3. Design Standards

3.9 Geometric Design Criteria

3.9.6 Intersection Design

3.9.6.1 Intersection Traffic Control Typologies

3.9.6.1.1 General Provisions

1. Traffic control is applied at all locations where two or more roads intersect to manage the movement of multiple users and directions of traffic. The traffic control technique depends on the traffic volume, Corridor type, and functional class of the roadways, with greater control required on higher speed and higher use facilities.
2. All traffic control devices should be designed in accordance with the standards and specifications as published in the most recent version of the Manual on Uniform Traffic Control Devices (MUTCD) and the current City of Albuquerque standard drawings.

3.9.6.1.2 Signalized Intersections

1. A signal warrant analysis is required before a new traffic signal is added. See section 23-4 Traffic Studies for further guidance.
2. Traffic signals may be removed and/or converted to a stop sign-controlled intersection if a signal warrant analysis is conducted and determines that a signalized intersection is unnecessary.
3. See the Network Design and Roadway Connectivity section (23-3.1) for guidance on the spacing of signalized intersections and related to signalized pedestrian crossings.
4. Where a development will cause traffic that warrants a signal, the developer will be financially responsible for all or a portion of the signal installation at the discretion of the City Engineer.

3.9.6.1.3 Unsignalized Intersections

1. An unsignalized intersection is an at-grade intersection in which the flow of traffic is not controlled by a traffic signal. Unsignalized intersections may be STOP-sign controlled, YIELD sign-controlled, or uncontrolled.
2. Unsignalized intersections are appropriate for locations where the vehicle and/or pedestrian volumes do not meet the thresholds set forth for new signals in the MUTCD.
3. The typical unsignalized intersection control shall be two-way stop control, which provides stop control on the secondary intersection approaches (i.e. side-street) and free flow on the primary street.

4. All-way stop control may be provided at intersections where traffic volumes or other conditions are consistent with the warrants set forth in the current edition of the MUTCD.
5. YIELD sign-controls may be placed as part of the entrance to a traffic circle, roundabout, channelized right turn, or at the intersection approach of a minor road.
6. Uncontrolled intersections (i.e. intersections without any signage or traffic control) are generally discouraged and are only appropriate at the intersection of two local roads.

3.9.6.1.4 Neighborhood Traffic Circles

1. Traffic circles are small raised islands placed in intersections around which traffic circulates. Traffic circles are intended to manage speeds in neighborhood settings by impeding through movements and forcing drivers to travel at slower speeds through intersections.
2. Yield signs may be used as traffic control at the approaches of the traffic circle.
3. Traffic circles are most appropriate at intersections on local and major local roads where large vehicle traffic is not a major concern but speeds, volumes, and safety are recorded problems. See the Traffic Calming section (23-3.12) and the City of Albuquerque Neighborhood Traffic Management Program (NTMP) for additional guidance.

3.9.6.1.5 Roundabouts

1. Roundabouts are a form of intersection control in which motorists (and cyclists) travel counter-clockwise around a center island and yield at entry points to traffic already circulating the roundabout.
2. A roundabout may be constructed at intersection locations along collectors and arterials where it may be desired in order to enhance intersection capacity, reduce vehicle speeds along a corridor, reduce the incidences of severe crashes, address irregular intersection geometry, or enhance intersection aesthetics. Roundabout design and bicycle and pedestrian accommodations shall be designed in accordance with the criteria set forth in the most recent version of the FHWA manual, Roundabouts: An Informational Guide, or a more recent comparable document acceptable to the City Engineer.
3. Care should be taken in order to ensure roundabouts are not located in close proximity to adjacent stop or signal controlled intersections where long queues may back up into the roundabout.

4. Additional right-of-way may be required for the construction of roundabouts. The purchase of right-of-way shall be considered as part of the design cost for roundabouts proposed along existing facilities.
5. See the current MUTCD for guidance on signage and pavement markings for bicyclists and pedestrians at roundabouts. Per the MUTCD, bicycle lanes are not permitted in roundabouts.
6. See NACTO, AASHTO, or other approved design guides for pedestrian and bicycle design considerations through roundabouts.

3.9.6.2 Intersection Design Considerations

3.9.6.2.1 Angle of Intersection

1. Streets shall be designed to intersect at right angles.
2. If an angled intersection is unavoidable the acute angles at intersections for all new streets shall be 80 degrees or greater. Consult the AASHTO Green Book for additional guidance on the effects of skewed intersections, including changes to the sight triangle and curb radii.
3. Intersections at less than 80 degrees require permission from the City Engineer.

3.9.6.2.2 Spacing of Intersections

1. See the Network Connectivity and Roadway Design section (23-3.1) for guidance on the spacing of signalized and unsignalized intersections along arterial roadways.

