

Caravan Towing Calculator

User Manual

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Introduction

The Caravan Towing Calculator was created to assist caravan owners to manage the load positioning in their caravan and tow vehicles. The system is based on MS Excel and the latest version has been designed without Macros or VBA to try and make it compatible with MS Windows and Apple based computers.

The calculator is purely a guide to load placement in the caravan and vehicle. It is not intended as a replacement to weighing the caravan and vehicle at a certified weighbridge.

Navigation

The Main worksheet has a brief description of each section of the calculator. To access the worksheet for each section select the corresponding worksheet tab.

The **Caravan** and **Caravan Load** sections are used to enter information relating to the caravan. The **Caravan** section is where weight information from the caravan compliance plate and storage location information is entered. The **Caravan Load** section is used to enter details of each item of load including a description, location and weight.

The **Vehicle** section relates to the tow vehicle and has facility to enter the manufacturer weight specifications for your specific vehicle. There is also facility to enter details for up to forty (40) load items that enable the vehicle load to be calculated.

The **Towing** section combines the information for the caravan and vehicle to provide an overview of the relevant combined weights when towing.

The **Ball Weight Calculator** is a separate calculator to assist owners calculate the weight at the tow hitch if the physical measurement is obtained at a different location along the draw bar or at the jockey wheel.

Sequence

The Caravan and Vehicle information need to be entered prior to the Towing section having any meaningful information to view. The **Caravan** section needs information entering prior to the **Caravan Load** being able to be entered.

Caravan

Users are able to enter information in the worksheet cells with a light blue background.

Navigate to the Caravan section and enter the following information.

Enter the Compliance Plate Values that can be located on a plate either in the front boot or tunnel boot of your caravan. These values relate to the caravan weights as built at the factory and maximum rated weights.

Compliance Plate Values	
Tare Weight	2524 kg
Ball Weight at Tare	237 kg
Maximum Ball Weight	350 kg
GTM	3258 kg
ATM	3495 kg

Measure the Tare Weights

For a new caravan the Tare Weights on the Caravan Compliance Plate should be a good starting point but confirming the weights at a certified weighbridge will provide confirmation. When picked up from the dealer the caravan will usually have full gas cylinders and some water in the water tanks. The water was added for testing and demonstration purposes.

Tare weights do not include water or gas so it is suggested that you empty the water tanks before visiting the certified weighbridge. The Tare and Ball Weight at Tare weights can be adjusted for the gas weight. The Nett gas weight for each gas bottle is approximately 9 kg so for two gas bottles subtract 18 kg from the measured Tare weight. The impact on Ball Weight at Tare will be identified when the information is entered in the Caravan and Caravan Load sheets. When the information has been entered you can check the Nett kg value for the Gas Bottles in the Caravan sheet. You can now subtract this value from the Measured Ball Weight at Tare value to bring the value back to the value we would have expected with the gas bottle empty and as weighed at the caravan factory.

It is the Measured Tare Weights that are used in the calculations. The manufacturer Tare weights are only for reference purposes.

Measured Tare Weights	
Measured Tare Weight	2524 kg
Measured Ball Weight at Tare	250 kg

A tape measure will be required for the next step of the process.

For a single axle caravan this is to the centre of the caravan wheel. For a dual axle caravan the centre of the axle is taken at the midpoint of the dual wheels as shown below.



First measure the distance from the caravan axle centre point to the tow hitch as per the diagram below. The value is then entered into the Tow Hitch to Axle Centre cell. This is the value to which all other measurements are referenced.



Scroll down to the Position Table where you can enter up to forty load positions on your caravan. They will be used to calculate the weights of your caravan with load items that will be entered into the Caravan Load section in a subsequent step.

