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PREFACE

P.1 PURPOSE

The purpose of the Delaware Department of Transportation's (DelDOT's) *Development Coordination Manual* is to set forth the requirements of DelDOT for the planning, design, construction, and acceptance of subdivision streets and access to State-maintained roadways.

Land development and subdivisions have a direct impact on the transportation system. These impacts have to be assessed to ensure that the system is safe and efficient. The safety and efficiency of a roadway depends to a large extent upon the amount and character of interruption in the movement of traffic. Vehicles entering, leaving, or crossing the roadway cause most interruptions in traffic.

Property owners fronting State-maintained roadways have certain rights of access consistent with the zoning and use of their property (except along controlled or limited access highways). In addition, the traveling public who use those State-maintained roadways have certain rights to freedom of movement and safety.

The standards and regulations presented herein are intended to regulate and control the location, design, and operation of access points and transportation facilities maintained by DelDOT. All commercial entrances, residential entrances and State-maintained subdivision streets are to be designed and constructed in accordance with these requirements. These requirements apply to the following:

- A. New subdivisions and land developments.
- B. Lot line adjustments.
- C. Changed or expanded subdivisions and land developments.
- D. Any new access onto a State-maintained roadway.
- E. Modifications to an existing access.
- F. Assessment of the impacts of traffic.
- G. Off-site improvements.
- H. Transportation Improvement Districts (TIDs).

P.2 LEGAL AUTHORITY

The authority for DelDOT's *Development Coordination Manual* is set forth in the Delaware Code. Applicable sections include, but are not limited to:

- A. Title 17 – Highways, Chapter 1, Subchapter III, Section 131 - General Jurisdiction
- B. Title 17 – Highways, Chapter 1, Subchapter III, Section 141 - Regulation of Traffic; Exceptions
- C. Title 17 – Highways, Chapter 1, Subchapter III, Section 146 – Access to State-Maintained Highways
- D. Title 17 – Highways, Chapter 5, Section 508 – Dedication of New Roads for State Maintenance; Approval Required; Security
- E. Title 21 – Motor Vehicles, Chapter 41 – Rules of The Road
- F. Title 29 – State Government, Chapter 61, Section 6103 – Deposit of State Money
- G. Title 9 – Counties

P.3 ACCESS APPLICATION AND APPROVAL PROCESS

This section outlines the procedures to be followed by developers and/or property owners in order to obtain approval of a commercial access or a State-maintained subdivision street. A full review of the plans includes, at minimum, comments from various groups within DelDOT including, but not limited to, the Traffic Section, the respective Maintenance District, Bicycle and Pedestrian Group, and Development Coordination before the letter is issued. Other Sections from DelDOT shall be included as needed. Access applications, construction permits and procedures for residential units are outlined in Chapter 7. The estimated review time by DelDOT is based on a complete submission. Incomplete submissions will be returned to the developer for resubmission. This process is illustrated in Figures P3-a and P3-b.

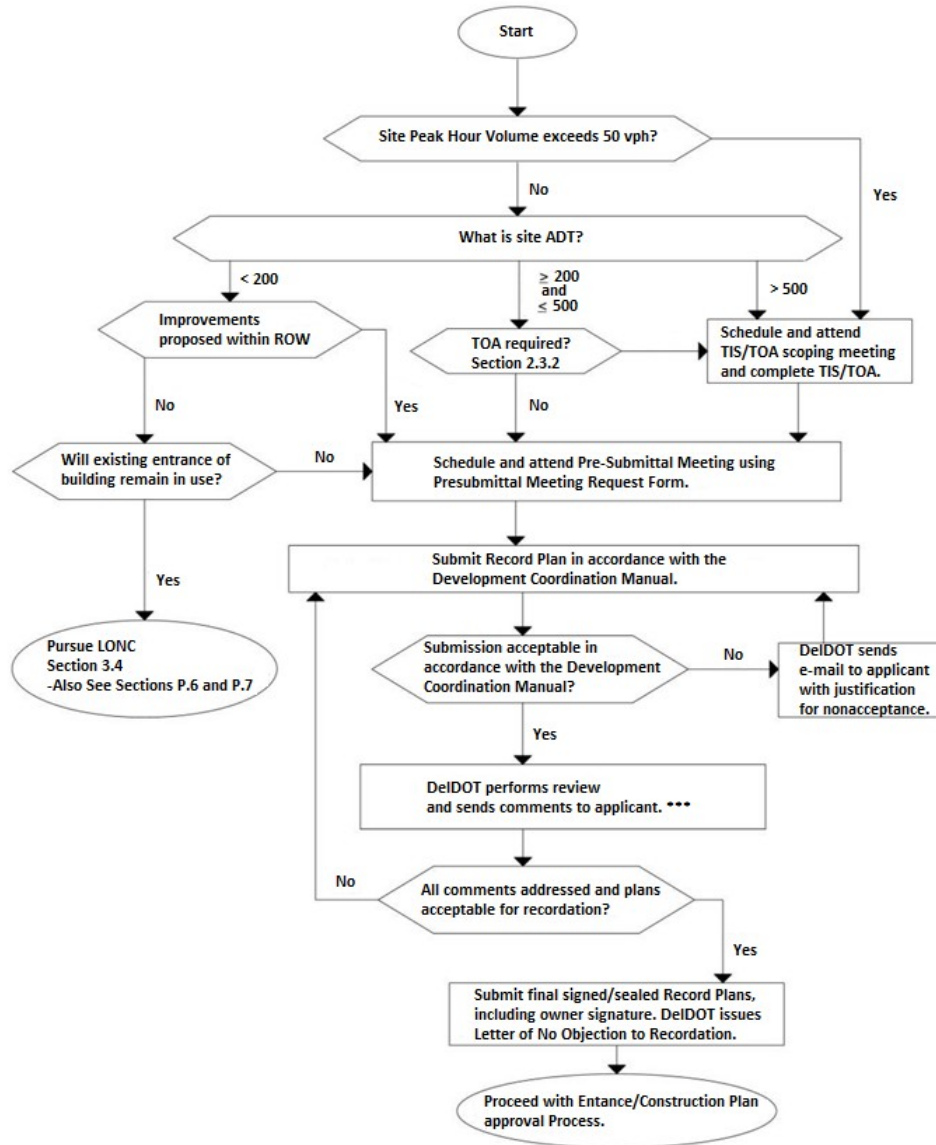
DelDOT reviews the Record Plan in accordance with this *Development Coordination Manual*. The initial stage fee as outlined herein shall be paid prior to review of the Record Plan. When the plan meets the requirements of DelDOT, a letter of “No Objection to Recordation” (LONOR) shall be issued to the governing land use agency.

DelDOT will also review construction plans for subdivision streets and/or entrances in accordance with this *Development Coordination Manual*. Construction/ Entrance plans must be signed and sealed by a land surveyor or professional engineer registered in Delaware as outlined in Chapter 4.

The construction stage fee must be paid prior to review of the Entrance/Construction plan. Upon review and approval of the Entrance/Construction plan, DelDOT will issue an approval letter.

Any site being considered by DelDOT for access to a State-maintained roadway shall be evaluated to determine if it will also impact any other DelDOT programs. These programs include, but are not limited to, the Corridor Capacity Preservation Program (CCPP), the Capital Transportation Program (CTP), the Transportation Alternatives (TA) Program, the Highway Safety Improvement Program (HSIP), and the Pavement Rehabilitation Program. If a plan would have an effect on any of these programs, DelDOT will require additional reviews and additional requirements to be met.

Figure P3-a Record Plan Review Process for Letter of No Objection to Recordation (LONOR)

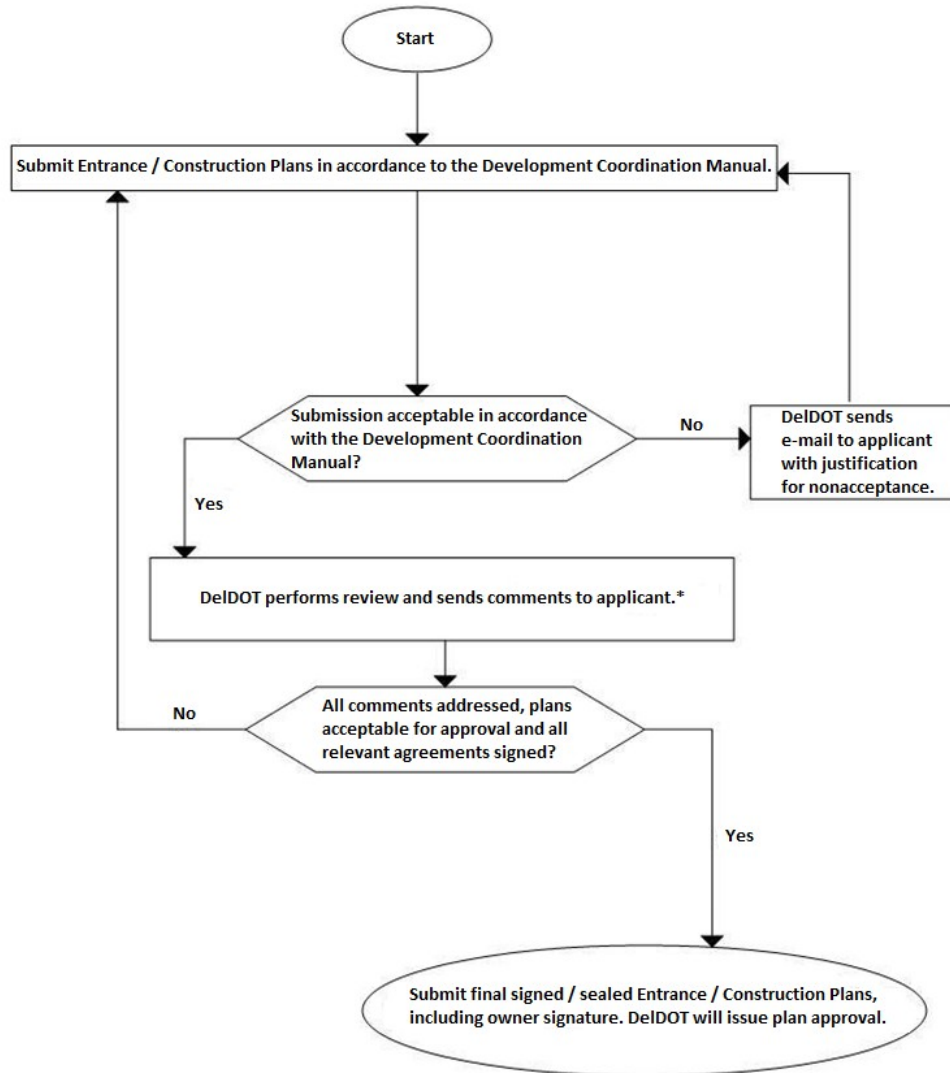


*This chart is intended only as a general guide for issuance of a Letter of No Objection to Recordation (LONOR). The review process may be modified depending on the specific nature of the project submitted.

**Construction / Entrance Plans will generally be reviewed concurrently with Record Plan submission. However, Construction / Entrance Plans will not be reviewed for final approval prior to issuance of LONOR.

***Plan review schedule available at www.deldot.gov/Business/subdivisions

Figure P3-b Review Process for Entrance/Construction Plan Approval



*Plan review schedule available at www.deldot.gov/Business/subdivisions

P.4 ACCESS APPLICATION AND APPROVAL PROCESS -APPLICATION

The application with supporting documents and plans shall be submitted to the Subdivision Engineer for review and approval. All documents shall be submitted electronically. Plans shall be in pdf format.

All fees shall be submitted in accordance with Section P.5.

P.4.1 Approval of Application

The approval of the application shall be subject to the following conditions:

- A. The application shall be properly and clearly completed in accordance with DelDOT. Applications found to be unsatisfactory shall be returned for correction and resubmission.
- B. The location, design, and construction of driveways and entrances shall meet the geometric requirements of DelDOT. Necessary provisions for drainage, pavement types and thicknesses, sight distance and other construction details shall conform to the current requirements of DelDOT.
- C. When access facilities cannot be provided in accordance with DelDOT's requirements due to limitations particular to the site or where the applicant refuses to comply, the access application for the intended use may be denied.

P.4.2 Access Application and Approval Process - Review of the Plan

DelDOT's Record Plan requirements are outlined in Chapter 3. DelDOT must review and approve the Record Plan and issue the letter of "No Objection to Recordation" prior to granting entrance approval. Submission of a Record Plan and issuance of a letter of "No Objection to Recordation" is required independent of the local land use agency's requirements, except in such individual cases where DelDOT determines that the proposal does not create any transportation impacts and does not trigger entrance/access improvements that would require further review by the Department. DelDOT's letter of "No Objection to Recordation" shall be valid for a period of 5 years, and DelDOT's Entrance/Construction Plan approval shall be valid for a period of 3 years. Once the approval expires, plans will need to be resubmitted for review with the proper fee. No extensions of the approval will be granted.

The requirements for the subdivision street and entrance plan are outlined in Chapter 4. DelDOT (e.g. Traffic, Maintenance Section, Bicycle and Pedestrian Group, and Development Coordination at minimum) will review and comment on the preliminary entrance plan prior to issuance of a letter of "No Objection to Recordation" to the local land use agency.

Once DelDOT has issued its letter of "No Objection to Recordation" for the Record Plan, the final entrance plan can be submitted along with the construction stage fee. DelDOT will then distribute the final plan to the support sections (e.g., Traffic Section, Pavement Management Section) for review and comment.

Upon addressing all comments provided by DelDOT, the entrance/construction plans can be submitted. When DelDOT notifies the applicant that the final entrance/construction plans meet the requirements outlined in this *Development Coordination Manual*, the applicant shall submit signed and sealed plans for final approval by DelDOT.

P.4.3 Access Application and Approval Process – Entrance/Construction Plan Approval

Following DelDOT's approval of the entrance/construction plan, the applicant's engineer shall receive the approved plan and approval letter from the Subdivision Engineer. The approved entrance/construction plan shall be valid for a period of time in accordance with Section P.4.2.

P.4.4 Access Application and Approval Process - Construction

The applicant shall submit construction documents (application, security, plans) for the work as outlined in Chapter 6. After review and approval of the security and the required construction documents, the Public Works Engineer shall issue the Notice to Proceed (NTP). No work shall be undertaken until the NTP is issued by DelDOT. For commercial sites, a Commercial Entrance Construction Permit will be issued in addition to NTP.

Upon completion of the construction to the satisfaction of DelDOT, in accordance with the terms of the Permit, DelDOT shall release the security and issue an entrance permit or begin the acceptance procedure when appropriate.

P.5 REVIEW FEES

Review fees (as applicable) will be assessed for all development proposals at the following stages:

- Traffic Impact Study Review (*pending review and approval of the General Assembly*).
- The Initial Stage.
- The Construction Stage.

The following applies to determining and collecting fees to cover the costs of administering the review of a typical land development proposal.

- A. Traffic Impact Study Review: A Fee of \$5000 is collected when an applicant requests confirmation of the Scope of Work for the study.
- B. Initial Stage: Fees are collected at the time of submission of the record plan for DelDOT's review. The fee associated with this stage offsets a portion of the costs associated with plan review activities before final plan approval by the local land use agency. An "Initial Stage Fee Calculation Form", available online at <http://devcoord.deldot.gov> > Forms, or digital equivalent must be submitted with the fee, which is calculated as follows:
 1. Minor residential subdivision: \$100*.
 2. Major State-maintained, residential subdivision: \$400 plus \$10 per lot.
 3. Non-residential development: \$500 plus \$20 per lot or \$500 plus \$20 per 1,000 square feet of gross floor area, whichever is greater.
 4. Mixed use development: calculated for each land use separately and added together.
 5. Residential, Non-State maintained development: \$520

*If all or a portion of the property subject to this fee is re-subdivided within 10 years of the payment of this fee, that subdivision shall be treated for fee purposes as if planned for 5 lots or more.

C. Construction Stage: Fees are collected at the time of submission of the construction plans for DelDOT's review. The fee associated with this review offsets a portion of the costs incurred by DelDOT for the technical review of subdivision street plans and highway access plans. A "Construction Stage Fee Calculation Form" available online at <http://devcoord.deldot.gov> > Forms, or digital equivalent must be submitted with the fee, which is calculated as follows:

1. Minor residential subdivision: No fee required.
2. Major residential, State-maintained subdivision: 150% of the Initial Stage Fee for a major residential subdivision as identified in Item 2 of the form.
3. Non-residential development: 150% of the Initial Stage Fee for non-residential development as identified in Item 2 of the form.
4. Residential, non-State maintained: 150% of the Initial Stage Fee for non-residential development as identified in Item 2 of the form.

All fees shall be paid using the methods described in the Fee Forms (available at <http://devcoord.deldot.gov>) and in accordance with DelDOT's current policies. Payments submitted to DelDOT must be accompanied by the appropriate fee calculation form (or the digital equivalent), which can be found on DelDOT's website under Development Coordination at the following link: <http://devcoord.deldot.gov>.

If DelDOT determines that a check or money order is the necessary form of payment for a particular project related fee, the check or money order shall be payable to the Delaware Department of Transportation. Checks or money orders that are requested by DelDOT must be dated within 90 days of the date submitted, must include the applicable fee forms and shall be mailed to DelDOT at the following address:

Attention: Controller
DelDOT
P.O. Box 778
Dover, DE 19903

A copy of the payment and appropriate fee form or digital equivalent shall be uploaded to DelDOT's Subdivision Section along with the submittal package using the methods described in the Fee Forms (available at <http://devcoord.deldot.gov>) and in accordance with DelDOT's current policies.

P.5.1 Review Fees - Fee Administration

DelDOT will not accept a record plan or construction plan submission without a respective fee calculation form and payment. Should any payment received be deemed insufficient, one of the following two options is available at the discretion of DelDOT:

- A. Funds will be accepted and deposited in accordance with DelDOT's current policies. DelDOT shall notify the applicant that no action on the submission will take place until the balance of required fees is received.
- B. All documents subject to review by the Subdivision Engineer will be returned to the applicant or processed as a declined submission. Documents can be resubmitted with correct fees at a later date.

DelDOT's Cash Receipt Policy must be followed in order to be in compliance with Title 29 of the Delaware Code, Section 6103 (all receipts in excess of \$100 per day must be deposited daily). The date that payments are received in the Division's financial management unit in DelDOT's administration building in Dover will be used and recorded for this purpose.

P.6 PROCESS FOR LETTER OF NO CONTENTION REQUESTS

This section defines the process as it relates to existing commercial uses/projects that are seeking an approval to use an existing entrance facility. Project eligibility is at DelDOT's discretion. Waivers for any of the conditions set forth in section P.6.1 shall require written approval from the Assistant Director of Planning. If a parcel is covered under an existing Transpiration Improvement District (TID), the site is still governed under that TID Agreement.

P.6.1 Eligibility of a Project

- A. The existing business must not have been vacant for three or more years.
- B. The project scope can include site alterations, building expansions, construction or placement of new structures. If a site is to be leveled, i.e. all existing trip generating buildings are demolished; the project shall follow the application and approval process outlined in Section P.4.
- C. The proposed site must either; generate a reduced amount of vehicular traffic or generate a net increase in vehicular traffic (less than 500 Average Daily Trips (ADT) or 50 vehicle peak hour [vph]) and must not be required to perform a Traffic Impact Study (TIS) or a Traffic Operational Analysis (TOA). DelDOT may require a TOA for any project that generates a total of 200 or more ADT.
- D. If a Capital Transportation Program (CTP) Project is occurring contiguous to the parcel/project then the application and approval process outlined in Section P.4 may be required.
- E. If a project generates a total site ADT of 200 ADT or greater (including existing and proposed trips), proper Right-of-Way (ROW) dedication must be confirmed to exist or be provided via recorded plan or a deed, along a Major Collector or greater roadway functional classification (i.e. Major Collector, Minor Arterial, Principal Arterial or Freeway/Expressways).
- F. If turn-lanes are not present at the entrance and are required, then the application and approval process outlined in Section P.4 shall be required. If turn lanes are present at the existing entrance, the Subdivision Engineer may at their discretion allow the project to proceed in the LONC/PEC Process.
- G. If a project generates a total site ADT between 200 and 1,999 and is located within Investment Level I or Investment Level II Areas as defined by the State Strategies for Policies and Spending maps, the applicant will be required to pay the Shared-Use Path (SUP)/Sidewalk fee in-lieu of construction. If the applicant chooses to construct the pedestrian facilities they will have to follow the application and approval process outlined in Section P.4.
- H. Projects that generate a total site ADT of 2,000 or greater (regardless of Investment Level Area designation) must provide proof of existing pedestrian facilities or they will be required to follow the application and approval process outlined in Section P.4 and construct any Department identified pedestrian facilities/upgrades.

P.6.2 Application and Approval Process

- A. All requests should be received through our online portal PDCA (<http://pdca.deldot.gov/>) or through the Subdivision Mailbox (Subdivision@state.de.us).
- B. All applicants will be required to complete and submit a [Permit Application](#) (available online at <http://devcoord.deldot.gov> > Forms) with site traffic / trip generation information (average number of daily: vehicles using entrance, customers, and employees). The applicant is encouraged to submit a site plan, trip generation diagram, Auxiliary Lane sheets and documents relating to ROW. Construction in the ROW will require engineered plans at the Department's discretion. Additional information allows the Department to effectively process the application and to help avoid delays.
- C. DelDOT will check safety issues such as: reviewing a minimum of 3 years of crash history data at the entrance location, adequacy of existing pedestrian facilities, the physical condition of the existing entrance and any other deficient elements within the ROW along the site frontage.
- D. For projects that generate over 200 ADT (including existing and proposed trips), any existing pedestrian facilities that are determined to be not adequate must be brought up to the current standards by the applicant.
- E. DelDOT will review the project for its eligibility per the LONC requirements and determine any deficiencies per the review outlined in item #3. Depending on the scope of work needed to correct any identified deficiencies, the project may be processed under the LONC/PEC process or the application and approval process outlined in Section P.4. This determination will be made at the discretion of the Subdivision Engineer. DelDOT will make the determination if the LONC/PEC process is appropriate and if any fee payments are required within 15 business days. If more time or information is needed to process the Application, DelDOT personnel will notify the Applicant with an expected response date or request that information.

P.7 DEFINITIONS

AASHTO – American Association of State Highway and Transportation Officials.

Acceleration Lane – A speed-change lane, including tapered areas, for the purpose of enabling a vehicle entering a roadway to increase its speed to a rate at which it can more safely merge with through traffic.

Access – Any point of ingress or egress such as a driveway, street, road, or highway that connects to the general street system.

Accessway – A connection other than a sidewalk or walkway that provides bicycle and pedestrian passage between streets, between a street and a destination, or connecting to an existing or proposed trail.

Alley – A privately maintained street which provides secondary access typically along the rear lot line of adjoining properties. Alleys are intended to accommodate access to parcels and service delivery, such as trash collection and utility service.

Angle of Intersection – The angle that is formed by the intersecting streets' centerlines. Where the angle of intersection departs significantly (more than approximately 20 degrees) from right angles, the intersection is referred to as a *skewed intersection*.

Applicant – An individual or firm seeking approval from DelDOT.

Applicant's Engineer – An engineer licensed in Delaware and retained by the applicant to perform engineering services associated with their expertise.

Approach Leg – The intersection leg used by traffic approaching an intersection.

Approval (DelDOT) – General conformity with current DelDOT regulations, standard specifications, and standard details.

Approved Study Area – The study area approved for analysis by DelDOT in the Traffic Impact Study or Traffic Operational Analysis Scope of Work Letter.

Area-Wide Study – A study performed, generally in lieu of an individual TIS, for a designated area to determine the area-wide impacts of proposed developments within the specified study area that encompasses more than one possible development project.

Auxiliary Lane – A lane striped for use as an acceleration lane, deceleration lane, right-turn lane, or left-turn lane, but not for through traffic use.

Average Daily Traffic (ADT) – The total volume of two-way traffic during a given time period in whole days greater than one day and less than one year, divided by the number of days in that time period.

Boulevard Street – A street which typically functions as a collector street which involves a landscaped median of varying width which divides opposing travel lanes by green space.

Bypass Lane – A paved area to permit through traffic to bypass left-turning vehicles stopped on the travel lane.

Capacity – The number of vehicles that can traverse a point or section of a lane or roadway during a set time period under prevailing roadway, traffic, and control conditions.

Commercial Entrance – An entrance to or exit from a non-residential site or non-State maintained street.

Committed Developments – Developments that are recorded or largely approved by the local jurisdiction but which have not yet been constructed.

Community Facilities – Public destinations of significance to a community including, but not limited to, schools, libraries, parks, senior and recreational centers, as well as other neighborhood facilities, such as pools and tot lots.

Connectivity – A measure of how efficiently a transportation network provides access between destinations. It is measured using a Connectivity Ratio.

Connectivity Ratio - The ratio of links (street segments) to nodes (intersections and cul-de-sac heads). It is determined by dividing the number of street segments (street sections between intersections and/or cul-de-sac ends) by the number of intersections and cul-de-sac ends. For purposes of this calculation, proposed street intersections with existing roads and stub roads for future access to vacant developable lands shall count as 0.5 intersections.

Connector Streets – A continuous suburban development street or combination of streets beginning and ending on the state-numbered road system, having a high volume of through traffic.

Construction Entrance – A temporary access for the ingress and egress of construction vehicles.

Corner Clearance – The distance along the edge of the traveled way from the closest edge of pavement of the intersecting roadway to the closest edge of pavement of the nearest access connection.

Corridor Capacity Preservation Program (CCPP) – A Program established in accordance with Title 17, Section 145 of the Delaware Code to reduce the need for expansion, and maintain the regional importance, of four designated corridors (SR 1 from Dover AFB south to Five Points; US 13 from Route 10 to MD state line; US113 from southern limits of Milford to MD state line; Route 48 from Hercules Road to Route 41). http://www.deldot.gov/information/pubs_forms/manuals/corr_cap/index.shtml

Crossover – An opening in a median on a divided highway provided for crossing and turning traffic.

Cul-de-Sac Street – A subdivision street with a single point of access which terminates at a circular, paved turn-around. Also referred to as a “dead-end street”.

Deceleration Lane – A speed change lane, including tapered areas, for the purpose of enabling a vehicle that is exiting a roadway to leave the travel lanes and slow to a safe exit.

Delaware MUTCD – Delaware Manual on Uniform Traffic Control Devices.

DelDOT – The Delaware Department of Transportation.

Departure Leg – The intersection leg used by traffic leaving an intersection.

Development Coordination Section – The unit within DelDOT’s Division of Planning charged with the responsibility for reviewing subdivision and site plans, traffic impact studies, CCPP and development proposals.

Divided Highway – A highway with a median designed to separate traffic moving in opposite directions.

Drainage Structure – An inlet box, pipe, box culvert, or other similar conduit installed for the purpose of draining the flow of surface water.

Driveway – An access that is not a public street, road, or highway.

Field Entrance – A limited use driveway for the occasional/infrequent use by equipment used for the purpose of cultivating, planting, and harvesting or maintenance of agricultural land.

Frontage – The length along the highway right-of-way of a single property tract.

Functional Area (Intersection) – The area of an intersection necessary to provide all appropriate auxiliary lanes. The functional boundary includes more than just the physical area of the intersection.

Functional Classification – A classification system that defines the purposes and hierarchy of all streets and highways within a network (classification system maps can be found on DelDOT's website).

FWOP (Future Without Project) – In a TIS, denotes the anticipated future traffic condition at a location without the addition of traffic generated by the proposed project.

FWP (Future With Project) – In a TIS, denotes the anticipated future traffic condition at a location after the addition of traffic generated by the proposed project.

Gradient or Grade – The rate or percent change in slope, either ascending or descending from or along the highway.

Gross Floor Area – The sum of the total horizontal areas of every floor of every building on a lot. The measurement of gross floor area shall be computed by applying the following criteria:

- A. The horizontal square footage is measured from the face of all exterior walls.
- B. Enclosed storage, mechanical areas, mezzanines and similar structures shall be included as gross floor area wherever at least seven feet are provided between the finished floor and the ceiling.

No deduction shall apply for horizontal areas void of actual floor space, for example, elevator shafts and stairwells.

High Density Development – Development that will result in a minimum of 50 employees per acre, or 9 residences per acre.

Higher Level Roads – Streets classified as one of the following: major collectors, minor and major arterials, freeways, and interstates.

Higher Order Streets – A term used as a relevant comparison between subdivision streets to refer to all streets which are classified above the street being described.

Highway – A general term for denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

Industrial Street – A Street in an area for manufacturing or industrial use as defined by the local land use agency's zoning code which is located in an unincorporated community and meets the following requirements:

- A. The aggregate internal street system contains a minimum of 500 linear feet of road surfacing.
- B. The internal street system connects to existing or proposed State-maintained roadways.

Infrastructure – In transportation planning, all the relevant elements of the environment in which a transportation system operates, including, but not limited to, bridges, drainage, lighting, pathways,

pavement, railways, roadways, sidewalks, traffic control and monitoring equipment and systems, transit facilities, transit systems, utility installations and utility systems.

Interchange – A facility that grade separates intersecting roadways and provides directional ramps for access movements between the roadways. The structure and the ramps are considered part of the interchange.

Interconnectivity – Physical connections of roadways and sidewalks between two or more independent developments or residential subdivisions.

Intersection – For the purposes of this manual, the intersection encompasses not only the area of pavement jointly used by the intersecting streets, but also those segments of the intersecting streets affected by the design. Thus, those segments of streets adjacent to the intersection for which the cross-section or grade has been modified from its typical design are considered part of the intersection.

Intersection Legs - Segments of roadway connecting to the intersection.

Intra-connectivity – Physical connections of streets and sidewalks within a single development or residential subdivision.

Lane – The portion of a roadway for the movement of a single line of vehicles which does not include the gutter or shoulder of the roadway.

Level of Service (LOS) – A measure of traffic flow and congestion. As defined in the Highway Capacity Manual, it is a qualitative measure describing operational conditions within a traffic stream; generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. LOS is measured on a scale from “A” to “F”.

Limited Access Highway – Highways, streets or roadways to which owners or occupants of abutting lands and other persons have no legal right of access to or from the same, except at such points and in such manner as may be determined by the public authority having jurisdiction over such highway, street or roadway.

Linkages – Roadways, sidewalks, access-ways and walkways that connect between adjacent development parcels and subdivisions.

Local Land Use Agency – The County or municipality that is responsible for reviewing and approving the applicant’s subdivision or land development plan.

Local Road – All roadways under DelDOT jurisdiction that provide direct access to land and links to the higher classification routes. Local roads have the lowest volumes of traffic and short trip lengths. These do not include subdivision streets.

Local Roadway Network – Those roadways comprising all roadway classifications designated as major collector or lower level (including minor collector, commercial collector, commercial access street, subdivision street, loop street, boulevard street, cul-de-sac, service road and alley).

Local Transportation Circulation Plan – A plan providing proposed locations for future roadways designated as minor collector or higher level, within a particular geographic area, that has been approved by DelDOT and the County or local jurisdiction to which it pertains.

Loop Street – A subdivision street with one or two points of access on a collector street or other higher order street.

Lot – A bounded area of land portrayed on a recorded or unrecorded plan, which usually also shows nearby

streets and other physical features, as well as other lots and parcels. The lots delimited by plans are a basis of separate legally established parcels, usually for houses or other buildings. The resulting parcels may contain more than one lot, especially where lots are small. Occasionally, lots are delimited to transfer land from one parcel to another. Since parcels and lots are related, the terms are often used interchangeably.

Major Access – The point at which a privately maintained road, street, driveway or other entrance, carrying more than 500 vehicles trips per day or more than 50 vehicle trips for any hour, intersects a publicly maintained road or street.

Major Residential Subdivision – A subdivision of six or more residential lots.

Major Street – Typically, the intersecting street with greater traffic volume, larger cross-section, and higher functional class.

Median – The portion of a divided highway separating the traveled ways for traffic in opposing directions. A median may be traversable or non-traversable.

Median Left-Turn Lane – A speed change lane within the median to accommodate left-turning vehicles.

Minor Residential Subdivision – A subdivision of five or fewer residential lots.

Minor Street – Typically, the intersecting street likely to have less traffic volume, smaller cross-section and lower functional classification than the major street.

Mixed Use Development – Development that consists of two or more land uses within the same building lot or area.

Multi-modal Access – Ability of pedestrians, bicyclists and transit vehicles to enter, exit or use a transportation facility.

Nationally Accepted Standards (NAS) - includes references to guidelines and design standards that have been researched, compiled, published and maintained through the efforts of nationally recognized professional organizations and publications, which typically encompass the efforts of societies or associations within the fields of engineering or civil design.

Natural Area or Feature – May include steep slopes, upland natural areas, wetlands, or other bodies of water.

Neighborhood Commercial District – Commercial districts that serve to provide goods and services to the surrounding neighborhoods, generally consisting of older buildings with unique architectural style.

Net Dwelling Unit Density – The computation of dwelling unit density that excludes land area dedicated to the public use or for use as open space.

Off-site Improvements – Road improvements for the benefit of safety and/or capacity, that are generally beyond the limits of the site entrance and frontage. Such improvements do not include auxiliary lanes that serve the site entrance, but may include roadway widening along the frontage of the site.

Parcel – A uniquely described piece of land whose boundaries are established by legal instrument such as recorded deed, court order or a recorded plot which is recognized as a separate legal entity for the purposes of transfer of title.

PCPHGPL – Passenger cars per hour of green time per lane.

Pedestrian Refuge Areas – Areas protected by curb, landscaping or some other similar device so as to provide shelter for pedestrians traveling across vehicle travel lanes.

Physical Constraint – Limitation on development or access created by topographical features on the development parcel, or adjacent parcels, e.g., spacing of existing adjoining streets, freeways, railroads or other physical structures.

Potentially Developable or Redevelopable Land – Land that is not restricted from development by virtue of factors such as farm land preservation, wetlands or other environmental constraints, parkland, etc.

Pre-Submittal Meeting – A meeting held with DelDOT and representatives of the developer prior to plan submittal to discuss proposed development.

Public Works Engineer – The DelDOT individual assigned to issue permits and supervise construction.

Record Plan (Approved) –

- A. A complete plan which defines property lines, proposed street and other improvements, and easements.
- B. A plan of private streets to be dedicated to public use.

Residential Access – An entrance serving a private, single-family, residential unit from an abutting State-maintained roadway.

Residential Site – A private, single-family, residential lot.

Right of Way – A general term denoting land, property, or interest therein; usually in a strip, acquired for, or devoted to, transportation purposes.

Roadway – The portion of a highway, including the travel-ways and shoulders.

Roundabout – A circular intersection with yield-control at entry, permitting a vehicle on the circulatory roadway to proceed, and with deflection of the approaching vehicle counter-clockwise around a central island.

Scoping Meeting – A meeting requested by an applicant to discuss the requirements and study area of a Traffic Impact Study or Traffic Operational Analysis.

Service Road – A subdivision street adjacent and generally parallel to a limited access arterial roadway or highway intended to provide access to properties adjoining or that are in close proximity to the limited access arterial roadway or highway.

Shared Access – A single connection serving two or more adjoining lots or parcels.

Shared-Use Path – A bikeway physically separated from motor vehicle traffic by an open space or barrier and either within a highway right-of-way or easement, or within an independent right-of-way. Shared-use paths may also be used by pedestrians, skaters, wheelchair users, joggers, and other non-motorized users. Most shared use paths are designed for two-way travel.

Shoulder Area – The portion of roadway adjacent to the travel-way for accommodating stopped vehicles, bicycles and pedestrians where there is no sidewalk, and providing lateral support to the base and wearing courses.

Sidewalks – Paved pedestrian pathways installed along roadways and streets, or within easements on private property.

Sight Distance – The distance visible to the driver of a passenger vehicle measured along the normal travel path of a roadway from one point to another point at a specified height above the roadway.

Site Plan – The plan sheet(s) signed by a licensed engineer or surveyor that depict the existing and proposed condition of a development site to scale, showing all pertinent information required by DelDOT and the local land use authority to receive the necessary planning or zoning board approvals.

Skewed Intersection – An intersection where the angle of intersection departs significantly (more than approximately 20 degrees) from right angles.

State-maintained Roadway – The entire width between the right-of-way of a publicly maintained roadway when any part thereof is open to the use of the public for purposes of multi-modal travel or the entire width of every roadway declared to be a public highway by any law of this state. It includes bridges, culverts, sluices, drains, ditches, waterways, embankments, walls, trees, shrubs, fences, etc.

Stopping Sight Distance (SSD) – The distance required by a driver of a vehicle, traveling at a given speed, to bring the vehicle to a stop after an object on the roadway becomes visible. It includes the distance traveled during driver perception and reaction times, and the vehicle braking distance.

Storage Length – Additional lane length added to an auxiliary lane, to store the maximum number of vehicles anticipated to accumulate in the lane, during a peak volume period. It prevents stored vehicles from interfering with the function of the deceleration lane or the through travel lanes.

Strip Development – See Minor Residential Subdivision.

Stub Street – Temporary dead end street for future connectivity with the adjacent property.

Subdivision –

- A. The division or re-division of a lot, or a parcel of land, by any means (including a plan or a description of metes and bounds) into two or more lots, tracts, parcels, or other divisions of land for the purpose of, whether immediate or future, lease, transfer of ownership, or building development.
- B. The division or allocation of land for the opening, widening, or extension of any street, or other public facilities.

Subdivision Manual – Development Coordination Manual.

Subdivision Street – A street, within a community or industrial park, categorized into three levels as follows:

- A. **Type I** – Subdivision streets with less than 500 ADT.
- B. **Type II** – Subdivision streets with between 501 to 3000 ADT.
- C. **Type III** – Subdivision streets with more than 3000 ADT.

Suburban Community – Any unincorporated community within the state of Delaware:

- A. Containing at least 5 separate and distinct property owners; provided, that each parcel of land, condominium or other individually owned unit of a multiunit building shall be deemed to have no more than 1 owner for the purposes of this subchapter;
- B. That are individually owned parcels of land whose streets in the aggregate equal a minimum of 500 linear feet of road surface or condominiums or other types of individually owned units of multiunit buildings whose streets in the aggregate equal a minimum of 300 linear feet of road surface; and
- C. Which, in the opinion of the local governing authority and DelDOT, is so situated as to form a unit which is reasonably and economically capable of being improved by the laying, repairing or completion of streets, signs, sidewalks and installation of surface drainage and stormsewers.

In addition to the above, such unincorporated communities within this State must be:

- D. Located on a highway which is part of the state highway system or will be connected to the state highway system when the projects provided for are complete and which street shall be either maintained by the DelDOT upon completion pursuant to the requirements of Title 17 of the Delaware Code and DelDOT's *Development Coordination Manual*; or
- E. Built pursuant to county rules and regulations requiring design and building standards and a means or mechanism to provide for the perpetual maintenance of such suburban community streets as provided herein.

Traffic Divider – A median type formation used to separate entering and exiting traffic.

Traffic Generator – An establishment or facility which produces and attracts traffic that did not previously exist and which causes that traffic to leave and enter the adjacent roadway. Traffic generation shall be expressed in terms of Average Daily Traffic (ADT). Each vehicle using the facility is to be counted twice (in and out).

Traffic Impact Study (TIS) – A study conducted during the development approval process to determine the impacts that traffic generated by the proposed development will have on the surrounding street network and the improvements needed to the transportation system in order to mitigate those impacts.

Traffic Island – A defined area between traffic lanes for control of vehicle movements or for pedestrian refuge.

Traffic Operational Analysis (TOA) – An evaluation, or series of evaluations, conducted during the review of subdivision, land development and entrance plans primarily intended to determine site entrance location and movements to be allowed at the site entrance. These evaluations may include: Queuing Analysis, Highway Capacity Manual Analysis, and Crash Analysis.

Transportation Improvement District (TID) – A geographic area defined for the purpose of securing required improvements to transportation facilities in that area.

Travel Demand Management (TDM) – A strategy, or a set of strategies, proposed by an applicant to mitigate the traffic impacts of a project by reducing the number of single occupied vehicles traveling to the site during the peak hour. TDM strategies can include such things as car and van pools, flex and staggered employee hours, transit or shuttle service.

Travel Demand Model – A set of computer based tools comprising of software, existing and projected land uses, demographics, roadway and street data commonly used by Departments of Transportation and Metropolitan Planning Organizations to estimate future travel patterns, analyze potential improvements, and support Federally-required travel-related air quality studies. As referred to in this regulation, the term specifically refers to the ‘Peninsula Travel Model’ operated and maintained by DelDOT Planning.

Turning Roadway - A short segment of roadway for a right turn, delineated by channelizing islands. Turning roadways are used where right-turn volumes are very high, or where skewed intersections would otherwise create a very large pavement area.

Walkways – Pathways within commercial development sites that can range in size from a minimum 5 foot width to accommodate pedestrians, to a maximum 12 foot width to accommodate pedestrians and bicyclists.

P.8 REFERENCES AND SOURCE MATERIALS

This Manual includes references to guidelines and design standards that have been researched, compiled, published and maintained through the efforts of nationally recognized professional organizations and publications. Any direct references to or insertion of specific portions of such guidelines or standards may generally be considered as minimum criteria or standards within the authority of this Manual. Any general references to such guidelines or standards in their entirety may generally be considered as guidance materials, (to be considered during design and construction), within the context of this Manual. The Department may exercise engineering judgement in some cases and rely on standards and criteria, (for transportation elements, streets and highways under its jurisdiction), that differ from the minimum criteria presented within this Manual or within the external guidelines and design standards referenced by this Manual.

This Manual is intended for use by qualified engineering practitioners, and provides access to relevant standards and criteria (including various numerical design values and use conditions). The design, construction, and maintenance references contained in this Manual recognize many variable and often complex process considerations. The engineering design process, and associated use of this Manual, incorporates aspects of engineering judgment, design principles, science, and recognized standards towards matters involving transportation operations and roadway infrastructure. Department standards, criteria, and manuals should be taken into consideration when planning for the design, drafting and submission of projects that abut or have an impact on the local transportation system, state highway system or the national highway system. Users of this Manual are cautioned that the strict application of exact numerical values, conditions or use information taken from portions of the text may not be appropriate for all circumstances. Individual references to design values or concepts should not be used out of context or without supporting engineering judgment.

The design professional is encouraged to evaluate individual references respective of their context and placement within this Manual and should act upon them as either: basic design guidance (to the extent that some references within this Manual are general and suggestive in the execution of sound engineering judgement), or specific design criteria (to the extent that some references within this Manual are specific to a discrete design element or topic and prescriptive in the execution of sound engineering judgement).

P.8.1 References and Source Materials – National

The following guidelines and design standards (which are made available in their entirety through nationally recognized professional organizations and publications) are incorporated by reference, except as modified within this Manual. In the event that conflicts may exist between incorporated references and this Manual, the *Development Coordination Manual* controls.

AASHTO's "**Guide for the Development of Bicycle Facilities**", 4th Edition (2012)

AASHTO's "**A Policy on Geometric Design of Highways and Streets**", 6th Edition (2011), commonly referred to as "**the Green Book**"

AASHTO's "**LRFED (Load and Resistance Factor Design) Bridge Design Specifications**", 6th Edition (with 2013 Interim Revisions)

AASHTO's "**Roadside Design Guide**", 4th Edition (2011)

AASHTO's "**Manual for Assessing Safety Hardware (MASH)**", 1st Edition (2009)

American Concrete Pipe Association (ACPA)'s "**Concrete Pipe And Box Culvert Installation Manual**", (2007)

ACPA's "**Concrete Pipe Design Manual**", (2009)

Institute of Transportation Engineers (ITE)'s "**Trip Generation Manual.**", 10th Edition (2017)

McTrans' "**Highway Capacity Software (HCS7)**", (2017)

Transportation Research Board (TRB)'s "**Highway Capacity Manual (HCM)**" 6th edition (2016)

TRB's "**NCHRP (National Cooperative Highway Research Program) Report 350 - Recommended Procedures for the Safety Performance Evaluation of Highway Features**", (1993)

P.8.2 References and Source Materials – State of Delaware

The following guidelines, design standards and/or independent manuals (which are made available in their entirety through their authoring Agencies and/or Departments of the State of Delaware) are incorporated by reference, except as modified within this Manual. In the event that conflicts may exist between incorporated references and this Manual, the *Development Coordination Manual* controls.

DelDOT's "**Pedestrian Accessibility Standards for Facilities in the Public Right-of-way**" (2015 as amended or current version)

DelDOT's "**Road Design Manual**" (2011 as amended)

DelDOT's "**Standard Construction Details**" (2017 as amended)

DelDOT's "**Standard Specifications for Road and Bridge Construction**" (2016 as amended)

DelDOT's "**Bridge Design Manual**" (2017 as amended)

DelDOT's "**Traffic Design Manual**" (2015 as amended)

DelDOT's "**Traffic Calming Manual**" (2012 as amended)

P.8.3 References and Source Materials – Regulations

Regulations that are adopted through the Federal or State of Delaware Register of Regulations shall be taken into consideration in each aspect of planning, design or construction, where such Regulations may have independent jurisdiction over applicable elements irrespective of any consideration in this Manual. The omission of explicit references to any such applicable State or Federal Regulation from this Manual shall not have the effect of sheltering the design professional from the separate and/or additional responsibilities that such Regulations may create. In the event that conflicts may exist between State or Federal Regulation and this Manual, the more restrictive criteria should be used, while meeting the intent of the controlling Regulation. All Regulations shall be considered in their entirety, inclusive of any amendments, in their most current version.

The following is not an exhaustive list, but includes some of the more commonly referenced Regulations:

Delaware version of the Federal Manual on Uniform Traffic Control Devices (DE-MUTCD)
(2011 as amended or current version)

Delaware Code, Section 2308: Development Related Improvements Requiring New Rights-of-way
(2006)

U.S. DOT Federal Transit Administration (ADA) American with Disabilities Act (2006 - Federal Register, Vol. 71, No. 209 as amended or current version)

U.S. DOJ American with Disabilities Act (ADA) Standards for Accessible Design (2010 - Federal Register Vol. 75, No.178 as amended or current version)

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CHAPTER 1 ACCESS STANDARDS

1.1 PURPOSE

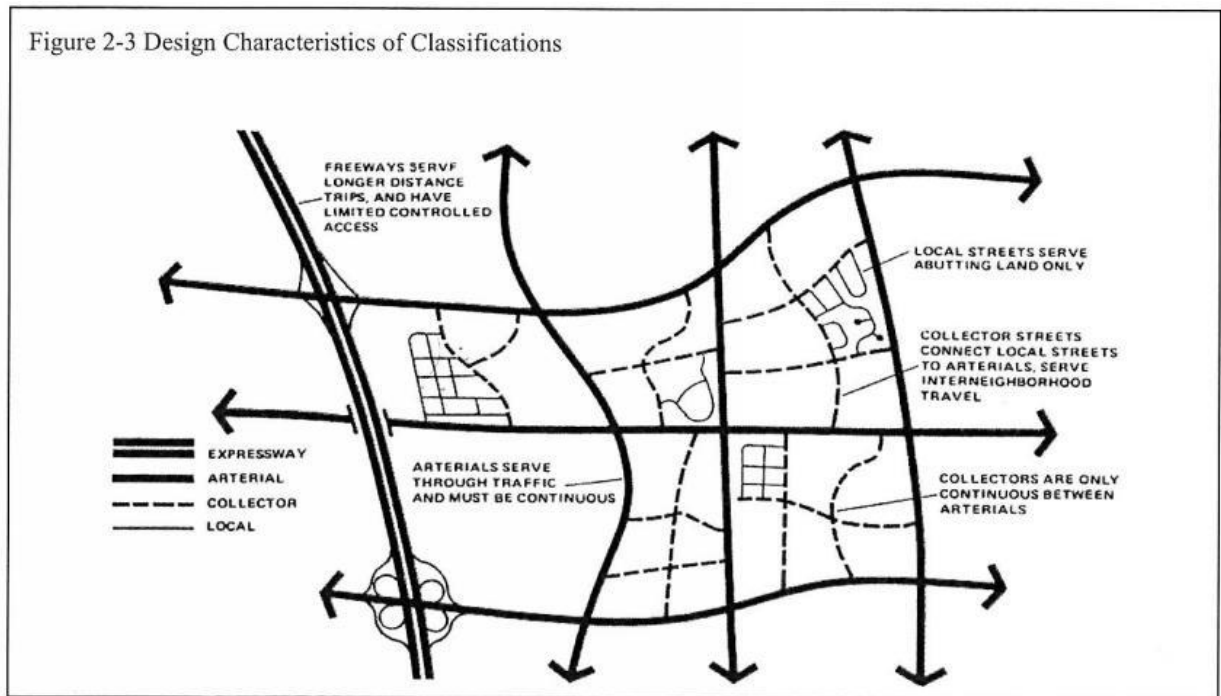
The purpose of this chapter is to provide general guidance on DelDOT's policies for access locations and signalization.

Roadways are designed to carry vehicles between land uses in order to carry out our daily activities associated with work and recreational activities. The functional classification of a roadway defines the level of access that it grants to surrounding land uses. As Figure 1.1-a shows, arterial roadways are designed with limited access to surrounding land uses in order to promote mobility, while local roads are designed to provide a higher level of land access at the sacrifice of increased mobility. Collector roadways are designed with the goal of providing both access and mobility.

While roadways provide the link between land uses, entrances provide the physical transition between a site and the abutting roadway. Entrances shall be designed to provide safe and reasonable access to the site while providing the least impact on the existing roadway system and its users. The number, spacing, type, and location of access and traffic signals have a direct and often significant effect on the capacity, speed, and safety of the highway.

Each state highway segment is assigned a functional classification as defined in Sections 1.4 to 1.7. The existing design of the highway is not required to meet the design standards of the functional classification at the time the classification is assigned. All new access permitting and other access design decisions shall meet the design standards set forth in this chapter for the assigned category of the affected highway or segment of highway. Roadways discussed in this chapter shall be in conjunction with DelDOT's Functional Classification Maps available at http://www.deldot.gov/information/pubs_forms/. Section 1.8 provides additional guidance for entrances onto Service Roads.

Figure 1.1-a Roadway Functionality in Serving Traffic Mobility and Land Access



Source for Figure 2-2 and 2-3: *Arterial Street Access Control Study*, Tri County Regional Planning Commission, 1981, p.3.

1.2 ENTRANCE POLICY

1.2.1 Entrance Policy - Location of Entrances

Entrances shall be located where the highway alignment and profile are favorable, where there are no sharp curves, steep grades or other factors that would limit sight lines, in order to provide the appropriate sight distance, in accordance with Section 5.4, Sight Distance. . Refer to Figure 1.2.1-a for guidance on entrance spacing. When feasible and practical, two adjacent commercial properties should use a common ingress and egress from the public highway. The first property owner should establish and record a cross access easement regarding the location and design of such ingress and egress subject to the review and approval of DelDOT.

Access locations and allowable movements shall be determined at DelDOT's discretion including but not limited to; granting an access to a State-maintained roadway, requiring design and operational modifications, restricting one or more turning movements, or denying the access, so long as such discretion does not violate relevant law. For individual residential access requirements, refer to Chapter 7.

Considerations for the placement of entrances should include evaluation of sight distance, location of adjacent entrances, length of auxiliary lanes, distance from intersecting streets, adjacent street queue lengths and the adjacent street speed limit. Where feasible, entrances shall not be located within 40 feet of an intersection radius, within queues of adjacent intersections or on acceleration and deceleration lanes. Additional requirements and guidance are given in the following sections. The applicant may be required

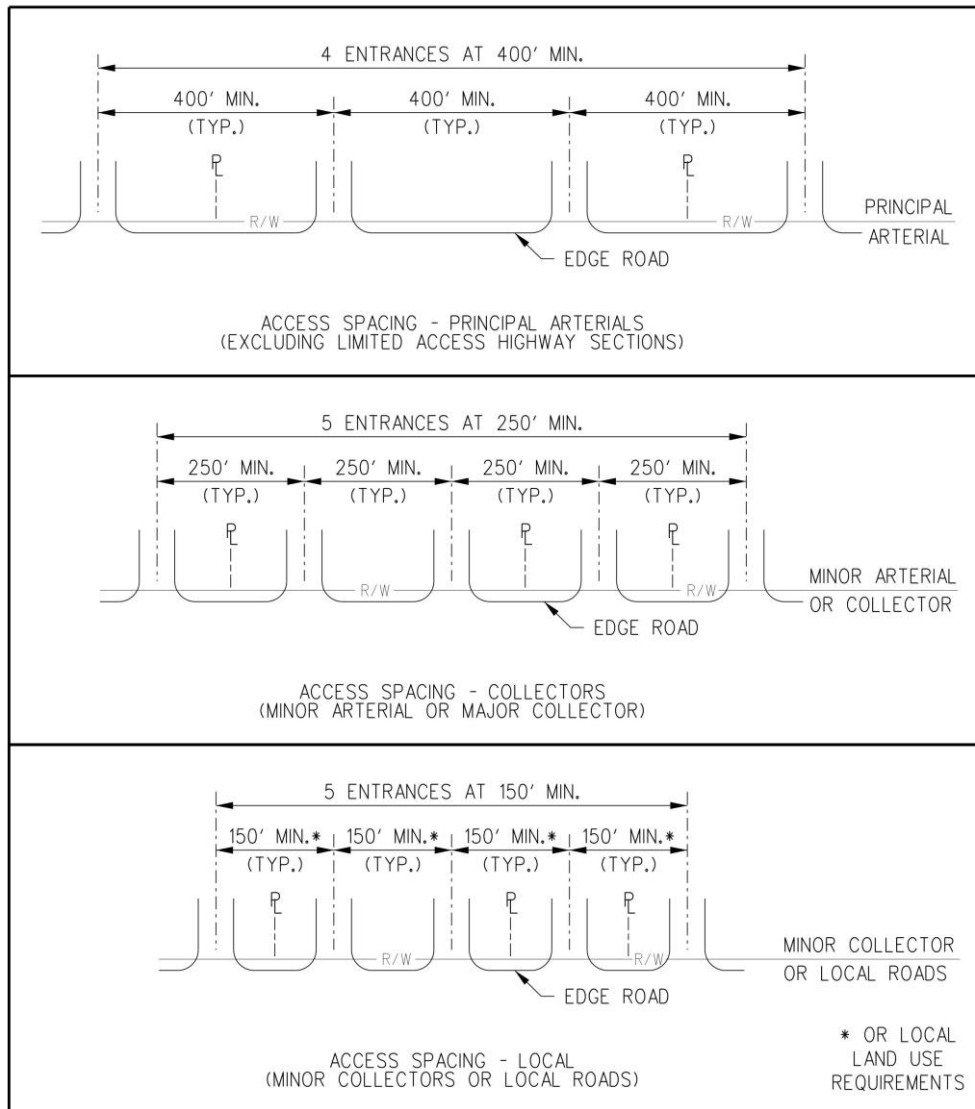
to provide analysis to document how a proposed access point will satisfy the requirements of this manual. See Chapter 2 for additional information on Traffic Operational Analyses and Traffic Impact Studies.

Site circulation should be designed to allow vehicles to easily enter the site without blocking entrances or parking spaces, and without impacting traffic control phasing. The design vehicle shall be able to perform all necessary maneuvers within the site to enter and exit the roadway safely. Backing of delivery vehicles and trucks into or out of a site entrance will not be permitted.

Both Major and Minor Subdivisions should be designed to ensure that lot layouts allow for safe and practical driveway locations. Driveway locations should also be accounted for in the configuration of residual lands of subdivisions.

Any site being considered by DelDOT for access on to a State-maintained roadway shall be evaluated to determine if it will also impact any other DelDOT programs. These programs include, but are not limited to, the Corridor Capacity Preservation Program (CCPP), the Capital Transportation Program (CTP), the Transportation Alternatives Program (TAP) Program, the Hazard Elimination Program (HEP), Pavement Rehabilitation Program, and Community Transportation Fund Program. If a plan would have an impact on any of these programs, it may necessitate additional review by DelDOT and additional requirements may need to be met.

Figure 1.2.1-a Spacing of Driveways and Entrances



1.2.2 Entrance Policy - Deeded Access Rights

Along some sections of State-maintained roadway, access rights have been obtained by DelDOT in the form of a recorded deed (Denial of Access). Where access is controlled by deed, there is no right of direct access through the deeded section. The property owner so affected may inquire with DelDOT about changes or purchase of any deeded access rights. The obtaining or revising of access rights by deed is regulated by the right-of-way acquisition process. Where access is not restricted by deed, an entrance permit consistent with the requirements of the *Development Coordination Manual* is still required for the construction and use of a driveway.

1.3 SIGNALIZED ACCESS REQUIREMENTS

Traffic signals and their installation are guided by the *Delaware Manual on Uniform Traffic Control Devices* (DE MUTCD) and subject to approval by the DelDOT Traffic Section, based upon review.

- A. When a signal is proposed, a signal justification study is required. The study shall be completed and signed by a Delaware registered professional engineer using the following standards:
 - 1. Highway signal progression bandwidth and efficiency analysis including current and anticipated future signalized intersections
 - 2. An optimum signal cycle as determined by DelDOT
 - 3. Actual speeds as determined by a spot speed study
 - 4. Highway bandwidth with the proposed traffic signal should be no less than the optimized existing bandwidth without the proposed traffic signal.
 - 5. The green time allowed for the cross street shall be no less than the time necessary to accommodate pedestrian movements
- B. The signal justification study shall also provide the following information:
 - 1. Notation of all existing access, possible future access locations for at least one mile in each direction, and all potential roadway and signal improvements
 - 2. Current and future roadway travel speed, travel time, and delay time
 - 3. Traffic generation rate estimates
 - 4. Information, data and reference sources
 - 5. An evaluation of the level of service for all geometric elements
 - 6. Accurate and understandable diagrams
 - 7. All assumptions and adjustment factors
 - 8. An analysis of all reasonable alternatives including a no build alternative
 - 9. A safety analysis including conflict points and movements
 - 10. A conceptual design showing all geometric elements and approximate dimensions with detailed analysis of any elements below code standards

Additional information and additional analysis based upon other factors and standards may be required if determined to be necessary for a complete evaluation.

Any access that would not meet the highway bandwidth requirements above, (if a traffic signal were installed), shall not be signalized and shall be limited to right turns.

1.4 LIMITED ACCESS HIGHWAYS (INTERSTATE OR FREEWAYS / EXPRESSWAYS)

1.4.1 Limited Access Highways - Functional Characteristics

Entrances are not permitted on limited access highways classified as interstates, freeways, expressways and sections of principal arterials. These highways have the capacity for high speed and high volume traffic movements over long distances in an efficient and safe manner, including interstate, interregional, intercity and, in larger urban areas, intra-city travel. Federal aid interstate highways are typical of these classifications.

1.4.2 Limited Access Highways - Design Standards

All opposing traffic movements shall be separated by physical constraints such as grade separations and median separators. Access, consisting of directional ramps, shall be suitably spaced and designed to provide the minimum differential between the speed of the through traffic stream and the speed of the merging or diverging vehicles. Location and design of access shall be determined on an individual basis by DelDOT. Each access allowed to a limited access highway must receive the specific approval of the Chief Engineer and the FHWA. Access to interstate highways must comply with federal regulations. Temporary access may be allowed during official emergencies or where directly related to a freeway construction project.

1.5 ARTERIALS

1.5.1 Arterials - Functional Characteristics

These highways, including sections of principal arterials and all minor arterial classifications, have the capacity for high speed and high volume traffic movements in an efficient and safe manner, providing for interstate, interregional, and intercity, travel needs and some intra-city travel needs. Direct access service to abutting land is subordinate to providing service to through traffic movements on the highway. Arterials are the highest classification that permits at-grade intersections.

1.5.2 Arterials - Design Standards

Private direct access may only be permitted on an arterial if there is no other reasonable access from a lower classification roadway, and if the access rights have not been previously purchased by the State.

All private direct access permitted shall be limited to right turns only unless a left turn movement can be designed that, in the opinion of DelDOT, meets all safety requirements.

For commercial or major residential subdivisions, no additional access rights shall accrue upon the splitting or dividing of existing parcels or contiguous parcels under the same ownership or control. All access to the newly created properties shall be provided internally from a single access. Any new access determined by the permit application shall be consistent with the requirements of the *Development Coordination Manual*.

All access provided to arterials shall be done so with the understanding that if the highway is reconstructed to a limited access highway, alternative access may be provided by a service road or other means.

1.6 COLLECTORS

1.6.1 Collectors - Functional Characteristics

These highways have the capacity for medium to high travel speeds and high traffic volume over medium and long distances in an efficient and safe manner. They provide connections between arterials and local roads. Direct access service to abutting land is subordinate to providing service to through traffic movements.

1.6.2 Collectors - Design Standards

The design of all collector roadways should be capable of achieving a posted speed limit of 35 to 45 MPH on urbanized signalized segments and preferably 50 MPH in rural areas. A speed limit of 35 to 45MPH in urbanized areas is acceptable where posted and there is little or no possibility of achieving higher speeds. If municipalities allow lesser speed limits, and there is little or no possibility of achieving higher speeds, a 25 MPH speed limit will be acceptable.

For commercial or major residential subdivisions, no additional access rights shall accrue upon the splitting or dividing of existing parcels or contiguous parcels under the same ownership or control. All access to the newly created properties should be provided internally from a single access. Any new access determined by the permit application shall be consistent with the requirements of the *Development Coordination Manual*.

1.7 LOCAL ROADS

1.7.1 Local Roads - Functional Characteristics

These highways have the capacity for moderate travel speeds and moderate traffic volumes over medium and short travel distances providing for intra-city and intercommunity travel needs. There is a reasonable balance between direct access and mobility needs within this category.

1.7.2 Local Roads - Design Standards

The design of all local roads should be capable of achieving a posted speed limit of 30 to 50 MPH. The posted speed limit shall be used to meet the requirements of access to State-maintained roadways unless an approved plan or study shows improvements to the highway require a higher speed limit be used.

One access may be allowed from a State-maintained roadway to an individual parcel or to contiguous parcels under the same ownership or control where such access will not compromise the safety and

operation of the roadway. Additional access may be provided in certain circumstances (see Section 7.2.3.1).

1.8 SERVICE ROADS

1.8.1 Service Roads - Functional Characteristics

Service roads are designed where there is no intended purpose of providing for long distance or high volume traffic movements. Service roads may be public or private. Access needs will take priority over through traffic movements without compromising safety or operation. Providing reasonable and safe access to abutting property is the primary purpose of this type. At the request of the local land use agency or their designee, DelDOT may change any service road to a higher classification to support local transportation plans.

1.8.2 Service Roads - Design Standards

One direct access may be allowed from a service road to an individual parcel or to contiguous parcels under the same ownership or control where such access will not be detrimental to the safety and operation of the service road.

Additional access may be allowed when DelDOT determines that the following conditions are met:

- A. There will not be any significant safety or operational problems created by the additional access
- B. Additional access would not cause a hardship to an adjacent property

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CHAPTER 2 TRAFFIC ANALYSIS AND IMPROVEMENTS

2.1 PURPOSE

The purpose of this Chapter is to provide a clear process for determining transportation impacts associated with new development so that the impacts can be mitigated and system capacity can be preserved.

In order to accommodate a proposed development access, traffic must operate safely and at satisfactory Levels of Service (LOS).

2.2 TRAFFIC IMPACT STUDIES

A Traffic Impact Study (TIS) can be required by DelDOT, by a local government, or by both. As state and local governments have different responsibilities, their specific reasons for requiring a TIS and the things they need from it differ. DelDOT has responsibility for most of the state's transportation system and therefore utilizes the TIS to identify impacts to that system and to determine appropriate mitigation for those impacts. DelDOT then seeks to obtain that mitigation through its advisory role in the local government's land use approval process, including the issuance of a Letter of No Objection to Recordation. Direct requirements by DelDOT, meaning conditions for the issuance of a permit or for acceptance of a street, as opposed to conditions for a Letter of No Objection or No Contention, typically are limited to the location and design of the development access.

While some local governments have responsibility for municipal streets and in that regard have interests parallel to DelDOT's, most local governments that require a TIS do so in the context of regulating land use. They require that area transportation facilities be demonstrated to operate adequately as a condition for land use approvals.

A TIS may be initiated by DelDOT, the applicable land use agency, or by the Applicant in anticipation of submission of a subdivision or land development proposal for review.

For the purposes of Chapter 2, an intersection shall be defined as a place where two publicly maintained roads or streets intersect; an access drive shall mean where a privately maintained road, street, driveway or other entrance intersects a publicly maintained road or street, and a "major" intersection shall be

defined as one where the side street likely carries more than 500 vehicle trips per day or more than 50 vehicle trips for any hour.

2.2.1 Traffic Impact Studies - Authority and Responsibility

Whenever the DelDOT Division of Planning, Development Coordination Section (DelDOT) determines that a development proposal exceeds the analysis warrants as defined in Section 2.2.2, a TIS shall be completed for such proposed development if in the opinion of DelDOT a TIS is necessary. The scope of the TIS shall be based on the type and intensity of the proposed land use change or development.

Independent of the TIS report, the DelDOT Subdivision Section may require a Traffic Operational Analysis (TOA) during its review of site access issues as outlined in Section 2.3.

2.2.1.1 Use of TIS Findings

If a TIS is required for a proposed development, DelDOT will direct its preparation for use in determination of impacts to the transportation network. Using the findings of the TIS, DelDOT may require transportation network improvements and modifications to be built or funded by the Applicant, as appropriate. DelDOT may also use the TIS to make recommendations to the local land use agency having land use jurisdiction over the property, or for any other purpose that DelDOT deems appropriate.

2.2.1.2 Area-Wide Study

At DelDOT's option, the Department may require the Applicant to provide a monetary contribution to conduct an Area-Wide Study in lieu of a TIS, the results of which will be used to determine transportation impacts and necessary transportation network improvements associated with multiple development proposals or sites. The Applicant shall not be required to pay more than its fair share of the cost of such an Area-Wide Study (See Section 2.2.2.2). The development of a Land Use and Transportation Plan (See Section 2.4.2.1) is one example of an Area-Wide Study.

2.2.1.3 Study Costs

If the Applicant desires to proceed with a development for which a TIS is required, the Applicant shall assume full responsibility for all costs incurred in its preparation, as calculated per the Area-Wide Study fee.

2.2.1.4 Qualifications to Perform a Traffic Impact Study

All TIS document submittals shall be signed and sealed by a professional engineer licensed in the State of Delaware.

2.2.1.5 Requirement of a New TIS

If a TIS is prepared for a proposed development and DelDOT finds that existing or projected future conditions in the study area have changed significantly after the completion of the TIS, DelDOT may require a new, revised, or updated TIS or a TOA at its sole discretion before issuing a Letter of No Objection to Recordation. DelDOT will take reasonable measures in scoping the study to avoid the need for additional work once the study is complete. However, it is the Applicant's responsibility to submit plans for approval in a timely manner. If DelDOT questions the continued validity of the TIS, due to the

passage of time, it is the Applicant's responsibility to demonstrate that it is still valid or to revise it as necessary.

Once DelDOT has issued a Letter of No Objection to Recordation, DelDOT may require a new, revised or updated TIS if the development changes in a way that necessitates a new or amended record plan. In the review of the entrance plans for that development, DelDOT may require a TOA, which may result in new or different requirements for improvement of the entrances and adjacent intersections. In jurisdictions that do not require a DelDOT Letter of No Objection to Recordation, DelDOT approval of entrance plans shall be considered a defacto Letter of No Objection in this context.

The above paragraph notwithstanding, DelDOT shall consider requiring a new or updated TIS in the following situations:

- A. If a Letter of No Objection to Recordation is not issued within five years of the traffic counts
- B. If a Letter of No Objection to Recordation expires before the subject plan is recorded
- C. If the subject plan expires before recordation or is sunset by the land use authority after recordation
- D. If a TIS was not done previously and a change to the subject plan increases its trip generation such that the warrants in Section 2.2.2 are now met

2.2.1.6 Types of Analysis that May Be Included

A TIS scope may include, but is not limited to, the following types of analyses:

- A. Highway Capacity Manual (HCM)/LOS Analysis – All TIS shall include HCM/LOS analysis to determine whether the approaches at the site entrance(s) and approaches of nearby intersections and road segments operate within acceptable LOS. See Section 2.2.8.12 for DelDOT's LOS Standards. See this section and Section 2.2.4.2.2 regarding the intersections that must be included.
- B. Queuing Analysis – This analysis may be required to determine whether existing and proposed left-turn storage at the site entrance(s) and nearby intersections is adequate, to assess U-turn lane storage adequacy, or to determine that lane queuing does not block access to turn lanes or spill back into upstream intersections.
- C. Safety Analysis – This analysis may consist of a number of factors including review of adequacy of sight distance, crash data, compliance with the Delaware Manual on Uniform Traffic Devices (DE MUTCD) and adherence to applicable guidelines and design standards, such as: the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets (the Green Book)*, DelDOT's Road Design Manual (RDM) or other **Nationally Accepted Standards (NAS)**. More specifically:
 - 1. A sight distance evaluation may be required at the entrance driveway(s), at intersections within the study area, and at proposed intersections within the subdivision to be constructed.
 - 2. A crash analysis shall be required if locations within the proposed study area are known to DelDOT as high accident locations as determined through DelDOT's risk assessment programs such as: Hazard Elimination Program, High Risk Rural Roads Program or Rail-Highway Grade Crossing Safety Program. Independent crash analysis may be waived by DelDOT if DelDOT determines that sufficient analysis has already been completed or is planned to be completed as a requirement of the relevant Program. The analysis will be used to determine whether a problem exists, and if so, how the proposed project relates to the problem, and what modifications or

improvements need to be made to ensure safe access on the State-maintained roadway system and safe operation on adjacent roadways and intersections.

3. An analysis to provide for an evaluation of roads near the site relative to DE MUTCD and applicable guidelines and design standards such as: AASHTO's *Roadside Design Guide* (RDG), the Green Book, DelDOT's Road Design Manual (RDM) or NAS. This analysis would be required to identify deficiencies in signing, striping, cross-section or geometry that represent or would represent an unsafe condition.
- D. Bicycle, Pedestrian and Transit Facility Analysis - The analysis shall be required to identify and evaluate related impacts and the need for enhancements to bicycle, pedestrian, and transit access, circulation, and facilities within the study area.

2.2.2 Traffic Impact Studies - Warrants

2.2.2.1 Basis for Requirement

This section primarily addresses the criteria that DelDOT uses to determine whether to require a TIS. Where DelDOT finds that a local government's process has not otherwise afforded adequate consideration of transportation impacts and it must decide whether to require a TIS directly in the review of a land development plan or entrance plan, DelDOT shall apply the same criteria.

When evaluating rezoning proposals in the absence of a subdivision or land development plan, DelDOT shall distinguish between residential and non-residential districts. Rezoning for residential use shall be evaluated based on the site's highest and best use while recognizing the limitations, such as mapped wetlands. For rezoning for non-residential use, DelDOT shall recommend that the rezoning be considered without a TIS and that the need for a TIS be evaluated when a subdivision or land development plan is proposed.

Subject to the above paragraph and Sections 2.2.2.2, 2.2.2.3 and 2.2.2.4, DelDOT shall require a TIS if any of the following conditions apply:

- A. A proposed land use change or development will generate 500 vehicles per day (vpd) or more in average weekday or weekend trips, or will generate 50 vehicles per hour (vph) or more during any one hour time period during any day of the week, be it weekday or weekend, that DelDOT finds to be critical with regard to traffic impact. Most commonly, the time period will be the weekday a.m. or p.m. peak hour of traffic on the adjacent street but DelDOT may consider other peak hours depending on the nature of the proposed development and the area in which it would be located.
 1. If an applicant provides information regarding internal capture and/or pass-by trips, DelDOT shall evaluate the information submitted and determine what, if any, reductions in site traffic beyond the site entrance are appropriate. If so, warrants shall be based on the reduced traffic.
 2. Daily traffic volumes shall be the highest of the weekday, Saturday or Sunday volumes as determined in accordance with Section 2.2.8.6.
- B. A new access for an existing land use is proposed for a state-maintained roadway, and the total trips generated by the site would be increased by 500 vpd or 50 vph in the peak hour.
- C. The local land use agency has more stringent TIS warrant requirements than those provided in this section, and requires a TIS using those more stringent requirements.

2.2.2.2 Area-Wide Study Fee

Provisions of Sections 2.2.2.1.A and 2.2.2.1.B notwithstanding, if a development will generate a net increase of fewer than 2,000 vpd and fewer than 200 vehicles in any hour of any day, and the Applicant has not been required to conduct a TIS under the provisions of Section 2.2.2.1.C, the Applicant, may be permitted, in lieu of conducting a TIS, to contribute funds equal to ten (\$10.00) per net daily trip to be generated by the development (Area-Wide Study Fee). Daily trips should be based on the day that generates the highest ADT for the land use proposed. For redevelopment projects, trips should be calculated using the ITE *Trip Generation Manual* for both the former use and the proposed use to calculate the net increase in trips. “Re-development” status will only apply to sites on which the business or other use has been operational within the past 3 years. Sites which have been out of operation for longer than 3 years will be considered new development.

The Area-Wide Study Fee shall be paid in conjunction with the Initial Stage discussed in Section P.4. DelDOT shall apply the collected fee to complete an Area-Wide Study that includes the development or transportation improvements that benefit the development. Payment of an Area-wide Study Fee in lieu of a TIS will not preclude the Applicant’s responsibility for funding and/or construction of its share of off-site improvements. Those improvements may be determined to be needed by the Area-Wide Study or other studies, e.g. TIS for other nearby developments.

THE TABLE BELOW IS INTENDED AS A QUICK REFERENCE. IT IS NOT A SUBSTITUTE FOR THE WARRANTS IN SECTION 2.2.2.1.

Figure 2.2.2.2-a Volume Warrants for Traffic Impact Studies (TIS)

Land Use Code (Per ITE Trip Gen. Manual, 9 th Ed.)	Land Use	TIS Not Warranted (Fewer than 500 vpd and 50 vph)	Eligible To Pay Area- Wide Study Fee (Fewer than 2,000 vpd and 200 vph)
210	Single Family Detached Houses	1-42 units	43-201 units
220	Apartments	1-57 units	58-287 units
230	Townhouses or Condominiums	1-23 units	24-368 units
240	Mobile Homes	1-60 units	61-340 units
251	Age-Restricted Single Family Detached Houses	1-36 units	37-505 units
320	Motel	1-42 rooms	43-226 rooms
710	General Office Building	1-18,000 square feet	18,001-82,000 square feet
720	Medical/Dental Office Building	1-11,000 square feet	11,001-46,000 square feet
826	Specialty Retail Center (Excludes convenience stores, pharmacies, banks, restaurants and gas stations)	N/A	1-17,000 square feet
851	Convenience Store (no fuel pumps)	N/A	1-2,300 square feet
881	Pharmacy with Drive-Through Window	1-5,000 square feet	5,001-20,000 square feet
912	Drive-in Bank	1-1,800 square feet	1,801-7,400 square feet
934	Fast Food Restaurant with Drive-Through Window	N/A	1-2,700 square feet
945	Gasoline/Service Station with Convenience Market	N/A	1-12 vehicle fueling positions

This table was compiled using the 9th edition of the ITE Trip Generation Manual.

2.2.2.3 Development Generating Fewer Than 500 VPD and 50 VPH

Developments generating fewer than 50 vph in any hour and 500 vpd shall be subject to the provisions of this chapter only if a TIS is required under the provisions of Section 2.2.2.1.C.

2.2.2.4 Development Within a Transportation Improvement District (TID)

The land use and transportation planning process involved in the creation of a TID is necessarily more comprehensive than that involved in a TIS for a specific development. See Section 2.4 regarding required and recommended elements of a TID.

If a development is proposed within a TID and is consistent with the current Land Use and Transportation Plan (LUTP) for that TID, DelDOT may require participation in the TID in lieu of conducting a TIS and making improvements based on the TIS if all of the following conditions apply:

- A. The TID has been created:
 - 1. By virtue of:
 - i. An act of the General Assembly; or
 - ii. An action of the Council of a Metropolitan Planning Organization; or
 - iii. A Memorandum of Agreement between DelDOT and the relevant local government(s)
 - 2. For purposes that include the implementation of transportation improvements that are based on forecast traffic volumes calculated from adopted demographic data
 - 3. In conformance with the circulation element of a comprehensive plan or a related master plan
- B. All of the development entrances are located within the boundaries of the TID.
- C. The completion date of the subject development is before the year for which traffic was forecast in the current LUTP for the TID, as determined under Section 2.2.8.10 and one of two conditions apply:
 - 1. The subject development (or another land use of equivalent or higher peak hour trip generation) was explicitly accounted for in the traffic forecasts used in the current LUTP for the TID.
 - 2. The traffic entering and exiting the subject development would not result in an increase of more than five percent in the forecast traffic volume on the adjacent road at any of the development entrances.
- D. A specific set of transportation system improvements has been identified as necessary within the TID based on forecast traffic and other relevant factors, such as safety or structural adequacy.
- E. The Applicant has agreed in writing to contribute toward the cost of the identified transportation improvements and that contribution is based on a formula defined in the TID agreement or, if no formula is defined, on the subject development's percentage contribution to the peak hour traffic passing through the facility to be improved in the forecast year.

DelDOT reserves the right to require a bond or similar security as a means of guaranteeing that the pledged funds will be available when needed and/or that any required work will be completed on time and to the satisfaction of DelDOT.

One premise of this section is that sufficient Level of Service (LOS) analysis was done in developing the LUTP for the TID, such that additional analysis is unnecessary. Where DelDOT or local government regulations require the determination of LOS at the development entrance(s) or immediately adjacent facilities, this work may be done through the preparation of a Traffic Operational Analysis, in accordance with Section 2.3. Where more extensive LOS information, not available from the LUTP, is needed, a TIS shall be required.

2.2.3 Traffic Impact Studies - Process

2.2.3.1 TIS Prepared By Applicant's Engineer (Option A)

To conduct a TIS, the Applicant shall complete the following steps:

- A. A request shall be made to DelDOT to schedule a mandatory Scoping Meeting in accordance with Section 2.2.4.1. The Applicant shall provide a copy of this letter to the applicable local land development agency concurrent with its submission to DelDOT.
- B. A Scoping Meeting shall be held with DelDOT, and at DelDOT's discretion with representatives of the local land use agency, to discuss the proposed development and the scope of work for the project TIS.
- C. DelDOT shall provide a memorandum, which will serve as the meeting minutes and scope of work for the study.
- D. If the Applicant wishes to proceed with this option, they shall provide a check in accordance with Section 2.2.4.3.
- E. Count and Trip Distribution Data. After the Applicant receives the Scope of Work Memorandum, the Applicant's engineer will complete traffic counts and the proposed trip distributions for the developments to be addressed in the TIS. The count data and proposed distribution shall be submitted to DelDOT prior to completion of any additional analysis. Once submitted, DelDOT will review the count and trip distribution information and will approve the data or, in the alternative will provide requirements for revisions to the data, which could include provision of future base volumes, the provision of growth factors to be used in calculating such volumes, or modifications to distribution percentages.
- F. Preliminary Traffic Impact Study Report. After acceptance of the traffic count data, the Applicant's engineer will complete the elements of the report indicated in Sections 2.2.5, 2.2.6, and 2.2.7, and shall submit a copy of the information to DelDOT as the "Preliminary Traffic Impact Study" (PTIS). This information allows DelDOT to review the base data prior to completion of the full analysis by the Applicant's engineer, saving the Applicant's engineer from potential resubmissions of more detailed analyses if a correction is required by DelDOT to the base data or assumptions. DelDOT shall respond by approving the PTIS either as submitted or with required amendments or additions. If significant problems are found, e.g., changes are needed to volumes in several report figures; further submissions at this stage will be required.
- G. Traffic Impact Study Report. After acceptance of the PTIS by DelDOT, the Applicant's Engineer shall complete the TIS in accordance with the analysis provisions of Section 2.2.8 and submit an electronic copy in PDF format of the full report (including the Preliminary TIS sections) to DelDOT for review. The final TIS report may be rejected by DelDOT if the report deviates from the approved PTIS, either through failure to make revisions or the inclusion of new, un-reviewed volumes.
- H. Department Recommendations and Requirements for Access. When DelDOT finds that the TIS is satisfactory and agrees with its conclusions, DelDOT shall establish conditions for approval of construction of subdivision streets and for approval of access to state-maintained roadways, and shall provide a letter detailing the conditions to the Applicant. Either prior to or at the same time that the Applicant is provided with the conditions letter, DelDOT may also provide copies of its requirements, recommendations and conditions to other relevant agencies, including the local land use agency. The Applicant shall still be subject to the plan review and entrance plan requirements of Development Coordination Section.

2.2.3.2 Traffic Impact Study Prepared By DelDOT's Traffic Engineer (Option B)

- A. A request shall be made to DelDOT to schedule a mandatory Scoping Meeting in accordance with Section 2.2.4.1. The Applicant shall provide a copy of this letter to the applicable local land development agency concurrent with its submission to DelDOT. A Scoping Meeting shall be held

with DelDOT and, at DelDOT's discretion with representatives of the local land use agency, to discuss the proposed development and the scope of work for the project TIS.

- B. DelDOT shall provide a memorandum, which will serve as the meeting minutes and scope of work for the study. DelDOT shall also provide a cost estimate from their traffic engineer to prepare the TIS in its entirety.
- C. If the Applicant wishes to proceed with this option, they shall provide an electronic payment to DelDOT in accordance with DelDOT's current procedures, in the full amount of the cost estimate. On receipt of that payment, DelDOT will work to issue a notice to proceed to their traffic engineer. Because the notice will be subject to DelDOT's procedures for work by consultants, issuance of the notice to proceed will not be immediate.
- D. DelDOT's traffic engineer will complete the draft final TIS in approximately 40 business days. Upon completion of the draft final TIS, DelDOT will schedule a meeting to discuss the results with the Applicant.
- E. Department Recommendations and Requirements for Access. When DelDOT finds that the TIS is satisfactory and agrees with its conclusions, DelDOT shall establish conditions for approval of construction of subdivision streets and for approval of access to state-maintained roadways, and shall provide a letter detailing the conditions to the Applicant. Either prior to or at the same time that the Applicant is provided with the conditions letter, DelDOT may also provide copies of its requirements, recommendations, and conditions to other relevant agencies, including the local land use agency. The Applicant shall still be subject to the plan review and entrance plan requirements of Development Coordination Section.
- F. DelDOT will provide a copy of the completed TIS to the applicant.

2.2.4 Traffic Impact Studies – Scope of Work Determination and Confirmation

2.2.4.1 Letter to Request Scoping Meeting

An Applicant considering submission of a subdivision or site plan development application shall request in writing, using the Scoping Meeting Request Form found online (for more information go to <http://devcoord.deldot.gov> > Forms), a Scoping Meeting with DelDOT to discuss elements of the project and project analysis assumptions.

