Energy Performance of Buildings

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PROJECT DOCUMENT

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Report on the application of the series of EN ISO standards on thermal transmission properties of building components and building envelope – EN ISO 6946, 10077, 10211, 10456, 13370, 13786, 13789, 14683; EN 13947

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IEE-CENSE

Leading the CEN Standards on Energy Performance of Buildings to practice
Towards effective support of the EPBD implementation and acceleration
in the EU Member States

Supported by

Intelligent Energy Europe

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1 Executive Summary and Recommendations

1.1 Executive Summary

The CENSE project

The CENSE-project was initiated by the European Commission to improve acceptance and use of the CEN-standards, which were developed to analyse the energy performance of buildings according to the EPBD. One of the project's major goals is to identify problems concerning the standards' content and their implementation via questionnaires and workshops and to formulate recommendations for improvement.

EN ISO standards on thermal transmission

This report concerns the feed back on the series of international standards for calculating the thermal performance of building components and building elements.

The questionnaire

The questionnaire is designed as a simplified questionnaire, as email, which contains a few questions and could be answered within a couple of minutes.

The evaluation of the questionnaire should provide information on future efforts to make the standards better known and accepted and on necessary contents for revising the standards in order to allow a broad application in daily design practice.

Because of the limited time remaining available for the preparation and follow up on this questionnaire until the end of the project, the questionaire was sent out only to specific known contact persons in 10 countries, as these personal contacts would make it likely to receive response at short notice without excessive persuasion. From representatives of 7 EU Member States a completed questionnaire was returned, plus one less detailed preliminary response.

Despite the limited number, the available responses were significant enough to indicate some trends.

Discussing the main results of the questionnaire

In all of the responding countries the subseries of EN ISO standards on transmission is used in one way or the other. In some of the responding countries this subseries of EN ISO standards is used directly: they are referenced in the national bulding codes. In other responding countries this subseries of EN ISO standards is used indirectly, by copying parts of it in the national standards or building codes. In most countries there are some specific elements conflicting with this subseries of EN ISO standards. We recommend that, as part of the preparation of the second generation of CEN standards for the EPBD, these deviations are analysed to see if there is a need to revise the CEN standards.

The subject of thermal transmission properties of building components and building envelope is one of the subjects related to energy saving in buildings with the longest tradition in national and international standardization. In consequence, international standards in this field have already been in existence for many years.

But it also means that in many countries there exists a long tradition in national standardization in this area, focusing on the specific national situation: building tradition, building inspection, building insulation levels, etc.

The two main reasons mentioned for not (directly) using this subseries of EN-ISO standards in the national building regulations are: the tradition of having national standards in this area and the advantages of an all-in-one document (as one country describes): a coherent and accurate document pre-

pared by a well-organised group of national experts, which includes all national choices and input data.

The questionnaire did not address technical details. Only concerning the strongly revised EN ISO 13370, (calculation of the heat transfer via the ground) the respondents were asked about their experiences. There, it seems that the specific question on new procedures to calculate the heat transfer via the ground came a bit too early, because these new procedures are not yet implemented widely. One point of attention seems to be the quantification of the impact of linear thermal bridges in the foundation. Because in several countries, the linear thermal transmittance values are given in a so called "thermal bridge atlas", the validity of this element in the new procedures in EN ISO 13370 is a point of attention.

It is also clear that harmonization simply takes time…. but with a good set of conditions the process can be significantly accelerated.

1.2 Recommendations

Despite the limited number of responses, the available responses were significant enough to indicate some trends. This led to the following recommendations regarding the standards's structure:

- A clear structure, which separates common procedures and national choices, is essential to make the EN ISO standards fit for use as normative document and to enable the introduction of brief and transparant (normative) National Annexes that comprises the national choices, boundary conditions and input data. The National Annexes thus control the national (or regional) application of the standards. Regarding this issue, a common structure of all CEN-standards should be aimed at.
- The need for a compact national document can be accomodated by an (informative) national Application Document that has the same content as the (normative) CEN standard plus (normative) National Annex(es), but re-edited, integrating the common and national elements.

Regarding technical details, due to the reasons mentioned above, concrete recommendations can currently not (yet) be given. Nevertheless, one point of attention became apparent: the quantification of the impact of linear thermal bridges in the foundation in EN ISO 13370. In general, because in most countries there are some specific elements conflicting with this subseries of EN ISO standards, we recommend that such deviations are analysed to see if revision of the CEN standards on these issues would improve the standards and increase their direct use in the context of the national building regulations.

2 Introducing the CENSE-Project

The “Energy Performance of Buildings” Directive (EPBD) of the European Commission aims at allocating substantial energy saving potentials in the European building sector. In support of the EPBD, the European Commission mandated the European Committee for Standardization (CEN) to develop a set of standards providing methods which allow to analyze, optimize and rate the integrated energy performance of buildings, including lighting.

Although these standards have been available for quite a while now, many of them are not yet implemented in the Member States and most of them are hardly known among experts and practitioners. In order to improve acceptance und use of the CEN-standards and to accelerate their implementation on a national level, the project IEE-CENSE with 13 partners from eight different countries was initiated by the Commission.

Within the CENSE project, a series of questionnaires on the practical use of the CEN standards is developed and sent to contact persons in the EU Member States. In addition several presentations and workshops are held discussing the standards and their content. All these actions are aiming at the identification of specific problems arising from

- the content of the standard (i.e. degree of complexity, completeness, practical relevance, ...)
- the implementation of the standard (i.e. national regulations, no software, ...)

