DETAILED REPORT ON CERTIFICATION

CONCERTED ACTION

SUPPORTING TRANSPOSITION AND IMPLEMENTATION OF THE DIRECTIVE 2002/91/EC CA – EPBD (2005 – 2007)

21 Member States
Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, UK

1 EFTA Country
Norway

1 Accession Country
Bulgaria (MS from 2007)

6 Invited Participants
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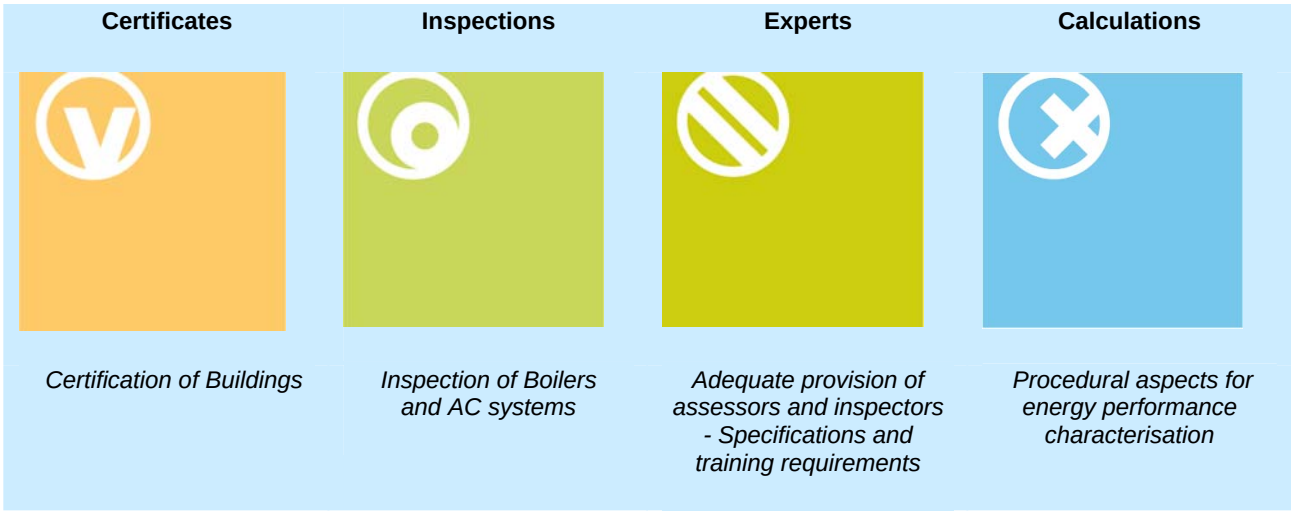


The four main themes of the EPBD

1. General Information

The Core Team Certification has been very active in the Concerted Action project. More than 40 sessions of 1.5 or 2 hours have taken place. Some sessions have been organised in collaboration with some of the other core teams. Certification of buildings has been of high interest from the beginning of the CA and hence there have been sessions including certification every time there have been parallel sessions.

The sessions have been highly visited – normally with 25 up to 65 participants. Typically most countries or all countries in the CA have participated in these workshops and often countries have sent more delegates to these workshops – in particular when the workshops were organised in collaboration with other core teams.

In the proposal for the Concerted Action, a long list of topics was referred for the core team certification and more topics have been identified on the way through the CA. More sessions have included work to assess the need for future workshops and selection of topics of interest for the member countries have been discussed in several sessions.

2. The Programme of Work for the Concerted Action EPBD

The range of topics for the certification core team has been large. This concerns the types of buildings: Small residential buildings, large residential buildings with apartments, non-residential buildings and in particular public buildings, which are covered by specific demands in the directive. But also mixed buildings with multiple functions have made requests. Similar there have been a need to cover both new and existing buildings as well as different types of ownership including special issues for rented buildings or apartments.

Different types of certification are possible – Asset Rating or Operational Rating (calculated versus metered) – and rating of buildings can be based on energy consumption, primary (fossil) energy or on CO_2 emissions, etc.

Special problems with certification occur for buildings with apartments or with several units of other nature, where it can be discussed whether the certification shall be based on the whole building or on the individual part. Special issues have to be assessed when buildings or flats are rented and there will be special concerns in the relations between owner (landlord) and user (renter).

The certification aims to draw up recommendations for improvements and these recommendations are an essential part of the certification, which shall ensure the energy savings. But this also raises specific questions for the procedures and the way information is handled and presented, etc.

Finally there are needs for software tools in order to keep the costs down and, so, there is a need for simplifications or standardisation to reduce the costs for the individual certificate and the system in general. Cost issues have been one of the continuously present red flags through the whole CA for the certification Team.

The project proposal for certification was aiming at specific questions such as:

A) Methodologies for Certification

- New vs. Existing buildings – methodologies for preparation of certificates
- Public Buildings and rent or sale of existing apartments - methodologies for preparation of certificates
- Certification per building or per apartment?
- Use of metered data
- Quality standards for certification software

B) Effectiveness and Public Acceptance of Certification:

- Cost of certification
- Identification of energy-saving recommendations and their real effectiveness
- How to require a certificate in the rental market?

3. Actual work in the Certification team

The work in the core team certification has included all the topics listed in section 2 and many other aspects of certification have been covered too. In the sessions, there have been more than 150 presentations including presentations of status or specific problems from almost all the member states that participate in the CA.

The many different types of certification led to the fact that some solutions might be suitable for some kinds of certifications or some types of buildings while impossible for other types of certifications or buildings, where other solutions might be more appropriate for these types. As an example: it could be a possibility and reasonable to base regular certification of existing public buildings on a metered consumption, while this option would be difficult and inappropriate for new one family houses – especially for a certificate at the project state.

