

AS/NZS 4968.3:2023



Australian/New Zealand Standard™

Heavy road vehicles — Mechanical coupling between articulated vehicle combinations

Part 3: Kingpins and associated equipment



AS/NZS 4968.3:2023

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- Heavy Vehicle Industry Australia
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- Municipal Works Operations Association
- National Heavy Vehicle Regulator
- New Zealand Heavy Haulage Association
- Queensland University of Technology
- Society of Automotive Engineers, Australasia
- Truck Industry Council
- Waka Kotahi — NZ Transport Agency

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Preface

This Standard was prepared by the joint Standards Australia/Standards New Zealand Committee ME-053, Heavy Road Vehicles, to supersede AS/NZS 4968.3:2011.

The objective of this document is to provide —

- (a) performance requirements and recommendations for the installation of kingpins and associated equipment;
- (b) assistance in the development of standard practice in this field;
- (c) the transport industry with a standardized kingpin for full interchangeability when coupling vehicle combinations; and
- (d) a procedure for rating and selecting a kingpin for safe usage for specific vehicle combinations.

This document forms part of the AS/NZS 4968 series on heavy road vehicles. A list of all parts in this series can be found in the Standards Australia online catalogue.

The major changes in this edition are as follows::

- (i) Skid plate requirements enhanced to reflect a “straight line approach” to flatness in order to better reflect *in situ* assessment procedures./
- (ii) Notation forces amended to reflect the forces as applied to the fifth wheel.

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Introduction

This document correlates with the dimensional requirements in International Standards for 50 mm kingpins (ISO 337), 90 mm kingpins (ISO 4086) and the rating and selection of kingpins based on the *D*-value method used in Regulation 55 of the Economic Commission for Europe of the United Nations. The process of determining the required *D*-value ratings is outlined in this document

In applying the *D*-value method, which is specified in kilonewtons to avoid confusion with the towed-load capability of the coupling, a series of equations are used to determine the required rated strength of the fifth wheel assembly. The equations used in this document were obtained from original experimental research conducted by the ARRB National Transport Research Organization. These equations differ from those used in the ISO standards in order to reflect Australian conditions. Whereas the equation for semi-trailers, i.e. for articulated vehicles with one trailer, is the same as in ISO standards, additional equations have been developed for multiple trailer combinations in accordance with Australian practice.

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1 Scope

This document specifies the requirements for 50 mm, 75 mm and 90 mm kingpins for use in articulated vehicles, B-doubles and road trains in normal use on both sealed and unsealed roads. It also includes requirements for mechanical properties, dimensional standards for interchangeability, and dynamic testing.

NOTE 1 The determination of dynamic strength using finite element analysis is given in [Appendix B](#).

NOTE 2 Recommendations and requirements for fifth wheel assemblies on prime movers are given in AS/NZS 4968.2.

NOTE 3 Guidelines for the attachment of kingpin to skid plate are given in [Appendix C](#).

NOTE 4 The method of calculation of *D*-values is given in AS/NZS 4968.1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1664.1, *Aluminium structures, Part 1: Limit state design*

AS 1664.2, *Aluminium structures, Part 2: Allowable stress design*

AS 3990, *Mechanical equipment — Steelwork*

AS 4100, *Steel structures*

AS/NZS 4968.1, *Heavy road vehicles — Mechanical coupling between articulated vehicle combinations, Part 1: Design criteria and selection requirements for fifth wheel, kingpin and associated equipment*

NZS 3404.1, *Steel structures Standard — Materials, fabrication, and construction*

3 Terms and definitions

For the purpose of this document, the definitions in AS/NZS 4968.1 and those below apply.

3.1

boundary conditions

constraints assigned to the kingpin, simulating its attachment to a skid plate via intermediate components

EXAMPLE Retention plate.

