SLOVENSKI STANDARD
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Oprema za komercialne kuhinje - Sestavni deli za prezračevanje v komercialnih kuhinjah - 1. del: Splošne zahteve, vključno z računskimi metodami

Equipment for commercial kitchens - Components for ventilation of commercial kitchens - Part 1: General requirements including calculation method

Großküchengeräte - Einrichtungen zur Be- und Entlüftung von gewerblichen Küchen - Teil 1: Allgemeine Anforderungen einschließlich Berechnungsmethoden

Équipement pour grande cuisine - Installation pour la ventilation de cuisines professionnelles - Partie 1: Exigences générales et méthode de calcul

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Equipment for commercial kitchens - Components for ventilation of commercial kitchens - Part 1: General requirements including calculation method

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (prEN 16282-1:2011) 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.

The structure of the standard series is as follows:

prEN 16282 *Equipment for commercial kitchens – Components for ventilation in commercial kitchens*

— *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 for dispatched kitchen ventilation systems in commercial kitchens, associated areas and other installations processing foodstuffs intended for commercial use. Kitchens and associated areas are special rooms in which meals are prepared and detached, and where tableware and equipment is washed and cleaned and food is stored.

This standard does not apply to household kitchens.

This standard stipulates the general requirements, such as ergonomic aspects in relation to ventilation of the kitchen (temperature, air aspects, moisture, noise, etc.), including the method for calculating the airflows and testing.

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.

prEN 16282-5, *Equipment for commercial kitchens – Components for ventilation in commercial kitchens – Part 5: Air duct – Design and dimensioning*

EN ISO 7730, Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria (ISO 7730:2005)

EN 12792, *Ventilation for buildings – Symbols, terminology and graphical symbols*

EN 13779, *Ventilation for non-residential buildings – Performance requirements for ventilation and room-conditioning systems*

EN 15251, *Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics*

3 Terms, definitions and classification

For the purposes of this European Standard, the terms and definitions given in EN 12792 together with the following apply.

3.1 capture velocity

Airflow velocity in the free space between the lower part of the hood and the cooking appliance

4 Symbols and abbreviations

For the purposes of this European Standard, the symbols and abbreviations given in EN 12792, together with the following, apply:

ACH	air changes per hour	
$q_{v\text{-}ext}$	airflow in the extraction hood	in m^3/h
v	capture air velocity	in m/s
P	perimeter of the hoods	in m

z	height above the heat source	in m
h	appliance height	in m
$\dot{V}$	volumetric airflow	in m^3/h
$\dot{Q}_{S,K}$	convectively-transmitted proportion of the direct heat load	in W
$\dot{Q}_S$	sensitive thermal output	in W
$_k$	convective	
b	degree of pollution	-
$\dot{V}_{th}$	thermic flow	in m^3/h
k	empirically-determined coefficient	in $m^{4/3}W^{-1/3}h^{-1}$
φ	simultaneity factor	-
r	reduction factor for thermal flow	-
d_{hydr}	hydraulic diameter	in m
L	Length	in m
B	Width	in m
$\dot{V}_{Erf}$	Extraction airflows for extraction hoods	in m^3/h
a	allowance factor	-
e_{eff}	capture and containment efficiency	in %
$\dot{V}_{th,ne}$	total airflow	in m^3/h
$\dot{V}_{ABL}$	exhaust airflows	in m^3/h
$\dot{V}_{Ausgl}$	compensation airflow	in m^3/h
$\dot{m}_d$	mess flow	In kg/h
x_{ABL}	absolute water content of air, exhaust air	in $kg/kg_{dry\ air}$
x_{ZUL}	absolute water content of air, exhaust air	in $kg/kg_{dry\ air}$
ρ	density	in kg/m^3
$\Delta\dot{V}$	difference in air volume flows	in m^3/h
AHU	Air handling units	

5 Objectives of kitchen ventilation

Ventilation and air conditioning systems are necessary in commercial kitchens because

— the air is polluted by odours, particles of fat and gaseous products of combustion;

— indoor air quality requirements shall be met with regard to peoples health, hygiene and comfort;

— heat is created to a considerable extent due to convection and radiation;

— moisture is created by the preparation of meals and by washing;

— it is necessary to renew the air in the rooms by an exchange with outside air and maintain comfortable or specified room air temperatures.

