FINALIZED TANZANIA STANDARD

MEDC 9 (3320) CD2- Rev. TZS 2084: 2025 – Modified safari vehicles - Code of practice for safari vehicles modification.

 Second Edition

0. FOREWORD

Tourism industry is important sector in National economy. Tourism attraction in Tanzania is worldwide known and thousands of tourists visit the country every year. Most of these attractions are in remote areas with road challenges to reach them.

From years these tourist transportation vehicles have been modified to suite comfortably during safari. It is important for National to develop a minimum requirement for these converted vehicles in the aspect of safety and comfort.

In preparation of this Tanzania standard assistance was derived from the following standards:

ISO 1176:1979 – Road vehicle – Masses – vocabulary and codes

ISO 10392:2011 – Road vehicle – determination of Centre of gravity

TZS 598:2010 – Automotive Engineering bus body building

EAS 181:2000 – Fuel tank assembly for automotive vehicles- safety requirement

ISO 612:1978 – Road vehicles – dimensions of motor vehicles and towed vehicles- terms and definitions

1. SCOPE

This Tanzania Standard gives guidelines for modified motor vehicles that are used in wildlife hunting and transportation of tourist within Tanzania national parks and other tourist attractions.

2. NORMATIVE REFERENCES

TZS 698: 2012 – Road vehicle –code of practice for inspection and testing of used motor vehicles for road worthiness.

TZS 792: 2003 - Road signs – Retro-reflective device for road traffic control purposes – Test method

3. DEFINITIONS

3.1 General definitions

3.1.1 Motor vehicle length

The distance between two length vertical planes perpendicular to the longitudinal median plane (of the vehicle) and touching the front and rear of the vehicle respectively.

NOTE - All parts of the vehicle, including any parts projecting from front or rear (towing-hooks, bumpers, etc.) are contained between these two planes.

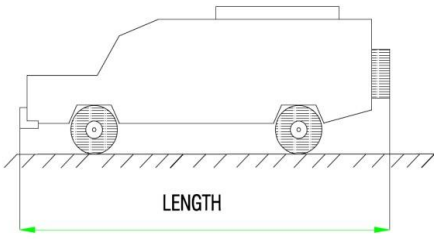


Fig. 2 Motor vehicle length

3.1.2 Vehicle width

The distance between two planes parallel to the longitudinal median plane (of the vehicle) (see clause 3.1) and touching the vehicle on either side of the said plane.

NOTE - All parts of the vehicle, including any lateral. projections of fixed parts (wheel hubs, door marker lamps, tyre pressure indicators, direction indicator lamps, position lights, customs seals, flexible mudguards, retractable steps, snow chains and the deflected part of the tyre walls immediately above the point of contact with the ground.

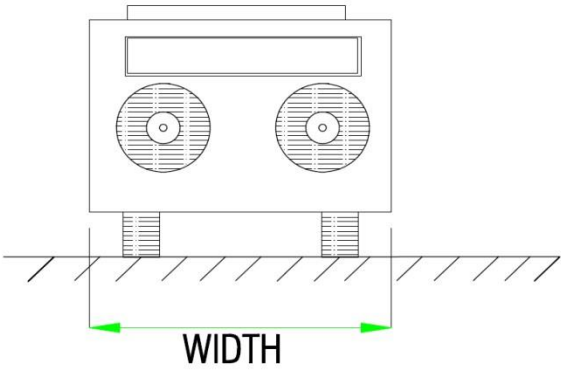


Fig. 3 Motor vehicle width

3.1.3 Vehicle height (unladen)
The distance between the supporting surface and a horizontal plane touching the topmost part of a vehicle.

NOTES
a) All fixed parts of the vehicle are contained between these two planes.
b) The vehicle is in operating order and unladen.

