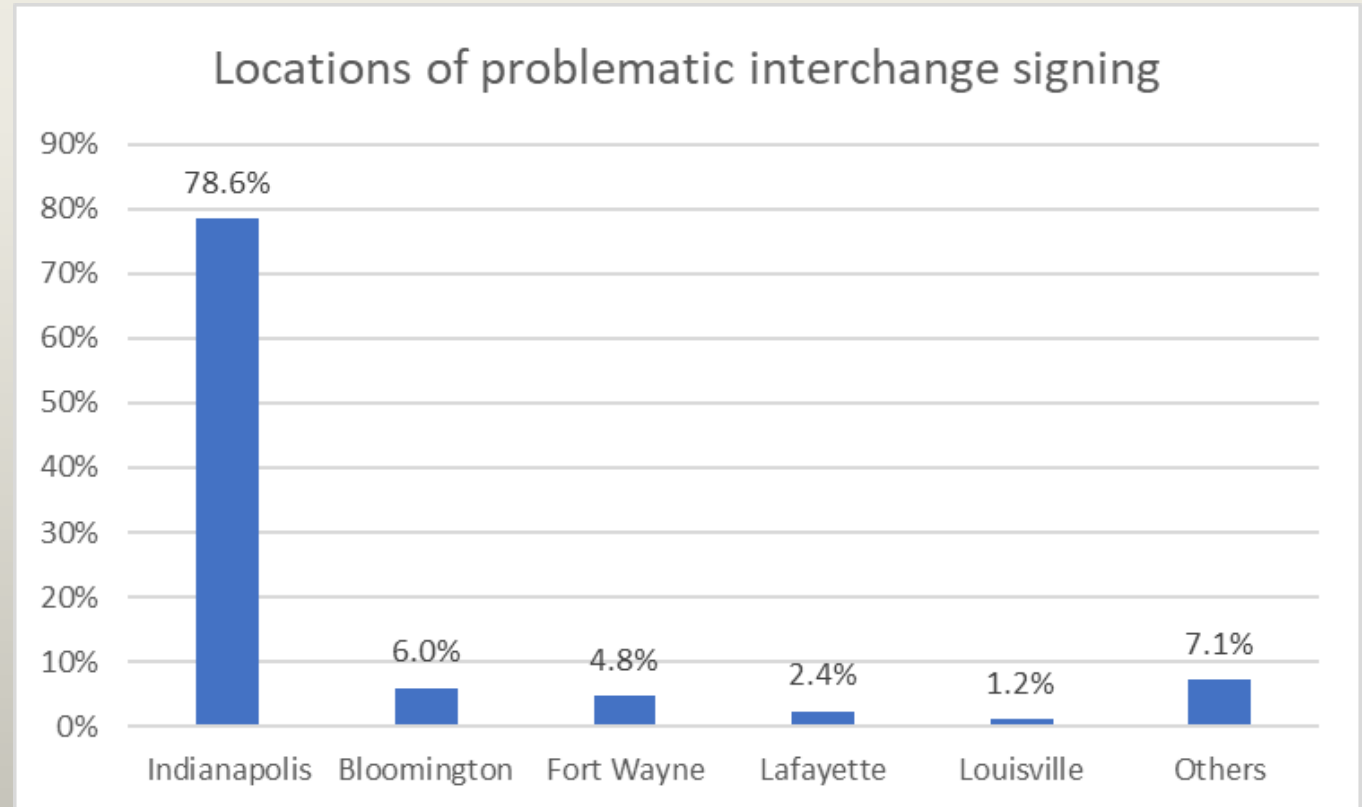
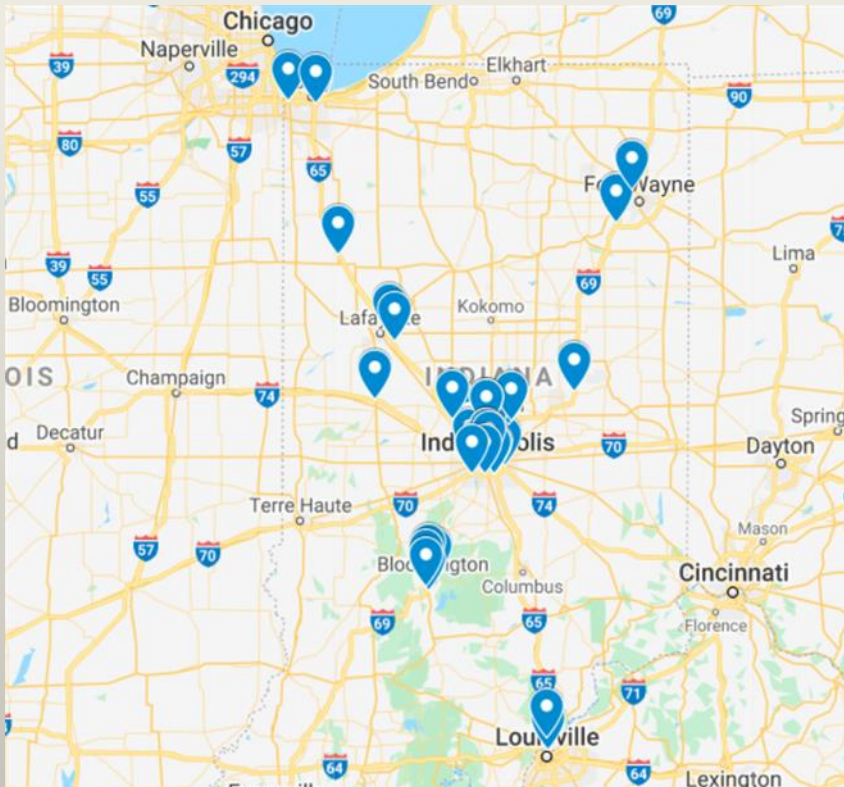
Confusing Sign Example (I-65 NB Exit 114):

