Chapter Forty-one

SPECIAL DESIGN ELEMENTS

BUREAU OF LOCAL ROADS AND STREETS MANUAL

Chapter Forty-one
SPECIAL DESIGN ELEMENTS

Table of Contents

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41-1 CUL-DE-SACS, TURNAROUNDS, AND ALLEYS

41-1.01 Cul-de-Sacs and Turnarounds

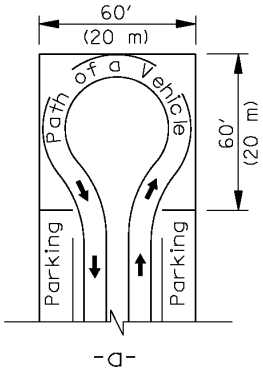
A local street, open at one end only, should have a special turning area at the closed end. This turning area may be an "L," "T," or circular shape cul-de-sac with dimensions as appropriate for the type of vehicles expected. The commonly used circular form should have a minimum outside radius of 30 ft (10 m) in residential areas and 50 ft (15 m) in commercial and industrial areas.

A dead-end street narrower than 40 ft (12 m) should be widened to enable passenger vehicles, delivery trucks, and emergency vehicles to make U-turns or at least turn around by backing only once. Typically, the design is circular pavement, symmetrical about the centerline of the street, sometimes with a central island, as shown in Figure 41-1A(a), which also shows minimum dimensions for the design vehicles. Although this type of cul-de-sac operates satisfactorily, improved operation is obtained if the design is offset so that the entrance-half of the pavement is in line with the approach-half of the street, as shown in Figure 41-1A(d). One steering reversal is avoided on this design. Where a radius of less than 50 ft (15 m) is used, provide mountable curbs on the island to permit maneuvering of an occasional oversized vehicle.

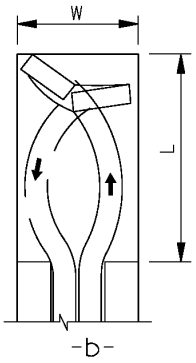
An all-paved plan, as opposed to an island configuration, with a 30 ft (10 m) outer radius, shown in Figure 41-1A(e), requires little additional paving. If the approach pavement is at least 30 ft (10 m) wide, the result is a cul-de-sac where passenger vehicles can make the customary U-turn and SU design trucks can turn by backing only once. A radius of about 40 ft (12 m) enables a WB-50 (WB-15) vehicle to turn around by maneuvering back and forth.

Other variations or shapes of cul-de-sacs that include right-of-way and site controls may be provided to permit vehicles to turn around by backing only once. Several types (e.g., Figures 41-1A(f), (g), and (i)) may also be suitable for alleys. The geometry of a cul-de-sac should be altered if adjoining residences also use the area for parking.

Generally, streets with cul-de-sacs should not be greater than 1,000 ft (300 m) in length.

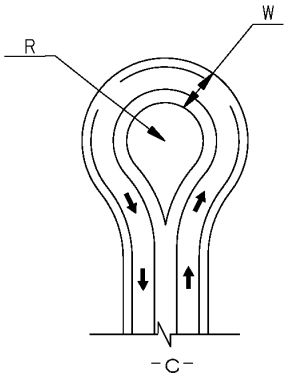


-a-



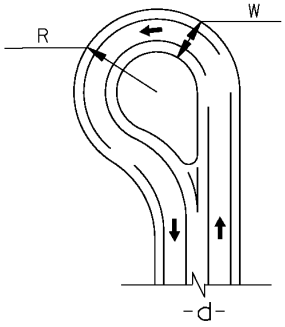
-b-

Design Vehicle	W	L
P	30 ft (10 m)	60 ft (20 m)
SU	50 ft (15 m)	100 ft (30 m)



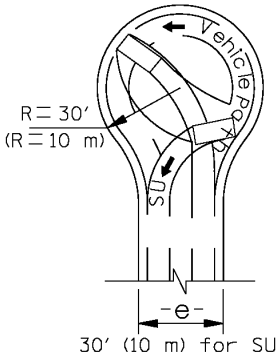
-c-

CIRCULAR



-d-

CIRCULAR - OFFSET

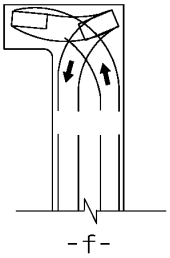


-e-

30′ (10 m) for SU

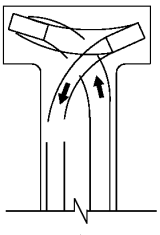
CIRCULAR - ALL PAVED

Design Vehicle	R	W
P	30 ft (10 m)	18 ft (6 m)
WB-40 (WB-12)	42 ft (13 m)	25 ft (8 m)
SU & WB-50 (WB-15)	47 ft (15 m)	30 ft (10 m)



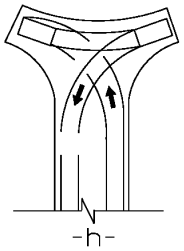
-f-

L - TYPE



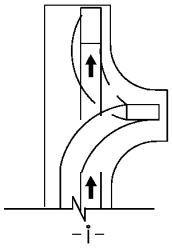
-g-

T - TYPE



-h-

Y - TYPE



-i-

BRANCH

CUL-DE-SACS

Figure 41-1A

41-1.02 Alleys

41-1.02(a) General

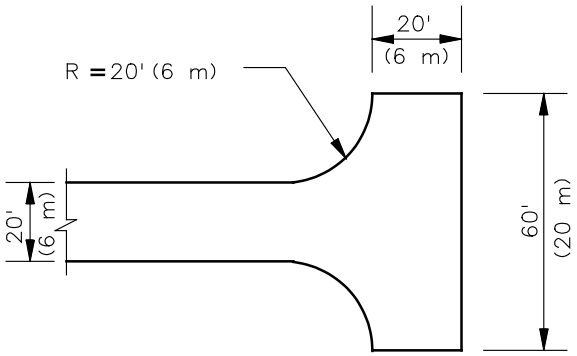
Alleys can assist site designers by allowing narrower lots and enhance safety by eliminating front driveways and the associated backing movements across sidewalks and into the street.

Alleys should be aligned parallel to, or concentric with, the street property lines. It is desirable to situate alleys in a manner that both ends of the alley are connected either to streets or to other alleys. Where two alleys intersect, a triangular corner cutoff of not less than 10 ft (3 m) along each alley property line should be provided to allow for a turning vehicle and to provide sight distance. Alleys without a connection to a street or another alley should include a turning area at the end of the alley as shown in Figure 41-1B. Figure 41-1B also may be suitable for application on some very low volume roads as well.

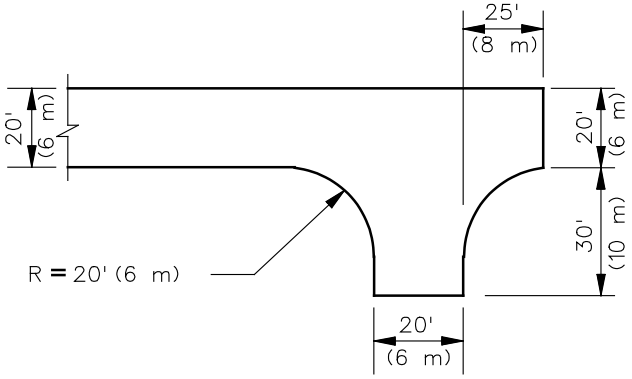
41-1.02(b) Design Criteria

Policies for the construction and maintenance of alleys are the same as for streets with the following exceptions:

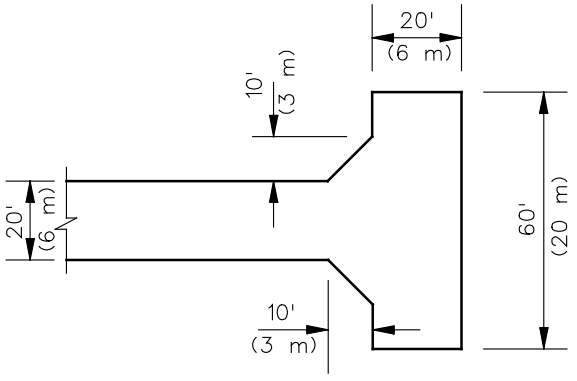
- Right-of-Way Width. The minimum right-of-way width is 16 ft (5 m).
- Surface Width. The minimum surface width is 10 ft (3 m).
- Horizontal Alignment. Use horizontal alignment criteria as necessary.
- Vertical Alignment. Alleys should have grades that meet the existing grades of the abutting land parcels to the extent practical. The longitudinal grade should not be less than 0.2%.
- Pavement Slope. Alley cross sections may be V-shaped with transverse slopes of 2.5% toward a center V-shaped gutter. Runoff is thereby directed to a catch basin in the alley or to connecting street gutters.
- Minimum Curb Radii. The radius of alley returns should be made as large as practical. Residential areas should have a minimum curb radius of 5 ft (1.5 m) and industrial and commercial areas should have a minimum radius of 10 ft (3 m).



STANDARD TURNING AREA



TURNING AREA



STANDARD CUT CORNERS

ALLEY TURNAROUNDS

Figure 41-1B

41-2 DRIVEWAYS

41-2.01 General

Driveway design considerations that are related to access management include turning radius or flare, width, number of lanes, throat length, auxiliary turn lanes, and directional controls. Driveway location issues include the need to locate and design driveway connections so that the driver of an exiting vehicle has an unobstructed intersection sight distance and motorists on the roadway have adequate stopping sight distance.

Additional considerations relate to functional area of the intersection and corner clearance, the influence area of an adjacent driveway, and corner clearance as well as driveway offsets and alignment. The functional area extends both upstream and downstream from the physical intersection area and includes the longitudinal limits of auxiliary lanes. The influence area associated with a driveway includes:

- the impact length (e.g., the distance approaching a driveway that vehicles begin to be affected),
- the perception-reaction distance, and
- the vehicle length.

It is important to avoid locating driveways along acceleration or deceleration lanes and tapers at street intersections or interchanges to minimize the potential for vehicular weaving conflicts.

From an operational and safety perspective, the appropriate width and radius of a driveway are a function of the volume of traffic served as well as the need to provide for efficient movement of vehicles off major thoroughfares. If driveways are too narrow or have inadequate turning radius, vehicles will be unable to maneuver quickly and comfortably off of the roadway and onto the site. Excessive radii and widths could pose safety hazards for pedestrians, bicycles, and vehicles on site.

The length of driveways or “throat length” is also important to avoid on-site circulation hazards and congestion at the entrance as it handles anticipated storage of entering and exiting vehicles that could conflict with the through movement on the abutting roadway. Criteria for the throat length vary according to the projected volume of the driveway and whether it is the principal access or a secondary driveway.

Other considerations in the construction of driveways include the following:

- joint and cross access of adjacent developments,
- out parcel requirements, and
- redevelopment and change in use of property.

41-2.02 Design Criteria

Figures 41-2A and 41-2B provide the design criteria for driveways. Additionally, consider the following:

1. Widths. Residential driveway widths typically should be at least 12 ft (3.6 m) and should not exceed 24 ft (7.2 m). Commercial/industrial driveway widths vary from 24 ft (7.2 m) for low volume activity to a maximum of 35 ft (10.7 m) for undivided design, high volume activity. Field entrances should be constructed wide enough to accommodate the farm equipment using the entrance.

2. Radii. A right-turn radius is on the side of a driveway exposed to enter or exit by right-turning vehicles. In many cases, a straight-line flare is constructed within the right-of-way in place of a radius, especially when a depressed curb is placed across the entrance. For high volume commercial entrances and entrances used by large trucks, use a radius which will accommodate trucks.

3. Driveway Spacing. Minimum driveway spacing is measured along the curb or edge of shoulder from the roadway end of the curb radius or flare. For individual residential properties, a suggested limitation on the number of driveways is:

   a. 1 driveway for less than 100 ft (30 m) of frontage,

   b. 2 driveways for 100 ft to 200 ft (30 m to 60 m) of frontage,

   c. 3 driveways for 201 ft to 500 ft (61 m to 150 m) of frontage, and

   d. 4 driveways for over 500 ft (150 m) of frontage.

   Commercial properties should generally be limited to one driveway location.

   The distance from any adjacent crossroad and from the property line should be considered in determining the location for a driveway.

   Existing driveways will usually be allowed to remain at their present location.

4. Angle. For two-way driveways, the centerline should generally be at a right angle to the roadway. Angles less than 60° should only be used for one-way driveways. The minimum angle is measured from the edge of traveled way.

5. Grades. The driveway should slope away from the pavement to the edge of the shoulder.

6. Sight Distance. Driveways should be located to provide adequate sight distance.

7. LPA Access Policy. The location and design of a driveway should also meet any minimum criteria established by a LPA in an adopted entrance access policy.

8. Additional Guidance. For additional guidance on driveways, the designer should review the following publications:

   a. *IDOT Policy on Permits for Access Driveways to State Highways*,

   b. *ITE Guidelines for Driveway Design and Location*, and

   c. *TRB Access Management Manual*.

41-2.03 Entrances at Bridges

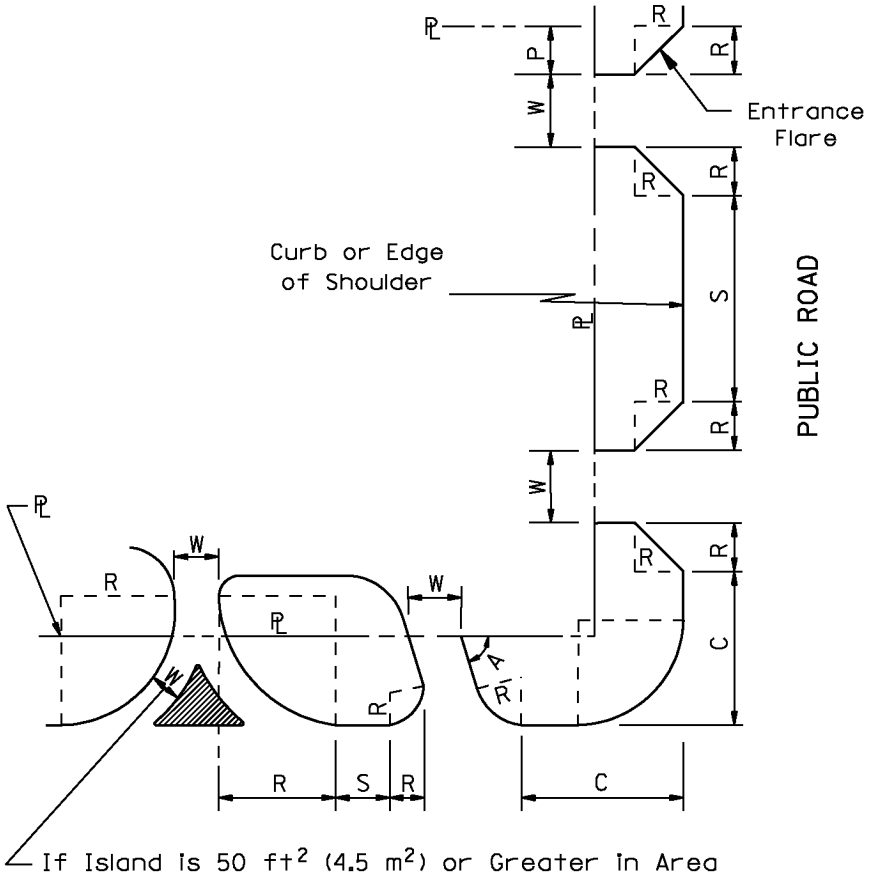
When driveways are within close proximity to structures, close or relocate the entrances from within the bridge approach area to outside the length of need for the guardrail wherever practical.

