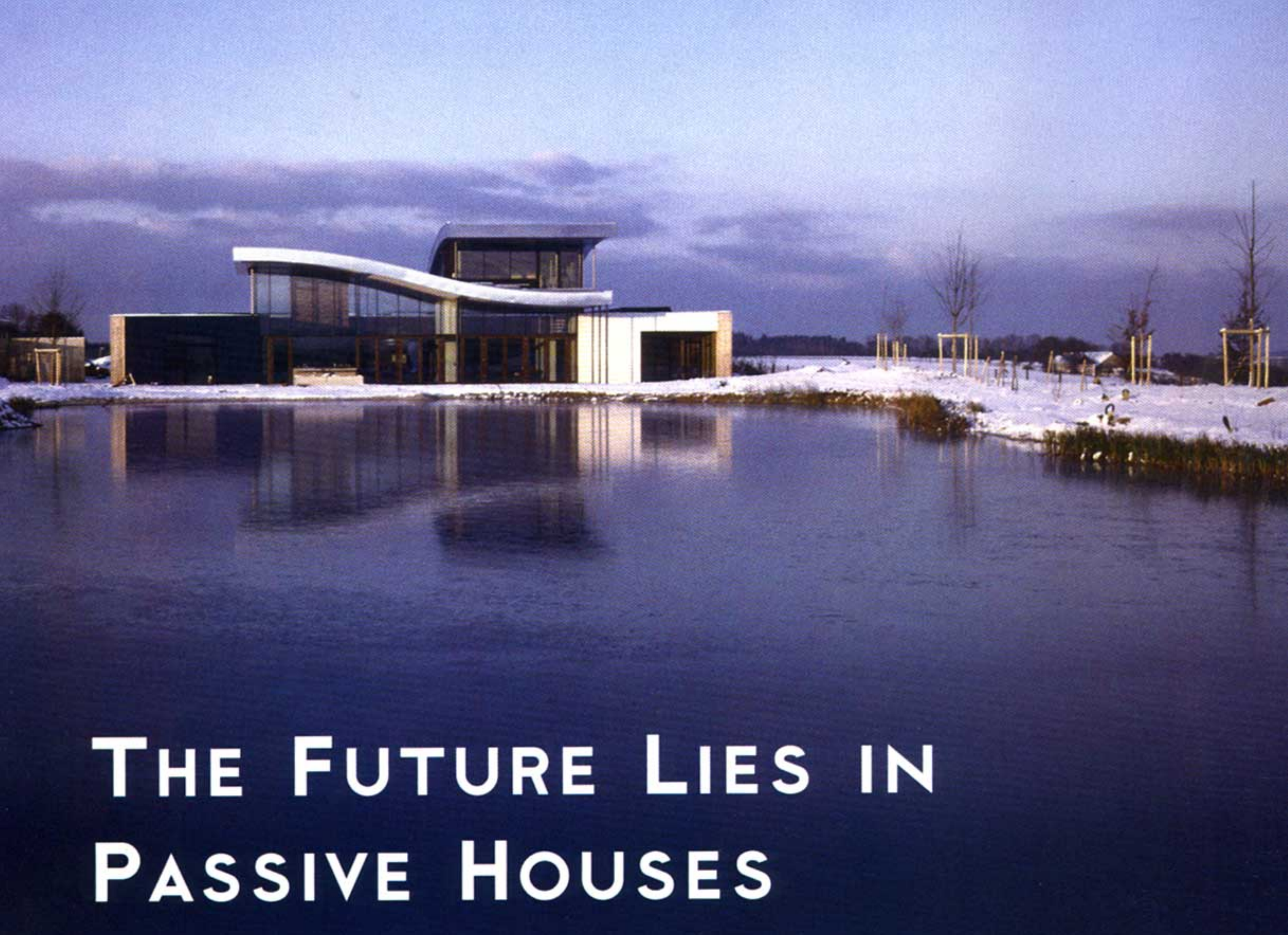

The Future Lies in Passive Houses

Rory O'Donovan, an Irish architect based in Vienna, reports on the growing popularity of super-insulated houses in Austria that require little or no heating

