Comparison of Danish design programme Be06 with PHPP

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To validate that new buildings in Denmark fulfil the energy requirements of the new building regulations the energy demand has to be calculated with the programme Be06 newly developed by SBI (The Danish Building Research Institute). Furthermore in the new building regulations are defined low energy classes 1 and 2. Since future low energy building will be designed and calculated using the Be06 programme it is often asked if passive houses as well might be designed making use of the programme Be06. If not, designers of passive houses in DK have to learn to use both the Be06 programme and the PHPP.

A low energy house design of the Thyholm Murer Company has been modified to have a calculated energy demand that approximately meet low energy class 1. The house is in one floor with an internal treated floor area on 123 m² and an external floor area on 149 m². Furthermore the design has been modified to meet passive house standard (mainly by changing the geometry to a house in 2-stocks with an internal treated floor area on 197 m² and an external floor area on 238 m²). The energy demand of the two houses has been calculated with both the Be06 programme and the PHPP. Both the PHPP and the Be06 use simplified calculation methods based on monthly climate data. However as a standard calculations with Be06 used in connection with the Danish building regulations uses other calculation conditions than the PHPP.

Main differences in description

- In PHPP the results are given pr. m² of the internal treated floor area, while results in Be06 are given pr. m² of the external (brut) floor area.
- The 2 programs uses different geometry for description of transmission areas etc. and as a result linear losses are calculated different. Furthermore in PHPP the temperature in the ground is calculated, while in Be06 is used simplified assumptions

In the calculations given below the differences in description is as far as possible taken into account. The main differences in conditions are:

- PHPP calculations use as internal heat sources (heat gain from persons etc) 2,1 W/ m² (internal area) while Be06 uses 5 W/ m² (external area).
- In Be06 is requested an air change on at least 0,3 l/s pr. m² (~ 0,5 h^{-1}), while in PHPP is requested an air change on at least 0,3 h^{-1}. Furthermore based on the same blower door test results the 2 programs gives different results for the resulting infiltration rate.

Calcu-lation	Space heating demand Based on external floor area kWh/m² pr. year	Based on internal floor area kWh/m² pr. year	Climate	Internal heat sources W/m²	Ventilation air change l/s m²	Infiltration rate l/s m²
	Low energy house					
	PHPP					
	21,1	25,4	HUSUM			
	24,0	**28,9**	DK			
	Be06					
Be06 1	**14,8**	17,9	DK	5,00	0,30	0,065
Be06 2	29,1	35,1	DK	1,74	0,30	0,065
Be06 3	24,4	29,4	DK	1,74	0,30	0,022
Be06 4	22,9	**27,6**	DK	1,74	0,22	0,022
	Passive house					
	10,7	12,9	HUSUM			
	12,4	**15,0**	DK			
	Be06					
Be06 11	**9,9**	12,0	DK	5,00	0,30	0,080
Be06 12	19,2	23,2	DK	1,74	0,30	0,080
Be06 13	15,1	18,3	DK	1,74	0,30	0,021
Be06 14	13,7	**16,6**	DK	1,74	0,17	0,021

The table gives the results of the calculations with PHPP and Be06. In calculation Be06 1-4 and Be06 11-14 the conditions in Be06 have been gradually changed to conditions used in PHPP

Conclusions

The low energy house will calculated with Be06 and using Danish conditions have a space heating demand on 14,8 kWh/m^2 pr. year, while the result calculated with PHPP is 28,9 kWh/m^2. By changing the conditions in Be06 to be in agreement with PHPP the result is 27,9 or close to the PHPP result. The corresponding figures for the passive house is 9,9 kWh/m^2 compared to 15,0 kWh/m^2 (and 16,6).

I.e. by using the same conditions in the 2 programs the results are in good agreement, but using the normal conditions for the 2 programs gives very different results. This must be taken into consideration when discussing the passive house definition for Danish houses. The results apply for the annual heat demand. For the dimensioning heat load the programmes use different methods and give very different results, were PHPP is the most developed and considered to be most correct.