Update on the *Human Factors Guidelines (HFG) for Road Systems*: Status and Implementation Activities

Presentation to the AASHTO Standing Committees on Traffic Engineering & Highway Traffic Safety

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Discussion Topics

• Background to the Human Factors Guidelines (HFG) for Road Systems
• Contents of the HFG
• Ways to Use the HFG
• Implementation & Evaluation
• Summary
History and Status of the HFG Effort

• The purpose of the HFG is to provide the best factual information and insight on road users’ characteristics to facilitate safe design and operational decisions.

• Development of the HFG has been an ongoing project since 2001.

• 3 subsections (NCHRP 600 A, B, & C) of the HFG were published in 2007, 2009, & 2010.

• 2nd Edition of the full HFG was published in 2012.
  - 90 distinct guideline topics
  - 475+ references
  - PDF version with updated external and internal links
  - 2-hour training course
Key Contributors

The *Human Factors Guidelines (HFG) for Road Systems* owes its successful publication to a number of key contributors:

- Mr. Charles Niessner, Senior Program Officer, Transportation Research Board
- Mr. Mark Bush, Senior Program Officer, Transportation Research Board
- MRI Global (formerly Midwest Research Institute)
- NCHRP Project Panel
- Project Working Group
Goals for the HFG

- Focus on road user needs, capabilities, and limitations
- Aid and augment the judgment and experience of highway designers and traffic engineers through presentation of factual information and insights from the scientific literature
- Reflect end-user requirements for content, format, and organization (clear, relevant, and easy-to-use)
- Complement existing sources of road design information
Content of the HFG

PART I: INTRODUCTION

PART II: BRINGING ROAD USER CAPABILITIES INTO HIGHWAY DESIGN AND TRAFFIC ENGINEERING PRACTICE

PART III: HUMAN FACTORS GUIDANCE FOR ROADWAY LOCATION ELEMENTS (Chapters 5-17)
Includes chapters on: sight distance, curves, grades, signalized and non-signalized intersections, interchanges, work zones, rail-highway grade crossings, speed perception and control.

PART IV: HUMAN FACTORS GUIDANCE FOR TRAFFIC ENGINEERING ELEMENTS (Chapters 18-21)
Includes chapters on: signing, changeable message signs, markings, and lighting

PART V: ADDITIONAL INFORMATION (Chapters 22-27)
Includes: Tutorials (6), References, Glossary, Index, Abbreviations, Equations
Presentation Format Used in the HFG

Guideline Title
Bar Scale Rating
Abbreviated Handbook Title (Both Pages)
Abbreviated Chapter Title (Both Pages)
Revision Version (Both Pages)

Introduction
Design Issues
Cross References
Key References

Design

Discussion

Figure, Table, or Graphic

Page Numbers

Left-hand page

Right-hand page
### Example Guidelines

#### Acceptable Gap Distance

<table>
<thead>
<tr>
<th>Design Vehicle</th>
<th>Left Turn</th>
<th>Right Turn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passenger car</strong></td>
<td>7.5</td>
<td>6.5</td>
</tr>
<tr>
<td><strong>Single-unit truck</strong></td>
<td>9.5</td>
<td>8.5</td>
</tr>
<tr>
<td><strong>Combination truck</strong></td>
<td>11.5</td>
<td>10.5</td>
</tr>
</tbody>
</table>

To account for the time needed to traverse additional lanes add 0.5 sec for passenger cars and 0.7 sec for trucks.
Example Guidelines

Countermeasures for Improving Accessibility of Vision-impaired Pedestrians at Roundabouts

Traffic noise from inside the circle can mask sound cues from oncoming vehicles, especially quiet hybrid vehicles or vehicles coasting downhill.

Exit-lane vehicles infrequently yield because it blocks traffic in the circle.

Sound cues from inside-lane vehicles are masked by outside-lane vehicles.

Vision-impaired pedestrians wait longer for crossable gaps because they cannot extend gaps that are initially too short with eye gazes and manual gestures in the same way that sighted pedestrians can.

