



CI-112C

Vehicle Safety and Standards Branch Circular to Industry

Bull Bar Construction Guidelines

Introduction

The purpose of this circular is to inform manufacturers and retailers of bull bars about the design and safety requirements that affect the industry.

A great deal of research is currently being conducted into the possible effects of bull bars and ways of optimising their design.

Standards Australia has published an Australian Standard AS 4876.1-2002 "Motor vehicle frontal protection systems Part 1: Road user protection". Part 1 of the standard concentrates on the issue of minimising the risk of injury to pedestrians as a result of colliding with a vehicle fitted with a bull bar.

Causes of concern

For many years, bull bars have been accepted as an accessory for most types of vehicle, including passenger cars, four-wheel drives, forward control vehicles, etc. However, the continued development of vehicle technology and ongoing improvements in vehicle safety systems have led to a situation whereby a bull bar may interfere with the sophisticated safety systems designed into modern vehicles.

The main causes of concern are outlined as follows:

- **Incompatibility with vehicle air bags**
A badly designed bull bar may interfere with the operation of an air bag, making it activate at the wrong time. In the worst case, this can cause significant additional injury to the occupant.
- **Nullification of crumple zones**
Modern vehicles have crumple zones that protect the occupants by cushioning the impact of a front-end collision. A badly designed bull bar may make the front end of the vehicle significantly more rigid, thereby nullifying the effect of the crumple zones. This causes a more severe impact for the occupants of all vehicles involved.
- **Incompatibility with other vehicles**
At an international level, significant research is being undertaken towards improving the "crash compatibility" between vehicles involved in vehicle-to-vehicle collisions. The aim of this research is to design vehicles in such a manner that maximises each vehicle's ability to absorb crash energy. A badly designed bull bar can negate these design features, thus increasing the risk of more significant injuries to the occupants of other

vehicles involved in the collision, than would have been the case, had the colliding vehicle not been fitted with a bull bar.

Danger to pedestrians

Accident statistics, confirmed by scientific studies, have shown that a badly designed bull bar may greatly increase the risk of injury to a pedestrian hit by a car, even at relatively low speeds. Figure 1 and Figure 2 show the reason for this.

Figure 1 shows a pedestrian collision where the pedestrian rolls onto the bonnet of the car. Generally, this is the best scenario for the pedestrian and the risk of injury is minimised. The chances of this happening are better if the point of initial contact between car and pedestrian is as low to the ground as possible.

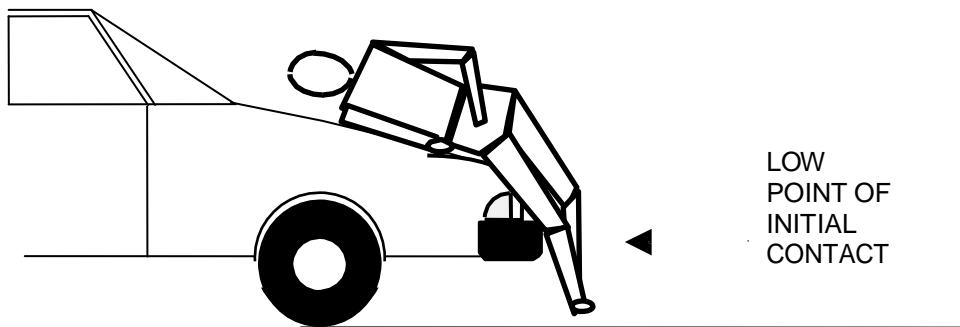


Figure 1
Pedestrian collision - pedestrian rolls onto bonnet

Figure 2 shows what is likely to happen if the pedestrian is struck by a car with a badly designed bull bar fitted. Because the bull bar presents a higher point of initial contact, the pedestrian is pushed forward and bent around the top of the bull bar, rather than being swept onto the bonnet of the car. As a result, there is a much higher risk of spinal, pelvic and head injuries to the pedestrian, even at relatively low collision speeds.

The risk to pedestrians may be decreased by using a bull bar design that incorporates a low point of initial contact. The "nudge bar" design shown in Figure 3 has a relatively low point of contact because it is angled backward and does not protrude above the bonnet line.

