SECTION 4 – ROADWAY DESIGN STANDARDS

4.01. General

The arrangement, character, extent, width and location of all streets shall be in general conformity with the Town's Thoroughfare Plan and Comprehensive Plan, and should be considered in their relation to existing and planned streets, topographical and environmental considerations, scenic views and the land uses proposed to be served by such streets.

The Town of Prosper shall approve the location of all public roadways, all driveway connections to public roadways, and all mutual access driveways between properties. Where a proposed public roadway or mutual access driveway will cross a property line, both property owners shall consent to the alignment; if the property owners fail to agree on an alignment, the alignment shall be determined by the Director of Engineering Services.

All thoroughfare and other roadway designs shall meet the guidelines in AASHTO's current *A Policy on Geometric Design of Highways and Streets*, and all street signs and pavements markings shall meet the guidelines in the current edition of the *Manual of Uniform Traffic Control Devices*.

4.02. Street Design

A. Thoroughfare Definitions - The Town of Prosper recognizes four basic classifications of public roadways that include freeways, thoroughfares, collectors, and local streets as identified in the transportation element of the Comprehensive Plan. Each class provides a certain degree of continuity, capacity, and accessibility to adjacent land uses. While differentiated by function, there is also a variance in geometric design. Table 4.1 summarizes the general design criteria of roadways within Prosper. The typical cross-sections are depicted in Figure 4.1.

B. Roadway Geometrics - Geometrics of city streets may be defined as the geometry of the pavement and curb areas that govern the movement of traffic within the confines of the rights-of- way (ROW). Included in the geometrics are pavement width, degree of curvature, width of traffic lanes, median nose radii, curb radii at street intersections, cross fall, crown height, pavement thickness and geometric shapes of islands separating traffic movements and other features.

1. Design Speed - The design speed is a primary factor in the horizontal and vertical alignment of roadways. Design features such as curvature, super-elevation, turning movement radii and sight distance affects roadway lane width, pavement width, pavement cross-fall, pavement crown and clearances. The design speeds depicted shall be used where existing ground slopes are less than six percent (6%). Refer to Table 4.1.

2. Grades - Roadway grades shall be a minimum of six-tenths percent (0.6%) in order to insure proper flow of surface drainage toward inlets and a maximum of six percent (6%). Steeper grades may be permitted on local residential streets and where required by topographical features, as approved by the Director of Engineering Services or their designee.

3. Roadway Centerline - Roadways shall be placed in the center of the ROW, but may be shifted slightly to avoid groupings of trees. The centerline of curves shall be tangent to the centerline of street at each end of curve.

4. Cross Fall/Crown Height – 6LD and 4LD thoroughfares shall have a minimum cross fall of one- quarter inch per foot and a maximum cross fall of three-eighths inch per foot. 3L and 2LC thoroughfares shall have six-inch (6") parabolic crowns, and 2LN and 2LRN thoroughfares a five-inch (5") parabolic crown.

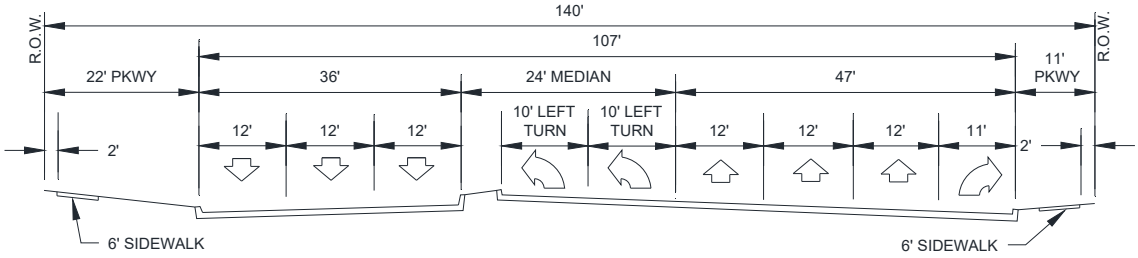
5. Pavement Thickness -. Refer to Table 4.1 for pavement thickness. The Town Paving and Subgrade Manual provides detailed design requirements for all street types.

TABLE 4.1: Town of Prosper Thoroughfare Definitions

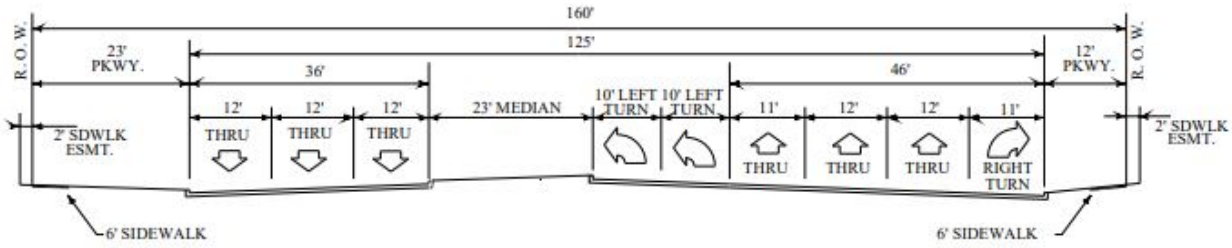
Criteria	Thoroughfare Class					
	Ultimate Major 6LD	**Interim(2) 4/6LD**	**Minor 4LD**	**Comm. Couplet 3L**	**Collector 2LC**	**Local 2LN/2LRN**
Right-of-Way (ROW)	120'(5)	120'(5)	90'(6)	65'	60'	50'/50'min.
Pavement Width (face-face)	2 @ 36'	2 @ 24'	2 @ 24'	53'(3)	36'(8)	30' / 26'
Traffic Lanes	6	4	4	2	2	2
Shoulder Width	--	--	--	--	--	-- / 2'
Left Turn-lane Width	2 @ 10'	1 @ 12'	1 @ 10'	--	--	--
Right Turn-lane Width	11'	11'	11'	--	--	--
Median Width	24'	48'	18'	--	--	--
Parkway Width	12'	12'	12'	6'	12'	10'/12'
Ditch Width	--	--	--	--	--	-- / 10'min.
Minimum Pavement	9"	9"	9"	7"	7"	6"
Design Speed, V (MPH)	50	50	45	35	30	25
Minimum Grade	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
Maximum Grade	6%	6%	6%	6%	6%	6%
Min. Horizontal Radii(1)	1,400'	1,400'	1,100'	450'	450'	300'(4)
Min. Tangent Between	100'	100'	100'	100'	100'	--
Min. Length of Crest Curve	See Table 4.3					
Min. Length of Sag	See Table 4.4					
Stopping Sight Distance	425'	425'	360'	200'	200'	155'
Parking	None	None	None	Permitted	Permitted	Permitted
Volume Range (VPD)	36-45,000	20-28,000	20-28,000	12-18,000	6-12,000	--

(1) Absolute minimum based on 2% cross slope.
(2) Four lane thoroughfare built in ROW of a 6LD thoroughfare so it can be widened in the future.
(3) Pavement of Commercial Couplet 3L includes 37' of travel way with 8' of parking on either side.
(4) May be reduced to two hundred feet (200') radius at mid-block locations provided that it is shown that the general public safety is not compromised. A curve, with a radius less than two hundred fifty feet (250'), must be a minimum of three hundred feet (300') from a street or alley intersection.
(5) 140' ROW at intersections with a 4 or 6 lane thoroughfare.
(6) 110' ROW at intersections with a 4 or 6 lane thoroughfare.
(7) Thickness shall be based on the geotechnical soils report. The Paving and Subgrade Manual provides detailed design requirements for all street types.
(8) Roadways adjacent to a neighborhood park or school shall have a minimum pavement width of 36'.

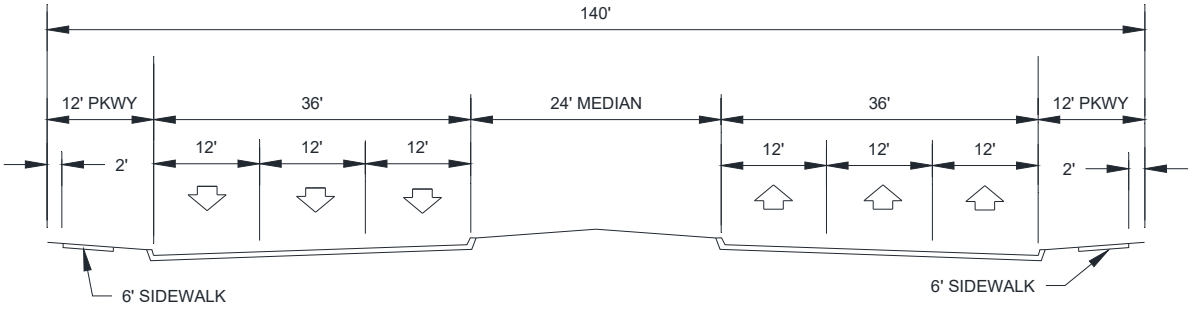
Ultimate Major Thoroughfare '6LD' (Intersection)



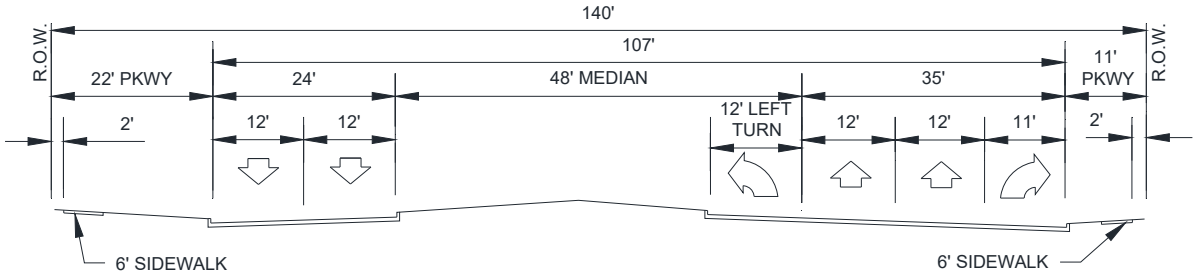
Ultimate Major Thoroughfare '6LD' (at DNT Frontage Roads)



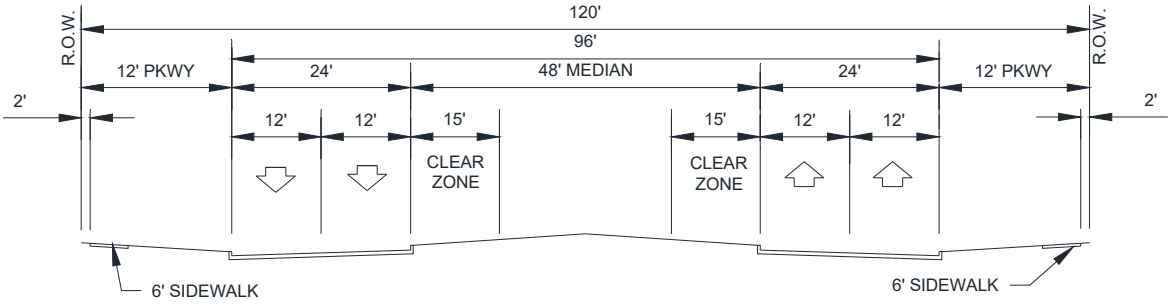
Ultimate Major Thoroughfare '6LD' (Midblock)



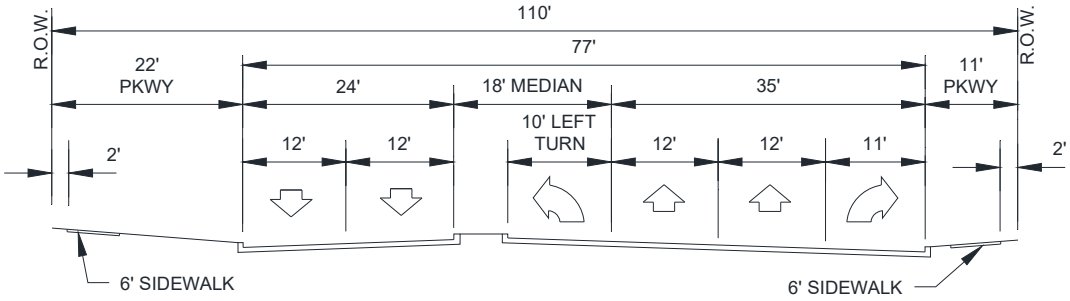
Interim Major Thoroughfare '4/6LD' (Intersection)



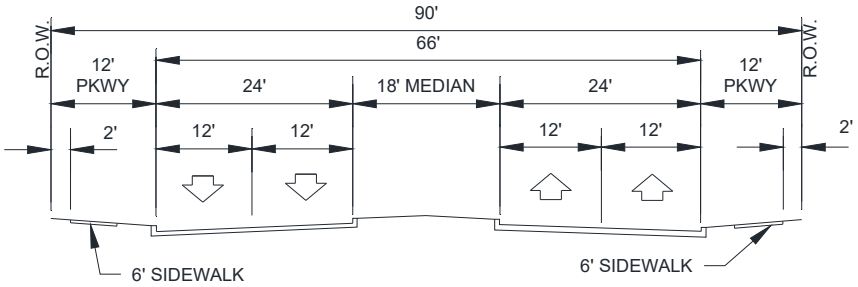
Interim Major Thoroughfare '4/6LD' (Midblock)



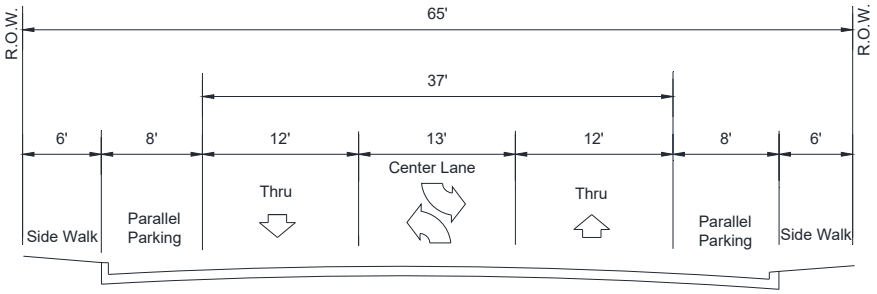
Minor Thoroughfare '4LD' (Intersection)



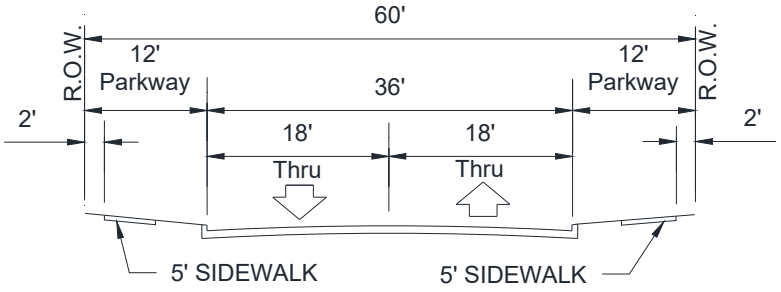
Minor Thoroughfare '4LD' (Midblock)



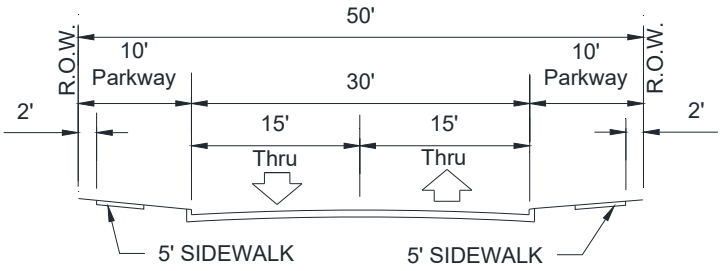
Commercial Couplet '3L'



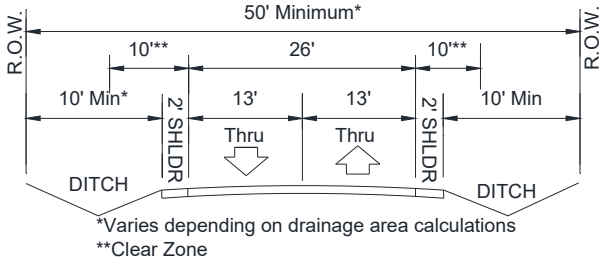
Collector Street '2LC'
(Commercial and Residential)



Neighborhood Street '2LN'



Rural
Neighborhood Street '2LRN'



Divided Residential Subdivision Entrance

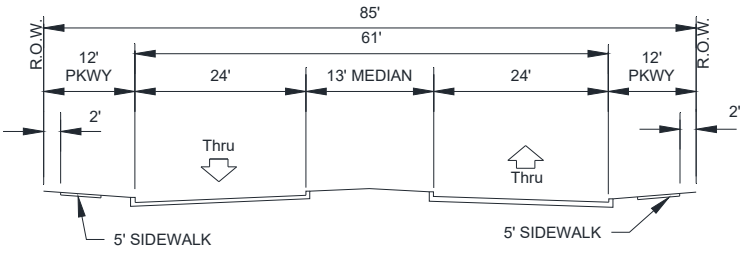


FIGURE 4.1: Typical Roadway Cross-Sections

C. Minimum Horizontal Design Radius:

1. The minimum centerline radius is a function of design speed, super-elevation and vehicle side friction. Side friction is the force that keeps a vehicle from sliding off the roadway. The minimum acceptable horizontal centerline radius is calculated using the following equation:

$$R(ft.) = \frac{V^2}{15(e+f)}$$

Where: R = centerline radius (ft); V = vehicle design speed (MPH); e = rate of roadway super-elevation (ft/ft); f = side friction factor (Table 4.2)

2. The minimum acceptable horizontal radius is shown in Table 4.2. The maximum length of a horizontal curve on 3L, 2LC, 2LN and 2LRN thoroughfares shall not exceed 1.6 times the centerline radius for a radius of two hundred feet (200') or greater.

TABLE 4.2: Minimum Horizontal Centerline Radius

Design Speed V (MPH)	f	e (ft/ft)	R (ft) (Rounded for Design)
25	0.165	-0.02	300(1)
30	0.160	-0.02	450
40	0.150	-0.02	600
45	0.145	-0.02	1,100
50	0.140	-0.02	1,400

1) May be reduced to two hundred feet (200') radius at mid-block locations provided that it is shown that the general public safety is not compromised. A curve, with a radius less than two hundred fifty feet (250'), must be a minimum of three hundred feet (300') from a street or alley intersection.

D. Minimum Vertical Alignment:

1. Vertical curves are utilized in roadway design to affect gradual change between tangent grades and will result in a design which is safe, comfortable in operation, pleasing in appearance and adequate for drainage. Vertical curve alignment shall also provide Stopping Sight Distance (SSD) in all cases. SSD is a function of design speed, perception-reaction time, grade, and vehicle deceleration. The perception-reaction time is assumed to be 2.5 seconds as stated by the American Association of State Highway and Transportation Officials (AASHTO). The vehicle deceleration is assumed to be 11.2 feet per second per second (fps2) based upon conservative pavement conditions and the ability of a vehicle to deceleration rate on a level grade. The equation for SSD appears below:

$$SSD = 1.47PV + 1.075\frac{V^2}{a}$$

Where: SSD = Stopping Sight Distance (ft); P = Perception Reaction Time (2.5 sec.); V = vehicle design speed (MPH); a = vehicle deceleration rate (11.2 fps2)

2. The minimum acceptable length of Crest and Sag curves are shown in Tables 4.3 and 4.4. Tables 4.3 and 4.4 also show values of K. K is defined as the rate of vertical curvature and is equivalent to the horizontal distance in feet required to make a one percent (1%) change in grade. The values of A are equivalent to the algebraic difference in grade between the two grades that are being joined together by the vertical curve.

