

PROJECT DOCUMENT

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Report on the application of two key standards for the EPBD: EN 15603 (Overall energy use and definition of ratings) and EN 15217 (Methods for expressing energy performance and for energy certification of buildings)

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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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Contents

1	Executive Summary	5
2	Introducing the CENSE-Project	8
3	Introduction to the standards EN 15603 and EN 15217	8
3.1	EN 15603: Energy performance of buildings - Overall energy use and definition of ratings	8
3.2	EN 15217: “Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings”	9
4	The questionnaire on EN 15603 and EN 15217	10
4.1	Introduction	10
4.2	Results of the questionnaire	11
4.3	Evaluation of the questionnaire	22
5	Presentations and Workshops on EN 15603 and/or EN 15217	23
5.1	Presentations	23
5.2	Workshops	23
5.3	Conclusions from the workshops	24
6	Bibliography	25
7	More information	26
Annex A	-- Selected details from CENSE workshops relevant for EN 15217 and/or EN 15603	27
A.1	Introduction	27
A.2	Workshop at the Concerted Action Meeting, December 1, 2008 in Prague	27
A.3	ASIEPI-CENSE workshop, February 18, 2009 in Stuttgart	28
A.4	CENSE Workshop: Towards Pan-European Software for Building Energy Performance?, June 29, 2009, Brussels	28
A.5	CENSE workshop – Croatian Ministry of Environmental Protection, Physical Planning and Construction, Directorate for Construction, December 8-9, 2009, Zagreb, Croatia	31
A.6	Other workshops	32
A.7	Conclusions from these workshops	32

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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 15603: Energy performance of buildings - Overall energy use and definition of ratings

This standard specifies a general framework for:

- the assessment of overall energy use of a building;
- the calculation of overall energy ratings (primary energy, CO₂ emissions, energy costs).

The standard collates results from other standards that specify calculation of energy consumption within a building. It accounts for energy generated in the building, some of which may be exported for use elsewhere. It presents a summary in tabular form of the overall energy use of the building and defines the uses of energy to be taken into account for setting energy performance ratings for new and existing buildings.

EN 15217: "Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings"

This is the standard that clarifies the different possible approaches for certification.

This standard defines:

- Global indicators to express the energy performance of whole buildings, including heating, ventilation, air conditioning, domestic hot water and lighting systems. This includes the different possible indicators as well as a method to normalize them.
- Ways to express energy requirements for the design of new buildings or renovation of existing buildings.
- Procedures to define reference values and benchmark.
- Ways to design energy certification schemes.

The choice of the relevant options must be made by each Member State.

The questionnaire

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

The questionnaire aimed at inquiring the status of implementation of the standards in the different member states of the European Union. The evaluation of the questionnaire should provide information on future efforts to make the standard better known and accepted and on necessary contents for revising the standard in order to allow a broad application in daily design practice.

The questionnaire was sent out to contact persons identified within the CENSE project from the 27 EU Member States as well as Switzerland. From representatives of 11 countries a completed short and/or detailed questionnaire was returned.

Main results of the questionnaire

In general, the respondents confirm the need for the standards EN 15603 and EN 15217 for the buildings regulations in the Member States of the EU.

These standards cover all relevant issues, they are detailed and concrete enough.

The majority of respondents is also satisfied with the number of normative options given in these standards.

The majority of the respondents wants no major changes in these standards. No additional guidance or background information is needed either.

A main operational obstacle is the timing of the preparation of the CEN standards which did not coincide with the timing decided at national level.

And although the structure of the standards EN 15603 and EN 15217 is clear and understandable the majority of respondents expressed the need for a compact method at national level which had as consequence that only selected parts of the CEN standards were integrated in the national methods.

The main conclusions are the following:

We need a restructuring of the standards, leading to a clear separation between the obligatory common procedures in the standards and the options to be chosen at national level. Also, to remove informative annexes to separate Technical Report(s).

- This will make it easier to adopt at national/regional level the CEN standards as they are, translated in national/regional language if necessary.

- This will also make it easier for the writers of the methods for the national/regional building regulation to follow actively the preparation of the CEN standards, to exchange knowledge and experience with colleagues in other countries and to anticipate on the CEN standards when writing or revising the procedures at national/regional level.

The national procedures could then formally consist of the CEN standards plus short national annexes (containing national choices and input data). To accommodate the need for a compact national method, a (e.g. informative) national application document could be envisaged that integrates the contents of the CEN standards with the national choices and input data.

Workshops

In the course of the project several workshops were organised, focussing on discussions to additionally receive feed back and/or further results on the issue. Consequently the (preliminary) results of the questionnaire were intended to serve as base of an intense discussion. In particular it was tried to identify and discuss problems arising from the content of the standards and its implementation.

Additional feed back from workshops

In general, the workshops underline the conclusions from the questionnaire.

At some of the workshops presentations were given on the national or regional implementation of EN 15603 and/or EN 15217 and related standards which underline the recommendations, but provide very interesting details on the experience, national practice and proposed improvements. As part of the preparation of the development of a second generation of CEN standards on the energy

performance of buildings, it is important to take these into consideration. The most relevant country presentations are mentioned in **Annex A** taking into account that general conclusions and recommendations are already provided in the CENSE document providing general recommendations on the whole set of CEN-EPBD standards.

Specific additional conclusions:

- The first priority seems to be to promote the common modular structure of EN 15603 to be used in all Member States and to work out in more detail the hierarchy in and links between the modular elements. In this respect, there is a strong need to develop a common position on the level of detailedness of the calculation procedures, such as the calculation time step (monthly, hourly, ..) and the complexity of the calculation procedures. Typically, the choice depends on the application and specific boundary conditions.
- A common understanding on the relation with the applications and the boundary conditions is necessary in order to be able to prepare a consistent set of standards that will fulfill the needs from the Member States and other interested parties.
In this respect it is also noted that the application range is wide: from a simple heated dwelling to very complex non-residential buildings; from an old building with very little information on the component and system properties to new highly energy efficient buildings.
➔ The development of a common position on these issues should be one of the highest priorities in the development of the second generation of CEN standards for the EPBD, which by its nature should precede the discussion of the revision of the individual standards.
- Another concern is that the MS don't want to be confronted with substantive changes in the calculation procedures which will jeopardize the continuity in the instrumentation implemented at national level.
➔ It is important to bring in from the start a maximum of clarity on the goals, the basic principles and the overall structure, and to involve the MS in the process.
- More specific observations and recommendations related to the level of complexity of the methods and the link with software tools are presented in the relevant sections of this report.

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 and 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 Introduction to the standards EN 15603 and EN 15217

3.1 EN 15603: Energy performance of buildings - Overall energy use and definition of ratings

This standard specifies a general framework for:

- the assessment of overall energy use of a building;
- the calculation of overall energy ratings (primary energy, CO₂ emissions, energy costs).

The standard collates results from other standards that specify calculation of energy consumption within a building. It accounts for energy generated in the building, some of which may be exported for use elsewhere. It presents a summary in tabular form of the overall energy use of the building and defines the uses of energy to be taken into account for setting energy performance ratings for new and existing buildings.

It provides:

- A method to compute the **standard calculated rating**, a standard energy use that does not depend on occupant behaviour, actual weather and other actual (environment or input) conditions.
- A method to assess the **measured energy rating**, based on delivered and exported energy.
- A methodology to improve confidence in the building calculation model by comparison with actual energy consumption.
- A method to assess the energy effectiveness of possible improvements.

Figure 1 gives a brief overview of the aggregation process described in full detail in EN 15603.