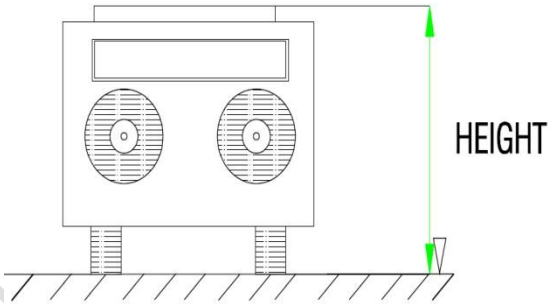


Fig. 4 Motor vehicle height

3.1.4 Front overhang
The distance between the vertical plane passing through the centres of the front wheels and the foremost point of the vehicle, taking into consideration lashing hooks, registration number plate, etc., and any parts rigidly attached to the vehicle.

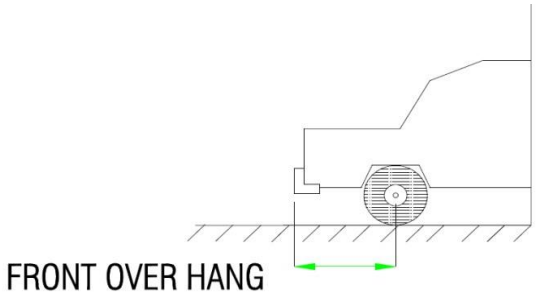


Fig. 5.

Front overhang

3.1.5 Rear overhang

The distance between the vertical plane passing through the centres of the rearmost wheels and the rearmost point of the vehicle, taking into consideration the towing attachment, registration number plate, etc., and any parts rigidly attached to the vehicle.

3.1.6 Ground clearance

The distance between the ground and the lowest point of the centre part of the vehicle. The centre part is that part contained between two planes parallel to and equidistant from the longitudinal median plane (of the vehicle) and separated by a distance which is 80 % of the least distance between points on the inner edges of the wheels on any one axle.

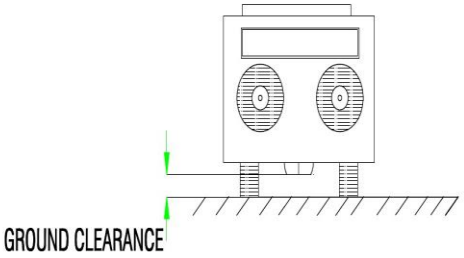


Fig.7.Ground clearance

3.1.7 Ramp angle

The minimum acute angle between two planes, perpendicular to the longitudinal median plane of the vehicle, tangential, respectively, to the tyres of the front and the rear wheels, static loaded, and intersecting at a line touching the lower part of the vehicle, outside these wheels. This angle defines the largest ramp over which the vehicle can move.

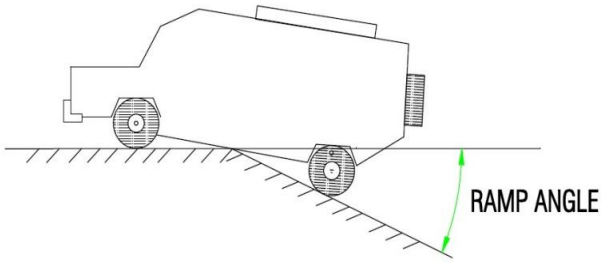


Fig.8. Ramp angle

3.1.8 Approach angle

The greatest angle between the angle horizontal plane and planes tangential to the static loaded front wheel tyres, such that no point of the vehicle ahead of the axle lies below these planes and that no part rigidly attached to the vehicle lies below these planes.

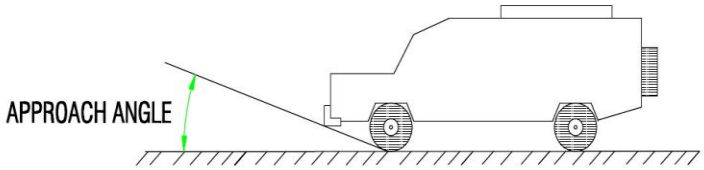


Fig.9 Approach angle

3.1.9 Departure angle

The greatest angle between the angle horizontal plane and planes tangential to the static loaded rear wheel tyres, such that no point of the vehicle behind the axle lies below these planes and that no part rigidly attached to the vehicle lies below these planes.