The Scoping Meeting Request Form will be used to gather information such as:

- A. Project name
- B. Name and address of the applicant
- C. Contact information for scheduling meeting
- D. Location of project
- E. Copy of tax map showing block number, lot number, parcel number and lot lines
- F. Total acreage of the project site
- G. Current and proposed zoning of the project site
- H. Proposed land use
- I. Proposed number and location of site access points

- J. Proposed build-out year, or if project is to be phased, phase-in dates
- K. Indication as to whether a land use application has been submitted to the local government land use department for review
- L. Indication as to whether a subdivision or land development plan has been submitted to DelDOT's Subdivision Section for review, and, if one has been submitted, a copy of the plan
- M. Indication as to whether a site plan for the project has been prepared, and, if one has been prepared, a copy of the plan
- N. Any other analysis assumptions the Applicant proposes using for the study
- O. Evidence that the Applicant and the current property owner were notified of the request for the meeting
- P. Names and titles of people anticipated to attend the Scoping Meeting

One copy of the request for Scoping Meeting letter shall be sent to the applicable local land use agency concurrent with the submission to DelDOT. The Applicant shall be requested to demonstrate to DelDOT that it has provided a copy of the letter to the land use agency. Failure to provide a concurrent copy of the request for Scoping Meeting letter to the local agency may result in the delay or postponement of the Scoping Meeting.

2.2.4.2 Scoping Meeting

2.2.4.2.1 General

DelDOT will schedule the Scoping Meeting. At the Scoping Meeting, the following TIS topics shall be discussed:

- A. Intersections and roadway segments to be studied. See Section 2.2.4.2.2
- B. The impact of any significant committed developments within a two-mile radius of the exterior boundaries of the project on the project study area
- C. The availability of crash data within the proposed study area and the requirements for analysis based on that data
- D. Method to be used to project traffic growth
- E. Traffic count locations and proposed schedule for manual and Automatic Traffic Recorder (ATR) counts
- F. Times and days of analysis
- G. Any anticipated seasonal variations of use
- H. Methods to be used to generate, distribute and assign trips
- I. When appropriate for use in the TIS analysis, pass-by and internal trip capture assumptions
- J. Signalized intersections known to become saturated during peak periods
- K. Other information and assumptions to be used in the analysis for the report

Within 20 business days DelDOT will supply a Memorandum of the Scoping Meeting Minutes and, if requested by the Applicant, an estimate for Option B. The cost estimate for Option B proposal will expire after 40 business days.

2.2.4.2.2 Intersections and Roadway Segments to be Studied

In considering the study area limits, DelDOT shall consider the area of influence of the proposed development on the surrounding roadway network. The area of influence shall be defined as the area beyond a development site entrance including any intersection or roadway segment that would carry projected site traffic of at least 50 vehicles per hour (during any peak hour) as determined by DelDOT using an adopted regional travel demand model, up to and including the third State-maintained road having a three-digit maintenance number (local roads and higher as defined on DelDOT's Functional Classification Maps). Within that area, the intersections to be analyzed shall also include any signalized access drives and any Type II and Type III subdivision streets. In this context, both State-maintained and privately-maintained subdivision streets shall be included. Municipally-maintained subdivision streets shall be included only at the request of the municipality.

DelDOT will also consider local requirements for area of influence when determining the study area limits. Further, to the extent that a local government receives requests from the public through their land use approval process that an intersection or other transportation facility be included in a TIS and asks that DelDOT include that facility in the study, it shall be included, provided that: 1) a recognized procedure exists for determining the Level of Service on such facilities; and 2) the local government specifies what, if any, requirement they have with regard to the Level of Service on that facility.

The above-described area of influence notwithstanding, the following study area limits shall also apply:

- A. The study area shall include all development site entrances for which a Level of Service can be determined, e.g. an unsignalized right-turn-in-only will generally be excluded, but the development site entrances shall not count toward determination of the third intersection mentioned above.
- B. Where the development would access a local or collector road, the study area should extend to follow any assignment of at least 50 vehicles per hour to the nearest arterial road.
- C. Where the development would have access on two intersecting roads, their intersection shall be included.
- D. Where two roads intersect in a grade such that through traffic movements do not intersect and some or all turning movements are made by means of ramps, DelDOT shall specify in the scoping meeting what elements need to be studied.
- E. Where one of the roads in the area of influence is an expressway, the study area may extend beyond the intersection with that road but it shall not extend along the expressway.
- F. Intersections of roads with State maintenance numbers ending in letters are excluded from the count of three intersections except where site traffic of 50 or more vehicles per hour is expected to use that road. If they are within the third-intersection limit, they may be included if the intersection is signalized or the local government requests their inclusion.

DelDOT may consider a smaller study area for developments located in any of the following situations:

- A. Central business districts and similar urban locations. Factors to consider in reducing the study area on this basis include the existence of a grid street pattern, physical constraints on road widening such as buildings adjoining the right-of-way, and posted speed limits of 30 miles per hour or less.
- B. Rural areas. Factors to consider in reducing the study area on this basis include location of the development in a Level 4 Investment Area relative to the Strategies for State Policies and Spending, Annual Average Daily Traffic volumes on most roads less than 1,000 vehicles per day, and little development other than farms and single-family detached houses (isolated or in strip developments).

- C. Arterial highways through developed areas. Factors to consider in reducing the study area on this basis include the number and density of signalized intersections at which the intersecting streets or driveways are not State-maintained, e.g. municipal streets, subdivision streets and commercial entrances.

Example 1: 250 single-family houses on the Judge Morris Estate, located on Polly Drummond Hill Road (N328)

1. Begin with the site entrance on Polly Drummond Hill Road.
2. To the north, follow the extent of 50 p.m. peak hour site trips to Old Coach Road (N316). Include that intersection but stop there as less than 50 p.m. peak hour site trips are on either road beyond there.
3. To the south, follow the extent of 50 p.m. peak hour site trips to Kirkwood Highway (N011). Include that intersection but do not continue south on Red Mill Road (N352) as less than 50 p.m. peak hour site trips are on that road.
4. Looking east on Kirkwood Highway, follow the extent of 50 p.m. peak hour site trips to Harmony Road (N355). Include that intersection. East of there, there are less than 50 p.m. peak hour site trips so look no further on Kirkwood Highway.
5. Continue following the extent of 50 p.m. peak hour site trips along Harmony Road to Ruthar Drive (N065). Stop there as it is the third intersection from the site.
6. Returning to the intersection of Kirkwood Highway and Polly Drummond Hill Road, follow the extent of 50 p.m. peak hour site trips west to Old Possum Park Road (N303). Include this intersection do not continue north on Old Possum Park Road as less than 50 p.m. peak hour site trips are on that road.
7. Continue following the extent of 50 p.m. peak hour site trips along Kirkwood Highway to Possum Park Road (N314). Stop there as it is the third intersection from the site.
8. Add in intervening Type II and Type III subdivision streets and signalized access drives.

Resulting list of intersections to be analyzed:

- Site Entrance / Polly Drummond Hill Road
- Polly Drummond Hill Road / Old Coach Road
- Polly Drummond Hill Road / Chestnut Avenue
- Kirkwood Highway / Polly Drummond Hill Road
- Kirkwood Highway / Brewster Drive
- Kirkwood Highway / Darwin Drive
- Kirkwood Highway / Harmony Road
- Harmony Road / Greenridge Road
- Harmony Road / Ruthar Drive
- Kirkwood Highway / Delaplane Avenue / Melrose Place Drive
- Kirkwood Highway / Old Possum Park Road
- Kirkwood Highway / Possum Park Road

Example 2: 100,000 square foot shopping center on the Judge Morris Estate, located on Polly Drummond Hill Road (N328)

1. Begin with the site entrance on Polly Drummond Hill Road.

2. To the north, follow the extent of 50 p.m. peak hour site trips to Old Coach Road (N316).
3. From Old Coach Road, continue following extent of 50 p.m. peak hour site trips east to North Upper Pike Creek Road (N295). Stop there as it is the third intersection from the site.
4. Returning to the intersection of Polly Drummond Hill Road / Old Coach Road, continue following extent of 50 p.m. peak hour site trips north to New Linden Hill Road (N321). Include that intersection but stop there as there are less than 50 p.m. peak hour site trips north along Polly Drummond Hill Road.
5. From Polly Drummond Hill Road, continue following extent of 50 p.m. peak hour site trips east along New Linden Hill Road to North Upper Pike Creek Road (N295). Stop there as it is the third intersection from the site.
6. Returning to the site entrance on Polly Drummond Hill Road, follow the extent of 50 p.m. peak hour site trips south to Kirkwood Highway (N011).
7. From Kirkwood Highway, continue following extent of 50 p.m. peak hour site trips south to Ruthar Drive (N065). Include that intersection but stop there as less than 50 p.m. peak hour site trips are on either road beyond there.
8. Returning to the intersection of Kirkwood Highway / Polly Drummond Hill Road, continue following extent of 50 p.m. peak hour site trips east along Kirkwood Highway to Harmony Road (N355).
9. From Harmony Road, continue following extent of 50 p.m. peak hour site trips east to South Upper Pike Creek Road. Stop there as it is the third intersection from the site.
10. Returning to the intersection of Kirkwood Highway / Harmony Road, continue following extent of 50 p.m. peak hour site trips south to Ruthar Drive. Stop there as it is the third intersection from the site.
11. Returning to the intersection of Kirkwood Highway and Polly Drummond Hill Road, follow the extent of 50 p.m. peak hour site trips west to Old Possum Park Road (N303). Include this intersection do not continue north on Old Possum Park Road as less than 50 p.m. peak hour site trips are on that road.
12. Continue following the extent of 50 p.m. peak hour site trips along Kirkwood Highway to Possum Park Road (N314). Stop there as it is the third intersection from the site.
13. Add in intervening Type II and Type III subdivision streets and signalized access drives.

Resulting list of intersections to be analyzed:

- Site Entrance / Polly Drummond Hill Road
- Polly Drummond Hill Road / Old Coach Road
- Old Coach Road / Dewalt Road
- Old Coach Road / Henderson Hill Road
- Old Coach Road / North Upper Pike Creek Road
- Old Coach Road / South Upper Pike Creek Road
- Polly Drummond Hill Road / Forge Road
- Polly Drummond Hill Road / New Linden Hill Road
- New Linden Hill Road / Chadd Road
- New Linden Hill Road / Quarry Lane
- New Linden Hill Road / Boyds Valley Drive / Henderson Hill Road
- New Linden Hill Road / North Upper Pike Creek Road

- Kirkwood Highway / Polly Drummond Hill Road
- Red Mill Road / Andries Road
- Red Mill Road / Darwin Drive
- Red Mill Road / Old Manor Road
- Red Mill Road / Ruthar Drive
- Kirkwood Highway / Brewster Drive
- Kirkwood Highway / Darwin Drive
- Kirkwood Highway / Harmony Road
- Kirkwood Highway / South Upper Pike Creek Road
- Harmony Road / Greenridge Road
- Harmony Road / Ruthar Drive
- Kirkwood Highway / Delaplane Avenue / Melrose Place Drive
- Kirkwood Highway / Old Possum Park Road
- Kirkwood Highway / Possum Park Road

2.2.4.3 Confirmation of Scope of Work for the TIS

If after the receipt of the Scoping Meeting Memorandum the Applicant decides to proceed with the project, the Applicant's engineer shall provide DelDOT with confirmation that they agree with the Scoping Meeting Memorandum or with any changes they find necessary. At this time they shall also identify if they want to proceed with Option A or Option B.

If the Applicant chooses Option A, their confirmation of the Scoping Meeting Memorandum shall be accompanied by a fee in the amount of \$5000 (pending review and approval of the General Assembly), in the form of a check made payable to the Department of Transportation. An estimated time for review of a TIS under Option A after the Applicant's engineer has submitted the Final TIS is 20 business days. Completion of a draft TIS review letter in a form suitable for discussion with the Applicant can be expected approximately 20 business days after that date, for a total of 40 business days.

If the Applicant chooses Option B, their confirmation of the Scoping Meeting Memorandum shall be accompanied by a check made payable to the Department of Transportation in the full amount of the estimate for Option B. After receipt of payment, DelDOT will issue its Traffic Engineer a Notice to Proceed (NTP) with the Final TIS preparation. An estimated time for a draft Final TIS and comment letter in a form suitable for discussion with the Applicant is approximately 40 business days with final TIS and comment letter completion approximately 20 business days after that date.

DelDOT may revise a scope of work if the TIS is not submitted within a 12-month period from the date of the Scope Confirmation Letter, or within a time period earlier than 12 months should conditions in the study area change. A revised scope of work may require a restart of the TIS process, including a requirement for a new processing fee.

2.2.5 Traffic Impact Studies - Report Format

All TIS submittals shall be signed and sealed on the first page by a licensed Delaware Professional Engineer.

The pages of the TIS shall be numbered and the topics shall be addressed in the same sequence as they appear in this subsection.

The following outline details the Topic Sections to be contained in a TIS:

- A. Table of Contents
- B. List of Figures
- C. List of Tables
- D. Executive Summary
- E. Project Description
- F. Study Area
- G. Existing Traffic and Transportation Conditions
- H. Trip Generation
- I. Pass-by and Internal Capture Trips (if appropriate)
- J. Trip Distribution
- K. Trip Assignment
- L. Future Traffic:
 - 1. Traffic Analysis
 - 2. Analysis Years
 - 3. Peak Hour Factors
- M. Safety Evaluation and Adequacy of Sight Distance
- N. Capacity Analyses
- O. Geometric Design Operational and Circulation Improvements
- P. Impacts on Bicycles, Pedestrians, and Transit
- Q. Mitigation Identification
- R. Recommendations
- S. Conclusions
- T. Appendices:
 - 1. Traffic Count Summary Sheets
 - 2. Collision Diagrams
 - 3. List of Committed Developments
 - 4. Trip Generation, Distribution and Assignment Calculations for the subject development and all committed developments
 - 5. Capacity Analysis Worksheets
 - 6. Critical Movement Summation Forms and Signal Timing Sheets
 - 7. DelDOT and Applicant Correspondence, including original scope of work
 - 8. Support for Recommendations

2.2.6 Traffic Impact Studies - Content of Traffic Count and Trip Distribution Submission (Option A only)

To avoid repetition of work in preparation of the Preliminary TIS and expedite the review process, traffic count data and proposed trip distributions for all committed developments shall be submitted for review as follows:

- A. Prior to beginning preparation of the Preliminary Traffic Impact Study, described in Section 2.2.7, the Applicant shall submit to DelDOT a copy of the data from the tasks completed in accordance with the work outlined in Sections 2.2.8.5.A and 2.2.8.5.C, and the proposed trip distributions for all committed developments.
- B. DelDOT shall review the items listed in paragraph 1 above and respond by approving them for use in the Preliminary TIS either as submitted or with required amendments or additions. If significant problems are found, e.g. unacceptable traffic counts, a resubmission at this stage will be required. At this time, DelDOT will also provide any additional data needed for the Applicant's engineer to project future traffic in accordance with Section 2.2.8.10.
- C. All content shall be submitted electronically.

2.2.7 Traffic Impact Studies - Preliminary Traffic Impact Study Report Content submission (Option A only)

To avoid repetition of analyses and expedite the review process, a Preliminary TIS report shall be completed as follows:

- A. Prior to beginning the analysis work outlined in Section 2.2.8.11, the Applicant shall submit to DelDOT a copy of the data from the tasks completed in accordance with the work outlined in Sections 2.2.8.2 through 2.2.8.10 and corresponding to report topics E through L and T.1 and T.4 in Section 2.2.5. Furthermore, diagrams of future peak hour traffic both with and without site traffic added shall be included in the report.
- B. DelDOT shall review the Preliminary TIS and respond by approving the Preliminary TIS either as submitted or with required amendments or additions. If significant problems are found, e.g., extensive errors in calculating future traffic, a resubmission at this stage will be required.
- C. All content shall be submitted electronically.

2.2.8 Traffic Impact Studies - Content

The TIS shall evaluate the intersection and roadway sections detailed in the Scoping Meeting Memorandum for the proposed development. The following sections list the information that shall be included in the submission.

2.2.8.1 Executive Summary

An Executive Summary shall be included at the beginning of the TIS report. The Executive Summary shall discuss the analysis and conclusions and identify recommended transportation improvements. If the project has changed between the scoping meeting and final TIS, list how it has changed.

2.2.8.2 Site Information

The following information shall be included in site information:

- A. Name(s) and address(es) of the site owner and Applicant
- B. Lot location noting tax parcel numbers, municipality (if incorporated), county
- C. Routes of access, with their direction and milepoint
- D. Size and type and zoning of all existing and proposed land use on the site
- E. A topographic site map (if available) and aerial photos
- F. Sketch plan of site (24" x 36") that includes the right-of-way (throughout), curb lines, entrances and lane striping of both sides of roadways adjacent to the site

2.2.8.3 Project Description

The TIS shall provide a comprehensive project description including, but not limited to, the following:

- A. Site plan showing block number, lot number, lot lines, proposed site access (including existing to remain), and proposed transportation improvements
- B. Project phasing and schedule: development staging identifying the year of development activities per phase and proposed access plans
- C. Narrative on the intended use of the site, including the range of uses allowed without additional land-use approvals and the ITE land use code(s) used to generate trips:
 - 1. Residential developments should be described in terms of number and type of dwelling units, e.g., 32 single-family homes
 - 2. Non-residential uses should be described in terms of use and gross leasable floor area or another relevant descriptor, e.g., industrial type of warehousing, or general or medical office
- D. Frequency of use:
 - 1. Anticipated peak days and hours of operation should be described
 - 2. Any anticipated seasonal variations of use should be discussed
- E. Intensity of use:
 - 1. At a minimum, the proposed use and buildable area (in square feet) of the site must be specified.
 - 2. For residential uses the buildable area (i.e., density) shall be described as the number of dwelling units per acre.
 - 3. For non-residential uses the buildable area shall be described in terms of floor area ratio and gross square footage by use which should be specific (e.g. medical office vs. office).
- F. Digital photographs of the site shall be provided showing sufficient detail of relevant features impacting traffic, including but not limited to, existing and proposed access entrances, adjacent entrances on both sides of the street, and features and intersections within the influence area.

2.2.8.4 TIS Study Area Description

The TIS shall provide a complete evaluation of existing conditions and include maps and tables displaying the following information for the study area identified in the Scoping Meeting Memorandum:

- A. Study Area/Vicinity Map. A map showing the street system including street names, functional classifications and entrance locations as specified in Chapter 3
- B. A description of the study area limits including intersections, roadway weaving sections and ramps to be studied
- C. Schematic diagram(s) of existing and future roadways and intersections including traffic control, geometric features (pavement, lane and shoulder widths, channelization, etc.) sidewalks, bikeways and roadway striping
- D. Any functional, operational or programmatic activities, including public and private operators or carriers, which affect trip making activity such as ridesharing participation, park and rides, transit services, or other travel demand management methods
- E. Intersection lane configurations in the study area
- F. Traffic signal information including traffic signal locations, type and capabilities of existing signal hardware.
- G. Existence of any privately owned shared access agreements or cross access easements
- H. Description, location and schedule of proposed transportation improvements and/or public or private mitigation, within the study area
- I. Digital photographs of each approach of each intersection included within the study area, as well as other locations as may be requested by DelDOT in the Scoping Meeting Memorandum, sufficient to determine relevant features including, but not limited to, traffic controls, striping and signing locations

2.2.8.5 Existing Traffic and Transportation Conditions

The report shall provide an inventory of the following traffic and transportation existing conditions for the Study Area identified in the Scoping Meeting Memorandum:

- A. Narrative and flow diagrams of seasonally adjusted peak hour traffic through the study area and identification of peak hours. **N.B.:** Flow diagrams must be continuous. Separate diagrams of each intersection are not acceptable
- B. Narrative describing existing pedestrian, bicycle and transit conditions within the study area. Transit information shall include routes, stop and shelter locations, route numbers, headways, frequency, passenger boardings, pull outs, and times of service
- C. Existing Condition Traffic Data:
 - 1. Unless explicitly eliminated from the Scope of Work by DelDOT, the Applicant shall provide traffic count data generally taken on a Tuesday, Wednesday, or Thursday, within 12 months of the application date.
 - 2. Classified peak hour manual turning-movement counts for one day shall be supported by one week of machine counts.
 - 3. To be acceptable, manual count volumes must be within 10 percent of the machine count volumes for the same time periods on each approach that day.
 - 4. For weekday a.m. and p.m. peak hours, manual counts shall be factored to agree with the highest of the weekday machine counts for the highest a.m. and p.m. peak hours respectively.

5. For Saturday peak hours, manual counts do not need to be factored if they are within 10 percent of machine counts. To be acceptable the manual count must include the peak hour identified from the machine counts.
6. Two-way (i.e., showing separate counts for each travel direction), all lane, ATRs shall be placed in the locations required in the Scoping Meeting Memorandum. If an ATR malfunctions, the counter should be restarted on the nearest whole day to make up the week (e.g. if a count starts on a Monday morning and the ATR breaks down on Wednesday afternoon, the Monday and Tuesday data will be useable but the count will need to be started again on a Wednesday morning to complete the week).
7. All counts shall be included in the traffic impact study as an appendix. The Engineer shall provide evidence of proper calibration of automatic traffic recorder (ATR) equipment.
8. Traffic counts shall be shown by 15-minute intervals over a period long enough to establish relevant peak hour(s). The manual peak hour count period is generally two hours.
9. Traffic counts shall not be taken on, or the day before or after, holidays or other special events when traffic may not be representative of average daily traffic.
10. Days and times of manual turning movement peak hour counts shall be subject to review and approval by DelDOT and should normally be conducted on a Tuesday, Wednesday, or Thursday from 7 a.m. to 9 a.m. and from 4 p.m. to 6 p.m. However, these days and times may differ depending on the type and location of the development proposed.
11. Counts also shall be provided for weekends if weekends are the peak traffic period for either the existing street or the proposed development.
12. Counts to be made on streets near a school shall be done when the school is in session;
13. If another TIS has been done in the area (provided that counts used in the TIS were taken within the past year) and DelDOT believes that it is relevant to the proposed project, DelDOT may, in its sole discretion, provide copies and the traffic counts from such a TIS may be used. Other traffic counts may be available from the Traffic Section, but must be deemed acceptable by DelDOT prior to their use in a TIS analysis for the project. If DelDOT allows the use of previous count data, it may also require actual sample counts at locations of its choosing to use as a verification of prior counts, and may require adjustments to the prior counts based on sample count verifications.
14. Vehicle classification must be sufficient to address the needs of the TIS, in most cases simply determining a percentage of heavy vehicles. However, where large percentages (i.e., 5 percent or higher) of multi-axle vehicles are present it may be necessary to more finely stratify the classification in order to conform to the machine count. Also, if a turning movement volume is less than 100 vph, 5 percent heavy vehicles shall be assumed and vehicle classification is unnecessary (See Section 2.2.8.11.6.H).
15. Seasonal variations in traffic volumes shall be considered. A seasonal adjustment factor may be provided by DelDOT to be applied to the volumes, and/or DelDOT may require traffic counts during summer periods in eastern Sussex County or along routes containing a high percentage of resort-oriented traffic.
16. During the counting period, the counter shall record the basic weather conditions, and any features or events particular to the count location such as detours, construction, or accidents. These conditions and events shall be included within the traffic count information provided to DelDOT by the Engineer when submitting the counts. An event occurring during the manual count will not necessarily disqualify the count from use in the analysis if the event has not materially impacted traffic flow conditions. However, events such as steady rain, snow-covered

surfaces, accidents or detours which block or substantially lower the rate of traffic flow through an intersection shall automatically require that the intersection volumes be recounted during a period of normal traffic flow conditions. DelDOT in its sole discretion shall determine the validity and usability of count data supplied by the Engineer.

17. Any new traffic counts should be submitted to DelDOT both electronically as Excel or pdf files and as draft report figures showing peak hour volumes posted on continuous flow diagrams of the road network. Individual location diagrams are not acceptable. Peak hour time period, day and date of count shall be shown on the forms.
18. At or after the Scope of Work meeting, DelDOT may approve alternative proposals for counting programs as long as they conform to the intent of the program as outlined above.
19. If an intersection becomes saturated during the count period, such that the queue of arriving vehicles does not clear, the Engineer shall record arrival volumes (arriving at the back of queue) as well as departure volumes (departing the stop line) and conduct their analyses using the arrival volumes. DelDOT will advise the Engineer of times and locations where saturation is expected, but it is the Engineer's responsibility to identify such locations and to record data appropriately. Where queues exceed turning lane lengths, the total queue shall be recorded and turning movements for arrival volumes shall be obtained by assuming that arrivals follow the same distribution of left, through and right volumes as departures. Where queues extend through the next intersection, such that arrival volumes cannot properly be determined, the length of the queue back to that intersection shall be recorded and the situation noted. Figure 2.2.8.5-a, Example of Estimating Arrival Volumes from Departure Counts, shows an acceptable procedure for estimating arrival volumes based on aggregation of the counts into 15-minute periods and one queue length measurement each period. Ideally, volumes and queues should be recorded continually (every cycle where there is a signal) and a similar calculation done each time the queue discharges (for each cycle where there is a signal) to obtain actual arrival volumes.

D. Crash Data:

1. If an intersection in the study area or a location along the site frontage has been addressed in current or past Highway Safety Improvement Programs (HSIPs) the Engineer shall report on the status or results of its inclusion in the program.
2. For all other intersections in the study area and locations along the site frontage, the Engineer shall provide collision diagrams showing crash data for the most recent three-year period for which data is available.

E. Signal Timing:

1. The Engineer shall coordinate with the DelDOT Traffic Management Center to collect signal timing charts, time of day charts, split charts and signal progressions and utilize the acquired information for signalized intersection analysis.

Figure 2.2.8.5.a Example of Estimating Arrival Volumes from Departure Counts

Time Period	Total Departure Count (Vehicles)	Queue Length (Vehicles)	Arrival Volume (Vehicles)
7:00 – 7:15 AM	165	0	165
7:15 – 7:30 AM	135	0	135
7:30 – 7:45 AM	196	0	196
7:45 – 8:00 AM	170	10	170 + 10 = 180

8:00 – 8:15 AM	201	12	$201 - 10 + 12 = 203$
8:15 – 8:30 AM	201	14	$201 - 12 + 14 = 203$
8:30 – 8:45 AM	173	0	$173 - 14 = 159$
8:45 – 9:00 AM	194	0	194
TOTAL	1,435		1,435

2.2.8.6 Trip Generation

The trip generation section of the TIS shall include a narrative describing the methodology used to generate site trips.

Estimates of the proposed development's trip generation shall be made for peak period traffic. Selection of the peak period used in the analysis shall be justified and shall consider, at a minimum, the peak period for the proposed development, and the peak period for surrounding streets. DelDOT may, in the Scoping Meeting Memorandum, require other time periods based on known or anticipated marginal or substandard traffic capacity or traffic safety. Except as directed and approved by DelDOT, trip generation estimates shall be based on ITE's *Trip Generation Manual* using the procedures of ITE's *Trip Generation Handbook*. DelDOT may approve different trip generation rates when trip generation data is not available in ITE's *Trip Generation Manual* or if different methods are justified.

The ninth edition of ITE's *Trip Generation Manual* does not specifically address duplex dwellings, defined as single structures, each containing exactly two distinct dwellings. For the purposes of this chapter treatment of duplex dwellings shall be consistent with their architectural characteristics, (i.e., structures in which two dwellings resembling single-family detached houses share a common wall shall be treated as two single-family detached houses; structures in which two dwellings resembling townhouses share a common wall shall be treated as two townhouses; and structures, in which the dwellings are stacked, one above the other, shall be treated as apartments or condominiums, depending on their form of ownership. DelDOT shall provide the final determination on how a building is to be classified based on its characteristics.

Previous traffic counts at similar sites for the same use may be used with the approval of DelDOT. If new counts are to be done to determine a trip generation rate, the sites to be counted shall be subject to DelDOT review and approval and DelDOT shall be given sufficient notice of the counts that they may be observed to ensure accuracy. Secondary measures of traffic, such as receipt counts or parking lot traffic may be accepted in some cases. In all cases, the method of trip generation must meet with the approval of DelDOT.

A tabular summary indicating the entering, exiting and total trips for a.m., p.m., and weekend peak hours and the weekday and weekend daily trips shall be provided.

2.2.8.7 Trip Distribution

Prior to the scoping meeting, DelDOT shall develop a trip distribution for the p.m. peak hour traffic. DelDOT shall provide that distribution to the consultant at the scoping meeting.

The TIS shall provide:

- A. Trip distribution documentation in the form of a narrative of rationale and procedures, possibly including use of a travel demand model or a site specific survey. Traffic generated by the proposed

development shall be distributed within the study area using engineering judgment based on knowledge of surrounding traffic characteristics.

- B. Proposed trip distributions for the developments to be addressed in the TIS shall be submitted for review with the traffic counts.
- C. Road network diagram(s) of percentage distributions to and from the site shall be included in the TIS report.
- D. Trip distribution shall be done by assigning percentages of the traffic entering and leaving the site to the principal directions of travel. This shall be done separately for different types of land use within the site. Generally, inbound and outbound percentage distributions in the a.m. peak hour should be the reverse of the p.m. peak hour. Where a different distribution is used, it must be justified.
- E. The source of the distribution assumptions shall be noted in this section if it is not original to the report.

2.2.8.8 Traffic Assignment

Prior to the scoping meeting, DelDOT shall develop a trip assignment for the p.m. peak hour traffic. DelDOT shall provide that distribution to the consultant at the scoping meeting.

Road network diagrams of traffic assignment shall be included in the report.

The traffic assignment shall follow logically from the trip distribution. Any special conditions must be explained.

Peak-hour traffic volumes covering the analysis area shall be depicted graphically. They must identify site generated, background, pass-by, and total traffic.

Entering and exiting traffic shall be routed on public roadways and the Applicant's site unless Applicant can demonstrate that there is or will be a cross-access easement. Routing on any other site shall be permitted only with the expressed approval of DelDOT.

The source of the assignment shall be noted in this section if it is not original to the report.

2.2.8.9 Pass-By and Internal Capture Trips

The source for determining pass-by and internal capture trips, such as the *ITE Trip Generation Handbook*, must be used as directed and approved by DelDOT. DelDOT, at its sole discretion may provide guidance to apply pass-by percentages where no information is provided in the *ITE Trip Generation Handbook*.

Justification shall be provided for any credits or reductions for pass-by trips or mixed-use developments. Included shall be an explanation of how these trips are being captured and a demonstration that the existing traffic volume is high enough to support the pass-by rates used. Assumed internalization must be supported by a sketch plan showing a balanced and interconnected site circulation system.

It is important to discuss procedures for estimating pass-by trips and internal capture trips at the Scoping Meeting. An agreement on the rates or an agreement on the approach must be reached at the meeting and included in the Scoping Meeting Memorandum.

2.2.8.10 Future Traffic

Road network diagrams of future peak hour traffic, both with and without site traffic added, shall be included in the report.

There are three acceptable ways of projecting future peak hour traffic:

- A. Through growth factors by which existing volumes should be multiplied
- B. Through assumptions made, in conjunction with, and subject to the approval of, DelDOT and the local zoning/land development agency, as to types and levels of development for the undeveloped land in the study area which are then used to generate and distribute trips for these developments
- C. Through use of forecast volumes from a DelDOT travel demand model

DelDOT shall determine which method, or combination of methods, is appropriate and will consider local requirements in making its determination.

DelDOT shall provide applicable growth factors and/or, if the land development agency requests, a list of committed development to address.

Future peak hour traffic should be calculated for conditions in the project's year of completion (build out year) and, if specified by DelDOT, at other significant conditions such as before or after highway projects are completed:

For residential developments, calculation of the project's year of completion shall assume a total of two years from the Scoping Meeting date for design and plan approvals and a minimum of one year per 50 dwelling units, provided that for a development containing two or more dwelling types (detached houses, townhouses, and apartments) the calculation may be based on the dwelling type that predominates; for developments consisting of apartments only, DelDOT may approve an earlier year of completion provided that it is at least three years from the Scoping Meeting date.

For non-residential developments, calculation of the project's year of completion shall assume a total of two years from the scoping meeting date for design and plan approvals and a minimum of one year of construction.

An exception to the assumption of two years from the scoping meeting date for design and plan approvals may be permitted at DelDOT's sole discretion if the applicant provides a letter from the local land use agency advising that plan approvals can be expected sooner.

When projecting future traffic for locations that are presently saturated, the projections shall be based on counts of the arrival (demand) volumes. Analysis of saturated conditions is further addressed in Section 2.2.8.11.6.J.

Peak hour factors for use in the analysis of future conditions shall be determined when the future volumes are calculated. Future peak hour factors shall be subject to DelDOT review and approval as part of the Preliminary TIS. Calculation of peak hour factors is further addressed in Section 2.2.8.11.6.F.

Heavy vehicle percentages for use in the analysis of future conditions shall be determined when the future volumes are calculated. Future heavy vehicle percentages shall be subject to DelDOT review and approval as part of the Preliminary TIS. Heavy vehicle percentages are further addressed in Section 2.2.8.11.6.H.

2.2.8.11 Analysis

2.2.8.11.1 General Criteria

The impact analysis section shall include a narrative of the standards and methodology used for each element of the analysis.

The TIS shall evaluate access, safety, operation, capacity, circulation, level of service, and performance of the transportation system within the proposed development's Study Area as outlined in this section.

The TIS shall include analysis results in tabular format wherever possible. Tables shall show evaluation criteria, including level of service and delay, for all intersections and roadway segments identified in the Scoping Meeting Memorandum for analysis for each of the following applicable conditions:

- A. Existing
- B. Future without Project
- C. Future with Project and proper entrance
- D. Future with Project, proper entrance, and off-site improvements

2.2.8.11.2 Safety Evaluation

Existing and potential safety problems resulting from conflicting turning movements between and among entrances, intersections, and internal traffic shall be corrected or improved as required.

Entrances on both sides of the streets fronting the site, in both directions, shall be shown on the site plan at lengths as indicated in Figure 3.4.2-a in Chapter 3. The safety evaluation shall include a discussion and, where necessary, calculations demonstrating that movements to and from the entrance will not conflict with the turning movements from adjacent entrances.

On-site entrance stacking and queuing impacts, the on-site roadway network for the project, and the potential for shared access with adjacent development also shall be assessed.

2.2.8.11.3 Geometric Design, Operational and Circulation Improvements

- A. Geometric design, operational and circulation improvements including, but not limited to, acceleration lanes, deceleration lanes, turning lanes, traffic signals, roundabouts, creation of one-way streets, and channelization shall be considered, evaluated, and required when determined necessary.
- B. No operational analysis completed under the TIS process shall be construed to relieve the Applicant of any operational analysis required during the access review for the development.
- C. The need for auxiliary lane analysis should be examined at all intersections itemized and included within the study area outlined in the Scoping Meeting Memorandum.
- D. Auxiliary lanes at entrances shall be examined in accordance with Section 5.2.9, Auxiliary Lanes.
- E. For auxiliary lanes at intersections beyond the site entrances, the following rules apply:
 - 1. Where auxiliary lanes exist at signalized intersections, or a need for them is identified through the Level of Service Analysis discussed in Section 2.2.8.11.6, their storage length should be evaluated or determined in accordance with Section 2.2.8.12.3.D. Deceleration lengths and tapers should be evaluated or determined in accordance with current DelDOT guidance and resources.

See Section 5.2.9, Auxiliary Lanes and the derived Auxiliary Lane Worksheet (<http://devcoord.deldot.gov> > Forms) for more info.

2. At intersections with two-way stop control (includes tee intersections), if auxiliary lanes do not exist and the Level of Service Analysis does not identify a need, the need for major street left turn lanes shall be further evaluated in accordance with applicable guidelines and design standards such as: HCM, *the Green Book*, Section 7.5 of DelDOT's RDM or **NAS**. If, at a specific intersection, the subject development will not add traffic to a major street left turn, this evaluation shall not be required.
3. At intersections with all-way stop, roundabout or signal control, if auxiliary lanes do not exist and the level of service analysis does not identify a need, no further analysis shall be required.
4. The volumes analyzed should be for the future year(s) identified in the Scoping Meeting Memorandum.
5. Average Daily Traffic (ADT) volumes shall be calculated as 10 times the weekday p.m. peak hour volumes for the Future With Project (FWP) condition unless otherwise specified by DelDOT in the Scoping Meeting Memorandum or the review of the Preliminary TIS.

2.2.8.11.4 Adequacy of Sight Distance

Entrance and intersection sight distance requirements shall meet DelDOT standards.

Adequacy of sight distance shall be demonstrated at:

- A. Identified locations within the scope of work area
- B. The proposed road access point(s) for both the existing road configuration and for the ultimate road configuration based on improvements planned for the development and improvements identified in the transportation element of the local government's Comprehensive Plan.

2.2.8.11.5 Impacts and Opportunities for Bicycles, Pedestrians and Transit

- A. The analysis shall identify and evaluate related impacts on bicycle, pedestrian, and transit access, circulation, and facilities.
- B. Opportunities to provide for improved bicycle, pedestrian and transit access and circulation shall be noted in the analysis.

2.2.8.11.6 LOS Analysis

- A. A Level of Service analysis will be used to determine the impacts and required improvements, if any, that a proposed site will have on the roadway network within the study area.
- B. Capacity analyses shall be completed for all intersections, roundabouts, roadway sections, weaving sections and ramps itemized and included within the study area outlined in the Scoping Meeting Memorandum.
- C. The TIS shall include a LOS analysis for each of the following conditions:
 1. Existing
 2. Future without project (FWOP)
 3. Future with project and proper entrance (FWP)
 4. Future with project, proper entrance and off-site improvements (if needed) (FWP and improvements)

Results of the LOS analysis for each condition shall be provided in a tabular format that includes the LOS and delay for each approach analyzed at each analysis location.

- D. Analysis Criteria and Assumptions – Unless expressly authorized by DelDOT, all analyses shall be done in accordance with TRB’s *Highway Capacity Manual* (HCM).
- E. Analysis Software – In general, the analysis should be completed using the Highway Capacity Software (HCS) that implements the HCM, and include completed input worksheets from the HCM software analysis, as well as any printed output from the software. If a detailed output format is submitted, then input worksheets are unnecessary. In addition to, or in place of, analyses using HCS, DelDOT may require corridor analysis, using Synchro or similar software, and simulation analysis, using SimTraffic or similar software. Exceptions to the use of HCS should be identified in the Scoping Meeting if possible.
- F. Peak Hour Calculations – The Applicant’s engineer shall calculate the peak hour factors for existing conditions. Except where saturated conditions exist (see Item J. below) or where directed otherwise by DelDOT to account for an unusual condition, the Applicant’s engineer shall use the total entering volume to determine the peak 15-minute interval and the peak hour and then compute an overall intersection peak hour factor (PHF). Generally existing PHFs shall be applied to future conditions as well. DelDOT may, on review of the existing and projected traffic volumes, authorize use of one of the following three PHFs to be selected according to the total intersection volume in the future conditions. For a total intersection volume of 500 vph or less, use 0.80. For a total intersection volume of 500 vph to 1,000 vph, use 0.88. For a total intersection volume over 1,000 vph, use 0.92.
- G. Lane Utilization Factors – Except as directed by DelDOT, all signalized intersection analyses shall use the HCM default lane utilization factors.
- H. Percentage of Heavy Vehicles – The Applicant’s Engineer shall calculate the percentage of heavy vehicles from traffic counts. For unsignalized intersections, the percentage of heavy vehicles shall be calculated separately for each turning movement. For signalized intersections, the percentage of heavy vehicles shall be calculated separately for each lane group. Where DelDOT finds the traffic counts to be a poor indicator of future heavy vehicle percentages, e.g. where the counts are very low and significant growth is expected, DelDOT may authorize the use of the following default values: 7% and 9% for two-lane highways and multi-lane highways, respectively, in rural areas; 6% and 8% for two-lane highways and multi-lane highways, respectively, in all other areas; and 3% for intersections. To account for traffic from specific uses that generate high heavy vehicle volumes, e.g. industrial facilities, or low heavy vehicle volumes, e.g. residential developments, DelDOT may specify higher or lower percentages.
- I. Base Saturation Flow Rates – North of the Chesapeake and Delaware (C&D) Canal, base saturation flow rates for signalized intersections shall be maintained at the HCS default value of 1,900 pcphgpl. South of the C&D Canal, base saturation flow rates for signalized intersections shall be reduced to 1,750 pcphgpl unless data is available or provided to indicate that a higher value is appropriate. Procedures for collecting such data are provided in Chapter 16, Appendix H of the 2000 HCM and Chapter 31 of the 2010 HCM. The Applicant’s engineer is encouraged to collect data where little or none is available.
- J. Saturated Conditions – Where a road segment, or one or more approaches of an intersection, is observed to be saturated for existing conditions (See Section 2.2.8.5, item 19) the Applicant’s engineer shall use demand volumes and a PHF of 1.00 and shall analyze a minimum of the highest four consecutive 15-minute periods. The number of 15-minute periods analyzed generally shall be expanded to capture the entire peak period. Where saturated conditions exist for several hours at a time, DelDOT may, on review of the traffic counts, authorize analysis of as few as the highest four consecutive 15-minute periods.

For analysis of future conditions, where the existing condition is saturated and saturation is expected to continue, the demand volumes for each of the highest four consecutive 15-minute periods shall be increased equally to project future volumes (unless there is a known reason to weight the increase to one or more specific periods), a PHF of 1.00 shall be used and multi-period analysis shall be performed for the highest four consecutive 15-minute periods.

2.2.8.12 LOS Standards

2.2.8.12.1 General

LOS standards shall be applied based on the location of the proposed development.

A. Development in Developed, Developing or Planned Development Areas:

If a proposed development is located within a developed, developing or planned development area, all intersections, roundabouts, roadway sections, weaving sections and ramps analyzed will be subject to the LOS standards for those areas even if the intersection, roundabout, roadway section, weaving section or ramp is in a rural area.

B. Development in Rural Areas:

If a proposed development is located in a rural area, all intersections, roundabouts, roadway sections, weaving sections and ramps shall be subject to the LOS standards for such areas even if the intersection, roundabout, roadway section, weaving section or ramp is inside a developed, developing or planned development area.

C. Local Government Standards:

DelDOT recognizes that the standards in this manual will not be appropriate to all areas. A local government, as part of its adopted comprehensive plan, may determine that acceptance of a lower LOS (D, E or F) for some portion of the day is necessary and appropriate for the pattern of development they seek to create. If a proposed development is located in, or affects, such an area, DelDOT will consider the local government's standards to the extent that adherence to them does not result in substandard LOS or an unacceptable operational condition outside that area.

D. Development in Areas Designated for Re-Development:

If a proposed development is located in an area, or on a land parcel or parcels of land, designated as a "re-development" site by either state or local government, with local government concurrence DelDOT may accept the existing Level of Service provided that the proposed development makes sufficient improvements, to DelDOT's satisfaction, to retain the existing measured Level of Service.

2.2.8.12.2 Uninterrupted-Flow Standards

LOS for uninterrupted-flow locations will be measured by density and volume to capacity ratio (V/C) and conform to the values shown in the appropriate exhibits in the HCM (Exhibits 15-3, 14-4 and 11-5 of the 2010 HCM).

When a development is in a developed, developing, or planned development area, an increase in the uninterrupted-flow V/C ratio to the low point of LOS D (approaching LOS E) will be allowed.

When a development is in a rural area, an increase in the uninterrupted-flow V/C ratio to the low point of LOS C (approaching LOS D) will be allowed in the FWP condition.

In analyzing facilities for which HCS does not calculate V/C ratios, e.g. multi-lane highways and freeways, separate calculation is required as determined by DelDOT.

2.2.8.12.3 Signalized Intersection Standards

All signalized intersections shall be analyzed using the following criteria for evaluating impacts and needed improvements:

- A. Sites in developed, developing or planned development areas: For each intersection, deterioration up to 55 seconds (the bottom of LOS D) will be allowed for the FWP Condition.
- B. Sites in rural areas: For each intersection, deterioration up to the 35 seconds (bottom of LOS C) will be allowed for the FWP condition.
- C. For saturated conditions, multi-period analysis shall be required and overall intersection delay for the peak period shall be calculated as the mean overall intersection delay for the four peak 15-minute periods.
- D. Regardless of LOS, for unsaturated conditions, DelDOT shall require turning lane improvements to accommodate 95th percentile queue lengths. For saturated conditions, DelDOT shall require turning lane improvements to accommodate 80th percentile queue lengths for fourth of the four peak 15-minute periods.
- E. The analysis shall document that the impacts of queuing from adjacent intersections or traffic restrictions have been addressed.
- F. The analysis shall document the interaction of conflicting movements at adjacent entrances.
- G. The analysis shall note changes made in signal timing and phasing (i.e. protected, permitted, etc). The Applicant shall obtain approval from DelDOT prior to incorporating phasing changes in its analysis.
- H. Minimum green times must be equal to or greater than minimum pedestrian crossing times on each approach unless specifically authorized by DelDOT.
- I. If there is a traffic signal within 2,640 feet of the site, an arterial analysis as in the HCM Chapter 15 may be required.
- J. In determining the signal timing for FWOP it shall be assumed that the existing traffic signal hardware will still be in use. Any recommendations for timing modification must be supported by the hardware and appropriate for the future year no-build traffic volumes. The build analysis may use traffic signal timing changes that are possible with new traffic signal hardware, provided the hardware is a recommendation for mitigation, and should comply with the standards for progression.

In addition to the HCM analysis, the TIS shall include Critical Movement Summation forms in an Appendix to the TIS for all existing or proposed signals. CMS calculations shall be done using the standard form shown in Figure CMS-4 in DelDOT's *Critical Movement Summation (CMS) How-To Guide* which can be found online (for more information go to <http://devcoord.deldot.gov> > Guidance).

2.2.8.12.4 Roundabouts

References to the HCM and HCS notwithstanding, the 2010 HCM shall be used for the analysis of roundabouts. For developments in developed, developing or planned development areas, the minimum acceptable LOS shall be D. For developments in rural areas, the minimum acceptable LOS shall be C.

2.2.8.12.5 Unsignalized Intersection Standards

For unsignalized intersections LOS will be measured by control delay per the appropriate exhibits in the HCM (Exhibits 17-2 and 17-22 of the 2000 HCM, or Exhibits 19-1 and 20-2 of the 2010 HCM).

Turns may not cause excessive disruption to through traffic and may not be allowed when acceptance of substandard gaps is promoted. In some cases, elimination of the movement and diversion of the demand to a nearby location is the preferred treatment. Comments on the interaction of conflicting movements at adjacent access points may be required.

For developments in developed, developing or planned development areas, the maximum allowable delay for each movement shall be 35 seconds (bottom of LOS D) in the FWP condition.

For developments in rural areas, the maximum allowable delay for each movement shall be 25 seconds (bottom of LOS C) in the FWP condition.

Unacceptable delay during a peak hour at a site entrance is not necessarily a justification for the installation of a traffic signal. While the installation of a signal may be appropriate at some point, in which case an agreement to fund that signal shall be required, DelDOT determines whether to install signals on the basis of 12-hour warrant studies.

Where the FWP volume on a stop-controlled approach would be 10 vph or less, any LOS problem that might exist is considered to be negligible and its mitigation is not required.

2.2.8.12.6 Weaving Area Standards

For the weave area, LOS will be measured by weaving speed and non-weaving speed and conform to the values shown in the appropriate exhibits in the HCM (Exhibit 12-10 of the 2010 HCM).

For non-freeways, the potential for site traffic to cause deterioration of the weaving area traffic flow and the methods to quantify such deterioration shall be discussed at the scoping meeting. Although weaving and non-weaving speeds are independent, it is desirable that these speeds be balanced. The addition of FWP traffic shall maintain the balance.

2.2.8.12.7 Ramp Standards

Ramp standards are based on density, the primary measure of effectiveness, and the level of service criteria shown in the appropriate exhibits in the HCM (Exhibit 13-2 of the 2010 HCM).

- A. For a study location applicable to a site in a developed, developing or planned development area, with a merge or diverge influence area, the maximum allowable density shall be to 35 pc/mi/ln (bottom of LOS D) in the FWP condition.
- B. For a study location applicable to a site in a rural area, with a merge or diverge influence area, the maximum allowable density shall be 28 pc/mi/ln (bottom of LOS C) in the FWP condition.

2.2.9 Traffic Impact Studies - Mitigation Identification

In order to protect the Delaware transportation system from potentially adverse impacts of the proposed development, to fulfill an identified need for public services within the impacted area related to the development, or both, mitigation measures will be required when deficiencies have been identified or LOS results do not meet the standards set forth in Section 2.2.8.12.

The TIS shall identify methods of mitigating on-site and off-site deficiencies for present and proposed phases of the development. The report shall indicate the level of improvement to the deficiency, including the capacity deficiencies identified in Section 2.2.8.12, provided by the mitigation.

[Guidance] The focus of the traffic analysis or mitigation should not be limited to the specific location where an unacceptable deterioration of the LOS standards has been identified. In many cases it is preferable to direct site-generated traffic to other roadways. In other cases, improvements apart from the deficient location may divert enough background traffic to make room for the site generated traffic and thus mitigate the impacts. Most capacity analyses assume that each intersection is acting independently; therefore, the analysis must account for the presence and operational characteristics of adjacent entrances.

The TIS shall list any factors that have been modified during analysis and the reasons for the modification.

Build out year and project phasing impacts shall be considered in the mitigation section of the report.

Mitigation shall be consistent with improvements identified in the transportation element of the relevant local government's Comprehensive Plan. At a minimum, the TIS shall consider ultimate rights-of-way and additional streets, bicycle, transit, and pedestrian connections and extensions and intersection improvements that are identified in the Transportation Element of the relevant local government's Comprehensive Plan. Mitigation measures may also include, but are not limited to, additional street connections and street extensions, turn lanes and turn lane extensions, signalization, signal modifications, installation of medians, shared access and other access management strategies, geometric improvements such as lane geometry improvements, and intersection realignments, structure widenings, frontage roads, local or collector roads, and alternative access.

Where stop-controlled intersections do not meet the minimum performance standard, an additional street connection or a street extension to distribute traffic from the site to another access point, preferably on a different road, shall be considered as a potential mitigation measure.

Mitigation measures must be evaluated with regard to their operational safety and effectiveness before being recommended. A measure that provides adequate capacity but creates an operational problem is not acceptable.

Mitigation measures must also be evaluated with regard to their context. As mentioned above, mitigation shall be consistent with improvements identified in the transportation element of the relevant local government's Comprehensive Plan. The transportation element of such a Plan should include any designated Delaware Byways, but regardless, any proposal to widen or otherwise improve a designated byways must be consistent with the Management Plan for that byway if such a plan exists.

[Guidance] Mitigation measures with regard to transit (See Section 2.2.8.11.5) may include waiting pads, sidewalk, benches, shelters, crosswalks and financial contributions toward such facilities, bus service or the maintenance or expansion of Park and Ride Facilities. It is important to recognize that most of the mileage on most bus routes is two-way: buses follow the same set of roads first in one direction and then in the other. Therefore, bus stops and their associated facilities ordinarily should be installed in pairs on opposite sides of the road. Where this has not occurred previously, an important mitigation measure may be to install the missing stop and facilities on the opposite side of the road.

Mitigation measures that involve changes in the number or usage of lanes at an intersection or the phasing at a signalized intersection will require conceptual approval from DelDOT prior to submission of the TIS. If the Applicant's engineer or DelDOT's engineer proposes mitigation that involves such measures, then they shall meet with representatives of DelDOT's Traffic and Development Coordination Sections, preferably at the same time, to discuss those changes and seek approval before submitting the TIS for review. If a measure is not approved, the engineer is responsible for finding an acceptable alternative. The engineer shall document the meeting(s) in the TIS, including the date(s) of the meeting(s), the names

of those attending, the measures discussed, and the results of the meeting(s). Failure to obtain approval for mitigation measures that require it shall be cause for DelDOT to return the TIS for revisions.

[Guidance] The mitigation section of the TIS may include a travel demand management plan in accordance with DelDOT and local requirements. This is an optional plan. The trip reduction anticipated in an approved travel demand management plan shall be deemed to reduce the site trips, thereby also reducing site traffic impacts and associated fair share financial obligations.

2.2.10 Traffic Impact Studies - Recommendations

If safety or capacity analyses using the existing or anticipated highway system and full development show that unsatisfactory levels of service will result, or that pedestrian, bicycle and transit accessibility, safety or compatibility is compromised, recommendations should be made as to how this may be prevented.

Recommendation Narrative – A narrative discussing the recommendations, including a development phasing plan, if needed, to maintain Levels of Service in accordance with Section 2.2.8.12 shall be included in the recommendations.

Access Driveway/Entrance – In all cases, a site entrance that meets the requirements of access in accordance with DelDOT's *Development Coordination Manual* shall be required.

All proposed improvements shall be supported by, and consistent with the analyses performed.

The following types of recommendations are anticipated:

- A. Phasing development to the completion of programmed highway projects
- B. Reducing the proposed density of development (where appropriate), or construction of off-site improvements by the Applicant
- C. Improvements necessary for safe and efficient flow of vehicle, bicycle, pedestrian, and transit movements and access
- D. Operational improvements to the roadway network
- E. Travel Demand Management Strategies

2.2.10.1 Depiction and Inclusion of Recommendation Support

All proposed recommended mitigation improvements that involve signing, striping or construction, including needed off-site improvements, as well as all site entrance(s) shall be illustrated at a scale of no more than 1" = 100', with 1" = 50' or 1" = 30' preferred. The drawing(s) shall show both existing and the recommended improvement conditions. In cases where improvement conditions repetitively extend, the improvements may be shown with line extensions between the end points of the improvement if there are no significant changes to the proposed features within the extensions.

If the recommended improvements include the installation of a traffic signal or the re-timing of an existing signal, the proposed timing shall be appended to the TIS. Proposed signals that would be needed the day a development opens, such as at a shopping center entrance, shall be supported by 12-hour MUTCD warrant investigations. Copies of those investigations shall be appended.

2.2.11 Traffic Impact Studies - Required TIS Appendices

Appendices shall include the following:

- A. Traffic count summary sheets
- B. Collision diagrams
- C. List of committed developments
- D. Trip generation, distribution and assignment calculations for the subject development and all committed developments
- E. Capacity analysis worksheets or reports
- F. Critical movement summation forms and signal timing sheets for all signalized intersections in the study area
- G. DelDOT and Applicant correspondence
- H. Support for recommendations

2.3 TRAFFIC OPERATIONAL ANALYSIS

A Traffic Operational Analysis (TOA) is an evaluation or series of evaluations conducted during the review of subdivision, land development and entrance plans primarily intended to determine site entrance location and movements to be allowed at the site entrance. These evaluations may include Queuing Analysis, Highway Capacity Manual (HCM) Analysis, and Crash Analysis. A TOA is usually, but not always, more limited in scope than a TIS.

2.3.1 Traffic Operational Analysis - Introduction

To ensure safe access to all proposed land development plans, the developer may be required to prepare an operational analysis for review by DelDOT. This operational analysis shall consist of but is not limited to one or more of the following evaluations:

- A. Queuing Analysis – This analysis is required to determine whether existing and proposed left-turn lane at the site entrance and nearby intersections is adequate. The 95th percentile maximum queue shall be used for the purpose of this analysis.
- B. Highway Capacity Manual (HCM) Analysis – This analysis is required to determine whether the operation of the site entrance and nearby intersections is adequate. HCM analysis should follow the requirements as described in Section 2.2.2.
- C. Crash Analysis – This analysis is required if the entrance is proposed at a known or alleged high crash location to determine whether a problem exists, and if so, how the entrance might relate to the problem, and what remedies might be possible.

This information shall be used to determine what modifications or improvements need to be made to ensure safe access to the State-maintained roadway system.

2.3.2 Traffic Operational Analysis - Rules for a Requirement of a TOA

DelDOT may require a TOA for any development project that is expected to generate 200 or more vehicle trips per day and for which a TIS was not completed. DelDOT shall require a TOA for such a project if:

- A. As part of a plan review process, DelDOT identifies a potential problem in the operation of the site access, such that information obtainable through a TOA is needed to properly review the plan and determine what access to permit.
- B. In considering whether a development should be required to participate in a TID or instead perform a TIS (See Section 2.2.2.4.) DelDOT or the County determines that additional LOS information is needed at the site access or an adjoining intersection. For example, information may be needed to determine whether a local concurrency requirement is met.

If a development project's scope changes after DelDOT and the Applicant have agreed upon the initial scope of study, DelDOT may revisit the scope of a TOA that is being prepared, or require a new TOA or a Traffic Impact Study (TIS).

If the TOA is not needed with respect to Section 2.2.2.4 and the project developer agrees to make traffic improvements determined by both the Subdivision Engineer and the Chief Traffic Engineer, or designee, to adequately address the concerns that prompted the initial requirement of a TOA, DelDOT may waive the requirement for the TOA.

Projects that do not generate 200 or more vehicle trips per day will not be required to complete a TOA.

The TOA, if required, must be reviewed and accepted by DelDOT prior to the issuance of a Letter of No Objection to Recordation.

Other traffic analyses that may be required in addition to a TIS or TOA in the review of land development plans may include traffic signal justification analysis, and/or the development of a Transportation Management Plan (TMP). A traffic signal justification analysis will likely be required to be performed by the developer if it is desired or expected that a new traffic signal will need to be installed concurrent with or soon after the opening of a new development. A TMP may be required for large projects, or projects that impact roadways on the National Highway System (NHS).

2.3.3 Requirements of a New TOA

If a TOA is prepared for a proposed development and DelDOT finds that existing or projected future conditions in the study area have changed significantly after the completion of the TOA, DelDOT may require a new, revised, or updated TOA at its sole discretion before issuing a Letter of No Objection to Recordation or, where a DelDOT Letter of No Objection to Recordation is not required, before approving entrance plans. DelDOT will take reasonable measures in scoping the study to avoid the need for additional work once the study is complete. However, it is the Applicant's responsibility to obtain plan approvals while their TOA is still valid and to demonstrate that validity as necessary.

2.4 TRANSPORTATION IMPROVEMENT DISTRICTS

2.4.1 Transportation Improvement Districts - Introduction

A Transportation Improvement District is a geographic area defined for the purpose of securing required improvements to transportation facilities in that area.

Essential to the creation of a Transportation Improvement District (TID) is the development of a comprehensive and specific plan for land use and transportation within the geographic area of the District. The existence of such a plan allows DelDOT and the local land use agency(ies) to assess developers building in accordance with the plan for the cost of needed transportation improvements in a more comprehensive way than a TIS specific to one development affords. See also Section 2.2.2.4 regarding the relationship between TIDs and TIS.

It is to be expected that there will be significant differences between TIDs in the terms of their land use and transportation characteristics. Because DelDOT creates TIDs in partnership with local governments there will necessarily be differences in their administration as well. The purpose of Section 2.4 is to set forth DelDOT's requirements and recommendations for the elements of a TID.

A TID may include lands under the jurisdiction of more than one local government. Particularly near municipal boundaries, this condition is to be expected.

2.4.2 Transportation Improvement Districts - Required Elements

2.4.2.1 Land Use and Transportation Plan (LUTP)

An LUTP should be completed for the TID based upon the forecast described in Section 2.4.2.5 below, identifying the improvements needed to bring all roads and other transportation facilities in the TID up to applicable State or local standards, including the service standards described in Section 2.4.2.6 below.

2.4.2.2 TID Agreement

DelDOT and the local government(s) in whose jurisdiction(s) the TID is located should enter a written agreement regarding it and addressing the following subjects:

- A. The initial boundaries and target horizon year for the TID and procedures for amending them
- B. Roles and responsibilities with regard to creation of the LUTP
- C. Service standards to be used in developing the LUTP (See also Section 2.4.2.6)
- D. Implementation of the improvements identified in the LUTP (See also Section 2.4.2.8)

2.4.2.3 Boundaries

A TID must have distinct boundaries such that one can determine what parcels are in the TID and what parcels are not. Where possible those boundaries should follow geographic features that are easily identified, are rarely altered and generally do not cross parcel lines, such as railroad lines and major drainage courses. An exception to this rule is that roads are not desirable boundaries. Absent a good reason to the contrary, TID boundaries should follow Traffic Analysis Zone (TAZ) boundaries for ease in working with population and employment projections (See Section 2.4.2.5 below).

2.4.2.4 Target Horizon Year

A TID must have a target horizon year for which population and employment is forecast in creating the TID. Usually, but not always, this year should be 20 years from the creation of the TID. As the LUTP for the TID is revised (See Section 2.4.2.7 below) the target horizon year may be adjusted.

2.4.2.5 Land Use Forecast

The LUTP for the TID must include a quantitative, parcel-specific forecast of land use in the TID. The forecast can be either in terms of population and jobs (classified by employment type) or in terms of numbers of dwelling units and floor areas of non-residential uses, such that DelDOT can calculate population and jobs. The forecast must have the following components:

- A. Existing land use as of a specific date
- B. Development approved and/or recorded but not yet built as of that date
- C. Development expected or in the land development process but not approved as of that date
- D. Development not yet proposed but projected by the target horizon year, based on population and employment forecasts, and the current Comprehensive Plan(s) and zoning map(s)

2.4.2.6 Service Standards

Service standards must be established for the TID, in the creation of the LUTP, to specify what is considered adequate transportation infrastructure. Service standards may include Levels of Service but shall also include desired typical sections for local, collector and arterial streets, and standards for the presence and frequency of transit service. Typically one standard will apply throughout the TID but there may be locations where a different standard is specified. The standards should be set collaboratively by DelDOT and the local governments involved, with some measure of public involvement. Review and approval of the standards by a local government committee at a public meeting constitutes public involvement.

2.4.2.7 Adoption in the Local Governments' Comprehensive Plan(s)

The Comprehensive Plan(s) should list and map any TIDs, and incorporate by reference any completed LUTPs and TID agreements. When a local government updates their Comprehensive Plan, they should also initiate an update of the LUTPs and TID agreements for those TIDs.

2.4.2.8 Infrastructure Fee Program

Where possible the TID Agreement shall estimate the costs of the improvements contemplated in the LUTP and apportion the cost of those improvements such that developers seeking plan approvals must either make improvements identified in the LUTP or contribute toward improvements to be made by others, and developers doing more than their share of improvements can be compensated. The program will allow developer contributions to take the form of cash payments, construction, land needed for rights-of-way (in excess of those needed for the development streets and dedications addressed in Section 3.2.5) or a combination of the three. Administration of the program should be specific to the TID with which it is associated. For each TID the funds received from developers should be held by DelDOT, or a participating local government, in a fund dedicated to transportation improvements within that TID alone.

2.4.2.9 Transitional Rules for Certain Pre-existing TIDs

The terms of the Memorandum of Agreement or other mechanism used to create and implement TIDs or their functional equivalent in existence as of May 10, 2013 may conflict with the Required Elements described in Section 2.4.2 hereof. In such cases, the adoption of these Required Elements in lieu of existing provisions may be negotiated and agreed as between the Department and the participating local governments. Otherwise, the existing terms will continue in force and effect.

2.4.3 Transportation Improvement Districts - Recommended Elements

2.4.3.1 Master Plan

Where possible, creation of a TID should be part of the development of a master plan for the area encompassed by the TID. A broad and holistic approach, such as outlined in the *Guide for Master Planning in Delaware* will necessarily yield a better land use forecast and an LUTP with greater public acceptance and support than will a planning effort conducted solely by local land use agency and DelDOT staff.

2.4.3.2 Monitoring Program

It may be appropriate to make transportation improvements gradually over time. In such situations the TID Agreement should include a program for monitoring conditions in the TID to determine when design and construction of the next level of improvements should be started. Such a program will involve tracking land development, transportation improvements and the need for transportation improvements in the TID and will provide information necessary for updates of the LUTP. Administration of the program should be specific to the TID with which it is associated. A surcharge may be added to the infrastructure fee described in Section 2.14.2.8 to fund the monitoring program.

2.4.3.3 MPO Participation

[Guidance] Where one exists, a Metropolitan Planning Organization (MPO) can provide assistance in the development and monitoring of an LUTP. An MPO can be of particular value in coordinating land use information where multiple local governments are involved. It may be appropriate to include the local MPO as a party to a TID agreement.

2.4.3.4 Build-out Analysis

[Guidance] While it is possible to create a TID considering only a target horizon year (See Section 2.4.2.4), examination of conditions when all land in the TID is considered to be fully developed can often be useful in the planning process. If build-out analysis is to be done, the TID Agreement should specify what degree of development is considered to be build-out, and what use is to be made of the results of the analysis.

2.5 AGREEMENTS

2.5.1 Agreements - Signals

The need for installation of new traffic signals and/or the modification of existing traffic signals to accommodate traffic from commercial establishments or subdivisions shall be determined by DelDOT.

When DelDOT, in its sole discretion, determines that a traffic signal may be required in the future or that an existing traffic signal requires modification, the developer shall enter into a Traffic Signal Agreement (TSA) with DelDOT prior to obtaining entrance approval. DelDOT shall consider the need for a TSA in the following situations:

- A. A Traffic Impact Study (TIS) or a Traffic Operational Analysis (TOA) has identified a need for a new signal or modifications to an existing signal.
- B. A DelDOT plan review has identified a need for signal modifications, possibly including implementation of safety mitigation measures identified by DelDOT's Hazard Elimination Program (HEP) and/or installation of pedestrian improvements, to provide for safety. Projects that abut an existing signalized intersection (including corner lots and parcels that have frontage on two roads that intersect at an existing signal) will at DelDOT's discretion be required to perform identified safety improvements and/or pedestrian improvements to complete connections to and/or crossings of that intersection. Pedestrian improvements may include but are not limited to: design, pedestrian signals, crosswalks, curb ramps, refuge islands, sections of sidewalk, conduit, junction wells, signing and striping.
- C. Access to a school is proposed.
- D. Access is proposed as an additional leg at an existing signalized intersection.

The TSA shall be kept on file by the DelDOT Traffic Section and used to assess costs when DelDOT finds it necessary to install or modify a signal at the location addressed in the agreement. The assessed costs will include both construction costs and a onetime fee to cover long-term maintenance costs. The Department will not separately track the maintenance funds collected, and may use these funds for any signal maintenance purpose, statewide.

Should a project impact, or reasonably be expected to impact, DelDOT traffic signal or Integrated Transportation Management Systems (ITMS) infrastructure, the developer may be required to relocate the infrastructure, enter into an agreement to fund the relocation of the infrastructure, or some combination thereof at DelDOT's discretion.

The following representative (but not exhaustive) types of information must be supplied to the DelDOT Traffic Section for the preparation of the agreement. See DelDOT's *Sample Traffic Signal Agreement Letters* which can be found online (for more information go to <http://devcoord.deldot.gov> > Forms).

- A. Name and address of the company or developer entering into the agreement
- B. Name and address of the development or subdivision
- C. Name of all intersections and/or streets affected (location of signal)
- D. Name and title of the person who shall be signing the agreement
- E. Phone number for the person who shall be signing the agreement.

2.5.2 Agreements - Off-Site Improvement Agreement

During the land development process, DelDOT may refer to a previously identified need, or determine the need for road improvements beyond the entrance to the site. These improvements shall be required as part of the entrance approval. The developer shall enter into an Off-Site Improvement Agreement (agreement) with DelDOT outlining the implementation of the improvements. The agreement may include the design, right-of-way acquisition, construction, and inspection of the improvements, or any part thereof, as determined by DelDOT. Alternatively, where there is another party, e.g. DelDOT or another developer, already preparing to make the improvements, the agreement may be for a monetary contribution toward the construction of the improvements. This agreement shall be executed prior to entrance plan approval. See Section 2308 of the Delaware Administrative Code “*2308 Development Related Improvements Requiring New Rights-of-way*” which is available online, (for more information go to <http://regulations.delaware.gov/AdminCode/title2/2000/2300/>) for guidance regarding improvements requiring new rights-of-way and refer to DelDOT’s online content for sample public road construction applications, forms and agreements (for more information go to <http://devcoord.deldot.gov> > Forms).

2.5.3 Agreements - Traffic Mitigation Agreements (TMAs)

Land use agencies may have adopted specific level of service or adequate facilities requirements. If these requirements cannot be met, the applicant may, through the local land use agency’s process, seek a waiver from such level of service requirements. As a condition of such a waiver, a Traffic Mitigation Agreement between the applicant and DelDOT shall be executed. DelDOT’s participation in such agreements shall not be unreasonably withheld.

2.5.4 Traffic Signal Revolving Fund

Under certain circumstances, described below, a developer has the option of voluntarily contributing to a Traffic Signal Revolving Fund (TSRF) in lieu of entering into a signal agreement. Advantages for the developer include knowing at the outset the amount they will need to pay and when that amount will be due. Advantages for DelDOT include the certainty that the payment will in fact be made and there will be funds available that are derived from a dedicated source of revenue.

DelDOT reserves the right to determine the appropriate location, configuration and implementation of all new and modified traffic signals paid for through use of this TSRF.

2.5.4.1 Improvements Qualifying for Use of the TSRF

The TSRF may be used to plan, design, construct, upgrade and maintain a traffic signal. Appropriate uses include signal equipment, pedestrian signals, crosswalks, curb ramps, refuge islands, sections of sidewalk, conduit, junction wells, cameras, interconnection, signing, striping, engineering and right-of-way needed for the signal installation.

2.5.4.2 Improvements Not Qualifying for Use of the TSRF

- A. If a development directly impacts existing signal equipment, e.g. development of a corner property, the developer must relocate DelDOT’s equipment or pay immediately for the repair, relocation or upgrade of the equipment, or some combination thereof, at DelDOT’s discretion. Use of the TSRF is not applicable or intended for this purpose.

- B. The TSRF shall not be used for turning lanes, realignments, or other geometric improvements.
- C. If Physical improvements are required as per the approved construction plans which require traffic signal modifications or installation, the developer must enter into a Traffic Signal Agreement.

2.5.4.3 Payments into the TSRF

- A. Any development that is qualified with respect to the criteria described in 2.5.4.1 and 2.5.4.2 and has been determined to be contributing to the future need to modify or install a traffic signal, will be given the option to contribute to the TSRF in lieu of executing a signal agreement that will require future payment. However, if the development has been determined to create the need for a current modification or installation of a traffic signal, then a TSA shall be required, and the TSRF shall not be an available option to pursue.
- B. The Development Coordination Section shall be responsible for informing developers of their option to pay into the TSRF, for determining the amount of their contribution in accordance with Section 2.5.4.5 below, and for ensuring that the funds are received prior to issuing entrance approval.
- C. Concurrent with payment into the TSRF, the developer will enter into a Traffic Signal Revolving Fund Agreement (TSRFA) which will memorialize the fact that they have no further financial obligations associated with a particular development to fund existing or future traffic signals at the intersection or intersections in question. They will also be informed that there is no guarantee a signal will be installed when and where they may want it.

2.5.4.4 TSRF Administration

- A. DelDOT will pool the funding that is collected from various developers related to various intersections into two separate funds: one for new traffic signals/major upgrades, and the other for regular maintenance. The construction fund may be used by DelDOT to fund a new traffic signal or modify an existing traffic signal related to any land development project. The maintenance fund may be used for any legitimate traffic signal/ITMS maintenance purposes, statewide.
- B. As traffic signal projects become justified, funding from the developer contributions to the Traffic Signal Revolving Fund will first be used. If this fund runs out, then state funding would be used to support the project.

2.5.4.5 Costs and Cost Allocation

- A. The current construction cost of installing a new signal, for purposes of contribution to the TSRF, is estimated to be \$200,000. This estimated cost will be updated periodically in the future, as costs change. An update of this cost will be documented via a memorandum from the Chief Traffic Engineer to the Assistant Director of Planning, Development Coordination, and will be posted on DelDOT's web site. If a design for a signal has proceeded such that the actual cost is available, this actual cost will be substituted for the estimated cost.
- B. The cost of maintaining a signal is highly variable. For purposes of contribution to the TSRF, the amount is five percent of the amount contributed. This five percent represents an anticipated expense of \$1,000 per year for ten years for a new signal costing \$200,000. The Department will assume maintenance costs that exceed the five percent. Once collected, these funds will be transferred to the signal maintenance operating budget. The Department will not separately track these maintenance funds, and may use these funds for any signal maintenance purpose, statewide.

- C. If a developer must modify an existing signal, the Traffic Section shall prepare a cost estimate specific to the work to be done. An additional five percent of the construction cost will be added for maintenance costs.
- D. A developer seeking access on a State-maintained road with no access opposite them shall pay into the TSRF at 105 percent of the current established signal construction cost (includes five percent for signal maintenance).
- E. If costs are to be allocated based upon proportional share, traffic on all existing movements should be counted. Where possible, existing counts should be used rather than obtaining new ones. Counts done for studies associated with the subject development shall generally be considered sufficiently recent. The Development Coordination Section shall determine whether previous counts can be used.

If costs are to be allocated based upon proportional share, the calculations shall be done using weekday evening peak hour volumes unless the Development Coordination Section determines that another analysis period is more appropriate to the specific situation.

If costs are to be allocated based upon proportional share, and it is necessary to project volumes to and from committed and proposed developments, the projected volumes shall be calculated using ITE's Trip Generation Manual where applicable. The Development Coordination Section shall determine applicability and will rule on any alternative methods of trip generation. The Development Coordination Section shall also develop or review and approve all trip distribution calculations and network assignments.

- F. For intersections beyond the site access, where the need for a future signal or a modification of an existing signal, has been identified, the developer must enter a signal agreement or pay into the TSRF. Payment into the TSRF shall be based on the developer's share of the existing background traffic plus committed and proposed development traffic.

Example:

Approach	Movement	Existing Traffic (vehicles per hour)	Committed Development Traffic (vehicles/hour)	Existing + Committed vehicles per hour)	Proposed Development Traffic (vehicles per hour)
Northbound	Left	50		50	56
	Through	25	25	50	6
	Right	75		75	38
Southbound	Left	50	28	78	
	Through	25	3	28	50
	Right	75	19	94	
Eastbound	Left	50	175	225	
	Through	1,500		1,500	
	Right	75		75	350
Westbound	Left	75		75	500
	Through	1,500		1,500	
	Right	50	250	300	
Total		3,550	500	4,050	1,000

For a new signal, the developer would pay \$41,580 into the TSRF, i.e. 20.79 percent ($1.05 \times (1,000/(1,000+4,050))$) of the cost (\$200,000) of a signal. For a modification of an existing signal, the percentage would be the same but the base cost would be reduced to reflect the smaller construction cost.

Note: The term “committed” shall be interpreted as defined in the Preface, Section P.5 Definitions. The Development Coordination Section shall determine which developments to include as committed in the calculations for a specific intersection and proposed development.

- G. Where a development depends on a nearby intersection for access, e.g. a corner parcel, (including parcels that have frontage on two roads that intersect at an existing signal), that has full access on a minor road and limited or no access on a major road, that intersection shall be treated, for purposes of cost allocation, as a site access, i.e., through movements on the major road shall be excluded from the calculation shown in part F.

2.6 SIGNALIZED ACCESS STUDY REQUIREMENTS

When properly designed and located, traffic signals can safely and efficiently control motor vehicle, pedestrian, and bicycle traffic by assigning the right-of-way at intersections. However, poor placement and design of the traffic signal and associated intersection can lead to excessive delay and increased crash rates. The decision to install a new traffic signal is at the sole discretion of DelDOT. New traffic signals will not be considered for commercial marketing purposes. The following studies will be required to be prepared by the applicant and approved by DelDOT, prior to approval being granted for a new traffic signal:

2.6.1 Traffic Signal Justification Report

If a Traffic Impact Study or Traffic Operational Analysis indicates that a traffic signal may be justified when the development opens to traffic, then the developer will be required to complete a Traffic Signal Justification Report. The report should be completed by a Delaware registered professional engineer and should include the following:

- A. Analysis of existing conditions
 - 1. Approach lane widths
 - 2. Approach lane configurations
 - 3. Location and lengths of exclusive turn lanes (storage and taper length should be noted separately)
 - 4. Other geometric features
 - 5. Horizontal and vertical geometry (description)
 - 6. Roadside features
 - 7. Adjacent land use
- B. Collection and analysis of turning movement count data
 - 1. 12 hours' worth of data is ideal, but 8 hours may be acceptable (include surrounding peak periods)
 - 2. Separate cars from heavy vehicles

3. Separate counts of bicycles and pedestrians

C. Collision data

1. Obtain at least three (3) years of data to be used for the Traffic signal warrant analysis
2. This requirement may be waived at DelDOT's discretion for new intersections

D. Traffic signal warrant analysis

1. Three scenarios are typically analyzed when considering signalization related to developments:
 - i. Existing conditions (Is a signal warranted now?)
 - ii. Build out of proposed site to determine when a traffic signal would be warranted. For example, if the site was commercial, how many operational parcels would warrant a signal? For a residential site, how many lots would warrant a signal? (Multiple scenarios may be required based on the construction schedule. The analysis should reflect the construction schedule, keeping in mind the Plan Review approval process, of the site.
2. Complete build out of the site (Is a signal warranted only when the entire site is built out?)
3. All nine (9) warrants provided in the Delaware Manual on Uniform Traffic Control Devices (DE MUTCD) should be evaluated if they are applicable. Some may not be applicable to the specific location being studied.

E. Intersection Capacity Analysis

1. Evaluate the operation of the intersection based on the outcome of the traffic signal warrant analysis. If a signal is warranted, how will it operate? If not, how will it operate?
2. Evaluate queue lengths at impacted intersection and effected intersections in the surrounding area.
3. Conduct capacity analysis, typically using HCS or Synchro. If the proposed signal is in a corridor and will be coordinated with other signals, now or in the foreseeable future, cycle lengths in the analysis should match existing signal's cycle lengths.
4. Conduct a Critical Movement analysis at the impacted intersection.
5. If applicable, evaluate the impact a pedestrian crosswalk may have at the impacted intersection. A recommended location for the crosswalk(s) should be provided, considering both pedestrian path desire lines and the impact to vehicular traffic.
6. Proposed signal phasing should be noted.

2.6.2 Bandwidth Analysis

If a new signal is being proposed within an existing signalized corridor, then a Bandwidth Analysis may be required. This analysis will ensure that the proposed traffic signal does not negatively impact the progression along a corridor. The analysis may result in a recommendation as to the best location to situate a new signalized intersection along the corridor. Alternately, if the locations cannot be easily adjusted, the analysis may indicate that the intersection should in fact not be signalized, or that the number of lanes required may be more than indicated by a capacity analysis alone (to ensure adequate green time for the mainline corridor).

- A. When a study is required, the study shall be completed and signed by a Delaware registered professional engineer using the following standards:

1. Highway signal progression bandwidth and efficiency analysis including current and anticipated future signalized intersections. The number of signals to be included in the study shall be at DelDOT's discretion.
 2. An optimum signal cycle as determined by DelDOT
 3. Actual speeds as determined by a spot speed study
 4. The goal is to achieve a coordinated, signalized corridor with an optimized highway bandwidth. The requirement is that the bandwidth with the proposed traffic signal be no less than the optimized existing bandwidth without the proposed traffic signal.
 5. The green time allowed for the cross street shall be no less than the time necessary to accommodate pedestrian movements.
- B. The study shall also provide the following information:
1. Notation of all existing access, possible future access locations within the scope of work defined by DelDOT, and all potential roadway and signal improvements
 2. Current and future arterial travel speed, travel time, and delay time
 3. Traffic generation rate estimates
 4. Information, data and reference sources
 5. An evaluation of the level of service for all geometric elements
 6. Accurate and understandable diagrams
 7. All assumptions and adjustment factors
 8. An analysis of all reasonable alternatives including a no build alternative
 9. A conceptual design showing all geometric elements and approximate dimensions with detailed analysis of any elements below code standards

Additional information and additional analysis based upon other factors and standards may be required if determined to be necessary for a complete evaluation.

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CHAPTER 3 RECORD PLAN DESIGN

3.1 PURPOSE

This chapter is intended to provide those seeking access to state-maintained roadways and/or who wish to construct subdivision streets that will be maintained by DelDOT with:

- Specific standards and design guidance needed to assure adequate Record Plan design in the development of site transportation facilities; and
- The elements that need to be provided to DelDOT on the Record Plan so that DelDOT can provide the applicable local land use agency with a letter of “No Objection to Recordation” (LONOR).

In most cases, if the requirements of this chapter are met, the result will be the issuance of a letter of “No Objection to Recordation” from DelDOT to the local land use agency.

Record Plans shall be in the format required by the local land use agency. The elements that DelDOT requires as part of this chapter shall be included on those plans.

The standards established by DelDOT reflect its best judgment as to design criteria for particular conditions. In addition to safety considerations, particular emphasis is given in this chapter to incorporating design elements that address multi-modal access to and through the development. The Applicant’s Record Plan must be completed within the context of the surrounding area by providing street types and connections consistent with the existing and future transportation network. Requirements for transportation facility rights-of-way, traffic calming, and operational analysis are also addressed in this chapter.

Design features that fall outside normal design criteria and accepted practice are to be determined using sound engineering judgment and must be thoroughly documented. The final design must meet the needs and expectations of DelDOT and the community, as well as providing for the users’ safety.

3.2 RIGHT-OF-WAY AND EASEMENTS

DelDOT has jurisdiction over the public right-of-way, which provides for pavement, drainage, pedestrian facilities, lighting, landscaping and the roadside. The applicant’s engineer is responsible for defining and verifying the existing right-of-way and/or easements on State-maintained roadways. The right-of-way

must be evaluated to determine if the existing width can accommodate the construction and maintenance of any improvements within the right-of-way. DelDOT must approve the placement of anything within the right-of-way. Non-compliant structures and roadside obstructions shall be removed at DelDOT's direction prior to the acceptance of improved section of the right-of-way.

3.2.1 Right-of-Way And Easements - Record Plan Right-of-Way And Easements

The widths of the right-of-way shall be in accordance with Figure 3.2.1-a. Refer to Section 5.4 for information on intersection sight easement requirements and Section 5.7.2.6 for information on drainage easement requirements. Additional right-of-way and/or easements may be required at existing or future signalized intersections for signal poles and devices.

Figure 3.2.1-a Minimum Right-of-Way Width

Roadway Type	Minimum Right-of-Way Width
Subdivision Street – Type I (< 500 ADT)*	50 feet
Subdivision Street – Type II (501 – 3000 ADT)* Type III (> 3000 ADT)*	60 feet
Industrial Street (plus 15 foot wide storm drainage easement on both sides)	60 feet
Local Road	60 feet
Collector (Major and Minor)	80 feet

**Provide an additional ten-foot drainage easement on both sides for subdivision streets with open drainage.*

Note: *At intersection streets the right-of-way shall have a minimum radius of 25 feet.*

3.2.2 Right-of-Way And Easements - Control of Right-of-Way

The Record Plan shall contain one of the following notes relative to future maintenance of the internal street system:

- A. State Maintenance – Subdivision streets constructed within the limits of the right-of-way dedicated to the public use shown on this plan are to be maintained by the Delaware Department of Transportation (DelDOT) following the acceptance of the streets. DelDOT assumes no maintenance responsibilities within the dedicated street right-of-way until the streets have been accepted by DelDOT.
- B. Municipal Maintenance – Subdivision streets constructed within the limits of the right-of-way dedicated to the public use shown on this plan are to be maintained by the municipality following the acceptance of the streets. DelDOT assumes no maintenance responsibilities within the dedicated street right-of-way.

