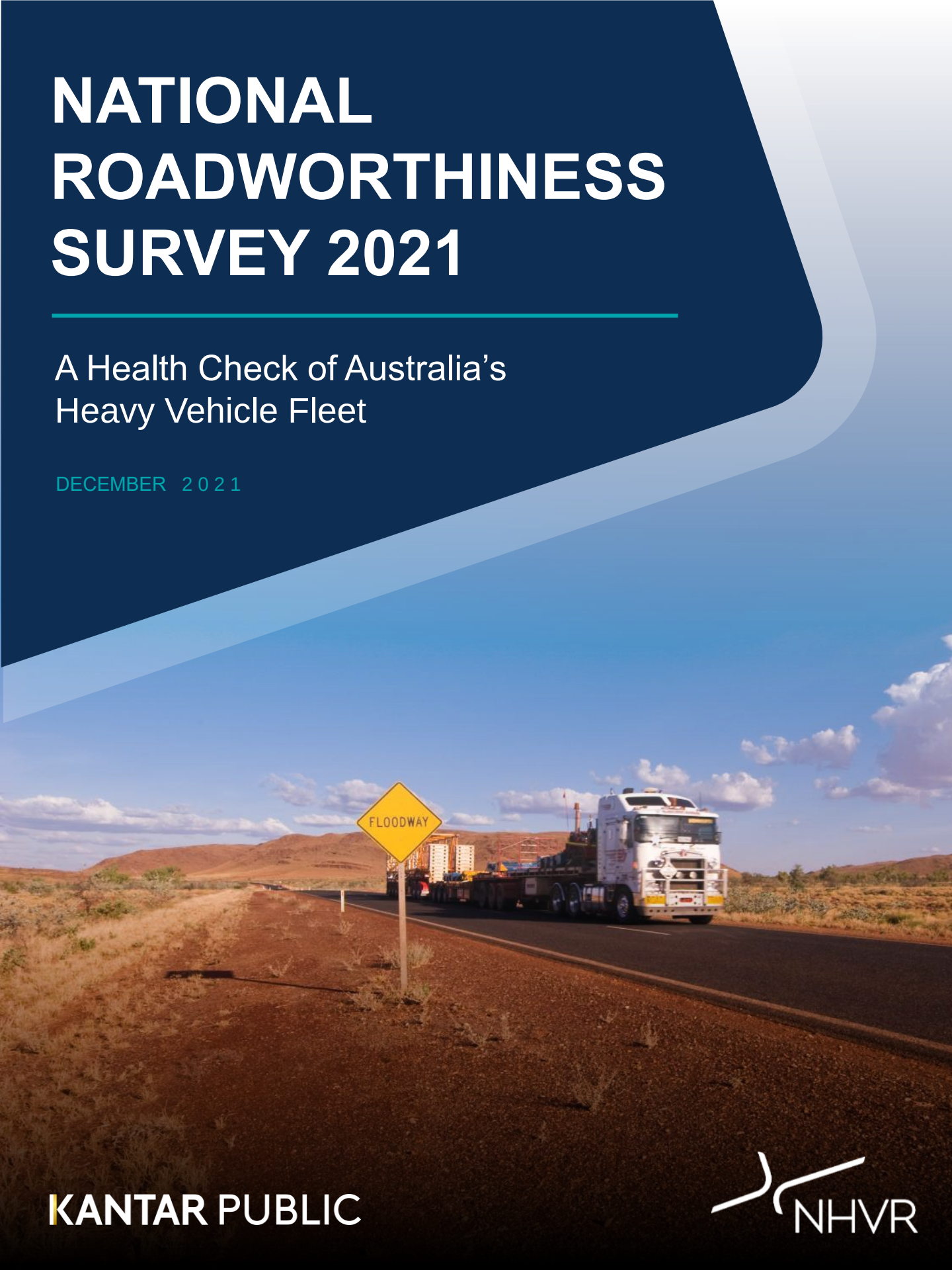
NATIONAL ROADWORTHINESS SURVEY 2021

A Health Check of Australia's Heavy Vehicle Fleet

DECEMBER 2021



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Executive Summary

Overall Outcomes

The National Roadworthiness Survey (NRS) was successfully conducted from 5 May to 29 July 2021 with 8,338 vehicle combinations inspected (7,130 in National Roadworthiness Baseline Survey 2016 (NRBS)), encompassing a total of 13,325 overall units (hauling and trailers), without incident.

The NHVR and jurisdictional partners, in partnership with Kantar, developed improved systems and roadside data capture applications including the integration of registration data, co-ordinated inspection methodologies using a team's approach. Industry consultation was also undertaken in the planning phases which aided reduced average inspection times to 31 minutes from 45 minutes (NRBS) equating to 2000 hours productivity gain.

Nationally, 75% of units passed inspection (conformed with Heavy Vehicle Inspection Manual standards), an increase from 55% during NRBS. Most vehicles inspected were intercepted in the same jurisdiction to which they were registered. Conformity did not differ greatly between units inspected in the state of their registration compared to those vehicles inspected interstate (69% and 70%, respectively). The national median mileage was almost 300,000km.

The average age of heavy vehicles on Australian roads is 10.2 years, comprising hauling units (10 years ↑ from 9 years NRBS) and trailers 11 years (↑ from 10 years NRBS). The percentage of national fleet over 12 years of age increased from 29% (NRBS) to 38%. This collective suggests an aging of the national fleet, in addition, direct correlation was established between vehicle age and non-conformity likelihood across all componentry.

Conformity

Conformity rates have increased across all vehicle types since NRBS, particularly for buses and coaches with a national average of 69%. States and territories conformity percentages vary from 51% (ACT) to 83% (WA) respectively.

Most non-conformities were issued with a minor defect notice. Minor defects were the highest category of non-conformity with 19% of units having a minor defect identified, a decrease from 34% in NRBS. There has been a slight increase (3% to 6%) in the incidence of self-clearing defects (lowest level defect representing a safety risk).

Executive Summary

Conformity *(continued)*

The lowest incidence of conformity was witnessed in rigid trucks (62%); however, conformity has increased in this category (48% conformity) since NRBS. Road Trains were the combination with the highest levels of conformity and, generally, the conformity increased as the size of the freight combination increased.

Decreases in major and minor non-conformities was evident amongst all unit/trailer combinations. Major defects for hauling units were found to have decreased to 5% from 11% (NRBS). A decrease in the overall proportion of trailers recording either a major (↓6% to 8%) or minor (↓11% to 18%) non-conformity was also identified.

Componentry

The most common non-conformity across metro and regional Australia was brakes, followed by lights and reflectors. Steering & suspension, engine driveline & exhaust, and structure & body are also in the top 5 most common areas of non-conformity. Overall, non-conformity has decreased across almost all areas since 2016.

Amongst freight hauling vehicles the most common areas of non-conformity were brakes (13%), light/reflector non-conformities (13%), engine, driveline, and exhaust (10%), steering and suspension (8%) and structure and body (8%).

Amongst trailers the most common areas of non-conformity were brakes (20%), steering and suspension (7%), structure and body (5%), light/reflector non-conformities (4%) and wheels, tyres, and hubs (4%).

Hauling units had an increase in conformities overall since NRBS. Similarly, there has been a increase in the incidence of major conformity amongst trailers overall.

Executive Summary

Hauling Units

The overall conformity in hauling units increased nationally from 68 in 2016 to 84%. The scale of increase in conformance was broadly consistent across different types of hauling units from Rigid Trucks (↑15% to 63%) to Bus/Coaches (↑22% to 92%). The decrease in the incidence of non-conformity was statistically significant across all vehicle categories.

Typically, most hauling units (83% in SA to 97% in TAS) were inspected in the state in which they were registered. The exception was ACT where just 59% of the hauling units inspected were registered in the ACT.

There has been a decrease in the overall proportion of hauling units recording either a major (↓6% to 5%) or minor (↓7% to 20%) non-conformity. However, there has been a small but statistically significant increase in the proportion of hauling units recording a self-clearing category (↑4% to 7%). The incidence of major non-conformities decreased amongst Rigid Trucks, Semi-Trailers, B Doubles and Bus/Coaches.

Rigid Trucks was the hauling unit vehicle category most likely to have a non-conformance. Bus/Coach were the least likely to have a non-conformance.

Trailers

Trailer conformity nationally has improved from 19% to 30% which was broadly consistent across different vehicle combinations from Road Trains (↑13% to 79%) to Semi- Trailer (↑22% to 69%).

2.0

INTRODUCTION

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Background

The National Heavy Vehicle Regulator (NHVR) administers a set of laws for heavy vehicles (over 4.5 tonnes gross vehicle mass) under the Heavy Vehicle National Law (HVNL). The NHVR undertakes a Roadworthiness Program which is a series of projects aimed at supporting reduction in the impacts of unroadworthy heavy vehicles on safety, the economy and the environment. This Program is being undertaken to implement a risk-based approach for assurance about adherence to vehicle standards by inspecting heavy vehicles on a common basis.

Data on the results of inspections is collected by jurisdictions in varying degrees; however, there is no national dataset that can be used to determine the current mechanical condition of the heavy vehicle fleet or be used to understand its effect on adverse road safety outcomes. In 2016, the NHVR commissioned AMR (now Kantar Public) to assist it undertake the National Roadworthiness Baseline Survey (NRBS) to gather information about the Australian heavy vehicle fleet, to assess mechanical condition and to guide the identification of causal factors that may result in adverse outcomes.

The project was undertaken to provide a national baseline for the condition of the heavy vehicle fleet against which future reform initiatives will be measured and was the first step towards a nationally consistent inspection approach. The foundation for this consistent approach is the use of the National Heavy Vehicle Inspection Manual (NHVIM) to describe the non-conformity identified. It was the first time that a survey of this type has been undertaken across the nation.

The NRBS is the broadest, most well-resourced and comprehensive assessment of the condition of the Australian heavy vehicle fleet ever undertaken. The NRBS was conducted by heavy vehicle Authorised Officers completing inspections of relevant vehicles around Australia, entering data in tablets using a Computer Assisted Personal Interview CAPI program. The results enable NHVR to:

- identify high-risk vehicle components, vehicle systems, vehicle types, operators and industry sectors, and
- develop a framework for selection of vehicles to inspect the right vehicles, for the right reasons.

Background - continued

In 2020 Kantar Public was again commissioned to undertake the first follow up wave of research, four years on from the original baseline survey. NRS 2021 would again assist the NHVR and participating road managers with information to move toward selecting vehicles based on risk to more efficiently allocate inspection resources to improve the safety of the national heavy vehicle fleet. The survey would also include WA for the first time (resourcing constraints in 2016 resulted in their inability to participate).

The project was originally planned to be repeated in mid-2020. However, the COVID-19 pandemic has since March 2020 disrupted all sectors of Australia. As a consequence of outbreaks in different parts of Australia and strict border controls to control the spread of the virus, the survey was postponed until operational conditions had improved to a point where fieldwork would be viable.

In February 2021, the NHVR decided that NRS 2021 fieldwork would commence in May 2021 and engaged Kantar Public to initiate the planning process.

The NHVR set a number of specific objectives for the project:

- assess the roadworthiness of the Australian heavy vehicle fleet through planning, coordinating and managing the conduct of a program of inspections on a recommended statistical basis;
- plan, coordinate and manage the conduct of sufficient inspections to establish the extent to which the heavy vehicle fleet meets Heavy Vehicle Standards;
- collect, analyse and report on the findings, results and outcomes of the data collected;
- work with jurisdictions to ensure sufficient inspections are conducted and performed to assess vehicle safety in a manner that allows comparison between vehicle types and location;
- ensure data is recorded and analysed during the survey in the agreed timeframe to monitor quality;
- work with jurisdictions to conduct a program of inspections of randomly selected vehicles using a standardised process, completing an approved inspection form, and reporting the findings from the data collected, as well as on the process itself;
- apply management process to the selection of vehicles and conduct of inspections to ensure the validity and reliability of the survey results for analysis and reporting on an Australia-wide comparison.

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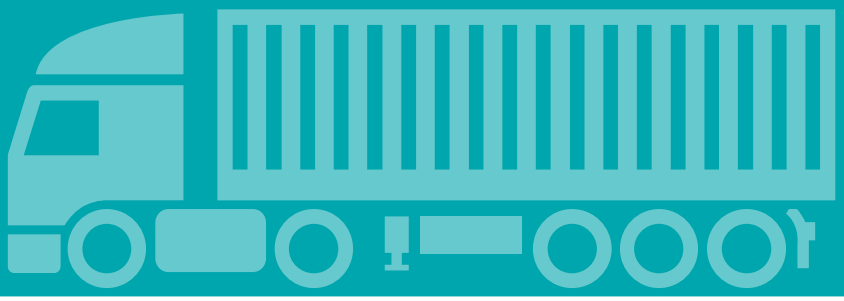
RESEARCH FINDINGS

3.1 Non-Conformities



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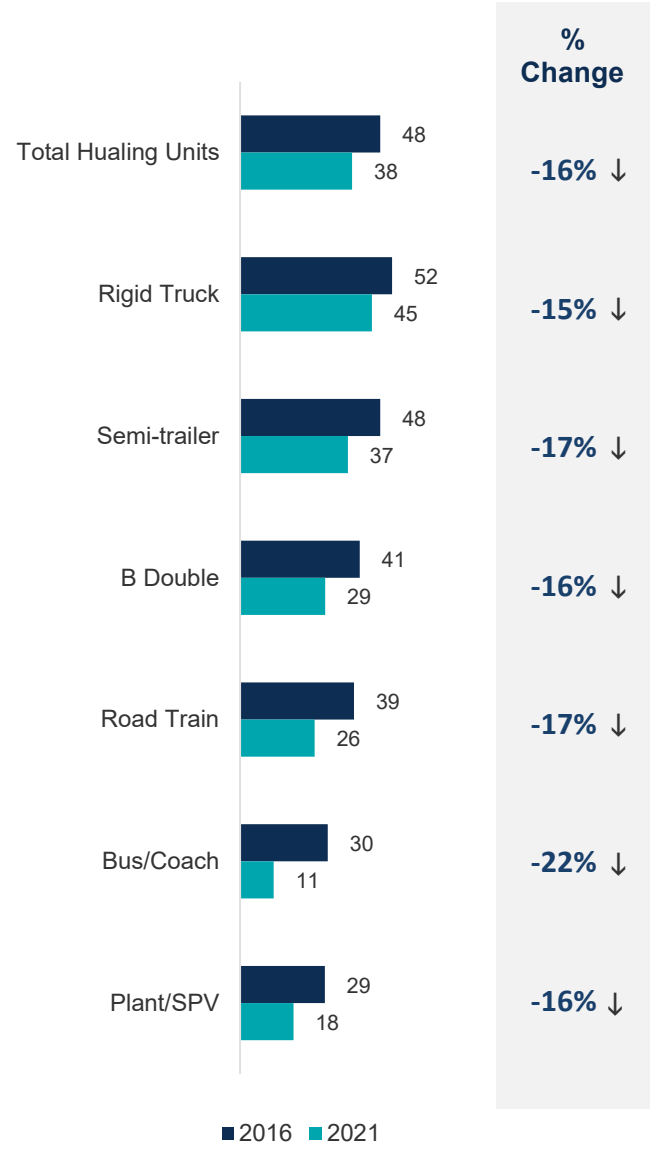
3.1.1 Non-Conformities: Incidence Amongst Hauling Units

Incidence of non-conformity amongst hauling units (%)



Overall there was a 16% decrease in the incidence of non-conformities amongst hauling units since 2016.