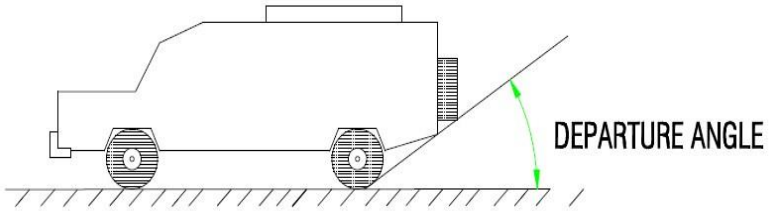


Fig.10. Departure angle

3.1.10 Overhang of attachment

The distance from the attachment to the vertical plane perpendicular to the longitudinal median plane and passing through the axis of the rearmost axle.

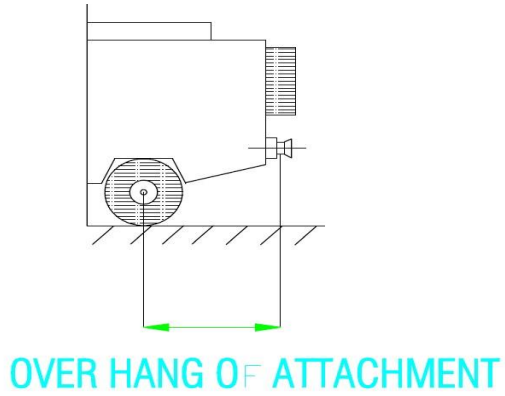


Fig 11. Overhang of attachment

3.1.11 Height of attachment

The distance from the attachment to the supporting plane, i.e. the distance from the Supporting plane.

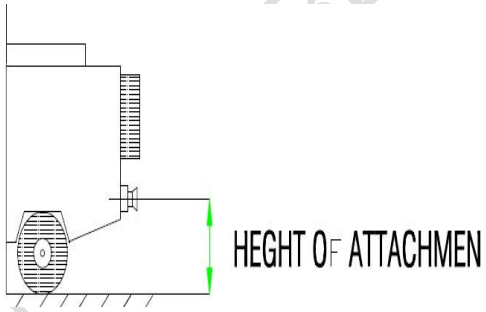


Fig 12. Height of attachment

3.1.12 Turning circles

The diameters of the circles circumscribing the extensions on the supporting plane of the mid-Planes of the steered wheels (the steering wheel being turned to full lock)

Notes

a) The smaller diameter of the circle circumscribing the extension on the supporting plane of the mid-plane of an inner non-steered wheel is also of practical interest.

b) Each vehicle has left-hand and right-hand turning circles.

3.1.13 Turning clearance circles

The turning clearance circles (the steering wheel being turned to full lock) are:

a) The diameter of the smallest circle enclosing the projections onto the supporting plane of all points of the vehicle.

b) The diameter of the largest circle beyond which are located the projections onto the supporting plane of all the points of the vehicle.

3.1.14 Vertical clearance

The vertical displacement of a wheel in relation to the suspended part of the vehicle from the position corresponding to the maximum permissible load to the position from which any additional vertical travel is impossible**.**

3.1.15 Lift

The height to which a wheel may be lifted without any other wheels leaving their supporting surface**.**

3.1.16 Gross vehicle mass (GVM)

The maximum weight that a vehicle can carry including its own weight.

4. GENERAL REQUIREMENTS

4.1 General requirement of Vehicles to be converted

The vehicle to be modified shall comply with requirements of TZS 698 – Road vehicle code of practice for inspection and testing of used motor vehicle for road worthiness after modification.

4.2 General requirement of Converted/modifies vehicle

4.2.1 Requirement of retro reflective marking

The vehicle shall be marked with retro-reflective materials according to TZS 792.

4.2.2 Requirement for electric powered vehicles

Modified electric safari vehicles shall comply with safety and operation requirements from recognised electric vehicle standards

4.2.3 Requirement of fire extinguisher and first aid equipment

Space shall be provided for fitting of one fire extinguisher and one first aid kit

4.2.3.1 Fire extinguisher and first aid kit may be secured against theft or vandalism, provided that the location of these items are clearly and means are provided for person to extract them easily in an emergence.

