7.1 Safe transport infrastructure and an efficient traffic management system are important pillars of road safety. The Panel has examined in depth issues concerning traffic engineering and management that define the road environment and shape the behaviour of road users. They include highway design standards, speed management, provision of traffic signs and road markings as well as other traffic control measures. As the July incident occurred on an expressway section of the Tuen Mun Road, the Panel has focused more on traffic engineering and management issues relating to the design of high-speed roads.

7.2 The Panel considers that Hong Kong’s design standards meet international standards and place proper emphasis on road safety, despite the challenges presented by limited space and a hilly topography. Members point to the need to differentiate between requirements for safety and comfort in highway design standards which will be discussed in greater detail in the following paragraphs. The Panel has also reviewed various traffic management and control measures with reference to suggestions from the public, and put forth recommendations for further enhancement.

7.3 Highway design concerns the selection of a road’s visible features and dimensions, which comprise road alignment factors and cross section elements. The road alignment is composed of various geometric parameters, including sight distance, gradient, horizontal and vertical curves and superelevation factors, which complement each other to serve the traffic in a safe, comfortable and efficient manner.
Chapter 7

Illustrations of different road alignment factors

Sight distance : The length of roadway ahead visible to the driver (Figure 7.1).

Figure 7.1 – Sight distance
Gradient: The change in elevation per unit change in the length of roadway.

Horizontal Curve (Bends): Circular arcs that connect straight sections of a road. The sharpness of a curve is measured by the radius of curvature - the shorter the radius, the sharper the curve.

Superelevation: Curves are banked (superelevated) so that the gravitational force associated with the weight of the vehicle can help counteract the centrifugal force which acts on objects travelling on a circular path. The frictional force between the vehicle’s tyres and the road surface counteracts the centrifugal force to prevent the vehicle from sliding out of the curve. (Figure 7.2)
Vertical Curve: A vertical curve is either a hill crest or a sag. Vertical curves are designed so that a driver operating at the design speed\(^1\) can react and brake to a stop on wet road surface within the sight distance.

7.4 Carriageway cross-section elements include carriageway width, marginal strip and hard shoulder width, and central reserve width. A typical cross section of an expressway is shown in Figure 7.3.

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\(^1\) Please see para. 7.16 for explanation of design speed.
7.5 Slip roads at diverging or merging points are defined by such factors as lengths of nose, taper, parallel lane and merging lane. They are illustrated in Figures 7.4 and 7.5.

![Figure 7.4 – Diagram to show a typical direct entry merging lane](image)

![Figure 7.5 – Diagram to show different factors at a typical parallel merging lane](image)

Design standards and comparison with overseas countries

7.6 Highway design standards are guidelines for the selection of appropriate design elements to provide comfort, safety and convenience to road users. The current highway design standards in Hong Kong are set out in Volume 2 of the Transport Planning and Design Manual – Highway Design Characteristics published by the Transport Department (TD).
Chapter 7

7.7 A comparison of the design standards in Hong Kong with those in the UK and USA is set out in Figure 7.6.

![Figure 7.6 – Comparison of highway design standards in Hong Kong, UK and USA](image)

(a) Design speed

<table>
<thead>
<tr>
<th></th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural area</td>
<td>100 km/h</td>
<td>120 km/h</td>
<td>80 - 110 km/h</td>
</tr>
<tr>
<td>Urban area</td>
<td>70 km/h (80 km/h for new roads) or above</td>
<td>Less than 120 km/h</td>
<td>80 - 110 km/h</td>
</tr>
</tbody>
</table>

(b) Sight distance

<table>
<thead>
<tr>
<th>Design speed (km/h)</th>
<th>HK Desirable</th>
<th>HK Absolute</th>
<th>UK Desirable</th>
<th>UK Absolute</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>295</td>
<td>215</td>
<td>295</td>
<td>215</td>
<td>250</td>
</tr>
<tr>
<td>110</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>220</td>
</tr>
<tr>
<td>100</td>
<td>215</td>
<td>160</td>
<td>215</td>
<td>160</td>
<td>185</td>
</tr>
<tr>
<td>90</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>160</td>
</tr>
<tr>
<td>85</td>
<td>160</td>
<td>120</td>
<td>160</td>
<td>120</td>
<td>-</td>
</tr>
<tr>
<td>80</td>
<td>145</td>
<td>110</td>
<td>-</td>
<td>-</td>
<td>130</td>
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<td>120</td>
<td>90</td>
<td>120</td>
<td>90</td>
<td>105</td>
</tr>
</tbody>
</table>

