

RIIVEH305F

Operate and Maintain a Four Wheel

Learner Guide Instructions

Who is this document for?

The learner.

What is in this document?

- Course information that matches the PowerPoint presentation.
- Review questions.
- Practical assessment instructions for learners.

What do you need to do before you use it for the first time?

1. Rebrand the document.
2. Review the document as part of your validation process.
3. Set the reading and test time limits that are highlighted in pink at the end of the document.

See the 'Read Me First' document for a complete set of instructions on how to use these resources.



LEARNER GUIDE

RIIVEH305F Operate and Maintain a Four Wheel Drive Vehicle

Learner Name:	
Learner ID:	
Learner Contact Number:	
Learner Email Address:	
Date Training Commenced:	

This Book Contains:

- Course Information.
- Review Questions.
- Practical Assessment overview and Instructions.

Table of Contents

1.1 Introduction	5
1.2 Introduction to Wheel Drives	5
1.2.1 2WD and 4WD	5
1.2.2 4WD Body Types	6
1.2.3 4WD Systems	6
1.2.4 4WD Capabilities	6
1.2.5 4WD Tyres	8
1.2.5.1 Tyre Ratings	8
1.2.5.2 Tyre Management	9
1.2.6 4WD Recovery Hooks and Mounting Features	9
Review Questions	10
1.3 Make Sure Your Work Activity is Compliant	13
1.3.1 Obtain Interpret and Confirm Work Requirements	13
1.3.2 Ensuring Compliance	14
1.3.3 Following the Rules When You Drive	14
1.3.4 Keeping Everybody Safe (Duty of Care)	14
Review Questions	15
1.4 Plan for Minimal Environmental Impact	16
1.4.1 Environmental Impact of 4WD Operation	17
1.4.2 Laws, Regulations and Permits for 4WDs	18
1.4.2.1 Permits	18
1.4.2.2 Consideration of Others	19
1.4.2.3 Cultural Heritage	19
Review Questions	19
2.1 Check the 4WD and Plan the Journey	22
2.1.1 Pre-Departure Checks	22
2.1.1.1 Fix Minor Faults	22
2.1.2 Maintenance Equipment and Spare Parts	23
2.1.3 Food, Recovery Equipment and Supplies	23
2.1.4 Maps and Navigation	24
2.1.5 Weather Conditions	24
2.1.6 Securing Loads	25
2.1.7 Load Safety Checklist	26
2.1.7.1 Personal Luggage	26
2.1.8 Communicating with Your Passengers	26
Review Questions	27
3.1 Drive the 4WD	31
3.1.1 Operating Within Manufacturer's Specifications	31
3.1.2 Seating Position	31
3.1.3 Driving the 4WD on Normal Roads	32
3.1.4 Road Hazards	32
3.1.4.1 Sudden Tyre Deflation	33
3.1.5 Driving Off-Road	33
3.1.5.1 Braking Distance	34
3.1.6 Skidding	35
3.1.6.1 Oversteer	35
3.1.6.2 Understeer	35
3.1.6.3 Wheel Lock-up	35
Review Questions	36
3.2 Inspect the Path of Travel	38
3.2.1 Driving Surface and Obstacles	38
Review Questions	39

3.3 Terrain and its Impacts	41
3.3.1 Drive across Rugged Terrain	41
3.3.2 Operating the 4WD on or across a Slope	42
3.3.3 Ascending and Descending Steep Slopes	43
3.3.4 Stall Recovery	47
3.3.5 Checking and Cleaning the 4WD	47
3.3.6 Repairing Damaged Tracks	48
Review Questions	48
3.4 Travelling in a Convoy	50
3.4.1 Techniques for Travelling in a Convoy	50
Review Questions	51
4.1 4WD Recovery	52
4.1.1 Plan Your Recovery	52
4.1.1.1 Environmental Impact of Recovery Operations	53
4.1.1.2 Choosing the Best Option for Recovery	54
4.1.2 Using Snatch Straps to Recover a 4WD	55
4.1.2.1 Snatch Strap Risks	55
4.1.2.2 Recovery Hooks	55
4.1.2.3 When Not to Use a Snatch Strap	56
4.1.2.4 Snatch Strap Mounting Strategy	56
4.1.2.5 Snatch Strap Recovery Process	57
4.1.3 Using a Winch to Recover a 4WD	59
4.1.3.1 Winch Safety	59
4.1.3.2 Winch Recovery Process	60
4.1.4 Post-Recovery Checks and Repairs	60
Review Questions	61
4.2 Use a Jack	65
4.2.1 Using a Jack to Recover a 4WD	65
4.2.2 Tyre Change Procedure	66
Review Questions	68
4.3 Routine Maintenance and Concluding Operations	69
4.3.1 4WD Maintenance Process	69
4.3.2 Routine Maintenance during the Trip	69
4.3.3 Minor Routine Servicing	70
4.3.4 Cleaning the 4WD and Equipment	71
4.3.5 Completing Documentation	71
Review Questions	71
Practical Assessment Instructions	74
Conditions of Assessment	74
Protective Personal Equipment (PPE) Requirements	74
Grounds for stopping the assessment	74
Achieving a Satisfactory Outcome	74
Practical Assessments	75

