

# NEW TRUCK BUYING GUIDE

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**ISUZU**  
RELIABILITY IS EVERYTHING

# A Handy Guide to Buying New Isuzu Trucks

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# Chapter One - Introduction

Unlike buying a new car, buying a new truck is a more complicated process and requires a lot more background information and knowledge about the application and options available.

This guide has been created to help you learn more about the process while introducing the services available at your local Isuzu Dealer that make buying a new truck much easier.

Unless it is a model that is already fitted with a body (e.g. Isuzu's "ready to work" range), purchasing a new truck involves selecting a suitable capacity Cab Chassis\*, and then adding the appropriate body to suit your application. (\*includes cab, chassis, engine, transmission, driveline etc.) This could mean fitting a tray, van, curtain sider, tipper, garbage compactor, concrete agitator or other specialised body, and some applications may further require the fitment of additional equipment such as hydraulic rear loaders, cranes, refrigerator units, etc.



On the surface, the selection process may seem quite complex, but the solution is as easy as understanding a few of the basics, then armed with the information specific to your application, make a visit to your nearest Isuzu Dealer.

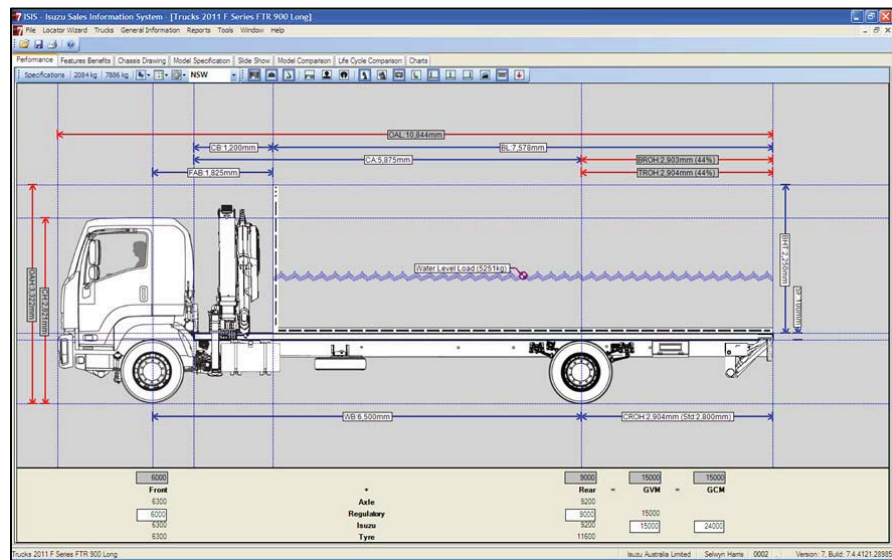
As an existing or potential truck operator, you will be familiar with the application or task you require your truck to perform, i.e. the type of load you need to carry, how far and over what type of roads you need to carry it.

This is vital information that will help your Isuzu Dealer to select, and then ultimately maintain, the right truck to meet your needs.

# The Isuzu Sales Information System (ISIS)

Isuzu Dealers are equipped with the computer based **Isuzu Sales Information System** (called ISIS for short). **ISIS** is a software program that has been designed to enable Isuzu dealers to select the most suitable truck for your application, based on the information you provide.

Once programmed with your information, ISIS can electronically simulate how the truck will perform in terms of its weight distribution, available power and other important performance characteristics.



Purchasing the wrong truck can be not only inconvenient but very costly. Therefore we recommend that you rely on your Isuzu Dealer and ISIS to assist you in your choice.

Additionally, all truck dimensions and mass placement when loaded must comply with the relevant statutory regulations and limitations. It is your responsibility to ensure that the truck you purchase meets these regulations and does not exceed the statutory limitations set down by the state or territory where the vehicle will operate.

In this book we have tried to set out simple explanations about how to select and maintain the right truck to meet your needs. It has been written as a guide only, and further information and advice should be obtained from your local Isuzu Truck Dealer.

## Chapter Two - Basic Principles

### What is a Tonne?

Before examining the truck selection process in more detail we should answer the question, "What is a Tonne"?

One "tonne" is the equivalent of 1000 kg in metric terms. A "3 tonner" is a truck that after a tray or van body has been fitted, will be able to carry approximately 3,000 kilograms or 3 tonnes of payload.

Strength is often related to size, and it is unrealistic to expect a chassis designed to carry a two tonne payload to carry a vastly greater payload without some degree of strain. Similarly, many related components will suffer if a truck is frequently overloaded.

Building, light, medium and heavy duty trucks isn't due to short sightedness on the part of a manufacturer, it is simply good sense. The lighter a truck can be built to carry a specific payload, the more economical it will be, and the better overall performance it will offer. This is why trucks are built in a variety of sizes and GVM ratings (Gross Vehicle Mass Rating – refer to Page 5).

A truck designed for a lighter payload, when laden to excess, will simply not take the stress. Tyres will be the first component affected, since these bear all the weight at the road surface.

Brakes will be the next component to suffer, since they convert the energy of a moving mass into heat in the process of bringing that mass to a halt. Clutches, transmissions, prop shafts and axles will suffer due to the stress of carrying and accelerating a load for which they are not designed.

**Overloading is dangerous.** This can affect not only to the operator, but other road users as well. A truck that is kept within its rated limits is safer, not likely to be overstressed, and should enjoy a long productive working life.

### **Under specifying could cost you more in the long run!**

Simply put, saving money by purchasing a truck that doesn't have the capacity to do the job could mean that you will be paying the price later through premature repair bills and the lost time associated with component overhauls.

So in choosing a suitable truck cab chassis for your application, the obvious starting point is to establish the minimum overall carrying capacity necessary to meet your total load requirements.

To do this you need to have some basic knowledge about a number of elements and understand some common industry terminology. Let's start with the Term **Gross Vehicle Mass**, commonly referred to as **GVM**.

## Manufacturer's GVM Rating Explained

Every new truck built is rated by the manufacturer to a specific GVM. The GVM is dependent on a number of factors such as axle and tyre capacity, chassis strength and so on.

The GVM rating is usually expressed in kilograms and is the maximum weight that the truck can carry, including its own weight, as measured where the tyres contact the road.

### Regulatory considerations

In most instances, particularly with light to medium duty rigid trucks, the manufacturer's GVM will be accepted by the various regulatory authorities as the maximum all up weight that the truck can present on the road. But in some cases however, loading to the manufacturer's GVM may exceed the regulatory limits.

**For example:** A manufacturer may give the truck a GVM rating of 16,500kg, but if the state regulations limit the front axle load to 6 tonnes and the rear axle load to 9 tonnes, the truck can only be loaded to a maximum regulatory GVM of 15,000kg. Also, in reaching that total load limit, neither the front or rear axle can be loaded beyond their individual regulatory limit.

**A truck should never be loaded above the maximum regulatory limits established by the relevant state transport authority.**

**A note on the term GVW:** GVM is the metric term we most commonly use today, but in countries that still employ imperial measures (i.e. the USA), the GVM is referred to as the Gross Vehicle Weight or GVW. Even though we have been metric for many decades, it is still possible to find some people and data sources associated with the transport industry in Australia that refer to a truck's "GVW". In simple terms, GVW and GVM mean the same thing, but it is most likely that the GVW rating will be in pounds (lb) or tons, instead of kilograms (kg) and tonnes, and to be meaningful the ratings must be converted to metric for Australian applications.

## How important is GVM in selecting the right truck?

To illustrate the importance of the trucks GVM, let's consider setting up a rigid truck chassis with a GVM of 8700kg, and look at the various weights and terminology that apply to our example.

### Kerb weight

The first element to consider in setting up our truck is the Kerb weight of the truck's cab chassis.

**The kerb weight** is the weight of the basic cab and chassis before any specific body has been added. It does however include an allowance for some fuel and lubricating oils, and may include the weight of a spare wheel and tyre.

Deducting the kerb weight of the cab chassis from the GVM will indicate what capacity is left to accommodate the weight of the driver, passengers, body, ancillary equipment, fuel and payload.

**To illustrate this principal**, let's say we have an application that requires a flat steel tray body truck, and the chassis we have chosen has a GVM of 8700kg with a "kerb weight" of 2685 kg.

Once we subtract the tare weight from the GVM, we are left with an overall load capacity of 6015 kg to cover the full payload requirements of the application, i.e. the combined weight of the tray body, payload, passengers and equipment.

8700 kg
- 2685 kg
= 6015 kg

### Adding the Body Type and Body Tare Weight

The design of the body to be added to the chassis will obviously depend on the type of work the truck is expected to perform.

This could be a flat tray body with no sides, enclosed van, curtain sider, refrigeration van, tipper, liquid tanker, or a specialised body like a cement mixer, crane truck, garbage compactor, etc.

But as we have chosen a flat steel tray body with no sides for our example, let's say that the tare weight of the body is 700 kg.

Once fitted to the chassis, the kerb weight of the truck will increase by the weight of the body.

2685 kg
+ 700 kg
= 3385 kg

This new figure of 3385 kg is referred to as the base "tare weight" of the truck and its body.

### **Additional Weight Factors**

Now to be effective, we must also allow for the other weights the truck will carry before taking on its load.

This includes the weight of the driver, passengers, tools, full tank of fuel and any auxiliary equipment. Let's allow 300 kg for these.

3385 kg
+ 300 kg
= 3685 kg

Adding this weight to the tare weight of the truck and its body means that the "all up weight" of the truck prior to adding a payload is now 3685 kg.

### **Available Payload Capacity**

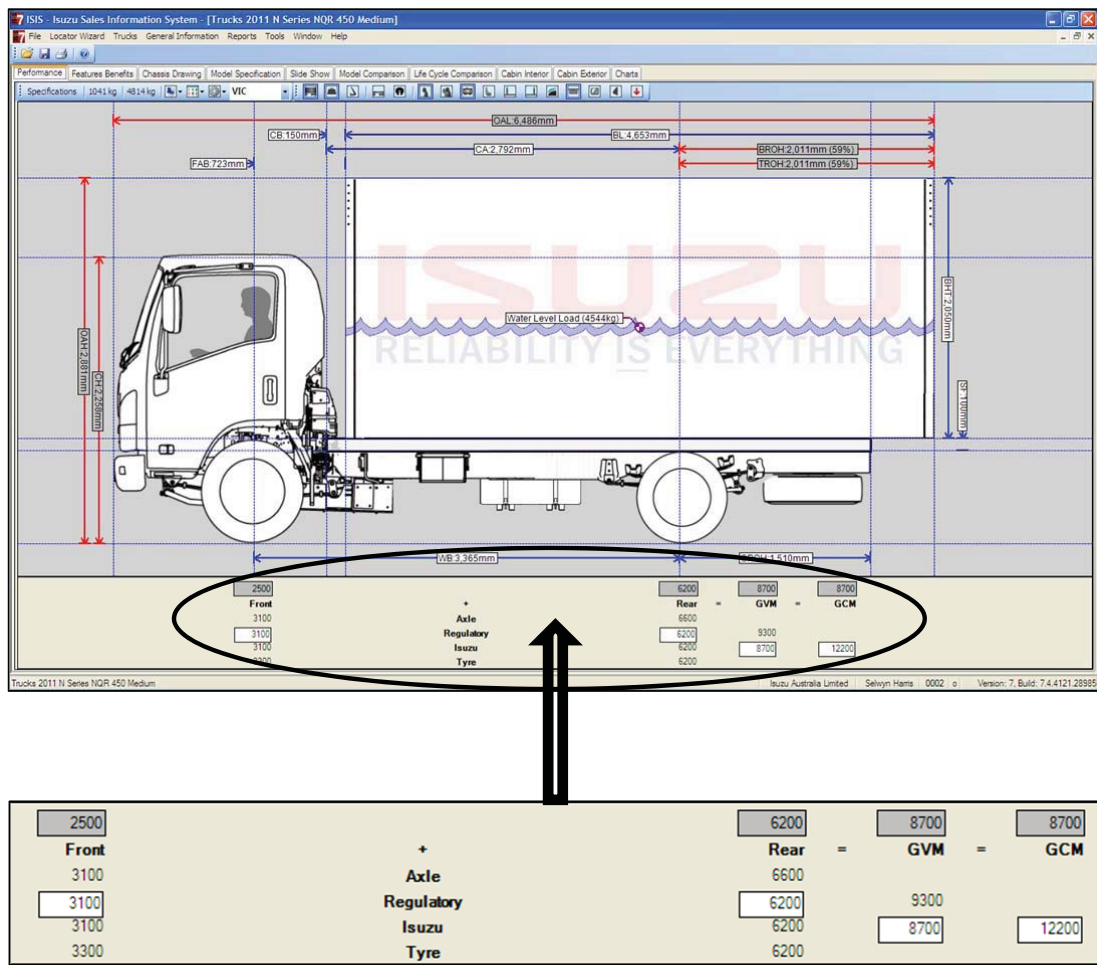
To determine the available payload capacity of the truck, we must now subtract the combined "all up weight" weight of 3685kg from the trucks GVM of 8700kg.

8700 kg
+ 3685 kg
= 5015 kg

This means we can carry up to 5015 kg on the truck without exceeding the manufacturer's GVM rating.

## Weight Distribution between Axles is important

In deciding which truck best suits your needs, your Isuzu dealer must consider not only the weight of the load you want to carry, and the type and weight of the body and its equipment, but also how that weight will be proportioned or distributed between the front and rear axles.



When these factors have been determined using the ISIS program, your Isuzu dealer will be able to recommend the right model truck to best suit your application.

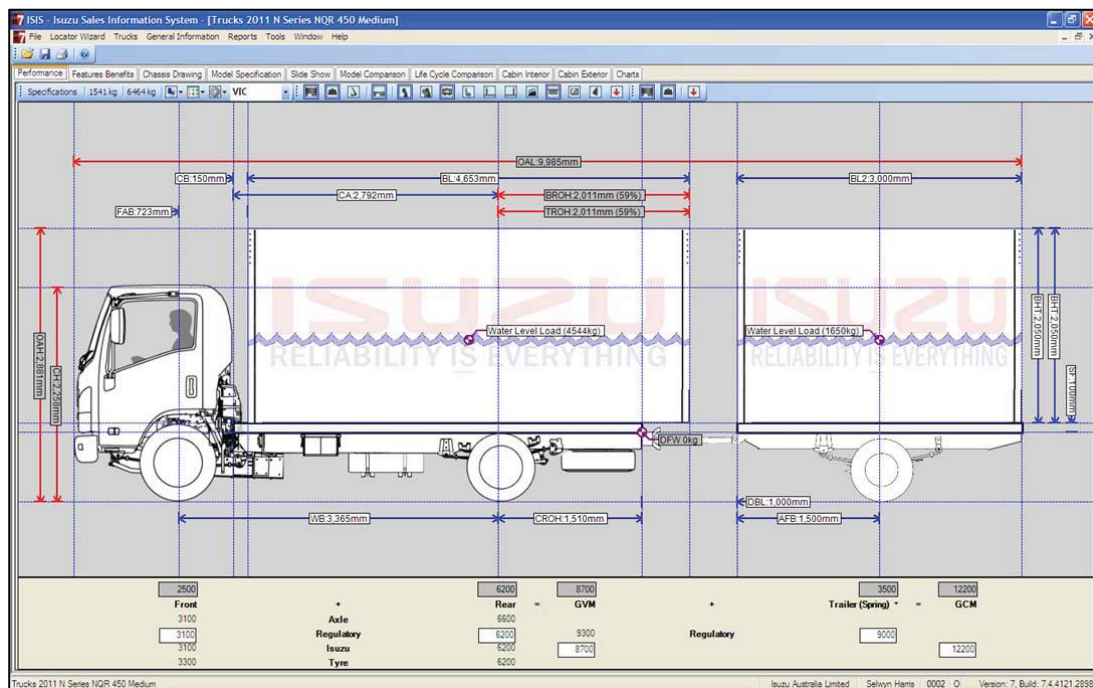
## Towing Mass considerations

The GVM is the total load the truck can carry on its own wheels, but in most cases the truck may also be capable of towing a trailer if required.

This brings us to another two ratings, (1) the Gross Towing Mass (GTM) and (2) the Gross Combination Mass (GCM).

### Gross Towing Mass Rating

Isuzu's policy for Light trucks towing trailers is to specify an all up Gross Towing Mass Rating for the trailer and its load, i.e. 3500kg.



This is the maximum all up weight of the trailer and its load that can be towed by the truck, and the subsequent weight it applies to the chassis through the towing hitch after coupling, should not allow the truck to exceed the manufacturer's GVM, axle load capacities or tyre ratings.

To effectively tow a trailer the truck must also be fitted with an ADR 62 compliant towing hitch, and all trailer and load combinations over 750kg total weight must be fitted with an ADR 38 compliant braking system.

In simple terms, an ADR 38 compliant braking system is one that automatically applies a braking force to the trailer when the truck brakes are applied. It usually employs an inertia applicator connected to either a mechanical, hydraulic or electric actuation system.

### **Trailer and load combinations of 2,000kg and above**

The law requires that the trailer and truck be fitted with a “**break-away**” type brake system, a system that automatically applies the brakes when the trailer is disconnected from the tow hitch. (As regulations can differ from state to state, always consult your state road authority for individual state towing regulations).

