CRUISEMASTER™
AUSTRALIA'S LEADER IN ALL-TERRAIN TOWING TECHNOLOGY

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TECHNICAL BULLETIN

Title: Chassis Design 2
Doc No: TB-070
Date: 28 Nov 2018

Introduction

The most important single component of any road vehicle is the chassis. Failures may render the vehicle undriveable, stranding the occupants in remote areas and may incur hefty repair costs. The worst-case failures are potentially lethal to the occupants and other road users.

It is important to understand the critical difference between chassis designed for beam axles and those designed for independent suspensions. The lightweight and sturdy design of independent suspensions allows for major benefits towards vehicle handling, improving ground clearance and clearing underbody space for utilities.

Splitting the beam into two independent suspensions axles means that wheel forces normally carried along it are instead transferred up through the supporting chassis cross member. For this reason, chassis fitted with independent suspensions are normally built from stronger sections or suitably reinforced. (See Figure 1)

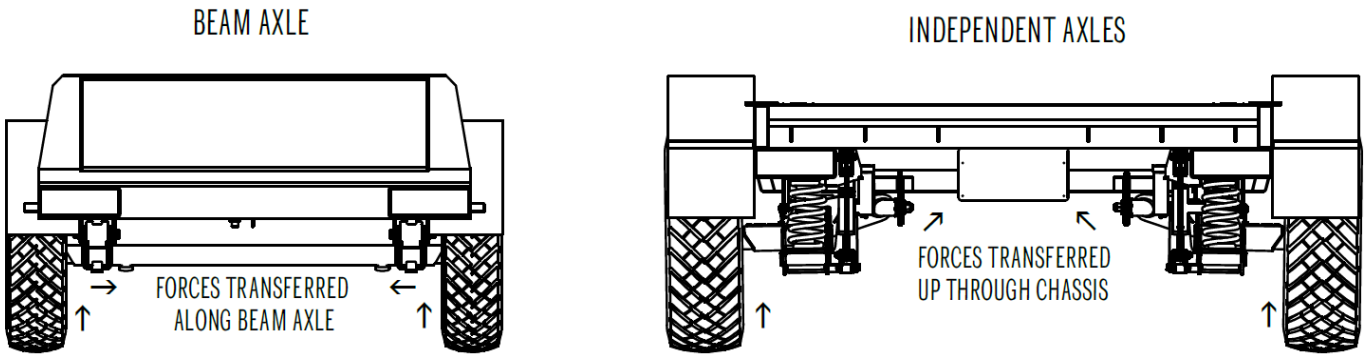

FIGURE 1 – WHEEL FORCES THROUGH BEAM AXLE TRAILER vs INDEPENDENT SUSPENSION TRAILER

This bulletin provides some basic recommendations for material selection and fabrication of chassis designed to be fitted with CRUISEMASTER INDEPENDENT SUSPENSIONS. However, it is the manufacturer's responsibility to ensure that chassis are designed and manufactured to suit their specific requirements and are fit for purpose.

CARE POINTS

Optimal chassis can be accomplished through a variety of alternatives apart from the recommendations in this bulletin. However, it is important to consider the implications these have on the overall structural integrity. For example,

- Care should be taken when reducing wall thickness and increasing material grade, as cross member deflection may be affected.
- Weld heat affected zones may increase with high grade materials
- Introducing holes, cut outs or slots into crossmembers will reduce their strength.

Consult with qualified engineers to ensure sound design.

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Standards and Regulations

It is recommended that trailers and caravans designed for use on Australian Roads are built to the relevant ADRs as summarized in the National Code of Practice – Vehicle Standards Bulletin (VSB1).
All chassis construction materials should comply with the relevant Australian Standard to ensure that the strength and performance requirements are met. Hollow steel tubes are a popular industry choice and should comply with AS1163.
The fabrication and welding of chassis built from steel must comply with AS/NZS 1554: Structural Steel Welding.
Applying the relevant standards, the following assumptions can be made for the various sections, specifically those used in the areas of the chassis where CRUISEMASTER INDEPENDENT SUSPENSIONS are to be fitted (See Figure 2):

- All sections AS/NZS 1163 – GRADE C350L0 minimum
- All sections 50mm WIDTH only
- 3mm minimum thickness for CHASSIS MAIN RAILS
- SUSPENSION CROSSMEMBERS must be fully welded to the chassis (refer TB040)
- SUSPENSION CROSSMEMBERS must be fully intact (no utility holes, cut outs or slots) unless its strength can be ensured.
- Do not weld ACROSS the WIDTH of chassis rails
- CHASSIS STRESSES are within the recommendations of international fatigue standards (BS7608)

