

LOCATION:  
BS101 Southsea

DATE:  
8.11.11

START TIME: 10.45  
END TIME:

WEATHER: Wet.

OPERATOR: MNE/JLG.

| MPH | ↓ wxm | TOTAL | NUMBER CHECKED |     | ↑ lodge. | TOTAL | NUMBER CHECKED |     |
|-----|-------|-------|----------------|-----|----------|-------|----------------|-----|
| 50+ |       |       | ***            | *** |          |       | ***            | *** |
| 49  |       |       |                |     |          |       |                |     |
| 48  |       |       |                |     |          |       |                |     |
| 47  |       |       |                |     |          |       |                |     |
| 46  |       |       |                |     |          |       |                |     |
| 45  |       |       |                |     |          |       |                |     |
| 44  |       |       |                |     |          |       |                |     |
| 43  |       |       |                |     |          |       |                |     |
| 42  |       |       |                |     |          |       | 1              |     |
| 41  |       |       |                |     |          |       |                |     |
| 40  |       |       |                |     |          |       |                |     |
| 39  |       |       |                |     |          |       |                |     |
| 38  |       |       |                |     |          |       |                |     |
| 37  |       |       |                |     |          |       |                |     |
| 36  |       |       |                |     |          |       |                |     |
| 35  |       |       |                |     |          |       |                |     |
| 34  |       |       |                |     |          |       |                |     |
| 33  |       |       |                |     |          |       |                |     |
| 32  |       |       |                |     |          |       |                |     |
| 31  |       |       |                |     |          |       |                |     |
| 30  |       |       |                |     |          |       |                |     |
| 29  |       |       |                |     |          |       |                |     |
| 28  |       |       |                |     |          |       |                |     |
| 27  |       |       |                |     |          |       |                |     |
| 26  |       |       |                |     |          |       |                |     |
| 25  |       |       |                |     |          |       |                |     |
| 24  |       |       |                |     |          |       |                |     |
| 23  |       |       |                |     |          |       |                |     |
| 22  |       |       |                |     |          |       |                |     |
| 21  |       |       |                |     |          |       |                |     |
| 20  |       |       |                |     |          |       |                |     |
| 19  |       |       |                |     |          |       |                |     |
| 18  |       |       |                |     |          |       |                |     |
| 17  |       |       |                |     |          |       |                |     |
| 16  |       |       |                |     |          |       |                |     |
| 15  |       |       |                |     |          |       |                |     |
| 14  |       |       |                |     |          |       |                |     |
| 13  |       |       |                |     |          |       |                |     |
| 12  |       |       |                |     |          |       |                |     |
| 11  |       |       |                |     |          |       |                |     |
| 10  |       |       |                |     |          |       |                |     |
| 09  |       |       |                |     |          |       |                |     |
| 08  |       |       |                |     |          |       |                |     |
| 07  |       |       |                |     |          |       |                |     |
| 06  |       |       |                |     |          |       |                |     |
| 05  |       |       |                |     |          |       |                |     |
| 04  |       |       |                |     |          |       |                |     |
| 03  |       |       |                |     |          |       |                |     |
| 02  |       |       |                |     |          |       |                |     |
| 01  |       |       |                |     |          |       |                |     |
| 00  |       |       |                |     |          |       |                |     |

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

$v$  = speed (m/s)

$t$  = driver perception - reaction time (s)

$d$  = deceleration (m/s<sup>2</sup>)

$$v = 38 \text{ mph} = \frac{38 \times 1609.344}{60 \times 60} = 16.98 \text{ m/s}$$

