Austroads Safety Barrier Assessment Panel – Technical Advice

Working Width for Temporary Safety Barriers

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Austroads

Preamble

If a temporary safety barrier is impacted by a vehicle, enough area behind the barrier is required to accommodate the vehicles' redirection. This area is called the 'working width' and it varies according to the Test Level (i.e. the vehicle mass, speed and angle of crash test impact) and the behaviour of the barrier system.

The purpose of this Technical Advice is to provide commentary on working widths for temporary safety barriers and the measurement of working width on-site.

Audience

- Road Agencies,
- Traffic management planners,
- Road safety auditors.

Definitions and measurements

Working width is defined in 'AS/NZS 3845.1:2015' as

> "The distance between the traffic face of the road safety barrier system before the impact and the maximum lateral position of any major part of the system or vehicle during and after the impact."

As some temporary safety barriers have feet that extend beyond the traffic face, this definition is clarified to conform with the description in EN1317.2. Consequently, working width is measured from the outermost extremity on the traffic side, regardless of shape, to the furthest extremity of any part of the system or vehicle during and after the impact.

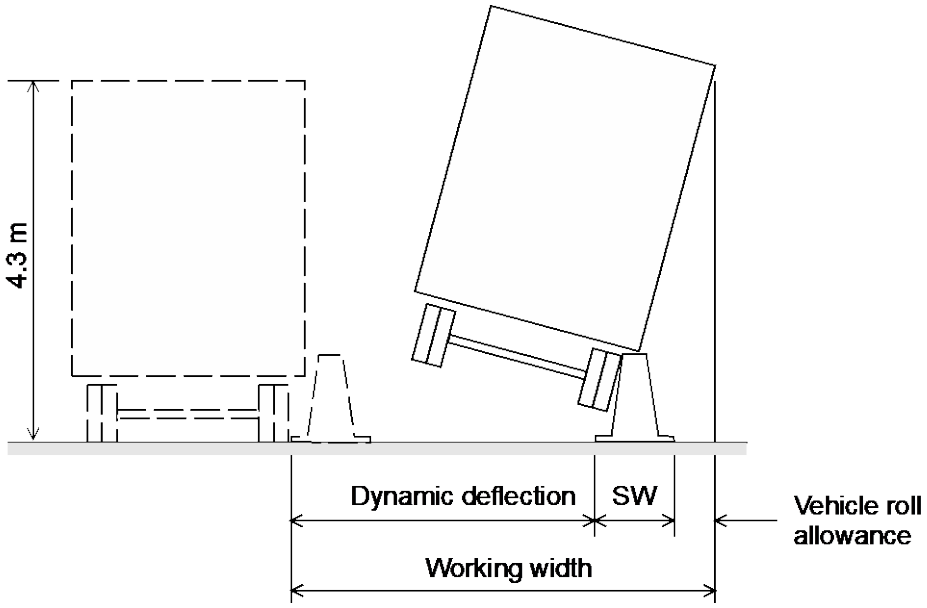
Working width is recorded during full scale crash testing and contains three sub-elements.

- **Dynamic deflection** - defined as "the largest transverse deflection of any part of a road safety barrier system recorded during a full-scale crash test".
- **System width** – The width of the system during or after impact and including any deformation.
- **Vehicle roll allowance** – is the lateral distance a vehicle protrudes beyond the deflected barrier. If the vehicle does not protrude beyond the deflected the barrier, then the vehicle roll allowance is zero.

The working width of a barrier is equal to the dynamic deflection plus the system width and any roll allowance. The roll allowances are included in the zone of intrusion measurements in the AASHTO Roadside Design Guide (RSDG4). Cab heights of 2.44 m and cargo box heights of 3.05 m are assumed in the US publications. In line with the roll allowance values in Austroads Guide to Road Design Part 6, a cargo box height of 4.3 m is to be used. Working widths, and zones of influence, define the appropriate clearances to road infrastructure elements.