(c) Gradients

<table>
<thead>
<tr>
<th>Design speed (km/h)</th>
<th>HK Desirable</th>
<th>HK Absolute</th>
<th>UK Desirable</th>
<th>UK Absolute</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>-</td>
<td>4%</td>
<td>8%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>110</td>
<td>-</td>
<td>4%</td>
<td>8%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>70 - 100</td>
<td>between 5% and 12%</td>
<td>5%</td>
<td>5%</td>
<td>-</td>
<td>4%</td>
</tr>
</tbody>
</table>
Figure 7.6 – Comparison of highway design standards in Hong Kong, UK and USA (Cont’d)

(d) Horizontal curve

<table>
<thead>
<tr>
<th>Design speed (km/h)</th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Desirable Minimum Radius</td>
<td>Absolute Minimum Radius</td>
<td>Desirable Minimum Radius</td>
</tr>
<tr>
<td>120</td>
<td>700 m</td>
<td>250 m</td>
<td>720 m</td>
</tr>
<tr>
<td>110</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>100</td>
<td>500 m</td>
<td>175 m</td>
<td>510 m</td>
</tr>
<tr>
<td>90</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>85</td>
<td>350 m</td>
<td>125 m</td>
<td>360 m</td>
</tr>
<tr>
<td>80</td>
<td>320 m</td>
<td>115 m</td>
<td>-</td>
</tr>
<tr>
<td>70</td>
<td>250 m</td>
<td>88 m</td>
<td>255 m</td>
</tr>
</tbody>
</table>

(e) Vertical curve

i) Minimum K value for vertical crest *

<table>
<thead>
<tr>
<th>Design speed (km/h)</th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum K value for vertical crest</td>
<td>Desirable</td>
<td>Absolute</td>
</tr>
<tr>
<td>120</td>
<td>182</td>
<td>182</td>
<td>100</td>
</tr>
<tr>
<td>110</td>
<td>-</td>
<td>-</td>
<td>74</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>100</td>
<td>55</td>
</tr>
<tr>
<td>90</td>
<td>-</td>
<td>-</td>
<td>39</td>
</tr>
<tr>
<td>85</td>
<td>55</td>
<td>55</td>
<td>30</td>
</tr>
<tr>
<td>80</td>
<td>55</td>
<td>-</td>
<td>26</td>
</tr>
<tr>
<td>70</td>
<td>30</td>
<td>30</td>
<td>17</td>
</tr>
</tbody>
</table>

ii) Minimum K value for vertical sag *

<table>
<thead>
<tr>
<th>Design speed (km/h)</th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum K value for vertical sag</td>
<td>Desirable</td>
<td>Absolute</td>
</tr>
<tr>
<td>120</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>110</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>100</td>
<td>37</td>
<td>37</td>
<td>26</td>
</tr>
<tr>
<td>90</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>85</td>
<td>26</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td>80</td>
<td>26</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>70</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

* The curvature of vertical curve should be as large as possible to provide for comfort and sufficient sight distance for safe stopping at design speed. The curvature should be derived from the appropriate K value where $K = \frac{L}{A}$ (curve length in metres)/A (algebraic difference in gradients (%)).
### Figure 7.6 – Comparison of highway design standards in Hong Kong, UK and USA (Cont’d)

#### (f) Superelevation

<table>
<thead>
<tr>
<th></th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>7%</td>
<td>7%</td>
<td>8 - 10%</td>
</tr>
<tr>
<td>Urban</td>
<td>7%</td>
<td>5%</td>
<td>8 - 10%</td>
</tr>
</tbody>
</table>

#### (g) Carriageway width

<table>
<thead>
<tr>
<th></th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane width</td>
<td>3.65 m</td>
<td>3.65 m</td>
<td>3.6 m</td>
</tr>
</tbody>
</table>

#### (h) Verges and hard shoulders

<table>
<thead>
<tr>
<th></th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verge</td>
<td>3.0 m</td>
<td>1.5 m</td>
<td>-</td>
</tr>
<tr>
<td>Hard shoulder</td>
<td>3.3 m</td>
<td>3.3 m</td>
<td>3.0 m</td>
</tr>
</tbody>
</table>

#### (i) Minimum vertical clearance

<table>
<thead>
<tr>
<th></th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum vertical clearance (m)</td>
<td>5.1</td>
<td>5.30 - 6.45</td>
<td>4.9</td>
</tr>
</tbody>
</table>

#### (j) Minimum central reserve width

<table>
<thead>
<tr>
<th></th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>3.2</td>
<td>2.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Urban</td>
<td>2.3</td>
<td>4.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Minimum central reserve (m)</td>
<td>3.0 - 9.0</td>
<td>3.0 - 9.0</td>
<td>3.0 - 9.0</td>
</tr>
<tr>
<td>Marginal strip adjacent to central reserve (m)</td>
<td>1.0</td>
<td>0.5</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Figure 7.6 – Comparison of highway design standards in Hong Kong, UK and USA (Cont’d)

