



Amusement rides and devices

Part 4.4: Specific requirements—Hire go-karts



This Australian Standard® was prepared by Committee ME-051, Amusement Rides and Devices. It was approved on behalf of the Council of Standards Australia on 9 February 2018. This Standard was published on 21 March 2018.

The following are represented on Committee ME-051:

- Attorney-General's Department South Australia
 - Australian Amusement Association
 - Australian Amusement Leisure and Recreation Association
 - Consumers Federation of Australia
 - Department of Justice and Attorney General, Qld
 - Engineers Australia
 - Kidsafe
 - Safety Institute of Australia
 - SafeWork NSW
 - Showmens Guild of Australasia
 - Worksafe Division, Department of Commerce, WA
 - WorkSafe Victoria
-

This Standard was issued in draft form for comment as DR AS 3533.4.4:2017.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting **www.standards.org.au**

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at **mail@standards.org.au**, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard®

Amusement rides and devices

Part 4.4: Specific requirements—Hire go-karts

Originated as part of AS 3533—1988.
Previous edition in part as part of AS 3533.1—2009 and AS 3533.2—2009.
Revised and re-designated as AS 3533.4.4—2011.
Second edition AS 3533.4.4:2018.

COPYRIGHT

© Standards Australia Limited

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968.

Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 978 1 76072 017 9

PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee ME-051, Amusement Rides and Devices, to supersede AS 3533.4.4—2011, *Amusement rides and devices, Part 4.4: Specific requirements—Concession go-karts*. After consultation with stakeholders in both countries, Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

This Standard complements the general requirements for amusement rides and devices specified in AS 3533.1 and AS 3533.2.

The objective of this Standard is to provide designers, manufacturers, proprietors and operating staff with requirements and guidance specific to the design, construction, operation and maintenance of hire go-karts and facilities that will protect the health and safety of both operating staff and patrons of these devices. WHS legislation may have specific requirements for record keeping and log requirements.

The current Australian Standard AS 3533.4 (series) requires the operator to refer to three separate documents in order to have an understanding of the industry standard for hire karts in Australia. This revised Standard will be an all-encompassing version which will have all the relevant information contained in one document.

This Standard is part of a series designed to cover aspects of safety for amusement rides and devices. AS 3533.1 and AS 3533.2 deal with the general aspects of safety common to all kinds of amusement rides and devices and are intended to be used in conjunction with the specific requirements for the particular type of ride. While some ride-specific requirements have been included in AS 3533.1 and AS 3533.2, these are now being progressively moved into individual Standards in a new AS 3533.4 series. Parts in the AS 3533.4 series relate to particular rides or devices and give requirements and guidance tailored to the particular kinds of hazards relevant for that ride or device. This Standard has completed this process for go-karts including clauses for design, maintenance, and testing.

It should be noted that compliance with this Australian Standard alone does not necessarily ensure that all legal obligations are being fulfilled.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendices to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

CONTENTS

	<i>Page</i>
FOREWORD.....	4
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE.....	5
1.2 REFERENCED DOCUMENTS.....	5
1.3 DEFINITIONS.....	6
SECTION 2 GO-KART AND TRACK DESIGN AND TESTING	
2.1 CLASSIFICATION	10
2.2 HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL OF RISK..	10
2.3 HIRE GO-KART DESIGN	10
2.4 HIRE GO-KART TRACK DESIGN AND CONSTRUCTION.....	15
SECTION 3 HIRE GO-KART FACILITY OPERATIONS	
3.1 TRACK RULES	21
3.2 PATRON RESPONSIBILITY	21
3.3 DRIVER BRIEFING AND INSTRUCTIONS	21
3.4 DRIVER SAFETY	22
3.5 DRIVER CHECKS	22
3.6 PIT AREA	22
3.7 VEHICLE IDENTIFICATION	22
3.8 ATTENDANTS	22
3.9 ATTENDANT TRAINING.....	23
3.10 COMMUNICATIONS.....	23
3.11 WARNING SYSTEM.....	23
3.12 MINIMUM AND MAXIMUM HEIGHT AND AGE	24
3.13 SMOKING.....	24
3.14 NUMBER OF PATRONS IN A GO-KART	24
3.15 TRACK OPERATION.....	24
3.16 FIRST AID	24
SECTION 4 MAINTENANCE, INSPECTIONS AND REPORTING	
4.1 MAINTENANCE	25
4.2 REPLACEMENT OF COMPONENTS	26
4.3 REPAIRS AND ALTERATIONS.....	26
4.4 INSPECTIONS	26
4.5 REPORTING OF INSPECTION ACTIVITIES	29
4.6 RECORDS.....	30
SECTION 5 DOCUMENTATION.....	
APPENDICES	
A SUGGESTED TRAINING, QUALIFICATIONS AND EXPERIENCE FOR COMPETENT PERSONS	32
B PATRON RESPONSIBILITIES	33
C BARRIERS TYPES	34
D MAINTENANCE AND INSPECTION CHECK LISTS	35
E CONTENTS OF LOG.....	37

