VEHICLE MANEUVERING DIAGRAMS

The City of Kent Planning Department, and the City of Kent Department of Public Works, have been given the responsibility to assess the adequacy of provisions for vehicular access, parking, and safe traffic circulation for all developments that require City of Kent review and approval. Vehicle Maneuvering Diagrams (sometimes referred to as Truck Maneuvering Diagrams) are required to determine if the Developer has adequately addressed access and circulation needs for site-specific and project-specific developments. The City of Kent Department of Public Works has prepared this City Of Kent Development Assistance Brochure (hereinafter DAB) to provide the Owner / Developer and their Transportation Engineer with the information necessary to prepare acceptable Vehicle Maneuvering Diagrams (VMD). For the purposes of development review, there are two basic types of VMDs: Conceptual (a not-to-scale and greatly simplified drawing); and Complete (the abutting public street - including lane markings, edges of pavement and curb lines - and all of the elements of the Site Plan – including loading doors and dumpsters - in addition to the wheel paths of the design vehicle are drawn to scale; the Complete VMD is usually prepared by a licensed civil engineer.)

**Conceptual Vehicle Maneuvering Diagram (VMD) Requirements:**

1. A Conceptual VMD is used to review potential traffic and circulation conflicts related to a proposed development.
2. A Conceptual VMD is a simple drawing that will show the path that would result if a bucket of paint with a small hole in the bottom was attached beneath the driver of the design vehicle. This path will start as the vehicle enters the project site from a public street and will include the path followed as the vehicle drives through the project site to make a delivery, and finally the path the vehicle takes as it leaves the project site and enters the public street once again.
3. Important: each Conceptual VMD / path must start, and end, within a traffic lane inside a public street.
4. The forward direction of the vehicle path will be shown with dashed lines and arrows at regular intervals, and a backing up path will be shown with a dotted line and arrows. In each case the arrows will indicate the direction of travel for the vehicle.
5. The approximate location where the vehicle stops to make deliveries, or dispense fuel, shall be shown with a star, or a descriptive label, and the location of all loading doors must be shown.
6. The loading doors should be identified as one of the following types: ground level loading doors (requires a minimum of 45-feet of clear maneuvering area in front of the door); dock-high loading doors (requires a minimum of 100-feet of clear maneuvering area in front of the door); or man door used for deliveries (minimum clear maneuvering areas determined on a case-by-case basis.)
7. The Conceptual VMD does not have to be drawn to scale, but must show the approximate driving paths that the provider believes that the design vehicle will actually take while making product deliveries, and also how the garbage truck will pick up the garbage.

8. When the proposed development includes a drive-through facility, the Conceptual VMD will also show the paths of the vehicles using the drive-through lanes.

9. A complete Conceptual VMD will show all possible entry and exit routes to and from each driveway onto the public street system; and should clearly indicate whether any driveway is restricted to right-in, and right-out only movements.

Complete Vehicle Maneuvering Diagram (VMD) Requirements:

1. Applicants shall provide a VMD that is drawn to an engineering scale (1" = 20' is preferred, but 1" = 40', and 1" = 50' are also acceptable). The VMD shall clearly show the outermost and innermost wheel paths (or vehicle overhangs) of the specified design vehicle entering the project site from abutting public street(s), traversing the site, backing into the dock-high or ground-level overhead doors (or otherwise maneuvering to delivery doors, or facilities such as fuel tanks), and leaving the loading area and site onto abutting public street(s).

2. The VMD shall show that the appropriate design vehicle wheel paths / vehicle overhangs are without encroachment into:

   a. An opposing lane of traffic in a public street. (The outside wheel paths shall be at least 3-feet inside the curb or outside traffic lane when entering and exiting the site on a two or three lane street. This is needed to show that the risk of head-on crashes in the street is not exacerbated by the driveway design.)

   b. An opposing lane of a two-way driveway. (Adjacent wheel paths of entering and exiting design vehicles should show at least 3-feet of minimum separation within driveways; and must provide at least 5-feet of minimum separation for P design vehicles. This is needed to show that the risk of head-on crashes won’t be exacerbated at the driveway, and to show that entering vehicles won’t be forced to wait in a traffic lane of the public street until an on-site vehicle leaves, and thereby increase the risk of a rear-end crash in the public street.)

   c. An inner traffic lane while entering from and exiting to a public street having more than two traffic lanes in the same direction. (The outside wheel paths of the design vehicle shall be no less than 1-foot inside the lane markings for the curb or outside lane. This is needed to show that the design vehicle won’t need more than the curb side lane when entering and exiting the public street and thereby increase the potential for side-swipe crashes when entering or exiting the site.)

   d. Any parking stalls. (No design vehicle wheel path shall be within 3-feet of any required parking stall markings. This is needed to ensure that the design vehicle won’t have to wait until a parked vehicle leaves to complete any maneuvers, and to ensure that the potential for backing-up crashes will not be increased due to poor circulation design.)
e. Areas outside of the reinforced driveway approach apron and driveway throat. (The inside wheel paths for entering and exiting design vehicles should be at least 3-feet inside the reinforced concrete apron, and must be at least 1-foot inside the limits of the reinforced cement concrete apron and curb & gutter. This is needed to ensure that heavy design vehicles will not break up curbs & gutters and sidewalks in the public streets and that the driveway approach is of the proper width and design.)