### **Gross Combination Mass**

For heavier GVM trucks, Isuzu provides a Gross Combination Mass Rating that cannot be exceeded by the total weight of the truck and its payload when added to the trailer weight and its payload.

This total weight of the truck, trailer and their loads together is the Gross Combination Mass and is commonly called GCM for short.

$$\text{GCM} = \text{Weight of truck} + \text{equipment} + \text{weight of trailer} + \text{payload}$$

The GCM on the ground should not exceed the manufacturer's GCM rating, and trucks cannot be loaded to exceed the truck's GVM or individual axle capacities, even if the total combination weight is lower than the rated GCM.

These principles apply to all truck and trailer combinations from single axle trailers for rigid trucks to Prime Mover, B Double and Road Train combinations.

In the main, the same principle of taking the Manufacturer's rating then subtracting the all up weight to equal the legal payload", applies for GCM applications as well as for GVM applications.

Your Local Isuzu Dealer is well qualified to recommend towing combinations to suit your specific application.

## Chapter Three - Statutory Regulations

Statutory regulations exist in each state, to regulate how much truck operators can carry, how they load it, and how safely they carry it on the road.

**Basically, statutory regulations cover the following:**

**Vehicle height** – i.e. Maximum Height is O.A.W.R.T (O.A.W.R.T = Overall Width across Rear Tyres) x 1.85 to a maximum of 4.3 metres, or 4.6 with a permit.

Vehicles that are too high can be unsafe on road systems which are designed to accommodate vehicles to certain heights.

Most bridges or tunnel structures have height markings, and serious fines are levied on operators who get it wrong.

**Vehicle widths** – i.e. Maximum width is O.A.W.R.T (O.A.W.R.T = Overall Width across Rear Tyres) + 300 to a maximum of 2.5 metres.

Apart from the stability issue associate with too wide a body, the safety of other road users must be taken into consideration, and vehicles operating outside this width must be classified as a “wide load” and the relevant state regulations followed accordingly.

**Vehicle Lengths** – Large trucks of excessive length have difficulty negotiating corners and can cause obstructions to other road users.

Rigid trucks are limited to a maximum length of 12 metres\* - Multi Combination, Single Trailer Prime Movers and Pocket B Doubles to 19 metres - Regular Bogie and Tri axle B Doubles to 25 metres, and some Prime Movers meeting the new 26 metre B Double Regulations can extend their overall length by one metre to 26 meters\*\*, provided all the relevant criteria are met.

\* Western Australia 12.5 meters \*\* Western Australia 27.5 meters.

**Vehicle mass** - Overloaded vehicles do not perform adequately in respect to safe handling and braking. Additionally, they cause damage to road and pavement surfaces, which are designed to specific load tolerances.

Additionally, statutory regulations cover: axle load mass limits for single and dual tyres; front and rear overhang limits; axle spacing; mass distribution; and so on.

The statutory regulations vary from state to state. Your ISUZU Dealer can advise you on meeting the various regulations that apply in your state.

## **Federal and State Authority Web sites**

The following Federal and State Authority Web sites may be helpful in providing further understanding of local details and national transport regulations:

**Australian Government:** [www.australia.gov.au/183](http://www.australia.gov.au/183)  
[www.dotars.gov.au/index.aspx](http://www.dotars.gov.au/index.aspx)

**VIC:** [www.vicroads.vic.gov.au](http://www.vicroads.vic.gov.au)

**TAS:** [www.transport.tas.gov.au/](http://www.transport.tas.gov.au/)

**ACT:** [www.rego.act.gov.au](http://www.rego.act.gov.au)

**NSW:** [www.rta.nsw.gov.au](http://www.rta.nsw.gov.au)

**QLD:** [www.transport.qld.gov.au](http://www.transport.qld.gov.au)

**SA:** [www.transport.sa.gov.au](http://www.transport.sa.gov.au)

**WA:** [www.mainroads.wa.gov.au](http://www.mainroads.wa.gov.au)

**NT:** [www.roadsafety.nt.gov.au](http://www.roadsafety.nt.gov.au)

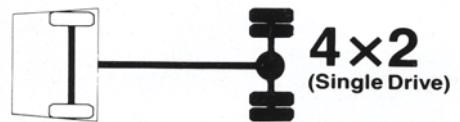
## Chapter Four - Axle Configurations

Trucks use various axle configurations that are usually referred to as 4 x 2's, 6 x 2's or whatever the axle configuration may be in each case.

The first figure refers to the number of wheels, or wheel pairs in the case of dual wheels, and the second figure refers to the number of driven wheels as opposed to simply load bearing wheels, as in the case of a 6x2 where only one set of rear wheels on the tandem are driven and the other set is merely load bearing.

### Single Steer Illustrations - driven axles show in black

A **4x2** is a truck with four wheels, two on the front steer axle and two on the rear driven axle. Note: Some rear axles have single wheels while others have dual wheels to increase the load bearing capability of the axle.



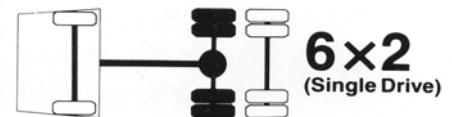
MOST COMMON RIGID TRUCK CONFIGURATION, WITH ONE DRIVEN REAR AXLE.

A **4x4** is a truck with a front load bearing steer axle that also has a drive line connected to the front axle through a front differential, so when engaged it drives through the front and rear axles.



TWIN AXLE VEHICLE WITH BOTH AXLES DRIVEN.

A **6x2**, is a truck that employs a load bearing front steer axle and two load bearing rear axles, but only one of the rear axles is "driven" by the drive train, the other rear axle simply "free wheels".



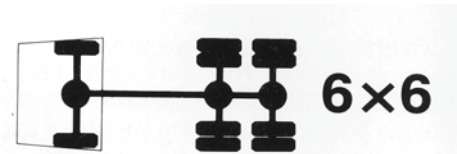
THREE AXLE VEHICLE, WITH ONE DRIVEN REAR AXLE.

A **6x4** is a truck with a front load bearing steer axle and a rear tandem axle where both wheel sets of the tandem are driven.



THREE AXLE VEHICLE, WITH TWO DRIVEN REAR AXLES.

A **6x6** describes a truck with a front load bearing steer axle that also has a driveline connected to the front axle and its differential. Both the tandem rear wheels are also driven.



THREE AXLE VEHICLE WITH DRIVE TO ALL AXLES.

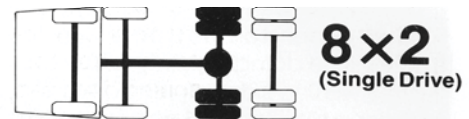
## Twin Steer Illustrations - driven axles show in black

A **6x2 twin steer** is a truck with two load bearing steerable front axles, and one driven single rear axle.



FOUR AXLE VEHICLE (FREQUENTLY WITH TWIN STEER FRONT AXLES), WITH ONE DRIVEN REAR AXLE.

An **8x2 twin steer** is a truck with two load bearing steerable front axles, and a tandem rear axle where only one rear axle is driven.



FOUR AXLE VEHICLE (FREQUENTLY WITH TWIN STEER FRONT AXLES), WITH ONE DRIVEN REAR AXLE.

An **8x4 twin steer** describes a truck with two load bearing steerable front axles, and a rear tandem axle where both wheel sets of the tandem are “driven” axles.

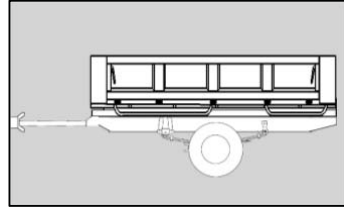


FOUR AXLE VEHICLE WITH TWO DRIVEN AXLES.

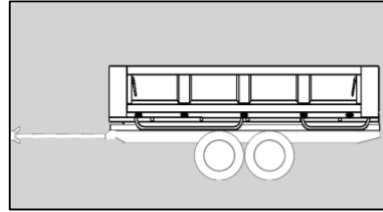
## Trailers for Rigid Trucks

### Pig Trailers – (Rigid Draw Bar)

Single axle (non steer)

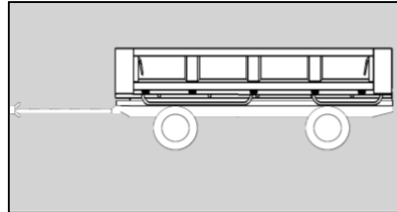


Twin axle (non steer)

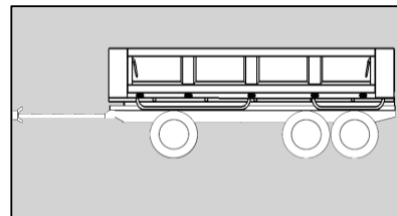


### Dog Trailers (Hinged Draw Bar)

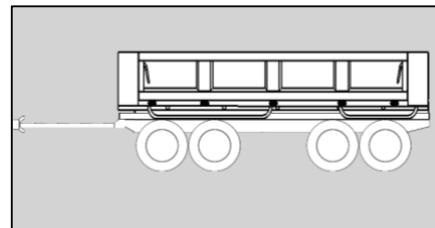
Single steer - single axle trailer



Single steer - bogie axle trailer

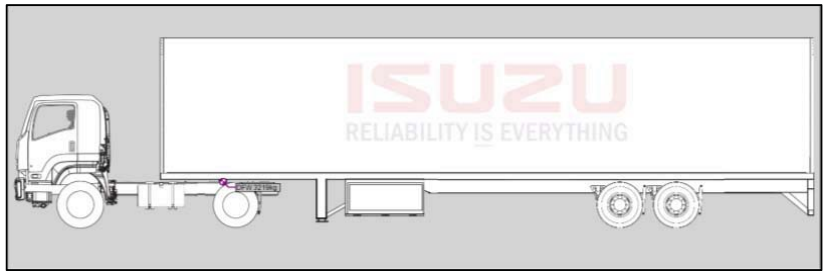


Bogie Steer - bogie Axle Trailer (Quad Dog)

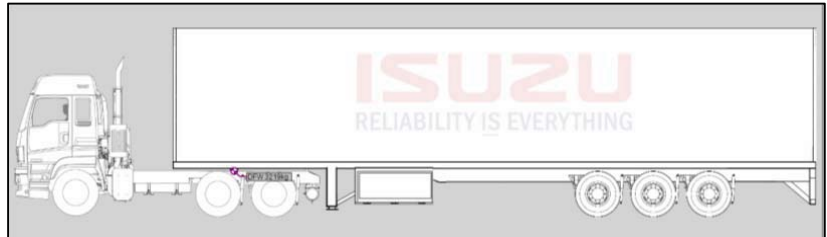


## Prime Movers & B Double Trailers

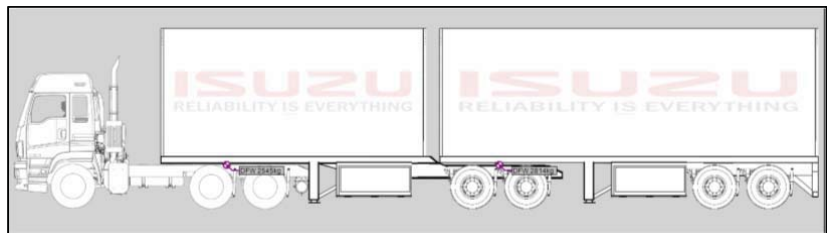
**4x2 Prime mover and  
Tandem Axle Trailer**



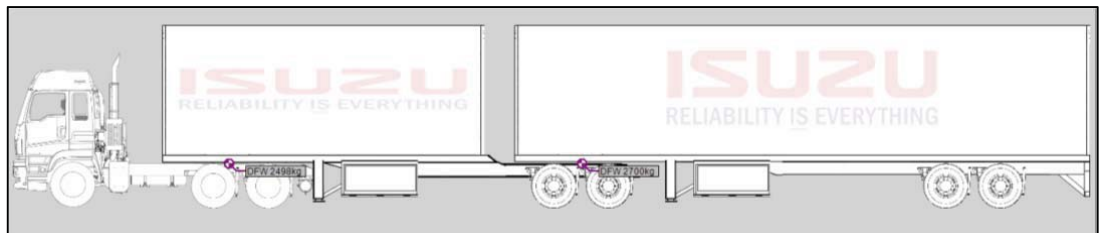
**6x4 Prime mover &  
Tri Axle Trailer Axle**



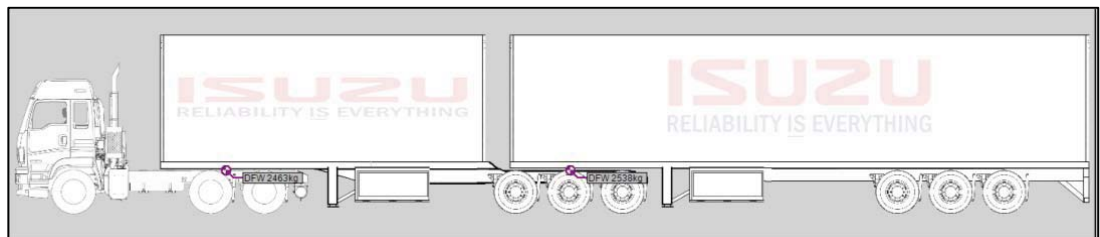
**6x4 Prime mover &  
19 meter B Double  
with Tandem Axle  
A & B Trailers**



**6x4 Prime mover & 25 metre B Double with Tandem Axle A & B Trailers**



**6x 4 Prime movers with 25 or 26 metre B Double & Tri Axle A & B Trailers**



# Chapter Five - The Conventional Approach to Selecting a Truck



Payload, GVM, tare, axle ratios? It all might sound confusing. But a logical approach to selecting the right truck is not difficult. The most important thing you must decide initially is "What specific task will the truck be used for?"

**Consider these three questions:**

1. **What is the type of material to be carried, and what is the mass (weight), volume and length of the load?**

This will determine the overall capacity and dimensional requirements of the truck as well as the configuration type, i.e. rigid, articulated or truck/trailer combination.

2. **What type of body is most suitable to carry the load?**

This will determine the type, approximate mass and dimensions of the body required to fit on to the chassis. i.e. Tray, Van, Curtain Sider, Tipper, Tanker etc.

3. **What are the normal requirements of the truck in respect to performance, e.g., desired highway top speeds, ability to climb out of quarries, etc?**

This will influence the choice of chassis in respect to engine capacity and performance.

## **Establishing the GVM requirements**

As previously mentioned, the first step in choosing the right truck is to locate the model that meets your requirements in respect to Gross Vehicle Mass (GVM) rating capacity.

Remember, the GVM is a figure established by the manufacturer to represent the total permissible mass of the vehicle on the road, including its body, payload, fuel and driver.

This figure is also lodged with the registration authorities and applies to all vocational applications. The GVM must be stamped on the compliance plate of every vehicle registered to operate within Australia and its territories.

## **Other Selection Considerations**

Once you have determined the GVM required, it is appropriate to give some consideration to the Performance, Gearing and Dimension requirements necessary to suit your application.

### **Performance**

Deciding on the performance requirements for your truck depends on a number of factors. Generally speaking, the greater the GVM capacity of the truck, the more powerful an engine is required to cope with the permissible load.

When you have decided on the correct GVM for your needs, you will have to consider a number of factors that will influence your engine power requirements.

### **Power Measurement**

Horsepower and Kilowatts are measurement standards that describe the amount of work that an engine can perform in terms of its power output, and they depend on complex mathematical formulae. Quoted as a maximum figure, they provide a useful guide for comparison with other models available from a particular manufacturer, as well as allowing comparison between similar vehicles from a variety of manufacturers.

In selecting an engine for your truck, however, maximum horsepower is not necessarily the only consideration.

## **Operating Considerations**

These are some of the main factors that must be considered when making your choice.

### **1. Travelling speed**

Where will your truck spend most of its operating life? Will you be travelling on the highway, along country roads, or mainly travelling in city traffic?

How much time will your truck spend driving partly laden or fully laden?

After assessing your real requirements, you may find it necessary to consider a truck of greater GVM in order to provide the necessary capacity and power to meet your needs.

### **2. Body size and accessories**

Beyond any weight considerations, the size of the body will have a direct bearing on the performance of your truck. The larger frontal area of a van body will offer more air resistance than a truck fitted with a tray body, and since air resistance increases with speed, maintaining top speed will require an engine capable of coping with the increased frontal area drag of the van body.

Accessories such as air conditioning, refrigeration and ancillary power take off, also reduce the engine power available at the back wheels.

## **Economy**

As a general rule of thumb, an engine with a larger power output will almost always consume more fuel than a smaller capacity engine, but this may not be the case if the smaller capacity engine is being challenged for example by difficult operating terrain and or a high frontal mass body, and forced to operate at higher RPM's and in lower gears in order to meet operating requirements.

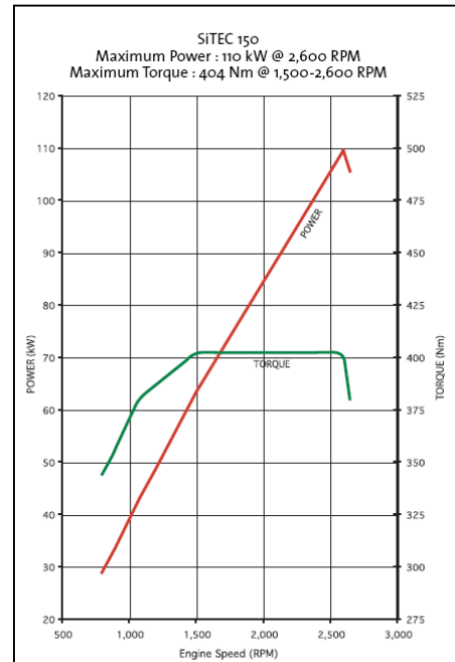
Ultimately, good economy benefits, (whether that be fuel, maintenance or operating costs), will be gained by carefully choosing the right engine for your needs, and balancing engine power with operating costs.