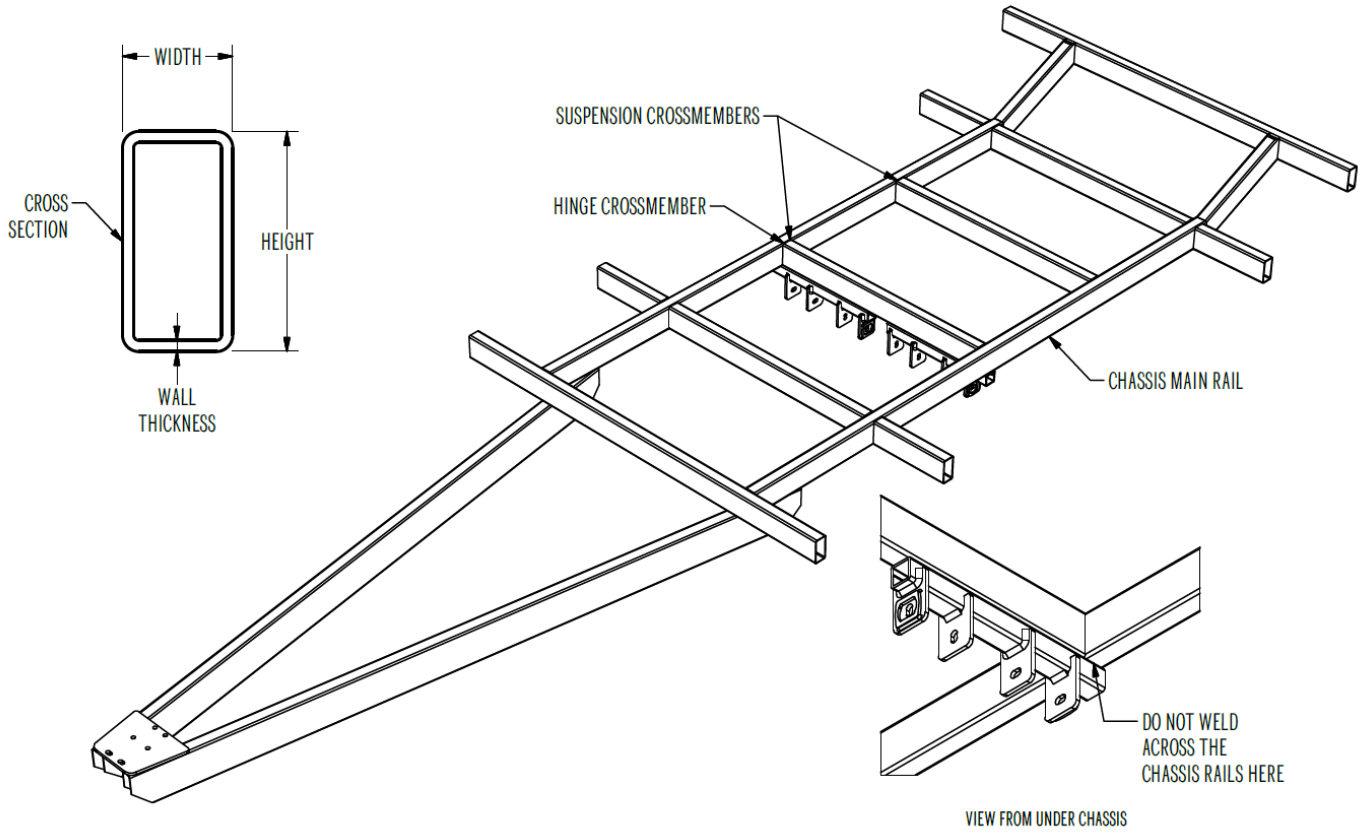

FIGURE 2 – CHASSIS MEMBERS AND SECTION

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Hinge cross member section

Independent suspensions transfer more force into the chassis cross members compared to their beam axle counterparts. For this reason, cross members used in independent suspension chassis need to be sized accordingly. It is important to note that for hollow tubes the section height (See Figure 2) has a larger effect on its strength than its wall thickness. The choice of section can vary depending on application, chassis width and required load capacity.
The table below provides a recommended HINGE CROSSMEMBER SECTION (See Figure 2) for a given RATED CAPACITY

ATX – Off road suspensions	
Rated Capacity (kg) – ATM (GTM)	Recommended HINGE CROSSMEMBER section (mm)
SINGLE AXLE up to 2000 (1800)	**150 x 50 x 3** or **100 x 50 x 5**
SINGLE AXLE up to 2800 (2520)	**150 x 50 x 4**
TANDEM AXLE up to 3700 (3300)	**150 x 50 x 3** or **100 x 50 x 4**
TANDEM AXLE up to 4500 (4050)	**150 x 50 x 3** or **100 x 50 x 5**

XT – Off road suspensions	
Rated Capacity (kg) – ATM (GTM)	Recommended HINGE CROSSMEMBER section (mm)
SINGLE AXLE up to 2000 (1800)	**150 x 50 x 3** or **100 x 50 x 5**
SINGLE AXLE up to 2800 (2520)	**150 x 50 x 4**
TANDEM AXLE up to 3700 (3300)	**150 x 50 x 3** or **100 x 50 x 4**
TANDEM AXLE up to 4450 (4005)	**150 x 50 x 3** or **100 x 50 x 5**