1.1 Introduction

This course is based on the unit of competency **RIIVEH305F Operate and Maintain a Four Wheel Drive Vehicle.**

The material covers the operation and maintenance of four-wheel drive vehicles and includes:

- ◆ Types of four-wheel drive (4WD) vehicles.
- ◆ Minimising environmental impact while driving the 4WD.
- ◆ Checking the 4WD before leaving and planning the journey.
- ◆ Four-wheel driving techniques.
- ◆ 4WD recovery techniques.
- ◆ 4WD maintenance and minor repairs.



1.2 Introduction to Wheel Drives



There are different types of wheel drives:

- ◆ Two-wheel drive (2WD, 4x2).
- ◆ Four-wheel drive (4WD, 4x4).
- ◆ All-wheel drive (AWD).
- ◆ Individual-wheel drive (IWD).

1.2.1 2WD and 4WD

2WD are vehicles that have 2 of the 4 wheels being driven under power.

The driven wheels can be either back or front wheels but are usually the back wheels.

4WD are vehicles that have all 4 wheels being driven under power.

This helps to maintain traction (grip) and control of the 4WD over rough, slippery or uneven ground.



1.2.2 4WD Body Types

There are two different body types of 4WDs:

Monocoque	A single frame that includes the body of the car that is designed to crumple in a collision.
Ladder Chassis	Made up of a frame and vehicle body. Lighter, easier handling than monocoque-type chassis.

1.2.3 4WD Systems

There are a range of different 4WD systems:

Part-Time 4WD	<p>Vehicles with part-time 4WD use a drive system that can power all 4 wheels when going off-road, or just the back 2 wheels when driving on normal roads.</p> <p>These vehicles have separate front and rear differentials and freewheeling hubs (front wheel hubs) that let the front wheels turn freely (not under power).</p> <p>WARNING:</p> <p>Driving constantly with all hubs engaged may cause transmission wind-up. This is where the transmission locks and the vehicle will not move forward. It can also be caused by uneven rolling diameters of tyres. If you think transmission wind-up is starting, reverse and shift to high 4.</p>
Full-Time 4WD	<p>Vehicles with full-time 4WD run in constant 4x4 mode (all wheels are powered all the time) and do not have freewheeling hubs.</p> <p>These 4WDs make use of high and low gears. Low gears provide more torque to help with driving off-road.</p>
Differential Locks (Diff Locks)	<p>Diff locks can be engaged in both part and full time 4WDs to lock the differential. This causes each wheel to always spin at the same rate of rotation to provide better traction.</p>

1.2.4 4WD Capabilities

Departure and Approach Angles

These are the angles between the point where the tyre touches the ground and the bumper or structure of the 4WD.

The bigger the angle the less chance of the vehicle hitting the ground while driving up or down an incline.



Departure angle

Approach angle

Ramp Over Angle

This is the angle that a 4WD can drive over without scraping the bottom of the vehicle.



Ramp over angle

Ground Clearance

Ground clearance is the amount of space between the ground and the underside of the 4WD. The lower the ground clearance the more careful you need to be going over uneven terrain.



Ground clearance

Suspension Travel

Suspension or wheel travel is the amount of vertical (up and down) movement that the suspension allows a wheel to move.

Being able to achieve larger amounts of wheel travel means you can keep more wheels on the ground while traveling over uneven terrain. This improves the traction and stability of the 4WD.



1.2.5 4WD Tyres



Tyre pressure is important and can affect the way the vehicle drives and handles. The pressure should be the same in all tyres and not be too high or too low.

Tyre pressure that is too high or too low can cause tyre wear and poor mileage.

Having different pressures in different tyres can make steering and handling more difficult and make the vehicle less stable.

1.2.5.1 Tyre Ratings

4WD tyres are rated by the maximum load bearing capacity at the speed indicated:

Rating/Speed			
J	100 km/h	Q	160 km/h
K	110 km/h	R	170 km/h
L	120 km/h	S	180 km/h
M	130 km/h	T	190 km/h
N	140 km/h	U	200 km/h
P	150 km/h	H	210 km/h

Index/Load		Index/Load		Index/Load	
96	710 kg	103	875 kg	110	1060 kg
97	730 kg	104	900 kg	111	1090 kg
98	750 kg	105	925 kg	112	1120 kg
99	775 kg	106	950 kg	113	1150 kg
100	800 kg	107	975 kg	114	1180 kg
101	825 kg	108	1000 kg	115	1215 kg
102	850 kg	109	1030 kg		

For example, a 108N tyre has a capacity of carrying 1000kg at a top speed of 140km/h.

