Transportation Criteria Manual Compliance Summary (Ver. August 30, 2019)
(Online content updated on February 7, 2018)

Territory			Reference	Rule	Document Type				How and where the application meets requirement		Travis County Comment	Date
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where		
SECTION 1 - VISION, GOALS, AND DESIGN CRITERIA												
1.3.0 - GEOMETRIC DESIGN CRITERIA												
1.3.1 - General Design Criteria												
1.3.1 (A) - Grades												
			TCM 1.3.1 (A)	The grade line is a series of straight lines connected by parabolic vertical curves to which the straight lines are tangent. Under all conditions this line should be smooth flowing. Short, choppy grades are unsightly and disrupt operating conditions.								
			TCM 1.3.1 (A)(1)	Maximum Grades. Maximum grades are determined primarily by the operation characteristics of vehicles on grades. Driving practices with respect to grades vary greatly, but nearly all passenger cars can readily negotiate upgrades as steep as seven (7) to eight (8) percent. Passenger vehicle speeds decrease progressively with steeper grades.								
				The effect of grades on bus or truck speeds is most pronounced. On upgrades, the maximum speed a bus or truck can maintain is dependent on the grade length and steepness, and on the ratio of the gross vehicle weight to engine horsepower. This will not only affect speed, but may also be a pronounced effect on the capacity of the street where there are appreciable bus and/or truck volumes. Tables 1-7, 1-8 and 1-12 indicate maximum permissible grades. However, such grades should be used infrequently.								
				The maximum gradient range for roadways carrying bus traffic is six (6) to eight (8) percent. (Urban Public Transportation: Systems and Technology, Vukan R. Vuchic. Englewood Cliffs, NJ: Prentice-Hall, 1981). To adequately exploit the travel time and speed advantage of an exclusive bus lane, the maximum recommended grade for a high-occupancy vehicle (HOV) lane or busway is four (4) percent (Institute of Transportation Engineers, Transportation and Traffic Engineering Handbook, 2nd ed. Englewood Cliffs, NJ: Prentice-Hall, 1982).								
			TCM 1.3.1 (A)(2)	Minimum Grades. Minimum grades are governed by drainage conditions. With curbed pavements, longitudinal grades should be provided to facilitate surface drainage. A minimum grade of 0.4 percent is used.								
			TCM 1.3.1 (A)(3)	General Controls for Vertical Alignment. The following are general design controls which should be addressed in determining vertical alignments:								
				• The grade line should be smooth flowing.								
				• The "roller coaster" type profile should be avoided.								
				• Undulating grade lines should be appraised for their effect upon traffic operations.								
				• A broken-back grade line (successive vertical curves in the same direction) generally should be avoided.								
				• It is desirable to reduce the grade through intersections on roadways with moderate to steep grades.								
				• A sag vertical or flat grade is desirable in advance of such features as channelizations and ramp takeoffs in order to provide good visibility.								
				• Steep downgrades should be avoided, whenever practicable, at the approach to traffic signals and stop signs.								
			TCM 1.3.1 (A)(4)	Vertical Curves. Vertical curves should be simple in application and should result in a design that is safe, comfortable in operation, pleasing in appearance and adequate for drainage.								
				For simplicity, the parabolic curve with an equivalent axis center on the vertical point of intersection is recommended in roadway profile design (see Figure 1-3 contained in Appendix H of this manual).								
				Figures 1-4 and 1-5 contained in Appendix H of this manual indicate the length of vertical curve in relation to algebraic difference in grades necessary to maintain safety and comfort for crest vertical curves and sag vertical curves.								
				Maximum grade breaks of 0.8 percent or less may be used without a vertical curve.								

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				Note that sight distance required from intersecting streets or driveways along vertical curves is not addressed in Figures 1-3, 1-4 and 1-5 contained in Appendix H of this manual. An intersecting street or driveway may not be appropriate along a vertical curve when required sight distance from side street or driveway is not attainable. If it is essential that a side street or driveway intersect the main street along a vertical curve, then it may be necessary to reduce the vertical curve so that necessary sight distance is available. Horizontal and vertical alignments should not be designed independently. They complement each other and poorly designed combinations can spoil the good points and aggravate the deficiencies of each. Horizontal alignment and profile are among the more important design elements of a roadway.								
				Comfort control criteria as defined in AASHTO for sag vertical curves is generally discouraged. This criteria, however, may be used when the subdivision is provided with adequate fixed-source lighting (street lights). The Director of the Watershed Protection and Development Review Department shall be consulted in regard to procedural and funding requirements pertaining to fixed-source lighting.								
			1.3.1 (B) - Minimum Horizontal Radii									
			TCM 1.3.1 (B)	The minimum radius of a roadway is directly related to a roadway's design speed (V), superelevation (e) and side friction factor (f). The minimum safe radius (R) is calculated from the formula $R=V^2/[15(e+f)]$ (eq. 1-1)								
			1.3.1 (C) - Cross Slope									
			TCM 1.3.1 (C)	On two-lane roadways that are crowned at the center, the accepted rate of cross slope ranges from 1.5% to 2%. When three or more lanes are inclined in the same direction on multilane roads, each successive pair of lanes or portions thereof that are positioned away from the first two lanes at the crown may have an increased slope. The two lanes adjacent to the crown line should be pitched at the normal minimum slope, and on each successive pair of lanes or portion thereof outward, the rate may be increased by 0.5% to 1.0%. Therefore, the minimum lane cross slope shall be 1.5%, while the typical lane cross slope shall be 2%. The maximum cross slope for outside lanes of multilane roads or streets shall be 3%.								
				Use of cross slopes greater than 2% on roads or streets with a central crown line is not desirable. In passing maneuvers, drivers cross and recross the crown line and negotiate a total rollover or cross slope change of over 4%. The reverse curve path of the passing vehicle causes a reversal in the direction of centrifugal force, which is further exaggerated by the effect of the reversing cross slopes. Trucks with high centers of gravity crossing over the crown line are caused to sway from side to side, which at times may be difficult to control. Therefore, the maximum algebraic difference between cross slopes in adjacent lanes, main lanes and auxiliary lanes shall be 4% for a crown or crest slope break.								
				On roadway section that incorporates median islands, the difference in curb heights between the two interior curb lines may vary. In the area of intersections, median openings or possible median openings, the slope between the two interior curb tops should be no more than 2%. Designs which utilize greater slopes will be individually reviewed by TPSD staff. Waivers may be approved for locations where drainage, landfill or environmental issues may require greater slope. Median openings are to be held to the same standard as intersections because driveway connections may be made to produce a three or four-legged intersection.								
			1.3.1 (D) - Intersection Design									
			TCM 1.3.1 (D)(1)	Vertical Alignment within Intersection Area. Intersection areas should be designed with a flat grade. In the more difficult terrains, this becomes economically impractical.								
				The design speed for the major street at any intersection shall be maintained through the intersection approaches. The minor street may be designed with a change in grade based on reduced design speeds between the maximum grade in the approach and the cross-slope of the intersected street not to exceed eight (8) percent for local streets and six (6) percent for collector streets. The change in grade shall be accomplished by means of a vertical curve of length equal to the minimum length for that approach for that intersection type as indicated in Tables 1-7 and 1-12.								

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			TCM 1.3.1 (D)(2)	Horizontal Alignment within Intersection Area. The horizontal approach to an intersection should be tangent for a length of 50-100 feet (see Tables 1-7 and 1-12). Note that these tangent lengths are minimum. Longer tangents are highly desirable. The tangent distance is measured from the curb line of one (1) street to the first point of curvature on the intersecting street. In this regard, radii greater or equal to 1000 feet may be considered tangent.								
				Where driveways are not limited to right in and right out movements, requirements for local streets (as indicated in Tables 1-7 and 1-12) should apply. It is desirable for all intersections to meet at approximately a 90 degree angle. However, necessary sight distance for streets intersecting from the outside of a curve is generally attainable. Skewed intersections should be avoided and in no case should the angle be less than 80 degrees or greater than 100 degrees. Studies have shown that skewed intersections have generally higher accident rates than those intersecting at 90 degrees. Desirable alignments will also provide for increased visibility of traffic control devices such as stop signs or yield signs and will also provide increased visibility of cross traffic.								
			TCM 1.3.1 (D)(3)	Minimum Curb Radius. As curb radius is increased, paving costs and intersection area required for a pedestrian to traverse are increased and higher turning speeds are encouraged. Substandard radii result in unnecessary lane encroachment and increased traffic conflict and accident potential. Reasonable design values of 15 feet are recommended for intersection radii of two (2) local streets, based on curb clearance of three (3) feet and without lane encroachment for a typical width street, using the AASHTO design passenger vehicle. This design will also accommodate garbage trucks and moving vans with wide swings. An increased radius of 20 feet for the local-collector or collector-collector intersection is predicated upon a desire to slightly improve the maneuverability of a vehicle in entering or leaving the collector. A collector intersection with an arterial street should have a 25 foot radius. An arterial-arterial intersection should have a 30 foot radius.								
			TCM 1.3.1 (D)(4)	Minimum Centerline Offset of Adjacent Intersection. Several studies of intersection design types have shown T-type intersections to be far safer than cross-type. Extensive use of T intersections in residential subdivisions is strongly recommended. One disadvantage, however, is "corner cutting" when inadequate offset exists between adjacent intersections. To reduce this hazardous practice, offsets of at least 150 feet between center lines are required. In the case of two (2) collector-street intersections, this offset shall not be less than 300 feet in order to allow for left-turn storage between intersections.								
				Offset intersections have disadvantages when one (1) or both such streets is a collector intersecting an arterial street, if volumes will be such to warrant traffic signals. Operations at such locations are more complicated than those for normal cross-type intersections. Therefore, other design solutions should be sought if signalization might otherwise be required. When offset intersections are used at an arterial street, they should be located to avoid conflicting left turns (this is especially important where two (2) way, left-turn lanes are to be provided or where left-turn slots are used in a fairly narrow median). Such left-turn conflicts exist when an intersection offsets to the right rather than to the left.								
				Multileg intersections [over four (4)] are undesirable from the control and safety standpoint.								
			TCM 1.3.1 (D)(5)	Drainage Structures. The location of drainage structures, inlets, catch basins, etc., should be consistent with the intended use of the roadway and in accordance with the Drainage Criteria Manual.								
				Inlets or catch basins should not be located within the corner curb return or within ten (10) feet from the point of curvature of the curb return. Clearance is needed to allow space for street lights, street name signs, utility poles, pedestrians, sidewalk ramps, etc.								
				At intersections which have valley drainage, the crowns of the intersecting streets will culminate in a distance of 40 feet from the intersecting curb lines unless otherwise noted on the construction plans. Inlets on intersecting streets shall not be constructed within 50 feet of the valley drainage.								
				Valley gutters should not be designed across streets with collector or higher classification.								

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			TCM 1.3.1 (D)(6)	Sight Distance. Intersections should be planned and located to provide as much sight distance as possible. A basic requirement for all controlled intersections is that drivers must be able to see the control device well in advance of performing the required action. Stopping sight distance on all approaches is needed as a minimum. Obstruction-free sight triangles are desirable, in both the horizontal and vertical planes as related to assumed driver eye height and position.								
				The stopping sight distance (SSD) in feet is determined from the formula: $SSD = 1.47\,PV + \frac{V^2}{30\,(f \pm g)}$ (eq. 1-2)								
				Entering intersection sight distance (ISD) at intersections controlled by "stop" signs may be measured as shown in Figure 1-6 contained in Appendix H of this manual. The resultant sight triangle should be free of sight obstructions such as parked vehicles, buildings, walls, hedges, bushes, low growing trees or guardrail (if located on a crest where the rail forms a sight restriction), above an assumed driver eye height line of sight to target. This height is three and one-half (3.5) feet for passenger cars and six (6) feet for SU and WB-50 design vehicles, related to an approaching vehicle (target) four and one-fourth (4.25) feet high. The sight line is based on the time required for the stopped vehicle to clear the intersection versus the distance a vehicle will travel along the major street.								
				See Table 1-1 for minimum sight distance.								
			TCM 1.3.1 (D)(7)	Median Design at Intersections. End treatment of medians at intersections should be designed to accommodate the design vehicle turning at a reasonable rate of speed. Semicircular radii may be used on the noses of medians up to six (6) feet wide. Bullet-nosed medians should be used for medians of greater width. A minimum 50 foot control radius or a 75 foot control radius is required as stated in Table 1-2. Figures 1-7 and 1-8 contained in Appendix H of this manual illustrate examples of providing adequate curves at the medians.								
			1.3.1 (E) - Tapers									
			TCM 1.3.1 (E)(2)	Approach Tapers. Taper length: L = W*S (eq. 1-3) L = (W*S*S)/60 (eq. 1-4) Equation 1-4 is recommended for posted speeds of 40 mph or less. Equation 1-3 is recommended for posted speeds of 45 mph or greater.								
			TCM 1.3.1 (E)(3)	Bay Tapers. The design of bay tapers in the City of Austin should conform to standards indicated in Figure 1-11 contained in Appendix H of this manual.								
			TCM 1.3.1 (E)(4)	Departure Tapers for Left-Turn Bays. There are two (2) different designs for developing the departure taper. The variation relates to the point of the start of the taper in a channelization that provides a full shadowed lane. The first variation starts the taper at the point of full median width, while the other begins the taper at the end of the storage lane, as shown in Figure 1-10 contained in Appendix H of this manual. Beginning at the end of the storage lane and ending at the beginning of the approach taper provides a flatter angle which is easier for a vehicle to negotiate. It requires less widening and/or parking restrictions and is recommended as the desirable design guide.								
			TCM 1.3.1 (E)(5)	Acceleration/Deceleration Lanes. Acceleration lanes are seldom used along urban major streets. However, when they are used, the transition taper design may be the same as for an approach taper. Many agencies utilize the rule of thumb that allows one (1) foot of lateral displacement per mph of the roadway into which the vehicle is emerging (L=W*S). Thus, a 12 foot (W) acceleration lane merging with a street having a speed of 30 mph (S) would produce a 360 foot taper. A deceleration lane is actually a right-turn lane (or left if on a one (1) way roadway) and therefore should be designed in accordance with bay-taper principles.								
			TCM 1.3.1 (E)(6)	Through-lane Tapers. When all traffic must transition to the left or right, the design represents an approach-taper condition. For an added through lane approaching an intersection, the transition into the lane may be made by either an approach or a bay-taper design. However, the termination of the added lane beyond the intersection (a lane drop) should be handled by the approach-taper type of design.								

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			TCM 1.3.1 (E)(7)	Tapers on Horizontal Curves. For a left-turn bay, the taper may be longer if the horizontal curve direction is to the driver's left. Conversely, the tapers may be shorter if the curve is to the driver's right. Figure 1-12 contained in Appendix H of this manual illustrates the reason for this, based upon the deflection angle required from a tangent line to the curve. Adjustment of "standard" local design criteria is most appropriate for turn-lane tapers located on curves of 500 foot radius or less. The adjustment can be determined graphically.								
1.3.1 (F) - Median and Median Breaks												
			TCM 1.3.1 (F)(1)	Function. Medians or two (2) way left turn lanes (2-WLTL) should be considered for all major urban streets of four (4) or more lanes.								
				An eight (8) to 20 foot curbed median often represents a good trade-off of operational advantages and disadvantages, if used for major streets on new alignment or through undeveloped areas and where access limitations are practical (reverse lot frontage subdivisions or combined access for direct connection tracts). With crossover access spacing of 600 to 1,000 feet, including left-turn bays, a balance can be struck between efficient service to through traffic and secondary service to abutting development. Wider roadways requiring three (3) lanes in each direction, resulting in seven (7) lanes if used-with the 2-WLTL concept, can produce severe problems for pedestrian crossings. The unprotected width to be traversed can be unsafe at local or mid-block locations and can restrict traffic signal efficiency. Where such large numbers of lanes are needed, curbed medians may be warranted.								
			TCM 1.3.1 (F)(2)	Types. Medians may be depressed, raised or flush with respect to their adjacent traveled way. Depressed medians may be edged with raised curbs or they may slope from the edge of the roadway directly. Often sections wider than 16 feet are depressed to collect drainage. Side slopes of 10:1 (6:1 minimum) are preferred to allow for vehicle recovery. Flush medians are typically narrow and paved. They do not prevent access to adjacent property and serve the purpose of separating opposing flows at less cost. Raised medians may be preferred for access control and landscaping purposes where drainage is not a problem. Raised medians also provide a positive visual barrier which prevents erratic cross-traffic movements.								
			TCM 1.3.1 (F)(3)	Median Width. The width of a median is its most important geometric design consideration. Table 1-3 indicates widths necessary to accomplish certain functions, based on the passenger vehicle for primary design of crossing protection and U-turns (see Figures 1-13 through 1-18 in Appendix H of this manual for various median applications).								
			TCM 1.3.1 (F)(4)	Median Break Spacing. Driveway spacing should allow reasonable deceleration of vehicles approaching on the street and acceleration by vehicles entering the street. Median breaks for driveways should not be contemplated unless sufficient length is available to accommodate deceleration tapers and storage lengths. Table 1-4 reflects median and median break criteria.								
				Full-function median openings (Figures 1-19, 1-20 and 1-21 in Appendix H of this manual) on major arterials should be allowed only where the minimum spacings for signalized intersections are practicable. At intermediate locations along major arterials, limited-function openings may be provided at the spacings listed in Table 1-4.								
				High volume driveways on major arterials should only be located opposite streets or other driveways when the minimum spacing requirements for signalized locations are met. Otherwise, T-intersection configurations should be designed. When driveways are located opposite street intersections the two (2) should have compatible design elements.								
				On streets other than major arterials, full-function median openings are acceptable at the spacings listed in Table 1-4. On both major and minor arterials, access to public streets will have priority over access to private property.								
1.3.1 (G) - Turn Lanes and Channelization												

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			TCM 1.3.1 (G)(1)	Turn Lanes. At a minimum, storage lengths should be 150 feet when turning into a collector or an arterial and 100 feet when turning into a local street. At any unsignalized intersections, the storage length, exclusive of taper may be based on the number of turning vehicles likely to arrive in an average two (2) minute period within the peak hour with each vehicle accounting for approximately 20 feet of storage. At signalized intersections, the storage length depends on the signal cycle length, the signal phasing arrangement and the rate of arrivals and departures of left-turning vehicles (see Table 1-5).								
				Dual left-turn and right-turn lanes are successful where traffic volumes exceed the capacity of a single lane and the cross-street is of sufficient width to receive two (2) vehicles turning abreast. For dual right-turn lanes and dual left-turn lanes from one (1) way streets, the inside lane must be a mandatory turn.								
			TCM 1.3.1 (G)(2)	Channelization. Small, isolated channelization islands should be avoided. Islands should be readily visible and designs with numerous small islands should be discarded in favor of those with a few large ones. Long narrow islands may be undesirable adjacent to turn lanes. Islands with at least 100 square feet are desirable but, under very restricted conditions, 75 square feet may be used. Islands used for pedestrian refuge desirably should be six (6) feet wide, with a minimum of four (4) feet. If wheelchair access is to be considered, the minimum width of a curb ramp shall be 36 inches, exclusive of flared sides.								
				The following principles should be considered and addressed in meeting conditions at particular intersections. However, if they are disregarded, the objectives of channelization will not be achieved and the resulting design may be hazardous and inefficient. • Reduce the area of conflict; large paved intersectional areas invite hazardous vehicle and pedestrian movements. • When traffic streams cross without merging and weaving, make the crossing at or near right angles. If traffic signal control is planned, the crossing angle may be less than right angle with suitable signal design and visual clues. • Merge traffic streams at small angles. • The speed of a traffic stream entering an intersection may be controlled by funneling. • Provide refuge (shadowing) for turning and crossing vehicles where possible and necessary with channelization. • Use channelization to separate conflict points within an intersection. • Block prohibited turns with well-delineated channelization. • Channelization may provide locations for the installation of essential traffic control devices to enhance their visibility.								
			1.3.1 (H) - Environmental Considerations									
			TCM 1.3.1 (H)	Application of the street design criteria contained in this document to new subdivisions and site developments must take into consideration all applicable environmental standards, including restrictions on cut and fill and development setbacks from waterways and critical environmental features. Requirements of the street design criteria shall not be considered as sole justification for variances from the Comprehensive Watersheds Ordinance or any of the Special Watershed Ordinances. Conversely, requirements of the Comprehensive Watersheds Ordinance or any of the Special Watershed Ordinances shall not be considered as sole justification for variances from street design criteria. It is advisable to delineate all required setbacks and other applicable environmental protection measures prior to designing streets. Minor deviations from the street design criteria may be applied for, on a case-by-case basis, in order to protect specific environmental features on severely constrained tracts provided that proposed deviations meet minimum safety standards and are approved by the Directors of the Public Works Department, the Transportation, Planning and Sustainability Department and the Watershed Protection and Development Review Department. General deviations may be pursued as stated in the Preface of this Manual. In the event that differences occur, the resolution procedure provided for in Title 25, the Land Development Code, applies.								
			1.3.2 - Classification Design Criteria									
			TCM 1.3.2	The following includes specific design criteria for each street classification noted in Section 1.2.2 as required to attain adequate levels of service and safety. Table 1-7 summarizes the general design criteria for each of the street classification noted in Section 1.2.2.								
			1.3.2 (A) – Local Streets									

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			TCM 1.3.2 (A)(1)	Local Street, General. In a residential neighborhood, a local street typically serves less than 50 SF-1 or SF-2 zoned dwelling units in number. Local streets should be designed to minimize through traffic movement; on-street parking is usually permitted (see Figure 1-22 contained in Appendix H of this manual for design criteria).								
				Where SF-3 through SF-6 development exists, local streets characteristically have significant on-street parking. The criteria noted in Figure 1-23 in Appendix H of this manual is designed to address this condition.								
				When applicant can demonstrate that significant on-street parking will not occur or that off-street parking comparable to SF-2 is provided, design criteria for SF-1/SF-2 may be utilized.								
			TCM 1.3.2 (A)(2)	Local Streets, Loop. Loop streets serve low density areas. As with regular local streets, they are not intended to carry through traffic movement since the loop originates and terminates on the same street (see Figure 1-24 in Appendix H of this manual for design criteria).								
			TCM 1.3.2 (A)(3)	Local Streets, Elbow. Elbow streets serve low density areas. They should only be designed to connect two (2) local streets or a residential collector with a local street and are not intended to carry through traffic (see Figure 1-25 in Appendix H of this manual for design criteria).								
1.3.2 (B) – Collector Street												
			TCM 1.3.2 (B)(1)	Collector, Residential. A residential collector street generally serves to collect traffic from local streets within a residential district and is not intended to continue through several districts. Residential collector streets provide access to abutting property with SF-1 through SF-6 zoning, low density multifamily MF-1 zoning and neighborhood office NO zoning and generally provide on-street parking. Such streets typically exist within a subdivision adjacent to single family and to multifamily developments (see Figure 1-27 in Appendix H of this manual for design criteria).								
			TCM 1.3.2 (B)(2)	Collector, Neighborhood. A neighborhood collector street is characterized by serving several districts or subdivisions. Neighborhood collector streets provide limited access to abutting property and may provide on-street parking, except where bus routes can be expected. Typically multifamily developments, schools, local retail developments and public facilities are located adjacent to neighborhood collectors. Direct driveway access for detached houses should be discouraged (see Figure 1-28 in Appendix H of this manual for design criteria).								
			TCM 1.3.2 (B)(3)	Collector, Commercial. This type of a collector street serves as principal access to commercial developments. Large vehicles such as delivery trucks can be expected to utilize this type of collector. Driveways should be limited and designed to accommodate higher traffic volumes. On-street parking is generally limited or restricted. Multifamily developments may front on these collectors provided adequate off-street parking is available (see Figure 1-29 in Appendix H of this manual for design criteria).								
			TCM 1.3.2 (B)(4)	Collector, Industrial. This type of a collector street serves as principal access to industrial developments. Vehicles served by these streets may be large, i.e., WB-50 design vehicles, requiring greater area for circulation and movement than automobiles. Driveway access should be limited and designed to accommodate higher traffic volumes and/or larger vehicles. On-street parking is generally restricted. Multifamily developments may front on these collectors provided adequate off-street parking is available (see Figure 1-30 in Appendix H of this manual for design criteria).								
			TCM 1.3.2 (B)(5)	Collector, Primary. A primary collector street serves several subdivisions providing access from local or residential/neighborhood collectors to arterials. Primary collector streets may also be utilized to serve high traffic generating developments as determined essential through the development review process, i.e., T.I.A. Parking is restricted and access to abutting properties should be very limited (see Figures 1-31 through 1-34 in Appendix H of this manual for primary collector street design criteria).								
			TCM 1.3.2 (B)(NOTE)	See Section 7 for additional information pertaining to bicycle design criteria. The street cross-sections noted in this section may need to be increased to account for bicycle routes.								
1.3.2 (C) – Arterial Street												

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			TCM 1.3.2 (C)(1)	General. Arterial streets represent the primary network of streets for the through movement of traffic in an urbanized area. Arterial streets generally move high volumes of traffic (ADTs ranging from 5,000 to 70,000 vehicles) for great distances and at relatively high speeds. The Austin Metropolitan Area Transportation Plan identifies the streets that compose the arterial street network. Access to abutting property should therefore be limited or restricted, with on-street parking strictly prohibited. Single-family residential development should not normally front on arterial streets. In all instances, the minimum travel lane shall be 12 feet as a large variety of vehicles can be expected to utilize the system. Arterials are typically spaced every one (1) to two (2) miles within the network system. The design criteria for the various arterial streets are provided in Figures 1-35 through 1-39 contained in Appendix H of this manual.								
			TCM 1.3.2 (C)(NOTE)	See Section 7 for additional information pertaining to bicycle design criteria. The street cross-sections noted in this section may need to be increased.								
				As a means of assuring proper placement of utilities, the City may require easement dedications from the applicant.								
1.3.2 (D) – Parkway												
			TCM 1.3.2 (D)	The City of Austin defines the term "parkway" for use in the Austin Metropolitan Area Transportation Plan as a subcategory of freeway; a parkway is a roadway which has fully controlled access, no at-grade crossings and no continuous frontage roads; requires the acquisition or donation of access rights; has a generous greenspace buffer between the roadway and adjacent development and which preserves and enhances the natural landscape as much as possible.								
1.3.2 (E) – Cul-de-sac												
			TCM 1.3.2 (E)	Cul-de-sac streets are open at one (1) end, the closed end constructed so as to facilitate traffic circulation in the reverse direction. Single outlet streets serve a network of streets with one (1) point of access (see Figure 1-58 in Appendix H of this manual). Note that the distance from the System Origination Point (SOP) to the System Termination Point (STP) should be less than 700 feet. Greater lengths, up to 3,000 feet, may be considered if there are severe environmental constraints and a second outlet is not available. Lengths exceeding 2,000 feet, however, will require approval by the Planning Commission (see Table 1-11 for Single Outlet Street Criteria).								
				The use of islands with cul-de-sac bubbles is not recommended. However, islands are permitted provided that the bubble has a radius of 60 feet to FOC and the island is designed with a 30 foot radius measured to FOC. When islands are proposed, a maintenance agreement must be established between the applicant and the City.								
			TCM 1.3.2 (E)(1)	Cul-de-sac, Local. Local cul-de-sacs are intended to serve residential dwelling units. Throat width and curb basis shall meet the same design criteria as required for a general local street (see Figure 1-40 in Appendix H of this manual for design criteria).								
			TCM 1.3.2 (E)(2)	Cul-de-sac, Commercial. Cul-de-sacs serving primarily commercial use shall have a throat designed to commercial collector criteria. Islands should be discouraged and are not permitted without the approval of the Director of the Transportation, Planning and Sustainability Department (see Figure 1-41 in Appendix H of this manual for design criteria).								
			TCM 1.3.2 (E)(3)	Cul-de-sac, Industrial. The vehicles serviced by this type of cul-de-sac are often large, therefore, islands will not be permitted without the approval of the Director of the Transportation, Planning and Sustainability Department. The throat shall be designed to industrial collector standards (see Figure 1-42 in Appendix H of this manual for design criteria).								
			TCM 1.3.2 (E)	Dead-end streets that are stubbed out for future extension to the adjacent property must terminate in an open-ended cul-de-sac (as illustrated in Figure 1-42a in Appendix H of this manual), unless the dead-end street is less than 150 feet long, in which case the cul-de-sac bubble may be omitted. If the stubbed-out street is not extended when the adjacent property is developed, a bubble is required on the adjacent property, or access to the dead-end street from the adjacent property must be prohibited.								
1.3.2 (F) – Single Outlet Streets												