4.2.4 Requirement for seat belt

4.2.4.1 All seats shall be provided with the seat belts.

4.2.4.2 The seat belt anchorage shall not break when a test load of 2225 daN ± 20 daN applied to a traction device.

4.2.5 Requirement of fuel tank assembly and fuel system

4.2.5.1 No part of the fuel system shall constitute the widest part of the vehicle.

4.2.5.2 No part of the fuel tank shall be in front of the vertical transverse plane passing through the centre line of the front wheels.

4.2.5.3 No part of the fuel tank or the delivery pipes shall be located within or above the vehicle cabin or any other enclosed passage area unless separated by a metal or other approved fire-resistant barrier designed to prevent any leakage from entering the driver's cabin or any other enclosed passage area.

4.2.5.4 A minimum distance of 35 mm shall be maintained between any part of the fuel tank and exhaust pipe with or without a heat shield.

4.2.4.5 The design of the fuel system shall not provide for gravity or self-sustaining feed from the tank to the fuel pump or any other feeding system.

4.2.5.6 The tank shall be filled and vented to the outside of the body and the fuel filler should be placed on the right side in a location where accidental fuel spillage will not drop or drain on any part of the exhaust system.

4.2.5.7 The delivery pipes shall be designed and protected in such a way that overflows from a filling operation would be prevented from spilling on any part of the exhaust or electrical system.

4.2.5.8 At least one safety vent shaft shall be provided on the fuel tank system which is above the fuel level, when it is filled to the designed capacity.

4.2.5.9 Each fuel tank shall be fitted with a safety vent of size not less than 1.6 mm diameter.

4.2.5.10 From a tank filled with liquid fuel, the rate of leakage from a fuel tank and fittings shall not exceed 50 g/min, when inverted for five minutes relative to its installed position on the vehicle. The fuel outlet pipe connection shall be plugged while carrying out the test.

4.2.5.11 The fuel tank shall be capable of withstanding without leakage an internal pressure of 130 kPa (1.3 atmospheres). Change of shape may be permitted.

4.2.6 Requirement for exhaust system

4.2.5.1 Exhaust pipe, muffler, and tail pipe shall be outside bus body attached to chassis.

4.2.6.2 Tail pipe shall be constructed of seamless or electrically welded tubing of 16- steel or equivalent.

4.2.6.3 Size of tail pipe shall not be reduced after it leaves muffler.

4.2.6.4 Exhaust system shall be properly insulated from fuel tank and tank connections by securely attached metal shield at any point where it is 305 mm or less from tank or tank connections.

4.2.6.5 Muffler shall be constructed of corrosion-resistant material.

4.2.7 Requirement of Chassis frame

4.2.7.1 Frame lengths shall be established in accordance with the design criteria for the complete vehicle.

4.2.7.2 Making holes in top or bottom flanges or side units of the frame and welding to the frame shall not be permitted except as provided or accepted by the chassis manufacturer.

4.2.7.3 Any secondary manufacturer that modifies the original chassis frame shall provide a warranty equal to the warranty offered by the original equipment manufacturer, and shall certify that the modification and other parts or equipment affected by the modification shall be free from defects in material and workmanship under normal use and service intended by the original equipment manufacturer.

4.2.8 Requirement of suspension system

4.2.8.1 The vehicle shall be equipped with front and rear double-acting shock absorbers compatible with manufacturer's rated axle capacity.

4.2.8.2 Springs or suspension assemblies shall be of ample resiliency under all load conditions and of adequate strength to sustain loaded vehicle without evidence of overload and springs or suspension assemblies shall be designed to carry their proportional share of gross vehicle weight.

4.2.8.3 Rear springs shall be of progressive, parabolic or coil type.

4.2.8.4 The capacity of springs or suspension assemblies shall be commensurate with the chassis manufacturer's gross vehicle weight and chassis specification minimums.

NOTE: Suspension system should not be modified without original manufacturer permission and specifications.