3 CEN-ISO standards on thermal transmission

3.1 Introduction

The standards for *U*-values fall into two groups:

a) Simplified methods (EN ISO 6946, EN ISO 13370, EN ISO 10077-1, EN 13947), which can be used for components within the scope of those standards

b) Detailed methods (EN ISO 10211, EN ISO 10077-2), which can be used as an alternative, or for cases for which there is not an applicable simplified method

The *U*-value of components, including windows and doors, can alternatively be established by measurement according to test methods cited in applicable product standards.

Thermal bridges (at junctions between elements, etc) are covered in EN ISO 10211 (detailed) and EN ISO 14683 (simplified).

The standards in this group also include those for obtaining thermal values of building materials (e.g. EN ISO 10456).

Figures 1 and 2 show schemes of the interrelations between the different standards and how they are based on each other, finally all relevant for the calculation of energy use for heating and cooling. The figures can be read from bottom to top, where the top of figure 2 equates the bottom of figure 1.
.Figure 1 applies when one of the simplified (monthly or hourly) methods to calculate the energy needs for heating and cooling is chosen in EN ISO 13790. In case the option of detailed dynamic simulations is chosen, the component (or subcomponent) properties are directly used as input.

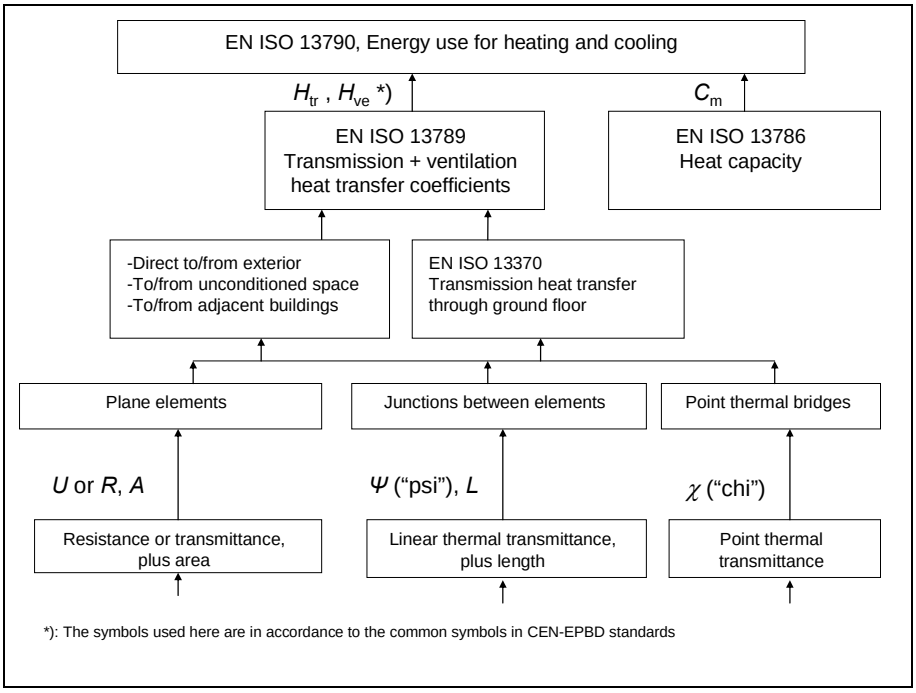


Fig. 1 — Scheme 1: From the thermal transmission properties of building components or building elements to input at building level

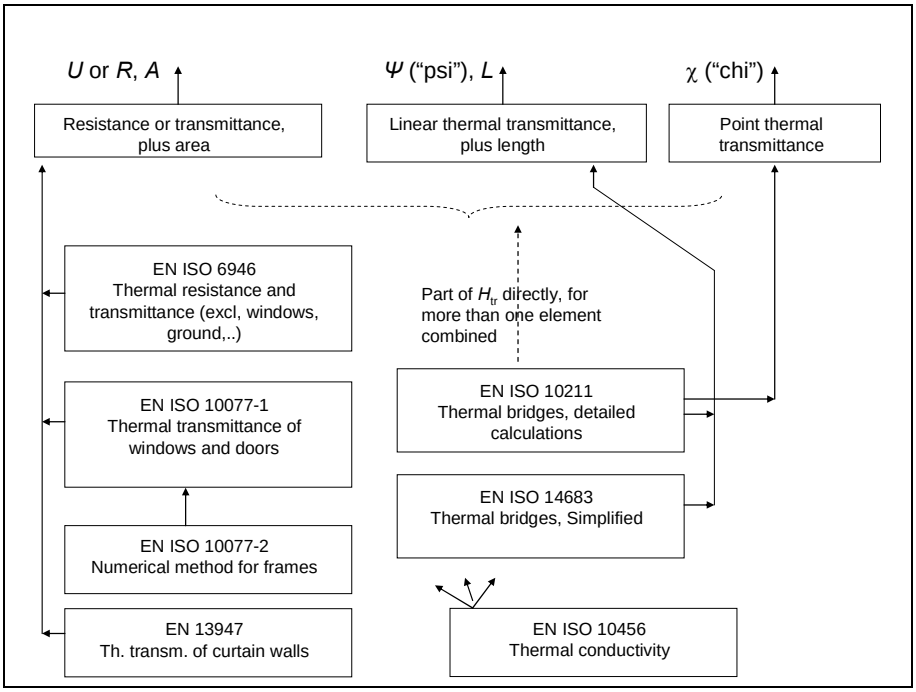


Fig. 2 — Scheme 2: From material and subcomponent properties to properties of building components or building elements

These international standards are applicable to buildings at the **design** stage as well as to **existing** buildings.