Territory			Reference	Rule	Document Type				How and where the application meets requirement		Travis County Comment	Date
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where		
			TCM 1.3.2 (F)	Traffic issues pertaining to single outlet streets are partially mitigated by: (1) providing mid-block turnarounds (or cross-streets/loop streets), (2) increased pavement widths and (3) utilization of divided roadways, as noted in Table 1-6. The criteria pertaining to single outlet streets are applicable to new developments whether the single outlet is temporary or permanent. When future extensions to the street system are anticipated, which will provide additional outlets, a temporary restriction may be placed on the amount of development allowed, until an additional outlet becomes available.								
			1.3.2 (G) – Alley									
			TCM 1.3.2 (G)	An alley is a passageway designed primarily to provide access to property. The existing/planned street network in the immediate vicinity should impact the decision for planning one (1) or two (2) way alleys. Typically, a one (1) way alley should not be encouraged unless the alley is short. Parking in alleys should be restricted.								
			TCM 1.3.2 (G)(1)	Alley, One (1) Way. Where applicable, the direction of travel on a one (1) way alley should be consistent with the surrounding street network (see Figure 1-43 in Appendix H of this manual).								
			TCM 1.3.2 (G)(2)	Alley, Two (2) Way. In an effort to reduce the potential for motorist confusion, the combining of two (2) and one (1) way alleys in the same subdivision should be avoided (see Figure 1-44 contained in Appendix H of this manual).								
			1.4.0 - ALTERNATE GEOMETRIC DESIGN CRITERIA									
			1.4.1 - Applicability of Alternate Geometric Design Criteria									
			TCM 1.4.1	If alternate geometric design criteria for streets as noted in this section are proposed, the developer shall identify this condition at the time of submittal of the preliminary plan.								
			1.4.2 - General Design Criteria									
			1.4.2 (A) - Grades									
			TCM 1.4.2 (A)	General guidelines pertaining to grades as noted in Section 1.3.1 A apply. Specific grade criteria (alternate design) for local and collector streets are noted in Figures 1-45 through 1-58 contained in Appendix H of this manual. Specific grade criteria for arterials (alternate design) are noted below in Table 1-8.								
				Construction at grades of 8 percent or greater requires that a Traffic and Environmental Report, prepared by a registered professional engineer, be submitted to the Public Works Department. This report shall be provided to the Environmental Board and Urban Transportation Commission. The report should analyze and estimate the following items.								
				1. Necessary ROW Widths								
				2. Level of Service								
				3. Vehicle Operating Speeds								
				4. Stopping Distance								
				5. Access to Adjacent Property								
				6. Impact to Bridge Structures, Ramps and Cross-street Intersections								

Territory			Reference	Rule	Document Type				How and where the application meets requirement		Travis County Comment	Date
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where		
				7. Environmental Impacts which address and identify: • Profiles for those portions of the roadway crossing slopes in excess of 15 percent. • Cross-sections for those portions of the roadway requiring cuts and fills over four (4) feet, including proposed clearing widths. This information should also include details of any proposed waterway crossings. • Estimation of spoil amounts and proposed spoil disposal areas. • Erosion/sedimentation control and permanent restoration plan. • Environmental assessment addressing the anticipated impacts of the proposed roadway. The assessment shall include a hydrogeologic and vegetation element. Hydrogeologic Element - This element to provide general information on the topography, geology and soils of the proposed roadway alignment. Some geotechnical data may be required if significant amounts of cuts land fills are proposed. Methods of containment/stabilization for cuts and fills should also be addressed in this section. This section should also identify the location of any critical environmental features. Methods for the protection of quantity and quality of recharge to point recharge features and maintenance of the integrity of bluffs and canyon rimrocks should also be addressed. Vegetation Element - This includes an eight (8) inch tree survey. This section should also demonstrate that the roadway alignment has preserved to the greatest extent reasonable any significant trees and vegetation on the site. • An analysis that illustrates alternative alignments and design standards that were considered in the roadway design and how the different factors were weighted in the analysis.							
				8. Economic impacts - Address economic impacts associated with options considered.								
			1.4.2 (B) - Minimum Horizontal Radii									
			TCM 1.4.2 (B)	General guidelines pertaining to minimum horizontal radii as noted in Section 1.3.1 B apply.								
			1.4.2 (C) - Intersection Design									
			TCM 1.4.2 (C)	General guidelines pertaining to intersections as noted in Section 1.3.1 C apply.								
			1.4.2 (D) - Tapers									
			TCM 1.4.2 (D)	General guidelines pertaining to tapers as noted in Section 1.3.1 D apply.								
			1.4.2 (E) - Median and Median Breaks									
			TCM 1.4.2 (E)	General guidelines pertaining to medians and median breaks as noted in Section 1.3.1 E apply.								
			1.4.2 (F) - Turn Lanes and Channelization									
			TCM 1.4.2 (F)	General guidelines pertaining to turn lanes and channelization as noted in Section 1.3.1 F apply.								
			1.4.2 (G) - Curbed and Guttered Streets									
			TCM 1.4.2 (G)	General guidelines and criteria pertaining to driveways as noted in Section 5 apply.								
			1.4.2 (H) - Non-Curbed and Guttered Streets									
			TCM 1.4.2 (H)(1)	Streets constructed without standard curb and gutter shall take into account provision for fordable driveway approaches or City/County culvert crossing of open drainage systems.								
			TCM 1.4.2 (H)(2)	Driveway widths and spacing shall conform to Section 5; however, the minimum spacing of 100 feet is desired for open ditches. This will provide for mowers.								
			TCM 1.4.2 (H)(3)	Drainage carried in roadside channels shall be minimized, but, when it is required, it shall meet design criteria specified in the Drainage Criteria Manual of the City of Austin.								
			1.4.3 - Classification Design Criteria									
			TCM 1.4.3	This section includes specific design criteria for local, collector and arterial functional classifications of streets as authorized above. Table 1-12 provides a summary of the alternative design criteria for these streets.								
			1.4.3 (A) - Local Streets									
			TCM 1.4.3 (A)	As indicated in Section 1.3.2 A, local streets are intended to serve abutting land use and traffic within a neighborhood or limited residential district. A local street is not generally continuous through several districts (see Figures 1-45 through 1-47 in Appendix H of this manual for design criteria). The alternate design criteria for Loop Streets and Elbow Streets should conform to that specified in Figures 1-24, 1-25 and 1-26 contained in Appendix H of this manual except for street widths. The street width criteria identified in this section will apply for Loop and Elbow Streets.								

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TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where		
			1.4.3 (B) - Collector Streets									
			TCM 1.4.3 (B)	As indicated in Section 1.3.2 B, collector streets typically serve to collect traffic from local streets in route to arterial or other collector streets. Designation of collector streets shall be made in accordance with Section 25-6-173 of the City of Austin's Land Development Code. Figures 1-48 through 1-58 in Appendix H of this manual include design criteria for the five (5) types of collector streets.								
			1.4.3 (C) - Arterial Streets									
			TCM 1.4.3 (C)	The width and general alignment of arterial streets will be designed in accordance with the Austin Metropolitan Area Transportation Plan.								
			1.4.3 (D) - Cul-de-sacs and Single Outlet Streets									
			TCM 1.4.3 (D)	As indicated in Figure 1-59 contained in Appendix H of this manual, cul-de-sacs provide a turnaround to the reverse direction and single outlet streets serve a network of streets with one (1) point of access. In general, lengths of cul-de-sacs and single outlet streets should be limited so as to minimize response time by emergency vehicles and to provide efficient public service such as solid waste service. Also, when roadway lengths and the number of persons exclusively served by a single roadway increase, the potential hazard of temporary roadway blockage increases, directly impacting access to the development by emergency vehicles. The distance from the System Origination Point (SOP) to the System Termination Point (STP) (see Figure 1-59 in Appendix H of this manual), should be less than 700 feet. Greater lengths, up to 3,000 feet, may be considered if there are severe environmental constraints and a second outlet is not available. Lengths exceeding 2,000 feet, however, will require approval by the Planning Commission.								
				The traffic issues pertaining to single outlets are partially mitigated by: (1) providing mid-block turnarounds (or cross-streets/loop streets), (2) increased pavement widths and (3) utilization of divided roadways. Tables 1-8 through 1-11 and Figures 1-60 and 1-61 in Appendix H of this manual provide design criteria.								
				These design criteria are applicable to new developments whether the single outlet is temporary or permanent. When future extensions to the street system are anticipated, which will provide additional outlets, a temporary restriction may be placed on the amount of development allowed, until an additional outlet becomes available.								
			1.4.3 (E) - Private Streets									
			TCM 1.4.3 (E)	A private street is a vehicular roadway under private ownership and maintenance which is not intended for use by the general public and may have its access controlled or restricted. Private streets normally serve residential properties on individual lots but may be used in commercial subdivisions as well. Private streets are subject to city regulations in order to insure: • Safe movement of all vehicles from a private street to the public street system. • Adequate vehicular access to all buildings and lots by emergency and service vehicles. • Adequate construction standards in the event that such roads later become public streets. • Adequate drainage and utilities.								
				Right-of-way for a private street is not dedicated to the public; however, it must be designated as a "private street, drainage, and public utility easement." The right-of-way required for private streets shall be based upon the same criteria as for public streets in similar developments.								
				Private streets are normally designed as cul-de-sacs or loop streets. In order to discourage through traffic, private streets should not form a direct link between two public streets that would normally become a thoroughfare for other traffic. Connection to two public streets to accommodate internal circulation is permitted. In such cases, access should be restricted by security gates at one or both outlets.								
				Within the city's zoning jurisdiction, concrete permits for driveway and sidewalk construction along private streets will be required as for public streets.								
				<u>Creation of Private streets in New Subdivisions.</u> New subdivisions within the City or ETJ which are proposed to be built with private streets must request a variance to Sec. 25-4-171 of the Land Development Code, which requires all lots to abut a dedicated public street. A variance to permit lots to front on private streets instead of public streets will normally be recommended under the following conditions:								

Territory			Reference	Rule	Document Type				How and where the application meets requirement		Travis County Comment	Date
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where		
				1. A homeowners association must be created to assume responsibility for the maintenance and taxation provisions regarding the proposed private streets. Draft copies of the following documents are required to be submitted for review and approval during the preliminary review process, and approved copies must be recorded with final plat: • Covenants, Conditions and Restrictions (outlines ownership, maintenance, fee assessment, association dues, and any other requested restrictions). • Association Bylaws (outlines membership, voting rights and other items similar in nature). In conjunction with the draft documents a note is required to be placed on the preliminary plan stating: "All private streets shown hereon over List street names] and any security gates or devices controlling access to such streets will be owned and maintained by the established homeowners association of this subdivision."								
				2. The following verbiage is required to be placed in the owner's dedication statement on the final plat: … do hereby subdivide _____ acres of land out of said _____ acre tract in accordance with the plat shown hereon, to be known as "[subdivision's title']" subdivision, subject to the covenants and restrictions shown hereon, and we do hereby dedicate to the public the use of all easements shown hereon, subject to any easements and/or restrictions heretofore granted and not released. Further that the responsibility for maintenance and taxation of [private street name], a private street, shall be vested in the home owners association of [name of this final plate], as recorded in vol. _____ , pg. _____ , of the Travis County deed of records, and an express easement is, hereby granted across said private streets and any common areas for the use of the surface for all governmental functions, vehicular and non-vehicular, including fire and police protection, solid and other waste material pick up and any other purpose any governmental authority deems necessary, and we do further agree that all governmental entitles, their agents or employees, shall not be responsible or liable for any damage occurring to the surface of the said private street and any common area as a result of governmental vehicles traversing over same.								
				3. The private street must be constructed to City of Austin standards (or County standards in Suburban subdivisions). The appropriate standards will be determined by the functional classification of the street. Applicable standards include geometric design criteria, pavement design, sidewalks, and clear zones.								
				4. The private street must not be needed to provide access to an adjacent property; or, if the street is needed for access to the adjacent property, a joint access agreement must have been executed with the adjacent property owner for use of the private street, and the private street must be stubbed out to the property line with an open-ended cul-de-sac for future extension.								
				5. The private street must be identified on the plat as a separate lot, and any easements needed must be dedicated with the final plat.								
				6. The private street must have a direct connection to a dedicated public street or another approved private street. A private street will not be permitted as the only connection between two public streets.								
				7. If security gates are proposed, their location must be shown on the construction plans; a minimum storage space of 40 feet must be provided between the gates and the nearest intersecting street right-of-way; and the design of the gates must be approved by the City, County, and emergency service provider (see Uniform Fire Code, Sec. 10.302, as amended).								
				8. If the subdivision is located in the ETJ, the appropriate county must concur with the creation of the private street.								
				9. Standard street name signs must be installed at all intersections. An additional "Private Street" sign must be posted at the entrance and exit locations of all private streets which intersect public rights-of-way.								

Territory			Reference	Rule	Document Type				How and where the application meets requirement		Travis County Comment	Date
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				Creation of Private Streets in Existing Developments. In certain cases, the City may allow existing public streets to be converted to private streets for the purpose of providing private security, decorative pavers, landscape plantings, or other special features not normally found on public streets. In such cases, the abutting property owners must request the vacation of the public right-of-way in accordance with either the procedures in Sections 15-12-1,15-12-3 and 15-12-71 through 15-12-75 of the Land Development Code, or the plat vacation process specified in State law, or the appropriate County procedures, if the street is located in the ETJ. The following criteria must be met before the vacation will be recommended:								
				1. A homeowners association must be created to assume responsibility for the maintenance and taxation provisions regarding the proposed private streets. Draft copies of the following documents are required to be submitted for review and approval during the review process, and approved copies must be recorded at the time of vacation: • Covenants, Conditions and Restrictions (outlines ownership, maintenance, fee assessment, association dues, and any other requested restrictions). • Association Bylaws (outlines membership, voting rights and other items similar in nature). Approved, executed copies of these documents must be submitted prior to the formal vacation of the right-of-way.								
				2. The private street must not be needed to provide access to an adjacent property; or, if the street is needed for access to the adjacent property, a joint access agreement must have been executed with the adjacent property owner for use of the private street, and the private street must be stubbed out to the property line with an open-ended cul-de-sac for future extension.								
				3. Any easements needed must be dedicated at the time the right-of-way is vacated.								
				4. The private street must have a direct connection to a dedicated public street or another approved private street. A private street will not be permitted as the only connection between two public streets.								
				5. If security gates are proposed, plans must be prepared showing the location of the gates. A minimum storage space of 40 feet must be provided between the gates and the nearest intersecting street right-of-way. The design of the gates must be approved by the City, County, and emergency service provider (see Uniform Fire Code, Sec. 10.302, as amended).								
				Conversion of Existing Private Streets to Public Streets. In certain cases, the City may allow existing private streets to be converted to public streets. In order to be accepted by the City as public streets, the following conditions must be met:								
				1. The streets must conform to the design criteria in Table 1-7 or 1-12, as well as the pavement design standards in Section 3. The owners of the private street must provide documentation verifying the cross section construction of the private street.								
				2. There must be no outstanding unpaid taxes owed on the streets.								
				3. Existing building setbacks, lot widths, lot sizes, and yard sizes must conform to the requirements of the zoning district in which they are located, based upon the right-of-way lines established at an appropriate distance from the edge of the pavement.								
				4. A street deed must be prepared and processed through normal procedures to dedicate the right-of-way to the public, with the concurrence of all abutting property owners. The owners of the private street are responsible for surveying and conveyance of the right-of-way to the City.								
				5. Any covenants or other legal documents which created the private streets must be amended or terminated.								
				6. Any existing security gates, overhead rock entrance ways, speed bumps, special pavement treatments, and similar facilities which do not meet City design standards must be removed and the pavement repaired in an acceptable manner at the owner's expense, as determined by the Director of the Public Works Department.								
				7. Sidewalk construction must conform to Section 4, including approved curb ramps and curb ramp warnings.								
				8. Private improvements left within the proposed right-of-way may require license agreements.								
				9. Street lighting, signals, and other street-related infrastructure must be acceptable to the responsible department.								

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				10. The street must be inspected by the Public Works Department. All needed repairs or maintenance strategies identified during the inspection must be made and paid for by the owners of the private street prior to acceptance by the City. Repairs of maintenance strategies must conform to the same requirements and specifications as required for public streets. The City will have no obligation to repair, maintain, or reconstruct newly accepted private streets for a period of two years, unless required by emergency or safety reasons.								
				11. Designated off-street parking and garbage container areas will not become the responsibility of the City.								
				12. The City shall reserve the right to deny acceptance of the private street if current City street maintenance budgets are 90% or less of the current maintenance needs.								
1.6.0 - HIGHWAYS												
			TCM 1.6.0 (A)	All highway designs should conform with the State Department of Highways and Public Transportation (SDHPT) Highway Design Division Operations and Procedures Manual and must be approved by the SDHPT District Engineer.								
			TCM 1.6.0 (B)	The Highway Design Division Operations and Procedures Manual should be consulted for complete design details.								

