Title	**Demonstrate knowledge of vehicle exhaust systems**		
Level	**3**	**Credits**	**4**

Purpose	People credited with this unit standard are able to demonstrate knowledge of exhaust material handling and safety requirements, vehicle safety and legislative requirements relating to exhaust systems, exhaust mufflers and resonators, exhaust emission systems, and describe exhaust mounting, flexible joints, and sealing methods.

Classification	Motor Industry > Automotive Fuel Systems and Exhaust

Available grade	Achieved

Guidance Information

1 Evidence presented for assessment against this unit standard must be consistent with safe work practices and be in accordance with applicable service information, and company requirements and legislative requirements. This includes the knowledge and use of suitable tools and equipment.

2 Legislation, regulations and/or industry standards relevant to this unit standard may include:
- Health and Safety at Work Act 2015;
- Land Transport Rules: Vehicle Equipment 2004, Rule 32017;
- Vehicle Exhaust Emissions 2007, Rule 33001/2;

and any subsequent amendments and replacements.

3 Definitions
Company requirements refer to instructions to staff on policy and procedures that are available in the workplace. These requirements may include – company policies and procedures, work instructions, product quality specifications and legislative requirements.
Service information refers to information such as technical information for a vehicle, machine, or product detailing operation; installation and servicing procedures; manufacturer instructions; technical terms and descriptions; and detailed illustrations.
Suitable tools and equipment refer to industry approved tools and equipment that are recognised within the industry as being the most suited to complete the task in a professional and competent manner with due regard to safe work practices.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of exhaust material handling and safety requirements.

Performance criteria

1.1 Workshop and personal protective equipment for safe handling of exhaust materials are identified.

Range may include – hot components, welding, sharp edges, catalytic converters, using air and electric tools, cutting pipes, fume extraction;
evidence of four are required.

1.2 Methods of storing exhaust pipes and mufflers in a workshop to prevent damage are described.

Outcome 2

Demonstrate knowledge of exhaust systems, including vehicle safety and legislative requirements relating to exhaust systems.

Performance criteria

2.1 The implications of fitting non-standard exhaust components to a vehicle are identified.

Range vehicle warranty, Land Transport Rules regarding modifications and decibel noise level, customer satisfaction, effect on engine performance.

2.2 The danger of exhaust fumes entering the interior of a vehicle is identified in relation to the impact on occupant health.

2.3 The positioning requirements of exhaust systems to the vehicle are described.

Range may include – proximity to liquid and gaseous fuel systems, heat shielding requirements, fire danger, hitting against underbody components, damage to brake lines, clearance from floor pan and moving components including drive train and suspension, ground clearance considerations;
evidence of four is required.

2.4 Exhaust system materials and their application are identified.

Range may include – mild steel, ali-clad, stainless steel, galvanised steel, titanium, cast iron.

2.5 Exhaust system noise testing requirements are described.

Outcome 3

Describe exhaust mufflers and resonators.

Performance criteria

3.1 Types of muffler and resonator design differences are described.

Range reverse flow, free flow, spark arrestor, noise output.

3.2 Compatibility of muffler and resonator types to vehicles and engines are described.

Range may include – gas flow, back pressure, noise factor, centre muffler and/or resonator, rear muffler and/or resonator, diameter of pipes, high performance and turbocharged engines.

Outcome 4

Demonstrate knowledge of exhaust emission systems.

Performance criteria

4.1 Component chemicals of petrol and diesel exhaust emissions are identified in terms of their composition.

Range hydrocarbons (HC), carbon dioxide (CO^2), carbon monoxide (CO), nitrous oxides (NOx), particulates, sulphur, lead, water (H^2O).

4.2 Exhaust emissions are described in terms of their dangers and effects.

Range CO poisoning, exhaust emissions contributing to the greenhouse effect and global warming, smoke emission, by-products of combustion affecting exhaust system life, explosive mixtures present in system.

4.3 Exhaust emission controls directly affecting the exhaust system are described.

Range exhaust gas recirculation (EGR) system, air injection, catalytic converters, oxygen sensor, diesel exhaust emissions after-treatment components.

4.4 Catalytic converter types, and their positioning within the emission control system, are identified.

Range may include – monolithic type, pellet type;
mini and main converters, two-way (oxidation) converter, three-way (reduction) converter, dual-bed converter.

4.5 Precautions when handling catalytic converters are identified.

Range heat, material, testing, disposal.

Outcome 5

Describe exhaust mounting, flexible joints, and sealing methods.

Performance criteria

5.1 Types of exhaust mounting systems are described.

Range may include – rubber loops and hooks, cotton reel type, adjustable straps, hangers, brackets and insulators;
evidence of three is required.

5.2 Purpose of flexible pipe sections and semi-flexible joints, and procedure to replace sections and joints are described.

Range may include – aligning the system, reducing vibration and stresses, allowing for expansion and contraction from heat, removing existing sections and joints, attaching replacement sections and joints.

5.3 Methods of sealing joints are described.

Range may include – vee flange, block flange, sealing rings, gaskets, sealant, clamps, welding;
evidence of five is required.

5.4 The importance of aligning the exhaust and relieving any binding of the system is described.

Range transmission of noise, vibration, breakage of hangers, damage and leakage of system components.

5.5 External factors affecting exhaust system life are described.

Range may include – engine tuning, misuse, modification, clutch performance, faulty engine mounts, short running, old age, ground clearance.

Planned review date	31 December 2026

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	25 September 1997	31 December 2018
Review	2	28 February 2001	31 December 2018
Review	3	25 January 2008	31 December 2018
Review	4	21 April 2016	31 December 2023
Review	5	24 March 2022	N/A

Consent and Moderation Requirements (CMR) reference	0014

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.