3.2 History of these standards

The first series of standards on thermal and hygrothermal properties of building components and elements were prepared by ISO Technical Committee TC 163 in the 1980's, as a result of growing global concern on future fuel shortages and inadequate health and comfort levels in buildings. During the following decades these first standards were revised and new standards were added, to cope with new developments and additional needs. From the 1990's on, many of these standards were developed in close collaboration with CEN (see further on).

As part of Mandate 343 of the European Commission to CEN to support the EPBD (2003), the series of standards were scrutinized to see which changes would be needed for the purpose of supporting the EPBD. This resulted in new versions of a number of standards, most of them published in 2007. The main new features in these versions are listed in the successive paragraphs below.

More information on this series of standards can be found in the CENSE Information Paper P94 [1].

4 The questionnaire on these standards

4.1 Introduction

Because of the limited time remaining available for the preparation and follow up on this questionnaire until the end of the project, it was decided to send out the questionnaire only to specific known contact persons in 10 countries (Austria, Belgium, Denmark, France, Germany, Italy, The Netherlands, Norway, United Kingdom and Switzerland), as these personal contacts would make it likely to receive response at short notice without excessive persuasion. From representatives of the following 7 EU Member States a completed questionnaire was returned: Belgium, Denmark, Germany, Italy, The Netherlands, Norway, United Kingdom. France responded with a preliminary general comment.

Despite the limited number, the available responses were significant enough to indicate some trends.

The questionnaire is copied in the following section (4.2). The questionnaire's evaluation is described in section 4.3.

4.2 The questionnaire

On: Implementation in your country of the series of EN ISO standards on thermal transmission properties of building components and building envelope (EN ISO 6946, 10077, 10211, 10456, 13370, 13786, 13789, 14683; EN 13947)

The European project IEE CENSE (www.iee-cense.eu) supports the EU Member States and other interested parties, aiming at better awareness and a more effective use of the set of European (CEN) standards that are related to the European Energy Performance of Buildings Directive (EPBD).

The CEN standards are typically published by the national CEN Member Body as EN-national standard (translated or not); optionally with a national annex containing the relevant national choices, boundary conditions and input data.

However, concerning the use of the CEN methods in the *national building regulations:* in many Member States the CEN standards are used only in a "practical way", e.g. by copying only parts of the technical content into national documents, mixed with national methods and data.

For the purpose of finding out the main obstacles for implementation of each of these standards in national or regional building regulations, if there are any, we developed a number of questionnaires on specific topics.The collected responses will be used to prepare recommendations to CEN for the second generation of CEN standards to support the EPBD. Those will be developed within the next few years.

For your information we attached our recently published information paper P094 on this series of standards.

We kindly ask you to quickly answer the **three questions** below, by simply typing in your reply-email.

Thank you very much in advance for your effort and your cooperation! We will keep you informed on the results!

Dick van Dijk (TNO) , also on behalf of Anna Staudt (Fraunhofer-IBP)

Questionnaire on the following specific CEN standard/cluster of CEN standards:

The series of EN ISO standards on thermal transmission properties of building components and building envelope

(EN ISO 6946, 10077, 10211, 10456, 13370, 13786, 13789, 14683; EN 13947)

Please send us a reply-email with your answers to the questions simply typed in.

Question 1: Is this series of EN-ISO standards put in force by your national building regulation, implementing the EPBD, in the framework of the assessment of the energy performance of buildings?
NOTE 1: You may differentiate for individual standards in this series of EN-ISO standards. You may want to differentiate for new and existing buildings
NOTE 2: If major changes are foreseen: we are in particular interested in the near future situation (the next 5 years)!

- Directly *(meaning: the national/regional building regulations refer to these EN-ISO standards, normally as EN-ISO-national standard, in English or translated)*: Yes/No?
  -If so: With a national annex? _____

- Indirectly *(meaning: parts/options of it are adopted in a national standard)*: Yes/No?

-If so:- Which parts are implemented?

_____

- In which national Standard(s)? _____
  -A reference to these EN-ISO standards is made: Yes/No?

- How do you judge the analogy of both documents, these EN-ISO standards and the national standard(s)?
  -The national Standards are fully in line with these standards , benefiting from the possibilities given in these EN-ISO standards to make choices at national level
  -Specific elements in the national Standard(s) are in conflict with these EN-ISO standards .
  If so: Which elements? _____
  _____

-If not directly, nor indirectly put in force:

-Instead a national Standard is implemented: Yes/No? If so: which national standard: _____

-A reference to these EN-ISO standards is made: Yes/No?

- Or: Instead the national regulation directly specifies a method for determining energy use for space heating and cooling: Yes/No?
- How well established are the methods used alternatively?

-Already in long term use: Yes/No?
-Just established: yes/No?

