

ARTICLE 9
TRANSPORTATION DESIGN STANDARDS
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ARTICLE 9

TRANSPORTATION DESIGN STANDARDS

SECTION 9-100 GENERAL CRITERIA

Requirements of this Article shall apply to all roadway construction in the City. Where no specific roadway construction, or design standard, or specification is set forth in this Manual, the requirements of the Virginia Department of Transportation (VDOT) Road and Bridge Standards, VDOT Road Design Manual, VDOT Urban Construction and Maintenance Program (Urban Manual), Manual of Uniform Traffic Control Devices with Virginia Supplement (MUTCD), the 2010 ADA Standards for Accessible Design, and the applicable Federal AASHTO standards shall be used. All streets shall be designed and built as set forth in this Manual. All public streets will be, upon completion, accepted into the State system, but will be maintained by the City of Manassas.

SECTION 9-200 STREET FUNCTIONAL CLASSIFICATIONS

Functional classification is the process by which streets and highways are grouped into systems according to the character of service they provide or are intended to provide. It is a method of organizing the network of streets into hierarchies of travel movement for comprehensive transportation planning. The VDOT Functional Classification Comprehensive Guide (2014) identifies seven classifications:

- *Interstate*: Interstates are the highest classification and designed with mobility and long-distance travel in mind. This classification is for highways designated as part of the Eisenhower Interstate System. Roadways classified as interstates are limited access, divided highways with the highest level of mobility. There is also no ambiguity in the functional classification, as only the Secretary of Transportation can designate a roadway as an interstate. The City of Manassas does not have any interstate designated roadways.
- *Other Freeways and Expressways*: This classification is for highways that are generally divided with partial or full control-of-access. They primarily serve through traffic and major circulation movements within or around Urban Areas. These routes provide connecting links between interstates, principal arterials and minor arterials. The City of Manassas has half a mile of Freeways and Expressways.
- *Other Principal Arterial*: Other Principal Arterials in urban areas serve the major activity centers of a metropolitan area and the highest traffic volume corridors. These facilities carry a high proportion of total urban travel on the minimum amount of mileage and provide continuity for major rural corridors to accommodate trips entering and leaving an urban area. The City of Manassas has six miles of Other Principal Arterials.
- *Minor Arterial*: Minor Arterials provide service for trips of moderate length, serve geographic areas that are smaller than their higher Arterial counterparts and offer connectivity to the higher Arterial system. The City of Manassas has 24 miles of Minor Arterials.
- *Major Collector*: Major Collector routes are longer in length; have lower connecting driveway densities; have higher speed limits; are spaced at greater intervals; have higher annual average traffic volumes; and may have more travel lanes than minor collectors may. The City of Manassas has 7 miles of Major Collectors.

- *Minor Collector*: Minor Collectors serve both land access and traffic circulation in lower density residential and commercial/industrial areas. Typical operating characteristics of Minor Collectors include lower speeds and fewer signalized intersections. Minor Collectors penetrate residential neighborhoods, but only for a short distance. The City of Manassas has 7 miles of Minor Collectors.
- *Local Roads*: Locally classified roads account for the largest percentage of all roadways in terms of mileage. They are not intended for use in long distance travel, except at the origin or destination end of the trip, due to their provision of direct access to abutting land. The City of Manassas has 167 miles of Local Roads.

Refer to the Manassas Transportation Master Plan (TMP) for a map of Existing Functional Classification of Roadways (Minor Collector and Above) in the City of Manassas.

SECTION 9-300 COMPLETE STREET DESIGN

9-310.1 COMPLETE STREET TYPOLOGIES

The City's complete street typologies will serve as the primary set of design standards for roadway improvements instead of the traditional functional classification system that addresses only vehicular circulation. The Complete street typologies incorporate adjacent land use and ensure safety and comfort for all users, including pedestrians, bicyclists, motorists, and transit riders of all ages and abilities. All City streets have been classified into eight categories: Urban Street, Mixed-Use Street, Collector/Connector, Commercial Corridor, Industrial/Suburban Business Road, Neighborhood Connector, and Neighborhood Street (TS-2.0). Typical section for each typology can be found in TS-4.1 through TS-4.4.

9-310.2 TRAFFIC CALMING

Traffic calming measures, such as curb extensions, crosswalk refuges, and pavement markings to narrow travel lanes, are used to reduce vehicle speed as well as discourage cut-through traffic. Traffic calming measures shall be implemented on neighborhood streets and neighborhood connectors only in accordance with the current version of the [VDOT Traffic Calming Guide for Neighborhood Streets](#). Traffic calming measures shall not include speed humps, speed tables, and stops signs.

9-320 PEDESTRIAN FACILITIES STANDARD

9-320.1 SIDEWALKS

Sidewalks shall be provided and designed per the appropriate street typology (TS-2.0 and TS-4.1 through 4.5). They shall be constructed in accordance with Article 11-750 and conform to the following:

- A. Sidewalks shall be constructed in accordance with Standard Detail TS-14.0 and TS-17.0 of this Article.
- B. Sidewalks shall have minimum unobstructed widths in accordance with the complete street typology assigned to the corridor.
- C. The maximum sidewalk cross-slope allowed shall be 2.0 %.
- D. The maximum longitudinal sidewalk slope shall be 5 % except sidewalks adjacent to streets shall match and not exceed the roadway slope. Where stairs are employed, consideration shall be given for including wheelchair ramps and handrails.

- E. Sidewalks shall be constructed of VDOT type A3 concrete, to a minimum depth of four (4) inches. Provide expansion joints at intervals of approximately 100 feet and around stationary structures. All sidewalks shall be constructed on 21A/21B aggregate base at least four (4) inches in depth.
- F. All pedestrian facilities constructed in City right-of-way shall be designed and constructed in accordance with [Public Rights-of-Way Accessibility Guidelines](#) (PROWAG).
- G. In no case will overhang of City sidewalk by vehicle parking or loading be permitted.

9-320.2 CURB RAMPS

Ramps for Persons with Disabilities shall be constructed in accordance with Section 11-750 of this Manual and the following requirements:

- A. In parking lots, standard curb ramps shall be located at accessible parking spaces and major crosswalks and shown on the development plan. Where site sidewalks are constructed at various vertical elevations, a curb ramp shall be installed at each sidewalk elevation.
- B. All facilities where the public assembles shall provide standard curb ramps as required by the 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.
- C. All sidewalks and curb ramps on City property and in public rights-of-way shall to be constructed in conformance with PROWAG.
- D. The locations of curb ramps for disabled persons shall be:
 - 1. In the public right-of-way, located adjacent to the normal location of the cross walk and on the intersection side of the stop line pavement marking.
 - 2. On-site, located:
 - a. As close as possible to the entrance of the building that is fully accessible to persons with disabilities.
 - b. To provide a route for persons with disabilities from a vehicle to the building that does not traverse parking lot aisles, travelways, or vehicle stacking areas.
- E. At entrances utilizing VDOT a CG-11 commercial entrance, the sidewalk will be ramped down to the travel way in accordance with City and VDOT Standards. Refer to Standard Detail TS-11.0 through TS-11.4.

9-320.3 CROSSWALKS

Crosswalks are areas of potential conflict between pedestrians and vehicles. All crosswalks shall be designed to provide as much protection to pedestrians as possible. Consideration should be given to adjusting curb lines to reduce crosswalk lengths wherever practical. All crosswalks shall be designed and built in accordance with this manual and the latest version of the Manual on Uniform Traffic Control Devices.

- A. Guidance for Placement of Crosswalk Markings:
 - 1. Urban Streets and Mixed-Use Streets shall have crosswalk markings on all legs of every intersection.
 - 2. Crosswalk markings with pedestrian signal heads shall be installed at all signalized intersections.

3. Marked crosswalks shall be provided at all legs of stop-controlled intersections of the following street types: Collector/Connector, Neighborhood Connector, Commercial Corridor, and Industrial/Suburban Business Road.
 4. A crosswalk is required if would serve at least 20 pedestrians per hour during the peak hour, 15 elderly and/or children per hour, or 60 pedestrians total during the highest consecutive 4-hour period.
 5. Marked crosswalks shall be considered on all approaches near pedestrian generators such as a school, library, hospital, senior center, shopping center, park, employment center, transit center, service loading islands, midblock pedestrian crossings, or where pedestrians could not otherwise recognize the proper place to cross.
 6. New marked crosswalks without other measures designed to reduce traffic speeds shall not be installed across uncontrolled roadways where the speed limit exceeds 40 mph and either the roadway has four or more travel lanes without a raised median or pedestrian refuge and an ADT of 12,000 vehicles per day; or the roadway has four or more travel lanes with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.
 7. An engineering study may be performed and engineering judgement used to evaluate crosswalk installation at non-signalized or stop-controlled locations. The engineering study shall determine crosswalk design and placement, including which approaches of an intersection warrant a crosswalk. The engineering study shall consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, and the availability of street lighting to determine if a crosswalk is desirable for pedestrian safety and mobility.
- B. The three crosswalk types prescribed in these guidelines are:
1. Standard Crosswalk (S) – Marked with standard parallel lines. With or without diagonal hatching. Standard crosswalks may only be used on private roads where traffic and pedestrian counts are expected to be low.
 2. High Visibility Crosswalk (HV) – Features longitudinal markings and increased width of markings. May include contrasting pavement markings. High-visibility crosswalks shall be used at all marked crosswalks of public streets except those requiring Stamped Asphalt.
 3. Stamped Thermoplastic Crosswalk (ST) – Stamped asphalt crosswalks are textured and marked to mimic brick. Crosswalks on shared, urban, mixed use, and collector/connector street within the Downtown and Mathis Character Areas shall be Stamped Thermoplastic Crosswalks. Details for Stamped Thermoplastic Crosswalks are located in TS-16.0 Crosswalk Details. All other crosswalks in public streets shall be high visibility continental crosswalk markings. Crosswalks within a single intersection shall be the same type on the same street. See Article 11-1900 Stamped Thermoplastic Crosswalk for material and installation specifications.
- C. Per the MUTCD, stop bars shall be placed a minimum of four feet in advance of a crosswalk. The width of the crosswalk shall be a minimum of six feet, maximum of 12 feet and center on the curb ramps. The crosswalk width shall match that of the adjacent pedestrian facility. Parking shall be restricted within twenty feet of a crosswalk in order to ensure visibility of crossing pedestrians, unless curb extensions are employed.
- D. Refuge Medians – Should be implemented at all intersections on any roadway which has raised center medians of at least 6 feet, unless impractical due to other engineering design considerations.

9-320.4 PEDESTRIAN BRIDGES

Pedestrian bridges, when required, shall be a minimum width of 2 feet wider than the facility conveyed by the bridge and shall be designed with appropriate dead and live loadings.

- A. All pedestrian bridges shall be designed and sealed by a registered Professional Engineer licensed to practice in the Commonwealth of Virginia and specializing in bridge design.
- B. The approving Department may require an independent review of any pedestrian bridge, or other specialized structure, prior to approval of the structure.
- C. Independent review shall be by a registered professional engineer licensed to practice in the Commonwealth of Virginia and specializing in design of the type of structure to be reviewed. The review professional shall be chosen by the City.
- D. The developer shall bear all costs of such independent review.

9-320.5 HANDRAILS AND PHYSICAL BARRIERS

Handrails and Physical Barriers applies to both public and private sidewalks, paths, shared-use paths, site retaining walls or other elevated structure of the approved site improvement plan up to and within five (5) feet from the outside of any building and require inspection or enforcement by the City.

The Virginia Uniform Statewide Building Code will apply from five (5) feet of the outside perimeter of the building and will include all buildings and require inspection or enforcement from the City Building Official or designee.

Where Public or Private use of a sidewalk or path is adjacent to a parallel water hazard, other obvious hazard or downward slope of 3:1 or steeper, a minimum five (5) foot wide separation from the edge of the path pavement to the top of slope is required.

When the separation from the edge of the Public or Private sidewalk or shared-use path to the top of the slope is less than five (5) feet, a physical barrier is required in the following situations:

- Any vertical drop-off or slopes steeper than 2:1 within five (5) feet from the edge of sidewalk or path
- Slopes 2:1, with a drop of four (4) feet or greater
- Slopes 3:1 or steeper, with a drop of six (6) feet or greater
- Slopes 3:1 or steeper, adjacent to a parallel water hazard (greater than two (2) feet deep) or other obvious hazard.

The physical barrier may be a black railing (e.g. HR-1, Type III) or black vinyl coated chain link fence (FE-CL) and shall be offset from a sidewalk by a one (1) foot flat area or offset from a shared-use path by a three (3) foot flat area. A physical barrier used to protect shared use path users from a drop-off shall be a minimum height of forty-two (42) inches.

When railing is required and the grade of the sidewalk or is 5% or greater, a gripping rail is required.

When a railing is required, approval must be obtained from the City prior to installation if not provided as part of the approved plan. Also see VDOT Road Design Manual, Figure A (1)-1-24 Railing for Sidewalks.

9-330 BIKE FACILITIES STANDARD

9-330.1 SHARED-USE PATHS

Trails and Shared-Use Paths shall be provided and designed per the appropriate street typology (TS-2.0 and TS-4.2). and conform to the following:

- A. Trails shall be constructed in accordance with Standard Detail TS-13 of this Article.
- B. Signage and other design elements shall conform to VDOT standards, as indicated in the Appendix A (1) of the Road Design Manual – *VDOT Complete Streets: Bicycle & Pedestrian Facility Guidelines, Bus Stop Design, & Parking Guidelines*.
- C. Two-way trails shall be designed and constructed to a minimum ten (10) foot width. Trails with one-way bike traffic shall be a minimum of six (6) feet.
- D. Trails shall have a vertical clearance of ten (10) feet to allow for bicycle travel.
- E. Trails outside the road right-of-way shall be provided with a minimum twelve (12) foot easement.
- F. The maximum cross-slope allowed shall be 2.0 %.
- G. Preferable maximum longitudinal slope allowed is 5%. Absolute maximum longitudinal slope is 8.33% with the approval from the City. The minimum allowable centerline radius shall be fifteen (15) feet.
- H. Appropriate drainage measures shall be provided for all trails in accordance with Article 8 of this Manual.
- I. Trails may be allowed to cross roads or streams provided adequate safety measures are taken as required by the approving Department.
- J. Standard access ramps shall be provided at all trail curb crossings to allow continuity of trail use.
- K. In the case of conflicts or obstructions or in context-sensitive areas, trail width may be reduced to eight (8) feet with approval from the City.
- L. Bollards shall not be used at entrances to trails or shared-use paths unless illegal vehicular traffic is known to be common. Enforcement and education shall be attempted prior to installation of bollards to solve an issue of illegal motor vehicle access. If bollards must be implemented, they shall be installed with a minimum of two (2), five (5) foot wide paved openings between bollards to allow bicycle traffic to pass safely. Bollards shall never be placed in the center of a bicycle travel lane. Any bollards shall be marked with retroreflective tape or Object Markers per MUTCD Section 9B.26 as well as yellow pavement marking to provide warning to cyclists.
- M. When a physical barrier such as railing (HR-1, Type III; black color) or black vinyl coated chain link fence (FE-CL) is required for a shared-use path:
 - 1. The physical barrier, railing or fence shall begin prior to, and extend beyond the area of need. The lateral offset of the physical barrier shall be 3 feet from the edge of a shared-use path and must be shown on the approved plan. The ends of the physical barrier shall be flared away from the edge of the shared-use path. When railing or fence is used to discourage shared-use path users from venturing off the path or onto adjacent property the design can include two or four horizontal members with vertical members spaced frequently enough to provide the needed structural support and in accordance with applicable building codes. Berms and/or vegetation can also be used to serve this function. See VDOT Road Design Manual, Appendix A(1) VDOT Complete Streets, Figure A(1)-1-6 Physical Barrier for Shared Use Path for more information.
 - 2. All Physical Barriers outside of the City Right of Way shall be privately maintained.

3. When railing is required and the grade of the shared-use path is 5% or greater, a gripping rail is required. When a railing is required, approval must be obtained from the City prior to installation if not provided as part of the approved plan.

9-330.2 BIKE LANES

A bike lane is a facility that is specifically set aside for bicycles within the right-of-way. The specific type and width of bike lane (basic, buffered, barrier-protected, parking-protected, or separated) would be determined by the Complete Streets Typology, although a localized design process should be conducted before each bike lane improvement is installed to ensure that local conditions are appropriately considered. Bike lanes shall be installed in accordance with TS-4.7 Bike Lane Implementation.

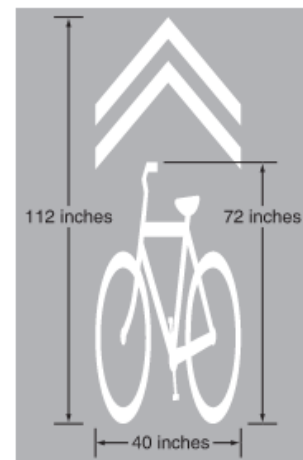
- A. Conflict Areas Green Pavement for Bike Lanes – Bike lanes shall include green pavement markings in the final 100 feet -200 feet of approach to an intersection, with the specific extent and type of markings to be determined by an engineering design process. Colored pavement can serve as a warning to both drivers and cyclists to an upcoming conflict area, and help to reinforce the bike lane’s “claim” to a portion of the roadway. Additionally, dotted white lane markings shall be used to delineate the bike lane through an intersection. In general, green paint should be used to delineate bike lanes at their approach to all public streets except those designated as Neighborhood Streets in the TMP. For more guidelines on use of green paint at intersections, refer to TS-4. Bike Lane Implementation.

9-330.3 SIGNED SHARED ROADS WITH LANE MARKINGS

A signed shared road is intended to facilitate the sharing of right-of-way between bicycles and automobiles by alerting drivers to the presence of cyclists through both roadside signage and share-the-road markings, or sharrows, on the pavement. Streets where this level of infrastructure is selected should have relatively low speeds and restricted right-of-way widths in order to facilitate the safe sharing of space.

FIGURE 9-1. SHARED LANE MARKING

- A. Signed Shared Roads shall be marked with Shared Lane Marking, per Figure 9-1.
- B. For streets with speed limit of 25 MPH, Shared Lane Marking shall be placed in the center of the lane. For streets with speed limit between 25 MPH and 35 MPH, Shared Lane Marking shall be placed a minimum of four (4) feet from the edge of pavement. When on-street parking is present, the Shared Lane Marking shall be placed a minimum of eleven (11) feet from the face of curb.
- C. Shared Lane Markings shall be placed at the exit of each intersection and at a maximum spacing of two hundred (200) feet. On streets with high vehicle or bicycle traffic, Markings shall have reduced spacing, as close as fifty (50) feet or as deemed appropriate by the City.



9-330.4 BICYCLE PARKING REQUIREMENTS

- A. For the purpose of this section, “long-term bicycle parking” shall mean facilities for the parking or storing of bicycles for six or more hours.
- B. The City shall specify the number of required spaces for any use not listed in the following table based upon a similar use.

TABLE 9-1 MINIMUM BIKE PARKING REQUIREMENTS

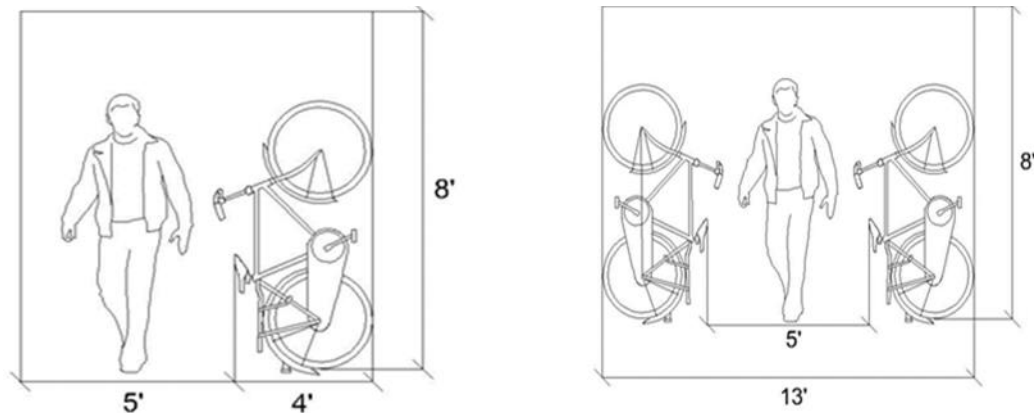
Use Category	Specific Use	Number of Short-Term Bicycle Parking Spaces Required	Number of Long-Term Bicycle Parking Spaces Required
Residential	Multi-Family Dwelling: Without private garage or equivalent separate storage space for each unit.	(1) space per (20) units (1) space per (20) units	(1) space per (4) units
	With private garage or equivalent separate storage space for each unit	(1) space per (20) units	None
Commercial	Office	(1) space per 25,000 sq. ft. of floor area	(1) space per 10,000 sq. ft. of floor area
	Retail	(1) space per 10,000 sq. ft. of floor area	(1) space per 12,000 sq. ft. of floor area
Assembly and Institutional Uses	Institutional	(1) space per 25,000 sq. ft. of floor area	(1) per each (25) employees/students
	Assembly, Place of	Spaces for (2) percent of maximum expected daily attendance	None
Industrial	Manufacturing and Production	(1) space per 25,000 sq. ft. of floor area	(1) per (25) employees

C. General standards for bicycle parking. All bike parking shall be subject to the following standards:

1. Each space on the facility or rack shall accommodate a bike at least six (6) feet in length.
2. No bike parking shall be installed in locations that obstruct pedestrian paths or vehicle rights-of way.
3. Parking areas shall be well lit if accessible to the public or bicyclists after dark.

4. Parking areas shall be located to ensure significant visibility by the public and building users, except in the case of long-term bike parking located in secure areas.
 5. Any in-street bicycle parking areas shall be separated from motor vehicles by a physical barrier (such as bollards, concrete or rubber curbing or pads, etc.) designed to adequately protect the safety of bicyclists and bikes.
 6. Bike rack materials shall consist of stainless steel, vinyl coating, or powder coating.
 7. The bike parking area shall consist of a dustless, hard surface, and shall not include any gravel, dirt, sand, or turf.
- D. Maneuvering areas. All required bike parking shall meet all of the following minimum criteria:
1. All bike racks shall be located at least 36 inches in all directions from any obstruction (other bike racks, walls, doors, posts, columns, interior or exterior landscaping, etc.)
 2. Each parking space shall be accessible without moving another parked bicycle.
 3. The maneuvering area may extend into portions of a street right of way but not portions established as an alley, driveway, off-street parking space, or any buffer or landscaped area.
 4. Vertical space-saving racks may be used as set forth in Figure 9-2.

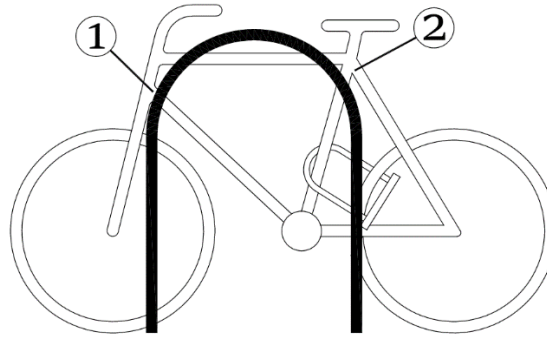
FIGURE 9-2. BICYCLE VERTICAL RACK



- E. Standards for short-term bicycle parking. All short-term bicycle parking facilities or racks shall meet the following standards:
1. Location. The parking area shall be located either:
 - a. Within fifty (50) feet of the main public entrance of the facility, measured along the most direct pedestrian access route; or
 - b. No further than the nearest motor vehicle parking space to the main public entrance (excluding accessible parking).
 2. A publicly owned or shared bicycle facility or rack may be utilized to meet the requirements for short-term bicycle parking provided the facility or rack has sufficient capacity to accommodate the proposed use and meets the minimum requirements of this section.
 3. The bike rack or facility shall be maintained to withstand severe weather and permanent exposure to elements.

4. The facility or rack shall be securely anchored to concrete footings, a concrete sidewalk, or comparably secure concrete surface or structural element of a building or structure.
5. The bike rack or facility shall accommodate securing a bicycle using an industry-standard lock that shall provide for at least two points of contact with the bike frame as shown in Figure 9-3.

FIGURE 9-3. BIKE RACK



- F. Standards for long-term bicycle parking. All long-term bicycle parking facilities or racks shall meet the following standards:
 1. Location. The parking area shall be located in a secure location in which access to the bicycles is limited and is unavailable to the general public. The facility or rack shall be located within 650 feet of the main entrance, measured along the most direct pedestrian access route.
 2. The parking area shall be constructed with at least one of the following features:
 - a. Bicycle locker. A structure solely used for securing and protecting a standard size bicycle from rain, theft, and tampering within a temporary enclosure.
 - b. Indoor storage. A dedicated, secured bicycle parking area either inside the principal building on the lot or a building located within 650 feet of a main entrance to the principal building. Indoor storage areas shall contain bike racks or comparable storage devices. Such rooms shall be designed to maximize visibility of all portions of the room or designated area from the entrance.
 - c. Covered. A dedicated, secured parking area that completely protects bicycles from rain with a minimum of eight (8) feet of clearance above the floor or ground with improved hard surface.
 3. The facility or rack shall be securely anchored to concrete footings, a concrete sidewalk, or comparably secure concrete surface or structural element of a building or structure.

9-340 ROADWAY DESIGN

9-340.1 STREET DESIGN REQUIREMENTS

Typical sections shall be labeled by street typology and vehicle per day (VPD). Street typology has been determined by the City of Manassas Transportation and Mobility Master Plan (TMP). A map of the street typology of all current and proposed streets within the City can be found in the TMP or in TS-2.0. Streets shall conform to the design requirements laid out in TS-4.1 through TS-4.6. These details include typical sections, street components, and geometric design requirements for street typologies. These geometric

requirements are related to functional classification; however, they also consider a multimodal vision for transportation in the City.

A. Street design shall comply with the following standards:

1. Collector/Connector, Commercial Corridor, and limited access streets shall have no direct access from single-family detached residential driveways.
2. Grades of relatively short lengths (up to 300 feet) may be increased to 10% absolute maximum. Approval by the City is required and design rationale shall show that such steep grades will not cause an intolerable maintenance situation.
3. Sufficient stopping sight distance shall be provided to safely accommodate realistic operating speeds notwithstanding the suggested design speed shown in the tabulation.
4. Easements must be provided if the analysis line for the sight distance is outside of the right-of-way. If an easement cannot be provided, then the intersection location needs to be re-evaluated.
5. Consideration must be given to the location of on-street parking when determining intersection sight distance.
6. Due to the normal density of development adjacent to residential subdivision streets, standard curve super-elevation is not practical; therefore, on streets where the posted speed is 35 MPH or less or traffic volumes less than 2,000 VPD, no super-elevation is applicable. On streets with traffic volumes over 2,000 VPD and speed limits of 35 MPH or greater, the maximum super-elevation rate shall be 2.0% (reverse crown). For collector / connector streets, commercial corridors, or other arterial route with projected volumes exceeding 2,000 VPD where the posted speed is greater than 35 MPH, super-elevation and pavement widening shall be provided in accordance with the current VDOT Road Design Manual.
7. Construction of all existing roadway widening projects shall conform to VDOT Road and Bridge Standard WP-2 "Asphalt Pavement Widening for Widening Subject to Traffic."
8. Each street should have continuity of design throughout. Therefore, multiple or "step down" typical designs will not be acceptable except where a major traffic generator such as an intersection with a collector street would delineate a clear line of demarcation.
9. An adequate turnaround shall be provided at the end of dead-end or cul-de-sac streets to allow safe maneuvering by service vehicles, highway equipment, and school buses. A minimum 50-foot pavement radius and 58 foot right-of-way radius is required. Refer to Standard Detail TS-5.0 and TS-5.1.
10. Each cul-de-sac shall have a minimum of identifiable typical street sections equal to the normal lot width between the intersecting street curb return and the beginning of the circular turnaround. Absolute minimum length of typical street sections shall be seventy-five (75) feet (PC to PC).
11. Minimum curve radii for public streets are based on design speed and super elevation and can be found in standard detail TS-4.6 Geometric Design for Street Typologies.
12. Privately maintained streets may comply with any defined street typology but shall have a minimum width of 22 feet from face of curb to face of curb to accommodate emergency vehicle access. If street is to serve as a fire lane, the minimum width is 26 feet.
13. All elements of roadway design shall meet the VDOT road design standards except as specified herein.

14. All projects shall contain pavement marking, signage, and maintenance of traffic (MOT) plans to show existing and proposed pavement markings and signage for the transportation facility.

B. Functional Classifications

Functional classification of City streets can be found in the TMP. If a street is not classified in the TMP, Table 9-2 provides a guide to determine functional classification from traffic volume (VPD). However, this table is only a guide and final determination shall be made by the City based on site conditions.

TABLE 9-2. FUNCTION CLASSIFICATION

Traffic Volume (VPD)	Design Speed (MPH)	Functional Classification
≤2,000	20 – 30	Local Street
≥2,000	35	Local Connector
	40	Minor Arterial
	50	Principal Arterial

C. Design Speed and Stopping Sight Distance

Street design speed and stopping sight distances shall comply with the following:

1. Design speed for existing streets can be determined with the following table:

TABLE 9-3. DESIGN SPEED

Posted Speed	25	30	35	40	45	50	55
Design Speed	30	35	40	45	55	65	70

2. New streets shall have design speed and sight distance based on street typology. Please see standard detail TS-4.6 Geometric Design for Street Typologies.
3. Design each new roadway so that all horizontal and vertical curves meet the minimum stopping sight distance and minimum K values outlined in Table 9-4. K value is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve that will provide minimum sight distance.
4. Sight distances shall be noted on the profile sheet for all vertical curves and on the plan sheets for all horizontal curves and at all intersections.

TABLE 9-4. STOPPING SIGHT DISTANCE AND MINIMUM K VALUES

Height of Eye 3.5'	Height of Object 2'										
Design Speed (mph) **	25	30	35	40	45	50	55	60	65	70	75
Min. Sight Distance (ft.)	155	200	250	305	360	425	495	570	645	730	820

Source: 2018 AASHTO Green Book, Chapter 3, Section 3.2.2

Minimum K Value For:											
Crest Vertical Curves	12	19	29	44	61	84	114	151	193	247	312
Sag Vertical Curves	26	37	49	64	79	96	115	136	157	181	206

Source: 2018 AASHTO Green Book, Chapter 3, Section 3.4.6

Design Speed (mph) **	Stopping Sight Distance on Grades					
	Downgrades			Upgrades		
	3%	6%	9%	3%	6%	9%
15	80	82	85	75	74	73
20	116	120	126	109	107	104
25	158	165	173	147	143	140
30	205	215	227	200	184	179
35	257	271	287	237	229	222
40	315	333	354	289	278	269
45	378	400	427	344	331	320
50	446	474	507	405	388	375
55	520	553	593	469	450	433
60	598	638	686	538	515	495
65	682	728	785	612	584	561
70	771	825	891	690	658	631
75	866	927	1003	772	736	704

TABLE 2-7 STOPPING SIGHT DISTANCE ON GRADES

(See 2018 AASHTO Green Book, Chapter 3, Section 3.2.2)

**For all tables, use design speed if available, if not use legal speed.

9-340.2 STOP BARS AND STOP SIGNS

A. Guidance for Placement of Stop Bars:

1. In the absence of a marked crosswalk, the stop bar shall be placed at the desired stopping point, but shall not be placed more than thirty (30) feet or less than four (4) feet from the nearest edge of the intersecting traveled way.
2. Stop bars shall be placed at all locations with stop signs or traffic signals within the public right-of-way.
3. Stop bars shall be placed on recommended school routes within a 1/4-mile radius from school entrance of property.

B. Guidance for Placement of Stop Signs:

1. Stop signs shall be installed on minor roads at all locations within City right-of-way where a minor road intersects a major road, unless the intersection is controlled by a signal or alternative intersection design such as a roundabout.
2. Stop signs may be installed on all legs of an intersection only if recommended by a traffic engineering study that has considered traffic, pedestrian, and bicycle safety; roadway geometry; traffic volumes; roadway design speed; and other relevant design factors.
3. Stop signs shall be installed in line with the stop bar at intersections where a full stop is necessary at all times.

9-340.3 INTERSECTION IMPROVEMENTS AND CROSSOVER CRITERIA

A. Intersection Sight Distance:

After each street has been designed to meet the typology, design speed, and stopping sight distance criteria, then each intersection needs to be designed to meet all requirements of this manual. Intersection sight distance meet the standards outlined in Table 9-5. The verification of this sight distance shall be done graphically checking both the horizontal and vertical alignments. profiles of existing roads shall be provided for a minimum 350 feet or the applicable sight distance whichever is greater in each direction. Adequate sight distance easements shall be provided, outside of the rights-of-way, to assure that the line of sight will be kept clear of any obstructions that may diminish the available sight distance. An appropriate note to identify the person or entity that has the maintenance responsibility of the sight distance easement shall be shown on the plans and plats.

TABLE 9-5. INTERSECTION SIGHT DISTANCE

Height of Eye 3.5 Feet				Height of Object 3.5 Feet					
Design Speed (MPH)	20	25	30	35	40	45	50	55	60
SDR=SDR 2 Lane Major Road	225	280	335	390	445	500	555	610	665
SDR: 4 Lane Undivided	250	315	375	440	500	565	625	690	750
SDL: 4 Lane Undivided	240	295	355	415	475	530	590	650	710
SDR: 4 Lane Divided	275	340	410	480	545	615	680	750	820
SDL: 4 Lane Divided	240	295	355	415	475	530	590	650	710
<i>The term "Major Road" refers to the road with the highest VPD of the two (2) intersecting roads.</i>									
<i>All existing City maintained roads are considered as the "Major Road".</i>									
<i>For more than four (4) lanes on major roads, or for large truck volumes on minor roads (20% to 25% of ADT), crossover, or commercial entrance, use values in the latest edition of "Policy on Geometric Design of Rural Highways" published by AASHTO.</i>									

Height of Eye 3.5 Feet				Height of Object 3.5 Feet					
Design Speed (MPH)	20	25	30	35	40	45	50	55	60
<i>If major roadway configuration is not included in this table, sight distance shall comply with requirements of VDOT Road Design Manual.</i>									

B. Turn Lanes

1. A left turn lane and taper shall be required at all intersections where there are projected to be greater than 100 left turning movements per hour. This is to be determined through trip generation and direction and mode splits established through traffic impact analysis (TIA) scoping meeting. Minimum lengths of turn lanes and tapers shall be designed in accordance with Table 9-6, below. If TIA indicates that the minimum turn lane length does not provide adequate storage, the turn lane must be lengthened to contain the turning queue in the peak hour. Alternatively, if the TIA indicates that all legs of an intersection operate at a Level of Service of C or better in the peak hour without a dedicated turn lane, the turn lane requirement may be waived at the discretion of the Director of Engineering.
2. A right turn lane and taper shall be required at all intersections of urban section streets that warrant for a turn lane and taper in Figure 9-4. Right turn lanes and tapers shall meet the minimum length requirements of Table 9-6. If a traffic study indicates that the minimum turn lane length does not provide adequate storage, the turn lane must be lengthened to contain the turning queue in the peak hour. At intersections without curb and gutter, shoulders of turn lanes shall be paved per VDOT specifications.

