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Guide to the Energy Efficiency Regulations 2012 Regarding Log Buildings

The new regulations for energy efficiency in buildings came into effect in Finland on 1.7.2012 ("National Building Code of Finland 2012 – Section D3 on Energy Management in Buildings"). The new regulations have applied to all requested building permits from that date onwards. Experts of the Finnish Log House Industry Association cooperated closely with authorities in order that the special characteristics of log construction were considered in the regulations as well. This handout is one result of the cooperation.

The purpose of this guide is to clarify the process of putting the new regulations into practice, especially as for log buildings. The aim is to facilitate the work of a building permit applicant as well as authorities handling the permits. The purpose is also to reduce possible differing interpretations of the regulations depending on the municipality.

Definition of a log and a log house

A log *is a shaped piece of wood with minimum nominal thickness of 68 mm.* (Log standard SFS 5973, article 4.1)

A log house *is a building where the main building material of exterior walls is log with the minimum average structural thickness of 180 mm*. (RakMK-D3 2012, article 1.3.1)

Log walls of a holiday house may be less in thickness as well. (RakMk D3 2012, article 2.10.1). Also a living house may be built from logs less than 180 mm by adding insulation to the walls, but in this case the log house regulations do not apply.

It is worth noticing that a log building mainly differs from buildings made of other materials only for its exterior walls.

Log houses have tailored reference values

For log houses there are separate reference values for log walls and slightly higher values for total energy consumption (E-number), as compared to other buildings. The Ministry of Environment justifies the higher E-numbers for log buildings by the smaller overall environmental impact of log construction during the entire life cycle. At the same time the aim is to ensure continuity of log construction in Finland (The Ministry of the Environment: Energy package 2012, Background memo 2010-09-28, article 5 Requirements for energy efficiency).

The regulations include exceptions, especially for holiday houses, which have essential effect to the building's energy efficiency evaluation, regardless of the used building material. Most holiday houses are built from log in Finland, thus they are being considered in this handout as well.

The following abbreviations are used in the text:
RakMk = The National Building Code of Finland
D3-2012 = part of the RakMk; Energy Management in Buildings, Regulations and guidelines 2012.
Italic text is a direct quote form the building code.

Building categories for living houses and holiday houses according to RakMk D3 2012, article 1.1:

1. *Class 1: Detached houses and semi-detached houses, terraced houses and linked detached houses. This class also includes holiday houses, which are intended for accommodation business and have heating systems meant for year-round use* (RakMk D3 2012, appendix 1).
2. *A building with maximum net heating area of 50 m²* (RakMk D3 2012, article 1.1.3 b).
3. *A holiday house, in which a heating system meant for year-round use has not been planned* (RakMk D3 2012, article 1.1.3 e).
4. *A holiday house, in which a heating system meant for year-round use has been planned, but which is not intended for accommodation business* (RakMk D3 2012, article 1.1.4)

How the energy efficiency of a building is considered depends on the category, presented above, in which the building belongs to. Here only the categories regarding living houses and holiday houses have been introduced, and they have been numbered from 1 to 4 in order to clarify their further processing. Categories are examined in more detail on the following pages.

1. Detached houses and semi-detached houses, terraced houses and linked detached houses. (RakMk D3 2012, article 1.1).

This class also includes *holiday houses, which are intended for accommodation business and have heating systems meant for year-round use* (RakMk D3 2012, appendix 1).

Evaluation of total energy consumption and area-based E-number requirements apply to these buildings. **E-number requirement for a log house is 25 kWh/m² less stringent than for other corresponding living houses.**

E-number of a new construction must not exceed the following values (RakMk D3 2012, article 2.1.4):

Class 1

Detached house, semi-detached house, terraced house and linked detached house	**Net heating area, A_{net}**	**kWh/m² per year**
Living house	A_{net} <120 m²	204
	120 m² ≤ A_{net} ≤ 150 m²	372 - 1,4 · A_{net}
	150 m² ≤ A_{net} 600 m²	173 - 0,07 · A_{net}
	A_{net} > 600 m²	130
Log house	A_{net} < 120 m²	229
	120 m² ≤ A_{net} ≤ 150 m²	397 - 1,4 · A_{net}
	150 m² ≤ A_{net} ≤ 600 m²	198 - 0,07 · A_{net}
	A_{net} > 600 m²	155

A_{net} = Net heating area (m²) refers to *the sum of the heated floor level areas as calculated according to the inner surfaces of the surrounding exterior walls. The net heating area can also be calculated from gross heating area, from which the area of the building components comprising the exterior wall has been decreased* (RakMk D3 2012 article 1.3.1 17)

The maximum value for a building's heat transfer coefficients is the same for all wall structures:

The maximum heat transfer coefficient must not exceed 0,60 W/m²K for components comprising the external envelope of a building, including wall, roof or ground floor, nor for building components adjacent to semi-heated spaces. (RakMk D3 2012, article 2.4.1)

U-value for 180 mm log is 0,60 W/(m² K), thus fulfilling the given requirement.

