BS EN 1846-3:2013

BSI Standards Publication

Firefighting and rescue service vehicles

Part 3: Permanently installed equipment — Safety and performance

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National foreword

This British Standard is the UK implementation of EN 1846-3:2013. It supersedes BS EN 1846-3:2002+A1:2008 which is withdrawn.

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.

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

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Firefighting and rescue service vehicles - Part 3: Permanently installed equipment - Safety and performance

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Feuerwehrfahrzeuge - Teil 3: Fest eingebaute Ausrüstung - Sicherheits- und Leistungsanforderungen

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Foreword

This document (EN 1846-3:2013) has been prepared by Technical Committee CEN/TC 192 “Fire and Rescue 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of an identical text or by endorsement, at the latest by January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

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 EN 1846-3:2002+A1:2008.

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.

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* (the present document).

Significant changes:

The significant changes with respect to the previous edition EN 1846-3:2002+A1:2008 are listed below:

a) demountable systems using a hydraulic hook arm are integrated in the standard;

b) Clause 2: updated;

c) Clause 3:

   1) 3.1.1 "specified rate(s) of the water installation, Q_1" and 3.1.2 "specified outlet pressure(s) of the water installation, p_{a1}" replaced with new 3.1.1 "classification of the water installation";

   2) 3.1.4 "specified height of the water installation, d" deleted;

   3) 3.1.10 "hosereel system": new wording;

   4) 3.6 "equipment gantry" replaced with "bracket assembly";

   5) new definitions: 3.7 "demountable" and 3.8 "hold-to-run control device";

d) Clause 4: updated;

e) Clause 5: verification placed directly after the requirements;

   1) 5.2.1: new numbered sub-entries dealing with oil hydraulic components;

   2) 5.2.2.3: addition of requirements regarding the installation of the final supply and delivery connection(s);

3) 5.2.3.1: reference to prEN 16327:2011 added;

4) 5.2.6 and 5.3.6: addition of requirements for demountable systems using a hydraulic hook arm;

5) 5.3.2: amended to take into account all type of pumps and/or water installation;

6) 5.3.2.7: Figure 3 amended with new dimensions;

7) 5.3.4: text amended taking into account EN 15767-1;

f) Annex A: new informative annex "Symbols and abbreviated terms";

g) Annex B: new normative annex "Theoretical stability calculation";

h) Annex C: new normative annex "Rated capacity of the tank".

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 document is a type C standard as stated in EN ISO 12100:2010.

This document should be used with EN 1846-2 which also deals with some optional specific permanently installed equipment used by firefighters.

The equipment concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

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 document also deals with the performance requirements which apply to the equipment as defined in the scope.

1 Scope

1.1 This part of this European Standard specifies the minimum requirements for safety and performance of some optional specific permanently installed equipment on firefighting and rescue service vehicles, operated by trained persons, as designated in EN 1846-1 and specified in EN 1846-2.

NOTE Categories and mass classes of the firefighting and rescue service vehicles are given in EN 1846-1.

The permanently installed equipment covered by this Part of this European Standard is given below:

— water installation;

— liquid additive installation;

— monitor;

— equipment gantries;

— demountable systems using a hydraulic hook arm.

This part of this European Standard should be read in conjunction with any national regulations in force for vehicles using the public roads and with any EU Directives and associated EFTA regulations in force relevant to vehicles and their equipment.

For the purposes of this European Standard, the normal ambient temperature range is - 15 °C to + 35 °C.

For equipment to be used at temperature outside this temperature range, the particular temperature range should be specified by the user and the manufacturer should determine by a risk assessment any need for additional precautions.

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

— all control systems outside of the cabin related to hook arm system;

— 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 part of 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.

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;

— noise (as permanently installed equipment cannot be operated separately from the vehicle, this hazard is covered in Part 2);

— 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 document is not applicable to the equipment which is manufactured before its date of publication by CEN.

2 Normative references

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

EN 547-2, *Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings*

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 1028-1:2002+A1:2008, *Fire-fighting pumps — Fire-fighting centrifugal pumps with primer — Part 1: Classification — General and safety requirements*

EN 1028-2, *Fire-fighting pumps — Fire-fighting centrifugal pumps with primer — Part 2: Verification of general and safety requirements*

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

EN 1846-2:2009+A1:2013, *Firefighting and rescue service vehicles — Part 2: Common requirements — Safety and performance*

EN 1947, *Fire-fighting hoses — Semi-rigid delivery hoses and hose assemblies for pumps and vehicles*

EN 14710-1:2005+A2:2008, *Fire-fighting pumps — Fire-fighting centrifugal pumps without primer — Part 1: Classification, general and safety requirements*

EN 15767-1, *Portable equipment for projecting extinguishing agents supplied by fire fighting pumps — Portable monitors — Part 1: General requirements for portable monitor assemblies*

prEN 16327:2011, *Fire-fighting — Positive pressure foam proportioning systems (PPFPS) and compressed air foam systems (CAFS)*

EN ISO 4413, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13849-2:2008, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation (ISO 13849-2:2003)*

EN ISO 13850, *Safety of machinery — Emergency stop— Principles for design (ISO 13850)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1846-1, EN 1846-2:2009+A1:2013 and the following apply.

NOTE The list of the symbols and abbreviated terms used in the standard is given in Annex A.

3.1
water installation
combination of components for the collection, storage and delivery of water and/or water-additive mixture at varying pressures and delivery rates

3.1.1
classification of the water installation
combination of the delivery rate Q_1 specified at pressure p_{a1} and at specified height d

3.1.2
height
d
difference of level between the standing surface of the vehicle and the water surface at the time of a pumping appliance suction operation

3.1.3
standing surface of the vehicle
surface on which the vehicle wheels are resting when it is operating

3.1.4
standing surface of the operator
surface on which the operator stands

3.1.5
installed water pump
pump permanently installed on a vehicle and driven by the motive power of the vehicle, or a pump complete with drive motor

3.1.6
installed water tank
container for storage of water for fire service purposes

3.1.7
supply and delivery connections for water
inlet and outlet devices for joining hoses to the pipework installation

3.1.8
pipework installation for water
system linking the installed water pump(s), the installed water tank(s) and the supply and delivery connections

3.1.9
operating and control instruments for water
controls and gauges necessary to operate and monitor the water installation system

3.1.10
hosereel system
fixed hose storage system on a rotating drum for semi-rigid hose(s) permanently connected to the pipework installation

3.1.11
wheeled hosereel
hosereel designed for the storage, the transport and the deployment of layflat hose

3.2
liquid additive
addition to water to enhance firefighting capabilities e.g. foam concentrate, fire retardant

Note 1 to entry: In this document, the term "additive" means "liquid additive".

3.2.1
additive installation
combination of components for the collection, storage and delivery of additive at varying pressures and delivery rates before mixing with water

3.2.2
installed additive pump
pump permanently installed on a vehicle and driven by the motive power of the vehicle, or a pump complete with drive motor

3.2.3
installed additive tank
container for storage of additive for fire service purposes

3.2.4
supply and delivery connections for additive
inlet and outlet devices for joining hoses to the additive installation

3.2.5
pipework installation for additive
system linking the installed additive pump(s), the additive installed tank(s) and the supply and delivery connections

3.2.6
operating and control instruments for additive
controls and gauges necessary to operate and monitor the additive installation system

3.3
rated capacity of a tank
capacity of liquid contained in a tank that could be used by the corresponding pump(s)

3.4
mixing system
system to mix the additive (including foam concentrate) with water (and sometimes air) to produce the required firefighting media

Note 1 to entry: The mixing system is part of the water and/or additive installation.

3.5
monitor
device for projection of extinguishing agents

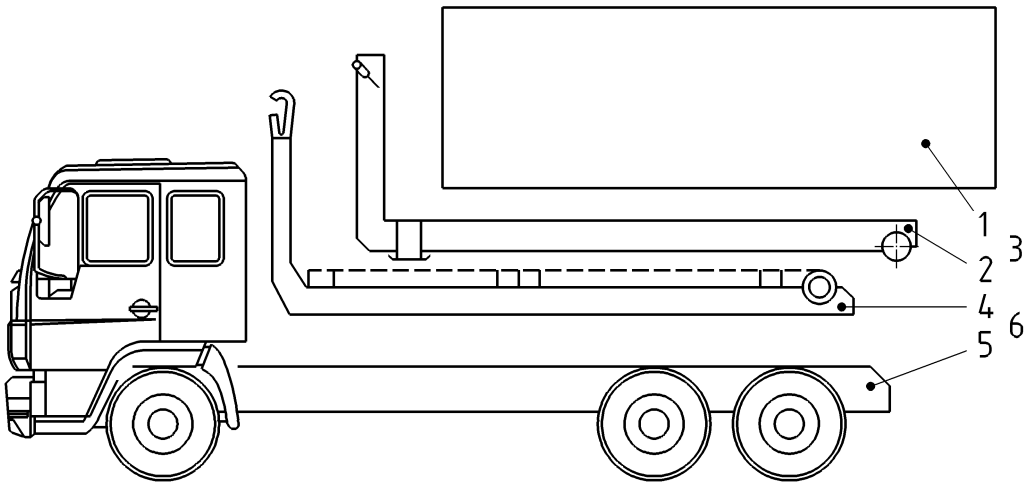
3.6
bracket assembly
mechanical system(s), manually or power driven, to assist with the loading, unloading and storage of equipment

3.7
demountable
specially designed frame with superstructure that can be easily mounted on, removed from and transported by a suitable vehicle with a hydraulic hook arm system

Note 1 to entry: See Figure 1.