	Dimension Reference (See Figure 41-2B)	Non-Commercial Rural	Non-Commercial Urban	Commercial/ Industrial Rural	Commercial/ Industrial Urban	High-Volume Commercial/ Industrial
Throat Width	W	12 ft – 24 ft (1) (3.6 m – 7.2 m)	12 ft – 24 ft (1) (3.6 m – 7.2 m)	24 ft – 35 ft (2) (7.2 m – 10.7 m)	24 ft – 35 ft (3) (7.2 m – 10.7 m)	2@ 24 ft (7.2 m) with median
Return Radii (8)	R	10 ft – 40 ft (3 ft – 12 m)	5 ft – 25 ft (1.5 m – 7.5 m)	10 ft – 50 ft (3 m – 15 m)	10 ft – 40 ft (3 m – 12 m)	25 ft – 60 ft (7.5 m – 18 m)
Angle	A	60° – 90°	45° – 90° (5)	45° – 90° (5)	45° – 90° (5)	45° – 90° (5)
Spacing (minimum)	P (From Property Line to Beginning of Flare)	0 ft (0 m)	0 ft (0 m)	5 ft (1.5 m) (4)	3 ft (1 m)	10 ft (3 m)
	C (9) (From Street Corner)	50 ft (15 m)	30 ft (9 m) (6)	50 ft (15 m)	30 ft (9 m)	100 ft (30 m)
	S (Between Driveways)	0 ft (0 m)	0 ft (0 m)	0 ft (0 m)	0 ft (0 m)	440 ft to 660 ft (135 m to 200 m)
Island Width (minimum		N/A	N/A	10 ft (3 m)	6 ft (1.8 m)	4 ft – 18 ft (1.2 m – 5.4 m)
Island Radius (minimum)		N/A	N/A	5 ft (1.5 m)	5 ft (1.5 m)	N/A
Gradient (7)		15%	10% Des. 15% Max.	6% Des. 10% Max.	5% Des. 10% Max.	5% – 8%

Notes:
(1) Minimum is 16 ft (4.8 m) for field entrances.
(2) Maximum is 60 ft (18 m), located 6 ft (1.8 m) from edge of traveled way (ETW).
(3) Maximum is 85 ft (26 m) at curb.
(4) Located 6 ft (1.8 m) from edge of traveled way (ETW).
(5) Use a minimum of 45° for one-way drives and 60° for two-way drives.
(6) This distance is the undisturbed length of curb between driveway flare and intersecting street flare.
(7) Maximum breakover is 12%.
(8) Straight line flare may be used in place of radius.
(9) Measured from edge of cross-street pavement, not end of radius.

DESIGN CRITERIA FOR DRIVEWAYS

Figure 41-2A



Key: R = Driveway radius (flare may be used in place of radius)
W = Driveway width
PL = Property line
C = Corner clearance (includes corner radius)
A = Driveway angle of intersection
S = Spacing between two driveway radius points
P = Spacing between driveway and property line radius point

Note: To ensure that a private drive does not infringe upon the access rights of an adjacent property owner, R must not extend beyond the property line as measured perpendicular to the highway from where the property corner meets the highway line unless there is an agreement between property owners permitting a shared drive.

DRIVEWAY MEASUREMENTS

Figure 41-2B

41-3 OFF-STREET PARKING

A proposed highway project may incorporate some form of off-street parking. Typical applications may include providing off-street parking to replace on-street parking that will be removed as part of a proposed project or the construction of a park-and-ride lot for commuters. Public parking built with federal, State, or MFT funds administered by IDOT must be generally available to the public and may not contain individually reserved parking spaces.

For information regarding off-street parking for individuals with disabilities, see Section 41-6.

41-3.01 Park-and-Ride Lots

The following provide general considerations for park-and-ride lots:

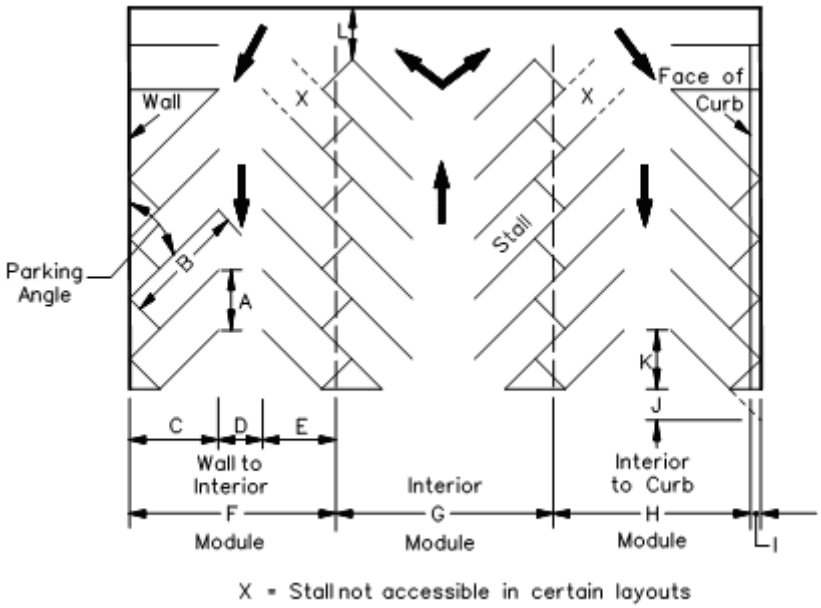
1. Location. Park-and-ride lots may be located in either rural or urban areas to accommodate car pooling or to provide access to transit terminals. By locating these lots outside of the downtown area, congestion is reduced, parking lot property costs are decreased, and accessibility is improved. Determine the general location and size of the park-and-ride lots. Guidance for site selections can be found in the AASHTO *Guide for the Design of Park-and-Ride Facilities*. Some of the factors that affect the location of a parking facility include:
   - site availability,
   - accessibility,
   - visibility,
   - demand,
   - congestion,
   - capacity,
   - design, and
   - land use.
2. Layout. Consider the following when laying out a park-and-ride facility:
   - entrances and exits, including:
     1. location,
     2. spacing,
     3. traffic signals,
     4. storage, and
     5. design;
   - drop-off/pick-up zones (kiss-and-ride),
   - bus loading,
   - traffic circulation,
   - pedestrian and bicyclist considerations, and
   - accessibility for individuals with disabilities.

For more detailed information on park-and-ride lots, see Section 58-2 of the *BDE Manual.*

41-3.02 Design Elements

Consider the following elements in the design of off-street parking lots:

1. Parking Lot Dimensions. Parking stall dimensions vary with the angle at which the parking space is arranged relative to the aisle. Figure 41-3A provides the design dimensions for 9 ft x 18.5 ft (2.7 m x 5.6 m) parking stalls and shows how stalls may be combined into a parking lot. From a traffic operations standpoint, one-way aisles are desirable and should be designed to provide counterclockwise circulation. When determining parking stall widths, consider the following:
   - Typical stall widths (measured perpendicular to the vehicle when parked) range from 8.5 ft to 9.5 ft (2.6 m to 2.9 m).
   - The recommended minimum stall width for self parking of long term duration is 9.5 ft (2.9 m).
   - For higher turnover self parking, a stall width of 9 ft (2.7 m) is recommended.
   - Stall widths at parking facilities, where the loading of large packages into vehicles is prevalent, should desirably be 9.5 ft (2.9 m) or even 10 ft (3.0 m) in width.
2. Bus Loading Areas. Bus loading and unloading areas located adjacent to park-and-ride lots should be designed to provide for continuous counterclockwise circulation and for curb parking without backing maneuvers. The through traffic lanes and the curb loading area should each be 12 ft (3.6 m) wide. Section 41-4.02 provides details of bus loading areas.
3. Sidewalk Dimensions. All sidewalks should be at least 5 ft (1.5 m) wide. In loading areas, the width should be 12 ft (3.6 m) or the adjacent sidewalk width plus 7 ft (2.1 m) whichever is greater. The accessibility criteria for individuals with disabilities must be met for all new lots; see Section 41-6.
4. Cross Slope. To provide proper drainage, the minimum cross slope on a parking lot should be 1.0%. At a maximum, the cross slope should not exceed 5.0%. Desirably, design the lot to direct the drainage runoff into existing drainage systems. If water impoundment cannot be avoided along pedestrian routes, bicycle routes, and standing areas, provide drop inlets and underground drainage. In parking areas, design the drainage to avoid standing water. The detailed drainage design for the lot should be prepared using *IDOT Drainage Manual* to determine design frequency, pavement discharge, and capacity of drainage inlets.
5. Pavements. For information on pavement designs, see Chapter 44.
6. Lighting. Desirably, the lot should be lighted for pedestrian safety and lot security. Ensure provisions are considered for lighting supports and power lines. Section 41-7 provides information on the design of lighting.
7. Bicycle and Motorcycle Storage. Provide bicycle stalls that allow the use of locking devices. Bicycle stalls are typically 2 ft by 6 ft (600 mm by 1.8 m). Motorcycle stalls are 3 ft by 6 ft (1 m by 1.8 m).
8. Traffic Control Devices. Provide signs and pavement markings to direct drivers and pedestrians to appropriate loading zones, parking areas, bicycle facilities, accessibility parking, and entrances and exits.



Parking Layout Dimension for 9 ft x 18.5 ft (2.7 m x 5.6 m) Stalls at Various Lengths

Design Feature	Notation	Parking Angle							
		45° (ft)	45° (m)	60°(ft)	60° (m)	75° (ft)	75° (m)	90° (ft)	90° (m)
Stall width, parallel to aisle	A	12.7	3.9	10.4	3.2	9.3	2.8	9.0	2.7
Stall length of line	B	25.0	7.6	22.0	6.7	20.0	6.1	18.5	5.6
Stall depth to wall	C	17.5	5.3	19.0	5.8	19.5	5.9	18.5	5.6
Minimum aisle width between stall lines	D	12.0	3.7	16.0	4.9	23.0	7.0	26.0	7.9
Stall depth, interior	E	15.3	4.7	17.5	5.3	18.8	5.7	18.5	5.6
Module, wall to interior	F	44.8	13.7	52.5	16.0	61.3	18.7	63.0	19.2
Module, interior	G	42.6	13.0	51.0	15.5	61.0	18.6	63.0	19.2
Module, interior to curb face	H	42.8	13.1	50.2	15.3	58.8	17.9	60.5	18.4
Bumper overhang (typical)	I	2.0	0.6	2.3	0.7	2.5	0.8	2.5	0.8
Offset	J	6.3	1.9	2.7	0.8	0.5	0.2	0.0	0.0
Setback	K	11.0	3.4	8.3	2.5	5.0	1.5	0.0	0.0
Cross aisle, one-way	L	14.0	4.3	14.0	4.3	14.0	4.3	14.0	4.3
Cross aisle, two-way	—	24.0	7.3	24.0	7.3	24.0	7.3	24.0	7.3

Notes:
1. *See Section 41-6 for criteria on the number and dimensions of parking spaces for individuals with disabilities.*
2. *If a special section is designated for subcompact vehicles, these stalls can be 8 ft x 15 ft (2.5 m x 4.6 m) for a 90° angle.*
3. *Stalls should be wider for commercial parking.*
4. *The designer should consider bumper overhang when placing lighting, railing, etc. Therefore, these appurtenances should be placed beyond dimension "I" in the figure.*
5. *Two-way traffic in aisles may only be used with a 90° parking angle. Use an aisle width of 26 ft (7.9 m).*

PARKING LOT LAYOUT DIMENSIONS
(9 ft x 18.5 ft (2.7 m x 5.6 m) Stalls)

Figure 41-3A

9. Fencing. The need for fencing around a parking lot will be determined on a case-by-case basis.

10. Landscaping. In some locations, consider landscaping to minimize the visual impact of the parking lot. This may include providing a buffer zone around the perimeter of the lot or improving the aesthetics of the lot itself. Desirably, include a 10 ft to 20 ft (3.0 m to 6.0 m) buffer zone around the lot to accommodate vegetation screens. Also, raised-curb islands and parking lot separators provide suitable locations for shrubs and trees. Landscaping should include low maintenance vegetation that does not cause visibility or security problems.

11. Accessibility. See Section 41-6 for accessibility requirements.

12. Snow Removal. To assist with snow removal and storage, the design should include a 10 ft to 20 ft (3.0 m to 6.0 m) snow shelf around the perimeter of the lot on at least two sides. This area can coincide with the buffer zone around the lot, provided that the entire area is not filled with shrubs or trees. Place any fencing outside the area of the snow shelf. Providing painted islands rather than raised-curb islands can also make it easier to plow snow from the parking lot.

41-3.03 Parking Garages

Design and layout of parking spaces in parking garages can be found in the *ITE Traffic Engineering Handbook*, *ITE Guidelines for Parking Facility Location and Design*, *American Planning Association Aesthetics of Parking*, and other documents.

41-4 PUBLIC TRANSIT FACILITIES

41-4.01 General

The requirements for public transit should be considered early in the development of an urban highway improvement program, and should not be delayed until construction has been completed. Information gathered during the planning process on the routing of transit vehicles (e.g., turns, transfer points), and the volumes of buses (e.g., average or minimum headways) should be considered in the design.

Design and operational features of the highway that are affected by public transit facilities include:

- locations of bus stops,
- design of bus stops (e.g., turnouts),
- reservation of bus lanes, and
- special traffic control measures.

Generally, the municipality or local transit authority will determine the location of the bus stop or bus turnout. However, the designer usually has some control over the best placement of a bus stop or turnout location when considering layout details, intersection design, and traffic flow patterns.

41-4.02 Bus Loading Areas

Bus loading and unloading areas are usually located adjacent to park-and-ride lots. Figure 41-4A provides criteria for the recommended lengths of bus loading areas.

41-4.03 Bus Stops

If local bus routes are located on an urban or suburban highway, the designer should consider their impact on normal traffic operations. The stop-and-go pattern of local buses will disrupt traffic flow, but certain measures can minimize the disruption. The location of bus stops is particularly important. These are determined not only by convenience to patrons, but also by the design and operational characteristics of the highway and the roadside environment. If the bus must make a left turn, for example, do not locate a bus stop in the block preceding the left turn.

There are three basic bus stop designs — far-side or near-side of an intersection, and mid-block. Consider the following:

1. Far-Side Stops. For capacity and other reasons, far-side stops are generally preferred to near-side or mid-block bus stops.
2. Near-Side Stops. Near-side stops must be used where the bus will make a right turn at the intersection.
3. Mid-Block Stops. Mid-block bus stops may be considered where right turns at an intersection are high (250 in peak hour) and far-side stops are not practical.

Figure 41-4B provides the recommended distances for the prohibition of on-street parking near bus stops. Section 41-6 provides accessibility requirements.

41-4.04 Bus Turnouts

Providing bus turnouts can reduce interference between buses and other traffic significantly. Turnouts remove stopped buses from the through lanes and provide a well defined user area for bus stops. Consider bus turnouts where the following conditions exist:

- The street provides arterial service with higher speeds (e.g., posted speeds of 35 mph or greater).
- Bus volumes are 10 or more during the peak hour.
- Passenger volumes exceed 20 to 40 boardings an hour.
- The average bus dwell time generally exceeds 30 seconds per stop.
- During peak hour traffic, there are at least 250 vehicles per hour in the curb lane.
- Buses are expected to layover at the end of the trip.
- Potential vehicular/bus conflicts warrant the separation of transit and other vehicles.
- There is a history of traffic crashes and/or crashes involving pedestrians that can be resolved by a bus turnout.
- Right-of-way width is sufficient to prevent adverse impact on sidewalk pedestrian movements.
- Curb parking is prohibited, at least during peak hours.
- Sight distances prevent traffic from stopping safely behind the bus.
- Appropriate bus signal priority treatment exists at the intersection.
- Other improvements (e.g., widening) are planned for the major roadway.

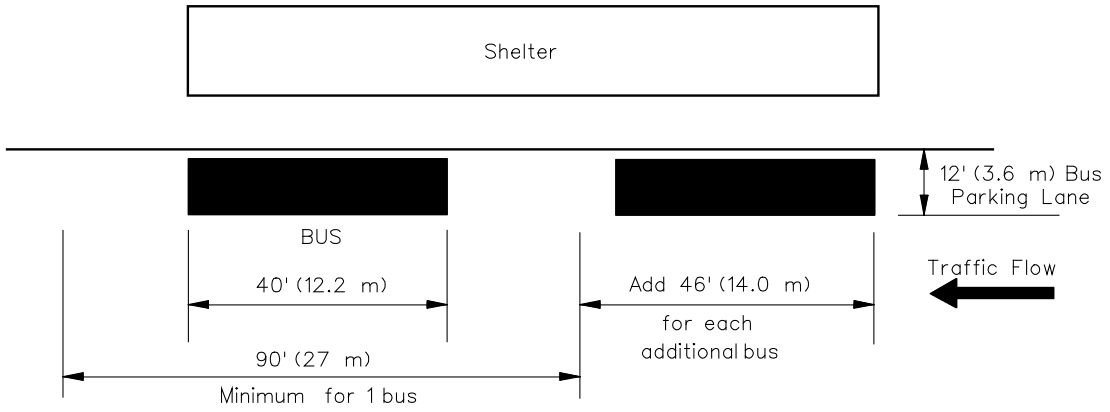
Desirably, the total length of a bus turnout will allow for an entrance taper, a deceleration length, a stopping area, an acceleration length, and an exit taper. Figure 41-4C illustrates the design details for bus turnouts. Providing separate deceleration and acceleration lengths is desirable in open suburban area and on rural arterials and may be provided wherever feasible. However, common practice is to accept deceleration and acceleration in the through lanes and only build the tapers and stopping area. Additionally, consider the following:

1. Far-Side Turnouts. Typically, far-side intersection placement is desirable. Placing turnouts after signal controlled intersections allows the signal to create gaps in traffic.
2. Near-Side Turnouts. Avoid using near-side turnouts because of conflicts with right turning vehicles, delays to transit services as buses try to re-enter the traveled way, and obstructions to traffic control devices and pedestrian activities.
3. Mid-Block Turnouts. Only use mid-block turnouts in conjunction with major traffic generators.