4.3 Dimensional Requirement

4.3.1 Motor vehicle length
Shall be in accordance to Tanzania road act

4.3.2 Vehicle height (unladen)
Shall be in accordance to Tanzania road act

4.3.3 Vehicle width
Should be in accordance with Tanzania road act

4.3.4 Front overhang
Shall not exceed 60 % of the wheelbase.

4.3.5 Rear overhang
Shall not exceed 60 % of the wheelbase.

4.3.6 Ground clearance
Shall be in accordance to the vehicle original manufacturer

4.3.7 Ramp angle
Shall be in accordance to the vehicle original manufacturer

4.3.8 Departure angle
Shall be in accordance to the vehicle original manufacturer

4.3.9 Overhang of attachment
Shall be in accordance to the vehicle original manufacturer

4.3.10 Height of attachment
Shall be in accordance to the vehicle original manufacturer

4.3.11 Turning circles
Shall be in accordance to Tanzania road act

4.3.12 Vertical clearance
Shall be in accordance to the vehicle original manufacturer

4.3.13 Turning clearance circles
Shall be in accordance to Tanzania road act

4.3.14 Lift

Shall be in accordance to the vehicle original manufacturer

5 SPECIFIC REQUIREMENTS

5.1 Construction materials for sides, roof and floor

5.1.1 Vehicle body shall be of sufficient strength to support entire weight of the full loaded vehicle on its top or side if overturned.

5.1.2 Vehicle body shall be unit designed and built to provide impact resistance.

5.2 Side posts and roof bows

There shall be a body side post and roof bow before and after each window opening. This may be a continuous bow or two separate pieces effectively joined.

5.3 Proof

For station wagon vehicles, the construction shall provide dust proof and watertight unit and shall also protect the passenger compartment from excessive heat.

5.4 The floor

5.4.1 The floor shall be of prime commercial quality steel of at least 16-gauge or other metal of at least equal in strength to 16-gauge steel.

5.4.2 The floor shall be slippage free and corrosion resistance.

5.4.3 The floor shall protect the passengers against shock and noise.

5.4.4 The floor shall be covered with fire resistance rubber floor covering or approved equivalent.

5.5 Doors

5.5.1 Service doors shall be manually operated and designed to afford easy release and prevent accidental opening.

5.5.2 Doors shall be designed such that it can be opened and closed from both inside and outside

5.5.3 The hinges, catches or pillars of a door shall not be loose to the extent the door is not secured when closed.

5.5.4 All doors shall be outward opening type.

5.5.5 The minimum number of doors shall be three.

5.6 Requirement for windows and windscreen

5.6.1 All side windows shall be capable of being opened

5.6.2 Any window pane, windscreen or transparent partition shall be in a sound, unbroken and clear condition.

5.6.3 The glass used in window shall be identifiable as toughened glass or laminated glass

5.6.4 The glass used in windscreen shall be identifiable as laminated glass.

5.7 Bumper bars protective devices, bonnets and roof carriers

5.7.1 A bumper bar, protective device, bonnet, roof carrier or similar fitting shall be securely fixed and shall have no sharp edges that could cause injury.

5.7.2 Any lump, retro reflector or registration plate shall not be obscured by the bumper bar or protective device.

5.8 Requirement for the seats

5.8.1 Requirement seat dimensions - general

5.8.1.1 Any seat backrest shall have height not less than 350 mm, measured from seat level to the highest point.

5.8.1.2 Every seat shall be designed to in such a way that it provides head restrain

5.8.1.3 The distance between the front of a seat squab and the back of the squab of the seat preceding it (dimension H), when measured horizontally and at all heights above the floor between the level of the top surface of the seat cushion and a point 500mm above the floor, shall not be less than 450mm.

5.8.2 Minimum seat width

The minimum width of the backrest shall not be less than 450 mm measured at its widest point.

5.8.3 Minimum seat height

The height of any seat from the floor or the height from the foot rest of such seat to seat level shall be not less than 300 mm.