TABLE 4.3: Minimum Acceptable Crest Curve Given Speed and Difference in Grade of Road

Design Speed, V (MPH)	SSD (ft)	K	Length of Vertical Curve, ft (L=KA)									
			A=1 (1)	A=2	A=3	A=4	A=5	A=6	A=7	A=8	A=9	A=10
25	155	12	--	100	100	100	100	100	100	100	110	120
30	200	19	--	100	100	100	100	120	140	150	170	190
35	250	29	--	100	100	120	150	180	200	230	260	290
40	305	44	100	100	130	180	220	270	310	350	400	440
45	360	61	100	120	180	250	310	370	430	490	550	610
50	425	84	100	170	250	340	420	510	590	670	760	840

(1)Speeds less than forty miles per hour (40 MPH), no vertical curve is necessary. Speeds greater than forty miles per hour (40 MPH), use length of one hundred feet (100').

TABLE 4.4: Minimum Acceptable Sag Curve Given Speed and Difference in Grade of Road

Design Speed, V (MPH)	SSD (ft)	K	Length of Vertical Curve, ft (L=KA)									
			A=1 (1)	A=2	A=3	A=4	A=5	A=6	A=7	A=8	A=9	A=10
25	155	26	--	100	100	110	130	160	180	210	240	260
30	200	37	--	100	110	150	190	220	260	300	330	370
35	250	49	--	100	150	200	250	300	340	390	440	490
40	305	64	100	130	190	260	320	390	450	510	580	640
45	360	79	100	160	240	320	400	480	550	630	710	790
50	425	96	100	190	290	390	480	580	670	770	870	960

(1)Speeds less than forty miles per hour (40 MPH), no vertical curve is necessary. Speeds greater than forty miles per hour (40 MPH), use length of one hundred feet (100').

Advisory Note: Values provided in Table 4.3 and 4.4. are minimum standards for stopping sight distance requirements. However, maximum design lengths should be considered to allow prosper drainage.

E. Standard Intersection Layout:

1. Street intersections shall intersect at ninety-degree (90°) angles. Intersection approaches for 4 or 6 lane thoroughfares shall remain perpendicular for a minimum distance equal to the corresponding design speed Stopping Sight Distance (SSD) identified in Table 4.3. For residential collector and/or local street intersections, a five-degree (5°) tolerance is allowable.
2. The curb radii shall be twenty feet (20') where 2 lane thoroughfares intersect with other 2 lane thoroughfares. All other intersecting streets, curb radii shall be thirty feet (30').

3. Intersection of 4 or 6 lane thoroughfares with other 4 or 6 lane thoroughfares shall maintain a maximum slope of two percent (2%) a minimum distance of two hundred feet (200') upstream and downstream of the intersection.
4. Roadway connections to a 4 or 6 lane thoroughfare shall maintain a maximum slope of two percent (2%) a minimum distance of one hundred feet (100') upstream and downstream of the intersection.
5. A separate grading plan shall be provided for intersections of 4 or 6 lane thoroughfares with other 4 or 6 lane thoroughfares.
6. At four-way intersections of parabolic streets, the reduction of the crown height shall occur on the thoroughfare with the through gutter.

a) For 3L and 2LC thoroughfares, the crown height reduction from six inches (6") to three inches (3") shall occur through the intersection and transition from the curb return to a point fifty feet (50') past the curb return.

b) For 2LN and 2LRN thoroughfares, the crown height reduction from five inches (5") to three inches (3") shall occur through the intersection and transition from curb return to a point thirty feet (30') past the curb return.

7. Alley curb radii shall be fifteen feet (15').
8. A minimum of nine and a half feet (9.5') of parkway shall be maintained from the back of the curb along the curb's radius.
9. ROW width for 6LD or 4/6LD thoroughfare that intersects a 4 or 6 lane thoroughfare shall be one hundred forty feet (140') for a distance of two hundred feet (200') from the intersection and then taper at a 15:1 ratio to the standard ROW width. This allows for the future construction of additional traffic lanes at the intersection. See Figure 4.2.

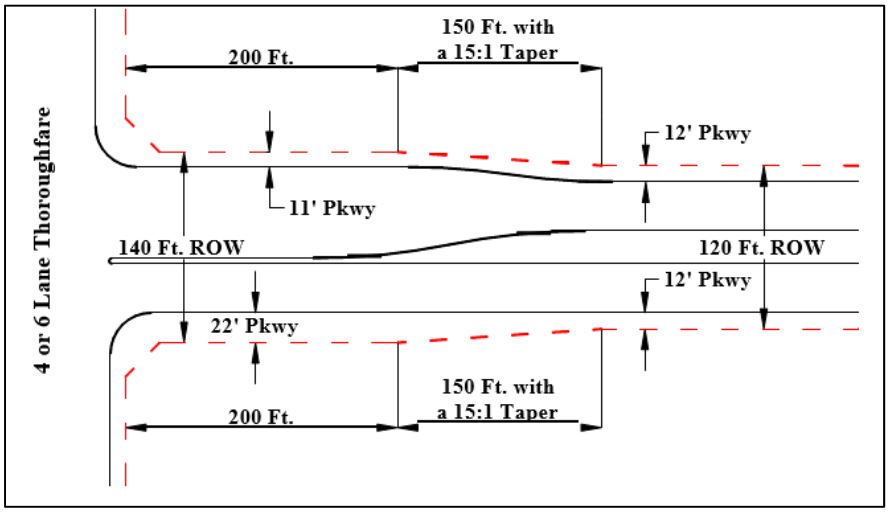


FIGURE 4.2: Major Intersection Detail (6LD or 4/6LD Thoroughfare)

10. ROW width for a 4LD thoroughfare that intersects a 4 or 6 lane thoroughfare shall be one hundred ten feet (110') for a distance of one hundred fifty feet (150') from

the intersection and then taper at a 15:1 ratio to the standard ROW width to allow build-out of the intersection. See Figure 4.3.

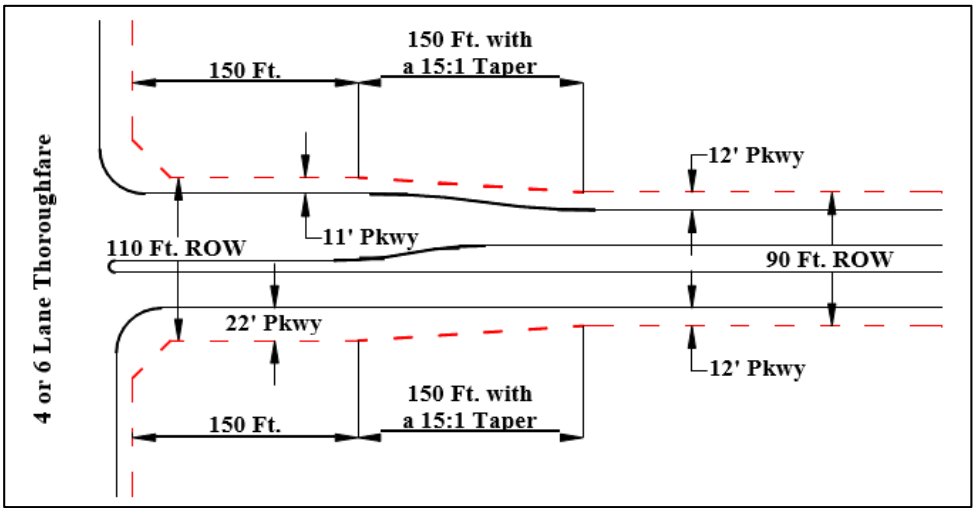


FIGURE 4.3: Minor Intersection Detail (4LD Thoroughfare)

F. Roundabouts

1. Roundabouts may be considered for the intersection of 4LD, 3L, and 2LC, roads with 4LD, 3L, 2LC, and 2LN. Roundabouts may also be considered for intersections along interim major thoroughfares (4LD/6LD) that have not yet been widened to six lanes. Roundabouts shall not be installed at the intersection of two 6LD thoroughfares, 6LD-4LD thoroughfares, or two 4LD thoroughfares without a detailed traffic simulation and cost-benefit analysis approved by the Director of Engineering Services. Roundabouts shall not be installed along a 6LD thoroughfare.
2. Roundabouts on private property that connect to a private street or to a fire lane shall be designed to the standards in these design requirements.
3. Roundabouts shall be designed to accommodate a Town fire truck making all possible entry and exit movements. A fire truck shall be able to make the “through” movement without traveling on a truck apron. Roundabouts located along a 6LD, 4LD, or 2LC thoroughfare shall also accommodate a WB-67 design vehicle.
4. Roundabouts shall include the typical features of a modern roundabout shown in Figure 4.4 and described in these design requirements.
5. The curb surrounding the central island shall be six inch (6”) vertical curb if a truck apron is provided and six inch (6”) mountable curb if no truck apron is provided. The curb surrounding a truck apron shall be three inch (3”) mountable curb. The curb surrounding all faces of each splinter island shall be four inch (4”) mountable curb.
6. The inscribed circle radius shall be minimum of fifty-five feet (55’) and a maximum of eighty feet (80’) for a single lane roundabout, and a minimum of seventy-five feet (75’) and a maximum of a hundred feet (100’) for a two-lane roundabout.

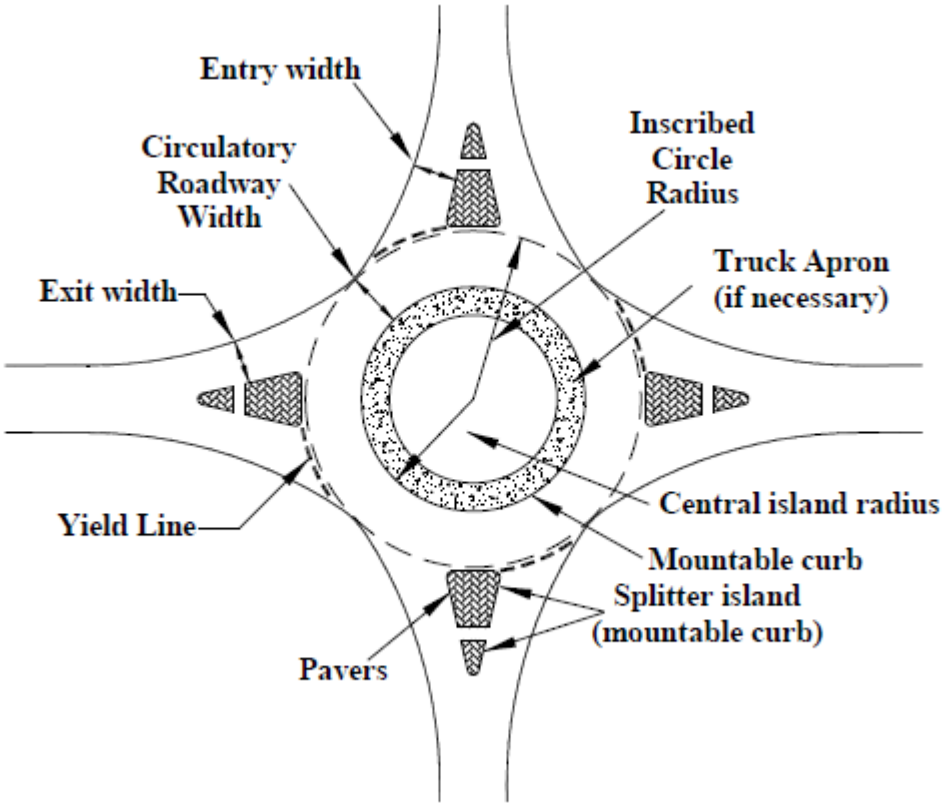


FIGURE 4.4: Typical Roundabout

7. The circulatory roadway shall have a minimum width of sixteen feet (16'), face-to-face. The circulatory roadway shall be at least as wide as the maximum entry width at the roundabout. If the circulatory roadway is less than twenty-nine feet (29') wide, face-to-face, a truck apron shall be provided. The combined width of the circulatory roadway and the truck apron shall be a minimum of twenty-nine feet (29'). Truck aprons shall provide a solid surface of concrete pavers that are a contrasting color compared to the pavement of the circulatory roadway and shall not give the appearance of being a sidewalk.
8. Single lane entries and exits shall be a minimum of sixteen feet (16') wide, face to face. Two-lane entries and exits shall be a minimum of twenty-four feet (24') wide, face to face.
9. Splitter islands shall provide a solid surface of concrete pavers unless the entry and exit on the same leg of the roundabout are both at least twenty-four feet (24') wide, face to face. The pavers shall be a contrasting color compared to the street pavement and no signs shall be installed in the splitter island. If pavers are not required, the splitter island can contain Town approved landscaping provided it does not interfere with the necessary sight distance.
10. Crosswalks shall pass through or in advance of each splitter island.

11. All streets, fire lanes, and approved driveways shall intersect radially with a roundabout. Residential driveways and alleys shall not intersect with a roundabout (including the splitter island components).
12. The design of any roundabout located along a 4LD or 2LC thoroughfare shall include calculations of the vehicle entry path deflection (fastest path) in each direction. Each critical radius along the fastest path must be shown to reduce speeds to the desirable levels shown in the latest edition of FHWA's Roundabouts: An Informational Guide.
13. Landscaping and/or monuments within the central island are encouraged, but shall be limited so that the minimum sight distance described in the latest edition of FHWA's Roundabouts: An Informational Guide are provided at the roundabout. For vehicles approaching the roundabout, this includes the approach stopping sight distance to the crosswalk or the yield line, the stopping sight distance to the crosswalk on the next exit, and the intersection sight distance to circulating vehicles and vehicles entering at the immediate upstream entry. For circulating vehicles, this includes the stopping sight distance on the circulatory roadway.
14. Parking is prohibited within a roundabout.
15. On any approach to a roundabout, driveways, alley connections, and on-street parking shall not be permitted between the crosswalk and the yield line nor along any portion of street that contains a splitter island.
16. No building (e.g., a home, amenity center, school, business, sports facility, etc.) shall front onto a roundabout or have a private driveway or pedestrian entrance facing the roundabout in a way that would encourage motorists to park, stop, or stand in the roundabout. No building shall be located adjacent to a roundabout in a way that would have the roundabout serve as its primary fire protection and/or emergency response staging area.
17. The ROW for a roundabout shall extend a minimum of twelve feet (12') beyond the back of its outer curb. The ROW for any street entering the roundabout will flare out as the street flares so that a minimum of twelve feet (12') is provided beyond the back of curb on each side of the street.
18. The roundabout entries and exists and the pavement contained within the inscribed circle radius shall be constructed on a uniform plane of the same grade, which shall not exceed two percent (2%) Roadway approaches to the roundabout shall have a maximum slope of two percent (2%) for a distance of at least two hundred feet (200') for 4LD thoroughfares and at least one hundred feet (100') for 2LC thoroughfares.
19. Roundabouts shall be illuminated by street lights as described in the latest edition of FHWA's Roundabouts: An Informational Guide.
20. The design of any roundabout located along a 4LD or 2LC thoroughfare shall include calculations of the vehicle entry path deflection (fastest path) in each direction. Each critical radius along the fastest path must be shown to reduce speeds to the desirable levels shown in the latest edition of FHWA's Roundabouts: An Informational Guide.

G. Residential Frontage - Residential units, except for multifamily and townhome units, shall not front or side a 6LD, 4/6LD, 4LD, 4LRD, 3L or 2LC thoroughfare (with limited exceptions for 2LC as stated below) roadways unless parallel access roads are provided. Minimum distances between adjacent curbs of the thoroughfare and the access road shall be twenty feet (20'). Access road ROW shall be in addition to the thoroughfare ROW and shall not connect to the adjacent thoroughfare.

1. In accordance with Town of Prosper Subdivision Ordnance, no residential roadway (2LN) shall connect to thoroughfare roadways. Residential developments must connect with a collector roadway (2LC) or a divided roadway (which shall consist of two 24-foot lanes, a minimum of 4-foot median and 9.5 foot parkways) to a major or minor thoroughfare.
2. This collector or divided roadway can terminate at the first intersection or transition after sixty (60) feet measured from the thoroughfare right-of-way line. Longer 2LC section may be required due to size of development as determined by the Director of Engineering Services. Transitioning from collector (2LC) to residential (2LN) section must be done in a minimum of 30 feet.
3. Residential units may front this entry 2LC for no more than half of the length of the collector (2LC) section. Residential driveways shall be prohibited from connecting to the 2LC roadway, any portion of a divided entry roadway, or the transition section.

H. Street Lengths

1. Major and Minor (6LD, 4/6LD, 4LD) thoroughfares and commercial streets (3L, commercial 2LC) have no street length restrictions. Residential streets (2LN, 2LRN, 2LC in a single-family, duplex, or townhome neighborhood) shall have street length restrictions to discourage speeding and cut- through traffic. All street length restrictions shall be measured from the ROW line of the intersecting street on each end of the street being measured.
2. A residential street shall not directly connect to thoroughfares (6LD, 4/6LD, 4LD). Residential roadways must connect to or transition from a collector or a subdivision divided entry roadway which shall connect to the thoroughfare.
3. Residential streets (2LN and 2LRN) shall not have a straight tangent section over eight hundred feet (800') in length before requiring a "minor" traffic calming street treatment. Residential streets with straight tangent sections shall not exceed two thousand feet (2000') before requiring a "major" traffic calming street treatment.
4. See Section 4.02.K for information on Minor and Major Traffic Calming Street Treatments. Residential collectors (2LC) shall not have a straight tangent section over one thousand two hundred feet (1200') in length before a change in direction or major traffic calming street treatment.

I. Block Length Requirements

1. Residential blocks shall not exceed one thousand feet (1,000') in length, measured from street ROW line to street ROW line. In the case of non-rectangular blocks, each side of the block with lots fronting onto it shall not exceed one thousand feet (1,000'), measured between the vertices formed by the extension of ROW lines at each corner of the block. Per Section 6.08.E. of the Town of Prosper Subdivision Ordinance, a waiver to minimum block length may be approved by the Director of Development Services.
2. Street Block Width – Blocks shall be wide enough to allow two tiers of lots and shall have a block width of no less than 200 feet, except when only one tier of lots is possible due to the size of the property or the *need to back up* to an arterial.

J. Entrance Streets – A street serving a residential development that connects to a major/minor thoroughfare shall meet the following requirements:

1. Unless approved as a cul-de-sac, all neighborhoods shall have a minimum of two entrance streets.
2. A neighborhood with public residential streets shall have a minimum of two public entrance streets. A public entrance street cannot be removed or converted to a private entrance street unless the neighborhood retains at least two other public entrance streets.
3. An entrance street shall be a minimum of thirty feet (36') wide, face to face, or meet the requirements of a divided residential street.
4. Each neighborhood shall have at least one entrance street designated as a primary entrance street. Regardless of phased construction, neighborhoods that will ultimately be larger than one hundred (100) acres in size, including any parks, schools, or floodplain areas, shall have one primary entrance street on each major/minor thoroughfare bounding the neighborhood. Individual neighborhoods that will connect to other neighborhoods to eventually form a larger combined neighborhood surrounded by major/minor thoroughfares shall each have a primary entrance so that the combined neighborhood will eventually have at least one primary entrance on each major/minor thoroughfare.