The decrease in incidence of non-conformities was greatest amongst bus/coach's (↓22%) and least amongst Rigid Trucks (↓15%).

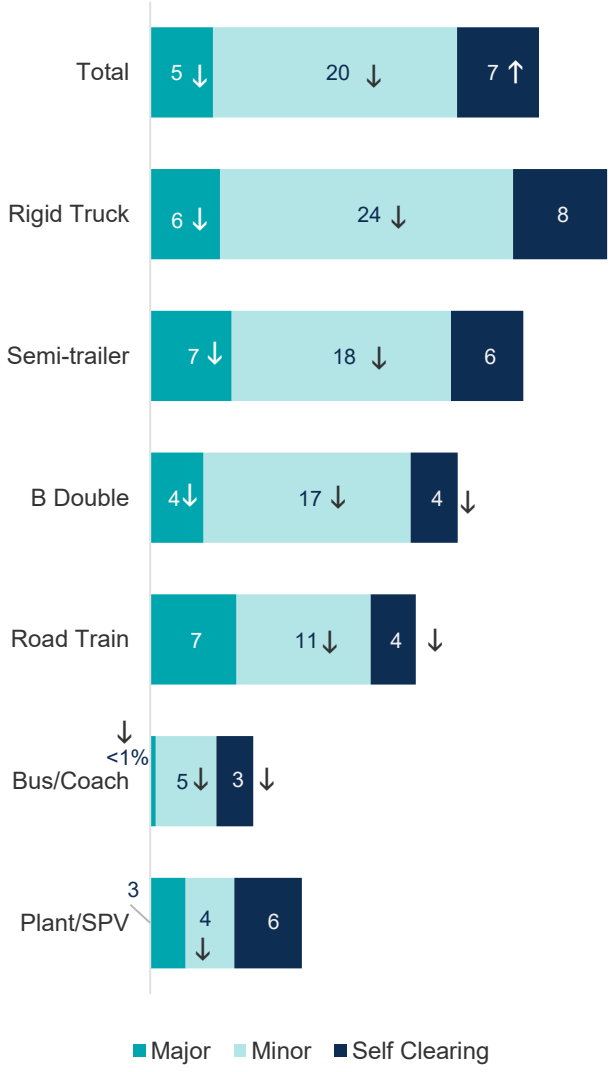
The decrease was statistically significant amongst all hauling unit types.

The incidence of one or more non-conformities was higher amongst rigid truck hauling units (37%) than other hauling units.

The incidence of non-conformity was lower for semi-trailers (31%), B Doubles (25%), Road Trains (25%), bus/coach (8%) and plant vehicles (13%).

3.1.2 Non-Conformities: Level Of Non-Conformity Amongst Hauling Unit

Level of non-conformity amongst hauling units (%)



There has been a decrease in the incidence of major non-conformities (-6%) amongst hauling units since 2016.

In 2016, 11% of hauling units overall had a major non-conformity. Now in 2021, this has decreased to 5%.

In addition, there has been a decrease in the proportion of hauling units recording a minor non-conformity (↓7% in comparison with 2016). However, there has been an increase in the proportion of hauling units with a self clearing non-conformity (an increase of 4% to 7%).

There was a decrease in the incidence of major non-conformities amongst Rigid trucks (↓6%), Semi-trailers (↓7%), B double (↓7%) and Bus/coach (↓3%).

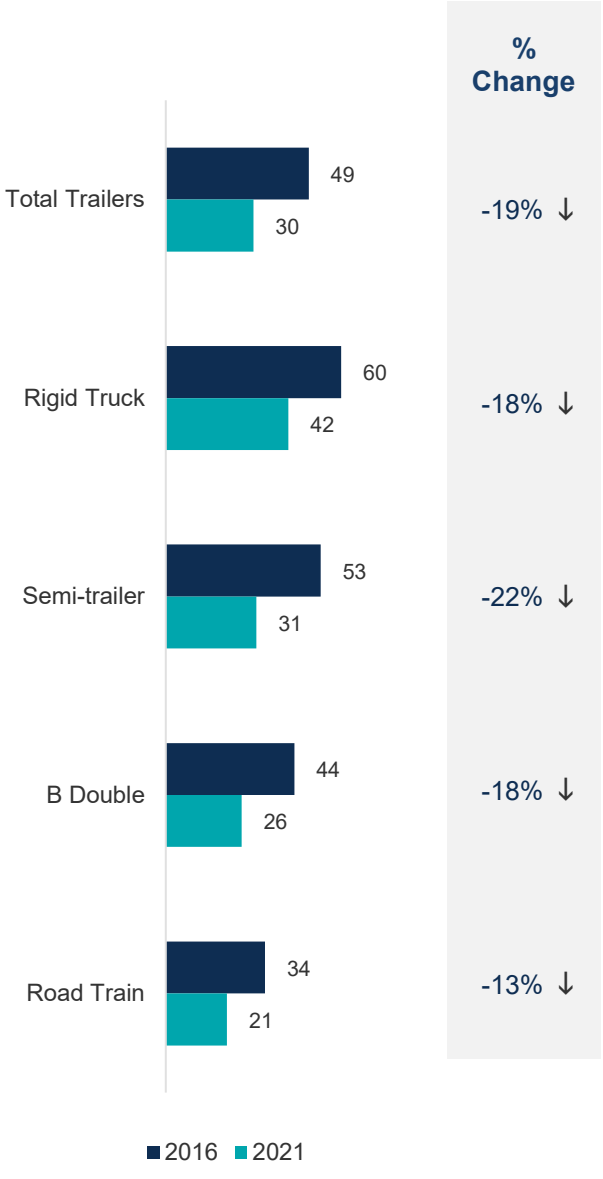
The most common, highest level of non-conformity for all types of vehicles, was a minor non-conformity. There has been a decrease in the incidence of minor non-conformance across each haulage unit type – Rigid truck (↓13%); Semi-trailer (↓16%); B Double (↓15%), Road train (↓12%); Bus/Coach (↓18%); and Plant/SPV (↓10%)

Base: Hauling units: Total (n=8338), Rigid Truck (n=3835), Semi-trailer (n=1443), B Double (n=842), Road Train (n=423), Bus/Coach (n=1036), Plant (n=759);
Base 2016: Hauling units: Total (n=7130), Rigid Truck (n=3227), Semi-trailer (n=1221), B Double (n=802), Road Train (n=221), Bus/Coach (n=1015), Plant (n=644);

⇅ Statistically significant increase/decrease in comparison with 2016

3.1.3 Non-Conformities: Incidence Amongst Trailers

Incidence of non-conformity amongst trailers (%)



Overall there was a 19% decrease in the incidence of non-conformity amongst trailers since 2016.

The decrease in incidence of non-conformity was greatest amongst trailers hauled by Semi-trailers (↓22%) and least amongst Road Train combinations (↓13%).

The decrease in the incidence of non-conformity was statistically significant amongst all hauling unit/trailer combinations.

The incidence of one or more non-conformity was statistically significantly higher for Rigid Truck's with trailers (42%) then other trailer combinations. The incidence of non-conformities was lower for trailers hauled by Semi's (31%) and statistically significantly lower for trailers in combination with B Doubles (26%) and Road Trains (21%).

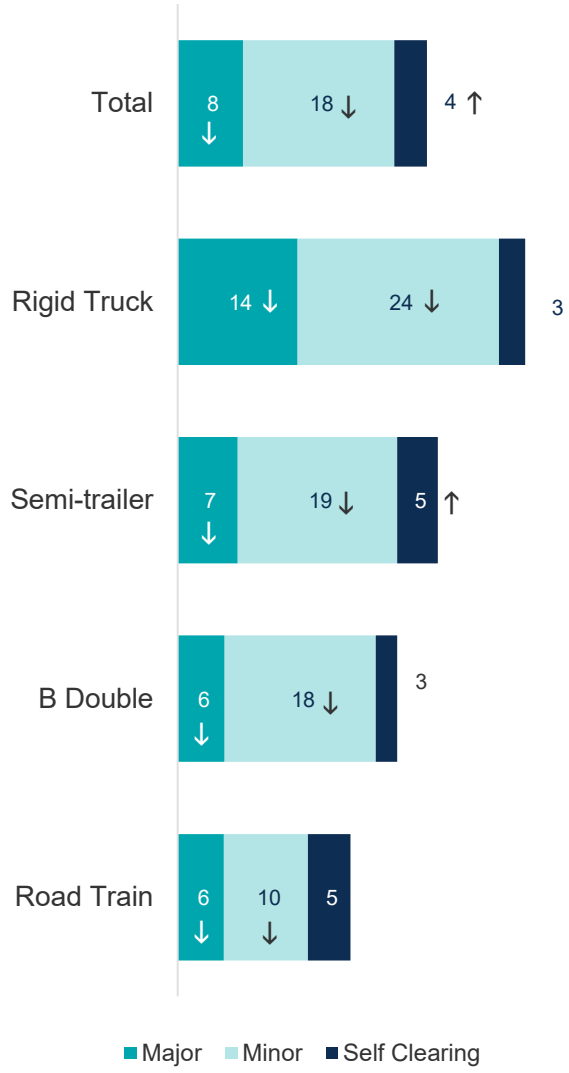
The incidence of any classification of non-conformity decreased with the size of freight combinations.

Base 2021: Trailers: Total (n=4987), Rigid truck (n=435), Semi-trailer (n=1461), B-double (n=1689), Road train (n=1376)
Base 2016: Trailers: Total (n=3936), Rigid truck (n=342), Semi-trailer (n=1224), B-double (n=1604), Road train (n=756)

⬆⬇ Statistically significant increase/decrease in comparison with 2016

3.1.4 Non-Conformities: Level Of Non-Conformity Amongst Trailers

Level of non-conformity amongst trailers (%)



There has been a decrease in the incidence of major non-conformities (-6%) amongst Trailers since 2016.

In 2016, 14% of hauling units overall had a major non-conformity. Now in 2021, this has decreased to 8%. In addition, there has also been a decrease in the incidence of hauling units recording a minor non-conformity (↓11% in comparison with 2016).

However, there has been a slight increase in the proportion of trailers with a self clearing non-conformity (an increase of 1% to 4%).

There was a decrease in the incidence of major non-conformities amongst trailers attached to Rigid trucks (↓7%), Semi-trailers (↓7%), B doubles ↓4%) and Road trains (↓5%).

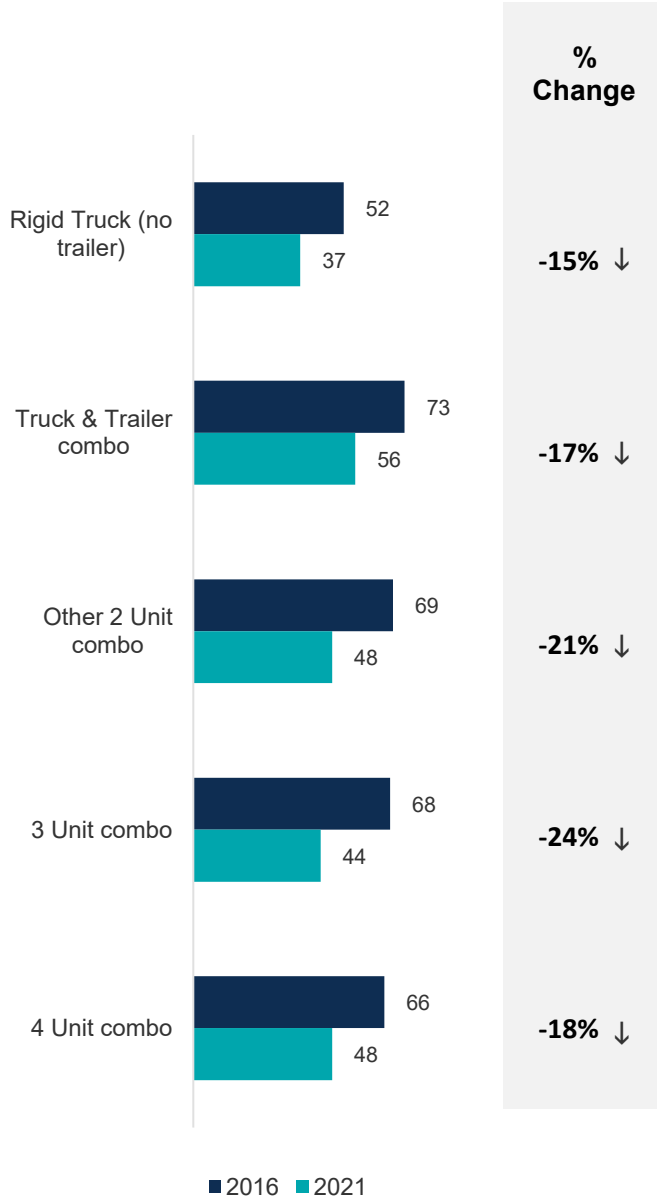
The most common, highest level of non-conformity for all types of trailers, was a minor non-conformity. Again there has been a decrease in the incidence of minor non-conformance across each haulage unit type – Rigid truck (↓13%); Semi-trailer (↓17%); B Double (↓14%), and Road train (↓10%) since 2016.

Base 2021: Trailers: Total (n=4987), Rigid truck (n=435), Semi-trailer (n=1461), B-double (n=1689), Road train (n=1376)
Base 2016: Trailers: Total (n=3936), Rigid truck (n=342), Semi-trailer (n=1224), B-double (n=1604), Road train (n=756)

⇅ Statistically significant increase/decrease in comparison with 2016

3.1.5 Non-Conformities: Incidence Amongst Vehicle Combinations

Incidences of non-conformities amongst vehicle combinations, by number of units (%)



The incidence of non-conformity in vehicle combinations has also decreased significantly across different combinations since 2016.

The incidence of non-conformity decreased for each combination type as well as for Rigid Trucks without a trailer.

In 2016 Rigid Truck combinations had a higher incidence of any classification of non-conformity (73%) than rigid trucks with no trailer (52%). This continues to be the case in 2021 (56% compared to 37%) despite the overall decrease in non-conformity across different combinations.

There was an overall variation in the average number of non-conforming units between the vehicle types being measured: The average was highest for 3 unit (1.29) and 4+ unit (1.92) combinations. This was consistent with 2016 results.

When assessing the rate of non-conformity, dividing the number of non-conforming units by the number of units in the combination, there was again an overall variation between the groups. The rate was higher for 2 unit combinations (0.62 for truck and trailer combinations and other 2 unit combinations 0.79) and lower for 3-unit combinations (0.44) and 4-unit combinations (0.27).

Base 2021: Rigid truck (no trailer) (n=3405), Truck & trailer combination (n=430), Other 2-unit combination (n=1425), 3-unit combination (n=903), 4-unit combination (n=380)
Base 2016: Rigid truck (no trailer) (n=2885), Truck & trailer combination (n=342), Other 2-unit combination (n=1218), 3-unit combination (n=808), 4-unit combination (n=162)

⇅ Statistically significant increase/decrease in comparison with 2016

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RESEARCH FINDINGS

3.2 Profile of Major Grounded Non-Conformities

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3.2.0 Profile of Major Grounded Non-Conformities

A major grounded non-conformity is the highest level of non-conformity. It is defined as creating critical concern over the safety of a vehicle and the vehicle must not be used on a road while the non-conformity exists.

