2 Design Control and Criteria

2.1 Objectives

1. Design Vehicles, Driver and Traffic Characteristics
2. 13 AASHTO criteria
3. AASHTO administered, federal-wide
4. State-DOT administered - Green Book
5. local goverment administered - ordinance or code

2.2 Design vehicles

1. Design Vehicle
   Its weight, dimensions, and operating characteristics will be used to establish the geometric standards of the highway.
2. design vehicle P: passenger car
   (a) Geometry - length 19ft (5+11+3), width 7ft
   (b) Minimum turning path - outline 25.4ft, front wheel 23.8ft, CTR 21ft, min 14.4ft
3. WB-50 - length 55ft, width 8.5ft, height 13.5ft

ASSHTO guideline - Selection of design vehicle 1

1. parking lot - passenger car
2. intersection of local area - SU-30, 30ft
3. intersection of state highway and city street - City transit buses, 40ft
4. intersections of highways; low-volume county roads with ADT ¡ 400 - City bus (40ft, 84 passengers) or conventional bus(36ft, 64 passengers)
5. freeway ramp; arterial crossroads; intersections of state highways; with high volume of traffic - WB-40 to WB-62

2.3 Older Driver Deficiencies

1. Slower information processing
2. Slower reaction times
3. Slower decision making
4. Visual deterioration

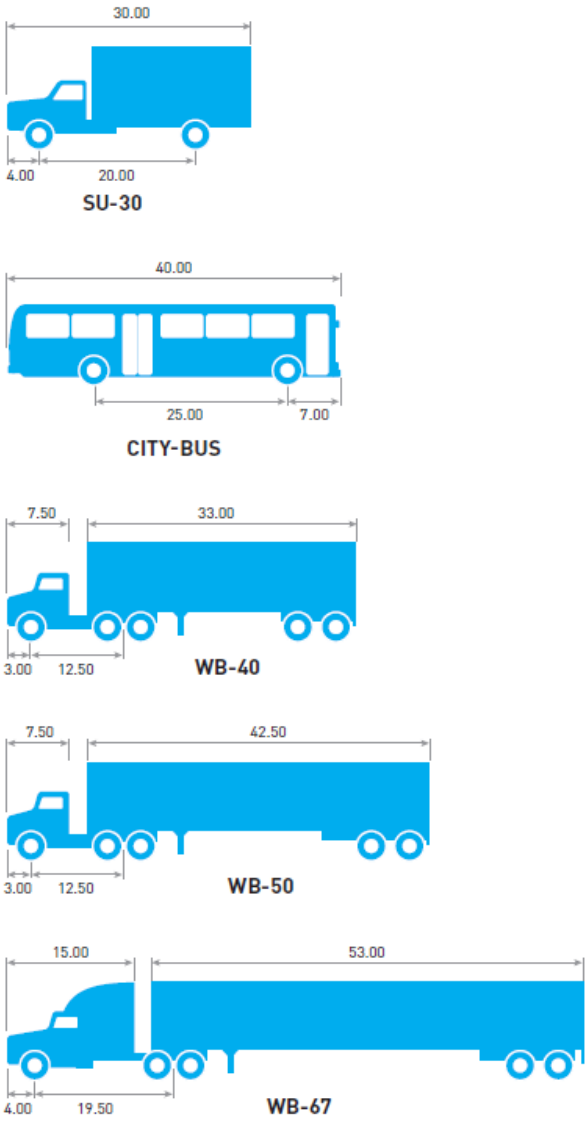

Figure 1: Design Vehicles

5. Hearing deterioration
6. Decline in ability to judge time, speed, and distance
7. Limited depth perception
8. Limited physical mobility

9. Side effects from prescription drugs

2.4 LOS and ADT

acceptable LOS / level of "congestion" 2

Roadway	urban	rural level	rural rolling	rural mountainous
Freeway	C/D	B	B	C
Arterial	C/D	B	B	C
Collector	D	C	C	D
Local	D	D	D	D

2.5 13 AASHTO Criteria

1. design speed
2. lane width
3. shoulder width
4. bridge width
5. structural capacity
6.
7. horizontal alignment
8. vertical alignment
9. cross slope
10. grades
11. superelevation
12. horizontal clearance
13. vertical clearance

2.6 speed

1. running speed - the speed of an individual vehicle
2. design speed - AASHTO: max safe speed
3. operation speed - the 85th percentile of observed speed in free flow conditions
4. safty of over speed - ΔV: [0, 5] low; [5, 15] medium; [15, infinit] high