There is also a difference in the level of development of the different types of certification. In most countries, the certification of new buildings is further developed than the certification of existing buildings and small residential buildings are generally better covered than the large and complex residential buildings, and the non-residential buildings.

Hence, this report emphasises different major topics or issues which have been covered in the CA and a paragraph with some remarks on some of the remaining issues. This thematic approach gives the opportunity to treat the different topics, the different types of certification and buildings, and to place an emphasis on the issues that have been identified as essential for exactly these kinds of buildings.

This is also reflected in the way that the Core Team Certification organized its work during the CA, since a specific type of buildings or certifications have often been approached individually and some problems of general interest have been treated in a particular session.

Some of the types of certification which have been covered more deeply and which will be reported here are:

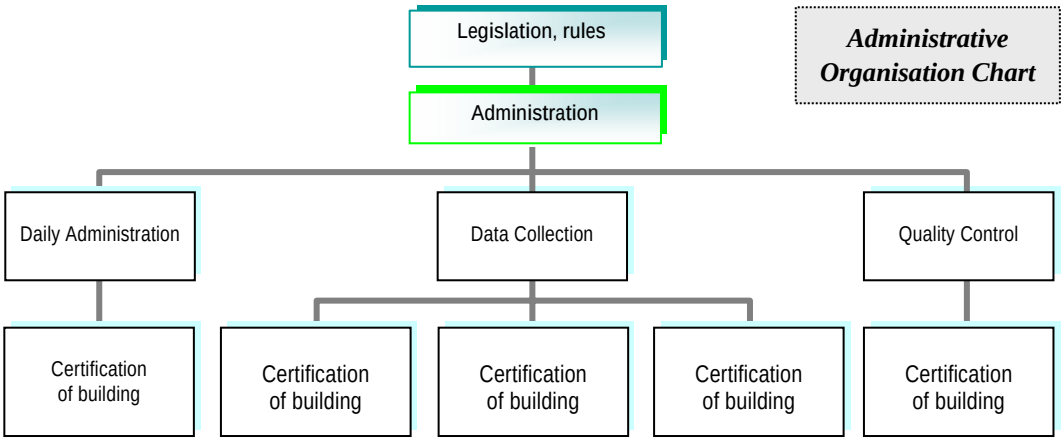
- New Buildings
- Small residential
- Large residential buildings / apartments
- Non-residential buildings / public buildings

Some issues of general character which are similar for different types of certification have been treated in specific paragraphs or in a general part, such as:

- Organisation
- Certificates and scales
- Advising on energy efficiency improvements

3.1 Organisation of Certification

It has been stressed that there is a need for different levels of control to set up a certification scheme from the political/legal authority, which sets up the rules to the daily administration and information on the rules and the certificates, and the consultants, who are responsible for the certificates.



Some of these functions can be combined into one single function. For instance, the legal authority may also be the administrator, or the general administration can be combined with the daily administration. Daily administration, data collection and quality control can be combined in one function. When the certificates are organised with an accredited body, which is responsible for the certification, all the lower levels – from administration and below - might be integrated in the certifying body.

3.2 Buildings in general

Some issues are common for all types of buildings, e.g., the cost issue, and some issues about quality or the layout of certificates. But many of the issues on certification will highly depend on the size and the use of the buildings and whether it is an existing building or a new building.

For all buildings there is a need for simplification to keep down the costs, but there is also a need for accuracy and reproducibility. Working time for consultants and the costs for consumers or building owners need to be kept down, but at the same time two certifications need to come to the same result. There is a need for clever reductions of the work, standard values, shortcuts and helping tools. But often the solutions and the simplifications will be different depending on the type of building and building owner. Simplifications might not be the same for new and for existing buildings.

Some issues have hence been discussed generally, but most of the topics have different implications or solutions for different types of buildings. Most often, the discussions have been in sessions with the main focus on a particular type of buildings or when there have been common sessions. Some of the discussions have concerned different types of buildings.

The report in this Core Team is hence made with a strong emphasis on the major different types of buildings.

3.2.1 New Buildings

New buildings have been addressed in multiple sessions, but new buildings have also been addressed in workshops on simplification of certificates, on content in the certificates and in workshops on different building uses. New buildings have also been addressed in many of the poster sessions.

3.2.1.1 Calculated energy consumption versus metered

Certification of new buildings is different from existing buildings because certification will normally take place before the building is occupied and definitely before the buildings have been used so long that there will be reliable data on the energy consumption. On the other hand, new buildings will usually be well documented in form of drawings and prints of drawings, etc.

Nearly all countries have decided to go for calculated energy consumption for the certification of new buildings.

3.2.1.2 By construction or at planning stage?

The Directive requires that buildings must be certified by construction but the exact time for certification isn't specified. It has been discussed whether certificates should be issued at project stage or by the end of construction. If certificates are issued at project stage, the chances to directly influence buildings energy performance are high, while energy certificates at the end of construction can mostly be used to ensure the compliance with building codes.

Most participants agree that there is a need for both certifications but, for many countries, the concern of high costs for the constructors or the owners of buildings made it necessary to choose between the two options. Some countries have chosen certificates at construction time because of the possibility to influence the building process, while others have chosen to issue them after construction to ensure compliance with the requirements. Some countries, e.g., Portugal, have chosen to make certification checks both at construction time and after construction is completed. By a questionnaire in 2005, most countries answered that they would go for both certification by design and after construction but that one might be self inspection where the constructor, adviser or even the owner declares the energy consumption.

At least one country (Sweden) has chosen an alternative where the buildings are certified long after construction so that the metered data for consumption can be used to ensure the actual consumption in the building. This certification will be combined with a declaration at the time of construction. In Greece, certification can be done up to one year after construction.

