TECHNICAL REPORT

ISO TR 9774

First edition
1990-10-15

Thermal-insulation materials — Application categories and basic requirements — Guidelines for the harmonization of International Standards and other specifications

Produits isolants thermiques pour le bâtiment — Catégories d'applications et caractéristiques relatives aux performances maximales — Guide pour l'harmonisation des Normes internationales et autres spécifications

Reference number
ISO/TR 9774:1990(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 9774, which is a Technical Report of type 3, was prepared jointly by Technical Committees ISO/TC 61, *Plastics*, and ISO/TC 163, *Thermal insulation*.

The form of a type 3 Technical Report has been chosen to enable the technical committees concerned to demonstrate, in their future standardization work, whether the basic requirements for any particular application of thermal insulation products for buildings are an appropriate basis for specifications.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland
Printed in Switzerland

Thermal-insulation materials — Application categories and basic requirements — Guidelines for the harmonization of International Standards and other specifications

1. SCOPE

1.1 This Technical Report lists common applications for thermal insulating products for insulating of buildings and gives guidance on the selection of minimum performance characteristics.

This Technical Report is intended to serve as a background document for standardization and to assist in the harmonization of specifications for thermal insulating products of different origin.

This Technical Report is not intended to serve as a guide to users or producers to prove the suitability of any particular product or any given application.

The product properties listed for each application are expressed as minimum performance characteristics, which shall be maintained during the expected service life of the insulation within the structure*).

1.2 When standards or specifications are established or existing standards are revised on the basis of this Technical Report, the minimum performance characteristics of this Technical Report should in the standards or specifications be translated into product requirements (specified values) together with appropriate test methods, which must be fulfilled at the time of delivery, in order to ensure that the product fulfills the performance requirements in service. This relationship between specified values for the product and the service performance characteristic of the product in use can be different for different insulating products, depending on the characteristic of the material (e.g. aging or time-dependent behaviour). Not each basic requirement needs to be specified in each product standard, if it is obvious

- that certain requirements are always fulfilled
- that several requirements can be covered by one specified property.

*) Note: The expected service lifetime depends on the application of the insulating product in the construction, taking into account the ease with which the product may be maintained or replaced. Service lifetime should be addressed by the product specifications.

1.3 This Technical Report applies only to prefabricated thermal insulating products. Products are any manufactured mats and boards including any facings or coverings, which may be present. The basic characteristics may also be applied to other insulation products, e.g. in situ, in systems or components, where appropriate.

The Technical Report covers only thermal insulating products for use in buildings within normal climatic conditions. It does not cover insulating products for building services, e.g. plumbing, heating and not for industrial use.

Acoustic properties are not included in the properties given in this Technical Report, although these may be additionally required for some application fields.

2. REFERENCE DOCUMENTS

ISO/TR 9165 : 1988, Practical thermal properties of building materials and products.

3. APPLICATIONS OF THERMAL INSULATING PRODUCTS IN BUILDINGS

A review of the most common applications of thermal insulating products in different structures of roofs, walls, ceilings and foundations is given in Table 1. The applications are illustrated in more detail in Figure 1.

The purpose of Figure 1 is only to illustrate the applications for the various insulating products and to assist in relating the performance characteristics for the products to their application. The Figure will also assist in determining requirements for other applications not listed.

The sketches are for illustration only and are not intended as construction drawings, for example water vapour barriers and air infiltration barriers which may be necessary, are not shown.
Waterproofings in the roof or foundation area are only shown to clarify the position of the insulation layer - in the area affected by precipi-

tation water or ground water or in the area protected against the penetration of water.

4. PERFORMANCE CHARACTERISTICS OF PRODUCTS ACCORDING TO THEIR APPLICATION

Table 2 lists those properties - according to different applications - which need to be considered when preparing standards and specifications for different products. The performance characteristics for these properties to ensure a serviceable and durable thermal insulation are explained and some values are suggested in Table 3.

Derived from Table 2, Table 2a gives basic necessary properties for thermal insulations in any application, while Table 2b gives specific properties which may be also necessary only for certain applications.

For additional applications in building not shown in Figure 1, the properties for the insulating products are to be determined accordingly.

Necessary properties for insulating products used in constructions or components which are characterized by two or more applications according to Figure 1 are derived from all relevant required properties.