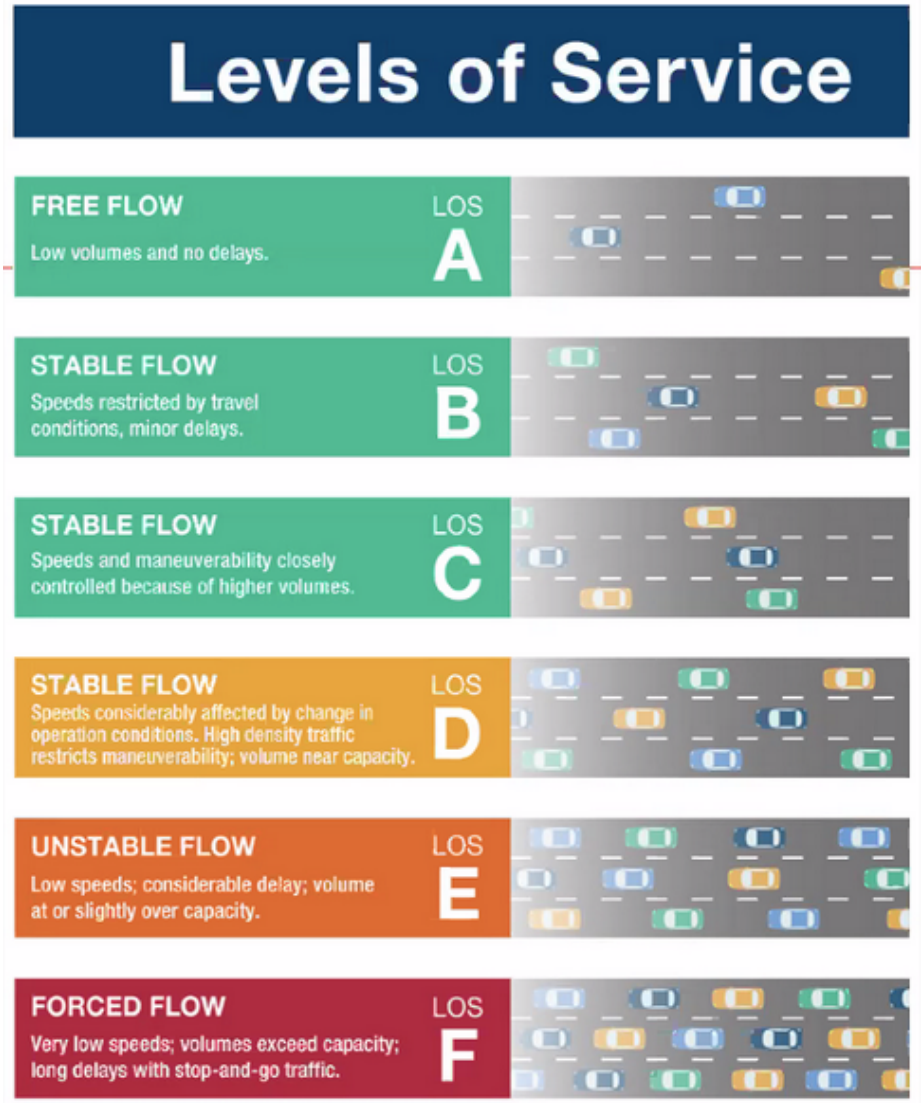

Figure 2: Level of Service

minimum design speed for **rural** roadways vs vehicle per day(VPD)

rural terrain	0-400	400-2000	over 2000
level	40	50	60
rolling	30	40	50
mountainous	20	30	40

2.7 lane width for urban and rural (1-2ft wider than urban)

Types	urban	rural
Freeway and Interstates:	12ft,	12ft
Ramp:	12-30ft	12-30ft
Arterial:	11-12ft,	10-12ft
Collections:	10-12ft,	10-12ft
local roads:	9-12ft,	9-12ft

2.8 cross slope

paved surfaces: 1.5-2%, typical 2% - Green Book
unpaved surfaces: 2-6% - Green Book
areas with high intensity rainfall: 2-2.5%
ALDOT use in 2 Counties: 2.2%

Table 1: Lane Widths for Different Types of Roadways

Type of Roadway	**Rural**		**Urban**	
	US (feet)	**Metric (meters)**	**US (feet)**	**Metric (meters)**
Freeway	14-16*	4.3-4.9*	14–16*	4.3–4.9*
Arterial	14-16	4.3-4.9	14–16	4.3–4.9
Collector	14	4.3	14	4.3
Local	14	4.3	14	4.3

Table 2: Functional Classification of Roadways

Criteria	**Local**	**Collector**	**Arterial**
Street pavement width	24 ft	22 ft (1), 31 ft	36 ft (2), 48 ft
Minimum horizontal curve radius	200 ft	350 ft	550 ft
Maximum grade (3)	15%	12%	8%
Minimum design speed for vertical curve	25 mi/h	35 mi/h	45 mi/h

2.9 Terms

SU - represents all single unit trucks and small buses, with length 35-60ft
ADT - average daily traffic
AADT - the annual average daily traffic, empersizing annual average
DHV - design hour volume
DDHV - The directional design hour volume
30HV - the 30th Highest Hour of Yearly Traffic - the 30th Hour volume
design speed (DS) - design maximum speed of a roadway
free flow speed (FFS) - the observed speed at which vehicles can travel with

minimal delays and no restrictions from traffic signals, congestion, or other factors.
LOS - Characterization of operating conditions, related to speed, travel time, traffic density, freedom to maneuver
FFS is close to DS - It means a good design
K-factor - DHV = K * ADT, K is 8 to 12% for urban facilities; 12 to 18% for rural facilities.
D-factor - DDHV = D * DHV, D is 50% for urban highways; 55 - 80% for rural and suburban roads
DDHV = ADT (or AADT) * K * D
CMF - Crash Modification Factor
Cul-de-sac: deed end street

2.10 Rules

Tandem Axle - 2 axles which are very close
State maximum gross vehicle weight - 73,280 - 164,000 lbs
State maximum gross vehicle weight - 73,280 - 164,000 lbs

DHV = 8% - 12% ADT in urban area, refer to Green Book
30HV = 15% ADT in a typical rural arterial, refer to Green Book

2.11 Formulas

1 mile = 5,280 feet
1000 kg = 2204.62 lbs
1 foot = 0.3048 meters
1 lb = 16 oz
1 gallon = 3.785 liters (U.S. liquid gallon)
1 gallon = 4.546 liters (U.K. imperial gallon)

2.12 Reference

FHWA Website
http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/