While residents across Ireland will face a grim winter in the wake of recent energy and heating cost increases, the owners of so-called 'passive houses' in Austria can enjoy a comfortable environment with only occasional supplementary heating required. Many of these pioneer passive houses can be found in Austria's most westerly province Vorarlberg, where the people are known for thriftiness and pragmatism. Although environmental awareness can at times reach almost irritating heights in Austria, these new house designs dispel the general belief that a passive house offers little opportunity for design, as it must always be wrapped in thick insulation and glazed to the south. Instead these attractive Vorarlberg houses prove that it is indeed possible to combine design quality with the use of the passive house system.

According to the Institute for Energy Research (Energieinstitut) in Voralberg, a passive house is defined as "a building in which a comfortable interior climate can be produced both in summer and winter without the need for a separate heating system". In technical terms, the annual heating needs should not exceed 15kWh/(mÇa). The basic principles of the passive house are simple: "an extremely well-insulated building envelope [1] that is as air-tight as possible, the avoidance of thermal bridges, and the maximum exploitation of passive solar energy such as large areas of south-facing glazing, while minimised openings on the north side". Within this sealed building, a ventilation system provides fresh air and the heat from the extract stale air is recovered. On particularly cold days – Austrian winters can be extremely cold – the fresh air can be warmed slightly, additional pre-warming by means of ground heat exchangers is also possible.

Architect Johannes Kaufmann is an extremely well known figure in the area of timber building in Vorarlberg and indeed far beyond the borders of this province. His economic terraced housing development *Passivhaus Falkenweg* [2] on the periphery of the town of Dornbirn in the extreme west of Austria, uses an idiom of crisply detailed and reduced timber building familiar to those who know modern architecture in Vorarlberg. The terrace of nine two-storey houses is built entirely of wood (including the party walls, which have an F60 rating). The modestly-sized houses (86 m²) have a simple and logical clarity. The ground floor comprises a kitchen-dining-living area, single flight staircase (with storage space behind) leading to the upper floor with the bathroom and two bedrooms. The entrance is from the north side, the living areas face south. The opaque areas of wall have U values of about 0.1 W/(m²K), the windows are timber framed with triple glazing. The ventilation system is used to heat the houses, but there are additional radiators in the bathrooms and in the more exposed end units. The ventilation can be individually adjusted and the ventilation plant is located in 'mini-cellars' that run in a strip beneath the north front of the terrace and are accessed by heavily insulated trapdoors.

The theme of the passive house has long since spread beyond the state of Vorarlberg to the rest of Austria, and although warnings are often issued of dubious business practices that exploit the Austrians' innate susceptibility for anything dubbed 'öko' (ecological), there are by now quite a number of single family houses and, more recently, apartment buildings that use the principles of the passive house.

The *Villa K* [3] in Sipbachzell, Upper Austria by the young team of junger beer architektur uses a very different idiom to the terraced houses in Vorarlberg. Two curving roof slabs hover over what the architects describe as a "living room landscape" which has, for the most part, completely glazed walls and is surrounded by the "houses", containing the private areas (bedrooms, guest rooms, service areas). The style is dramatic and sensuous; the image of the glazed main space seen across a snowy landscape is highly memorable. This house successfully combines a perfectly functioning passive house concept with a maximum of openness and transparency.