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 2 - TRAFFIC IMPACT ANALYSIS										
2.2.0 - ADMINISTRATIVE REQUIREMENTS										
			TCM 2.2.0	The applicant is responsible for contacting the Transportation Review Section staff of the Watershed Protection and Development Review Department before a development application is submitted to determine the proposed trip generation for the site and confirm whether a TIA will be required. Trip generation shall be calculated based on the criteria in Section 2.3.2A below.						
				If a TIA is required, a preliminary meeting must be held to discuss the scope of the TIA and the requirements for TIA content and format.						
				The applicant is responsible for submitting five (5) copies of the TIA report at the time that a development application is submitted. Up to 15 additional copies may be required if needed for the planning commission or other review boards.						
				If the applicant fails to comply with the technical requirements and the scope of study outlined in the preliminary meeting, the applicant will be advised in writing that an addendum is needed. An addendum must be submitted 18 working days or 26 calendar days prior to the date on which the project is scheduled for consideration by the City of Austin Planning Commission or the Urban Transportation Commission. If the TIA addendum is not submitted within this time frame and the staff does not have adequate time to review the report and submit comments to be included in the commission agenda packet, the development request may be postponed to the next scheduled commission meeting. Minor corrections or changes to the TIA, as determined by the Director of Planning and Development, will not be subject to a TIA addendum fee.						
				Applicants will be assessed a review fee for TIA reports according to the latest fee schedule adopted by City Council. The review fee for TIA addenda is ½ the regular fee.						
				After the TIA and any addenda have been approved by the staff, three (3) copies of the final version of the TIA incorporating all corrections and additions must be submitted as a permanent file record. A final TIA for a zoning case must be submitted before third reading of the rezoning by the City Council. A final TIA for a site plan must be submitted before release of the site plan.						
2.3.0 - TECHNICAL CRITERIA AND REQUIREMENTS										
2.3.1 - Scope of the TIA										
			TCM 2.3.1	The study area or scope of a TIA shall be determined by a transportation planner from the Watershed Protection and Development Review Department. Applicants are responsible for contacting the Transportation Review Section to determine the scope of the TIA and to discuss all requirements before any studies are conducted. If a proposed development consists of several phases, a scope must be determined for each phase. The scope shall contain all of the information described below.						
2.3.1 (A) - Scope Requirements										
			TCM 2.3.1 (A)	The information described in the Data Collection and Study Assumption sections below must be approved by a transportation reviewer prior to formal submittal of a traffic impact analysis.						
2.3.1 (B) - Data Collection										
			TCM 2.3.1 (B)	The following background information should be included in the study: a. Completed TIA determination worksheet						
				b. Location/Study area map that specifies major roadways and intersections within study area						
				c. Identification of applicable existing planning efforts: this includes, but is not limited to the comprehensive plan, master thoroughfare plan, corridor studies, and neighborhood plans.						
				Level of Service calculations for a.m. and p.m. peak hours must be performed for all intersections identified by the transportation reviewer. Existing traffic and projected traffic conditions, identifying site, non-site, and total traffic should be provided for each analyzed intersection. Information on how to depict intersection LOS can be found in Section 2.4.4.						
				Existing signal timings shall be used for the intersection analyses in order to maintain adequate traffic progression, unless alternative timing proposals are approved by the Transportation Department. Any data collection occurring when school is in not in session will require an adjustment factor as identified by the transportation reviewer.						
				A capacity analysis may be required to be performed for any roadway segments that are considered substandard or are known to be carrying heavy volumes of traffic.						
				Neighborhood impacts must be evaluated for residential street segments, based upon the desirable operation levels described in Sec. 25-6-114 of the Land Development Code. The applicant and staff shall work together to identify streets that could be impacted by the proposed development.						
				Any other considerations staff or the applicant feel is relevant to the study may also be included in this section of the scope.						
2.3.1 (C) - Study Assumptions										
			TCM 2.3.1 (C)	Provide average annual growth rate and identify what data sources were used to determine the rate (such as TxDOT ADT maps, TTA traffic volume projections, and previous intersection and roadway counts). Other area projects that will be constructed before build-out of the study should also be included as background traffic.						
				Specific internal capture, pass-by, and transit trip reduction rates must be provided in the scope. Reduction rates should come from the ITE Trip Generation Handbook. Reduction rates not consistent with ITE data must be approved by the transportation reviewer. Study information and data that supports the alternative rate must be provided for review. To take a trip reduction for transit usage, identify what routes operate within the study area and provide bus stop level ridership data for all bus stops within a quarter mile of the study area.						
				A table and/or map that identify the proposed trip distribution within the study area should be provided. The trip distribution must equal 100%.						
				Any other considerations staff or the applicant feel is relevant to the TIA may also be included in this section of the scope. This may include, but is not limited to, a queuing study, weaving study, access design, or bicycle and pedestrian access plan.						
				The scope is to be based upon the assumed development uses and intensities. Any change in these assumptions may require a change in the scope.						
2.3.2 - Site Generated Traffic										
2.3.2 (A) - Trip Generation										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 2.3.2 (A)	Trip generation shall be based upon the proposed land use and density. A.M. peak, P.M. peak and total daily site-generated traffic must be calculated using an independent variable or determinant which has been confirmed by the transportation planner before the TIA is prepared. The applicant must identify and justify the applicability of the trip rates used. Gross square footage is the usually accepted determinant for office and gross leasable square footage is the usually accepted determinant for retail projects. The number of dwelling units is the most often accepted determinant for residential uses. A table of proposed land uses must also be included in each TIA report for review.						
				Trip generation rates shall be adopted from the references listed below. The second and third references may be used only when the information is not available in the first reference. If none of these sources contains appropriate trip rates for the proposed land use, other sources may be used at the discretion of the Director of the Watershed Protection and Development Review Department, if adequately documented. 1. Trip Generation: An Informational Report , most recent edition, Institute of Transportation Engineers, 109 14th St., NW, Suite 300 W, Washington DC, 20005-3438. 2. Travel Estimation Techniques for Urban Planning , NCHRP Report 365. Transportation Research Board, national Academy of Science, 500 Fifth St., NW, Washington DC. 3. San Diego Traffic Generators , San Diego Association of Governments and CALTRANS District 11, January 1990.						
				Average weekday trip rates shall be used in estimating total daily trips generated unless otherwise indicated by staff in defining the scope of study. Weekend or other trip rates shall also be required if the peak hour does not occur on an average weekday. The average trip rate for peak hour of adjacent street traffic shall be used to estimate A.M./P.M. peak hour traffic entering and exiting the site. Guidelines in the Trip Generation manual shall be used for determining whether to use average trip rates or equations.						
				If the TIA is filed in conjunction with a site plan review, trip generation shall be based upon the uses and intensities identified on the site plan. If a site plan is not available, trip generation shall be based upon the maximum allowable density for the most intensive use. In such cases, the trip generation rates listed in Table 2-1 shall be applied, unless the applicant is willing to accept a density limitation as a condition of zoning or can document the fact that flood plains, watershed ordinance restrictions, compatibility standards or other factors limit the developable area of the site.						
				Reductions for internal capture, pass-by traffic and transit usage should be discussed with the staff in defining the scope of study and must be supported by adequate documentation. No reductions in trip rates may be made for driveway turning movements unless it can be documented that certain trips will not use the driveway. Guidelines contained in the Trip Generation manual or other approved sources shall be used to document internal capture and pass-by trips.						
2.3.2 (B) - Trip Distribution										
			TCM 2.3.2 (B)	Percentages for directional distribution of the site generated traffic must be well referenced. The basis for directional attraction shall largely rely on the following information: Marketing Study Subarea Transportation Study City or State Travel Demand Estimation						
				If the above information is not available, a traffic study for determining directional attraction is required to address the area that is surrounded by the nearest arterial streets. The traffic study must be consistent with the procedures established for calculating trip distribution in Quick-Response Urban Travel Estimation Techniques and Transferable Parameters, NCHRP 187. , Transportation Research Board.						
2.3.2 (C) - Traffic Assignment										
			TCM 2.3.2 (C)	This is the assignment of site generated traffic according to the percentages of distribution determined in the previous step. Traffic assignments shall be clearly illustrated with roadway and intersection geometry. The proposed roadway network shall conform to the Roadway Plan or other approved design by the Transportation Review Section.						
2.3.3 - Forecasting Future Nonsite Traffic										
			TCM 2.3.3	Non-site related traffic must be estimated for the proposed build-out year of the project. In forecasting future traffic, the following factors must be considered: • Existing traffic;						
				• Existing and proposed street network;						
				• Traffic growth rates, using historic trends;						
				• Traffic from any site plan within or adjacent to the study area of the TIA which has been filed, approved, or extended since January 1, 1988 but is not yet built or fully occupied;						
				• A reasonable portion of traffic from any project with a preliminary or final subdivision within or adjacent to the study area of the TIA which has been filed, approved, or extended since January 1, 1988, and which is expected to be completed by the build-out year of the subject tract;						
				• A reasonable portion of traffic from any project with approved zoning within or adjacent to the study area of the TIA, unless there is reason to believe that the project is unlikely to be built within the time frame covered in the TIA.						
				Traffic growth rates and projects to be considered in background traffic should be determined in the scoping meeting. Existing 24 hour traffic counts and A.M./P.M. peak hour intersection turning movement counts are needed as input. A copy of the traffic counts with the date and time they were conducted must be provided. Annual traffic growth rates must be well documented. A comparison should be made with other recent forecasts where available.						
2.3.4 - Capacity Analysis and Traffic Impact Assessment										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 2.3.4	Levels of service for roadways and intersections must be calculated before and after the proposed development. The acceptable methodologies for calculating levels of service are: • Operational Analysis from the Transportation Research Board Special Report 209, Highway Capacity Manual, 2000 (or most current version). • PASSER III-90 from the Texas Transportation Institute. • The TEXAS model, version 3.0, from the University of Texas. • Other methodologies approved by the Director of the Transportation, Planning and Sustainability Department or his designee. For diamond interchanges, the use of either PASSER or the TEXAS model is mandatory. CORSIM or the VISSIM model may be required for analyzing U-turns at unsignalized intersections.						
				In a multiphased development, levels of service must be evaluated before and after each new phase. Unless otherwise indicated by staff in defining the scope of study, Level of Service D shall be the minimum acceptable standard.						
				In addition, the following characteristics shall be addressed when evaluating capacity and level of service: A. Physical Configuration - intersection and roadway geometry;						
				B. Traffic Characteristics - peak hour factor;						
				C. Traffic Control - signalized and unsignalized control;						
				D. Environmental Condition - topography, sight distance and other safety hazards;						
				E. Capacity - as determined in the most recent edition of the Highway Capacity Manual.						
				The applicant must indicate all assumptions used in the analysis, including cycle length, phasing, G/C ratios, etc. Default values must be used for percent of heavy vehicles, peak hour factor, arrival type, etc. (see Table 9-3 of the Highway Capacity Manual) unless the applicant can document other values through field data.						
				A capacity analysis must be performed for key intersections within and adjacent to the site, as well as major intersections determined in the scope of the TIA. Level of service and volume/capacity ratios must be provided for each movement within the intersection. For residential streets, the TIA must also address desirable operating levels as specified in Sections 25-6-113, 25-6-114, 25-6-116, 25-6-141, 25-6-142 and 25-6-143 of the Land Development Code.						
				The TIA must present conclusions regarding the impacts of the proposed development on the roadway system. These conclusions should be expressed in quantitative terms whenever possible. The report must specifically address any adverse traffic impacts (level of service E or worse) which cannot be avoided if the development occurs. Transit-related issues should also be discussed if applicable.						
2.3.5 - Recommendations on Roadway Improvements and Traffic Control Modifications										
			TCM 2.3.5	The TIA must include specific recommendations to mitigate the transportation impacts of site-generated traffic on roadways and intersections to an acceptable level of service. If any of the intersections or turning movements is projected to operate at level of Service E or worse, the TIA should include specific recommendations to mitigate the site-traffic impact on roadways and intersections to an acceptable level of service. If the intersections or turning movements analyzed operate at an unacceptable level of service prior to the introduction of the proposed development, the TIA should include specific recommendations to mitigate the site-traffic impact on roadways and intersections to maintain the existing level of service. Various traffic control improvements or land use decisions can be used to mitigate traffic impacts on adjacent roadways and intersections.						
				The TIA must clearly identify in the recommendations any roadway improvements (including geometric changes), traffic control modifications (including signal retiming), or other measures necessary to mitigate site-generated traffic impacts.						
2.3.6 - Certification Statement										
			TCM 2.3.6	The TIA must contain the following statement, signed by the person responsible for the contents of the document: "I hereby certify that this report complies with Ordinance requirements and applicable technical requirements of the City of Austin and is complete and accurate to the best of my knowledge."						
2.4.0 - SUBMITTAL REQUIREMENTS										
2.4.1 - Study Documentation										
			TCM 2.4.1	The following information should be provided in any TIA submittal submitted for review to the City: A. City of Austin timing sheets to be included in the Appendix of the TIA.						
				B. Synchro signal timing sheets to be included in the following format: existing conditions (am + pm on one sheet), future conditions (am background, am background + site on one sheet, pm background, pm background + site on one sheet).						
				C. All intersections must be modeled in one Synchro file, including unsignalized intersections.						
				D. Submit a CD containing the following: electronic PDF of the TIA, Synchro Network for all conditions analyzed and background DXF or aerial format. Synchro files must be in real world coordinates.						
				E. A CAD or PDF file for the site plan, if available.						
				F. A map showing all bicycle routes, rail stops, hike & bike trails, sidewalks, bus routes, and bus stops within ½ mile of the site						
				G. A map showing all background projects and a table showing trip generation for each project,						
				H. A map showing all roadways and driveways analyzed (labeled and dimensioned),						
				I. An aerial map of all intersections with roadway improvements (dimensioned), including above ground utilities called out.						
2.4.2 - TIA Submittal Requirements										
			TCM 2.4.2 (A)	Scope of TIA. 1. Study area (as defined in consultation with staff). 2. Target year for project build-out.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 2.4.2 (B)	Trip Generation. 1. Proposed land use or zoning category (or uses and square footage for site plans)* for each tract. 2. Generation rates based on proposed land use intensity (if known) or most intense use permitted (if with a zoning case). - daily - peak hour (A.M., P.M., other)						
			TCM 2.4.2 (C)	Trip Distribution. 1. Percentages for directional distribution. 2. Sources of information.						
			TCM 2.4.2 (D)	Traffic Assignment. 1. Roadway network in study area (existing and proposed). 2. Access points (conceptual) or driveways (for site plans)*						
			TCM 2.4.2 (E)	Traffic Forecast. 1. Existing 24-hour A.M./P.M. peak traffic, including copies of field data 2. Assumptions on annual growth rate or other source of future background traffic at time of build-out 3. Projected site, background and total traffic for 24 hour, A.M./P.M. peak at time of build-out						
			TCM 2.4.2 (F)	Capacity Analysis for Street Intersections and Driveways*. 1. Intersection/roadway geometry (existing and proposed). 2. Traffic control (signalized or unsignalized). 3. Traffic characteristics (turn movements, percent trucks and buses).						
			TCM 2.4.2 (G)	Traffic Impact Assessment. 1. Impacts expressed in quantitative terms. 2. Adverse impacts which cannot be avoided. 3. Transit issues (if applicable).						
			TCM 2.4.2 (H)	Recommendations. 1. Roadway improvements. 2. Traffic operation modifications. 3. Limitation of land use intensity. 4. Other options recommending alternate transportation improvements (i.e. transit improvements, bike lanes, carpooling, flex-work, etc.)						
			TCM 2.4.2 (I)	Certification Statements.						
				* Note: If a TIA has previously been reviewed for a zoning case on the same project, a TIA addendum is required for the site plan only if some items listed above have not been fully addressed or the scale of the project has changed significantly. If the previous TIA was accepted by the staff as adequate for the zoning case and there has been no significant change in the anticipated target year, trip generation, trip distribution, background traffic or funded improvements, the TIA addendum need only address the items indicated by an asterisk. In such cases, the level of detail needed should be discussed with the staff in defining the scope of the TIA.						
2.4.3 - Requirements for Depicting Analyzed Intersections in TIA Submittals										
			TCM 2.4.3 (1)	For clarity and legibility provide one intersection graphic per page						
			TCM 2.4.3 (2)	Dimension the existing and proposed right-of-way, pavement, and lane widths within the intersection						
			TCM 2.4.3 (3)	Depict and dimension all existing and recommended modes (bus lanes, bike lanes, pedestrian facilities, etc) that will utilize the intersection						
			TCM 2.4.3 (4)	A standard legend that identifies all elements included in the graphic.						
			TCM 2.4.3 (5)	Level of Service for each movement should be identified for site traffic, background traffic, and total traffic.						
2.5.0 - NEIGHBORHOOD TRAFFIC ANALYSIS										
				If a proposed project has access only to a local or collector street serving predominantly single-family residential uses and exceeds the thresholds defined in Sections 25-6-113 and 25-6-114, a Neighborhood Traffic Analysis will be performed by the Watershed Protection and Development Review Department. If a neighborhood Traffic Analysis is required as part of a TIA, the applicant is required to perform the analysis. The applicant may be required to conduct a 24-hour vehicle traffic count for the affected streets. If required, this traffic count must be submitted with the development application.						
				A Neighborhood Traffic Analysis will include an evaluation of existing and projected operating levels of residential streets. If the projected operating levels exceed the limits in Section 25-6-116, traffic mitigation measures will be recommended. A Neighborhood Traffic Analysis will be prepared with the review periods specified in Chapter 25-6, Article 3 for development application.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 3 - COMPUTERIZED PAVEMENT DESIGN										
3.1.0 - GENERAL										
			TCM 3.1.0	The City has observed premature distress on many of the heavily traveled streets and on streets built on clay subgrade soils with high plasticity indices (P.I. >20). A map is provided in Appendix J that represents the general soil PI distribution within the Austin area, but this does not relieve the designer's responsibility to provide a geotechnical report and to design to the site specific soil condition. The minimum pavement standards included in this TCM do not relieve the design engineer from the responsibility of designing a cross section that is appropriate for the soil conditions to meet the required design life of 20 years. A clay subgrade classification of CH (Unified Soil Classification System) with a minimum Liquid Limit of 50; more than 50% passing a #200 sieve and a P.I. greater than 22 is considered highly expansive requiring special pavement design considerations.						
3.1.2 - GENERAL PAVEMENT DESIGN REQUIREMENTS										
			TCM 3.1.2 (1)	Flexible pavements must be designed for crack resistance for both environmental (subgrade shrink/swell) and fatigue (surface thickness) modes. Although the fatigue requirement will most likely result in thicker surface layers, thinner allowable base layers will partially compensate for and offset some of the cost of the increased surface thickness. This concept has been referred to as a "balanced" design. Using MFPS alone does not ensure a "balanced" design.						
			TCM 3.1.2 (2)	Excessively thick base layers do not effectively compensate for subgrade soils with high swell potential. It is recommended that the designer consider one or more of the stabilization strategies listed in Section 3.1.3.						
			TCM 3.1.2 (3)	Rigid pavement designs must include proper jointing plans, joint types, and either non-erodible bases or a non-erodible prepared subgrades.						
3.1.3 - DESIGN REQUIREMENTS FOR PAVEMENTS ON EXPANSIVE SOILS										
			TCM 3.1.3	Whenever a soil investigation indicates that more than two feet of expansive subgrade soil with P.I. greater than 25 exists underneath the expected base layer, the design professional is advised to adopt at least one and preferably a combination of the following measures: 1. Replace 18 inches of subgrade by approved material with P.I. less than 15 and more than four and provide for appropriate edge drainage,						
				2. Use lime, cement, or lime/cement material to stabilize eight to twenty-four inches of subgrade as appropriate to minimize vertical shrink/swell potential and environmental cracking,						
				3. Horizontal or vertical moisture barriers of sufficient width or depth to minimize moisture migration into and out of the subgrade soils. a. Although 4 foot barriers may be adequate, barriers of 6 to 10 feet are often required to be effective. b. Contiguous sidewalks and driveways placed at the time of roadway construction are highly desirable and will be considered a horizontal barrier. c. An acceptable design with moisture barriers must be used in combination with at least one other strategy listed here,						
				4. Reinforcement of the pavement section with GeoGrid. a. a documented GeoGrid design must be approved by the Director of the Public Works Department or designated representative. b. An acceptable GeoGrid design must be used in combination with at least one other strategy listed here, The designer shall utilize references such as FHWA/TW-05-4518 Vol. 1 Design Procedure for Pavement on Expansive Soils, when electing to use moisture barriers.						
				5. Other measures as may be approved by the Director of the Public Works Department or designated representative.						
3.2.0 - GENERAL CRITERIA										
			TCM 3.2.0	All streets shall be constructed on a compacted or stabilized subgrade, and shall consist of a base layer and Hot Mix Asphaltic Concrete (HMAC) surface layer, and/or a Portland Cement concrete (PCC) pavement, designed by a Licensed Professional Engineer registered in the State of Texas, using: 1. The concepts of the AASHTO Pavement Design Guide incorporated into the City of Austin Computerized Pavement Design procedure, 2. The current edition of the City of Austin Policy on Geometric Roadway Design, and 3. The current edition of the Austin Drainage Criteria Manual.						
				The material selection shall consist of one or more of the following support layers that conform to the City of Austin Standard Details and the City of Austin Standard Specifications. 1. Improved subgrade, 2. Compacted subbase, stabilized subbase, 3. Flexible base, asphalt stabilized base, and 4. A surface layer consisting of either a hot mix asphaltic concrete (HMAC) or Portland Cement concrete (PCC).						
				Each material selected for the structural pavement design section shall meet or exceed the following minimum requirements: • Subgrade compaction, 95% (Tex-114-E); • Lime Stabilized Subgrade, eight-inch minimum thickness; • Portland cement treatment of materials in place, six-inch minimum thickness; • Flexible base, eight-inch minimum thickness; • Asphalt treated base, four-inch minimum thickness; • Hot Mix Asphaltic Concrete (HMAC) base, two-inch minimum thickness; • Hot Mix Asphaltic Concrete (HMAC), 1 ½-inch minimum thickness; • Jointed reinforced Portland Cement concrete (PCC) pavement, six-inch minimum thickness. Exception to the flexible base course: thickness may be reduced by one inch when the material is placed on solid rock.						
3.2.1 - Stabilization Selection and Mix Design for Subgrade and Base Materials										
			TCM 3.2.1	The stabilization selection and mix design approach shall include the selection of the type of stabilizer (see Figure 3.2.1) and the development of an appropriate stabilized mix design (see Figures 3.2.2 and 3.2.3) based upon the gradation (TxDOT Test Method Tex-110-E), plasticity index (TxDOT Test Method Tex-106-E) and pH (TxDOT Test Method Tex-128-E) of the candidate soil mixture.						
				Appropriate mix designs for any stabilized/treated subgrade, subbase and base layers shall be developed by a Registered Professional Engineer, Licensed in the State of Texas.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
3.2.1 (A) - Lime Stabilization										
			TCM 3.2.1 (A)	The principal goal of the mixture design process is the establishment of an appropriate lime content for construction. However it should be noted that there may be instances where acceptable soil-lime mixtures may not be obtained regardless of the lime percentages used to treat the base and subbase materials. The flow diagram presented in Figure 3.2.1 shall be used as an aid in defining those soil mixtures that are expected to be amenable to lime treatment.						
				In general the addition of lime to a fine-grained soils results in spoil mixtures that display decreased plasticity, improved workability, reduced volume change characteristics and strength increases. Improvement in soil strength, however, does not always develop with the addition of lime. In general soils classified by the AASHTO method as A-4, A-5, A-6, A-7 and sometimes A-2-7 and A-2-6 are more readily susceptible to stabilization with lime. It should be noted that a number of variables, including soil type, lime type, lime percentage and curing conditions can impact the properties of soil-lime mixtures.						
				The impact of lime on the post-conditioned properties of materials proposed for lime treatment can range from reduction in the plasticity properties (with minimal strength increases) to significant strength increases. The latter impact (i.e. significant strength increase) is identified as stabilization of lime-reactive soils/materials (i.e. normally soils/materials with pH values greater than 7.0), while the former impact (i.e. reduction in plasticity properties) is identified as conditioning of non-lime-reactive soils/materials (i.e. normally soils/materials with pH values less than 7.0). The type of lime treatment proposed for the work should be indicated in the mix design report (i.e. lime stabilization for strength increase or lime conditioning for plasticity reduction).						
				Most fine-grained soils can generally be conditioned/stabilized effectively with 3% to 10% of lime addition (dry weight of soil basis). The lower percent lime additions are normally identified with lime conditioning (with minimal strength increases) of the soil material, while the higher percent lime additions are normally necessary to achieve lime soil mixtures with significant strength increases.						
				In the case of lime conditioning of soil mixtures (with minimal strength increases) the lime conditioned soil mixture design for the City of Austin shall be developed using TxDOT Test Method Tex-112-E, "Method of Admixing Lime to Reduce Plasticity Index of Soils."						
				In development of a lime stabilized soil mix design for the City of Austin, the mix design approach presented in Figure 3.2.2 and the procedures specified in TxDOT Test Method Tex-121-E, "Soil-Lime Testing," shall be used to establish the lime content that would produce a 28 day unconfined compressive strength (TxDOT Test Method Tex 117-E) of 50 psi for a lime stabilized subgrade and 100 psi for a lime stabilized base layer.						
				The minimum rate of lime solids application shall be 5% by weight (mass) for non-lime-reactive materials (pH of 7.0 or less) or 7% by weight (mass) for lime-reactive materials (pH greater than 7.0), unless indicated otherwise in the mix design process or as directed by the Engineer or designated representative.						
3.2.1 (B) - Cement Stabilization										
			TCM 3.2.1 (B)	A wide range of soil types may be stabilized using Portland cement. The greatest effectiveness is with sands, sandy and silty soils, and clayey soils of low to medium plasticity. However, Portland cement is difficult to mix into soils with a plasticity index that exceeds 30. The flow diagram presented in Figure 3.2.1 shall be used as an aid in defining those soil mixtures that are expected to be amenable to cement treatment.						
				Soil mixtures that are acid, neutral or alkaline may well respond to cement treatment; however the higher pH soils react more favorably to cement addition and undergo significant strength increases. Although some organic matter such as un-decomposed vegetation may not influence stabilization adversely, other organic compounds of lower molecular weight, such as nucleic acid and dextrose, act as hydration retarders and reduce strength.						
				A special pH test (see Table 3.2.1) shall be used to provide an indication of the impact of organics on normal hardening of the cement stabilized soil mixture. In essence a 10:1 mixture (by weight) of soil and cement is mixed with distilled water for a minimum of 15 minutes and the pH of the combined mixture is then measured. If the pH value is at least 12.1, then it is probable that organic matter, if present, will not interfere with normal hydration/hardening of a soil-cement mixture. This pH measurement is a principal feature in identifying the soil mixtures that can likely be stabilized with cement and are candidates for development of a cement-soil mix design (see the mix design flow diagram presented in Figure 3.2.3).						
				Since sulfate attack is known to adversely affect some cement stabilized soil, the sulfate content of a soil should be considered in the selection of cement as a stabilizer. The impact of the sulfate factor on the mix design is also identified in Figure 3.2.3, where cement stabilization of soils with sulfate contents greater than 0.9% is discouraged. Procedures for determining sulfate content of soils are presented in Tables 3.2.4 and 3.2.5.						
				There are additional selection criteria based on gradation and Atterberg limits results that should be used in establishing the acceptability of a soil mixture for cement stabilization, specifically: 1. Fine-grained soils - Plasticity Index should be less than 20 and the Liquid Limit less than 40; 2. Sandy soils - Plasticity Index should be less than 30; 3. Coarse-grained (gravel) soils - Minimum of 40% passing the no. 4 sieve; and 4. All soils - Plasticity Index should not exceed the number calculated in the following equation: $N = 20 + \frac{50 - \%\ \text{passing no. 200 sieve}}{4}$						
				The properties of cement-treated soils are principally dependent on cement content, density, moisture content and confining pressure. It should also be noted that the addition of cement to a soil mixture could produce some change in both the optimum water content and maximum dry density for a given compactive effort. The principal goal of the cement stabilization mixture design process is therefore the establishment of an appropriate cement content-optimum moisture-density relationship appropriate for construction.						
				Most soils can generally be stabilized effectively with 5% to 16% of cement addition (dry weight of soil basis). The lower percent cement additions are normally identified with coarser soil mixtures (AASHTO classifications A1 and A2), while the higher percent cement additions are normally necessary for the fine-grained soils (AASHTO A6 and A7). Estimates of cement requirements for various soil classifications are presented in Table 3.2.2 below.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
				In development of a cement stabilized soil mix design for the City of Austin, the mix design approach presented in Figure 3.2.3 and the procedures specified in TxDOT Test Method Tex-120-E, "Soil-Cement Testing," shall be used to establish the design cement content that would produce a mix that meets the allowable durability requirements presented in Table 3.2.3. The mix design report should include the molding moisture content, the dry density to the nearest 0.1 pcf, the seven-day unconfined compressive strength to the nearest psi and the recommended cement content to the nearest whole percent.						
				The seven-day compressive strength associated with the recommended cement content should be used as the field control measure during construction. The seven-day compressive strength for cement stabilized soils can vary between 100 psi for fine-grained soils to more than a 1,000 psi for coarse-grained soils.						
				If a mix design is not developed in the laboratory in accordance with in TxDOT Test Method Tex-120-E, "Soil-Cement Testing," the minimum rate of cement solids application shall be the percent by weight for the specific soil classification (i.e. AASHTO or Unified Classification) identified with the percent cement for moisture-density testing (column four of Table 3.2.2), unless indicated otherwise by the Engineer or designated representative.						
3.2.1 (C) – Lime-Cement Stabilization										
			TCM 3.2.1 (C)	Cement stabilization alone is normally not desired with high plasticity soil mixtures (i.e. soils with a plasticity Index greater than 30) because of difficulties in the mixing phase. In this instance combinations of lime and cement can often produce an acceptable combination. Lime is initially added to the soil mixture to increase the workability and mixing characteristics of the soil, as well as to reduce its plasticity. Cement is subsequently added to the lime-soil mixture to provide rapid strength gain. The lime-cement combination stabilization of high plasticity soils is especially advantageous when rapid strength gain is required for placement during cooler weather conditions.						
				The lime content to reduce the plasticity index below 30 should be established using TxDOT Test Method Tex-112-E, "Method of Admixing Lime to Reduce Plasticity Index of Soils," while the TxDOT Test Method Tex-120-E, "Soil-Cement Testing," shall be used to establish the design cement content that would produce a mix that meets the allowable durability requirements presented in Table 3.2.3.						
				The mix design report should include the molding moisture content, the dry density to the nearest 0.1 pcf, the seven-day unconfined compressive strength to the nearest psi and the recommended lime and cement contents to the nearest whole percent. Expected lime contents range from 1% to 3%, while the expected subsequent cement contents range from 3% to 10%. The amount of lime and cement additions is dependent upon the type of soil.						
				The seven-day compressive strength associated with the recommended lime and cement contents should be used as the field control measure during construction.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 4 - SIDEWALKS AND CURB RAMPS										
4.2.0 - SIDEWALK REQUIREMENTS										
4.2.1 - General Requirements										
			TCM 4.2.1	Sidewalks must be constructed between the curb line and the property line. The standard alignment is two (2) feet off the property line. In the central area of Austin, bounded by First St., Interstate 35, Martin Luther King, Jr. Blvd., and Lamar St., sidewalks may be constructed for the entire width from the property line to the curb line.						
				Should the available right of way between the curb and adjacent property line be of insufficient size to accommodate the requirements of this section, alternative designs of the sidewalk may be constructed only with the approval of the Director of the Public Works Department.						
				The sidewalk shall be sloped ¼ inch in (1) one foot and the area between the sidewalk and the curb shall be sloped a minimum ¼ inch in one (1) foot above the curb and shall drain toward the roadway.						
				Sidewalks shall be constructed in accordance with the City of Austin Standards and the City of Austin Standard Specifications and in accordance with applicable provisions of the Americans With Disabilities Act.						
				Sidewalks on cul-de-sacs shall be located on both sides of the throat and around the bubble, except on Industrial Collectors, where they are required only on one side of the throat.						
				Tables 1-7 and 1-12 indicate sidewalk requirements. If these requirements create an accessible route having less than 60 inches clear width, then passing spaces at least 60 inches by 60 inches shall be located at reasonable intervals not to exceed 200 lineal feet of distance. A T-shaped intersection of 2 sidewalks having a clear area of 60 inches square is an acceptable passing space.						
4.2.2 - Location Criteria for Streetscape Furnishings										
			TCM 4.2.2	Streetscape furnishings are objects of the streetscape available for public use that are intended to enhance the pedestrian experience and support pedestrian activity as a transportation mode. Typically streetscape furnishings are located in the curbside zone of the sidewalk but may also be located at back of sidewalk in some instances. Regardless of their location, a 5' (1.5 m) clear zone shall be left for pedestrian travel, unimpeded by permanent or temporary objects. The dimensions of the curbside and clear zone will vary depending on street type and location within the city.						
4.2.2 (A) - Bike Racks										
			TCM 4.2.2 (A)	Bike racks on sidewalks are intended to serve as decentralized parking where the bicycle is left for a short period of time. Racks should be located close to transit stops, places of major employment, recreational destinations and in pedestrian and retail districts. Racks should be visible from and convenient to building entrances, easily accessed from the street, protected from motor vehicles and visible to passersby to promote usage and enhance security. Where sidewalks have distinct use zones, the racks shall be located in the curbside zone.						
				Bike racks shall be located in the sidewalk curbside zone and as follows: • For sidewalks 12' (3.6 m) wide or greater, racks shall be placed perpendicular to the curb, with the center of the rack aligned with the street trees and street lights (if any) or a minimum of 4' (1.2 m) from face of curb, with at least 5' (1.5 m) clearance from the rack to the back of sidewalk or adjacent building wall, to allow room to maneuver the bike. The racks shall be placed 36" (900 mm) on center and 24" (900 mm) clearance from nearest vertical object or edge of tree pit. • As an alternative location on sidewalks 12' (3.6 m) wide or greater and less than 18' (5.4 m) wide, racks shall be placed parallel to and 24" (600 mm) from back of sidewalk or adjacent building wall. • The clearance from the bike rack to any public or private utility appurtenance shall be a minimum of 36" (900 mm). Bike racks shall not be mounted on top of vaults or storm drain inlets.						
4.2.2 (B) - Trash Receptacles										
			TCM 4.2.2 (B)	Trash receptacles are located on sidewalks for the purpose of reducing litter on the street by providing a place for pedestrians to deposit small amounts of trash that they do not want to carry to their destinations. Receptacles should increase in number in high pedestrian use areas and near food service establishments. Receptacles shall be located no closer than 2' (600 mm) to benches or seating areas in order to minimize exposure of bench users to objectionable odors and insects. To enable users to find and use receptacles and facilitate servicing receptacles, they should be located in a consistent, predictable manner within each district or street type.						
				In the Downtown, receptacles shall be located at the intersections, adjacent to the sidewalk ramps. If the sidewalk ramps have wings, the receptacle shall be centered in the curbside zone. For ramps with a curb return, the outside of the receptacle shall be aligned with the top of the ramp. 1' (300 mm) clearance shall be provided between receptacle and outside edge of curb return. The receptacle shall be oriented so that the opening to receive trash is parallel with the ramp and the service door when fully open will not block access to the ramp.						
4.2.2 (C) - Benches										
			TCM 4.2.2 (C)	Benches provide places for pedestrians to rest, wait for buses or companions and gather together. Benches should be concentrated in areas of high pedestrian activity where there is lighting for secure night-time use. Benches are best located in shaded areas of the sidewalk for optimal year-round use. Place benches in groups facing each other to facilitate social interaction. Groups of benches shall include a space for wheelchair access to the seating group.						
				Benches shall be located in the sidewalk curbside zone and as follows: • On sidewalks 12' (3.6 m) wide or greater, benches shall be placed perpendicular to the curb with the center of the bench aligned with the street trees and street lights (if any), provided that the end of the bench is a least 18" (450 mm) from face of curb. • On sidewalks 12' (3.6 m) wide or greater and less than 18' (5.4 m) wide if utilities or other site constraints prevent benches from being placed in the curbside zone, benches shall be placed parallel to and 6" (150 mm) from back of sidewalk or adjacent building wall. • The clearance from bench back to any vertical object or surface shall be 6" (150 mm). • The clearance from the bench to any public or private utility appurtenance must be a minimum of 36" (900 mm). Benches shall not be mounted on top of vaults or storm drain inlets.						
4.2.3 - Nonconventional Sidewalks										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 4.2.3	With the approval of the Directors of the Watershed Protection and Development Review Department, and the Public Works Department, an alternative sidewalk design (such as a hike and bike trail) may be substituted for a conventional sidewalk, provided that maintenance and public access agreements are provided and that they are accessible to persons with disabilities as defined and required in the Americans With Disabilities Act. Meandering sidewalks are encouraged in order to avoid trees or other natural features, provided that sufficient right-of-way is dedicated to accommodate them.						
4.2.4 - Sidewalks on Bridges										
			TCM 4.2.4	Where sidewalks are required on bridges, they shall be a minimum of six (6) feet wide (clear of guardrail).						
4.2.5 - Sidewalk Omissions										
			TCM 4.2.5	Except as noted below, sidewalks are required unless a variance or waiver is granted as provided in Chapter 25-6 of the Land Development Code. In determining whether a variance or waiver is appropriate, the factors in Table 4-3 will be considered. For site plans which represent small additions to or minor redevelopment of existing sites, the Director of the Watershed Protection and Development Review Department may, based on the magnitude of the project and its pedestrian impacts, either waive sidewalk requirements or require that sidewalks be installed only in the area affected by the addition or redevelopment. The absence of curbs and gutters on a street is not sufficient justification for elimination of sidewalks. However, where alternate design criteria for streets is permitted, sidewalks on curbed and guttered streets are generally required on only one side, and on streets which are not curbed and guttered, sidewalks are generally not required unless it is determined that sidewalks are the only means to provide an accessible path of travel or accessible route as defined by the Americans With Disabilities Act. Based on recommendations of the Directors of the Watershed Protection and Development Review Department, the Public Works Department, and the Transportation, Planning and Sustainability Department, the Planning Commission may require sidewalks on streets designed to alternate criteria, as determined essential for serving schools, commercial facilities, or other pedestrian generators, where environmental constraints have been addressed and as required to fulfill the requirements for accessible route as defined by the Americans With Disabilities Act.						
4.2.6 - State Facilities										
			TCM 4.2.6	Sidewalks are required on State-maintained highways except where prohibited by the Texas Department of Transportation. Sidewalks on State-maintained highways must be located in accordance with the requirements of the Texas Department of Transportation and as required by the American With Disabilities Act. Generally, sidewalks on State highways must be located within the right-of-way adjacent to the property line.						
4.3.0 - CURB RAMPS										
			TCM 4.3.0	Sidewalks constructed to the requirements herein shall include a curb ramp wherever an accessible route crosses a curb. Curb ramps shall be designed and constructed in accordance with the City of Austin Standard Details, the City of Austin Standard Specifications and the requirements of the American With Disabilities Act (ADA), Appendix A to Part 36-Standards for Accessible Design, Section 4.7 Curb Ramps. Where these standards conflict, the stricter design criteria shall apply and take precedent.						
				Prior to subdivision acceptance by the City, all concrete and/or paver stone work within the right-of-way shall be constructed in accordance with the design details shown on the drawings. This includes Curb Ramps located at the radii PC and PT of the intersection, which shall be constructed in accordance with Standard Details 432S-5A and 432S-3. In locations where there are "Tee" type intersections, the cross of the Tee (opposite the intersection street) shall have a ramp constructed in line with the ramp across the street.						
				The preferred alignment for new curb ramp construction is perpendicular to the vehicular flow of traffic and perpendicular to the curb, as indicated by the Standard Details. However, the Standard Details shall not be used in the ramp design at signalized intersections.						
			TCM 4.3.0 (A)	Curb ramps shall be located so that they are not obstructed by parked vehicles and shall not intrude into vehicular traffic lanes.						
			TCM 4.3.0 (B)	The least possible slope shall be used for any curb ramp. Curb ramp slope shall not exceed a 1:12 vertical rise to horizontal run ratio. Curb ramp wings shall not exceed a 1:10 vertical rise to horizontal run ratio (See Figure 4-1 in Appendix H of this manual). Curb ramps to be constructed on existing sites or in existing buildings or facilities may have slopes and rises as allowed in Table 4-2 if space limitations prohibit the use of a 1:12 slope or less. A flat landing area with a minimum dimension of 48 inches (1.2 meters) deep and as wide as the ramp area must be located at the top of each curb ramp. In existing right-of-way or street locations where existing property lines do not allow for this 48 inch (1.2 meters) deep landing area, the wings or flared sides of the ramp must have a slope of 1:12 maximum. (See Figure 4-1 in Appendix H of this manual)						
			TCM 4.3.0 (C)	Sloped surfaces shall be stable, firm and slip-resistant. Ramp surface shall have a detectable warning surface system integral to the walking surface.						
			TCM 4.3.0 (D)	Detectable warning system shall consist of raised truncated domes with a diameter of nominal 0.9 in. (23mm), a height of nominal 0.2 in. (5mm) and a center-to-center spacing of nominal 2.35 in. (60mm) and shall contrast visually with adjoining surfaces, either light-on-dark, or dark-on-light. (See Figures 4-3 and 4-4 in Appendix H of this manual). The coloring agent used to provide contrast shall be an integral part of the walking surface.						
			TCM 4.3.0 (E)	The width of the curb ramp shall be a minimum dimension of 48 inches (1.2 meters) exclusive of flared sides or wings. On existing sidewalks only, where 48 inches (1.2 meters) is not feasible, a minimum width of 36 inches (0.9 meters), exclusive of flared sides or wings shall be allowed. If a curb ramp is located where pedestrians must walk across the ramp, or where it is not protected by handrails or guardrails, it shall have flared sides. Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramp. See Figure 4-5 in Appendix H of this manual.						
			TCM 4.3.0 (F)	Curb ramps shall be designed so that the "cradle" will allow wheelchair footrests to clear the adjoining surface during transition. The minimum angle from surface to surface shall be 170 degrees (see Figure 4-2 in Appendix H of this manual).						
			TCM 4.3.0 (G)	Curb ramps shall be located so as to provide a continuous accessible path of travel.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 5 - DRIVEWAYS										
5.1.0 - GENERAL										
			TCM 5.1.0	This section provides minimum and desirable design criteria, provisions and requirements for safe and convenient access to abutting private property along streets and highways. The intent is to assure that access is provided to abutting private property with a minimum of interference with the free and safe movement of vehicular and pedestrian traffic and to prevent traffic congestion arising from vehicular entry to or exit from abutting private property. The right of the public to free and unhampered passage of the public streets shall be held paramount to other interests. Regulated limitation of access is necessary on arterials to enhance their primary function of mobility. Conversely, the primary function of local roads and streets is to provide access. Figure 1-2 in Appendix H of this manual reflects the relationship of street classifications with access and mobility.						
5.3.0 - DESIGN CRITERIA										
5.3.1 - General										
			TCM 5.3.1 (A)	If a curb inlet is present there shall be ten (10) feet between the inlet opening and the edge of a driveway curb return.						
			TCM 5.3.1 (B)	Access to alleys requires approval by the Directors of the Public Works Department and the Transportation, Planning and Sustainability Department. Access to and from unimproved alleys is discouraged.						
			TCM 5.3.1 (C)	The angle of driveway approach shall be approximately 90 degrees for two (2) way driveways, 45-90 degrees for one (1) way driveways.						
			TCM 5.3.1 (D)	Unless approved by the Directors of the Public Works Department and the Transportation, Planning and Sustainability Department, one-way driveways shall be prohibited on two-way undivided streets. In addition, one-way driveways are limited to developments where two-way access is unfeasible because of special design considerations, such as severe site constraints, the need for circular drop-offs or other circumstances where one-way circulation may be preferred to two-way access. Examples of such developments include public and private schools, day care uses, car wash facilities and existing developments or small sites where two-way circulation is impractical (see Figure 9-9 in Appendix H of this manual for design criteria of semicircular drop-offs). Where one-way access is proposed, developments shall be designed to promote one-way, on-site circulation in support of the one-way drives. Circular drop-offs and one-way driveways shall be designed to prevent conflicts with traffic access, parking and on-site circulation. Priority, however, shall be directed towards reducing the number of driveway approaches along Principal Roadways and Arterial streets to limit conflict points and enhance traffic flows along such roadways. All one-way driveways separated by more than 15 feet (measured from edge to edge) must be signed for one-way operation.						
			TCM 5.3.1 (E)	Areas used as motor vehicle service stations or parking lots shall have a six (6) inch raised curb along the entire street frontage except at the driveway approaches and access sidewalks.						
			TCM 5.3.1 (F)	Where Type I driveways are not appropriate, head-in, back-out parking is generally prohibited on all streets and alleys. Such a condition requires the approval of the Director of the Public Works Department. Other alternatives, however, should be encouraged when possible.						
			TCM 5.3.1 (G)	All driveways must be constructed within the street frontage of the subject property, as determined by extending the side property lines to the curb line. Neither the driveway nor the curb returns shall overlap adjacent property frontage without written approval from the adjacent property owner.						
			TCM 5.3.1 (H)	Common driveways may be approved provided that a permanent written access easement is obtained. The developer must include a plat note and provide dedication documents indicating that maintenance of the joint use driveway shall be the responsibility of the lot owners served by the joint use driveway. If more than three (3) residences are to be served by a single joint use driveway, the following requirements apply:						
				1. The developer must post fiscal surety for the construction of the joint use driveway prior to plat approval and must construct the driveway during the construction of the streets within the same subdivision, or within the term of the fiscal instrument if no public or private streets are to be constructed within the subdivision. The driveway construction shall be subject to City inspection and obtain City approval before fiscal will be released.						
				2. The developer must construct a driveway, designed by a professional engineer, to have an all-weather surface and a pavement structure meeting at least private street standards. The driveway must be designed to have no more than 9 inches of water overtopping the driveway during the one-hundred year storm event as defined in Sec. 25-7-5 of the City Code.						
				The developer must construct a turnaround meeting City of Austin Fire Criteria at the end of the driveway, or no further than 200 feet from the end of the driveway.						
				3. The developer must obtain a written signature from the area fire service providers acknowledging their approval of the proposed joint use driveway.						
				4. The joint use access easement will be required to be dedicated as a public utility easement and may be required to be dedicated as a drainage easement, unless otherwise approved by the Director. In those cases where the joint use access easement is to be combined as a public utility and drainage easement, the access agreement for the driveway must include a clause indicating that the driveway may be used by public service personnel and equipment for servicing public utilities.						
				5. If the developer does not use a restrictive covenant to require homeowners to park all vehicles off the joint use driveway surface, then the joint use driveway surface must be at least 24 feet wide. Otherwise, the driveway surface may be no less than 20 feet wide.						
				6. The developer must erect signs indicating "private driveway" at the driveway entrance and include a plat note indicating that maintenance of the driveway will not be the responsibility of the City.						
			TCM 5.3.1 (I)	Driveways may not exceed 70 percent of roadway frontage.						
			TCM 5.3.1 (J)	Type I driveways are to be located no closer to the corner of intersecting rights of way than 60 percent of parcel frontage or 50 feet, whichever is less. All other driveways are to be located no closer to the corner of intersecting rights of way than 60 percent of parcel frontage or 100 feet; whichever is less. Also, driveways shall not be constructed within the curb return of a street intersection.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 5.3.1 (K)	All Type II and III driveways on undivided arterial streets shall be designed to align with opposing streets or driveways or be offset by a minimum of 120 feet (measured from edge to edge). All Type II and III driveways on undivided collector streets shall be designed to align with opposing streets or driveways or be offset by a minimum of 80 feet (measured from edge to edge). All Type II and III driveways on divided streets shall be designed to align with median breaks or be offset by a minimum of 100 feet (measured from the nose of the median to the nearest edge of the driveway). Alignment of driveways with opposing streets is discouraged for signalized intersections unless approved by the Directors of the Public Works Department and the Transportation, Planning and Sustainability Department. When such a design is approved, the driveway approach may be constructed without an apron and the maximum driveway widths in Table 5-2 may be increased to match the cross-section of the opposing street.						
			TCM 5.3.1 (L)	Premises used as a motor or drive through bank or parking garage may have driveway approaches as approved by the Directors of the Public Works Department and the Transportation, Planning and Sustainability Department. Said approaches shall be utilized for drive-in facilities and shall not be utilized for angle or head-in parking.						
			TCM 5.3.1 (M)	It is desirable to minimize the number of driveways on an arterial street in order to reduce the number of conflict points and facilitate traffic flow. The dimension in Table 5-2 for spacing between driveways should be increased whenever possible so that the number of driveways can be reduced. It is recognized, however, that certain existing tracts may not be able to fully comply with these standards due to limited frontage or other constraints. When compliance with criteria stated in Table 5-2 is precluded due to the location of driveways on adjoining properties, attempts should be made to obtain alternative access where feasible, including joint access driveways, access easements to adjoining properties or access to intersecting streets.						
			TCM 5.3.1 (N)	The throat lengths in Table 5-2 may be reduced, if approved by the Watershed Protection and Development Review Department and the Directors of the Public Works Department and the Transportation, Planning and Sustainability Department, after considering the following factors: 1. Physical constraints on the site, such as existing structures; 2. The impact upon on-site circulation; 3. Shallow lot depths or unusual lot configurations; 4. Existing or potential traffic movements which are unsafe or which have an adverse effect on traffic operations; 5. Traffic volumes and classification on the driveway and the intersecting street; 6. Alternatives to the proposed design; 7. Other information presented by the applicant; and 8. For existing sites, the extent of redevelopment proposed. Throat lengths in excess of those shown in Table 5-2 may be required by the Directors of the Public Works Department and the Transportation, Planning and Sustainability Department if justified by the findings of a traffic impact analysis or queuing study.						
			TCM 5.3.1 (O)	Right-turn deceleration lanes should be considered on approach to driveways when criteria indicated in Figure 5-3 in Appendix H of this manual is met.						
			TCM 5.3.1 (P)	Driveway Grade Breaks. The following has been adapted from the ITE report, Guidelines for Driveway Designs and Locations. Figure 5-4 in Appendix H of this manual reflects acceptable driveway profile intended to limit abrupt changes in grades. These standards should eliminate the need for extremely low speeds and provide adequate vehicle clearance. The value of G1 is limited by shoulder slope or by the presence of a sidewalk within the right of way, but should not exceed ten (10) percent. If this grade exceeds ten (10) percent, then the tangent length shall be a minimum of 50 feet. The value of G2 for commercial and industrial driveways should be limited to six (6) percent and limited to ten (10) percent for multi-family driveways.						
				Where a driveway crosses or adjoins a sidewalk, walkway, or an accessible path of travel (as defined by the Americans With Disabilities Act of 1990) the driveway grade shall be a maximum of two (2) percent, over a minimum throat length of three (3) feet contiguous with the sidewalk, thereby effectively matching the cross slope of the sidewalk or accessible path of travel across the full width of the driveway.						
			TCM 5.3.1 (Q)	Channelized islands for limited movement driveways conforming to Figure 5-6 in Appendix H of this manual may be utilized, provided that the applicant establishes a maintenance agreement with the City.						
				Where a sidewalk, walkway, or an accessible path of travel, (as defined by the Americans With Disabilities Act of 1990) crosses a limited movement driveway island, a minimum four (4) foot wide sidewalk, across the island to provide a continuous, uninterrupted detectable warnings at the boundaries between the sidewalks and the driveways. Comply with applicable requirements of the Sidewalks and Curb Ramps Section 4 of the City of Austin. Transportation Design Criteria Manual.						
			TCM 5.3.1 (R)	As provided in Section 25-6-321 of the Land Development Code, existing driveways may be required to conform with the standards in this manual, including driveway closing, sidewalk and curb construction where appropriate, as a condition of the approval of any application for zoning, rezoning, or site plan, approval. In implementing any change in existing driveways, the Director of Public Works Department shall consider the recommendation of the Watershed Protection and Development Review Department.						
			TCM 5.3.1 (S)	Refer to Section 4.2.3 and 4.2.5 of the Administrative Criteria Manual for the application of driveway standards to developed properties and properties with an approved site plan which are subject to right-of-way condemnation.						
			TCM 5.3.1 (T)	Where divided driveways are proposed, on-site circulation must be designed to minimize driver confusion and reinforce the one-way traffic flow on either side of the driveway median.						
5.3.2 - Criteria for Various Types of Driveway										
			TCM 5.3.2	Tables 5-1 through 5-4 represent criteria for the various driveway classes.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 6 - CLEAR ZONES AND GUARD FENCES										
6.2.0 - CLEAR ZONES										
			TCM 6.2.0	The term "clear zone" is used to describe the generally flat and unobstructed area that is provided beyond the travel lanes. The clear zone may include shoulders. For urban streets, arterials, collectors and local streets, where curbs are used, available area for clear zones may be limited. A minimum offset distance of 18 inches (450 mm) should be provided between the face of curb and obstructions such as utility poles, lighting poles and fire hydrants (Local Urban Streets, Horizontal Clearance to Obstructions, Chapter 5 of AASHTO's, "A Policy On Geometric Design of Highways and Streets, 2001"). Greater offsets should be provided when possible to permit curbside parking. Because most curbs do not have a capability to redirect vehicles, the minimum clear zone distance should be increased as directed by the Engineer or designated representative commensurate with increases in traffic volumes and vehicle speeds.						
6.2.3 - Transportation Guidelines for Landscaping										
6.2.3 (A) - Roadsides										
			TCM 6.2.3 (A)	Safety shall be the foremost consideration in the placement and selection of plant material in the City's right-of-way. The main focus of these guidelines is the prevention of traffic hazards that can be created by the placement of landscaping which restricts the sight distance or creates roadside obstacles. The following addresses acceptable criteria for landscaping and planting on roadsides, within the median, and at intersections. All dimensions specified for trunk diameter and height will include plants at maturity unless it is stated otherwise on the Drawings.						
			TCM 6.2.3 (A)(1)	Trees with = 6 Inches (150 mm) Mature Trunk Diameter. The following reflect minimum setback requirements for existing and newly planted trees. 50 MPH (80 KPH) or Greater Design Speed. • Barrier curbs adjacent to travel lane. Where there are barrier curbs adjacent to the travel lane, a minimum setback of two (2) feet (600 mm) for existing trees and four (4) feet (1.2 meters) for new trees behind the face of the curb shall be provided as shown in Table 6-1and illustrated in Figure 6-1in Appendix H of this manual. • Shoulder adjacent to travel lane. Where there are shoulders adjacent to the travel lane, a minimum setback of ten (10) feet (3 meters) for existing trees and eighteen (18) feet (5.4 meters) for new trees from the edge of the travel lane shall be provided as shown in Table 6-1and illustrated in Figure 6-2 in Appendix H of this manual. 45 MPH (72 KPH) or Less Design Speed. • Barrier curbs adjacent to travel lane. Where there are barrier curbs adjacent to the travel lane, a minimum setback of one and a half (1.5) feet (450 mm) for existing trees and three (3) feet (900 mm) for new trees behind the face of the curb shall be provided as shown in Table 6-1and illustrated in Figure 6-1in Appendix H of this manual. • Shoulders adjacent to travel lane. Where there are shoulders adjacent to the travel lane, a minimum setback of eight (8) feet (2.4 meters) for existing trees and ten (10) feet (3 meters) for new trees from the edge of the travel lane shall be provided as shown in Table 6-1 and illustrated in Figure 6-2 in Appendix H of this manual. • Adjacent to parking lane on local street. A two (2) foot (600 mm) setback distance behind the face of the curb is required where parking is permitted adjacent to the curb on local streets. • Sidewalks adjacent to the curb. Where there are sidewalks adjacent to the curb, no definite setback distance from the sidewalk is required. However, a two (2) foot (600 mm) setback distance is desirable. Trees shall not be allowed in sidewalks less than 12' (3.6 m) in width. Whenever possible sidewalks should be routed around trees on public property or private sidewalk easements if provided.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 6.2.3 (A)(2)	Trees With > 6 Inches (600 mm) Mature Trunk Diameter. The following reflect minimum setback requirements for existing and newly planted trees. 50 MPH (80 KPH) or Greater Design Speed. • Barrier curbs adjacent to travel lane. Where there are barrier curbs adjacent to the travel lane, a minimum setback of six (6) feet (1.8 meters) behind the face of the curb shall be provided for both existing and newly planted trees as shown in Table 6-1and illustrated in Figure 6-1in Appendix H of this manual. • Shoulders adjacent to travel lane. Where there are shoulders adjacent to the travel lane, a minimum setback of thirty (30) feet (9 meters) for both existing and newly planted trees from the edge of the travel lane shall be provided as shown in Table 6-1and illustrated in Figure 6-2 in Appendix H of this manual. • Sidewalks adjacent to the curb. Where there are sidewalks adjacent to the curb, a minimum setback of six (6) feet (1.8 meters) behind the face of the curb shall be provided. All trees are required to be placed a minimum of 2 feet (600 mm) from the edge of sidewalk to the ultimate edge of the mature tree. Trees shall not be allowed in sidewalks less than 12 feet (3.6 m) in width. Whenever possible sidewalks should be routed around trees on public property or private sidewalk easements if provided. When a tree is to be planted in a sidewalk that is 12' (3.6 m) or wider, the minimum setback distance may be reduced when appropriate measures, that are approved by the Engineer or designated representative, are adopted to protect the subgrade and base layer supporting the curb and gutter from tree root growth and water/moisture intrusion from the newly planted tree area. The approval for reduction in the setback distance by the Engineer or designated representative shall be in writing. 45 MPH (72 KPH) or Less Design Speed. • Barrier curbs adjacent to travel lane. Where there are barrier curbs adjacent to the travel lane, a setback of four (4) feet (1.2 meters) for existing trees and six (6) feet (1.8 meters) for newly planted trees behind the face of the curb shall be provided as shown in Table 6-1 and illustrated in Figure 6-2 in Appendix H of this manual. • Shoulders adjacent to travel lane. Where there are shoulders adjacent to the travel lane, a minimum setback of eighteen (18) feet (5.4 meters) for existing trees and twenty-five (25) (7.5 meters) feet for newly planted trees from the edge of travel lane shall be provided as shown in Table 6-1and illustrated in Figure 6-2 in Appendix H of this manual. • Sidewalks adjacent to the curb. Where there are sidewalks adjacent to the curb, a minimum setback of six (6) feet (1.8 meters) behind the face of the curb shall be provided. All trees are required to be placed a minimum of 2 feet (600 mm) from the edge of sidewalk to the ultimate edge of the mature tree. Trees shall not be allowed in sidewalks less than 12 feet (3.6 m) in width. Whenever possible sidewalks should be routed around trees on public property or private sidewalk easements if provided. When a tree is to be planted in a sidewalk that is 12' (3.6 m) or wider, the minimum setback distance may be reduced when appropriate measures, that are approved by the Engineer or designated representative, are adopted to protect the subgrade and base layer supporting the curb and gutter from tree root growth and water/moisture intrusion from the newly planted tree area. The approval for reduction in the setback distance by the Engineer or designated representative shall be in writing.						
			TCM 6.2.3 (A)(3)	Side Slopes. On roadways with shoulders having side slopes of 5 to 1 or steeper, no tree shall be planted or allowed to remain within the recommended clear zone as shown in Table 6-2 and illustrated in Figure 6-3 in Appendix H of this manual. The recommended distances may be adjusted if the trees are located in the ditch or if the average daily traffic volume of the roadway is less than 6000. These adjustments shall be made using the guidelines presented in AASHTO, Guide for Selecting, Locating, and Designing Traffic Barriers , 1977.						
			TCM 6.2.3 (A)(4)	Clearance Height. A minimum clearance height of eight (8) feet (2.4 meters) above the street level must be provided and maintained for all existing and newly planted trees if adjacent to a sidewalk. However, if the limbs of trees overhang the curb line or edge of travel lane of any street, a minimum clearance height of fourteen (14) feet (4.2 meters) is required.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 6.2.3 (A)(5)	Curve Section of Roadways with Shoulder. The setback requirements for landscaping on roadways with shoulders should be increased on the outside of curves as shown in Figure 6-4 in Appendix H of this manual. The required setback varies with the design speed as presented in the AASHTO, Guide for Selecting, Locating, and Designing Traffic Barriers , 1977. • 45 mph (72 KPH) or Less Design Speed. Where the horizontal curve of the roadway through lanes is designed with a 45 mph (72 KPH) or less design speed, the setback distance should be increased from a point one hundred fifty (150) feet (45 meters) beyond the point of curvature (PC) to a point one hundred fifty (150) feet (45 meters) beyond the point of tangency (PT) using the formula shown in Figure 6-4 in Appendix H of this manual. • 50 mph (80 KPH) or Greater Design Speed. Where the horizontal curve of the roadway through lanes is designed with a 50 mph (80 KPH) or greater design speed, the setback distance should be increased from a point two hundred eighty (280) feet (84 meters) beyond the point of curvature (PC) to a point two hundred eighty (280) feet (84 meters) beyond the point of tangency (PT) using the formula shown in Figure 6-4 in Appendix H of this manual. • On curves, the sight distance requirements presented in Section 1.3.1.C.6 of this manual must be maintained. Only low growing shrubs not greater than two (2) feet (600 mm) in height or small plants shall be considered in areas where horizontal sight distance is a factor.						
6.2.3 (B) - Median										
			TCM 6.2.3 (B)(1)	Lateral Landscaping Placement Requirements. All planting (existing and new trees) in the median shall comply with the same lateral placement requirements as set forth in the Roadsides Section (6.2.3.A).						
			TCM 6.2.3 (B)(2)	Longitudinal Landscaping Placement Requirements. • All plantings, except ground covers with no more than twelve (12) inches (300 mm) in height, shall be located greater than seventy-five (75) feet (22.5 meters) from the end of the median nose as shown in Figure 6-5 in Appendix H of this manual. • Ground covers with no more than twelve (12) inches (300 mm) in height and trees with a mature trunk diameter of six (6) inches (150 mm) or less is recommended in the area from a point seventy-five (75) feet (22.5 meters) to one hundred fifty (150) feet (45 meters) from the nose of the median (see Figure 6-5 in Appendix H of this manual). All trees shall be maintained to provide an eight (8) foot (2.4 meters) minimum foliage clearance height. A minimum 15 feet (4.5 meters) spacing (center-to-center) shall be provided for all trees. • In the area beyond 150 feet (45 meters) from the nose of the median, any planting shall be allowed as long as the minimum sight distance requirements are provided. Although not required, maintaining an eight (8) foot (2.4 meters) or greater clearance height is desirable.						
6.2.3 (C) - Intersection										
			TCM 6.2.3 (C)	No landscaping of any type shall obstruct vision within the sight triangle as defined by the shaded area in Figure 6-6 in Appendix H of this manual. The criteria for a sight triangle is presented in Section 1.3.1.C.6 of this manual. These requirements will apply to any material from a height of two (2) feet (600 mm) to a clearance height of eight (8) feet (2.4 meters) above the top of curb, including, but not limited to full grown trees, full-grown shrubs, fences, structures, any signs except traffic control signs, etc.						
6.2.3 (D) - General Requirements										
			TCM 6.2.3 (D)(1)	Railroad Crossing. Only low growing shrubs no greater than a height of two (2) feet (600 mm) and small trees are recommended within two hundred fifty (250) feet (75 meters) of a railroad crossing to assure adequate sight visibility.						
			TCM 6.2.3 (D)(2)	School Crossing. Only small trees and low growing shrubs no greater than two (2) feet (600 mm) in height are recommended within one hundred fifty (150) feet (45 meters) of a school crossing to assure pedestrian safety by not restricting the sight visibility of motorists.						
			TCM 6.2.3 (D)(3)	Traffic Control Devices. No vegetation from a height of seven (7) feet (2.1 meters) to a height of fourteen (14) feet (4.2 meters) is recommended within twenty-five (25) feet (7.5 meters) of any existing or proposed traffic signal, regulatory or warning signs, or other traffic control devices.						
			TCM 6.2.3 (D)(4)	Right-of-Way. Where limited right-of-way or the necessity for planting would result in less clearance, all factors in a specific area should be weighed to decide if a special exception is justified. Such an exception must be approved by the Director of the Public Works Department or the Director's designee.						
6.2.3 (E) - General Note										
			TCM 6.2.3 (E)	Any landscaping that is not in compliance with the requirements stated in this criteria or has been planted without an approved License Agreement from the City shall be removed by the sponsoring organization or individual at their cost. The required License Agreement may be obtained from the Real Estate Division of the City of Austin Public Works Department.						
6.2.3 (F) - Maintenance Requirements										
			TCM 6.2.3 (F)	1. The adjacent property owner(s) or civic organization will be expected to maintain the landscaping located between curb or edge of pavement and the property line. The adjacent property owner or civic organization shall also be responsible for trimming tree limbs from trees located on private property, which cause an obstruction of the right-of-way. 2. The City reserves the right to prune or remove any vegetation, at the cost of the sponsoring organization or individual, as determined necessary for visibility and ease of maintenance.						
6.3.0 - GUARD FENCES AND RAILING										
6.3.1 - Pedestrian and Separator Railing										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 6.3.1 (A)	This section of the Transportation Criteria Manual (TCM) describes the requirements of the City of Austin relative to pedestrian and separator railing. In order to maintain consistency and safety to the general public, the TxDOT "Bridge Railing Manual" (BRM, see http://manuals.dot.state.tx.us/dynaweb/colbridg/rlg) is hereby included by reference as a requirement within the jurisdiction of the City of Austin. The City of Austin's TCM will provide supplementary and complementary information and requirements to the TxDOT document. When there are differences between BRM and TCM, the more restrictive or conservative of the two shall be required.						
			TCM 6.3.1 (B)	The "AREA OF INFLUENCE" for pedestrian railing purposes shall be defined as the five-foot (5') strip of area parallel and adjacent to sidewalks, on either or both sides, if applicable.						
			TCM 6.3.1 (C)	On roadway or bridge sections, if any portion of the area of influence will include side slopes (interim or final) steeper than three (3) horizontal to one (1) vertical, then a pedestrian railing shall be required.						
			TCM 6.3.1 (D)	On roadway or bridge sections, if there is or will be a vertical dropoff of more than two (2) inches anywhere in the area of influence (exclusive of curb and gutter), then a pedestrian railing shall be required.						
			TCM 6.3.1 (E)	For projects proposing the installation of publicly maintained improvements in the right-of-way or easements, pedestrian railing shall be one of the following Texas Department of Transportation (TxDOT) standard drawings: "Pedestrian Rail, Type PR1"; "Pedestrian Rail, Type PR2" or a railing approved by the Engineer or designated representative. Responsibility for the appropriate selection and application of these standard railings remains with the licensed professional engineer who specifies them.						
			TCM 6.3.1 (F)	For bridges with a design or operating speed above forty-five (45) mph, a separator railing is required to shield pedestrians from vehicles. In order to maintain comsistency and safety to the general public, refer to the TxDOT "Bridge Railing Manual" (BRM, at http://manuals.dot.state.tx.us/dynaweb/colbridg/rlg), Chapter 5, Section 2, "Bridge Railing for Pedestrians".						
			TCM 6.3.1 (G)	Any bridge with a design or operating speed of forty-five (45) mph or less shall be considered a "low speed" facility and shall generally not require a separator railing shielding pedestrians from vehicles.						
6.3.2 - Bridge Railing										
			TCM 6.3.2 (A)	This section of the Transportation Criteria Manual (TCM) describes the requirements of the City of Austin. In order to maintain consistency and safety to the general public, the TxDOT "Bridge Railing Manual" (BRM, see http://manuals.dot.state.tx.us/dynaweb/ colbridg/rlg) is hereby included by reference as a requirement within the jurisdiction of the City of Austin. The City of Austin's TCM will provide supplementary and complementary information and requirements to the TxDOT document. When there are differences between BRM and TCM, the more restrictive or conservative of the two shall be required.						
			TCM 6.3.2 (B)	Bridge railing shall be as defined in the TxDOT BRM. For construction by site permit or for new subdivision construction, bridge railing shall be required at all bridges. For capital improvement projects on any roadways, bridge railing shall be required for all bridges. Responsibility for the appropriate use of TxDOT standard bridge railings remains with the licensed professional engineer who specifies them.						
			TCM 6.3.2 (C)	When a bridge railing is to be specified on a bridge with a pedestrian walkway and a combination railing is deemed inappropriate (e.g. design speed too high for combination railing), then the pedestrian railing shall be used in conjunction with a non-combination bridge railing.						
			TCM 6.3.2 (D)	When transitions from bridge railing on the bridge to traffic railing on the roadway cannot be accommodated with metal beam guard fence (e.g. driveways), then suitable end protection (energy absorbing devices) shall be specified for the exposed ends of the bridge railing.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 7 - BIKEWAYS										
7.2.0 - TYPES AND FUNCTIONAL CHARACTERISTICS										
7.2.1 - Bikeways										
			TCM 7.2.1	Bikeways identified in the City's Bikeway Plan are to be designed to accommodate the necessary criteria as stated in this section. In most circumstances, bicycles share the roadway with other vehicles. An additional three (3) to five (5) feet of pavement width should be used to accommodate cyclists on major collectors and arterials. A 15 foot outer lane should be used where motor vehicles and bicycles share the outside lane with no special lane markings for the bicycle. Bicycle lanes, however, require the addition of five (5) feet measured from outer lane line to face of curb. Bicycle lanes should be limited to roadways in which parking is prohibited.						
7.2.2 - Types of Bikeways										
			TCM 7.2.2 (A)	Type I Bikeway "Off-Road Bikeway" or "Bicycle Path." The bicycle path is used primarily for recreational purposes. It should be located in a park-type setting as far from the roadway as practicable. Intersections with roadways should be minimized and signed to avoid bicycle-motorist conflicts. If the path must be in the roadway right of way there should be a minimum distance of three (3) feet and desirable five (5) feet separating the path from the roadway. Separation from pedestrians is desirable where feasible. Figure 7-1 in Appendix H of this manual shows typical widths and clearances for bike paths.						
			TCM 7.2.2 (B)	Type II Bikeway "Bicycle Lane." The bicycle lane is located within the vehicular roadway in the outside lane and is intended for the preferential or exclusive use of bicycles. The bicycle lane is usually five (5) feet wide and is delineated by means of pavement markings. Typically, bicycle lanes should not be used on roadways which allow parking unless designed to accommodate both uses. The lane should cease far enough from intersections to allow the cyclist to merge into the traffic flow in order to avoid conflict with vehicles turning right. Bicycle lanes should always be one (1) way because of the hazards associated with opposing directions of traffic. Figure 7-2 in Appendix H of this manual shows a typical bicycle lane design with and without parking.						
			TCM 7.2.2 (C)	Type III Bikeway "Bicycle Compatible Street." Most cyclists use streets that have no special markings for bicycles. Neighborhood and residential collectors are often compatible for bicycle use without additional pavement. Collectors and arterials used by commuters and experienced recreational cyclists require a minimum 12 1/2 feet outer lane for collectors and 13 1/2 feet outer lane for arterials measured from outer lane line to the top of gutter for the cyclist to share the lane with a motorist. Signs may be used to define the street as a bicycle route as determined by the Director of the Transportation, Planning and Sustainability Department. Figure 7-3 in Appendix H of this manual shows a typical bicycle street.						
7.3.0 - GEOMETRIC DESIGN CRITERIA										
7.3.1 - Design Criteria for Type I Bikeways										
			TCM 7.3.1 (A)	Design Speed. The speed that a cyclist travels is dependent upon the geometric features of the traveled way, type of bicycle, weather conditions and physical condition of the rider. In determining the design speed of a bikeway, the geometric features of curvature, superelevation, grade and width of traveled way are used to produce a traveling speed that is at least as high as the preferred speed of the faster travelers. Nearly all bicyclists travel within a speed range of seven (7) to 20 mph with an 85th percentile speed of 15 mph. Design speeds should usually be 15 mph and on long downgrades, speeds of 20 mph or more may be considered. For bike lanes and bike streets, the design speed necessary to serve motor vehicle operation will adequately serve bicycle traffic needs.						
			TCM 7.3.1 (B)	Curvature. For a given design speed of a bikeway, consideration should be given to the minimum radius of curvature. Where bicycle lanes and bike streets follow the roadway alignment, the curvatures designed to accommodate the motor vehicles will be more than adequate for bicycles. However, care should be taken for bikeways not paralleling roadways to insure that the minimum radius of curvature is provided to permit unbraked turns at the design speed. Figure 7-4 in Appendix H of this manual shows a graph for determining the curvature and superelevation for various bikeway design speeds. It should be noted that the superelevation should never exceed 0.12 feet per foot. Where the radius of curvature is less than 100 feet, it is advisable to widen the bikeway in order to increase the lateral space required by the cyclist as he leans to the inside of a turn. Figure 7-5 in Appendix H of this manual shows the methodology used in determining the necessary widening to compensate for lean. The amount of widening should be limited to a maximum of four (4) feet.						
			TCM 7.3.1 (C)	Grade. Whether or not a bikeway is favorable to cyclists is largely dependent upon the grade and alignment of the bikeway. The amount of energy a cyclist expends in using a bikeway will affect the usage of the bikeway. Therefore, the grades should be kept to a minimum. A bikeway grade should not exceed ten (10) percent. Figure 7-6 in Appendix H of this manual shows the desirable gradients for various lengths of grade. Due to Austin's topography, however, exceptions may be warranted in some instances. Also associated with design speed is stopping distance. Figure 7-7 in Appendix H of this manual gives the stopping sight distance for various speeds and related grades. The stopping sight distance for crest vertical curves can be determined from Figure 7-8 in Appendix H of this manual.						
7.3.2 - Design Criteria for Type II and Type III Bikeways										
			TCM 7.3.2 (A)	Clearance. In order to prevent encroachment conflicts, adequate vertical and horizontal clearances must be provided. The minimum vertical clearance for overhead obstructions is eight (8) feet. The minimum lateral clearance to an obstruction from the edge of the bikeway is three (3) feet. These clearances are illustrated in Figure 7-1 in Appendix H of this manual.						