These elements, illustrated in Figure 1, are different for each product and are influenced by the impact characteristics (e.g. vehicle type, speed and angle), the flexibility of the barrier (e.g. frequency of pinning), and how the barrier deforms during impact. Figure 1 illustrates the same concepts to those in the Austroads Guide to Road Design, Part 6.

Figure 1: Working width measurements showing dynamic deflection, system width (SW) and vehicle roll allowance



Legend: SW = System Width

Commentary

While working width is different for each system, the Austroads Safety Barrier Assessment Panel (ASBAP) notes the following common behaviours observed through crash testing.

Working width for freestanding barriers

Freestanding temporary barriers have larger dynamic deflections, which results in vehicles being redirected with minimum roll. In crash tests for barriers rated to Test Levels 1, 2 or 3, the 2,270 kg pick-up vehicles rarely lean over past the system width. In crash tests for barriers rated to Test Level 4, the 10,000 kg single unit trucks remain reasonably upright.

The working width of a typical freestanding temporary barrier is also equal to the dynamic deflection plus the system width and any roll allowance. The roll allowance values in the current AGRD Part 6 apply to permanent barriers and do not apply here. Figure 2 illustrated the working width dimensions free standing barriers.

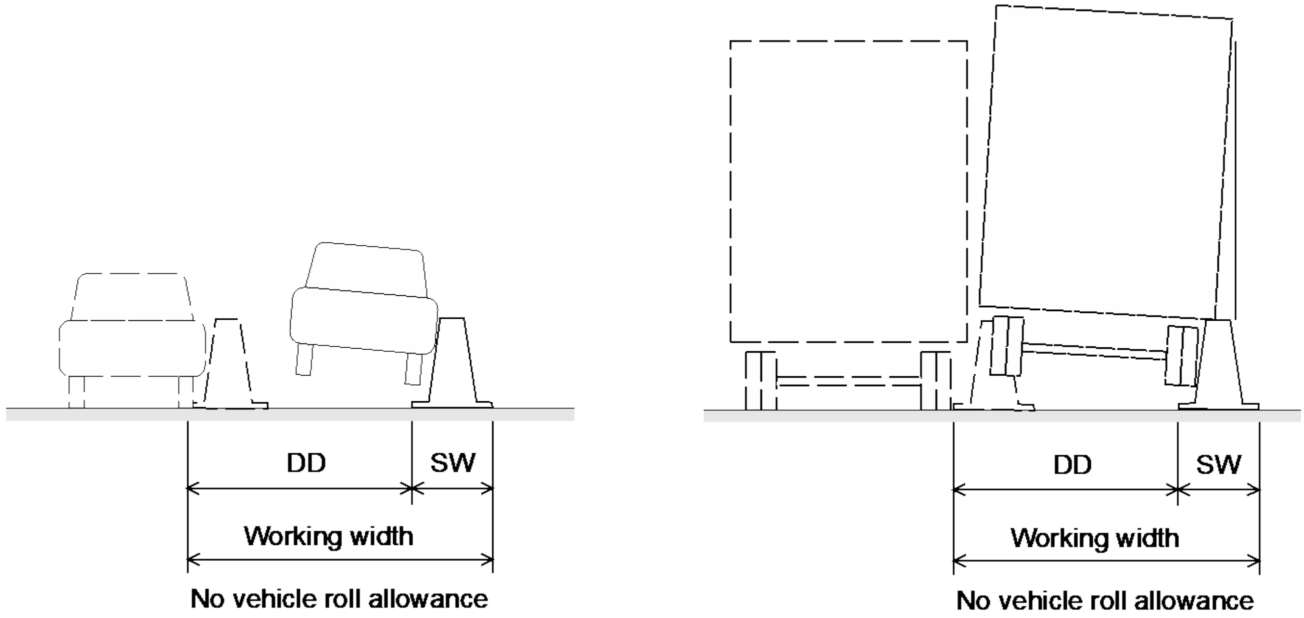
Concrete and steel temporary barriers exhibit negligible deformation therefore the system width is often unchanged. Plastic barriers often deform (crush) during impact, therefore the system width may be reduced during impact.

