TOWN OF
VIENNA
Public Works

TO: Planning Commission

FROM: John Jay Sergent, DPW Engineer

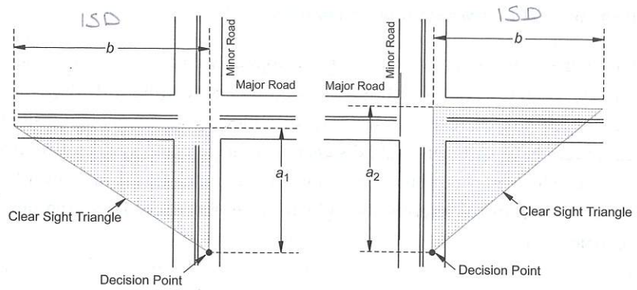
CC: Cindy Petkac, AICP, Planning and Zoning Director
Mike Gallagher, PE, Public Works Director

DATE: February 21, 2018

SUBJECT: Vienna Market MAC Application & Sight Distance Requirements

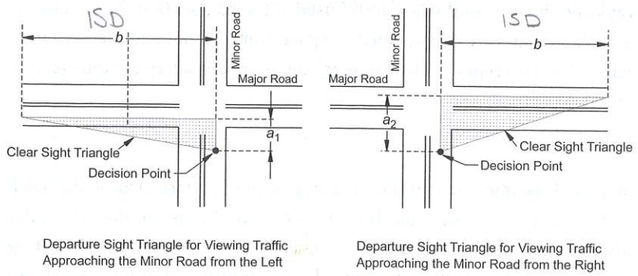
The Vienna Market MAC Application has adequately demonstrated that it does and can meet DPW codes and regulations. They have demonstrated an overall plan for road improvements, pedestrian improvements, utilities and storm water management. The Multi-modal transportation impact analysis shows that they will have a negligible impact to the surrounding road network. In addition, they are providing new sidewalks connections to Maple Avenue and bike stations to promote multi-modal transportation.

There have been questions on when and why we implement intersection sight distance. Intersection sight distance allows a driver enough visible distance to safely enter a road that is not stop controlled. For example, a driver intending to turn right on to Maple Avenue from Pleasant Street must be able to see 355 feet to the left along Maple Avenue. This sight distance helps the driver to avoid pulling out in front of approaching vehicles. Sight distance left for a 4 lane divided road with a posted speed of 30 MPH, such as Maple Avenue, is 355 feet. Intersection sight distance is a regulation from the ASSHTO Green Book (attached) and reinforced in the VDOT Road Design Manual (attached). Items that may impede sight distance include poles, hedges, trees, tall grass, walls, fences and terrain itself.



Approach Sight Triangles (Uncontrolled or Yield-Controlled)

– A –



Departure Sight Triangles (Stop-Controlled)

– B –

Figure 9-15. Intersection Sight Triangles

The vertex of the sight triangle on a minor-road approach (or an uncontrolled approach) represents the decision point for the minor-road driver (see Figure 9-15A). This decision point is the location at which the minor-road driver should begin to brake to a stop if another vehicle is present on an intersecting approach. The distance from the major road, along the minor road, is illustrated by the distance a_1 to the left and a_2 to the right as shown in Figure 9-15A. Distance a_2 is equal to distance a_1 plus the width of the lane(s) departing from the intersection on the major road to the right. Distance a_2 should also include the width of any median present on the major road unless the median is wide enough to permit a vehicle to stop before entering or crossing the roadway beyond the median.

The geometry of a clear sight triangle is such that when the driver of a vehicle without the right-of-way sees a vehicle that has the right of way on an intersecting approach, the driver of that potentially conflicting vehicle can also see the first vehicle. Distance b illustrates the length of this leg of the sight triangle. Thus, the provision of a clear sight triangle for vehicles without the right-of-way also permits the drivers of vehicles with the right-of-way to slow, stop, or avoid other vehicles, if needed.

Although desirable at higher volume intersections, approach sight triangles like those shown in Figure 9-15A are not needed for intersection approaches controlled by stop signs or traffic signals. In that case, the need for approaching vehicles to stop at the intersection is determined by the traffic control devices and not by the presence or absence of vehicles on the intersecting approaches.

Departure Sight Triangles

A second type of clear sight triangle provides sight distance sufficient for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. Figure 9-15B shows typical departure sight triangles to the left and to the right of the location of a stopped vehicle on the minor road. Departure sight triangles should be provided in each quadrant of each intersection approach controlled by stop or yield signs. Departure sight triangles should also be provided for some signalized intersection approaches (see Case D in Section 9.5.3 on "Intersection Control"). Distance a_2 in Figure 9-15B is equal to distance a_1 plus the width of the lane(s) departing from the intersection on the major road to the right. Distance a_2 should also include the width of any median present on the major road unless the median is wide enough to permit a vehicle to stop before entering or crossing the roadway beyond the median. The appropriate measurement of distances a_1 and a_2 for departure sight triangles depends on the placement of any marked stop line that may be present and, thus, may vary with site-specific conditions.

The recommended dimensions of the clear sight triangle for desirable traffic operations where stopped vehicles enter or cross a major road are based on assumptions derived from field observations of driver gap-acceptance behavior (*12*). The provision of clear sight triangles like those shown in Figure 9-15B also allows the drivers of vehicles on the major road to see any vehicles stopped on the minor-road approach and to be prepared to slow or stop, if needed.