3.8
hold-to-run control device
control device which initiates and maintains machine functions only as long as the manual control (actuator) is actuated

[SOURCE: EN ISO 12100:2010, 3.28.3]



Key

1 super structure of demountable
2 frame of demountable
3 demountable (1 + 2)
4 hook arm system
5 chassis
6 vehicle with hook arm system (4 + 5)

Figure 1 — Vehicle with a hook arm system and demountable

4 List of significant hazards

The significant hazards relevant to permanently installed equipment which are dealt with in this European Standard are given in Tables 1 to 5.

Table 1 — List of significant hazards for water installation *(1 of 2)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Mechanical hazards			
Due to accumulation of energy inside the machinery caused, for example, by liquids and gases under pressure	Variation of pressure for firefighters at the end of the branchpipe	/	5.2.2
Entanglement by a powered system	Exposed power take off (PTO)/ transmissions	• 5.1.1.5 of EN 1846-2:2009+A1:2013 • EN 953	/
	Powered rewind hosereel(s)	/	5.2.2.6
Rupture or piercing of the water installation	Exposed parts of the installation	/	5.2.2
Ejection of coupling	Supply and delivery location	/	5.2.2.1 / 5.2.2.3
Thermal hazards			
Resulting in burns by contact with the pump or by projection of hot water from the pump	Exposed parts of the pump, pipework and delivery connections	• 5.2.3 of EN 1028-1:2002+A1:2008 • 5.2.3 of EN 14710-1:2005+A2:2008	/
Material/substance hazards			
Inhalation of exhaust gases	Bad location of the exhaust	• 5.1.1.1 of EN 1846-2:2009+A1:2013	/

Table 1 *(2 of 2)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Ergonomics hazards			
Inadequate local lighting	At the operating position	• 5.1.3.3 and 5.1.4.4 of EN 1846-2:2009+A1:2013	/
Mental overload and underload, stress	No logical relationship between the command and the expected operation at the operating position	• 5.1.2.5 of EN 1846-2:2009+A1:2013 • 3rd dash of 6.2.8 of EN ISO 12100:2010	5.2.2.4; 5.2.2.5
Human error, human behaviour			
Inadequate design, location or identification of manual controls	At the operating position	• 5.1.4.4 and 6.4 of EN 1846-2:2009+A1:2013 • 3rd dash of 6.2.8 of EN ISO 12100:2010	/
Confusion between different signals	At the operating position	• 5.1.4.3 and 6.4 of EN 1846-2:2009+A1:2013	/
Impossibility of stopping the machine in the best possible conditions	At the operating position	/	5.2.1
Relating to the travelling function			
Excessive oscillations when moving	Overturning of vehicle. Loss of lateral stability during braking	• 5.1.1.2 and 5.1.1.3 of EN 1846-2:2009+A1:2013	5.2.2.2

Table 2 — List of significant hazards for additive installation *(1 of 2)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Mechanical hazards			
Entanglement by a powered system (if pump)	Exposed PTO/transmissions	• 5.1.1.5 of EN 1846-2:2009+A1:2013 • EN 953	/

Table 2 — List of significant hazards for additive installation *(2 of 2)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Rupture or piercing of the additive installation	Exposed parts of the additive installation	/	5.2.3.1
Ejection of coupling	Supply and delivery location	/	5.2.3.4
Material/substance hazards			
Contact with or inhalation of harmful additive	Point of contact with additive	/	6.1 6.2
Inhalation of exhaust gases	Bad location of the exhaust	• 5.1.1.1 of EN 1846-2:2009+A1:2013	/
Ergonomics hazards			
Inadequate local lighting	At the operating position	• 5.1.3.3 and 5.1.4.4 of EN 1846-2:2009+A1:2013	/
Mental overload and underload, stress	No logical relationship between the command and the expected operation at the operating position	• 5.1.4.5 of EN 1846-2:2009+A1:2013 • 3rd dash of 6.2.8 of EN ISO 12100:2010	5.2.3.5
Human error, human behaviour			
Inadequate design, location or identification of manual controls	At the operating position	• 5.1.4.4 and 6.4 of EN 1846-2:2009+A1:2013 • 3rd dash of 6.2.8 of EN ISO 12100:2010	/
Confusion between different signals	At the operating position	• 5.1.4.3 and 6.4 of EN 1846-2:2009+A1:2013	/
Impossibility of stopping the machine in the best possible conditions	At the operating position	/	5.2.1
Relating to the travelling function			
Excessive oscillations when moving	Overturning of the vehicle. Loss of lateral stability during braking	• 5.1.1.2 and 5.1.1.3 of EN 1846-2:2009+A1:2013	5.2.3.2

Table 3 — List of hazards for monitor *(1 of 2)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Mechanical hazards			
Impact hazard when monitor is operating: — movement (when remote control); — movement (vertical, rotation)	Monitor location	/	5.2.4 6.1; 6.2
Rupture or piercing of the pipework system or monitor	Exposed pipework installation	/	5.2.4
Electrical hazards			
Full stream on high voltage conductors	Electric shock by stream contact on high voltage conductors	• 6.2 of EN 1846-2:2009+A1:2013	6.1; 6.2
Material/substance hazards			
Inhalation of exhaust gases	Bad location of the exhaust	• 5.1.1 of EN 1846-2:2009+A1:2013	/
Ergonomics hazards			
unhealthy postures or excessive effort	At the operating position	• 5.1.4.4 of EN 1846-2:2009+A1:2013	/
Inadequate lighting of the operating position	At the operating position	• 5.1.3.3 and 5.1.4.4 of EN 1846-2:2009+A1:2013	/
Loss of permanent control of the monitor	At the operating position	/	5.2.4
Confusion between different signals	At the operating position	• 5.1.4.4 and 6.2 of EN 1846-2:2009+A1:2013	/
Impossibility of stopping the machine in the best possible conditions	At the operating position	/	5.2.1
Slip, trip and fall of persons	At the operating position	• 5.1.2.3.3 / 5.1.2.3.4 and 5.1.2.3.5 of EN 1846-2:2009+A1:2013	/

Table 3 — List of hazards for monitor *(2 of 2)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Linked to the work position			
Falling of person from the work position	At the operating position when the vehicle is in motion	• 5.1.2.3.5 of EN 1846-2:2009+A1:2013	5.2.4

Table 4 — List of hazards for bracket assembly *(1 of 2)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Mechanical hazards			
due to machine parts or workpieces	In vicinity of bracket assembly	/	5.2.5
Impact	In vicinity of bracket assembly	5.1.3.3 of EN 1846-2:2009+A1:2013	5.2.5
Ergonomics hazards			
Unhealthy posture or excessive efforts	At the operating position	5.1.2.3.3 of EN 1846-2:2009+A1:2013	5.2.5 5.2.5
Inadequate consideration of hand-arm or foot-leg anatomy	At the operating position	/	5.2.5 5.2.5
Inadequate local lighting	At the operating position	• 5.1.3.3 of EN 1846-2:2009+A1:2013	/
Human error, human behaviour	At the operating position	/	5.2.5; 6.1; 6.2

Table 4 — List of hazards for bracket assembly *(2 of 2)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Inadequate design, location or identification of manual control	At the operating position	• 5.1.4.4 / 6.2 of EN 1846-2:2009+A1:2013 • 3rd dash of 6.2.8 of EN ISO 12100:2010	/
Falling or ejected objects or fluids	In vicinity of bracket assembly	/	5.2.5
Slip, trip and fall of persons	At the operating position and in vicinity of bracket assembly	/	5.2.5
Relating to travelling function			
Movement without all parts in a safe position	When vehicle is in motion	• 5.1.4.3 of EN 1846-2:2009+A1:2013	5.2.5

Table 5 — List of hazards for hook arm system *(1 of 3)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Mechanical hazards			
Being run over, being thrown	Operator in cabin	/	5.2.6.1; 5.2.6.2; 5.2.6.10; 5.2.6.11; 5.2.6.19
Crushing hazard	Operator outside cabin	/	5.2.6.11
Cutting or severing hazard	Persons in the vicinity of the specified working area	/	5.2.6.5; 5.2.6.13
Drawing- in or trapped hazard	Maintenance personnel	/	6.2
Friction or abrasion hazard	Loading and unloading the demountable	/	5.2.6.5; 5.2.6.7; 5.2.6.8; 5.2.6.12; 5.2.6.21

Table 5 — List of hazards for hook arm system *(2 of 3)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Slip, trip, fall	At the operating position	5.1.2.3 and 5.1.2.5 of EN 1846-2:2009+A1:2013	/
Stabbing or puncture hazard	Wrong weight distribution of the demountable	/	5.2.6.6; 5.2.6.9
Entanglement hazard	Loading and unloading the demountable	/	5.2.6.5; 5.2.6.7; 5.2.6.8; 5.2.6.12; 5.2.6.21
Ejection	Line rupture hydraulic system	/	5.2.6.16
Impact hazard	Connection between demountable and hook arm system	/	5.2.6.2; 5.2.6.3; 5.2.6.15; 5.2.6.16; 5.2.6.18
Misunderstanding	Control system	/	5.2.6.3; 5.2.6.4; 5.2.6.7; 5.2.6.14;
Malfunctioning	Safety information for the user, training, transport situation	/	5.2.6.2; 5.2.6.21; 5.2.6.20; 6.2
Electrical hazards			
Burn, Electrocution, falling, being thrown, fire, shock	Approach to live parts under high voltage	/	5.2.6.15
	Contact of persons with live parts (direct contact)	See EN 60204-32	/
Thermal hazards			
Objects or materials with a high temperature	Exhaust, hydraulic parts	5.1.1.3.2 of EN 1846-2:2009+A1:2013	5.2.6.17
Inhalation	At the operating position	5.1.1.3.2 of EN 1846-2:2009+A1:2013	/
Noise hazards			
Moving parts, scraping surfaces, hydraulics components, etc…	At the operating position, people in the vicinity	5.1.5 of EN 1846-2:2009+A1:2013	/