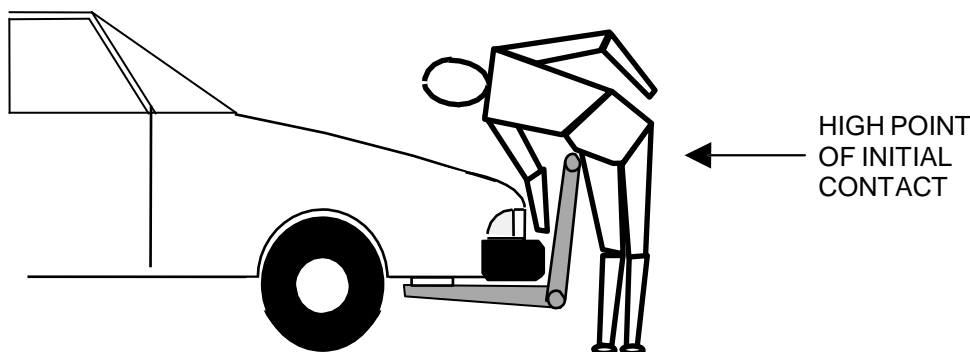


Figure 2
Pedestrian collision with a poorly designed bull bar
Pedestrian pivots about the high contact point, with increased risk of spinal, pelvic and head injuries

Bull bar design

For all vehicles

Existing regulations relevant to bull bar design prohibit dangerous projections, sharp corners and obstructions to lighting.

Each bull bar needs to generally conform to the shape, in plan view, front view and side view, of the front of the vehicle to which it is fitted.

Measures need to be taken to prevent the bull bar from hooking or grazing other road users:

- Exposed edges need to be chamfered and free of burrs or sharp edges.
- Forward facing edges must have radii not less than 5mm.
- Open ended frame members are not permitted.

In addition, bull bars should be designed to minimise the risk to pedestrian safety and to minimise the likelihood of penetrating into other vehicles in the event of a crash, by adhering to the following guidelines:

For city vehicles

For metropolitan use, a “nudge bar” design is preferred.

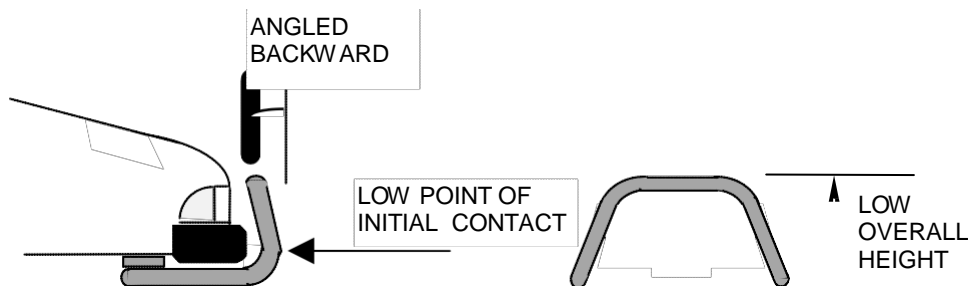


Figure 3
“Nudge bar” design for metropolitan use

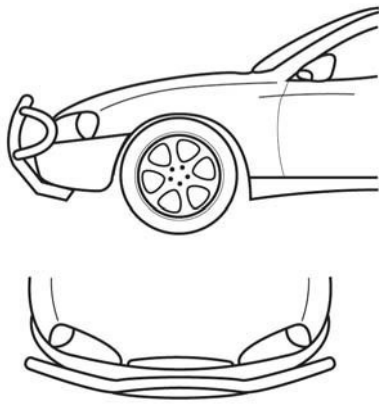
The bar should be angled backward to present the lowest possible point of initial contact with a pedestrian.

The overall height of the bar should be kept as low as possible.

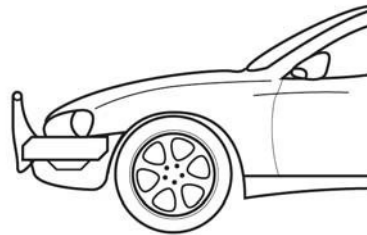
For country vehicles

Vehicles that travel extensively on country roads may need a higher level of protection against a collision with an animal such as a kangaroo or an emu.

In this case the more traditional bull bar design may be desirable.