FIGURE 9-4. RIGHT TURN LANE WARRANT

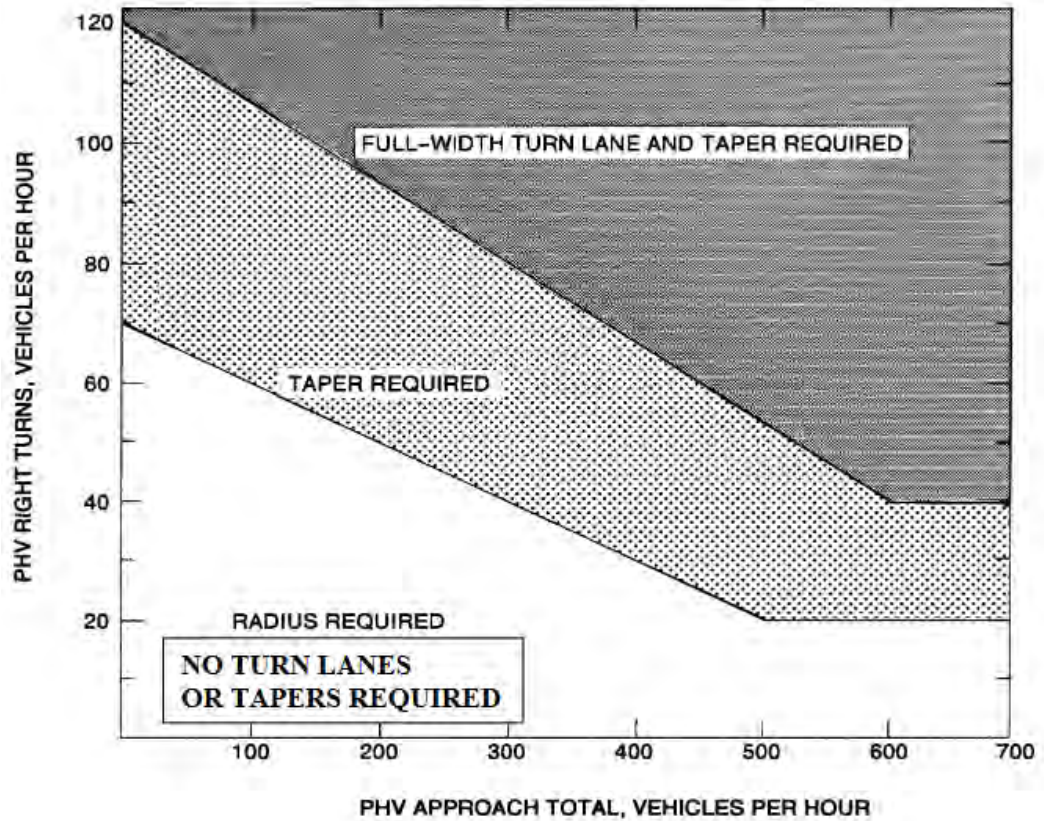


TABLE 9-6. MINIMUM TURN LANE REQUIREMENTS

Design Speed	Min. Length Turn Lane	Min. Length of Taper
≤ 30 mph	100 feet	100 feet
35 mph	100 feet	100 feet
40 mph	100 feet	100 feet
45 mph	100 feet	100 feet

C. Street Intersection

1. The number of intersections of private and neighborhood streets with collector / connector streets or commercial corridors shall be held to a minimum to avoid hazard and delay.
2. Along collector / connector streets and commercial corridors, the centerline separation of streets intersections (including high traffic generating commercial entrances of 1,000 VPD or more) within the same lot, parcel, or development shall follow the minimum distance between crossovers, noted on Table 9-1. For other streets, the separation will be three hundred (300) feet unless proven undesirable by an approved intersection study.

3. A distance of at least two hundred (200) feet shall be maintained between centerlines of offset intersecting neighborhood streets.
4. In general, all streets shall join each other so that the streets are at approximately right angles to each other for a minimum distance of 100 feet from the intersection.
5. The following design choices should be considered to improve intersection safety, reduce vehicle speeds, and avoid or mitigate conflicts between modes at intersections:

Remove Slip-Ramps – Slip ramps are in some cases necessary for traffic flow, but in many cases are remnants of a default approach to prioritize maintaining vehicle speed over safety considerations. Their removal will reduce intersection complexity and remove an unimpeded vehicle movement that creates high vehicle turning speeds. Consider at any intersection with slip ramps, particularly on Commercial Corridors and Collector/Connectors.

Reduce Curb Radii – Shorter turning radii can facilitate lower turning speeds, shorten the overall crossing distance for pedestrians, and improve sight distance between pedestrians and motorists at intersections. Consider during all intersection re-design processes, particularly for Commercial Corridors and Collector/Connectors.

D. Intersection and Commercial Entrance Criteria

1. All public street intersections and commercial entrances shall comply with criteria set forth in this section.
2. The configuration of all new or modified commercial entrances and median crossovers shall be analyzed with Auto TURN to verify that the design vehicle can make turning movements without undue impact to adjacent roadway features.
3. Minimum intersection and commercial entrance spacing is established in Table 9-7.

TABLE 9-7. MINIMUM INTERSECTION AND COMMERCIAL ENTRANCE SPACING

Street Type	Design Speed (MPH)	Minimum Spacing Between Intersections & Commercial Entrances (Feet)			
		Signalized Intersection	Unsignalized Intersection with Crossover	Entrance with Full Access ¹	Entrance with Partial Access ²
Neighborhood Connector ⁴	30	660	440	225	200
Collector / Connector ⁴	40	660	440	335	250
Commercial Corridor ³	40	1050	660	470	250
Industrial / Suburban Business Road ³	35	880	660	355	200

Notes:

(1) Full access entrance may include a directional crossover if the street has a median.

(2) Partial access entrance would include an entrance with no crossover or with directional access (i.e. right-in, right-out).

(3) Assumes streets have functional classification of Minor Arterial.

(4) Assumes streets have functional classification of Collector.

(5) All values taken from VDOT Road Design Manual, Appendix F, Table 2-2 Minimum Spacing Standards for Commercial Accesses, Intersections, and Median Crossovers.

(6) Neighborhood, Urban, and Mixed-Use Street Types shall have minimum commercial entrance spacing of two hundred (200) feet.

9-340.4 VEHICLE GUARDRAILS

- A. In general, guardrail shall be used as a last resort to protect vehicles from roadside hazards. Every effort should be made to remove a hazard from the clear zone before guardrail is considered for use. Guardrail shall not be used to separate vehicle traffic from pedestrian or bicycle facilities unless there is a hazard behind the pedestrian or bicycle facility that requires guardrail installation.
- B. A standard "W" beam guardrail shall be provided when vehicles are to be protected from fill slopes in excess of ten (10) feet or are adjacent to stormwater wet ponds. The requirement of guardrails and handrails shall be determined on the plans, whenever possible, in order to include their cost in the bond estimate.
- C. Furthermore, the following note shall be added to the plan: "A joint inspection will be held with the developer, City representatives, and if required representatives of VDOT to determine if and where guardrail and/or handrails will be needed if not determined on the approved plan and field conditions dictate the requirements. Further, the developer will be responsible for providing guardrail and handrails as determined by this inspection." Also see VDOT guardrail and handrail specifications.
- D. Guardrail shall comply with latest revision for VDOT standards for Midwest Guardrail System MGS-1 or MGS-1A, including appropriate end treatments and fixed object attachments.
- E. Alternative to standard "W" beam guardrail which may be permitted and/or approved in subdivisions is a rustic wood post and wood rail design, based on FHWA standard for Steel-Backed Timber Guardrail.
- F. Written approval for the alternatives within the public right-of-way is required prior to plan approval by the City.
- G. For design criteria of a specific type of guardrail, refer to American Association of State Highways and Transportation Officials (AASHTO) "Roadside Design Guide."
- H. At a minimum, the construction plans shall indicate the following:
 - 1. Strong post or weak post system and design criteria.
 - 2. Terminal end treatment and anchorage.
 - 3. Warrant for guardrail installation.
 - 4. Curvature radius, if applicable.
 - 5. Installation height.
 - 6. Weed control provisions.

9-340.5 BRIDGE & OVERPASS

- A. Highway bridges shall meet all VDOT requirements and shall be designed with appropriate live and dead loadings.

- B. All highway bridges shall be designed and sealed by a registered Professional Engineer licensed to practice in the Commonwealth of Virginia and specializing in highway bridge design.
- C. All highway bridges will be referred to VDOT for review and comment prior to approval.

9-340.6 PARKING AND LOADING DESIGN STANDARDS

Parking and loading shall be provided according to the requirements of the Zoning Ordinance and this Article.

A. Off-Street Parking Lot Design Standards

The design of any off-street parking lot shall meet the dimensions provided in the table below. Alternative dimensions may be approved by the City provided they conform to commonly accepted engineering design standards and do not compromise the safety, appearance, or function of the parking area.

TABLE 9-8. MINIMUM OFF-STREET PARKING LOT DIMENSIONS

Angle of Parking (Degrees)	Direction of Traffic	Dimensions of Stall (in feet)	Width of Aisle (in feet)
Parallel	One-way	8x20	11
30	One-way	9x18	14
45	One-way	9x18	14
60	One-way	9x18	18
90	Two-way	9x18	22
No adjacent parking	One-way	n/a	11
No adjacent parking	Two-way	n/a	22

B. Compact Vehicle Requirements

- 1. When ten (10) or more off-street parking spaces are required, compact parking spaces may fulfill up to 15% of the minimum parking requirement.
- 2. The minimum size requirement for a compact parking space shall be 8x16 feet.
- 3. Compact spaces shall be grouped together and clearly identified with markings on the surface of the parking space and with signage restricting use of the parking space for compact vehicles only.

- C. Entrances to parking bays shall be located along the site accessway to avoid blockage of the street right-of-way by vehicles entering the site.
- D. A hierarchy of on-site travelways shall be maintained with no direct parking along the major site accessways.
- E. All loading spaces and all trash dumpsters, trash compactors, or refuse collection areas shall be accessible by the design vehicle with all parking spaces occupied.
- F. All parking bays with more than twenty (20) spaces shall provide a turnaround at the most remote end. The turnaround shall accommodate an AASHTO SU Design Vehicle.
- G. Minimum aisle width is exclusive of gutter pans used for drainage.

- H. The maximum travel aisle slope within off-street parking areas shall be 5%.
- I. All retaining, screening, landscaping, and building walls shall be protected from vehicle contact.
- J. "Overhang" areas that are a part of the required parking space shall be graded no higher than two (2) inches above the top of the curb and shall not be encroached by landscaping, signs, or other obstructions.
- K. A physical barrier shall be provided adjacent to a sidewalk that runs parallel with a travelway or parking bay.
- L. Head-in parking that abuts a sidewalk shall provide wheel stops, or a 6-inch header curb and shall maintain the minimum sidewalk width required under the DCSM.
- M. Off-street parking spaces and any vehicle display areas shall be demarcated by lines painted on the pavement.
- N. Parking lot landscaping shall be provided in accordance with DCSM Section 3-460, Parking Lot Landscaping.
- O. Off-street parking areas containing four (4) or more parking spaces, except for single-family detached dwellings, shall provide a minimum of one direct and continuous paved pedestrian connection within the parking area that connects building entrances, off-street parking spaces, and new or existing sidewalks adjacent any street right-of-way. The pedestrian connection shall be uninterrupted by off-street parking spaces and may be contained within landscaping islands or buffer areas.

9-340.7 ACCESSIBLE PARKING REQUIREMENTS

Accessible parking and building or sidewalk accessibility shall be provided in accordance with the current adopted Virginia Uniform State Building Code (VUSBC)

TABLE 9-9. MINIMUM ACCESSIBLE PARKING SPACE REQUIREMENT

Total Parking in Lot	Required Minimum Number of Accessible Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2 Percent of Total
1001 and Over	20 plus 1 for every 100 spaces over 1000
One in every eight, but no less than one, shall be van accessible	

- A. Accessible parking spaces shall be identified by above grade signs and demarcated per Standard Detail TS-12.0 and TS-12.1 of this Article as modified by the VCC Accessible Parking Signage requirements. The sign shall be supplemented by the painting of the international symbol with a 4-foot by 4-foot blue box on the surface.
- B. Accessible parking spaces shall be located as close as possible to a main building entrance, ramp, or walkway and shall have a maximum cross slope of 2%. If serving more than one (1) building, accessible parking spaces shall be centrally located and a designated walkway shall be provided.
- C. Where a curb exists between the parking lot surfaces and the sidewalk or walkway, an inclined approach shall be provided to allow convenient access for wheelchairs. Built-up curb ramps shall be located so that they do not project into vehicular traffic lanes. The approach shall have a slope of not more than one (1) foot in twelve (12) feet and be a minimum of five (5) feet standard width, exclusive of flared sides. Inclined approaches shall be provided and arranged to allow convenient access to a building entrance and from one (1) curb area to another. Such approaches shall be provided at intervals not exceeding one hundred (100) feet.
- D. A request for modification of any of the requirements of this section shall be submitted, in writing to the Building Official.

9-340.8 ADDITIONAL CHARACTER AREA OFF-STREET PARKING REQUIREMENTS

The location of off-street parking or driveways shall meet the following requirements, in addition to the requirements of the Zoning Ordinance.

- A. Traditional Neighborhood. For single-family attached or duplex dwelling located in the Traditional Neighborhood Character Area of the Comprehensive Plan, no off-street parking or driveways shall be located between a principal structure and any adjacent public streets
- B. Special Districts: Mathis and Sudley Medical. In the Mathis and Sudley Medical Character Areas of the Comprehensive Plan, the following standards shall be met:
 - 1. No off-street parking shall be located in any required landscaping buffer areas, or open space.
 - 2. A minimum of 75% of off-street parking shall be located to the rear or side of the principal structure. Where off-street parking is visible from a street right-of-way, the off-street parking shall be fully screened in accordance with DCSM requirements within an enclosed courtyard or by a wall or decorative fence no less than four (4) feet in height, and supplemented by landscaping.
- C. Special Districts: Downtown. In the Downtown Character Area of the Comprehensive Plan, the following standards shall be met:
 - 1. No off-street parking shall be located in any required landscaping areas, buffer areas, or open space.
 - 2. All off-street parking shall be located to the rear or side of a principal structure. Where off-street parking is visible from a street right-of-way, the off-street parking shall be fully screened in accordance with DCSM requirements within an enclosed courtyard or by a wall or decorative fence no less than four (4) feet in height, and supplemented by landscaping.
 - 3. No off-street parking or driveways shall be provided anywhere in the front yard abutting a public street of a single-family attached or duplex dwelling.

9-340.9 SURFACING

- A. Surfacing of off-street parking, driveways, travelways, accessways, and aisles, and exterior storage areas used for the storage or movement of vehicles shall be designed to maintain proper drainage, shall consist of an improved dustless surface, and shall not include dirt, gravel, or sand.
- B. Historic Overlay District. The use of gravel or other pervious material may be permitted for single-family detached dwellings located in the Historic Overlay District (HOD), provided the use is approved by the City in accordance with the requirements of the HOD and the DCSM.
- C. Asphalt Millings. The use of RAP and Recycled Concrete Aggregate for the purposes of construction or repairs of fill material, backfill, equipment and vehicle storage lot, building pads or foundations, overflow storage or parking lots, pipe bedding or stormwater controls is prohibited where stormwater or groundwater may come into contact with RAP or recycled concrete aggregate to be collected and/or discharged to the stormwater system or receiving waterbody.
- D. Low-impact design. Pervious or semi-pervious materials, such as open joint pavers, porous asphalt, pervious concrete, turf grid, or other comparably effective material, may be approved for off-street parking or driveways provided:
 - 1. The materials conform to commonly accepted engineering design standards.
 - 2. The site is designed to maintain proper drainage in accordance with the DCSM.
 - 3. The property owner has provided sufficient assurance that such areas shall be properly maintained.
 - 4. The use of engineered grass pavers shall only be approved by the City in low-traffic, non-residential areas (such as overflow parking areas), where it can be demonstrated that the vegetation will survive the level of expected traffic.

9-340.10 ALTERNATIVE PARKING STANDARDS

Alternative parking may be approved as permitted under the Zoning Ordinance and in accordance with the following requirements.

- A. Alternative Parking Plans
 - 1. An alternative parking plan for off-site parking may be approved in accordance with the Zoning Ordinance to fulfill the minimum off-street parking requirements for a land use. The parking plan shall identify the alternative off-street parking, show that it is located no more than 650 feet from the land use to which it is designated, and demonstrate compliance with the off-street parking requirements enumerated in the Zoning Ordinance.
 - 2. An alternative parking plan may be approved to allow off-street parking spaces to be shared between multiple, separate uses. The parking plan shall show that the uses, tenants, or activities have established operating hours that do not generate an overlap in employee or client use of the parking spaces to be shared under the plan. The process for City approval of alternative parking shall be in accordance with the Zoning Ordinance.
- B. Downtown Character Area.
 - 1. Any use of land in the Downtown Character Area may meet off-street parking requirements through payment-in-lieu of required off-street parking spaces. The payment shall be in accordance with the fee established by an uncodified ordinance enacted by the City Council, as

amended. Credit for an off-street parking requirement met in this manner shall run with the land. No refund shall be made when a subsequent change of use requires less parking.

2. The City shall collect the fee prior to the issuance of a certificate of use or occupancy. Such payment shall be in one lump sum or as otherwise approved. Payment of this fee does not guarantee parking spaces will be constructed for the sole use or within immediate proximity of a particular land use. These funds shall be deposited by the City in a special parking fund and shall be used to:
 - a. Provide additional off-street public parking to serve the Downtown Character Area;
 - b. Acquire land for such parking through purchase, lease, or license;
 - c. Develop land to make it suitable for public parking;
 - d. Replace existing City-owned parking lots with public parking structures; or
 - e. Engage in projects that increase the amount of available public parking spaces or reduce dependence upon automobiles and thereby reduce parking demand.

9-340.11 OFF-STREET STACKING REQUIREMENTS

Off-street stacking spaces shall be provided in accordance with the following requirements:

- A. Stacking spaces shall not interfere with the travelway traffic or designated parking spaces.
- B. Stacking spaces shall be at a minimum eighteen (18) feet in length.
- C. Stacking spaces shall be located to the side or rear of the building and shall not be located between the building and any street right-of-way.
- D. For drive-through restaurant uses, an abort lane shall be provided at or near the menu board or service unit.
- E. Off-street stacking spaces shall be provided according to the requirements set forth in Table 9-10.

TABLE 9-10. MINIMUM STACKING SPACE REQUIREMENTS

TYPE OF ACTIVITY	REQUIRED NUMBER OF STACKING SPACES	START POINT FOR STACKING SPACES
Financial Institutions - automated teller machine	3	Teller machine
Financial Institutions - bank teller lane	3	Teller window/tube
Professional Personal Service - dry-cleaning/laundry	3	Cleaner/laundry window
Retail Sales - pharmacy	3	Pharmacy window
Restaurant	6	Order box/speaker
	4*	Pick-up window
Other	To be determined by City. Such determination shall consider any study prepared by an engineer or other qualified design professional.	
* These spaces are required in addition to the stacking spaces required to be located behind the order box/speaker and shall be located between the pickup window and the order box/speaker.		

9-340.12 OFF-STREET LOADING REQUIREMENTS

- A. Off-street loading requirements. The quantity of off-street loading spaces shall comply with the requirements of the Zoning Ordinance.
- B. Standard Loading Area:
 - 1. Standard loading spaces shall be a minimum of 15 feet in width and 30 feet in length, and provide a minimum vertical clearance of 15 feet.
 - 2. When loading spaces are located alongside each other, additional loading spaces shall require a minimum of 12 feet in width.
 - 3. All uses required to provide standard loading spaces shall provide an entrance and circulation system which can accommodate an American Association of State Highway and Transportation Officials (AASHTO) SU Design Vehicle.
- C. Semi-Trailer Loading Space:
 - 1. Semi-Trailer loading spaces shall be a minimum of 15 feet in width and 55 feet in length and provide a minimum horizontal clearance of 15 feet.
 - 2. Uses requiring a semi-trailer loading space shall utilize an AASHTO WB-50 Design Vehicle for planning the entrance and on-site circulation system.

- D. All loading spaces shall be accessible to the design vehicle with no more than two (2) backing movements. The circulation pattern for the design vehicle shall provide for forward movements and shall discourage backing movements.
- E. Access lanes shall be a minimum of eleven (11) feet in width for one-way traffic and twenty two (22) feet in width for two-way lanes. This space may also be considered as a space for the maneuvering apron.
- F. Surfacing. All outdoor or exterior loading areas shall be surfaced with an improved, dustless material capable to bear a live load of 200 pounds per square foot.

9-340.13 FUELING/GASOLINE STATION DESIGN REQUIREMENTS

Fueling/gasoline stations shall be approved by the Fire Marshal's Office and installed in accordance with the requirements of VUSBC and the following standards:

- A. Gasoline pump islands shall be protected at each corner by a vertically imbedded metal post filled with concrete at least thirty (30) inches in height above the ground and three (3) inches in diameter.
- B. Each gasoline pump island shall be located so that there is a refueling area of at least ten (10) feet in width on both sides of the pump island. A minimum of twenty (20) feet is required between pump islands and an abort lane adjacent to the building of eleven (11) feet to bypass the pumps.
- C. There shall be travel lanes of not less than twenty-two (22) feet in width between any refueling area at the pumps and any parking spaces provided on-site.
- D. Parking spaces located outside of the refueling area will be demarcated with paint and equipped with wheel stops where deemed necessary by the approving Department.
- E. The following minimum setback distance from the pump islands to the ultimate right-of-way line shall be required for various angles:
 - 1. Parallel to R/W: 12 feet
 - 2. From 1 Degree to 45 Degrees: 20 feet
 - 3. From 45 Degrees to 90 Degrees: 30 feet

9-340.14 BUS PARKING REQUIREMENTS

- A. If bus parking is provided, it shall be arranged for functional efficiency and convenience and shall be designed to be amenable to surrounding property.
 - 1. Site plan required. In accordance with the zoning ordinance, site plans shall be submitted for all new off-street parking areas designated for buses or for any additions to existing bus off-street parking areas.
 - 2. Location. Bus parking shall be located no closer than 30 feet to adjacent residential uses, hotels, hospitals, or institutes of human care and occupancy. Upon finding that due to enhanced landscaping, use of berms, or other site characteristics and/or improvements, the bus parking area is sufficiently screened from the aforementioned uses, the approving Department may reduce this setback requirement to a minimum of twenty (20) feet.
 - 3. Signs for bus parking only. Parking areas designated for bus parking shall only be used for bus parking. Signs shall be present within the parking lot indicating areas that are designated solely for bus parking.

4. Dimensions. The bus parking lot shall meet the minimum geometric standards outlined in Table 9-11.

TABLE 9-11. MINIMUM OFF-STREET BUS PARKING DIMENSIONS

Type	Stall Dimensions (in feet)	Aisle Width (in feet)
Parallel Parking	12x50	Determined by the turning radii necessary to safely maneuver in and out of parking spaces, but no less than 24 feet.
Perpendicular or Angled Parking	12x40	

5. Entrances to parking areas. The site plan shall clearly indicate the location, size, and number of entrances from parking areas onto public or private roads. The City may approve modified entrance designs upon finding that on-site traffic circulation, off-site traffic flow, or public safety may be impaired or improved.
6. The minimum bus turning radius is forty-five (45) feet in accordance with VDOT’s Road Design Manual, Appendix B(1).

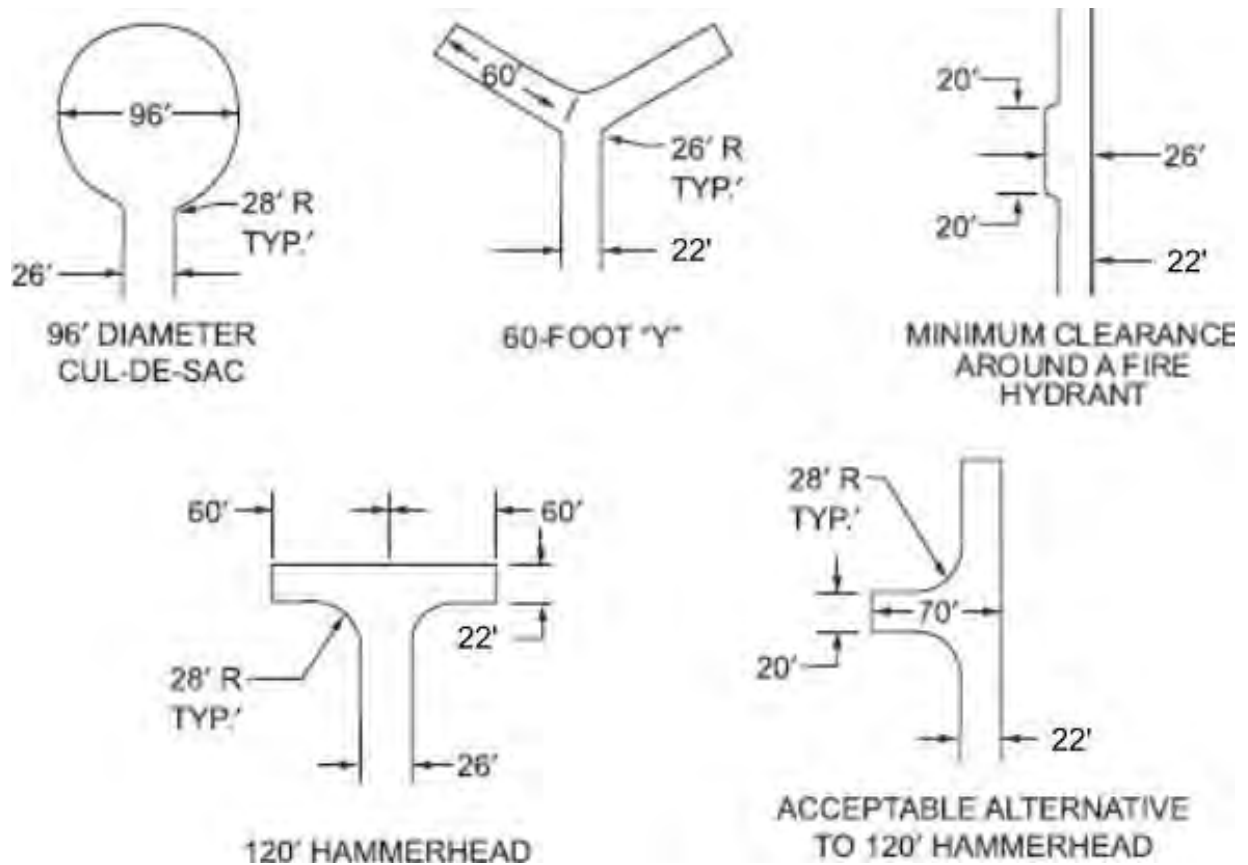
9-340.15 DEAD-END EMERGENCY VEHICLE TURN AROUND

All dead-end streets, whether or public or private, shall meet the minimum requirements for emergency vehicle turn around provided in the following table and figure.

TABLE 9-12. DEAD-END STREET EMERGENCY VEHICLE TURN AROUND REQUIREMENTS

Dead- End Length (FT)	Min. Street Width (FT)	Turn Around Required
0 - 150	22	None Required
151 - 500	22	120-Foot Hammerhead, 60-Foot 'Y' or 96-Foot Diameter Cul-De-Sac
501 - 750	26	120-Foot Hammerhead, 60-Foot 'Y' or 96-Foot Diameter Cul-De-Sac
Over 750		Special Approval Required from Fire Marshall

FIGURE 9-5. DEAD-END EMERGENCY VEHICLE TURN-AROUND EXHIBITS



9-350 DRAINAGE AND STORMWATER MANAGEMENT

9-350.1 STORMWATER MANAGEMENT REQUIREMENTS

Transportation improvement projects shall be subject to all drainage design and stormwater management criteria articulated in Article 8 of this manual in addition to Virginia Stormwater Management Code per 9VAC25-870. If on-site stormwater management is not possible due to technical constraints, nutrient credits may be purchased from a regional bank to offset a project's nutrient reduction requirement. On-site stormwater management shall be provided to the maximum extent practical.

9-350.2 ALTERNATE STREET DESIGN WITH OPEN DITCH CROSS-SECTION

An alternative street design with open ditches will be allowable when within City parks. Streets with open ditches must meet the following requirements:

- A. Design speed shall be 25 MPH and posted speed limit shall be \leq 20 MPH
- B. Minimum pavement width is twenty-two (22) feet
- C. Ditch side slopes shall be \leq 3:1
- D. Street shall be a Signed Shared Road, unless an alternative bicycle access facility is provided.
- E. Sidewalk or other pedestrian accommodation must provide equal access to park facilities.

- F. Ditch sections shall convey the 10-year storm with adequate freeboard and the 2-year storm at non-erodible velocities in accordance with the requirements of Article 8 of this manual.

9-350.3 GREEN INFRASTRUCTURE

The use of green infrastructure (sometimes referred to best management practices, or BMPs) is encouraged and expected for meeting stormwater management requirements wherever technically feasible. Green infrastructure measures provide filtering to improve stormwater quality and infiltration to reduce the volume of runoff. During the project planning phase of transportation and site development projects, consideration should be given to stormwater infrastructure that compliments the proposed improvements. Examples of integrating green infrastructure into both transportation and site development projects include but are not limited to:

- A. Roadway safety and pedestrian improvements often provide opportunities for small scale bioretention or tree wells in sidewalk buffers and to separate on-street parking from curb ramps.
- B. Traffic calming measures such as curb bump-outs in residential areas provide space for small scale bioretention.
- C. Parking lot islands provide opportunities for bioretention, tree wells, or other infiltration measures.
- D. Parking stalls, parking lanes, and separated bike lanes are suitable applications for permeable pavement.

All green infrastructure features must meet the requirements of the Virginia Stormwater BMP Clearinghouse. Design shall follow the procedures of the Virginia Stormwater Management Handbook and the VDOT Drainage Manual.

9-350.4 UNDERDRAIN

- A. Sidewalk underdrain may be required when the sidewalk longitudinal gradient is 3% or more and/or when the underlying soil has 34% or more passing the No. 200 sieve and has a Plasticity Index (PI) of 13 or less. If required, sidewalk underdrains shall be designed and constructed according to VDOT standard UD-3.
- B. Sidewalk underdrains shall be tied into the storm sewer systems at points approximately a city block apart with runs not exceeding 1,000 feet in length without discharging into the storm drain system or into an open drain. The length of run may be increased by up to an additional 1,000 feet if 8-inch diameter pipe is used in the downstream 1,000-foot section of the run.
- C. All underdrain pipe to be six (6) inch unless otherwise noted on plans. Minimum grade of pipe shall be 0.5 %. Bends of 45 degrees may be used to permit connection to drainage structures. The pipe used under pavement sections and commercial entrances shall comply with VDOT standards.
- D. After the street section has been rough graded, CBR tests are to be conducted for street pavement design, sieve and PI analysis shall be done in conjunction with them. If these tests indicate that underdrains are required, additional classification tests will be made of the sidewalk subgrade to determine the size and location of sidewalk underdrains.
- E. These tests will be made at all changes of subgrade soil type and not more than 500 feet apart. Plan revisions based on these tests will then be prepared by the designer and submitted to the City for review and approval.
- F. Density tests on natural subgrade shall be made and approved after the subgrade has been shaped and compacted to 95 % density at optimum moisture, prior to the placing of sidewalks.

- G. Where required, sidewalk underdrains shall be used for all walkways that are to be maintained by a public agency or a homeowner association.
- H. Underdrain strength shall comply with VDOT standards.
- I. Roadway and Raised Grass Median Underdrains: Underdrains for roadways and raised grass median shall be provided in areas of frost susceptible soils and high ground water on a case-by-case basis, or based upon actual field verification of such conditions

9-360 STREET FURNITURE

9-360.1 LIGHTING

A. GENERAL REQUIREMENTS

1. The design and layout of a power distribution system to service lights will generally be accomplished by the City Electric Department. Advice on lighting levels, selections of poles, heights of mounting, type of luminaries, and placement of lights shall be in conformance with this manual or standards required by the City.
2. All installation costs for the system will be the responsibility of the developer. Where the proposed system lies within dedicated right-of-way and requires that such installation only be contracted by Public Utilities, the developer will sign an agreement with the City of Manassas guaranteeing full payment to the City of Manassas of all installation charges, as well as all administrative costs to the City in contracting for such installation. Said agreement shall be executed prior to the approval of a record plat.
3. Operational and maintenance costs of the lighting system shall be the responsibility of the City of Manassas within the public system of roads. The record plat of the subdivision will indicate this and will further designate with whom this responsibility will ultimately lie for private streets within a development.
4. The developer shall post a completion bond with the City prior to approval of plans covering the entire cost of installation.

B. LUMINAIRE AND POLE STANDARD

1. All luminaries and supporting poles shall conform to the following:
 - a. Standard fixture shall mean those fixtures normally supplied by the City for the site in question. (Standard fixtures will be maintained by the City.)
 - b. Within the Manassas Downtown and major gateways, the standard fixtures shall be as shown in TS-20.2, TS-20.3, and TS-20.6 unless otherwise approved in order to achieve acceptable minimum lighting levels for public safety purposes. A map showing the limits of the Manassas Downtown and Historic Districts to determine luminaire requirements is in TS-20.0.
 - c. Alternate fixture shall mean one (1) of the three (3) fixture designs as approved by the City. Alternate fixture installations will be maintained by the City and shall be metered. The Developer shall provide 25% in excess of the total number of alternate fixtures installed for parts and replacement.
2. The City will review of all streetlight, parking, and onsite lighting plans for roadways serving more than five (5) dwellings and all non-residential roadways. All commercial entrances will be provided with street lighting. This includes lighting of any new intersections along existing roadways. All

public street lighting will be bonded by the developer and installed by the City Electric Department. All illumination levels of roadway lighting designs shall conform to the Section 9-740 of this Article and shall meet all requirements of the City for the site in question.

3. The standard roadway fixture shall be utilized where one or more of the following conditions apply: Refer to Standard Detail TS-20.2 or TS-20.3, or TS 20.6 of this Article.
 - a. Installations along extensions of roadways that are lighted with standard fixtures.
 - b. Installations along roadways within or surrounding a non-residential subdivision.
 - c. Installations along roadways with projected or existing traffic counts of 1,000 or more vehicles per day.

C. LIGHT SOURCES

All light sources shall be light emitting diode (LED), with type, model, and make, as approved by the City. When a different color rendition is necessary, a metal halide or other source will be reviewed on a case-by-case basis for on-site lighting. A photometric design shall accompany site plans in accordance with the requirements of Article 2 of this Manual.

D. DESIGN OF STREET LIGHT INSTALLATION

A street lighting design prepared and stamped by a professional engineer shall be presented with the site plan. This design shall conform to the following criteria.

TABLE 9-13. AVERAGE MAINTAINED ILLUMINANCE VALUES IN FOOTCANDLES

ROAD TYPE	AREA CLASS	FOOTCANDLES	UNIFORMITY RATIO (Eavg to Emin)
LIMITED ACCESS/ MAJOR/ MINOR	Commercial	1.7	3 to 1
	Intermediate	0.3	3 to 1
	Residential	0.9	3 to 1
COLLECTOR	Commercial	1.2	4 to 1
	Intermediate	0.9	4 to 1
	Residential	0.6	4 to 1
LOCAL	Commercial	0.9	6 to 1
	Intermediate	0.7	6 to 1
	Residential	0.4	6 to 1

NOTES:

The values given in Table 9-13 represent the lowest in-service illuminance values.

The illuminance value for intersections shall be at least equal to the sum of the recommended values associated with each roadway that forms the intersection.

Commercial: Business areas of the City where ordinarily there are many pedestrians during night hours. The area contains land use that frequently attracts a heavy volume of nighttime vehicular and pedestrian traffic.

Intermediate: Areas of the City characterized by frequent moderately heavy nighttime pedestrian activity, as in blocks having public facilities, large multifamily buildings, industrial buildings, or neighborhood retail stores.

Residential: Residential areas characterized by few pedestrians at night. This definition includes areas with single-family homes detached dwellings, duplex, single-family attached dwellings, or small multifamily buildings.

E. DESIGN OF PARKING FACILITIES

A parking lot lighting design prepared and stamped by a professional engineer shall be presented with the site plan. Parking lot lighting shall not exceed 22 feet in height above grade and shall conform to the following criteria:

TABLE 9-14. ILLUMINANCE VALUES IN FOOTCANDLES

GENERAL PARKING & PEDESTRIAN AREA		
LEVEL OF ACTIVITY	FOOTCANDLES (min. on pavement)	UNIFORMITY RATIO (Average: Minimum)
High	1.0	4:1
Medium	0.6	4:1
Low	0.4	4:1

F. DEFINITIONS:

High Activity:

- Institutional, public, or assembly uses (operating more than 5 days per week)
- Regional & community commercial (excluding B-2 zoning)
- Restaurant facilities that include a drive-through

Medium Activity:

- Office
- Hospitals
- Transportation facilities (airports, commuter parking lots, etc.)
- Institutional, public, or assembly uses (operating 3 to 5 days per week)

Low Activity:

- Neighborhood commercial (B-2 zoning only)
- Industrial
- Educational facilities
- Institutional, public, or assembly uses (operating up to 2 days per week)

- Residential

G. LIGHTING INFORMATION TO BE SHOWN ON DEVELOPMENT PLANS

1. The standard roadway fixture will be for use on curb and gutter roads. (Refer to Standard Detail TS-20.0.) The locations shall be designated on the plan. Each shall be labeled as to luminaire size and bracket length as follows: RF-2 (luminaire size) - (bracket length), i.e., RF-2-14-10 refers to a 14,000-lumen luminaire with a ten (10) foot bracket length.
2. Alternative Security Fixture. The locations shall be designated on the plan. Each shall be labeled as to luminaire size as follows: SF-5-14 (luminaire size) - (pole height) i.e., 5000 lumens and 14-foot pole.
3. All street lights shall be plotted accurately and to scale on the plan with respect to pole location and, where applicable, bracket length. Refer to Standard Detail TS-20.0 of this Article.