FOREWORD

Under Health and Safety legislation in Australia, persons conducting a business or undertaking have a duty to ensure the safety of their workers and other people at the workplace. The operator of a hire go-kart facility therefore has a duty to ensure that patrons and others present are not exposed to risks arising from the activities.

This Foreword indicates how these duties can generally be interpreted and may provide an understanding of the basis for the requirements in this Standard.

This duty of care includes, as far as reasonably practicable, providing a safe and healthy work environment, safe plant and structures, safe systems of work and any information, training, instruction or supervision as necessary to protect persons, including patrons, workers, and spectators from the conduct of the facility and its operation.

Persons conducting a business or undertaking also have a duty to consult with workers, not just employees, who carry out work for the business or undertaking who are, or are likely to be, directly affected by a matter relating to work health or safety.

Designers, manufacturers and suppliers of plant and structures also have duties to ensure, so far as is reasonably practicable, the plant (or structure) is safe and without risk when used for a purpose for which it was designed and manufactured. Additionally they need to provide information on the purpose and any conditions necessary to ensure it is safe when used, including maintenance and repair.

In addition to this Standard, readers are advised that legislation in their jurisdiction may also apply.

In preparation of this Standard the committee reviewed ASTM F2007-07a and EN 16230-1. It was noted the European kart into kart crash test speed was 15 km/h. Investigation with numerous Australian kart operators identified a common maximum speed for indoor karts at 45 km/h and outdoor karts at 70 km/h. It was hence considered that a crash test speed of 15 km/h was not representative (too low) of the speeds Australian hire go-karts achieve on tracks. Therefore a kart into kart test at a higher speed is specified. Impact tests at similar speeds are specified for impacts with barriers.

STANDARDS AUSTRALIA

Australian Standard

Amusement rides and devices

Part 4.4: Specific requirements—Hire go-karts

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements and guidance for the design, construction, operation, inspection, testing and maintenance of hire go-karts, tracks and facilities. This includes arrive and drive patrons and corporate or other pre-booked events, e.g. simulated race events.

This Standard is not applicable to—

- (a) events where track time is hired and privately owned karts are used;
- (b) fun karts or race kart activities; or
- (c) dirt or clay tracks.

This Standard is only written to apply to commercially operated facilities where hire karting for a fee is conducted.

This Standard is to be applied for any replacement or new go-karts and is not intended to be applied retrospectively.

This Standard considers karts that run at no more than 70 km/h.

NOTES:

- 1 Some parts of this Standard may be useful for karts that run at more than 70 km/h. However, the safety of the design of the kart and track should be assessed in light of the higher speed.
- 2 This Standard is intended to be used in conjunction with AS 3533.1 and AS 3533.2, which provide requirements and recommendations on matters common to all amusement rides and devices. Specific requirements in this Standard take precedence over corresponding requirements in AS 3533.1 and AS 3533.2. If the requirements of any part of this Standard conflict with any National, State or Territory regulations, the appropriate statutory regulations apply.