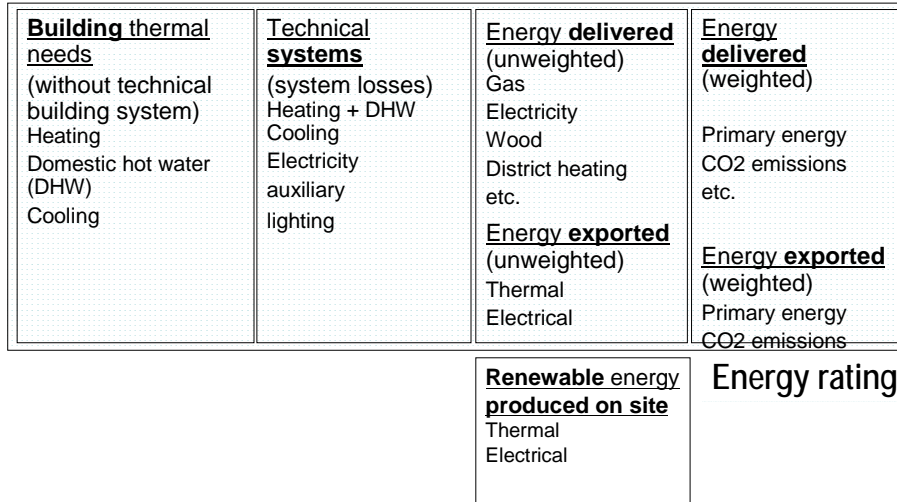


Fig. 1 — Schematic overview of the aggregation of the results from the lower level standards according to EN 15603.

See CENSE Information Papers P88 for an extensive introduction to the standard, plus P87 on the application of this standard as basic structure for national methods.

3.2 EN 15217: “Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings”

This is the standard that clarifies the different possible approaches for certification.

This standard defines:

- Global indicators to express the energy performance of whole buildings, including heating, ventilation, air conditioning, domestic hot water and lighting systems. This includes the different possible indicators as well as a method to normalize them.
- Ways to express energy requirements for the design of new buildings or renovation of existing buildings.
- Procedures to define reference values and benchmark.
- Ways to design energy certification schemes.

The choice of the relevant options must be made by each Member State.

Figure 2 shows the kaleidoscope of different ways to display the energy performance rating and classification in the Member States.

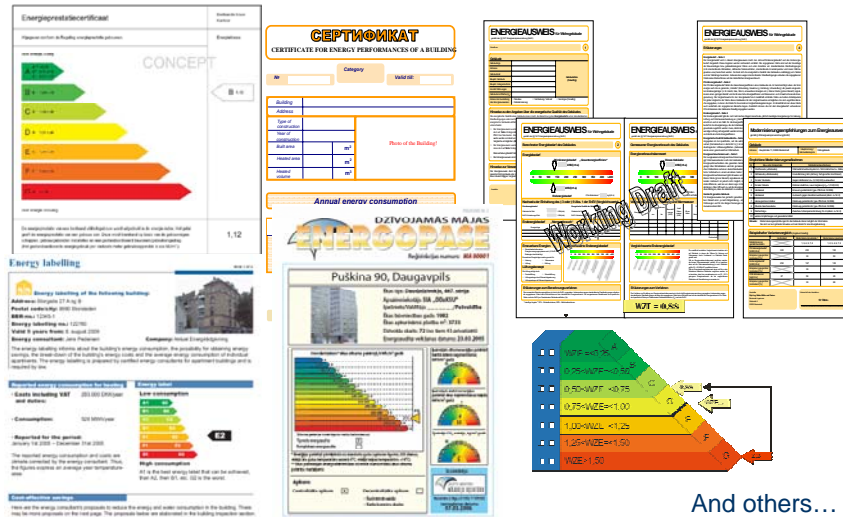


Fig. 2 — Illustration of the differences in energy performance certificates being implemented in the EU Member States, based on EN 15217

See CENSE Information Paper P155 for an extensive introduction to this standard.

The main reason for the variety is that most Member States have not yet or little practical experience with energy certification of buildings. The certificate has to fulfil various quality aspects, some of which are contradictory (see also P26 on the issue of quality aspects).

It is expected that in the coming years feedback from early experience will lead to a basis for further harmonisation.

4 The questionnaire on EN 15603 and EN 15217

4.1 Introduction

This chapter gives the summary of the results of the short questionnaire on the practical use of the **EN 15603** 'Energy performance of buildings - Overall energy use and definition of ratings' and **EN 15217** 'Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings'

The questionnaire was sent to contact persons in 23 Member States in the summer of 2009.

11 Member States completed the overview.

The next table gives an overview of the Member States to which the questionnaire was sent to and the Member States who completed the questionnaire. Other Member States were not contacted at the time the questionnaire was distributed.

Table 1 – Overview responses

Member States	Sent to	completed the questionnaire	Member States	Sent to	completed the questionnaire
Austria	x		Lithuania		
Belgium	x		Luxembourg	x	
Bulgaria	x		Malta	x	x
Cyprus	x		Netherlands	x	x
Czech Republic	x	x	Norway	x	x
Denmark	x		Poland	x	x
Greece	x		Portugal	x	x
Germany	x		Romania	x	
Estonia			Slovakia	x	
Finland	x	x	Slovenia	x	
France	x	x	Spain	x	
Hungary	x		Sweden	x	
Ireland	x		Switzerland	x	x
Italy	x	x	UK	x	x
Latvia	x				

4.2 Results of the questionnaire

The results are given in a scale from 5-1 (5= I highly agree; 1= I do not agree at all; ?= I don't know)

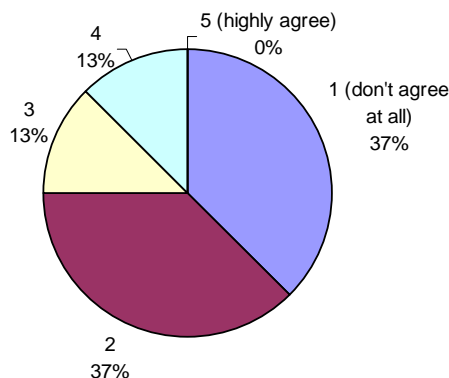
The average score is the total score divided by the number of respondents. N is the number of respondents on this question.

Part 0 General: Personal background of the respondents

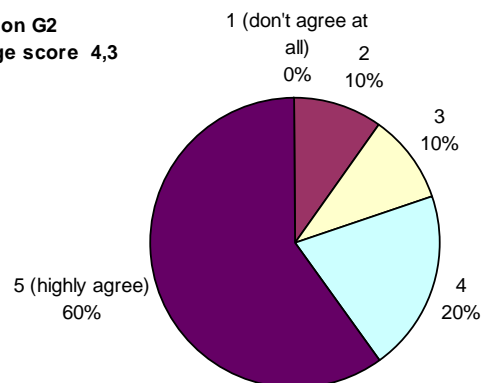
G1 I am not so closely involved in the methodologies used or prepared for the national building regulations, so my response is my personal impression:

G2 My response is mainly based on my professional experience

question G1
average score 2
N= 8



question G2
average score 4,3
N=10



G3 Response is based on experience as writer of national standards or codes:

question G3
average score 3,9
N= 11

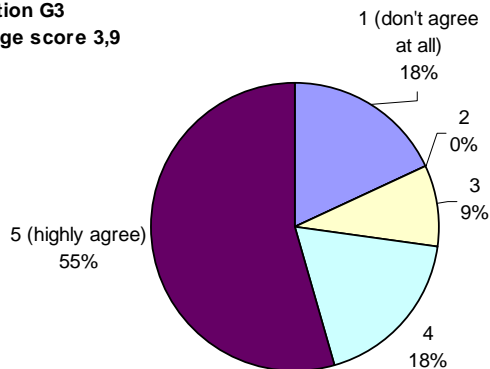


Fig. 3 — Responses on questions concerning personal background

The field of expertise/professional interest for the respondents is:

Table 2 - field of expertise/professional interest for the respondents

Building Physics and HVAC Engineer	1
Building Simulation, overall energy consumption, cooling	1
Energy use in buildings and industry	1
building services, especially ventilation of buildings	1
energy systems, overall energy use	1
Energy consultancy (building sector and industry)	1
Energy Performance of Buildings	1
Building energy, especially building services	1
heating and dhw systems, water based	1
Building regulations, energy performance in buildings, building design and construction	1
building physics	1

The response refers to a specific sector (residential or non-resid. buildings; new or existing buildings):

all buildings	8
mainly new buildings - both residential and non-residential	1
new residential buildings	1
No answer given	1

Comments general question:

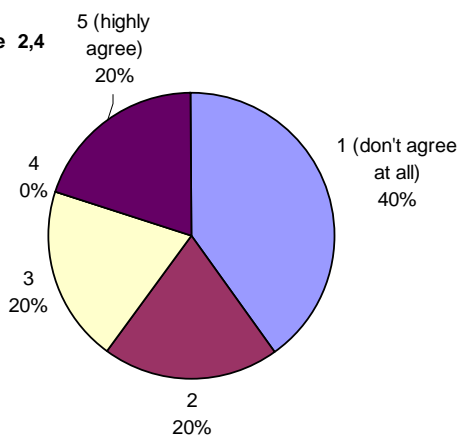
- Country 1 has different regulations for both residential and non-residential buildings. Rules may be different in some respects. If so, replies are specified to which type of buildings they apply.