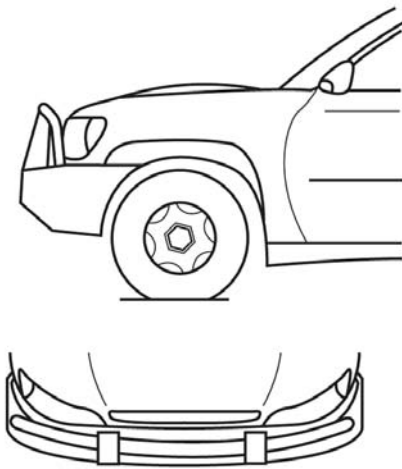


Acceptable

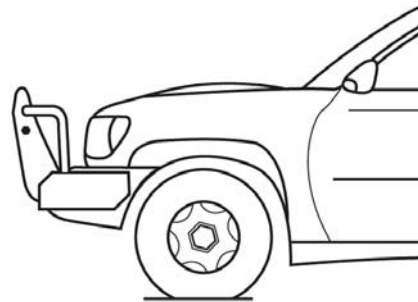


Not acceptable

General profile requirement for sedan type vehicles (including utilities) for country use



Acceptable



Not acceptable

General profile requirement for four wheel drive vehicles for country use

**Figure 4
Bull bar designs for country use**

The front face of the bull bar should not lean outward from the vehicle.

The ends of the bull bar should be curved to wrap around the profile of the vehicle and must not protrude beyond the outer extremities (not including mirrors) of the vehicle.

The overall height of the bar should be kept as low as possible. It should not protrude above the front of the bonnet line.

In all cases it is important to keep the point of initial contact (between bull bar and pedestrian) as low as possible. This point of initial contact should be relatively rigid to allow the pedestrian's legs to be swept upward cleanly, similar to the situation shown in Figure 1.