## Some Other Things You Will Need to Consider

### 1. Engine power (Horsepower) & Torque.

The efficiency or measure of work that an engine is capable of performing is usually expressed in kilowatts produced @ a specific engine RPM (Metric measurement) or Horsepower @ a specific engine RPM (imperial measurement), and is an indication of the power an engine is likely to provide.

**Torque** is basically the ability of the engine to perform work and is expressed in Newton Metres produced at a specific RPM. High engine torque, maintained over a wide part of the rev cycle (as per our example above), will provide a truck with better “hold on” ability when travelling up hills, and will usually require less gear changes than a truck engine with similar power but producing less torque.

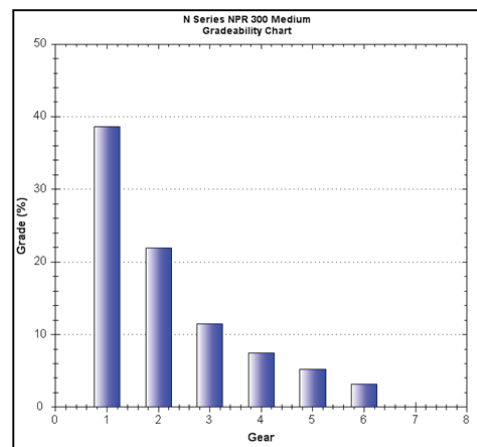


### 2. Gradeability.

Gradeability is the steepest grade that can be climbed by a truck at maximum torque and is usually expressed in terms of a gradient percent.

A gradient percent of 1% is a surface that rises 1 metre over a distance of 100 metres.

A 15% gradient is a surface that rises 15 metres in 100 metres. Maximum Gradeability is achieved at full throttle in first gear.

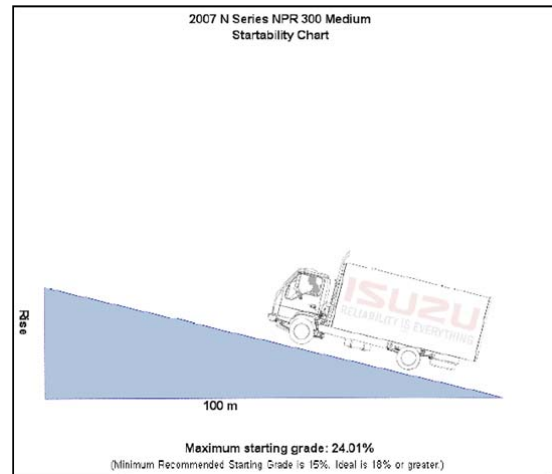


Isuzu dealers, by means of the ISIS program, can provide you with various performance indicators including a Gradeability chart for the truck cab chassis you are considering for your application.

### 3. Startability.

A Startability calculation is provided for all Isuzu trucks and indicates the steepest grade that can be negotiated by a truck from a standing start at GVM or GCM. It takes into consideration such factors as engine power, clutch type and engagement, and lowest gear ratios (combination of low gear transmission and differential ratios).

A **Startability Chart** is also available through ISIS, and performance is expressed in terms of a gradient percent.



Startability performance should always be taken into consideration when determining the suitability of a truck chassis' power train specifications for the application, as choosing a truck with Startability below the recommended minimum of 15% can lead to frustration, embarrassment, and higher maintenance costs.

### 4. Force (Power) required.

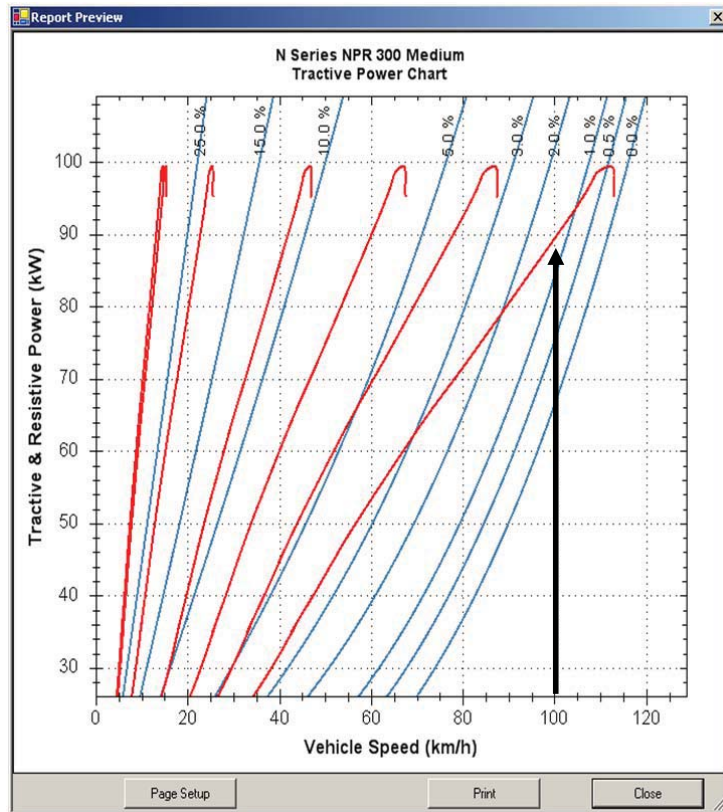
Even on a level surface, there are frictional forces and air resistance acting on a vehicle, and to maintain a given speed, a certain amount of engine power is consumed in overcoming these forces.

The term "Force required" describes how much power is needed to overcome these forces, as more force (power) is required to overcome the resistance of higher frontal areas, steeper grades etc.

It is important that the truck chosen has adequate power in reserve to handle the demands of both the application; conditions and terrain in which the truck will be operating in and under.

5. **ISIS** provides a **Tractive Power Chart** to represent the simulated performance of a particular truck based on specification, load and operating environment.

Performance in each gear is represented by a line that indicates the tractive power available at the rear wheels in each gear to overcome resistance (expressed in kilowatts), and gradient lines indicate the degree of rise that can be encountered before it is necessary to change gear.



This can be used in relation to predicting road speed, and from our example above, we can see that by tracing a line up from the 100 km/h mark, that the particular truck represented is quite capable of maintaining this speed in top gear (6<sup>th</sup> gear), without changing gear, up to a gradient rise of 1.5%.

If a gradient of 2% is encountered, the truck would slow down to a speed of 85 kilometres per hour while still remaining in 6<sup>th</sup> Gear. If the gradient were to increase to 3%, it would be necessary to change down to 5<sup>th</sup> gear in order to maintain a road speed of 85 kilometres per hour.

## 6. Gearing

Engine power, maximum revolutions, tyre size, and gear ratios all contribute to the top speed and acceleration that a truck is capable of providing.

Some Isuzu trucks offer a choice of transmissions or rear axle ratios within a specific GVM range and understanding the relationship of varying ratio's to the acceleration and top speed capabilities of the truck will be of benefit to you.

**Note:** The following information is provided as a guide only, and performance attributes should always be validated using the ISIS program.

### **Understanding Gear Ratios**

A rule to remember with gearing is that the lower the number, the higher the output ratio, it's probably the reverse of what you may initially think.

For example; even though the number is lower, a rear axle ratio of 4.750:1 is a higher ratio than a 6.142:1 rear axle ratio.

This means that for every one revolution of the input shaft of a rear axle, the output shaft will turn at just under one fifth of a revolution for the 4.750:1 rear axle ratio, and will require fewer engine revolutions to move the rear tyres a certain distance, as opposed to a ratio of 6.142:1 where the output shaft will turn at just over one sixth of a revolution, and will require more engine revolutions to travel the same distance.

At equivalent engine revolutions, this will mean a higher top speed for the 4.750:1 ratio than the 6.142:1 ratio.

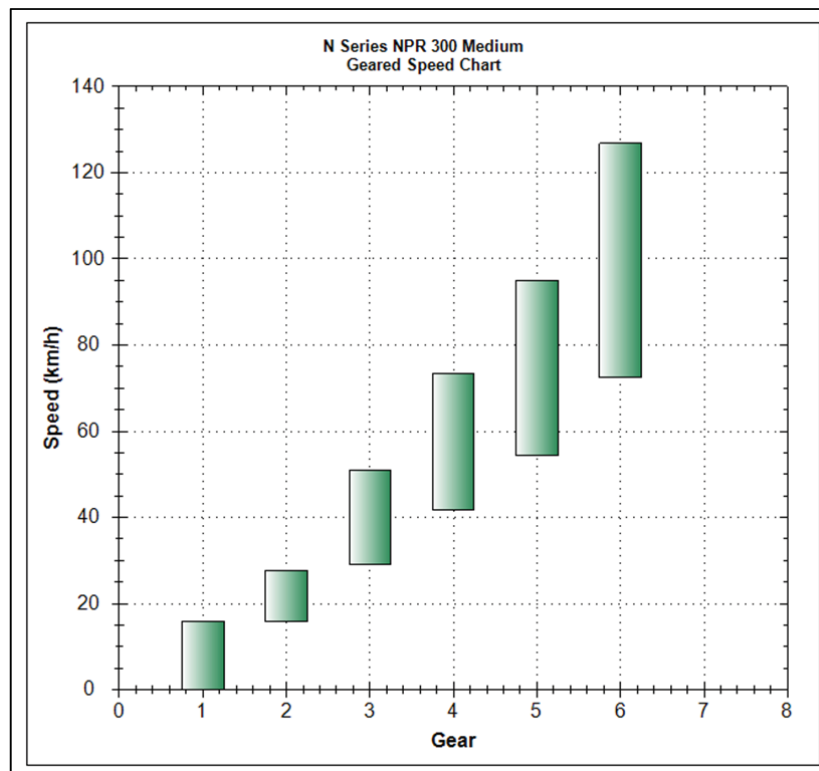
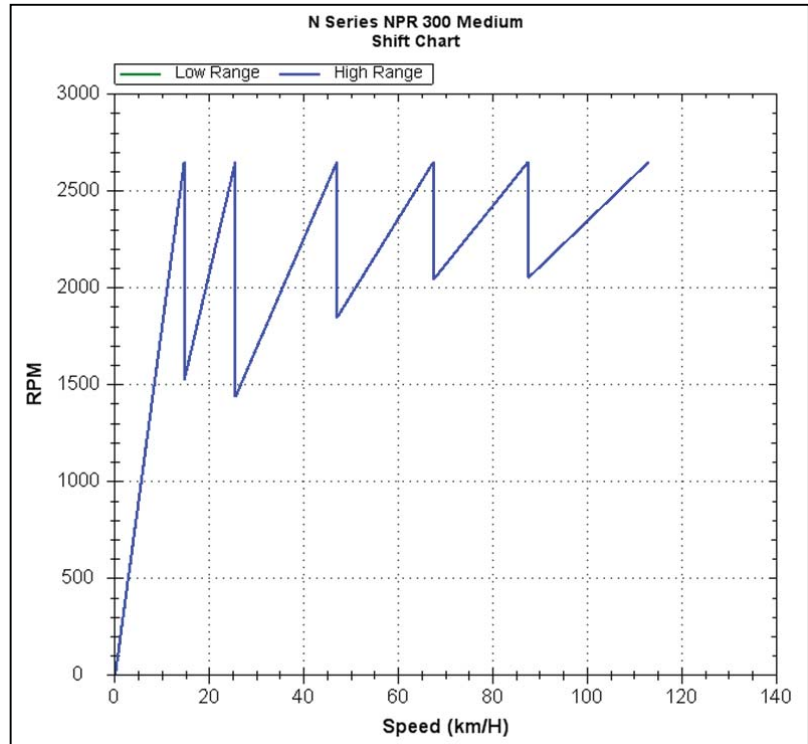
There is a performance versus application trade off to be considered in determining the right axle ratio, in that even though the lower ratio axle will provide less top speed, it may provide more acceleration, and will have a higher Gradeability and Startability capability.

Choosing the right balance between acceleration and top speed will depend on the trucks specific application.

A truck that is constantly travelling long distances on open highways will generally return better fuel economy when it is geared higher. The reason for that is that the engine is revving slower to maintain cruising speed.

On the other hand, a truck that is continually being started and stopped, sped up and slowed down in metropolitan applications, particularly with a full load, could perform better when geared with a lower ratio so that less stress is put on the engine and drivetrain components.

**ISIS** will assist your Isuzu dealer to suggest the right truck power and gearing specifications to suit your specific application, and they can provide you with performance **Shift Charts & Geared Speed Charts** to indicate engine rpm in specific gears at various road speeds.



## 7. Determining Top Speed by Manual Calculation

To determine top speed with a manual calculation, use the following formulae:

$$\frac{(0.37) \times \text{tyre radius (m)} \times \text{maximum engine revs}}{\text{top gear ratio} \times \text{final gear ratio}}$$

To see how that works, consider the following example:

Isuzu NPR 300 Medium

Tyre radius (205/75R 17.5) = 0.380 metre.

Maximum engine revs (SiTEC 150 engine) = 2600 rpm

Top gear ratio (6<sup>th</sup> gear) = 0.756

Final gear (rear axle) ratio = 4.100:1

0.37 is constant for all vehicles.

$$\text{Top speed is therefore: } \frac{0.37 \times 0.380 \times 2600}{.744 \times 4.1} = 119.84 \text{ km/hr}$$

This calculation gives a theoretical top speed of 119 km/hr, but in practice, top speed will be slightly lower than this, due to air resistance and friction.

### ISIS Loaded Speed Indicator

**ISIS** takes into consideration the load, some frictional losses, and frontal area resistance.

Therefore for the NPR 300 Medium, ISIS indicates a

#### **Geared Speed of**

approximately 117.7 km/hr at Peak Power with a full GVM of 6,500 kg. (This speed indication guide can easily be provided by an Isuzu dealer with only a few clicks of a computer mouse.)

N Series NPR 300 Medium Loaded Speed Chart	
Loaded Speed at 6,500kg GCM	
	Loaded Speed at Peak Power
Grade (%):	0.0%
Gear:	6
Axle Ratio:	4.10
RPM:	2,600
Top Speed:	117.7km/h

## 8. Dimensions vary with the GVM & Watch the Overhang

In most GVM groups you will find that trucks are offered in a wide range of wheelbases in order to provide a selection of suitable chassis lengths to match a buyer's body and carrying application needs.

Today's trend toward "cab-over" bodies (and less on bonneted trucks) means better load sharing between front and rear axles and shorter overall length.

A shorter overall truck length also means a better turning circle and greater manoeuvrability, particularly in tight urban distribution applications.

In many applications, higher GVM trucks require bigger body lengths but consideration must be given to the Body overhang.

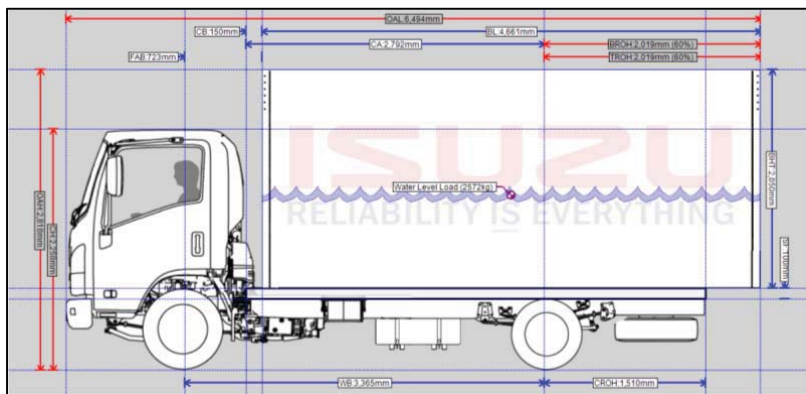
The law in most states allows for a truck to be fitted with a maximum body overhang dimension that is measured from the centre of the rear axle or axle group to the rear most extremity of the body.

That figure must not exceed 60% of the vehicle's wheelbase or 3.7 metres

whichever occurs first,

and the truck must be configured in accordance with VSB 6 considerations i.e.

Front and rear axle weights are not exceeded when the truck is loaded to its regulatory GVM rating. (See P 28 for more details).



## **Chapter Six - VSB 6 (Vehicle Standards Bulletin 6)**

The Australian Department of Transport and Regional Services insists that truck and body manufacturer's act responsibly when configuring a truck to operate on Australian Roads, and most state regulatory authorities have legislated to adopt VSB 6 as the standard for Heavy Vehicle modification practices.

Section J of this National Code of Practice covers the mounting of truck bodies to a chassis and in simple terms implies that when a truck is configured, it should be designed in such a manner that when the load is distributed evenly over the surface of the body (commonly called a water level load), and the truck is loaded to GVM, that neither the tyre or axle capacities or state axle limits be exceeded.

Obviously there will be situations and special vehicles that require positional loads and the principles of water level loading may not apply. However the vehicle must still be configured to consider tyre and axle configurations and a weight distribution analysis produced accordingly.