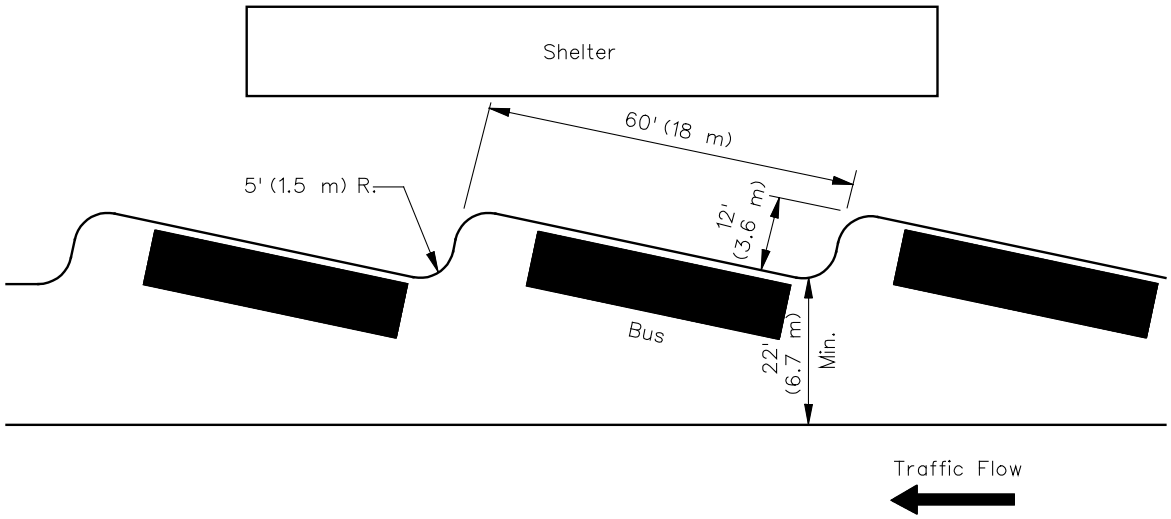
4. Tapers. Figure 41-4C provides information on taper lengths that may be used for entrance and exit tapers. To improve traffic operations, use short horizontal curves (100 ft (30 m) radius) on the entry end and 50 ft to 100 ft (15 m to 30 m) curves on the re-entry end. Where a turnout is located at a far-side or near-side location, the cross street area can be assumed to fulfill the need for the exit or entry area, whichever applies.

41-4.05 Bus Shelters

Generally, the municipality or the local transit authority will determine the need for and location of bus shelters. The local transit authority will determine the design of a bus shelter. The designer should ensure that the shelter does not restrict vehicular sight distance, pedestrian flow, or accessibility for individuals with disabilities. Pedestrian shelters are desirable when loading areas for buses and trains are provided. Their inclusion will be determined on a case-by-case basis. The shelter should provide approximately 5 ft^2 (0.5 m^2) of covered area per person. At least, the shelter should provide lighting, benches, and trash receptacles. Routing information signs and a telephone should also be considered. Section 41-6 provides accessibility requirements.



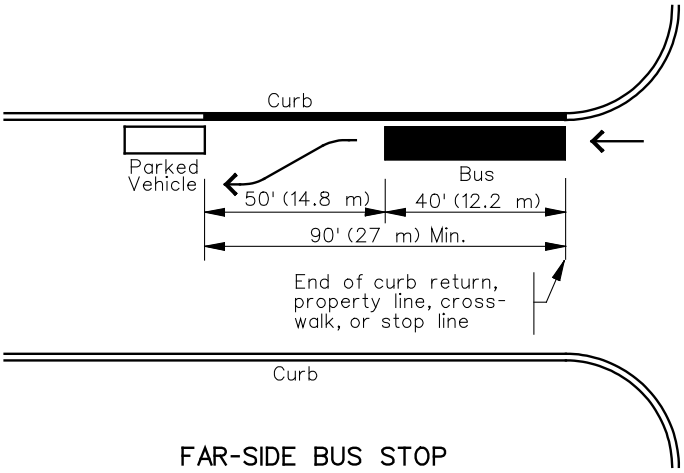
PARALLEL PARKING



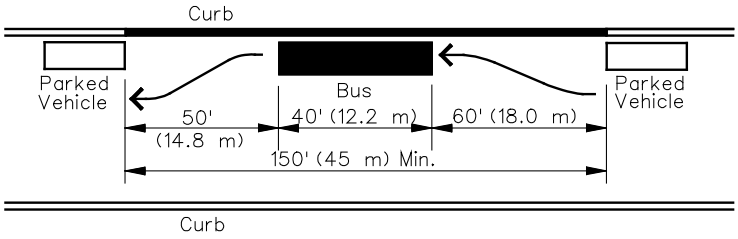
SHALLOW SAWTOOTH PARKING

RECOMMENDED LENGTHS FOR BUS-LOADING AREAS (Park-and-Ride Lots)

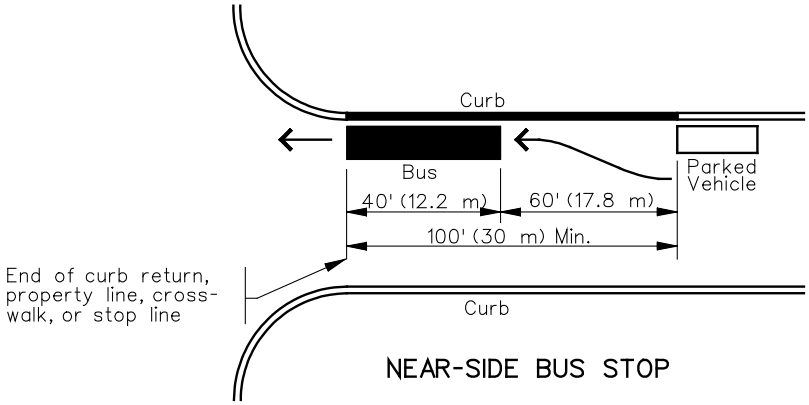
Figure 41-4A



FAR-SIDE BUS STOP



MID-BLOCK BUS STOP



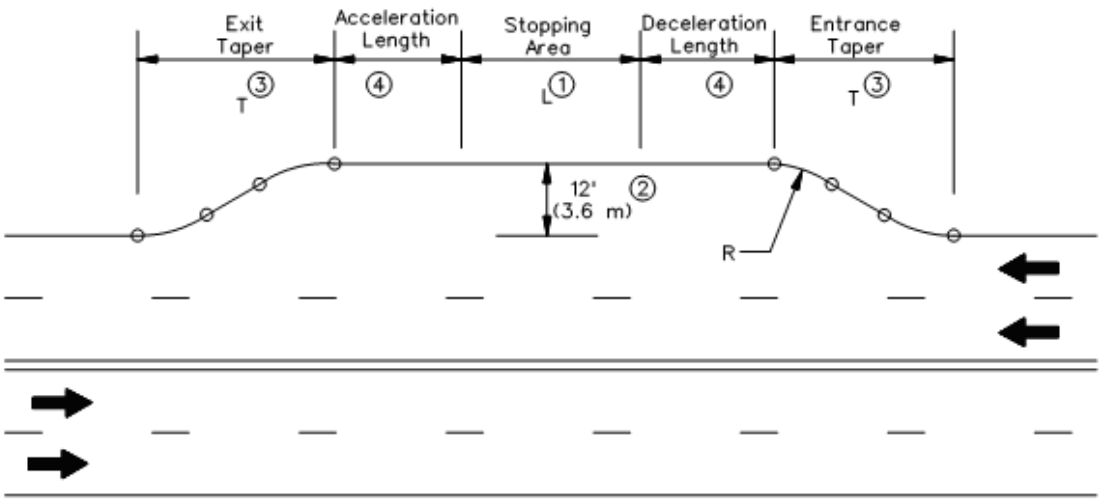
NEAR-SIDE BUS STOP

Notes: 1. *Where articulated buses are expected to use these stops, add an additional 20 ft (6 m) to the bus distances.*

2. *Provide an additional 50 ft (15 m) of length for each additional bus expected to stop simultaneously at any given bus stop area. This allows for the length of the extra bus (40 ft (12.2 m)) plus 10 ft (2.8 m) between buses.*

ON-STREET BUS STOPS

Figure 41-4B



Notes:
1. *Stopping area length consists of 50 ft (15 m) for each standard 40 ft (12.2 m) bus and 70 ft (21 m) for each 60 ft (18.3 m) articulated bus expected to be at the stop simultaneously.*
2. *Bus turnout width is desirably 12 ft (3.6 m). For posted speeds under 30 mph, a 10 ft (3.0 m) minimum bay width is acceptable. These dimensions do not include gutter width.*
3. *Suggested taper lengths are listed below. A minimum taper of 5:1 may be used for an entrance taper from an arterial street for a bus turnout while the merging or re-entry taper should not be sharper than 3:1.*
4. *The minimum design for a bus turnout does not include acceleration or deceleration lengths. Recommended acceleration and deceleration lengths are listed below.*

Design Speed	Entering Speed*	Acceleration Lengths	Deceleration Lengths **	Suggested Taper Lengths
US CUSTOMARY				
30 mph	20 mph	50 ft	120 ft	150 ft
35 mph	25 mph	250 ft	185 ft	170 ft
40 mph	30 mph	400 ft	265 ft	190 ft
45 mph	35 mph	700 ft	360 ft	210 ft
50 mph	40 mph	975 ft	470 ft	230 ft
METRIC				
40 km/h	25 km/h	15 m	35 m	40 m
50 km/h	35 km/h	60 m	45 m	45 m
60 km/h	45 km/h	105 m	70 m	50 m
70 km/h	55 km/h	200 m	105 m	60 m
80 km/h	65 km/h	310 m	145 m	70 m

* *Desirably, the bus speed at the end of taper should be within 10 mph (15 km/h) of the design speed of the traveled way.*

** *Based on a 2.5 mph/sec (4.0 km/h/s) deceleration rate.*

TYPICAL BUS TURNOUT DIMENSIONS

Figure 41-4C

41-5 PEDESTRIAN ACCOMMODATIONS

41-5.01 General

Consider the travel needs of all users of a transportation corridor when planning transportation improvements. Pedestrian accommodations are an integral part of urban and suburban transportation corridors. They facilitate pedestrian travel and access to public transportation, thereby contributing to alleviation of urban traffic congestion. The most pressing need for pedestrian accommodation is at points of community development that result in pedestrian concentrations near or along the highway, (e.g., schools, public transportation stations and stops, local businesses, industrial plants, hospitals, churches, shopping centers, parking lanes). Accommodations can include sidewalks, elevated walkways, grade separated structures, stairs, curb ramps, and traffic signal devices. If during the planning phase of a project, pedestrian travel in the vicinity of the project is determined to be sufficient to warrant consideration, provide appropriate accommodations.

Pedestrian accommodations will be considered appropriate if they are not already available and any of the following conditions exist:

- there is current evidence of frequent pedestrian activity,
- there is a history of pedestrian related crashes,
- the roadway improvement will create a safety impediment to existing or anticipated pedestrian travel (e.g., adding lanes so that the improvement itself acts as a barrier to pedestrian traffic),
- there is urban or suburban development that would attract pedestrian travel along the route to be improved,
- pedestrian attracting development is expected along the route within 5 years of project completion, either as documented in a local plan or anticipated as a factor of similar development history, and/or
- the roadway provides primary access to a school, park, recreation area, or other significant destination, or across a natural or man-made barrier.

41-5.02 Design

Design criteria for sidewalks are in Section 31-2.02. Facilities intended to also accommodate bicycle travel should follow the guidance in Chapter 42. Policies and guidelines for sidewalk/curb ramps for individuals with disabilities are addressed in Section 41-6.

Project limits may be extended beyond highway improvements for reasonable distances to include necessary pedestrian facilities at nearby intersections, to provide access to public transportation facilities, or to avoid short sidewalks gaps.

41-5.03 Older Pedestrians

Older and impaired pedestrians may be affected by limitations in sensory, perceptual, cognitive, or motor skills. The following measures may be considered at the discretion of the designer to aid older and impaired pedestrian road users:

- Assume a lower walking speed. To accommodate the shorter stride and slower gait of less capable (15^{th} percentile) pedestrians, and their exaggerated "start up" time before leaving the curb, pedestrian control-signal timing based on an assumed walking speed of 2.8 ft/s (0.85 m/s) is recommended.
- Provide median refuge islands of sufficient width at wide intersections.
- Consider the traffic control system in the context of the geometric design to ensure compatibility and to provide adequate advance warning or guide signs for situations that could surprise or adversely affect the safety of older pedestrians.
- Use properly located signals with large signal indications.
- Provide enhanced markings and delineation.
- Consider increasing sign letter size and retroreflectivity to accommodate individuals with decreased visual acuity.
- Use repetition and redundancy in design and in signing.

41-5.04 Overpasses

Because of the high costs associated with grade separated facilities, overpasses should be incorporated into the early stages of planning where new developments are intended to generate substantial volumes of pedestrians. Overpasses are considered to be the most beneficial under the following conditions:

- where there is moderate to high pedestrian demand to cross a freeway or expressway,
- where there is a large number of young children (e.g., schools) who must regularly cross a high speed or high volume roadway,
- on streets having high vehicle and high pedestrian crossing volumes and an extreme hazard for pedestrians exists (e.g., on wide streets with high speed traffic and poor sight distance), and
- where one or more have the conditions stated above in conjunction with a well-defined pedestrian origin and destination (e.g., a residential neighborhood across a busy street from a school, a parking structure affiliated with a university, an apartment complex near a shopping mall).

Overpasses and underpasses will be evaluated on a case-by-case basis considering the type of pedestrian travel, travel generators (e.g., schools, factories, stadiums, parks, transit terminals, shopping districts), the amount of anticipated non-motorized traffic, and the safety impacts of not providing the accommodations. Consider the following when evaluating and/or designing a pedestrian overpass:

1. Trip Length. Anticipated pedestrian trip length to generators should be 1 mile (2 km) or less and the adverse travel distance alleviated by construction to the facility should be greater than 0.5 miles (1 km).

2. Walkways. Walkways for pedestrian separation should have a minimum width of 8 ft (2.4 m). Greater widths may be needed where there are exceptionally high volumes of pedestrian traffic (e.g., downtown areas, near sports stadiums).

3. Protective Screens. Consider including a protective screen in the design of a pedestrian overpass. The screen is intended to prevent objects dropping into the path of traffic moving under the structure. Locations where screens should be considered include the following:

   - on an overpass near a school, playground, or elsewhere where it would be expected that the overpass would be frequently used by children unaccompanied by adults,
   - on all overpasses in large urban areas used exclusively by pedestrians and not easily kept under surveillance by police, and
   - on an overpass where the history of incidents on nearby structures indicates a need for screens.

4. Accessibility Considerations. When deciding where to locate a pedestrian crossing, the highway and structure designers must coordinate their efforts to properly address the accessibility considerations. All current and future pedestrian access routes (PARs) must be identified. If existing routes are inaccessible, the designer must evaluate the likelihood that the routes will be made accessible in the future. This may be done as part of the project under design. The evaluation may lead to the decision to relocate the pedestrian overpass or underpass to another site where accessibility can be more easily provided.

   The proposed design must meet the *ADA Standards* criteria for stairs, ramps, curb ramps, and PARs; see Section 41-6.

Additional guidance on pedestrian overpasses can be found in FHWA-RD-84/082 *Warrants for Pedestrian Over and Underpasses.*

41-6 REQUIREMENTS FOR ACCESSIBLE PUBLIC RIGHTS-OF-WAY

41-6.01 General

Many highway elements can affect the accessibility and mobility of individuals with disabilities. These include sidewalks, curb ramps, parking spaces, buildings at transportation facilities, overpasses or underpasses, temporary traffic control, and landscaping or streetscaping. According to the *Americans with Disabilities Act* (ADA), 42 U.S.C. §12181 - 12189 and the *Illinois Environmental Barriers Act,* 410 ILCS 25/1 *et seq*, public highway right-of-way shall be made accessible to all users. Local Public Agencies (LPAs) are required to perform a self-assessment to determine barriers to accessibility within the public highway right-of-way.