The majority of the countries seem to go for a kind of double certification or after construction to check the fulfilment of requirements. Hence, the certificates for new buildings have a strong emphasis on the enforcement of requirements for new buildings. But a few countries, e.g., Germany, have chosen to do it only at design stage.

3.2.1.3 Simplifications

Simplification and use of existing work and data have been a significant part of these discussions. Many possibilities have been decided based upon the desire to keep down costs and to keep up the quality at the same time.

For new buildings, it has been discussed that there is a need for more categories. Certification should not only include one category for buildings that fulfil the Building Codes but also encourage constructors to go further. Several countries have chosen to have 3 or more categories for new buildings where the best categories A and B, A1 and A2 or A+ and A++ are reserved for buildings, which are built to a higher standard than the minimum requirements of the building code (e.g., Spain, Denmark, Ireland and Portugal).

3.2.1.4 Rating of new buildings

If more categories are set for new buildings, the number of categories for existing buildings is reduced and, if A-G is used, this might reduce the categories to 3 or 4 for existing buildings, which again will make it difficult to make savings which makes the buildings move from one class to the next. Some countries have solved this problem by adding categories, for instance an A+ and a B- category in Portugal

There are large differences for new buildings between one family houses and complicated multifamily buildings or non-residential buildings. For small one family houses, there might not be involved technicians or advisers, which have substantial understanding of energy issues, but for large and complex buildings, highly specialised advisers might even work with different parts of the HVAC system or different parts of the building.

3.2.2 Small residential buildings

Small residential buildings, such as one family houses, have been a central part of the discussions in the Core Team Certification, as they are the target for a substantial part of the certifications because a large number of this type of buildings are sold every year. But they are also interesting because the consumers are often non-professionals and because there is a special need to keep costs low for this group of consumers.

Small residential is on one hand more simple than non-residential or multifamily buildings but, on the other hand, these are essential for the success of the certification schemes, because of the many certificates to be issued and the political impact of this part of the certification.

The needs to handle less skilled constructors, projects without advisers such as architects and engineers and the issues of the costs have been central themes. The development of standard solutions, simplified models, computer tools, handbooks, guidelines, default values and simplified calculations have been seen as possible solutions and a large emphasis has been put in this.

Many workshops on certification of small residential buildings have been made in collaboration with the Procedures core team.

3.2.2.1 Comparison and quality aspects

Many similar small buildings (maybe even the same house) can be certified by different consultants and they would need to come to the same result or at least to results which are very close. Otherwise, the whole scheme would be undermined and criticised. This will set specific requirements for the training of experts and to the solutions used for the models. Sometimes, repeatability can be more important than accuracy.

A large emphasis has been put on developing models and methods, and the workshops have been used for sharing these solutions and for discussions of the differences.

3.2.2.2 Calculated needs versus metered consumption

Small residential buildings will typically be certified and rated when they are sold or rented out. This will lead to an exchange of all the occupants at the same time. Even the number of users may change, sometimes substantially.

The core team agreed that the best solution is to go for a calculated energy consumption for these buildings because the behaviour of the individual family could have too large an impact on any operational (measured) rating, and the aim of the certification was seen as a means to certify buildings and not the behaviour of the present owner of these buildings.

Many countries have already started with certification of one family houses and in many countries these certificates are more mature than the other certificates.

The costs of the certificates for one family houses and the need for a large number of skilled consultants have been especially important issues of concern.

3.2.3 Apartments and blocks with flats

Multifamily buildings and apartments have a specific set of problems or concerns. Apartments need to have a certificate when the apartment are rented out or sold. The directive leaves multiple possibilities for this certificate: it can be issued for the individual flat or apartment, it can be issued for the whole building or it can be issued for specific and typical apartments or units in the building. This reflects the fact that the situation for these buildings and apartments can be very different.

Multifamily buildings and apartments have been the target for several specific workshops, as well as part of other sessions on simplifications, design of labels, recommendations and number of scales.

3.2.3.1 Whole building or apartment

The key issue has been that the consumption in the apartment or the unit will be dependent on the whole energy consumption of the building in most cases, but that this will also be dependent on individual circumstances for the individual apartment. Units in the upper corner will use more energy than those in the middle.

But, for apartments, the use will also depend on the heating and cooling systems, if they are collective or individual and how they are designed, how the metering and the payment systems for heating and cooling are set up.

Some apartments will, on the other hand, behave in a similar way as individual single family row-houses, which just lye close to other units, for instance if they have individual heating or cooling systems.

This topic involved many results from the IMPACT project where apartments were studied in detail, including different Danish systems and pilot studies in Germany and other countries.

3.2.3.2 Different conditions, different users – different solutions

Conclusions from these workshops are that the apartments and multifamily buildings are different in different countries, but also that different ownerships can have a substantial impact on the choice of the right solutions. Social housing might not have the same needs as individually owned apartments in the same country. Old buildings can be different from new buildings.

A specific need will also occur for the recommendations. In many multiple family buildings, there will be split incentives where owners or owner associations will have to pay for the improvements while it will be the renters or individual owners or occupiers who will gain for the improved energy efficiency. Two owners in the same building might have very different impact of investments in improved efficiency and different feasibility but often the savings will have to be obtained in a common project. This will lead to the need to address both the individual apartment users and the whole ownership. Moreover, some owners have to be addressed individually because the impact will be different.

Many discussions have concerned these complex problems on targeting the users and owners and how to find the right means for the different types of multiple family buildings. In general, the findings of these workshops can be seen as a bucket of solutions where the members of the core team have contributed with experiences and can gain by a selection of solutions, which fit exactly their building stock.