The load rating refers to tyres that are inflated to their maximum psi (pounds per square inch). As the tyre pressure decreases so does the rating. In Australia any 4WD vehicle that has been designed for off-road use must have a tyre speed rating of N or higher.

1.2.5.2 Tyre Management

A tyre management system can be used to extend the life of tyres. A tyre management program generally includes guidelines for:



- ◆ Keeping track of tyre use including duration and environmental exposure.
- ◆ Reducing cut damage by limiting travel to sealed roads or relatively even terrain, avoiding driving in wet conditions or over rocks and shale and travelling at safe speeds to maintain traction (not spinning the 4WD wheels).
- ◆ Repairing cut-damaged tyres quickly before their condition gets beyond safe use or repair.
- ◆ Operating tyres within their capabilities by matching tyre load and speed capacity for the vehicle and 4WD operations, and making sure tyre pressures stay at recommended levels for the terrain.

1.2.6 4WD Recovery Hooks and Mounting Features

Recovery hooks are used to connect recovery equipment such as winch hooks and snatch straps.



Each 4WD should be fitted with recovery hooks. These points are purpose-built to withstand the pressure of shifting the bulk weight of the vehicle.

All recovery hooks should have a rating clearly marked on the hook and should be attached directly to the chassis of the vehicle.

Recovery hooks should be mounted on the front and rear of the vehicle (two on each end is preferable).

Always make sure you know the location of the recovery hooks of the vehicle you are using.



Review Questions

1.

What is the difference between 2WD and 4WD vehicles?

2.

What are the 2 4WD body types?

1.

2.

3.

Which 4WD system has freewheeling hubs?

4.

What do diff locks do?

5.

What can occur if you drive constantly with all hubs engaged on a part-time 4WD?

6.

What is the definition of Approach and Departure Angles?

7.

What effect can different pressures in tyres have on the 4WD?

8.

What do the letters and numbers on a tyre indicate?

9.

What is the purpose of a tyre management system?

10.

What are recovery hooks used for?

Evaluation Copy Only

1.3 Make Sure Your Work Activity is Compliant

Any work that you do, including operating and maintaining a 4WD vehicle, needs to be done in line with relevant state and national road legislation as well as your workplace instructions, policies and procedures.

All of this information is called 'documentation'. Check documentation to find out what to do, when and how to do it.



1.3.1 Obtain Interpret and Confirm Work Requirements

It is important that you and the people you are working with understand your roles and responsibilities for the work being conducted on site. It ensures that everybody knows who is responsible if conditions or circumstances change and allows work to be completed efficiently. Once you have obtained your instructions you need to:



1. Make sure you understand exactly what you need to do – ask any your supervisor about any questions you may have.
2. Find out who else is working with you – make sure they have received the same instructions and are clear about what needs to be done.
3. Identify the equipment and materials you will be working with – and if required, double check with your supervisor that this equipment is appropriate and available for you to use.
4. Confirm the timeline of the job – identify whether other tasks need to be completed first, or when your task needs to be completed.

Completing these steps will ensure that you have a clear understanding of exactly what needs to be done to complete your job safely, effectively and in line with site and organisational procedures. This will also let you know when you can make decisions or when you have to check with your supervisor before doing something.

If the situation changes while you are carrying out the work (e.g. an unexpected hazard, or other issue is identified) you may need to coordinate with your supervisor for guidance on how to proceed and finish the job.

Some personnel you may need to speak with may include:

- ◆ Supervisors
- ◆ Team Leaders
- ◆ Plant operators



1.3.2 Ensuring Compliance



By following the instructions or guidelines in your workplace documentation you can make sure all of your work is compliant (does not break the rules).

It is important to clarify your work instructions before departure. Make sure you communicate clearly and coordinate with any required parties both before departure and during your work activity.

1.3.3 Following the Rules When You Drive

Site rules, instructions, policies and procedures are there to keep everybody safe and to make sure the job gets done properly. These rules are based on a range of different requirements such as:

- ◆ Manufacturers' guidelines and specifications.
- ◆ Legislative requirements (laws, regulations and codes of practice, permits and road rules).
- ◆ Organisation rules and procedures (emergency procedures, fatigue management and journey planning).
- ◆ Environmental protection requirements.
- ◆ Australian standards.
- ◆ State traffic authority regulations and requirements.
- ◆ Licensing – make sure you have the right driver's licence for the vehicle you will be driving.



Once you have your work instructions it is a good idea to double-check with your supervisor to make sure you understand everything properly and you have not missed anything important.

1.3.4 Keeping Everybody Safe (Duty of Care)



It is your responsibility to make sure that anything you do while driving the 4WD will not put yourself or any other people in danger, or damage vehicles or equipment on-road or off-road.

This is called '**duty of care**'.

Review Questions

11.

Give two (2) examples of personnel you may need to speak with to obtain or confirm your work requirements?

1.

2.

12.

What steps should you take to confirm your work requirements with your supervisor?

13.

How can you make sure your work is compliant?