For certain insulating materials, further properties other than those listed can be decisive for a durable behaviour during service, e.g. the stability to the action of adhesives, of solvents or of temperature. The product specification should then deal with these additional properties.

For certain constructions the knowledge of the water vapour permeability rate and the air permeability is necessary. The values for these should be dealt with in the product specifications.

5. APPLICATION CATEGORIES

For simplicity the various applications for insulating products shown in Figure 1 may be grouped into categories having common performance requirements. It is then the task of the insulating material standards or specifications to determine these categories and the applications which are covered by these categories.

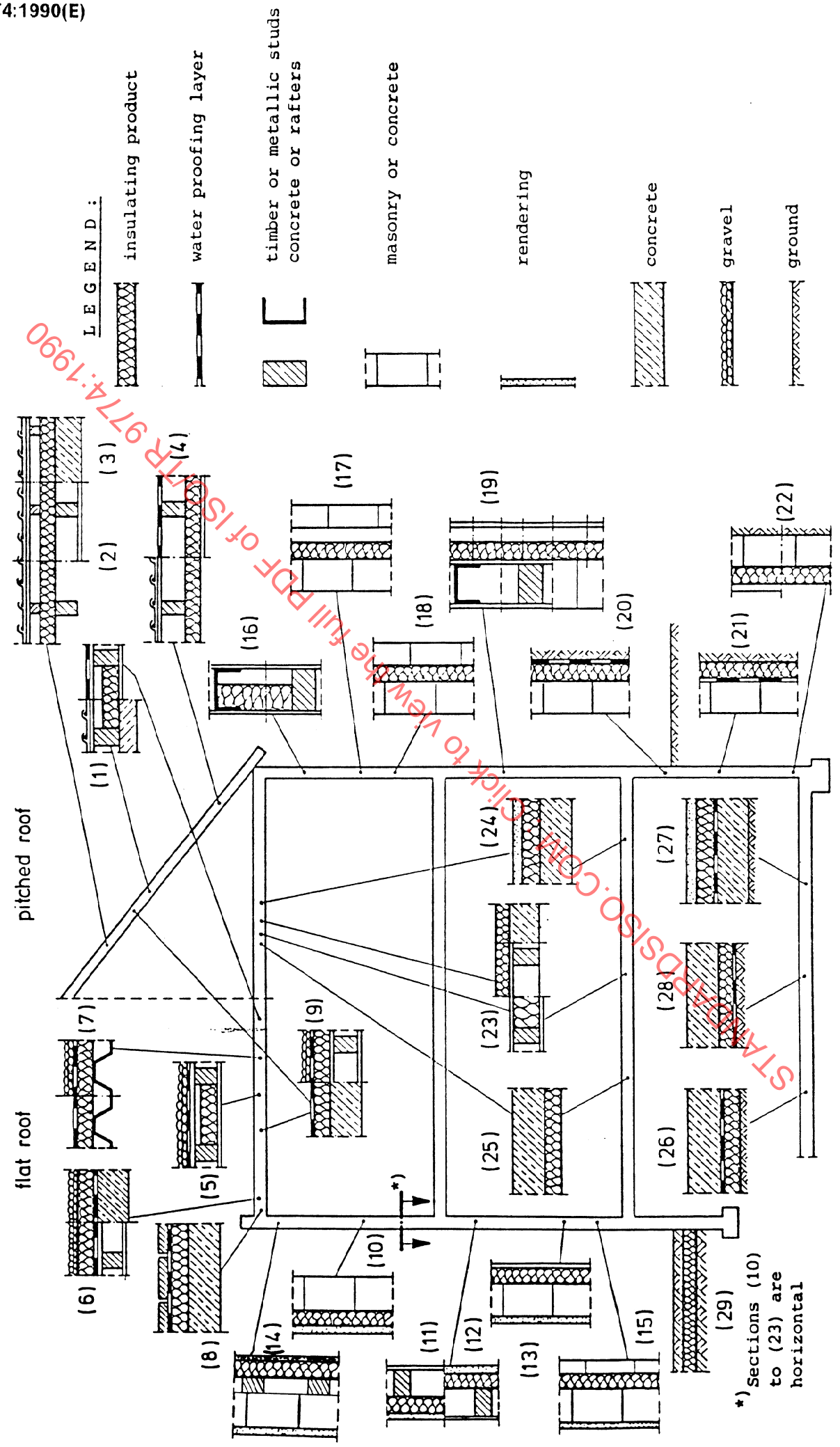

Figure 1: Examples of the most common applications of thermal insulating products in buildings