Part 1 Question 1 Which major changes in the content of this specific CEN standard/cluster of CEN standards are required to make it/them applicable for the national building regulations

1A Our national building regulations do not ask for the kind of procedures as laid down in this specific standard/cluster of standards and consequently it is not relevant for us:

1B Its structure is clear and understandable

question 1A
average score 2,4
N= 10



question 1B
average score 3,8
N=11

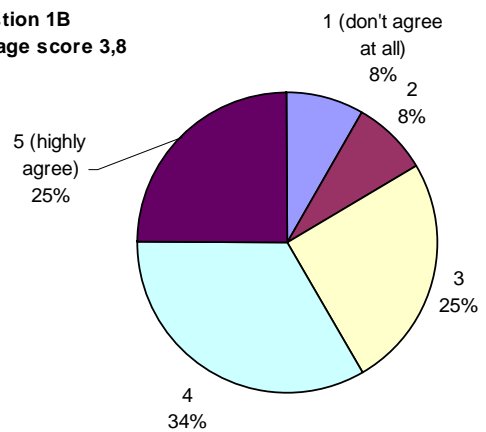
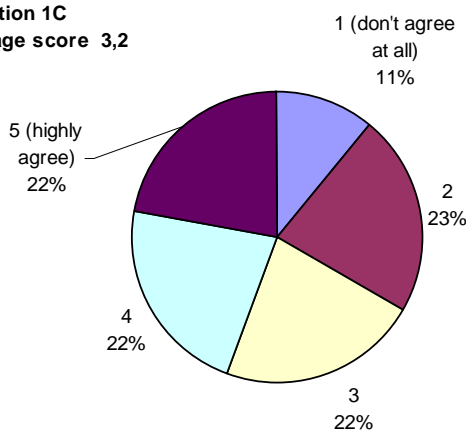


Fig. 4 — Responses on questions 1A and 1B

1C It contains many choices to be made or to be worked out with more detail at national level:

1D A national annex or national "guidance document" describing how this CEN standard must be used to meet the national or regional building regulations is not feasible because too many options, boundary conditions and input data have to be specified:

question 1C
average score 3,2
N= 9



question 1D
average score 2,0
N=9

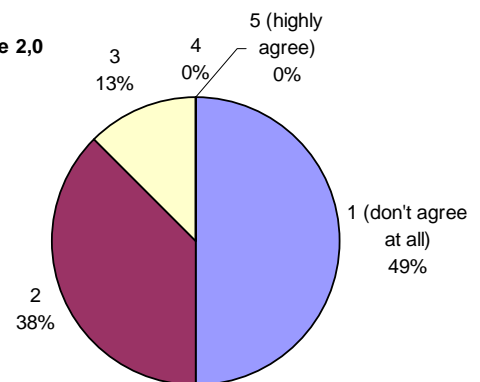
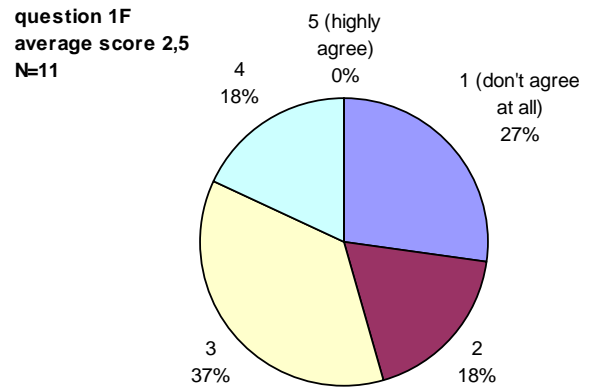
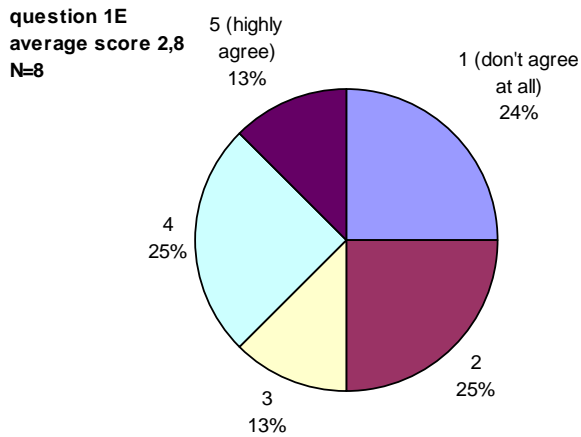


Fig. 5 — Responses on questions 1C and 1D

1E A systematic split between the (harmonized) method and the (national/regional) input data would make it easier to write a national annex or national guidance document:

1F It requires more background information or guidance to be able to use it



1G It covers all relevant issues:

1H It needs to contain a more concrete method:

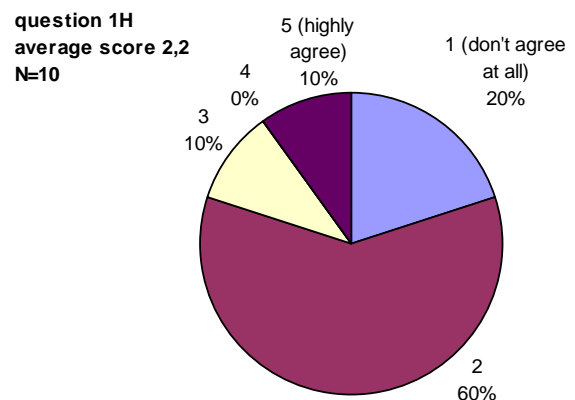
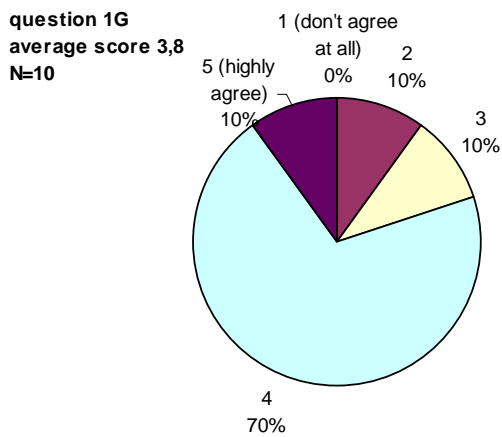
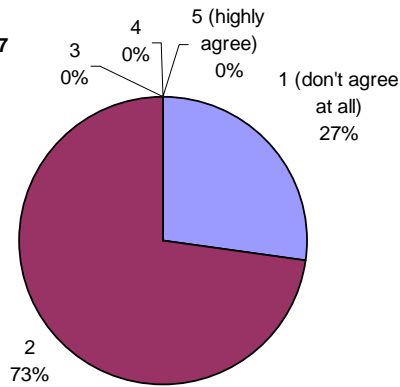


Fig. 6 — Responses on questions 1E - 1H

1I It needs to provide more normative options to choose

1J It needs to provide fewer options to choose

question 1I
average score 1,7
N=11



question 1J
average score 2,5
N=10

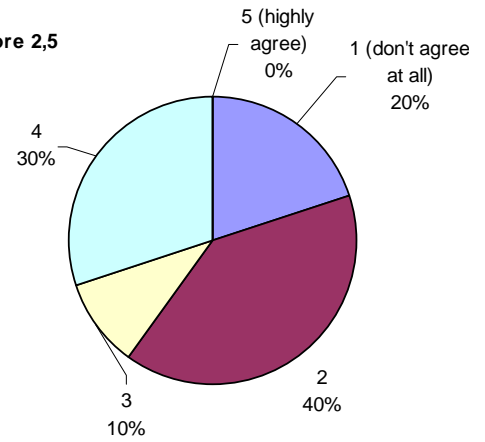
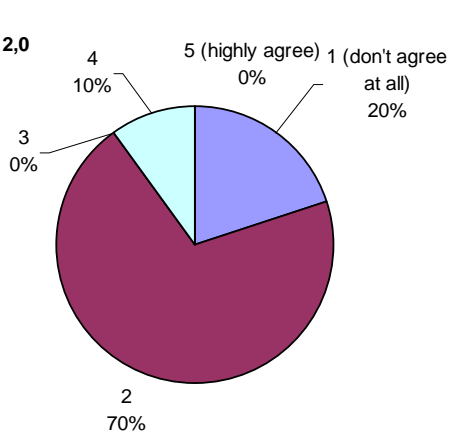