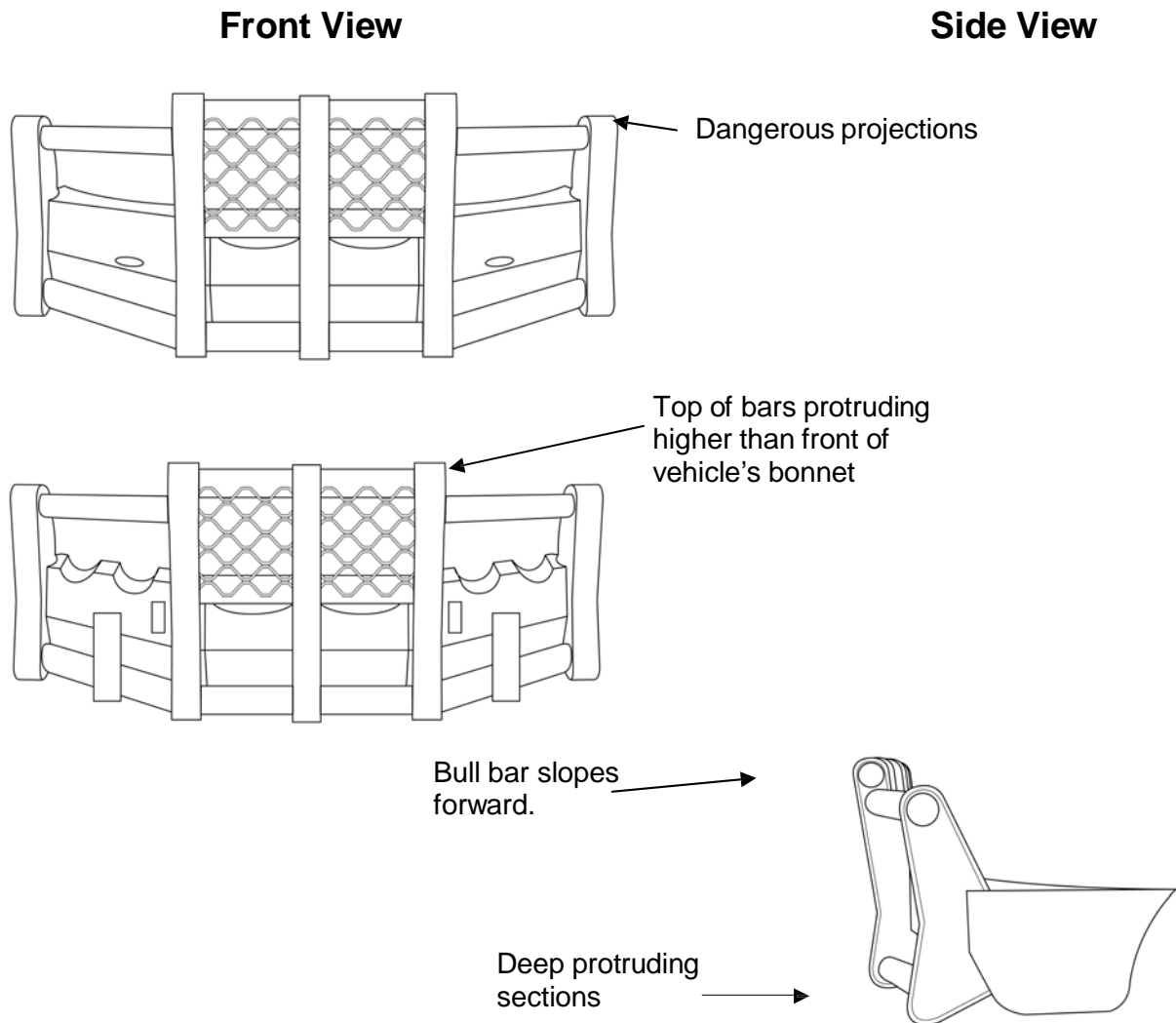


Figure 5
Typically unacceptable bull bars
 (For any passenger car or passenger car derivatives including most utilities and panel vans)

Heavy vehicles

In considering the design and construction of bull bars for heavy vehicles, the design principles listed above should be applied wherever possible.

The use of innovative design to produce a lighter, less-aggressive bull bar, in addition to improving pedestrian protection, may also result in increased safety for the occupants of another vehicle in the event of a crash.



Figure 6
An acceptable bull bar

In the past, State Ministers have shown concern about the contribution of aggressive bull bars to the severity of sideswipe accidents. Measures were taken to counter this in the 1990's.

Less aggressive truck bull bars will contribute significantly in reducing the likelihood of the “can opener effect” by having large radii on the top leading corners of the bar. (See Figures 6 and 7).



Figure 7
Aggressive bull bars

Selection of bull bars

Consumers should be strongly advised to buy a lighter design of bar (such as a “nudge bar”), unless they do a major part of their driving in the country and require a higher level of protection against collisions with large animals.

Fitment of bull bars to ADR 69/00 vehicles

Australian Design Rule ADR 69/00 sets minimum levels of occupant protection, as determined by crash testing. Depending on the design and application, a bull bar may positively or negatively affect occupant safety in a crash situation.

ADR 69/00 affects the following vehicles:

- From 1 July 1995, all new model MA vehicles (passenger cars)
- From 1 January 1996, all MA vehicles (passenger cars)
- From 1 January 1998, all new model MB vehicles (forward control passenger vehicles)
- From 1 January 1998, all new model MC vehicles (off-road passenger vehicles)
- From 1 July 1998 for new model NA1 vehicles (light goods vehicles)
- From 1 January 2000 all MB vehicles (forward control passenger vehicles)
- From 1 January 2000 all MC vehicles (off-road passenger vehicles)
- From 1 July 2000 all NA1 vehicles (light goods vehicles).

On these vehicles, bull bar manufacturers will need to be in a position to show that the fitment of their product does not interfere with the intent of the occupant protection provisions specified in ADR 69/00. Various techniques are being researched, by the industry, for determining the effect of the bull bar on ADR 69/00 (e.g. pendulum tests and computer simulations).

Research to date indicates that the strength of the mounting points is one of the most significant parameters of the bull bar's potential to interfere with the vehicle's crashworthiness. The research has shown that carefully designed mounting points result in little or no effect on the vehicles ability to satisfy ADR 69/00.

Bull bar manufacturers should acquaint themselves with this information and ensure that their bull bar designs comply with these requirements. Manufacturers should utilise the services of a professional engineer to assist them in interpreting this data and applying it to their designs.

Fitment of bull bars to vehicles with air bags

Air bags may be fitted by vehicle manufacturers in order to comply with ADR 69/00 or as an additional safety feature at the manufacturer's discretion. The triggering methods used to deploy the air bags vary greatly in complexity between manufacturers.

The fitting of a bull bar to the front of a vehicle may have an unknown affect on the deployment characteristics of an air bag. Research to date indicates that the strength of the mounting points is one of the most significant parameters of the bull bar's potential to interfere with the vehicle's air bag deployment. The research has shown that carefully designed mounting points can result in little or no effect on the vehicles ability to trigger the air bags.

Bull bar manufacturers should acquaint themselves with this information and ensure that their bull bar designs comply with these requirements.

Manufacturers should consider utilising the services of a professional engineer to assist them in interpreting this data and applying it to their designs. Bull bar manufacturers will need to

be in a position to show that the fitment of their product does not adversely interfere with the triggering of the air bag system.

