The Future of Innovative Safety Crash Barrier Systems

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Abstract

An innovative road side crash barrier re-engineered and internationally accredited to Manual for Assessing Safety Hardware (MASH) TL4 by Australian company KSI Global Australia Pty Ltd, is redefining the future of efficient and effective safety crash barrier systems - Safety Roller Barrier (SRB). The SRB converts collision energy into rotational energy, whilst maintaining the vehicle trajectory post impact, resulting in increased occupant protection to motorists. SRB's MASH TL4's accreditation meets the critical criteria for Structural Adequacy, Occupant Risk and Vehicle Trajectory Post Impact.

Background, Method, Results and Conclusions

Safety Roller Barrier is a safety barrier system that prevents fatal injuries by not only absorbing kinetic energy and maintaining vehicle trajectory, it also converts the kinetic energy into rotational energy. The key to the barrier's effectiveness is the large amount of kinetic energy being transferred from the impacting vehicle into the safety barrier system, improving the ride-down and controlled deceleration for the occupants. The effective energy transfer from the impacting vehicle into the roller barrier, provides sufficient energy loss, reducing the exit speed by 30-50% which in turn, reduces the likelihood and severity of secondary impacts.

The performance of the safety barrier is achieved through its essential design elements being:

rollers absorb the collision shock, converting kinetic energy into rotational energy
front rails absorb the second shock
back rails absorb the third shock
metal pipes with steel pipe inserts support the barrier between the front and back rails
friction (rotational stopper boards) clutch plates fitted top and bottom add braking to rollers and decrease vehicle inertia (Figure 1).

The first Australian SRB trial in Laverton, Victoria (in collaboration with VicRoads) has been very successful since being installed at a busy off-ramp on the Princess Highway in December 2016. This location was selected, as it was a known blackspot where previous guardrail was regularly being significantly damaged by vehicles and had to be replaced as often as every 10 -15 days. On the 99th day of the SRB being installed, it was struck by a vehicle presumed to be travelling over 70 km/h, with no damage found on the SRB. There was no police report of injury or vehicle damage in this location after this incident. The visually distinctive bright yellow Ethylene Vinyl Acetate rollers (EVA), with their yellow retroreflective band performs well to alert drivers of the potential hazard ahead.

The SRB whole of life cost, makes it a cost-effective barrier system when making decisions on choosing the most appropriate barrier to protect traffic from road side hazards (Table 1).

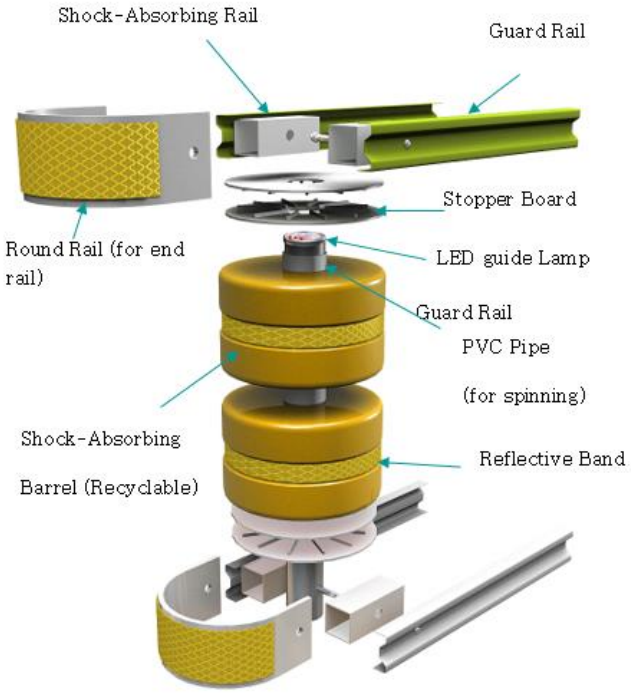
SRB was MASH accredited in December 2012 by Holmes Solutions LP (2012), Christchurch, New Zealand. The objectives of the tests reported herein, were to evaluate safety performance of the KSI Global Australia PTY LTD Safety Roller Barrier system against the requirements of MASH Test Level

4 (TL4). MASH TL4 requires the successful completion of three dynamic vehicle impacts to evaluate the crash worthiness of a barrier system, namely:

- Test 4-10 – (1100kg car, travelling at a nominal 100 km/h, impacting the test article at 25 degrees).
- Test 4-11 – (2270kg pick-up truck, travelling at a nominal 100 km/h, impacting the test article at 25 degrees).
- Test 4-12 – (10000kg single unit truck, travelling at a nominal 90 km/h, impacting the test article at 15 degrees).

SRB International Accreditations include: MASH, European Norm 1317, National Cooperative Highway Research Program Report 350, Austroads, Federal Highways Administration and Korean Safety Barrier TL 4/5 with registered patents across key international markets.

SRB has been installed in Australia, Thailand and Korea, with trials currently pending in United Arab Emarat, India, United States of America, Singapore, Malaysia and Taiwan.



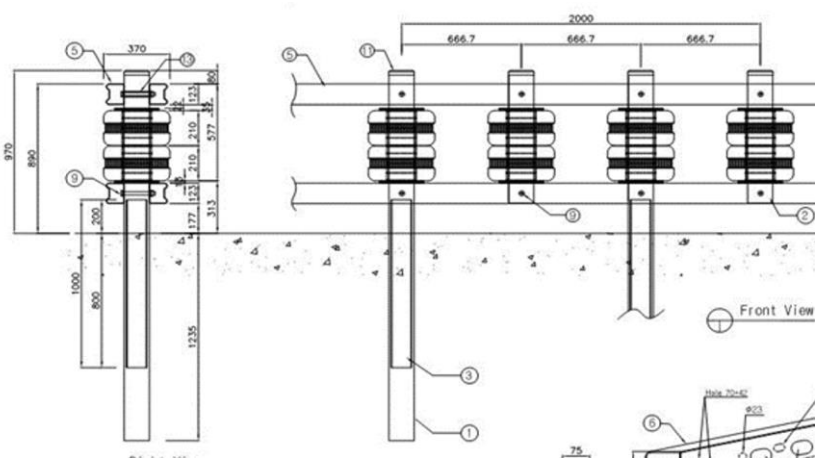


Figure 1. Safety Roller Barrier

Table 1. Cost Benefit - Previous Maintenance Cost with W Beam now replaced by Safety Roller Barrier (projected over 10 Years) Laverton, Victoria

	Benefit ($AUD)	Present Benefit ($AUD)
Present Value of benefit W-Beam	$342,600	$ 300,819
Present Value of benefit of Safety Roller	$ 56,800	$ 55,552
Benefit Cost Ratio Value	5.42	

References

Holmes Solutions LP (2012). MASH TL4 Compliance Testing of the Safety Roller Barrier System (Performing Organisation Report No. 102350.25-1). Christchurch, New Zealand.