Comments:

_____

_____

For the next question:

Scale: Answering can be done by simply “giving a number”. In general, we offer a statement asking for your (dis-)agreement, where you can use the following scale: 5-0:

5 = I highly agree; 4 = I agree; 3 = I generally agree; 2 = I hardly agree; 1 = I do not agree at all;? = I don't know

Example:

- These instructions are clear:_5_

Note: The response will be analysed manually, so feel free to add whatever comments!

Question 2: To your opinion, which main <u>operational</u> obstacles need to be removed to implement this specific CEN standard/cluster of CEN standards in the national building regulations?

Scale 5-1 *(5= I highly agree; 1= I do not agree at all; ?= I don't know)*

- There is no operational obstacle: this specific CEN standard/cluster of CEN standards is or will (in near future) be put in force by our national/regional regulation: __
- It already requires a lot of time and energy to agree nationally upon the national method, thus:
  - adding a CEN circuit would only mean more time and effort and added risk that the procedures are not available in time or do not describe what is nationally needed: __
  - we would probably implement this specific CEN standard/cluster of CEN standards in the near future in case of a transparent planning of revisions of these CEN standards (when and what) : __
- A major obstacle is that the timing of the preparation of CEN standards did not coincide with the timing decided at national level (from projectplan to implementation in the law and application in practice) : __
- We need a national method that is compact; consequently we (intend to) integrate selected parts from this specific CEN standard/cluster of CEN standards: __

- A major obstacle is that this specific CEN standard/cluster of CEN standards does not enable us to link the calculation method to national product certification (national product labels or quality marks) : __
- This specific CEN standard/cluster of standards is too hard to obtain (price, copyright protection), compared to our national building regulations: __
- People involved in our national or regional building regulations should become involved in the CEN standardization activities, otherwise they go their own way: __
- Other: …….

Comments: ....

Question 3: (if applicable) Which major steps are needed to implement this specific CEN standard/cluster of CEN standards in the building regulations

- If in your country the CEN-standard is not implemented directly but its methods and equations are put in a national or regional regulation or in a national standard that differs from the CEN standard(s):
  - Why do you think that is the case? …… …… ……
    …… …… …… …… …… ……
    …… …… …… …… …… ……
  - And what needs to be done to make it possible to implement the standard itself?
    …… …… …… …… …… ……
    …… …… …… …… ……

Comments: ....

Bonus question:

We have special interest in the implementation of **EN ISO 13370:2007, heat transfer via the ground**, because this new version of this standard has some important new features (monthly values suited for heating ànd cooling, clear split between area and edge heat transfer, procedures for dynamic simulation programs). Is this standard implemented directly or indirectedly in your building regulations? Or used in another way (see questions above)?

…… …… …… …… …… ……

Comments: ....

General comments: ....

4.3 The questionnaire's results

In the following the results of each of the questionnaire's question are presented. First, a diagram indicates the statistical interpretation. Second, the country specific answers are listed in a table. Finally, a short discussion of the answers is given.

Q 1.1:
Is this series of EN-ISO standards put in force by your national building regulation, implementing the EPBD, in the framework of the assessment of the energy performance of buildings?

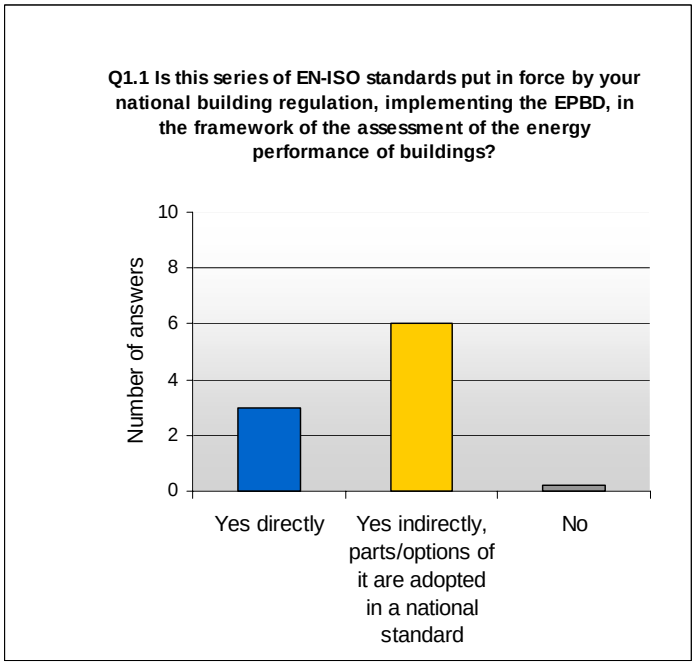


Fig. 3 — Responses on question Q 1.1

Discussion: Three of the respondents voted "yes, directly"and six respondents voted "yes, indirectly" (Italy voted both "yes" and "no", because of differences between regions),. From the more detailed responses (see below) we can see that there is a differentiation per standard and also that often a standard, if implemented, is not implemented for the full 100 %.

