

<b>STN</b>	<b>Komíny. Metódy tepelnotechnického a hydraulického výpočtu. Časť 1: Komíny s pripojením jedného spotrebiča palív.</b>	<b>STN EN 13384-1</b>
		73 4206

Chimneys - Thermal and fluid dynamic calculation methods - Part 1: Chimneys serving one heating appliance

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 07/15

Obsahuje: EN 13384-1:2015

Oznámením tejto normy sa ruší  
STN EN 13384-1+A2 (73 4206) z mája 2010

**121070**

---

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2015  
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

English Version

## Chimneys - Thermal and fluid dynamic calculation methods - Part 1: Chimneys serving one heating appliance

Conduits de fumée - Méthodes de calcul thermo-aéraulique  
- Partie 1: Conduits de fumée ne desservant qu'un seul  
appareil

Abgasanlagen - Wärme- und strömungstechnische  
Berechnungsverfahren - Teil 1: Abgasanlagen mit einer  
Feuerstätte

This European Standard was approved by CEN on 24 January 2015.

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-CENELEC 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-CENELEC Management Centre has the same status as the official versions.

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



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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Contents

Page

Foreword.....	5
1 Scope .....	6
2 Normative references .....	6
3 Terms and definitions .....	6
4 Symbols and abbreviations .....	10
5 Calculation method for non-balanced flue chimneys .....	14
5.1 General principles.....	14
5.2 Pressure requirements.....	15
5.2.1 Negative pressure chimneys .....	15
5.2.2 Positive pressure chimneys .....	16
5.3 Temperature requirement .....	16
5.4 Calculation procedure.....	17
5.5 Flue gas data characterising the heating appliance .....	18
5.5.1 General.....	18
5.5.2 Flue gas mass flow .....	18
5.5.3 Flue gas temperature .....	19
5.5.4 Minimum draught for the heating appliance ( $P_W$ ) for negative pressure chimney .....	19
5.5.5 Maximum draught for the heating appliance ( $P_{Wmax}$ ) for negative pressure chimney .....	20
5.5.6 Maximum differential pressure of the heating appliance ( $P_{W0}$ ) for positive pressure chimney .....	20
5.5.7 Minimum differential pressure of the heating appliance ( $P_{W0min}$ ) for positive pressure chimney .....	20
5.6 Characteristic data for the calculation .....	20
5.6.1 General.....	20
5.6.2 Mean value for roughness ( $r$ ) .....	20
5.6.3 Thermal resistance ( $1/\Lambda$ ) .....	20
5.7 Basic values for the calculation .....	21
5.7.1 Air temperatures .....	21
5.7.2 External air pressure ( $p_L$ ) .....	23
5.7.3 Gas constant .....	23
5.7.4 Density of the external air ( $\rho_L$ ) .....	24
5.7.5 Specific heat capacity of the flue gas ( $c_p$ ) .....	24
5.7.6 Condensing temperature ( $T_{sp}$ ).....	24
5.7.7 Correction factor for temperature instability ( $S_H$ ).....	24
5.7.8 Flow safety coefficient ( $S_E$ ) .....	24
5.8 Determination of the temperatures .....	25
5.8.1 General.....	25
5.8.2 Calculation of the coefficient of cooling ( $K$ ) .....	25
5.8.3 Coefficient of heat transmission ( $k_b$ ) .....	26
5.9 Determination of the density of the flue gas and the velocity of the flue gas.....	28
5.9.1 Density of the flue gas ( $\rho_m$ ) .....	28
5.9.2 Velocity of the flue gas ( $w_m$ ).....	28
5.10 Determination of the pressures.....	29
5.10.1 Pressure at the flue gas inlet into the chimney .....	29
5.10.2 Theoretical draught available due to chimney effect ( $P_H$ ) .....	30
5.10.3 Pressure resistance of the chimney ( $P_R$ ).....	30
5.10.4 Wind velocity pressure ( $P_L$ ) .....	31