CRS – Semi off road suspensions	
Rated Capacity (kg) – ATM (GTM)	Recommended HINGE CROSSMEMBER section (mm)
SINGLE AXLE up to 1600 (1440)	**100 x 50 x 4**
SINGLE AXLE up to 2500 (2250)	**150 x 50 x 3** or **100 x 50 x 5**
TANDEM AXLE up to 2600 (2340)	**100 x 50 x 3**
TANDEM AXLE up to 3500 (3150)	**100 x 50 x 4**

Aggregate Trailer Mass (ATM) - The total mass of the laden trailer when carrying the maximum load recommended by the manufacturer. This includes any mass imposed upon the drawing vehicle when the combination vehicle is resting on the horizontal supporting plane.

Gross Trailer Mass (GTM) – ATM less the weight on the drawbar (estimated at 10% of the ATM)

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GT – Road suspensions	
Rated Capacity (kg) – ATM (GTM)	Recommended HINGE CROSSMEMBER section (mm)
SINGLE AXLE up to 1250 (1080)	**100 x 50 x 3**
SINGLE AXLE up to 2000 (1800)	**150 x 50 x 3** or **100 x 50 x 5**
TANDEM AXLE up to 2500 (2250)	**100 x 50 x 3**
TANDEM AXLE up to 3100 (2790)	**100 x 50 x 4**

Hinge cross member reinforcement

If it is not possible to use recommended sections, a FULL WIDTH HINGE MOUNT should be used or the HINGE CROSSMEMBER should be built up to the recommended section (See examples in Figure 3). Where possible, the connections between HINGE CROSSMEMBERS AND CHASSIS MAIN RAILS should use GUSSETS (See Figure 3b) or other reinforcement as shown in TB040.

The crossmember can be reinforced by stitch welding the 50x50x5 tube to the top of the crossmember (See Figure 3a). The tube should span the full width between the chassis main rails, if this is not possible ensure the tube extends as far as possible over both hinge mounts. Ensure the tube ends are miter cut and capped with a 5mm plate.

Alternatively, a 50x50x5 tube length can be stitch welded under the crossmember between the hinge mounts. Ensure the tube ends are chamfered and fully welded to each hinge (See figure 3b).

Example: For a recommended 150 x 50 section, if the existing crossmember is
- 100 x 50, reinforce with 50 x 50
- 75 x 50, reinforce with 75 x 50
The reinforcement piece can be attached above as shown in Figure 3a or below as shown in Figure 3B

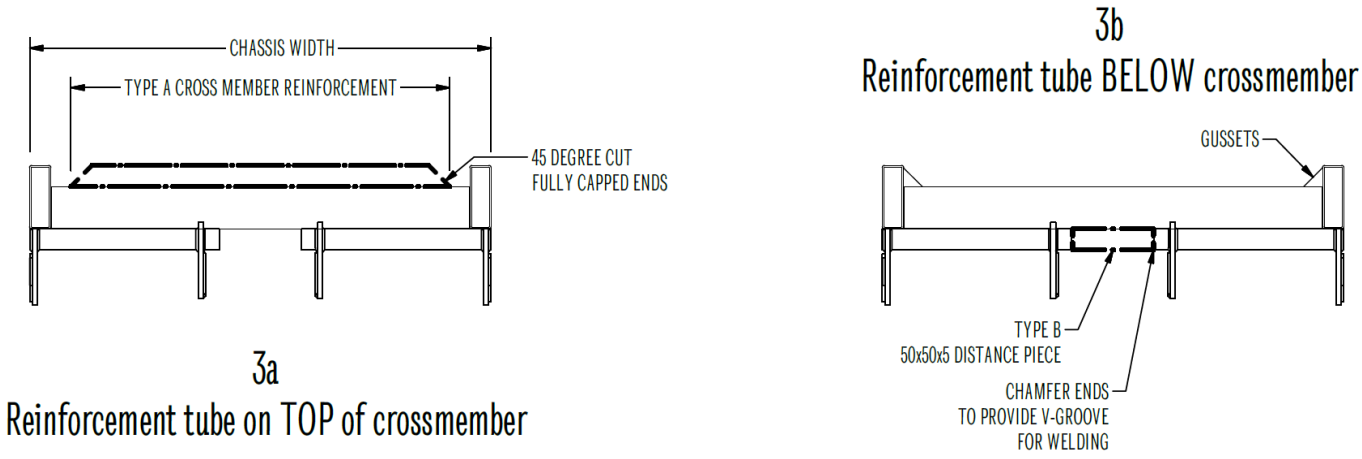

FIGURE 3 – RECOMMENDED CROSSMEMBER REINFORCEMENT METHODS

For further detail on attachment of suspension components, refer to the CRUISEMASTER Installation Guides.
Thank you for your ongoing support; if you have any feedback, questions or concerns please contact your local BDM or our Customer Service Team