SLOVENSKI STANDARD
SIST EN 12416-2:2001+A1:2007

01-december-2007

Vgrajeni gasilni sistemi - Sistemi s praškom - 2. del: Projektiranje, izvedba in vzdrževanje

Fixed firefighting systems - Powder systems - Part 2: Design, construction and maintenance

Ortsfeste Brandbekämpfungsanlagen - Pulverlöschanlagen - Teil 2: Planung, Einbau und Wartung

Installations fixes de lutte contre l'incendie - Systèmes d'extinction a poudre - Partie 2: Conception, construction et maintenance

Ta slovenski standard je istoveten z: **EN 12416-2:2001+A1:2007**

ICS:

13.220.10	Gašenje požara	Fire-fighting

SIST EN 12416-2:2001+A1:2007 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12416-2:2001+A1

June 2007

ICS 13.220.20

Supersedes EN 12416-2:2001

English Version

Fixed firefighting systems - Powder systems - Part 2: Design, construction and maintenance

Installations fixes de lutte contre l'incendie - Systèmes d'extinction à poudre - Partie 2: Conception, construction et maintenance

Ortsfeste Brandbekämpfungsanlagen - Pulverlöschanlagen - Teil 2: Planung, Einbau und Wartung

This European Standard was approved by CEN on 2 May 2001 and includes Amendment 1 approved by CEN on 16 May 2007.

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 Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 12416-2:2001+A1:2007: E

Contents

Foreword

This document (EN 12416-2:2001+A1:2007) has been prepared by Technical Committee CEN/TC 191 "Fixed firefighting systems", the secretariat of which is held by BSI.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2007 and conflicting national standards shall be withdrawn at the latest by December 2007.

This document includes Amendment 1 approved by CEN on 2007-05-16.

This document supersedes EN 12416-2:2001.

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

This European Standard has the general title "Fixed firefighting systems - Powder systems" and consists of the following two parts:

- Part 1: Requirements and test methods for components
- Part 2: Design, construction and maintenance

⟨A1⟩ *deleted text* ⟨A1⟩

Annexes A to C are informative annexes.

This European standard is included in a series of European Standards planned to cover also:

a) gas extinguishing systems (EN 12094);

b) sprinkler systems (EN 12259 and EN 12845);

c) smoke control systems (EN 12101);

d) explosion protection systems (EN 26184);

e) foam systems (EN 13565);

⟨A1⟩ f) hose systems (EN 671);

g) water spray systems (EN 14816). ⟨A1⟩

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

Introduction

It has been assumed in the preparation of this Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

Risks which can be protected using powder extinguishing systems include the following:

a) Flammable or combustible liquids and combustible gases; and

b) Combustible solids having burning characteristics similar to naphthalene and pitch, which melt when involved in a fire; and

c) Combustibles such as wood, paper, or cloth arranged in such a way that powder extinguishant could reach all burning surfaces in the event of a fire.

Powder extinguishing systems shall not be used to provide protection for the following:

d) Chemicals containing their own oxygen supply such as cellulose nitrate;

e) Combustibles arranged in such a way that there is a risk of deep seated or burrowing fires which the extinguishant would not be able to reach;

ABC powder should not be used on machinery such as carding equipment in textile operations or delicate electrical equipment because, upon exposure to temperatures in excess of 120 °C or relative humidity in excess of 50 %, deposits will be formed which can be corrosive, conductive and difficult to remove.

NOTE 1 Powder, when discharged, will drift from the immediate discharge area and settle on surrounding surfaces. Prompt cleaning will minimize possible staining or corrosion of certain materials which may take place in the presence of moisture.

NOTE 2 The extinguishing of uncontrolled discharge of flammable liquids or combustible gases may result in a subsequent explosion.

[A1] Powder systems can consist of the following components (see Figure 1):

powder container unit including pressure regulator;

expellant gas unit with mechanical and/or electrical delay system;

actuation and control system (manual or automatic release);

distribution header with selector valves assembly;

nozzles for total flooding or local application. [A1]

1 Scope

[A1] This document specifies requirements and gives recommendations for the design, construction and maintenance of fixed fire extinguishing systems which discharge powder from a container, or centrally grouped containers, through nozzles by means of expellant gas in accordance with EN 12416-1 and the relevant part of EN 54 where required. [A1]

This European standard covers systems which are suitable for general use in buildings and other construction works as well as outdoor hazards.