Labelling

Conforming bars shall have a durable plastic or metal plaque permanently attached by bonding, riveting, welding, drive screws, or a durable integral label, on a surface of the bar such that the label can be read when the bar is attached to a vehicle and located where it will not sustain environmental damage.

It shall display the following information in permanent and legible letters not less than 4 mm high:

- A description indicating the vehicle make and year model(s) for which the bar is suited
- The bull bar manufacturer's business name
- An identification code that permits the manufacturer (or importer) to identify a specific production batch
- The statement "this product and the associated fixings must not be modified".

Vehicle lighting

The installation of a bull bar may result in the existing lighting being obscured and consequently prevent the vehicle from complying with the relevant ADR for Forward Facing Lamps. Where ADR lighting requirements are not satisfied, additional lamps shall be fitted so that the vehicle complies.

Original lamps that seem to be obscured but pass a scientific test proving ADR compliance will be accepted upon presentation of the relevant test results. All additional lamps shall comply with the relevant ADRs. In order to avoid rejection at an examination site it is recommended that the Vehicle Safety and Standards Branch is notified of the model numbers of these bars, so that the vehicle examiners can be advised accordingly.

Attachments and attachment points on bull bars

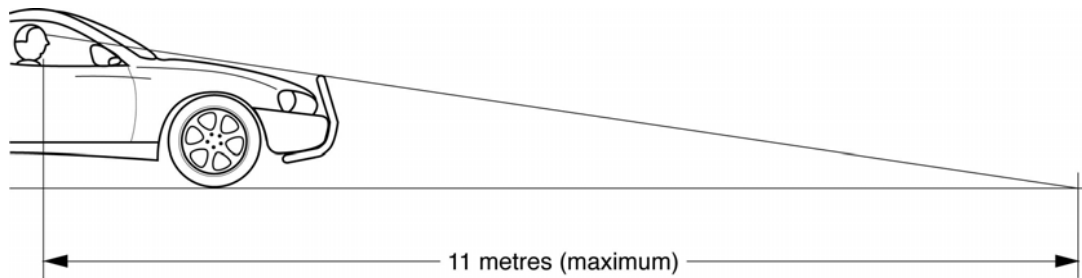
Of particular concern are the ways in which items protruding forward of the bumper or bull bar are fitted e.g. accessory fittings attached to the front of a vehicle such as brackets and attachment points supporting aerials and driving lights.

It is acceptable to have attachment points fixed to bull bars for these items provided they are fixed to the rear surface of the bull bar in a manner that prevents them from becoming dangerous projections. Similarly, fishing rod holders may only be fitted if they do not protrude forward of the front face of the bull bar to which they are fitted.

Field of view

Any bull bar, together with any attachments, must not reduce a driver's ability to safely drive the vehicle to which it is attached.

When sitting in the driver's seat with the seat located at its rearmost position, it shall be possible to see either the surface of the road, 11 metres in front of the driver's eye or the front edge of the original body when looking across the top of the bull bar.



Modification permits

Bars complying with the requirements of this Circular to Industry (CI) or the Australian Standard AS 4876.1-2002 are considered to be acceptable vehicle modifications that do not require the owner of the vehicle to purchase a “Modification Permit” from the Department of Transport (DoT). Bull bar manufacturers or suppliers who fit complying bull bars therefore do not need to seek prior approval before fitting these bars to road vehicles.

If there is any doubt that the fitment of a particular bull bar design may not comply with this CI or the Australian Standard, suppliers or manufacturers must contact the DoT before fitting the bull bar. In many of these cases the owner may be required to submit a written request for a modification approval to the DoT.

If the application is considered to be acceptable, given the particular circumstances, the particular bull bar installation will be approved, or the design itself may be approved for use on certain vehicles.

Modifications that require assessment must be presented for inspection to either one of the DOT Vehicle Examiners in the metropolitan area, or an Approved Inspection Station (AIS) in the country.

Following a satisfactory inspection, a “Modification Permit”, for which there is a fee, is issued to confirm that the modification is acceptable. To assist on-road enforcement officers in determining the acceptability of vehicle modifications in the field, owners are advised to carry a copy of the Modification Permit in their vehicle at all times.

Related documents and links

- Standard AS 4876.1-2002 is available through the Standards Australia website (www.standards.org.au)
- Australian Design Rules are available on the Department of Infrastructure and Regional Development website (www.infrastructure.gov.au)
- Vehicle examination centres can be found on the Western Australian Department of Transport website (www.transport.wa.gov.au)

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