In 2016, there was a total 146 vehicle units grounded, including 82 hauling units and 64 trailers. The most common type of non-conformity causing the grounding for hauling units was brakes (56 units), followed by steering and suspension (19 units). The most common non-conformity trailer was also brakes (54 trailers), followed by couplings (7).

In 2021, there was a total of 148 vehicle units grounded, including 79 hauling units and 69 trailers. The most common type of non-conformity causing the grounding for hauling units was brakes (55 units), followed by steering and suspension (15 units). The most common non-conformity trailer was also brakes (59 trailers), followed by steering and suspension (10 units).

Profile of major grounded units (unweighted)

Profile	Hauling unit	Trailer
	Sample n=	*Sample n=*
Type of inspection		
Interception	73	67
PFI – invitation	1	2
PFI – periodic	5	0
Type of vehicle		
Rigid truck	44	11
Semi-trailer	19	15
B-Double	7	13
Road Train	7	30
Bus/Coach	0	0
Plant/SPV	2	0
Type of non-conformity*		
Brakes	55	59
Couplings	1	6
Steering and suspension	15	10
Wheels, tyres and hubs	4	2
Structure and body	7	0
Seats and seatbelts	4	0
Lights and reflectors	5	3
Mirrors	0	0
Engine, driveline and exhaust	11	0

Profile	Hauling unit	Trailer
	Sample n=	*Sample n=*
State of Inspection		
NSW	13	8
VIC	13	10
QLD	43	37
SA	1	6
WA	5	6
TAS	2	0
NT	1	2
ACT	1	0
State of Registration		
NSW	12	5
VIC	13	12
QLD	45	39
SA	0	6
WA	6	5
TAS	2	0
NT	1	1
ACT	0	1
Area		
Metropolitan	31	12
Non-metropolitan	48	57

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RESEARCH FINDINGS

3.3 Vehicle Systems

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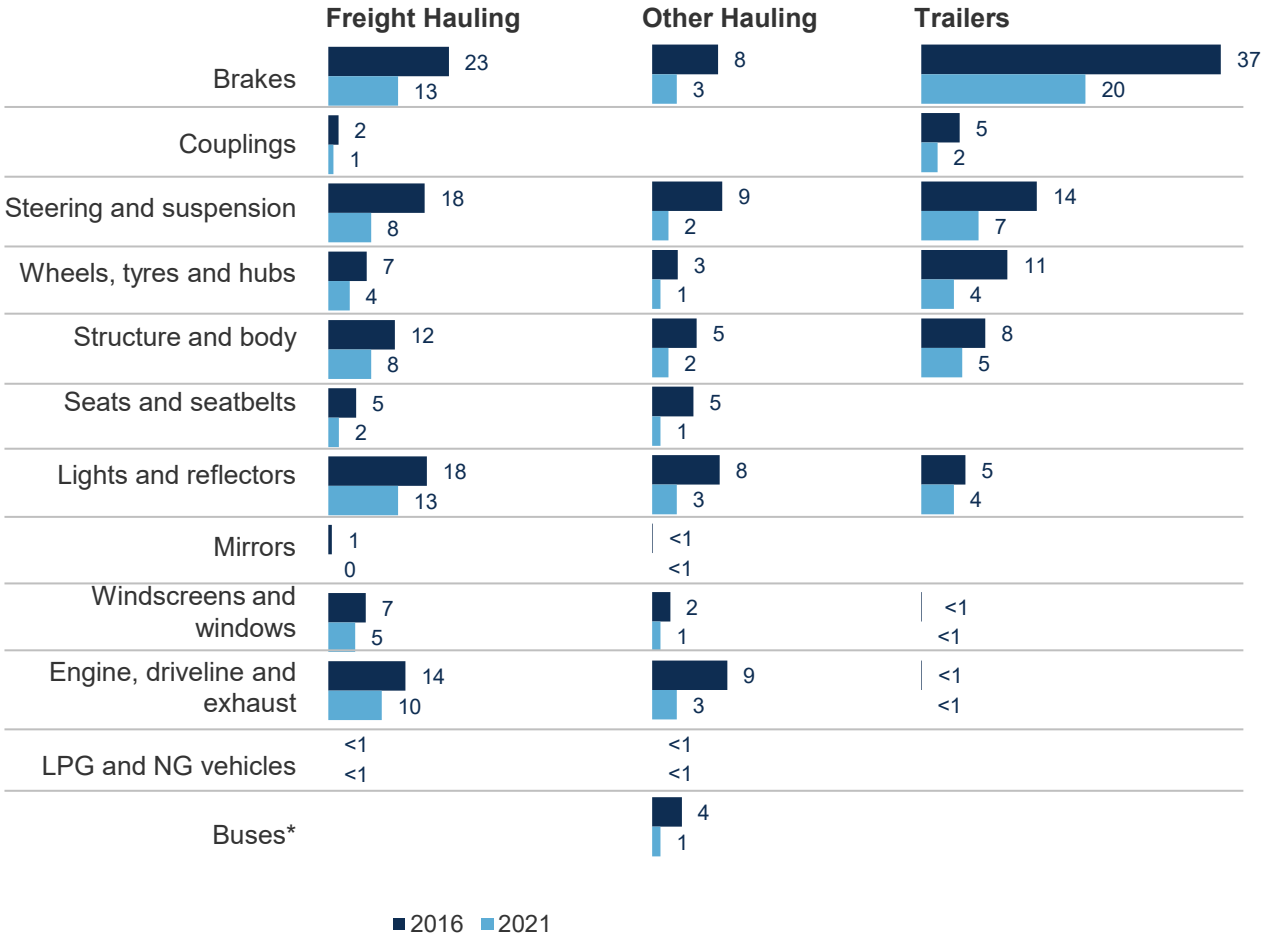
3.3.1 Vehicle Systems: Incidence of Non-Conformity

The incidence of non-conformity has decreased since 2016 across different system categories amongst freight and other hauling units as well as trailers. Brake non-conformities and light/reflector non-conformities were the most common system non-conformity among freight hauling units (each 13%). This was followed by engine, driveline and exhaust (10%) and Steering and suspension (8%) non-conformities. Amongst trailers a brake non-conformity was the most common system non-conformity (20%). This was followed by steering and suspension (7%) and structure and body (5%) non-conformities.

Incidence of non-conformity by category by unit type (%)



** Incidence based on bus/coach vehicles only*

Note: There may be cases of a system non-conformity recorded which is atypical for the type of unit

Note: All data changes statistically significant

Base 2021: Freight hauling units (n=6543), Other hauling (n=1795), Trailers (n=4987)
Base 2016: Freight hauling units (n=5471), Other hauling units (n=1659), Trailers (n=3936)

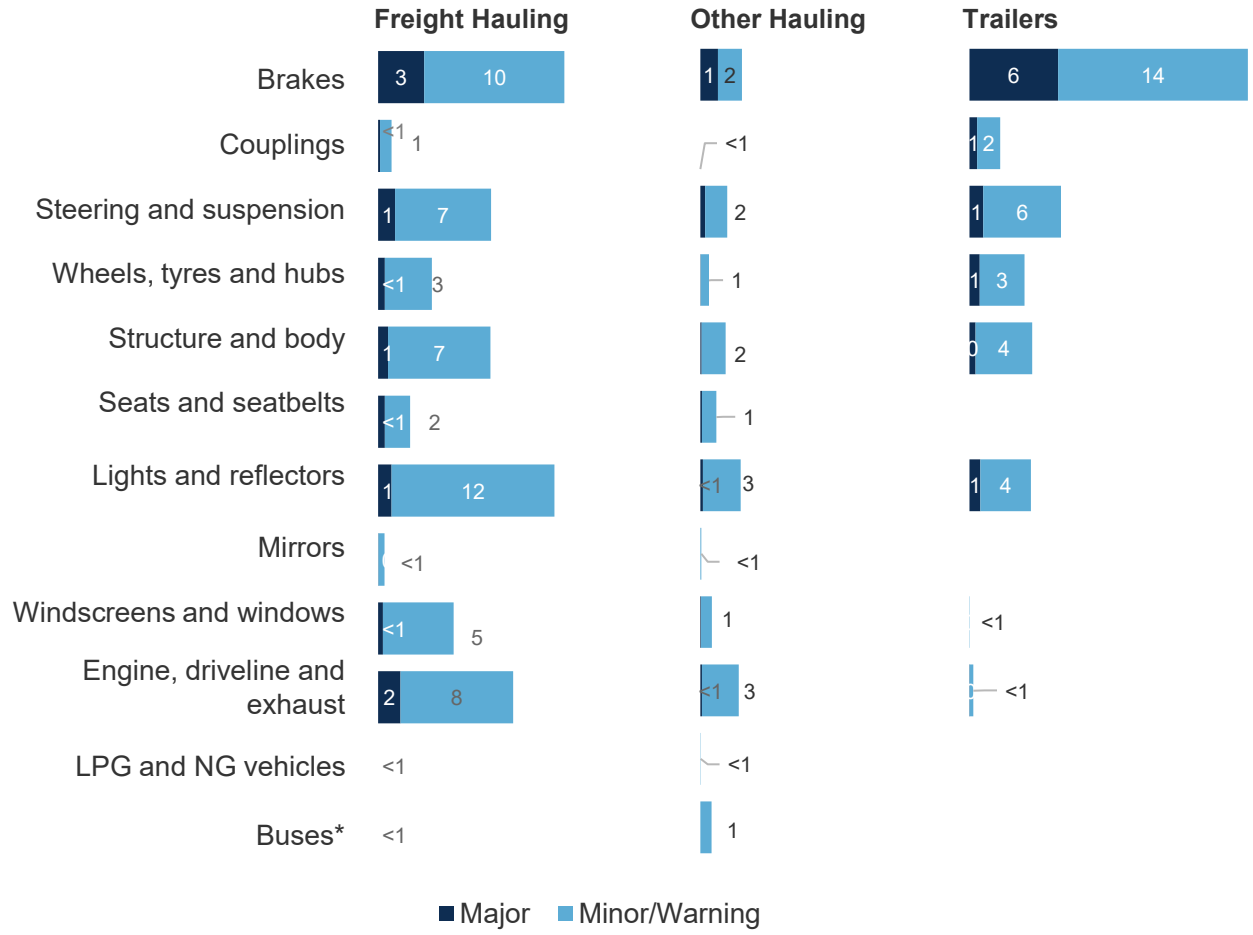
⇅ Statistically significant increase/decrease in comparison with 2016

3.3.2 Vehicle Systems: Level of Non-Conformity Amongst Hauling Units and Trailers

Amongst hauling units there has been a decrease in the incidence of major non-conformities in brakes (↓4%), couplings (↓1%), steering and suspension (↓3%)Structure and body (↓1%), Seats and seatbelts (↓1%) and engine, driveline and exhaust (↓1%) since 2016.

Similarly, there has been a decrease in the incidence of major non-conformity amongst trailers related to brakes (↓5%), couplings (↓1%), steering and suspension (↓2%), wheels, tyres and hubs (↓2%) and structure and body (↓1%).

Highest level of non-conformity in freight hauling units, other hauling units and trailers by system (%)



** Incidence based on bus/coach vehicles only*
Note: There may be cases of a system non-conformity recorded which is atypical for the type of unit

Base 2021: Freight hauling units (n=6543), Other hauling (n=1795), Trailers (n=4987)
Base 2016: Freight hauling units (n=5471), Other hauling units (n=1659), Trailers (n=3936)

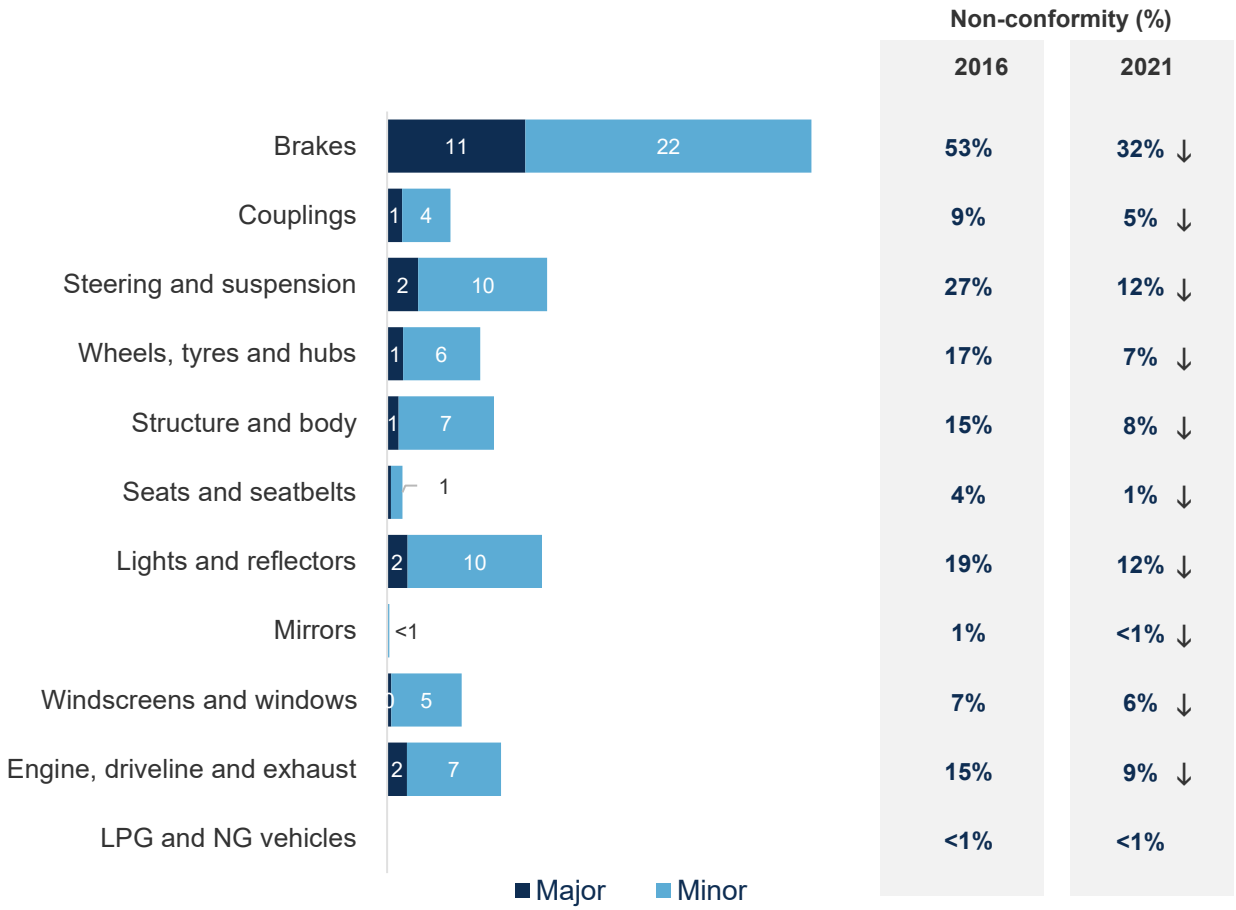
Statistically significant increase/decrease in comparison with 2016

3.3.3 Vehicle Systems: Level of Non-Conformity Amongst Freight Vehicle Combinations

Freight vehicle combinations are defined as a vehicle with a freight hauling unit towing one or more trailers. This includes truck and trailer, semi-trailer, B-double and road train combinations. There has also been a decrease in the incidence of non-conformity across categories (with the exception of LPG and NG vehicles).

