

Firefighting and rescue service vehicles

Part 2: Common requirements — Safety and performance

ICS 13.220.10

National foreword

This British Standard is the UK implementation of EN 1846-2:2009+A1:2013. It supersedes BS EN 1846-2:2009 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee FSH/17, Fire brigade equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

National annex NA provides guidance on the application of BS EN 1846-2:2009.

Compliance with a British Standard cannot confer immunity from legal obligations.

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English Version

Firefighting and rescue service vehicles - Part 2: Common requirements - Safety and performance

Véhicules des services de secours et de lutte contre l'incendie - Partie 2: Prescriptions communes - Sécurité et performances

Feuerwehrfahrzeuge - Teil 2: Allgemeine Anforderungen - Sicherheit und Leistung

This European Standard was approved by CEN on 3 July 2009 and includes Amendment 1 approved by CEN on 8 December 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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Foreword

This document (EN 1846-2:2009+A1:2013) has been prepared by Technical Committee CEN/TC 192 "Fire service equipment", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes A1 EN 1846-2:2009 A1.

This document includes Amendment 1, approved by CEN on 2012-12-08.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This European Standard contains requirements common to fire fighting and rescue vehicles. Additional requirements are given for specific types of fire fighting and rescue vehicles in EN 1777, EN 14043 and EN 14044. These additional requirements supplement or modify the requirements of this European Standard. Compliance with the requirements of EN 1777, EN 14043 or EN 14044 and this European Standard is required to achieve conformity with the essential health and safety requirements of the Directives concerned.

Additional requirements may be necessary for vehicles operating outside the limits of this European Standard e.g. the operating temperature range specified in the scope, fires in the natural environment and flooding. These additional requirements should be agreed between the vehicle manufacturer and the user. Such requirements are outside the scope of this European Standard and compliance with this European Standard will not give conformity with the essential health and safety requirements of the Directives concerned for the related hazards.

A1 *deleted text* A1

EN 1846 "Firefighting and rescue service vehicles" is composed of three parts:

- Part 1: *Nomenclature and designation*;
- Part 2: *Common requirements - Safety and performance*;
- Part 3: *Permanently installed equipment - Safety and performance*.

A1 This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document. A1

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard has been prepared as a harmonised standard to provide one means of conformity with the essential safety requirements of the Machinery Directive and associated EFTA Regulations.

This European Standard is a type C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this part of this European Standard.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

This European Standard also deals with the performance requirements which are common to all firefighting and rescue service vehicles as defined in the scope.

1 Scope

1.1 This European Standard specifies the common requirements for safety and the (minimum) common performance requirements of firefighting and rescue service vehicles as designated in EN 1846-1.

NOTE 1 Categories and mass classes of these vehicles are given in EN 1846-1.

When drafting this European Standard it has been assumed that the finished standard automotive chassis (or the chassis designed in accordance with the same principles) that is the basis for the firefighting or rescue vehicle, offers an acceptable safety level for its basic transport functions within the limits specified by the manufacturer. Therefore, this European Standard does not formulate requirements for this chassis.

This European Standard deals with all significant hazards, hazardous situations and events relevant to firefighting and rescue service vehicles, when they are used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

Complementary specific requirements for aerial appliances are the subject of the following European Standards:

- EN 1777: Hydraulic platforms (HPs) for fire fighting and rescue services,
- EN 14043: Turntable ladders with combined movements,
- EN 14044: Turntable ladders with sequential movements.

These specific requirements may supplement or modify the requirements of this document and they take precedence over the corresponding requirements of this document.

NOTE 2 Additional regulations, not dealt with in this document, may apply in relation with the use of the vehicles on public roads.

This European Standard deals with firefighting and rescue vehicles intended for use in a temperature range from – 15 °C to + 35 °C.

NOTE 3 In the case of utilisation outside this temperature range, additional measures may be necessary as agreed between the manufacturer and the user. Such requirements are outside the scope of this European Standard.

1.2 This European Standard does not deal with the following types of fire-fighting or rescue vehicles or equipment:

- vehicles designed exclusively for carrying personnel;
- vehicles with a gross laden mass not exceeding 3 t;
- boats;
- aircraft;
- railway vehicles;
- ambulances (see EN 1789);
- provisions for removable equipment driven by PTO;
- airport vehicles in the scope of the recommendations of the International Civil Aviation Organisation (ICAO).

