1 Introduction and Highway Function

1.1 Objectives

1. Geometric Design concepts
2. Highway Funciton

1.2 Geometric Design Definition

1. fit the highway to the terrain
2. maintaining design standards for safety and performance

1.3 Geometric Design Basic

1. make criteria matches
   (a) driver expectancy/behavior
   (b) vehicle performance/behavior
2. balance safty, cost, mobility, community values, environmental, politics, liability, sustainable development, etc

1.4 AASHTO Role

1. American Association of State Highway and Transportation Officials
2. the membership of AASHTO consists of FHWA, and state DOTs

1.5 Reference - AASHTO publications

1. **a.k.a Green Book/PGDHS:** A Policy on Geometric Design of Highways and Streets, 2018, 7th Edition
2. Guidelines for Geometric Design of Very Low Volume Local Roads, 2001
3. A Guide to Achieving Flexibility in Highway Design, May 2004
4. Guide for the Planning, Design, and Operation of Pedestrian Facilities, July 2004
5. Guide for the Development of Bicycle Facilities, June 2012
6. Good for New Highway Design
7. TRB Special Report 214, Designing Safer Roads: Practices for Resurfacing, Restoration, and Rehabilitation for guidance.

1.6 Reference - ITE publications

ITE - Institute of Transportation Engineers. It is an international educational and scientific association of transportation professionals.

1. Urban Street Geometric Design Handbook, 2008
2. Freeway and Interchange Geometric Design Handbook, 2007
3. Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, March 2010

1.7 design elements

Design elements affect design consistency, driver expectancy, and vehicular operation.

1. horizontal and vertical alignment
2. embankments and slopes
3. shoulders, crown and cross slope, superelevation
4. bridge widths
5. signing and delineation
6. guardrail and placement of utility poles or light supports

1.8 Highway Design Control Factors

1. Highway Function (Arterials, Collections, Locals)
2. Design speed of the facility
3. Physical characteristics of the "design vehicle"
4. Performance of the design vehicle (heavy trucks, RVs)
5. Acceptable degree of congestion

1.9 The first step of hightway design process!!!

the 1st step is to define the function of the facility
Then, define the LOS required to fullfill the function.
Next, LOS selects the design speed and the geometry criteria.

1.10 Highway functions

Highway Function: Arterials, Collections, Locals
Arterials: principal arterials, minor arterials
Mobility: the ability to move goods and passengers to their destination in a reasonable time
Accessibility: the ability to reach desired destination

1.11 Highway hierarchy of Movements - 6 stages

1. Main Movement
2. Transition
3. Distribution
4. Collection
5. Access
6. Termination

1.12 Hierarchy of Movements

Roadway Class	**% Through Movement**	**VMT in Rural**	**Miles in Rural**	**VMT in Urban**	**Miles in Urban**
Freeways	100%				
Arterials	60-80%	**45-75%**	6-12%	**65-80%**	15-25%
Collectors	40-60%	20-35%	20-25%	5-19%	5-10%
Local Streets	0-40%	5-20%	**65-75%**	10-30%	**65-80%**

1.13 Highway Design Volume

Highway Type	Approximate Design Speed	Approximate Design Volume
Freeway – free flow	70-75 mph	2400 veh/h/ln
Freeway – free flow	65 mph	2300 veh/h/ln
Rural Highways		
a) Multilane-one way		1600-2000 veh/h/ln
b) Two lane		2000-2800 veh/h
Urban Highways		
a) Arterials		See Highway Capacity Manual
b) Signalized intersections		1900 pc/h/ln
c) Unsignalized intersections		1100-2000 veh/h

1.14 Traffic Information for Roadway Designers

These traffic information should be available to the designer prior to or very early in the design process:

1. AADT for the current year: opening year (completion of construction), and design year
2. Existing hourly traffic volumes over a minimum of 24-hour period, including peak hour turning movements and pedestrian counts
3. Directional distribution factor (D_{30}).
4. 30th highest hour factor (K_{30}).
5. Truck factors (T) for daily and peak hour.
6. Design speed and proposed posted speed.
7. Design vehicle for geometric design.
8. Turning movements and diagrams for existing and proposed signalized intersections.
9. Special or unique traffic conditions, including during construction.
10. Crash history, including analyses at high crash locations within the project limits.
11. Recommendations regarding parking or other traffic restrictions.

1.15 Terms

1. cross section - A cross section refers to the vertical view of a roadway or highway at right angles to its centerline.
2. embankment - An embankment is a constructed mound of earth, stones, or other materials. Its purpose is to support the raising of a roadway or railway above the level of the surrounding ground surface.
3. cross slope - Cross slope plays a crucial role in ensuring proper drainage and safety on roadways.
4. crown - The crown of a highway refers to the cross-sectional shape of the road surface.
5. signing and delineation -
6. guardrail - A guardrail on a highway serves as a safety barrier designed to protect motorists.
7. guardrail and placement of utility poles or light supports -

8. detour - walkaround roadway
9. through movement - refers to the uninterrupted flow of vehicles or goods from one location to another
10. VMT - Vehicle Miles Traveled
11. open year and design year - open year means compeletion of construction.
12. AADT - the average daily volume of vehicle traffic of a year. It is calculated by dividing the total traffic volume for the year by 365 days.
13. D_{30} factor - Directional Distribution factor
14. K_{30} factor - the 30th highest hour factor

1.16 Rules

1.17 Formulas

1.18 Reference