

Implementation of the EPBD in Denmark

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Abstract

The scope of this paper is to give a survey of the implementation in Denmark of the Energy Performance of Buildings Directive (EPBD) [1] and to give examples from other countries where they have been visionary in their line of thought regarding how to implement the Directive.

The survey in this paper is based on the approved building regulation from Denmark together with a new energy action plan supplemented by constructive suggestions/plans from other countries where they have been more visionary in order to achieve an effective “energy-efficient” implementation of the Directive.

As part of the implementation of the Directive, Denmark has introduced three levels of energy consumption per m² together with requirements to component used for renovation. The two levels below the minimum requirement indicate the levels to become the minimum requirement in the next revisions to be made in 2010 and 2015.

Denmark is one of the few countries that had already a scheme for energy labelling of buildings. In some areas this scheme, however, did not work as originally intended, and therefore the law dealing with the new scheme will now be revised based on experience from the previous scheme.

The EPBD has now been implemented in Denmark, and CEN standards have been taken into consideration as much as possible. The official approval of occupation and use of a new building is conditioned by an approved energy audit of the building where the assumptions used in calculating the energy consumptions are controlled.

1. Introduction

Denmark is considered having a relatively high insulation standard. This is also true as regards new constructions, but 75% of the existing buildings were constructed before 1979 when the first essential tightening of requirements for energy performance of buildings was introduced. The energy performance of the remaining 25% of the building stock will be approx. 25-50% below the energy requirements from the new regulations 2005/2006 [2]. This means that also in Denmark a large potential for energy savings exists.

Table 1: Development in energy-performance requirements in DK together with typical U-values of a Passive House.

| U-values: [W/m²K] | BR¹ 61/72 | BR 77/82 | BR 95 | BR 05 renovation requirement | Passive House |
|---|-----------------------------|-----------------|--------------|---|--------------------------|
| Wall, heavy | 1.00 | 0.4/0.35 | 0.30 | 0.20 | < 0.15 |
| Wall, light | 0.60 | 0.30 | 0.20 | 0.20 | < 0.10 |
| Floor on ground/with floor heating | 0.45 | 0.30 | 0.20 | 0.15/0.12 | < 0.10 |
| Loft/roof | 0.45 | 0.20 | 0.15 | 0.15 | < 0.10 |
| Horizontal roof/pitch wall against roof | - | - | 0.20 | 0.15 | < 0.10 |
| Windows (façade/roof) | 2.90 | 2.9 | 1.80 | 1.50/1.80 | 0.8/1.0 |

¹ BR is the Danish building regulation. The numbers following (e.g. 61/72) is the year of validity. 95 is the existing regulation and 05 is the regulation which will come into force later this year.

Today, an upgrading of the energy performance is only carried out to a very small extent in existing buildings in connection with major renovations. Some of the important barriers seem to be that people do not know and do not take interest in knowing how much energy they are using, and if people know their energy consumption, they do not know if the consumption is small or large. Besides, there seems to be a high inertia in investments which are not related to visible building improvements [3] despite a high return on investments. This means that changing the behaviour of building owners needs to be done mainly by legislation and by effective control, as normal market forces are not sufficient within this area.

2. Regulation - new buildings

Since 1995 it has been possible to choose between three different ways to prove conformity with building regulations when applying for a building permit: fulfilment of either requirements for construction performance (restriction on glass area), area-weighted requirements for construction performance (heat loss) or an energy frame concerning room heating. With the new regulation [4], which is a consequence of the implementation of the EPBD, requirements will focus on the energy performance of the building, taking into account the energy used for heating, hot water, cooling, ventilation and lighting as requested in the Directive.

The limit on energy performance becomes: $(70 + \frac{2200}{A}) kWh / m^2$, in which A is the gross heated floor space. This is a tightening in regulation compared to the existing energy frame of approx 25-30%. The tightening in regulation is in line with the development seen in other countries. Beside the requirement for energy performance, the regulation contains a requirement for air tightness. To ensure that the insulation level of the building envelope does not decrease due to the change in framework of the legislation, the regulation also includes a requirement for transmission loss through the building envelope, when excluding windows and doors.

The reason for this is that the building envelope has a long lifetime compared to technical installations.

2.1 Low-energy buildings

To promote erection of buildings with a better energy performance than the minimum requirement in the regulation, the new regulation introduces two levels of “low-energy buildings”.

Low-energy building – class 1: the energy performance is 50% better than the minimum requirement, and class 2: the energy performance is 25% better than the minimum requirement. In a class-1 building it is proposed not to require connection to district heating, if there is such in the area, as this heat supply will not be economically profitable with a low-energy consumption due to the settling of account.

