Hygrothermal performance of building equipment and industrial installations -Calculation of water vapour diffusion -Cold pipe insulation systems

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN	This Estonian standard EVS-EN
14114:2002 sisaldab Euroopa standardi	14114:2002 consists of the English text of
EN 14114:2002 ingliskeelset teksti.	the European standard EN 14114:2002.
Käesolev dokument on iõustatud	This document is endorsed on 06 08 2002
06 08 2002 ja selle kohta on avaldatud	with the notification being published in the
teade Eesti standardiorganisatsiooni	official publication of the Estonian national
amotlikus välisandos	standardisation organisation
anetikus valjaandes.	standardisation organisation.
Standard on kättasaaday Easti	The standard is sysilable from Estanian
Stanuaru on Kallesaauav Eesti	
standardiorganisatsioonist.	standardisation organisation.
Käsitlusala:	Scope:
This standard specifies a method to	This standard specifies a method to
calculate the density of water vapour flow	calculate the density of water vapour flow
rate in cold pipe insulation systems, and	rate in cold pipe insulation systems, and
the total amount of water diffused into the	the total amount of water diffused into the
insulation over time. This calculation	insulation over time. This calculation
method presupposes that water vapour	method presupposes that water vapour
can only migrate into the insulation	can only migrate into the insulation
system by diffusion, with no contribution	system by diffusion, with no contribution
from airflow. It also assumes the use of	from airflow. It also assumes the use of
homogeneous isotronic insulation	homogeneous isotronic insulation
materials so that the water vapour partial	materials so that the water vanour partial
procesure is constant at all points	procesure is constant at all points
or a start from the axis of the pine. The	pressure is constant at all points
equidistant norm the axis of the pipe. The	equidistant norm the axis of the pipe. The
standard is applicable when the	standard is applicable when the
temperature of the medium in the pipe is	temperature of the medium in the pipe is
above 0 C. It applies to pipes inside	above 0 C. it applies to pipes inside
buildings as well as in the open air.	buildings as well as in the open air.
	$\nabla_{\mathbf{x}}$
ICS 91.120.10	

Võtmesõnad: accountancy, basic domestic facilities, buildings, calculating methods, heat loss, heat losses, heat transfer, mathematical calculations, pipelines, quantity surveying, refrigerating plants, service installations, thermal insulation, water vapour permeability

EUROPEAN STANDARD NORME EUROPÉENNE **EUROPÄISCHE NORM**

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ICS 91.120.10

English version

Hygrothermal performance of building equipment and industrial installations - Calculation of water vapour diffusion - Cold pipe insulation systems

Performance hygrothermique des équipements de bâtiments et installations industrielles - Calcul de la diffusion de vapeur d'eau - Systèmes d'isolation de tuyauteries froides

Wärme- und feuchtetechnisches Verhalten von haus- und betriebstechnischen Anlagen - Berechnung der Wasserdampfdiffusion - Dämmung von Kälteleitungen

This European Standard was approved by CEN on 28 June 2001.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

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

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Foreword

This document (EN 10264-1:2002) has been prepared by Technical Committee CEN/TC 89 "Thermal performance of buildings and building components"", the secretariat of which is held by SIS.

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 September 2002, and conflicting national standards shall be withdrawn at the latest by September 2002.

The enquiry version was designated prEN ISO 15758. However, as a result of the enquiry, ISO decided to decouple from the Vienna Agreement; CEN and ISO will proceed to publication on their own.

This standard is one of a series of standards which specify calculation methods for the design and evaluation of the thermal and moisture related performance properties of buildings and building components.

The Annexes A and B are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

, Greece, ICC... Spain, Sweden, SwitzerIan.

EN 14114:2002 (E)

Introduction

If the thermal insulation of a cold pipe system is not completely water vapour tight, there will be a flow of water vapour from the warm environment to the surface of the pipe, whenever the temperature of the surface of the cold pipe is below the dew point of the ambient air. This flow of water vapour leads to an interstitial condensation in the insulation layer and/or dew formation on the surface of the pipe itself. Interstitial condensation may cause the insulation material to deteriorate and dew formation on the surface of a metal pipe may cause corrosion over time. If the temperature is below 0 °C ice will be formed and the methods of this standard will not apply.

In periods where the dew point of the ambient air is higher than the temperature of the outer surface of the insulation surface condensation will occur. This is dealt with in EN ISO 12241.

Different measures are available to control water vapour transfer and reduce the amount of condensation. The following are normally applied:

- a) Installation of a vapour retarder;
- b) Use of insulation materials with a high water vapour resistance factor (low permeability);
- c) Use of a vapour retarder and a capillary active fabric to continuously remove condensed water from the pipe surface to the environment.

Which protection measure is chosen depends on the ambient climate, the temperature of the medium in the pipe and the water vapour diffusion resistance of the insulation layer. The success of any system is strongly dependent on workmanship and maintenance. In any case anti-corrosion measures should be applied to a metal pipe in severe conditions.

The expected economic lifetime of an insulation system, assuming a maximum acceptable accumulated moisture content, can be calculated using the methods in this standard.

1 Scope

This standard specifies a method to calculate the density of water vapour flow rate in cold pipe insulation systems, and the total amount of water diffused into the insulation over time. This calculation method presupposes that water vapour can only migrate into the insulation system by diffusion, with no contribution from airflow. It also assumes the use of homogeneous, isotropic insulation materials so that the water vapour partial pressure is constant at all points equidistant from the axis of the pipe.

The standard is applicable when the temperature of the medium in the pipe is above 0 °C. It applies to pipes inside buildings as well as in the open air.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 9346	Thermal insulation - Mass transfer - Physical quantities and definitions (ISO 9346:1987)
EN ISO 12241	<i>Thermal insulation for building equipment and industrial installations - Calculation rules (ISO 12241:1998)</i>
EN ISO 12572	Hygrothermal performance of building materials and products - Determination of water vapour transmission properties (ISO 12572:2001)
EN ISO 13788	Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation – Calculation methods (ISO 13788:2001)

3 Terms, definitions, symbols and units

3.1 Terms and definitions

For the purposes of this standard, the terms and definitions given in EN ISO 9346, EN ISO 12572, EN ISO 13788 and the following apply.

3.1.1

exposed moist area

surface area of a capillary active fabric that is exposed to the ambient atmosphere

3.1.2

vapour retarder

material with high resistance to the flow of water vapour

3.1.3

corrected water vapour diffusion equivalent air layer thickness

thickness of an imaginary plane layer with $\mu = 1$, and an area of πD_j which has the same diffusion resistance as the layer *j* with $\mu = \mu_j$

NOTE See Equation (18).