H. MAXIMUM ON-SITE LIGHTING FOR PARKING, SECURITY, OR SIGNAGE

1. A lighting plan shall be provided that indicates all outdoor lighting fixtures, exclusive of street lights, and signage will not have a source of illumination that is visible beyond the site or cause illumination of adjacent properties in excess of 0.5 foot-candles, as measured at the lot line.
2. Sign luminaries shall be shielded to eliminate glare or extraneous light on the roadway.

9-360.2 BUS STOPS & SHELTER

Typical Bus Turnout detail is provided in TS-9.0. Bus shelters or modified bus turnout configurations must be coordinated with OmniRide.

9.360.3 LANDSCAPING

Landscaping shall be in accordance with Article 3 and shall be reviewed and approved by the City Arborist. Landscaping shall not impair intersection sight distance at street intersections, commercial entrances, or private entrances.

9.360.4 SMALL CELL AESTHETICS

A. GENERAL REQUIREMENT

1. Facilities and wireless support structures shall be located in a manner that does not negatively impact the structural integrity of the associated wireless support structure. Further, facilities shall be affixed to any existing wireless support structure pole in the least intrusive manner possible. Applicants are encouraged to consult with the City in advance of preparing and filing applications to assist with this determination. Co-location is expressly encouraged.

B. ANTENNAS, CABLES & WIRES

1. Each facility antenna shall be located entirely within a shroud or canister type enclosure.
2. The diameter of the antenna enclosure at its widest point shall not be wider than two times the diameter of the top of the wireless support structure. The enclosure shall not exceed six cubic feet in volume.
3. All antenna enclosures shall either be mounted to the top of the wireless support structure pole and aligned with the centerline of the wireless support structure, or mounted to the side of the wireless support structure such that the vertical centerline of the antenna enclosure shall be parallel with the wireless support structure with the height of the side mounted antenna being

at a location on the wireless support structure noted in the application and approved by the City, but at least 25 feet above ground level at its lowest point.

4. Any proposed pruning or removal of trees, shrubs or other landscaping already existing in the City public rights of way must be noted in the application and must be approved by the City. The City shall be notified of the planned date and time of any tree trimming/pruning so that City staff may be present to determine that such trimming/pruning is being undertaken correctly and in accordance with City standards.
5. All cables, wires and connectors related to the Facility must be fully concealed on the wireless support structure and shall match the color of the wireless support structure. There shall be no external cables and wires related to the Facility hanging off or otherwise exposed on the wireless support structure.

C. COLORS

1. All colors shall match the background of any wireless support structure that the facilities are located upon, including equipment cabinets. Notwithstanding the foregoing, finishes of conduit, and equipment cabinets shall be reviewed and approved by the City.

D. EQUIPMENT ENCLOSURES

1. Equipment enclosures, including electric meters, shall be as small as possible, but in no event larger than 28 cubic feet in volume. Ground-mounted equipment shall incorporate concealment elements into the proposed design matching color and materials of the wireless support structure, unless other materials or colors are approved by the City. Concealment may include, but shall not be limited to, landscaping, strategic placement in less obtrusive locations and placement within existing or replacement street furniture. Final equipment enclosures shall be subject to approval by the City prior to installation.
2. Radio equipment shall be fully enclosed within an equipment cabinet or concealed within the antenna shroud enclosure matching the color and materials of the wireless support structure, unless other materials or colors are approved by the City. Radio equipment enclosures shall be subject to approval by the City prior to installation.
3. Landscaping concealing equipment enclosures shall be planted in such quantity and size, as preapproved by the City, such that 100% screening is achieved within two years of installation.

D. SIGNAGE/LOGOS/LIGHTS/DECALS/COOLING FANS

1. Signage: The permittee shall post its name, location identifying information, and emergency telephone number in an area on the cabinet of the small wireless facility that is visible to the public. Signage required under this section shall not exceed 3 square feet, unless otherwise required by law (e.g. radio-frequency (RF) ground notification signs) or the City. If no cabinet exists, the signage shall be placed at the base of the pole.
2. Lights: New Facilities and wireless support structures shall not be illuminated, except in accord with state or federal regulations, or unless illumination is integral to the camouflaging strategy such as design intended to look like a street light pole.
3. Logos/Decals: The permittee shall remove or paint over unnecessary equipment manufacturer decals. The color shall match or shall be as approved by the City. Facilities and wireless support structures shall not include advertisements and may only display information required by a federal, state or local agency, and then to the minimum extent necessary under such applicable laws or regulations. The permittee shall utilize the smallest and lowest visibility RF warning

sticker required by government or electric utility regulations. Placement of the RF sticker shall be as close to the antenna as possible.

4. Cooling Fans: For all facilities within 150 feet or less of residential dwelling unit, including multifamily dwelling units located above ground floor nonresidential uses, the facility shall use a passive cooling system. In the event that a fan is needed, the facility shall use a cooling fan with a low noise profile. In any event, such systems/fans shall be subject to approval by the City prior to installation.

9-370 NOMENCLATURE

Street names and address numbers shall conform to appropriate requirements of Article 9-810 and 9-820 respectively.

9-370.1 STREET NAMES

- A. All new street names shall be reviewed and approved prior to approval of the final site or subdivision plan.
- B. No duplication of existing street names in the City of Manassas or the City of Manassas Park or Prince William County adjacent to Manassas will be approved. Streets with the same name, but different type designations will be considered duplications (i.e., Longstreet Drive is considered a duplication of Longstreet Court).
- C. Near duplications in spelling, confusing spelling, or names that are phonetically similar will not be approved. A word beginning a name may be used a total of three (3) times when used in the two- or three-word name, i.e., Willow Brook Court, Willow Glen Court, Willow Grove Trail.
- D. Names shall not exceed seventeen (17) characters in length including spaces between words and excluding the street type designation. Names containing hyphens, apostrophes, or other non-letter characters will not be approved. Street names shall not contain more than three (3) words, including the street type.
- E. Streets continuing directly through an intersection shall keep the same name. Exceptions may be authorized in the event that a street crosses a major arterial road. This does not apply to cul-de-sacs directly opposite each other that intersect with a common street. For commercial, multifamily, or townhouse developments that have entrance or access through a publicly maintained cul-de-sac, a separate street name for the entrance or access road may be required in the event that it serves or is intended to serve a structure or structures that require the assignment of more than three address numbers.
- F. Compass points, such as "north" and "south", shall not be used in street names.
- G. A developer may submit street names for conditional approval by telephone or letter prior to the submission of plans. Reservation of street names for use should not be construed to mean that the name has been approved for use.
- H. Names shown and approved on a preliminary or final plan shall be reserved only for the period that the plan remains valid.
- I. Subdivision plats shall not be signed and released for recordation or building permits issued until approved street names are shown thereon.
- J. Proposed street names shall appear on all final site and subdivision plans and plats.

- K. The following street type designators are the only designators that will be approved by the City:
1. Major roadways such as an Interstate, multilane Federal highway normally four (4) or more lanes, limited access, divided Parkway, Highway, Pike, Freeway, Expressway, Throughway.
 2. Major roadways - multilane, non-limited access, usually the main traffic arteries carrying high volume traffic: Highway, Boulevard, Avenue, Road.
 3. Local connector roads - usually two (2) lane, non-limited access: Avenue, Street, Road, Drive.
 4. Local roadway providing access to individual lots within a subdivision or commercial area: Lane, Drive, Way, Trail, Loop, Circle.
 5. Local streets that have only one way in and out such as a cul-de-sac: Court, Place, Terrace, Mews.
 6. Ingress/Egress to shopping malls: Square, Arcade, Center, Plaza.
 7. Travelway usually behind housing and not used for normal through travel: Alley.
 8. Travelways restricted to pedestrian access shall be referred to as Way, Walk, Promenade, Square or Alley.

9-370.2 STREET ADDRESSES

- A. Addresses shall be assigned during final plan review, site development, or prior to building permit application. The assigned addresses shall be transmitted to the owner or owner's agent and those departments or individuals requesting notice.
- B. Multi-family or condominium developments, including conversions, shall have unit numbers assigned with the street numbers.
- C. The entrance(s) to each building and to units within a building shall be clearly identified on the final plans. Floor plans detailing the configuration of the building, separate levels, units within the levels, and common entrances, as well as individual unit entrances, shall be forwarded for use in addressing.
- D. Plans for variable office, warehouse and retail space shall specify the maximum number of units possible within the overall structure. The number shall be broken down by level for multi-story structures.
- E. Addresses will be assigned only after receipt of the information required to properly assign addresses.

9-370.3 SIGNS

All street name signs shall be purchased through the City and paid for by the developer. Other signs required in this section and available through the City Sign Shop shall be paid for by the developer. All signs shall meet requirements of the MUTCD for size, color, text size, text font, and reflectivity. All sign posts and foundations shall comply with requirements of the VDOT Road and Bridge Standards.

9-370.4 STREET NAME SIGNS

Standard street name signs shall be installed at all street intersections in accordance with MUTCD Standards and/or as directed by the City; shall meet the following criteria:

- A. Street name signs shall be nine (9) inches wide extruded blank. The length will be determined by the number of letters in the street name, including prefixes and suffixes. Street name sign posts shall meet the requirements of VDOT Standard STP-1, Square Tube Sign Posts.
- B. Reflective materials shall be applied to treated blanks with mechanical equipment as specified by the sheeting manufacturer.

- C. The street name or legend may be screened on the green background or applied with cut out letters or numbers of white reflective sheeting mechanically applied, and shall appear on both sides of the blank. Letter type shall conform to MUTCD, "Standard Alphabets for Highway Signs," Series C. Site plans shall include a symbol that street signs will be placed in locations that best identify named travelways and streets so that time is not lost by emergency response teams.
- D. The shorter name plate shall be mounted above the longer name plate in assembly.
- E. In locations where no curb and gutter is placed, the street name sign shall be erected in such a manner that the longest name plate is a minimum of two (2) feet behind the ditch line and is safe from damage by traffic. Where curb and gutter exist, the sign shall be placed in the grass utility strip near its terminus at an intersection.
- F. Standard street signs shall be installed prior to issuance of occupancy permits.
- G. No street signs shall be erected until the street name has been approved by the City Council.

9-370.5 PRIVATE STREET DESIGNATION SIGNS

Private street designation signs, when required by Section 9-5110, shall be installed in accordance with the following:

- A. Private streets, including pipestem driveways serving two (2) or more houses, which are not maintained by the City, shall be designated as such. *See Section 9-590 of this Article.*
- B. Private streets and pipestem driveways serving two or more houses shall have signs installed stating "PRIVATE ROAD NOT PUBLIC MAINTAINED."
- C. Private street designation signs shall be twelve (12) inches wide and eighteen (18) inches long. Signs shall be installed in accordance with all MUTCD standards.

SECTION 9-400 AIRPORT

9-410 AIRPORT PAVEMENT STANDARDS

The minimum standards for pavement materials for all land designated as Airport on the Comprehensive Plan Character Area Map are as follows:

- A. All airside pavements must meet the following requirements in addition to conforming to the design requirements in FAA Advisory Circular 150/5320-6 (latest edition) Airport Pavement Design and Evaluation.
- B. All paving materials must meet the requirements prescribed in FAA Advisory Circular 150/5300-10 (latest edition) Standards for Specifying Construction of Airports.
- C. Airside:
 1. Heavy Duty Airside Pavement (Gulfstream, Dash 8): 4" FAA P-401 Type Asphalts Surface Course 10" FAA P-304 Type Cement Treated Base Course) and compacted subgrade in accordance with FAA P-152 specification.
 2. Light Duty Airside Pavement for all other Airside areas (Single, Twin, King Air): 2" FAA P-401 Type Asphalt Surface Course 8" FAA P-304 Type Cement Treated Base Course and compacted subgrade in accordance with FAA P-152 specification All airside pavement sections may be required to

conform to a greater pavement design to control for differing subgrade conditions, high water table, etc.

D. Landside:

1. All Landside Pavement (Parking Lots, Access Roads): 2" VDOT Type SMEA Asphalt Surface Course (SM12.5 a or SM9.5A) 6" VDOT Cement Treated Base Course (8% cement content by weight).
2. All sidewalks shall be constructed of 6 inches of VDOT A3 concrete on a minimum of 4 inches of VDOT 21A or 21B crushed aggregate base course.
3. All new entrances to local roads shall include the construction of a PCC apron meeting VDOT requirements.

9-420 AIRPORT PARKING

In the I-A, Airport zoning district, vehicle parking shall be located a minimum distance of ten (10) feet from any security fence.

9-430 AIRPORT STACKING REQUIREMENTS

Within the I-A, Airport zoning district, stacking areas, pickup and drop-off lanes shall be limited to taxicab, Transportation Network Companies (TNC), and bus lanes at terminals. All other vehicles shall either be on an authorized travel way or in a designed parking space. Stacking lane shall be a minimum of twelve (12) feet wide for buses and ten (10) feet wide for taxi cab unless multiple stacking lanes are running parallel then all lanes may be ten (10) feet in width.

9-440 AIRPORT LIGHTING AND ANTENNA REQUIREMENTS

- A. No use may be made within the I-A, Airport Zoning District in such a manner as to create electrical interference with radio aircraft, inhibit the ability for pilots to distinguish between Airport lights and others, cause glare to pilots using the Airport or personnel engaged in air traffic control operations, impair visibility in the vicinity of the Airport or otherwise endanger the landing, taking off, or maneuvering of aircraft. Lighting within the I-A, Airport Zoning District shall be subject to the following additional requirements:
1. Parking Lot Poles are subject possible height restrictions under Federal Aviation Regulation (FAR) Part 77.
 2. Pole lighting shall provide adequate lighting for access and safety of all facilities.
 3. Lighting poles or any type of illuminating system cannot interfere with aeronautical services and the vision of pilots and air traffic controllers.
 4. Shielding of lights may be required depending on their location relative to the airport's runways and taxiways.
 5. All lighting poles or antennas are subject to a FAA Obstruction Evaluation (FAA 7460 Form) to determine potential hazards (frequency or height) within the I-A.

SECTION 9-500 SITE PLAN & DEVELOPMENT

9-510 TRANSPORTATION IMPACT ANALYSIS

- A. A Transportation Impact Analysis (TIA) shall be required, if the total generated additional trips meet or exceed one (1) or more of the following thresholds:

1. One hundred (100) or more total site generated weekday AM or PM peak hour trips or 1,200 trips per day as defined by the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual or by an alternative trip generation study acceptable to the City.
 2. Anticipated new trip generation that uses any reserve roadway capacity to a point which changes the existing level of service on a roadway or each lane group at the intersection to "D" or below, based on the highway capacity manual thresholds.
 3. The study area contains a segment of roadway and/or intersection considered unsafe. A location is considered unsafe when five (5) reportable accidents have occurred in the prior twelve (12) month period, or if it is on the City's list of most hazardous locations, provided by the Manassas City Police Department.
 4. The City deems that it is prudent to require such assessment in the plan review process.
- B. If a TIA was submitted at the rezoning or special use permit review stage, and the assumptions used in the TIA are consistent with the submitted site plan, no additional TIA will be required.
- C. The TIA shall be prepared and submitted in accordance with Section 9-510 of this Manual.

9-510.1 APPROVAL OF TRANSPORTATION STUDY

- A. A TIA shall conform to all of the requirements of this section unless the requirements of specific subsections are modified or deemed not necessary by the approving Department as a result of the pre-application or scoping meeting. The applicant shall meet with the approving Department prior to preparation of any TIA to determine the scope of the TIA, which shall include the following:
1. The study area.
 2. Size and phasing of the proposed development.
 3. Clarification, justification, and agreement for all assumptions and methodologies to be used in the analysis.
 4. Submitted or approved plans, within the study area for estimation of background traffic.
 5. The future street construction/improvements in the study area which may impact the subject site.
 6. The applicant shall provide a written summary of the pre-application agreements of the proposed analysis before proceeding.
- B. The applicant shall provide three (3) copies of the TIA at the time of submission of the site development plan application. Two (2) copies of the TIA shall contain USB Flash Drives containing computer files used in the analysis.
- C. If the applicant fails to comply with the technical requirements and the scope of study outlined in the pre-application meeting, the applicant shall be advised that the TIA shall be revised.
- D. Each TIA shall contain a signed and sealed Certification of Statement of the responsible person for the contents of the documents. The responsible person shall be certified or licensed to do traffic engineering or planning (PE, PTOE, AICP) professional work in the Commonwealth of Virginia.

9-510.2 STUDY AREA

- A. The study area shall be determined with staff during the scoping meeting. However, generally, the study area shall consist of the area containing and/or surrounding the proposed development within which the transportation network is impacted in one of the following ways:

1. At a minimum, the study area shall include all site access driveways and intersections on adjacent roadways and all major internal intersections.
 2. At least five percent (5%) of the average daily traffic (ADT) or peak hour(s) traffic of the roadways and/or intersections within the study area is composed of the development's new trips.
 3. The generated trips from the proposed development changes the level of service of a roadway or intersection.
 4. An identified dangerous roadway or intersection within the area identified above.
- B. The study area shall also include any additional area deemed appropriate based on acceptable transportation engineering criteria.

9-510.3 DESIGN YEAR

The design year shall be in accordance with the Table 9-15.

TABLE 9-15. TIA GUIDELINES FOR STUDY DESIGN YEAR HORIZONS

Development Characteristic	Suggested Horizons
1. Single-phase development (<500 weekday AM and PM peak hour trips)	1. Anticipated opening year, assuming full build-out and occupancy.
2. Single-phase development (500 – 1,000 weekday AM and PM peak hour trips)	1. Anticipated opening year, assuming full development build-out and occupancy. 2. Five years after opening date.
3. Single-phase development (>1,000 weekday AM and PM peak hour trips)	1. Anticipated opening year, assuming full build-out and occupancy. 2. Five years after full build-out and occupancy. 3. Adopted transportation plan horizon year if the development is larger than that included in the adopted Comprehensive Plan or travel forecasts for the area.
4. Multiple-phase development (when ultimate road improvements are proposed to be phased)	1. Anticipated opening years of each major phase, assuming build-out and full occupancy of each phase. 2. Anticipated year of complete build-out and occupancy. 3. Adopted transportation plan horizon year if the development is significantly larger than that included in the adopted plan or travel forecasts for the area. 4. Five years after opening date if completed by then and there is no significant trip generation increase

Development Characteristic	Suggested Horizons
	from adopted Comprehensive Plan or area transportation forecasts (e.g., at least 15%)
<i>Note: weekday AM and PM Peak hour trips based on the ITE Trip Generation Manual</i>	

9-510.4 TRANSPORTATION DATA REQUIREMENTS AND EXISTING CONDITIONS

- A. All existing traffic counts used shall have been conducted within the prior twelve (12) month period. The approving Department shall determine if and what growth rate factor shall be used to update the counts (i.e., utilizing historical traffic counts or available data from a transportation model).
- B. The weekday AM and PM peak hour(s) shall be determined using a minimum three (3) hour counting period on an average weekday (Tuesday - Thursday) not on a holiday, and conducted in favorable weather conditions or other period as deemed necessary. All count data, including daily traffic volumes and pedestrian/bicycle counts shall be presented in the study.
- C. Existing conditions of the study area shall be documented including some or all of the following:
 - 1. Roadway configurations (number and length of lanes and lane usage).
 - 2. On-street parking availability and regulations.
 - 3. Driveways serving developments on roadways adjacent to subject site.
 - 4. Transit stops.
 - 5. Pedestrian and bicycle facilities
 - 6. Posted speeds and current traffic count data.
 - 7. Substandard roadway design features.
 - 8. Adjacent land uses.
 - 9. Roadway geometrics and traffic controls such as traffic signals and stop and yield signs.

9-510.5 TRIP GENERATION

- A. The estimated weekday trip generation for each transportation mode (motor vehicle, transit, walk, and bicycle) and land use shall be obtained by utilizing the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual. The appropriate land use code and independent variable units from the manual shall be indicated for each category.
- B. The fitted curve equation shall be used for all trip generation estimates. For those land uses for which the equation is not available, average trip rates shall be used.
- C. In addition to weekday AM and PM peak hour trip generation, the daily trip generation for all uses shall also be included in the report.
- D. For commercial development (e.g., shopping centers), calculations for weekend trip generation, and capacity analysis shall be included in the report.
- E. The weekday AM and PM peak hour trip generation for single-family attached dwelling shall be calculated by using the single-family detached housing category (land use category #210, ITE Trip

Generation Manual, current edition). If an adopted local trip generation rate exists for a specific category, it shall be utilized.

- F. A pass-by trip reduction factor up to fifteen percent (15%) may be considered for commercial development, upon concurrence of the approving Department prior to preparation of the report. Each case shall be considered individually. An internal capture rate reduction up to fifteen (15) percent may be considered on mixed use development.
- G. For mixed used developments, the current version of the Mixed-Use Trip Generation Model shall be used as documented by VDOT.
- H. Any trip reduction based on a mixed-use concept, pass-by trips, or transportation demand management (TDM) program, etc., shall be considered during the pre-application meeting of the TIA. Only the following justifications shall be considered by staff for the purpose of defining a trip reduction rate:
 - 1. Transit service (i.e., bus or rail service).
 - 2. Developments which provide for less than two thousand (2,000) feet of uninterrupted walking or biking distance or uninterrupted pedestrian movement facilities (such as, pedestrian bridge or signals) between non-similar uses (i.e., residential to commercial or office to commercial).
 - 3. Any trip reduction rate based on the TDM program concept shall include a concise binding plan/program and funding mechanisms for implementation of the proposed TDM program. Any study of a TDM program within the Washington metropolitan area, which is similar in nature to the proposed development, may be submitted to staff to assist them in evaluating the proposed TDM program prior to preparation of the TIA.

9-510.6 FUTURE TRAFFIC CONDITIONS

The documented total future traffic in the report shall include the following:

- A. Background traffic that may be calculated using one or both of the following techniques.
 - 1. Existing traffic adjusted by an annual growth rate factor and based on the design year(s), and the total estimated traffic generated at build-out of submitted and approved development plans within the designated study area; or
 - 2. Projected traffic volumes from approved regional or local traffic forecasting models.
- B. Estimated generated trips to and from the site.

9-510.7 TRIP DISTRIBUTION AND ASSIGNMENT

- A. Any one of the following trip distribution and assignment methodologies shall be acceptable with the concurrence of staff. Justifications for trip generation and assignment shall be discussed and approved by staff at the pre-application meeting. One of the following techniques shall be used:
 - 1. The gravity distribution model technique may be acceptable, but may require calibration prior to its use, particularly if utilizing an old gravity model for the study area.
 - 2. Metropolitan Washington Council of Government (MWCOG) latest trip assignments. Portions of MWCOG's trip assignment report related to the study area shall be included in the TIA.
 - 3. Utilization of local and/or regional demographic data.

4. The current directional distribution based on observed traffic counts is acceptable if justification is provided indicating the directional distribution will not change before the design year, due to future changes in the land use or transportation system improvements.
- B. Assignment of traffic to the network shall be in accordance with the agreed upon percentage distribution and type of transportation facility. The City shall approve and may provide recommendations prior to preparation of the report.
- C. Inbound/outbound traffic may not always have similar distribution or assignments; therefore, the approach and/or departure routes may be different. The calculations for inbound/outbound traffic are subject to discussion and concurrence of the approving Department.
- D. The twenty-four (24) hour (daily) volume shall be distributed and assigned according to the method used for peak hour distribution and assignment.

9-510.8 ANALYSIS

- A. Capacity analysis shall be performed for all intersections, streets, ramps, weaving sections, internal circulation and access points as identified in the TIA scoping meeting.
- B. The version of the Highway Capacity Software (HCS) operational module used shall be consistent with the latest revision of the City of Manassas Transportation and Mobility Masterplan (TMP) (HCM 6th Methodology based on 2019 TMP). All worksheets indicating the inputs and outputs of the HCS program shall be presented in the study. Any deviation from the default values in the program shall be proposed, documented and agreed to by the approving Department.
- C. If approved, Highway Capacity Manual (HCM) "planning procedure" may be used for any proposed intersections being analyzed, subject to the evaluation of ten (10) years or more into the future.
- D. A level of service (LOS) "C" or better is the minimum acceptable level of service on existing or planned freeway segments, interchanges, signalized/unsignalized intersections and ramp terminals, multi-lane, two-lane and urban roadways. A level of service "C" also shall be maintained for the segment or link of roadways and all individual movements at all analyzed intersections. A LOS "D" or better shall be maintained on the following roads: Liberia Avenue (Prince William Parkway to Mathis Avenue) and Godwin Drive.
- E. The approving Department may require all intersections be analyzed for off-site/on-site queuing (i.e., queuing analysis to determine the length of a left and right-turn lane(s) and storage area(s) to assess potential spill-back effects.
- F. The TIA shall include a capacity analysis for all identified locations within the study area before and after each phase of the proposed development to determine the development's impact and necessary improvements.
- G. If roadways and/or intersections within the study area are currently operating or are projected to operate under hazardous conditions or unacceptable levels of service, the improvements needed to mitigate the conditions shall be noted in the recommendations.
- H. Use of any reserve capacity of a roadway or intersection resulting at a level of service "D" or below shall warrant recommendations in the study for future improvements.
- I. On-site traffic circulation analysis may be included in the TIA. The analysis shall include, but not be limited to, major internal intersections, access points, travelways, and parking circulation and queuing analysis.

- J. If required, a progression analysis shall be performed for arterials having two or more signalized intersections within a mile of the proposed development. Transportation/traffic computer software or programs such as Synchro, HCS or SIDRA may be utilized for the analysis. Other software may be used when approved during the scoping meeting.
- K. Diagrams included in the study should include and identify the existing and proposed spacing(s) of all intersections/entrances and/or crossovers of divided roadways.

9-510.9 RECOMMENDATIONS

- A. At a minimum, the TIA shall include recommendations on the following items to mitigate the traffic impacts on the study area:
 - 1. Widening and/or construction of roadways and intersections.
 - 2. Intersection signalization, including but not limited to, signal warrant analysis, timing, phasing, and optimization and approved signal priority control equipment.
 - 3. Transportation demand management (TDM) programs which reduce the number of vehicle trips being generated by the proposed development.
 - 4. Pedestrian, bicycle or transit facilities which reduce the number of vehicle trips being generated by the proposed development.
 - 5. Transportation system management (TSM) techniques, such as traffic signal coordination, which optimizes the capacity of the transportation network.
- B. The recommended improvements shall be achievable. The DCSM, HCS, VDOT standards, American Association of State Highway and Transportation Officials (AASHTO), and National Association of City Transportation Officials (NACTO) manuals shall be used to design the recommended improvements. Whether or not the recommended improvements can be constructed shall not preclude acceptance of the TIA.
- C. All recommended roadway improvements shall include the description, timing, funding, and source of the construction of said improvements.
- D. A TIA which does not contain specific recommendations to mitigate any noted negative impacts shall not be considered complete.

9-510.10 APPROVAL OF TRANSPORTATION IMPACT ANALYSIS

The City shall approve the TIA prior to approval of any site plan or prior to recommending approval or denial to the Planning Commission of the preliminary subdivision plat or generalized development plan.

9-510.11 COORDINATION OF TRANSPORTATION IMPACT ANALYSES AND CONSTRUCTION DRAWINGS

The approved traffic study shall be submitted with the submission of the site plan, final subdivision plat, or generalized development plan, and such plat or plan submission shall show that:

- A. All intersection improvements are supported by the traffic study;
- B. All street widths are supported by the traffic study;
- C. The construction drawings agree with the traffic study; and
- D. The minimum "Level of Service" requirements are satisfied.

9-520 SITE PLAN AND DEVELOPMENT

This section includes all requirements specific to land development. Transportation and stormwater elements standards are referred to the complete street design and stormwater section, respectively.

9.520.1 FRONTAGE IMPROVEMENTS

For any site development requiring a major site plan or when required by the conditions of a SUP or rezoning, frontage improvements (including curb, gutter, and pedestrian and bicycle facilities) and right-of-way (ROW) dedication or reservation shall be provided in accordance with TS-4.1 through TS-4.4 and Table 9-16:

TABLE 9-16. FRONTAGE IMPROVEMENTS

	<i>Non-Residential or Mixed Use</i>	<i>Residential</i>
Roadway, sidewalk, curb, gutter and bicycle facilities, where location is not in 5-Year Capital Improvement Program (CIP) or Constrained Bike Plan (Map 6.3 Comp. Plan)	<p>Where adjacent facilities do not exist, dedicate right-of-way (ROW) and construct or replace facilities to match typical section.</p> <p>Where adjacent facilities exist, ROW dedication shall be in accordance with the typical section but improvements should match the adjacent facilities. Sidewalk width must match current standard.</p>	<p><u>3 or more residential units:</u></p> <p>Where adjacent facilities do not exist, dedicate ROW and construct or replace facilities to match typical section.</p> <p>Where adjacent facilities exist, ROW dedication shall be in accordance with the typical section but improvements should match the adjacent facilities. Sidewalk width must match current standard.</p> <p><u>Less than 3 residential units:</u></p> <p>ROW reservation or dedication only to match typical section.</p>
Roadway, sidewalk, curb, gutter and bicycle facilities, where location is in 5-Year Capital Improvement Program (CIP) or Constrained Bike Plan (Map 6.3 Comp. Plan)	Dedicate ROW and construct or replace facilities to match typical section or approved CIP design.	<p><u>3 or more residential units:</u></p> <p>Dedicate ROW and construct or replace facilities to match typical section or approved CIP design.</p> <p><u>Less than 3 residential units:</u></p> <p>ROW reservation or dedication only to match typical section.</p>

NOTE: Refer to Article 2 for checklist of frontage requirement that need to be shown on the site plan. For projects located in the 5-year CIP a cash-in-lieu of construction payment may also be considered.

9.520.2 CURB AND GUTTER

- A. Curb and gutter shall be installed for all new construction within the public right-of-way and shall be Type (CG-2) header curb, (CG-3) header curb, (CG-6) curb and gutter, (CG-7) Curb and gutter according to VDOT standards, or others with the approval of the City. Curb and gutter that are adjacent to drop inlet will be reinforced with #4 rebar, Refer to Exhibit 24 in Appendix A. See Article 11-740 for material and installation specifications.
- B. The use of reverse curb and gutter, or spill type curb and gutter (CG-6R) is only permitted within the public right-of-way if used to maintain the flow line across commercial entrances (VDOT CG-11).
- C. For curb and gutter section streets, the aggregate material shall extend from under the curb and gutter a minimum distance of six (6) inches beyond the back of curb. The aggregate thickness under the curb and gutter shall be the sectional difference of the total pavement design and the gutter pan which is seven (7) inches or a minimum of four (4) inches, whichever is greater; i.e., pavement design of twenty (20) inches minus gutter pan of seven (7) inches requires thirteen (13) inches of 21-A aggregate under the curb and gutter.
- D. Provide expansion joints at intervals of approximately 100 feet and around stationary structures.
- E. Underdrain (VDOT UD-4) will be required under curb and gutter when 21B aggregate or coarser aggregate is used in the subbase. Underdrains will be reviewed for use in sag vertical curves and cut and fill transitions. The City may require underdrains if field conditions warrant. Underdrain will conform to Section 9-550.1 of this Manual.

9-520.3 PEDESTRIAN FACILITIES

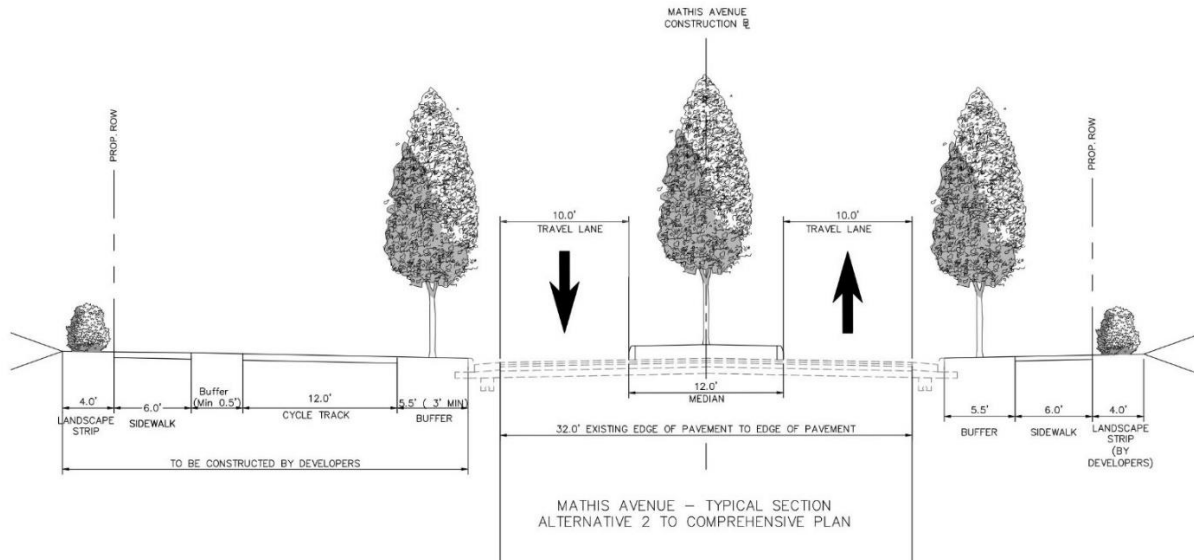
- A. See section 9-320 for pedestrian facilities standards.
- B. Sidewalks shall be provided on both sides of the street in all residential subdivisions.
- C. On-site private sidewalks shall be connected to public sidewalks if public sidewalks are within 650 feet of the development.

9-520.4 MATHIS AVENUE CHARACTER AREA

Streets within the Mathis Avenue Character Area including but not limited to Mathis Avenue, Centreville Road, Carriage Lane, and Reb Yank Drive, delineated by Sudley Road to the west, Liberia Avenue to the east, Mathis Avenue to the north, and Centreville Road to the south, which require frontage improvements shall use the following:

1. Sidewalks on both sides of the street shall have a minimum unobstructed width of 6 feet and a 6-foot landscape buffer between the street and sidewalk containing street trees meeting the requirements of Article 3 of this Manual.
2. In addition to required street frontage improvements, a landscape strip or parking lot perimeter landscaping shall be provided when required by the zoning ordinance and/or DCSM. Alternatively, where landscaping is not required, streetscape amenities or usable open space including but not limited to plazas, parklets, and seat walls shall be provided adjacent to the sidewalk.
3. Additionally, frontage improvements on Mathis Avenue shall adhere to the cross section shown in Figure 9-6, which includes a 12-foot wide cycle track on the west side of the street. Where there are conflicts between the typical section and the above requirements, the typical section shall take precedent.

FIGURE 9-6. MATHIS AVENUE TYPICAL SECTION (FACING NORTH)



9-520.5 CURB RAMPS

- A. All residential developments shall provide curb ramps in accordance with this manual and VDOT standards located to provide access to and from the development by the public.
- B. See Section 9-320.2 for curb ramp standards.

9-520.6 BICYCLE FACILITIES

See Section 9-330 for bicycle facilities standards. An interconnected trail system may be substituted for sidewalks, provided the trail system provides equal or improved access to buildings and dwellings or where required by the Zoning Ordinance or Comprehensive Plan Map 6.3.

9-520.7 STREET DESIGN

- A. See Section 9-340 for street design standards.
- B. All right-of-way shall conform to the standards as set forth in this Manual.
- C. Subdivision blocks shall be spaced to provide reasonable traffic circulation within and between existing or anticipated subdivisions.
- D. For a site plan or subdivision that abuts one side of any publicly owned and maintained street, the applicant shall be required to dedicate or reserve one-half (1/2) of any right-of-way necessary to make such street comply with the minimum width established for same.
- E. The applicant may be required to dedicate or reserve more than one-half (1/2) of the right-of-way to improve the horizontal alignment or meet the minimum design standards for that street.
- F. The applicant will be required to assume responsibility for grading, widening, surfacing, sidewalks, trails, and curbing of such streets to meet minimum City and VDOT safety and design standards. All single-family detached dwelling unit sites shall have frontage on existing city maintained public streets unless otherwise approved through a rezoning or subdivision waiver. Streets that are approved shall be bonded and will be constructed to a standard acceptable for addition to the VDOT System. The amount of frontage shall be established in accordance with the appropriate regulations as set out in the Zoning Ordinance.