1.3 This European Standard deals with the technical requirements to minimise the hazards listed in Clause 4 which can arise during operational use, routine checking and maintenance of firefighting and rescue service vehicles when carried out in accordance with the specifications given by the manufacturer or his authorised representative.

It does not cover the hazards generated by:

- non-permanently installed equipment i.e. portable equipment carried on the vehicle;
- use in potentially explosive atmospheres;
- commissioning and decommissioning;
- electromagnetic compatibility.

Additional measures not dealt with in this European Standard may be necessary for specific use (e.g. fire in natural environment, flooding, etc.).

1.4 This European Standard is not applicable to machines that are manufactured before its date of publication as a European Standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 659, *Protective gloves for firefighters*

EN 953, *Safety of machinery – Guards - General requirements for the design and construction of fixed and movable guards*

EN 981, *Safety of machinery – System of auditory and visual danger and information signals*

EN 1846-1:1998, *Firefighting and rescue service vehicles – Part 1: Nomenclature and designation*

EN 60204-1:2006, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements (IEC 60204-1:2005, modified)*

FprCEN/TS 15989¹, *Firefighting vehicles and equipment – Symbols for operator controls and other displays*

EN ISO 3744:1995, *Acoustics – Determination of sound power levels of noise sources using sound pressure–Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

EN ISO 4871, *Acoustics – Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 5353, *Earth moving machinery, and tractors and machinery for agriculture and forestry – Seat index point (ISO 5353:1995)*

EN ISO 11201, *Acoustics – Noise emitted by machinery and equipment – Measurement of emission sound pressure levels at a work station and at other specified positions – Engineering method in an essentially free field over a reflecting plane (ISO 11201:1995)*

EN ISO 12100-1:2003, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 13849-1, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design (ISO 13849-1:2006)*

¹ In preparation.

EN ISO 13857, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

EN ISO 14121-1:2007, *Safety of machinery – Risk assessment – Part 1: Principles (ISO 14121-1:2007)*

ISO 3864-1:2002, *Graphical symbols - Safety colours and safety signs – Part 1. Design principles for safety signs in workplaces and public areas*

IEC 60364-7-717, *Electrical installations of buildings – Part 7-717: Requirements for special installations or locations; Mobile or transportable units*

3 Terms and definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and EN 1846-1:1998 and the following apply.

3.1

unladen mass

mass of the vehicle, including the driver (75 kg) and all items needed to operate the vehicle including a full capacity of cooling water, fuel and oil and all permanently installed equipment, but excluding the spare wheel and extinguishing agents

3.2

gross laden mass

GLM

unladen vehicle mass as defined in 3.1, plus the mass of the remainder of the crew, calculated as 90 kg for each crew member and his personal equipment, and additional 15 kg for the driver's personal equipment for which the vehicle is designed and the mass of the extinguishing agents and other equipment to be carried

3.3

permissible total laden mass

PTLM

maximum permitted gross laden mass as declared by the chassis manufacturer

NOTE See European Directive 70/156/EEC.

3.4

approach angle

α

angle between the horizontal ground contact plane and the plane tangent to the tyres of the front wheels, such that no rigid part ahead of the first axle of the vehicle is located between these planes, measured when the vehicle is at its gross laden mass

NOTE See Figure 1

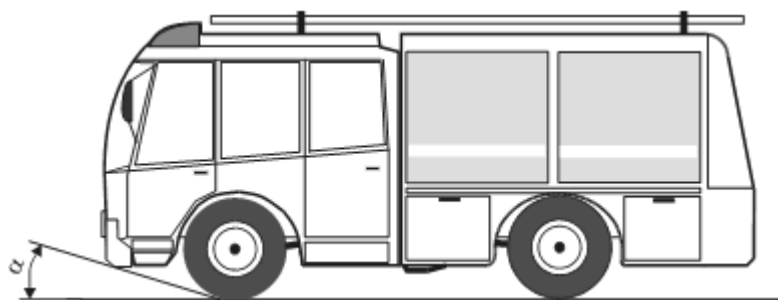


Figure 1

3.5 departure angle

β

angle between the horizontal ground contact plane and the plane tangent to the tyres of the rearmost wheels such that no rigid part of the vehicle behind the last axle is between these planes, measured when the vehicle is at its gross laden mass

