

# Raised Safety Platforms (RSPs)

RDN 03-07

December 2019

## 1. Purpose

This Road Design Note (RDN) provides guidance for the design of Raised Safety Platform (RSP) treatments, including:

- site selection considerations
- ramp profile and location
- signing and linemarking
- design and construction considerations
- post implementation monitoring and evaluation.

The guidance provided in this RDN is based on information currently available and best practice. As RSPs are considered an innovative treatment and are a relatively new treatment on arterial roads, this document is expected to continually evolve over time. The principles behind their use are the same as that applied by councils when using “speed humps” or “raised intersections” on the local road network. Users are advised to seek the latest version via [VicRoads website](http://VicRoads website).

## 2. What is a raised safety platform?

VicRoads’ approach towards a Safe System requires practitioners to recognise that humans, as road users, are liable to errors and will continue to make mistakes. In a Safe System, roads should be designed to reduce the severity of injury when crashes inevitably occur.

RSPs are speed management treatments capable of reducing the maximum comfortable operating speed for a vehicle, thus lowering the overall speed of vehicles to a Safe System collision speed (i.e. should a collision occur, impact forces are within human tolerances).

RSPs may be designed for a range of vehicle speeds and types. Design speeds  $\leq 50\text{km/h}$  are encouraged to reduce the side-impact severity for a vehicle to a survivable level. Design speeds  $\leq 30\text{km/h}$  are encouraged to reduce the severity of any pedestrian or cyclist related crashes to a survivable level.



Image 1: Artist's impression of RSPs at Surf Coast Hwy / Kidman Ave, Belmont

The implementation of RSPs can involve the following

### At intersections:

- placing platforms on the approach to an intersection (often referred to as ‘**Approach Platforms**’ or ‘raised stop bars’)
- raising the entire intersection so that motorists ascend on the approach to, and descend on the departure from, the intersection (often referred to as a ‘**Raised Intersection**’)

### At mid-block locations:

- placing platforms mid-block as a traffic calming device or to improve safety at pedestrian crossings (suitable for local roads and low speed arterial roads)

The merits and considerations for each type is discussed further in Sections 5 and 6 of this document. Supporting treatments should be considered where necessary to achieve desired safe speeds.

## 3. Scope

This RDN provides guidance around installing RSPs at intersections with posted speeds  $\leq 70\text{km/h}$ . Similar principles can be applied to placing RSPs at mid-block locations.

Consideration may be given to installing RSPs at intersections with posted speeds  $\geq 80\text{km/h}$ , however this would require additional speed management treatments (refer 6.1.7) to achieve desired Safe System collision speeds. Practitioners considering the use of RSPs on higher speed roads should consider the principles contained within this document while seeking expert guidance from VicRoads Safe System Engineering (SSE) team to understand road function, context and risks.

It is important to note that RSPs have not been widely implemented on arterial roads. As such, the overall performance and associated benefits attributable to RSPs requires further data and evaluation.

## 4. Site selection

Detailed below are some of the key considerations for determining whether a RSP is warranted and potential site characteristics to avoid.

### 4.1. Warrants

- Intersections or mid-block locations where there is potential for collisions to occur at non-Safe System speeds – i.e.  $> 50\text{km/h}$  for vehicle to vehicle side impacts, or  $> 30\text{km/h}$  for collisions involving pedestrians or bicyclists (refer figure 1). Evidence to support this, such as 85<sup>th</sup> percentile determined speeds, will help provide further justification and form important 'before' data for evaluation purposes.
- History of crashes, particularly cross-traffic, right turn against and those involving pedestrians
- Operating speeds  $\leq 70\text{km/h}$  (refer Section 3)
- Locations where pedestrian priority is warranted
- Clusters of sites where an area-wide treatment could be applied
- Ideally flat sites for ease of construction

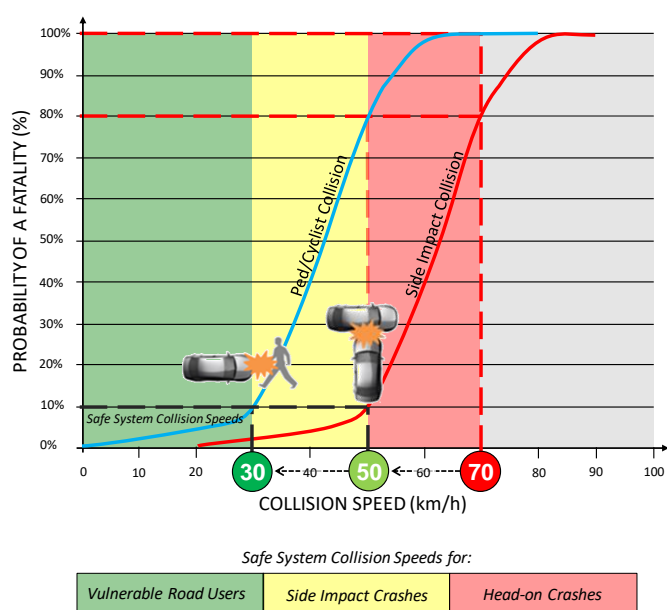


Figure 1: Probability of Fatality vs. Collision Speed

## 4.2. Characteristics to avoid

- Tram routes
- Routes with high volumes of heavy vehicles (e.g. sites on the Principal Freight Network)
- Sites with notable horizontal or vertical curves that may impede sight lines to RSPs and associated signing
- Sites with vertical clearance restrictions
- When addressing crash trends, consideration should be given to the conditions in which crashes occurred and whether the introduction of RSPs will improve these. (E.g. if most crashes are occurring during congested, low speed conditions, the presence of RSPs may provide minimal benefit during these times)

## 5. Approach Platforms vs. Raised Intersections

While both RSP designs aim to achieve speed reductions and the same road safety benefits, their suitability will be largely dependent upon existing site conditions.

Detailed below are some of the characteristics suited to each RSP type and broader considerations.

### 5.1. Approach Platforms

Platforms are most appropriate for divided carriageways as the presence of a median or traffic island allows for the device to be applied to a single direction of travel.

If platforms were to be installed on an undivided carriageway, the absence of a median or traffic island means the device would extend across the entire carriageway, impacting motorists both approaching and departing an intersection. Given the intent of the treatment is to reduce speeds at conflict points within an intersection, this approach is generally not recommended.