[A1] This standard does not cover systems with permanently pressurized containers and pre-engineered systems up to 150 kg of the extinguishing media quantity, powder hose lines and monitor systems, nor areas with a risk of explosion, earthquake zones or extreme environmental conditions e.g. marine, offshore, mining or aircraft. [A1]

This European standard does not apply to systems where there is a risk of class "D" fires according to EN 2.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 54 (all relevant parts), *Fire detection and fire alarm systems*

[A1] CEN/TS 54-14 [A1], *Fire detection and fire alarm systems - Part 14: Guidelines for planning, design, installation, commissioning, use and maintenance*

EN 615, *Fire protection - Fire extinguishing media - Specifications for powders (other than class D powders)*

EN 1092, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated*

[A1] EN 12094-9 [A1], *Fixed firefighting systems - Components for gas extinguishing systems - Part 9: Requirements and test methods for special fire detectors*

EN 12416-1:2001, *Fixed firefighting systems - Powder systems - Part 1: Requirements and test methods for components*

EN 25923, *Fire protection - Fire extinguishing media - Carbon dioxide (ISO 5923:1989)*

[A1⟩ *deleted text* ⟨A1]

3 Terms and definitions

For the purposes of this Standard the terms and definitions of EN 12416-1:2001 and the following apply:

3.1
[A1⟩ **powder system**
fixed installed system discharging powder as extinguishing media

3.2
discharge time
time period, during which the design quantity of extinguishing powder is discharged

3.3
rate of application
specific mass of extinguishing media to extinguish a fire in the protected zone

3.4
protected zone
area or enclosure which is extinguished by the powder system ⟨A1]

4 Expellant gas

4.1 The expellant gas shall be one of the gases listed in table 1.

The quantity of expellant gas shall be calculated for the most hydraulically unfavourable flooding zone such that the required powder quantity is discharged in at least the [A1⟩ maximum discharge time ⟨A1] and an additional expellant gas quantity shall be provided to empty the powder container and to allow the distribution pipe to be flushed at the working pressure for a period of at least 1 min.

4.2 When using CO_2 as expellant gas the system shall be carefully designed to ensure that the CO_2 concentration does not exceed 5 %Vol. in the protected enclosure. CO_2 shall be in accordance with EN 25923.

Table 1 - Expellant gases

Gas	Maximum water content %
Air	0,006
Argon	0,006
CO_2	0,015
Helium	0,006
Nitrogen	0,006

5 Extinguishing powder

[A1⟩ This standard is applicable for the use of extinguishing powder based on sodium bicarbonate. ⟨A1]

If other types of powder are used, the complete design and calculation shall be modified proportionally to the relative efficiency of this powder.

The powder shall be in accordance with EN 615.