- C. Private Maintenance – Private streets within this subdivision shall be maintained by the Developer, the property owners within this subdivision or both (Title 17, Section 131). DelDOT assumes no responsibility for the future maintenance of these streets.

3.2.3 Right-of-Way And Easements - Acceptance of Right-of-Way Dedicated to the Public Use

DelDOT will only accept the maintenance of roadways with right-of-way dedicated to public use. The dedication of right-of-way shall be approved by DelDOT prior to recording the plan by the local land use agency.

The maintenance responsibility of DelDOT within the dedicated right-of-way is outlined in Chapter 6.

3.2.4 Right-of-Way And Easements

3.2.4.1 Right-of-Way Monuments - Subdivision Street Right-of-Way Monumentation

The developer shall be required to furnish and place right-of-way monuments on the dedicated subdivision street right-of-way in accordance with this *Development Coordination Manual*, and the requirements of the land use agency. Right-of-way monuments shall be placed along the right-of-way lines, at a minimum on one side of the street at every change in horizontal alignment to provide a permanent reference for re-establishing the centerline and right-of-way line. Right-of-way monuments shall be set and/or placed by a Professional Land Surveyor (PLS) licensed in Delaware. Right-of-way monuments shall be located and punched so the center is on the right-of-way line. Details of standard right-of-way monuments are shown in DelDOT's Standard Construction Details.

3.2.4.2 Frontage Road Right-of-Way Monumentation

Right-of-way markers shall be placed to provide a permanent reference for re-establishing the right-of-way and property corners on frontage roads. Right-of-way markers shall be set and/or placed along the frontage road right-of-way at property corners and at each change in right-of-way alignment by a Professional Land Surveyor (PLS) licensed in Delaware. Frontage road right-of-way markers shall consist at a minimum of capped rebar/pins, and shall be located and punched so the center is on the right-of-way line.

3.2.5 Right-of-Way And Easements - Dedication of Right-of-Way And Easements

The subdivision, development or redevelopment of property adjacent to a State-maintained roadway is subject to a dedication of right-of-way sufficient to provide a total roadway right-of-way in accordance with the minimum standards shown in Figure 3.2.5-a.

This width provides for future roadway improvements to accommodate the forecasted traffic based on the Record Plan and the local land use agency's comprehensive plan. Figures 3.2.5-b, 3.2.5-c, and 3.2.5-d show typical sections for various road types.

Figure 3.2.5-a Minimum Standards for Total Roadway Right-of-Way

Department of Transportation Functional Classification Map	Minimum Dedicated Right-of-Way
Local Road or Street (All roads other than Subdivision Streets not shown)	30 feet of right-of-way from physical centerline of road, see Figure 3.2.5.b.
Two-lane Arterials and Collectors	40 feet of right-of-way from physical centerline of road, see Figure 3.2.5.c.
Multi-lane Arterials, Collectors, Freeways and Expressways	30 feet of right-of-way from outermost edge of the through lane(s), see Figure 3.2.5.d.

3.2.5.1 Easement Dedication

3.2.5.1.1 Easements

An easement or open space shall be established at the entrance of all subdivisions for the purpose of a planned or future neighborhood sign or structure. This area shall be located outside of any existing or proposed right-of-way. If there is no easement area available because of limited site frontage, provisions may be made to locate the gateway feature within the right-of-way provided that a right-of-way use agreement is executed and the gateway feature does not pose a sight distance or safety hazard. The ability to locate a gateway feature within the right-of-way will be at the sole discretion of DelDOT.

3.2.5.1.2 Frontage Easements

A 15-foot easement beyond the minimum right-of-way listed in Figure 3.2.5-a, must be established along the property frontage to provide for infrastructure, such as: drainage, lighting, pathways, sidewalks, traffic control and monitoring equipment and systems, transit facilities, utility installations and utility systems etc. This easement may be required regardless of the inclusion of a shared-use path or any other features. The following note should be added to the plan: *“A 15-foot permanent easement is hereby established for the State of Delaware as per this plat.”*

3.2.5.1.3 Shared-Use Path and Sidewalk Easements

In areas where a proposed Shared-Use Path (SUP) and/or Sidewalk (SW) is designed to meander beyond the minimum right-of-way listed in Figure 3.2.5-a and outside of the 15-foot Frontage Easement required in Section 3.2.5.1.2, an additional permanent easement must be established to provide for the SUP/SW and any topographical changes that are directly related to the meandering of the SUP/SW. These easements will require additional metes and bounds and other documentation to clarify the exact location and extents of these permanent easements. The following note should be added to the plan: *“A permanent easement containing X square feet is hereby established for the State of Delaware as per this plat.”*

3.2.5.1.4 Drainage Easements

Drainage easements are required for all drainage facilities which collect or convey roadway runoff, but are not located within a dedicated right-of-way. Drainage easements must be shown and labeled on the Plans, and must take into account the requirements of Sections 3.8 and 5.7.2.6 of this manual. These easements will require additional metes and bounds and other documentation to clarify the exact location and extents of these permanent easements. A note which includes the following language should be added to the plan: *“A(n) X-foot wide permanent easement containing X square feet is hereby established for the State of Delaware as per this plat, for emergency access to drainage facilities conveying runoff from State maintained roads and/or rights-of-way. The portions of the drainage easement and system that are upstream or offsite as well as sections that are not directly collecting and conveying the drainage runoff of the proposed State maintained roads and/or rights-of-way shall be the responsibility of the developer, property owners, or both. The State of Delaware assumes no responsibility for the future maintenance of any exempted portions of the storm drain system and/or drainage easements.”*

3.2.5.2 Right of Way Dedication

The applicant’s engineer shall verify how the right-of-way was acquired for the road in order to determine which dedication note to use.

If the existing right-of-way for the State-maintained roadway was previously acquired as a permanent easement, then the additional right-of-way dedication will be from the centerline along with the following note:

“An X-foot wide strip of right-of-way from the centerline is hereby dedicated to the State of Delaware as per this plat.”

If the existing right-of-way for the State-maintained roadway was previously acquired in fee, then the additional right-of-way dedication will be from the existing right-of-way line along with the following note:

“An additional X-feet of right-of-way is hereby dedicated to the State of Delaware as per this plat.”

Per 17 Del.C. § 530, DelDOT cannot require a dedication of land along a State-maintained roadway for a minor subdivision plan for farms that are (1) subdivided into smaller farms, and (2) subdivided merely for the purpose of transferring land to family members for their use as a primary residence or residences, unless DelDOT can adequately demonstrate that additional right-of-way is necessary due to safety concerns caused by the proposed subdivision. The right-of-way that would normally be dedicated shall be reserved in accordance with Section 3.2.6.

3.2.6 Right-of-Way And Easements - Reservation of Right-of-Way

Where DelDOT has established future right-of-way lines beyond what is shown in Figure 3.2.5-a, the frontage adjacent to proposed subdivisions shall be reserved for future right-of-way, and the following note shall be added to the plan:

“An X-foot wide strip is hereby reserved for the State of Delaware as per this plat, for future right-of-way needs.”

Setback requirements by the local zoning code are to be measured from the reserved right-of-way line.

3.2.7 Right-of-Way And Easements - Reduced Right-of-Way

Upon request, DelDOT shall consider a reduction in the required right-of-way for subdivision streets. DelDOT shall accept the maintenance of subdivision streets with reduced right-of-way as outlined in Chapter 6.

Reduction in right-of-way is intended to permit greater flexibility in community design while retaining adequate safeguards to provide the traveling public with sufficient travelway for anticipated traffic.

3.2.7.1 Reduced Right-of-Way Applications

Reduced right-of-way can be applied to:

- A. Streets that are dedicated to public use and shall not require widening due to future land development
- B. Areas where upright or barrier-type curbs are utilized along all interior streets
- C. Group, semi-detached, two-family, and single family dwellings constructed on fee simple lots
- D. Subdivision Streets Type I
- E. Areas where the Record Plan has incorporated the use of alleys to serve as the major access to the lots

Figure 3.2.5-b Typical Section – Various Roadway Types
(Not to Scale)

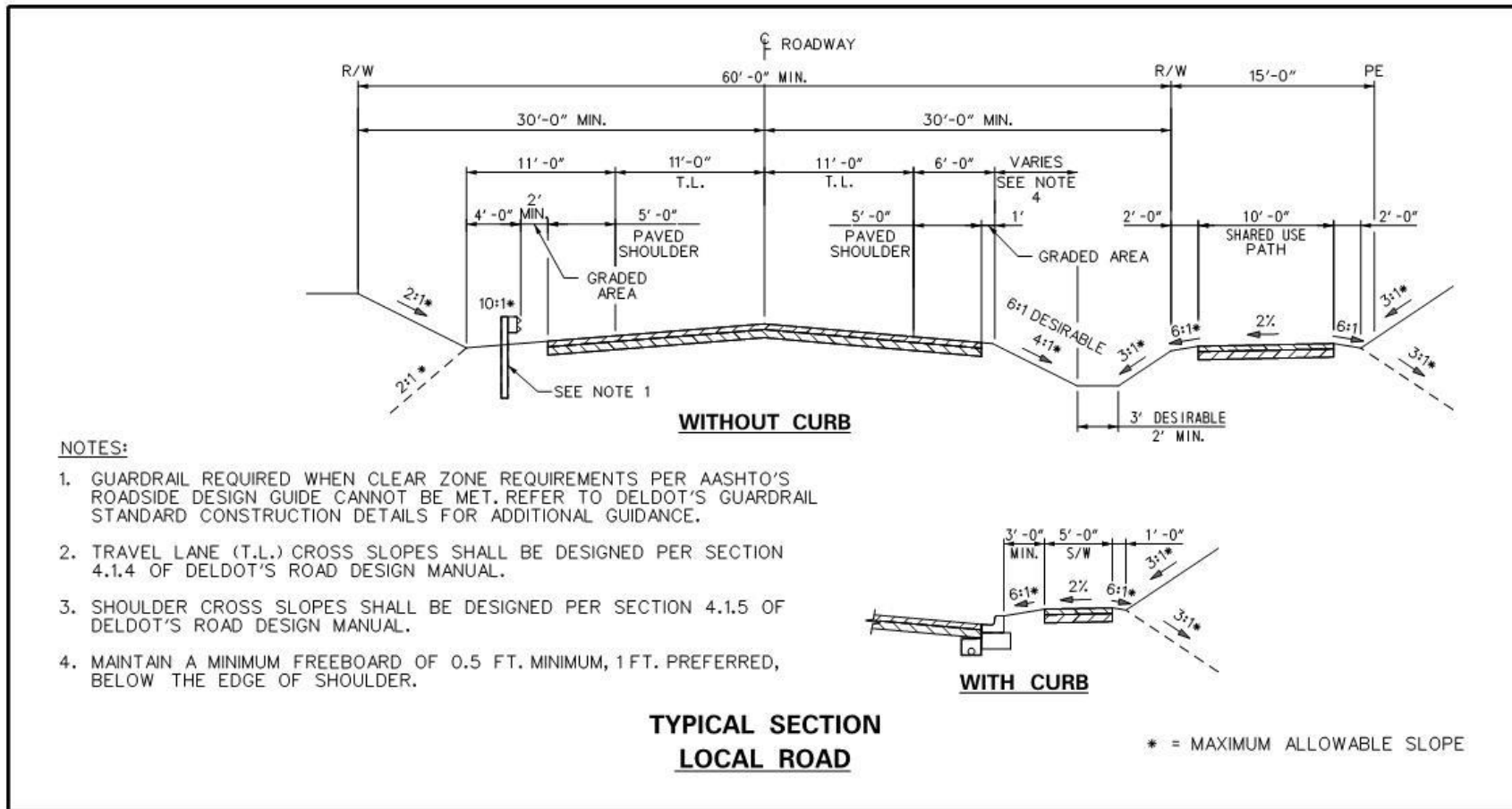
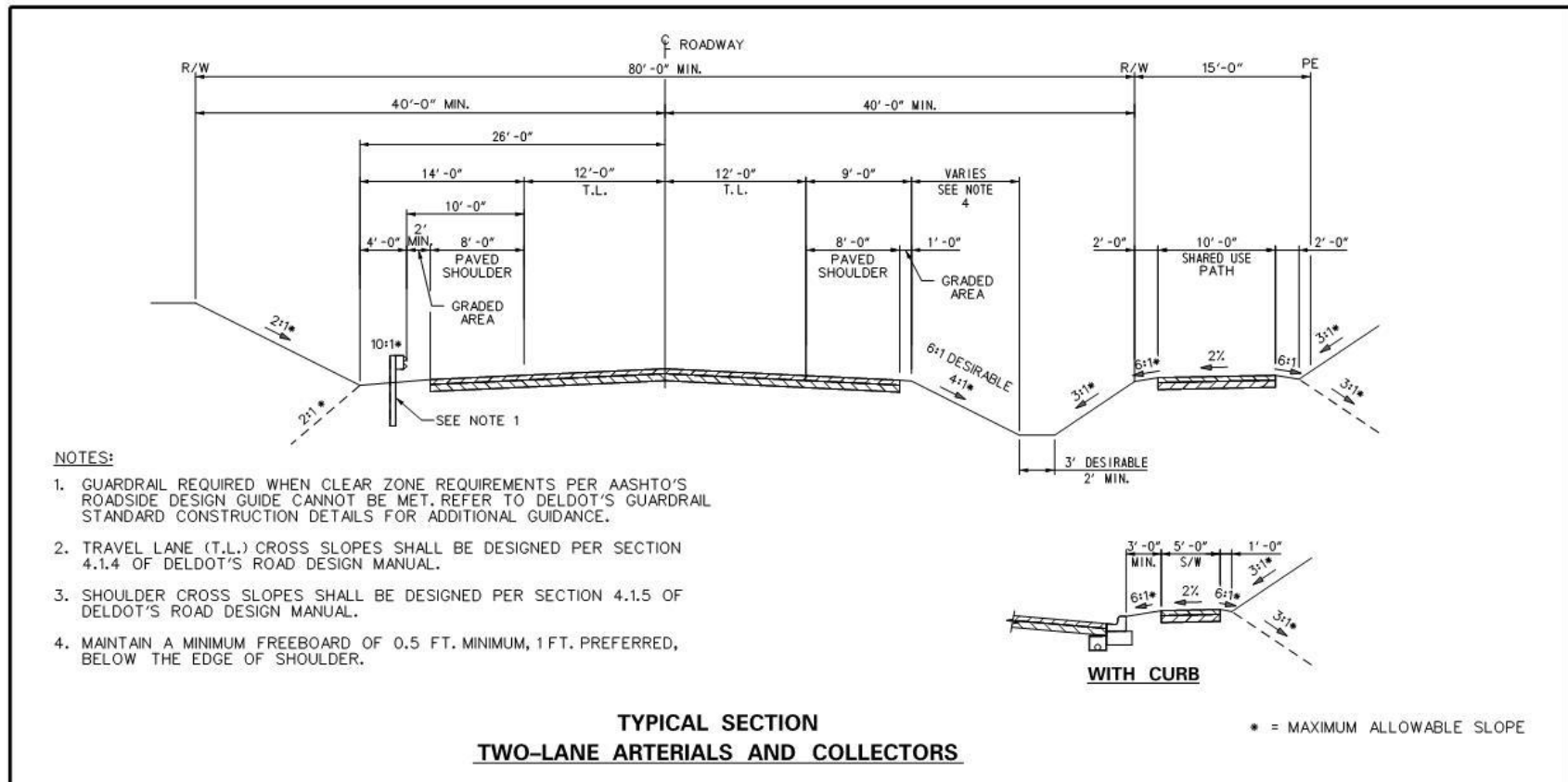


Figure 3.2.5-c Typical Section – Various Roadway Types
(Not to Scale)



3.2.7.2 Reduced Right-of-Way Criteria

DelDOT shall only consider a reduced right-of-way if the following criteria are met:

- A. Proposed reduced right-of-way is consistent with the local land use agency's ordinances
- B. The reduced right-of-way line shall be located at the back of the curb. The minimum reduced right-of-way width shall be 28 feet.
- C. A 10-foot permanent easement shall be provided along each side of all streets to allow DelDOT personnel to undertake routine and emergency maintenance work and shall also be available for utility and construction purposes, and permanent placement of signs and traffic control devices.
- D. On-street parking within the reduced right-of-way shall be reduced by providing:
 - 1. Two spaces (minimum) on each lot
 - 2. One space per every three units (overflow parking) which may be provided outside the public right-of-way. These parking bays are perpendicular and shall be graded wherever possible to slope toward the street. Regardless of the slope, away from or toward the street, a concrete gutter shall be required along the street right-of-way line for carrying stormwater flow, creating a physical separation of streets from parking bays and demarcation of the reduced right-of-way. Sidewalks shall be constructed parallel to the curb line. The barrier type around the perimeter of the parking bays (when required) shall be subject to DelDOT approval.
- E. Whenever possible, all utilities, except for surface drainage appurtenances, shall be located outside the right-of-way.
- F. Turnarounds, independent of the parking bay areas, must be provided at the end of the streets to permit maneuvering of service and emergency vehicles.
- G. Any utility work within the permanent easement shall proceed only after prior notice of at least 24 hours has been given to DelDOT.

3.3 MINOR RESIDENTIAL SUBDIVISIONS

If a property owner is seeking to subdivide its property into five or less lots through the local land use agency process and is not constructing any internal subdivision streets, the property owner must coordinate access with DelDOT. DelDOT has established requirements for access, drainage, and adequacy of adjacent roadway right-of-way. These elements must be addressed prior to DelDOT issuing its letter of "No Objection to Recordation" to the local land use agency.

Chapter 1 outlines the minimum standard for the spacing of residential drives and shall be used to determine entrance locations. If this spacing cannot be met for each individual lot, each pair of lots shall be required to have a single combined access.

3.3.1 Minor Residential Subdivisions - Minor Plan Submittal Process

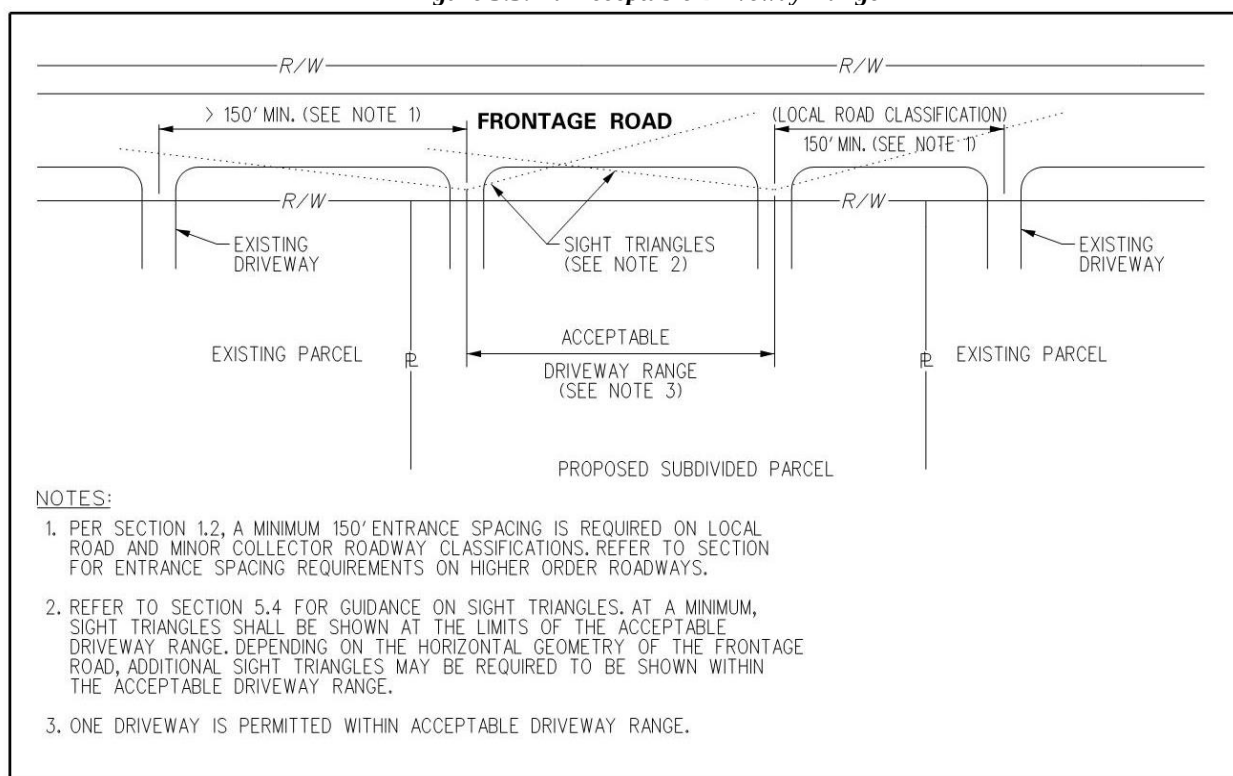
An initial stage fee calculation form which is available online (for more information go to <http://devcoord.deldot.gov> > Forms) and fee payment is to be submitted with the electronic submission in accordance with the submission process outlined in the preface of this manual.

A completed minor subdivision plan checklist which is available online (for more information go to <http://devcoord.deldot.gov> > Checklists) is to be submitted. The applicant shall make revisions or additions to the design upon receipt of comments from DelDOT. If revisions are required, the applicant shall revise the plans and resubmit to the Subdivision Section. Once all comments have been addressed, DelDOT will issue a letter of “No Objection to Recordation” to the local land use agency. When access provisions cannot be provided in accordance with DelDOT’s requirements due to limitations particular to the site or where the applicant refuses to comply, the access application for the intended use may be denied.

3.3.2 Minor Residential Subdivisions - Minor Plan Requirements

The location and design of driveways and entrances shall meet the general geometric requirements of DelDOT. Lots and entrances shall be laid out with consideration for possible future connections to adjoining land. If the entrance location of the subdivided lot has not been determined at the time of the electronic plan submittal, then an acceptable driveway range should be shown on the plan as depicted in Figure 3.3.2-a. If a change in driveway location is proposed outside of the acceptable driveway range by the owner after the letter of “No Objection to Recordation” has been issued, then it must be approved by DelDOT. This process may result in delay of issuance of entrance permit. In addition, sight distance and drainage requirements shall conform to Sections 5.4 and 5.7 of this *Development Coordination Manual*.

Figure 3.3.2-a Acceptable Driveway Range



The plan for a minor residential strip development on a State-maintained roadway shall include the items as specified in Section 3.4.2.1, as well as the following:

- A. The following note shall be added to the minor subdivision record plan:

If the residual lands of the applicant are ever developed into a major subdivision, then the access to the minor subdivision parcels may be required to be from an internal subdivision street.

- B. The access to subdivided lots along the streets shown on the Functional Classification Network shall be clearly portrayed on subdivision plan. See Chapter 7 for detailed access requirements.

3.3.3 Minor Residential Subdivisions – Private Streets with Shared Driveways

Entrances to private streets serving multiple residential lots should be paved, from the edge of the travel lane to the ROW line (at a minimum), with a driveway/throat width of 16 to 24 feet and should generally meet the geometric criteria shown in the agricultural entrance example for **Collector Frontage Roads** shown in **Figure 8.5.2-a Agricultural Entrance Detail**. The submittal process for review of the entrance to the private street will be coordinated and included with the **Minor Plan Submittal Process** as outlined in Section 3.3.1. The entrance location must be determined in accordance with DelDOT requirements and clearly shown on the electronic plan submittal. If a change in the location of the entrance to a private street is proposed by the landowner after the letter of “No Objection to Recordation” has been issued, then it must be approved by DelDOT. This process may result in delay of issuance of entrance permit. In addition, sight distance and drainage requirements shall conform to Sections 5.4 and 5.7 of this *Development Coordination Manual*. Entrances to private streets should be paved (unless directed otherwise by DelDOT), with bituminous concrete using the residential paving sections matching Figure

7.2.3.7-a, and shall be subject to permit conditions similar to those listed in Section 8.4.D for Temporary / Seasonal Entrances.

3.4 COMMERCIAL OR MAJOR RESIDENTIAL SUBDIVISIONS

If a property owner / developer is seeking to subdivide their property into six or more residential lots or constructing internal subdivision streets or developing a commercial site through the local land use agency process, they must coordinate access with DelDOT. The developer shall submit the required information to DelDOT for review and approval prior to DelDOT issuing its letter of “No Objection to Recordation” to the local land use agency.

The Plan shall be in the format required by the local land use agency supplemented with DelDOT’s requirements as outlined in this chapter. DelDOT shall require recordation of the Plan regardless of the local land use agency recordation requirement. These elements shall be addressed prior to DelDOT issuing its letter of “No Objection to Recordation”.

Existing commercial uses/projects that are seeking an approval to use an existing entrance facility and are proposing to: re-use an existing building, make a small expansion/addition to an existing building, or implement small changes in site use, such as, offering minimal additional services, may fall under an alternate process (see Section P.6 and P.7). This process may at the subdivision engineer’s discretion accommodate minimal changes to site traffic as well as projects that do not affect traffic flow (i.e. addition of a mobile food cart, ancillary sales of additional merchandise, outdoor display of inventory/merchandise etc.). In such cases, DelDOT may consider issuance of a "Letter of No Contention" (LONC) in lieu of a LONOR to the local land use agency.

This process will generally apply where DelDOT determines that:

- A. There are no significant entrance improvements proposed or required.
- B. There are no significant building expansions proposed, no significant new structures being created, and no changes to the character, volume or pattern of site traffic.
- C. There is no DelDOT roadway project adjacent to the site.
- D. There are no safety issues in the immediate vicinity of the proposed entrance.
- E. The existing right-of-way (ROW) meets DelDOT’s standards for Minor Collectors and higher order roadways.
- F. The local land use agency does not require a LONOR.

For applications where DelDOT finds that a LONC is appropriate, the LONC will be issued by DelDOT and will not require a full project submission/approval. LONC applications, where DelDOT determines that limited activities or construction within the ROW are required, may be eligible to obtain a Permit for Entrance Construction (PEC), which will be issued by DelDOT and will not require a full project submission/approval.

3.4.1 Commercial or Major Residential Subdivisions - Record Plan Application Process

Prior to submitting the Record Plan for review, a pre-submittal meeting with DelDOT is required for projects generating 200 or more site ADT. If a DelDOT LONOR is more than 5 years old, a new pre-submittal meeting and application process is required. For any project: additional pre-submittal meetings should be held prior to a submittal for DelDOT review (unless directed otherwise by DelDOT): if the last pre-submittal meeting or plan submittal to DelDOT for the project is more than one (1) year old, or if the project's scope has changed (including site changes, changes to local roadways or planned local transportation improvements). DelDOT will use the project coordination meeting as a platform to evaluate potential impacts that may affect the processing of the project submittal, in an attempt to provide the most direct path for review and approval. See DelDOT's Meeting Request Form which is available online for meeting request requirements (for more information go to <http://devcoord.deldot.gov> > Forms). A completed Record Plan gatekeeping checklist which is available online (for more information go to <http://devcoord.deldot.gov> > Checklists) is to be submitted to the Subdivision Engineer. Refer to <http://www.deldot.gov/information/business/> under Subdivisions for a plan review schedule. The applicant shall make revisions or additions to the design upon receipt of comments from DelDOT and resubmit to the Subdivision Section. Once all comments have been addressed, submit signed and sealed plans for approval. DelDOT will issue a letter of "No Objection to Recordation" to the local land use agency.

The letter of "No Objection to Recordation" is not a DelDOT endorsement of the project. Rather, it is a recitation of the transportation improvements which the applicant may be required to make as a pre-condition to recordation steps and deed restrictions as required by the respective county/municipality in which the project is located. If transportation improvements are necessary, they are based on an analysis of the proposed project, its location, and its estimated impact on traffic movements and densities. The required improvements conform to DelDOT's published rules, regulations and standards. Ultimate responsibility for the approval of any project rests with the local government in which the land use decisions are authorized. There may be other reasons (environmental, historic, neighborhood composition, etc.) which compel that jurisdiction to modify or reject this proposed plan even though DelDOT has established that these enumerated transportation improvements are acceptable.

DelDOT's District office shall require a copy of the above-mentioned recorded Record Plan showing all appropriate signatures, seals and plot book and page, which is consistent with the DelDOT "No Objection to Recordation" stamped plan, prior to issuing the entrance permit.

When access provisions cannot be provided in accordance with DelDOT's requirements due to limitations particular to the site or where the applicant refuses to comply, the access application for the intended use may be denied.

3.4.2 Commercial Or Major Residential Subdivisions - Record Plan Submittal Requirements

The Record Plan shall be prepared in accordance with the local land use agency's requirements. The following elements are supplemental information required by DelDOT to be addressed and/or included with the Record Plan submittal:

- A. Completed Record Plan gatekeeping checklist (for more information go to <http://devcoord.deldot.gov> > Checklists) Failure to submit required documents will result in delays reviewing and approving submittals.
- B. Completed design criteria form (for more information go to <http://devcoord.deldot.gov> > Forms)

- C. Completed design deviation form and supporting documentation, if applicable
- D. Completed checklist for subdivision record plan approval (for more information go to <http://devcoord.deldot.gov> > Checklists)
- E. Initial stage fee calculation forms (for more information go to <http://devcoord.deldot.gov> > Forms)
- F. Preliminary entrance plan - Plan shall include but not be limited to the following items (see Chapter 4 for complete list of requirements):
 - 1. Traffic generation diagram, including the design vehicle for the site (for more information, see Figure 3.4.2-a and DelDOT's *Traffic Generation Example* which is available online at <http://devcoord.deldot.gov> > Guidance)
 - 2. Adjacent entrances
 - 3. Functional classification of adjacent roadway
 - 4. Layout of required auxiliary lanes and bike and pedestrian facilities with supporting documentation and a completed auxiliary lane worksheet. Auxiliary lane worksheet and typical entrance diagrams are available on DelDOT's website at: <http://devcoord.deldot.gov> > Forms & > Guidance.
 - 5. Sight distance triangles with supporting calculations and Intersection Sight Distance (ISD) spreadsheet found on DelDOT's website at: <http://devcoord.deldot.gov> > Checklists.
 - 6. Transit facilities and bus pull offs including existing facilities along with improved or proposed facilities, if recommended by the local land use authority.
- G. Turning movement diagrams for specified design vehicle (a separate plan sheet or exhibit is acceptable)
- H. To facilitate review of the plans, the entrance shall be staked in the field in order to determine the feasibility of the design based on the following procedures:
 - 1. Place two wooden stakes at the entrance. The stakes shall be visible 24 inches to 36 inches above the ground. The stakes shall be placed 24 feet apart, and as close to the roadside property line as possible, while being clearly visible from the road. The stakes shall not be set closer than five feet from the edge of pavement.
 - 2. Tie ribbons or apply yellow paint to the top of stakes to make them clearly visible.
 - 3. Write the property owner's last name on each stake.

3.4.2.1 Commercial Or Major Residential Subdivisions - Record Plan Content

The following items are required by DelDOT to be included on the Record Plan:

- A. A title block containing:
 - 1. Name of proposed development
 - 2. DelDOT Project ID Number (to be provided by DelDOT)
 - 3. Name of town/hundred and county
 - 4. Maintenance number of highway being accessed
 - 5. Graphic Scale (1" = 30' preferred, 1" = 20' acceptable)
 - 6. Date
 - 7. Name, address, and telephone number of owner and engineer or surveyor preparing plan
 - 8. Seal of engineer or surveyor (Delaware License required)

9. Owner's signature (for final approval)

B. A data block containing:

1. Gross acreage of property
2. Zoning
3. Present use
4. Proposed use
5. Sewer provider
6. Water provider
7. Tax Parcel Number
8. Total number of lots, existing and proposed
9. Posted speed limit on frontage road(s)
10. Proximity to identified Transportation Improvement Districts (TID)
11. Investment Level Area as defined by the State Strategies for Policies and Spending maps (for major or commercial subdivisions only). Maps are available at:
<http://stateplanning.delaware.gov/strategies/>

C. Existing Features

All Record Plans for commercial or residential subdivision access onto a State-maintained roadway must be at scale and clearly show the location of the following items according to Figures 3.4.2-b, 3.4.2-c and 3.4.2-d:

1. Existing entrances showing dimensions, location and spacing of any entrances. This applies to each side of the entrance and shall include entrances on both sides of the road. If there are no entrances within the required distance, then show the distance to the nearest entrance. The type of use served by each entrance shall be noted as well as any restrictions in movements.
2. Identification of the existing and proposed land uses adjacent to and opposite the site
3. Existing rights-of-ways, easements or reservations
4. Buildings and other structures may need to be shown and labeled, as determined by DelDOT based upon field conditions

D. Proposed Features:

1. Proposed land uses
2. Proposed entrance locations
3. Label any necessary right-of-way or easement dedication or reservation
4. New street names (if applicable)
5. New street right-of-way widths (if applicable)
6. Future interconnection note (if applicable)
7. Dimensions of relevant physical features
8. Existing and proposed cross-access easements (if applicable)

E. Notes:

1. Note outlining the date a traffic impact study was completed and requirements submitted to the local land use agency (if applicable)
2. Note outlining any transportation improvements required

3. Note specifying the maintenance of proposed subdivision streets (if applicable, see <http://devcoord.deldot.gov> > Quick Links > DelDOT Notes)
4. General notes (<http://devcoord.deldot.gov> > Quick Links > DelDOT Notes)

F. Traffic Information:

1. Traffic generation (from ITE Traffic Generation Manual) and distribution for the site
2. Truck percentage for the site
3. Existing and buildout volumes for the site (daily and peak hour) (*DelDOT will provide projected volumes upon request*)
4. Existing and projected (10-year) directional distribution volumes for the adjacent roadway (*DelDOT will provide projected volumes upon request*) - The minimum projected 10-year volumes should be 20% greater than the existing volumes plus the site traffic.
5. Posted speed limit
6. Design vehicle - Applicant will be required to coordinate with owner/developer to determine correct design vehicle for site usage.

Figure 3.4.2-a Traffic Generation Diagram

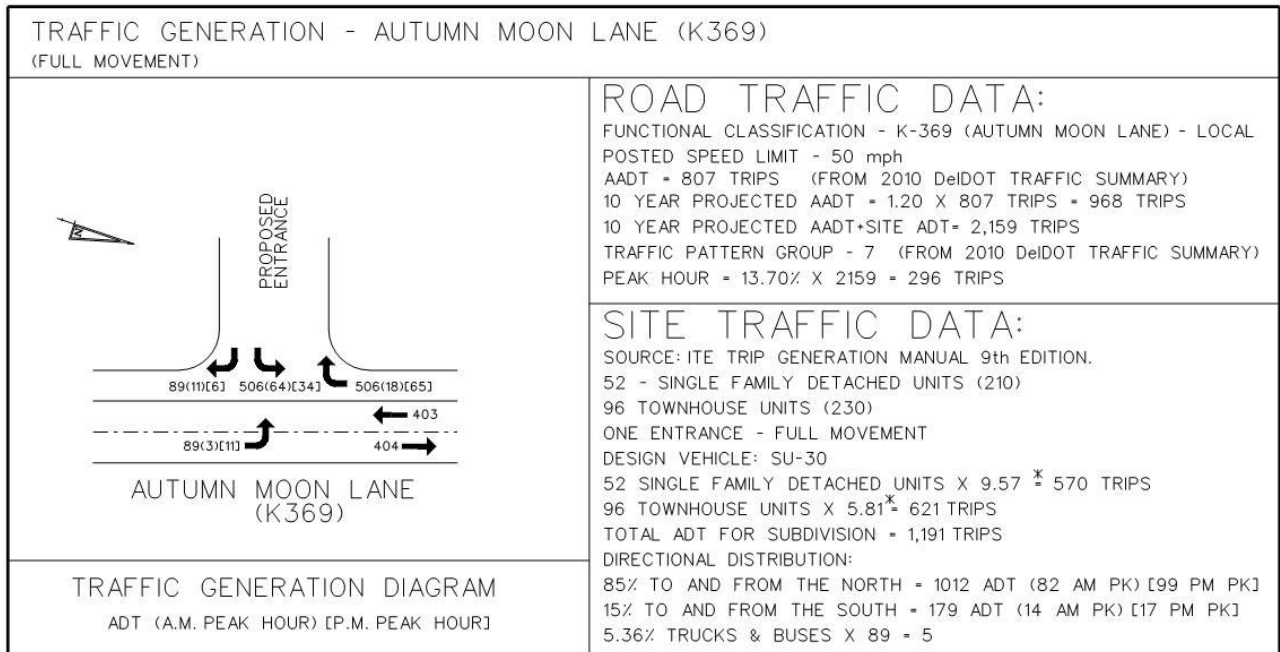


Figure 3.4.2-b Requirements for Adjacent Existing Features on Record Plans

Roadway with Posted Speed Limit	Show Features Within*
35 mph or less	300 feet
40 – 45 mph	450 feet
50 – 55 mph	600 feet

**Distances measured from site access or a minimum of 200 feet beyond a site's property lines whichever is greater. Drawing shall be to scale.*

Figure 3.4.2-c Requirements for Adjacent Existing Features on Record Plan – Direct Frontage

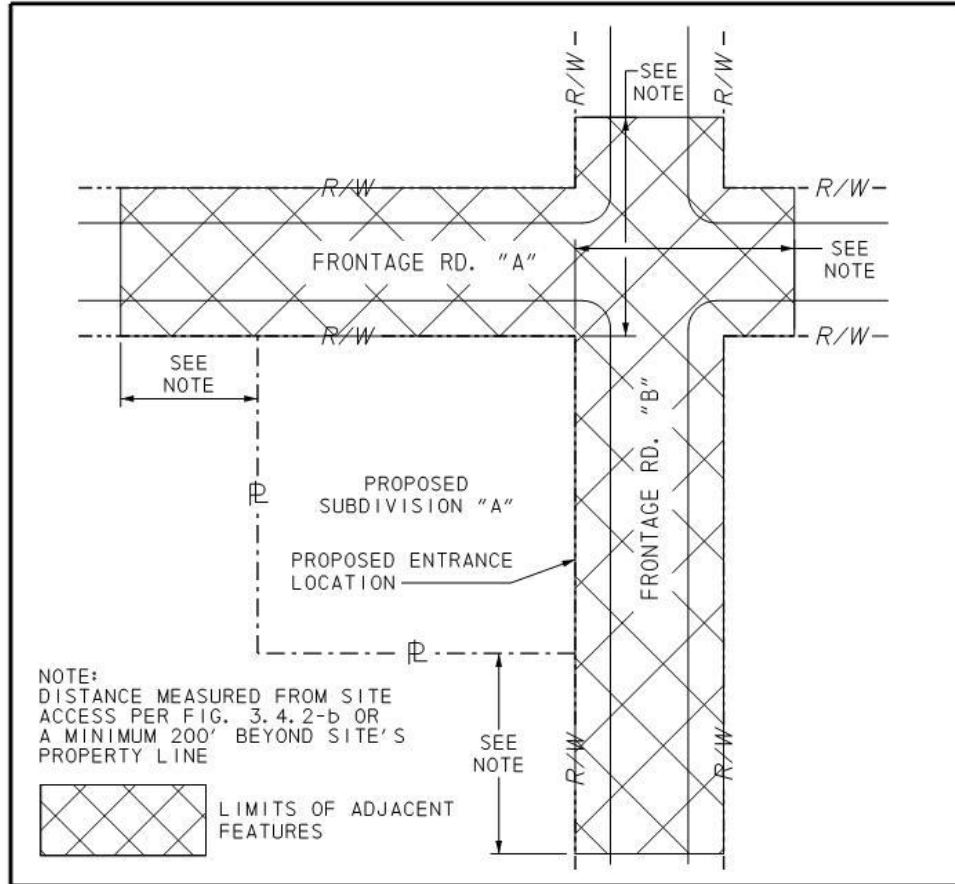
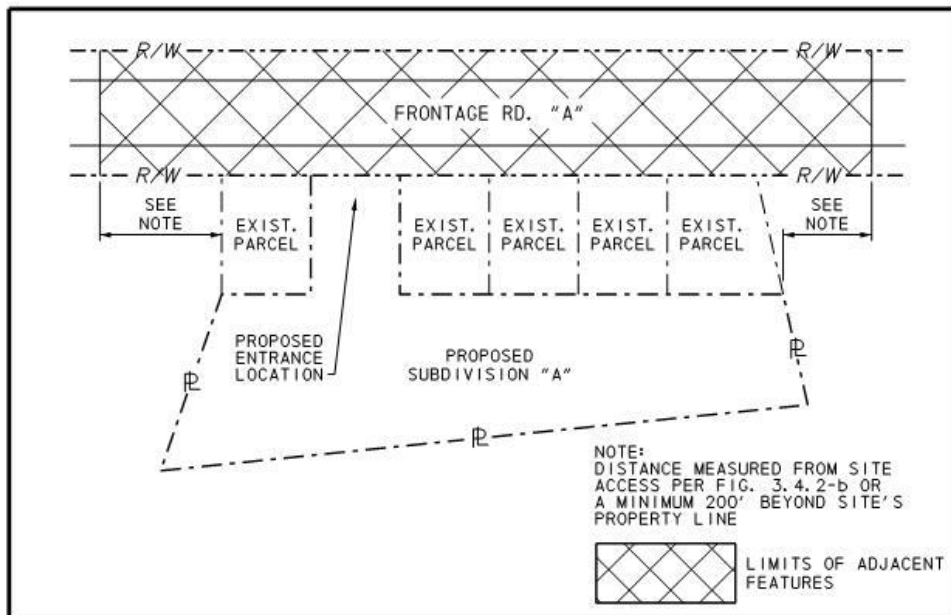


Figure 3.4.2-d Requirements for Adjacent Existing Features on Record Plan – Limited Frontage



3.4.3 Commercial or Major Residential Subdivisions - Site Entrance

Intersections of subdivision streets with state-maintained roadways are to be designed in accordance with this *Development Coordination Manual*. The location and design of entrances and exits onto state-maintained roads are governed by the criteria established in Chapter 1 and the detailed design elements listed in Chapter 5. Considerations must be given to the location of the entrance to ensure applicable guidelines listed in Section 5.2 are addressed.

3.5 CONNECTIVITY

This section provides connectivity requirements for all development projects having access to state roads or proposing DelDOT maintained public roads for subdivisions. Private or municipal streets should follow the local land use agency's requirements for connectivity.

3.5.1 Connectivity - Purpose and Scope

The purpose of this section is to set forth requirements for achieving a connected transportation system in the State of Delaware.

When local travel is restricted by a lack of connecting routes, local trips are forced onto the regional network. The aggregate effect of a disconnected local street network will be to reduce the effectiveness of the overall regional and local roadway system.

In addition to improving the flow of through trips on DelDOT collector and arterial streets, interconnections will provide Delaware residents and travelers with the following benefits:

- A. Alternative routes to local destinations to provide redundancy during road closures
- B. Opportunities for community interaction by eliminating barriers between developments
- C. Alternative mode choices (driving, transit, bicycling or walking)
- D. Improved access to community facilities and shopping centers
- E. A reduction in travel times and vehicle miles traveled for trips to local and regional destinations
- F. Improved air quality because of reduced delay
- G. Reduced emergency response times because of more direct access for fire, police and EMS vehicles
- H. More effective use of municipal resources for municipal service delivery (utility routing, sanitation vehicles, school bus routing, etc.)
- I. Improved regional long-distance travel as arterial road capacity is better utilized for regional trips through the transfer of local trips to local roads

The connectivity requirements in this section are provided so that vehicular, bicycle and pedestrian connections are used more effectively to encourage safe and efficient circulation and access for motor vehicles, bicycles, pedestrians, and transit.

3.5.2 Connectivity - Overview and Objectives

The Record Plan shall be developed to provide or incorporate a street system that will allow access to and from the proposed development, as well as access to all existing and future development within the immediate area. Proposed residential and commercial development parcels shall be designed to connect to existing linkages on adjacent parcels. The Record Plan shall attain the following connectivity objectives:

- A. Encourage pedestrian and bicycle travel by providing short, direct public routes to connect residential uses with nearby existing and planned commercial services, transit facilities, schools, parks and other neighborhood facilities.
- B. Provide bike and pedestrian access-ways or walkways on public easements or right-of-way when full street connections are not possible, at spacing that shall be consistent with the provisions of Section 3.5.4 except where prevented by topography, barriers such as railroads or freeways, or environmental constraints such as tax ditches, major streams and rivers.
- C. Identify and, where possible, create opportunities to extend and connect local streets in previously developed areas.
- D. Serve a mix of land uses on contiguous local streets.
- E. Consider narrow street design alternatives that feature total right-of-way of no more than 50 feet, including pavement widths of no more than those noted in Figures 5.5.2-a through 5.5.2-c of Chapter 5, sidewalk widths of at least five feet and landscaped pedestrian buffer strips that include street trees. In certain situations or in urban environments, DelDOT may require sidewalks wider than 5 feet.
- F. Limit the use of cul-de-sac designs and closed street systems to situations where topography, pre-existing development or environmental constraints prevent full street connections. Include a street design that accommodates and promotes multi-modal access (buses, bicycles and pedestrians) to land uses, improves area circulation and reduces travel distance.

3.5.3 Connectivity - Content

3.5.3.1 Transportation Networks and Connections

- A. The Applicant shall also identify on the Record Plan:
 - 1. The location and spacing of existing or proposed stub streets that intersect with or connect to the Applicant's proposed development site.
 - 2. The location of any existing or proposed Type III subdivision street, local or higher order road within the adjacent development, whether or not such road would connect to the Applicant's proposed development site.
 - 3. The location and spacing of existing or proposed bicycle and pedestrian connections, including bicycle striping on roadways, sidewalks, and shared-use paths.
- B. The proposed transportation network for the Record Plan shall be determined based on the following criteria:
 - 1. Proposed local or higher order roadways and connections identified in an Approved Local Transportation Circulation Plan shall be included in the transportation network. DelDOT shall determine if an Approved Local Transportation Circulation Plan is complete or if it should be supplemented to accommodate the proposed development or for modifications to the project area

since the approved plan was completed. Planned roads that have not yet been constructed shall be indicated.

2. Local and higher order DelDOT road spacing at distances not exceeding 2,640 feet (1/2 mile)
3. The Applicant may be required at DelDOT's discretion to provide direct connection to local or higher order roads that abut or traverse the Applicant's property unless DelDOT determines that a connection is undesirable.
4. A portion of a local or higher order road may need to be constructed through the Applicant's site based on the spacing of existing roadways or of roadways proposed in Approved Local Transportation Circulation Plans.

3.5.3.2 DelDOT Subdivision Streets

The subdivision street system shall provide multi-modal access and multiple routes from each development to existing or planned neighborhood centers, parks and schools, without requiring the use of local and higher order roads, unless DelDOT has determined that doing so is infeasible.

The Applicant shall provide a dedication of right-of-way for all proposed roadway segments on its Record Plan in accordance with Figure 3.2.1-a and shall construct all proposed roadway segments unless DelDOT determines such construction to be unnecessary.

Type I and Type II Subdivision Streets, Industrial Streets

The Applicant shall show on the Record Plan and, if not currently existing, construct streets in the following fashion:

1. *Residential, Commercial and Mixed-Use Development or Redevelopment* - Type I and Type II Subdivision or, if applicable, Industrial street connections shall be spaced at intervals of no more than 1,000 feet as measured from the near side right-of-way line, unless DelDOT determined that doing so is infeasible.
2. *High Density Residential or High Density Mixed Use Development* - Subdivision street connections at intervals of no more than 500 feet shall be provided in areas planned for the highest density residential and mixed-use development. Where the street pattern in the area immediately surrounding the site meets this spacing interval, the existing street pattern should be extended into the site.
3. *Large Lot Subdivisions* - The above provisions notwithstanding, subdivisions with lot sizes of one acre or more may use a Type I and Type II subdivision street spacing of up to 1,320 feet.

Type III Subdivision Streets

A portion or portions of Type III Subdivision streets may need to be constructed through the Applicant's site based on the spacing of existing roadways, and of roadways proposed in Approved Local Transportation Circulation Plans.

3.5.4 Connectivity - Bicycle and Pedestrian Spacing

Existing and proposed bicycle and pedestrian connections shall also be shown on the Record Plan as provided in this section. A fee in lieu of constructing connections may be appropriate in some instances as determined by DelDOT.

3.5.4.1 Bicycle Compatibility

Bicycles shall be accommodated on all subdivision and higher order roads within the proposed development in accordance with applicable standards such as those provided in AASHTO's *Guide for the Development of Bicycle Facilities*.

3.5.4.2 Shared-Use Paths and Sidewalks

- A. **Frontage Roadways** – This section defines the Shared-Use Path (SUP) and/or Sidewalk (SW) requirements that apply when the commercial or major residential subdivision has frontage along State maintained: Arterial, Collector, and/or Local roadways. If DelDOT requires such facilities, DelDOT will determine whether the facility should be a sidewalk or a shared-use path and the owner or applicant shall be required to construct a SUP/SW or to provide the fee payment in lieu of construction. Specific requirements related to the warrants for a SUP/SW are as follows:
1. Regardless of the location of the project or whether a project is required to actually construct a SUP/SW, a Permanent Easement (PE) is required per Section 3.2.5.1.2 of this manual. The proposed Permanent Easement (PE) shall be shown (on the Record Plan or Site Plan) and recorded via separate deed or recorded plat.
 2. SUP/SW construction shall be required for all projects that generate a total of 2,000 Average Daily Trips (ADT) or more, and are requesting an Entrance Plan Approval (EPA) or Entrance Permit in all Investment Level Areas as defined by the State Strategies for Policies and Spending maps.
 3. SUP/SW construction shall be required for all projects requesting an EPA or Entrance Permit in all Investment Level I and Investment Level II Areas as defined by the State Strategies for Policies and Spending maps. (If a physical impossibility exists, then the SUP/SW fee in lieu of construction shall be paid.)
 4. SUP/SW shall be required for all projects requesting an EPA or Entrance Permit in all Investment Level III and Investment Level IV Areas as defined by the State Strategies for Policies and Spending Maps if the project abuts an existing facility. If the project does not abut an existing facility it will be at the Subdivision Engineer's discretion. No fee in lieu of construction is required if the SUP/SW facilities are not required as per the Subdivision Engineer's determination.
 5. SUP/SW fee in lieu of construction shall be based on current accepted rates. The Shared-Use Path and Sidewalk Fee Calculation Form, (available on DelDOT's website http://www.deldot.gov/information/business/subdivisions/SUP_and_SW_Fee_Calc_Form.docx), shall be used to calculate the amount.
 6. If a non-profit organization (school, fire-company, church etc.) receives funding for the construction of the required SUP/SW from the Community Transportation Fund (CTF) then the SUP/SW will either be constructed at that location through the applicant's construction process under a third party agreement or at a future date through the Department's Capital Transportation Program (CTP).
 7. The fee in lieu of construction will be utilized in accordance with the Department's SUP/SW fund procedure.
 8. If any of the criteria above is to be waived, it will require the Director of Planning's approval.
- B. **Internal Development and Subdivision Streets** – This section defines the SUP/SW requirements that apply within residential subdivisions, redevelopment projects and commercial or mixed-use

developments. The owner or applicant shall be required to provide items on the Record Plan and/or to construct a SUP/SW for development projects in accordance with the following warrants:

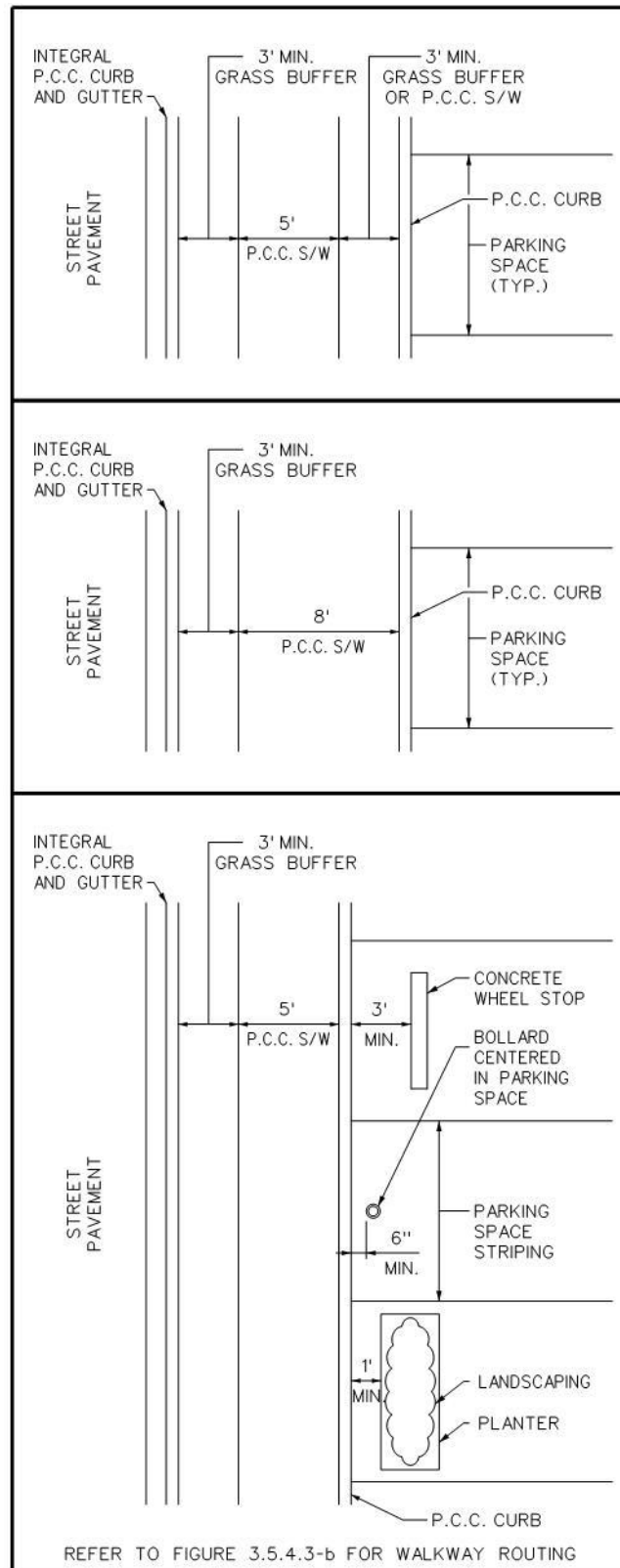
1. Regardless of whether or not a project is required to install a SUP/SW at the time of the development's construction, a Permanent Easement (PE) is required per Section 3.2.5.1.2 of this manual. The proposed Permanent Easement (PE) shall be shown (on the Record Plan or Site Plan) and recorded via separate deed or recorded plat.
 2. The Applicant shall provide a SUP/SW along both sides of subdivision streets where the development has a net density of three dwelling units or greater per acre.
 3. The Applicant shall provide a SUP/SW along both sides of development project streets where the development has access to transit or other local destinations or is of such a nature that it is reasonable to assume, as determined by DelDOT, that it will attract pedestrians.
 4. The Applicant shall provide a SUP/SW along at least one side of a street that does not meet the requirements in paragraph 2 or 3 or where there are physical or environmental constraints that make sidewalks on both sides of a street impractical.
- C. Off-Network Trails – This section defines the SUP/SW requirements that apply, when constructing a SUP/SW which does not fully match the location and placement criteria of Section 3.5.4.2.A or 3.5.4.2.B. Off-Network Trails may connect existing or proposed SUP/SW facilities by passing through the development project, and typically will not follow internal streets. The owner or applicant shall construct Off-Network Trails SUP/SW in accordance with the following warrants:
1. Regardless of whether or not a project is required to install a SUP/SW at the time of the development's construction, a Permanent Easement (PE) is required, and shall be provided in accordance with Section 3.2.5.1.2 of this manual. The proposed physical location and Permanent Easement (PE) for the facility is required to be shown (on the Record Plan or Site Plan) and recorded via separate deed or recorded plat. The intent is to allow current or future land owners and adjoining land owners the opportunity to understand the location and nature of any such Off-Network Trail.
 2. The location of any such Off-Network Trail/facility is required to be situated based upon guidance from the DelDOT Planning Section's Bicycle and Pedestrian coordinators.

3. The approved and recorded plans shall include the following note:
“Initial construction, ongoing maintenance and long term funding associated with any Shared-Use Path (SUP) and/or Sidewalk segments and their associated Permanent Easements shall be the responsibility of the developer, the property owners or both associated with this project. The State of Delaware assumes no responsibility for the future maintenance of these Shared-Use Path (SUP) and/or Sidewalk segments and their associated Permanent Easements.”

4. SUP/SW construction for development projects that are responsible for the creation of such Off-Network Trails shall coordinate the timing and/or phasing of trail construction during the process of seeking an Entrance Plan Approval (EPA) from the Development Coordination Section. Unless agreed to by the Development Coordination Section of DelDOT as a condition of approval, the Shared-Use Path (SUP) and/or Sidewalk construction shall begin concurrent with initial site-entrance construction, and be complete prior to 25% occupancy or leasing of the development project.

- D. Shared-use paths and sidewalks shall be constructed in accordance with Chapter 5 of this manual and shall meet Americans with Disabilities Act requirements.
- E. Shared-use paths and sidewalks shall be separated from the edge of road, pavement, driveways, parking lots, and site entrances in accordance with Chapter 5 of this manual. Where a sidewalk is planned to adjoin the pavement edge of parking lot areas, such sidewalk shall be grade-separated from the parking lot surface by at least

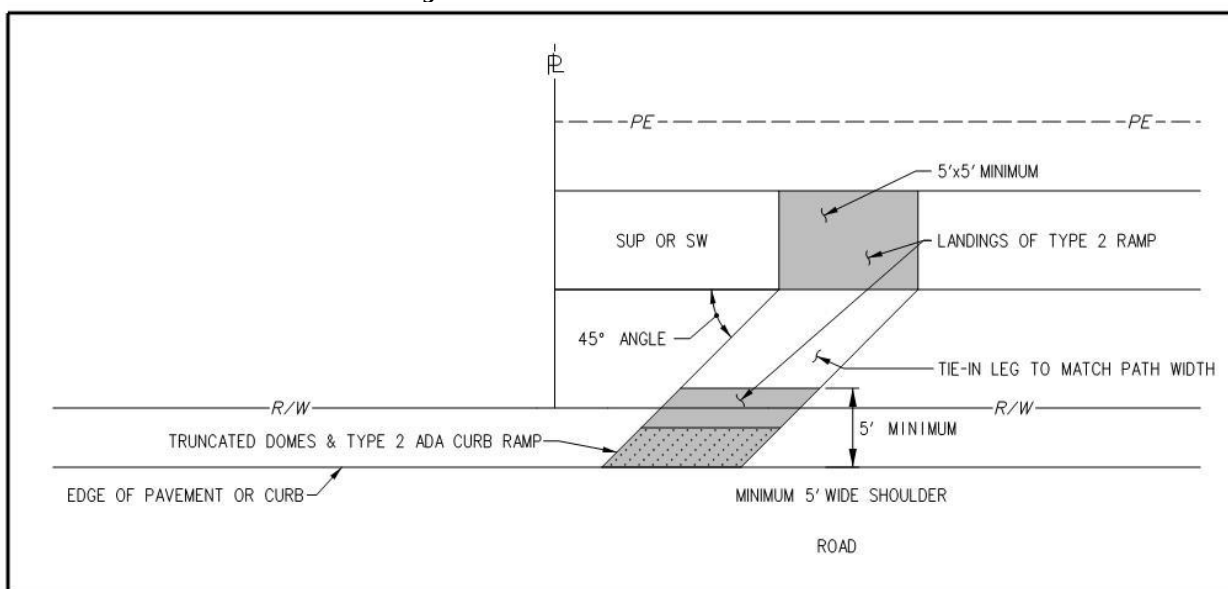
Figure 3.5.4.2-a Sidewalk Designs



a six-inch vertical face curbing and shall be at least eight feet wide unless concrete wheel stops, bollards, landscaping, minimum 3' wide grass buffer, or other similar improvements are provided which prevent parked vehicles from obstructing the sidewalk. See Figure 3.5.4.2-a.

- F. Shared-use paths and sidewalks shall be free of utility poles, bushes, plants, and all other obstructions.
- G. Shared-Use Path and Sidewalk Termination Points and Road Tie-ins shall be designed in accordance with the Americans with Disabilities Act (ADA) standards for shared transportation paths, and additional requirements as follows. Guidance for SUP signing and pavement marking is shown in the DE MUTCD and AASHTO publications.
 - 1. When a minimum 5 ft. wide shoulder is present the SUP/SW shall tie into the shoulder at a 45 degree angle with a detectable warning surface (truncated domes) and Type 2 curb ramp (with ADA landings), leading to the road connection. The tie-in segment shall match the width of the SUP/SW. The SUP/SW should still dead-end at the property line.
 - i. To promote pedestrian/user safety and minimize the distances that must be traversed within the road/travelway, when no shoulder exists within the project's own frontage, DelDOT may exercise discretion and request the tie-in of the SUP/SW to a turn/deceleration lane. DelDOT will avoid such tie-ins wherever possible, and will consider other practical alternatives. When DelDOT deems it more practical, and sufficient Right-Of-Way (ROW) or Permanent Easement (PE) exist, DelDOT may require that the SUP/SW be extended beyond project's own frontage a minimal distance to tie-in to the shoulder beyond a turn/deceleration lane or to allow for a connection to an adjacent SUP/SW facility or driveway.

Figure 3.5.4.2-b Sidewalk/Shared Use Path Tie-in



- 2. Where a ditch must be crossed to tie-in to the roadway, a 2 ft. graded SUP/SW user recovery area with a slope of 6H:1V or flatter shall be provided adjacent to the path followed by a maximum 3H:1V slope to the invert of pipe or swale.
- 3. When no shoulder is present, no connection to the roadway shall be established. The SUP/SW shall terminate at the property line, other facility or DelDOT determined location to promote a safe termination.

If a property is developed adjacent to a parcel with a SUP/SW stub and road tie-in, it shall be the responsibility of that Developer to remove the road tie-in on the adjacent property once the main line connection is made. This requirement should be identified during the plan review process and a note shall be placed on the Record Plan defining the Developer's responsibility, ([http:// www.deldot.gov/ information/ business/ subdivisions/ DelDOT_Development_Coordination_Plan_Sheet_Notes.doc](http://www.deldot.gov/information/business/subdivisions/DelDOT_Development_Coordination_Plan_Sheet_Notes.doc)). Physical removal of the SUP/SW road tie-in on the adjacent property shall be at DelDOT's discretion.

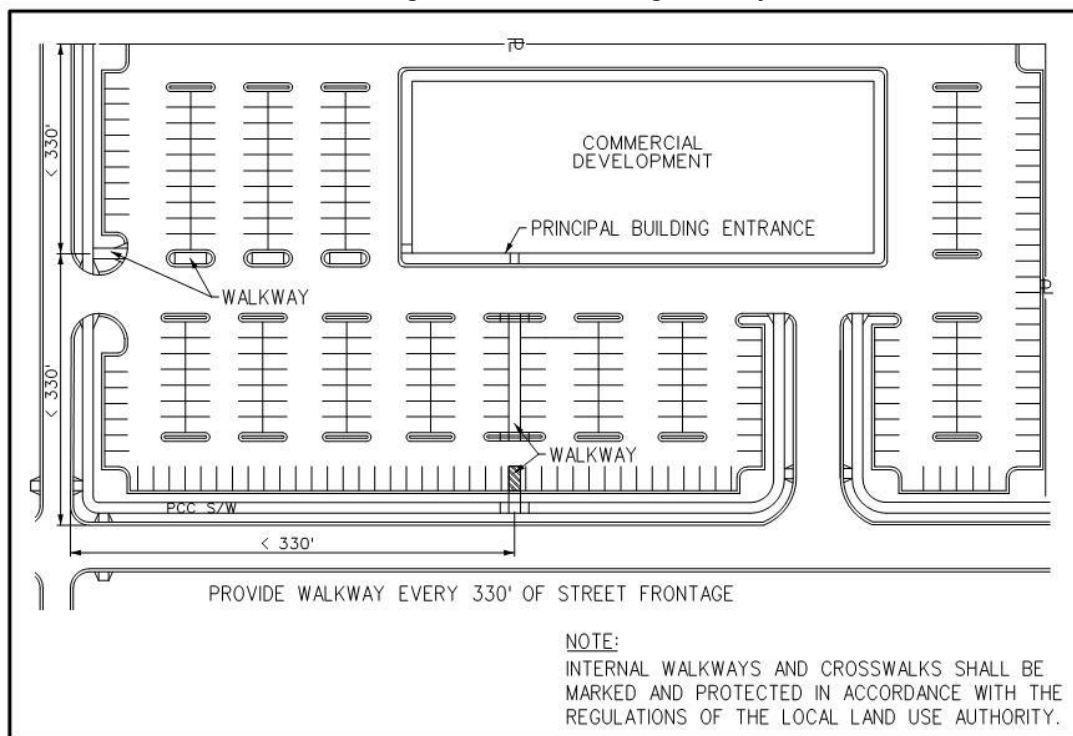
3.5.4.3 Walkways

Non-residential developments shall provide a system of internal pedestrian connections to encourage safe and convenient pedestrian movement within the site. These pedestrian connections, known as walkways, shall also link the site with the public street sidewalk, transit facilities and shared-use trail system, where they exist.

Walkways are recommended between parts of a site where the public is invited or allowed to walk. Walkways should be included as part of office/warehouse and retail/warehouse combinations. Walkways are not recommended between buildings or portions of a site such as truck loading docks and warehouses that are not intended or likely to be used by pedestrians or are considered to be unsafe for use by pedestrians.

- A. *Locating Walkways* - A walkway into the site shall be provided for every 330 feet of street frontage unless otherwise directed by DelDOT. A walkway should also be provided to any sidewalk or access-way abutting the site. See Figure 3.5.4.3-a.

Figure 3.5.4.3-a Locating Walkways



- B. *Walkway Connections* - Walkways should connect building entrances to one another and from building entrances to adjacent public streets and existing or planned transit facilities. On-site walkways should connect with walkways, sidewalks, bicycle facilities, alleyways and other bicycle or pedestrian connections on adjacent properties. DelDOT may request connections to be constructed and extended to the property line at the time of development.
- C. *Walkway Routing* - Walkways should be as direct as possible when connecting. Driveway crossings should be minimized. Internal parking lot circulation and design should provide reasonably direct access for pedestrians from streets and transit facilities. Internal crosswalks shall be marked and protected in accordance with the regulations of the local land use authority.
- D. *Walkway Design* - Walkways should be paved and should maintain at least five feet of unobstructed width. Walkways bordering parking spaces should be at least eight feet wide unless concrete wheel stops, bollards, landscaping, or other similar improvements are provided which prevent parked vehicles from obstructing the walkway. Ramped walkways should be provided where necessary to afford a reasonably direct route and should conform to DelDOT standards. Walkways should be differentiated from parking areas and circulation aisles by changes in grade, different paving material, landscaping or other similar method. See Figures 3.5.4.3-b and 3.5.4.3-c.

Figure 3.5.4.3-b Walkway Routing

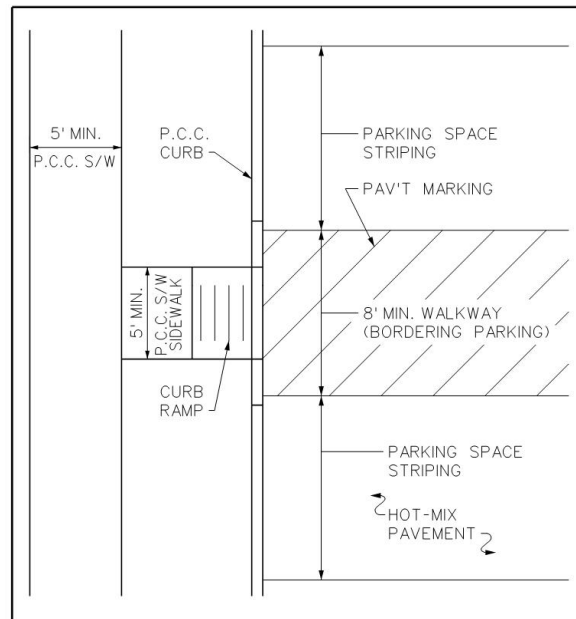
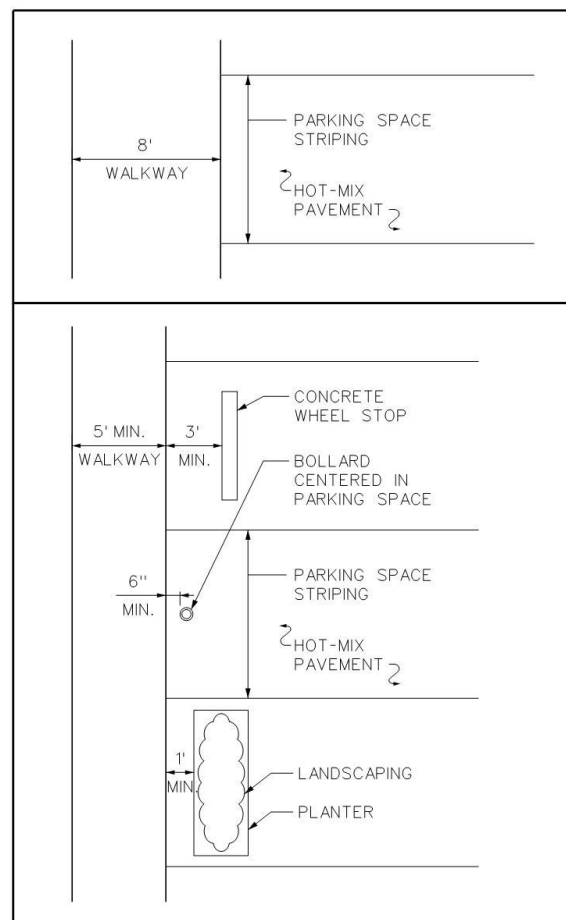


Figure 3.5.4.3-c Walkway Designs



- E. *Walkway ADA Compliance* - The Americans with Disabilities Act (ADA) contains different and stricter standards for some walkways. The ADA applies to the walkway that is the principal building entrance and walkways that connect transit stops and parking areas to building entrances. Where the ADA applies to a walkway, the stricter standards of ADA must be applied.

3.5.4.4 Access-ways

Access-ways shall be used to provide bicycle and pedestrian passage between streets and/or existing or proposed trails when the spacing between streets is inadequate to accommodate convenient pedestrian and bicycle travel. Access-ways are similar to walkways constructed in commercial or mixed use developments but are generally wider so as to accommodate bicycle traffic in residential areas. A shared-use path may be identified within a development project as an access-way however access-ways will typically carry less traffic, be narrower and require less total right-of-way than a shared-use path. Access-ways differ from sidewalks in that they do not generally run along the right of way of roads and streets.

Access-ways shall be provided as part of all new developments and redevelopments where the net dwelling unit density is greater than 1 dwelling unit per acre.

Access-ways shall be provided for pedestrians and bicycles on recorded open space where full street connections are not possible, with spacing between full street and access-way connections of no more than 660 feet, except where prevented by topography, barriers such as buildings, railroads or freeways, or environmental constraints such as major streams and rivers (all collectively to be called “constraints”).

- A. *Access-way Width and Access Width* - The width of the recorded open space for access-ways must be sufficient to accommodate expected users, and provide a safe environment, taking into consideration the characteristics of the site and vicinity, such as the existing street and pedestrian system improvements, existing structures, natural features, and total length of the access-way connection. Access-ways shall be set at a minimum width of 8 feet, with a minimum recorded open space width of 18 feet. A minimum 2 foot clearance should be provided to lateral obstructions such as shrubs or trees. In addition, the DE MUTCD requires a minimum 2' clearance from post mounted signs. See Figure 3.5.4.4-a. Access-ways within a subdivision street system shall be provided as follows:
1. Where any block of the subject street that is longer than 660 feet as measured from the near side right-of-way line of an intersecting street to the near side right-of-way line of another intersecting street, an access-way shall be required through and near the middle of the block. See Figure 3.5.4.4-b.
 2. Where any block of the subject street is longer than 1,320 feet as measured from the near side right-of-way line of an intersecting street to the near side right-of-way line of another intersecting street, two or more access-ways may be required through the block. See Figure 3.5.4.4-c.
 3. Where a street connection is not feasible, one or more new access-ways to the following shall be provided as a component of the development: an existing transit stop, a planned transit route as identified by DTC and/or DelDOT, shopping center or a community facility. The access-way shall be made as direct as possible.
 4. DelDOT may require an access-way to connect from one cul-de-sac to an adjacent cul-de-sac or street. See Figure 3.5.4.4-d.

5. In a proposed development or where redevelopment potential exists and a street connection is not proposed or possible, one or more access-ways may be required to connect a cul-de-sac to public streets, to other access-ways, or to the project boundary to allow for future connections.
 6. A new access-way to a community facility shall be provided as a component of a development proposal if the addition of an access-way would reduce walking or bicycling distance by at least 50 percent over other available sidewalks, walkways or access-ways and the reduced walking or bicycling distance is greater than 660 feet. See Figure 3.5.4.4-e.
- B. Access-way Design Standards – Access-ways shall be as short as possible and wherever practical, straight enough to allow one end of the path to be visible from the other.

Access-ways shall be located to provide a reasonably direct connection between destinations via pedestrian and bicycle travel.

Access-ways through parking lots should be physically separated from adjacent vehicle parking and parallel vehicle traffic through the use of curbs, car stops, landscaping buffer, trees, lighting, and such other methods as may be desirable, if not otherwise provided in the parking lot design. See Figures 3.5.4.3.b and 3.5.4.3.c.

Where possible, access-ways shall converge with streets at traffic-controlled intersections for safe crossing.

Figure 3.5.4.4-a Access-way Width

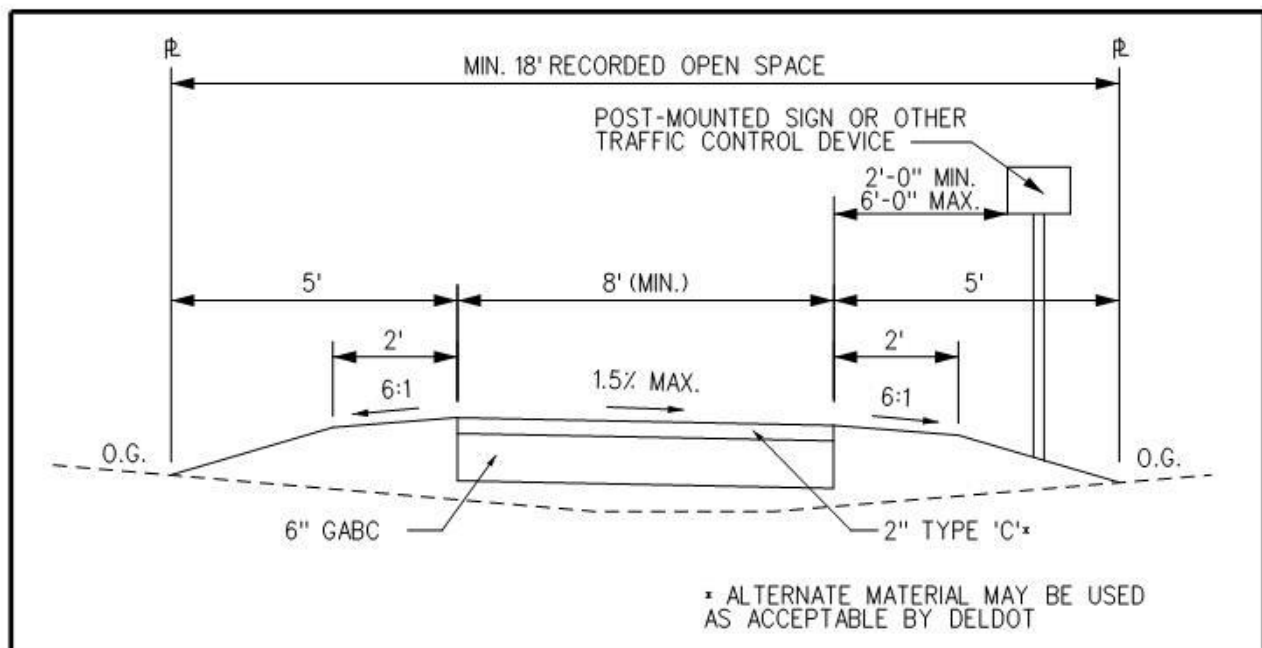


Figure 3.5.4.4-b Access-ways – 660' < Block Length < 1320'

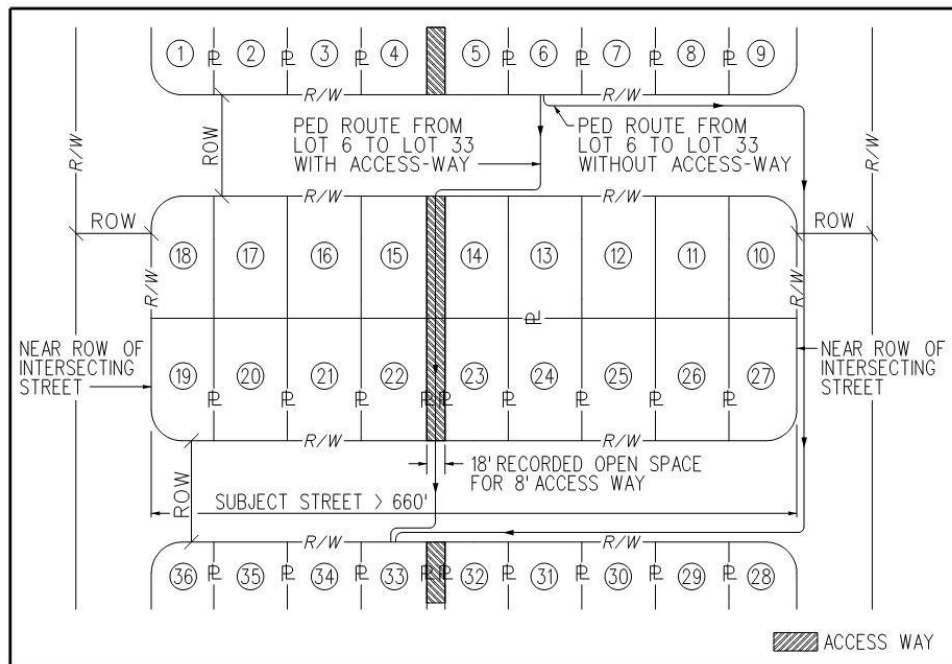


Figure 3.5.4.4-c Access-ways – Block Length > 1,320'

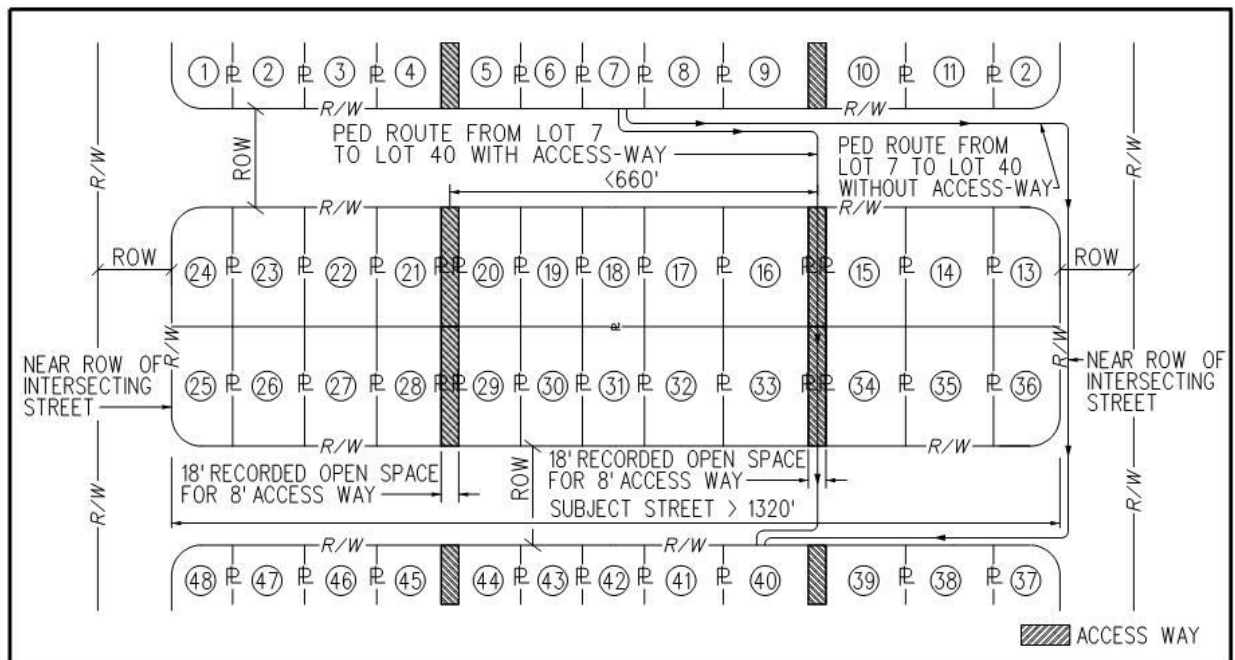


Figure 3.5.4.4-d Access-ways – Cul de Sac Connection

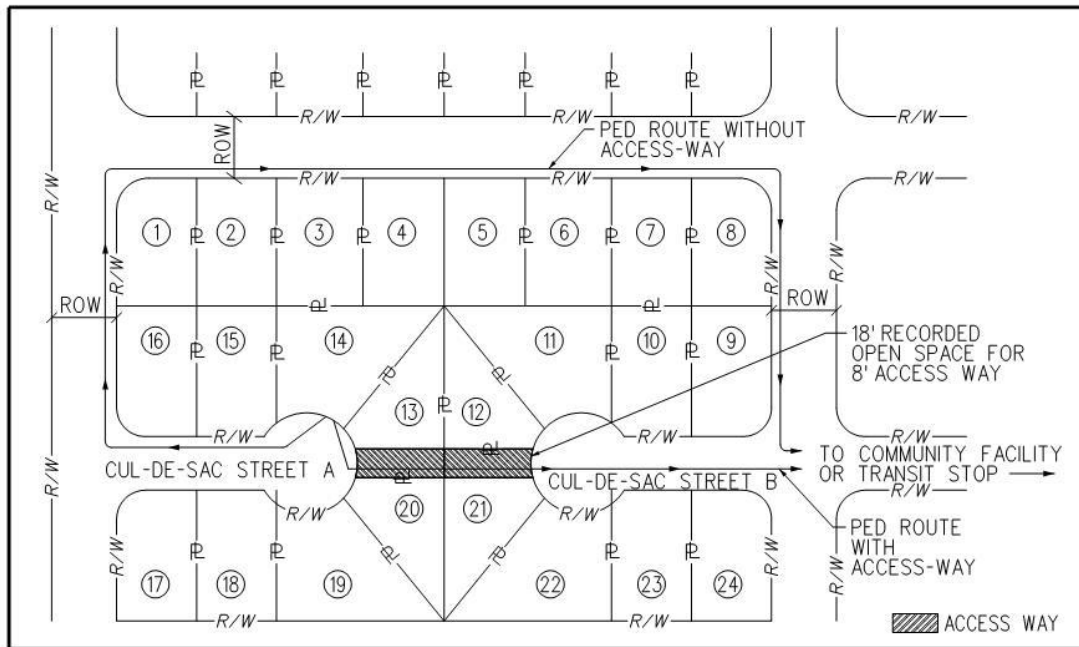
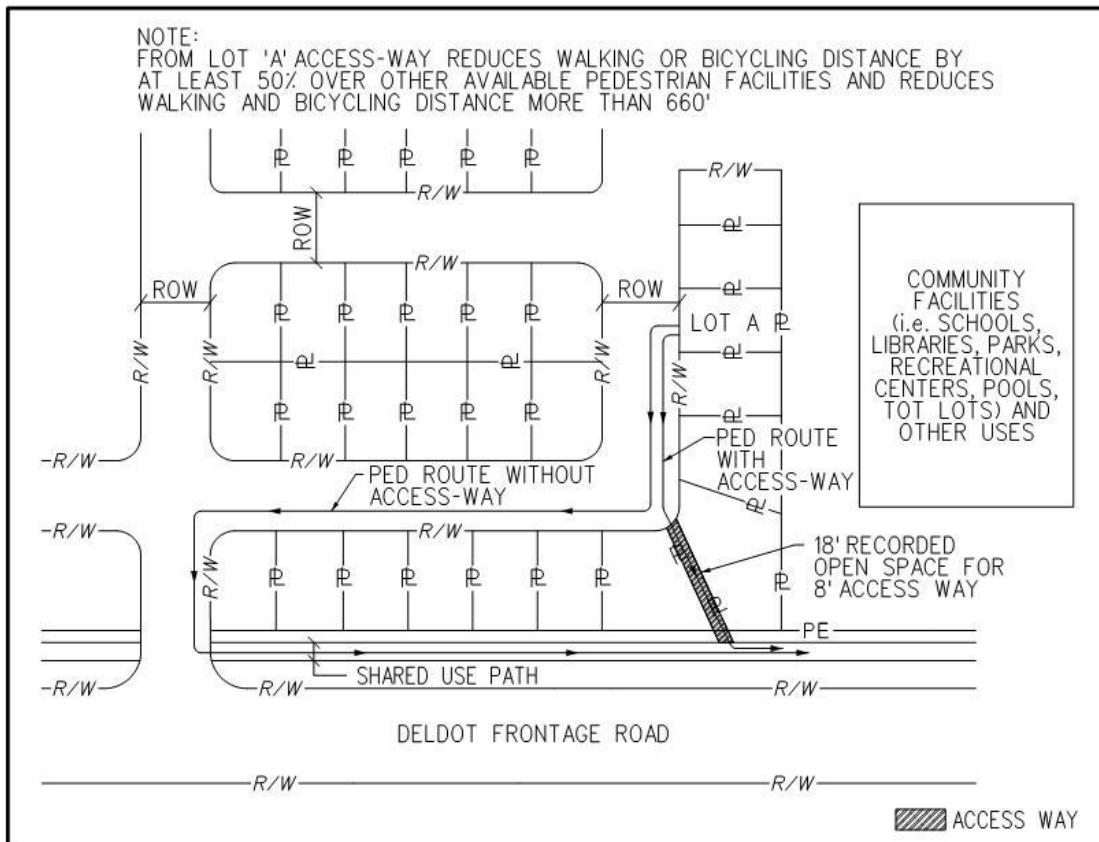


Figure 3.5.4.4-e Access-ways – Community Facilities



3.5.4.5 Roadway Crossing by Bicycles and Pedestrians

The Applicant shall be required to install marked crosswalks between curb ramps for the purpose of delineating pedestrian and bicycle street-crossing locations in the following instances:

- A. Across subdivision streets where the subdivision street intersects a frontage road. Crosswalks may also be required across the frontage road at DelDOT's discretion
- B. At all signalized intersections adjoining the development site
- C. At key locations to provide marked street crossing access to active or passive parkland and open space areas, schools, playgrounds, neighborhood shopping centers, transit and similar pedestrian destinations within and adjoining the development site
- D. *Pedestrian Refuge* – If at all feasible, pedestrian refuge areas shall be constructed across roadways of 4 or more travel lanes at key locations where a marked crosswalk is to be installed.