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TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 7.3.2 (B)	Drainage Grates. For bicycle lanes and bicycle streets, the existing street drainage inlet grates may prove to be a hazard. Drainage inlet grates with openings large enough to entrap narrow bicycle wheels should be prohibited in future construction. Suitable designs include, but are not limited to diagonal bars at a 45 degree angle, slotted grates with cross bars or slanted bars transverse to traffic. Long slotted grates with wide (one (1) inch or more) openings parallel to traffic should not be used on streets.						
			TCM 7.3.2 (C)	Railroad Grade Crossings. The road-surface height should be within one (1) inch of the track height and the slot between road and track should be less than three (3) inches wide. The cyclist needs to cross the tracks at a perpendicular angle. It is desirable that the track angle be no more than 20 degrees from the roadway to avoid the cyclist zigzagging into traffic.						
			TCM 7.3.2 (D)	Bicycle Ramps. Figure 7-9 in Appendix H of this manual depicts standard bicycle ramp design.						
			TCM 7.3.2 (E)	Intersections and Crossings. The greatest number of conflicts between motorists, bicyclists, and pedestrians occur at intersections and crossings. Elimination of conflicts where bicycle paths cross a roadway can be accomplished by providing a grade separation, but this is not always possible or economically feasible. Appropriate signs are necessary to regulate roadway users and path users at intersections between roadways and bicycle paths. Some special treatment is required at intersections to minimize conflicts between traffic lanes and bicycle lanes (see Figure 7-10 in Appendix H of this manual for channeling at intersections).						
7.3.3 - Bicycle Signs and Pavement Markings										
			TCM 7.3.3	In order to ensure that safe and efficient operation of a bikeway, there must exist adequate signs and markings to warn bicyclists of hazardous conditions or obstacles, to delineate bicycle rights of way, to exclude undesired vehicles from the route and to warn motorists and pedestrians of the presence of bicycle traffic. The standard signs to be used on bikeways are shown in Figure 7-11 in Appendix H of this manual. The Texas Manual on Uniform Traffic Control Devices should be consulted for additional signing and pavement marking options and regulations.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 8 - TRAFFIC CONTROL										
8.2.0 - PAVEMENT MARKINGS										
			TCM 8.2.0	In general, Part III of the 1980 Texas Manual on Uniform Traffic Control Devices should be consulted regarding pavement markings. Figures 8-1 through 8-4 identify policies as set forth by the City of Austin regarding specific marking widths, placements and spacings.						
8.3.0 - SIGNING										
			TCM 8.3.0	The 1980 Texas Manual on Uniform Traffic Control Devices should be referred to in regard to the type and placement of signs on proposed streets (see Figure 8-5 in Appendix H of this manual for City of Austin policy regarding "end of school zone" signing).						
8.4.0 - SIGNALIZATION										
			TCM 8.4.0	In identifying intersections for signal installations, the 1980 Texas Manual on Uniform Traffic Control Devices should be referenced for warrants. The City of Austin typically permits timber pole installations for temporary use only. Mast arm installation shall be used for all permanent pole locations. The City of Austin Standards and City of Austin Standard Specifications identify materials, size and makeup of permissible equipment. NOTE: In an effort to provide for optimization of signal timing and signal progression, it is generally desirable to maintain spacings in excess of ¼ mile.						
8.5.0 - TEMPORARY TRAFFIC CONTROL ZONES										
			TCM 8.5.0	Any person who undertakes to perform any activity upon, in, under, above or about any public street, road, alley, sidewalk or any portion of the public right of way, shall use: barricades, warning signs and all other traffic control devices and procedures about the area during the duration of the activity within the public right of way. All devices shall be of the type and used in the manner required by the current edition of the Texas Manual on Uniform Traffic Control Devices and as indicated in this section. The provisions set forth in this section shall apply to all individuals performing activities on or adjacent to any road, street, alley or sidewalk in the City of Austin and includes: • All City employees. • Contractors employed by the City. • Public Utility Companies. • Contractors employed by Utility Companies. • All others whose work affects, either directly or indirectly, the free flow of vehicular, bicycle or pedestrian traffic within the city limits of Austin.						
8.5.1 - Fundamental Principles of Temporary Traffic Controls										
			TCM 8.5.1 (A)	Training Each person whose actions affect temporary traffic control zone safety, from upper-level management personnel through field personnel, should receive training appropriate to the job decisions each is required to make. Only those who are trained in safe traffic control practices, and who have a basic understanding of the principles established by applicable standards and regulations (including those in this section and the TMUTCD), should supervise the selection, placement, and maintenance of traffic control devices in work and incident management areas.						
			TCM 8.5.1 (B)	Traffic Safety Traffic safety in temporary traffic control areas should be an integral and high-priority element of every project from planning through design and construction. Similarly, maintenance and utility work should be planned and conducted with the safety of motorists, pedestrians, and workers kept in mind at all times. Formulating specific plans for incident management traffic control is difficult because of the variety of situations that can arise. Nevertheless, plans should be developed in sufficient detail to provide safety for motorists, pedestrians, workers, and enforcement/emergency personnel and equipment. A traffic control plan, in detail appropriate to the complexity of the work project or incident, should be prepared and understood by all responsible parties before the site is occupied.						
			TCM 8.5.1 (C)	Mobility Traffic movement should be inhibited as little as practicable. Frequent and abrupt changes in geometrics should be avoided and the activities should be scheduled during off-peak hours to reduce traffic congestion.						
			TCM 8.5.1 (D)	Guidance Drivers and pedestrians should be guided in a clear and positive manner while approaching and traversing the temporary traffic control zone. Adequate warning, delineation, and channelization by means of proper pavement marking, signs, or use of other devices should be provided where appropriate to assure the driver and pedestrian of positive guidance before approaching and while passing through the area. Signs, pavement markings, and other traffic control devices that are inconsistent with intended travel paths should be removed.						
			TCM 8.5.1 (E)	Inspection To ensure acceptable levels of operation, routine inspection of traffic control elements should be performed. Temporary traffic control areas should be carefully monitored under varying conditions of traffic volume, light, and weather to ensure that traffic control measures are operating effectively and that all devices used are clearly visible, clean, and in good repair. Inspections should ensure that all traffic control measures implemented on the project are necessary, conform to the traffic control plan, and are effective in providing safe conditions for motorists, pedestrians, and workers.						
8.5.2 - Procedures										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 8.5.2 (A)	Any person wishing to perform any work within the public right-of-way must obtain the proper permit(s) prior to starting such work. In order to insure proper advance planning and coordination, except in emergency situations as noted in section 8.5.2 C.1, all requests for temporary traffic controls require advance notice be given to the Transportation Division of the Transportation Planning and Sustainability Department. Written notification shall be given on forms provided by the city for all temporary traffic control zones. The advance notification requirements depend on the type of street the activity will occupy and the duration of the activity. The following minimum advance notifications are required for all temporary traffic control zones. Any person wishing to setup temporary traffic controls in the area bounded by Martin Luther King Jr. Boulevard, Chicon Street (to the river), IH 35, Oltorf Street, and MoPac Boulevard (from Barton Skyway to just north of Enifield Road) must submit requests on forms provided by the city. The Transportation Division will review and coordinate the requests and inform the applicant of dates the activity may proceed. In all other areas of the city the following notifications requirements shall apply. • Long-term stationary - Work that occupies a location more than 3 days. Two (2) weeks advance notice for all roadways and detours. • Intermediate-term stationary - Work that occupies a location from overnight to 3 days. Three (3) working days advance notice for Arterial and Collector streets, one (1) working day advance notice for Residential streets and two (2) weeks for detours. • Short-term stationary - Daytime work that occupies a location from 1 to 12 hours. Three (3) working days advance notice for Arterial and Collector streets and two (2) weeks for detours. • Short, Duration - Work that occupies a location up to 1 hour. Three (3) working days advance notice for Arterial streets. • Mobile - Work that moves intermittently or continuously. Three (3) working day advance notice for all streets. When arterial streets are to be completely close, advance warning signs shall be installed a minimum of one (1) week before the closure. The size, location and wording shall be determined on a case by case basis. For the purpose of this section; Arterial streets are any street with striping to provide two-lanes or more of traffic in one direction or streets located in the Central Business District (Figure 8-6). Collector streets are any street connecting two (2) or more arterial streets. All others are considered Residential streets.						
			TCM 8.5.2 (B)	Incident Management The primary function of traffic control at an incident area is to move traffic safely and expeditiously through or around the incident. An incident is an emergency work activity, major traffic accidents, natural disaster or special event. 1. Emergency Operations Emergency operations are defined under Section 15-2-1 of the City Code as any operations or repairs necessary to prevent imminent damage or injury to the health or safety of the public or any person. During such emergencies, the ability to install proper traffic control may be greatly reduced, and any devices on hand should be used for the initial response as long as they do not present a hazard themselves. If the incident is prolonged, standard temporary traffic control procedures and devices shall be used. Procedures for emergencies are as follows: a. Provide temporary traffic control with devices on hand such as cones, vehicles, flaggers or police officers to guide motorist and pedestrians around the incident. b. During normal work hours, immediately contact the Transportation Division of the Transportation Planning and Sustainability Department at 974-2217to report the location of the emergency. During non-business hours contact the Electric Department dispatch at 322-9500. The Transportation Division shall determine what, if any, additional temporary traffic controls will be needed at the site. c. Provide proper temporary traffic control as required to complete the activity. 2. Special Events Special events such as parades, sporting events and nonconstruction street closures for filming and street events, can be planned for and coordinated. Therefore, proper temporary traffic control shall be provided for these events. Procedures for special events are as follows: a. Applicants shall make application to the Austin Police Department for parade permits as required under Section 8-11 of the Austin City Code or to the Transportation, Planning and Sustainability Department for Nonconstruction Street Closure permits as required under Section 15-2 of the Austin City Code. b. The applicant shall submit a traffic control plan for approval to the Transportation Division of the Transportation, Planning and Sustainability Department, which indicates the proposed route of the parade and/or the streets to be closed, and the locations of all temporary traffic control devices to be used during the event. c. The Transportation Division shall determine if the proposed traffic control plan will not interfere with any other previously planned activities and if any temporary traffic control devices other than police officers shall be required for the event. d. If temporary traffic control devices are required for the event, the applicant shall provide a letter from a professional barricade company stating that all devices to be used during the event shall be set up and removed by them in accordance with the current addition of the Texas Manual On Uniform Traffic Control Devices and this section.						
8.5.3 - Requirements										
8.5.3 (A) - Time Restrictions and Special Requirements										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 8.5.3 (A)(1)	Daily lane closures on arterial roadways shall not be permitted during the hours of 6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m. Monday through Friday, except in emergencies as defined in Section 8.5.2-C1 or situations where it can be demonstrated that traffic flow or safety will not be adversely affected. Traffic lanes approved for daily closures which are not occupied by activities during the hours of 11:30 a.m. to 1:30 p.m. shall be opened to allow traffic to flow freely.						
8.5.3 (B) - Traffic Control Plan										
			TCM 8.5.3 (B)	A Traffic Control Plan (TCP) describes temporary traffic controls to be used for facilitating vehicle and pedestrian traffic through a temporary traffic control zone. The plan may range in scope from being very detailed, to merely referencing typical drawings contained in the TMUTCD, this chapter, or specific drawings contained in contract documents. The degree of detail in the TCP depends entirely on the complexity of the situation, and TCPs should be prepared by persons knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed. If a traffic setup shown on standard detail sheets 804S-1 Lane Closures, Sidewalk Closures and Shifting Traffic or 804S-2 Detours and Flagging Operations, does not address the traffic controls needed for a specific site, then a Professional Engineer registered in the State of Texas, must prepare a TCP specific to the site. A standard detail or TCP which shows the proposed method of warning, directing and guiding traffic, shall be approved by the Transportation, Planning and Sustainability Department, prior to installing any devices on the right-of-way, the following information shall be provided with the standard detail or TCP: 1. Activity location, right-of-way and curb-lines, and existing traffic controls of the street sought to be closed or blocked. 2. Areas of the street to be closed or blocked. 3. Proposed pedestrian and vehicular detour routes. 4. Location and type of all barricades, signals, signs, channelizing devices, pavement markings and other warning devices to be used to direct traffic. 5. A schedule of construction showing each phase of work, start and completion dates for each phase, and proposed work hours. Any changes in the plan shall be approved by the Transportation Division of the Transportation, Planning and Sustainability Department in advance of the change.						
8.5.3 (C) - Existing Traffic Control Devices										
			TCM 8.5.3 (C)(1)	Traffic Signals If maintenance or construction activities require excavation in the vicinity of a signalized intersection, the Traffic Signals Section of the Transportation Division of the Transportation, Planning and Sustainability Department shall be notified at least three (3) working days prior to commencing work activities. Any damage to the traffic control signal or associated equipment, resulting from the maintenance or construction activity, will be repaired by the Transportation, Planning and Sustainability Department and the cost of the repairs shall be paid by the contractor, utility, agency or department causing the damage.						
			TCM 8.5.3 (C)(2)	Traffic Control and Street Name Signs All traffic control or street name sign posts adjacent to construction or maintenance work site shall be protected from damage. If removal of such signs is necessary, the Signs and Marking Section of the Transportation Division of the Transportation, Planning and Sustainability Department will perform the work. All regulatory and/or warning signs that are applicable to traffic shall remain visible to the motorist. The contractor shall relocate existing signs on to temporary mounts as needed to facilitate construction activities. Any sign or support damaged by the construction or maintenance activity will be repaired by the Transportation, Planning and Sustainability Department and the cost of such repairs will be paid by the contractor, utility, agency or department causing the damage.						
			TCM 8.5.3 (C)(3)	Parking Meters All metered parking spaces shall be maintained open for parking at all times unless other actions are authorized by the Transportation Division of the Transportation, Planning and Sustainability Department and appropriate permits for the use of the city right-of-way have been obtained. Parking meter post removal, relocation or installation will be done by the Parking Meter Section of the Transportation Division of the Transportation, Planning and Sustainability Department. Three (3) working days advance notification is required when meters need to be removed or installed. The contractor shall be required to provide barricades and no parking signs to block off parking spaces.						
8.5.3 (D) - Property Access										
			TCM 8.5.3 (D)(1)	Access to public and private property Local access shall be maintained to all properties on all streets during construction and maintenance activities. The Traffic Control Plan (TCP) shall provide for access to all sidewalks, business and residence entryways and driveways. If access cannot be maintained, the contractor, utility, department or supervisor shall notify the affected property owner, resident or tenant a minimum of one (1) week in advance of the pending work unless the work is of an emergency nature. Access shall, in all cases, be restored as soon as possible. To ensure this, the contractor or work crew shall only perform the work affecting the restricted access areas while access is not maintained.						
			TCM 8.5.3 (D)(2)	Access to Emergency Service Facilities Access to fire stations, hospitals, EMS facilities and police stations shall be maintained at all times. If work activities require some access restrictions or access cannot be maintained, the contractor or work crew shall provide a minimum of two (2) week notice, to the affected emergency service facility prior to commencing the work, unless the work is of an emergency nature. For emergencies, the contractor, utility, department or supervisor shall notify the occupant of the emergency service facility of the need to restrict their access and shall as soon as possible restore access to the property with steel plates or temporary pavement repairs.						
8.5.3 (E) - Steel Plates										
			TCM 8.5.3 (E)	Where traffic must cross trenches, the contractor shall provide suitable bridges. For trenches less than 450 millimeters (18 inches) in width, sheet steel plates having a minimum thickness of 19 millimeters (¾ inch) shall be used. For trench widths from 600 millimeters (24 inches) to 1.8 meters (72 inches), sheet steel plates having a minimum thickness of 25 millimeters (1 inch) shall be used.						