A major advantage of platforms is they have a smaller footprint, are easier to construct and are less expensive than their alternative, the Raised Intersection.

### 5.2. Raised Intersections

Raised Intersections are most appropriate for undivided carriageways, sites with small footprints, where high pedestrian movements are expected, or pedestrians have increased priority.

A major advantage of raised Intersections is they are well suited for a large portion of existing metropolitan sites (i.e. those with undivided carriageways) and have the potential to create a more pedestrian friendly area with crossing paths raised closer to connecting footpaths.

The trade-off, however, is they are generally a more expensive solution than their counterpart due to the increased footprint and their potential impact upon services and drainage.

## 6. Design guidance

### 6.1. Profile

The following section outlines the components of a RSP and the recommended dimensions for a range of scenarios. These dimensions align with guidance provided in Austroads Guide to Traffic Management (2008)<sup>3,9</sup>.

#### 6.1.1. Shape

RSPs must adopt a flat top profile, as depicted in figure 2. Watts, Sinusoidal or other ramp shapes are not to be used (ARRB 2014).

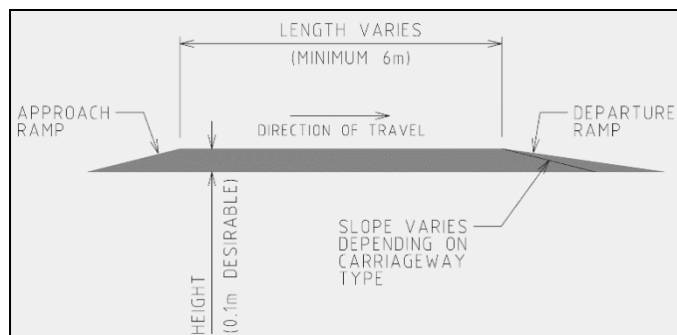


Figure 2: Typical RSP Shape

RSP ramps must be flat with a consistent grade between the top and bottom of the ramp. Where a RSP is located on an undivided carriageway (e.g. a typical Raised Intersection site), the approach and departure ramp grades will be uniform.

#### 6.1.2. Platform height

- Desirable height = 100mm
- 75mm may be considered where site constraints and traffic composition suggests a lower height profile is suitable (e.g. high truck volume routes). Refer to section 6.5 for heavy vehicle consideration
- Ramp heights < 75mm are not effective at reducing speeds and should not be considered
- 150mm may be used for low speed (< 50km/h) and low traffic volume environments, however, platforms > 100mm in height may damage low-floor vehicles and are not recommended on arterial roads.

#### 6.1.3. Platform length

The flat section (i.e. the plateau) of a RSP must extend a minimum of 6m in length to store a standard passenger vehicle, including when used as a pedestrian crossing.

When raising an entire intersection, this length will of course extend significantly to encompass the intersection footprint.

*“Where a RSP is located on an undivided carriageway, the approach and departure grades will be uniform”*

#### 6.1.4. Ramp grade on approach

The recommended approach ramp grades to achieve Safe System speeds are detailed in Table 1. These grades are designed to optimise the likelihood of vehicles slowing to the desired speed when entering an intersection, while minimising undue occupant discomfort, risk of heavy braking or vehicle damage.

Table 1: Recommended ramp grades for various speeds

Operating Speed (km/h)	Divided Carriageway		Undivided Carriageway	
	Approach Ramp Grade	Comfortable Max. Speed (km/h)	Approach/Departure Ramp Grade	Comfortable Max. Speed (km/h)
50	1:15 (6.7%)	30*	1:20 (5%)	40
60	1:20 (5%)	40	1:25 (4%)	50
70	1:25 (4%)	50	1:25^ (4%)	50

Note: \*Max. survivable speed for a pedestrian or cyclist related crash  
^May result in increased motorist discomfort, consult VicRoads SSE Team for further guidance

- RSP should achieve an equivalent change in grade if longitudinal grade of site is not flat
- Refer VicRoads Supplement to Austroads Guide to Road Design Part 3 for the definition of 'operating speed'

Easing of ramp grades below values listed in Table 1 may be considered to accommodate certain road users, such as heavy vehicles, emergency vehicles, buses, bicycles or low floor vehicles. This should be balanced against the extent of speed reduction required for the majority of road users and vehicle types – i.e. adopting a reduced grade to accommodate a particular user type may result in the majority of users being able to traverse a RSP relatively comfortably, thus reducing effectiveness.

It is important to take into consideration the existing longitudinal grade of a road when constructing RSP ramps. Values contained in Table 1 assume RSPs are installed on a flat terrain (example provided in figure 3).

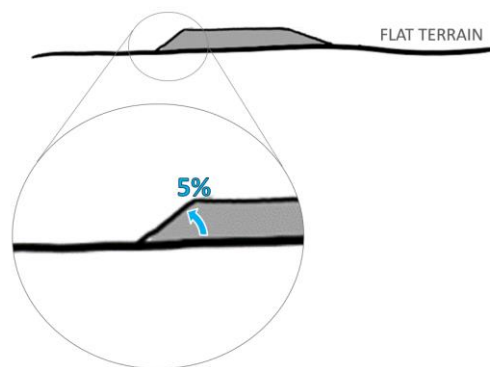


Figure 3: RSP Grades for Flat Terrain

If, however, the section of road leading to a RSP is on an incline or decline, the grade of the ramp will need to be appropriately adjusted to achieve an equivalent change in grade (example provided in figure 4).

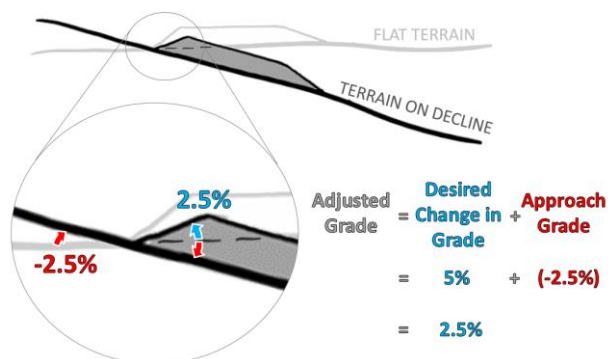


Figure 4: Adjusted RSP Grades for Terrain on Decline

### 6.1.5. Ramp grade on departure

Where possible, departure ramps should be designed to provide a smooth exit from a RSP. Based on previous trials in Victoria, a 1:35 grade is considered appropriate for the departure ramp. Flatter slopes may also be considered; however, this will result in a greater distance between the approach ramp and the conflict points contained within the intersection.