(k) Connector road design speed

<table>
<thead>
<tr>
<th>Mainline design speed (km/h)</th>
<th>Connector road design speed (km/h)</th>
<th>HK</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td></td>
<td>-</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>110</td>
<td></td>
<td>-</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>100</td>
<td>80 - 100</td>
<td>60</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>90</td>
<td>50 - 80</td>
<td>60</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

(l) Merging and diverging lanes

<table>
<thead>
<tr>
<th>Entry merging lane</th>
<th>Exit diverging lane</th>
</tr>
</thead>
<tbody>
<tr>
<td>HK</td>
<td>UK</td>
</tr>
<tr>
<td>Single lane width (m)</td>
<td>3.7</td>
</tr>
<tr>
<td>Two lane ramp width (m)</td>
<td>3.7</td>
</tr>
<tr>
<td>Taper gradient (i) Single lane</td>
<td>1:25</td>
</tr>
<tr>
<td>(ii) Two lane</td>
<td>1:25</td>
</tr>
</tbody>
</table>

7.8 The Panel notes that the Hong Kong standards are similar to those adopted in the UK. The major difference lies in the maximum gradient – the desirable and absolute maximum gradients of Hong Kong are 4% and 8% respectively while those of UK are 3% and 4%. The deviation is attributable to topographical differences between Hong Kong and the UK.

7.9 The Panel also notes that Hong Kong standards are comparable with the USA standards despite the following differences. The carriageway and hard shoulder widths in the USA are smaller than those in Hong Kong. The minimum sight
distance and the K value for vertical sag curves of the USA are greater than those of Hong Kong, but the maximum gradients and superelevation rate adopted in the US are also higher, denoting steeper road sections and sharper bends.

7.10 There are comments from the public on the inadequate length of merging lanes along the expressways in Hong Kong. The Panel notes that Hong Kong’s standard for the length of such merging lanes is 205 m, lower than that of freeways and motorways in the US and UK, which ranges from 245 m to 385 m. The Panel considers that it is not practicable for Hong Kong to adopt overseas standards in this regard, given the constraints imposed by limited space and hilly terrain. Besides, the function and characteristic of freeways and motorways which are intended for inter-city traffic should be differentiated from expressways in Hong Kong that only serve intra-city traffic.

Safety vs comfort

7.11 It is shown in Figure 7.6 that many standards are specified by both ‘desirable’ and ‘absolute’ values, and the values adopted vary slightly from one country to another. ‘Desirable’ values offer a high level of comfort and considerable safety margins at the design speed. ‘Absolute’ values specify a lower level of comfort. It should be noted that slight deviations from the standards would not have a substantial impact on the safety of a road. For instance, current standards specify that the minimum carriageway width for three lanes should be 11 m. It does not mean that a carriageway of 10.5 m is unsafe.

7.12 The superelevation rate and the maximum value of side friction are two key elements of horizontal curve design. Design values are usually set at such a level to avoid giving the driver the discomfort of sliding on the car seat. This is a good illustration of how comfort is being taken into account in highway design.

7.13 A vertical curve is designed on the basis of providing road users a reasonable sight distance over a crest. For a given design speed, the required sight distance is set according to two assumptions: (i) the reaction time for a driver to brake his car to an emergency stop and (ii) the frictional force that can be generated
between the vehicle’s tyres and the pavement surface. To provide considerable margins of safety in design, the assumptions are usually based upon a near-worst case scenario, i.e. drivers locking their brakes and skidding to a stop on a wet pavement. Under normal circumstances, the braking distance, and thus the sight distance required, should be shorter.

7.14 Highway design standards are a product of accumulated experience and a model of good practices at the time of design. Such standards and practices evolve with time, as the information, judgments and economic considerations that determine them keep on changing. Hence, when there is a change in design standards, it does not mean that existing roads which fall short of the revised standards are not safe. Theoretically speaking, more generous dimensions give rise to safer roads. However, no road is accident proof, no matter how generous the dimensions are, as accidents are multi-factor random events involving human elements, vehicles and the road. In light of the above, the Panel considers that a well-designed road should be one that provides an acceptable level of safety with the intended level of comfort at an acceptable cost.

**Speed Management**

7.15 There is a close relationship between highway design decisions and the speed. To enhance the readers’ appreciation of the choice of design speed and posted speed limit for highways, explanations of the concepts of design speed and speed limit are set out below.