Position Table			
Description	Distance m	Weight kg	Nett kg
Gas Bottles	4.45	18	14.6
Tunnel Boot	3.40	48	29.7
Under Bed Storage	2.60	8	3.8
Water Tank Front	1.20	95	20.7
Water Tank Rear	-1.05	95	-18.1
Rear Storage Lockers	-2.15	48.5	-19.0
Rear Bumper	-2.60	0	0.0
Front Wardrobes	3.50	30	19.1
Ensuite Cupboards	-2.05	18.2	-6.8
Fridge	-0.75	19	-2.6
Kitchen O/H Cupboard - Rear	-0.65	5.5	-0.7

For each load position you will need to measure the distance to the centre of the position in relation to the centre of the axles. Positions that are forward of the Axle Centre are positive values and positions to the rear of the Axle Centre are entered as a minus value. In the above diagram the Gas Bottles are shown to be 4.45 metres from the Axle Centre and being a positive value indicates the position to be forward of

the Axle Centre. The Rear Bumper is shown to be -2.60 metres from the Axle Centre which indicates it is to the rear.

The Description should be meaningful to you as it will appear in a selection list in the Caravan Load Table that you will use in the next step.

At this stage the Weight and Nett columns can be disregarded as the values are calculated once load items are entered in the Caravan Load section.

The values in the table at the top of this section will be calculated as load items are entered into the Caravan Load Table in the Caravan Load section.

Calculated Caravan Weights with Load	
Calculated Ball Weight	276 kg
Calculated ATM	2937 kg
Calculated GTM	2661 kg
Load Allowance at Tare	971 kg
Current Load	413 kg
Load Remaining	558 kg

9.40% of ATM
Total Weight of Caravan (Disconnected from the Tow Vehicle)
ATM - Ball Weight

Caravan Load

Next you can enter up to one thousand (1,000) individual load items into the Caravan Load Table.

Caravan Load

Load Allowance at Tare	971
Current Load	413
Load Remaining	558

Item	Description	Location	Weight (kg)
1	Gas Bottles	Gas Bottles	18.00
2	Weber Baby Q Barbeque	Tunnel Boot	10.00
3	Rafters and Broom	Tunnel Boot	3.50
4	Hoses - Water & Grey	Tunnel Boot	7.50
5	Storage Box	Tunnel Boot	10.50
6	Rubber Floor Mat	Tunnel Boot	6.00
7	Rubber Floor Mat	Under Bed Storage	3.00
8	Wheel Clamp	Tunnel Boot	8.50
9	Hydraulic Jack	Rear Storage Lockers	12.00

The Load Allowance at Tare is a calculated value based on the information you should have previously entered in the Caravan section.

As load items are added the Current Load and Load Remaining values will be calculated as a guide.

For each item you need to type in a meaningful Description, select a Location and type in the Weight (kg). The list of available Locations is based on the Load Positions previously entered in the Caravan section. A drop down list will appear when you click on the Location cell. Scroll down the list and select the required storage location for the item.

Location	Weight (kg)
Gas Bottles	18.00
Gas Bottles	10.00
Tunnel Boot	3.50
Under Bed Storage	7.50
Water Tank Front	10.50
Water Tank Rear	6.00
Rear Storage Lockers	3.00
Rear Bumper	8.50
Front Wardrobes	
UNDER BED STORAGE	
Tunnel Boot	

As items are added to the table their values will be calculated as being associated with each location.

Note: If a location description is changed in the Caravan Position Table any loads associated with that position will require their locations to be updated in the Caravan Load list to ensure the weights are calculated correctly. A quick check to see if there are any mismatched positions in the Caravan Load list is to look at the Load table at the top of the Caravan Load sheet and the “Calculated Caravan Weights with Load” table at the top of the Caravan sheet. If the Load remaining on both sheets is equal then it is an indication that there are no mismatched Position Descriptions. If the values are different as shown in the following diagrams you will need to review the load list to find any items that have an invalid location. This will occur if you modify a Description in the Position Table after adding a load item.