When placed on undivided carriageways, departure ramps will be uniform with approach ramps. In such instances, an appropriate 'middle-ground' grade is required to meet the needs of motorists both approaching and departing the RSP (listed in Table 1).

### 6.1.6. Comfortable maximum speeds

The 'comfortable maximum speed' reflects the threshold speed at which motorists can comfortably traverse a RSP. Speeds above these figures will ideally result in greater discomfort for vehicle occupants, thus encouraging reduced speeds.

### 6.1.7. Higher speed environments

As mentioned at the outset of this document, the intent of RSPs is to reduce the overall speed of vehicles to a Safe System collision speed ( $\leq 50\text{km/h}$  for side-impact crashes and  $\leq 30\text{km/h}$  for crashes involving pedestrians and bicyclists).

To achieve this target on a higher speed road environment ( $\geq 80\text{km/h}$ ) is not seen as practical using RSPs alone. Therefore, consideration shall be given to adopting supporting treatments such as, but not limited to:

- speed reduction in stages (e.g. multiple platforms with appropriate ramp profiles)
- permanent speed limit reduction (supported by speed cameras to support operation where required)
- additional warning signs (e.g. flashing warning signs)
- speed calming line marking
- rumble strips
- gateway treatments

When selecting supporting treatments, practitioners must consider the principles contained within this document and seek expert guidance from VicRoads SSE team to understand the context and risks. Performance monitoring and evaluation is essential to ensure benefits realised on site are quantified and attributable to specific treatments, refer Section 9.

Alternatively, a 'Step Towards' Safe System approach may be pursued by adopting a RSP design targeting reduced speeds, albeit above Safe System collision speed thresholds ( $> 50\text{km/h}$ ). In such instances, practitioners should seek expert design guidance from VicRoads SSE team to determine appropriate ramp grades and an ultimate transformational treatment where necessary.

*Note: RSPs installed in a high-speed environment will largely depend on context; e.g. road function, sight line requirements, potential for rear-end crashes and vehicle type and mix.*

## 6.2. General considerations

Key elements for consideration when designing RSPs should include:

- vehicle types (including large or special vehicles) and turning movements, particularly truck stability
- vertical grade through intersections and approach to intersection
- minimum ground clearance for light and heavy vehicles
- pedestrian crossing locations / desire lines
- horizontal and vertical sight distance to the platform (desirably approach sight distance)
- vertical clearance to bridges, traffic signal mast arms, overhead power lines and other utilities
- impact and delay to emergency services, bus service and heavy vehicle operations
- impact on neighbouring streets and service roads
- potential damage to vehicles and pavement
- storm water drainage design, including major/minor flows
- adequate warning to approaching motorists
- increased queuing and overtaking requirements due to speed disparities between vehicle types
- bus stop locations
- lighting
- noise implications

*"...the intent of RSPs is to reduce the overall speed of vehicles to a Safe System collision speed"*



### 6.3. Location & orientation

RSP ramps shall be:

- placed clear of the through lanes of the intersecting road
- (when installed on turning lanes) placed in a location that allows a turn to be commenced, or completed, prior to crossing the ramp
- orientated perpendicular to the direction of traffic flow to ensure both front wheels of a vehicle begin to rise or fall on the ramps concurrently. Should this not occur, vehicles may traverse the ramps with wheels at different levels, potentially causing instability and affecting the driver's ability to safely operate the vehicle
- avoided where lane changing is necessary or frequent (e.g. at or beyond directional signs)

### 6.4. Stop line location

It is important that with the introduction of RSPs and their associated linemarking that the conspicuity of the stop line is maintained. If not, motorists may misinterpret where to come to a stop and potentially not trigger signal detector loops if located at a signalised intersection. For this reason, it is recommended that stop lines be located either:

1. prior to the beginning of the RSP ramp (preferred), or
2. on the platform, prior to the beginning of the departing ramp (for platforms) or pedestrian crossing (for Raised Intersections).

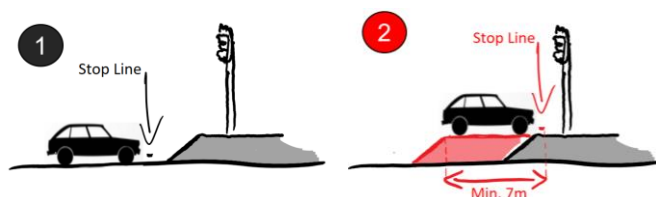


Figure 5: Illustration of stop line placement impacting position of RSP ramp

The second scenario may allow for optimal vehicle storage and operational efficiency. If this approach is adopted, a minimum clearance of 7m is required between the start of the platform plateau and stop line to ensure a standard passenger vehicle can comfortably store in advance of the stop line. Further guidance on linemarking is provided in 7.3.

Similarly, where there is a high percentage of heavy vehicles using the road, consideration may be given to locating approach ramps the equivalent length of the critical stability vehicle prior to the turning point (refer Section 6.6).

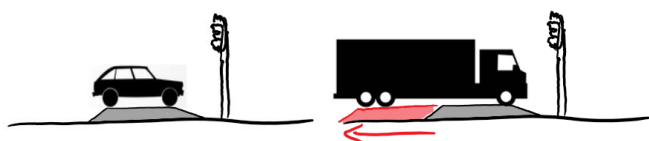


Figure 6: Illustration of modifying profiles for HV's impacting position of RSP ramp

In placing stop lines on platforms or increasing platform lengths to provide for heavy vehicles, the RSP approach ramps, which provide the speed calming effect, will be positioned further from the intersection and the associated conflict points. Practitioners should therefore consider the potential trade-offs (i.e. reducing the effectiveness) when taking this approach.

Sight distance requirements, as stated in Austroads Guide to Road Design Part 3 (chapter 5) and Part 4 (chapter 3), shall be maintained at all times to ramp and stop/give way linemarking.

### 6.5. RSPs and slip lanes

Where possible, pedestrian or shared use path (SUP) crossings may be incorporated into RSPs installed on slip lanes to emphasise the presence of vulnerable road users.