Table 5 — List of hazards for hook arm system *(3 of 3)*

Hazard (see EN ISO 12100:2010)	**Situation/area**	**References to Part 2 of this standard or other standards**	**Clause/subclause reference in this Part of this standard (in addition to Part 2 when dealt with in it)**
Radiation hazards			
Ionising, low frequency, optical radiation, radio frequency	At the operating position	1.3 of EN 1846-2:2009+A1:2013	/
Materials and substances hazards			
Fluid	Leakage of hydraulic oil at the operating position	/	5.2.6.16
Ergonomics hazards			
Unhealthy posture or excessive efforts	At the operating position	See ISO 10075 and ISO 10075-2	/
Inadequate consideration of hand-arm or foot-leg anatomy	At the operating position	See ISO 10075 and ISO 10075-2	/
Inadequate local lighting	At the operating position	5.1.3.3 of EN 1846-2:2009+A1:2013	/
Human error, human behaviour	At the operating position, Connection between demountable and hook arm system	/	5.2.6.10; 5.2.6.11; 5.2.6.12; 5.2.6.15; 5.2.6.18; 5.2.6.19
Inadequate design, location or identification of manual control	At the operating position	5.1.4.2/7.1 of EN 1846-2:2009+A1:2013 3rd dash of 6.2.8g) of EN ISO 12100:2010	/
Combination hazards			
Movement without all parts in a safe position	When vehicle is in motion	• 5.1.1.2; 5.1.4.1 of EN 1846-2:2009+A1:2013	5.2.6.1; 5.2.6.2
Failure of the control system		/	5.2.6.14

5 Requirements and verifications

5.1 General

The general conditions for the tests to which this part refers are given in Annex A of EN 1846-2:2009+A1:2013.

Data supplied by the manufacturer of the component(s) may be used as part of the verification.

Any permanently installed equipment shall not cause unintended interference to other permanently installed equipment on the vehicle.

Adjustments permitted during the intended use of the vehicle shall be possible without the use of tools.

NOTE Tools means: screw driver, hammer, etc.

Design and construction of permanantly installed equipments shall be in accordance with the requirements and specifications of the chassis manufacturer and with the ones of the installed equipment manufacturer.

Verification

By checking compliance with the chassis manufacturers specification, if relevant, or otherwise by attestation of the chassis and/or equipment's manufacturer.

5.2 Safety requirements and/or protective measures

5.2.1 General

5.2.1.1 Permanently installed equipment shall comply with the general safety requirements and/or protective measures described in EN 1846-2 as well as with the safety requirements and/or measures of 5.2. In addition the equipment shall be designed according to the principles of EN ISO 12100:2010 for hazards relevant but not significant which are not dealt with in this document.

5.2.1.2 Each operating position for each item of equipment shall have a stop control. This stop control does not have to be an emergency stop control as specified in EN ISO 13850.

Verification

By visual inspection and functional test of the stop control.

5.2.1.3 The design and selection of oil hydraulic components of permanently installed equipment shall conform to the requirements of EN ISO 4413.

Precautions against hydraulic line rupture shall be taken, e.g.:

— pressure limiting device (relief valve);

— load holding valves on functions where pressure is required to support the load;

— a minimum burst pressure of 3 times the maximum working pressure for metal pipes or tubes.

Verification

By inspection of the information supplied.

5.2.1.4 Oil hoses operating at pressures greater than 5 MPa and /or at temperatures greater than 50 °C shall be protected from mechanical damage.

Oil hydraulic hoses shall have a minimum burst pressure of 2,5 times the maximum working pressure.

Verification

By inspection of the information supplied.

5.2.2 Water installation

5.2.2.1 General

5.2.2.1.1 All parts of the water installation designed to work at a pressure higher than atmospheric pressure shall withstand the designed maximum working pressure ($p_{a\ lim}$) specific to that part of the installation plus 5,5 bar without any permanent deformation or damage.

NOTE Water tank(s) are considered to be subjected to only atmospheric pressure.

Verification

By hydrostatic test. The pump may be excluded from this test.

5.2.2.1.2 The maximum outlet pressure p_a shall not exceed the limit pressure ($p_{a\ lim}$) as defined in EN 1028-1 or EN 14710-1 at the maximum inlet pressure defined by the manufacturer of the pump.

Verification

By calculation or dynamic test.

5.2.2.1.3 The maximum speed of the installed water pump shall be less than the maximum speed n_0 as defined in 3.6.3 of EN 1028-1:2002+A1:2008 or 3.6.2 of EN 14710-1:2005+A2:2008.

Verification

By measuring the maximum speed of the pump.

5.2.2.1.4 The deviation of the outlet pressure of the pump shall meet the requirements of Table 6 when operating at p_{a1} and Q_1, as defined in 3.1.1 (see also 5.2.1).

Table 6 — Allowed pressure deviation

Pump	Flowrate variation	Allowable pressure deviation
Pump with Q_1 < 3 000 l/min	Q_1 to 0,7 Q_1	p_{a1} to 1,25 p_{a1}
Pump with $Q_1 \geq$ 3 000 l/min	Q_1 to 0,85 Q_1	p_{a1} to 1,25 p_{a1}

Verification

By measuring the pressure deviations. During the test, manual adjustment of the speed of the pump shall not be allowed. The variation of flow rate shall be achieved within 2 s $\pm$ 0,5 s.

5.2.2.2 Water tank

In addition to compliance with the stability requirements given in EN 1846-2, the design and mounting of the water tank and the location and the installation of baffles, if necessary, shall prevent any excessive dynamic force that may cause vehicle instability under anticipated operational conditions.

Verification

By inspection and functional test.

Manufacturers have developed several different methods of designing machines which are stable under the conditions of intended use, and experience has shown that they can be equally effective. These may be based upon analytical computer software, physical testing, or designs which have been proven over several

years of use. With the present state of knowledge it is not possible to describe a single standardised method of design and of verification.

5.2.2.3 Access to supply and delivery connections for water

5.2.2.3.1 The maximum height from the lowest point of the final supply and delivery connection(s) to the standing surface of the operator shall not exceed 1,5 m at unladen mass (see 3.1 of EN 1846-2:2009+A1:2013). Hosereel systems shall comply with requirements of 5.3.2.7.

Verification

By visual inspection and measurement.

5.2.2.3.2 The final supply and delivery connection(s) shall be angled downwards at an angle between 10° and 30° from the horizontal when they are higher than 0,5 m from the standing surface of the vehicle.

If it is technically impossible to reach these angles, a device shall be provided to be inserted between the delivery or supply connection and the related hoses to achieve the required angle. It shall not be possible to connect hoses without this device.

Verification

By measurement and functional test.

5.2.2.3.3 It shall be possible to relieve any pressure build up between the delivery connection and any blank cap fitted.

When hoses are stored in a locker in which the delivery connections are located, it shall not be possible to pressurise the hoses with the locker closed.

Verification

By visual inspection and functional test.

5.2.2.4 Pipework installation for water

The final delivery shall be equipped with valve(s) to shut off the water.

Verification

By visual inspection.

5.2.2.5 Operating and control instruments

5.2.2.5.1 Operating and control instruments shall conform to EN ISO 12100:2010, 3rd dash of 6.2.8.f and 5.1.4.1 of EN 1846-2:2009+A1:2013.

Verification

In accordance with 5.1.4.1 of EN 1846-2:2009+A1:2013.

5.2.2.5.2 Operating controls shall be easily accessible, easily adjustable without the use of tools and not deviate from their set position.

Verification

By visual and functional verification of the operation of controls.

5.2.2.6 Hosereel system

5.2.2.6.1 The operation of a powered rewind hosereel, if fitted, shall be controlled by a hold to run control.

Verification

By visual inspection and functional test.

5.2.2.6.2 When rewinding, the hosereel shall be visible by the operator of the hold to run control.

Verification

By visual inspection of the location.

5.2.2.6.3 The hosereel system shall be fitted with a means which prevents unintended unwinding.

Verification

By functional test and visual verification for unintended unwinding following the tests of 5.1.1.3 of EN 1846-2:2009+A1:2013.

5.2.3 Additive installation

5.2.3.1 General

5.2.3.1.1 When positive pressure proportioning systems (PPPS) or compressed air foam systems (CAFS) are installed, they shall comply both with prEN 16327:2011 and with the requirements of 5.2.3 and 5.3.3 of this standard.

The other types of systems shall comply with the requirements of 5.2.3 and 5.3.3 of this standard.

All parts of the additive installation designed to work at a pressure higher than atmospheric pressure shall withstand the designed maximum working pressure specific to that part of the installation plus 5,5 bar without any permanent deformation or damage.

NOTE Additive tank(s) are considered to be subjected to only atmospheric pressure.

Verification

By hydrostatic test.

5.2.3.1.2 The design and materials used shall take into account the nature of the additive, especially concerning corrosion.

Verification

By manufacturer's attestation of the construction and materials.

5.2.3.2 Additive tank

In addition to compliance with the stability requirements given in EN 1846-2, the design and mounting of the additive tank and the location and the installation of baffles, if necessary, shall prevent any dynamic force that may cause vehicle instability under anticipated operational conditions.

Verification

By inspection and functional test.