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				The thickness of plates for trench widths exceeding 1.8 meters (72 inches) shall be established in an analysis completed by a Licensed Professional Engineer registered in the State of Texas.						
				The sheet steel plating may be installed in a "surface placement" or "flush placement" configuration. The type of steel sheet plating installation shall be based on the street classification, posted speed and/or anticipated length of time in service. Longer-term plating installations and/or plating installations in high-trafficked portions of roads/streets shall include consideration of "flush placement" of the plates (i.e. milling of the pavement surface is undertaken to insure that the top-of-plate elevations essentially match the existing elevations of adjacent pavement surfaces) to minimize the impact on vehicular traffic.						
				In either installation configuration, the sheet steel plates shall extend beyond the edge of the trench a minimum of 450 millimeters (18-inches) but no more than 750 millimeters (30 inches) on both sides. Transition ramping shall be provided for all "surface placement" configurations (Standard Detail 804S-4) by the installation of cold mix asphalt on all sides.						
				For safe traverse of plating installations during the term of service, the top surface of the installed plates shall be flat and free of any clips, chains, attachments, weldments or surface irregularities.						
				When the plate dimension in the direction of traffic flow exceeds 1.8 meters (6 feet), a non-skid coating, approved by the Engineer or designated representative, shall be applied to the entire surface area of all plates.						
				Additional methods of securing plates may be required depending on field conditions. The contractor should avoid using a long series of plates that run parallel to traffic wheel paths. If allowed the length of a series of plates that run parallel to traffic wheel paths shall not exceed 9 meters (30 feet).						
				The use of steel plates shall be approved by the Transportation Division, Planning and Sustainability Department or successor department prior to construction. See City of Austin Standard Detail No. 804S-4 for additional requirements and information.						
8.5.3 (F) - Identification of Temporary Traffic Control Devices										
			TCM 8.5.3 (F)	Temporary traffic control devices that are placed in public right of ways shall be marked or affixed with a sticker, clearly identifying the name, address and/or telephone number of the individual responsible for the device.						
8.5.3 (G) - Responsibility of Traffic Control										
			TCM 8.5.3 (G)	It is the responsibility of the permit-holder for private activities or the job supervisor for public projects to ensure that all policies, procedures and requirements set forth in this manual and the Texas Manual on Uniform Traffic Control Devices (TMUTCD) are met. Each work site shall have a designated competent person responsible and available on the project site or in the immediate area to ensure compliance with the traffic control plan and the provisions of this manual. The competent person shall be required to demonstrate sufficient training in traffic control and competency in setting traffic control devises. Training Certificates shall be provided to the Transportation Division of the Transportation, Planning and Sustainability Department prior to setting any traffic control devices. Training certificates for competent persons shall be good for four (4) years from the date of training. After such time the competent person must show that additional training or re-certification has been achieved in order to maintain competent person status. Competent persons who continually fail to demonstrate competence in setting temporary traffic controls shall be required to provide additional documentation of training.						
8.5.4 - Temporary Traffic Control Elements										
8.5.4 (A) - Temporary Traffic Control Components										
			TCM 8.5.4 (A)(1)	Advance Warning Area In the advance warning area, drivers are informed of what to expect. The advance warning may vary from a single sign or flashing lights on a vehicle to a series of signs in advance of the temporary traffic control zone transition area. The true test of adequacy of sign spacing is to evaluate how much time the driver has to perceive and react to the condition ahead. In this regard, the use of speed, roadway condition, and related driver expectancy must be considered in order to derive a practical sign spacing distance. As a guide, Table 8-2 in Section 8.5.6 should be used in conjunction with consideration of actual or anticipated field conditions. Advance warning is normally not needed when the activity area is sufficiently removed from the driver's path that it does not interfere with traffic.						
			TCM 8.5.4 (A)(2)	Transition Area When redirection of the driver's normal path is required, traffic must be channelized from the normal path to a new path. This redirection is intended to occur at the beginning of the transition area. In mobile operations, this transition area moves with the work space. Transition areas usually involve strategic use of tapers, which (because of their importance) are discussed in more detail in Section 8.5.4.B.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 8.5.4 (A)(3)	Activity Area The activity area is an area of roadway where the work takes place. It is composed of the work space and the traffic space, and may contain one or more buffer spaces. a. Work Space The work space is that portion of the roadway closed to traffic and set aside for workers, equipment, and material. Work space may be fixed or may move as work progresses. Work spaces are usually delineated by channelizing devices or shielded by barriers to exclude traffic and pedestrians. b. Traffic Space The traffic space is the portion of the roadway in which traffic is routed through the activity area. c. Buffer Space The buffer space is an optional feature in the activity area that separates traffic flow from the work activity or a potentially hazardous area and provides recovery space for an errant vehicle. Neither work activity nor storage of equipment, vehicles, or material should occur in this space. Buffer spaces may be positioned longitudinally and laterally, with respect to the direction of traffic flow. i. Longitudinal Buffer Space The longitudinal buffer space may be placed in the initial portion of a closed lane in advance of the work space, as shown in Figure 8-7. When a protection vehicle is placed in advance of the work space, only the space upstream of the vehicle constitutes the buffer space. The longitudinal buffer space, as depicted in Figure 8-8, should be used where a closed lane separates opposing traffic flows. Typically, it is formed as a traffic island and defined by channelizing devices. A guide for the length of longitudinal buffer space is shown in Table 8-1. ii. Lateral Buffer Space A lateral buffer space may be used to separate the traffic space from the work space, as shown in figure 8-7, or a potentially hazardous area, such as an excavation or pavement drop-off. A lateral buffer space also may be used between two (2) travel lanes, especially those carrying opposing flows. The width of the lateral buffer space should be determined by good engineering judgment.						
			TCM 8.5.4 (A)(4)	Termination Area The termination area is used to return traffic to the normal traffic path. The termination area extends from the downstream end of the work area to the END ROAD WORK signs, if posted. Conditions may be such that posting of the END ROAD WORK signs is not helpful. For example, the END ROAD WORK signs should normally not be used if other temporary traffic control zones begin within 1.6 kilometers (a mile) of the end of the work space in rural areas, or about 400 meters (a quarter-mile) within urban areas. For normal daytime maintenance operations, the END ROAD WORK sign is optional.						
8.5.4 (B) - Tapers										
			TCM 8.5.4 (B)	A common important element of a temporary traffic control zone is a roadway taper. Tapers may be used in both the transition and termination areas. Tapers are created using a series of channelizing devices or pavement markings placed to move traffic out of or into its normal path. Whenever tapers are to be used near interchange ramps, crossroads, curves, or other influencing factors, it may be desirable to adjust the length of tapers. Longer tapers are not necessarily better than shorter tapers (particularly in urban areas characterized by short block lengths, driveways, etc.), because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. The real test of taper length involves observation of driver performance after traffic control plans are put into effect. Types of taper lengths are presented in Table 8-3. The suggested maximum space between devices in a taper is presented in table 8-4 (The spacing in feet approximates the speed in miles per hour (i.e.: a 55 mph speed road should normally have devices space). Types of tapers are shown in Figure 8-8.						
			TCM 8.5.4 (B)(1)	Merging Taper A merging taper requires the longest distances because drivers are required to merge with an adjacent lane of traffic at the prevailing speed. The taper should be long enough to enable merging drivers to adjust their speeds and merge into a single lane before the end of the transition. For freeways, expressways, and other roadways having a speed of 45 mph or greater, the minimum length for merging tapers should be computed by a formula L = W × S. For residential, urban, and other streets with speeds less than 45 mph, the formula L = (W × S)/60 should be used. Under either formula, L is the taper length in feet, W is the lateral shift of traffic due to the partially or fully closed lane (in feet), and S is the posted speed, the off-peak 85th percentile speed prior to work starting or the anticipated operating speed. The formula L = (W × S)/60 is used for speeds less than 45 mph because slower traffic can merge safely in a shorter distance.						
			TCM 8.5.4 (B)(2)	Shifting Taper A shifting taper is used when merging is not required, but a lateral shift is needed. Approximately one-half L has been found to be adequate. Where more space is available, it may be beneficial to use longer distances. Guidance for changes in alignment may also be accomplished by using horizontal curves designed for normal highway speeds.						
			TCM 8.5.4 (B)(3)	Shoulder Taper A shoulder taper may be beneficial on high-speed roadways with improved shoulders that may be mistaken for driving lanes (when work is occurring in the shoulder area). If used, shoulder tapers approaching the activity area should have a length of about one-third L. If a shoulder is used as a travel lane either through practice or during a temporary traffic activity, a normal merging or shifting taper should be used. An example of a shoulder taper is presented in Figure 8-8.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 8.5.4 (B)(4)	Downstream Taper The downstream taper may be useful in termination areas to provide a visual cue to the driver that access is available to the original lane/path that was closed. When a downstream taper is used, it should have a minimum length of about 30 meters (100 feet) per lane, with devices spaced about 6 meters (20 feet) apart. An example of a downstream taper is shown in Figure 8-8.						
			TCM 8.5.4 (B)(5)	One-Lane, Two-Way Taper The one-lane, two-way traffic taper is used in advance of an activity area that occupies part of a two-way roadway in such a way that a portion of the road is used alternately by traffic in each direction. Typically, traffic is controlled by a temporary traffic signal or a flagger. A short taper having a maximum length of 30 meters (100 feet) with channelizing devices at approximately 6 meters (20 foot) spacings should be used to guide traffic into the one-way section.						
8.5.5 - Pedestrian and Worker Safety										
8.5.5 (A) - Pedestrian Considerations										
			TCM 8.5.5 (A)(1)	Pedestrians should not be led into direct conflicts with work site vehicles, equipment, or operations.						
			TCM 8.5.5 (A)(2)	Pedestrians should not be led into direct conflicts with mainline traffic moving through or around the work site.						
			TCM 8.5.5 (A)(3)	Pedestrians should be provided with a safe, convenient travel path that replicates as nearly as possible the most desirable characteristics of sidewalks or footpaths. Every effort should be made to separate pedestrian movement from both work site activity and adjacent traffic. Whenever possible, signing should be used to direct pedestrians to safe street crossings in advance of an encounter with a temporary traffic control zone. Signs should be placed at intersections so that pedestrians, particularly in high-traffic-volume areas, are not confronted with mid-block work sites that will induce them to skirt the temporary traffic control zone or make a mid-block crossing. All pedestrian passage ways/routes should comply with the Americans with Disabilities Act where ever possible. See Standard Detail Sheet 804-1, for typical traffic control device usage and techniques for pedestrian movement through work areas.						
8.5.5 (B) - Worker Safety Considerations										
			TCM 8.5.5 (B)	Following the Fundamental Principles noted above in Section 8.5.1 will usually provide the degree of control and traffic operation that will bring about safe conditions for the worker. Of particular importance is maintaining work areas with traffic flow inhibited as little as possible, providing standard and clear traffic control devices that get the driver's attention and provide positive direction. All workers should be trained in how to work next to traffic in a way that minimizes their vulnerability. In addition, workers with specific traffic control responsibilities shall be trained in traffic control techniques, device usage, and placement. Workers in the right-of-way shall be attired in bright, highly visible clothing similar to that of flaggers.						
8.5.6 - Hand-Signal Control										
8.5.6 (A) - Qualifications For Flaggers										
			TCM 8.5.6 (A)	Since flaggers are responsible for human safety and make the greatest number of public contacts of all temporary traffic control personnel, it is important that a qualified person be selected. A flagger should possess the following minimum qualifications: • Average intelligence • Good physical condition, including sight and hearing • Mental alertness & ability to react in an emergency • Courteous but firm manner • Neat appearance • Sense of responsibility for the safety of the public & workers • Capable of communicating verbally with drivers • Trained in safe traffic control practices						
8.5.6 (B) - Flagging Equipment										
			TCM 8.5.6 (B)	For daytime work, the flagger's vest, shirt, or jacket shall be orange, yellow, strong yellow green, or fluorescent versions of these colors. For nighttime work, similar outside garments shall be retroreflective. The retroreflective material shall be orange, yellow, white, silver, strong yellow-green, or a fluorescent version of one of these colors and shall be visible at a minimum distance of 1,000 feet. Hand-signaling devices, such as STOP/SLOW paddles, lights, and red flags are used to control traffic through temporary traffic control zones. The STOP/SLOW paddle, which gives drivers more positive guidance than red flags, shall be the primary hand-signaling device. The standard STOP/SLOW sign paddle shall be a minimum of 450 millimeters (18 inches) wide and octagonal in shape with letters at least 150 millimeters (6 inches) high. A rigid handle should be provided. This combination sign should be fabricated from light semirigid material, and shall have an octagonal shape. The background of the STOP face shall be red with white letters and border. To improve conspicuity, the STOP/SLOW paddles may be supplemented by one or two symmetrically positioned alternately flashing white high-intensity lamps on each side. The background of the SLOW face shall be orange with black letters and border. When used at night, the STOP/SLOW paddle shall be retroreflectorized in the same manner as signs. Flags used for emergency signaling purposes shall be a minimum of 600 millimeters (24 inches) square, made of a good grade of red or red orange material securely fastened to a staff about 1 meter (3 feet) long. The free edge should be weighted so the flag will hang vertically, even in heavy wind. When used at night, flags shall be retroreflective.						
8.5.6 (C) - Flagging Procedures										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 8.5.6 (C)	The use of the sign paddle and flag are illustrated in Figure 8-9. The following methods of signaling with a paddle should be used: To Stop Traffic - The Flagger shall face traffic and show the stop face of the paddle to traffic. For greater emphasis, the free arm may be raised with the palm toward approaching traffic. When It Is Safe for Traffic to Proceed - The flagger shall stand parallel to the traffic movement and show the slow face of the paddle to traffic, motion traffic ahead with his free arm. To Alert or Slow Traffic - Where it is desired to alert or slow traffic by means of flagging, the flagger shall face traffic and show the slow face of the paddle to traffic. For added emphasis, the flagger may slowly raise and lower his free hand with the palm down.						
8.5.7 - Temporary Traffic Control Zone Devices										
8.5.7 (A) - Signs										
			TCM 8.5.6 (A)(1)	Warning Signs This category of signs is used when it is necessary to warn traffic of exiting potentially hazardous conditions on or adjacent to the roadway or sidewalk. Warnings signs require caution on the part of the vehicle operator or the pedestrian and may require a reduction of speed or maneuver in the interest of safety. Warning signs in temporary traffic control zones have black legends with an orange background. Yellow warning signs within the temporary traffic control zone which are still applicable may remain in place. Warning signs shall be retroreflective or illuminated for nighttime visibility. Roadway lighting does not meet the requirement for sign illumination.						
			TCM 8.5.6 (A)(2)	Regulatory Signs Regulatory Signs impose legal obligations and restrictions on all traffic. They may only be used under the authority of the agency responsible for traffic control. Therefore, no regulatory sign shall be used without the authorization of the Transportation, Planning and Sustainability Department.						
			TCM 8.5.6 (A)(3)	Guide Signs Guide signs show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. The following guide signs used as needed at temporary traffic control zones: a. Standard route markings, where temporary route changes are necessary. b. Directional signs such as motorist service signing, recreational and cultural interest area signs, driveway entrance signs, civil defense signing, and street name signs. When used with detour routing, these signs may have a black legend on an orange background. c. Special information signs relating to work being done. These signs shall have a black legend on an orange background. Typical signs used in temporary traffic control zones are shown in Figure 8-10.						
			TCM 8.5.6 (A)(4)	Sign Mounting and Placement Principles As a general rule, signs should be located on the right-hand side of the roadway. When special emphasis is needed or on one-way roadways, signs shall be placed on both the left and right sides of the roadway, where space is available. Signs shall be placed in positions where they will convey their messages most effectively. The following statements provide good placement principles. • Visibility to oncoming motorist and pedestrians is essential. • Signs should never be positioned where essential sight lines from intersecting driveways or streets are blocked. • The first warning sign shall never be placed in the street itself. • Signs used only during the day shall be covered or removed at night. • Signs shall be removed or changed immediately if condition change. Typical construction warning sign size and spacing requirements are shown in Table 8-4. Portable sign supports shall only be used for Short-term stationary or Short Duration activities, as defined in Section 8.5.9. Signs mounted on portable sign supports shall be mounted a minimum of 300 millimeters (1 foot) above ground level. Temporary and fixed sign supports shall be used for all Long-term Stationary or Intermediate-term Stationary activities. Signs mounted on temporary and fixed sign supports shall be mounted a minimum of 2.1 meters (7 feet) above ground level. Approved typical sign supports are shown on Standard Detail Sheet 804-5. Only warning signs found in the Texas Manual on Uniform Traffic Control Devices (TMUTCD) or this manual may be used at temporary traffic control zones. Any variation must be approved by the Transportation, Planning and Sustainability Department. Advisory speed signs may only be used if authorized by the Transportation, Planning and Sustainability Department.						
			TCM 8.5.6 (A)(5)	Arrow Displays Arrow Displays are intended to provide additional warning and directional information to assist in merging and controlling traffic through and around temporary traffic control zones. Arrow displays will not solve difficult traffic problems by themselves, but they can be very effective when properly used to reinforce signs, barricades, cones and other traffic control devices. . For this reason arrow displays are required for all lane closures. Necessary signs, barricades or other traffic control devices shall be used in conjunction with the arrow displays.						
8.5.7 (B) - Channelizing Devices										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 8.5.7 (B)(1)	Traffic Cones/Tubular Markers The primary purpose of this group of devices is to channelize traffic and to delineate short duration activities. Cones shall be predominantly orange, fluorescent red-orange, or fluorescent yellow-orange, and shall be made of a material that can be struck without damaging vehicles on impact. Cones used for delineating traffic shall be a minimum of 700 millimeters (28 inches) in height. Cones used for marking of wet paint on striping operations may be 450 millimeters (18 inches) in height. Tubular markers shall be predominantly orange, minimum 51 millimeters (2 inches) wide when facing traffic, and made of material that can be struck without damaging vehicles. Tubular markers shall be a minimum of 700 millimeters (28 inches) height. For nighttime use, cones and tubular markers shall be retroreflective or equipped with lighting devices for maximum visibility. Retroreflection of cones shall be provided by a white band 150 millimeters (6 inches) wide, no more than 75 to 100 millimeters (3 to 4 inches) from the top of the cone, and an additional 100 millimeter (4 inch) wide white band a minimum of 50 millimeters (2 inches) below the 150 millimeter (6 inch) band. Retroreflection of tubular markers shall be provided by two 75 millimeter (3 inch) wide white bands placed a maximum of 50 millimeters (2 inches) from the top, with a maximum of 150 millimeters (6 inches) between bands. If cones are used at night, the temporary traffic control zone must be continuously manned in order to ensure that cones or tubular markers are not displaced by wind or moving traffic. See Standard Detail Sheet 804-5 for additional information.						
			TCM 8.5.7 (B)(2)	Vertical Panels Vertical panels may be used to channel traffic, divide opposing lanes of traffic, divide traffic lanes or in place of barricades where space is limited. Vertical Panels shall be made of a material that can be struck without damaging vehicles on impact. Vertical panels shall be a minimum of 200 to 300 millimeters (8 to 12 inches) wide and at least 600 millimeters (24 inches) high. They shall have orange (fluorescent red-orange or fluorescent yellow-orange) and white stripes, and be retroreflective. Panel stripe widths shall be 150 millimeters (6 inches), except where panel heights are less than 900 millimeters (36 inches), when 100 millimeter (4 inch) stripes may be used. If used for two-way traffic, back-to-back panels shall be used. Markings for vertical panels shall be alternating orange and white retroreflectorized stripes (sloping downward at an angle of 45 degrees in the direction traffic is to pass). Vertical panels used on expressways, freeways, and other high-speed roadways shall have a minimum of 174,193 square millimeters (270 square inches) of retroreflective area facing traffic. See Standard Detail Sheet 804-5 for additional information.						
			TCM 8.5.7 (B)(3)	Drums Drums are most commonly used to channelize or delineate traffic flow but may also be used singly or in groups to mark specific locations. Drums are highly visible and have good target value, given the appearance of being formidable obstacles and, therefore, command the respect of drivers. Drums used for traffic warning or channelization shall be constructed of lightweight, flexible, and deformable materials and be a minimum of 900 millimeters (36 inches) in height; and have at least an 450 millimeters (18 inch) minimum width, regardless of orientation. Steel drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 100 200 millimeters (4 to 6 inches) wide. Each drum shall have a minimum of two orange and two white stripes. Any non-retroreflective spaces between the horizontal orange and white stripes, shall not exceed 50 millimeters (2 inches) wide. Drums shall have closed tops that will not allow collection of roadwork or other debris.						
			TCM 8.5.7 (B)(4)	Barricades A barricade is a portable or fixed device having from one (1) to three (3) rails with appropriate markings used to control traffic by closing, restricting or delineating all or a portion of the right of way. Barricades are located adjacent to traffic and are therefore subject to impact by errant vehicles. Because of their vulnerable position and the hazard they could create, they should be constructed of lightweight materials and have no rigid stay bracing for A-frame designs. There are three types of barricades: Type I, Type II and Type III. Figure 8-11 illustrates the proper stripping configuration for various barricade applications. Type I Barricades Type I Barricades are intended for the use in situations where traffic will be maintained through the temporary traffic control zone. They may be used singly or in groups to mark specific conditions or may be used in a series for channelizing traffic. Type II Barricades Type II Barricades may be used much like the Type I. Type II Barricades have more reflective area and they are intended to be used on higher speed roadways or where high visibility is needed. Where barricades may be susceptible to overturning in the wind, sandbags may be placed on the lower parts of the frame supports to provide ballast but shall not be placed on the top of any striped rails. Type III Barricades Type III Barricades are intended to be used in temporary traffic control zones for which sections of the roadway will be closed to traffic. At least one (1) Type III barricade shall be erected at the points of closure. Type III barricades used at a road closure may extend completely across a roadway or from curb to curb. Where provision is made for access of authorized equipment and vehicles, the responsibility for the Type III barricades should be assigned to a person to ensure proper closure at the end of each work day. When a roadway is legally closed but access must still be allowed for local traffic, the Type III barricade should not be extended completely across a roadway. A sign with the appropriate legend concerning permissible use by local traffic shall be mounted.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 8.5.7 (B)(5)	Safety Fences Safety fences are used to separate pedestrians and motorist from specific conditions in the right-of-way. They must be a minimum of 1.2 meters (4 feet) tall and may be made out of wood, orange polyurethane plastic or chain link material. If the fence is to be placed within the roadway, the fence shall be retroreflective and/or have stripped barricade panels and warning lights. Lights, if required, shall be placed at least every 9 meters (30 feet) along the fence. In all cases, fences must be set back a minimum of 300 millimeters (1 foot) from the existing lane as marked on the street. Standard Detail Sheet 804-4 for additional information.						
			TCM 8.5.7 (B)(6)	Pedestrian Walkways Pedestrian Walkways separate pedestrians from both the work site and adjacent traffic. A canopied walkway will be required when the distance to the construction activity is less than the height of the work activity. Pedestrian Walkways should be sturdily constructed and adequately lighted for nighttime. Figure 8-12 illustrates a typical canopied pedestrian walkway and provides the specifications for their use. Sight distance must be maintained at corners and openings. Ends of pedestrian walkways placed in traffic lanes, facing oncoming traffic must have stripped barricade panels. In all cases, walkways must be set back a minimum of 300 millimeters (1 foot) from the existing lane as marked on the street. In places where pedestrians are judged especially vulnerable to impact by errant vehicles, all foot traffic should be separated and protected by longitudinal barrier systems.						
			TCM 8.5.7 (B)(7)	Portable Barriers When work activities necessitate excavations to remain open within the roadway, portable barriers shall be used to protect vehicles from the excavation. Portable barriers are designed to prevent vehicles from penetrating work areas behind the barrier while minimizing vehicle occupant injuries. They may also be used to separate two-way traffic. These devices are usually concrete traffic barriers (CTB), Low Profile Barriers (LPB) or Water Filled Traffic Barriers (WFTB) When serving the additional function of channelizing traffic, the barrier taper shall meet the standard channelizing taper lengths. The Channlizing barrier shall be supplemented by standard delineators, channelizing devices, or pavement markings. Channelizing barriers should not be used for a merging taper except in low-speed urban areas.						
			TCM 8.5.7 (B)(8)	Warning Lights The lightweight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on hazard warning devices. The flashing lights are effective in attracting a driver's attention and, therefore, provide an excellent means of identifying the hazard. As used herein, warning lights are portable, lens-directed, enclosed lights. The color of the light emitted shall be yellow. They may be used in either a steady-burn or flashing mode. Warning lights shall have a minimum mounting height of 750 millimeters (30 inches) to the bottom of the lens. Type A low intensity flashing warning lights and Type C steady-burn warning lights shall be maintained so as to be visible on a clear night from a distance of 900 meters (3,000 feet). Type A low-intensity flashing warning lights are most commonly mounted on barricades, drums, vertical panels, or advance warning signs, and are intended to warn drivers that they are approaching or are in a potentially hazardous area. All warning signs shall have a Type A warning light. Type C steady-burn lights are intended to be used to delineate the edge of the traveled way on detour curves, on lane changes, on lane closures, and on other similar conditions. All devices used in tapers shall have Type C warning lights. All other channelizing devices may use either Type C warning lights or an approved large reflectors/ object markers.						
8.5.7 (C) - Temporary Pavement Markings										
			TCM 8.5.7 (C)	1. Inappropriate pavement markings should be removed and the new markings placed before opening the affected lane or lanes to traffic. 2. Conflicting pavement markings shall be obliterated to prevent confusion to drivers. Proper pavement marking obliteration leaves a minimum of pavement scars and completely removes old marking materials. Obliterated markings shall be unidentifiable as pavement markings under day or night, wet or dry conditions. Overlaying existing stripes with black paint or asphalt does not meet the requirements of covering, removal, or obliteration. Sand blasting is the preferred method of obliteration. However, light grinding maybe used on thermoplastic and or roadways that will be resurfaced prior to final striping. 3. When a temporary roadway is constructed to bypass a closed portion of the street, appropriate reflectorized pavement markings shall be placed on the approach to, and throughout the length of hard-surfaced temporary roadways. 4. Temporary pavement markings shall be maintained in long-term stationary work areas and shall match and meet the markings in place at both ends of the work area. 5. Temporary pavement markings should be provided in intermediate-term stationary work areas, to the extent practicable. 6. Short-Term pavement markings should normally be used only on newly resurfaced roadways. However, they may be used in other situation with prior approval. 7. Pavement marking installations within temporary traffic control zones shall be accomplished only on weekends unless prior approval has been obtained from the Transportation Division of the Transportation, Planning and Sustainability Department. See Standard Detail Sheet 804S-3 for additional information.						
8.5.8 - Maintenance and Inspection										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 8.5.8	In order for the traffic control devices to "command respect and authority," they must be well-maintained. Deteriorated traffic control devices lose their effectiveness and the intent for which they were installed. Signs, cones, barricades and other devices shall be kept in their proper position, clean and legible at all times. Signs and other devices which do not apply to work site shall be removed or covered. Damaged, defaced or dirty signs, cones, barricaded and other devices shall be cleaned, repaired or replaced. Barricades and sign supports shall be neatly constructed and shall not appear makeshift or hastily thrown together. They shall be repaired and cleaned as needed to keep up their appearance. Special care shall be taken to see that traffic control devices are not obstructed by weeds, shrubbery, construction materials or equipment. If weeds, shrubs or trees require trimming or removal, such work shall be performed by the person responsible for the installed device. Warning lights, if used, shall be inspected at the end of every working day to insure that they are in proper working condition, clean and properly placed. It is the responsibility of the job supervisor to assure that the traffic control devices are in proper position and doing the job for which they are intended. Repair and maintenance should be schedule during off-peak traffic periods. Such repair/maintenance includes replacing worn out devices or cleaning signs, cones and barricades. However, if the repair or maintenance is of an emergency nature, such as misplaced barricade or cone, it shall be done immediately. Routine, periodic inspection and maintenance of traffic control at a work site is essential. The frequency of such inspection will depend upon the particular job site. Heavier traffic and higher traffic speeds will necessitate frequencies such as every hour or two. However, on a low volume, low speed street, such as in a residential area, two inspections per day may be adequate; one at the beginning and one at the end of the work day.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 10 - TRANSIT CONSIDERATIONS										
10.1.0 - GENERAL										
			TCM 10.1.0	When designing a street or when developing a complete street network system, consideration should be given to potential utilization and integration of transit vehicles and transit operations. To assist in this endeavor, the Capital Metropolitan Transportation Authority has requested that the Transit Facility Design Guide, (see Appendix G) developed by the Center for Transportation Research, The University of Texas at Austin, June 1988, be included in this manual. This report should be referenced as it provides valuable information and guidance for planners and designers. This report also includes design criteria for on-site development. If criteria noted in this report conflicts with adopted City of Austin criteria, the criteria adopted by the City of Austin shall govern. It is not intended that this report be applied as a City of Austin standard.						