#### 6.5.1. Pedestrian crossings

When providing pedestrian-only crossings (i.e. a zebra crossing), it is important to differentiate pedestrian facilities from RSP ramp linemarking to avoid the road hump ramp markings being mistaken for zebra crossings. To minimise this risk, a minimum of 1m separation shall be provided between pedestrian space and the ramps (refer figure 22). Further guidance on signs and linemarking is provided in Section 7.1 and 7.3.



Image 2: Example of a Pedestrian Crossing incorporated into a RSP

#### 6.5.2. SUP crossings

When providing Shared Use Path (SUP) crossings, the 'priority crossing' arrangements outlined in figure 7 shall be adopted.

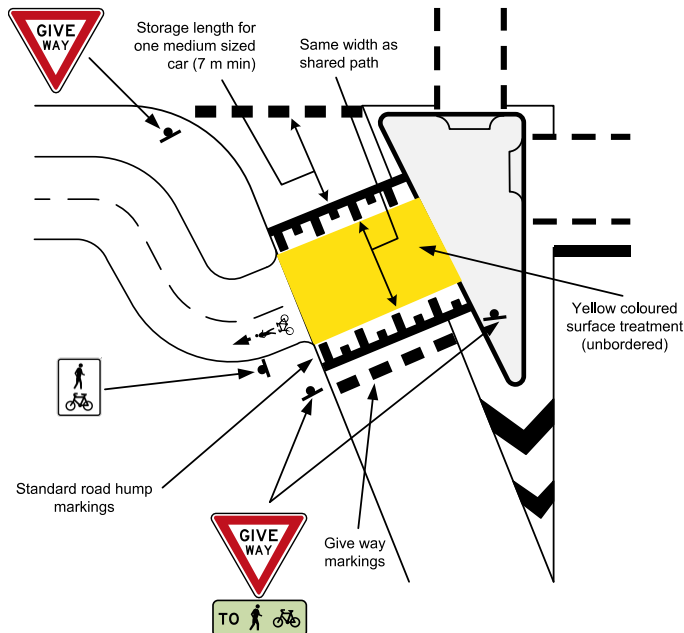
This treatment is provided when priority to cyclists is required when linking SUPs across unsignalised crossing points (e.g. at a slip lane). The treatment gives cyclists and pedestrians priority over vehicles and allows cyclists to ride across the crossing without needing to dismount.

The treatment consists of the following:

- Golden yellow (AS colour 'Y14') coloured surface treatment at the crossing.
- Give way signs with a supplementary sign and give way linemarking at the crossing.

- Sufficient storage space between the crossing and terminus of the slip lane – at least 7 m is required to store a medium sized car.

Similarly, where bicycle facilities are intersected by a signalised intersection, bicycle lanterns should be provided to ensure cyclists can cross without needing to dismount.



**Figure 7: Priority Crossing on Slip Lane (raised crossing)**

## 6.6. Consideration of heavy vehicles

Practitioners must carefully consider the effect that RSPs will have on heavy vehicles, while recognising that competing objectives must be balanced.

The following are key considerations for heavy vehicles:

- location & orientation of the approach and departure ramps to avoid the critical vehicle instability
- maximum RSP height to avoid critical vehicle instability
- potential operational deficiency and delays due to the lower acceleration and deceleration of heavy vehicles
- potential implications of heavy vehicle drivers using alternate routes (e.g. local streets) to avoid the RSP.

### 6.6.1. Selection of critical vehicle for RSP design

The design process for RSPs must recognise that ramps will likely be located within the turning path of a heavy vehicle in order to maximise RSP benefits for passenger vehicles. This will thereby increase stability risk for heavy vehicles. It is the designer's responsibility to include appropriate measures (e.g. signing outlined in Section 7.2) to ensure the driver of a heavy vehicle is alert to the unique environment and that the RSP will not cause critical instability or truck roll over for minor errors.

The design of all RSPs must consider the "critical unstable vehicle", or low performing vehicle, to ensure the treatment

does not present an undue dynamic stability (or roll-over) risk to these vehicles. The critical stability vehicle is site specific and should be determined considering the traffic composition, traffic data, designated heavy vehicle routes and permitted heavy vehicles in the area.

For information regarding designated heavy vehicle routes in Victoria, refer 'Heavy vehicle networks maps in Victoria' on [VicRoads website](#).

For sites accommodating high volumes of heavy vehicles, a computer simulation assessment (i.e. 3D dynamic modelling) using the proposed RSP configuration and selected critical unstable vehicle (e.g. 19m prime mover and semi-trailer, 25m B-double or other low-profile combinations such as low loader truck) shall be used to assess the effect of a RSP on heavy vehicle stability. In doing so, it is recommended that assessments be undertaken on designs both with and without RSPs to gain a clear understanding of how these treatments impact vehicle stability, as opposed to an intersection's horizontal geometry.

Examples of simulation programs that can be used include, but not limited to: PC-Crash (dsd.at), HVE (edccorp.com), or Truck Sim (carsim.com).

### 6.6.2. Low floor vehicles

In accordance with the Australian Design Rule 43 for Vehicle Dimensions and Configurations, the minimum ground clearance for low floor vehicles including heavy vehicles under the conditions of 'Maximum Loaded Test Mass loading' is 100mm. When fully loaded, low loader trailers often operate close to the minimum ground clearance of 100mm. Roads that accommodate low loader trucks should have RSPs designed such that the axle group of the low-loader combination span the flat section of the RSP. To alleviate the risk of low floor vehicles bottoming out, focus should be given to raising the entire intersection instead of placing raised stop bars.



**Image 3: Examples of Low Loader Combinations**

As a general starting point for practitioners, the following may be considered;

- where the volume of a particular heavy vehicle movement is high (e.g. >15%), a maximum RSP height of 75mm should be considered.

- where the volume of a particular heavy vehicle movement is extremely high (e.g. >25%), the use of an RSP should be reconsidered or modified, for the high-volume movement path (this may include one specific movement through an intersection). Modifications may include adopting a flatter grade (e.g. 1:30) on approaches. It is acceptable to use flatter grades on critical approaches, while maintaining steeper grades for other approaches.

For further guidance on heavy vehicle performance and requirements, contact VicRoads Heavy Vehicle Services team.

## 6.7. Other Road Users

Other road users such as emergency services, buses, motorcyclists, cyclists, vision impaired, etc. should be considered in the project risk assessment based on the individual merits and context of the project, in determining the feasibility of the site selected for treatment. If the proposal presents an unacceptable risk for other road users, the treatment should not be considered further.