1.2 REFERENCED DOCUMENTS

AS

1668	The use of mechanical ventilation and air conditioning in buildings
1668.2	Part 2: Mechanical ventilation in buildings
1851	Routine service of fire protection systems and equipment
1940	The storage and handling of flammable and combustible liquids
2444	Portable fire extinguishers and fire blankets—Selection and location
3533	Amusement rides and devices
3533.1	Part 1: Design and construction
3533.2	Part 2: Operation and maintenance
4024	Safety of machinery (series)

AS/NZS

1698 Protective helmets for vehicle users

2596 Seat belt assemblies for motor vehicles

AS/NZS ISO

31000 Risk management—Principles and guidelines

UN ECE

Regulation Uniform provisions concerning the approval of:

No.16, I. Safety-belts, restraint systems, child restraint systems and ISOFIX child restraint systems for occupants of power-driven vehicles

MOD II. Vehicles equipped with safety-belts, safety-belt reminder, restraint systems, child restraint systems and ISOFIX child restraint systems and i-Size child restraint systems

FMVSS

209 Seat belt assemblies

1.3 DEFINITIONS**1.3.1 ATD**

Anthropometric Test Device (crash test dummy).

1.3.2 Children's go-kart

A go-kart that is designed to travel at no more than 40 km/h and is primarily designed for use by children under 12 years old.

1.3.3 Competent person

A person who has acquired through training, qualifications or experience, or a combination of these, the knowledge and skills enabling that person to perform a specified task.

NOTE: See Appendix A for the minimum training, qualifications and experience that a competent person might be expected to possess.

1.3.4 Crash pulse

A pulse where a 20g level is maintained for 50ms, applied in a horizontal plane from the front and rear of a go-kart with driver and, where applicable, passenger.

1.3.5 Delineation system

A painted marking or barrier system installed on the go-kart track surface, which defines the boundaries of the track surface, and is installed in such a way as to guide drivers, via a designated track route or path of travel.

1.3.6 Design speed

75% of maximum kart speed (maximum speed not exceeding 70 km/h), but not less than 30 km/h.

1.3.7 Design track speed

The maximum achievable speed for a particular kart/track combination.

1.3.8 Driver

The patron, who is sitting in the kart, and is responsible for the direction of travel, braking and speed of the hire go-kart.

1.3.9 Dynamic deflection

The largest transverse deflection of a safety barrier system recorded during a crash test. See Figure 1.1.

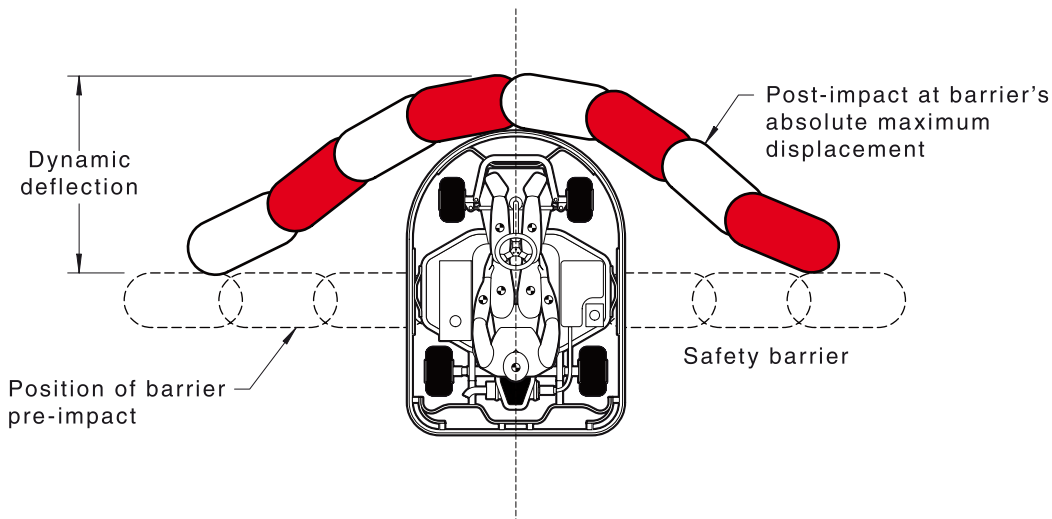


FIGURE 1.1 DYNAMIC DEFLECTION

1.3.10 Flail space

The space where the go-kart occupant is assumed to be a point mass that moves similar to an unrestrained 'free-missile' within the go-kart. For design and certification purposes when assessing crashworthiness, continued use of the flail space model will provide protection to unrestrained errant drivers and vehicle occupants in a worst case scenario.