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TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 11 - STRUCTURES IN THE RIGHT OF WAY AND IN EASEMENTS										
11.3.0 - RETAINING WALLS										
11.3.3 - General Requirements										
			TCM 11.3.3	Retaining walls, regardless of type or height, must be designed by engineers licensed in the State of Texas, using current industry standards and accepted engineering practices. Retaining walls, regardless of type, must be constructed of materials meeting City of Austin Standards and Standard Specifications, where applicable, or ASTM or AASHTO materials and test specifications. Walls for which there are no published, nationally recognized, design criteria or for which there are no ASTM or AASHTO materials or test specifications will not be permitted.						
				Conditional or incomplete designs will not be accepted for city review. All aspects of design must be addressed and clearly conveyed in the drawings and specifications.						
				Tiered walls and back-to-back walls will be permitted only under special circumstances and only with the approval of the Director.						
				Retaining walls must be designed for external and internal stability. The design must include, as necessary, the effects of water or wastewater line breaks, the effects of inundation and rapid drawdown resulting from flooding or stormwater detention or retention, including hydrostatic pressures, internal erosion, and alteration of engineering characteristics and behavior of foundation and backfill materials. The walls must be designed to support, where applicable, surcharge loads from traffic or structures and lateral loads from nearby guardrail or street light footings. Wall design must consider scour at the base, where appropriate.						
				Walls consisting of pre-cast segmental units, whether these units are facing or structural elements, must have a coping or capstone at the top of the wall. The coping may be pre-cast or cast in place. The coping or capstone must extend above the adjacent ground at least 4 inches (100 millimeters). If cast in place, the coping must be reinforced and must have control and expansion joints to accommodate differential movements in the wall. Pre-cast coping and capstone must be affixed to the upper layer of segmental wall by using epoxy, non-shrink grout or other methods or material as recommended by the manufacturer, appropriate for the material and installation.						
				Walls constructed using flexible facing elements, such as welded or woven wire, will be permitted only in drainage channel applications not affecting or related to roadway embankment. Metal prefabricated modular walls will not be permitted.						
				Where retaining walls are used as the exterior walls in stormwater retention structures, the walls must be cast-in-place reinforced concrete made watertight by using water stops in joints and using underdrains behind the walls, as necessary. Where retaining walls are used as the exterior walls in stormwater detention structures and the walls are not watertight, then the walls must be designed to provide free drainage of the backfill following drawdown.						
11.3.4 - Wall Location and Layout										
11.3.4 (A) - General										
			TCM 11.3.4 (A)	The city will assume maintenance responsibility only for those walls that support roadway embankment in street right of way or support channel slopes in drainage easements. Retaining walls that support private property must be built on private property and must be privately owned and maintained. Only in special cases approved by the Director will retaining walls that support private property be allowed in public right of way. License agreements will be required for all retaining walls in the right of way that support private property.						
				In street right of way, a minimum of 36 inches (1 meter) of protective soil or rock cover must be provided over the upper layer or row of external structural components such as geogrid, strips, bars, tie bars or buried pre-cast units.						
				Utility mains and service lines must not pass through or under a retaining wall unless the utility is installed in an encasement pipe meeting the approval of the affected Utility. The encasement pipe must extend beyond the retaining wall a sufficient distance to insure that future excavation to expose the ends of the casing will not endanger any external structural component of the wall, will not threaten the stability of the wall itself and will not encroach upon any components of the wall system. For utility services, the encasement pipe must extend from the main to the property line and must be large enough to pass valves, connections, couplings and other components that are integral parts of the service.						
11.3.4 (B) - In Streets and Utility Easements										
			TCM 11.3.4 (B)	Utilities, utility appurtenances, and pavements have priority over retaining walls in street right-of-way and utility easements. As a consequence, retaining wall layout must take into account utility assignments in addition to allowing for future utility installation and future excavation for utility maintenance and repair, including mains as well as services. No component of the retaining wall that is essential to the stability of the wall or wall system (such as footings, underdrains, strips, geogrid, bars, tie bars, or buried pre-cast units) can be within the excavation / backfill zone of any utility main or service regardless of the type of utility. The wall or wall system must be stable under any scenario involving utility excavation in the excavation / backfill zone. External components of the retaining wall, such as geogrid, anchors, strips, tie bars or buried pre-cast units, which are essential to stability of the wall, cannot extend beyond the back of curb, under the street, or into utility easements unless the external components are at least 10 feet (3 meters) below the street surface and at least 3 feet (1 meter) below the deepest utility.						
				The distance between the street-side face of the wall and the back of curb must be such that sidewalk and ramps can be accommodated, but in no case can this distance be less than 5 feet (1.5 meters), with provisions for pedestrian and vehicular railing, as needed						
11.3.5 - Structural Requirements										
			TCM 11.3.5	Retaining walls must be designed according to Division I Section 5 of AASHTO Standard Specifications for Highway Bridges, latest edition. The following additional requirements apply, depending on type of wall.						
11.3.5 (A) - Design Life										
			TCM 11.3.5 (A)	Design must be based on a 100-year service life that, from a structural standpoint, is essentially maintenance-free.						
11.3.5 (B) - Cast in Place Concrete										
			TCM 11.3.5 (B)	Joints, including waterstops where applicable, must be provided according to ACI Manual of Concrete Practice Standard 224.3R Chapter 8.						
11.3.5 (C) - Conventional Segmental Gravity Walls (without mechanically stabilized backfill)										
			TCM 11.3.5 (C)	Internal stability of segmental gravity retaining walls without mechanically stabilized backfill (mortared or dry-stack rock, boulders or pre-cast concrete units) must be analyzed according to NCMA Design Manual for Segmental Retaining Walls, latest edition. The minimum factor of safety for internal shear capacity must be at least 1.5 if product-specific information is available; otherwise, it must be at least 4. External and overall, or global, stability shall be analyzed according to AASHTO Standard Specifications for Highway Bridges, latest edition.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
11.3.5 (D) - Tie-backs, Soil and Rock Nailing										
			TCM 11.3.5 (D)	Tie-back walls must be designed according to PTI, Recommendations for Prestressed Rock and Soil Anchors, 1996 edition or newer. Soil and rock nail walls must be designed according to FHWA Manual for Design & Construction Monitoring of Soil Nail Walls and the University of Texas Center for Transportation Research Report 1407-1F, Rock Nail Design Guidelines for Roadway Cuts in Central Texas. Steel anchors must be corrosion-protected by epoxy coating or by encapsulation. Steel anchors protected only by grouting will not be permitted. In all cases, rock nails must be used in conjunction with shotcrete and a fascia wall.						
				Surface drainage must be prevented from infiltrating behind the wall or flowing over the wall by installing an interceptor ditch behind the top of the wall. To control groundwater seepage, composite geosynthetic face drains must be installed on the exposed rock face before shotcreting. The face drains must extend the full height of the wall and must connect to a base drain that discharges from behind the wall in a manner that water is not directed onto the adjacent sidewalk or into the street.						
11.3.6 - Material Requirements										
			TCM 11.3.6	Materials must meet City of Austin Standard Specifications, where applicable. Otherwise, they must meet the requirements of the applicable Sections in Division II of AASHTO Standard Specifications for Highway Bridges, latest edition.						
11.3.7 - Internal Drainage										
			TCM 11.3.7	Retaining wall backfill must be free-draining, non-expansive material that is non-aggressive to external structural or drainage components. Underdrains must be provided to prevent hydrostatic loading caused by local groundwater seepage, surface water infiltration, floodwater inundation or by water and wastewater line breaks. Geotextile fabric or graded granular filters must be provided as necessary to prevent migration of fine-grained soil particles from the surrounding soils into the backfill and drainage media. The fabric or granular filter must be designed not only to prevent migration of fine-grained soil particles but also not to become clogged by those particles. Underdrains must not discharge where drainage can flow onto adjacent sidewalk or into the street.						
11.3.8 - External (Surface) Drainage										
			TCM 11.3.8	Surface runoff that flows toward the retaining wall from the retained slope must be collected in a vegetated or paved interceptor ditch behind the wall and transmitted to a stormwater inlet or let-down structure to prevent water from flowing over the wall, collecting in low points behind the wall or eroding the slope at the ends of the wall.						
11.3.9 - Maintenance Provisions										
			TCM 11.3.9	A 20-feet (6 meters) wide truck-accessible maintenance access zone must be provided at the base of walls higher than 10 feet (3 meters) that support roadway embankment. The maintenance access zone must be free of obstacles to vehicles, relatively smooth and level, all-weather accessible, and able to support loads from maintenance vehicles. The maintenance access zone may consist of easement or right of way, or both.						
11.3.10 - Safety Provisions										
			TCM 11.3.10	Handrail must be provided on any wall that supports roadway embankment where the wall height exceeds the distance between the street-side face of the wall and the closest edge of the sidewalk or, in the absence of a sidewalk, the back of curb. Handrail must be provided on any wall not supporting roadway embankment if the ground surface behind the wall slopes toward the wall and this surface is part of a park, playground, single or multi-family residence. A chain link fence may be preferable to and substituted for handrail in many of these installations.						
				A roadside barrier, such as metal beam guardrail or concrete barrier curb, must be provided wherever the height of a wall supporting roadway embankment exceeds 6 feet (1.8 meters) for local streets and 3 feet (1 meters) for collector and arterial streets, or the distance between the back of curb and street-side face of the wall is less than 10 feet (3 meters), regardless of street classification. Roadside barriers must be designed according to the latest editions of AASHTO Roadside Design Guide and AASHTO Standard Specifications for Highway Bridges.						
11.3.11 - Warning Devices										
			TCM 11.3.11	Walls supporting roadway embankment and having structural components (geogrid, strips, tie bars, or pre-cast units) extending behind the wall must have plaques placed in the coping or capstone along the top of the wall at intervals not exceeding 100 feet (30 meters). The plaques must be made of durable metal, at least 5 inches (125 millimeters) by 8 inches (200 millimeters), with ½ inch (12.5 millimeters) raised lettering that reads "Do not excavate between the retaining wall and street/No excave entre el muro de contención y la calle." The plaque must have at least two studs attached to the back so it can be mounted flat against the coping or capstone by inserting the studs into holes drilled into the side or top of the coping or capstone. The plaque must be set in epoxy or non-shrink grout covering the mounting surface and filling the holes.						
				Walls not supporting roadway embankment, but having structural components (geogrid, strips, tie bars, or pre-cast units) extending behind the wall must have warning plaques as described above but which say "Do not excavate behind the wall within _____ feet/No excave detrás del muro de contención dentro de una distancia de _____ meters."						
				Warning tape must be placed 6 inches (150 millimeters) above the uppermost layer of geogrid or strips used in MSE walls. The tape must be placed in a crisscross pattern on 24-inch (600 millimeters) spacing.						
11.3.12 - Supplemental Construction										
			TCM 11.3.12	Conduits must be installed adjacent to retaining walls that support roadway embankment wherever geogrid, tie bars, rods or pre-cast units extend behind the wall. Two 4-inch (100 millimeters) diameter, Schedule 40 polyvinyl chloride (PVC) pipes must be provided between the retaining wall and street, parallel to the back of curb along the entire wall, to provide for future installation of utilities such as communications cables. Pull-boxes must be installed at the ends of the pipe and at intermediate points, as appropriate, but in no case shall the distance between pull-boxes exceed 200 feet (60 meters).						
11.3.13 - Geotechnical Information										
			TCM 11.3.13	A geotechnical investigation must be performed for retaining walls constructed on fill, on soils subject to shrink/swell behavior and on soils mapped (See Garner, L. E., and K.P. Young, Environmental Geology of the Austin Area: An aid to Urban Planning , Bureau of Economic Geology, University of Texas at Austin, Report of Investigations No. 86, 1976) as Taylor Clay, Del Rio Clay, or Eagle Ford Formation, as well as for walls higher than 10 feet (3 meters) regardless of the subsurface materials and conditions.						
11.3.14 - Construction Drawings										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 11.3.14	The drawings must contain a design summary report listing the design assumptions, material properties and all factors of safety and reduction factors compared to the recommended values or criteria in the AASHTO, NCMA or FHWA design criteria, whichever applies, and in the project geotechnical report.						
				The retaining wall and any external structural elements, such as geogrid, tie bars or pre-cast units, must be shown on the plan and profile sheets for street, drainage and utility construction and on the site plan for drainage structures so that the location of the retaining wall and related components will be obvious to anyone reading the drawings.						
				The drawings must contain a separate plan and profile sheet for the wall itself, drawn to a 1 inch = 30 feet (1 to 400), or larger detail plan view and 1 inch = 3 feet (1 to 40), or larger detail profile view. The plan view drawing must show all buried utilities, structures and other constructed features, both existing and proposed, within a horizontal distance of 2 times the wall height. The following must be included: wastewater mains, services and manholes; stormwater drainage pipe, inlets, junction boxes and manholes; water mains, services and hydrants; electrical lines and services; gas mains and services; communications and entertainment lines and services; pavement curb and gutter; sidewalk; guardrail, pull boxes, sign footings, street light footings, and the limits of geogrid, strips, tie bars or nail tendons or rods and other features as required.						
				The profile view drawing must include the top of wall elevations, footing elevations, locations of changes in top of wall; locations of warning plaques; the elevations of each layer of geogrid, strips or tie bars, if used; the existing ground line at the base of the wall; the proposed ground line at the back of wall; all utilities shown on the plan view, and other features as required. Exact locations of existing utilities must be provided, based on "pot holing" if necessary.						
				The drawings must contain cross-sections of the wall at points where the wall height is maximum, where drainage structures penetrate the wall, where the utility excavation/backfill zone is most critical and where structures behind the wall fall within the zone of geogrid, strips, tie bars or pre-cast units, if used. The cross sections must be drawn to scale and must show utilities, utility excavation/backfill zone, sidewalks, pavements, wall units, backfill, filter fabric, handrail, guardrail, geogrid, strips, or tie bars, inlets, headwalls, the existing ground line, and other features as required.						
				Typical sections of the wall must be provided, showing all components necessary to construct the wall and appurtenances.						
				Details of appurtenances such as handrail, guardrail and headwalls, must be included in the drawings.						
			11.3.15 - Technical Specifications							
			TCM 11.3.15	Technical specifications must describe all materials that comprise the wall, using City of Austin Standard Specifications where applicable. Specific—rather than generic—products, brands, models or styles should be referenced, if possible, and locally produced materials should be specified by producer and product designation, listing alternative sources and products. Alternately, materials may be specified by their composition and physical and chemical properties and characteristics, in which case, the design engineer and the City must approve each product, based on the contractor's submittals including the requisite test results and certifications.						
				The specifications must state that the contractor, producer or manufacturer are responsible for quality control testing during production or manufacture of the materials and for testing of materials for the purpose of demonstrating, before construction, that they meet the project specifications. The specifications must also require that a Texas-licensed professional engineer certify that the materials meet the project specifications. Test results, including a summary comparison of the tests to the project specifications, must be submitted with the certification. The certification must be accepted by the City before construction. This testing and certification is to be performed at no cost to the City and is separate from and precedes quality control testing performed by the City during construction.						
				All materials that comprise the wall appurtenances, such as guardrail and handrail, must be described.						
				The specifications must state that chipped, cracked or honeycombed pre-cast concrete units, and marred or damaged geosynthetic, metal straps, tie bars or other components must not be incorporated into the project.						
			11.3.16 - Shop Drawings/Materials Tests							
			TCM 11.3.16	The specifications must require submittal of shop drawings, concrete mix designs, and other technical information, as required, for pre-cast wall components, geogrid, strips, tie bars, filter fabric and other components of non-standard walls.						
			11.3.17 - Changes in Design or Materials							
			TCM 11.3.17	Material substitutions or changes in wall components, design or configuration are not permitted after the City has issued a development permit unless revised drawings and, if required, revised technical specifications are submitted for City review and approval before construction.						
			11.3.18 - License Agreements/Construction Waivers							
			TCM 11.3.18	License agreements are required for all retaining walls in the right of way that do not support roadway embankment or drainage channel slopes. Construction waivers may be granted for retaining walls less than 3 feet (1 meter) high and not supporting roadway embankment.						
			11.4.0 - BRIDGES							
			11.4.1 - Structural Requirements							
			TCM 11.4.1	Bridges must be designed according to the latest edition of AASHTO Standard Specifications for Highway Bridges or AASHTO LRFD Bridge Design Specifications.						
			11.4.2 - Material Requirements							
			TCM 11.4.2	Materials must meet the requirements in City of Austin Standard Specifications, where applicable. Otherwise, they must meet ASTM and/or AASHTO requirements.						
			11.5.0 - CULVERTS/STORMWATER DRAINAGE PIPE							
			11.5.1 - Structural Requirements							
			TCM 11.5.1	Culverts must be designed according to the latest edition of AASHTO Standard Specifications for Highway Bridges or AASHTO LRFD Bridge Design Specifications.						
			11.5.2 - Material Requirements							
			TCM 11.5.1	Materials must meet the requirements in City of Austin Drainage Criteria Manual and Standard Specifications, where applicable. Otherwise, they must meet ASTM and/or AASHTO requirements.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
SECTION 12 - RULES AND DESIGN MANUAL FOR SMALL CELL NETWORK FACILITIES IN THE RIGHT-OF-WAY										
12.2 - General Provisions: Network Nodes, Node Support Poles, and Transport Facilities Within Public Right-of-Way										
12.2.1 - Network Provider Responsibilities										
			TCM 12.2.1 (A)	A network provider shall be responsible and liable for the acts, submissions and omissions of the network provider's employees, temporary employees, officers, directors, consultants, agents, affiliates, subsidiaries, authorized agents, authorized joint licensees, and subcontractors.						
			TCM 12.2.1 (B)	A network provider shall provide and maintain current contact information for an authorized representative to participate in regularly scheduled Austin Utility Location and Coordination Committee (AULCC) meetings.						
			TCM 12.2.1 (C)	A network provider must submit an application to place a network node in the public right-of-way. In addition to the right-of-way permit, a network provider must follow the application process to collocate on a pole or place a node support pole in the public right-of-way. The application to place a network node in a public right-of-way can be submitted at the same time and with an application to construct a network node support pole or collocate on a service pole. Application forms are available from the director.						
			TCM 12.2.1 (D)	If the director determines that due to the absence or inaccuracy of essential information provided, a network provider has failed to submit an application in good faith, the submission is not an application and the director may reject the submission without an obligation to comment on completeness.						
			TCM 12.2.1 ()	A network provider shall not install a facility in public right-of-way without all applicable approvals, including, but not limited to: attachment agreements, node support pole permits, temporary use of right-of-way permits, excavation permits, electrical permits, etc.						
			TCM 12.2.1 (F)	Accuracy and compliance of the plans is the responsibility of the network provider and the professional engineer of record. The network provider is responsible for bringing any installation into compliance with all applicable laws and regulations at any time.						
12.2.2 - Restrictions on Placement										
			TCM 12.2.2 (A)	A network provider must obtain approval from the City before collocating network nodes or installing node support poles in an area zoned or otherwise designated as a historic district or a design district if the design district has decorative poles. Approval shall be obtained from the Planning and Zoning Department.						
			TCM 12.2.2 (B)	Network nodes, node support poles, transport facilities, and related equipment and facilities may not be placed in a manner that in the director's opinion: obstructs, impedes, or hinders the usual pedestrian or vehicular travel; affects public safety; obstruct the legal use of right-of-way by public utilities; violates applicable law; violates or conflicts with public right-of-way design standards, specifications, or design district requirements; violates the federal Americans With Disabilities Act of 1990; or in any way creates a risk to public health, safety, or welfare. The network provider shall be responsible for correcting the noncompliant installation.						
			TCM 12.2.2 (C)	Placement of network nodes, node support poles, and transport facilities must comply with undergrounding requirements that prohibit installing aboveground structures in a public right-of-way imposed by applicable ordinances, City Codes, zoning regulations, state law, public or private covenants or restrictions, or applicable criteria manuals, including this Rule, other sections of the Transportation Criteria Manual, and the Utilities Criteria Manual.						
12.2.3 - Size Limitations of Equipment										
			TCM 12.2.3 (A)	Unless otherwise specified in this Rule, a network node installed on any pole within the public right-of-way must conform to the following:						
			TCM 12.2.3 (A)(1)	Each antenna that does not have exposed elements and is attached to an existing structure or pole: a. Must be located inside an enclosure of not more than six cubic feet in volume; b. May not exceed a height of three feet above the existing structure or pole; and c. May not protrude from the outer circumference of the existing structure or pole by more than two feet;						
			TCM 12.2.3 (A)(2)	If an antenna has exposed elements and is attached to an existing structure or pole, the antenna and all of the antenna's exposed elements: a. Must fit within an imaginary enclosure of not more than six cubic feet; b. May not exceed a height of three feet above the existing structure or pole; and c. May not protrude from the outer circumference of the existing structure or pole by more than two feet;						
			TCM 12.2.3 (A)(3)	The cumulative size of other wireless equipment associated with the network node attached to an existing structure or pole may not: a. Be more than 28 cubic feet in volume; or b. Protrude from the other circumference of the existing structure or pole by more than two feet;						
			TCM 12.2.3 (A)(4)	Ground-based enclosures, separate from the pole, may not be higher than three feet six inches from grade, wider than three feet six inches, or deeper than three feet six inches;						
			TCM 12.2.3 (A)(5)	Pole-mounted enclosures may not be taller than five feet.						
			TCM 12.2.3 (B)	The following types of associated ancillary equipment are not included in the calculation of equipment volume under subsection A: 1. Electric meters; 2. Concealment elements; 3. Telecommunications demarcation boxes; 4. Grounding equipment; 5. Power transfer switches; 6. Cut-off switches; and 7. Vertical cable runs for the connection of power and other services.						
			TCM 12.2.3 (C)	Equipment attached to node support poles may not protrude from the outer edge of the node support pole by more than two feet.						
			TCM 12.2.3 (D)	Equipment attached to a utility pole must be installed in accordance with the National Electrical Safety Code, subject to applicable codes, and the utility pole owner's construction standards.						
12.2.4 - No Overhead Lines										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 12.2.4	No network provider shall install overhead lines connecting to a network node collocated on a service pole or a node support pole, unless approved by the director for temporary maintenance or repair not to exceed ten days. All lines, including power and transport facilities, connecting to a pole mounted network node, shall be placed in duct or conduit that is buried below ground, provided that a network node attached to a utility pole may connect to aerial transport facilities for which an attachment right has been granted for attachment to the utility pole by the utility pole owner.						
12.2.5 - Generators Not Allowed										
			TCM 12.2.5	Electric generators are prohibited in the public right-of-way to provide back-up power to a network node.						
12.2.6 - Tree Maintenance										
			TCM 12.2.6	A network provider shall ensure appropriate clearance from any trees and obtain any required permits if tree trimming is warranted.						
12.2.7 - Signage										
			TCM 12.2.7 (A)	A network provider shall post its name, location identifying information, and emergency telephone number in an area on the network node, aerial equipment, manholes and fiber that is visible to the public but that shall not exceed 4" x 6", unless otherwise required by law (e.g. RF ground notification signs) or the director.						
			TCM 12.2.7 (B)	A network provider shall not post any other signage or advertising in the public right-of-way.						
12.2.8 - Repair										
			TCM 12.2.8	A network provider will promptly repair any damage to City property from the network provider's installation, placement, attachment, repair, modification, removal, operation, use, or relocation of a network node promptly and repair and return such property to its original condition. The City may opt to perform the repair and charge it to the network provider if the network provider fails to perform the repair if the unrepaired condition creates an imminent danger to the public.						
12.2.9 - Graffiti Abatement										
			TCM 12.2.9	A network provider shall remove all graffiti on any of its network nodes, transport facilities, poles, or other property or equipment located in the public right-of-way.						
12.2.10 - No Interference and No Liability										
			TCM 12.2.10 (A)	A network provider, by operating its network nodes, must not cause interference to the City's radio and emergency radio frequency, wireless network, traffic signal network, or communications operations.						
			TCM 12.2.10 (B)	Following installation or modification of a network node, the director may require a network provider to test the network node's radio frequency and other functions to confirm it does not interfere with the City's operations or equipment.						
			TCM 12.2.10 (C)	The City is not responsible for any inconvenience, annoyance, or injury to facilities or activities conducted by a network provider, arising from the need to repair any portion of the public right-of-way, or from the making of any necessary alteration or improvements, in, or to, any portion of the public right-of-way, or in, or to the City's fixtures, appurtenances or equipment.						
			TCM 12.2.10 (D)	A network provider shall maintain all its equipment and appurtenances in a timely and responsible manner.						
12.2.11 - Abandoned Facilities										
			TCM 12.2.11	A network provider must remove all abandoned network nodes, node support poles, or transport facilities from the public right-of-way. Unless the director determines that the abandoned network nodes, node support poles, or transport facilities must be removed immediately to ensure public health, safety, and welfare, a network provider has a reasonable time to completely remove the abandoned network node, not to exceed 30 days after abandoning the network node.						
12.2.12 - Removal Required by City										
			TCM 12.2.12 (A)	A network provider must, at its cost, promptly disconnect, remove, or relocate a network node if the director determines that the disconnection, removal, or relocation (a) is necessary to protect the public health, safety, or welfare, or City property, (b) the network node is adversely affecting City operation or operations of City property, or (c) a network provider fails to obtain permits and certifications required by law. If there is imminent danger to the public, then the City may immediately disconnect, remove, or relocate the applicable network node at the network provider's expense.						
			TCM 12.2.12 (B)	A network provider shall reimburse City for the City's actual cost of removal of its network node within 45 days of receiving the invoice from the City.						
12.2.13 - Removal or Relocation by Network Provider										
			TCM 12.2.13 (A)	If the network provider removes or relocates a network node at its own discretion, it shall notify the director in writing not less than 10 business days prior to removal or relocation. The network provider shall obtain all permits required for relocation or removal of its network node prior to relocation or removal.						
			TCM 12.2.13 (B)	A network provider's removal or relocation does not entitle the network provider to fee or rate refunds for network nodes that have been removed or relocated.						
12.2.14 - Removal or Relocation Required for City Project										
			TCM 12.2.14 (A)	A network provider shall remove or relocate a network provider's facility at the network provider's cost whenever the director determines that the relocation or removal is required for the construction, completion, repair, widening, relocation, or maintenance of public right-of-way or City or other public utility facility, or use in connection with any City construction or maintenance project.						
			TCM 12.2.14 (B)	If the network provider fails to remove or relocate its facility within the time period identified by the director, the City will remove the facility at the network provider's cost, without further notice, and the network provider will reimburse the City for its removal expenses (including reasonable overhead and storage).						
12.2.15 - No City Affiliation										
			TCM 12.2.15	A network provider, and its employees, contractors, and agents shall not at any time represent themselves as being associated with the City of Austin. A network provider shall inform any person asking of the company they work for and that it is allowed to work on service poles pursuant to state law.						
12.2.16 - Restoration										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 12.2.16	A network provider shall repair any damage to the right-of-way and City property, and the property of any third party resulting from the network provider's removal or relocation activities within 10 days following the date of removal or relocation, at the network provider's cost, including restoration of the right-of-way and property to substantially the same condition as it was immediately before the date the network provider installed its facility, including restoration or replacement of any damaged trees, shrubs or other vegetation.						
12.2.17 - Safety										
			TCM 12.2.17 (A)	A network provider shall use protective equipment to ensure the safety of all personnel working on the network provider's network nodes and transport facilities, as well as pedestrians and vehicular traffic. A network provider shall ensure all personnel are qualified to work in the public right-of-way. A network provider shall ensure its workers follow all appropriate safety protocols.						
			TCM 12.2.17 (B)	Whenever traffic is diverted, detoured, or impacted, a network provider must ensure that competent and certified individuals are on site to provide temporary traffic control. A network provider shall not perform work over an active travel lane or pedestrian route without the appropriate traffic control in place.						
			TCM 12.2.17 (C)	City inspectors may halt work if safety practices or City standards are violated. The City will not be responsible for any additional expenses that are incurred, to include extension of permits or investigation fees.						
			TCM 12.2.17 (D)	In the event of contact with electrical lines, call 512-322-9100 to provide information on the incident. Call 911 if emergency response is required.						
			TCM 12.2.17 (E)	In the event of contact with traffic signal lines or equipment, call 512-974-2000 and 512-974-4075 to report the incident.						
12.2.18 - Radio Frequencies										
			TCM 12.2.18 (A)	A network provider must identify the proposed frequency or frequencies to be used by the network node. The director may deny the application or request a different frequency be used if use of such frequencies would interfere with City operations.						
			TCM 12.2.18 (B)	A network provider must provide a Radio Frequency Emission Certification for each network node by a Telecommunications Engineer certified by the International Association for Radio, Telecommunications and Electromagnetics (iNARTE) or similarly recognized certifying body with experience regarding radio frequency transmissions.						
			TCM 12.2.18 (C)	A network provider shall adhere to the FCC's most current federal radio frequency emissions standards set forth in OET Bulletin 65, as may be updated or amended, or other applicable regulation.						
12.2.19 - Facility Inventory										
			TCM 12.2.19 (A)	Network provider shall maintain, and provide to the director upon request, a list of its network nodes, node support poles, transport facilities, and associated equipment, in the public right-of-way.						
			TCM 12.2.19 (B)	Network provider shall maintain and make available to the director accurate as-built drawings of its network nodes and transport facilities in a format approved by the director and in accordance with any applicable City criteria manual.						
12.2.20 - Unauthorized Network Nodes and Transport Facilities										
			TCM 12.2.20 (B)	The director shall deem as unauthorized any type of facility, node, or equipment not authorized by law or installed or operated in violation of law. The director at his or her sole discretion may, after providing 30 days written notice, remove or require the network provider to remove unauthorized equipment at the provider's expense without any liability to the City. The City will invoice and the provider shall reimburse the City within 45 days of receipt of the invoice for the City's cost for removal of unauthorized equipment.						
			TCM 12.2.20 (C)	Unauthorized equipment, if determined by the director to interfere with the normal operation of City infrastructure or public right-of-way, may be removed immediately by the City upon the expiration of 24-hours advance notice to a provider. The City will invoice and the provider shall reimburse the City within 45 days of receipt of the invoice for the City's cost for removal of unauthorized equipment.						
12.2.21 - Installation										
			TCM 12.2.21 (A)	Installation of network nodes will be done in a good and workmanlike manner and in accordance with the requirements established by the director in compliance with all applicable laws, ordinances, codes, standards, criteria, rules and regulations.						
			TCM 12.2.21 (B)	Installation of a network node or network node support pole shall not interfere with the operation of City infrastructure unless approved by the City for a specific time and location. Interference with traffic signal operations may require the presence of City employees.						
			TCM 12.2.21 (C)	Installation of a network node or network node support pole shall not interfere with the operation of City infrastructure unless approved by the City for a specific time and location. Interference with traffic signal operations may require the presence of City employees.						
12.2.22 - Electrical Supply										
			TCM 12.2.22 (A)	A network provider shall be responsible for obtaining any required electrical power service to the network node. The City will not be liable to the network provider for any stoppages or shortages of electrical power furnished to the network node, including without limitation, stoppages or shortages caused by any act, omission, or requirement of the City or the act or omission of any other tenant or user of the structure. The network provider will not be entitled to any abatement of any fee for any such stoppage or shortage of electrical power.						
			TCM 12.2.22 (B)	The network provider shall be responsible, at the network provider's expense, for correcting any discovered pre-existing non-conforming conditions related to the provision of power for a network node.						
			TCM 12.2.22 (C)	If the network node is to be installed on a different pole than the electric service is installed, it is the network provider's responsibility to install the necessary underground conduit and cabling to provide power to the network node.						
			TCM 12.2.22 (D)	Network provider shall install a device or devices to disconnect network provider's network node, such as a fused linkage, cut-off switch or similar mechanism that is capable of disconnecting and de-energize network provider's network nodes so that the City personnel performing maintenance may quickly and safely shut down the network node so that they are not exposed to dangerous electrical current or radiofrequency radiation or electromagnetic fields generated by the network node. The disconnect device must be clearly identified and easily accessed, and the operation of the cut-off switch must be obvious and intuitive. The City will instruct its maintenance personnel to use the disconnect device to de-activate the network node while performing work in proximity to the network node.						
			TCM 12.2.22 (E)	Network provider electric meter may not be installed on a traffic pole, unless the director determines that placement on the traffic pole is necessary to avoid the use of right-of-way surface for the meter placement and the meter's placement is consistent with the applicable design standards.						
12.3 - Network Node										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 12.3	A network provider must submit an application in a form to be determined by the director and receive a permit to install a network node in the public right-of-way. An application to install a network node must include information that the director determines is necessary to review and approve the application, including, but not limited to:						
			TCM 12.3 (1)	A completed application on a form approved by the director, for each location requested;						
			TCM 12.3 (2)	A map showing the intended location of the proposed facility in the public right-of-way, with distances from any historic landmarks, parks, schools, or residentially zoned property, if any. This map should also include all existing utilities and surface features (including trees, street furniture, etc.) within 20 feet of the proposed node support pole location;						
			TCM 12.3 (3)	Representative drawings or pictures of the specific node location;						
			TCM 12.3 (4)	Artistic renderings, drawings, cut sheets, or pictures showing the location with network provider's equipment installed, including conduit, attachment method, and shroud;						
			TCM 12.3 (5)	Details and graphics on the type of network facility to be installed and installation method proposed for the City's approval.						
12.4 - Collocation on a Traffic Pole										
12.4.1 - Eligibility and Application										
			TCM 12.4.1 (A)	Network providers may request to collocate network nodes on traffic poles provided that network nodes or associated equipment may only be installed and enclosed in the manner according to the allowed design, installation, and construction details for a traffic pole collocation shown and described in Exhibit A (Figures 1 through 7) incorporated into and attached to this Rule. For traffic poles with street light fixtures mounted by a vertical extension to the traffic pole, the director may allow an antennae to be mounted to the vertical extension supporting the street light in a manner that does not materially deviate from the construction details for a traffic pole collocation shown and described in Exhibit A (Figures 1 through 7), provided the overall height for the top of the antenna shroud is not more than 35 feet above ground level.						
			TCM 12.4.1 (B)	To be eligible to request a collocate a network node on a traffic pole, a network provider must execute a Traffic Pole Attachment Agreement in the form attached and incorporated into this Rule as Exhibit B. No attachment may be placed on a traffic pole unless an application for the attachment is submitted and approved by the director in accordance with Chapter 15-7 (Use of City-Owned Utility Infrastructure) of the City Code.						
			TCM 12.4.1 (C)	In order to minimize structural impact to the traffic pole or negative visual impact to the surrounding area, the director may deny an application for attaching to a traffic pole upon which a network node has been attached or for which a complete application for attachment has been approved or is pending approval.						
			TCM 12.4.1 (D)	A network node or any associated equipment may not obstruct the visibility of a traffic control device or sign. A network node or any associated equipment may not interfere in any way with the function or operation of a traffic control device or sign. Should traffic control devices or signs be added, modified, or moved, a network provider shall relocate or remove its equipment after receiving written notice.						
			TCM 12.4.1 (E)	Network providers shall comply with and observe all applicable City, State, and federal historic preservation laws and requirements.						
			TCM 12.4.1 (F)	Unless approved by the director, a network node, including any shroud or mounting structure, shall be installed a minimum of 6" above the traffic mast arm infrastructure. The upper height limit for an antenna placed atop a traffic pole is 35 feet above ground level.						
			TCM 12.4.1 (G)	Exposed equipment and shrouds shall match the existing pole color to the extent possible.						
			TCM 12.4.1 (H)	If the director determines that cable necessary to connect the components of a node located on a traffic pole cannot be located internally within the traffic pole, external cables and wires must be enclosed in conduit. The maximum number and size of conduit that may be attached to a traffic pole is two 1½" EMT conduit. External conduit attached to a traffic pole must match the color of the existing pole. External conduit should be installed flush to the pole and in an unobtrusive manner as possible. If needed, the network provider may have a one foot radius drip loop exposed. Conduit shall be installed as to not conflict with access to any traffic signal activities.						
			TCM 12.4.1 (I)	An application to collocate on a traffic pole must include information that the director determines is necessary to review and approve the application, including, but not limited to:						
			TCM 12.4.1 (I)(1)	1. A completed application on a form approved by the director, for each location requested;						
			TCM 12.4.1 (I)(2)	2. A map showing the intended location of the proposed network node and transport facilities serving that network node in the public right-of-way, with distances from any historic landmarks, parks, schools, or residentially zoned property, if any. The map must also include all existing utilities and surface features (including trees, street furniture, etc.) within 20 feet of the proposed node support pole location;						
			TCM 12.4.1 (I)(3)	3. Representative drawings or pictures of the specific traffic pole location.						
			TCM 12.4.1 (I)(4)	4. Artistic renderings, drawings, cut sheets, or pictures showing the location with network provider's equipment installed, including conduit, attachment method, and shroud;						
			TCM 12.4.1 (I)(5)	5. Details on the attachment method proposed for the City's approval. No penetration of the traffic pole is allowed;						
			TCM 12.4.1 (I)(6)	6. A photograph of the specific traffic pole to be attached to;						
			TCM 12.4.1 (I)(7)	7. Pole load analysis in accordance with Section 12.4.2;						
			TCM 12.4.1 (I)(8)	8. Construction plan sheets (11 inches by 17 inches) at a scale of no smaller than 1 inch = 40 feet in plan view, and 1 inch = 6 feet in profile view, sealed by a professional engineer licensed in the State of Texas that represents: a. the specific location of the existing traffic pole; b. location and method of proposed installation (trench, bore, existing conduit pull) of proposed and existing transport facilities necessary to connect the network node to the PSTN; c. horizontal alignment of proposed or existing fiber or conduit in relation to the proposed fiber assignment; d. proposed work areas required to install infrastructure that will disrupt or divert traffic; e. placement of network node and equipment on the traffic pole as well as any ground equipment, cabinets, etc.; f. any and all existing utilities, both underground and overhead; and g. the specific location of the existing traffic pole using latitude/longitude in decimal degrees to the 6th decimal point.						
12.4.2 - Traffic Pole Load Analysis										
			TCM 12.4.1 (A)	Each application for collocation of a network node on a service pole shall include a load analysis prepared by a Texas Registered Professional Engineer and must conform to the Transportation Department's approved process and methodology.						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 12.4.1 (B)	The load analysis shall take into account and allow space for all attachments which are currently constructed or planned for future construction.						
			TCM 12.4.1 (C)	The following information is required to be submitted:						
			TCM 12.4.1 (C)(1)	1. Specific location with X, Y coordinates and Traffic Signal Pole ID;						
			TCM 12.4.1 (C)(2)	2. Picture of entire Traffic Signal Pole;						
			TCM 12.4.1 (C)(3)	3. Traffic Signal Pole brand information (height and class);						
			TCM 12.4.1 (C)(4)	4. Height of each existing attachment present on the traffic pole and proposed height of wireless attachment;						
			TCM 12.4.1 (C)(5)	5. Identification of each attachment present on the traffic pole;						
			TCM 12.4.1 (C)(6)	6. Detailed drawings of the proposed wireless attachments and physical specifications (weight and dimensions);						
			TCM 12.4.1 (C)(7)	7. Electric Service Planning Application in accordance with the Austin Energy Design Criteria Manual;						
			TCM 12.4.1 (C)(8)	8. Type, height, and size of all attachments present on the traffic pole; and						
			TCM 12.4.1 (C)(9)	9. Ownership information on all attachments.						
12.5 - Node Support Poles and Associated Facilities										
			TCM 12.5	A network provider must submit an application in a form to be determined by the director and receive a permit to install a node support pole in the public right-of-way.						
12.5.1 - Application for Installation of Node Support Pole within the Right-of-Way										
			TCM 12.5.1 (A)	An application for placing or constructing a node support pole in the public right-of-way must be made to the Development Services Department in a form to be provided by the director and comply with all applicable laws and regulations, including any applicable zoning or design standards or manuals.						
			TCM 12.5.1 (B)	An application to install a node support pole must include information that the director determines is necessary to review and approve the application, including, but not limited to:						
			TCM 12.5.1 (B)(1)	1. A completed application on a form approved by the director, for each location requested;						
			TCM 12.5.1 (B)(2)	2. A map showing the intended location of the proposed facility in the public right-of-way, with distances from any historic landmarks, parks, schools, or residentially zoned property, if any. The map must include all existing utilities and surface features (including trees, street furniture, etc.) within 20 feet of the proposed node support pole location;						
			TCM 12.5.1 (B)(3)	3. Representative drawings or pictures of the specific pole location;						
			TCM 12.5.1 (B)(4)	4. Artistic renderings, drawings, cut sheets, or pictures showing the location with network provider's equipment installed, including conduit, attachment method, and shroud;						
			TCM 12.5.1 (B)(5)	5. Details and graphics on the type of network facility to be installed and installation method proposed for the City's approval;						
			TCM 12.5.1 (B)(6)	6. Justification for installation of new facility, including analysis for any nearby poles determined as unsuitable; and						
			TCM 12.5.1 (B)(7)	7. Construction plan sheets (11 inches by 17 inches) at a scale of no smaller than 1 inch = 40 feet in plan view, and 1 inch = 6 feet in profile view, sealed by a professional engineer licensed in the State of Texas that represents:						
			TCM 12.5.1 (B)(7)(a)	a. the specific location of the proposed node network pole and associated facilities;						
			TCM 12.5.1 (B)(7)(b)	b. location and method of proposed installation (trench, bore, existing Conduit pull) of proposed and existing transport facilities necessary to connect the node to provider's network;						
			TCM 12.5.1 (B)(7)(c)	c. horizontal alignment of proposed or existing fiber or conduit in relation to the proposed fiber assignment;						
			TCM 12.5.1 (B)(7)(d)	d. proposed work areas required to install infrastructure that will disrupt or divert traffic;						
			TCM 12.5.1 (B)(7)(e)	e. placement of network node and equipment on the network pole as well as any ground equipment, cabinets, etc.;						
			TCM 12.5.1 (B)(7)(f)	f. any and all existing utilities, both underground and overhead; and						
			TCM 12.5.1 (B)(7)(g)	g. the specific location of the proposed node support pole using latitude/longitude in decimal degrees to the 6th decimal point.						
12.6 - Transport Facilities										
			TCM 12.6 (A)	A network provider must obtain right-of-way permits by submitting an application in a form to be determined by the director for excavation and facility installation and coordinate installation with utilities.						
			TCM 12.6 (B)	A network provider must submit an application to the Development Services Department in a form to be determined by the director and obtain a permit to construct transport facilities in the public right-of-way.						
12.6.1 - Application for Transport Facility										
			TCM 12.6.1 (A)	An application must be made to the Development Services Department and comply with all applicable laws and regulations, including any applicable zoning or design manuals.						
			TCM 12.6.1 (B)	An application to install a node support pole must include information that the director determines is necessary to review and approve the application, including, but not limited to:						
			TCM 12.6.1 (B)(1)	1. A completed application on a form approved by the director, for each location requested;						
			TCM 12.6.1 (B)(2)	2. A map showing the intended location of the proposed facility in the public right-of-way, with distances from any historic landmarks, parks, schools, or residentially zoned property, if any;						
			TCM 12.6.1 (B)(3)	3. Representative drawings or pictures of the specific location;						
			TCM 12.6.1 (B)(4)	4. Artistic renderings, drawings, cut sheets, or pictures showing the location with network provider's equipment installed, including conduit, attachment method, and shroud;						
			TCM 12.6.1 (B)(5)	5. Details and graphics on the type of transport facility to be installed and installation method proposed for the City's approval;						
			TCM 12.6.1 (B)(6)	6. Justification for installation of new facility, including analysis for any nearby transport facilities determined as unsuitable; and						
			TCM 12.6.1 (B)(7)	7. Construction plan sheets (11 inches by 17 inches) at a scale of no smaller than 1 inch = 40 feet in plan view, and 1 inch = 6 feet in profile view, sealed by a professional engineer licensed in the State of Texas that represents:						
			TCM 12.6.1 (B)(7)(a)	a. the specific location of the proposed network nodes pole and associated facilities being served by the transport facility;						