## 6.8. Drainage

The introduction of RSPs will introduce new high and low surface points on site, with the RSPs themselves acting as barriers to existing drainage lines. It is therefore important to evaluate how drainage will be impacted and adopt suitable modifications within the design to cater for the proposed conditions.

Appendix B outlines design solutions to be considered by practitioners.

## 7. Traffic control devices

### 7.1. Warning signs

All RSPs shall have warning signs with a recommended advisory speed based on the 'comfortable maximum speed' listed in Table 1.

Warning signs shall include a:

- Safety Platform Ahead sign located prior to the approach ramp (refer to Traffic Engineering Manual (TEM) Vol 2 for sign placement and distance requirements) and
- Safety Platform and Advisory Speed signs located in-line with the beginning of the approach ramp.

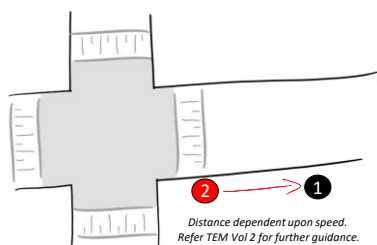


Figure 9: Placement of warning signs for typical intersection

Practitioners shall ensure that signs do not impede motorists' view of traffic signal lanterns. Should difficulties be faced in

positioning signs as per TEM guidance, please contact [VicRoads SSE Team](#).

Table 2 provides a summary of signage arrangements to be adopted for typical RSP scenarios, with further guidance provided throughout this section.

Table 2: Typical Signage Arrangements

SCENARIO	LOCATION			
	In Advance of RSP			At RSP
Approach Platform	Figure 10	OR	Figure 18	Figure 11
Raised Intersection	Figure 12			Figure 13
Incorporating Pedestrian Crossings	Figure 14			Figure 15

#### 7.1.1. Warning signs for Approach Platforms

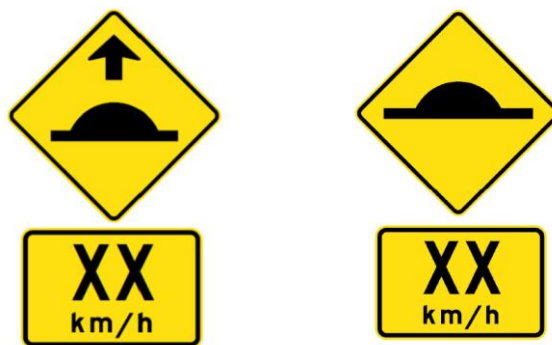


Figure 10: Approach Platform Ahead (with Advisory Speed)

Figure 11: Approach Platform (with Advisory Speed)

#### 7.1.2. Warning signs for Raised Intersections

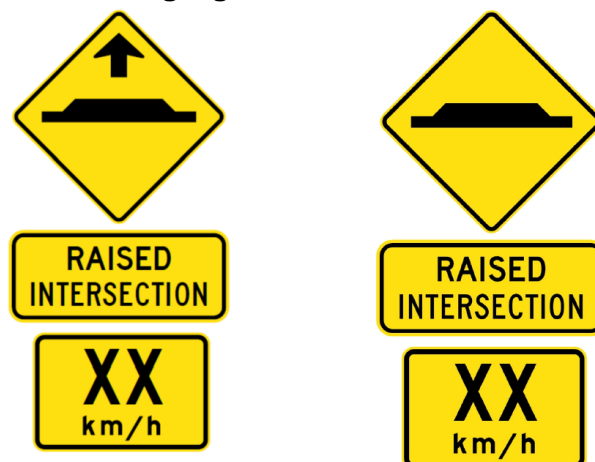


Figure 12: Raised Intersection Ahead (with Advisory Speed)

Figure 13: Raised Intersection (with Advisory Speed)

### 7.1.3. Warning signs when pedestrian crossings incorporated with raised safety platforms

As stated in Table 1, the maximum survivable speed for a pedestrian or cyclist related crash is 30km/h. Therefore, the highest advisory speed that may accompany the below signs shall be 30km/h.

If positioned on a slip lane, the road geometry may dictate a reduced design speed (i.e. < 30km/h). In which case an advisory speed sign may be omitted.



Figure 14

Figure 14: Safety Platform/Pedestrian Crossing Ahead (with Advisory Speed)

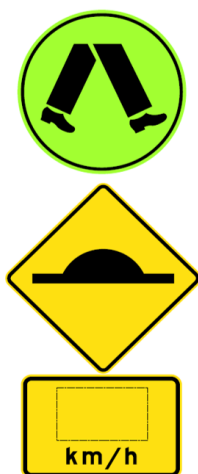


Figure 15

Figure 15: Safety Platform/Pedestrian Crossing (with Advisory Speed)

### 7.1.4. Warning signs for high risk sites

For sites considered to be of high risk (e.g. significant crash history, poor vertical/horizontal alignment, etc.), a red backing can accompany signs outlined in Section 7.1.1 to 7.1.3 to further emphasise messaging.



Figure 16. Approach Platform (with Advisory Speed) High Risk Site



Figure 17. Raised Intersection (with Advisory Speed) High Risk Site

### 7.1.5. Incorporating advanced warning with directional signs

Advance warning of RSPs may be incorporated with direction signs instead of providing standalone warning signs (as shown in figures 10 and 12). This arrangement assists in consolidating the total number of signs on site.

Figure 18 shows an advisory message with a green direction sign (G1 series) and with a road name sign (G3 series). The advisory message is in a similar format as a roundabout advance direction sign that contains a 'SLOW TO' advisory speed message.

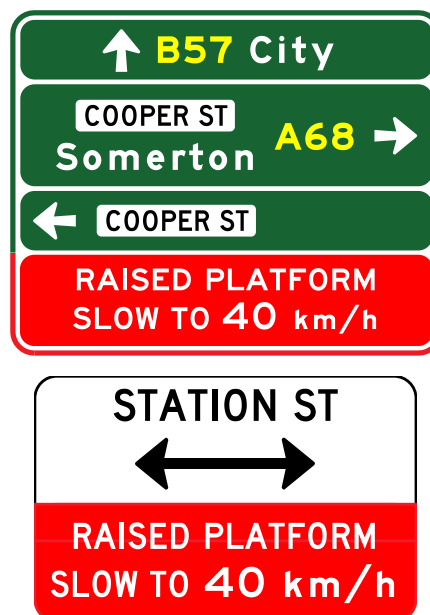


Figure 18: Direction signs with advance warning and advisory speed for a RSP

### 7.1.6. Variable message signs in early operation

It is recommended that variable message signs be installed on the approach to new RSP sites for the first month of operation. This reinforces the message to motorists of the changed conditions and reduced speed environment they're approaching.