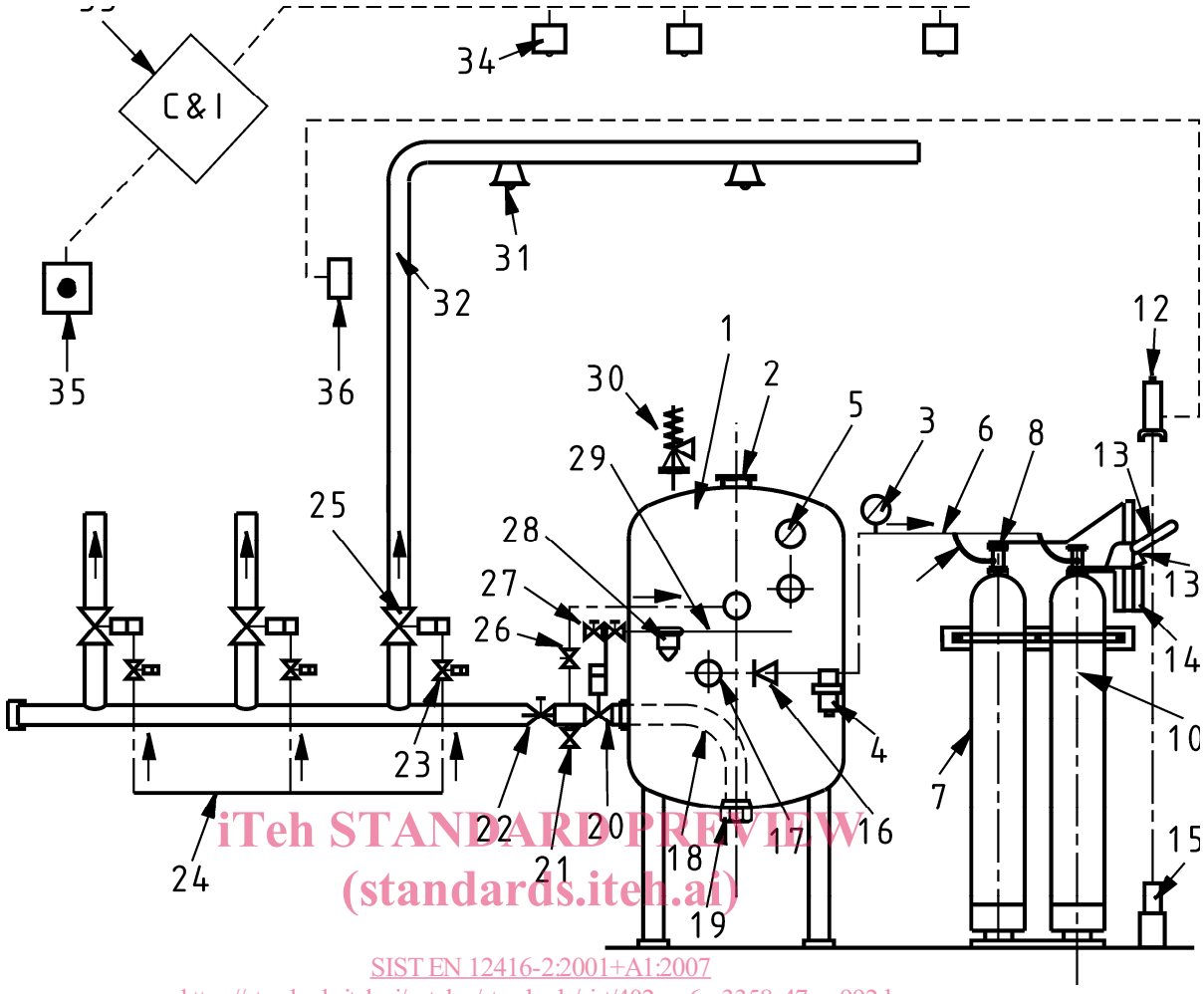
WARNING 1 The mixing of different types of powder (ABC and BC) may result in caking, and the production of gas will increase pressure in the container to an unsafe level. Such increases in pressure have been known to cause containers to rupture, and to cause bodily injury and damage.

WARNING 2 Recovered powder may have previously been contaminated, and may have absorbed moisture. If it is then recycled the powder may eventually become lumpy, and interrupt the flow of powder when used on a fire.

6 Components

[A1] Mechanical components shall be in accordance with EN 12416-1 and electrical components shall be in accordance with the relevant part of EN 54 [A1]. The components used in the powder system shall be compatible. The installer shall declare and document the compatibility in accordance with [A1] EN 12416-1 [A1]. If components are not delivered by a single manufacturer, a function test without powder discharge shall be carried out in order to confirm the compatibility of the complete system.

A typical arrangement of the components in a powder system is given in Figure 1 and a block diagram for powder extinguishing systems is given in Figure 2.



Key

1 Powder container
2 Fill opening
3 Pressure gauge A
4 Pressure regulator
5 Pressure gauge B
6 Expellant gas line
7 Expellant gas container
8 Actuator for expellant gas container
9 Flexible connector
10 Pilot container
11 Actuators for pilot container
12 Solenoid actuator
13 Manual actuator
14 Delay device
15 Drop weight with wire rope
16 Non-return valve
17 Expellant gas tube
18 Powder diptube
19 Drain connection
20 Main powder valve with pneumatic drive
21 System test valve
22 Main isolating valve
23 Solenoid valve
24 Control line for selector valve
25 Selector valve with pneumatic drive
26 Flushing valve
27 Vent valve
28 Release control valve
29 Control line
30 Pressure relief valve
31 Powder nozzle
32 Pipework
33 Control panel and interface
34 Fire detector
35 Manual release
36 Alarm device