- Type of Problem:
 - Signs being missed due to too much information presented in a short distance.
- Proposed Actions:
 - An additional left plaque could be put on the 1/2 mile sign for MLK/West Street.



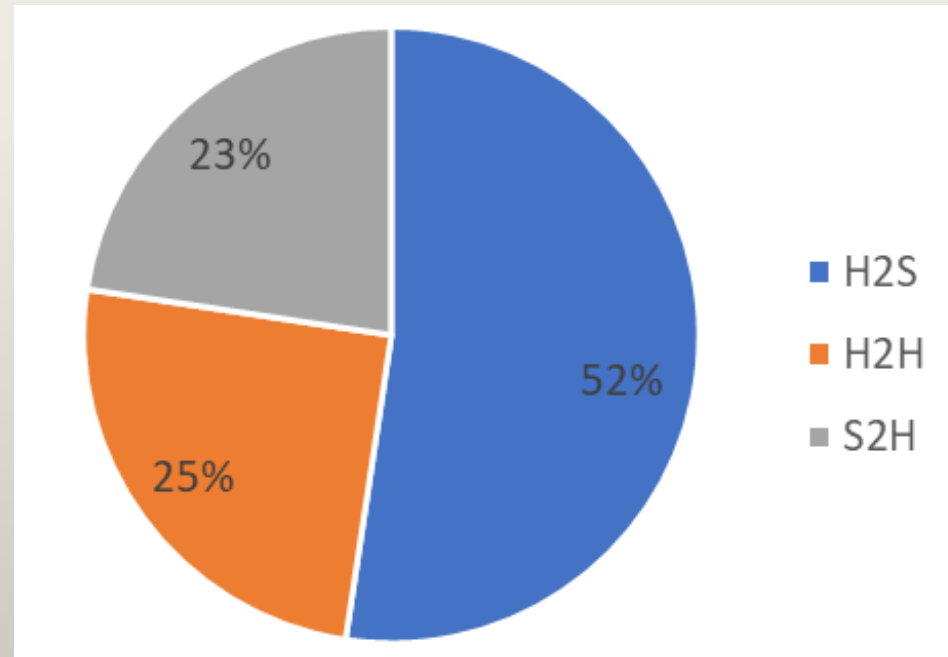
Survey Data Analysis: Location

- Most cases were located around the greater Indianapolis area since it has many highway interchanges and many uncommon interchanges in a densely populated area.