NOTE See Figure 2

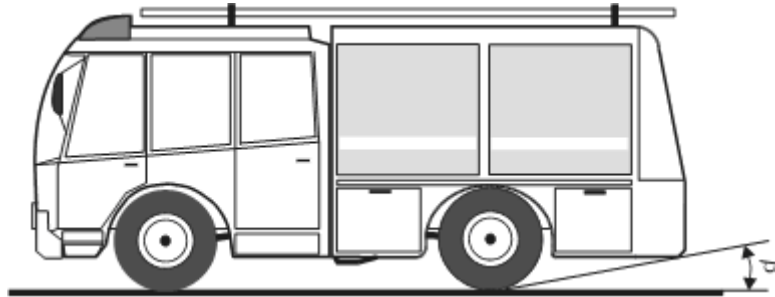


Figure 2

3.6 angle of slope

γ

smallest angle measured, when the vehicle is at its gross laden mass, between two planes tangential to the innermost front and rear tyres which intersect at the lowest rigid point or surface of the underside of the vehicle between these tyres

NOTE 1 See Figure 3

NOTE 2 This angle defines the largest ramp over which the vehicle can pass.

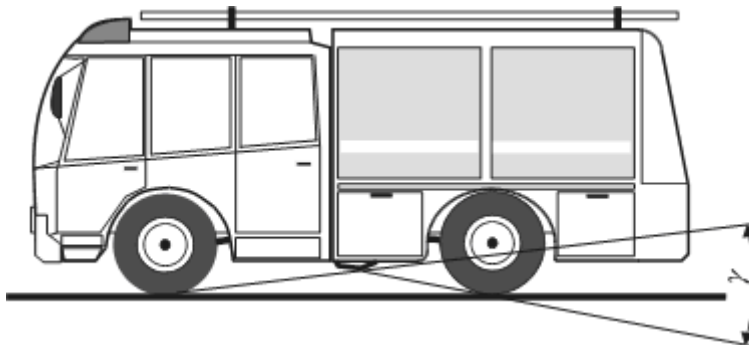


Figure 3

3.7 ground clearance

d

distance between the horizontal ground contact plane and the lowest fixed point on the vehicle, other than the axles, measured when the vehicle is at its gross laden mass

NOTE 1 See Figure 4

NOTE 2 Multiple axle sets are considered as a single axle.

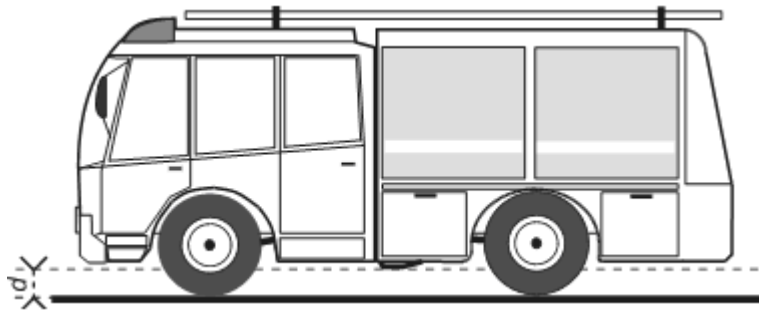


Figure 4

3.8

ground clearance under axle

h

distance determined by the highest part of a quadrilateral having its base as the ground contact plane between the innermost wheels on an axle and its upper plane as the lowest rigid part of the vehicle falling between the wheels and within 0,3 m of both sides of the vehicle centre line, measured when the vehicle is at its gross laden mass

NOTE See Figure 5

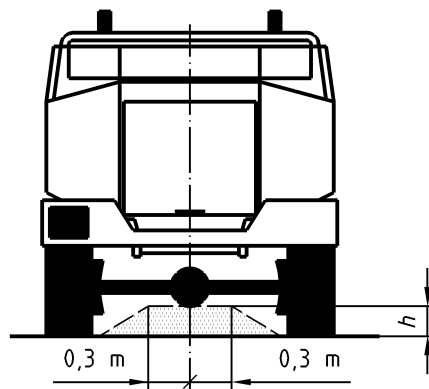


Figure 5

3.9

cross-axle capability

c

ability of the vehicle to remain functional and with no unintended interference between the various components of the vehicle including cabin and bodywork, when driven onto two blocks of specified height c simultaneously disposed diagonally on a horizontal plane, measured when the vehicle is at its gross laden mass

3.10

turning circle between walls

D

diameter of the smallest imaginary cylinder within which the vehicle can turn at maximum steering lock