To meet these tasks, supply and exhaust air systems shall be installed in the kitchen areas. They should ensure that odours, air pollutants and moisture are drawn off, impairment of rooms not forming part of the kitchen area are avoided and no air which could be considered unhygienic is either supplied or can flow back.

Particular attention is to be paid to separate odours, particles of fat and gaseous products from the exhaust air.

6 Classification of kitchens

Kitchens are classified according to the following features:

— spatial arrangement of appliances;

— types of meal preparation;

— number of portions to be prepared within the time limit;

— variety of meals to be prepared;

— work sequence;

— assignment of individual rooms with the kitchen area and the kitchen area itself to the meal dispatched point.

Table A2 in Annex A shows the classification of kitchens.

The following are possible ways of connecting the kitchen to the meal dispatched point:

— kitchens with a directly-connected meal dispatched point to the dining room;

— kitchens with a separately-arranged meal dispatched point or with a distribution kitchen;

— kitchens within dining areas without a spatial separation, e.g. snack bars etc.

There are zones within kitchens which may be subject to special hygiene requirements. These are for example.

— cold areas;

— hot areas;

— meat preparation areas;

— fish preparation areas;

— meal dispatched areas.

7 Basic design principles

7.1 General

Typical kitchen equipment emitting critical air pollution

— table top deep fat fryer;

— standard deep fat fryers;

— double deep fat fryers;

— large deep fat fryers;

— fat baking devices;

— conveyer fryer;

— tilting frying pans;

— automatic units for grilling;

— wok;

— tilting frying pans;

— frying and grilling appliance;

— griddle plate;

— lava stone-grill;

— gas heated range;

— rotisserie, gas heated;

— dishwashing machines.

Kitchens with kitchen equipment as well as kitchens with a nominal power supply in excess of 25 KW shall have exhaust and supply air. All other kitchens shall have at least an exhaust air system.

The following data and facts must be known for the design and operation of ventilation and air conditioning systems for kitchens:

— type of kitchen;

— number of portions to be prepared per time unit;

— operating time;

— room geometry;

— physical data for the individual building components;

— type and intensity of lighting.

Details of the following are also necessary:

— type of appliances and connected loads;

— installation and dimensions of appliances;

— duty times;

— simultaneity of appliance utilisation.

To minimise the necessary airflows, it is useful to install heat-emitting appliances in continuous blocks or along surfaces forming room boundaries.

If the exhaust air comes into direct contact with the structure of the building, it is need to ensure that this does not damage the building structure and that no persistent condensation occurs.

7.2 Heat and substance loads

Areas with different pollution loads may well within kitchens. The total heat emission takes place directly due to convection radiation and latently is due to the generation of steam and other gaseous components.

Radiation-intensive areas are characterised by high surface temperatures. These include preparation areas with grills and salamanders, grill plates, tipping frying pans, stoves, etc.

The direct and latent heat relative to the connected load of the appliances as well as the emission of steam are given for individual appliances in table A1 of Annex A for normal operation and limited operation. The values given in Annex A, table A3 and table A4, apply to dishwashers.

Pollution levels due to foreign substances in the air and micro-organisms may be given in national regulation or guidelines.

Foreign substances in the air occur almost any time food is heated. The type and amount are influenced particularly by the amount of fat and the temperature, with the ensuing pyrolyzates being possibly damaging to health. These particularly include short-chain aldehydes, such as formaldehyde, acetaldehyde, tr-2 hexenal and acrolein as well as highly-volatile nitrosamines and polycyclic aromatic hydrocarbons (e.g. benzo-a-pyrene).