In a new draft action plan for increased energy efficiency [5], which has been submitted to public consultation, it is stated that the level of energy performance of class-2 buildings will be the minimum requirement in the next revision of the regulation which will take place in 2010, and the level of class-1 buildings will be the minimum requirement in the revision to be made in 2015.

3. Regulation - existing buildings

Denmark has in principle implemented the “25%”¹ interpretation of a major renovation from the Directive. The requirement for construction parts to be fulfilled in case of a major renovation is presented in table 1. However, it is still required that the individual measures are profitable in order to make the requirements come into force. Measures where savings times lifetime of measure divided by investment is more than 1.33 are considered to be profitable.

Individual measures which are always covered by the requirement for upgrading performance to the level in table 1 are: insulation of external walls when changing rain shield, insulation of loft and roof when changing roof, change of boiler and change of heat supply. The only exception to the rule is if it can be proved that the measure is not profitable according to the above-mentioned evaluation. This requirement is expected to have an important effect.

3.1 Alternative interpretation of major renovation

In Sweden they state that they cannot use the definition of major renovations coming from the Directive, as the property value differs very much, dependent on the location in Sweden [8]. How this will be implemented in Sweden is not known at the moment, but large differences in value exist in all countries. Germany and UK give some visionary examples on how to set up requirements for existing buildings.

In Germany the existing regulation, launched in 2002 [7], sets general requirements for alteration of building components if more than 20% of the building component areas of identical orientation is altered. If within one year at least three alterations from a specified list (e.g. replacement of roof, windows and doors) are

¹ Major renovations are renovations related to the building shell and/or energy installations the total cost of which is higher than 25% of the value of the building, excluding the value of the land on which the building is situated, or renovations where more than 25% of the building shell undergoes renovation.

carried out in connection with replacement of a heating boiler or a conversion of the heating system, or if the heated building volume is expanded by more than 50%, an energy requirement statement of the total building must be drawn up.

For existing buildings, the draft UK 2006 Building Regulations [6] set out performance requirements for small-scale replacements and improvements, e.g. replacement windows and roofs. In addition, the Regulations propose that every time money is spend on renovation not related to energy efficiency an extra 10% of the total cost must be used on upgrading energy performance.

4. Energy-performance certificate

Denmark is one of the few countries that has already a scheme for energy labelling of buildings. The current scheme is based on a Danish law from 1996. However, the existing scheme has proved not to work as originally intended and will therefore be revised based on experience gained from the existing law. A new law has been submitted to public consultation and is sent for reading in the Danish Parliament; the law will come into force January 1, 2006.

As a first step the Directive will result in implementation of minimum legislation, as the Directive stipulates that an energy-performance certificate must be issued when a building is constructed, sold or rented. However, it is possible without changing the new law to make it mandatory at a later stage to have an energy certificate issued for all buildings. The possibility for making the energy-performance certificate mandatory for all buildings will be evaluated when the new law has been in force for a couple of year. Such solution would eliminate one of the problems with the existing scheme that the consultant who makes the energy audit of the building is not in direct contact with the person interested in improving the energy performance of the building when the house is sold.

Implementation of the Directive means that an energy certificate must also be issued for new buildings. In Denmark the new building regulation demands a receipt for having the energy performance calculated and sent to the energy certificate secretariat as a basis for issuing a building permit. The official approval of occupation and use of a new building is conditioned by an approved energy audit of the building where the assumptions used in calculating the energy consumptions are controlled.

In order to set a good example institutions owned by the Danish government will be forced to carry out profitable energy-saving measures identified by the energy audit.

In Sweden it is proposed that the consultants who perform the energy audit be certified or employed by an accredited company to ensure the quality of the audit.

Like Denmark, Sweden plans to set up a central register for the certificates, and if a certificate in Sweden is not issued, it will cause a penalty of the same size as the cost for issuing a certificate [8]. Due to lack of trained and certified consultants, Sweden plans from January 1, 2006 to set up a transition period of two years where it is possible for non-certified consultants to perform the energy audit, and the penalty

system will only be implemented by 2009. The period of validity for certificates issued by a non-certified consultant will be shorter than ten years.

5. Conclusion

The main thoughts behind the implementation of the EPBD in Denmark have been outlined in this paper. In order to focus buildings having a better energy performance than required by the regulation, the levels of energy performance for the coming review of the regulation in 2010 and 2015 have now been introduced in the regulation. Regarding existing buildings the requirement concerns each component when being replaced.

The existing law for energy labelling of buildings will be revised based upon experience with current legislation. The main thought behind the new law is that the scheme will need to be evaluated and adjusted regularly, as it is not possible to make a static scheme within this area. Another important matter is that the public sector needs to act as a good example and be obliged to implement identified measures which are economically profitable.

The official approval of occupation and use of a new building is conditioned by an approved energy audit of the building where the assumptions used in calculating the energy consumptions are controlled.

References

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