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 12.6.1 (B)(7)(b)	b. location and method of proposed installation (trench, bore, existing conduit pull) of proposed and existing transport facilities necessary to connect the node to the network provider's network;						
			TCM 12.6.1 (B)(7)(c)	c. horizontal alignment of proposed or existing fiber or conduit in relation to the proposed fiber assignment;						
			TCM 12.6.1 (B)(7)(d)	d. proposed work areas required to install infrastructure that will disrupt or divert traffic;						
			TCM 12.6.1 (B)(7)(e)	e. placement of facilities as well as any ground equipment, cabinets, etc.;						
			TCM 12.6.1 (B)(7)(f)	f. any and all existing utilities, both underground and overhead; and						
			TCM 12.6.1 (B)(7)(g)	g. the specific location of the existing traffic pole using latitude/longitude in decimal degrees to the 6th decimal point.						
12.7 - Design Standards										
12.7.1 - Design Standards City-Wide										
			TCM 12.7.1 (A)	Where design district or historic district boundaries overlap, the more restrictive of the standards shall apply.						
12.7.1 (B) - Site Selection										
			TCM 12.7.1 (B)	Site Selection - It is the City's policy to preserve as open, as much as possible, the surface and air above the public right-of-way to keep sight-lines open for public safety and aesthetic purposes. To achieve that end, permits to use the public right-of-way for network nodes and node support poles will be prioritized in the following order:						
			TCM 12.7.1 (B)(1)	1. First, colocation on existing utility poles. The allowed design, installation, and construction details, for utility pole collocation is shown and described in the Utilities Criteria Manual.						
			TCM 12.7.1 (B)(2)	2. Second, collocation on existing traffic poles - In order to minimize visual clutter and maintain future infrastructure availability for both the City and other projects, a maximum of two traffic poles per intersection may be made available for network node installation. Only one antenna and base equipment cabinet may be permitted on a traffic pole. The design, installation, and construction must comply with section 12.4.1 of this Rule.						
			TCM 12.7.1 (B)(3)	3. Third, collocation on non-decorative streetlight poles. Network nodes may not be placed on decorative poles. The allowed design, installation, and construction details for non-decorative streetlight poles is shown and described in the Utilities Criteria Manual.						
			TCM 12.7.1 (B)(4)	4. Last, node support poles. In order to receive a permit to install a node support pole, the network provider must demonstrate that no collocation options are available for the service area. Node support poles must be separated by at least 250 feet.						
12.7.1 (C) - Underground Utility Districts										
			TCM 12.7.1 (C)(1)	1. Nodes support poles may not be placed in public right-of-way in areas of the City where wireline based public utilities such as electricity and telecommunications are provided by underground distribution networks rather than by aerial support on utility poles. Such an area is, for the purposes of this Rule, an Underground Utility District: an area where poles, overhead wires, and other above-ground utility equipment have been removed and placed underground or have been approved for future placement underground.						
			TCM 12.7.1 (C)(2)	2. If the director determines that a section of public right-of-way within an Underground Utility District has, as of September 1, 2017, utility poles supporting aerial wireline based public utility distribution extending more than 300 feet, node support poles may be placed in that section of right-of-way subject to the requirements in this Rule applicable to node support poles.						
			TCM 12.7.1 (C)(3)	3. Except for base-mounted and shrouded equipment for collocations on traffic poles consistent with construction details for a traffic pole collocation set out in section 12.4.1 of this Rule, network node equipment, other than the antenna, must be placed below ground in an Underground Utility District.						
			TCM 12.7.1 (D)	Equipment shall be installed in a manner that does not hinder pedestrian walkways or interfere with traffic signal equipment. All attachments to a pole that are projecting, or any equipment or appurtenance mounted on the ground, shall comply with the Americans With Disabilities Act and shall not obstruct an existing or planned sidewalk.						
			TCM 12.7.1 (E)	For network nodes placed on existing poles, the color of the network nodes shall match the existing pole color, such that the network nodes blend with the existing pole.						
			TCM 12.7.1 (F)	Where applicable, node support poles shall be placed within the planting zone in alignment with existing street trees or light poles. Poles shall be placed equidistant between street trees, with a minimum separation of 15 feet from tree to pole. The planting zone is an area adjacent to the curb in which street trees may be planted. The zone is also intended for the placement of street furniture, public utility equipment such, and similar elements in a manner that does not obstruct pedestrian access or motorist visibility.						
			TCM 12.7.1 (G)	Faux Treatments - Concealment may not include faux trees, faux landscaping, or other faux decorative items.						
			TCM 12.7.1 (H)	The network provider is responsible for all make-ready costs, whether performed by the provider, a third party or the City.						
12.7.2 - Design District Requirements										
12.7.2.3 - Core Transit Corridors, Waterfront Overlay, Special Regulating Districts, Planned Unit Developments (PUD), and Planned Development Agreements (PDA)										
			TCM 12.7.2 (3)(B)	Node support poles shall be placed within the planting zone in alignment with existing street trees or light poles. Poles shall be placed equidistant between street trees, with a minimum separation of 15 feet from tree to pole.						
			TCM 12.7.2 (3)(C)	Poles may not be located so as to inhibit a consistent, uniform streetscape, or tree trimming. Any tree trimming must maintain the tree's natural shape and growth pattern.						
			TCM 12.7.2 (3)(D)	Node and Pole Design - Network nodes and node support poles must be designed to be compact and unobtrusive so as to minimize the visual impact on the surrounding streetscape. The applicant shall avoid using enclosures that are bulky or include distracting materials.						
			TCM 12.7.2 (3)(D)(1)	1. Placement - Network nodes and equipment shall be grouped or stacked close together on the same side of the pole. Large gaps between equipment and enclosures should be avoided.						
			TCM 12.7.2 (3)(D)(2)	2. The color of a network node placed on any existing pole must match the color of the existing pole.						
			TCM 12.7.2 (3)(E)	Cabinet Placement and Design - Equipment cabinets may be mounted to the pole, placed in the designated street furniture area, or located underground. Cabinets placed on poles must be located at least nine feet above ground level and follow the design standards described above in subsection E. The center of the cabinets must be located the same distance from the face of curb as street trees and service poles. Cabinets shall be designed to be unobtrusive and compatible with the surrounding environment.						
12.7.3 - Historic Districts										