Table 1: Examples of the most common applications of thermal insulating products in buildings; for additional information see sketches in Figure 1

		APPLICATION	SKETCH NO.
ROOF	pitched roof	ventilated, unloaded insulation between rafters, fully supported	1
		ventilated, insulation separating rafters and outer covering	2
		ventilated, insulation separating supporting construction and outer covering	3
		ventilated, insulation beneath rafters	4
	flat roof	ventilated, insulation between rafters or beams	5
		inverted, insulation above roofing membrane	6
		on steel deck, insulation beneath roofing membrane	7
		accessible to light or heavy traffic or loads from roof garden (soil layer, plants, etc.), insulation beneath roofing membrane	8
		accessible only to maintenance, insulation beneath roofing membrane	9
WALL		masonry or concrete wall, external insulation covered by rendering	10
		timber stud construction, outside insulation and rendering directly supported by the studs	11
		timber stud construction, insulation at the internal side with rendering	12
		masonry or concrete wall, fully supported internal insulation supporting light protective internal facing (e.g. gypsum board)	13
		masonry or concrete wall, internal insulation supporting light protecting facing, partly supported by studs	14
		masonry or concrete wall, internal insulation with heavy self-supported protective internal facing (e.g. tiles at roomside)	15
		timber or metal stud construction with boards covering, insulation between the studs	16
		cavity wall construction, insulation between the leaves, cavity ventilated	17
		cavity wall construction, cavity fully filled with insulation, outer leave not watertight	18
		timber or metal stud construction with boards covering, insulation supported by boards; or masonry or concrete wall, supporting the insulation with ventilated exterior covering	19
		wall under ground, external insulation behind waterproof membrane with mechanical protection	20
		wall under ground, external insulation with direct contact to the ground	21
		cellar or crawlway hall, internal insulation with or without covering	22
CEILING		insulation over the supporting construction or between the beams	23
		insulation under load distributing flooring, fully supported	24
		insulation under the construction	25
FOUNDATION		concrete, insulation under the slab with direct contact to the ground	26
		concrete, insulation supported by the slab, above waterproof membrane, beneath load distributing flooring	27
		concrete, insulation under the slab above waterproof membrane	28
		frost insulation in or against the ground	29

Table 2 : List of relevant properties to be considered according to the application of insulating material in buildings

	Application of insulation with reference to sketch figure			roof								wall												ceiling			foundation			
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
a	Thermal resistance R or thermal conductivity λ			o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
b	service temperature	normal -40°C./.+60°C		o	o	o	o	o			o		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
c		elevated -40°C./.+90°C							o	o		o																			
d	shape and dimensional stability	under temperature action		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
e		under humidity action		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
f		under humidity + temperature action							o																							
g	compressive behaviour	application	no loading or compression action	o			o	o					o			o		o	o	o	o	o			o	o		o				
h			compression under uniform load other than svc. load		o	o								o	o		o						o	o							o
i		service load	only by maintenance						o	o		o																			
k			light traffic (persons)								o																o		o	o	o	
l			heavy traffic cars								o																					
m			heavy traffic trucks								o																					
n1	lateral tensile according to wind load					o			o		o	o									o										
n2	flexural strength according to wind load				o		o							o																	
o	shear strength											o	o	o		o	o														
p	handling property			o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
q	bending strength under man load								o																							
r	behaviour under influence of water	not planned, short-term wetted			o	o				o	o	o	o	o						o			o								o	
s		planned long-term wetted							o												o	o		o					o			o
t	frost resistance								o															o					o			o
u	influence on health and safety			o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
v	fire behaviour			o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
w	behaviour under biological attack			o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
x	compatibility with other materials			o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

Table 2a: Basic necessary properties for thermal insulation products in any application

Application of insulation with reference to sketch figure		
a	Thermal resistance R or thermal conductivity λ	
b	service temperature	normal -40 °C ./. +60 °C
d	shape and dimensional stability	under temperature action
e		under humidity action
p	handling property	
u	influence on health and safety	
v	fire behaviour	
w	behaviour under biological attack	
x	compatibility with other materials	