1.3.11 Fun kart

A four wheel privately owned vehicle that is motorized and sold with the intention of being used off road or in a recreational way.

1.3.12 Hire go-kart

A device which meets all of the following specifications:

- (a) A small single vehicle, unattached to other vehicles or a common frame system.
- (b) Fitted with a steering wheel.
- (c) With seating less than 250 mm above the ground.
- (d) Powered without connection to a common energy source.
- (e) Driver-controlled with respect to acceleration, speed, braking and steering.
- (f) Intended to operate within the delineated path of travel of a defined track.
- (g) Simulates competitive motor sports.
- (h) Used by patrons for a fee.
- (i) Has a maximum capacity of two persons and no cargo capacity.

This definition is not applicable to fun karts or race karts that are privately owned and used for personal recreational activities or competitive motor sport. This definition expressly excludes any dodgem karts, bumper karts, Ferrari karts, Formula 500 or any amusement ride or device that runs karts on a rail system.

1.3.13 Hire go-kart attendant

The person or persons whose duties may include, but are not limited to, the supervision, instruction, dispatch and limitation of ride duration of persons driving hire go-karts. One attendant is to be nominated as the facility supervisor at all times during operation.

1.3.14 Hire go-kart facility

The entire property, track area, spectator areas, buildings and workshops.

1.3.15 Maximum kart speed

The maximum speed the kart model is capable of achieving.

1.3.16 Median barrier system

A longitudinal safety barrier system designed to be impacted from either side.

1.3.17 Normal operation

Patrons drive as instructed by attendants, show consideration for other patrons, follow track rules and avoid deliberate collisions.

NOTE: Collisions may occur during operation of the facility and may involve impact between go-karts or safety barrier systems.

1.3.18 Operator

The person in charge of the hire go-kart facility.

1.3.19 Owner

A person or entity that controls the operation of the hire go-kart facility and is responsible for the compliance with regulatory legislation.

1.3.20 Passenger

A person in the hire go-kart that does not have control of the direction of travel, braking or speed of the go-kart.

1.3.21 Patron

A driver or passenger of a hire go-kart.

1.3.22 Pit

The defined parking area beside the track into which drivers will enter, or disembark, from the go-kart during driver change overs.

1.3.23 Pocketing

The behaviour of a safety barrier involving relatively large lateral displacements within a relatively short longitudinal distance, thereby creating a pocket in which the go-kart is brought to rest rather than being redirected back onto the track.

1.3.24 Race kart

A performance-orientated vehicle designed for competitive kart club activities on a defined circuit for motor sport.

1.3.25 Racing line

Racing line is the route that a driver would take in order to minimize the time taken to complete a lap of the track.

1.3.26 Risk

The chance and outcome of an event happening, which will have an impact upon objectives.

NOTE: Risk is measured in terms of a combination of the consequences and their likelihood. Refer to AS/NZS ISO 31000.

1.3.27 Risk analysis

The systematic process used to understand the nature of risk and to deduce the level of risk.

NOTE: Refer to AS/NZS ISO 31000.

1.3.28 Runoff

The clear ground which surrounds the track surface and is within the track area.

1.3.29 Safety barrier system

A device installed on the hire go-kart track, which defines the boundaries of the track area, and provides a physical restriction of the go-kart by impact absorption and/or kart deflection in a way that reduces the risk to the driver, other go-kart drivers on the track, marshals and spectators.

1.3.30 Test go-kart

A commercially available, production model go-kart or an approved alternative go-kart used in a crash test to evaluate either the go-kart's crashworthiness performance or the impact performance of a safety barrier.

1.3.31 Track area

The track surface, barriers, and all runoff and ancillary areas associated with the running of hire go-karts, which are located within the perimeter fence and that have restricted public access.

1.3.32 Track safety zone

An area, similar to a pit, to the side of a track separated by barriers which karts can be pulled into during normal operation for the purpose of dealing with break down or marshalling.

