

Prispevki sodelavcev v okviru projekta

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Zahteve po energijski učinkovitosti stavb se zaostrojujejo. Razvil se je standard pasivne hiše, trenutno optimalna energijsko učinkovita hiša. Pasivna hiša potrebuje za ogrevanje največ 15 kWh/(m²a). Da se doseže tako nizka poraba, mora imeti stavba dobro toplotno izoliran in zrakotesen ovoj brez toplotnih mostov. Na ta način se doseže izredno nizke transmissijske toplotne izgube. Stavba mora imeti vgrajen sistem kontroliranega prezračevanja z vračanjem toplote odpadnega zraka, s čimer se zmanjšajo tudi prezračevalne izgube. Toplotne izgube ob ustrezni zasnovi ne presegajo 10 W/m² in jih je mogoče pokriti s t.i. toplozračnim ogrevanjem. Klasični ogrevalni sistem ni več potreben.

Ena osnovnih zahtev za doseganje standarda pasivne hiše je "konstruiranje brez toplotnih mostov". Večino problematičnih stikov je mogoče rešiti s prekinitvijo toplotnega mostu z vgradnjo toplotne izolacije med elemente nosilne konstrukcije. Bolj zahtevno je preprečevanje toplotnega mostu na stiku stavbe s terenom. Stroka predlaga vgradnjo toplotne izolacije z ustrezno tlačno trdnostjo pod temeljno ploščo ali pasovne temelje. Za ta namen se najbolj pogosto uporabljata XPS ter granulat penjenega stekla.

V evropskem prostoru, kjer so pasivne hiše že postala ustaljena praksa, večinoma ne poznajo potresov, zato so te rešitve ustrezne. V zadnjih letih pa se standard pasivne hiše počasi uveljavlja tudi na področjih, kjer so pogosti tudi močni potresi, med drugim v Španiji, Portugalski, Italiji, Grčiji, Hrvaški in Sloveniji.

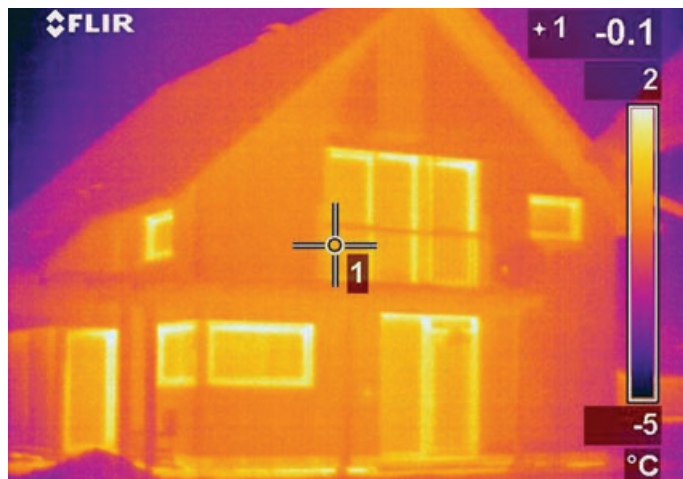
V okviru raziskovalnega projekta so bile izpostavljene ključne rešitve temeljenja brez toplotnih mostov, ki se uporabljajo v tujini, vendar niso preverjene na potresne obremenitve.

UPORABNOST REZULTATOV

Rezultati so pokazali, da je prenašanje rešitev iz tujine lahko v naših pogojih problematično. Kritična je lahko, višina stavbe, oblika stavbe, konstrukcijsko gradivo in kvaliteta toplotne izolacije.

KLJUČNE BESEDE

Temeljenje, toplotni most, pasivna hiša, toplotna izolacija.

**SUMMARY**

Energy efficiency of buildings has been growing more stringent. The passive house standard has been developed – this is currently the optimal energy-efficient house.

The annual heating energy demand in passive house may not exceed 15 kWh/(m²a). In order to achieve such low consumption, the building must have a well thermally insulated and airtight envelope without thermal bridges. In this way, transmission heat losses through the envelope are kept very low. The building must have a system of controlled ventilation with heat recovery, which also helps reduce ventilation heat losses. With suitable planning, heating loads do not exceed 10 W/m² and can be covered by so-called air heating. A traditional heating system is no longer necessary.

One of the basic requirements for the treatment of the passive house standard is 'construction without thermal bridges'.

The majority of problematic junctions can be resolved through interruption of the thermal bridge by installing thermal insulation between the elements of the supporting structure. Eliminating the thermal bridge at the point of contact between the building and the ground is more difficult. Experts propose installation of thermal insulation with suitable compressive strength below the foundation slab or strip foundations. The materials most frequently used for this purpose are XPS and foam glass granulate.

In those parts of Europe in which passive houses have already become established practice, earthquakes are for the most part unknown and therefore these solutions are suitable. In recent years, however, the passive house standard has slowly been gaining ground in areas where earthquakes (including strong earthquakes) are frequent, such as Spain, Portugal, Italy, Greece, Croatia and Slovenia.

Within the research project, some key solutions regarding founding without thermal bridges were introduced. These solutions are being used abroad, but aren't calculated for seismic activity.

ISSUES AND ITS SIGNIFICANCE

The results have shown that applying foreign solutions in our conditions can be problematic. Critical can be the height and the shape of the building, construction material and the quality of thermal insulation.

KEY WORDS

Foundation, thermal bridge, passive house, thermal insulation.

Slika 1: Toplotni mostovi na fasadnem ovoju energijsko učinkovite hiše.

Okenski okvirji in nedokončan podstavek stavbe.

Figure 1: Thermal bridges on the facade envelope of energy efficient house. Window frames and unfinished facade at the bottom.