Caravan Load sheet

Load Allowance at Tare	971
Current Load	413
Load Remaining	558

Caravan sheet

Calculated Caravan Weights with Load	
Calculated Ball Weight	262 kg
Calculated ATM	2919 kg
Calculated GTM	2657 kg
Load Allowance at Tare	971 kg
Current Load	413 kg
Load Remaining	576 kg

The weight associated with each storage location can be reviewed by returning to the Caravan section and viewing the table.

Position Table			
Description	Distance m	Weight kg	Nett kg
Gas Bottles	4.45	18	14.6
Tunnel Boot	3.40	48	29.7
Under Bed Storage	2.60	8	3.8
Water Tank Front	1.20	95	20.7
Water Tank Rear	-1.05	95	-18.1
Rear Storage Lockers	-2.15	48.5	-19.0
Rear Bumper	-2.60	0	0.0
Front Wardrobes	3.50	30	19.1
Ensuite Cupboards	-2.05	18.2	-6.8
Fridge	-0.75	19	-2.6
Kitchen O/H Cupboard - Rear	-0.65	5.5	-0.7

For each position there is a Weight and Nett value. The Weight is the total weight of items added to each position and the weight forms part of the caravan overall weight. The Nett value is the calculated impact on the caravan Ball Weight. In the above diagram it should be see for example that the 95 litre “Water Tank Front” will add 95 kg to the overall weight of the caravan when full and increase the Ball Weight by

20.7 kg. Items to the rear of the Axle Centre have a negative weight impact on the Ball Weight and the “Water Tank Rear” will add 95 kg to the overall weight of the caravan when full but it will effectively subtract 18.1 kg from the Ball Weight.

Being aware of the impact of load position on the Ball Weight is useful in making decisions on where to best position the load. It is also useful in calculating the impact on Ball Weight of adding or relocating items such as water tanks.

An example may be that you are considering adding a Bike Carrier to your caravan and want to see the impact it would have on the Ball Weight if it was fitted to the front Draw Bar or the rear Bumper. To check the impact on the Ball Weight you will most likely already have a position for the Gas Bottles and Rear Bumper so just add the Bike Carrier and Bikes to the Load list and review the values in the Calculated Caravan Weights with Load table on the Caravan sheet.

If you are considering the impact of relocation a Water Tank then just change the Distance value in the Position Table on the Caravan sheet and review the values in the Calculated Caravan Weights with Load table.

That effectively completes the Caravan information so you can now move on to the Vehicle.

Vehicle

The Vehicle section is where you can enter all the information relating to the tow vehicle. The vehicle weights have been shown on a diagram with scales to try and make it easier to see where each weight relates.

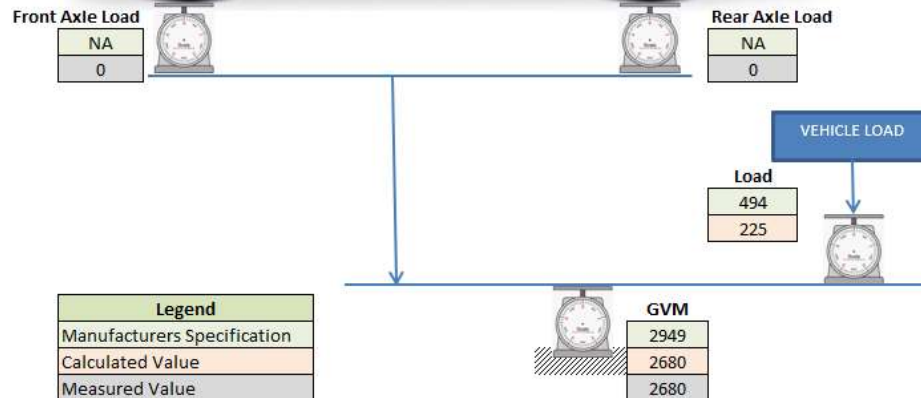
Vehicle (weights when not towing)

Manufacturer	Jeep
Model	Grand Cherokee Overland
Year	2015



Note:

Ball Weight will be taken into consideration in the Towing section. The Caravan Ball Weight will be added to the Load of the Tow Vehicle.