K. Curvilinear Streets – The majority of residential streets within a neighborhood are encouraged to be curvilinear. If the criteria for curvilinear streets are met, the street sections within the development will not require a Minor or Major Traffic Calming Street Treatment. Curvilinear streets are as defined by the following requirements:

1. The centerline of a curvilinear street shall consist of one or more horizontal curves or a combination of straight lines and horizontal curves. Each curve shall meet the minimum radius requirements described in Subsection 4.02.C and shall have a minimum arc length of one hundred twenty-five feet (125').
2. A straight line drawn between the two ends of the centerline of a curvilinear street shall cross over a curb in at least two locations along the length of the street. This straight line shall be offset from the curb a minimum of thirty feet (30') in at least one location along the street so that a motorist on one end of the street cannot see the other end.

3. The closest residential street parallel to a major/minor thoroughfare is not required to be curvilinear, but the design of the neighborhood shall become more curvilinear as the distance from the major/minor thoroughfare increases. However, at no time shall maximum tangent length for these streets be over 1200 feet.
4. The use of a street that is primarily straight with a short curve at one end of the street shall be limited to streets whose straight end is perpendicular to the straight edge of the neighborhood and is separated from that straight edge by no more than one lot. However, a primarily straight street with a larger curve at one end of the street that changes the direction of the street by ninety degrees (90°) can be used in any location.
5. A short residential street that connects between two curvilinear streets is not required to be curvilinear if it has no homes fronting onto it.
6. Curvilinear streets should follow the natural features of a site so that the leveling and/or filling of the natural topography is minimized.
7. Curvilinear streets shall be designed so that the sight distance requirements in Table 4.1 are maintained.

L. Other Street Designs and Requirements:

1. Any segment of a residential street that is adjacent to a school shall be constructed with the 2LC Residential cross section. Chokers and pedestrian bulb-outs shall not be used adjacent to a school without prior approval by the Director of Engineering Services.

> **Advisory Note:** Lots are encouraged to side a residential roadway adjacent to and serving an elementary school in leu of fronting said street. Efforts should be made to side residential lots where possible.

2. Any segment of a residential street that is adjacent to a park, or adjacent to an HOA open space that has sufficient level space for one or more practice fields, shall be constructed with the 2LC Residential cross section. If the 2LC Residential cross section will extend for more than eight hundred feet (800'), midblock chokers and pedestrian bulb-outs at intersections shall be used for traffic calming.
3. A choker is a midblock location where a residential street is narrowed to twenty-two feet (22') wide, face to face. A choker shall be twenty-five feet (25') long, not counting the taper on either end. Pedestrian bulb-outs are used at an intersection to narrow the residential street to twenty-four feet (24') wide, face to face, at the location where pedestrians cross the street. Pedestrian bulb outs shall consist of a fifteen foot (15') tangent extending from the curb return. Chokers and pedestrian bulb-outs shall contain landscaping or a sign to increase their visibility to motorists; however, trees shall not be planted in them.
4. On-Street Parking - Where on-street parking is allowed, it shall operate as parallel parking unless otherwise approved by the Director of Engineering Services. Where head-in parking is approved by the Director of Engineering Services, the parking spaces shall be angled in the direction of traffic flow on each side of the street, assuming a vehicle pulls forward into a parking space. Where on-street angled parking is used, the street shall provide a travel section that is no less than twenty-four feet (24') wide.

5. Bike Lane Consideration – if a thoroughfare is designated as a bike route, the width of the outside lane and the width of the ROW shall be increased by three feet (3') on 4 or 6 lane thoroughfares. For federal funding, five feet (5') may be required.

M. Traffic Calming Street Treatments with Initial Design

To promote safe streets and discourage speeding through residential neighborhoods when alignments cannot meet the requirements of section 4.02.K for curvilinear streets, street design shall include the design elements as stated below. It shall be the design consultant's responsibility to analyze the suitability of all traffic calming treatments and ensure adequate signage and/or pavement markings are installed, appropriate sight distance is provided, and all other potential physical conditions have been evaluated. Traffic calming treatments shall be done in a manner to not significantly impact response times for emergency vehicles. Treatments shall also be designed as to not impact other features of residential design which include, but not limited to, street lights, fire hydrants, curb inlets, and barrier free ramps. Drainage shall be considered in all treatments ensuring that street capacity and positive flow is not compromised. All treatments shall follow the guidance and requirements as identified by the FHWA "Traffic Calming ePrimer" resource when applicable (ITE guidelines shall be used when FHWA guidelines do not cover all design requirements).

Traffic calming treatment shall only be allowed when physical constraints of the property are such that the curvilinear requirments cannot be reasonably met. Any traffic calming treatments shall require the pre-approval of both the Director of Engineering Services and the Prosper Fire Marshal.

1. Minor Traffic Calming Treatments – required when straight tangent sections exceed 800 ft in length. Treatments may include a combination of items listed below and shall be spaced so no straight section without treatment shall exceed 600 ft in length (with the exception of raised intersections).

    a. Enhanced pavement – includes stamped and stained (integral color) concrete of a pattern and color that is cohesive with the neighborhood while color has enough contrast to distinguish it. The enhanced pavement section shall be for the full road width, but may exclude two (2) foot for the gutter and curb. Enhanced pavement length shall be a minimum of 25 ft, and shall include a section for every one hundred (100) feet over the maximum 800 ft straight tangent section (if not combined with other minor treatments) equally spaced throughout the straight section.

    b. Raised Intersection – the full intersection, including crosswalks, of a 4-way intersection shall be raised a height between 2.5 to 3 inches with 6-foot approaches. Raised intersections shall only be allowed where the straight section exceeding the maximum length does not warrant stop signs. Other than 4-way intersections, raised intersections shall only be allowed on T-intersections when opposite an open space lot so as not to hinder residential lot access.

c. Raised Crosswalk – raised crosswalks shall be designed with a raised height between 2.5 to 3 inches with a 6-foot approach and shall only be used where pedestrian traffic is intended to be higher than normal which shall include, but not limited to, routes to schools, neighborhood parks or part of a hike & bike trail. Raised crosswalks shall not be used arbitrarily in attempt to satisfy minor treatment for exceeding maximum straight sections, but only when there is a high potential for pedestrian traffic such as for hike & bike crossings, or near parks or amenity centers.

d. Choker – a horizontal extension of the curb into the street resulting in a narrower roadway section (a minimum of 24 ft to remain). They shall be between 12 ft and 20 ft in length and designed with a mountable curb. Chokers shall include stamped and stained (integral color) concrete of a pattern and color that is cohesive with the neighborhood. Pavers shall be allowed with approval by the Director of Engineering Services and may include a maintenance agreement with the HOA. Chokers shall only be allowed adjacent to open space lots or residential lots greater than 60 ft in width when centered on lot lines so as not to hinder residential lot access.

e. Median Island – a raised island in the middle of a roadway along a street centerline. The raised island shall be 3 to 3.5 inches in height with a mountable curb, a minimum of 4 feet in width (as measured from back of curb) and a minimum of 20 in length. Median Islands shall include stamped and stained (integral color) concrete of a pattern and color that is cohesive with the neighborhood. Pavers shall be allowed with approval by the Director of Engineering Services and may include a maintenance agreement with the HOA. Median Islands shall only be allowed adjacent to open spaces (both sides), and shall require 24 foot lanes on either side (face of curb to face of curb).

2. Major Traffic Calming Treatments – required in combination with minor street treatments, but when the straight tangent section exceeds 2000 feet.

   a. Mini Residential Traffic Circle –a mini traffic circle shall be allowed on residential roadways to satisfy a major traffic calming treatment and shall include the following:

      - Design shall follow Town detail for a Mini Traffic Circle
      - Driveway/access restrictions shall be placed on the final plat for all residential lots that are adjacent to traffic circle.

   b. Mini Roundabout - a mini roundabout following criteria as listed in FHWA technical bulletin and similar features as identified in section 4.02.F. shall be allowed on residential roadways (2LN) and shall include the following:

      - Common areas shall be provided adjacent to the roundabout up to the pedestrian crossings on minor legs of intersection and for the full length of the adjacent lot on the major leg of intersection.
      - Roundabouts shall be used in lieu of a traffic circles when one of the intersection legs is a significantly dominant route over the other leg.

Advisory Note: Dominant routes can be subjective, but are mostly considered for entries into a development, or major routes to schools or neighborhood parks.

4.03. Median, Left-Turn Lane, Right-Turn Lane, Deceleration Lane, and Island Design

A. Required Median Openings and Left-Turn Lanes:

1. Median openings on divided thoroughfares shall be required at all street intersections. Median openings may be constructed to serve non-residential drives provided that the minimum spacing requirements listed are met. Left-turn lanes shall be provided at all median openings.

2. All non-residential lots on a divided thoroughfare shall have direct or indirect access to a median opening. Indirect access shall be provided through a series of fire lane and access easements. Multifamily developments, on a divided thoroughfare, shall have direct access to a median opening. Median openings for street intersections and non-residential driveways may be moved at the discretion of the Town to facilitate traffic flow as long as minimum distances are maintained as per Sections 4.03.B.4 and 4.03.B.5.

B. Minimum Left-Turn, Transition Length, and Median Opening Width, Location, and Spacing Requirements:

1. Left-Turn Lane Storage:

   a. All left-turn storage areas on divided thoroughfares shall be ten feet (10') wide.
   b. Storage requirements listed in Table 4.5 are absolute minimums. Storage requirements may be increased by the Town based upon actual and projected traffic demands of the properties, which will be served by the left-turn lane.
   c. Left-turn lanes will be delineated by using buttons.
   d. Stamped and stained concrete shall be used in the median rather than grass when the median width measured from back of curb to back of curb is a distance of four feet (4') or less.

2. Transition Length – The transition specifications for left-turn lane entrance areas are specified in Table 4.5. The variables used for the specification are shown in Figure 4.5.

3. Median Openings:

   a. Median openings at intersections shall accommodate all turning paths and crosswalks.
   b. The length of mid-block median openings shall be between sixty feet (60') and seventy feet (70'). Median openings may be up to eighty feet (80') long where necessary to accommodate turning paths and crosswalks, subject to approval by the Director of Engineering or their designee.

4. Minimum Spacing Between an Intersection and the First Mid-Block Median Opening on Divided Thoroughfares – The minimum distance to the first mid-block median opening along 4 or 6 lane thoroughfares that are immediately downstream from an intersection with a 4 or 6 lane thoroughfare are shown in Figure 4.6. These distances vary from three hundred fifty feet (350') to four hundred twenty-five feet (425') nose to nose depending on the thoroughfare type and the type of mid-block opening.

5. Minimum Distance Between Mid-Block Median Openings for 3L, 2LC, 2LN, and 2LRN Thoroughfares and Driveways along Divided Thoroughfares – The minimum distance between median openings on a 4 or 6 lane thoroughfare where left-turn storage is provided in both directions for 3L, 2LC, 2LN, and 2LRN intersecting thoroughfares and driveways is shown in Figure 4.7. The distances shown are measured nose to nose. Refer to Tables 4.8-4.10 for driveway design requirements.

TABLE 4.5: Minimum Left-Turn Design Requirements

Type of Thoroughfare On	Type of Thoroughfare At	Turn Lane Width(s) (ft)	Length of Full-Width Turn Lane (ft)	Transition Specifications		
				Length (ft)	R_1(ft)	R_2(ft)
6LD, 4/6LD	4 or 6 lane	10(1)	150, 250(2)	200	505	505
4LD, 4LRD	4 or 6 lane	10	150	100	250	250
4 or 6 lane	3L, 2LC	10	150	100	250	250
4 or 6 lane	2LN, 2LRN	10	100(3)	100	250	250
4 or 6 lane	Non-Residential Driveway	10	150	100	250	250
NTTA Service Road	All Types	10	150, 250(2)	200	505	505

(1) Double Left-Turn Lanes
(2) 150' – Inside Left-Turn Lane; 250' – Outside Left-Turn Lane
(3) 150' stacking shall be required for gated communities

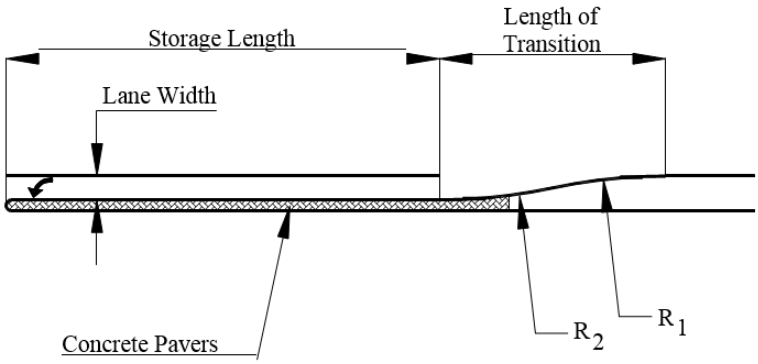


FIGURE 4.5: Typical Left-Turn Lane Dimensions

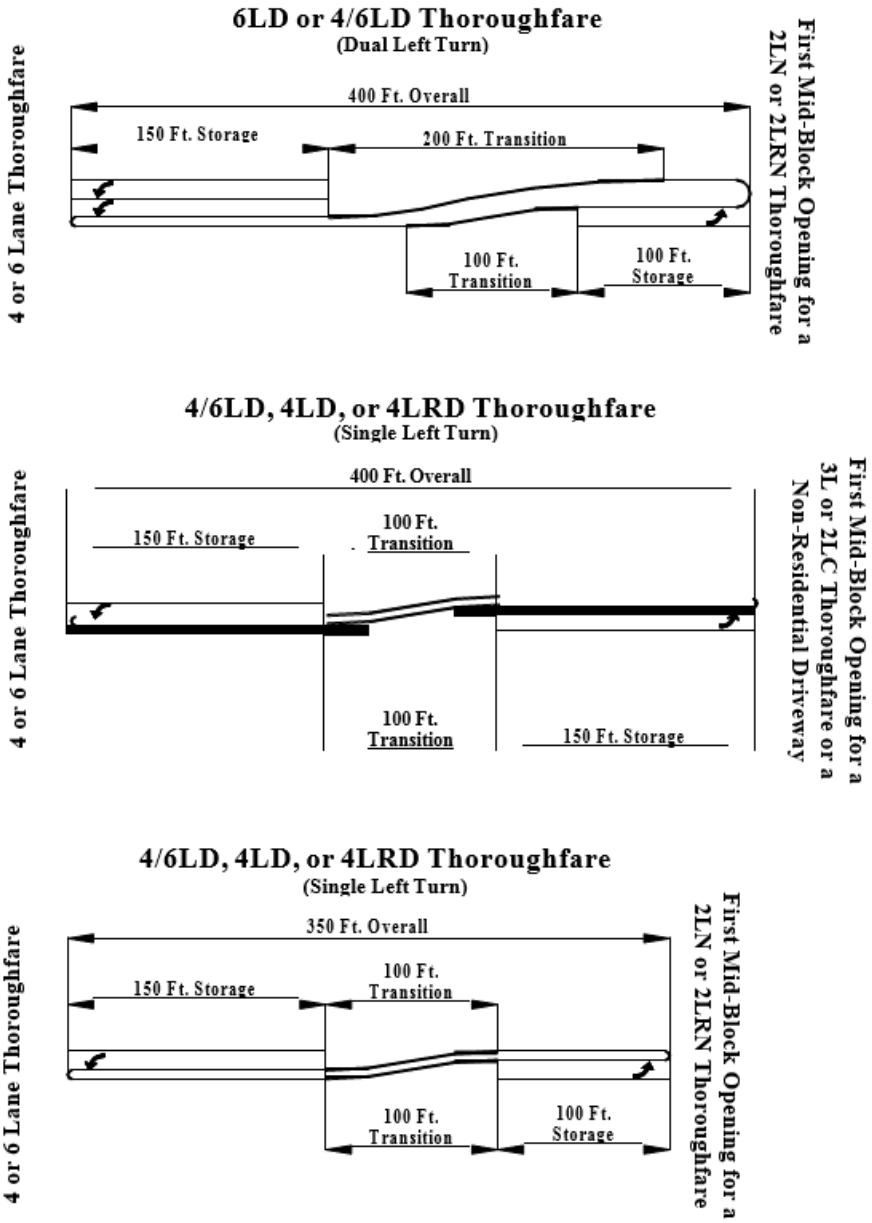


FIGURE 4.6: Minimum Spacing Between an Intersection and the First Mid-Block Median Opening on a Divided Thoroughfare

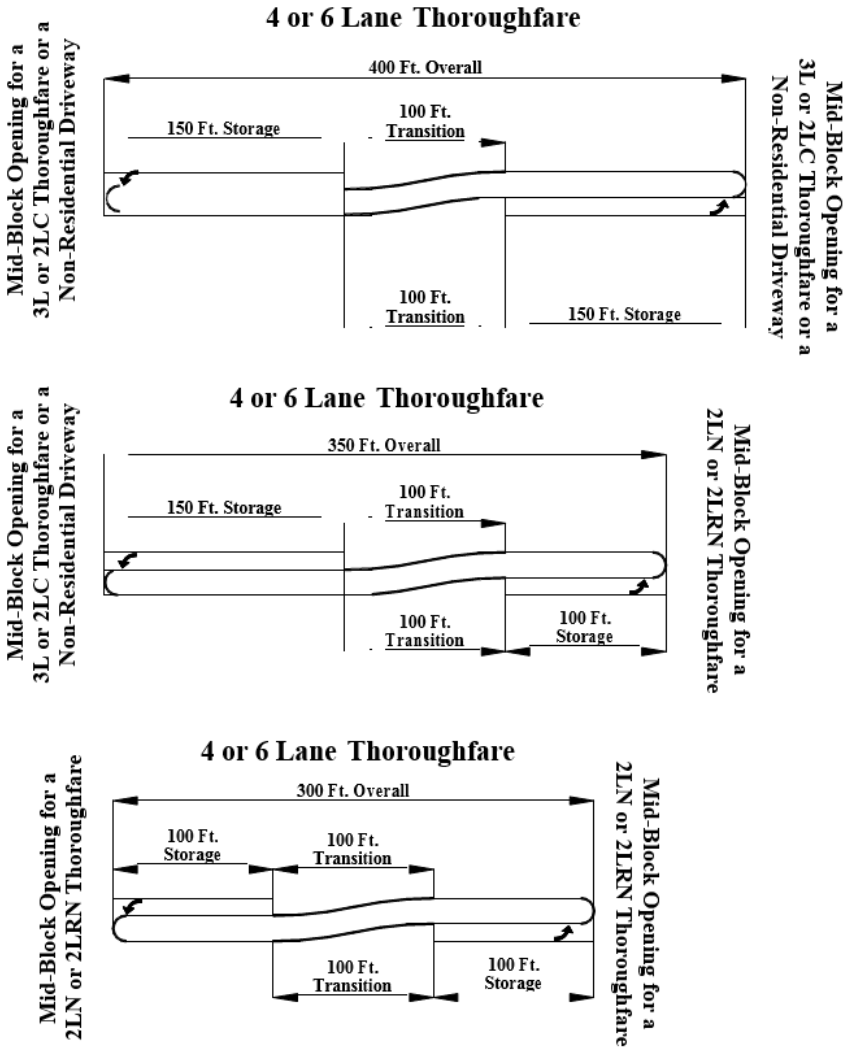


FIGURE 4.7: Minimum Distance Between Mid-Block Median Openings on a 4 or 6 Lane Thoroughfare

6. Medians Where No Left-Turn Lane is Needed:

   a. The minimum length of median shall be the sum of the required left-turn storage, transition length, ten-foot (10') tangent and length of median nose. This requirement is reflected in Figure 4.8. This allowed, provided that access is not compromised for vacant property on the opposite side of the street.

