SLOVENSKI PREDSTANDARD

oSIST prEN 15544:2006

september 2006

One off Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) - Calculation method

ICS 97.100.30

Referenčna številka
oSIST prEN 15544:2006(en)

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 15544

July 2006

ICS

English Version

One off Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) - Calculation method

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 295.

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.

This draft European Standard was established by CEN 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, 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.

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.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

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

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

Ref. No. prEN 15544:2006: E

Contents

Page

Foreword

This document (prEN 15544:2006) has been prepared by Technical Committee CEN/TC 295 “Residential solid fuel burning appliances”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This standard contains specifications for the dimensioning of Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves). If the calculations of this standard are observed, the minimum energy efficiency of 78% and the emission values of carbon monoxide 1.500 mg/m_n^3 (1.000 mg/MJ), nitrogen dioxide 225 mg/m_n^3 (150 mg/MJ), organically bound carbon 120 mg/m_n^3 (80 mg/MJ) and dust 90 mg/m_n^3 (60 mg/MJ) will be observed too.

This calculation method for the dimensioning of Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) is based on appropriate literature as well as European standard EN 13384-1, whereat besides physical and chemical formulas also empirically determined correlations are used.

Note: In case of a calculation method for different interior materials than fireclay the proof of the compliance of the emission values has to be delivered separately. Furthermore the empiric data of the combustion chamber dimensions, the minimum flue pipe length, the burning rate as well as the combustion chamber temperature and the decrease of the temperature along the flue pipe have to be determined.

1 Scope

This standard contains specifications for the dimensioning of Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves). The Kachelgrundöfen/Putzgrundöfen (one off tiled/mortared stoves) are constructed technically individual. The standard can be used for log wood fired Kachelöfen (tile stoves) that burn one fuel load per storage period with a maximum load between 10 and 40 kg and a storage period (nominal heating time) between 8 and 24 h.

This standard is valid for Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) equipped with fireclay as interior material, with an apparent density between 1.750 and 2.200 kg/m³, a degree of porosity 18 up to 33 percent by volume and a heat conductivity from 0,65 up to 0,90 W/mK (temperature range 20 – 400 °C).

This standard is valid for Kachelgrundöfen/Putzgrundöfen (tiled/mortared stoves) with sidewise combustion air supply of the combustion chamber.

This standard is not valid for combinations with water heat exchangers for central heating or other heat absorbing elements like glass plates greater than 1/6 of the combustion chamber surface, open water tanks etc. It is also not valid for combinations with heating/fireplace elements according to EN 13229. Furthermore this standard is not valid for mass-produced prefabricated or partly prefabricated slow heat release appliances according to EN 15250.

This calculation method can be used to proof requirements of emissions and energy efficiency in case of burning log wood or wood briquettes according to the manual of the producer.

2 Normative references

EN 13384-1, *Chimneys – Thermal and fluid dynamic calculation methods – Part 1: Chimneys serving one appliance*

3 Terms and definitions

3.1
construction with air gap
construction, with an air gap between the inner and the outer shell

3.2
construction without air gap
construction, with no air gap between the inner and the outer shell

3.3
combustion chamber base A_{BR}
area of an horizontal cut through the combustion chamber at the height of the lower edge of the firebox opening

3.4
combustion chamber height H_{BR}
mean vertical distance between combustion chamber base and combustion chamber ceiling

3.5
combustion chamber surface O_{BR}
sum of the inner surfaces of the combustion chamber

3.6
mean combustion chamber temperature t_{BR}
value to calculate the thermal lift in the combustion chamber

3.7
burning rate m_{BU}
mean fuel load divided by burning time

3.8
combustion chamber admeasurement U_{BR}
admeasurement of the combustion chamber base

3.9
gas groove
additional opening for the conduction of the flue gas

3.10
flue pipe length L_Z

length of the connecting line of all geometric centres of the flue pipe profiles from the combustion chamber exit to the connecting pipe entrance

3.11
Kachelgrundofen/tiled stove (also Kachelofen)

One off slow heat release appliance, which is adapted individually to the local conditions and whose visible surface is predominantly made of tiles

3.12
short flue pipe section
section of the flue pipe, where the length of the section is shorter than the hydraulic diameter

3.13
minimum flue pipe length L_{Zmin}
minimal acceptable length of the flue pipe

3.14
maximum load m_B
load of the fuel at nominal heat output

3.15
minimum load m_{Bmin}
load of the fuel at the lowest reduced heat output

3.16
nominal heat output
mean useable heat output of the heating appliance

3.17
Putzgrundofen/mortared stove (also Putzofen)

One off slow heat release appliance, which is adapted individually to the local conditions and whose visible surface is predominantly plastered

3.18
storage period (nominal heating time)
period of time while the nominal heat output is set free; has to be specified by the producer

3.19
efficiency
proportion (in percent) of the nominal heat output multiplied with the storage period to the total heat input

4 Calculations

4.1 Nominal heat output

The nominal heat output has to be specified.