Brakes remain the vehicle system with the highest incidence of non-conformities amongst freight vehicle combinations (32%). However, the incidence of brake system non-conformity decreased significantly between 2016 and 2021. Other notable decreases include the following categories - steering and suspension non-conformities (27% down to 12%), wheels, tyres and hubs (17% to 7%) and lights and reflectors (19% to 12%) over the same period.

Highest level of categories of non-conformity in freight vehicle combinations (%)



Base 2021: All freight vehicle combinations (n=8099)
Base 2016: All freight vehicle combinations (n=3586)

↑↓ Statistically significant increase/decrease in comparison with 2016

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3.4 Brake Test Outcomes

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3.4.1 Brake Test Outcomes: Roller Brake Tests

An important component of the NRS was the collection of data from roller brake tests (RBTs). Roller brake testing was intended to be conducted on all axles of all units, unless it was unsafe to do so, weather issues or practical issues such as the unit not being suitable for testing. In these instances, a visual inspection was conducted, another effective method of identifying defects in braking systems.

Compared to the 2016 baseline, there was a significant decrease in the number of RBTs completed (71% vs 2016 95%), instead authorised officers opted to conduct visual inspections. This is partly due to the different timing of inspections compared to 2016, more inspections were conducted in the wet (19% vs 2016 13%), limiting the use of RBTs, plus issues with the machines themselves – out of operation and availability at some sites.

There were less RBTs conducted across all vehicle types – in line with 2016, Plant/SPV were the least likely to have a RBT conducted. Similar to 2016, the number of possible tests to be conducted on plant/SPV is influenced by the location of the inspection and the availability of mobile testing units.

Examining the locations RBTs were not conducted, the incidence was much higher in WA (73%) and VIC (45%). Additionally, it appears RBTs were significantly less likely to occur between 8am and 1:59pm, one in three (34%) of units not undergoing the test and having a visual inspection conducted instead. This could be potentially due to time pressures felt by authorised officers, who opted for the later option.

There were several issues observed with the RBTs when conducted. There were issues with faulty tests, influenced by factors associated with vehicles as well as the brake test unit, drivers failed to follow the instructions correctly, and some operator error in recording each axle sequentially and accurately. In some cases, axles were missed, or re-tested and sufficient information was not always available by which to interpret which results were relevant. Where these types of issues were identified, the unit was not included in the analysis.

Incidence of roller brake tests by hauling units by state of inspection (%)

State of Inspection	Hauling unit		Plant/SPV		Trailers	
	2021 (%)	2016 (%)	2021 (%)	2016 (%)	2021 (%)	2016 (%)
NSW	15%	<1%	8%	3%	14%	<1%
VIC	42%	1%	15%	92%	52%	1%
QLD	13%	<1%	26%	50%	11%	<1%
SA	22%	2%	21%	9%	21%	<1%
WA	68%	-	6%	-	81%	-
TAS	2%	<1%	14%	<1%	0%	<1%
NT	22%	6%	20%	67%	12%	6%
ACT	7%	2%	44%	84%	7%	2%

Base 2021: Total (n=13325), Rigid truck (n=3835), Semi-trailer (n=1443), B-double (n=842), Road train (n=423), Bus/Coach (n=1036), Plant/SPV (n=759), Trailer (n=4987)
Base 2016: Total (n=11066), Rigid truck (n=3227), Semi-trailer (n=1221), B-double (n=802), Road train (n=221), Bus/Coach (n=1015), Plant/SPV (n=644), Trailer (n=3936)

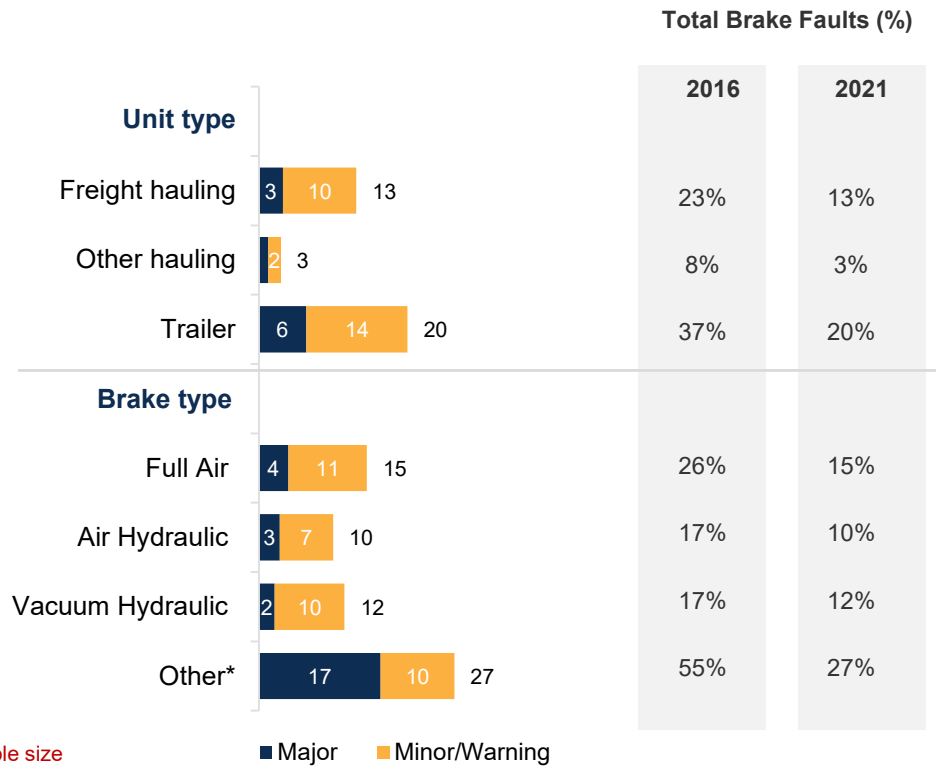
3.4.2 Brake Test Outcomes: Type of Brake Systems

The number of brake non-conformities has significantly decreased compared to NRBS 2016 across all unit types. While the most common brake type, full air brakes, are again the most likely to experience issues of non-conformity among the three main types.

Examining the age of the fleet, there is a positive correlation between unit age and the likelihood of a braking defect. Units less than 6 years old are the least likely to experience any braking defect (8%), whereas units manufactured over 12 years ago defects increase to 21%. The incidence of a major defect also increases with age of unit (<6 years 2%, 6-<12 years 3%, 12+ years 7%). There are several manufacturers who experience significantly higher braking defects. These manufactures are Western Star (33%), Freightliner (28%), Kenworth (23%), and Mack (22%).

NRS 2021 recorded more units with different brake types (n=107 units vs 2016 n=29). The most common brake type amongst brake types was electric followed by hydraulic and disc. In line with 2016, units with electric brake systems were more likely to experience non-conformity issues.

Incidence of highest level of brake non-conformities in units and by type of brake system (%)



*Caution – small sample size

Base 2021: Freight hauling (n=6543), Other hauling (n=1759), Trailer (n=4987), Full air (n=11442), Air hydraulic (n=1443), Vacuum hydraulic (n=333), Other (n=107)
Base 2016: Freight hauling (n=5471), Other hauling (n=1659), Trailer (n=3932), Full air (n=9571), Air hydraulic (n=1109), Vacuum hydraulic (n=353), Other (n=29)

3.4.3 Brake Test Outcomes: Brake Efficiency (1)

During the NRBS 2016, the NHVR requirement for measuring brake efficiency for a vehicle when measured in the roller brake test was kiloNewtons per tonne (kN/T) – force generated by the brakes. Vehicles were required to met a minimum level of 4.5 kN/T. Subsequently, NHVR has updated their NHVIM to the measure the deceleration to measure braking efficiency. The measure of deceleration is expressed in m/s/s. The minimum required deceleration is 4.4 m/s/s as expressed in the NHVIM.

To allow for comparison to the NRBS 2016 we captured force as measured in kN/T and we have also included deceleration to form a new benchmark for future NRS to compare against. The percentages of units meeting the standard of 4.5 kN/tonne has significantly increased for Rigid Trucks, Articulated Hauling units and Trailers. In line with the improvements seen among braking defects, braking performance has also improved across Rigid Trucks (↑4%), Articulated Hauling units (↑8%) and the biggest improvement was seen with Trailers (↑15%). While these improvements are significant, with out being able to identify why there was such a decrease in the number of units who completed an RBT these results should be treated with some caution.

Force – Brake efficiency

Measure	Rigid Truck		Articulated hauling unit		Trailer		Bus/Coach	
	2021	2016	2021	2016	2021	2016	2021	2016
≥ 4.5 kN/T (%)	89%	85%	86%	77%	51%	37%	92%	90%
Mean	5.73	5.58	5.68	5.34	4.74	4.27	6.13	5.87
STD DEV.	1.24	1.21	1.36	1.22	1.52	1.36	1.32	1.55
Sample	2,893	2,709	1,776	2,191	2,925	3,489	644	931

Deceleration – Brake efficiency

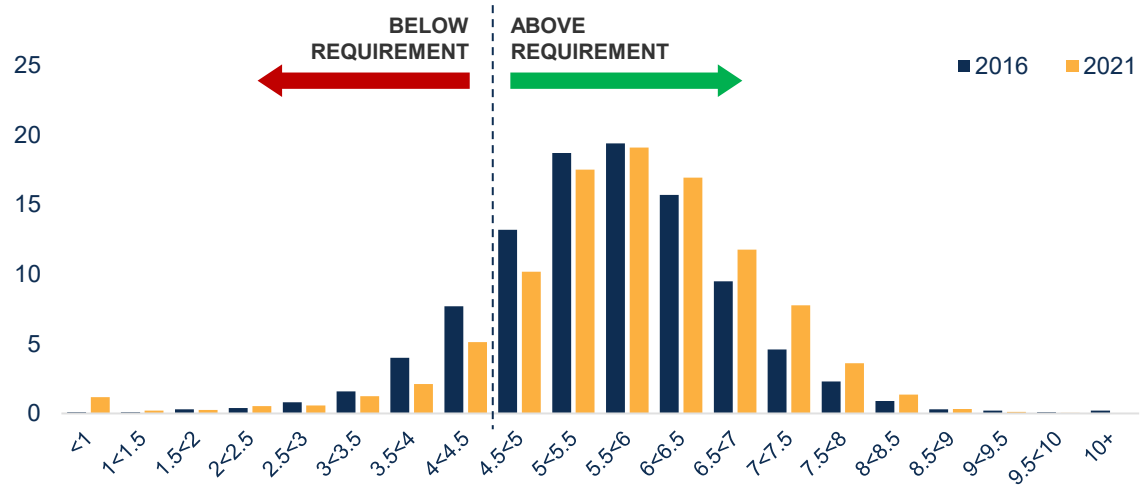
Measure	Rigid Truck	Articulated hauling unit	Trailer	Bus/Coach
≥ 4.4 m/s/s (%)	89.2%	82.8%	60.8%	95.7%
Mean	60.75	59.95	52.56	67.40
STD DEV.	13.77	16.40	18.74	12.15
Sample	4,235	2,441	4,223	822

Base: All units that had completed roller brake test output available

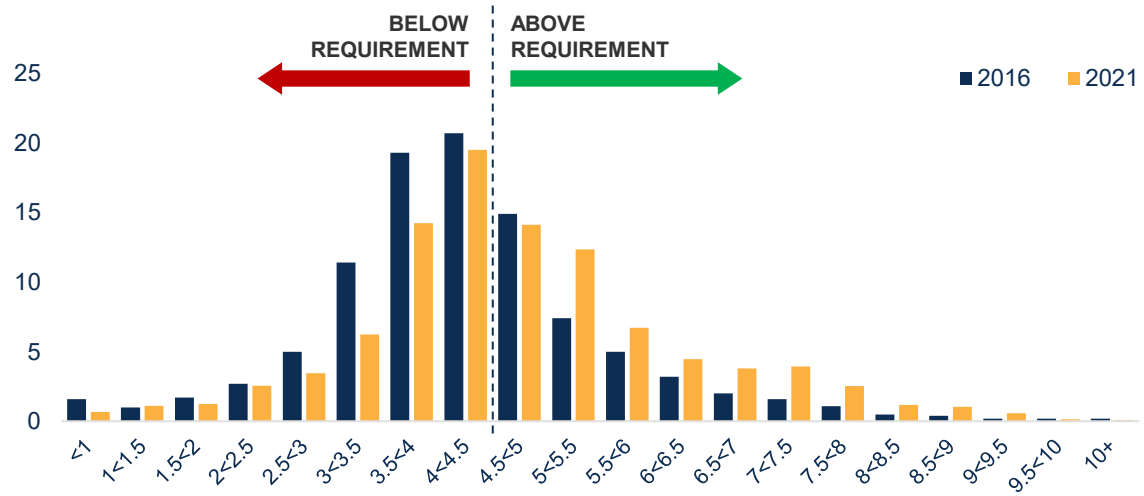
3.4.3 Brake Test Outcomes: Brake Efficiency (2)

The charts below show the 2016 and 2021 distributions of brake efficiency (kN/T) for the different vehicle types. The distribution of braking efficiency has shifted further to the right above the minimum requirements in the 2021 NRS for hauling units and trailers especially.

Brake efficiency (kN/T) Rigid trucks



Brake efficiency (kN/T) Trailers

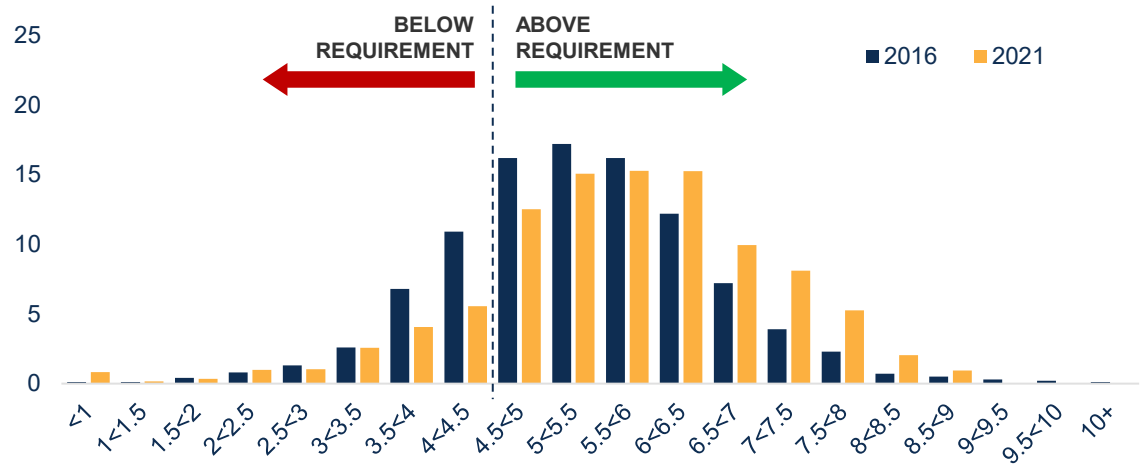


Base: 2021 All units that had completed roller brake test output available.
Base: 2016 Rigid trucks (n=2709), Articulated hauling units (n=2191), Trailer (n=3489), Bus/Coach (n=931)

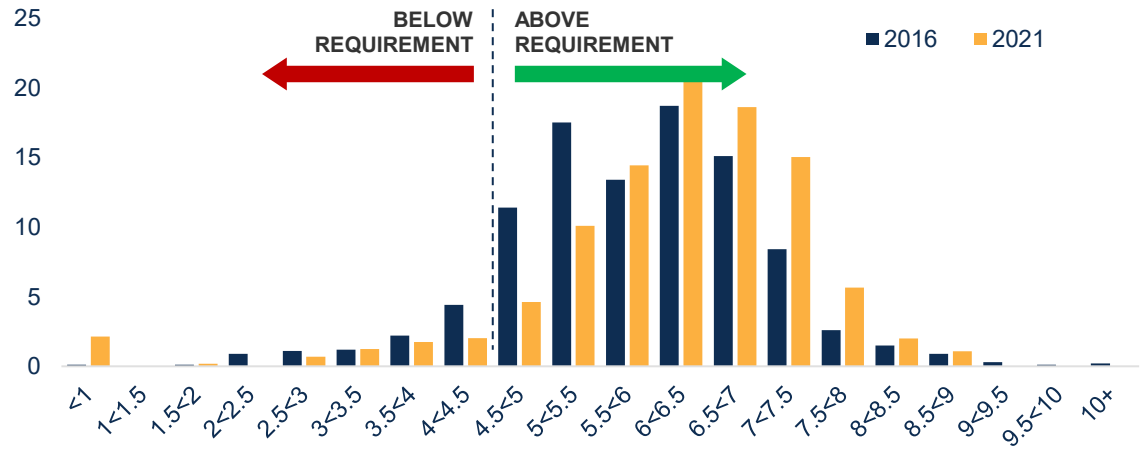
3.4.3 Brake Test Outcomes: Brake Efficiency (3)

The charts below show the 2016 and 2021 distributions of brake efficiency (kN/T) for the different vehicle types. Bus/Coach braking efficiency has further skewed to the right of the minimum standard.

