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Smoke and heat control systems - Part 11: Horizontal flow powered ventilation systems for enclosed car parks

Systèmes pour le contrôle des fumées et de la chaleur - Partie 11 : Systèmes de ventilation motorisée à flux horizontal pour aires de stationnement fermées

Rauch- und Wärmefreihaltung - Teil 11: Rauchfreihaltung von Parkhäusern

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Contents

Page

European foreword 4
Introduction 5
1 Scope 7
2 Normative references 7
3 Terms and definitions 8
3.1 Terms 8
3.2 Symbols 9
3.2.1 Latin upper case letters 9
3.2.2 Latin lower case letters 10
3.2.3 Greek upper case letters 10
3.2.4 Greek lower case letters 11
4 Design fires 11
4.1 Design principle 11
4.2 Heat release rate 11
5 Normative requirements 11
5.1 Design objectives 11
5.2 Design solutions 13
5.3 Activation sequence 13
5.4 Wind effect 14
6 Installation and components 14
6.1 Fans 14
6.2 Controls 15
6.2.1 Operation of the smoke and heat control systems 15
6.2.2 Functions of the synoptic and manual control device 15
6.3 Cabling 16
6.4 Ducts (including fixings), attenuators (silencers) and grilles 16
6.5 Dampers 16
6.6 Discharge terminations 17
6.7 Air inlet and smoke extract (natural and powered) 17
6.8 Smoke discharge 17
6.9 Initiation systems: sprinklers and detection 18
6.10 Smoke barriers 18
6.11 Power supply systems 18
6.11.1 Reliability of operation 18
6.11.2 Power source 18
7 Interactions between horizontal flow powered ventilation and other systems and functions 19
7.1 Sprinklers interaction 19
7.2 Pressure difference 19
7.3 Day to day ventilation 20
8 Commissioning 21
9 Acceptance testing of installation on site 21
10 Maintenance and periodical checking 22

11 Documentation 22
11.1 General design documentation 22
11.2 System design documentation 22
11.3 Installation, maintenance and testing documentation 23
11.4 Computer control software documentation 23
Annex A (normative) Horizontal flow ventilation design without CFD analysis – Systems without jet fans 26
Annex B (normative) Horizontal flow ventilation design without CFD analysis – Systems with jet fans 32
Annex C (informative) Verification of horizontal ventilation design by CFD calculation Systems with or without jet fans 41
Annex D (informative) Commissioning 47
Annex E (informative) Hot smoke testing 49
Bibliography 51

European foreword

This document (CEN/TS 12101-11:2022) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

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Introduction

0.1 General

The requirements in this document are provided for powered smoke and heat control systems installed in car parks with or without sprinkler protection.

Modern cars are generally larger than their predecessors and contain a larger quantity of flammable materials, in particular plastics, which results in an increase of heat and smoke output from burning cars. Consequently, the design fires recommended in this document are larger and have a greater heat and smoke output than those in some previous guidance.

0.2 Purposes of smoke control systems

Smoke control systems can be generally designed for one or more of three purposes in the event of a fire:

— to protect means of escape from the car park;

— to provide an access sufficiently free of smoke for fire-fighters to a point close to the seat of the fire;

— to assist fire-fighters to clear smoke from a car park.

The system requirements will differ depending upon the purpose. Not all types of ventilation systems are suitable for all purposes.

This document only covers smoke control systems which are intended to provide an access sufficiently free of smoke for fire-fighters.

0.3 Smoke control systems to provide an access sufficiently free of smoke for fire-fighters

This document deals only with horizontal flow powered ventilation systems.

The following systems are not covered by this document however, they are briefly discussed here:

— Horizontal natural ventilation - These systems may be suitable for open car parks, where at each level, ventilation openings are located on at least two opposite façades. The size of the ventilation openings will need to meet the relevant national regulations.

— SHEVS – These systems are covered by the recommendations of CEN/TR 12101-5 for steady-state design fires or prCEN/TR 12101-12 (under development) for time-dependent design fires. Hot smoky gases from a fire rise up to the ceiling, where it spread to form a smoke layer above the denser cold air beneath. SHEVS, which may be natural or powered, are designed and sized to maintain conditions beneath the smoke layer that allow evacuation and/or firefighting operations. Such a system requires a sufficient height from the ceiling to the floor.