3.5.5 Connectivity - Transit Facilities

Existing and proposed transit stops, shall be shown on the Record Plan with applicable bicycle and pedestrian connectivity. These facilities may include passenger shelters, bicycle parking, landing pads, bus pull-offs, walkways to the transit stop location, or some combination thereof, as required by DTC or DelDOT, in consultation with the applicable land use authority.

3.5.5.1 Industrial, Institution, Retail, and Office Developments

DelDOT or DTC may require: industrial uses, office, institutional uses, or retail establishments; larger than 150,000 s.f. to provide either a transit stop on-site or adjacent to the site, or a pedestrian connection to an existing transit stop.

In such cases, pedestrian connections shall be made to any transit facility within 1,320 feet of the boundary line of a site. The connections should take the most practical direct route. Users should be able to see the ending of the connection from the entrance point, if possible.

If transit service exists along the frontage of the development, or if, after consultation with DTC, it is determined that the development is a feasible candidate for transit service, and there is no existing transit stop within 1,320 feet of the site, pedestrian routes and transit facilities shall be designed to support transit use through provision of improvements.

3.5.5.2 Residential Developments

- A. *School and Transit Bus Stop Requirements* – All subdivision and residential site development proposals involving more than 50 dwelling units shall be required to designate and reserve locations for transit and school bus stop accommodations within and/or adjacent to the proposed development, as directed by DelDOT or DTC. If these accommodations are adjacent to the proposed development, pedestrian connections may be required, taking the most practical direct route.

- B. *School Bus Stop Locations*

The following specifies school bus stop locating procedures:

1. The developer shall notify the local public school district of the location, character and layout of the proposed subdivision or residential site development as early as possible in the plan development process, but in any case, by registered mail no later than 30 days prior to the date of the public meeting at which such proposal will be considered for approval. The purpose of this notification is to offer the local public school district the opportunity to provide input and direction with respect to the most appropriate and serviceable location for school bus stops within the proposed development. If available, the applicant/ developer shall use a School District Notification Form provided by the local jurisdiction developed for this purpose.
2. The local public school district shall have 30 days to provide commentary to both the applicant/developer and to the local jurisdiction with respect to school bus stop provisions. Such commentary shall describe preferred locations of bus stops within and adjoining the proposed development site. Should the local school district choose not to respond within the prescribed period, the development proposal may proceed through the review and approval process.

3.5.5.3 Transit at Mixed Use Developments

To facilitate transit usage and circulation, mixed use developments should provide transit stops at key nodes with easy access to the surrounding thoroughfares. Transit routes through the mixed use development shall be designed to accommodate the technical requirements of bus operations. Transit easements through and within mixed use centers shall be provided as requested by DTC. DTC is involved in the project development process to ensure feasibility and conformance with intended use. The designer should refer to Section 5.3.3 of this manual for more information.

3.5.6 Connectivity - Subdivision Street Intra-Connectivity

In addition to minimum roadway spacing requirements, the Applicant shall demonstrate that the streets within the proposed development will provide adequate connectivity by calculating the project's connectivity ratio.

A. Minimum Required Connectivity Ratio

All Plans shall demonstrate that the proposed subdivision street system will achieve a **connectivity ratio of 1.4 or greater**.

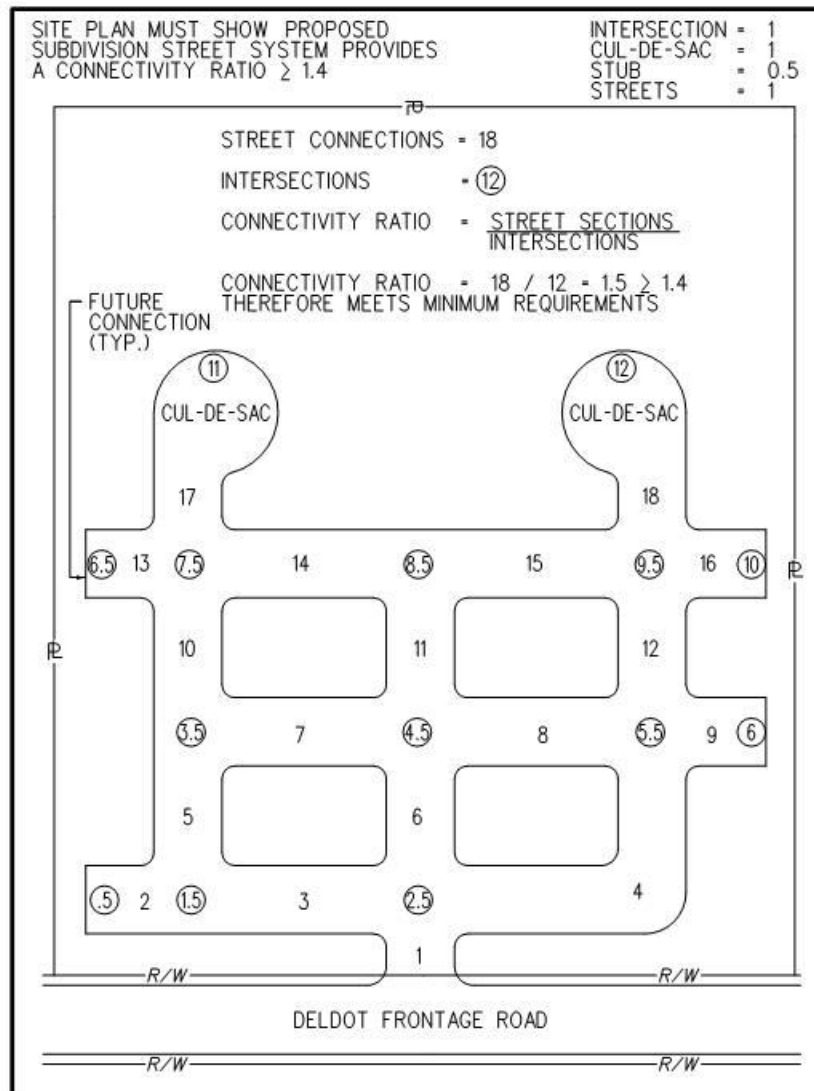
B. Connectivity Ratio for Phased Development

If a subdivision is planned to be constructed in distinct development phases, then Plan shall demonstrate that the initial phase individually and in conjunction with all subsequent phases, will achieve and maintain the minimum connectivity ratio requirement.

C. Verification of Connectivity Ratio

The Record Subdivision Plat shall reflect compliance with the minimum connectivity ratio requirement. See Figure 3.5.6-a. A calculation sheet reflecting the information in Figure 3.5.6-a shall be submitted.

Figure 3.5.6-a Intra-connectivity – Minimum Required Connectivity Ratio



3.5.7 Connectivity - Interconnectivity

Linkages shall be provided among adjoining subdivisions in order to allow convenient and effective travel among neighborhoods. Benefits include ease of access, alternative travel routes for residents, sidewalk networks on local streets and internal circulation routes for service providers such as school buses, transit vehicles, sanitation vehicles, and emergency management personnel.

Where proposed subdivisions abut communities which restrict residents to the age of 55 and over, interconnections shall be regulated by the provisions of 17 Del.C. §531.

3.5.7.1 Linkages to Existing Adjacent Developments with no Connection

When proposed development is being planned adjacent to previously developed land and the previously developed land has not incorporated linkage street stubs to its perimeter as part of its recorded plan, the proposed development shall provide access-way connections if at all possible.

If required by DelDOT, the Applicant shall provide right of way for a future access-way connection, and/or a full street connection, within the span of each such property boundary line.

3.5.7.2 Linkages to Existing Adjacent Developments with Connection

When proposed development is being planned adjacent to previously developed land and the previously developed land has incorporated linkage street stubs to its perimeter as part of its recorded plan, the proposed development must incorporate street connections to the existing linkage street right-of-way stubs as part of its street system.

- A. *Sidewalk Interconnections* - All development plans shall provide for sidewalks along future public street connections to adjacent developable parcels along each property boundary that abuts potentially developable or re-developable land in accordance with the provisions for sidewalks.
- B. *Access-ways or Walkways* - Access-ways or walkways for bicycles, pedestrians, and emergency vehicles shall connect the on-site circulation system to existing adjacent bicycle and pedestrian connections, transit facilities and to entrances open to the public that abut the property. Connections may approach parking lots on adjoining properties if the adjoining property used for such connection is open to public pedestrian and bicycle use, is paved, and is unobstructed.

3.5.7.3 Linkages to Undeveloped or Re-developable Property

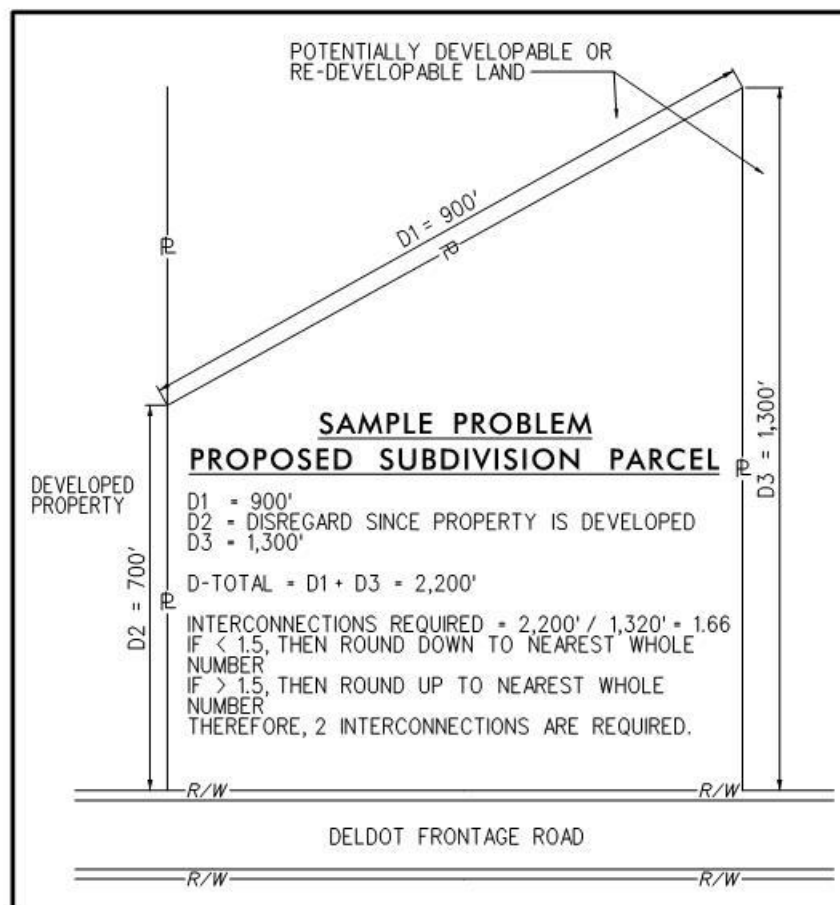
Where abutting properties are undeveloped or can be expected to be redeveloped within the next ten years, the location and potential arrangement of streets, bicycle and/or pedestrian connections shall be provided at the following spacing to provide for the continuation of these connections into surrounding areas. See Figure 3.5.7.3-a.

- A. *Subdivision Street Type I and II Interconnections* - All development plans shall provide for linkage street stubs at a ratio of one per 1,320 linear feet of the boundary line or fraction thereof, which adjoins potentially developable or re-developable land. The ratio should be rounded to the nearest whole number as shown in Figure 3.5.7.3-a.
- B. *Subdivision Street Type III or Higher Order Road* - All development plans shall provide for future public street connections to adjacent developable parcels by providing a Type III street connection as a continuation of the site circulation and spaced at intervals: 1) in accordance with an approved DelDOT and County local traffic circulation plan; or 2) if no such plan exists, not to exceed 1,320 linear feet along each development plan boundary or as measured from the nearest parallel collector road to the site. Where it is determined that such connections or the spacing thereof are not feasible or practical, DelDOT may at its discretion, waive or modify this requirement.
- C. *Development Adjacent to Vacant Land* - Where new development is adjacent to vacant land likely to be subdivided in the future, all streets, sidewalks bicycle lanes, and access-ways in the development's proposed street system shall continue through to the boundary lines of the area under the same ownership as the subdivision, if directed by DelDOT or the appropriate land use agency to provide for

the orderly subdivision of such adjacent land or the transportation and access needs of the community.

- D. *Redevelopment Projects* - All redevelopment projects shall retrofit existing streets to provide increased vehicular, bicycle and pedestrian connectivity along with increased transit accessibility.
- E. *Sidewalk Interconnections* - All development plans shall provide for sidewalks along future public street connections to adjacent developable parcels along each development plan boundary that abuts potentially developable or re-developable land in accordance with the provisions for sidewalks.
- F. *Walkway and Access-way Interconnections* - All development plans shall provide for future public walkways and/or access-ways, as applicable, to connect to adjacent developable parcels by providing such connections as a continuation of the walkways or access-ways provided for the development in accordance with the walkway and access-way standards for each development plan boundary that abuts potentially developable or re-developable land.
- G. *Stub Street Turn-Around Area* - The right-of-way stubs shall be planned and constructed to the subdivision boundary line for future connections as outlined in Section 5.1.5.2, Temporary Dead End Streets.

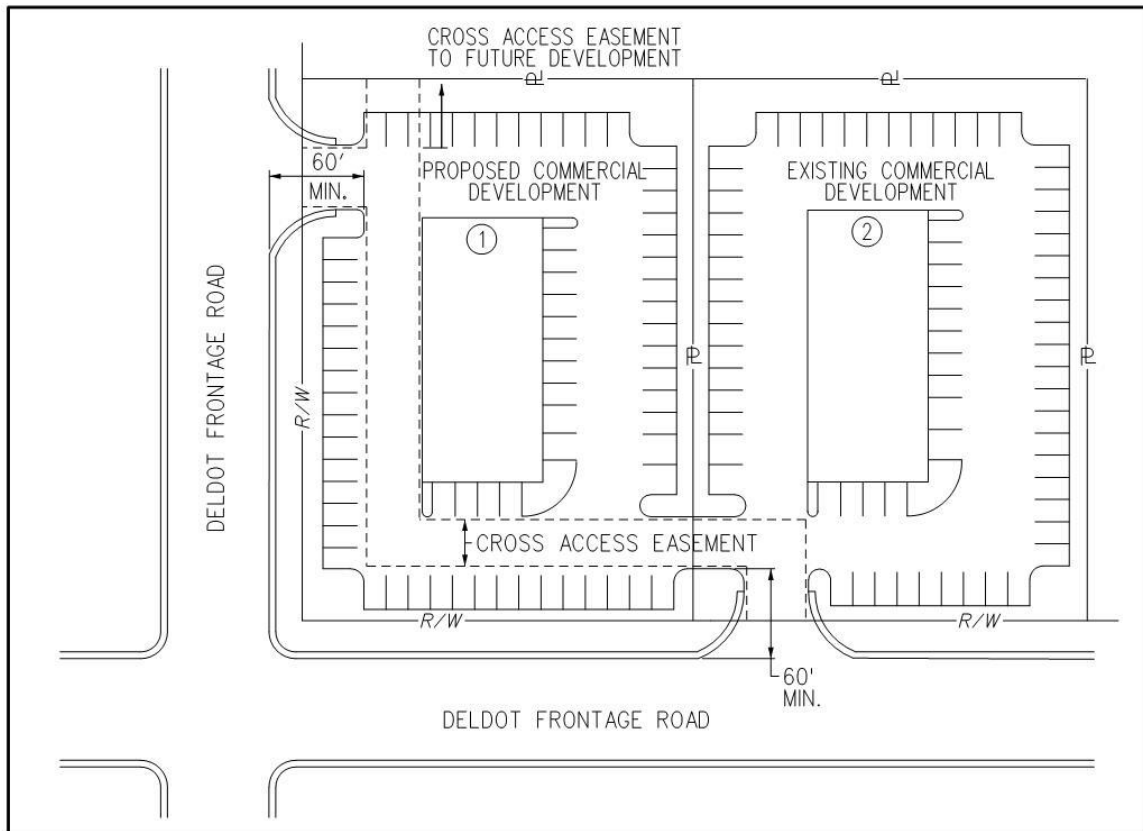
Figure 3.5.7.3-a Subdivision Street Interconnections



3.5.7.4 Non Residential Cross-Access Interconnectivity

Developments should minimize or eliminate access points along DelDOT frontage roads. Where possible, vehicular access should be shared with the adjacent properties and/or alleys should be used for access. See Figure 3.5.7.4-a.

Figure 3.5.7.4-a Non-Residential Cross-Access Interconnectivity



- A. *Cross-Access* - To reduce the number of access points to DelDOT frontage roads, and to promote efficient and convenient access along roadway corridors, shared entrances, connecting driveways and street linkages are recommended wherever practical.
- B. *Aisle length between Cross-access and Street* - A minimum distance of 60 feet shall be required between a cross-access-way and an intersection or driveway entrance to allow for car storage between the cross-access and the driveway.
- C. *Cross-Access Types and Locations* - Locations and types of cross-access will vary from site to site and are dependent upon a number of factors including: overall size of the properties involved, building types and land uses of the properties being served, locations of the existing and proposed buildings, locations of existing and proposed parking lots and site utility and landscape requirements.
- D. *Recordation* - Any cross-access easements shall be shown on the Record Plan for the development and recorded at the applicable local recordation office.

E. Cross-Access Construction:

1. Development plans shall indicate the location of cross-access easement(s).
2. The access connection shall be completed if an immediate or near term benefit (as determined by DelDOT) can be derived by completing the link.
3. If no immediate or near term benefit would be derived, development plans should provide cross access and construction easements and arrange the site design so that when the adjoining property owner extends the connection to the property line, the link will be completed. If the link is to be completed in the future, the grade of the connection, parking, landscaping and other improvements must be set to allow for extension into the adjacent lot.

F. Internal Access Driveways - Whenever possible, internal access drives should be located to join together existing public streets and/ or connect to adjacent private drives so that the internal circulation functions as an integral part of the surrounding transportation network.

3.5.8 Connectivity - Hindrances

Street, bicycle, and/or pedestrian connections are not required where one or more of the following conditions exist:

- A. Where physical or topographic conditions make a street, access-way or walkway connection impracticable. Such conditions include but are not limited to the alignments of existing connecting streets, freeways, railroads, slopes in excess of DelDOT standards, wetlands or other bodies of water where a connection could not reasonably be provided.
- B. Existing buildings or other development on adjacent lands physically preclude a connection now and in the future, considering the potential for redevelopment.
- C. Where the installation of street, bicycle, and/or pedestrian connections would violate provisions of leases, easements, covenants, or restrictions written and put into effect prior to the effective date of these regulations.

DelDOT shall make the final determination as to whether or not a connection shall be made. Where connectivity ratio cannot be met for any of the above reasons, DelDOT may waive the connectivity ratio requirement.

3.6 DELDOT NOISE POLICY

Any development proposed to be constructed in the proximity of any roadway with a functional classification of principal arterial, freeway or interstate will be required to perform a noise analysis and shall meet the requirements of this noise policy with regard to the following:

- A. Existing and future noise levels impacting developments proposed along existing transportation facilities
- B. Future noise levels generated by off-site improvements that are linked to proposed land development projects

This policy is based on accepted practices and procedures such as those used by Federal and State transportation departments to assess highway-related noise levels.

3.6.1 DelDOT Noise Policy - Introduction

Highway traffic generated noise is typically a combination of noise composed of; tire and pavement interaction, engine operation, and exhaust expulsion. During the rapid expansion of the highway and roadway system in the 20th century, communities began to recognize that highway traffic noise and construction noise had become important environmental impacts, and that this noise could sometimes interfere with normal human activities. The Federal government and DelDOT have adopted transportation noise policies with the intent to mitigate highway and construction generated noise. These policies will be in effect for any transportation related improvements necessary due to any proposed development.

For land development projects adjacent to existing transportation facilities or requiring off-site improvements to transportation facilities, it is the developer's responsibility to evaluate noise levels and their impacts to proposed and existing development.

3.6.2 DelDOT Noise Policy - Highway Transportation Noise Standards

The Federal Highway Administration (FHWA) has issued regulations for noise evaluation in 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. DelDOT has developed a noise policy to implement of the requirements of the Federal Highway Administration (FHWA) Noise Standards. The policy (Delaware Policy Implement No. D-03) can be found in the environmental tab of DelDOT's "Doing Business" webpage (<http://deldot.gov/information/business/drc/environmental>). Please refer to that policy for guidance regarding data collection, noise prediction, impact analysis, abatement measures and other procedures used to evaluate highway traffic and construction noise.

3.6.3 DelDOT Noise Policy - Noise Abatement Criteria

The FHWA has developed specific criteria that serve as the maximum recommended highway traffic noise levels for various types of land use. The noise abatement criteria, depicted in Table 1, are interpreted by DelDOT as values which, when approached or exceeded, require the consideration of traffic noise abatement measures. The developer should consider noise mitigation when traffic noise levels exceed one decibel below the values shown in Figure 3.6.3-a.

Figure 3.6.3-a: Noise Abatement Criteria

Activity Category	Design Noise Level Leg (h)	Evaluation Location	Description of Activity Category
A	57 dBA	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 dBA	Exterior	Residences
C	67 dBA	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas. Section 4(f) sites, schools, television studios, trails and trail crossings.
D	52 dBA	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 dBA	Exterior	Hotels, motels, offices, restaurants/bars, and other undeveloped lands, properties or activities not included in A-D or F.
F	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing

3.6.4 DelDOT Noise Policy - Developer Responsibilities: Site Improvements

Development projects fronting roadways that are designated on DelDOT's Functional Classification Map as a principal arterial, a freeway or an interstate will be required to conduct a noise impact study utilizing the FHWA Traffic Noise Model (TNM) criteria based upon the existing and/or forecasted traffic on the roadway. The noise impact study will predict and evaluate future traffic noise levels for the impacted receptors proposed by the development. In performing the TNM analysis, the developer shall utilize the average pavement type unless an alternative pavement type is approved for use by DelDOT. The developer is required to utilize the TNM to determine at what point during the year would yield the worst traffic noise impacts and utilize those traffic characteristics in performing the noise impact modeling. The study should include examining mitigation measures to shield the future abutting property owners from noise impacts or to reconfigure the site to place less sensitive receptors adjacent to the roadway.

DelDOT will review the noise impact study and analyze proposed mitigation measures as noted in Delaware's Highway Transportation Noise Policy. In lieu of installing mitigation measures, the Department may suggest that the Developer redesign the site plan by changing impacted areas from sensitive land uses to non-sensitive land uses. The DelDOT letter of no objection to record the

subdivision will be contingent upon a subdivision layout that has been designed to minimize noise impacts to the satisfaction of DelDOT following the full build-out of the site.

DelDOT will require that the Record Subdivision Plans for proposed land development projects include provisions for highway noise abatement if the results of the noise analysis indicate an adverse noise impact will result. The security that is required to indemnify the construction agreement for subdivision streets shall be calculated including the estimated cost to construct the noise mitigation measures specified on the Record Subdivision Plans for the lots abutting the proposed streets.

Although the local land use authority is responsible to ensure that all noise mitigation measures are constructed prior to the issuance of any Certificates of Occupancy for impacted structures, DelDOT will be responsible for insuring that the noise mitigation measures are constructed prior to accepting the street construction. The plans for streets serving impacted residences must include construction plans for noise barriers and/or walls. Noise mitigation measures shall be designed and constructed to meet DelDOT requirements. The security will not be released by the Department until the noise mitigation measure is constructed to DelDOT standards. Maintenance of any fence, berm or noise wall will remain the responsibility of the Developer or community, as described in a maintenance agreement with DelDOT.

3.6.5 DelDOT Noise Policy - Developer Responsibilities: Off-Site Improvements

If a development project requires an off-site improvement which requires the addition of one or more through lanes, the Developer of the land development project will be required to conduct a noise impact study utilizing the FHWA Traffic Noise Model (TNM) criteria based upon the forecast traffic on the improved section of roadway for any road that is designated in whole or in part on the DelDOT Functional Classification Map as a principal arterial, a freeway or an interstate. The noise impact study will predict and evaluate future traffic noise levels for the design that is under consideration. In performing the TNM analysis, the developer shall utilize the average pavement type unless an alternative pavement type is approved for use by DelDOT. The developer is required to utilize the TNM to determine at what point during the year would yield the worst traffic noise impacts and utilize those traffic characteristics in performing the noise impact modeling. The study should include examining mitigation measures to shield current abutting property owners from noise impacts.

DelDOT will review the noise impact study and analyze proposed mitigation measures as noted in Delaware's Highway Transportation Noise Policy. The DelDOT letter of no objection to record the subdivision will be contingent upon a mitigation plan that has been designed to minimize noise impacts to the satisfaction of DelDOT following the construction of the off-site improvements.

DelDOT will be responsible for insuring that the noise mitigation measures are constructed prior to accepting the street construction. The plans for streets serving impacted residences must include construction plans for noise barriers and/or walls. Any abatement measures are to be constructed by the developer concurrently with the offsite improvements. Noise mitigation measures shall be designed and constructed to meet DelDOT requirements. The security will not be released by the Department until the noise mitigation measure is constructed to DelDOT standards. Maintenance of any fence, berm or noise wall adjacent to an off-site improvement and within DelDOT's Right-of-Way will become the maintenance responsibility of the Department.

3.6.6 DelDOT Noise Policy - Decision Criteria

The Federal Highway Administration's noise regulations – 23 CFR 772 – require “the highway agency to identify noise abatement measures which are reasonable and feasible.” The criteria below shall be used by DelDOT to ensure that noise mitigation measures are both reasonable and feasible. The feasibility and reasonableness of a potential noise abatement measure must be evaluated before the Department will examine detailed noise mitigation concepts.

3.6.6.1 DelDOT Noise Policy - Decision Criteria: Feasibility

The evaluation of the feasibility of a noise mitigation measure deals primarily with engineering considerations. The Developer will be required to design all noise mitigation measures with the intention of achieving a noise level below the criteria shown in Figure 3.6.3-a.

However, there are factors that may limit the ability to achieve substantial noise reduction. These factors include but are not limited to the following:

- A. Safety conditions
- B. Access requirements for driveways and entrances
- C. Maintenance requirements
- D. Topography
- E. Drainage
- F. Other noise sources in the area

If the developer is unable to meet the noise levels shown in Figure 3.6.3-a due to the limiting factors listed above (or other limiting factors), DelDOT's Subdivision Engineer may waive the requirement. If the requirement is waived, the record plan should clearly identify the proposed locations that will not meet the noise level requirements shown in Figure 3.6.3-a.

3.6.7 DelDOT Noise Policy - Reasonableness

The Department will evaluate a number of factors when determining if a noise mitigation measure is reasonable. The criteria that shall be used to determine the reasonableness of a noise mitigation measure are listed below:

- A. Noise levels: Noise mitigation will be considered reasonable only for areas where the predicted noise levels for a project approach or exceed the Noise Abatement Criteria.
- B. Cost: A noise mitigation measure will be considered reasonable if the total cost does not exceed \$20,000 per benefited residence. A benefited residence is a dwelling unit that would receive a noise reduction of at least 3 decibels from the installation of a noise barrier.
- C. Environmental Impacts: A noise mitigation measure will be considered reasonable only if the construction of the measure does not have an adverse impact on the natural environment of the area.

3.6.8 DelDOT Noise Policy - Departure From Policy

There may be extenuating circumstances where unique or unusual conditions warrant special considerations of highway traffic noise impacts and/or implementation of noise abatement measures. These circumstances could involve areas such as; those that are extremely noise sensitive, those where severe traffic noise impacts are anticipated, or those containing Section 4(f) resources. Extenuating circumstances will be considered on an individual project basis and require the approval of DelDOT's Subdivision Engineer.

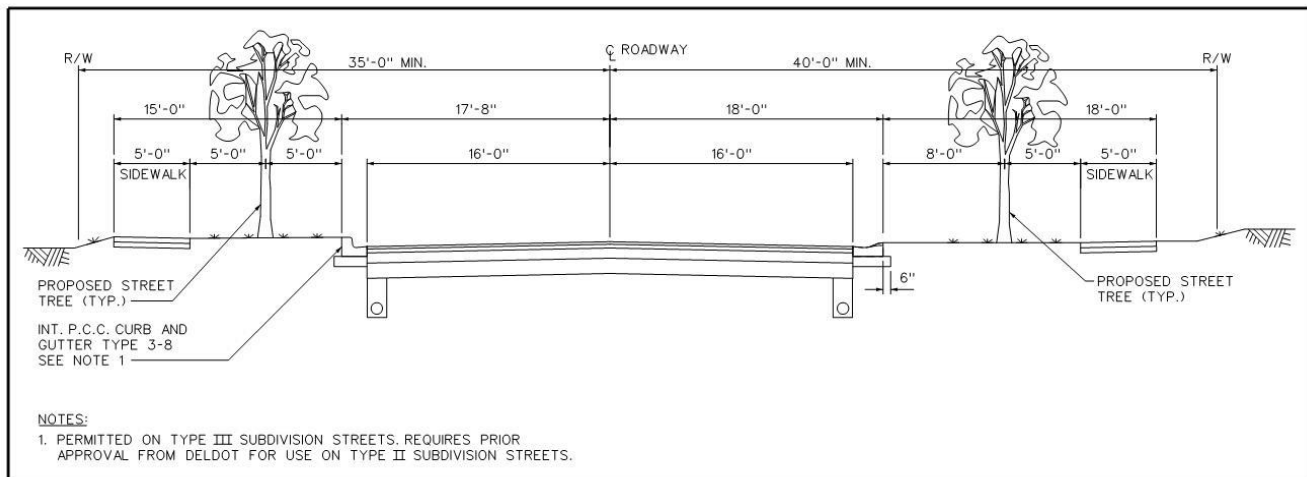
3.7 LANDSCAPING

Landscaping is an important aspect of the roadside. Street trees can be added within the right-of-way of a subdivision street under the following conditions:

- A. Additional right of way widths are provided for subdivision streets Types II and III as shown on Figure 3.7-a.
- B. Subdivision streets designed using Integral PCC Curb and Gutter Type 3 shall provide a minimum offset of five feet from the back of the curb and edge of sidewalk/path to the center of the tree trunk. Approval from DelDOT is required for use of PCC Integral Curb and Gutter Type 3 on Type II subdivision streets.
- C. Subdivision streets designed using Integral PCC Curb and Gutter Type 2 shall provide a minimum offset of eight feet from the back of the curb and a minimum offset of five feet from edge of sidewalk/path to the center of the tree trunk.
- D. A note, (in accordance with DelDOT's current notes which are available online at <http://devcoord.deldot.gov> > Quick Links > DelDOT Notes), is added on the record plan stating that DelDOT will not maintain trees.
- E. A landscaping plan must be submitted for DelDOT review and approval, and the following guidelines must be followed, noted and/or included on the landscape plan:
 - 1. The species of trees to be added within the right-of-way of a subdivision street must be listed in detail and must be confirmed as having been determined to be non-invasive and must not be listed in the Delaware Department of Agriculture's Invasive Species List. Any trees planted are to be installed in accordance with applicable current standards that may be in place at the time of installation, such as: International Society of Arboriculture (ISA) or American National Standards Institute (ANSI).
 - 2. Trees planted within ten feet (10') of a sidewalk or other pedestrian facility must be grown with a structured canopy limbed to a seven foot (7') minimum clearance at time of installation. Annual street tree maintenance must include structural pruning of the canopy until a maximum height clearance of ten feet (10') has been acquired and maintained.
 - 3. A Certified Tree Inventory and a Maintenance Plan for any trees planted in the right of way must be submitted to the Homeowners Association prior to acceptance of the subdivision by the Department.

4. The Certified Tree Inventory should be completed by an ISA-certified arborist, and must identify the community's public trees (trees in open spaces, along streets, entranceways, greenways, parks, etc.).
 5. The Tree Management Plan should be developed by an ISA-certified arborist and must detail tree maintenance scheduling and timing; tree replacement schedule; pruning and tree maintenance practices using best management practices and ANSI standards.
 6. The Maintenance Organization or Home Owners' Association are responsible for maintenance of any trees planted in the state right of way within a subdivision, to include pruning, pest control and any necessary hazard remediation to include complete removal as required for safety of the adjoining properties and users of the subdivision streets.
 7. Trees planted in containers must receive consistent and frequent attention to maintain a healthy vigor. Feeding, watering and winterization are of particular importance.
- F. Placement of landscaping shall not impact sight distance or sidewalk stability.

Figure 3.7-a Street Trees



3.7.1 Landscaping - Median Islands

Median islands within a subdivision may also be landscaped, provided the following criteria are met:

- A. If street trees are proposed, the islands must have PCC Curb, Type 1-8. There is a minimum offset of five feet from the back of the curb to the center of the trunk of the tree.
- B. If no street trees are being proposed, PCC Curb, Type 2 may be used.
- C. A note, (in accordance with DelDOT's current notes which are available online at <http://devcoord.deldot.gov> > Quick Links > DelDOT Notes), is added to the record plan stating that DelDOT will not maintain landscaping or trees.
- D. Placement of landscaping shall not impact sight distance.

3.7.2 Landscaping - Reforestation Regulations and Ordinances

The requirements established by these regulations, including but not limited to the right-of-way dedication/reservation, permanent easements, shared use paths, auxiliary lanes at the entrance, sight triangles, and drainage features, shall be incorporated into the Record Plan prior to any evaluation of tree impacts as required by the local land use agency and other guidelines such as those found in Appendix A of DelDOT's *Road Design Manual*.

3.8 STORMWATER AND DRAINAGE REQUIREMENTS FOR RECORD PLAN

Private stormwater management facilities, excluding filter strips and bioswales, shall be located a minimum of 20 feet from the State right-of-way, as measured to the top of slope of the facility.

Construction Plans shall be sufficiently developed at the Record Plan stage to allow for adequate review of any drainage easement needs. Drainage easements are generally required for any conveyance systems that carry roadway drainage, see Sections 3.2.5.1.4 and 5.7.2.6 of this manual.

See Chapter 5 for further guidance related to design of drainage facilities.

3.9 TRAFFIC CALMING

Traffic calming shall be considered in the site plan development. The applicant's engineer shall identify areas where higher traffic speeds and volumes are expected and shall include appropriate traffic calming design elements.

DelDOT's Traffic Calming Design Manual (TCDM) provides detailed guidance regarding the appropriate use, design, signing and marking of traffic calming measures that have been evaluated by DelDOT and are preferred for use.

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CHAPTER 4 CONSTRUCTION PLANS

4.1 PURPOSE

The purpose of this chapter is to outline the requirements for Construction/Entrance plan submissions to DelDOT. General criteria for a plan submission are summarized as follows:

Plans must comply with the requirements of DelDOT's *Development Coordination Manual*. Construction plans must be signed and sealed by a land surveyor or professional engineer registered in Delaware. It is the engineer's responsibility to meet the standards and plan requirements. Plan approval does not release the responsibility of the developer and engineer to meet the standards. If geotechnical and/or structural design are included, then a professional engineer registered in Delaware and qualified to perform the design must sign and seal the plans.

4.2 CONSTRUCTION PLAN SUBMITTAL PROCESS

Construction plans shall be prepared showing the feasibility of constructing a subdivision street system and entrance(s) or commercial entrance(s) prior to recording the right-of-way with the land use agency. The construction stage fee must be paid prior to review of the construction plans as outlined in the Preface of this manual.

The applicant shall make revisions or additions to the design upon receipt of comments from DelDOT. If revisions are required, an electronic submission shall be made to the Subdivision Section. Once all comments have been addressed, electronically submit signed and sealed (pdf) plans for approval.

When design criteria cannot be met in accordance with DelDOT's requirements due to limitations particular to the site or where the applicant refuses to comply, the application for the intended use may be denied. When these conditions cannot be met or mitigated, a design deviation form should be completed and submitted to the Subdivision Section for review and approval.

4.3 SUBDIVISION CONSTRUCTION PLAN SUBMITTAL REQUIREMENTS

This section applies to the requirements for state maintained subdivision streets.

Any project submitted to DelDOT for review must contain all elements listed in this section and in accordance with the Gatekeeping Checklist, available online at <http://devcoord.deldot.gov> < Checklists. When a project is submitted for review, the submission will be checked to ensure that all required elements are on the plan and all necessary documents are included. If any elements are not relevant to the particular site then these elements shall be specified in the submittal letter or on the checklist. Incomplete submissions will be returned to the engineer for resubmission with no comments provided by DelDOT.

The subdivision construction plans shall be prepared in accordance with the requirements provided in this manual. The following elements are supplemental information required by DelDOT to be addressed and/or included on the construction plans. Failure to submit completed required documents will result in delays reviewing and approving submittals and/or declining the submission.

- A. Completed Entrance Plan/Construction Plan Gatekeeping Checklist (for more information go to <http://devcoord.deldot.gov> > Checklists)
- B. Completed Design Criteria form (for more information go to <http://devcoord.deldot.gov> > Forms)
- C. Completed Checklist for Subdivision Plan Approval (for more information go to <http://devcoord.deldot.gov> > Checklists)
- D. Construction Stage Fee Calculation Form and associated fee (for more information go to <http://devcoord.deldot.gov> > Forms)
- E. Entrance plan meeting the requirements of Section 4.3.7
- F. Sight distance triangles with supporting calculations and Intersection Sight Distance spreadsheet found on DelDOT's website at <http://devcoord.deldot.gov> > Forms & >Guidance)
- G. Layout of required auxiliary lanes and bike and pedestrian facilities with supporting documentation and left and right turn lane spreadsheets. Auxiliary lane worksheet and typical entrance diagrams are available on DelDOT's website at: <http://devcoord.deldot.gov> > Forms & > Guidance
- H. A digital copy of back-up calculations for design elements outlined in Chapter 5 (i.e. entrance design, sight distance triangles, typical section elements, pavement design, drainage design, and signing and striping) and a complete set of stormwater and sediment/erosion control drawings must be submitted for review with the plans

4.3.1 Subdivision Construction Plan Submittal Requirements - General Guidelines

The following items are required by DelDOT for Subdivision Construction Plan submittals:

- A. The plan sheet size shall be 24" x 36" or 22"x36". Plan sheets of other sizes shall be returned without review.
- B. Drafting work shall be neat, legible and reflect locations of existing and proposed features based on actual field surveys. All text height shall be 0.1 times the scale of the plan sheet. All text shall be legible when plans are produced at half size. Existing and proposed text and linestyles shall be distinguishable from each other.

- C. Construction plans shall be drawn to a scale of 1" = 30'. In certain cases where clarity of plans can be maintained, a scale of 1" = 50' may be allowed at DelDOT's discretion.
- D. Drainage system calculations for: total drainage area, total impervious area, peak discharge,
- E. Open and closed drainage systems, drainage spread on roadways, stormwater management, outfalls, etc.

4.3.2 Subdivision Construction Plan Submittal Requirements - Title Sheet

A title sheet shall include the following:

- A. DelDOT project ID number (provided by DelDOT)
- B. Name of subdivision
- C. Section of the subdivision or name of the streets to be considered by this plan
- D. Identification of subdivision streets as public or private (see Section 3.2.2)
- E. General Location map showing the relationship of the site to existing state-maintained roadways. The location map shall be drawn to a scale of no less than 1 inch = 1 mile.
- F. County in which subdivision is located
- G. Total sheets in subdivision street construction plan
- H. Plan view of entire subdivision indicating streets to be constructed in accordance with this plan and their relation to all other streets within the subdivision. Show north arrow for reference
- I. General Notes (<http://devcoord.deldot.gov> > Quick Links > DelDOT Notes)
- J. Index of sheets
- K. Legend for existing and proposed features (symbols, line types, etc.)
- L. Signature block:
 - 1. Seal of individual properly licensed in Delaware to perform the engineering and design for the preparation of construction plans for subdivision streets
 - 2. Signature of engineer and date

See Figure 4.3.2-a for a sample title sheet provided as general guidance.

Figure 4.3.2-a Sample Subdivision Title Sheet

N ↑ GENERAL LOCATION OF SUBDIVISION Scale: 1" = _____ <u>GENERAL NOTES:</u> SEE GENERAL NOTES IN APPENDIX J.	(Project ID No.) (Name of Subdivision) (Section) (The Hundred, Town or City) Construction Plans for Public Streets 11" N ↑ LOCATION MAP ACCEPTANCE OF STREETS FOR MAINTENANCE SUBURBAN COMMUNITY OF DEVELOPMENT NAME N ↑ Plan view of entire subdivi- sion indicating streets to be constructed by this plan and their relation to all other streets within the subdivision. (scale: 1"=200') <u>LEGEND</u> STREETS TO BE CONSTRUCTED BY THIS PLAN STREETS PRESENTLY UNDER CONSTRUCTION STATE MAINTAINED HIGHWAYS & STREETS PREVIOUSLY ACCEPTED RECOMMENDED _____ SUBDIVISION MANAGER DATE: _____ APPROVED _____ SUBDIVISION MANAGER DATE: _____ 8 1/2"	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: center;">COUNTY</th> <th style="text-align: center;">SHEET NUMBER</th> <th style="text-align: center;">TOTAL SHEETS</th> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> </tr> </table> <u>INDEX OF SHEETS</u> — TITLE SHEET — TYPICAL SECTION AND CONSTRUCTION DETAILS — PLAN AND PROFILE SHEETS <u>LEGEND OF UTILITIES</u> — G — GAS — W — WATER — T — UNDERGROUND TELEPHONE — E — UNDERGROUND ELECTRIC — S — SANITARY SEWER <u>EXISTING SYMBOLS</u> <u>SURVEY CONTROL & MONUMENTATION</u> BM — SURVEY BENCHMARK LOCATION TP — SURVEY TIE POINT LOCATION Δ — SURVEY TRAVERSE POINT ○ — POINT OF CURVATURE OR TANGENCY ● — POINT OF INTERSECTING TANGENTS <u>RIGHT-OF-WAY SYMBOLS</u> PM — PROPERTY MARKER - CONCRETE MON. IP — PROPERTY MARKER - IRON PIPE 100+00 — HISTORIC RIGHT-OF-WAY BASELINE — — — — — EXISTING RIGHT-OF-WAY — — — — — EXISTING PROPERTY LINE — — — — — EXISTING EASEMENT — — — — — EXISTING DENIAL OF ACCESS — R/W-DA — EXISTING R/W & DENIAL OF ACCESS <u>PROPOSED SYMBOLS</u> ■ — PROPOSED RIGHT-OF-WAY MONUMENT — DA — PROPOSED DENIAL OF ACCESS — PE — PROPOSED PERMANENT EASEMENT — R/W — PROPOSED RIGHT-OF-WAY — R/W-DA — PROPOSED R/W & DENIAL OF ACCESS — TCE — TEMPORARY CONSTRUCTION EASEMENT 100+00 — PROPOSED RIGHT-OF-WAY BASELINE	COUNTY	SHEET NUMBER	TOTAL SHEETS			
COUNTY	SHEET NUMBER	TOTAL SHEETS						
AGREEMENT # _____ STREET NAME STA. _____ TO STA. _____ TOTAL LENGTH _____ STREET NAME STA. _____ TO STA. _____ TOTAL LENGTH _____		PREPARED BY: _____ SEAL SIGNATURE _____						

4.3.3 Subdivision Construction Plan Submittal Requirements - Typical Section Sheets

Typical section sheets are required as part of subdivision construction plans. They are required for each major change of section and shall include the following:

A. Typical street sections for internal streets and frontage roads:

1. Existing and proposed widths of streets, lanes, shoulders, right-of-way and easements
2. Existing and proposed cross slopes of all lanes, shoulders and swales
3. Slope of roadside embankment (front slope and back slope)
4. Clear zone width and horizontal clearance
5. Proposed limit of construction
6. Point-of-Profile Grade Application and Point-of-Ditch Grade Application
7. Type of curb
8. Depth and type of pavement material
9. Locations to place topsoil, seed and mulch
10. Location of underdrains
11. Subgrade to be prepared in accordance with DelDOT *Standard Specifications*

B. Non-Roadside Ditches/Swales:

1. Width of ditch bottom
2. Point-of-Profile Grade Application (Ditches longer than 100 feet require a profile)
3. Side slopes
4. Type and depth of ditch protection
5. Locations to place topsoil, seed, and mulch
6. Existing and proposed easements

4.3.4 Subdivision Construction Plan Submittal Requirements - Detail Sheets

Detail sheets shall provide information to the contractor on construction that is not included in the *Standard Construction Details*, and shall include the following:

A. Special Details:

1. Intersection roads
2. Super-elevation diagrams (when required)
3. Bridges
4. Details of non-standard drainage structures
5. Pavement section(s)

B. Intersection Details (at 1"=10'):

1. Intersection radii with stations and offsets to curve points
2. Location by station and offset to islands
3. Grade elevations at edge of pavement at maximum interval of 25 feet on edge of pavement and 10 feet on intersection radii

4. Curb ramps and drainage inlets
- C. Plan sheet index (separate sheet) for plan sets containing 5 or more Construction Plan sheets:
 1. Sheet numbers
 2. Total sheets
 3. Streets
 4. Street names

For general guidance on index setup, refer to DelDOT's Model Plans at:
<http://www.deldot.gov/information/business/drc/modelplans.shtml>

4.3.5 Subdivision Construction Plan Submittal Requirements - Plan Sheet

Plan sheets shall include the following:

- A. General Plan Criteria:
 1. Limits of construction
 2. North arrow on each plan sheet
 3. Right-of-way line, existing and proposed (dimensioned in accordance with Fig. 3.2.5-a)
 4. Right-of-way monuments
 5. Street names
- B. Horizontal and vertical control data:
 1. Benchmarks: Maximum spacing is 1,000 feet. Show elevation and location. Use NAVD 88
 2. Centerline stationing and curve data (both horizontal and vertical)
 3. Survey references to horizontal control points
 4. Bearings of centerline tangents
 5. Station equations of intersecting road baselines
- C. Topography:
 1. Topography shall extend beyond the limits of the property to include the proposed positive drainage outfall, critical features of the existing highway for a minimum distance beyond the proposed entrance location as specified in Figures 3.4.2-b, 3.4.2-c, and 3.4.2-d.
 2. Contours showing the elevation of the existing ground within the limits of the topographic survey. The contour interval for various ground slopes shall be as follows:

Figure 4.3.5-a Contour Interval for Various Ground Slopes

Average Ground Slope	Contour Interval
Less than 0.5%	1.0 feet with spot grades
0.5% to 5.0%	1.0 feet
Over 5%	2.0 feet

D. Lot layout within the site showing relationship of lots to the proposed internal street system

E. Utilities:

Location of all existing and proposed sanitary sewer and water lines. A separate set of utility plan sheets may be required depending on the complexity of the plan sheet.

F. Drainage:

1. Location and elevations of parallel ditches every 50 feet
2. Location and type of ditch protection other than seed and mulch
3. Drainage flow arrows on pipes, underdrains, and ditches
4. Identify and locate drainage structures, storm sewers, and culverts with specific symbols
5. Location, flow line, elevation, typical section and ditch protection for culvert or storm sewer outfall
6. Pipe and drainage structures schedule shall be included on each plan sheet. These schedules shall list the structure ID, type, invert, and top elevation, pipe ID, size, length, invert elevations, slopes and type. See Figures 4.3.5-b and 4.3.5-c for storm drainage structure and pipe schedule.
7. Pipe angles shall be listed in the schedule and shall not exceed the maximum values allowable for the drainage devices used. Acceptable pipe angles have been derived and listed in the pipe cover/angle spreadsheet available online at <http://devcoord.deldot.gov> > Forms
8. Drainage easements, shown in accordance with Section 5.7.2.6

G. Construction plans shall be at a scale of 1"=30'. Enlargements may be needed to show additional details.

Figure 4.3.5-b Storm Drainage Structure Schedule

Structure	Description			T.G. Elev.	Invert In	Invert In	Invert In	Invert Out
	Box	Top Unit	Grate					

Figure 4.3.5-c Storm Drainage Pipe Schedule

Pipe	Description							Invert Elevation	
	From	To	Size	Type	Length	Class	Slope (%)	In	Out

4.3.6 Subdivision Construction Plan Submittal Requirements - Profile Sheet

Profiles shall be on same sheet as plan views, where possible. Profiles shall include the following:

- A. Horizontal scale (shall be same as plan sheet)
- B. Vertical scale (shall generally be 1" = 5')
- C. Vertical Curve Data: PVC, PVI, PVT, length of curve, PVI Elevation, K value
- D. Soil boring information (when available) – Use exaggerated scale and indicate type and depth of material
- E. Drainage features – Identify drainage features with pipe or structure symbols that matches schedule
- F. Existing and proposed utilities
- G. Existing and proposed elevations every 50' at minimum
- H. Longitudinal grades (%)

For general guidance on profile sheet setup, refer to DelDOT's Model Plans at:

<http://www.deldot.gov/information/business/drc/modelplans.shtml>

4.3.7 Subdivision Construction Plan Submittal Requirements - Entrance Plan Sheet

Entrance plans shall include the following:

- A. Existing and proposed right-of-way, property lines and easements
- B. Names and parcel information of abutting land owners
- C. Existing and proposed pavement edges and material types
- D. Existing and proposed utilities including all DelDOT infrastructure
- E. Contours showing the elevation of the existing ground within the limits of the topographic survey. The contour interval for various ground slopes shall be shown in accordance with Figure 4.3.5-a. Topography shall extend to the limits as defined in Section 4.3.5-C.
- F. Proposed contours
- G. Location of any crossovers
- H. Roadway curves
- I. Existing and proposed entrances serving the adjacent properties on both sides of the road
- J. Proposed sight distance easements
- K. Existing and proposed drainage features
- L. Location of existing and proposed buildings
- M. Existing and proposed utility poles, signs, etc
- N. Parking layout
- O. Proposed entrance geometry, including entrance radii dimensions
- P. Centerline stationing for the frontage road(s)
- Q. Proposed curb and sidewalk grades

- R. At a proposed entrance that requires widening to the existing State-maintained roadway, spot elevations on the proposed edge of pavement and where the proposed pavement meets the existing pavement shall be provided at 25-foot intervals. Spot elevations at the entrance radii shall be given at 10-foot intervals
- S. Site specific entrance construction details. (A separate plan sheet may be required for details.) DelDOT standard details shall not be shown on plans
- T. Proposed limit of construction
- U. Traffic Generation Diagram (for more information, see Figure 3.4.2-a and DelDOT's *Traffic Generation Example* which is available online at <http://devcoord.deldot.gov> > Guidance), showing the following:
 - 1. Site generated ADT and distribution (per the latest edition of the ITE Trip Generation Manual)
 - 2. Mainline ADT (existing and projected) and speed limit
- V. Signing and striping plan with existing and proposed striping, including lane widths. A separate plan view or sheet may be required.
- W. Existing traffic infrastructure, devices and systems including but not limited to signal and pedestrian poles, junction wells, inductive loops, cameras, conduit, weather equipment, pedestrian signals, cabinets and red light cameras
- X. North arrow and Graphic scale (1" = 30' preferred, 1" = 20' acceptable)
- Y. Typical sections as defined in Section 4.3.3
- Z. Existing/Proposed transit facilities, pedestrian and shared-use pathways, pedestrian crossings and bicycle facilities

4.3.8 Subdivision Construction Plan Submittal Requirements - Maintenance of Traffic Sheet

A MOT plan must be prepared for all projects that have an impact to an active roadway. Depending on the complexity of the project, the plan may range from a short narrative on the plans referencing the MOT Typical Application in the DE MUTCD to a series of sheets detailing the traffic control measures for phased construction. Applicable MOT General Notes shall be placed on the plan. See <http://devcoord.deldot.gov> > Quick Links > DelDOT Notes for General Notes for MOT.

4.3.9 Subdivision Construction Plan Submittal Requirements - Signal Plans

Signal plans may be required. Digital files shall be provided to DelDOT. Refer to Section 5.13 for more information on signal design.

4.3.10 Subdivision Construction Plan Submittal Requirements – Cross Section Sheets

Where subdivision construction plans include proposed improvements to frontage roads, cross sections shall be required. Cross sections shall be shown along the frontage road every 50 feet at even stations (e.g. 1+00, 1+50, etc.) and at critical and transition locations within the limits of improvements. Cross sections shall show the following information:

- A. Existing and proposed widths of streets, lanes, shoulders, right-of-way and easements

- B. Existing and proposed cross slopes of all lanes, shoulders and swales
- C. Slope of roadside embankment (front slope and back slope)
- D. Clear zone width and horizontal clearance
- E. Proposed limit of construction
- F. Point-of-Profile Grade Application
- G. Existing and proposed curb, including curb type(s)
- H. Depth and type of pavement material
- I. Locations to place topsoil, seed and mulch
- J. Location of underdrains
- K. All existing and proposed drainage structures and utilities

4.4 COMMERCIAL ENTRANCE PLAN SUBMITTAL REQUIREMENTS

This section applies to the requirements for commercial entrances, as well as private subdivision entrances onto State-maintained roadways.

Any project submitted to DelDOT for review must contain all elements listed in this section and in accordance with the Gatekeeping Checklist, available on DelDOT's website at <http://devcoord.deldot.gov> > Checklists. When a project is submitted for review, the submission will be checked to ensure that all required elements are on the plan and all necessary documents are included. If any elements are not relevant to the particular site then these elements shall be specified in the submittal letter or on the checklist. Incomplete submissions will be returned to the engineer for resubmission with no comments provided by DelDOT.

4.4.1 Commercial Entrance Plan Submittal Requirements – General Guidelines

The following items are required by DelDOT for Commercial Entrance Plan submittals:

- A. The plan sheet size shall be 24" x 36". Plan sheets of other sizes shall be returned without review.
- B. Drafting work shall be neat, legible and reflect locations of existing and proposed features based on actual field surveys. All text height shall be 0.1 times the scale of the plan sheet. All text shall be legible when plans are produced at half size.
- C. Entrance plans shall be drawn to a scale of 1" = 30' (1" = 20' acceptable). Location map showing the relationship of the site to existing State-maintained roadways. The location map shall be drawn to a scale of no less than 1 inch = 1 mile.
- D. Drainage report which will include calculations for: total drainage area, total impervious area, peak discharge, open and closed drainage systems, drainage spread on roadways, stormwater management, outfalls, etc.

4.4.2 Commercial Entrance Plan Submittal Requirements - Title Sheet

Title sheets shall include the following:

- A. A title block containing:
 - 1. DelDOT project ID number (provided by DelDOT)
 - 2. Name of proposed business
 - 3. Name of nearest town or city with name of applicable hundred or county
 - 4. Road name and maintenance number of roadway being accessed
 - 5. Scaled drawing of the project
 - 6. Date and/or revised date
 - 7. Name, address and telephone number of engineer or surveyor preparing plan
 - 8. Seal of engineer or surveyor (Delaware license required)
- B. A data block containing:
 - 1. Type of business
 - 2. Gross acreage of property
 - 3. Gross leasable floor area
 - 4. Parking spaces required
 - 5. Parking spaces provided
 - 6. Local government responsible for land use approval
 - 7. General location map
 - 8. North arrow
 - 9. General Notes (<http://devcoord.deldot.gov> > Quick Links > DelDOT Notes)
 - 10. Sheet index with total sheet count
 - 11. Legend for existing and proposed features (symbols, line types, etc)

4.4.3 Commercial Entrance Plan Submittal Requirements - Entrance Plan Sheet

Entrance plans shall include the following:

- A. Existing and proposed right-of-way, property lines and easements
- B. Names and parcel information of abutting land owners
- C. Existing and proposed pavement edges and material types
- D. Existing and proposed utilities including all DelDOT infrastructure
- E. Contours showing the elevation of the existing ground within the limits of the topographic survey. The contour interval for various ground slopes shall be shown in accordance with Figure 4.3.5-a. Topography shall extend to the limits as defined in Section 4.3.5-C.
- F. Proposed contours
- G. Location of any crossovers
- H. Roadway curves
- I. Existing and proposed entrances serving adjacent properties

- J. Proposed sight distance easements
- K. Existing and proposed drainage features
- L. Location of existing and proposed buildings
- M. Existing and proposed utility poles, signs, etc.
- N. Parking layout
- O. Proposed entrance geometry, including entrance radii dimensions
- P. Centerline stationing for the frontage road(s)
- Q. Proposed curb and sidewalk grades
- R. At a proposed entrance that requires widening to the existing State-maintained roadway, spot elevations on the proposed edge of pavement and where the proposed pavement meets the existing pavement shall be provided at 25-foot intervals. Spot elevations at the entrance radii shall be given at 10-foot intervals.
- S. Site specific entrance construction details. (A separate plan sheet may be required for details.) DelDOT standard details shall not be shown on plans.
- T. Proposed limit of construction
- U. Traffic Generation Diagram (for more information, see figure 3.4.2.a and DelDOT's Traffic Generation Example which is available online at <http://devcoord.deldot.gov> > Guidelines), showing the following:
 - 1. Site generated ADT and distribution (per the latest edition of the ITE Trip Generation Manual)
 - 2. Mainline ADT (existing and projected) and speed limit
- V. Signing and striping plan with existing and proposed striping, including lane widths. A separate plan view or sheet may be required.
- W. Existing traffic infrastructure, devices and systems including but not limited to signal and pedestrian poles, junction wells, inductive loops, cameras, conduit, weather equipment, pedestrian signals, cabinets and red light cameras
- X. North arrow and Graphic scale (1" = 30' preferred, 1" = 20' acceptable)
- Y. Typical sections as defined in Section 4.3.3
- Z. Existing/Proposed transit facilities, pedestrian and shared-use pathways, pedestrian crossings and bicycle facilities

4.4.4 Commercial Entrance Plan Submittal Requirements - Maintenance of Traffic Sheet

Maintenance of Traffic (MOT) must be accounted for on all projects. Depending on the complexity of the project, MOT requirements may range from notes or a short narrative on the plans referencing the MOT Typical Application in the DE MUTCD to a series of sheets detailing the traffic control measures for phased construction. Applicable MOT General Notes shall be placed on the plan. See <http://devcoord.deldot.gov> > Quick Links > DelDOT Notes for General Notes for MOT.

4.4.5 Commercial Entrance Plan Submittal Requirements – Cross Section Sheets

Where subdivision construction plans include proposed improvements to frontage roads, cross sections shall be required. Cross sections shall be shown along the frontage road every 50 feet at even stations (e.g. 1+00, 1+50, etc.) within the limits of improvements. Cross sections shall show the following information:

- A. Existing and proposed widths of streets, lanes, shoulders, right-of-way and easements
- B. Existing and proposed cross slopes of all lanes, shoulders and swales
- C. Slope of roadside embankment (front slope and back slope)
- D. Clear zone width and horizontal clearance
- E. Proposed limit of construction
- F. Point-of-Profile Grade Application
- G. Existing and proposed curb, including curb type(s)
- H. Depth and type of pavement material
- I. Locations to place topsoil, seed and mulch
- J. Location of underdrains
- K. All existing and proposed drainage structures and utilities

4.5 OFF-SITE IMPROVEMENT PLAN SUBMITTAL REQUIREMENTS

Prior to submittal of off-site improvement plans, the engineer shall schedule a pre-submittal meeting with DelDOT Development Coordination. It is recommended that this meeting should be held at least 12 months prior to the intended start of construction of the off-site improvements. The engineer shall complete and submit a design criteria form (<http://devcoord.deldot.gov> > Forms) prior to the meeting.

Any plan submitted to DelDOT for review must contain all elements listed in this section. When a plan is submitted for review, it will be checked to ensure the required elements are on the plan. If any elements are not relevant to the particular site then these elements shall be specified in the submittal letter. If all elements are not on the plan, the plan will be returned to the engineer for resubmission with no comments provided by DelDOT.

The developer's engineer shall prepare and submit all construction plans and right of way exhibits to DelDOT for review and approval for the project as outlined in the Off-site Improvement Agreement described in Chapter 2. All required submissions to internal DelDOT support sections shall be made to the Development Coordination Section and then shall be distributed throughout DelDOT in accordance with these regulations. The engineer shall design the project in accordance with the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*, DelDOT's *Road Design Manual* (RDM), and DelDOT Standards Specifications, Policies, and Practices. In instances where the engineer determines that the project cannot comply with these standards, the engineer shall provide to DelDOT a completed design deviation form. DelDOT shall have the final authority on any process modifications or design deviations.

The engineer shall coordinate with the utility companies to determine existing facility locations and to start the discussions on possible relocations.

Existing deeds, plot plans, existing roadway plans and field surveys shall be used to establish and verify the existing right-of-way and property lines. The engineer or surveyor is responsible for attesting to the right-of-way shown on the plans.

The engineer will work through the Development Coordination Section for pavement evaluation and design verification. This may include pavement cores and subgrade soils analysis. The engineer will work through the Development Coordination Section for hazardous material/contaminated site delineation.

The engineer will work through the Development Coordination Section to identify environmental or cultural resources that are present within the existing and/or proposed right-of-way. The engineer shall prepare, apply for, and obtain all necessary permits and environmental or historic documentation required by federal, state, and local authorities. Copies of the permits and supporting documentation shall be provided to DelDOT prior to final plan approval.

DelDOT will provide assistance in identifying but not obtaining all necessary permits and coordination for off-site road improvements. To construct the off-site improvements, the project may require, but not be limited to:

- A. Right-of-way
- B. Utility coordination
- C. Permits associated with the Environmental Protection Agency's (EPA) Clean Water Act, Section 404
- D. Permits associated with the Federal Highway Administration's (FHWA) Department of Transportation act of 1966, Section 4(f) regarding historical sites
- E. Permits associated with the Federal Highway Administration's (FHWA) Land and Water Conservation Fund Act, Section 6(f) regarding parklands
- F. Permits associated with the National Pollutant Discharge Elimination System (NPDES) regarding erosion control
- G. Delaware Department of Natural Resources and Environmental Control (DNREC) Wetlands and Subaqueous Land Permit

4.5.1 Off-Site Improvement Plan Submittal Requirements - Content and Process

- A. Off-site Improvement Plans shall be prepared in accordance with Construction Plan standards as established in Section 4.3 and the requirements outlined in this section. Review fees are not applicable to stand-alone, off-site improvement submittals. Submittal shall include the following items, along with the Off-site Improvement Gatekeeping Checklist and Design Checklist (<http://devcoord.deldot.gov> > Checklists):
 - 1. Title sheet
 - 2. Plan sheet index
 - 3. Notes and legend sheet
 - 4. Typical sections as defined in Section 4.3.3
 - 5. Horizontal and vertical control points

6. Construction plan with proposed design (including conceptual drainage layout and clear zone)
7. Existing and proposed profile including existing and proposed drainage, underground utilities with test hole data, soil boring, and test holes plotted
8. Grades and Geometrics showing where coordinates are to be given (edge of gutter, begin/end of transitions, and critical curve points) for proposed geometrics and tick marks where grades will be given (edge of gutter in intersections, super-elevation transitions, and critical points)
9. Stormwater management plans and report or a waiver from the SWM Engineer
10. Site specific construction details. (A separate plan sheet may be required for details.) DelDOT standard details shall not be shown on plans.
11. Construction Phasing, M.O.T., and Erosion Control plans (with utility construction phasing taken into account)
12. Detour plans
13. Environmental Compliance Plan
14. Lighting plan, including proposed pole locations
15. Landscaping plan
16. Utility relocation plans, including overhead and underground utility relocations
17. Signing and striping and conduit plans
18. Signalization plans
19. Cross sections as defined in Section 4.3.10

Refer to DelDOT's Model Plans at: <http://www.deldot.gov/information/business/drc/modelplans.shtml> for a sample plan set.

B. DelDOT's Development Coordination Section will distribute the Construction Plans to the following stakeholders for review and comment:

1. Stormwater Engineer with Stormwater Report
2. Construction Management to review constructability and phasing
3. Traffic Section for review and comment pertaining to signal design, proposed signing and striping, and detour plan consideration
4. Roadside Development Administrator to determine tree replacement requirements and subsequent real estate needs, and to ensure proper selection of tree types for replacement policy. The engineer shall coordinate tree impact and mitigation analysis with a landscape architect.
5. Design Services Section for documentation of proposed impacts to environmental and cultural resources. Any permits that have been issued shall be made available to the Design Services Section. The engineer should also make Design Services aware of all correspondence that has occurred between the resource agencies and the developer.
6. Materials and Research
7. Chief Safety Officer
8. Bicycle/Pedestrian Coordinator
9. Architectural Accessibility Board (for approval)
10. DTC
11. Chief Engineer
12. Public Works
13. Others, as determined by the Subdivision Engineer

- C. Depending on the complexity of the project, DelDOT may require the Developer to hold at least one Public Workshop. This workshop should be held soon after the initial plan submittal.
- D. Signed and sealed Right of Way Exhibits shall be submitted to Development Coordination for review. The following elements must be included on Right of Way Exhibits:
 - 1. Symbols and legends
 - 2. Right of way plan view
 - 3. Right of way data
 - 4. Right of way tabulation (see <http://devcoord.deldot.gov> > Checklists for the Right of Way Plan Checklist)

4.6 INDUSTRIAL PARK STREETS

Industrial park streets shall follow the standard construction plan development procedure, as previously outlined in Section 4.3.

4.7 STANDARDS AND SPECIFICATIONS

4.7.1 Standards and Specifications - Standard Construction Details

DelDOT has developed *Standard Construction Details* to provide consistency on State-maintained projects. *Standard Construction Details* are available on DelDOT's website (www.DelDOT.gov).

The *Standard Construction Details* shall be utilized in the construction unless there is an unusual circumstance requiring a special design. The plans shall show construction details only for those construction elements not shown in DelDOT's *Standard Construction Details*.

If there are engineering elements, including but not limited to, structural designs required on a plan that are not included in the *Standard Construction Details*, then detailed engineering designs and calculations signed and sealed by a Delaware-registered professional engineer shall be submitted to DelDOT for review and approval. All structural elements shall be designed in accordance with AASHTO LRFD (Load and Resistance Factor Design) *Bridge Design Specifications* (latest revised edition).

The project shall be constructed using the latest version of DelDOT's *Standard Construction Details* that are in effect at the time of construction.

4.7.2 Standards and Specifications - Standard Specifications

Specifications for frequently used construction items have been prepared by DelDOT. Copies of these *Standard Specifications* are available online at (www.DelDOT.gov).

Construction shall be in accordance with the latest version of DelDOT's *Standard Specifications*, *Supplemental Specifications*, and any Special Provisions that are in effect at the time of construction. Should it be necessary to construct an item for which a standard does not exist or where it is desired to

modify the *Standard Specifications*, *Supplemental Specifications*, or Special Provisions, additional details and/or notes along with any applicable references to Nationally Accepted Standards (NAS) shall be included on the plans to adequately document any modified designs.

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CHAPTER 5 DESIGN ELEMENTS

5.1 GEOMETRIC DESIGN OF SUBDIVISION STREETS

5.1.1 Geometric Design of Subdivision Streets - General

The design of subdivision streets is required to be in accordance with applicable guidelines and standards, such as those listed in Section P.9.1 of this manual, which include but are not limited to: Manuals, Guidelines and Policies published by the *American Association of State Highway and Transportation Officials* (AASHTO); DelDOT's *Road Design Manual (RDM)*; DelDOT's *Bridge Design Manual*; DelDOT's *Design Guidance Memorandums (DGM)*; DE MUTCD; other **Nationally Accepted Standards (NAS)** and DelDOT's *Development Coordination Manual*. Where conflicts exist, DelDOT's *Development Coordination Manual* shall take precedence for subdivision streets.

In instances where the engineer determines that it is not in the best interest of the traveling public to comply with these standards, the engineer shall provide to DelDOT a written justification and rationale for their decision. DelDOT shall have the final authority on any process modifications, design exceptions, or design deviations.

The street layout of a subdivision has the following elements that must be considered by the developer and engineer:

- A. Horizontal and vertical alignment
- B. Intersection design
- C. Sight distance
- D. Typical sections designed to support the traffic volumes anticipated for each road segment
- E. Connectivity of both vehicular, bicycle and pedestrian traffic along with transit accessibility
- F. Traffic calming
- G. Stormwater management
- H. Drainage

5.1.2 Geometric Design of Subdivision Streets - Design Criteria

The design criteria for subdivision streets shall be in accordance with Figure 5.1.2-a.

Figure 5.1.2-a Design Criteria for Subdivision Streets

Type of Subdivision Street	Design Speed	Sight Distance*	Maximum Grades**	Minimum Horizontal Radii	Minimum K-Value	
					Sag	Crest
Type I (< 500 ADT)	25 mph	155 feet	10%	150 feet	26	12
Type II (501 – 3000 ADT)	30 mph	200 feet	8%	300 feet	37	19
Type III (> 3000 ADT)	35 mph	250 feet	7%	500 feet	49	29
Industrial Streets	35 mph	250 feet	7%	500 feet	49	29

* For upgrades and downgrades 3% or greater, refer to the AASHTO Green Book, A Policy on Geometric Design of Highways and Streets (Table 3-2 of the 2011 Edition), or other NAS for adjusted values. Sufficient right-of-way dedicated to the State of Delaware shall be provided to maintain the required line-of-sight.

** Maximum street grades can be waived on an individual basis subject to DelDOT's engineering judgment with respect to the severity of the topography. Minimum street grades should be 0.5%.

Notes:

1. Vertical curves will be required on streets with an algebraic grade difference greater than one percent (1%).
2. Deviations from these criteria shall only be considered if presented in writing and if it has been proven to the satisfaction of DelDOT that the required criteria cannot be met.

5.1.3 Geometric Design of Subdivision Streets - Intersection Design

The intersection design of subdivision streets shall be in accordance with the following:

- A. 90° intersections are preferred. Intersection angles less than 70° are not permitted.
- B. The edge of pavement radii of internal subdivision streets shall meet the requirements of Figure 5.1.3-a. The use of larger radii may be considered if there is a need to accommodate larger vehicles. Any entrance for a new subdivision shall meet or exceed the requirements of Section 5.2.
- C. The profiles of intersecting subdivision streets influence the vertical alignment of an intersection, especially when different types of streets intersect such as Type I and Type II streets. When this occurs, the major street type retains a crown through the intersection as shown in Figure 5.1.3-b. The intersection approach grade in the uphill direction affects the acceleration of motor vehicles from a stopped condition, and therefore can have an impact on vehicular delay at the intersection. The intersection approach grade in the downhill direction affects the stopping sight distance of approaching motor vehicles. The length of vertical curves between the non-intersection grade and the intersection approach grades are governed by the 'K' values listed in Figure 5.1.2-a. See Figure 5.1.3-c for additional design guidance.

Figure 5.1.3-a Intersection Design Radii

Intersecting Subdivision Street Types		Corner Radii (@ edge of pavement)
Type I	Type I	15 feet
Type I	Type II	20 feet
Type II	Type II	25 feet
Type II	Type III	25 feet
Type III	Type III	Set to meet design vehicle

Figure 5.1.3-b Maintaining Major Street Crown through Intersection

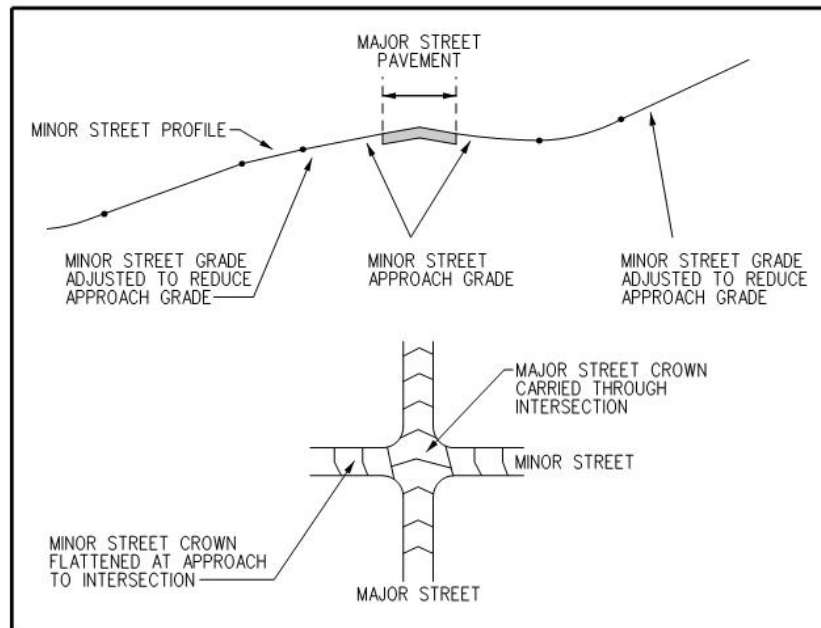
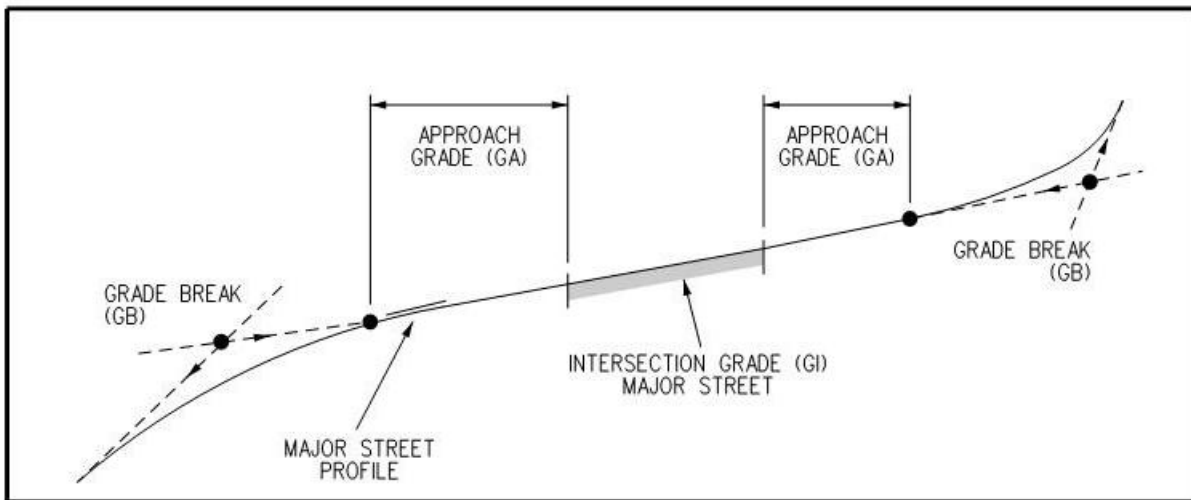


Figure 5.1.3-c Vertical Alignment Guidelines

Subdivision Street Type	Design Speed (mph)	Maximum Intersection Grade (GI, %)	Maximum Grade Break (GB, %)	Minimum Length of Approach Grade (GA, ft)
I	25	5	4	40
II	30	5	3	60
III	35	5	2	60

- D. The distance required to remove the roadway crown of a minor street at an intersection is to be established using a maximum relative longitudinal slope between the profiles of the edge of pavement and centerline. A relative gradient (G) of 0.666 percent between the centerline profile grade and edge of traveled way should be used.

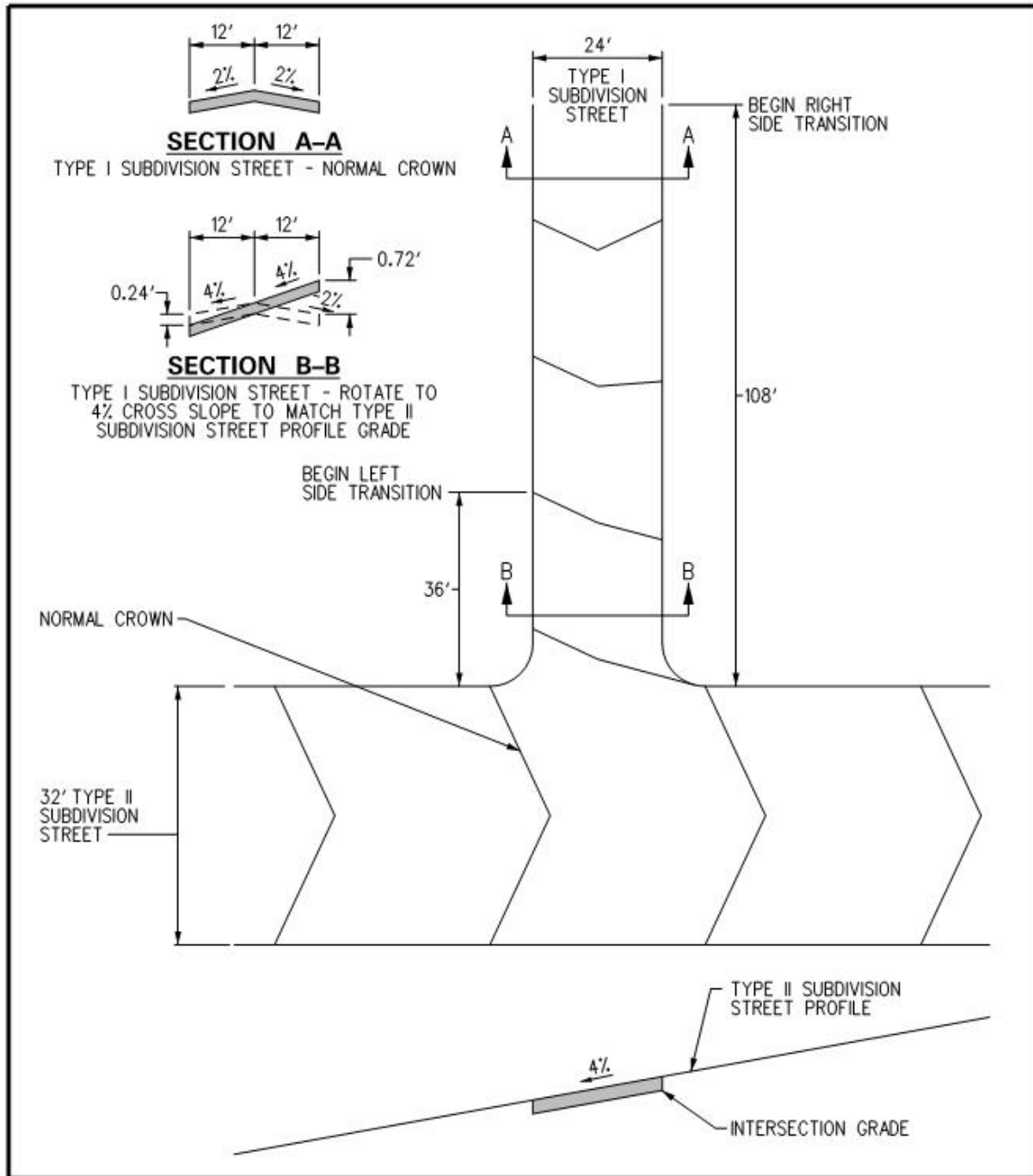
$$G (\%) = 1/RS \times 100$$

RS = 150 or reciprocal of relative longitudinal slope between the profile grade and outside edge of pavement of a two-lane street

The roadway crown of the major street is to be maintained.