Brake efficiency (kN/T) Articulated haling units



Brake efficiency (kN/T) Bus/Coach



Base: 2021 All units that had completed roller brake test output available.
Base: 2016 Rigid trucks (n=2709), Articulated hauling units (n=2191), Trailer (n=3489), Bus/Coach (n=931)

3.0

RESEARCH FINDINGS

3.5 Compliance Schemes

KANTAR PUBLIC

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3.5.1 Compliance Schemes: Participation In Compliance Schemes

Compared to the 2016 NRS, there were multiple categories of units who are significantly less likely to be participating in any compliance scheme – which is surprising given the decrease in non-conformities observed. The unit types with less involvement in compliance programs were: Articulated (51% vs 2016 58%); Semi-trailer (36% vs 2016 46%); B-double (64% vs 2016 78%); Road train (61% vs 2016 78%); and Trailers (42% vs 2016 47%).

The 2021 NRS also included fieldwork in WA, which increased the overall participation of units registered in WA. Among these units we see on average slightly lower rates of participation in the maintenance schemes compared to the comparable NHVAS scheme.

Units currently participating in any program are significantly less likely to register any defect (28% vs not-participating 32%). However, the incidence of major defects were similar for units participating (5%) and those that weren't (6%).

Participation of drivers units in alternative compliance schemes (%)

NHVAS scheme	Freight	Articu-lated	Rigid truck	Semi-trailer	B-double	Road train	Bus/ coach	Plant/ SPV	Trailers
Fatigue	9	13	1	7	11	17	13	1	0
Maintenance	8	28	1	12	21	40	28	1	18
Mass management	7	31	1	13	17	47	31	1	25
Loading and dimension	5	21	1	16	3	28	21	0	17

Units Participation in Compliance Schemes (%)

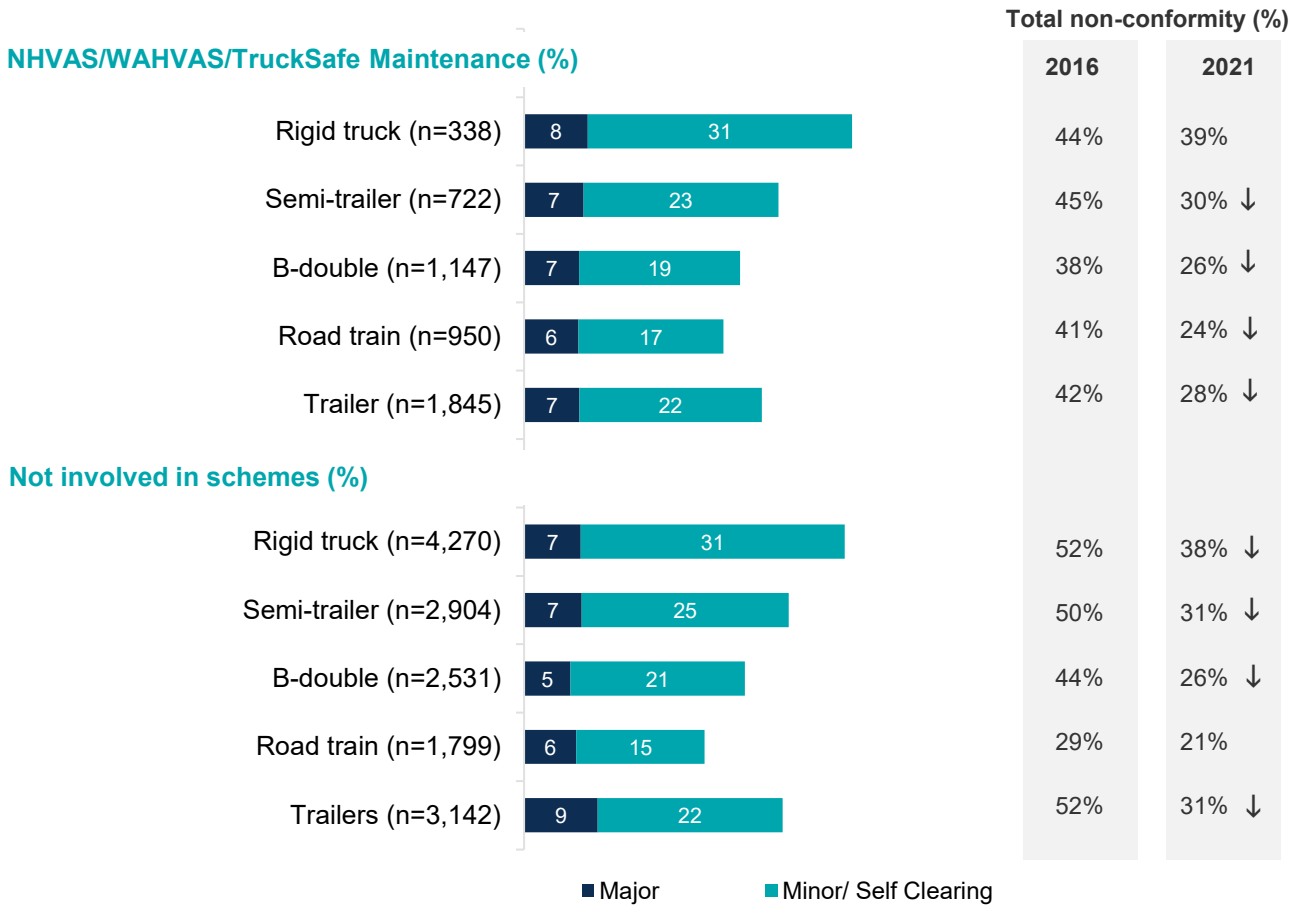
Measure	NHVAS Maintenance		Trucksafe Maintenance		NHVAS Mass Management		Participation in any program	
	2021	2016	2021	2016	2021	2016	2021	2016
Freight	12	13	<1	<1	13	12	20	20
Articulated	33	38	<1	1	28	45	51	58
Rigid truck	8	6	<1	<1	6	4	11	10
Semi-trailer	22	27	<1	1	23	33	36	46
B-double	47	54	<1	1	41	64	64	78
Road train	33	61	<1	<1	16	57	61	78
Bus/coach	<1	<1	-	<1	<1	<1	2	4
Plant/SPV	<1	2	-	<1	<1	<1	30	27
Trailers	29	34	<1	<1	18	24	42	47

3.5.2 Compliance Schemes: Impact of NHVAS / TRUCKSAFE / WAHVAS Maintenance Schemes

Compared to the 2016 NRS, there were no significant differences observed across unit type. Whereas the incidence of non-conformities was significantly lower for rigid truck, semi-trailer and B-double hauling units in 2016.

However, when comparing the incidence of non-conformities for the same condition (e.g. semi-trailers participating in Maintenance schemes) there are significant differences. Among those participating in the maintenance schemes, Semi-trailers, B-doubles, Road trains, and trailers are significantly less likely to observe any non-conformities. A similar trend is observed among vehicle units not participating in schemes.

In 2016, it was noted that participation in schemes was not a strong predicator of non-conformity compared to age of vehicle. However, even with the average increased age of the vehicles surveyed in 2021 there has been a significant decrease in non-conformities across the different vehicles.



Base 2021: Freight (n=6543), Articulated (n=4961), Rigid truck (n=3835), Semi truck (n=1443), B-double (n=842), Road train (n=423), Bus/coach (n=1036) Plant/SPV (n=759) Trailers (n=4987)
Base 2016: Freight (n=5571), Articulated (n=2244), Rigid truck (n=3227), Semi truck (n=1221), B-double (n=802), Road train (n=221), Bus/coach (n=1015) Plant/SPV (n=644) Trailers (n=3936)

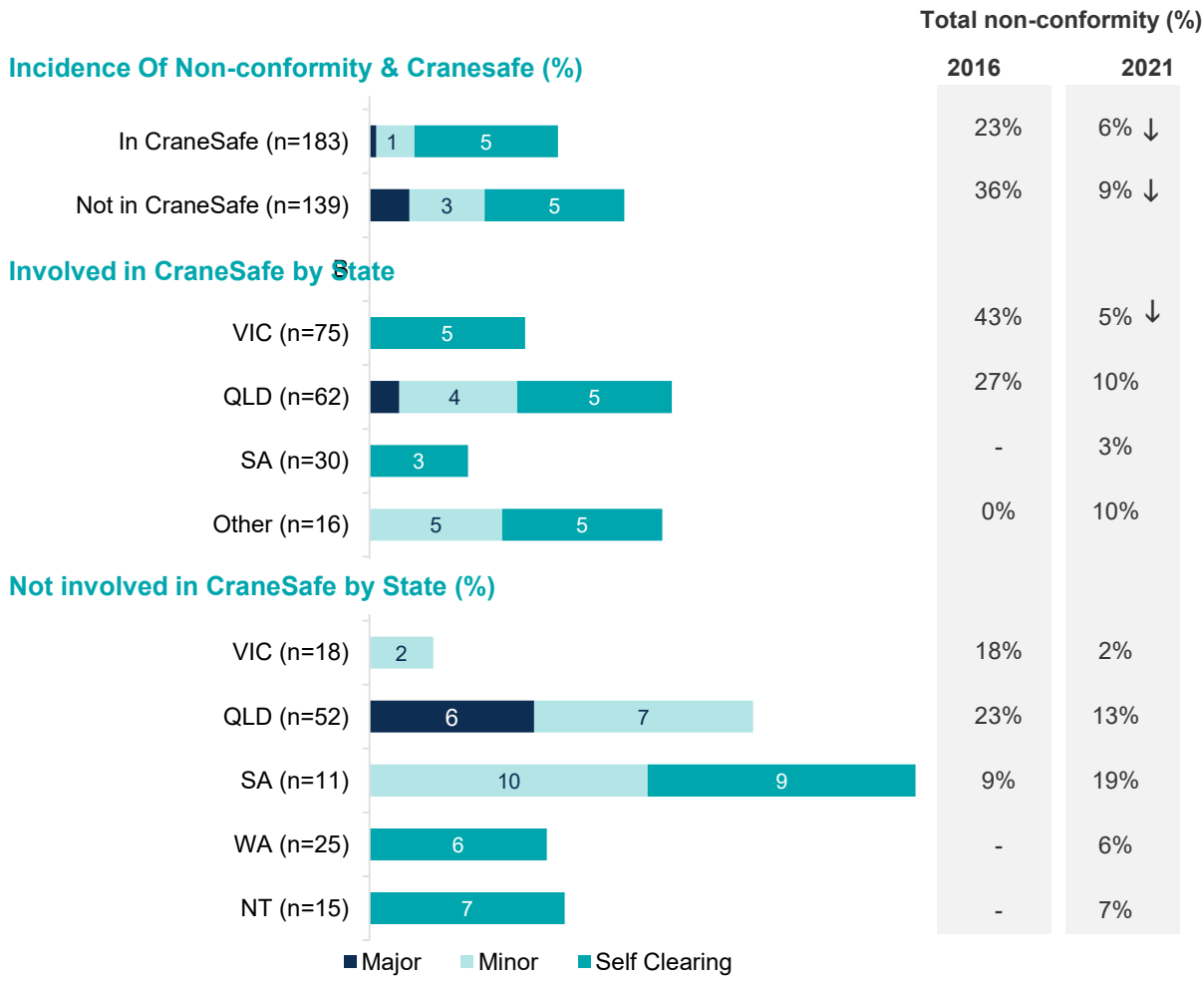
↑↓ Statistically significant increase/decrease in comparison with 2016

3.5.3 Compliance Schemes: CRANESAFE

Participation in the CraneSafe scheme and the incidence of non-conformity among cranes was examined in NRS 2021. A quick reminder, CraneSafe is a national, industry-initiated voluntary crane assessment program, with the aim of supplementing existing safety standards with annual assessments. Among the n=322 cranes inspected in the survey, half (50%) were participating in CraneSafe program.

The incidence of minor or major non-conformities was not significantly different for participation (6%) than non-participation (9%) cranes in the 2021 NRS. However, the incidence of any non-conformity decreased significantly compared to the 2016 NRS for both those in the CraneSafe scheme and those not participating.

We also examined the relationship between age of the crane and the incidence of non-conformity, but no significant differences were observed.



Base 2016: In CraneSafe (n=146), Not in CraneSafe (n=168), Involved in CraneSafe by State: VIC (n=114), QLD (n=30), ACT (n=16), Other (n=8), Not involved in CraneSafe by State: VIC (n=17), QLD (n=47), SA (n=35), NSW (n=43)

↑↓ Statistically significant increase/decrease in comparison with 2016

3.0

RESEARCH FINDINGS

3.6 Inspection Time

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3.6.0 Inspection Time: Day Time Versus Night Time Inspections

During the NRBS 2016 there was a potential relationship noted between the time of the inspection and the likelihood of a vehicle/combination to record a defect / non-conformity. In the 2021 NRS 3.5 times more inspections occurred between the hours of 8pm and 5:59am (n=1,000 inspections vs 277 inspections in 2016) and NSW again conducted the vast majority of night-time inspections (n=658), followed by QLD (n=199) and VIC (n=91).

There is no relationship (correlation r=0.05) between the time of inspection and the likelihood of a non-conformity to be observed, we note that inspections that occurred after 2:00pm were significantly more likely to observe non-conformities. The opposite pattern was observed during the NRBS 2016 – where inspections after 6pm were significantly less likely to observe any non-conformities compared to the morning and early afternoon.

Another item noted was the ratio of hauling units and trailers inspected across the different parts of the day. In the NRBS 2016 more vehicles were inspected with trailers in the evening (after 6pm) around a 50:50 split for hauling units and trailers, whereas the split in 2021 NRS was 62% hauling units : 38% trailers after 6pm. Potentially for the next NRS it could be worth considering the times different vehicle types are intercepted.