I) In case of: "Yes, directly":

Table 1 — Country-specific answers to the questionnaire's question Q1.1 in detail (1)

	If "Yes, directly": With a national annex?
Germany	No. (See more details in table 2)
Italy	No. (See more details in table 2)
United Kingdom	No. (See more details in table 2)

II) In case of: "Yes indirectly, parts/options of it are adopted in a national standard ":

Table 2 — Country-specific answers to the questionnaire's question Q1.1 in detail (2) (including the countries voting with "Yes, directly" of table 1)

	Which parts are implemented?	In which national Standard?
Belgium	e.g.: EN ISO 10456 (lambda 90/90 choice); EN 6946 (U-values); EN10077 (+tabulated values); EN ISO 10211 (thermal bridges required from 2010); EN ISO 13370 (partly); EN ISO 13786 (NOT implemented); EN ISO 14683 (thermal bridges required from 2010); EN ISO 13947 (yes)	NBN B62-002
Germany	Exceptions: EN ISO 6946: not the correction for insulation thickness for drainage flat roofs EN ISO 13789: the correction factor for unconditioned spaces EN ISO 13370: for ground floors: default factor = 0,6 instead of the calculation	
Denmark	Various	DS 418
France		part of Règles Th-Bât
Italy	some directly (e.g. UNI EN ISO 10077/1 and /2, UNI EN ISO 6946), some indirectly (e.g. EN ISO 13789 in UNI TS 11300)	UNI-TS 11300
The Netherlands	Most parts are used in the national all-in-one standard (NEN 1068): EN ISO 6946: more or less followed EN ISO 10077: part 1 more or less followed, part 2 referenced EN ISO 10211: more or less followed/ referenced EN ISO 10456: these tabulated design values are not used EN ISO 13370: in update of NEN 1068 (in preparation): more or less followed, but with amended split out of the floor perimeter thermal bridge, otherwise physically nonsense values EN ISO 13786: dynamic characteristics: not adopted: is too detailed EN ISO 13789: more or less followed EN ISO 14683: these simplified method and default values are not used as such EN 13947: is normatively referenced for curtain walls	NEN 1068 This standard (version 2001) is currently under revision; the reply is anticipating the new version

Norway	EN ISO 6946, 10077-1, 10077-2 10211, 13370, 13789	They are implemented as a normative reference to the national standard for calculation of energy performance of buildings (NS 3031:2007)
United Kingdom	-	-

II) continued:

In case of: "Specific elements in the national Standard are in conflict with EN ISO 13790": Which elements?

Table 3 — Country-specific answers to the questionnaire's question Q1.1 in detail (3)

	If specific elements in the National Standard(s) are in conflict with these EN-ISO standards: which elements?
Belgium	In Belgium NBN published an overall document NBN B62-002, referring to the above EN-ISO documents. However the regional (3 regions) have partly taken over some of the NBN B62-002 parts and consequently also then some of the EN-standards in this respect. However it is foreseen (nearly agreed) that in the ongoing updating of the software of the regional requirements (published and managed by the official departments/regio), the software & regulatory methods of the 3 regions (Fl, Br, Wal) are becoming more and more aligned with the EN & NBN B62-standards.
Germany	See table 1: Most of this series of EN-ISO standards is put in force by the national building regulations directly
Denmark	The national standard is almost fully in line with the international standards. Deviations are mainly found with regards to calculation of U-value of inhomogeneous constructions (timber frame etc.) and it is more clearly defined when simplified calculations (inhomogeneous constructions) can be utilized and when calculation procedures from EN/ISO 10211 should be applied. Also, minor deviations are found with regards to heat transfer to ground – and perhaps (to be confirmed) regarding heat loss through foundations. Additional comments: The standards are implemented indirectly. The Danish Building Regulation (from 2008) state that energy calculations (so-called energy frame calculation – the Danish implementation of the EPBD) are to be performed according to a document from the Danish Building Research Institute – and in that document it is stated that calculation of U-values etc. should be calculated in accordance with Danish Standard, DS 418. DS 418 is inspired, but do deviate on a number of points, from EN ISO 6946. In DS 418, reference is made to the other above mentioned standards. All the above mentioned EN-ISO standards are also Danish Standards (so they are DS/EN ISO standards), but the foreword of DS 418 clearly states that DS 418 supersedes EN/ISO 6946 etc. References to all the above mentioned standards are made.
France	Preliminary reply:

	All standards (and specially related detailed methods) are taken into account in the French calculation rules. A reference to these standards is clearly made. We are following revisions made in ISO TC163/SC2/WG9 and all future revisions to those standards will be taken into account when revising our national rules.
Italy	See table 1: This series of EN-ISO standards is put in force by the national building regulations directly
The Netherlands	In general: - the structure is different because NEN 1068 is an all-in-one document; some of the texts are copied, some specific details are left out (if less relevant for the country) and for other details the EN ISO standard is referenced. With respect to the content of the procedures there are minor (but relevant...) differences and for most sections various concrete specifications and choices were made where the EN ISO standards leave room for national choices and input. Impression per standard: See table 1
Norway	Not applicable: The national Standards are fully in line with these standards
United Kingdom	See table 1: This series of EN-ISO standards is put in force by the national building regulations directly

III) In case of "No":

Instead, the following national Standard is implemented, or the national regulation directly specifies a method for determining energy use for space heating and cooling:
None of the respondents voted "no".

Discussion:

In all of the responding countries this subseries of EN ISO standards is used, either directly or indirectly by copying parts of it in the national standards or building codes.