It has so far not been possible to find one good solution which fits all needs.

3.2.3.3 Enforcement for apartments, rental buildings

Finally, there have been specific issues on how to deal with the enforcement of these rules. Which kind of enforcement structures are needed and appropriate for buildings with apartments? If there is a demand for a certificate for the whole building, can an individual flat owner have penalties when one single unit is sold without certificates?

Some examples have been that the common owners have a joint obligation and that some sanctions or possibilities to make the certification on behalf of the owners have been implemented.

For buildings with many units or apartments, only a small share of the users will be changed over a short time. The general behaviour in these buildings will only change slowly because of this and some countries have chosen to base the certification on metered consumption in these buildings (e.g., in France).

Setting up rules for apartments and large residential buildings is one of the most complicated parts of the certification. This work on certification of apartments and the exchange on experience on large residential buildings might continue with unchanged intensity in a possible Concerted Action II.

3.2.4 Public buildings / non-residential buildings

There are specific requirements for public buildings in the EPBD directive. Public buildings which are used by the public have to have a certificate visible at the entrance of the building and this certificate must be up to a maximum of 10 years old.

On top of this, there are special issues for non residential buildings, where the consumption can depend on the size of the building, the type of use and the time the building is used over the day, week or the year. The age and the type of the installations can also have a large impact on the certificates.

There are some specific topics for certification of non residential buildings.

3.2.4.1 Definition of Public Buildings

One of the first specific topics that needed to be clarified was the definition of public buildings which have specific requirements for the issue of certificates, since they have to be displayed in the building and issued periodically. The definitions of public buildings have been discussed at an early stage of the CA. According to this discussion, the options of the countries were:

1. Buildings under public ownership
2. Buildings which are freely accessed by the public (including shopping centres, etc.)
3. Buildings under public ownership and also accessed by the public
4. Buildings occupied by public services (administration, Government, national banks, prisons, etc.)
5. Including building used for public purposes (private hospitals, private schools, private sports, etc.)
6. Publicly funded buildings (paid with public money)
7. EPBD Definition
8. Every Non-residential and non technology buildings

By the discussion in the last CA meeting in May 2007, it was clear that the definition of public buildings include many small differences in the countries, which are based on the national traditions, and that there is a need for modifications in the picture given above. Commercial buildings give room for discussion but also railroad stations, airports, libraries and museums are substance for differences.

In some countries, the actual ownership is of importance for these kinds of public buildings and in some countries there is a limit for the number of users. E.g., France has set a threshold for the number of users starting with 200 and rules differentiate with a larger number of users.

In some countries, there is a difference between the buildings which have to display certificates, and the buildings which have to do the certifications regularly. E.g., in Denmark all buildings with more that 1000 m^2 have to be certified every 5 years, no matter if they are public or private and no matter if they are used for multi residential or non-residential purposes. But only publicly owned buildings by state or community have to display the certificate.

A special problem for the certification of public buildings is the types of buildings. They can be either publicly owned or as privately owned or owned by a foundation, etc. This is, for instance, buildings for transportation, museums, libraries and different institutions. In some countries there can be no difference made between these kinds of buildings and in other countries, e.g., in Finland, public buildings cannot be favoured compared to similar privately owned buildings.

Some countries require only a certificate without recommendations for the regular and displayed certificates in public buildings and leave the recommendations up to a voluntary addition to the certificates, other countries include advice in these certificates too.

The displaying of certificates is also different in the various countries. In some countries, the display must be actually in the building – for instance on the wall by the entrance – while other countries put emphasis on the internet and require that certificates must be available to everybody through this media. Again, there are examples of countries where both options are required.

For many countries, discussions about public buildings and the certification of commercial buildings are still going on, since the certification of non residential buildings are often the part of these schemes which will be implemented last.

3.2.4.2 Complex buildings

Public buildings and commercial buildings which are included in the certification schemes can be very complicated and they can include many different solutions or systems for heating, cooling and ventilation. Sometimes the large buildings are built in many steps and there might be many different types of constructions and these will often be insulated according to the current standards at the time of construction for the different parts of the building. Similarly, the heating systems might have evolved over time, different cooling or ventilation systems might have been installed in different parts of the buildings.

The certification of large commercial or public buildings can therefore be a complicated and a costly process. For public buildings, there is hence a need for simplification or for setting the right level of details.

The energy consumption in commercial buildings will also, to a very large extent, depend on the use of the building, including how many hours the buildings are in use every day and if they are in use every day of the week, etc.

But the installations in the commercial and public buildings will also have a large impact on the consumption. Some buildings will have special needs such as swimming halls or hospitals. The consumption is only rarely measured individually for the different functions and the subdivision of a metered consumption can be very difficult. This is especially the case for electricity, which can be used for cooling, ventilation, lighting systems, computers, pumps, special equipment, etc., and maybe all the electricity is metered at once or the sections are shared according to different parts of the building and not for different uses.

3.2.4.3 Metered or calculated consumption

It has been a specific discussion on whether metered or calculated consumption should be used for certification of the non-residential buildings. For large non-residential buildings where the change in behaviour is not so dramatic, energy consumption will to a large extend be by lighting and appliances and the collection of details for the calculation of the energy performance can be quite substantial.

Especially for non-residential buildings, metered data (operational rating) have been discussed and quite many countries base the calculations on metered consumption or allow this option. See further discussion of the advantages of operational ratings under a specific point ahead (3.3.3).

3.2.4.4 How many scales?

Another issue which has been discussed on some of the later workshops was the number of scales needed for the certification of buildings. If there is only one scale, some types of use will always get a bad rating while others will always get a good one.

