IPAC-24 | Z-axis Centre of Gravity (ZCOG) heights for PBS Assessments

Audience: PBS Assessors
Effective Date: 19 December 2025

This IPAC provides guidance for the disclosure of Z-axis Centre of Gravity (ZCOG) heights within the Performance Based Standards (PBS) Scheme.

Scope

This IPAC applies to all Design Approval (DA) Application Form - Part A submitted as part of a DA application, amendment, or variation. PBS Assessors must comply with this IPAC.

Background

The National Heavy Vehicle Regulator (NHVR) administers the PBS Scheme via the Heavy Vehicle National Law (HVNL). The NHVR plays a critical role in administering the PBS Scheme to enhance safety, productivity, and efficiency in the heavy vehicle industry. This includes assessing and approving innovative vehicle designs, streamlining access arrangements with road managers, and promoting compliance with rigorous safety and infrastructure standards. Additionally, the NHVR fosters national consistency, drives industry innovation, and supports informed participation through stakeholder engagement, data-driven insights, and educational outreach.

Assessments conducted by NHVR-accredited subject matter experts, known as PBS Assessors, are based on engineering principles, including inputs and assumptions. Variability in applied assumptions influences vehicle performance and affects the performance of the vehicle against the PBS standards.

To improve the transparency of the engineering principles applied by the PBS Assessors for assessments, the NHVR is implementing the requirement to disclose the ZCOG heights used in PBS assessments.

By introducing ZCOG requirements, the NHVR aims to improve clarity of the assessment process; ensuring that the safety, productivity, and integrity of the PBS Scheme is upheld and enforced.

PBS Design Approval

Z-axis Centre of Gravity (ZCOG)

The performance of vehicles is primarily dictated by the vehicle's design characteristics, such as suspension, tyres, payload mass, vehicle tare mass, and body type. Different body types across vehicle designs will have varying ZCOG heights. As a result, the payload heights shown on PBS DA are highly dependent on the ZCOG height of the vehicle.

For the purposes of declaring a vehicle's ZCOG height in design applications, the following ZCOG heights are to be disclosed:

1. Unladen sprung ZCOG height (m)

- The unladen sprung ZCOG height accounts for all components supported by the suspension system, relative to the ground.

2. Unladen sprung mass (kg)

- The unladen sprung mass accounts for all components supported by the suspension system, relative to the ground.

3. Unladen unsprung ZCOG height (m)

- The unladen unsprung ZCOG height accounts for all components not supported by the suspension system, relative to the ground. Additionally, the suspension system itself is to be regarded as part of the unsprung height.

4. Unladen unsprung mass (kg)

- The unladen unsprung mass accounts for all components not supported by the suspension system, relative to the ground. Additionally, the suspension system itself is to be regarded as part of the unsprung height mass.

5. Payload ZCOG height (m)

- The payload ZCOG height accounts for the vertical centre of gravity of the payload, considering the height at which the payload's mass is concentrated, relative to the ground. [1]

---

[1] Containers are classified as payloads and must be included when calculating the payload ZCOG height. Unladen containers are also classified as payloads.

An example of a blank template and a completed template example is shown in Appendix 1.

Implementation

Appendix 1 of the Design Approval Application Form – Part A is to include the declaration of applied ZCOG heights stated above.

As of 30 September 2025, PBS Assessors will be required to declare these values within the amended Design Approval Application Form – Part A to cover off the assessment. PBS Assessors may be asked to provide supporting evidence for any ZCOG heights declared.

Grandfathering

Previously accepted applications not conforming to this protocol will continue to be accepted and PBS Assessors are not required to amend existing applications.

When modifying previously accepted applications, these are considered new and therefore must conform to this IPAC.

Contact

This IPAC was produced by the PBS Design Team. For queries, please email pbsdesigns@nhvr.gov.au

IPAC-24: Revision history	
Second version	December 2025
First Published	August 2025

For more information:
Visit: www.nhvr.gov.au
Subscribe: www.nhvr.gov.au/subscribe
Email: pbs@nhvr.gov.au for Vehicle Approvals
Email: pbsdesigns@nhvr.gov.au for Design Approvals
Phone: 13 NHVR* (13 64 87)

Appendix 1 – ZCOG declaration template

Example: Blank Template

UNIT	VEHICLE	BODY TYPE	UNLADEN SPRUNG ZCOG HEIGHT (m)	UNLADEN SPRUNG ZCOG MASS (kg)	UNLADEN UNSPRUNG ZCOG HEIGHT (m)	UNLADEN UNSPRUNG ZCOG MASS (kg)	PAYLOAD ZCOG HEIGHT (m)
<VEHICLE NO.>	<VEHICLE>	<INSERT BODY>	<SPRUNG Z-HEIGHT>	<SPRUNG MASS>	< UNSPRUNG Z-HEIGHT >	<UNSPRUNG MASS>	<PAYLOAD Z-HEIGHT >
<VEHICLE NO.>	<VEHICLE>	<INSERT BODY>	<SPRUNG Z-HEIGHT >	<SPRUNG MASS>	< UNSPRUNG Z-HEIGHT >	<UNSPRUNG MASS>	<PAYLOAD Z-HEIGHT >
<VEHICLE NO.>	<VEHICLE>	<INSERT BODY>	<SPRUNG Z-HEIGHT >	<SPRUNG MASS>	< UNSPRUNG Z-HEIGHT >	<UNSPRUNG MASS>	<PAYLOAD Z-HEIGHT >
<VEHICLE NO.>	<VEHICLE>	<INSERT BODY>	<SPRUNG Z-HEIGHT >	<SPRUNG MASS>	< UNSPRUNG Z-HEIGHT >	<UNSPRUNG MASS>	<PAYLOAD Z-HEIGHT >
<VEHICLE NO.>	<VEHICLE>	<INSERT BODY>	<SPRUNG Z-HEIGHT >	<SPRUNG MASS>	< UNSPRUNG Z-HEIGHT >	<UNSPRUNG MASS>	<PAYLOAD Z-HEIGHT >

Example: Completed Template

UNIT	VEHICLE	BODY TYPE	UNLADEN SPRUNG ZCOG HEIGHT (m)	UNLADEN SPRUNG ZCOG MASS (kg)	UNLADEN UNSPRUNG ZCOG HEIGHT (m)	UNLADEN UNSPRUNG ZCOG MASS (kg)	PAYLOAD ZCOG HEIGHT (m)
1	PRIME MOVER	CAB OVER	1.1	7000	0.522	3000	NA
2	SEMITRAILER	SKELETAL	1.2	3900	0.537	2400	2.6
3	DOLLY	CONVERTER	0.9	900	0.479	1600	NA
4	SEMITRAILER	SKELETAL	1.2	3900	0.479	2400	2.6

Note: Values are indicative for informative purposes only.