For a copy of the VSB 6 Bulletins go to:

[www.dotars.gov.au/roads/safety/bulletin/vsb\\_06.aspx](http://www.dotars.gov.au/roads/safety/bulletin/vsb_06.aspx)

### **Chain of Responsibility Considerations**

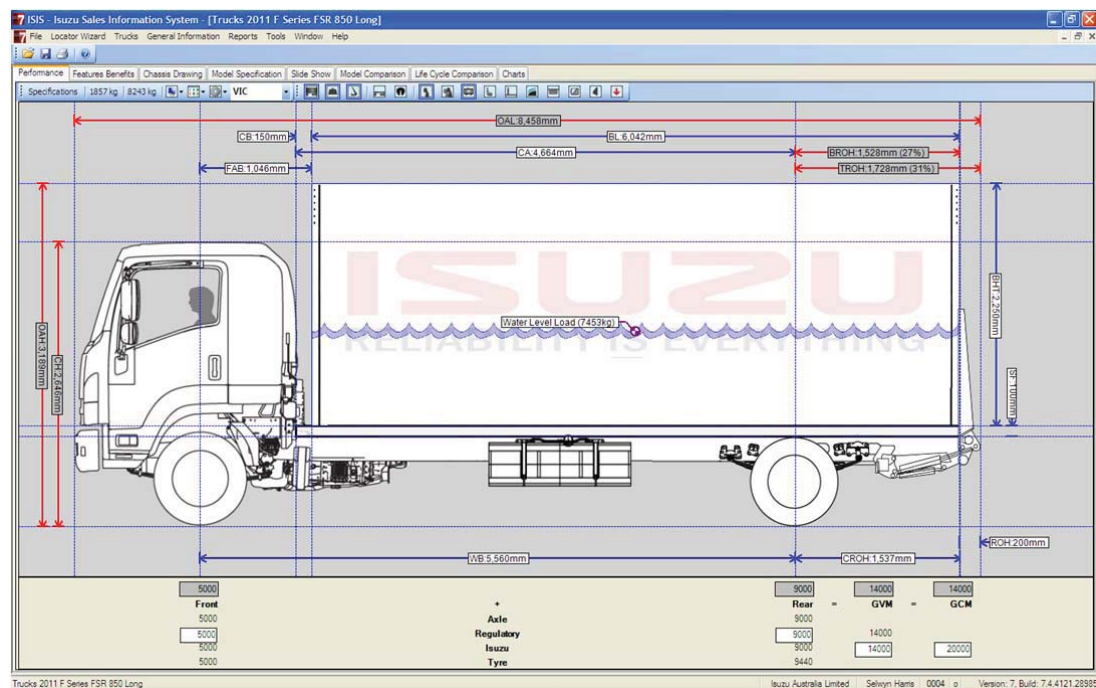
Applied correctly, these principles will insure that trucks have the ability to be loaded in a responsible manner and will assist all truck owners and operators to meet their responsibility under the National Transport Commissions "Chain of Responsibility" Laws that now apply to all transport operators in Australia.

For a copy of the "Chain of Responsibility" Bulletins go to:

<http://ntc.gov.au/DocView.aspx?page=A02209508300530020>

## ISIS provides Weight Distribution and Dimensional Solutions

ISIS is designed to provide VSB 6 solutions by default for all applications, and ensures that vocational solutions provided by an Isuzu Dealer will assist customers in meeting their “Chain of Responsibility” obligations.



Adaptable and intuitive, the ISIS solver utility will suggest the right wheel base to body length ratios to meet tyre, axle and regulatory limits for specific body applications.

ISIS provides the Isuzu Dealer and their customers with the ability to choose the right dimensional combinations to suit customer applications and eliminate any nasty surprises when it comes to loading the truck for the first time.

The screenshot shows the ISIS Specifications dialog box, specifically the Solver tab. The dialog box contains the following sections:

- Solver:** A list of options including Unit, Drive Line, Chassis, Body, and Environment.
- Weights:**
  - Payload: 7453 (kg)
  - Buttons: Current Configuration, Calculate to GVWR
- Dimensions:**
  - Maintain: (empty field)
  - Solve for: (empty field)
  - Wheelbase: 5560 (mm)
  - Body Length: 6042 (mm)
  - Cab to Body: 150 (mm)
  - Buttons: Body Length, CB + Body Length, Wheelbase
- Buttons:** OK, Cancel

# Chapter Seven - Guide to Body Dimensions

Isuzu Australia publishes detailed dimensional information to allow customers to determine the dimensional suitability of a particular chassis to their application.

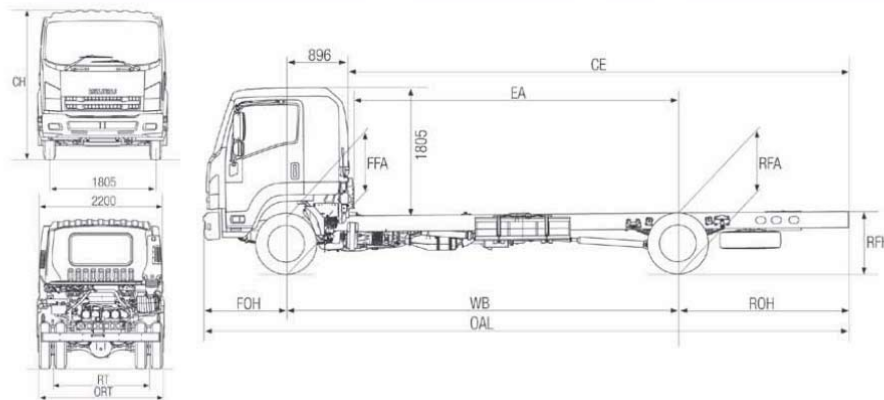
Below is a typical sample of the detailed information available from your Isuzu Dealer or Isuzu Australia's Website ([www.isuzu.com.au](http://www.isuzu.com.au)). In this instance the model is an Isuzu NPR 250/300:

WEIGHTS (kg)							
Models	Ratings*		Loading Limit* (at ground)		Cab Chassis Mass #		
	GVM	GCM	Front	Rear	Front	Rear	Total
FSR 700 / 850 Auto	12,000**/ 14,000**	15,000**	5,000	9,000	2,370	1,405	3,775
FSR 700 / 850 Long	12,000 / 14,000	18,000 / 20,000	5,000	9,000	2,450	1,450	3,900
FSR 700 / 850 Long Premium	12,000 / 14,000	18,000 / 20,000	5,000	9,000	2,485	1,455	3,920
FSR 700 / 850 X-Long Premium	12,000 / 14,000	18,000 / 20,000	5,000	9,000	2,540	1,530	4,070
FSD 700 / 850 Long	12,000 / 14,000	18,000 / 20,000	5,000	9,000	2,455	1,510	3,965
FSD 700 / 850 Long Premium	12,000 / 14,000	18,000 / 20,000	5,000	9,000	2,495	1,530	4,025

\* Vehicle ratings and front/rear weight limits are subject to government regulatory requirements and weight distribution analysis. Consult your Isuzu dealer to select the correct vehicle for your specific application.

\*\* Street sweeper only. Refuse application GVM and GCM limited to 11,000 kg. # Cab chassis only as supplied and including 10 litres of fuel.

DIMENSIONS (mm)													Turn Circle (m)
Models	WB	OAL	FOH	ROH	EA	CE	RT	ORT	CH	FFA (unladen)	RFA (unladen)	RFH (unladen)	KERB TO KERB
FSR 700 / 850 Auto	3,790	6,555	1,170	1,595	2,770	4,490	1,660	2,215	2,665	745	885	940	13.6
FSR 700 / 850 Long	5,560	9,155	1,170	2,425	4,575	7,090	1,660	2,215	2,665	745	885	940	19.9
FSR 700 / 850 X-Long	6,560	10,705	1,170	2,975	5,575	8,640	1,660	2,215	2,665	750	880	935	23.5
FSD 700 / 850 Long	5,560	9,155	1,170	2,425	4,575	7,090	1,660	2,215	2,590	745	790	790	19.9



The following is an explanation of what the dimensional terms mean:

## Ratings:

GVM – Gross Vehicle Mass

GCM – Gross Combination Mass

## Tare Mass:

Total – Total mass weight of chassis measured across all wheels

Front – Front mass weight of chassis measured at front wheels

Rear – Rear mass weight of chassis measured at rear wheels

### Dimensions:

WB – **Wheel Base** in mm

OAL – **Over All Length** in mm

FOH – **Front Over Hang** in mm

ROH – **Rear Over Hang** in mm

EA – **Exhaust to Rear Axle** in mm

CE – **Cab to End of Frame** in mm

RT – **Rear Track** in mm

ORT – **Outside Rear Track** in mm

CH – **Cab Height** in mm

CW – **Cab Width** in mm

FFH – **Front Frame Height** in mm

RFH – **Rear Frame Height** in mm

### Turning Circle

Kerb to Kerb – The minimum turning diameter of the wheels in metres

## A Quick Formula for Determining Maximum Body Length from a Known Wheelbase

### Using the Isuzu Specification Sheet

EA (Exhaust to rear axle distance) + 60% of WB

### Or if Exhaust to Rear Axle Dimension is not known:

CA (cab to rear axle distance) – CB (Clearance between the cab and the body front to clear upright exhaust) + 60% of WB.

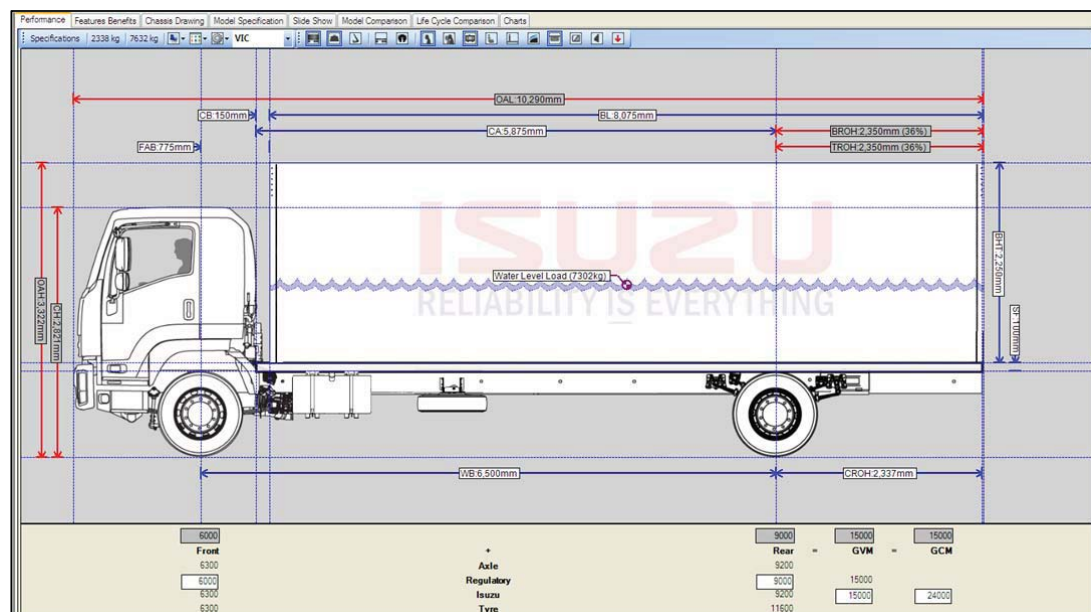
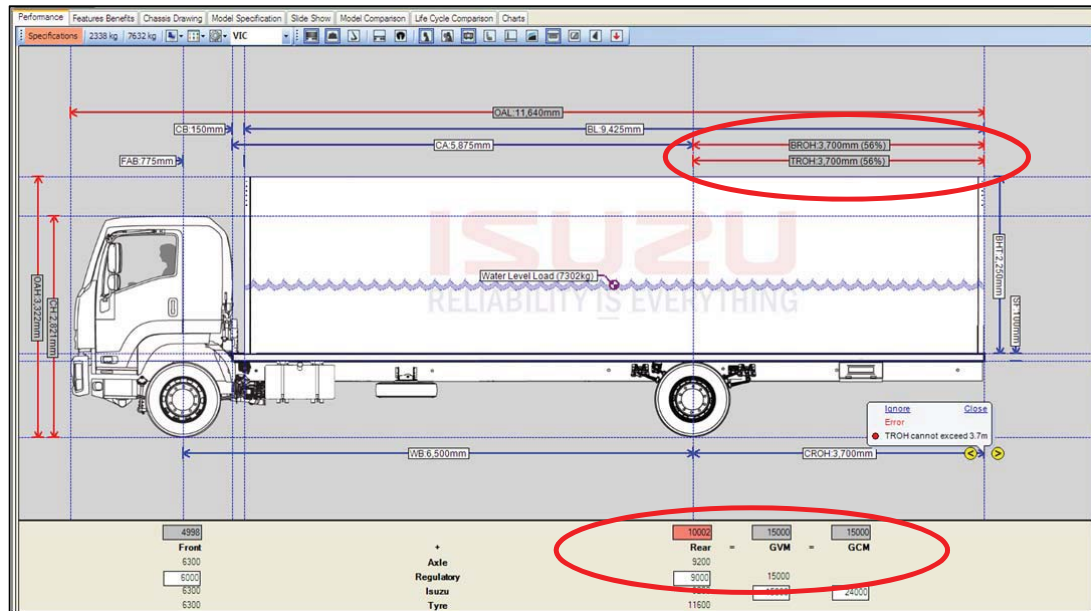
Clearance between cab and body is necessary to allow the body and cab to flex without contacting each other, as well as allowing room for the air intake and exhaust stacks, and any other mechanical components that may be fitted between the cab and the body.

### A Note on Rear Body Overhang

The figure of 60% of the Wheelbase is the maximum allowable overhang of the rear body allowed by state regulatory authorities, provided that this measurement does not exceed a maximum dimension of 3.7 metres.

Note: It must be remembered that these allowances are the maximum allowable, but it may not be possible to achieve a suitable weight distribution outcome on some trucks. A weight distribution analysis should always be utilised because with higher GVM trucks, and high mass loads. It is possible to overload the rear axle before the 60% of wheelbase or 3.7 Metres Overhang is reached.

The first illustration below shows a truck body with an overhang that meets the regulatory dimensional requirements, but when loaded according to VSB 6 guidelines as required by most state regulatory authorities, (i.e. loaded to water level simulation), results in a rear axle that is over loaded by over one tonne.



Isuzu Dealers can supply an ISIS weight distribution analysis for your particular application, enabling you, with careful attention to loading practices, to meet all state regulatory requirements and considerations for both dimensions and mass, as illustrated in the example directly above.

# Chapter Eight – Practical Examples

Let's look at some Practical Examples of how to best determine, select and set up the most suitable truck for a specific purpose

## Example 1

### Application & Material to be carried: General Delivery - Pallets

The dry freight shipping pallets to be carried weigh around 700kg each, and the carrying capacity required is 10 pallets, making a payload requirement of 7000kg.

### Type of body:

A Van or Curtain Side Body is preferable, as the pallets must be protected from wind and rain.

### The first step is calculating the Load requirement

Before selecting a chassis from the ISUZU range with the right available payload capacity for the application, we must first establish the total payload requirements by adding together the following:

- |    |                       |   |
|----|-----------------------|---|
| 1. | Payload to be carried | 7000 kg Minimum payload                       |
| 2. | Weight of body        | + 2000 kg (Approx mass of 10 pallet Van Body) |
| 3. | Contingency           | + 250 kg Allowance for fuel, passengers etc.  |

**Total Payload Required = 9250 kg**

### Next - Establish the Truck's Available Load Capacity

To establish the available load capacity of the chassis it is simply a matter of deducting the tare mass (or kerb weight) 'of the cab/chassis from the trucks GVM (Gross Vehicle Mass). Let's consider the following three examples:

#### A. Cab/Chassis - Isuzu 2011 FSR 700 Long

GVM	12000 kg
Tare Mass	– 3900 kg
Available load capacity	= 8100 kg

Result: This model doesn't have the load capacity for the task.

### **B. Cab/Chassis - Isuzu 2011 FSR 850 Long**

GVM 14000 kg  
Tare Mass – 3900 kg  
Available load capacity = 10100 kg

Result: This model has sufficient capacity for the task and more to spare.

### **C. Cab/Chassis - Isuzu 2011 FVR 1000 Long**

GVM 16500kg\*  
\* Regulatory 15500 kg  
Tare Mass - 5715 kg  
Available load capacity = 9785 kg

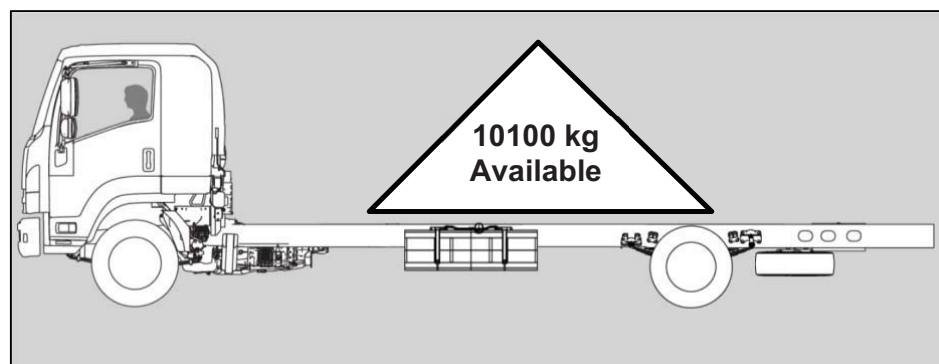
**Note:** This model is more heavily specified in driveline and axle capacities to handle heavy duty applications, hence the higher tare weight and GVM of the truck, and in this application could be considered “over specified for the task”.