NOTE See Figure 6

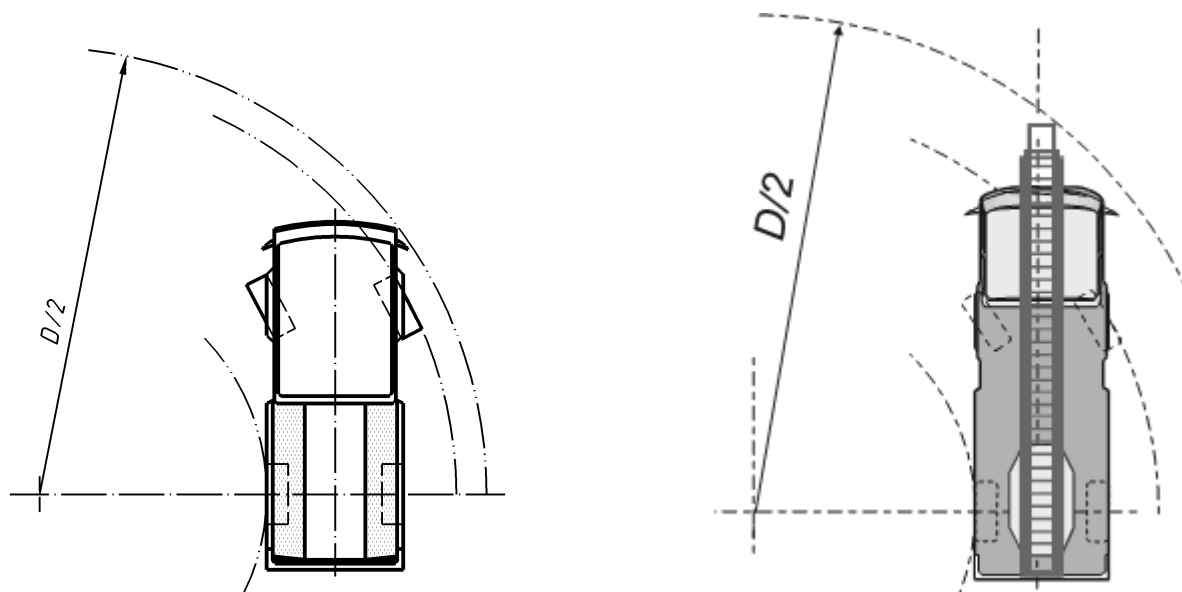


Figure 6

3.11 static tilt angle

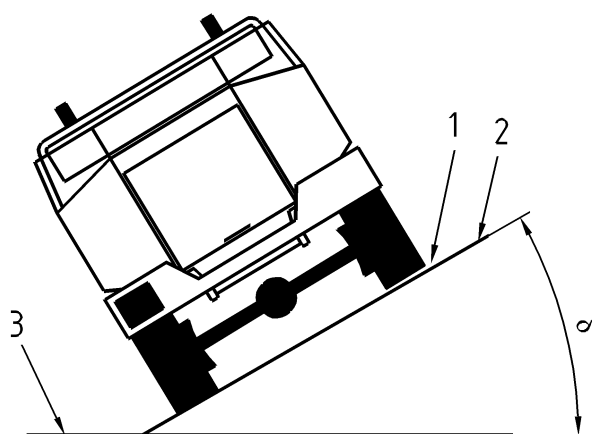
δ

angle between the horizontal and ground contact planes at which the vehicle when tilted along its longitudinal axis undergoes loss of stability

3.12 loss of stability

point at which the final upslope wheel loses contact with the ground contact plane, at the gross laden mass of the vehicle

NOTE See Figure 7



Key

- 1 Loss of contact
- 2 Ground contact plane
- 3 Horizontal plane

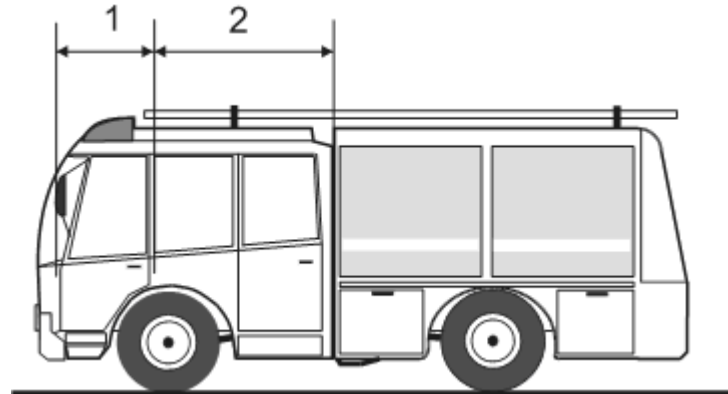
Figure 7

3.13

cabin

driver's cab and crew compartment

NOTE See Figure 8



Key

- 1 Driver's cab, including the first range of seats
- 2 Crew compartment, separate or not