Judging gaps for exit lanes is difficult because pedestrians have to attend to complex traffic movements in the circular roadway.
# Example Guidelines

## Driver Comprehension of Signs

<table>
<thead>
<tr>
<th>Format</th>
<th>Example</th>
<th>Guideline</th>
</tr>
</thead>
</table>
| **Text Only**        | ![Example Text Sign](Image) | - Use for highly complex messages  
                       |                     | - Use when indicating hazards    |
|                      |         | - Use for destination information                                        |
|                      |         | - Use in areas requiring frequent lane shifts                            |
| **Graphic / Icon Only** | ![Example Icon Sign](Image) | - Use for safety and warning information                                  |
|                      |         | - Use for prohibited actions                                              |
|                      |         | - Use in visually degraded conditions                                     |
|                      |         | - Use in areas with higher posted speeds                                  |
|                      |         | - Use diagrammatic graphics when road geometry violates the drivers’ expectations |
|                      |         | - Minimize symbol complexity by using few details                         |
| **Mixed**            | ![Example Mixed Sign](Image) | - Add text when symbols alone are unintuitive                             |
|                      |         | - Keep text to no more than two-three words                               |
|                      |         | - Use a clear and simple font for the text                                |
Ways to Use the HFG

• Enhance initial roadway planning and design activities
• Conduct diagnostic assessments of safety concerns & incidents
• Support road safety audits
• Identify & select safety countermeasures
• Educate traffic engineers & designers on user needs, capabilities, and limitations
Implementation & Evaluation

• Currently working with Four (4) State DOTs participating as test sites to implement the HFG and evaluate its value and efficacy.
  – Work with state PoCs to obtain approvals and outline pilot test activities
  – Define details of the pilot test: HFG application, User group, schedule
  – Conduct on-site training, provide on-going support
  – Evaluate overall usefulness and value, contents, presentation format, specific strengths and weaknesses
Implementation & Evaluation

- Nevada Department of Transportation (NDOT; Chuck Reider and Jaime Tuddao, PoCs)
  - HFG training sessions conducted in December and January
  - Incorporating the HFG into NDOTs Road Safety Audit program
  - Roadway sections in both northern (Carson City) and southern (Las Vegas) Nevada have been selected as sites for the pilot testing
  - The “Tropicana” RSA examined a 7-mile corridor, and was intended to look at safety issues from a different perspective and develop recommendations for potential safety enhancements.
Implementation & Evaluation

• Nevada Department of Transportation (NDOT; Chuck Reider and Jaime Tuddao, PoCs) (Cont.)
  – Key HFG chapters considered especially relevant to this RSA were: Signalized and Non-signalized intersections (10 & 11), Urban environments (15), Speed (17), Signing (18), Markings (20), and Lighting (21), resulting in “numerous applications of the HFG to this RSA” in terms of both “identification of issues as well as associated recommendations.”
  – Limited sight distance combined with high speed right turns at an intersection may be contributing to a high number of crashes
    • Add deceleration lane, improve visibility of the merge, add signing
  – Poor visibility of a traffic signal is leading to red light running
    • Add additional signal head to median island; move stop bar further back
  – Driver are confused about the proper lane to be near freeway entrance ramps
    • Add overhead signs specifying lane assignments
Implementation & Evaluation

• Wisconsin Department of Transportation (WIDOT; Rebecca Szymkowski, PoC)
  – HFG training provided in February
  – Initial focus is on the I-94 East/West project, which is a planning-level engineering analysis. The project includes one system interchange and five service interchanges.

• Using the HFG to support the Road Safety Audit element of the project
Implementation & Evaluation

• Delaware Department of Transportation (DelDOT; Mark Luszcz and Adam Weiser, PoCs)
  – HFG training scheduled to take place on July 22- expecting 60 trainees to participate
  – Will use the HFG in an “ad-hoc” fashion, with staff most likely to get value from the HFG being provided with the training and then asked to use it day-to-day as they see fit.
  – Assist DelDOT in identifying solutions in the HFG for specific trouble spots
Implementation & Evaluation

• Idaho Transportation Department (Brent Jennings, PoC)
  – Initial HFG training took place in December, another session tentatively planned for July
  – Incorporating use of the HFG as part of a new “Highway Corridor Safety Analysis Project” to help prioritize safety improvement needs and project across the state.
  – Implementation details includes the requirement in ITD project charters (project planning documents) that human factors be examined and considered as part of the safety analysis / design process.
  – Will be using both the HSM and the HFG to identify and assess “priority segments”
Summary

• After ≈10 years of planning & development, the full HFG was published in 2012

• 4 states are currently pilot testing the HFG:
  – Various applications of the HFG are being tested
  – ≈75 users trained to-date

• Very positive feedback received so far; full evaluation results expected by the end of 2013
For More Information…

• 2nd Edition of the full HFG; NCHRP Report 600 available at:


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