Manufacturers have developed several different methods of designing machines which are stable under the conditions of intended use, and experience has shown that they can be equally effective. These may be based upon analytical computer software, physical testing, or designs which have been proven over several years of use. With the present state of knowledge it is not possible to describe a single standardised method of design and of verification.

5.2.3.3 Access to supply and delivery connections for additive

The maximum height from the lowest point of the final supply and delivery connection(s) to the standing surface of the operator shall not exceed 1,5 m under at unladen mass (see 3.1 of EN 1846-2:2009+A1:2013).

This requirement shall not apply to gravity feeding device.

Verification

By measurement.

5.2.3.4 Pipework installation for additive

The final supply connection(s) and the final delivery shall be equipped with valve(s) to shut off the additive.

Verification

By visual inspection.

5.2.3.5 Operating and control instruments for additive

Operating controls shall be easily accessible, easily adjustable without the use of tools and not deviate from their set position.

Verification

By visual and functional verification of the operation of controls.

5.2.4 Monitor

5.2.4.1 A visual indicator shall identify the direction to the monitor if the monitor is not visible from the operating position.

Verification

By visual inspection.

5.2.4.2 At the monitor operating position, it shall be possible to open, close, move and maintain the monitor at the required position.

Verification

By visual inspection and functional test.

5.2.4.3 Where firefighters are allowed to be in the vicinity of remote control monitors, a visual and/or audible warning device(s) shall be provided to indicate the monitor is about to leave its travelling position.

Verification

By functional test.

5.2.4.4 Where there is an inlet monitor connection, the designed maximum working pressure shall be indicated close to the inlet of this installation.

Verification

By visual inspection.

5.2.4.5 Communication between driver and operator of the monitor shall be possible if the monitor is intended to be operated whilst the vehicle is in motion.

Verification

By functional test.

5.2.4.6 All parts of the pipework installation for the monitor shall withstand the designed maximum working pressure specific to that part of the installation plus 5,5 bar without any damage.

Verification

By hydrostatic test.

5.2.4.7 Operating controls shall be easily accessible, easily adjustable without the use of tools and not deviate from their set position.

The reaction force from a monitor is not considered as a significant hazard for the stability of the vehicle. However the manufacturer should give consideration to this for the design of specific appliances.

Verification

By visual inspection and functional test.

5.2.5 Bracket assembly for removable equipment

5.2.5.1 Bracket assemblies shall be fitted with devices to prevent unintended movement of the bracket assembly or the equipment carried thereon.

Verification

By visual inspection and functional test during and after the verification described in 5.1.1.2 and 5.1.1.3 of EN 1846-2:2009+A1:2013 and by measurement.

5.2.5.2 The equipment shall be stowed securely in the bracket assemblies. The removal of equipment from bracket assemblies shall require an intentional act.

Verification

By functional test.

5.2.5.3 Where the bracket assembly is power driven, any failure of the power supply shall result in the bracket assembly and equipment remaining in a safe position.

Verification

By functional test.

5.2.5.4 Bracket assemblies which extend more than 25 cm horizontally outside of the vehicle, when deployed, shall be marked to indicate possible impact hazard to operators moving around the vehicle.

Road regulation(s) should be taken into account for vehicles where bracket assemblies may extend out of the body of the vehicle.

Verification

By measurement and visual inspection.

5.2.5.5 When unlocked, the wheeled hosereel or similar equipment shall be able to be maintained in its stowed position by a force less than 40 N exerted by one hand of a firefighter.

For other equipments the number of operators to maintain the equipment in its stowed position should be agreed between the user and the manufacturer.

Verification

By measurement

5.2.5.6 Unlocking and removal of the wheeled hosereel or similar equipment from its support shall only be possible from ground level.

Verification

By functional test.

5.2.6 Hook arm system

5.2.6.1 A visual warning system shall indicate to the driver when the demountable is in its transport position but not securely fixed to the vehicle.

Verification:

By visual inspection and functional test.

5.2.6.2 During transportation a visual warning system shall indicate to the driver if the hook arm system is not in transport position as defined by the manufacturer.

Verification:

By visual inspection and functional test.

5.2.6.3 During transportation, the demountable and all components of the hook arm system on the vehicle shall remain in their correct position. Movement of the hook harm system shall be prevented.

Verification:

By visual inspection and functional test.

5.2.6.4 A hold-to-run control device shall be provided at the operating position in the cabin. When the control is released all movements shall stop immediately and the demountable shall remain in that position.

Verification:

By functional test.

5.2.6.5 The vehicle shall remain stable during loading and unloading at the maximum allowable mass of the demountable.

Verification:

By axle load measurement and appropriate calculations according to Annex B.

Stability test approval criteria: The test shall be considered to be successful if the test load is held static. During the test the wheels of the most forward axle shall remain on the ground.

5.2.6.6 The ratio of the axle weight of a vehicle transporting a demountable that is loaded to the maximum allowable mass shall be in accordance with the vehicle manufacturer specification.

Verification:

By checking compliance with the chassis manufacturers specification.

5.2.6.7 The speed of loading and unloading a demountable shall not cause excessive loading and/or instability of the vehicle. The system shall withstand the dynamic effects during all movements.

The vehicle with hook arm system shall be capable of loading and unloading 1,1 times the maximum allowable mass of the demountable.

Verification:

By functional test.

NOTE A test procedure is under consideration.

5.2.6.8 During loading and unloading the demountable shall remain in contact with the hook arm system at all times unless otherwise required.

NOTE A locking device for a hook is considered to comply with this requirement.

Verification:

By visual inspection and functional test

5.2.6.9 The limits for the maximum height of the centre of gravity and the maximum mass of the demountable and its maximum length (see Annex B) shall be specified.

The vehicle manufacturer should consider both the information given by the chassis manufacturer and the information given by the hook arm system manufacturer.

Verification:

By inspection of the information supplied.

5.2.6.10 The hook arm system shall be operable from the drivers position as a minimum requirement.

Verification

By visual inspection and functional test.

5.2.6.11 If there is more than one operating position, it shall not be possible to operate the controls at more than one position at any time. The selection of the operating position in use shall be made at the driver's position.

Verification:

By visual inspection and functional test.

5.2.6.12 In all light conditions, the demountable and the hook shall remain visible by the operator at each operating position when loading and unloading (e.g. provision of lighting, direct view, mirror or CCTV).

Verification:

By visual inspection and functional test.

5.2.6.13 During loading and unloading an audible warning device shall be provided to give a warning in the vicinity of the operation.

Verification:

By visual inspection and functional test.

5.2.6.14 The required performance level (PL_r), in accordance with EN ISO 13849-1:2008, of the safety related parts of the control system shall comply with:

— PL_r b for non tipping systems;

— PL_r c for tipping systems.

Verification:

In accordance with EN ISO 13849-2:2008.

5.2.6.15 If a vehicle with a hook arm system is loaded with a demountable having connections (e.g. electric, hydraulic or pneumatic) between the vehicle and the demountable of the manually disconnecting type, a warning device shall warn the operator when starting the unloading process. The warning shall indicate, at any operating position where the unloading of a demountable can be initiated, when the connections are made.

Verification

By visual verification.

5.2.6.16 Hydraulic connections between the vehicle and the demountable shall be prevented from incurring damage from the movement of the demountable.

Verification

By inspection and functional test.

5.2.6.17 Contact with surfaces that may reach a temperature greater than 86 °C shall be prevented.

NOTE See EN ISO 13857 for accessibility of parts.

Verification

By inspection and measurement.

5.2.6.18 If different locking devices are installed to accommodate different demountables, the correct operation of each locking system shall not be affected by the other systems.

Verification

By inspection and functional test.

5.2.6.19 Information providing the maximum allowable height of the demountable shall be provided at and visible from the driver's position.

Verification

By inspection.

5.2.6.20 If a stabilising system is installed and the hook arm system is not engaged, an audible and visual warning device shall indicate at the drivers position that the stabilising system is not in the right position ("transport position") to drive the vehicle.

Verification

By inspection and functional test.

5.2.6.21 For category 2 and 3 vehicles an indication shall be provided at the drivers position when the vehicle is within the allowable gradient for loading and unloading the demountable.

Verification

By inspection and functional test.

5.3 Performance requirements

5.3.1 General

5.3.1.1 Permanently installed equipment shall comply with the general performance requirements described in EN 1846-2 as well as the specific requirements of 5.3.

Verification

By applying the verification of each subclause.

5.3.1.2 Construction techniques and materials of the permanently installed equipment shall be chosen so that they are protected against corrosion.

Verification

By verification of the attestation of the equipment/material's supplier.

5.3.1.3 The equipment shall be protected against accumulation of water, dirt and corrosive substances, between and within the construction elements. Particular care shall be taken to avoid electro-chemical corrosion.

Verification

By visual inspection

5.3.1.4 The design of permanently installed equipment and their mountings shall withstand the physical stresses applied in normal operational use.

Verification

By visual inspection and functional verification after transportation tests.

5.3.2 Water installation

5.3.2.1 General

5.3.2.1.1 Components and connections shall withstand the pressure (positive and/or negative) to which they may be subjected without leakage.

Verification

By examining for leakage during the classification test of the water installation. For pump with primer, after priming the pump to 0,8 bar, with inlet and outlet valves closed, verify that pressure variation of the water installation is not more than 0,1 bar after 1 min.

5.3.2.1.2 The installation, including pump(s), tank(s) and monitor(s) shall be able to be drained. If drain points are used, they shall be clearly identified, be accessible and protected, if necessary, against unintended opening and damage.

Verification

By visual and functional verification for drainage.

5.3.2.1.3 Additional precautions against frost shall be provided where necessary.

Verification

By checking the instruction handbook for frost protection.