Figure 8

3.14

operating position

position at which firefighters are located to operate firefighting or rescue equipment permanently installed on the vehicle

3.15

working platform

operating position above the ground level

3.16

gradient capability

P

ability of a vehicle at its gross laden mass (GLM) to start and stop on and to ascend or descend a slope

4 List of significant hazards

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this European Standard, identified by risk assessment as significant for this type of machinery and which require action to eliminate or reduce the risk (see Table 1).

Table 1 — List of hazards

Reference in EN ISO 14121-1:2007	Situation/area	Clause reference in this standard
1 Mechanical hazards		
Crushing	Unintended movement of the vehicle	5.1.1.4
	Falling of tilting cabin	5.1.2.2.1
	Reversing of vehicle	5.1.1.8
	Rolling over of vehicle	5.1.1.2
	Forward movement of load/body work	5.1.2.2.2 5.1.2.2.3
Shearing	Injury from horizontally moving load carriers	5.1.2.4.2
Cutting or severing	Sharp edges of body and fixed equipment	5.1.2.1
	Unprotected sharp objects in the cabin	5.1.2.2.2
Entanglement	Exposed PTO/transmission	5.1.1.5
Drawing in or trapping	Movement of the vehicle with doors lockers equipment etc., outside the body perimeter	5.1.2.1
Impact	Movement of crew at sudden stopping of vehicle	5.1.2.2.2 5.1.2.2.3 5.1.2.2.4
		5.1.1.1
		5.1.2.2.2 5.1.2.2.3
	Movement of equipment at sudden stopping of vehicle	5.1.1.1
Loss of stability	Overturning of vehicle	5.1.1.1 5.1.1.2 5.1.1.6
		5.1.1.2 5.1.1.3.1 5.1.1.6
		5.1.1.2 5.1.1.7
	Loss of lateral stability during braking	5.1.1.2 5.1.1.7
		5.1.1.2 5.1.1.7
Slip, trip, fall	Falling from/through roof and working platforms	5.1.2.3.4 5.1.2.3.5
	Injury from leaving/entering crew compartment	5.1.2.3.2 5.1.2.2.6
	Leaving/entering the cabin	5.1.3.3 5.1.2.2.6
	Tripping in area of the operating positions	5.1.2.1 5.1.3.3
		5.1.2.1 5.1.3.3

(continued)

Table 1 — List of hazards (continued)

Reference in EN ISO 14121-1:2007	Situation/area	Clause reference in this standard
2 Electrical hazards		
Contact of persons with live parts (direct contact)	Connection of external power supply to vehicle	5.1.3.1 5.1.4.3
Contact of persons with live parts (indirect contact)	Electrical equipment	5.1.3.1
3 Thermal hazards		
A1 Burns	Exposed exhaust systems Ignition of fuel	5.1.1.1 6.2 A1
4 Noise hazard		
Hearing loss	Noise at operating position	5.1.5
Interference with speech	Speech and acoustic signals not audible at operating position	5.1.5
7 Materials and substances hazards		
Fluids, gases, mists, fumes and dusts	Inhalation of exhaust gases	5.1.1.1
	Loss of acids from batteries	5.1.3.2
	Contact with harmful fluids and fumes	5.1.2.4.1
8 Ergonomic hazards		
Unhealthy postures, excessive efforts	Bad access to vehicle (crew compartment, equipment, roof.)	5.1.2.3 5.1.2.3.3 5.1.2.4.2
Human anatomy	Access and location of operating and seating positions	5.1.2.2.7 5.1.2.3.4 5.1.2.5 5.1.4.4
Area lighting	Tripping in area of the operating positions/ equipment lockers	5.1.3.3
Human error	Incorrect operations	5.1.4.3 6.2
Inadequate design, location or identification of manual controls	Lack of information or confusion at the operating position	5.1.4
10 Combination of hazards		
Failure of energy	Falling of cabin during tilting	5.1.2.2.1
	Mechanical damage for category 3 as defined in EN 1846-1	5.1.1.1
Failure of control system	Unintentional moving of vehicle when PTO is in operation or other unintended movement	5.1.1.5 5.1.4.3
	Remote control	5.1.4.2
Errors of fitting	Incorrect electric connection HI/LO (voltage - polarity)	5.1.3.1
Overturn, loss of stability	Loss of longitudinal and lateral stability (category 3 as defined in EN 1846-1)	5.1.1.2 5.1.1.3
	Loss of latitudinal stability of all vehicles (roll over)	5.1.1.2 6.2
	Loss of lateral control of the vehicle	5.1.1.3 5.1.1.6
Missing and/or incorrectly positioned safety related measures/means	Absence of safety measures for operational use	5.1.6
		5.1.7

