

# Human Factors

# Engineering in Road Safety

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# WHAT IS IT?



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Design of the interface between the human operator and a system.

Usually between a human and machine system

*Often called:*

Human Factors

Human Factors Engineering

Ergonomics

Man-machine interface (MMI)

Human Systems Interface (HSI)

# When is it used?



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- Anytime you build a system that people have to use.
- Started in 1930's but came into its own during WW II – Sgt York, Hummer examples
- At the initial concept/planning/design of a system-- otherwise retrofit or worse.
- A dedicated field of study



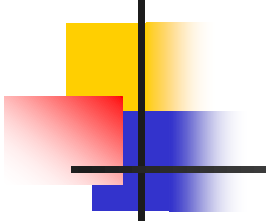
# A Distraction Example

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- Anyone seen a digital billboard?

# Side of building – 7 stories tall



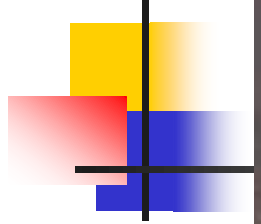




# Human Factors Considerations

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- Brightness and contrast
- Movement—frequency of change, flashing
- Glance time – how much time can eyes be off the road
- Concept of traffic density—a refinement of volume







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**Missing: Jozlynn Mari Martinez**

**Female | Age: 2YO | Hair: Brown | Hispanic | Scab on her chin, spot on  
right side of her head that doesn't grow hair, walks with her feet turned  
inward**

92B90

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# What Constitutes Distraction?

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- Look away from traffic 2 sec within a 6 second window.
- Risk of crash or near-crash doubles  
(from 100 car naturalistic driving study)



# Other Kinds of HF Considerations

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- Recent FHWA study
  - Glance duration for digital billboards not much different from other billboards or other external distractions. Conclude they are not as significant a distraction as purported.
  - Didn't control for density



# Very Recent Danish Study

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- They did control for density-all advertising signs, not just digital
- 25% of glances had buffer to next car of 2 sec. or less and 20% had 1.5 sec. or less
- Visual distraction occurs in every 6-7 drives past advertising sign.
- Where do you want digital billboards?



# Implications for Us of Digital Billboards

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- Less density so people have time to glance and repeat glances—fewer exits/merges, unfamiliar drivers, intersections, in general lower demand
- Human factors is important consideration in research and using research results.



# Recent Developments

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- MN widen a road -- \$4 million to compensate and take down digital billboard.
- Once up, hard to take down
- There are current lawsuits from NGO's like Scenic America to curtail FHWA guidelines in violation of Highway Beautification Act





# Broader Use of Human Factors

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- HUMAN FACTORS GUIDELINES FOR ROAD SYSTEMS—NCHRP Report 600.
- Specific design guidance
  - Roadway location elements, e.g. sight distance, curves, intersections interchanges, work zones, RR crossings, speed perception and choice, urban
  - Traffic engineering elements, e.g. signing, CMS, markings, lighting
  - Tutorials



# GOALS OF HFG

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- 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*
- Complement existing sources of road design information