Currently, a national uniform design guideline for public highway right-of-way has not been adopted by the United States Department of Justice and Federal Highway Administration (FHWA). However, the *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG)* has been introduced by the United States Access Board through the federal rule-making process. Furthermore, FHWA has issued guidance that PROWAG may be used in order to comply with accessibility requirements. Therefore, the Department recommends that LPAs use the latest revision of PROWAG available at www.access-board.gov, when constructing or altering facilities within the highway public right-of-way.

Figure 41-6A provides a reference to criteria contained in PROWAG unless otherwise noted. The *ADA Standards for Accessible Designs* (ADAAG), the *Illinois Accessibility Code* (IAC), the *Uniform Federal Accessibility Standards* (UFAS), the *ILMUTCD*, and the *American National Standards Institute* (ANSI) should also be consulted as needed. Where LPA policies or local codes require criteria that exceed PROWAG, then the local criteria should be used.

41-6.02 Equivalent Facilitation

The use of alternative designs, products, or technologies, that result in substantially equivalent or greater accessibility and usability than the requirements in PROWAG, is permitted. However, the LPA should document how the equivalent facilitation was determined.

41-6.03 Application

All newly constructed facilities, altered portions of existing facilities, and elements added to existing facilities for pedestrian circulation and use located in the public right-of-way shall comply with the requirements in this Section.

Accessible Component	Scoping Requirements	Technical Requirements
Pedestrian Access Route (PAR)	R204	R302
Alternate PAR	R205	
Pedestrian Street Crossing	R206	R306
Curb Ramps and Blended Transitions	R207	R304
Detectable Warnings	R208	R305
Accessible Pedestrian Signals and Pedestrian Pushbuttons	R209	
Protruding Objects	R210	R402
Signs	R211	R410
Transit Stops and Transit Shelters	R213	R308
On-Street Parking	R214	R309
Off-Street Parking	ADAAG R208	ADAAG R502; IAC 400.310(c)
Passenger Loading Zones	R215	R310
Stairways and Escalators	R216	R408
Handrails	R217	R409
Doors, Doorways, and Gates	R218	
Ramps		R407

SCOPING AND TECHNICAL REQUIREMENTS

Figure 41-6A

41-6.04 Alterations

41-6.04(a) General

Where existing elements, spaces, or facilities are altered, each altered element, space, or facility within the scope of the project shall comply with the applicable requirements for new construction unless existing physical constraints exist. The alteration of multiple elements or spaces within a facility may provide a cost-effective opportunity to make the entire facility or a significant portion of the facility accessible.

Figure 41-6B provides a summary of some common alterations.

Type of Work	Alteration Required
Resurfacing (includes, but not limited to, addition of a new layer of asphalt, reconstruction, concrete pavement rehabilitation and reconstruction, open-graded surface course, microsurfacing and thin lift overlays, cape seals, and in-place asphalt recycling)	Correct non-compliant curb ramps and crosswalks
Remove and Replace Sidewalk (sidewalk patch, relocate poles or posts, etc.)	Replace with compliant (includes transition to non-compliant)
Curb & Gutter Replacement	Install curb ramps if replaced curb and gutter is at a pedestrian crossing with adjacent sidewalk
Pedestrian Signal (signal controller and software altered, or signal head replaced)	Installed Accessible Pedestrian Signals and accessible pushbutton
Restriping Parking Markings	Provide accessible spaces

ALTERATION REQUIRED BY TYPE OF WORK

Figure 41-6B

41-6.04(b) Existing Physical Constraints.

Where existing physical constraints make it impracticable for altered elements, spaces, or facilities to fully comply with the requirements for new construction, compliance is required to the extent practicable within the scope of the project. Existing physical constraints include, but are not limited to, underlying terrain, right-of-way availability, underground structures, adjacent developed facilities, drainage, or the presence of a notable natural or historic feature.

The LPA should document the various options considered, reasons for selecting, and any public comments received concerning an alteration to the extent practicable. Furthermore, the facility shall continue to be listed as a barrier in the LPA's self-evaluation.

41-6.04(c) Transitional Segments.

Transitional segments of an altered PARs shall connect to existing unaltered segments of pedestrian circulation paths. The transitional segment shall be removed when the existing unaltered section is altered in the future.

41-6.04(d) Reduction in Access Prohibited.

An alteration shall not decrease or have the effect of decreasing the accessibility of a facility or an accessible connection to an adjacent building or site below the requirements for new construction in effect at the time of the alteration. Sidewalk improvements that correct existing excessive cross slope should be carefully planned to avoid creating excessive slope in curb ramps or adding a step at existing building entrances. Solutions may include:

1. Split sidewalks that serve building entrances and street or highway at separate levels;

2. Sidewalks with greater cross slope along the curb and PARs with lesser cross slope along building fronts;

3. PARs along the curb and ramped entrances to buildings.

41-6.04(e) Alterations to Qualified Historic Facilities.

Where the State Historic Preservation Officer or Advisory Council on Historic Preservation determines that compliance with a requirement would threaten or destroy historically significant features of a qualified historic facility, compliance shall be required to the extent that it does not threaten or destroy historically significant features of the facility.

Where there is a federal agency "undertaking", as defined in 36 CFR 800.16 (y), the requirements in section 106 of the National Historic Preservation Act (16 U.S.C. 470f) and 36 CFR part 800 apply. Location of a facility within an historic district by itself does not excuse compliance with the requirements in this document. The State Historic Preservation Officer or Advisory Council on Historic Preservation must determine that compliance would threaten or destroy historically significant features of the facility. Reproductions or replications of historic facilities are not qualified historic facilities.

41-6.05 Pedestrian Access Route

A PAR shall be provided within sidewalks and other pedestrian circulation paths located in the public right-of-way. The pedestrian access route shall connect to accessible elements, spaces, facilities, and to other accessible routes not within the public right-of-way.

PARs shall consist of one or more of the following: sidewalks and other pedestrian circulation paths, or a portion of sidewalks and other pedestrian circulation paths; pedestrian street crossings and at-grade rail crossings; pedestrian overpasses and underpasses and similar structures; curb ramps and blended transitions; ramps; elevators and limited use/limited application elevators; platform lifts; and doors, doorways, and gates.

41-6.06 Alternate Pedestrian Access Route

When a pedestrian circulation path is temporarily closed by construction, alterations, maintenance operations, or other conditions, an alternate PAR shall be marked and/or provided. Any pedestrian barricades and channelizing devices shall comply with the *ILMUTCD.*

The *ILMUTCD* recommends that whenever possible, work should be done in a manner that does not create a need to detour pedestrians from existing pedestrian routes. Extra distance and additional pedestrian street crossings add complexity to a trip and increase exposure of risk to accidents.

41-6.07 Curb Ramps and Blended Transitions

A curb ramp, blended transition, or a combination of curb ramps and blended transitions shall be installed to allow pedestrians to continue through pedestrian street crossings, alleys, or driveways. The curb ramp (excluding any flared sides) or blended transition shall be contained wholly within the width of the crossing served. In alterations where existing physical constraints prevent a curb ramp at each crossing, a single diagonal curb ramp shall be permitted to serve both pedestrian street crossings.

There are two types of curb ramps:

- Perpendicular curb ramps have a running slope that cuts through or is built up to the curb at right angles, or meets the gutter break at right angles where the curb is curved. On large corner radiuses, it will be necessary to indent the gutter break on one side of the curb ramp in order for the curb ramp to meet the gutter break at right angles.
- Parallel curb ramps have a running slope that is in-line with the direction of sidewalk travel and lower the sidewalk to a level turning space where a turn is made to enter the pedestrian street crossing.
- Parallel and perpendicular curb ramps may be combined. A parallel curb ramp is used to lower the sidewalk to a mid-landing and a short perpendicular curb ramp connects the landing to the street.

Blended transitions are similar to curb ramps. However, blended transitions have a less severe running slope and some other differences from curb ramp design. Raised pedestrian street crossings are considered blended transitions. Blended transitions are suitable for a range of sidewalk conditions and should be considered at level intersections.

The Department has developed a series of highway standards that provide the requirements for curb ramp and/or blended transition construction. However, these standards may not provide the contractor and LPA construction supervisor with enough information to ensure accessibility compliance at locations with severe slopes, existing site constraints, or other unique situations. Therefore, the LPA should consider providing plan details for each corner where curb ramps or blended transitions are being constructed.

41-6.08 Detectable Warning Surfaces

41-6.08(a) General

Detectable warning surfaces indicate the boundary between pedestrian and vehicular routes where there is a flush rather than a curbed connection and shall be provided at the following locations on the PAR and at transit stops:

- Curb ramps and blended transitions at pedestrian street crossings;
- Pedestrian refuge islands (minimum width 6 ft);
- Pedestrian at-grade rail crossings not located within a street or highway;
- Boarding platforms at transit stops for buses and rail vehicles where the edges of the boarding platform are not protected by screens or guards; and

- Boarding and alighting areas at sidewalk or street level transit stops for rail vehicles where the side of the boarding and alighting areas facing the rail vehicles is not protected by screens or guards.

Detectable warning surfaces should not be provided at crossings of residential driveways, since the pedestrian right-of-way continues across residential driveway aprons. However, where commercial driveways are provided with yield or stop control, detectable warning surfaces should be provided at the junction between the pedestrian route and the vehicular route.

41-6.09 Pedestrian Street Crossing

All pedestrian street crossings shall be accessible to pedestrians with disabilities. Where pedestrian signals are provided at pedestrian street crossings, they should consider accessible pedestrian signals

41-6.10 Protruding Objects

Objects along or overhanging any portion of a pedestrian circulation path shall not reduce the clear width required for the PAR.

41-6.11 Signs

Where audible sign systems and other technologies are used to provide information equivalent to the information contained on pedestrian signs and transit signs, the signs are not required to comply with accessibility requirements.

Audible sign systems and other technologies that provide information equivalent to the information contained on signs are more usable by pedestrians who are blind or have low vision. Remote infrared audible signs that transmit information to portable devices that are carried by and audible only to the user are an example of audible sign systems and other technologies.

41-6.12 Transit Stops and Transit Shelters

Where provided (regardless of who provides), transit stops and transit shelters shall comply with accessibility requirements.

Transit stops in the public right-of-way typically serve fixed route bus systems, including bus rapid transit systems, and light rail transit systems. Signs that identify the routes served by the transit stop shall comply with the technical requirements for visual characters on signs unless audible sign systems or other technologies are used to provide the information. The FHWA has issued guidance on the obligations of state transportation departments, metropolitan planning organizations, and transit agencies to coordinate the planning and funding of accessibility improvements to transit systems and facilities.

41-6.13 On-Street Parking

41-6.13(a) General

Where on-street parking is provided on the block perimeter and the parking is marked or metered (including pay stations), accessible parking spaces shall be provided. Where parking pay stations are provided and the parking is not marked, each 20.0 ft (6.1 m) of block perimeter where parking is permitted shall be counted as one parking space. Figure 41-6C specifies how many accessible parking spaces shall be provided on the block perimeter where on-street parking is marked or metered.

Accessible parking spaces shall be identified by signs complying with the *ILMUTCD*. Accessible parking spaces should be located where the street has the least crown and grade and close to key destinations.

Total Number of Marked or Metered Parking Spaces on the Block Perimeter	Minimum Required Number of Accessible Parking Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 and over	4 percent of total

ON-STREET PARKING SPACES

Figure 41-6C

41-6.13(b) Signage

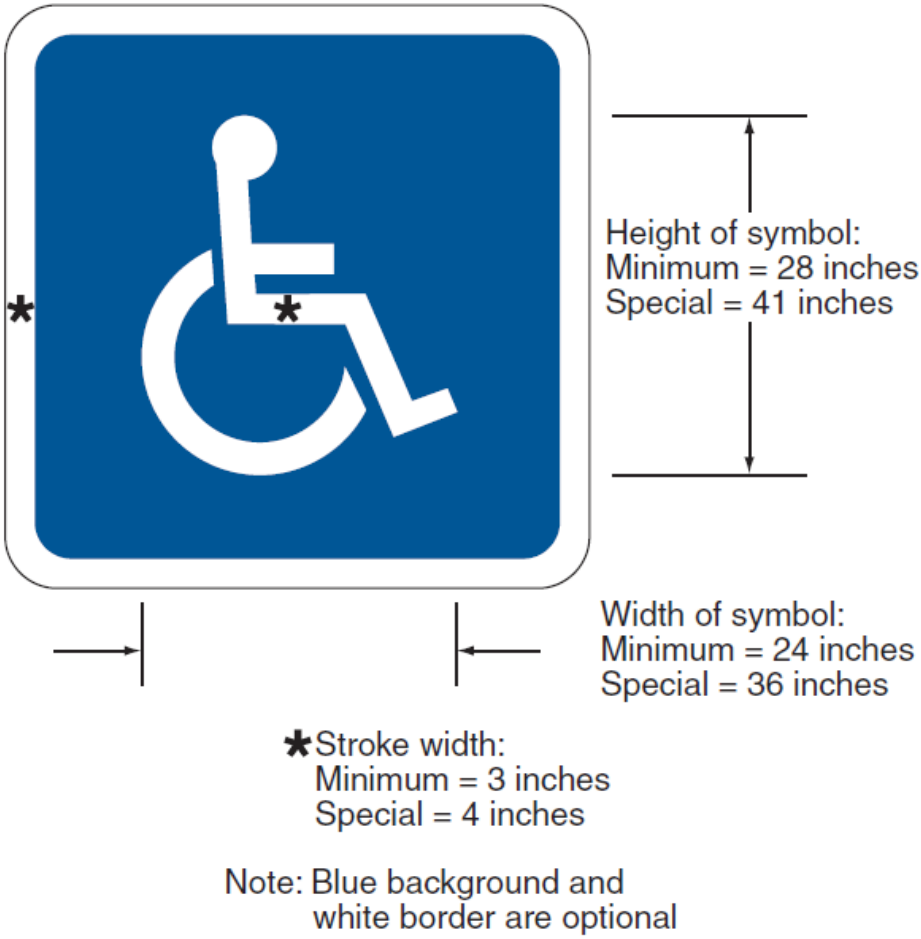
Accessible parking spaces shall be designated with a ground-mounted RESERVED PARKING for persons with disabilities (R7-8) sign with the $____ FINE (R7-I101) supplemental plaque. The amount of the fine shall be as established by 625 ILCS 5/11-1301.3(c). Signs shall be 7 ft (2.0 m) minimum above the finish floor or ground surface measured to the bottom of the sign, and no more than 2 ft (0.6 m) horizontally from the face of curb. Signs shall be located at the head or foot of the parking space so as not to interfere with the operation of a side lift or a passenger side transfer.

41-6.13(c) Pavement Marking

1. Color. Accessible parking spaces and access aisles shall be designated with white pavement marking and may be supplemented with blue pavement markings.
2. Width. Pavement marking shall be 3 in (75 mm) to 6 in (150 mm) wide.

3. Access Aisle. When required, the access aisle shall be marked with 45 degree diagonal lines. The diagonal lines should be 3 in (75 mm) to 6 in (150 mm) wide and separated by gaps of 12 in (300 mm) to 36 in (900 mm). The gap between the lines should not exceed 6 times the width of the diagonal lines.

4. Symbol. The international symbol of accessibility should be used to provide additional emphasis. See Figure 41-6D.



INTERNATIONAL SYMBOL OF ACCESSIBILITY FOR PAVEMENT MARKING

Figure 41-6D

41-6.13(d) Dimensions

Where parking spaces are marked with lines, width measurements of parking spaces and access aisles shall be made from the centerline of the markings. The required size of parking spaces and access aisles shall be determine by the type of parking space.

41-6.13(e) Curb Ramps or Blended Transitions

Curb ramps or blended transitions complying with Section 41-6.07 shall connect the access aisle to the PAR. Curb ramps shall not be located within the access aisle. At parallel parking spaces, curb ramps and blended transitions should be located so that a van side-lift or ramp can be deployed to the sidewalk and the vehicle occupant can transfer to a wheelchair or scooter. Parking spaces at the end of the block face may be served by curb ramps or blended transitions at the pedestrian street crossing, provided that the curb ramp is not accessed from a travel lane.

