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By Fax

9 October 2012

Secretary General
Legislative Council Secretariat
Legislative Council Complex
1 Legislative Council Road
Central, Hong Kong
(Attn.: Ms. Macy NG)

Dear Ms. Ng,

Legislative Council Panel on Transport Meeting on 10 July 2012
Supplementary Information –
The Use of Crash Cushion in Hong Kong

The Administration presented "the Use of Crash Cushion in Hong Kong" to Panel Members at the captioned meeting. The aim of installing crash cushions is to reduce the severity of injuries to drivers and passengers of errant vehicles during collisions with fixed objects on roads.

As requested by a Member at the meeting, a copy of the relevant parts of the Transport Planning and Design Manual, which stipulates relevant guidelines for installation of crash cushions, for Members' information. Please note that Chinese translation of the Manual is provided for reference only and the English version shall prevail.

Yours sincerely,

(Miss Carrie LEE)
For Secretary for Transport and Housing

Encl.

c.c.
Commissioner for Transport (Attn.: Mr. Tony S. K. CHEUNG)
Director of Highways (Attn.: Mr. K. C. HO)

Extracts from the Transport, Planning and Design Manual

3.9.4 Crash Cushions

3.9.4.1 Where fixed objects cannot be removed, relocated or shielded by longitudinal barrier, crash cushions may be provided to slow down a vehicle to a safe stop for head-on impacts or redirect a vehicle away from the fixed object for side impacts so that the potential for serious injury to its occupants is eliminated.

3.9.4.2 Most crash cushions perform their functions by the principle of kinetic energy absorption or momentum transfer. Some crash cushions use a combination of these principles.

3.9.4.3 Different types of crash cushions possess different functions. The crash cushion type which suits Hong Kong most shall be able to withstand head-on, side-angle and reverse-angle impacts up to the design speed that the crash cushion can withstand. The design speed shall be taken to be the posted speed limit plus additional safety margin speed of 10 km/h to take into account the possible speeding of a vehicle. Furthermore, the crash cushion shall be able to perform the following characteristics :

(i) The crash cushion shall not allow the impacting vehicle to pass through the attenuator when it is struck at an angle on the front or "nose" to avoid the potential for secondary impacts.

(ii) It shall redirect vehicle in all designed side impacts on the unit at angles not exceeding 20° back to the originally travelled direction at no greater than 60% of the impact angle to avoid the potential for secondary accidents with vehicle travelling in adjacent travel lane.

(iii) The crash cushion shall be designed to be free from any protruding elements that may cause an errant vehicle to change direction in an uncontrolled phenomenon that will increase the potential for secondary accidents.

(iv) It shall also possess anti-climb characteristics to ensure that impacting vehicle will not roll over the system.

3.9.4.4 To ensure a crash cushion type satisfies the above required characteristics, it shall meet the evaluation criteria of *National Cooperative Highway Research Program (NCHRP) Report 350* of U.S.A. for different test levels 1 (50 km/h), 2 (70 km/h) and 3 (100 km/h). The crash cushion must be compliant with three dynamic performance evaluation criteria that are structural adequacy, occupant risk and post-impact vehicular trajectory.

3.9.4.5 The crash cushion so chosen should be wide enough to shield the ends of median barriers or other hazardous objects.

3.9.4.6 A transition section is needed between the back of the system and the barrier when the crash cushion cannot be attached directly to a median barrier or there exists a gap of greater than or equal to 500mm wide between them. Such transition section should also be provided if the median barrier terminates in sloping end.

3.9.4.7 The road surface on which the crash cushion is installed must be free from kerbs. The path between the carriageway and the crash cushion should be clear of any obstruction or irregularities. In addition, for structures, they should be placed free of joints.

3.9.4.8 Retroreflective sheeting should be provided on the nosing of a crash cushion to make it more conspicuous at night and during inclement weather. The required visibility distance for a crash cushion is stipulated in Table 3.3.5.1. When the sight distance is below the desirable minimum sight distance, an illuminated traffic bollard should be erected behind the crash cushion. Highways Department standard drawing No. H 2265 for the typical arrangement refers.

3.9.4.9 Since the crash cushion barriers are proprietary products, the dimensions corresponding to any particular design speed that they are designed to cater for are varied for different products. It is therefore desirable to obtain the dimensions of those crash cushion barriers available in the market. For new highway design, the largest size of the available product in the market in respect of the design speed should be adopted. Further, the necessary chevron road markings should be so designed to allow for the proposed crash cushion barrier to be installed with sufficient horizontal clearance as specified in Table 3.5.2.1.

3.9.4.10 Crash cushions are desirable to be provided under the following criteria :

(i) For high speed road with a speed limit of 70 km/h or above;

(ii) In front of the terminal of barriers where the diverging point for main roads and slip road are located; and

(iii) The main road and slip road are grade separated or at a level difference between them.

3.9.4.11 For any traffic black spot locations with potential hazards, such as bridge column, not complying with the above criteria, the necessity of the crash cushion barrier installation should be studied on an individual basis.

Table 3.3.5.1: Sight distances

Design speed (km/h)	Desirable minimum (m)	Absolute minimum (m)
120	295	215
100	215	160
85	160	120
80	145	110
70	120	90
60	90	70
50	70	50

Table 3.5.2.1: Horizontal Clearances from the Carriageway to obstructions

Design Speed (km/h)	Height of object	Minimum Clearance where carriageway cross fall is :		
		Away or towards object but not steeper than 2.5% (mm)	Towards object but not steeper than 4% (mm)	Towards object and steeper than 4% (mm)
50 or Less	(i) Less than 3m	500	600	600
	(ii) 3m and above	500	600	800
Above 50 less than 80	(i) Less than 3m	600	600	600
	(ii) 3m and above	1000	1000	1000
80 and above	Any height	1000	1000	1000