SLOVENSKI STANDARD
oSIST prEN 16282-9:2012

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Oprema za komercialne kuhinje - Sestavni deli za prezračevanje v komercialnih kuhinjah - 9. del: Pridobitev in obvladovanje uspešnosti pridobivanja sistemov - Preskusne metode

Equipment for commercial kitchens - Components for ventilation in commercial kitchens - Part 9: Capture and containment performance of extraction systems - Test methods

Großküchengeräte - Einrichtungen zur Be- und Entlüftung von gewerblichen Küchen - Teil 9: Erfassung, Abführungsverhalten und Effizienz - Prüfverfahren

Appareils pour la grande cuisine - Systèmes pour la ventilation de cuisines professionnelles - Partie 9: Efficacité de captage et de retenue des systèmes d'extraction - Méthodes d'essai

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97.040.99	Druga kuhinjska oprema	Other kitchen equipment

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Equipment for commercial kitchens - Components for ventilation in commercial kitchens - Part 9: Capture and containment performance of extraction systems - Test methods

Appareils pour la grande cuisine - Systèmes pour la ventilation de cuisines professionnelles - Partie 9: Efficacité de captage et de retenue des systèmes d'extraction - Méthodes d'essai

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 156.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (prEN 16282-9:2011) has been prepared by Technical Committee CEN/TC 156 “Ventilation for buildings”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

Basic intention of this document is to evaluate extraction system components with regards to the calculation given in prEN 16282 – 1. A factor X should be added to the calculation formula of V_{th} in 10.3 of prEN 16282 – 1. This factor is to be set at 0,6 (default factor used in order to ensure the safety of a even very bad designed system) if a manufacturer of components chose not to carry out the tests of this standard prEN 16282 – 9. With the test of this part 9 it can be shown that an extraction system is able to work properly with the air flow calculated according to prEN16282 – 1 or even better. Clause 10 of this part shall contain the calculation of the above described factor X.

The document is drafted for extraction systems in general. Special information / tests for hoods, ceilings or other extraction systems will / can be added in annexes.

— Part 1: General requirements including calculation method

— Part 2: Kitchen ventilation hoods – Design and safety requirements

— Part 3: Kitchen ventilation ceilings – Design and safety requirements

— Part 4: Air inlets and outlets – Design and safety requirements

— Part 5: Air duct – Design and dimensioning

— Part 6: Aerosol separators – Design and safety requirements

— Part 7: Installation and use of fixed fire suppression systems

— Part 8: Installation for treatment of cooking fumes – Requirements and tests

— Part 9: Capture and containment performance of extraction systems for commercial kitchen – test methods

1 Scope

This standard is intended to measure the capture and containment performance of ventilation extraction systems during simulated cooking conditions of an extraction device installed over standardized cooking appliance thermal plume challenges under specified appliance configurations and positioning, in kitchens and other companies processing foodstuffs intended for commercial use.

This test method describes flow visualization techniques that are used to determine the threshold of capture and containment capture and containment for non cooking and specified heavy cooking conditions. The threshold of capture and containment can be used to estimate minimum flow rates for hood/appliance systems.

The test procedure determines static pressure differential after the exhaust collar of the hood.

It does not apply to household kitchens.

It does not address safety concerns, if any, associated with its use.

2 Normative references

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

EN ISO 5801, *Industrial fans - Performance testing using standardized airways*

ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements*

ISO 5167-2, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 2: Orifice plates*

ISO 5167-3, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 3: Nozzles and Venturi nozzles*

ISO 5167-4, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 4: Venturi tubes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Aspect ratio

Ratio of length to width of an opening or grill.

3.2 Energy rate

The average rate at which an appliance consumes energy during a specified condition (for example, non cooking or cooking).

3.3 Cooking energy consumption rate

The average rate of energy consumed by the appliance(s) during cooking.

3.4 Fan and control energy rate

The average rate of energy consumed by fans, controls, or other accessories associated with cooking appliance(s). This energy rate is an average during preheat, non cooking, and cooking tests.