5.11	Minimum draught required at the flue gas inlet into the chimney and maximum allowed draught ( $P_{Ze}$ and $P_{Zemax}$ ) and maximum and minimum differential pressure at the flue gas inlet into the chimney ( $P_{ZOe}$ and $P_{ZOemin}$ ) .....	32
5.11.1	General .....	32
5.11.2	Minimum and maximum draught for the heating appliance ( $P_W$ and $P_{Wmax}$ ) and maximum and minimum differential pressure of the heating appliance ( $P_{WO}$ and $P_{WOmin}$ ) .....	33
5.11.3	Effective pressure resistance of the connecting flue pipe ( $P_{FV}$ ) .....	33
5.11.4	Pressure resistance of the air supply ( $P_B$ ) .....	34
5.12	Calculation of the inner wall temperature at the chimney outlet ( $T_{job}$ ) .....	35
6	Secondary air for negative pressure chimneys .....	37
6.1	General .....	37
6.2	Calculation method .....	37
6.3	Basic values for the calculation of secondary air.....	37
6.3.1	General .....	37
6.3.2	Mixing calculations .....	37
6.4	Pressures .....	38
6.4.1	Pressure resistance for the air supply with secondary air ( $P_{BNL}$ ).....	38
6.4.2	Draught required for the secondary air devices ( $P_{NL}$ ) .....	39
6.4.3	Pressure resistance for that part of the connecting flue pipe before the secondary air device ( $P_{FV1}$ ).....	40
6.4.4	Pressure requirement with secondary air.....	41
6.5	Temperature requirement with secondary air .....	41
7	Calculation method for balanced flue chimneys .....	41
7.1	General principles .....	41
7.2	Pressure requirements .....	42
7.3	Temperature requirements .....	43
7.4	Calculation procedure.....	43
7.5	Flue gas data characterizing the heating appliance .....	43
7.6	Characteristic data for the calculation .....	44
7.7	Basic values for the calculation.....	44
7.7.1	Air temperatures.....	44
7.7.2	Other basic values.....	45
7.8	Determination of the temperatures.....	45
7.8.1	Non-concentric (separate) ducts .....	45
7.8.2	Concentric ducts – calculation based on a correction factor for heat radiation .....	45
7.8.3	Concentric ducts – calculation based on calculated heat radiation .....	60
7.8.4	Mean temperatures for pressure calculation.....	64
7.9	Determination of densities and velocities .....	65
7.9.1	Density and velocity of the flue gas .....	65
7.9.2	Density and velocity of the supply air.....	65
7.10	Determination of pressures.....	66
7.10.1	Pressure at the flue gas inlet into the chimney.....	66
7.10.2	Theoretical draught due to chimney effect in the chimney segment ( $P_H$ ) .....	66
7.10.3	Pressure resistance in the chimney segment ( $P_R$ ).....	66
7.10.4	Wind velocity pressure ( $P_L$ ) .....	66
7.11	Minimum draught required at the flue gas inlet into the chimney and maximum allowed draught ( $P_{Ze}$ and $P_{Zemax}$ ) and maximum and minimum differential pressure at the flue gas inlet into the chimney ( $P_{ZOe}$ and $P_{ZOemin}$ ).....	66
7.11.1	General .....	66
7.11.2	Minimum and maximum draught for the heating appliance ( $P_W$ and $P_{Wmax}$ ) and maximum and minimum differential pressure of the heating appliance ( $P_{WO}$ and $P_{WOmin}$ ) .....	67
7.11.3	Effective pressure resistance of the connection pipe ( $P_{FV}$ ) .....	67
7.11.4	Pressure resistance of the air supply .....	67
7.12	Calculation of the inner wall temperature at the chimney outlet ( $T_{job}$ ) .....	70
8	Consideration of the condensation heat of the flue gas water vapour .....	70

**EN 13384-1:2015 (E)**

<b>8.1</b>	<b>General</b> .....	<b>70</b>
<b>8.2</b>	<b>Onset of condensation</b> .....	<b>71</b>
<b>8.3</b>	<b>Calculation of the flue gas temperature at the outlet of a chimney segment with condensation (<math>j \geq N_{seg}K</math>)</b> .....	<b>73</b>
<b>9</b>	<b>Consideration of chimney fans</b> .....	<b>78</b>
<b>9.1</b>	<b>General</b> .....	<b>78</b>
<b>9.2</b>	<b>Inline fans</b> .....	<b>79</b>
<b>9.3</b>	<b>Exhaust fans</b> .....	<b>80</b>
<b>Annex A</b> (informative)	<b>Calculation of thermal resistance</b> .....	<b>82</b>
<b>Annex B</b> (informative)	<b>Tables</b> .....	<b>83</b>
<b>Annex C</b> (informative)	<b>Chimney outlet with regard to adjacent buildings</b> .....	<b>98</b>
<b>Annex D</b> (informative)	<b>Determination of the gas constant R considering the condensation</b> .....	<b>99</b>

## Foreword

This document (EN 13384-1:2015) has been prepared by Technical Committee CEN/TC 166 “Chimneys”, the secretariat of which is held by ASI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2015, and conflicting national standards shall be withdrawn at the latest by October 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13384-1:2002+A2:2008.

According to EN 13384-1:2002+A2:2008 the following fundamental changes are given:

- editorial mistakes have been corrected;
- mistakes in formulas have been corrected;
- for wood the rise of the dew point to take into account the acid condensation has been deleted;
- table for material characteristics in Table B.5 has been adapted to EN 15287-1 and supplemented by radiation coefficients;
- in Calculation of thermal resistance according to Annex A are linked to the method of EN 15287-1 for taking into account the temperature dependence has been added;
- for non-concentric ducts the calculation of the mean temperature of the air supply has been amended;
- for chimney fans a calculation procedure has been added;

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This European Standard “Chimneys — Thermal and fluid dynamic calculation methods” consists of three Parts:

- Part 1: Chimneys serving one heating appliance
- Part 2: Chimneys serving more than one heating appliance
- Part 3: Methods for the development of diagrams and tables for chimneys serving one heating appliance

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

## 1 Scope

This European Standard specifies methods for the calculation of the thermal and fluid dynamic characteristics of chimneys serving one heating appliance.

The methods in this part of this European Standard are applicable to negative or positive pressure chimneys with wet or dry operating conditions. It is valid for chimneys with heating appliances for fuels subject to the knowledge of the flue gas characteristics which are needed for the calculation.

The methods in this part of this European Standard are applicable to chimneys with one inlet connected with one appliance. The methods in Part 2 of this European Standard are applicable to chimneys with multiple inlets and one inlet with multiple appliances. Part 3 describes methods for the development of diagrams and tables for chimneys serving one heating appliance.

## 2 Normative references

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

EN 1443, *Chimneys - General requirements*

EN 1856-1, *Chimneys - Requirements for metal chimneys - Part 1: System chimney products*

EN 1859, *Chimneys — Metal chimneys — Test methods*

EN 13502, *Chimneys - Requirements and test methods for clay/ceramic flue terminals*

EN 15287-1:2007+A1:2010, *Chimneys - Design, installation and commissioning of chimneys - Part 1: Chimneys for non-roomsealed heating appliances*

prEN 16475-2, *Chimneys - Accessories - Part 2: Chimney fans - Requirements and test methods*

CEN/TR 1749, *European scheme for the classification of gas appliances according to the method of evacuation of the combustion products (types)*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**