**Design speed**

7.16 The design speed of a road is the speed chosen to correlate various design features, such as the minimum horizontal and vertical curvature and superelevation. It should be a realistic estimate of the speed adopted by vehicles. As pointed out in the section on highway design, many highway features have built-in safety margins to cater for near-worst case scenarios and to provide a high level of
comfort at the design speed. As such, the design speed of a highway is not the ‘maximum safe speed’ along the road.

**Posted speed limit**

7.17 The posted speed limits are determined by a combination of factors including the design speed, results of speed surveys, accident rates, and road surface characteristics. They are used as a means to control the speed of traffic to an appropriate level under the general conditions. They are not supposed to be exceeded. Motorists are always required to drive with care and make necessary allowances in respect of their vehicles, driving skill, traffic conditions, climatic conditions, and constraints such as bends and surface characteristics of the road.

7.18 There are suggestions to review the speed limits in Hong Kong. The Panel notes that a Working Group comprising members from relevant departments and related non-government organisations has been conducting regular reviews of speed limits. Approximately 50 sections of roads, including expressways, are covered each year. The review takes into account the results of speed surveys, road configurations, accident rates, traffic conditions and the need to avoid frequent changes of speed limit over a short section of road etc.

7.19 **The Panel recommends that TD continue to conduct regular reviews of speed limits and, if necessary, adjust the speed limit to optimise traffic flow without compromising road safety.**

7.20 The Panel also received suggestions to tighten the speed limit of expressways. Members point out that this would reduce the efficiency of Hong Kong’s road network and increase the economic costs in terms of longer travelling time and business foregone by the freight industry. Setting an unrealistically low speed limit for a road, which is capable of accommodating traffic travelling at higher speeds, would also bring about serious enforcement problems.
As regards the proposal to set different speed limits for different lanes on expressways i.e. designating a slow lane for heavy vehicles and fast lanes for other vehicles, the Panel notes that there is a similar requirement in the Road Traffic (Expressway) Regulations. Under the Regulations, heavy vehicles are prohibited from using the offside lane (i.e. the fast lane) on an expressway with three or more lanes, unless it has to get access to an offside exit (see lane discipline for heavy vehicles in paragraph 7.57).

On the suggestion to impose different speed limits for heavy and light vehicles, the Panel notes that heavy vehicles, including medium and heavy goods vehicles and buses, are already subject to a maximum speed of 70 km/h (see speed limit for heavy vehicles in paragraph 7.58). Hence, a difference in speed limits between heavy and light vehicles already exists on roads with a speed limit exceeding 70 km/h. The Panel does not recommend a wider differential in speed limits between heavy and light vehicles, as it may increase the risk of traffic accidents.

For the proposal to limit the speed of passenger services vehicles to 70 km/h, the Panel notes that the maximum speed for buses, including both franchised and non-franchised buses, is already set at 70 km/h, but this limit does not apply to taxis and public light buses (PLBs). The Panel does not see any strong justification on road safety grounds to restrict the maximum speed of taxis and PLBs to 70 km/h. Members also point out that this will affect the efficiency of Hong Kong’s public transport system.

Instead of limiting the speed of passenger services vehicles (other than buses), the Panel recommends that targeted education programmes and more stringent enforcement be mounted to inculcate a good driving culture. The Panel also recommends that TD evaluate the effectiveness of those speed display units currently in use in green minibuses running overnight routes, and consider the advantages of extending their use to other PLBs. Please see Chapter 8 for a more detailed discussion about the installation of speed display and control devices in vehicles.
There is also a suggestion to lower the speed limit for buses under strong wind conditions. The Panel notes that all franchised bus operators have already issued guidelines to their drivers on operating bus services under strong wind conditions. Slowing down the vehicles is one of the requirements. The Panel is satisfied with the existing administrative arrangement.

**Traffic Signs and Road Markings**

Traffic signs and road markings are integral parts of the road system. They convey important information to drivers on the directions and the driving rules.

The Panel notes that the design of traffic signs and road markings in Hong Kong is largely based on the UK Traffic Signs Regulations and General Directions 1975 and 1981. These regulations are in turn developed on the basis of the Convention on Road Traffic and Road Signs and Signals, Vienna 1968, the European Agreement, Geneva 1971, and the Protocol on Road Markings, Geneva 1973. With the adoption of the above conventions, a high degree of uniformity of traffic signing and road marking is achieved throughout the world.

Traffic signs

The Panel considers that traffic signs intended for vehicular traffic have to transmit clear messages at the right time to motorists who are travelling at normal speed. It is hence important for traffic signs to have correct legibility distance, simplicity of content and layout and effective illumination or reflectorisation. They need to be appropriately located in relation to the junction, restriction, hazard or other features to which they apply.
7.29 Traffic signs serve regulatory, warning, informative and directional functions as specified by their shapes and colours. Regulatory signs give orders. They are normally circular in shape, and are either mandatory or prohibitive in nature. They are located at the point where the regulatory effect commences (Figure 7.7).