Calculated Load	
Current Load	225
Load Remaining	269

Start by entering the Manufacturers Weight Specifications for your specific make and model of vehicle. This information is available in the User Manual that was provided with your vehicle and is usually buried at the bottom of the glove compartment. The information can also generally be found on the internet.

The Base Weight (Full Tank Fuel) is effectively the Kerb weight of the vehicle but it would be beneficial to obtain an actual weight for your vehicle at a Certified Weighbridge as optional extras and accessories will impact on the actual weight. This value forms the basis of the calculations so needs to be correct.

Weights	Manufacturer	Calculated	Measured	
Base Weight (Full Tank Fuel)			2455	kg
GVM (Gross Vehicle Mass)	2949	2680	2680	kg
Maximum Towing Mass	3500			kg
Maximum Ball Weight	350			kg
GCM (Gross Combined mass)	6449			kg
Front Axle Load	NA			kg
Rear Axle Load	NA			kg
Load	494	225		kg

Any values that aren't specified can be left as blank. Important values are Base Weight (Full Tank Fuel), GVM, Maximum Towing Mass, Maximum Ball Weight and GCM. The Tare is the vehicle weight as completed at the factory with no fuel or additions unless they form part of the standard design. GVM is the maximum the vehicle can weight when loaded. The maximum Ball Weight is the weight that can be placed on the towbar. GCM is the maximum combined weight of the loaded vehicle and caravan. In certain situations one or more of these maximum weights can be exceeded while others remain within specification.

Next you need to enter any items of load that have or will be added to the vehicle. You can enter up to forty load items for your vehicle. For each item enter a meaningful description and weight (kg). As items are added the Current Load and Load Remaining values will be calculated as a guide.

It should be realised that anything added to the vehicle is considered part of the load. Here is a list of items as an example.

- Fuel
- Driver and all passengers including pets
- Accessories such as Bull Bar, Side Steps, Roof Rack, Tool Box, Tow Bar, Canopy, Awning
- WDH (Weight Distribution Hitch)
- Clear View or other type of Rear Vision Mirror
- Additional Battery
- Load in the Cabin
- Load in the Rear Tray if a Dual Cab

Note: The caravan Ball Weight only becomes part of the vehicle load once the caravan is connected so DO NOT add it to the vehicle load as it will be taken into consideration in the Towing section. You should be mindful that if your vehicle is loaded to maximum at this stage it most likely will not have the potential to legally tow a caravan.

In some vehicles the maximum Ball Weight and/or maximum GVM can be reduced in the Manufacturers Specifications under certain conditions and the owners need to be aware of all these conditions to ensure they satisfy all the legal requirements.