$$t = 1.5 \text{ s}$$

$$d = 4.41 \text{ m/s}^2$$

$$SSD = (16.98 \times 1.5) + \frac{16.98^2}{2 \times 4.41}$$

$$29.97 + 32.69$$

$$= 62.66 \text{ m}$$

**Table 7.1 Derived SSDs for streets (figures rounded).**

| Speed                                                    | Kilometres per hour | 16 | 20 | 24 | 25 | 30 | 32 | 40 | 45 | 48 | 50 | 60 |
|----------------------------------------------------------|---------------------|----|----|----|----|----|----|----|----|----|----|----|
|                                                          | Miles per hour      | 10 | 12 | 15 | 16 | 19 | 20 | 25 | 28 | 30 | 31 | 37 |
| SSD (metres)                                             |                     | 9  | 12 | 15 | 16 | 20 | 22 | 31 | 36 | 40 | 43 | 56 |
| SSD adjusted for bonnet length. See 7.6.4                |                     | 11 | 14 | 17 | 18 | 23 | 25 | 33 | 39 | 43 | 45 | 59 |
| Additional features will be needed to achieve low speeds |                     |    |    |    |    |    |    |    |    |    |    |    |

7.5.7 The SSD values used in MfS are based on a perception–reaction time of 1.5 seconds and a deceleration rate of  $0.45g$  ( $4.41 \text{ m/s}^2$ ). Table 7.1 uses these values to show the effect of speed on SSD.

7.5.8 Below around 20 m, shorter SSDs themselves will not achieve low vehicle speeds: speed-reducing features will be needed. For higher speed roads, i.e. with an 85th percentile speed over 60 km/h, it may be appropriate to use longer SSDs, as set out in the *Design Manual for Roads and Bridges*.

7.5.9 Gradients affect stopping distances. The deceleration rate of  $0.45g$  used to calculate the figures in Table 7.1 is for a level road. A 10% gradient will increase (or decrease) the rate by around 0.1g.

## 7.6 Visibility requirements

7.6.1 Visibility should be checked at junctions and along the street. Visibility is measured horizontally and vertically.

7.6.2 Using plan views of proposed layouts, checks for visibility in the horizontal plane ensure that views are not obscured by vertical obstructions.

7.6.3 Checking visibility in the vertical plane is then carried out to ensure that views in the horizontal plane are not compromised by obstructions such as the crest of a hill, or a bridge at a dip in the road ahead. It also takes into account the variation in driver eye height and the height range of obstructions. Eye height is assumed to range from 1.05 m (for car drivers) to 2 m (for lorry drivers). Drivers need to be able to see obstructions 2 m high down to a point 600 mm above the carriageway. The latter dimension is used to ensure small children can be seen (Fig. 7.17).

7.6.4 The SSD figure relates to the position of the driver. However, the distance between the driver and the front of the vehicle is typically up to 2.4 m, which is a significant proportion of shorter stopping distances. It is therefore recommended that an allowance is made by adding 2.4 m to the SSD.

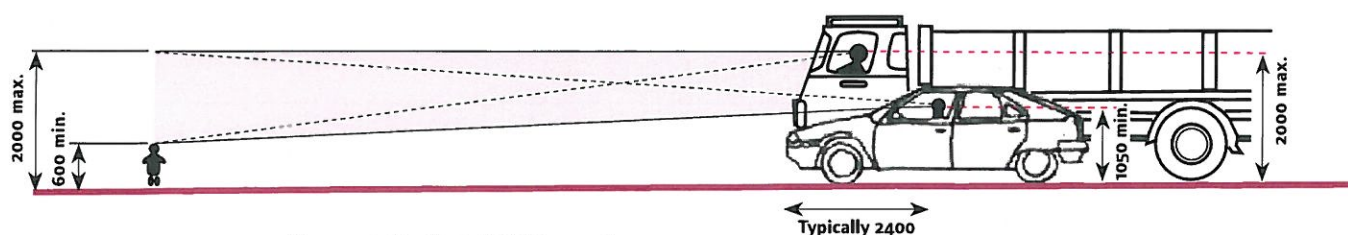


**Figure 7.17 Vertical visibility envelope.**

7.4.6 A street with a 20 mph limit is not the same as a 20 mph zone. To create a 20 mph zone, it is a legal requirement that traffic-calming measures are installed to ensure that low speeds are maintained throughout. In such cases, the limit is signed only on entering the zone, and no repeater signs are necessary.