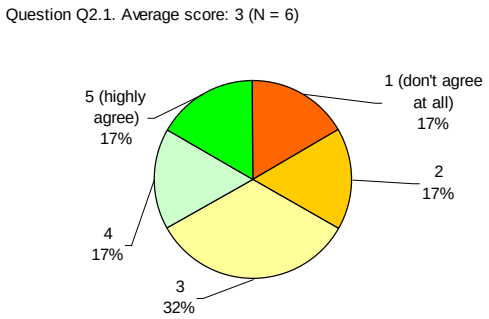
In most countries there are specific elements conflicting with this subseries of EN ISO standards.

Q 2:
In your opinion, which main <u>operational</u> obstacles need to be removed to implement this specific CEN standard/cluster of CEN standards in the national building regulations?

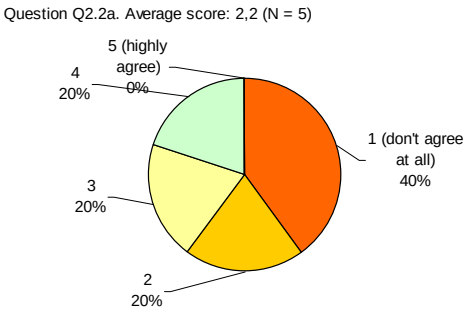
Scale 5-1 *(5= I highly agree; 1= I do not agree at all; ?= I don't know)*

N: Number of Answers given

Q 2.1 There is no operational obstacle: this specific CEN standard/cluster of CEN standards is or will (in near future) be put in force by our national/regional regulation:



Q 2.2a It already requires a lot of time and energy to agree nationally upon the national method, thus adding a CEN circuit would only mean more time and effort and added risk that the procedures are not available in time or do not describe what is nationally needed:



Q 2.2b ...we would probably implement this specific CEN standard/cluster of CEN standards in the near future in case of a transparent planning of revisions of these CEN standards (when and what) :

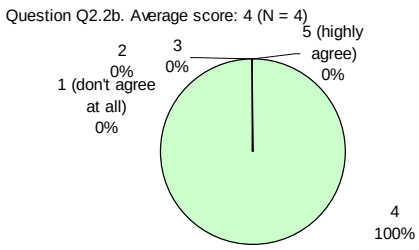


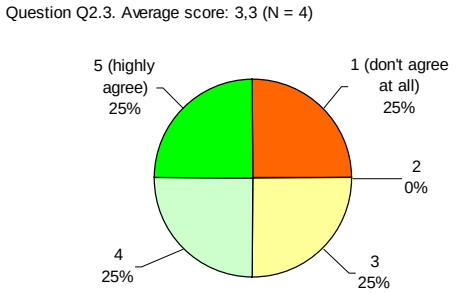
Fig. 4 — Responses on questions Q 2.1 and Q 2.2

Legend		
Rating	**Description**	**Colour**
5	I highly agree	Green
4	I agree	Blue
3	I generally agree	Yellow
2	I hardly agree	Gold
1	I do not agree at all	Red

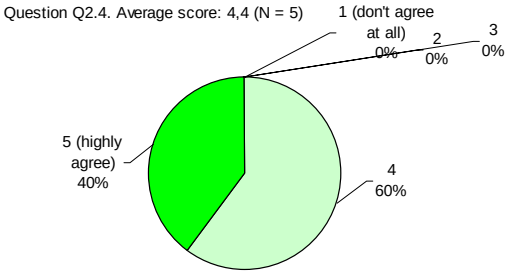
Table 4 — Country-specific answers to the questionnaire's question Q 2.2 in detail

Belgium	Belgian position => since the EN standards have been published in final version only from 2007 on, and as regulatory officers need also to adapt their regulations in respect of laws, decrees, ministry (&political) judgments, …. it is clear that the overall job to have regulations fully aligned via the NBN/EN standards takes time and money (experts). Despite our big efforts to collect all thermal aspect in NBN B62-002, the officials/regional officials started parallel work to start already in 2006 with the first EPBD-implementation. The reason that NBN-committee firmly grouped all the transposition of EN-standards in 1 global standard is because of the following: - NBN B62-002 first edition is 1985 and has always been referenced in legal requirements since 1991 (Wallonian & Flanders regulations). - Experts and expertise is well organised when grouped together, especially since in the EN-standards in lot of case national choices have to be made. As a consequence the final NBN B-standard groups all the national choices in a coherent & accurate way.
Denmark	Q2.1: the major obstacle is DS 418 – and it is currently being up-dated/revised. Q2.2b: but again, it requires that DS 418 is removed
United Kingdom	BRE published a booklet (BR_443_(2006_Edition).pdf) which provides guidance on selecting and using the standards. That is the UK's solution to the possible obstacles mentioned above.

Q 2.3 A major obstacle is that the timing of the preparation of CEN standards did not coincide with the timing decided at national level (from projectplan to implementation in the law and application in practice) :



Q 2.4 We need a national method that is compact; consequently we (intend to) integrate selected parts from this specific CEN standard/cluster of CEN standards:



Q 2.5 A major obstacle is that this specific CEN standard/cluster of CEN standards does not enable us to link the calculation method to national product certification (national product labels or quality marks) :