An example as shown in Figure 5.1.3-d is a Type 1 subdivision street intersecting a Type II subdivision street having a 4% grade as shown below. The right outside edge of the Type 1 subdivision street must rotate from a -2% C.S. to a 4% C.S. or 0.72'. Dividing 0.72' by G or 0.666% results in a transition length of 108' on the right outside edge of the Type 1 subdivision street. Dividing 0.24' by 0.666% results in a transition length of 36' on the left outside edge of the Type 1 subdivision street.

Figure 5.1.3-d Intersection Cross Slope Transition Example



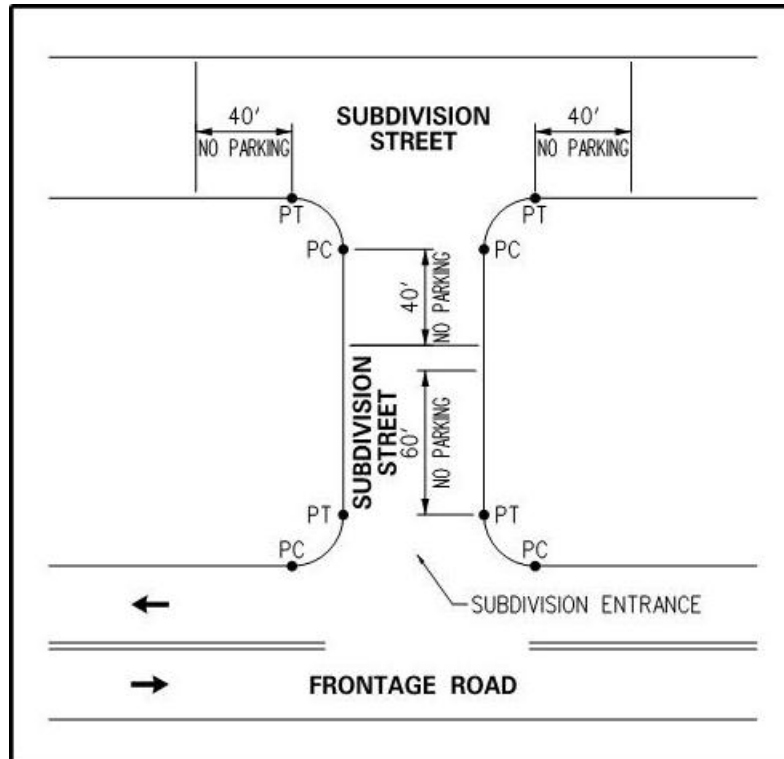
- E. Signing and striping shall be in accordance with the DE MUTCD, latest edition.
- F. Roundabouts may be used for intersection design within subdivisions. The design shall conform to applicable guidelines and standards such as: DelDOT's Guidelines on Roundabouts, DelDOT's Design Guidance Memorandum (DGM) 1-26 for Roundabouts or other **NAS**. At a minimum, the roundabouts shall include a center island, truck apron, splitter islands on all approaches, and appropriate pedestrian signs and markings.

5.1.4 Geometric Design of Subdivision Streets - Parking Provisions

Parking is not allowed on turnarounds and cul-de-sacs within subdivisions.

No driveways or parking bays shall be located in subdivisions within 40 feet from the edge of the radius return for the connecting street. This distance shall increase to 60 feet at the entrance to the subdivision.

Figure 5.1.4-a Subdivision Street Parking Provisions



In order to restrict parking in areas within a subdivision street that can accommodate overflow on-street parking, the DelDOT Traffic Section must receive a petition signed by 75% of the owners indicating their support for “Stopping, Standing, and Parking Restriction.” DelDOT will determine whether to restrict on-street parking within subdivision streets considering the petition and engineering study performed by DelDOT.

5.1.5 Geometric Design of Subdivision Streets - Dead End Streets

5.1.5.1 Permanent Dead End Streets

The use of cul-de-sac and other closed end street design is to be limited to those situations where the developer’s engineer meets the connectivity requirements of Section 3.5 or can justify that full street extensions are not possible based on topography, pre-existing development or environmental constraints.

Cul-de-sacs must be incorporated in the design of all permanent dead end streets except those eligible to be constructed within a reduced right-of-way. The minimum design criteria for cul-de-sacs are:

- A. Design radii shall be in accordance with Figure 5.1.5.1-a.
- B. Graded aggregate base course material for cul-de-sacs is to extend a minimum of two feet beyond the edge of paving when an open drainage design is utilized (no curbs).
- C. The maximum tangent length as measured from the corner radii of the intersecting street to the cul-de-sac radius for a permanent dead end street is 200 feet.

Figure 5.1.5.1-a Design Radii for Cul-de-Sacs

Radius*	Cul-de-sacs	Cul-de-sacs with Center Islands
Right-of-Way	50 feet	60 feet
Outside Edge of Pavement	38 feet	46 feet
Center Island	N/A	24 feet

* Measured to the face of curb.

Developers planning streets with reduced right-of-way should select one of the turn-around designs shown in Figure 5.1.5.2-a in lieu of the standard cul-de-sac. Any alternative design must have prior approval of DelDOT.

5.1.5.2 Temporary Dead End Streets

Temporary dead end streets shall be constructed to the property line of the development in order to provide for future development of adjacent lands. A temporary turn around must be provided when the length of a temporary dead end street exceeds 200 feet. The additional right-of-way needed to accommodate a temporary turn around can be provided through a temporary easement which must be clearly labeled on the site plan. If the street segment is accepted for State maintenance, DelDOT will maintain the temporary dead end street in accordance with Chapter 6.

If the temporary dead end street shall ultimately provide connectivity to the adjacent property, the following shall apply:

- A. For all projects with planned connectivity, a note stating “Future Connection to Adjoining Property” shall be prominently displayed on the Record Subdivision Plan.
- B. For all projects where the connection stub street is constructed abutting the adjacent property, a sign stating “Street Connection to Future Development” shall be installed by the developer at the end of the stub street prior to the first Certificate of Occupancy being issued. Maintenance of the sign shall be the responsibility of the developer until DelDOT accepts the streets into the State maintenance system.

For projects where the connection is internal, but will not be constructed until future phases, stub streets shall be constructed to extend to the end of the radii at the intersection with the future street. A sign stating “Future Internal Street and Connection to Future Development” and barricade, as shown in DelDOT’s Standard Construction Details, shall be installed by the developer at the end of the stub street. The sign shall be placed immediately after the placement of the base paving course. At DelDOT’s

discretion, the barricade requirement may be waived. Maintenance of the sign and barricade shall be the responsibility of the developer until DelDOT accepts the streets into the State maintenance system. Upon acceptance of the streets, the development's maintenance association assumes maintenance responsibility of sign. Refer to Figures 5.1.5.2-a and 5.1.5.2-b for stub street sign details.

Figure 5.1.5.2-a Design Alternatives in lieu of Cul-de-Sacs in Reduced Right-of-Way
(Not to Scale)

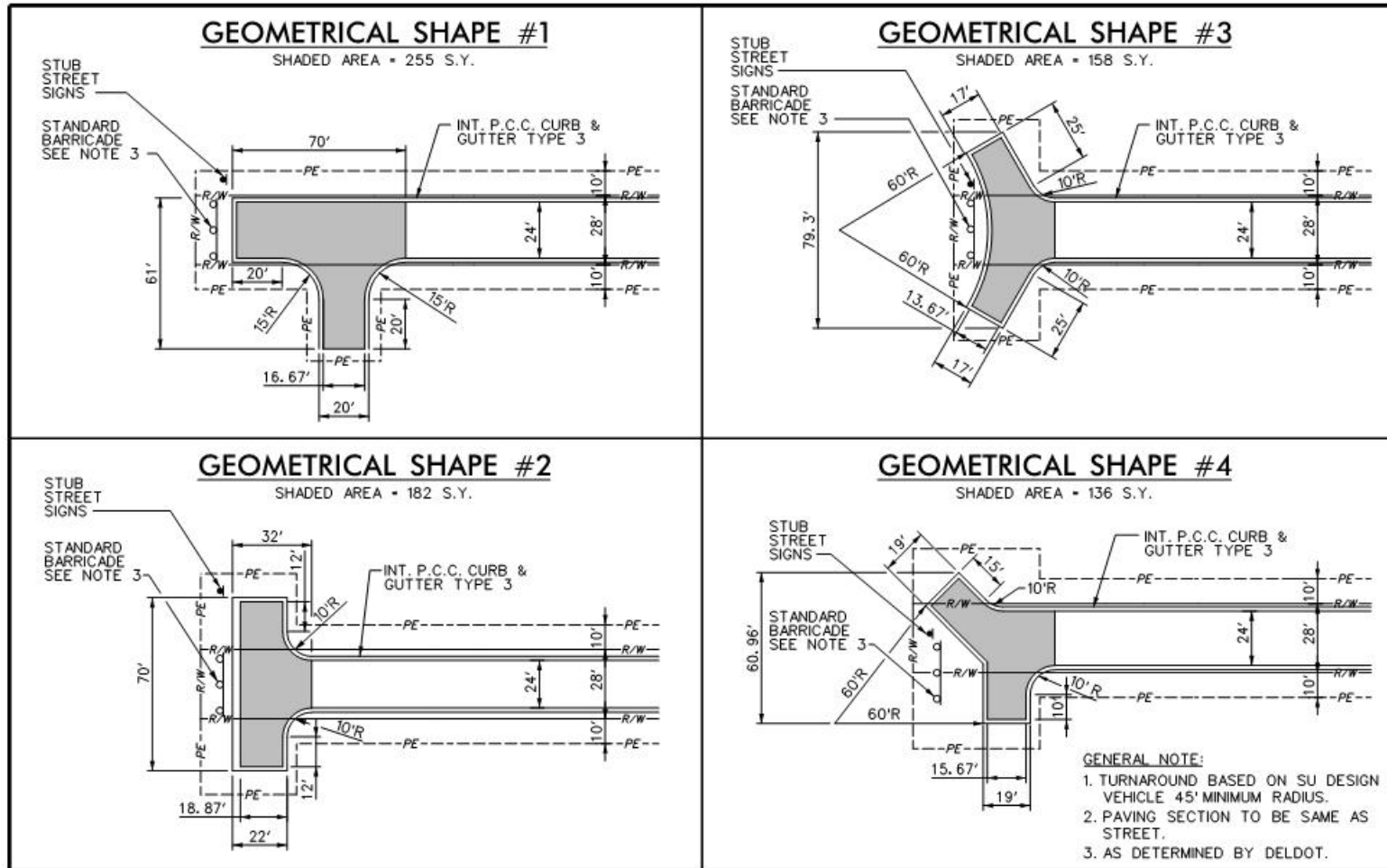
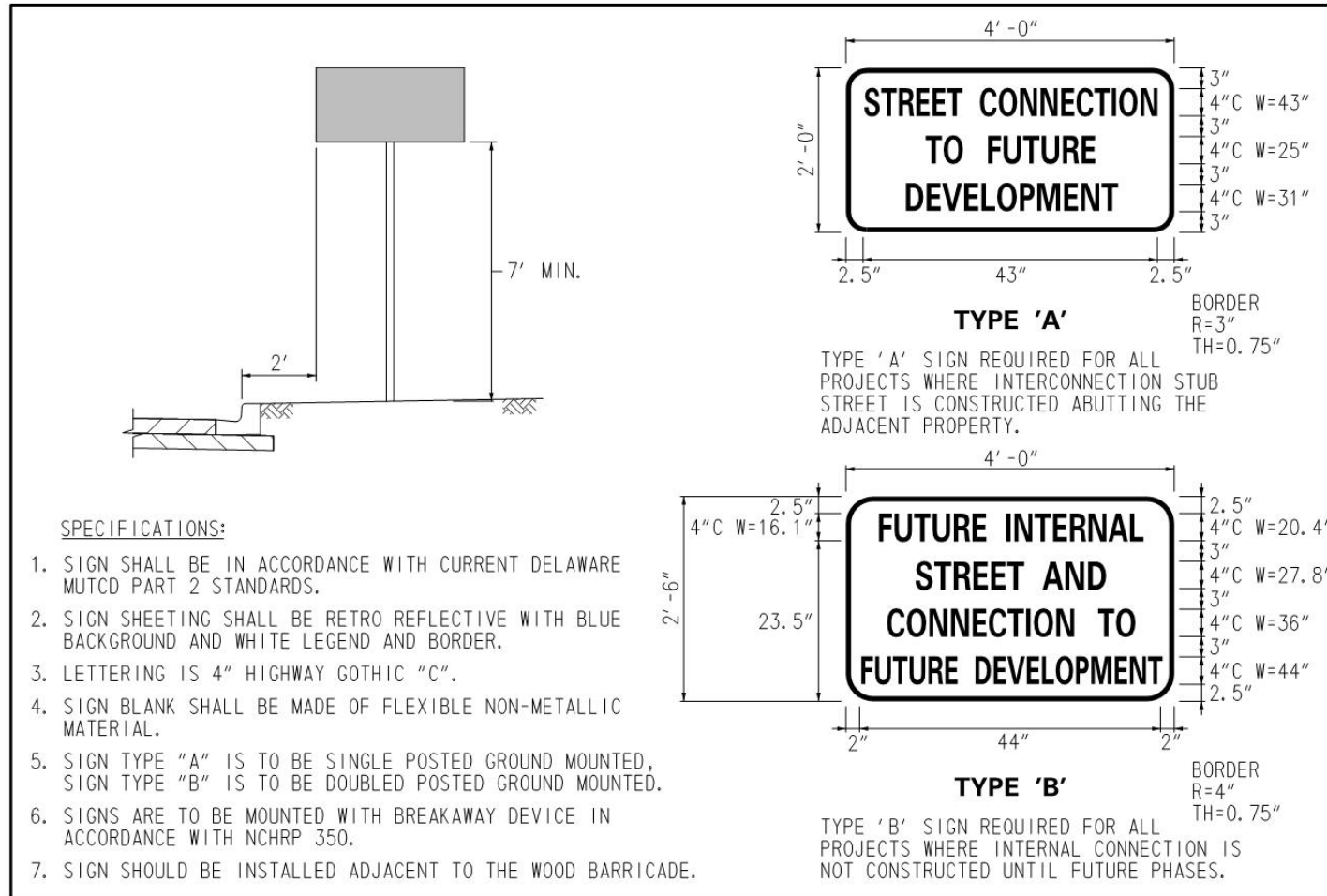


Figure 5.1.5.2-b Stub Street Sign Detail

(Not to Scale)



5.1.6 Geometric Design of Subdivision Streets - Traffic Calming

The DelDOT *Traffic Calming Design Manual* (TCDM) provides detailed guidance regarding the appropriate use, design, signing and marking of traffic calming measures approved for use in Delaware. Even if the TCDM is not used for subdivision design, site design should be done in a manner so as to reduce the need for speed control devices after subdivision construction.

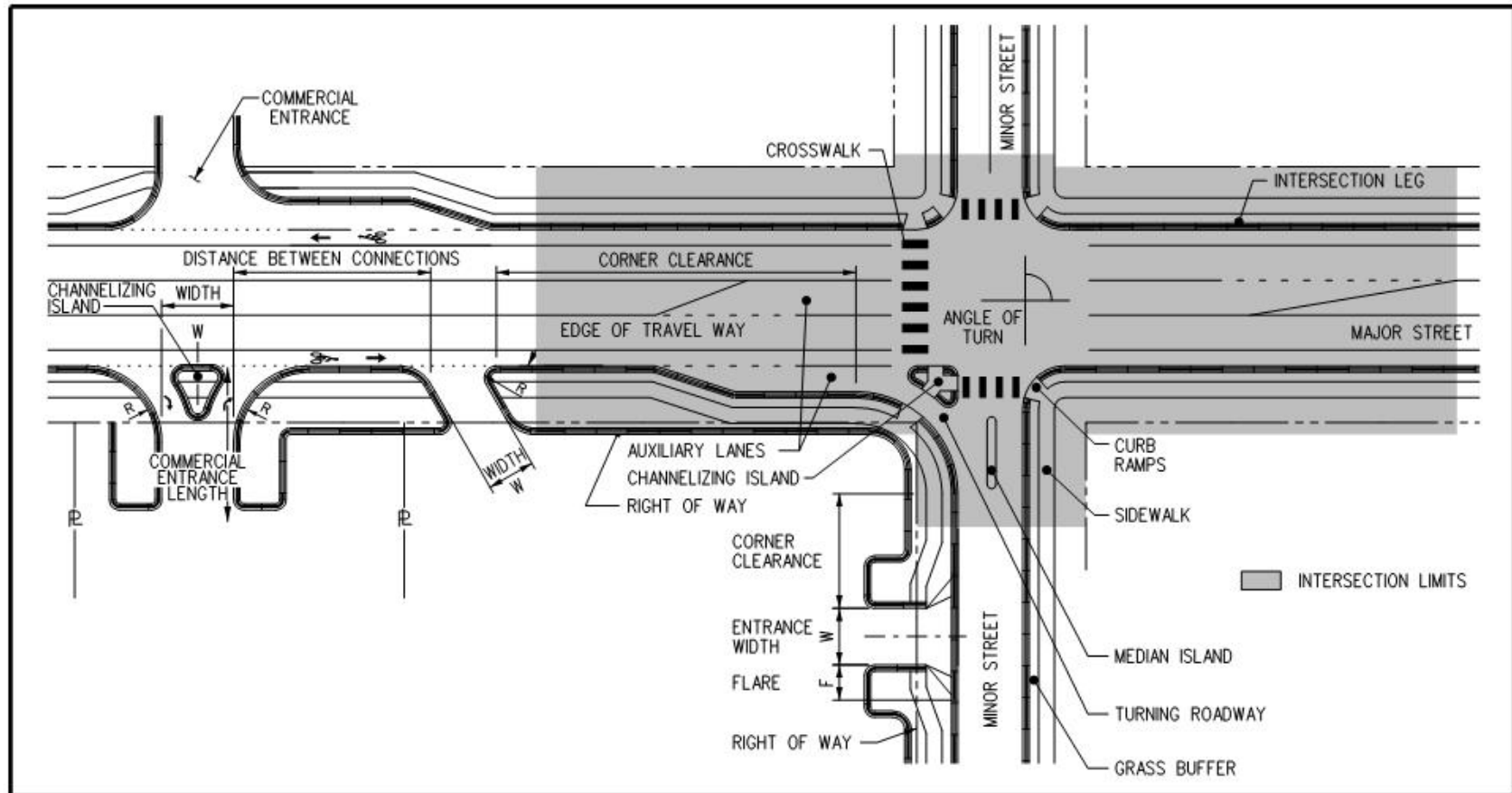
5.2 SUBDIVISION AND COMMERCIAL ENTRANCE DESIGN GUIDELINES

DelDOT has adopted policies with regard to subdivision and commercial entrances that create public intersections which warrant special consideration with respect to location and design.

- A. Entrance design should consider a range of objectives that include:
 - 1. Maintaining the safe and efficient operations of the intersecting roadway
 - 2. Providing reasonable access to the property
 - 3. Providing sight distance between vehicles and pedestrians as well as efficient travel for sidewalk users
 - 4. Incorporating ADA requirements for pedestrians with disabilities
 - 5. Accommodating bicycle lanes or paths
 - 6. Maintaining or providing public transportation locations
- B. In order to achieve the objectives mentioned above, entrances need to be properly designed with respect to:
 - 1. Location, among existing and planned intersections within the vicinity
 - 2. Design vehicle selection
 - 3. Entrance width, number of lanes, and lane configuration
 - 4. Horizontal alignment
 - 5. Vertical alignment
 - 6. Auxiliary lane provisions
 - 7. Channelization
 - 8. Pedestrian, bike, and transit considerations

Detailed guidance on each of the design controls mentioned above are discussed in subsequent sections of this Chapter. Figure 5.2-a illustrates the basic elements and design controls associated with entrance design. The Preface includes detailed definitions for those elements described.

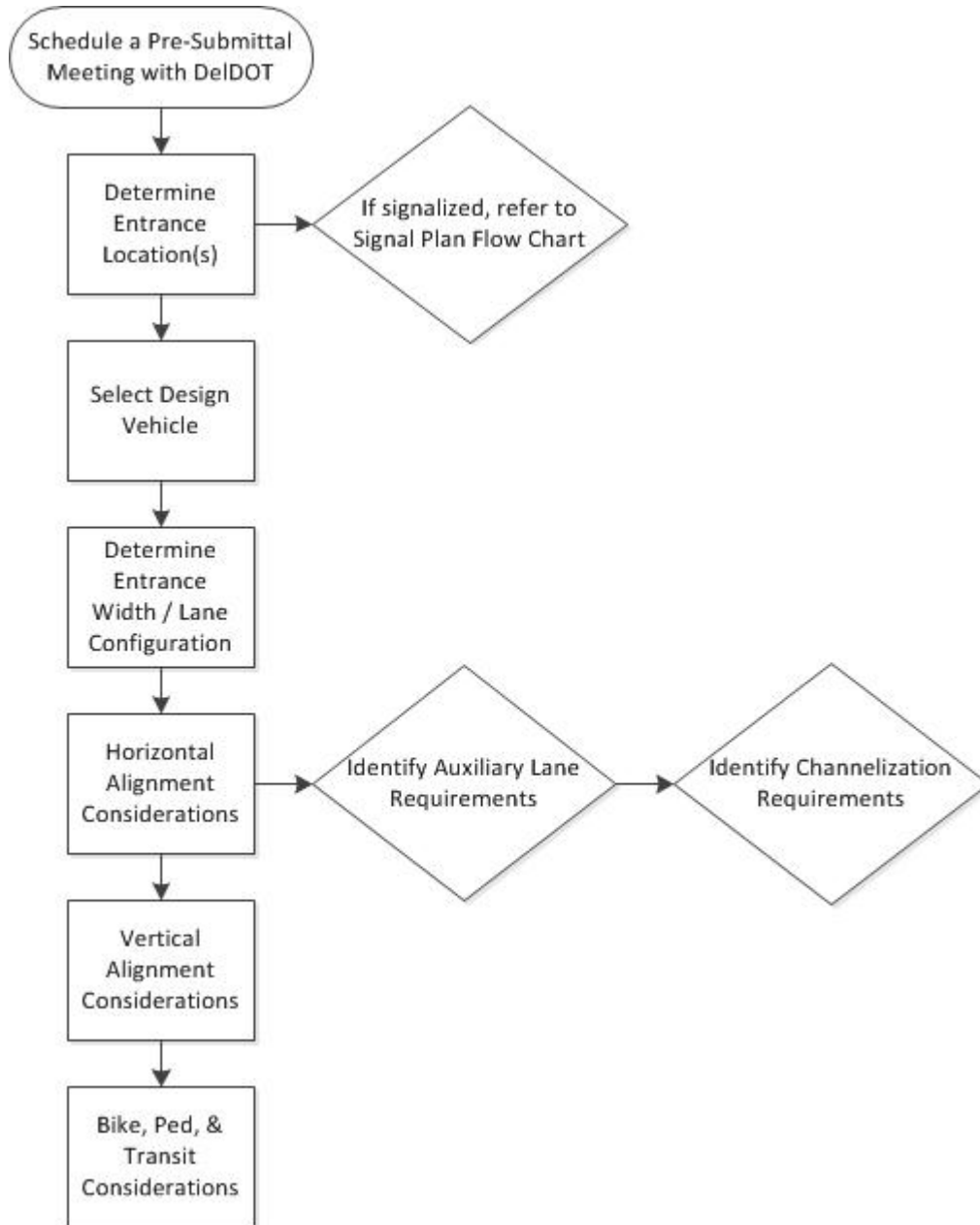
Figure 5.2-a Entrance and Intersection Design Elements



5.2.1 Subdivision and Commercial Entrance Design Guidelines –Process

Proper entrance design requires consideration of many design controls in the context of surrounding intersections, entrances, roadways, and their users (e.g. vehicles, pedestrians, bicycles, transit). Figure 5.2.1-a provides an outline for successfully planning and designing a commercial site entrance. It is recommended that the design engineer schedule a Pre-Submittal meeting with DelDOT staff early in the design process in order to confirm consensus on critical design controls. The design engineer assumes full responsibility for design performed without first confirming design controls with DelDOT.

Figure 5.2.1-a Subdivision and Commercial Entrance Plan Decision Flow Chart



5.2.2 Subdivision and Commercial Entrance Design Guidelines – Entrance Location

As entrances are introduced to an existing roadway, additional vehicle-to-vehicle conflict points are created, which has the direct impact of reducing safety along the roadway. Insufficient spacing between nearby entrances and intersections compound these adverse effects. While no access management program can completely eliminate safety concerns associated with entrances, there are guidelines to selecting an entrance location that can reduce these impacts.

When deciding on the location of a proposed entrance, one of the most important factors is its distance to nearby intersections. According to AASHTO, entrances should ideally be located outside the functional area of an intersection or adjacent driveway. The functional area extends both upstream and downstream from the physical intersection area and includes the longitudinal limits of auxiliary lanes. This allows for the best operations with respect to traffic exiting the site and positioning itself at the intersection approach and reduces the chance that queues from the downstream intersection will block the entrance.

Ideally, spacing between entrances should be provided as equal to the stopping sight distance on the abutting roadway. This allows drivers on the roadway to take notice and be prepared for entering or exiting vehicles at each individual access point. When spacing is shorter than this distance, the driver experiences overlapping attention demands and attention is diverted from other driving tasks.

In cases of urban infill and redevelopment, ideal spacing of entrances cannot always be provided. With that in mind, the following general guidelines should be followed when selecting an entrance location.

- A. When possible, entrances should not be located within the functional area of a nearby intersection or driveway. Entrances close to a major intersection result in motorists negotiating conflicts close to an area designed to manage large volumes of traffic, which may lead to unsafe and bad operational conditions as shown in Figure 5.2.2-a.
- B. When possible, provide spacing between successive entrances equal to the stopping distance of the adjacent roadway.
- C. When a parcel of land is being developed that fronts on a major and a minor roadway, the access to this parcel should be from the minor roadway and not the major roadway. Exceptions may be considered by the Subdivision Engineer.
- D. Where feasible, an entrance should be located directly across from an entrance on the opposite side of the roadway. If this is not possible, entrances should be located a sufficient distance from nearby entrances to avoid the “jog maneuvers” shown in Figure 5.2.2-b. Desirable offset distances are given in Figure 5.2.2-c.
- E. In the case of corner lot development and redevelopment, entrances should be placed as far away from the adjacent intersection as the property limits allow. The minimum distance between the entrance radius and the property line shall be 5 feet.

Figure 5.2.2-a Corner Clearance

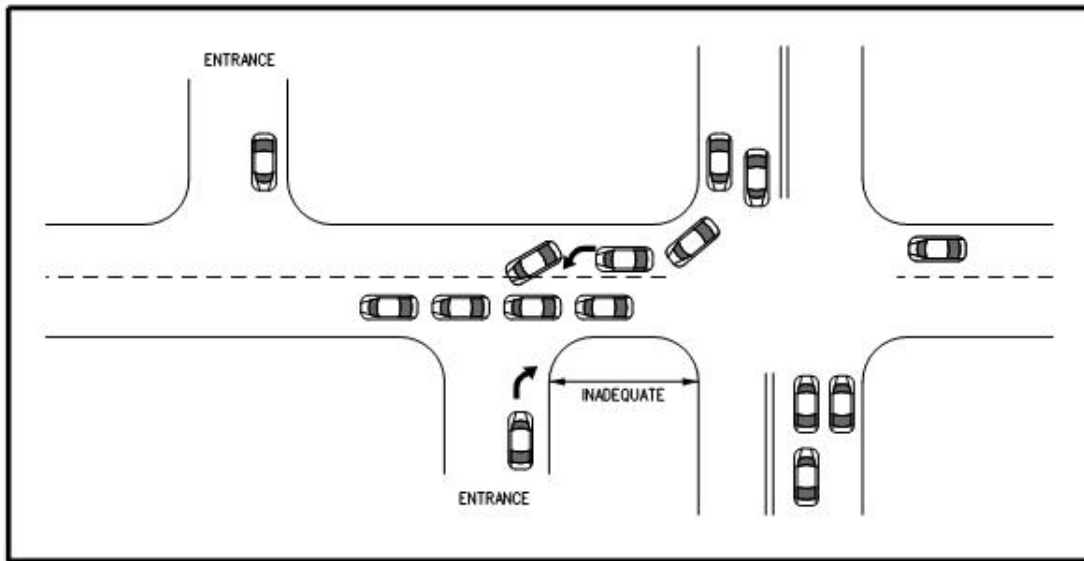


Figure 5.2.2-b Avoiding Entrance Jog Maneuvers

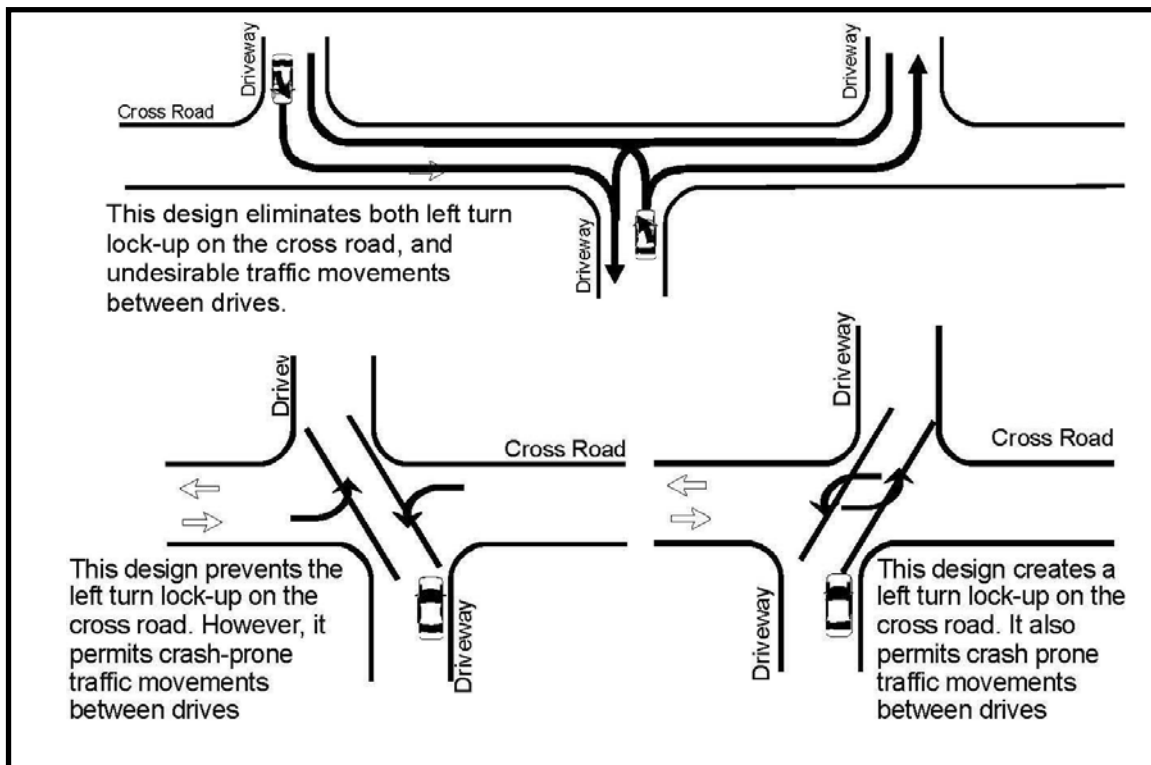


Figure 5.2.2-c Desirable Offsets on Undivided Highways

Posted Speed (mph)	Desirable Offset Distance Between Access Points on Opposite Sides of the Roadway (feet)
25	255
30	325
35	425
40	525
45	630
50	750

(Source: Michigan Department of Transportation *Traffic and Safety Note 608A*)

The design elements required for a specific entrance shall be constructed within the right-of-way or easements of the roadway. The engineer is responsible for verifying the right-of-way width and that the required improvements can be constructed. If the right-of-way cannot accommodate the required entrance improvements, the developer can acquire the necessary right-of-way, restrict movements, or reduce the traffic generated from the site to eliminate the need for the improvement.

5.2.3 Subdivision and Commercial Entrance Design Guidelines – Design Vehicle

Proper entrance design with respect to safety, operations, and sustainability is heavily dependent upon selecting the appropriate design vehicle. The functional requirements associated with the entrance to a residential subdivision will be much different than those associated with the entrance of an industrial facility due to the types of vehicles that they will serve. The design vehicle has a major role in determining entrance/lane width and turning radius design. In general, Figure 5.2.3-a should be used for proper design vehicle selection based on the proposed development use. It is incumbent upon the design engineer to confirm consensus of the design vehicle with DelDOT before proceeding with design. The design engineer assumes full responsibility for designing an entrance or intersection without first confirming the selection with DelDOT.

Figure 5.2.3-a Design Vehicle Selection

Proposed Development Use	Design Vehicle*
Residential Subdivision	SU-30, WB-50**
Bank	SU-30
Gas Station	WB-40, WB-50, or WB-62
Big Box Store (e.g. Walmart, Lowes, Best Buy)	WB-67
Restaurant (e.g. Applebee's, Chili's, Ruby Tuesday)	WB-62
Fast Food	WB-40, WB-50, or WB-62
Mid-size Retail/Grocery (e.g. Dollar Store, Giant, Safeway)	WB-62
Small Retail	SU-30, WB-40, or WB-50
Pharmacy	WB-62
Car Wash	SU-30
School	SU-30, WB-62**
Intersections of State Maintained Roadways	WB-62

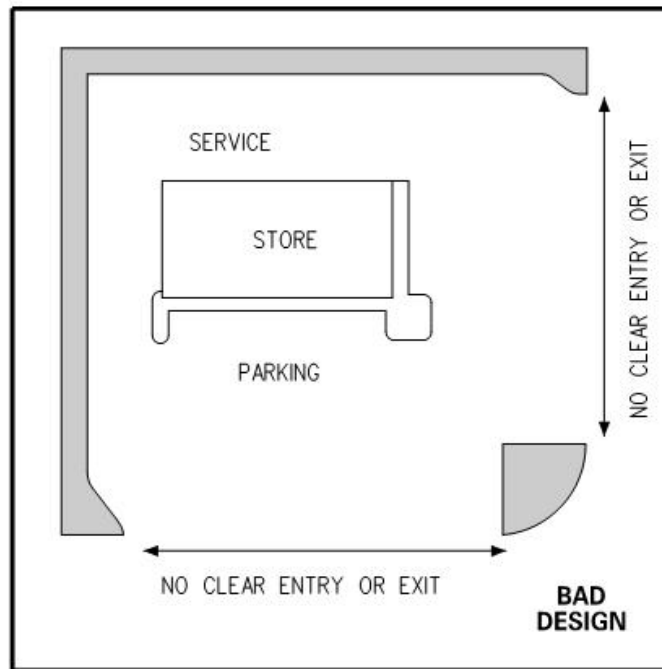
*Refer to Table 2-1 of AASHTO's *A Policy on Geometric Design of Highways and Streets* (Green Book), 6th Edition, for additional information about design vehicle dimensions.

** Encroachment into the opposing lane of the entrance drive may be permitted but not on curb or islands. Refer to Section 5.2.5 for additional guidance.

5.2.4 Subdivision and Commercial Entrance Design Guidelines – Entrance Width

The entrance width refers to the driveway opening for both ingress and egress lanes. Proper entrance widths are dependent on the number of lanes needed to adequately serve the volume of entrance and exit movements with lanes wide enough so that movements do not encroach upon each other. Entrances should be narrow enough to provide clear points of ingress and egress with appropriate pavement and lane markings to separate movements and travel direction. Figure 5.2.4-a shows an example of poorly designed entrance widths.

Figure 5.2.4-a Poorly Designed Entrance Widths



(Source: Michigan Department of Transportation *Access Management Guidebook*)

In general, entrance pavement widths should be provided as shown in Figure 5.2.4-b.

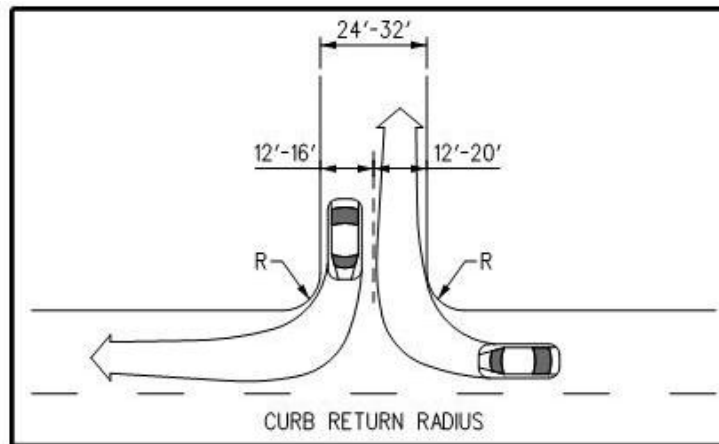
Figure 5.2.4-b Entrance Pavement Widths

Entrance Type	Pavement Width
Subdivision Type I, II, and III Streets (One-way)	16 feet 18 feet (without curb and gutter)
Subdivision Type I Street (Two-way)	24 feet
Subdivision Type II and III Streets (Two-way)	32 feet
Industrial Street (Two-way)	32 feet
Commercial Access (One-way)	18 feet
Commercial Access (Two-way)	24 – 32 feet

Notes:

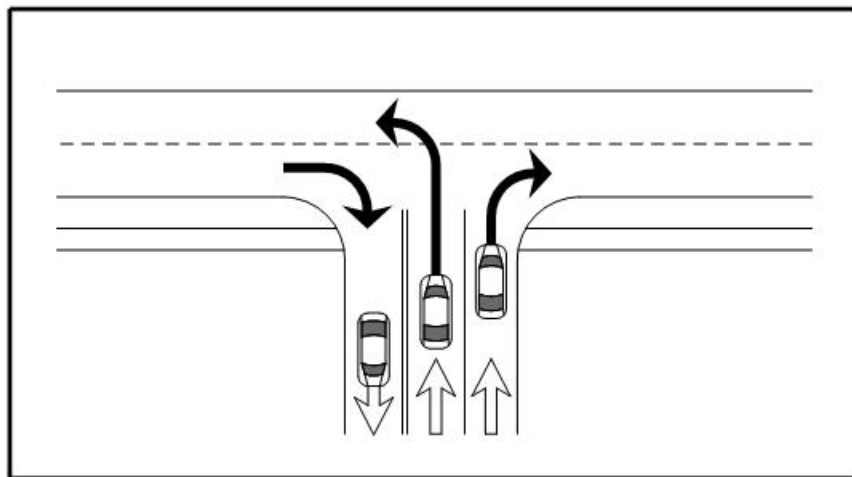
1. Entrance widths are also closely related to choice of design vehicle and corner radii design. The widths shown above are given as general guidelines but are not meant as a substitute for design vehicle and corner radii design considerations.
2. Entrance widths may be driven by the need to provide multiple lanes of ingress and egress based on capacity needs of the proposed development in which case the widths shown above would be superseded.

It is acceptable for the entering and exit lanes to be of unequal width in order to accommodate the required turning paths of the design vehicle in combination with corner radii design, as shown in Figure 5.2.4-c.

Figure 5.2.4-c Commercial Entrance Lane Width Example

(Adopted from Florida Department of Transportation *Driveway Information Guide*)

When determined by a TOA or TIS, separate left and right-turn lanes may be required exiting the entrance of a commercial or large subdivision development. This may also be suggested by the engineer based on site needs. In some cases, only a small number of left-turn vehicles will cause a significant delay to right turning vehicles at a single exit lane. In this case, the additional exit lane will greatly improve operations of an entrance with high entrance volumes.

Figure 5.2.4-d Separate Left and Right-Turn Exiting Lanes

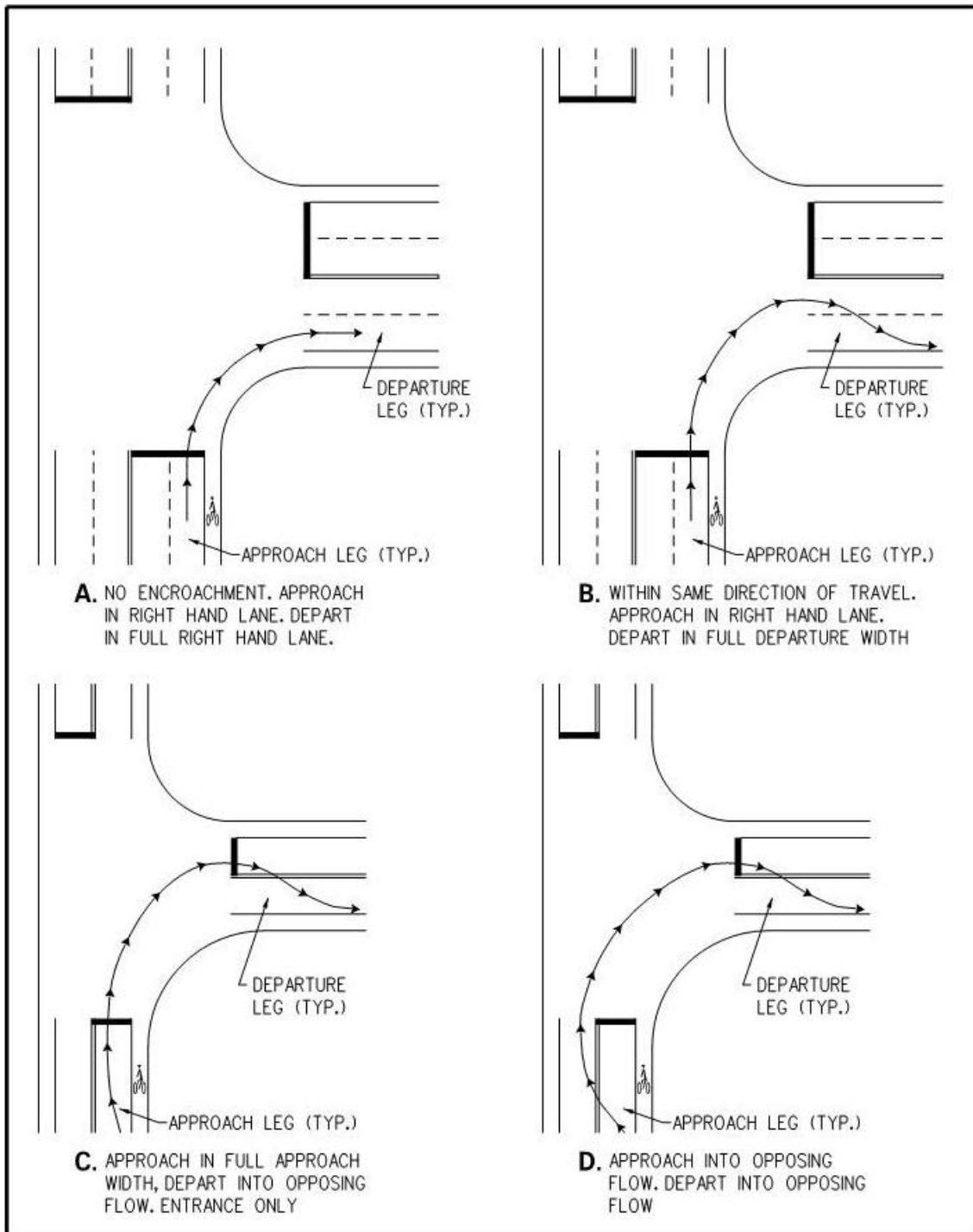
5.2.5 Subdivision and Commercial Entrance Design Guidelines – Intersection Corner Radii

The radii of an intersection's corners or the curves connecting the edges of pavement of the intersecting streets are defined by either the curb (face or where bituminous concrete/asphalt pavement and edge of gutter meet), or by the edge of pavement where there is no curb. The intersection's corner radii are key factors in the multimodal performance of the intersection. The corner radius affects the pedestrian crossing distance, the speed and travel path of turning vehicles, and the appearance of the intersection.

Excessively large pavement corner radii result in significant drawbacks in the operation of the street since pedestrian crossing distance increases with pavement corner radius. Further, the speed of turning motor vehicles making right turns is higher at corners with larger pavement corner radii. The compounded impact of these two measures—longer exposure of pedestrians to higher-speed turning vehicles—yields a significant deterioration in safety and quality of service to both pedestrians and bicyclists.

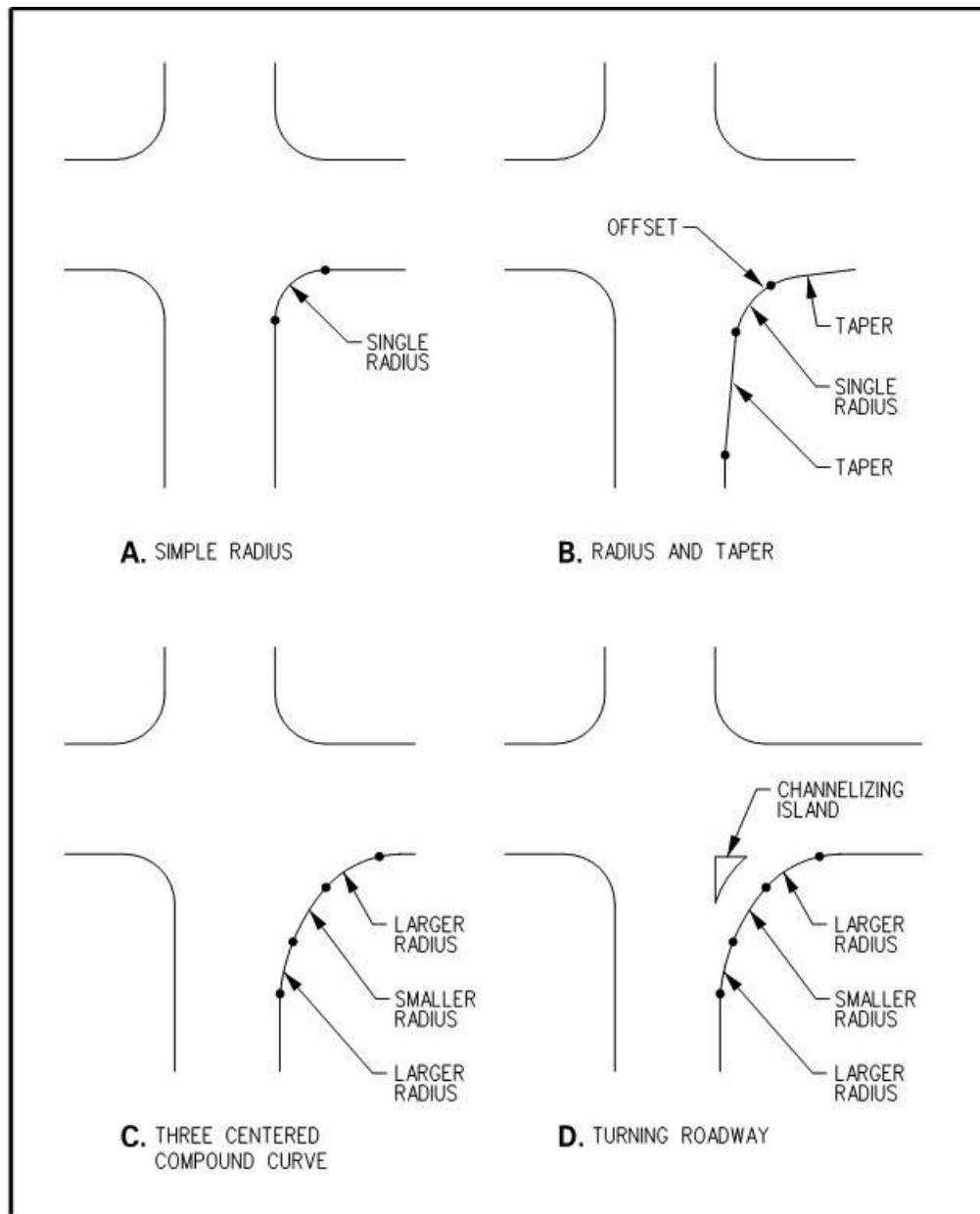
The underlying design control in establishing pavement corner radii is the need to have the design vehicle turn within the permitted degrees of encroachment into adjacent or opposing lanes. Figure 5.2.5-a illustrates degrees of lane encroachment often considered acceptable based on the intersecting roadway types. These degrees of lane encroachment vary significantly according to roadway type, and balance the operational impacts to turning vehicles against the safety of all other users of the street. Although Figure 5.2.5-a provides a starting point for planning and design, the designer must confirm the acceptable degree of lane encroachment during the project development process. It is acceptable for a design vehicle turning from a right turn lane to encroach onto the adjacent bike lane on the approach leg. Lane encroachment in full departure width (not full approach width) as shown in Condition B may be permitted at signalized intersections where a gap is provided allowing the design vehicle turning onto a multi-lane roadway to utilize both travel lanes to make a right turn. Condition C may be acceptable for right turns into an entrance if design vehicle movements are expected during off-peak times. In nearly all cases, Condition D, in which the turning vehicle encroaches into opposing flow, should be avoided. Encroachment by the design vehicle on curbed channelized islands, outer curb line or beyond the edge of pavement (when no curb is present) is not permitted.

Figure 5.2.5-a Typical Lane Encroachment by Design Vehicle



At the great majority of all intersections, whether curbed or otherwise, the pavement corner design is dictated by the right-turn movement. Left turns are seldom a critical factor in corner design, except at intersections of one-way streets, in which case their corner design is similar to that for right turns at intersections of two-way streets. The method for pavement corner design can vary as illustrated in Figure 5.2.5-b and described below.

Figure 5.2.5-b Methods for Pavement Corner Design



5.2.5.1 Simple Curve Radius

A simple curb radius may be used for right turns on roadways at unchannelized intersections for passenger, single unit and small semitrailer design vehicles.

In many situations, the “effective” pavement width on approach and departure legs is greater than an 11 or 12 foot wide travel lane. This is the pavement width usable, by the design motor vehicle, under the permitted degree of lane encroachment. At a minimum, effective pavement width is always the right-hand lane and therefore usually at least 11-12 feet, on both the approach and departure legs. Where a shoulder is present, the shoulder (typically 5 to 8 feet) is added to the effective width on those legs (approach,

departure or both), the effective width may increase to between 16 to 20 feet. In addition, the effective width may include encroachment into adjacent lanes of traffic. An example of this is a combination vehicle using an inside travel lane to make a right turn at a signalized intersection. Figure 5.2.5.1-a shows Conditions A, B and C where the effective width may be utilized to design an intersection corner. An example using Condition B in the figure to determine the curve radius is a SU-30 vehicle turning right at a 90 degree intersection from a local road having an 11 foot travel lane and a 5 foot shoulder onto a collector road having a 12 foot travel lane and an 8 foot shoulder. Therefore, the effective approach leg width is 16 feet and the effective departure leg width is 20 feet. Figure 5.2.5.1-b provides design values for various widths of approach and departure legs at unchannelized intersections.

For larger angles of turns and/or large design vehicles, simple curve radius with taper combinations or three centered compound curves should be considered.

Figure 5.2.5.1-a Effective Pavement Width Examples

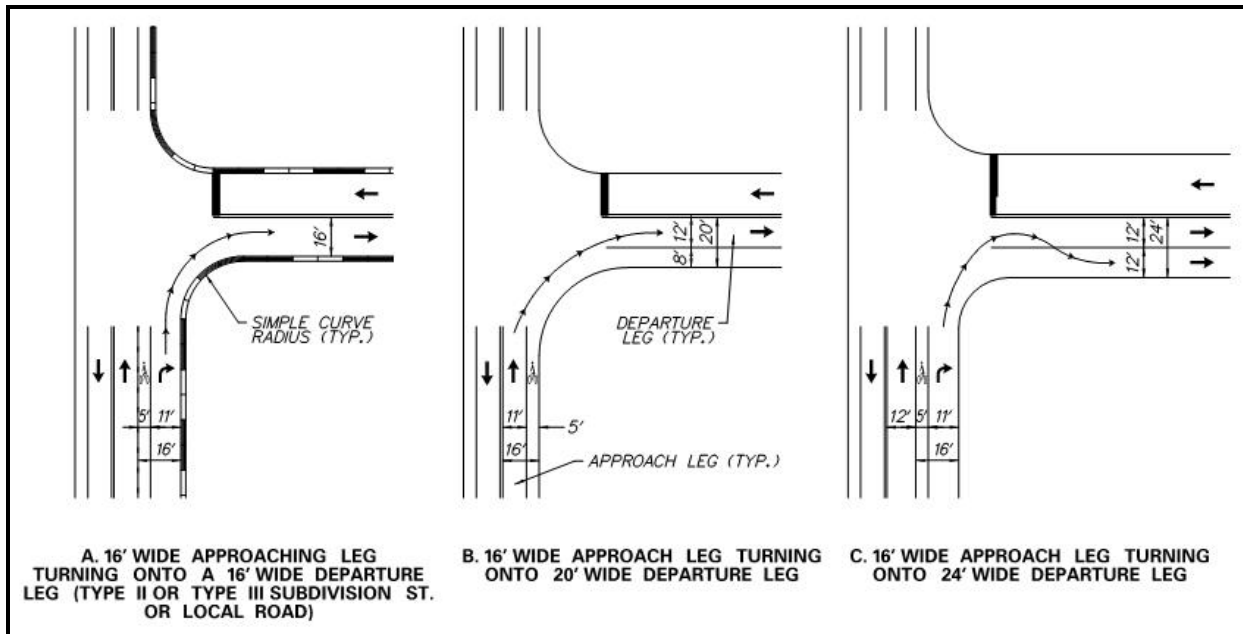


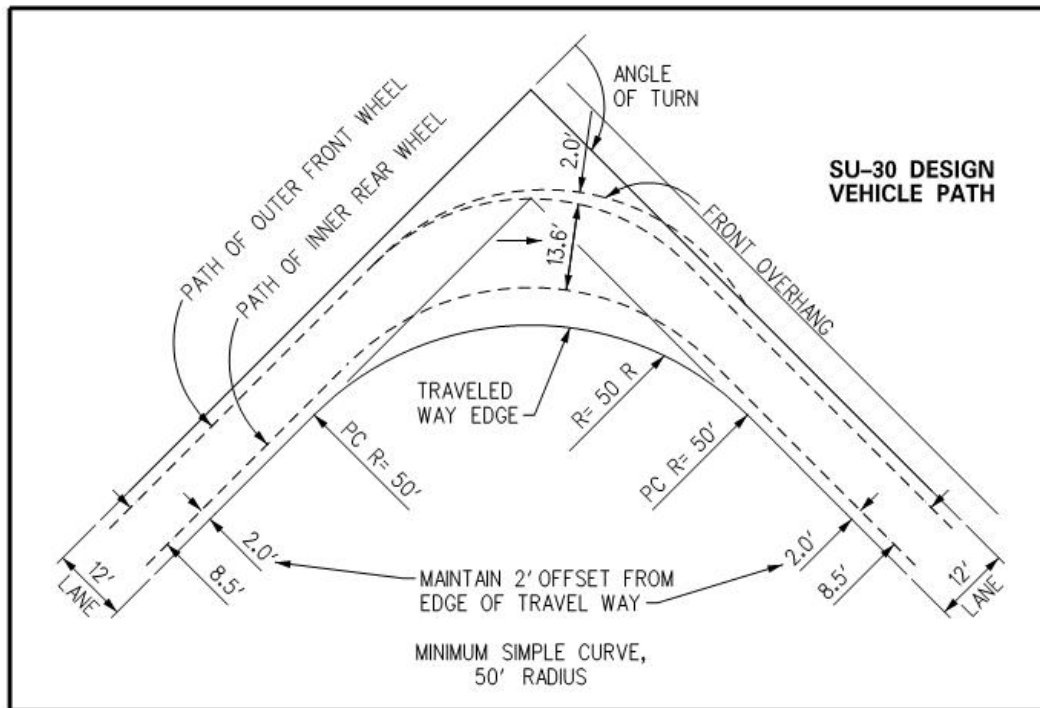
Figure 5.2.5.1-b Simple Curve Radius with Effective Widths

Angle of Turn (Degrees)	Effective Width on Approach Leg (ft)	Effective Width on Departure Leg (ft)									
		Passenger Car (P)			Single Unit Truck (SU-30)			Tractor Trailer (WB-40)			
		12	16	20	12	16	20	12	16	20	24
75	12	35	20	15	55	50	35	100	60	40	35
	16	20	15	15	55	45	25	80	60	35	20
	20	20	15	15	50	35	15	75	50	20	15
90	12	30	20	15	50	40	30	80	60	35	30
	16	20	15	15	50	35	20	75	55	35	25
	20	15	15	15	45	30	15	65	50	25	15
105	12	20	20	15	50	40	30	65	50	35	30
	16	20	15	15	45	35	25	60	50	30	25
	20	15	15	15	40	25	15	55	45	25	20
120	12	20	15	15	45	40	30	60	50	35	30
	16	15	15	15	45	30	25	55	45	30	25
	20	15	15	15	40	25	20	55	40	25	20
150	12	20	15	15	40	30	30	45	40	30	30
	16	15	15	15	40	30	25	45	40	30	25
	20	15	15	15	35	25	25	40	35	25	20

Minimum 15 ft. radius used.

Source: Adapted from A Policy on Geometric Design of Highways and Streets, AASHTO Green Book, 2011, Chapter 9, Intersections

Based on values provided in Figure 5.2.5.1-b, Figure 5.2.5.1-c illustrates the components of a simple curve radius for a SU-30 design vehicle at an unchannelized intersection.

Figure 5.2.5.1-c Simple Curve Radius Example for a SU-30

5.2.5.2 Simple Curve Radius with Taper

The combination of a simple radius flanked by tapers can often fit the pavement edge more closely to the design vehicle than a simple radius (with no tapers). This closer fit can be important for large design vehicles where effective pavement width is small (due either to narrow pavement or need to avoid any lane encroachment), or where turning speeds greater than minimum are desired. Figure 5.2.5.2-a summarizes design elements for curve/taper combinations at unchannelized intersections that permit various design motor vehicles to turn, without any lane encroachment, from a single approach lane into a single departure lane. Values provided are for design vehicles turning from a 12 foot wide approach leg onto a 12 wide foot departure leg. If the effective width of the approach leg and/or departure leg is greater than 12 feet, than the offset or taper length ratio may be reduced to optimize the corner design. Refer to DelDOT's *Intersection Corner Radii Examples* which are available online at <http://devcoord.deldot.gov> > Guidance for additional guidance on how to design a corner with a simple curve and taper and examples.

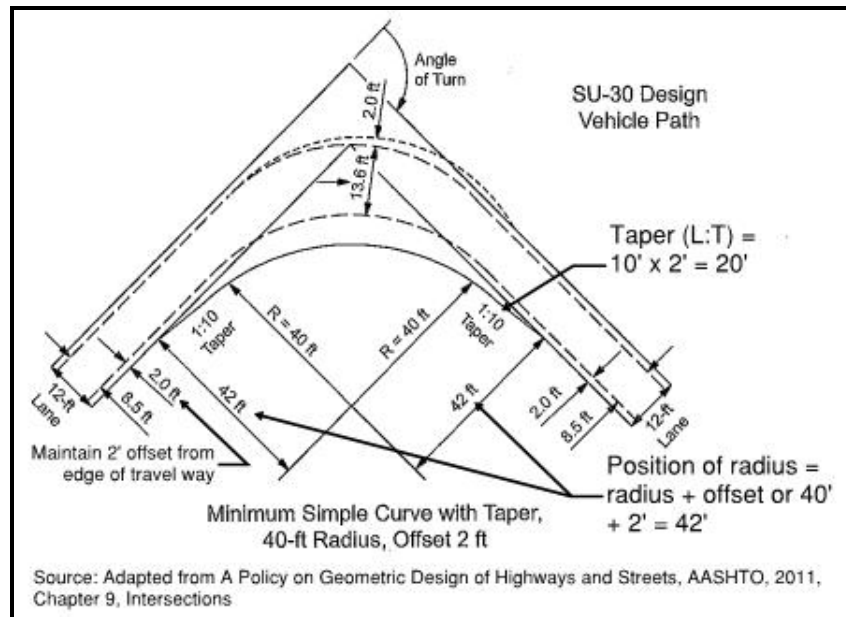
Based on values provided in Figure 5.2.5.2-a, Figure 5.2.5.2-b illustrates the components of a simple curve radius with taper corner design for an SU-30 design vehicle at an unchannelized intersection.

Figure 5.2.5.2-a Simple Curve Radius and Taper

Angle of Turn (Degrees)	Design Vehicle	Simple Curve Radius with Taper		
		Radius (ft)	Offset (ft)	Taper Length (L:T)
75	P	25	2	10:1
	SU-30	45	2	10:1
	WB-40	60	2	15:1
	WB-62	145	4	20:1
90	P	20	2.5	10:1
	SU-30	40	2	10:1
	WB-40	45	4	10:1
	WB-62	120	4.5	30:1
105	P	20	2.5	10:1
	SU-30	35	3	10:1
	WB-40	40	4	10:1
	WB-62	115	3	15:1
120	P	20	2	10:1
	SU-30	30	3	10:1
	WB-40	35	6	8:1
	WB-62	100	5	15:1
150	P	18	2	10:1
	SU-30	30	4	10:1
	WB-40	60	6	8:1
	WB-62	60	10	10:1

Source: Adapted from A Policy on Geometric Design of Highways and Streets, AASHTO, 2011, Chapter 9, Intersections

Figure 5.2.5.2-b Simple Curve Radius and Taper Example for a SU-30



5.2.5.3 Three Centered Compound Curves

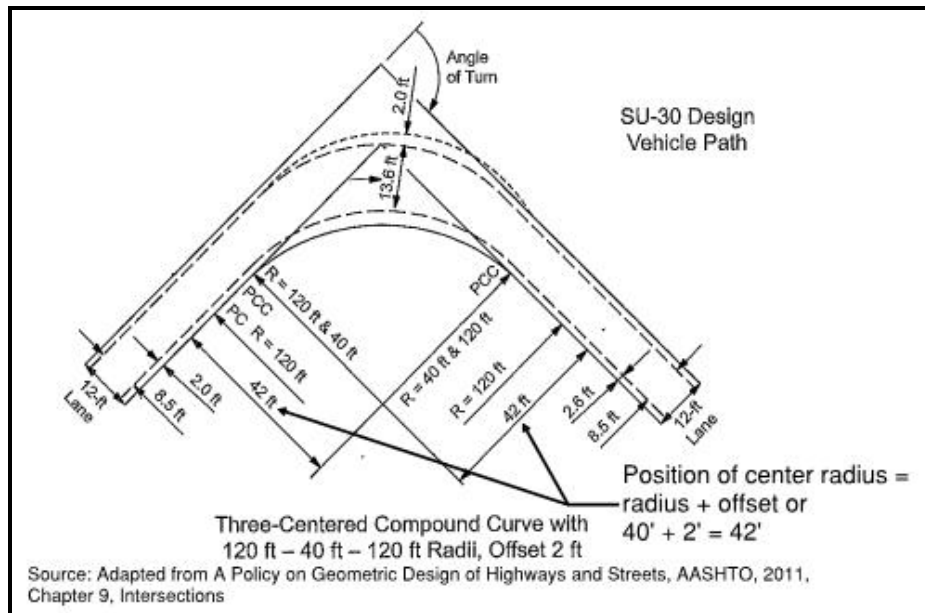
Figure 5.2.5.3-a shows the minimum edge of traveled way design values for various uses using three centered compound curves at an unchannelized intersection, without any lane encroachment, from a single approach lane into a single departure lane. Values provided are for design vehicles turning from a 12 foot wide approach leg onto a 12 wide foot departure leg. If the effective width of the approach leg and/or departure leg is greater than 12 feet, than the offset may be reduced or the radii and taper for a smaller design vehicle may be used to optimize the corner design. Refer to DelDOT's *Intersection Corner Radii Examples* which are available online at <http://devcoord.deldot.gov> > Guidance for additional guidance on how to design a corner with a three centered compound curve and examples.

Figure 5.2.5.3-a Three Centered Compound Curves

Angle of Turn (Degrees)	Design Vehicle	Radius (R1-R2-R1, ft)	Offset (ft)
75	P	100-25-100	2
	SU-30	120-45-120	2
	WB-40	120-45-120	5
	WB-62	440-75-440	15
90	P	100-20-100	2.5
	SU-30	120-40-120	2
	WB-40	120-40-120	5
	WB-62	400-70-400	10
105	P	100-20-100	2.5
	SU-30	100-35-100	3
	WB-40	100-35-100	5
	WB-62	520-50-520	15
120	P	100-20-100	2
	SU-30	100-30-100	3
	WB-40	120-30-120	6
	WB-62	520-70-520	10
150	P	75-20-75	2
	SU-30	100-30-100	4
	WB-40	100-30-100	6
	WB-62	480-55-480	15

Source: Adapted from A Policy on Geometric Design of
Highways and Streets, AASHTO, 2011, Chapter 9,
Intersections

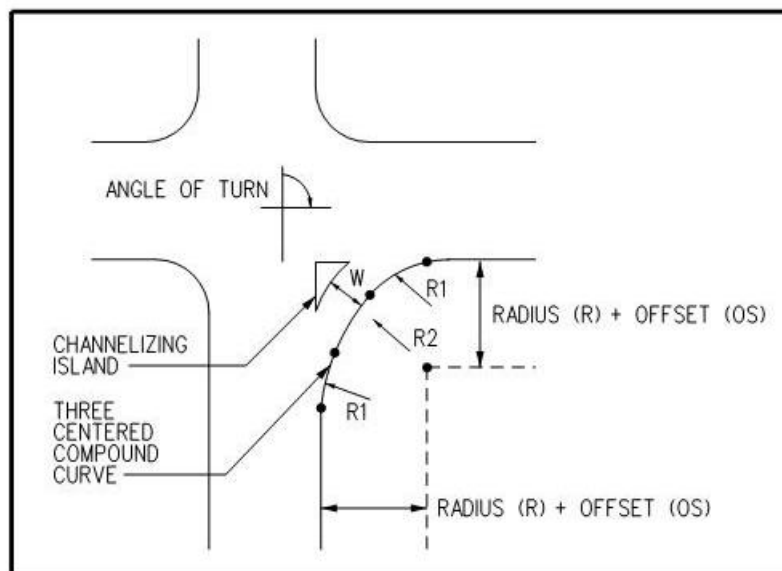
Based on design values provided in Figure 5.2.5.3-a, Figure 5.2.5.3-b illustrates the components of a three-centered compound curve corner for a SU-30 design vehicle at an unchannelized intersection.

Figure 5.2.5.3-b Three Centered Compound Curves Example for a SU-30

5.2.5.4 Turning Roadways

A separate right-turn roadway, usually delineated by channelization islands and auxiliary lanes, may be appropriate where right-turn volumes are large, where lane encroachment by any motor vehicle type is unacceptable, where higher speed turns are desired, or where angle of turn is well above 90 degrees.

Three centered compound curves may be used on turning roadway for passenger vehicles and should be considered where SU and semitrailer combinations will be turning as shown in Figure 5.2.5.4-a.

Figure 5.2.5.4-a Turning Roadways and Island

[Figure 7-6 Design Widths for Turning Roadways](#) of DelDOT's *Road Design Manual* provides suggested simple curve radii and lane widths combinations for turning roadways based on several types of smaller design vehicle. Figure 5.2.5.4-b shows a sample turning roadway design using simple curve radii for passenger cars and occasional SU's for a right-in and right-out entrance. Figure 5.2.5.4-c shows a sample turning roadway design for bus and WB-40 design vehicles for a right-in and right-out entrance using simple curve radii. The "effective" pavement width on approach and departure legs may vary the turning roadway width and island size. In all cases, the channelizing island should be checked to verify that it meets the minimum size requirements.

Figure 5.2.5.4-b Sample Turning Roadway Design for Passenger Cars and Occasional SU-30's

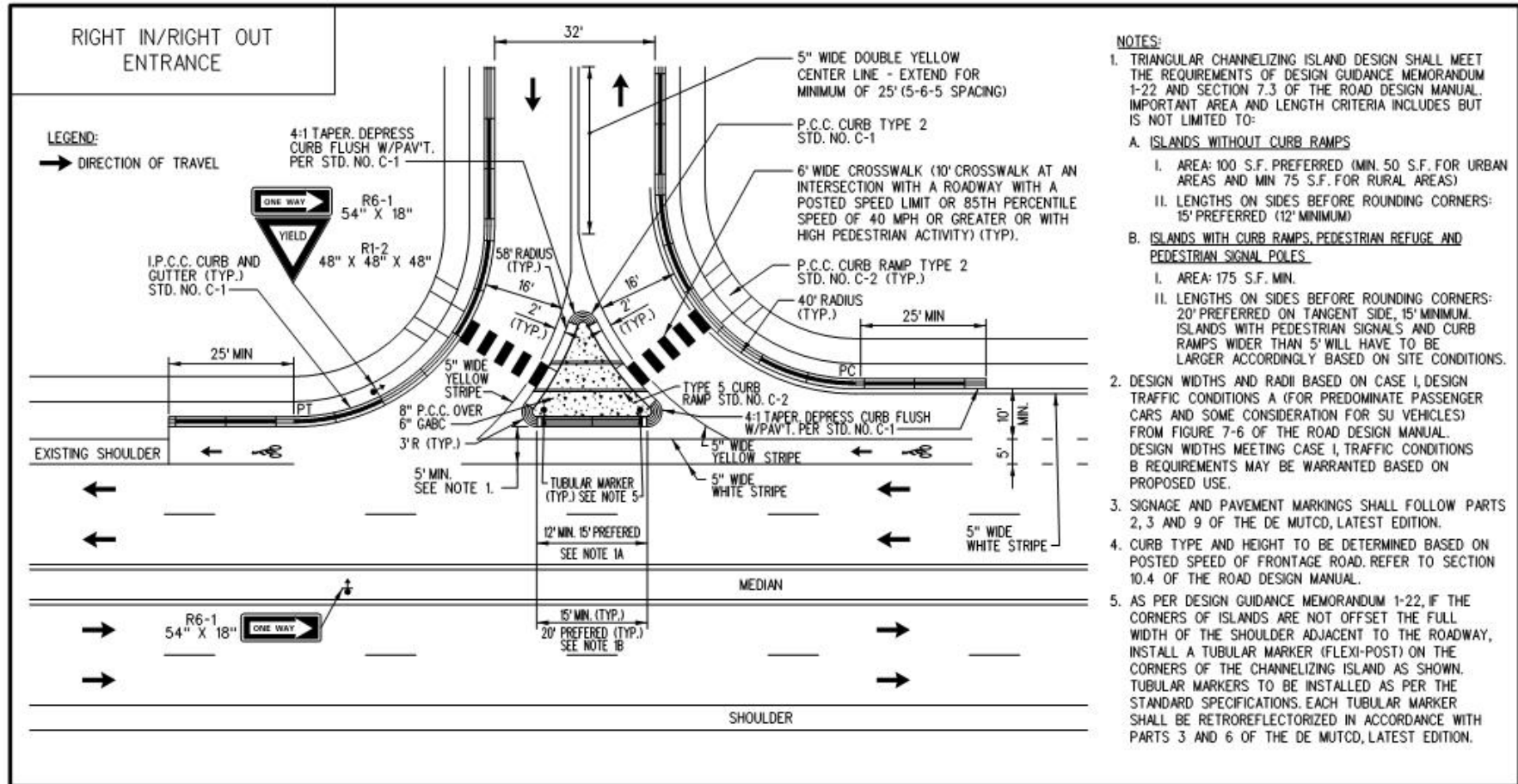
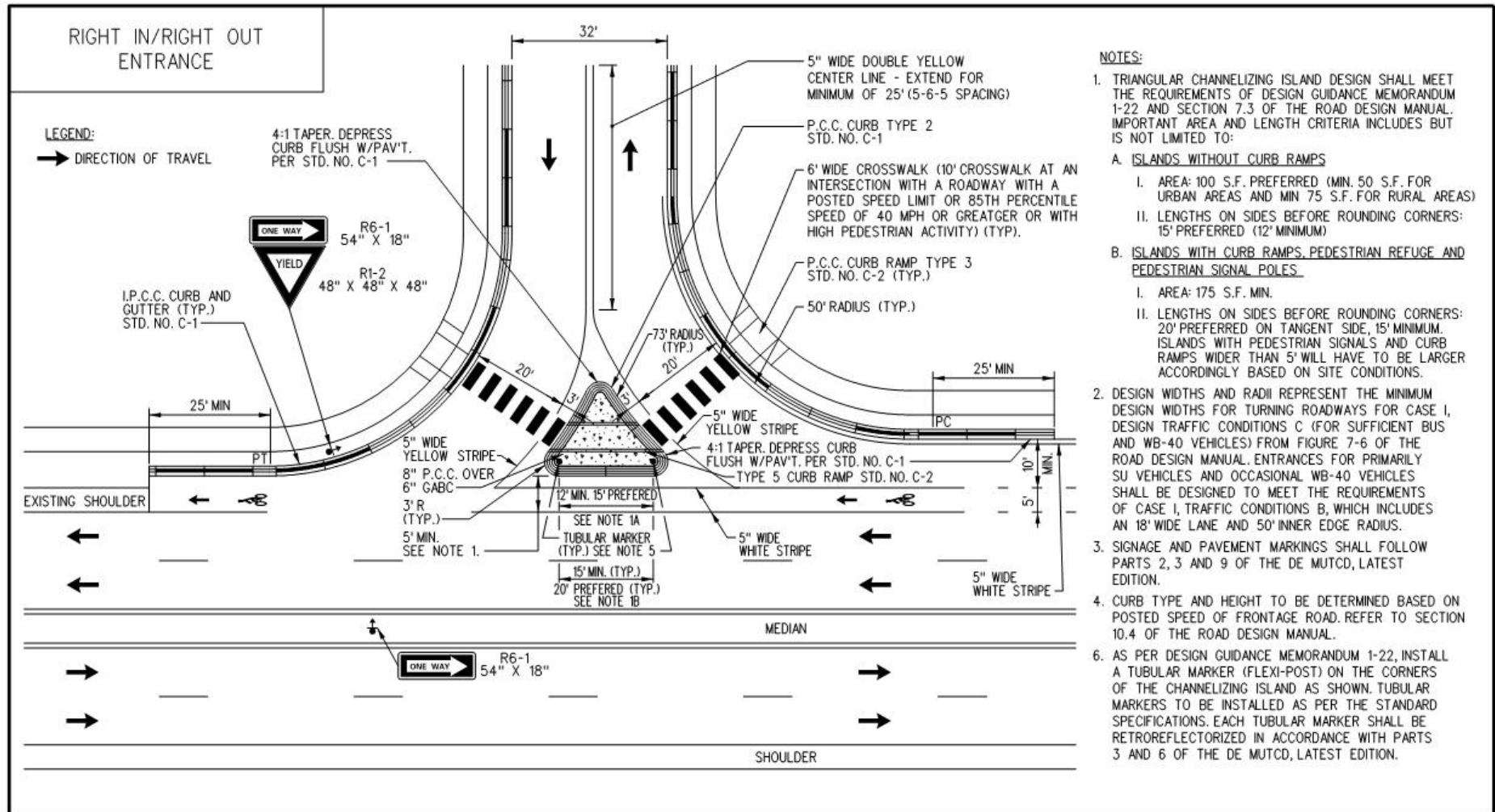


Figure 5.2.5.4-c Sample Turning Roadway Design for WB-40's



Appropriate design values for turning roadways using three centered compound curves turning from a 12 foot wide approach leg onto a 12 foot wide departure leg are provided in Figure 5.2.5.4-d. When the effective width of the approach leg and/or departure leg are wider than 12 feet, then it may be possible to use smaller curve radii and offset to design the turning roadway. The turning roadway lane widths may be reduced with pavement markings to channelize passenger cars and discourage the usage of the wider turning roadway as two turning lanes. Refer to DelDOT's *Intersection Corner Radii Examples* which are available online at <http://devcoord.deldot.gov> > Guidance for additional guidance on how to design a turning roadway and examples.

Figure 5.2.5.4-d Turning Roadways

Angle of Turn (Degrees)	Design Classification	Three Centered Compound Curve		Width of Lane (ft)
		Radii (R1-R2-R1, ft)	Offset (ft)	
75	A	150-75-150	3.5	14
	B	150-75-150	5	18
	C	220-135-220	5	22
90	A	150-50-150	3	14
	B	150-50-150	11	21
	C	200-70-200	11	25
105	A	120-40-120	2	15
	B	150-35-150	11.5	29
	C	180-60-180	9.5	32
120	A	100-30-100	2.5	16
	B	150-30-150	10.5	33
	C	140-55-140	7	45
150	A	100-30-100	2.5	16
	B	150-30-150	9	42
	C	160-40-160	6	53

Design Classification:

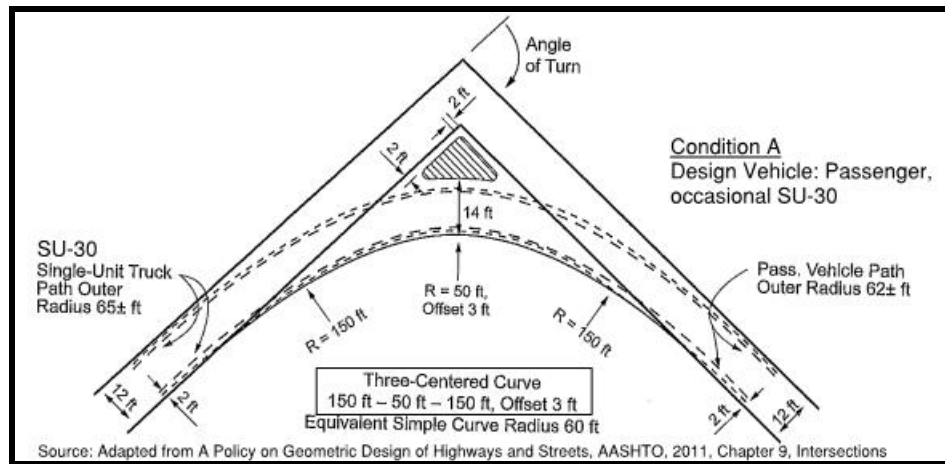
A – Primarily passenger vehicles; permits occasional design single-unit trucks to turn with restricted clearances.

B – Provides adequately for the SU-30 and SU-40 design vehicles; permits occasional WB-62 design vehicles to turn with slight encroachment on adjacent traffic lanes.

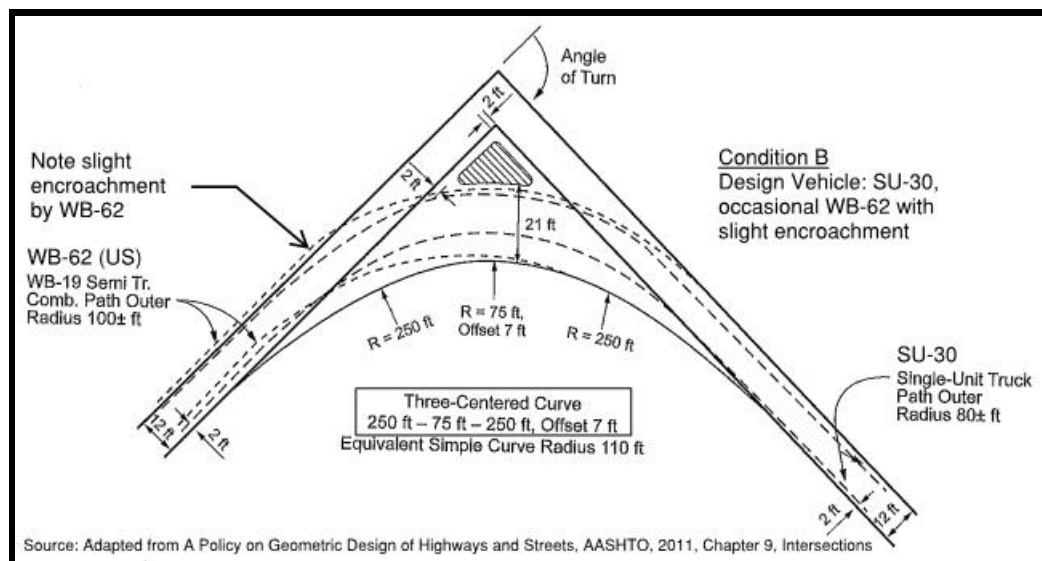
C – Provides fully for the WB-62 design vehicle.

Verify island size meets minimum preferred size of 100 ft² for curbed islands or 175 ft² for islands with curb ramps, pedestrian refuge and pedestrian signal poles. Refer to Figures 5.2.5.5-a and 5.2.5.5-b.

The next three figures show examples of minimum turning roadway designs for 90-degree right turn based on the design vehicle and its frequency of use. Figure 5.2.5.4-e shows a minimum turning roadway using a three-centered curve with radii of 150, 50, and 150 ft with the middle curve being offset 3 ft from the tangent edged extended and a 14 ft lane width. This design not only permits passenger vehicles to turn at a speed of about 15 mph but also enables single-unit truck designs vehicles to turn on a radius (right front wheel) of approximately 65 ft and still clear turning roadway by about 1 ft on each side.

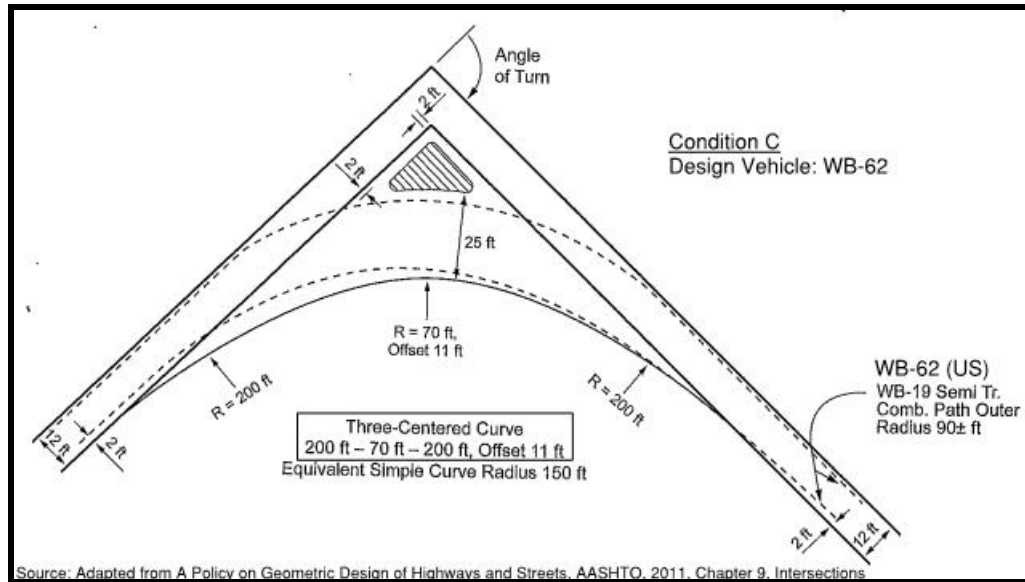
Figure 5.2.5.4-e Turning Roadway Design for Passenger Car and Occasional SU-30

By increasing the turning roadway width 2 ft and using the same combination of curves but with the middle curve being offset 7 ft from the tangent edges extended, a more desirable arrangement results as shown in Figure 5.2.5.4-f. This design enables the single unit truck design vehicles to use a 75 ft turning radius with adequate clearances and makes it possible for the WB-62 design vehicle to negotiate the turn with only slight encroachment on adjacent through-traffic lanes.

