SUPER THERM insulation Proof of House in Germany

Expertise on buildings in Taufkirchen (short version)

Evaluation of heat insulation standards at buildings Fichtenstrasse 5-8 and Nelkenstrasse 11/2 and 11/3 in 84416 Taufkirchen/Germany.

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Evaluation of the relevant results of on-site measurements during winter 2008, numerous reports and records, as well as the energy performance certificate, validated and executed in april 2008.

Situation:

It is to be clarified, whether the coating with the product Super Therm at the above mentioned buildings exhibits heat insulating properties.

For this purpose measurements of the air temperature and of the relative air humidity in four chosen appartments have been carried out during winter 2008. Also the prevailing climate outside the houses, including air humidity and temperature, has been recorded.

The analysis of more than 10.000 data, the recording of consumption of heating oil, and especially the analysis of the latest version of the energy performance certificate, validated in april 2008 (according to regulation EnEV 2007) reflects a clear picture of the heat insulating characteristics of the buildings concerned.

Procedural method of analysis:

As already thoroughly explained at the owners meeting on 4/22/2008, the results from both measuring spots, located at the inside of the exterior walls are significally related to the trends of temperature and air humidity of the outside climate.
This means that a decrease of temperature on the outside causes temporally delayed an decrease of temperature on the interiour side of the wall. Same situation with an increase of temperature on the outside, the temperature amplitude relation shows the increase on the inside temporally delayed. The heat insulation properties of a wall are among other reasons the cause for how fast, slow or explicit these outside temperature changes can be measured on the inside.

For the exact anlysis, we chose 7 prominent periods, when strong thermal fluctuation occurred. By means of thermal simulation processes, based on the Finite-elements-calculation we simulated the close-to-surface temperatures of different wall constructions with consideration of the original weather data. We evaluated a comparable non-insulated massive exterior wall as well as the exterior wall with different insulations. The non-insulated wall reacted relatively quickly to temperature changes, the walls with thick insulations reacted only weakly and dully.

We determined the equivalent insulation thickness by comparing the real measured curve to the theoretical calculated one.

Results:

1. According to the existing construction plans the exterior walls consist of 7-cavity block tiles. The regulations for heat protection from 1964 make an equivalent heat conductivity of $\lambda = 0{,}54$ W/(mK) for the tiles most probable. From this results an U-value for the wall of at least **U_{AW} = 1,38 W/(m²K)**. This value is also part of the thermal calculation basis.

2. Evaluating the thermal simulation, the highest congruence in phase shift can be found on the original 30 cm wall with an average insulation thickness of 81 mm (lower limit 78 mm, higher limit 84 mm). The insulating material is accounted for a conductivity of **λ = 0,035 W/(mK)** here. (The equivalent insulation thicknesses related to a conductivity of $\lambda = 0{,}040$ W/(mK) are therefore between 89 and 96 mm.)

3. Following this calculation, a wall with the theoretically determined insulation thickness of 81 mm reaches an U-value of **U_{AW} = 0,33 W/(m²K)**. The comparison to the original U-value of 1,38 to 0,33 shows a reduction of the U-value of 76 % strictly concerning the wall. This means, that the exterior wall allows 76% less heat energy to pass through than before. So there is a 76% saving of energy in the wall.

4. As there is no thermal insulation composite system at the building, this means, that the energy saving is made possible by the Super Therm coating.
   The effect on saving heating energy is also influenced by the insulating performance of windows, the roof areas and the existing heating system.

5. For the evaluation of the total result we received important information through the energy performance certificate, validated on 4/18/2008 (valid until 4/18/2018).
   It says, that the concerning object has the same heat insulating properties than a single family house which was newly built according to the recent EnEV regulation. This result points out the excellent insulation performance of the exterior walls, because with the original U-value of 1,38 W/(m²K) from 1964 the building would range in the red-orange area and would be due to thermotechnical reconstruction. But this is not the case.

6. The results of the measurements, of the thermal simulations, and of the energy performance certificate underline the fact, that at least the outer shell of the corcerned building fulfills the requirements as stated in the regulations EnEv 2007 and of course also EnEV 2002.
   Refurbishments of windows and heating system will lead to further perceptible savings in energy consumption.

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