Detectable warning surfaces are not required on curb ramps and blended transitions that connect the access aisle to the sidewalk, including where the sidewalk is at the same level as the parking spaces, unless the curb ramps and blended transitions also serve pedestrian street crossings.

41-6.14 Off-Street Parking

41-6.14(a) General

Accessible parking spaces for individuals with disabilities and accessible passenger loading zones that serve a particular building shall be the spaces or zones closest to the nearest accessible entrance on a PAR. In separate parking facilities that do not serve a particular building, locate parking spaces for individuals with disabilities on the shortest possible circulation route to an accessible pedestrian entrance of the parking facility. In buildings with multiple access entrances with adjacent parking, accessible parking spaces may be dispersed and located closest to the accessible entrances. The total number of accessible parking spaces may be distributed among parking facilities, if greater accessibility is achieved in consideration of such factors as anticipated usage, number and location of entrances and level parking areas. Figure 41-6E specifies how many accessible parking spaces shall be provided.

Each parking space shall have its own access aisle and all access aisles shall blend to a common level with an accessible route. Parking spaces and access aisles shall be level with surface slopes not exceeding 1:50 (2.0%) in all directions. Minimum vertical clearance of 98 in (2490 mm) at the parking space and along at least one vehicle access route to such spaces from site entrance(s) and exit(s) shall be provided.

Total Number of Marked or Metered Parking Spaces on the Block Perimeter	Minimum Required Number of Accessible Parking Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2 percent of total
1001 and over	20, plus 1 for each 100, or fraction thereof, over 1000

OFF-STREET PARKING SPACES

Figure 41-6E

41-6.14(b) Signage

See Section 41-6.13(b).

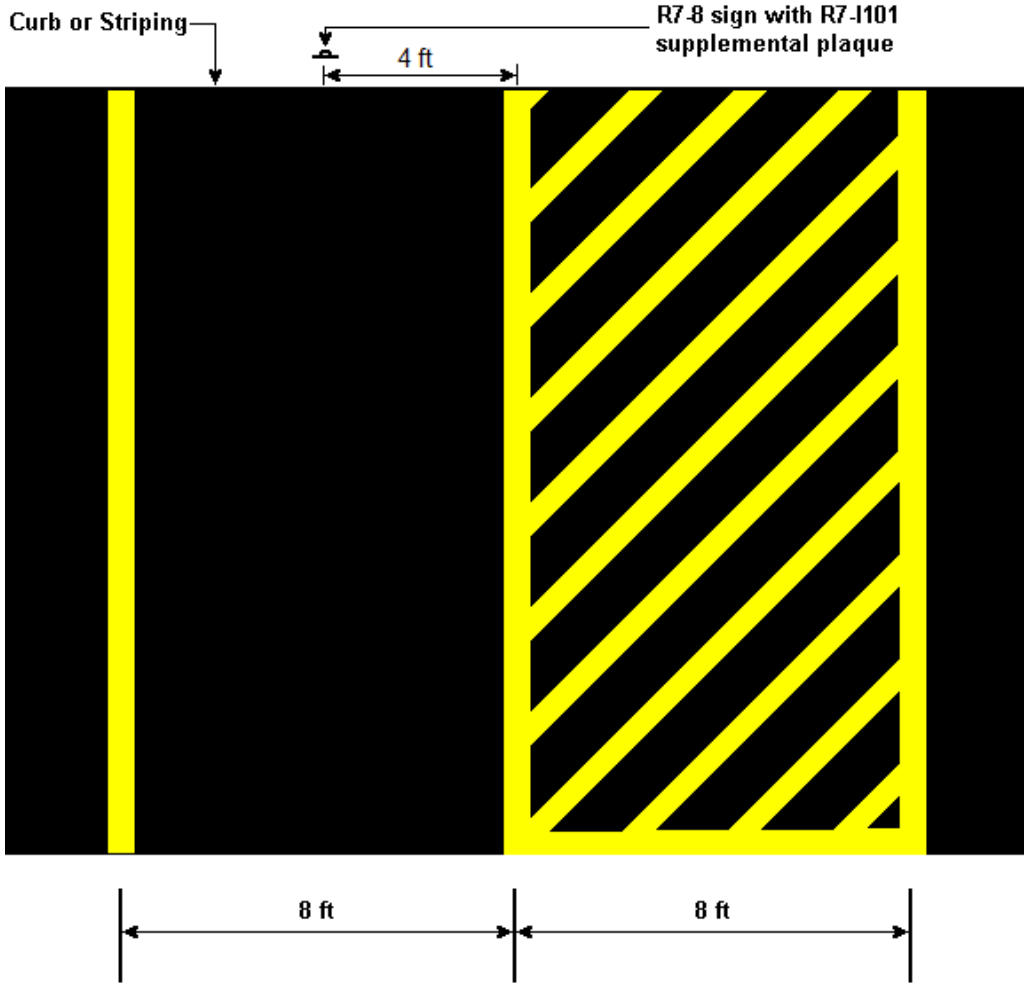
41-6.14(c) Pavement Marking

1. Color. Accessible parking spaces and access aisles shall be designated with yellow pavement marking.
2. Width. See Section 41-6.13(c).
3. Access Aisle. See Section 41-6.13(c).
4. Symbol. See Section 41-6.13(c).

41-6.14(d) Dimensions

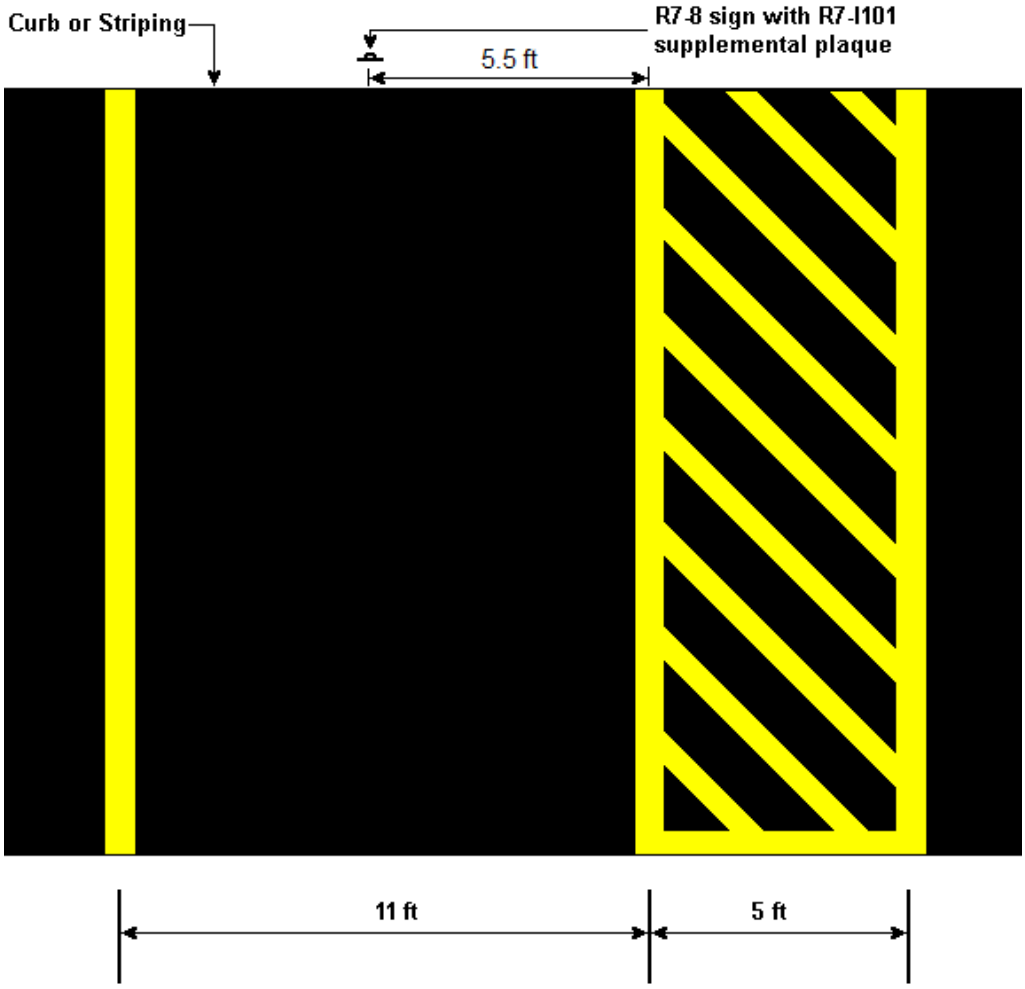
An accessible parking space shall consist of a 16 ft (4.9 m) wide parking space, which includes an 8 ft (2.4 m) wide access aisle (See Figure 41-6F). In the alternative, an accessible space may be 16 ft (4.9 m) wide, including a space 11 ft (3.4 m) wide with a 5 ft (1.5 m) access aisle (See Figure 41-6G).

A common access aisle shall not be shared between adjacent parking spaces. Access aisles shall be permitted to be placed on either side of the parking space except for angled parking spaces, which shall have access aisles located on the passenger side of the parking space.



STANDARD OFF-STREET ACCESSIBLE PARKING SPACES

Figure 41-6F



UNIVERSAL PARKING DESIGN OFF-STREET ACCESSIBLE PARKING SPACES

Figure 41-6G

41-6.15 Passenger Loading Zones

Where passenger loading zones other than transit stops are provided, at least one accessible passenger loading zone shall be provided for each 100.0 ft (30 m) of continuous loading zone space or fraction thereof. Accessible passenger loading zones must be identified by signs displaying the International Symbol of Accessibility.

41-6.16 Other

Where provided on pedestrian circulation paths, Stairways and Escalators (shall not be part of a PAR), Handrails, Doors, Doorways, and Gates; and Ramps shall comply with accessibility requirements.

41-7 HIGHWAY LIGHTING

41-7.01 Guidelines for Justifying Highway Lighting

Providing lighting for all highway facilities is neither practical nor cost effective. It is generally only practical to provide highway lighting where justified based on sound engineering judgment and on the criteria, recommendations, and principles presented in the AASHTO publication *Guidelines for Highway Lighting.*

For a highway facility to be considered for lighting, the lighting system must be both economically feasible and justified based on the applicable criteria presented in the following Sections. The impacts of local conditions (e.g., frequent fog, ice, snow, roadway geometry, ambient lighting, sight distance, signing) also should be considered when analyzing highway lighting needs.

41-7.01(a) Analyzing Highway Lighting Needs

The AASHTO publication *Guidelines for Highway Lighting* presents an empirical approach to analyzing highway lighting needs with primary application to freeway-type facilities. The principal considerations are vehicular traffic volume, land development, and artificial lighting conditions in the area surrounding the roadway, and the night-to-day crash ratio. The affect of these factors on driver visibility should be considered in the lighting needs analysis.

A supplemental approach to analyzing highway lighting needs, based primarily on an analytical evaluation of driver information, is published in NCHRP Report No. 152 *Warrants for Highway Lighting*. This publication has application to both urban-type facilities (e.g., streets, arterials, intersections). In urban areas where the analyst may find difficulty in applying the AASHTO empirical approach, Report No. 152 offers an alternative approach for analyzing highway lighting needs.

41-7.01(b) Lighting of Streets and Highways

Urban and rural conditions, traffic volumes (both vehicular and pedestrian), intersections, turning movements, signalization, channelization, and varying geometrics are factors that should be considered when determining the lighting needs of streets and highways. Consider the following:

1. Facilities with Raised Medians. Consider highway lighting along sections of facilities that have raised medians.

2. Major Urban Arterials. Consider highway lighting along all major arterials that are located in urban areas.

3. Intersections. Consider intersection lighting at rural intersections that meet any one of the following conditions:

    - there are 2.4 or more crashes per million vehicles in each of 3 consecutive years;

- there are 2.0 or more crashes per million vehicles per year and 4 or more crashes per year in each of 3 consecutive years;
- there are 3.0 or more crashes per million vehicles per year and 7 or more crashes per year in each of 2 consecutive years;
- the intersection is signalized and there have been, in the past year, 5 or more reported nighttime crashes and a day-to-night crash ratio of less than 2.0;
- substantial nighttime pedestrian volume exists;
- less than desirable alignment exists on any of the intersection approaches;
- the intersection is an unusual type requiring complex turning maneuvers;
- commercial development exists in the vicinity that causes high nighttime traffic peaks;
- distracting illumination exists from adjacent land development; and/or
- recurrent fog or industrial smog exists in the area.

Isolated intersections located within the fringe of corporate limits that are suburban or rural in character may be illuminated provided they meet the above criteria.

4. High Conflict Locations. Consider providing lighting along roadway sections with high vehicle-to-vehicle interactions (e.g., sections with numerous driveways, significant commercial or residential development, and high percentage of trucks). Lighting generally improves traffic safety and efficiency at these locations.

5. Complex Roadway Geometry. Consider providing lighting at spot locations in rural areas where the driver is required to pass through a roadway section with complex geometry.

6. Night-To-Day Crash Ratio. Lighting should be considered at locations or sections of streets and highways where the night-to-day ratio of crash rates is higher than the statewide average for similar locations, and a study indicates that lighting may be expected to significantly reduce the night crash rate. The number of nighttime crashes also should be evaluated.

7. LPA Needs. Lighting should be provided where the LPA finds sufficient benefit in the forms of convenience, safety, policing, community promotion, public relations, etc., to pay the installation, maintenance, and operation of the lighting facilities.

41-7.01(c) Lighting of Bridge Structures and Underpasses

Because of their typical configuration and length-to-height ratio, underpasses generally have good daylight penetration and do not require supplemental daytime lighting. Underpass lighting generally is installed to enhance driver visibility after daylight hours. When the length-to-height ratio of the underpass exceeds approximately 10:1, it usually is necessary to analyze specific geometry and roadway conditions, including vehicular and pedestrian activity, to determine the need for supplemental daytime lighting.

On highways that are not continuously lighted, consider providing underpass lighting where frequent nighttime pedestrian traffic exists through the underpass or where unusual or critical geometry exists within or on an approach to the underpass.

Provide underpass lighting on all highways that are continuously lighted. Favorable positioning of conventional highway luminaires adjacent to a relatively short underpass often can provide adequate illumination within the underpass without a need to provide supplemental lighting. If this action is considered, ensure that shadows cast by the conventional luminaires do not become a visibility problem within the underpass.

41-7.01(d) Other Locations

Provide lighting for all pedestrian underpass and pedestrian tunnel facilities. In addition, the need to provide lighting for the following facilities will be determined on a case-by-case basis:

- commuter park-and-ride lots,
- bike paths,
- pedestrian walkways, and
- pedestrian overpasses.

41-7.01(e) Roadway Reconstruction

During roadway reconstruction projects, existing highway lighting should be evaluated and upgraded or removed, if necessary, to meet current highway lighting criteria.

41-7.01(f) Ornamental Lighting

Ornamental lighting is lighting provided along the roadway for purposes other than highway lighting. There are some ornamental lighting luminaires with distribution patterns that will control the light and meet AASHTO requirements. A LPA may provide ornamental lighting if the minimum requirements are met.

41-7.02 Highway Lighting Procedures

Consider street lighting at all intersections and continuous street lighting heavily built up areas, particularly on collector and arterial streets. Determinations on lighting should be coordinated with crime protection and other community needs.

Use the following guidelines in the design and submittal of street lighting projects to be maintained by a LPA. The design of street lighting systems should be as recommended in the AASHTO publication, *Guidelines for Highway Lighting.* ANSI/IESNA *American National Standard Practice for Roadway Lighting* also presents guidelines for highway lighting.

Previous design criteria may be used if the proposed work is a part of an overall street lighting improvement already begun. Traffic safety should be given consideration in the physical design of lighting systems. In additions, certain characteristics (e.g., traffic speed, type of parking, type of curb, location of sidewalk) should govern the pole type and setback.

It is important to analyze charges for energy consumed by various lighting types (i.e., high-pressure sodium, low-pressure sodium, metal halide). Note that 55% to 75% of maintenance and operational costs are for electricity.

Generally, breakaway or frangible supports are recommended whenever the support is exposed to traffic. An exception would be a situation where a falling support would create a greater hazard than that of a vehicle striking a non-breakaway support. Selection of the proper light support to be used is discussed in AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

Street lighting projects to be maintained by the State shall be designed in accordance with Chapter 56 of the *BDE Manual*.