7.3 Further notes

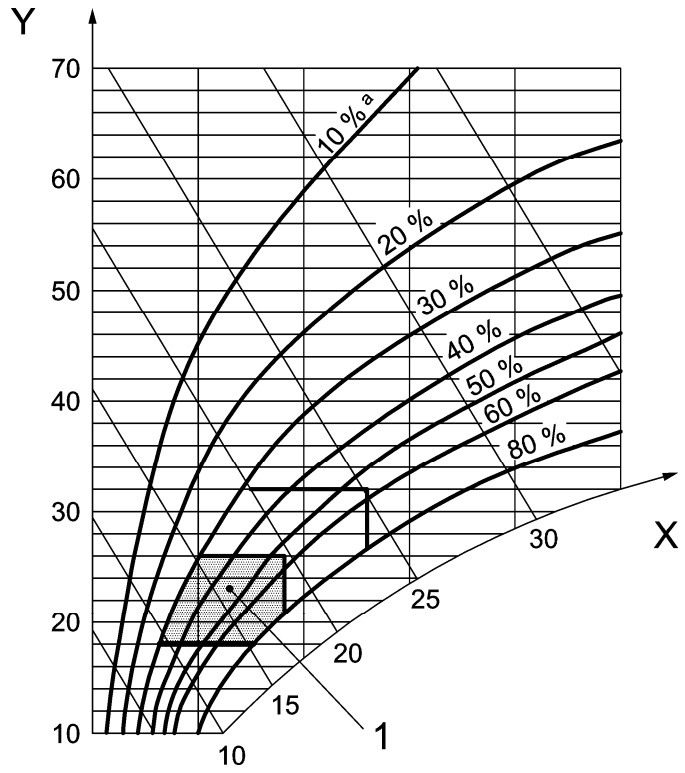
To achieve a cost-effective design of the ventilation and air conditioning systems, the values in Annex A, table A1, shall be used.

It may be necessary to cool the inlet air where there are high heat loads or for reasons of hygiene. Partitions between individual preparation areas in kitchens may be necessary particularly for areas requiring different levels of temperature or hygiene.

8 Ergonomic and hygiene requirements

8.1 Thermal comfort, tolerance

For the following it is assumed that kitchen personnel wear clothing with an average clothing insulation corresponding to 0,6 clo. This value is used for the relevant comfort parameters according to EN ISO 7730 (humidity, air movement, radiation, temperature) given in figure 1.



Legend

X Wet bulb temperature in °C
Y Air temperature in °C
a Relative humidity in %
1 Workplace Range

Figure 1 — Air quality range in kitchens according to EN ISO 7730

Air temperature and humidity are measured at a height of 1,10 m above the floor at a distance of 0,50 m from the appliances.

It is not always possible to maintain thermal comfort in kitchens. This applies particularly to work areas close to kitchen appliances which are strong heat emitters (latent and direct heat), e.g. within a distance of approximately 1 m of stoves with heat-radiating surfaces, tilting frying pans, large fryers or dishwashers. In these areas, tolerable climatic conditions according to EN ISO 7730 should be guaranteed as a minimum.

NOTE If too many heat-emitting cooking appliances are installed in a room which is not sufficiently large enough for the purpose, it may not be possible to meet the ergonomic requirements for ventilating and air conditioning systems.

Draughts due to higher airflow velocities may occur, particularly where there are supply airflows in excess of 90 $m^3/(m^2h)$.

8.2 Temperature of room air

The temperature of the room air in kitchens and sculleries should be at least 18 °C and should not exceed 26 °C unless unavoidable due to the processes. This does not include brief, seasonal, excess temperatures or areas in which higher temperatures are unavoidable due to their function.

Cooling of the room air is recommended for good thermal comfort and is required by some national regulations or guidelines.

8.3 Humidity of room air

The relative humidity in the occupied zone shall not exceed the values given in table 1.

Table 1 — Relative humidity in the occupied zone

Room air temperature in °C	**Room humidity** in %
20	80
22	70
24	62
26	55

In comfort areas, the upper limit of the moisture content of the air is 11,5 g of water per kg of dry air and 65 % relative humidity.

Because comfortable climatic conditions may not always be achieved in kitchens, the design of a ventilation and air conditioning system may be based on a maximum moisture content x of the air of 16,5 g of water per kg of dry air.

No reliable data is available regarding the lower limit of the relative humidity of the room air. 30 % relative humidity of the room air may be taken as the comfort limit – as independent as possible from the temperature of the room air – with occasional undershoots being acceptable.

8.4 Air velocity in the room

The limits of the air velocity in the comfort area depend on the temperature of the room air, the turbulence of the flow, the degree of activity and the thermal resistance of the clothing according to EN ISO 7730.

The limiting values given in EN ISO 7730, example curve shown in figure 2 for 0,6 clo should not be exceeded. Measurements are generally carried out at the workstation at a height of 1,7 m.