

Double Tennis Ball Intersection Design (Roe Hwy & Berkshire Rd)

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Abstract

Built as part of the Gateway WA project, the Roe Berkshire interchange delivered an innovative design providing the safest possible road environment for road users. This interchange incorporates a 'double tennis ball' intersection design which is the first of its kind in Australia. The intersection manages impact angles and / or speeds to be within survivable limits for vehicle occupants. This design occurred as a result of a multi stakeholder Trauma Review Group being established, as well as excellent innovative design work by the project team.

Situation

Previous to the Gateway WA project; the Roe Berkshire intersection was an at grade staggered T junction, with the intersection servicing Berkshire Road to the east being signalised and a giveway controlled intersection servicing the western side. Queue lengths were up to 1km long and the intersections had recorded 170 crashes over 5 years. The intersection was the 6th worst in the state in terms of crash cost. Predominant crash types for the intersections were rear end and right angle crashes.

Typically for a location such as this a diamond interchange incorporating two traffic signalised intersections would have been constructed. Land had already been acquired to enable this type of intersection to be constructed, however diamond interchanges are typically not forgiving of human error. This is because they fail to manage impact speeds or impact angles and present a high number of right angle conflict points.

Task

To develop a safe system compliant intersection design that catered for the expected traffic volume and composition, within the land constraints provided. Traffic volumes on Roe Hwy are in the order of 40,000 vpd, Berkshire Rd has 2,500 vpd (west) and 5,000 vpd (east). Both legs of Berkshire are expected to increase 400% by 2031 due to a planned airport park and ride rail facility. Berkshire Rd west services an industrial area with 36.5m road trains, traffic to the east of the intersection are predominantly residential commuters.

Action

The signalised diamond interchange was dismissed from a road safety perspective. A number of other options were explored including a grade separated roundabout, dog bone, diverging diamond and a roundabout cut through option. All of these options were considered and were not possible in their standard form due to items such as land availability, level of service and inability to provide for the 36.5 metre road trains.

The double tennis ball concept drew on some of the design principles associated with a cut through round about, dog bone and signalised intersections. The intersection design provides for the 36.5m road trains while minimising the number of side impact conflict points and managing vehicle travel speeds.

Result

The Roe Berkshire double tennis ball interchange was completed March 2016. The design has delivered an excellent result given the land constraints and large vehicle types that it needed to cater for. Although it could not eliminate all right angle conflicts an assessment of traffic speed has been undertaken and shows that only 1% of vehicles are exceeding 50km/h through these conflict points.

It is acknowledged that the intersection has only recently been installed so the crash performance of the intersection cannot be accurately determined, however preliminary (unaudited) reported crash results from April 2016 to end December 2016 indicate no crashes have occurred since the intersection was built.



Figure 1. Satellite image of Roe Berkshire interchange

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