1.3.33 Track surface

A concrete or bitumen path for the operation of a hire go-kart within the delineation system as defined in Clause 1.3.6.

1.3.34 Working width

The distance from a barrier to a fixed object to allow for the dynamic deflection of the barrier.

NOTE: Also see Clause 1.3.10 Dynamic deflection.

SECTION 2 GO-KART AND TRACK DESIGN AND TESTING

2.1 CLASSIFICATION

Notwithstanding the classification system of AS 3533.1, hire go-karts and tracks designed to this Standard shall be deemed as Class 2 devices.

2.2 HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL OF RISK

In designing a go-kart, a designer is required to—

- (a) identify hazards associated with the use of the device;
- (b) ensure that an assessment is made to determine the risks associated with such identified hazards and any risks associated with patron characteristics; and
- (c) control such risks by implementing measures to either eliminate or minimize risks.

Designers shall take into account health and safety legislation (including noise levels) environmental impact and the relevant requirement of the AS 4024 series when identifying hazards, assessing related risks and implementing control of such risks. Designers shall make known to the purchasers all risk assessment information, highlighting any residual risks associated with the go-kart, including any patron restrictions.

NOTE: Designers should reference AS/NZS ISO 31000 for risk management guidelines.

2.3 HIRE GO-KART DESIGN

2.3.1 General design requirements

As this Standard does not cover every aspect of go-kart safety, a hazard identification and risk assessment shall be carried out as part of the design, it shall incorporate risk controls within the structural and mechanical aspects of the design.

The safety critical components within the structural and mechanical equipment of a hire go-kart shall be designed and manufactured to satisfy or exceed the following requirements:

- (a) Where design computations are utilized as part of the design process, they shall be completed using at least the 50th percentile adult male anthropometric data set.

NOTE: Consideration should be given to the upper and lower anthropometric dimensions and weight for which the kart is being designed.

- (b) For children's go-karts (see Clause 1.3.2), the design clauses of this Standard still apply.
- (c) For children's go-karts the appropriate age range and child anthropomorphic dimensions shall be considered in place of adult dimensions.

2.3.2 Structural elements/components

2.3.2.1 Chassis

The chassis of a go-kart shall be designed to withstand the loads of normal operation (acceleration, braking, cornering forces) with a driver and, if applicable, passenger, on board.

The chassis shall also be designed such that during a collision any deformation or breakage does not contribute to or cause injury to the driver, passenger, or others nearby.

If design computation is used to design the chassis, a crash pulse as detailed in Clause 1.3.4 may be used as a guide. The driver (and passenger if applicable) however, shall comply with Clause 2.3.1(a). Actual values will depend on the specific kart design.

2.3.2.2 *Engine mounting*

Mounting bolts shall be as prescribed by the engine manufacturer or kart manufacturer, or where this is unavailable, by a competent person.

The engine of a hire go-kart shall be attached to the chassis of the kart by bolting through the lugs and bolt holes specified for the purpose by the manufacturer of the engine.

The attachment points on the chassis for the engine, the engine mounts and bolts shall be designed so that the engine will not detach during a collision.

If design computation is used to design the engine mounting, a crash pulse as detailed in Clause 1.3.4 may be used as a guide. The driver (and passenger if applicable) however, shall comply with Clause 2.3.1(a). Actual values will depend on the specific kart design.

2.3.2.3 *Wheel guarding*

Guarding shall be provided to effectively prevent wheel-to-wheel side contact should the go-karts come into close proximity while travelling on the track.

2.3.2.4 *Kart impact protection*

A kart impact protection system shall be provided around the outer lower section of the kart for intrusion protection.

The kart impact protection system shall be designed such that during a collision any deformation or breakage does not contribute to or cause injury to the driver, passenger, or others nearby.

The wheel guarding in Clause 2.3.2.3 may form part of this system.

If design computation is used to design the kart impact protection system, a crash pulse as detailed in Clause 1.3.4 may be used as a guide. The driver (and passenger if applicable) however, shall comply with Clause 2.3.1(a). Actual values will depend on the specific kart design.