But, on the other hand, if the scales shall be too much adopted to the specific use, it might end that nearly every building will have its own scale. As example, if all sports facilities have the same scale, sports halls will normally get a bad score while a stadium might normally get a good one. If sports halls are given a specific scale, swimming halls will get a bad score while badminton halls might get a good class no matter how efficient they are. Even if swimming halls are given one own specific scale, this might not be fair because some of these swimming pools will have heated areas, special saunas, different water temperatures (e.g., for medicinal purposes), etc., which increase the consumption even if they are efficient.

It was agreed that the scales should be set in a consistent way where it will be possible for most buildings to move on the scale and that, by the end of the day, it will not be possible to develop scales which give same justice for all buildings.

Many commercial buildings have more different functions which can lead to different efficiency in the building and need for different scales for the different parts of the building if too many scales are set depending on the functions.

At the last meeting, many countries indicated that they work with only one scale or with one scale for residential and one scale for non-residential buildings. Many countries combined this with reference buildings or with a kind of normalising the building to some reference buildings. This was for instance the case in UK (England and Wales), Germany, Austria, Sweden and Bulgaria. Other countries expected to adopt as many as 20 different scales for non-residential building types.

The discussion on the number of scales also depends on the way the consumption is obtained. When buildings are certified based on a calculated consumption from the actual U-values and the installations, then the consumption will be based on the same normalised conditions independently of the actual use. On the other hand, when the buildings are certified based on metered consumption, it is not so easy to fully adjust for the different ways of use of buildings or for installed equipment in the buildings and this may lead to a need for further scales which can adjust for these differences. For instance, the use pattern in non-residential buildings will lead to different consumptions and, without adjustment, this would lead to the fact that certification would be highly influenced by the opening hours or whether buildings are used during the weekend or not.

Studies about the consumption in non-residential buildings in the EPLabel project resulted in more than 150 different types of buildings which they have tried to condense down to only 15 different scales or types.

Some countries use benchmarks which are calculated on the basis of the use and the type of the buildings. These benchmarks are then used to develop individual scales for the individual building based on the common scale which can be the same for all non-residential buildings. This is the case in Spain and in the UK.

In some countries, the certificates can be based on either a metered consumption or a calculated consumption and large discussions were addressing whether the buildings could be certified based on the same scale or if there was a need for different scales for metered consumption and for calculated consumption. In Germany, this is addressed with a scale, which is open like a speedometer and where the only relation is the consumption in kWh/m^2.

It was commonly agreed that the problem with scales was not so much a technical matter but far more a political question and a question of communication. The choice of scales were hence to a large extent a question on what the country aimed to achieve with the certification and which signals they want to send to the different users of the certification.

3.2.4.5 Responsibility rests on the owner or on the user?

A special issue for commercial or public buildings is whom are the target for these certificates: the most important target group is the owner, or the persons which are responsible for the use of the buildings, or the users? All these groups will have different needs for information and they will need different simplifications or a different language to be able to understand the certificates.

It was agreed that a good certificate should address more of these target groups and that the certificates should include the necessary content for all the most important user groups. This makes specific requirements for the certificates and for the advices which come along with these certificates.

3.2.5 Buildings with mixed use

Buildings in the central parts of cities or old building blocks often include spaces with different functions. This might be shops in the ground floor, at corners or in the centre, there might be some service functions in the building and this might all be mixed with residential parts with flats. This trend has also been taken up in some new buildings. If the scales and the certification rules are different - how should these buildings then be certified?

Should buildings with more different uses be labelled according to the main use or as separate parts, with one certificate for each?

3.3 Design of certificates

3.3.1 Rating of the buildings energy performance

Certificates must be clear and follow a standard, since they must be recognisable even for a less experienced building owner or buyer. They have to be decoded quite simply but there is also a need for significant information and for a good presentation of the results of the certification.

A special issue was the design of a rating scale. Many countries have developed certificates which are based on the A-G labelling of refrigerators and other white goods and products. Some countries have added more figures such as A1, A3, A3 or A+, A++ and B- or other combinations to increase the number of levels, since 7 scales only were found too few to certify both new and existing buildings in the same scale.

Some countries have chosen a totally different graphic, such as Germany, where the certificates are set as a speed bar, with colours in graduation from red to green, where there are no fixed scale values but where values are typically indicated under the bar. This graphic was selected after a field test where also an A-G scale was tested.

Many countries have included user tests or focus interviews in the selection of the right graphic identity, because the graphic of the certificate was commonly accepted to be an important tool to make the certificate appealing and recognisable.

3.3.2 Information in the certificate

Many countries have also chosen to include a photo of the building in the certificate to ensure that the building is recognised and to make the certificate appealing for users.

Similarly, most countries have chosen to include blocks of information where specific parts of the certificate are used for simplified information on size, consumption, preset text, etc. This helps to set focus on the essential information and makes the comparison of different certificates easier. The content in the certificates varies to a large extend and there is large difference between the information which have to be given in connection to the rating of the building.

For one family houses and other small residential buildings, there has been an effort to keep the information particularly simple, since these owners might read the certificates very rarely, maybe only once in a lifetime.

Many countries have chosen a similar layout for all the different certificates, to make a clear identification and to make information activities more efficient. But the content of the certificates for different types of buildings varies significantly. Differences in the contents of the certificates for buildings with complex HVAC or with non residential use are larger.

Buildings with apartments require specific and complicated demands for the certificates since these might need to include some information of typical apartments, units or keys for the calculation of the consumption.

3.3.3 Information based on metered or calculated consumption

Some countries have chosen to make ratings based on both metered and calculated values but most countries have chosen only one of these two options and this varies with the different types of buildings. The calculation rules also vary with building type. Similarly, some countries will be giving both values for the consumption – calculated and metered, typically normalised to normal use and conditions – while other countries have chosen to adopt only one of these values.

