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Applying safe systems principles to priority crossing for pedestrian and cycle paths

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Abstract:

Safe systems principles have been incorporated into technical guidance and practical examples of cycling infrastructure in Queensland.

Providing crossings at side roads that give pedestrians and bicycle riders priority over vehicles is one way of ensuring that shared pathways are more direct and comfortable for users. However, the key concern of many practitioners and users is whether these facilities are safe.

Results of observational studies into existing raised priority crossings were used to identify key design attributes for priority crossings on side roads. The design guidance was also tested against safe systems principles to ensure that facilities allow for human error but are unlikely to result in serious injury or harm to users.

The results of this work demonstrate that priority crossing treatments can be developed, consistent with safe systems principles to deliver safe, convenient and more direct cycling facilities where more users are comfortable to use shared pathways.

Keywords: guidelines for practitioners, cycling facilities, Safe Systems, crossings



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Where pathway users are given priority across a road using regulatory Give Way or Stop signs and line marking, it is referred to as a priority crossing (TMR, 2019)(see Figure 1). Providing raised crossings at side roads that give pedestrians and bicycle riders priority over vehicles is one way of ensuring that shared pathways are more direct and comfortable for users. However, the key concern of many practitioners is whether these facilities are safe.

Figure 1: Raised Priority Crossing, Goonawarra Drive, Mooloolaba



The Safe Systems philosophy for road safety has been adopted by Queensland and Australian Governments in their road safety strategies published in 2015 and 2011 respectively (TMR, 2019; Australian Transport Council, 2011). Despite this, the most recent review of the National Road Safety Strategy found that *“the Safe System approach has been adopted but not ingrained or mainstreamed within government business by federal, state, territory or local governments.”* (2019 DTCRD)

The central premise of the Safe Systems philosophy to road safety is that people should not be killed or seriously injured as result of traffic crashes (Austroads, 2015). It also recognises that people will make mistakes and puts an onus onto designers to create infrastructure that is forgiving to these mistakes, so that crashes do not result in serious injuries or fatalities.

There are 5 key principles to Safe Systems philosophy. They provide a framework that can be used to assess whether infrastructure is consistent with the philosophy. They are broadly described as functionality, homogeneity, predictability, state of awareness and forgivingness. Table 1, Column 2 describes how the Safe Systems Principles apply to planning for all users in traffic networks as described in Austroads (2015). Column 2 describes how the principles can be more specifically applied to protect vulnerable road users at side roads.



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Table 1: Safe System Principles

| Safe System Principle | General Safe Systems Description | Vulnerable Road Users/Pathway Users |
|-----------------------|--|--|
| Functional | Single function of roads as through, distributor, or access road in a hierarchically structured road network | Path facility has same priority as parallel road, such that cyclists are attracted onto the separated facility, and not delayed at lower order roads. |
| Homogeneous | Equality in speed between users sharing space, and mass and medium and high speeds | Equitable speeds between path users and vehicles at crossing point (<30km/h). This allows users to see each other and opens up time to react and avoid crashes. |
| Predictable | Road environment and road user behaviour that support road user expectations through consistency and continuity in road design | Areas where vulnerable road users and vehicles come into conflict are clearly delineated. Signage and line marking used to clearly indicate priority. |
| State of awareness | Ability for network user to assess one's capability to handle the task | Unlicensed users not relied upon to avoid conflicts and make complex decisions. Road design reinforces responsibility of licensed road users to give way to pedestrians and bike riders at side roads. |
| Forgiving | Injury limitation through a forgiving road environment and anticipation of road user behaviour | Motor vehicle speeds reduced such that, consequences of crash probably not serious or fatal. Aim to provide vehicle speeds of 20km/hr at pedestrian crossings. |

To assess whether environments are 'forgiving', critical impact speeds are used. Critical impact speeds have been calculated for different crash types and users (Austroadsb, 2015). They represent the speed of a bullet vehicle in a crash which results in a 10% chance of severe injuries or death. For crashes involving pedestrians (and cyclists), this speed is approximately 20km/hr. For adjacent direction crashes the critical impact speeds is 30km/hr and for rear-end crashes it is 55km/hr (Austroadsb, 2015).

The preferred attributes of raised priority crossings are defined in the TMR Guideline, *Raised priority crossings for pedestrian and cycle paths* (TMR, 2019). These attributes were developed following observational research on existing facilities, and to be consistent with the Safe Systems framework



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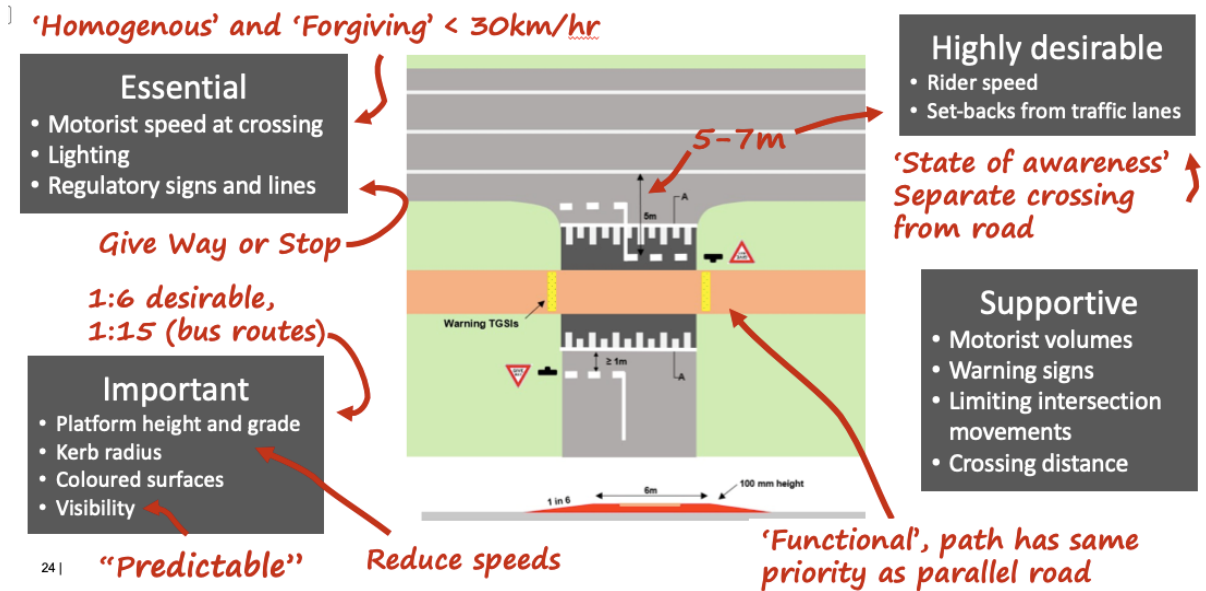
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and critical impact speeds. A general overview of the attributes and their links to Safe Systems is provided in Figure 2.

Figure 2: Attributes of raised priority crossings



The Safe Systems principles provide an effective framework for designing infrastructure to avoid crashes that might result in serious injuries or fatalities. Understanding critical impact speeds for the crash types that might occur, and uses involved, is an important component of the assessment.



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