- G. Single-family attached or duplex dwellings, multifamily dwellings, and non-residential building lots may be approved for recording without public street frontage provided the building lots have frontage on a right-of-way or access easement in accordance with the Zoning Ordinance with a design satisfactory to the approving Department. A mandatory owners' association shall be established prior to the approval of any plats or plans to assure the maintenance of the access easement, parking, planting, and other necessary open space. Improvements within the access easement shall be sufficient to accommodate the type and volume of traffic anticipated and constructed to standards.
- H. All streets shall be constructed to the lot line if eligible to be accepted into the VDOT Street System, and shall terminate with an off-site temporary turnaround. If this construction causes undue hardship to the developer and the developer is unable to obtain the off-site easements necessary to construct the streets to the lot line, the approving Department may allow the street construction to stop a distance from the lot line. In such instances, an escrow shall be obtained for the following future completion of the street to the lot line and removal of the temporary turnaround. In these cases, it is also necessary to dedicate on-site grading easements for the future completion of the street when the off-site area is developed.
- I. The maximum cul-de-sac length is one thousand (1,000) feet.

9-520.8 STREET LAYOUT CRITERIA

- A. The arrangement of streets in a development shall provide for the continuation of principal streets of adjoining developments, and for the proper projection of principal streets into adjoining properties that are not yet developed. This inter-parcel connecting arrangement shall be accomplished by the use of stub streets and temporary cul-de-sacs, etc., in order to provide possible necessary fire and police protection, school bus services, movement of traffic and the construction or extension, presently or when later required, of needed utilities and public services and facilities. The principal street will be designed to carry no more than 3,000 VPD. Stub streets and loop streets will be designed to carry no more than 1,000 VPD and will be considered tertiary streets.
- B. Comprehensive Plan Map 6.2 indicates street typologies for which their design and provision for continuation shall be addressed in the design of all developments.
- C. All such interparcel connections streets shall be designed in consideration of the anticipated future traffic from undeveloped adjacent tracts based on the current adopted Comprehensive Plan.
- D. The minimum access widths permitted in any business or industrial district shall be twenty-two (22) feet. If such access is also required to serve as a fire lane then the minimum width shall be twenty-six (26) feet. Fire access lanes may be reduced in width with special written permission of the Fire Marshal or the approving Department

9.520.9 ENTRANCES ONTO THE PUBLIC ROW

When the traffic generated from an entire development is projected to exceed 960 vehicles per day, the development shall provide through access and connect to an existing City maintained road in two (2) locations. One of the two required connections may be to a road constructed to a State standard and to be included in the State System. Internal roads shall be designed in such a manner to incorporate good traffic design, providing ease of access for domestic service and emergency vehicular traffic. In situations where two connections cannot be physically made in single-family detached developments, due to restrictions in topography or sight distance, or limitations in City road frontage, a single connection may be allowed where specifically approved. This single connecting roadway shall be of a four (4) lane divided standard, extending at least three hundred (300) feet into the development for the first 960 vehicle trips per day generated. For every additional 500 vehicle trips per day generated, or portion thereof, the four

(4) lane divided standard shall be extended an additional 100 feet. No private entrances shall connect to a four-lane divided roadway. Internal roadways may connect where crossovers are permitted.

- A. Driveway entrances shall be designed to accommodate all vehicle types having occasion to enter the site, including delivery vehicles. There shall be not more than one (1) entrance and exit or one combined entrance and exit along any street frontage unless deemed necessary in order to alleviate traffic congestion and interference along such street. The width of all entrances and exits to off-street parking and loading areas shall comply with the requirements herein, Refer to Standard Detail TS-10.3, except that the approving Department may authorize a narrower driveway width for parking and loading areas if:
 - 1. The driveway leading to the off-street parking or loading area is no longer than fifty (50) feet in length;
 - 2. The driveway provides access to not more than ten (10) parking spaces; and
 - 3. Sufficient turning space is provided so that vehicles need not back into a public street.
- B. No more than one (1) commercial entrance serving a townhouse or multi-family development will be allowed off the circular segment of a publicly maintained cul-de-sac. If possible, this entrance shall align at 180 degrees with the centerline of the public road. Two (2) entrances will be allowed for non-residential developments provided that their centerlines are aligned at 90 degrees.
- C. Arterial or limited access streets shall have no direct access to single-family detached residential driveways.
- D. All entrances shall incorporate a 2% landing for a minimum of 25 feet from the existing edge of pavement or right-of-way.

9-520.10 ENTRANCE TYPES

Only two (2) types of entrances onto the highway system are permitted: private entrances and commercial entrances.

- A. "Private entrances" shall mean a single-family detached driveway entering onto the public right-of-way.
- B. "Commercial Entrance" shall mean all other access points onto the public right-of-way.
- C. Subdivision street connections to the existing highway system are considered as commercial entrances until these streets are accepted into the public system.
- D. Roads within subdivisions shall meet the sight distance requirements of commercial entrances at their intersections.
- E. At all driveway entrances (including pipestem entrances), the size, length, and type of driveway entrance shall be indicated on development plans.
- F. "Private Entrances" shall be constructed as per TS-10.0 or the VDOT CG-9D Standard.
- G. Standard Detail TS-10.0 of this Article is to be used for all detached single-family and pipe stem residential lots entering onto streets with curb and gutter.
- H. The minimum private entrance width is 12 feet and the minimum commercial entrance width is 24 feet.
- I. Where driveway grades exceed 8%, a profile of the driveway shall be provided to demonstrate that vehicles will not "bottom out" or "scrape" while entering or leaving the public right-of-way.

- J. The following standard entrances shall be constructed for all commercial entrances.
 - 1. TS-10.0 of this Article shall be used within the limits of the Historic District or where pedestrian movements warrant this type of entrance.
 - 2. CG-9D (modified) shall be used within the limits of the Historic District where the entrance crosses a brick sidewalk.
 - 3. CG-13 shall be used for all entrances onto arterial roadways, or for high volume, high truck traffic entrances as determined by the approving Department. The approving Department will require this entrance regardless of the type of abutting pavement.
 - 4. CG-11 shall be used for high volume entrances with a curb inlet immediately upstream of the entrance.
 - 5. The Engineering Department may modify the type of entrance required in order to maintain consistency along a street segment.
 - 6. A profile of the must be provided for all entrances to demonstrate that vehicles will not "bottom out" or "scrape" while entering or leaving the public right-of-way.
- K. All elements of entrances onto the public right-of-way shall meet the requirements set forth in the VDOT Road Design Manual, except as modified herein.
- L. All commercial entrances shall be designed such that all vehicle types that may use the entrance can enter and exit the entrance without committing an illegal traffic maneuver within the public right-of-way. Further, the design of the entrance will be such that a vehicle may enter and exit the entrance to the right of the driveway centerline.
- M. All private streets that enter onto the public right-of-way shall meet the design requirements for public road intersections.
- N. All common driveways serving more than 100 VPD or ten (10) dwelling units, shall meet the design requirements for public road intersections where the common driveway enters the public right-of-way.
- O. All common driveways serving less than 100 VPD or ten (10) dwelling units, shall meet the design requirements for commercial entrances where the common driveway enters the public right-of-way.
- P. All common parking courts serving more than 100 VPD or fourteen (14) dwelling units, shall meet the design requirements for commercial entrances where the common parking court enters the public right-of-way.

9-520.11 SPACING OF ENTRANCES

- A. Entrance spacing shall comply with minimum spacing requirements shown in Section 9-340.3. D. Intersection and Commercial Entrance Criteria.
- B. No entrance (commercial or private) shall be placed within the limits of a public street intersection auxiliary lane (to include storage bay or taper).
- C. The entrance centerline for commercial entrances shall align with those on the opposite side of the street or shall be offset a minimum of one hundred and twenty five (125) feet.
- D. Generally, private entrances (single-family detached driveway entrances) shall be separated a minimum of four (4) feet from edge of apron to edge of apron. Refer to Standard Detail TS-10.1 of this Article.

9.520.12 PRIVATE STREETS & SHARED DRIVEWAYS

- A. Single-family attached or duplex, multifamily, manufactured home parks, and non-residential developments shall have access to City maintained roads. This access may be via a private street or travelway provided that it meets the appropriate design standards in this section of the Manual.
- B. Private streets shall be platted such that all lot owners are assured perpetual right of access to the City maintained road. The final recorded plat shall note each private street as "privately owned and privately maintained by the lot owner(s)". The final plat shall also provide an adequate easement for ingress, egress, maintenance of utilities, and public agencies including Police and Fire Departments to allow them to carry out their duties. Travelways that provide access to multi-structure developments shall also provide this emergency access easement.
- C. Private streets will not carry in excess of one thousand (1,000) vehicles per day.
- D. Entrances and travelways into shopping centers, non-residential, and similar developments may carry in excess of 1,000 VPD, provided that these entrances and travelways are designed to the appropriate typology standard equal to that of a public street, including but not limited to: travel lane widths, curve radii, sight distances, medians, sidewalks, pavement design, and entrance spacing.
- E. Parking spaces shall not have direct access to private streets or main travelways carrying in excess of six hundred (600) VPD.
- F. Private streets carrying in excess of sixty (60) units or six hundred (600) VPD shall have at least two (2) accesses to a public roadway.
- G. All permitted private streets and travelways shall be named in accordance with Section 9-370 of this Manual. Private roadway names shall be subject to the requirements of Section 9-370.1 of this Manual.
- H. Entrances carrying in excess of 1,000 VPD and all private streets shall have the standard landing at all intersections with City maintained roads. All other entrances shall conform to Section 9-520.6. of this Article.
- I. Stop signs shall be provided and posted at all intersections of roads or travelways that each carry in excess of 600 VPD including those with City maintained roads.
- J. Permitted private roadways and parking areas, single-family attached, duplex, multifamily, and non-residential developments may be designed in accordance with any designated street typology cross section. In residential developments where off-street parking is provided and no individual units front directly to the street, private streets may use modified street typology cross-sections with no on-street parking. The minimum two-way travel width is 22 feet, exclusive of curb and gutter, for private streets, parking courts, and parking aisles.
- K. A turn-around shall be provided at the end of all private streets in accordance with Section 9-340.7. Turn-arounds shall be designed to allow for the safe movement of emergency vehicles, service trucks, and school buses. Otherwise, travelways shall interconnect to provide for adequate emergency vehicular access within the same development. If turn-around configurations are used that do not match those provided in Section 9-340.7 at the end of a private street, an AutoTURN analysis shall be provided to show that the design vehicle can turn around in the space provided.
- L. Private access streets, aisles and parking areas in residential or commercial developments that will be maintained by the property owner, a minimum six (6) inch aggregate base and a two (2) inch bituminous asphalt surface will be required to insure a dust free surface. For access streets with traffic

counts exceeding one hundred (100) VPD, refer to Standard Drawing TS-3.0 for the appropriate pavement section. CBR tests are required for design of private road pavement sections.

Should the subgrade CBR be less than ten (10), one (1) inch of subbase shall be added for each point below CBR 10 or the pavement section may be redesigned per the Vaswani Method. If the subgrade CBR is 10 or greater, no additional subbase is required. Alternate equivalent pavement design may be substituted with prior City approval when designed by an engineer using the Vaswani Method.

- M. When two or more lots use a private travelway or street, an owners' association shall be established and given the responsibility of ownership and perpetual maintenance of private roadways and, where appropriate, sidewalks and/or trails.
- N. The plat recorded for residential subdivisions being served by private streets shall contain the following statement in a highlighted box:

"The street serving this development is private and is not eligible for acceptance into the State System. Maintenance of the road, including snow removal, is not a public responsibility."
- O. Any street within a subdivision that is not intended to be incorporated into the State System shall be identified with a sign attached to the street sign or address sign (for pipestem) state: Private Road Not Public Maintained. Signs are available through the City and are paid for by the developer. The signs shall meet the requirements of Section 9-370.3 of this Manual.
- P. Shared driveways, when permitted within the jurisdiction, are to provide private access to a public street for two (2) but no more than five (5) single-family detached dwellings. All units that share a driveway shall provide a minimum of two (2) on-site parking spaces per dwelling. In addition, these driveways shall be clearly labeled "No Parking Along Driveway" on all plats and plans submitted. The plats and plans shall also designate the person or entity that has the maintenance responsibility.

9-520.13 PRIVATE STREETS & SHARED DRIVEWAYS ACCESS EASEMENTS

- A. Adequate and recorded ingress and egress easements shall be provided when more than one (1) lot uses a common driveway or travelway.
- B. All access easements regardless of number of units served or easements width shall have such additional easements provided for slope maintenance where necessary due to steepness in terrain.
 - 1. Easements shall note which lots have the right to use these travelways and maintains responsibilities.
 - 2. Access easements are to include rights-of-access for publicly owned and emergency vehicles.

9-520.14 PRIVATE STREETS & SHARED DRIVEWAYS DESIGN CRITERIA

- A. The design for all pipestem driveways which are to serve more than one (1) lot shall be shown in typical section and on the grading plan of the construction plans, together with turnaround and required utilities, and shall be included in the completion bond for the project.
- B. Pipestem driveways shall be constructed in accordance with the standards as set forth in this Manual and materials shall conform to VDOT's specifications.
 - 1. The maximum grade for all pipestem driveways shall be 12%.
 - 2. All pipestem driveways shall have an adequate angle of approach and angle of departure.
 - 3. The minimum centerline radius of pipestem driveways is 50 feet.

4. Provision shall be made for a turnaround on all pipestem driveways serving three or more lots as identified in Section 9-340.7. An AASHTO "WB-50" vehicle shall be able to back into and exit the pipestem driveway.
- C. An approved alternative to standard asphalt driveways is a five (5) inch non-reinforced portland cement concrete pavement subject to the following:
1. Concrete shall be the VDOT, Class A3. Refer to VDOT Section 217.06 and 217.07.
 2. Concrete may be hand finished and shall be provided with a broom texture.
 3. Forming, testing, jointing, finishing, curing, protection of pavement and opening to traffic shall be in accordance with the VDOT Road and Bridge Specifications.
 4. Transverse crack control joints shall be provided at a maximum spacing of fifteen (15) feet.
 5. Longitudinal control joints shall be provided in all pavement sections wider than twelve (12) feet.
 6. Stormwater runoff shall not be longitudinally channeled within the paved portion of the pipestem driveway.

9.520.15 PARKING COURTS

Driveways with no adjacent parking bays shall be clearly labeled "No Parking Along Driveway" on all plats and plans submitted.

9.520.16 PARKING COURTS ACCESS EASEMENTS

- A. Adequate and recorded ingress and egress easements shall be provided when more than one lot is to use a common parking or travelway court and suitable provision shall be made for an AASHTO "SU" vehicle turnaround on all common parking courts serving three or more lots as per Section 9-340.7.
- B. All common parking courts, regardless of number of units served or easement width shall have such additional easements provided for slope maintenance where necessary due to steepness in terrain.
 1. Easements shall note which lots have the right to use these parking courts.
 2. Access easements are to include rights of access for publicly owned and emergency vehicles.

9-520.17 PARKING COURTS DESIGN CRITERIA

The design for all common parking courts, which are to serve more than one (1) lot, shall be shown in typical section and on the grading plan of the construction plans, together with turnaround and required utilities, and shall be included in the completion bond for the project.

- A. No common parking court shall serve as a through function.
- B. Dimensions of parking spaces. The width of all aisles and sizes of all parking spaces shall comply with the standards established in Section 9-340.6 of this Manual.
- C. Landscaping required. Common parking courts shall be landscaped to ensure the residential character of the development, as required by the Zoning Ordinance and Article 3 of this Manual.
- D. Identification of common parking court. Each common parking court shall be clearly identified as a private roadway. A single sign, not to exceed two (2) square feet in area, shall be posted at the entrance of each such parking court, displaying only the words "Private Parking Court" and the addresses of any residences utilizing the parking court.

- E. Final plat requirements. In addition to all other requirements for a final plat, any subdivision containing a common parking court shall include a statement on the final plat acknowledging the private maintenance responsibility and guaranteeing public utility and emergency vehicle access.
- F. The maximum grade for all common parking courts shall be 12 %.
- G. All common parking courts shall have an adequate angle of approach and angle of departure.
- H. The minimum centerline radius of common parking court travel aisles is 50 feet, with no adjacent parking.

9-520.18 ROAD PAVEMENT SECTIONS

Road pavement sections in the City of Manassas shall meet or exceed those detailed in TS-3.0 Minimum Pavement Structure Design. Pavement designs prepared and sealed by a professional engineer in accordance with VDOT "Pavement Design Guide for Subdivision and Secondary Roads in Virginia," latest revision are an acceptable alternative. CBR tests and alternate pavement designs shall be provided to the City for any street improvements within the public right-of-way.

- A. Two-way travelways in parking courts or private parking lots serving more than three single-family attached units shall meet the pavement design requirements for Category I for the entire width and length of the travelway. Pipestem driveways shall provide a minimum of the Category I pavement section for the full length and width.
- B. These sections are minimum sections to be utilized when the actual California Bearing Ratio (CBR) of the pavement subgrade is ten (10) or more.
- C. Where the actual CBR is below ten (10), the Vaswani method, or acceptable VDOT method shall be used for determining the overall pavement design. When using the Vaswani design, additional material shall be provided to increase the pavement thickness beyond the minimum, and the following conditions also apply:
 1. Pavement design in accordance with current VDOT "Pavement Design Guide for Subdivision and Secondary Roads in Virginia" is required. Increase the thickness equivalency value of the asphalt concrete from 1.67 to 2.25 where its total thickness is 4.50 inches or more as required by Vaswani's method. The nomograph of the thickness index (T.I.) and Soil Support Value (SSV) are found in the aforementioned design guide.
 2. When the projected traffic requires a four-lane facility, 90% of the projected traffic (ADT) shall be the basis for determining the applicable class for the pavement structure design.
 3. Representative California Bearing Ratio (CBR) samples VTM-8, taken at subgrade elevation, shall be used as the basis for evaluating the Soil Support Value (SSV).
- D. Each street should have continuity of design throughout. Therefore, multiple and/or variable pavement structure designs will not be acceptable.
- E. Cement treated aggregate (CTA) or full depth asphalt concrete may be substituted for any aggregate, subgrade stabilization, or select material on basis of one inch of CTA or asphalt concrete for 2 inches of the other materials. Neither CTA nor asphalt concrete shall be placed directly on a resilient soil (as defined in Vaswani's design guide) unless the soil is stabilized with cement or other approved stabilizing agent. Cement treated aggregate (CTA) shall have a minimum of 4 inches of aggregate base material under it when less than 4 inches of asphalt concrete is to be applied over the CTA.
- F. All materials and construction controls shall be in accordance with current VDOT specifications and special requirements, except as modified herein.

- G. Asphalt concrete with a total thickness greater than 4 ½ inches is considered base and surface. All aggregate materials under that thickness are considered subbase. Appropriate structural values shall be assigned these materials when using the Vaswani method of design.
- H. For principal and minor arterial, design the pavement using the Vaswani method based upon actual CBR values or based upon the Vaswani predicted CBR value equal to 4. In either case, the resiliency factor shall be one, and in no case shall the pavement section be less than the pavement section for through collectors.
- I. For all roads within the City of Manassas, subgrades with a CBR value below 5 will not be accepted. In the specific areas where the subgrade CBR is below five, a minimum of six (6) inches of cement treated aggregate, eighteen (18) inches of untreated aggregate or twenty-four (24) inches of non-plastic select material, Type II (min. CBR = 20) will be provided to form an acceptable pavement subgrade.
- J. Soil stabilization with cement (low plasticity soils) at a minimum of 10% by volume or lime (high plasticity soils) at a minimum of 5% by weight will be accepted only on streets classified as through collectors or higher.

9-520.19 ROAD PAVEMENT ACTUAL DESIGN

For actual pavement section design, laboratory CBR tests shall be conducted.

- A. Tests shall be taken whenever subgrade soil types change.
- B. Tests shall be made at a maximum of 500-foot intervals where the subgrade soils remain constant.
- C. A minimum of two (2) CBR tests are required for a cul-de-sac or streets less than 500-feet in length.
- D. The City's inspector shall witness the sampling.
- E. The approving Department may require stronger pavement sections where specific soil problems exist based on the Type II Geotechnical Report. *Refer to Article 10-200 of this Manual.*

9-520.20 ROAD PAVEMENT ALTERNATE EQUIVALENT PAVEMENTS

When using an alternate equivalent pavement, the following minimum and maximum thickness of layers shall apply:

- A. Minimum thickness of the aggregate layer used as the base in a one- or two-layer system is six (6) inches.
- B. Minimum thickness of the aggregate layer used as the subbase is 4 inches.
- C. Minimum thickness of the bituminous concrete base (BM-25.0) layer used on top of subbase is three (3) inches.
- D. Minimum thickness of the bituminous concrete surface (SM-9.5A or D) layer used on top of bituminous concrete base (BM-25.0) or binder is 1½ inches.
- E. Minimum thickness of the bituminous concrete surface (SM-9.5A or D) layer used on top of aggregate material (treated or untreated) is two (2) inches, if installed in one lift, three (3) inches if two lifts are applied.
- F. Minimum thickness of bituminous concrete intermediate base (IM-19.0) is two (2) inches.
- G. Minimum thickness of the stabilized soil layer (cement, lime, etc.), is six (6) inches.
- H. The maximum thickness of the bituminous concrete surface (SM-9.5A or D) for one lift is two (2) inches.

- I. For stage constructions of the pavement surface, the minimum thickness of bituminous concrete surface (SM-9.5A or D) is 1½ inches for the lower lift. Maximum thickness of bituminous concrete surface (SM-9.5A or D) is three (3) inches.
- J. Aggregate material shall be placed in increments of no less than ½-inch. (Example: 8" or 8½", but not 8 ¼").
- K. The combined aggregate material of the subbase shall not exceed twelve (12) inches. If it is anticipated that twelve (12) inches will be exceeded, a bituminous material (BM-25.0) shall be substituted.
- L. Should the aggregate material reach a depth of eighteen (18) inches or more, under drain shall be considered.
- M. When the bituminous concrete base is equal to or exceeds three (3) inches, the underlying material is considered as subbase.
- N. As long as the total bituminous concrete thickness does not exceed four (4) inches, the first eight (8) inches of the underlying material may use the thickness equivalency value for the base. The remaining depth shall use the subbase value.
- O. Maximum thickness of aggregate layer used over soil cement or cement treated aggregate is six (6) inches.
- P. Minimum thickness of cement treated aggregate placed directly on untreated subgrade soil is six (6) inches.

SECTION 9-600 PROCEDURE FOR WORK REQUIRED WITHIN EXISTING PUBLIC RIGHTS-OF-WAY AND EASEMENTS

9-610 GENERAL CRITERIA

Any person who undertakes the performance of any work upon, in, under, above or about any public street, highway, roadway, alley, dedicated easement or sidewalk, hereafter collectively called public right-of-way, which requires that the street be partially or completely closed for a construction maintenance operation, which work shall require excavation within or occupancy of the whole or a portion of the width of any such public right-of-way by equipment, materials, debris or workmen shall use barricades, signals, flags, flares, and all other traffic control and warning devices. All procedures about the work area during the duration of the work within the public right-of-way shall designate the type and in the manner required by the Manual of Uniform Traffic Control Devices for Streets and Highways, Part VI, Traffic Controls for Street and Highway Construction and Maintenance Operations and the latest edition of the Virginia Work Area Protection Manual, VDOT.

9-610.1 WORK ZONE TRAFFIC CONTROL AND TRANSPORTATION MANAGEMENT PLANS

Work Zone Traffic Control or Transportation Management Plans shall be developed as a part of the initial plan for all Projects, Permits and/or Contracts which pertain to Improvements, Utility Work, Maintenance Operations including Minor Maintenance and Utility Projects prior to occupying the City Right of Way or Easements. The WZTC/TMP Plan shall be consistent with Part IV of the Manual of Uniform Traffic Control Devices for Streets and Highways (MUTCD) and designate the type and in the manner required of:

- A. Traffic control methods to be implemented

- B. Public and pedestrian safety to be implemented
- C. Certified and Trained personal in WZTC Operation, Management and Maintenance

All Work Zone Traffic Control plans shall be submitted to the City for review and approval. Approved Permitted Developer or Contractors Shall provide documentation of Competent Certified Personnel responsible and trained to maintain and manage the WZTC as part of the Approved City Permit or Contract and a copy of the WZTC Contractor Certification shall be kept at all times with the approved permit or contract for the duration of the subject project, permit or contract.

9-620 HAUL ROUTES

The Contractor shall select haul routes between the project and material source(s) that will minimize disturbance to the community. The Contractor shall furnish to the City Designee, for review, of their plan for the haul route and for minimizing the adverse effects of hauling operations on persons who reside adjacent to the haul route or persons who otherwise use a portion of the haul route for ingress or egress to their residential or business areas. The City may select alternate haul routes, divide the hauling traffic over several routes, and impose other restrictions deemed necessary to minimize the impact of the hauling operation on local residents and businesses.

9-620.1 REQUIREMENTS

- A. A plan shall be prepared by the permittee showing where the work is to be performed. The plan will include a detailed barricading layout drawn to scale showing placement of arrow boards, barricades, cones, and informational signs used on the project. In most cases, layouts will be similar to those shown in the latter part of the Manual of Uniform Traffic Control Devices.
- B. The plan required in paragraph 1, shall be submitted prior to issuance of permits and construction to allow the approving Department the opportunity to survey the construction site, to determine any traffic problems that may develop as a result of the barricading. A note shall be added that this work shall not be performed during the peak hour congestion periods of 7:00-9:00 A.M. and 4:00-6:00 P.M., on collector or arterial roads, unless otherwise approved by the City.
- C. An excavation permit shall be approved upon the posting of the applicable bonds. The applicant shall call the inspecting Department 24 hours in advance of the actual construction.

9-620.2 SPECIAL REQUIREMENTS

- A. All work done under this permit on the road right of way, shall in all respects, including location, alignment, elevation and grade; manner of performing the work; restoration of conditions, etc., be subject to the Manual and shall be done to the satisfaction of the City.
- B. Long, open trenches will not be permitted. The maximum length of trench at any time, including backfill portion of the same not suitable for traffic, shall not exceed 100 feet. Trenches are not to be left open overnight.
- C. All backfilling of trenches shall be in layers of not greater thickness than six (6) inches, and shall be made to a minimum of 95% theoretical density, at optimum moisture content, in accordance with the Virginia Department of Transportation, Road and Bridge Specifications. On pavement cuts, the pavement shall be replaced and the material used shall conform to this Manual and the Virginia Department of Transportation, Road and Bridge Specifications. Compaction shall be by pneumatic tampers, or by other approved method or methods. Compaction by water will not be permitted. The permittee will be held responsible for any sinks in backfill or pavement for a period of one (1) year

after the completion of the work. The backfill trench shall be maintained to the satisfaction of the City.

- D. Wherever pavement is permitted to be cut, not over one-half of the width shall be disturbed at one time; and on crossings, the first opening shall be completely restored to satisfactory travelable condition before the second half can be opened. Where the pavement is disturbed, or deemed weakened, it, in its entirety, or such portions of it as deemed desirable by the City, shall be restored or replaced in manner as directed by and to the satisfaction of the City.
- E. No excavated material is to be placed on the pavement without written permission of the Engineer. When so permitted the pavement shall be satisfactorily cleaned by an approved method. Tracking of material onto roadway is a violation of City ordinance and subject to legal action.
- F. Road drainage is not to be blocked. The shoulders, ditches, roadside, and drainage facilities, as well as the pavement, shall be kept in condition satisfactory to the City Inspector.
- G. Refer to Article 8 for allowable pipe materials
- H. Road and street connections and private entrances are to be kept in satisfactory condition. Entrances are not to be blocked, and ample provision shall be made for safe ingress and egress to adjacent property at all times.
- I. Traffic is not to be blocked or re-routed without special written permission of the Fire Marshal or approving Department. Traffic shall at all times be properly protected by adequate lights, barricades, and signs, and flagmen when needed. Additionally, fire access to rear of buildings must be maintained at all times in accordance with minimum width and turn-around requirements described in Section 9-340. Fire lane widths may be reduced with special written permission of the Fire Marshall and approving Department.
- J. The City reserves the right to stop the work at any time the terms of the permit are not satisfactorily complied with; and the City may, at its discretion, complete any of the work covered in the permit, at the expense of the permittee.
- K. The permit is revocable at the pleasure of the City and permittee may be required to move, alter, change, or remove from the road right-of-way in a satisfactory manner any installation made on the right-of-way under the permit.
- L. The permittee shall immediately have corrected any situation that may arise as a result of these installations that the inspector or engineer deems hazardous to the traveling public even though it may not be specifically covered in the permit or this Manual.
- M. The permittee assumes full responsibility for all damages that occur due to work performed under this permit.
- N. All open cut roadway crossings are to be made as nearly as possible at right angles to the center line of the road. Wherever possible, pipe lines shall be bored and jacked, or otherwise pushed under the roadway or a portion thereof, especially on concrete or other hard surface roadways, in order to eliminate as far as possible, the cutting of the pavement.
- O. Restoration of pavement shall conform to Standard Detail TS-15.0 and Sections 9-5100 and 10-700 of this Manual. Open cut trenches shall be cut by a saw method in a smooth line to present a neat appearance. Ripping and jackhammer cutting of pavement will not be allowed. The trench shall be backfilled in accordance with VDOT's Road and Bridge Specifications. The entire trench shall be filled with stone aggregate base course type 21-A, five-inch (5") section of BM-25.0 bituminous base course

and a one- and one-half inch (1 ½") minimum SM-9.5A bituminous surface course. The surface course shall overlap the trench and be bonded to the existing pavement.

- P. In the event of the possibility of interference to the flow of traffic, the Permittee shall notify the City at (703) 257-8347 (or other numbers as provided) giving the location and time schedule of the work to be accomplished, and again shall call the City upon completion of the work or upon reopening of the road.
- Q. The permittee will be responsible for all damages to City facilities, roadways, etc., incidental to this construction.
- R. The permittee shall provide adequate means of cleaning trucks and/or other equipment of mud prior to entering a City of Manassas roadway and it is the permittee's responsibility to clean the streets and alley dust and to take whatever measures necessary to insure that the road is maintained in a clean, mud and dust free condition, at all times.
- S. All damages to existing road(s) will be restored to the satisfaction of the Engineer.
- T. Driveway and curbs shall be maintained for the duration of the permittee's interest in the entrance exactly as indicated on the permit.
- U. No tree trimming or removal allowed without approval of the City.
- V. All damaged sidewalk and/or curb and gutter to be removed to provide a minimum of a six (6) foot section of curbing and a four (4) foot section of sidewalk.
- W. Signs shall be in accordance with the specifications of the "Virginia Manual of Uniform Traffic Control Devices" and the "Virginia Work Area Protection Manual." The signs are to be located as directed by the Engineer or his representative.
- X. Emergencies. The requirements herein are to be used for all planned construction projects. In the event of an emergency, notification of work to be done can be made by telephone directly to the City of Manassas Police Department, thereby bypassing the requirements mentioned above. Under these conditions, the contractor or agency shall still follow the basic barricading standards of the Uniform Traffic Control Devices Manual. The applicant shall apply for the proper permits the following work day.

9-630 STEEL PLATES

Steel plates shall not be permitted within the public street unless specifically approved by the City.

All steel plates within the City Right-Of –Way (ROW), whether used in or out of the traveled way, shall be without deformation. The plate surface must not deviate more than 1/4 inch when measured with a 10-foot straight edge along the length of the plate

Use of Steel Plates for Permitted Site Improvements/ Excavations/ Utilities or other permitted work in the City (ROW). No steel plates will be allowed within the City of Manassas Right-Of –Way (ROW), streets or alleyways between October 15th and April 15th. If working between April 16th and October 14th and using steel plates, they must be approved by the City and must be placed in accordance with City of Manassas standards and specifications. All damages to existing City (ROW), streets or alleyway(s) must be restored to the satisfaction of the City of Manassas.

Steel plates must be properly secured so that it does not slip and must not deflect from traffic loads. Steel plates must extend at least one foot on all sides of the excavation and must be firmly anchored with pins. (See Steel Plate Requirements this section)

When the use of steel plates is approved by the City, the STEEL PLATE AHEAD (W8-24) sign (See Detail 4) shall be used to warn road users whenever a steel plate(s) is being used to protect the surface of the roadway open to travel. Also See Virginia Work Area Protection Manual Section 6F.55 Steel Plate Ahead Sign (W8-24). Plates left overnight may require, at the discretion of the City Inspector or designee, that the sign be supplemented with a Type "A" Low-Intensity-flashing warning light mounted on the sign support.

When used on a portable sign support, the STEEL PLATE AHEAD sign shall be adjusted daily with the work operation and a sand bag weighing approximately 25-pounds shall be placed on each leg of the sign stand.

The steel plate could make the road surface uneven and could create slippery conditions during wet weather; therefore, conspicuity pavement markings are required when steel plates are used. This situation provides a challenge to motorcyclists when they traverse a steel plate unexpectedly in the roadway. Motorcycle Symbol Sign shall be added to STEEL PLATE Sign in high traffic areas.

When steel plates are used in areas where an excavation is made in the roadway for repairs or utility work, providing temporary protection to motorists and pedestrians and continued movement of traffic (Each Owner, Developer, Contractor and/or Permittee) will be subject to requirements for excavation sites that are set forth herein and shall include, but not be limited to, the following measures:

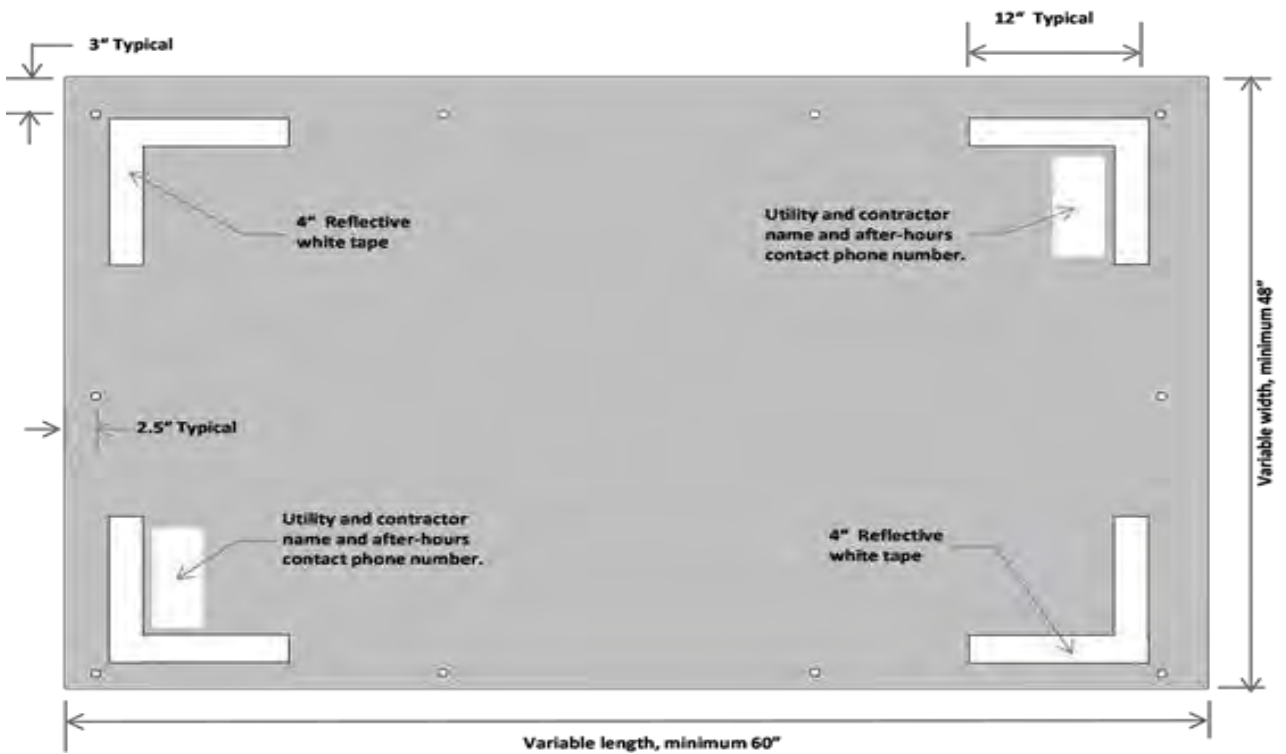
- A. Steel Plates, Protection of Excavation. Each Permittee shall cover an open excavation with properly designed and H-20 load rated steel plates ramped to the elevation of the contiguous street, pavement, or other Public Right-of-Way, or otherwise protected in accordance with guidelines prescribed by the City.
- B. Steel plates must be properly secured so that it does not slip and must not deflect from traffic loads. Steel plates must extend at least one foot on all sides of the excavation and must be firmly anchored with pins.
- C. All Temporary steel plates installed on roadways open to vehicular traffic shall be marked with a durable and highly reflective white Type B, Class VI pavement marking tape, no less than 4 inches in width, and shall be recommended for turning movements by the manufacturer. Placement of the reflective white pavement marking shall be as shown in Figure 9-7 at a minimum, include all four corners of the plate, similar to the pattern shown in Figure 9-7. The marking tape dimensions shall not be less than those shown in Figure 9-7. The 3-inch distance from the plate's edge to the tape may be varied depending on the conditions.
- D. Pavement marking shall comply with Sections 246 and 704 of the Road and Bridge Specifications. 6G-1. The markings shall be maintained throughout the use of the plate in a condition that provides sufficient retro reflectivity to distinguish the corners of the steel plate. Replacement of the markings shall be based on a visual assessment performed periodically at night by a moving inspection vehicle. Any leg of the marking that has lost fifty percent or more of its conspicuity shall be replaced.
- E. Warning signs must be placed in advance of all temporary steel plates used on roadways open to vehicular traffic to advise motorists that they may encounter plates. The advance or warning sign shall contain the message "STEEL PLATES." The warning sign and markings must be maintained in a condition that will satisfy their intended purpose. Additional warning signs may be needed due to the complexity of the work location and other field conditions.