3.2

design case

combination of *load case* ([3.7](#)) and *boundary condition* ([3.1](#))

3.3

endurance limit**fatigue limit**

maximum stress to which a material can be subjected without fatigue failure, regardless of the number of load cycles

3.4

finite element analysis**FEA**

numerical method for the evaluation and analysis of the structural behaviour at any point within a body for a design case

3.5

kingpin

pin attached to the skid plate of a vehicle for coupling to the fifth wheel of another vehicle

Note 1 to entry: A kingpin may include a *retention plate* ([3.6](#)) and bolts.

Note 2 to entry: A typical kingpin location is illustrated in [Figure 5.5](#).

3.6

kingpin retention plate

component of a bolt-in kingpin assembly that is attached directly to the *skid plate* ([3.13](#)) and which provides for the simple exchange of the *kingpin* ([3.5](#)) should it become worn or damaged

Note 1 to entry: The kingpin retention plate may be either a “dome” type used for flange bolt-in kingpins or a “cone” type used for taper bolt-in kingpins.

3.7

load case

applied load representing a critical vehicle movement

3.8

material test

tensile testing of a specimen removed from a sample of the subject *kingpin* ([3.5](#)) to determine the *ultimate tensile strength* ([3.16](#))

3.9

may

indicates the existence of an option

3.10

node

fixed point on a body

3.11

shall

indicates that a statement is mandatory

3.12

should

indicates a recommendation

3.13

skid plate

plate structure forming part of the vehicle that houses the *kingpin* ([3.5](#)) and mounts on the coupler plate to form the connection between the towing vehicle and the towed vehicle

Note 1 to entry: For a typical skid plate, see [Figure 5.5](#).

3.14

skid plate locking key

rigid block attached to the *skid plate* (3.13), positioned in line with the *kingpin* (3.5) in the throat of the turntable based fifth wheel to prevent relative rotation of these two components

Note 1 to entry: Skid plate locking key ensures that fifth wheel transverse pivot mounting is fixed constantly at 90 degrees relative to the longitudinal centre-line of the towed or towing vehicle. Rotation is effected at the turntable.

Note 2 to entry: For a typical skid plate locking key, see [Figure 5.5](#).

3.15

ultimate tensile strength

UTS

maximum stress encountered during a tensile test

3.16

von Mises stress

combination of all stress components at a given point within a body, yielding a single value

4 New designs and innovations

This document does not prevent the use of materials, methods of assembly, procedures and the like that do not conform to the specific requirements of this document, or are not mentioned in it, provided the minimum dimensional and performance requirements specified herein are met.