Working width for pinned barriers

Pinned temporary safety barriers have a lower dynamic deflection than freestanding variants, which causes the 10,000 kg single unit trucks to lean over and beyond the barrier. As such, these stiffer systems may require greater barrier heights to pass the Test Level 4 crash test criteria. Crash testing demonstrates that for barriers rated to Test Levels 1, 2 and 3, the 2,270 kg pick-up vehicles transfer much of the impact energy into the barrier, and rarely lean over and past the system width. Figure 3 illustrated the working width dimensions for pinned barriers.

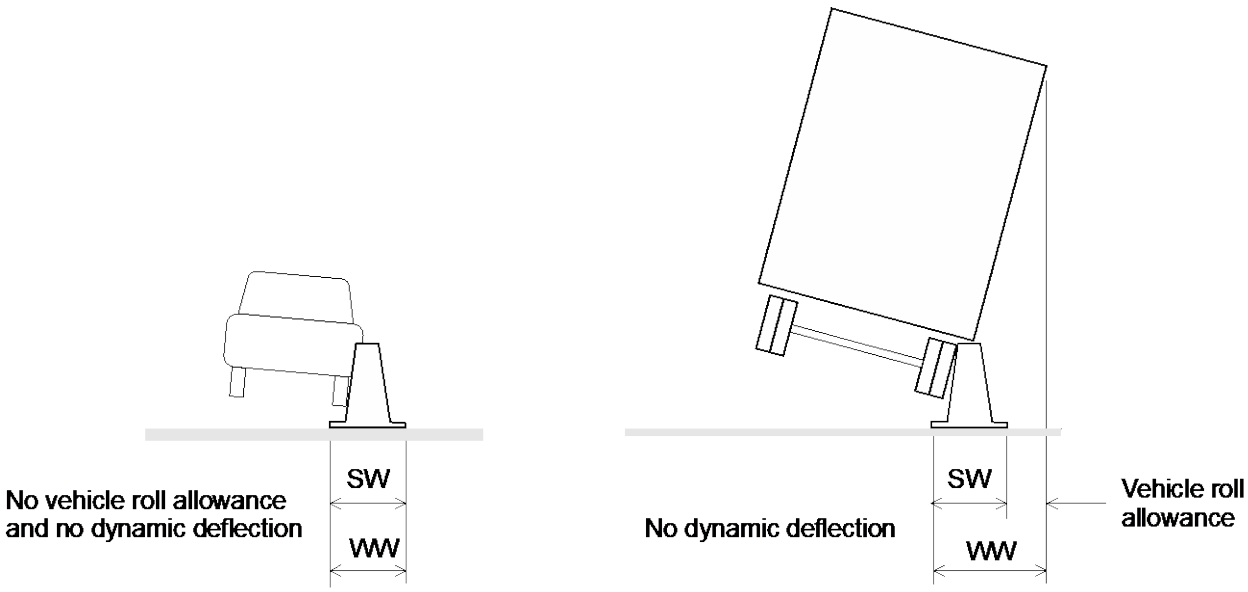
Working Width for Temporary Safety Barriers

Figure 2: Typical working width measurements for freestanding barriers



Legend: DD = Dynamic Deflection, SW = System Width

Figure 3: Typical working width measurements for pinned barriers



Legend: WW = Working Width, SW = System Width

Changes in system width

Pinned concrete safety barriers often exhibit negligible deformation therefore the system width is unchanged. In comparison, some steel safety barriers do deform during capacity impacts, but the change in system width is dependent on where the deformation occurs (e.g. top of the barrier)