9-630.1 REQUIREMENTS

When backfill operations of an excavation in the traveled way, whether transverse or longitudinal, cannot be properly completed within a work day, steel plate bridging will be required to preserve unobstructed traffic flow in City streets and roadways. In such instances the following applies:

- A. Steel plates must be able to withstand H-20 traffic loading without any movement.
- B. Steel plates shall be fabricated to meet ASTM A36 steel requirements.
- C. When two or more of plates are used, the plates shall be tack welded together at each corner to reduce or eliminate vertical movement. Alternative methods to accomplish this, such as metal connectors, will be considered for approval on case by case basis.
- D. Steel plates shall be installed to resist bending, vibrations, etc., under traffic loads and shall be anchored securely to prevent movement. If these conditions are not met, the applicant will be required to backfill and pave the excavation daily, or use alternative methods such as "Plate Locks" which are designed to secure the plates with minimum noise and vibration.
- E. All steel plates shall be properly marked with the utility and contractor name, after-hours contact phone number in the event the plates need to be secured.
- F. All steel plates within the right-of -way, whether used in or out of the traveled way, shall be without deformation. The plate surface must not deviate more than 1/4 inch when measured with a 10-foot straight edge along the length of the plate.
- G. It is the responsibility of the permittee to perform and document daily inspections of all active plate(s) or unattended plate(s) location(s), and where necessary take appropriate measures to protect the public safety until work is completed. This documentation shall be available to the City inspector upon request. No un-plated excavation shall be left unattended overnight.
- H. In the event of improper installation of the steel plates that presents a nuisance or a public safety problem, the permittee shall respond to all excavation restoration requests by the City immediately upon notification. Non-responses will result in the required restoration work being done by the City, with all expenses to be paid by the permittee.
- I. Steel plates must extend a minimum of 12-inches beyond the edges of the excavation.
- J. Before steel plates are installed, the excavation shall be adequately shored to support the bridging and traffic loads.
- K. Temporary paving with a cold asphalt mix shall be used to feather the edges of the plate to form a wedged taper to cover the edges of the steel plate. Other alternative methods to accomplish this will be considered for approval.
- L. Wedges or other non-asphaltic devices shall be used for leveling as required to eliminate rocking of the plates. Compacted temporary asphalt shall be used to fill all gaps between the plates and existing pavement surfaces.
- M. All steel plates within the City right-of -way, whether used in or out of the traveled way, shall be without deformation. The plate surface must not deviate more than 1/4 inch when measured with a 10-foot straight edge along the length of the plate.

FIGURE 9-7. STEEL PLATE



Steel plates must be properly secured so that it does not slip and must not deflect from traffic loads. Steel plates must extend at least one foot on all sides of the excavation and must be firmly anchored with pins. (See Steel Plate Requirements section)

9-630.2 INSTALLATION

Steel plate placement on traverse and longitudinal excavations shall be in accordance with the following:

Steel Plate Installation Posted Speed Limit Steel Plate Thickness

- TYPE 1 Urban/Residential 25 MPH or Less 1-inch minimum
- TYPE 2 Arterial/Collector Greater than 25 MPH 1-1/4-inch minimum.

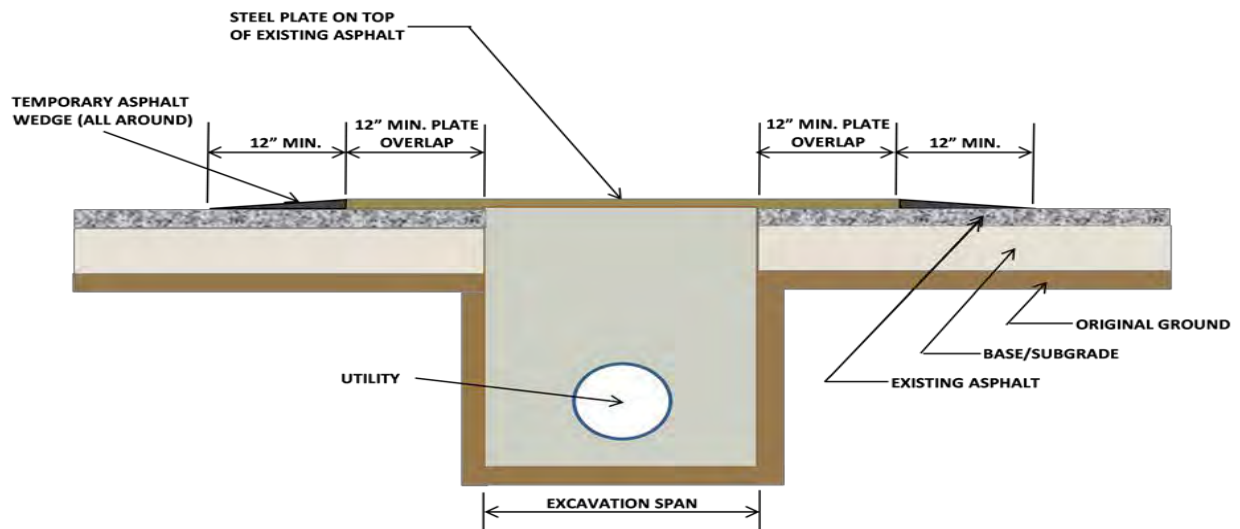
TABLE 9-17. STEEL PLATE INSTALLATION REQUIREMENTS

Steel Plate Installation	Street/Road Type	Posted Speed Limit	Steel Plate Thickness
TYPE 1	Urban/Residential	25 MPH or Less	1-inch minimum
TYPE 2	Arterial/Collector	Greater than 25 MPH	1-1/4-inch minimum

A. TYPE 1 INSTALLATION

1. Type 1 installation shown in Figure 11-7-2, shall be used in areas where backfilling operations of an excavation in the traveled way, whether traverse or longitudinal cannot be properly completed within the same day, and the posted speed limit is 25 MPH or less.
2. The steel plate shall be anchored securely to prevent movement. Temporary paving with a cold asphalt mix, or approved equal, shall also be used to feather the edges of the plate to form a wedged taper to cover the edges of the steel plate

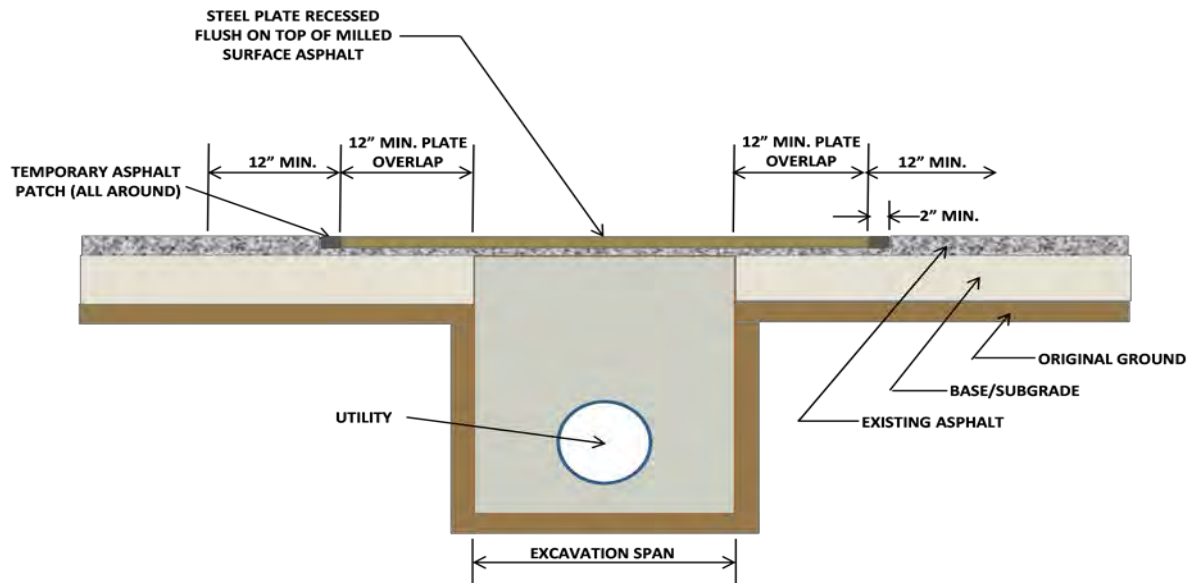
FIGURE 9-8. TYPE 1 INSTALLATION DETAIL



B. TYPE 2 INSTALLATION

1. Type 2 installation shown in Figure 3, shall be used in areas where backfilling operations of an excavation in the traveled way, whether traverse or longitudinal cannot be properly completed within the same day and the posted speed limit is greater than 25 MPH.
2. The steel plate for type 2 installations shall be recessed by milling into the existing asphalt to set flush with the surface of the existing asphalt.
3. The pavement shall be cut and cold planed to a depth equal to the thickness of the plate and to a width and length equal to the dimensions of the plate.
4. Full depth cutting of the asphalt section of excavation is not allowed. The steel plate shall be anchored securely to prevent movement.
5. The gap between the edge of the plate and the adjacent existing asphalt pavement must be filled with temporary asphalt patch (cold mix). Wedges or other non-asphaltic devices shall be used for leveling as required to eliminate rocking of the plates.
6. Compacted temporary asphalt shall be used to fill all gaps between the plates and existing pavement surfaces.

FIGURE 9-9. TYPE 2 INSTALLATION DETAIL



9-630.3 SIGNAGE

Provisions shall be made for the safety and protection of vehicular and pedestrian traffic during the construction period as follows:

- A. The permittee shall be responsible for the furnishing, erection and maintenance of all required traffic control devices. All signs and devices shall conform to the requirements of the current edition of the Virginia Work Area Protection Manual (VAWAPM) and Manual on Uniform Traffic Control Devices (MUTCD).
- B. When in the opinion of the City Inspector or designee, the work constitutes a hazard to traffic in any area of the work, the permittee may be required to suspend operations during certain hours and to remove any equipment from the area of work.
- C. The roadway surface shall be kept clean of debris at all times and shall be thoroughly cleaned at the completion of the work.
- D. The permittee shall be responsible to replace all pavement markings in kind which have been disturbed as a result of the utility work 6.1 Signage In addition of the traffic control devices required by the Engineering Division Permit, warning signs advising motorist that they should expect to encounter steel plates, shall be placed at approximately 100 feet in advance of each steel plate location.

FIGURE 9-10. STEEL PLATE AHEAD SIGN DETAIL



A	B	C	D	E	F	G	H	J	K	L	M	N
30	0.5	0.75	4 D	3	2.5	7.214	7.713	7.374	7.874	8.356	8.855	1.875
36	0.625	0.875	5 D	3.5	3.5	9	9.659	9.28	9.78	10.5	11.014	2.25
48	0.75	1.25	7 D	4.5	4.75	12.561	13.561	12.842	13.842	14.560	15.560	3

COLORS: LEGEND, BORDER – BLACK

9-640 SAFETY PRECAUTIONS

Public Protection: The following provision shall apply to insure adequate and safe protection to the public whenever construction work is readily accessible to the public.

9-640.1 WARNING SIGNS AND LIGHTS

- A. Danger signs on construction, excavation, or demolition projects shall be posted in a conspicuous manner.
- B. Excavations shall be conducted in accordance with the requirements of VUSBC and Section 10-700 of this Manual.

9-640.2 APPLICABILITY

For the purposes of Section 11-2040, construction work deemed readily accessible to the public shall include, but not be limited to the following:

- A. Sites within five hundred (500) feet of residential areas; or

- B. Sites within five hundred (500) feet of public use areas such as schools, parks, places of assembly, commercial areas, etc.; or
- C. Any other sites which in the determination of the City are readily accessible to the public by reason of one or more of the following factors:
 - 1. Prolonged time of construction;
 - 2. Close proximity to public or private streets; or
 - 3. Any other characteristics or conditions making the site particularly attractive to children.

9-640.3 FENCING

- A. These types of projects are attractive to children and can be very dangerous. Therefore, they shall be fenced and posted, or otherwise made inaccessible to persons or animals unless this is deemed unnecessary due to the remoteness of the site or other circumstances.
- B. In general, temporary fencing shall be a minimum of five (5) feet high woven wire fabric or approved equal.

9-640.4 WAIVER

Whenever it is determined a construction site otherwise subject to the requirements of Section 9-640 is adequately isolated from public access by existing physical barriers, the City may, in writing, waive application of any or all requirements of this section.

9-650 FINAL APPROVAL

Final approval for the satisfactory completion of the roadway improvements or repairs within an existing right-of-way shall not be given until all site work is completed, an as-built plan is submitted to and approved, and the applicable bonds are released. All new subdivisions will be inspected by a representative of the City of Manassas as part of the final approval of the project.

SECTION 9-700 TRANSPORTATION SYSTEM DETAILS

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B.M. x 125.00	Permanent or temporary bench and elevation
--- 8 ---	Existing minor contour line
-- 8 --	Existing major contour line
— 8 —	Proposed minor contour line
—— 8 ——	Proposed major contour line
6.6 x	Existing spot elevation
6.6	Proposed spot elevation
— CL —	Centerline
— PL —	Property line
— X — X —	Fence line
— - - —	Proposed right of way line
— ····· —	Easement
— E.P. —	Edge of pavement
⊙ 8"SS →	Existing sanitary sewer (size as noted) and manhole, direction of flow
○ →	Proposed sanitary sewer (size noted on plan) and manhole, direction of flow
▭ 18"STM ▭	Existing storm sewer (size as noted) and catch basin and manhole
▭ ▨ ▭	Proposed storm sewer (size noted on plan) and catch basin and manhole
— 8"W — ○	Existing water main (size as noted) and valve and hydrant
— 8"W — ◆ F.H.	Proposed water main (size noted on plan) and valve and hydrant
○ W.M.	Water meter (proposed or existing)
⊖ A.R.	Water manhole (air relief)
⊕ ⊕	Tee (proposed and existing)
⊕ ⊕	Cross (proposed and existing)
→ ▷	Reducer (proposed and existing)

Not to Scale

STANDARD LEGEND



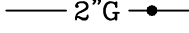
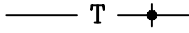
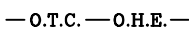
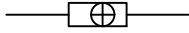
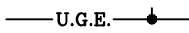


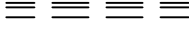
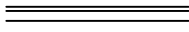
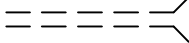



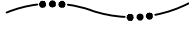

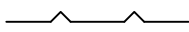
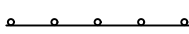
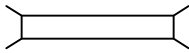
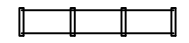


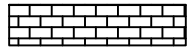



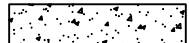

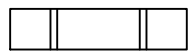
REVISION & DATE
DRAWING NUMBER

Jane K. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

TS - 1.0

	Proposed Bend		
	Existing Bend		
	Existing gas main and valve (size as noted)		
	Underground telephone line and pole		
	Overhead telephone and power pole		
	Telephone MH and electric MH (noted on plan)		
	Underground electric and pole (ext./prop. so noted)		
	Underground cable television line		
	Test hole location		
	Existing curb and gutter		
	Proposed curb and gutter		
	Existing culvert		
	Proposed culvert		
	Existing channel		
	Proposed channel		
	Wet weather ditch		
	Levee or embankment		
	Retaining wall		
	Guard rail		
	Bridge		
	Railroad		
	Hedge		
	Tree, wooded area		
	Brick		Earth
	Cement or sand		Gravel
	Concrete		Rip Rap
	Concrete masonry unit		

Not to Scale

STANDARD LEGEND CONTINUED

REVISION & DATE

DRAWING NUMBER

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

TS - 1.1

Abbreviation

Name

E.P.	Edge of Pavement
W.M.	Water Meter
P.I.V.	Post Indicator Valve
U.G.E.	Underground Electric
CIP	Cast Iron Pipe
CMP	Corrugated Metal Pipe
CMU	Concrete Masonry Units
C.O.	Cleanout
CONC.	Concrete
STM	Storm Drainage
DIP	Ductile Iron Pipe
A.R.	Air Relief
ELEV.	Elevation
F.H.	Fire Hydrant
EX.	Existing
FIN.	Finished
F.M.	Force Main
GR.	Grade
INV.	Invert
MH	Manhole
NRS	Non-rising Stem
PROP.	Proposed
RCP	Reinforced Concrete Pipe
RED.	Reducer or Reducing
RS	Rising Stem
R.O.W.	Right of Way
S.S.	Sanitary Sewer
S.T.S.L.	Stainless Steel
STD.	Standard
U.T.C.	Underground Telephone
T.C.	Top of Curb
T.S.&V.	Tapping Sleeve and Valve
W	Water Main
O.T.C.	Overhead Telephone Cable
O.H.E.	Overhead Electric

Not to Scale

STANDARD LEGEND CONTINUED

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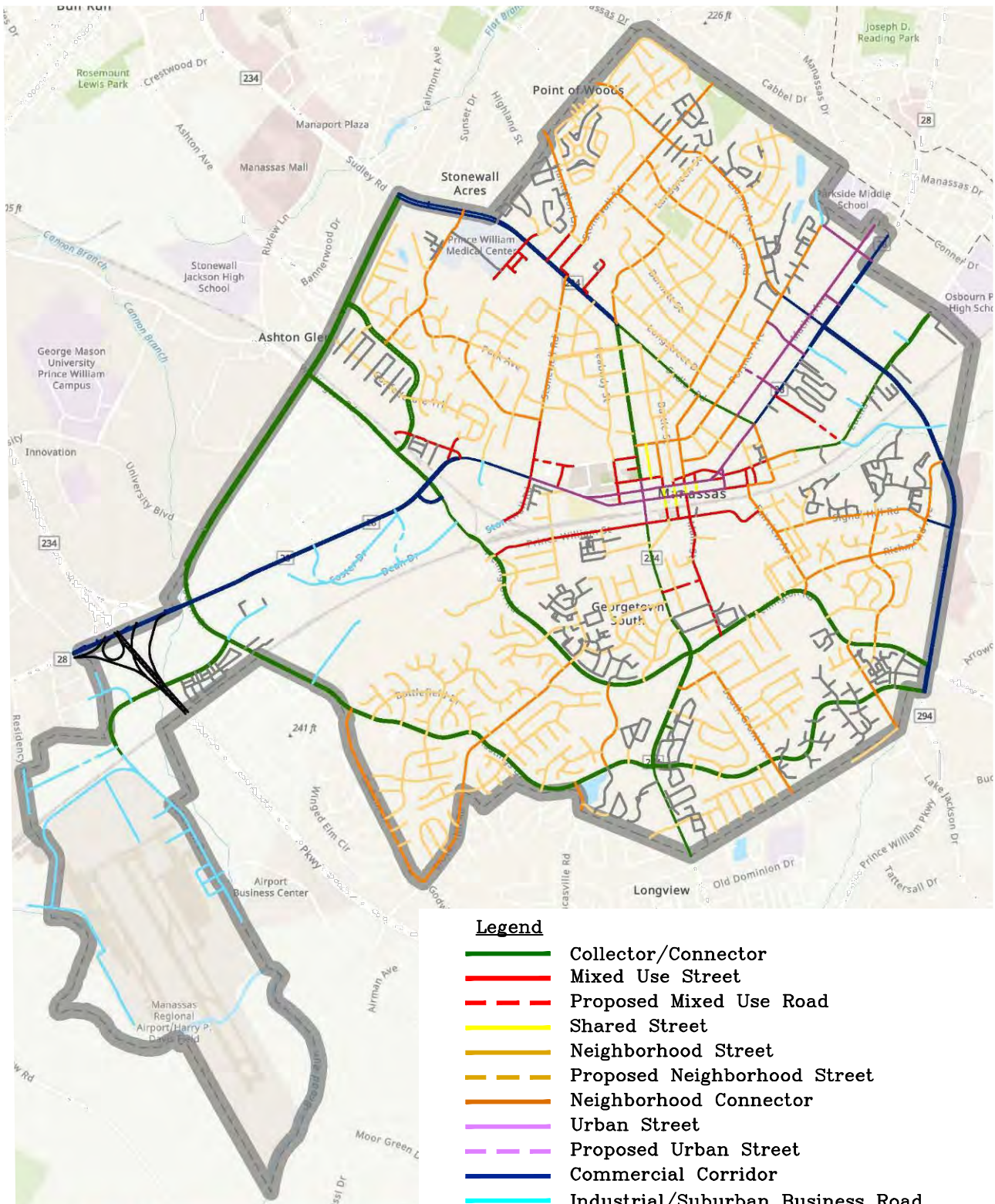
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DATE

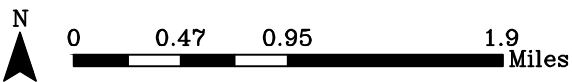
CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

TS - 1.2



Legend

- Collector/Connector
- Mixed Use Street
- - - Proposed Mixed Use Road
- Shared Street
- Neighborhood Street
- - - Proposed Neighborhood Street
- Neighborhood Connector
- Urban Street
- - - Proposed Urban Street
- Commercial Corridor
- Industrial/Suburban Business Road
- - - Proposed Industrial/Suburban Business Road
- Highway/Ramps
- Private



STREET TYPOLOGY MAP

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

REVISION & DATE

DRAWING NUMBER

TS - 2.0

DIRECTOR

DATE

MINIMUM PAVEMENT STRUCTURE DESIGN

Lance K. Kelly
DIRECTOR

2/28/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

REVISION & DATE

DRAWING NUMBER

TS - 3.0

CATEGORY	SUBBASE	BASE	SURFACE
I Up to 250 VPD	1. 6" Aggregate Subbase	3" BM-25A	1-1/2" SM-9.5A
II 251 VPD to 400 VPD	1. 8" Aggregate Subbase	3" BM-25A	1-1/2" SM-9.5A
III 401 to 1000 VPD	1. 8" Aggregate Subbase 2. 6" Cement CTA	3" Asphalt Concrete Type BM-25A 3" BM-25A	2" SM-9.5D 2" SM-9.5D
IV 1001 to 1500 VPD	1. 10" Aggregate Subbase 2. 8" Aggregate Subbase	3" Asphalt Concrete Type BM-25D 6" Asphalt Concrete Type BM-25D	2" SM-9.5D 1-1/2" SM-9.5D
V 1501 to 3000 VPD	1. 6" Cement CTA & 5" Aggregate Subbase 2. 12" Aggregate Subbase 3. 8" Aggregate Subbase	3" Asphalt Concrete Type BM-25D 3" Asphalt Concrete Type BM-25D 6" Asphalt Concrete Type BM-25D	1-1/2" SM-9.5D 2" SM-9.5D 2" SM-9.5D
VI 3001 to 8000 VPD	1. 12" Aggregate Subbase 2. 10" Aggregate Subbase 3. 8" Cement CTA	6" Asphalt Concrete Type BM-25D 8" Asphalt Concrete Type BM-25D 4" Asphalt Concrete Type BM-25D	2" SM-9.5D 2" SM-9.5D 2" SM-9.5D
VII 8001+ VPD	1. 8" Cement CTA 2. 12" Aggregate Subbase	8" Asphalt Concrete Type BM-25D 8" Asphalt Concrete Type BM-25D	2" SM-9.5D 2" SM-9.5D

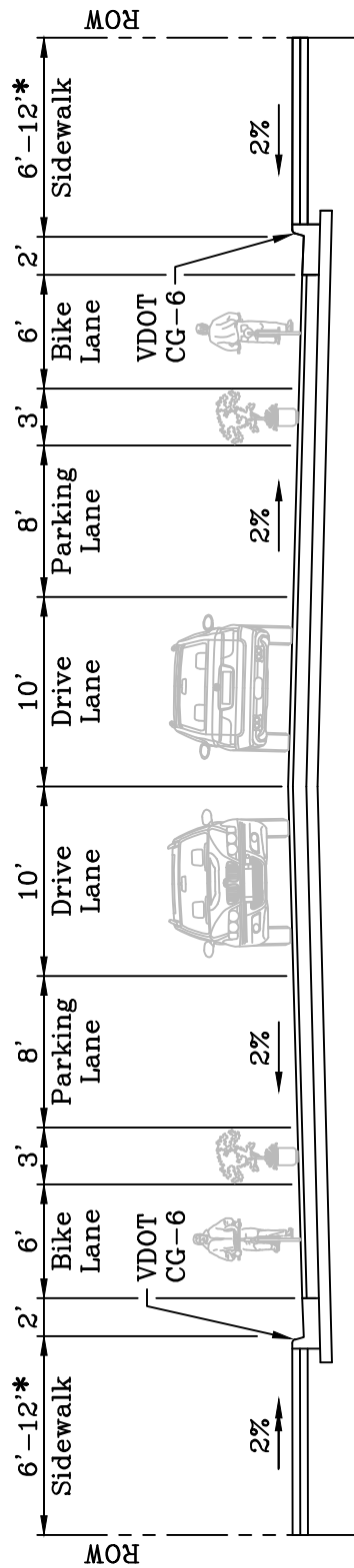
This design is based upon a minimum CBR value of 10. Redesign is not permissible for higher C.B.R. values.

Notes:

- (1) When the projected traffic requires a four lane facility, 80% of the projected traffic shall be the basis for determining the applicable class for the pavement structure design.
- (2) Sufficient engineer certified C.B.R. tests must be run to determine the soil support value (ssv) of the various soils in the subgrade. Details as to the VDOT approved method may be obtained through any VDOT District or Residency Office or its Central Office.
- (3) CBR Testing must be provided to the City for any roadway widening or improvements in the public right-of-way.
- (4) Pavement design in accordance with VDOT'S "Pavement design guide for subdivision and secondary roads in Virginia," latest revision is an acceptable alternative.
- (5) Each street should have continuity of design throughout. Therefore, multiple and/or variable base design will not be acceptable.
- (6) Designs within a specific traffic category may not be structurally equal because of differences in the materials flexural strengths and practical construction consideration.
- (7) Cement Treated Aggregate (CTA) or full depth Bituminous Concrete can be substituted for any aggregate, subgrade stabilization, or select material on a basis of 1 inch of CTA or Bituminous Concrete for 2 inches of the other materials. Neither CTA nor Bituminous Concrete should not be placed directly on a resilient soil unless the soil is stabilized with cement or other stabilizing agent.
- (8) VDOT Standard WP-2 for pavement widening shall be used whenever existing asphalt pavement is widened.

Not to Scale

This section shall apply to complete streets typologies for one-way and two-way urban streets and mixed-use streets



* Typology	Minimum	Preferred
Urban Street	10'	12'
Mixed-Use	6'	8'

Notes:

1. On one-way urban street, parking lane shall be on the left side and bike lane on the right side of street.
2. Where parking lane is adjacent to curb and gutter, parking lane may be reduced to 8' from face of curb.
3. Pavement section shall be based on TS-3.0 or as directed by geotechnical engineer.
4. Aggregate subbase shall extend a minimum of 6" beyond back of curb.
5. Standard intersection landings per TS-6.0 required.
6. Bike lanes are to be protected by planters wherever possible. Flexible delineators or alternative measures may be used in lieu of planters with approval of Engineering Director.
7. Bike lanes shall be constructed and marked in accordance with TS-4.6 and MUTCD.
8. Sidewalk shall be built in accordance with TS-14.0.
9. Pavement markings & signage shall comply with MUTCD.
10. A portion of parking lane shall be designated as pick-up and drop-off zone or 15-minute parking. Limits and locations of these zones shall be approved by the City Engineer and Community Development Director. Planters shall not be used in these areas to provide emergency access.
11. Parking lane shall be marked with perimeter, minimum 4" white box and individual spaces should not be marked.

Right-of-Way Table

Typology	Total ROW Width Required
One-Way Urban Street	48'
Two-Way Urban Street	78'
Mixed-Use Street	70'

Not to Scale

URBAN AND MIXED-USE STREET SECTION

James H. Kelly
DIRECTOR

1/21/22
DATE

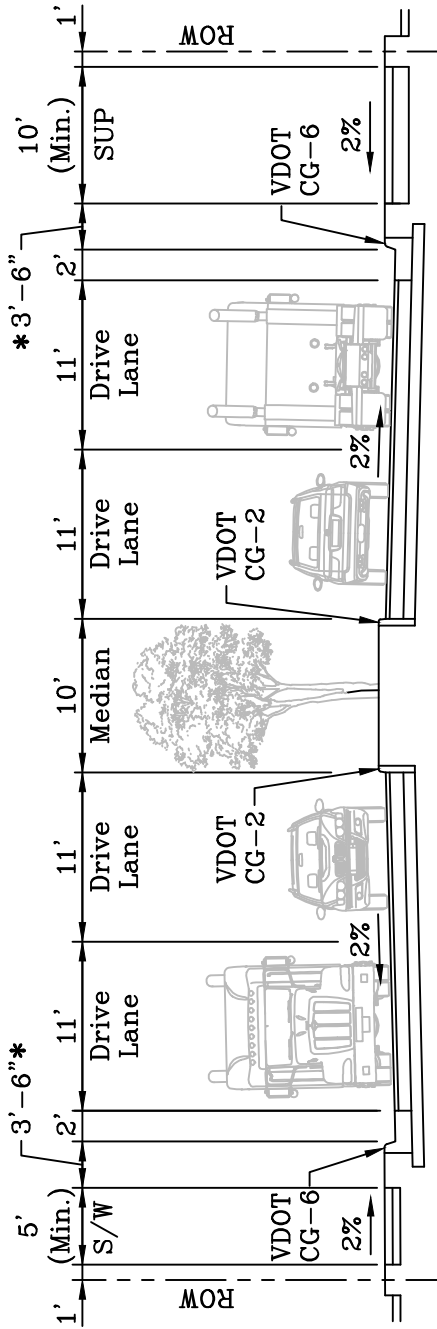
CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

REVISION & DATE

DRAWING NUMBER

TS - 4.1

This section shall apply to complete streets typologies for collector/connector and commercial corridor



* Typology	Buffer Width
Collector/Connector	6'
Commercial Corridor	3'

Notes:

1. Commercial corridors may have three lanes in each direction, as justified by traffic study.
2. Pavement section shall be based on TS-3.0 or as directed by geotechnical engineer.
3. Aggregate subbase shall extend a minimum of 6" beyond back of curb.
4. Standard intersection landings per TS-6.0 required.
5. Bike lanes shall be constructed and marked in accordance with TS-4.6 and MUTCD.
6. Sidewalk shall be built in accordance with TS-14.0 and shared use path (SUP) shall be built in accordance with TS-13.0.
7. Pavement markings & signage shall comply with MUTCD.
8. Commercial corridor shared use paths shall be constructed in the following locations:

Street	Location	Right-of-Way Table
Liberia Avenue	East Side	
Sudley Road	West Side	
Nokesville Road (Route 28)	North Side	
Centreville Road (Route 28)	North Side	

Typology	Total ROW Width Required
Collector/Connector	87'
Commercial Corridor (4-Lane)	81'
Commercial Corridor (6-Lane)	103'

Not to Scale

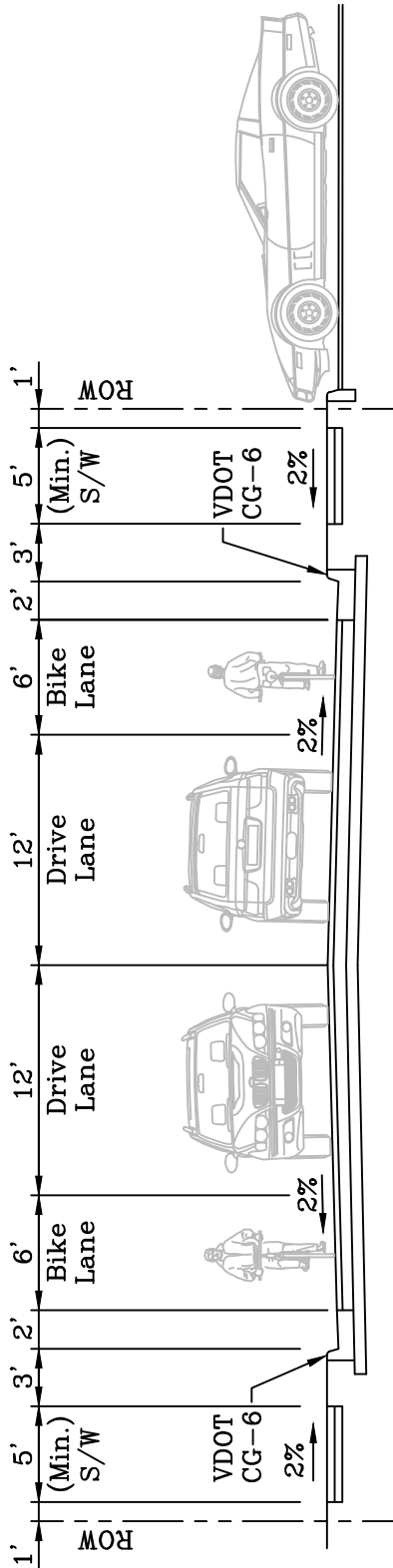
COLLECTOR/CONNECTOR AND COMMERCIAL CORRIDOR

James H. Kelly
 DIRECTOR 1/21/22
 DATE

CITY OF MANASSAS, VIRGINIA
 DEPARTMENT OF ENGINEERING

REVISION & DATE
 DRAWING NUMBER
 TS - 4.2

This section shall apply to complete street typology for industrial/suburban business road



Notes:

1. Adjacent land use must provide minimum 2' buffer between sidewalk and adjacent parking to prevent vehicle overhang onto sidewalk.
2. Pavement section shall be based on TS-3.0 or as directed by geotechnical engineer.
3. Aggregate subbase shall extend a minimum of 6" beyond back of curb.
4. Standard intersection landings per TS-6.0 required.
5. Pavement marking and signage shall comply with MUTCD.

Right-of-Way Table

Typology	Total ROW Width Required
Industrial/Suburban Business Road	58'

Not to Scale

INDUSTRIAL/SUBURBAN BUSINESS ROAD

James H. Kelly
DIRECTOR

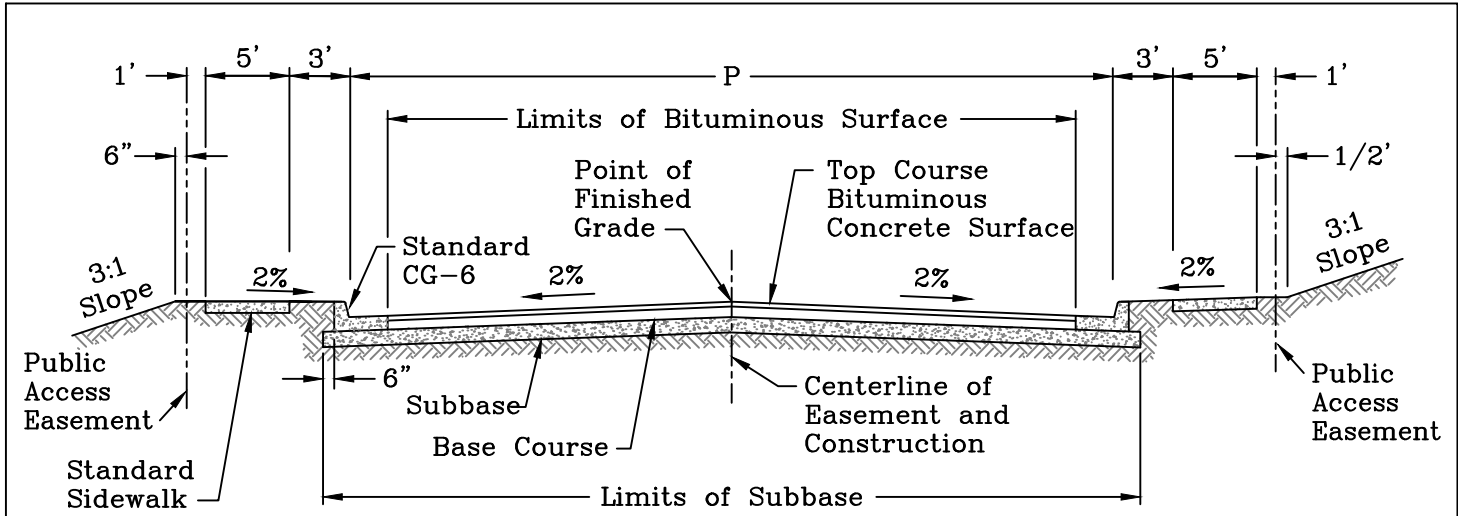
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DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

REVISION & DATE

DRAWING NUMBER

TS - 4.4



TRAFFIC COUNTS (VPD)	PARKING	P	PAVEMENT SECTION
0-250	No Parking	24'	Category I
	Parallel (one side)	30'	Category I
	Parallel (both side)	36'	Category I
	Perpendicular	22' ⁽¹⁾	Category I
251-400	Perpendicular	24' ⁽¹⁾	Category II
300-1000	No Parking	24'	Category III

Notes:

1. These dimensions are between parking stalls.
2. Stone material shall extend under the curb and gutter, a minimum of 6" beyond the back of curb. The aggregate thickness under the curb and gutter shall be that in excess of the depth of the gutter face or a minimum of 4", whichever is greater.
3. Sidewalk connectivity shall be provided to access all residential units, storefronts, and other main building entrances.
4. Private street horizontal and vertical curves shall meet requirements of TS-4.6 unless lower speed limit is posted and autoturn analysis is provided.