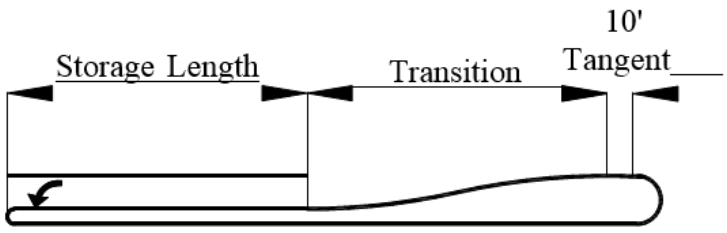


FIGURE 4.8: Minimum Length of Median Where No Left-Turn Lane is Needed

b. If left-turn storage is not required in either direction, and the median is simply a spacer between two median openings, the minimum length of the spacer must be one hundred feet (100'). This is reflected in Figure 4.9.

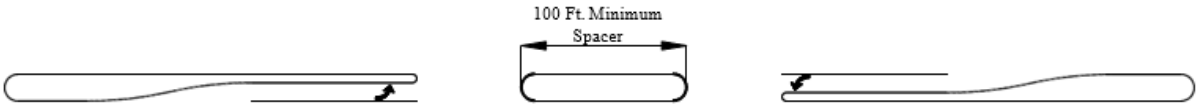


FIGURE 4.9: Minimum Spacer Length

c. If a driveway is not served by a median opening, then seventy-five feet (75') of separation shall be provided from the edge of driveway to the nearest median opening.

7. Medians on Public Street Entrances to Developments:

a. Medians installed on undivided streets at entrances to subdivisions for aesthetic or any other purpose shall be a minimum of thirteen feet (13') wide and one hundred feet (100') long. See Figure 4.1 for Divided Residential Subdivision Entrance cross section.

b. In areas where a divided subdivision entry is constructed, the transition to the normal residential street width shall begin upstream or downstream of the first street intersection. No part of the transition shall occur within the intersection.

c. Alternative design standards may be required for these types of subdivision entries if they are located within special overlay districts defined by the Town.

C. Minimum Right-Turn Storage and Transition Length:

1. Right-Turn Lane Storage:

a. Right-turn lanes shall be required at every street intersection along 4 or 6 lane thoroughfares at the time of construction of each intersection.

b. All right-turn storage areas shall be eleven feet (11') wide (except on 4LRD thoroughfares where a minimum width of ten feet (10') will be allowed).

c. An additional ten feet (10') of ROW shall be provided with right-turn lanes.

d. Storage requirements listed in Table 4.6 are absolute minimums. Storage requirements may increase based upon actual and projected traffic demands.

e. A tangent section of ten feet (10') shall be provided from the receding driveway curb return to the transition of a right-turn lane.

2. Transition Length – The transition specifications for right-turn lane entrance areas are specified in Table 4.6. The variables used for the specification are shown in Figure 4.10.

TABLE 4.6: Minimum Right-Turn Lane Design Requirements

Type of Thoroughfare On	Type of Thoroughfare At	Turn Lane Width (ft)	Storage Length of Full-Width Turn Lane (ft)[1]	Transition Specifications[2]		
				Length (ft)	R_1 (ft)	R_2 (ft)
6LD, 4/6LD	4 or 6 lane	11	200	150	515	515
4LD	4 or 6 lane	11	150	150	515	515
6LD, 4/6LD, 4LD	3L, 2LC	11	150	110	280	280
6LD, 4/6LD, 4LD	2LN, 2LRN	11	100	110	280	280
4LRD	All Types	10	100	110	280	280
NTTA Service Road	All Types	11	200	150	515	515

(1) Measured from the intersection thoroughfare ROW.
(2) No driveways are permitted within the transition area.

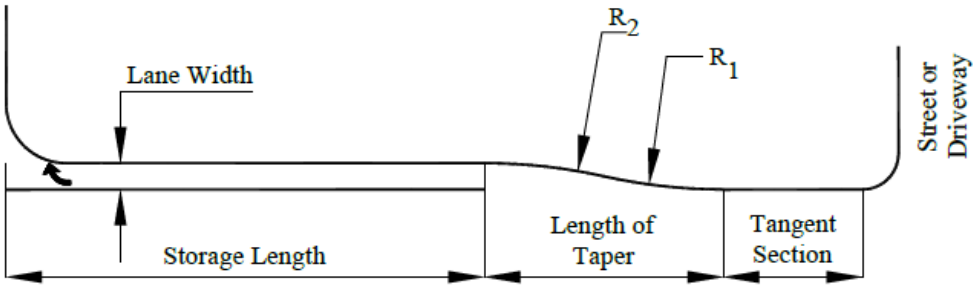


FIGURE 4.10: Typical Right-Turn/Deceleration Lane Dimensions

D. Minimum Deceleration Lane Storage and Transition Length:

1. Deceleration Lane Storage:

   a. Deceleration lanes shall be provided at driveways on 4 or 6 lane thoroughfares where required by Section 4.04.(A.4).
   b. All deceleration lane storage areas shall be eleven feet (11') wide.
   c. Ten feet (10') of street easement, adjacent to ROW, shall be provided with deceleration lanes.
   d. Storage requirements listed in Table 4.7 are absolute minimums. Storage requirements may increase based upon actual and projected traffic demands.
   e. A tangent section of ten feet (10') shall be provided from the preceding driveway curb return to the transition of a deceleration lane.

2. Transition Length – The transition specifications for deceleration lane entrance areas are specified in Table 4.7. The variables used for the specification are shown in Figure 4.10.

TABLE 4.7: Minimum Deceleration Lane Design Requirements

Type of Thoroughfare On	Type of Thoroughfare At	Turn Lane Width(s) (ft)	Length of Full-Width Turn Lane (ft)(1)	Transition Specifications		
				Length (ft)	R_1 (ft)	R_2 (ft)
6LD, 4/6LD	Non-Residential Driveway	11	80	110	280	280
4LD	Non-Residential Driveway	11	60	110	280	280
4LRD	Non-Residential Driveway	10	60	110	280	280
NTTA Service Road	Non-Residential Driveway	11	80	110	280	280

(1) Measured from the curb return of the driveway

E. Cost of Median Openings and Turn Lanes:

1. Median openings, left-turn lanes, and right-turn lanes constructed for residential streets and/or subdivision entrances shall be the responsibility of the developer and shall be paved to Town standards and inspected by the Town.
2. Median openings, left-turn lanes and declaration lanes for multifamily and non-residential developments shall be the responsibility of the developer and shall be paved to Town standards and inspected by the Town.
3. The Town shall require escrow of funds for such future improvements prior to final acceptance or Certificate of Occupancy, whichever occurs first. The escrow shall include all construction costs; engineering (7% of construction cost) and inspection (3% of construction cost).

4.04. Driveway Design

A. Introduction – Driveway design standards are needed to provide safe and efficient vehicular access to and from the public street system, to provide public street capacity for accommodating peak traffic volumes of public streets, to maintain smooth traffic flow, and to maintain street ROW and drainage. The intent of driveway design standards is to achieve the following:

1. Prohibit the indiscriminate location and spacing of driveways while maintaining reasonable vehicular access to and from the public street system.
2. Reduce conflicting turning movements and congestion thereby reducing vehicular accidents.
3. Maintain and enhance a positive image for the attraction of new, high quality, residential and non-residential development in the Town.
4. Provide right-turn and deceleration lanes for all streets and driveways along all 4 or 6 lane thoroughfares.

B. Definition of Driveway Types:

1. Residential Driveway – Provides access to a single-family residence, duplex, or multifamily building containing four or fewer dwelling units. These drives shall intersect 2LN, and 2LRN roadways only.
2. Non-residential Driveway:
   a. Commercial Driveway – Provides access to an office, retail or institutional building, or multifamily building having more than four dwelling units. It is anticipated that such buildings will have incidental truck service. Commercial drives shall access 3, 4 or 6 lane thoroughfares only.
   b. Industrial Driveway – Serves truck movements to and from loading areas of an industrial facility, manufacturing, warehouse, or truck terminal. A retail development may have one or more driveways specially designed, signed, and located to provide access for trucks. These types of driveways shall be considered industrial driveways. Driveways to industrial plants whose principle function is to serve administrative or employee parking lots shall be considered

commercial driveways. Industrial drives shall not access Residential 2LC, 2LN, or 2LRN thoroughfares.

3. Standard Driveway – Provides two-way access at a single, undivided curb opening.
4. One-Way Driveway – Provides inbound or outbound access and can only be permitted when the orientation of on-site circulation and parking layout clearly utilize the driveway for one-way movements.
5. High Capacity Driveways – Intended to provide two-way access with geometric provisions which more adequately respond to greater driveway volumes and/or access limitations than standard driveways. These provisions include increased width and/or internal storage. Median divider and/or deceleration lanes may also be required.

C. General Design Parameters:

1. The centerline angle for a driveway approach shall be ninety degrees (90°) to the street curb line for all driveways.
2. Driveways shall not be permitted in the transition area of any right-turn lane or deceleration lane.
3. Driveways that intersect at a mid-block median shall have the driveway centerline intersect with the midpoint of a median opening (measured nose-to-nose).
4. Driveway restrictions can be required by the Director of Engineering to ensure adequate circulation.
5. Driveway elevations at the ROW line shall be a minimum of six inches (6”) above the street gutter. A residential driveway that intersects an alley shall be three inches (3”) above the edge of the alley pavement at the ROW line.
6. Cross access is required between adjacent retail, office and commercial properties.
7. Driveway grades in a fire lane shall not exceed six percent (6%) either longitudinally or four percent (4%) cross slope to accommodate emergency vehicle access.
8. Differential grades on driveways shall not exceed twelve percent (12%). Differential grades on commercial driveways with fire lanes shall not exceed six percent (6%).
9. All driveway approaches within right-of-way shall match the street pavement thickness, subgrade, and moisture conditioning depth. Steel reinforcement shall meet current street standards.

D. Driveway Width – The width of a driveway refers to the width of pavement at the property line and is measured where the curb return radii ends perpendicular to the street curb or edge of pavement. The minimum and maximum widths of driveways are listed in Table 4.8.

TABLE 4.8: Minimum and Maximum Driveway Widths

Driveway Type	Land Use	Width in Feet (face to face)	
		Minimum (ft)	Maximum (ft)
Standard Drive	Residential	10	24
	Commercial/Multifamily	24	33
	Industrial	30	40
One-Way Drive	Residential (circular)	10	16
	Commercial	16	24
	Industrial	24	24
Divided High Capacity Drive for Non-residential Uses	Entrance Lane	16	24
	Exit : Two	24	24
	Three	30	33
Driveway Medians (non-residential/multifamily uses)		4	11

Notes:
1. A residential driveway width of thirty-two feet (32') may be allowed to an alley if the garage faces onto the alley.
2. The maximum width for service station driveways shall be thirty-six feet (36').
3. Driveways that serve as a fire lane shall be a minimum of twenty-four feet (24') in width.

E. Driveway Radius:

1. All driveways intersecting dedicated streets shall be built with a circular curb radius connecting the six-inch (6") raised curb of the roadway to the design width pavement of the driveway.
2. Driveway radii shall fall entirely within the subject property so as to begin at the street curb at the extension of the property line. Commercial driveways may encroach past property line if deceleration lanes are required and proper easements have been acquired.
3. Table 4.8 presents the minimum and/or maximum standards to be applied in designing and locating driveways on public streets.
4. High capacity driveways shall meet the same standards as those defined in Table 4.8.

F. Driveway Spacing:

1. Driveways shall be spaced at distances sufficient to ensure that conflicting movements do not overlap at adjacent driveways or at offset driveways on opposite sides of the street.

2. Spacing between driveways should be measured along the property line from the edge of one driveway to the closest edge of the next driveway and not from centerline to centerline.
3. The minimum spacing between driveways is a function of street classification and shall be as listed in Table 4.9.
4. The driveway spacing from a railroad crossing shall be a minimum of fifty feet (50') from the railroad ROW.

TABLE 4.9: Driveway Design Requirements

Criteria	Thoroughfare Classification	Residential Driveway (ft)	Commercial/Multifamily Driveway (ft)	Industrial Driveway (ft)
Driveway Curb Radius	Major: 6LD, 4/6 LD	--	20-30	20-30
	Minor: 4LD, 4LRD	--	20-30	20-30
	3L, Commercial 2LC	--	20-30	20-30
	Residential 2LC	5-10	20	--
	Local: 2LN, 2LRN	5-10	--	--
Minimum Driveway Spacing Along Roadway (edge to edge)	Major: 6LD, 4/6 LD	--	240	240
	Minor: 4LD, 4LRD	--	200	200
	3L, Commercial 2LC	--	90	90
	Residential 2LC	20	Max of 1 drive	--
	Local: 2LN, 2LRN	20	--	--
Minimum Distance between Intersection and Driveway (driveway edge to intersecting ROW)(1)	Major: 6LD, 4/6 LD	--	75/100	75/100
	Minor: 4LD, 4LRD	--	75/100	75/100
	3L, Commercial 2LC	--	50/50	50/50
	Residential 2LC	20/20	100/100	--
	Local: 2LN, 2LRN	10/10 from tangent to edge of drive	--	--

(1) Upstream/downstream distance to intersection. (See Figure 4.11)

5. To minimize the number of curb cuts along public roadways, joint or shared access is encouraged for residential driveways and required for commercial driveways. Shared access drives shall conform to the following standards.
   a. Residential: no less than ten feet (10') of the total driveway width (20' min. – 24' max.) shall be located on each property.
   b. Commercial/Industrial: no less than twelve feet (12') of the total driveway width (24' min. – 36' max.) shall be located on each property.

c. Joint access drives for commercial/industrial developments shall include full drive width and access pavement and be built at the same time as development.
d. The spacing and location of driveways shall be related to both existing adjacent driveways and those shown on approved development plans.

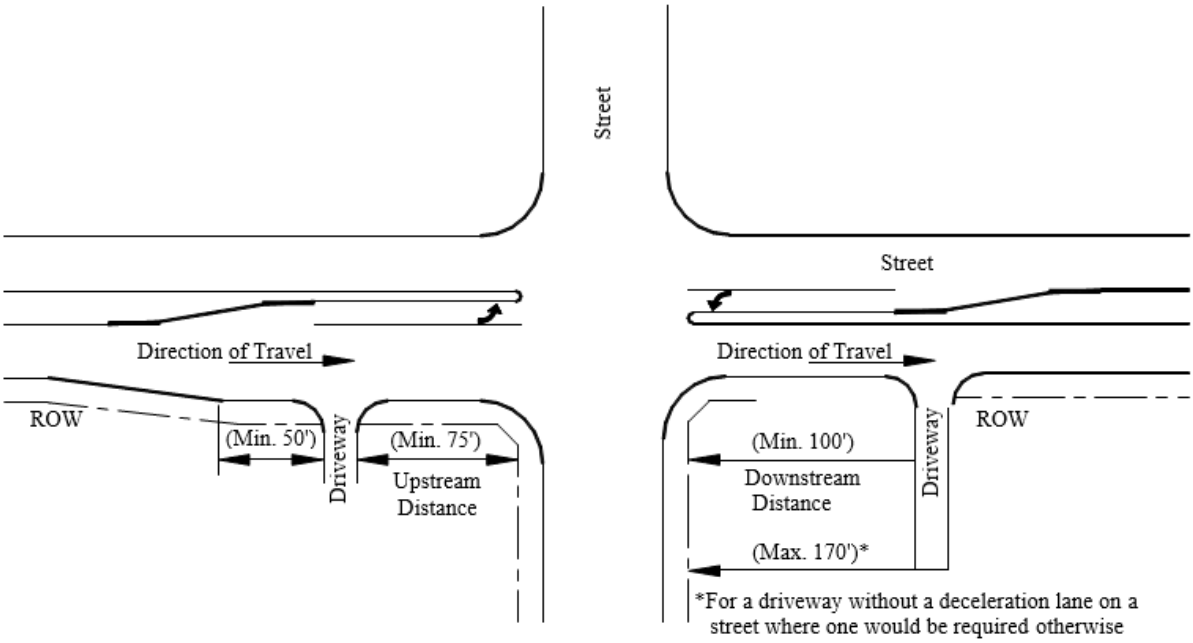


FIGURE 4.11: Distance Between Driveway and Intersection

G. Distance Between Driveway and Intersection:

1. Adequate distance between cross street intersections and access drives shall be provided to ensure intersection/driveway conflict areas are minimized.
2. Table 4.9 defines the upstream and downstream distance from an intersection as a function of street classification.

H. Deceleration Lanes:

1. Deceleration lanes for right-turns into driveways will ease the negative impact a driveway will have on traffic flow, driveway conflict points and safety due to speed differential.
2. One driveway may be located within the full-width storage portion of a right-turn lane at a public street intersection. Such a driveway shall be located a minimum of seventy-five feet (75') in advance of the intersecting ROW, and a minimum of fifty feet (50') of storage length shall be provided in advance of the driveway (see Figure 4.11).
3. The developer shall be responsible for the design, ROW adjustment of utilities, and construction costs of any auxiliary and deceleration lane required as a condition of a driveway permit.
4. Refer to Table 4.7 for deceleration lane design standards.

I. Driveway Storage Lengths:

1. On-site internal storage shall be provided at all non-residential and multifamily driveways for queuing of vehicles off-street, to minimize congestion, and increase safety both on the public street and within the driveway.
2. Internal storage requirements shall be based on the total number of parking spaces accessible by the affected driveway.
3. Internal storage length shall be measured from the ROW line to the first aisle or parking stall that intersects with inbound traffic. If inbound traffic and outbound traffic are separated by a median for the required storage distance, a parking aisle can connect to the outbound portion of the driveway closer to the street (as long as a minimum of twenty-five feet (25') is maintained between the aisle and the ROW line).
4. Table 4.10 presents internal storage requirements.

TABLE 4.10: Minimum Driveway Storage Lengths

Parking Spaces per Driveway	Storage Required (ft)			
	Multifamily/Commercial Uses		Industrial Land Uses	
	Non-Median Opening	Median Opening	Non-Median Opening	Median Opening
Less than 25	25	25	25	25
25-50	25	40	25	40
51-100	25	40	40	40
101-200	40	80	40	60
More than 200	100	100	40	100

J. Driveway for Gated Developments:

1. <u>Residential/Multifamily:</u>

   a. Gated developments shall have a median divided street that will allow for a vehicular turn-around prior to the gate in the event that access is denied.
   b. The turn-around shall be a minimum of eighteen feet (18') in width.
   c. Entry gates shall be set back from the ROW a minimum of one hundred thirty-five feet (135') to provide stacking space to the card reader (or first stop) of a minimum of one hundred feet (100') to allow the longest queue of vehicles expected to access the gate.
   d. The drives shall be a minimum of twenty-four feet (24') in width with driveway curb radii of thirty feet (30'). See Figure 4.12.
   e. The hinge point of the gate shall be a minimum of eighteen inches (18") behind the back of the curb. The gate shall open to twenty-four inches (24") behind the back of curb.
   f. Gates shall be equipped with both Opticom and Knox-Box for emergency access.
   g. Gates shall not encroach on sidewalks.

