LANLEO14

Service and repair braking systems on land-based equipment

Overview

This standard covers the service and repair of braking systems on land-based equipment, including tracked and wheeled land-based engineering vehicles and machinery.

It includes the principles and practices required in maintaining and repairing braking systems in a safe and serviceable condition.

Braking systems refer to systems used to retard speed, to bring vehicles and machinery to a halt, to retard or stop component rotation as in skid and slew steer systems and to secure vehicles from moving away when stopped. This standard refers to the construction, function, operation, repair and reinstatement of braking systems and their components. Identifying faults in a braking system is an important part of this standard.

When working with machinery or equipment you should be trained and hold current certification, where required, in accordance with the relevant legislation.

When working on high voltage (hazardous voltage/HaV) electric vehicles, de-energising must be done by a person who has been trained in accordance with the manufacturer's procedures.

This standard is for those who work in land-based engineering under supervision.

Performance criteria

You must be able to:

1. be aware of hazards and assess the risks associated with the activity and the location where it is to be carried out
2. be aware of the potential environmental impact associated with the activity and the ways in which this can be controlled
3. select and wear suitable clothing and personal protective equipment (PPE)
4. select, prepare, use, maintain, and store the tools and equipment required to carry out the activity in accordance with the relevant legal requirements, manufacturer's instructions and company practices
5. check that the land-based equipment requiring service and repair is safe, prepared and isolated from power sources, where required
6. take the necessary precautions to prevent the escape of chemicals, gases and other substances and minimise dangers from contamination and hazards, where required
7. use a variety of methods to collect diagnostic information to identify defects and faults
8. determine the requirements for service and repair
9. identify and establish the availability of replacement components required for the activity
10. remove and replace worn and damaged components on braking systems in accordance with instructions and specifications
11. dismantle and reassemble braking systems and their components
12. clean contamination from braking systems and components
13. service/repair and reinstate braking systems and their components in line with the manufacturer’s specification and standards
14. adjust and reset the components used to apply braking mechanisms
15. use suitable testing methods to assess the performance of the reassembled braking system on completion of the activity, and confirm that it performs to operating specifications prior to returning the equipment to the customer
16. recycle or sustainably dispose of the different types of waste, including hazardous and non-hazardous, caused by the activity, in accordance with instructions and the relevant legal and environmental requirements
17. complete records as required by the relevant legislation, warranty requirements and company procedures

Knowledge and understanding

You need to know and understand:

1. how to identify hazards and assess risks when preparing to service and repair land-based equipment
2. the type of clothing and personal protective equipment (PPE) suitable for the activity
3. the tools and equipment required to carry out the activity and how to select, prepare, use, maintain and store these safely and correctly, in accordance with the manufacturer's instructions and company practices
4. the relevant legal requirements for the preparation and use of work equipment
5. how land-based equipment should be prepared for service and repair
6. the dangers created by stored energy and how to respond to these during the preparation stage
7. the hazardous chemicals, gases and other substances that may be present and how they should be dealt with
8. the construction, function and operation of the different designs of hydraulic and pneumatic braking systems found on land-based equipment
9. the function and operation of the components used in braking systems
10. the different methods that can be used for the assessment of defects and faults with braking system performance and for the identification of the root cause
11. how to recognise and rectify faults in braking systems
12. the factors that determine whether it is worthwhile carrying out the service and repair, such as cost, estimated working life or urgent need for the equipment
13. the components required for the service and repair and the company procedures for obtaining replacements
14. how to dismantle, service/repair, reinstate, adjust and reset braking systems and their components in line with the manufacturer’s specifications and standards, in order to achieve acceptable levels of system performance
15. the effects that heat has on braking efficiency and components
16. the effect that brake actuator free-travel adjustment has on braking performance and system response time
17. the role of vehicle Load Sensing Valves (LSVs), their potential influence on braking performance and the suitable methods used to test, re-adjust and reset these components to achieve the required performance
18. how and why increasing vehicle speed increases braking system loading to a

much greater extent than increasing vehicle mass/gross weight
19. how vehicle ballast, loading and weight transfer can influence braking sys-tem performance and service life
20. the operation of the trailer braking system and the required braking performance relationships between the towing and towed vehicles
21. the minimum acceptable service and parking and braking system performance requirements for the equipment, as specified by the relevant legislation and regulations
22. the methods used to adjust, bleed or balance braking systems
23. the methods of testing the braking system on completion of the activity to confirm that it performs in line with the operating specifications, prior to re-turning the equipment to the customer
24. how to recycle or sustainably dispose of the different types of waste, includ-ing hazardous and non-hazardous, caused by the activity, in accordance with instructions and the relevant legal and environmental requirements
25. the potential impact that the activity could have on the environment and the ways in which this can be controlled
26. the information that needs to be recorded, the company procedure for main-taining records and the requirements of data protection legislation

Glossary

- braking systems e.g. service, parking, secondary, emergency/failsafe, independent, 2wd, 4wd, tracked, transmission, parking brakes/locks
- components used in braking systems, e.g. master and slave cylinders, linkages, self-adjusting and manual brake/slack adjusters, flat and S-type brake operating cams, camshafts, brake shoes (leading and trailing, bonded and riveted), brake bands, single and multi-plate discs, oil-immersed and dry discs, brake actuators (pistons, hydraulic rams, air chambers, dual-supply and spring brake actuators), brake reservoirs, hydraulic pumps, air compressors, tractor-trailer brake control valves, tractor-trailer hydraulic, pneumatic and electrical couplings, pipes, unions, trailer braking systems, Load Sensing Valves and proportional valves, braking aids (servo, accumulator, pressurised, anti-lock braking systems [ABS])
- construction and function of braking systems, e.g. drum/band, wet/dry discs, induction, exhaust, and overrun braking applied by mechanical, hydraulic (including single and dual-line systems), pneumatic or hydro-pneumatic actuation. Tractor-trailer brake control (synchronization) valves, relay/emergency/failsafe brake control valves, vehicle Load Sensing valves and anti-lock braking systems (ABS)
- contamination e.g. moisture, incorrect fluids, foreign material
- the effects that heat has on braking efficiency and components e.g. glazing, brake fade, wear, vapour lock
- the effects incorrect braking system specification has upon system performance and/or longevity, e.g. excessive wear, premature wear/failure of the towing vehicle braking system, brake friction lining glazing, excessive towed vehicle braking system response time
- faults in braking systems e.g. brake grabbing, binding, bias, snatch, fade, failure, spongy and soft pedal, uneven braking, poor (slow) system response time, poor braking performance (excessive system free-travel, vibration, noise, pitting-scoring, contamination, leaking seals, incorrect fluids, excessive wear), uneven/ mismatched braking performance between the towing and towed vehicle
- hazardous chemicals and substances could include fuels, oils, fluids, gases, dust, compressed air
- instructions and specifications e.g. drawings/plans, schedules, method statements,

Standard Operating Procedures (SOPs), manufacturer's instructions, customer requirements, verbal instructions

- methods of diagnosis e.g. visual inspections, functional and operational tests, diagnostic equipment, remote electronic control and monitoring systems, reviewing technical data
- stored energy e.g. springs, belt tension, hydraulic pressure, electrical discharge, accumulator discharge
- trailer/towed vehicle braking system operation e.g. single and dual line systems, brake advance, failsafe devices (hydraulic, pneumatic and spring brake), Load Sensing systems, trailer swing, jack-knifing

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