Figure 1 - Typical arrangement of components in a powder system

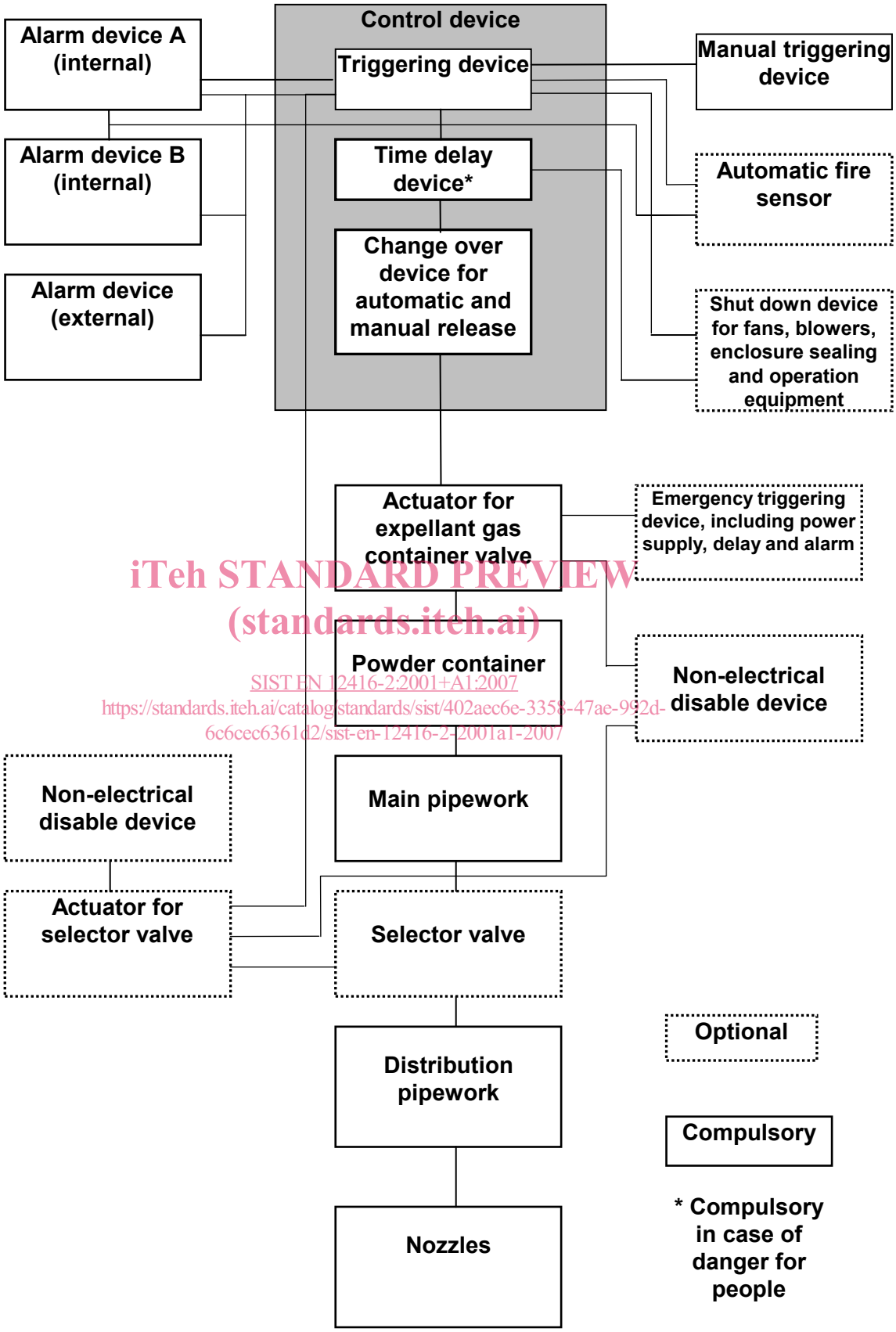


Figure 2 - Block diagram for powder extinguishing systems

7 Reserve quantity

When more than five separately released zones are included in the system a reserve quantity of powder and expellant gas of at least the same amount as the supply quantity shall be permanently connected. After manual changeover the reserve quantity and the supply quantity shall be in the fully operational mode. The reserve quantity shall be stored in a separate container.