2. <u>Other Non-Residential:</u>

a. Gated developments shall have a median separating ingress and egress traffic flow allowing for a vehicular turn-around prior to the gate in the event that access is denied.
b. The turn-around shall be a minimum of eighteen feet (18') in width.
c. Entry gates shall be set back from the ROW or fire lane a minimum of seventy-five feet (75') to provide stacking space to the card reader (or first stop) of a minimum of forty feet (40') to allow the longest queue of vehicles expected to access the gate.
d. The drives shall be a minimum of twenty-four feet (24') in width with driveway curb radii of thirty feet (30'). See Figure 4.12.
e. The hinge point of the gate shall be a minimum of eighteen inches (18") behind the back of the curb. The gate shall open to twenty-four inches (24") behind the back of curb.
f. Gates shall be equipped with both Opticom and Knox-Box for emergency access.
g. Gates shall not encroach on sidewalks.
h. Alternate standards may be required based on the results of a Traffic Impact Analysis (TIA).

3. Individual Gated Single-Family Residences – Gate shall have a minimum setback of twenty feet (20') from the ROW to provide space for at least one vehicle to wait while accessing the gate.

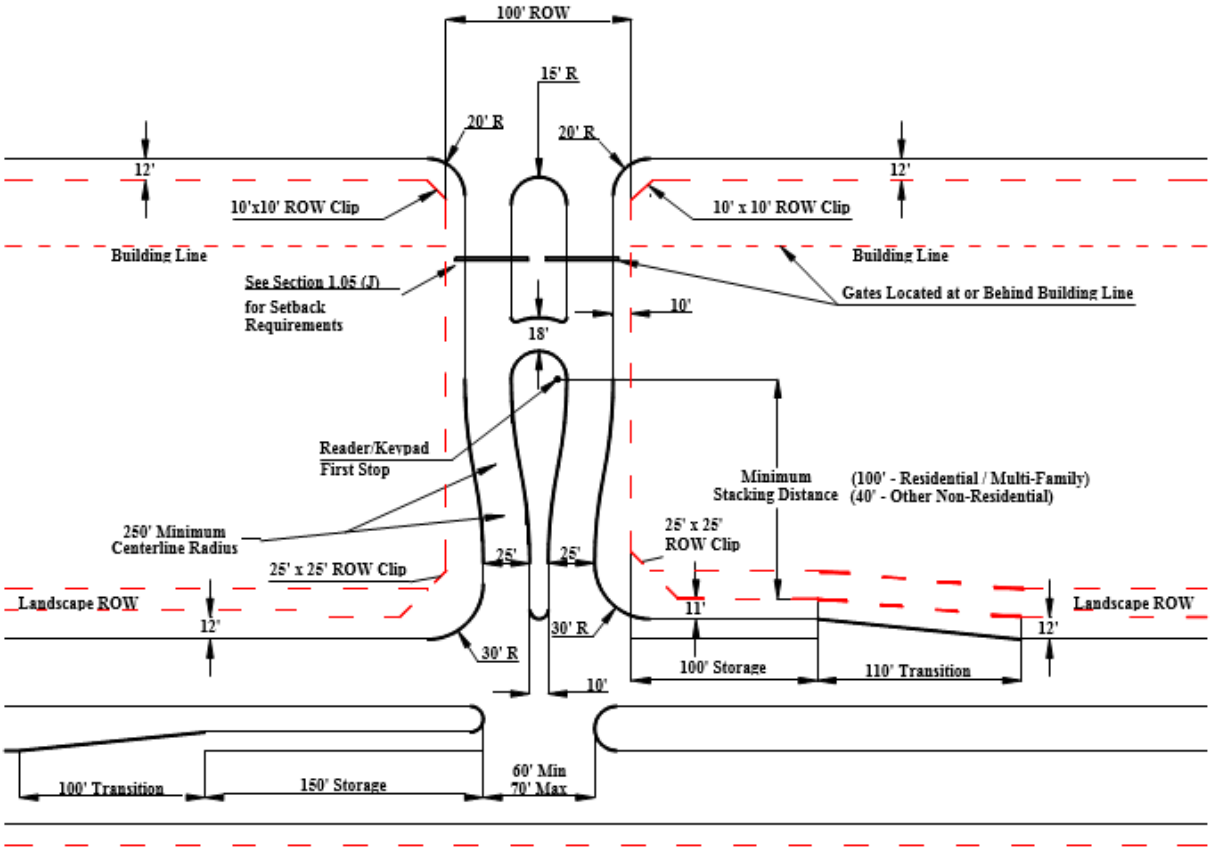


FIGURE 4.12: Gated Entrance Detail

K. Nonconforming Driveways:

1. All nonconforming driveways on a lot, tract, parcel or site shall be allowed to remain in place until the occurrence of one or more of the following events:

   a. A change in use, or an increase in intensity of use, occurs such that the site requires a ten percent (10%) increase in required parking spaces.
   b. Addition of parking spaces.
   c. Any modification that changes the design or function of the existing driveway.
   d. The addition of a median opening on the public street by a developer. All driveways that are served by the new median opening shall comply with the requirements of these standards.

2. Upon the occurrence of the events described, the nonconforming status of the driveway shall cease and the driveway must be either reconstructed in accordance with this ordinance or eliminated.

4.05. Alley Design

A. Alley Intersections:

1. Alleys shall only intersect 3L, Residential 2LC, 2LN, and 2LRN thoroughfares.

2. If an alley and a Commercial 2LC, or higher-class thoroughfare, are parallel and separated only by a landscape buffer, the alley shall turn away from that thoroughfare not less than one subdivision lot width or a minimum of forty feet (40') (whichever is greater) from the cross street as shown in Figure 4.20.
3. The ROW line of all alley intersections shall be a minimum of forty feet (40') or one subdivision lot width (whichever is greater) away from the ROW line of the nearest street intersection. See Figure 4.13.
4. All alley intersections with streets shall be perpendicular or radial, within a five-degree (5°) tolerance, at the intersection of the ROW lines.
5. Alley offsets along residential streets shall be less than fifteen feet (15') or greater than seventy-five feet (75') measured from alley centerline to alley centerline.
6. Alleys shall not align with existing streets such as to create a four-way intersection. Alleys shall be offset from such a street or driveway by a minimum of seventy-five feet (75') measured from edge of alley to edge of street or driveway.
7. Alleys shall not align across from future streets to create an intersection.
8. Internal alley to alley intersections (if not lined up) shall be offset, from the centerline, a minimum of one hundred feet (100').
9. Alleys that intersect at "elbow" street intersections shall not intersect within thirty degrees (30°) of the centerline of the adjacent streets. See Figure 4.14.
10. Alleys shall not intersect with a roundabout.

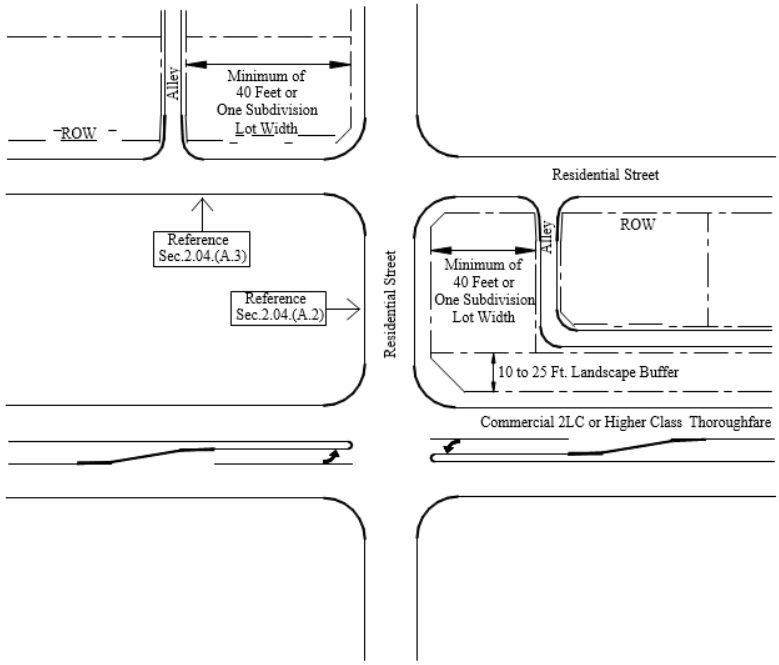


FIGURE 4.13: Minimum Distance from Intersection for Parallel Alley

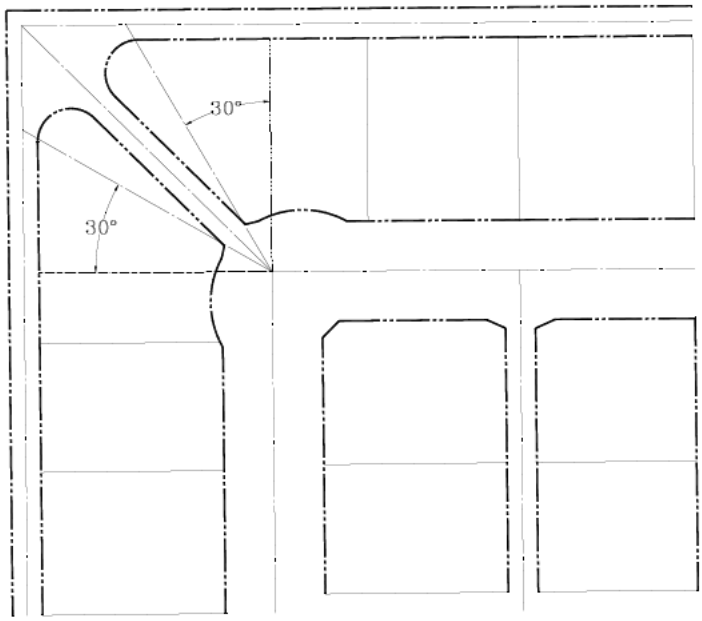


FIGURE 4.14: Alley Intersecting an Elbow

11. Internal alley intersections shall consist of no more than three (3) alley approaches.
12. No permanent dead-end alley shall be permitted in new subdivisions. Alleys shall connect and/or be aligned with alleys in adjacent subdivisions.
13. The radius of alley pavement at street intersections shall not be less than fifteen feet (15'). At the intersection of two alleys, the radius of the alley ROW is dependent upon the alley ROW intersection angle as listed in Table 4.11. At the intersection of two alleys, the radius of the alley pavement shall be two feet (2') greater than the radius of the alley ROW. See Figure 4.15.

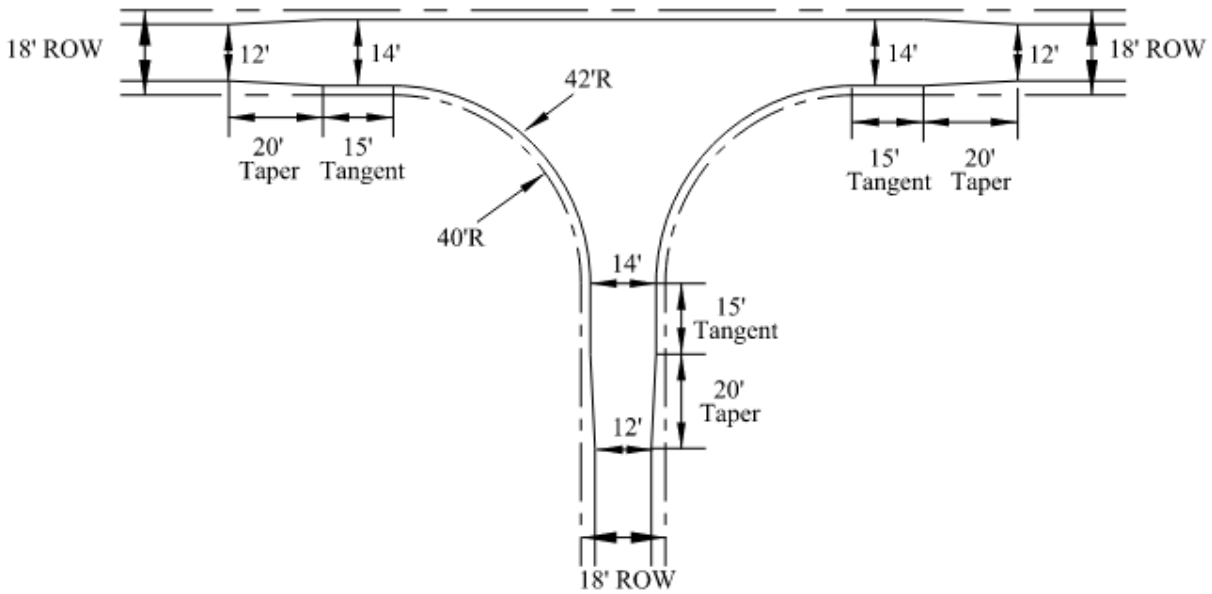


FIGURE 4.15: Alley to Alley Intersection

B. Alley Radius – Alley radii at street intersections shall not be less than fifteen feet (15'). See Figure 4.16.

1. Alley Intersecting Alley Radius – The radius shall be measured from the ROW and vary based upon the alley ROW intersection angle listed in Table 4.11.

TABLE 4.11: Alley Intersecting Alley Radius

Alley ROW Intersection Angle	Minimum Required ROW Radius (ft)
1°-40°	70
41°-70°	50
71°-90°	40
> 90°	50

C. Alley ROW Width – The alley ROW width shall be eighteen feet (18) for residential alleys and twenty feet (20') for non-residential alleys.

D. Alley Pavement Width – The alley pavement width shall be twelve feet (12') for residential alleys and twelve feet (12') for non-residential alleys, except near street intersections as shown in Figure 4.16.

E. Alley Pavement Thickness: The thickness shall be a minimum of 6" with pavement strength and reinforcement as required in Section 4.02.(B.5).

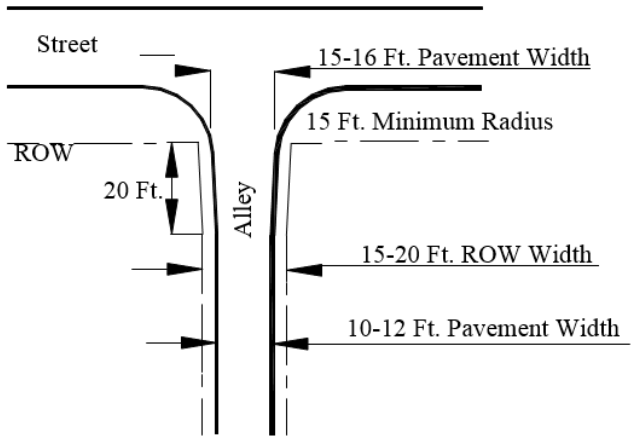


FIGURE 4.16: Alley Dimensions

F. Alley Length – Alleys shall not exceed eight hundred feet (800') in length without an intermediate connection to a residential street.

G. Rear Alley Frontage – The minimum alley rear frontage shall be twenty feet (20').

H. Alley as a Fire Lane – An alley that also serves the purpose of a fire lane shall be constructed to the standards of a fire lane as required by the Fire Department. These standards include, but are not limited to, a minimum pavement width of twenty-four feet (24') and a minimum radius of alley pavement of thirty feet (30') at street intersections. Right-of-way shall be 30 feet in width for 24 foot alley sections.

I. Alley Speed Limits – The speed limit in alleys shall be ten miles per hour (10 MPH).

J. Alley Visibility Obstructions:

1. No Fence, wall, screen, sign, structure, or foliage of hedges, trees, bushes, or shrubs shall be erected, planted or maintained in any alley ROW.

2. Foliage of hedges, trees, bushes, and shrubs planted adjacent to the alleys ROW shall be maintained such that the minimum overhang or encroachment shall be fourteen feet (14') above the alley surface one foot (1') outside the edge of the pavement.

K. Alley Grade:

1. Alleys shall have a maximum grade of six percent (6%) and a minimum of six-tenths percent (0.60%). Steeper grades may be permitted where required by topographical and/or natural features, as approved by the Director of Engineering Services.

2. Alleys shall maintain a maximum cross-slope of two percent (2%) at the intersection of the adjacent sidewalk.

L. Vertical Curves in Alleys – Vertical curves in alleys shall be used in order to provide a design which is safe, comfortable in operation, pleasing in appearance and adequate for drainage. Vertical curve alignment shall also provide stopping sight distance in all cases based on a design speed of twenty miles per hour (20 MPH).

M. Alley Screening Walls – The area between screening walls and alleys shall be paved and graded to drain to the invert.

4.06. Frontage Road Design (Non-TxDOT)

A. Frontage roads are typically found adjacent to existing or planned freeway type facilities.

B. Frontage roads are considered 6LD thoroughfares and should be designed to the 6LD standards set forth in this document.

C. Access to frontage roads shall also conform to the standards set forth for 6LD thoroughfares. In addition, the following access restrictions apply to frontage road design:

1. Exit Ramp Restrictions:
    a. No driveway shall be located less than fifty feet (50') in advance of the concrete curb gore of an exit ramp.
    b. No driveway shall be located less than four hundred feet (400') beyond the striped gore of an exit ramp (designated as the point where the striping of the exit ramp lane and the through lane converge), measured from the edge of the driveway.
2. Entrance Ramp Restrictions:
    a. No driveway shall be located less than two hundred feet (200') in advance of the striped gore of an entrance ramp (designated as the point where the striping of the entrance ramp lane and the through lane diverge), measured from the edge of the driveway.
    b. No driveway shall be located less than fifty feet (50') beyond the concrete curb gore of an entrance ramp.

4.07. Bridge and Bridge-Class Culvert Design

All bridges and bridge-class culverts in Prosper shall be designed at a minimum in accordance with the latest edition of the AASHTO Standard Specifications For Highway Bridges and the *TxDOT Bridge Design Manual*. Specifications for bridge construction shall be in accordance with the TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (edition to be used shall be determined by the Town of Prosper). All bridge railing shall be in accordance with the latest edition of the TxDOT Bridge Railing Manual and shall be approved in the NCHRP Report 350. All bridge rails shall be appropriately rated railing based on design conditions. Guardrail, end treatments, or other features associated with bridge construction shall be in accordance with the latest edition of the AASHTO Policy on Geometric Design of Highways and Streets, the AASHTO Roadside Design Guide, and current TxDOT Standards.

The local standards that shall govern the applicable elements of the design can be found in Table 4.12

TABLE 4.12: Elements of Bridge Design Standards

Element of Bridge Design	Standard of Design
Reinforcing Steel	Epoxy coating required
Travel Lane Width	12' minimum
Offset to Face of Rail	2' minimum Where no sidewalk is present, shoulders shall be flush with the roadway slab.
Sidewalk Width	6' minimum, 8'-10' if designated hike & bike corridor
Parkways	Culverts to be extended to the ultimate right-of-way and graded to the standard parkway
Bridge Rail	TxDOT T401 for vehicular protection only TxDOT T401 for vehicular/pedestrian separation Separation rail shall be used on all major and minor arterial bridges; it shall not be required on collectors or local streets, or on culverts where the sidewalk is not located adjacent to the back of curb TxDOT C402 for vehicular and pedestrian protection TxDOT PR1 for pedestrian protection only
Parapet Wall with Rail Finish	Stone facia all vertical surfaces, Ashlar Stone or similar Stain all vertical surfaces, color(s) shall be approved by the Director of Engineering
Pedestrian Rail Finish	Paint all surfaces with industrial-grade exterior paint, color shall be approved by the Director of Engineering
Drainage	All roadway drainage shall be carried to the bridge ends and collected in closed storm sewer system. If deck drains are required they shall discharge to downspout and a properly designed splash basin or closed storm sewer system to minimize erosion. Drainage shall not discharge against any part of the structure.
Lighting	Spacing based on approved photometric plan, standard fixtures, both directions Decorative lighting options shall be approved by the Director of Engineering
Conduit	Required fiber optic and street lighting conduit shall be fastened to the exterior slab overhang.
Aesthetic Variations	All aesthetic variations shall be consistent with surrounding features and shall be approved by the Director of Engineering.