Figure 5.2.5.4-f Turning Roadway Design for SU-30 and Occasional WB-62

At locations where a significant number of semitrailer combinations, particularly the longer units, will be turning, the arrangements shown should be used as shown in Figure 5.2.5.4-g. This design, consisting of a minimum curve of 70 ft radius, an offset of 11 ft and terminal curves with radii of 200 ft generally provides for WB-62 design vehicle passing through a 25 ft turning roadway width and greatly benefits the operation of smaller vehicles.

Figure 5.2.5.4-g Turning Roadway Design for WB-62



5.2.5.5 Channelizing Islands

An island's principle functions are to control and direct traffic movements, usually turning, dividing opposing and same direction traffic streams and to provide refuge for pedestrians and bicyclists. An island is defined as an area between traffic lanes for control of vehicle movements and may be delineated by barrier curb (having a vertical rise greater than 6 inches), mountable curb (having a vertical rise 6 inches or less) or a pavement area marked by paint. P.C.C. curb, Type 2 is the preferred curb used to delineate an island. Islands should be sufficiently large to be visible to motorists and to accommodate pedestrian refuge and pedestrian signal poles where required. Figures 5.2.5.5-a and 5.2.5.5-b provide minimum and preferred island sizes as stated in [Section 7.3.3 Islands](#) of DelDOT's *Road Design Manual*.

Figure 5.2.5.5-a Island Sizes without Pedestrians Facilities

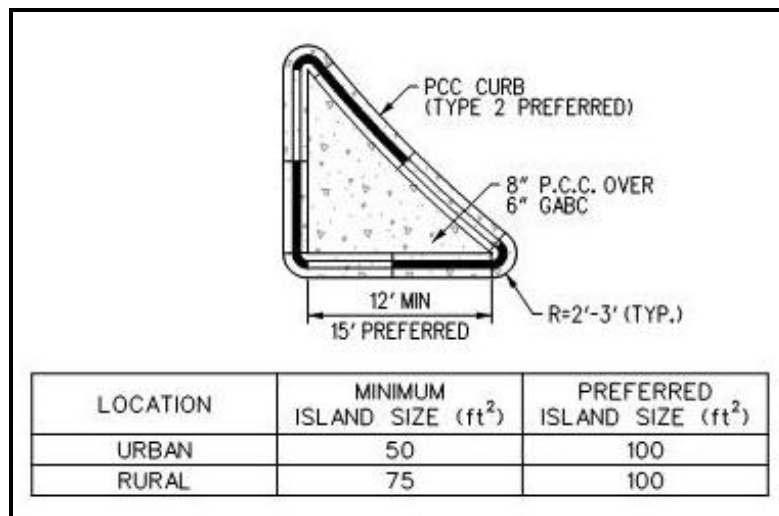
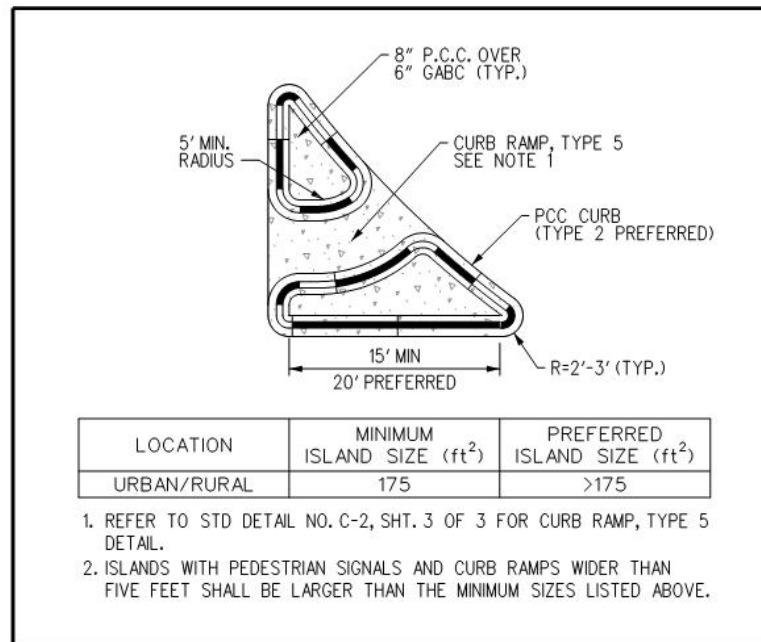


Figure 5.2.5.5-b Island Sizes with Pedestrians Facilities

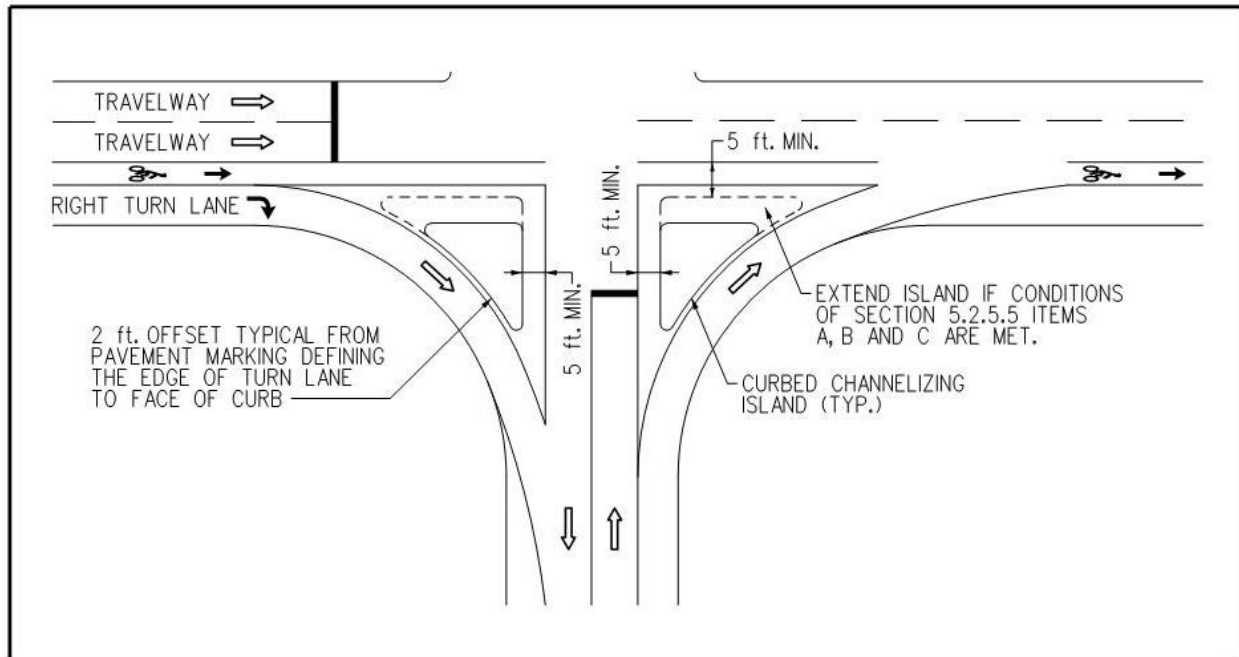
[Design Guidance Memorandum 1-22](#) provides additional guidance related to an island's offset from the travel lane based on several conditions. Typically, the island is offset from the traveled way the full width of the shoulder or turn lane. This offset may be reduced to only five feet to accommodate bicycles (as shown in Figure 5.2.5.5-c) under the following conditions:

- A. Urban, suburban and developing areas where, due to queue lengths and congestion, there is a need to discourage traffic from using the shoulder to pass on the right
- B. Commercial driveway entrances or streets leading up to an urban, suburban or developing intersection to prevent illegal shoulder traffic prior to the deceleration lane. Here, the island also offers protection to the vehicle entering the highway and prevents a car crossing the highway entering the business or side street from being involved in an angle crash.
- C. Crosswalks where pedestrian refuge and shortening the length of the crossing is needed, particularly where there is signalization

As stated in the AASHTO Green Book, "islands used for channelization should not interfere with or obstruct bicycle lanes at intersections." The offset for bicycles may be reduced to 4 feet at locations of high pedestrian use to minimize crossing time.

If U-turn movements are permitted on the intersecting roadway where channelizing islands are proposed to extend into the shoulder, then U-turn turning movement diagrams shall be prepared and submitted for review to verify that U-turn movements may still be made or to determine if additional signing or movement restrictions are needed for certain design vehicles.

Figure 5.2.5.5-c Triangular Island Offsets



For every island configuration, positive drainage must be provided for the safety of vehicles and pedestrians. The corners of the island shall be flush with the pavement as per the *Standard Specifications* for snow plowing operations. The corners of islands which are not offset the full width of the shoulder adjacent to the roadway shall be delineated with flexible delineators as per the *Standard Specifications* Section 701.11. See [Chapter 7 Intersections](#) of the *Road Design Manual* for additional information.

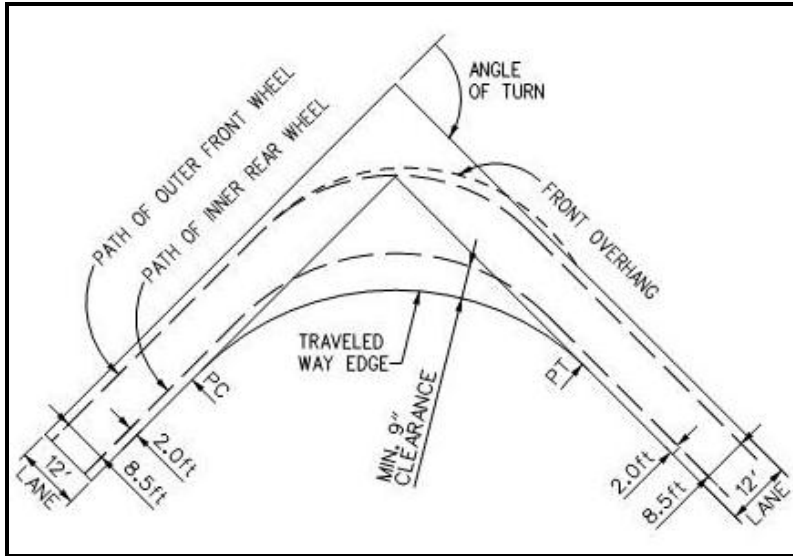
Prior to finalizing the island design, the engineer shall verify that the minimum island size listed in Figures 5.2.5.5-a and 5.2.5.5-b have been met. If the island size is not met using the recommended three centered compound curve radii from Figure 5.2.5.4-d, then the curve radii and/or offsets should be increased until the required minimum island size is achieved.

5.2.5.6 Turning Movement Diagrams

Based on the design vehicle chosen for the proposed development, turning movement diagrams shall be included with the initial plan submittal to verify that the minimum requirements for edges of traveled way for the design vehicle, drive aisle widths and channelizing islands sizes are met. Proposed pavement markings and an elevation view of the design vehicle must be shown on the diagrams. If u-turn movements will be permitted at intersections, then include the turning movements on the diagrams. If a signal is proposed at the intersection, then electronic files shall be forwarded to the Traffic Section to begin signal design only after these design features have been verified.

The design vehicle shall be properly positioned within the traffic lane at the beginning and end of the turn with a 2 foot offset from the edge of traveled way on the tangents. It is recommended to maintain the 2 foot offset of the design vehicle's inner wheel path throughout most of the turn and with a clearance at no point less than 9 inches from the face of curb or edge of pavement if uncurbed as shown in Figure 5.2.5.6-a. If a turning software application is used to create the templates, a minimum 10 mph speed shall be used for the design vehicle.

Figure 5.2.5.6-a Turning Movement Offsets

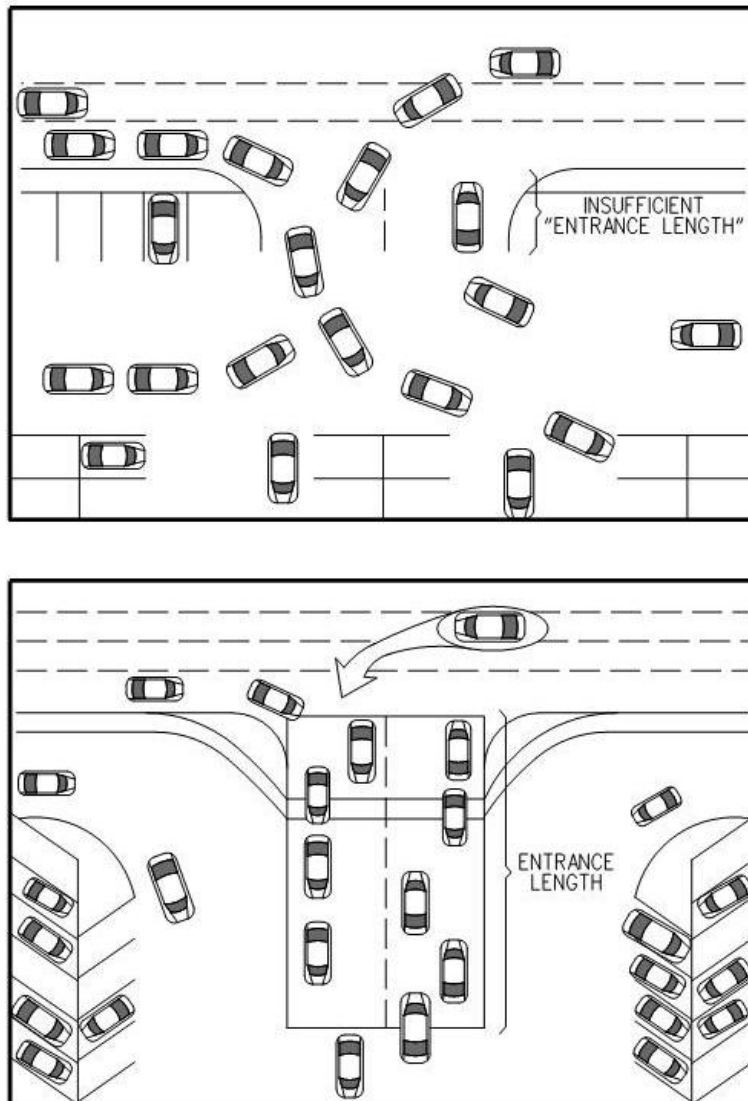


5.2.6 Subdivision and Commercial Entrance Design Guidelines – Entrance Length

The entrance length refers to the amount of space available for stacking incoming and outgoing vehicles or the distance between the street and the end of the entrance within the development. As shown in Figure 5.2.6-a, when insufficient lengths between the entry point and parking spaces or on-site drive aisles exist, vehicles can be subject to multiple conflict points near the entrance which inhibit operations on the adjacent roadway as well as within the developed site. Figure 5.2.5-b shows recommended minimum entrance lengths based on proposed land uses.

If the use of an entrance is to be controlled by an electronic gating system, the gate shall be located a minimum of 50 feet from the edge of the shoulder, and a turnaround for the appropriate design vehicle must be provided within the site entrance, in the area between the Right-Of-Way and the gates. For proposed uses that would be anticipated to create a queue of vehicles waiting to pass through the gating system, additional storage length may be required between the Right-Of-Way and the gates.

Figure 5.2.6-a Entrance Length Example



Source: Michigan Department of Transportation *Access Management Guidebook*

Figure 5.2.6-b Recommended Minimum Entrance Lengths

Land Use	Entrance Length
“Big Box” centers with four or more total lanes at the entrance.	300 feet
Regional Shopping Centers over 150,000 s.f.	250 feet
Community Shopping Centers between 100,000 sf and 150,000 s.f.	150 feet
Small Strip Shopping Center	50 feet
Small Commercial Developments	50 feet

Note: For large developments 100,000 s.f. or greater, the total recommended length is not necessary for all entrances, only the major ones.

Considerations for entrance length are especially important when the proposed use includes an element of drive-thru service such as fast-food restaurants, banks, and pharmacies. It is important that sufficient length be provided to allow the queuing of vehicles at drive-thru windows to be contained within the site and not back up into lanes of the adjacent roadway. Figure 5.2.5-c provides recommended queue distances for design consideration based on land use and the expected maximum number of queued vehicles.

Figure 5.2.6-c Recommended Drive-thru Queue Distances

Use	Expected Maximum Number of Queued Vehicles	Queue Distance Required
Fast-food restaurant	9	225 feet
Bank	7	175 feet
Car Wash	2	50 feet
Pharmacy	4	100 feet

Notes:

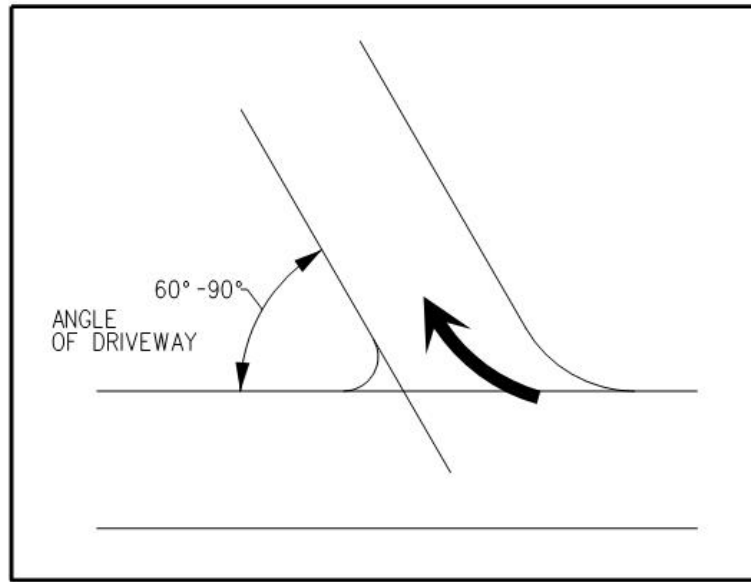
1. Queue Distance Required is based on assuming 25 feet per queued vehicle.
2. The Expected Maximum Number of Queued Vehicles shown above are given as general guidelines: it is the responsibility of the design engineer to provide adequate space for queued vehicles on-site based on expected arrival rates, service rates, and the number of drive thru windows provided. The design engineer may be asked to provide such calculations at the discretion of the reviewer.

5.2.7 Subdivision and Commercial Entrance Design Guidelines – Horizontal Alignment

Horizontal alignment of two-way entrance drives should be designed to intersect the frontage road at 90° whenever possible. Skewed intersections can reduce visibility of approaching motor vehicles, require higher degrees of traffic control, require more pavement to facilitate turning vehicles, and require greater crossing distances for pedestrians. If this is not possible due to field conditions, then the intersection angle must always be greater than 70°.

One-way commercial entrance drives may be used having a range of 60° to 90° without interfering with the motorists' visibility as shown on Figure 5.2.7-a.

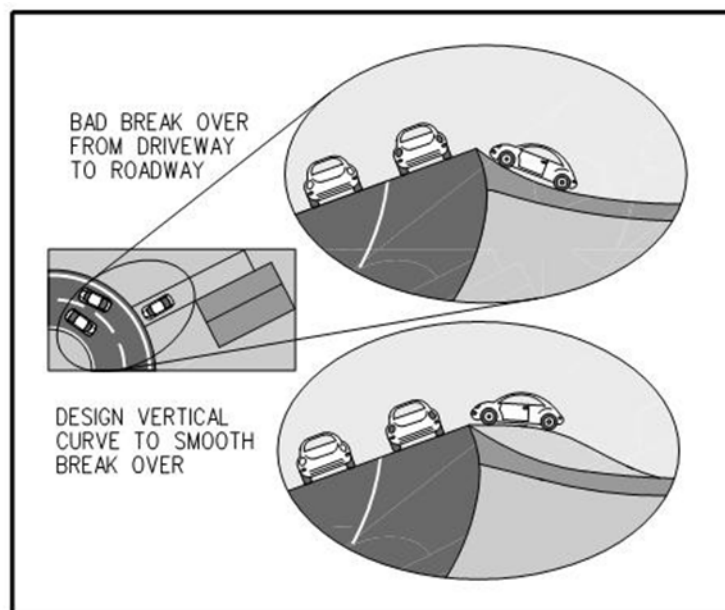
Figure 5.2.7-a Angle of Driveway



5.2.8 Subdivision and Commercial Entrance Design Guidelines – Vertical Alignment

Vertical alignment of entrances with the adjacent roadway is an important design consideration. Vehicles must slow down to traverse abrupt changes in grade, creating increased speed differentials with the adjacent roadway which increases crash potential. Another concern is the visibility of the entrance. For example, an entrance that slopes down and connects with a roadway on a superelevated horizontal curve can create issues with sight distance (see Figure 5.2.8-a).

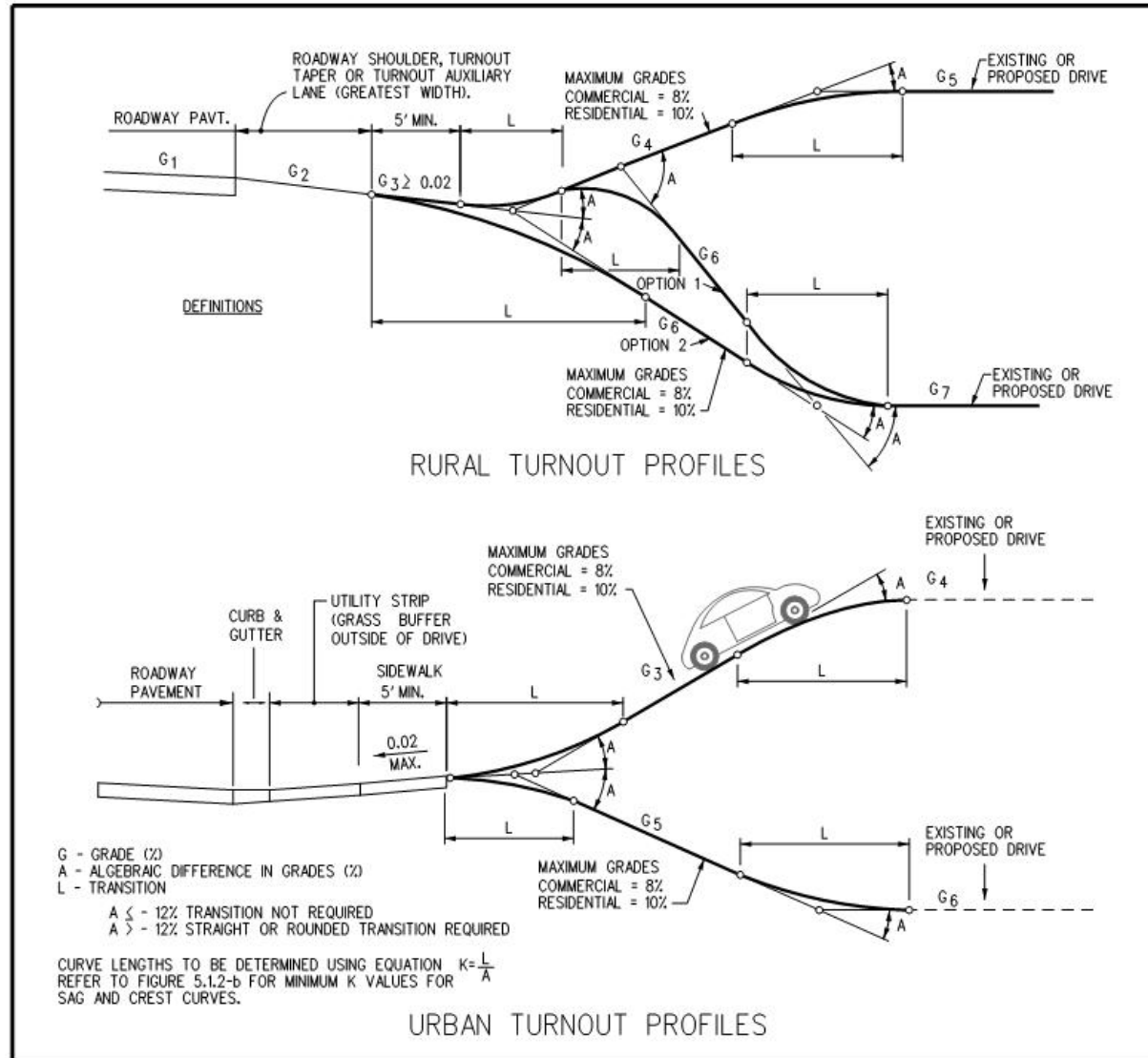
Figure 5.2.8-a Vertical Alignment at an Entrance



(Source: Florida Department of Transportation *Driveway Information Guide*)

Profiles of entrances shall be designed to include vertical curves at their intersections with adjacent roadways using the design criteria shown in Figure 5.2.8-b. Vertical curve transition shall be provided at the intersection of the entrance profile and the cross slope of the roadway shoulder extended. Transition lengths should be based on minimum K-values listed in Figure 5.1.2-a. Minimum grades should be 0.5% and maximum grades should not exceed 8% for commercial entrances and 10% for residential entrances. Special design consideration must also be given to locations where pedestrian crossing facilities are proposed at entrances. All sidewalk, curb ramp, and crosswalk longitudinal slopes and cross slopes must adhere to applicable regulations and should follow DelDOT guidance for achieving Americans with Disabilities Act (ADA) compliance.

Figure 5.2.8-b Entrance Drive Tie-in to Frontage Road



(Source: Florida Department of Transportation *Driveway Information Guide*)

5.2.9 Subdivision and Commercial Entrance Design Guidelines – Auxiliary Lanes

When turning movements are introduced to a roadway, speed differentials between turning vehicles and through traffic are created. These differentials have a detrimental effect on both crash potential and level of service. Auxiliary lanes provide an area for turning traffic to be separated from the through lanes in an effort to improve safety and capacity of the roadway. Auxiliary lanes include right-turn lanes, left-turn lanes, bypass lanes, and crossovers. Auxiliary lane length should be dictated by traffic volumes, composition, speeds, desired level-of-service, and local conditions. Auxiliary lane warrants and lane lengths shall be determined in accordance with this section. Projects shall demonstrate compliance by completing DelDOT's Auxiliary Lane Worksheet available in the "Doing Business" section of DelDOT's website available online. Projected 10-year roadway ADT shall be calculated by multiplying the roadway AADT by the "10-Year Growth Factor" (which is established as 1.16 based on assumed 1.5% annual growth) and multiplied by the associated K and D factors from the latest DelDOT *Traffic Summary Report*, (published on the DelDOT website annually under "*Vehicle Volume Summary (Traffic Counts)*") at:

http://deldot.gov/information/pubs/forms/manuals/traffic_counts/index.shtml, and then adding any known committed development traffic volumes. Projected 10-year roadway ADT shall be used for the analysis. The "User Inputs-Tab 1" tab on the Auxiliary Lane Worksheet shall be completed and submitted for review for each proposed entrance. If the entrance is to be signalized, the "Signalized Intersection-Tab 6" tab shall also be completed and submitted for review for each proposed entrance.

5.2.9.1 Right-Turn Lane

Right-turns can be free flowing, yield or stop-controlled. In order to operate properly, free flowing right-turn lanes must have an adequate deceleration distance, with no access points, for drivers to safely merge with and diverge from the through traffic. Separate right-turn lanes at signalized and unsignalized intersections shall be required when warranted in accordance with this section. Projects shall demonstrate compliance by completing DelDOT's Auxiliary Lane Worksheet. Right-turn lanes shall be designed in accordance with Figure 5.2.9.1-a and b. A five foot bike lane shall be provided between the adjacent travel lane and right-turn lane to accommodate bicycles. Listed below are notes related to the warrants and right turn lane lengths:

- A. The tables provided in Figures 5.2.9.1-a and 5.2.9.1-b are based on the following criteria:
 - 1. Roadway grades are between -3% and +3%
 - 2. Site's percentage of heavy vehicles making right-turn movements is less than 10% of the site's total right turn movements
- B. All right turn deceleration lengths include a 50-foot taper length
- C. An additional 25 feet of deceleration length is included in right turn length if the site's percentage of heavy vehicles making right-turn movements is equal to or greater than 10% of the site's total right turn movements.
- D. Deceleration lengths are determined by adding Stopping Sight Distance and Storage Length and rounding up to the nearest 5 feet.
- E. Minimum Deceleration Length as follows:
 - 1. 100 feet for 10-Year Roadway ADT $\leq$ 4,000 vehicles and Posted Speed $\leq$ 35 MPH
 - 2. 135 feet for 10-Year Roadway ADT $>$ 4,000 vehicles, Posted Speed $>$ 35 MPH and $R > 50'$
 - 3. 150 feet for 10-Year Roadway ADT $>$ 4,000 vehicles, Posted Speed $>$ 35 MPH and $R \leq 50'$
- F. A right-turn lane is not warranted when:

1. Right-turn ADT ≤ 100 and projected 10-year roadway ADT $\leq 4,000$
 2. Right-turn ADT ≤ 50 and projected 10-year roadway ADT $> 4,000$
- G. The tables are for unsignalized intersections only. For signalized intersections complete the “Signalized Intersection-Tab 6” tab of DelDOT’s Auxiliary Lane Worksheet.

Figure 5.2.9.1-a Right Turn Lane Warrants ($R \leq 50'$)

Projected 10-Year Roadway ADT	Right-turn ADT	Assumed Speed Change on Through Lane	Highway Posted Speed					
			25 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH
			Deceleration Length					
Less Than 2,000 Vehicles	0-100	-	-	-	-	-	-	-
	101 - 200	20 MPH	100	100	150	160	195	240
	Over 200	15 MPH	100	125	160	195	240	290
2,000 to 4,000 Vehicles	0-100	-	-	-	-	-	-	-
	101 - 200	20 MPH	100	100	150	160	195	240
	201 - 400	15 MPH	100	125	160	195	240	290
	Over 400	10 MPH	100	160	195	240	290	340
4,001 to 10,000 Vehicles	0-50	-	-	-	-	-	-	-
	51 - 100	20 MPH	150	150	150	160	195	240
	101 - 200	15 MPH	150	150	160	195	240	290
	201 - 400	10 MPH	150	160	195	240	290	340
	Over 400	5 MPH	150	195	240	290	340	400
Over 10,000 Vehicles	0-50	-	-	-	-	-	-	-
	51 - 100	15 MPH	150	150	160	195	240	290
	101 - 200	10 MPH	150	160	195	240	290	340
	201 - 400	5 MPH	150	195	240	290	340	400
	Over 400	0 MPH	160	240	290	340	400	460

Assumptions

1. Vehicle Length (ft): 25
2. Brake Reaction time, t (sec): 1
3. Full deceleration to 0 mph (stop condition)
4. Stopping Sight Distance determined, using methodology adopted from the AASHTO Green Book, as follows:
 - a. Per Eq. 3-1, Braking distance on level, $d_1 = 1.075 * ((V_{\text{design speed}})^2 / a)$, $a = 11.2 \text{ ft/s}^2$
 - b. Per Eq. 3-2, Brake reaction distance, $d_2 = 1.47 * (V_{\text{design speed}}) * t$
 - c. Per Eq. 3-3, Brake distance on grade, $d_3 = (V_{\text{design speed}})^2 / (30 * (a/32.2) \pm G)$, $a = 11.2 \text{ ft/s}^2$; G = percent of grade divided by 100
 - d. AASHTO equations reference design speed which DelDOT defines as posted speed + 5 mph.
5. A practical minimum storage length of 25 feet (1 vehicle) is included in the deceleration length as per the NCHRP 457, page 24.
6. All right turn deceleration lengths include a 50-foot taper length.

Figure 5.2.9.1-b Right Turn Lane Warrants (R>50')

Projected 10-Year Roadway ADT	Right-turn ADT	Assumed Speed Change on Through Lane	Highway Posted Speed					
			25 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH
			Deceleration Length					
Less Than 2,000 Vehicles	0-100	-	-	-	-	-	-	-
	101 - 200	20 MPH	-	100	135	135	150	195
	Over 200	15 MPH	-	100	135	150	195	240
2,000 to 4,000 Vehicles	0-100	-	-	-	-	-	-	-
	101 - 200	20 MPH	-	100	135	135	150	195
	201 - 400	15 MPH	-	100	135	150	195	240
	Over 400	10 MPH	100	110	150	195	240	295
4,001 to 10,000 Vehicles	0-50	-	-	-	-	-	-	-
	51 - 100	20 MPH	-	135	135	135	150	195
	101 - 200	15 MPH	-	135	135	150	195	240
	201 - 400	10 MPH	135	135	150	195	240	295
	Over 400	5 MPH	135	150	195	240	295	355
Over 10,000 Vehicles	0-50	-	-	-	-	-	-	-
	51 - 100	15 MPH	-	135	135	150	195	240
	101 - 200	10 MPH	135	135	150	195	240	295
	201 - 400	5 MPH	135	150	195	240	295	355
	Over 400	0 MPH	135	195	240	295	355	415

Assumptions

- Vehicle Length (ft): 25
- Brake Reaction time, t (sec): 1
- Deceleration to 15 mph (turning design speed of a corner radius > 50 feet adopted from the DelDOT Road Design Manual)
- Stopping Sight Distance determined by adding the Brake Reaction Distance, (adopted from AASHTO Green Book) and the Braking Distance on Level from the Uniform Acceleration Formula (UAF) as follows:
 - Per Eq. 3-2, adopted from the AASHTO Green Book, Brake reaction distance, $d_1 = 1.47 * (V_{\text{design speed}}) * t$
 - Per UAF, Braking distance on level from Design Speed to 15 mph, $d_2 = ((1.47 * 15 \text{ mph})^2 - (1.47 * V_{\text{design speed}})^2) / 2a$, $a = -11.2 \text{ ft/s}^2$
 - Per UAF, Braking distance on grade from Design Speed to 15 mph, $d_2 = ((1.47 * 15 \text{ mph})^2 - (1.47 * V_{\text{design speed}})^2) / 2 * (-32.2 * (0.35 \pm G))$; G = percent of grade divided by 100
 - Equations reference design speed which DelDOT defines as posted speed + 5 mph.
- A practical minimum storage length of 25 feet (1 vehicle) is included in the deceleration length as per the NCHRP 457, page 24.
- All right turn deceleration lengths include a 50-foot taper length.

5.2.9.2 Bypass Lane

A bypass lane is a paved shoulder that permits through traffic to bypass a left-turning vehicle which is stopped on the travel lane. They are intended to reduce delay and expedite the movement of through traffic at T- intersections.

An intersection shall first be considered for a bypass lane using the warrants in accordance with Figure 5.2.9.2-a of this section. Projects shall demonstrate compliance by completing DelDOT's Auxiliary Lane Worksheet. Bypass lanes shall be designed in accordance with Figure 5.2.9.2-b. A five foot shoulder shall be provided on the outside of the bypass lane to accommodate bicycles.

Listed below are notes related to the warrants and bypass lane lengths:

- A. Bypass lanes will not be permitted in the following locations:
 - 1. On roads with a projected 10-year roadway ADT > 8,000 vpd
 - 2. Where an existing entrance or street lies within the limits of the proposed bypass lane, including at intersections where the proposed entrance creates the fourth leg. Separate worksheets shall be completed and submitted for review of both the proposed entrance and the existing entrance or street to determine if either entrance would meet the bypass lane warrants and thereby trigger the need for left turn lane(s).
 - 3. Signalized intersections. The table provided in Figure 5.2.9.2-a is for unsignalized intersections only, coordinate with the DelDOT Traffic Impact Studies Group to determine left turn lane warrants and required lengths at signalized intersections, (see the “Signalized Intersection-Tab 6”, of the Auxiliary Lane Worksheet for additional guidance)
 - 4. On roads with more than 2 through lanes (such as if there are already two through lanes where a bypass would be created)
 - 5. On roads where physical characteristics limit the ability to provide adequate sight distance meeting DelDOT’s requirements. Inadequate intersection sight distance would trigger the need for left turn lane(s).
- B. If any of the conditions listed in Section 5.2.9.2.A exist, then the left turn lane warrants will be evaluated in accordance with Section 5.2.9.3.
- C. For unique conditions, such as at age-restricted communities or schools where there is a need to accommodate drivers who may wait for longer gaps to make left turns, DelDOT Subdivision Engineer may require a bypass lane.
- D. For any special cases with very low opposing volumes, DelDOT’s Subdivision Engineer may waive the requirement of a bypass lane.
- E. If a bypass lane is warranted, alternative intersection designs may be considered at DelDOT’s discretion.

Figure 5.2.9.2-a Bypass Lane Warrants

Projected 10-year Roadway AADT	Projected 10-Year Opposing Volume (vph)	Left-Turning Vehicles (vph)					
		Less than 10	10-14	15-20	21-30	31-40	Over 40
		Storage Length (feet)					
Less than 1,500 Vehicles	Over 100	-	-	-	50	50	50
1,500 to 2,000 Vehicles	0* – 400	-	-	50	50	50	See Left-Turn Lane Warrants
2,001 to 4,000 Vehicles	0* - 100	-	50	50	50	50	
	101 - 200	-	50	50	50	50	
	201 - 300	-	50	50	50		
	301 – 400	-	50	50	50		
	Over 400	-	75	75			
4,001 to 8,000 Vehicles	Over 100	-	75				
Over 8,000 Vehicles	Over 100	-					

*See Section 5.2.9.2.D for special cases with very low opposing volumes

Posted Speed (mph)	Approach Taper Length (feet)
25	Bypass Lane Not Warranted
30	125
35	155
40	155
45	180
50	215
55	250

Posted Speed (mph)	Departure Taper Length (feet)
25	Bypass Lane Not Warranted
30	65
35	80
40	80
45	90
50	110
55	125

Notes:

- 2) Bypass lanes are not allowed on roads with a projected 10-year roadway ADT > 8,000 vpd.
- 3) Bypass lane is only for two lane roadways. If bypass lane warrant is satisfied for a 4 lane section, then it will automatically warrant a left turn lane (see Section 5.2.9.3).

Assumptions:

1. Vehicle Length (ft): 25
2. Brake Reaction time, t (sec): 2.5
3. Assumes the following speed reduction from posted speed limit in through lane:
 - a. 0 mph for 25 - 35 mph posted speed
 - b. 5 mph for 40 - 55 mph posted speed
4. Stopping Sight Distance adopted from Table 3-1 from AASHTO Green Book
 - a. AASHTO equation and exhibit references design speed which DelDOT defines as posted speed + 5 mph.
 - b. Approach Taper Length = Stopping Sight Distance/2.0
 - c. Departure Taper Length = Stopping Sight Distance/4.0
5. Queue Storage and Taper Lengths listed in chart are rounded up to the nearest 5'.
6. Queue Storage length calculated as per Transportation Research Record (TRR) 1500, Lengths of Left-Turn Lanes at Unsignalized Intersections, p.193.
 - a. The required space for the first vehicle in the queue is 15 ft because no buffer zone is needed between the first car and the stop line.
 - b. Proportion of Heavy Vehicles (%) = 5%
 - c. Left-Turn from Major Road on a Two or Four-Lane Roadway
 - d. Critical Headway (sec) = 4.2 (in this case, based on the assumptions listed above)
 - i. Per the HCM 2010, Equation 19-30, Critical Headway = Base critical headway + (adjustment factor for heavy vehicles * % of HV). For example, using 5% of Heavy Vehicles; Critical Headway = $4.1 + (2 * 0.05) = 4.2$
 - ii. The values on the critical headway tables from TRR 1500, pages 197-198, have been adapted to always include a minimum of one vehicle storage or 15'.
 - iii. Based on the Proportion of Heavy Vehicles (truck %) selected, critical headway values 4.1-4.9, 5.1 and 5.5 are used
 - e. Threshold Probability of Overflow = 0.015; From TRR 1500, p. 194
 - f. Storage Length = (Lane Length in Number of Vehicles * Vehicle Length) + 25 ft
 - g. 25 ft length represents 25 ft on departure side of the entrance

5.2.9.3 Left-Turn Lane

Separate left-turn lanes shall be required on signalized and unsignalized intersections of roadways when warranted. If left turns are proposed on roads with an Arterial classification, or roads with 2 or more travel lanes that must be crossed, the project shall be referred to DelDOT prior to start of site design for an access determination, in accordance with applicable sections such as 1.5.2 *Arterials - Design Standards* or 1.2.1 *Entrance Policy - Location of Entrances*, prior to allowing the left turning movement or designing an auxiliary lane, (such as a left-turn lane, a two way left turn lane or other traffic storage facility). When it is determined that a project shall generate sufficient number of left-turns to warrant the construction of an auxiliary lane to accommodate left-turns, it shall be the responsibility of the developer to construct an auxiliary lane, (such as a left-turn lane or other traffic storage facility as directed by DelDOT), at the locations designated by DelDOT. Left turn lanes when permitted shall be designed in accordance with Figure 5.2.9.3-b. Raised medians should be considered and designed in accordance with applicable guidelines and standards such as: Chapters 4 and 9 of AASHTO's *Policy on Geometric Design of Highways and Streets (The Green Book)* or other **NAS**.

A separate left-turn lane shall be required for all signalized entrances located on roadways. The design shall be in accordance with applicable standards and guidelines such as the *Highway Capacity Manual (HCM)* or **NAS**. When access to a proposed site requires vehicles to utilize an existing left-turn lane, the existing facility shall be evaluated for compliance with the requirements of this section, and the appropriate configuration shall be demonstrated using the Auxiliary Lane Worksheet, to determine if modifications are needed to provide sufficient storage length. The developer will be required to make any modifications necessary to provide an adequate left-turn lane.

Listed below are notes related to the warrants and left turn lane lengths:

A. The table provided in Figure 5.2.9.3-a is based on the following criteria:

1. Roadway grades are between -3% and +3%
2. Left-turn movements from major 2 or 4-lane roadway. Contact DelDOT Development Coordination Section when the left-turn movements are from a roadway having more than 4 travel lanes
3. Left-turn movement volume with Heavy Vehicles (HV) $\leq 5\%$
4. Opposing volumes are less than 1200 vph OR left-turning vehicles per hour are less than 400 vph. If volumes are greater than specified limits, then the engineer shall submit an intersection and traffic signal analysis to the Development Coordination Section for review.

B. Opposing Volume (vph) is the total volume of vehicles on the approach across from (and heading in the opposite direction of) the left-turn movement under analysis. The opposing volumes shall be calculated by adding any known committed development traffic volumes (including traffic generated from secondary entrances of the site under analysis) to the Projected 10-year roadway ADT.

C. If an entrance is proposed across from an existing entrance or street to create a four-legged intersection, then separate worksheets shall be completed and submitted for review of both the proposed entrance and the existing entrance or street. For any four-legged intersection, the need for a left-turn lane on one approach to the intersection will trigger DelDOT's determination of the need to create a reciprocal "shadowed" left-turn lane including the minimum storage length and taper on the opposing approach.

D. Left-turn lanes may be required when physical characteristics limit the ability to provide adequate sight distance meeting DelDOT's requirements for intersection sight distance, (such as those adopted from AASHTO's standards or other **NAS**).

E. For unique conditions, such as at age-restricted communities or schools where there is a need to accommodate drivers who may wait for longer gaps to make left turns, DelDOT Subdivision Engineer may require a left turn lane.

- F. Queue storage length may need to be greater, (depending on the design vehicle or proposed use), than the length given by the design methodology outlined in this chapter and demonstrated through the completion of the Auxiliary Lane Worksheet.
- G. If a left turn lane is warranted, alternative intersection designs may be considered at DelDOT's discretion.
- H. The following conditions apply for left-turning vehicle (vph) volumes less than 50 vph:
 - 1. Left-turn lanes will not be required along roadways with 10-year Projected AADT < 1,500 vpd (See Section 5.2.9.2).
 - 2. Left turn lane (having the recommended queue storage length shown in the table for 50 vph), will be warranted on roadways for any combination of conditions that include; left-turning vehicle volumes > 40 vph and a projected 10 yr roadway AADT $\geq 1,500$ and $\leq 2,000$.
 - 3. Left turn lane, (having the recommended queue storage length shown in the table for 50 vph), will be warranted on roadways for any combination of conditions that include; left-turning vehicle volumes > 40 vph, projected 10 yr opposing volumes ≤ 200 , and a projected 10 yr roadway AADT > 2,000 and $\leq 4,000$.
 - 4. Left turn lane, (having the recommended queue storage length shown in the table for 50 vph), will be warranted on roadways for any combination of conditions that include; left-turning vehicle volumes > 30 vph , projected 10 yr opposing volumes > 200 and ≤ 400 , and a projected 10 yr roadway AADT > 2,000 and $\leq 4,000$.
 - 5. Left turn lane, (having the recommended queue storage length shown in the table for 50 vph), will be warranted on roadways for any combination of conditions that include; left-turning vehicle volumes > 20 vph, projected 10 yr opposing volumes > 400, and a projected 10 yr roadway AADT > 2,000 and $\leq 4,000$.
 - 6. Left turn lane, (having the recommended queue storage length shown in the table for 50 vph), will be warranted on roadways for any combination of conditions that include; left-turning vehicle volumes ≥ 15 vph and a projected 10 yr roadway AADT > 4,000 and $\leq 8,000$.
 - 7. Left turn lane, (having the recommended queue storage length shown in the table for 50 vph), will be warranted on roadways for any combination of conditions that include; left-turning vehicle volumes ≥ 10 vph and a projected 10 yr roadway AADT > 8,000.
 - 8. For any special cases with very low opposing volumes, DelDOT's Subdivision Engineer may waive the requirement of a left turn lane.
 - 9. For any intersection/corridor with a high crash history, DelDOT's Subdivision Engineer may require a left turn lane.

- I. The table is for unsignalized intersections only. For signalized intersections, coordinate with the DelDOT Traffic Impact Studies Group to determine left turn lane warrants and required lengths at signalized intersections, (see the “Signalized Intersection-Tab 6” tab of the Auxiliary Lane Worksheet for additional guidance).

Figure 5.2.9.3-a Left-Turn Lane Warrants at Unsignalized Intersections

QUEUE STORAGE (Feet)												
Left-Turning Vehicles (vph)	Projected 10-Year Opposing Volume (vph)											
	100	200	300	400	500	600	700	800	900	1000	1100	1200
50	15	15	15	40	40	40	40	40	40	65	65	65
100	15	15	40	40	40	65	65	65	65	65	90	90
150	15	40	40	40	65	65	65	90	90	90	115	115
200	15	40	40	65	65	90	90	90	115	115	140	140
250	40	40	65	65	90	90	90	115	115	140	165	190
300	40	40	65	65	90	90	115	140	140	165	190	240
350	40	40	65	90	90	115	140	140	165	190	240	290
400	40	65	65	90	115	115	140	165	190	240	290	365

Posted Speed (mph)	DECELERATION (Feet)*	LEFT-TURN LANE LENGTH (Feet) = QUEUE STORAGE + DECELERATION			
		Input Data		Sample	
25	135	Queue Storage	Left-turning vehicles in vph	Input Data	Length from Table
35	180		Opposing Volume in vph	150	65
40	180	Deceleration	Posted Speed in mph	600	
45	220			45	220
50	270			Total Left-Turn Lane Length (feet)	285
55	325				

* Includes a 100-foot taper length

Assumptions

7. Vehicle Length (ft): 25
8. Brake Reaction time, t (sec): 1
9. Deceleration length includes 100' opening taper to left turn lane
10. Full deceleration to 0 mph (stop condition)
11. Braking reaction distance assumes the following speed reduction from posted speed limit in through lane:
 - c. 0 mph for 25 - 35 mph posted speed
 - d. 5 mph for 40 - 55 mph posted speed
12. Braking distance assumes the following speed reduction from posted speed limit in through lane:
 - a. 0 mph for 25 mph posted speed
 - b. 5 mph for 35 mph posted speed
13. Lengths determined, using methodology adopted from AASHTO Green Book, as follows:
 - d. Per Eq. 3-2, Brake reaction distance, $d = 1.47 * V_{\text{design speed}} * t$
 - e. Per Eq. 3-1, Braking distance on level, $d = 1.075 * ((V_{\text{design speed}})^2 / a)$, $a = 11.2 \text{ ft/s}^2$ (-3% < Grade < 3%)

- f. Per Eq. 3-3, Braking distance on grade, $d = [(V_{\text{design speed}})^2 / (30 * (a/32.2) \pm G)]$, $a = 11.2 \text{ ft/s}^2$, $-3\% \leq G \leq 3\%$
- g. AASHTO equation and exhibit references design speed which DelDOT defines as posted speed + 5 mph.

Deceleration Length (ft) = Brake Reaction (ft) + Braking on Level (ft)	Posted Speed (mph)					
	25	35	40	45	50	55
Brake reaction distance	44.1	58.8	58.8	66.2	73.5	80.9
Braking distance on level	86.4	117.6	117.6	153.6	194.4	240
Stopping Sight Distance	131	177	177	220	268	321

14. Queue Storage and Deceleration Lengths listed in chart are rounded up to the nearest 5'.
15. Queue Storage length calculated as per Transportation Research Record (TRR) 1500, Lengths of Left-Turn Lanes at Unsignalized Intersections, p.193.
- h. The required space for the first vehicle in the queue is 15 ft because no buffer zone is needed between the first car and the stop line.
- i. Proportion of Heavy Vehicles (%) = 5%
- j. Left-Turn from Major Road on a Two or Four-Lane Roadway
- k. Critical Headway (sec) = 4.2 (in this case, based on the assumptions listed above)
- i. Per the HCM 2010, Equation 19-30, Critical Headway = Base critical headway + (adjustment factor for heavy vehicles * % of HV). For example, using 5% of Heavy Vehicles; Critical Headway = $4.1 + (2 * 0.05) = 4.2$
- ii. The values on the critical headway tables from TRR 1500, pages 197-198, have been adapted to always include a minimum of one vehicle storage or 15'.
- iii. Based on the Proportion of Heavy Vehicles (truck %) selected, critical headway values 4.1-4.9, 5.1 and 5.5 are used
- l. Threshold Probability of Overflow = 0.015; From TRR 1500, p. 194
- m. Storage Length = (Lane Length in Number of Vehicles * Vehicle Length) - 10
16. Projected 10-Year Opposing Volume in vph = $AADT * K * D * 10\text{-Year Growth Factor}$
- a. AADT - From the DelDOT Traffic Summary Book
- b. K and D factors from the TPG (Traffic Pattern Group) included in the most recent DelDOT Traffic Summary Reports
- c. 10-Year Growth Factor = 1.16 (Assuming a 1.5% annual growth)

5.2.9.4 Crossover

Crossover design at two-lane crossroads or connecting roads should be in accordance with standard crossover design found in applicable guidelines, standards and manuals such as: Chapter 9 of AASHTO's *Policy on Geometric Design of Highways and Streets (The Green Book)* and DelDOT's RDM or other NAS.

The following general guidelines shall be used:

- A. The minimum length of opening width may be controlled by the median width and control radius of the design vehicle.
- B. The shape of the median end plays an important role in the design of the crossover and if u-turn movements will be permitted. For medians greater than 10 feet in width, bullet nose shape is preferred.
- C. Crossovers shall not be placed, regardless of existing spacing on highways, where DelDOT has determined that crossovers should not be added for reasons of safety or capacity.
- D. Crossovers shall not be placed on limited access highways under any circumstances.
- E. It is desirable to maintain an average spacing of 1,000 to 1,500 feet between crossovers in urban areas and 2,000 to 3,000 feet between crossovers in rural areas.
- F. Closer spacing shall be permitted when DelDOT finds it beneficial for traffic operations and safety. The absolute minimum spacing of crossovers shall be governed by the requirements for left-turn lanes to include required taper lengths, deceleration lengths and storage lengths. DelDOT may remove crossovers when warranted by changes in surrounding land use or when necessary for traffic operation and safety.
- G. Turning movement diagrams for left and/or U-turn movements for the selected design vehicle(s) shall be provided for review. It may be necessary to widen the opposing shoulder to permit U-turn movements for the chosen design vehicle.

Figures 5.2.9.4-a thru 5.2.9.4-d provide examples for directional median crossovers providing left-in movements for WB-40 and WB-62 design vehicles and U-turn movements for passenger car vehicles from a divided roadway with varying median widths being measured from the median nose.

Figure 5.2.9.4-a Directional Median Crossover for WB-40 D.V. – Median Width $\geq 4'$ to $< 18'$

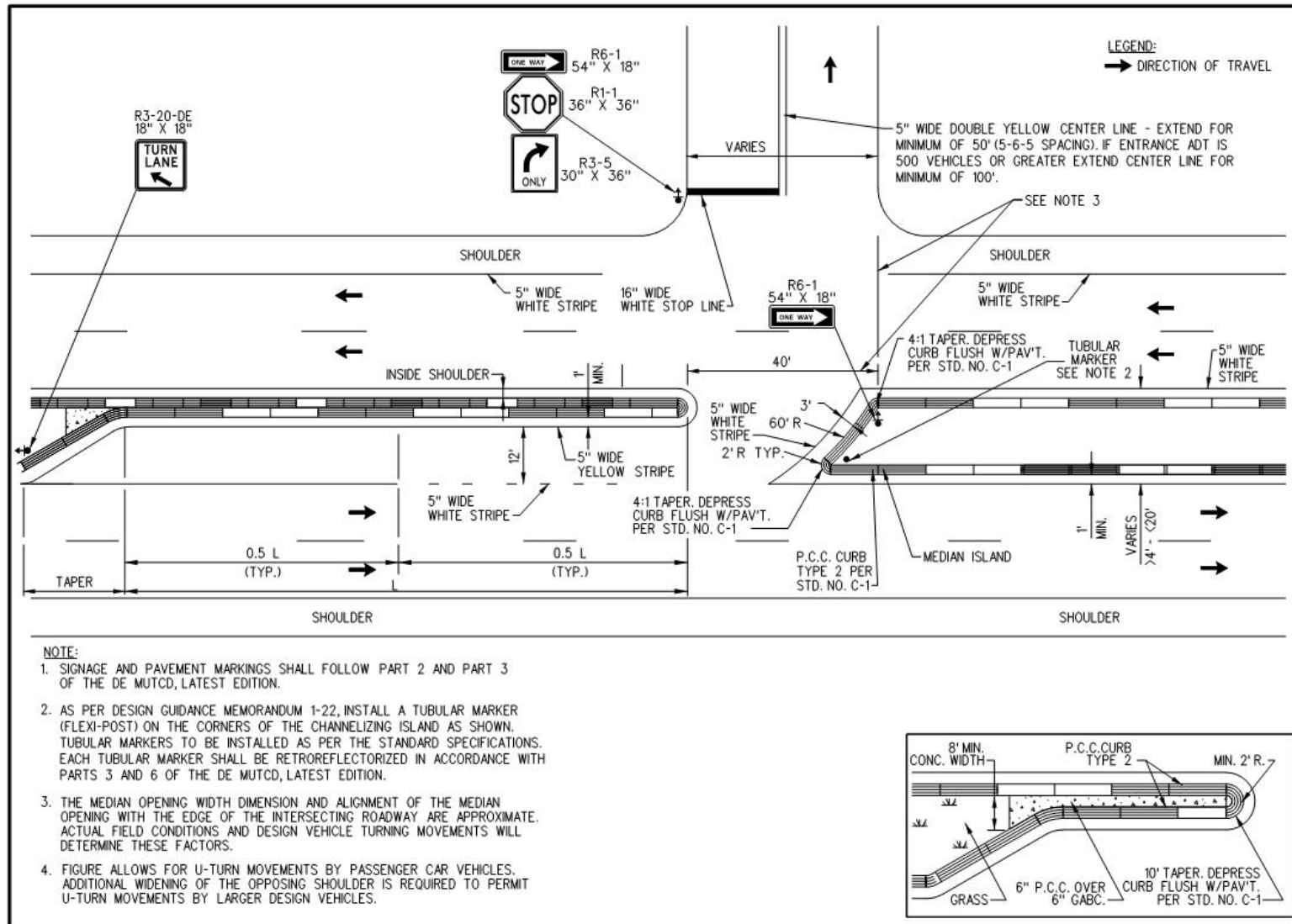
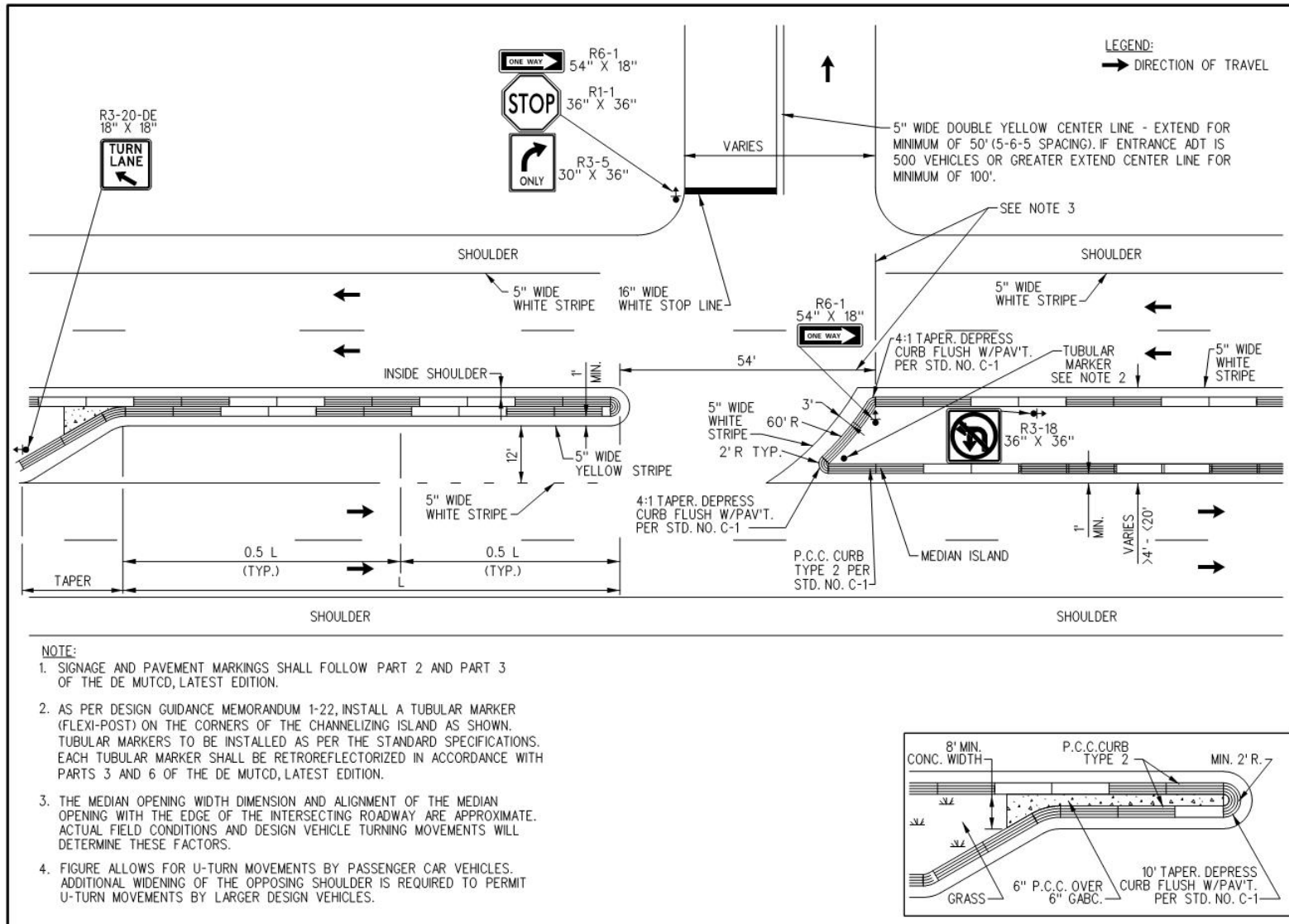


Figure 5.2.9.4-b Directional Median Crossover for WB-62 D.V. – Median Width $\geq 4'$ to $< 18'$



5.2.10 Subdivision and Commercial Entrance Design Guidelines – Bike Lanes

Suitable accommodations for bicyclists shall be required for all subdivision and commercial site plans. Additional guidance is available through DelDOT's *Complete Streets Policy* and other reference materials. All new roadways, except those where bicyclists shall be legally prohibited, shall be designed and constructed to encourage use of bicycles as a form of transportation. Unless access is specifically denied, some level of bicycle use can be anticipated on most roadways. Site entrance designs must accommodate bicycle traffic.

The design of a bike lane needs to include appropriate pavement markings and signing approaching and through intersections to reduce the number of conflicts. Guidance for signing and pavement marking of bike lanes is provided through regulations and standards such as the DE MUTCD and AASHTO's *Guide for the Development of Bicycle Facilities*.

A bike lane shall be delineated to indicate the separation from the motor vehicle travel lanes with a five-inch wide solid white line. Adequate pavement surface, bicycle-safe grate inlets, and safe railroad crossing shall be provided on roadways where bicycle lanes are being designated. Raised pavement markings and raised barriers can cause steering difficulties for bicyclists and shall not be used to delineate bicycle lanes.

5.3 PEDESTRIAN FACILITIES

Pedestrian facilities shall meet the requirements of DelDOT's Shared Use Path and/or Sidewalk Process and Sidewalk Termination Policy as described in section 3.5.4.2 of this manual.

5.3.1 Pedestrian Facilities - Sidewalks

Sidewalks are an integral part of DelDOT's infrastructure program and Complete Streets policy. They facilitate and encourage safe and convenient pedestrian travel within communities and among different land uses. They provide safe and reasonably direct access to public transportation and other alternative modes of transportation, thereby helping to alleviate vehicular traffic congestion and reduce emissions. They also reinforce the Americans with Disabilities Act (ADA) by increasing the access opportunity for mobility-impaired individuals. DelDOT requires sidewalks on both sides of subdivision streets.

All sidewalks and curb ramps must be ADA compliant.

5.3.1.1 Placement

In establishing the location of sidewalks, consideration must be given to drainage facilities, sideslopes, new traffic control and signing devices, intersection crossovers, striping, utility appurtenances, mailboxes with posts, and transit stops, in order to avoid conflicts in the design.

For new sidewalks, a minimum width of five feet, not including the width of the top of curb, is required. Wider sidewalks may be preferred or required by local ordinance depending upon the volume and nature of two-way pedestrian traffic. Narrower sidewalks may be allowed subject to consistency with ADA requirements, and surrounding roadside or geographic constraints. Sidewalks should be designed with a

1.5% cross slope and may not exceed 2%. A 6:1 maximum slope is required for 2 feet on both side of the sidewalk. Refer to standard detail no. M-3 for more guidance.

A buffer between the sidewalk and curb shall be considered. For increased user safety, sidewalks should be as far away from travel lanes as practical. Also, a buffer width of at least five feet between the edge of a sidewalk and the edge of pavement, parking lot, or traveled way is preferred. A five-foot wide strip improves safety, driver comfort, and provides an area for snow removal, utilities and mailbox posts. On uncurbed frontage roads, the buffer width should be 10' from the edge of pavement to the edge of sidewalk. If sod is used next to a sidewalk, the area adjacent to the sidewalk shall be graded to ensure that the sod is placed flush or just below the edge of sidewalk to avoid water ponding on the sidewalk.

5.3.1.2 Material

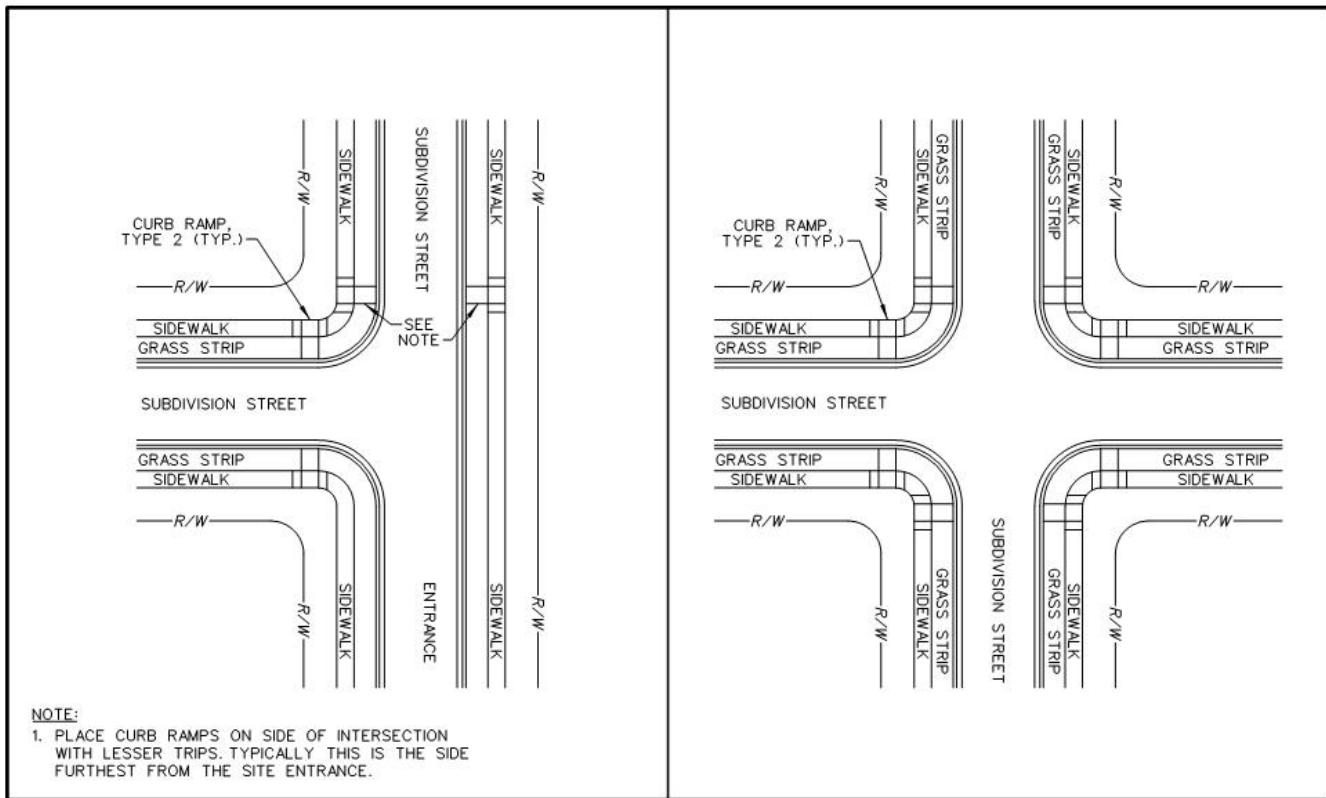
Standard material for any sidewalk or walkway is usually Portland Cement Concrete. However, sidewalk or walkway materials are not limited to Portland Cement Concrete. Upon approval, other materials may be used.

Minimum thickness can vary according to materials, but must be at least four inches for Portland Cement Concrete (PCC) on four inches of graded aggregate base course (GABC). A minimum thickness of six inches of PCC and six inches of GABC are required where sidewalks traverse entrances and driveways. Channelizing islands shall include a minimum thickness of eight inches of PCC and six inches of GABC.

5.3.1.3 Ramps

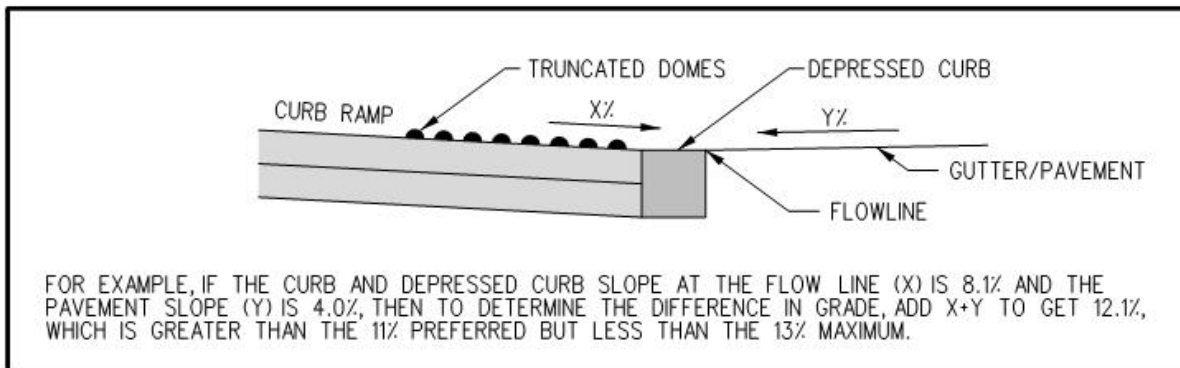
At intersections, paired perpendicular curb ramps are preferred because they provide an accessible route to enter the crosswalk perpendicular to the travel lane. 4-way intersections should have a total of 4 crossings, whenever possible, with two ramps on each corner. 3-way "T" intersections should have a total of 2 crossings, with one for each road. Where feasible, drainage structures shall be placed to allow for two ramps on each corner and perpendicular crossings. Single ramps at the intersection radius may only be used in exceptional circumstances at entrances or offsite intersection improvements such as retro-fit improvements, where the existing infrastructure or field conditions prohibit two ramps to be installed. In any case, a single ramp on a corner shall not be placed if it is a risk to the user.. See Figure 5.3.1.3-a for suggested curb ramp locations at intersections of subdivision streets.

**Figure 5.3.1.3-a Intersection Curb Ramp Detail
(Not to Scale)**



Curb ramps shall be designed in accordance with DelDOT's standard detail no. C-2. A 24 inch wide strip of detectable warnings (truncated domes) shall be placed along the full width of the ramp at the transition to the street. It is preferred that the difference in grade where a ramp ties into a gutter or pavement be less than 11 percent but in no cases shall it be greater than 13 percent as shown in Figure 5.3.1.3-b. Sidewalks crossing driveway entrances should be designed per DelDOT's standard detail no. C-3. For more guidance on sidewalks and curb ramps refer to [Chapter 10 Miscellaneous Design](#) in DelDOT's *Road Design Manual*.

Figure 5.3.1.3-b Maximum Difference in Grade for all Curb Ramp Types



5.3.2 Pedestrian Facilities - Shared Use Path

A shared use path is a facility that is physically separated from the roadway and intended for exclusive use of modes other than motorized vehicles. Figure 5.3.2-a shows a layout for a typical two-way shared use path.

Guidance for signing and pavement marking of shared use paths is shown in the DE MUTCD and various AASHTO publications.

5.3.2.1 Design Criteria

Refer to applicable guidelines and standards such as those available in the *DelDOT Road Design Manual* and AASHTO's *Guide for the Development of Bicycle Facilities* for additional design criteria that should be used for shared use paths.

A shared use path should be adequately separated from nearby roadways to prevent operational problems that inconvenience path users. The desirable separation of a shared use path from a roadway is ten feet. The minimum separation of a shared use path from the pavement is five feet. When this minimum is not possible, a separate facility for bicyclists such as a shoulder or a treatment such as rumble strips on the edge of the adjacent roadway should be provided. If sod is used next to a shared use path, the area adjacent to the shared use path shall be graded to ensure that the sod is placed flush or just below the edge of sidewalk to avoid water ponding on the shared use path.

Shared use paths should be at least 10 feet wide. In high use areas it is recommended to increase the width to 12 feet. Paths should be designed with a 1.5% cross slope and may not exceed 2%.

5.3.2.2 Intersections

Intersections with roadways are important safety considerations in shared use path design. There are three basic types of path-roadway intersections: mid-block, adjacent path and complex. If alternate locations are available, the one with the most favorable intersection conditions should be selected.

The use of mid-block crossings is generally discouraged. However, if the use of a mid-block crossing is the only option, then a neck-down of the roadway width or curb extension should be considered to minimize the length of the crossing.

Adjacent path intersections occur when the path is parallel to a roadway and it crosses a driveway or other intersecting roadway such as a T-intersection or a simple four-legged intersection. In designing this type of crossing, it is important to keep the location close to the intersection. This allows the motorist and path user to recognize they are a part of the traffic mix and to be prepared to react accordingly.

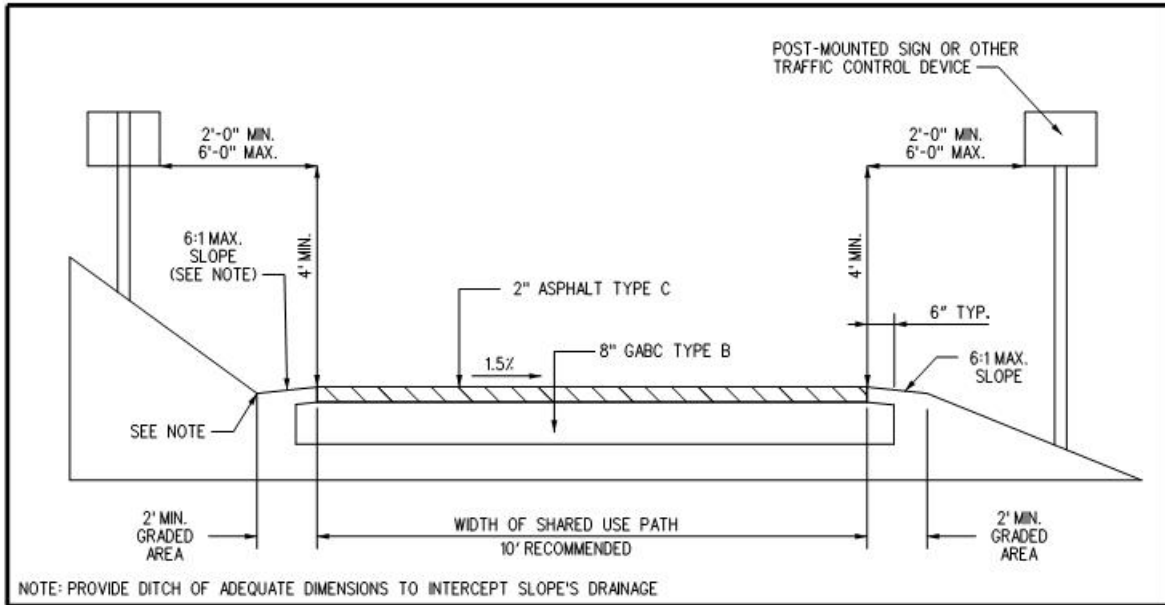
Complex intersections such as grade separated interchanges are site-specific and need to be designed to meet the unique issues associated with them.

When shared use paths terminate at existing roads, it is important to integrate the path into the existing system of roadways. Care should be taken to properly design the terminals to transition the traffic into a safe merging or diverging situation. Appropriate signing is required per the DE MUTCD to warn and direct both bicyclists and motorists regarding these transition areas. Shared use path intersections and approaches should be on relatively flat grades. Stopping sight distances at intersections should be checked and adequate warning should be given to permit bicyclists to stop before reaching the intersection, especially on downgrades.

Curb ramps at intersections should be the same width as the shared use path. Curb ramps shall be ADA compliant and should be designed per DelDOT standard details C-2 and M-3.

Figure 5.3.2.2-a Cross Section – Two Way Shared Use Path

(Not to Scale)



5.3.3 Transit Stop Design

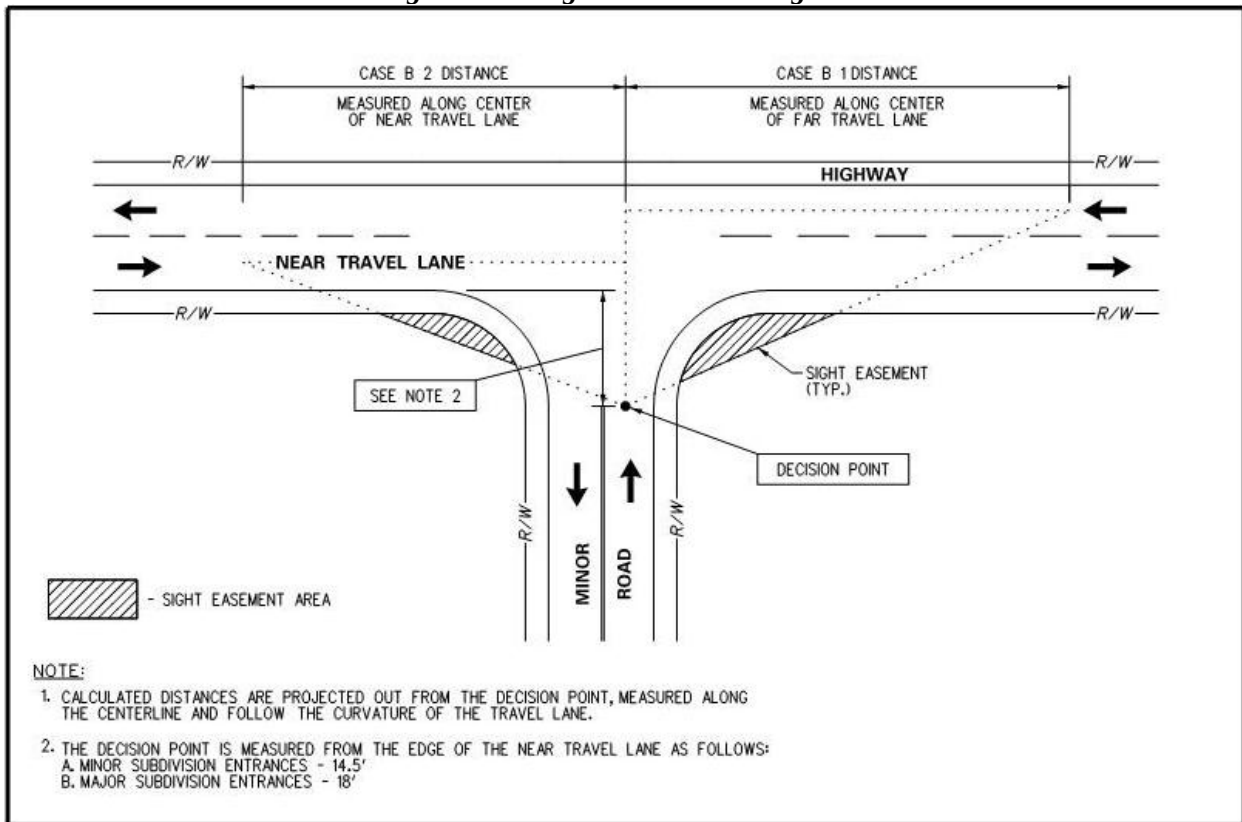
DTC has established policy and design guidelines that should be used for designing bus stops and other transit-related facilities. As part of the project development process, highways and corridors served by transit will be identified and appropriate facilities will be included in the project. For specifics, the designer should refer to the applicable guidelines and standards, such as: DTC's "Bus Stop and Passenger Facilities Standards"; Sections 10.10 Bus Stops and 10.11 Park-and-Ride Lots of DelDOT's Road Design Manual; and DelDOT's Standard Construction Details. If it is determined that a transit facility is necessary, the facilities are to be installed in locations which maximize pedestrian safety while minimizing operation conflicts within auxiliary lanes and channelizing islands.

5.4 SIGHT DISTANCE

When an entrance is provided to a State-maintained roadway, the area adjacent to the right-of-way shall be clear and free of obstructions. When approaching an intersection, a driver should have an unobstructed view of the intersecting roadway and the ability to view any approaching vehicles at the intersection. The sight distances shall be determined in accordance with the requirements of this section. Projects shall demonstrate compliance by completing the Intersection Sight Distance worksheet available online at <http://devcoord.deldot.gov> > Forms.

- A. The entrance location and design shall provide a clear line of sight for the driver of a vehicle preparing to enter the roadway and should be designed in accordance with applicable guidelines and standards such as DelDOT's policies and AASHTO's location and design standards.
- B. The departure sight triangle (see Figure 5.4-a) shall be used at entrances where a stopped driver on a minor road approach (entrance) attempts to depart from the intersection and enter or cross a major road. Calculated distance from the center of the near travel lane to 18 feet from the edge of through lane (see note 2.b in Figure 5.4-a) should be used as the decision point in departure sight triangle. For minor subdivision plans, the calculated distance can be a minimum of 14.5 feet from the edge of the near through lane.
- C. Any marquee sign located in conformance with the Outdoor Advertising requirements must be placed to maintain the required sight distance.
- D. If the sight triangle established in accordance with the standards of this chapter is outside the existing of dedicated right-of-way on the subject parcel, then a sight easement shall be established to maintain the required sight distance as shown on Figure 5.4-a. If the sight triangle is outside the existing of dedicated right-of-way on an adjacent parcel, then a sight easement should be obtained by the applicant to maintain the required sight distance. If the applicant is unable to obtain the easement, then development may be limited to eliminate the need for the easement on the adjacent parcel.
- E. At entrances, the sight triangle shall be maintained so as to be free of plantings or anything that could obstruct the sight distance.
- F. Within the streets of a subdivision the placement of shrubbery or other visual barriers is prohibited within the triangular area formed by the intersection of two curb lines and a line joining the respective points on each of these lines at a distance of 30 feet from the point of intersection. These triangular areas shall be designated on the record plans as sight triangle easements. DelDOT shall have full authority to maintain or require them to be maintained in order to keep the required sight distance. Fire hydrants shall not be considered visual barriers or hazardous obstacles.

Figure 5.4-a Sight Distance Triangles



5.5 TYPICAL SECTIONS

Typical sections shall be designed in accordance with the requirements of this section, and shall include all necessary features as specified in Chapter 4.

- A. Subdivision Streets – Typical sections are required for subdivision streets and shall define the roadway width, cross slopes, and stormwater runoff accommodations (curbs or ditches/sideslopes).
- B. State-maintained Roadways (frontage roads) – If an entrance requires any modification or improvement on the State-maintained roadway, a typical section shall be required. The typical section shall show the existing and proposed pavement widths and sideslopes and ditches as outlined in this section.

5.5.1 Typical Sections - Pavement Widths

- A. Subdivision Streets – Pavement widths shall be designed in accordance with appropriate street classification (refer to Figure 5.2.4-b) and drainage design. See Figures 5.5.1-a through 5.5.1-d for typical cross sections.
- B. State-maintained Roadways (frontage roads) – The width of deceleration lanes associated with the entrance design shall be a minimum of ten feet in width excluding the curb's gutter pan width. If accommodations are required for bikes on the facility, the width of the auxiliary lane shall be increased to a minimum width of 15 feet. The lateral offset from the roadway centerline of a

deceleration lane shall accommodate a minimum 11-foot wide through lane. For example, if an existing local roadway is 20 feet wide, then the through lane will be widened to 11 feet for the length of the deceleration lane.

5.5.2 Typical Sections - Curbs

Curbing may be used to accommodate stormwater runoff. Refer to the DelDOT *Standard Construction Details* for curb types. Any proposed modification to the DelDOT standard curb types shall be shown with a detail on the construction plan and is subject to DelDOT approval.

A minimum of six inches of GABC type B shall be placed under curbs proposed in subdivisions and four inches for all curbs proposed elsewhere and shall extend six inches beyond the back of curb.

