



WEIGHTY MATTERS

WHAT YOU NEED TO WEIGH UP WHEN TOWING A TRAILER

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USEFUL VEHICLE TERMS



TARE Mass – Weight of the vehicle - includes oils & fluids & 10L fuel (usually) but nothing else

KERB Mass - Same as TARE but with full tank of fuel (and no accessories)

Gross Vehicle Mass (GVM) – the most the manufacturer (and hence the Law) says your vehicle can weigh and be legally driven. KERB Mass plus everything else – family, dog, esky, accessories, and Tow Ball Download

Payload – the maximum load the manufacturer says your vehicle can carry = GVM minus KERB Mass

Gross Vehicle Axle Mass – the most the manufacturer says your front and rear axles can carry.
Front + Rear usually is greater than GVM to provide a safety margin

Gross Combination Mass (GCM) – the maximum weight allowed by the manufacturer for your vehicle and trailer combined



USEFUL TRAILER TERMS



TARE Empty and unhitched. No water.No gas.



GTM Loaded and connected to vehicle.



ATM Loaded and *unhitched*. With water, gas, food & clothing.

ATM & GTM are RATINGS – determined by the manufacturer

TARE Mass and Tow Ball Download are actual Masses and must be measured

ATM Rating – TARE Mass = Legal load carrying capacity



PUTTING IT ALL TOGETHER

How much can I legally tow?

No more than your vehicle manufacturer says you can (ATM and Tow Ball Download), provided that:

- ❖ both vehicle and trailer are registerable and registered
- ❖ and the weight of your trailer (ATM) is not greater than your tow bar's (& tyres) maximum capacity
- ❖ and the tow ball download when hitched up is not greater than your tow bar's maximum download
- ❖ and the combined weight of your vehicle (GVM) and trailer (ATM) is less than your vehicle's allowed GCM.

In December 1998, agreement was reached by all State's Ministers of Transport to implement national towing regulations.

One rule, put simply, says the most you can tow is the amount specified by the vehicle manufacturer or the capacity of the tow bar - WHICHEVER IS THE LESSER.

If a motor vehicle manufacturer has not specified a maximum towing weight or capacity, the towing limit is 1.5 times the unladen or kerb weight of the motor vehicle if the trailer is fitted with brakes or the unladen weight of the motor vehicle if the trailer is not fitted with brakes.



CASE STUDY - TRAILER

Off-Road Caravan – 18'6"

| | | |
|-------------------|-------|---------|
| TARE | 2,500 | |
| GTM | 2,900 | (2,800) |
| ATM | 3,200 | (3,120) |
| Tow Ball Download | | (320) |

Figures in BLACK are manufacturers ratings/weights. Figures in RED are actual weighbridge results.



CASE STUDY – MAZDA BT-50

2016 BT-50

| | | |
|-------------------|---------------|--------------------------------|
| TARE | not specified | |
| KERB | 1,885 + tray | (2,200 no people or any stuff) |
| GVM | 3,200 | |
| Payload | 1,315 - Tray | (1,000) |
| Front Axle | 1,480 | (1,240) |
| Rear Axle | 1,850 | (960) |
| GCM | 6,000 | |
| Towing Capacity | 3,500 | |
| Tow Ball Download | 350 | |

$GVM = 2,200 + 170$ (occupants) $+ 320$ (tow ball download) $= 2,690$. GVM okay.

$GCM = 2,690 + 2,800 = 5,490$. GCM okay. We can still add 510 kg to the mix – mainly in the vehicle.

Tow Ball Download $= 320$. Tow Ball Download okay. Note: only count the tow ball download once!

Let's go



CASE STUDY – TOYOTA LC200

2008 LC200

| | | |
|-------------------|-------|--|
| TARE | 2,590 | |
| KERB | 2,695 | (3,200 no people, bull bar, side rails & steps, roof rack; empty fridge & full rear drawers) |
| GVM | 3,300 | |
| Payload | 605 | (100) |
| Front Axle | 1,630 | (1,450) |
| Rear Axle | 1,950 | (1,600) |
| GCM | 6,800 | |
| Towing Capacity | 3,500 | |
| Tow Ball Download | 350 | |

$GVM = 3,200 + 170$ (occupants) $+ 320$ (tow ball download) $= 3,690$. GVM way too high!

$GCM = 3,690 + 2,810 = 6,500$. No problem with GCM – 300 kg to spare.

Tow Ball Download = 320. Tow Ball Download okay. Note: only count the tow ball download once!

Going nowhere. 500 kg GVM upgrade to 3,800 kg the only way out. \$3,500 - \$5,500 estimated cost.



AXLE LOADS

Front and Rear axle loadings are affected by Tow Ball Download. Rear gets heavier, Front gets lighter.

Rear axle load change = $(\text{overhang}/\text{wheelbase}) * \text{tow ball download}$

e.g. LC200 overhang is 1,350mm, wheelbase is 2,850mm, tow ball download is 320 kg.

$$(1.35/2.85)*320 = 152 \text{ kg}$$

The effect of 320kg at the tow ball is $320+152 = 472$ kg on the rear axle (this is also a problem) and the front axle loading reduces by 152 kg. But the overall weight increase is only 320 kg.

e.g. BT-50 overhang is 1,300mm, wheelbase is 3,220mm, tow ball download is 320 kg.

$$(1.30/3.22)*320 = 130 \text{ kg}$$

The effect of 320kg at the tow ball is $320+130 = 450$ kg on the rear axle and the front axle loading reduces by 130 kg. The overall weight increase is still only 320 kg.



BALL WEIGHT

Trailer actual ATM = 3,120 kg, actual GTM = 2,800 kg.