\* Even though the FVR 1000 has a manufacturer’s GVM of 16500 kg, the Maximum axle loads permitted by the regulatory authorities for this class of vehicle are, 6500 kg for the front axle, and 9000kg for the rear axle, giving a total permissible capacity of 15500 kg GVM. Therefore in determining the available load capacity, it is the regulatory axle and GVM limits that must be taken into consideration. Please consult your Isuzu Dealer for further information.

When considering our all up available payload requirement for the application of 9250 kg, we can see that example B, the FSR 850 Long with its load capacity of

10100 kg, will give us more than the target capacity required, without

being too over specified for the task.



# The ISIS Solution to Example One

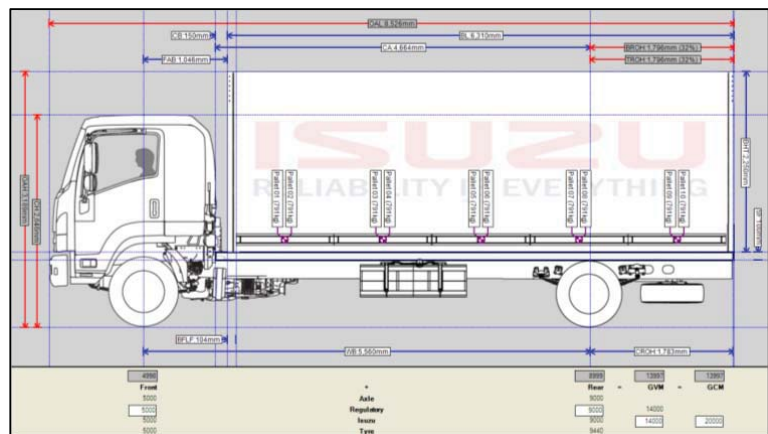
ISIS makes easy work of selecting the right truck for the application.

The Isuzu Dealer simply opens the **ISIS Suggested Model Wizard**, types in the type of body and the range of the payload to be carried, and the program offers a selection of Isuzu Models that meet the requested criteria. Customers then have the option of choosing a model that meets their particular power requirements.

Year	Series	Sub-Series	Model	Payload	Wheelbase	GVM	GCM
2011	F Series	FSR	850 Long	8153	5560	14000	20000
2011	F Series	FSR	850 Long Premium	8133	5560	14000	20000
2011	F Series	FSR	850 X-Long Prem...	8133	6560	14000	20000
2011	F Series	FSD	850 Long	8081	5560	14000	20000
2011	F Series	FSD	850 Long Premium	8062	5560	14000	20000
2011	F Series	FVR	1000 Long	8379	6500	16500	32000
2011	F Series	PVD	1000 Long	8430	6500	16500	32000
2011	FX Series	GXD	Prime Mover	8135	3480	16500	38000

Selecting the FSR 850 with its SiTEC Series III 235 engine, the Dealer can then choose the pallet weight option and ISIS will provide a weight distribution and performance analysis with a pallet load.

We can see that with the weight of the driver, a full load of fuel, a spare tyre, some tools and the Van body taken into consideration, ISIS indicates that the truck in question has a payload capacity of 10 pallets up to 790 kg, surpassing our original target of 700 kg. Also, ISIS has ensured that we are dimensionally correct, providing the right body length and overhang to match the application requirement.



## Example 2

### Application & Material to be carried: Transporting Landscaping Supplies – Sand, Gravel, Crushed Rock, Soil, Bark & Mulch

Sand and soil are normally carried using a tipping body, and for this application, approximately 3.5 cubic metres is a commonly sought capacity. On some occasions the truck may have to carry gravel or crushed rock, and these commodities weigh approximately 1200 to 1500 kg per cubic metre. That means that the upper payload target is around 5,250 kg.

(**Note:** Wet Sand and Gravel can weigh up to 500 kg per cubic metre more than dry i.e. 1700 to 2000kg per cubic metre, so payload volume will need to be reduced if wet material is to be carried in the same truck, or if wet material is the normal load, a larger capacity truck must be specified for the application).

#### Type of body:

The operator is required to dump various portions of the load at different locations, and therefore a tipping body is essential. Because gravel and rock can be quite abrasive, a steel tipping body is often preferred.

### Normal Operating Requirements

The normal operation of the truck dictates that it has the ability to pull out of a quarry fully loaded, keep up with traffic during its rounds, and return to the depot empty from the final drop-off point. As the truck is normally running all day, fuel efficiency also becomes a very important consideration.

From this information we can establish the total payload requirements for this particular application by adding together the following:

- |    |                       |  |
|----|-----------------------|--|
| 1. | Payload to be carried | 5250 kg (Maximum load)                         |
| 2. | Weight of body        | + 1600 kg (Approx mass of tipper & hydraulics) |
| 3. | Contingency           | + 250 kg (Allowance for fuel, passengers etc.) |

**Total Payload Required                      = 7100 kg**

In finding a chassis to fit this application a review of the Isuzu Product Range reveals the FRR 500 Factory Tipper with a capacity of 3.8 Cubic metres and an available payload of approximately 5600kg proves to be an ideal match and factory ready for the application.

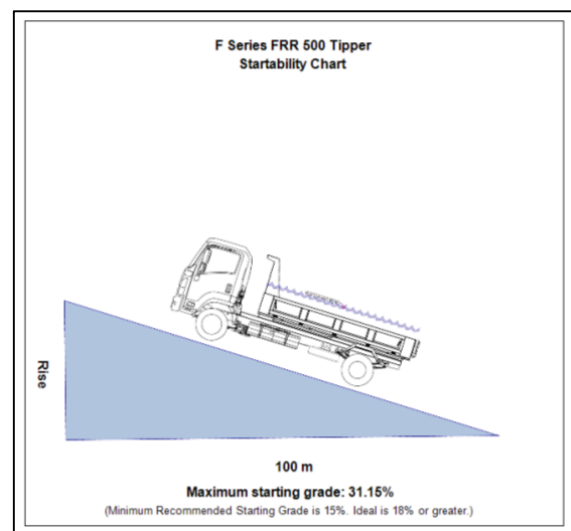
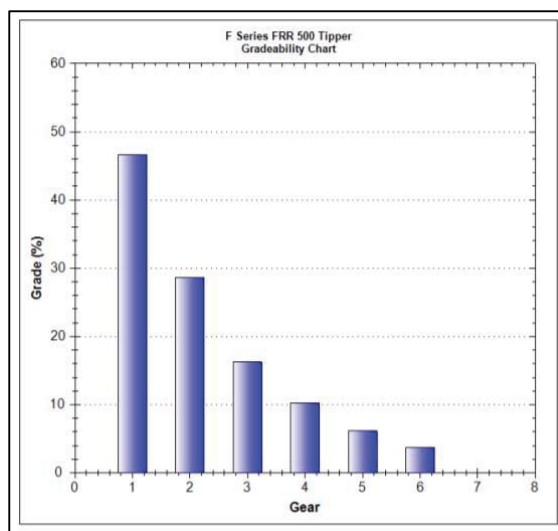
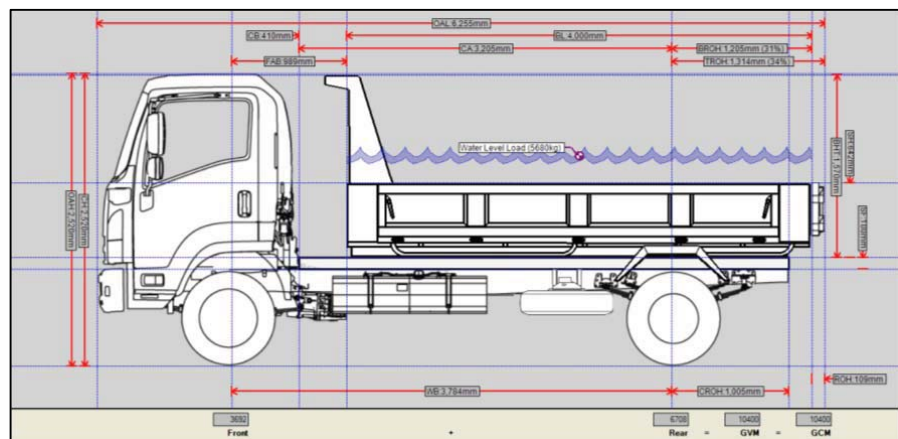
The major benefit of choosing this particular truck is that it is purpose built for the application, and comes directly from IAL's "Ready to Work" range with no waiting period for body manufacture and installation.

**The ISIS Tipper Solution,** we notice that the FRR 500 Tipper, with all load criteria taken

into consideration, exceeds our payload target of 5250 kg.

A further examination of its performance

details confirm that it has the power and gearing to deliver more than ample Gradeability and Startability to pull out of a quarry when fully loaded to its GVM.

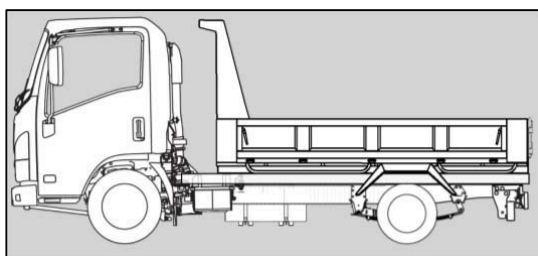
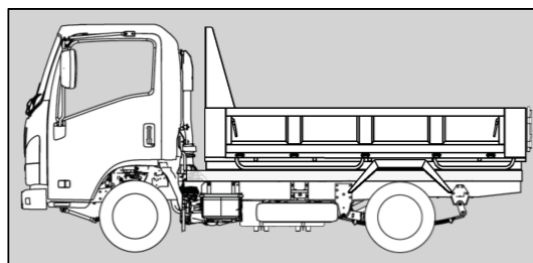


## Wide Range of “Ready to Work” and Specialist Tipper

From Light Duty tipping and landscaping applications, to Heavy Duty applications of up to 50 tonnes GCM, Your local Isuzu Dealer can supply the right truck for your specific tipping application.

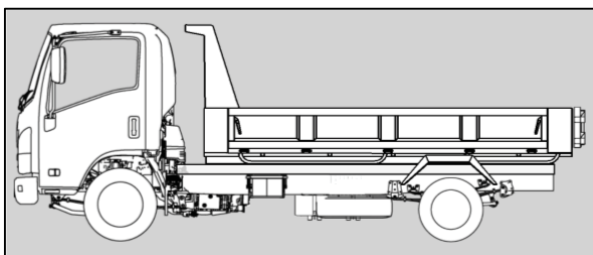
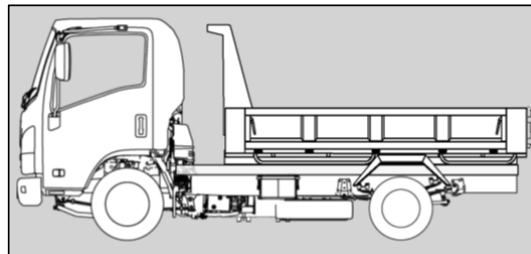
### Isuzu Ready to Work Tipper Models

NLR 200/275 “Ready to Work” Tipper  
Cubic volume: 2.0 m<sup>3</sup>  
Payload approx: 1.5 & 2.5 tonnes with only the driver in the truck



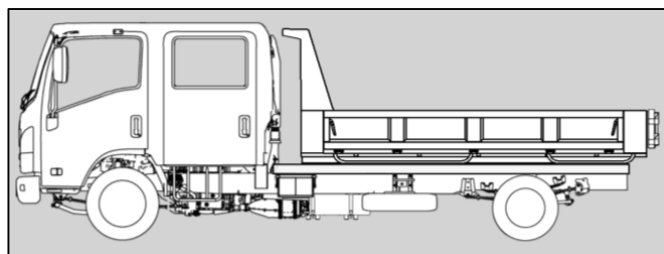
NLS 200 AWD “Ready to Work”  
Tipper  
Cubic volume: 2.0 m<sup>3</sup>  
Payload approx: 1.4 tonnes with only the driver in the truck

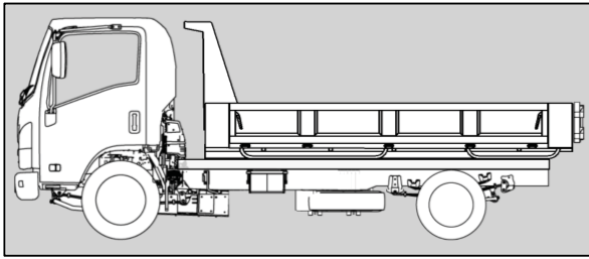
NPR 200/275 “Ready to Work” Tipper  
Cubic volume: 2.3 m<sup>3</sup>  
Payload approx: 1.2 & 2.2 tonnes with only the driver in the truck



NPR 300 “Ready to Work” Tipper  
Cubic volume: 3.0 m<sup>3</sup>  
Payload approx. 2.6 tonnes with only the driver in the truck

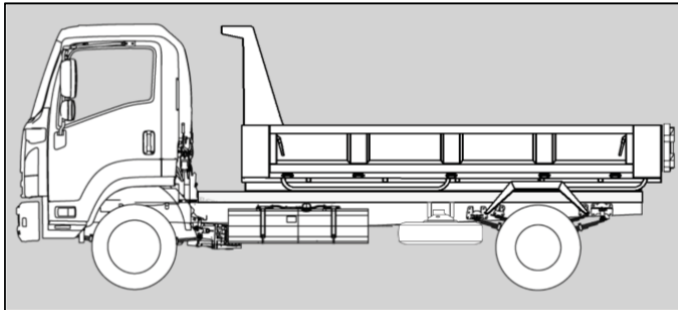
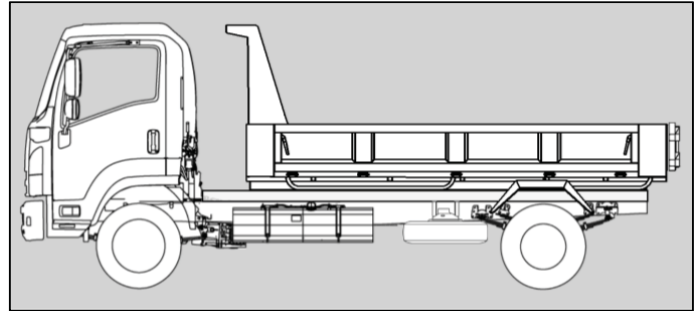
NPR 300 Crew  
“Ready to Work” Tipper  
Cubic volume: 2.8 m<sup>3</sup>  
Payload approx. 1.8 tonnes with 7 persons, 2.3 with only the driver in the truck





NQR 450 AMT (Automated Manual Transmission)  
 “Ready to Work” Tipper  
 Cubic volume: 3.6 m<sup>3</sup>  
 Payload approx. 4.3 tonnes with only the driver in the truck

FRR 500 “Ready to Work” Tipper  
 Cubic volume: 3.8 m<sup>3</sup>  
 Payload approx. 5.5 tonnes with only the driver in the truck

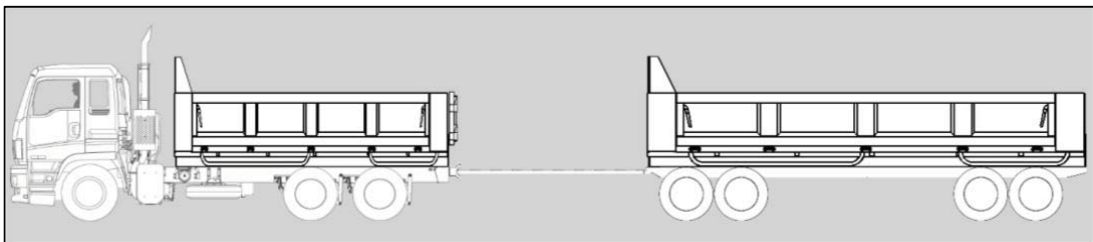


FRR 500 AMT (Automated Manual Transmission)  
 “Ready to Work” Tipper  
 Cubic volume: 3.8 m<sup>3</sup>  
 Payload approx. 5.5 tonnes with only the driver in the truck

## Isuzu Dealer Order Build & Specialist Tippers Models

Talk to your nearest Isuzu Dealer for more details about the availability of a wide range of vocationally specified tippers that can be built on a matched Isuzu chassis to meet your specific tipping needs:

A good example being the Giga CXY 455 tipper with 4 axle dog trailer as illustrated below.



## **Example 3**

### **Prime Movers and Semi-Trailers**

So far we have covered truck applications which we refer to in general terms as "Rigid Truck applications". We will now consider Articulated Trucks or "Semi-Trailers" as they are commonly known.

As with rigid trucks, the first step is to match the specific operational requirements to a truck with the required carrying capacity. However, in selecting a truck chassis for prime mover applications, we must now consider not only the GVM but also the GCM - Manufacturer's Gross Combination Mass rating.