4.08. Pedestrian Facilities

A. All pedestrian facilities must conform to the following current requirements and shall be in accordance with the Town's Hike & Bike Trail system, Zoning and Town's Comprehensive Master Plan or as amended through ordinance.

B. Pedestrian Design Guidelines include the current edition of the following:

1. Texas Accessibility Standards (TAS).
2. Americans with Disabilities Act (ADA) Standards.
3. Proposed Accessibility Guidelines for Pedestrian Facilities in Public Right-of-Way (PROWAG).
4. Texas Manual on Uniform Traffic Control Devices (TMUTCD).

C. Sidewalks

The purpose of the public sidewalk is to provide a safe area for pedestrians. Town of Prosper policy provides that sidewalks are to be constructed with the paving of streets or building construction unless deferred by the Director of Engineering. Sidewalks constructed as part of a new development or re-development are considered public facilities and shall be constructed according to the requirements outlined in this section.

A sidewalk is the paved area in a street ROW between the curb lines or the edge of pavement of the roadway and the adjacent property lines for the use of pedestrians. The Town of Prosper considers a sidewalk to be an "accessible route" as specified in Section 4.3 of the Texas Accessibility Standards (TAS) and considers a public sidewalk a "facility" under the TAS and the U.S. Department of Justice Americans with Disabilities Act (ADA) regulations at 28 C.F.R. Part 35 unless exempted by the Director of Engineering. Compliance with these regulations shall be the responsibility of the owner/developer.

1. Design:

For pedestrian comfort, it is desirable to provide buffer space between the sidewalk and the back of curb of at least 3 feet (3'). All new sidewalks in the Town of Prosper shall be placed 1 foot (1') inside the ROW line unless approved by the Director of Engineering.

Sidewalks shall conform to all current TAS, ADA requirements, and in accordance with this section, and if there is a conflict among those standards, the more stringent shall govern. The maximum running grade (longitudinal slope) of the sidewalk shall not exceed 5% unless approved by the Director of Engineering. The maximum cross-fall (cross slope) of the sidewalk shall not exceed 2%.

Sidewalk widths vary depending on the roadway classification. A concrete sidewalk 6 feet in width is required on all Regional Freeways, Arterial thoroughfares and collector roadways. A concrete sidewalk 5 feet in width is required along both sides of all residential roadways. See Table 4.13 for sidewalk widths on all street types. The sidewalks shall be located within the street ROW unless pre-existing physical encroachments (e.g., utility infrastructure or trees) dictate otherwise. Sidewalks may be allowed in landscape areas and pedestrian access easements with the approval of the Director of Engineering. Sidewalks along arterial roadways shall be done in manner to follow the Town of Prosper's Thoroughfare landscaping requirements as depicted in the Zoning Ordinance.

Sidewalks and parkways (curb to ROW) shall be graded at 2% above the top of the street curb.

TABLE: 4.13: Sidewalk Widths

Street Type	Sidewalk Width
Arterial	6 ft
Collector	6 ft
Residential	5 ft

2. Hike & Bike Trails:

   For pedestrian comfort, it is desirable to provide buffer space between the sidewalk and the back of curb of at least three feet (3'). All new sidewalks in the Town of Prosper shall be placed one foot (1') inside the ROW line unless approved by the Director of Engineering.

   Sidewalks shall conform to all current TAS, ADA requirements, and in accordance with this section, and if there is a conflict among those standards, the more stringent shall govern. The maximum running grade (longitudinal slope) of the sidewalk shall not exceed 5% unless approved by the Director of Engineering. The maximum cross-fall (cross slope) of the sidewalk shall not exceed 2%.

   Sidewalk widths vary depending on the roadway classification. A concrete sidewalk six feet (6') in width is required on all Regional Freeways, Arterial thoroughfares and collector roadways. A concrete sidewalk five feet (5') in width is required along both sides of all residential roadways. The sidewalks shall be located within the street ROW unless pre-existing physical encroachments (e.g., utility infrastructure or trees) dictate otherwise. Sidewalks may be allowed in landscape areas and pedestrian access easements with the approval of the Director of Engineering. Sidewalks along arterial roadways shall be done in manner to follow the Town of Prosper's Thoroughfare landscaping requirements as depicted in the Zoning Ordinance. Sidewalks and parkways (curb to ROW) shall be graded at 2% above the top of the street curb.

3. Sidewalks on Bridges:

   a. All street bridges shall have a sidewalk constructed on each side of the bridge. The sidewalk shall be a minimum of six feet (6') wide with a parapet wall that is separated from the travel lane by an eighteen-inch (18") shoulder.

   b. A standard pedestrian bridge rail protecting the sidewalk shall be provided on the outside edge of the bridge.

4. Hike & Bike Trail Under Bridges – When new bridges are built as a part of the construction of a roadway or the reconstruction of a roadway and a hike and bike trail crossing as depicted on the Town's Master Hike & Bike Trail Plans, the hike and bike trail will be built as a part of the embankment design underneath the bridge structure

5. Sidewalks on Culverts – All culvert crossings shall have a sidewalk constructed on each side of the culvert. The sidewalk shall be a minimum of six feet (6') wide with a standard pedestrian hand rail as shown in Figure 4.18 provided on the outside edge of the culvert. Parapet wall may be required by the Engineering Department.

6. Access to Cul-de-sacs from Adjacent Streets – To promote a pedestrian friendly environment, a sidewalk shall be provided between cul-de-sacs and adjacent streets.

7. Pedestrian Handrail - Pedestrian handrail of a height not less than 42 inches shall be required when any of the following conditions are located within 5 feet of an existing or planned public sidewalk, or as directed by the Director of Engineering:

   a. A permanent or intermittent body of water;
   b. Top of slope steeper than 6:1 (17%) with drop-off ending at a body of water;
   c. Top of slope steeper than 3:1 (33%) with drop-off greater than 2.5 feet; OR
   d. Vertical surface with drop-off greater than 2.5 feet

   Pedestrian handrails are a long-term maintenance liability and may be considered a roadside hazard and/or a general aesthetic nuisance. To minimize these impacts, the conditions that invoke the requirement for a pedestrian handrail shall first be reviewed for alteration to remove the hazard. If no alteration is feasible, then a pedestrian handrail shall be constructed. Exemptions to this requirement may be considered by the Director of Engineering when:

   a. The depth of a body of water is less than 1 foot;
   b. The sidewalk provides recreational access to a body of water;
   c. The handrail would irreversibly spoil the natural landscape; OR
   d. Alternative means of protection are approved

   Pedestrian handrails located on public sidewalks shall be TxDOT Type E rails, constructed in accordance with the PRD-06 standard (the grip rail may be eliminated unless required by TAS/ADA requirements), or as approved by the Director of Engineering. Any required concrete foundation shall be in addition to the minimum sidewalk width. All rail surfaces shall be painted with industrial-grade exterior paint, with the color approved by the Director of Engineering.

4.09. Public Rights-of-Way Visibility Requirements

A. Adequate sight distance at the intersection of a thoroughfare and a proposed thoroughfare/driveway/alley must be ensured. This sight distance is provided through the use of a Corner Visibility Triangle and/or a Sight Line Triangle. Corner Visibility Triangles shall be dedicated as ROW and Sight Line Triangles shall be identified and dedicated as Visibility, Access and Maintenance Easements (VAM's). In addition, a Sight Line Triangle must also be provided for the following cases:

   1. Where a driveway, alley, or any thoroughfare that is controlled by a stop sign intersects with an uncontrolled thoroughfare.

   2. On any signalized intersection approach where right-turn on red operation is permitted, a sight line triangle must be provided for the right turn driver.

B. Corner Visibility Triangle Defined:

   1. The corner visibility triangle is defined at an intersection by offsetting the two ROW lines from their point of intersection to a distance as shown on Table 4.14. These two points are then connected with an imaginary line to form the corner visibility triangle as shown in Figure 4.19. If there are no curbs existing, then the triangular area shall be formed by offsetting the property lines for a distance of thirty feet (30') from their point of intersection.

TABLE 4.14: Corner Visibility Triangle Distances

Type of Thoroughfare On	Type of Thoroughfare At	Distance (ft)
4 or 6 Lane	All Types	25
3L, Commercial 2LC	3L, 2LC	25
3L, Commercial 2LC	2LN, 2LRN	10
Residential 2LC, 2LN, 2LRN	Residential 2LC, 2LN, 2LRN	10
NTTA	All Types	25

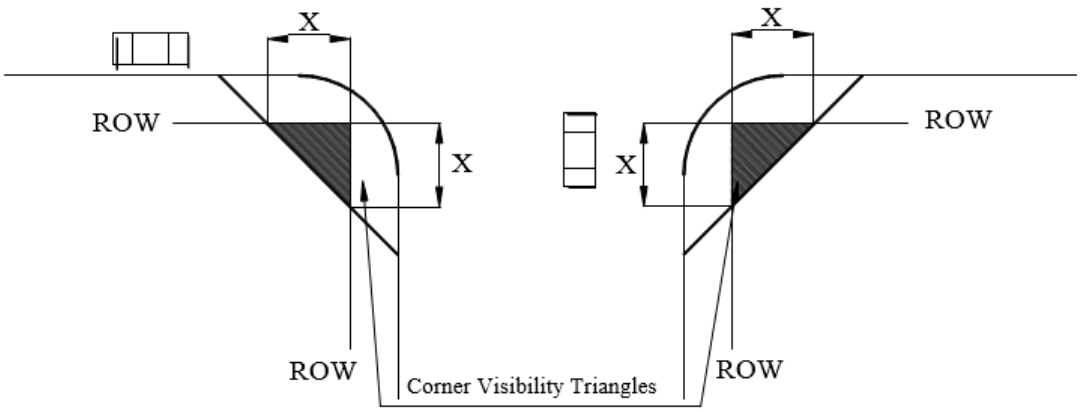


FIGURE 4.19: Corner Visibility Triangle for an Intersection

2. Where alleys intersect residential 2LN or 2LRN thoroughfares, the corner visibility triangle is measured as fifteen feet (15') along the residential street ROW and five feet (5') along the alley ROW form the point of intersection. These two points are then connected with an imaginary line to form the corner visibility triangle as shown in Figure 4.20. The alley corner visibility triangle shall be dedicated as ROW.

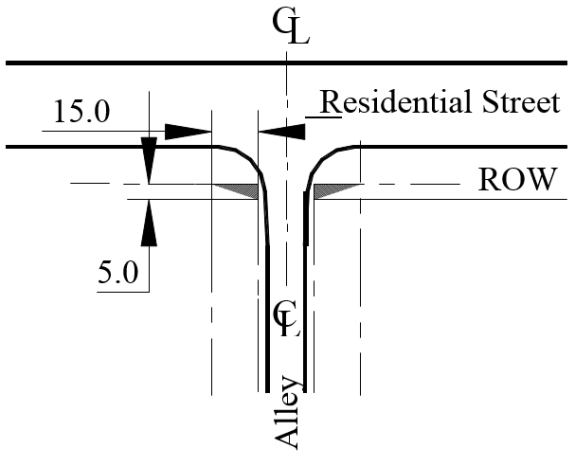


FIGURE 4.20: Corner Visibility Triangle for an Alley

C. Sight Line Triangle Defined:

1. The sight line triangle is formed by first extending a line along the center line of the proposed side street or driveway that begins at the tangent curb of the existing thoroughfare and extends to its endpoint fifteen feet (15') into the proposed side street or driveway. For the sight line triangle to the left, construct a second imaginary line that is parallel to and five feet (5') out from the existing thoroughfare's curb that begins at the centerline of the side street and continues to the left for a distance L to its endpoint. To complete the sight line triangle, connect the endpoints of the first two lines as shown in Figures 4.21 and 4.22. In the case of the sight line triangle to the right, the second imaginary line is parallel and five feet (5') out from the nearest edge of the conflicting traffic flow (or adjacent median in the event of a divided thoroughfare). It begins at the centerline of the side street and continues to the right for a distance R to its endpoint (See Figures 4.21 and 4.22).

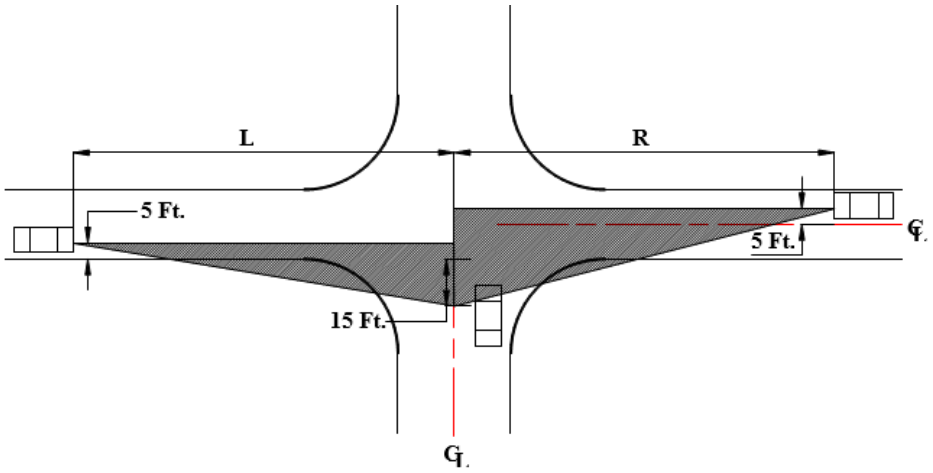


FIGURE 4.21: Sight Line Triangle for an Undivided Thoroughfare

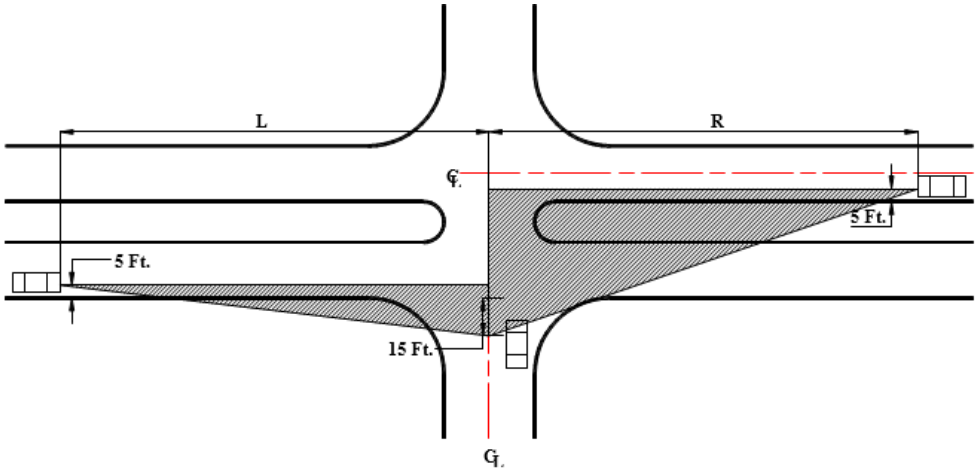


FIGURE 4.22: Sight Line Triangle for a Divided Thoroughfare

2. The distance to the driver's eye for driveways or side streets that intersect a thoroughfare is fifteen feet (15') from the intersecting curb line as shown in Figures 4.21 and 4.22.

3. In the case where the thoroughfare contains existing horizontal curvature, the distances L and R must be measured along the horizontal curve.
4. According to the American Association of State Highway and Transportation Officials (AASHTO), the minimum lengths of the distances L and R are equal. The minimum sight line distances L and R vary according to the design speed and width of the thoroughfare that will be accessed by a vehicle stopped on the side street, as shown in Table 4.15.

TABLE 4.15: Minimum Sight Line Triangle Distances(1)

Design Speed, V (MPH)	Minimum Sight Distance to Left and Right, L and R (ft)			
	2-lane Undivided	2-lane Divided(2) or 4-lane Undivided	4-lane Divided(2) or 6-lane Undivided	6-lane Divided(2)
25	280(3)	295	315	335
30	335	355	375	400
35	390	415	440	465
40	445	475	500	530
45	500	530	565	600
50	555	590	625	665

(1) Source AASHTO Green Book – Chapter 9. Distances based upon design speed and width of the thoroughfare that will be accessed by a vehicle stopped on the side street.
(2) These calculations assume a median width equivalent to one travel lane. If the median is wider than a travel lane, add 30 feet of sight distance for every 12 feet of additional median width.
(3) L can be 150 feet with approval by the Director of Engineering or their designee.

D. Landscaping and Obstruction Requirements for corner Visibility and Site Line Triangles:

1. No fence, wall, screen, sign, structure, foliage, hedge, tree, bush, shrub, berm, driveway, parking space, drive aisle, or any other item, either man-made or natural shall be erected, planted, or maintained in a position that will obstruct or interfere with a driver's clear line of sight within both the corner visibility and sight line triangle (i.e., VAM's).
2. Vision at all intersections where streets intersect at or near right angles shall be clear at elevations between thirty inches (30") and nine feet (9') above the average gutter elevation within each triangle.

E. Rights-of-Way Obstructions Outside the Site Line Triangles:

1. Fences, walls, screens, signs and other structures shall conform to the Comprehensive Zoning and Sign Ordinances of the Town.
2. Foliage of hedges, trees and shrubs in ROW which are not governed by Prosper's Comprehensive Zoning Ordinance, or the above triangles shall be maintained such that the minimum overhang above a sidewalk shall be seven feet (7') and the minimum over hang above a street shall be fourteen feet (14').
3. All other areas within ROW shall be clear at elevations between thirty inches (30") and nine feet (9') above the average gutter.

4. Plants in the ROW that will grow over thirty inches (30") (when mature) above the adjacent street's curb shall conform to all of the above requirements, where applicable. All landscape plans shall show all items as required by the Parks and Recreation Department and Planning Department, including:
    a. The locations and type of such plants.
    b. The prescribed corner visibility and sight line triangles.
    c. Ground elevations or spot elevations as necessary, to avoid conflicts, will be shown by contour lines within both triangles.
    d. No plantings berms over thirty inches (30") above the adjacent gutter elevation are allowed in the median for the length of the left turn storage.
    e. Single trunked trees within the triangles and in the median, shall be allowed and spaced so as to not cause a "picket fence" effect. Because of the large variation of ways in which trees can be planted, the spacing shall be decided upon by the Director of Engineering or their designee and the developer at the time of review of the landscape plans. Any other item that obstructs these lines so as to interfere with the above requirements shall not be allowed.

F. Abatement:
    1. The Director of Engineering or their designee shall have the authority to determine whether any such fence, wall, screen, hedge, tree, bush, shrub, sign or structure, as erected, planted or maintained, constitutes a public hazard or public nuisance in violation of the provision of this ordinance. Upon determination, they shall cause to be issued a written notice to the owner or lessee of the property demanding that corrective action be taken within ten (10) days of the date the notice is mailed.
    2. Following written notice, the Town of Prosper may abate the hazard or nuisance and assess the property owner reasonable charges for labor.
    3. Under conditions which pose an immediate threat to the public's health, safety, or general welfare, the Director of Engineering or their designee may require immediate corrective action.

G. Exceptions – The provisions of the Roadway Design Standards shall not apply to, or otherwise interfere with, the following:
    1. Placement and maintenance of traffic control devices under governmental authority and control.
    2. Existing and future Town, State and Federal Regulations.

4.10. Street Lighting

A. The following standards shall apply to all 6LD and 4LD thoroughfares:

1. Street lighting shall be placed in the medians, with spacing not to exceed three hundred feet (300') and no closer than one hundred fifty feet (150') depending on median breaks and intersections. Locations shall be determined by a photometric plan.
2. Luminaries and poles shall be the current Town approved standard.
3. Street lighting conduit shall be two-inch (2") Schedule 40 PVC.
4. Conduit shall be installed for irrigation to meet the landscape requirements in the median.