Non-conformity by inspection time (%)

Time of Inspection	12:01am - 2:59am	3:00am - 5:59am	6:00am - 7:59am	8:00am - 9:59am	10:00am - 11:59am	12:00pm - 1:59pm	2:00pm - 3:59pm	4:00pm - 5:59pm	6:00pm - 7:59pm	8:00pm - 12:00am
Self-Clearing	7	3	4	7	6	6	8	6	4	4
Minor	17	18	21	18	17	16	22	26	26	32
Major	7	4	3	4	4	6	5	5	6	6
Major (Grounded)	1	<1	1	1	1	1	2	1	3	1
NET: Minor *	24	21	25	25	23	22	29	32	29	35
NET: Major	8	4	4	5	5	7	6	6	9	6
NET: Any non-conformity recorded	32	26	29	30	29	29	36	38	38	41
Sample	274	232	528	2567	3355	2539	1496	1066	774	494

*NOTE: The 'NET Minor' combines Self-Clearing and Minor categories together

3.0

RESEARCH FINDINGS

3.7 Metro Versus Non-Metro

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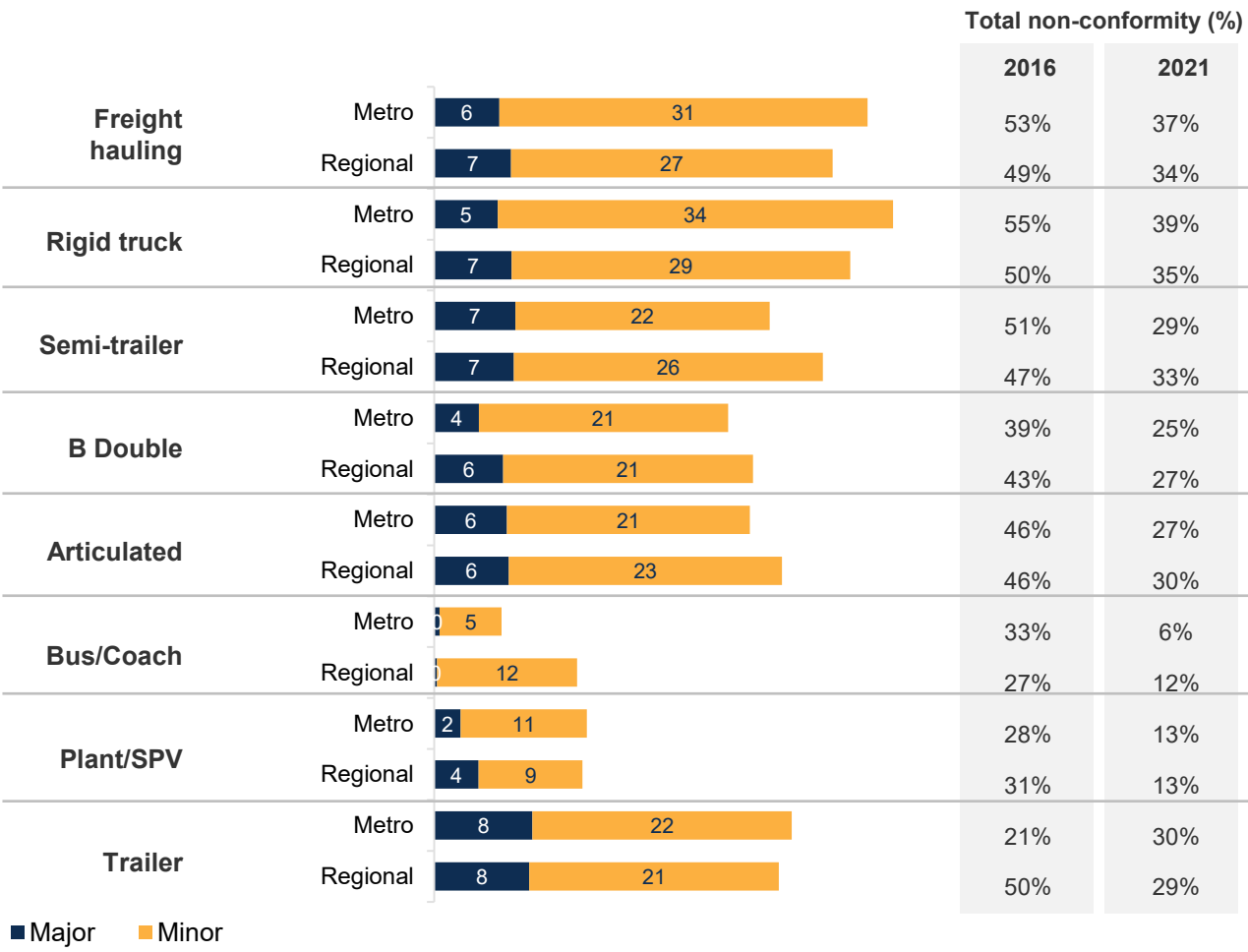
3.7.0 Inspection Time: Metro Versus Non-Metro

Accounting for the inclusion of WA in the 2021 analysis of differences between metro and regional areas we have maintained the 2016 NRS approach. This is to exclude NT, TAS and ACT where each state or territory is categorised as only one type of area. That means, the incidences of non-conformities for hauling units and trailers are shown for inspections in NSW, VIC, QLD, WA and SA comparing metropolitan and non-metropolitan areas. Freight hauling units were significant more likely to have a minor non-conformity in metropolitan areas (31% vs regional 27%). This was also repeated in Rigid trucks (minor - 34% metro vs 29% regional). Meanwhile, Semi-trailers were significantly more likely to have a minor non-conformity in regional areas (33% vs metro 29%).

Compared to the 2016 findings, metro and regional Bus/Coaches, metro Semi-trailers and regional Plant/SPV units were half as likely to record a non-conformity. Meanwhile trailer units inspected in metro areas were significantly more likely to record a non-conformance compared to 2016.

Incidence of non-conformity (%)



Base 2021: Freight hauling metro (n=3234), Freight hauling regional (n=3309), Rigid truck metro (n=2104), Rigid truck regional (n=1731), Semi-trailer metro (n=699), Semi-trailer regional (n=744), B-double metro (n=384), B-double regional (n=458), Articulated metro (n=1826), Articulated regional (n=3135), Bus/Coach metro (n=685), Bus/Coach regional (n=351), Plant/SPV metro (n=416), Plant/SPV regional (n=343), Trailer (n=1836) metro, Trailer regional (n=3151)

3.0

RESEARCH FINDINGS

3.8 Vehicle Profile

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3.8.1 Vehicle Profile

10% ↑ from **9** years in 2016

Average age (years) Hauling Units

11% ↑ from **10** years in 2016

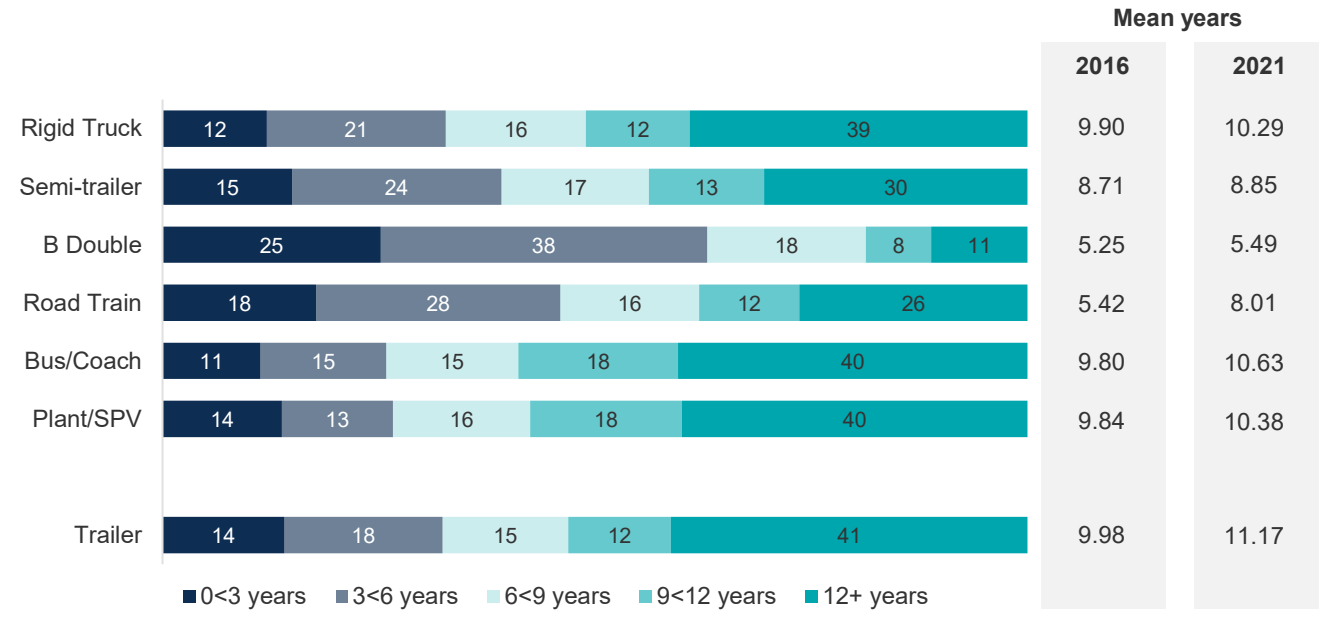
Average age (years) Trailers

Vehicle age had been found in NRBS 2016 to be strongly associated with the incidence of non-conformities. A profile of age of vehicle units was assessed to provide context to the roadworthiness results.

The age of each unit was calculated based on the date of manufacture, referenced to the survey year for the unit. Overall 38% of total units were assessed to be 12 years and older, and 50% of total units were assessed to be 9 years and older.

B-double's were the newest, with the average age below 5.5 years. Rigid trucks, buses/coaches, plant/SPV and trailers were again the oldest, with an average exceeding 9 years. Four in ten of each of these unit types were 12 years and older.

2021 vehicle units (%)



Base 2021: Rigid Truck (n=3835), Semi-trailer (n=1443), B Double (n=842), Road Train (n=423), Bus/Coach (n=1036), Plant (n=759), Trailer (n=4987)
Base 2016: Rigid Truck (n=3164), Semi-trailer (n=1197), B Double (n=789), Road Train (n=208), Bus/Coach (n=1012), Plant (n=616), Trailer (n=3774)

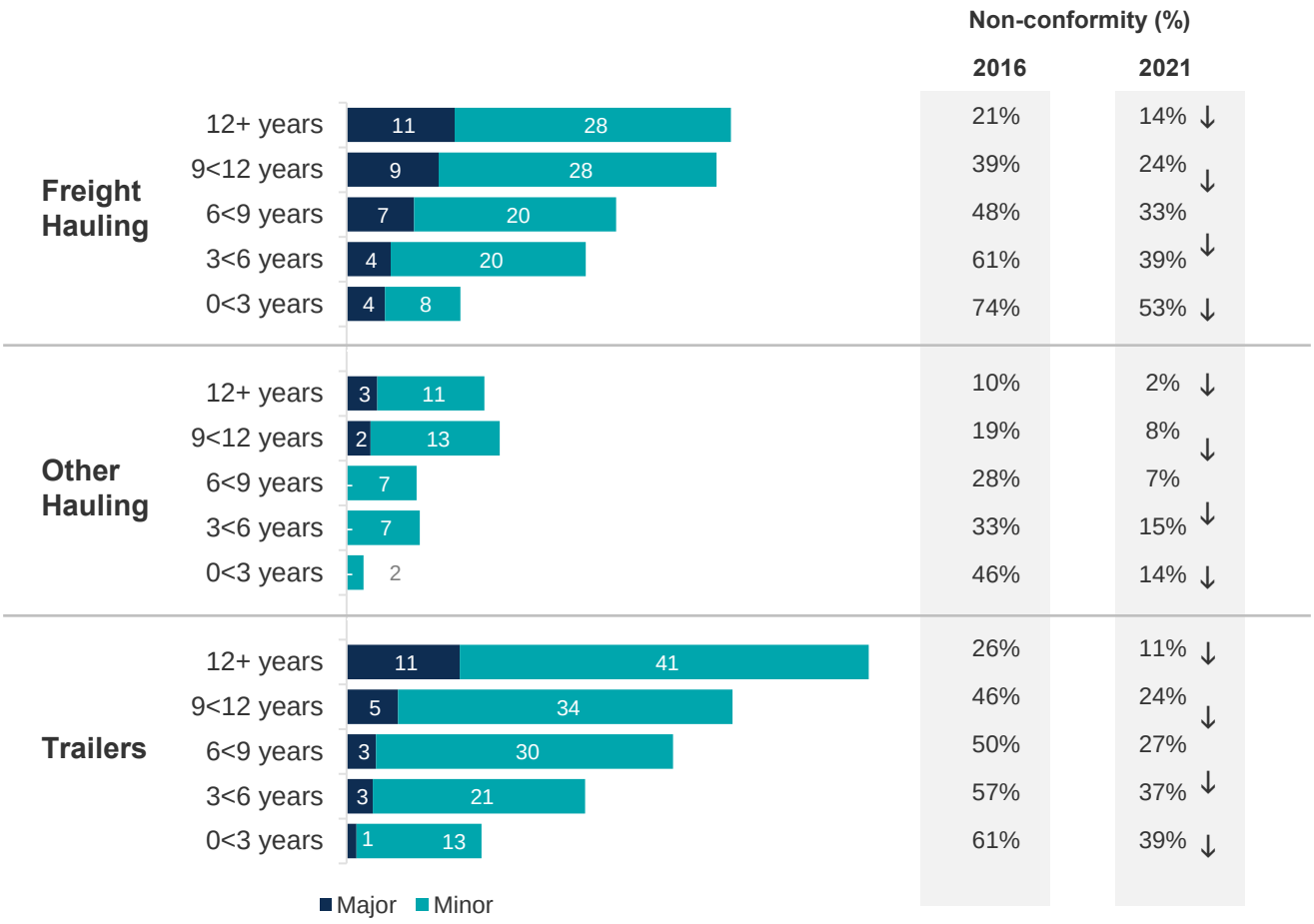
3.8.2 Vehicle Profile: Relationship Between Vehicle Age and Non-Conformity (1)

The relationship between age and non-conformity was assessed for freight hauling units, other hauling units and trailers across the five age groups.

There again appeared to be a direct relationship between the age of a unit and the incidence of non-conformity. The findings demonstrated that the incidence of non-conformity increased with age. Freight hauling units showed the greatest increase with age (from 14% for 0<3 years up to 53% for 12+ years age).

Encouragingly there has been a decrease in the level of non-conformity across each age group since 2016.