As previously mentioned, GCM is the total "all-up" mass of the entire combination including, in this example, the mass of the prime mover (sometimes referred to as the "tractor"), the semi-trailer, the payload, the fuel, passengers etc. Again, GCM is a figure set by the manufacturer, is lodged with the registration authorities, and is the upper limit or determining factor in all prime mover applications.

**Important things to consider are the Application and Material to be carried.**

For example, in the distribution of Palletised Goods, the size of a "pallet of dry freight" is generally set by the transport companies as a cube of 1200mm x 1200mm x 1200 mm, and the all up weight of each loaded pallet is usually in the vicinity of 500 kg to 700 kg. Pallets of heavy commodities like machine parts, fruit or alcohol can weight heavier but usually no more than 1000 kg per pallet.

For the convenience of freight protection from the weather and better unloading flexibility a Curtain side trailer is ideal for this application

Regarding the per pallet weight of the freight, and to ensure that we have sufficient capacity for a variety of general freight applications, it is wise to work on a pallet weight of 1000 kg per pallet for this example.

## Manual GCM Capacity Calculation

To get an Idea of the GCM capacity of the truck we will require by manual calculation, we first establish the total payload requirements by multiplying 1000 kg x 24 (maximum floor pallet capacity of a 14.6 metre or 48 foot trailer), and then add the weight of the semi-trailer, turntable, fuel etc. e.g:

- |    |                       |   |
|----|-----------------------|---|
| 1. | Payload to be carried | 24000 kg Pallet Payload                         |
| 2. | Weight of trailer     | + 8500 kg Approx. mass of curtain sider trailer |
| 3. | Contingency           | + 1250 kg Allowance for fuel, turn table etc.   |

**Total Payload Required = 33750 kg**

### Establishing Prime Mover and Trailer Payload Capacity

The procedure for establishing total load capacity is the same as used with Heavy Rigid Trucks. We simply add up the allowable regulatory axle capacities of both the prime mover and the trailer, or trailers in the case of B doubles. As some states support higher mass limits, we will look at the productivity increase of higher mass limits as well in this exercise.

### Adding together axle capacities

#### General Mass Limits

P/Mover Regulatory Front Axle capacity	6000 kg or 6500kg*
P/Mover Regulatory Rear Axle capacity	+ 16500 kg
Trailer Regulatory Axle Capacity	+ 20000 kg
<b>Total Allowable Capacity</b>	<b>= 42500/43000 kg</b>

#### Higher Mass Limits

P/Mover Regulatory Front Axle capacity	6000 kg or 6500kg*
P/Mover Regulatory Rear Axle capacity	+ 17000 kg
Trailer Regulatory Axle Capacity	+ 23000 kg
<b>Total Allowable Capacity</b>	<b>= 45500/46000 kg</b>

\* 6500 kg available if approved FUPS device fitted (see following note)

**Note:** To be eligible to load to higher mass limits where state laws allow, trucks and trailers must be operating on approved suspensions certified as “Road Friendly” by the relevant state transport Authority. At this time, not all states support higher mass limits for road friendly suspensions, and even in those states that do, not all roads are approved for higher mass limits. Please consult your relevant state transport authority for details. FUPS refers to Front Underrun Protection Device. When an approved FUPS is fitted in accordance with Australian Design rules, regulatory authorities will allow the regulatory front axle capacity to be increased by 500kg.

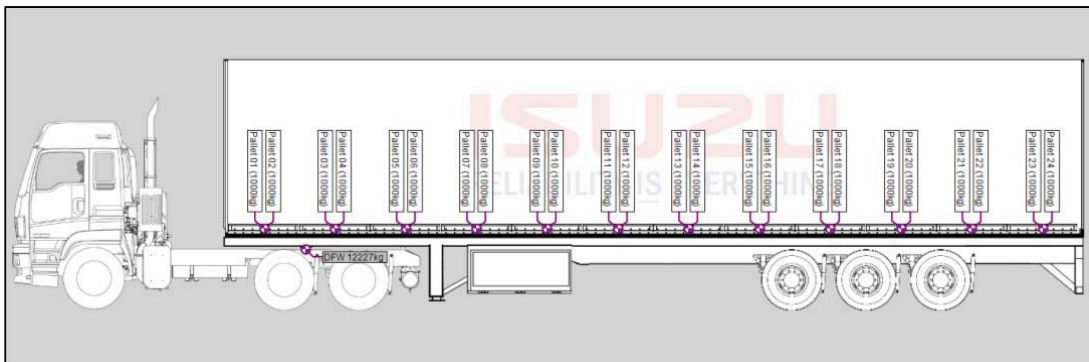
### Choosing an Isuzu Prime Mover Chassis for our application

Remember, the target payload is 33750 kg, plus we must add the tare weight of the Prime mover chassis.

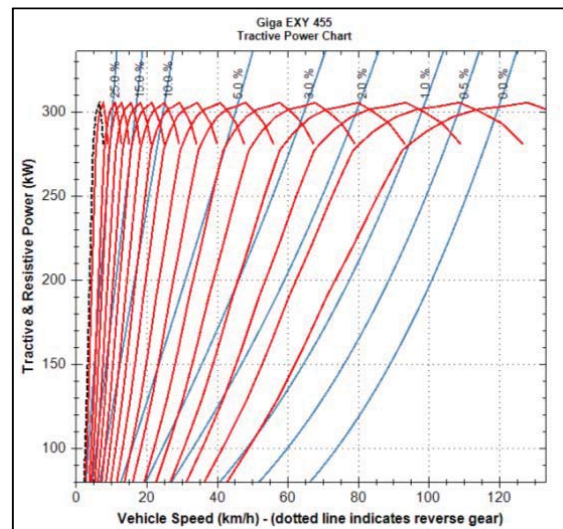
The truck we have selected is a Giga EXY 455 Prime Mover with a tare weight of 7760 kg and a GCM of 50000 kg.

Target payload	33750 kg
Prime Mover Chassis Tare	+ 7760 kg
<b>Total estimated all up weight</b>	<b>= 41510 kg</b>

With a General Mass limit regulatory capacity of 42,500 kg and a manufacturer's GCM of 50,000 kg, this Prime Mover will more than fit the application.



Isuzu Giga EXY 455 with 14.6 metre 24 Pallet Curtain-Side Trailer

[illegible]

## Chapter Nine - Getting the Right Advice

Once you have made a decision on what size and type of truck will be most suited to your needs, you will need to give serious thought to your budget as it may seem tempting to buy the least expensive truck that fits your requirements.

But the reality is that if you compromise on price, and purchase a truck that is lower in capability than your real needs dictate, it could cost you more in the long run through increased maintenance, down time and lost productivity.



Beware! You are making a business decision, not buying a bargain. A truck that cannot cope with the work you intend it to do is money down the drain. Worse still, warranties can become void if you experience mechanical trouble with a truck that is working or carrying loads beyond its specified rating.

This guide is designed to help you to access your truck requirements, and make you aware that both your present and future requirements must be matched to the truck you buy.

If your business is growing, and your needs today are for a truck that will carry two tonnes, next month you may need to carry two and a half. The best way to ensure full life and reliability from your truck is to purchase a vehicle that can easily cope with these added requirements.

One final thought: Isuzu truck salespeople have many years of experience in the truck industry. Sure, they want to sell trucks. But one thing they don't want to do is to damage their own reputation, or that of their Dealership.

That's because, in the truck industry, good salespeople are known and respected! Their income depends not only on selling you the right truck today, but making sure that you are satisfied enough to want to buy your next truck at the same Dealership.

Isuzu Salespeople are consultants in the widest sense of the word. They would rather lose a sale than let you drive off in a truck which won't do the job.

Talk to others who drive Isuzu Trucks, and you'll often find that their trucks have covered huge distances, with only regular servicing. They'll probably tell you too, that their next truck will be an Isuzu.

Isuzu trucks have built up a very high reputation for reliability both internationally and in the Australia, and part of that reputation has been the quality of Isuzu's highly committed sales force.

At an Isuzu Dealership, you will find not only a truck that will do the job you need, but the help and advice that ensures your truck can be one of the best business decisions you'll make.

## **Isuzu Care**



Then once you have purchased an Isuzu Truck you will begin to appreciate the benefits of Isuzu Care.

Isuzu Care starts with an in house Customer Care Centre staffed by highly trained consultants whose aim is to ensure that operating an Isuzu truck is a positive and rewarding experience for all Isuzu owners.

Isuzu owners also have access to a vast range of service and support products promoted under the Isuzu Care banner including; Isuzu Truck Insurance, Isuzu Truck Assist, Isuzu Service Agreements and Isuzu Extended Warranties, to name a few.

All Isuzu Dealers have participated in Isuzu Dealer Care practices training, ensuring that Isuzu owners will experience a uniform nationwide best practice Dealership service experience.

# **Some tips for Operating Trucks**

## **Obtaining Maximum Life from Your Truck**

Ensuring that the potential life of every truck is realised takes a little daily care, as with any mechanical device, small problems picked up during frequent checks can prevent major inconveniences on the road.

### **Oil and Fluid Leaks**

New leaks are a pointer to potential mechanical hazards. They can indicate something as basic as a plug not tightened properly, or something as major as the breakdown of a gasket or seal.

Engine and drive-line lubricants, and the various other fluids used in a truck, are its lifeblood. If leaks aren't attended to, at the very least, topping up will be more frequent and annoying.

Under the worst circumstances, serious mechanical failure could mean loss of income and wasted time.

### **Daily Checks**

A daily check of vehicle functions and fluids is a good habit that should never be dispensed with as it reinforces the old saying that “prevention is better than cure”.

It must be stressed that with operating a truck, not only is personal mobility an issue, but safety and your income may be at stake as well. While there may be no reason to suspect the reliability of your truck, checks should be followed on a regular basis if you want to maintain that reliability.

## **Daily Checks should include the following:**

### **Fluids:**

Engine oil  
Brake fluid (for hydraulic brake systems)  
Coolant level  
Windscreen washer fluid

### **Filters**

Fuel filters  
Air filters  
Air Brake filter/dryers

**Every operator should ensure that their diesel engine is receiving the three basics needed for long life and maximum efficiency:**

Clean Oil!  
Clean Air!  
Clean Fuel!

### **Tyres**

Check tyres regularly for inflation pressure, cut tread and sidewalls and other visible signs of accidental damage.

**Under inflation** is the number one cause of poor tyre performance and reduced tyre life. Because tyre load capacity varies directly with tyre inflation pressure, under inflated tyres can become “under capacity” tyres, resulting in dangerous case and sidewall damage and the potential of experiencing a blow-out.

**Over inflation** can be just a damaging, resulting in premature tyre wear, and increased stress on suspension components, not to mention a harsh and rougher ride quality.

## Chapter Ten - Commodity Mass Guide

The following list of various materials is compiled from the best sources available and is issued for guidance purposes only. Regarding timber, as most industry measurements remain in "Super Feet" (imperial quantities), so calculations are made in Super feet per tonne mass.

<b>Timber " m3 per tonne"</b>	<b>m3</b>
Hardwood .....	0.85
Oak, Maple etc. ....	1.18
Oregon, .....	1.89
Kauri Pine .....	1.65
WhitePine.....	1.77
Rimu Pine Flooring .....	1.77
Jarrah Flooring .....	1.60
Redwood, .....	2.36
Cypress Flooring .....	1.65
Hardwood Pickets .....	1.18
Doors, average.....	50 units per tonne

<b>Stone (kg per m3)</b>	<b>kg</b>
Basalt (Blue Metal).....	2390
Granite - Solid .....	2145
Crushed .....	1233
Limestone - Solid .....	2132
Crushed .....	1220
Marble - Solid .....	2120
Crushed .....	1233
Quartz .....	2209
Sandstone - Solid .....	1901
'Crushed .....	1105
Shale - Solid .....	2210
Crushed .....	1182
Slate .....	2248

<b>Metals (kg per m3)</b>	<b>kg</b>
Aluminium .....	2120
Brass, copper-zinc cast .....	6860
Bronze, alum .....	6179
Bronze, phos .....	7117
Copper, cast-roll .....	7117
Iron, grey-cast .....	5678
Iron, pig-cast .....	5781
Iron, wrought .....	6243
Lead .....	9121
Manganese .....	6102
Nickel .....	6898
Silver .....	8427
Steel .....	6295
Tin .....	5896
Zinc .....	5652
Sulphur .....	1605

**Grain and Fodder (bushels per tonne) (1 bushel = 35.23907 Litres)**

Chaff .....	104
Wheat .....	36.74
Oats .....	64.84
Barley .....	45.93
Rye .....	39.36
Flaxseed .....	39.36
Canola/Rapeseed .....	44.09
Corn .....	39.36
Faba Beans .....	36.74
Soybeans .....	36.74
Peas .....	36.74
Buckwheat .....	45.93
Canary Seed .....	44.09
Sunflower Seed .....	73.48
Beans (White) .....	36.74

## **Fruit**

Apples .....	56 cases per tonne or 18 kgs per case
Oranges .....	45 cases per tonne or 23 kgs per case
Lemons .....	43 cases per tonne or 25 kgs per case
Peaches .....	90 half bushel cases per tonne or 12 kgs per case
Pears .....	45 cases per tonne or 23 kgs per case
Cherries .....	188 quarter bushel cases per tonne or 11 kgs per case

## **Building Materials**

Brick (ordinary) .....	296 per tonne weight
Cement .....	6 casks, or 18 jute bags or 24 paper bags per tonne
Stone Lime .....	60 bushels per tonne weight
Sand or Soil .....	1 cubic metre per tonne

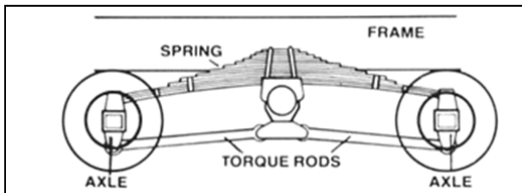
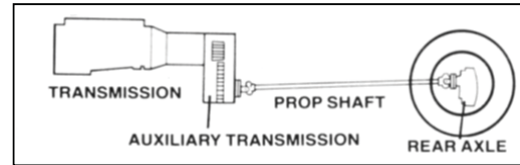
## **Livestock                      Number (per tonne)**

Bullocks .....	3
Cows .....	4
Calves .....	10
Horses .....	3
Pigs .....	13
Sheep .....	22

# Chapter Eleven - Truck Terminology

## Auxiliary Transmission

A second transmission mounted behind the main transmission. Its purpose is to provide additional gears for various types of truck operation. Two speed auxiliaries which provide direct and over-drive are mostly used. Rarely used in modern trucks now that overdrive top gear is common in most transmissions.



## Axle, Bogie

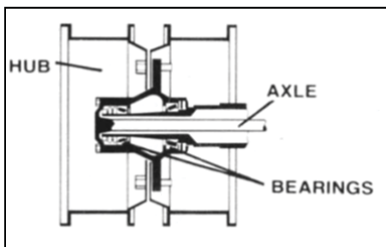
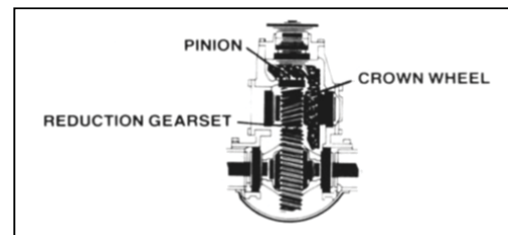
A tandem axle is used on semitrailers to increase their load carrying capacity.

## Axle Capacity

The capacity of the front or rear axle to support and carry a load as specified by the manufacturer.

## Axle, Double Reduction

A system of gears, where the gear ratio of a single speed axle is achieved through two sets of gears acting in series. This system results in lower gear loads than a single reduction, as the ratio reduction is split over two stages of gearing.

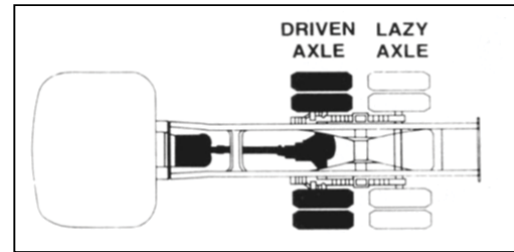


## Axle, Fully Floating

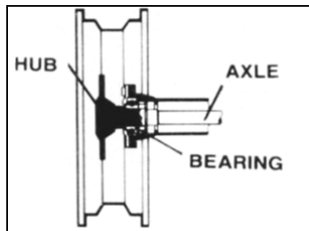
With a fully-floating axle, drive shafts have a single function in driving the wheels only. The housing supports the entire rear weight through the wheel hubs being mounted directly onto the casing, supported on double opposed wheel bearings which absorb all load and wheel stresses. Should axle shaft breakage occur, the truck can be towed without removing the wheels or disturbing the differential, although all broken sections of the failed axle shaft should first be removed.

### Axle, Lazy

The "non-tractive" axle of a tandem assembly of a truck, added only to increase load carrying capacity. "Pusher" type has lazy axle in front of driving axle. "Puller": or "trailing" type, has lazy axle behind driving axle.



