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Calculation and compliance procedures of thermal bridges in energy calculations in various European countries

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Abstract

EPBD directive 2002 and its recast 2010 have led to significant efforts in Member States to improve the energy performance of buildings. Important aspect of this goal is the compliance of building energy performance assessment which needs developed procedures in order to be able to achieve stringent energy targets in practice. Transmission characteristics have a significant role in energy efficient buildings. QUALICHeCK project conducted a review of thermal bridges in energy calculation and compliance procedures in nine European countries (Austria, Belgium, Cyprus, Estonia, France, Greece, Romania, Spain, Sweden). Results showed that there are four main types of methods to take thermal bridges into account in transmission heat loss calculation: the detailed calculation based on linear thermal transmittance values, simple basic rules, default transmittance values, and mean U-values. Regarding the compliance, review showed that often there are no specific thermal bridge related compliance procedures. General conclusion of this study was that compliance frameworks needs to be extended in order to be able to assess as built energy performance. It is common approach in many countries that control mechanisms stop with building permit phase.

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Keywords: Thermal bridges; energy calculations; compliance assesment

1. Introduction

Influence of thermal bridges to building energy need is becoming more important whereas the goal is to achieve nearly zero energy buildings. Previous studies have shown that the impact of thermal bridges on the heating energy need of the building can be as high as 30 % [1]. The impact of thermal bridges on the energy consumption can be even more significant in the case of building retrofit. Study conducted in Estonia [2] showed that in retrofitted apartment

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building, heat loss through window-wall junction was higher (19 MWh/a) than through insulated opaque walls (14 MWh/a). Study conducted in Belgium [3] concluded that there was an average difference of 7 kWh/(m² a) between the net energy need reduction from the original to the refurbished with non-refurbished joints on the one side, and the net energy need reduction from the original to the refurbished with refurbished joints on the other side.

Energy Performance of Building Directive [4] Annex I states that the methodology for calculating the energy performance of buildings must take into consideration thermal bridges. A variety of regulations and thermal bridges calculation practices are used in Member States. QUALICHeCK project studied thermal bridges calculation rules and practices in 9 European countries.

2. Thermal bridges calculation rules in energy calculations

Thermal bridges calculation rules are addressed in the building codes of all studied countries. Detailed thermal bridges calculations are allowed in all countries but there is also an alternative way. Results showed that there are five different types of alternative approaches for thermal bridges calculations in studied building codes, see Table 1.

Table 1 Alternative approaches for thermal bridges calculations

Thermal bridges calculations	Description	Countries
Calculation with energy calculation software	Thermal bridges values are calculated using a mandatory software for energy calculations	France
Tabulated values in energy calculation software	Values for thermal bridges in energy calculation software will be computed without the need of user input	Austria, Cyprus, Greece, Spain
Basic verification rules	Simple rules which, when followed, do not require calculation of linear thermal transmittance values	Belgium
Tabulated values in legislation	In the absence of more specific data, it is allowed to use tabulated values given in legislation	Estonia
Mean U-values	Mean U-values for the building envelope components includes linear and point thermal bridges	Romania, Sweden

2.1. Thermal bridges values can be calculated with energy calculation software (France)

The thermal bridges values are calculated using a RT 2012 [5] software and the respect of the aforementioned requirements is mentioned in the thermal study report, as seen in Figure 1.

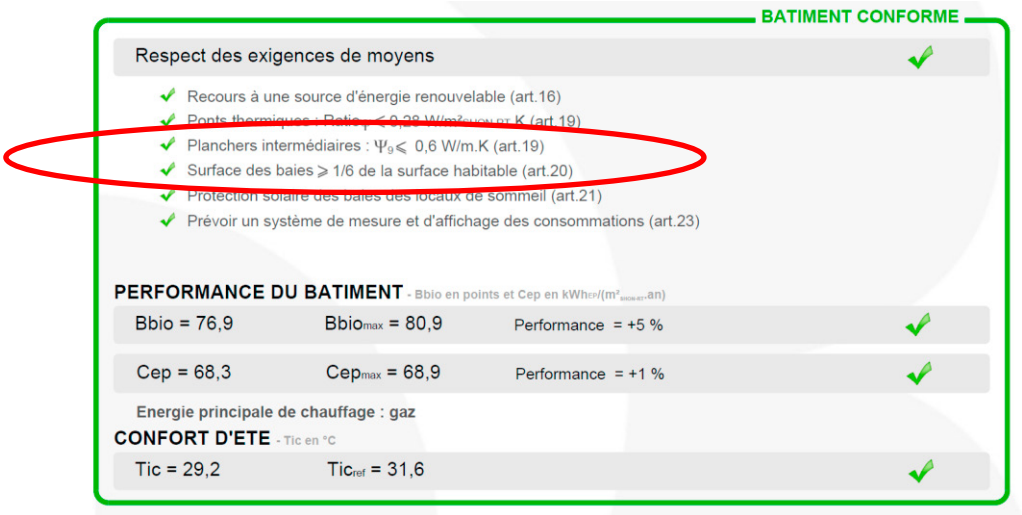

Fig. 1. Excerpt of a typical thermal study report, respect of thermal bridge requirements is mandatory (shown in red circle).