4.4.4 Forward Visibility

Forward Visibility, also referred to as Forward Sight Distance (FSD), is the distance along the street ahead which a driver of a vehicle can see. The results of research carried out by Transport Research Laboratory UK (TRL) for the UK *Manual for Streets* (2007) found that reducing forward visibility is one of the most effective measures used to increase driver caution and to reduce speeds.[33]

The minimum level of forward visibility required along a street for a driver to stop safely, should an object enter its path, is based on the Stopping Sight Distances (SSD). The SSD has 3 constituent parts:

- Perception Distance: The distance travelled before the driver perceives a hazard.
- Reaction Distance: The distance travelled following the perception of a hazard until the driver applies the brakes.
- Braking Distance: The distance travelled until the vehicle decelerates to a halt.

The perception and reaction distances are generally taken as a single parameter based on a combined perception and reaction time. The formula for the calculation of SSD is:

$$SSD = vt + v^2/2d$$

Where:

v = vehicle speed (m/s)
t = driver perception-reaction time (s)
d = deceleration rate (m/s^2)

SSDs have generally been applied according to those contained within the NRA DMRB TD 9 which where derived from the UK DMRB Manual of the same name using a perception reaction time of 2 seconds, and a deceleration rate of 0.25g, or 2.45 m/s^2. TRL found these SSD values to be overly conservative as they underestimated driver reaction times, deceleration rates and did not take into account actual road design details.[34] Based on this research, a driver perception-reaction time of 1.5 seconds, and a deceleration rate of 0.45g, or 4.41 m/s^2, should be applied with design speeds of 60 km/h and below. For larger vehicles such as HGVs and buses, a deceleration rate of 0.375g, or 3.68 m/s^2 should be applied.

A revised set of reduced SSDs, based on the parameters included in the UK *Manual for Streets* (2007), are presented in Table 4.2. The reduced SSDs should be applied according to the design speed of a street (see Section 4.1.1 A Balanced Approach to Speed) at junctions and along the alignment of a street (see Sections 4.4.5 Visibility Splays and 4.4.6 Alignment and Curvature, respectively and *Advice Note 3 - Geometric Standards.*

33 Refer to Section 7.4.4 of UK *Manual for Streets* (2007) and *UK Manual for Streets: Redefining Residential Street Design* (2006).

34 Refer to *Manual for Streets: Evidence and Research (TRL Report 661)* (2007).

SSD STANDARDS

Design Speed (km/h)	SSD Standard (metres)
10	7
20	14
30	23
40	33
50	45
60	59

Forward Visibility

Design Speed (km/h)	SSD Standard (metres)
10	8
20	15
30	24
40	36
50	49
60	65

Forward Visibility on Bus Routes

Table 4.2: Reduced SSD standards for application within cities towns and villages. Reduced forward visibility increases driver caution and reduces vehicle speeds.

4.4.5 Visibility Splays

Visibility splays are included at junctions to provide sight lines along the intersected street to ensure that drivers have sufficient reaction time should a vehicle enter their path. Visibility splays are applied to priority junctions where drivers must use their own judgement as to when it is safe to enter the junction. Junction visibility splays are composed of two elements; the X distance and the Y distance.

- The X distance is the distance along the minor arm from which visibility is measured. It is normally measured from the continuation of the line of the nearside edge of the major arm, including all hard strips or shoulders.

- The Y distance is the distance a driver exiting from the minor road can see to the left and right along the major arm. It is normally measured from the nearside kerb or edge of roadway where no kerb is provided.

The procedure for checking visibility splays at junctions is illustrated in Figure 4.63. An additional check is made by drawing an additional sight line tangential to the kerb, or edge of roadway, to ensure that an approaching vehicle is visible over the entire Y distance.

Longer X distances allow drivers more time to observe traffic on the intersected arm and to identify gaps more readily, possibly before the vehicle comes to a stop, thus allowing increased vehicle speeds through junctions. Furthermore, a longer X distance may encourage more than one vehicle on the minor arm to accept the same gap even where it is not ideal that they do so. Neither circumstance is desirable in urban areas. The attention of a driver should not solely be focused on approaching vehicles and the acceptance of gaps. The pedestrian/ vulnerable road users should be higher in the movement hierarchy

For this reason, priority junctions in urban areas should be designed as Stop junctions, and a maximum X distance of 2.4 metres should be used. In difficult circumstances this may be reduced to 2.0 metres where vehicle speeds are slow and flows on the minor arm are low. However, the use of a 2.0 metre X distance may result in some vehicles slightly protruding beyond the major carriageway edge, and may result in drivers tending to nose out cautiously into traffic. Care should be taken to ensure that cyclists and drivers can observe this overhang from a reasonable distance and manoeuvre to avoid it without undue difficulty.

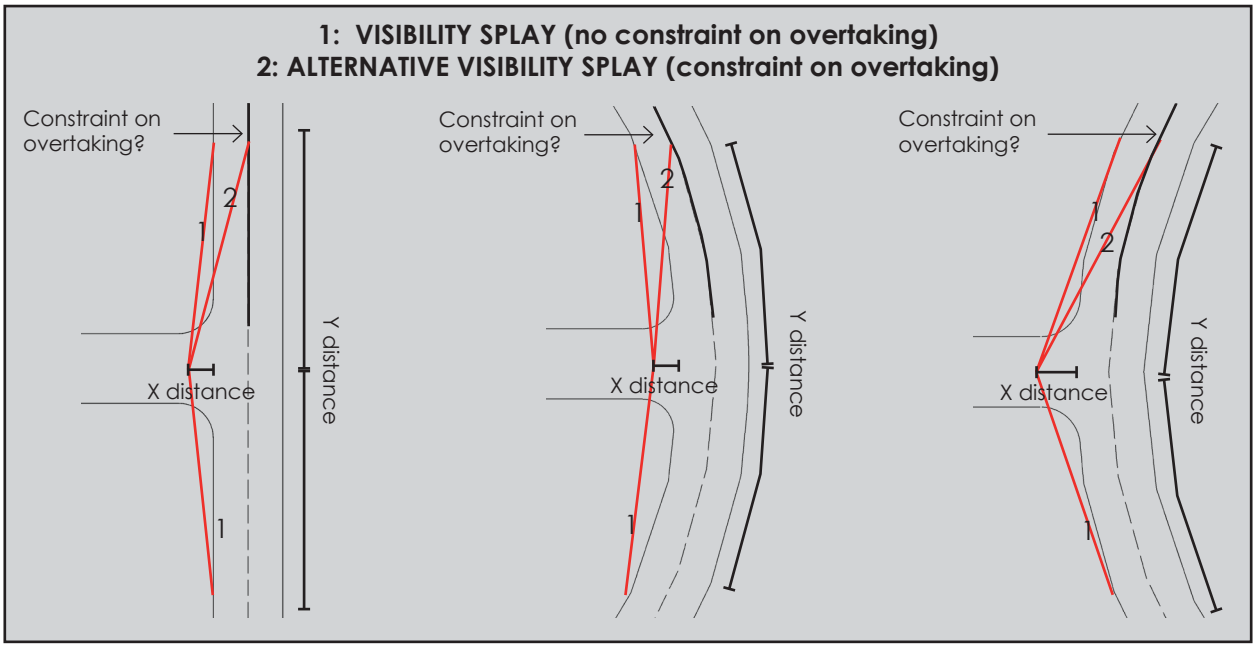

Figure 4.63: Forward visibility splays refer to an X and Y value. The X value allows drivers to observe traffic on the intersected arm. The Y value allows the driver of a vehicle to stop safely should an object enter its path, and is based on the SSD value.