Table 1 — List of hazards (concluded)

Reference in EN ISO 14121-1:2007	Situation/area	Clause reference in this standard
Inadequate lighting of moving/working areas	Tripping in area of the operating position. Bad area lighting	5.1.3.3
Sudden movement, instability during handling	Tilting cabin	5.1.2.2.1
	Injuries due to unexpected movement of equipment (e.g. doors, lockers, canopy, steps, masts).	5.1.2.4
Inadequate seat/seating	Loss of control when driving category 3 vehicles as defined in EN 1846-1 on suspended seat	5.1.2.2.4
	Personal injury from sudden movement during travel	5.1.2.2.2 5.1.2.2.4
Inadequate design/positioning of controls	Dangerous operation of equipment, risk of error	5.1.2.2.1 5.1.2.3.5 5.1.4
Starting/moving of self propelled machinery	Unexpected or sudden movement of the vehicle or apparatus	5.1.1.3 5.1.1.4 5.1.4.3
Hazards to exposed persons due to uncontrolled movement	Unexpected or sudden movement of the vehicle or apparatus	5.1.1.3 5.1.1.4 5.1.4.3
	Unexpected tilting of cabin during movement (category 3 as defined in EN 1846-1)	5.1.2.2.1
Hazards due to rolling over	Rolling over of vehicle (category 3 as defined in EN 1846-1)	5.1.2.2.1
Hazards due to batteries, fire emissions etc.	Contact with acids of batteries	5.1.3.2
Movement when starting the engine	Unauthorised movement of the vehicle	5.1.1.4
Movement without a driver at the driving position	Unauthorised movement of the vehicle	5.1.1.5
Movement without all parts not in a safe position	Movement of the vehicle	5.1.4.3
Insufficient ability of machinery to be slowed down, stopped and immobilised	Dangerous movement of the vehicle. Loss of control of the vehicle	5.1.1.3
Insufficient means for evacuation/emergency exit	Inadequate emergency exit	5.1.2.2.5

5 Requirements

5.1 Safety requirements and/or protective measures - Verifications

5.1.1 General requirements

5.1.1.1 General

Vehicles shall comply with the safety requirements and/or protective measures of this clause. In addition, the vehicles shall be designed according to the principles of EN ISO 12100 for relevant but not significant hazards which are not dealt with by this European Standard.

NOTE 1 For hazards which are to be reduced by the application of the B level standard, the manufacturer should carry out a risk assessment to establish the requirements of that standard which are to be applied. This specific risk assessment is part of the general risk assessment of the machine.

The design and construction of the firefighting and rescue vehicle shall conform to the requirements and specifications of the automotive chassis as defined by its manufacturer.

The method for verification of compliance with the requirements of this European Standard and the criteria for acceptance are included in each clause. The general conditions for verification are given in Annex A.

The permanently installed equipment, the load and the locks of doors, flaps and drawers shall be firmly secured against unintended release. The locks and holding devices used shall be easy to open.

The filler-opening of fuel tank(s) shall be designed and/or positioned to avoid the risk of fuel contacting any hot parts of the vehicle or equipment, including the exhaust system.

Exhaust system(s) shall be designed and installed to protect the operator and crew from exhaust gases or burns. If necessary, for use at the place of the operation, additional means such as detachable exhaust extension and/or interfaces for connection to a stationary exhaust system may be used (see an example of an exhaust coupling in Annex B).

The temperature of readily accessible elements of the exhaust system A_1 of the vehicle or of installed equipment A_1 (except the discharge end) shall not exceed 86 °C. A_1 When this requirement cannot be fulfilled, a warning sign shall be placed close to the hot parts and a warning advice shall be included in the instruction handbook. A_1

NOTE 2 See EN ISO 13857 for the accessibility of the elements.