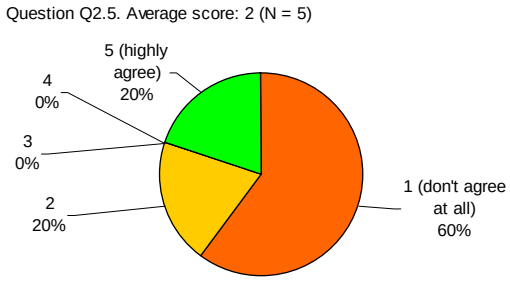
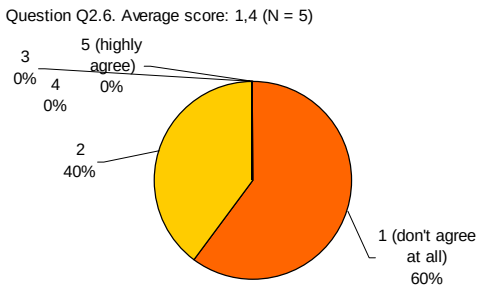


Fig. 5 — Responses on questions Q 2.3 - Q 2.5

Legend		
Rating	**Description**	**Colour**
5	I highly agree	Green
4	I agree	Blue
3	I generally agree	Yellow
2	I hardly agree	Gold
1	I do not agree at all	Red

Comments: No additional comments were given.

Q 2.6 This specific CEN standard/cluster of standards is too hard to obtain (price, copy-right protection), compared to our national building regulations:



Q 2.7 People involved in our national or regional building regulations should become involved in the CEN standardization activities, otherwise they go their own way:

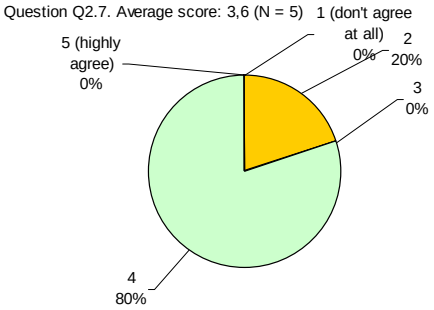


Fig. 6 — Responses on questions Q 2.6 and Q 2.7

Comments: No additional comments were given.

Discussion:

The discussion of Q2 is combined with that of the next question.

Q 3:
If in your country the CEN-standard is not implemented directly but its methods and equations are put in a national or regional regulation or in a national standard that differs from the CEN standard(s):. Why do you think that is the case?

Table 5 — Country-specific answers to the questionnaire's question Q 3

Belgium	
Germany	
Denmark	Tradition – DS 418 has been "the" Danish standard for quite many years
France	
Italy	
Netherlands	All-in-one standard, which is tailored to national legal framework and unambiguous
Norway	The standards give national choices and national dependent input values which have to be made in either national annexes or integrated in a national standard(s) which is in compliance with the CEN standards.
United Kingdom	Not applicable

Discussion (including Q2):

The subject of thermal transmission properties of building components and building envelope is one of the subjects related to energy saving in buildings with the longest tradition in national and international standardization. In consequence, international standards in this field have already been in existence for many years.

But it also means that in many countries there exists a long tradition in national standardization in this area, focusing on the specific national situation: building tradition, building inspection, building insulation levels, etc.

As main reasons for not (directly) using this subseries of EN-ISO standards in the national building regulations, the following are mentioned: the tradition of having national standards in this area and the advantages of an all-in-one document, (as one country describes it) a coherent and accurate document including all national choices and input data and prepared by a well-organised group of national experts.

It is also clear that harmonization simply takes time…. but with a good set of conditions the process can be significantly accelerated.

Q 4: Bonus question:
We have special interest in the implementation of EN ISO 13370:2007, heat transfer via the ground, because this new version of this standard has some important new features (monthly values suited for heating ànd cooling, clear split between area and edge heat transfer, procedures for dynamic simulation programs). Is this standard implemented directly or indirectedly in your building regulations? Or used in another way (see questions above)?

Table 6 — Country-specific answers to the questionnaire's bonus question Q4

Belgium	Belgian position => in NBN B62-002, we have referred to EN 13370 but indicating Belgian environmental conditions, but as the number of factors needed to a full calculation/equation formulas is that complex, in NBN B62 we developed 2 approaches: - the exact according EN-standard with all factors,…. To be respected; - a simplified method with 'default' tables for a more easy calculation of the Hg-values.
Germany	
Denmark	Indirectly – it is an annex to DS 418. The method clearly reflects EN ISO 13370. In Denmark we've decided to develop our own calculation procedure for determining the linear thermal transmittance for foundation constructions (which means that also heat transfer to the ground is handled differently). The procedure draws inspiration from the standard, but is more accurate and easier to perform. The values obtained with our national method differ significantly from the values obtained through the EN ISO 13370 method, meaning that Danish results can not be utilised outside of Denmark and vice versa. Any change to our national method would imply a revision of all national thermal bridge atlases as well.
France	
Italy	
Netherlands	In the updated version of NEN 1068 (under preparation): Yes, implemented indirectly (monthly calculations), but with amended split out of the floor perimeter thermal bridge, otherwise physically nonsense values
Norway	EN-ISO 13370 is implemented indirectly in NS 3031 with national default values for the phase difference between the heat flow and the temperature variations (beta).
United Kingdom	We have implemented it partly up to now. The next edition of BR 443 should go into these aspects more fully.

Discussion:

It seems that this question comes a bit too early, because the new procedures in EN ISO 13770 to calculate the heat transfer via the ground are not yet implemented widely. One point of attention seems to be the quantification of the impact of linear thermal bridges in the foundation. As in several countries, the linear thermal transmittance values are given in a so called "thermal bridge atlas", the validity of this element in the new procedures in EN ISO 13370 is a point of attention.