Vehicle Units (%)



Base 2021: Units where age is recorded – Freight hauling (n=5815), Other hauling (n=1732), Trailers (n=4783)
Base 2016: Units where age is recorded – Freight hauling (n=5354), Other hauling (n=1628), Trailers (n=3774)

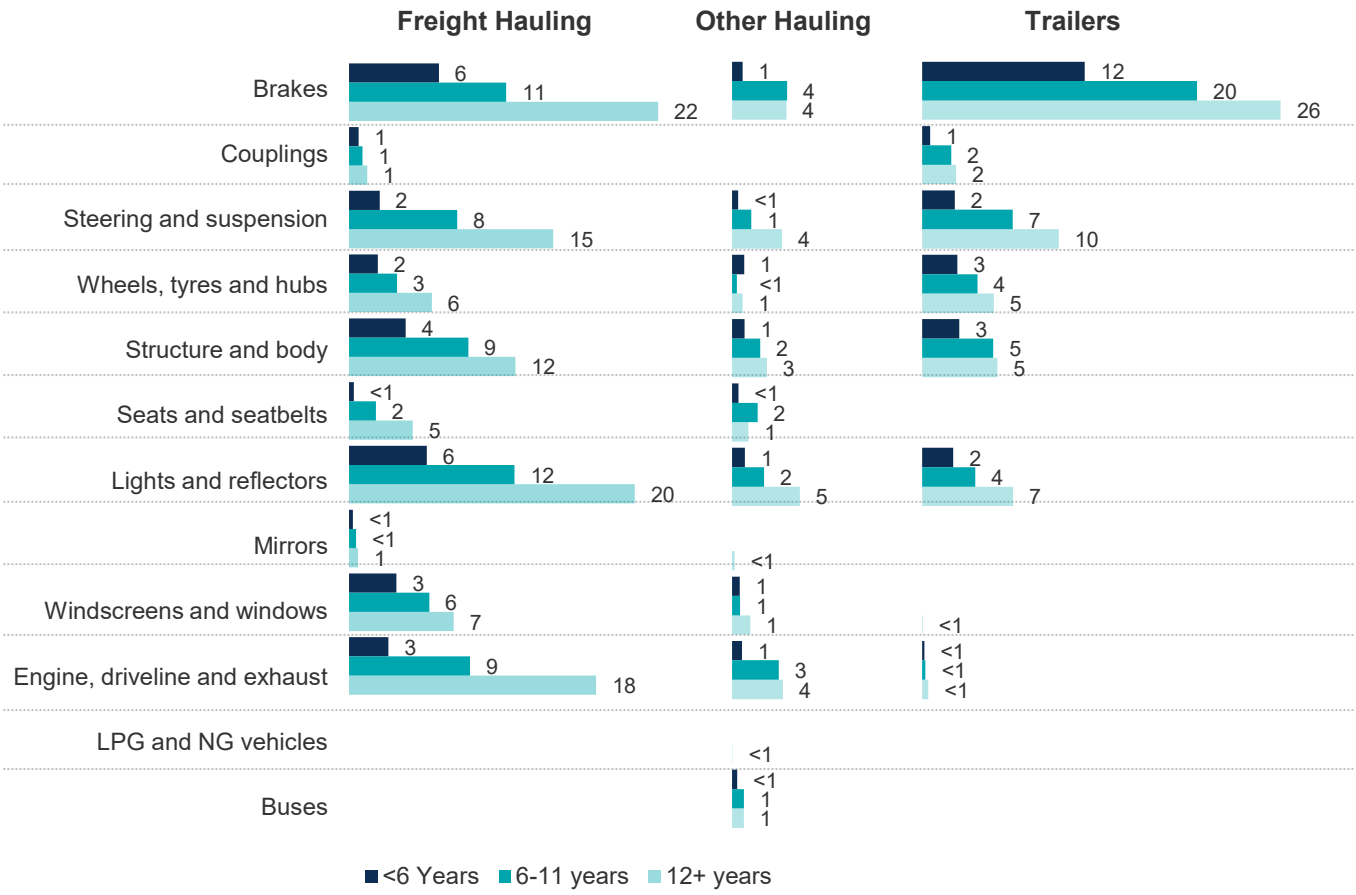
↓↑ Statistically significant increase/decrease in comparison with 2016

3.8.2 Vehicle Profile: Relationship Between Vehicle Age and Non-Conformity (2)

Non-conformities were assessed for 12 main vehicle systems covered in the NHVIM, to have a consistent way of reporting the non-conformities identified. The increase in incidence of a non-conformity occurred consistently for the 12 main vehicle system non-conformities covered in the survey, including brakes, and steering and suspension.
The charts show that the increase in the incidence of any classification of non-conformity (i.e. minor or major) occurred consistently with age for the 12 systems, including brakes, and steering and suspension. The incidence was greatest for brake non-conformities for freight hauling units and trailers aged 12 years and over.

The four systems with the highest incidences for units aged 12 years and over were:
- brakes: trailers (27%) and freight hauling units (22%);
- steering and suspension: freight hauling units (15%);
- lights and reflectors: freight hauling units (21%); and
- engine, driveline and exhaust: freight hauling units (18%).

Age by non-conformity (%)



Base 2021: Units where age is recorded – Freight hauling (n=5815), Other hauling (n=1732), Trailers (n=4783)

4.0 Appendix A

RESEARCH METHODOLOGY

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Consultation and management

The NHVR consulted extensively with jurisdictions nationally and with industry to explain the rationale and objectives of the survey, along with details of implementation, to demonstrate the value of the survey and address any concerns about the impact of its implementation. NHVR undertook a pre-survey media and industry engagement campaign to inform industry about survey, what to expect, etc; therefore there is risk that industry manipulated fleet, particularly for PFIs.

The overall management approach involved three key stakeholders:

- Jurisdictions: to manage the inspection logistics, perform inspections and record the survey data.
- Kantar Public: as the survey partner, to set up the survey method, address issues with data collection through the survey period, provide daily reports on progress, and analyse and report on the results.
- NHVR: to coordinate the survey implementation and liaise with the jurisdictions to address any logistical issues.

Inspection modes

Three main modes of selection of vehicles for inspection were implemented in the survey:

- roadside intercept, principally for rigid trucks, truck and trailer combinations and articulated vehicle combinations, as well as plant vehicles, where relevant;
- scheduled Inspection - observe annual and/or periodic inspections conducted by third parties where roadside intercepts and PFIs were unavailable.

Final Survey Numbers by State of Inspection

Sample Size

Total	NSW	VIC
13325	3327	2766

QLD	SA	WA
2596	1626	1774

TAS	NT	ACT
454	556	226

Vehicle systems

Non-conformities have been reported for the vehicle systems covered in the NHVIM to provide a consistent way of reporting. Categories of non-conformity included Brakes, Couplings, Steering and Suspensions, Wheels, Tyres and Hubs, Structure and Body, Seats and Seatbelts, Lights and Reflectors, Mirrors, Windscreens and Windows, Engine, Driveline and Exhaust. Liquid Petroleum Gas (LPG) and Natural Gas (NG) vehicles, as well as Bus/ Motorhomes were also included within vehicle systems.

Method and presentation of results

The NHVR engaged a statistical consultant, to recommend a sample size and sampling method to ensure the data collected was valid and reliable. This approach included over-sampling jurisdictions and vehicle groups with a smaller share of the vehicle fleet. Weighting involved applying a multiplier to individual sub-groups in the survey so that the resulting distribution matched that of the target heavy vehicle population. In general, the weighted results are presented in this report.

Vehicle selection

The most effective method for achieving a representative sample of vehicles would involve random selection. Fixed and mobile inspection stations along or close to main and secondary travel routes, with facility to use mobile interception on roads up to several kilometres away, provided a very good basis for achieving a representative sample, particularly of freight of vehicles. While certain freight vehicles would be less likely to be on such a route, or even active over the time period of the survey, the ability to access such vehicles was limited.

Within this sampling regime, access to plant/special purpose vehicles and buses/coaches was also limited. In the case of plant/SPV there was limited travel on the relevant routes, and in the case of buses/coaches there was a need to minimise disruption to services and passengers; in addition, it was not seen as appropriate or safe to attempt an inspection of a bus or coach loaded with passengers.

As a result of these sampling issues, it was accepted that the majority of the plant and bus/coach quotas would be inspected via special arrangement to visit a depot or attend an inspection station. Many of the plant vehicles were therefore inspected at depots, or arrangements made for the vehicles to be brought to an inspection station. In addition, the large majority of inspections of coaches and buses were also made at depots or through special arrangement.

Where jurisdictions had periodic inspections of vehicles, such vehicles were also allowed to be included in the survey, based on the full inspection required for the survey being implemented.

Survey Instrument

The survey instrument was based on that used in NRBS 2016. The survey had four broad categories of content:

- details of the inspection time and location;
- details about the vehicle combination, and then for each unit;
- details of non-conformity, completed separately for each unit; and
- capturing roller brake test results – printouts/recorded; in some cases information photographed.

Data collection

The primary data collection method was through Computer Assisted Personal Interview (CAPI), using tablets or mobile phones. The survey was programmed with the survey authoring software Confirmit, and implemented on the tablet/phone with the Confirmit CAPI app. This approach allowed the survey to be conducted offline, which facilitated inspections being conducted in some rural locations.

Online connectivity was required to download any revisions to the survey and upload data. Use of the tablets/phones and data input was managed by Authorised Officers. Paper forms were provided as a back-up for where use of the tablets was not possible.

Electronic data collection provided benefits of:

- the program managing the sequence of data entry, reducing the risk of missing information;
- storing/uploading data, reducing the need to handle paper forms; and
- taking and storing photographs, to demonstrate non-conformity.

Time efficiencies were achieved through auto-population of data and improved navigation in Confirmit and 3-4 person inspection teams with dedicated roles.

Monitoring of the fieldwork

The survey was monitored daily during fieldwork, and updates on the number of inspections completed were provided to NHVR and each jurisdiction Operations Managers.

Tests of statistical significance

Test of statistical significance were conducted (at 95% confidence interval) to assess whether differences in the incidences of non-conformity between groups of vehicles in the survey (e.g., comparing results for different jurisdictions, or comparing results for different vehicle categories) should be considered as real differences or just occurring by chance. Where a difference is confirmed, it is described as statistically significant.

Reporting non-conformity

The incidence of non-conformity in a unit or vehicle combination has been reported in three ways:

- the incidence of any classification of non-conformity for a unit or vehicle combination;
- the incidence of the highest level of non-conformity for a vehicle system for three categories: self clearing, minor and major/major grounded combined, along with the total incidence; and
- the incidence of the highest level of non-conformity for a vehicle system for two categories: self clearing/minor combined and major/major grounded combined, along with the total incidence.

It was possible for situations where the highest non-conformity identified was minor, however a major non-conformity notice was issued due to the number of minor non-conformities identified.

Terminology

All jurisdictions conducted inspections under the National Heavy Vehicle Inspection Manual (NHVIM) and NHVR mechanical inspection procedures to ensure consistency across jurisdictions. A non-conformity describes an item that does not meet the heavy vehicle safety standards. Categorisation does not reflect the condition of the vehicle, it simply reflects the risk the non-conformity presented with the use of the vehicle.

The classifications, in order of increasing severity, are described below:

- A self-clearing notice may be issued when a reasonable belief exists that the use of the vehicle on road does not pose a safety risk or the number plate is obscured, defaced or illegible.
- A minor non-conformity creates a concern over the safety of a vehicle, and subject to conditions, does not prevent the vehicle from being used on the road.
- A major non-conformity creates a significant concern over the safety of a vehicle, and subject to conditions and restrictions of use, does not prevent the vehicle from being used on the road.
- A major (grounded) non-conformity creates critical concern over the safety of a vehicle and the vehicle must not be used on a road while the non-conformity exists.

Terminology *(continued)*

As the NRBS was a research activity designed to take a snapshot of the mechanical condition of Australia's Heavy Vehicle fleet, the categorisation identified on a corresponding Defect Notice may not reflect the data captured for the purpose of the survey.

Each non-conformity was classified in isolation, rather than being classified as the safety risk of the aggregate impact of all non-conformity identified on the vehicle combination.

The report analyses three vehicle categories:

1. Hauling unit: the motorised unit of the vehicle combination (which may or may not be towing a trailer), including:
   - Rigid truck with no trailer (also includes a prime mover running bob-tail),
   - Prime mover,
   - Bus/Coach, and
   - Plant/SPV.
2. Trailer: the non-motorised unit attached to the hauling unit.
3. Freight vehicle combination: where the hauling unit is towing a trailer, including:
   - Rigid truck and trailer,
   - Semi-trailer: prime mover with one trailer,
   - B-double: prime mover with two trailers, and
   - Road train: rigid truck with three or more trailers and prime mover with two or more trailers.

Vehicle categories were further divided into:

- Freight - Rigid truck, Semi-trailer, B-double, Road train.
- Non-freight: the other vehicle categories - Bus/Coach, Plant/SPV.
- Articulated: semi-trailer, B-double or road train.

Sample sizes for vehicle categories by state of inspection

The tables below records the number of vehicles intercepted, of differing types, inspected in each jurisdiction in 2016 and 2021.

2021	STATE OF INSPECTION							
VEHICLE TYPE	**NSW**	**VIC**	**QLD**	**SA**	**TAS**	**NT**	**ACT**	**WA**
	n=	n=	n=	n=	n=	n=	n=	n=
Vehicle units								
Rigid truck	937	813	731	501	159	108	75	511
Semi-trailer	426	313	250	165	62	40	20	167
B-double	264	266	117	116	39	8	9	23
Road train	46	20	132	35	0	54	1	135
Articulated	*736*	*599*	*499*	*316*	*101*	*102*	*30*	*325*
Bus/Coach	279	182	222	117	24	33	52	127
Plant/SPV	154	200	141	120	12	20	27	85
Total vehicle units	**2106**	**1794**	**1593**	**1054**	**296**	**263**	**184**	**1048**
Trailers	**1221**	**972**	**1003**	**572**	**158**	**293**	**42**	**726**
TOTAL UNITS	**3327**	**2766**	**2596**	**1626**	**454**	**556**	**226**	**1774**

2016	STATE OF INSPECTION							
VEHICLE TYPE	**NSW**	**VIC**	**QLD**	**SA**	**TAS**	**NT**	**ACT**	**WA**
	n=	n=	n=	n=	n=	n=	n=	n=
Vehicle units								
Rigid truck	854	792	756	419	175	110	121	NA
Semi-trailer	286	362	279	178	65	30	21	NA
B-double	159	284	195	122	29	4	9	NA
Road train	60	8	59	51	0	43	0	NA
Articulated	*505*	*654*	*533*	*351*	*94*	*77*	*30*	NA
Bus/Coach	247	242	265	136	34	51	40	NA
Plant/SPV	155	229	142	77	13	3	25	NA
Total vehicle units	**1761**	**1917**	**1696**	**983**	**316**	**241**	**216**	NA
Trailers	**876**	**1043**	**972**	**622**	**140**	**233**	**50**	NA
TOTAL UNITS	**2637**	**2960**	**2668**	**1605**	**456**	**474**	**266**	**NA**

Highlighting small sample sizes <30 – results for these cells have not been reported in the detailed results

Sample sizes for vehicle categories by state of registration

The tables below records the number of vehicles intercepted, of differing types, registered in each jurisdiction in 2016 and 2021

2021	STATE OF REGISTRATION							
VEHICLE TYPE	**NSW**	**VIC**	**QLD**	**SA**	**TAS**	**NT**	**ACT**	**WA**
	n=	n=	n=	n=	n=	n=	n=	n=
Vehicle units								
Rigid truck	886	936	812	422	157	75	34	513
Semi-trailer	373	414	293	102	64	20	7	170
B-double	159	341	188	79	41	1	2	31
Road train	19	37	165	38	0	33	2	129
Articulated	*551*	*792*	*646*	*219*	*105*	*54*	11	*330*
Bus/Coach	268	186	234	113	23	32	52	128
Plant/SPV	131	172	192	121	11	20	24	88
Total vehicle units	**1836**	**2086**	**1884**	**875**	**296**	**181**	**121**	**1059**
Trailers	**818**	**1343**	**1407**	**428**	**147**	**124**	**11**	**699**
TOTAL UNITS	**2654**	**3429**	**3291**	**1303**	**443**	**305**	**132**	**1758**

2016	STATE OF REGISTRATION							
VEHICLE TYPE	**NSW**	**VIC**	**QLD**	**SA**	**TAS**	**NT**	**ACT**	**WA**
	n=	n=	n=	n=	n=	n=	n=	n=
Vehicle units								
Rigid truck	830	874	802	387	169	84	65	16
Semi-trailer	242	412	301	155	70	29	7	5
B-double	135	334	198	100	29	4	0	2
Road train	15	13	104	54	0	24	1	10
Articulated	*392*	*759*	*603*	*309*	*99*	*57*	*8*	*17*
Bus/Coach	243	245	271	135	34	45	39	3
Plant/SPV	144	204	179	71	15	3	22	6
Total vehicle units	**1609**	**2082**	**1855**	**902**	**317**	**189**	**134**	**42**
Trailers	**567**	**1274**	**1241**	**528**	**133**	**120**	**11**	**62**
TOTAL UNITS	**2176**	**3356**	**3096**	**1430**	**450**	**309**	**145**	**104**

Highlighting small sample sizes <30 – results for these cells have not been reported in the detailed results

Glossary

TECHNICAL

Axle
One or more shafts positioned in a line across a vehicle, on which one or more wheels intended to support the vehicle turn.

