5.6.3 Placement of Curb

Curb introduced intermittently along a street should be offset 3 feet from the edge of lane if there is no shoulder: where the curb is continuous, the offset should be at least 1 foot. See Figure 6-D for offsets of curbs for islands with and without shoulders.

5.6.4 Curb Height

For new installations of sloping curb, the overall curb height shall not exceed 4 inches.

For new installations of vertical curb, the curb height (face) shall conform to the following:

1. For posted speeds greater than 40 mph, the curb height shall not exceed a 4 inch face.
2. For posted speeds less than or equal to 40 mph, the desirable curb height is 4 inches. Where sidewalks are to be constructed, a 6 inch face may be used.
3. For traffic calming areas a 6 inch face may be used.
4. For curb on bridges with sidewalk, the desirable curb height should be 6 inches to accommodate future resurfacing and/or conduits through the sidewalk.

When curb is used in conjunction with guide rail, see Section 8, "Guide Rail Design and Median Barriers," for the placement of guide rail and for curb height requirements.

Where posted speeds are 40 mph or less and no guide rail exists, an 8 inch face vertical curb may be used to discourage parking of vehicles in the border area of the highway.

When resurfacing adjacent to curb, the curb should not be removed unless it is deteriorated or the curb face will be reduced to less than 3 inches. A curb face less than 3 inches is permissible, provided drainage calculations indicate the depth of flow in the gutter does not exceed the remaining curb reveal.

When replacing short sections of existing curb or installing short sections of new curb, the curb face should match the adjacent existing curb face. A short section of curb is approximately less than 100 feet long at each location. When there are closely spaced short sections of curb to be replaced, install the entire run of curb at the standard curb height and type as specified above.

5.7 Sidewalk

5.7.1 General

The Americans with Disabilities Act (ADA) of 1990 is a civil rights statute that prohibits discrimination against people with disabilities. Designing and constructing pedestrian facilities in the public right-of-way that are usable by people with disabilities is an important component of highway design.

ADA accessibility provisions apply to the entire transportation project development process including planning, design, construction, and maintenance activities.

The requirements of ADA include:

- New construction must be accessible and usable by persons with disabilities.
- Alterations to existing facilities, within the scope or limits of a project, must provide usability to the extent feasible.

On new roadway construction, roadway rehabilitation, roadway reconstruction, new bridge construction, bridge replacement and bridge widening projects, sidewalk, where feasible, should be provided on both sides of land service highways and structures in urban areas. All of these projects should have some type of walking facility out of the traveled way. A shoulder will provide a safer environment for a pedestrian than walking in the live lane.

Generally, sidewalks will not be provided in rural areas. However, sidewalks shall be considered where there is evidence of heavy pedestrian usage. Sidewalks may be provided to close short gaps in existing sidewalk and where there are major pedestrian traffic generators such as churches, schools, hospitals, public transportation facilities, etc., adjacent to the highway or where there is a worn pedestrian path. A worn path is an indicator of pedestrian traffic that requires a sidewalk. Individuals tend to walk in locations where continuous sidewalk connections are provided. A lack of pedestrian activity in a location with discontinuous sidewalks is therefore not necessarily an indication of a lack of pedestrian demand. Future development should also be considered for possible major traffic generators. Sidewalk should not be constructed along undeveloped land, unless a maintenance jurisdiction agreement or a resolution of support with the municipality can be obtained.

A sidewalk may be omitted from a project where there is insufficient border width or there is no anticipated pedestrian traffic due to the land use adjacent to the roadway.

In order to ensure that sidewalk installations provide satisfactory linkages and contribute to system connectivity, all designers should take the following actions:

1. When project limits are established, continuity of pedestrian travel should be a consideration relating to the ends of the project including addressing arrival and departure curb ramps at pedestrian street crossings. For example: Where resurfacing only the northbound side of a divided highway, and the intersections(s) have sidewalk on both bounds, then curb ramps will be addressed on the entire intersection.
2. Sidewalks should extend to common destinations and logical terminal points.

   Sufficient clear zone width, drainage patterns and infrastructure, grade issues, and the presence or future likelihood of bus transit stops are all key considerations of where to install sidewalks. The location of drainage ditches, buildings, retaining walls, utility poles, bus stops, vegetation, and significant roadside grade changes should be carefully coordinated with sidewalk alignment where possible to provide adequate sight distance and separation between pedestrians and vehicular traffic.

In general, sidewalks should be placed within the highway right of way. However, the exact alignment can vary throughout the section and practical considerations should be given to:

barriers and guide rail may increase pedestrian safety and comfort, and therefore encourage higher levels of walking.