For category 3 vehicles (see EN 1846-1) particular attention shall be paid to the protection against mechanical damage of all electrical wiring, fuel lines, pipes, hoses by rough ground/terrain.

When fixed guards, or parts acting as such, are not permanently fixed e.g. by welding, their fixing systems shall remain attached to the guards or to the supporting structure when the guards are removed.

Verification:

Data such as specifications and test results, received from the manufacturer(s) of components, shall be used as elements for the verification.

Verification requirements are intended for the verification of the compliance of the "type". In the case of series manufacture a vehicle representative for the series and the vehicle type may be used.

NOTE It is the responsibility of the manufacturer to ensure the conformity of each individual vehicle to the type.

Subsequent to the static and dynamic tests the vehicle shall be examined to verify that vehicle doors and shutters have remained secure but can be easily opened for operational use. All equipment installed and carried shall be examined to verify that it has remained secure but can easily be released for operational use.

Requirements dealing with the filler-opening and, for category 3 vehicles (see EN 1846-1), for electrical wiring, fuel lines, brake pipes and hoses shall be confirmed by visual inspection and/or functional test.

Vehicles for specific use with additional requirements shall have their complementary verifications agreed between the user and the manufacturer.

Exhaust system(s): By visual and/or functional verification, and measurement.

5.1.1.2 Static stability

The design of the vehicle, at gross laden mass (GLM) shall be such that the centre of gravity (CG) of the stationary vehicle is within the chassis manufacturers recommended limits.

Vehicles, except high rise aerial appliances, shall comply with the static tilt angles given in Table 2.

A_1 NOTE EN 1777 gives static tilt angles values for hydraulic platforms; EN 14043 and EN 14044 give static tilt angles values for turntable ladders. A_1

Table 2 — Static tilt angle values

Mass class (see EN 1846-1)	L (Light)			M (Medium)			S (Super)		
Category (see EN 1846-1)	1 (urban)	2 (rural)	3 (all terrain)	1 (urban)	2 (rural)	3 (all terrain)	1 (urban)	2 (rural)	3 (all terrain)
static tilt angle $\delta(^{\circ})$	≥ 32	≥ 27	≥ 27	≥ 32	≥ 27	≥ 25	≥ 32	≥ 27	≥ 25
NOTE See also 6.2.d.									

The static tilt angle for all vehicles fitted with a demountable system and for vehicles intended to carry mainly various loads shall be 3° more than the values of the Table 2, tested without the demountable unit or the load.

For damage control tender, command and control appliance, personnel carrying vehicle, support vehicle and other specialized motor vehicle (see EN 1846-1), any reduction of the tilt angle shall be based on a risk assessment.

Verification:

NOTE 1 During these tests, precautions should be taken to prevent the loss of any liquids from the vehicle tanks by means of temporary devices.

Incline the stationary vehicle with the engine switched off along its longitudinal axis. Measure and record the angle δ at which loss of stability, as defined in 3.11, occurs.

Carry out the test by inclining the vehicle to the right and to the left.

Any stop used to prevent the wheels from slipping sideways during this test shall have a maximum height dimension not exceeding, in horizontal position of the vehicle, 50 % of the minimum vertical measurement between the surface on which the vehicle stands and the wheel rim.

NOTE 2 During this test precautions should be taken to prevent complete loss of vehicle stability for which purpose a form of temporary restraint may be used.

Carry out additional tests on categories 2 and 3 vehicles fitted with tank(s) for carrying firefighting liquids, with the tank(s) at half capacity (± 50 l).

Calculation e.g. computer modelling, may be used as an alternative to practical testing. The calculation method shall be validated by practical testing for each category of vehicle, comparing the two results obtained. If the difference between the two results is less than 5 % then the calculation method shall be acceptable.

5.1.1.3 Dynamic stability

5.1.1.3.1 Stability during braking

During braking, the vehicle shall not deviate from its course by more than 20 % of its width to either side.

NOTE 1 European Directive 71/320/EEC, or national regulations if these are more stringent, also apply to the braking system.

Verification:

NOTE 2 During the following test, precautions should be taken to prevent complete loss of vehicle stability e.g. by checking brake performance at speeds lower than the test speed before carrying out the test as specified.

The vehicle, including brakes, shall be at normal working temperature at the beginning of the tests.