Not to Scale

ALTERNATE TYPICAL SECTION
FOR PRIVATE ACCESS ROAD

Lance K. Kelly
DIRECTOR
2/28/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

REVISION & DATE
DRAWING NUMBER
TS - 4.5

Street Type	Recommended Posted Speed Limit (MPH)	Design Speed (MPH)	Maximum Grade	Minimum Stopping Sight Distance (FT)	Minimum Radius (FT) w/+2% Superelevation	Minimum Radius (FT) w/-2% Superelevation
Private Street	20 ¹	20	11% ²	125 ²	77 ⁶	107 ⁶
Neighborhood Street	20 ¹	25	8%	155 ³	167 ⁶	198 ⁶
Neighborhood Connector	25 ¹	30	8%	200 ³	273 ⁶	333 ⁶
Urban Street	25 ¹	30	8%	200 ³	273 ⁶	333 ⁶
Mixed Use Street	25 ¹	30	8%	200 ³	273 ⁶	333 ⁶
Collector/Connector	35 ¹	40	8%	305 ⁴	593 ⁶	762 ⁶
Commercial Corridor	35 ¹	40	8%	305 ⁵	593 ⁶	762 ⁶
Industrial/Suburban Business Road	30 ¹	35	8%	250 ⁵	408 ⁶	510 ⁶

(1) Per Citywide Transportation and Mobility Plan

(2) Taken from VDOT Geometric Design Standards for Service Roads (GS-9)

(3) Taken from VDOT Geometric Design Standards for Urban Local Street System (GS-8)

(4) Taken from VDOT Geometric Design Standards for Urban Collector Street System (GS-7)

(5) Taken from VDOT Geometric Design Standards for Urban Minor Arterial Street System (GS-8)

(6) Taken from VDOT Standard TC-5.11.

(7) This standard assumes superelevation based on VDOT Urban-Low Speed (ULS) conditions with a maximum superelevation of +2% or -2%, as indicated.

Not to Scale

GEOMETRIC DESIGN FOR STREET TYPOLOGIES

James H. Kelly
DIRECTOR

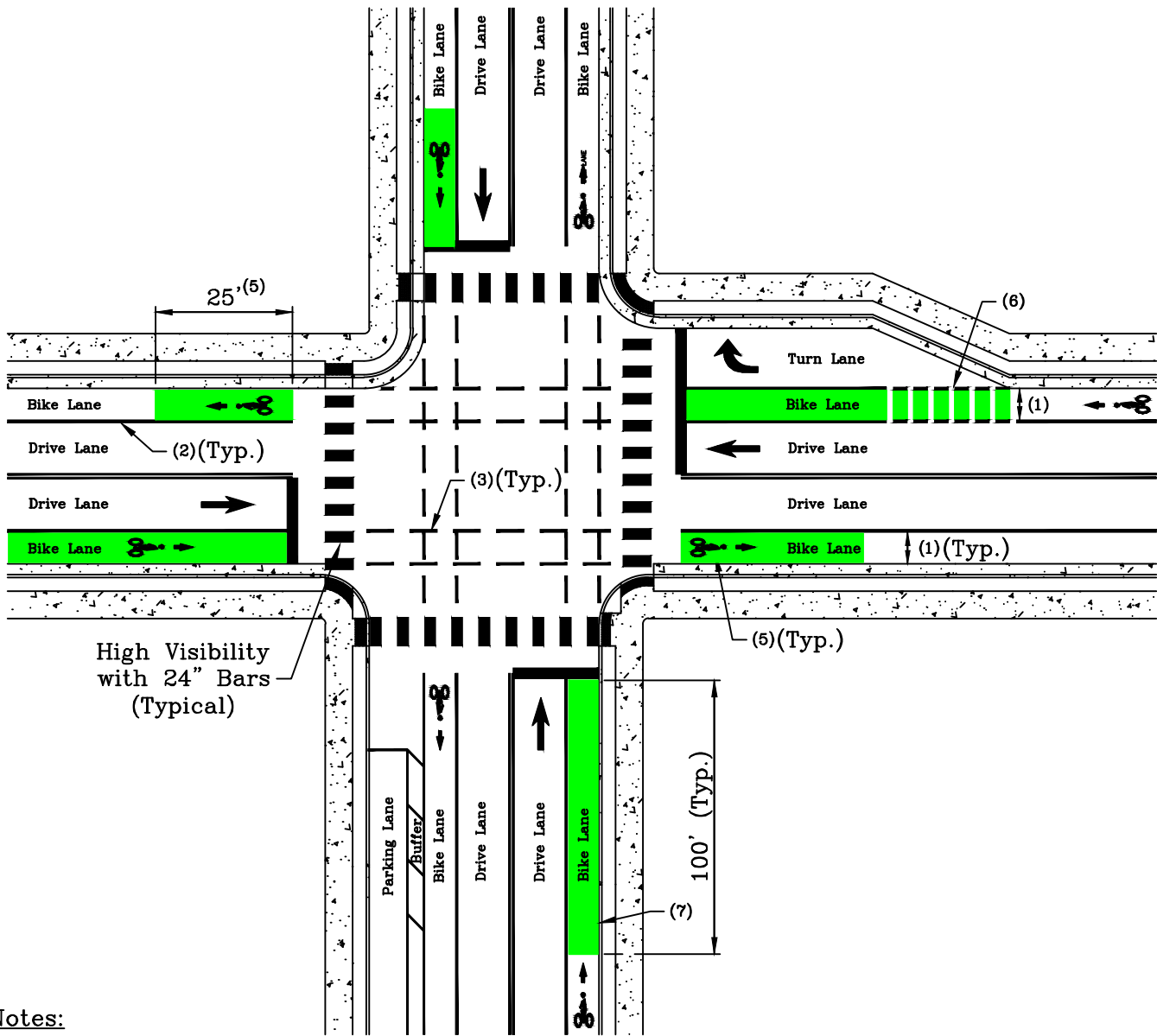
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DEPARTMENT OF ENGINEERING

REVISION & DATE

DRAWING NUMBER

TS - 4.6



Notes:

1. Bike lane width should comply with appropriate street typology typical section.
2. All pavement markings and signage shall comply with the MUTCD. Lines separating drive lane from bike lane shall be 6" or 8" wide.
3. Dotted lines should be provided through intersection to delineate the bike lane. They should be 2' long with 4' skips.
4. Green marking shall be VDOT Type A or Type B, Class II pavement marking with green color matching Pantone #368 or approved equivalent. Markings must be skid resistant and should be retroreflective. White lane markings are still required adjacent to green marking.
5. MUTCD standard helmeted bicyclist symbol shall be placed to indicate bike lane at each approach to and departure from intersection. Pavement symbol shall then be placed at maximum spacing of 500'.
6. Where turn lane crosses bike lane, dotted markings shall be used to delineate both sides of bike lane. Green paint shall be installed in dotted pattern, matching locations of edge lines.
7. If bike lane is immediately adjacent to curb without buffer or gutter pan, VDOT Std. CG-3 mountable curb should be used to prevent pedal strike on curb.
8. Bike lanes shall be signed in accordance with all MUTCD requirements. Signing and pavement marking plan shall be submitted to the City for review and approval.

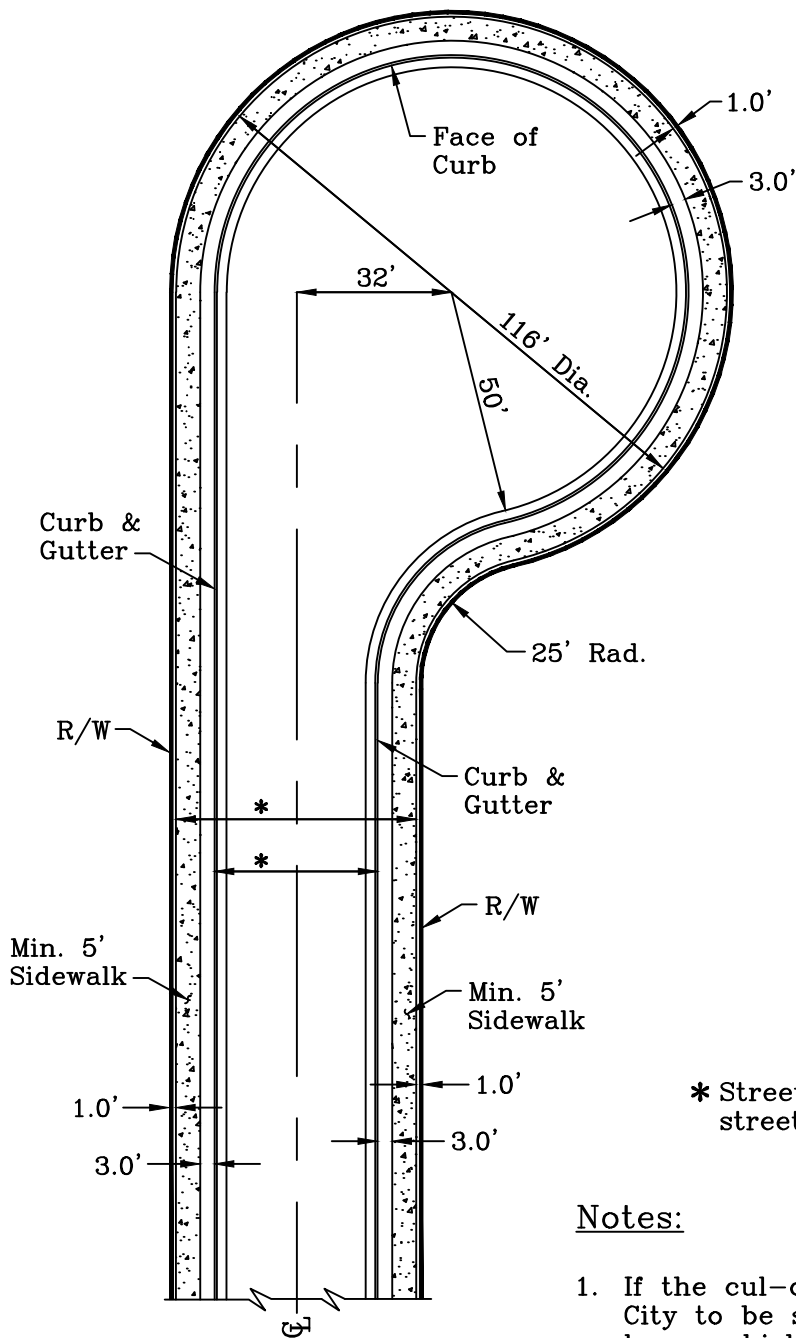
Not to Scale

BIKE LANE IMPLEMENTATION

James H. Kelly
 DIRECTOR 1/21/22
 DATE

CITY OF MANASSAS, VIRGINIA
 DEPARTMENT OF ENGINEERING

REVISION & DATE	
DRAWING NUMBER	
TS - 4.7	



* Street & ROW width to be based on street typology standards.

Notes:

1. If the cul-de-sac is determined by the City to be subject to bus traffic or other large vehicle traffic regularly, a larger pavement radius is required.
2. Minimum length of cul-de-sac is one lot width between the intersecting street and the beginning of the circular turn-around.

Not to Scale

TYPICAL OFFSET CUL-DE-SAC DESIGN FOR STREET WITH SIDEWALK, CURB AND GUTTER

REVISION & DATE

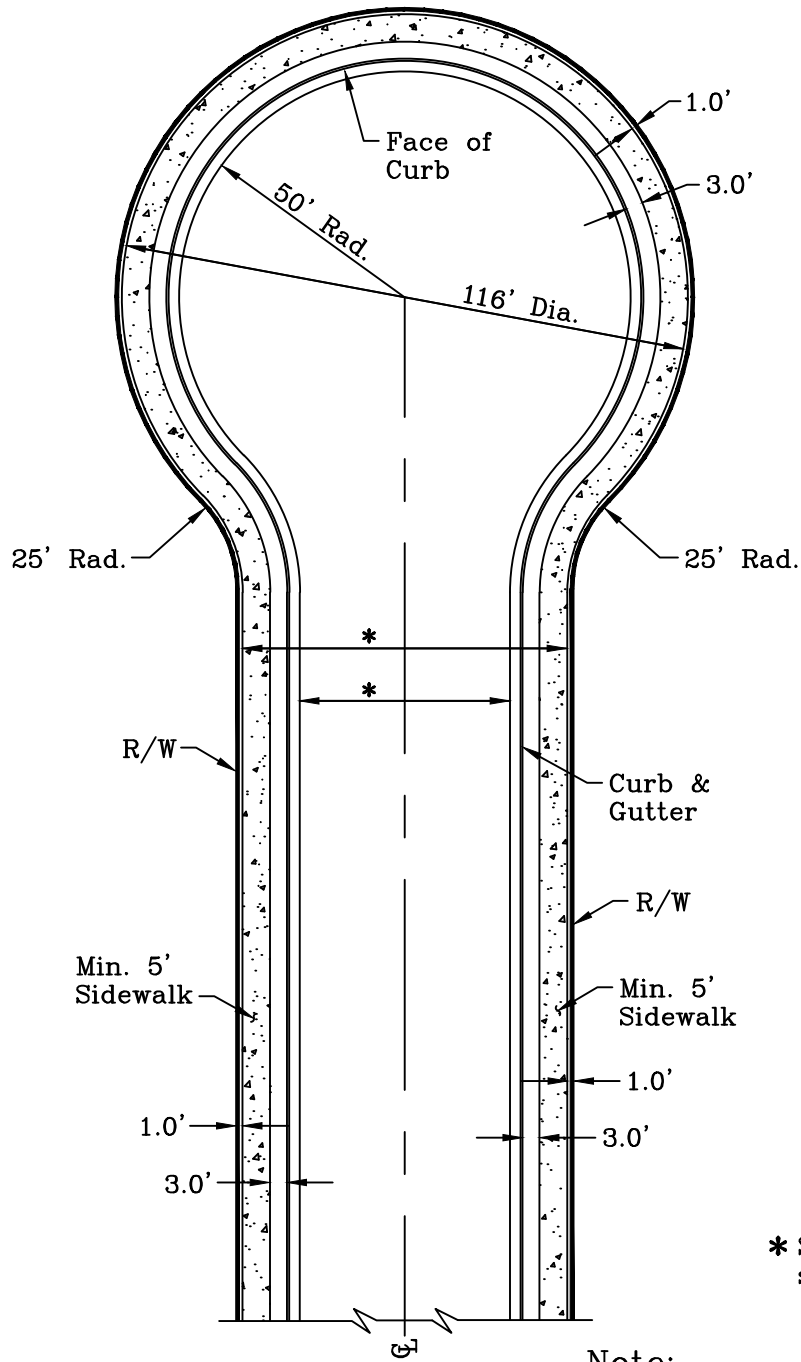
DRAWING NUMBER

TS - 5.0

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



* Street & ROW width based on street typology standards.

Note:

1. If the cul-de-sac is determined by the City to be subject to bus traffic or other large vehicle traffic regularly, a larger pavement radius is required.

Not to Scale

TYPICAL CUL-DE-SAC DESIGN FOR STREET WITH SIDEWALK, CURB AND GUTTER

REVISION & DATE

DRAWING NUMBER

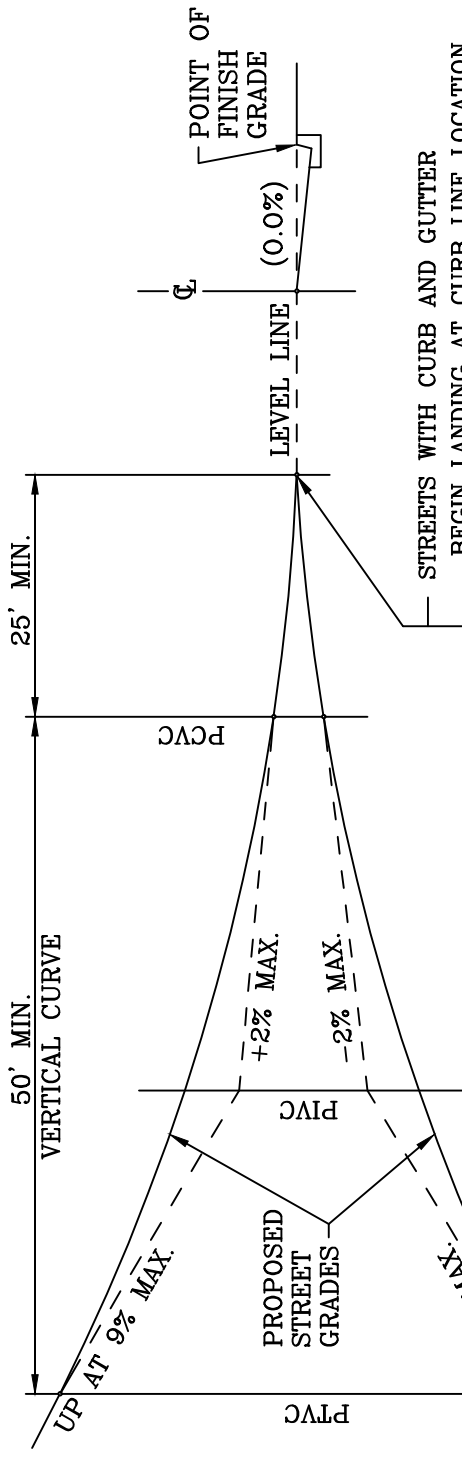
James H. Kelly
DIRECTOR

1/21/22
DATE

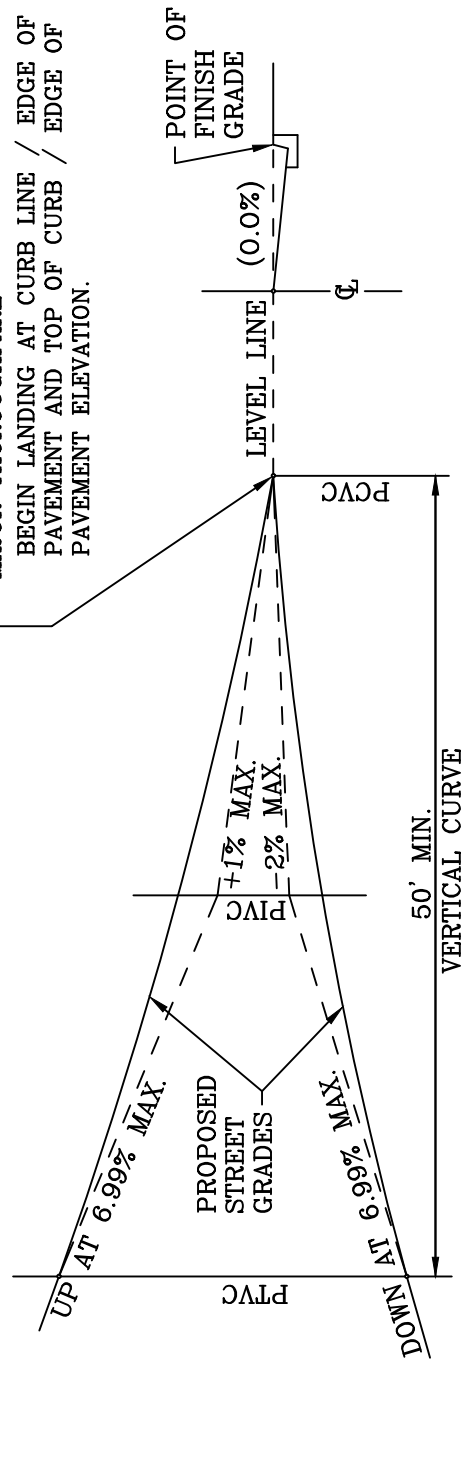
CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

TS - 5.1

LANDING FOR GRADES GREATER THAN 7%



LANDING FOR GRADES LESS THAN 7%



STREETS WITH CURB AND GUTTER BEGIN LANDING AT CURB LINE LOCATION AND TOP OF CURB ELEVATION

STREETS WITHOUT CURB AND GUTTER BEGIN LANDING AT OUTSIDE EDGE OF PAVEMENT AND CENTERLINE ELEVATION

MAJOR THOROUGHFARE BEGIN LANDING AT CURB LINE / EDGE OF PAVEMENT AND TOP OF CURB / EDGE OF PAVEMENT ELEVATION.

Notes:

1. Flow line may be maintained across intersection as appropriate. However flow across intersection must be less than 1 C.F.S. in 10-YR storm.
2. Pedestrian path with minimum width of 5' and max. cross-slope of 2% must be provided for crosswalk at all intersection legs controlled by stop condition or traffic signal.

Not to Scale

INTERSECTION LANDING REQUIREMENTS

REVISION & DATE

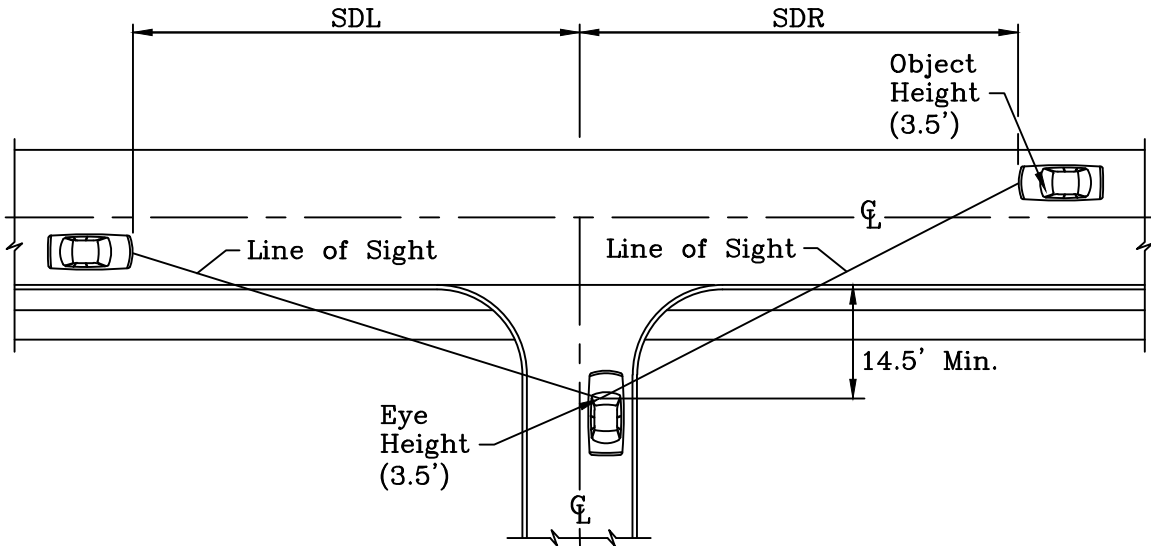
DRAWING NUMBER

TS - 6.0

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



SDR = Sight Distance Right (For a vehicle making a left turn)
 SDL = Sight Distance Left (For a vehicle making a right or left turn)

Height of Eye 3.5'		Height of Object 3.5'					
Design Speed (mph)		20	25	30	35	40	45
SDL=SDR: 2 Lane Major Road	In Feet	225	280	335	390	445	500
SDR: 4 Lane Major Road (Undivided) or 3 Lane		250	315	375	440	500	565
SDL: 4 Lane Major Road (Undivided) or 3 Lane		240	295	355	415	475	530

* If major roadway configuration is not shown here, see Table 9-5 in DCSM Article 9-250.

** Information taken from VDOT Road Design Manual Appendix F

Not to Scale

ENTRANCE SIGHT DISTANCE

REVISION & DATE

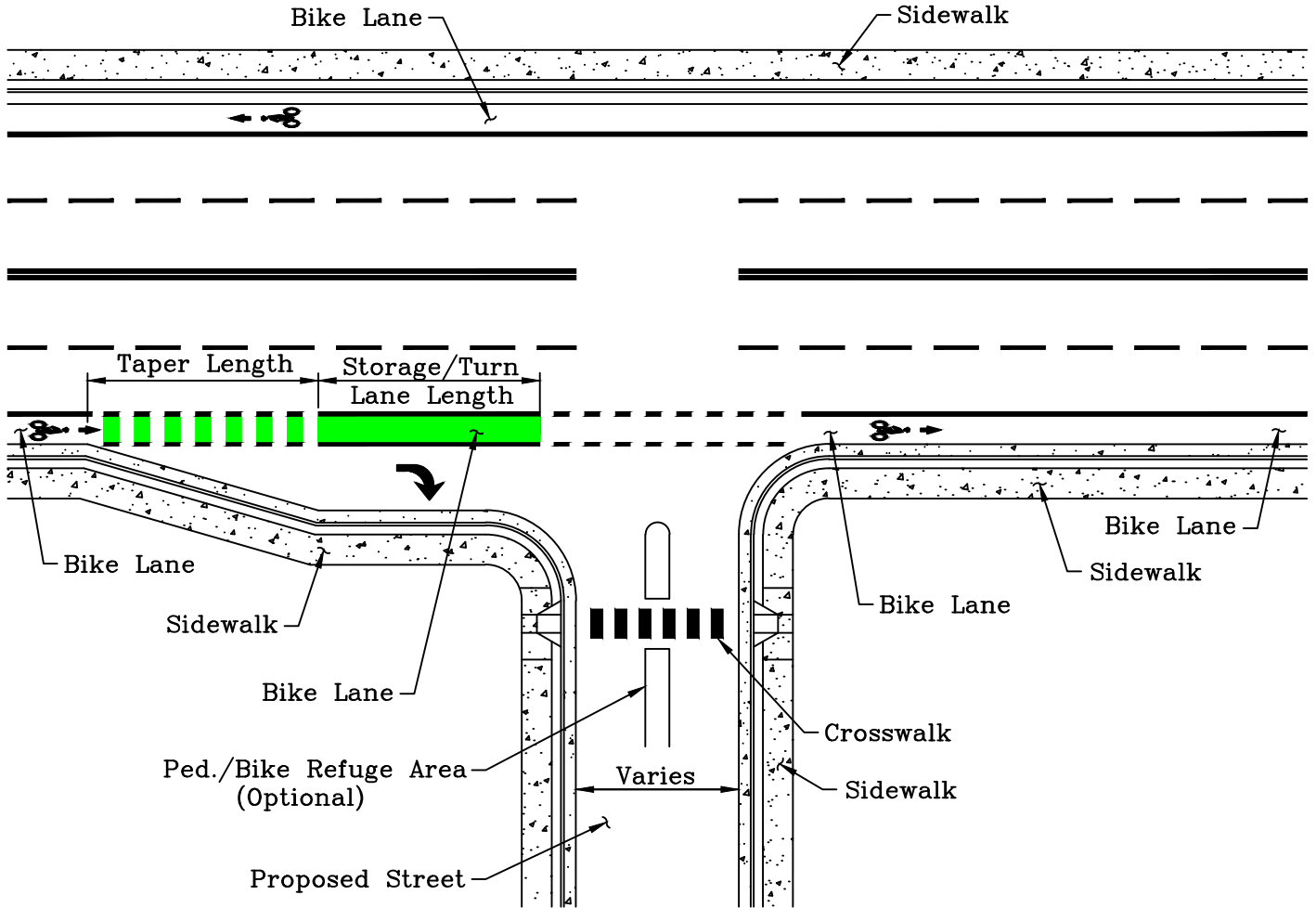
DRAWING NUMBER

TS - 7.0

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



Notes:

1. The length of the storage and taper to be in accordance with DCSM Table 9-6 or as determined by a transportation impact analysis.
2. Pavement transition requires an asphalt overlay from the centerline to eliminate false gutters and to provide a consistent cross slope. See TS-15.0 for pavement restoration requirements.
3. Pavement markings to be VDOT Type B. Markings to be at the expense of the developer.
4. Appropriate curb ramps per TS-11.0 thru 11.2 are required at intersection.
5. Bike lanes shall be installed and marked in accordance with TS-4.6.

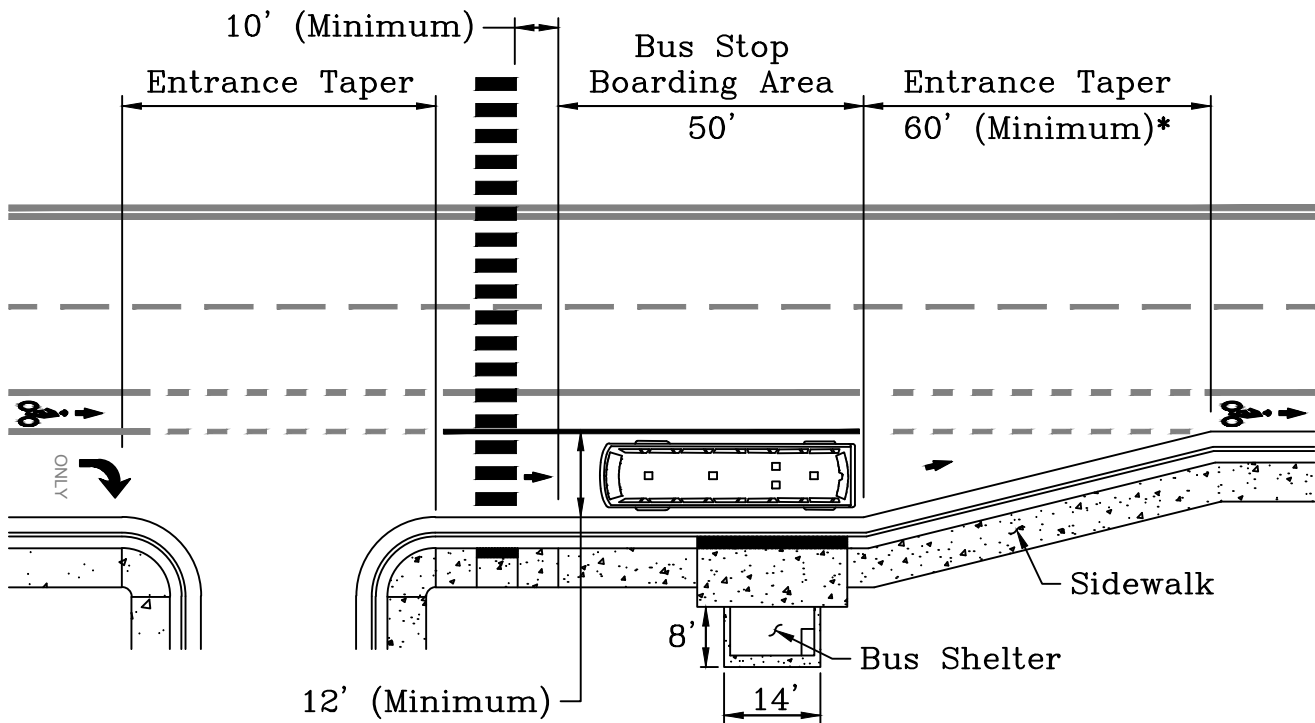
Not to Scale

TYPICAL RIGHT TURN LANE

James H. Kelly
 DIRECTOR
 1/21/22
 DATE

CITY OF MANASSAS, VIRGINIA
 DEPARTMENT OF ENGINEERING

REVISION & DATE
DRAWING NUMBER
TS - 8.0



Note:

1. See VDOT Road Design Manual, Appendix A(1): VDOT Complete Streets: Bicycle and Pedestrian Facility Guidelines, bus stop design and parking guidelines for additional design guidance.

Not to Scale

TYPICAL BUS TURNOUT

REVISION & DATE

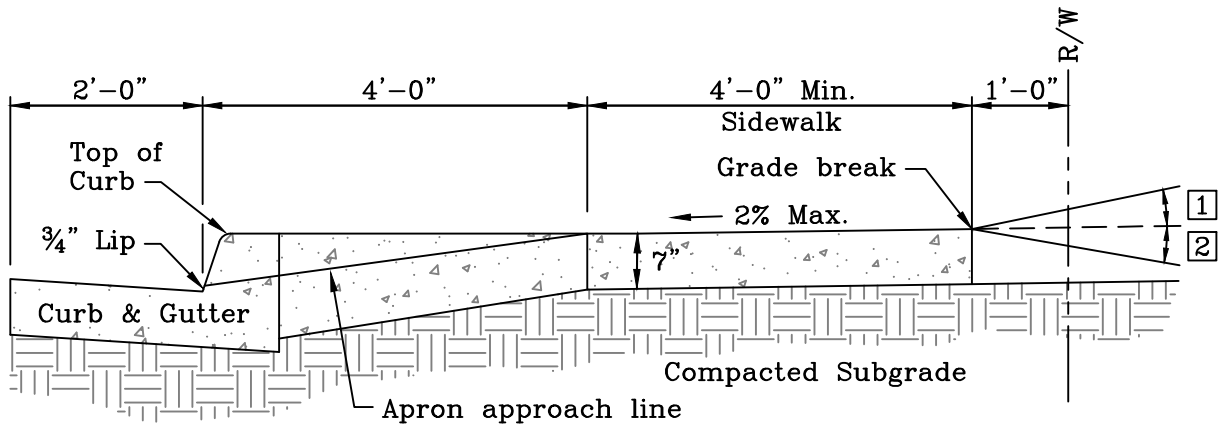
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TS - 9.0

James H. Kelly
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1/21/22
DATE

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DEPARTMENT OF ENGINEERING

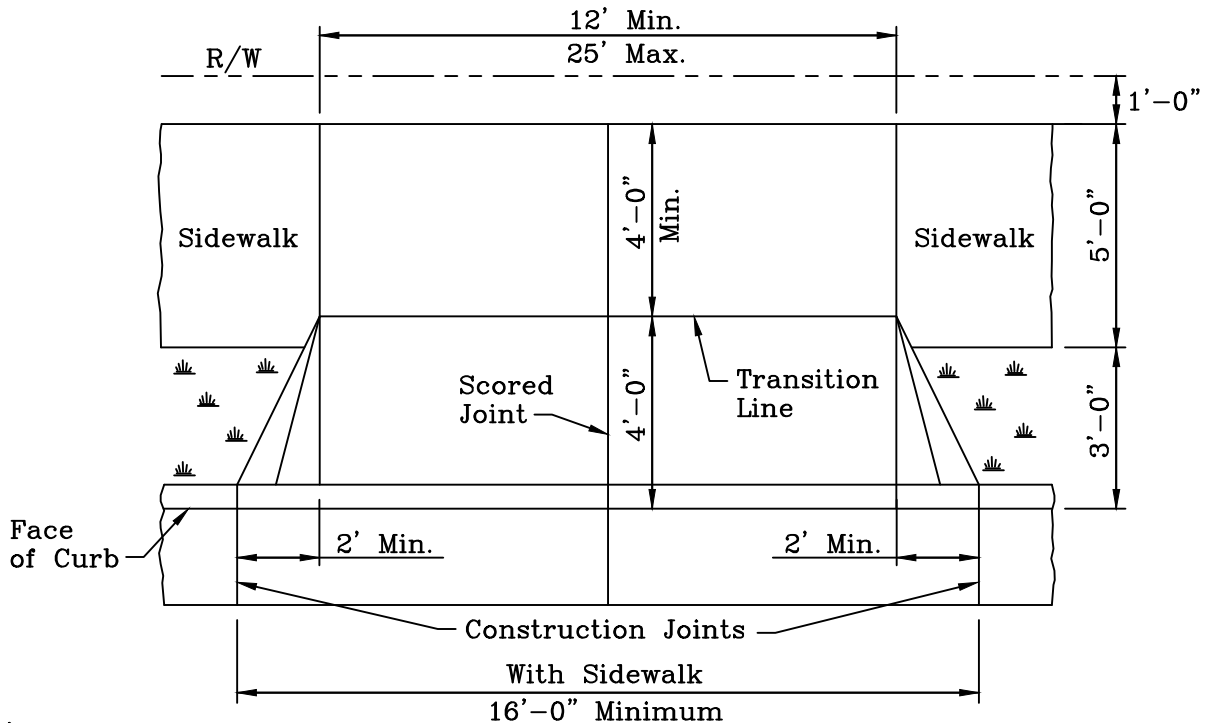


Notes:

- 1 12% Maximum increase in slope at 10' intervals.
- 2 3% Maximum decrease in slope at first grade break, 8% at 10' intervals after.
- 3 Entrance concrete shall be VDOT Class A3 with minimum 7" depth.