41-8 MAIL DELIVERY

Mailboxes and newspaper tubes served by carriers in vehicles may constitute a safety hazard, depending upon the placement of the mailbox and the width of the turnout. Therefore, the designer should make every reasonable effort to replace all non-conforming mailboxes and turnouts with designs that meet the criteria in the *BLRS Highway Standards*, 605 ILCS 5/5-411, 605 ILCS 5/6-412, and the AASHTO *A Guide for Erecting Mailboxes on Highways*.

41-8.01 Location

Mailboxes and turnouts should be placed for maximum convenience to the patron, consistent with safety considerations for highway traffic, the carrier, and the patron. Consider the following:

1. Intersections. Placing a mail stop near an intersection will have an effect on the operation of the intersection (e.g., reduction of intersection sight distance, blocked lanes). The nature and magnitude of this impact depends on traffic speeds, volumes on each of the intersecting roadways, the number of mailboxes at the stop, type of traffic control, how the stop is located relative to the traffic control, and the distance the stop is located from the intersection. Figure 41-8A provides the recommended minimum clearance distances to mailbox stops near intersections.

2. Near-Side/Far-Side at Driveways. On rural two-lane highways where a single mailbox installation is required, the near-side turnout is preferable because this design allows the postal patron to pull up to the mailbox and then to turn into the driveway without backing up. If there is a need for multiple mailbox installations at one location, the far-side turnout is preferable because all postal patrons except for one can pull into the turnout and then drive out and proceed to their homes.

3. Right or Left Side. Only place boxes on the right-hand side of the highway in the direction of travel of the carrier, except on one-way streets where they may be placed on the left-hand side.

4. Guardrail. Where a mailbox is installed in the vicinity of an existing guardrail and where practical, place the mailbox support behind the guardrail. Allow for deflection of the guardrail.

5. Suburban/Urban Areas. A potential problem frequently occurs where a roadway section with shoulder originally existed and where the roadway is reconstructed to a curb and gutter cross section. Previously, the mail carrier would have delivered mail from a vehicle by driving along the shoulder. With the reconstruction to a curb and gutter section, the mail now has to be delivered by driving on the pavement adjacent to the curb and gutter. A curb and gutter section 30 ft (9 m) wide provides adequate width for a vehicle to pass a stopped mail carrier in a vehicle. Under certain conditions, mail delivery along a curb and gutter roadway has the potential to be hazardous. The factors that could contribute to a potential problem along the street are high-operating speeds, the number of through and turning lanes, and the amount of congestion due to traffic volumes. To alleviate the potential for mail delivery problems where a curb and gutter cross section is proposed, the LPA should work closely with local postmaster during the development of the project. In many cases, after coordination with a postmaster is completed, the designer will determine that the potential for mail delivery problems is minor and no special design features are needed. However, where the potential for mail delivery problems is determined to be significant, it may be possible to modify rural type delivery on streets with curb and gutter by considering the following:

   a. Grouping. Where there are a number of closely spaced houses located along a highway, it may be desirable to group 2, 4, or 6 mailboxes at one location as shown on Figures 41-8B and 41-8C.

   b. Neighborhood Delivery and Collection Box Unit (NDCBU). NDCBU is a cluster of 8 to 16 locked boxes mounted on a pedestal or within a framework. These clusters can weigh between 100 lbs to 200 lbs (45 kg to 90 kg) and may be a roadside hazard. Therefore, they should be located outside the clear zone in rural areas and preferably on a side street in urban areas. Usually, NDCBU is located in trailer parks, apartment complexes, and new residential subdivisions. However, note that postal patrons usually do not like this solution in older established neighborhoods.

   c. Park and Loop Routes. Request the mail carrier to park his/her vehicle on a side street, walk the block, and return to the vehicle.

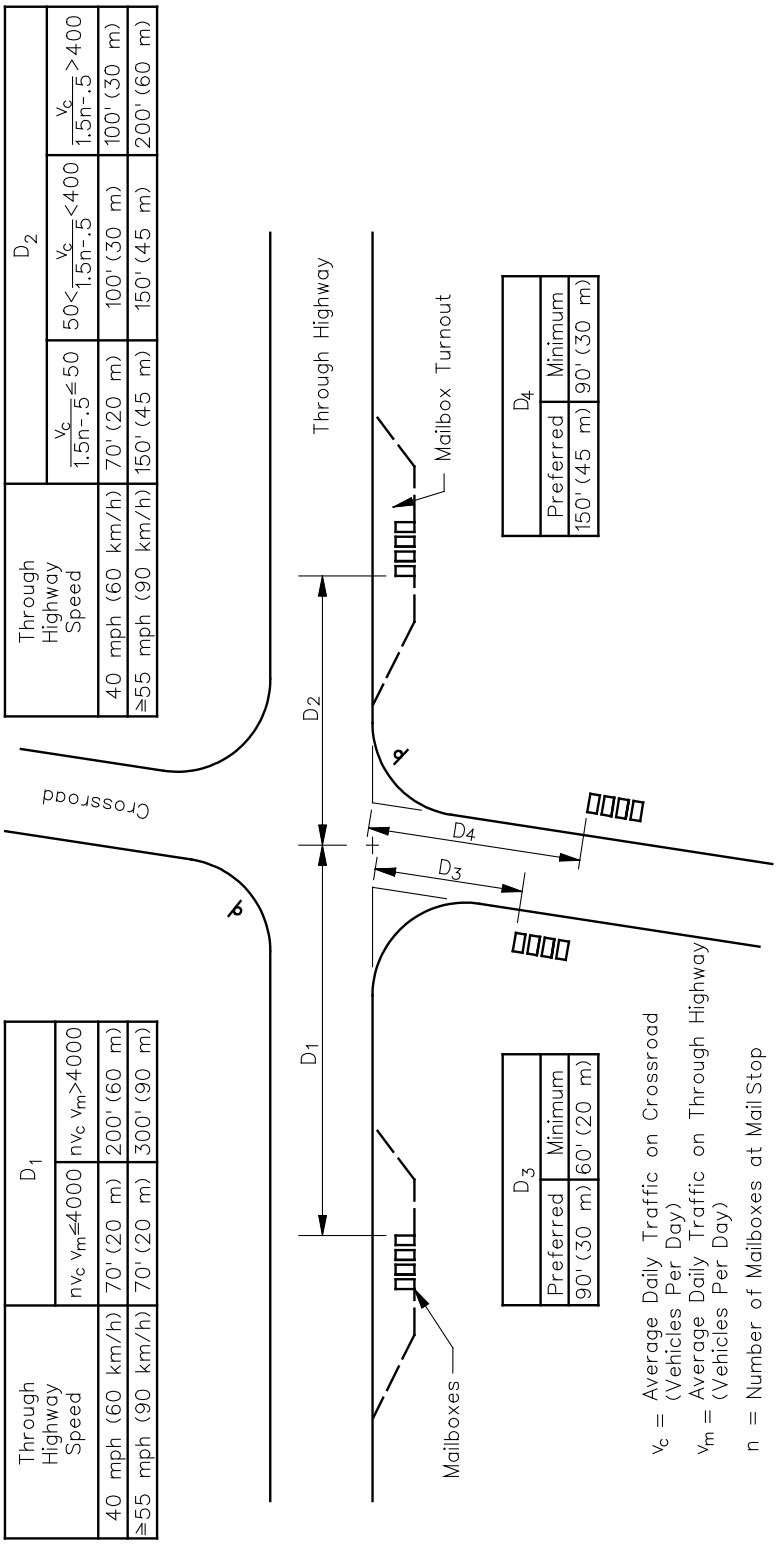
   d. Paved Shoulder. Provide a continuous 6 ft (1.8 m) paved shoulder with curb and gutter located behind the shoulder. This alternative is expensive and right-of-way may not be available in many cases. However, this design allows for mail carriers, garbage trucks, and delivery trucks to avoid parking in the traffic lane.

   e. Construction. If during the preparation of the plans it is determined that temporary locations will be required for mail delivery during construction, provide the necessary details in the plans and special provisions.

      Where a satisfactory mail delivery solution cannot be reached between all parties involved, contact the Delivery Programs Support Analysts at one of the US Postal Services' district offices at the following locations:

      - For northern Illinois, contact the postal official at (630) 260-5260.
      - For central Illinois, contact the postal official at (708) 563-7360.

- For southern Illinois, contact the Midwest Area Office in St. Louis at (314) 692-5426.



Through Highway Speed	D_1	
	$nv_c\ v_m \leq 4000$	$nv_c\ v_m > 4000$
40 mph (60 km/h)	70' (20 m)	200' (60 m)
≥55 mph (90 km/h)	70' (20 m)	300' (90 m)

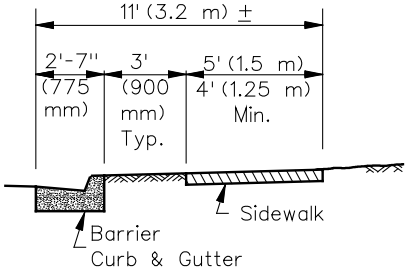
Through Highway Speed	D_2		
	$\frac{v_c}{1.5n-.5} \leq 50$	$50 < \frac{v_c}{1.5n-.5} < 400$	$\frac{v_c}{1.5n-.5} > 400$
40 mph (60 km/h)	70' (20 m)	100' (30 m)	100' (30 m)
≥55 mph (90 km/h)	150' (45 m)	150' (45 m)	200' (60 m)

D_3	
Preferred	Minimum
90' (30 m)	60' (20 m)

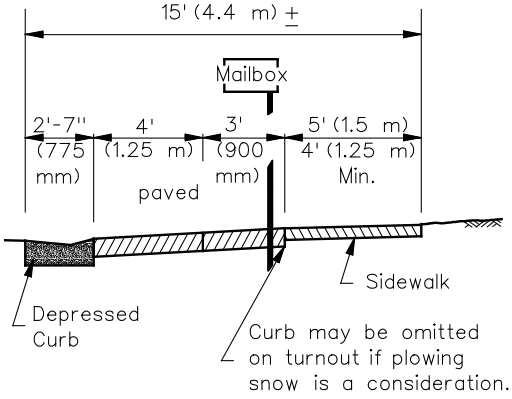
D_4	
Preferred	Minimum
150' (45 m)	90' (30 m)

RECOMMENDED MINIMUM CLEARANCE DISTANCES TO MAILBOX STOPS NEAR INTERSECTIONS

Figure 41-8A

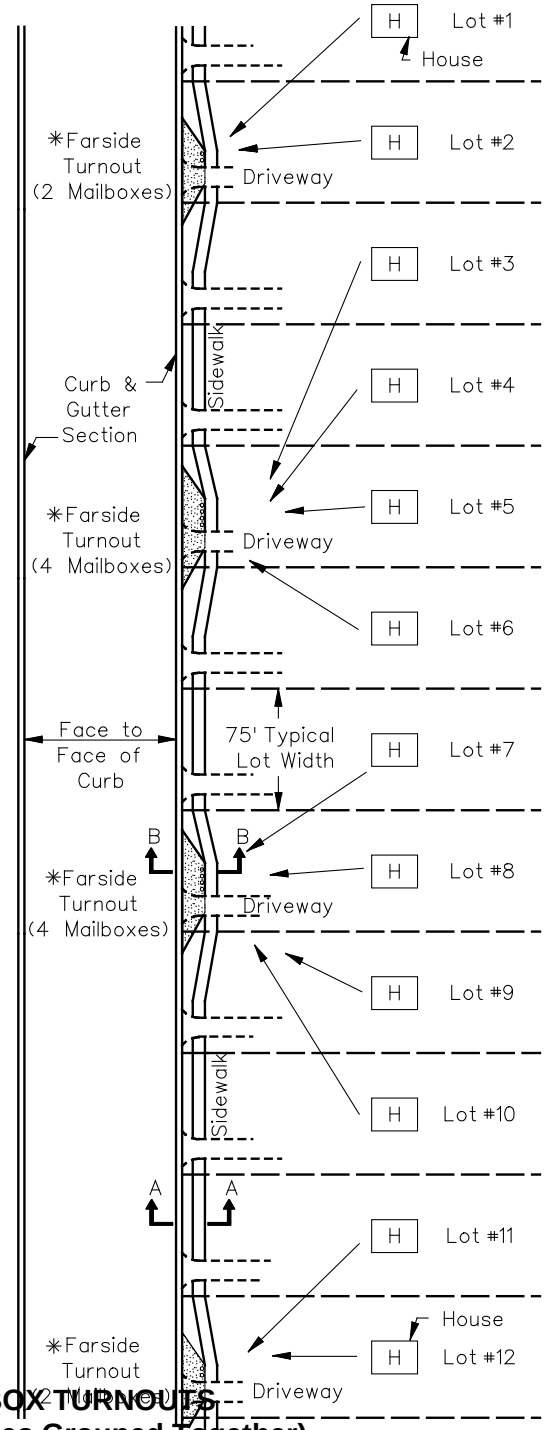


Section A-A



Section B-B

✳Note: Farside turnouts are preferable from a traffic operations standpoint. Nearside locations may be considered after discussions with homeowners and the local postmaster.



URBAN MAILBOX TURNOUTS
(Two or Four Mailboxes Grouped Together)

Figure 41-8B

URBAN MAILBOX TURNOUTS
(Six Mailboxes Grouped Together)

Figure 41-8C

41-8.02 Mailbox Turnout Designs

The *IDOT Highway Standards* provide the geometric design criteria for rural mailbox turnouts. The designer should also consider the following:

1. Stopping Sight Distance. Ensure that there is sufficient stopping sight distance in advance of the mailbox turnout.

2. Width. The minimum width of a mailbox turnout should be in accordance with the BLR Standard for Mailbox Turnouts on Local Roads.

3. Narrow Shoulders. Widening and/or resurfacing of highways may result in shoulder widths that are too narrow for mailbox turnouts. In these cases, it will be necessary to widen out the shoulder at the mailbox location to provide the minimum width and, in some cases, installing a sufficient length of pipe culvert to provide for roadside drainage.

4. Surface. The following will apply:

    a. County Roads. For turnouts along county roads with all weather surfaces, provide an all-weather surface (605 ILCS 5/5-411).

    b. Township and Road District Roads. For township and road district roads that have an all-weather surface, also provide this surface to the mailbox if funds are available (605 ILCS 5/6-412).

5. Special Designs. Due to the multitude of different conditions, the standard mailbox turnout designs may not always be practical and a special design must be used. This is especially true in urban and suburban areas.

41-8.03 Mailbox Supports

41-8.03(a) Removal of Hazardous Supports

Removal and replacement of mailboxes can be a sensitive issue and should be reviewed with the local postal authorities and the postal patron. The process for evaluating the removal and replacement of these supports discussed in Section 22-2 as required for Federal-funded projects and may be used for other projects.

41-8.03(b) Mailbox Designs

In determining acceptable mailbox designs, consider the following:

1. Heights. Mailbox heights are usually located so that the bottom of the box is 3 ft (1.0 m) to 4 ft (1.2 m) above the mail stop surface.

2. Mailbox Supports and Attachment Design. The post-to-box attachment details should be of sufficient strength to prevent the box from separating from the post top if a vehicle strikes the installation. For guidance on mailbox posts, supports, and attachments, see the AASHTO *A Guide for Erecting Mailboxes on Highways*.

3. Multiple Mailboxes. Due to the possibility of spearing of windshields by the horizontal support, it is desirable to individually mount each mailbox on a separate support. However, it may be acceptable to mount multiple mailboxes on one support if it meets the criteria in the AASHTO *A Guide for Erecting Mailboxes on Highways*. No more than two mailboxes may be mounted on a support structure unless the support structure and mailbox arrangement have been shown to be safe by crash testing. However, lightweight newspaper boxes may be mounted below the mailbox on the side of the mailbox support. To reduce the possibility of ramping, multiple mailboxes supports should be separated by a distance at least equal to three-fourths of their height above ground.

4. Foundations. Do not set mailbox supports in concrete unless the support design has been shown to be safe by crash tests when so installed. Do not embed the post more than 2 ft (600 mm) into the ground. Do not fit a metal post with an anchor plate; however, it may have an anti-twist device that extends no more than (10 in) 250 mm below the ground surface.

5. Post Sizes. The following posts sizes are generally considered to be acceptable:

   - a single 4 in x 4 in (100 mm x 100 mm) square wooden post,
   - a 4 in (100 mm) diameter wooden post, or
   - a metal post with strength no greater than a 2 in (50 mm) diameter standard strength steel pipe.