3.5 Product performance: Capture and containment

The ability of the ventilation system to capture and contain grease-laden cooking vapors, convective heat, and other products of cooking processes. The extraction system capture refers to the products getting into the extraction system reservoir from the area under the extraction system while containment refers to the products staying in the extraction system reservoir.

3.6 Energy consumption rate during non-cooking process

The average rate at which an appliance consumes energy while it is non cooking, holding, or ready-to-cook, at

a temperature.

3.7 Measured energy input rate

The maximum or peak rate at which an appliance consumes energy measured during appliance preheat, that is, measured during the period of operation when all gas burners or electric heating elements are set to the highest setting.

3.8 Rated energy input rate

The maximum or peak rate at which an appliance consumes energy as rated by the manufacturer and specified on the appliance nameplate.

3.9 Compensating air

Air deliberately supplied into the space (test room), and to the exhaust hood to compensate for the air, vapor, and contaminants being expelled (also referred to as make-up air). Can be dedicated make-up air directed locally in the vicinity of the hood, transfer air, or a combination.

3.10 Make-up air

The part of compensating air which is supplied through the hood, generally in the front face. This doesn't' include airflows supplied directly into the hood for captation purpose.

3.10.1 Integrated hood plenums

3.10.1.1

Air curtain supply, n - compensating air that it is introduced vertically downward, typically from the front edge of the hood.

3.10.1.2

Backwall supply, n - compensating air delivered behind and below the cooking appliance line, typically through a ducted wall plenum. Sometimes referred to as rear supply.

3.10.1.3

Front face supply, n - compensating air that it is introduced into the kitchen space through the front face of the hood.

3.10.1.4

Internal supply, n-compensating air delivered directly to the interior of an exhaust hood such that it is exhausted without entering the occupied space. Sometimes referred to as short-circuit supply.

3.11 Threshold of capture and containment

The conditions of hood operation in which minimum flow rates are just sufficient to capture and contain the products generated by the appliance(s). In this context, two minimum capture and containment points can be determined, one for appliance non cooking condition, and the other for heavy-load cooking condition.

3.12 Simulated thermal plume challenge

An appliance plume that duplicates the actual cooking effluent and/or thermal plume from an appliance or line

of appliances.

4 Calibration

Calibrate the instrumentation and data acquisition system in accordance with device requirements to ensure accuracy of measurements.

Relative humidity (RH) accuracy within ± 5 % at 40 % RH and at 95 % RH.

Calibrate all temperature sensors in the temperature measurements systems upon receipt to within ± 0.5 °C against a NIST-traceable temperature reference over the range of expected measurements.

5 Equipment

5.1 Introduction

The general configurations and devices necessary to perform this test method include an airtight room as shown schematically in figures 2. The minimum volume of the room shall be 170 m^3. The method of airflow measurement differs between the types of room used.

The exhaust hood under test is hung and connected to an exhaust duct and fan. The terminal devices of the compensating air configuration, if applicable, are ducted and connected to a compensating air fan. The test facility includes different devices described in 5.3. In any case they use a flow visualisation system described in 5.2.

Tests shall be made with a representative production models of installed appliances for performance testing according clause 7, table 1.

5.2 Flow Enhancement Visualisation Systems

5.2.1 Optical Systems

Optical systems, such as schlieren visualization, see figure 1, and shadowgraph should be used.