Axle Group
A single axle group, tandem axle group, twin steer axle group, tri-axle group or quad-axle group.

B-double
A combination consisting of a prime mover towing two semitrailers, with the first semitrailer being attached directly to the prime mover by a fifth wheel coupling and the second semitrailer being mounted on the rear of the first semitrailer by a fifth wheel coupling on the first semitrailer.

Combination
A group of vehicles consisting of a motor vehicle such as a prime mover or rigid truck towing one or more other vehicle units such as semi-trailer or trailer.

Consultation
Communicate or engage with persons through appropriate methods (face-to-face, email, meetings etc.).

Coupling
A device used to couple a vehicle in a combination to the vehicle in front of it.

Dog Trailer
A trailer (including a trailer consisting of a semitrailer and converter dolly) that has:
- one axle group or a single axle at the front that is being steered by connection to a towing vehicle by a drawbar; and
- one axle group or a single axle at the rear.

Hauling Unit
A motor vehicle that forms part of a combination, but does not include a trailer.

Heavy Vehicles
Vehicles that have a gross vehicle mass (GVM) or aggregate trailer mass (ATM) greater than 4.5 tonnes.

Inspection
An Inspection is an assessment of a vehicle against a set of standards to determine compliance to the standards. Its components and subsystems are examined to determine if their jurisdiction complies with the applicable design and operating standards.

Inspection Form
The data collection survey form aligned to the NHVIM which is designed to record the outcome of an Inspection for the purpose of the NRBS 2016.

Inspection Operation
Inspections for the purpose of the NRBS 2016.

Inspection Service Provider (ISP)
Organisation undertaking safety Inspections of Heavy Vehicles, usually a jurisdiction

Inspection Type
Inspections categorised by specific tasks and processes

Authorised Officer
A skilled person engaged by an ISP to examine Heavy Vehicles to identify non-conformities which would render the vehicle unsafe

Glossary

TECHNICAL

Investigate
Inspections categorised by specific tasks and processes.

Jurisdictions
Australian State and Territory Road Authorities.

National Heavy Vehicle Accreditation Scheme (NHVAS)
NHVAS is voluntary and open to operators who can demonstrate a record of compliance with heavy vehicle regulation and standards. Operators can apply for accreditation under several NHVAS modules.

Non-conformity
Systems and components on a Heavy Vehicle that contravenes the Heavy Vehicle Safety Standards, or part that does not perform its intended function, or has deteriorated to such an extent that it cannot be reasonably relied upon to perform its intended function or has deteriorated to an extent that it can not be reasonably relied on to perform its intended function.

Defect notice
Issued to the operator of a Heavy Vehicle by an Inspector who after conducting an Inspection, reasonably believes that the vehicle is a non-conforming Heavy Vehicle and the use of the vehicle on a road poses a safety risk. A defect notice categorisation does not reflect the condition of the vehicle, it simply reflects the risk the non-conformity presents with continued use of the vehicle.

Registration Authorities
The Australian state or territory government agencies that currently undertakes registration related business.

Road Train
A B-triple; or A combination, other than a B-double, consisting of a motor vehicle towing at least two trailers, excluding any converter dolly supporting a semitrailer.

Semitrailer
A trailer that has:
- one axle group or a single axle towards the rear; and
- a means of attachment to a prime mover that results in some of the mass of the trailer's load being imposed on the prime mover.

Special purpose vehicle (SPV)
A motor vehicle or trailer, other than an agricultural vehicle or a tow truck, built for a purpose other than carrying goods; or a concrete pump or fire-engine.

Survey Partner
The contracted party, Kantar, engaged to assist the NHVR and the Jurisdictions deliver the National Roadworthiness Baseline Survey

Trailer
A vehicle that is built to be towed, or is towed, by a motor vehicle, but does not include a motor vehicle being towed.

Truck
A rigid motor vehicle built mainly as a load carrying vehicle.

Glossary

SURVEY

Computer assisted personal interviewing (CAPI)
Where the survey data is entered using a computer. Inspectors entered the survey into a tablet during the inspection.

Quota
The required number of sample items (i.e., vehicles), for the overall survey and for specific sub-groups.

Random sampling
Selection of units where each unit has equal probability of being selected.

Standard deviation
A measure of variation in the distribution of results, as a distance from the mean; it is determined by taking the square root of the average of the squared deviations of a distribution of scores or results.

Statistical significance
A pre-determined probability level. A significance level of .01 or less has been applied generally—meaning that there is a 99% probability that the differences are real.

Statistical test
To assess the probability, or likelihood, that differences in results for sub-groups are great enough that it is unlikely to be due to chance.

Unweighted data
Results from the survey without any manipulation, or weighting, of the representation of the vehicle units.

Weighting
Applying a multiplier to individual sub-groups in the survey so that the resulting distribution matches that of the target population.

Weighted data
Results from the survey after weighting has been applied, to represent the target population.

4.1 Appendix B

DATA TABLES

KANTAR PUBLIC

NHVR

Incidence Of Vehicle System Non-conformity: By Vehicle Categories

Incidence of highest level of categories of non-conformity in freight hauling units (%)

TYPE OF NON-CONFORMITY	Rigid truck				Semi-trailer			
	Major	Minor/ Warn.	2021 Total	2016 Total	Major	Minor/ Warn.	2021 Total	2016 Total
	%	%	%	%	%	%	%	%
Brakes	3	10	13	22	5	12	16	28
Couplings	<1	1	1	2	<1	1	1	4
Steering and suspension	1	8	9	19	1	4	5	16
Wheels, tyres and hubs	1	4	4	8	<1	2	2	7
Structure and body	1	9	10	14	<1	3	3	7
Seats and seatbelts	1	2	3	6	1	1	2	3
Lights and reflectors	1	13	14	20	1	7	7	17
Mirrors	<1	1	1	1	<1	<1	<1	<1
Windscreens and windows	<1	5	6	7	<1	5	6	7
Engine, driveline and exhaust	2	8	10	14	2	7	9	16
LPG and NG vehicles	-	-	-	-	-	-	-	-

TYPE OF NON-CONFORMITY	B-double				Road train			
	Major	Minor/ Warn.	2021 Total	2016 Total	Major	Minor/ Warn.	2021 Total	2016 Total
	%	%	%	%	%	%	%	%
Brakes	3	8	11	23	4	8	12	27
Couplings	<1	1	1	3	1	<1	2	2
Steering and suspension	<1	5	5	11	2	2	4	8
Wheels, tyres and hubs	<1	1	1	4	<1	<1	<1	1
Structure and body	<1	1	1	5	<1	1	1	2
Seats and seatbelts	<1	<1	<1	2	<1	<1	<1	2
Lights and reflectors	<1	5	5	9	1	4	4	11
Mirrors	<1	<1	<1	<1	<1	<1	<1	<1
Windscreens and windows	<1	5	5	7	<1	5	5	8
Engine, driveline and exhaust	1	7	8	11	2	3	5	14
LPG and NG vehicles	-	-	-	-	-	-	-	-

Base 2021: Rigid truck (n=3835), Semi-trailer (n=1443), B-double (n=842), Road train (n=423)Base 2016: Rigid truck (n=3227), Semi-trailer (n=1221), B-double (n=802), Road train (n=221)

Incidence Of Vehicle System Non-conformity: By Vehicle Categories

Incidence of highest level of categories of non-conformity in non-freight hauling units (%)

TYPE OF NON-CONFORMITY	Bus / Coach				Plant / SPV			
	Major	Minor/ Warn.	2021 Total	2016 Total	Major	Minor/ Warn.	2021 Total	2016 Total
	%	%	%	%	%	%	%	%
Brakes	<1	2	2	9	2	2	4	7
Couplings	<1	<1	<1	<1	<1	<1	<1	<1
Steering and suspension	<1	2	2	8	1	1	2	9
Wheels, tyres and hubs	<1	<1	<1	1	<1	1	1	6
Structure and body	<1	1	1	4	<1	2	3	8
Seats and seatbelts	<1	2	2	6	<1	<1	1	4
Lights and reflectors	<1	1	1	7	<1	5	5	11
Mirrors	<1	<1	<1	<1	<1	<1	<1	<1
Windscreens and windows	<1	1	1	3	<1	1	1	2
Engine, driveline and exhaust	<1	2	2	11	<1	3	3	6
LPG and NG vehicles	-	<1	-	-	-	-	-	-
Buses*	<1	2	2	4	<1	<1	<1	-

**** Incidence based on bus/coach vehicles only***
Note: There may be cases of a system non-conformity recorded which is atypical for the type of unit

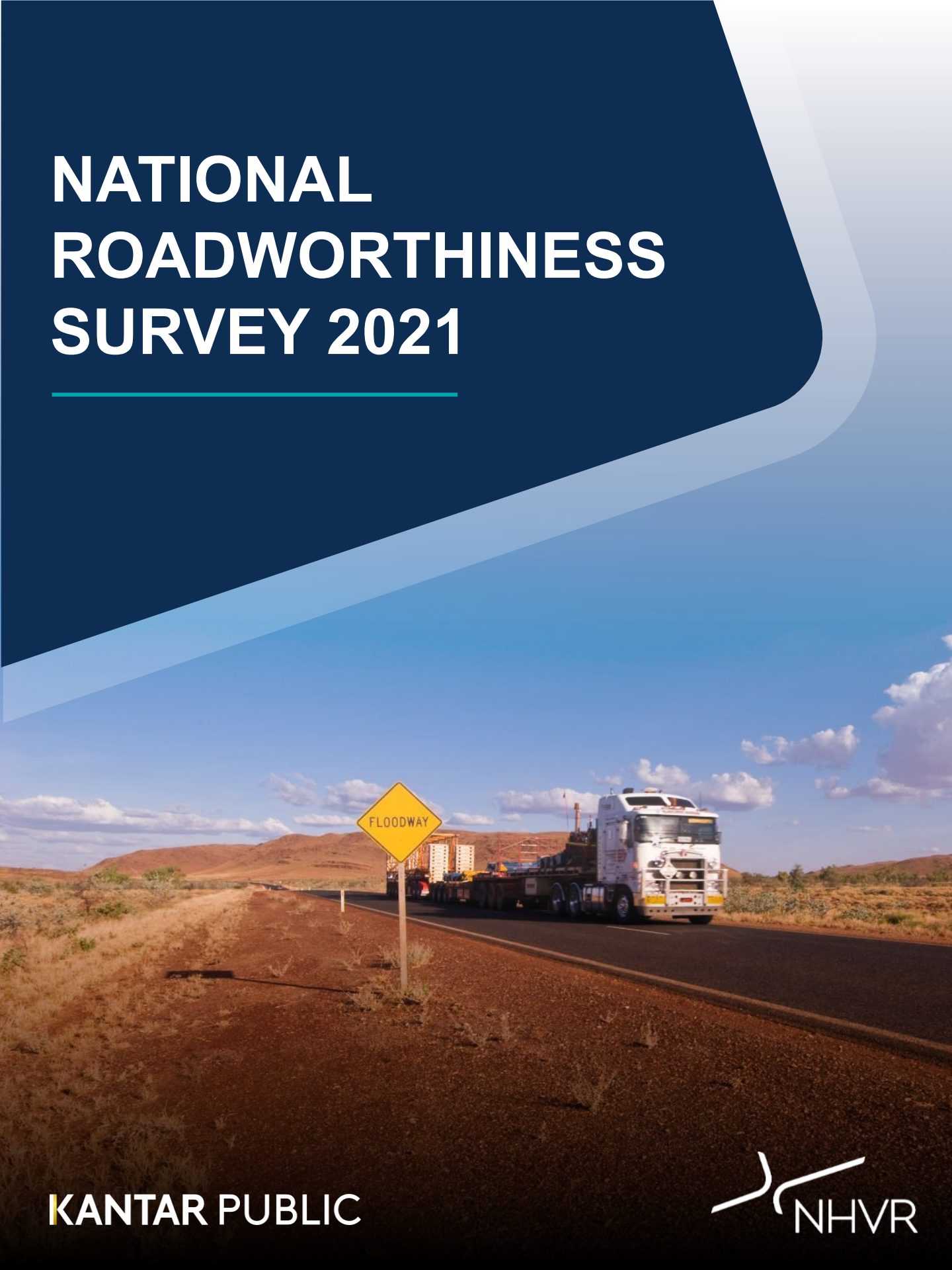
Incidence Of Vehicle System Non-conformity: By Freight Vehicle Combinations

Incidence of highest level of categories of non-conformity in freight vehicle combinations (%)

TYPE OF NON-CONFORMITY	Rigid truck				Semi-trailer			
	Major	Minor/ Warn.	2021 Total	2016 Total	Major	Minor/ Warn.	2021 Total	2016 Total
	%	%	%	%	%	%	%	%
Brakes	14	23	37	57	9	22	31	51
Couplings	2	9	11	19	<1	1	1	5
Steering and suspension	3	8	11	28	2	11	13	29
Wheels, tyres and hubs	2	7	9	17	1	5	6	18
Structure and body	1	8	9	16	1	6	7	15
Seats and seatbelts	<1	1	1	6	1	1	2	3
Lights and reflectors	3	13	16	20	2	9	11	20
Mirrors	<1	<1	<1	1	<1	<1	<1	<1
Windscreens and windows	<1	6	7	8	<1	5	5	7
Engine, driveline and exhaust	2	8	10	15	2	7	9	16
LPG and NG vehicles	<1	<1	<1	<1	<1	<1	<1	<1

TYPE OF NON-CONFORMITY	B-double				Road train			
	Major	Minor/ Warn.	2021 Total	2016 Total	Major	Minor/ Warn.	2021 Total	2016 Total
	%	%	%	%	%	%	%	%
Brakes	9	24	33	52	11	14	24	56
Couplings	1	2	2	5	3	3	6	10
Steering and suspension	2	11	13	25	3	10	13	24
Wheels, tyres and hubs	1	6	7	17	<1	5	5	11
Structure and body	1	9	9	15	<1	6	7	8
Seats and seatbelts	<1	<1	<1	2	<1	<1	<1	2
Lights and reflectors	<1	9	9	14	1	9	10	17
Mirrors	<1	<1	<1	<1	<1	<1	<1	<1
Windscreens and windows	<1	5	5	7	<1	5	5	8
Engine, driveline and exhaust	1	7	8	11	2	3	5	15
LPG and NG vehicles	<1	<1	<1	<1	<1	<1	<1	<1

NATIONAL ROADWORTHINESS SURVEY 2021



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