### 7.2. Warning signs for heavy vehicles

Where vehicle stability assessments (refer Section 6.6.1) have identified a high level of risk for associated with heavy vehicle turning movements across RSPs, an appropriate truck tilting advisory speed (refer figure 19) should be considered for installation prior to the turning lanes at visible locations.

The advisory speed must be site specific and be informed via output from the vehicle stability assessment.

To avoid the potential for sight lines to become impeded, prescribed sign sizes may be modified to meet the needs on site. Further guidance can be provided by [VicRoads SSE Team](#).



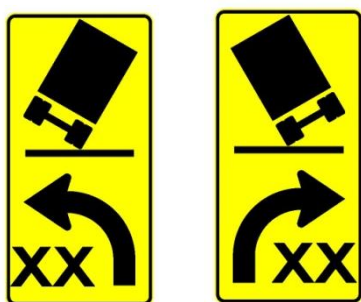


Figure 19: Truck tilting warning signs with advisory speed

## 7.3. Linemarking

All linemarking shall be white to ensure consistency across the state.

### 7.3.1. Intersections

Figures 20 and 21 depict typical linemarking for RSPs located at an intersection. Further guidance on stop line placement is provided in Section 6.4.

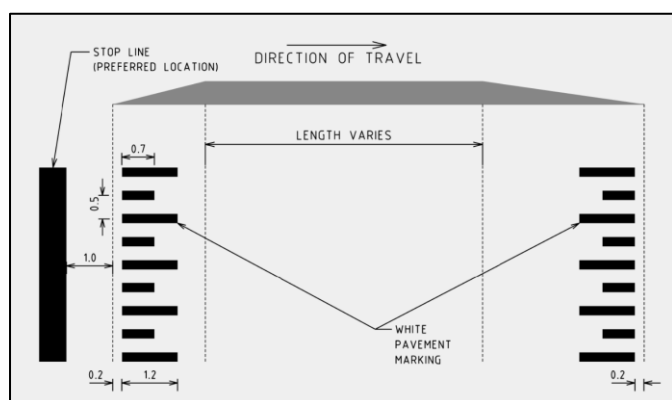


Figure 20: Typical RSP Linemarking at Intersections (Stop Line positioned prior to RSP)

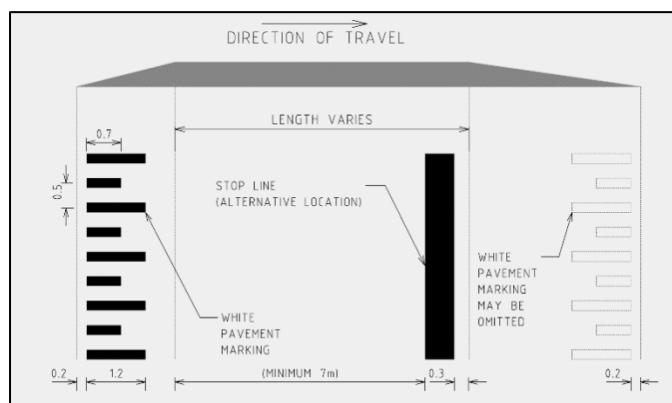


Figure 21: Typical RSP Linemarking at Intersections (Stop Line positioned on RSP)

It is worth noting this linemarking varies slightly from that of a traditional road hump. To minimise potential confusion with the stop line, the transverse line which generally accompanies the 'piano keys' has been removed.

To avoid linemarking clutter, consideration can be given to removing the smoother departure 'piano keys' on RSPs located on divided carriageways.

### 7.3.2. Pedestrian crossings & mid-block

When pedestrian crossings (zebra crossings) are incorporated into RSPs, linemarking shall be in accordance with figure 22. When placed at mid-block locations or sites without an accompanying stop line, the transverse line accompanying the piano keys shall be reinstated to further emphasise the toe of the RSP.

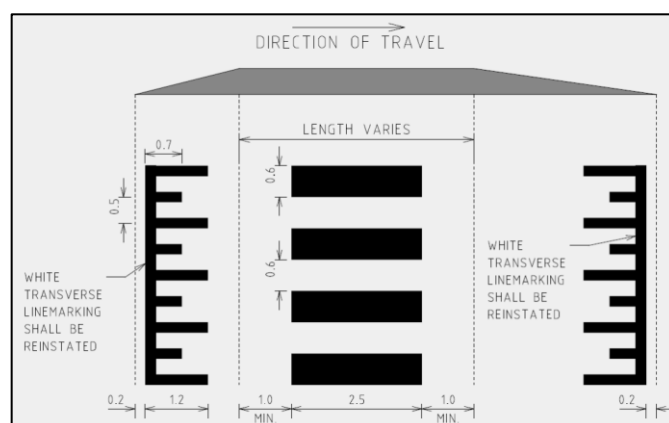


Figure 22: Typical RSP Linemarking – Pedestrian Crossing or Mid-Block

## 7.4. Delineation of road space and pedestrian space

The introduction of RSPs may lessen the conspicuity between road space and pedestrian space, particularly when proposed platforms are flush with adjacent land. Therefore, additional delineation such as contrasting coloured pavement marking and/or white kerbside linemarking may be considered to improve the conspicuity of the RSP.



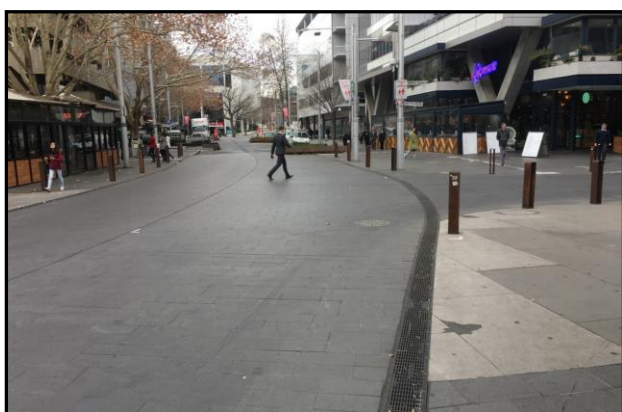
Image 4: Example of Contrasting Coloured Pavement on Local Road Network (Keysborough)

As per AS1742.13, the 'piano key' linemarking outlined in Section 7.3 may be omitted where coloured pavement has been adopted and the RSP is clearly visible under all conditions. The preferred colour is light grey, or terracotta red.

