CHAPTER 2
DESIGN CONTROLS AND CRITERIA

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2.0 INTRODUCTION

Chapter 2 of the *PGDHS* **(1)** discusses characteristics of vehicles, pedestrians and traffic that act as criteria for the optimization or improvement in design of the various highway and street functional classes.

2.1 DESIGN VEHICLES

2.1.1 General Characteristics

Selection of design criteria should be determined and documented.

The physical characteristics and the proportions of vehicles of various sizes using the highway are key controls in geometric highway design. Four general classes of design vehicles have been established as follows:

- Passenger cars
  - passenger cars of all sizes, sport/utility vehicles, minivans, vans, and pickup trucks
- Buses
  - intercity (motor coaches), city transit, school, and articulated buses
- Trucks
  - single-unit trucks, truck tractor-semitrailer combinations, and truck tractors with semitrailers in combination with full trailers
- Recreational vehicles
  - motor homes, cars with camper trailers, cars with boat trailers, motor homes with boat trailers, and motor homes pulling cars

The bicycle should also be considered a design vehicle where bicycle use is allowed on a highway.

In the design of any highway facility, the designer should consider the largest design vehicle to normally use that facility or a design vehicle with special characteristics appropriate to a particular intersection in determining the design of such critical features as radii at intersections and radii of turning roadways. In addition, consider the following when selecting a design vehicle:

- A passenger car may be selected when the main traffic generator is a parking lot or series of parking lots.
- A two-axle single-unit truck may be used for intersection design of residential streets and park roads.
- A three-axle single-unit truck may be used for the design of collector streets and other facilities where larger single-unit trucks are likely.

- A city transit bus may be used in the design of state highway intersections with city streets that are designated bus routes and that have relatively few large trucks using them.
- Depending on expected usage, a large school bus (84 passengers) or a conventional school bus (65 passengers) may be used for the design of intersections of highways with low- volume county highways and township/local roads under 400 ADT. The school bus may also be appropriate for the design of some subdivision street intersections.
- See Table 9-3 for the minimum size design vehicle considered for intersections of freeway ramp terminals with arterial crossroads and for other intersections on state highways and industrialized streets that carry high volumes of traffic and/or that provide local access for large trucks.

2.1.2 Minimum Turning Paths of Design Vehicles

The *PGDHS* **(1)** includes drawings and tables to be referenced for minimum turning paths for typical design vehicles.

It is recommended that the Tables 2-2a and 2-2b in the *PGDHS* **(1)** be applied for the appropriate design vehicle. Confirm that the chosen turning radius design will function as planned by using turning template software.

2.2 TRAFFIC CHARACTERISTICS

2.2.1 Volume

Refer to the CDOT website for Traffic Data, including volume, and also the *CDOT Online Transportation Information System (OTIS)* **(2).** Also, see Section 4.01 of the *CDOT Project Development Manual* **(3)** for guidance on traffic data.

2.3 HIGHWAY CAPACITY

2.3.1 Levels of Service

The Region Traffic Engineering Section should be consulted to obtain traffic counts to ascertain if a highway capacity analysis is necessary. Refer to the *Highway Capacity Manual* **(4)** and associated software to determine the effect of design improvements on the level of service.

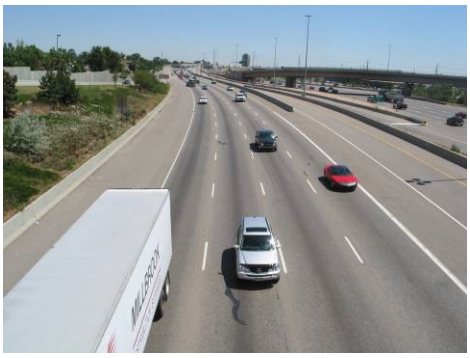
See Table 2-1 for definitions of levels of service and Table 2-2 for design levels of service.

Level of Service	General Operating Conditions
A	Free flow
B	Reasonably free flow
C	Stable Flow
D	Approaching unstable flow
E	Unstable flow
F	Forced or breakdown flow
Note: Specific definitions of level of service A through F vary by facility type and are presented in the Highway Capacity Manual (4).	

Table 2-1 General Definitions of Level of Service

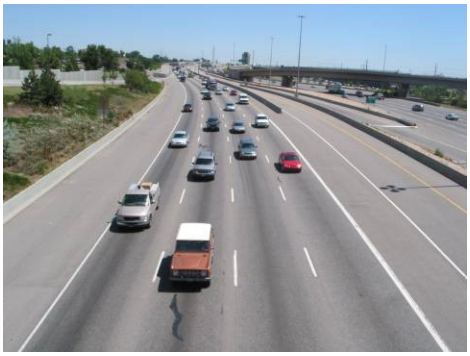
Functional Class	Appropriate Level of Service for Specified Combinations of Area and Terrain Type			
	Rural Level	Rural Rolling	Rural Mountainous	Urban and Suburban
Freeway	B	B	C	C or D
Arterial	B	B	C	C or D
Collector	C	C	D	D
Local	D	D	D	D
Note: While this table provides guidance, engineers should strive to provide the most practical level of service for the conditions/facility.				

Table 2-2 Guidelines for Selection of Design Levels of Service Characteristics by Highway Type



Level of Service A

Level of Service B



Level of Service C

Level of Service D

Level of Service E

Level of Service F

Figure 2-1 Levels of Service

2.4 ACCESS CONTROL AND ACCESS MANAGEMENT

Refer to Chapter 11 and the *State Highway Access Code* **(5)** for further information.

2.5 PEDESTRIANS

Refer to Chapter 12 and Chapter 14.

2.6 SAFETY

Refer to Chapter 20.

2.7 ENVIRONMENT

See Section 3 of the *CDOT Project Development Manual* **(3)** and consult with the Region Environmental Section for information on environmental issues.

REFERENCES

1. AASHTO. *A Policy on Geometric Design of Highways and Streets,* American Association of State Highway and Transportation Officials, Washington, D.C.: 2011.

2. CDOT. *CDOT Online Transportation Information System (OTIS)*: [http://dtdapps.coloradodot.info/Otis]

3. CDOT. *CDOT Project Development Manual,* Colorado Department of Transportation, 2013 (with revisions through 2016).

4. TRB. *Highway Capacity Manual,* Transportation Research Board, Washington, D.C.: 2010.

5. State Highway Access Code, 2 CCR 601-1, as adopted and amended by the Transportation Commission of Colorado, Revised March 2002.