

## Why use cambered axles on heavy trailers?

This is a question that often pops up when discussing heavy trailer axles. Almost everybody agrees that, for improved tyre life, the tyres should sit as close as possible to square to the road surface. However, there are three main variables to consider:

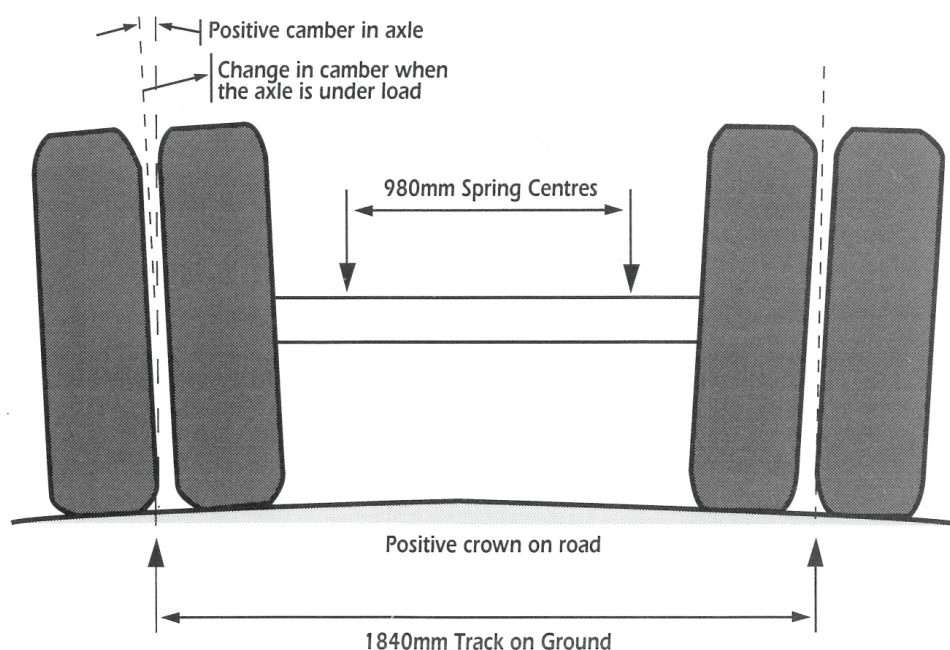
1. the varying degree of road camber on Australian roads
2. the initial camber on the axle beam, and
3. the changes to axle beam camber when the trailer is loaded.

There is not much that can be done about the camber on Australian roads. The vast majority of local roads are either flat or have a positive crown, with some roads having a severe positive crown. The best that can be achieved is to set up the trailers axle so the angle between the tyres and the **average** road surface is close to 90° when the trailer is loaded.

The changes to axle beam camber with axle load can be significant and depend on the axle beam section, spring centres and axle track. The table opposite shows the axle load required to change the camber by 5mm/metre per side (ie. 17 minutes per side) for various axle beam sections. For comparison purposes, these results are based on spring centres of 980mm and an axle track of 1,840mm. The table also shows the relative weights and strengths of the axle beam sections.

The significance of the initial camber setting on the axle can be seen from the results listed in the table. Taking the 127mm round 16mm wall axle beam as an example, if this were supplied with zero camber then, at 6.9 tonne axle load (ie. 20.7 tonne over a tri-axle group), the axle's camber would be negative 5mm/metre per side (ie. 17 minutes per side). This may not be ideal, since there are not many Australian roads which have a 'negative' crown.

Axle beams supplied with positive camber will 'deflect' under load, maybe leaving some residual positive camber, thereby increasing the chances the tyres will run at close to 90° to the average road surface.



1 Axle beam section		Measure of axle beam resistance to bending 2	Comparison of axle beam section resistance to permanent deformation 4	
Profile	Wall Thickness	Axle Load required to give camber change of 5mm/m (17 minutes) per side 3	Weight of Axle Beam Section per metre of length	Relative Strength of Axle Beam Section under bending load
120mm Square	x 15.0mm	8.2 tonne	46.5 kg/m	130%
127mm Round	x 17.5mm	7.2 tonne	47.5 kg/m	106%
120mm Square	x 10.0mm	6.5 tonne	33.0 kg/m	100%
127mm Round	x 16.0mm	6.9 tonne	44.0 kg/m	100%
127mm Round	x 14.0mm	6.4 tonne	39.0 kg/m	92%
127mm Round	x 12.0mm	5.8 tonne	34.0 kg/m	82%

1. The 120mm square axle beams are BPW axle beam sections, with radius corners having thicker wall.
2. Resistance to bending depends on the profile and wall thickness of the axle beam section and the elastic stiffness of the axle beam material. All types of steel currently used on commercially available heavy trailer axle beams have approximately the same elastic stiffness.
3. For the purposes of this comparison, 980mm spring centres and 1840mm axle track has been utilised for all the Axle Beam Sections, as depicted on the diagram.
4. Resistance to Permanent Deformation is a relative measure of the load required to put a permanent bend in the axle beam. This depends on spring centres, axle track, axle beam section and axle beam material. For the purposes of this comparison, the same spring centres, axle track and axle beam material have been used in the calculations.

**Assumptions used in calculations; spring seats/supports do not contribute to axle beam stiffness or strength; the flexural properties of the axle beam are constant along the entire track of the axle.**

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