41-9 NOISE BARRIERS

41-9.01 General

Properly constructed noise barriers (e.g., earth berms, structural walls) in combination with landscaping, whether within or outside the highway right-of-way, can reduce excessive noise levels. Thick dense wooded areas with no visual path between the highway and the affected site can also reduce noise levels. However, trees by themselves do not prove to be a good noise barrier unless they have a very dense mass. Rows of buildings and houses can reduce noise impacts on subsequent rows of buildings and houses.

41-9.02 Design Considerations

The FHWA's *Highway Traffic Noise Analysis and Abatement Policy and Guidance* provides guidelines and design considerations for noise barriers.

41-9.03 Roadside Safety

Chapter 35 provides the design criteria for clear zones. If practical, noise barrier walls should be placed outside of the applicable clear zone value. Otherwise, guard rail should be considered to shield the wall from run-off-the-road vehicles. The designer must ensure that adequate deflection distance is available between the guard rail and noise barrier. Chapter 35 discusses the design of guardrail in detail.

If the noise barrier is a mound of dirt, the toe of the barrier should be traversable by a run-off-the-road vehicle.

41-9.04 Sight Distance

For at-grade intersections, noise barriers should not be located in the triangle required for corner sight distance. Section 28-3 provides the criteria to determine the required sight distance triangle.

Noise barriers can also impact sight distance along horizontal curves. Section 29-5 provides the detailed criteria to determine the middle ordinate value that will yield the necessary sight distance. The location of the noise barrier must be outside of this value.

41-9.05 Right-of-Way

The noise barrier must be located within the highway right-of-way.

41-9.06 Interference with Roadside Appurtenances

A noise barrier may be constructed on a new or on an existing highway. Its proposed location could interfere with proposed or existing roadside features, including signs, sign supports, utilities, and illumination facilities. The designer must determine if the noise barrier impacts these features.

41-10 LANDSCAPING AND EROSION CONTROL

41-10.01 Landscape Plantings General Information

Highway landscape plantings are the living component of the highway design and, through the use of native and non-native materials, provide the means to fully integrate the highway with the surrounding environment. Landscape plantings will serve as functional elements (e.g., erosion control, screening, sound abatement, snow control) in the highway environment.

41-10.01(a) Plant Selection

The plants selected generally should be characteristic, native, or indigenous to the specific locality. Consider the following guidelines:

1. Native Plants. Native plants are effective in perpetuating a self-sustaining roadside landscape. They are adapted to regional environmental conditions and can survive extreme temperatures, wind, and rainfall without additional irrigation or fertilizer.

2. Non-Native Plants. Non-native plants may be selected to achieve special effects (e.g., color, texture, growth habit) for emphasis. For example, non-native plants could be used in urban areas to accentuate an artificial manmade environment. Another example would be to use non-native material to screen the unsightly view of a junkyard.

3. Plant Maintenance. Maintenance is a major consideration in landscape plant selection. Strive to choose those plants that require a minimum of maintenance.

41-10.01(b) Prohibited Plants

The following plants are banned from use on highway projects in Illinois:

1. Ash Tree (*Fraxinus spp.*). Due to federal Emerald Ash Borer quarantine established by the United States Department of Agriculture, highway plans should not include any species of ash tree (*Fraxinus spp.*).

41-10.01(c) Hardiness

Select plants for a particular section of roadway based on their climatic and soil requirements. In Illinois, climatic conditions and soil types are favorable to both southern and northern plant groups. Conduct a study of soils, climate, and existing plant growth in the area when planning each planting project. Plant hardiness zones will be as stated in the *IDOT Standard Specifications*. Use the USDA Plant Hardiness Zone Map, latest edition, when selecting plant material for any project.

41-10.01(d) Size

The size at which a plant matures will determine the number of plants that will be required in a group planting. Consider the following guidelines:

1. Younger Plants. Younger plants generally establish themselves faster than older plants. As a general practice, specify the smallest size of plants that is consistent with the requirements of the environment.

2. "Balled and Burlapped" Planting. Specify all deciduous trees larger than 1.5 in (40 mm) in diameter or 5 ft (1.5 m) in height as "balled and burlapped" at the time of planting. Also, specify this method of planting for plants that, according to good horticultural practice, require a ball of earth. It is acceptable to specify container-grown material in lieu of "balled or burlapped" plants as an alternative. The relationship of the plant size to the soil ball size or the container size will be as stated in the *IDOT Standard Specifications*.

3. Perennial Plants. Perennial plants can be planted as bulbs, tubers, or container plants. Bulbs and tubers should be of a size large enough to produce a healthy plant and to flower the first year. Container plants should be well rooted in the container. A quart sized container is usually the smallest size that should be planted on highway projects.

4. Prairie Forbs and Grasses. Prairie forbs and prairie grasses can be planted as root plugs or as seed. The minimum size plug should be 1.25 in (30 mm) in diameter by 4.25 in (110 mm) deep.

41-10.01(e) Considerations for Plantings

Consider the following:

1. Fertilizing and Mulching. For survivability and lack of future maintenance, give consideration to fertilizing and mulching all plantings.

2. Roadside Safety. Do not locate woody plants with diameters at maturity greater than 4 in (100 mm) in the clear zone, as defined for new construction. These plants should not be planted on the front slope or in ditches even if outside the clear zone.

3. Existing Soil. Where practical, use the existing soil in the planting operation. In cases where highway construction has made the condition of the existing soil unsuitable, consider the use of soil amendments or new topsoil. When soil conditions require topsoil placement to ensure adequate growth, specify 8 in (200 mm) where extensive plantings of woody or perennial plants are proposed.

4. Impacts of Salt. Due to the adverse effect of salt upon plants, give special consideration to the type and location of plants and their proximity to the roadway in those areas of the State where there is extensive snow and ice control.

5. Agricultural Areas. Do not plant large trees or evergreens on the right-of-way where there is adjacent agricultural land use due to their shading characteristics and their impact on farm machinery mobility.

6. Signage. Do not place plants in a location that will block the view of legally placed advertising signs.

7. Screening. Landscape plantings are used to screen adjacent properties that have undesirable land usage; to reduce highway noise, dust, etc., reaching adjacent properties; and/or to screen the highway from a residential area or park.

8. Sight Distance. When planting in urban areas, consider potential sight distance problems and the problems of obstructing traffic signals, signs, lighting, etc.

9. Snow Drifting. Do not plant dense continuous hedges within 40 ft (12 m) of the edge of pavement where they may cause snow to drift onto the pavement.

41-10.02 Classification

Consider the following groups for planting:

1. Shade Trees. A single-stem, high-headed, deciduous plant that generally grows to a height in excess of 30 ft (9 m).

2. Intermediate Trees. Generally, a multi-stem, deciduous, low, round-headed plant that matures at 30 ft (9 m) or less in height.

3. Shrubs. Low-growing multiple stemmed plants that are either deciduous or evergreen.

4. Evergreen Trees. Tall-growing evergreen plants.

5. Ground Cover and Vines. A colony forming plant less than 1.5 ft (0.5 m) high that has the ability to spread and root itself.

6. Seedlings. Small shade trees, intermediate trees, shrubs, and evergreens that are usually less than 2 years old.

41-10.03 Turf Grasses

Non-native grass, grains, legumes, and native grasses form the backbone of highway vegetation cover. The large number of species and varieties of vegetative cover may be used for many applications. Consider the following guidelines:

1. Temporary Erosion Control. Use temporary vegetative cover for temporary erosion control at locations where the duration of the turf cover is short term and is expected to prevent loss of soil.

2. Permanent Erosion Control. Permanent vegetative cover is used for permanent erosion control in most highway applications. To achieve a cost-effective permanent cover, select a type of turf grass appropriate to the landscape conditions and planned maintenance.

3. Weed Control. Good turf establishment will minimize weed growth, thereby reducing pesticide requirements.

4. Groomed Appearance. Provide a vegetative cover that can be mowed into a park-like appearance. In urban settings, use a lawn-type mixture to blend in with the urban landscape.

5. Wildlife. Provide a vegetative cover that will enhance and encourage wildlife.

6. Sodding. Seed mixtures are most commonly used; however, some instances may call for the use of sodding to provide for the rapid establishment of turf.

7. Applications. The turf grasses specified in the *Standard Specifications* are used for specific applications as follows:

   a. Lawn Mixtures. Lawn mixtures are used in urban settings to create a park-like appearance and require a relatively high degree of maintenance.

   b. Salt Tolerant Mixtures. Salt tolerant mixtures are used along road segments where de-icing salts are heavily used.

   c. Roadside Mixtures. Roadside mixtures are used in more rural settings where a tougher, lower maintenance turf is desired.

   d. Slope Mixtures. Slope mixtures are used on slopes usually 1V:3H or greater.

   e. Native Grass and Forb (Wildflower) Mixtures. Native grass and forb (wildflower) mixtures can be planted to create specific turf conditions; see Section 59-7.05 of the *BDE Manual*.

   f. Conservation Mixtures. Conservation mixtures are used for wildlife nesting cover. These are usually planted at the request of resource agencies.

   g. Temporary Erosion Control Mixtures. Temporary erosion control mixtures are seeded to prevent soil from being displaced on a construction project that will be exposing soil. The mixture is spread over all exposed earth to provide a quick cover of the turf that will interrupt the force of rain on the soil and prevent soil from moving. The temporary erosion seed mixture may need to be spread on construction sites numerous times during construction activities. The temporary erosion control mixture also can be combined with a permanent erosion control mixture to provide a nurse crop while the permanent seed is establishing.

41-10.03(a) Seeding

The seeding operation that is conducted in the field occurs in a series of steps. The most important aspects of seeding are seed mixture selection, site preparation, and placement of mulch. Select the class of seed mixtures that are appropriate to the specific roadside environment. Consider the following:

1. Class 1 (Lawn Mixture). Use Class 1 seeding in an urban setting.

a. Class 1A (Salt Tolerant Lawn Mixture). Use Class 1A seeding for:

- urban projects not covered in Class 1B, and/or
- all projects where the entire right-of-way is not torn up and Bluegrass is the primary existing cover.

b. Class 1B (Low Maintenance Lawn Mixture). Use Class 1B in the southern half of the State for urban projects.

2. Class 2 (Roadside Mixture). Class 2 seeding is a hardy roadside turf and should be used where reduced mowing will occur. Use Class 2A seeding (Salt Tolerant Roadside Mixture) for:

- all rural reconstruction projects where the entire right-of-way is to be seeded or any situation where grasses other than Bluegrass are the primary existing cover, and/or
- areas adjacent to roads subject to salt spray and/or disposition.

3. Class 3 (Slope Mixture). Use Class 3 seeding in rural areas for slopes 1V:3H or steeper.

4. Class 4, 4A, 4B, 5, 5A, 5B (Native Grass and Forbs Mixture). See Section 59-7.05 of the *BDE Manual* for additional discussion.

5. Class 6 and 6A (Conservation Mixture). Class 6 seeding is used for wildlife cover in the east central part of Illinois. Class 6A seeding is a Class 6 which includes salt tolerant grass. Use caution when considering this class with other seeding classes.

6. Class 7 (Temporary Turf Cover). Class 7 seeding is used as a temporary cover for areas to be regraded more than a year from the time of seeding. Use Class 7 for winter shut down. Provide temporary mulch or erosion control blanket with Class 7 seeding.

   Use the Temporary Erosion Control Seeding System weekly for shorter-term temporary cover.

41-10.03(b) Sodding

Appropriate uses of sodding are as follows:

- urban areas with residential or commercial development (e.g., in front of homes, businesses, parks, adjacent to paved shoulders or edges of paved ditches);
- in front of maintained parks and cemeteries;
- erosion control in ditch bottoms and around culverts; and
- special areas (e.g., channelized medians, around inlets in grassed areas). Small areas which would normally be seeded should be sodded where a large majority of the remainder of the project (90% +/-) is to be sodded.

Specify salt tolerant sod in those areas where large quantities of deicing salt are used by maintenance forces (e.g., highly urbanized areas).

41-10.04 Planting in Urban Areas

Use the following criteria for planting in urban areas:

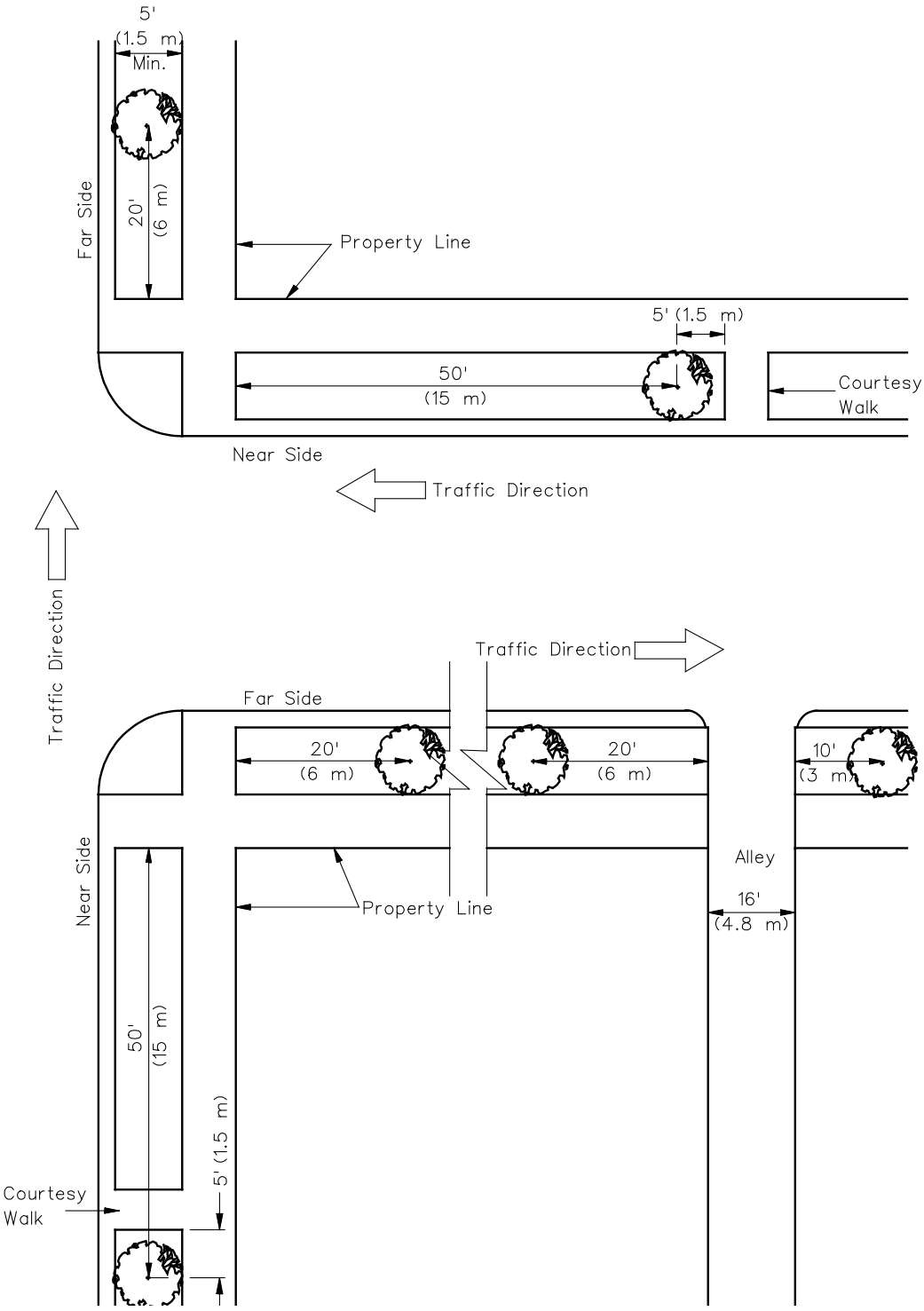
1. Minimum Distance from Intersections, Alleys, and Driveways. The following criteria relates to distances as measured from the property line and along the property lines:

    a. Intersections. Do not locate trees within 50 ft (15 m) on the near side and 20 ft (6 m) on the far side of the intersection; see Figure 41-10A. Trees on medians should be located a minimum of 50 ft (15 m) from intersections.

    b. Alleys. Do not locate trees within 20 ft (6 m) on the near side and 10 ft (3 m) on the far side.

    c. Commercial Driveways. Do not locate trees within 20 ft (6 m) on the near side and 10 ft (3 m) on the far side.

    d. Residential Driveways. Do not locate trees within 10 ft (3 m).