![Figure 7.7 – Examples of regulatory traffic signs](image)

7.30 Warning signs are normally triangular in shape, bearing a black symbol on a white background with a red border while informative signs are usually rectangular in shape (Figure 7.8).

![Figure 7.8 – Examples of warning and informative traffic signs](image)
7.31 Directional signs enable motorists to find their way to a desired destination. Directional signs can be of different types and in various formats. They can be installed at the roadside or on gantries over the carriageway depending on actual site situations and road conditions.

7.32 For expressways, trunk roads, primary distributor roads and rural roads, a set of three signs, namely, “Advance Direction Sign”, “Final Advance Direction Sign” and “Direction sign” must be provided at all junctions or locations at which there is a slip road branching from the main road. These signs provide drivers with sufficient advance information to choose the correct route (Figure 7.9).

7.33 There are suggestions to review the standard of road signage, install more directional and traffic signs to give early warning to motorists and to improve the visibility of the signs. The Panel considers that the signing arrangements in Hong Kong accord with international practices, and notes that TD has recently
Traffic Engineering and Management completed a study titled ‘Comprehensive Review of Directional Signing in Hong Kong’, which recommends improvements in signing strategy, sign provision, sign format and sign mounting. A pilot scheme to assess the effectiveness of the recommendations will be carried out in Shatin. More details of the Review are set out in paragraphs 7.43 - 7.46.

7.34 On the other hand, the Panel expresses reservations about the proposal to provide a countdown facility for vehicular signals. According to overseas studies, any advance facility indicating imminent change of traffic signal may increase the risk of traffic accidents, as motorists may have different perceptions and reactions to the advance indication.

Road markings

7.35 Road markings are designed to convey regulatory, advisory and warning messages. Regulatory markings are used to –

- prohibit certain actions;
- indicate the direction for vehicles to follow;
- determine the area where certain activities are permitted; and
- direct a driver to take certain actions.

7.36 Warning and advisory markings serve the following functions –

- promote full utilisation of the carriageway;
- warn of a hazard ahead;
- provide carriageway delineation;
- direct traffic around an obstruction or signify a change in traffic lane alignment;
- warn of an action to be taken;
- provide route information; and
- delineate hazardous areas.
7.37 In general, white markings are intended to direct and control moving vehicles, and yellow markings to control stopping of vehicles, e.g. box junction, hatched marking, and yellow lines are stopping restrictions. Road markings should be designed and verified for their compatibility with all traffic signs, directional signs, traffic signals as well as any variable signs and signals. Figure 7.10 are some examples of road markings.

![Figure 7.10 – Examples of road markings](image)

- **Bus only lane**
- **Vehicles merge - no entry to hatched area**
- **Vehicles should not cross the solid line**
- **No entry to box junction unless the exit is clear**

7.38 Many submissions from the public touch on road markings. There are suggestions to use double white lines to deter lane changing activities at certain road sections (e.g. high-risk locations). The Panel considers that double white lines have already been used at locations where lane changing is considered potentially dangerous, and the suitability of applying double white lines to specific road sections should be assessed on a case-by-case basis. It should be noted that an extensive use of double white lines runs the risk of diluting the respect for such markings, which will not reduce the amount of lane changing but merely shift the act upstream to where the double white lines begin.
7.39 As for suggestions to use double white lines to prevent last-minute attempts to change lanes at diverging points, the Panel considers that, if there is clear visibility ahead of the interchange, coupled with adequate directional signing, it may not be necessary to apply double white lines. Imposing double white lines at diverging points might indeed shorten the time allowed for drivers to observe traffic condition for lane changing and could create an adverse impact on safety.

7.40 There are also suggestions to use double white lines to deter lane changing on roads with speed limit at 70km/h, which are mainly expressways. The Panel appreciates that there are practical and legitimate needs for drivers to change lanes along the way, especially at and near to intersections. The Panel also recognises that when lane changing is not allowed, slower moving vehicles would largely dictate the traffic flow and result in congestion.

7.41 On the suggestion to use road markings to provide motorists travelling on expressways with more information, the Panel notes that this is already in practice. In general, information is best provided through signs mounted on gantries rather than road markings, as the latter could be easily obscured by other travelling vehicles.