Identification of Sight Obstructions within Sight Triangles

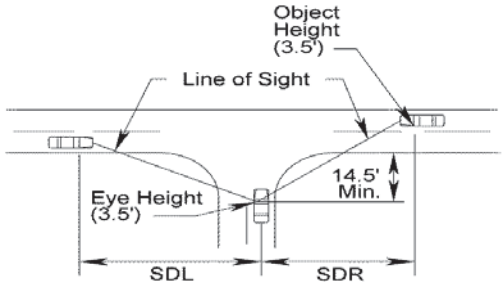
The profiles of the intersecting roadways should be designed to provide the recommended sight distances for drivers on the intersection approaches. Within a sight triangle, any object at a height above the elevation of the adjacent roadways that would obstruct the driver's view should be removed or lowered, if practical. Such objects may include buildings, parked vehicles, highway structures, roadside hardware, hedges, trees, bushes, unmowed grass, tall crops, walls, fences, and the terrain itself. Particular attention should be given to the evaluation of clear sight triangles at interchange ramp/crossroad intersections where features such as bridge railings, piers, and abutments are potential sight obstructions.

The determination of whether an object constitutes a sight obstruction should consider both the horizontal and vertical alignment of both intersecting roadways, as well as the height and position of the object. In making this determination, it should be assumed that the driver's eye is 1.08 m [3.50 ft] above the roadway surface and that the object to be seen is 1.08 m [3.50 ft] above the surface of the intersecting road.

This object height is based on a vehicle height of 1.33 m [4.35 ft], which represents the 15th percentile of vehicle heights in the current passenger car population less an allowance of 250 mm [10 in.]. This allowance represents a near-maximum value for the portion of a passenger car height that needs to be visible for another driver to recognize it as the object. The use of an object height equal to the driver eye height makes intersection sight distances reciprocal (i.e., if one driver can see another vehicle, then the driver of that vehicle can also see the first vehicle).

Intersection Sight Distance

The following table shows intersection sight distance requirements for various speeds along major roads:



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

Height of Eye 3.5'												**Height of Object 3.5'**
Design Speed (mph)**		**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**
SDL=SDR: 2 Lane Major Road	**In Feet**	225	280	335	390	445	500	555	610	665	720	775
SDR: 4 Lane Major Road (Undivided) or 3 Lane		250	315	375	440	500	565	625	690	750	815	875
SDL: 4 Lane Major Road (Undivided) or 3 Lane		240	295	355	415	475	530	590	650	710	765	825
SDR: 4 Lane Major Road (Divided – 18' Median)		275	340	410	480	545	615	680	750	820	885	955
SDL: 4 Lane Major Road (Divided – 18' Median)		240	295	355	415	475	530	590	650	710	765	825
SDR: 5 Lane Major Road (continuous two-way turn-lane)		265	335	400	465	530	600	665	730	800	860	930
SDL: 5 Lane Major Road (continuous two-way turn-lane)		250	315	375	440	500	565	625	690	750	815	875
SDR: 6 Lane Major Road (Divided – 18' Median)		290	360	430	505	575	645	720	790	860	935	1005
SDL: 6 Lane Major Road (Divided – 18' Median)		250	315	375	440	500	565	625	690	750	815	875
SDL: (Where left turns are physically restricted)		210	260	310	365	415	465	515	566	620	670	725

TABLE 2-5 INTERSECTION SIGHT DISTANCE

Source: AASHTO Green Book, Chapter 9, Section 9.5.3, page 9-37 thru 9-52, * Table 9-5 thru 9-14

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

* Rev. 1/14

Note: Both SDR and SDL must be met at the entrance or intersection, unless left turns are physically restricted by a median or channelization island; then only SDL is needed. Intersection sight distance determinations apply both horizontally and vertically, measured in each direction, and are to be based on a height of driver's eye of 3.5' and a height of object 3.5'.

The term "Major Road" refers to the road with the higher functional classification, or if both have the same classification, the road with the higher volume.

Intersection sight distance does not control the access spacing for entrances and intersections shown in Table 2-2.

For major roadways of more than four lanes, large truck volumes on a minor road or median crossover, or median widths over 60', see AASHTO's *A Policy on Geometric Design of Highways and Streets.*

The Engineer must check each entrance and intersection to insure that adequate sight distance is provided. On a typical two-lane road horizontal curve there are numerous objects that restrict sight distance such as cut slopes, buildings, vegetation, vehicles, etc.

These obstructions should be considered when reviewing commercial entrances. A divided highway can have similar problems. It is very important to obtain adequate intersection sight distance for all "New" and "Reconstructed" commercial entrances from the entrance as well as the left turn position into the entrance. If the minimum intersection sight distance values in the table mentioned above cannot be met, including applying the adjustment factors for sight distances based on approach grades, a Design Waiver shall be requested in accordance with IIM-LD-227, see 2011 AASHTO Green Book, Chapter 9, Section 9.5.3, page 9-32 for further guidance. Design Waiver and Design Exception requirements are based on the following;

1) Design Waiver – Meets Stopping Sight Distance but not Intersection Stopping Sight Distance.
2) Design Exception – Does not meet the minimum Stopping Sight Distance (See Chapter 2D). *

The Intersection Sight Distance values in the table above permit a vehicle stopped on a minor road or median crossover, to cross the major road safely or merge safely in the case of turns.

The Intersection Sight Distance table above is based on the following criteria:

The AASHTO Green Book shows that it requires 7.5 seconds for a passenger car to turn left onto a two-lane road. For a passenger vehicle to turn right into the first lane, the Green Book shows that only 6.5 seconds is required because drivers making right turns generally accept gaps that slightly shorter than those accepted in making left turns.

The reference to 18' median in Table 2-5 applies to medians up to 18' in width (18' or less). For medians up to this width there is not sufficient room to stop so more sight distance is needed. For wider medians, there would be room to stop in the middle of the highway so sight distance can be less.

* Rev. 1/17