Green pavements should be avoided unless justification from other guidance can be provided.

To further emphasise the separation between road space and pedestrian space, the following treatments should be considered to deter motorists from tracking in this area:

- Edge-linemarking (including tactile linemarking)
- Coloured pavement treatment within pedestrian space
- Energy absorbing bollards and/or street furniture at the roads edge



**Image 5: Example of Bollards Providing Separation on Local Road Network (Canberra)**

## 7.5. Street lighting

All RSP treatments should be illuminated in accordance with AS/NZS 1158:2015 - Lighting for roads and public spaces and TCG 006: Guidelines for Street Lighting Design.

## 8. Achieving the desired ramp profile

It is imperative that the nominated ramp grades, platform heights and lengths specified in this guide are achieved on site. Flatter grades are likely to produce ineffective ramps, while steeper grades may be unsafe for motorists.

To help ensure the correct profile is achieved, the following steps shall be undertaken:

- Project designer shall clearly depict the proposed RSP profile within the design drawings, including specific mention of the proposed approach/departure ramp grades, platform heights and lengths.
- Project manager shall discuss the ramp profile with the contractor prior to commencement of construction, emphasising the importance of the RSP profiles in achieving the desired road safety benefits.
- Close attention shall be paid to the formation and construction of RSP approach and departure grades by both project and surveillance managers. It is the change in grade as well as the grade itself of the ramps that makes the treatment effective, so this aspect is crucial. Gradual rounding of the change in grade locations may make the treatment less effective.

To further assist in achieving the correct profile, the following steps are suggested:

- Project and surveillance manager to liaise with counterparts previously involved in delivering RSP sites to share learnings. This should include councils who have much experience in constructing these treatments on local roads.
- As part of tendering process, request proposed construction methodology from contractors to determine suitability to deliver scope of works and/or provide necessary guidance prior to award of works.

## 9. Performance monitoring & evaluation

Given the relatively new implementation of these treatments on arterial roads, selected projects incorporating RSPs under the Safe System Road Infrastructure Program (SSRIP) will be subjected to performance monitoring to help inform future guidance.

For projects outside SSRIP, performance monitoring and evaluation is warranted if the implementation of a RSP contains new design or innovative elements.

For evaluation needs and further guidance on performance monitoring sites, contact VicRoads SSRIP team. The SSRIP team contact at the time of publish is Amir Sobhani.

SSRIP, 1, McNab Avenue, Footscray, Vic 3011

Phone: (03) 8572 7992

Email: [ssrip@roads.vic.gov.au](mailto:ssrip@roads.vic.gov.au)

## References

- 1) ARRB Research Report, Innovative Raised Stop Bars at Signalised Intersections; Report No. 008159 (ARRB 2014).
- 2) ARRB Contract Report, Innovative Safety Platform Trials, Report No. 009261 (ARRB 2015).
- 3) Austroads Guide to Traffic Management, Part 8: Local Area Traffic Management (Austroads 2008).
- 4) Australian / New Zealand Standard 1158:2015 – Lighting for roads and public spaces (Australian Standards 2015).
- 5) Austroads Research Report, Achieving Safe System Speeds on Urban Arterial Roads, AP-R514-16 (Austroads 2016).
- 6) Kjemtrup, K 1988, 'Speed reducing measures', ARRB Conference, 14th, 1988, Canberra, ACT, ARRB Group, Vermont South, Vic, vol. 14, no. 2, pp. 125-32. AASHTO, 2011, Roadside design guide.
- 7) Towards Zero Safe System Road Infrastructure Program (2017).
- 8) VicRoads Supplements to Australian Standards (VicRoads 2016).
- 9) VicRoads Supplement to Austroads Guide to Traffic Management Part 8 (VicRoads 2008).
- 10) Watts G. R. (1973), 'Road Humps for the control of vehicle speeds', TRRL Report LR 597
- 11) AS1742.13-2009 – Manual of uniform traffic control devices, Part 13: Local area traffic management.

## Appendices:

**APPENDIX A:** Examples

**APPENDIX B:** Drainage Considerations

**APPENDIX C:** Typical Case Study

## For information and suggestions please contact:

VicRoads Safe System Engineering team,  
60 Denmark St, Kew Vic 3101  
Email: [safesystemengineering@roads.vic.gov.au](mailto:safesystemengineering@roads.vic.gov.au)

### Road Design Note 03-07 – Revision Summary

Issue	Approved	Date	Amendment
03-07	M-SSE	July 2017	First edition
03-07-B	M-SSE	Sept 2018	Major changes
03-07-C	M-SSE	Dec 2019	Minor changes Sections 6.1.1, 6.1.4, 6.4, 6.5, 6.6.1, 7.1, 7.1.3, 7.1.5, 7.1.6, 7.3.1, App A

Road Design Notes are subject to periodic review and may be superseded.



## Appendix A – Examples

Disclaimer – these examples have been extracted from various states of Australia and presented here for illustrative purposes only. Guidance in this document shows the requirements in Victoria. Therefore, signs, linemarking, coloured surfacing treatments, ramp locations and extents of RSPs in Victoria are to be in accordance with the requirements set-out in this document.