The minimum width of a buffer strip is 3 feet (measured from the face of curb to the nearest edge of the sidewalk). The desirable width should be increased up to 6 feet when feasible.

Grades and Cross Slopes

The maximum sidewalk cross slope is 2%. The maximum grade is 12:1 (8.33%), however, the longitudinal grade of the sidewalk should be consistent with the grade of the adjacent roadway. If the 12:1 grade is not feasible due to topography and other physical constraints, then the grade should be developed to the extent feasible. When sidewalk grades steeper than 12:1 for a maximum distance of 30 feet are unavoidable, a level 4 foot long landing should be included if feasible (or at a distance that is practicable).

Surface Treatments

The sidewalk should have a firm, stable slip resistant surface. A concrete surface is preferred; brick or concrete pavers may be used if they are constructed to avoid settling or shifting of bricks. Hot mix asphalt sidewalks may also be used. It is important to avoid ponding on sidewalks.

5.7.4 Public Sidewalk Curb Ramp

General

The ADA Law under 28 CFR Part 35.151(e) provides general direction for the placement of curb ramps:

- Crosswalks can be marked or unmarked but where crosswalks are marked curb ramps should be wholly contained within marked pedestrian crosswalks to enable ramp use to be incorporated as part of the established pedestrian control at the intersection.
- Curb ramps are not limited to intersections and marked crosswalks but should also be considered at other appropriate points of pedestrian concentration or access such as refuge medians/islands, mid-block crossings, parking areas and other traffic separation islands.
- Adequate visibility is required to ensure safe pedestrian movement. A sight distance evaluation is recommended to ensure that curb ramps are not placed at locations where motorists cannot see the low profile of people using mobility devices. For vehicles parking at intersections see Title 39 for parking restrictions. Parking should also be eliminated at midblock crossings to provide access from the curb ramp and to increase the visibility of the pedestrian.

Sidewalks curb ramps and roadway drainage features must be designed and constructed to prevent surface drainage from ponding at the bottom of the curb ramp. Edge of road elevations at the gutter line must be graded to ensure positive drainage. For new construction, additional inlets may be required to prevent drainage issues.

Public sidewalk curb ramps shall be provided where sidewalks permit pedestrian to cross curbs such as at:

- Intersections
- Painted crosswalks at mid-block locations
- Crosswalks at exit or entrance ramps
- Driveways, alleys, passenger loading zones, handicapped parking stalls
- Channelized islands, divisional islands or medians served by crosswalks
- Trail crossings

Existing substandard curb ramps shall be replaced with curb ramps designed in compliance with this section. Designers are to perform field investigation and evaluation of existing curb ramps to determine whether the ramps are substandard.

All new construction, reconstruction, major rehabilitation, widening, resurfacing (open –graded surface course, hot in-place recycling, microsurfacing/thin lift overlay, structural overlays, and mill and fill), cape seals, signal installation, and pedestrian signal installation and major upgrades, and projects of similar scale and effect are subject to the ADAAG contained in this Sidewalks subsection which includes providing curb ramps. In alterations to existing facilities where full compliance with the ADAAG is technically infeasible the alteration shall comply with these standards to the maximum extent feasible. Designers shall document the basis for their determination using Form TIF-1 (ADA Technically Infeasible Form). This form shall be submitted as part of the Final Design Submission (FDS). Form TIF-1 and its instructions are available on the Department's website in the "Engineering" section.

Technically Infeasible means, with respect to an alteration of a building or a facility, something that has little likelihood of being accomplished because existing structural conditions would require removing or altering a load-bearing member that is an essential part of the structural frame; or because other existing physical or site constraints prohibit modification or addition of elements, spaces, or features that are in full and strict compliance with the minimum requirements.

Providing accessibility to the maximum extent feasible applies to the occasional case where the nature of an existing facility makes it impracticable to comply fully with applicable accessibility standards through a planned alteration. In these circumstances, the alteration shall provide the maximum physical accessibility feasible. This applies to alterations to an existing facility that cannot fully meet the standards because of existing site conditions. Existing site constraints such as existing utilities, existing structures, environmental/historic impacts or other site constraints may prohibit modification or addition of elements, spaces, or facilities from being in full and strict compliance with the standards. Reasons for providing accessibility to the maximum extent feasible may include the following constraints:

- Existing utilities
- Existing buildings, walls or vaults
- Environmental impacts
- Historic impacts
- Safety
- Roadway profile slope (Terrain)

For less extensive projects, limited improvements to accessibility would generally be expected. For example, if an existing portion of sidewalk along a residential block

- Highways (MUTCD). Provide pedestrian crossing signs to selectively aid in limiting pedestrian crossing to safe places. For proper placement of these signs, see "Section 2B 36" of the MUTCD.
- Provide a pedestrian overpass if intersection/ interchange spacing exceeds one mile and if a user benefit cost analysis warrants an overpass. A pedestrian overpass is very effective when accompanied by median fencing.
- Provide roadway lighting.