3. The VMD shall show required minimum queue lengths (or stacking space as described in the Kent Zoning Code) prior to exiting the development, and shall show that no portion of the minimum queue length will be within the driveway aisle abutting required parking stalls. Unless otherwise determined by the Director of Public Works, all commercial and industrial project sites shall provide at least 100-feet of protected queue length from the exiting driveway apron. Sites which will experience more than 1000 vehicles per peak-hour, and sites with a heavy percentage of truck traffic will require a more stringent assessment of minimum protected queue length. Refer to the Kent Zoning Code, and to appropriate ITE, NCHRP, and NHI publications for recommended minimum queue lengths for specific types of developments.

4. The VMD shall clearly identify the applicable design vehicle(s) used to prepare the VMD.

5. The VMD shall include project-specific NOTES which state:
   a. How often each design vehicle is expected to enter and leave the site. I.e. hundreds of times each day, four times a day, once a day, or two times a week, etc, This information is needed to assess possible deviations or exceptions from required driveway and access standards.
   b. The expected hours for the delivery of fuel, groceries, and other materials delivered to the site.
   c. The expected hours for vehicles transporting raw and finished goods to and from the site.
   d. Whether wheel tracks or vehicle overhangs were used to prepare the VMD.
   e. How the provided queue length was determined. (See #3 above.)

6. The VMD shall show at least 100-feet of clearance area in front of each door for trucks backing into dock-high loading doors, and at least 45-feet of clear maneuvering area in front of each door for trucks backing into ground-level loading doors, as required by Section 15.05.060 of the Kent Zoning Code.

7. The VMD must show how the design vehicle can drive away from each loading door and exit the site. (The VMD does not always have to show how the design vehicle will back up to reach the doors since the leaving maneuver is more difficult.)

8. The design vehicle shall generally be taken from the AASHTO DESIGN VEHICLES table given within this brochure; the applicable design vehicle shall be determined by the City Transportation Engineer.
### AASHTO DESIGN VEHICLES

- **P**  (Passenger car; minimum outside radius = 24.0-feet; minimum inside radius = 13.8-feet; total length = 19-feet)

- **MH**  (Motor Home; minimum outside radius = 40.0-feet; minimum inside radius = 26.0-feet; total length = 49-feet)

- **P/T**  (Passenger Car with Travel Trailer; minimum outside radius = 24.0-feet; minimum inside radius = 2.0-feet; total length = 30-feet)

- **P/B**  (Passenger Car with Boat and Trailer; minimum outside radius = 24.0-feet; minimum inside radius = 6.5-feet; total length = 42-feet)

- **MH/B**  (Motor Home with Boat and Trailer; minimum outside radius = 50.0-feet; minimum inside radius = 35.0-feet; total length = 53-feet)

- **SU**  (Single Unit truck; minimum outside radius = 42.0-feet; minimum inside radius = 27.8-feet; total length = 30-feet)

- **BUS**  (Single Unit Bus; minimum outside radius = 42.0-feet; minimum inside radius = 24.4-feet; total length = 40-feet)  
  NOTE: Fire Trucks will require an outside radius of 45.0-feet.

- **A-BUS**  (Articulated Bus; minimum outside radius = 38.0-feet; minimum inside radius = 14.0-feet; total length = 60-feet)

- **WB-40**  (Intermediate Semi-Trailer; minimum outside radius = 40.0-feet; minimum inside radius = 18.9-feet; total length = 50-feet)

- **WB-50**  (Large Semi-Trailer Combination; minimum outside radius = 45.0-feet; minimum inside radius = 19.2-feet; total length = 55-feet)

- **WB-60**  (Semi-trailer Full Trailer Combination; minimum outside radius = 45.0-feet; minimum inside radius = 22.2-feet; total length = 65-feet)

- **WB-62**  (Interstate Semi-Trailer; minimum outside radius = 45.0-feet; minimum inside radius = 9.1-feet; total length = 69-feet)

**NOTES:**  For additional information on design vehicles refer to Table II-1, page 22, of 1990 edition of *A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS*, published by the American Association of State Highway and Transportation Officials (AASHTO) and to Figures II-1 through II-15, pages 24 to 39.

When no specific design vehicle is specified by the Transportation Engineer for a development, the appropriate design vehicle shall be the BUS design vehicle unless otherwise determined by the Director of Public Works. The BUS design vehicle approximates such vehicles as garbage trucks, and fire trucks.

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