Territory			Reference	Rule	Document Type				How and where the application meets requirement	
TC	COA ETJ	O ETJ			PP	FP	SP	CP	How	Where
			TCM 12.7.3 (B)	Node support poles shall be placed within the planting zone and aligned with any existing trees or poles. Node support poles shall be placed between street trees, with a minimum separation of 15 feet from tree to pole.						
			TCM 12.7.3 (D)	Network nodes may not be placed on historic or decorative poles.						
			TCM 12.7.3 (E)	Network Node and Node Support Pole Design - Network nodes and node support poles must be designed to be compact and unobtrusive so as to minimize the visual impact on the surrounding streetscape. The applicant shall avoid using enclosures that are bulky or include distracting materials.						
			TCM 12.7.3 (E)(1)	1. Placement - Nodes and equipment should be grouped or stacked close together on the same side of the pole. Large gaps between equipment and enclosures should be avoided.						
			TCM 12.7.3 (E)(2)	2. The color of a new node placed on any existing pole must match the color of the existing pole. For new poles in districts with a designated historic pole, the pole and node shall match the color of the designated historic pole for that district.						
			TCM 12.7.3 (F)	Cabinet Placement and Design - Equipment cabinets may be mounted to the pole, placed in the designated street furniture area, or located underground. Cabinets placed on poles must be located at least nine feet above ground level and follow the design standards described above in subsection E. The center of the cabinets must be located the same distance from the face of curb as street trees and service poles. Cabinets shall be designed to be unobtrusive and compatible with the surrounding environment.						
12.7.4 - Historic Landmarks										
			TCM 12.7.4 (B)	Site Selection - Nodes or new node poles must be placed at least 20 feet from a property zoned as a Historic Landmark.						

Table Legend		
Territory	TC	Travis County
	COA ETJ	City of Austin Extraterritorial Jurisdiction
	O ETJ	ETJ of a municipality other than the City of Austin
Reference	TC 482	Chapter 482.Travis County Development Regulations
	TC 464	Chapter 464. Regulations for Floodplain Management and Guidelines and Procedures for Development Permits
	TCM	City of Austin Transportation Criteria Manual
	DCM	City of Austin Drainage Criteria Manual
Document Type	PP	Preliminary Plan
	FP	Final Plat
	SP	Site Plan
	CP	Construction Plan