Survey Data Analysis: Location

- Highway to local street (H2S) signs were reported most, while the highway to highway (H2H) and local street to highway (S2H) signs have the similar reported case number.



Distribution of problematic interchange signs in terms of highway entry and exit

Survey Data Analysis: Road Geometry

Type of Environment	Descriptions	Case Numbers
1-S	1 lane on straight road	3
2-S	2 lanes on straight road	7
3-S	3 lanes on straight road	27
4-S	4 lanes on straight road	20
5-S	5 lanes on straight road	11
6-S	6 lanes on straight road	2
1-C	1 lane on curved road	1
2-C	2 lanes on curved road	2
3-C	3 lanes on curved road	3
4-C	4 lanes on curved road	6
5-C	5 lanes on curved road	2
Total		84

Survey Data Analysis: Types of Problems

Problem Types	Descriptions	Case Numbers
1	Sign is located too far from the actual split	1
2	Information is not complete on the sign	19
3	Information appears too late to change lanes to exit/enter	14
4	Placing two individually correct signing causing confusion	1
5	The location of the sign is inappropriate	13
6	Incorrect/Confused/Misleading information on the sign	17
7	Too much info (signs) and little time to respond	11
8	Damaged sign	1
9	Confusing sign sequence	1
10	No sign or unclear for the road exit	3
11	Inconsistency of information in the signing sequence	1
12	Counter intuitive with road sign	2
Total		84

Findings from Survey

- Drivers do not always know the interchange geometry types as they approach the interchange on the freeway.
- Drivers are most interested in which lane they should drive on when approaching an interchange.
- Drivers do not like the signs that require cognitive work since that can delay their driving decision.
- A perfect sign for one driver may be confusing for another driver, since different drivers may need different types of information on the signing.
- In some instances, a driver familiar with the area is more confused by the signs due to the sign information contradicting driver's knowledge.

Situations Need Special Considerations

- Two roads are parallel for a long distance - **the driver forgets driving on which road**
- Exits on the left side of the road - **less common in Indiana**
- Left exit goes to the right direction and right exit goes to left direction - **cognitive contradiction for driver familiar with the direction**
- The short distance between a road and highway entry/exit - **short time to digest and react on the information**
- Large signs and a small sign at the same location - **info on small signs are ignored**
- An exit or split is after the end of the right most lane but the sign is before the end of the right most lane. - **driver shift to right lane following the sign and has to shift back**
- Sign on or before reaching a curved road - **driver shifts lane and then shifts back**

Situations Need Special Considerations

- Missing essential direction information
- Many individual road signs at a complex intersection
- Multiple signs and lane marking are inconsistent or with wrong information
- Several close by consecutive exits to different roads
- Separate signs at one intersection, each one has partial information (e.g., one has directions, and the other has names)
- In split road exits, which lane goes to which road is not clear
- Inconsistent information in adjacent signs
- Confusing temporary sign
- The layout of the sign information may give different interpretations
- The location of a correct sign may cause different interpretations
- The road indicated on the exit sign is not the first road after the exit
- The sign is designed correctly but can be misinterpreted

Project Impact

- INDOT has modified some sign layouts during recent signing updates and maintenance.
- INDOT will consider possible future actions for the suggested locations based on each survey case.
- INDOT will also consider the recommendations proposed in this study for future interchange signing design.
- The implementation will be executed by coordination with project design teams, traffic engineering team, and FHWA engineers by laying out and reviewing interchange modification proposals.
- The design standards group is necessary to be involved to improve driver understanding.

Thank you!
For Your Attention