MINIMUM PLANTING DISTANCES FROM INTERSECTIONS

Figure 41-10A

2. Minimum Distances from Walks, Curbs, Utilities, and Structures. The following criteria applies from face of curb or center of utility to edge of tree, as measured horizontally:

- sidewalks and carriage walks — 3 ft (900 mm),
- access of courtesy walks — 5 ft (1.5 m),
- face of curb — 4 ft (1.2 m),
- manholes and catch basins — 10 ft (3 m),
- fire hydrants — 10 ft (3 m),
- underground utility mains and services — 5 ft (1.5 m),
- street lights — see Item 3,
- existing trees — see spacing criteria below,
- overhead wires — do not plant ascending shade trees under overhead wires,
- railroad crossings — 100 ft (30 m), written approval from railroad is required to plant within 100 ft (30 m), and
- other structures — 30 ft (9 m) or as directed.

These requirements are for reduced speed urban areas and must be adjusted for higher speeds so that clear zone and sight distance requirements are met.

3. Minimum Basal Clearance Between Trees and Structures. Basal clearance is defined as the distance from the center of the tree to the structure or object involved. Minimum basal clearance between trees and between trees and structures located on parkways, medians, or other areas of the right-of-way are as follows:

- Trees with spreading crowns must have a minimum basal clearance of 15 ft (4.5 m).
- Trees with global or pyramidal crowns must have a minimum basal clearance of 12 ft (3.6 m).
- Trees with fastigiated or columnar crowns must have a minimum basal clearance of 10 ft (3 m).
- Do not plant trees in areas where basal clearance is less than 10 ft (3 m).
- Select tree species from the approved tree list of the district Landscape Architect or from a municipal tree list if it is applicable to the project site.

4. Spacing of Trees Within Parkways. Use the following criteria for spacing of trees within parkways:

- Space trees with spreading crowns at a minimum of 30 ft (9 m).
- Space trees with global or pyramidal crowns at a minimum of 25 ft (7.5 m).
- Space trees with fastigiate or columnar crowns at a minimum distance of 20 ft (6 m).

5. Spacing Between Trees Within Median or Other Right-of-Way Areas. Spacing will follow the same criteria given for spacing between trees within parkways.

6. Width of Parkway, Medians, and Other Public Ways. Landscape designs must be so arranged to provide a sufficiently wide, clear, and safe pedestrian walkway. The required width will in no case be less than 6 ft (1.8 m) wide, measured from a line 1 ft (300 mm) within the right-of-way. Use the following criteria:

   a. Minimum Width of Parkways. Use the following criteria for minimum width of parkways:

      - Do not plant trees on any parkway that is less than 6 ft (1.8 m) in width.
      - Do not plant trees on any commercial or industrial sidewalk or cut-out in a sidewalk that is less than 16 ft (4.8 m) in width.

   b. Minimum Width of Medians. Do not plant trees on any median that is less than 10 ft (3 m) in width.

41-10.05 Erosion and Sediment Control

41-10.05(a) Background

Appropriate implementation of erosion and sediment is necessary on highway construction projects as necessary to protect the roadway and associated rights-of-way, adjacent properties, and sensitive environmental resources (e.g., endangered and threatened species, wetlands, water bodies, and other resources for which the LPA commits to the implementation of erosion and sediment control measures). The policies documented in this Section are for use to comply with FHWA regulations on erosion and sediment control which are detailed in 23 C.F.R. 650, Subpart B. They also ensure fulfillment of commitments for erosion and sediment control associated with Section 404 permits issued by the U.S. Army Corps of Engineers, or such commitments made to the Illinois Environmental Protection Agency (IEPA), and other regulatory and natural resource agencies during project development.

The National Pollutant Discharge Elimination System (NPDES) program under Section 402 of the *Federal Clean Water Act* currently imposes erosion and sediment control requirements on construction projects that involve disturbance of 1 acre (4047 m^2) or more of total land area.

41-10.05(b) Policy

Provide erosion and sediment control on all projects that will expose areas of soil to potential displacement by storm events such that sediment could adversely affect operations on the highway or associated rights-of-way, could be introduced into receiving waters, or could affect adjacent properties, sensitive environmental resources, or other resources for which a commitment was made to protect from sedimentation impacts. The nature and extent of the control measures should be appropriate to address the specific conditions involved and the measures will be properly maintained to ensure continued effective operation.

Projects that involve no clearing and grubbing, excavation, stockpiling of topsoil, borrow, or construction of embankment normally will not require erosion and sediment control measures. Projects that involve only isolated excavation for installation of lighting, signing, traffic signals, guardrail, or woody plant materials likewise normally will not require erosion and sediment control measures. The following are examples of actions that normally will not require erosion and sediment control measures:

- installation of lighting, signing, traffic signals, or guardrail,
- weed spraying,
- pavement marking,
- seal coating,
- bituminous resurfacing,
- pavement patching, and
- planting of woody landscaping materials.

Evaluate the need for erosion and sediment control, and any additional right-of-way necessary to accommodate their implementation, prior to the preparation of design plans and include the appropriate information to address the identified needs in the plans. Erosion and sediment control needs should be evaluated and addressed for construction of both roadway and bridge/culvert components of proposed projects. The selection and application of erosion and sediment control measures should reflect use of the best temporary and permanent devices and practices appropriate for the site and project conditions.

41-10.05(c) Temporary Erosion Control Systems

Temporary erosion control systems are meant to control erosion and sediment damages to the roadway, adjacent properties, and water resources during the construction phase and before the final erosion control measures can be placed. Temporary practices include the use of sedimentation basins, temporary ditch checks, perimeter erosion barriers, temporary seeding, and other erosion control devices and methods. The designer must ensure that the temporary erosion control system is fully coordinated with the permanent erosion control measures. The following are the various available types of erosion and sediment control systems and the applications to which each is best suited:

1. Temporary Ditch Checks. When used, this system acts as a dam and slows the velocity of water through the project. Temporary ditch checks should be used at the outfall of existing ditches to collect silt. Straw bales, rolled excelsior, or urethane foam/geotextile ditch checks should be used for newly seeded ditch lines that have a velocity of less than 8 ft/sec (2.4 m/sec). Aggregate ditch checks should be used for ditch lines with a velocity of 8 ft/sec (2.4 m/sec) or greater.

2. Perimeter Erosion Barrier. This system is used to prevent exposed soil along the perimeter of the project from leaving the job site and can prevent exposed soil adjacent to the project from entering the job site. The NPDES Permit requires the perimeter erosion barrier to be in place prior to any earth disturbing activities. The designer should specify this system at the limits of the construction site where sediment in sheet flow will run off from the area under construction and can be captured.

3. Inlet and Pipe Protection. This system protects inlets that will receive runoff from areas within the limits of construction and inlets along access streets where material will be tracked by construction vehicles. Inlet and pipe protection for initial sediment control should be specified for existing inlets.

4. Sedimentation Basins. Sedimentation basins are settling ponds constructed to trap waters carrying sediment. The basins detain sediment laden runoff from larger drainage areas long enough for most of the sediment to settle out. Sedimentation basins have a maximum designed depth of 2.5 ft (750 mm) and a maximum designed allowed drainage area of 5 acres (2 ha). Guidance for use of sediment basins can be found in the *Illinois Urban Manual.*

5. Temporary Ditches. This system is constructed to divert and/or intercept water borne silt and runoff at designated locations. Temporary ditches are also used to divert clean water around construction sites and to stop the mixing of clean waters with silt-laden waters. It may be necessary to line the temporary ditch with a fabric barrier to stop sediment introduction into the waterway. Ditches can create safety hazards on construction sites that should be considered and adequately protected. Guidance for use of temporary ditches can be found in the *Illinois Urban Manual.*

6. Temporary Erosion Control Seeding. This system should be used on a weekly basis to cover those areas of exposed soil due to contractor operations. The designer should specify temporary erosion control seeding on all projects where grading or soil stockpiling is involved. Erosion control blanket should be specified for use with temporary erosion control seeding for exposed areas adjacent to bodies of water, for lining ditches, and for slopes 1V:3H or steeper.

7. Temporary Mulch. This system should be specified for temporary cover when grading will occur on a project after September 30th or in the winter when temporary seed will not germinate and provide erosion protection until the following spring. Mulch, Method I; Mulch, Method 2; and Erosion Control Blanket are the various methods used for temporary mulch.

8. Aggregate (Erosion Control). This system can be used as an erosion control method to prevent soil displacement. Various uses would include aggregate ditch checks, aggregate lined ditches, or aggregate for temporary construction entrances. The designer should specify the proper aggregate gradation. Guidance for use of aggregate for erosion control can be found in the *Illinois Urban Manual*.

Additional information can be found in Section 59-8 of the *BDE Manual*.

41-11 DESIGN CONSIDERATIONS FOR UTILITIES

The designer should consider the following in designing utility placements:

1. Utility Locations. Utility installations should be located as follows:
   a. General. Consider the following:
      - Locate above-ground utilities as far from the traveled way as practical. Desirably, locate the utility within 1 ft (300 mm) from the right-of-way line.
      - New utilities installed under paved or shoulder areas must be constructed of long life materials that are expected to be maintenance free.
      - Locate ground-mounted appurtenances for underground facilities within 1 ft (300 mm) or as near as practical to the right-of-way line.
      - Install suitable markers at the right-of-way line for any high-pressure gas or liquid fuel line that crosses a roadway.
      - No utility appurtenances (e.g., pumping stations, transformers) will be allowed within interchange right-of-way.
      - Special restrictions may be placed on utility companies where visual quality is an important consideration. See the *IDOT Accommodation of Utilities on Right-of-Way of the Illinois Highway System* for more information.

   b. Longitudinal Utilities. Consider the following:
      - No new above-ground longitudinal utilities, including any above-ground appurtenances for underground installations, should be placed within the clear zone. Where it is necessary to locate installations within the clear zone, give consideration to locating the installation where there is low probability it can be struck by a vehicle, make it breakaway, or provide a barrier or crash cushion; see Chapter 35.
      - Locate longitudinal utilities parallel and as near as practical to the right-of-way line but not more than 8 ft (2.4 m) from the right-of-way line.
      - No new longitudinal utility installations should be permitted under the paved portion of streets and highways unless there is no other practicable location available.

   c. Manholes. Consider the following:
      - New manholes should not be permitted in the traveled way or shoulders of rural highways. Existing manholes may remain in place.
      - Manholes may be permitted in city streets where existing utilities have been permitted to remain in place under existing or proposed roadways.
      - New manholes should not be permitted at intersections.

   d. Utility Crossings. Consider the following:
      - Utility crossings should be approximately 90° to the highway centerline as practical.
      - Utility crossings should be installed by trenching except under paved roads.
      - Install utility crossings under paved roads by boring or jacking. Trenching may be acceptable in special cases if approved by the proper highway authorities.
      - Utilities should not be permitted to cross under highways in cattle passes, culverts, or other drainage facilities.

2. Cover. The following cover criteria, below the pavement surface, will be required for underground installations:
   a. Power. These installations will require a minimum cover of 2.5 ft (750 mm).
   b. Communication. Where these installations are installed by the plowed method, the minimum cover will be 2 ft (600 mm).
   c. Gas Pipelines. Gas installations must have a minimum cover of 2.5 ft (750 mm) at all locations within the highway right-of-way.
   d. Water Lines. To prevent freezing, place water lines below the frost line.
   e. Sewers and Drain Lines. Storm sewers, sanitary sewers, and drain lines must have a minimum clearance of 2.5 ft (750 mm) to the top of pipe to prevent freezing.

3. Casings. Where casings are used for underground utilities, the following criteria is required:
   - Install at least one vent located on the high side and extend to the right-of-way line.
   - Place vents above the pipeline to serve as markers for a crossing utility.

4. Aerial. The following will apply to power lines and/or communication lines:
   a. Guy Wires and Brace Posts. These devices should not be allowed within the right-of-way.
   b. Overhead Clearances. For overhead power and communication lines crossing the highway or street, the minimum vertical clearance is 18 ft (5.5 m).
   c. Location. In general, aerial utility poles should be located as close to the right-of-way line as practical. However, for urban areas the following will apply:
      - Curbed. For curbed sections, the placement distance of poles behind the face of the curb shall be at least 1.5 ft (500 mm), measured to the closest face of the pole.
      - Curb and Gutter. For curb and gutter sections, place the poles a minimum of 2 ft (600 mm) from the face of curb. In addition, the clear zone distance must be checked.
      - Shoulder with Curb and Gutter at Shoulder Edge. The minimum pole placement is 4 ft (1.2 m) beyond the outside of the shoulder to the closest face of the pole. In addition, the clear zone distance must be checked.
      - Sidewalks. Where there are sidewalks, provide a minimum of 3 ft (1 m) of "obstacle free sidewalk," where feasible.

5. Attachments to Structures. If it is determined that there is no reasonable alternative means of attachment except to the main structural member or to the deck, the following locations may be considered in the listed order of preference:
   - diaphragms,
   - beams, and
   - deck.

   The structural integrity of the structure must be checked. See Section 36-2.04 for additional information.

6. Light Standards. Place light standards and power poles in accordance with the criteria presented in Section 56-5 of the *BDE Manual*.

7. Detours. Awareness of potential utility conflicts is extremely important when constructing detours near the right-of-way line or on temporary right-of-way.

41-12 SPEED HUMPS AND TABLES

41-12.01 Speed Humps

41-12.01(a) General

Speed humps are raised sections of pavement that are placed across the entire width of a highway to reduce vehicle speeds and enhance pedestrian safety. Speed humps have a more gradual slope than traditional speed bumps. Therefore, speed humps are more effective at slowing traffic to a desired design speed. In addition, speed humps are a low cost tool. However, speed humps may be controversial in some localities due to their appearance, jarring effects on vehicles and passengers, and impact to emergency response vehicles.

Speed humps shall not be installed if highway drainage is not considered or in the path of a pedestrian crossing or curb ramp.

41-12.01(b) Design

The best speed hump designs employ a very gradual slope. Traditional designs include a 3 - 4 in (75 - 100 mm) vertical elevation change, with the width varying based on the design speed, although many LPAs limit the height of speed humps to 3 to 3 ½ in (75 to 83 mm). Figure 41-12A provides the typical speed hump length and design speed.

Length of Speed Hump	Typical Design Speed
12 ft (3.7 m)	15 mph (25 km/h)
14 ft (4.3 m)	20 mph (30 km/h)
22 ft (6.8 m)	25 - 30 mph (40 - 50 km/h)

SPEED HUMP LENGTH AND DESIGN SPEED

Figure 41-12A

The *ILMUTCD* provides marking and signing requirements.

41-12.01(c) Impact on Pedestrian Access

In general, speed humps enhance pedestrian safety by effectively slowing traffic. However, people with mobility impairments may experience problems on speed humps. For example, people with back or neck problems may experience pain or discomfort caused by the jarring effect when traveling over speed humps in an automobile. This is further complicated if the person relies on para or public transit and does not have control over the speed of the vehicle.

41-12.02 Speed Tables

41-12.02(a) General

Speed tables are speed humps with a flat section on top. Speed tables may be used as raised crosswalks to serve as a pedestrian crossing. Speed tables are preferred over speed humps by emergency response vehicles.

Speed tables shall not be installed if highway drainage is not considered.

41-12.02(b) Design

The length of speed tables should accomodate the entire wheel base of a passenger vehicle to rest on the flat section. The flat section is typically 10 ft (3.1 m) long. Combined with gently sloped ramps, speed tables permit slightly higher motorist speeds and smoother transitions than speed humps. Traditional designs include a 3 - 4 in (75 - 100 mm) vertical elevation change with the width varying based on the design speed. However, if used as a raised crosswalk, the height should match the curb height. Figure 41-12B provides the typical speed table length and design speed.

Length of Speed Table (including 10 ft flat section)	Typical Design Speed
22 ft (6.8 m)	20 mph (30 km/h)[1]
24 ft (7.4 m)	25 mph (40 km/h)[1]
32 ft (9.8 m)	30 mph (50 km/h)[1]

Note: 1. Reduce design speed by 5 mph (10 km/h) or use longer speed table if the height of the speed table is greater than 4 in (100 mm).

SPEED TABLE LENGTH AND DESIGN SPEED

Figure 41-12B

The *ILMUTCD* provides marking and signing requirements.

41-12.02(c) Impact on Pedestrian Access

Speed tables have the same pedestrian safety impact as speed humps by effectively slowing traffic. However, when used as a pedestrian crossing, an added safety impact is the increased visibility of pedestrians crossing the highway. Speed tables resolve some of the access problems for people with mobility impairments. However, when used as a pedestrian crossing, detectable warnings shall be installed (See Section 41-6).

41-13 REFERENCES

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30. 23 C.F.R. 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise."

31. *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, FHWA, 1995.