2.3.2.5 *Seat assembly*

Seat assemblies (seat forms or mouldings and their support frames), for hire go-karts shall be constructed so that they support patrons when loaded under normal operation conditions.

Seat assemblies for drivers and passengers shall be designed such that during a collision any deformation or breakage does not contribute to or cause injury to the driver, passenger, or others nearby.

If design computation is used to design the seat assembly, a crash pulse as detailed in Clause 1.3.4 may be used as a guide. The driver (and passenger if applicable) however, shall comply with Clause 2.3.1(a). Actual values will depend on the specific kart design.

2.3.2.6 *Head rest and roll over protection*

A head rest shall be provided in go-karts to support the head during rear end collisions. Its dimensions shall be sufficient to cater for the minimum and maximum height of drivers the kart is designed for.

Rollover protection shall be provided on all hire go-karts fitted with seat belts. This rollover protection shall be designed to support the combined loads, both static and dynamic, of driver and go-kart including seat belt loads during dynamic impact.

2.3.2.7 *Upper seat belt mounts or guides*

Upper seat belt mounts or guides shall be provided on all hire go-karts fitted with seat belts. This shall be designed to support the combined loads, both static and dynamic, of driver and go-kart including seat belt loads during dynamic impact such that during a collision any deformation or breakage does not contribute to or cause injury to the driver, passenger, or others nearby; this includes deflection forward during a crash resulting in driver head strike with the steering wheel.

The upper seat belt mount or guide shall be positioned no lower than 50 mm below the top of the shoulder of the tallest person the kart is designed for, so that it does not put significant downward forces onto the driver (or passenger) during a collision.

If design computation is used to design the upper seat belt mounts or guides, a crash pulse as detailed in Clause 1.3.4 may be used as a guide. The driver (and passenger if applicable) however, shall comply with Clause 2.3.1(a). Actual values will depend on the specific kart design.

2.3.3 Mechanical elements/components

2.3.3.1 Brakes

As a minimum, the brake effort produced by the fitted (and maintained) brakes on a hire go-kart shall exceed the maximum thrust that can be produced by the engine with the go-kart static on the track.

In dynamic conditions the fitted (and maintained) brakes on a hire go-kart, when actuated by the force capable of being exerted by the specified minimally capable driver, shall arrest the go-kart from its full speed (as specified by the designer) in a distance equal to or less than half the distance in which the go-kart reaches its full speed, from stationary, under full throttle.

Unless otherwise justified within the design documentation the following shall be taken to be the actuating force on a foot pedal as capable of being exerted by the driver:

- (a) For heel pivoted pedal 90 N.
- (b) For remotely pivoted pedal 200 N.

The brake mechanism (e.g. calliper arms, pivots, pins, etc.) together with the brake actuating mechanism (e.g. pedal, Bowden wire and its restraints, pivots, pins or hydraulic system) shall be all of sufficient strength to resist, without failure by breakage or by distortion such as to impair proper function when loaded by a force exerted on the principal actuator (e.g. a pedal), being six times the actuating force for the following:

- (i) Heel pivoted pedal 540 N.
- (ii) Remotely pivoted pedal 1200 N.

2.3.3.2 Drive axles

For the most adverse condition of driving under maximum engine torque or braking under maximum brake effort, considering a limit for road/tyre adhesion at 50% and a lateral loading due to cornering, a driving axle shall not be loaded beyond 50% of its capacity (at failure by yield).

2.3.3.3 Steering gear

Steering gear shall include all those components that comprise the path of action from the steering wheel of the hire go-kart to the steerable wheels.

The components in the steering path shall satisfy the following two conditions:

- (a) *Normal action* Under a total torque, applied at the steering wheel, of 65 Nm all components and connections in the path of action shall achieve a factor of safety of at least three against yield when the reaction at the wheels/axles is taken to be that of a locked condition one axle at a time.
- (b) *Under a load* Under a lateral load of 12 kN, applied at one of the front wheels of the hire go-kart, and considering the mechanism to be at full lock or locked up at the other steerable axle, no part of the steering action path shall fail under tension or shear, in the full lock, and compression members shall not fail beyond simple buckling.