7.4.7 Any speed limits below 30 mph, other than 20 mph limits or 20 mph zones, require individual consent from the Secretary of State for Transport. Designers should note that such approval is unlikely to be given.

7.4.8 A speed limit is not an indication of the appropriate speed to drive at. It is the responsibility of drivers to travel within the speed limit at a speed suited to the conditions. However, for new streets, or where existing streets are being modified, and the design speed is below the speed limit, it will be necessary to include measures that reduce traffic speeds accordingly.

7.4.9 Difficulties may be encountered where a new development connects to an existing road. If the junction geometry cannot be made to conform to the requirements for prevailing traffic speeds, the installation of traffic-calming measures on the approach will allow the use of a lower design speed to be used for the new junction.

## 7.5 Stopping sight distance

7.5.1 This section provides guidance on stopping sight distances (SSDs) for streets where 85th percentile speeds are up to 60 km/h. At speeds above this, the recommended SSDs in the *Design Manual for Roads and Bridges*<sup>16</sup> may be more appropriate.

7.5.2 The stopping sight distance (SSD) is the distance within which drivers need to be able to see ahead and stop from a given speed. It is calculated from the speed of the vehicle, the time required for a driver to identify a hazard and then begin to brake (the perception–reaction time), and the vehicle's rate of deceleration. For new streets, the design speed is set by the designer. For existing streets, the 85th percentile wet-weather speed is used.

7.5.3 The basic formula for calculating SSD (in metres) is:

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

where:

$v$  = speed (m/s)

$t$  = driver perception–reaction time (seconds)

$d$  = deceleration (m/s<sup>2</sup>)

7.5.4 The desirable minimum SSDs used in the *Design Manual for Roads and Bridges* are based on a driver perception–reaction time of 2 seconds and a deceleration rate of 2.45 m/s<sup>2</sup> (equivalent to 0.25*g* where *g* is acceleration due to gravity (9.81 m/s<sup>2</sup>)). *Design Bulletin 32*<sup>17</sup> adopted these values.

7.5.5 Drivers are normally able to stop much more quickly than this in response to an emergency. The stopping distances given in the Highway Code assume a driver reaction time of 0.67 seconds, and a deceleration rate of 6.57 m/s<sup>2</sup>.

7.5.6 While it is not appropriate to design street geometry based on braking in an emergency, there is scope for using lower SSDs than those used in *Design Bulletin 32*. This is based upon the following:

- a review of practice in other countries has shown that *Design Bulletin 32* values are much more conservative than those used elsewhere;<sup>18</sup>
- research which shows that the 90th percentile reaction time for drivers confronted with a side-road hazard in a driving simulator is 0.9 seconds (see TRL Report 332<sup>19</sup>);
- carriageway surfaces are normally able to develop a skidding resistance of at least 0.45*g* in wet weather conditions. Deceleration rates of 0.25*g* (the previously assumed value) are more typically associated with snow-covered roads; and
- of the sites studied in the preparation of this manual, no relationship was found between SSDs and casualties, regardless of whether the sites complied with *Design Bulletin 32* or not.

<sup>16</sup> Highways Agency (1992) *Design Manual for Roads and Bridges* London: TSO.

<sup>17</sup> Department of the Environment/Department of Transport (1977; 2nd edn 1992) *Design Bulletin 32, Residential Roads and Footpaths – Layout Considerations*. London: HMSO.

<sup>18</sup> D.W. Harwood, D.B. Fambro, B. Fishburn, H. Joubert, R. Lamm and B. Psarianos. (1995) *International Sight Distance Design Practices, International Symposium on Highway Geometric Design Practices*, Boston, Massachusetts Conference Proceedings. Washington USA: Transportation Research Board.

<sup>19</sup> Maycock G, Brocklebank P. and Hall, R. (1998) *Road Layout Design Standards and Driver Behaviour*. TRL Report No. 332. Crowthorne: TRL