5.3.2.1.4 Where the installation contains water/additive mixture, it shall be possible to flush the installation.

National water supply regulations and/or recovery of used water regulations may apply.

Verification

By functional verification for flushing and also checking the instruction handbook.

5.3.2.1.5 The values for Q_1, p_{a1} and specified height *d* (as defined in 3.1.1 and 3.1.2) or positive pressure or water tank operation shall be agreed between the user and the manufacturer.

For pumps with primer (see EN 1028-1), classification of the water installation shall be achieved using Q_1, p_{a1} and *d* (see Table 7).

For pumps without primer working at positive inlet pressure (see EN 14710-1) classification of the water installation shall be achieved using Q_1, p_{a1} at the inlet pressure agreed between the user and the manufacturer.

For other types of pumps and/or water installations the requirements should be agreed between the user and the manufacturer.

Specified rate(s) Q_1 of the water installation shall correspond to the nearest lower value(s) in the lists given in EN 1028-1 and/or EN 14710-1.

Specified outlet pressure(s) p_{a1} of the water installation shall correspond to the nearest lower value(s) in the lists given in EN 1028-1 and/or EN 14710-1.

When the water installation contains a tank, the maximum specific flow-rate from the tank to the pump and the rated capacity of the tank shall be agreed between the user and the manufacturer.

Table 7 — Hydraulic classification of the water installation

Delivery rate/Pressure (l/min)/ bar		***d*** m
Pumps according to EN 1028-1	Q_1 / p_{a1}	1,5 or 3
Pumps according to EN 14710-1	Q_1 / p_{a1}	Not applicable
Other pumps	Q_1 / p_{a1}	Agreed between the user and the manufacturer

Verification

By measurement of Q_1 at p_{a1} and d.

By measurement of the delivery rate using the tank and the rated capacity of the tank (according to Annex C) or by manufacturer's attestation.

5.3.2.1.6 The water installation shall be designed to prevent water hammer, e.g. by the use of a suitable closing time for valves.

Verification

By functional test.

5.3.2.2 Installed water pump

5.3.2.2.1 The water pump shall preferably be one of the types specified in EN 1028-1 or EN 14710-1.

Verification

By verification of the attestation of a pump type's manufacturer.

5.3.2.2.2 The pump shall remain functional at vehicle maximum cross-axle capability according to EN 1846-2:2009+A1:2013, Table 7.

Verification

By functional test with vehicle at maximum cross-axle capability according to Table 7 of EN 1846-2:2009+A1:2013, with the pump in its normal mode for 2 min at least at 0,5 Q_1.

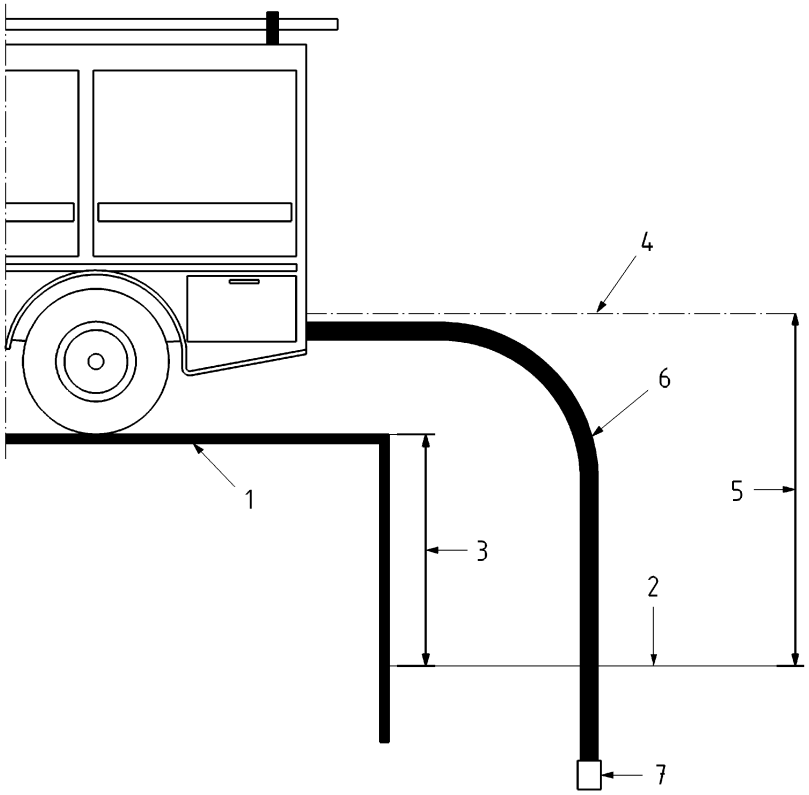
5.3.2.2.3 For EN 1028 pumps, the priming device shall achieve the performances given in Table 8 at height *d* = 6 m with the suction hose size designed for the vehicle and with the shortest possible suction hose length (see Figure 2).

Table 8 — Priming times

Type (EN 1028 (all parts))	FPN 6 – 500	FPN 10 – 750	FPN 10 – 1 000 FPN 15 – 1 000	FPN 10 – 1 500	FPN 10 – 2 000 FPN 15 – 2 000	FPN 10 – 3 000 FPN 15 – 3 000	FPN 10 – 4 000	FPN 10 – 6 000
Time (in s)	≤ 30	≤ 30	≤ 30	≤ 30	≤ 40	≤ 40[a]	≤ 60[a]	b

[a] Unless otherwise agreed between manufactured and user.

[b] The priming times shall be agreed between the user and the manufacturer.



Key

1 standing surface of the vehicle
2 water surface
3 height (see 3.1.2), d
4 pump axle
5 geodetic suction height
6 suction line
7 suction strainer

Figure 2 — Description of the suction installation

If there is more than one suction line, the priming times shall be agreed between the user and the manufacturer.

For other types of pumps and/or water installations the requirements should be agreed between the user and the manufacturer.

Verification

By measurement of the priming time (see 3.8 of EN 1028-1:2002+A1:2008). Determine the priming time three times in succession at the corrected specified height. During these measurements, no manual readjustment or refilling operations shall be carried out on the primer system. Before each test, drain the installation and remove the suction line from the water to the open air. After each test leave the pump running for at least 2 min at least at 0,5 Q_1. Record the average value.

5.3.2.2.4 If automatic pressure regulation is installed, the output pressure of the pump shall not vary by more than ± 10 % from the set pressure under all operational conditions above 4 bar and up to the appliance manufacturer's allowable pressure.

Verification

By functional tests and measurement at 4 bar, 2/3 p_{a1} and p_{a1}.

5.3.2.3 Water tank

5.3.2.3.1 A water tank level indicator shall be fitted and visible from the installed pump operating position.

Verification

By visual verification of the tank level indicator.

5.3.2.3.2 Each filling connection to the water tank shall incorporate an easy reachable filter (as defined in 6.10 of EN 1028-1:2002+A1:2008) to protect the pump.

Each filling connection shall prevent water return.

Verification

By visual and functional verification of the filling connections.

5.3.2.3.3 A tank filling valve shall be fitted. A tank level indicator shall be visible at or near to the control position of the tank filling valve.

NOTE A single tank level indicator can be used if it is visible from both the control position of the tank filling valve and from the installed pump operating position.

The water tank shall be designed and installed to ensure that the tank is not damaged by filling or discharging in normal operating conditions, including driving. Water tank installation shall allow filling at a flow rate of at least 800 l/min, unless otherwise specified.

It may be possible to fill the water tank by the installed water pump and/or through a fixed installation.

Verification

By visual verification of the tank filling valve and indicator.

5.3.2.3.4 The design of the water tank shall avoid any excessive water spillage.

National regulations may apply to water spillage.

Verification

By visual verification during the tests given in 5.1.1.3 of EN 1846-2:2009+A1:2013.

5.3.2.3.5 If personnel access holes are installed, the minimum clearance dimension shall be 450 mm and shall be accessible without removing major fixed components.

Verification

By visual verification and measurement and by functional verification for access holes.

5.3.2.4 Supply and delivery connections for water

5.3.2.4.1 The number, type, size, location and purpose of these connections should be agreed between the user and the manufacturer.

Verification

By visual verification of the connections.

5.3.2.4.2 The positioning of the initial supply and final delivery connections shall allow the easy attachment of the corresponding components.

Verification

By functional verification of positioning.

5.3.2.4.3 Supply and delivery connections shall be identified.

Verification

By visual verification of identification.

5.3.2.4.4 Removable blank caps, if fitted, shall be flexibly attached to the relevant couplings to prevent loss.

A discharge system shall be used, eg: a hole in the blank caps

A pressure relief facility may be incorporated in the initial supply and/or final delivery connections.

Verification

By visual verification of blank caps.

5.3.2.5 Pipework installation for water

The design of the pipework installation shall not allow variations of delivery rate to exceed 10 % for similarly installed final delivery connections of the same diameter.

Verification

Verification by measurement of delivery rates when the pump is operated at p_{a1} and Q_1.

5.3.2.6 Controls and indicators

Controls at the pump operating position shall include:

— pump speed control device;

— stop control (see 5.2.1).

Indicators at the pump operating position shall include:

— pump pressure indicator according to 5.2.5.2 of EN 1028-1:2002+A1:2008;

— pump vacuum indicator (where priming system fitted) according to 5.2.5.2 of EN 1028-1:2002+A1:2008;

— engine coolant temperature warning device;

— water tank level indicator.

Supplementary controls at the pump operating position may include, for example:

— pump engaging device;

— suction valve control;

— priming device control;

— delivery valve(s) control(s).