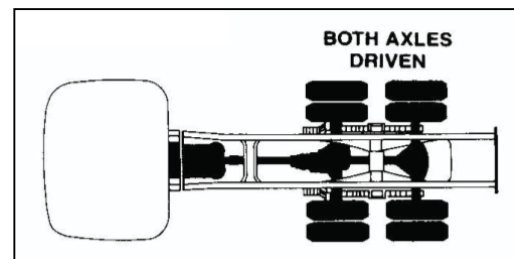
### Axle, Semi-Floating



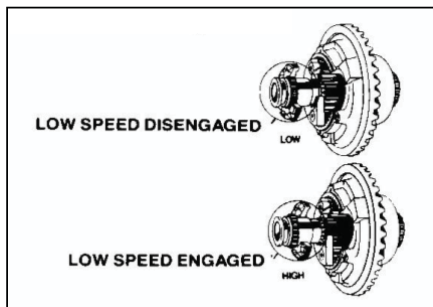
Bearings housed in an extension of the differential case, support the inner, ends of the half shafts with the outer (or wheel) bearings being carried directly on the axle shaft. With this type, the axle shafts and wheel bearings not only support the total rear weight, but must also transmit driving torque to the wheels and resist stresses due to skidding, turning corners and tractive forces.

### Axle, Tandem

Tandem axles incorporates two driving (live) axles at the rear of the vehicle. This design is used to obtain greater traction in addition to increasing load carrying capacity. Tandem axles are usually spaced approximately 1.0-2.0m apart.



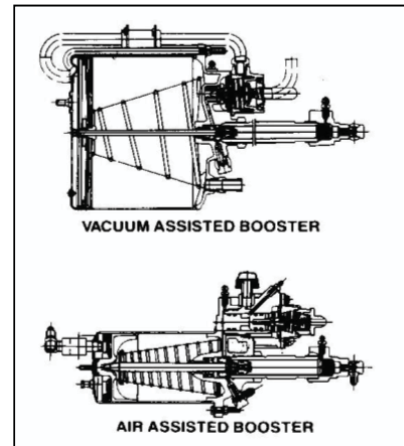
### Axle, Two Speed



Rarely used in modern trucks except in heavy tandem axles for forestry or off road applications, two speed axles contain multiple gearing that provides a choice of two rear axle ratios, remotely controlled from the cab by the driver. These axles accordingly double the drive ratios available from the gearbox.

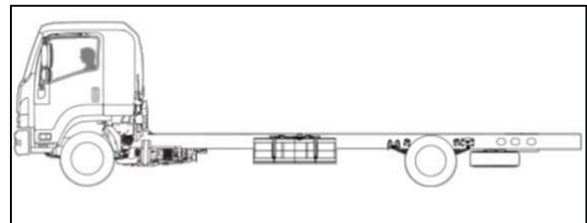
## Brake Booster

A mechanical means of reducing brake pedal effort to provide more powerful brake application. Operated by vacuum or air pressure usually acting on a diaphragm or piston which is connected to a secondary high pressure master cylinder, in series with the pedal operated master cylinder, so giving a compounded pressure effort. When vacuum operated, usually termed a Vacuum Booster or Servo unit. When air operated, usually termed Air over Hydraulic.



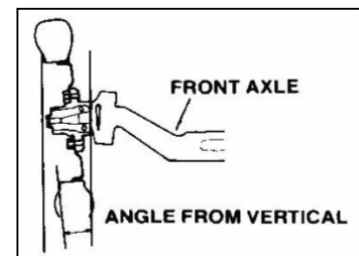
## Cab Chassis

Consists of a complete truck chassis, plus driver's cab, ready to run on the road. All that remains is for a body or "fifth wheel" (trailer turntable) to be fitted, to make the vehicle complete for operation.



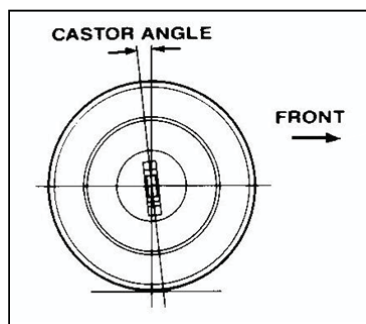
## Camber, Wheel

The amount, in degrees, that the front wheel inclines away from the vertical, as viewed from the front of the truck.



## Camber, Spring

The concave or convex shape of spring leaves, which can be formed to give positive or negative cambered springs.



## Castor

The amount, in degrees, that the king pin is inclined towards the front or rear of the truck as viewed from the side of the truck.

## **Compression Ratio**

The volume of the combustion chamber and cylinder when the piston is at the bottom of its stroke, divided by the volume of the combustion chamber when the piston is at the top of its stroke. Higher compression ratios tend to increase engine efficiency, but require higher grade fuels to avoid detonation.

## **Combustion Chamber (Diesel)**

Located in the cylinder head, the combustion chamber is designed to provide the most efficient mixing of compressed air and fuel within in the diesel engine.

## **Common Rail Diesel Fuel Injection System**

A modern fuel injection system that produces high pressure injection by storing the fuel in what is known as a “Common Rail”. The main storage component, of the “Common Rail” stores high pressure diesel fuel prior to distribution to the various cylinder injectors. Injection timing, volume and pressure is controlled electronically by a CPU (Central Processor Unit), delivering instruction to the electronically managed diesel pump and electronic injectors located at each combustion chamber.

## **Chassis/Cowl**

A vehicle which consists of a complete truck chassis plus a partial cab which has the cab rear panels, seating, door trims, headlining, etc., deleted. Cowls are used for special body adaptations which commence at or near the windscreen.

## **Cylinder Bore**

The diameter of an engine cylinder.

## **Diesel Engine**

An internal combustion engine which operates on oil fuel and does not rely on spark plugs to ignite the fuel, but on heat developed during compression of intakes air in the cylinders. Fuel is injected directly into the cylinder, and ignition takes place immediately the oil fuel enters the super heated air in the combustion chamber. Diesel engines operate at more than twice the compression ratio of truck petrol engines to achieve this spontaneous ignition of fuel.

## **Deflection Rate**

This is a term relating to spring flexibility. Normally expressed as the number of kilograms required to compress the spring one centimetre. The higher the deflection rate the greater the carrying capacity.

## **Differential**

The set of gears in an axle which permits the wheels of the driving axle to turn at different speeds, when turning a corner.

## **Dimensions**

Refers to the more important truck dimensions concerned with vehicle and/or body sizes:

"WB" - Wheelbase - is the distance between the centreline of front and rear axles, measured at ground level at tyre contact points. In multiple axle vehicles, 'Mean' Wheelbase is the distance from a front axle to a point midway between the rear axle group.

"BBC" - Bumper to back of cab – can have an influence on the maximum length of body, or body trailer combination that can be hauled.

"CA" - Cab to Axle - distance from the back of cab to centre of rear axle.

"CE" - This is the distance from the back of the cab to the end of the frame. Mainly of interest to body builders.

"FOR" - This is the distance from the foremost point of the front bumper to the centre line of the front axle. Usually applies to applications involving forward control trucks and, in some States, controls the legal length of the body in relation to the wheelbase.

"OAL" - Overall length from the front bumper to rear end of the frame of body.

## **Engine Displacement**

The displacement of an engine is the volume through which the head of a piston moves multiplied by the number of pistons. Expressed in litres or C.C.'s (cubic centimetres). 1000cc = 1 litre.

## **Engine Governor**

A mechanical device for controlling the maximum speed at which an engine can operate. May be operated or controlled mechanically, or by air flow (velocity).

## **Fifth Wheel**

A turntable coupling device on a prime mover, used to connect a semitrailer. It acts as a hinge or swivel point to permit changes in direction of travel between prime mover and semi-trailer. (SEE 'KING PIN (b):')

## **Force Required**

The effort (increasing with speed) required to move a vehicle along a level road. Force required is a measure of two components:

- a. Air resistance - The "drag" or retarding effect due to the air turbulence and friction produced by a vehicle in motion. Because air resistance varies theoretically as the square of the speed, it affects the ability of a vehicle to reach top speed on level going as well as gradeability at speed.
- b. Rolling resistance - a measure of the retarding effect of road surfaces, wheel bearing friction and tyre deflection to the forward motion of the vehicle.

## **Frames and Frames Reinforcement**

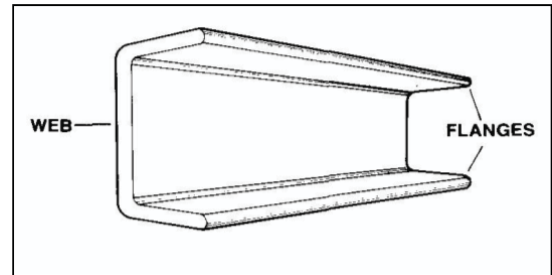
Frames are constructed from U shaped steel section, with two long members running the length of the truck, connected by U shaped cross members, which are riveted into place. Rivets are generally used in preference to welding, to prevent localised distortion during construction. Rivets are used cold, to ensure frame holes are completely filled. Various attachments are riveted to the frame to allow fitting of springs, cab, body, and mechanical components.

## Frame Terms

**Web:** The vertical part of the frame.

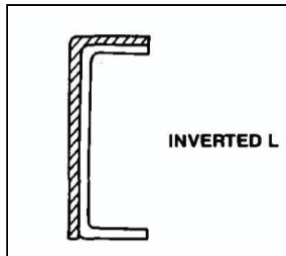
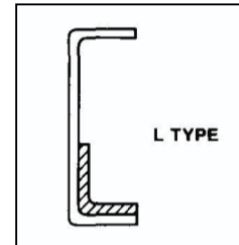
**Flange:** The upper and lower horizontal parts of the frame.

**Reinforcement:** Metal sections added to inside or outside of the frame.



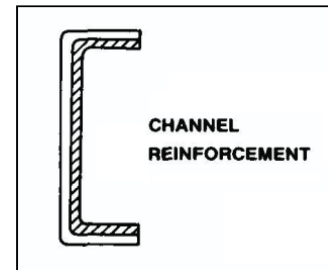
## Frame Reinforcement Terms

**L type:** Right angle reinforcement attached to inside or outside of the lower part of a frame.

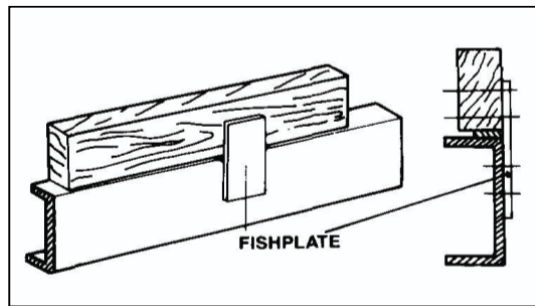


**Inverted L type:** Similar to the previous reinforcement, but attached to the upper frame.

**Channel:** Reinforcement that fully follows the frame dimension.



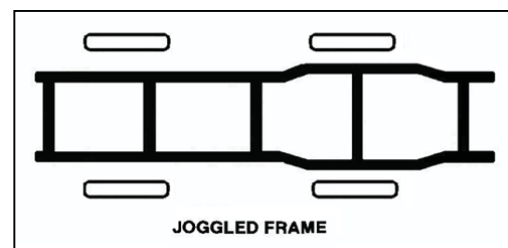
Channel reinforcement is usually attached to the inside of the frame.



**Fishplate:** Fishplate reinforcement is used in conjunction with body mounting, where it is necessary to avoid frame mounted components.

Frame reinforcement can be attached to the full length of the frame, but is usually only applied at two areas - cab back, and rear axle.

**Joggled frame:** Most frames are not parallel when viewed from the top. The frame is usually wider at the front to provide room for engine and gearbox, and allow wider based cab support.



**Section Modulus:** a term used to refer to the resistance of a frame to bending. It is used to compare frames made of similar materials, but with different dimensions.

**Yield strength:** Most materials will bend under load to a certain point and return to their original dimensions.

Yield strength indicates the maximum load that can be applied to a frame before it deforms permanently. Yield strength will always be significantly higher than allowable payload.

### **Gear Ratio**

The number of revolutions a driving gear requires to turn a driven gear through one complete revolution. The ratio is found by dividing the number of teeth on the driven gear by the number of teeth on the driving gear. "Overall" gear ratio is equal to the product or compound of all the ratios in the transmission train. For example, transmission ratio, times auxiliary transmission ratio, times rear axle ratio, equals final drive or 'overall ratio':

### **Gradeability**

The steepest grade that can be climbed by a truck in any given gear at maximum torque and expressed as a percent of grade. A 1% gradient is one that if you were to draw a straight line over 100 metres, would rise by one metre over this length. A 5% gradient is a rise of 5 metres in 100 metres. Maximum Gradeability is achieved in first gear (low ratio in 2 speed axle) and with engine operating at maximum torque, i.e. full throttle - best torque R .P M.

### **Gross Combination Weight/Mass**

G.C.W. or G.C.M. - The total "all-up" weight of a prime mover (tractor) with semi-trailer and/or trailers, and including payload, fuel etc.

## **Gross Vehicle Weight/Mass**

The accepted trade abbreviation is G V.W. or G.V.M. This is the "all-up" or total weight of the vehicle including body, payload, fuel and driver. It is a figure set by the manufacturer and is lodged with registration authorities. It governs all applications and is stamped on the compliance plate of the vehicle.

The G.V.W/G.V.M figure is controlled by vehicle specifications and individual component sizes and ratings. Included in these component factors are frame strength, spring and axle capacities and tyre loading capacities (tyre capacity is determined by size and ply rating).

## **Horsepower**

A measure of the amount of work that can be done by an engine in a certain time. One horsepower is equal to 33000 ft./lb. of work per minute. The horsepower of an engine depends upon the combustion pressures generated (BmeP), torque development, and the speed of the engine in terms of number of firing impulses.

## **Horsepower; Taxable (RAC)**

Is a purely mechanical formula for the convenience (yardstick) of establishing an arbitrary engine rating for taxation purposes, and is no longer indicative of actual engine developed horsepower.

Formula - RAC Horsepower =  $\text{Bore}^2 \times \text{No. of Cylinders}$  divided by 2.5.

## **Hotchkiss Drive**

Typical of the generally used attachment of axle to leaf spring, wherein the driving forces (both thrust and torque) are transmitted from the rear axle to the frame through the rear springs. The springs 'cushion' these forces providing a smoother power application and, to some extent, protecting the transmission components from harsh shocks. This system is still used almost universally on trucks.

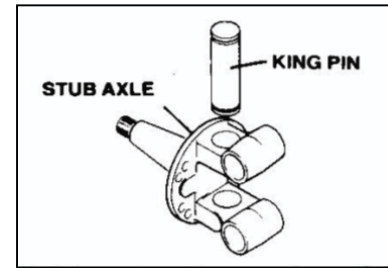
## Kerb Weight

This is the weight of a base chassis (without body, payload or driver) but includes coolant, lubricating oil and all items of standard equipment, and usually fuel. This is also referred to as 'wet' weight.

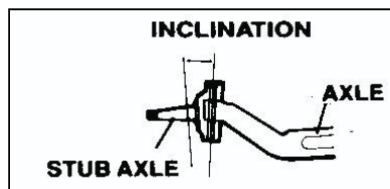
Dry weight refers to the weight of a vehicle without any fluids (coolant, lubricants, brake fluids and fuel) added.

## King Pin

- a. Front axle - pin which connects front axle and steering knuckles, and about which the knuckles pivot.
- b. Semi-trailer - connecting swivel pin which locks into the fifth wheel on the prime mover coupling the trailer with the prime mover. (See "FIFTH WHEEL!")



## King Pin Inclination



The amount (in degrees) that the top of the king pin inclines from the vertical, as viewed from the front of truck.

## Payload

The weight of the actual load (cargo) carried by a truck, not including the weight of the body, chassis or any equipment.

## Pintle Hook

Hook mounted on the rear of a truck or semi-trailer onto which a full trailer can be coupled and towed.

## Ply Rating

Or P.R. This is a measure of strength of a tyre, based on the strength of a single ply of designated traditional construction.

**Power Plant**

Unit assembly of engine, clutch and transmission.

**Power Take Off (P.T.O.)**

A gear box usually mounted on the side of the transmission or transfer case, used to transmit engine power to auxiliary equipment such as hydraulic pumps, winches, compressors, etc.

**Power Train**

The group of components used to transmit engine power to the wheels, i.e., clutch, transmission, universal joints, propeller shafts, differential assembly and axle half shafts.

**Pyrometer**

An instrument used to measure the temperature of exhaust gases from the engine manifold. Its function is to determine how "hard" the engine is working.

**Rim Pull**

The force available at the point that the driving tyres of a vehicle contact the road. Rim pull (tractive effort) is determined by engine torque, transmission ratio, axle ratio, tyre size and frictional losses in the drive train.

**Section Modulus**

A measure of the strength of frame side rails determined by the dimensions of the chassis sectional area and the profile shape of the side rails. It is assessed from a complex engineering formula.

**Split Shifting**

The simultaneous changing (in opposite directions) of both axle and transmission ratios. Permits half step gear changes which enhances performance by providing greater transmission flexibility and minimising R.P.M. fluctuations.

### **Spring Capacity**

A frequently used term is "pad capacity": This is the total weight that the spring can support in its maximum load position, as measured at the spring mounting pad on the axle.

### **Spring Deflection Rate**

The deflection rate of a spring is the number of pounds required to compress or deflect the spring a distance of 1 inch.

### **Spring Ratings**

- a. At ground - the total weight, both sprung and unsprung, which will deflect the spring its maximum normal amount.
- b. At pad - the amount of sprung (chassis) weight which will deflect the spring its planned maximum amount.