Curbs shall be used for all entrances and islands located in the following areas:

- A. Subdivision Streets and Industrial Streets – Use curb types shown on Figures 5.5.2-a through 5.5.2-d.
- B. State-maintained Roadways (frontage roads)
 - 1. On all collectors and arterials as shown on DelDOT's Functional Classification Map
 - 2. In municipalities and urban areas
 - 3. Where the existing highway is curbed
 - 4. Where necessary to control access
 - 5. When the design velocity of an open ditch section exceeds 3 ft./sec., soil reinforcement or a curb and gutter system should be considered. See [Chapter 6 Drainage and Stormwater Management](#) of DelDOT's RDM for more guidance.

The type of curb to be used must be shown on the entrance drawing. Where the roadway is curbed, any curb returns of the driveway shall match the existing curb line. In rural areas curbing may be omitted if access and drainage can be effectively controlled by a roadside ditch or other means as determined by DelDOT.

No portable curb channelization shall be permitted on the entrance facility. Curbing for channelization should be constructed using a mountable-type curbing having a sloping face such as type 2 PCC curb. Special details must be included in the construction plans. Channelization may be poured monolithically if approved by DelDOT.

If drainage runoff will be conveyed along the edge of a curbed frontage road, then a curb and gutter type shall be used. Curbs proposed on roadways with a design speed of 50 mph or greater shall be mountable and be limited to a 4 inch vertical face. Roadways with a design speed of 45 mph or less should use an 8 inch barrier curb.

Where 8 inch height curb is allowable, it must include a throat adjacent to drainage inlets. Refer to Section 5.7 for more information.

Where guardrail is proposed, a maximum curb height of 4" is allowed and shall be positioned under the w-beam railing as shown on standard detail no. B-1. Within the limits of the end treatment and throughout the length of the taper grading, a maximum curb height of 2" is allowed as shown on standard detail no. B-2.

Figure 5.5.2-a Subdivision Street Typical Section (With Curb) - Types I and II
(Not to Scale)

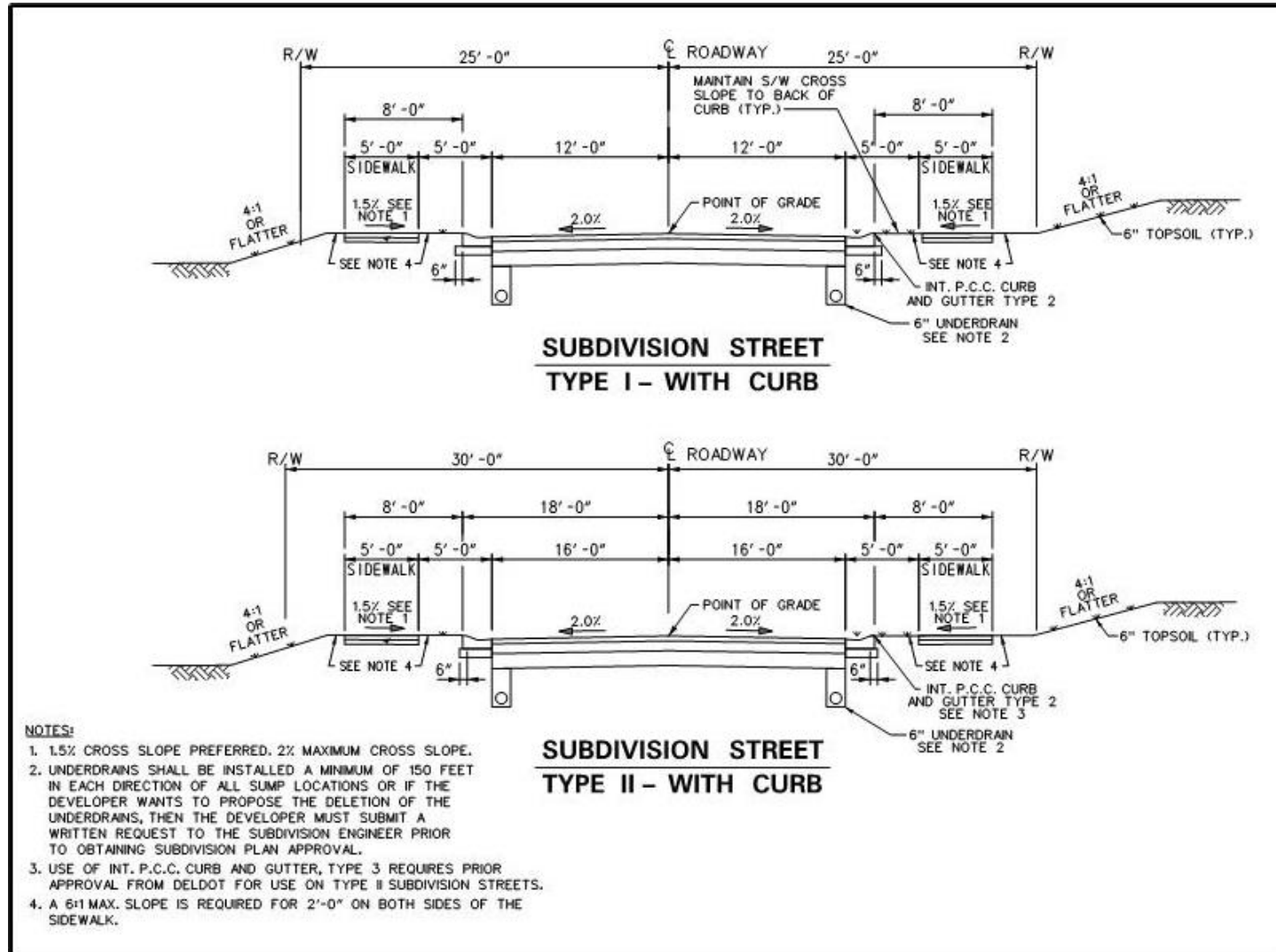


Figure 5.5.2-b Subdivision Street Typical Section (With Curb) - Type III
(Not to Scale)

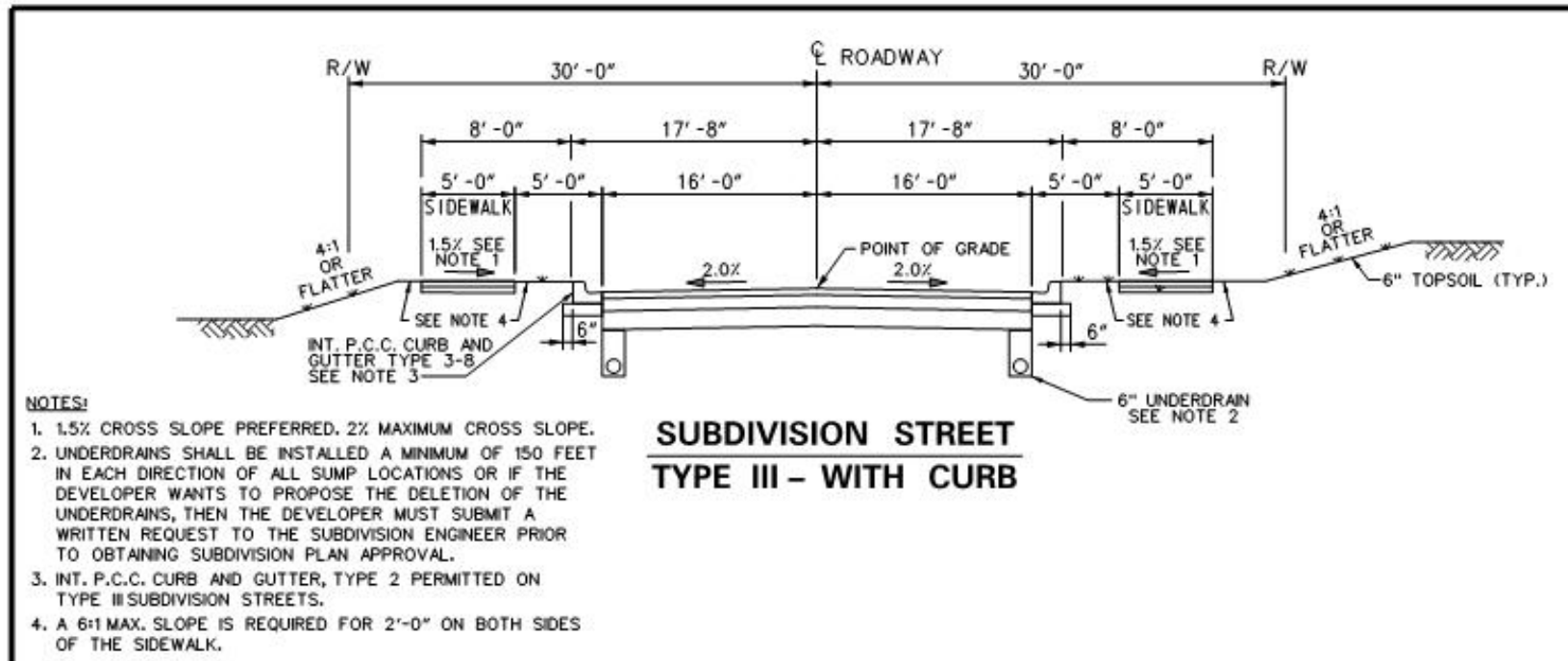


Figure 5.5.2-c Subdivision Street Typical Section (Without Curb)
(Not to Scale)

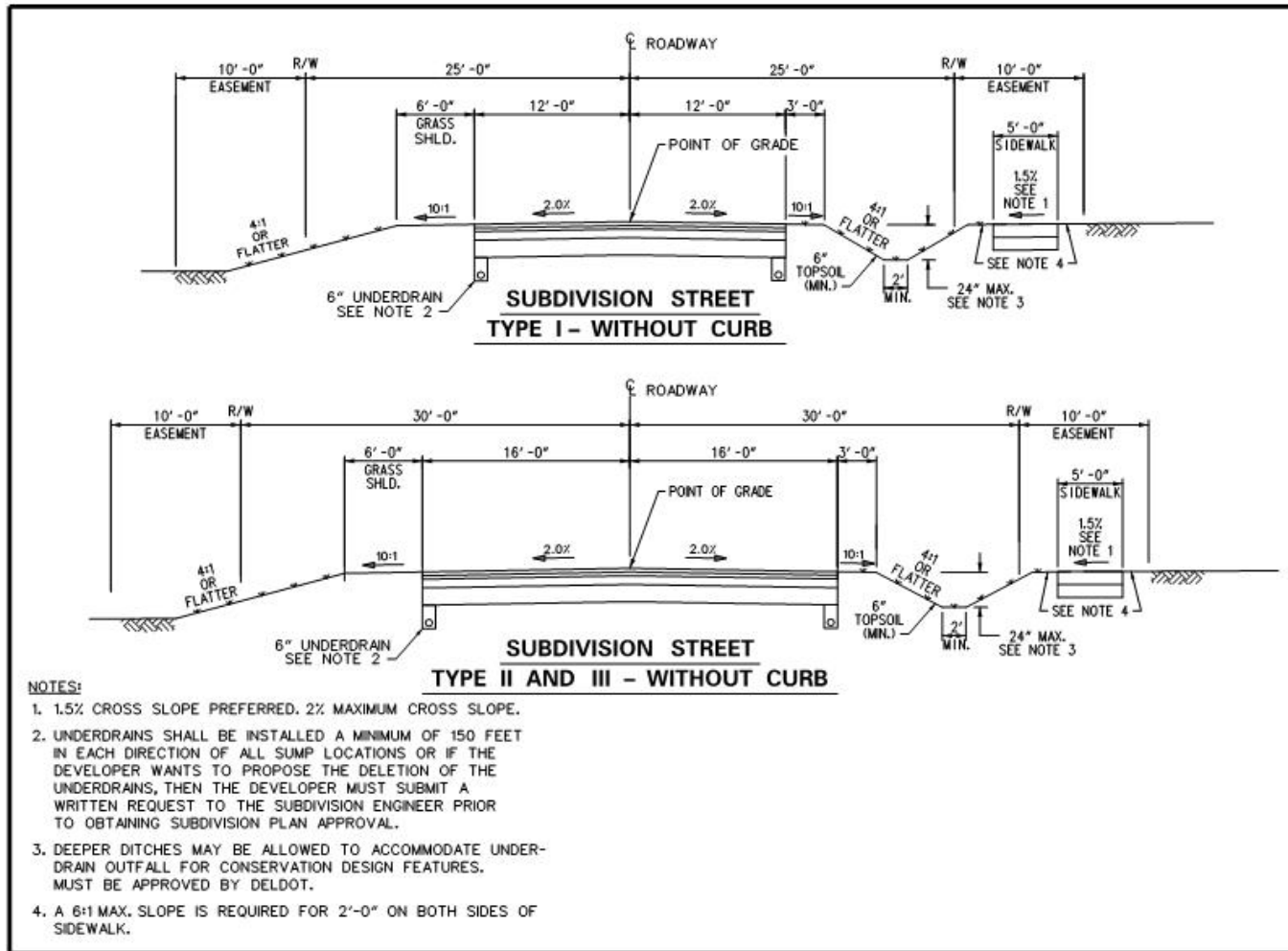
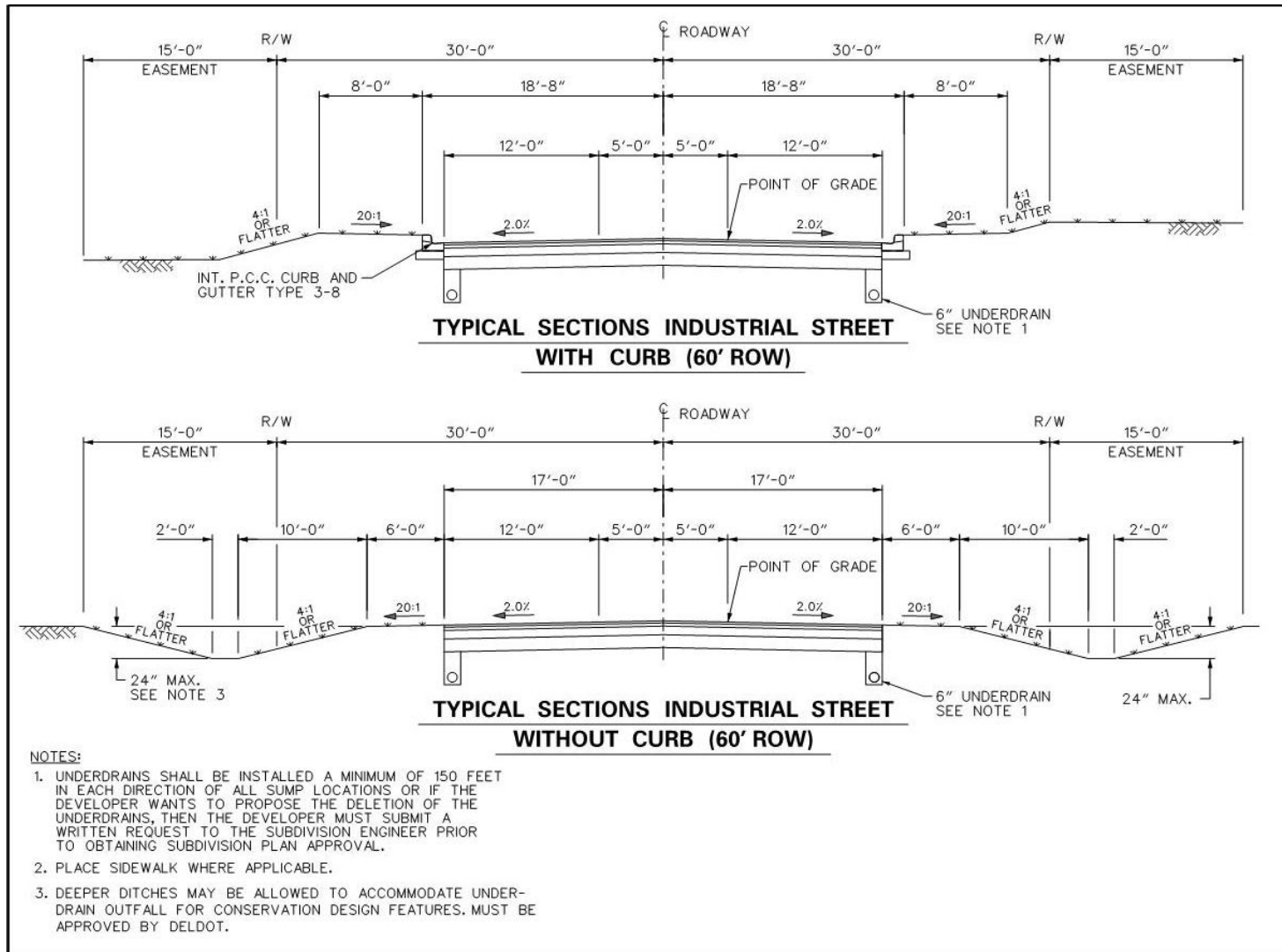


Figure 5.5.2-d Industrial Streets Typical Section (With and Without Curb)

(Not to Scale)



5.5.3 Typical Sections - Ditches and Sideslopes

- A. Subdivision Streets – The ditch and sideslope sections for subdivision streets shall meet the minimum slopes as shown on Figures 5.5.1-a through 5.5.1-c.

The minimum depth of a ditch has been established to provide for sub-surface drainage. This minimum depth must be maintained throughout the subdivision. This depth can vary if a swale over a closed drainage system is used.

To minimize rutting and erosion of the roadside due to on-street parking, the site plan shall be developed to allow for vehicles to be stored in the driveway beyond the right-of-way. A note on the record plan shall state this requirement.

A six-foot grass shoulder shall be treated with an approved turf reinforcement mat to protect the edge of the pavement and to minimize the potential for soil erosion. In addition, design stormwater velocities within the open ditch section should be limited to a maximum of three feet per second.

- B. State-Maintained Roadways – applicable guidelines and standards such as: DelDOT's *Road Design Manual*, AASHTO's *Roadside Design Guide* or **NAS** shall be used when designing sideslopes and ditch sections associated with any entrance improvements.

If pipes are used at site entrances in conjunction with an open drainage system, the longitudinal slope from the entrance pavement to the top of the pipe shall be six-to-one (6:1).

5.5.4 Typical Sections - Underdrains

The long-term presence of water within the pavement structure is largely responsible, directly and indirectly, for many of the distress and performance problems in pavement systems. The addition of longitudinal perforated underdrains is a feasible and cost-effective option for removing water from the road bed. Underdrains are a system of perforated pipes that collect and transmit the water to an outfall site.

Underdrains shall be installed at a minimum length of 150' in each direction from any sump location on all subdivision streets. Based on field conditions encountered while performing reviews or during construction, additional underdrain may need to be installed, at DelDOT's direction, along portions of streets affected by conditions such as the following: segments that have a longitudinal slope of 2% or flatter, where high water-table issues are observed, where the road is placed in a deep-cut versus original existing grade, or where poor soils are present. The typical section shall show the location of the underdrain in accordance with Figures 5.5.1-a through 5.5.1-d. Refer to DelDOT's *Standard Construction Details* for dimensions and materials.

If the developer can demonstrate underdrains are not warranted, through an engineering analysis, signed and sealed by a Professional Engineer registered in Delaware, DelDOT shall grant a waiver on the required underdrains referenced above. All costs associated with the developer's engineering analysis shall be at their cost. DelDOT will not provide any reimbursement.

The engineering analysis shall include the following:

- A. Average water table for the last 25 years for the area in question
- B. Soil boring or test pit information including characteristics and relevant AASHTO classification to a minimum depth of ten feet

- C. Infiltration rate (tested in accordance with ASTM D5126-90 “Comparison of Field Methods for Determining Hydraulic Conductivity in the Vadose Zone”)
- D. Construction plan showing the inlet and boring locations
- E. Topography maps showing proposed road stationing and boring locations for the area in question
- F. USGS wetland delineation maps

Upon submission of all the information listed above, DelDOT will review the analysis and provide a written response to the developer’s request for non-utilization of underdrains.

5.5.5 Typical Sections - Clear Zone

The clear zone as defined in AASHTO’s *Roadside Design Guide* (RDG) includes “the total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired width is dependent upon the traffic volumes and speeds and on the roadside geometry.”

Adequate lateral clearance between the edges of traffic lanes and roadside obstructions has been shown to be a very important safety factor. Vehicles leaving the roadway should have a reasonable opportunity to recover control and return to the roadway without overturning or colliding with roadside obstacles such as trees, poles, headwalls, or other large objects. The combination of a relatively flat slope and an obstacle-free roadside within the prescribed clear zone helps this situation.

The determination of a clear zone is a function of speed, volume, curvature, and embankment slope. Chapter 3 of AASHTO’s RDG or other **NAS** should be used for determining clear zone widths. When deviations from the clear zone criteria are proposed, the engineer shall prepare and submit justification for review and approval by the Planning Section’s Assistant Director. Justification documentation may include but not be limited to: tables and excerpts from Chapter 3 of AASHTO’s RDG or other **NAS**; construction plan views; and typical sections of the area. Regardless of the required clear zone width or ability to implement that width fully, a minimum horizontal clearance of 10 feet from the edge of travel lane and 5 feet from the edge of pavement shall be provided along rural collectors and rural local roads.

Some roadside appurtenances, such as guardrails, breakaway light poles and signs using breakaway posts, may be part of a proposed development. If they are located within the specified clear zone they must be crashworthy in accordance with applicable guidelines and standards such as: NCHRP Report 350 Test Level III Criteria, AASHTO’s *Manual for Assessing Safety Hardware* (MASH) or **NAS**. When used, they should also be placed in the safest available location.

For guardrails within the clear zone, it is desirable to maintain a minimum 2 foot lateral offset between the outer edge of the usable shoulder and the face of the rail. Guardrails in and of themselves present a hazard and only should be used as a last resort if objects cannot be moved or the required sideslopes cannot be provided. At bridge approaches, guardrails should either match the width of the bridge or taper to meet the bridge rail. Refer to DelDOT’s *Standard Construction Details* for more information on guardrail types and end treatments.

5.5.6 Typical Sections – Lateral Offset

For arterials and other non-controlled access facilities in an urban environment, however, rights-of-way often are extremely limited and, in many cases, establishing a clear zone using guidance in Chapter 3 of

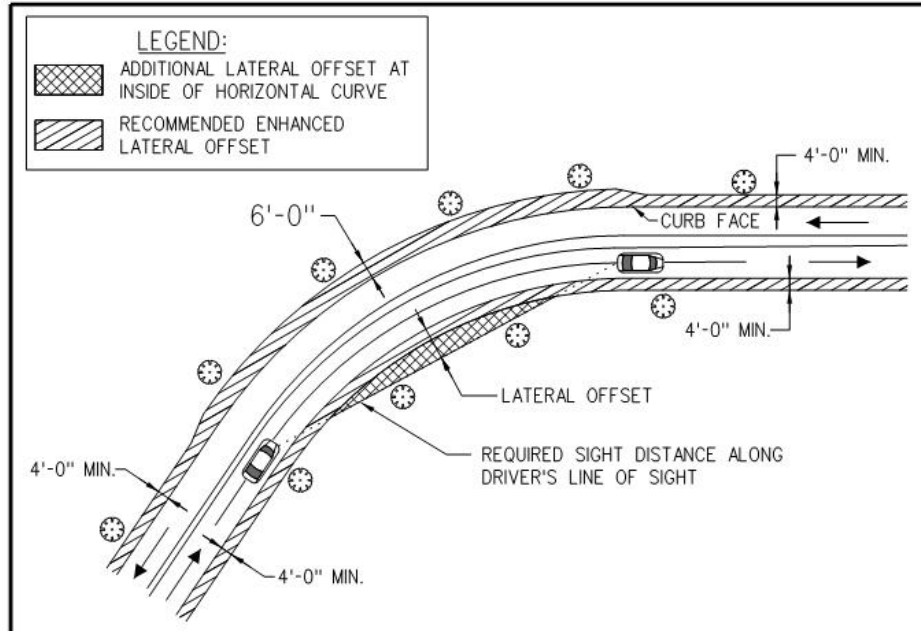
DelDOT's RDM is not practical. These urban environments are characterized by sidewalks beginning at the back of curb, enclosed drainage, numerous fixed objects (ex: signs, utility poles, fire hydrants, etc.) and frequent traffic stops. These environments typically have lower operating speeds and, in many instances, on-street parking. In these environments, a lateral offset to vertical obstructions, including breakaway devices, may be used to accommodate motorists operating on the highway.

The lateral offset value of 1.5 ft. has been considered a minimum lateral distance for placing the edge of objects from the face of curb. The minimum lateral offset was never intended to represent an acceptable safety design criteria, though sometimes it has been misinterpreted as such. In a constrained urban environment, there is still a need to position rigid objects as far away from the active traveled way as possible.

A few general guidelines have been provided below for lateral offsets, but, chapter 10, *Roadside Safety in Urban or Restricted Environments*, of the 2011 AASHTO RDG discusses in detail the various applications for lateral offsets. Please refer to applicable guidelines and standards such as those found in AASHTO's RDG to help determine the appropriate lateral offset(s) for your site-specific location.

- A. Where curb is used, the lateral offset is measured from the face of the curb.
- B. An enhanced lateral offset of 4 ft. to 6 ft. to obstructions is a more appropriate guide for these (urban or restricted) environments, and is recommended along roadway tangents and insides of curves. Note: Along the inside of curves, a lateral offset should be provided that keeps the driver's line of sight clear, to provide the required stopping distance. An enhanced lateral offset of 6 ft. is recommended at intersections and along outsides of curves. Refer to Figure 5.5.6-a.

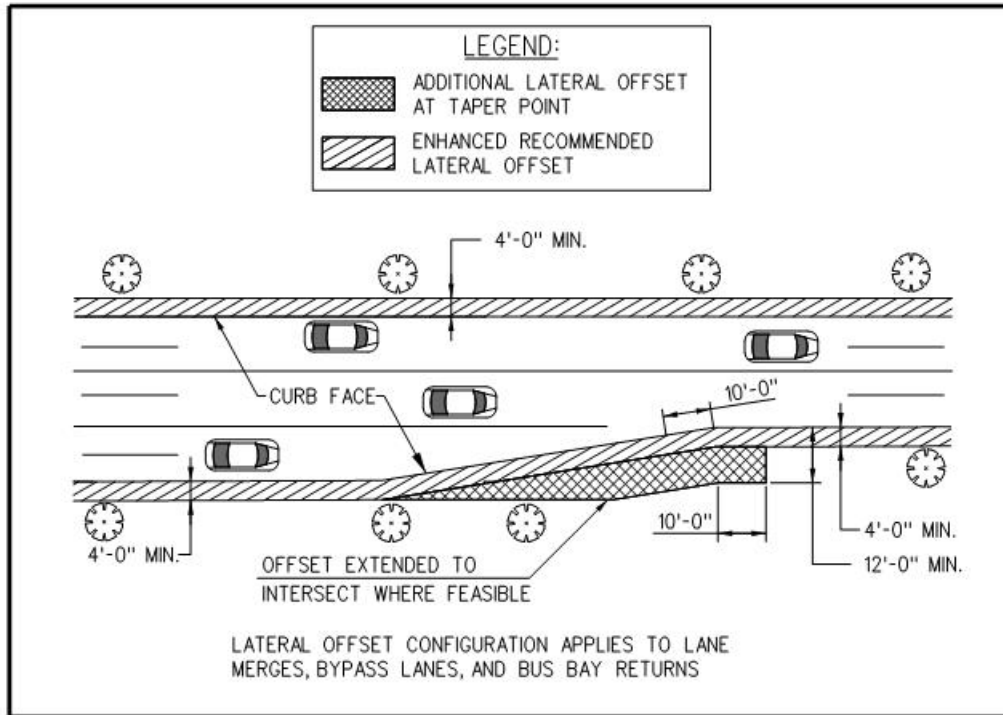
Figure 5.5.6-a Lateral Offset Widths



- C. Where curb is NOT present, lateral offsets of 8 ft. are recommended along roadway tangents and insides of curves when clear zone widths cannot be achieved.
- D. Where curb is NOT present, lateral offsets of 12 ft. are recommended along outsides of curves when clear zone widths cannot be achieved.

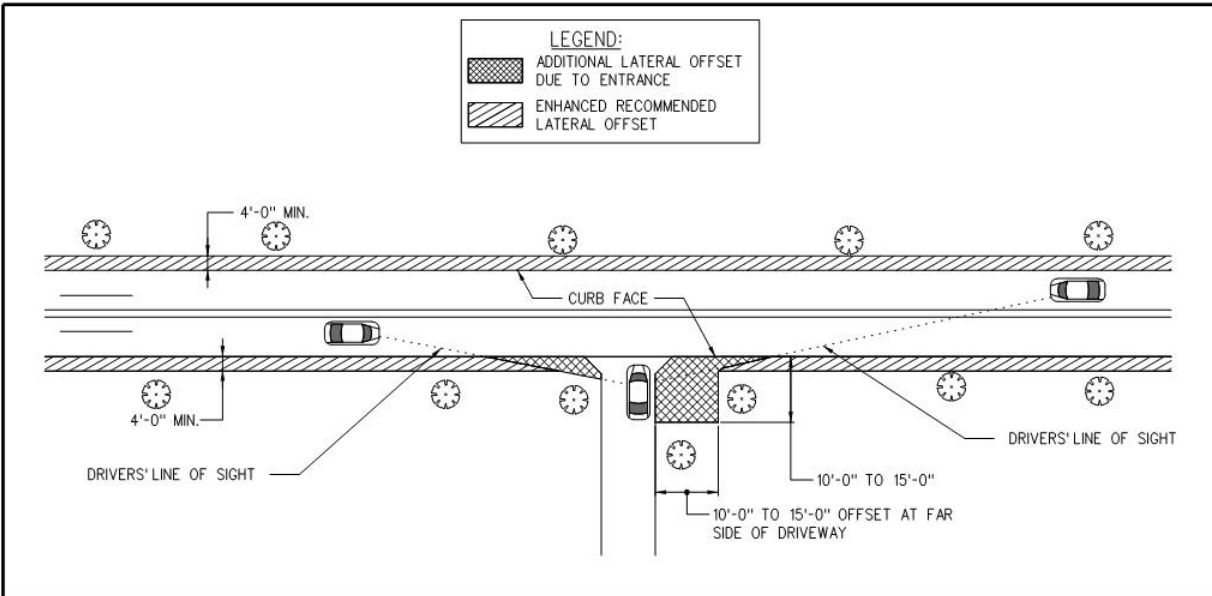
- E. At lane merge points, an enhanced lateral offset of 12 ft. is recommended in the immediate vicinity of the taper point from the lane merge curb face as shown in Figure 5.5.6-b. (See Figure 10-2 of the RDG for a detailed explanation of this enhanced lateral offset.

Figure 5.5.6-b Lateral Offsets at Merge Points



- F. At driveways a lateral offset of 10 to 15 ft. beyond the edge of the driveway should be considered to reduce the potential for a fixed-object collision in this high crash location as shown in Figure 5.5.6-c.

Figure 5.5.6-c Lateral Offsets at Entrances



5.6 PAVEMENT SECTIONS

Pavement sections are to be designed based on the ADT utilizing the planned roadway and the existing subsurface conditions. Acceptable pavement sections are to be designed based on assuming poor soils. If the applicant wishes to propose pavement sections based upon anything other than poor soils, soil testing may be performed, at no cost to DelDOT, by an accredited lab with DelDOT supervision of testing. This request shall be made prior to preliminary plan submission. The pavement sections listed in Figures 5.6.1-a and 5.6.2-a are designed to meet the required Structural Numbers (SN) and meet the following conditions/criteria:

- A. Bituminous Concrete (Asphalt) pavement may only be placed directly over GABC, never placed directly over select borrow or subgrade.
- B. Undisturbed sub-grade and/or select borrow cannot be counted in Structural Number calculations.

The binder grade and gyrations of mix for bituminous concrete (asphalt) pavements will be specified on a project basis during the review process and must be indicated on the plans.

Materials placed for construction of roadways in subdivisions, entrances, and industrial roadways must not be constructed in lifts that violate DelDOT's minimum and maximum lift thickness. The allowable lift thickness and structural values for materials used are shown in Figure 5.6-a.

Figure 5.6-a Material Properties

	Lift Thickness		SN Contribution Per Inch
	Minimum	Maximum	
Bituminous Concrete (Asphalt) Pavement Type C	1 ¼"	2"	0.4
Bituminous Concrete (Asphalt) Pavement Type B	2 ¼"	4"	0.4
Bituminous Concrete Base Course (BCBC)	3"	6"	0.32
GABC	4"	8"	0.14

5.6.1 Pavement Sections - Subdivision Streets

All subdivision streets and entrances shall be paved with bituminous asphalt concrete or Portland cement concrete surface. Pavement sections for internal subdivision streets are to be built to serve the traffic generated from the development upon completion, including all construction related traffic of the development. Should additional development phases be planned that will be connected to the portion of the development under construction, the pavement section for the street shall be such that it will support both the phase under construction and the future phases. The surface of the Type B bituminous concrete (asphalt) pavement shall be free of defects such as potholes, alligator cracking or rutting prior to the placement of the Type C bituminous concrete (asphalt) lift. Figure 5.6.1-a shows examples of pavement sections acceptable for use on internal subdivision streets.

When calculating the structural number of a pavement section, consider whether vehicular traffic used the street section previously. For example:

A subdivision has an ADT of 136. Figure 5.6-b requires that the structural number at completion be 2.98, while the pavement section in place prior to 75% completion of the development must have a structural value of 2.48. To determine the structural value of the overall section, the structural capacity of the section must be determined using SN contribution values as follows:

Thickness_C = 2 ¾" (1 ½" placed at initial pavement construction; 1 ¼" placed after DelDOT acceptance).

$$SN_C = 0.4 \text{ per inch}$$

$$\text{Thickness}_B = 2 \frac{1}{4}"$$

$$SN_B = 0.4 \text{ per inch}$$

$$\text{Thickness}_{GABC} = 7"$$

$$SN_{GABC} = 0.14 \text{ per inch}$$

$$SN_{total} = \text{Thickness}_C * SN_C + \text{Thickness}_B * SN_B + \text{Thickness}_{GABC} * SN_{GABC}$$

$$SN_{Total} = 2 \frac{3}{4} * 0.4 + 2 \frac{1}{4} * 0.40 + 7 * 0.14 = 2.98$$

The structural number meets the requirements structurally for the overall value and meets the conditions set forth in the beginning of this section. Once it is established that these are sufficient,

the section must be verified to meet the required structural value prior to 75% completion of the development. This calculation uses SN contribution values without the 1 ¼" Type C bituminous concrete (asphalt) pavement placed after DelDOT acceptance and is as follows:

$$\text{Thickness}_C = 1 \frac{1}{2}''$$

$$SN_C = 0.4 \text{ per inch}$$

$$\text{Thickness}_B = 2 \frac{1}{4}''$$

$$SN_B = 0.4 \text{ per inch}$$

$$\text{Thickness}_{GABC} = 7''$$

$$SN_{GABC} = 0.14 \text{ per inch}$$

$$SN_{75\%} = \text{Thickness}_C * SN_C + \text{Thickness}_B * SN_B + \text{Thickness}_{GABC} * SN_{GABC}$$

$$SN_{75\%} = 1 \frac{1}{2} * 0.4 + 2 \frac{1}{4} * 0.40 + 7 * 0.14 = 2.48$$

This calculation shows how the required section is calculated and may be used to adjust thickness requirements of example sections as long as all requirements are met and lift thickness values are not violated.

Figure 5.6.1-a Pavement Design Chart for Internal Subdivision Streets

ADT	Required Structural Number – Overall (prior to 1 ¼” Type C bituminous concrete (asphalt) pavement overlay)	Bituminous Concrete (Asphalt) Pavement Section ¹
1– 500	2.98 (2.48)	1 ¼” Type C ³ 1 ½” Type C ² 2 ¼” Type B 7” GABC
501 – 1000	3.12 (2.62)	1 ¼” Type C ³ 1 ½” Type C ² 2 ¼” Type B 8” GABC
1001 – 2000	3.42 (2.92)	1 ¼” Type C ³ 1 ½” Type C ² 3” Type B 8” GABC
2001 – 3000	3.82 (3.32)	1 ¼” Type C ³ 1 ½” Type C ² 4” Type B 8” GABC
3001 – 5000	4.02 (3.52)	1 ¼” Type C ³ 2” Type C ² 4” Type B 8” GABC
> 5000	Submit data to DelDOT for Pavement design	

1 - Variations from the sections provided must be approved by DelDOT.

2 - Bituminous Concrete (Asphalt) Type C course to be installed with Type B and GABC

3 - Bituminous Concrete (Asphalt) Type C course to be installed just prior to DelDOT acceptance.

5.6.2 Pavement Sections - Entrances

Pavement sections for entrances on State-maintained roadways are to be designed using the average daily traffic using that entrance or 20% of the mainline traffic, whichever is greater (see Figure 5.6.2-a). Other sections, to be constructed in conjunction with the entrance to the highway that must be submitted for design to DelDOT are:

- Travel lanes
- Right-turn lanes
- Bypass lanes
- Left-turn lanes
- Crossovers
- Entrances that do not conform to the description listed in Figure 5.6.2-a for each class
- Class III entrances

Figure 5.6.2-a Pavement Design Chart for Entrances

CLASS	Required Structural Number	Bituminous Concrete (Asphalt) Pavement Section ¹
Class I - Traffic Volume 51 to 500 ADT - Limited to 1 light truck per day	3.12	1 ¼" Type C ³ 1 ½" Type C ² 2 ¼" Type B 8" GABC
Class II - Traffic Volume 501 to 2000 ADT - Less than 15 light duty trucks per day	3.62	1 ¼" Type C ³ 1 ½" Type C ² 3.5" Type B 8" GABC
Class III - Traffic Volume greater than 2001 ADT - Greater than or equal to 15 light duty trucks per day	Submit traffic data to DelDOT for Pavement design	

1 - Variations from the sections provided must be approved by DelDOT.

2 - Bituminous Concrete (Asphalt) Type C course to be installed with Type B and GABC

3 - Bituminous Concrete (Asphalt) Type C course to be installed just prior to DelDOT acceptance.

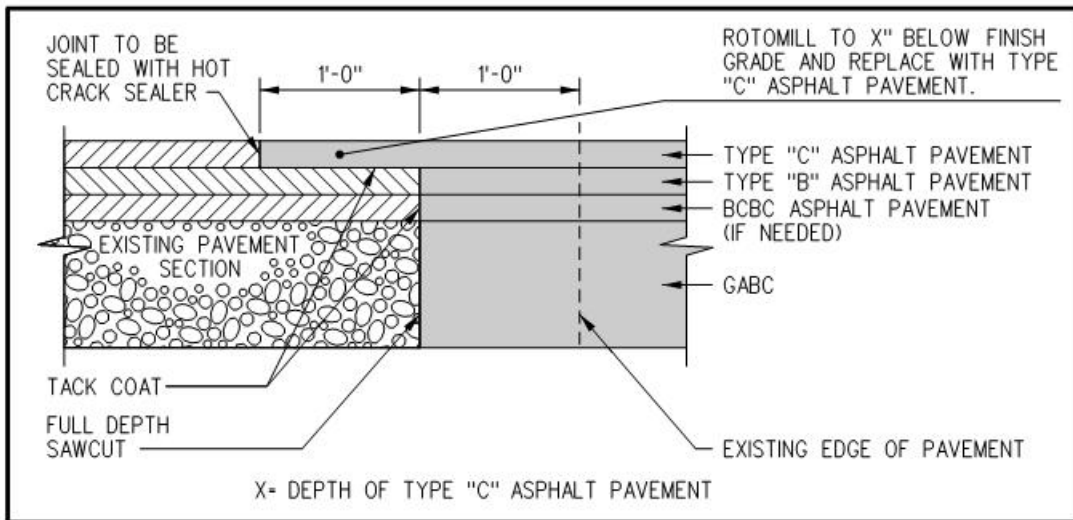
5.6.3 Pavement Sections Industrial Streets / Entrances

Streets that are to be used as entrances to industrial parks must be built to State requirements. DelDOT must perform all pavement designs for proposed industrial streets, to match the design with the anticipated vehicle use.

5.6.4 Pavement widening

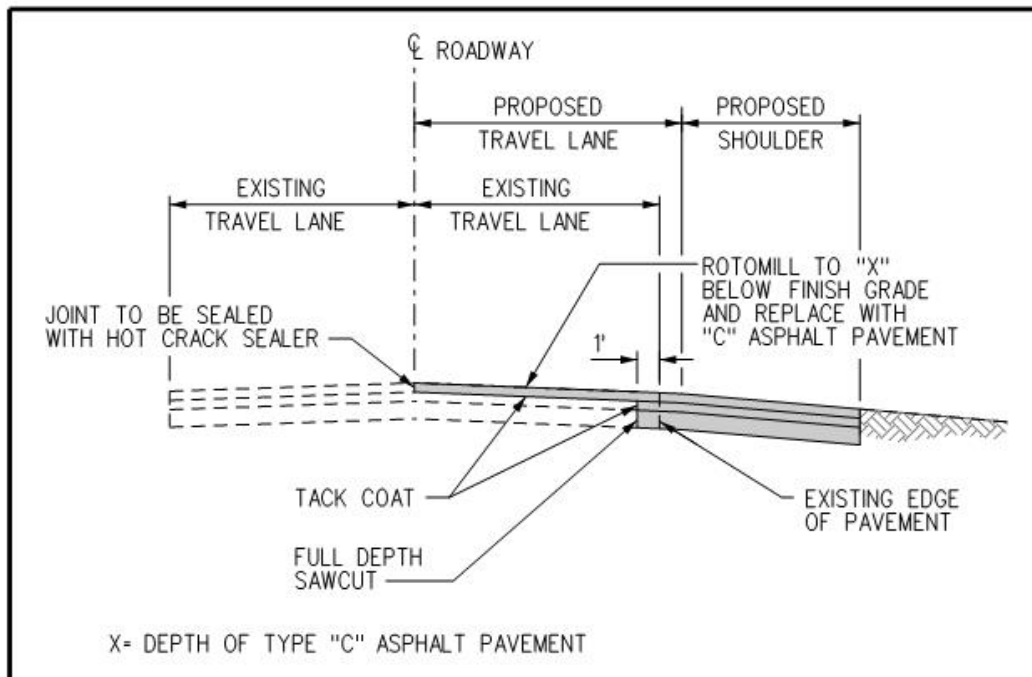
When a trench is made to install utilities or drainage across or longitudinally along an existing shoulder or a shoulder is widened, the pavement tie-in detail shall be provided on the construction plans as shown on figure 5.6.4-a.

Figure 5.6.4-a Pavement Tie-in Detail



When widening is proposed for auxiliary lanes or shoulders or utilities are to be installed longitudinally on roadways, any encroachment of one foot or more onto a travel lane requires restoration of the full lane width as shown on figure 5.6.4-b.

Figure 5.6.4-b Lane Widening/Restoration Detail



5.7 SUBDIVISION DRAINAGE DESIGN

5.7.1 Subdivision Drainage Design - General

Surface runoff water is a serious threat to both the physical integrity and the serviceability of roadway facilities. Runoff water must be adequately controlled so that it may pass through and be removed from the roadway area without damaging the roadway or adjacent properties, or creating safety issues.

As part of the overall design, the developer's engineer shall provide adequate drainage of the roadway and the site in accordance with all applicable standards. DelDOT maintains the authority to dictate drainage design methods and drainage design systems for all facilities that impact the State right-of-way.

The following sections apply to drainage design within subdivisions. For drainage and stormwater management design of entrances, offsite and frontage road improvements, applicable regulations shall be followed and relevant guidelines, standards and DelDOT policies should be applied to the design process, such as: [Chapter 6 Drainage and Stormwater Management](#) of DelDOT's *Road Design Manual*; and the reference materials found on DelDOT's Website under the Design Resource Center's *Hydraulics and Hydrology Tab* (<http://deldot.gov/information/business/drc/hydrology.shtml>) .

5.7.2 Subdivision Drainage Design - Drainage Criteria

Drainage criteria for different drainage installations are discussed below and summarized in Figure 5.7.2-a.

5.7.2.1 Open Channels

Open channels are a commonly used component of a drainage system. They include natural/manmade ditches, streams, median swales and gutters.

Open Channel/ Roadside ditch design within subdivisions shall generally be in accordance with the design methodology described in DelDOT's *Road Design Manual*. The following specific criteria shall be used in the design of roadside ditches within subdivisions:

- A. A 10-year storm frequency.
- B. The rational method shall be used to compute the design runoff, and Manning's equation for capacity.
- C. Maintain a minimum freeboard of 0.5 ft., 1 ft. preferred, below the edge of shoulder.
- D. The minimum ditch grade is 0.3%, but 0.5% is preferred.
- E. Maximum allowable flow velocity is 3 ft/sec. for grass-lined channels. Higher velocities will require lining and additional review.
- F. Maximum 4:1 sideslopes are preferred, with steeper sideslopes subject to DelDOT approval.
- G. Flat bottoms with a minimum width of 2-feet are preferred, although 1' flat bottoms may be acceptable in some designs. V-ditches will only be permitted where there is no feasible alternative.

5.7.2.2 Culverts

A culvert is an open-ended drainage structure which transports water between drainage courses.

Based on the peak flow and watershed area, an appropriate method for determining runoff shall be determined. The following criteria shall be used for culverts:

- A. A 25-year storm frequency shall be used
- B. The headwater elevation shall be one foot below the edge of the proposed roadway. The resulting ponding shall not negatively impact the highway or the adjacent property.
- C. The minimum pipe size for cross-road culverts within subdivisions shall be 15”.
- D. The minimum pipe size for culverts under residential driveways within subdivisions shall be 12”.

See Hydraulic Design Series Number 5 (HDS 5), *Hydraulic Design of Highway Culverts*, September 2001, USDOT, FHWA.

5.7.2.3 Storm Sewers

The following criteria shall be used for storm sewers within subdivisions:

- A. A 10-year storm frequency shall be used.
- B. For sump conditions a 25-year storm frequency shall be evaluated to assess the impacts of potential flooding in sump locations in higher storm events.
- C. The minimum size for pipes within subdivisions shall be 15”.
- D. Storm sewers should be designed for non-pressure flow. In certain cases, where site topography or other constraints warrant design of pressure flow in pipes, engineering justification and supporting calculations shall be submitted for review by DelDOT. In no case shall the hydraulic gradient be higher than one foot below the top of the grate for ten-year storms and just below the top of the grate for 25-year storms.
- E. The following criteria shall be used in calculating the Hydraulic Grade Line (HGL):
 - 1. The starting elevation of the HGL shall be the normal crown of the outfall pipe, or the tailwater elevation of the outfall, if it is higher than the normal crown of the outfall pipe.
 - 2. The HGL shall be calculated in accordance with HEC-22.
- F. The following criteria shall be used to establish the inverts of outfall pipes:
 - 1. For dry ponds, the pipe invert elevation shall be equal to the bottom of pond elevation. For wet ponds, the pipe invert elevation shall be equal to or higher than the normal pool elevation of the pond.
 - 2. For a storm drain system discharging into a stream, the invert of the discharging pipe shall be no lower than the level of the base flow. If the stream flow is intermittent, the invert shall be at least a foot above the stream bottom. The HGL shall start from the crown of the pipe.

See DelDOT’s *Road Design Manual*, [Chapter 6 Drainage and Stormwater Management](#), for additional guidance and information on storm sewer design.

Culverts and storm sewers can be made from Reinforced Concrete Pipe (RCP), Metal Pipe (MP) or High Density Polyethylene (HDPE). Refer to DGM 1-20 Pipe Materials for further information.

5.7.2.4 Inlet Design

Inlet design for subdivision streets shall be in accordance with the design methodology described in DelDOT's *Road Design Manual*. The following criteria shall be used for inlets:

- A. A 10-year storm frequency
- B. The spread of water shall be no greater than 8 feet from the flow line of the curb
- C. Maximum spacing of inlets is 300 feet
- D. Double inlets shall be used at all sump locations

5.7.2.5 Pipe Cover

Appropriate care must be taken in the layout, selection and sizing of drainage components, to ensure that adequate cover is provided over culverts and storm sewers below roadways and at storm sewer connections with drainage structures, to help assist with the cataloguing and review of these elements, DelDOT's Pipe Cover/Pipe Angle Worksheet, available online at <http://devcoord.deldot.gov> > Forms, shall be completed by the engineer and submitted for review. Pipe Materials including, rigid and flexible pipe, shall require a minimum allowable cover, H_{min} , as shown on Figure 5.7.2.5-a, which has been adapted from DelDOT's DGM 1-20 *Pipe Materials*. When rigid pipe is proposed under bituminous concrete (asphalt) pavement, extends into the bituminous concrete (asphalt) pavement section and H_{min} is met, then bituminous concrete (asphalt) pavement should be placed directly over the pipe. For this condition, refer to Figure 5.7.2.5-b to see examples for existing and proposed pavements. In addition, use of elliptical reinforced concrete pipe (ERCP) should be considered to increase pipe cover under the pavement when H_{min} cannot be provided. On roadways listed on the National Highway System where the minimum allowable cover requirement cannot be met due to field conditions, DelDOT may approve reinforced concrete pipe having AASHTO HL-93 loads as specified in the American Concrete Pipe Association's (ACPA) Concrete Pipe Manual. This will require pipe design calculations to be prepared and submitted for review and approval prior to issuance of construction plan approval. The National Highway System map can be found on DelDOT's website. Under special circumstances, on roadways not listed on the National Highway System, where the minimum cover requirement cannot be met due to field conditions, DelDOT may approve the use of class V RCP.

Figure 5.7.2.5-a Material Based Pipe Cover Requirements (Standard Installation)

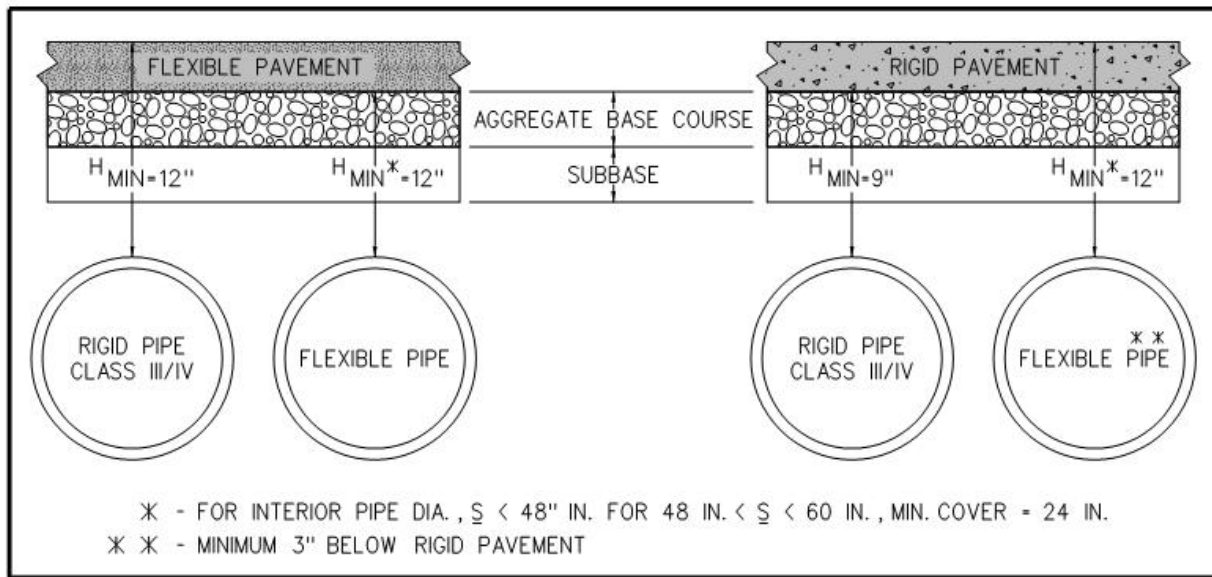
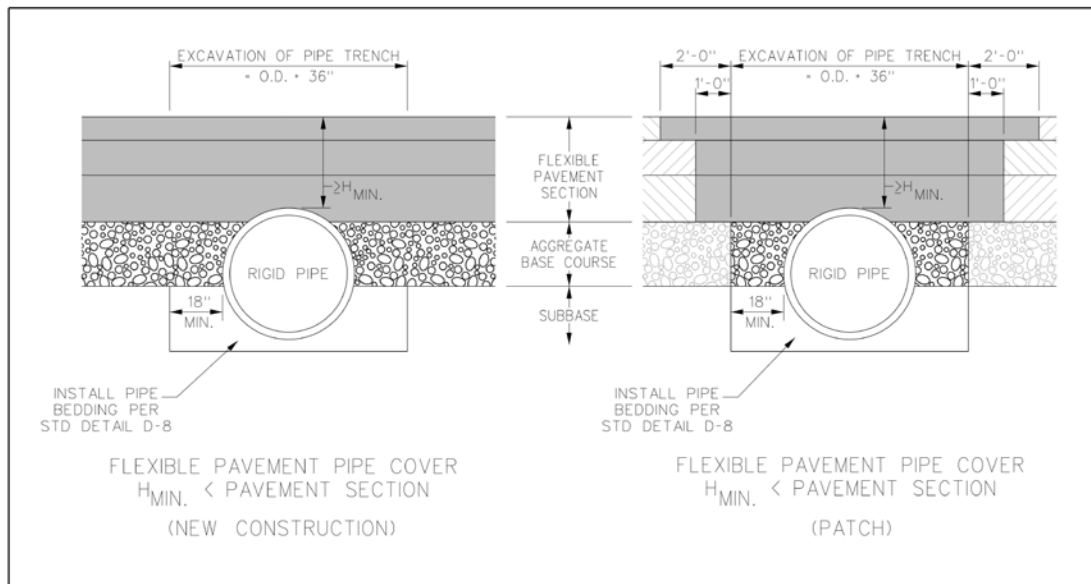


Figure 5.7.2.5-b Existing Pavement Shallow Pipe Cover Details

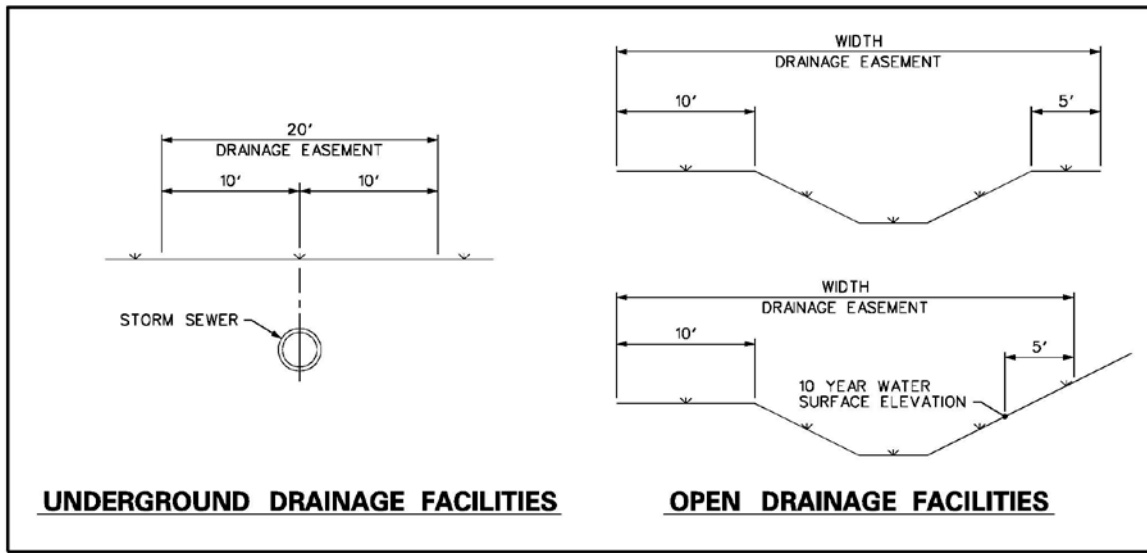


5.7.2.6 Drainage Easements

Drainage easements are required for all drainage facilities handling roadway runoff which are not located within a dedicated right-of-way. DelDOT may authorize the use of such drainage easements for accessing and removing downstream blockages that impede roadway runoff from the state maintained portion of the system. Downstream easements do not imply or create a maintenance responsibility on the part of the Department, but communicate the underlying authority to take emergency or corrective action if the Department believes it is appropriate. The Department will not maintain portions of the drainage easement and system that are exempted under Section 3.2.5.1.4 (such as portions that are not directly

collecting and conveying the drainage runoff of the proposed State maintained roads and/or rights-of-way, as well as portions that are located upstream or are offsite). Underground drainage facilities shall require a 20-foot drainage easement. The pipe must be located in the center of the easement. Open drainage facilities shall require a width equal to the width of the facility plus a 10-foot easement on one side and a minimum of a 5-foot easement on the other side of the open drainage facility, as measured from the top of slope. Where the top of slope is undefined, measure from the 10-year water surface elevation. Refer to Figure 5.7.2.6-a for additional detail.

Figure 5.7.2.6-a Drainage Easement Requirements



5.7.2.7 Drainage Design Report

A drainage report shall be submitted with the construction plans to verify pipe sizing, Hydraulic Grade Line (HGL), pipe cover and angles, velocities, channel lining and water spread on the roadway.

A drainage design report containing the following minimum data shall be prepared for each project:

- A. Drainage area plan
- B. Time of concentration
- C. Weighted runoff coefficient
- D. Design discharge
- E. Type and slope of drainage facility
- F. Storm drain size and type calculations
- G. Scour protection methods – riprap sizing and shear stress calculations
- H. Inlet spacing and spread calculations, including bypass flow
- I. Culverts – headwater elevations
- J. Hydraulic Grade Line (HGL) calculations
- K. Full flow pipe velocity

- L. Actual flow pipe velocity
- M. Difference between inlet grate elevation and HGL elevation
- N. Pipe cover/pipe angle calculations. Spreadsheet is available online at <http://devcoord.deldot.gov> > Forms
- O. If DelDOT is accepting maintenance responsibility for any BMP, a Drainage area shapefile for all outfall pipes is to be submitted with the report.

See DelDOT's Design Resource Center, Hydrology & Hydraulics Section, for a sample drainage report.

See [Chapter 6 Drainage and Stormwater Management](#) of DelDOT's Road Design Manual for rainfall intensity estimates and depths that are to be used in the preparation of the drainage report.

Figure 5.7.2.7-a Subdivision Streets Drainage Criteria

Type	Design Frequency		Minimum Flow Full Velocity (ft/sec)	Maximum Allowable Velocity (ft/sec)	Minimum Free Board from Edge of Roadway
	Normal	Sump			
Culvert	25	25	2	–	6 inches acceptable, 1 foot preferred
Storm Sewer	10	25	2	8	1 foot
Roadside Ditch	10	10	–	3	6 inches acceptable, 1 foot preferred
Inlets	10	10*	–	8	–

* The 25-year storm event will also be evaluated for impacts.

5.7.2.8 Safety Grate for Pipe Inlet

Safety grates shall be installed on the inlets of stormwater pipes to improve safety on all stormwater pipes 12 inches and larger with open inlets (i.e., without a grate or drainage inlet) for which full daylight is not visible when looking through the pipe to the other end, regardless of length. Refer to DelDOT Standard Construction Details for applicable safety grate for each installation. Efforts shall be made to minimize use of open end pipe inlets which require safety grates.

5.7.3 Subdivision Drainage Design - Hydrology

Hydrology shall be analyzed using acceptable calculation methods (e.g. Rational Method, TR-55, etc.). Additional guidance on hydrologic calculations can be found in [Chapter 6 Drainage and Stormwater Management](#) of DelDOT's Road Design Manual, TR-55, HEC-22, etc.

5.7.4 Subdivision Drainage Design - Hydraulics

Manning's Equation shall be utilized to calculate the flow of water in open channels. Additional guidance can be found in [Chapter 6 Drainage and Stormwater Management](#) of DelDOT's Road Design Manual.

5.8 STORMWATER MANAGEMENT

The following section applies to stormwater management for disturbed areas within the State right-of-way as a result of roadway widening for turn lanes, shoulders, etc.

DelDOT will work cooperatively with Delaware Department of Natural Resources and Environmental Control (DNREC) and delegated agencies responsible for enforcing Delaware Sediment and Stormwater Regulations (DSSR) to ensure stormwater is adequately controlled. These agencies include New Castle County Land Use Engineering, New Castle County Conservation District, Kent Conservation District (KCD), and Sussex Conservation District (SCD). See the Stormwater Links online at <http://devcoord.deldot.gov> > Guidance.

Stormwater management shall meet State law and regulations in terms of quality and quantity.

When determining the need for stormwater management, the impervious areas added to the existing State-maintained roadway shall be considered. If stormwater management is required, it shall be managed by a private stormwater management facility. The area of the entrance construction and roadway improvements shall be included in the analysis and clearly documented in the stormwater report.

When the proposed development is limited to the site and the entrance, the review of design and construction of a stormwater management facility is performed by a non-DelDOT delegated agency for DSSR enforcement. In this case, the non-DelDOT delegated agency shall attest that the DSSR within DelDOT right-of-way have been met and shall be documented in a memo and forwarded to DelDOT's Stormwater Engineer.

If the proposed roadway work is not contiguous with the land development proposal, the review of design and construction of a stormwater management facility shall be performed by DelDOT's Stormwater Management Section for Delaware Sediment and Stormwater Regulations (DSSR) enforcement. The Stormwater Engineer will sign the plans upon determination of full compliance of the plans and reports with the requirements of the DSSR.

If there are proposed roadway upgrades above and beyond those required by the development project, then a shared use agreement will be entered into by DelDOT and the Developer. For any BMP that is proposed within the State's right-of-way that DelDOT will be partially or fully responsible for maintaining, a GIS shapefile of the drainage area for the area treated by the BMP shall be included with the stormwater management design report and submitted to DelDOT.

The stormwater management report shall be required in order to assess conformance with the provisions of DSSR.

The following shall also apply to all stormwater management designs:

- A. If stormwater runoff from a site does not discharge into the State right-of-way during pre-existing conditions, DelDOT will not allow the outflow to discharge into the State right-of-way.
- B. Where the outfall for any stormwater runoff outlets into the State right-of-way, a detailed hydraulic and stormwater analysis shall be required to determine the impacts on the roadway drainage system and to ensure no adverse stormwater impacts for surrounding property owners.
- C. Where the proposed stormwater runoff will alter drainage patterns, including location of discharge points into the State right-of-way, DelDOT will require supporting calculations to show that there will be no adverse impacts to the State right-of-way.

- D. If there is an identified drainage problem and the proposed site will impact the problem area, the applicant shall contribute towards mitigation through management of stormwater.
- E. If a stormwater management facility is proposed within the State right-of-way, the following will need to be submitted to DelDOT:
 - 1. Coordinates of BMP (NAD83/DE State Plane)
 - 2. BMP Data Sheet
 - 3. BMP Identification Form: After submission of the form, DelDOT will assign a BMP identification number to be shown on the stormwater management plans.

5.9 EROSION AND SEDIMENT CONTROL

DelDOT will work cooperatively with Delaware Department of Natural Resources and delegated agencies to ensure proper erosion control. These agencies include New Castle County Land Use Engineering, New Castle County Conservation District, Kent Conservation District (KCD), and Sussex Conservation District (SCD).

All developments shall require a plan for erosion control measures during construction, following the requirements outlined in DSSR. The erosion and sediment control measures shall be designed following applicable regulations, guidelines and standards, such as: the Delaware Erosion and Sediment Control Handbook (Delaware ESC Handbook), to minimize erosion and sedimentation during earth moving operations.

When the proposed roadway work is limited to the site and the entrance, and the new impervious area is less than 5,000 sf, the review of the design and construction of stormwater management and erosion and sediment control facilities will be performed by a non-DelDOT delegated agency for DSSR enforcement

If the proposed roadway work is not contiguous with the land development proposal, the review of design and construction of erosion control plans shall be performed by DelDOT for DSSR enforcement. DelDOT will sign the plans upon determination of full compliance of the plans and reports with the requirements of DSSR indicating that the plans meet the requirements of State and Federal sediment and stormwater regulations.

5.10 STRUCTURAL DESIGN

Any structure, including supports, erected over a depression or an obstruction, such as water, a highway or a railway, for carrying vehicular or pedestrian traffic or other moving loads that has at least a 20' span length or has an opening exceeding 20 square feet and is 48" tall shall be reviewed by DelDOT's Bridge Design Section. Other structures not meeting the above criteria, including but not limited to box culverts and non-standard drainage structures, may require a separate review by DelDOT. Additional guidance can be found on DelDOT's website in the Doing Business section.

All structural designs shall be in accordance with applicable regulations, guidelines and standards, such as: *DelDOT's Bridge Design Manual* and *AASHTO's Load and Resistance Factor Design (LRFD) Bridge Design Specifications*.

If there are structural designs required on a plan and not included in the Standard Construction Details, shop drawings signed and sealed by a professional engineer registered in the State of Delaware shall be submitted for review and approval.

5.11 SIGNING AND PAVEMENT MARKING DESIGN

5.11.1 Signing and Pavement Marking Design - Signing

Traffic control signs shall be required for all commercial and subdivision entrances and streets. The signs must be included on the construction plan in accordance with the DE MUTCD, and should follow applicable DelDOT guidelines and standards in addition to the requirements of this manual. All advertising signs in conjunction with a business establishment shall be placed in conformance with the current (at the time of construction) Delaware Code relating to Outdoor Advertising.

5.11.1.1 Placement of Signs

Traffic signs shall be furnished and installed by the developer in accordance with a signing plan prepared by the developer's engineer and approved by DelDOT. Signs shall be installed in accordance with the DE MUTCD and Standard Construction Detail T-15. DelDOT shall provide direction regarding necessary signs and their placement on the signing plan at the time of semi-final construction plan review.

5.11.1.2 Specifications

All signs shall conform to Federal and State specifications applicable to size, color, reflectivity, and fabrication. Developers are encouraged to seek private sources first. DelDOT shall fabricate signs upon request, provided that the developer bears all costs for the signs. Additional information pertaining to the size, colors, and fabrication of signs may be obtained by contacting DelDOT's Sign Shop at 302-760-2000.

5.11.1.3 Signs Required in Residential Development

A. Street Name Signs

1. Placement – The location of street name signs shall be in accordance with Figure 5.11.1.3-a.
2. Specifications – Street name signs shall be fabricated in accordance with applicable regulations, guidelines and standards such as: Section 2D.43 of the DE MUTCD and the DelDOT Guide for Fabrication and Installation of Traffic Control Devices.

B. Development Name Signs

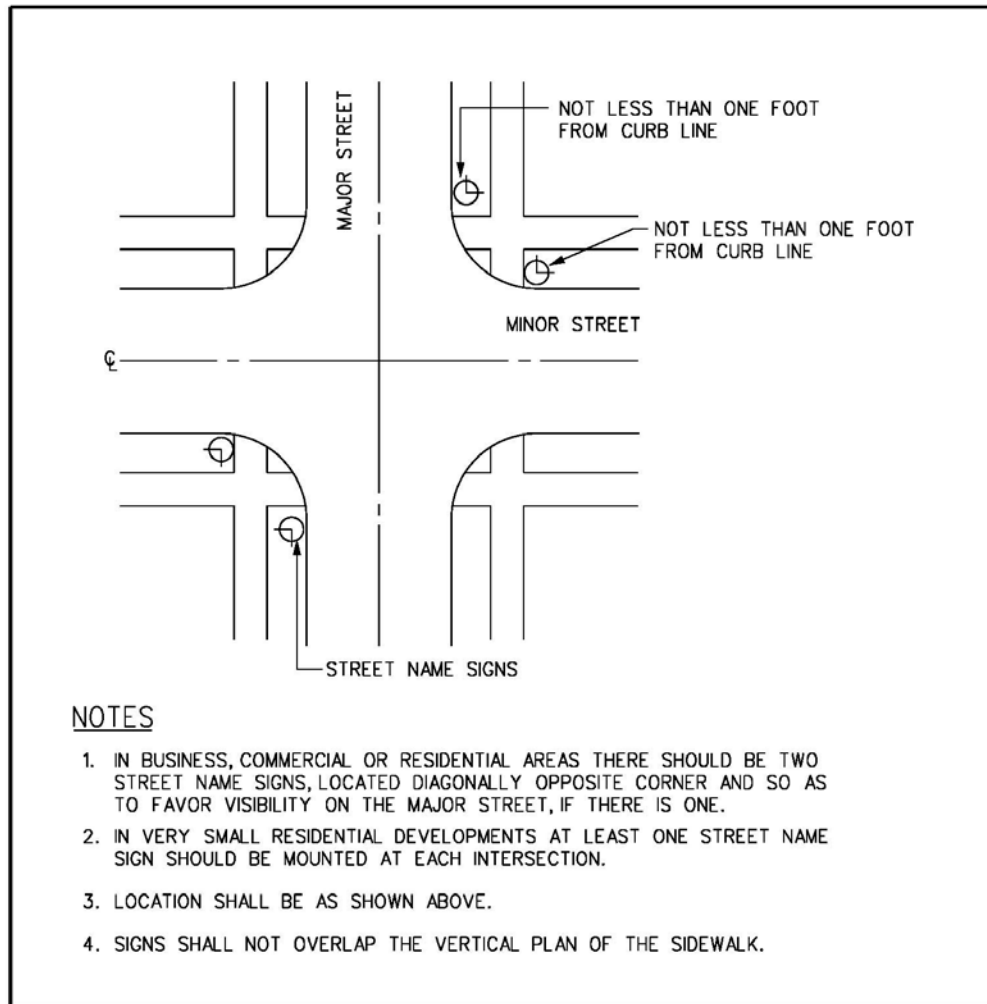
1. Placement – The development name signs shall be installed within the right-of-way of the highway on which the entrance(s) is (are) located. The signs shall be placed within 500 feet of the centerline of the entrance(s). In order to adequately notify motorists of entrances to subdivisions, one set of development name signs can be authorized per major or minor roadway on which there is an entrance.
2. The development name signs are not directional signs nor guide signs and the placement of these signs at adjacent intersections near the development or on State-maintained roads other than the road on which the entrance is located is prohibited.

3. Specifications – All development name signs shall be fabricated in accordance with applicable regulations, guidelines and standards such as: Section 2D.50 of the DE MUTCD and the DelDOT Guide for Fabrication and Installation of Traffic Control Devices, Standard No. S-5.

C. Regulatory and Warning Signs

1. Placement – One advisory speed plaque “25 MPH”/ Pictorial “Watch Children” sign combination (typical) shall be installed at each entrance to a residential development. Other signs shall be installed in accordance with applicable regulations, guidelines and standards such as: DelDOT requirements in accordance with the DE MUTCD and the DelDOT Guide for Fabrication and Installation of Traffic Control Devices.
2. Specifications – All regulatory, warning, and other traffic control signs shall be fabricated in accordance with applicable regulations, guidelines and standards such as: Chapter 2B of the DE MUTCD and the DelDOT Guide for Fabrication and Installation of Traffic Control Devices.

Figure 5.11.1.3-a Street Name Sign Location



5.11.2 Signing and Pavement Marking Design - Pavement Markings

Pavement markings required as part of an entrance design shall be in accordance with DE MUTCD requirements. Type III subdivision streets shall have a centerline and edge line striping in accordance with DE MUTCD guidelines.

When pavement markings are to change on existing roadways, asphalt/pavement milling and overlay is normally performed to provide a clean surface for proposed pavement markings to be installed. A secondary option is to remove the existing pavement markings prior to installing the proposed pavement markings. Removal of pavement striping shall be performed using shot/abrasive grit or hydro-blasting. Grinding will not be permitted. The contractor's method must be approved by DelDOT prior to work beginning. Scarring of the road surface shall be repaired, but DelDOT must approve the repair method prior to work commencing. Limits of repair will be determined by DelDOT. Depending on the severity of the scarring, the Developer may be required to mill (typically to a depth of 2") and overlay the section, across full lane width(s). If the scarring is minor, the restoration may be limited to applying flat black paint or asphalt sealer to cover any exposed aggregate. If scarring isn't severe but the removal creates

shadow lines or ghost lines, the repair may not require milling and paving but the contractor will be required to apply flat black paint or asphalt sealer to the full lane width as directed by DelDOT. When the project is accepted, the Developer will be required to warranty the pavement and any repairs that were implemented where using shot/abrasive grit or hydro-blasting to remove pavement striping. The warranty period following acceptance of the project shall be 3 years.

5.12 MAINTENANCE OF TRAFFIC

To ensure that traffic control for construction along State-maintained roadways has been addressed on all land development projects, a Transportation Management Plan (TMP) shall be required. DelDOT will provide guidance on the type of TMP required during the construction plan review process. The TMP must be submitted and approved prior to final construction plan approval by the Subdivision Engineer. All TMP's shall be developed in accordance with the DE MUTCD and shall be submitted to the Subdivision Engineer with the construction plans. The TMP shall be reviewed and approved by DelDOT's Safety Section. Additional guidance on TMP warrants and requirements can be found in Chapter 6 of the DE MUTCD.

Work hour restrictions may be required depending upon the type of work being performed or the type of roadway affected. See Chapter 6 of this manual for additional work hour restrictions for construction in or adjacent to residential areas.

5.13 SIGNAL DESIGN

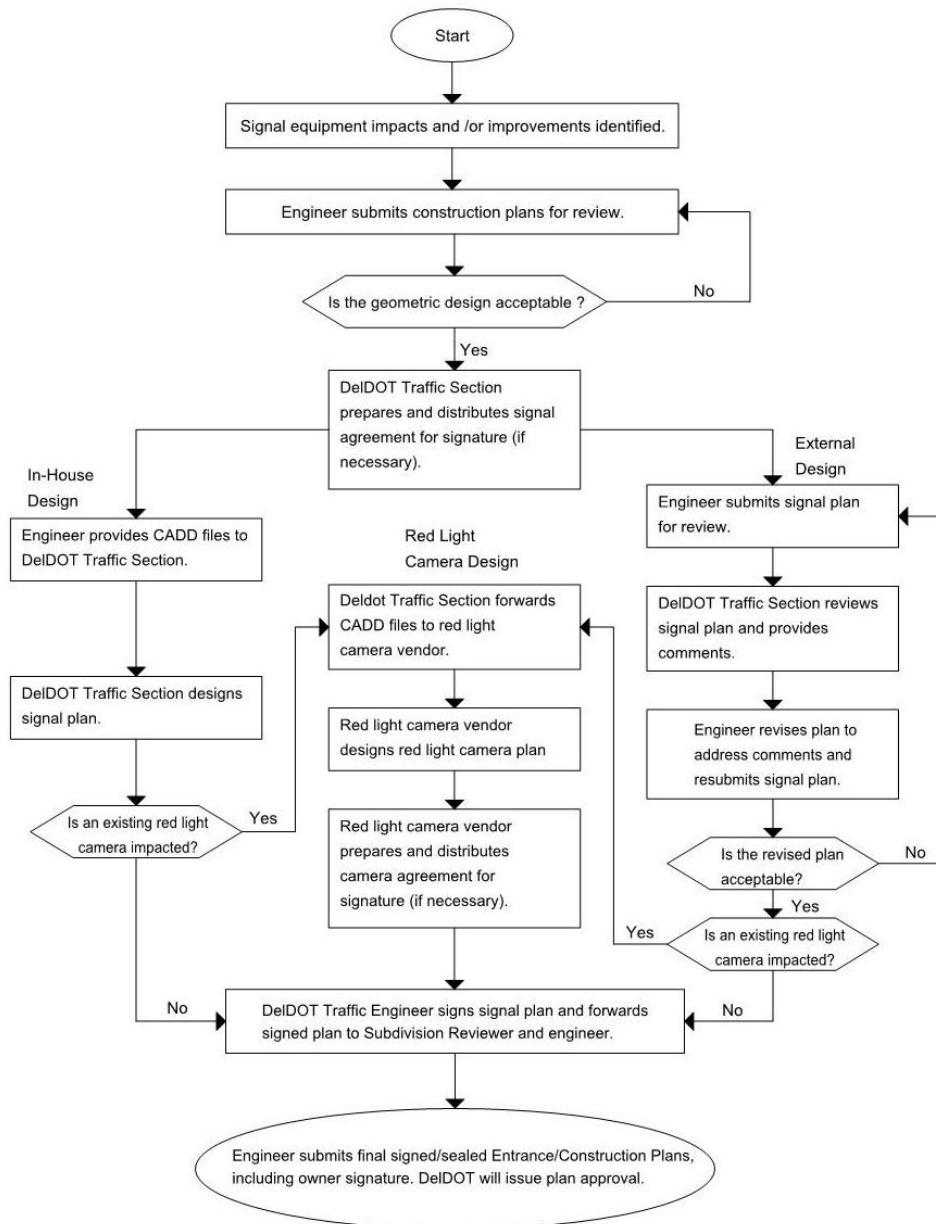
Signal design required for an entrance or offsite improvements within the right-of-way shall be performed by DelDOT's Traffic Section, their representatives or developer's representatives. Construction of pole foundations, channelizing islands, conduits, etc. shall be performed by the developer's contractor. DelDOT's on-call electrical/traffic contractor shall install the proposed signal poles, traffic signal heads, pedestrian signals, cabling and associated equipment.

Prior to beginning signal design, the engineer shall provide a copy of the approved signal justification study to DelDOT's Traffic Section for review and approval. Prior to beginning signal design, additional survey may be needed to depict all below and above ground signal equipment. Once the project's geometric, drainage, stormwater and utility designs have been developed to a point that DelDOT finds the design satisfactory and feels that no major changes are anticipated, the engineer will be asked to forward electronic files of base survey and proposed improvements in CADD format to DelDOT's Traffic Section to begin signal design.

The Traffic Section will coordinate with the local utility company as needed and complete the signal design. Close coordination between the engineer and DelDOT Traffic Section during this stage is required to efficiently complete the signal design and incorporate the signal plans into the project's design.

Once the signal plans are completed and signed by DelDOT, the Traffic Section will distribute electronic files to the site engineer to incorporate the signal plans into the project's plan set prior to DelDOT issuing plan set approval. The developer shall make a fair share contribution towards the signal design and construction costs based on DelDOT Traffic Section's estimate.

Figure 5.13-a Signal Design Flow Chart



5.14 UTILITY DESIGN

Utility design and relocations within the right-of-way shall be performed in accordance with DelDOT's *Utilities Design Manual* available at http://www.deldot.gov/information/pubs_forms. Where feasible, underground utilities shall be placed behind the proposed curb line or in an established utility easement.

- A. Existing utilities shall be shown on the plans with the best available information. This may be done by placing a design ticket call to Miss Utility of Delaware (1-800-282-8555) to obtain a list of utilities

having facilities within the limits of construction in order to obtain as-built plans from utility companies and/or by field designating utilities.

- B. The developer's engineer shall ensure coordination with utility companies for overhead facility relocation design (to determine real estate needs), and underground facility conflict review. Based upon the extent of underground utility conflicts, utility test pits and designation shall be performed by the applicant during design. Also, plans shall provide locations and approximate depths of large cuts and fills.

Ongoing coordination with affected utility companies is required during design so the proper amount of real estate can be acquired or dedicated to facilitate the relocation, and to coordinate these facilities with other aerial structures such as signal poles and light poles. It is also imperative that the utility test hole information be analyzed to determine which underground utility conflicts cannot be avoided. Once it is determined that it is not possible to avoid the utility conflict, the affected utility company needs to be informed as soon as possible so underground relocation design can commence. If underground utility relocation will impact real estate needs, it should be identified as early as possible.

- C. Should utility relocations be required, the engineer shall prepare and submit a utility relocation plan for review. It should also be noted that if any conflicts arise as the result of a design change after plan submittal, then the engineer shall notify the affected utility company as soon as it is identified.

5.15 LIGHTING DESIGN

Lighting may be required for an entrance or offsite improvements, at the discretion of DelDOT.

Lighting design for an entrance or offsite improvements within the right-of-way will be performed in accordance with applicable guidelines and standards such as: DelDOT's *Lighting Design Guidelines*, available at http://www.delDOT.gov/information/pubs_forms. DelDOT's Traffic Section or their representatives will perform the lighting and electrical analysis and design and a DelDOT on-call electrical/traffic contractor shall install the proposed lighting. Once the project's geometric, drainage, stormwater and utility designs have been developed to a point that DelDOT finds the design satisfactory and feels that no major changes are anticipated, the engineer will be asked to forward the electronic files in CAD format to DelDOT's Traffic Section to begin lighting design.

The Traffic Section will coordinate with the local electric company to provide service and complete the lighting and electrical analysis and design. Close coordination between the engineer and DelDOT Traffic Section during this stage is required to efficiently complete the lighting design and incorporate the lighting into the overall project's design plan.

Once the lighting design is completed, the Traffic Section will distribute electronic files to the site engineer to incorporate the lighting plans into the project's plan set prior to DelDOT issuing plan set approval. The developer shall make a fair share contribution towards the lighting design and construction costs based on the DelDOT Traffic's estimate.

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CHAPTER 6

CONSTRUCTION ADMINISTRATION

6.1 PURPOSE

This chapter addresses the permit application process, Notice to Proceed (NTP), and inspection and acceptance procedures for construction of commercial sites, subdivision streets, including industrial streets, and off-site improvements.

Implementation of these procedures will ensure that construction within the State right-of-way is in compliance with this *Development Coordination Manual*, Standard Specifications, Standard Construction Details, *Construction Manual* and other applicable DelDOT standards.

6.2 UTILITIES

Any proposed utility work within the existing or proposed right-of-way of a State-maintained roadway shall require a permit in accordance with the DelDOT *Utilities Manual* prior to the start of construction. Utility work with the proposed right-of-way will only be allowed to occur at the discretion of the Public Works Engineer and in conjunction with a Temporary Entrance Permit as outlined in Section 6.4.2.1 of this manual.

Upon completion and acceptance of the subdivision or industrial streets, the utilities that are located within the State right-of-way shall be franchised in accordance with the existing countywide blanket agreement for each individual utility.

The proposed sanitary sewer and water utilities within a new subdivision or industrial street shall be shown on the construction plans as outlined in Chapter 4.

Utilities that must be located within the dedicated right-of-way or in easements granted in DelDOT's favor shall be installed in accordance with the DelDOT *Utilities Manual*. Prior to beginning utility construction, it shall be the contractor's responsibility to contact any utility companies involved in order to secure the most accurate information available as to utility location and elevation. No construction around or adjacent to the utilities shall begin without notifying their owners at least 48-hours in advance. The contractor shall take the necessary precautions to protect the existing utilities and maintain uninterrupted service. Any damage caused to utilities by the contractor shall be immediately and completely repaired at the contractor's expense. The contractor shall contact Miss Utility of Delaware at 1-800-282-8555 to have utilities located within the limits of construction prior to beginning construction.

For entrance or offsite improvement projects requiring utility relocations, the applicant shall submit a utility relocation plan and correspondence from the impacted utility companies stating preliminary approval to the relocation and design of the utilities prior to the DelDOT pre-construction meeting. Physical construction shall not begin until the utility plans are approved, each impacted utility company issues final approval and a DelDOT utility permit is issued.