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- Focuses on the road user as a component of the road system with needs, capabilities and limitations that do influence how road users make driving choices
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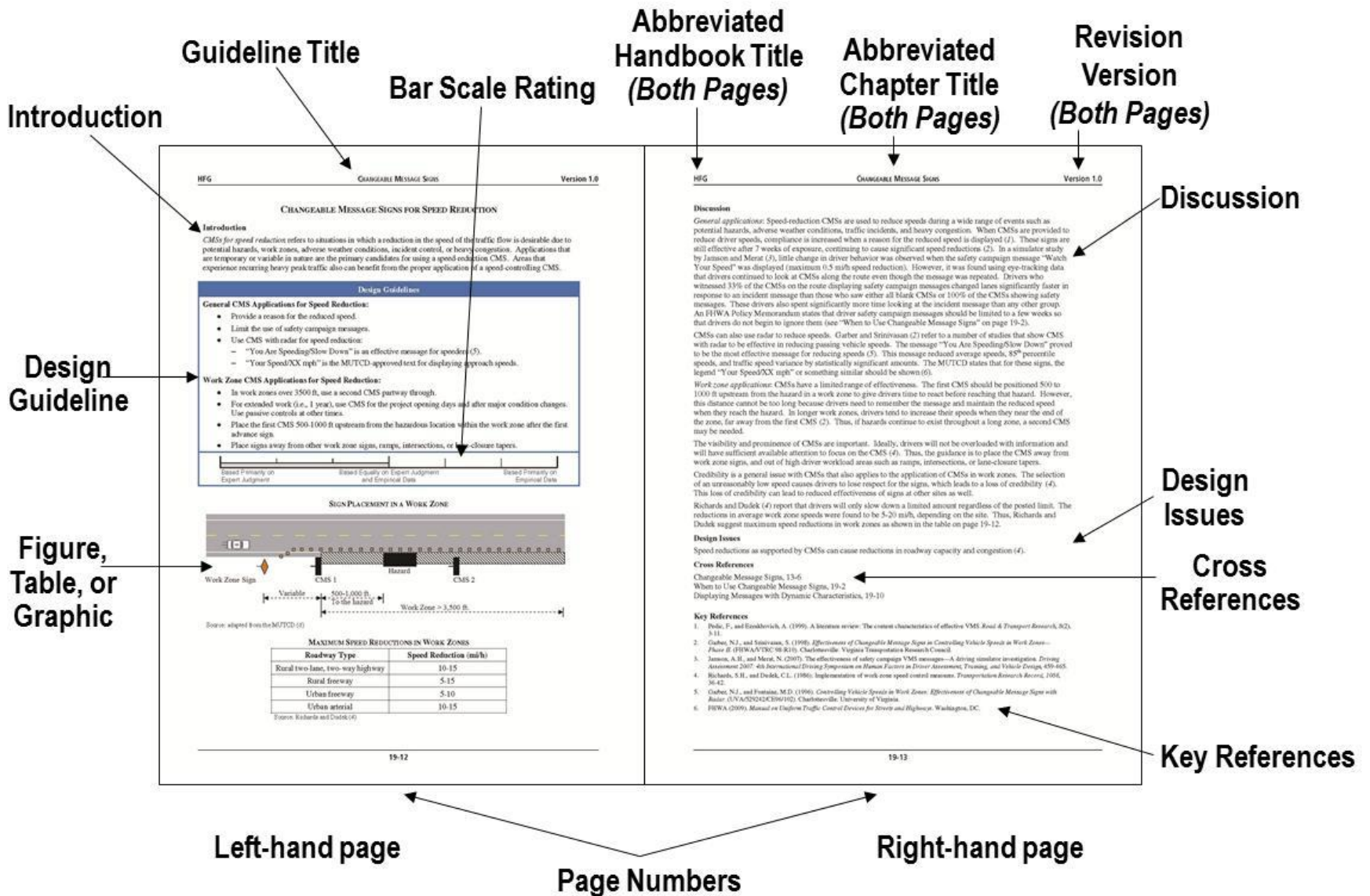
- Provides design guidelines for end users that take into consideration human factors and how they influence road users' driving practices:
- Complements design information presented in existing reference sources
  - Age and personal capabilities or challenges
  - Perceptions and the effects of visual demands
  - Cognition and the influence of expectancies
- Promotes road users' safety as human factors design guidelines influence roadway design

# Factors and variables in the process of finding the MMI,

| Factor      | Variable                    |                             |
|-------------|-----------------------------|-----------------------------|
| User        | Age                         | Cognitive ability           |
|             | Vision                      | Road familiarity            |
|             | Experience                  |                             |
| Operations  | Speed                       | One-way flow                |
|             | Vehicle type                | Two-way flow                |
|             | Traffic volume              | Control type                |
| Highway     | Functional class            | Condition                   |
|             | Lane width                  | Roadside                    |
|             | Shoulder width              | Grades                      |
|             | Sight distance              | Curvature                   |
|             | Pavement type and condition |                             |
| Environment | Weather                     | Rural                       |
|             | Land use                    | Time of day                 |
|             | Pedestrians                 | Light condition             |
|             | Urban                       | Scenic/interest attractions |