5.8.4 Requirements for cushioning

5.8.4.1. Minimum cushion height

The height of the uncompressed seat cushion, relative to the floor shall be such that the distance from the floor to a horizontal plane tangential to the front upper surface of the seat cushion is between 400 mm and 500 mm: this height may however be reduced to not less than 350 mm at the wheel arches and at the engine compartment.

5.8.4.2. Minimum cushion depth

The minimum of any seat from the front of the seat to the front of the backrest shall not be less 400 mm.

5.9 Requirement for free height over seating position

Each seating position shall have a free height of not less than 350 mm measured from the highest point of the uncompressed cushion. This free height shall extend over the vertical projection of the whole area of the seat and associated foot space.

5.10 Requirements for surface finish and paints

5.10.1 The vehicle body surface finish shall be adequate with no unnecessary projections and sharp edges

5.10.2 Paints to be applied shall be lead free.

5.11 Requirement for interior

5.11.1 The interior of the vehicle shall be free of all unnecessary projections likely to cause injury.

5.11.2 There shall be inner lining on ceilings and walls.

5.11.3 Ceiling panels shall be constructed so as to contain lapped joints with all exposed edges hemmed to minimize sharpness.

5.11.4 If lateral panels are used, forward panels shall be lapped by rear panels

5.11.5 Ceilings and walls shall be coated with proper materials to deaden sounds and to reduce vibrations to a minimum.

5.11.6 The interior of the vehicle shall be equipped with sufficient light

5.12 Requirement for Gross Vehicle Mass (GVM)

The Gross Vehicle Mass (GVM) of the modified safari vehicle shall not exceed Gross Vehicle Mass
specified by the manufacturer.

6 Determination of CG height: Axle lift method

6.1 Loading conditions, suspensions and mechanical parts

Any load shall be held in place to avoid displacement due to the inclination of the vehicle. After loading the vehicle to the desired loading conditions, the wheel suspension can be blocked if necessary, to avoid changes in deflection due to the inclination of the vehicle. This may also apply to other vehicle components that could affect the test result due to flexible mounting.

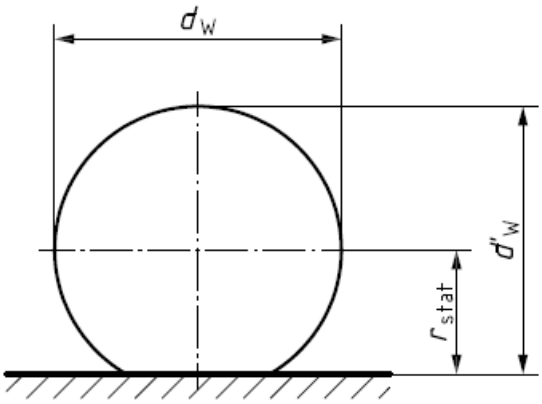
When lifting the vehicle, the gear-box shall be in neutral. The parking-brake shall be released; rolling of the wheels of one axle only shall be avoided by wedges or other means. The front wheels shall remain pointing straight ahead as far as possible.

6.2 Measuring procedure

6.2.1 With the vehicle horizontal, measure and record the static radii:

*r*stat,1, the static loaded radius, front left, in millimetres;
*r*stat,2, the static loaded radius, front right, in millimetres;
*r*stat,3, the static loaded radius, rear left, in millimetres;
*r*stat,4, the static loaded radius, rear right, in millimetres.

The static loaded radius may be determined as shown in Figure 1. The formula is sufficiently accurate for the test procedure described in this International Standard.



$$r_{stat} = d'_W - d_W / 2$$

Key
*d*w - wheel diameter
d ‘w - loaded wheel diameter
*r*stat - static loaded radius

Figure 1 — Determination of static loaded radius, *r*stat

6.2.2 Lift one axle in steps (three or more steps are recommended). Record the axle load of the other axle and the lifting angle for each position. The maximum lifting angle and the accuracy of the scale used to measure axle load affect the accuracy of the computation of the CG height.

6.2.3 To take the hysteresis into account, lower the lifted axle by steps back to the level position and record axle loads and lifting angle as described in 6.2.2.