Only after the previous countermeasures are evaluated and implemented should the engineer consider providing fencing in medians. That is, fencing should be used as a last resort. Fencing in medians should stop approximately 90 percent of the pedestrian crossings; however, it has its drawbacks. If the decision is made to install median fencing, the following issues should be recognized:

- Difficulty in maintaining fence on median barrier curb.
- Potential to reduce horizontal sight distance when installed on median barrier curb.
- Litter can be a problem along fence located in grass medians adjacent to high litter generators such as shopping malls.

Median fencing should be installed in well-lighted areas so that pedestrians can see the fence prior to attempting to cross the highway at night. Where existing roadway lighting is inadequate, provide additional roadway lighting in accordance with Section 11, “Roadway Lighting Systems.”

Adequate sight distance at intersections and emergency U turns should be provided when designing limits of fencing. Therefore, fencing on barrier curb shall stop a minimum of 300 feet from the median barrier curb terminal, and fencing in grass medians shall terminate a minimum of 200 feet from the end of the grassed island. Fencing shall not be installed in medians where there is substandard horizontal stopping sight distance.

When installed on median barrier curb, chain link fabric shall be 4 feet high, with 3 inches diamond mesh.

When installed in grass medians, the chain link fabric shall be 6 feet high, with 3 inches diamond mesh. All chain link fence posts within the clear zone shall be made breakaway (i.e., breakaway coupling).

5.10 Standard Typical Sections

Typical sections should be developed to provide safe and aesthetically pleasing highway sections within reasonable economic limitations.

The typical sections shown in the plans should represent conditions that are "typical" or representative of the project. It is not necessary to show a separate typical section to delineate relatively minor variations from the basic typical. The most common or predominant typical section on the project should be shown first in the plan sheets followed by sections of lesser significance.

Figures 5 B through 5 J inclusive illustrate the various control dimensions for single lane and multi-lane highways.

5.11 Bridges and Structures

5.11.1 General

Designers should make every effort during the early design phase to eliminate or minimize certain features on bridge decks such as, horizontal curves, vertical curves, variable horizontal widths and cross slopes. Locating these features off the structure simplifies construction, is more economical and reduces future maintenance requirements.

For further information, the designer should review Section 5.2., "Geometrics on Bridges" in the Design Manual Bridges and Structures.

5.11.2 Lateral Clearances

It is desirable that the clear width on the bridge be as wide as the approach pavement plus shoulders.

On underpasses, the desirable treatment is to maintain the entire roadway section including median, pavements, shoulders and clear roadside areas through the structure without change.

Minimum lateral clearances are illustrated in Figures 5 K through 5 P inclusive.

On divided highways where the median width is less than 30 feet consideration should be given to eliminating the parapets and decking the area between the structures.

5.11.3 Vertical Clearance

Vertical clearances for bridges and structures shall be in accordance with Section 3.2, Vehicular Bridge Structures, of the Design Manual Bridges and Structures.

Bridges and Structures Design should be notified of all changes in bridge clearances.

5.12 Traffic Stripes and Traffic Markings

The following provides the Department Policy on Traffic Stripes, Traffic Markings and Raised Pavement Markers.

1. On interstate highways, all permanent lane lines, longitudinal edge lines and edge lines on (curbed and uncurbed) ramps shall be 6 inch wide epoxy resin traffic stripes. The traffic stripes shall be calculated in linear feet for each 6 inch width of actual stripe (gaps are not counted) under the item TRAFFIC STRIPES, 6”.
2. On non-interstate highways, all permanent longitudinal center, edge and lane lines, edge lines on ramps, curbed and uncurbed ramps on Freeways and left turn slots shall be 4 inch wide epoxy resin traffic stripes. Permanent lane lines separating exclusive right or left turning lanes from through lanes shall be 8” wide epoxy resin traffic stripes. The traffic stripes shall be calculated in linear feet for each specific width (4” or 8”) of actual stripe (gaps are not counted) under the item TRAFFIC STRIPES, __”.
3. All permanent gore lines, crosswalks, stop lines, words, arrows and other pavement symbols shall be thermoplastic. The gore lines, crosswalks and stop lines shall be calculated in linear feet for each specific width (4”, 8”, 12”, 16”, 20”, 24”, etc.) of marking line under the item TRAFFIC MARKINGS LINES,__”. The words, arrows and other pavement symbols shall be calculated in square feet under the item TRAFFIC MARKINGS SYMBOLS. The route symbols shall be calculated in square feet under the item TRAFFIC MARKINGS ROUTE SYMBOLS.