5 Skid plate design

5.1 General

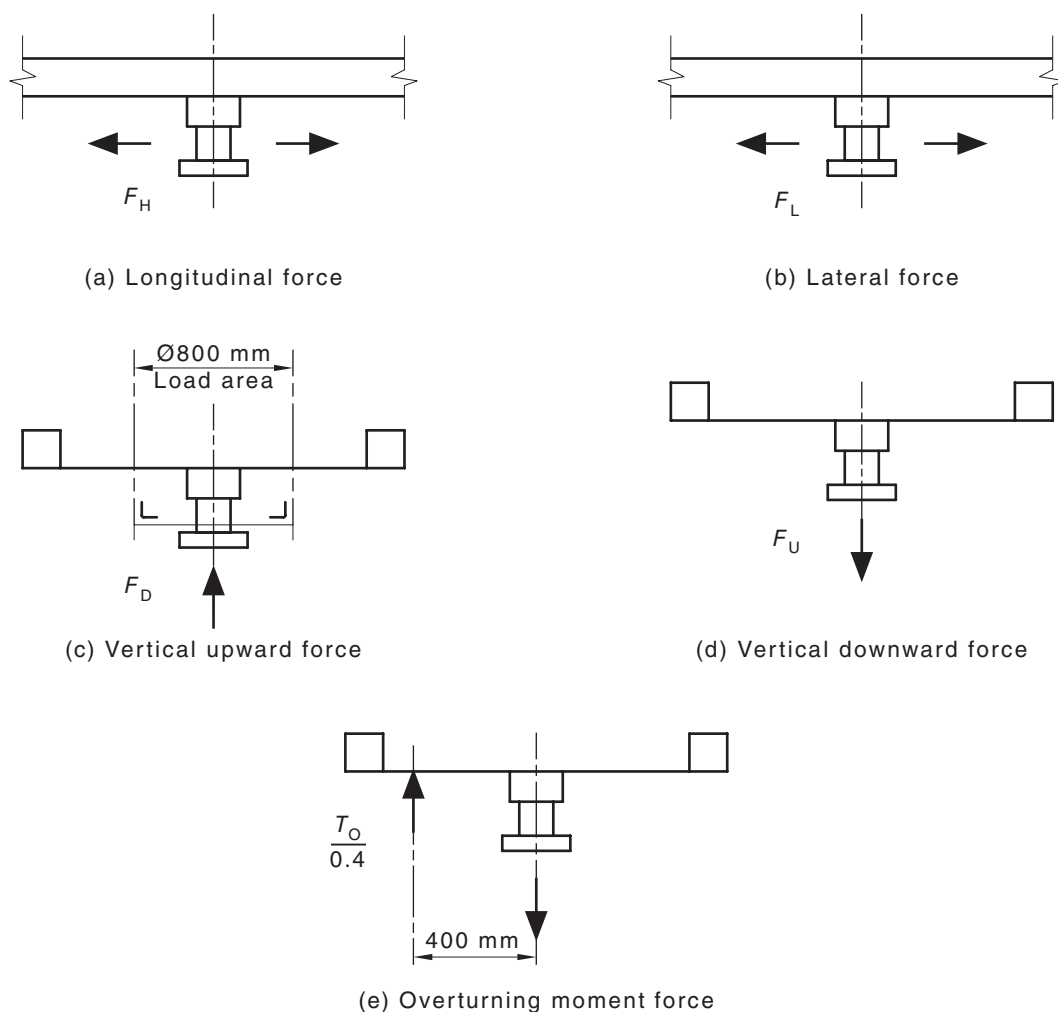
The skid plate and its attachment shall be designed to cover each of the loading conditions for its given application as specified in the attachment design forces of AS/NZS 4968.1, see [Figure 5.1](#).

In the absence of instructions from the component or vehicle manufacturer, the skid plate assembly and its attachment to the vehicle shall provide the structural integrity of the skid plate so that chassis stresses do not exceed the allowable stress limits specified in —

- (a) AS 3990 or AS 1664.2 for a working stress design method; or
- (b) AS 4100, NZS 3404.1 or AS 1664.1 when working to a limit state design method

when subjected to the loading specified in the attachment design forces of AS/NZS 4968.1.

The assessment should take into account good fatigue design principles, and allowance should be made for details in the chassis frame that contain stress raisers.



Note 1 The forces, F_U and F_D , are equal and opposite to the forces acting upwards and downwards on the fifth wheel assembly, refer to AS/NZS 4968.1.

Note 2 The forces, F_H and F_L , are equal to and in the same direction as the forces acting laterally and longitudinally on the fifth wheel assembly, refer to AS/NZS 4968.1.

Figure 5.1 — Skid plate design loads

5.2 Installation

When the skid plate is installed (or in-service unladen), any deflection shall be not greater than the limits of flatness specified in [Clause 5.3](#).

The skid plate shall be of a smooth surface without sharp projections.

The skid plate shall be sized to completely cover the top plate of the fifth wheel assembly.

Note An undersized skid plate permits the entry of dirt and the like into the locking jaw and kingpin area resulting in accelerated wear and coupling difficulties.

5.3 Flatness

The flatness of the loadbearing surface of the installed skid plate shall not exceed —

- (a) for the convex (downward) surface — $d/150$; or