**Recent development of traffic signs and road markings in Hong Kong**

7.42 The Panel notes that TD commenced in July 1999 a comprehensive review on the traffic signs and road markings. The objectives of the review were to identify problem areas from complaints received, research into the latest practices adopted in major overseas cities, and put forth a set of recommendations with priorities. The Study brought about the following improvements –

- improve the layout of the no-stopping restriction sign;
- simplify contents of traffic signs, such as removing the letters ‘km/hr’ from speed limit signs to enable a larger speed limit numeral to be shown;
- adjust the orientation of taxi and light bus stand signs to face the traffic to enhance their visibility from a distance; and
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- use distinct wide short dotted markings to delineate exclusive turning lanes and lane drops on expressways/trunk roads and at other suitable locations to facilitate motorists’ timely entry into the correct lane.

7.43 In August 2001, TD undertook another study titled ‘Comprehensive Review of Directional Signing in Hong Kong’. The objectives were to assess the design standards of directional signing adopted in Hong Kong against those of overseas countries, and to identify areas for continual improvement. The Study was completed in early 2003.

7.44 The Study concludes that the current design standards and provision of directional signs in Hong Kong are generally in line with those of major overseas countries, but a number of problem areas are identified –

- inadequate directional guidance for access to the strategic road network;
- discontinuity and inconsistency in destination names;
- insufficient advance signing;
- inadequate visibility due to obstruction or improper positioning of some signs; and
- bulky appearance of gantry structures.

7.45 To address the above problems, the Study recommends that improvements should cover four key areas, viz. signing strategy, sign provision, sign format and sign mounting, along the following lines –

- develop a four-level destination hierarchy comprising Regions, Sub-regions, Districts and local destinations;
- adopt new design techniques to address junction importance, speed, lane change and maximise sign visibility;
- provide an advance information sign (AIS) 1 000 to 2 000 m ahead of strategic road network junctions to provide early alert to motorists;
- incorporate distance indicators and optimise x-height (size of letters and numbers on the sign) to improve the sign format; and
use alternative sign mounting techniques to address space constraints, minimise risks of crashes on signs and enhance the aesthetic value.

7.46 To follow up on the recommendations of the Study, TD will rationalise the route numbering system and provide exit numbers on the strategic road network to give clearer directions to inter-district and inter-region traffic. This enhancement measure is scheduled to be completed by early 2004. A pilot scheme, in Shatin, to assess the other recommendations is under planning.

7.47 The Panel endorses the above improvements and recommends to expedite the implementation of the pilot scheme and the evaluation process so that an implementation programme can be drawn up for the rest of the road network as soon as possible.

7.48 The Panel also recommends that a publicity programme be formulated to brief motorists whenever there are changes in signing standards to avoid creating any confusion.

USE RESTRICTIONS

7.49 Apart from traffic signs and road markings, there are suggestions on other traffic control measures. For instance, some suggest that the ‘keep left’ restriction should be strictly imposed on all roads with two or more lanes. The Panel notes that there are already mechanisms to implement the ‘keep left unless overtaking’ requirement, which is a basic driving principle set out in the Road Users’ Code. It is also reinforced by the installation of ‘Keep Left Unless Overtaking’ signs at selected locations where additional warning is warranted. On expressways, the requirement to keep to the nearside unless for overtaking is stipulated in Regulation 12 of the Road Traffic (Expressway) Regulations, and failure to comply may result in prosecution.

7.50 On the other hand, there are suggestions to remove the ‘keep left’ restriction on all expressways. The Panel does not support this proposal as the ‘keep left’ restriction is a basic safety requirement for expressway driving. This
requirement aims to prevent excessive weaving and to help bring about a more orderly traffic flow. Removing the ‘keep left’ restriction would allow motorists to overtake on the nearside, which is potentially hazardous to other road users.

7.51 There is also a proposal for heavy goods vehicles and buses to use only the middle lane. The Panel has reservations about this proposal as motorists are well accustomed to the ‘keep left unless overtaking’ practice required under the Road Traffic (Expressway) Regulations. The proposed change may create confusion and increase the risk of accidents. In addition, Members also point to the potential danger arisen from this lane-use restriction to passengers during emergency evacuation, if a bus broke down in the middle of the road.

**Traffic Control in Tunnels and Tsing Ma Control Area**

7.52 The Panel notes that specific traffic control measures are introduced on safety grounds for certain types of vehicles in tunnels and Tsing Ma Control Area.

**Tunnel Restrictions**

7.53 While vehicles conveying dangerous goods are prohibited from using the tunnels, different Tunnel Regulations require some or all of the following vehicles to be confined to the nearside lane of the tunnel –

- bus;
- goods vehicle with a permitted Gross Vehicle Weight in excess of 5.5 tonnes;
- vehicle requiring certain specified permits; and
- vehicle towing another vehicle.
Measures taken in Tsing Ma Control Area

7.54 The Tsing Ma Control Area (General) Regulations require that permits have to be obtained for vehicles of excessive weight, height, length and width to travel in the Tsing Ma Control Area, and that the vehicles have to be accompanied by an escort vehicle.