Driveway Clearances

Lot grading plans must provide for adequate vehicular sight distance, clearance for driveway approach, departure and breakover transitions. Driveway profiles are required where grades are steeper than 5%.



Note:

Construction methods to comply with the current VDOT specifications.

Not to Scale

**PRIVATE DRIVEWAY ENTRANCE
WITH CURB AND GUTTER**

REVISION & DATE

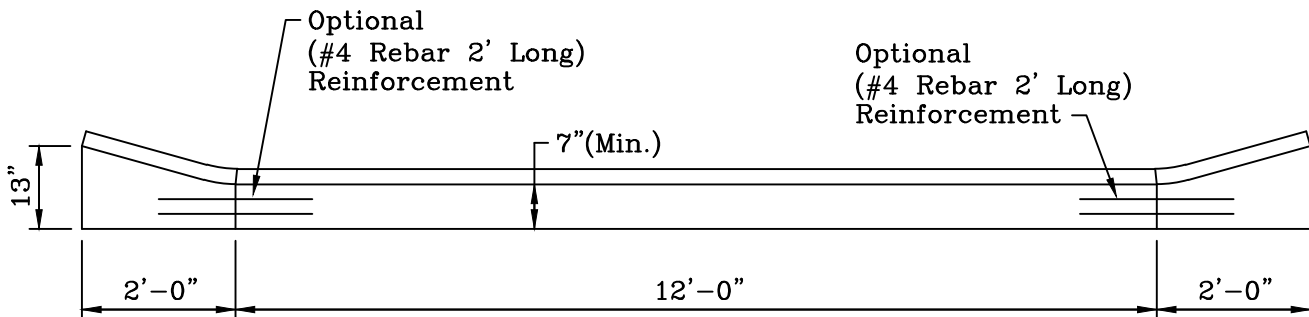
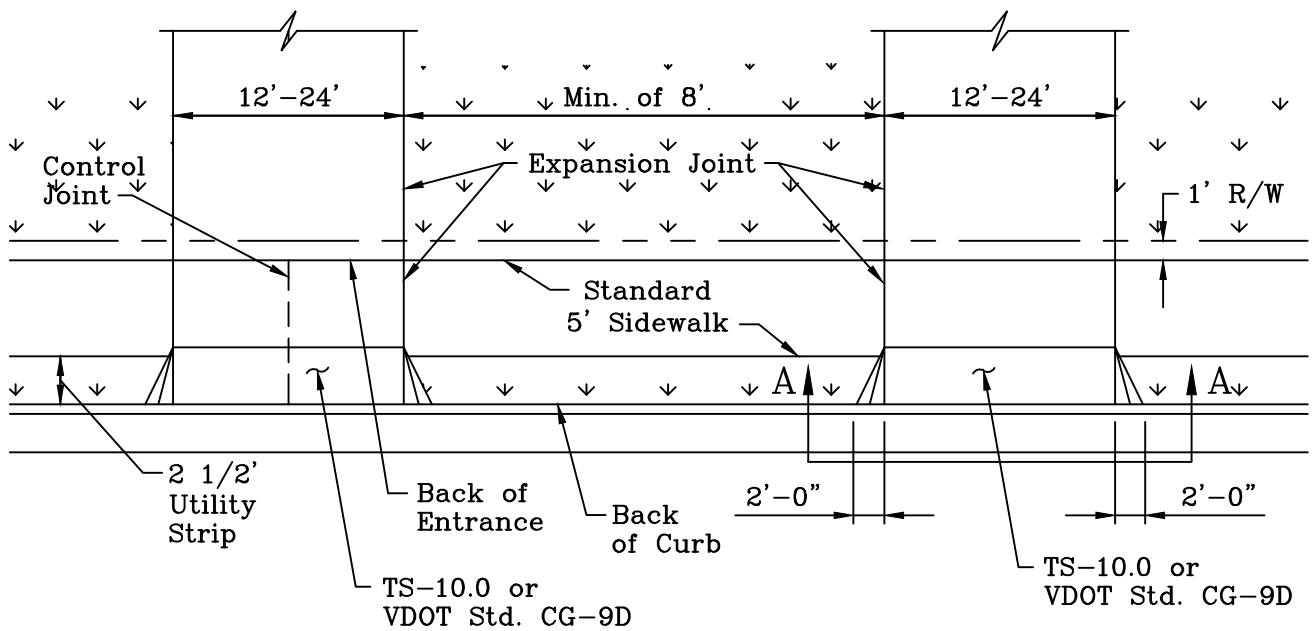
DRAWING NUMBER

Lance K. Kelly
DIRECTOR

2/28/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

TS - 10.0



Section A-A

Note:

All concrete shall be VDOT Class A-3.

Not to Scale

DRIVEWAY APRON CONFIGURATION

REVISION & DATE

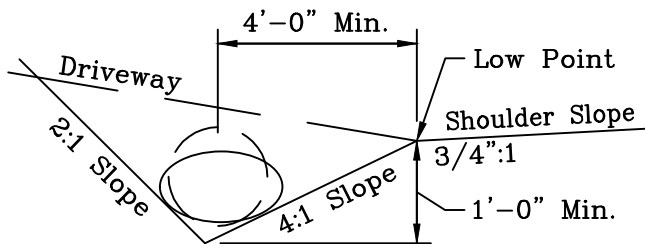
DRAWING NUMBER

TS - 10.1

James H. Kelly
DIRECTOR

1/21/22
DATE

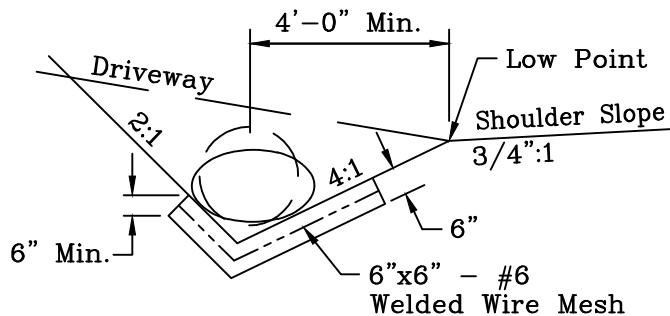
CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



6" Minimum cover over pipe or 4" of asphalt

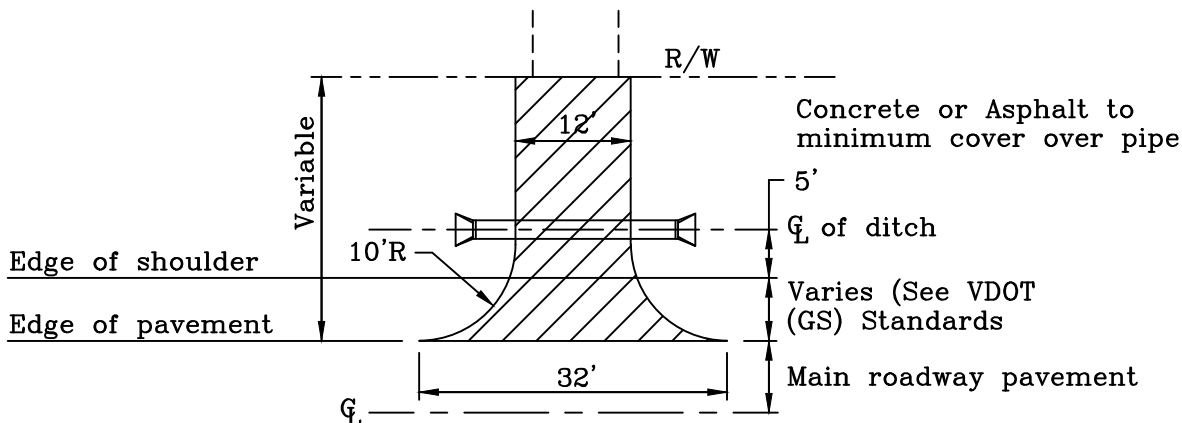
Unpaved Roadside Ditch

Surface to R/W line. Minimum of 1½" of the same type of surfacing as used on the street and 6" of 21A stone base or 5" of concrete.



Paved Roadside Ditch

A paved ditch is required where soil conditions and runoff velocities will cause erosion



Notes:

1. Reinforced concrete pipe with 15" minimum diameter shall be used within ROW. HDPE or polypropylene pipe may be used for culverts outside City maintained ROW. Indicate class and size on plans. All pipe shall be in accordance with DCSM Article 8-300.1.
2. Driveways shall be surfaced from edge of pavement to property line with the same type of surfacing used on the street.
3. All driveway grades shall start at the edge of the shoulder.
4. In cut sections, sides of driveway shall be graded to a maximum 3:1 slope.
5. Minimum length of culverts shall be 20 feet with flared endsections.
6. Ditch line may be moved back to provide required cover. The transition of the ditch line shall be smooth with a minimum length of 10 feet.

Not to Scale

**PRIVATE DRIVEWAY ENTRANCE
WITH NO CURB AND GUTTER**

REVISION & DATE

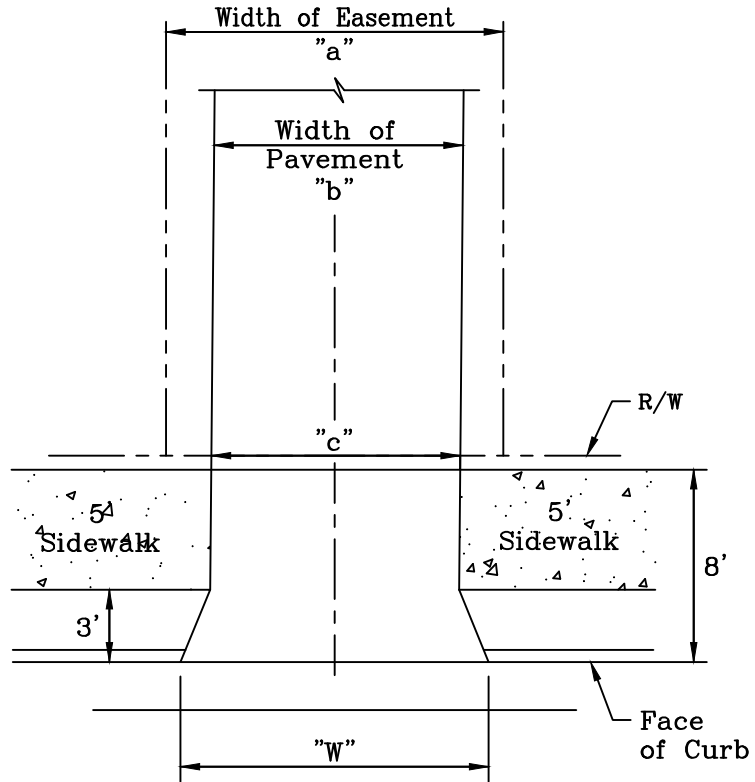
DRAWING NUMBER

TS - 10.2

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



Number of Lots	"a"	"b"	"c"	"W"
1	20'	12'	12'	16'
2-5	40'	18'	24'	28'

Notes:

1. Pavement section shall be 2" of SM-9.5A surface mix asphalt over 6" of compacted aggregate base.
2. 2% landing required for the first (20') twenty feet.
3. Entrance shall be constructed per TS-10.0.

Not to Scale

PIPE STEM DESIGN FOR CURB AND GUTTER SECTIONS

REVISION & DATE

DRAWING NUMBER

TS - 10.3

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

General Notes:

1. All curb ramps shall meet Public Rights-of-Way Accessibility Guidelines (PROWAG).
2. All grade breaks in a curb ramp shall be perpendicular to the path of pedestrian travel along the sidewalk.
3. The detectable warning surface shall conform to VDOT CG-12 standards and be red in color. It shall be installed on a radius to match the curb return as applicable.
4. Ramps are to be located as shown on design plans or as required by these details and VDOT CG-12 standards. Design engineer shall provide spot elevations at all corners and grade breaks of ramp, curb, gutter flow line, and edge of pavement and provide slopes of ramp, landing, and gutter flow line.
5. The maximum ramp slope shall not exceed 12:1 (8.33%). However, the ramp length is limited to 15' as measured from the back of landing, regardless of slope.
6. Gutter pan is to be transitioned to a cross slope of 20:1 through curb ramp
7. Provide dowels every 12" when center of ramp is not poured monolithically with adjacent curb.
8. Ramp width shall always, at a minimum, match the width of adjacent sidewalk.
9. When curb is used to edge ramp, it shall have a minimum radii of 1' and be flared down where possible to prevent damage from snow plowing.
10. Alternative curb ramp designs are permissible with approval from the City.
11. See Article 11-750 for concrete sidewalk and detectable warning surface specifications.

Not to Scale

CURB RAMP GENERAL NOTES

REVISION & DATE

DRAWING NUMBER

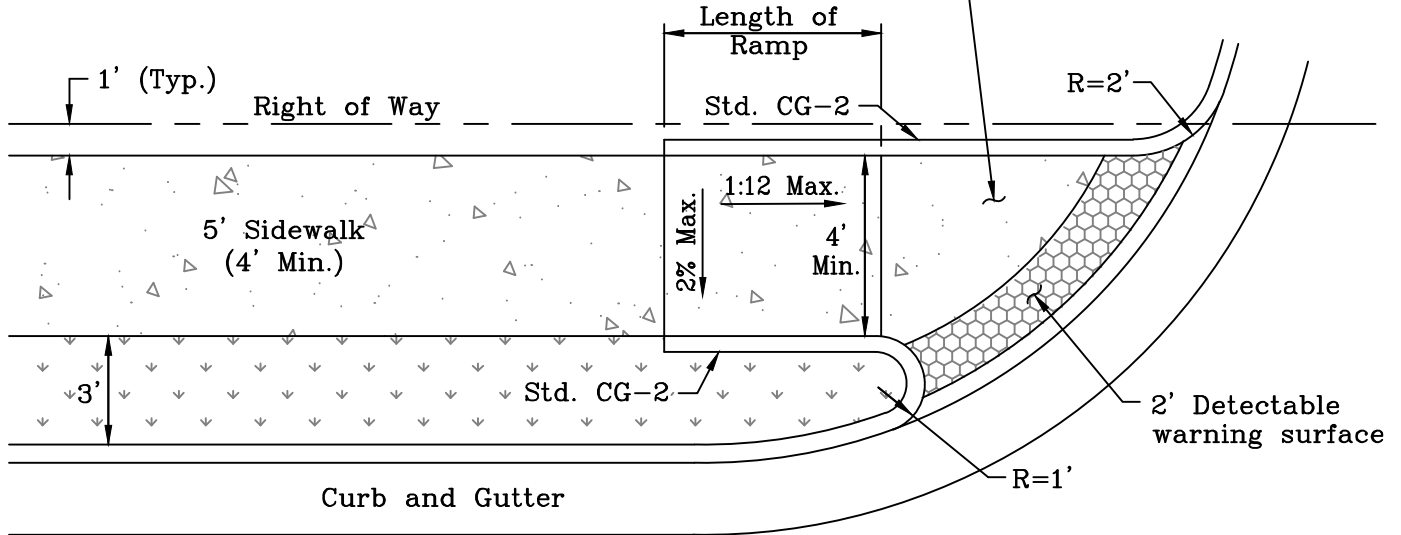
TS - 11.0

DIRECTOR

DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

Provide turning space with minimum dimensions of 4'x4'; 2% Max, 0.5% minimum cross slope for positive drainage



Notes:

1. This ramp design may only be used where the sidewalk does not continue around the curb radius onto the side street.
2. When no utility strip exists, ramp may be placed against back of curb.
3. CG-2 curb may be replaced by concrete wing when right-of-way permits.

Not to Scale

PARALLEL CURB RAMP EXHIBIT 1

REVISION & DATE

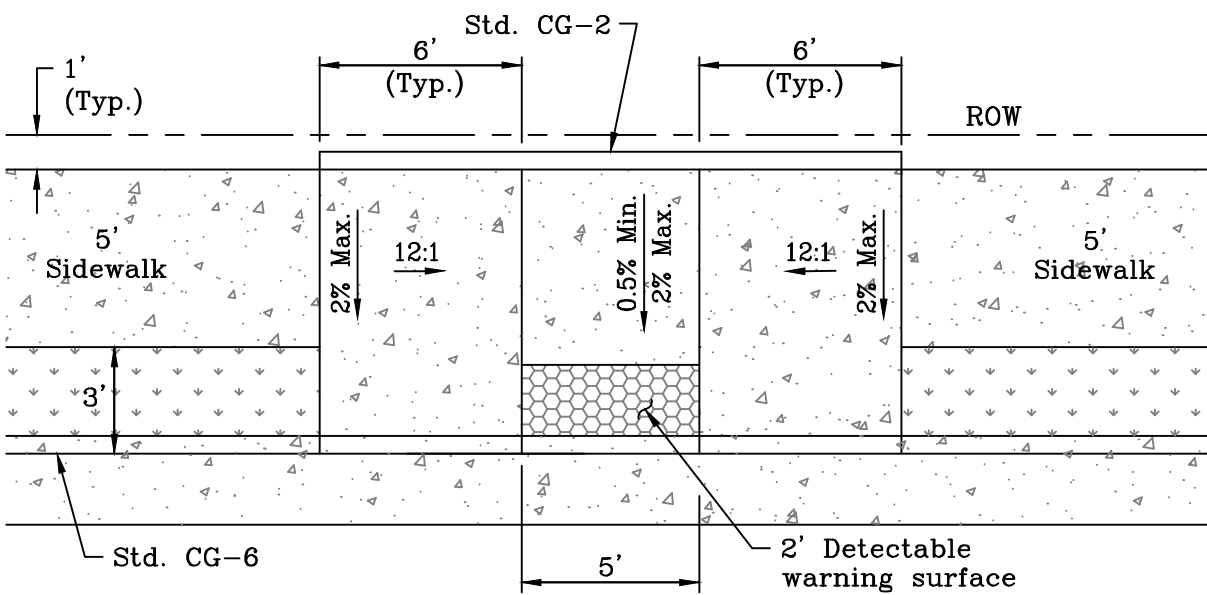
DRAWING NUMBER

TS - 11.1

James H. Kelly
DIRECTOR

1/1/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



Notes:

1. This detail shall be used when back of sidewalk is less than 10' behind curb and perpendicular curb ramp is not feasible.
2. When placed on a radius, ramp slope shall be measured along the shortest length.

Not to Scale

PARALLEL CURB RAMP EXHIBIT 2

REVISION & DATE

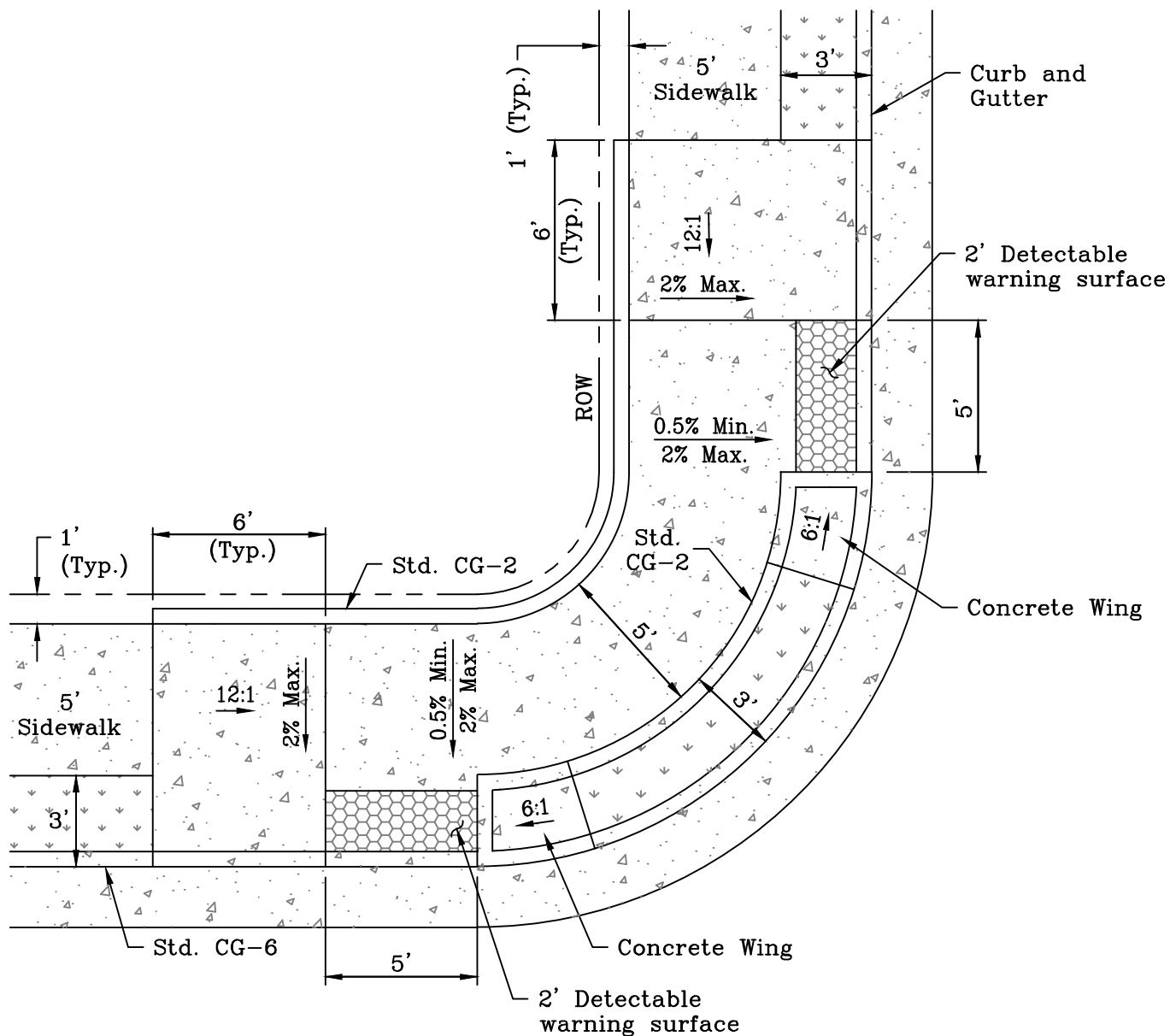
DRAWING NUMBER

TS - 11.2

Laure H. Kelly
DIRECTOR

1/1/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



Notes:

1. This detail shall be used when the sidewalk will continue around the radius of the entrance.
2. When no utility strip exists, ramp may be placed against back of curb.
3. Curb shall be flared down in concrete wing to prevent damage from snowplow strikes.

Not to Scale

PARALLEL CURB RAMP EXHIBIT 3

REVISION & DATE

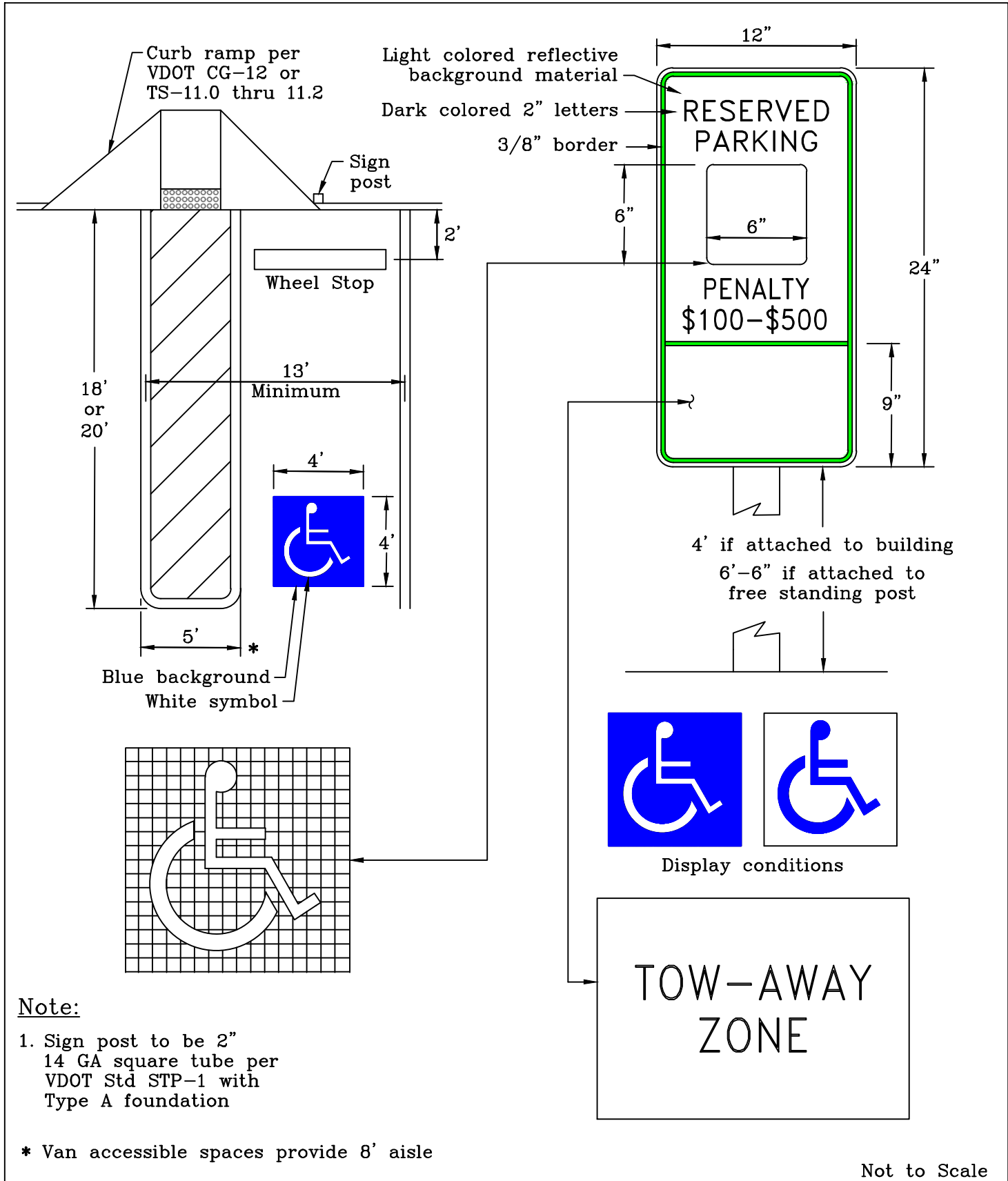
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TS - 11.3

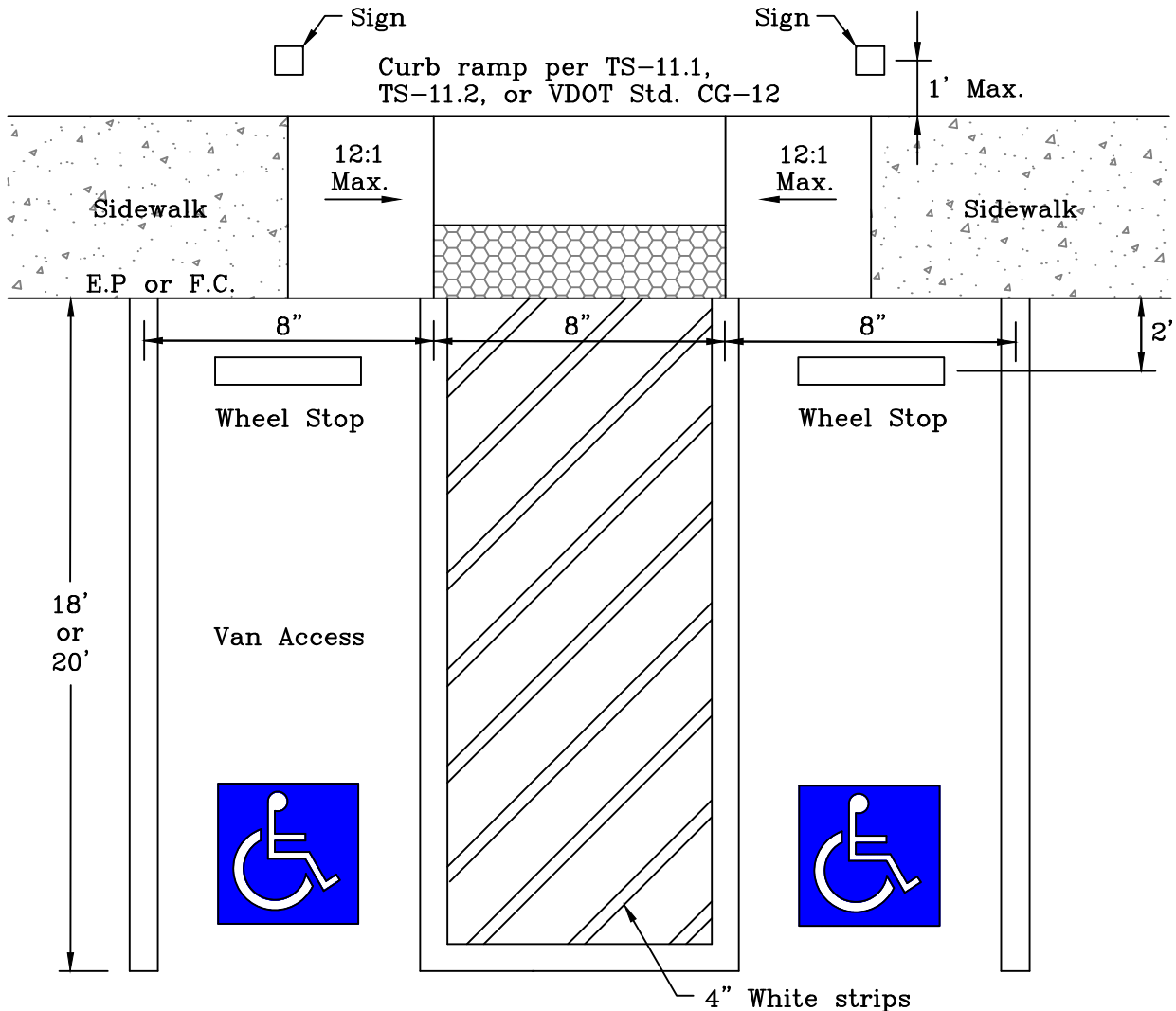
DIRECTOR

DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



<h2>DISABLED PARKING SIGN AND SPACE</h2>			
		REVISION & DATE	
<p><i>James H. Kelly</i> DIRECTOR</p> <p>2/28/22 DATE</p>		CITY OF MANASSAS, VIRGINIA DEPARTMENT OF ENGINEERING	
		DRAWING NUMBER TS - 12.0	



Notes:

1. Access ramp must be located at the center of the adjacent aisle.
2. For signage information see Standard Detail TS-12.0

Not to Scale

**STANDARD FOR TWO ADJACENT DISABLED
PARKING SPACES**

REVISION & DATE

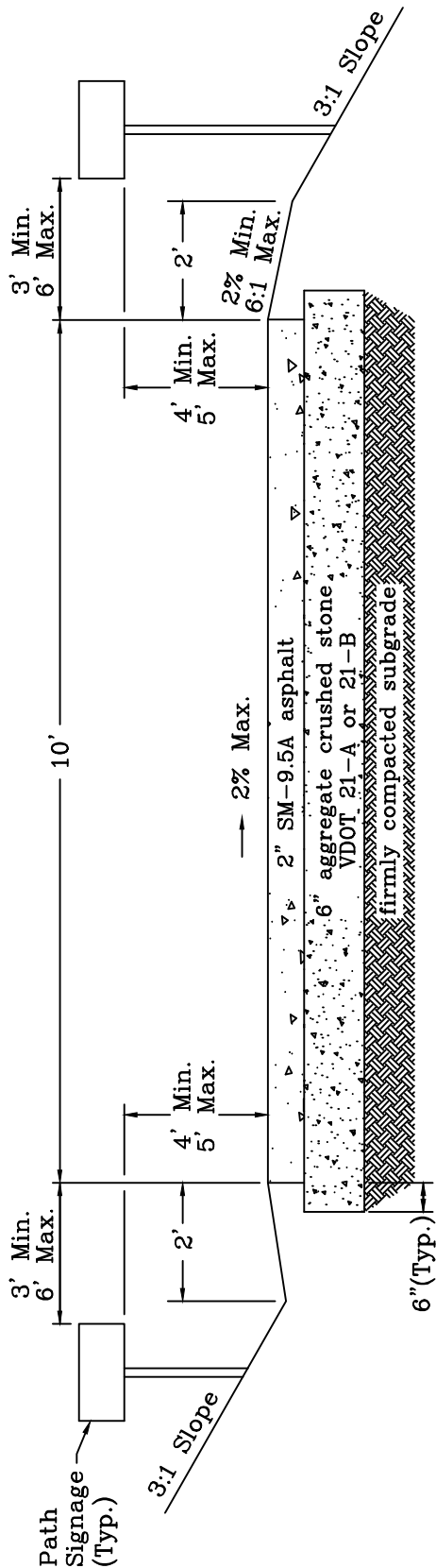
DRAWING NUMBER

TS - 12.1

Lance K. Kelly
DIRECTOR

2/28/22
DATE

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DEPARTMENT OF ENGINEERING



Notes:

- (1) Maximum grades shall be 5% for length up to 300'. Path grades must conform to maximum allowable street grades. Steeper grades will require approval from the Engineering Department.
- (2) Minimum radius of curvature is 36'.
- (3) Minimum horizontal clearance is 3' from the edge of pavement to adjacent obstructions. If 3' cannot be provided, a smooth guardrail can be provided to protect cyclists from construction. Guardrail must be minimum of 42" high and have minimum clearance of 1' from edge of pavement.
- (4) Minimum vertical clearance is 10'.
- (5) Maximum pavement cross slope of 2% required. Pavement surface may be crowned in the middle or sloped to one side. Cross slope may be transitioned to provide 2% superelevation through curves. When this is done, a minimum 25' transition should be provided.
- (6) Horizontal location and profile shall be shown on the development plans, along with typical section.
- (7) Minimum one way trail width is 6'.
- (8) Full-Width parallel curb ramps shall be provided at all Roadway Crossings.
- (9) When constructed adjacent to street, shared-use path slope may equal that of street.

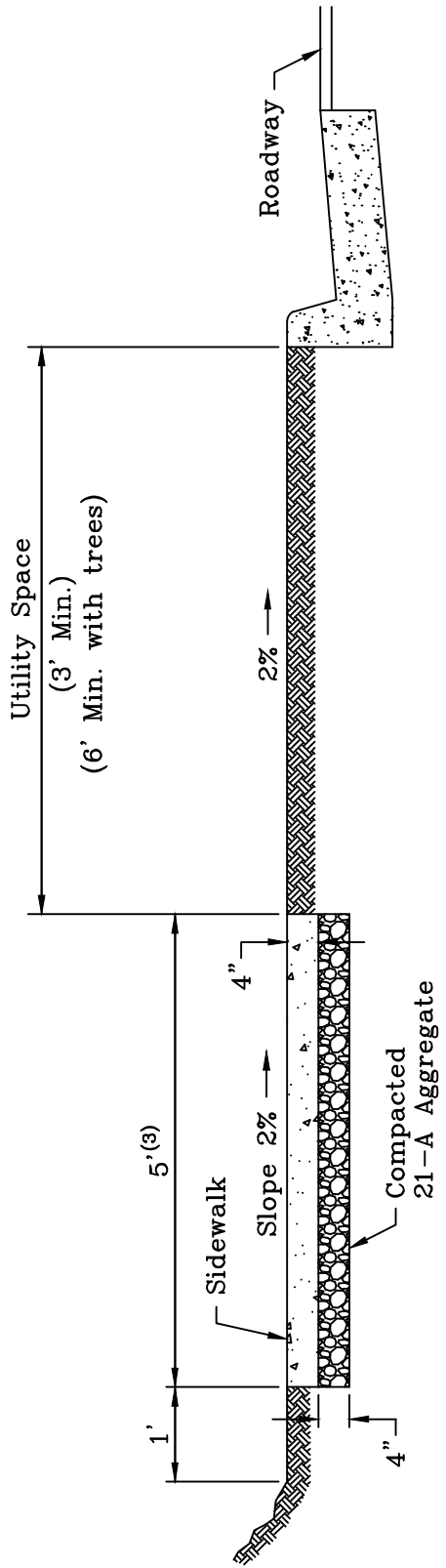
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ASPHALT SHARED-USE PATH

Laura K. Kelly
 DIRECTOR 2/28/22
 DATE

CITY OF MANASSAS, VIRGINIA
 DEPARTMENT OF ENGINEERING

REVISION & DATE	
DRAWING NUMBER	
TS - 13.0	



Notes:

1. Sidewalk to be built with VDOT A-3 concrete. The use of calcium shall not be permitted.
2. Aggregate base shall be compacted according to VDOT specifications.
3. Sidewalk and buffer width shall be determined by street typology for corridor.

