

Title	Describe light four wheel drive vehicle design features that affect performance and handling		
Level	4	Credits	6

Purpose	People credited with this unit standard are able to: describe light four wheel drive (4WD) vehicles in terms of design, characteristics and feature function; describe light 4WD vehicle capabilities and implications for operating off-road; demonstrate knowledge of light 4WD vehicle handling characteristics on roads.
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Classification	Driving > Driver Educator
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Available grade	Achieved
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Prerequisites	Unit 20179, <i>Describe light motor vehicle components, systems, dynamics, and handling characteristics</i> , or demonstrate equivalent knowledge and skills.
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Guidance Information

- References are available from the Accident Compensation Corporation, the Ministry of Transport, Waka Kotahi NZ Transport Agency (NZTA), and other transport agencies.
- Definitions**

Ditches and *drains* are those that the vehicle is able to be driven over as opposed to driving through.

Handling characteristics refer to how a light 4WD vehicle manoeuvres as the result of the interaction of its design and the handling dynamics present at the time.

A *light 4WD vehicle* refers to a Class 'MC' vehicle (as defined in the Land Transport Rule: Vehicle Standards Compliance 2002) which is also a light motor vehicle.

A *light motor vehicle* refers to a motor vehicle that has a gross vehicle mass of 3500kg or less.

Off-road refers to an area that is not a formed road. It includes undulating terrain, bush tracks, beaches, river-beds, and open paddocks. It may or may not be a legal road. The legal definition of a *road* (as per the Land Transport Act 1998 s2(1)) is:

Road includes:

 - A street; and
 - A motorway; and
 - A beach; and
 - A place to which the public have access, whether as of right or not; and
 - All bridges, culverts, ferries, and fords forming part of a road or street or motorway, or a place referred to in paragraph (d);

- (f) All sites at which vehicles may be weighed for the purposes of this Act or any other enactment.

Outcomes and performance criteria

Outcome 1

Describe light 4WD vehicles in terms of design, characteristics and feature function.

Performance criteria

- 1.1 Light 4WD vehicles are described in terms of their characteristics.
- Range length, height, weight, ground clearance, wheel base.
- 1.2 Design and features of light 4WD suspension systems are described.
- Range live axles, independent suspension, wheel travel, axle articulation, rebound and damping, centre of gravity.
- 1.3 Fixture clearances, approach angles, break over angles, and departure angles are described in terms of their effectiveness in avoiding body damage and fouling ground obstructions.
- Range fixtures include – towbars, bush bars, spare wheel carriers, winches, running boards.
- 1.4 Factors in determining the selection of wheels and tyres for a light 4WD vehicle are described in terms of intended vehicle usage and the type of vehicle.

Outcome 2

Describe light 4WD vehicle capabilities and implications for operating off-road.

Range part-time 4WD vehicles, full-time 4WD vehicles;
manual transmission, automatic transmission.

Performance criteria

- 2.1 A light 4WD vehicle's capability to negotiate obstacles are described, taking into consideration the design of the vehicle.
- Range five different obstacles.
- 2.2 The effects of driving light 4WD vehicles on a side slope are described in terms of traction and centre of gravity.
- 2.3 The effects on light 4WD vehicles climbing and descending steep slopes or access tracks are described in terms of weight transfer and gravity.

- 2.4 Light 4WD vehicle capability to negotiate water obstacles is described.
- Range relationship between buoyancy and traction; the effects of water on engine air intakes, brakes, clutch, electrical systems, exhaust, engine and transmission breathers.
- 2.5 Considerations for light 4WD vehicle drivers when negotiating water obstacles are described in terms of vehicle motion and handling, implications of striking submerged objects, and the force of moving water.
- 2.6 Light 4WD vehicle capability to cross low traction surfaces is described in terms of off-road tyre tread design and handling characteristics.
- Range low traction surfaces include but are not limited to – wet grass, muddy areas, ice, sand, gravel.
- 2.7 Light 4WD vehicle capability to cross rough and broken ground, including ditches and drains, is described in terms of design and handling characteristics.
- Range tyre tread design, suspension, ground clearance, wheel base.
- 2.8 Performance capability of light 4WD vehicles in soft ground conditions is described in terms of engine speed, steering, tyre type and pressure, and means of recovery from immobilisation.
- 2.9 The selection of correct gear and drive-train option for soft ground conditions is described.
- Range two wheel drive (2WD)/4WD, high or low ratio, differential lock(s), manual or automatic free wheeling hubs.

Outcome 3

Demonstrate knowledge of light 4WD vehicle handling characteristics on roads.

Performance criteria

- 3.1 The handling characteristics of light 4WD vehicles and conventional light motor vehicles are compared in terms of on-road handling characteristics.
- 3.2 Factors affecting light 4WD vehicle stability when travelling on sealed roads are described in terms of impact on vehicle stability.
- Range centre of gravity, suspension movement, effect of wind.
- 3.3 Road and vehicle risk factors affecting light 4WD vehicles when being driven on unsealed roads are described in terms of their contribution to loss of control.
- Range risk factors include – nature of road surface; effect of camber, banking and road shape changes; use of unsuitable tyre type; speed.

- 3.4 Selection of light 4WD vehicle gear and drive-train configuration is explained in relation to extended on-road use.

Range 2WD/4WD, high or low ratio, manual or automatic free wheeling hubs, traction control devices.

Planned review date	31 December 2025
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	6 May 1999	31 December 2023
Review	2	28 July 2003	31 December 2023
Review	3	16 April 2010	31 December 2023
Review	4	28 April 2022	N/A

Consent and Moderation Requirements (CMR) reference	0014
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Comments on this unit standard

Please contact Hanga-Aro-Rau Manufacturing, Engineering, and Logistics Workforce Development Council qualifications@hangaarorau.nz if you wish to suggest changes to the content of this unit standard.