7.55 The Panel notes that during strong wind conditions, High Wind Management is implemented at Lantau Link and Ting Kau Bridge. Under Stage I when the hourly mean wind speed is between 40 km/h - 65 km/h, wind susceptible vehicles (vehicle with an overall height exceeding 1.6 m, motorcycles or motor tricycles) are prohibited from using the Ting Kau Bridge and the upper deck of the Lantau Link. During Stage II when the hourly mean wind speed is between 65 km/h - 165 km/h, only the lower deck of the Lantau Link can be used. At wind speeds in excess of 165 km/h, both road links will be completely closed to traffic.

Traffic Management Measures on Heavy Vehicles

7.56 In light of the traffic incident on Tuen Mun Road on 10 July and the recent accidents involving franchised buses, there is heightened public concern about the safety standard of heavy vehicles, especially container trucks and franchised buses. The Panel notes that some safety related controls and restrictions on heavy vehicles are already in place, and some improvement measures will be adopted in light of the traffic accidents.

Lane discipline

7.57 Under the Road Traffic (Expressway) Regulations, heavy vehicles including medium and heavy goods vehicles and buses are prohibited from using the offside lane of an expressway with three or more lanes. This regulation helps
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segregate the slower heavy vehicles from the faster light vehicles, and hence minimises potentially dangerous lane cutting activities. For other major roads, ‘Keep Left Unless Overtaking’ traffic signs, climbing lanes on uphill roads and passing bays are provided where appropriate to perform the same function.

Speed limit

7.58 To enhance road safety, the Road Traffic Ordinance restricts the maximum speed of heavy vehicles to 70 km/h on roads with a posted speed limit over 70 km/h.

Loading of vehicles

7.59 There are traffic regulations stipulating the maximum weight and size of loads permitted to be carried by goods vehicles. TD has issued a Code of Practice on Loading of Vehicles to advise goods vehicle drivers and operators of the practice and manner for safe conveyance of goods, so that goods vehicles will not pose a danger to other traffic.

Prohibitions

7.60 The Panel received suggestions for imposing restrictions (full time or time limited) on buses and heavy vehicles from using certain road sections. The Panel notes that heavy vehicles are prohibited from entering around 120 locations throughout the territory due to site constraints, such as steep gradient, substandard width or bends, or insufficient headroom or turning radius.

Specific Measures for Franchised Buses

7.61 The Panel notes that franchised buses are subject to specific safety measures in terms of route planning, withdrawal of old vehicles from service and
working conditions of bus drivers. The Panel has examined in detail the major
accidents involving buses and reviewed the entry requirements and training for bus
drivers as well as improvement measures taken/being considered in the wake of
the traffic accidents.

Route planning

7.62 In formulating a bus network, bus routes or route changes, the following
factors will be taken into account –

- transport policy and objectives;
- volume of passenger demand;
- suitability of operating bus services with regard to the nature of terrain
  and conditions of roads and transport termini;
- deployment of suitable vehicle models on the route;
- availability of existing services;
- possibility of meeting the anticipated increase in passenger demand by
  adjustment of existing services;
- bus network efficiency and financial viability of the route; and
- views of the local community including the District Councils.

7.63 Where necessary, there will be additional requirements on specific
franchised bus routes. For instance, since 1993 double-decked buses operating
on steep roads with a gradient of 10% or more have been required to have integral
retarders to improve the breaking efficiency of the vehicles. Double-decked buses
running on Route Twisk have been required to be equipped with tachographs since

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2 Traffic engineers will advise on the suitability of the roads for bus operation in areas without existing bus route or on
roads which have been realigned. Bus trial runs, with the assistance of Traffic Police, will be arranged.
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Withdrawal of old vehicle from service

7.64 Under an agreement with franchised bus companies, buses will be withdrawn from service before they reach the age of 18. A younger and more modern fleet will ensure a high level of safety and reliability and generate less pollution.

Entry requirements for franchised bus drivers

7.65 All franchised bus companies, except the Kowloon Motor Bus Co. (1933) Ltd (KMB) and Long Win Bus Co Ltd (LW), recruit new driver trainees who are holders of public bus driving licences. For KMB and LW, their driver trainees have to be holders of private car driving licences for at least three years. Unless the driver trainee has already obtained a public bus driving licence, he must pass the driving tests set by TD upon completion of training.