There has been a large opportunity to discuss these options and many countries have got the certificates discussed in the core team certification meetings. In some cases, this caused changes in the final layout.

Some countries have included CO_2 and other greenhouse gas emissions in the certificate, but the majority of countries just give the calculated energy consumption and the costs for the consumers or owners of the buildings.

3.3.4 Electronic or paper version

It has been discussed whether the certificates should be presented as an electronic version or as a paper copy with a signature. Countries have chosen different solutions based on the actual legislation in this field and based on the maturity of consultants and real estate markets, etc.

In the countries where the certificate is based on an electronic version, such as a PDF file, there is a particular issue to ensure that these are reported. As an example, Denmark chose this option but all values need to be reported in html format together with the final version of the PDF, which will then become the real original of the certificate. This makes specific requirements for the databank which collects the information from the national scheme.

3.3.5 Identification

A specific topic for the certificates is the identification of the building and the specific certificate. Building address, meter numbers, national or regional registration of buildings, etc., can all be used for identification purposes.

Many countries will give a number to each certificate to ensure its registration and to keep track about all the certificates on the same buildings (History).

This information is needed both for the safe identification of the buildings and for the quality inspection, as well as to ensure that information can be collected on improvements over time when buildings are certified multiple times.

3.3.6 Other information on the certificates

Many countries include further information in the certificates on how to implement savings or how to get more information on energy efficiency and energy savings. This can also include information and link for actors which can help the building owner with the implementation.

These kinds of information are often internet based and in some cases interactive.

3.3.7 Recommendations and the impact of the certification schemes

Recommendations were treated in special workshops but also at several workshops where specific certificates were discussed for individual countries or for different types of buildings. Specific combined Core Team sessions were looking at National Incentives Promoting the Implementation of Recommendations and market impact of new EPBD regulation.

The demands for recommendations are different for different types of buildings. In particular, there is a difference between certification of new buildings, which are mainly used for the control of energy efficiency requirements and where there might be no need for recommendations, and for existing buildings.

The recommendations might be a part of the overall certificates or it might be a separate document, which is given together with the certificate. For some countries, the recommendations can be given in different levels.

Many countries have chosen to make quite detailed recommendations as a part of the certificates. This is for instance Ireland, Portugal and Denmark.

For instance, The Netherlands works with simplified recommendations as part of the certificate and a more complicated tailored advice which is an option in particular for those buildings with a large potential. In the first certificates, the certificate and the advice are simpler unless the owners choose the more complicated option – which also has a longer validity period. In the second certificate, they will require more details in both registration and in advice. In Germany, more levels of details are used for the certificates too. In some cases, the advice is more standardised and in other cases it is more specific for the building.

3.3.8 Recommendations for Public Buildings

A special topic on recommendations has been in the certificates of Public Buildings. Some countries have made a narrow definition on the display of the certificates in public buildings and have only included a rating and a certification in these demands while other countries have decided to include recommendations in these demands.

3.3.9 Demands for saving measures

Often specific demands are set up on how to describe the energy savings and which kind of values shall be calculated for the savings. This can include investment, saving in energy, saving in costs, payback times, technical life time for the investment, internal rates or other information on feasibility.

Typically there are demands for how to select profitable saving measures for the certificates. But some countries have let this up to the consultants.

The recommendations are often placed in a particular hierarchy depending on the feasible improvement measures. The most feasible or the most obvious are normally placed first in the certificates.

3.3.10 Requirement to implement savings measures

In Denmark and Portugal there are obligations to implement identified cost-effective savings in public buildings. The demand in Denmark is that all recommendations with a simple payback time of less than 5 years must be implemented in the first 4 years after the certification. In Portugal, all recommendations with a simple payback time of less than 8 years must be implemented in the first 3 years after the certification in the non-residential buildings which have a rating lower than a certain threshold.

3.3.11 Acceptance of recommendations

Some tests of new systems show a high acceptance for the new certificates and especially for the recommendations. In particular, the buyers and the renters are happy for these but, on the other hand, the sellers and the housing owners who actually have to pay for the certificates might be less happy for the costs and the obligation in general. These are issues which have to be considered and treated in campaigns or other information.

The majority of home-owners should be targeted to implement measures, as the recommendations are a valuable contribution for the decision process. They should include suggestions on improved comfort, indoor climate and stress these issues since this can improve the acceptance of the certificates.

Housing companies in some countries (Germany and France) prefer not to pass the recommendations to renters of apartments and houses.

Most home-owners appreciate personal presentation/advice, but this might also increase the costs for the certificates. In one family houses, recommendations are mainly interesting for the buyer/future owner of the building, and these will not enter the scene before the certificate is issued, eventually only maybe a long time after the certificate is issued. This makes direct information more complicated.

Standardized downloadable templates for advisory reports referring to common building types can help reduce costs for the certificates.

The recommendations should refer to the thresholds-limits for regulatory compliance and high performance.

There is a special topic for costs versus quality. Most owners or at least buyers would prefer tailored advice but there is a cost issue and sellers or housing companies might not be ready to pay for this kind of advice.

3.3.12 Independent consultants and experts

It has been discussed whether the architects who design buildings or the engineers who calculate the HVAC or building envelope for the requirements in buildings codes can make the certification of the buildings. On one side is the possibility of being independent which has to be balanced with the costs for the consumers. It has further been considered that the use of Architects and Engineers involved in the process of design and construction could have a direct impact on the design of these buildings and that this could increase the energy savings from the certification.