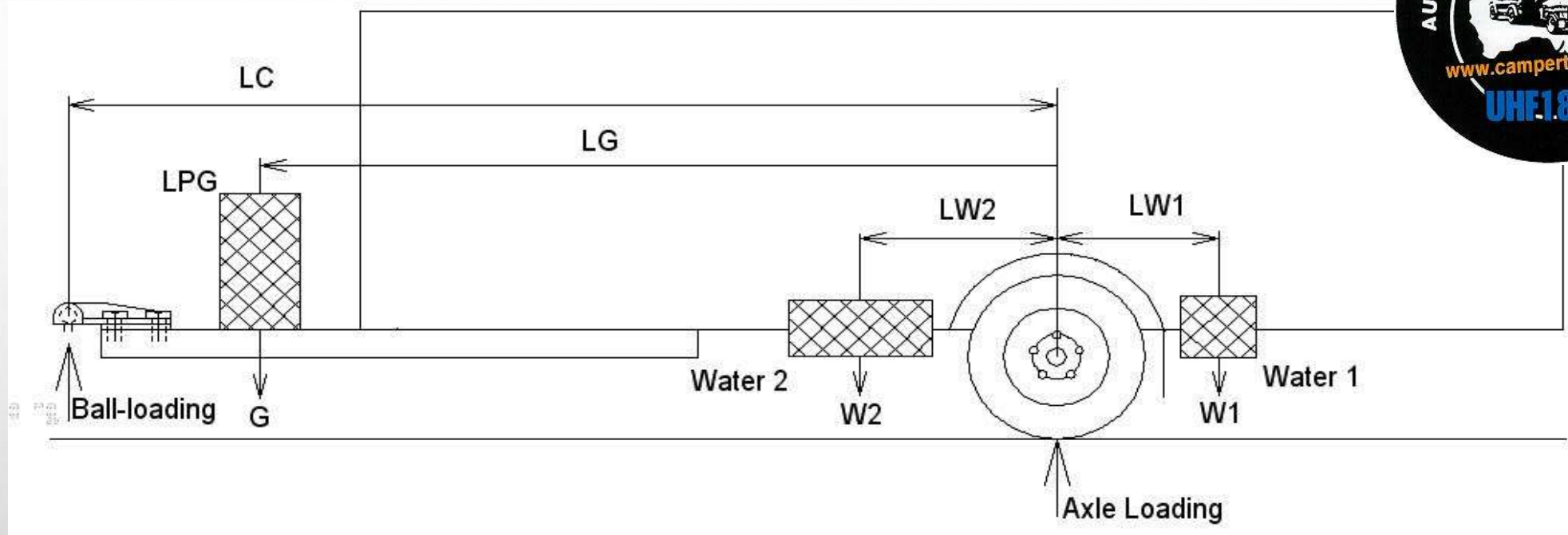
$$3,120 - 2,800 = 320 \text{ kg}$$

But compliance plate ATM = 3,200 and GTM = 2,900 indicating a tow ball download of 300 kg

Tow ball download is largely controlled by the trailer owner deciding what goes in and where it goes. The same payload can have a dramatic affect on tow ball download depending on where it is loaded in the trailer.

Simple analogy – small person and large person balancing on a see-saw.

Complex explanation on next slide.



The Actual Mass of the 'van will increase by: $G + W1 + W2$ when the empty tanks are filled. One (1) litre of water weighs one (1) kg.

Change in Ball-Loading = $((G \times LG) + (W2 \times LW2) - (W1 \times LW1)) / LC$

Example: $G = 18 \text{ kg}$; $W1 = 45 \text{ kg}$; $W2 = 90 \text{ kg}$; $LG = 3.0 \text{ m}$; $LW1 = 1.5 \text{ m}$; $LW2 = 1.5 \text{ m}$; $LC = 3.5 \text{ m}$

Change in Ball-Loading = + 35 kg

Worst Case 1: $W1$ empty; G & $W2$ full

Change in Ball-Loading = + 54 kg

Note: Dimensions from the centre of the axle-group to the left are positive... dimensions to the right are negative.

When containing water / LPG, tanks ahead of the axle(s) increase the Ball-loading; tanks behind of the axle(s) decrease the Ball-loading.



MORE STUFF TO CONSIDER

Trailer Brakes

Required if trailer's GTM > 750 kg and must operate on both wheels of at least one axle.

Additionally, the brakes on a trailer with a GTM over 2t must—

- operate on all wheels and must be able to be operated by the driver from the normal driving position; and
- operate automatically and quickly if the trailer breaks away from the towing vehicle; and
- remain in operation for at least 15 minutes after a breakaway; and
- be able to hold the trailer on a 12% grade while in operation after a breakaway (ACT & VIC)

(NSW registered vehicles must have a monitoring system which is visible or audible to the driver and indicates the status of the breakaway braking system's battery. And the BBS battery must be charged from the vehicle).



Safety Chains

ATM < 2.5 tonnes. One safety chain required.

ATM 2.5 – 3.5 tonnes. Two safety chains required.

Australian Standard AS 4177.4-1994 or

Australian Standard AS 4177.4-2004 'Caravan and light trailer towing components - Part 4: Safety chains up to 3500kg capacity'

Speed Limits when Towing can vary from state to state, particularly WA (100km/hr), TAS (100 km/hr) & NSW (100km/hr if GCM > 4,500kg). Otherwise it's the posted speed limit. But check!!

Some vehicle manufacturers specify reduced towing capacities when towing off-road and some specify a reduced vehicle payload as ball weight increases.

MORE INFORMATION



Vehicle Standard Bulletin - Building Small Trailers (VSB1) is available on the Department of Infrastructure and Regional Development website (www.infrastructure.gov.au)

Australian Design Rules are available on the Department of Infrastructure and Regional Development website (www.infrastructure.gov.au)

Standard AS 4177 can be accessed through the Standards Australia website