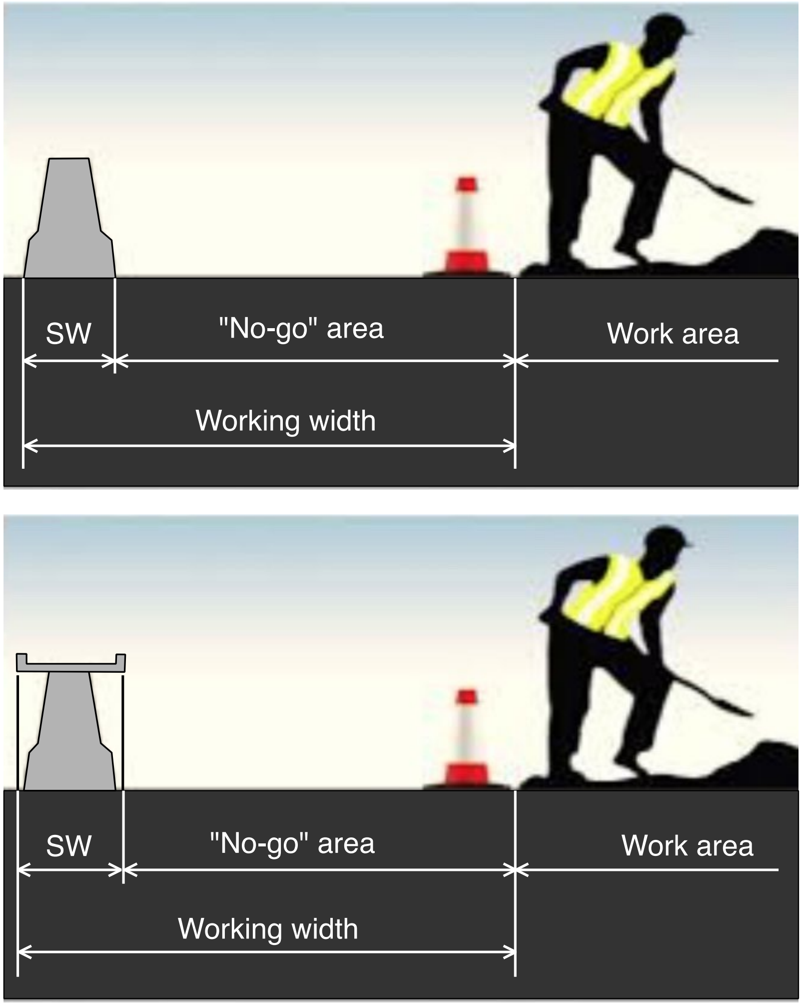
Risks associated with people and objects in the working width

It is obvious that workers are at risk if they are in the working width. There is also a risk from impacts with taller infrastructure behind the barrier such as signs and/or temporary lighting creating secondary risks. These items should not be positioned within the no-go zone (where practicable).

How to measure working width on-site

While working width is defined from the traffic side of a barrier, it is often safer to measure the 'no-go zone' from behind the barrier when working next to live traffic This 'no-go' distance is simply the working width minus system width before impact. (The 'no-go' zone be measured from the widest element of the barrier). Refer to Figure 4.

Figure 4: Working width and "no-go" area measurements



Recommendations

It is recommended that

- Working width is measured from the outermost extremity of the barrier, regardless of shape, on the traffic side, to the furthest extremity of any part of the system or vehicle during and after the impact.
- Working width is different for each system.
- When working width extends behind the barrier, the 'no-go' distance must be calculated as working width minus system width.
- Working widths should be reported in line with this Technical Advice.
- Taller infrastructure such as signs and/or temporary lighting should not be positioned within the no-go zone (where practicable).

References

AASHTO 2011, *Roadside design guide*, 4th edn, American Association of State Highway and Transportation Officials, Washington, DC, USA.

Standards

AS/NZS 3845.1:2015, *Road safety barrier systems and devices: part 1: road safety barrier systems.*

EN1717.2 *Road restraint systems - Part 2: Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicle parapets*