B. The following standards shall apply to all 2LC commercial collectors:

1. Street lighting shall be placed in the parkway between the curb and the sidewalk, with spacing not to exceed one hundred eighty feet (180') and no closer than one hundred fifty feet (150'). Locations shall be determined by a photometric plan.
2. Collector lighting shall be installed prior to final acceptance by the Town. Where property lines bisect collectors longitudinally, each Developer is equally responsible for their fair share of the cost of fully developed lighting. If the Commercial Collector Street is shown on the Comprehensive Plan the Developer can receive reimbursement through a Development Agreement.
3. Luminaries and poles shall be the current Town approved standard.
4. Street lighting conduit shall be two-inch (2") Schedule 40 PVC.

C. The following standards shall apply to all 3L, 2LC, 2LN, and 2LRN Residential Streets:

1. Poles shall meet the standard requirements of the local electric company and current Town standards. Upgraded options must be approved by the Director of Engineering Services.
2. Light locations shall typically be at intersections and at mid-block if the block length is greater than six hundred feet (600'). Cul-de-sacs, six hundred feet (600'), measured from centerline of street to center point of cul-de-sac, shall have a light installed at the street intersection and at the beginning of the bulb or at the top of the bulb. Other locations may be required as deemed necessary by the Director of Engineering Services. Lights shall not be closer than one hundred fifty feet (150').
3. Subdivisions bounded by arterials shall have common type of luminaries. Streetlights shall be installed prior to final acceptance by the Town.

4.11. Street Name Signs (At Non-signalized Intersections)

A. Street name signs shall be installed at all intersections of public streets, private streets, and public ways in accordance with the Town's Standard Details, Technical Specifications and requirements.

B. Street name blades shall be nine inch (9") tall extruded aluminum.

C. The street name shall be left justified, with block numbers located in the upper right-hand corner. Abbreviated street designations shall be located in the lower right-hand corner and right justified.

D. The lettering of the street name shall be Clear View 2W, six inches (6") tall and upper/lower case. Letters of abbreviated street designations shall be three inches (3") tall and all uppercase (i.e., LN, PKWY, DR, CT, etc.). Block numbers shall be 3" tall.

E. A street name shall be limited to sixteen (16) characters, not including the street designation. A street name shall either consist of one word no longer than sixteen (16) letters or two words separated by one space where the two words have no more than fifteen (15) letters combined.

F. Sign sheeting shall be diamond grade intensity. The background shall be green and the legend shall be white.

G. For a street with only one cul-de-sac end, a standard W 14-2a shall be mounted under the street name blade. In the case of a street with two cul-de-sac ends, two standard W 14-2a signs shall be mounted under the street name blade in the appropriate directions.

H. Owners, developers, and/or contractors should contact Development Services to obtain block numbers. Block numbers are required on all street name blades, even if no homes or buildings front onto the street.

4.12. Traffic Signals

A. Design Process

1. The designer shall schedule a kick-off meeting with the Town of Prosper Engineering department to discuss signal design guidelines and requirements as they apply to each project.
2. Obtain existing as-built plans for the intersection from the Town of Prosper or another agency, if available.
3. Conduct a field visit to verify existing information shown on the base map prepared by the designer.
4. Contact DIG-TESS, Town of Prosper, and adjacent public agency, as applicable, to verify existing utility locations at the beginning of design. If needed, the designer should also call for utility locates immediately before the award of construction contract. Existing and proposed utilities shall be shown on the plans.
5. Schedule a field visit with the Town of Prosper Engineering Department to identify traffic signal pole locations, controller cabinet location, power source location, and to discuss specific issues.
6. Prepare preliminary traffic signal layout plans (60%) and submit to the Town for review. This submittal shall include the following:
    a. Traffic signal layout sheet(s) showing signal poles, vehicular and pedestrian signal heads, barrier-free ramps and associated sidewalks, vehicle detection, pedestrian push buttons, controller cabinet location, power source location, electrical service, conduits, ground boxes, and all known existing and proposed utilities. The designer should recognize that the pedestrian pushbutton locations are often driven by the ramp locations and sidewalks.
    b. Signal design tables sheet(s)
    c. Pavement marking and signing sheet(s) showing all existing and proposed pavement markings and signs.

7. The following additional sheets may be included based on the type of project and existing intersection condition:
    a. Existing conditions layout showing the existing signal equipment to be removed.
    b. Curb ramp details
    c. Geometric modifications layout showing minor intersection improvements such as:
        i. Median nose modifications to provide adequate crosswalks and/or left turning paths.
        ii. Traffic control plan sheets.
        iii. Temporary signal layout plan sheets.
8. After receiving 60% submittal review comments from the Town of Prosper, the designer shall prepare and submit 90% submittal to the Town for review. This submittal is expected to include the following:
    a. Updated traffic signal layout, signal design tables, and pavement marking and signing, and any other additional sheets identified above.
    b. All applicable standard sheets
    c. General notes
    d. Standard specification list (TxDOT and Town of Prosper) and special specifications
    e. Quantity summary
    f. Cost estimate
    g. All contract documents, if the project will be let by the Town. The Designer should request the latest contract documents from the Town.
9. After receiving 90% submittal review comments from the Town, the designer shall update the complete plan set and submit FINAL signed and sealed plan sets to the Town.

B. Traffic Analysis

The Town of Prosper may request a traffic analysis for the intersection before signal design plans are developed. The following items may be included in the traffic analysis:

1. Turning movement counts – Collect 24-hour video turning movement counts for a typical weekday (Tuesday, Wednesday, or Thursday school day, without rain) or use the existing data available from the Town. The Designer should identify the need for additional counts (i.e. weekend) based on the location of the intersection in the Town and type of the project.
2. Synchro Analysis – Conduct AM, PM, and Mid-day peak hour capacity analysis for the existing and future (three years) conditions.
3. Left-turn phasing – Based on the capacity analysis results and field conditions, recommend phasing for left turns (i.e. protected only, protected/permissive, or split phase)

4. Storage Length – Based on the capacity analysis and queuing analysis, recommend storage lengths for the left and right turn lanes.
5. Improvements – Based on the capacity analysis, identify short-term and long-term improvements for each intersection.
6. Signal Timing Parameters – Provide signal timing parameters for the existing/proposed signalized intersection as applicable. These parameters should include pedestrian clearance times, yellow and all-red clearance times, min and max green times for each phase, extension times, delay settings for right turn lane detection, coordination timings (if the signal is part of a coordinated system), overlaps, and railroad preemption timings. The designer should utilize the NCHRP Report 731 or other industry accepted guidelines for the calculation of yellow and all-red intervals.

C. Signal Phasing

1. If the existing controller cabinet is not being replaced, then consult the Town of Prosper Engineering department to determine how phasing revisions (if required) will be incorporated.
2. If the controller cabinet is being replaced or a new traffic signal is being installed, then Phase 2 should always be Northbound Thru.
3. The Designer shall be responsible for recommending a left turn phasing based on the intersection geometry and traffic operations inclusive of signal progression.
4. When a dedicated right turn lane is provided, a separate right turn phase (right turn overlap) may be needed. This phase should operate in conjunction with a compatible left turn phase.
5. When a right turn overlap is provided, U-turns from the compatible left turns may need to be prohibited and adequate signage should be provided.

D. Traffic Signal Heads

1. All signal heads shall be LED.
2. All signal heads, including any required metal tubing, shall be made of aluminum and brown in color.
3. All signal heads shall be fitted with brown vented aluminum back plates.
4. Louvers, if used, and the inside of the visors shall have a black finish.
5. Signal heads shall be located as specified in the latest edition of the Texas Manual on Traffic Control Devices.
6. All signal heads shall be mounted horizontally unless otherwise directed by the Director of Engineering Services.
7. The Town prefers to provide a signal head for each thru lane. It should be notes that TxDOT standards typically allow up to three signal heads on standard mast arms (up to 48 feet long) and up to four signal heads on long mast arms (LMA).
8. If a nearside signal head is required, it should be mounted on the right side of the roadway. If roadway curvature requires mounting the nearside signal head on the left side of the roadway, it should be mounted vertically on a signal pole.

E. Curb Ramps, Pedestrian Signals and Push Button Assembly

1. Typically, pedestrian signal heads, Accessible Pedestrian Signals (APS), crosswalks, and curb ramps shall be provided for all approaches to an intersection. Specific exceptions might include situations where a pedestrian crossing would be unsafe because of geometric conditions or traffic signal operation. Designer should provide specific information to the Town as to why pedestrian crossing(s) Is not provided.

2. Curb ramps should be located to provide straight crosswalks. This may require median nose modifications. Curb ramps shall be designed according to the latest ADA requirements.

3. All pedestrian signal heads shall be LED.

4. Accessible Pedestrian Signal System shall be Polara Navigator.

F. Signal Poles and Mast Arms

1. The Town of Prosper uses TxDOT Dallas for signal poles and mast arm assemblies, pedestal poles, and foundations. All signal poles and pedestal poles shall be powder coated and Brown (RAL-8008) in color.

2. If the project is an upgrade of an existing signal installation, the new poles installed shall be similar to the existing poles that will remain in place at the intersection (round/polygonal).

3. Standard is 30’ poles with 8’ luminaire arms – powder coated brown.

G. Conduits and Ground Boxes

1. All conduits placed under ground shall be Polyvinyl Chloride Conduit (PVC) schedule 40. All conduits that are above ground shall be Rigid Metal Conduit (RMC).

2. A 4” conduit ring (ground box to ground box) shall be installed around the intersection. No ground boxes should be installed in the medians to complete a ring.

3. A 3” conduit should be installed between the conduit ring and standard/pedestal poles.

4. The home run (between controller cabinet and an adjacent ground box) shall have 2-4” conduits for traffic signals, 1-2” conduit for power, and one 2” conduit for future fiber optic cable installation should be provided as part of the home run

5. A separate 2” PVC conduit shall be used for power cable between the electrical service and the controller cabinet.

H. Electrical Conductors

Table 4.16 identifies different types of traffic signal cables and electrical conductors used.

Table 4.16: Signal Electrical Conductors

Location	Signal Cable/ Conductors
Terminal block of mast arm signal pole to the controller cabinet	20-Conductor #14AWG
Terminal block of pedestal pole to the controller cabinet	10-Conductor #14 AWG
Terminal block of mast arm signal pole to each: 3-section vehicular signal head 4-section and 5-section Pedestal signal head	 5-Conductor #14 AWG 7-Conductor #14 AWG 5-Conductor #14 AWG
Terminal block of pedestal pole to pedestrian signal head	5-Conductor #14 AWG
Electrical service meter to the controller cabinet	2 – 1 Conductor #6 XHHW
Electrical service meter to each signal pole mounted luminaire	2 – 1 Conductor #8 XHHW
Each push button to the controller cabinet	2-Conductor #12 AWG Type C

1. All wires inside the pole (from terminal block of the signal pole to signal heads or other devices) including traffic signal cable, electrical conductors for power and luminaire, and communication cable shall not be paid for separately and shall be considered subsidiary to Item 680 “Installation of Highway Traffic Signal”.
2. Power cable shall not be spliced between the electrical service and the controller cabinet.
3. Luminaire cable shall not be spliced between the electrical service and each signal pole mounted luminaire.
4. No. 6 Bare wire shall be used for grounding in all conduits except the run between the power service and disconnect.
5. 2-1 Conductor #8XHHW for illumination can be daisy chained.
6. Use 2 Conductor #8XHHW for ILSN. Provide a separate photocell for ILSN/120V circuit. ILSN conductors can be daisy chained.
7. The Town uses Type 721 uni-directional Opticom detectors and Type 764 Phase Selectors manufactured by Global Traffic Technologies.

I. Luminaires

1. All signal pole mounted luminaires shall be Philip Lumac Road Focus Medium LED cobra head (# RFM-108W48LED4K-T-R35-UNIV-DMG-RCD-B).
2. All signal pole mounted luminaires at an intersection shall be controlled with a central photocell which will be installed inside an enclosure mounted on the service pedestal.
3. The luminaire arm mounted on the traffic signal pole shall be 8’ long.

J. Electrical Service

1. Typically, the Town of Prosper uses pedestal type electrical service for traffic signal installations requiring new power using the following code:

   a. Type D (120/240)070(NS)AL(E)PS(U)

2. The designer shall verify the location of a power source with the appropriate utility company and discuss the type of service that will be installed at each intersection with the Town of Prosper Engineering Department.

K. Detection Systems

The Town of Prosper typically uses Radar Vehicle Detection System that meet the latest TxDOT special specifications for Radar Vehicle Detection System for Signalized Intersection Control.

The designer shall discuss the type of detection system and detection system layout to be used at each intersection with the Town of Prosper Engineering Department.

L. Traffic Signal Controller and Cabinet Assembly

1. The Town of Prosper uses Econoline Cobalt controllers. The designer should request the latest controller model number from the Town.

2. The Town of Prosper uses NEMA TS2 (TxDOT Specification traffic signal controller cabinets with shelf or externally mounted Battery Back-Up-System (BBU System). For all on-system (TxDOT roadways) intersections, BBU shall be externally mounted. However, the designer should verify with the Town and TxDOT staff. Traffic signal controller cabinet and BBU (if externally mounted) shall be powder coated brown (RAL-8008).

3. Traffic signal controller cabinet shall be installed according to the TxDOT standard specification TS-CF.

4. A concrete apron shall be installed around the controller cabinet.

M. Illuminated Street Name Signs (ILSN)

1. Typically, the Town of Prosper uses cantilever ILSN arm (TxDOT specifications) above the mast arm, mounted at 24 feet height. Mast arm mounted ILSN are allowed only if 19 feet high signal pole is used.

2. The Town uses Clean Profile series ILSN manufactured by Southern Manufacturing. The contractor shall be responsible for furnishing and installing the ILSN and all mounting hardware according to the Town's specifications (attached).

3. On specific projects, the Town may require the contractor to furnish and install standard street name sign blades. In this case, the Town will provide the Town of Prosper logo to be installed on the street name sign furnished by the contractor.

N. Communication System

The Designer shall provide one-2" conduit for future fiber optic cable installation from signal controller cabinet to the adjacent ground box (home run).

O. Red Light Confirmation Lamp

The Designer should request that latest specifications for Red Light Confirmation Lamp from the Town's Engineering Department.

P. Traffic Control During Construction/USE of Temporary Signals

1. The Designer shall discuss their approach for traffic control during signal construction with the Town of Prosper Engineering Department.
2. If it is determined that traffic control plans and/or temporary signal plans are required on a project, the designer shall be responsible for preparing such plans.
3. Traffic control requirements during construction will vary depending on the type of project. For example, a new traffic signal installation may not require traffic control plans, while signal modifications as part of a roadway construction project may require traffic control plans and/or temporary (span wire) signal installation.
4. If required, span wire signal design plans shall be prepared according to TxDOT Dallas standard sheet "Construction Details for Span Wire Mounted Signals".
5. Plans shall clearly indicate how transition from the existing traffic signal equipment to the new signal equipment will be accomplished for traffic signal modifications. Installation of temporary signals may be required.

4.13. Traffic Impact Analysis Mitigation

A. Purpose – The purpose of a traffic Impact Analysis (TIA) is to assess the effects of specific development activity on the existing and planned thoroughfare system. Development activity may include but is not limited to rezoning, preliminary site plans, site plans, preliminary plats, driveway permits, certificates of occupancy, and Thoroughfare Plan amendments.

B. Pre-application meeting – Prior to the commencement of a TIA, an initial or pre-application meeting with Town staff is required to establish a base of communication between the Town and the applicant. This meeting will define the requirements and scope relative to conducting a TIA and ensure that any questions by the applicant are addressed.

C. Applicability of TIA Requirements:

1. Zoning – These TIA requirements shall apply to all zoning requests for land uses which will generate 2,500 or more vehicle trips per day or contain a density of 0.75 Floor Area Ratio (FAR) or greater. Applicable requests include zoning requests and Thoroughfare Plan amendments, if no previous traffic assessment was performed. Special circumstances, including but not limited to development with no case history, which to not meet the daily trip generation threshold, may also require a TIA. Such circumstances, as determined by the Director of Engineering Services may include, but are not limited to, impacts to residential neighborhoods from non-residential development, inadequate site accessibility, the implementation of the surrounding Thoroughfare Plan is not anticipated during the estimated time period of the proposed development, the proposed land use differs

significantly from that contemplated in the Comprehensive Plan, or the internal street or access is not anticipated to accommodate the expected traffic generation.

2. Development – These TIA requirements shall apply to all development requests for land uses, except single-family residential development, which will generate over 100 total trips during the AM or PM peak hour. Applicable development requests include concept plans, preliminary site plans, site plans and preliminary plats. Special cases, in which site generated peak hour trip activity is different from that of the adjacent street (weekdays 7:00-9:00 a.m. and 4:00-6:00 p.m.), may require and additional separate analysis as determined by the Director of Engineering Services. such circumstances may include, but are not limited to, commercial/retail, entertainment or institutional activity. The Director of Engineering Services may waive the TIA for a development request if a TIA was performed previously with the Zoning request and conditions listed in the report are still current.
3. Single-Family Residential Exception – A TIA for single-family residential development will not be required if the development contains fewer than six dwelling units unless special circumstances exist, as determined by the Director of Engineering Services. These special circumstances may include, but are not limited to, impacts to other residential development from cut-through traffic, inadequate site accessibility, the implementation of the surrounding Thoroughfare Plan is not anticipated during the estimated time period of the proposed development, the internal street or access system is not anticipated to accommodate the expected traffic generation, or the development is outside the urban core of the community.
4. Daycares and Schools – All development requests and/or specific use permit requests for a daycare, Montessori school, private school, charter school, or public school shall include, at a minimum, a traffic circulation study. This study shall include the estimated maximum peak hour trip generation of the facility, the planned circulation of inbound and outbound traffic during drop-off and pick-up operations, and the estimated length of the queue of cars waiting to pick up students. The design of the site and the circulation plan shall ensure that school traffic does not back up onto any public street. The traffic circulation study shall include a statement that the owner and/or operator of the daycare or school agrees to operate the facility in accordance with the approved circulation plan. The circulation plan must be approved by the Director of Engineering Services before the development request or the specific use permit can be approved.
5. Determination of Applicability – The need for a TIA shall be determined by the Director of Engineering Services based upon the results and recommendation from a pre-application meeting. It shall be the responsibility of the applicant to demonstrate that a TIA should not be required. If a TIA is required, the level of effort for a TIA submission shall be determined based on the criteria set forth in Table 4.17. Depending upon the specific site characteristics of the proposed development, one or more of the following elements may also be required as part of the TIA: an accident analysis, sight distance survey, traffic simulation, traffic signal warrant analysis, queuing analysis, turn lane analysis, and/or traffic circulation plan.

TABLE 4.17: Criteria for Determining TIA Study Requirements

Analysis Category	Site Trips Generated at Full Build-Out	TIA Analysis Periods[1]	Minimum Study Area[3]
I	>50 peak hour driveway trips; or 100-500 total peak hour trips	1. Existing year 2. Opening year[2] 3. Five years after opening	1. All site access drives 2. All signalized intersections and/or major un-signalized intersections within 0.5 mile to 1 mile of site boundary
II	>500 total peak hour trips	1. Existing year 2. Opening year of each phase 3. Five years after initial opening 4. Ten years after final opening with full build-out	1. All site access drives 2. All signalized intersections and/or major un-signalized intersections within 1.5 of site boundary

(1) Analysis periods shall include build and no-build scenarios. Assume full occupancy when each phase opens.
(2) Assume full build-out.
(3) For certain projects, the Town may require an enlarged study area. Land uses within the study area should include recently approved or pending development adjacent to the site.