Supplementary indicators at the pump operating position may include, for example:

— engine oil pressure warning device; (engine failures)

— pump engaged indicator;

— speed indicator of pump;

— speed indicator of pump engine;

— priming device engaged indicator;

— hour metre(s);

— fuel content indicator.

If other operating position is provided, e.g. for monitor, controls and indicators shall be agreed between the user and the manufacturer.

Verification

By visual and functional verification of controls and indicators except where the function of the component is outside normal operating use, in which case verification shall be by checking the wiring circuit.

The same method of verification should be applied to the optional indicators and/or controls, where used.

5.3.2.7 Hosereel system

5.3.2.7.1 Hosereel(s) shall be capable of containing the specified hose length and diameter as agreed between the user and the manufacturer. The hoses shall be of a type specified in EN 1947.

Verification

By visual and functional verification, measurement.

5.3.2.7.2 It shall be possible to manually unwind and rewind the hosereel(s).

Verification

By functional verification of manual operation.

5.3.2.7.3 It shall be possible for one firefighter to unwind any hosereel.

Verification

By functional verification for unwinding.

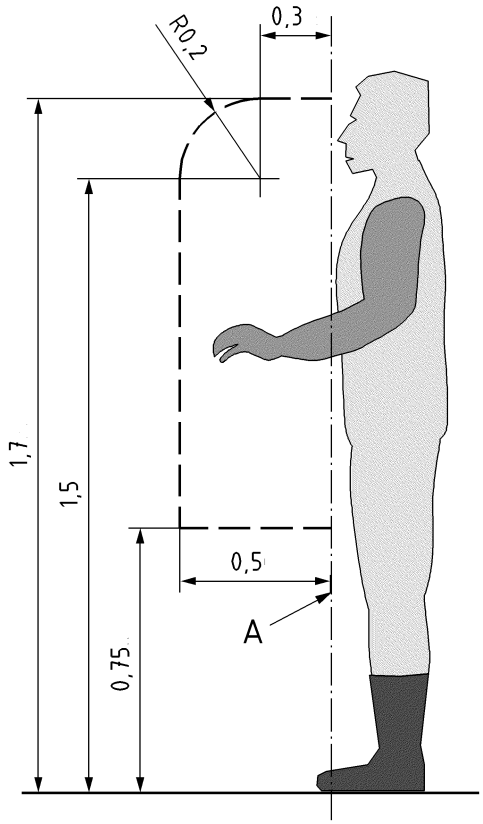
5.3.2.7.4 The hosereel branch, the locking system for the hosereel and, where applicable, the water control valve shall be located at a height between 700 mm and 1 700 mm from the standing surface of the operator and with a maximum depth of 500 mm (see Figure 3).

If because of operational reasons, higher values than those in Figure 3 are required, they may be agreed between the user and the manufacturer.

Verification

By measurement of location.

Dimensions in metres



Key

A body of the vehicle

Figure 3 — Access to hosereel

5.3.3 Additive installation

5.3.3.1 General

5.3.3.1.1 Components and connections shall withstand the pressure (positive and/or negative) to which they may be subjected without leakage.

Verification

By visual and functional verification for leakage.

5.3.3.1.2 The installation, including pump(s), tank(s) and monitor(s) shall be able to be drained. The drain points shall be clearly identified, preferably grouped together, protected against unintended opening and be readily accessible in order to collect additive and/or water/additive mixture.

Verification

By visual and functional verification for drainage.

5.3.3.1.3 Additional precautions against frost shall be provided where necessary.

Verification

See instruction handbook for frost protection.

5.3.3.1.4 It shall be possible to flush the installation.

Verification

By functional verification for flushing and also checking the instruction handbook.

5.3.3.1.5 Instructions concerning the method of flushing shall be fitted at the operating position.

Verification

By visual verification.

5.3.3.1.6 If installed, the mixing system shall be able to mix additive and water in the specified proportions and delivery rates.

Verification

By functional verification and measurement of mixing system.

5.3.3.1.7 Design data and documentation shall be given in the instruction handbook (see Clause 6).

Verification

By checking design data and documentation in the instruction handbook.

5.3.3.2 Installed additive pump

The additive pump shall allow the specified requirements of the additive system to be met.

Verification

By verification of the attestation of a pump type's manufacturer.

5.3.3.3 Additive tank

5.3.3.3.1 An additive tank level indicator shall be fitted and visible from operating position of the installed water pump.

Verification

By visual verification of the level indicator.

5.3.3.3.2 Filling connection(s) to the additive tank shall incorporate a strainer or filter and a control or non-return valve. This requirement is not applicable to tanks filled only by gravity.

Verification

By visual verification of the filling connections.

5.3.3.3.3 A tank filling valve accessible from ground level shall be fitted. An additive tank level indicator shall be visible at or near to the control position of the tank filling valve. This requirement is not applicable to tanks filled only by gravity.

Verification

By visual verification of the tank filling valve and the indicator.

5.3.3.3.4 The additive tank shall be designed and installed to ensure that the tank is not damaged by filling or discharging in normal operating conditions, including driving.

Verification

By functional verification for tank filling.

5.3.3.3.5 Overflow from the additive tank shall be prevented during normal operational use and driving.

Verification

By visual verification of spillage before and after tests given in 5.1.1.3 of EN 1846-2:2009+A1:2013.

5.3.3.3.6 If the filling of the additive tank is power driven, overflow shall be automatically prevented, unless it is operated by a hold to run control.

For vehicles equipped with permanently installed equipment which comply with prEN 16327:2011, overflow shall be automatically prevented during the filling operation.

Verification

By functional verification of overflow.

5.3.3.3.7 If access opening(s) are installed, their type shall be agreed between the user and the manufacturer. The minimum clearance dimension shall comply with EN 547-2 and shall be accessible without removing major fixed components.

Verification

By visual verification and measurement and by functional verification for access holes.

5.3.3.4 Supply, delivery and flushing connections for additive

5.3.3.4.1 The number, type, size, location and purpose of these connections shall be agreed between the user and the manufacturer.

Verification

By visual verification of connections.

5.3.3.4.2 The positioning of these external connections shall allow the easy attachment of the corresponding components.

Verification

By functional verification of positioning.

5.3.3.4.3 External connections shall be identified.

Verification

By visual verification of identification.

5.3.3.4.4 Removable blank caps, if fitted, shall be flexibly attached to the relevant couplings.

A pressure relief facility may be incorporated in the initial supply and/or final delivery connections.

Verification

By visual verification of blank caps.

5.3.3.5 Pipework installation for additive

Water and additive shall not be mixed except where required by design.

Verification

By functional verification.

5.3.3.6 Controls and indicators

Controls and indicators required in 5.3.2.6 should not be duplicated in 5.3.3.6 at the same operating position.

Controls and indicators at the water pump operating position shall include:

— start/stop foam operation;

— additive tank level indicator;

— mixing control, by agreement between the user and the manufacturer maybe at another location;

— adjustment of mixing control if necessary.

NOTE Positive pressure foam proportioning systems (PPFPS) and compressed air foam systems (CAFS) are covered by prEN 16327:2011.

Supplementary controls and indicators at the pump operating position may include for example:

— delivery valve(s) control(s);

— power source warning device(s);

— hour metre(s).

Verification

By visual and functional verification of controls and indicators except where the function of the component is outside normal operating use, in which case verification shall be by checking the wiring circuit.

The same method of verification should be applied to the optional indicators and/or controls, where used.

5.3.4 Monitor

5.3.4.1 The movement of the monitor shall allow horizontal rotation of at least 240°, unless otherwise specified by agreement between manufacturer and user.

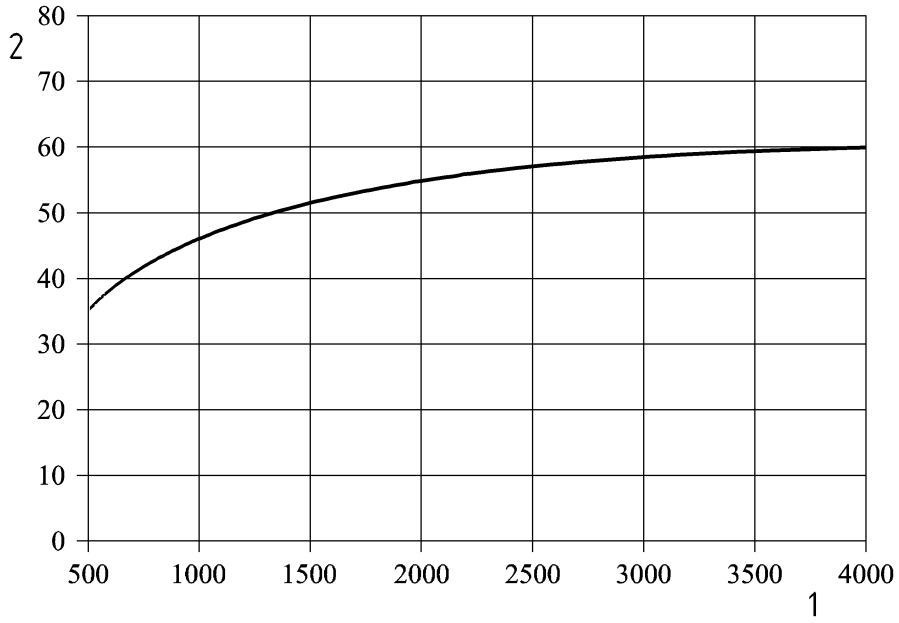
Verification

By measurement of the rotation.