8 Location of extinguishing powder container and expellant gas container

The extinguishing powder container and expellant gas container as well as the reserve quantities shall be located as close as possible to the flooding zone but not exposed to the risk of fire. The container shall be marked with the wording: ”CONTAINER SHALL NOT BE EXPOSED TO THE RISK OF FIRE”.

9 Safety precautions

In the event that people could be exposed to a powder discharge, appropriate safeguards shall be provided to ensure prompt evacuation of such locations, and to provide means for prompt rescue of any trapped people. Appropriate safeguards include personnel training, warning signs, fire alarms, delay devices and provision of respiratory protection. In any case the national regulations and legislation valid in the place of use shall be considered.

WARNING The discharge of powder can create hazards such as reduced visibility and temporary breathing difficulty.

10 Total flooding systems

10.1 General

In total flooding systems the total area of uncloseable openings shall not exceed 15 % of the total area.

NOTE Loss of powder from the enclosure generally reduces the extinguishing effectiveness of the system and should be minimized by closing openings wherever possible.

10.2 Quantity of powder

The quantity of powder discharged and the rate of application shall be sufficient to build up and maintain the calculated amount (Q) throughout the enclosure with an adequate margin of safety to compensate for any uncloseable openings, and for any ventilation system which is not shut down or closed off when the system is activated. The closure of the openings shall be arranged to occur no later than the start of discharge.

The total minimum quantity of powder shall be calculated with the following formula:

$$Q = K_1 V + K_2 A_S + K_3 A_L + K_4 R_V t$$

where

Q quantity of powder, in kilogram
K_1 basic quantity factor, in kilograms per cubic metre
K_2 additional quantity factor for openings $1\% < A_R < 5\%$ of the total area A_R, in kilogram per square metre
K_3 additional quantity factor for openings > 5 % of the total area, in kilograms per square metre
K_4 additional quantity factor to compensate for any ventilation system which is not shut or closed down during the discharge, in kilograms per cubic metre
V total enclosure volume, in cubic metres
A_R total area of enclosure (walls, ceiling, floor), in square metres
A_S total area of openings > 5 % of A_R, in square metres
A_L total area of openings $5\% < A_R < 15\%$ of A_R, in square metres
R_V ventilation flow rate, in cubic metres per second
t discharge time, in second.

For hydrocarbon fires the following K-factor values shall be used:

K_1 = 0,65 kg/m^3

K_2 = 2,5 kg/m^2

K_3 = 5,0 kg/m^2

K_4 = 0,65 kg/m^3

For other types of fires the *K*-factors may be determined by fire tests or may be taken from reference installations.

10.3 Maximum discharge time and minimum rate of powder discharge

10.3.1 Maximum discharge time

The period from the release of the powder system to the discharge of the calculated amount of powder shall not exceed 30 s.

10.3.2 Minimum rate of powder discharge

The minimum rate of discharge *R*, in kilograms per second, shall be not less than that given by the equation

$$R = \frac{Q}{30}$$

where *Q* is the calculated amount, in kilogram.

10.4 Enclosure volume

The enclosure volume *V* used in 10.2 shall be the gross volume of the enclosure less only the volume of any permanent, impermeable, non-combustible elements (e.g. building elements) within the enclosure.

10.5 Total flooding nozzles

Total flooding nozzles shall be located in accordance with the manufacturer's recommendation.

11 Local application systems

11.1 General

11.1.1 Local application systems shall be used to protect separate objects.

11.1.2 Local application systems shall be designed and calculated differently for surface fires and equipment fires.

If a combination of surface and equipment fires is to be protected the larger calculated amount of powder quantity shall be selected.

A surface fire shall be calculated in accordance with Figure C.1.

An equipment fire shall be calculated in accordance with A1 11.2.2 A1 and Figure C.3 (indoor systems) and Figure C.4 (outdoor systems). Example calculations for local application systems are given in annex B.

11.2 Protection of local applications

11.2.1 Local application nozzles

The local application nozzles for surface or equipment fire shall be located in accordance with the manufacturer's recommendation. Example calculations are given in annex A.

A1 The powder quantity, the minimum discharge time and discharge rate can be designed in accordance with Figures C.1 to C.4 depending on the arrangement of nozzles. A1