4.2 Load of fuel

4.2.1 Maximum load

The maximum load of fuel is calculated as follows:

$$m_B = \frac{P_n \cdot t_n}{3,25} \qquad (1)$$

Note: To calculate the factor 3,25 in equation (1) a net calorific value of wood of 4,16 kWh*kg^{-1} and an efficiency of 0,78 (78%) are presumed.

With:

m_B maximum load (kg)

P_n specified nominal heat output (kW)

t_n specified storage period (h)

Note: The specified storage period can vary between 8 and 24 hours

4.2.2 Minimum load

The minimum load is fixed with 50 % of the maximum load.

$$m_{Bmin} = 0,5 \cdot m_B \qquad (2)$$

With:

m_B maximum load (kg)

m_{Bmin} minimum load (kg)

4.3 Design of the essential dimensions

4.3.1 Combustion chamber dimensions

The design of the dimensions of the combustion chamber is necessary, because on one hand enough room to place the fuel in it is needed and on the other hand the requirements for a clean combustion have to be fulfilled.

4.3.1.1 Combustion chamber surface

The dimension of the combustion chamber surface has to be calculated as follows:

$$O_{BR} = 900 \cdot m_B \tag{3}$$

With:

m_B maximum load (kg)

O_{BR} combustion chamber surface (cm^2)

For the calculation of the combustion chamber surface all its walls, the ceiling and the base including the area of the combustion chamber opening and the combustion chamber exit for the flue gas have to be regarded equally.

4.3.1.2 Combustion chamber base

The combustion chamber base can be varied between a minimum and a maximum value.

The minimum value results from the requirement that at maximum load a height of the fuel of 33 cm shall not be exceeded. Therefore a base of 100 cm² per kg fuel is needed.

$$A_{BRmin} = 100 \cdot m_B \tag{4}$$

With:

m_B maximum load (kg)

A_{BRmin} minimum combustion chamber base (cm^2)

The maximum area of the base of the combustion chamber is defined as a result of equations (3) and (6) as follows:

$$A_{BRmax} = \frac{900 \cdot m_B - (25 + m_B) \cdot U_{BR}}{2} \tag{5}$$

With:

m_B maximum load (kg)

A_{BRmax} maximum combustion chamber base (cm^2)

U_{BR} combustion chamber admeasurement (cm)

When the base is square, the proportion of length to width can be varied from 1 to 2, but a minimum width of 23 cm is required.

4.3.1.3 Combustion chamber height

The minimum combustion chamber height is defined as follows:

$$H_{BR} \geq 25 + m_B \tag{6}$$

With:

m_B maximum load (kg)

H_{BR} combustion chamber height (cm)

On the basis of the specifications of the combustion chamber base and the combustion chamber surface the combustion chamber height is calculated as follows:

$$H_{BR} = \frac{900 \cdot m_B - 2 \cdot A_{BR}}{U_{BR}} \quad (7)$$

With:

m_B maximum load (kg)

A_{BR} combustion chamber base (cm^2)

H_{BR} combustion chamber height (cm)

U_{BR} combustion chamber admeasurement (cm)

4.3.2 Minimum flue pipe length

4.3.2.1 Construction without air gap

The minimum flue pipe length is calculated as follows:

$$L_{Zmin} = 1{,}3 \cdot \sqrt{m_B} \quad (8a)$$

With:

m_B maximum load (kg)

L_{Zmin} minimum flue pipe length (m)

4.3.2.2 Construction with air gap

The minimum flue pipe length is calculated as follows:

$$L_{Zmin} = 1{,}5 \cdot \sqrt{m_B} \quad (8b)$$

With:

m_B maximum load (kg)

L_{Zmin} minimum flue pipe length (m)

4.3.3 Gas groove profile

The gas groove profile is calculated as follows:

$$A_{GS} = 1 \cdot m_B \quad (9)$$

With: