Developing a Practical Guide to Achieve Safe System Outcomes for Pedestrians

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Abstract

The Safe System Approach states that no pedestrian should be killed or injured using the transport system. While the key underlying principles of the Safe System Approach are generally well-understood, the translation of its premises into practice is not yet fully realized. Using the Kinetic Energy Management Model, we developed a framework to study pedestrian crash and injury risks. We developed a practical guide, consisting of pedestrian safety infrastructural measures, to address pedestrian crash and injury risk. We believe the guide will provide the necessary tool to address pedestrian safety issues, in an effective and Safe System compliant manner.

Background

The Safe System Approach states that nobody should be killed or seriously injured when using the transport system. The main underlying principles of the Safe System, relevant to road design and speed management for pedestrians are: a) *moral demand*, b) *human frailty*, c) *human fallibility*, and d) *shared responsibility*.

The key underlying principles and the intended outcomes (no deaths or serious injuries on the roads) of the Safe System Approach are generally well-understood. However, the translation of its theoretical and philosophical premises into practice is not yet fully realised, due, in part, to a lack of practical guiding principles. Such practical principles do not necessarily prescribe definitive solutions for road safety issues at hand, but provide a platform to assess the Safe System compliance of existing safety measures and to develop new measures to achieve Safe System outcomes.

Conceptual platform: Kinetic Energy Management Model

The concept of human frailty is the centrepiece of developing practical guides to realising the Safe System. Any practical realisation of the Safe System should ensure that the human body's tolerance of external forces is not exceeded. The Kinetic Energy Management Model (KEMM), developed by researchers at the Monash University Accident Research Centre (Corben, Cameron, Senserrick & Rechnitzer, 2004; Corben, van Nes, Candappa, Logan & Archer, 2010), is a conceptual model to study the risks of transferring of kinetic (motion) energy to the human. Five layers of protection are assumed to either prevent the crash (by 'deflecting' energy) or mitigate its effects (by absorbing energy). Figure 1 shows these layers.

It should be noted that the Safe System Approach does not require the elimination of crashes, if that proves to be impractical or too cost-prohibitive, but, mandates the elimination of deaths and serious injuries. Therefore, a greater emphasis should be put into the management of injury risk when applying the KEMM designing Safe System compliant measures.

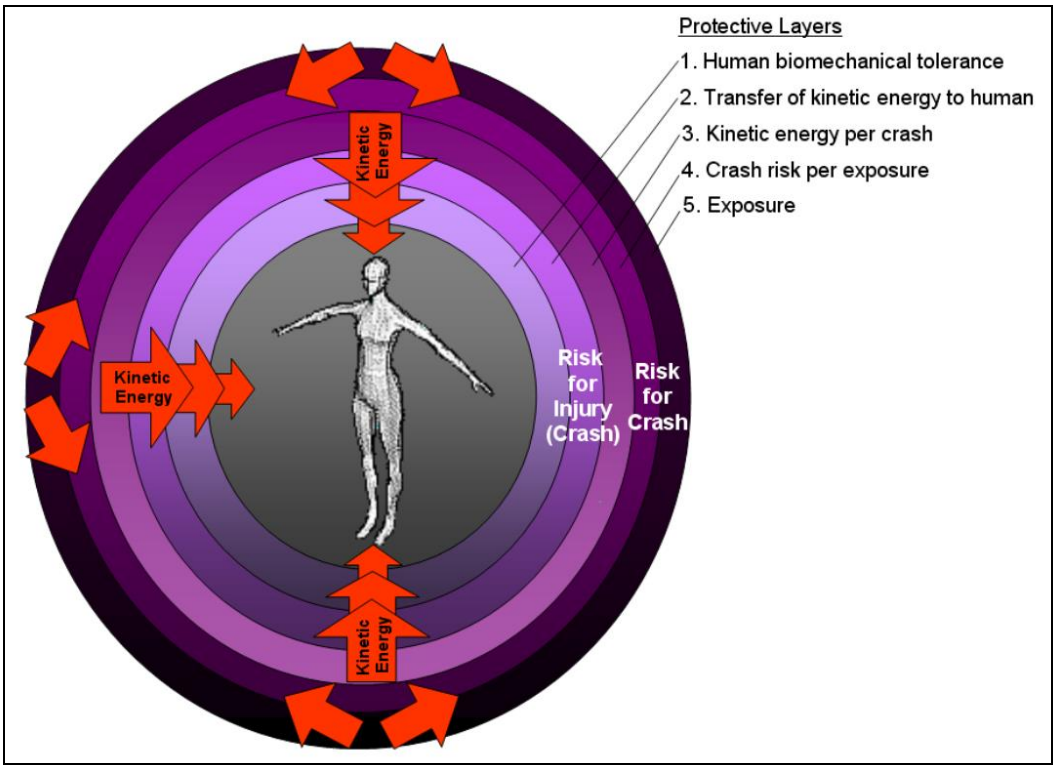

Figure 1. The five layers of protection of the KEMM (adopted from Corben et al., 2010)

Results: Practical guides to achieve Safe System outcomes for pedestrians

The KEMM provides the necessary conceptual framework to develop a set of practical guides to achieve Safe System outcomes for pedestrians. These guides are presented under the five layers of the KEMM, below.

It should be noted that speed and road infrastructure were the focus of this guide; therefore, all the practical guidelines are related to these pillars. However, it is acknowledged that vehicle safety and human behaviour play important roles to achieve Safe System outcomes for pedestrians. These were out of the scope in this research.

Furthermore, fatal/serious injury prevention is the focus of the Safe System Approach. Therefore, a greater emphasis should be put into measures that manage injury risk than those that just manage crash risk.

Exposure management

1. Re-think road function: Depending on the type and frequency of road use, re-consider the function of the road to manage exposure.
2. Manage traffic flows: Redirecting traffic to low-risk, alternative routes to provide a safer environment for pedestrians and cyclists.
3. Reduce travel speeds

Reduce crash risk

1. Reduce travel speeds
2. Eliminate/manage conflicts at intersections
3. Eliminate/manage conflicts at road lengths

4. Increase readability of road environment
5. Provide appropriate number and position of crossings:
6. Eliminate or moderate crash risk factors

Limit crashes' kinetic energy levels

1. Reduce travel/impact speeds
2. Increase homogeneity of mass

Limit crashes' kinetic energy levels

Increase the energy absorption of pavements, roadside and road furniture.

Enhance human biomechanical tolerance

No practical infrastructural solution is identified to enhance human biomechanical tolerance.

Conclusions

The Safe System Approach aspires to eliminate deaths and serious injuries for those using the transport system. Based on a set of elegantly simple theoretical and philosophical principles, its application can be a challenge to the general practitioner when translating it into practice. This document has applied the KEMM conceptual model to develop a set of practical guides to achieve Safe System for pedestrians. It is envisaged that these guides will be an aid to the general practitioner in the journey towards achieving Safe System outcomes through identifying and/or developing Safe System compliant measures.

References

Corben, B., Cameron, M., Senserrick, T. and Rechnitzer, G., 2004. Development of the Visionary Research Model - application to the car /pedestrian conflict, Monash University Accident Research Centre, Report No. 229.

Corben, B., van Nes, N., Candappa, N., Logan, D.B., Archer, J., 2010. 'Intersection study – Task 3 report'. Monash University Accident Research Centre. Report No. 316c. (http://www.monash.edu/__data/assets/pdf_file/0006/217617/muarc316c.pdf).