14.6 Latex Traffic Stripes and Traffic Markings

Department Policy on Traffic Stripes and Traffic Markings are as follows:

1. Placement of TRAFFIC STRIPES and TRAFFIC MARKINGS may be delayed for up to 14 days after paving. Temporary pavement markers shall be used to delineate center and lane lines on newly paved sections of roadways that need to be opened to traffic prior to the placement of TRAFFIC STRIPES.
2. TRAFFIC STRIPES LATEX and TRAFFIC MARKINGS LATEX shall be used when traffic stripes or traffic markings are required on intermediate pavement layers that need to be opened to traffic due to stage construction and shall not be in place for more than 14 days. The traffic stripes shall be calculated in linear feet for each specific width (4", 6", 8") of actual stripe (gaps are not counted) under the item TRAFFIC STRIPES, LATEX,__". Chevrons, crosswalks, and stop lines shall be calculated in linear feet for each specific width (4" 8", 12", 16", 20", 24", etc.) of actual stripe under the item TRAFFIC MARKINGS LINES, LATEX,__". Words, arrows and other pavement symbols shall be calculated in square feet under the item TRAFFIC MARKINGS SYMBOLS, LATEX.

   Temporary pavement marking tape and temporary pavement markers shall be specified when lane shifts are necessary on existing pavements not being repaved. The placement of temporary pavement markers shall be in accordance with the Construction Details. However, the designer shall specify TRAFFIC STRIPES and TRAFFIC MARKINGS rather than temporary pavement marking tape and temporary pavement markers when the usage of the placed material would extend beyond December 21st.

   When traffic stripes/markings are removed to accommodate stage construction, the removal process invariably mars the final surface. Marring is allowable on intermediate layers, however, the final surface course must not be marred.

   Designers are to design the project in such a way as to ensure the final surface course does not require temporary traffic stripes or markings to be removed, or develop additional quantities for milling and paving of the final surface course marred by the removal of traffic stripes or markings.
3. TRAFFIC STRIPES or TRAFFIC MARKINGS may be considered for stage construction, detours, and diversionary roads on those occasions when it can be justified based on cost considerations, site conditions, or length of time when the stripes or markings will be in place. It is important to estimate the length of striping based on all of the above factors of a project.

14.7 Lane and Roadway Closures

14.7.1 Lane Closures

Designers should modify standard sheet TCD-1 to provide a table showing specific restrictions placed on travel lanes, durations of closures and hours when work may be performed, including holidays and weekends. The closures and lane restrictions shall be evaluated in the Traffic Impact Report (see Section 14.4) and approved by the Regional Traffic Operations and Local Authorities. The following table is provided as an example of the form of presentation of this information:

Roadway Route Designation and Direction	Type of Closure	Monday thru Thursday	Friday	Saturday	Sunday
	No Closure				
	One Lane Closure				
	Two Lane Closures				
	Full Closures (indicate duration and type of operation)				

14.7.2 Total Roadway Closures

Total roadway closures (i.e. all lanes, single direction or two directions) required for the erection of overhead sign structures, cantilevered sign structures or bridge steel shall be performed in accordance with the following:

- The use of total roadway closures shall be specifically addressed in the Traffic Impact Report (see Section 14.4) and shall be considered only after detours have been determined to be unavailable or infeasible.
- Closures shall be approved by the Regional Traffic Operations and Local Authorities.
- Closures shall be performed during non-peak hours and with prior approval of the Engineer concerning the timing and method of operation.
- The application of nighttime operation of the closure shall be considered (see Section 14.10).
- The erection of overhead and cantilever sign support structures shall be done when the overhead electric lines have been de-energized.
- Closures shall be initiated with a slowdown of traffic 1/2 mile in advance of the work area. The slowdown shall be accomplished with the assistance of Traffic Direction, Police.
- Closures, whether single direction or two directions, shall be limited to 15 minute intervals. At the end of each 15 minute interval the work must stop, the span must be secured and traffic allowed to pass. After traffic has cleared, the roadway may again be closed for another maximum 15 minute interval (following the procedures in this section) and work may resume. Continue this procedure until all work over the roadway is complete.