Main: The sensous *Villa K* combines passive house technology with a maximum of openness

Top and small: *Passivhaus Falkenweg*: a terrace of nine heavily-insulated timber houses with exceptional low energy usage

Top left and right: *Solar City Linz*, one of Europe's largest and most innovative eco-building projects. Apartments by Martin Treberspurg
Bottom right: The cost-effective *Wöginger Passive House* uses a considerable amount of prefabrication

Poppe&Prehal Architects have designed a number of single-family houses that employ this idea, as well as passive supermarket and have produced an ecological urban development concept for the Upper Austrian town of Grieskirchen on a 32-hectare site not far from the town centre. These architects are passive house specialists but not fundamentalists; where there is a clash of interests architectural and urban criteria take precedence. Their *Wöginger Passive House* [4] is a compact single-family house where, in an infringement of the rules, the glazed façade that faces approximately south is a short end façade, rather than one of the longer sides. The lightweight timber envelope was built using a considerable amount of prefabrication; the wood used is untreated larch. This house meets all the criteria of a classic passive house and has received a number of awards, including the major Austrian Solar Architecture Prize in 2003.

Vienna-based architect Martin Treberspurg [5] has been one of the main proponents of the exploitation of solar energy in housing for many years, and is indeed regarded as something of a doyen in this area. He tells how, more than ten years ago, his colleagues scolded him for promoting energy-saving building with large amounts of thermal insulation, as "you can't build decent houses that way". Treberspurg admits that in quite a number of ecologically oriented housing projects aesthetic and architectural aspects have not been given adequate attention, largely because the development of the passive house concept was not initiated by architects. "But nor will they be able to stop it," he says.

Treberspurg has demonstrated how architectural quality can be combined with the sensible use of available energy in his project *einfach:wohnen* (simple living) in the Solar City in Linz. In 1996 he won the urban planning competition for the next stage of an ecological housing development the core of which had been designed by the READ group (Renewable Energies in Architecture and Design) consisting of Norman Foster Thomas Herzog, Renzo Piano, Richard Rogers and energy technology planner Norbert Kaiser.

For the housing association EBS, Martin Treberspurg has designed seven apartment buildings in the Solar City with a total of 93 dwelling units. One of these buildings is an "almost passive building", one is a "passive building", while the other five are low energy buildings (the predecessor of the passive house). Whereas these five buildings have conventional radiators, the "almost passive building" has additional insulation, a supply and exhaust ventilation system in which the fresh air is heated by a ground collector and heat is recovered from the exhaust air. These buildings have smaller radiators, whereas the passive building, which has extremely high levels of insulation, has no additional heating apart from a small radiator in the bathroom that is supplied from the district heating system. Solar collectors help heat the warm water and, according to calculations, can supply up to 60 per cent of the energy required. Treberspurg says that he regards the passive house as the logical end point of the development of energy-saving houses and explains that one reason why this concept has been largely confined to private single-family houses is that the technical demands on both designers and the construction firms are extremely high.

That the concerns of energy-saving and exploitation of the sun's free (solar) energy can indeed be combined with ambitious architectural design has clearly been proved by these and other innovative passive houses in Austria. There can however be little doubt that this is where the future lies.

Endnotes

[1] Note: As part of an air-tight building, windows glazing should have a U-value (heat-loss) of less than 0.75 W/mÇK

[2] Passive Terraced Houses Falkenweg, Dornbirn, Austria. Architect: Johannes Kaufmann. E office@jkarch.at
Photography: Ignacio Martinez, Spain.

[3] Villa K, Sipbachzell, Austria. Architects: junger_beer architektur. E office@jungerbeer.at
Photography: Dietmar Tollerian

[4] Wöginger Passive House, Grieskirchen, Austria. Architects: Poppe & Prehal Architekten. E office@poppeprehal.at
Photography: Dietmar Tollerian

[5] EBS housing development Solar City Linz, Austria.
Architect: Martin Treberspurg. E office@treberspurg.at
Photography: Friedrich Mühling

The author owes a special debt of thanks to the people from nextroom architecture databank. Their website offers a superb range of information on almost every aspect of modern architecture in Austria. www.nextroom.at

Other useful Austrian and German websites on passive houses and energy and building:
www.ig-passivhaus.de
(with English translations)
www.igpassivhaus.at
www.energieinstitut.at