Training, continual education and publicity targetted at bus drivers

7.66 Franchised bus companies provide new drivers with basic training courses with durations ranging from a few days to about three weeks depending on the driving qualifications of the drivers. The programmes cover classroom and on-the-road training which include the following aspects –

- driving legislation and code of practice;
- bus and facilities operation;
- bus checking procedures;
- bus driving techniques including manoeuvering, driving responses and manners on the road; and
- route training and driving practices.
In addition, one to two-day refresher and enhancement courses are provided for incumbent franchised bus drivers on a regular basis. The main objectives of these courses are to –

- strengthen drivers’ driving skills and manners, including defensive driving;
- enhance drivers’ understanding of the potential risks of the routes they serve and the appropriate reaction; and
- reinforce concepts of road safety.

Apart from formal training courses, TD has been conducting Road Safety Seminars for franchised bus drivers since 2002. The Seminars highlight concepts of safe driving and analyse major accident spots and common contributory factors of bus accidents. In addition, franchised bus companies also remind their drivers of the importance of safe driving through regular issue of circulars, notices and in-house publications.

**Working conditions of bus drivers**

The issue of fatigue driving was raised in some of the submissions from the public. There are suggestions to introduce legislation on the maximum working hours for professional drivers. The Panel notes that TD has issued guidelines on the working hours of franchised bus drivers, as follows –

- drivers should take a break of at least 30 minutes after 6 hours of duty and within that 6-hour duty, the drivers should have total service breaks of at least 20 minutes;
- maximum duty (including all breaks) should not exceed 14 hours and driving duty (i.e. maximum duty minus all breaks of 30 minutes or more) should not exceed 11 hours; and
- the break between successive working days should not be less than 8 hours.

To prevent fatigue driving, the Panel considers it important for bus operators and drivers to adhere to the above guidelines.
Safety improvement measures

7.70 Apart from reviewing the existing safety measures, the Panel has examined in detail the following major traffic accidents involving franchised buses which occurred from 1998 to 2003 –

- Tonnochy Road Flyover on 30 January 1998;
- Lung Mun Road on 2 February 1999;
- Tate’s Cairn Tunnel on 8 September 2001;
- Tuen Mun Road near So Kwun Wat on 23 January 2003;
- Lantau Island on 26 January 2003;
- Tuen Mun Road on 10 July 2003; and
- Western Kowloon Expressway on 18 October 2003.

7.71 The Panel notes that specific traffic improvement and engineering remedial measures were taken after some of the above traffic accidents when the road environment was found to be a contributory factor. The Panel also notes that TD has requested the franchised bus companies to carry out a comprehensive review of their safety arrangements as a matter of urgency in three months.

7.72 The Panel recommends that TD continue to implement the following safety improvement measures –

- identify the cause of bus accidents and map out improvement measures to enhance bus safety;
- monitor closely the trend of bus accident rate of different franchised bus companies and take actions, such as that mentioned in paragraph 7.71, to improve the trend; and
- promote bus passenger safety and safe driving through different means of publicity such as Announcements of Public Interest (APIs) on TV and radio.
7.73 The Panel notes that apart from franchised buses, specific safety measures are applicable to other buses. Under the Road Traffic Ordinance, all operators of public and private buses must apply for a Passenger Service Licence (PSL) which regulates the operation of the service.

7.74 To cope with the surge of cross boundary vehicular traffic arising from closer economic and social links between Hong Kong and the Mainland, a quota system for cross-boundary traffic was introduced in 1982 to help regulate the volume of cross-boundary traffic. It is jointly administered by the Hong Kong and Guangdong/Shenzhen authorities. The operation of cross-boundary coach service is subject to quota restrictions.

7.75 The Panel notes that the following safety measures for cross boundary coaches have been implemented –

- non-franchised buses registered on or after 1 June 2002 which are deployed to provide cross-boundary coach service should be installed with seat belts according to the standards set by TD;
- with effect from 1 February 2002, a PSL condition has been imposed for operators to report to TD on a quarterly basis any accidents involving injury and fatality which occurred in the Mainland or Hong Kong;
- to facilitate passengers to offer comments or lodge complaints related to the coach service, a PSL condition has been imposed since 1 February 2002 requiring each operator to set up a hotline and to publicise the phone number inside the bus and on the ticket for the coach service; and
- the traffic accident records of operators have been used as one of the determining factors for quota allocation starting from 2002.
Observations

7.76 After examining the highway design standards and various traffic management measures, the Panel considers that Hong Kong has a safe highway network and an efficient traffic management system. The Panel also notes that improvement measures arising from systematic reviews are in the pipeline. The Panel urges the Government to expedite the implementation of the improvement measures and to keep track of the best practices in overseas countries.

7.77 The Panel also recommends that the Government keep a close watch of the safety record of specific vehicle types and take proactive steps to enhance their safety standards with participation of the relevant transport trades.