Countries that use the architects and engineers involved in the project have generally set up systems, either in form of quality inspection or in form of a double certification system. If involved architects or engineers are responsible for the final certification, these should be checked randomly or by a quality assessment plan and penalties should be put in place (e.g., Belgium, Germany, Spain, Portugal). The other option is where designers can be involved in the certification or declaration at design stage but where this will be followed by a certification by an independent consultant (e.g., Sweden, Denmark).

3.3.13 Price and cost issues

The price and cost of certification is essential. Some companies or associations own many buildings with apartments and they have pressured authorities that the general costs must be kept down. The need to keep prices down has especially been large when apartments are rented, because only small transaction costs are generally involved in these contracts and the frequency of rental can be quite high for these units.

There are many different owner forms for buildings with apartments: they can be privately owned, they can be owned by a social housing company, the can be owner occupied with an owner association or a mixture. Who shall pay for the certificates, for instance when an owner occupied flat is sold? Is it the individual owner or the association of owners? What happens if the certificate includes or is based on the whole building? These situations depend, most of the time, on national factors and circumstances and each MS must find the best solutions that better fits all the details of the local market.

3.3.14 Validity of the certificates

Validity depends on whether the certificate was intended for regular certification of public buildings or certification for buildings by sale or rent.

For public buildings and other buildings which have to be certified regularly, the validity depends on how often this certification has to be done. The vast majority of countries have either chosen 5 or 10 years, but with most countries opting for 10 years rather than 5 years. The major reason for the choice is the limit set by the directive (10 years) or the responsibility for advisers and constructors, normally 5 years.

But some countries have chosen different periods for the regular certification. Examples were 6 years in Portugal, 7 years in Bulgaria and 8 years in the Netherlands.

In the UK, there was a demand to make a display certificate based on metered consumption every year but only to make a larger inspection every 7 years.

Most of the countries have chosen to make the certificates for sale and rental valid for 10 years. But there are also quite some countries, which have made the certificates valid for only 5 years, meaning that only a resale or a new rental within 5 years can be covered by the same certificate.

A few countries have chosen a different period of validity for the certificates, such as The Netherlands with 6 years and Bulgaria with 7 years.

UK has chosen 10 years for rental, but only 3 months for the certificates for sale.

The validity of the certificates are typically a part of the legislation and might be set in a law or at least in executive orders or ministerial decrees, and these parts of the regulation seem to be already in place in most countries or, at least, very close to adoption.

3.4 Metered or calculated consumption

There has been a specific discussion on whether metered or calculated consumption should be used for certification of buildings. For large non-residential buildings or the large blocks with apartments, the change in behaviour is small. The change of a few consumers will not change the overall behaviour. For non-residential buildings, the energy consumption will to a large extent be by lighting and appliances and the collection of details for the calculation of the energy performance can be quite substantial.

Especially for non-residential buildings, metered data (operational rating) have been discussed and quite many countries base the calculations on metered consumption or allow this option. But it is also used for large residential blocks in quite some countries.

There are special implications of the metered versus calculated consumption and this discussion has been ongoing in many CA meetings and under different sessions.

If calculated consumption is used, it can be complicated to obtain the needed information to make this energy performance calculation, but it will be possible to normalise the energy consumption and define the energy consumption by a specific indoor climate, specific conditions for the use and for a standardised use.

If a metered consumption is used, it can be difficult to make a subdivision of the energy consumption and to estimate how efficient the different parts of the building or the HVAC system functions. Metered consumption will include behaviour of the users of the building and these can be included in the advice to reduce the energy consumption. Metered consumption can in some cases be difficult to obtain. For instance, if more owners have individual meters, it is not clear where this information can be included in legislation on the grounds of privacy. On the other hand, the users will better understand the metered consumption than the calculated rating and this can be important for the acceptance of the certification systems.

In some countries or in some specific cases, metered data can be difficult to obtain. It might be against the laws on privacy or ownership to collect information on energy consumption for individual parts of a building, and collection of information on consumption for a building with individually owned parts might require the acceptance of all owners or even renters. In some cases, the data is not available from the utilities and it might have to be collected from the individual users.

Especially in hot climates where cooling is needed, there are problems with the metered consumptions because the cooling is often provided by the individual systems for each flat or unit owner and they pay individually for the electricity, which also covers all other electricity use in the building.

In Poland, a special problem was raised because many apartments are unoccupied or unused (20 %). Metered data would hence be giving a large mistake in buildings with many unoccupied flats. Metered data can be biased by other reasons and, in the German field test, 70 % of the metered data was seen as unusable or misleading.

It was agreed throughout the CA that both types of consumptions have advantages and disadvantages. Probably there is a need for both types, but this will on the other hand increase the costs for the certificates.

Some countries have taken the metered consumption as basis for the energy performance and the certification of the buildings, some have taken only the calculated rating, some countries have both ratings and, finally, some allow a choice of the two. In some cases, metered data are used for some types of buildings while calculated ratings are used for other buildings. Some countries use calculations for the rating and metered data for the declaration. Some countries use both values. There is a substantial variation in the use of metered versus calculated throughout the EU countries.

As an example, Finland and France have decided to issue certificates based on metered consumption for existing buildings, especially for the public sector but also in most cases for large residential buildings.

Germany and Cyprus have set up a more free choice between calculated or metered data and both systems with operational and asset rating will exist side by side for existing buildings.

In Denmark, the consumption in large existing buildings (with more than 1000 m^2) is given as a normalised metered consumption, but the certificates (the scales) are based on a calculation.

Some countries have based certificates on calculation for almost all buildings. This includes Austria and Portugal, for example.

3.5 Software tools

Software tools have been discussed in specific sessions and in collaboration with the Procedures Core Team.