— Smoke dilution systems – These systems are based on powered ventilation with air change rates which are significantly lower than these required for mechanical SHEVS. Smoke dilution systems are meant to reduce smoke concentration and temperature, and increase visibility, during the fire. In addition, it can assist firefighters to clear the smoke after the fire. They are not suitable to create smoke free areas during fire.

0.4 Effects of sprinklers

The main effects of sprinklers is to prevent fire spread to adjacent cars. This is reflected in the design fire sizes recommended for car parks with and without sprinklers. A further effect of sprinklers is to reduce the average temperature of the smoke.

Sprinklers are considered to have no negative effect on smoke ventilation systems in car parks.

Measures to avoid possible negative effects of smoke ventilation systems on sprinklers efficiency are taken into account in this document.

0.5 Horizontal flow powered ventilation systems

When the hot gases from the fire reach the ceiling due to buoyancy, it create a relatively rapid gas flow spreading in every horizontal direction, in a shallow layer beneath the ceiling surface, which is called ceiling jet.

The aim of horizontal flow powered smoke ventilation is to oppose the ceiling jet generated by the fire, so that the upstream smoke propagation is limited.

This document is intended to describe the conditions to be fulfilled by a horizontal flow powered smoke ventilation system to provide an access path sufficiently clear of smoke to allow fire-fighters to reach a point close to the fire for fire-fighting operations. The smoke ventilation system should rely on a smoke detection installation able to activate immediately the evacuation alarm of the car park in order that the evacuation is completed prior to the full activation of the smoke ventilation system, to avoid conditions which would be worse for escape.

NOTE 1 Activation of SHEVS at a lower velocity could be possible during evacuation.

The smoke detection installation should also be able to locate the origin of the fire, i.e. the first activated smoke detector, in order to:

— start the right activation sequence of the smoke ventilation system;

NOTE 2 In large or complex car parks, it is likely that the smoke ventilation system will need to be automatically configured to move the smoke in one of several directions, depending on the location of the fire (multiple extraction points, multiple air inlets and/or multiple access points for fire-fighters).

— inform the fire-fighters on the location of the fire to organize fire-fighting operations.

1 Scope

This document gives minimum design, installation and commissioning requirements for powered smoke and heat control systems for enclosed car parks using horizontal flow powered ventilation, with or without sprinkler protection, on one or more levels, for cars and light commercial vehicles (max 3,5 t), to reach the design objectives outlined in this document .

This document is applicable for car parks with vehicles powered by petrol, diesel, electricity, CNG or LPG.

NOTE 1 For the purpose of this document for smoke ventilation systems, it is assumed that cars powered by electricity, CNG (compressed natural gas) or LPG (liquefied petroleum gas) will have similar HRR to vehicles powered by petrol or diesel.

NOTE 2 Cars powered by hydrogen are not covered by this document.

This document only covers traditional car parks that are with cars parked alongside each other, with common car access lanes. It does not cover other forms of car parking systems, such as stacking systems.

This document does not cover requirements for day-to-day ventilation.

Any other risks than fire from cars are not covered by this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 12101-1, *Smoke and heat control systems - Part 1: Specification for smoke barriers*

EN 12101-2, *Smoke and heat control systems - Part 2: Natural smoke and heat exhaust ventilators*

EN 12101-3, *Smoke and heat control systems - Part 3: Specification for powered smoke and heat control ventilators (Fans)*

EN 12101-7, *Smoke and heat control systems - Part 7: Smoke duct sections*

EN 12101-8, *Smoke and heat control systems - Part 8: Smoke control dampers*

EN 12259 (all parts), *Fixed firefighting systems - Components for sprinkler and water spray systems*

EN 12845, *Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance*

EN 13501-4, *Fire classification of construction products and building elements - Part 4: Classification using data from fire resistance tests on components of smoke control systems*

EN ISO 13350, *Fans - Performance testing of jet fans (ISO 13350)*