Utility conflicts with future State-maintained street construction shall be corrected by the utility company or the developer at no expense to the State. Any modification to the existing or proposed utility locations shall be reflected on the as-built plans.

On State-maintained roadways, utilities should be located outside of the pavement, sidewalk and curb whenever possible. Where utilities need to be located within the pavement, manholes and valves should not be placed at the crown of the roadway or within the vehicle wheelpath.

Requests for utility permits must be submitted by the utility company through the electronic utility permitting system (UPA System).

Figure 6.2-a DelDOT Public Works Engineers

New Castle County (DelDOT Canal District) Public Works Engineer 250 Bear-Christiana Road Bear, DE 19701 (302) 326-4679
Kent County (DelDOT Central District) Public Works Engineer 930 Public Safety Blvd. Dover, DE 19901 (302) 760-2433
Sussex County (DelDOT South District) Public Works Engineer 23697 DuPont Blvd. Georgetown, DE 19947 (302) 853-1340

6.3 COST ESTIMATE

Following the approval of the final construction plan, a separate cost estimate shall be prepared for the improvements and shall be provided to DelDOT for review. For internal subdivision street cost estimates, follow the security determination chart in the construction agreement for subdivision streets (see online content housed at <http://devcoord.deldot.gov/>). Each item of construction shall be listed in accordance with DelDOT's *Standard Specifications*. The method of measurement for each item shall be in accordance with the *Standard Specifications* and a current unit price shall be supplied for each item.

Guidance on calculation of quantities and cost estimates can be found in the Doing Business section of DelDOT's website, within the Design Resource Center in the Cost Estimating & Project Timing subsection.

The itemized construction cost estimate shall be broken down to provide sufficient detail to allow DelDOT to establish the accuracy and completeness of the estimate. Each material shall be accounted for as a separate item in the estimate as illustrated in Figure 6.3-a.

DelDOT, as part of the review, shall approve all the cost estimates. These estimates shall be used to determine the security required for each part of construction.

Figure 6.3-a Itemized Cost Estimate Example

Item No.	Item Description	Quantity	Unit Cost	Total Cost
701021	Integral Portland Cement Concrete Curb & Gutter, Type 2	15,000 l.f.	\$20.00 per l.f.	\$300,000.00
401648	Superpave, Type B Hot-Mix, 160 Gyration, Pg. 64-22	2,500 tons	\$75.00 per ton	\$187,500.00

6.4 COMMERCIAL ENTRANCES

6.4.1 Commercial Entrances - Application Process

This section outlines the application process for the construction of commercial entrances. Prior to issuance of a permit for entrance construction the following documents must be submitted to the Public Works Engineer for review and approval:

- A. An application for commercial entrance permit (for more information go to <http://devcoord.deldot.gov> > Forms)
- B. Proof of ownership from the local land use agency (this must be an official document or on letterhead from the local land use agency) or an affidavit indicating property owner's name and Tax Map I.D. Number
- C. If the applicant is not the current property owner, the power of attorney form must be completed and included in the application (See online content housed at <http://devcoord.deldot.gov> for a sample power of attorney form). The Power of Attorney form is not used to issue the permit to someone other than the property owner. Its purpose is to allow someone else to sign for the permit. The permit holder is still the property owner.
- D. A copy of the recorded record plan, which is consistent with the DelDOT "No Objection to Recordation" stamped plan and all appropriate signatures, seals, plot book and page number
- E. Two paper sets along with an electronic copy in PDF format of construction drawings that have been approved by DelDOT's Subdivision Engineer
- F. The itemized construction cost estimate (See Figure 6.3-a for a sample cost estimate.)

G. A security in the amount of 150% of the approved construction cost estimate. A security will not be required for federal, state, and local government projects. The following forms of security shall be acceptable:

1. Surety Bond issued by a bonding company licensed in Delaware
2. Commercial Letter of Credit issued by a lending institution licensed in Delaware
3. Certified check with escrow agreement. This requires completion of a Federal W-9 form and a Delaware State Substitute W-9 form available online at http://accounting.delaware.gov/w9_notice.shtml

The approved security forms are provided online at <http://devcoord.deldot.gov/> > Forms.

H. Approval letter from DNREC or the DNREC approved delegated agency

I. An executed construction agreement for projects requiring 3rd party inspection

J. A copy of the construction schedule

K. A copy of the material sources. A sample form is available on DelDOT's Doing Business website at <http://devcoord.deldot.gov/> > Forms.

6.4.2 Commercial Entrances - Notice to Proceed (NTP)

After review and approval of the documentation and security, the Public Works Engineer will evaluate the following items prior to issuance of a permit for entrance construction. The permit shall serve as the NTP:

Preconstruction Meeting – The Public Works Engineer will determine if a preconstruction meeting is needed prior to issuance of the NTP. The preconstruction meeting shall be scheduled by the Public Works Engineer or designee and attended by appropriate representatives of DelDOT, the developer, design engineer, contractor, utility firms and such other agencies as may be deemed appropriate. Items to be discussed at this meeting may include, but are not limited to, the following:

- A. Contractor and subcontractor
- B. Source of supplies
- C. Maintenance of traffic
- D. Removal of unsuitable materials
- E. Construction access
- F. Construction Inspection Coordination
- G. Utility coordination
- H. Material testing
- I. Construction schedule
- J. Contributions (if applicable) to Signal Improvements, Traffic Signal Revolving Fund, and/or Bicycle and Pedestrian Improvement Fund
- K. Executed Letter Agreements (if applicable)
- L. Attestation by relevant agencies that all required permits have been obtained
- M. Coordination of proposed work with regard to the record plans and construction plans as necessary

Once the Public Works Engineer is satisfied with the items listed above, the permit for entrance construction will be issued.

6.4.2.1 Temporary Entrance Permits

The developer may request from the Public Works Engineer a temporary entrance permit, to perform clearing and grading activities and installation of utilities, at its own risk for a period of thirty calendar days, prior to final approval of construction plans by the DelDOT Subdivision Engineer. Only the work that is directly part of the temporary entrance permit may be performed within the State-maintained right-of-way, and no construction materials (such as graded aggregate base course, asphalt or drainage pipe) can be placed until after the NTP is issued by the Public Works Engineer. If final plan approval is not received within thirty calendar days of the issuance of the temporary entrance permit, all construction activities shall be stopped and the temporary entrance permit shall be withdrawn.

No foundation work or building construction is permitted under a temporary entrance permit. The temporary entrance permit is not to be used to obtain a County or Municipal building permit.

Once the DelDOT Subdivision Engineer approves the construction drawings, two complete sets of approved construction drawings shall be forwarded to the Public Works Engineer. The drawings must have the approval stamp of the DelDOT Subdivision Engineer.

Upon receipt of approved construction drawings and following a review of the items required in Section 6.4.1, the Public Works Engineer will evaluate the items specified in Section 6.4.2 prior to the issuance of a permit for entrance construction. The permit will serve as the notice to proceed, allowing the developer to proceed with permanent construction activities.

6.4.3 Commercial Entrances - Inspection and Acceptance

Projects are divided into two levels based on their size and impact on the abutting State-maintained roadway. This categorization helps DelDOT identify the level of involvement necessary for each project, and what division will manage the construction of the project. Figure 6.4.3-a summarizes the two levels of construction inspection.

DelDOT reserves the right to inspect and approve any construction associated with the proposed entrance in accordance with Section 6.8 and the inspection procedures in DelDOT's *Construction Manual*.

DelDOT also reserves the right to make such changes, additions, and relocations to the approved entrance plans that may be considered necessary to ensure compliance with this Development Coordination Manual along with applicable guidelines and standards, such as those listed in Section P.9.1 of this manual, which include but are not limited to: Manuals, Guidelines and Policies published by the *American Association of State Highway and Transportation Officials (AASHTO)*; DelDOT's *Road Design Manual (RDM)*; DelDOT's *Bridge Design Manual*; DelDOT's *Design Guidance Memorandums (DGM)*; DE MUTCD; other **Nationally Accepted Standards (NAS)** and ensure the safety of the traveling public. Non-compliant structures and roadside obstructions including brick mailboxes shall be removed at DelDOT's direction prior to final acceptance.

The Developer shall request a semi-final inspection when all work is complete. Once the semi-final inspection is completed and accepted, an accessibility inspection shall be scheduled. Once the accessibility inspection punch list items are completed and accepted a final inspection may be requested. The Public Works Engineer or the Construction Group Engineer may then schedule a final inspection which shall be conducted by DelDOT. DelDOT personnel, accompanied by the developer and/or his/her

contractor, and representatives of the appropriate County and/or municipal officials, shall inspect the site and determine those items of work, if any, that must be completed, repaired or replaced.

In the event of failure to perform the intended construction in accordance with the terms of the commercial entrance permit as determined by DelDOT, the developer shall receive written notice and have fourteen calendar days to provide DelDOT with an approved schedule for completion. If a schedule for completion has not been received within the specified time period, the developer shall receive a second written notice and have an additional seven calendar days to meet in person with DelDOT and present an approved schedule for completion.

Should the developer fail to provide a satisfactory construction schedule or fail to comply with the approved completion schedule, DelDOT shall withdraw its permit and shall have the right to collect the construction security to correct the condition. All costs incurred in the removal and/or correction of defective workmanship and/or materials over and above the construction security shall be borne by the applicant.

Figure 6.4.3-a Construction Inspection Responsibilities

	Criteria			
Level	Existing Roadway AADT	Total Site ADT	Traffic Impact	Inspection
Level I ²	Kent/Sussex ≤ 4,000 New Castle ≤ 10,000	≤ 2,000	Construction is not complex and has low impact to the traveling public	DelDOT will provide inspection for Level I projects through the Public Works Section in accordance with the construction agreement and DelDOT's <i>Construction Manual</i> .
Level II	Kent/Sussex > 4,000 New Castle >10,000	> 2,000	Construction is complex or has significant impact to the traveling public	The applicant will be required to enter into a construction inspection agreement with an inspection firm currently under contract with DelDOT. The applicant will reimburse DelDOT for all inspection costs. DelDOT will coordinate management of the inspection.

Notes:

1. All work shall be in accordance with the construction agreement and DelDOT's *Construction Manual*.
2. Any work which exceeds the thresholds of 2 of the 3 above criteria for Level I review shall require a Level II inspection.
3. Traffic impact and complexity may include but not be limited to: night work, detours, road closures, work impacting major intersections, projects with complex construction phasing, roadway realignment and total reconstruction.
4. Any structure classified as a bridge shall require a Level II inspection.

6.4.4 Commercial Entrances - Maintenance

After the entrance has been constructed to the satisfaction of DelDOT and the commercial entrance permit has been issued, the property owner shall be responsible for the repair of any deficiencies within the entrance for a period of one year. A deficiency is generally defined as an item that does not meet DelDOT's specifications or the approved plans. Deficiencies identified by DelDOT shall be repaired in accordance with DelDOT's *Construction Manual*. If repairs are not initiated within three months of notification, then DelDOT shall void the commercial entrance permit and access to the property shall be denied.

After a one year warranty period, DelDOT shall assume responsibility for future maintenance of the entrance within the shoulder area and any necessary cleaning or replacing of drainage pipe, and guardrail repair within the right-of-way. Entrance appurtenances beyond the edge of shoulder are the responsibility of the property owner for maintenance. This includes any traffic control signs (i.e., Stop or Yield) that may need future maintenance. Should the applicant, heirs, or assigns desire to alter or reconstruct any portion of the entrances or appurtenances, application for a new permit must be submitted to DelDOT for approval.

Upon acceptance of the improvements within the right of way into the State maintenance system, while retaining all controls over the dedicated right-of-way or easements, DelDOT assumes no responsibility for:

- A. The paved portion of the entrance
- B. Entrance curbing and gutters
- C. Maintenance of grass and plantings in any portion of the right-of-way, including landscaped islands and medians
- D. Closed drainage systems, including inlets and pipes, outside of the right of way, that do not convey roadway runoff
- E. Open drainage systems not within the right of way, or not adjacent and parallel to the right of way, regardless of whether the system conveys roadway runoff
- F. Removal of silt and debris that have a minimal impact on the drainage system in open swales, gutters and inlet openings
- G. Removal and/or maintenance of improvements, such as landscaping, underground sprinklers, etc.
- H. Maintenance of sidewalks, lighting, and entrance amenities
- I. Guardrails outside of the right of way
- J. Physical removal of snow and ice
- K. All signs, including signs shown on the approved plans. The owner or maintenance corporation shall be responsible for maintenance of all signs installed as part of the project.

6.5 SUBDIVISION STREETS

6.5.1 Subdivision Streets - Application Process

This section outlines the application process for the construction of new subdivision streets dedicated for public use and intended for acceptance into State maintenance. Prior to issuance of a NTP the following documents must be submitted to the Public Works Engineer for review and approval:

- A. A copy of the recorded record plan, stamped with DelDOT's "No Objection" and stamped or signed indicating final approval from the local land use agency
- B. Two sets of construction drawings that have been approved by DelDOT's Subdivision Engineer
- C. For phased subdivisions, two copies of the signed and sealed title sheet, listing the streets to be constructed in a particular phase. Subsequent phases will follow the same process
- D. Proof of ownership from the local land use agency (this must be an official document or on letterhead from the local land use agency) or an affidavit indicating property owner's name and Tax Map I.D. Number
- E. A security using the security determination chart in the construction agreement for subdivision streets (see <http://devcoord.deldot.gov> > Forms). Also, a security in the amount of 150% of the estimated cost to construct all entrances that abut local and higher order roads. A security will not be required for federal, state, and local government projects. The approved security forms for subdivision streets are provided at <http://devcoord.deldot.gov> > Forms. Entrances to subdivisions with non-State-maintained streets use the same forms that are used for commercial entrances

The following forms of security shall be acceptable:

- 1. Surety Bond issued by a bonding company licensed in Delaware
- 2. Commercial Letter of Credit issued by a lending institution licensed in Delaware
- 3. Certified check with escrow agreement. This requires completion of a Federal W-9 form and a Delaware State Substitute W-9 form available online at http://accounting.delaware.gov/w9_notice.shtml

The approved security forms are provided online at <http://devcoord.deldot.gov/> > Forms.

- F. Completed construction agreement for subdivision streets which are to be a minimum of 1000 ft. in length per street within an agreement or as approved (see <http://devcoord.deldot.gov> > Forms).
- G. Approval letter from DNREC or the DNREC approved delegated agency
- H. An executed construction agreement for projects requiring 3rd party inspection
- I. A copy of the construction schedule
- J. A copy of the material sources. A sample form is available on DelDOT's Doing Business website at <http://devcoord.deldot.gov/> > Forms

6.5.2 Subdivision Streets - Notice to Proceed (NTP)

After review and approval of the construction agreement and security, the Public Works Engineer will address the following items prior to issuance of the NTP:

Preconstruction Meeting – The Public Works Engineer will determine if a preconstruction meeting is needed prior to issuance of the NTP. The preconstruction meeting shall be scheduled by the Public

Works Engineer or designee and attended by appropriate representatives of DelDOT, the developer, the design engineer, contractor, utility firms and such other agencies as may be deemed appropriate. Items to be discussed at this meeting may include, but are not limited to, the following:

- A. Contractor and subcontractor
- B. Source of supplies
- C. Street construction phasing
- D. Maintenance of traffic
- E. Removal of unsuitable materials
- F. Construction Inspection Coordination
- G. Utility Coordination
- H. Material Testing
- I. Construction Schedule
- J. Contributions (if applicable) to Signal Improvements, Traffic Signal Revolving Fund, and/or Bicycle and Pedestrian Improvement Fund
- K. Executed Letter Agreements (if applicable)
- L. Attestation by relevant agencies that all required permits have been obtained
- M. Coordination of proposed work with regard to the record plans and construction plans as necessary
- N. Pavement placement guidelines and restrictions per Section 3.6.1 for the first lift and final wearing course of asphalt pavement on subdivision streets

Following approval of the required submissions and a successful preconstruction meeting, the Public Works Engineer shall issue the NTP, allowing the developer to proceed with construction on bonded streets.

Construction of the entrance to the subdivision shall be complete (excluding the top paving course) prior to the 1st certificate of occupancy. Once construction has started on the roadway it must remain active until completed up to but not including the final lift of asphalt. The entrance may be required to be built sooner at the discretion of the Public Works Engineer.

6.5.2.1 Temporary Construction Permits

If a project is nearing approval as determined by DelDOT, then the developer may request from the Public Works Engineer a temporary entrance permit, to perform specific allowable construction activities such as clearing and grading at its own risk prior to final approval of subdivision construction plans by the DelDOT Subdivision Engineer. Only the work that is directly part of the entrance permit may be performed within the State-maintained right-of-way, and no construction materials (such as graded aggregate base course, asphalt or drainage pipe) can be placed until after the construction plans of the subdivision drawings are stamped "APPROVED" by the DelDOT Subdivision Engineer. Unapproved work activities performed may result in DelDOT closing or removing the temporary construction entrance. If final approval is not received within the timeframe specified in the temporary entrance permit, then all construction activities shall be stopped and the permit shall be withdrawn.

Once the DelDOT Subdivision Engineer approves the subdivision construction drawings, two complete sets of approved construction drawings shall be forwarded to the Public Works Engineer. The drawings must have the approval stamp of the DelDOT Subdivision Engineer.

Upon receipt of approved construction drawings and following review of items required in Section 6.5.1, the Public Works Engineer will evaluate the items specified in Section 6.5.2 prior to issuance of a final “Notice to Proceed” letter, allowing the developer to proceed with permanent street construction within the subdivision.

6.5.3 Subdivision Streets - Inspection and Acceptance

Projects are divided into two levels based on their size and impact on the abutting State-maintained roadway. This categorization helps DelDOT identify the level of involvement with each project, and what division will manage the construction of the project. Figure 6.4.3-a summarizes the two levels of construction inspection to be used for subdivision entrances and/or bridges within subdivisions.

DelDOT reserves the right to inspect and approve any construction associated with the proposed subdivision in accordance to Section 6.9 and the inspection procedures outlined in the *DelDOT Construction Manual*. Additional inspection will be required for all proposed bridges within subdivisions.

DelDOT also reserves the right to make such changes, additions, and relocations to the approved plans that may be considered necessary to ensure compliance with this Development Coordination Manual along with applicable guidelines and standards, such as those listed in Section P.9.1 of this manual, which include but are not limited to: Manuals, Guidelines and Policies published by the *American Association of State Highway and Transportation Officials (AASHTO)*; DelDOT’s *Road Design Manual (RDM)*; DelDOT’s *Bridge Design Manual*; DelDOT’s *Design Guidance Memorandums (DGM)*; DE MUTCD; other **Nationally Accepted Standards (NAS)** and ensure the safety of the traveling public. Non-compliant structures and roadside obstructions including brick mailboxes shall be removed at DelDOT’s direction prior to final acceptance.

The Developer shall request a semi-final inspection when all work is complete. Once the semi-final inspection is completed and accepted, an accessibility inspection shall be scheduled. Once the accessibility inspection punch list items are completed and accepted, a final inspection may be requested. The Public Works Engineer or the Construction Group Engineer may then schedule a final inspection which shall be conducted by DelDOT. DelDOT personnel, accompanied by the developer and/or his/her contractor, and representatives of the appropriate County and/or municipal officials, shall inspect the site and determine those items of work, if any, that must be either completed, repaired or replaced.

- A. As-built construction plans – The as-built construction plans shall be a print of the approved construction plan annotated in red to show all revisions. The developer's engineer shall prepare this plan and submit it to the Public Works Engineer or his/her designee prior to the issuance of the letter recommending acceptance. In addition, the developer’s engineer shall also submit an electronic plan version of the as-built construction plans for the entire subdivision to the Public Works Engineer or designee. The as-built plans shall show in red ink any alterations made in foundations; locations, lengths and elevations of pipe culverts; side ditches, ditch paving, and other drainage items added or altered; final checked stationing; and all other significant variations from the original plans. As-built plans will be required as part of the final acceptance. See Chapter 4 for electronic plan submission requirements.

- B. A letter from the local land use agency stating that all work required by the land use agency is complete
- C. A letter from DNREC or the DNREC-approved delegated agency stating that all work required by the agency is complete (if applicable)
- D. A letter from the maintenance association providing contact information
- E. A letter to DelDOT from the developer releasing DelDOT from any claims as a result of any unpaid bills or obligations. An affidavit releasing DelDOT is to be fully executed and furnished to the Public Works Engineer prior to the issuance of the letter recommending acceptance. See the online content housed at <http://devcoord.deldot.gov/> for a sample affidavit.

Once DelDOT is satisfied with the construction, the inspector shall recommend final acceptance and the release of the security by the Public Works Engineer. The local land use agency shall be notified prior to final acceptance.

In the event of failure to perform the intended construction in accordance with the terms of the construction agreement as determined by DelDOT, the developer shall receive written notice and have fourteen calendar days to provide DelDOT with an approved schedule for completion. If a schedule for completion has not been received within the specified time period, the developer shall receive a second written notice and have an additional seven calendar days to meet in person with DelDOT and present an approved schedule for completion.

Should the developer fail to provide a satisfactory construction schedule or fail to comply with the approved completion schedule, DelDOT shall have the right to collect the construction security to correct the condition as per the construction agreement. All costs incurred in the removal and/or correction of defective workmanship and/or materials over and above the construction security shall be borne by the applicant.

Withdrawal of subdivision street construction approval for failure to complete the intended construction in accordance with the terms of the construction agreement as determined by DelDOT shall be cause to increase the required construction security to 100% of the itemized cost estimate on future subdivision street construction projects proposed by the defaulting applicant.

Following completion of street construction and submission of required documentation to the satisfaction of the Public Works Engineer, the Public Works Engineer will recommend acceptance of the streets and shall prepare an "Acceptance Drawing and an Acceptance Statement" for signatures. Once accepted into the State maintenance system, the Developer shall be responsible for any failure of shared-use paths, sidewalks, pavement or drainage for three years from the date of acceptance, as noted in the Construction Agreement found at <http://devcoord.deldot.gov/>, and as described in Section 6.5.4. If the developer fails to correct three year good faith punch list items, this shall also be cause to increase the required construction security to 100% of the itemized cost estimate on future subdivision street construction projects. Once the three year good faith punch list items have been corrected, standard security rates will be reinstated on future subdivision street construction projects.

Upon acceptance of the streets into the State maintenance system, an entrance permit shall be required for each new entrance to the street as outlined in Chapter 7. The applicant shall be responsible for damage to the curb, gutter, shoulders, and drainage affected by any entrance construction.

In subdivisions where residential streets and cul-de-sacs have been completed and the collector street serving them is complete except for the final lift of asphalt pavement, the developer shall submit the completed residential streets and cul-de-sacs for acceptance. Additionally, the developer shall provide:

- A. One-hundred percent security for the cost to complete the collector street
- B. A letter to the District Office requesting acceptance of the submitted streets

6.5.3.1 Road Number Assignment

The Planning Section shall assign maintenance road numbers to the subdivision streets following acceptance by DelDOT.

6.5.4 Subdivision Streets - Maintenance

- A. Prior to the acceptance of the streets into the State maintenance system, the developer agrees to be responsible to maintain the following items:
 - 1. The paved portion of the roadway, including wedge material around structures and at curb ramps where streets have not received the final course of pavement
 - 2. Curbing and gutters
 - 3. Closed drainage system including inlets and pipes that convey roadway runoff
 - 4. Open ditch systems, including entrance pipes, located within the right-of-way and easements that convey roadway runoff
 - 5. Guardrails
 - 6. Maintenance of grass and plantings in any portion of the right-of-way, including landscaped islands and medians
 - 7. Removal of silt and debris in open swales, gutters and inlet openings
 - 8. Any necessary removal of improvements by residents, such as landscaping, non-conforming mailboxes, underground sprinklers, signs, etc. not shown on the plans
 - 9. Maintenance of sidewalks (including removal of snow and ice), lighting, and entrance amenities.
 - 10. Removal of snow and ice having a measurable snow accumulation on pavement of 4 inches or more. Measurement of snow accumulation should follow the snow removal reimbursement program guidelines.
 - 11. Signs, including all standard roadway signage
- B. Upon acceptance of the streets into the State maintenance system, DelDOT agrees to maintain the following elements within the dedicated right-of-way or easements:
 - 1. The paved portion of the roadway
 - 2. Curbing and gutters
 - 3. Closed drainage system including inlets and pipes that convey roadway runoff
 - 4. Open ditch systems adjacent to and parallel to the roadway, including entrance pipes, located within the right-of-way and easements that convey roadway runoff
 - 5. Guardrails
- C. While retaining all controls over the dedicated right-of-way, DelDOT assumes no responsibility for:
 - 1. Maintenance of grass and plantings in any portion of the right-of-way, including landscaped islands and medians
 - 2. Closed drainage systems, including inlets and pipes, outside of the right of way, that do not convey roadway runoff
 - 3. Open drainage systems not within the right of way or easements, regardless of whether the system conveys roadway runoff

4. Removal of silt and debris that have a minimal impact on the drainage system in open swales, gutters and inlet openings
5. Removal and/or maintenance of improvements by residents, such as landscaping, underground sprinklers, etc.
6. Maintenance of sidewalks, lighting, and entrance amenities
7. Physical removal of snow and ice, however DelDOT offers reimbursement of snow removal expenses through the “Snow Reimbursement Program”
8. Signs, including all standard roadway signage
9. Stormwater management ponds or BMPs, including the outlet structure and discharge pipe

Alleys should be used within the subdivision street layout in accordance with appropriate subdivision design principles and the requirements of local land use ordinances. While DelDOT encourages the appropriate use of alleys in subdivision street layout, DelDOT shall not accept any maintenance responsibilities for alleys in the public right-of-way.

6.6 INDUSTRIAL STREETS

6.6.1 Industrial Streets - Application Process

The application process for industrial streets follows the same procedures as subdivision streets presented in Section 6.5.1 with a separate security for industrial street construction being required in the amount of 10% of the itemized construction cost estimate, as approved by DelDOT. See the online content housed at <http://devcoord.deldot.gov> > Forms for related forms and agreements.

6.6.2 Industrial Streets - Notice to Proceed (NTP)

Requirements for obtaining a NTP for industrial streets follow the same procedures as subdivision streets presented in Section 6.5.2.

6.6.3 Industrial Streets - Inspection and Acceptance

The developer is responsible for providing inspection of the bonded internal industrial park streets as per the construction agreement. The developer's engineer shall be certified by the DelDOT Consultant Control Coordinator to perform construction engineering.

DelDOT reserves the right to inspect and approve any construction associated with the proposed development in accordance with Section 6.8 and the inspection procedures outlined in the *DelDOT Construction Manual*.

DelDOT also reserves the right to make such changes, additions, and relocations to the approved plans that may be considered necessary to ensure compliance with this Development Coordination Manual along with applicable guidelines and standards, such as those listed in Section P.9.1 of this manual, which include but are not limited to: Manuals, Guidelines and Policies published by the *American Association of State Highway and Transportation Officials* (AASHTO); DelDOT's *Road Design Manual (RDM)*; DelDOT's *Bridge Design Manual*; DelDOT's *Design Guidance Memorandums (DGM)*; DE MUTCD;

other **Nationally Accepted Standards (NAS)** and ensure the safety of the traveling public. Non-compliant structures and roadside obstructions including brick mailboxes shall be removed at DelDOT's direction prior to final acceptance.

Upon completion of the construction, the following documents shall be submitted:

- A. As-built construction plans – The as-built construction plans shall be a print of the approved construction plan annotated in red to show all revisions. The developer's engineer shall prepare this plan and submit it to the Public Works Engineer or his/her designee prior to the issuance of the letter recommending acceptance. In addition, the developer's engineer shall also submit an electronic plan version of the as-built construction plans for the industrial street to the Public Works Engineer or designee. The as-built plans shall show in red ink any alterations made in foundations; locations, lengths and elevations of pipe culverts; side ditches, ditch paving, and other drainage items added or altered; final checked stationing; and all other significant variations from the original plans. As-built plans will be required as part of the final acceptance. See Chapter 4 for electronic plan submission requirements.
- B. A letter from the local land use agency stating that all work required by the land use agency is complete
- C. A letter from DNREC or the DNREC-approved delegated agency stating that all work required by the agency is complete (if applicable)
- D. A letter to DelDOT from the developer releasing DelDOT from any claims as a result of any unpaid bills or obligations. An affidavit releasing DelDOT is to be fully executed and furnished to the Public Works Engineer prior to the issuance of the letter recommending acceptance. See the online content housed at <http://devcoord.deldot.gov/> for a sample affidavit.
- E. A certification letter from the consultant inspection, per the Industrial Street Agreement (see the online content housed at <http://devcoord.deldot.gov/>)

If the developer fails to satisfactorily complete industrial park street construction in accordance with the construction agreement for industrial park streets as determined by DelDOT, the developer shall receive written notice and have fourteen calendar days to provide DelDOT with an approved schedule for completion. If a schedule for completion has not been received within the specified time period, the developer shall receive a second written notice and have an additional seven calendar days to meet in person with DelDOT and present an approved schedule for completion.

Should the developer fail to provide a satisfactory construction schedule or fail to comply with the approved completion schedule, DelDOT shall withdraw its agreement and shall have the right to collect the construction security to correct the condition. All costs incurred in the removal and/or correction of defective workmanship and/or materials over and above the construction security shall be borne by the developer.

Upon completion of all aspects of the initial street construction to the satisfaction of the inspecting engineer, a semi-final inspection will be held. Once semi-final inspection punch list items have been completed and accepted, an accessibility inspection shall be scheduled. Once the accessibility inspection punch list items are completed and accepted, the first final inspection shall be requested. The Public Works Engineer or the Construction Group Engineer may then schedule a first final inspection which shall be conducted by DelDOT. DelDOT personnel, accompanied by the developer and/or his/her contractor, and representatives of the appropriate County and/or municipal officials, shall inspect the site and determine those items of work, if any, that must be either completed, repaired or replaced. After the first final inspection, a three-year waiting period is required, during which time, the 10% surety shall

remain in effect, prior to the acceptance of said streets into DelDOT's maintenance system. At this time a final inspection shall be held to ensure that the streets as designed have held up to the anticipated traffic loading. The three-year waiting period is required by DelDOT because of the significantly higher traffic volumes that are typically generated by an industrial park type development and the heavier vehicle loadings that are experienced by the high percentage of truck traffic. DelDOT accepts no responsibility for maintenance or snow removal during the three-year waiting period.

Withdrawal of industrial park street construction approval for failure to complete the streets shall be cause to increase the required construction security to 100% on future industrial park street construction projects requested by the defaulting applicant.

Following completion of the three year waiting period and submission of required documentation to the satisfaction of the Public Works Engineer, the Public Works Engineer will recommend acceptance of the streets and shall prepare an "Acceptance Drawing and an Acceptance Statement" for signatures.

6.6.4 Industrial Streets - Maintenance

Upon acceptance of the streets into the State maintenance system, DelDOT agrees to the following limited maintenance responsibilities:

- A. DelDOT agrees to maintain the following elements within the dedicated right-of-way or easements:
 - 1. The paved portion of the roadway
 - 2. Curbing and gutters
 - 3. Closed drainage systems including inlets and pipes that convey roadway runoff
 - 4. Open ditch systems adjacent to and parallel to the roadway, including entrance pipes, located within the right-of-way and easements that convey roadway runoff
 - 5. Guardrails
 - 6. DE MUTCD-compliant signs
- B. While retaining all controls over the dedicated right-of-way, DelDOT assumes no responsibility for:
 - 1. Maintenance of grass and plantings in any portion of the right-of-way, including landscaped islands and medians
 - 2. Closed drainage systems, including inlets and pipes, outside of the right of way, that do not convey roadway runoff
 - 3. Open drainage systems not within the right of way or easements, regardless of whether the system conveys roadway runoff
 - 4. Removal of silt and debris that have a minimal impact on the drainage system in open swales, gutters and inlet openings
 - 5. Removal and/or maintenance of improvements by occupants, such as landscaping, underground sprinklers, etc.
 - 6. Maintenance of sidewalks, lighting, and entrance amenities
 - 7. Physical removal of snow and ice
 - 8. Non DE MUTCD-compliant signs

6.7 OFF-SITE IMPROVEMENTS (PUBLIC ROAD CONSTRUCTION)

6.7.1 Off-site Improvements - Application Process

During the land development process, DelDOT may determine the need for road improvements beyond the entrance to the site. These improvements shall be required as part of the entrance approval. The developer shall enter into an agreement with DelDOT outlining the implementation of the improvements. This may be for the actual design, construction, and inspection of the improvements, or monetary contribution for the actual construction of the improvements. This agreement shall be executed prior to entrance plan approval. See section 2308 of the Delaware Administrative Code (“2308 Development Related Improvements Requiring New Rights-of-way” at <http://regulations.delaware.gov/AdminCode/title2/2000/2300/>) for regulations regarding improvements requiring new rights-of-way.

If a proposed development triggers the need for improvement to the abutting State-maintained roadway beyond the entrance, the following documents shall be obtained and submitted prior to the start of construction.

- A. Approved roadway construction drawings. Refer to DelDOT’s publications and forms web page for the checklist for offsite plan development (www.DelDOT.gov).
- B. Construction agreement for public roads (off-site improvements)
- C. The itemized cost estimate. See Figure 6.3-a for a sample cost estimate
- D. Prior to DelDOT issuing a NTP for the construction of the offsite improvements the developer shall provide DelDOT with a security in the amount of 100% of the estimated construction cost as approved by DelDOT. A security will not be required for state, federal and local government projects.

The following forms of security shall be acceptable:

- 1. Surety Bond issued by a bonding company licensed in Delaware
- 2. Commercial Letter of Credit issued by a lending institution licensed in Delaware
- 3. Certified check with escrow agreement. This requires completion of a Federal W-9 form and a Delaware State Substitute W-9 Form available online at http://accounting.delaware.gov/w9_notice.shtml

The approved security forms are provided online at <http://devcoord.deldot.gov> > forms.

6.7.2 Off-site Improvements - Notice to Proceed (NTP)

The following requirements must be fulfilled before DelDOT issues a NTP for off-site improvements:

- A. Approved construction plans and estimates
- B. Executed construction agreement for public roads (off-site improvements)
- C. Security for the proposed work
- D. A preconstruction meeting shall be scheduled by the Public Works Engineer or Construction Group Engineer and attended by appropriate representatives of DelDOT, the developer, the developer’s engineer and contractor, utility firms and such other agencies as may be deemed appropriate. Items to be discussed at this meeting may include but are not limited to the following:
 - 1. Contractor and subcontractor
 - 2. Source of supplies

3. Street construction phasing
4. Maintenance of traffic
5. Removal of unsuitable materials
6. Utility coordination
7. Construction access
8. Copy of construction contract between the developer and his contractor if applicable
9. Materials testing
10. Construction inspection coordination
11. Attestation by relevant agencies that all required permits have been obtained
12. Coordination of proposed work with regard to the record plans and construction plans as necessary

Following approval of the required submissions and a successful preconstruction meeting, the Public Works Engineer or DelDOT's Construction Group Engineer shall issue the NTP.

6.7.3 Off-site Improvements - Inspection and Acceptance

Off-site improvement projects are divided into two levels based on their size and impact on the abutting State-maintained roadway. This categorization helps DelDOT identify the level of involvement with each project, and what division will manage the construction of the project. Figure 6.4.3-a summarizes the two levels of classification for off-site inspection and acceptance.

The following roles and responsibilities shall apply to Level II impacts:

A. As-Built Plans

The as-built construction plans shall be a print of the approved construction plan annotated in red to show all revisions. The inspecting engineering firm shall prepare this plan and submit it to the Public Works Engineer or his/her designee prior to the issuance of the letter recommending acceptance. In addition, the inspecting engineer shall also submit an electronic plan version of the as-built construction plans for the off-site improvement to the Public Works Engineer or designee. The as-built plans shall show in red ink any alterations made in foundations; locations, lengths and elevations of pipe culverts; side ditches, ditch paving, and other drainage items added or altered; final checked stationing; and all other significant variations from the original plans. As-built plans will be required as part of the final acceptance of the off-site improvements. See Chapter 4 for electronic plan submission requirements.

B. Acceptance

Following completion of roadway construction and submission of required documentation to the satisfaction of the Public Works Engineer, the Public Works Engineer will recommend acceptance of the roadways and the Subdivision Engineer shall accept the work. The developer will then be released of liability. The local land use agency shall be notified when the work has been accepted.

6.8 CONSTRUCTION RESPONSIBILITIES

The following outlines the applicant's construction responsibilities:

- A. The applicant shall furnish all materials and assume all costs of construction deemed necessary by the Public Works Engineer or the Construction Group Engineer in accordance with the approved plans, agreement and/or the permit.
- B. All material and construction shall be in accordance with DelDOT's current *Standard Specifications*.
- C. The entrance improvements for a commercial site must be complete and accepted prior to the issuance of the certificate of occupancy by the local land use agency.

Construction of the entrance (except for the final wearing course) to a subdivision shall be completed, per Section 6.5.2, prior to the 1st certificate of occupancy. Once construction has started on the roadway it must remain active until completed up to but not including the final lift. The entrance may be required to be built sooner at the discretion of the Public Works Engineer.

- D. In the event that poles, lights, signs, traffic signals, or other appurtenances need to be moved per the approved plans, or per significant changes in field conditions as identified by the Public Works Engineer, the applicant shall pay all costs involved in the relocation. The applicant shall resolve with the affected utility any required utility relocation, the time of moving and the required reimbursement prior to the preconstruction meeting.
- E. In the event that a mailbox needs to be relocated, DelDOT authorizes the developer to relocate the mailbox with prior notification to the property owner. The developer shall be responsible for any damage to the mailbox and, through coordination with the local postal service, shall be required to maintain the mail service at all times.

6.8.1 Construction Responsibilities - Pavement Placement Guidelines

The first lift of asphalt pavement shall be placed no later than 18 months from the NTP or the beginning of the second winter after the NTP.

The final wearing course of asphalt pavement on subdivision streets shall not be placed until 75% of the houses contributing traffic to those streets have been completed or as directed by the Public Works Engineer.

Prior to placing the pavement sections, the subgrade shall be prepared and test-rolled as detailed in DelDOT's *Standard Specifications*. If the test rolling shows the subgrade to be unstable, the contractor shall scarify, disc, aerate or add moisture and re-compact the subgrade to the extent that when retested it shall be stable. If, in the opinion of the Public Works Engineer or the Construction Group Engineer, there are areas to be removed or undercut, they may be ordered excavated and replaced with approved material.

6.8.2 Construction Responsibilities - Work Hour Restrictions

If DelDOT determines that extended work hours (e.g. night work) are required to construct the improvements associated with a project adjacent to residential properties, the Developer shall notify the local land use agency, local municipality and residents in a timely fashion of the proposed work and scheduled work hours. This notification, as approved by DelDOT, shall be provided to residents at least 2 weeks in advance of the anticipated start of work. Such notification shall include a description of the proposed work, the proposed use of any equipment that may cause noise, vibration or odor disruptions to the residents, and an estimate of the time required to complete the project. The developer must also request a noise ordinance waiver from the local land use agency and/or local municipality if required to do so as part of that local code.

If the proposed work associated with the project (regardless of scheduled time) may cause any vibration or other damage to neighboring property, the developer shall complete a pre-work survey, including video survey of basements and foundations, of the potentially affected properties to determine the baseline condition of those properties. The developer shall monitor the properties during construction to ensure that any vibration or other damage is minimized. If any damage does occur, the developer is responsible to reimburse the property owners.

6.9 INSPECTION

The developer shall provide DelDOT and/or consultant inspectors, access to all parts of the work and furnish such information and assistance as is required to make a complete and detailed inspection as described in DelDOT's *Standard Specifications*.

During construction, the developer shall provide DelDOT and/or consultant inspectors at least two working days' notice of all major construction activities. These activities shall include, but are not limited to, the following:

- A. Installation of utilities
- B. Installation of drainage pipe and all major structures
- C. Underdrains
- D. Test rolling of the subgrade
- E. Placement of base material
- F. Placement of curbing
- G. Placement of paving material (underground utilities must be installed and utility permits closed out prior to placement of paving and seeding)
- H. Installation of sidewalk

A DelDOT Designated Inspector must be present during these construction activities. All materials shall be released, inspected, tested, and approved before being incorporated in the work in accordance with DelDOT's *Standard Specifications* Section 106 – Control of Material.

All inspection of paving materials used and placement of paving materials shall be in accordance with the Contractor's Quality Control (QC) Plan. The Contractor's QC Plan shall be prepared in accordance with DelDOT's Special Provision 401699 – Quality Control/Quality Assurance of Bituminous Concrete.

Credit for Bituminous Concrete – If the Contractor constructs any pavement that does not meet the requirements outlined in DelDOT's Quality Control/Quality Assurance (QA/QC) specification, the developer will be required to remove and replace the material or may be permitted to leave the material in place and pay DelDOT by certified check for a loss of service life of the material based on the amount of pavement that does not meet the specifications. The amount of the certified check will be equal to the average bid prices of the pavement minus the cost of the pavement that does not meet the requirements of the contract documents.

$$\text{Assessment for Future Maintenance} = (\text{Tonnage of Bituminous Concrete in question}) \times \text{Pavement Bid Cost} \times \left[1 - \frac{\% \text{Compliant}}{100\%} \right]$$

The percent compliant is based on the procedures outlined in DelDOT's Special Provision 401699 – Quality Control/Quality Assurance of Bituminous Concrete. The percent compliant is broken down into the amount of material production pay adjustment and the pavement construction pay adjustment. The material production is 70% of the pavement cost and the pavement construction is 30% of the pavement cost. The payment is calculated for each lot tested. The pay adjustment is discussed in greater detail in Special Provision 401699.

Defective Portland cement concrete shall be addressed following the requirements of DelDOT's *Standard Specifications* Section 602.25.

The Developer shall request a semi-final inspection when all work is complete. Once the semi-final inspection is completed and accepted, an accessibility inspection shall be scheduled. Once the accessibility inspection punch list items are completed and accepted a final inspection may be requested. The Public Works Engineer or the Construction Group Engineer may then schedule a final inspection which shall be conducted by DelDOT. DelDOT personnel, accompanied by the developer and/or his/her contractor, and representatives of the appropriate County and/or municipal officials, shall inspect the site and determine those items of work, if any, that must be either completed, repaired or replaced.

DelDOT shall then provide the developer with a punch list of the remaining work within ten working days. The punch list shall include required letters or documents required prior to Acceptance. Should the developer fail to request a final inspection, the District Engineer may at his sole discretion provide to the developer a punch list of the remaining work to complete the streets.

Following completion of street construction and submission of required documentation to the satisfaction of the Public Works Engineer, the Public Works Engineer will recommend acceptance of the streets and shall prepare an "Acceptance Drawing and an Acceptance Statement" for signatures. Once accepted into the State maintenance system, the Developer shall be responsible for any failure of shared-use paths, sidewalks, pavement or drainage for three years from the date of acceptance, as noted in the Construction Agreement (found at <http://devcoord.deldot.gov> > Forms), and as described in Section 6.5.4. If the developer fails to correct three year good faith punch list items, this shall also be cause to increase the required construction security to 100% of the itemized cost estimate on future construction projects. Once the three year good faith punch list items have been corrected, standard security rates will be reinstated on future subdivision street construction projects.

6.9.1 Inspection - Inspection of Closed Drainage System

To assure that the storm drainage systems within State right of way and easements are constructed per DelDOT's *Standard Specifications* just prior to placement of final wearing course of asphalt pavement and acceptance into the State maintenance system, a digital video inspection and report, verifying acceptability of the system, shall be required.

The procedure for inspecting closed drainage systems, including providing coordinates for all flared ends, pipe outfalls and structures, shall follow DelDOT's *Standard Specifications* and DelDOT's *Storm Sewer CCTV Manual for Storm Sewer Assessment and Acceptance*.

6.9.2 Inspection - Inspection Fee

Upon review and approval of the Delaware General Assembly, DelDOT shall collect inspection fees on all new commercial entrance and subdivision street construction projects, built on the public right-of-way, whether seeking State-maintenance or not. When fees are collected they shall be collected from the project developer or owner prior to the start of any aspect of entrance or street construction. The fee shall be made payable to DelDOT, at the rate of 10% of the estimated cost of construction as approved by DelDOT. This fee shall cover a period of five years from the date of the NTP. If construction is not completed within the five-year period, an annual renewal fee of one quarter the current inspection fee shall be required. This fee must be paid at the beginning of each additional year of construction. NTP with initial construction shall not be issued until DelDOT has collected the inspection fee.

If a developer fails to comply with the renewal fee requirements within 100 days of receipt of written notification, DelDOT shall initiate forfeiture of the security bond.

NTP on additional entrance or street construction projects shall not be issued until all outstanding inspection fees have been collected.

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CHAPTER 7 RESIDENTIAL ACCESS

7.1 PURPOSE

This chapter describes standards and regulations associated with residential lots abutting State-maintained roadways. Access from residential lots has an impact on the mobility, safety, and efficiency of the abutting roadway. Control of these access points is necessary to maintain safety and increase efficiency of State-maintained roadways while allowing access to individual properties.

Residential access permits are issued by the Public Works Engineer in the respective county. Land owners are responsible to ensure that entrances used to access State-maintained roadways are kept in conformance with the specifics of the Residential Entrance Permit issued by DelDOT. In the event that the Land Owner does not have proof of a valid Residential Entrance Permit, the Owner is responsible to obtain one. The land owner must contact DelDOT for review of the situation and to obtain a new entrance permit or obtain confirmation of valid entrance permitting in the following circumstances:

- A. Whenever a new or expanded entrance is being requested
- B. Change of site layout or building configuration is proposed
- C. Change of location or width of entrance or access point is proposed
- D. Change of special circumstances that justified the additional access points has occurred. (See Section 7.2.3.1)
- E. If a local land use agency is issuing a certificate of occupancy (C/O) for the residence
- F. If a local land use agency has requested a DelDOT response or comments, but no valid permit is on file for the entrances serving that property

If DelDOT's review of the entrance(s) identifies safety concerns, the use of an existing entrance may require modifications and or removal of non-permitted and/or multiple access points, at the owner's expense, prior to obtaining an entrance permit for the property.

7.1.1 Removal of Non-Permitted Access Points and/or Multiple Entrances

In order to promote an orderly and manageable implementation of these regulations, to address the issues of non-permitted entrances that may already exist or may knowingly be created and to shelter landowners

from random requests for arbitrary enforcement action, the following thresholds will be used to provide a clear set of guidelines for interactions regarding non-permitted access points and/or multiple entrances:

- A. Properties served by non-permitted access points or multiple entrances constructed or modified on or after June 17, 2013, (as verified by State of Delaware Aerial imagery or equivalent digital records), are subject to entrance removal at the owner's expense, and/or closure until authorized remedy is implemented.
- B. Properties served by non-permitted access points or multiple entrances constructed or modified prior to June 17, 2013, (as verified by State of Delaware Aerial imagery or equivalent digital records), are subject to entrance removal at the owner's expense, and/or closure on the basis of: land use changes, site redevelopment activities, or upon referral to the Department by local land use agencies for confirmation of valid permitting.

Figure 7.1.1-a shows the mailing address for each county.

Figure 7.1.1-a DelDOT Public Works Engineers

New Castle County (DelDOT Canal District) Public Works Engineer 250 Bear-Christiana Road Bear, DE 19701 (302) 326-4679
Kent County (DelDOT Central District) Public Works Engineer 930 Public Safety Blvd. Dover, DE 19901 (302) 760-2433
Sussex County (DelDOT South District) Public Works Engineer 23697 DuPont Blvd. Georgetown, DE 19947 (302) 853-1340

7.2 RESIDENTIAL ACCESS TO LOCAL ROADS AND HIGHER

Property owners of single residential lots requesting to gain access to a local road or a higher classification road according to Functional Classifications as defined in section 1.4 through 1.7, shall adhere to the following criteria detailed in this section.

7.2.1 Residential Access to Local Roads and Higher - Permit Application Process

The following documentation must be provided when applying for a residential entrance permit for access to a State-maintained road:

- A. Any individual desiring to construct a new entrance, use an existing entrance or modify a previously permitted entrance to serve a new residence shall make written application to DelDOT in the District in which the construction is to take place before beginning any construction or improvements on the property. The [Permit Application](http://devcoord.deldot.gov) form is available online (for more information go to <http://devcoord.deldot.gov> > Forms). A permit shall be obtained from DelDOT for any modification to the roadway, curb, sidewalk, or drainage ditches within the right-of-way.
- B. The applicant shall include a plan, such as a Lines and Grades Plan, for the single residential lot. The plan shall fully comply with the local land use agency's most recent recorded plan (if any) for the site. The plan shall include sufficient detail including:
 - 1. House location (if available)
 - 2. Driveway location
 - 3. Property lines
 - 4. Tax Parcel Number
- C. The applicant shall include with the application proof of ownership from the local land use agency in the form of an official document on letterhead.
- D. If the applicant is not the current property owner, a power of attorney form must be attached with the application. See the online content housed at <http://devcoord.deldot.gov> for a sample power of attorney form.
- E. The property owner must identify the proposed or existing entrance location. If the residential lot is part of a minor subdivision, a copy of the recorded minor subdivision plan must be included with the application form. If the entrance location has been identified on a recorded plan, the applicant shall stake it accordingly. Otherwise, the applicant shall stake the preferred entrance location. In either case, follow the procedure below:
 - 1. Place two wooden stakes at the entrance. The stakes shall be visible 24 inches to 36 inches above the ground. The stakes shall be placed 24 feet apart, and as close to the roadside property line as possible, while being clearly visible from the road. The stakes shall not be set closer than five feet from the edge of pavement. If stakes are not placed, a permit will not be issued.
 - 2. Tie ribbons or apply yellow paint to the top of stakes to make them clearly visible.
 - 3. Write the property owner's last name on each stake.

Upon review and approval of the application and the actual driveway location, the Public Works Engineer shall issue an entrance permit for the construction of the residential entrance. The design requirements outlined in Section 7.2.3 must be met by the applicant.

7.2.2 Residential Access to Local Roads and Higher - Construction Responsibilities

The property owner shall be responsible for all costs associated with driveway materials including furnishing drainage pipe and approved backfill materials. DelDOT will determine if any drainage pipe is necessary and notify the property owner with the size and type of pipe required to maintain positive drainage flow.

The property owner shall coordinate with DelDOT for the installation and inspection of the pipe placement, if a pipe is required.

Should the construction not be completed to the satisfaction of DelDOT, the Department may seek compliance as permitted by the Delaware Code including, but not limited to, the closing or removal of the entrance. All costs associated with obtaining compliance shall be assessed to the property owner.

7.2.3 Residential Access to Local Roads and Higher - Design Requirements

The following design criteria apply to residential access on non-subdivision streets and are illustrated in Figure 7.2.3.3-a.

7.2.3.1 Number of Access Points

Although DelDOT generally limits the number of access points for individual residential properties to one point of access, a second access point may be granted if the property frontage allows for the proper spacing as outlined in Figure 1.2.1-a.

If the proper access point spacing requirements cannot be met, DelDOT may grant a second point of access to individual residential lots in special circumstances on local or collector roads. These special circumstances may include:

- A. Needs of a handicapped resident to facilitate home access.
- B. No ability to provide a turn around.
- C. Access to outbuildings or features that cannot be served by the original entrance.

A field visit should be performed by DelDOT to check sight distance and any potential operational or safety concerns. All costs associated with the additional access point will be borne by the applicant.

7.2.3.2 Entrance Location

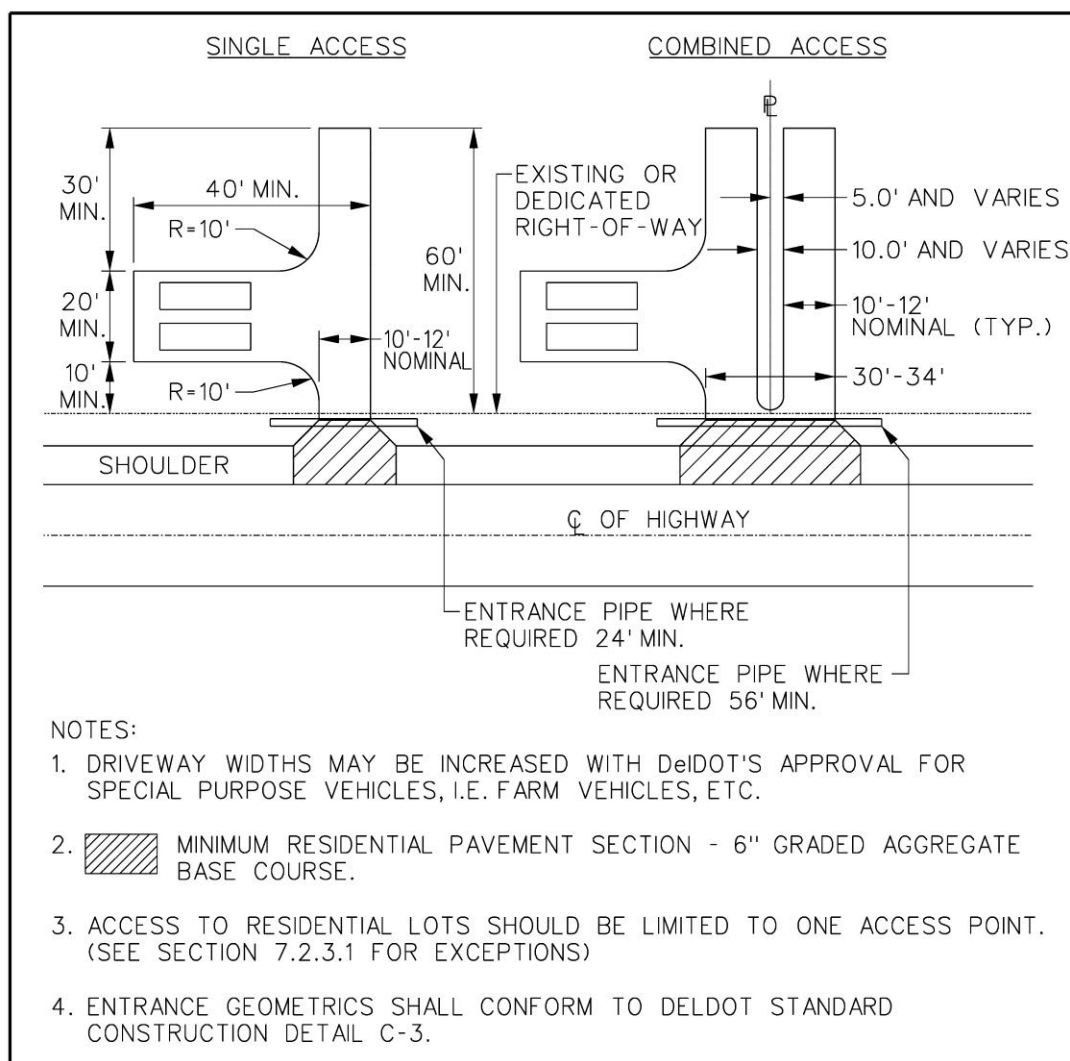
When a property has frontage on two roadways, whenever feasible and practicable, the driveway shall be located on the lower volume road. See Section 1.2 for more information on entrance policy and access spacing.

Entrance locations must take into account potential impacts on any existing or proposed stormwater management facilities, often referred to as Best Management Practices (BMPs), that may be located in or adjacent to the right-of-way. Confirmation is required prior to construction that the requested location does not impact an existing or proposed BMP as per DelDOT's [NPDES Viewer](#) inventory.

7.2.3.3 Entrance Width

A single residential entrance shall have a width of ten to twelve feet. A combined residential entrance, serving two residential properties, shall have a width of 30 feet to 34 feet. Upon written request, DelDOT may consider entrance widths larger than those listed above to accommodate larger vehicles (See Figure 7.2.3.3-a).

Figure 7.2.3.3-a Residential Access Design Requirements



7.2.3.4 Entrance Profile

Profiles of entrances shall be designed in accordance with this *Development Coordination Manual* and manuals, guidelines and policies published by the *American Association of State Highway and Transportation Officials (AASHTO)* or other Nationally Accepted Standard (NAS). Maximum grades shall not exceed 10% and maximum algebraic difference in grade shall not exceed 12% to prevent vehicles from 'bottoming out'. Vertical curve transition should be provided at the intersection of the driveway profile and the cross slope of roadway shoulder extended.

7.2.3.5 Entrance Drainage

Pipes are manufactured in various sizes, shapes, and materials. Entrance pipes commonly used in Delaware include:

- A. Reinforced concrete pipe (RCP) or elliptical (ERCP).

B. Metal Pipe (MP).

C. High Density Polyethylene (HDPE).

Metal Pipes (MP) shall not be used in corrosive environments, such as areas with water tables that are tidally influenced, or other areas where MP's have performed poorly. Use of MP must be approved by DelDOT prior to use.

Figure 7.2.3.5-a shows minimum cover depths for these pipes.

Figure 7.2.3.5-a Residential Entrance Pipes

Material		Cover Depth*
RCP Class	III	> 1 ft.
	IV	6 in. – 1 ft.
	V	< 6 in.
HDPE		1 ft.
MP		1 ft.

* From top of pipe to bottom of pavement

The slope from the edge of driveway pavement to the top of the pipe shall be a maximum of 6:1.

7.2.3.5.1 Frontage Ditch Enclosures

When a residential property owner intends to enclose a road frontage swale or roadside ditch that abuts the residential property, a DelDOT permit is required in advance of any construction activity. The following items shall be provided to DelDOT for review and approval in advance of any permit being issued:

- A. Engineered plans (signed and sealed by Delaware licensed professional engineer) with lines and grades sufficient to establish existing and proposed drainage and ensure that neighboring properties are not flooded by re-grading. Detailed Hydraulic and Hydrology reports shall be included, confirming that enclosure will not impair the drainage performance of the roadside system below operational standards.
- B. Safety and Maintenance of Traffic (MOT) submittals for all work and any materials within state Right-Of-Way
- C. Land owner will bear the full costs of the enclosure including but not limited to: design, utility relocations, materials and labor
- D. Confirmation that the requested enclosure does not impact an existing BMP as per DelDOT's [NPDES Viewer](#) inventory.

7.2.3.6 Entrance Apron

Upon DelDOT's review and concurrence with the items listed above, the property owner can request a permit from the Public Works Office.

Aprons shall be placed on residential driveways to facilitate turning movements. Entrance apron geometry shall be designed in accordance with DelDOT's current *Standard Construction Details*.

The area of the driveway between the edge of pavement for the State-maintained roadway and the right-of-way should be paved, but may be stabilized with graded aggregate base course as approved by the Public Works Engineer.

7.2.3.7 Pavement Section

Residential entrance pavement sections may be constructed using different types of materials upon approval. Figure 7.2.3.7-a specifies the minimum sections permitted for each material type.

Figure 7.2.3.7-a Residential Entrance Sections

Material	Minimum Section
Stone	6" GABC
Bituminous Concrete (Asphalt Pavement)	2" Type C over 8" GABC
Concrete Pavement	6" P.C.C. over 6" GABC

7.2.3.8 Entrance Turnaround

Driveways shall be designed and constructed to provide storage for vehicles off the State-maintained roadway right-of-way and include a provision for vehicular turnaround to enable entrance to the State-maintained roadway in a forward direction.

7.2.3.9 Sight Distance

Driveways shall be clear and free of obstruction. A driver shall have an unobstructed view of the adjacent roadway and the ability to view any approaching vehicles at the intersection with the roadway.

Design guidelines necessary to provide sufficient sight distance shall be in accordance with manuals, guidelines and policies published by the *American Association of State Highway and Transportation Officials* (AASHTO) and Section 5.4 of this *Development Coordination Manual*.

7.3 RESIDENTIAL ACCESS WITHIN SUBDIVISION STREETS

For residential access within subdivisions, the following criteria apply:

- A. Property owner is responsible to ensure that the proposed second access conforms to local land use agency requirements.
- B. No more than two entrances shall be allowed for each property on subdivision street type I.
- C. For subdivision street type II, no more than one point of access should be provided for each property. DelDOT may grant a second access point as outlined in Section 7.2.3.1.
- D. The area of the driveway between the subdivision street and the right-of-way shall be paved.
- E. The driveway width may vary from 10 feet to 20 feet.
- F. An apron may be placed as necessary.

For sidewalk placement across driveways see Chapter 5 and DelDOT's *Standard Construction Details* (available in the "Doing Business" section of DelDOT's website).

7.4 MAILBOX REQUIREMENTS

No mailbox or newspaper delivery box (hereafter referred to as mailbox) shall be allowed to exist on the State-maintained roadway right-of-way if it interferes with the safety of the traveling public or the function, maintenance, or operation of the State-maintained roadway. A mailbox installation that does not conform to the provisions of this regulation is an unauthorized encroachment.

7.4.1 Mailbox Requirements - Mailbox Installation

A mailbox installation that conforms to the following criteria shall be considered acceptable unless, in the judgment of DelDOT, the installation interferes with the safety of the traveling public or the function, maintenance, or operation of the State-maintained roadway.

7.4.1.1 Location

No mailbox shall be permitted where access is obtained from the lanes of a freeway or where access is otherwise prohibited by law or regulation.

On curbed streets the roadside face of the mailbox shall be set back from the face of curb distance between six and eight inches. On roadways without curbs or all-weather shoulders and which carry low-traffic volumes operating at low speeds, the roadside face of a mailbox shall be offset between eight and twelve inches behind the edge of pavement.

Where a mailbox is located at a driveway entrance, it shall be placed on the far side of the driveway in the direction of the delivery route.

Where a mailbox is located at an intersecting road it shall be located a minimum of 100 feet beyond the center of the intersecting road in the direction of the delivery route. This distance shall be increased to 200 feet when the average daily traffic on the intersecting road exceeds 400 vehicles per day.

7.4.1.2 Structure

Mailboxes shall be of light sheet metal or plastic construction sized to conform to the requirements of the U.S. Postal Service. Newspaper delivery boxes shall be of light sheet metal or plastic construction of minimum dimensions suitable for holding a newspaper.

No more than two mailboxes may be mounted on a support structure. Lightweight newspaper boxes may be mounted below the mailbox support.

A single 4"x 4" square or 4.5" diameter round wooden post or a metal post with a strength no greater than a 2" diameter standard strength steel pipe and embedded no more than 24" into the ground shall be acceptable as a mailbox support. A metal post shall not be fitted with an anchor plate, but it may have an anti-twist device that extends no more than 10" below the ground surface. Mailbox supports shall not be encased in concrete or brick.

The post-to-box attachment details should be of sufficient strength to prevent the box from separating from the post top if the installation is struck by a vehicle.

The minimum spacing between the centers of support posts shall be three-fourths the height of the posts above the ground line.

7.4.2 Mailbox Requirements - Removal of Non-Conforming or Unsafe Mailboxes

Any mailbox that is found to violate the intent of this regulation shall be removed by the postal patron upon written notification by DelDOT.

At the discretion of DelDOT, based on an assessment of hazard to the public, the patron shall be granted not less than 24 hours or more than 60 days to remove an unacceptable mailbox. After the specified removal period has expired, the unacceptable mailbox shall be removed by DelDOT, at the postal patron's expense.

7.5 RESIDENTIAL DISCHARGES

Residential discharges into roadside drainage systems require a permit which must be obtained from DelDOT Public Works Office prior to connection/installation. Residential discharges include, but are not limited to: sump pump discharges, downspout runoff from structures, open drainage ditches and swales located on private property. DelDOT encourages groundwater recharge and preserving system capacity by requiring that residential discharges are purposely disconnected from roadside drainage systems and allowed to flow over grassed areas to promote infiltration.

Prior to requesting a permit approval to outlet residential discharges into a roadside drainage system, the property owner must provide written justification that there is no other feasible alternative. The property owner must, prove that the discharge cannot be routed to another outlet that is not located within State right-of-way, and document why the discharge cannot be contained within the parcel boundaries of the discharge source.

This justification shall be reviewed by DelDOT only after being approved (in writing) by the Conservation District, acknowledging that there is no alternative drainage outlet for the residential

discharge other than the roadside drainage system. DelDOT may agree in such cases to allow a connection of residential discharge to the roadside drainage system located within State right-of-way. Discharges that would flow across sidewalks or paved surfaces will not be allowed. The property owner must contact the DelDOT Public Works Engineer in their county to request a permit to connect to the system.

Highlighted text is included for guidance purposes.

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CHAPTER 8 MISCELLANEOUS ACCESS GUIDELINES

8.1 PURPOSE

This chapter contains regulations for access to State-maintained roadways for conditions and occurrences not described thus far. These include temporary/seasonal entrances, temporary construction entrances, mobile/movable businesses, special use sites, and access to extremely low volume generators such as utility sites. Controlling access to these sites enhances safety and increases capacity on the State-maintained roadway network.

Furthermore, policies associated with conversion of private streets to public roads, connector streets, and paper streets are discussed in this chapter.

8.2 IMPROPER ENTRANCES

Should DelDOT find that an access or an entrance is in violation of this *Development Coordination Manual*, the property owner will be contacted and required to immediately cease and desist from the use of this access or entrance as long as such action does not violate relevant law. The following actions shall be taken in order to gain compliance:

- A. The Public Works Engineer shall notify the property owner by registered mail of the nature of the violation. The property owner shall be given 20 business days from the date of the receipt of the notification to submit to DelDOT a schedule to correct the violation.
- B. In the event that the property owner fails to correct the violation within the time specified or to comply with DelDOT's request, the Public Works Engineer shall notify the Property owner by registered mail that the violation is to be corrected within ten days. Failure to comply with the second notification shall cause DelDOT to seek compliance in accordance with the remedies permitted by the Delaware Code, including closing and/or removing the entrance.
- C. All costs incurred by DelDOT incidental to obtaining compliance with these entrance requirements, including closing and/or removing the entrance, shall be borne by the property owner.
- D. In the event that there are no physical entrance improvements that must be removed or corrected, steps A through C shall be deferred provided that the property owner complies with the requirement to immediately cease and desist from the use of this access or entrance. Situations such as vehicles

crossing unpaved or grassy areas to take secondary access and other similar cases will be resolved in this way when possible.

8.3 TEMPORARY CONSTRUCTION ENTRANCE

If a property owner seeks to gain access to property for construction purposes prior to receiving final entrance plan approval, the Public Works Engineer may issue a temporary construction entrance permit if the project is nearing approval as determined by DelDOT. The temporary entrance permit shall state specific allowable construction activities which may be performed and the number of days it is active. Unapproved work activities performed may result in DelDOT closing or removing the temporary construction entrance. Warning signage on the frontage road shall be approved by the Traffic Safety Section prior to installation.

A temporary construction entrance permit does not relieve the applicant of the responsibility of obtaining a permit to construct a permanent entrance facility.

8.4 TEMPORARY / SEASONAL ENTRANCE

When a site is to be occupied for business purposes operating less than 180 days in any consecutive 12-month period, a temporary roadside/entrance permit may be issued in lieu of a permanent permit.

In order to secure a temporary permit, the following steps are to be performed as directed by DelDOT:

- A. The applicant must show that sufficient off-street parking exists on the site as determined by local land use regulations.
- B. The applicant must provide a plan listing/showing the following:
 - 1. Road name
 - 2. Street address
 - 3. Tax parcel number
 - 4. Parking area
 - 5. Entrance material
 - 6. Proposed channelization
 - 7. Access point to the roadway
- C. DelDOT will review the plan and the site conditions to assess the appropriate type of permit for the site with respect to the following:
 - 1. Functional classification of the frontage road
 - 2. AADT of the frontage road
 - 3. Estimated traffic generated by the site
 - 4. Proposed size of the operation – number of employees, square footage of sales/display area, frequency and size of delivery vehicles
 - 5. Existing and proposed structures
 - 6. Site access conditions – proposed and existing

7. Sight distance for exiting vehicles
 8. Traffic studies or statistics
 9. Entrance materials/paving
- D. At DelDOT's direction, the applicant shall install channelization to delineate the entrance which may consist of the following: plastic drums, cones, prefabricated temporary curbing or other temporary means approved by DelDOT.

Based upon DelDOT's review of the above information, either a temporary entrance permit with conditions will be issued or a formal engineered plan will need to be submitted for full review.

The permit holder shall be responsible for maintenance of the entire entrance, the limits being defined on the temporary permit. The limits shall include the entrance up to the edge of the traveled way. The entrance, including the shoulder of the roadway, may be stone or dirt at DelDOT's discretion but are subject to be re-evaluated annually. Any ruts, potholes, etc. in the shoulder of the roadway in the vicinity of the entrance shall be the responsibility of the permit holder to repair. If stone or dirt is used for the entrance, the permit holder shall be responsible for cleaning the roadway of any materials that are tracked onto adjacent paving by exiting vehicles. The roadway and shoulder should be cleaned at least once per week, or more depending upon weather and traffic conditions. Failure to maintain the entrance area as defined shall cause DelDOT to revoke the permit and the entrance shall be closed. A permit shall not be issued to any individual, partnership, corporation, or other entity until all previous obligations created with DelDOT are fully satisfied.

DelDOT reserves the right to review the entrance materials, site access and traffic operations of sites using a temporary permit and require additional improvements if there are observed operational or safety concerns.

8.5 MISCELLANEOUS ENTRANCE

Entrance permits are required for low traffic volume entrances and special uses such as temporary used car sales, access to farm fields, and access to utilities. The process for obtaining the permit will follow the same process as a residential entrance permit outlined in Chapter 7.

8.5.1 Mobile / Movable Business

Entrance Permits will NOT be required or issued when a site is to be occupied for business purposes operating less than 3 days in any consecutive 14 day period, for: lemonade stands, movable tables, temporary structures, wheeled displays, yard sales, BBQ stands, merchandise tents, outdoor auctions, etc. DelDOT may require improvements to the property or the roadway if safety issues arise during business operation.

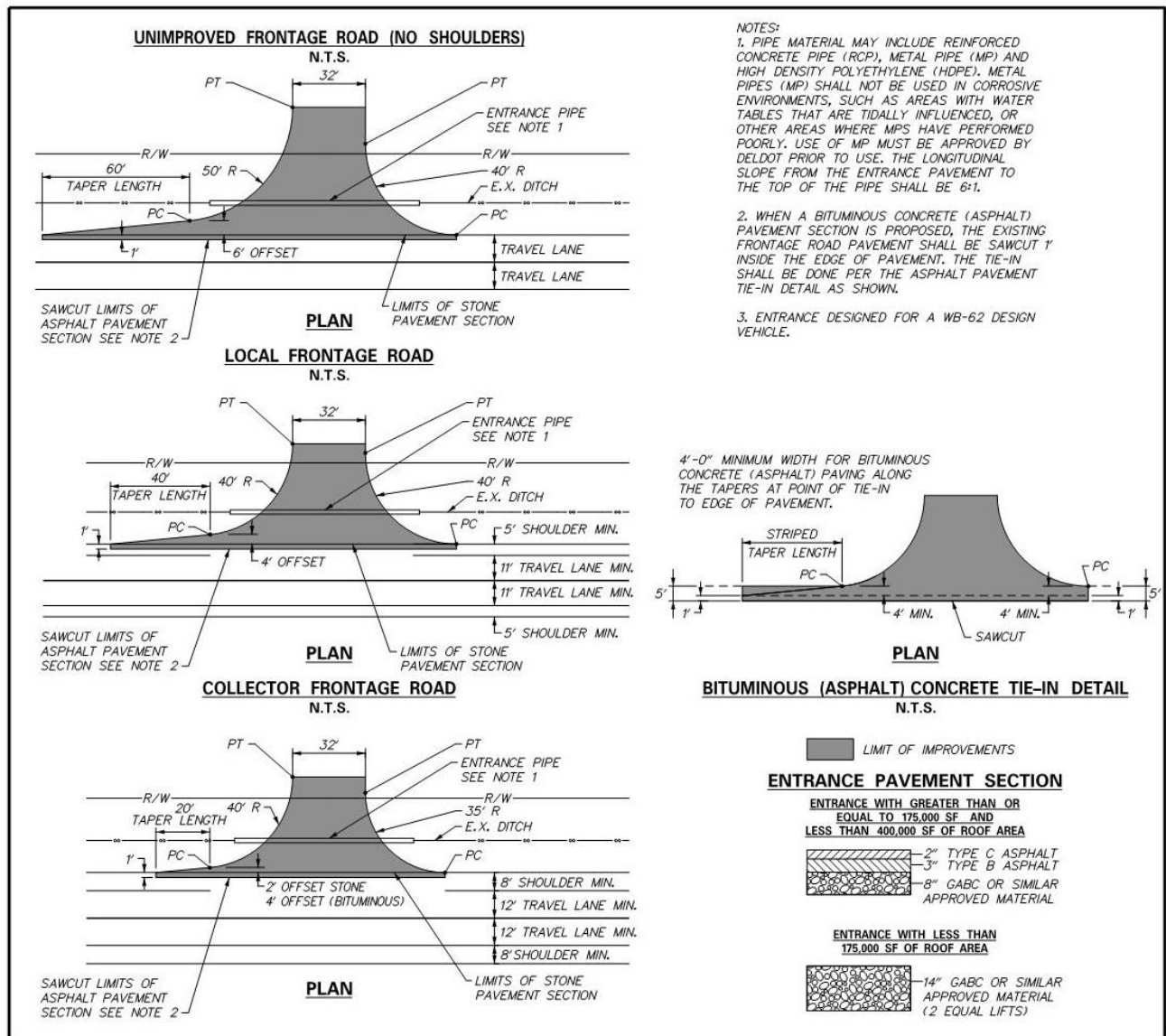
8.5.2 Agricultural Production Operations (Within Structures)

Entrance permits are required for ongoing agricultural production operations, (within buildings/structures), which create low to moderate traffic volumes. The process for obtaining an entrance permit shall: follow the same process as a commercial entrance permit outlined in Chapter 6, require that

entrance modification/construction be completed, and require that plans be submitted as outlined in Chapters 3 and 5; when either of the following conditions apply:

- A. Buildings/structures have been or will be erected/used for agricultural production operations and the total combined existing and proposed roof area is greater than or equal to 400,000 sf.
- B. The existing entrance was not designed and approved for the combined traffic of the existing and proposed uses, which total 100 trips (daily traffic entering and exiting is 50 vehicles) or more during periods of peak production or activity.

Figure 8.5.2-a Agricultural Entrance Detail



If the buildings/structures used for ongoing agricultural production operations fall below both thresholds outlined above, the entrance shall be improved as illustrated in Figures 8.5.2-a and the entrance permit will be issued in similar fashion to the process for obtaining a residential entrance permit, which is outlined in Chapter 7. A Maintenance of Traffic (MOT) plan in accordance with Section 4.3.8 or 4.4.4

must be prepared and submitted for approval for any work that will have an impact to an active roadway or occur within the right-of-way. To expedite entrance permitting, the Public Works Office may request a copy of a lines and grades plan similar to what is described in Section 7.2.1.B (if available) to ensure positive drainage of the entrance, entrance pipe and roadside swale.

8.6 PROPERTY CHANGE OF USE / CHANGE OF OWNERSHIP

If an existing business changes ownership or the existing Commercial Entrance Permit is still applicable, no new entrance permit will be required. Change of ownership alone does not warrant a new permit. If an existing property changes use or expands, the existing Commercial Entrance Permit shall be evaluated to determine if entrance improvements will be required. If the existing entrance does not accommodate the traffic for the proposed use, then entrance modifications shall be required and plans shall be submitted as outlined in Chapters 3 and 5.

In the event that an entrance is approved, constructed, and at a later date an additional facility is constructed or the conditions change off the right-of-way in such a manner as to adversely affect the safe or proper use of the entrance, then DelDOT may require a new application or deny use of the entrance until such time as DelDOT is satisfied that the conditions are rectified.

8.7 CONVERSION OF PRIVATE STREETS TO PUBLIC STREETS

Private streets can be converted into public streets with or without being accepted into the State maintenance system.

8.7.1 Conversion of Private Streets to Public Streets - Dedicating Streets to Public Use (State-Maintained)

The following criteria shall be met in order for a street to be accepted into the State maintenance system:

- A. The subdivision where the street is located shall meet the definition of a suburban community as defined in the Preface of this manual.
- B. The homeowner's association or a majority of the property owners must submit a written request for a roadway investigation, in accordance with State guidelines, to the Public Works Engineer. The letter must give the State all necessary right of entry onto private property to perform the necessary investigations. A copy of the record plan shall accompany the letter.

Following the investigation, DelDOT will notify the homeowner's association or property owners of the required work necessary to bring the streets up to State standards.

- C. The homeowner's association or property owners must have the current subdivision record plan re-recorded, dedicating the streets to public use.

The plan shall include the words "dedicated to the State of Delaware" within the street right-of-way and the following note:

Subdivision streets constructed within the limits of the right-of-way dedicated to the public use, shown on this plan, will not be maintained by the State of Delaware until such time that the existing streets are brought up to current State standards and accepted by the State. The State assumes no

maintenance responsibilities within the dedicated street right-of-way until the streets have been accepted by the State.

- D. The following note must be included concerning the drainage / utility easement:
The front and side ten feet of each lot hereon are reserved as easements for drainage and utilities unless otherwise noted.
- E. A copy of the proposed record plan shall be submitted to the Subdivision Engineer, prior to recordation to ensure that all right-of-way and easements are correct. Once all comments have been addressed, DelDOT will issue a “No Objection to Recordation” letter to the local land use agency.
- F. The homeowner’s association or property owners must submit construction plans as outlined in Chapter 4 for the reconstruction or the rehabilitation of the existing subdivision streets as determined in item B above. Upon approval of the construction plans, the construction will be governed by Chapter 6 of this *Development Coordination Manual*.
- G. Once DelDOT’s Subdivision Engineer has received a copy of the recorded plan showing plot book and page of recordation, and a letter from DelDOT’s Public Works Engineer stating all work has been completed to State requirements, the street will be accepted into the State maintenance system.

8.7.2 Conversion of Private Streets to Public Streets - Dedicating Streets to Public Use (Not State-Maintained)

The following is the process for dedicating private streets that are not State-maintained to public use.

The homeowner’s association or property owners must have the streets dedicated to public use by: re-recording the record plan, executing a Dedication Agreement, or other acceptable method of dedication. Once the roads have been dedicated to public use, they are eligible for improvements funded by the Community Transportation Program, at the request of local legislators. The plan shall include the words “Dedicated To Public Use – Privately Maintained” within the street right-of-way, for each street to be dedicated to public use and the following note:

Subdivision streets constructed within the limits of the right-of-way are hereby dedicated to the public use and are to be maintained by the homeowner’s association or property owners or both. The State assumes no maintenance responsibilities within the dedicated street right-of-way.

8.8 PAPER STREET POLICY

The term “Paper Streets” refers to rights-of-way which have been recorded and dedicated to public use but in which no State-maintained streets have been built. In this way they differ from private streets where the rights-of-way have been dedicated and a street has been built but not accepted for State maintenance.

8.8.1 Paper Street Policy - Guidelines for Access

DelDOT shall regulate access to properties fronting on paper streets as follows:

- A. Access for one single-family home may be permitted by the Public Works Engineer as though the paper street was the homeowner's driveway only if it has been determined that there are no other buildable lots fronting the paper street.
- B. In all other cases, the applicant shall be required to construct a street in accordance with DelDOT standards. The street shall be constructed from the existing State-maintained street to the end of the applicant's property. The end of the applicant's property is hereby defined as the width of their building lot, which fronts the paper street.

The minimum required pavement section shall be two inches of Type 'C' Hot Mix over eight inches of stone aggregate base material.

Bonding may not be required if it is determined that the street improvements are minimal and/or do not have any detrimental impact on the surrounding community should the applicant fail to complete its obligation. A security shall be required for performance, and shall be posted in the amount of 10% of the cost to construct the approved street improvements.

Generally, where two or more interconnected paper streets are involved, the Subdivision Section shall determine which paper right-of-way should be improved for access and, if appropriate, shall recommend to the Public Works Engineer what street(s) should be barricaded

Following construction of the streets in accordance with approved construction plans, DelDOT agrees to accept for maintenance the paved portion of these streets including curbing and gutters, and open and closed drainage systems where they exist.

8.9 CONNECTOR STREET

A connector street is a continuous street or streets entirely in the Subdivision Street category beginning and ending on the state numbered road system, and having a high volume of through traffic.

- A. DelDOT may transfer certain connector streets into the state maintenance numbered road system. Transfer of connector streets from subdivision streets to maintenance road number designation changes the responsibility for funding from the legislator's Community Transportation Funds to DelDOT's Paving and Rehabilitation Work Programs. All streets in the subdivision street category are eligible for transfer, provided the minimum Annual Average Daily Traffic (AADT) along the length of the road is above 4,000 vehicles.
- B. Acceptance of resurfacing and reconstruction responsibilities for these roads in no way changes existing acceptance agreements which remain in full force and effect. When it comes to the attention of DelDOT that a subdivision street may meet criteria for transfer, the Division of Planning shall conduct a study to determine whether the criteria are met, and whether it is in the best interest of all concerned to complete the transfer. If the study supports the transfer, the Department shall hold a public meeting in the community to receive comments on the proposal. As a minimum, the following must be notified at least two weeks in advance of the meeting:
 - 1. Secretary of Transportation.
 - 2. DelDOT District Engineer.
 - 3. All legislators in whose districts the street is located.
 - 4. All established civic groups in areas through which the street passes.
 - 5. All residences and/or owners located on the street.

Within 30 calendar days of the public meeting, DelDOT shall decide which maintenance category the street shall be in and publicly notify the above-listed individuals/groups of that decision.

- C. DelDOT's Director of Planning is responsible for the administration of these guidelines and the certification of eligibility of roads.

8.10 ABANDONMENT/VACATION AND/OR CLOSURE OF AN EXISTING ROAD

This section provides the guidelines for determining the merits of considering a request for the abandonment/vacation and/or closure of an existing road or an interconnection.

When considering any request for abandonment/vacation and/or closure, an Operational Analysis as outlined in Chapter 2 of this *Development Coordination Manual*, shall be performed by the Applicant and made available to the local land use agency and DelDOT for review.

The following additional criteria shall be considered:

- A. Safety, in terms of pedestrian, bicycle, motor vehicle and property owners
- B. Traffic volumes on the road in question would exceed the capacity of the roadway and the road cannot be reasonably modified to handle the increased volume of traffic
- C. How the closure/abandonment/vacation will affect access to the area via emergency vehicles, school buses, local service providers
- D. Whether the closure/abandonment/vacation is for the benefit of the health, safety and welfare of the public
- E. Effect of the closure/abandonment/vacation upon the local street and pedestrian network
- F. The Local Area Plan has been amended by the local jurisdiction through a public process to allow the closure, if applicable
- G. Effect of the closure/abandonment/vacation upon the provision of transit, including paratransit,
- H. How the closure/vacation/abandonment will affect pedestrian and vehicular connectivity if it is rejected and if it is approved
- I. How the proposal will affect access to, provision of, and maintenance on public utility systems such as drinking water, stormwater, sewer, electric and gas