It is commonly agreed that there is a need for software tools to ensure the quality of the certification. The needed calculations are simply too complicated to carry out without software. Software is also a means to reduce the costs because the consultants can use default values or standard building parts or HVAC systems which are already stored in the programs. Similarly, the tools may include some values that have to be repeated every time.

Software tools are also commonly used to in the process to issue the certificates and to report the information to the national or regional databanks, secretariats or to quality inspection.

Finally, the software tools are generally used in the process to set up recommendations and to calculate the feasibility of the proposals. This process can be more or less automatic. In some countries, only standard proposals are generated, while in other countries more tailored advice has to be drawn up and this makes larger requirements for the users of the programs and less possibility for automatisms.

3.5.1 Central or local software

Some software tools are centralised and are available over the internet. This can include automatic reporting, generation of data and a kind of quality check before the certificates are issued. A central program will also make updating of programs easier and ensure that this happen for all consultants at the same time.

Other countries have chosen models where programs are located on local workstations, which give the consultant more flexibility but also more responsibility for updates, and regular maintenance and reporting.

3.5.2 Development of tools

For the development of tools for the certification, there are different solutions which are used in the countries.

Some countries have developed the tool as a part of the national scheme. Consultants have to use this tool for the calculation and the issue of the certificates. This is for example the case in Ireland.

Other countries have set up a specific procedure and left it up to private companies to develop the specific applications. E.g., in Germany and Netherlands this is combined with a test procedure where the programs are tested to be accepted. In Denmark, the central calculation core is programmed and has to be used while the programmers can develop the software interface around these as they like. The rules and the testing are different for the various countries.

Finally there are countries where the development of software is give free to the market.

To some extent, there are differences between the programs used for new buildings and for existing buildings.

3.5.3 Some questions to be further considered in the future

- Don’t underestimate the challenge of specifying, developing, managing, reviewing and testing software tools.
- Testing via standard control and release procedures and model case study applications is a way to test programs and secure a certain quality but bugs can’t be totally avoided.
- Consider the implications if software bugs lead to incorrect ratings.
- Check performance of new software versions. What if subsequent software versions change old ratings?
- Need case studies to train assessors & reduce calls to technical support. Technical queries will require helpdesk support.
- Introducing/allowing proper alternative market based model development without sticking to the standard method may lead to different ratings.
- Consider market/property needs (integration of energy performance assessment in property management tools and clients building databases, increase the accuracy and reproducibility of tools, add other factors in building management safety, environment, functionality, life cycle optimization) to properly design the interfacing.

4. Summary of Certification topics discussed during the CA-EPBD

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
Organisation	There is a need for *different levels of control. Organisation is a key to success and it needs to be flexible* because many adjustments will need to take place.	No, but there is a good consensus about the major options.	Lessons learned need to be discussed.
New Buildings	The specific problems for new buildings; such as *timing of certification, control of requirements, encouragement for improvements and independence of experts* have been discussed.	No, but most MS have selected their solutions among a limited set of options.	Lessons learned need to be discussed.
Small Residential Buildings	These have been the first group of buildings to be addressed in most countries. Many aspects have been discussed such as *simplification, costs, standardized tools, metered versus calculated ratings, target groups,* etc.	No, but there is a good consensus about the major options.	Need to discuss results after monitoring implementation at MS level.
Apartments and blocks with flats	*No common solution has been found so far that can satisfy the very different conditions in all the MS*. There is still a need to find good solutions to many problems, e.g., costs, metered versus calculated, complexity.	Two major options: certification of whole building or by apartment.	Large need to continue discussions and improve consensus.
Non-residential buildings	These buildings have only been discussed to a minor extent since countries are further away from implementation. The *definition of public buildings has been widely interpreted by MS*.	No, it is a complex and difficult issue.	Large need for further discussions to search for useful solutions.
Mix-used buildings	Many buildings have mixed use, residential, services, etc. These buildings are complex and need particular attention. *There is yet no simple methodology to handle this type of building*.	No, it is a complex and difficult issue.	Large need for further discussions to search for useful solutions.
Certificates	*The forms of the certificates* and the rules for advice on energy efficiency improvements *have been designed in many different ways among MS*. They all seem fit for their desired purpose.	Most or all countries have developed certificates.	Need to discuss results after monitoring implementation at MS level.
Advice on improvements	This issue has been discussed, but many issues still remain. *Standard tools for guiding experts* are still needed in most MS. *Take-up incentives* are important.	An essential part of certification that remains not yet developed in most MS.	Large need for further discussions to search for useful solutions.
Computer tools	There is a *large need for computer tools* to improve certificates and advice and to reduce costs.	Many MS still need tools, or improved tools.	Need to continue sharing experiences and ideas.

5. Conclusions and recommendations

Certification of buildings includes many, often interdependent, topics. Solutions depend on the type of building, type of certificate and if certification is periodic or by sale/rent. Given the advancements made, however, there is a need for increased emphasis on:

- non-residential buildings
- apartments
- implementation of advice

For other topics, such as new buildings and small residential buildings, the focus should be on monitoring results from implementation, followed by further development and improvement of the schemes.

At the beginning of the CA, only a few countries had any experience or results to present. By its end, the vast majority of countries had their own experience and all participated actively and enthusiastically in the discussions. MS have implemented certification with different speeds and some countries have changed approaches along the way. Thus, there was a need to revisit some discussions during the CA. The CA inspired developments at national level and it has strongly contributed towards conclusions being drawn on a more enlightened basis. The CA was also useful for getting feedback on the developed solutions. Finally, MS have in many aspects chosen different solutions, but the CA has been useful in reducing the range of variations.

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