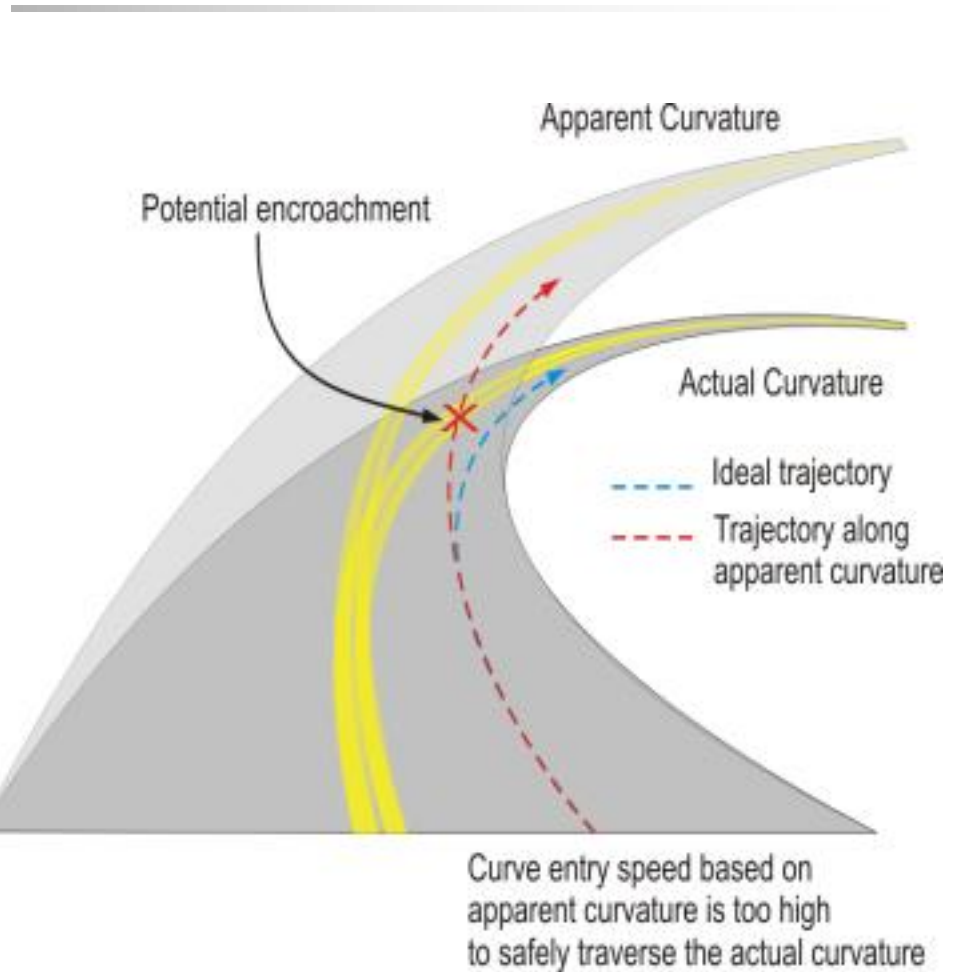
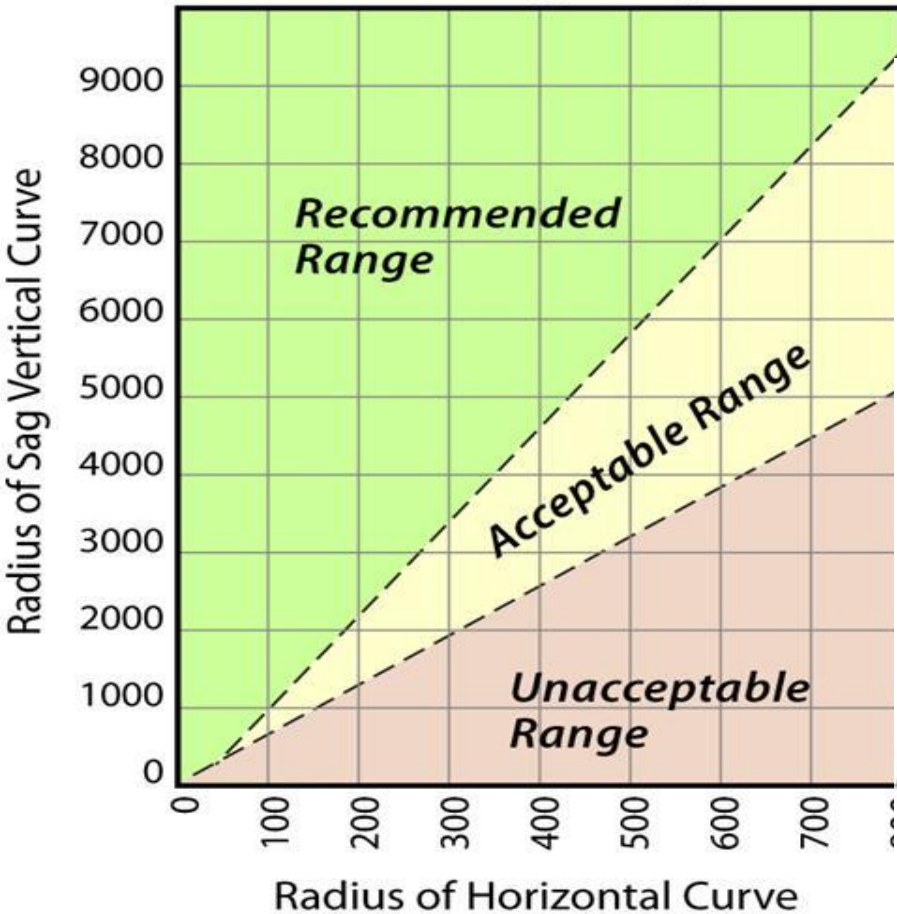
# Using the *HFG* Presentation Format



# Influence of Perceptual Factors on Curve Driving (6-4)

## Design Guideline - the influence of apparent radius on driver's actual speed

### From Long Tangent





# Take away

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- Drivers make poor choices, e.g. speed, impaired, etc.
- If design or policy leads/draws/induces driver error we need to look at our laws, planning, designs, and operations.
- Human Factors has a distinct role in highway transportation.
- Thank you.

# For More Information...

2<sup>nd</sup> Edition of the full HFG; NCHRP Report 600  
available at:

[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_600Second.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_600Second.pdf)

SPECIAL OFFER – up to one day  
introduction/training for SHA using current  
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