5.3.4.2 The monitor shall be designed to operate between two flowrates defined by the manufacturer (Q_{min} and Q_{max}). The monitor shall achieve, for each Q_{min} and Q_{max}, a minimum effective throw d_{eff} as shown in Figure 4, when set to a straight jet.

For monitor above 4 000 l/min, the minimum effective throw shall be at least 60 m.

The effective throw at Q_{min} and Q_{max} shall be marked at the operating position of the monitor.



Key

1 flowrate *Q* in litres per minute
2 effective throw d_{eff} in metres

Figure 4 — Effective throw

Verification

By measurement of the effective throw according to Annex D.

5.3.4.3 Other performance(s) and corresponding test(s) of the monitor shall be agreed between the user and the manufacturer, e.g. maximum pressure.

Verification

Test(s) of additional performance(s) as agreed.

5.3.4.4 If the monitor is not manually operated the straight jet of the monitor shall not hit any part of the vehicle on which it is mounted.

Verification

By functional verification for no damage.

5.3.4.5 If the monitor assembly is a type which can be both permanently installed (e.g. on a flange, a vehicle, a fire boat, etc.) and may also be used as portable monitor assembly, it shall comply with EN 15767-1.

If the monitor assembly is only permanently installed and can be manually operated, it shall comply with the following requirements:

a) The monitor assembly shall be ergonomically designed to be operated without risk of injury, when wearing firefighter's gloves conforming to EN 659.

b) It shall be possible for the operator to control the speed of opening and closing. This shall not apply to safety devices.

   Any shut-off device should be easy to operate in a controlled manner, in order to minimise the risk of water hammer.

c) In the case of monitor bodies which are opened and closed with a valve, the "closed" position shall be located in the following position:

   1) with a valve handle: direction of the flow,

   2) with a lever: at right angle to the direction of the flow,

   3) with handwheels: in a clockwise direction.

d) If a different operating element is used, the "closed" position shall be clearly identified by visual means.

If the monitor assembly is only permanently installed and cannot be manually used, specific requirements should be agreed between the user and the manufacturer.

Verification

By visual and functional verification.

5.3.5 Bracket assembly

5.3.5.1 General

5.3.5.1.1 Bracket assemblies without their equipment fitted shall not restrict access to the hosereel system as specified in 5.3.2.7.

Verification

By visual and functional verification of access.

5.3.5.1.2 Where an assistance system for the bracket assembly is fitted, any failure of the power supply shall not prevent the operation of the equipment.

Verification

By functional verification by power supply failure.

5.3.5.1.3 Equipment retention devices shall be readily accessible and easy and quick to operate.

Verification

By functional verification of retention devices.

5.3.5.1.4 The design of the bracket assembly shall not cause damage to the equipment when loading and unloading.

Allowable movement of the equipment on the bracket assembly should be in accordance with the recommendation of the manufacturer of the equipment.

Verification

By functional verification for no damage to equipment.

5.3.5.1.5 The loading and unloading of equipment shall be preferably from ground level and, where necessary, with an assisting device.

Verification

By functional verification for loading and unloading.

5.3.5.1.6 Operating the bracket assembly(ies) and loading/unloading equipment shall not cause damage to the vehicle.

Design of the bracket assembly should require minimum maintenance.

Verification

By functional verification for no damage to vehicle.

5.3.5.2 Wheeled hosereel bracket assemblies

5.3.5.2.1 Bracket assemblies shall allow the removal of a wheeled hosereel by one firefighter.

Verification

By functional verification of removal.

5.3.5.2.2 The force required for the manual loading of a wheeled hosereel in its stowed position and its removal shall not exceed 350 N per firefighter.

An assistance device may be provided.

Verification

By measurement of manual force.

5.3.6 Hook arm system

5.3.6.1 The maximum allowable mass of the demountable shall be agreed between the user and the manufacturer. The hook arm system shall be capable of loading and unloading 1,1 times the maximum allowable mass of the demountable.

Verification

By functional test.

5.3.6.2 The speed of loading and unloading a demountable shall be adjustable. The way for adjusting the speed shall be agreed between the user and the manufacturer.

For demountables with maximum mass up to 15 t, it shall be possible to load and unload a demountable within 90 s. For the other demountables this time shall be agreed between the user and the manufacturer.

Verification

By testing the complete hook movement (loading and unloading) without load.

5.3.6.3 The hook arm system shall be able of picking up and setting down a demountable on a flat area even if the standing surface under rear axle of the chassis is 200 mm higher than the deposit-area of the demountable.

Verification

By testing (loading and unloading) with the maximum allowable mass of the demountable

6 Information for use

6.1 General

In addition to 6.2 of EN 1846-2:2009+A1:2013, information relating to optional specific permanently installed equipment and additive shall be provided.

This information shall be included in the instruction handbook required in 6.2 of EN 1846-2:2009+A1:2013.

All units of measurement shall comply with SI units except pressure where "bar" may be used instead of "pascal".

6.2 Essential information relevant to safety

Information for use shall be in accordance with EN ISO 12100:2010, 6.4.

The manufacturer shall provide information, described in 6.4.1, 6.4.4, and 6.4.5 of EN ISO 12100:2010, as appropriate for the permanently installed equipment, in the language of the country of use. This shall include:

— designation or other means to identify the permanently installed equipment;

— the intended use(s) of the equipment and its operating limitations;

— setting and commissioning procedures;

— operating procedures, in-service checking and specifications of any consumable materials;

— description and meaning of event/condition indicators and any safety related markings;

— description and location of the means of stopping the equipment;

— any residual risks and possible misuses causing significant hazard (e.g. monitor, hook arm system, exhaust system);

— elements of training required for the operator;

— for the additive installation, data on liquids which are, or are not, suitable for the materials of construction. Also, information on the safe disposal of water used to flush the additive installation, if relevant.

6.3 Information relevant to performance

Where appropriate, the manufacturer shall provide information in the instruction handbook concerning the performance of the equipment:

— performance of the water installation including tank capacities;

— performance of other permanently installed equipment;

— additional electrical system;

— specific operating instructions;

— maintenance instructions;

— precautions to prevent freezing;

— lifting capacity of the hook arm system;

— description of controls, indicators and warnings.

6.4 Marking on equipment

The permanently installed equipment shall be marked in compliance with 6.4 of EN 1846-2:2009+A1:2013.

The maximum mass of the demountable for vehicles equipped with a hook arm system shall be marked.

All controls, instruments shall have on or immediately adjacent to them, a permanently fixed and indelible identifying pictorial symbol or text in the language of the country of intended use.

Annex A
(informative)

Symbols and abbreviated terms

The following symbols are used in this document:

d	height
d_{eff}	minimum effective throw of the monitor
d_{max}	maximum throw of the monitor
p_{a}	maximum outlet pressure
P_{a1}	pressure
$p_{\text{a lim}}$	maximum working pressure
n_0	maximum speed
Q	flowrate of the monitor
Q_1	delivery rate of the water installation

The following abbreviated terms are used in this document:

CCTV	Closed Circuit Television
FPN	normal-pressure pump
PL_r	required performance level

Annex B
(normative)

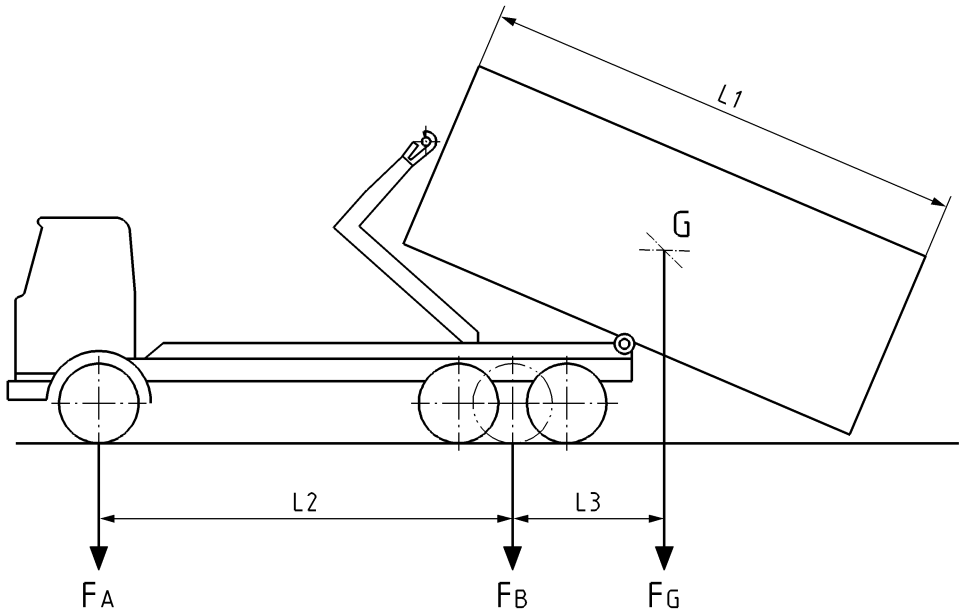
Theoretical stability calculation

To calculate the stability of a vehicle during the loading and unloading of a demountable by means of a hook arm system, from flat level road surface, the following formula shall be applied:

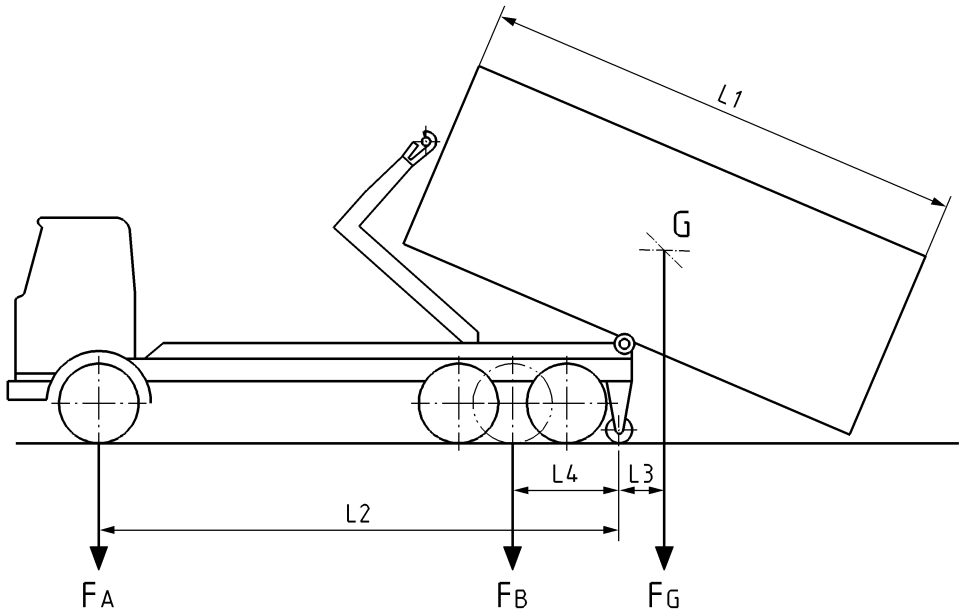
— in consideration of Figure B.1: $\frac{F_A \times L_2}{F_G \times L_3} > 1{,}25$

— in consideration of Figure B.2: $\frac{F_A \times L_2}{F_C \times L_3} > 1{,}25$

NOTE The load acting on a lifting point is dependent on the location of the centre of gravity of the demountable.



a) Vehicle with hook arm system and without stabilising system



b) Vehicle with hook arm system and stabilising system

Key

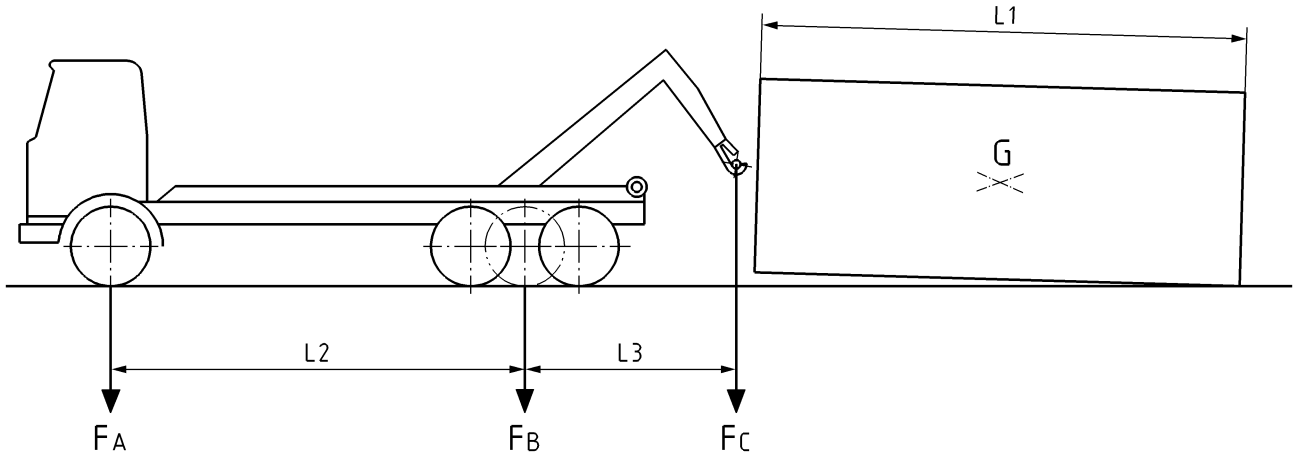
F_A axle load on unladen front axle (see EN 1846-2:2009+A1:2013, 3.1)

F_B axle load on unladen rear axle when (see EN 1846-2:2009+A1:2013, 3.1)

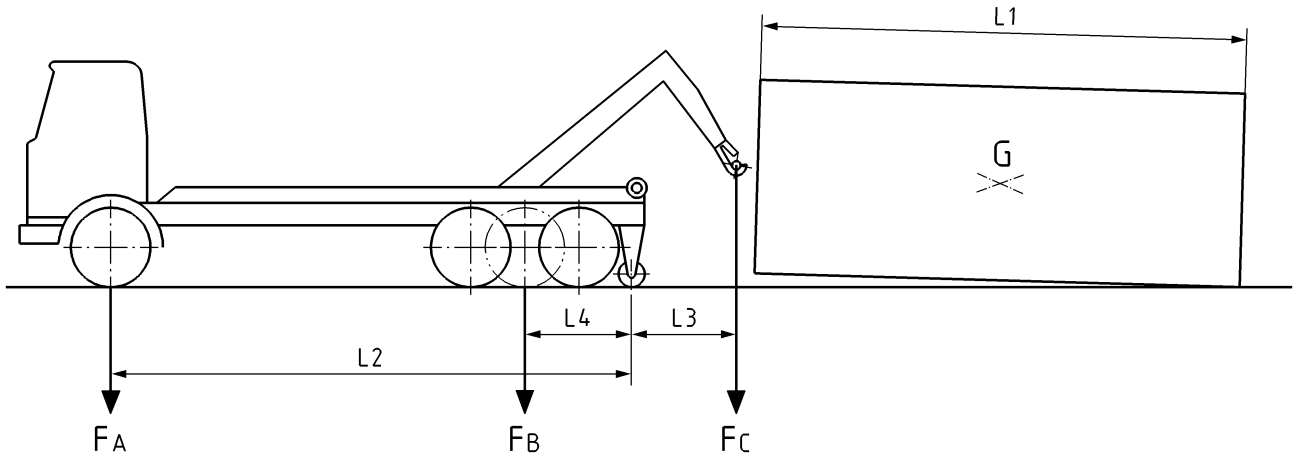
F_G load at centre of gravity of the demountable due to the payload

G centre of gravity of the demountable with load

Figure B.1 — Stationary safety calculation



a) Vehicle with hook arm system and without stabilising system



b) Vehicle with hook arm system and stabilising system

Key

F_A axle load on unladen front axle (see EN 1846-2:2009+A1:2013, 3.1)

F_B axle load on unladen rear axle when (see EN 1846-2:2009+A1:2013, 3.1)

F_C load at the lifting point due to the payload

G centre of gravity of the demountable with load

Figure B.2 — Static stability calculation for loading

Annex C
(normative)

Rated capacity of the tank

The rated capacity of the tank shall be determined as follows:

— place the vehicle on a horizontal plane;

— drain the pump;

— weigh the vehicle with a full water tank (filled up to the beginning of overflow);

— adjust the flowrate of the pump outlet to ¼ of the rated pump capacity with a maximum of 500 l/min; for operational reasons, other values of flowrate (lower or higher) can be agreed between the user and the manufacturer;

— if the water supply breaks off (sudden drop in pressure), shut off the pump (but not drained) and close the outlet;

— weigh the vehicle again.

The mass difference is the rated capacity of the tank, in litres.

Annex D
(normative)

Monitor throw measurement

D.1 General

This annex describes the measurement method for throw.

All tests shall be run with water. However as far as foam equipment is concerned the performance with water is only a guide. In this case, the following characteristics are influenced by the type and the state of the foam concentrate:

— effective throw;

— expansion;

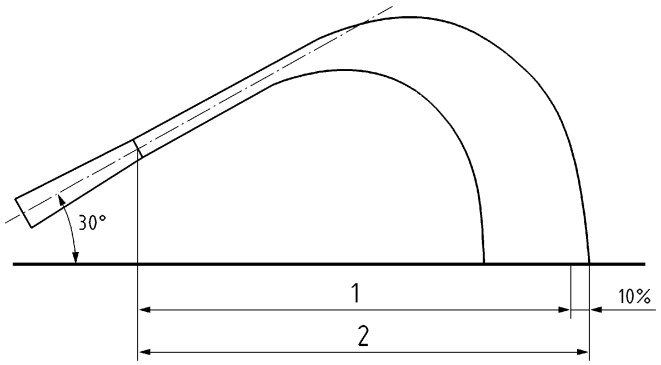
— metering (percentage).

It is recommended that manufacturers provide as much information as possible about the performance of their foam devices with different types of foam concentrates under operational conditions.

D.2 Test method

At Q_{min} and Q_{max}, operate the monitor with the vehicle on a horizontal area, with an inclination (30 $\pm$ 0,5)° (see Figure D.1), with wind speed less than or equal to 2 m/s (Beaufort scale 3). The height of the nozzle outlet from the ground is not relevant in this test.

Measure the longest distance d_{max} of the humid zone in the axis of the monitor (distance between the last significant drops on the ground and the nozzle of the monitor). The effective throw (in metres) is calculated as follows: furthest droplets - 10 % = d_{eff} = 0,9 d_{max}.



Key
1 effective throw (d_{eff})
2 maximum throw (d_{max})

Figure D.1 — Throw measurement

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard, except 5.3, 6.3 Annex A and Annex D, confers within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive, except Essential Requirement 1.7.4.2 (u), and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] EN 1789, *Medical vehicles and their equipment — Road ambulances*

[2] EN 60204-32, *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines (IEC 60204-32)*

[3] EN ISO 13857, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857)*

[4] ISO 10075, *Ergonomic principles related to mental work-load — General terms and definitions*

[5] ISO 10075-2, *Ergonomic principles related to mental workload — Part 2: Design principles*

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