Calculated Load	
Current Load	324
Load Remaining	296

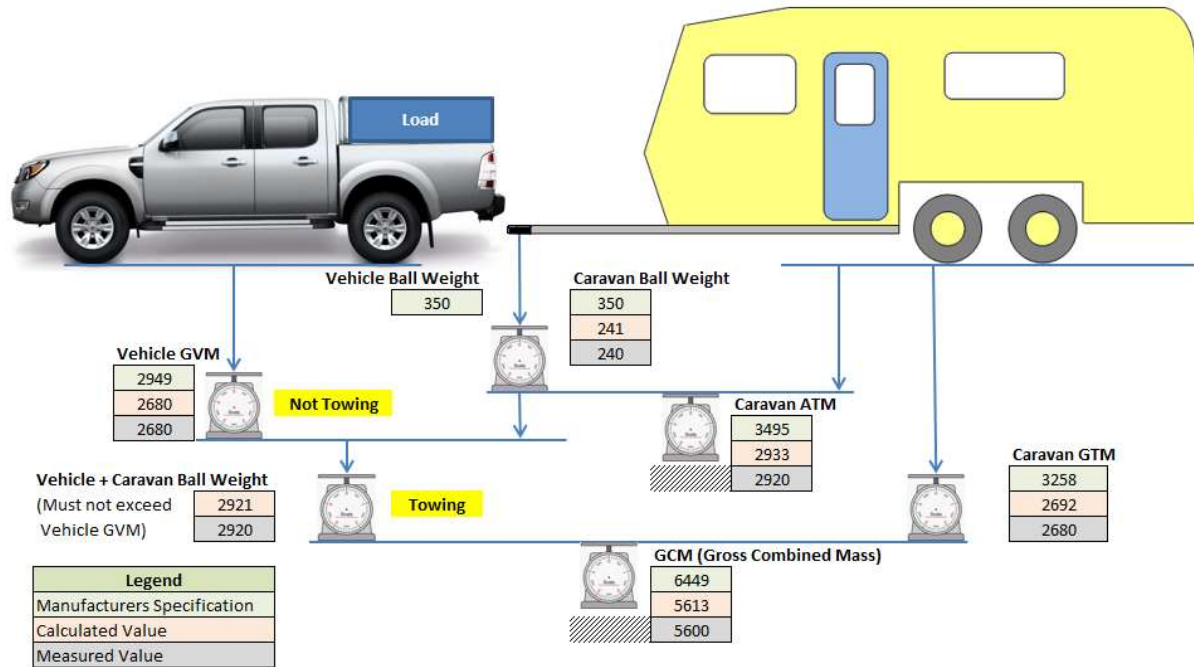
Item	Description	Weight (kg)
1	Fuel	93.50
2	Person 1	85.00
3	Person 2	100.00
4	WDH (Weight Distribution Hitch)	20.00
5	Towbar	15.00
6	Off Road Pack (Bash Plates)	10.00
7		
8		
9		

Towing

In this section we consider the combination of the caravan and tow vehicle as there are some weights specified when they are combined.

The various weights have been shown in a diagram to assist owners see the impact of the weights.

Towing



Vehicle	Manufacturer	Calculated	Measured	
Base Weight (Full Tank Fuel)			2455	kg
GVM (Gross Vehicle Mass)	2949	2680	2680	kg
Vehicle + Ball Weight		2921	2920	kg
Maximum Towing Mass	3500			kg
Ball Weight	350	241	240	kg
GCM (Gross Combined mass)	6449	5613	5600	kg
Front Axle Load	NA			kg
Rear Axle Load	NA			kg
Load	494	225		kg

Caravan	Manufacturer	Calculated	Measured	
Measured Tare Weight			2524	kg
Measured Ball Weight at Tare			237	kg
Ball Weight	350	241	240	kg
GTM	3258	2692	2680	kg
ATM	3495	2933	2920	kg

Most of the values in this section are linked to the values you have entered in the caravan and vehicle sections or have been calculated by the system. There is facility to enter values that have been measured with a scale or weighbridge for comparison.

Ball Weight Calculator

This is a separate calculator that can be used by owners to calculate the Caravan Ball Weight from weight measurements taken at locations such as the jockey wheel or just to the rear of the tow hitch assembly.

In the diagram below it can be seen that the distance from the Axle Centre to the Tow Hitch has been measured as 5.5 metres. The point that the Ball Weight was taken using a Ball Weight Scale was measured as being 0.48 metres (48 cm) to the rear of the Tow Hitch. So the distance of that point from the Axle Centre is $5.5 \text{ m} - 0.48 \text{ m} = 5.02 \text{ m}$. By multiplying the ratio of the two known distances with the measured weight the weight at the tow hitch can be calculated. $(5.02/5.5) \times 280 = 256 \text{ kg}$. This is just a simple calculator to save you having to remember how to complete the calculation.

Ball Weight

Calculating Tow Hitch Weight for a Weigh Point other than the Tow Hitch

This calculator works out the weight at the tow hitch from a weight measurement taken at some other point along the draw bar or at the jockey wheel. Measure and enter the distance from the weigh point to the axles, distance from the tow hitch to the axles and the weight measured at the weigh point.