3.9.6.2.3 Intersection Grading

1. Intersections must be graded to provide characteristics consistent with the design speed of the through street. Projected curb flowline profiles through the intersection will be required for design review of intersections involving arterial and collector streets. Alignment of arterial streets through intersections must be continuous without breaks in grade and meet the criterion for vertical curvature in Table 3.9-2. Grades within the intersection need to be flat enough to minimize problems with turning vehicles and to keep stopping distances reasonable. Grades should also be steep enough to ensure that proper drainage occurs. Grades should be between 0.5% minimum and 3% maximum.
2. Minor leg approach tangent gradients to intersections should not exceed 4% from the projected curb flowline of the through street. Deviations from this standard will require approval by the City Engineer.

3. Street crowns should be reduced through intersections to promote driver comfort. See Chapter 22 for guidance on drainage requirements at intersections.
4. Grades intended to serve as drainage water blocks may only be designed on minor approach legs of intersections. Maximum height of such water blocks allowed will be 12" as measured vertically from the projected gutter flowline elevation of the major or through street to the gutter flowline elevation at the high point of the minor leg gutter.
5. The designer should specifically investigate intersection design to assure that design flows will not overtop curbs resulting in damage outside the right-of-way. Drop inlets should be located away from curb access ramps. Curb returns should be designed to avoid ponding.
6. Intersections should be located so as to avoid roadway segments that are highly superelevated. Intersection grading for superelevated roadways needs to take into account the issues of grade compatibility, cross-over crown, etc. to insure that the intersection will operate properly.

3.9.6.2.4 Intersection Sight Distance

1. Intersections should be designed to ensure that drivers have an unobstructed view as they approach or depart an intersection. Standards related to intersection sight distance can be found in the Sight Distance section (23-3.9.5).

3.9.6.2.5 Bicycle and Pedestrian Accommodations

1. See the Bikeways and Trails section (23-3.6) for additional considerations related to bicycle travel at intersections.
2. See the Pedestrian Facilities section (23-3.5) for guidance on sidewalks, curb ramp design, and intersection pavement markings and crosswalk design.

3.9.6.2.6 Intersection Turn Lanes

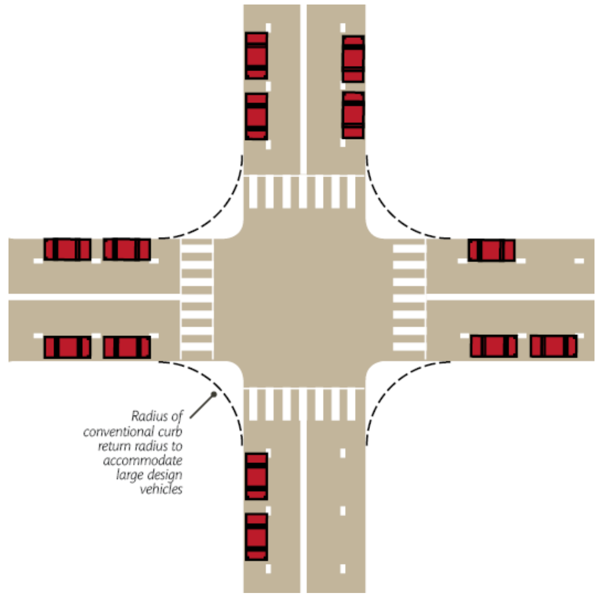
1. See the Medians and Turn Lanes section (23-3.9.7) for guidance on turn lane design at intersections.

3.9.6.3. Curb Return Radii

3.9.6.3.1 Definition

1. Curb returns are the curved corner formed by the intersection of two streets. Curb returns guide motor vehicle during turning movements, and are important for delineating pedestrian zones at intersections.

Figure 3.9.6-1 Standard Curb Return Radii Diagram



3.9.6.3.2 Design Considerations

1. See Table 3.9.6-1 for recommended ranges for curb return radii.
2. Important factors for determining the size of curb return radii are the Corridor type and the location (i.e. inside or outside of a Center), and should be designed to ensure safe movement for all roadway users.
3. Desired curb return radii are provided in Table 3.9.6-1 and are organized by Corridor type. The intersections of Corridors that carry higher traffic volumes at greater speeds generally have larger curb return radii. Turning radii of design vehicles should be checked during design. It is assumed that trucks and buses may need to swing wide to make right turns, but should be avoided where feasible. It is also assumed that large vehicles will turn into the middle or far lane if more than one lane is available.
4. Curb return radii are provided as ranges to ensure some flexibility, though the size of curb return radii should be minimized where possible. Smaller radii reduce vehicle speeds and reduce pedestrian crossing distance, and are particularly desirable in Centers and Premium Transit Station Areas, and along Multi-modal, Main Street, and Major Transit Corridors as defined in the Comp Plan.
5. The design vehicle is generally an SU-30, though a smaller design vehicle is encouraged where feasible.
6. Curb return radii may be 15’ or below within all designated Centers, regardless of Corridor types. If a 15’ radius may not be achieved in Centers or along desired Corridors, the curb return radii shall be the low value provided in Table 3.9.6-1.
7. The design standards for curb return radii reflect that local roads may serve commercial and industrial purposes, in which case larger radii may be required to support delivery vehicles and other large trucks.
8. Larger radii are appropriate in locations where large vehicles, including buses and delivery trucks, make regular turning movements.