4.4 Evaluation of the questionnaire

4.4.1 Discussion of the results

Because of the limited time remaining available for the preparation and follow up on this questionnaire until the end of the project, the questionaire was sent out only to specific known contact persons in 10 countries, as these personal contacts would make it likely to receive response at short notice without excessive persuasion. From representatives of 7 EU Member States a completed questionnaire was returned, plus one less detailed preliminary response.

Despite the limited number, the available responses were significant enough to indicate some trends.

In all of the responding countries the subseries of EN ISO standards on transmission is used in one way or the other. In some of the responding countries it is used directly: they are referenced in the national bulding codes. In other responding countries this subseries of EN ISO standards is used indirectly, by copying parts of it in the national standards or building codes. In most countries there are some specific elements conflicting with this subseries of EN ISO standards. We recommend that, as part of the preparation of the second generation of CEN standards for the EPBD, these deviations are analysed to see if there is a need to revise the CEN standards.

The subject of thermal transmission properties of building components and building envelope is one of the subjects related to energy saving in buildings with the longest tradition in national and international standardization. In consequence, international standards in this field have already been in existence for many years. But it also means that in many countries there exists a long tradition in national standardization in this area, focusing on the specific national situation: building tradition, building inspection, building insulation levels, etc.

The two main reasons mentioned for not (directly) using this subseries of EN-ISO standards in the national building regulations are: the tradition of having national standards in this area and the advantages of an all-in-one document (as one country describes): a coherent and accurate document prepared by a well-organised group of national experts, which includes all national choices and input data.

The questionnaire did not address technical details. Only concerning the strongly revised EN ISO 13370 (calculation of the heat transfer via the ground) the respondents were asked about their experiences. There, it seems that the specific question on new procedures to calculate the heat transfer via the ground came a bit too early, because these new procedures are not yet implemented widely. One point of attention seems to be the quantification of the impact of linear thermal bridges in the foundation. Because in several countries, the linear thermal transmittance values are given in a so called "thermal bridge atlas", the validity of this element in the new procedures in EN ISO 13370 is a point of attention.

It is also clear that harmonization simply takes time…. but with a good set of conditions the process can be significantly accelerated.

4.4.2 Recommendations

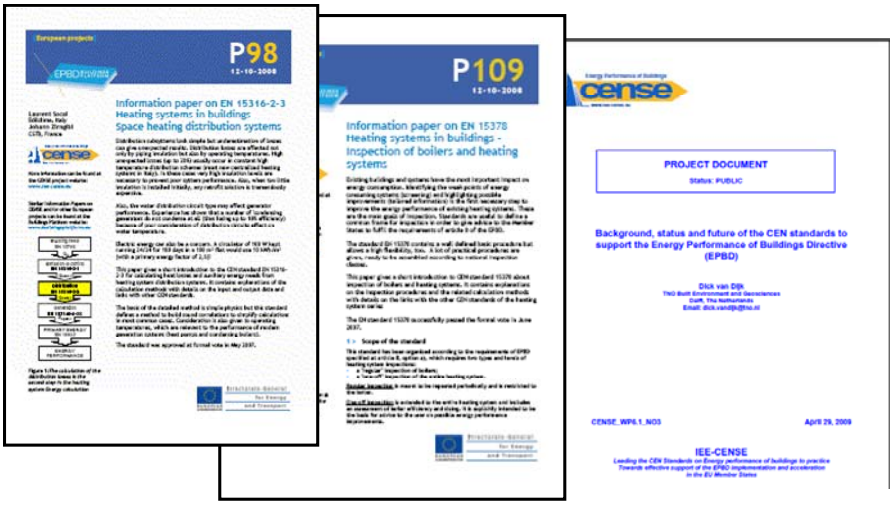
Despite the limited number of responses, the available responses were significant enough to indicate some trends. This led to the following recommendations regarding the standards' structure:

- A clear structure, which separates common procedures and national choices, is essential to make the EN ISO standards fit for use as normative document and to enable the introduction of brief and transparant (normative) National Annexes that comprises the national choices, boundary conditions and input data. The National Annexes thus control the national (or regional) application of the standards. Regarding this issue, a common structure of all CEN-standards should be aimed at.
- The need for a compact national document can be accomodated by an (informative) National Application Document that has the same content as the (normative) CEN standard plus (normative) National Annex(es), but re-edited, integrating the common and national elements.

Regarding technical details, due to the reasons mentioned above, concrete recommendations can currently not (yet) be given. Nevertheless, one point of attention became apparent: the quantification of the impact of linear thermal bridges in the foundation in EN ISO 13370. In general, because in most countries there are some specific elements conflicting with this subseries of EN ISO standards, we recommend that such deviations are analysed to see if revision of the CEN standards on these issues would improve the standards and increase their direct use in the context of national building regulations.

5 More information

More information, including summary and detailed information on the CEN standards and other interim reports with results of feed back from the target groups, can be found at the website: www.iee-cense.eu.



6 Bibliography

[1] CENSE Information Paper P94, *Information paper for the series of EN ISO standards on thermal transmission properties of building components and building envelope; EN ISO 6946, 10077, 10211, 10456, 13370, 13786, 13789, 14683; EN 13947*, Dick van Dijk, TNO Built Environment and Geosciences, The Netherlands and Brian Anderson BRE, UK, February 19, 2009