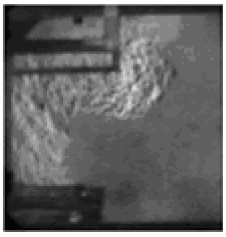
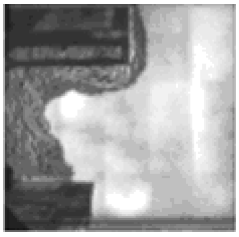
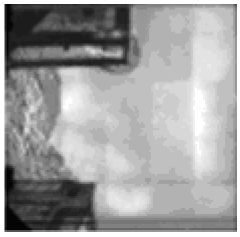
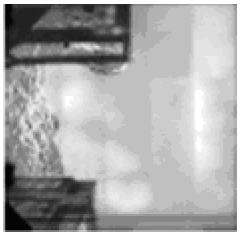
			
Spill at 800 SCFM	Spill at 1500 SCFM	Spill at 1800 SCFM	Spill at 1900 SCFM

Figure 1 — Example of schlieren flow visualisation for gas charbroilers under a canopy hood

5.2.2 Illumination

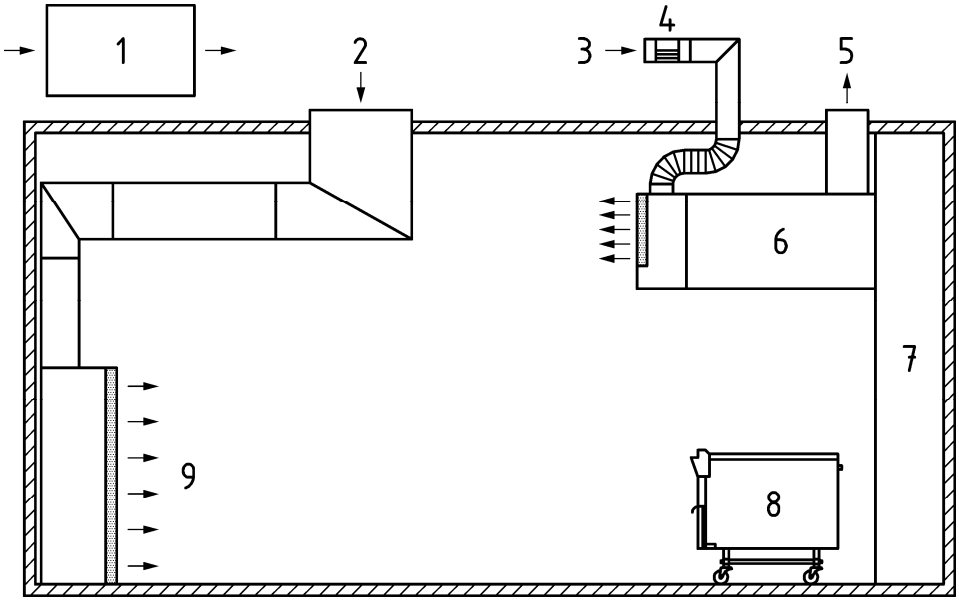
Illumination methods such as with high-intensity, focused lighting.

NOTE A 300 W halogen lamp with a lens or a 1000 W Freznel equipped theater spotlight and a dark backdrop in place aids in visualizing seeded effluent plume.

5.3 Configuration for airtight room

Airtight Room, with sealable access door(s), to contain the exhaust hood and make-up air configuration to be tested, with specified cooking appliance(s) to be placed under the hood. The room air leakage shall not exceed 34 m^3/h (9.4 l/s) at 50 Pa. Complementary compensating air fans are controlled to balance the exhaust rate, thereby maintaining a negligible static pressure difference between the inside and outside of the test room. Such a facility is described in detail in figure 2.

NOTE Because of potential problems with measurement in the hot, possibly grease-laden exhaust air stream, exhaust air flow rate can be determined by measuring the compensating air flow rate on the supply side. This requires the design of an airtight test facility that ensures the compensating air rate equals the exhaust rate since air leakage outside the system boundary, that is, all components between supply and exhaust blowers making up the system, is negligible.



Key

1 AMCA Nozzle Flow Measurement Station

2 General Replacement Air Flow

3 Make Up Air Flow

4 Laminar Flow Element Measurement Station

5 Exhaust Air Flow

6 Canopy Hood with Integrated Front Face Make Up Air Plenum

7 Backwall

8 Appliance

9 Low Velocity General Replacement Air Flow

Figure 2 — Configuration for an airtight test space