### **Sprung Weight**

The weight of these components above and supported by the spring, such as frame, body, payload, etc.

### **Unsprung Weight**

The weight of components such as tyres, wheels and axles that are not supported by the springs - the springs themselves constitute part of this unsprung weight.

### **Stroke**

The distance travelled by a piston in a cylinder.

### **Tachograph**

An instrument which graphically records engine RPM and other factors over a period of time, usually 7 or 14 days.

## **Tachometer**

An instrument which mechanically or electrically indicates engine crankshaft revolution speed (RPM.).

## **Tare Weight**

The registered weight of the fully equipped commercial unit. It is normally derived by putting the unit concerned over a weighbridge at time of registration, as it forms part of a basis of calculating registration costs.

The Tare Weight subtracted from the G.V.W./G.V.M. will reveal the actual payload.

## **Toe-In**

The amount (in millimetres) that the centre lines of the front wheels are turned in at the front when viewed from above. Due to normal steering geometry, toe-out influence occurs during turns.

## **Torque**

Product of a force acting through a distance, i.e., arm, lever, etc.

Engine torque is a twisting effort of the crankshaft, as measured on a dynamometer and indicated as a force acting one metre from the crankshaft centre.

GROSS = The maximum torque developed by an engine without allowing for the power loss absorbed by driving the engine's accessory units such as the fan, water pump, power steering pump, generator, and the impedance effort of the exhaust system.

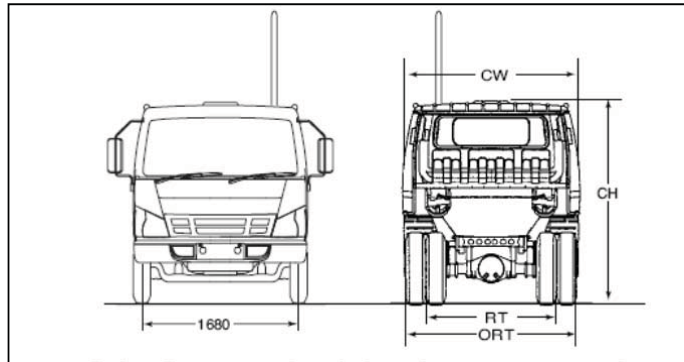
NET = The torque available at the flywheel of the engine, after the power required by the above engine accessories has been supplied.

DEPRECIATED = The net torque developed by an engine after normal wear losses and carbon accumulation in service. It is the torque realistically developed over most of the life of the engine.

Maximum torque is developed at the best combination of cylinder pressures (BmeP) and engine revolutions, i.e., maximum aspiration with wide open throttle and at best torque engine R.P.M.

## Track

This is the width between the centre of the front and rear tyres at the points where they contact the rear surface. The track of the truck has an important bearing on the width of the body that can be fitted.



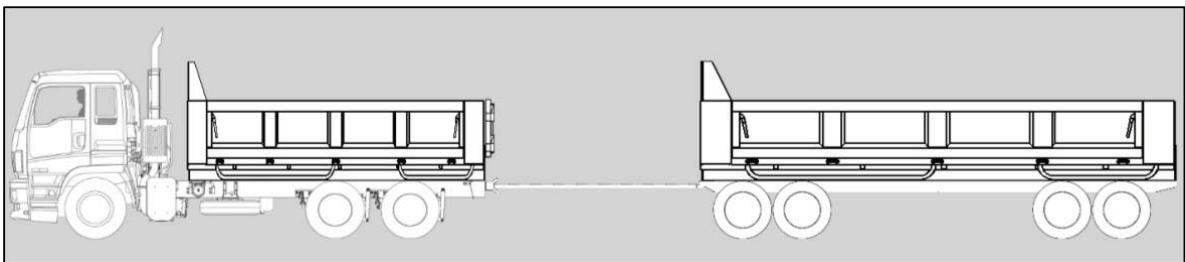
All things being equal, the wider the track the wider the load that can be carried with stability and safety. It is frequently necessary to calculate the distribution of weight, having regard to the body style and payload to be carried, to ensure that front and rear axle loadings are not exceeded.

## Tractor

Often used to describe the Vehicle or Prime Mover that is used to haul a Semi trailer or B Double.

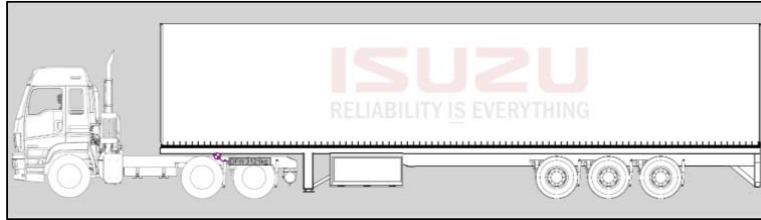
## Trailer

Trailers come in a variety of configurations for various applications.



**a. Semi trailer**

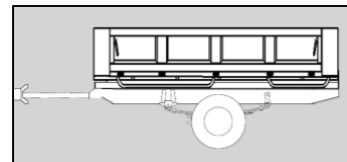
Load carrying trailer with an axle or axles at rear, and a King Pin at front designed to mate with a prime mover (tractor) fifth wheel (turntable). This allows a portion of the load weight to be carried by the prime mover.



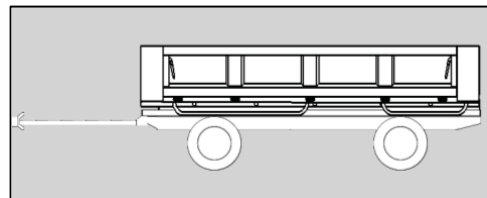
**b. Drawbar trailer**

In Australia, a variety of independent load carrying trailers are available for towing by rigid vehicles, prime movers, or behind semi trailers. In each case, all load weight is imposed on the trailer's own axles.

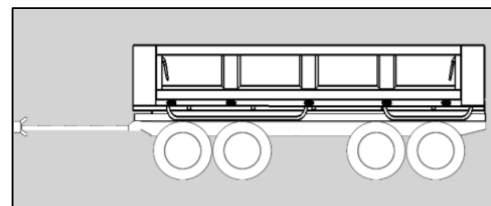
- (i) Pig trailer – Tri-axle, rigid frame, non steering. Axles are set close together.



- (ii) Dog trailer - Dual axle, rigid frame, non steering. Axles are set at each end of the trailer.



- (iii) Steerable Dog trailer • ('Superdog') - Created in Australia for local conditions, features a rigid frame with



dual rear axle and either a single or dual front steerable axle. Can be towed by a rigid truck, or with a modified drawbar (towing arm) can be mounted on the fifth wheel of a prime mover

**Transfer Box**

A secondary gearbox driven off the main gearbox and having one output shaft to the front drive the front axle and one to the rear to drive the rear axle(s). It often has a low range for better off-road power and Gradeability.

### **Transmission Oil Cooler**

A radiator used to cool transmission oil on many heavy duty vehicles.

### **Tri-Axle Group**

A group of 3 load sharing axles with centres of the front and rear axles not less than 2.0 metres apart and not more than 3.2 metres apart.

### **Turbocharger or Turbo**

A device in which a turbine wheel driven at 60,000 to 90,000 rpm by the exhaust gases drives an impeller to pump air into the cylinders under pressure thus increasing engine power and efficiency.

### **Turnbuckle**

A device used to tension a rod or wire linkage or chains used in securing loads on trucks or trailers. Not as common as dogs for securing loads because turnbuckles take longer.

### **Turntable**

A device for coupling a prime mover to a semi-trailer. The three basic types are greasy plate, ball race and fixed. The top of the greasy plate and ball race types move with the trailer and are located by the kingpin and the trailer block. A fixed turntable requires the trailer skid plate to slide around the kingpin while resting on top of the turntable.

### **Turntable Jaws**

The parts of the turntable that lock around the kingpin of the semi-trailer.

### **Twin-steer Axle Group**

An axle design that incorporates a second steer axle to increase the load carrying capacity at the front of the truck.

**Twist lock**

A device welded to the frame of a rigid truck or a trailer and used to secure a freight container to the vehicle. One twist lock is used on each corner of the container.

**Underbody Hoist**

A hoist used on tip-trucks or tip-trailers with the hydraulic ram mounted below the body and between the chassis rails.

**Universal Joint and Splines**

Devices fitted to tail and jack shafts to allow for suspension movement, vehicle flexing and variations in alignment.

**Unladen Mass**

The mass of the motor vehicle without any load, but including all tools, fixed components like cranes, tailgate loaders, lubricants and fuel. The unladen mass of an articulated vehicle is the unladen mass of the prime mover only.

**Vacuum Servo Brake**

A braking system in which the engine vacuum provides power assistance. reducing driver effort in applying the brakes.

**Waxing**

Wax is part of all diesel fuels but can block filters or even fuel lines in cold conditions. Australian refiners have winter blends with low wax levels to minimise the problem.

**Wet Tank**

The tank which receives air direct from the compressor. Most condensation occurs there and the wet tank should be drained as often as possible to protect the air system.

# **Chapter Twelve - Licence Requirements for Trucks and Heavy Vehicles**

Australia now has a nationally consistent graduated licensing scheme that applies to the driving of trucks and buses in all states and territories.

The following is a summary of information provided by Vic Roads and a complete copy is available at [www.vicroads.vic.gov.au](http://www.vicroads.vic.gov.au) or contact your relevant state body (a list of web sites are available on page 12 of this book).

## **When do I need a bus and truck licence?**

You need a bus and truck licence to drive trucks with a gross vehicle mass (GVM) equal to or greater than 4.5 tonnes for trucks, or buses which seat more than 12 adults.

To get your bus and truck licence, you must meet the requirements of the graduated licensing scheme.

## **What is the Graduated Licensing Scheme?**

The graduated licensing scheme requires you to gain experience driving smaller vehicles before you move on to driving larger, more complex vehicles.






The graduation requirements are given in the licence categories diagram published in this book. Truck and bus licences are issued in five different categories. These represent various industry requirements.

You can only drive vehicles in the category for which you are licensed, or vehicles in lesser categories. For example, when you get your heavy rigid (HR) licence you can drive buses and trucks in the light rigid (LR), medium rigid (MR) and heavy rigid (HR) categories, but you cannot drive vehicles in the heavy combination (HC) and multi-combination (MC) categories. When you get your multi-combination licence (MC), you can drive any bus or truck.

## Are state issued licences recognised by other states?

Yes, the categories are national categories. Licences are recognised throughout Australia. However, if you move interstate to live, you will need to obtain a new licence issued in that particular state.

## Licence Categories for Bus or Truck Drivers (including graduation eligibility criteria)

	<p>Any rigid vehicle, including bus and truck, greater than 4.5 tonnes GVM but equal to or less than 8 tonnes GVM or seating more than 12 adults including the driver.</p>
<b>Light Rigid (LR)</b>	<i>Must have held a car driver licence for at least 12 months</i>
	<p>Any 2-axle rigid vehicle, including bus and truck, greater than 8 tonnes GVM.</p>
<b>Medium Rigid (MR)</b>	<i>Must have held a car driver licence for at least 12 months</i>
	<p>Any rigid vehicle with 3 or more axles, including bus and truck, greater than 8 tonnes GVM</p>
<b>Heavy Rigid (HR)</b>	<i>Must have held a car driver licence for at least 24 months</i>
	<p>Prime mover/single semi-trailer exceeding 9 tonne, or rigid vehicle plus trailer greater than 9 tonnes GVM.</p>
<b>Heavy Combination (HC)</b>	<i>Must have held a car driver licence for at least 24 months, including a MR or HR licence for at least 12 months</i>
	<p>Heavy Combination vehicle with one or more additional trailers.</p>
<b>Multi Combination (MC)</b>	<i>Must have held a HR, HC or a combination of a HR and a HC vehicle licence for at least 12 months, plus completion of an approved course.</i>

## **Are there any special laws that apply to bus and truck licences?**

Yes if you are driving any bus or truck over 15 tonnes GVM you must!

- Always carry your licence.
- Have a zero blood alcohol reading (.00 BAC limit).

## **Are there restrictions on the types of transmission I can use?**

Yes. Your licence shows what kind of vehicle transmission you can use.

If you get your licence in a vehicle fitted with a synchromesh gear box, your licence will show code “B”. This means you can only drive a bus or truck with a synchromesh or automatic transmission.

If you wish to drive non-synchromesh vehicles (commonly known as “crash boxes”, constant-mesh, or “Road Ranger” type gears) you will have to be re-tested in a vehicle fitted with that type of transmission.

- If you get your automatic bus and truck licence while still on a probationary automatic car driver licence, you can only drive automatic vehicles for the remaining part of your probation period. The licence will then convert to a synchromesh (“B” code) classification when the probation period has ended.
- If you get your automatic bus and truck driver licence while on a manual car driver licence, the synchromesh (“B” code) classification will apply immediately.

## **Can rigid category licence holders tow trailers?**

LR, MR and HR licence holders can tow trailers up to 9 tonnes (GVM). However, national load and mass limits apply. For further information, contact Vic Roads on 03 131171, or the relevant road licencing authority within your state or territory.

## **Do I need a National Driver Work Diary?**

Who must use a work diary if you are driving the following:

- A heavy vehicle;
  - with a GVM over 12 tonnes (except a bus or tram);
  - that is part of a combination, if the total of the GVMs of the vehicles in the combination is over 12 tonnes; or
- A bus with more than 12 seats.

Work time is the time spent driving heavy vehicles or buses on or off the road, or doing tasks related to their operation (e.g.: pre-trip inspection).

## **When should you use a work diary?**

**You must use the work diary if you are working:**

- In NSW or Tas (regardless of the distance travelled); or
- More than 100km from your base (200km in Qld); or
- Under Basic Fatigue Management (BFM) or Advanced Fatigue Management (AFM) (you must carry a copy of the operator's BFM or AFM accreditation certificate at all times); or
- Under a work/rest hours exemption (you must carry a copy of the work/rest hours exemption at all times).

Drivers required to use a work diary must keep a work diary in the vehicle which contains records of your work and rest time within the last 28 day period. If you travel in WA or the ACT for less than 7 days you must continue to use the work diary.

You must only ever record information at any one time in a single work diary. This includes electronic work diaries.

However, if you used a paper work diary for part of the previous 28 days you need to keep that paper work diary in the vehicle for compliance purposes.

If you have changed from using an electronic work diary to a paper work diary, you must carry printouts of your daily records for the previous 28 days with you.

You can get a National Driver Work Diary from any Vic Roads Customer Service Centre (or equivalent within your state).

## **New Heavy Vehicle Driver Fatigue Laws**

On 29 September 2008 new nationally consistent Heavy Vehicle Driver Fatigue (HVDF) laws were introduced in all other states and territories (except WA and the ACT).

The new laws consider the health and well-being of heavy vehicle (including bus) drivers, aiming to help drivers get home safely by requiring that all parties in the chain-of-responsibility take 'reasonable steps' to prevent driver fatigue. The new laws stress that the causes of fatigue are a responsibility shared by off-road parties in the supply chain and unrealistic driver schedules and consigner demands and practices are not acceptable.

### **The new laws:**

- Promote positive fatigue management systems to ensure the safety of drivers and increase safety for all road users
- Monitor the hours that drivers of heavy trucks and buses can spend working (including driving) and resting
- Monitor the records that must be kept.

Employers and consignors are responsible for ensuring safe driving practices and may not roster or require a driver to carry out duties that could cause the driver to commit a fatigue or speeding offence.

Offences under the new laws are classified according to the actual level of risk and the greater the risk involved, the more significant the penalties.

Penalties range from an infringement notice to court imposed penalties and loss of demerit points.

Compliance with the laws will help employers meet their obligations under Occupational Health Safety & Welfare (OHS&W) legislation.

**There are three different “hours” options:**

- **Standard Hours (SH)** allows work for a maximum of 12 hours a day.
- **Basic Fatigue Management (BFM)** allows a maximum of 14 hours daily work.
- **Advanced Fatigue Management (AFM)** allows operators to nominate the number of daily working hours needed, up to an outer limit of 16 hours.

**What do you need to do?**

- Determine which of the three hours options best suits your work practices (i.e., SH, BFM or AFM);
- Consult with key personnel and drivers about the best way to manage fatigue in your work place;
- Undertake training that provides you with an understanding of driver fatigue and meets the competency requirement for accreditation;
- Developing a fatigue management system utilising a risk assessment approach;
- Prepare yourself to make an application for accreditation to the relevant jurisdiction if required.

## **Record Keeping**

A National Driver Work Diary replaced the National Driver Log Book on the 29<sup>th</sup> of September 2008.

If a driver's work diary is full, lost, stolen or destroyed the driver can record hours worked and rested in a supplementary record for up to 7 business days. The Work Diary supplementary record below can be downloaded and printed for this purpose. Within the 7 business days the driver must purchase a new work diary.

## In conclusion:

This publication has been written and published by Selwyn Harris, Sales Promotions Manager, Isuzu Australia Limited a wholly owned subsidiary of Isuzu Motors Japan.

It has been designed to act as an introductory guide to understanding and purchasing Isuzu trucks in the Australian market..

We trust you have enjoyed it and find it helpful when purchasing your new Isuzu truck.

We also strongly recommend that you spend time with your Isuzu Dealer to discuss your requirements thoroughly. This will enable our Dealer to assist you in selecting the best model to suit your particular application or applications if purchasing more than one truck.

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