Artist's impression of RSPs at Surf Coast Hwy / Kidman Ave, Belmont, Victoria



Signing at Surf Coast Hwy / Kidman Ave, Belmont, Victoria



Raised intersection located within City of Greater Dandenong, Victoria



Aerial view #1 of Raised Intersection at Plenty Rd / Wallan Rd, Whittlesea, Victoria



Aerial view #2 of Raised Intersection at Plenty Rd / Wallan Rd, Whittlesea, Victoria




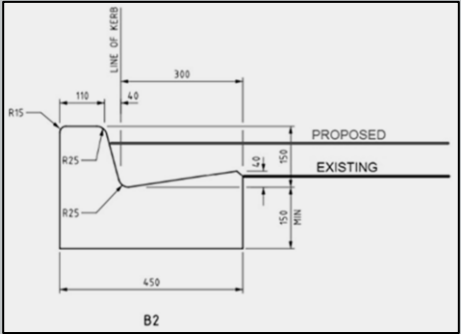
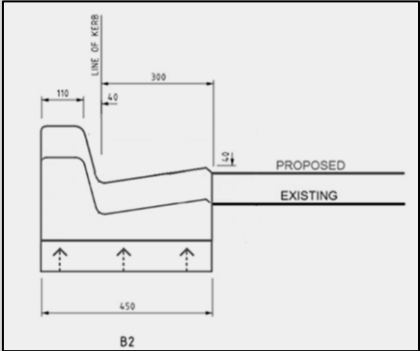
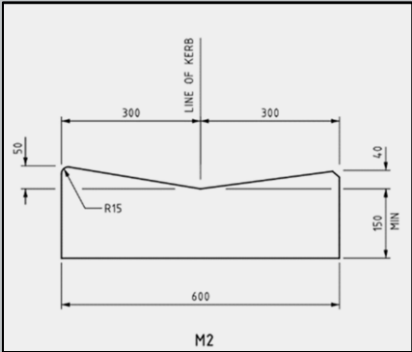
Signing at Plenty Rd / Wallan Rd, Whittlesea, Victoria

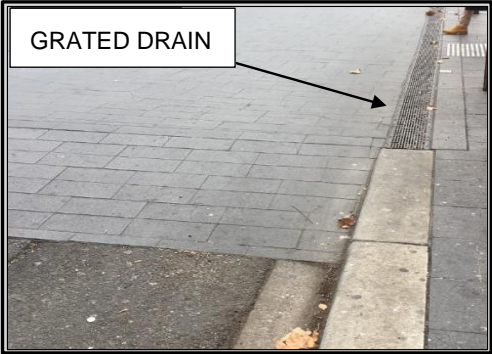


Signing at Dalton Rd / The Blvd, Thomastown, Victoria



## Appendix B – Drainage Consideration

Drainage Solution	Picture	Description
<b>KERB INLETS</b>		<p>Where it is anticipated that drainage lines will be impeded by RSPs, additional kerb inlets can be installed to allow the water to drain away prior to reaching the RSP. This will minimise the risk of water pooling at the face of the RSP.</p> <p>This treatment should be considered in conjunction with solutions addressing RSP interaction with adjacent land, outlined below.</p>
<b>RETENTION OF EXISTING KERBS</b>		<p>Kerb and Channel drains are a common feature across the arterial network. This solution looks to utilise the existing kerb and channel facility by either:</p> <ul style="list-style-type: none"> <li>• Tapering the platform down to the existing lip line of the kerb and channel, maintaining existing drainage capacity; or,</li> <li>• 'Burying' the existing kerb and channel beneath the newly laid RSP asphalt, resulting in a reduction in drainage capacity.</li> </ul> <p>When adopting the tapered solution, practitioners shall adopt a cross-fall no greater than 9.5% (1 in 6) and ensure the tapered segment terminates prior to the traffic lane, avoiding any adverse impact on vehicle stability.</p>
<b>RAISING KERBS (LIKE FOR LIKE)</b>		<p>As the RSP raises the pavement by approximately 100mm, raising the adjacent kerbs by this height would allow for the full capacity of the existing channel to be maintained. This option essentially provides a like-for-like solution.</p> <p>Existing kerbs would need to be demolished and replaced. Further, adjacent land behind the back of kerb would need to be regraded to tie in with the new top of kerb level. If an existing footpath sits behind the kerb, this would need to be demolished and a new footpath constructed to match the raised kerb height.</p>
<b>RAISING KERBS (MOUNTABLE KERBS)</b>		<p>This option would involve removing existing kerbs at the intersection and replacing them with mountable kerbs laid flush with (or close to) the existing, adjacent land. The installation of mountable kerbs would allow the water to shed from the RSP and be collected. Water would then be distributed into existing drainage lines / pits further downstream.</p> <p>Transition kerbs from the existing conditions to the mountable kerbs would need to be procured and installed as part of this treatment. The mountable kerbs (if precast) would need to be accurately measured for their radius to ensure they will fit the existing intersection.</p>

Drainage Solution	Picture	Description
<b>GRATED DRAINAGE SYSTEM</b>		<p>A grated drainage system that could be adapted to facilitate RSP drainage. To install such a system, existing kerb and channel would similarly need to be removed. The grated system allows water to drain from the road surface while also providing pedestrians a flush, anti-slip surface.</p> <p>This treatment would be especially beneficial where proposed platforms are flush with existing, adjacent land and/or there are high levels of pedestrian traffic.</p> <p>The lengths of grated drain would similarly tie in to the existing down-stream drainage line / pits.</p>

## Appendix C – Typical Case Study

Below is an example of the placement of RSP at an intersection (urban arterial) which highlights important features to consider when intersection utilising raised safety platforms.



- ① - RAISED PLATFORM LOCATED BEYOND STOP LINE
- ② - RAISED PLATFORM LINEMARKING
- ③ - STOP LINE 1.0M PRIOR TO THE RAISED PLATFORM
- ④ - PEDESTRIAN CROSSING INCORPORATED INTO RAISED PLATFORM
- ⑤ - DEPARTURE RAMP LOCATION TO AVOID POSSIBLE TRUCK INSTABILITY
- ⑥ - RIGHT TURNING PATH OF A 19.0m SEMI TRAILER
- ⑦ - COLOURED PAVEMENT IS NOT SUITABLE DUE TO TURN LINES, RPMs AND OTHER PAVEMENT MARKING AT THE INTERSECTION
- ⑧ - IF THIS HEAVY VEHICLE MOVEMENT IS PREDOMINANT, APPROPRIATE RAMP GRADES SHOULD BE SELECTED TO CATER FOR THAT MOVEMENT
- ⑨ - LOCATION OF WARNING SIGN WITH ADVISORY SPEED
- ⑩ - LOCATION OF 'ROAD HUMP' AHEAD ADVANCE WARNING SIGN
- ⑪ - TRUCK TILTING WARNING SIGN
- ⑫ - BICYCLE BOX IS PREFERRED ON THE FLAT TOP OF RAISED PLATFORM