Table 3.9.6-1 Curb Return Radii Table

From/To	Commuter	Major Transit	Multi Modal	Main Street	Other Arterial	Minor Arterial	Collector	Local Commercial	Local Residential
Commuter	30-35'	25-30'	25-30'	25-30'	25-30'	25-30'	25-30'	25-30'	25-30'
Major Transit	25-30'	25-30'	20-25'	20-25'	20-25'	20-25'	20-25'	20-25'	20-25'
Multi Modal	25-30'	20-25'	20-25'	20-25'	20-25'	20-25'	20-25'	20-25'	20-25'
Main Street	25-30'	20-25'	20-25'	15-20'	20-25'	20-25'	15-20'	15-20'	15-20'
Other Arterial	25-30'	20-25'	20-25'	20-25'	25-30'	20-25'	20-25'	20-25'	20-25'
Minor Arterial	25-30'	20-25'	20-25'	20-25'	20-25'	20-25'	20-25'	20-25'	20-25'
Collector	25-30'	20-25'	20-25'	15-20'	20-25'	20-25'	15-20'	15-20'	15-20'
Local Commercial	25-30'	20-25'	20-25'	15-20'	20-25'	20-25'	15-20'	15-20'	10-15'
Local Residential	25-30'	20-25'	20-25'	15-20'	20-25'	20-25'	15-20'	10-15'	10-15'

3.9.6.3.3 Effective Curb Radius

1. The presence of bicycle lanes, bicycle buffers, and/or on-street parking can increase the "effective" radius, which takes into account the available space for a turning movement, rather than just the curb return itself. Curb returns may be designed according to the effective curb radius rather than the actual curb radius.

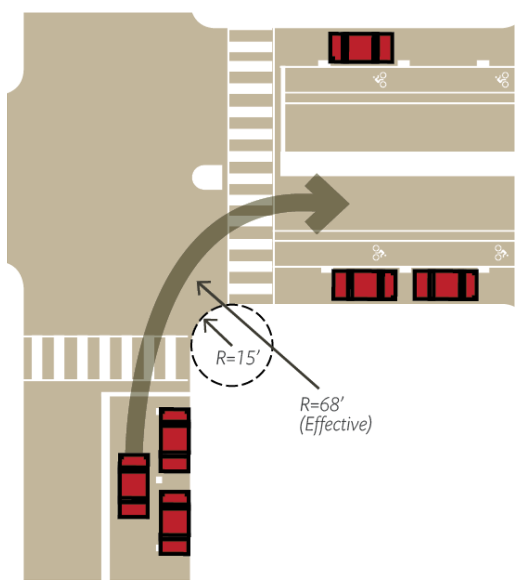


Figure 3.9.6-2 Effective Curb Return Radii Diagram

3.9.6.3.4 Curb Extensions

1. Where on-street parking lanes are provided, curb extensions may be considered for reducing the effective crosswalk width for pedestrians.
2. Curb return radii may be adjusted to allow sidewalk curb extensions for street crosswalk areas at intersections with local residential streets.

3.9.6.3.5 Freight Accommodations

1. Curb return radii may be increased along corridors with high levels of freight travel, or if one or more of the streets in question is impacted by a major freight traffic generator. In these cases, the curb return radii should correspond to a larger design vehicle.
2. For roundabouts, designers may consider incorporating mountable curbs, truck aprons, or other features that avoid the need for larger radii.

3.9.6.3.6 Channelized Right Turn Lanes

1. Channelized right turn lanes accommodate high levels of turning movements and encourage turning movements at higher speeds. Channelized right turns may be acceptable in locations with limited pedestrian activity and in locations where efficient traffic flow is particularly desirable, such as a Commuter corridor. Channelized right turn lanes should not be a standard design feature in high-pedestrian activity areas.
2. If such a turn lane is considered necessary, the designer should consult an accepted national design manual, including ITE Designing Walkable Urban Thoroughfares, and the City Engineer.
3. See section 23-3.9.7 (Median and Turn Lanes) for additional guidance.