D. Requirements for TIA Updates – A TIA shall be updated when time or circumstances of the original study fall within the parameters presented in Table 4.18. The applicant is responsible for preparation and submittal of appropriate documentation in order for Town staff to process the zoning or development application. A TIA for site development requests must be updated if two years have passed since the original submittal, or if existing or assumed conditions have changed within the defined study area. The Director of Engineering Services shall make the final determination as to the extent of a TIA update.

TABLE 4.18: Criteria for Determining TIA Update Requirements

Original TIA Report was based on:	Changes to the Originally Proposed Development	
	Access Changed(1) or Trip Generation Increased by more than 10%	**Access Not Changed and Trip Generation Increased by less than 10%**
Zoning; or Preliminary Site Plane or Site Plan that is less than 2 years old	Letter Amendment Required: Identify and report only analysis conditions that have changed.	Letter Documenting Change (No analysis is required)
Preliminary Site Plan or Site Plan that is more than 2 years old	Prepare New Study. Must meet all current TIA requirements	Prepare New Study. Must meet all current TIA requirements

(1) Changed access includes proposed new access or refinement of general access locations not specifically addressed in original proposed development.

E. Responsibility of TIA Preparation and Review:

1. A TIA shall be prepared in accordance with all of the guidelines in this section and submitted in accordance with the Development Review Schedule set by the Town. The responsibility for TIA preparation shall rest with the applicant and must be performed by a Professional Engineer (P.E.) licensed in the State of Texas with experience in traffic and transportation engineering. The final TIA report must be signed and sealed by the P.E. responsible for the analysis to be considered for review by the Town. Application and review fees are due at the time of each submittal. Town staff shall serve primarily in a review and advisory capacity and will only provide data to the applicant when available.
2. It shall be the responsibility of the applicant to submit four (4) draft TIA reports and executive summaries with the zoning and/or development request submission. The proper number of reports, the timing for submission, and the review of these reports shall be based on standard Town development review procedures. Incomplete TIAs or failure to submit a TIA with the submission shall delay consideration of zoning and development requests. Should it be determined during the review of any zoning and/or development plans that a TIA is required, consideration shall be deferred until the applicant submits a completed TIA and the Town has reviewed the assessment.
3. The Town shall review the TIA and provide comments to the applicant. It shall be the responsibility of the applicant to submit four (4) finalized TIA reports and executive summaries once all review comments have been addressed.

F. TIA Standards:

1. Design Level of Service – The minimum acceptable level of service (LOS) within the Town shall be defined as LOS “D” in the peak hour for all critical movements and links. All development impacts on both thoroughfare and intersection operations must be measured against this standard.
2. Trip Generation Resources – The Town’s standard for trip generation rates for various land use categories shall be those found in the latest edition of *Trip*

Generation published by the Institute of Transportation Engineers (ITE) or other published or recognized sources applicable to the region. Alternate trip generation rates may be accepted on a case-by-case basis if the applicant can provide current supporting data substantiating that their development significantly differs from the ITE rates. The Director of Engineering Services must approve alternative trip generation rates in writing in advance of the TIA submission.

3. Trip Reductions – Trip reductions for passer-by trips and mixed-use developments will be permitted, subject to analytical support provided by the applicant and approval by the Director of Engineering Services on a case-by-case basis. Assumptions relative to automobile occupancy, transit mode share, or percentage of daily traffic to occur in the peak hour must be documented and will be considered subject to analytical support provided by the applicant.
4. Study Horizon Years – The TIA must evaluate the impact of the proposed development on both existing traffic conditions and future traffic conditions for the horizon year(s) as specified in Table 4.18. however, applications for densities of 0.75 Floor Area Ratio (FAR) or greater within the Dallas North Tollway, US 380, or Preston Road corridors (throughout the Town Limits) shall require that the horizon year land use assumptions be updated to reflect full development based on all proposed zoning. These applications should also assume full development of the Master Thoroughfare Plan or pending amendments.

G. TIA Methodology:

1. Site Location/Study Area – A brief description of the size, general features, and location of the site, including a map of the site in relation to the study area and surrounding vicinity.
2. Existing Zoning – A description of the existing zoning for the site and adjacent property, including land area by zoning classification and density by FAR, square footage, number of hotel rooms, and dwelling units (as appropriate).
3. Existing Development – A description of any existing development on the site and adjacent to the site and how it would be affected by the development proposal.
4. Proposed Zoning/Site Development – A description of the proposed zoning/development for the site, including land area by zoning classification and density by FAR, square footage, number of hotel rooms, and dwelling units (as appropriate); identify other adjacent land uses that have similar peaking characteristics as the proposed land use; identify recently approved or pending land uses within the area.
5. Thoroughfare System – A description and map of existing planned or proposed thoroughfares and traffic signals for horizon years(s) within the study area.
6. Existing Traffic Volumes – Recent traffic counts for existing thoroughfares and major intersections within the study area.
7. Projected Traffic Volumes – Background traffic projections for the planned thoroughfare system within the study area for the horizon years.
8. Density of Development – A table displaying the amount of development assumed for existing zoning and/or the proposed development (using gross floor area, dwelling units, occupied beds, etc., as required by the trip generation methodology).

9. Existing Site Trip Generation – A table displaying trip generation rates and total trips generated by land use category for the AM and PM peak hours and on a daily basis, assuming full development and occupancy based on existing zoning (if applicable), and including all appropriate trip reductions (as approved by the Director of Engineering Services).
10. Proposed Site Trip Generation – A table displaying trip generation rates and total trips generated by land use category for the AM and PM peak hours and on a daily basis, assuming full development and occupancy for the proposed development, and including all appropriate trip reductions (as approved by the Director of Engineering Services).
11. Net Change in Trip Generation (for rezoning cases) – Proposed trip generation minus existing trip generation (if applicable); the net increase in trips to be added to base volumes for the design year.
12. Trip Distribution and Traffic Assignment – Tables and figures of trips generated by the proposed development (or net change in trips, if applicable) added to the existing and projected volumes, as appropriate, with distribution and assignment assumptions, unless computer modeling has been performed.
13. Level of Service Evaluations – Capacity analyses for weekday AM or PM peak hours of the roadway and peak hour of the site, if different from the roadway, for both existing conditions and horizon year projections for intersections, thoroughfare links, median openings and turn lanes associated with the site, as applicable.
14. Traffic Signal Evaluations – The need for new traffic signals based on warrants and their impact on the performance of the transportation system.
15. Evaluation of Proposed/Necessary Mitigation – Capacity analyses for weekday AM and PM peak hours of the roadway and peak hour of the site, if different from the roadway, for intersections, thoroughfare links, median openings and turn lanes associated with the site under proposed/necessary traffic mitigation measures.
16. Conclusions – Identification of all thoroughfares, driveways, intersections, and individual movements that exceed LOS D or degrade by one or more LOS, the percentage of roadway volume change produced by the proposed development, and any operational problems likely to occur.
17. Recommendations – Proposed impact mitigation measures consistent with Subsection I below.
18. Other information required for proper review – As requested by the Director of the Engineering Services.

H. TIA Report Format:

1. The TIA report must be prepared on 8.5” x 11” sheets of paper. However, it may contain figures on larger sheets, provided they are folded to this size. All text and map products shall be computer-based and provided in both published format and computer file format (PDF). In addition, all electronic files used as part of the traffic analysis (i.e., Synchro, HCS, Passer II/III, CORSIM, VISSIM, etc.) shall be provided.
2. The sections of the TIA report should be categorized according to the outline shown below:

Executive Summary

A. Introduction
   1. Purpose
   2. Methodology

B. Existing and Proposed Land Use
   1. Site Location/Study Area
   2. Existing Zoning
   3. Existing Development
   4. Proposed Zoning (if applicable)

C. Existing and Proposed Transportation System
   1. Thoroughfare System
   2. Existing Traffic Volumes
   3. Projected Traffic Volumes

D. Site Traffic Characteristics
   1. Existing Site Trip Generation (if applicable)
   2. Proposed Site Trip Generation
   3. Net Change in Trip Generation (if applicable)
   4. Trip Distribution and Traffic Assignment

E. Traffic Analysis
   1. Level of Service Evaluations
   2. Traffic Signal Evaluations

F. Mitigation

G. Conclusions

H. Recommendations

Appendices

I. Traffic Impact Mitigation:

1. Mitigation of traffic impacts shall be required if the proposed development would cause a facility or traffic movement to exceed LOS D, or where it already exceeds LOS D and the development would contribute five percent (5%) or more of the total traffic during any projected horizon year. If mitigation is required, the applicant must only mitigate the impact of the proposed development, and would not be responsible for alleviating any deficiencies in the thoroughfare system that may occur without the proposed development.

2. Acceptable mitigation measures shall include:

   a. Staging of development in order to relate site development to the construction of the required thoroughfare system;
   b. Staging of development so that the site contributes less than five percent (5%) of the total traffic to the affected facility or traffic movement during the projected horizon year;
   c. Off-site improvements, including the provision of right-of-way and/or the participation in funding for needed thoroughfare and intersection improvement projects (including, but not limited to, through lanes, turn lanes or traffic signals); and

d. On-site improvements, including access controls and site circulation adjustments.

3. Mitigation is not required if it can be shown that the traffic impacts of the project are fully mitigated ten (10) years after the final opening with any improvements that are already programmed to be implemented within five (5) years of the initial opening.

J. Administration of the TIA – Based on the results of the TIA and actions recommended by the Director of Engineering Services, the Planning & Zoning Commission and/or the Town Council, as appropriate, shall take one or more of the following actions:

1. Approve the zoning or development request, if the project has been determined to have no significant impact or where the impacts can be adequately mitigated;
2. Approve the development request, subject to a phasing plan;
3. Recommend study of the Town Thoroughfare Plan to determine amendments required to increase capacity;
4. Recommend amendment of the Capital Improvement Plan (CIP) to expedite construction of needed improvements; or
5. Deny the zoning or development request, where the impacts cannot be adequately mitigated.

K. Cost of TIA Review by Town – The cost for review of TIA submittals shall be based on the parameters set forth in the Town's Development Fee Schedule and paid in full at time of submission.

4.14. Post-Development Traffic Calming Guidelines

A. Introduction:

1. Traffic Calming, a concept that dates back to the 1960's and 70s, has been implemented more extensively throughout the United States during the 1990s. The primary purpose of traffic calming is to decrease speeds and reduce cut-through traffic volumes. The Institute of Transportation Engineers (ITE) defines traffic calming as follows:

> "Traffic Calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users."

2. Urban sprawl and traffic congestion continue to increase in the United States. As a result, speeds and cut-through volumes on local streets and collectors will continue to increase unless traffic calming measures are put in place or new local and collector thoroughfares are designed with traffic calming in mind.

3. The Roadway Design Standards and Subdivision Ordinances are intended to provide design and access requirements that are proactive in addressing traffic calming issues in residential areas. In instances where problems exist that can be addressed by traffic calming, a specific process will be used to identify the problem and potential solutions.

4. Traffic control devices such as STOP Signs and speed limit signs are regulatory measures that require enforcement. Traffic calming measures, however, are intended to be self-enforcing.

B. Traffic Calming Process - The traffic calming process contains steps that include the three E's commonly found in traffic calming programs. These E's are Education, Enforcement and Engineering. In many instances, applying the Education and Enforcement steps will solve the problem without implementing a costlier engineering solution. The traffic calming process will use the following steps:

1. Neighborhood must identify a problem and bring it to the Town's attention with a petition signed by seventy-five percent (75%) of the property owners along the street.

2. The Town will conduct a study, funded at the property owners' expense, to determine the extent of the reported problem.

3. The Town will examine the results of the study.

4. If the study indicates that a problem exists, the Town will identify if there are additional stakeholders in solving the problem. These additional stakeholders will typically include emergency services and the school district.

5. If a speeding problem exists, the Town will then:

   a. Identify possible causes.
   b. Work with the neighborhood to raise awareness to the problem (Education).
   c. Increase the enforcement level after the education process (Enforcement).
   d. Conduct another study to determine if Education and Enforcement have solved the problem.
   e. If a speeding problem still exists, the Town will then:
      i. Determine the best traffic calming measure to apply (Engineering).

ii. Determine whether the solution should be a temporary installation or permanent installation.
iii. Conduct an after study to see if the measure has had the desired effect.

6. If a cut-through problem exists, the Town will then:

a. Identify possible causes.
b. Examine the area roadway network to determine the best solution.
c. Work with surrounding neighborhoods to implement a solution. This step is necessary because traffic calming measures that address this problem may move the cut-through traffic to another neighborhood street.
d. Conduct an after study to determine if the solution was effective.

C. Role of Emergency Services and School District – The traffic calming process must involve Fire and Rescue, Police and the School District (bussing). It is recommended that these agencies play an advisory role. Some measures may delay emergency response time. It is imperative that each neighborhood realizes that this is a trade-off when implementing traffic calming measures. All traffic calming measures must be designed to accommodate emergency vehicles and school buses.

D. Traffic Calming Measures – Below is a list of traffic calming solutions for speed related problems and cut-through traffic problems. The solutions are listed in no particular order.

1. Potential Solutions for Speed Related Problems:
   a. Chokers – midblock
   b. Neckdowns – at intersection
   c. Neighborhood speed watch program
   d. Realigned intersections
   e. Medians
   f. Traffic circles/roundabouts
   g. Lateral shifts
   h. Textured pavements

Note: STOP signs are not intended for speed control. Studies have shown that installation of STOP signs to control speed actually increase the speeds measured at midblock locations between STOP signs.

2. Potential Solutions for Cut-Through Traffic Related Problems:
   a. Diverters
   b. Median Barrier
   c. Turn restrictions
   d. Street closures

4.15. Internal Site Circulation Requirements

Site Circulation within private development must meet all Town standards as set forth in the Town of Prosper Zoning Ordinance and Prosper's Fire Code as well as all applicable standards listed in previous sections of this manual. Site Circulation should also consider safe design for all drivers, pedestrians and other users.

A. Proper internal site circulation includes, but is not limited to, proper channelization and alignment of intersections, turning radii, fire truck access and maneuverability, sight distance, traffic control devices, traffic queue management, loading dock access,

delivery truck activity, loading zones, trash pickup location and procedures, parking lot circulation, crosswalk alignment, crosswalk location, ADA access routes, etc.

B. Fire Lanes, also known as Fire Apparatus Access Roads, must meet the requirements and provisions listed in the Town of Prosper Code of Ordinances: Fire Code. Basic requirements include:

1. All fire lanes must be a minimum of twenty-four feet (24') wide with all radii a minimum of thirty feet (30'), or thirty feet (30') wide with minimum radii of twenty feet (20') if intersecting with another thirty-foot (30') wide fire lane. If a thirty-foot (30') section intersects a twenty-four-foot (24') section, the radii must be a minimum of thirty feet (30'). A thirty-foot (30') wide fire lane can taper down to twenty-four (24') with a 10:1 transition (ten longitudinal feet to every one foot of width).
2. Fire lanes required for fire protection for structures over 30 feet in height shall require fire lane width to be increased to twenty-six feet (26') wide. Radii as previously described for twenty-four (24) foot wide fire lanes apply.
3. Dead-end fire lanes over 100 ft are prohibited without an approved turnaround.
4. Pavement and subgrade requirements can be found in the Town's Paving and Subgrade Design manual.
5. The curvature and/or alignment of a fire lane within a site shall not create difficult geometry for fire trucks to navigate, as determined by the Fire Department. Some specific requirements include
    a. When a fire lane contains a reverse curve (or S-curve) in its alignment, there must be a tangent at least twenty feet (20') long between the reverse curve and the next curve in the alignment or the next curb return of a fire lane intersection.
6. Fire Lane design should be designed in manner to discourage excessive speeds, "cut-thru" traffic or other hazardous conditions. If excessive speeds or other hazardous conditions have been determined, speeds cushions meeting Town standards may be approved by the Town of Prosper Fire Marshal.
    a. Speed Cushions shall not be used for initial design, as original design should be done in manner to discourage unsafe conditions.

C. Internal development parking and drive aisles must meet minimum requirements as depicted in the Town of Prosper's Zoning Ordinance. Basic requirements include:

1. Parking stalls shall be a minimum of 9 ft wide x 20 ft in length. Stalls may be shortened to 18 ft if a two-foot car overhang exclusive of landscape setbacks is provided.
2. Drive aisles with 90° head in parking must be a minimum of 24 ft wide.
3. Drive aisles with angled parking must meet minimum widths as depicted in Chapter 5, Section 2 Appendices in the Town's Zoning Ordinance.
4. Drive aisles designated as Fire Lanes shall meet all minimum Fire Lane Standards.

D. Drive-through Restaurants and Businesses

1. Drive-through restaurants and businesses shall be designed so that traffic queued up to use the business shall not block a fire lane, block required parking spaces,

interfere with traffic circulation for other businesses, block a driveway entrance to the shopping center, nor back up into a public street.

2. Drive-through restaurants and businesses shall be designed so that the drive-through lane never ends with its traffic traveling parallel to traffic traveling in the opposite direction.
3. Escape Lanes shall be designed as outlined in the Town's Zoning Ordinance Section 4.4.9.B of the Town's Zoning Ordinance for any use containing a drive-through facility.
4. Queuing - Staking spaces provide the ability for vehicles to queue on site prior to receiving a service. Stacking spaces shall be provided as required in Section 4.4.9.B of the Town's Zoning Ordinance.

E. Daycares and Schools – sufficient stacking shall be provided for child drop off and pick-ups so that queuing does not back up into fire lanes or public right-of-way, especially during peak hours. A site circulation study may be required.

F. Car Washes – sufficient stacking shall be provided so that queuing does not back up into fire lanes or public right-of-way, especially during peak hours. A site circulation study may be required.

G. Dumpster Geometry – dumpster widths, location, backing and maneuvering shall be in accordance with the current Town's waster provider. Guidelines and standards are available upon request.

H. Structured Parking Garages:

1. Parking garages containing five hundred (500) or more parking spaces shall have at least two driveway access points, each with a minimum of two lanes. If a parking garage is allowed to have only one driveway access point, that driveway shall have a minimum of one (1) inbound lane and two (2) outbound lane.
2. Parking garages shall have at least one pedestrian entrance which does not require pedestrians to walk in a driveway access point to enter the garage. This pedestrian entrance shall be served by a sidewalk connection that complies with the most current federal, state, and local ADA requirements. Additional pedestrian entrances may be required as deemed necessary by the Director of Engineering Services.
3. Where vehicles exit a parking garage, the fire lane shall be located at least fifteen feet (15') away from the exterior wall or column of the parking garage exit so adequate sight distance is provided for exiting vehicles.
4. The size of parking spaces within a parking garage is dictated by the Zoning Ordinance. If the parking spaces are eighteen feet (18') deep, no column or barrier cable is allowed to encroach into a parking space beyond an area measuring fourteen inches (14") by fourteen inches (14") in one front corner of that parking space. If the parking spaces are deeper than eighteen feet (18'), the encroachment area shall be no wider than fourteen inches (14") and no deeper than twenty-six inches (26") in one front corner of that parking space. If barrier cables are installed across the entire width of a parking space, the required parking space depth must be measured from the face of the barrier cable(s).