Not to Scale

STANDARD SIDEWALK

REVISION & DATE

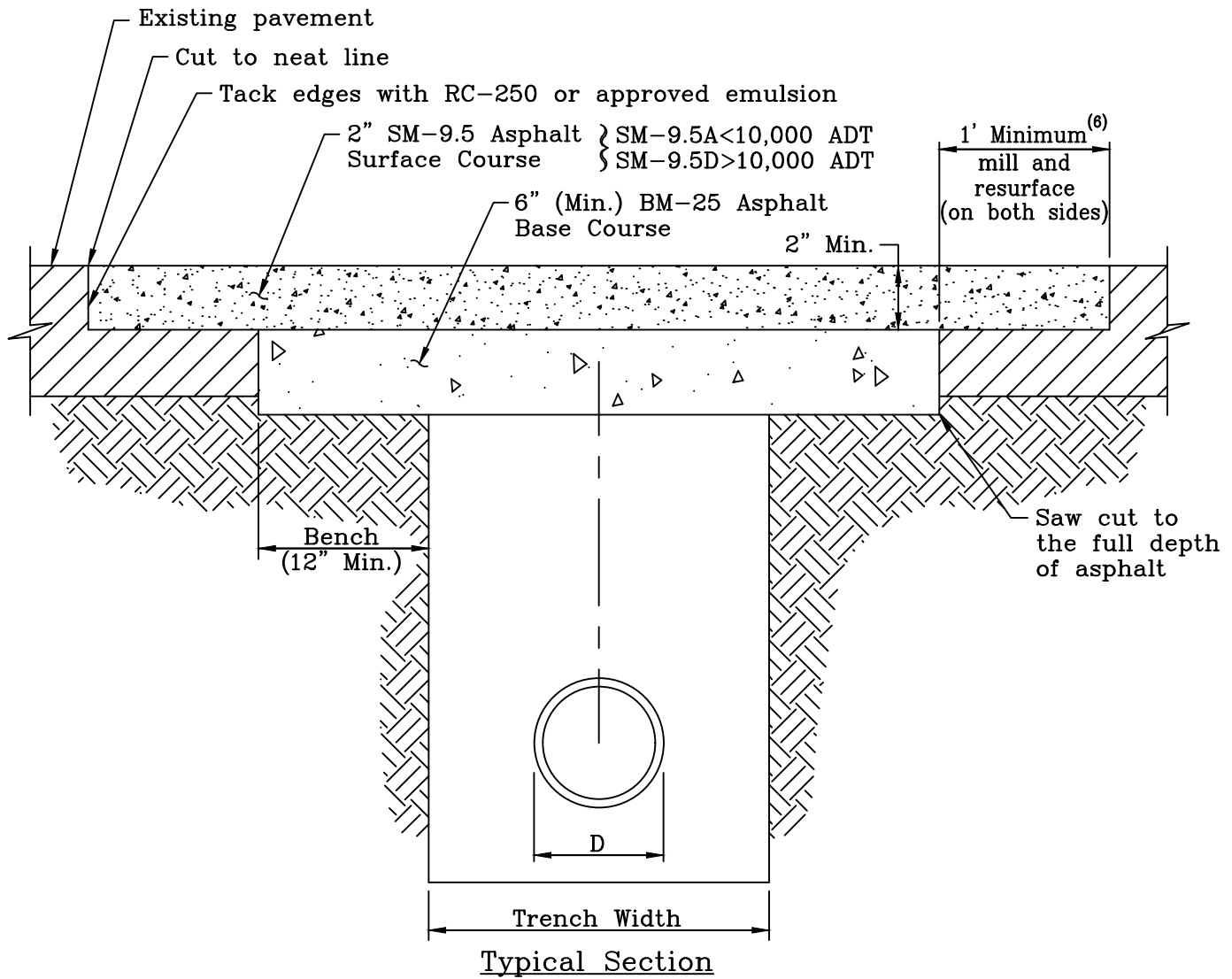
DRAWING NUMBER

TS - 14.0

Laure H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



Notes:

1. When the distance from the edge of existing pavement to the edge of the trench is 3' or less, the pavement shall be removed and replaced back to the edge.
2. When widening or patching a street with asphalt, a neat, clean joint to the depth of the surface course shall be provided between old and new pavement.
3. For trench and bedding details, see Drawings W-1.0, SS-4.0, and SS-4.1.
4. Use of alternate backfill (select material) in lieu of No. 21A aggregate base material may be considered by the inspector in the field.
5. Steel plates will not be permitted in the public street unless specifically approved by the Director of Public Works.
6. Minimum patch area of 12'x50' shall be milled and overlaid. If curb is installed or utility trench is parallel to roadway, patch should extend from edge of pavement to centerline of road for the full length of trench. If utility trench is perpendicular to roadway, patch should extend from edge of pavement to centerline of road or edge of pavement to edge of pavement for a minimum length of 50'.

Not to Scale

**PAVEMENT RESTORATION FOR
PAVEMENT OPEN CUTS**

REVISION & DATE

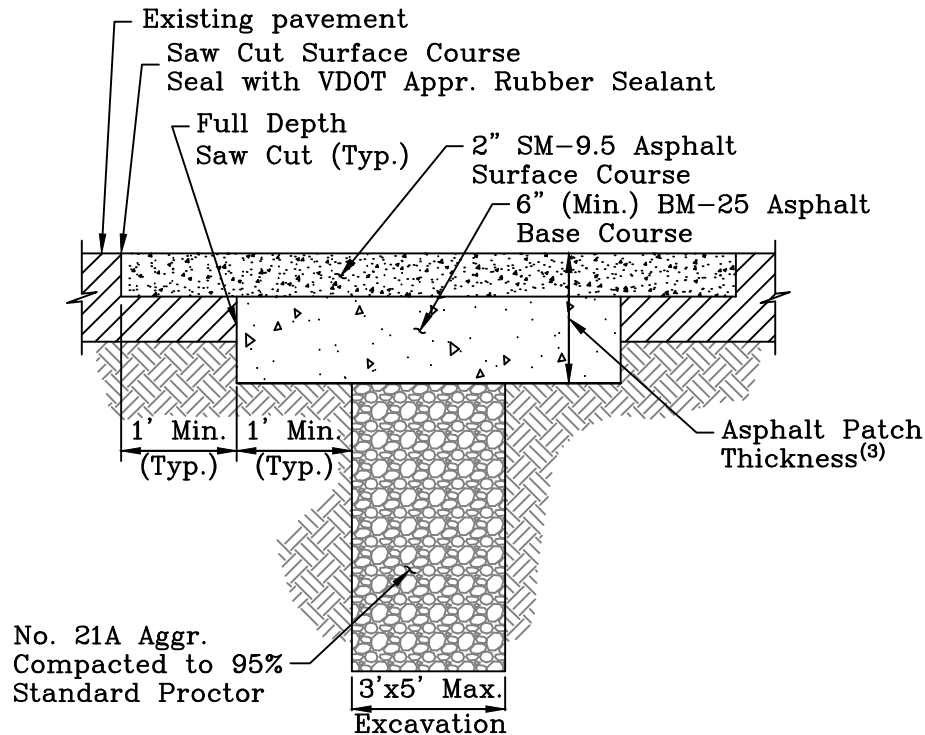
DRAWING NUMBER

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

TS - 15.0



Utility Repair
Typical Section

Notes:

1. Maximum Utility Repair Excavation dimensions are 3'x5'. If excavation is larger than 3'x5', pavement restoration shall be based on TS-15.0. All Utility Repair Surface Course patches shall be a minimum of 5'x5'.
2. Minor Utility Repair Typical Section shall be standard for small pavement cuts, less than 3'x5'.
3. Asphalt patch shall have min. total thickness of 1.5x thickness of existing asphalt pavement. For example, if existing pavement thickness is 6", total patch thickness shall be 9". Surface and base courses shall meet minimum thickness shown above.
4. When the distance from the edge of existing pavement to the edge of the trench is 3' or less, the pavement shall be removed and replaced to the edge of pavement.
5. When widening or patching a street with asphalt, a neat, clean joint to the depth of the surface course shall be provided between old and new pavement.
6. Surface Course shall be VDOT SM-9.5A for streets with ADT < 10,000 VPD and VDOT SM-9.5D for streets with ADT > 10,000 VPD. Edges shall be tacked with RC-250 or other approved emulsion.
7. Use of alternate backfill (select material) in lieu of No. 21A aggregate base material may be considered by the inspector in the field.
8. City inspector has the authority to modify restoration requirements based on site conditions.
9. The surface of the completed repair shall have no indentation's, pockets or recesses that may trap and hold water, or have false gutters, bumps or high places, and the completed surface shall match the grade of the existing pavement surface.
10. All excavations considered destructive or disturbing to the surrounding pavement, such as the use of a backhoe to break the pavement, will be subject to TS-15.0, no matter the reason for the excavation.

Not to Scale

**PAVEMENT RESTORATION FOR
MINOR UTILITY REPAIRS**

REVISION & DATE

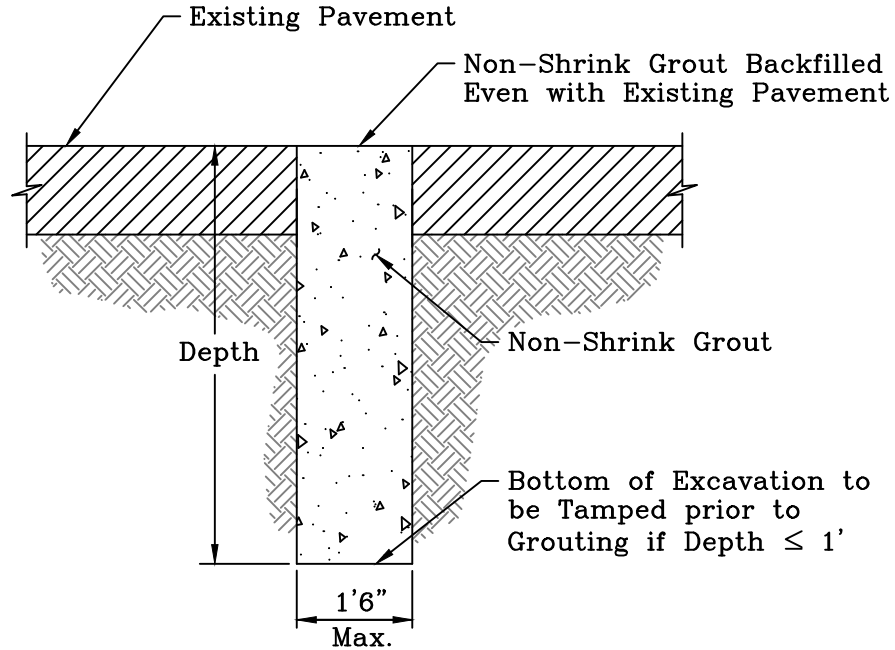
DRAWING NUMBER

Laura K. Kelly
DIRECTOR

2/28/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

TS - 15.1



Test Hole Restoration
Typical Section

Notes:

1. Test pits shall be considered excavations into traffic-bearing pavement with largest dimension $\leq 1'6''$. Larger excavations shall refer to TS-15.0 or TS-15.1.
2. Non-shrink grout shall have minimum compressive strength of 5,000 PSI at 28 days. Grout shall be compatible with street surface texture and seal pavement to prevent intrusion of moisture into subgrade.
3. Depending on location and at direction of City of Manassas, alternate restoration for test pits shall be to backfill with High Strength Fast Fix Flowable Fill (4F) Mix designed to set in 20 minutes or less, to 2" below surface. Following initial set, SM-9.5 asphalt or approved alternative shall be placed above 4F Mix to final grade.
4. The surface of the completed repair shall have no indentations, pockets or recesses that may trap and hold water, or have false gutters, bumps or high places, and the completed surface shall match the grade of the existing pavement surface.
5. All excavations considered destructive or disturbing to the surrounding pavement such as the use of a backhoe to break the pavement will be subject to TS-15.0, no matter the reason for the excavation.

Not to Scale

**PAVEMENT RESTORATION FOR
TEST PITS**

REVISION & DATE

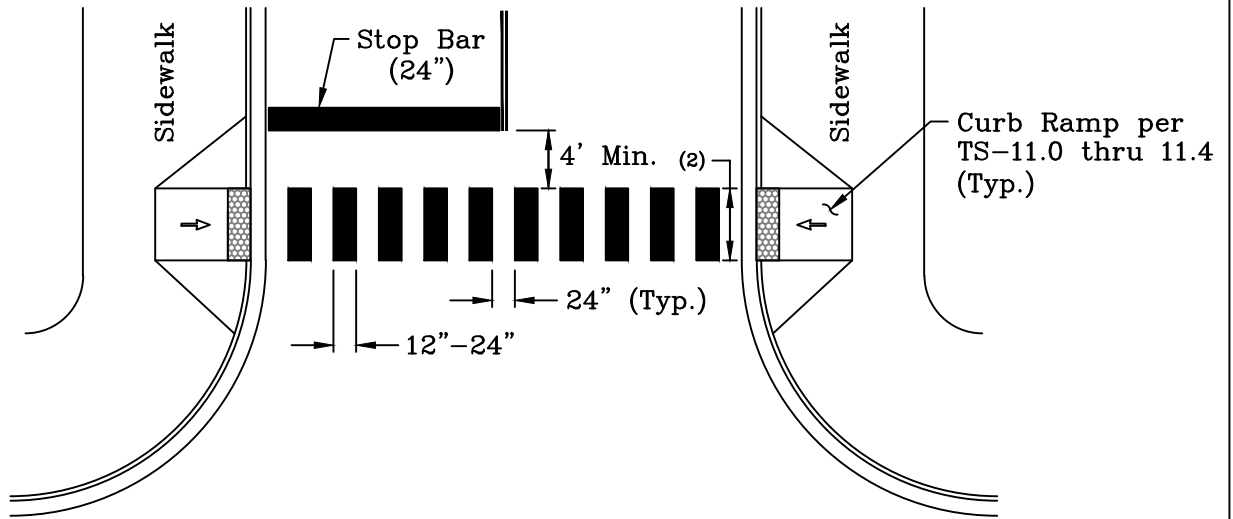
DRAWING NUMBER

James K. Kelly
DIRECTOR

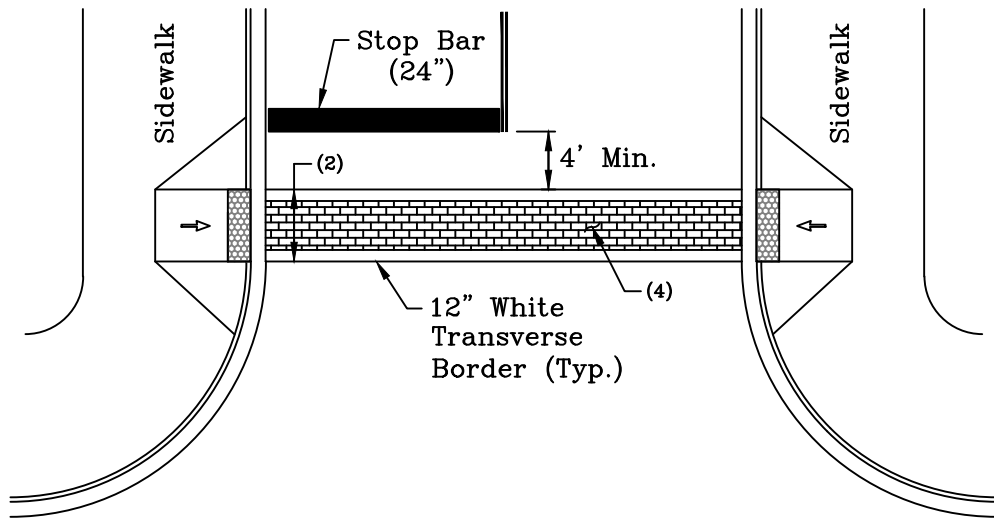
2/28/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

TS - 15.2



High Visibility Crosswalk



Stamped Thermoplastic Crosswalk

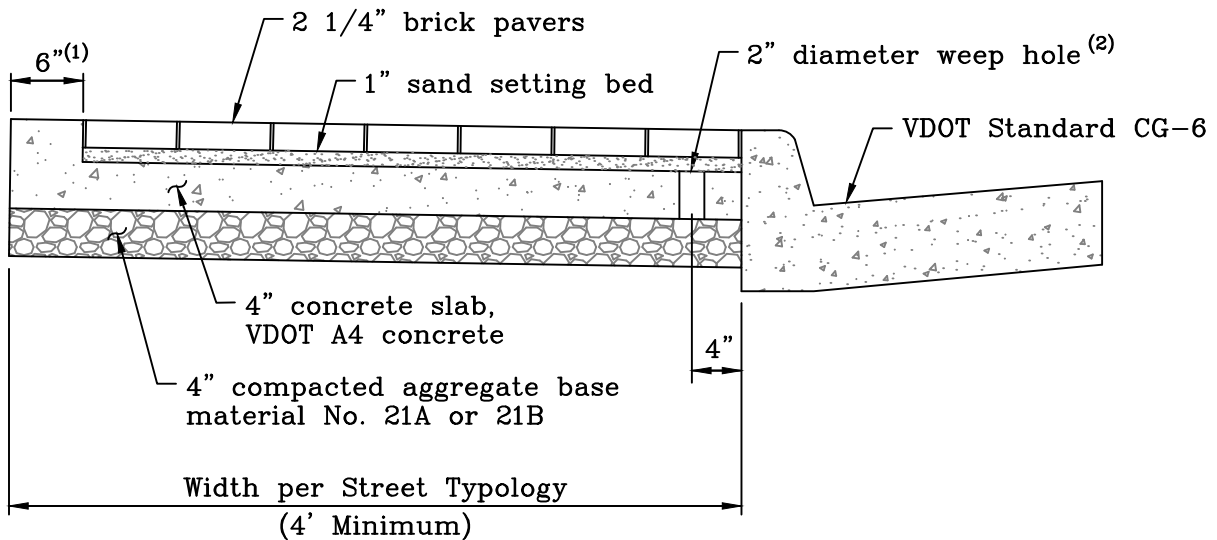
Notes:

1. Crosswalk markings are to be white VDOT Type B thermoplastic.
2. Minimum crosswalk width is 8' or the width of the sidewalk or trail facility approaching the crosswalk, whichever is greater.
3. Longitudinal markings should be arranged to avoid wheel paths, if practical.
4. Body of crosswalk is to be imprinted aggregate reinforced preformed thermoplastic pavement marking and must be skid resistant. Pattern is to be offset brick, perpendicular to road, and color should be colonial brick.
5. Crosswalks should cross street at as near to right angles as possible. Additionally an effort should be made to reduce pedestrian crossing distances by reducing curb return radii, installing pedestrian refuge islands, and extending curb lines.

Not to Scale

CROSSWALK DETAILS

<p><i>Lance K. Kelly</i> DIRECTOR</p> <p>2/28/22 DATE</p>		<p>CITY OF MANASSAS, VIRGINIA DEPARTMENT OF ENGINEERING</p>			
				<p>REVISION & DATE</p> <p>DRAWING NUMBER</p> <p>TS - 16.0</p>	



Notes:

1. 6" backing of concrete cradle may be replaced by 6"x1/4" steel edging with 1'-6" steel stakes 3'-0" on center with approval of Engineering Director.
2. Weep holes are to be placed 25' O.C. in lowest 100' section of profile and filled with pea gravel.
3. Curb ramps in brick paver sidewalk are to be concrete, per TS-11.0 thru 11.2. Detectable warning surface should be red or near to "brick" in color.

Not to Scale

BRICK PAVER SIDEWALK

REVISION & DATE

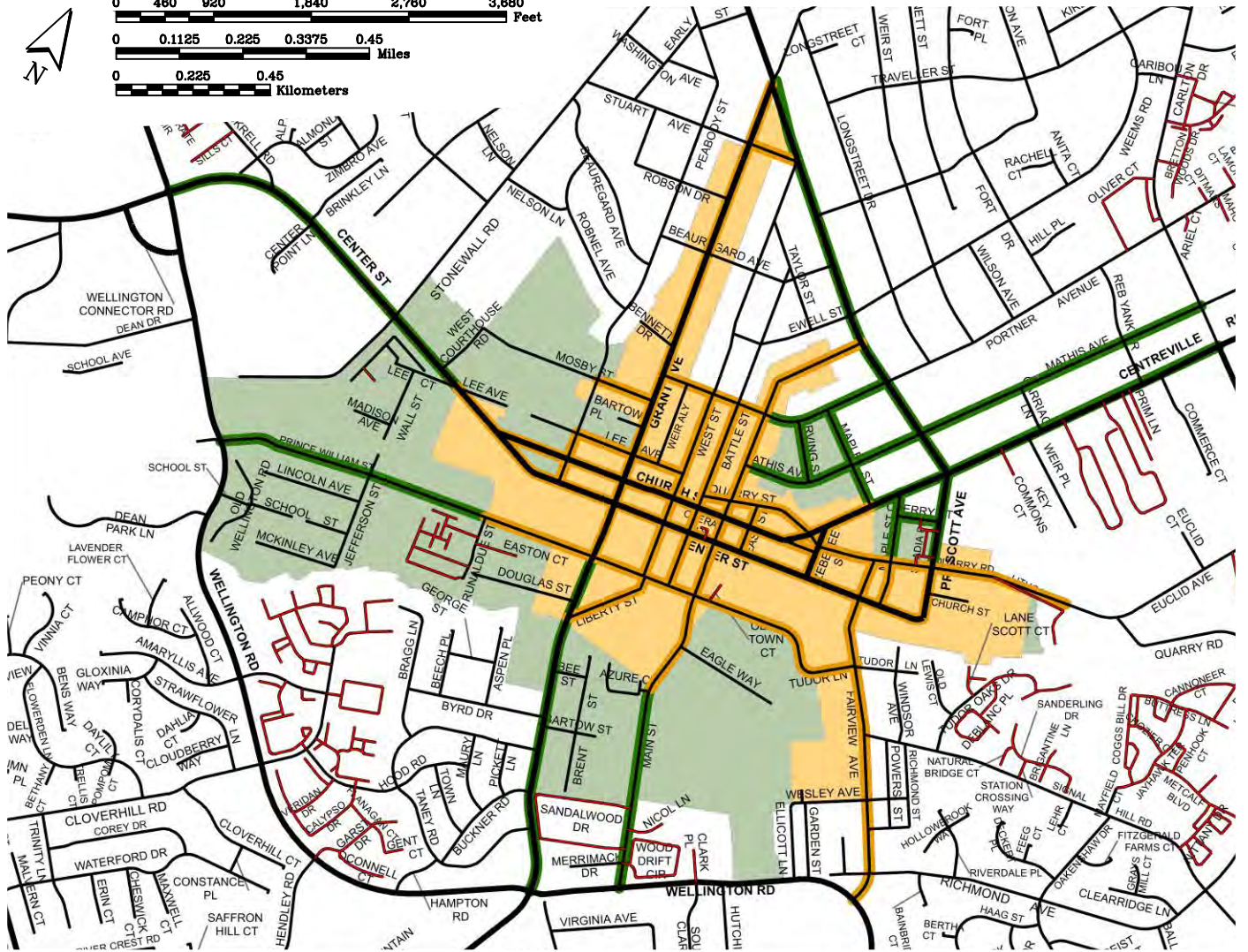
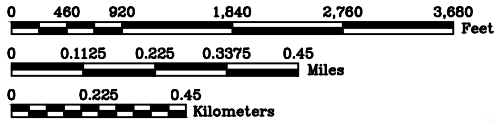
DRAWING NUMBER

TS - 17.0

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



Lighting Type

- Historic District: TS-20.3
- Downtown: TS-20.6

Planning District

- Historic District
- Downtown

Roads

- Major Road
- Minor Road
- Private Street

Historic District Lighting Type: TS-20.3



Downtown Lighting Type: TS-20.6



STREET LIGHT PLAN MANASSAS DOWNTOWN & MAJOR GATEWAYS

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING

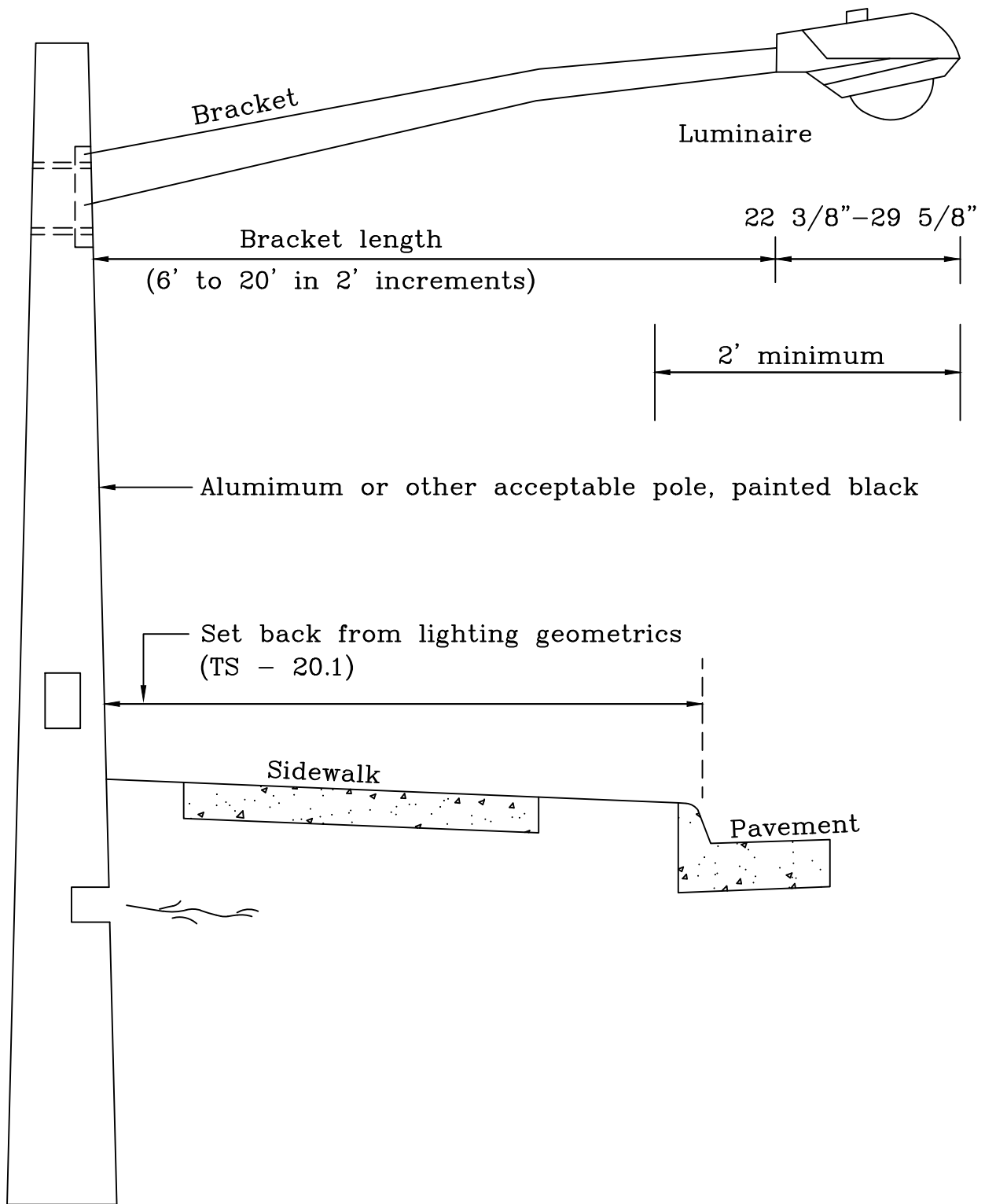
REVISION & DATE

DRAWING NUMBER

TS - 20.0

DIRECTOR

DATE



Not to Scale

STANDARD ROADWAY FIXTURE

REVISION & DATE	

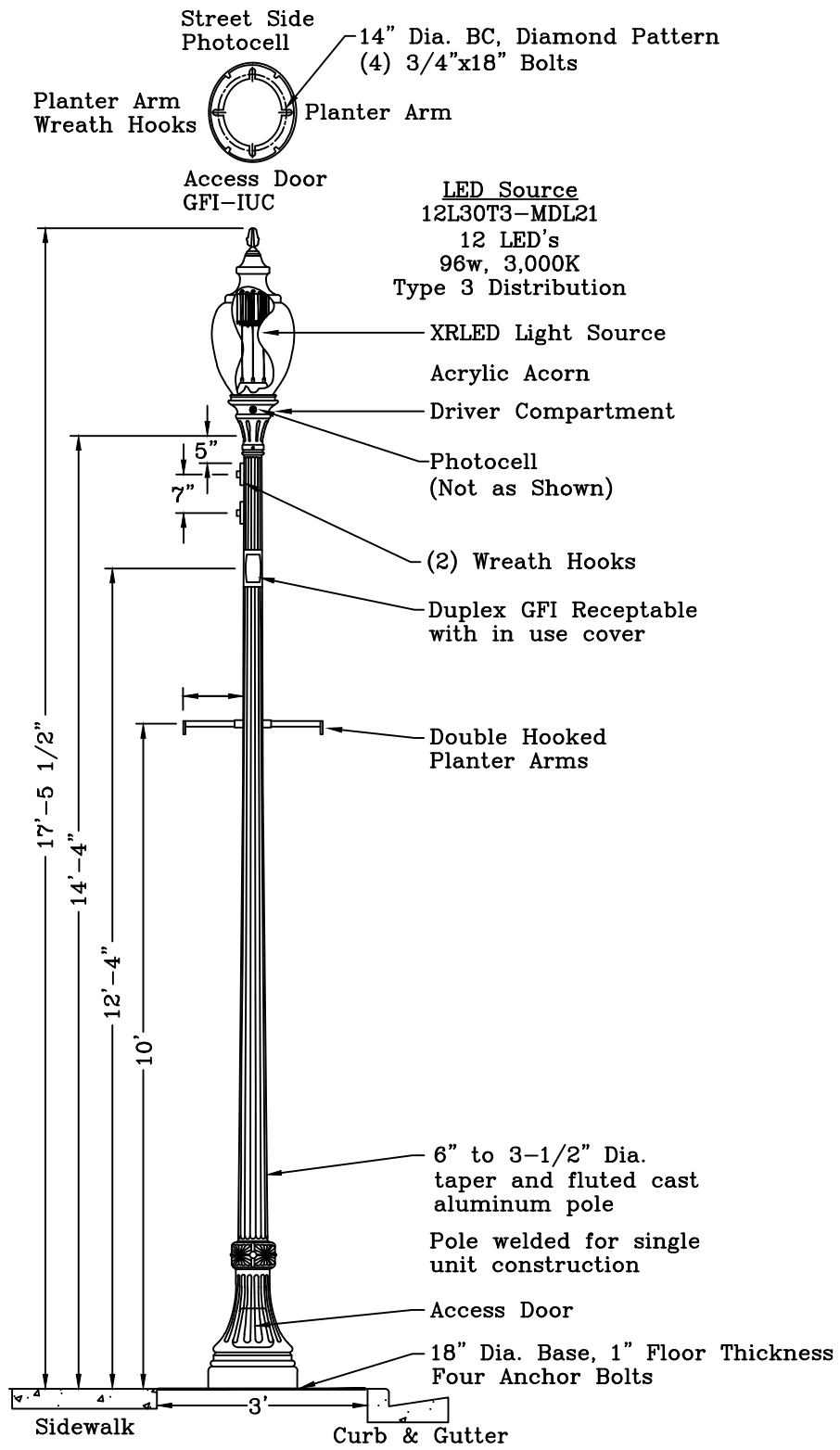
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TS - 20.2

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



Not to Scale

ACORN LIGHTING FIXTURE (HISTORIC DISTRICT)

REVISION & DATE

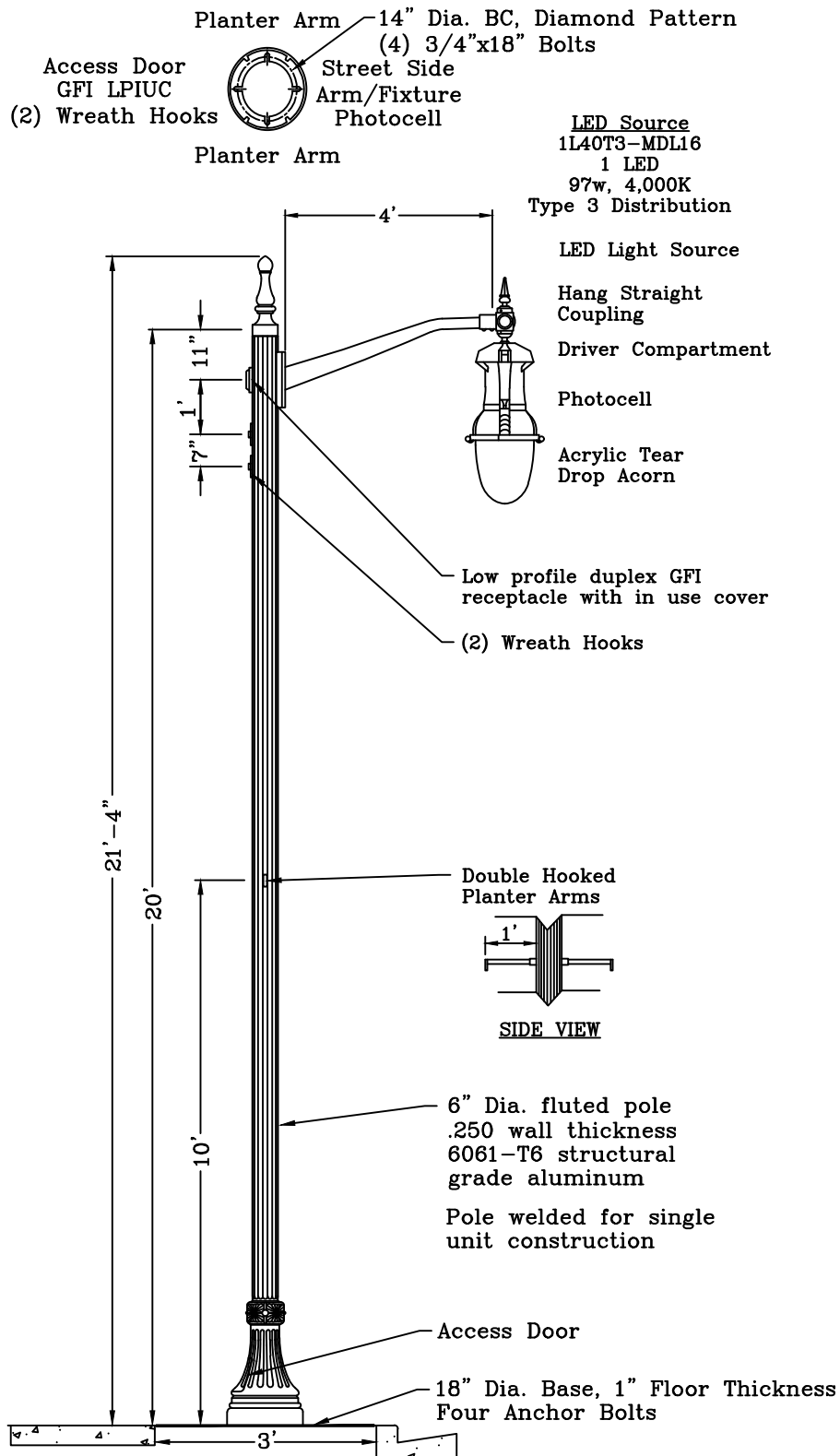
DRAWING NUMBER

TS - 20.3

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING



Not to Scale

ACORN LIGHTING FIXTURE (DOWNTOWN)

REVISION & DATE

DRAWING NUMBER

TS - 20.6

James H. Kelly
DIRECTOR

1/21/22
DATE

CITY OF MANASSAS, VIRGINIA
DEPARTMENT OF ENGINEERING