6.2.4 Plot the axle loads against the tangent of the corresponding lifting angles and determine the mean value of axle load for a corresponding lifting angle. The plot can also be useful for checking the linearity of the measurements. An alternative to generating the plot is to compute the individual CG heights using the individual load and angle measurements, using the equations provided in 6.5, and then averaging these values to get a final answer.

6.2.5 It is recommended that all the measurements be repeated lifting the other axle.

6.2.6 It may also be desirable to determine the lifting angle from the wheelbase and the elevation of the wheels above the ground for each inclination position. In this case the change in tyre deformation caused by lifting one end of the vehicle shall be taken into consideration.

6.3 Accuracy of determined parameters

The following accuracies are required:
– absolute axle load value: ±0,2 %;
– change in axle loads due to lifting: ±2,5 %;

NOTE Applies to scales which do not measure absolute loads, but changes in loads.
– dimensions: < 2,000 mm: ±1 mm; > 2,000 mm: ±0,05 %;
– angles: ±0,5 %.

6.4 Determination of axle load and lifting angle

The following values are obtained from the plotted data by linear curve fitting:

– m'_f and m'_r which are axle loads at front and rear respectively of the axle remaining on the ground while the vehicle is inclined;
– θ which is the corresponding lifting angle.

6.5 Location of CG above ground

The height of the CG above ground, z_{CG}, in millimetres, is determined by the equations:

$$z_{CG} = \frac{l(m'_f - m_f)}{m_v \times \tan\theta} + r_{stat,f} \quad (6)$$

or

$$z_{CG} = \frac{l(m'_r - m_r)}{m_v \times \tan\theta} + r_{stat,r} \quad (7)$$

where

m_f $= m_1 + m_2$ (as defined in 4.2) (8)
is front axle load, in kilograms;

m_r $= m_3 + m_4$ (as defined in 4.2) (9)
is rear axle load, in kilograms;

$r_{stat,f}$ $= 0{,}5(r_{stat,1} + r_{stat,2})$ (10)
is static loaded radius, front, in millimetres;

$r_{stat,r}$ $= 0{,}5(r_{stat,2} + r_{stat,3})$ (11)
is static loaded radius, rear, in millimetres;

l and m_v are as defined in 5.1.

NOTE m_f and m_r may be measured directly if only the height of the CG is required, in which case m_1, m_2, m_3 and m_4 are not needed.

6.6 Data presentation

Measured data and test results shall be presented in a test report as shown in Annex A.

Annex A
(informative)

Example of test report — Axle lift method

A.1 Vehicle identification

A.1.1 Make: .....

A.1.2 Model: .....

A.1.3 Type: .....

A.1.4 Tyres:

Tyre size, front: ..... rear: .....

Tyre pressure, front: ..... rear: .....

A.1.5 Suspension setting (if applicable): .....

A.2 Measurement data

A.2.1 Loading conditions (description of the loads, e.g. dummies, luggage, etc., and their locations in vehicle): .....
.....

A.2.2 Masses (loads):

Front left: ..... kg Rear left: ..... kg

Front right: ..... kg Rear right: ..... kg

Front total: ..... kg Rear total: ..... kg

Total vehicle: ..... kg

A.2.3 Track, front: ..... mm rear: ..... mm

A.2.4 Wheelbase, left: ..... mm right: ..... mm

A.2.5 Static load radii:

Front left: ..... mm Rear left: ..... mm

Front right: ..... mm Rear right: ..... mm

A.3 Test results

A.3.1 Longitudinal displacement between centre of front axle and CG: ..... mm

A.3.2 Distance between the longitudinal median plane of the vehicle and the CG (positive to the left): ..... mm

A.3.3 Height of the CG above the ground: ..... mm

A.3.3.1 Test with lifted front axle

lifting angle: ..... °

rear axle load (vehicle inclined): ..... kg

height of CG, front axle lifted: ..... mm

A.3.3.2 Test with lifted rear axle

lifting angle: ..... °

front axle load (vehicle inclined): ..... kg

height of CG, rear axle lifted: ..... mm