Horizontal and Vertical Curve Design

CE 576
Highway Design and Traffic Safety
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Human Factors – The driving Task
Three Levels

- The Control Level
  - A skill-based control: includes second-by-second exchange of information and control inputs between the driver and the vehicle. Most control activities are performed “automatically,” with little conscious effort (Safety Problems?)

- The Guidance Level
  - A rules-based: the driver’s main activities involve the maintenance of a safe speed and proper path relative to roadway and traffic elements. (dynamic inputs)

- The Navigation Level
  - A knowledge-based behavior: Route planning and guidance while en route

Human Factors – Driver Performance

- Perception-Response Time
- Control Movement Time
  - Braking Inputs
  - Steering Response Times
- Response to Traffic Control Devices (Time and Distance)
- Response to Other Vehicle Dynamic
  - The Vehicle Ahead
  - The Vehicle Alongside
- Hazard Detection, Recognition, and Identification

Human Factors – Individual Differences in Driver Performance

- Gender
- Age
  - Loss of Visual Acuity
  - Light Losses and Scattering in Optic Train
  - Glare Recovery
  - Figure/Ground Discrimination
  - Changes In Cognitive Performance
- Driver Impairment
  - Drug/Alcohol use
  - Fatigue
  - Distraction
Vehicle Characteristics

- Brake conditions
- Tire conditions
- Crash avoidance systems
- Passenger survivability
- SUV — Good and bad?

Highway Operation and Design

- Vertical and horizontal curves
- Sight distance (stopping and passing)
- Signal Timing design [Minimum green, Amber phase, Detector placement to minimize dilemma zone]

The Concept of Highway Function Classification

Group street and highways according to the type of service they are intended to provide

Highway network role:
- Provide access to properties
- Provide travel mobility to users

Problem:
- Conflict between serving through movements and providing access to the dispersed pattern to trip origin and destination.

Road Category groups

Classification Criteria:
- Location: inside (urban) or outside (rural) build-up areas
- Degree of concentration of access points on the road: low or high
- Design function (mobility- connectors), access (collectors), or local and pedestrian use
Road Category Groups
- Group A: Rural principal arterials (freeways and interstates), linkage between cities, etc
- Group B: Primary arterials-Suburban areas
- Group C: arterials used as collectors in urban areas
- Group D: urban roads that provide access to areas adjacent to the road
- Group E: Local urban roads

Highway Design Standards
- Design Vehicle
- Roadway alignment (horizontal and vertical curve)
- Cross section elements
- Roadway structural elements
- Signage and marking