Fig. 7 — Responses on questions 1I and 1J

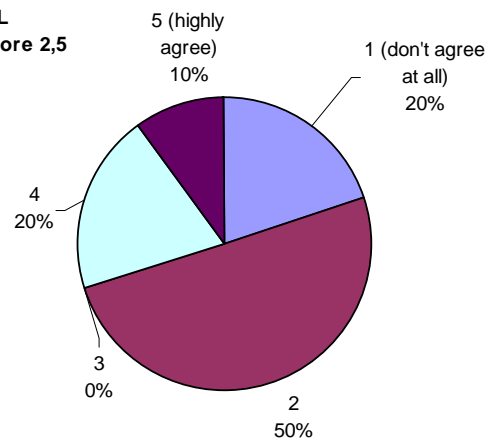
1K It needs to be more detailed

question 1K
average score 2,0
N=10



1L It needs to be less detailed:

question 1L
average score 2,5
N=10



1M It needs to be made more unambiguous

1N It needs no major changes:

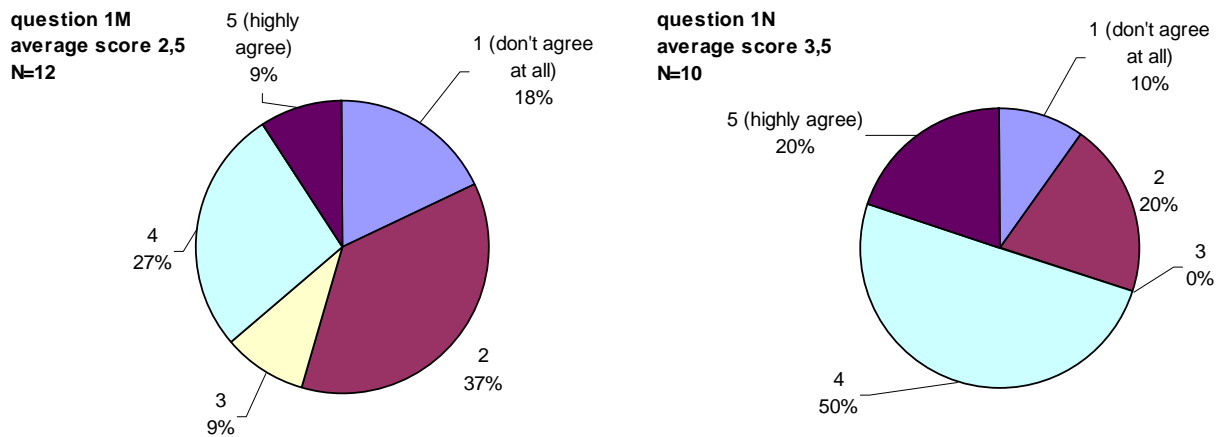


Fig. 8 — Responses on questions 1K – 1N

Comments:

- There is probably a difference in the use between EN 15603 and EN 15217. EN 15217 is focussed on the certificate, a clearly defined item. EN 15603 is related to the general structure of the overall energy use. Probably people think that the structure is evident and therefore there is no need for a standard (or they use EN 13790)
- It should specify clearly when measured energy ratings may be used and when they cannot be used because they are meaningless.
- It is relevant but the legal framework for implementing EPCs is not the Building Regulations
- Setting the national framework is done by government, so the target readership is very narrow
- It presupposes the availability of information on the national stock of buildings which, in practice, is not readily available
- We're past the stage where a change would be likely to have any practical effect: revisions now would be very disruptive
- EN 15603 and EN 15217 are simple standards. Two possible improvement areas for EN 15603 are: renewable contribution highlighting, information about interaction between systems (i.e. dhw losses --> cooling load)
- To make these standards more unambiguous and more clear and understandable all equations should be spelled out, including for each input variable an unambiguous reference to the equation or clause or other standard where this input data has to come from ; plus a spreadsheet with worked example to validate the standards. For EN 15603: the set of equations should be expanded to fill the gap between the given equations and the set of output variables that are supposed to be reported.

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

2A 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:

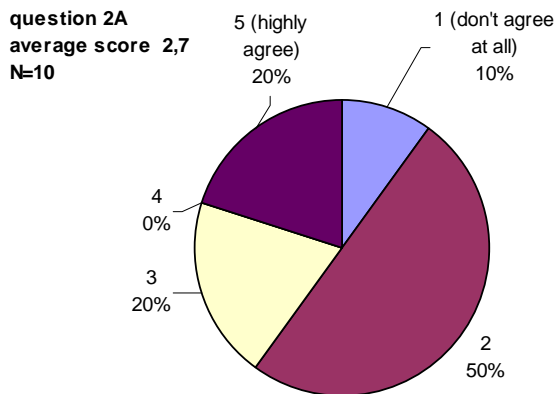


Fig. 9 — Responses on question 2A

It already requires a lot of time and energy to agree nationally upon the national method, thus:

2B 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:

2C 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)

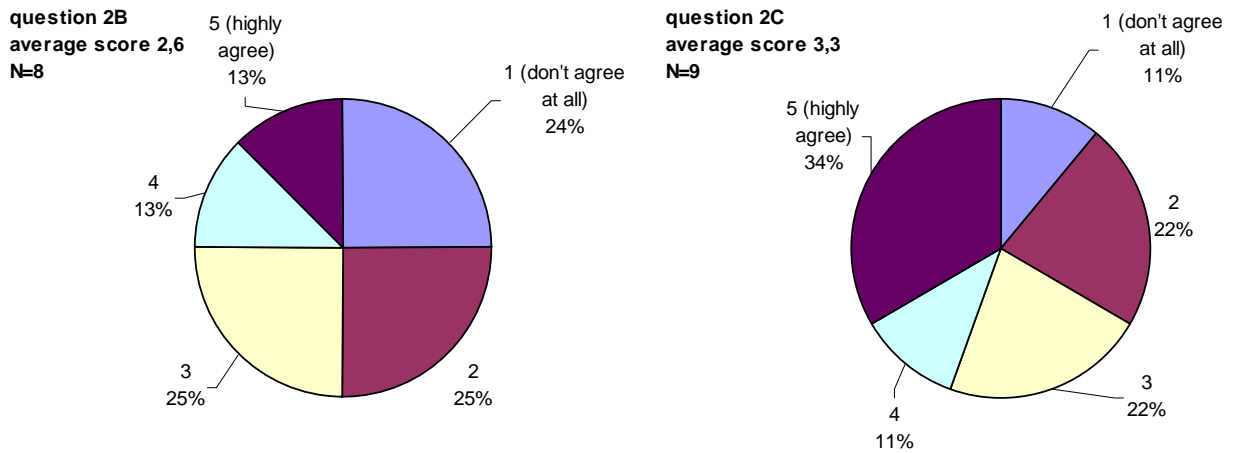


Fig. 10 — Responses on questions 2B and 2C

2D A major obstacle is that the timing of the preparation of CEN standards did not coincide with the timing decided at national level (from project plan to implementation in the law and application in practice) :

2E We need a national method that is compact; consequently we (intend to) integrate selected parts from this specific CEN standard/cluster of CEN standards:

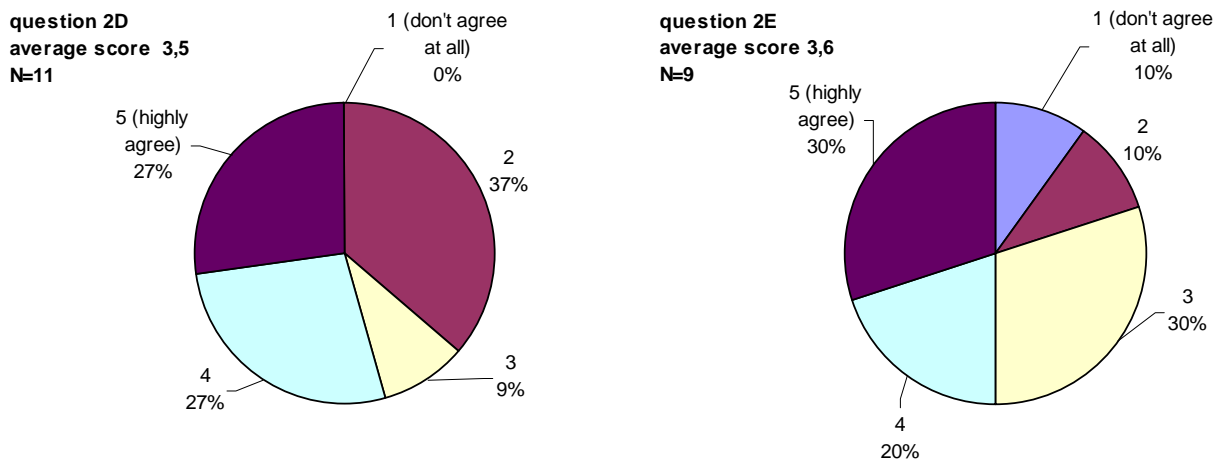


Fig. 11 — Responses on questions 2D and 2E

2F 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

2G This specific CEN standard/cluster of standards is too hard to obtain (price, copyright protection), compared to our national building regulations

labels or quality marks)

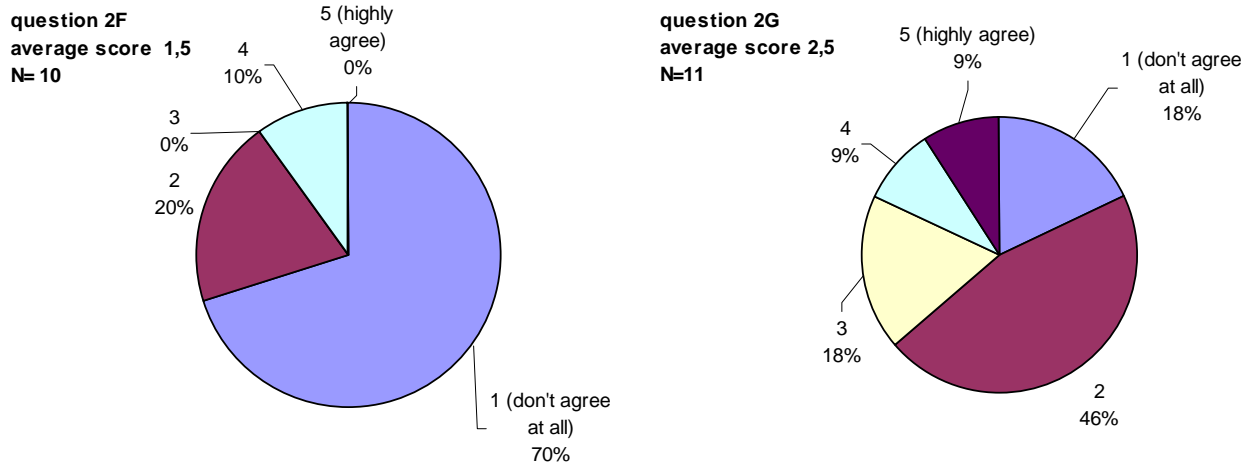


Fig. 12 — Responses on questions 2F and 2G

2H People involved in our national or regional building regulations should become involved in the CEN standardization activities, otherwise they go their own way

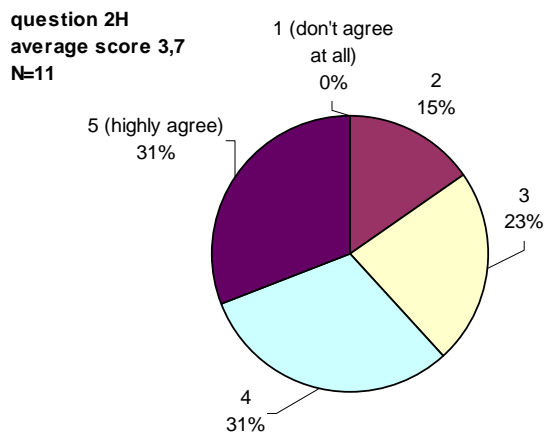


Fig. 13 — Responses on question 2H

Other reasons mentioned at question 2:

- Country 1 as a non EU country is not obliged to implement the EPBD. In the building regulations, the overall energy requirements according to the standards in question here are not required. Some areas, however, are. The energy certificate has been put in force on a voluntary basis and follows EN 15217.

- In the new standards SIA 382/2 and 382/3 (following EN 13790 and 15243), aimed at buildings not only heated and ventilated, the overall energy requirements according to EN 15603 are included. These standards, however, are not expected to be part of the regulations within the next 5 years, maybe later, depending on the experience.
- the national study mentioned under question 1 will also give some better estimate but some of the issues will need more time and possibly a more thorough study. It will take (more than expected) time and efforts to make the standards better known and to replace the existing national methods and practices
- It is in force, even if not listed by name because the CEN standards were published after the legislation was published.
- This is a reason why they are “translated” into national Law. The Law of country 2 shall never simply refer to a CEN standard, it will adapt itself to the CEN standards.
- There are obstacles but they have been overcome or bypassed
- Already taken into account as far as is practicable

Comments at question 2

- In the past and until now building regulation is a national topic (see legal frame of the EPBD). It was considered that buildings "do not move". Working on international level requires a change of mentality and organisation. A lot of people involved on the national level will not be able to participate on the international level. Some decision makers are financed only on national level.
- The only exception is the rejection of the software validation standard. The CEN standard is totally inadequate. Country 1 adopted ASHRAE 150 instead
- Answers for EN 15603. Definition of classes by regions were all different (5 different schemes) and no region took care of EN 15217.
- National law (June 2009, very new!) requires classification de facto according to EN 15217 and asks regions to have at least a double class, national + regional to have at least one common reference (straight disbanding of regional classification would be advisable but is not feasible for political reasons)

Part 3 Question 3: 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

Answers

- *Many reasons: timing of the CEN/EPBD work was far from optimal, the extent of the EPBD standards is much more than the existing codes - etc. etc*
- In country 1, the CEN-standard is not implemented directly but its methods and equations are put in a national or regional regulation
- I guess. This is a question for Standardization Institute
- Country 2 was delayed by 18 months with implementation due to the non-existence of adequate methodology and no translation of standards into the language of that country. Translation is the condition that standard can be referenced in regulation. Thus, the only way was inclusion of parts of the standards into regulation

- Because we need a compact and unambiguous national method in which from the CEN standard only the selected options are copied and national boundary conditions and input data are added

And what needs to be done to make it possible to implement the standard itself?

Answers:

- The main issue will be to convince both the legislators and stakeholders about the benefits of European standards/methods to justify the change (from national way to European, and in the long run into one global methodology). Standards also have to become better known, this also means that the main standards (including 15217 and 15603) have to be translated into national language(s) - and in this work the key issue is to build up a clear and understandable terminology. All this takes time!
- In country 3 the Building regulation is not based on standards. Building regulation should refer to standards
- The Law of country 1 shall never simply refer to a CEN standard, it will adapt itself to the content of the CEN standards.
- Should be verified for local circumstances, and having prepared national annexes.
- Make a clear distinction between the ("ready to use" and unambiguous) common procedures, the choices to be made at national level and the input data

Comments at question 3:

- EN 15603: UNI-TS 11300 is the same as 15603 with a defined set of options, even if it is not explicitly stated. Relevant parts of UNI-TS 11300 may be easily translated into "use EN 15603 with the following options..." Adoption of EN 15217 It is not a technical issue. Each regional regulator wanted to decide classes it's own way.... Definition of classes is not in the standard writer field but in the regulation writer field

Part 4 General comments: ...

