Roadside Safety for Secondary Roads and Urban Areas

Some Preliminary Thoughts

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Collision Scenarios and Risks

A primary consideration is the type of collisions with significant risks. For example:

- Double Decker buses can carry more than 100 passengers which are lightly protected by the fragile bus body. Potential high risk scenarios are rollover, fallover, frontal collision with objects and collision between the upper deck with roadside building structures.

- Car occupants are susceptible to penetration or intrusion of slender or sharp objects in a roadside collision. With stronger car body and mandatory safety belt usage, they have become less susceptible to severe injuries due to simple rollover.

- Vehicles intruding onto footpaths can result in mass fatalities or injuries of pedestrians. This is particularly the case at bus stops and crowded footpaths. Such events could be due to loss-of-control at elevated speeds or following a primary collision between vehicles. They have also happened due to drivers' accidental stepping onto the acceleration pedal in a panic to brake.

- Collapse of mounting posts onto pedestrians could be the immediate cause of fatal injuries in collisions involving errant vehicles. In other cases, flying debris of damaged street furniture leads to injuries.

Basic Principles

In developing a strategy, the following principles are relevant:

Passive Safety

- Passively safe street furniture is unlikely to be needed for <40km/h traffic environment unless accident history or other risk factors indicate otherwise (Ref 2)

- High quality passively safe roadside is obligatory for >= 80km/h traffic environment (DMRB TD19/06). In Hong Kong, the current threshold is 70km/h.

- Ramped-down terminals (P4 terminals) are permitted in the UK for <80km/h speed limit

- Sloping concrete terminals are considered acceptable at =<60km/h in the Roadside Design Guide (RDG)

- Modern car tests and star rating (http://www.euroncap.com/testprocedures.aspx)
  - 64km/h for frontal collision
  - 29km/h for side collision with a rigid pole (skid ad spin)

Mounting posts

Passively safe posts are those =< 89mm Ø and 3.2mm thk (4mm) at 100km/h. Mounting posts of 114mm Ø and 5mm thk are passively unsafe (Ref 3) at the same speed. The passive safety performance of metal sections is therefore an important criterion for higher speeds where safety barriers are not provided. However, in urban areas passive safety performance is less straightforward

given possible protection of pedestrians by rigid posts. On the contrary, collapsed posts which are passively safe have been the cause of fatalities and severe injuries among pedestrians.

Bollards

Bollards serve several purposes including deterrence of parking, protection of pedestrians from errant vehicles and aesthetical streetscape design. Larger rigid bollards are passively unsafe at high speed but offer protection for pedestrians. They would be appropriate where speed is low which implies low risk for loss-of-control and injuries. For moderate speed traffic environment, proprietary passively safe bollards could be a good compromise for the interest of both vehicle occupants and pedestrians. An example of such bollards for cars at 60km/h has been developed in Australia. Bus stops along Queensway (50km/h speed limit but much higher operating speeds) are possible candidates for such applications. (http://www.saferoads.com.au/products-services/crash-cushions/omni-stop-bollards/)

Non-conventional Hazards

In road safety audit, considerations should also be given to hazards other than commonly encountered posts and ground objects. In urban areas, for example, the following features may have severe consequences in a collision:

- Protruded lighting for traffic signs
- Building and bus stop canopies
- Descending staircase of footbridge parallel to a road
- Descending flyover parallel to a road

Guidance is necessary for road designers to identify roadside features with potential severe consequences in a collision.

The Way Forward

1 Modern concepts of Passive Safety should be the basis in addressing the issue. Passive safety covers both vehicle occupants and non-motorised users. EU standards for passively safe street furniture (EN12767) provides an important basis.

2 The diversity of road types should be taken into account in the formulation of strategies. Despite a general speed limit of 50km/h on urban roads, actual operating speeds, traffic conditions and road functions vary substantially. Appropriate categorization would be necessary to prioritize roadside safety requirements.

3 A study on historic roadside accidents will be necessary to establish the extent of the problem for a range of road types.

4 Traffic Calming and Streetscape

Road furniture including railings, sign posts, safety barriers and their terminals has a major influence on the aesthetic of the urban areas. Proliferation of highway standard equipment could be detrimental to streetscape and may not be beneficial to safety. An important consideration of the strategy is how to better integrate roadside passive safety with streetscape and urban design. Involvement with architects, planners and landscape professionals is desirable.

Likewise, designing for passive safety at actual operating speed may not always be the most appropriate solution. In the urban street network, speed reduction through physical/non-physical traffic calming measures and speed limit e.g. 30/40km/h zone could be a superior solution overall.

5 Evolvement of Equipment in the Market

With increasing attention to passive safety, the past decade has seen a boom of manufacturers and product range throughout the EU, Australia and Korea. These products include:

- Crash cushion for moderate speeds e.g. 50-60km/h

- End terminals for limited space
- Passively safe mounting posts and street furniture
- Light-weight mounting posts e.g. aluminium

An understanding of current products and trends is therefore an important step in the formulation of a strategy.

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