When travelling at 40 km/h, bring the vehicle to a halt by emergency braking. Repeat the test at a speed of 60 km/h.

During the test, the driver shall not influence the natural path taken by the vehicle other than to avoid a potential accident by allowing hands to remain on the steering wheel.

The test is satisfactory if the maximum deviation from a straight line complies with this requirement.

5.1.1.3.2 Gradient capability

At gross laden mass, vehicles of categories 2 and 3 shall comply with the gradient capability given in Table 3.

Table 3 — Gradient capability values

Mass class (see EN 1846-1)	L (Light)		M (Medium)		S (Super)	
Category (see EN 1846-1)	2 (rural)	3 (all terrain)	2 (rural)	3 (all terrain)	2 (rural)	3 (all terrain)
gradient capability $P(^{\circ})$	≥ 17	≥ 27	≥ 17	≥ 27	≥ 17	≥ 27

Verification:

Conduct these tests on a slope of consistent gradient, the angle of which depends on the category and mass class of the vehicle as defined in Table 3. The slope shall have a non-slip surface.

Drive the vehicle forwards up the gradient, stop at the mid point. Apply the installed system other than the service brake and check that the vehicle remains stationary. Continue to drive the vehicle to the top of the gradient and turn the vehicle.

Drive the vehicle forwards down the gradient, stop at the mid point. Apply the installed system other than the service brake and check that the vehicle remains stationary. Reverse the vehicle back up to the top of the gradient.

Drive the vehicle down the gradient in any chosen gear, without the use of any braking system acting directly on the road wheels, checking that the descent is completed without the engine speed exceeding its normal operating limits.

Except for category 3, calculation e.g. computer modelling, may be used as an alternative to practical testing. The calculation method shall be validated by practical testing for each mass class of vehicle, comparing the two results obtained. If the difference between the two results is less than 5 % then the calculation method shall be acceptable.

NOTE Secondary devices such as engine and/or transmission retarders, exhaust brakes, may be used during this test.

Carry out additional tests on categories 2 and 3 vehicles fitted with tank(s) for carrying firefighting liquids, with the tank(s) at half capacity (± 50 l).

5.1.1.4 Engine

If it is possible to start the vehicle remote from the driving position, a safety interlock to prevent the vehicle moving shall be fitted.

Where there is a Power Take Off (PTO) fitted, the speed of which can be higher than that permitted for the equipment to be connected, there shall be provision for keeping the speed of the PTO within the permissible limits.

If manual adjustment is required, control devices shall be located at the operating position (see 3.14).

Verification:

By measurement and functional verification.

5.1.1.5 Driven components

Access to dangerous moving parts shall be eliminated by design or when this is not possible prevented by distance in accordance with EN ISO 13857, or by guarding in accordance with EN 953 and EN ISO 13857.

When PTO operation is only intended with stationary vehicle an interlocking system shall prevent any travel movement of the vehicle with engaged PTO, and prevent PTO operation unless the vehicle is stationary.

For vehicles designed for PTO operation while moving, moving the vehicle with PTO in operation, shall require two independent actions by the driver or, as an alternative, a clear indication shall be provided to the driver that the PTO is in operation. The indicator shall be positioned close to the area of the driver's natural line of sight (see zone A or B as defined in EN 894-2:1997).

Verification:

By visual inspection, measurement and functional test.

5.1.1.6 Axle loading

The minimum and maximum permitted axle loads shall be in accordance with the values specified by the chassis manufacturer in all load conditions.

Verification:

By measurement and recording of each axle load under the following conditions:

- *unladen mass (see 3.1);*
- *gross laden mass (GLM) (see 3.2).*

NOTE Partial calculation can be made with reference to the unladen mass.

5.1.1.7 Provisions for tyre pressure control

Equipment shall be installed or supplied with the vehicle making it possible to inflate, deflate and check the tyre pressure of M.3 and S.3 vehicles (see EN 1846-1) when stationary.

Verification:

By visual inspection and functional test.

5.1.1.8 Reversing of vehicle

Vehicles designed for PTO operation while moving and where the driver has no visibility to the zone immediately behind it (direct or indirectly, e.g. with mirrors or Closed Circuit Television Cameras "CCTV") shall be fitted with one of the following:

- a device for detecting the presence of a person behind the vehicle when a reverse movement is to be started, or
- an automatic acoustic warning signal when the reversing gear is engaged .