- The EPBD standards are generally referred to in a national umbrella standard with normative references to the EN standards. The EN standards should preferably be edited and prepared having in mind that it should be easy to translate and implement the standard nationally. E.g. it should be an option to leave out many of the informative annexes and to replace these annexes with national adapted annexes in the implemented and translated version.
- The informative annexes should be separated in two categories, those which should be a part of the national adopted standard (explanatory and with global relevance) and those annexes which could be optional to keep, could be omitted or replaced by national annex with national values. With the current rules for standardization, national standardization institutes are obliged to include all informative annexes even if they are of no relevance for national conditions. This makes the standards unnecessary thick, over-complex and sometimes less relevant for the use.
- Not sure that the questions make a lot of sense in the context of these standards (though I'm not very familiar with the contents of the standards)
- EN 15603 covers issues that are in the standards scope, as part of the calculation method. There is only one national method plus one regional method. Both are in line with EN 15603.

- EN 15217 covers issues that are in the regulation scope. Every region has a different set of classes. Only the national law and one regional law use the legal requirement for new buildings as a reference for class definition.

4.3 Evaluation of the questionnaire

Summary of the replies:

Most respondents, as researcher or consultant, have personal experience as writer of national standards or codes related to the implementation of the EPBD, both for residential and non-residential buildings.

In general, the respondents confirm the need for the standards EN 15603 and EN 15217 for the buildings regulations in the Member States of the EU.

These standards cover all relevant issues, they are detailed and concrete enough.

The majority of respondents is also satisfied with the number of normative options given in these standards.

The majority of the respondents wants no major changes in these standards. No additional guidance or background information is needed either.

A main operational obstacle is the timing of the preparation of the CEN standards which did not coincide with the timing decided at national level.

And although the structure of the standards EN 15603 and EN 15217 is clear and understandable the majority of respondents expressed the need for a compact method at national level which had as consequence that only selected parts of the CEN standards were integrated in the national methods.

Conclusions:

For the interpretation of the replies, we need to understand the respondents' expectations with regards to the status of the CEN standards.

At this moment the use of the CEN standards is not obligatory. If a respondent takes this situation as it is, he/she will be more easily satisfied with the CEN standards as they are, considering these as interesting reference documents, but without consequences for the national procedures. This is what we can read in the replies on question 1.

However, in the next series of questions and in the general comments we can read which major steps are needed to more directly implement the standards in the building regulations.

From this we may conclude that we need a restructuring of the standards, leading to a clear separation between the obligatory common procedures in the standards and the options to be chosen at national level. Also, to remove informative annexes to separate Technical Report(s).

- This will make it easier to adopt at national/regional level the CEN standards as they are, translated in national/regional language if necessary.

- This will also make it easier for the writers of the methods for the national/regional building regulation to follow actively the preparation of the CEN standards, to exchange knowledge and experience with colleagues in other countries and to anticipate on the CEN standards when writing or revising the procedures at national/regional level.

The national procedures could then formally consist of the CEN standards plus short national annexes (containing national choices and input data). To accommodate the need for a compact national method, a (e.g. informative) national application document could be envisaged that integrates the contents of the CEN standards with the national choices and input data.

5 Presentations and Workshops on EN 15603 and/or EN 15217

5.1 Presentations

On several occasions presentations about the CEN-standards EN 15603 and/or EN 15217 were held within the CENSE-project. In most cases as part of the presentation of the set of key CEN standards to support the EPBD. Despite the usually happening discussion normally following each of these presentations, which are additionally often quite short and do not go into much detail, these presentations can clearly be seen as a one-way-information. Nevertheless they are highly important in the context of the CENSE-project, as they are a good opportunity to increase awareness of and knowledge about the CEN-standards.

The content of the presentations included the description of the main features of the standards and their methodology and the preliminary evaluation and results of the questionnaire as well as some additional background information about CEN and CENSE. The high awareness of the standards identified in the questionnaire could also be recognized in the presentations audience.

5.2 Workshops

Different from presentations, which primarily aim at informing about the CENSE-project and the CEN-standards, workshops focus on discussions intending to additionally receive feed back and/or further results on the issue. Consequently the (preliminary) results of the questionnaire were intended to serve as base of an intense discussion. In particular it was tried to identify and discuss problems arising from the content of the standards and their implementation.

Due to the personal way of communication an open discussion in more detail was possible, compared to the restricted form of the written questionnaire. Nevertheless, the conclusions derived from all the workshops dealing with EN 15603 and/or EN 15217 were generally the same as those from the questionnaire, apart from some points, where additional observations and experiences were formulated. Consequently, as the questionnaire's results were confirmed, they can be considered very relevant.

General remark:

EN 15217 plays a special role in the implementation of at national level: it contains procedures, some "normative", but many "informative" for the classification of the energy performance of buildings, including benchmarking and the expressions for the minimum requirements. These procedures are very closely related to the national policies. These procedures are applied *on the final results* of the holistic calculation procedures and can therefore be considered more or less independently from the calculation procedures.

For EN 15603 the contrary is the case: this standard provides the basic structure of the holistic calculation procedures.

Consequently, at the workshops the introduction to and discussion on EN 15603 was given much higher priority than EN 15217.

EN 15603 also contains procedures for the operational (measured) energy rating. Because the details of these procedures have an informative status and because most Member States implemented calculated energy rating these procedures were in most workshops not specifically addressed but see e.g. workshop in Zagreb, Croatia).

A few of the workshops are highlighted in **Annex A**.

Similar feedback was obtained at other workshops. See overview of workshops and the workshop reports that can be downloaded at the website.

5.3 Conclusions from the workshops

In general, the workshops underline the conclusions from the questionnaire.

At some of the workshops presentations were given on the national or regional implementation of EN 15603 and/or EN 15217 and related standards which underline the recommendations, but provide very interesting details on the experience, national practice and proposed improvements. As part of the preparation of the development of a second generation of CEN standards on the energy performance of buildings, it is important to take these into consideration. The most relevant country presentations are mentioned in **Annex A** taking into account that general conclusions and recommendations are already provided in the CENSE document providing general recommendations on the whole set of CEN-EPBD standards.

Note that the conclusions from key workshops such as in Paris, September 22, 2009 and Brussels, March 22, 2010 are included in the reports from these events. The conclusions from these two events are adopted in the CENSE document with the general recommendations on the whole set of CEN-EPBD standards.

Specific additional conclusions:

- The workshops underlined the high importance of the CEN-standards, as base for a Europe-wide common method, despite the existing problems in awareness, implementation and content, which need to be addressed. Here, the CENSE-project plays an important role.
- The first priority seems to be to promote the common modular structure of EN 15603 to be used in all Member States and to work out in more detail the hierarchy in and links between the modular elements. In this respect, there is a strong need to develop a common position on the level of detailedness of the calculation procedures, such as the calculation time step (monthly, hourly, ..) and the complexity of the calculation procedures. Typically, the choice depends on the application and specific boundary conditions. See also the specific observations on this subject below .
So some common understanding on relation with the applications and the boundary conditions is necessary in order to be able to prepare a consistent set of standards that will fulfill the needs from the Member States and other interested parties.
In this respect it is also noted that the application range is wide: from a simple heated dwelling to very complex non-residential buildings; from an old building with very little information on the component and system properties to new highly energy efficient buildings.
➔ The development of a common position on these issues should be one of the highest priorities in the development of the second generation of CEN standards for the EPBD, which by its nature should precede the discussion of the revision of the individual standards.
- Another concern is that the MS don't want to be confronted with substantive changes in the calculation procedures which will jeopardize the continuity in the instrumentation implemented at national level.
➔ It is important to bring in from the start a maximum of clarity on the goals, the basic principles and the overall structure, and to involve the MS in the process.
- Another type of recommendation is to set up a forum for exchange of additional calculation procedures during the development of the second generation of standards (e.g. as part of the BUILD UP internet community Energy performance calculation procedures).