Log walls have a separate reference value for calculating heat losses of a building:

When calculating the reference value of heat loss for a building's external envelope, the following reference values are used as heat transfer coefficients U for building components of warm space, extra warm space or for cold space that requires cooling (RakMk D3 2012, article 2.4.1):

wall	0,17 W/(m²K)
log wall (the average minimum thickness of a log structure 180 mm)	0,40 W/(m²K)

When the average minimum thickness of a log wall is 180 mm, U-value 0,40 W/(m²K) can be used as the reference value when performing compensation calculations for heat losses. For thinner log structures or other materials the corresponding reference value for U-value requirement is 0,17 W/m²K. The average thickness is calculated according to Log standard SFS 5973.

Airtightness of log buildings

The airtightness regulations for building's external envelope are the same for log buildings and for other buildings. Air leakage values (q50) less than 4 (m³/(hm²)) can be used, if the smaller airtightness is proved by measurements or other procedure (RakMk D3 2012, article 2.3.2). An example of such a procedure is defined in the quality assurance guidelines for airtightness in prefabricated residential buildings (RT-information file RT 80-10974 and LVI-information file LVI 01-10540).

A log house that is built carefully by using the contemporary building materials and technologies is as airtight as other buildings. Log house manufacturers gather information regarding air leakage values of the houses they deliver. Below are the results of measured air leakage values over a two-year period.

Airtightness measurements for log houses in 2010–2011

	n_{50}
measured buildings	38 pcs
maximum	2,6 1/h
minimum	0,4 1/h
standard deviation	0,53
arithmetic mean	**1,5 1/h**

2. A building with maximum net heating area of 50 m²
(RakMk D3 2012, article 1.1.3 b)

The energy efficiency regulations 2012 do not apply on buildings with maximum net heating area of 50 m², regardless of use.

3. A holiday house, in which a heating system meant for year-round use has not been planned
(RakMk D3 2012, article 1.1.3 e)

The energy efficiency regulations 2012 do not apply on holiday houses, in which a heating system meant for year-round use has not been planned, regardless of area.

It has not been defined in more detail in the regulations what is meant by the heating system designed for year-round use. Warm space refers to a space, of which design room temperature during the heating season is chosen to be +17°C or higher due to residential or other reasons (RakMk D3 2012. article 1.3 23). The heating system is regarded as being designed for year-round use when the previously mentioned definition of a warm space is fulfilled. A fireplace, level of equipment or electrification alone does not make a building suitable for year-round use.

4. A holiday house, in which a heating system meant for year-round use has been planned, but which is not intended for accommodation business (RakMk D3 2012, article 1.1.4)

To a holiday house, in which a heating system meant for year-round use has been planned, only the heat loss requirements for building's exterior envelope apply (RakMk D3 2012, article 2.10.1). This building type has separate reference values for U-values when calculating heat losses for the building's external envelope. Other energy efficiency requirements do not apply to this building type.

Heat loss of a building's external envelope can be at maximum as great as the heat loss calculated by using the following reference values (RakMk D3 2012, article 2.10.1):

wall	*0,24 W/(m²K)*
log wall (minimum average thickness of log wall structure 130 mm)	*0,80 W/(m²K)*
Roof and suspended beam floor	*0,15 W/(m²K)*
Floor above crawl space (ventilation openings 8 ‰ out of the floor area at maximum)	*0,19 W/(m²K)*
Slab-on-ground	*0,24 W/(m²K)*
Window, skylight window, door	*1,4 W/(m²K)*

When the average minimum thickness of a log wall structure is 130 mm, 0,80 W/(m²K) can be used as the reference value for a wall when calculating heat losses. The corresponding reference value for U-value for thinner log structures or other wall materials is 0,24 W/(m²K). The average thickness is calculated according to Log Standard SFS 5973. The heating system designed for year-round use is defined in the previous section.

Sincerely,

The Finnish Log House Industry Association (HTT) ry

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