More specific observations and recommendations related to the level of complexity of the methods and the link with software tools:

- With respect to the question of hourly or monthly method:
one opinion is that this is a wrong debate, compared to the capacities of the calculation engines; others stress that it will be a major challenge to reach international agreement on the descriptions of a common hourly method, covering the building, the systems and the dynamic interactions.
- By using a software tool the calculation method could be the same for different applications. The simplification will not be on the calculation method itself but on the interface between the user (certificator) and the calculation method. At national level it can be decided how deep to go into the details, for a given application. Default values, pre-calculated values based on the typology of buildings and technical systems will help to reduce the input data. Boundary conditions could be used to determine whether detailed or simplified models should be used.
- Low energy buildings require better calculation models and software, but on the other hand the biggest uncertainty in the model is often in the input data. More complex options sometimes have poor trade-off between data collection and apparent precision.
→ The user interfaces are as important as the content.
- The software developers are identified as important linking element between the standard writers and the standard users (designers, installers, certicators) in the field of energy performance of buildings. The software developers will read the standards and apply them in the development of software tools for building professionals. The content of the standards should be "software friendly" and "software proof". Also, in order to achieve energy efficiency in buildings, reliable software tools will definitely be needed.
- Software should be structured, not only to guide the user input, but also to give the user the feeling of "what is happening"; Intermediate results shall be available for energy diagnose purpose (to provide recommendations you need to know not only the result but also why).
- The advices on energy improvements are often very basic. Better tools are needed for better advices to upgrade the energy efficiency of the building stock in a cost efficient way.
- By sticking very close to the (further harmonized) EPBD-CEN standards national authorities may not need to finance software. This work can be done by the professionals (software companies).

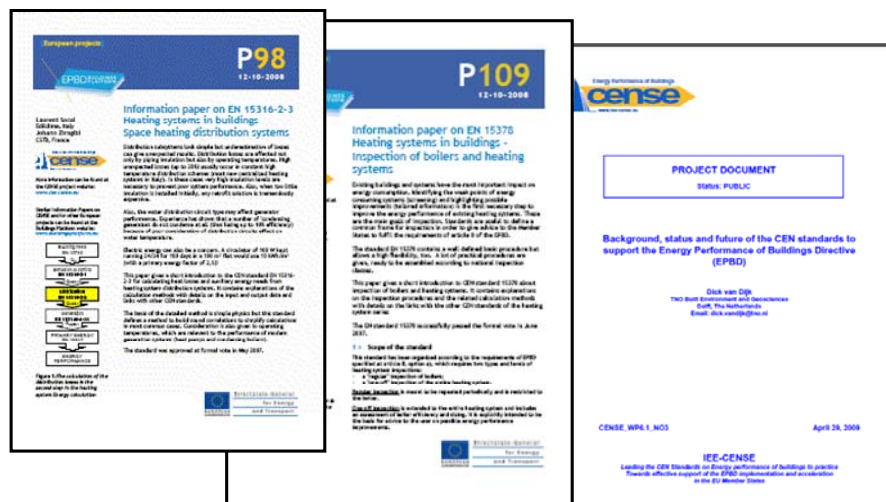
6 Bibliography

- [1] EN 15603, *Energy performance of buildings - Overall energy use and definition of ratings*, January 2008
- [2] EN 15217, *Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings*, June 2007
- [3] CENSE Information Paper P155, *Energy performance certificates. EN 15217 "Energy performance of buildings – Methods for expressing energy performance and for the energy certification of buildings"*, May 2009
- [4] CENSE Information Paper P88, *Information paper on Energy performance of buildings – Overall energy use and definition of energy ratings – Calculated energy rating. EN 15603 (Overall energy use)*, April 2009

- [5] CENSE Information Paper P87, How to integrate the CEN-EPBD standards in national building regulations? The use of EN 15603 to adopt the same structure as starting point for coordination of Member States regulations, February 2009

7 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.



Annex A -- Selected details from CENSE workshops relevant for EN 15217 and/or EN 15603

A.1 Introduction

This annex highlights some details of specific CENSE workshops which are most relevant for this report.

A.2 Workshop at the Concerted Action Meeting, December 1, 2008 in Prague

A joint initiative of the EU Member States and the European Commission, the Concerted Action EPBD was launched in 2005. It involves those representatives of national ministries or their affiliated institutions charged with preparing the technical, legal and administrative framework for the Energy Performance of Buildings Directive, EPBD (2002/91/EC) in each country. The key aim is to enhance the sharing of information and experiences from national adoption and implementation of this important European legislation. This makes the meeting a suitable platform to present and discuss intermediate results of the CENSE-project.

Making use of this good opportunity, a CENSE-workshop took place at the Concerted Action Meeting at December 1, 2008 in Prague, with 44 participants from 28 different European countries, consisting of 12 policy makers and 32 advisers to policy makers. The workshop started with general information about the CENSE-project, its background, aims and first results, before several issues were covered in more detailed, including "the Overall Consistency of the CEN EPBD standards". For all issues, in addition to the speaker of the CENSE-project, country-presentations from different European states were held, introducing experiences made with the implementation of CEN standards and the national or personal evaluation of the specific standards' content. Regarding the Overall Consistency of the CEN EPBD standards the two countries represented were United Kingdom and France.

In conclusion the complete CENSE-workshop-block within the Concerted Action Meeting underlined the high importance of the CEN-standards, as base for a Europe-wide common method, despite the existing problems in awareness, implementation and content, which need to be addressed. Here, the CENSE-project will play an important role.

One of the main messages was that at least the structure according to EN 15603 could be used as starting point for harmonization.

Additional general comments which may also apply to EN 15603 noted from the country presentations:

- (UK) Some parts of some standards seem (to the UK) to be impracticably detailed and data-intensive for EPBD application; especially for existing buildings; but they may be well-suited to other purposes (*And some Member States might insist on this complexity*)
→ Lesson: Separate the EPBD content from other purposes.
- (UK) Substantive changes to the energy performance calculation methodology would require strong justification: need for rating continuity.
- (France) As we need to update some parts of our methodology, we are interested in useful proposals implemented by Member States. For example :
Calculation of an indicator of summer comfort (different from the present one : the maximal conventional indoor temperature which is reached the warmest days in summer),

Calculation of the electricity production by wind turbines

→ Lesson: create a forum for presenting and discussing special calculation procedures.

- (Norway) Make a distinction between three categories of input data for energy calculations:
 - Reference data* - is default values which can not be altered and shall be used for EPC and benchmarking purposes, e.g. indoor temperature, hours of use, need of DHW, reference climate etc.
 - Guiding data* - is default conservative input data which can be picked and used if the calculation is simplified. This could be tabulated values, e.g. efficiency factors for different types of buildings systems (heating, cooling, generators, etc.), thermal bridge atlas, air leakages for existing buildings, specific heat capacity for different types of buildings. The other option is to do a detailed analysis and calculated more accurate factors.
 - Documented data* - is input data which is dependent on the actual building (or at the design stage) and includes solar shading, air flow rates, building size, air tightness (EN 13829) etc. These data will have to be documented for use in the in the calculation of EP.
- (Denmark) There is a lack of integration of buildings and systems (e.g. ventilation is a separate calculation).
- (Denmark) Different EN's use different approaches. → The level of details is different.
 - EN 13790 is an example of good approach and level of details
 - Heat pumps and lighting are example of problematic standards

A.3 ASIEPI-CENSE workshop, February 18, 2009 in Stuttgart

The aim of the workshop is to present and discuss common issues for the two EU projects which are dealing with the implementation of the EPBD and the use of related CEN-standards.

Members from the two project groups present activities in related work packages. Presentations introducing the CENSE project and the ASIEPI project are followed by presentations on the status and activities concerning four selected topics with mutual interest. The workshop is concluded with common discussions and identification of actions.

The session "Building energy performance" is mainly devoted to EN ISO 13790 and the thermal transmission standards. This session starts by showing the general framework of the energy performance calculations in the CEN standards and the special role of EN 15603, which provides a common, modular structure.

The first priority for CENSE seems to be to promote this common modular structure of EN 15603 to be used in all Member States. The next step could then be to replace gradually national modules by CEN modules. The building energy performance is one of these modules.

A.4 CENSE Workshop: Towards Pan-European Software for Building Energy Performance?, June 29, 2009, Brussels

The purpose of this workshop is to explore these issues further, in the context of: - software companies considering the regulatory market as an extension to existing design tools or e.g. as part of building stock maintenance tools, - Member States, especially those who have not yet fully implemented the EPBD. The objectives of the workshop are: - to inform about the present legal situation and the use of such software in Europe - to exchange views and opinions (interest on a common European method, linking regulation and design) - to discuss and identify common actions to push forward the development and application of a European energy calculation. The main objective is

to identify if there is an interest of a unified framework and, if this is the case, how to organise to reach this target.

A few items extracted from the presentations and discussions, which are relevant in general, but could also be of specific interest for EN 15603:

- To several participants, the question of hourly or monthly method is a wrong debate, compared to the capacities of the calculation engines; other participants stress that it will be a major challenge to reach international agreement on the descriptions of a common hourly method, covering the building, the systems and the dynamic interactions.
NOTE: The detailed calculation option in EN ISO 13790 does not contain a specific method, but allows any validated calculation procedure. The problem is that the current CEN standards that provide procedures to validate such calculation methods cover only a very small part of the calculation procedures. In addition, known validation procedures from international research (e.g. IEA BESTESTS) do not cover specific details and/or allow a too wide bandwidth to be of use in the context of building regulations.
- Low energy houses require better calculation models and software, but on the other hand the biggest uncertainty in the model is often in the input data. More complex options sometimes have poor trade-off between data collection and apparent precision. → The user interfaces are as important as the content.
- Boundary conditions could be used to determine whether detailed or simplified models should be used.
- Each section of a standard should be a software model.
- The importance of the software developers, as the linking element between the standard writers and the standard users (designers, installers, certifiers) in the field of energy performance of buildings was recognized. The software developers will read the standards and apply them in the development of software tools for building professionals. The content of the standards should be "software friendly" and "software proof". Also, in order to achieve energy efficiency in buildings, reliable software tools will definitely be needed.

More details, but not specific on EN 15603, can be found in the workshop report and presentations and in the Information Paper on this workshop (P161). Some specific comments:

- (UK) Our country generally used simpler permitted options; more complex options sometimes have poor trade-off between data collection and apparent precision (for UK)
 - (It) Many interesting detailed suggestions can be found in the presentation of Mr L. Socal, available at the CENSE website. The most relevant part of his presentation for the general structure:
 - The package has a clear overall structure but...
 - time step: hourly, monthly, yearly or bins?
 - several methods for the same topic...
 - sometimes there are only *requirements* to methods (e.g. for cooling systems) [ed.: meaning: not specific calculation procedures itself]
 - do you consider all services with the same details?
 - default data shall be checked or replaced by national data
 - besides energy, how to follow operating conditions (water temperature)?
- For calculation purpose, a fully consistent procedure without loose ends is required
→ evidence comes when producing application software...
A national document is necessary to give guidance and to fix loose ends → UNI-TS 11300

- Multiple methods, why? No one method is “the solution”
 - Simple tabulated methods are straightforward but may lead to very bad mistakes
 - Detailed methods are usually correct but require a lot of workTurn around:
 - EN standards: specify a set of methods
 - National annexes/standards: identify suitable boundary conditions to choose the method for each specific calculation

- The standards contain hidden complexities: The scheme looks fine but coming to details requires some care; the starting point is to define the building (geometry input) and its partition (apartments, ..., rooms?): there is no consistency for the different calculation parts (energy declaration, energy calculation) and the link with the systems servicing these spaces.

- It is not only a question of formulas: Understanding the standards needs expertise. Describing a large building and the interrelation with its systems is a long and complex task. It's easy to get lost with complex systems. Software should be structured:
 - to guide user input;
 - to give the feeling of “what is happening”Intermediate results shall be available for energy diagnose purpose (to provide recommendations you need to know not only the result but also why)

- There should be a link between energy calculation and system sizing. A system designer has to perform two tasks:
 - **Dimensioning a system**, that is selecting size of components
 - Power calculation, flow rate - Example: heat load according to EN 12831
 - **Calculating energy performance**
 - How do these selected components behave in actual operating conditions
 - For energy declaration and to check fulfillment of legal requirementsIn the past these two tasks were separated.
Now, energy calculation may be used for design purpose as well
Example: generator sizing according to a load factor or to design energy signature method (monthly power / external temperature)
 - Avoids large oversizing typical of traditional methods
 - Takes into account gains and long building time constants
 - Necessary for high performance generators because of high kW price
 - Critical for the correct design of heat pump systems**An energy declaration requires design expertise to provide recommendations**
→ Integrated tools for design and energy calculation ...

- A connection between calculated and actual performance is required
 - An essential part of the certificate is economic effective recommendations and this requires reliable simulation capacity and a reasonable link to actual performance
 - Actual consumption is usually the only available data to check if calculation is correct. EN 15603 → energy signature

A.5 CENSE workshop – Croatian Ministry of Environmental Protection, Physical Planning and Construction, Directorate for Construction, December 8-9, 2009, Zagreb, Croatia

The 8th and 9th of December 2009 a workshop has been organized in Zagreb by the IEE - CENSE project in cooperation with Croatian Ministry of Environmental Protection, Physical Planning and Construction, Directorate for Construction, who is responsible for building regulations.

The objective of the workshop was to exchange on how Croatia could adopt and adapt the EPBD - CEN standards in their building regulation and software.

For each topic the experts had prepared a short presentation focusing more on their experience with the standards (problems, solutions, choices made, etc) than explaining the standards itself (the participants knew the standards already). The experts explained how they applied the EPBD - CEN standards (national annexes, why they have chosen this or this option).

Conclusions and recommendations:

The Croatian authorities decided to use the experience of other countries and to adopt the EPBD – CEN standards.

Croatia will focus on the development on national annexes like climate data and boundary conditions. Through application of European standards, Croatian experts are provided with the possibility of using software which supports the same set of European standards.

Software will have prescribed obligatory control of their applicability under Croatian regulations. Software applicability control shall be carried out using an algorithm - a tool planned to be developed and which will contain all national additions necessary for the application of European standards.

The Directorate for Construction will also support Croatian experts to participate actively to EPBD - CEN standardization work to bring in their experience directly.

By sticking very close to the EPBD-CEN standards Croatian authorities do not need to finance software. This work can be done by the professionals (software companies).

A few items extracted from the presentations and discussions, which are of specific interest for EN 15603 or EN 15217:

- The Croatian building authorities were also interested in the experiences from other countries on operational rating, for example for public buildings. EN 15603 deals with operational rating too. An interesting experience with operational rating has been presented by Jana Bendžalová (Building Testing and Research Institute, SK): on measured energy use (available at CENSE website).
- After having discussed the calculation methods in details, some participants wondered if it would be possible to ask for so many detailed information for the building permit, for the use permit, for the certificates in new and existing buildings? Should the calculation method for these applications be the same or different (detailed, simplified methods)?
- It was recalled that the stake in energy efficiency is in the building stock. The certificates (and the inspection reports) are meant to be a trigger for upgrading the building stock through effective advice. Unfortunately today the certificates are often based on simplified tools as many countries are still in the starting phase with the certificates. The advices are often very basic. Better tools are needed for better advices to upgrade the energy efficiency of the building stock in a cost efficient way. The participants agreed that the calculation methods should be the same.

- During the meeting it was pointed out that for the certifiers it would be difficult to read the hundreds of pages of the standards and to apply the standard without help. But there is no need for the certifier to read the standards if he could use high quality software tools.
- By using a software tool the calculation method could be the same. The simplification will not be on the calculation method itself but on the interface between the user (certifier) and the calculation method. Each user can decide how deep he wants to go into the details. Default values, pre-calculated values based on the typology of buildings and technical systems will help to reduce the input data.
- The investments needed to develop high quality software tools (e.g.: integrated tools for design and energy calculation, graphical interfaces) are only justified for a significant market having the same rules. The significant market is Europe; the same rules for the calculation method are established by the EPBD - CEN standards.
- Final remarks from presentation by Prof. Igor Balen (Croatia), on various details of national implementation of various standards; also on component requirements:
 - very complex procedure, difficult to follow,
 - problems with different symbols in different standards,
 - problems with availability of input data,
 - problems with consistency of the results (“open ends” in the procedures),
 - difficult to find “the most practical way” (many offered methods in many standards).

A.6 Other workshops

Similar feedback was obtained at other workshops. See overview of workshops and the workshop reports that can be downloaded at the website.

Note that the conclusions from key workshops such as in Paris, September 22, 2009 and Brussels, March 22, 2010 are included in the reports from these events. The conclusions from these two events are adopted in the document with the general recommendations from CENSE.

A.7 Conclusions from these workshops

See paragraph 5.3.

